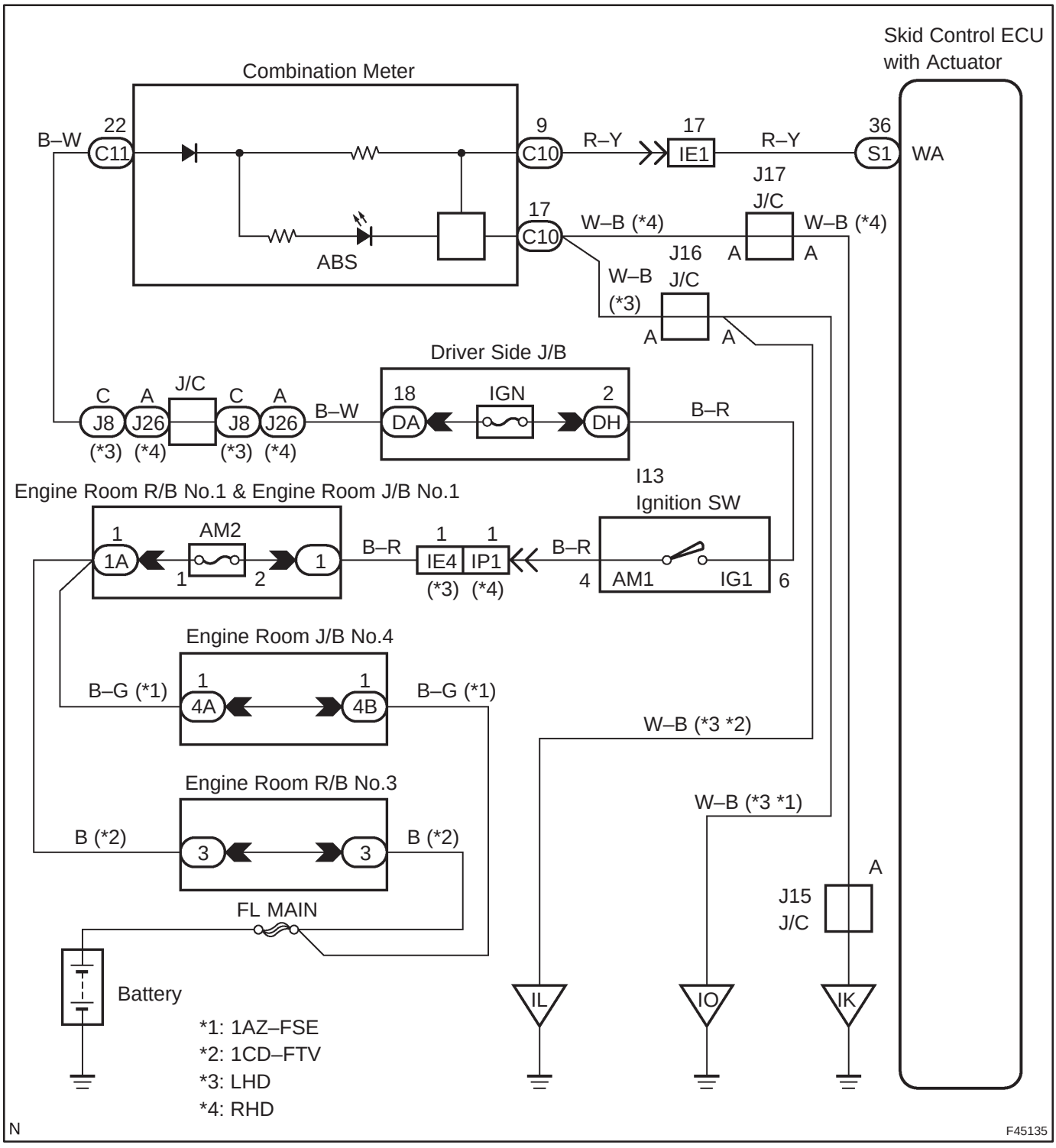
ABS WARNING LIGHT CIRCUIT (DOES NOT LIGHT UP)

CIRCUIT DESCRIPTION

If the ECU detects trouble, it will prohibit ABS control, turn on the ABS warning light, and store the DTC. Connect terminals Tc and CG of the DLC3 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(ABS WARNING LIGHT)

(a) Check that ”ON” and ”OFF” of the ABS warning light is shown on the combination meter by the hand–held tester.

OK → REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

2	INSPECT ABS WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTORL ECU – CMBINATION METER)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

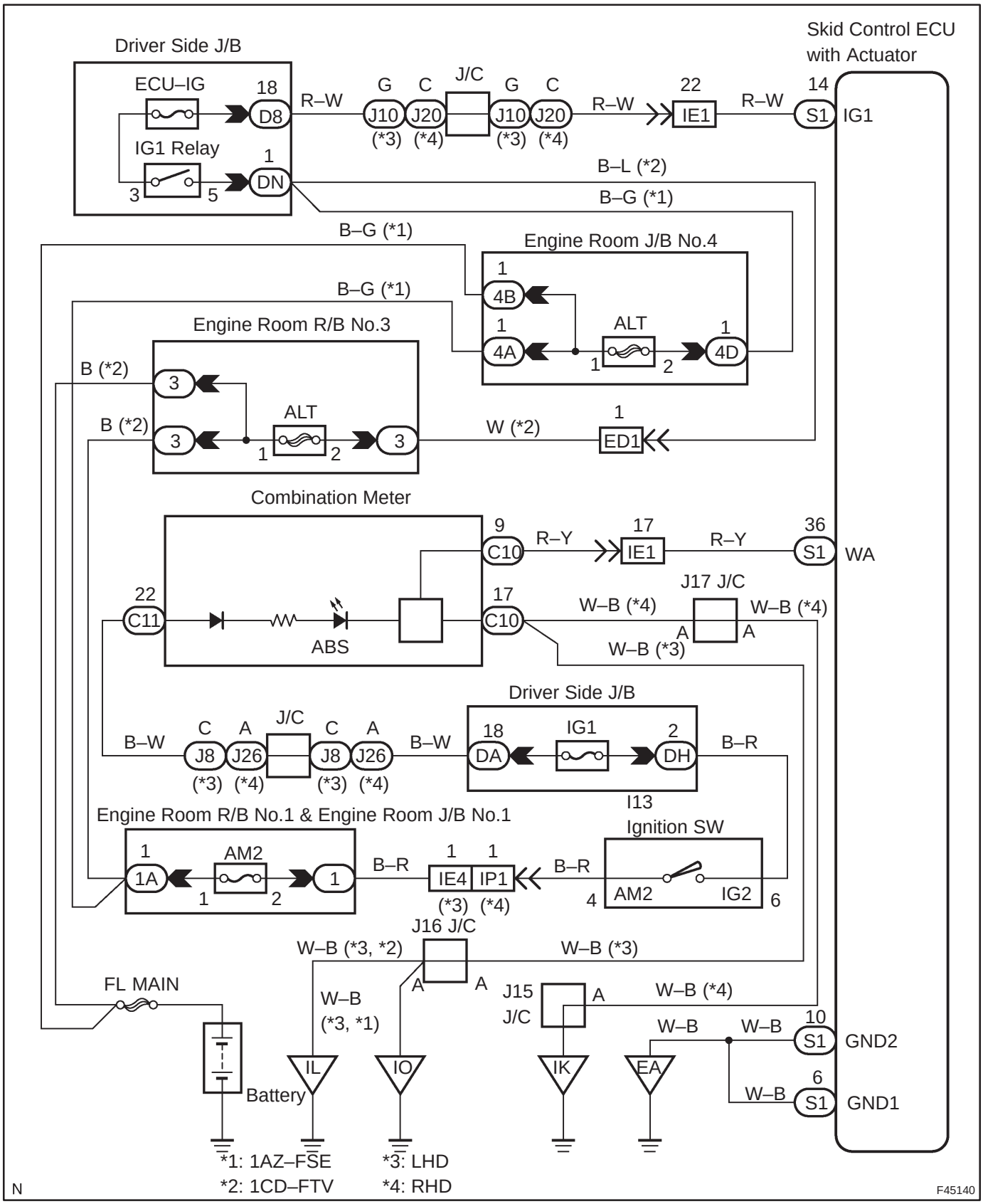
DTC	AlwaysON	MALFUNCTION IN ABS ECU

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Either of the following 1 or 2 is detected: 1. The ECU connectors are disconnected from the ECU. 2. There is a malfunction in the ECU internal circuit. 3. Malfunction in the circuit of meter or ABS warning light circuit.	• Battery • IC regulator • ABS warning light circuit • Power source circuit • Skid control ECU

HINT:
There is a case that hand–held tester cannot be used when ECU is abnormal.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC FOR ABS

(a) Check the DTCs are output (See page 05–756).

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

2	INSPECT SKID CONTROL ECU CONNECTOR SECURELY CONNECTED

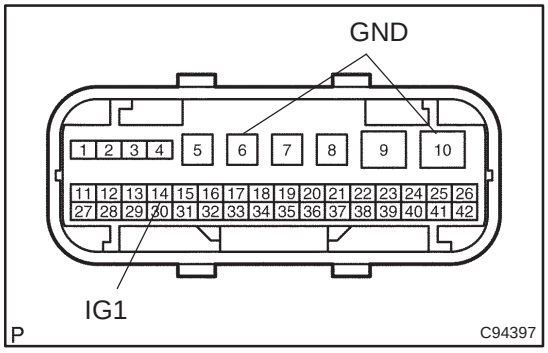
NO → CONNECT CONNECTOR TO ECU

YES

3	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(IG1 TERMINAL)

WITH USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



WITHOUT USING HAND–HELD TESTER:

(a) Disconnect the skid control connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

4	INSPECT BATTERY

OK:
Voltage: 10 to 14 V

NG → INSPECT CHARGING SYSTEM

OK

5	CHECK HARNESS AND CONNECTOR(DLC3 – SKID CONTROL ECU)

(a) Check for a short circuit in harness and connector between terminal Tc of the DLC3 and skid control ECU (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6	INSPECT ABS WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

7	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

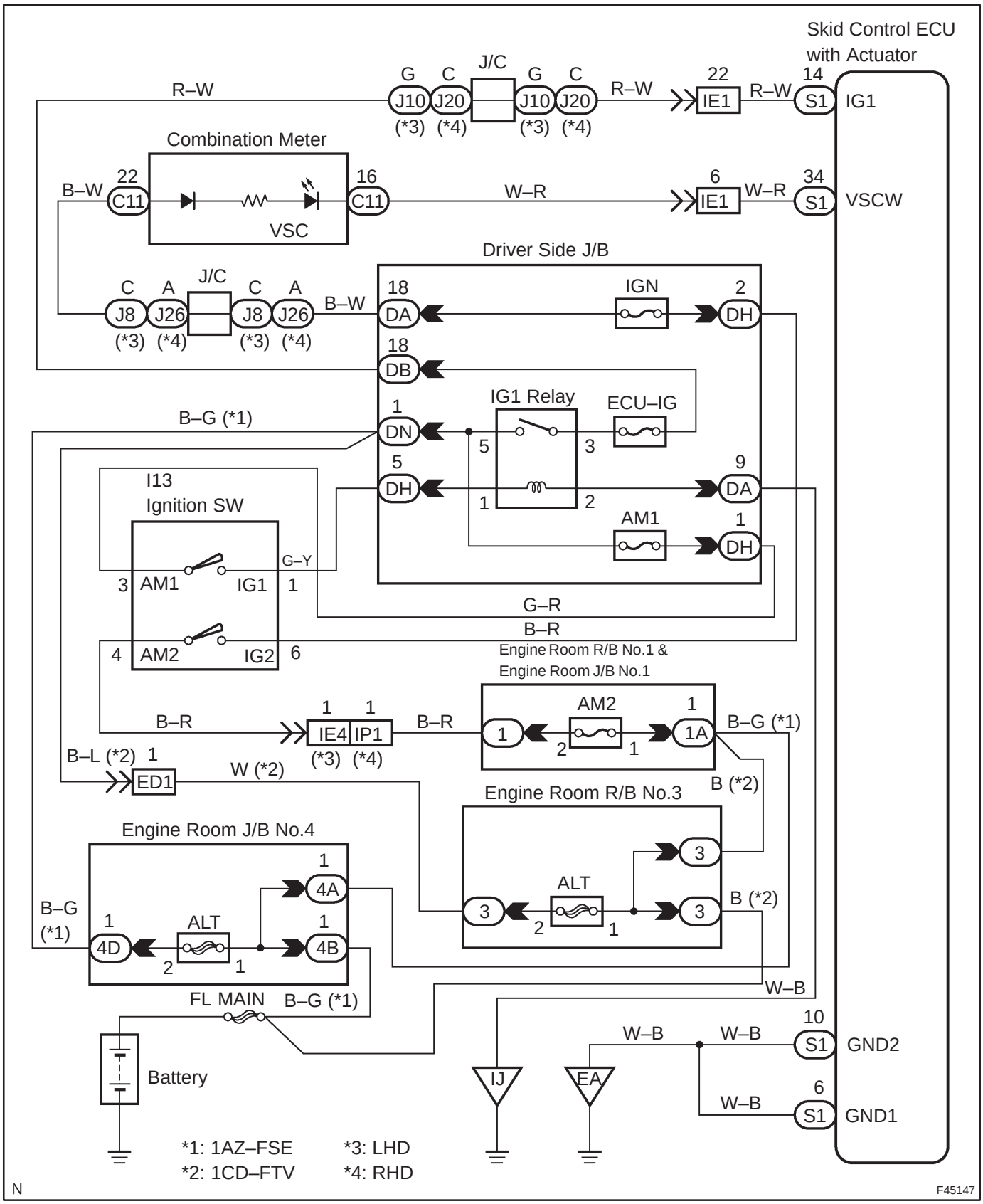
DTC	AlwaysON	MALFUNCTION IN ECU(VSC WARNING LIGHT)

CIRCUIT DESCRIPTION

When the ECU stores DTC, the VSC warning light illuminates on the combination meter.

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Malfunction in skid control ECU	• Battery • IC regulator • Power source circuit • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC FOR VSC

(a) Check the DTCs are output (See page 05–756).

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

2	INSPECT SKID CONTROL ECU CONNECTOR SECURELY CONNECTED

NO → CONNECT CONNECTOR TO ECU

YES

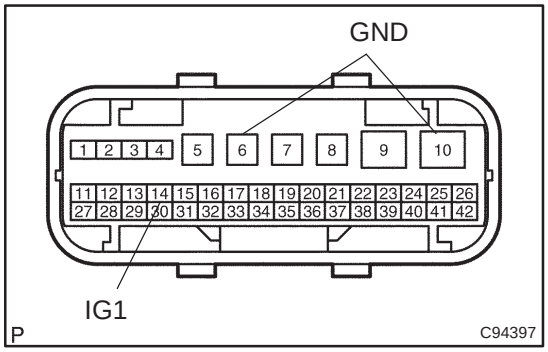
3	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(IG1 TERMINAL)

WITH USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.

OK:

"Normal" is displayed.



WITHOUT USING HAND–HELD TESTER:

(a) Disconnect the skid control connector.

(b) Turn the ignition switch ON.

(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.

OK:

Voltage: 10 to 14 V

OK → REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

4	INSPECT BATTERY

OK:

Voltage: 10 to 14 V

NG → INSPECT CHARGING SYSTEM

OK

5	CHECK HARNESS AND CONNECTOR(DLC3 – SKID CONTROL ECU)

(a) Check for a short circuit in harness and connector between terminal Tc of the DLC3 and skid control ECU (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6	CHECK VSC WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

7	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

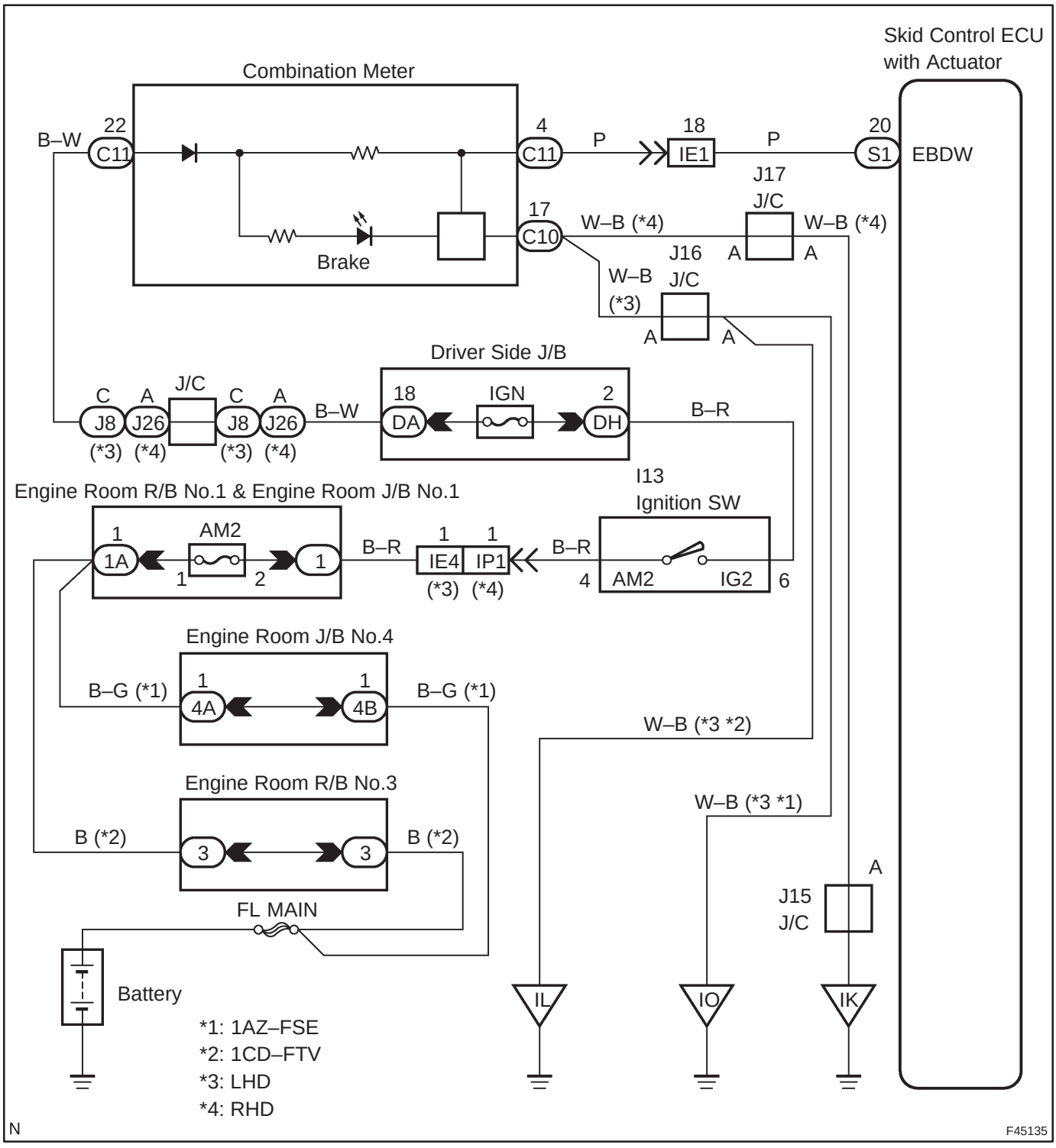
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

BRAKE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

The Brake warning light comes on when the brake fluid is insufficient, the parking brake is applied or the EBD is defective.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(BRAKE WARNING LIGHT)

(a) Check that ”ON” and ”OFF” of the Brake warning light is shown on the combination meter by the hand–held tester.

OK → Go to step 4

NG

2	CHECK DTC FOR ABS

(a) Check the DTC on page 05–756.

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

3	INSPECT BRAKE WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

4	INSPECT PARKING BRAKE SWITCH ASSY(See page 71–3)

NG → REPLACE PARKING BRAKE SWITCH ASSY

OK

5	INSPECT BRAKE FLUID LEVEL WARNING SWITCH(See page 71–3)

NG → REPLACE BRAKE MASTER CYLINDER RESERVOIR SUB–ASSY

OK

6	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – PARKING BRAKE SWITCH)

(a) Check for an open or short circuit in harness and connector between terminal PKB of the skid control ECU and parking brake switch (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – BRAKE FLUID LEVEL WARNING SWITCH)

(a) Check for an open or short circuit in harness and connector between terminal EBDW of the skid control ECU and brake fluid level warning switch (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION MERTER)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

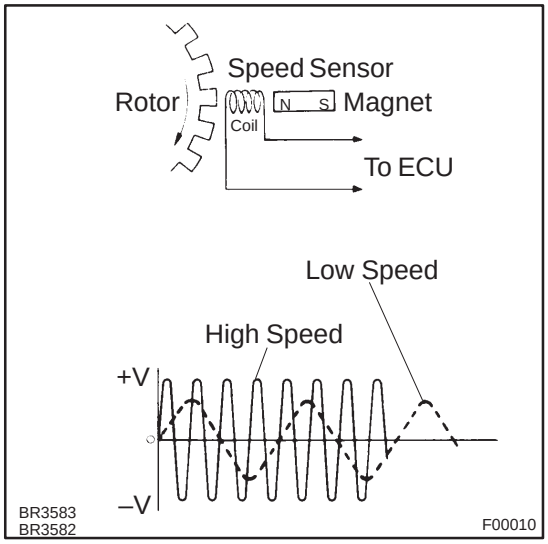
DTC	C0200/31	RIGHT FRONT SPEED SENSOR

DTC	C0205/32	LEFT FRONT SPEED SENSOR

DTC	C1330/35	RIGHT FRONT SPEED SENSOR CIRCUIT

DTC	C1331/36	LEFT FRONT SPEED SENSOR CIRCUIT

CIRCUIT DESCRIPTION

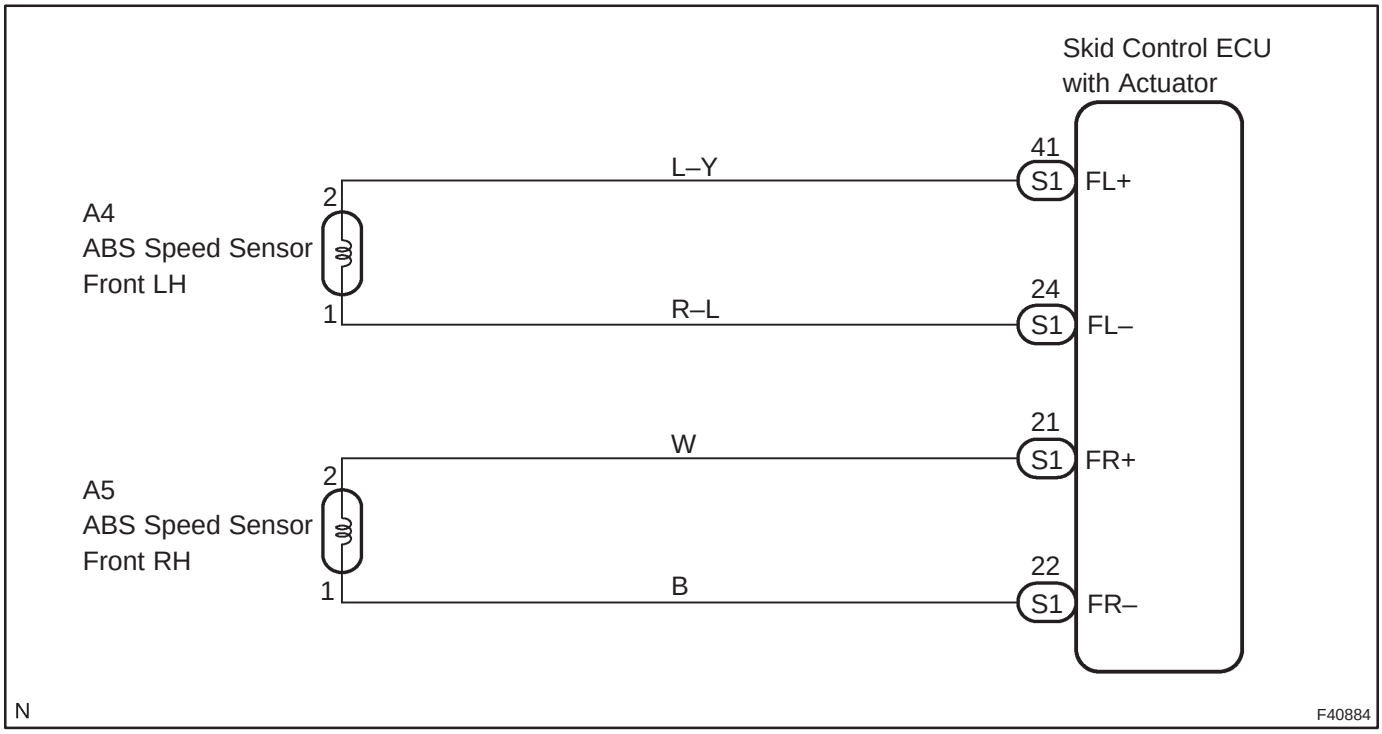


The speed sensor detects wheel speed and transmits the appropriate signals to the ECU. These signals are used for control of the ABS and VSC control systems. Each of the front and rear rotors has 48 serrations.
When the rotors rotate, the magnetic field generated by the permanent magnet in the speed sensor induces an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

DTC No.	DTC Detecting Condition	Trouble Area
C0200/31 C0205/32	When any of the following 1 to 3 is detected : 1. Vehicle speed is more than 40 km/h (25 mph), pulses are not input for 0.01 second. 2. After the initial start or restart and when the vehicle speed has reached 12 km/h (7 mph), the wheel speed of 0 km/h (0 mph) is detected. 3. After the initial start or restart and when the vehicle speed has reached 18 km/h (11 mph), the front wheel speed of 0 km/h (0 mph) is detected.	• Right front and left front speed sensor • Speed sensor rotor
C1330/35 C1331/36	Detecting abnormality in the resistance value of each speed sensor.	• Right front and left front speed sensor • Speed sensor circuit

HINT:
DTC No. C0200/31 and C1330/35 are for the right front speed sensor.
DTC No. C0205/32 and C1331/36 are for the left front speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF HAND–HELD TESTER(FRONT SPEED SENSOR)

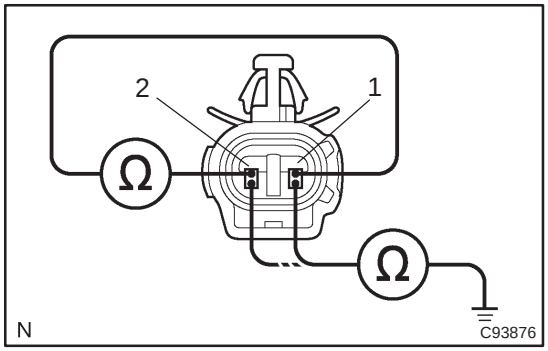
(a) Select the item "WHEEL SPEED FL (FR)" in the DATA LIST and read the value displayed on the hand–held tester.
(b) Check that there is no difference between the speed value output from the speed sensor displayed on the hand–held tester and the speed value displayed on the speedometer when driving the vehicle.
OK:
There is almost no difference in the displayed speed value.

HINT:
There is tolerance of ±10 % in the speedometer indication.

OK → **Go to step 5**

NG

2 INSPECT FRONT SPEED SENSOR



(a) Remove the fender liner.
(b) Disconnect the speed sensor connector.
(c) Measure resistance between terminals 1 and 2 of the speed sensor connector.
OK:
Resistance: 1.2 to 1.6 kΩ at 20°C (68°F)
(d) Measure resistance between each of terminals 1 and 2 of the speed sensor connector and body ground.
OK:
Resistance: 1 MΩ or higher

NG → **REPLACE SPEED SENSOR FRONT RH**

NG → **REPLACE SPEED SENSOR FRONT LH**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

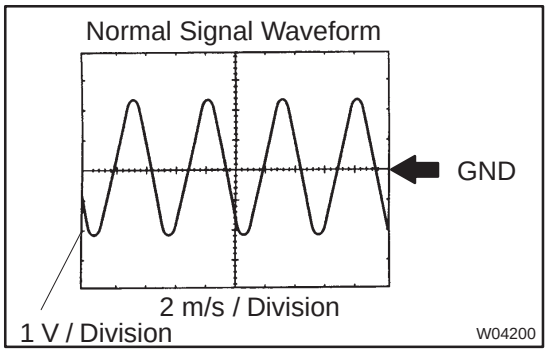
3 CHECK HARNESS AND CONNECTOR(FRONT SPEED SENSOR–SKID CONTROL ECU)

(a) Check for an open and short circuit in harness and connector between each front speed sensor and the skid control ECU connector (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



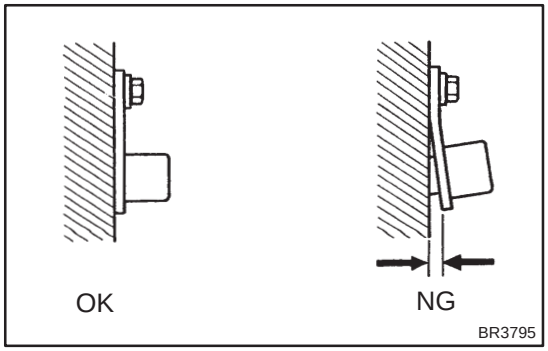
(REFERENCE) INSPECTION USING OSCILLOSCOPE
(a) Connect the oscilloscope to the terminals FR+ – FR– and FL+ – FL– of the skid control ECU.
(b) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

HINT:
- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform becomes shorter and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter deposited on it.

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

5 INSPECT FRONT SPEED SENSOR INSTALLATION



(a) Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and front steering knuckle.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

NG → **REPLACE SPEED SENSOR FRONT RH**

NG → **REPLACE SPEED SENSOR FRONT LH**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

6 INSPECT SPEED SENSOR TIP

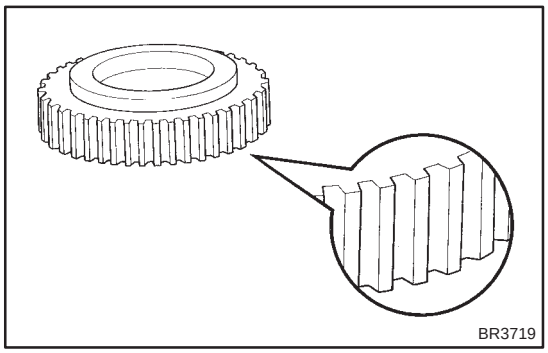
(a) Remove the front speed sensor (See page 32–59).
(b) Check the sensor tip.
OK:
No scratches or foreign objects on the sensor tip.

NG → **CLEAN OR REPAIR SPEED SENSOR**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

7 INSPECT SPEED SENSOR ROTOR



(a) Remove the front speed sensor rotor (See page 30–6).
(b) Check the sensor rotor serrations.
OK:
No scratches, missing teeth or foreign objects.

HINT:
If a foreign object is attached, remove it and after reassembling, check the output waveform.

NG → **CLEAN OR REPAIR SPEED SENSOR ROTOR**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC	C0210/33	RIGHT REAR SPEED SENSOR

DTC	C0215/34	LEFT REAR SPEED SENSOR

DTC	C1332/38	RIGHT REAR SPEED SENSOR CIRCUIT

DTC	C1333/39	LEFT REAR SPEED SENSOR CIRCUIT

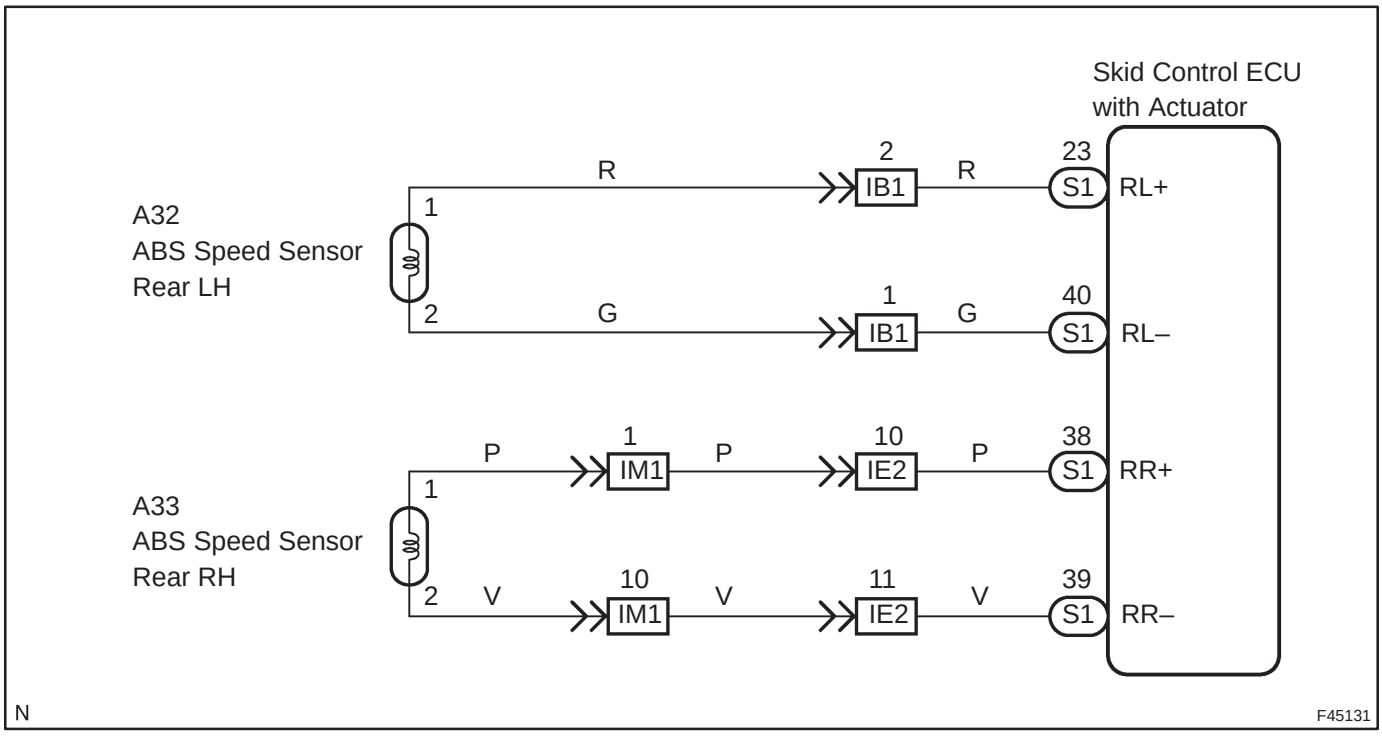
CIRCUIT DESCRIPTION

Refer to DTC C0200/31, C0205/32, C1330/35, C1331/36 on page 05–774.

DTC No.	DTC Detecting Condition	Trouble Area
C0210/33 C0215/34	When any of the following 1 to 3 is detected : 1. Vehicle speed is more than 40 km/h (25 mph), pulses are not input for 0.01 second. 2. After the initial start or restart and when the vehicle speed has reached 12 km/h (7 mph), the wheel speed of 0 km/h (0 mph) is detected. 3. After the initial start or restart and when the vehicle speed has reached 18 km/h (11 mph), the front wheel speed of 0 km/h (0 mph) is detected.	• Right rear and left rear speed sensor • Speed sensor rotor
C1332/38 C1333/39	Detecting abnormality in the resistance value of each speed sensor.	• Right rear and left rear speed sensor • Speed sensor circuit

HINT:
DTC No. C0210/33, C1332/38 are for the right rear speed sensor.
DTC No. C0215/34, C1333/39 are for the left rear speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF HAND–HELD TESTER(REAR SPEED SENSOR)

(a) Select the item "WHEEL SPEED RL (RR)" in the DATA LIST and read the value displayed on the hand–held tester.

(b) Check that there is no difference between the speed value output from the speed sensor displayed on the hand–held tester and the speed value displayed on the speedometer when driving the vehicle.

OK:

There is almost no difference in the displayed speed value.

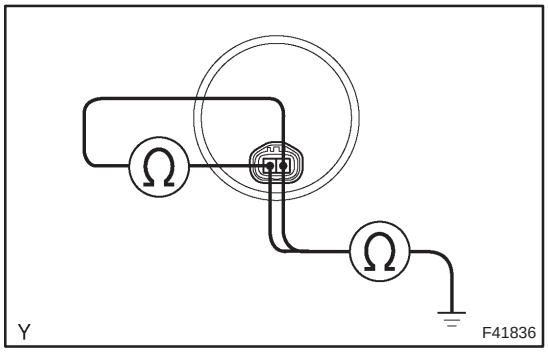
HINT:

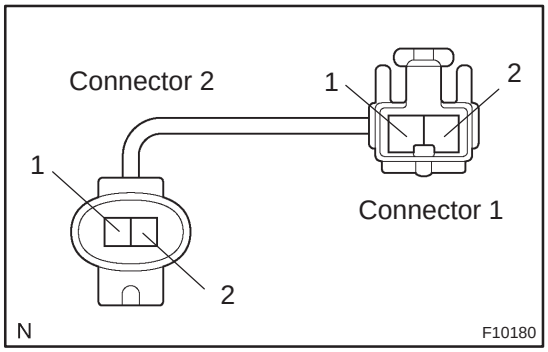
There is tolerance of ± 10 % in the speedometer indication.

OK	Go to step 5

NG

2	INSPECT SKID CONTROL SENSOR





(a) Disconnect the skid control sensor connector.

(b) Measure resistance between terminals 1 and 2 of the speed sensor connector.

OK:

Resistance: 2.2 kΩ or less

(c) Measure resistance between each of terminals 1 and 2 of the skid control sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher

Skid control Sensor Sub–Wire Harness:

(a) Disconnect the sub–wire harness connector from the floor wire harness

(b) Make sure that there is no looseness at the connector lock part and connecting part of the connector.

(c) Measure resistance between terminal 1 of the connector 1 and terminal 2 of the connector 2.

OK: 1 Ω or lower

(d) Measure resistance between terminal 2 of the connector 1 and terminal 1 of the connector 2.

OK: 1 Ω or lower

(e) Measure resistance between terminals 1 and 2 of the speed sensor connector 1 and body ground.

OK: 10 MΩ or higher

NG	REPLACE SKID CONTROL SENSOR

NOTICE:

Check the speed sensor signal last (See page 05–756).

OK

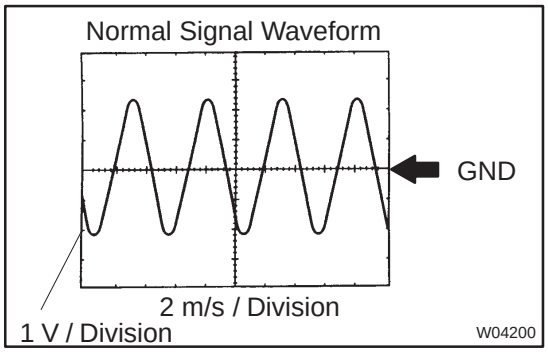
3	CHECK HARNESS AND CONNECTOR(REAR SPEED SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each skid control sensor and the skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



(REFERENCE) INSPECTION USING OSCILLOSCOPE

(a) Connect the oscilloscope to the terminals RR+ – RR– and RL+ – RL– of the skid control ECU.

(b) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

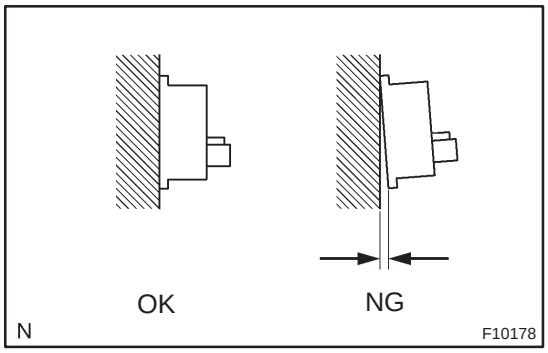
HINT:

- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform becomes shorter and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter deposited on it.

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

5	INSPECT SKID CONTROL SENSOR INSTALLATION



(a) Check the sensor installation.

OK:

There is no clearance between the sensor and rear axle carrier.

NG → **REPLACE SKID CONTROL SENSOR**

NOTICE:

Check the speed sensor signal last (See page 05–756).

OK

6	INSPECT SKID CONTROL SENSOR TIP

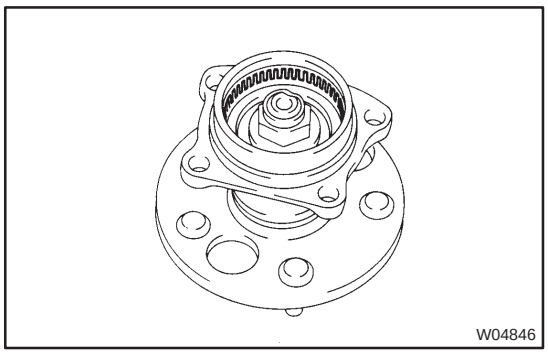
(a) Remove the skid control sensor (See page 32–61).
(b) Check the sensor tip.
OK:
No scratches or foreign objects on the sensor tip.

NG → **CLEAN OR REPAIR SKID CONTORL SENSOR**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

7	INSPECT SENSOR ROTOR



(a) Check the sensor rotor serrations.
OK:
No scratches, missing teeth or foreign objects.

NG → **REPLACE REAR AXLE HUB & BEARING ASSY RH**

NG → **REPLACE REAR AXLE HUB & BEARING ASSY LH**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

NOTICE:
Do not reuse the skid control sensor.

DTC	C0226/21	SFR SOLENOID CIRCUIT

DTC	C0236/22	SFL SOLENOID CIRCUIT

DTC	C0246/23	SRR SOLENOID CIRCUIT

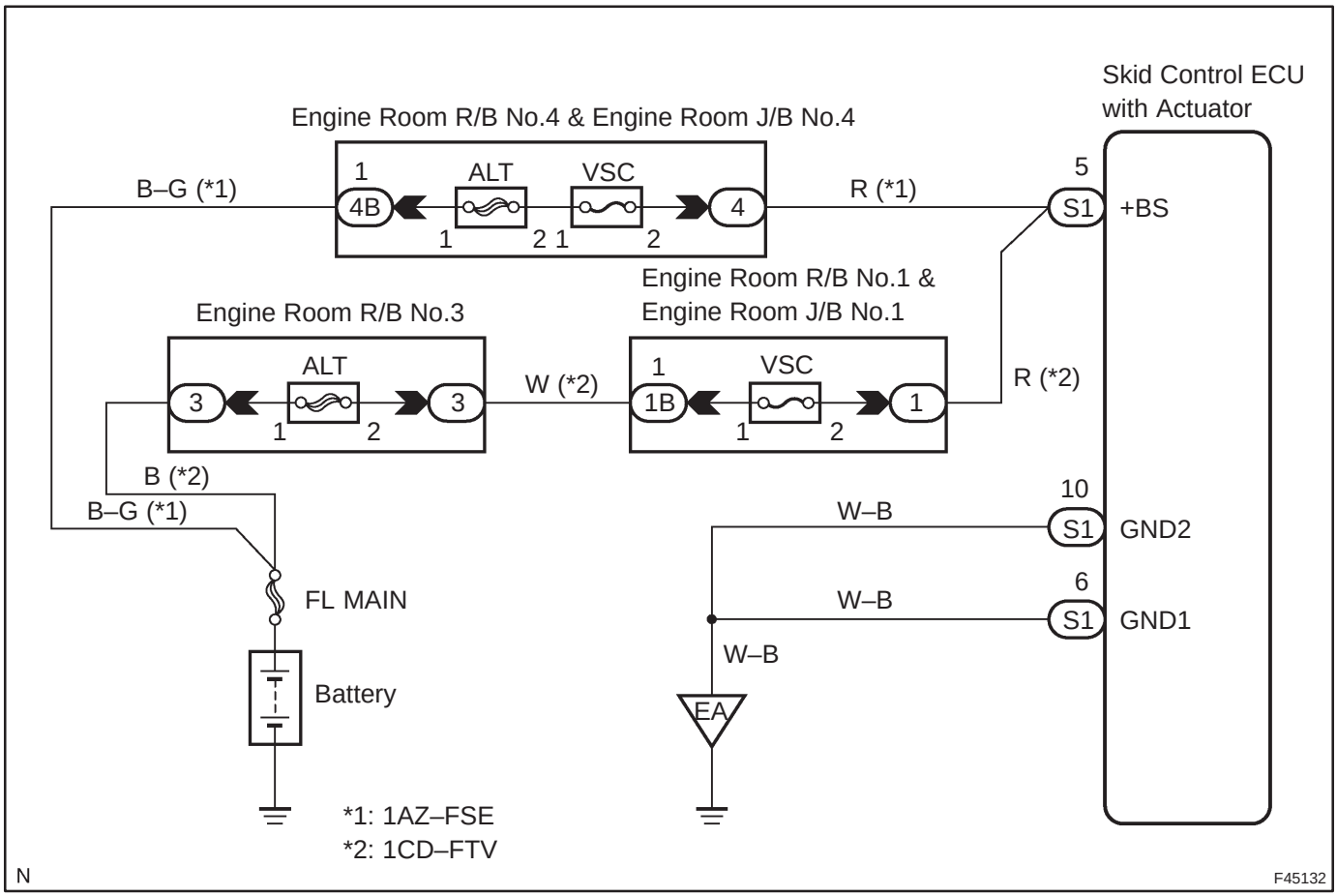
DTC	C0256/24	SRL SOLENOID CIRCUIT

CIRCUIT DESCRIPTION

The solenoid goes on when receiving signals from the ECU and controls the pressure action on the wheel cylinders to control the braking force.

DTC No.	DTC Detecting Condition	Trouble Area
C0226/21 C0236/22 C0246/23 C0256/24	Solenoid valve signal does not match to the check result.	• Each solenoid valve

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check if other DTCs are detected (See page 05–756).

YES → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

NO

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

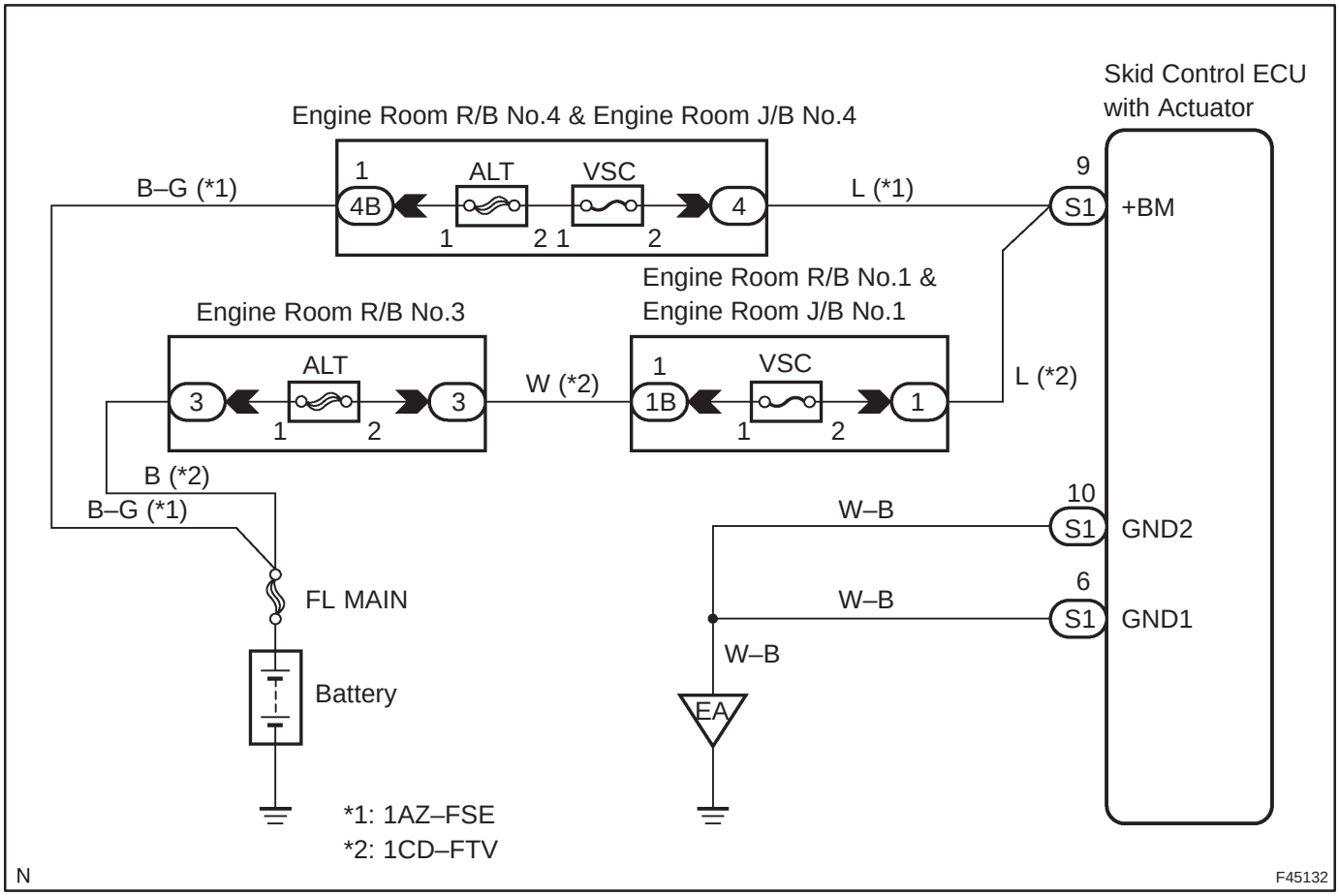
DTC	C0273/13	OPEN OR SHORT CIRCUIT IN ABS MOTOR RELAY CIRCUIT

CIRCUIT DESCRIPTION

The ABS motor relay supplies power to the ABS pump motor. While the ABS & BA & TRC & VSC are activated, the ECU switches the motor relay ON and operates the ABS pump motor.

DTC No.	DTC Detecting Condition	Trouble Area
C0273/13	Detection of any conditions from 1 to 3: 1. After actuation of the motor relay, pump motor voltage is not supplied within 0.08 second. 2. Pump motor voltage is at high level for 2.5 seconds or more although motor relay does not actuate . 3. Pump motor voltage keeps low level for longer than 0.04 second and the pump repeats activating for 0.7 seconds 3 times maximum. At the last time of activation, the pump motor goes dead because of short circuit.	• ABS motor relay • ABS motor relay circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

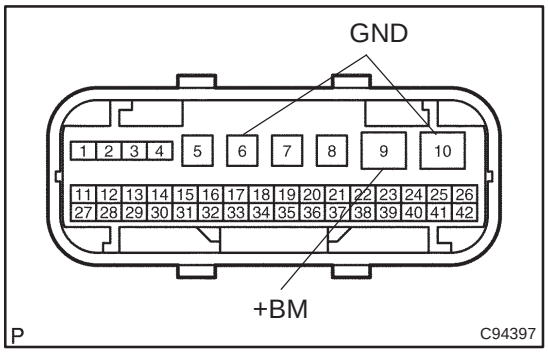
1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(ABS MOTOR RELAY)

(a) Check the operation sound of the ABS motor individually when operating it with the hand–held tester.
OK:
The operation sound of the ABS motor is heard.

OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

2	INSPECT SKID CONTROL ECU CONNECTOR(+BM TERMINAL VOLTAGE)

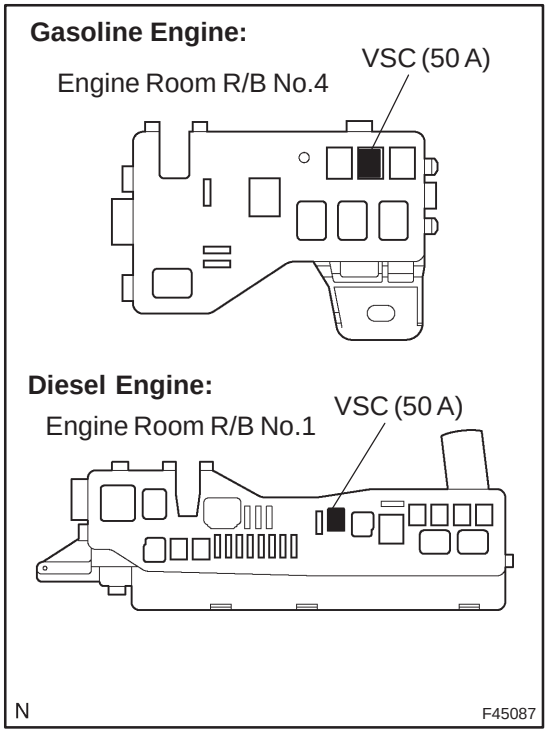


(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminals +BM and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

3 INSPECT FUSE(VSC FUSE)



(a) Remove the VSC (50 A) fuse from the engine room R/B No.4 (Gasoline engine) or engine room R/B No.1 (Diesel engine).

(b) Check continuity of the VSC fuse.

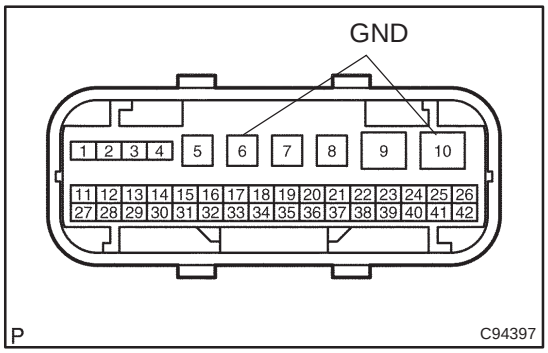
OK:

Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

4 INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – +BM TERMINAL) (See page 01–32)

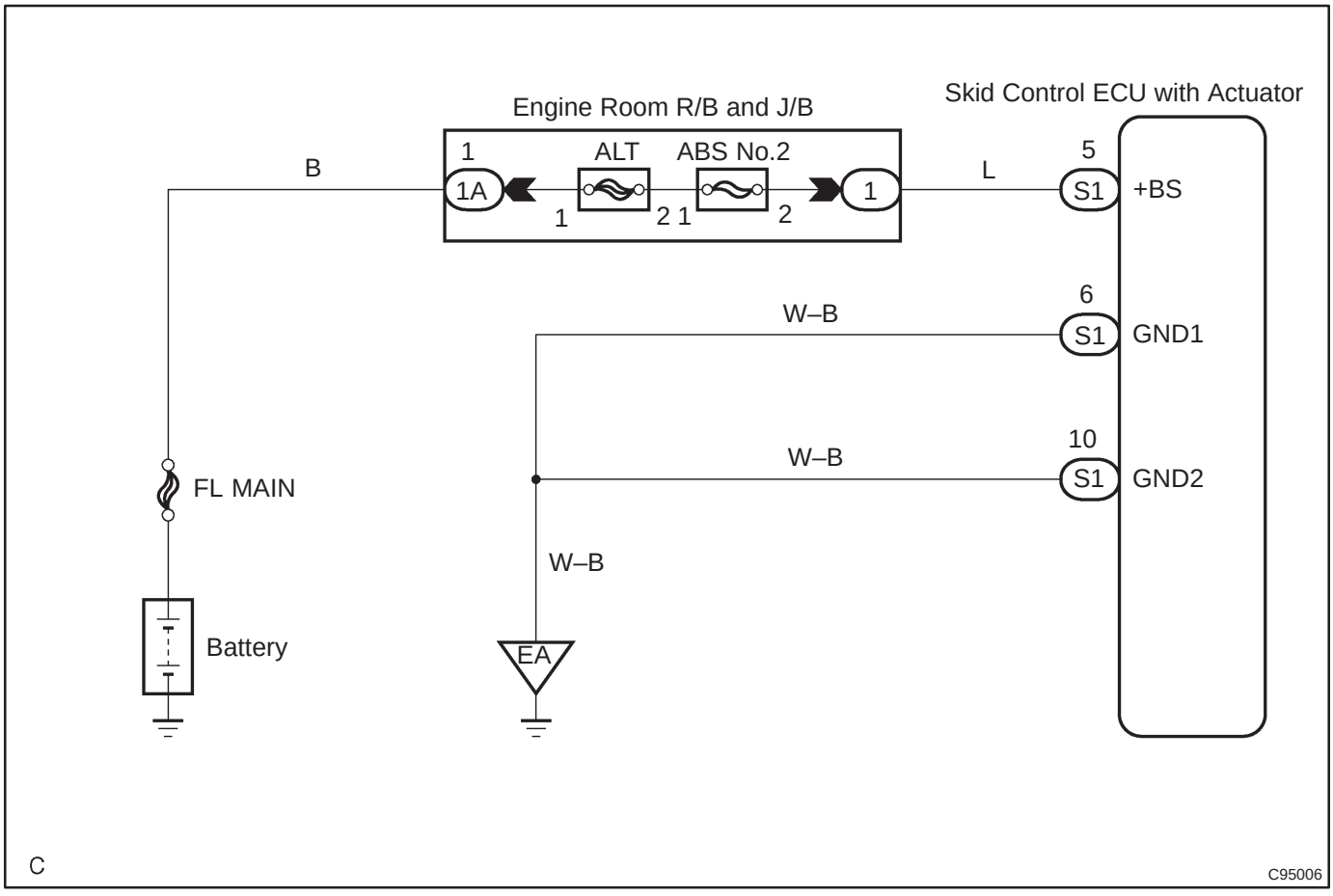
DTC	C0278/11	OPEN OR SHORT CIRCUIT IN ABS SOLENOID RELAY

CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

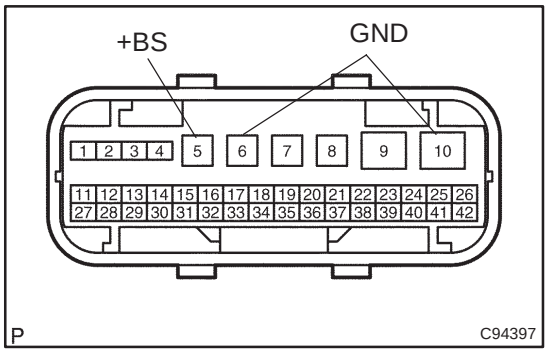
DTC No.	DTC Detecting Condition	Trouble Area
C0278/11	Detection of any conditions from 1 to 3: 1. 3 or more solenoid valves are shown faulty in response and simultaneously valve supply voltage is detected faulty. 2. Solenoid valve relay is not turned OFF.	• ABS solenoid relay • ABS solenoid relay circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT SKID CONTROL ECU CONNECTOR(+BS TERMINAL VOLTAGE)



(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminals +BS and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

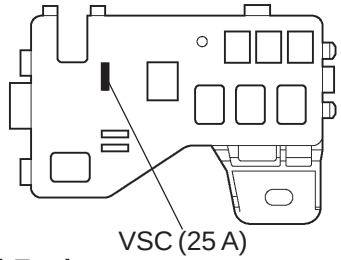
OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

2 INSPECT FUSE(VSC FUSE)

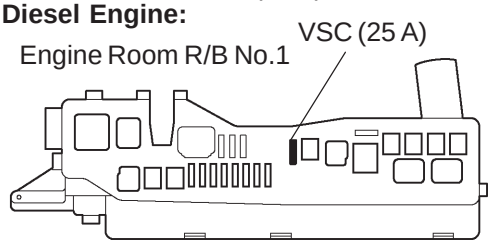
Gasoline Engine:

Engine Room R/B No.4



Diesel Engine:

Engine Room R/B No.1



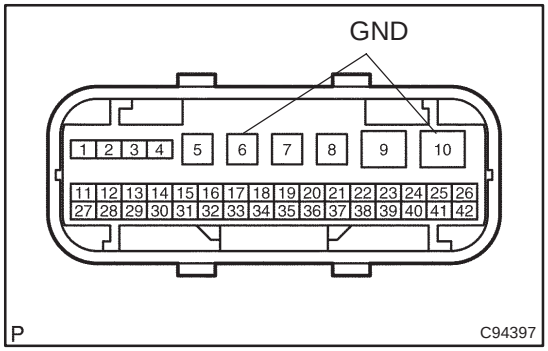
N F45087

(a) Remove the VSC (25 A) fuse from the engine room R/B No.4 (Gasoline engine) or engine room R/B No.1 (Diesel engine).
(b) Check continuity of the VSC fuse.
OK:
Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

3	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

CHECK AND REPLACE HARNESS AND CONNECTOR(BATTERY – +BS TERMINAL) (See page 01–32)

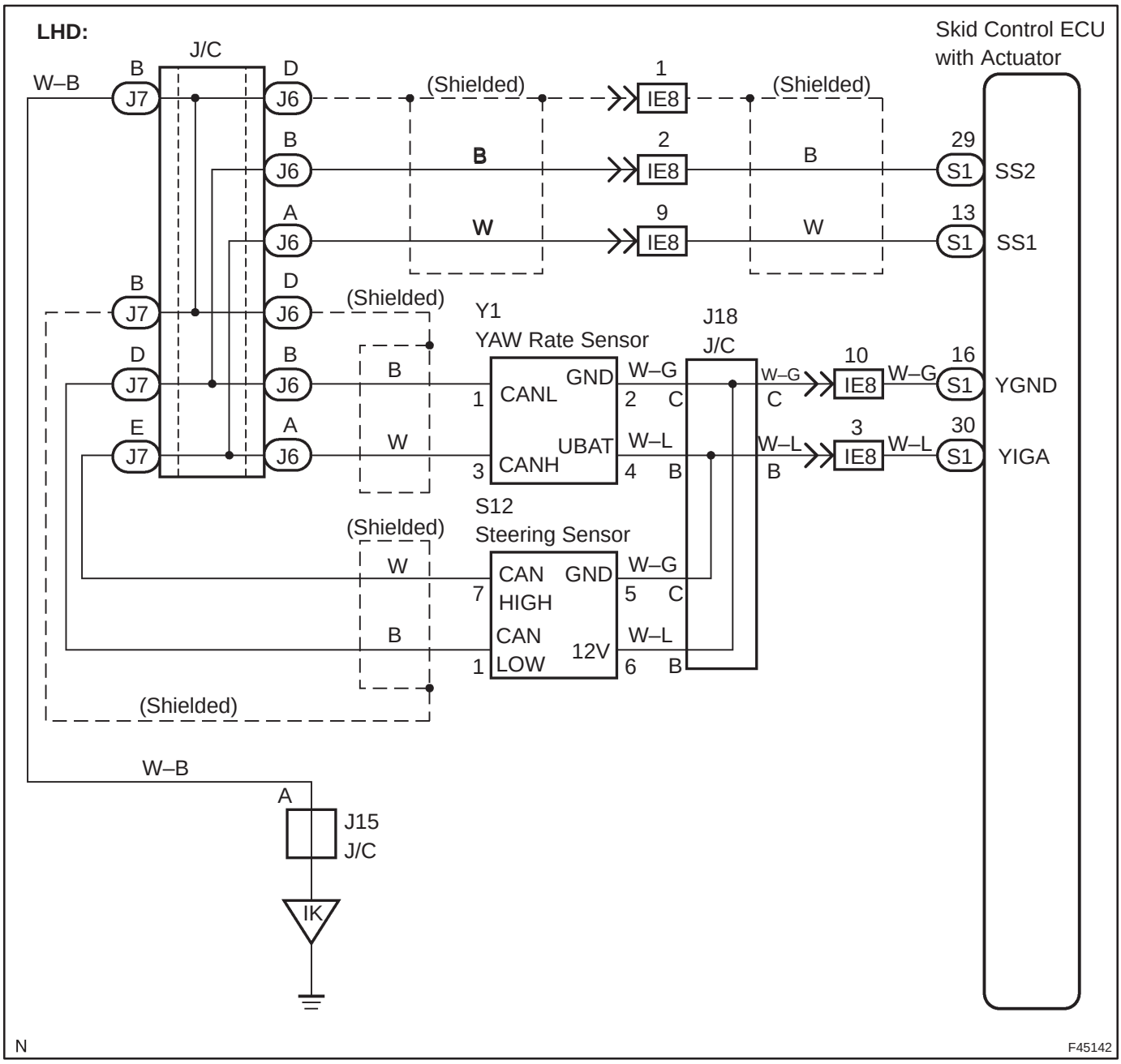
DTC C0365/43 MALFUNCTION IN DECELERATION SENSOR

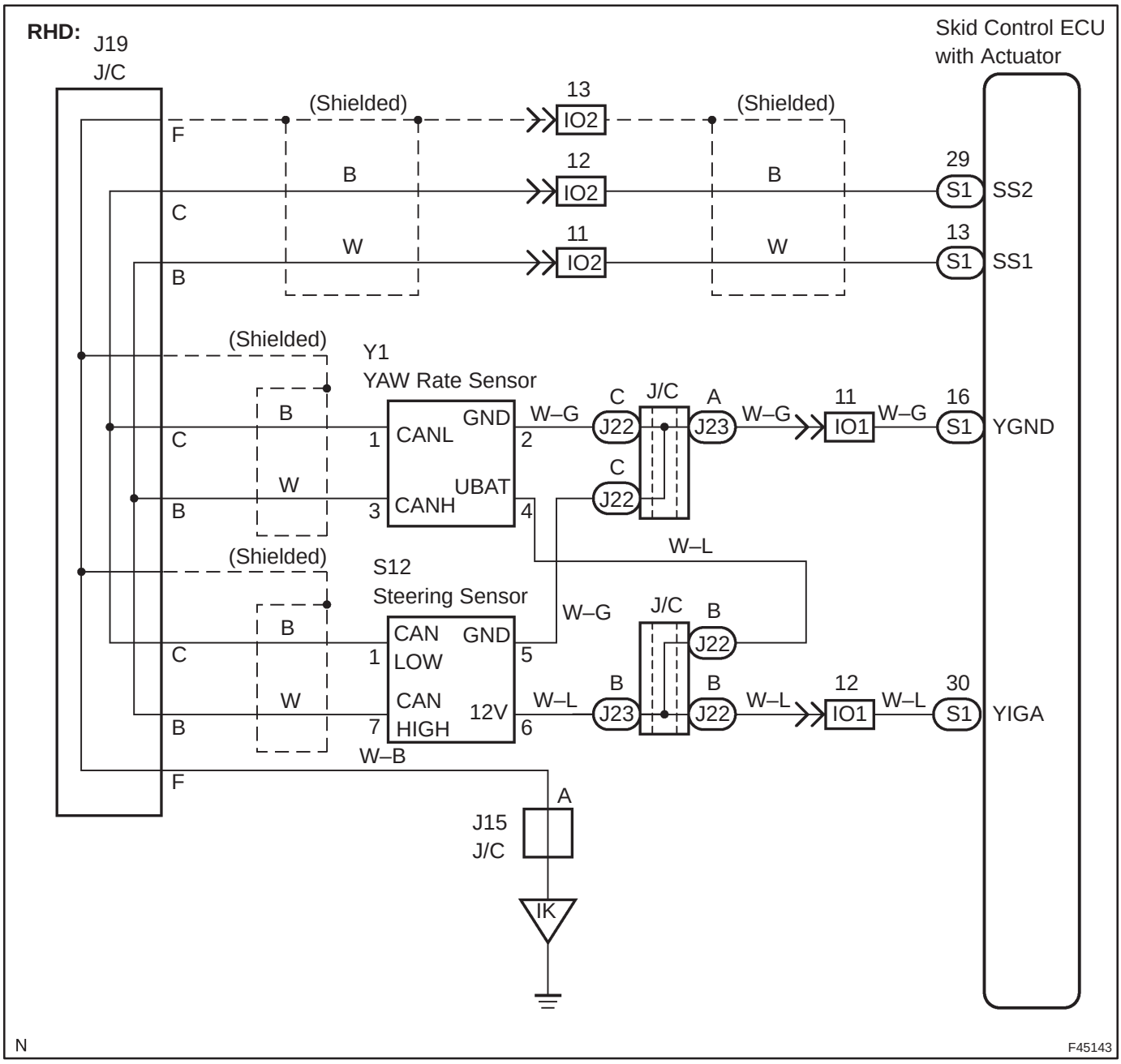
CIRCUIT DESCRIPTION

The lateral acceleration sensor is combined with the yaw rate sensor.

DTC No.	DTC Detecting Condition	Trouble Area
C0365/43	Detection of any of conditions from 1 through 2: 1. Lateral acceleration difference between sensor signal and reference value is large. 2. Offset value of sensor signal is higher than the standard value. 3. Sensor signal is out of range	• Yaw rate sensor • Yaw rate sensor circuit

WIRING DIAGRAM



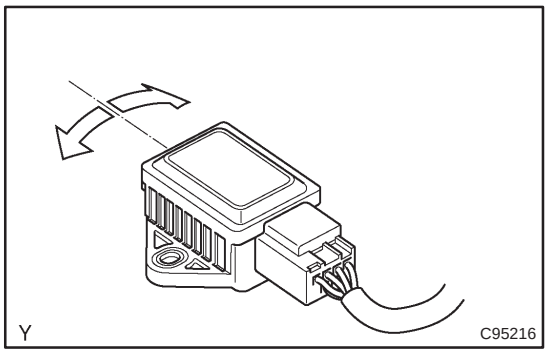

RHD:
J19
J/C
Skid Control ECU
with Actuator
(Shielded)
13
IO2
(Shielded)
F
B
12
IO2
B
29
S1
SS2
C
W
11
IO2
W
13
S1
SS1
B
(Shielded)
Y1
YAW Rate Sensor
B
C
1
CANL
GND
2
W–G
C
J/C
A
11
16
C
J22
J23
W–G
IO1
W–G
S1
YGND
W
B
3
CANH
UBAT
4
C
J22
W–L
(Shielded)
S12
Steering Sensor
B
C
1
CAN
LOW
GND
5
W–G
J/C
B
J22
W
B
7
CAN
HIGH
12V
6
W–L
B
J23
B
J22
W–L
12
IO1
W–L
30
S1
YIGA
W–B
F
A
J15
J/C
IK
N
F45143

INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF YAWRATE SENSOR(INCLUDE LATERAL ACCELERATION SENSOR)



(a) Remove the 2 bolts and lateral acceleration sensor with connector still connected.
(b) Connect the hand–held tester to the DLC3
(c) Turn the ignition switch and hand–held tester main switch ON.
(d) Select the DATALIST mode on the hand–held tester.
(e) Check the lateral acceleration value 0 ± 0.23 G.
(f) Check that the acceleration value displayed on the hand–held tester is changing: Place the yaw rate sensor vertically to the ground and turn the sensor pivoted on its center.

OK:

Lateral acceleration value is changing.

OK	REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

2	CHECK HARNESS AND CONNECTOR(YAW RATE SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each terminal SS1, SS2, YIGA and YGND of the yaw rate sensor and skid control ECU (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

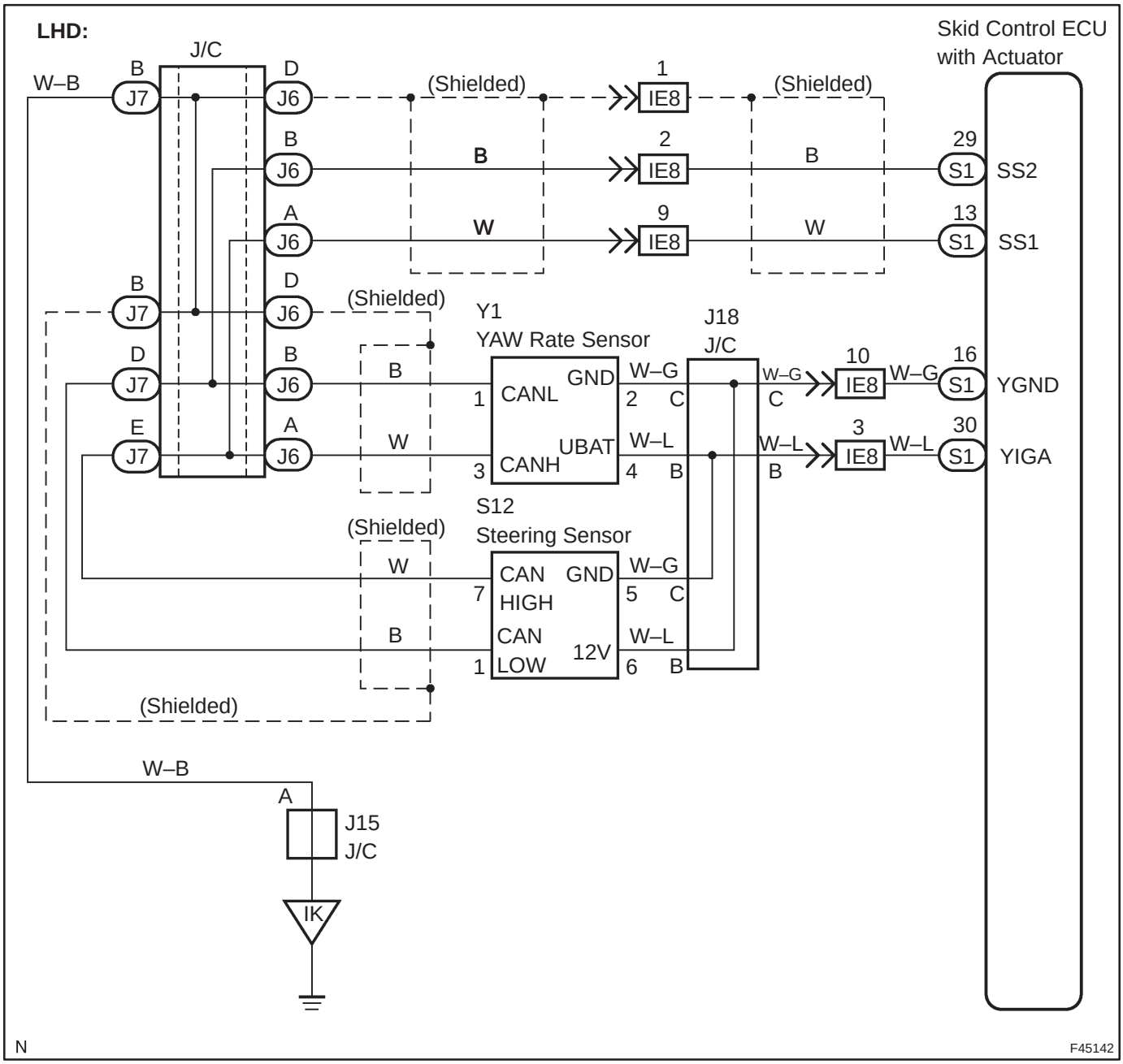
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

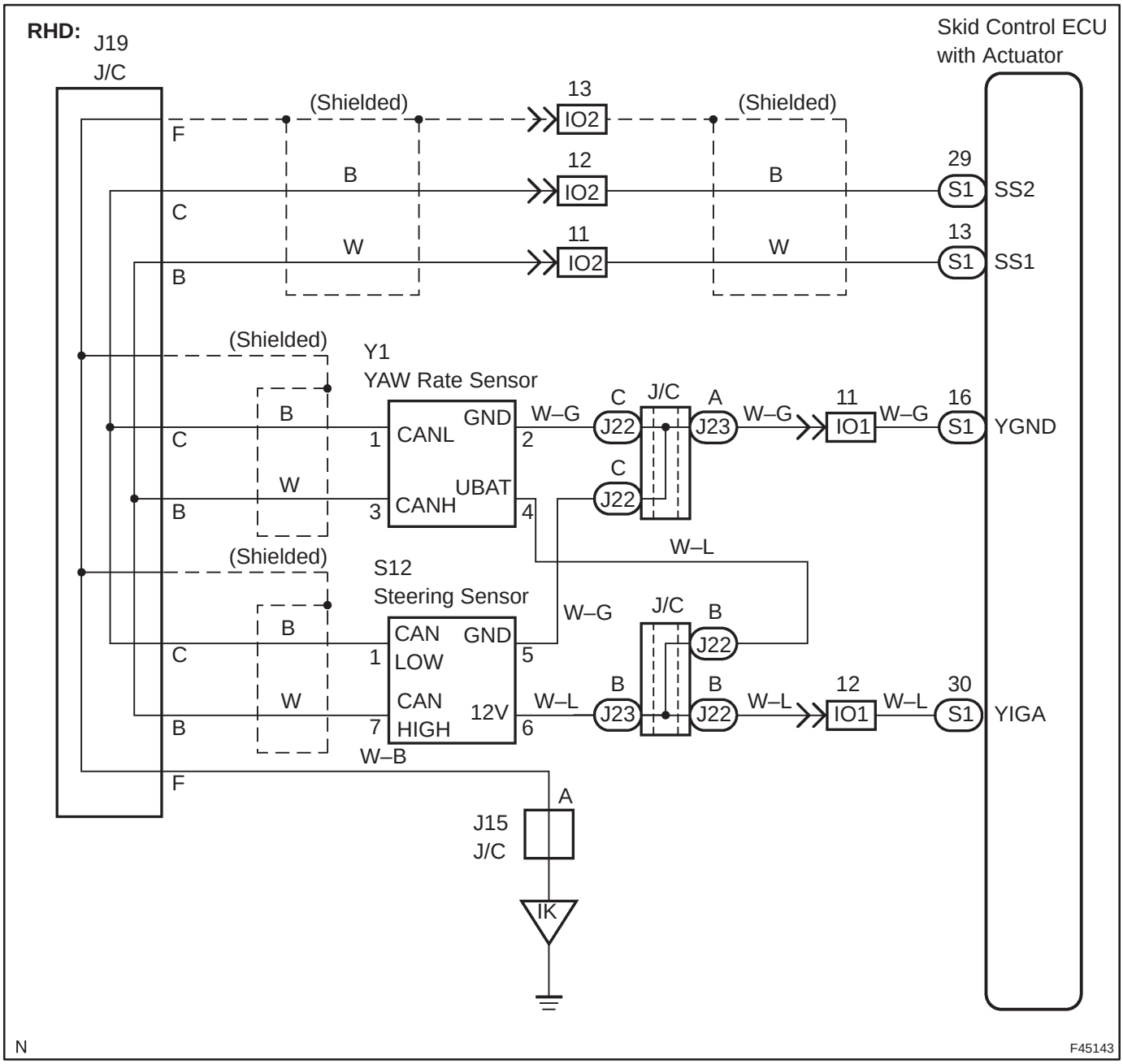
DTC	C0371/55	OPEN OR SHORT CIRCUIT IN YAW RATE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C0371/55	Detection of any of conditions from 1 through 4: 1. The voltage of sensor signal is out of range. 2. The offset value of sensor signal is outside the plausible range. 3. Sensor signal changes rapidly under normal driving. 4. Yaw rate sensor value is considerably different from the reference value of yaw rate during cornering.	• Yaw rate sensor • Yaw rate sensor circuit

WIRING DIAGRAM



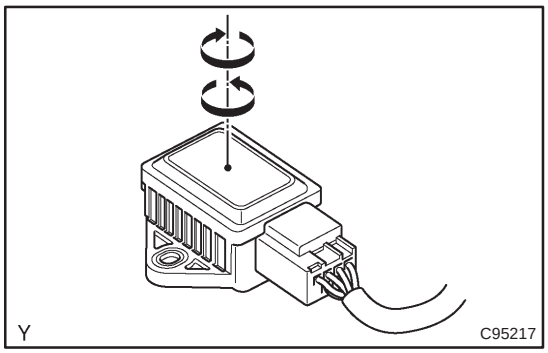

RHD:
J19
J/C
Skid Control ECU
with Actuator
(Shielded)
13
IO2
(Shielded)
F
B
12
IO2
B
29
S1
SS2
C
W
11
IO2
W
13
S1
SS1
B
(Shielded)
Y1
YAW Rate Sensor
B
C
1
CANL
GND
2
W–G
C
J/C
A
W–G
11
W–G
16
S1
YGND
J22
J23
IO1
W
B
3
CANH
UBAT
4
C
J22
W–L
(Shielded)
S12
Steering Sensor
B
C
1
CAN
LOW
GND
5
W–G
J/C
B
J22
W
B
7
CAN
HIGH
12V
6
W–L
B
J23
B
J22
W–L
12
IO1
W–L
30
S1
YIGA
W–B
F
A
J15
J/C
IK
N
F45143

INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF YAWRATE SENSOR



(a) Remove the 2 bolts and yaw rate sensor with connector still connected.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch and hand–held tester main switch ON.
(d) Select the DATALIST mode on the hand–held tester.
(e) Check the yaw rate value 0 ± 5 deg/s.
(f) Check that the yaw rate value of the yaw rate sensor displayed on the hand–held tester is changing: Place the yaw rate sensor vertically to the ground and turn the sensor pivoted on its center.

OK:

Yaw rate value is changing.

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

2	CHECK HARNESS AND CONNECTOR(YAW RATE SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each terminal SS1, SS2, YIGA and YGND of the yaw rate sensor and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC C1201/45 ENGINE CONTROL SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1201/45	A trouble signal in the engine control system is input.	Engine control system

HINT:
If trouble occurs in the engine control system, the ECU prohibits TRC and VSC control.

INSPECTION PROCEDURE

1	CHECK DTC FOR ENGINE

A	Normal Code
B	Malfunction Code

B → REPAIR ENGINE CONTROL SYSTEM ACCORDING TO CODE OUTPUT

A →

REPLACE ECM

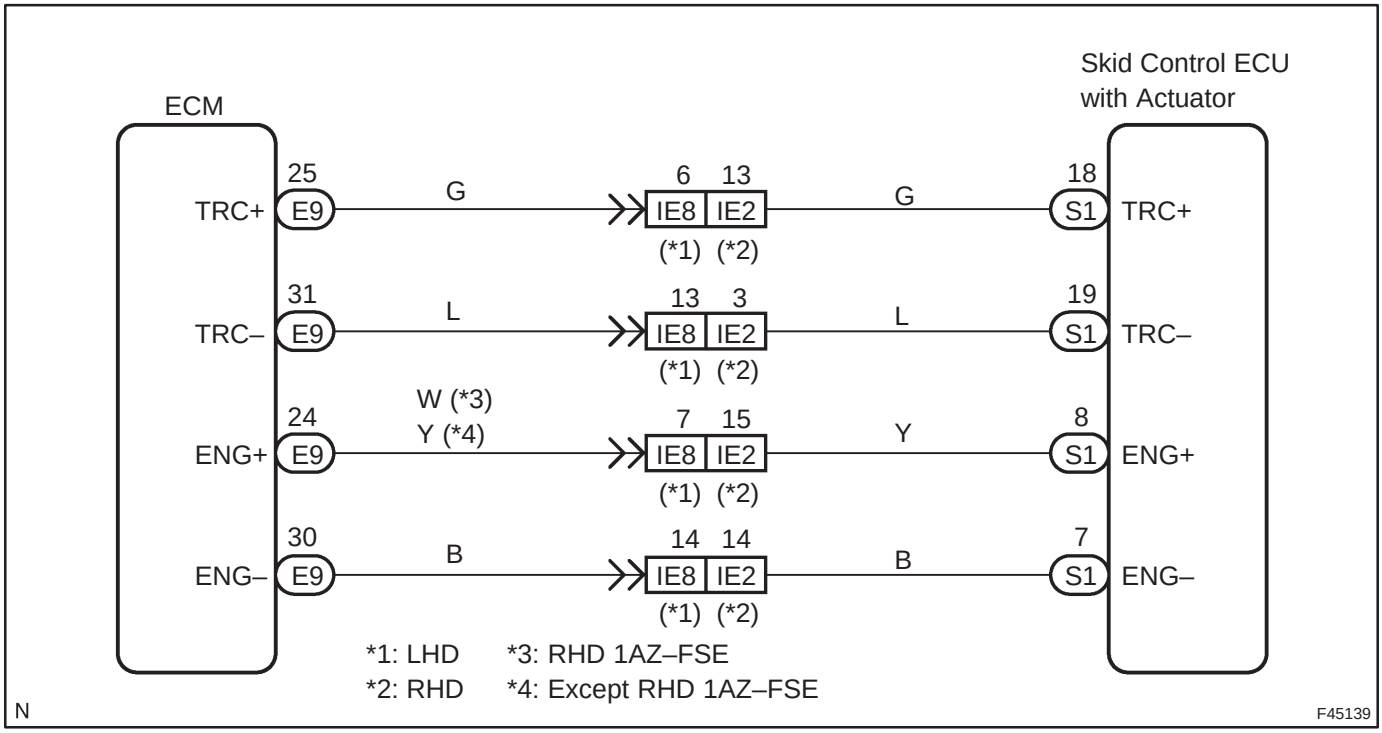
DTC	C1203/59	ECM COMMUNICATOIN CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

This circuit is used to transmit TRC & VSC control information from the skid control ECU to the ECM (TRC+, TRC–), and engine control information from the ECM to the skid control ECU (ENG+, ENG–).

DTC No.	DTC Detecting Condition	Trouble Area
C1203/59	When any of the following 1 through 3 is detected : 1. IG1 voltage is 8.5 V or more, and the condition that data can not be sent to ECM continues for 1.2 seconds or more. 2. IG1 voltage is 8.5 V or more, engine speed is 500 r.p.m or more, vehicle speed is 60 km/h (38 mph) or more, and the condition that data can not be received from ECM continues for 1.2 seconds or more. 3. The condition that data can not be transmitted between the skid control ECU and ECM occurs at least once within 5 seconds continues 10 consecutive times within 60 sec.	• TRC+ or TRC– circuit • ENG+ or ENG– circuit • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(ECM – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each of terminals ENG+, ENG–, TRC+, TRC– of the skid control ECU and the same one of the ECM (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	CHECK OPERATION OF MALFUNCTION INDICATOR

(a) Check the MIL.
(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

NG → CHECK AND REPLACE ECM

OK

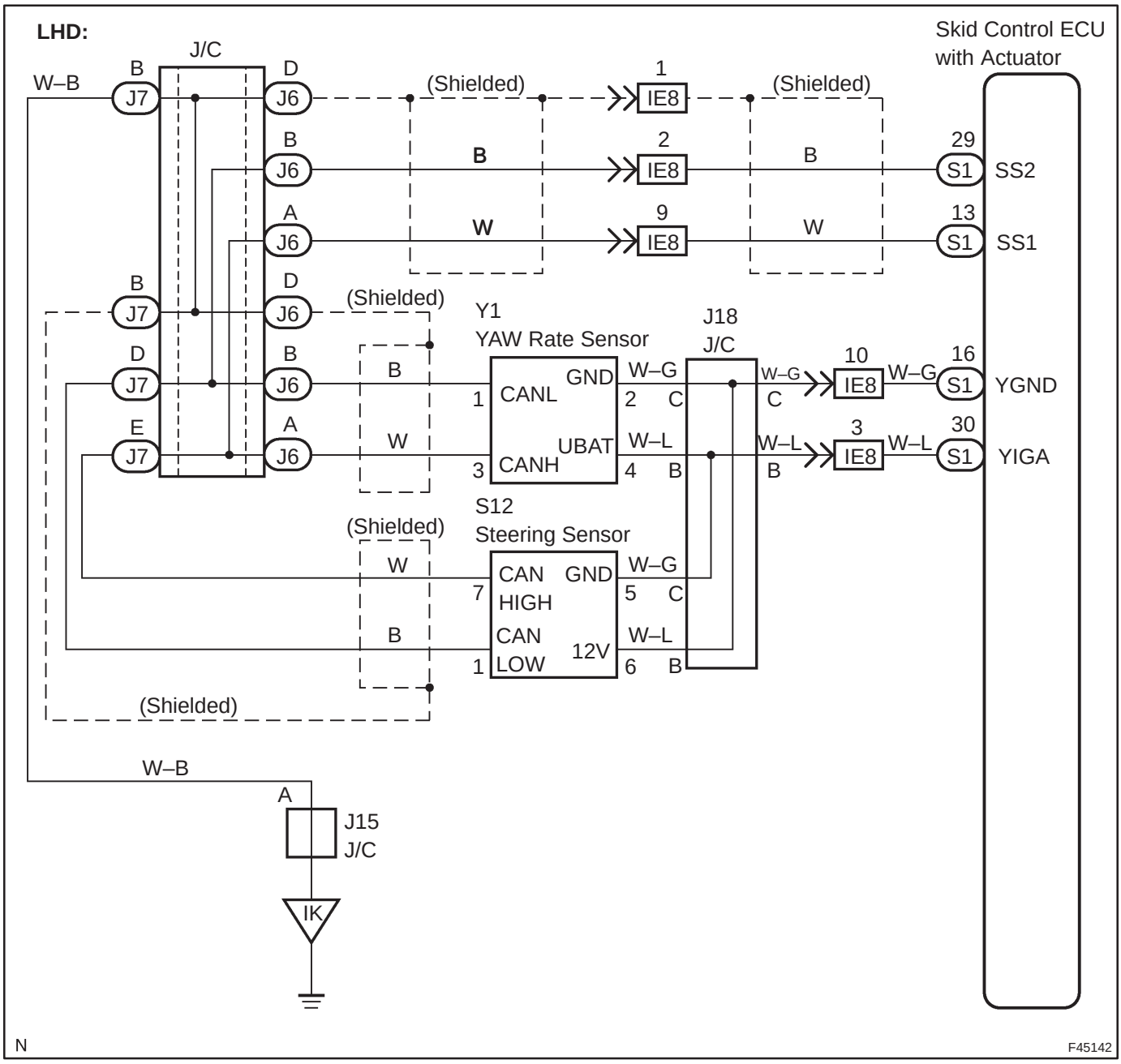
CHECK AND REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

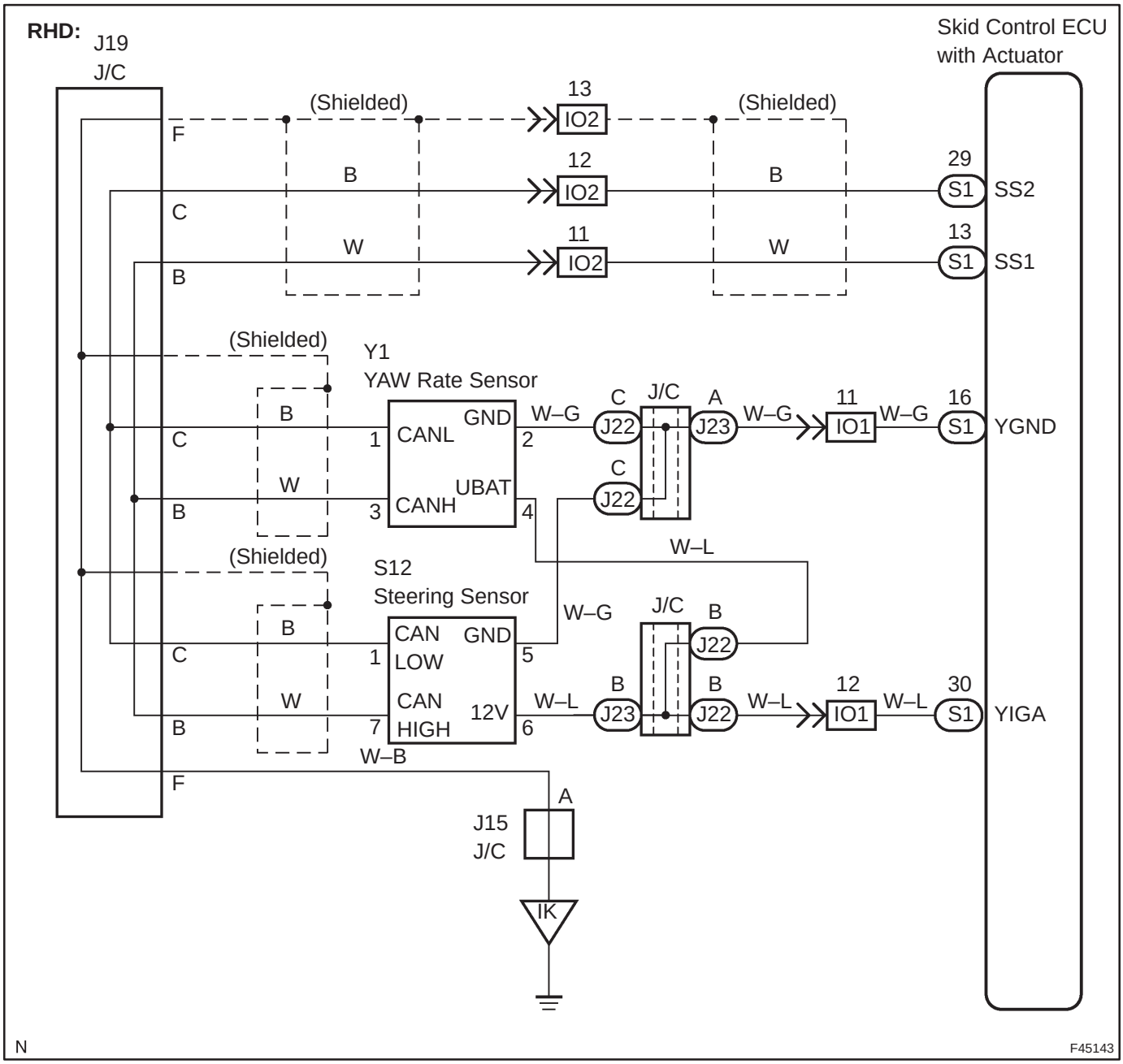
DTC	C1208/54	MALFUNCTION IN STEERING ANGLE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1231/31	Detection of any of conditions 1 through 7: 1. When the condition that ECU terminal IG1 voltage is 9.8 V or more, and does not receive data from steering angle sensor continues. 2. Sensor internal failure. 3. The offset value is out of range. 4. Sensor signal changes too rapidly. 5. Steering angle value difference between measured and reference is out of range. 6. Steering sensor is not centered. 7. Steering sensor signal is out of range. 8. Steering sensor is not calibrated.	• Steering angle sensor • Steering angle sensor circuit

WIRING DIAGRAM




RHD:
J19
J/C
Skid Control ECU
with Actuator
(Shielded)
13
IO2
(Shielded)
F
B
12
IO2
B
29
S1
SS2
C
W
11
IO2
W
13
S1
SS1
B
(Shielded)
Y1
YAW Rate Sensor
B
C
1
CANL
GND
2
W–G
C
J/C
A
W–G
11
W–G
16
S1
YGND
J22
J23
IO1
W
B
3
CANH
UBAT
4
C
J22
W–L
(Shielded)
S12
Steering Sensor
B
C
1
CAN
LOW
GND
5
W–G
J/C
B
J22
W
B
7
CAN
HIGH
12V
6
W–L
B
J23
B
J22
W–L
12
IO1
W–L
30
S1
YIGA
W–B
F
A
J15
J/C
IK
N
F45143

INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF STEERING SENSOR

(a) Select the DATALIST mode on the hand–held tester.

(b) Check that the steering wheel turning angle value of the steering angle position sensor displayed on the hand–held tester is changing when turning the steering wheel.

OK:

Steering wheel turning angle value is changing.

OK → **Go to step 4**

NG

2	CHECK INSTALLATION CONDITION OF STEERING ANGLE SENSOR

NG → **REPLACE STEERING SENSOR(See page 32–65)**

OK

3	CHECK HARNESS AND CONNECTOR(STEERING SENSOR CIRCUIT – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each terminal SS1, SS2, YIGA and YGND of the skid control ECU and steering angle sensor (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CALIBRATE STEERING ANGLE SENSOR(See page 05–756)

NG → **REPLACE STEERING SENSOR**

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

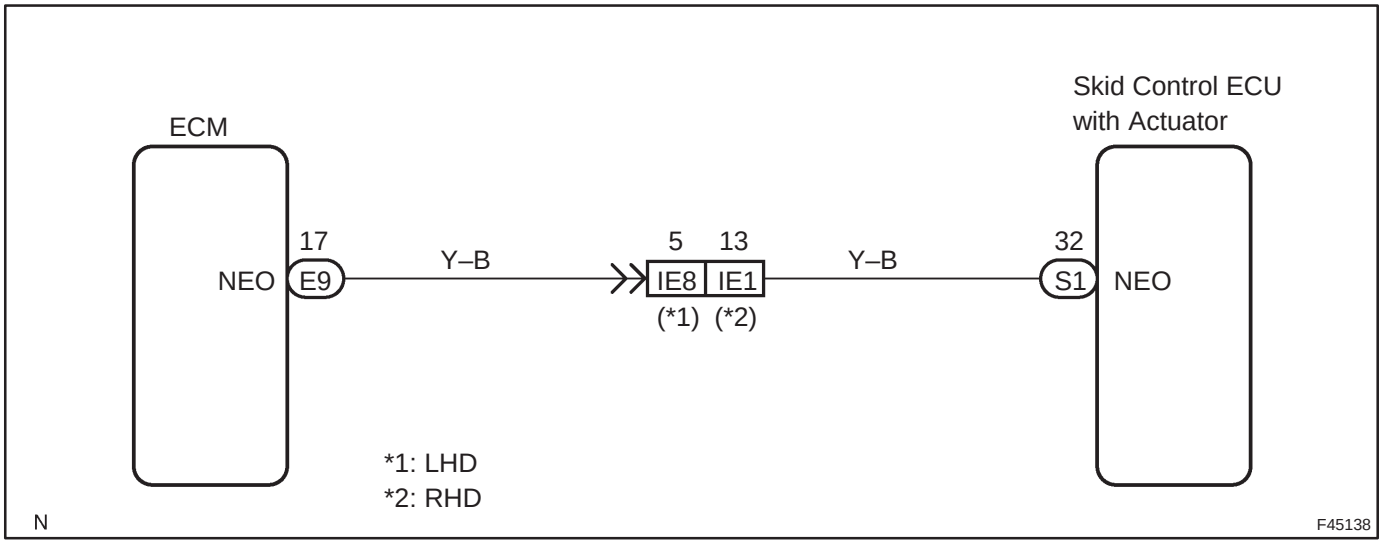
DTC C1204/44 NE SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

The skid control ECU receives engine revolution speed signals (NE signals) from the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
C1202/44	At vehicle speed of 30 km/h (19 mph) or more, when data received from the ECM is in normal condition, engine revolution signal > 0 rpm continues for 5 seconds or more.	• NEO circuit • ECM • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – ECM)

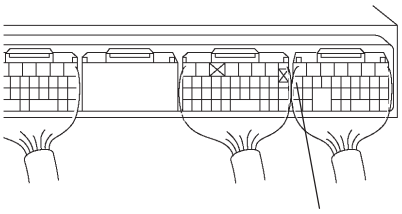
(a) Check for an open or short circuit in harness and connector between terminal NEO of the skid control ECU and ECM (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

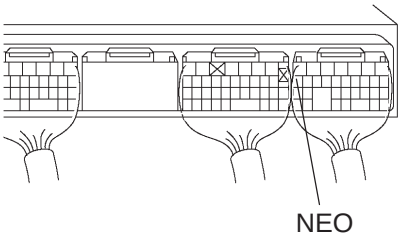
OK

2 INSPECT ECM TERMINAL VOLTAGE(NEO TERMINAL)

Gasoline engine:



Diesel engine:

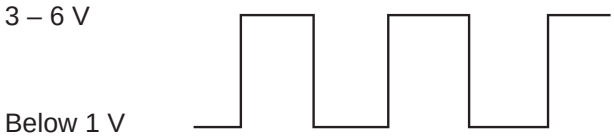


F45092

(a) Remove the ECM with connector still connected.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminal NEO of the ECM and body ground under the engine conditions below.
OK:

Engine condition	Voltage
OFF (IG ON)	3 to 6 V or below 1 V
ON (Idling)	3 to 6 V ⇔ below 1 V (Pulse)

(Reference)



F03007

NG → **REPLACE ECM**

OK

IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION

DTC	C1225/25	SMC SOLENOID CIRCUIT

DTC	C1226/26	SMC SOLENOID CIRCUIT

DTC	C1227/27	SRC SOLENOID CIRCUIT

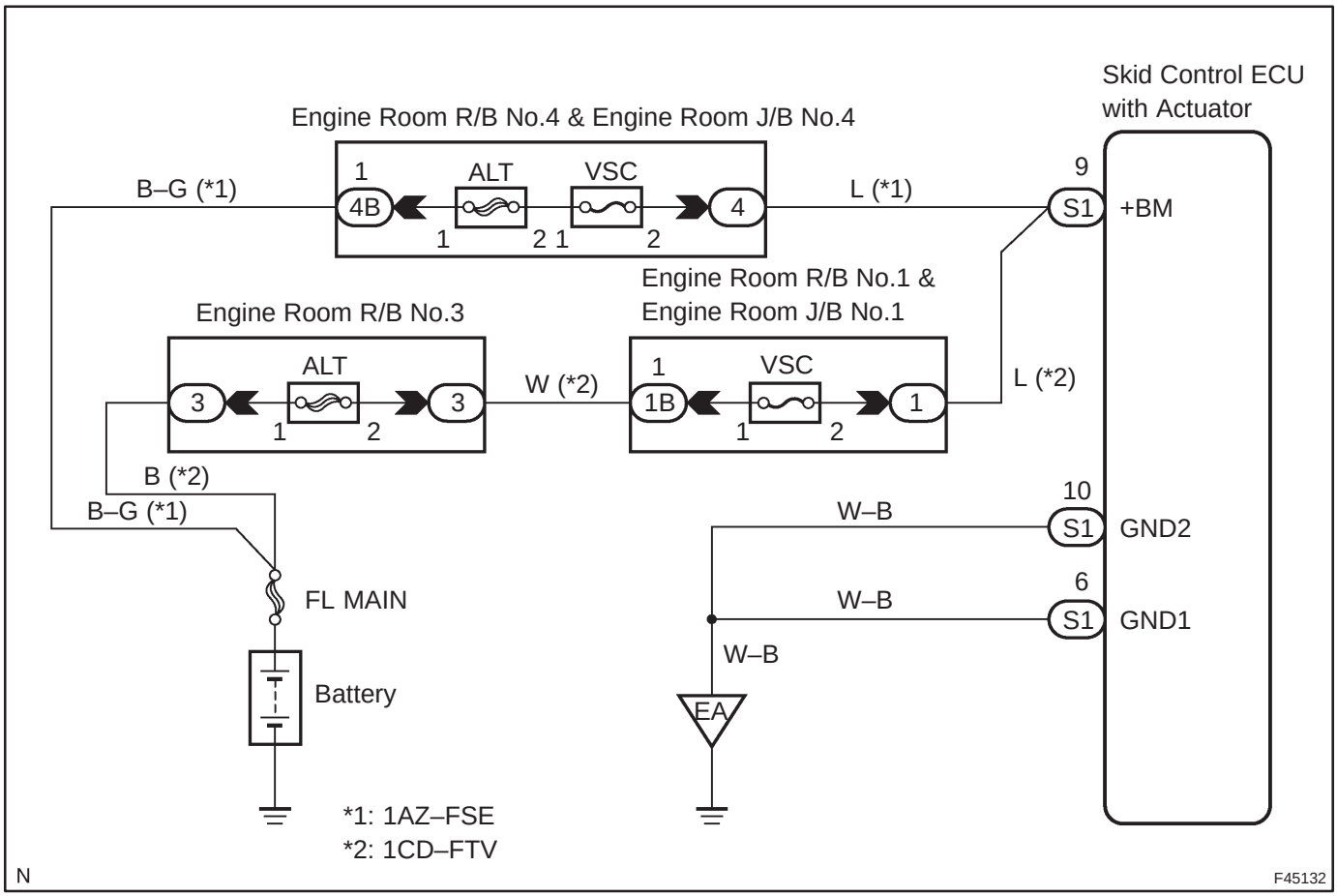
DTC	C1228/28	SRC SOLENOID CIRCUIT

CIRCUIT DESCRIPTION

The solenoid goes on when receiving signals from the ECU and controls the pressure action on the wheel cylinders to control the braking force.

DTC No.	DTC Detecting Condition	Trouble Area
C1225/25	Open or short in SMC1 circuit.	• Brake actuator • SMC1 circuit
C1226/26	Open or short in SMC2 circuit.	• Brake actuator • SMC2 circuit
C1227/27	Open or short in SRC1 circuit.	• Brake actuator • SRC1 circuit
C1228/28	Open or short in SRC2 circuit.	• Brake actuator • SRC2 circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check if other DTCs are detected (See page 05–756).

YES → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

NO

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC C1237/37 TIRES OF DIFFERENT SIZE

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1237/37	Detection of any of conditions from 1 through 4: 1. When the ignition switch is ON, the speed difference between max. and min. wheel speed is 5 % or more for 20 sec. at vehicle speed 20 km/h (12 mph)or more. 2. When the ignition switch is ON, the slip difference be wheels at either side of vehicle 6 % or more (vehicle speed: 100 km/h (62 mph) or more). 3. Continuous ABS control for 60 seconds or more. 4. Interference on 1 or more wheels for 20 seconds with the brake pedal depressed, or for 5 seconds when the brake pedal is not depressed.	• Speed sensor • Sensor rotor

INSPECTION PROCEDURE

1 INSPECT TIRE SIZE

NG → **REPLACE TIRES SO THAT ALL 4 TIRES ARE SAME IN SIZE**

OK

2 INSPECT SPEED SENSOR ROTOR

(a) Check the speed sensor rotors (See page 05–774 or 05–778).

NG → **REPLACE SENSOR ROTOR**

OK

3 INSPECT SPEED SENSOR

(a) Check the speed sensors (See page 05–774 or 05–778).

NG → **REPLACE SPEED SENSOR**

OK

4 CHECK HARNESS AND CONNECTOR(SPEED SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each terminal of the speed sensor and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

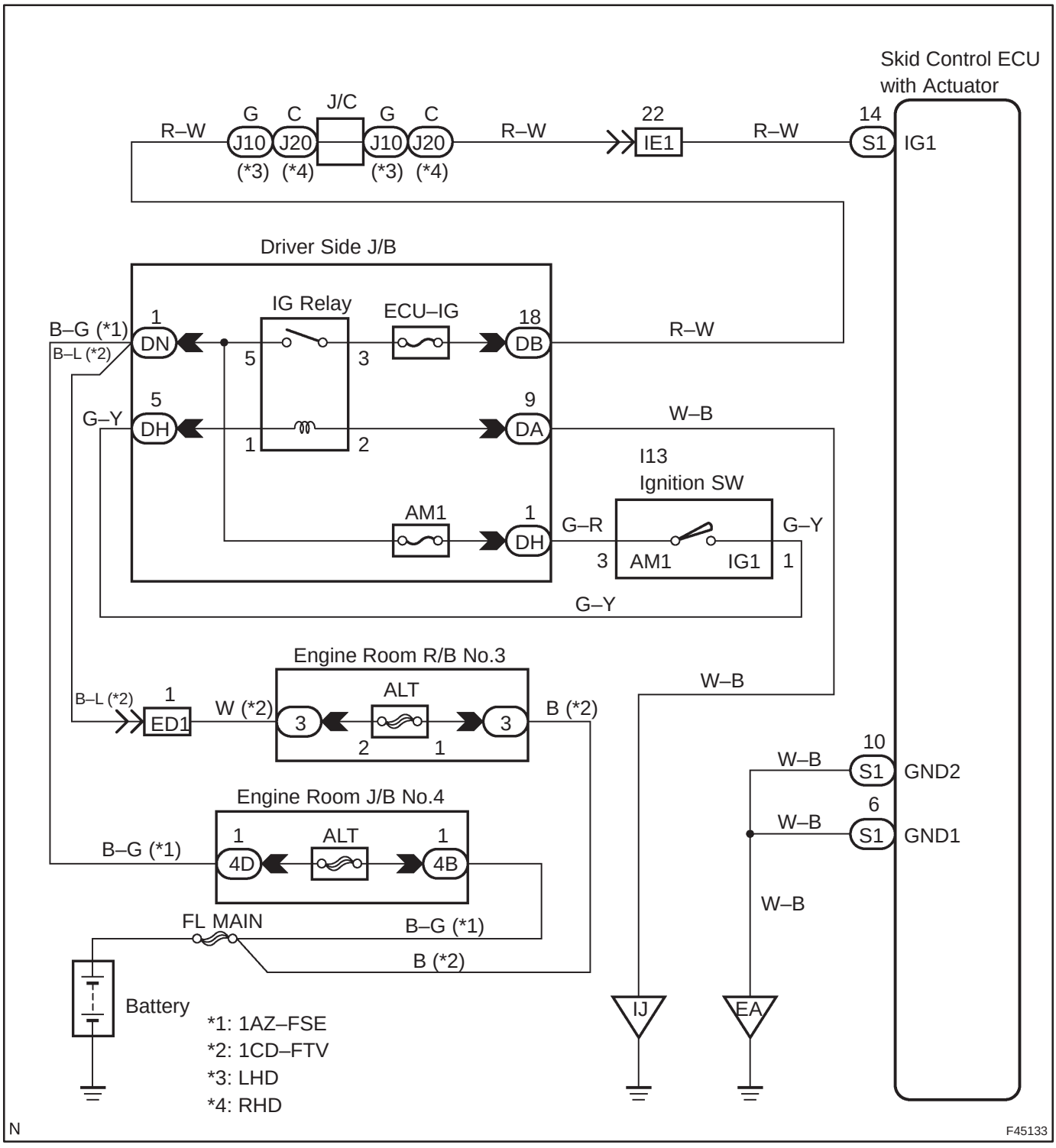
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC	C1241/41	LOW BATTERY POSITIVE VOLTAGE OR ABNORMALLY HIGH BATTERY POSITIVE VOLTAGE

CIRCUIT DESCRIPTION

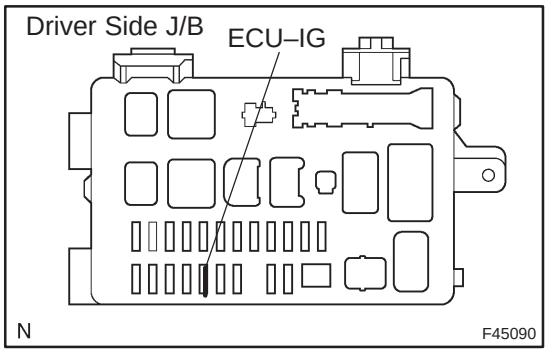
DTC No.	DTC Detecting Condition	Trouble Area
C1241/41	Low battery voltage is less than 9.8 V at the time of non–operation of ABS control or less than 9.4 V at the time of operation of ABS control, or battery voltage is more than 17.4 V.	• Battery • IC regulator • Power source circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT FUSE(ECU–IG FUSE)



(a) Remove the ECU–IG fuse from the driver side J/B.
(b) Check continuity of the ECU–IG fuse.
OK:
Continuity

NG → **INSPECT FOR SHORT CIRCUIT IN ALL HARNESS AND COMPONENTS CONNECTED TO ECU–IG FUSE**

OK

2 INSPECT BATTERY

OK:
Voltage: 10 to 14 V

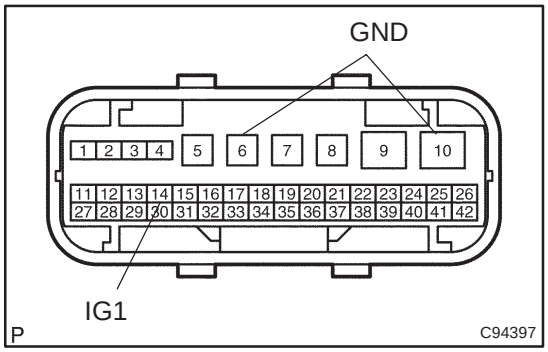
NG → **INSPECT CHARGING SYSTEM**

OK

3 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(IG1 TERMINAL)

IN CASE OF USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



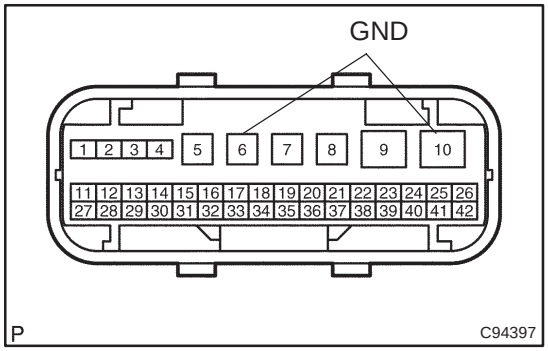
IN CASE OF NOT USING HAND–HELD TESTER:

(a) Disconnect the skid control connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

4 INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Disconnect the skid control ECU connector.
(b) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.
OK:
Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

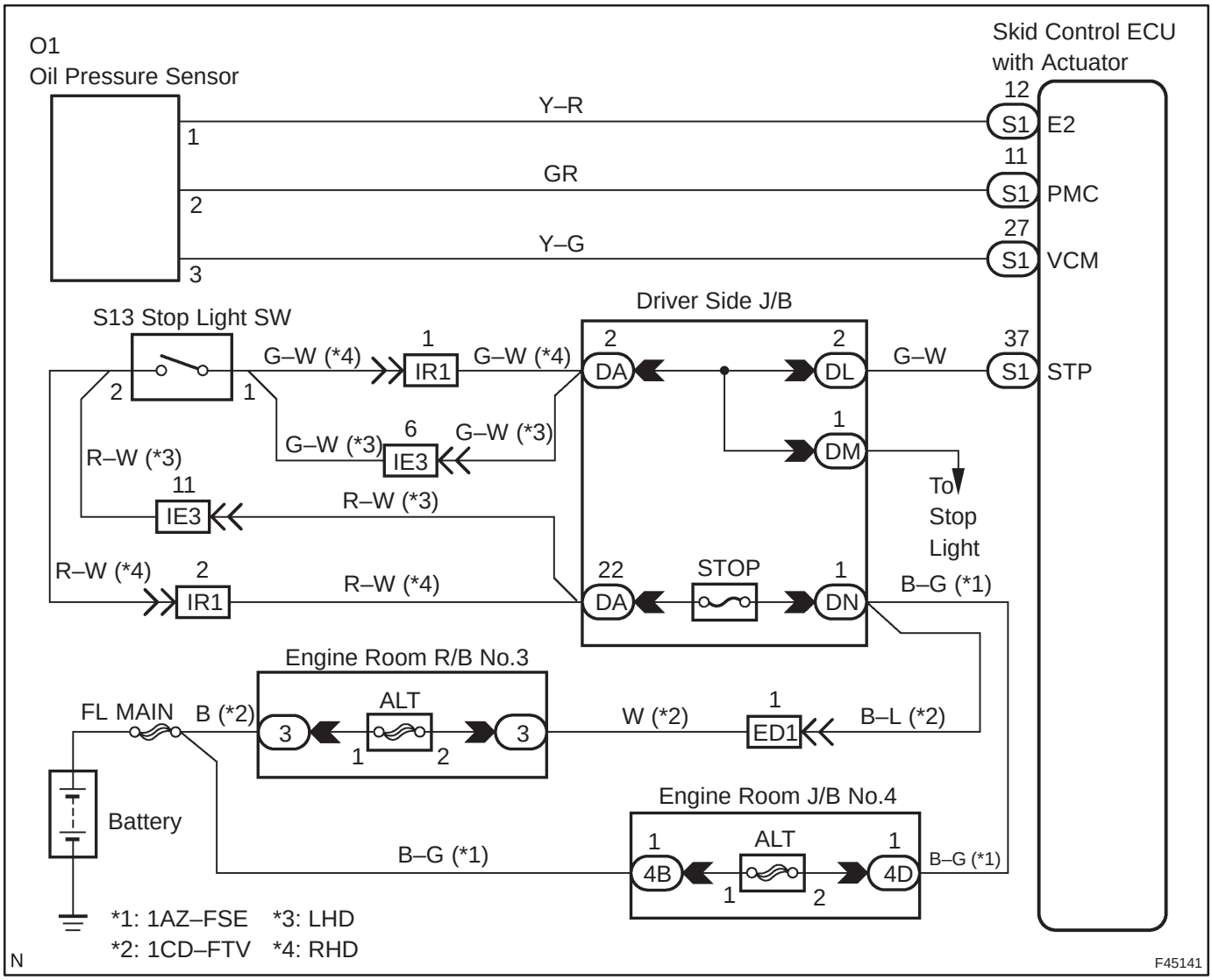
CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – IG1 TERMINAL) (See page 01–32)

DTC	C1246/53	MALFUNCTION IN MASTER CYLINDER PRESSURE SENSOR

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1246/53	When any of the following 1 through 3 is detected: 1. The voltage of sensor signal is out of range (less than 0.3 V, more than 4.7 V). 2. The sensor supply voltage is out of range (above 5.6 V, below 4.4 V). 3. The sensor signal offset value is out of range. 4. Gradient of sensor signal is not within allowed range.	• Master cylinder pressure sensor • Master cylinder pressure sensor circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF MASTER CYLINDER PRESSURE SENSOR

(a) Select the DATALIST mode on the hand–held tester.

(b) Check that the brake fluid pressure value of the No.1 master cylinder pressure sensor and No.2 master cylinder pressure sensor displayed on the hand–held tester changes when depressing the brake pedal.

OK:

Brake fluid pressure value is changing.

OK	Go to step 4

NG

2	INSPECT STOP LAMP SWITCH ASSY

(a) Check that the stop light comes on when the brake pedal is depressed and goes off when the brake pedal is released.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

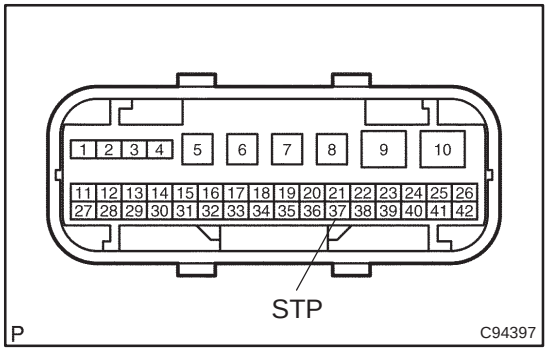
3	CHECK HARNESS AND CONNECTOR(MASTER CYLINDER PRESSUR SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between terminal of the master cylinder pressure sensor and skid control ECU (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(STP TERMINAL)



(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminal STP of the skid control ECU harness side connector and body ground when the brake pedal is depressed.
OK:
Voltage: 8 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

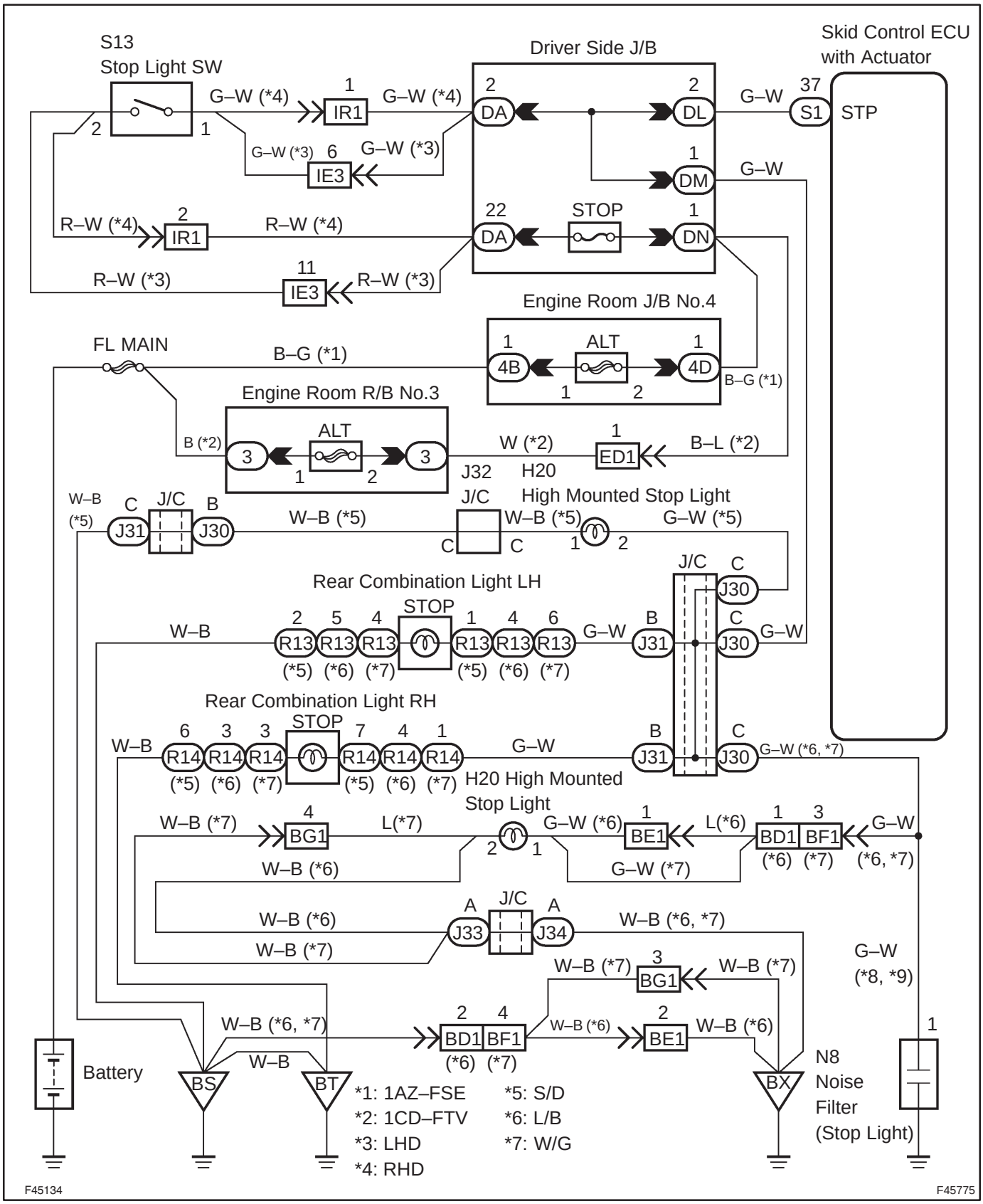
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC C1249/58 STOP LIGHT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1249/58	After the ignition switch is turned ON, the condition that the STP terminal voltage of ECU is 40 % to 67 % of supplied voltage, continues for 1 second or more.	Stop light switch circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

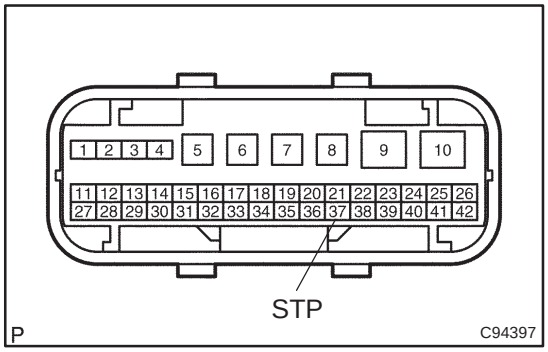
1	INSPECT STOP LAMP SWITCH ASSY

(a) Check that the stop light comes on when the brake pedal is depressed and goes off when the brake pedal is released.

NG → **Go to step 4**

OK

2	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(STP TERMINAL)



(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminal STP of the skid control ECU harness side connector and body ground when the brake pedal is depressed.
OK:
Voltage: 8 to 14 V

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

3	CHECK HARNESS AND CONNECTOR(STOP LIGHT SWITCH – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the stop light switch and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

4	CHECK HARNESS AND CONNECTOR(STOP LIGHT CIRCUIT)

(a) Check for an open or short circuit in harness and connector of the stop light circuit (See page 01–32).

OK → **REPLACE STOP LAMP SWITCH ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC C1288/88 ECU VERSION MISS MATCHI

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1288/88	When either of the following 1 or 2 is detected: 1. ECM does not match. 2. Steering angle sensor is not calibrated.	• ECM • Steering angle sensor calibration.

INSPECTION PROCEDURE

1 PERFORM STEERING ANGLE SENSOR ZERO POINT CALIBRATION

(a) Perform the steering angle sensor zero point calibration (See page 05–756).

2 RECONFIRM DTC

(a) Check if the same DTC is stored in the memory.

NO → **END**

YES

3 CHECK HARNESS AND CONNECTOR(STEERING ANGLE SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the steering angle sensor and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC C1300/62 SKID CONTROL ECU MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1300/62	1. Skid control ECU continuously detects the continuous operation of ABS at all 4 wheels for max. 1.28 sec. 2. Continuos VSC operation for 10 sec. or more. 3. Internal malfunction in ECU.	• ECU

INSPECTION PROCEDURE

1 RECONFIRM DTC

A	DTC C1300/62
B	Except DTC C1300/62

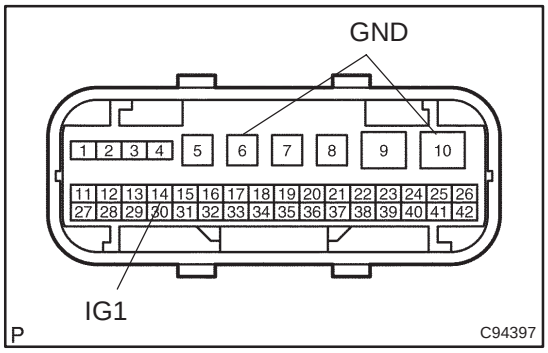
B → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

A

2 INSPECT SKID CONTROL ECU CONNECTOR(IG1 TERMINAL VOLTAGE)

WITH USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



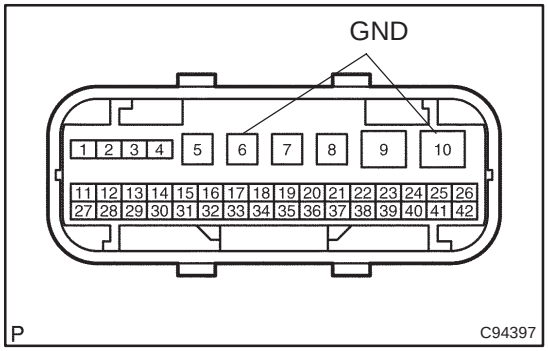
WITHOUT USING HAND–HELD TESTER:

(a) Disconnect the skid control connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

3	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Disconnect the skid control ECU connector.
(b) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.
OK:
Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR

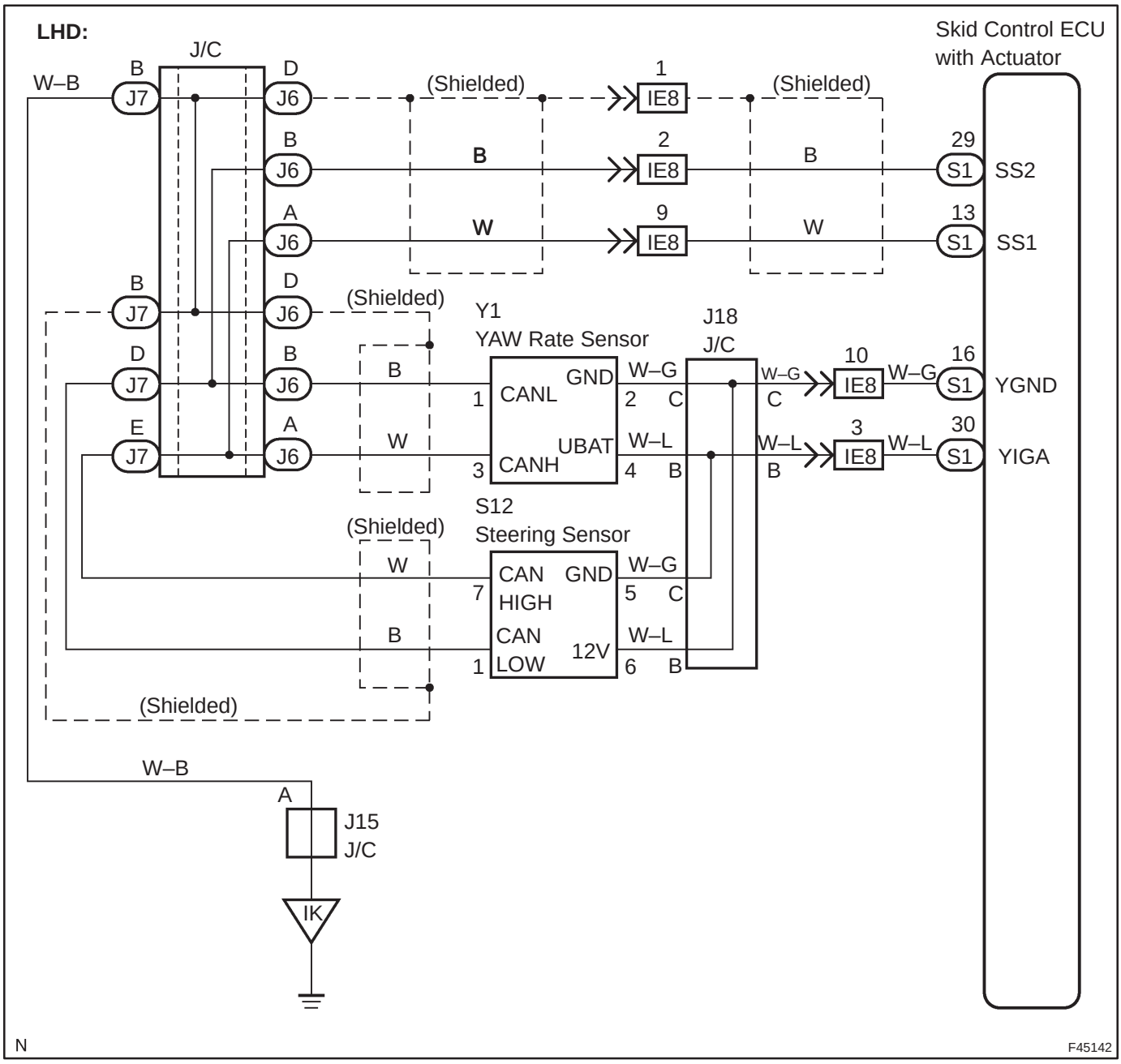
DTC	C1301/42	CAN COMMUNICATION SYSTEM MALFUNCTION

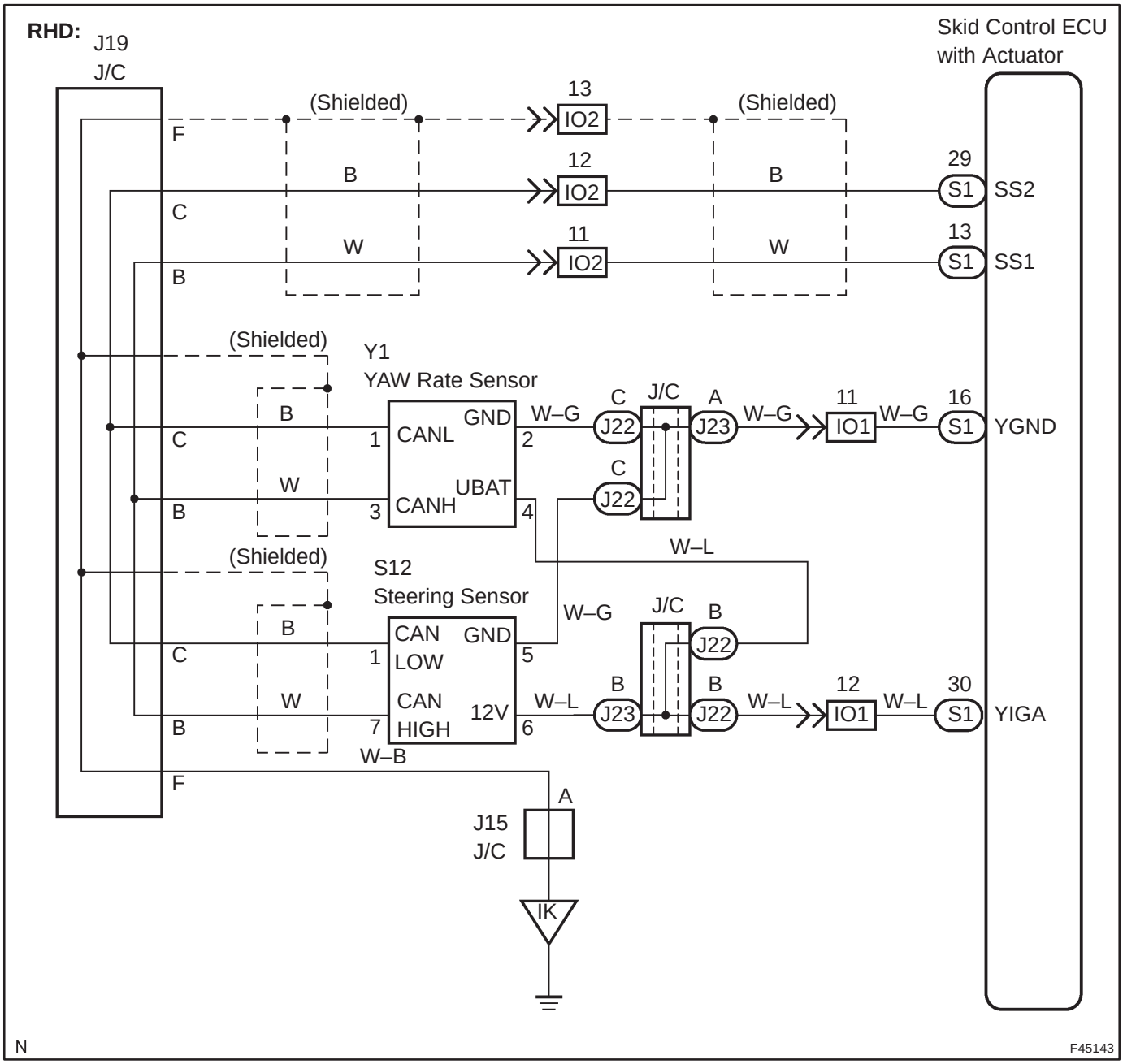
CIRCUIT DESCRIPTION

This circuit is used to send TRC & VSC control information from the yaw rate sensor and steering angle sensor information to the skid control ECU

DTC No.	DTC Detecting Condition	Trouble Area
C1301/42	IG1 voltage is 9.5 V or more, and the condition that data from steering angle sensor or yaw rate sensor can not be received continues for 0.1 seconds or more.	• Yaw rate sensor • Steering angle sensor • Yaw rate sensor circuit • Steering angle sensor circuit

WIRING DIAGRAM




RHD:
J19
J/C
Skid Control ECU
with Actuator
(Shielded)
13
IO2
(Shielded)
F
B
12
IO2
B
29
S1
SS2
C
W
11
IO2
W
13
S1
SS1
B
(Shielded)
Y1
YAW Rate Sensor
B
C
1
CANL
GND
2
W–G
C
J/C
A
W–G
11
W–G
16
S1
YGND
J22
J23
IO1
W
B
3
CANH
UBAT
4
C
J22
W–L
(Shielded)
S12
Steering Sensor
B
C
1
CAN
LOW
GND
5
W–G
J/C
B
J22
W
B
7
CAN
HIGH
12V
6
W–L
B
J23
B
J22
W–L
12
IO1
W–L
30
S1
YIGA
W–B
F
A
J15
J/C
IK
N
F45143

INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(YAW RATE SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the yaw rate sensor and skid control ECU (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	CHECK HARNESS AND CONNECTOR(STEERING ANGLE SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the steering angle sensor and skid control ECU (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

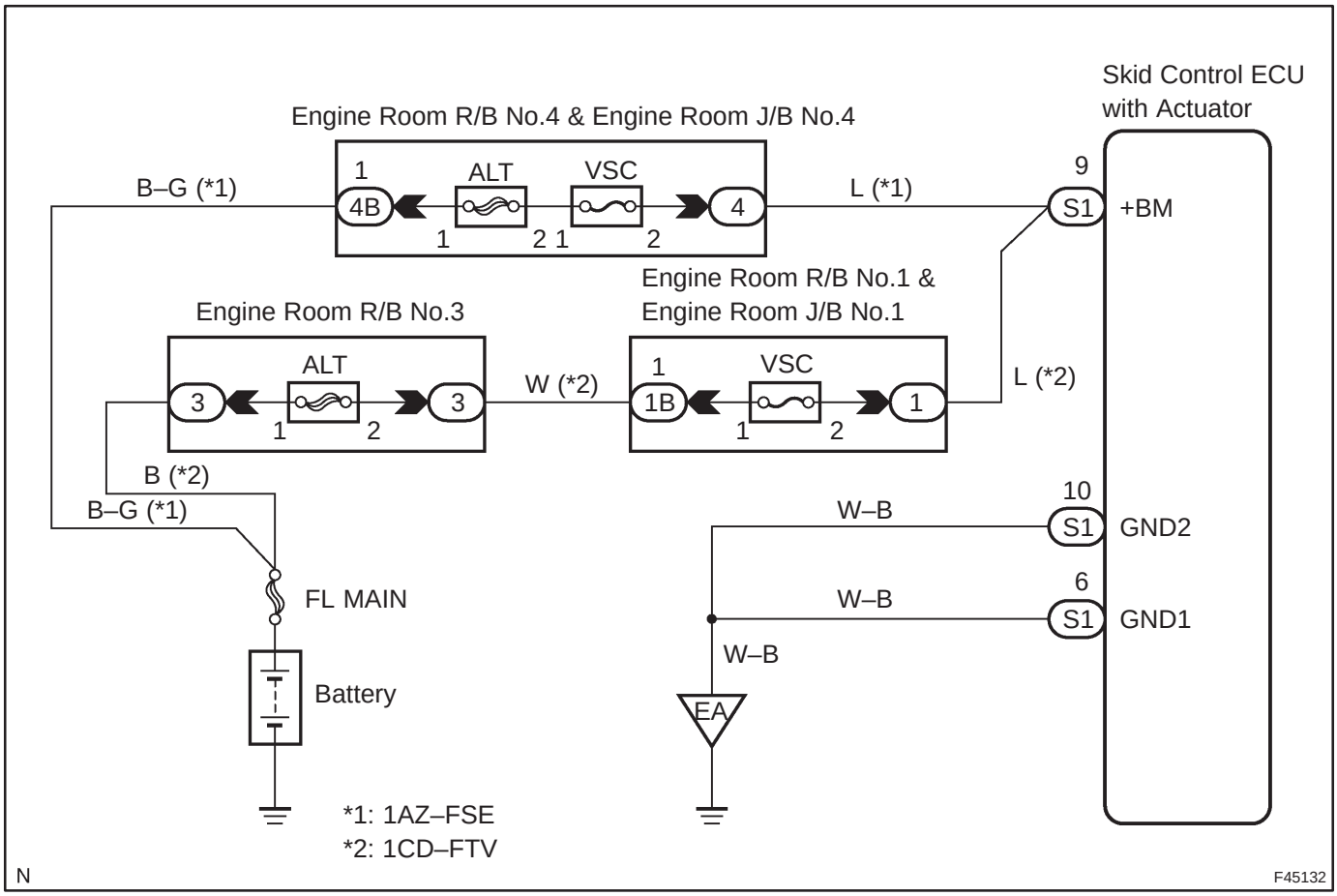
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC	C1350/51	PUMP MOTOR IS LOCKED/OPEN CIRCUIT IN PUMP MOTOR GROUND

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1350/51	When any of the following 1 through 3 is detected. 1. No motor voltage supply within 0.08 sec. after actuation starts the motor relay. 2. A high level of motor voltage when actuation does not starts the motor relay for more than 2.5 sec. 3. The pump motor voltage is high level for a certain time after the motor relay has elapsed.	• Brake actuator pump motor • ABS motor relay circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check if other DTCs are detected (See page 05–756).

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

0542O–04

CUSTOMER PROBLEM ANALYSIS CHECK

ABS & EBD & BA Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	☐ BA does not operate.	
	☐ EBD does not operate.	
	ABS Warning Light	☐ Remains ON ☐ Does not Light Up
	Brake Warning Light (PKB released)	☐ Remains ON ☐ Does not Light Up

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data	STOP LIGHT SW	☐ ON ☐ OFF
	SYSTEM	☐ NO SYS ☐ ABS ☐ BA ☐ FAIL SF
	#IG ON	
	VEHICLE SPD	km/h MPH

TRC & VSC Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ TRAC does not operate. (Wheels spin when starting rapidly.)	
	☐ VSC does not operate. (Wheels sideslip at the time of sharp turning.)	
	TRC OFF Indicator Light	☐ Remains ON ☐ Does not Light Up
	VSC Warning Indicator	☐ Displays ☐ Does not Display
	SLIP Indicator Light	☐ Remains ON ☐ Does not Light Up
	Skid Control Buzzer	☐ Sounds ☐ Does not Sound

Check Item	**ABS Warning Light**	☐ Normal ☐ Malfunction Code (Code)
	Malfunction Indicator Light	☐ Normal ☐ Malfunction Code (Code)

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data	VSC/TRC OFF SW	☐ ON ☐ OFF
	SYSTEM	☐ VSC/TRC
	SHIFT POSITION	☐ P,N ☐ 2 ☐ R ☐ 3 ☐ D ☐ 4 ☐ L ☐ FAIL
	STEERING ANG	deg
	YAW RAT	deg/s
	MAS CYL PRESS	V
	THROTTLE	deg
	MAS PRESS GRADE	MPa/s
	G (RIGHT&LEFT)	G
	G (BACK&FORTH)	G

0542Q–04

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- Using SST 09843–18040, connect the terminal Tc and CG of the DLC3.
- If malfunction is not found when inspecting parts, inspect the ECU and ground points for poor contact.
- If a malfunction code is displayed during the DTC check, check the circuit listed for that code. For details of each code, refer to the "See page" for respective "DTC No." in the DTC chart.
- When 2 or more DTCs are detected, perform circuit inspection one by one until the problem is identified.

DTC chart of ABS system:

DTC No. (See Page)	Detection Item	Trouble Area
C0200 / 31 (05–774)	Right front wheel speed sensor signal malfunction	• Right front speed sensor • Right front speed sensor circuit • Right front speed sensor rotor
C0205 / 32 (05–774)	Left front wheel speed sensor signal malfunction	• Left front speed sensor • Left front speed sensor circuit • Left front speed sensor rotor
C0210 / 33 (05–778)	Right rear wheel speed sensor signal malfunction	• Right rear speed sensor • Right rear speed sensor circuit • Right rear speed sensor rotor
C0215 / 34 (05–778)	Left rear wheel speed sensor signal malfunction	• Left rear speed sensor • Left rear speed sensor circuit • Left rear speed sensor rotor
C0226 / 21 (05–782)	Open or short circuit in brake actuator	• Brake actuator • SFRR or SFRH circuit
C0236 / 22 (05–782)	Open or short circuit in brake actuator	• Brake actuator • SFLR or SFLH circuit
C0246 / 23 (05–782)	Open or short circuit in brake actuator	• Brake actuator • SRRR or SRRH circuit
C0256 / 24 (05–782)	Open or short circuit in brake actuator	• Brake actuator • SRLR or SRLH circuit
C0273 / 13 (05–784)	Open or short circuit in ABS motor relay circuit	• ABS motor relay • ABS motor relay circuit
C0278 / 11 (05–787)	Open or short circuit in ABS solenoid relay circuit	• ABS solenoid relay • ABS solenoid relay circuit
C1237 / 37 (05–807)	Wrong tire size	• Tire size • Speed sensor rotor
C1241 / 41 (05–808)	Low battery positive voltage or abnormally high battery positive voltage	• Battery • Charging system • Power source circuit
C1249 / 58 (05–815)	Open circuit in stop light switch circuit	• Stop lamp switch • Stop lamp switch circuit
C1300 / 62 (05–819)	Malfunction in skid control ECU	• Battery • Skid control ECU
C1330 / 35 (05–774)	Open circuit in right front speed sensor circuit	• Right front speed sensor • Right front speed sensor circuit
C1331 / 36 (05–774)	Open circuit in left front speed sensor circuit	• Left front speed sensor • Left front speed sensor circuit
C1332 / 38 (05–778)	Open circuit in right rear speed sensor circuit	• Right rear speed sensor • Right rear speed sensor circuit

C1333 / 39 (05–778)	Open circuit in left rear speed sensor circuit	• Left rear speed sensor • Left rear speed sensor circuit
Always ON (05–827)	Malfunction in skid control ECU Open circuit in ABS warning light circuit	• Battery • Charging system • Power source circuit • Skid control ECU

DTC chart of VSC system:

DTC No. (See Page)	Detection Item	Trouble Area
C0365 / 43 (05–790)	Malfunction in lateral acceleration sensor (combined in yaw rate sensor)	• Yaw rate sensor • Yaw rate sensor circuit
C0371 / 55 (05–793)	Malfunction in yaw rate sensor circuit	• Yaw rate sensor • Yaw rate sensor circuit
C1224 / 44 (05–797)	Open or short circuit in NE signal circuit	• NEO circuit • ECM • Skid control ECU
C1201/45 (05–796)	VSC shut down due to ECM failure	• ECM
C1203 / 59 (05–799)	ECM communication circuit malfunction	• TRC+ or TRC– circuit • ENG+ or ENG– circuit • ECM
C1208 / 54 (05–801)	Malfunction in steering angle sensor	• Steering angle sensor • Steering angle sensor circuit
C1225 / 25 (05–805)	Open or short circuit in brake actuator solenoid circuit (SMC1 circuit)	• Brake actuator • SMC1 circuit
C1226 / 26 (05–805)	Open or short circuit in brake actuator solenoid circuit (SMC2 circuit)	• Brake actuator • SMC2 circuit
C1227 / 27 (05–805)	Open or short circuit in brake actuator solenoid circuit (SRC1 circuit)	• Brake actuator • SRC1 circuit
C1228 / 28 (05–805)	Open or short circuit in brake actuator solenoid circuit (SRC2 circuit)	• Brake actuator • SRC2 circuit
C1246 / 53 (05–812)	Malfunction in master cylinder pressure sensor	• Master cylinder pressure sensor • Master cylinder pressure sensor circuit
C1288 / 88 (05–818)	Malfunction in ECM version	• Steering angle sensor zero point calibration
C1301 / 42 (05–821)	Malfunction in CAN communication circuit (steering angle sensor circuit, yaw rate sensor circuit)	• Steering angle sensor circuit • Yaw rate sensor circuit
C1350 / 51 (05–825)	Pump motor is locked Open circuit in pump motor ground	• Brake actuator pump motor
Always ON (05–831)	Malfunction in skid control ECU Open circuit in VSC warning light circuit	• Battery • Charging system • Power source circuit • Skid control ECU

DTC of sensor check function :

Code No.	Diagnosis	Trouble Area
C1271/71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation • Sensor rotor
C1272/72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation • Sensor rotor
C1273/73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation • Sensor rotor
C1274/74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation • Sensor rotor
C1275/75	Change in output voltage of right front speed sensor	Right front sensor rotor
C1276/76	Change in output voltage of left front speed sensor	Left front speed sensor rotor
C1277/77	Change in output voltage of right rear speed sensor	Right rear sensor rotor
C1278/78	Change in output voltage of left rear speed sensor	Left rear speed sensor rotor

ABS WITH EBD & BA & TRC & VSC SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

0542N–04

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–754)

3	Check and Clear DTCs and Freeze Frame Data (See page 05–756)

4	Problem Symptom Confirmation

- Symptom does not occur: Go to step 5
- Symptom occurs: Go to step 6

5	Symptom Simulation (See page 01–32)

6	DTC Check (See page 05–756)

- There is no output: Go to step 7
- There is output: Go to step 8

7	Problem Symptoms Table (See page 05–772)

- Check for fluid leakage and Go to step 10

8	DTC Chart (See page 05–766)

9	Circuit Inspection (See page 05–774 – 05–854)

HINT:
When 2 or more DTCs are detected, perform circuit inspection one by one until the problem is identified.

10	Identification of Problem

11	Repair

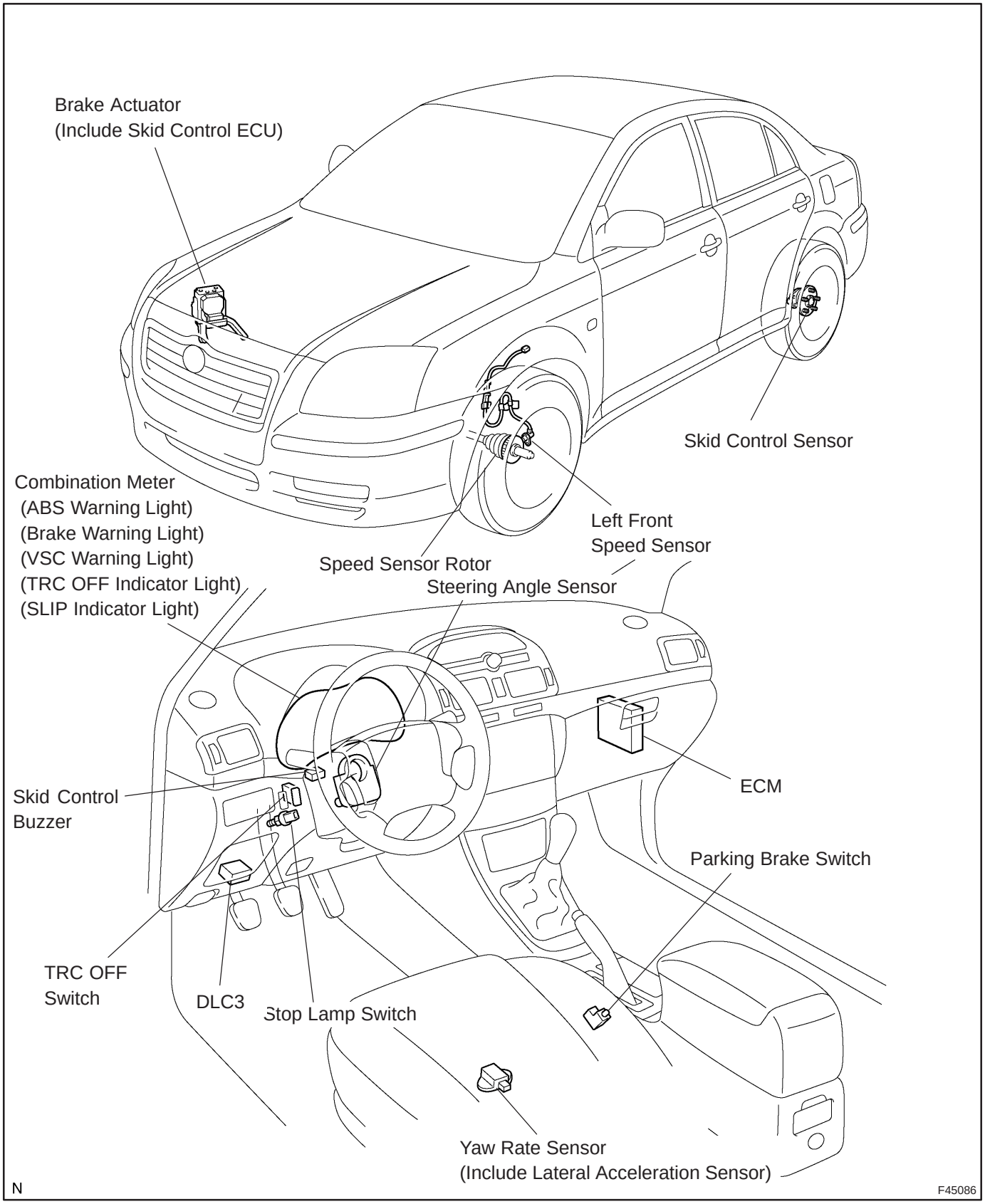
12	Confirmation Test

End

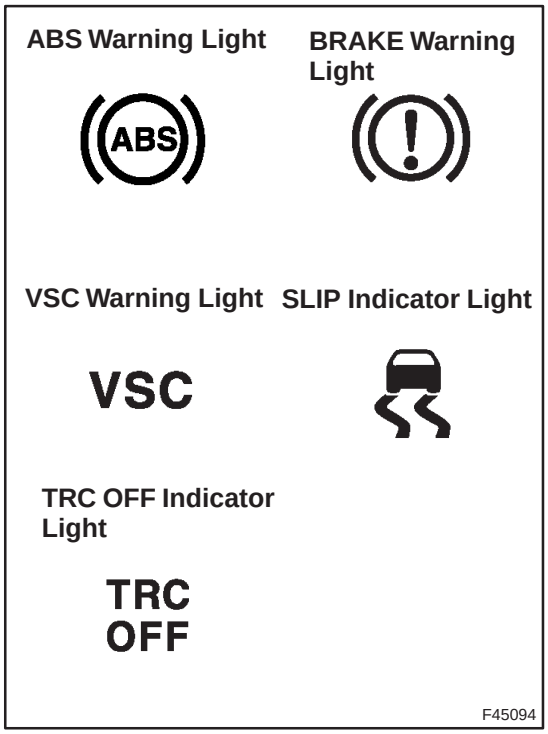
HINT:
Step 3, 6, 9, 12:
Diagnostic steps permitting the use of the hand–held tester.
Fail safe function:
When a failure occurs in the ABS & BA & TRC & VSC systems, the ABS warning light, the VSC warning light and the TRC OFF indicator light come on and the ABS & BA & TRC & VSC operations are prohibited. In addition to this, when the failure that disables the EBD operation occurs, the brake warning light comes on as well and the EBD operation is prohibited.

056T1–03

LOCATION



0577Y–02



PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Check the warning lights.

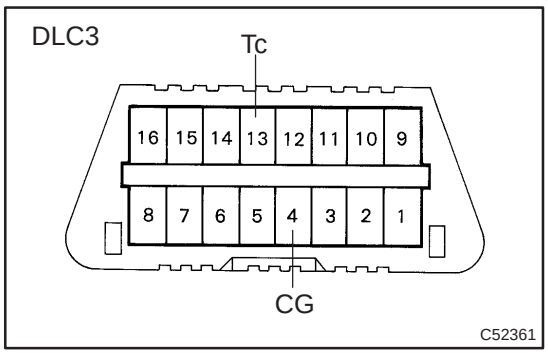
(1) Release the parking brake lever.

(2) When the ignition switch is turned ON, check that the ABS warning light, Brake warning light, VSC warning light, TRC OFF indicator light and SLIP indicator light come on for approx. 3 seconds.

HINT:

- When the parking brake is applied or brake fluid level is low, the Brake warning light comes on.
- If the ECU stores DTC, the ABS warning light , VSC warning light and TRC OFF indicator light come on.
- If the indicator check result is not normal, proceed to troubleshooting for the light circuit.

Trouble Area	See page
ABS warning light circuit	05–827
Brake warning light circuit	05–840
VSC warning light circuit	05–831
TRC OFF indicator light circuit	05–844
SLIP indicator light circuit	05–848



(b) Without using hand–held tester:
Check the DTC.

(1) Using SST, connect terminal Tc and CG of the DLC3.

SST 09843–18040

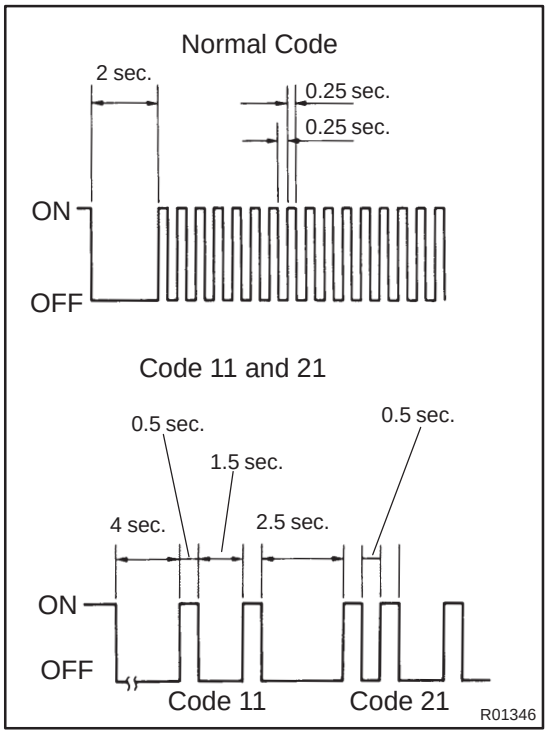
(2) Turn the ignition switch ON.

(3) Read the DTC from the ABS warning light or VSC warning light on the combination meter.

HINT:

- If no code appears, inspect the diagnostic circuit, ABS warning light circuit or VSC warning light circuit.

Trouble Area	See page
Tc terminal circuit	05–852
ABS warning light circuit	05–827
VSC warning light circuit	05–831



- As an example, the blinking patterns for the normal code and codes 11 and 21 are shown on the left.

(4) Codes are explained in the code table on page 05–766.

(5) After completing the check, disconnect terminal Tc and CG of the DLC3, and turn off the display.

If 2 or more DTCs are detected at the same time, the lowest numbered DTC is displayed first.

(c) With using the hand–held tester:

Check the DTC.

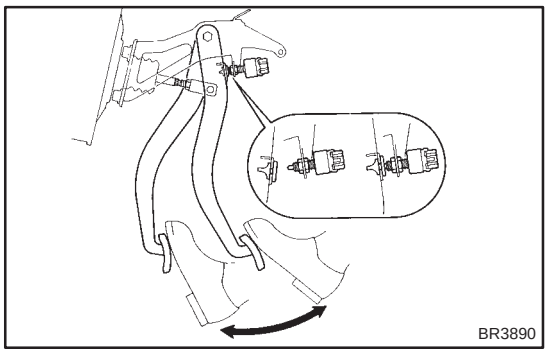
(1) Hook up the hand–held tester to the DLC3.

(2) Turn the ignition switch ON.

(3) Read the DTC by following the prompts on the tester screen.

HINT:

Please refer to the hand–held tester operator's manual for further details.



(d) Without using hand–held tester:

Clear the DTCs.

(1) Using SST, connect the terminal Tc and CG of the DLC3.

SST 09843–18040

(2) Turn the ignition switch ON.

(3) Clear the DTCs stored in the ECU by depressing the brake pedal 8 or more times within 5 seconds.

(4) Check that the ABS warning light and VSC warning light indicates the normal code blinking pattern.

(5) Remove the SST from the DLC3.

SST 09843–18040

HINT:

Disconnecting the battery cable during repairs will not erase the DTCs in the ECU.

(e) With using hand–held tester:

Clear the DTCs.

(1) Turn the ignition switch ON.

(2) Operate the hand–held tester to erase the codes.

HINT:

Please refer to the hand–held tester operator's manual for further details.

2. DATA LIST

HINT:

According to the DATA LIST displayed on the Hand–held tester, you can read the value and status of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of trouble-shooting is one of the methods to shorten the labor time.

(a) Connect the Hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) From the display on the tester, read the ”DATA LIST”.

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
ABS MOT RELAY	ABS motor relay / ON or OFF	ON : Motor relay ON	–
SOL RELAY	Solenoid relay / ON or OFF	ON : Solenoid relay ON	–
VSC / TRC OFF SW	VSC / TRC OFF switch / ON or OFF	ON : Switch ON OFF : Switch OFF	–
STOP LIGHT SW	Stop light switch / ON or OFF	ON : Brake pedal de-pressed OFF : Brake pedal re-leased	–
PKB SW	Parking brake switch / ON or OFF	ON : Parking brake applied OFF : Parking brake re-leased	–
WHEEL SPD FR	Wheel speed sensor (FR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD FL	Wheel speed sensor (FL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD RR	Wheel speed sensor (RR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD RL	Wheel speed sensor (RL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
DECELERAT SENS1	Lateral acceleration sensor 1 reading / min.: –1.869 G, max.: 1.869 G	Approximately 0 ± 0.1G at still condition	Reading changes when vehicle is bounced
IG VOLTAGE	ECU power supply voltage / NORMAL or TOO LOW	NORMAL : 9.8 V or over TOO LOW : Below 9.8 V	–
SFRR	ABS solenoid SFRR / ON or OFF	ON : Operate	–
SFRH	ABS solenoid SFRH / ON or OFF	ON : Operate	–
SFLR	ABS solenoid SFLR / ON or OFF	ON : Operate	–
SFLH	ABS solenoid SFLH / ON or OFF	ON : Operate	–
SRRR (SRR)	ABS solenoid SRRR (SRR) / ON or OFF	ON : Operate	–
SRRH (SRH)	ABS solenoid SRRH (SRH) / ON or OFF	ON : Operate	–

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
SRLR	ABS solenoid SRLR / ON or OFF	ON : Operate	–
SRLH	ABS solenoid SRLH / ON or OFF	ON : Operate	–
SRCF(SA1)	TRC solenoid SRCF(SA1) / ON or OFF	ON : Operate	–
SRCR(SA2)	TRC solenoid SRCR(SA2) / ON or OFF	ON : Operate	–
SRMF(SMCF,SA3)	TRC solenoid SRMF(SMCF,SA3)1 / ON or OFF	ON : Operate	–
SRMR(SMCR,STR)	TRC solenoid SRMR(SMCR,STR) / ON or OFF	ON : Operate	–
ENGINE SPD	Engine Speed/ Min.: 0 rpm, Max.: 6000 rpm	Actual engine speed	–
VEHICLE SPD	Maximum wheel speed sensor reading / min.: 0 km/h (0 MPH), max.: 326 km/h (202 MPH)	Actual vehicle speed	Speed indicated on speedometer
YAW RATE	Yaw rate sensor/ Min.: –128 deg/s, Max.: 128 deg/s		–
YAW ZERO VALUE	Memorized zero value/ Min.: –128 deg/s, Max.: 128 deg/s		–
STEERING ANG	Steering sensor/ Min.: –1152 deg, Max.: 1150.875 deg		–
MAS CYL PRS1	Master cylinder pressure sensor 1 reading / min.: 0 V, max.: 5 V	When brake pedal is released : 0.3 – 0.9 V	Reading increases when brake pedal is depressed
TEST MODE	Test mode / NORMAL or TEST	NORMAL : Normal mode TEST : During test mode	
#CODES	Number of DTC recorded / min.: 0, max.: 255	Min.: 0, max.: 26	

3. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the Hand–held tester allows the relay, solenoid, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the methods to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the Hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) From the display on tester, select the ”ACTIVE TEST”.

HINT:

IG must be turned ON to proceed Active Test using a hand–held tester.

*1: For VSC equipped vehicles only

Item	Vehicle Condition / Test Details	Diagnostic Note
SFRR	Turns ABS solenoid SFRR ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH	Turns ABS solenoid SFRH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR	Turns ABS solenoid SFLR ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLH	Turns ABS solenoid SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRR(SRR)	Turns ABS solenoid SRRR(SRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRH(SRH)	Turns ABS solenoid SRRH(SRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR	Turns ABS solenoid SRLR ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLH	Turns ABS solenoid SRLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRCF(SA1)	Turns TRAC solenoid SRCF (SA1) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRCR(SA2)	Turns TRAC solenoid SRCR (SA2) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRMF(SMCF,SA3)	Turns TRC solenoid SRMF (SMCF,SA3) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRMR(SMCR,STR)	Turns TRC solenoid SRMR(SMCR,STR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRR & SFRH	Turns ABS solenoid SFRR & SFRH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR & SFLH	Turns ABS solenoid SFLR & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard

Item	Vehicle Condition / Test Details	Diagnostic Note
SRH & SRR	Turns ABS solenoid SRH & SRR ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR & SRLH	Turns ABS solenoid SRLR & SRLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH & SFLH	Turns ABS solenoid SFRH & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRCF & SRCR	Turns ABS solenoid SRCF & SRCR ON / OFF	Operation of solenoid (clicking sound) can be heard
SRMF & SRMR	Turns ABS solenoid SRMF & SRMR ON / OFF	Operation of solenoid (clicking sound) can be heard
SOL RELAY	Turns ABS solenoid relay ON / OFF	Operation of solenoid (clicking sound) can be heard
ABS MOT RELAY	Turns ABS motor relay ON / OFF	Operation of motor can be heard
ABS WARN LIGHT	Turns ABS warning light ON / OFF	Observe combination meter
VSC WARN LIGHT	Turns VSC warning light ON / OFF	Observe combination meter
VSC / TRC OFF IND	Turns VSC / TRC OFF indicator ON / OFF	Observe combination meter
SLIP INDI LIGHT	Turns SLIP indicator light ON / OFF	Observe combination meter
BRAKE WRN LIGHT	Turns BRAKE warning light ON / OFF	Observe combination meter
VSC WARN BUZ	Turns VSC warning buzzer ON / OFF	Buzzer can be heard

4. FREEZE FRAME DATA

(a) The vehicle (sensor) status memorized during ABS and/or VSC operation or at the time of error code detection can be displayed using the hand–held tester.

(b) Only one record of the freeze frame data is stored and the freeze frame data generated during ABS and/or VSC operation are constantly updated. Also, the number of the operations of the ignition switch ”ON” after the freeze frame data is stored can be memorized up to 31 and it can be displayed.

HINT:

If the ignition switch ”ON” operation exceeds 31 times, ”31” appears on the display.

(c) If the diagnosis code malfunction occurs, the freeze frame data at the occurrence of the malfunction is stored but the ABS actuation data is deleted.

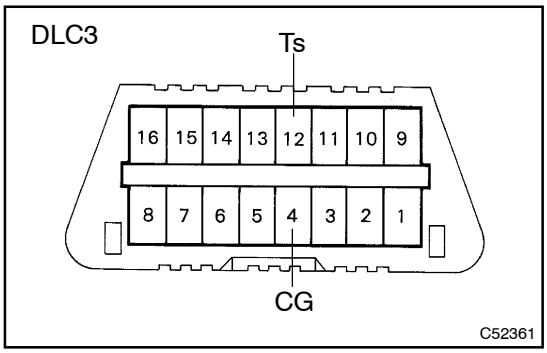
Hand–held tester display	Measurement Item	Reference Value*
VEHICLE SPD	Vehicle speed	Speed indication of a meter
STOP LIGHT SW	Stop light switch signal	Stop light switch ON: ON, OFF: OFF
# IG ON	Numbers of operations of ignition switch ON after memorizing freeze frame data	0 to 31
MAS CYL PRESS	Master cylinder pressure sensor output voltage	Release brake pedal: 0.3 to 0.9 V Depress brake pedal: 1.5 to 4.5 V
MASS PRESS GRADE	Master cylinder pressure sensor changing gradient	–30 to 200 MPa/s
SYSTEM	Operate system	ABS operate: ABS BA operate: BA VSC (TRC) operate: VSC (TRC)
YAW RATE	Yaw rate angle sensor output value	–70 to 70
STEERING ANG	Steering sensor output value	Left turn: Increase Right turn: Drop
THROTTLE	Throttle position sensor output value	Release accelerator pedal: Approx. 0 deg Depress accelerator pedal: Approx. 90 deg
G (RIGHT & LEFT)	Right and left G	–1.869 to 1.869 G
VSC (TRC) OFF SW	TRC OFF switch signal	TRC OFF SW ON: ON OFF: OFF
SHIFT POSITION	Shift lever position	P: P R: R N: N D: D 2: 2 L: L

*: If no conditions are specifically stated for ”Idling”, it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

5. Without using hand–held tester:
ABS SENSOR SIGNAL CHECK (TEST MODE)

NOTICE:
After replacing the steering angle sensor and/or ECU, perform zero point calibration of the steering angle sensor or system decision (When replacing the ECU) (See step 7.).

HINT:
If the ignition switch is turned from ON to ACC or LOCK during test mode, the DTCs will be erased.



(a) Procedures for test mode:
(1) Turn the ignition switch OFF.
(2) Using SST, connect terminal Ts and CG of the DLC3.
SST 09843–18040
(3) Check that the steering wheel is in the straight–ahead position and shift the shift lever to P range.
(4) Turn the ignition switch ON.
(5) Check that the ABS warning light blinks.

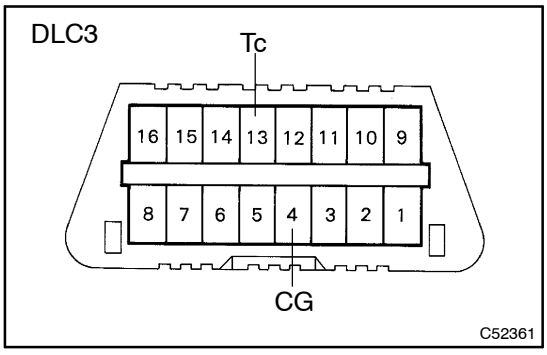
HINT:
If the ABS warning light does not blink, inspect the ABS warning light circuit or Ts terminal circuit.

Trouble area	See Page
Ts terminal circuit	05–854
ABS warning light circuit	05–827

(b) Check the speed sensor signal.
(1) Drive the vehicle straight forward at the speed of 45 km/h (28 mph) or over for several seconds and check that the ABS warning light goes off.

HINT:
The sensor check may not be completed if the wheels spin or the steering wheels are steered during this check.

(c) Stop the vehicle.

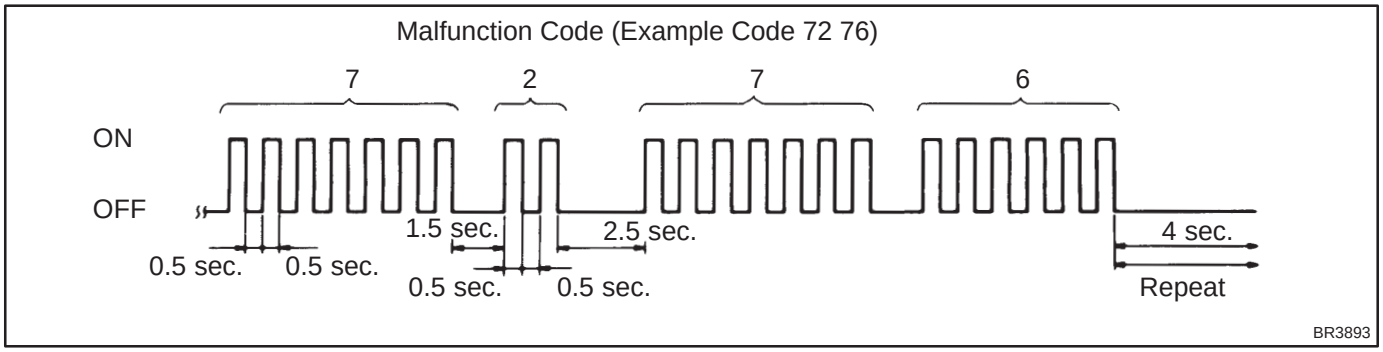


(d) Using SST, connect terminal Tc and CG of the DLC3.
SST 09843–18040

(e) Read the number of blinks of the ABS warning light.

HINT:
- See the list of DTCs on page 05–766.
- If every sensor is normal, the normal code is output (A cycle of 0.25 second ON and 0.25 second OFF is repeated).

- If 2 or more DTCs are detected at the same time, the lowest numbered code is displayed first.



(f) After the check, disconnect the SST from terminal Ts and CG, Tc and CG of DLC3 and turn the ignition switch to OFF.
SST 09843–19040

6. With using hand–held tester:
ABS SENSOR SIGNAL CHECK (TEST MODE)

NOTICE:

After replacing the steering angle sensor and/or ECU, perform zero point calibration of the steering angle sensor or system decision (When replacing the ECU) (See step 7.).

HINT:

If the ignition switch is turned from ON to ACC or LOCK during test mode, the DTCs will be erased.

(a) Hook up the hand–held tester to the DLC3.
(b) Perform step 5. (c) to (d) on the previous page.
(c) Read the DTC by following the prompts on the tester screen.

HINT:

Please refer to the hand–held tester operator's manual for further details.

7. STEERING ANGLE SENSOR ZERO POINT CALIBRATION

NOTICE:

When replacing the steering angle sensor with column assembly or ECU, Engine and ECT ECU (A/T), Engine ECU (M/T) or when adjusting the front wheel alignment or steering wheel center point in accordance with the removing or installing or replacing the suspension, axle or steering parts, make sure to perform steering angle sensor zero point calibration.

(a) Using SST, connect terminals Ts and CG of the DLC3.
SST 09843–18040
(b) Turn the ignition switch ON and keep the shift lever at P range.
(c) Make sure the steering off center angle is less than ±3° when assembling the steering wheels (Smaller value is desirable).
(d) Press the TRC OFF switch and hold it.
(e) Check that the following conditions are satisfied.

HINT:

- Engine warning light comes on.
- ABS warning light is blinking.

(f) Depress the brake pedal 3 times or more within 2 seconds.

(g) Check that the skid control buzzer sounds for 3 seconds.

HINT:

- Press and hold the TRC OFF switch until the skid control buzzer sounds. When it starts sounding, turn off the switch.
- When the skid control buzzer starts sounding, turn off the TRC OFF switch.
- If the skid control buzzer sounds, the sensor calibration is in normal completion.
- If the skid control buzzer does not sound, perform the sensor calibration again.
- If the skid control buzzer still will not sound, there is malfunction in the steering angle sensor, so check the DTC.

0542T–04

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

NOTICE:

When replacing the ABS & TRACTION actuator, sensor or etc., turn the ignition switch to OFF.

Symptom	Suspect Area	See page
ABS does not operate BA does not operate EBD does not operate	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. IG power source circuit 3. Speed sensor circuit 4. Check the brake master cylinder with a ABS actuator checker or hand–held tester. If there is malfunction, check the hydraulic circuit for leakage.	 05–756 05–808 05–774 05–778 32–56
ABS does not operate properly BA does not operate properly EBD does not operate properly	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. Speed sensor circuit 3. Stop light switch circuit 4. Check the brake master cylinder with a ABS actuator checker or hand–held tester. If there is malfunction, check the hydraulic circuit for leakage.	 05–756 05–774 05–778 05–815 32–56
ABS warning light malfunction	1. ABS warning light circuit 2. ABS & TRACTION actuator	05–827 –
DTC of ABS check cannot be performed	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. Tc terminal circuit	 05–756 05–852
Sensor signal check cannot be performed	1. Ts terminal circuit 2. ABS & TRACTION actuator	05–854 –
TRC does not operate	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. IG power source circuit 3. Check the hydraulic circuit for leakage. 4. Speed sensor circuit	 05–756 05–808 – 05–774 05–778

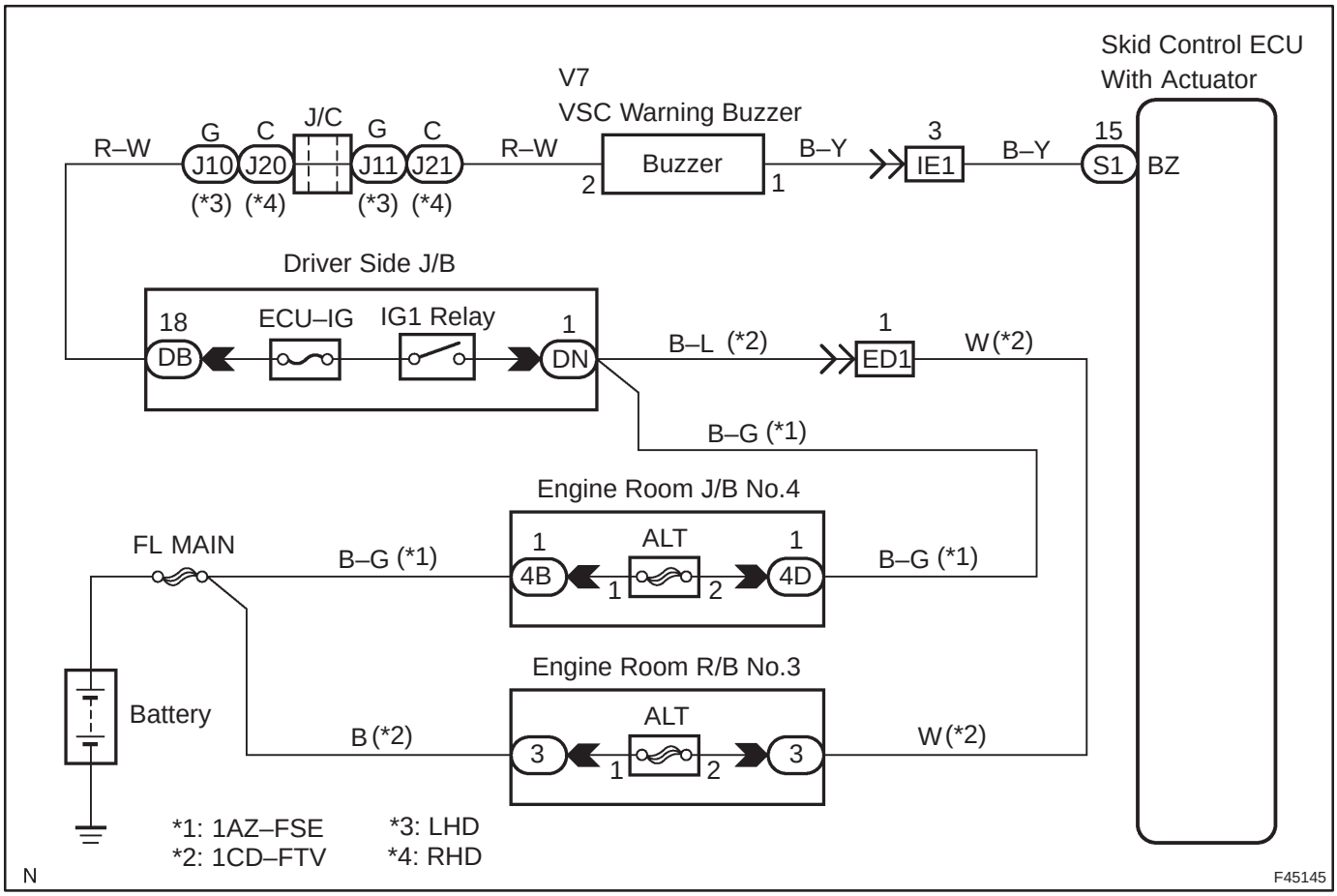
Symptom	Suspect Area	See page
VSC does not operate	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. IG power source circuit 3. Check the hydraulic circuit for leakage. 4. Speed sensor circuit 5. Yaw rate sensor and deceleration sensor circuit 6. Steering angle sensor circuit	 05–756 05–808 – 05–774 05–778 05–790 05–793 05–801
SLIP indicator light malfunction	1. SLIP indicator light circuit 2. ABS & TRACTION actuator	05–848 –
TRC OFF indicator malfunction	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. TRC OFF switch circuit	 05–756 05–844
DTC of VSC check cannot be performed	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. Tc terminal circuit	 05–756 05–852
VSC warning light malfunction	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. VSC warning circuit	 05–756 05–831

SKID CONTROL BUZZER CIRCUIT

CIRCUIT DESCRIPTION

The skid control buzzer sounds during VSC operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

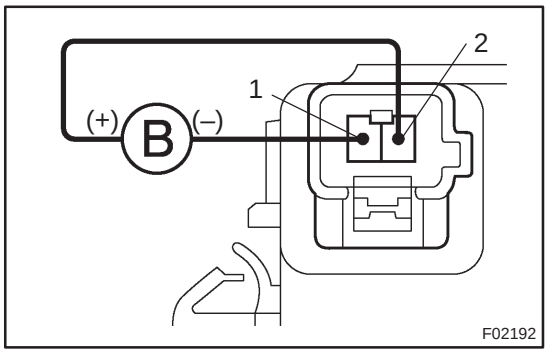
1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(SKID CONTROL BUZZER)

(a) Check that skid control buzzer sounds ”ON” and ”OFF” with the hand–held tester.

OK → REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

2	INSPECT SKID CONTROL BUZZER ASSY



(a) Disconnect the skid control buzzer connector.

(b) Apply battery positive voltage to the terminals 1 and 2 of the skid control buzzer connector, check that the buzzer sounds.

NG → REPLACE SKID CONTROL BUZZER ASSY

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL BUZZER – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between terminal BZ of the skid control ECU and skid control buzzer (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

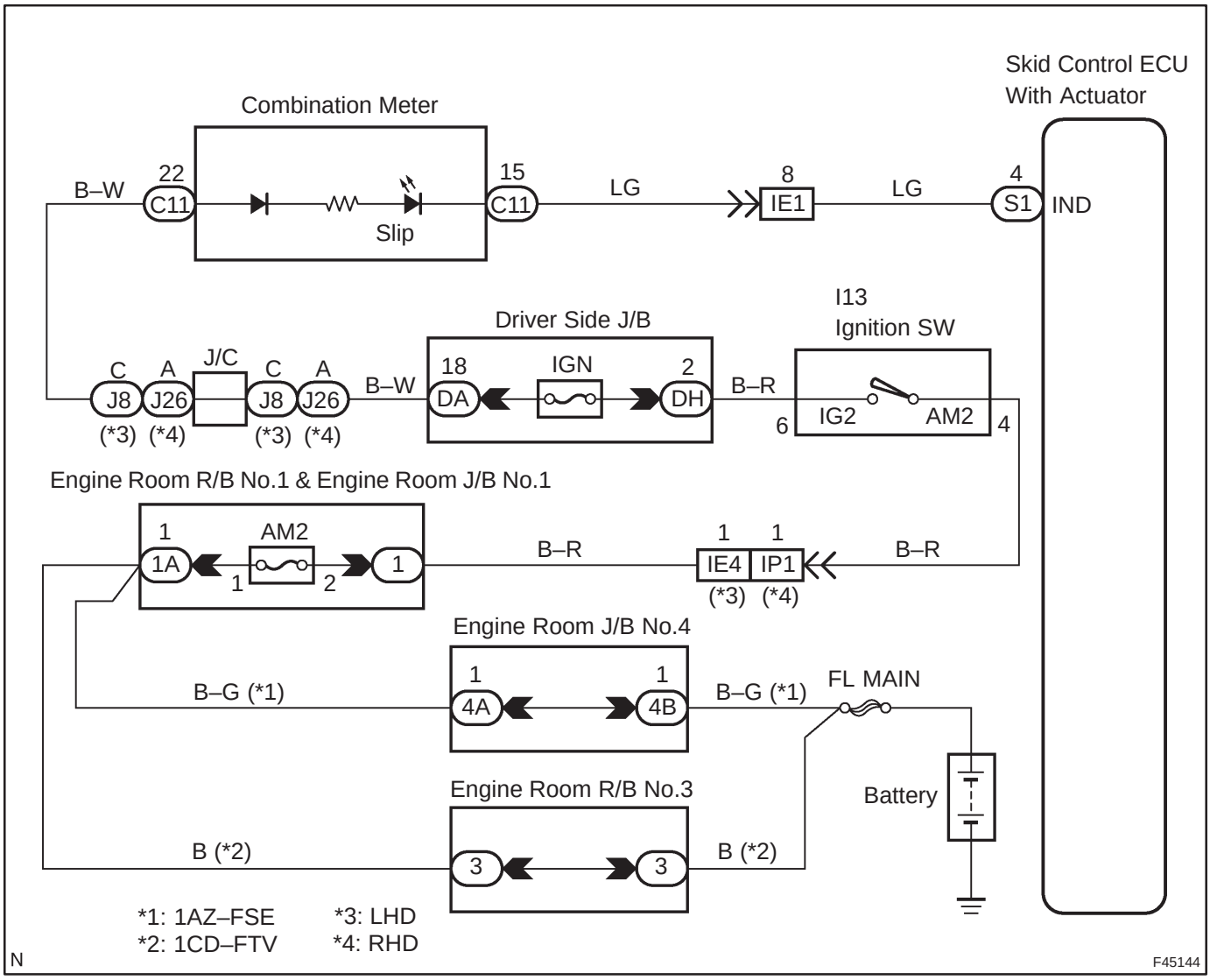
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

SLIP INDICATOR LIGHT CIRCUIT

CIRCUIT DESCRIPTION

The SLIP indicator blinks during TRC & VSC operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(SLIP INDICATOR LIGHT)

(a) Check that ”ON” and ”OFF” of the SLIP indicator light is shown on the combination meter by the hand–held tester.

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

2	INSPECT SLIP INDICATOR LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → **REPAIR OR REPLACE COMBINATION METER ASSEMBLY**

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for an open or short circuit in harness and connector between terminal IND of the skid control ECU and combination meter (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

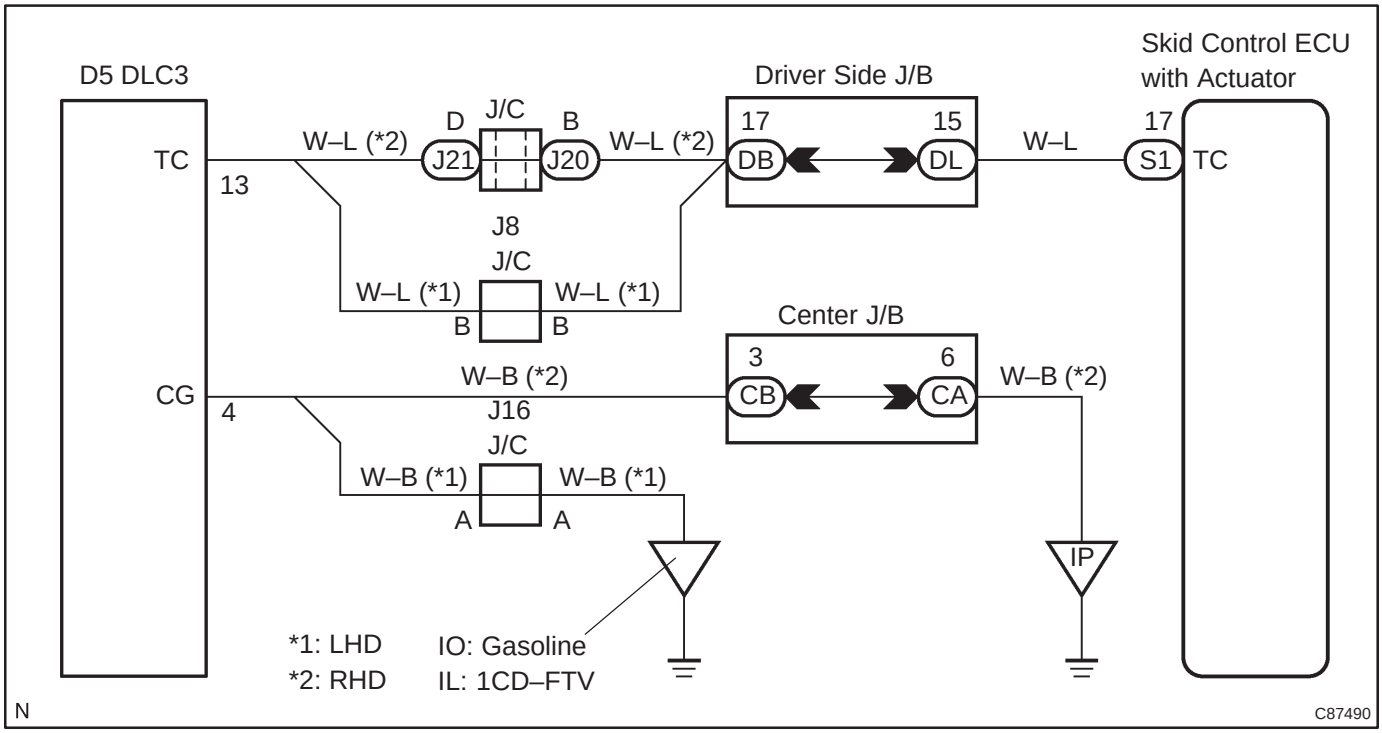
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

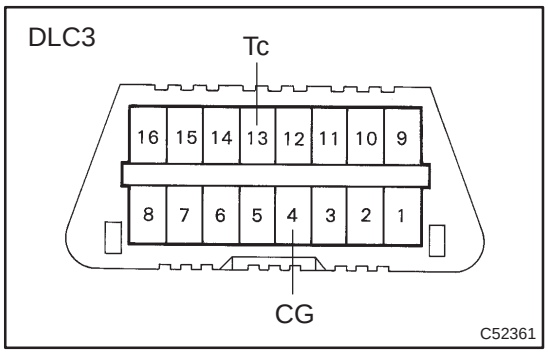
Connecting terminals Tc and CG of the DLC3 causes the ECU to display the DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Tc TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Tc and CG of the DLC3.
OK:
Voltage: 10 to 14 V

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminal CG of the DLC3 and body ground (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – DLC3)

(a) Check for an open or short circuit in harness and connector between terminal Tc of the skid control ECU and DLC3 (See page 01–32).

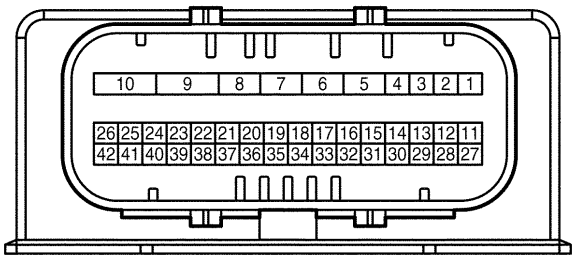
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

0542S–04

TERMINALS OF ECU



P C94401

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
WT (2) – GND (6, 10)	LG–B – W–B	IG Switch ON, TRAC OFF Light ON	Below 2.0
		IG Switch ON, TRAC OFF Light OFF	10 to 14
IND (4) – GND (6, 10)	LG – W–B	IG Switch ON, SLIP indicator light ON	Below 2.0
		IG Switch ON, SLIP indicator light OFF	10 to 14
+BS (5) – GND (6, 10)	R – W–B	Always	10 to 14
ENG+ (8) – ENG– (7)	Y – B	IG switch ON	Pulse generation
+BM (9) – GND (6, 10)	L – W–B	Always	10 to 14
PMC (11) – E2 (12)	GR – Y–R	IG switch ON, stop light switch OFF	0.3 to 0.9
SS1 (13) – SS2 (29)	W – B	Engine idling, slowly tun steering wheel	Pulse generation
IG1 (14) – GND (6, 10)	R–W – W–B	IG switch ON	10 to 14
BZ (15) – GND (6, 10)	B–Y – W–B	IG switch ON, VSC buzzer is sounded	Below 1.0 ↔ 10 to 14
		IG switch ON, VSC buzzer is not sounded	10 to 14
Tc (17) – GND (6, 10)	W–L – W–B	IG Switch ON	10 to 14
TRC+ (18) – TRC– (19)	G – L	IG switch ON	Pulse generation
EBDW (20) – GND (6, 10)	P – W–B	IG Switch ON, Brake warning light ON	5 to 9
		IG Switch ON, Brake warning light OFF	Below 2.0
FR+ (21) – FR– (22)	W – B	IG switch ON, slowly turn right front wheel	AC generation
RL+ (23) – RL– (40)	R – G	IG switch ON, slowly turn left rear wheel	AC generation
D/G (26) – GND (6, 10)	W–G – W–B	IG switch ON	8 to 12
VCM (27) – GND (6, 10)	Y–G – W–B	IG switch ON	4.5 to 5.5
Ts (28) – GND (6, 10)	W – W–B	IG switch ON	10 to 14
YIGA (30) – YGND (16)	W–L – W–G	IG Switch ON	10 to 14
PKB (31) – GND (6, 10)	B–W – W–B	IG switch ON, parking brake switch ON	Below 1.5
		IG switch ON, parking brake switch OFF	10 to 14
NEO (32) – GND (6, 10)	Y–B – W–B	Engine idling	Pulse generation
VSCW (34) – GND (6, 10)	W–R – W–B	IG Switch ON, VSC warning light ON	5 to 9
		IG Switch ON, VSC warning light OFF	Below 2.0
SP1 (35) – GND (6, 10)	L–W – W–B	Vehicle drives at about 20 km/h (12 mph)	Pulse generation
WA (36) – GND (6, 10)	R–Y – W–B	IG Switch ON, ABS warning light ON	Below 2.0
		IG Switch ON, ABS warning light OFF	10 to 14
STP (37) – GND (6, 10)	G–W – W–B	Stop light switch OFF	Below 1.5
		Stop light switch ON	8 to 14
RR+ (38) – RR– (39)	P – V	IG switch ON, slowly turn right rear wheel	AC generation
FL+ (41) – FL– (24)	L–Y – R–L	IG switch ON, slowly turn left front wheel	AC generation

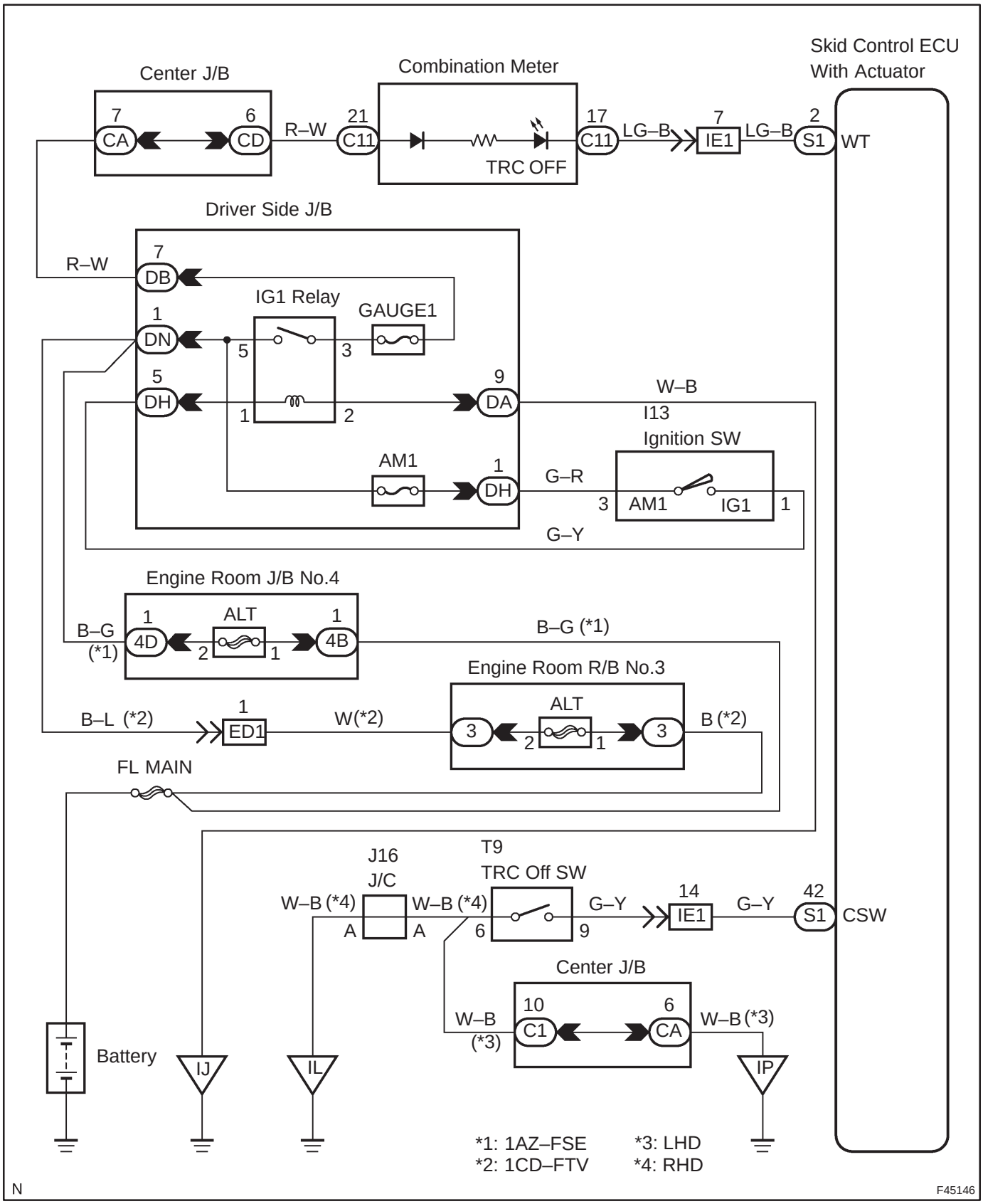
CSW (42) – GND (6, 10)	G–Y – W–B	IG switch ON, TRC OFF switch pressed	Below 1.5
		IG switch ON, TRC OFF switch released	8 to 14

TRC OFF INDICATOR, TRC CUT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

This is the TRC control main switch. When the TRC OFF switch is pressed, TRC control goes off and the TRC OFF indicator illuminates. Also, turn the TRC OFF indicator light to ”ON” when the VSC system is at the fail safe control. If the ignition switch is turned off, TRC control surely comes on the next time the ignition switch is turned ON.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(TRC OFF INDICATOR LIGHT)

(a) Check that ”ON” and ”OFF” of the TRC OFF indicator light is shown on the combination meter by the hand–held tester.

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

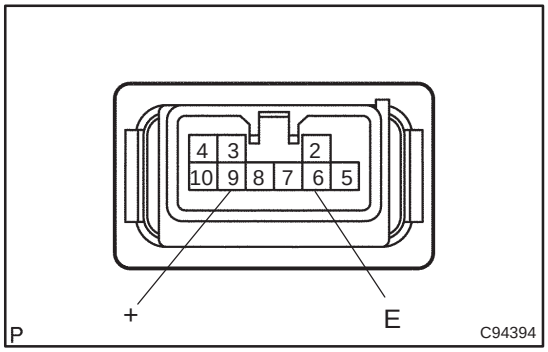
2	INSPECT TRC OFF INDICATOR LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → **REPAIR OR REPLACE COMBINATION METER ASSEMBLY**

OK

3	INSPECT TRACTION CONTROL SWITCH



(a) Remove the TRC OFF switch.
(b) Disconnect the TRC OFF switch connector.
(c) Measure resistance between terminals + and E of the TRC OFF switch when the TRC OFF switch is ON and OFF.

OK:

TRC OFF switch	Resistance
Pushed in	Continuity
Released	1MΩ or higher

NG → **REPLACE TRACTION CONTROL SWITCH**

OK

4	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – TRC OFF SWITCH)

(a) Check for an open or short circuit in harness and connector between terminal CSW of the skid control ECU and TRC OFF switch (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

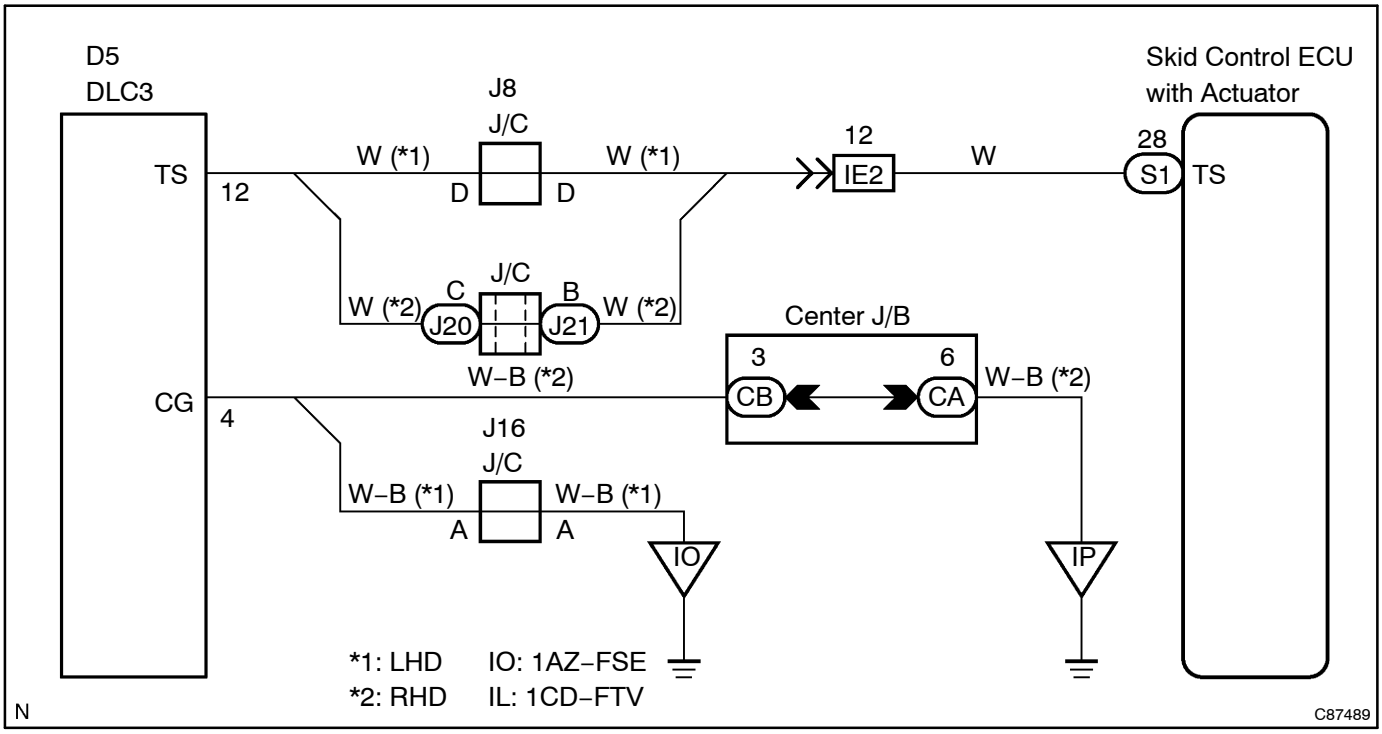
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

TS TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

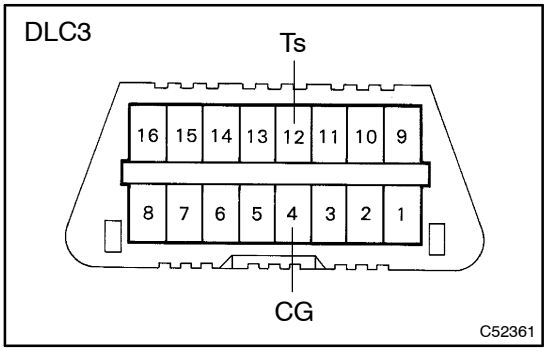
The sensor check circuit detects troubles in the sensor signal which cannot be detected by the DTC check. Connecting terminals Ts and CG of the DLC3 starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Ts TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Ts and CG of the DLC3.
OK:
Voltage: 10 to 14 V

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminal Ts of the DLC3 and skid control ECU (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK AND REPAIR HARNESS AND CONNECTOR(SKID CONTROL ECU – DLC3)

(a) Check for an open or short circuit in harness and connector between terminal CG of the DLC3 and body ground (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

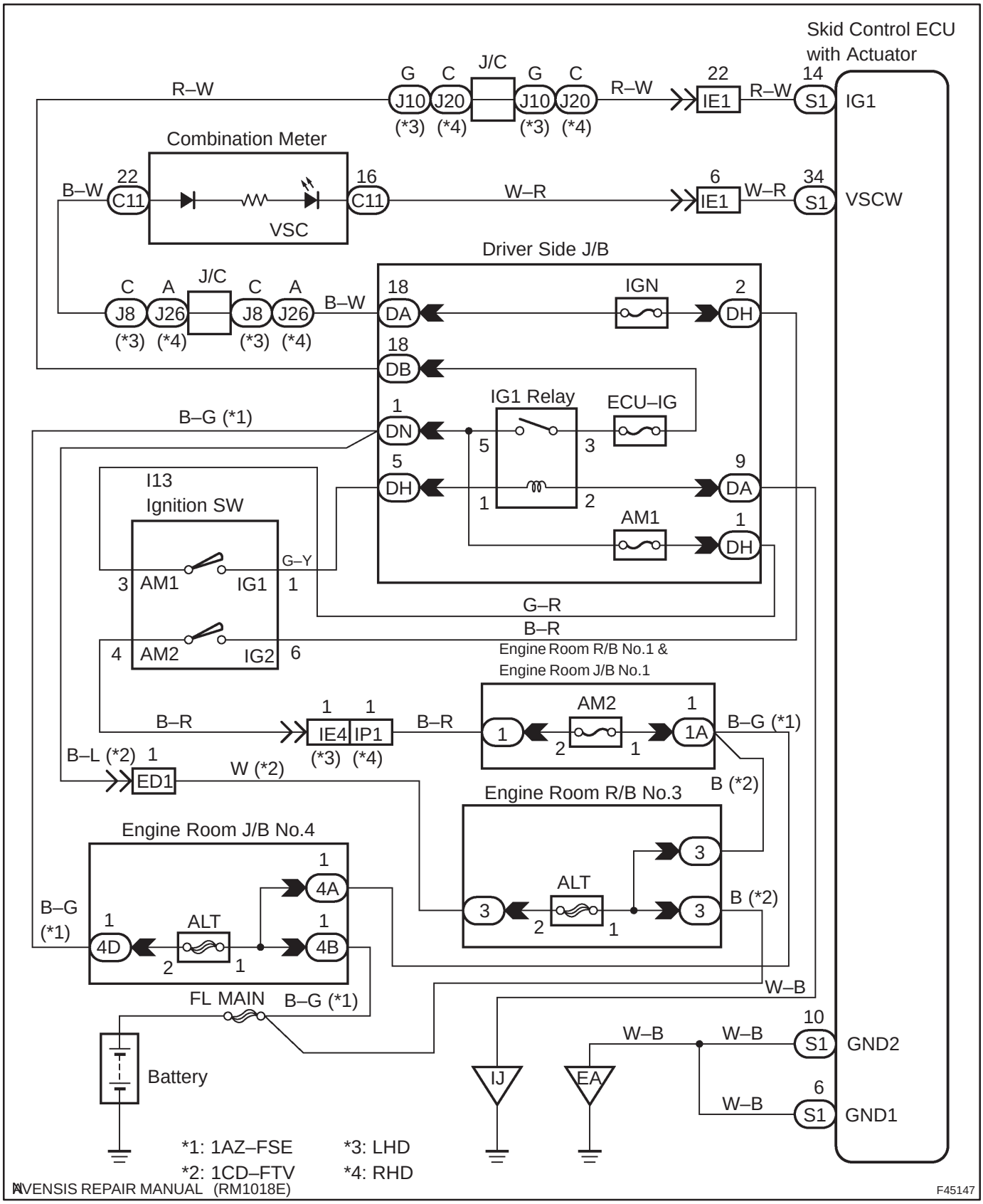
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

VSC WARNING LIGHT CIRCUIT (DOES NOT LIGHT UP)

CIRCUIT DESCRIPTION

When the ECU stores DTC, the VSC warning light illuminates on the combination meter.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSC WARNING LIGHT)

(a) Check that ”ON” and ”OFF” of the VSC warning light is shown on the combination meter by the hand–held tester.

OK → REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

2	INSPECT VSC WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

3	CHECK HARNESS AND CONNECTOR(COMBINATION METER – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

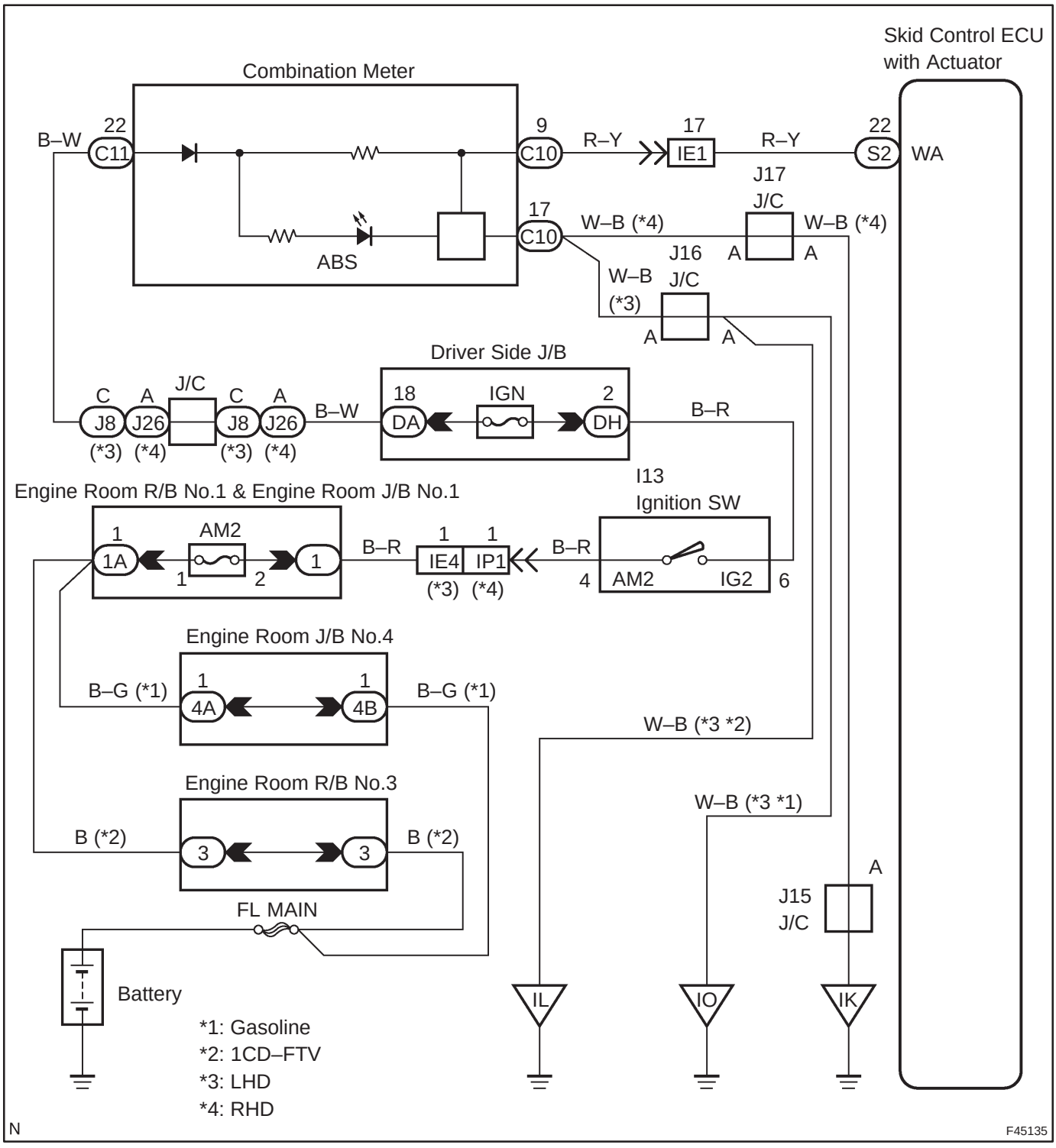
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

ABS WARNING LIGHT CIRCUIT (DOES NOT LIGHT UP)

CIRCUIT DESCRIPTION

If the ECU detects trouble, it will prohibit ABS control, turn on ABS warning light, and store the DTC. Connect terminals Tc and CG of the DLC3 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(ABS WARNING LIGHT)

(a) Check that ”ON” and ”OFF” of the ABS warning light is shown on the combination meter by the hand–held tester.

OK → **REPLACE BRAKE ACTUATOR ASSY (See page 32–54)**

NG

2	INSPECT COMBINATION METER ASSY(ABS WARNING LIGHT) (See page 71–1)

(a) Disconnect the connector from the skid control ECU.
(b) Turn the ignition switch ON.
(c) Check the ABS warning light.

OK:

ABS warning light comes on

NG → **REPAIR OR REPLACE COMBINATION METER ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(WA CIRCUIT)

(a) Check for a short circuit in harness and connector between terminal WA of the skid control ECU and combination meter (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

DTC	AlwaysON	MALFUNCTION IN ABS ECU

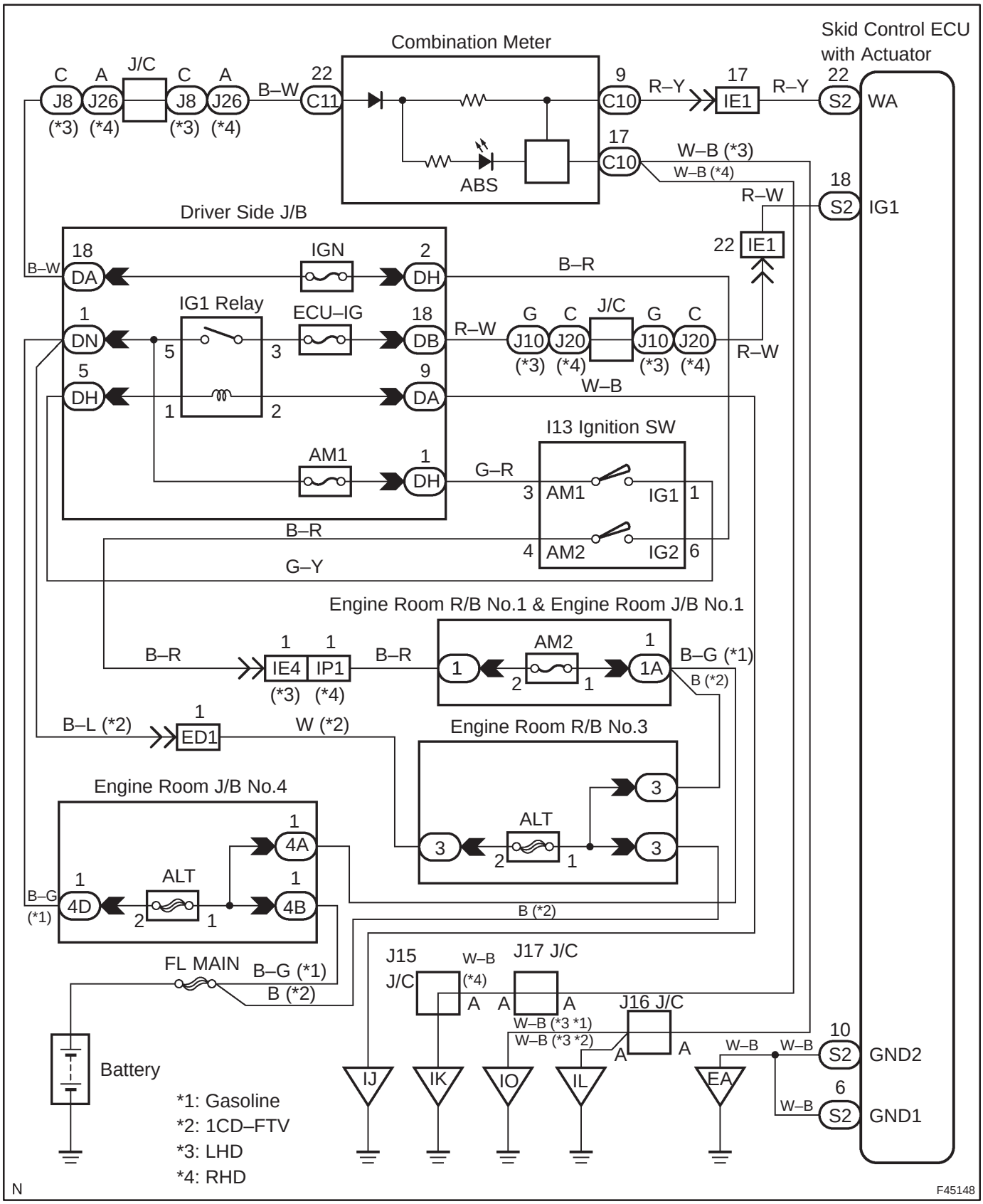
CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Either of the following 1 or 2 is detected: 1. The ECU connectors are disconnected from the ECU. 2. There is a malfunction in the ECU internal circuit.	• Battery • Charging system • Power source circuit • ABS warning light circuit • Skid control ECU

HINT:

There is a case that hand–held tester cannot be used when there is a malfunction in the ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check the DTCs are output (See page 05–699).

YES → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

NO

2	INSPECT SKID CONTROL ECU CONNECTOR SECURELY CONNECTED

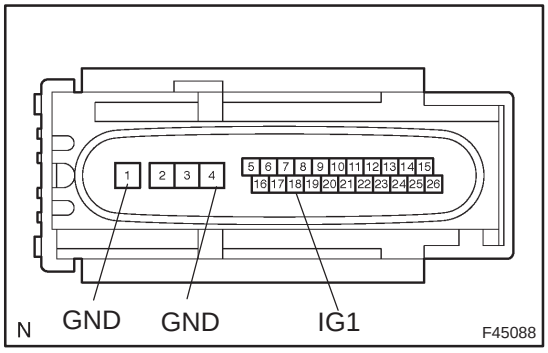
NO → **CONNECT CONNECTOR TO ECU**

YES

3	INSPECT SKID CONTROL ECU CONNECTOR(IG1 TERMINAL VOLTAGE)

IN CASE OF USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



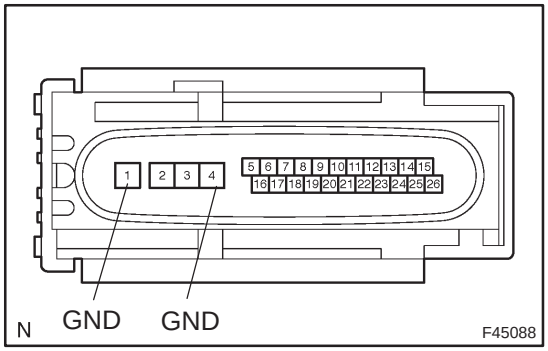
IN CASE OF NOT USING HAND–HELD TESTER:

(a) Disconnect the skid control ECU connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.
Voltage: 10 to 14 V

OK → **Go to step 5**

NG

4 INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



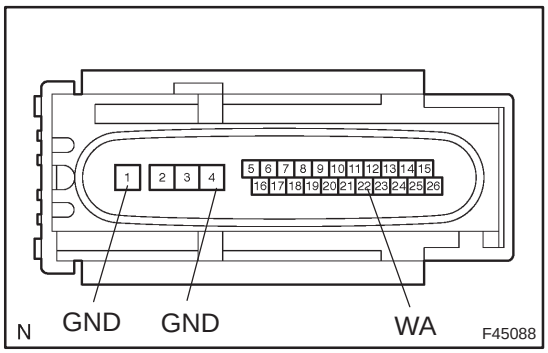
(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.
Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – IG1 TERMINAL) (See page 01–32)

5 INSPECT COMBINATION METER(ABS WARNING LIGHT)



(a) Disconnect the skid control ECU connector.
(b) Using service wire, connect terminals WA and GND of the skid control ECU harness side connector.
(c) Turn the ignition switch ON.
OK:
ABS warning light goes off.

NG → **REPAIR OR REPLACE COMBINATION METER**

OK

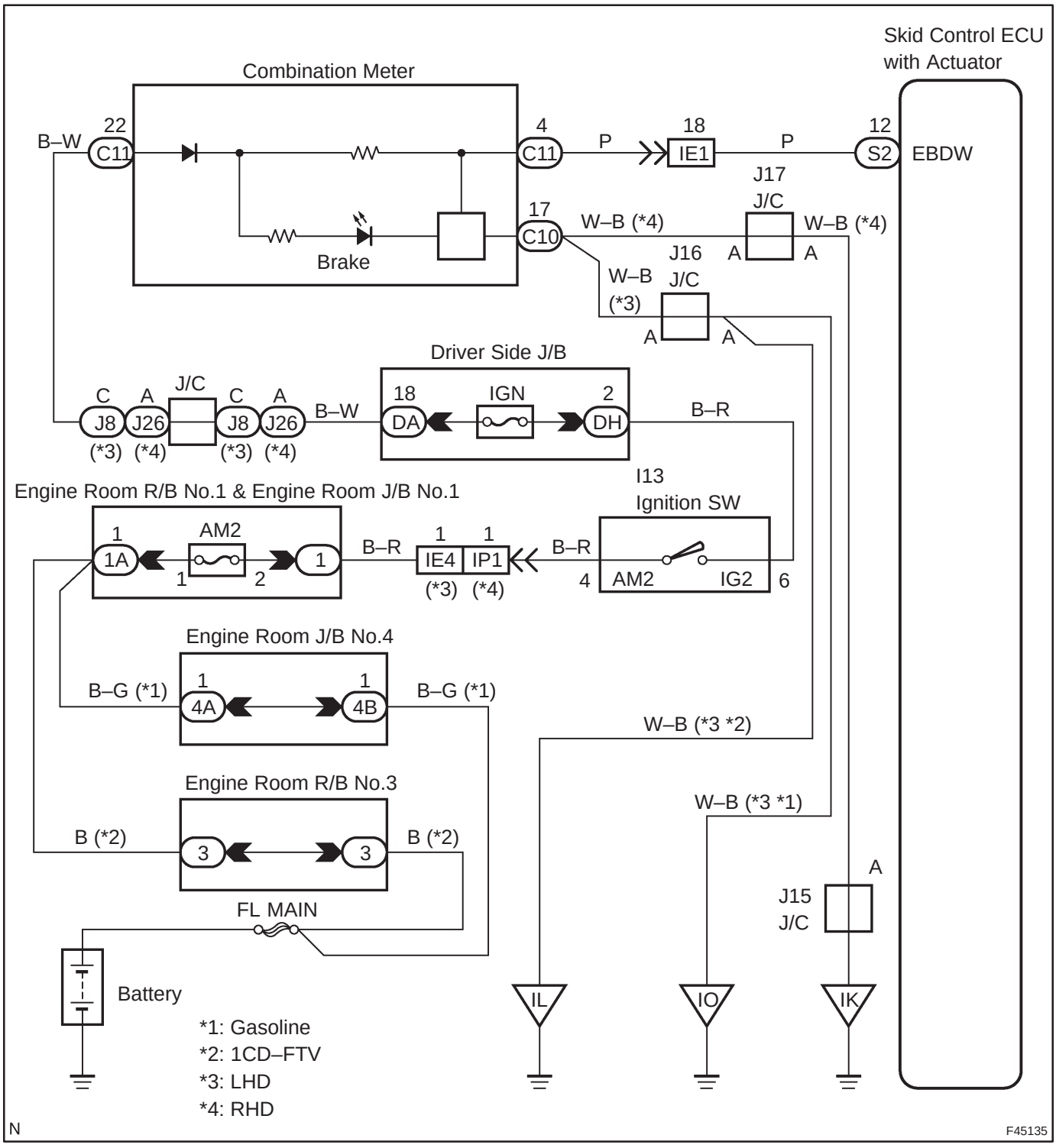
REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

BRAKE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

The Brake warning light comes on when the brake fluid is insufficient, the parking brake is applied or the EBD is defective.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check the DTC (See page 05–699).
OK:
Normal code

NG → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

OK

2	INSPECT PARKING BRAKE SWITCH CIRCUIT

(a) Check for an open or short circuit in the parking brake switch circuit (See page 01–32).

NG → **REPAIR OR REPLACE PARKING BRAKE SWITCH CIRCUIT**

OK

3	INSPECT BRAKE FLUID LEVEL WARNING SWITCH CIRCUIT

(a) Check the brake fluid level in reservoir.
(b) Check for an open or shot circuit in brake fluid level warning switch circuit (See page 01–32).

NG → **REPAIR OR REPLACE BRAKE FLUID LEVEL WARNING SWITCH CIRCUIT**

OK

4	INSPECT VACUUM WARNING SWITCH CIRCUIT

(a) Check for an open or short circuit in harness and connector between the vacuum warning switch and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	INSPECT COMBINATION METER ASSEMBLY(BRAKE WARNING LIGHT CIRCUIT)

(a) Check for an open or short circuit in the combination meter (See page 01–32).

NG → **REPAIR OR REPLACE COMBINATION METER ASSEMBLY**

OK

6	CHECK HARNESS AND CONNECTOR(BRAKE ACTUATOR – COMBINATION METER)

(a) Check for an open or short circuit in harness and connector between the brake actuator and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

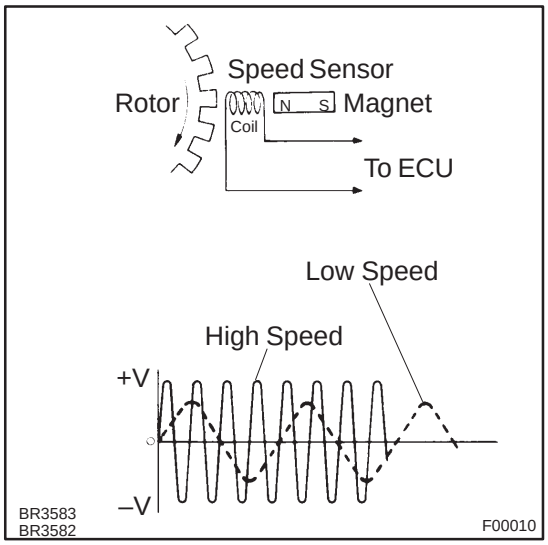
DTC	C0200/31	RIGHT FRONT SPEED SENSOR

DTC	C0205/32	LEFT FRONT SPEED SENSOR

DTC	C1330/35	RIGHT FRONT SPEED SENSOR CIRCUIT

DTC	C1331/36	LEFT FRONT SPEED SENSOR CIRCUIT

CIRCUIT DESCRIPTION



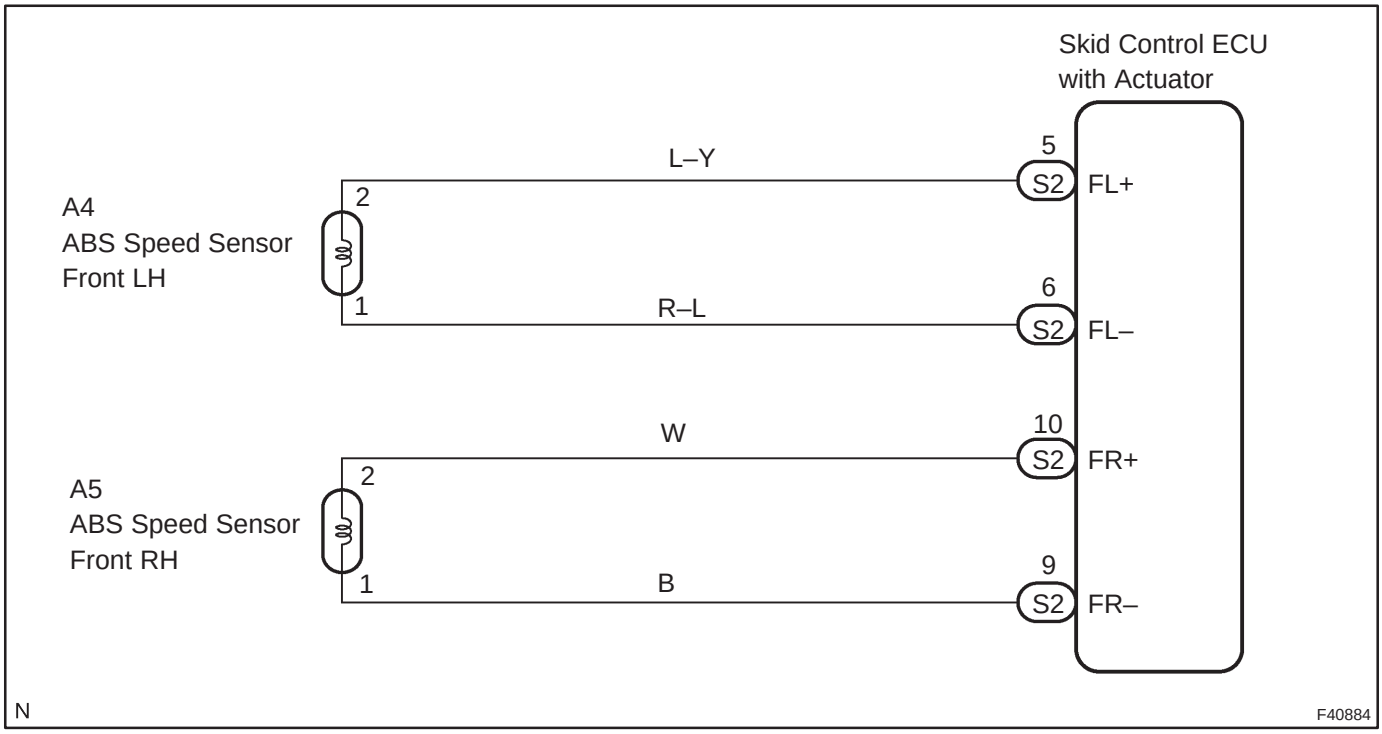
The speed sensor detects wheel speed and transmits the appropriate signals to the ECU. These signals are used for control of the ABS control system. Each of the front and rear rotors has 48 serrations.

When the rotors rotate, the magnetic field generated by the permanent magnet in the speed sensor induces an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

DTC No.	DTC Detecting Condition	Trouble Area
C0200/31 C0205/32	When any of the following 1. to 3. is detected : 1. Non–plausible high frequent signal, high wheel acceleration or high gradient for 20 sec. with the brake pedal applied or for 5 sec. when the brake pedal is not applied. 2. After the initial start or restart and when the vehicle speed has reached 12 km/h (7 mph), the wheel speed of 0 km/h (0 mph) is detected. 3. Deviation of 2 wheel speed.	• Right front and left front speed sensor • Speed sensor rotor
C1330/35 C1331/36	Detecting abnormality in the resistance value of each speed sensor.	• Right front and left front speed sensor • Speed sensor circuit

HINT:
DTC No. C0200/31 and C1330/35 are for the right front speed sensor.
DTC No. C0205/32 and C1331/36 are for the left front speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF HAND–HELD TESTER(FRONT SPEED SENSOR)

(a) Select the item "WHEEL SPEED FL (FR)" in the DATA LIST and read the value displayed on the hand–held tester.

(b) Check that there is no difference between the speed value output from the speed sensor displayed on the hand–held tester and the speed value displayed on the speedometer when driving the vehicle.

OK:

There is almost no difference in the displayed speed value.

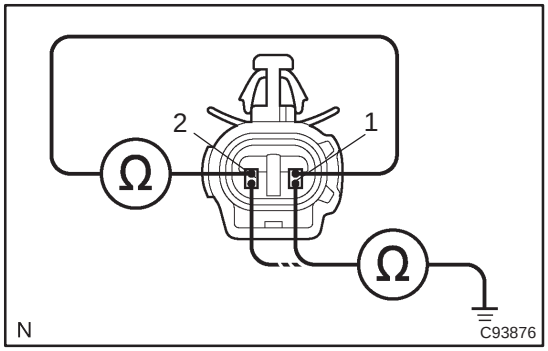
HINT:

There is tolerance of ±10 % in the speedometer indication.

OK	Go to step 5

NG

2 INSPECT FRONT SPEED SENSOR



(a) Remove the fender liner.
(b) Disconnect the speed sensor connector.
(c) Measure resistance between terminals 1 and 2 of the speed sensor connector.
OK:
Resistance: 1.2 to 1.6 kΩ at 20°C (68°F)
(d) Measure resistance between each of terminals 1 and 2 of the speed sensor connector and body ground.
OK:
Resistance: 1 MΩ or higher

NG → **REPLACE SPEED SENSOR FRONT RH**

NG → **REPLACE SPEED SENSOR FRONT LH**

NOTICE:
Check the speed sensor signal last (See page 05–699).

OK

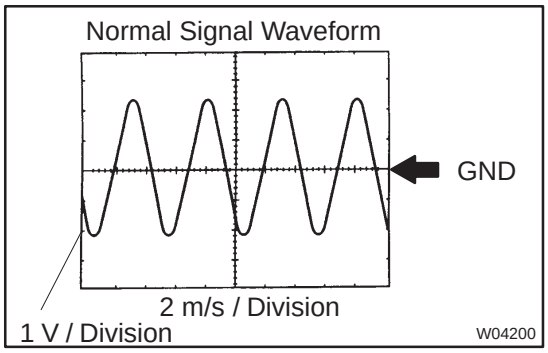
3 CHECK HARNESS AND CONNECTOR(FRONT SPEED SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each front speed sensor and the skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



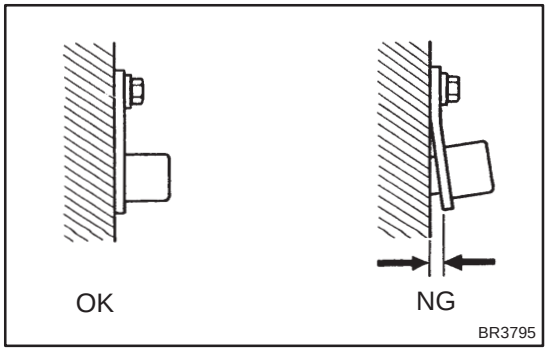
(REFERENCE) INSPECTION USING OSCILLOSCOPE
(a) Connect the oscilloscope to the terminal FR+ – FR– and FL+ – FL– of the skid control ECU.
(b) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

HINT:
- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform becomes shorter and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter deposited on it.

OK → **REPLACE BRAKE ACTUATOR ASSY (See page 32–54)**

NG

5 INSPECT FRONT SPEED SENSOR INSTALLATION



(a) Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and front steering knuckle.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

NG → **REPLACE SPEED SENSOR FRONT RH**

NG → **REPLACE SPEED SENSOR FRONT LH**

NOTICE:
Check the speed sensor signal last (See page 05–699).

OK

6 INSPECT SPEED SENSOR TIP

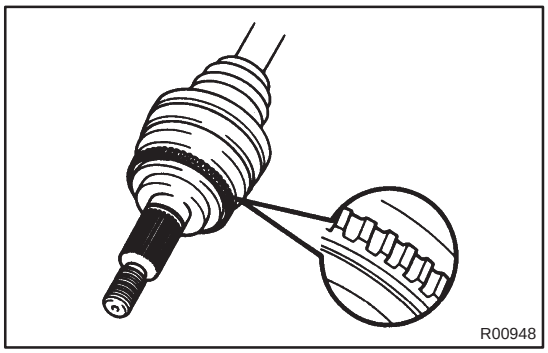
(a) Remove the front speed sensor (See page 32–59).
(b) Check the sensor tip.
OK:
No scratches or foreign objects on the sensor tip.

NG → **CLEAN OR REPAIR SPEED SENSOR**

NOTICE:
Check the speed sensor signal last (See page 05–699).

OK

7 INSPECT SPEED SENSOR ROTOR



(a) Remove the front speed sensor rotor (See page 30–6).
(b) Check the sensor rotor serrations.
OK:
No scratches, missing teeth or foreign objects.

HINT:
If a foreign object is attached, remove it and after reassembling, check the output waveform.

NG → **CLEAN OR REPAIR SPEED SENSOR ROTOR**

NOTICE:
Check the speed sensor signal last (See page 05–699).

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

DTC	C0210/33	RIGHT REAR SPEED SENSOR

DTC	C0215/34	LEFT REAR SPEED SENSOR

DTC	C1332/38	RIGHT REAR SPEED SENSOR CIRCUIT

DTC	C1333/39	LEFT REAR SPEED SENSOR CIRCUIT

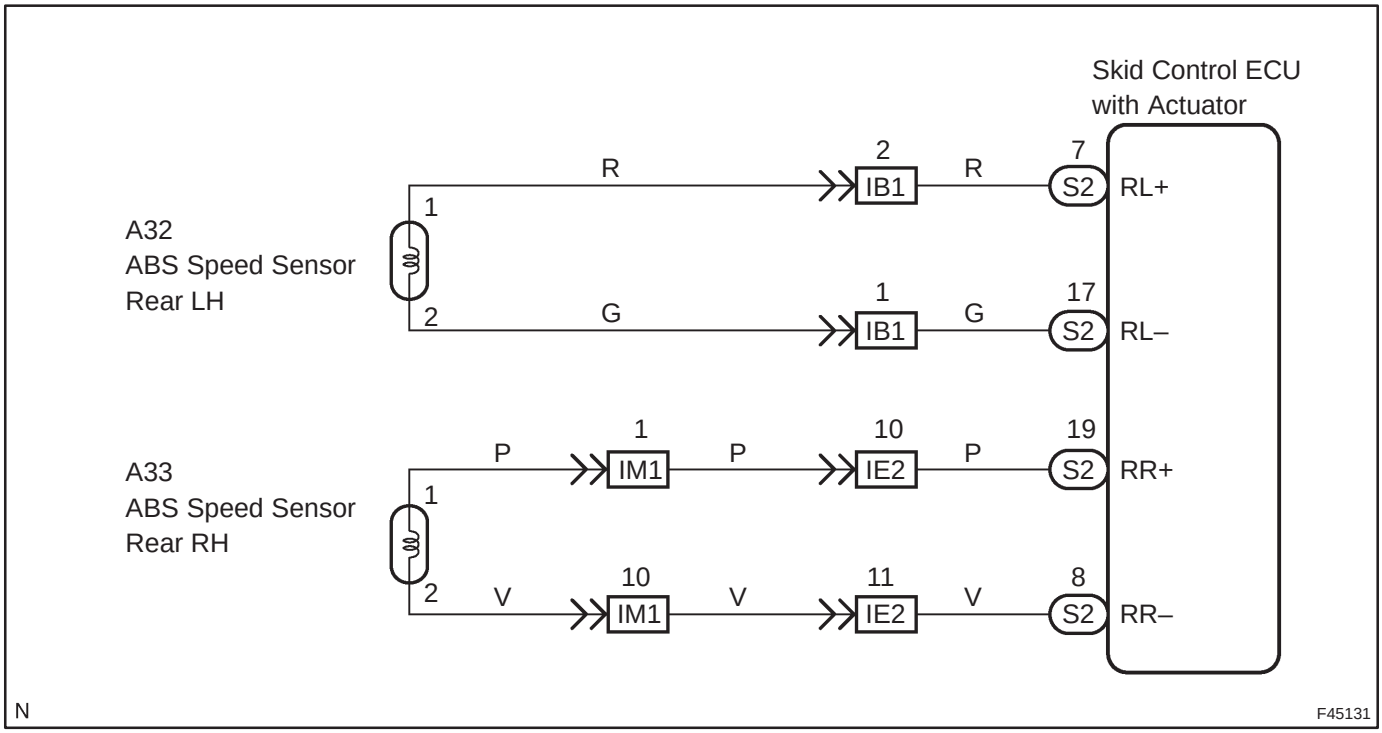
CIRCUIT DESCRIPTION

Refer to DTC C0200/31, C0205/32, C1330/35, C1331/36 on page 05–709.

DTC No.	DTC Detecting Condition	Trouble Area
C0210/33 C0215/34	When any of the following 1 to 3 is detected : 1. Non–plausible high frequent signal, high wheel acceleration or high gradient for 20 sec. with the brake pedal applied or for 5 sec. when the brake pedal is not applied. 2. After the initial start or restart and when the vehicle speed has reached 12 km/h (7 mph), the wheel speed of 0 km/h (0 mph) is detected. 3. Deviation of 2 wheel speed.	• Right rear and left rear speed sensor • Speed sensor rotor
C1332/38 C1333/39	Detecting abnormality in the resistance value of each speed sensor.	• Right rear and left rear speed sensor • Speed sensor circuit

HINT:
DTC No. C0210/33, C1332/38 are for the right rear speed sensor.
DTC No. C0215/34, C1333/39 are for the left rear speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF HAND–HELD TESTER(REAR SPEED SENSOR)

(a) Select the item "WHEEL SPEED RL (RR)" in the DATA LIST and read the value displayed on the hand–held tester.

(b) Check that there is no difference between the speed value output from the speed sensor displayed on the hand–held tester and the speed value displayed on the speedometer when driving the vehicle.
OK: There is almost no difference in the displayed speed value.

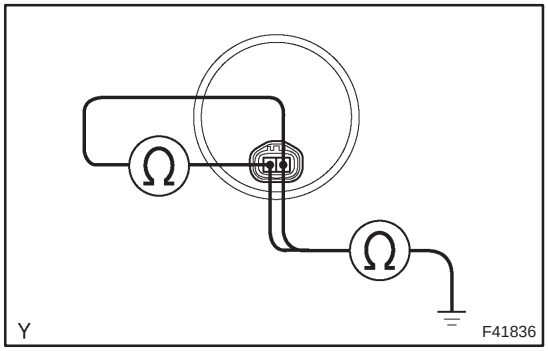
HINT:

There is tolerance of ± 10 % in the speedometer indication.

OK	Go to step 5

NG

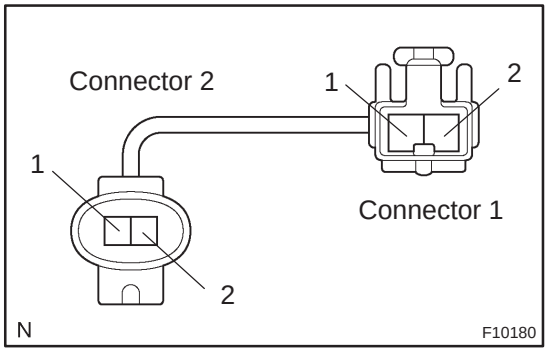
2	INSPECT REAR SPEED SENSOR



(a) Disconnect the skid control sensor connector.

(b) Measure resistance between terminals 1 and 2 of the skid control sensor connector.
OK: Resistance: 2.2 kΩ or less

(c) Measure resistance between each of terminals 1 and 2 of the skid control sensor connector and body ground.
OK: Resistance: 1 MΩ or higher



Skid control Sensor Sub–Wire Harness:

(a) Disconnect the sub–wire harness connector from floor wire harness.

(b) Make sure that there is no looseness at the connector lock part and connecting part of the connector.

(c) Measure resistance between terminal 1 of the connector 1 and terminal 2 of the connector 2.
OK: 1 Ω or lower

(d) Measure resistance between terminal 2 of the connector 1 and terminal 1 of the connector 2.
OK: 1 Ω or lower

(e) Measure resistance between terminals 1 and 2 of the speed sensor connector 1 and body ground.
OK: 10 MΩ or higher

NOTICE:

Check the speed sensor signal last (See page 05–699).

NG	REPLACE SKID CONTROL SENSOR OR SUB–WIRE HARNESS

OK

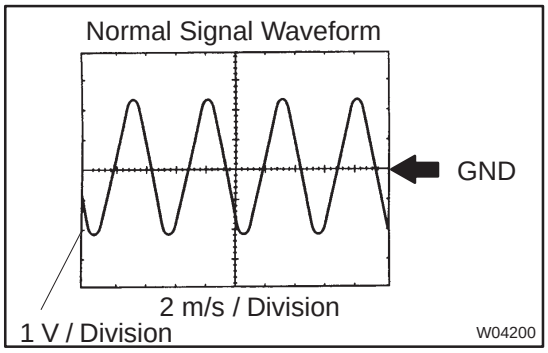
3	CHECK HARNESS AND CONNECTOR(SKID CONTROL SENSOR – SKID CONTROL ECU)

(a) Check for on open or short circuit in harness and connector between each skid control sensor and the skid control ECU (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	INSPECT SENSOR AND SENSOR ROTOR SERRATIONS



(REFERENCE) INSPECTION USING OSCILLOSCOPE

(a) Connect the oscilloscope to the terminals RR+ – RR– and RL+ – RL– of the skid control ECU.

(b) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

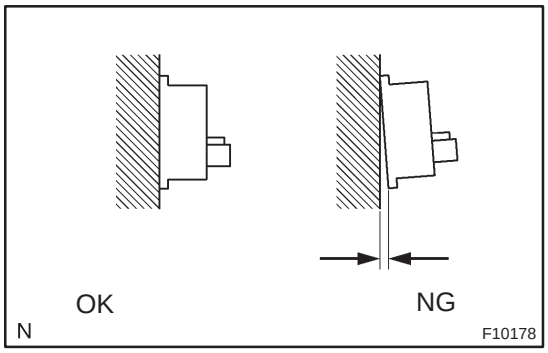
HINT:

- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform becomes shorter and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter deposited on it.

OK → REPLACE BRAKE ACTUATOR ASSY (See page 32–54)

NG

5	INSPECT SENSOR INSTALLATION



(a) Check the sensor installation.

OK:

There is no clearance between the sensor and rear axle carrier.

NOTICE:

Check the speed sensor signal last (See page 05–699).

NG → REPLACE SKID CONTROL SENSOR OR SUB–WIRE HARNESS

OK

6	INSPECT SPEED SENSOR TIP

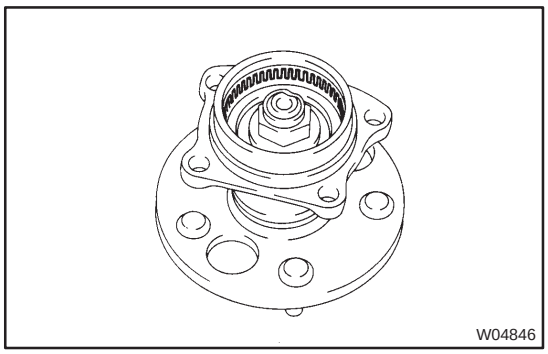
(a) Remove the skid control sensor (See page 32–61).
(b) Check the sensor tip.
OK:
No scratches or foreign objects on the sensor tip.

NOTICE:
Check the speed sensor signal last (See page 05–699).

NG → **CLEAN OR REPAIR SKID CONTORL SENSOR**

OK

7	INSPECT SENSOR ROTOR



(a) Check the sensor rotor serrations.
OK:
No scratches, missing teeth or foreign objects.

NOTICE:
Check the speed sensor signal last (See page 05–699).

NG → **REPLACE REAR AXLE HUB & BEARING ASSY RH**

NG → **REPLACE REAR AXLE HUB & BEARING ASSY LH**

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

DTC	C0226/21	SFR SOLENOID CIRCUIT

DTC	C0236/22	SFL SOLENOID CIRCUIT

DTC	C0246/23	SRR SOLENOID CIRCUIT

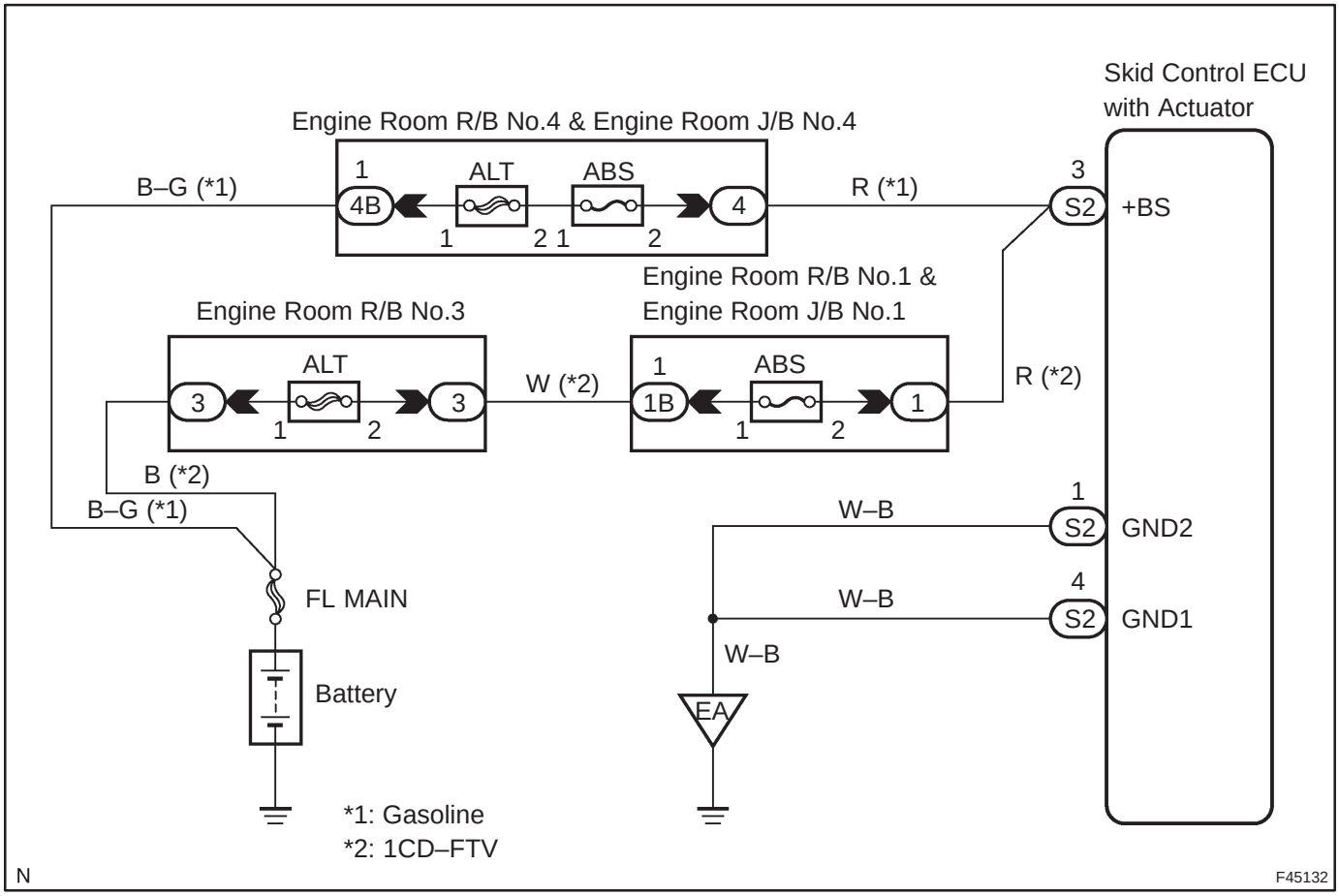
DTC	C0256/24	SRL SOLENOID CIRCUIT

CIRCUIT DESCRIPTION

This solenoid goes on when receiving signals from the ECU and controls the pressure acting on the wheel cylinders to control the braking force.

DTC No.	DTC Detecting Condition	Trouble Area
C0226/21 C0236/22 C0246/23 C0256/24	Solenoid valve signal does not match to the check result.	• Each solenoid circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check if other DTCs are detected (See page 05–699).

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

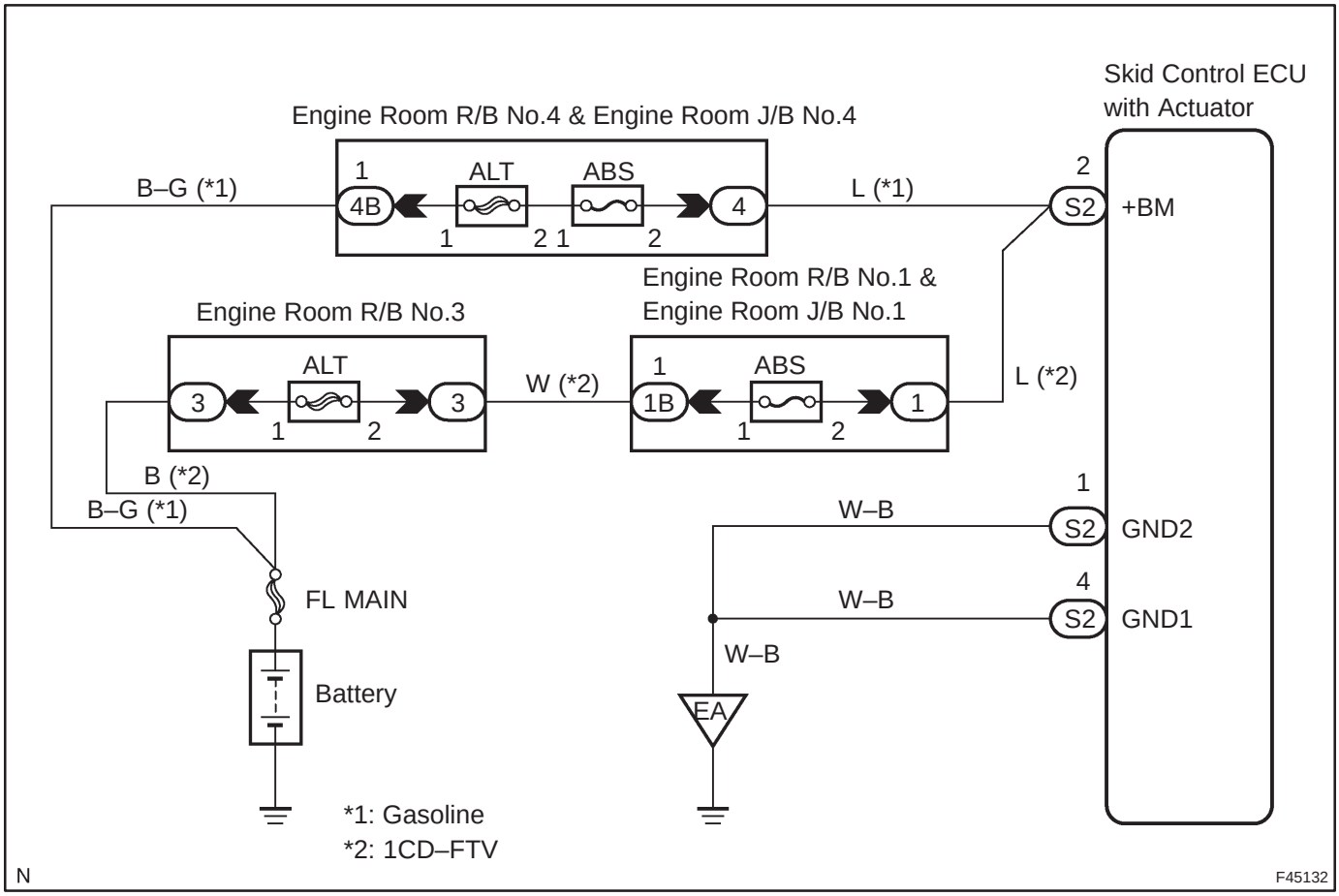
DTC	C0273/13	OPEN OR SHORT CIRCUIT IN ABS MOTOR RELAY CIRCUIT

CIRCUIT DESCRIPTION

The ABS motor relay supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the motor relay ON and operates the ABS pump motor.

DTC No.	DTC Detecting Condition	Trouble Area
C0273/13	Detection of any conditions from 1 to 3: 1. Pump motor voltage is 2.0 V or more for 1 sec. or more at motor relay OFF. 2. Pump motor voltage is (IG – 4.0 V) or less for 0.1 sec. or more at motor relay ON. 3. After the end of the actuation of the motor relay slow down condition of motor does not meet the specification.	• ABS motor relay • ABS motor relay circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

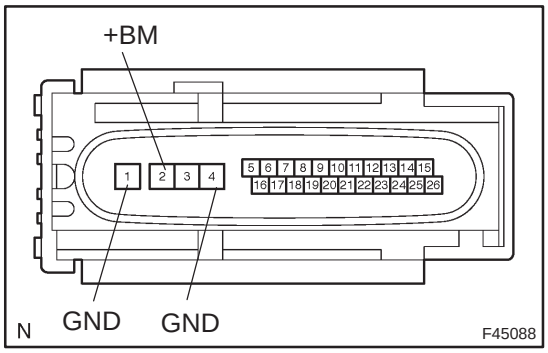
1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(ABS MOTOR RELAY)

(a) Check the operation sound of the ABS motor individually when operating it with the hand–held tester.
OK:
The operation sound of the ABS motor is heard.

OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

2	INSPECT SKID CONTROL ECU CONNECTOR(+BM TERMINAL VOLTAGE)

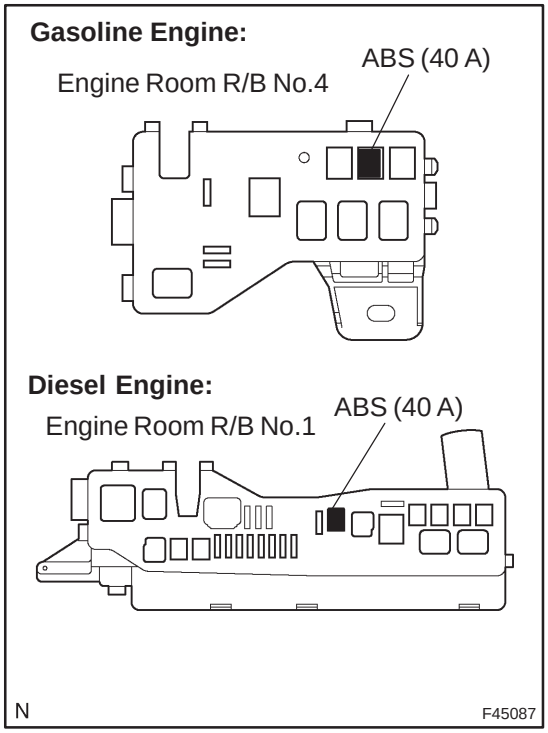


(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminals +BM and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

3 INSPECT FUSE(ABS FUSE)



(a) Remove the ABS (40 A) fuse from the engine room R/B No.4 (Gasoline engine) or engine room R/B No.1 (Diesel engine).

(b) Check continuity of the ABS fuse.

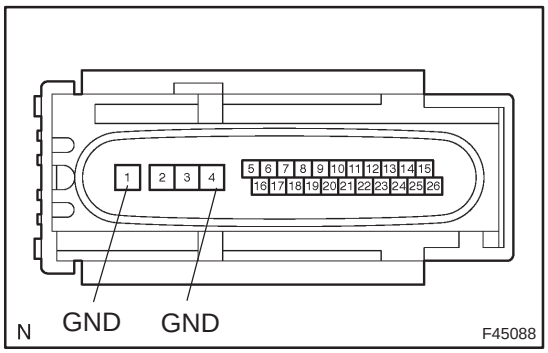
OK:

Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

4 INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

CHECK AND REPLACE HARNESS AND CONNECTOR(BATTERY – +BM TERMINAL) (See page 01–32)

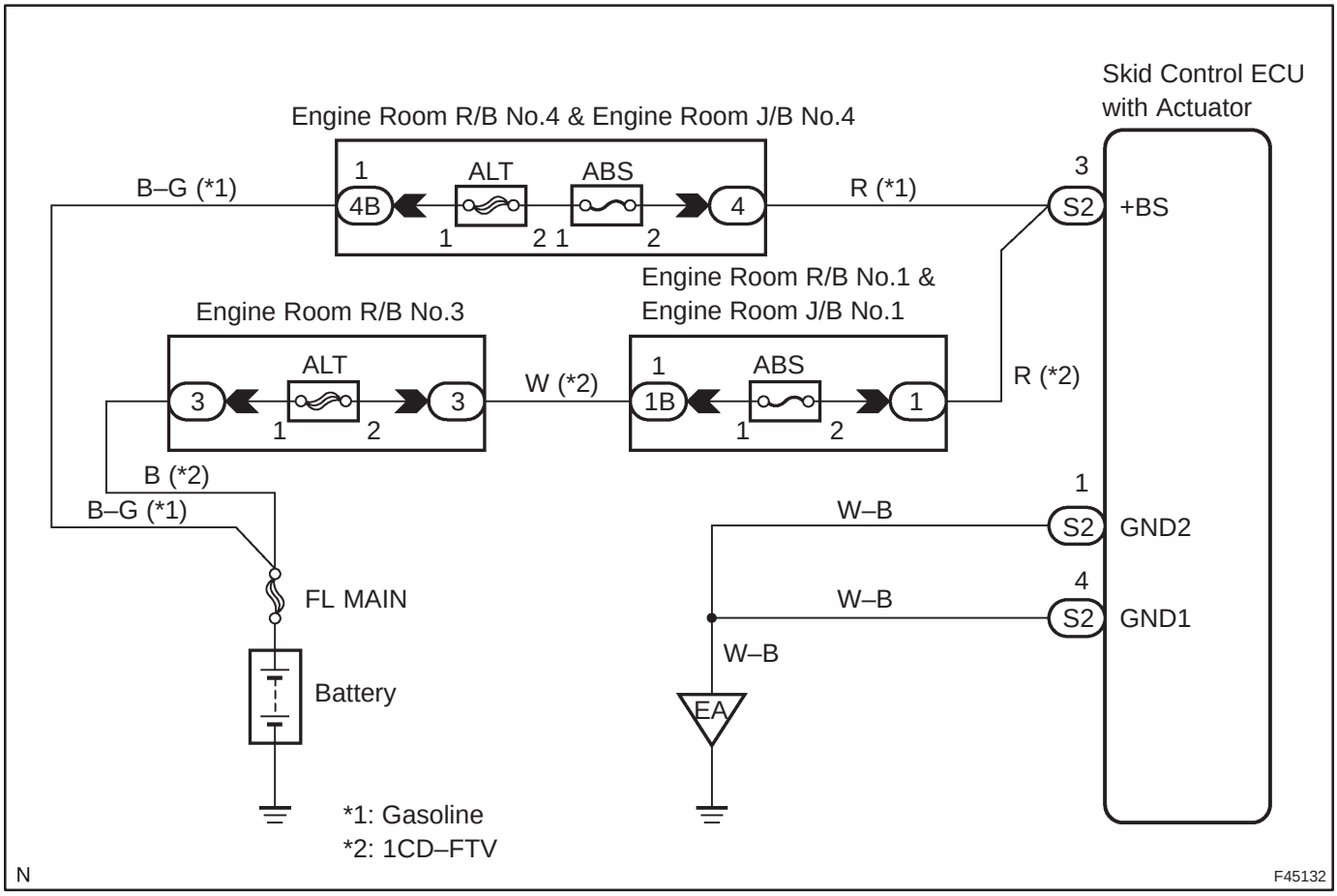
DTC	C0278/11	OPEN OR SHORT CIRCUIT IN ABS SOLENOID RELAY

CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

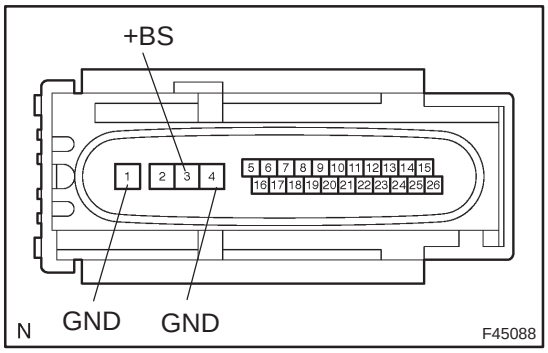
DTC No.	DTC Detecting Condition	Trouble Area
C0278/11	Detection of any conditions from 1 to 3: 1. Internal circuit malfunction in ECU. 2. Valve relay voltage is 0.8 x IG or less for 0.5 sec. 3. Valve relay voltage is high level at valve relay OFF.	• ABS solenoid relay • ABS solenoid relay circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT SKID CONTROL ECU CONNECTOR(+BS TERMINAL VOLTAGE)



(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminals +BS and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

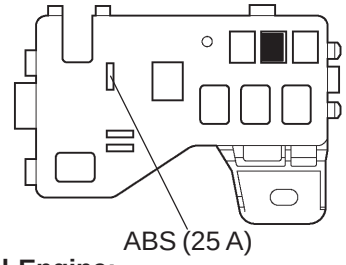
OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

2 INSPECT FUSE(ABS FUSE)

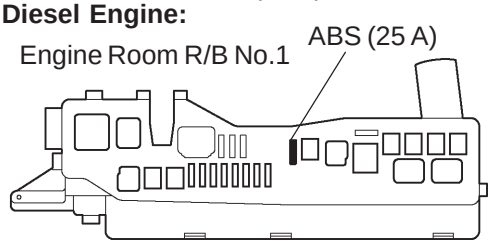
Gasoline Engine:

Engine Room R/B No.4



Diesel Engine:

Engine Room R/B No.1



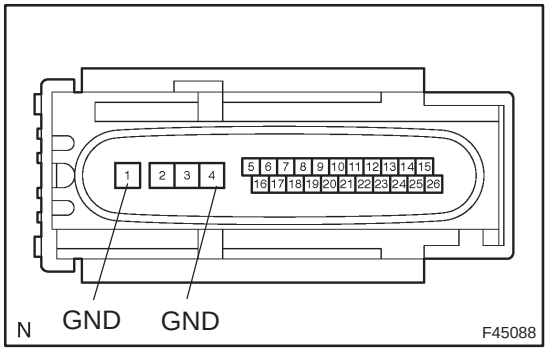
N F45087

(a) Remove the ABS (25 A) fuse from the engine room R/B No.4 (Gasoline engine) or engine room R/B No.1 (Diesel engine).
(b) Check continuity of the ABS fuse.
OK:
Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

3	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR(GND TERMINAL – BODY GROUND) (See page 01–32)**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – +BS TERMINAL) (See page 01–32)

DTC C1237/37 SPEED SENSOR ROTOR FAULTY

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1237/37	Detection of any of conditions from 1 through 4: 1. Wheel speed deviation of unspecified wheel. 2. Wheel sensor signal failure suspicion. 3. Continuous ABS control for 60 sec. or more.	• Speed sensor • Sensor rotor

INSPECTION PROCEDURE

1 INSPECT TIRE SIZE

NG → **REPLACE TIRES SO THAT ALL 4 TIRES ARE SAME IN SIZE**

OK

2 INSPECT SPEED SENSOR ROTOR

NG → **REPLACE SENSOR ROTOR**

OK

3 INSPECT SPEED SENSOR

NG → **REPLACE SPEED SENSOR**

OK

4 CHECK HARNESS AND CONNECTOR(SPEED SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each terminal of speed sensor and the skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

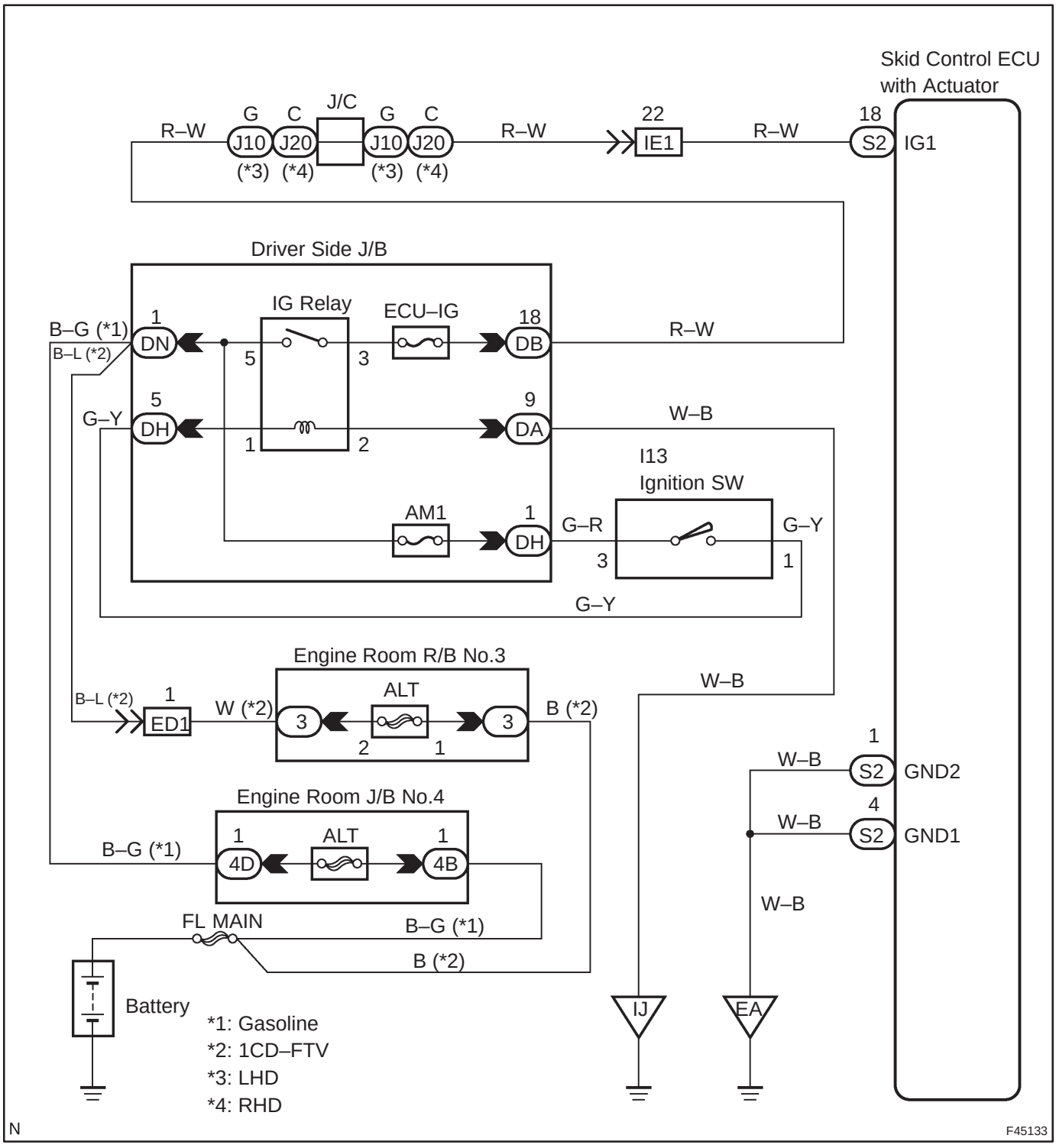
DTC	C1241/41	LOW BATTERY POSITIVE VOLTAGE OR ABNORMALLY HIGH BATTERY POSITIVE VOLTAGE

CIRCUIT DESCRIPTION

This is the power source of the ECU, hence the actuators.

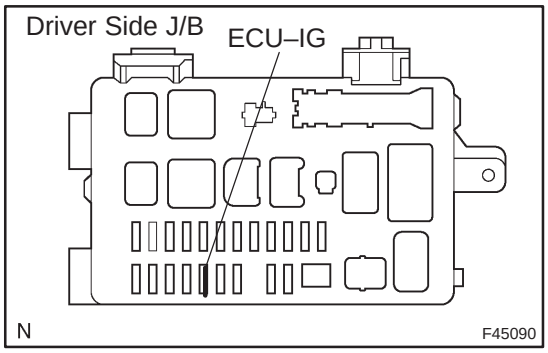
DTC No.	DTC Detecting Condition	Trouble Area
C1241/41	With vehicle speed to about 6 km/h (4 mph), battery voltage is less than 9.4 V at the time of non–operation of ABS control or less than 9.2 V at the time of operation of ABS control, or battery voltage is more than 16.9 V.	• Battery • Charging system • Power source circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT FUSE(ECU–IG FUSE)



(a) Remove the ECU–IG fuse from the driver side J/B.
(b) Check continuity of the ECU–IG fuse.
OK:
Continuity

NG → **INSPECT FOR SHORT CIRCUIT IN ALL HARNESS AND COMPONENTS CONNECTED TO ECU–IG FUSE**

OK

2	INSPECT BATTERY

OK:
Voltage: 10 to 14 V

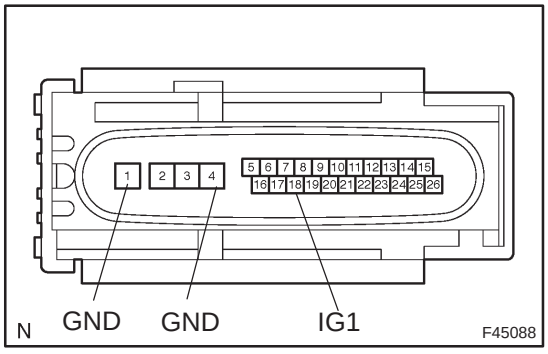
NG → **INSPECT CHARGING SYSTEM**

OK

3	INSPECT SKID CONTROL ECU CONNECTOR(IG1 TERMINAL VOLTAGE)

IN CASE OF USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



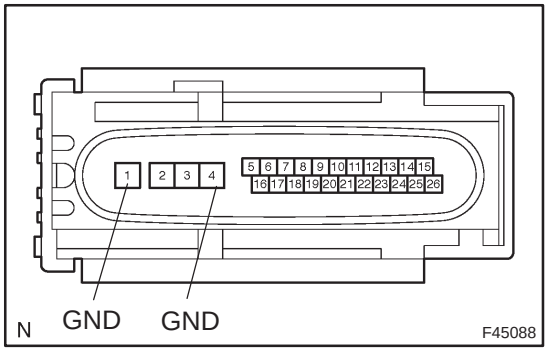
IN CASE OF NOT USING HAND–HELD TESTER:

(a) Disconnect the skid control ECU connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **REPLACE BRAKE ACTUATOR ASSY (See page 32–54)**

NG

4	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

(b)

OK:

Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR(GND TERMINAL – BODY GROUND) (See page 01–32)**

OK

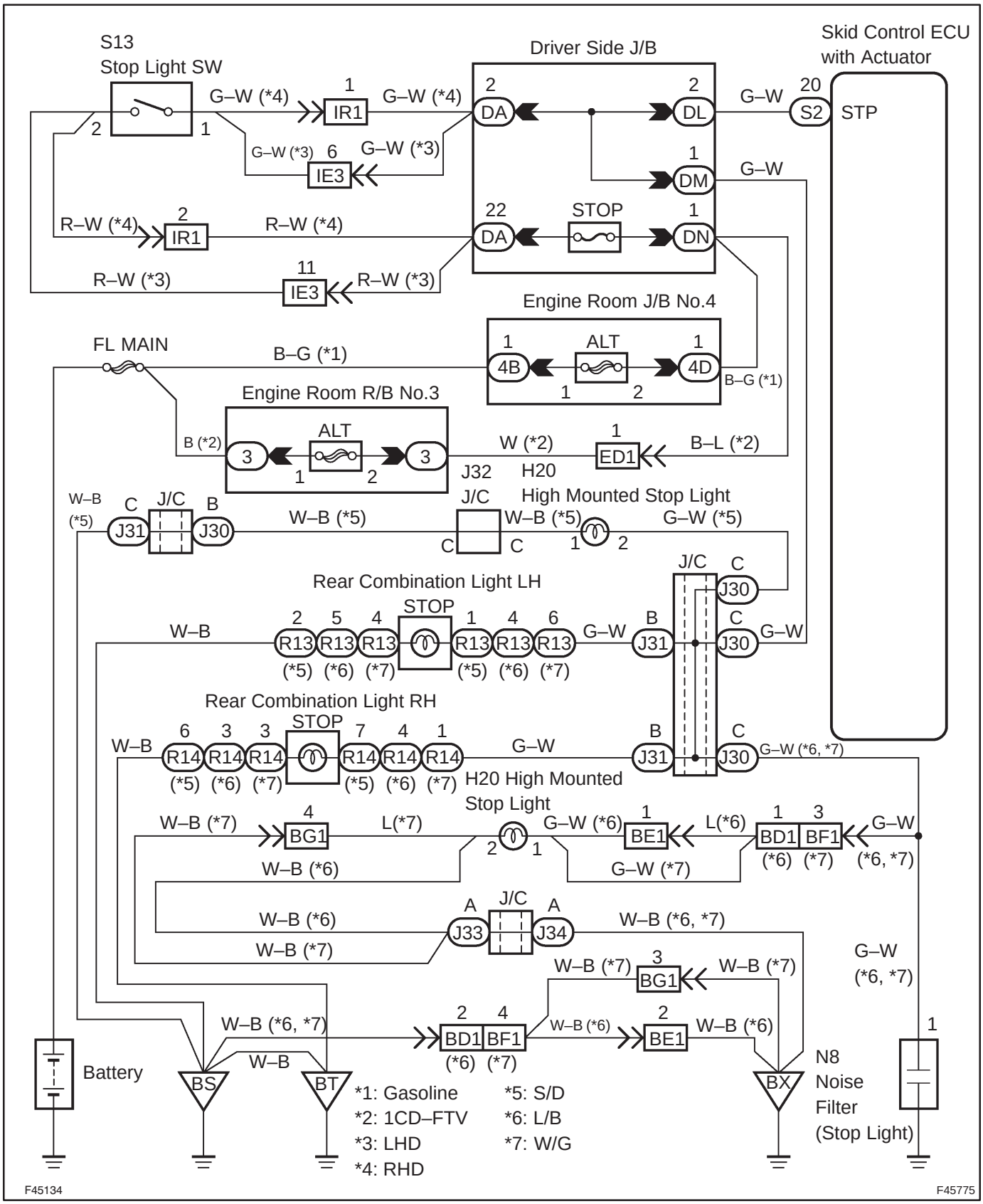
CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – IG1 TERMINAL) (See page 01–32)

DTC C1249/58 STOP LIGHT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1249/58	Stop light switch circuit is open, and stop light switch voltage is in the level between 40 % and 70 % of the battery voltage.	• Stop light switch • Stop light switch circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

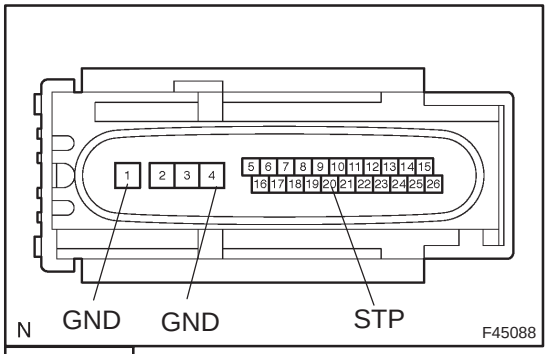
1	INSPECT STOP LAMP SWITCH ASSY

(a) Check that the stop light comes on when the brake pedal is depressed and goes off when the brake pedal is released.

NG → **Go to step 4**

OK

2	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(STP TERMINAL)



(a) Disconnect skid control ECU connector.
(b) Measure the voltage between terminal STP and GND of the skid control ECU harness side connector when the brake pedal is depressed.
OK:
Voltage: 10 to 14 V

OK → **REPLACE BRAKE ACTUATOR ASSY (See page 32–54)**

NG

3	CHECK HARNESS AND CONNECTOR(STOP LIGHT SWITCH – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the stop light switch and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–708)

4	CHECK HARNESS AND CONNECTOR(STOP LIGHT CIRCUIT)

(a) Check for an open or short circuit in harness and connector of the stop light circuit (See page 01–32).

OK → **REPLACE STOP LAMP SWITCH ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC C1300/62 SKID CONTROL ECU MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1300/62	Internal control unit of skid control ECU failure.	• ECU

INSPECTION PROCEDURE

1	RECONFIRM DTC

A	DTC C1300/62
B	Except DTC C1300/62

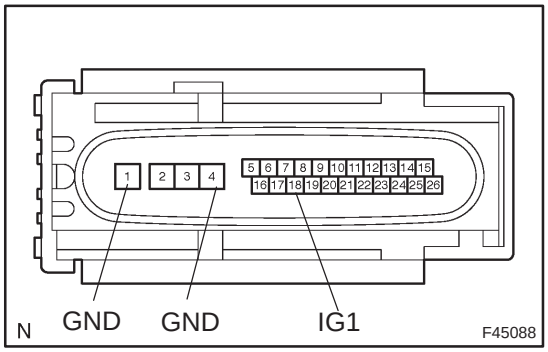
B → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

A

2	INSPECT SKID CONTROL ECU CONNECTOR(IG1 TERMINAL VOLTAGE)

IN CASE OF USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



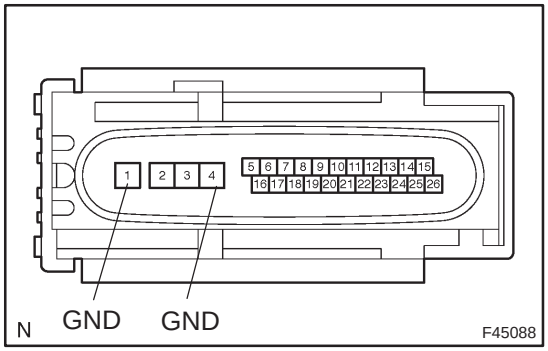
IN CASE OF NOT USING HAND–HELD TESTER:

(a) Disconnect the skid control ECU connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **REPLACE BRAKE ACTUATOR ASSY (See page 32–54)**

NG

3	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

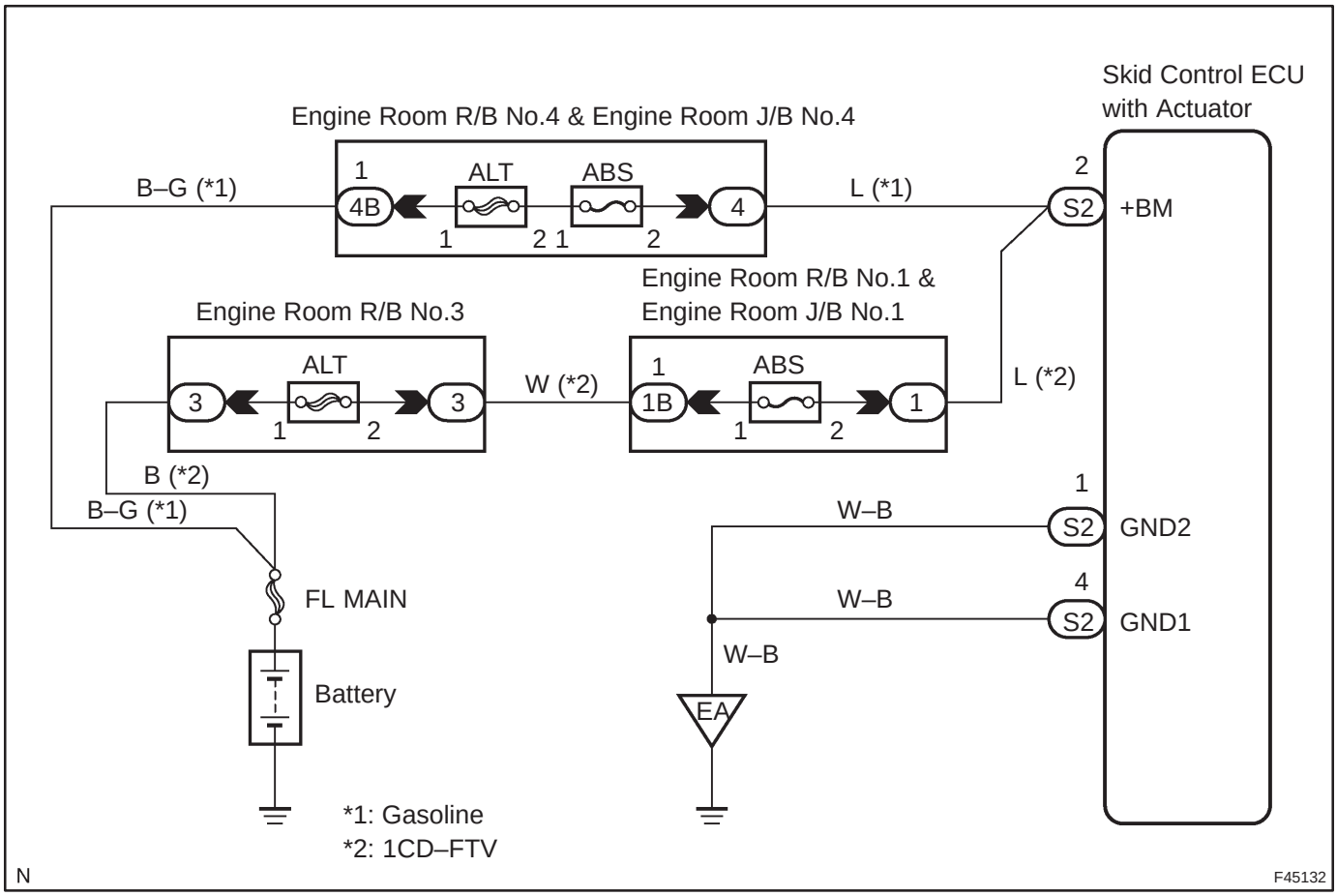
CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – IG1 TERMINAL) (See page 01–32)

DTC	C1350/51	PUMP MOTOR IS LOCKED/OPEN CIRCUIT IN PUMP MOTOR GROUND

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1350/51	When any of the following 1 through 3 is detected. 1. No motor voltage supply after skid control ECU starts the motor relay. 2. A high level of motor voltage when skid control ECU does not start the motor relay. 3. The pump motor voltage is high level for a certain time after the motor relay has elapsed.	Brake actuator pump motor

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check if other DTCs are detected (See page 05–699).

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

050X4–14

CUSTOMER PROBLEM ANALYSIS CHECK

ABS Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency the Problem Occurs	☐ Continuously ☐ Intermittently (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light	☐ Remains ON ☐ Does not Light Up
	Brake Warning Light	☐ Remains ON ☐ Does not Light Up

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data	STOP LIGHT SW	☐ ON ☐ OFF
	SYSTEM	☐ NO SYS ☐ ABS ☐ FAIL SF
	#IG ON	
	VEHICLE SPD	km/h MPH

050XB–14

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- Using SST 09843–18040, connect the terminal Tc and CG of the DLC3.
- If malfunction is not found when inspecting parts, inspect the ECU and ground points for poor contact.
- If a malfunction code is displayed during the DTC check, check the circuit listed for that code. For details of each code, refer to the "See page" for respective "DTC No." in the DTC chart.
- When 2 or more DTCs are detected, perform circuit inspection one by one until the problem is identified.

DTC No. (See Page)	Detection Item	Trouble Area
C0200/31 (05–709)	Right front wheel speed sensor signal malfunction	• Right front speed sensor • Right front speed sensor rotor
C0205/32 (05–709)	Left front wheel speed sensor signal malfunction	• Left front speed sensor • Left front speed sensor rotor
C0210/33 (05–713)	Right rear wheel speed sensor signal malfunction	• Right rear speed sensor • Right rear speed sensor rotor
C0215/34 (05–713)	Left rear wheel speed sensor signal malfunction	• Left rear speed sensor • Left rear speed sensor rotor
C0226/21 (05–717)	Open or short circuit in ABS actuator solenoid (SFR) circuit	• SFRR or SFRH circuit
C0236/22 (05–717)	Open or short circuit in ABS actuator solenoid (SFL) circuit	• SFLR or SFLH circuit
C0246/23 (05–717)	Open or short circuit in ABS actuator solenoid (SRR) circuit	• SRRR or SRRH circuit
C0256/24 (05–717)	Open or short circuit in ABS actuator solenoid (SRL) circuit	• SRLR or SRLH circuit
C0273/13 (05–719)	Open or short circuit in ABS motor relay circuit	• ABS motor relay • ABS motor relay circuit
C0278/11 (05–722)	Open or short circuit in ABS solenoid relay circuit	• ABS solenoid relay • ABS solenoid relay circuit
C1237/37 (05–725)	Speed sensor rotor is wrong number of teeth on one of the 4 wheels	• Speed sensor • Sensor rotor • Speed sensor circuit
C1241/41 (05–726)	Low battery voltage or abnormally high battery voltage	• Battery • Charging system • Power source circuit
C1249/58 (05–730)	Open circuit in stop light switch circuit	• Stop light switch • Stop light switch circuit
C1300/62 (05–733)	Malfunction in skid control ECU	• Battery • Skid control ECU
C1330/35 (05–709)	Open circuit in right front speed sensor	• Right front speed sensor • Right front speed sensor circuit
C1331/36 (05–709)	Open circuit in left front speed sensor	• Left front speed sensor • Left front speed sensor circuit
C1332/38 (05–713)	Open circuit in right rear speed sensor	• Right rear speed sensor • Right rear speed sensor circuit
C1333/39 (05–713)	Open circuit in left rear speed sensor	• Left rear speed sensor • Left rear speed sensor circuit
C1350 / 51 (05–735)	Pump motor is locked Open circuit in pump motor ground	• Brake actuator pump motor
Always ON (05–737)	Malfunction in ECU	• Battery • Charging system • ABS warning light circuit • Power source circuit • Skid control ECU

DTC of speed sensor check function:

Code No.	Diagnosis	Trouble Area
C1271/71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation • Sensor rotor
C1272/72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation • Sensor rotor
C1273/73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation • Sensor rotor
C1274/74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation • Sensor rotor
C1275/75	Abnormal change in output voltage of right front speed sensor	Right front speed sensor rotor
C1276/76	Abnormal change in output voltage of left front speed sensor	Left front speed sensor rotor
C1277/77	Abnormal change in output voltage of right rear speed sensor	Right rear speed sensor rotor
C1278/78	Abnormal change in output voltage of left rear speed sensor	Left rear speed sensor rotor

ABS WITH EBD SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

050YD–14

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–698)

3	Check and Clear DTCs and Freeze Frame Data (See page 05–699)

4	Problem Symptom Confirmation

- Symptom does not occur: Go to step 5
- Symptom occurs: Go to step 6

5	Symptom Simulation (See page 01–32)

6	DTC Check (See page 05–699)

- There is no output: Go to step 7
- There is output: Go to step 8

7	Problem Symptoms Table (See page 05–708)

- Check for fluid leakage and Go to step 10

8	DTC Chart (See page 05–704)

9	Circuit Inspection (See page 05–709 – 05–750)

HINT:
When 2 or more DTCs are detected, perform circuit inspection one by one until the problem is identified.

10	Identification of Problem

11	Repair

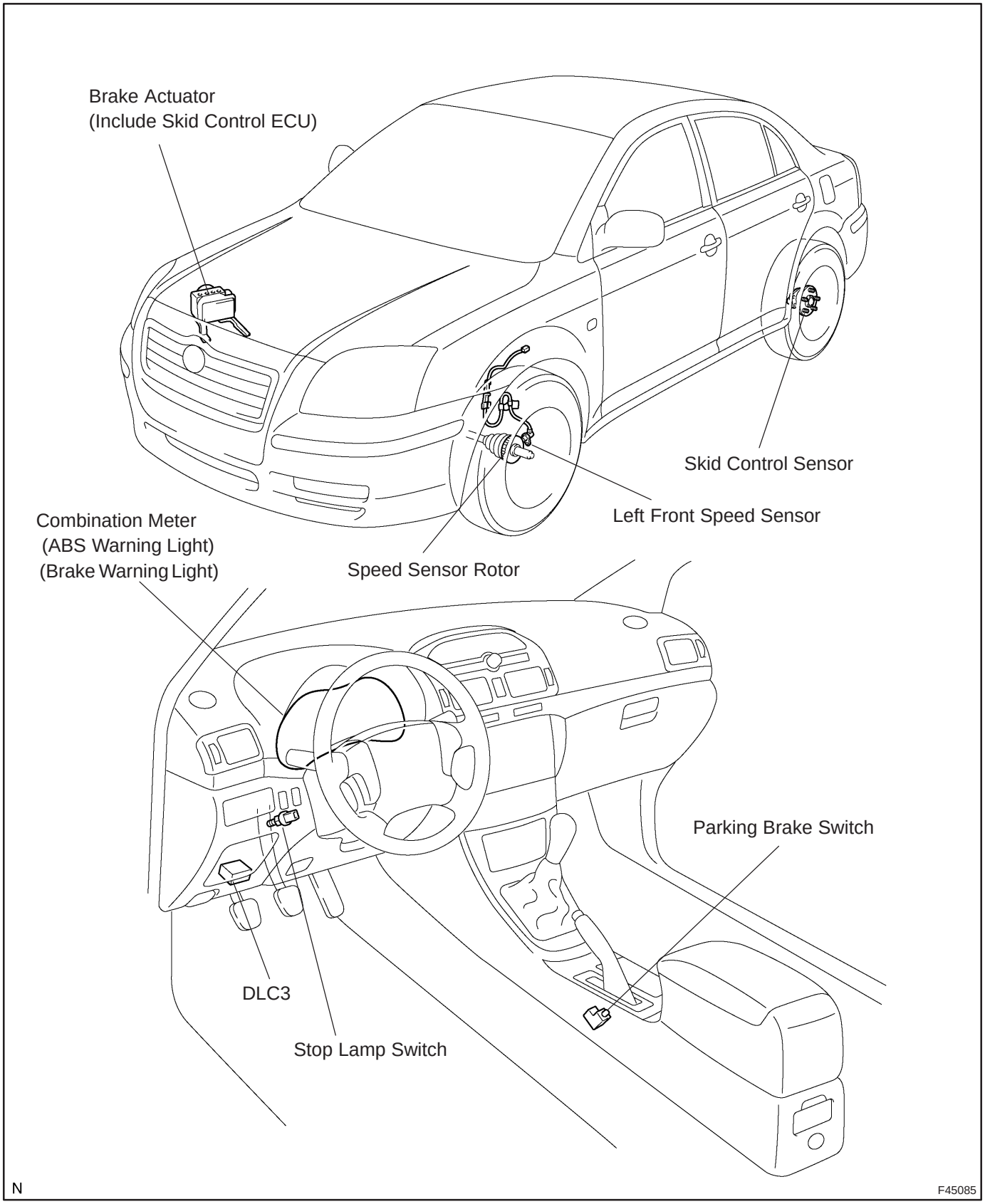
12	Confirmation Test

End

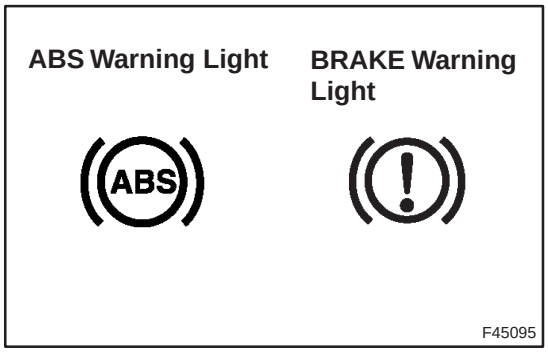
HINT:
Step 3, 6, 9, 12:
Diagnostic steps permitting the use of the hand–held tester.
Fail safe function:
When a failure occurs in the ABS system, the ABS warning light comes on and the ABS operation is prohibited. In addition to this, when the failure which disables the EBD operation occurs, the brake warning light comes on as well and the EBD operation is prohibited.

050XD–10

LOCATION



0577T–04



PRE–CHECK

1. DIAGNOSIS SYSTEM

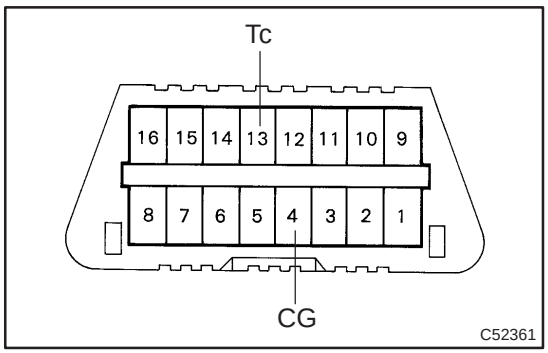
(a) Release the parking brake lever.

(b) Check the warning lights.

When the ignition switch is turned ON, check that the ABS warning light and brake warning light come on for 3 sec.

HINT:

- When the parking brake is applied or the level of the brake fluid is low, the brake warning light comes on.
- If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit (See page 05–737 or 05–741) or brake warning light circuit (See page 05–744).



(c) Without using hand–held tester:

Check the DTC.

(1) Using SST, connect terminal Tc and CG of the DLC3.

SST 09843–18040

(2) Turn the ignition switch ON.

(3) Read the DTC from the ABS warning light on the combination meter.

HINT:

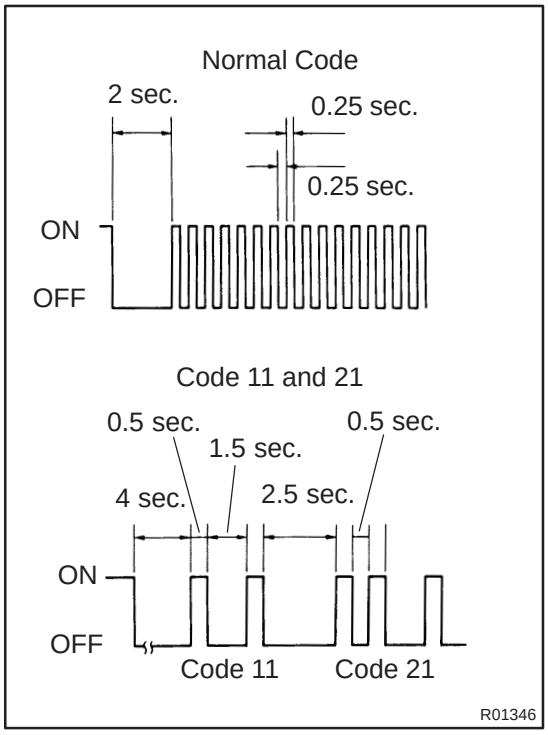
- If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page 05–737 or 05–744).
- As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.

(4) Codes are explained in the code table on page 05–704.

If 2 or more DTCs are detected at the same time, the lowest numbered DTC is displayed 1st.

(5) After completing the check, remove the SST from the DLC3.

SST 09843–18040



(d) With using hand–held tester:

Check the DTC.

(1) Read the DTC by following the prompts on the tester screen.

HINT:

Please refer to the hand–held tester operator's manual for further details.

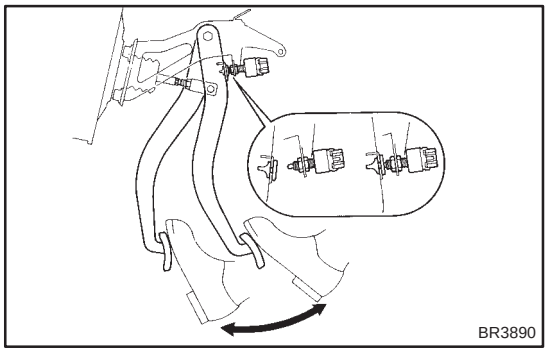
(e) Without using hand–held tester:

Clear the DTCs.

(1) Using SST, connect the terminal Tc and CG of the DLC3.

SST 09843–18040

(2) Turn the ignition switch ON.



(3) Clear the DTCs stored in ECU by depressing the brake pedal 8 or more times within 5 sec.
(4) Check that the ABS warning light indicates the normal code blinking pattern.
(5) Remove the SST from the DLC3.
SST 09843–18040

HINT:
Disconnecting the battery cable during repairs will not erase the DTCs in the ECU.

(f) With using hand–held tester:
Clear the DTCs.
(1) Turn the ignition switch ON.
(2) Operate the hand–held tester to erase the codes.

HINT:
Please refer to the hand–held tester operator's manual for further details.

2. DATA LIST

HINT:
According to the DATA LIST displayed on the Hand–held tester, you can read the value and status of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the methods to shorten the labor time.

(a) Connect the Hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) From the display on the tester, read the "DATA LIST".

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
ABS MOT RELAY	ABS motor relay / ON or OFF	ON : Motor relay ON	–
SOL RELAY	Solenoid relay / ON or OFF	ON : Solenoid relay ON	–
STOP LIGHT SW	Stop light switch / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
PKB SW	Parking brake switch / ON or OFF	ON : Parking brake applied OFF : Parking brake released	–
ABS OPERT FR	ABS operation (FR) / BEFORE or OPERATE	BEFORE : No ABS operation (FR) OPERATE : During ABS operation (FR)	–
ABS OPERT FL	ABS operation (FL) / BEFORE or OPERATE	BEFORE : No ABS operation (FL) OPERATE : During ABS operation (FL)	–
ABS OPERT RR	ABS operation (RR) / BEFORE or OPERATE	BEFORE : No ABS operation (RR) OPERATE : During ABS operation (RR)	Speed indicated on speedometer
ABS OPERT RL	ABS operation (RL) / BEFORE or OPERATE	BEFORE : No ABS operation (RL) OPERATE : During ABS operation (RL)	Speed indicated on speedometer

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
WHEEL SPD FR	Wheel speed sensor (FR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD FL	Wheel speed sensor (FL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD RR	Wheel speed sensor (RR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	–
WHEEL SPD RL	Wheel speed sensor (RL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	–
IG VOLTAGE	ECU power supply voltage / NORMAL or TOO LOW	NORMAL : 9.8 V or over TOO LOW : Below 9.8 V	–
SFRR	ABS solenoid (SFRR) ON / OFF	Operate: ON	–
SFRH	ABS solenoid (SFRH) ON / OFF	Operate: ON	–
SFLR	ABS solenoid (SFLR) ON / OFF	Operate: ON	–
SFLH	ABS solenoid (SFLH) ON / OFF	Operate: ON	–
SRRR (SRR)	ABS solenoid (SRRR (SRR)) ON / OFF	Operate: ON	–
SRRH (SRH)	ABS solenoid (SRRH (SRH)) ON / OFF	Operate: ON	–
SRLR	ABS solenoid (SRLR) ON / OFF	Operate: ON	–
SRLH	ABS solenoid (SRLH) ON / OFF	Operate: ON	–
AIR BLD SUPPORT	Air bleed support / SUPPORT or NOT SUP	Not supported	–
TEST MODE	Test mode / NORMAL or TEST	NORMAL : Normal mode TEST : During test mode	–
#CODES	Number of DTC recorded / min.: 0, max.: 255	Min.: 0, max.: 19	–

3. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the Hand–held tester allows the relay, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the methods to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the Hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) From the display on the tester, select the ”ACTIVE TEST”.

Item	Vehicle Condition / Test Details	Diagnostic Note
SFRR	Turns ABS solenoid (SFRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH	Turns ABS solenoid (SFRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR	Turns ABS solenoid (SFLR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLH	Turns ABS solenoid (SFLH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRR	Turns ABS solenoid (SRRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRH	Turns ABS solenoid (SRRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR	Turns ABS solenoid (SRLR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLH	Turns ABS solenoid (SRLH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRR & SFRH	Turns ABS solenoid SFRR & SFRH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR & SFLH	Turns ABS solenoid SFLR & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRR & SRRH	Turns ABS solenoid SRRR & SRRH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR & SRLH	Turns ABS solenoid SRLR & SRLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH & SFLH	Turns ABS solenoid SFRH & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
ABS MOT RELAY	Turns ABS motor relay ON / OFF	Operation of motor can be heard
ABS WARN LIGHT	Turns ABS warning light ON / OFF	Observe combination meter
BRAKE WRN LIGHT	Turns BRAKE warning light ON / OFF	Observe combination meter

4. FREEZE FRAME DATA

(a) The vehicle (sensor) status memorized during ABS operation or at the time of error code detection can be displayed using the hand–held tester.

(b) Only one record of the freeze frame data is stored and the freeze frame data generated during ABS operation are constantly updated. Also, the number of the operations of the ignition switch ”ON” after the freeze frame data is stored can be memorized up to 31 and it can be displayed.

HINT:

If the ignition switch ”ON” operation exceeds 31 times, ”31” appears on the display.

(c) If the diagnosis code malfunction occurs, the freeze frame data at the occurrence of the malfunction is stored but the ABS actuation data is not stored.

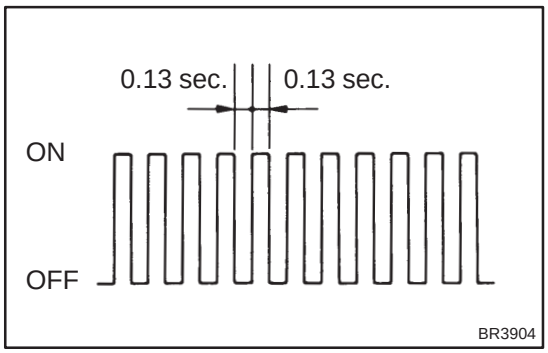
Hand–held tester display	Measurement Item	Reference Value*
VEHICLE SPD	Vehicle speed	Speed indication of a meter
STOP LIGHT SW	Stop light switch signal	Stop light switch ON: ON, OFF: OFF
# IG ON	Numbers of operations of ignition switch ON after memorizing freeze frame data	0 to 31
SYSTEM	Operate system	ABS operate: ABS

*: If no conditions are specifically stated for ”Idling”, it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

5. SPEED SENSOR SIGNAL CHECK

HINT:
If the ignition switch is turned from ON to ACC or LOCK during the test mode, the DTCs of the sensor check function will be erased.

(a) Check the sensor signal.
  (1) Start the engine.
  (2) Connect the hand–held tester to the DLC3.
  (3) Select the TEST MODE.



  (4) Check that the ABS warning light blinks.

HINT:
If the ABS warning light does not blink, inspect the ABS warning light circuit (See page 05–737).

  (5) Drive the vehicle straight forward.

HINT:
- Drive the vehicle faster than 45 km/h (28 mph) for several sec.
- There is a case that the sensor check is not completed if the vehicle has its wheels spun or its steering wheel steered during this check.

  (6) Stop the vehicle.
  (7) Using SST, connect the terminals Tc and CG of the DLC3.

(b) Read the DTC from the hand–held tester screen.

HINT:
- See the list of DTCs shown on the 05–704.
- Please refer to the hand–held tester operator’s manual for further details.

050XH–14

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

NOTICE:

When replacing Skid Control ECU, sensor or etc., turn the ignition switch to OFF.

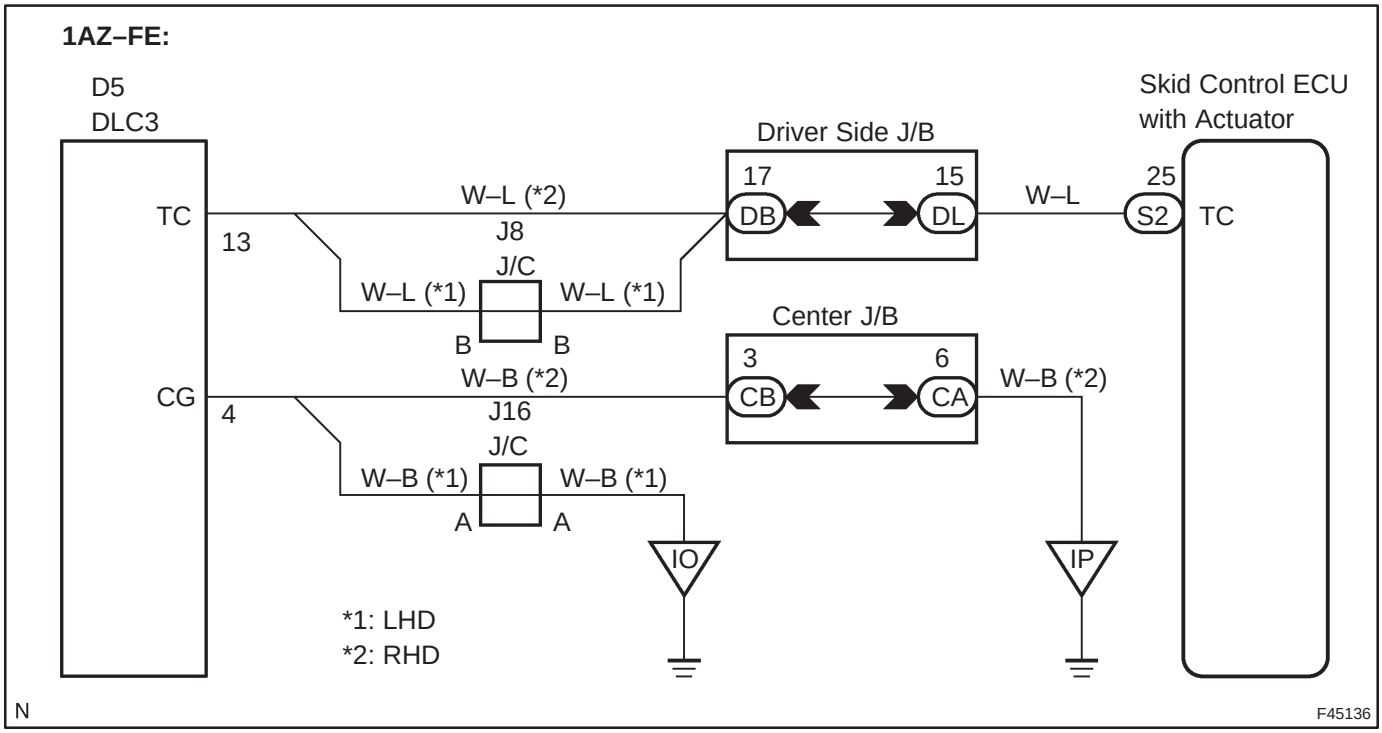
Symptom	Suspect Area	See page
ABS does not operate	1. Check the DTC reconfirming that the normal code is output. 2. IG power source circuit 3. Speed sensor circuit 4. Check the brake actuator with a hand–held tester. If there is malfunction, check the hydraulic circuit for leakage. 5. When the above areas (1. to 4.) are all normal but the problem still occurs, replace the skid control ECU.	05–699 05–709 05–713 32–53
ABS does not operate properly	1. Check the DTC reconfirming that the normal code is output. 2. Speed sensor circuit 3. Stop light switch circuit 4. Check the brake actuator with a hand–held tester. If there is malfunction, check the hydraulic circuit for leakage. 5. When the above areas (1. to 4.) are all normal but the problem still occurs, replace the skid control ECU.	05–699 05–709 05–713 32–53
ABS warning light malfunction	1. ABS warning light circuit 2. Skid control ECU	05–737 –
DTC check cannot be performed	1. ABS warning light circuit 2. Tc terminal circuit 3. When the above areas (1. and 2.) are all normal but the problem still occurs, replace the skid control ECU.	05–737 05–748
Speed sensor signal check cannot be performed	1. D/G terminal circuit 2. Skid control ECU	– –

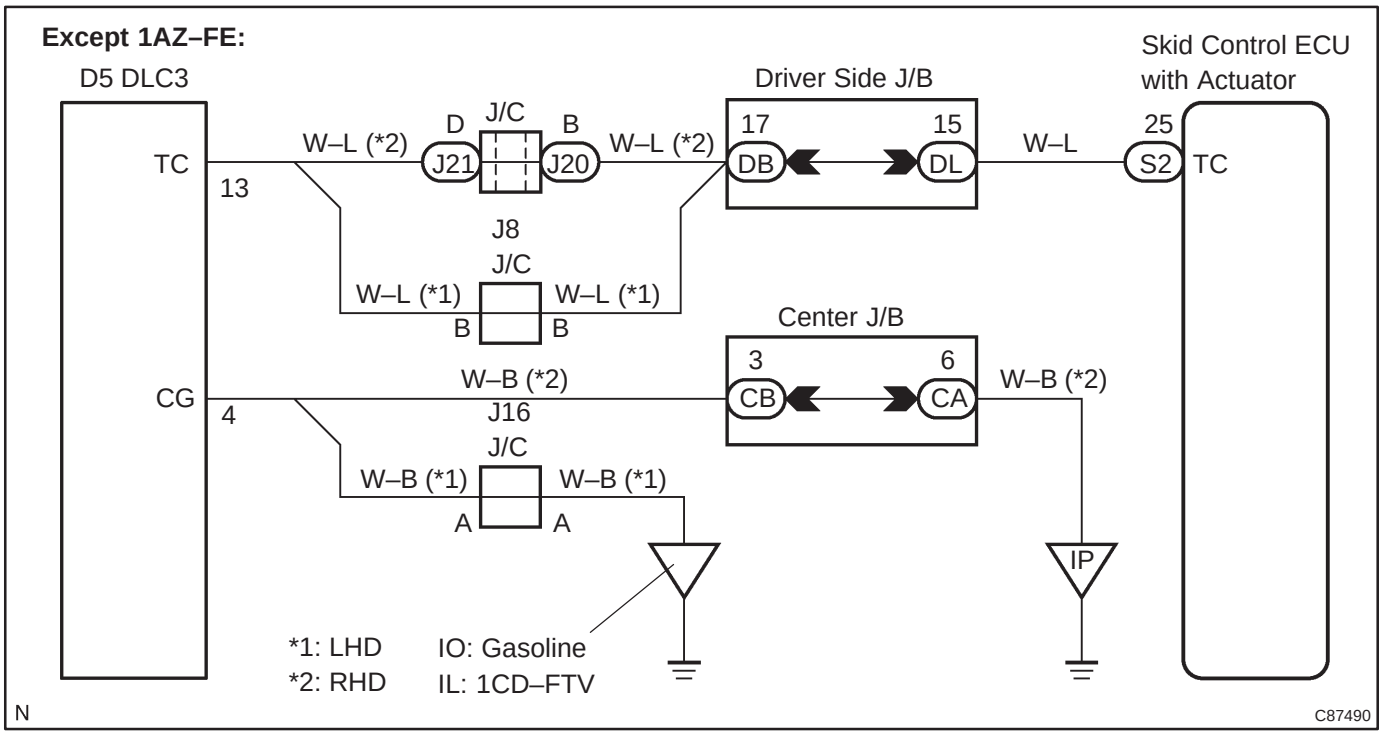
TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

Connecting terminals Tc and CG of the DLC3 causes the ECU to display the DTC by flashing the ABS warning light.

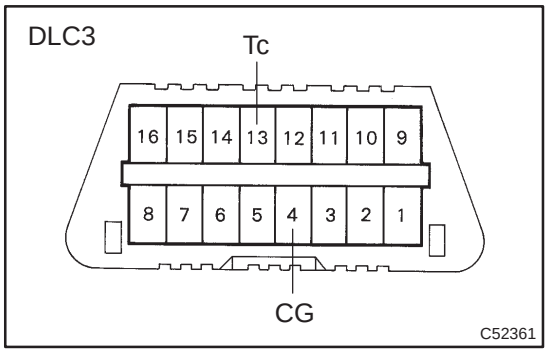
WIRING DIAGRAM





INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Tc TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Tc and CG of the DLC3.
OK:
Voltage: 10 to 14 V

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminal CG of the DLC3 and body ground (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – DLC3)

(a) Check for an open or short circuit in harness and connector between terminal Tc of the skid control ECU and the DLC3 (See page 01–32).

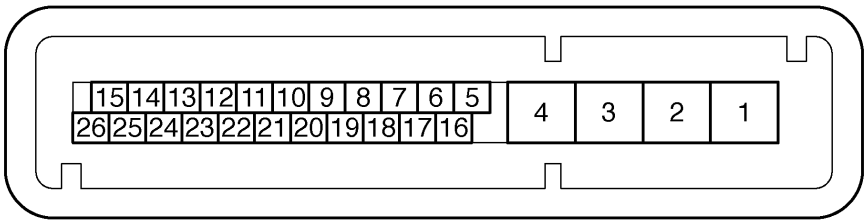
NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

050XF–14

TERMINALS OF ECU



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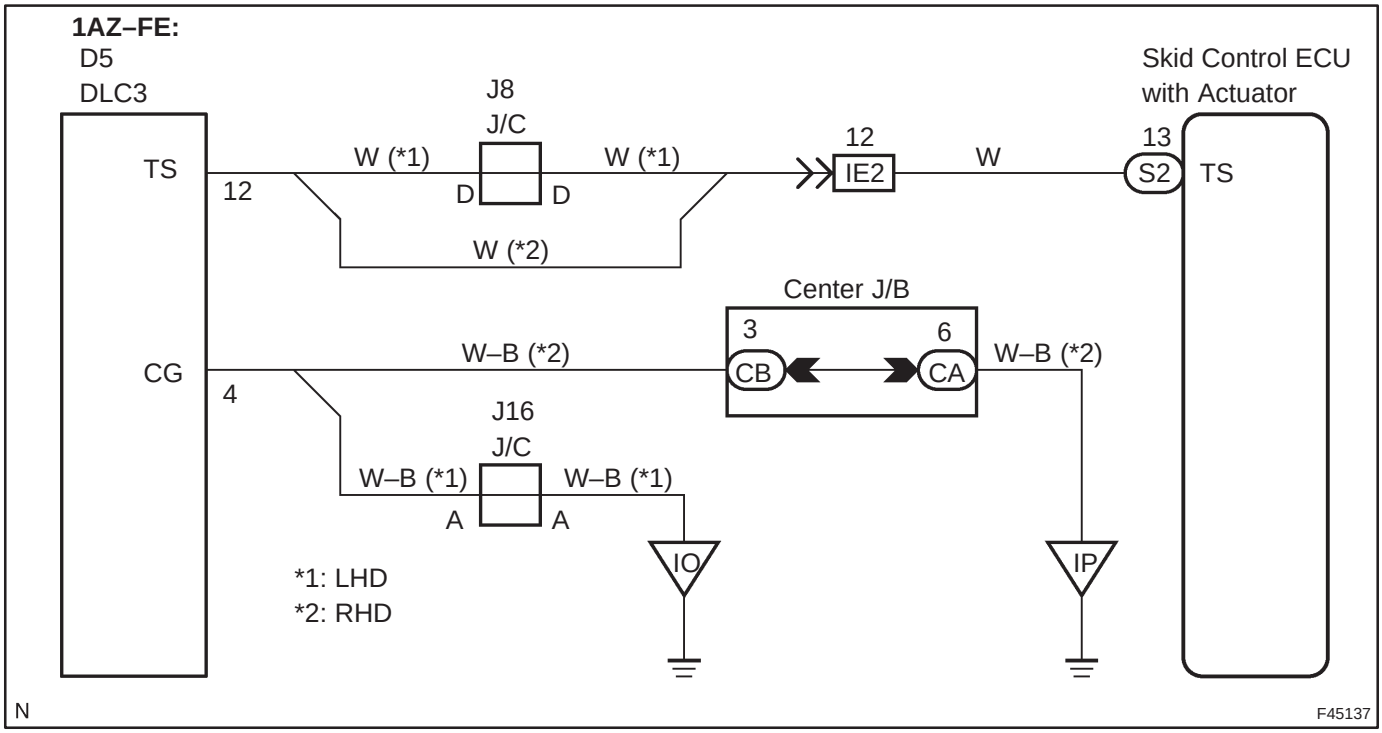
Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
+BM (2) – GND (1, 4)	L – W–B	Always	10 to 14
+BS (3) – GND (1, 4)	R – W–B	Always	10 to 14
FL+ (5) – FL– (6)	L–Y – R–L	IG switch ON Slowly turn left front wheel	AC generation
RL+ (7) – RL– (17)	R – G	IG switch ON Slowly turn left rear wheel	AC generation
FR+ (10) – FR– (9)	W – B	IG switch ON Slowly turn right front wheel	AC generation
D/G (11) – GND (1, 4)	W–G – W–B	IG switch ON, ABS warning light OFF	8 to 12
EBDW (12) – GND (1, 4)	P – W–B	IG switch ON, BRAKE warning light ON	5 to 9
		IG switch ON, BRAKE warning light OFF	Below 2.0
PKB (14) – GND (1, 4)	B–W – W–B	IG switch ON, parking brake switch ON	Below 2.0
		IG switch ON, parking brake switch OFF	10 to 14
IG1 (18) – GND (1, 4)	R–W – W–B	IG switch ON	10 to 14
RR+ (19) – RR– (8)	P – V	IG switch ON Slowly turn right rear wheel	AC generation
STP (20) – GND (1, 4)	G–W – W–B	Stop light switch ON	8 to 14
		Stop light switch OFF	Below 4.0
WA (22) – GND (1, 4)	R–Y – W–B	IG switch ON, ABS warning light ON	5 to 9
		IG switch ON, ABS warning light OFF	Below 2.0
SP1 (23) – GND (1, 4)	L–W – W–B	Vehicle drive at about 20 km/h (12mph)	Pulse generation
Tc (25) – GND (1, 4)	W–L – W–B	IG switch ON	10 to 14

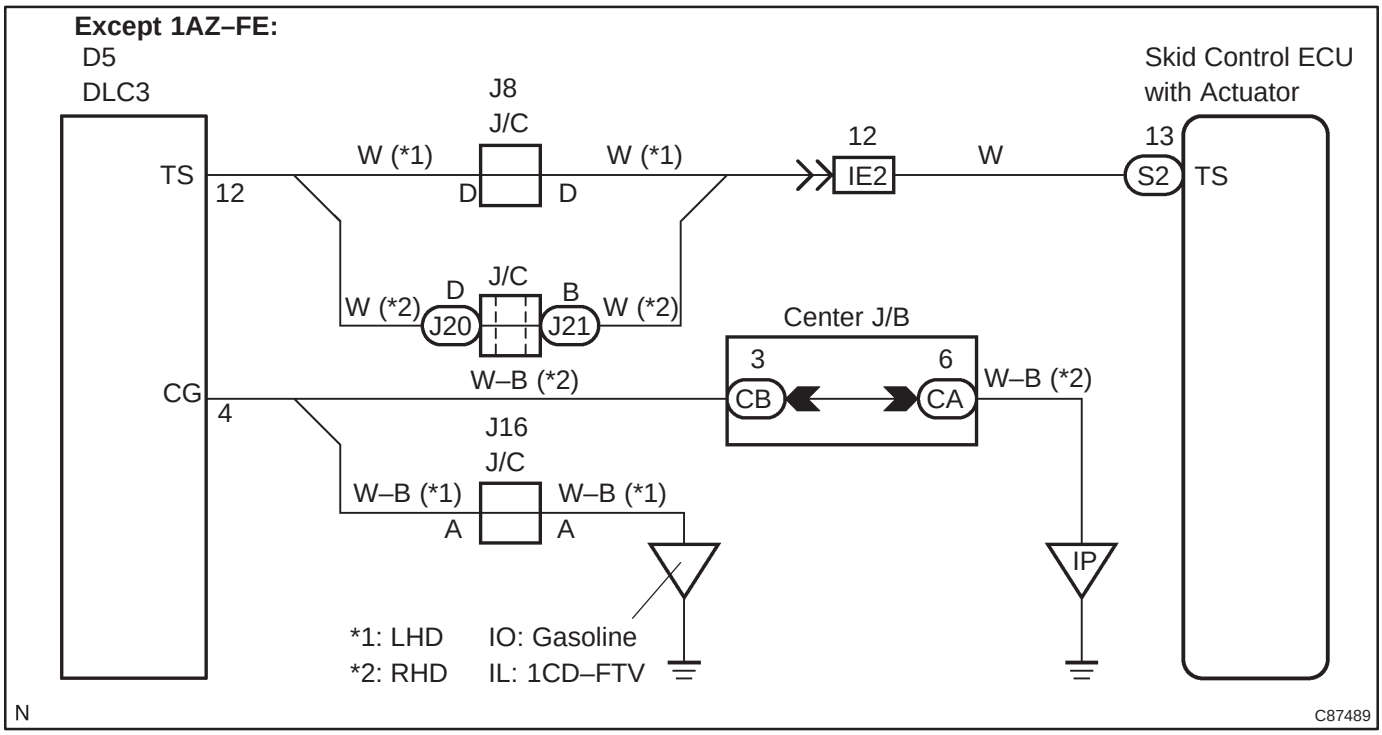
TS TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

The sensor check circuit detects troubles in the sensor signal which cannot be detected by the DTC check. Connecting terminals Ts and CG of the DLC3 starts the check.

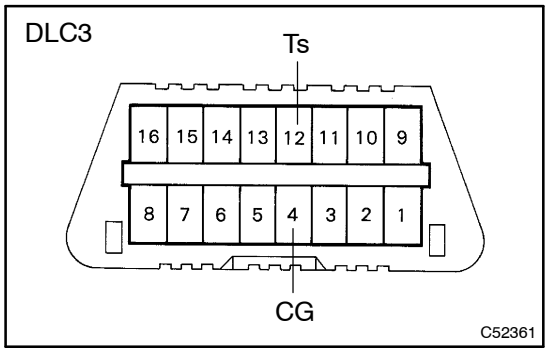
WIRING DIAGRAM





INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Ts TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Ts and CG of the DLC3.
OK:
Voltage: 10 to 14 V

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminal Ts of the DLC3 and the skid control ECU (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK AND REPAIR HARNESS AND CONNECTOR(SKID CONTROL ECU – DLC3)

(a) Check for an open or short circuit in harness and connector between terminal CG of the DLC3 and body ground (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE BRAKE ACTUATOR ASSY (See page 32–54)

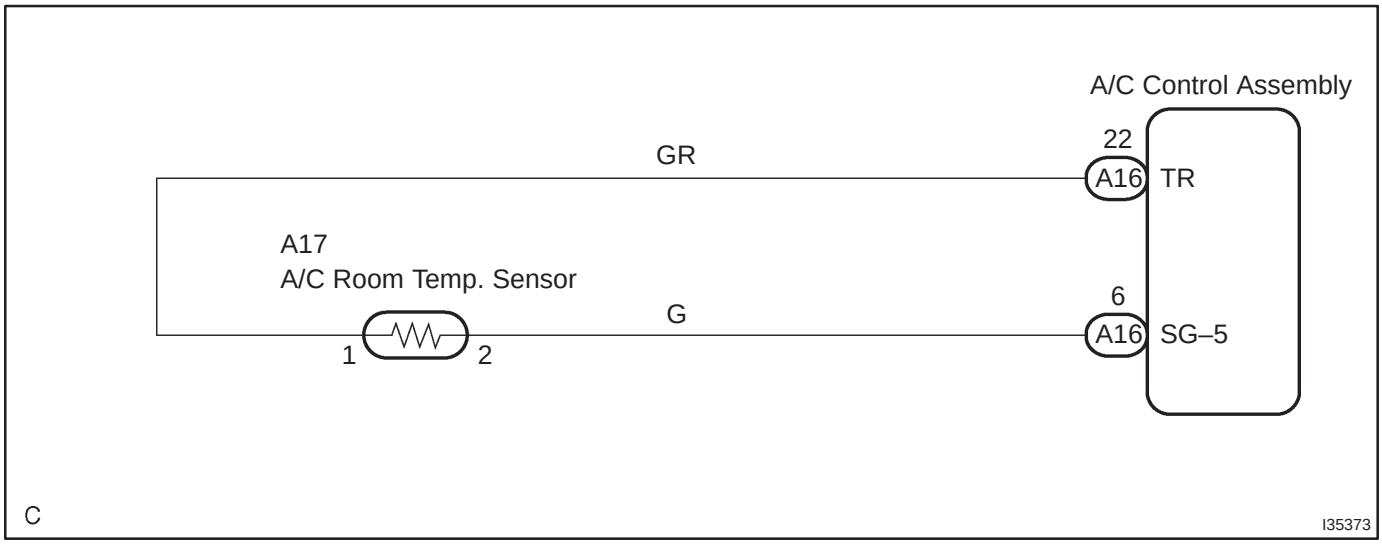
DTC	11	ROOM TEMPERATURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

This sensor detects the temperature inside the cabin and sends the appreciate signals to the A/C amplifier.

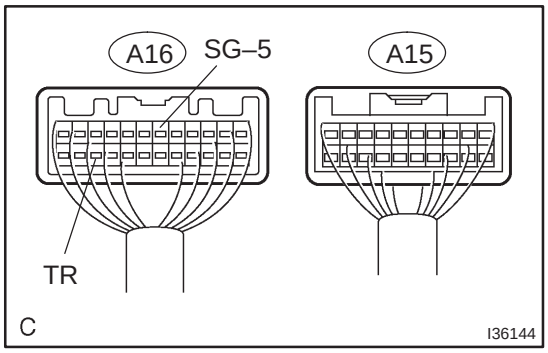
DTC No.	Detection item	Trouble Area
11	Open or short in room temperature sensor circuit	• Cooler thermistor (room temp. sensor) • Harness or connector between cooler thermistor (room temp. sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TR – SG–5)



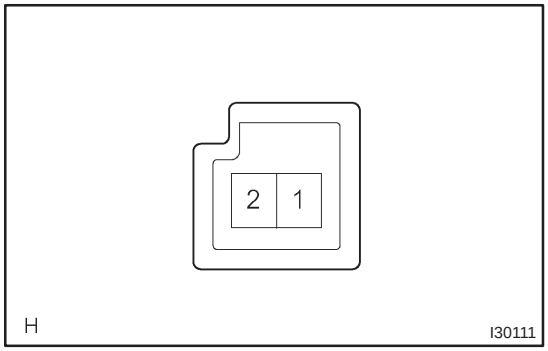
(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between terminal TR and SG–5 of A/C amplifier connector at each temperature.
Standard:
1.8 to 2.2 V at 25°C (77°F)
1.2 to 1.6 V at 40°C (104°F)

HINT:
As the temperature increases, the voltage decreases.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

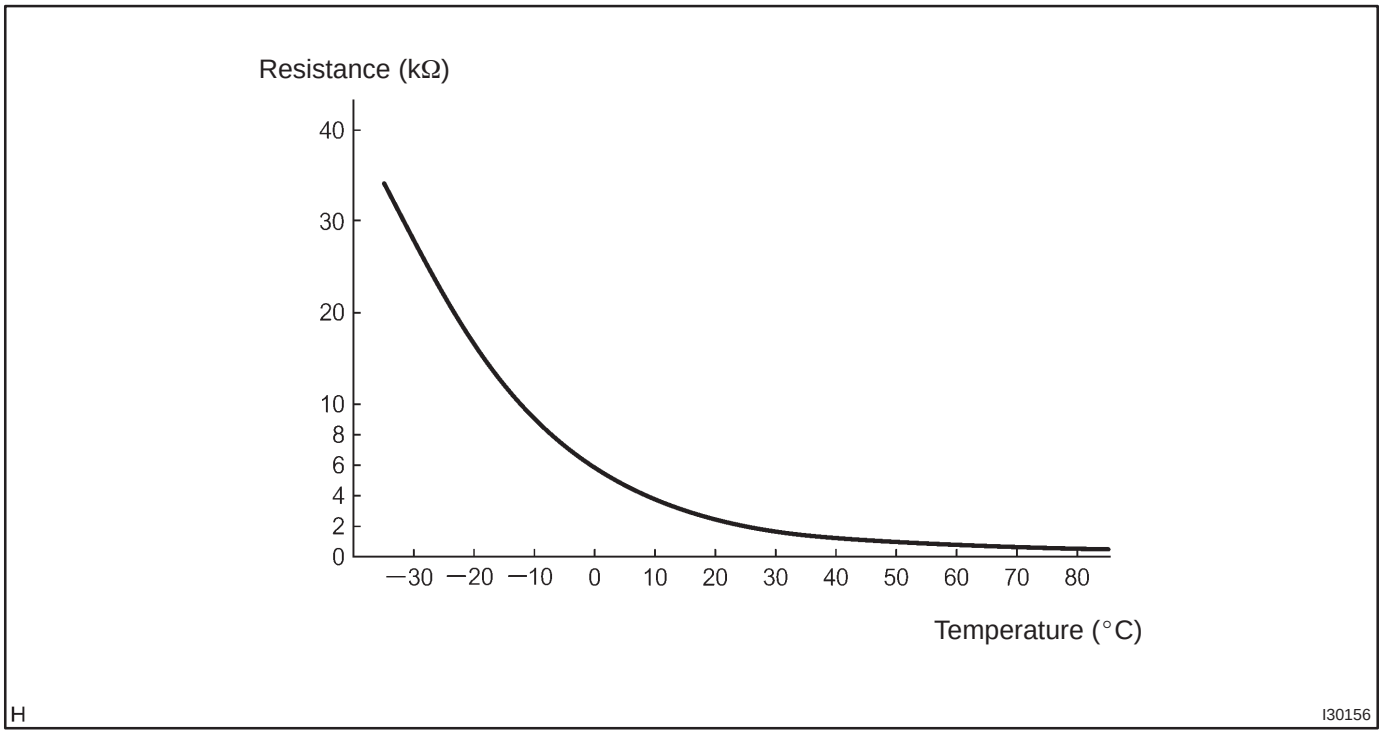
NG

2 INSPECT COOLER (ROOM TEMP. SENSOR) THERMISTOR



(a) Remove cooler the thermistor (room temp. sensor).
(b) Measure the resistance between terminal 1 and 2 of cooler thermistor (room temp. sensor) connector at each temperature.
Standard:
1,615 to 1,785 Ω at 25°C (77°F)

HINT:
As the temperature increases, the resistance decreases.



NG → **REPLACE COOLER (ROOM TEMP. SENSOR) THERMISTOR**

OK

3	CHECK HARNESS AND CONNECTOR(COOLER (ROOM TEMP. SENSOR) THERMISTOR – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between terminal TR and SG–5 of A/C amplifier (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 8.5 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

MG → REPLACE AIR CONDITIONING AMPLIFIER

OK

SYSTEM OK

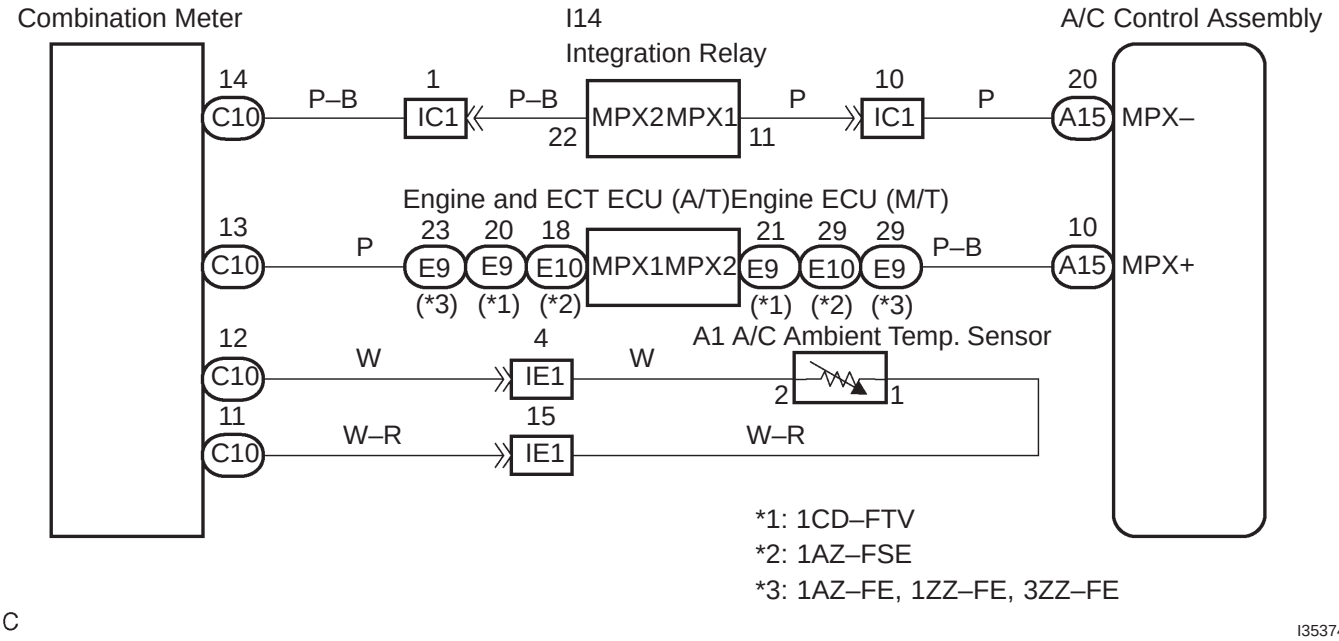
DTC	12	AMBIENT TEMPERATURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

This sensor detects the temperature outside the cabin and sends the appropriate signals to the A/C amplifier.

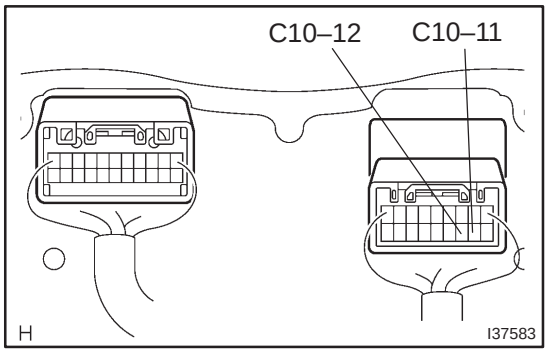
DTC No.	Detection item	Trouble Area
12	Open or short in ambient temperature sensor circuit	• Thermistor assy (ambient temp. sensor) • Harness or connector between thermistor assy (ambient temp. sensor) and combination meter • Combination meter • Harness or connector between combination meter and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT COMBINATION METER ASSY



(a) Disconnect the connector from the combination meter assy.

(b) Measure resistance between the terminal C10–11 and C10–12 of the ambient temp. sensor connector at each temperature.

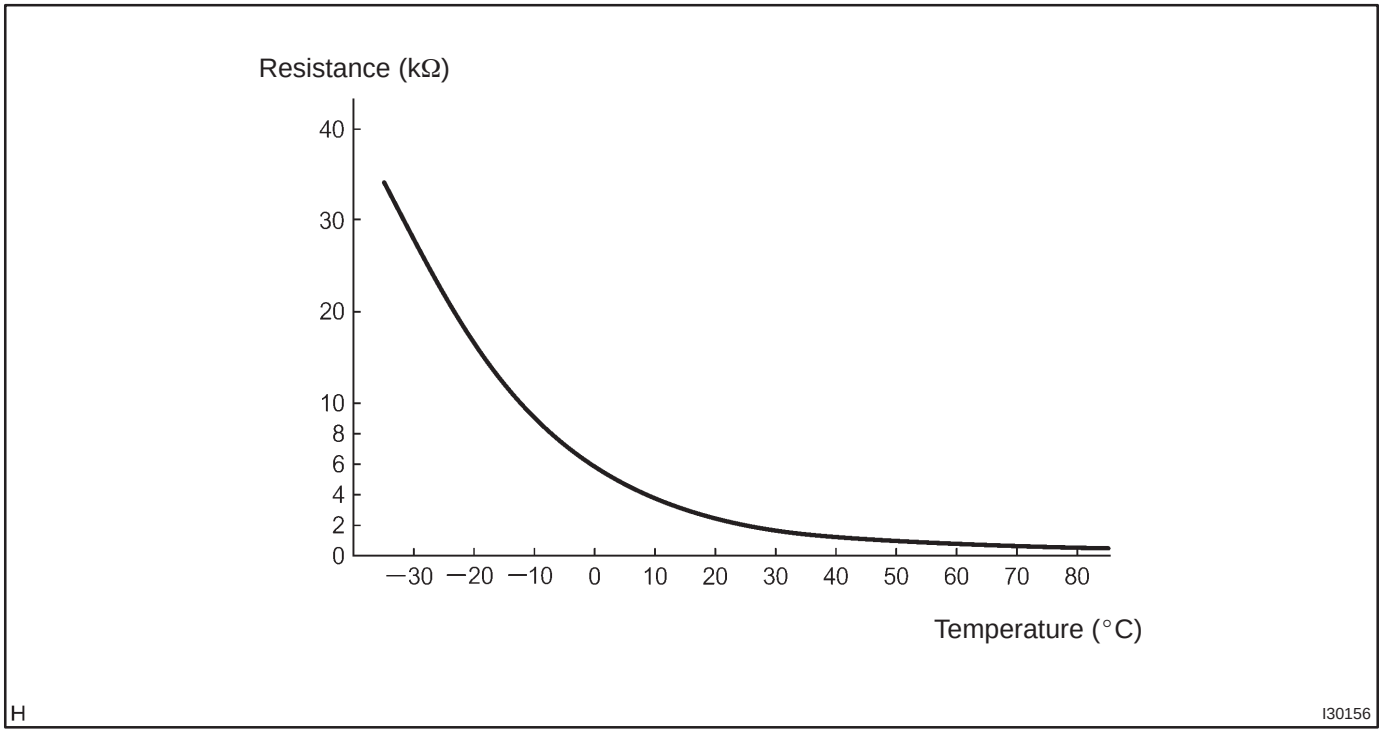
Standard:

9.0 to 9.8 kΩ: at 0°C (0°F)

2.7 to 2.9 kΩ: at 25°C (77°F)

HINT:

As the temperature increases, resistance decreases.



OK → **REPLACE COMBINATION METER ASSY**

NG

2	CHECK HARNESS AND CONNECTOR(COMBINATION METER – OUTER AMBIENT TEMPERATURE SENSOR)

(a) Disconnect the connector from ambient temp. sensor.
(b) Check continuity between the terminal C10–11 (12) of combination meter assy and the terminal A1–1 (2) of ambient temp. sensor connector.
Standard: Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 8.5 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

NG → **REPLACE OUTER AMBIENT TEMPERATURE SENSOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

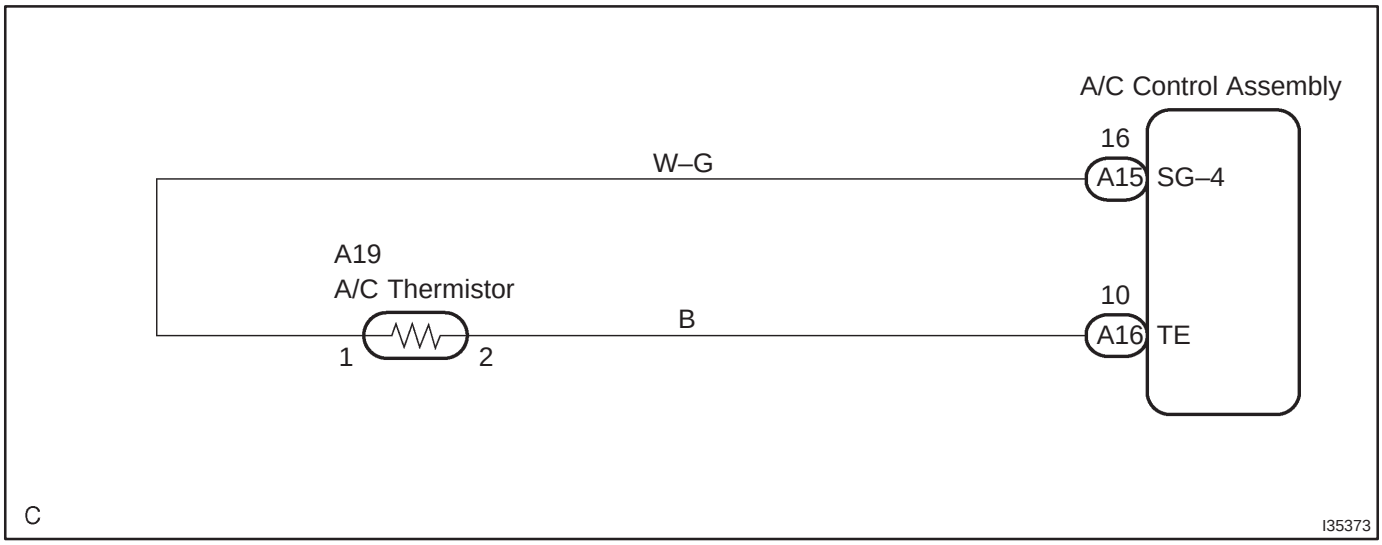
DTC	13	EVAPORATOR TEMPERATURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

This sensor detects the temperature inside the cooling unit and sends the appropriate signals to the A/C amplifier.

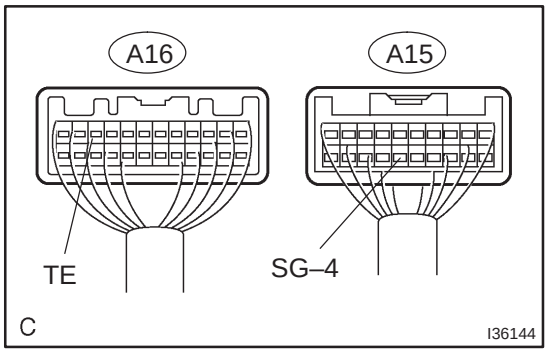
DTC No.	Detection Item	Trouble Area
13	Open or short in evaporator temperature sensor circuit.	• Cooler thermistor No.1 (evaporator temp. sensor) • Harness or connector between cooler thermistor No.1 (evaporator temp. sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TE – SG–4)

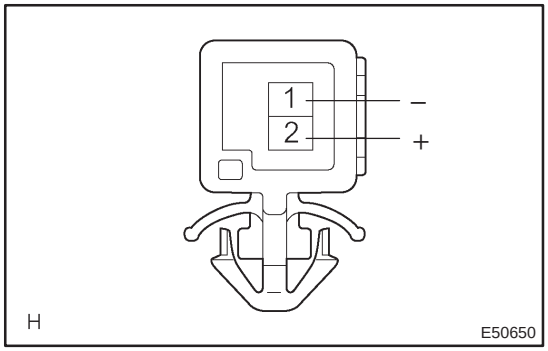


(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between terminal TE and SG–4 of A/C amplifier connector at each temperature.
Standard:
2.0 to 2.4 V at 0°C (32°F)
1.4 to 1.8 V at 15°C (59°F)

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT COOLER THERMISTOR NO.1



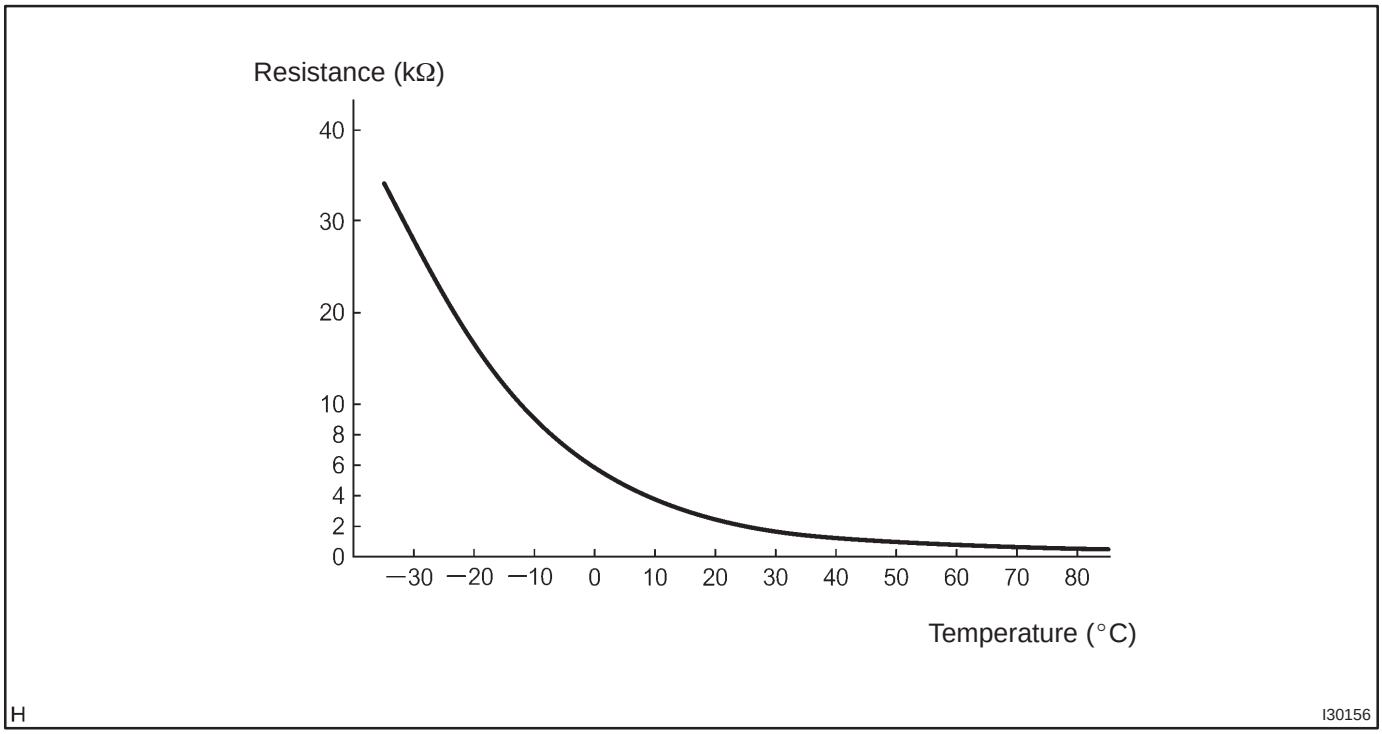
(a) Remove the cooler thermistor No.1 (evaporator temp. sensor).

(b) Check the resistance between terminal 1 and 2 of cooler thermistor No.1 (evaporator temp. sensor) at each temperature, as shown in the chart.

Standard: 1,500 Ω at 25°C (77°F)

HINT:

As the temperature increases, the resistance decreases.



NG → **REPLACE COOLER THERMISTOR NO.1**

OK

3	CHECK HARNESS AND CONNECTOR(COOLER THERMISTOR NO.1 – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between terminal TE and SG–4 of A/C amplifier (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 8.5 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

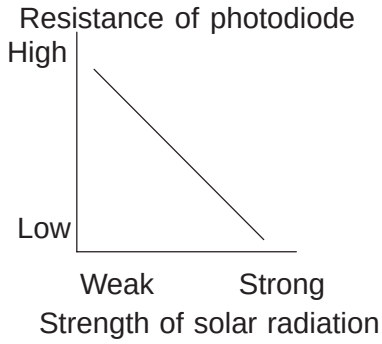
NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

SYSTEM OK

DTC	21	SOLAR SENSOR CIRCUIT(PASSENGER SIDE)

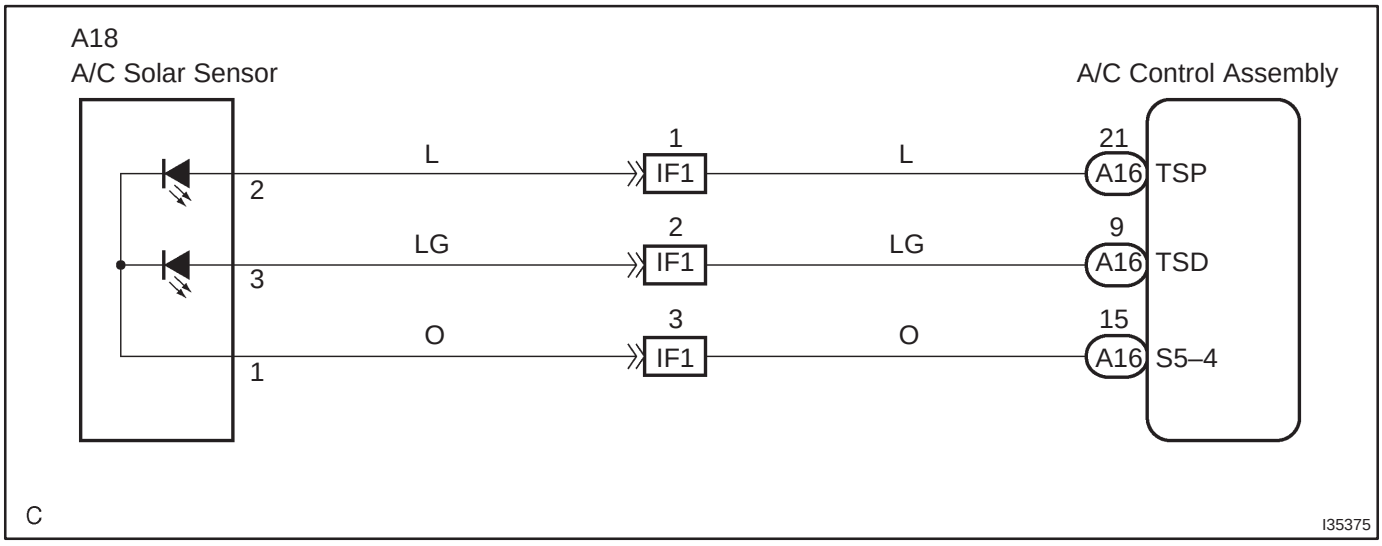
CIRCUIT DESCRIPTION



A photo diode in the solar sensor detects solar radiation and sends signals to the A/C amplifier.

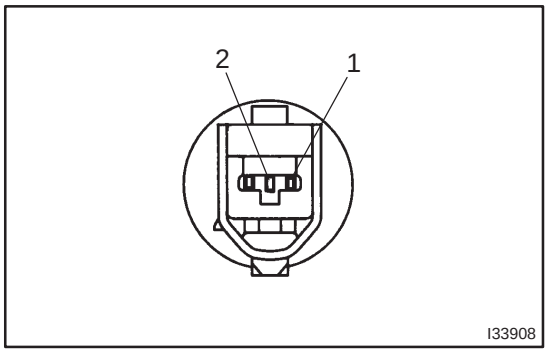
DTC No.	Detection Item	Trouble Area
21	Open or short in solar sensor circuit. (If the checking is being performed in a dark place, DTC 21 could be displayed.)	• Automatic light control sensor (solar sensor) • Harness or connector between automatic light control sensor (solar sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT COOLER (SOLAR SENSOR) THERMISTOR



(a) Remove cooler (solar sensor) thermistor.
(b) Cover the sensor with a cloth, and check the cooler (solar sensor) thermistor resistance.
  (1) Measure resistance between terminals 1 and 2 of the cooler (solar sensor) thermistor.
  Resistance: ∞ Ω (No continuity)

HINT:
Connect the ohmmter positive (+) lead to terminal 2 and the ohmmeter negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

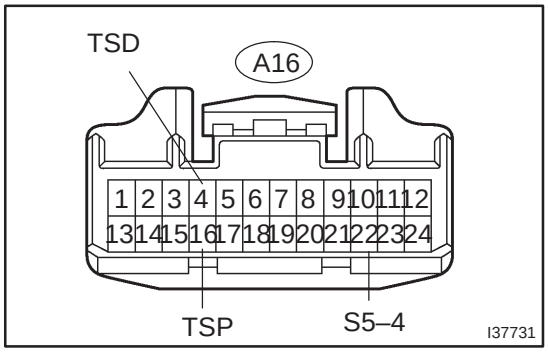
(c) Remove the cloth from the cooler (solar sensor) thermistor, and subject the sensor to the electric light and check the cooler (solar sensor) thermistor resistance.
  (1) Measure resistance between terminal 1 and 2 of the cooler (solar sensor) thermistor.
  Resistance: Approx. 10 kΩ (Continuity)

HINT:
Connect the positive (+) lead to ohmmeter to terminal 2 and negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

NG → **REPLACE COOLER (SOLAR SENSOR) THERMISTOR**

OK

2	CHECK HARNESS AND CONNECTOR(COOLER (SOLAR SENSOR) THERMISTOR – A/C AMPLIFIER)



(a) Check for an open or short circuit in harness and connector between solar sensor and A/C amplifier
(See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 8.5 minutes after turning the ignition switch ON.
Standard: Normal codes are output

NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

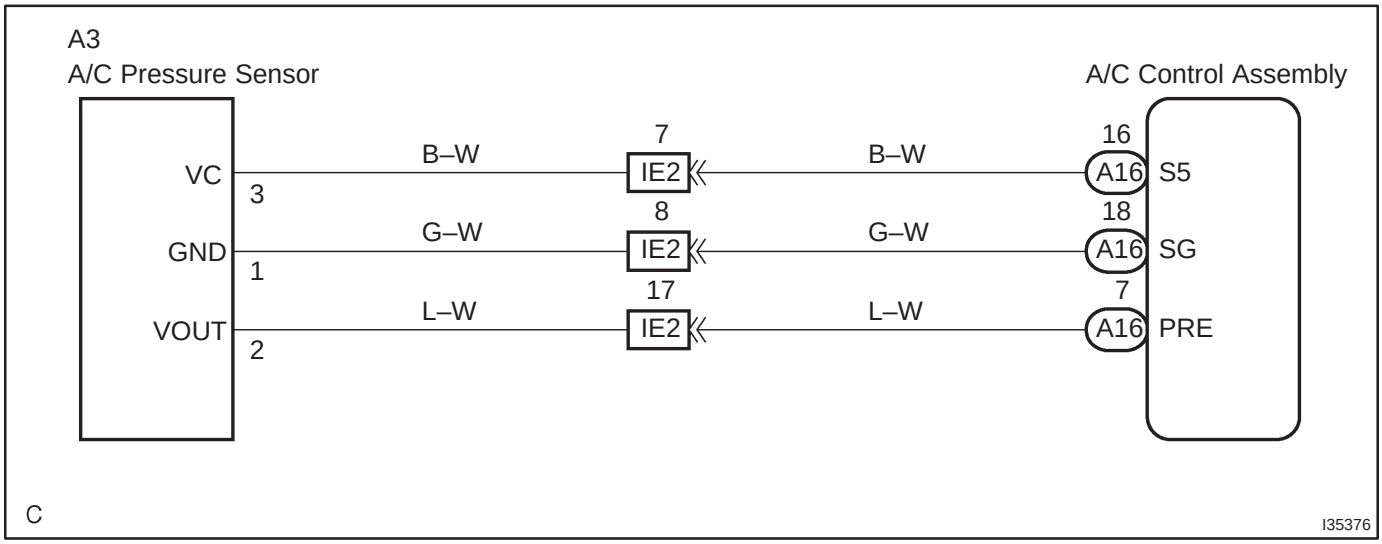
DTC	23	PRESSURE SWITCH CIRCUIT

CIRCUIT DESCRIPTION

The pressure sensor sends the appropriate signals to the A/C amplifier assy when the A/C refrigerant pressure drops too low or rises too high. When the A/C amplifier receives these signals, it outputs signals though the A/C amplifier to switch OFF the compressor relay and turns the magnetic clutch OFF.

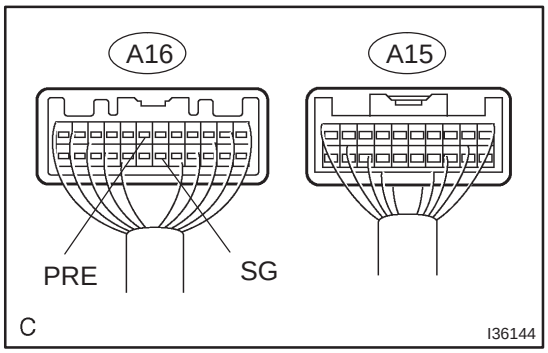
DTC No.	Detection Item	Trouble Area
23	• Open in pressure sensor circuit. • Abnormal refrigerant pressure. below 196 kPa (2.0 kgf/cm^2, 28 psi) over 3,140 kPa (32.0 kgf/cm^2, 455 psi)	• A/C tube assy (pressure sensor) • Harness or connector between A/C tube assy (pressure sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT AIR CONDITIONING AMPLIFIER(PRE)



(a) Install the manifold gauge set.
(b) Remove the A/C amplifier with connectors being connected.
(c) Turn the ignition switch to ON.
(d) Check the voltage between terminal PRE and SG of A/C amplifier connector when refrigerant pressure is changed.
(e) The voltage changes following refrigerant pressure change, as shown in the diagram below.

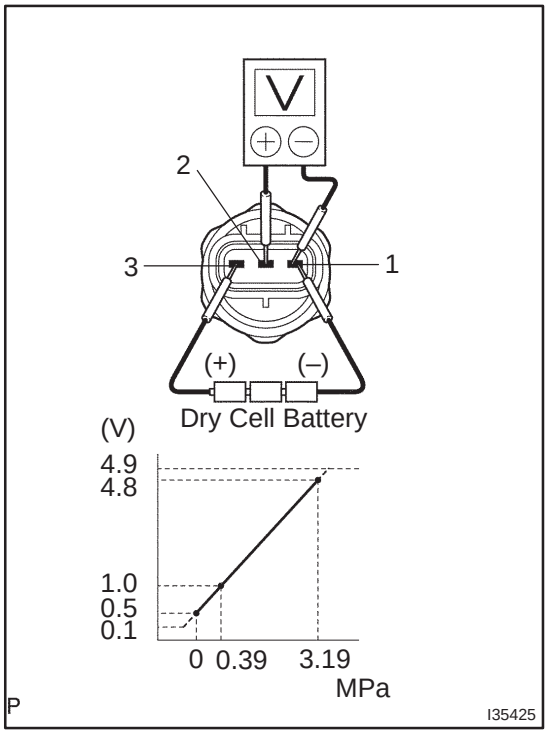
Standard:

Low Pressure Cut Side	Reference : High Pressure Cut Side
ON (0V) 225 kPa 196 kPa OFF (4.5 – 5.5 V)	ON (0V) 2,550 kPa 3,140 kPa OFF (4.5 – 5.5 V)

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2 INSPECT AIR CONDITIOER PRESSURE SENSOR



(a) Disconnect the pressure sensor connector.
(b) Install the manifold gauge set (See page 55–38).
(c) Connect the positive (+) lead from the three 1.5 V dry cell batteries to terminal 3 and negative (–) lead to terminal 1.
(d) Check the voltage between terminals 2 and 1 of pressure sensor.

Standard:

The voltage varies with on the refrigerant pressure as shown in the chart.

NG → **REPLACE AIR CONDITIOER PRESSURE SENSOR**

OK

3	CHECK HARNESS AND CONNECTOR(AIR CONDITIONER PRESSURE SENSOR – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between pressure sensor and A/C amplifier (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) After turning the ignition switch ON, read DTC.
Standard: Normal codes are output.

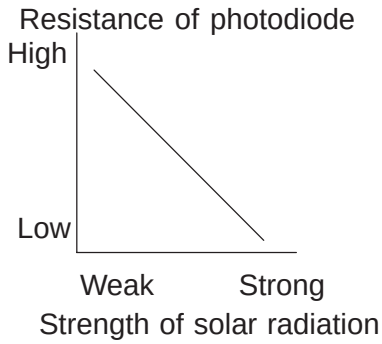
NG → REPLACE AIR CONDITIONING AMPLIFIER

OK

SYSTEM OK

DTC 24 SOLAR SENSOR CIRCUIT (DRIVER SIDE)

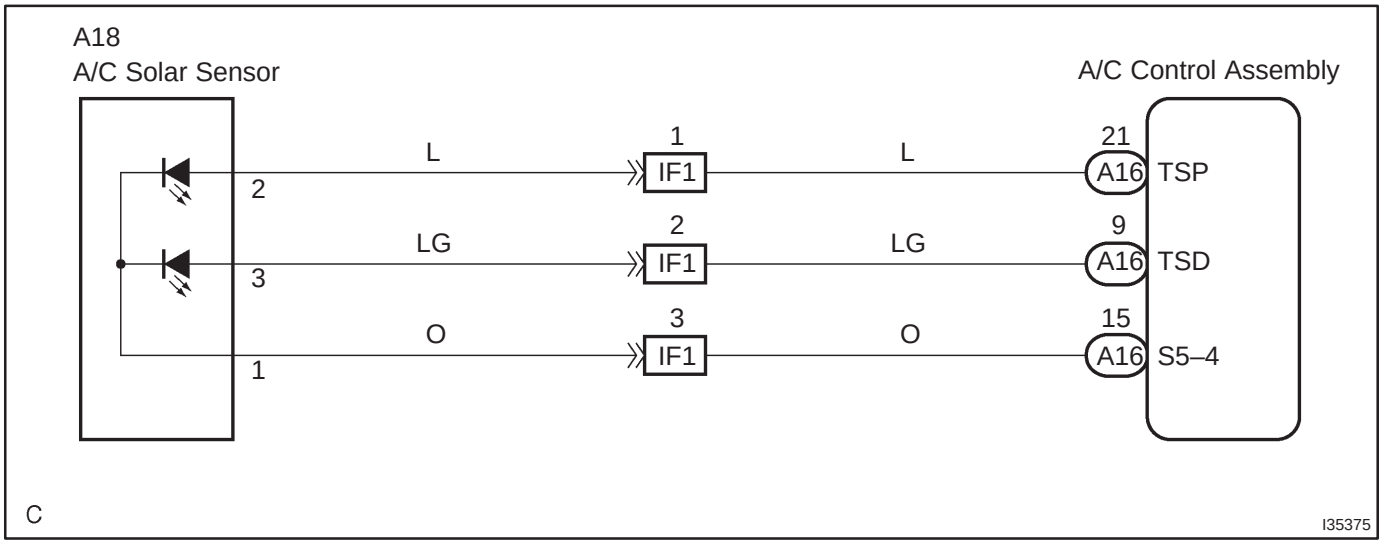
CIRCUIT DESCRIPTION



A photo diode in the solar sensor detects solar radiation and sends signals to the A/C amplifier.

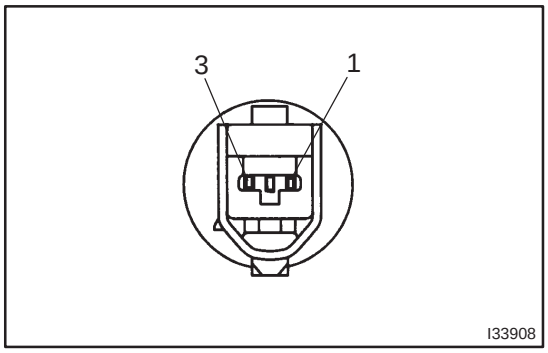
DTC No.	Detection Item	Trouble Area
24	Open or short in solar sensor circuit. (If the checking is being performed in a dark place, DTC 24 could be displayed.)	• Automatic light control sensor (solar sensor) • Harness or connector between automatic light control sensor (solar sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT COOLER (SOLAR SENSOR) THERMISTOR



(a) Remove cooler (solar sensor) thermistor.
(b) Cover the sensor with a cloth, and check the cooler (solar sensor) thermistor resistance.
(1) Measure resistance between terminals 1 and 3 of the cooler (solar sensor) thermistor.
Resistance: ∞ Ω (No continuity)

HINT:
Connect the ohmmter positive (+) lead to terminal 3 and the ohmmeter negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

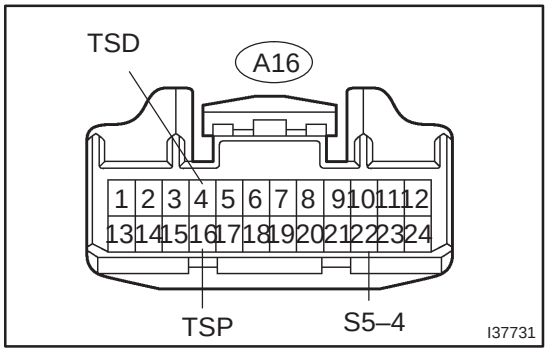
(c) Remove the cloth from the cooler (solar sensor) thermistor, and subject the sensor to the electric light and check the cooler (solar sensor) thermistor resistance.
(1) Measure resistance between terminal 1 and 3 of the cooler (solar sensor) thermistor.
Resistance: Approx. 10 kΩ (Continuity)

HINT:
Connect the positive (+) lead to ohmmeter to terminal 3 and negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

NG → **REPLACE COOLER (SOLAR SENSOR) THERMISTOR**

OK

2	CHECK HARNESS AND CONNECTOR(COOLER (SOLAR SENSOR) THERMISTOR – A/C AMPLIFIER)



(a) Check for open or short circuit in harness and connector between solor sansor and A/C amplifier
(See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 8.5 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

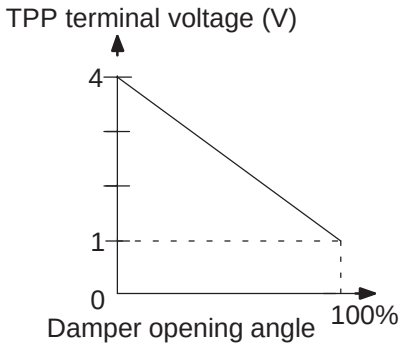
NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

DTC	31	AIR MIX DAMPER POSITION SENSOR CIRCUIT(PASSENGER SIDE)

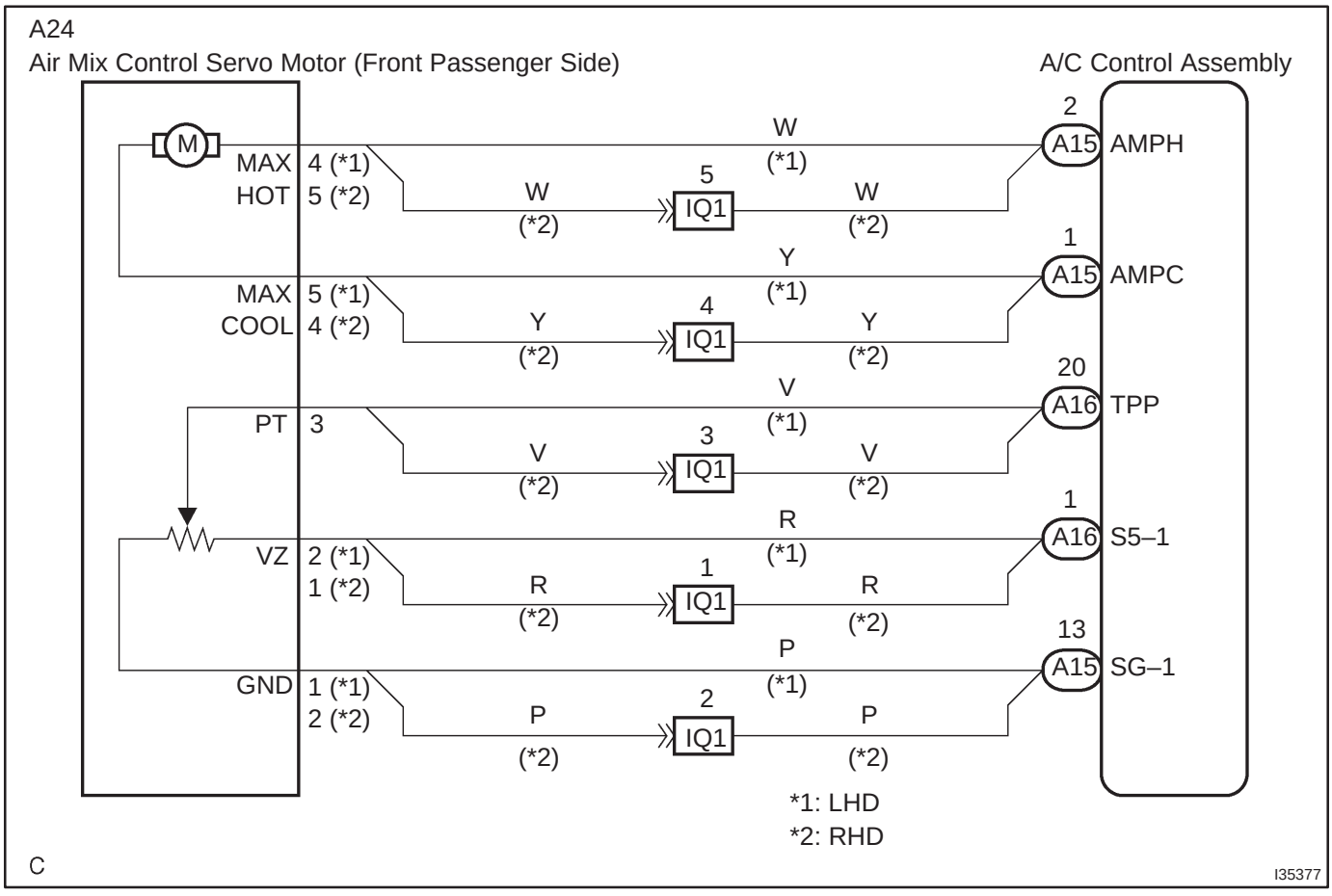
CIRCUIT DESCRIPTION



This sensor detects the position of the air mix damper and sends the appropriate signals to the A/C amplifier. The position sensor is built in the air mix damper servo sub–assy.

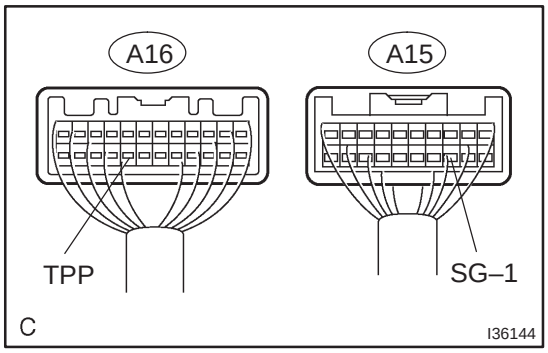
DTC No.	Detection Item	Trouble Area
31	Short to ground or power source circuit in air mix damper position sensor circuit.	• Air mix damper servo sub–assy (air mix damper position sensor) • Harness or connector between air mix damper servo sub–assy (air mix damper position sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TPP – SG–1)



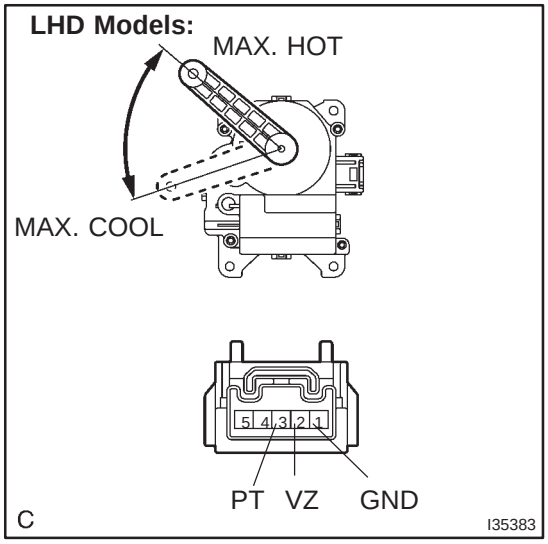
(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Change the set temperature to activate the air mix damper and measure the voltage between terminal TPP and SG–1 of A/C amplifier assy.
Standard:
MAX. COOL: 3.5 to 4.5 V
MAX. HOT: 0.5 to 1.8 V

HINT:
As the set temperature increases, the voltage decreases gradually without interruption.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

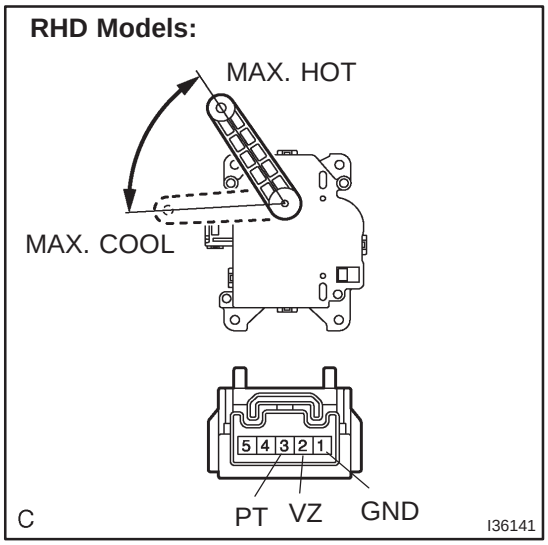
NG

2 INSPECT AIRMIX NO.2 DAMPER SERVO SUB–ASSY



(a) Remove the air mix damper servo sub–assy.
(b) Measure the resistance between terminal VZ and GND of air mix damper servo sub–assy connector.
Resistance: 4.2 to 7.8 kΩ
(c) While operating air mix damper servo sub–assy as shown in the procedure on page 05–1133, measure the resistance between terminal PT and GND of air mix damper servo sub–assy.
Standard:
MAX. HOT: 3.4 to 6.2 V
MAX. COOL: 0.8 to 1.6 V

HINT:
As the air mix damper servo sub–assy moves from COOL side to HOT side, the resistance decreases gradually without interruption.



NG → **REPLACE AIRMIX NO.2 DAMPER SERVO SUB–ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(AIRMIX NO.2 DAMPER SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between air mix damper position sensor and A/C amplifier (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 1.0 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

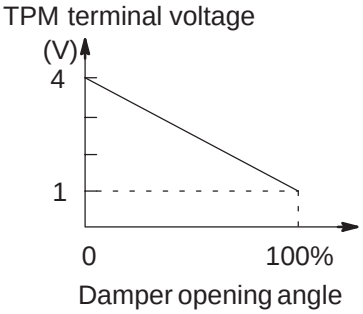
NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

DTC	33	AIR OUTLET DAMPER POSITION SENSOR CIRCUIT

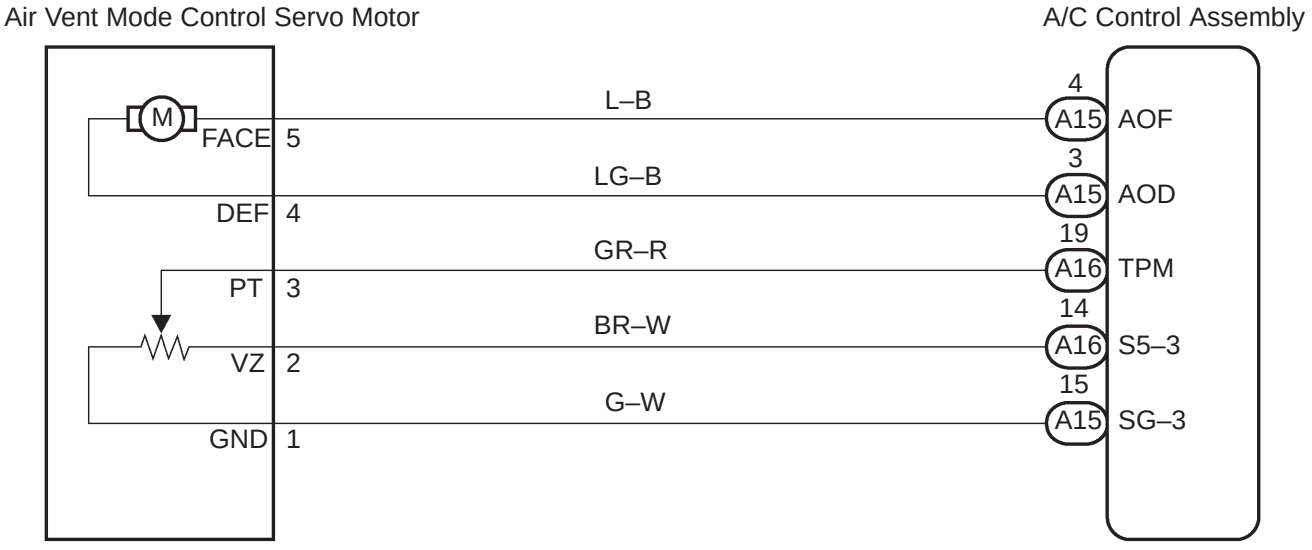
CIRCUIT DESCRIPTION



This sensor detects the position of the mode damper and sends the appropriate signals to the A/C amplifier. The position sensor is built in the mode damper servo sub–assy.

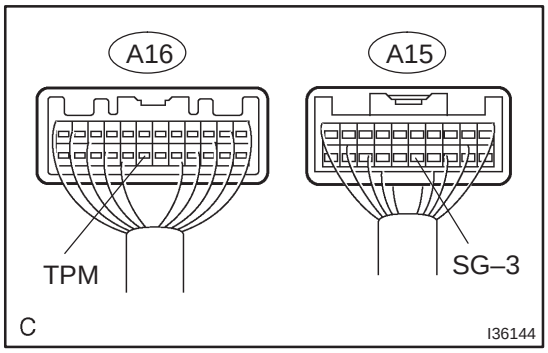
DTC No.	Detection Item	Trouble Area
33	Short to ground or power source circuit in mode damper position sensor circuit.	• Mode damper servo sub–assy (mode damper position sensor) • Harness or connector between mode damper servo sub–assy (mode damper position sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TPM – SG–3)



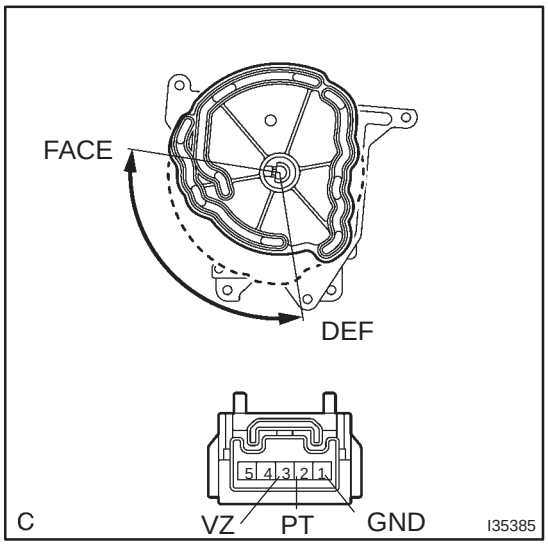
(a) Remove the A/C amplifier with being connectors connected.
(b) Turn the ignition switch to ON.
(c) Change the set to activate the mode damper sub–assy and measure voltage between terminal TPM and SG–3 of A/C amplifier assy.
Standard:
FACE: 3.5 to 4.5 V
DEF: 0.5 to 1.5 V

HINT:
As the is moved from FACE side to DEF side, the voltage decreases gradually with out interruption.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT MODE DAMPER SERVO SUB–ASSY



(a) Remove the mode damper servo sub–assy.
(b) Measure the resistance between terminal VZ and GND of mode damper servo sub–assy connector.
Standard: 4.2 – 7.8 kΩ
(c) While operating mode damper servo sub–assy as in the procedure on page 05–1136, measure the resistance between terminal PT and GND of mode damper servo sub–assy.
Standard:
DEF: 3.4 to 6.2 kΩ
FACE: 0.8 to 1.6 kΩ

HINT:
As the mode damper servo sub–assy moved from DEF side to FACE side, the resistance decreases gradually with out interruption.

NG → **REPLACE MODE DAMPER SERVO SUB–ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(MODE DAMPER SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between mode damper position sensor and A/C amplifier (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 1.0 minutes after turnig the ignition switch ON.
Standard: Normal codes are output.

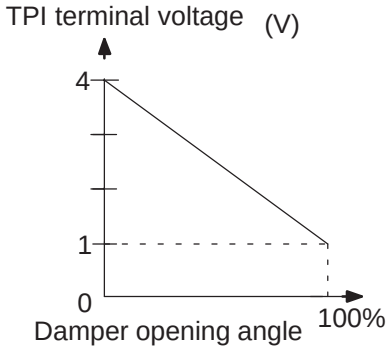
NG → REPLACE AIR CONDITIONING AMPLIFIER

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

DTC	36	AIR MIX DAMPER POSITION SENSOR CIRCUIT (DRIVER SIDE)

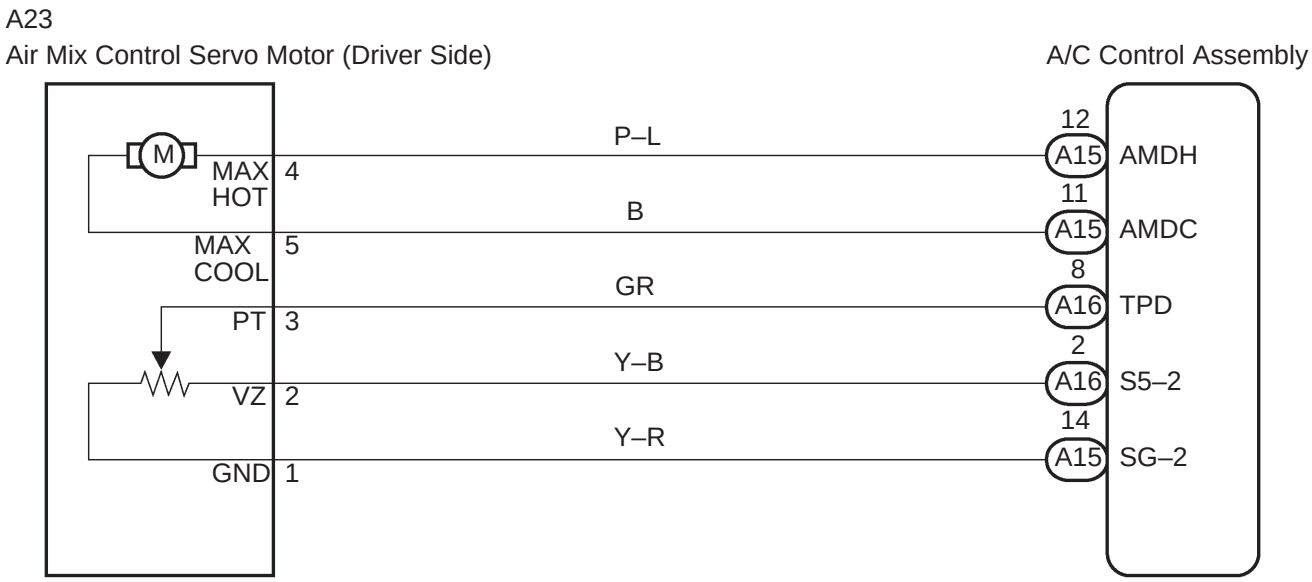
CIRCUIT DESCRIPTION



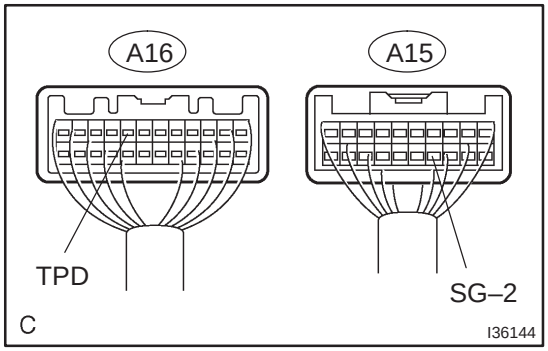
This sensor detects the position of the air mix damper and sends the appropriate signals to the A/C amplifier. The position sensor is built in the air mix damper servo sub–assy.

DTC No.	Detection Item	Trouble Area
36	Short to ground or power source circuit in air mix damper position sensor circuit.	• Air mix damper servo sub–assy (Air mix damper position sensor) • Harness or connector between air mix damper servo sub–assy (air mix damper position sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



1	**INSPECT AIR CONDITIONING AMPLIFIER(TPD – SG–2)**



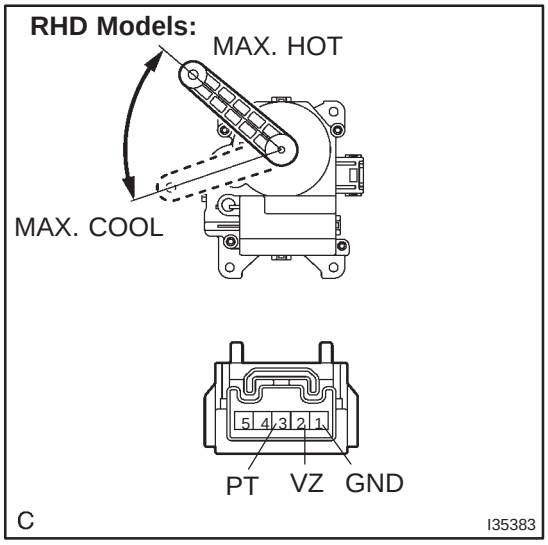
(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Change the set temperature to activate the air mix damper and measure the voltage between terminal TPD and SG–2 of A/C amplifier.
Standard:
MAX. COOL: 3.5 to 4.5 V
MAX HOT: 0.5 to 1.8 V

HINT:
As the set temperature increases, the voltage decreases gradually without interruption.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

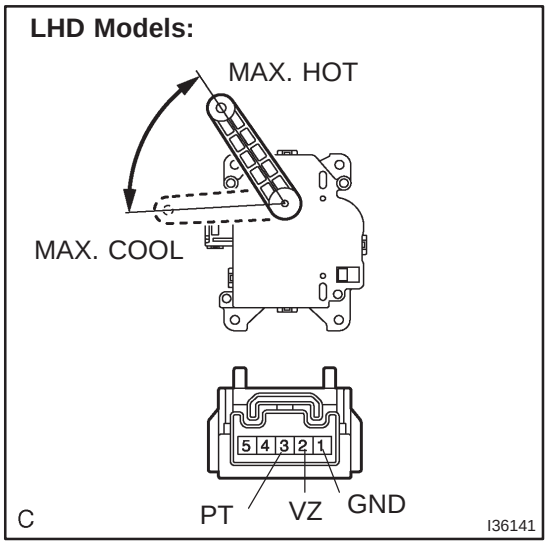
NG

2 INSPECT AIRMIX DAMPER SERVO SUB–ASSY



(a) Remove the air mix damper servo sub–assy.
(b) Measure the resistance between terminal VZ and GND of air mix damper servo sub–assy connector.
Resistance: 4.2 to 7.8 kΩ
(c) While operating air mix damper servo sub–assy as shown in the procedure on page 05–1139, measure resistance between terminal PT and GND of air mix damper servo sub–assy.
Resistance:
MAX. HOT: 3.4 to 6.2 kΩ
MAX. COOL: 0.8 to 1.6 kΩ

HINT:
As the air mix damper servo sub–assy moves from COOL side to HOT side, the resistance decreases gradually without interruption.



NG → **REPLACE AIRMIX DAMPER SERVO SUB–ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(AIRMIX DAMPER SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open and short circuit in harness and connector between air mix damper position sensor and A/C amplifier (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 1.0 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

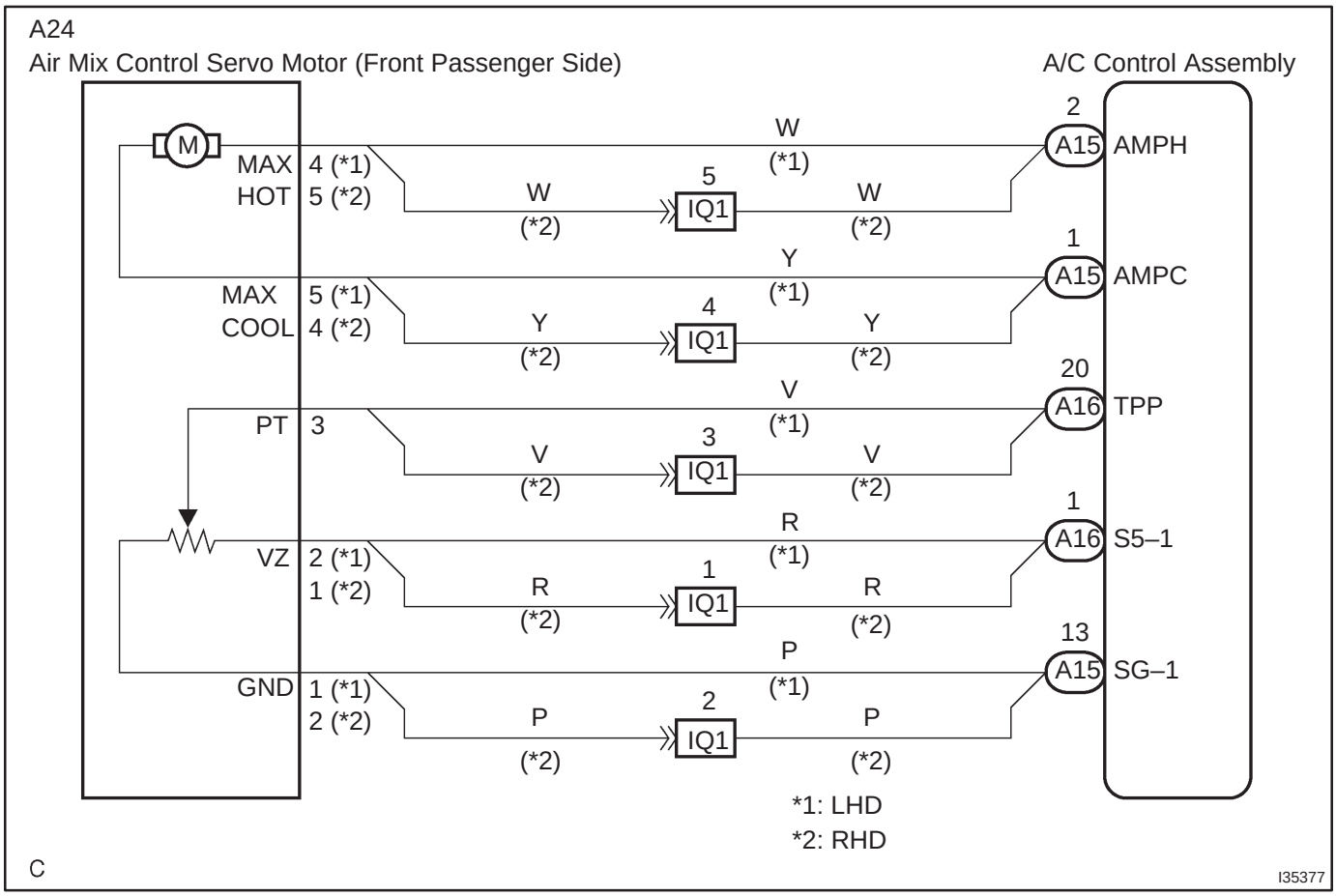
DTC	41	AIR MIX DAMPER CONTROL SERVOMOTOR CIRCUIT(PASSENGER SIDE)

CIRCUIT DESCRIPTION

This air mix damper servo sub–assy is controlled by the A/C amplifier and moves the air mix damper to the desired position.

DTC No.	Detection Item	Trouble Area
41	Air mix damper position sensor value does not change even if A/C amplifier operated air mix damper control servomotor.	• Air mix damper servo sub–assy (air mix damper control) • Harness or connector between air mix damper servo sub–assy (air mix damper control) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	PERFORM ACTUATOR CHECK

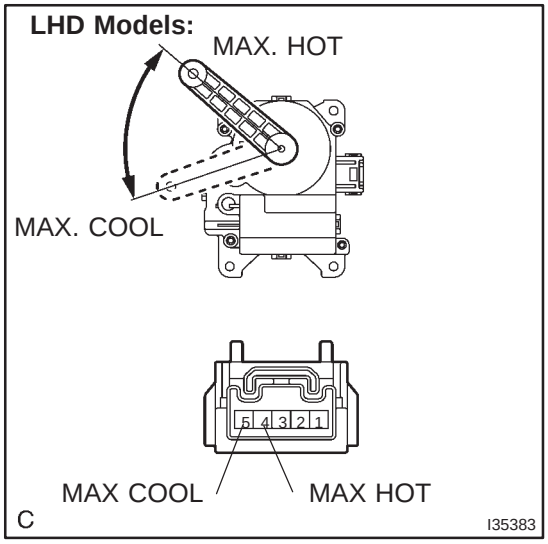
(a) Set the actuator check mode (See page 05–1091).
(b) Press the DEF switch (passenger side) and change to step operation.
(c) Check the air flow temperature by hand.

Display Code	Air Mix Damper Operation
0	COOL side (0% open)
1	COOL side (0% open)
2	COOL side (0% open)
3	COOL side (0% open)
4	COOL/HOT (50% open)
5	COOL/HOT (50% open)
6	HOT side (100% open)
7	HOT side (100% open)
8	HOT side (100% open)
9	HOT side (100% open)

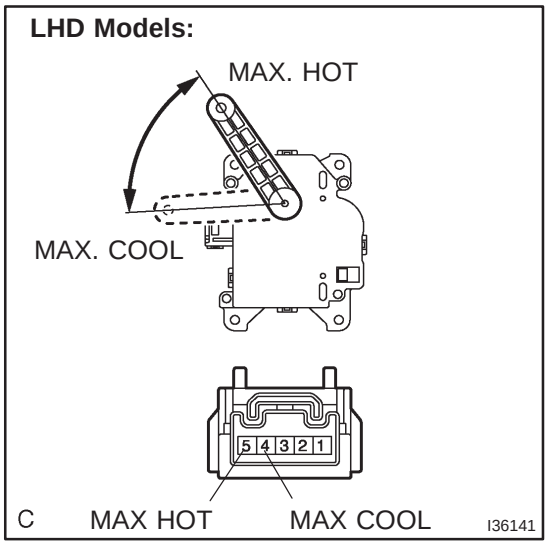
OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT AIRMIX NO.2 DAMPER SERVO SUB–ASSY



(a) Remove the air mix damper servo sub–assy.
(b) Connect the positive (+) lead from the battery to terminal MAX HOT and negative (–) lead to terminal MAX COOL, then check that the lever turns to ”HOT” side smoothly.
(c) Connect the positive (+) lead from the battery to terminal MAX COOL and negative (–) lead to terminal MAX HOT, then check that the lever turns to ”COOL” side smoothly.



NG → **REPLACE AIRMIX NO.2 DAMPER SERVO SUB–ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(AIRMIX DAMPER NO.2 SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between air mix damper control servomotor and A/C amplifier (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE AIR CONDITIONING AMPLIFIER

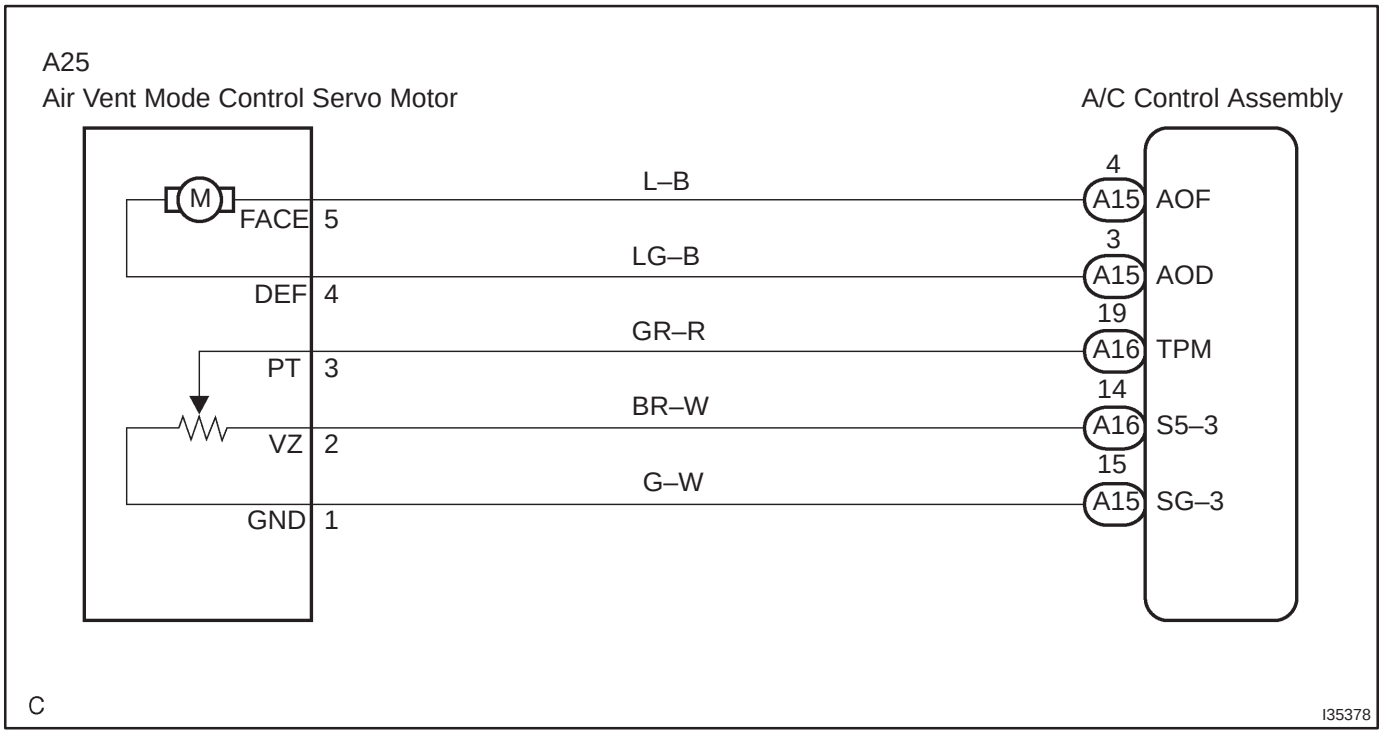
DTC	43	AIR OUTLET DAMPER CONTROL SERVOMOTOR CIRCUIT

CIRCUIT DESCRIPTION

This circuit turns the servomotor and changes each mode damper position by the signals from the A/C amplifier assy. When the AUTO switch is on, the A/C amplifier changes the mode automatically between ”FACE”, ”BI–LEVEL”, ”FOOT” and ”FOOT/DEF” according to the temperature setting.

DTC No.	Detection Item	Trouble Area
43	Air mode damper position sensor value does not change even if A/C amplifier operated mode damper control servomotor.	• Mode damper servo sub–assy (mode damper control) • Harness or connector between mode damper servo sub–assy (mode damper control) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	PERFORM ACTUATOR CHECK

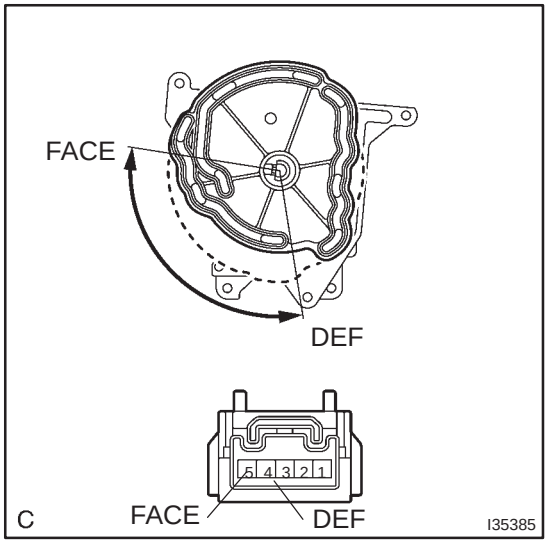
(a) Warm up engine.
(b) Set the actuator check mode (See page 05–1091).
(c) Press the DEF switch and change it to the step operation.
(d) Check the air flow by hand.

Display code	Air flow condition
0	FACE
1	FACE
2	FACE
3	FACE
4	FACE1
5	B/L
6	FOOT1
7	FOOT
8	FOOT/DEF
9	DEF

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT MODE DAMPER SERVO SUB–ASSY



(a) Remove the mode damper servo sub–assy.
(b) Connect the positive (+) lead from the battery to terminal DEF and negative (–) lead to terminal FACE then check that the lever turns to ”DEF” position.
(c) Connect the positive (+) lead from the battery to terminal FACE and negative (–) lead to terminal DEF then check that the lever turn to ”FACE” position.

NG → REPLACE MODE DAMPER SERVO SUB–ASSY

OK

3	CHECK HARNESS AND CONNECTOR(MODE DAMPER SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between mode damper servo sub–assy and A/C amplifier (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER

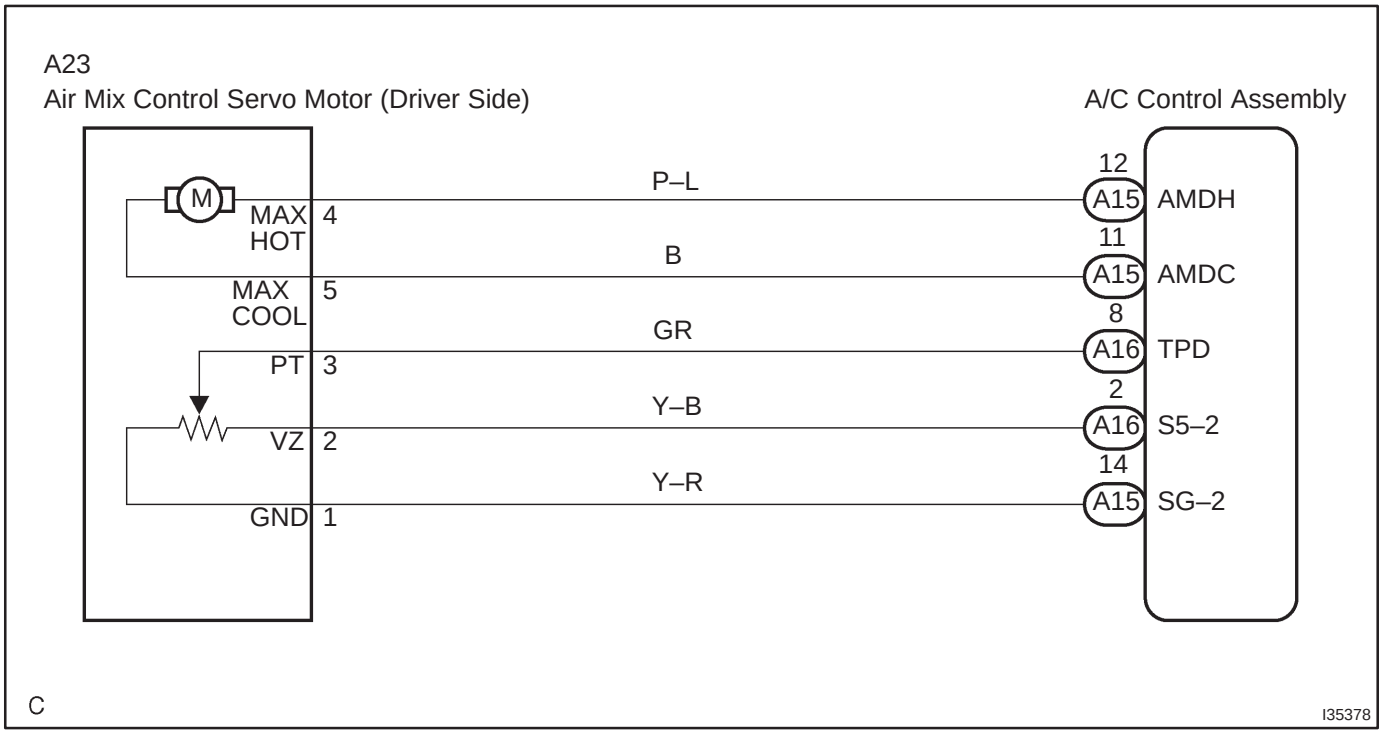
DTC	46	AIR MIX DAMPER CONTROL SERVOMOTOR CIRCUIT (DRIVER SIDE)

CIRCUIT DESCRIPTION

The air mix damper servo sub–assy is controlled by the A/C amplifier and moves the air mix damper to the desired position.

DTC No.	Detection Item	Trouble Area
46	Air mix damper position sensor value does not change even if A/C amplifier operated air mix damper control servomotor.	• Air mix damper servo sub–assy (air mix damper control) • Harness or connector between air mix damper servo sub–assy (air mix damper control servomotor) and A/C amplifier • A/C amplifier assy

WIRING DIAGRAM



1	PERFORM ACTUATOR CHECK

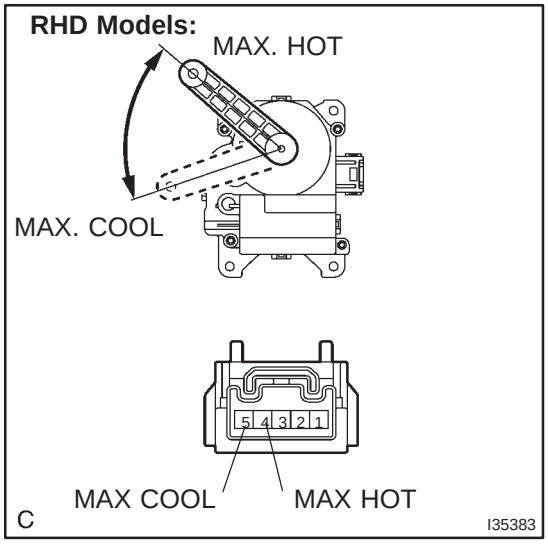
(a) Set the actuator check mode (See page 05–1091).
(b) Press the DEF switch (driver side) and change to the step operation.
(c) Check the air flow temperature by hand.

Display Code	Air Mix Damper Operation
0	COOL side (0 % open)
1	COOL side (0 % open)
2	COOL side (0 % open)
3	COOL side (0 % open)
4	COOL/HOT (50% open)
5	COOL/HOT (50% open)
6	HOT side (100% open)
7	HOT side (100% open)
8	HOT side (100% open)
9	HOT side (100% open)

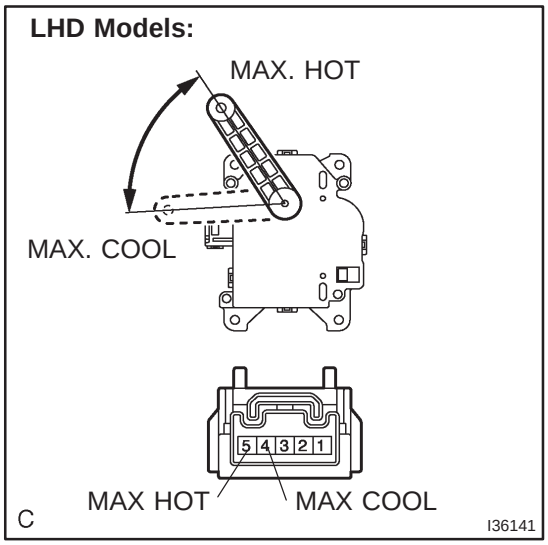
NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

OK

2	INSPECT AIRMIX DAMPER SERVO SUB–ASSY



(a) Remove the air mix damper servo sub–assy.
(b) Connect the positive (+) lead from the battery to terminal MAX HOT and negative (–) lead to terminal MAX COOL, then check that the lever turns to ”HOT” side smoothly.
(c) Connect the positive (+) lead from the battery to terminal MAX COOL and negative (–) lead to terminal MAX HOT, then check that the lever turns to ”COOL” side smoothly.



NG → REPLACE AIRMIX DAMPER SERVO SUB–ASSY

OK

3	CHECK HARNESS AND CONNECTOR(AIRMIX DAMPER SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between air mix control servomotor and A/C amplifier (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

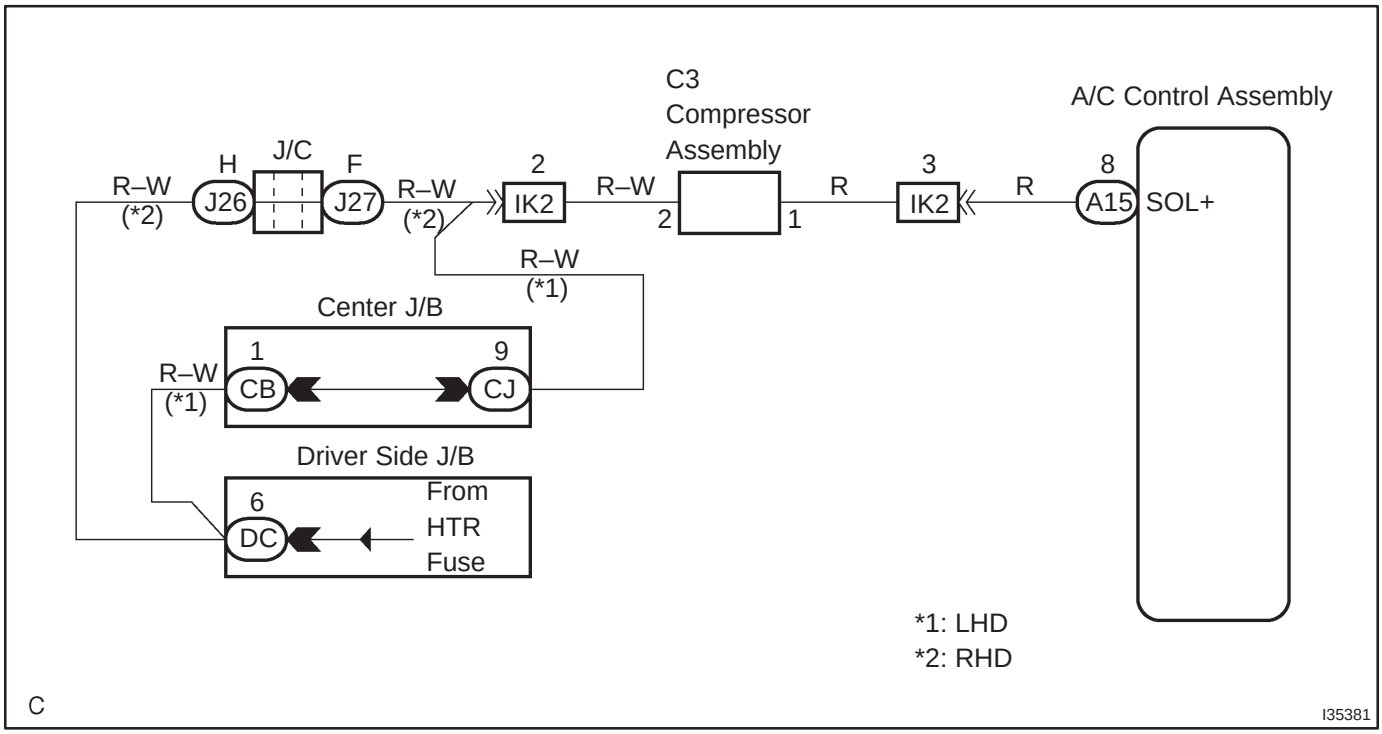
REPLACE AIR CONDITIONING AMPLIFIER

AIR CONDITIONER MAGNETIC VALVE CIRCUIT

CIRCUIT DESCRIPTION

The air conditioner magnetic valve is controlled by A/C amplifier.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 PERFORM ACTUATOR CHECK

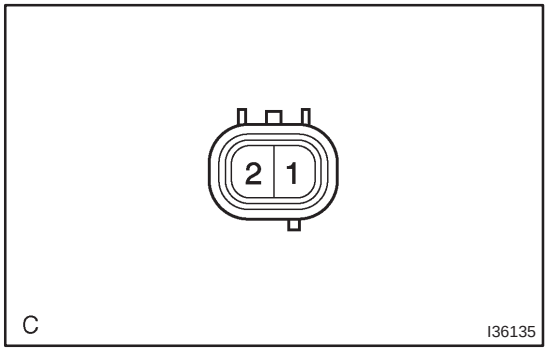
(a) Set the actuator check mode (See page 05–1091).
(b) Press the DEF switch and change to the step operation.
(c) Check the air flow level by hand.

Display Code	Blower level
0	ON
1	ON
2	OFF
3	OFF
4	OFF
5	OFF
6	OFF
7	OFF
8	OFF
9	OFF

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2 INSPECT AIR CONDITIONER MAGNETIC VALVE



(a) Measure the resistance between terminals 1 and 2.
Standard: 10 to 11 Ω at 25 °C (77 °F)

If the resistance is not as specified, replace the compressor assy.

NG → **REPLACE W/PULLEY COMPRESSOR ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(A/C AMPLIFIER – BATTERY)

(a) Check for an open or short circuit in harness and connector between terminal SOL+ of A/C amplifier and battery + terminal (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

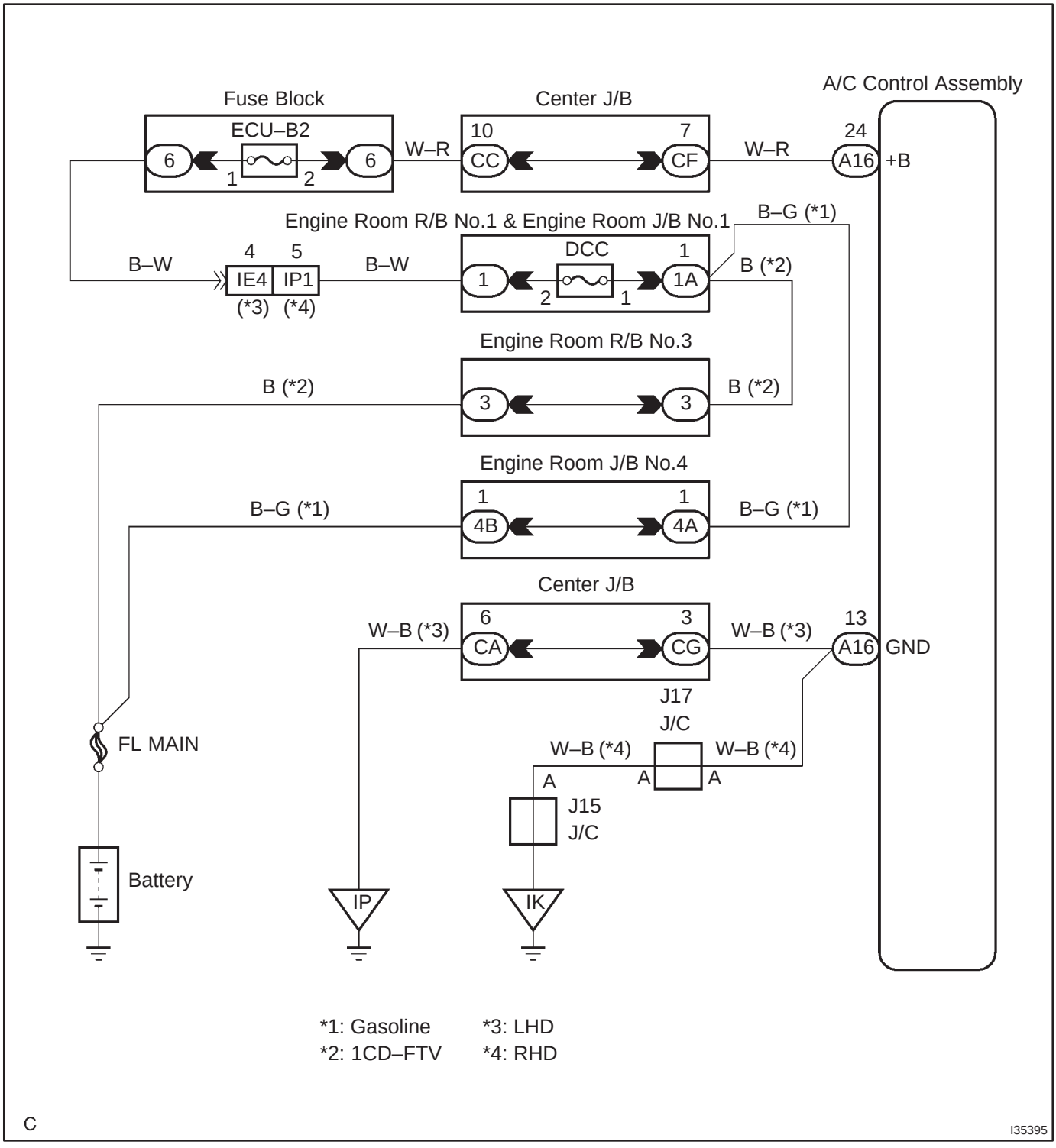
REPLACE AIR CONDITIONING AMPLIFIER

BACK–UP POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This is the back–up power source for the A/C amplifier. Power is supplied even when the ignition switch is off and is used for diagnostic trouble code memory etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

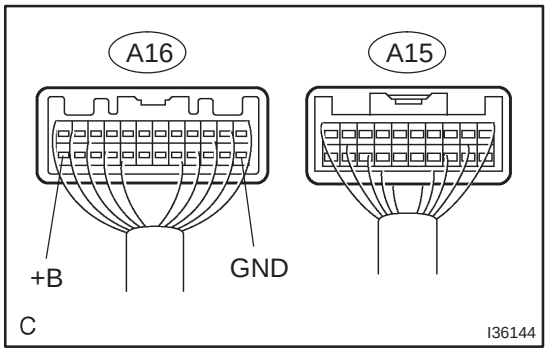
1	CHECK FUSE(ECU–B2, DCC FUSE)

(a) Remove the ECU–B2 fuse and DCC fuse from the fuse block and engine room J/B.
(b) Check for the continuity of ECU–B2 fuse and DCC fuse.

NG → **REPLACE FUSE**

OK

2	CHECK HARNESS AND CONNECTOR(A/C AMPLIFIER – BATTERY)



(a) Remove the A/C amplifier with being connected.
(b) Measure the voltage between terminal +B and GND of A/C amplifier.

Standard: 10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

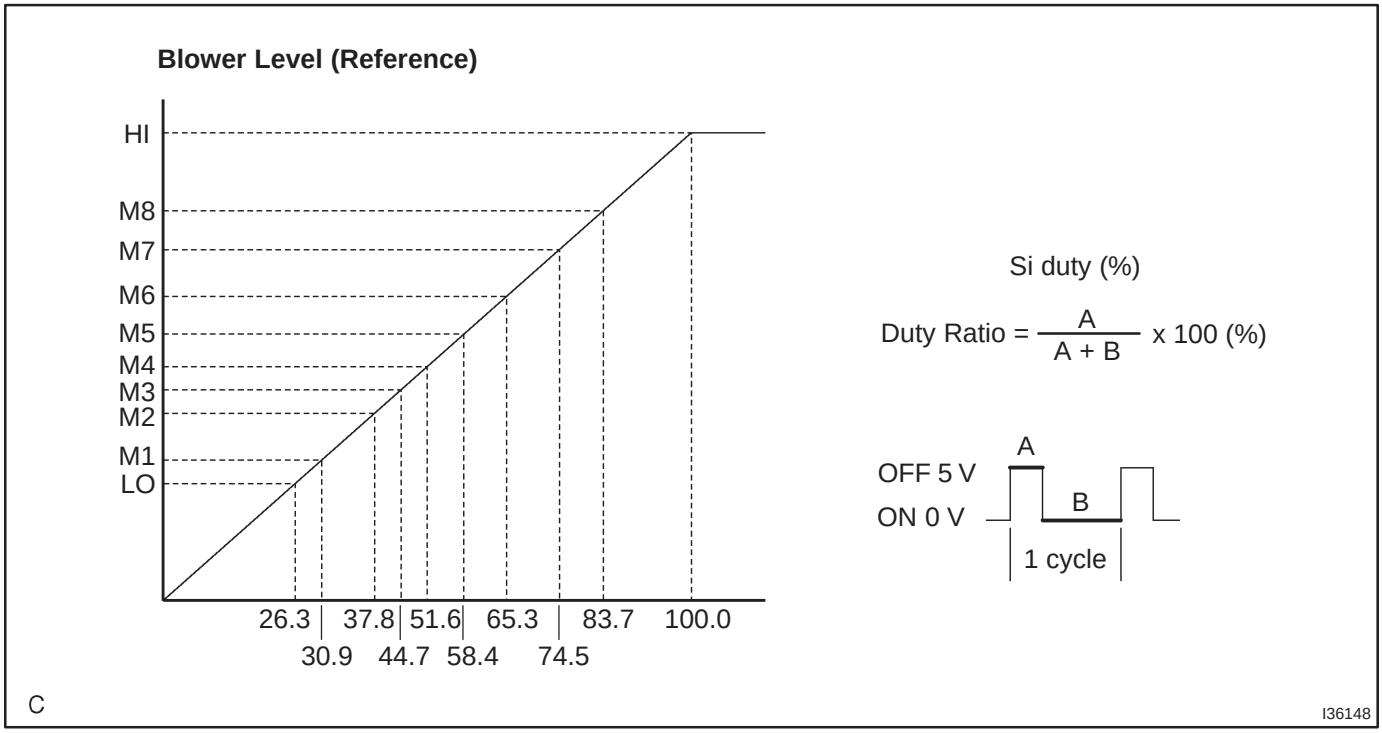
BLOWER MOTOR CIRCUIT

CIRCUIT DESCRIPTION

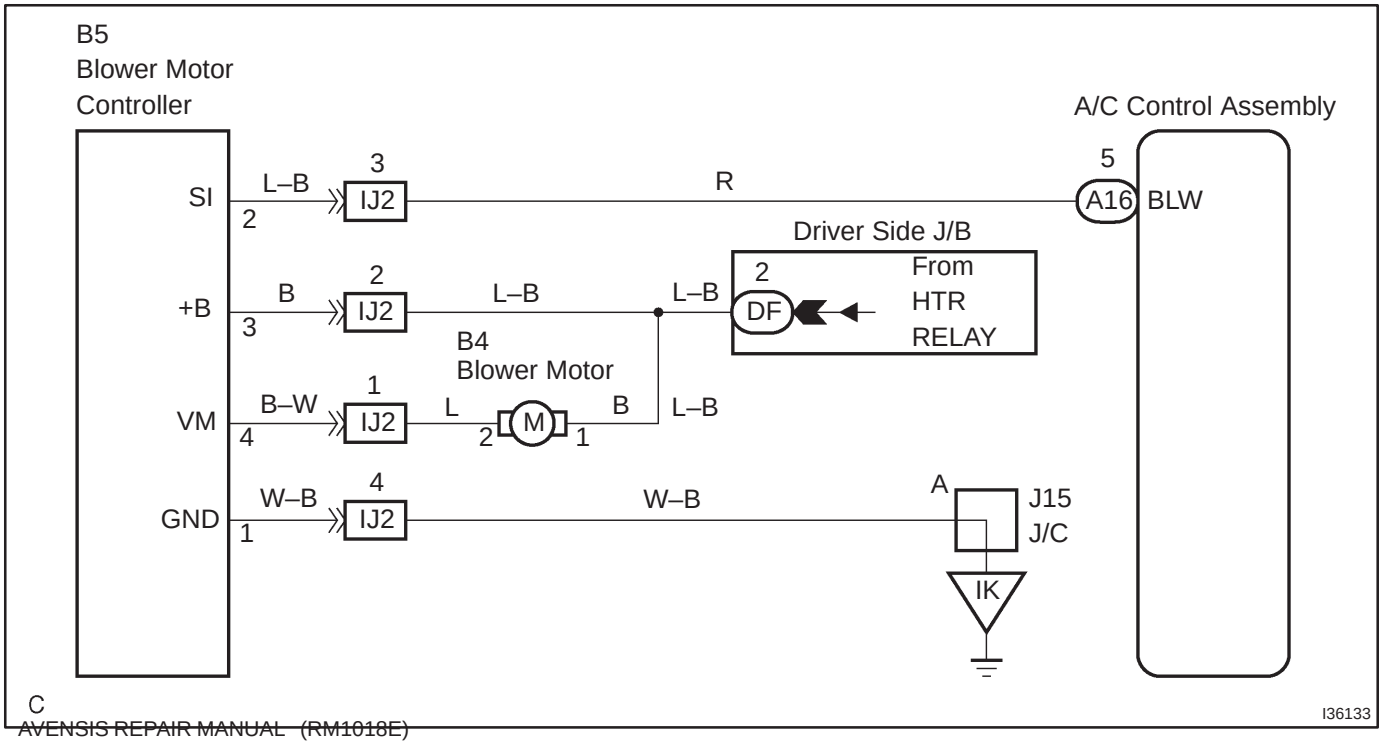
The blower motor is operated by signals from the A/C amplifier. Blower motor speed signals are transmitted by changes in the Duty Ratio.

Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and then B is the period of non–continuity.



WIRING DIAGRAM



INSPECTION PROCEDURE

1	PERFORM ACTUATOR CHECK

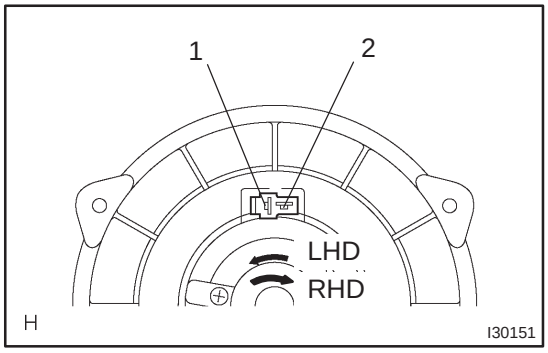
(a) Set to actuator check mode (See page 05–1091).
(b) Press the DEF switch and change to step operation.
(c) Check the air flow level by hand.

Display Code	Blower level
0	0
1	1
2	16
3	16
4	16
5	16
6	16
7	16
8	16
9	31

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT BLOWER W/FAN MOTOR SUB–ASSY



(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) to terminal 2.
Standard: Blower motor operates smoothly.

If operation is not as specified, replace the blower motor.

NG → **REPLACE BLOWER W/FAN MOTOR SUB–ASSY**

OK

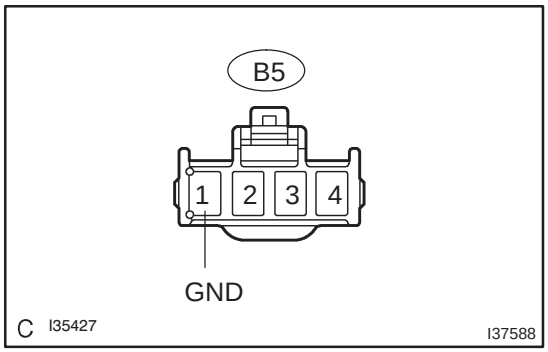
3	CHECK HARNESS AND CONNECTOR(BLOWER W/FAN MOTOR SUB–ASSY – BLOWER MOTOR CONTROL)

(a) Check for an open or short circuit in harness and connector between blower w/fan motor sub–assy and blower motor control (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK HARNESS AND CONNECTOR(BLOWER MOTOR CONTROL – BODY GROUND)

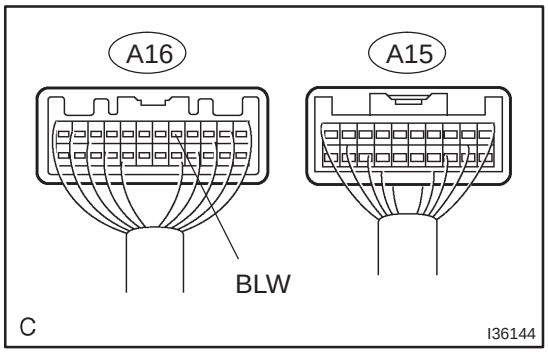


(a) Check for an open circuit in harness and connector between terminal GND of blower motor control and body ground (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

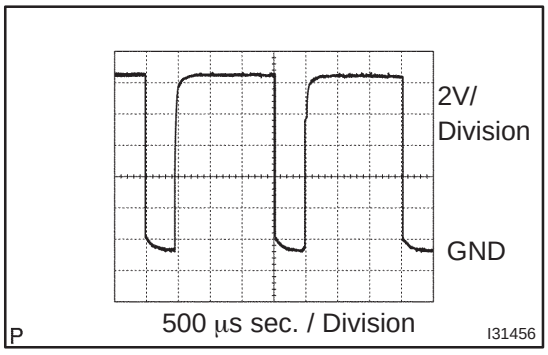
OK

5	INSPECT AIR CONDITIONING AMPLIFIER(BLW)



(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch ON.
(c) Blower switch is ON.
(d) Measure the waveform between terminal BLW of A/C amplifier and body ground.
OK: Pulse generation

HINT:
- The correct waveform is as shown.
- Waveform varies with blower level.



NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

6	CHECK HARNESS OR CONNECTOR(A/C AMPLIFIER – BLOWER MOTOR CONTROL)

(a) Check for an open or short circuit in harness and connector between A/C amplifier and blower motor control (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE BLOWER MOTOR CONTROL

050TH–09

CUSTOMER PROBLEM ANALYSIS CHECK

AIR CONDITIONING SYSTEM Check Sheet

Inspector's name:

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date vehicle Brought In	/ /	**Odometer Reading**	**km Miles**

Date of Problem Occurrence	/ /
How Often does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)
Weather	☐ Fine ☐ Cloudy ☐ Snowy ☐ Various / Other
Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F °C)

Symptoms	**Air Flow Control Faulty**	☐ Blower motor does not operate ☐ Blower motor speed does not change (Always Hi, Always Mid, Always Lo)
	Temperature Control Faulty	☐ Cabin temperature does not go down ☐ Cabin temperature does not rise ☐ Response is slow
	Air Inlet Control Faulty	☐ Cannot change between FRS and REC (Always Fresh or always Recirculating)
	Vent Control Faulty	☐ Mode will not change ☐ Will not enter the desired mode

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

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050TJ–13

DIAGNOSTIC TROUBLE CODE CHART

If malfunction code is displayed during the DTC check (sensor check), check the circuit listed for the code in the table below (Proceed to the page given for that circuit).

DTC No. (See Page)	Detection Item	Trouble Area	Memory
00	Normal	–	–
11 *1 (05–1102)	Room temperature sensor circuit (open/short)	• Cooler thermistor (room temp. sensor) • Harness or connector between cooler thermistor (room temp. sensor) and A/C amplifier assy • A/C amplifier assy	○ (8.5 min. or more)
12 *2 (05–1106)	Ambient temperature sensor circuit (open/short)	• Thermistor assy (ambient temp. sensor) • Harness or connector between thermistor assy (ambient temp. sensor) and combination meter • Combination meter • Harness or connector between combination meter and A/C amplifier assy • A/C amplifier assy	○ (8.5 min. or more)
13 (05–1109)	Evaporator temperature sensor circuit (open/short)	• Cooler thermistor No.1 (evaporator temp. sensor) • Harness or connector between cooler thermistor No.1 (evaporator temp. sensor) and A/C amplifier assy • A/C amplifier assy	○ (8.5 min. or more)
21 *3 (05–1113)	Solar sensor circuit (open) (Passenger side)	• Automatic light control sensor (solar sensor) • Harness or connector between automatic light control sensor (solar sensor) and A/C amplifier assy • A/C amplifier assy	○ (8.5 min. or more)
	Solar sensor circuit (short) (Passenger side)		–
23 (05–1116)	Pressure sensor circuit	• A/C tube assy (pressure sensor) • Harness or connector between A/C tube assy (pressure sensor) and A/C amplifier assy • A/C amplifier assy	–
24 *3 (05–1119)	Solar sensor circuit (open) (Driver side)	• Automatic light control sensor (solar sensor) • Harness or connector between automatic light control sensor (solar sensor) and A/C amplifier assy • A/C amplifier assy	○ (8.5 min. or more)
	Solar sensor circuit (short) (Driver side)		–
31 (05–1122)	Air mix damper position sensor circuit (Passenger side)	• Air mix damper servo sub–assy (air mix damper position sensor) • Harness or connector between air mix damper servo sub–assy (air mix damper position sensor) and A/C amplifier assy • A/C amplifier assy	○ (1 min. or more)
33 (05–1126)	Air outlet damper position sensor circuit	• Mode damper servo sub–assy (mode damper position sensor) • Harness or connector between mode damper servo sub–assy (mode damper position sensor) and A/C amplifier assy • A/C amplifier assy	○ (1 min. or more)
36 (05–1129)	Air mix damper position sensor circuit (Driver side)	• Air mix damper servo sub–assy (Air mix damper position sensor) • Harness or connector between air mix damper servo sub–assy (air mix damper position sensor) and A/C amplifier assy • A/C amplifier assy	○ (1 min. or more)
41 (05–1133)	Air mix damper control servomotor (Passenger side)	• Air mix damper servo sub–assy (air mix damper control) • Harness or connector between air mix damper servo sub–assy (air mix damper control) and A/C amplifier assy • A/C amplifier assy	○ (15 sec.)

43 (05–1136)	Air outlet damper control servomotor	• Mode damper servo sub–assy (mode damper control) • Harness or connector between mode damper servo sub–assy (mode damper control) and A/C amplifier assy • A/C amplifier assy	○ (15 sec.)
46 (05–1139)	Air mix damper control servomotor (Driver side)	• Air mix damper servo sub–assy (air mix damper control) • Harness or connector between air mix damper servo sub–assy (air mix damper control servomotor) and A/C amplifier • A/C amplifier assy	○ (15 sec.)

HINT:

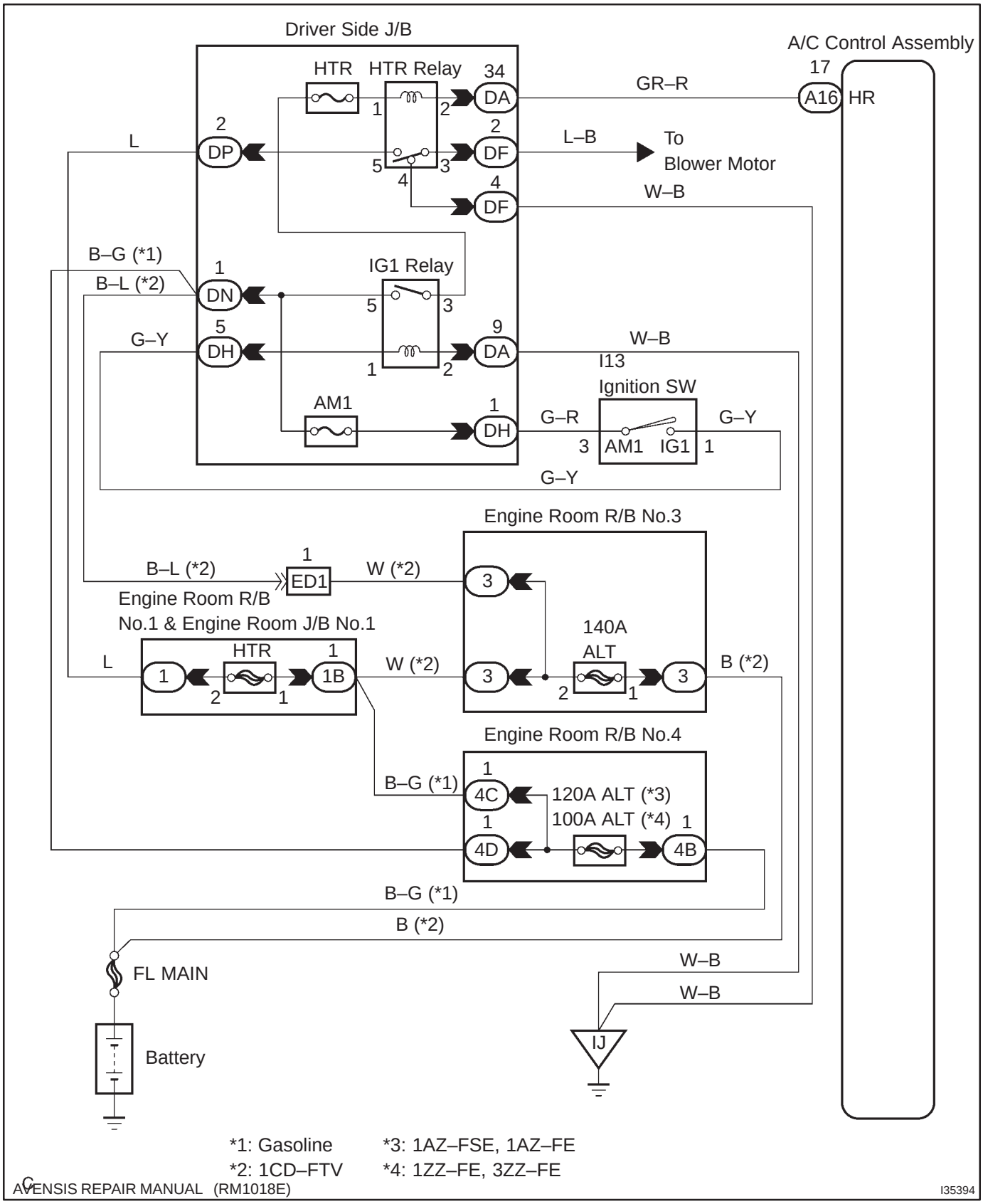
- *1: If the room temp. is approx. –18.6˚C (–3.7˚F) or lower, DTC 11 may be output even though the system is normal.
- *2: If the ambient temp. is approx. –52.9˚C (–61.4˚F) or lower, DTC may be output even though the system is normal.
- *3: If the check is being performed in a dark place, DTC 21 and 24 (solar sensor circuit abnormal) could be displayed.

HEATER RELAY CIRCUIT

CIRCUIT DESCRIPTION

The heater relay is switched on by signals from the A/C amplifier. It supplies power to the blower motor.

WIRING DIAGRAM



INSPECTION PROCEDURE

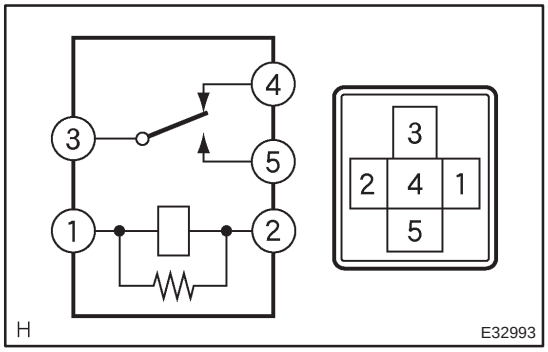
1	CHECK FUSE(HTR FUSE)

(a) Remove the HTR fuse from the driver side J/B and engine room J/B.
(b) Check for the continuity of HTR fuse.

NG → **REPLACE FUSE**

OK

2	INSPECT HEATER RELAY



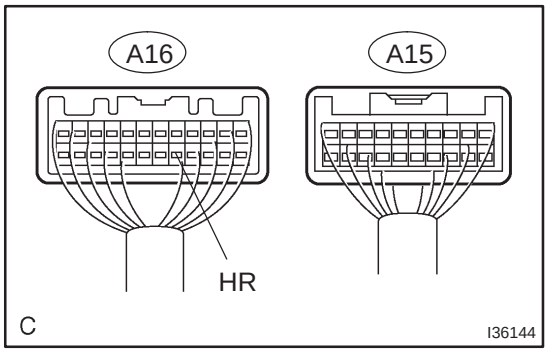
(a) Check for the continuity between each pair of terminals of cooler relay assy, as shown in the chart.
Standard:

Terminal No.	Specified condition
3 – 5	No continuity
	Less than 1 Ω (When battery voltage applied to terminals 1 and 2)
3 – 4	Less than 1 Ω
	No continuity (When battery voltage applied to terminals 1 and 2)
1 – 2	Approx. 1.3 kΩ

NG → **REPLACE HEATER RELAY**

OK

3	CHECK HARNESS AND CONNECTOR(A/C AMPLIFIER – BATTERY)



(a) Remove the A/C amplifier with connectors being connected.
(b) Measure the voltage between terminal HR of A/C amplifier and body ground when ignition switch is ON and OFF.
Standard:

Ignition switch position	Blower switch position	Voltage (V)
OFF	OFF	0
ON	ON	Below 1.0
ON	OFF	10 to 14

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

HOT GAS HEATER MAGNETIC VALVE CIRCUIT

CIRCUIT DESCRIPTION

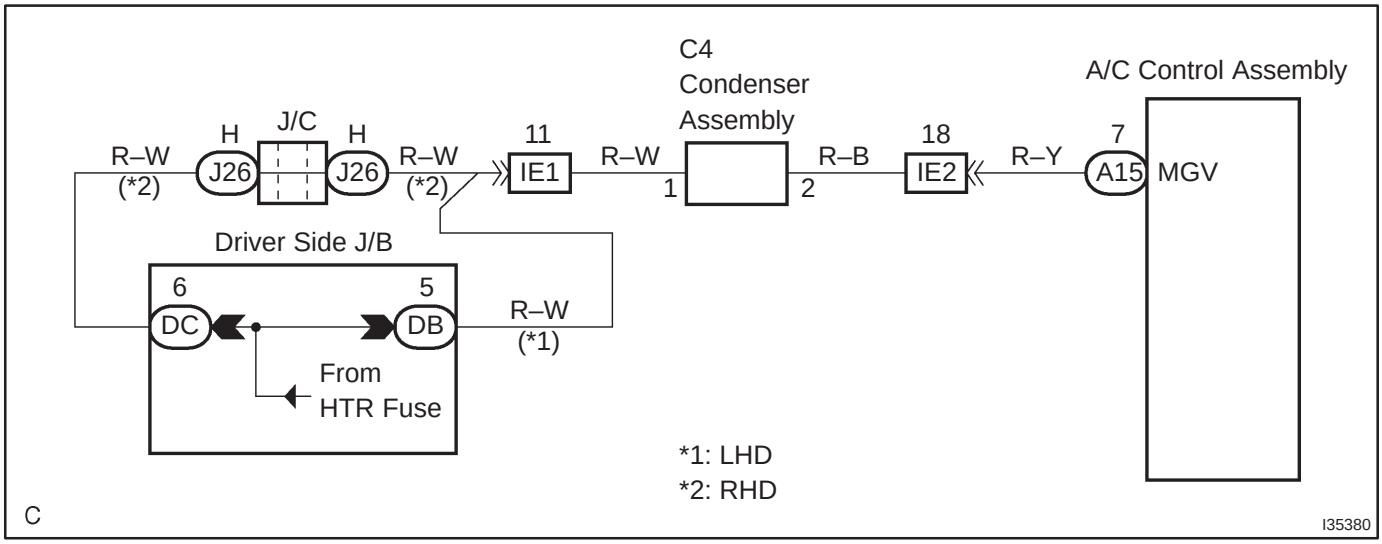
For the hot gas heater, it is necessary to fulfill the following 6 conditions.

- Hot gas heater switch is ON.
- Recirculation damper position is FRS.
- Blower motor switch is in the position other than OFF.
- Ambient temperature varies according to the following condition;

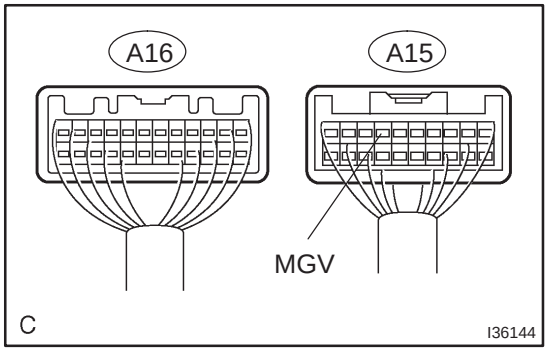
A/C switch ON	Below –1.5°C (32°F)
A/C switch OFF	Below 8°C (46°F)

- Air mix damper position is MAX HOT.
- Water temperature is 70°C (158°F) or less.

WIRING DIAGRAM



1 INSPECT AIR CONDITIONING AMPLIFIER



(a) Remove the A/C amplifier with connectors being connected.

(b) Measure the voltage between terminals MGV of the A/C amplifier and body ground.

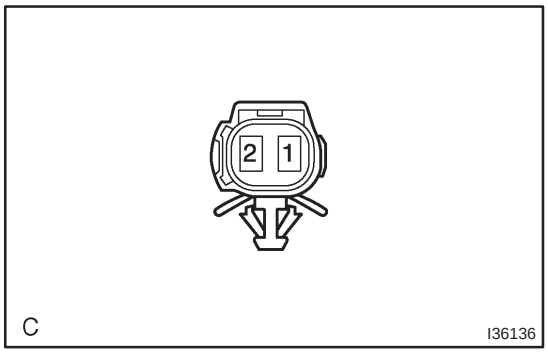
Standard:

Recirculation switch	Voltage (V)
Operate	Below 1.0
Not Operate	No Continuity

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE**

NG

2 INSPECT W/RECEIVER CONDENSER ASSY



(a) Apply voltage between terminals and check that the refrigerant passages switch.

NG → **REPLACE W/RECEIVER CONDENSER ASSY**

OK

3 CHECK WIRE HARNESS(W/RECEIVER CONDENSER ASSY – AIR CONDITIONING AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between w/ receiver condenser assy and A/C amplifier (See page 01–32).

NG → **REPAIR OR REPLACE WIRE HARNESS**

OK

REPLACE AIR CONDITIONING AMPLIFIER

HOT GAS HEATER SWITCH CIRCUIT

CIRCUIT DESCRIPTION

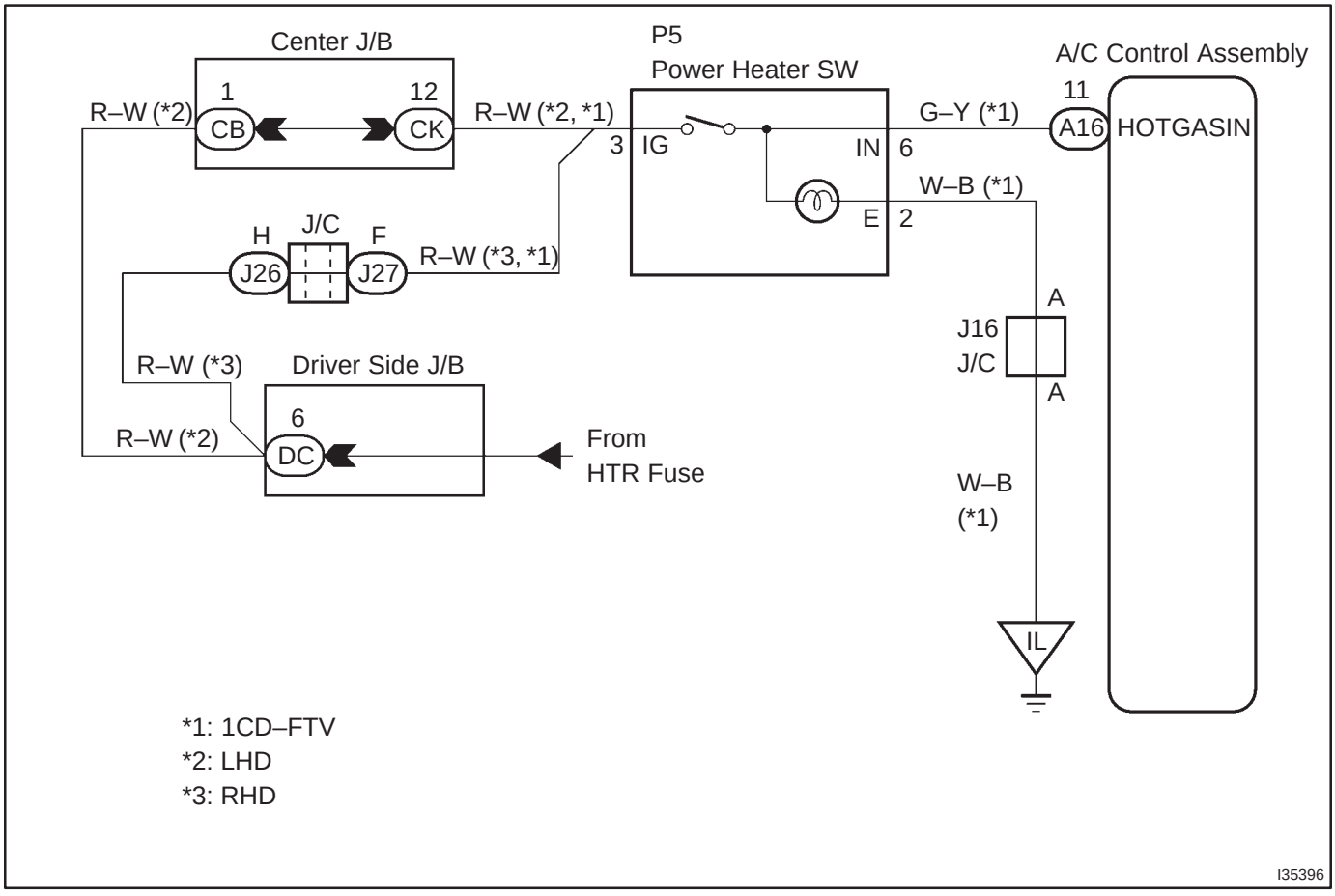
Hot gas heater performs only when its switch turns to ON and fulfill the following 6 conditions.

- Hot gas heater switch is ON.
- Recirculation damper position is FRS.
- Blower motor switch is in the position other than OFF.
- Ambient temperature varies according to the following condition;

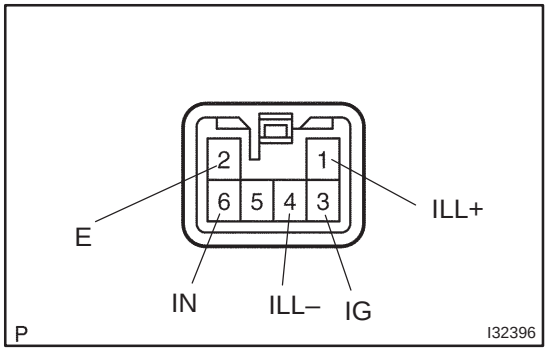
A/C switch ON	Below –1.5°C (32°F)
A/C switch OFF	Below 8°C (46°F)

- Air mix damper position is MAX HOT.
- Water temperature is 70°C (158°F) or less.

WIRING DIAGRAM



1 INSPECT HETER SWITCH ASSY



(a) Check that the continuity when connecting the positive tester lead (+) and the negative tester lead (–) to the following terminals.

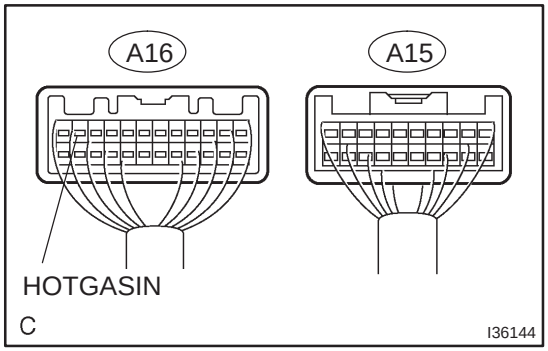
Standard:

Heater switch condition	Connecting terminals	Standard value
ON	IG – IN	Continuity
OFF	IG – IN	No continuity
ON	IG – E	Continuity
OFF	IG – E	No continuity
ON	ILL+ – ILL–	Continuity
OFF	ILL+ – ILL–	Continuity

NG → **REPAIR OR REPLACE HETER SWITCH ASSY**

OK

2 CHECK WIRE HARNESS(A/C CONTROL ASSEMBLY – BATTERY)



(a) Remove the A/C amplifier with connectors being connected.

(b) Turn the ignition switch to ON.

(c) Measure the voltage between terminal HOTGASIN and GND of the A/C amplifier.

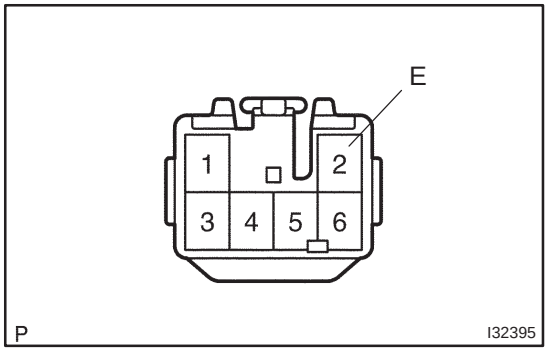
Standard:

Heater switch condition	Standard value
ON	10 to 14 V
OFF	0 V

NG → **REPAIR OR REPLACE WIRE HARNESS**

OK

3 CHECK WIRE HARNESS(HETER SWITCH – BODY GROUND)



(a) Check for an open or short circuit in harness and connector between heater switch and body ground
(See page 01–32).

NG → **REPAIR OR REPLACE WIRE HARNESS**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

AIR CONDITIONING SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

050TG–11

1	VEHICLE BROUGHT TO WORK SHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1090)

3	CHECK AND CLEAR DTC (See page 05–1091)

4	PROBLEM SYMPTOM CONFIRMATION

SYMPTOM OCCUR (GO TO STEP 6)

SYMPTOM DOES NOT OCCUR (GO TO STEP 5)

5	SYMPTOM SIMULATION (See page 01–22)

6	DTC CHECK (See page 05–1091)

MALFUNCTION CODE (GO TO STEP 7)

NORMAL CODE (GO TO STEP 8)

7	DTC CHART (See page 05–1094)

GO TO STEP 10

8	PROBLEM SYMPTOMS TABLE (See page 05–1100)

9	ACTUATOR CHECK (See page 05–1091)

10	CIRCUIT INSPECTION (See page 05–1102 to 05–1159)

11	IDENTIFICATION OF PROBLEM

12	PARTS INSPECTION

13	REPAIR

14	CONFIRMATION TEST

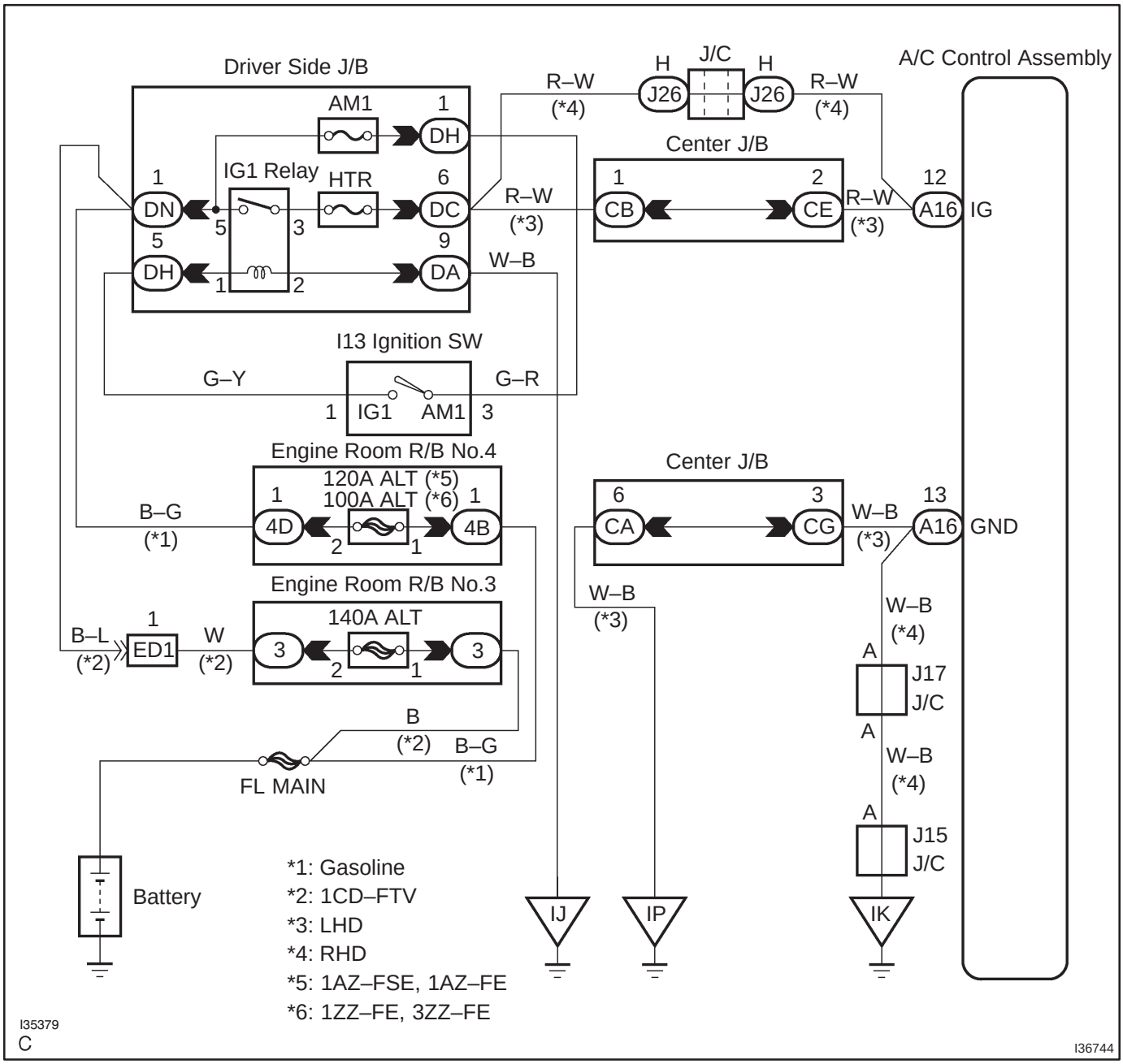
15	END

IG POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This is the power source for the A/C amplifier and servomotor, etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

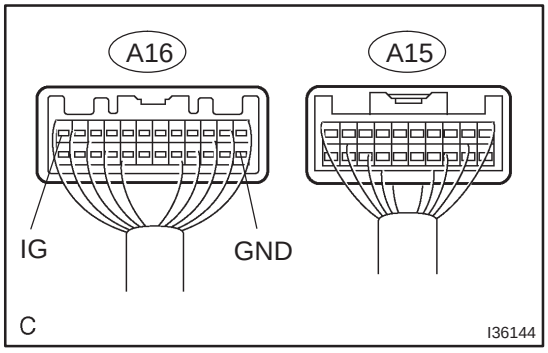
1	CHECK FUSE(HTR FUSE)

(a) Remove the HTR fuse from the driver side J/B.
(b) Check for the continuity of HTR fuse.

NG → **REPLACE FUSE**

OK

2	CHECK HARNESS AND CONNECTOR(A/C AMPLIFIER – BATTERY)



(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between terminal IG and GND of the A/C amplifier.
Standard: 10 to 14 V

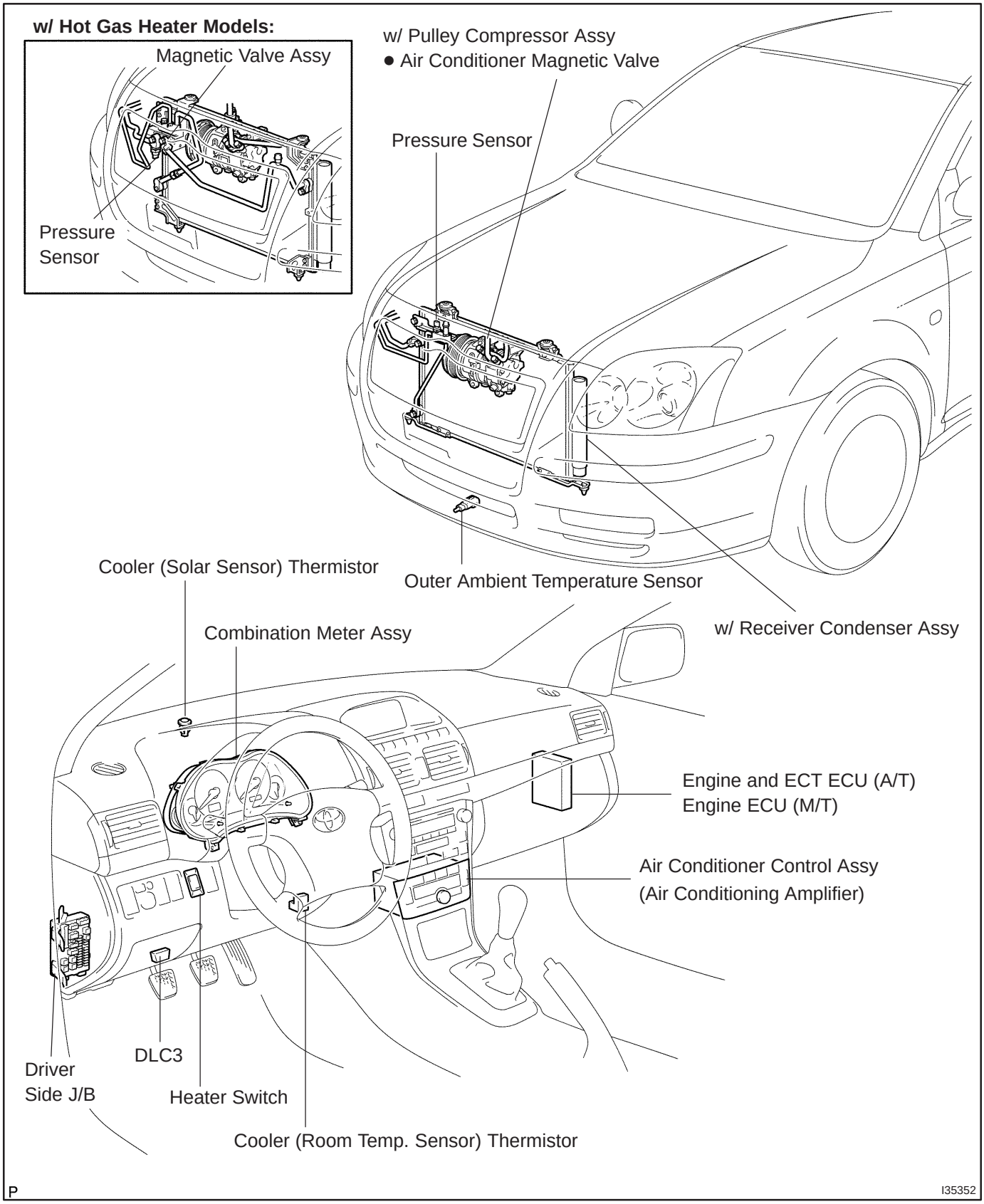
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

05C7J–01

LOCATION



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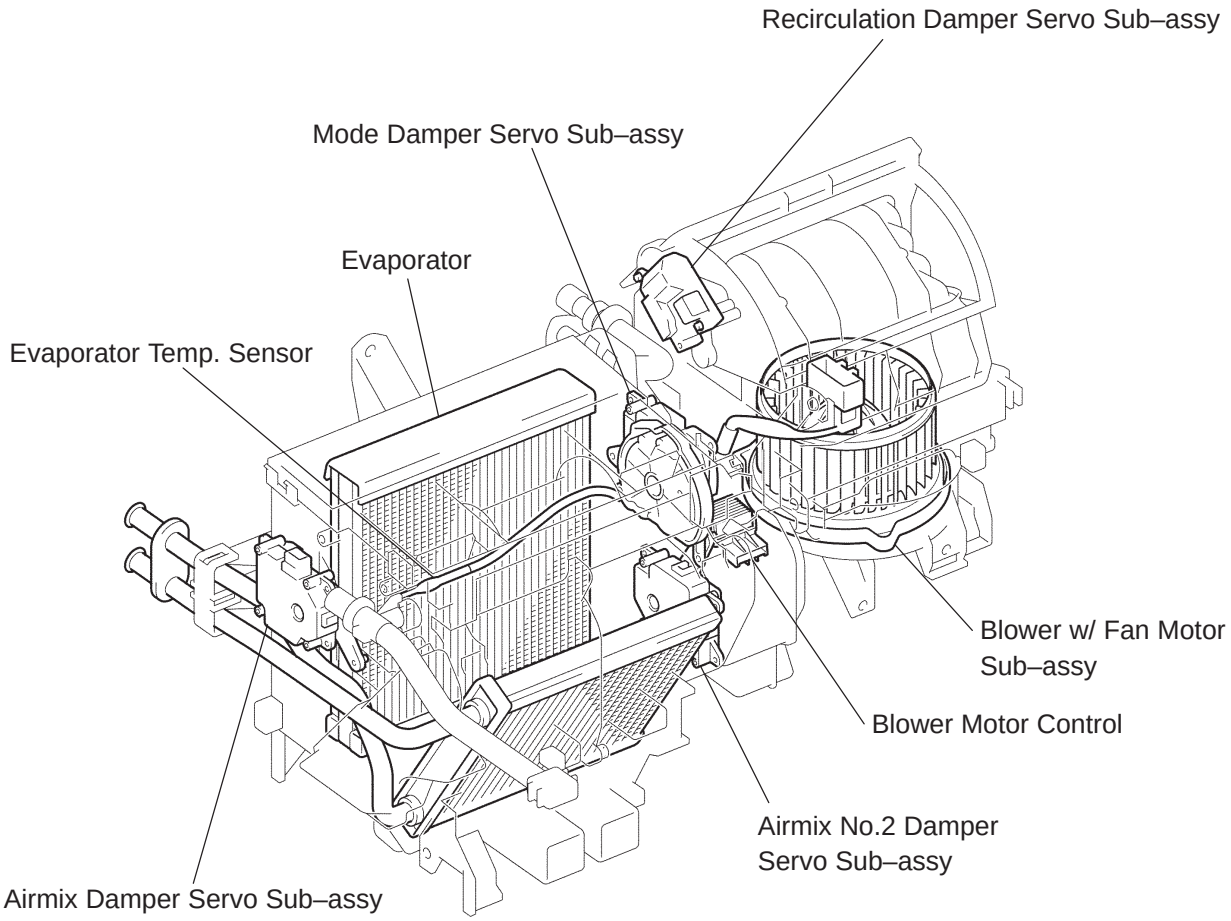

Recirculation Damper Servo Sub–assy
Mode Damper Servo Sub–assy
Evaporator
Evaporator Temp. Sensor
Blower w/ Fan Motor Sub–assy
Blower Motor Control
Airmix No.2 Damper Servo Sub–assy
Airmix Damper Servo Sub–assy
P
I35353

050TH–09

CUSTOMER PROBLEM ANALYSIS CHECK

AIR CONDITIONING SYSTEM Check Sheet

Inspector's name:

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date vehicle Brought In	/ /	**Odometer Reading**	**km Miles**

Date of Problem Occurrence	/ /
How Often does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)
Weather	☐ Fine ☐ Cloudy ☐ Snowy ☐ Various / Other
Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F °C)

Symptoms	**Air Flow Control Faulty**	☐ Blower motor does not operate ☐ Blower motor speed does not change (Always Hi, Always Mid, Always Lo)
	Temperature Control Faulty	☐ Cabin temperature does not go down ☐ Cabin temperature does not rise ☐ Response is slow
	Air Inlet Control Faulty	☐ Cannot change between FRS and REC (Always Fresh or always Recirculating)
	Vent Control Faulty	☐ Mode will not change ☐ Will not enter the desired mode

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

I30150

050TM–13

PROBLEM SYMPTOMS TABLE

If the normal code is displayed during DTC check although the problem still occurs, check the circuits for each problem symptom in the order given in the table below, and proceed to the relevant troubleshooting.

Symptom	Suspect Area	See page
Whole functions of the A/C system does not operate.	1. IG power source circuit	05–1144
	2. A/C amplifier assy	05–1098
	3. Engine ECU 1AZ–FSE:	05–294
	1AZ–FE:	05–149
	1ZZ–FE/3ZZ–FE:	05–5
	1CD–FTV:	05–528
Air Flow Control : No blower operation	1. Blower motor circuit	05–1148
	2. Heater relay circuit	05–1146
	3. Blower w/fan motor sub–assy	05–1148
	4. A/C amplifier assy	05–1098
Air Flow Control : No blower control	1. Blower motor circuit	05–1148
Air Flow Control : Insufficient air out	1. Blower w/fan motor sub–assy	05–1148
	2. Blower motor circuit	05–1148
	3. A/C amplifier assy	05–1098
Temperature Control : Cool air does not come out	1. Volume of refrigerant	55–24
	2. Drive belt tension	55–46
	3. Refrigerant pressure	55–24
	4. Air conditioner magnetic valve circut	05–1151
	5. Pressure sensor circuit	05–1116
	6. Air mix control servomotor circuit	05–1133
	7. Air mix damper position sensor circuit	05–1122
	8. Room temp. sensor circuit	05–1102
	9. Ambient temp. sensor circuit	05–1106
	10.A/C amplifier assy	05–1098
Temperature Control : Warm air does not come out	1. Air mix control servomotor circuit	05–1133
	2. Air mix damper position sensor circuit	05–1122
	3. Ambient temp. sensor circuit	05–1106
	4. Room temp. sensor circuit	05–1102
	5. A/C amplifier assy	05–1098
	6. Heater radiator	–
Temperature Control : Output air is warmer or cooler than the set temperature or response is slow.	1. Room temp. sensor circuit	05–1102
	2. Ambient temp. sensor circuit	05–1106
	3. Solar sensor circuit	05–1113
	4. Air mix damper position sensor circuit	05–1122
	5. Air mix control servomotor circuit	05–1133
	6. Evaporator temp. sensor circuit	05–1109
	7. A/C amplifier assy	05–1098
Temperature Control : No temperature control (only Max. cool or Max. warm)	1. Room temp. sensor circuit	05–1102
	2. Ambient temp. sensor circuit	05–1106
	3. Solar sensor circuit	05–1113
	4. Air mix damper position sensor circuit	05–1122
	5. Air mix control servomotor circuit	05–1133
	6. Evaporator temp. sensor circuit	05–1109
	7. A/C amplifier assy	05–1098
No air inlet control	1. Recirculation damper servomotor circuit	05–1153
	2. A/C amplifier assy	05–1098
No air outlet control	1. Air outlet damper position sensor circuit	05–1126
	2. Air outlet control servomotor circuit	05–1136
	3. A/C amplifier assy	05–1098

Engine idle up does not occur, or is continuous	1. Air conditioner magnetic valve circut 2. A/C amplifier assy 3. Engine ECU 1AZ–FSE: 1AZ–FE: 1ZZ–FE/3ZZ–FE: 1CD–FTV:	05–1151 05–1098 05–294 05–149 05–5 05–528
Set temperature value displayed does not much up with operation of temperature control switch.	1. Air conditioner magnetic valve circut 2. A/C amplifier assy	05–1151 05–1098
Brightness does not change when light control switch it turned.	1. Illumination light system 2. A/C amplifier assy	– 05–1098
Unable to access the diagnosis mode.	1. A/C amplifier assy	05–1098
DTC is not recorded. Set mode is cleared when IG switch is turned off.	1. Back–up power source circuit 2. A/C amplifier assy	05–1142 05–1098

Hot gas heater:

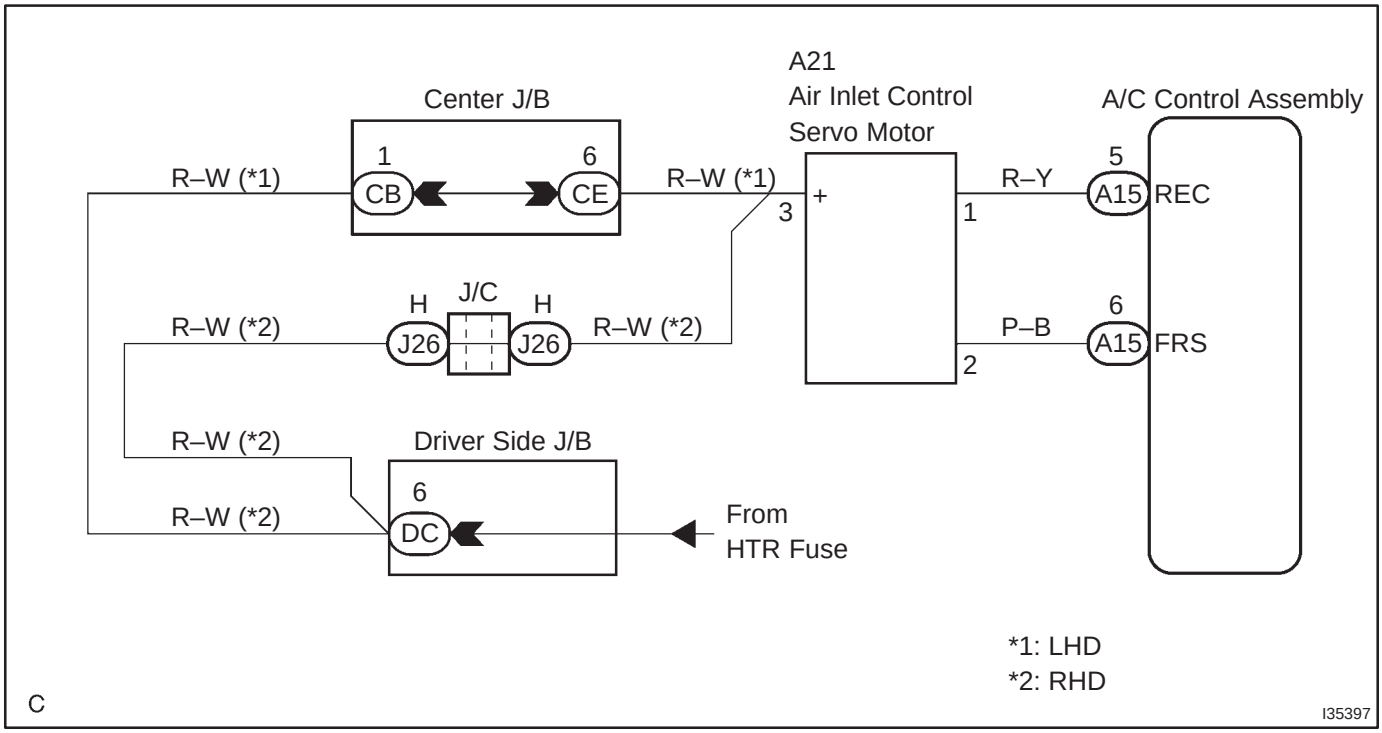
Symptom	Suspect Area	See page
Warm wind does not blow out even if the gas heater switch is turned on before the water temperature rises under the condition where the ordinal A/C correctly operates.	1. Hot gas heater magnetic valve circuit 2. Hot gas heater switch circuit 3. A/C amplifier assy	05–1157 05–1159 05–1098

RECIRCULATION DAMPER SERVOMOTOR CIRCUIT

CIRCUIT DESCRIPTION

The recirculation damper servomotor is controlled by the A/C amplifier and moves the air inlet damper to the desired position.

WIRING DIAGRAM



1	PERFORM ACTUATOR CHECK

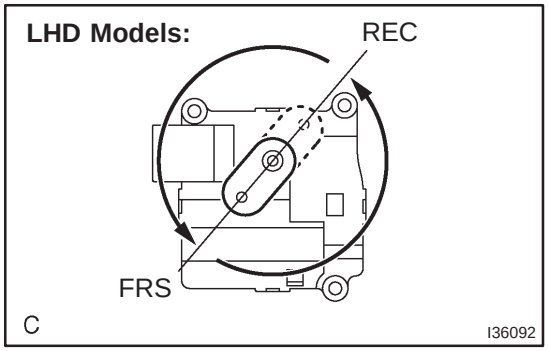
(a) Set to actuator check mode (See page 05–1091).
(b) Press the DEF switch and change to step operation.
(c) Check the air flow temperature by hand.

Display code	Recirculation damper position
0	FRESH
1	FRESH
2	FRESH
3	FRESH
4	RECIRCULATION
5	RECIRCULATION
6	RECIRCULATION
7	RECIRCULATION
8	RECIRCULATION
9	RECIRCULATION

NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

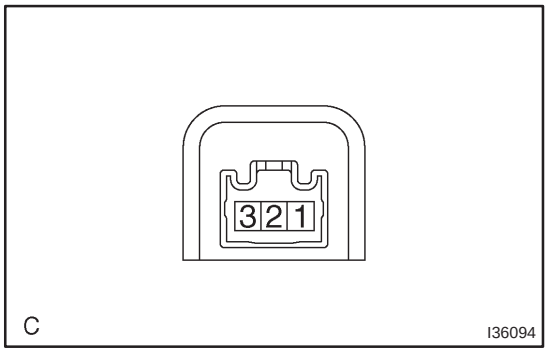
OK

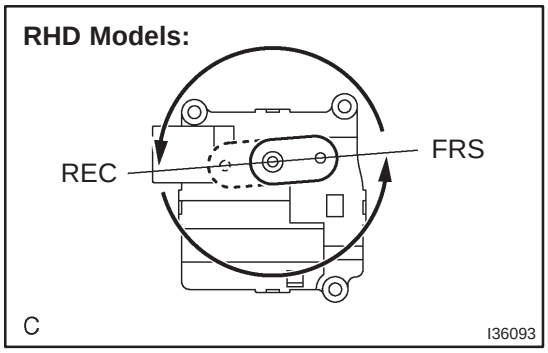
2 INSPECT RECIRCULATION DAMPER SERVO SUB–ASSY

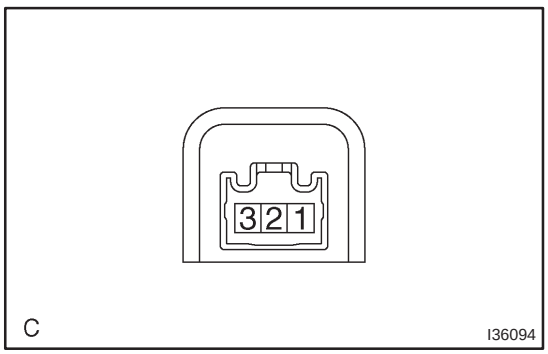


(a) Remove the recirculation damper servo sub–assy.
(b) Connect the positive (+) lead to from the battery to terminal 3 and negative (–) lead to terminal 2, then check that the arm turns to ”FRS” side smoothly.
(c) Connect the positive (+) lead to from the battery to terminal 3 and negative (–) lead to terminal 1, then check that the arm turns to ”REC” side smoothly.

If operattions are not as specified, replace the mode damper servomotor.







NG → **REPLACE RECIRCULATION DAMPER SERVO SUB–ASSY**

OK

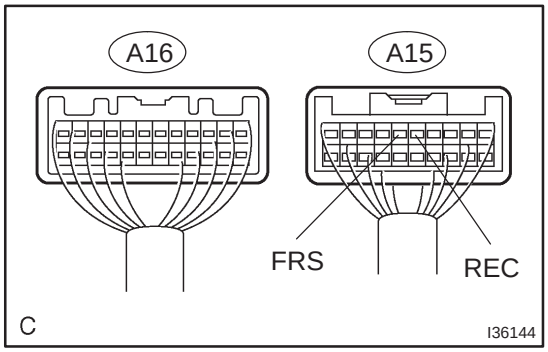
3	CHECK HARNESS AND CONNECTOR(RECIRCULATON DAMPER SERVO SUB–ASSY – BATTERY)

(a) Check for an open or short circuit in harness and connector between recirculation damper and battery + terminal (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT AIR CONDITIONING AMPLIFIER(REC, FRS)



(a) Remove A/C amplifier with connectors being connected.
(b) Measure the voltage between terminal FRS of A/C amplifier and body ground when recirculation switch is operated, as shown in the table.

Standard:

Recirculation switch	Voltage (V)
FRESH	Below 1.0
RECIRCULATION	10 to 14

(c) Measure voltage between terminal REC of A/C amplifier and body ground when recirculation switch is operated, as shown in the table.

Standard:

Recirculation switch	Voltage (V)
FRESH	10 to 14
RECIRCULATION	Below 1.0

NG → **REPLACE AIR CONDITIONING AMPLIFIER**

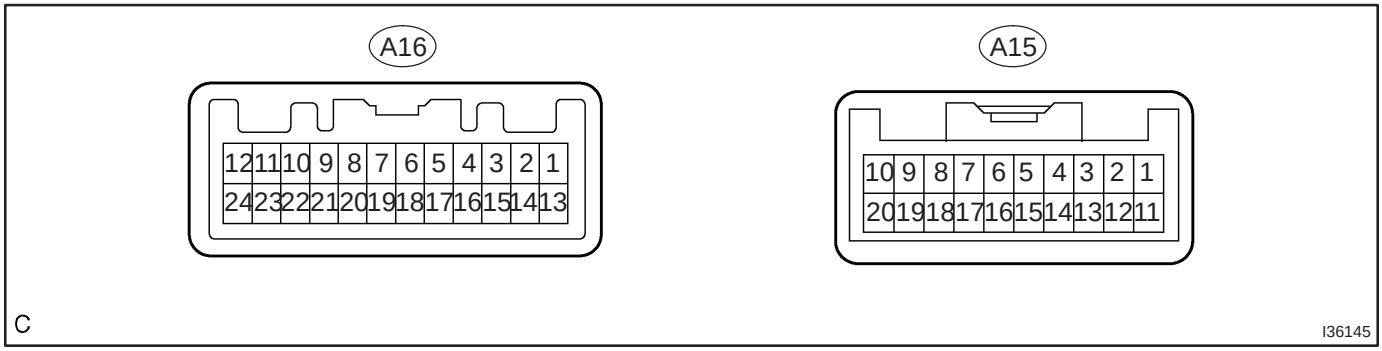
OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

05C7K–01

TERMINALS OF ECU

1. AIR CONDITIONER AMPLIFIER ASSY

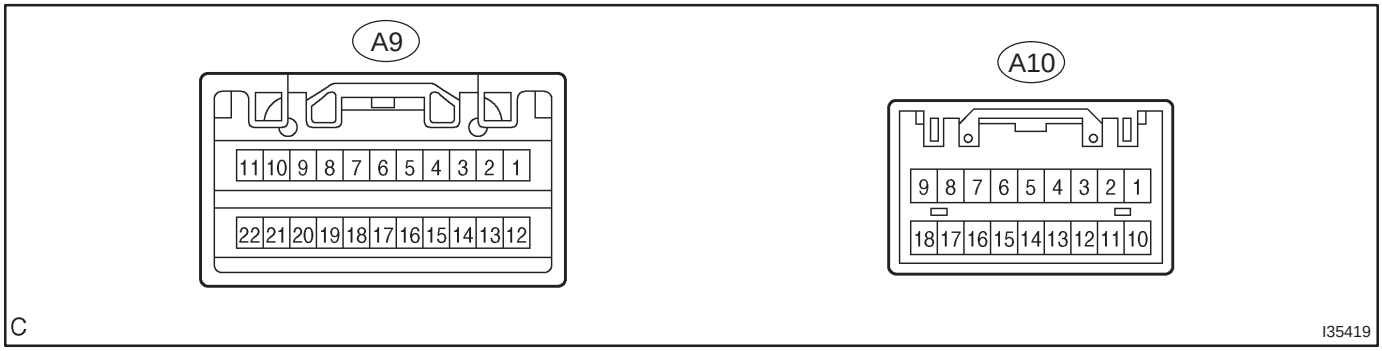


Terminal No. (Symbols)	Wiring Color	Condition	Specification
A16–5 (BLW) – A16–13 (GND)	R – W–B	IG SW: ON Front blower: Operate	Pulse generation
A16–7 (PRE) – A16–18 (SG)	L–W – G–W	Start engine Refrigerant pressure: 0 kPa (0 kgf/cm^2, 0 psi) → 3,138 MPa (32.0 kgf/cm^2, 455 psi)	0.5 → 4.8 V
A15–20 (MPX–) – A16–13 (GND)	P – W–B	Multiplex communication circuit	–
A15–10 (MPX+) – A16–13 (GND)	P–B – W–B	Multiplex communication circuit	–
A15–6 (FRS) – A16–13 (GND)	P–B – W–B	IG SW: ON R/F SW: RECIRCULATION → FRESH	10 to 14 → Below 1.0 V
A15–5 (REC) – A16–13 (GND)	R–Y – W–B	IG SW: ON R/F SW: FRESH → RECIRCULATION	10 to 14 → Below 1.0 V
A16–17 (HR) – A16–13 (GND)	GR–R – W–B	IG SW: ON Front blower: OFF → Operate	10 to 14 → Below 1.0 V
A15–4 (AOF) – A16–13(GND)	L–B – W–B	IG SW: ON Mode switch: DEF. → FACE	Below 1.0 → 10 to 14 V
A15–3 (AOD) – A16–13 (GND)	LG–B – W–B	IG SW: ON Mode switch: FACE → DEF.	Below 1.0 → 10 to 14 V
A16–12 (IG) – A16–13 (GND)	R–W – W–B	IG SW: LOCK → ON	Below 10 to 14 V
A15–2 (AMPH) – A16–13 (GND)	W – W–B	IG SW: ON Set passenger side temp.: MAX. COOL → MAX. HOT	Below 1.0 → 10 to 14 V
A15–1 (AMPC) – A16–13 (GND)	Y – W–B	IG SW: Set passenger side temp.: MAX HOT → MAX. COOL	Below 1.0 → 10 to 14 V
A15–12 (AMDH) – A16–13 (GND)	P–L – W–B	IG SW: Set driver side temp.: MAX. COOL → MAX. HOT	Below 1.0 → 10 to 14 V
A15–11 (AMDC) – A16–13 (GND)	B – W–B	IG SW: Set driver side temp.: MAX HOT → MAX. COOL	Below 1.0 → 10 to 14 V
A16–13 (GND) – Body ground	W–B – Body ground	Always	Continuity
A16–24 (+B) – A16–13 (GND)	W–R – W–B	Always	10 to 14 V
A16–8 (TPD) – A15–14 (SG–2)	GR – Y–R	IG SW: ON Set driver side temp.: MAX HOT → MAX. COOL	1.0 → 4.0 V
A16–20 TPP – A15–13 (SG–1)	V – P	IG SW: ON Set passenger side temp.: MAX HOT → MAX. COOL	1.0 → 4.0 V
A16–9 (TSD) – A16–13 (GND)	LG – W–B	IG SW: ON Solar sensor subject to electric light	0.8 to 3.3 V
A16–21 (TSP) – A16–13 (GND)	L – W–B	IG SW: ON Solar sensor subject to electric light	0.8 to 3.3 V

Terminal No. (Symbols)	Wiring Color	Condition	Specification
A16–22 (TR) – A16–6 (SG–5)	GR – G	IG SW: ON Cabin temp.: 25°C (77°F) → 40°C (104°F)	1.8 to 2.2 → 1.2 to 1.6 V
A16–10 (TE) – A15–16 (SG–4)	B – W–G	Evaporator temp.: 0°C (32°F) → 15°C (59°F)	2.0 to 2.4 → 1.4 to 1.8 V
A16–23 (ILL+) – A16–13 (GND)	G – W–B	Light control switch TAIL or HEAD	10 to 14 V
A16–19 (TPM) – A15–15 (SG–3)	GR–R – G–W	IG SW: ON Set air flow setting: DEF. → FACE	1.0 → 4.0 V
A15–8 (SOL+) – A16–13 (GND)	R – W–B	Start engine Compressor: Operate	Pulse generation
A15–7 (MGV) – A16–13 (GND) (*1)	R–Y – W–B	Start engine Hot gas heater: Operate	10 to 14 → Below 1.0 V
A16–11 (HOTGASIN) – A16–13 (GND) (*1)	G–Y – W–B	IG SW: ON Hot Gas SW: ON	10 to 14 V
A16–16 (S5) – A16–18 (SG)	B–W – G–W	IG SW: LOCK → ON	0 → 5.0 V
A16–1 (S5–1) – A15–13 (SG–1)	R – P	IG SW: LOCK → ON	0 → 5.0 V
A16–2 (S5–2) – A15–14 (SG–2)	Y–B – Y–R	IG SW: LOCK → ON	0 → 5.0 V
A16–14 (S5–3) – A15–15 (SG–3)	BR–W – G–W	IG SW: LOCK → ON	0 → 5.0 V
A16–15 (S5–4) – A16–9 (TSD)	O – LG	IG SW: LOCK → ON	1.7 → 4.2 V
A16–15 (S5–4) – A16–21 (TSP)	O – L	IG SW: LOCK → ON	1.7 → 4.2 V
A15–17 (CFAN) – A16–13 (GND)	W–R – W–B	Start engine Condenser fan: operate	10 to 14 → Below 1.0 V
A16–19 (PBKIG) – A17–13 (GND)	B–W – W–B	IG SW: ON PARKING BRAKE SW: OFF → ON	10 to 14 → Below 1.0 V
A17–3 (PBLT) – A17–13 (GND) (*3)	L–R – W–B	IG SW: ON SEAT BELT SIGNAL: OFF → ON	10 to 14 → Below 1.0 V
A17–4 (RDEFIN) – A17–13 (GND) (*2)	G–W – W–B	IG SW: ON RDEF RELAY : OFF → ON	Below 1.0 → 10 to 14 V

(*1) Diesel (standard) only
(*2) Petrol only
(*3) Except 1AZ–FE

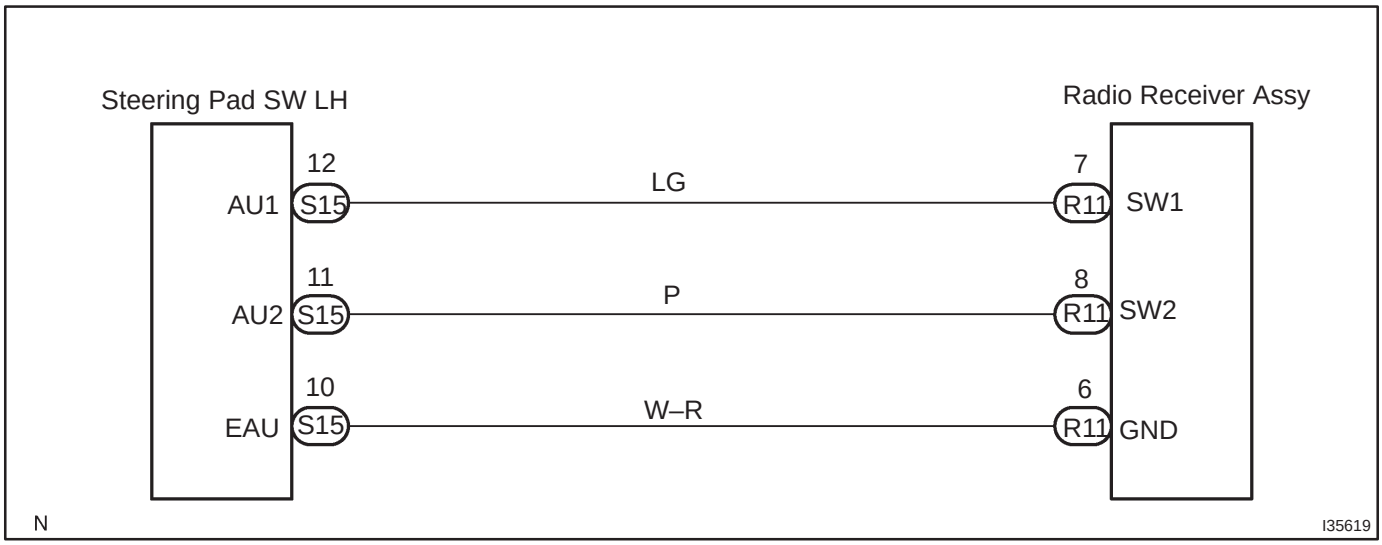
2. COMBINATION METER



Terminal No. (Symbols)	Wiring Color	Condition	Specification
C10–17 (Z1H) – Body ground	W–B – Body ground	Always	Continuity
C10–11 (HAY) – C10–12 (HAZ)	W–R – W	IG SW: ON Ambient temp.: 25°C (77°F) → 40°C (104°F)	1.35 to 1.75 → 0.85 to 1.25 V

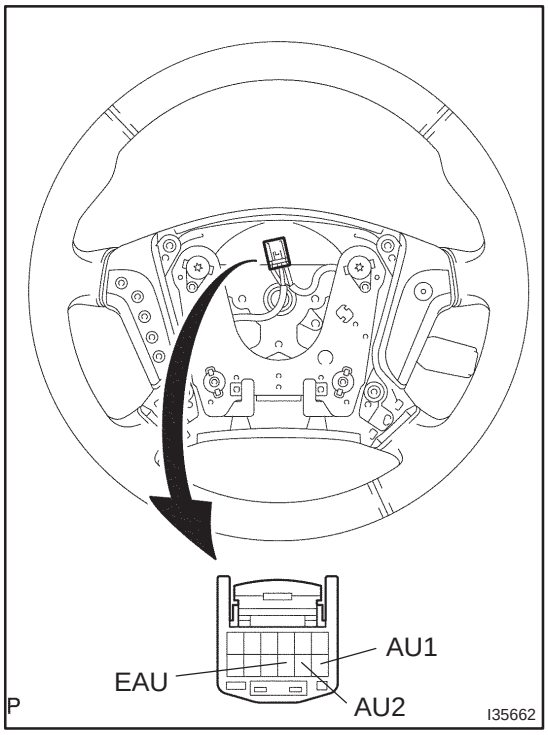
A AUDIO SYSTEM CANNOT BE OPERATED WITH STEERING PAD SWITCH

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT STEERING WHEEL ASSY(AU1, AU2, EAU)



(a) Remove the steering pad switch LH.
(b) Check continuity between terminals at each condition, as shown in the chart.

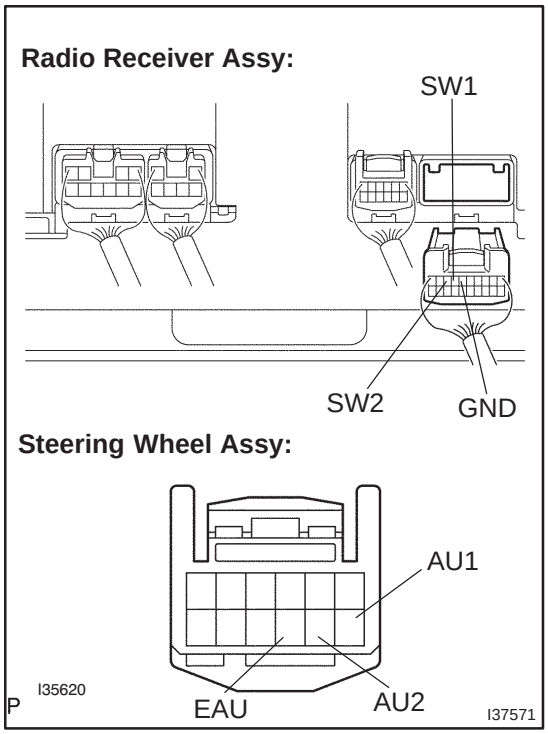
Standard:

Tester connection	Condition	Specified condition
AU1 – EAU	Do not switch position	Approx. 100 kΩ
AU1 – EAU	SEEK+ switch: push	0 Ω
AU1 – EAU	SEEK– switch: push	Approx. 0.3 kΩ
AU1 – EAU	VOL+ switch: push	Approx. 1 kΩ
AU1 – EAU	VOL– switch: push	Approx. 3.2 kΩ
AU1 – EAU	Do not switch position	Approx. 100 kΩ
AU1 – EAU	MODE switch: push	0 Ω

NG → **REPLACE STEERING WHEEL ASSY**

OK

2	CHECK HARNESS AND CONNECTOR(STEERING WHEEL ASSY – RADIO RECEIVER ASSY)



(a) Disconnect the connectors from the steering wheel assy and radio receiver assy.

(1) Check continuity between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
SW1– – AU1	Continuity
SW2 – AU2	Continuity
GND – EAU	Continuity

(2) Check for a short between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
SW1 – Body ground	No continuity
SW2 – Body ground	No continuity
GND – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–32)**

OK

REPLACE RADIO RECEIVER ASSY

CASSETTE TAPE CANNOT BE EJECTED

INSPECTION PROCEDURE

1	PRESS ”EJECT” AND CHECK OPERATION

(a) Press ”EJECT” and check the operation.
  (1) Press the cassette tape EJECT switch of the radio receiver assembly for 2 seconds or more and check that the cassette tape is ejected.
  Standard: The cassette tape is ejected.

NG → **REPLACE RADIO RECEIVER ASSY**

OK

2	CHECK CASSETTE TAPE

(a) Check the cassette tape.
  (1) Check that the ejected cassette tape does not have the label peeled, cassette body deformation or others.
  Standard: No fault on the cassette tape.

NG → **CASSETTE TAPE FAULTY**

OK

3	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK

(a) Replace the cassette tape with another and recheck.
  (1) Replace the cassette tape with another normal one to see if the same trouble occurs again.
  Standard: Malfunction disappears.

OK → **CASSETTE TAPE FAULTY**

NG

REPLACE RADIO RECEIVER ASSY

CASSETTE TAPE CANNOT BE INSERTED OR PLAYED

INSPECTION PROCEDURE

1	CHECK FOR ANY FOREIGN OBJECT

(a) Check for any foreign objects.
(1) Check that no foreign objects or defects are detected in the cassette tape player of radio receiver assy.
Standard: No foreign objects or defects detected.

NG → **REMOVE FOREIGN OBJECT**

OK

2	CHECK CASSETTE TAPE

(a) Check the cassette tape.
(1) Check that the cassette tape is a normal tape to which music or voice is recorded.
Standard: Proper cassette tape to which music or voice is recorded.

NG → **CASSETTE TAPE FAULTY**

OK

3	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK

(a) Replace the cassette tape with another one and recheck.
(1) Replace the cassette tape with another normal one to see if the same trouble occurs again.
Standard: The function is recovered to be normal.

OK → **CASSETTE TAPE FAULTY**

NG

REPLACE RADIO RECEIVER ASSY

CD CANNOT BE EJECTED

INSPECTION PROCEDURE

1	PRESS ”EJECT” AND CHECK OPERATION

(a) Press ”EJECT”and check the operation.
  (1) Press the CD EJECT switch of the radio receiver assembly for 2 seconds or more to see if the CD is ejected.
  Standard: CD is ejected.

Reference:
If the CD is not ejected, send the vehicle for repair.
Do not try to remove it by force.

NG → **REPLACE RADIO RECEIVER ASSY**

OK

2	CHECK IF A PROPER CD IS INSERTED

(a) Check that a proper CD is inserted.
  (1) Check that in what conditions the sound skipping occurs.
  Standard: Driving on the bad road.

NG → **REPLACE RADIO RECEIVER ASSY**

OK

3	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
  (1) Check the installation condition of the radio receiver assembly.
  Standard: Installed properly.

OK → **CD FAULTY**

NG

REPLACE RADIO RECEIVER ASSY

CD CANNOT BE INSERTED OR IS EJECTED RIGHT AFTER INSERTION

INSPECTION PROCEDURE

1	CHECK IF A PROPER CD IS INSERTED

(a) Check if a proper CD is inserted.
  (1) Make sure that the CD is normal audio CD, and that there is no deformation, flaw, stain, burr and other defects on the CD.
  Standard: Normal audio CD.

Reference:
- Translucent or different–shaped CD cannot be played.
- CD–ROM for the computers (with music recorded in) and recorded CD –R may not be played.

NG → **CD FAULTY**

OK

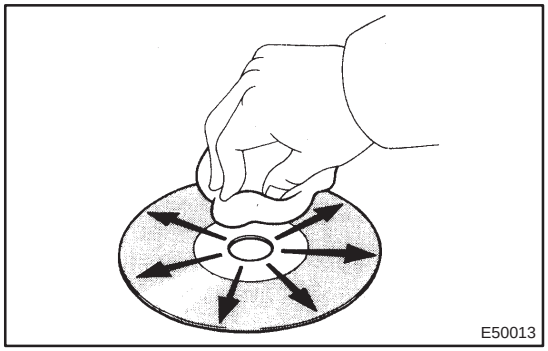
2	CHECK IF A CD IS INSERTED PROPERLY

(a) Check that a CD is inserted properly.
  (1) Check whether or not the CD is inserted upside down.
  Standard: Not upside down.

NG → **SET DISC CORRECTLY**

OK

3	DISC CLEANING


E50013

(a) Disk cleaning
  (1) If the disk gets dirty, clean the disk by wiping the surface from the center to outside in the radial directions with a soft cloth.

NOTICE:
Do not use a conventional record cleaner or anti–static preservative.
  Standard: Malfunction disappears.

OK → **DISC DIRTY**

NG

4	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
  (1) Replace the CD with onother normal one to see if the same trouble occurs again.
  Standard: Malfunction disappears.

OK → **CD FAULTY**

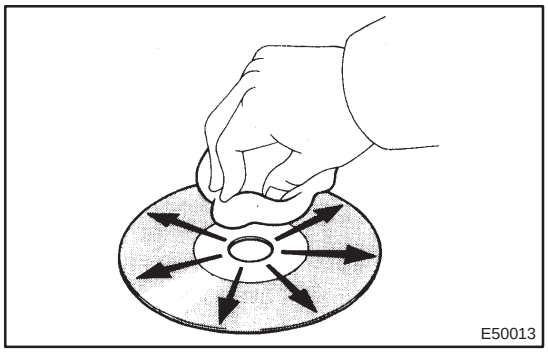
NG

REPLACE RADIO RECEIVER ASSY

CD SOUND SKIPS

INSPECTION PROCEDURE

1	DISC CLEANING



(a) Disk cleaning
  (1) If the disk gets dirty, clean the disk by wiping the surface from the center to outside in the radial directions with a soft cloth.

NOTICE:
Do not use a conventional record cleaner or anti–static preservative.

Standard: Malfunction disappears.

OK → **DISC DIRTY**

NG

2	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
  (1) Replace the CD with onother normal one to see if the same trouble occurs again.
  Standard: Malfunction disappears.

OK → **CD FAULTY**

NG

3	CHECK WHEN THIS HAPPENS

(a) Check when this happens.
  (1) Check that in what condition (place) noise occurs.
  Standard: Driving on the bumpy road.

OK → **Go to step 5**

NG

4	COMPARE IT WITH ANOTHER CAR OF SAME MODEL

(a) Compare it with another vehicle of the same model.
  (1) Compare with the vehicle of the same type which does not have a trouble to see if there is any difference in the condition of trouble occurrence.
  Standard: No difference found.

OK → **SETTING**

NG

5	CHECK OF RADIO RECEIVER ASSEMBLY INSTALLATION

(a) Check of radio receiver assembly installation.
  (1) Check the installation condition of the radio receiver assembly.
  Standard: Installed properly.

NG → **INSTALL THE RADIO RECEIVER ASSEMBLY PROPERLY**

OK

6	DID THE TEMPERATURE IN THE CABIN CHANGE RAPIDLY?

(a) Did the temperature in the cabin change rapidly?
  (1) Check whether or not the rapid temperature change occurred in the cabin.
  Standard: The rapid temperature change occurred.

Reference:
The rapid temperature change creates condensation inside the CD player, which may prevent the CD from being played.

OK → **CONDENSATION DUE TO TEMPERATURE CHANGE (LEAVE IT AS IT IS FOR A WHILE BEFORE USING)**

NG

REPLACE RADIO RECEIVER ASSY

05C4W–01

CUSTOMER PROBLEM ANALYSIS CHECK

AUDIO SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Brought–in Date	/ /	**Odometer Reading**	**km Mile**

Date of First Occurrence	/ /
Frequency of Problem Occurrence	☐ Constant ☐ Intermittent (Times a day)

Problem Symptom	☐ **Switch**
	☐ **Radio**
	☐ **CD**
	☐ **Noise**

DTC Check	**Parts name**	**DTC (1st time).**	**DTC (2nd time).**
	Radio receiver assy		

I30195

AUDIO SYSTEM

DESCRIPTION

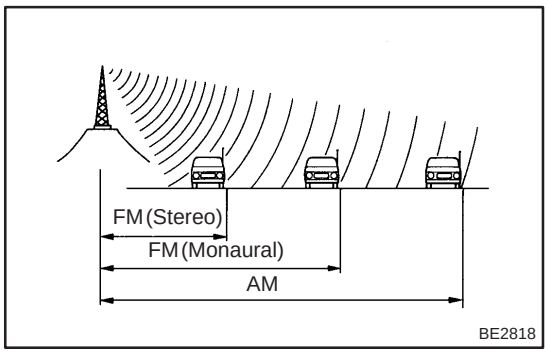
0549F–10

1. RADIO WAVE BAND

The radio wave bands used in radio broadcasting are as follows:

Frequency	30 kHz	300 kHz	3 MHz	30 MHz	300 MHz
Designation	LF	MF	HF	VHF	
Radio wave		AM ⟷		FM ⟷	
Modulation	Amplitude modulation			Frequency modulation	

LF: Low Frequency
MF: Medium Frequency
HF: High Frequency
VHF: Very High Frequency



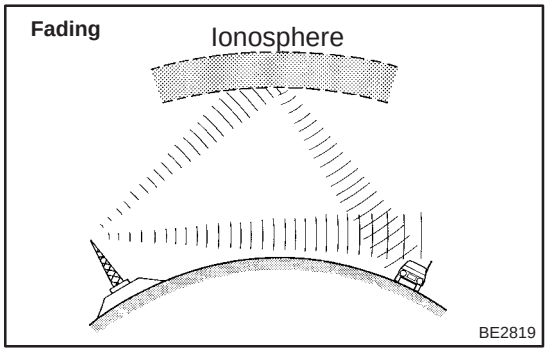
2. SERVICE AREA

There are great differences in the size of the service area for AM and FM broadcasting. Sometimes FM stereo broadcast cannot be received even through AM can be received very clearly. FM stereo has the smaller service area, but it also picks up static and other types of interference (”noise”) easily.

3. RECEPTION PROBLEMS

HINT:

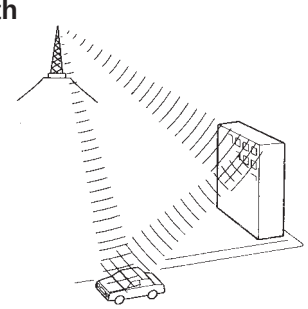
Besides the problem of static, there are some move problems called ”fading”, ”multipath” and ”fade out”. These problems are caused not by electrical noise but by the nature of the radio waves themselves.



(a) Fading

Besides electrical interference, AM broadcasts are also susceptible to other types of interference, especially at night. This is because AM radio waves bounce off the ionosphere at night. These radio waves then interfere with the signals that reach the vehicle’s antenna directly from the same transmitter. This type of interference is called ”fading”.

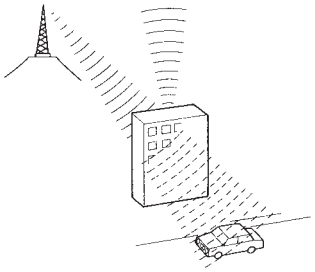
Multipath



BE2820

(b) Multipath
Interference caused by reflection of radio waves against obstructions is called ”Multipath”. Multipath occurs when radio signals emitted from the broadcast transmitter antenna are reflected against tall buildings or mountains and interferes with other signals which are to be received directly.

Fade Out



BE2821

(c) Fade Out
Because FM frequency is higher than that of AM, FM radio wave tends to be reflected against obstructions such as tall buildings or mountains. For this reason, FM signals often seems to gradually disappear or fade away as the vehicle goes behind those obstructions. This phenomenon is called ”fade out”.

4. NOISE PROBLEMS

(a) It is very important for noise troubleshooting to understand a customer’s claim clearly. Use the following table to diagnose the phenomenon.

Radio wave	Condition in which noise occurs	Probable cause
AM	Noise occurs at a specific place.	Strong possibility of foreign noise.
	Noise occurs when listening to faint broadcasting.	The same program may be broadcasted from some local stations. If the program is the same, one of those may be tuned in.
	Noise occurs only at night.	Strong possibility of beat from a distant broadcasting.
FM	Noise occurs at a specific place while driving.	Strong possibility of multipath noise and fading noise caused by changes of FM frequency.

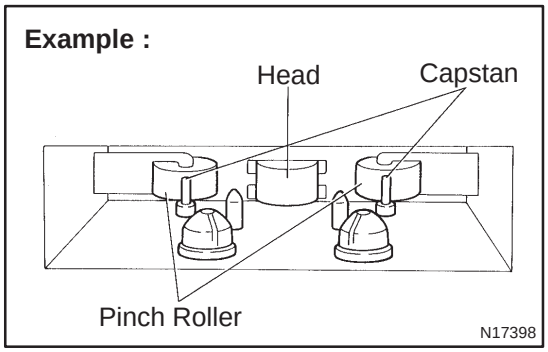
HINT:
If the condition where the noise occurs does not meet any of the above, find out the cause based on ”Reception Problems”. Refer to the description about Multipath and Fading mentioned previously.

5. COMPACT DISC PLAYER

(a) Compact Disc (hereafter called ”CD”) Players use a laser beam pick–up to read the digital signals recorded on the CD and reproduce analog signals of the music, etc. 4.7 in. (12 cm) and 3.2 in. (8 cm) discs are available for the CD player.

HINT:
Never attempt to disassemble or apply oil to any part of the player unit. Do not insert any object into the magazine except for a disc.

NOTICE:
CD players use an invisible laser beam which could cause hazardous radiation exposure. Be sure to operate the player correctly as instructed.

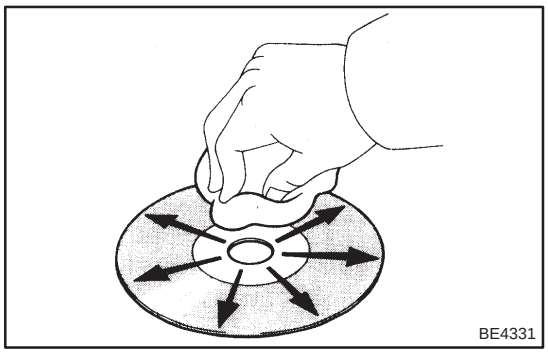


6. MAINTENANCE

Tape Player / Head Cleaning:

(a) Raise the slot cover with your finger.
Using a pencil or similar object, push in the guide.

(b) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.



7. MAINTENANCE

CD Player / Disc Cleaning:

If the disc gets dirty, clean the disc by wiping the surface from the center to outside in the radial directions with a soft cloth.

NOTICE:

Do not use a conventional record cleaner or anti–static preservative.

8. COMMUNICATION SYSTEM

(a) Components in the audio system communicate each other though AVC–LAN. (Radio receiver function)

(b) The master component of AVC–LAN is the radio receiver assy with a resistance (60 – 80 Ω), which is necessary for communication.

(c) When short circuit or open circuit occurs in the AVC–LAN circuit, the audio system does not operate normally due to the communication cutoff.

9. DIAGNOSIS FUNCTION

(a) The audio system has diagnosis function (The diagnosis result is displayed on the LCD of the radio receiver assy). (Radio receiver function)

(b) The component code (physical address), or three–digit number (in hexadecimal) is set for each component comprising AVC–LAN.

(c) The logical address, or two–digit number (in hexadecimal) is set for each function and component unit in each component.

0549J–12

DIAGNOSTIC TROUBLE CODE CHART

Terms	Meaning
Physical address	Three–digit code (shown in hexadecimal) which is given to each component comprising the AVC–LAN. Corresponding to the function, individual symbols are specified.
Logical address	Two–digit code (shown in hexadecimal) which is given to each function comprising the inner system of the AVC–LAN.

1. RADIO RECEIVER ASSY (Physical address: 190)

HINT:

- *1: Even if no failure is detected, trouble code may be stored depending on the battery condition or voltage for starting the engine.
- *2: It is stored when 180 seconds have passed after the power supply connector is pulled out after the engine starts.
- *3: It may be stored when the engine key is turned 1 minuite after the engine starts.
- *4: It may be stored when the engine key is turned again after the engine starts.
- *5: When 210 seconds have passed after pulling out the power supply connector of the master component with the ignition switch in ACC or ON, this code is stored.

(a) Logical address: 01 (Communication control)

DTC	Diagnosis item	Description	Action to be taken
22	RAM Error	Abnormal condition of RAM is detected.	Replace radio receiver assy.
D6 *1	Absence of Master	Component in which this code is recorded was disconnected from system or master component with ignition in ACC or ON.	• Check harness for power supply system of radio receiver assy. • Check harness for communication system of radio receiver assy.
D7 *5	Connection check Error	Component in which this code is recorded was disconnected from system or master component ignition with in ACC or ON.	• Check harness for power supply of radio receiver assy. • Check harness for communication system of radio receiver assy.
D8 *2	No Response to Connection Check	Component shown by sub code is or was disconnected from system after engine start.	• Check harness for power supply system of component shown by sub code. • Check harness for communication system of component shown by sub code.
D9 *1	Last Mode Error	Audio or visual component operated before engine stop is or was disconnected with ignition switch in ACC or ON.	• Check harness for power supply system of component shown by sub code. • Check harness for communication system of component shown by sub code.
DA	No Response to ON/OFF Instruction	No response is identified when changing mode (audio and visual mode change). Sound and picture does not change by button operation.	• Check harness for power supply system of component shown by sub code. • Check harness for communication system of component shown by sub code. • If error occurs again, replace component shown by sub code.
DB *1	Mode Status Error	Dual alarm is detected.	• Check harness for power supply of component shown by sub code. • Check harness for communication system of component shown by sub code.
DC *3	Transmission Error	Transmission to component shown by auxiliary code failed. (Detecting this DTC does not necessarily mean actual failure.)	If same sub code is recorded in other component, check harness for power supply and communication system of all components shown by code. (If not, delete DTC and recheck.)

DD *4	Master Reset (Momentary Interruption)	After the engine was started, master component was disconnected from system.	• Check harness for power supply system of multi–display. • Check harness for communication system of radio receiver assy. • If this error occurs frequently, replace radio receiver assy.
DE *4	Slave Reset (Momentary Interruption)	After the engine was started, component shown by sub code had been disconnected from system.	• Check harness for power supply of component shown by sub code. • Check harness for communication system of component shown by sub code.
E0 *1	Registration Completion Instruction Error	”Registration Completion Instruction” command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E2	ON/OFF Instruction Parameter Error	Error occures in ON/OFF controlling command from master component.	Replace radio receiver assy
E3 *1	Registration Request Transmission	Registration Request command is output from component shown by sub code. Receiving Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

(b) Logical address: 61 (Cassette switch)

DTC	Diagnosis item	Description	Action to be taken
40	Mechanical Error of Media	Malfunction due to mechanical failure is identified. Or cassette tape is cut or entangled.	• Inspect cassette tape. • Replace radio receiver assy.
41	EJECT Error	Malfunction due to mechanical failure.	Replace radio receiver assy.
42	Tape caught in the radio receiver assy	Hub lock etc.	Inspect cassette tape.

(c) Logical address: 62 (CD player)

DTC	Diagnosis item	Description	Action to be taken
42	No Disc Readout	Disc cannot be read.	• Inspect CD. • Replace radio receiver assy.
44	CD player Error	Error is detected in CD player.	Replace radio receiver assy.
45	EJECT Error	Magazine cannot be ejected.	Replace radio receiver assy.
46	Scratched/Reversed Disc	Scratches or dirt is found on CD surface or CD is set upside down.	Inspect CD.
47	CD High Temp.	High temperature is detected in CD player.	Replace radio receiver assy.
48	CD Excess Current	Excess current is applied CD player.	Replace radio receiver assy.

0549G–09

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (SEE PAGE 05–1398)

3	CHECK AND CLEAR THE DTCS (SEE PAGE 05–1399)

4	PROBLEM SYMPTOM CONFIRMATION

→ SYMPTOM OCCURS (GO TO STEP 6)

SYMPTOM DOES NOT OCCUR (GO TO STEP 5)

5	SYMPTOM SIMULATION (SEE PAGE 05–1398)

6	DTC CHECK (SEE PAGE 05–1399)

→ MALFUNCTION CODE (GO TO STEP 7)

→ NORMAL CODE (GO TO STEP 8)

7	DTC CHART (SEE PAGE 05–1405)

→ GO TO STEP 9

8	PROBLEM SYMPTOMS TABLE (SEE PAGE 05–1412)

9	CIRCUIT INSPECTION (SEE PAGE 05–1413 – 05–1432)

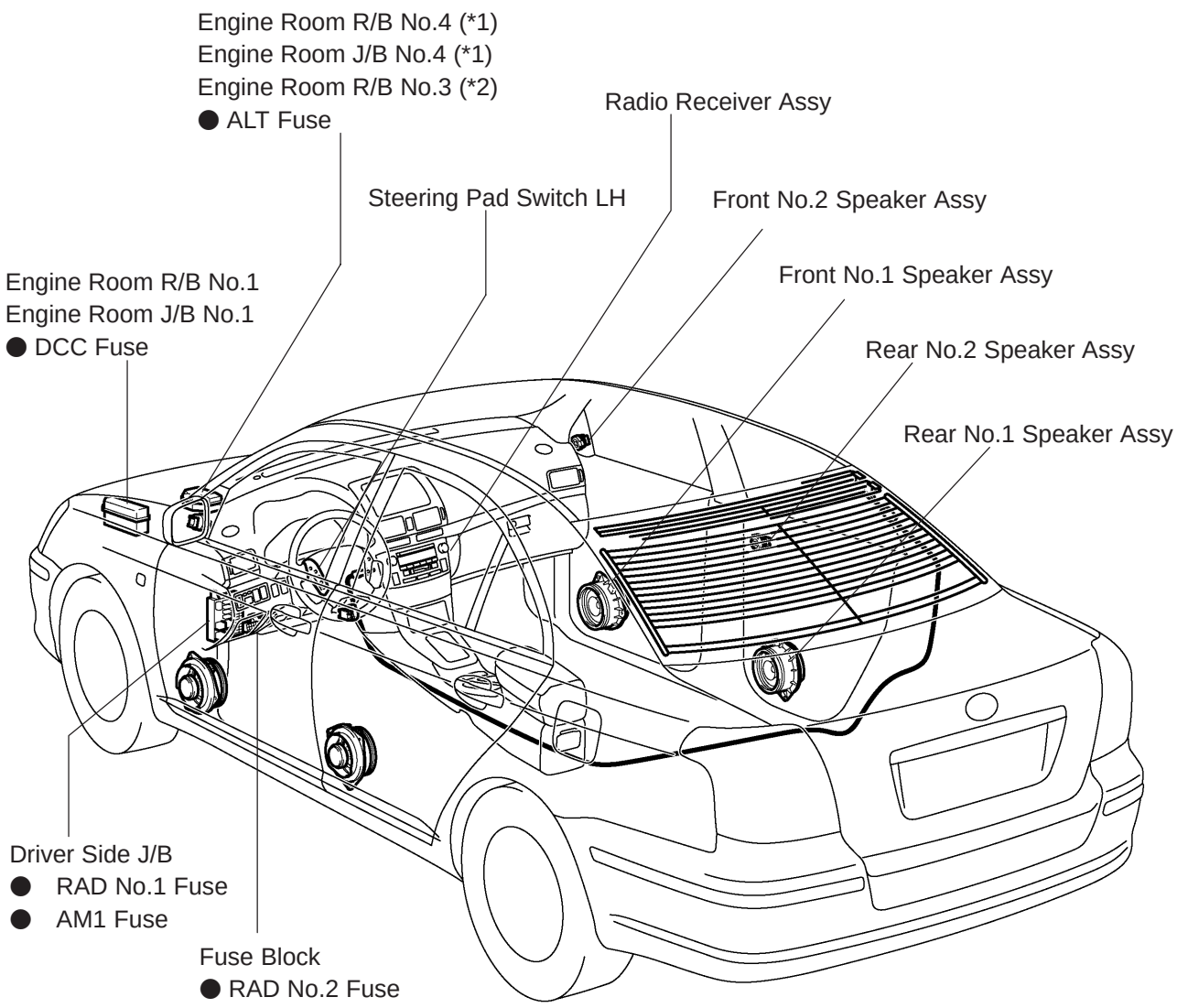
10	CONFIRMATION TEST

END

05C4X–01

LOCATION

Sedan:



*1: Gasoline
*2: 1CD–FTV

H

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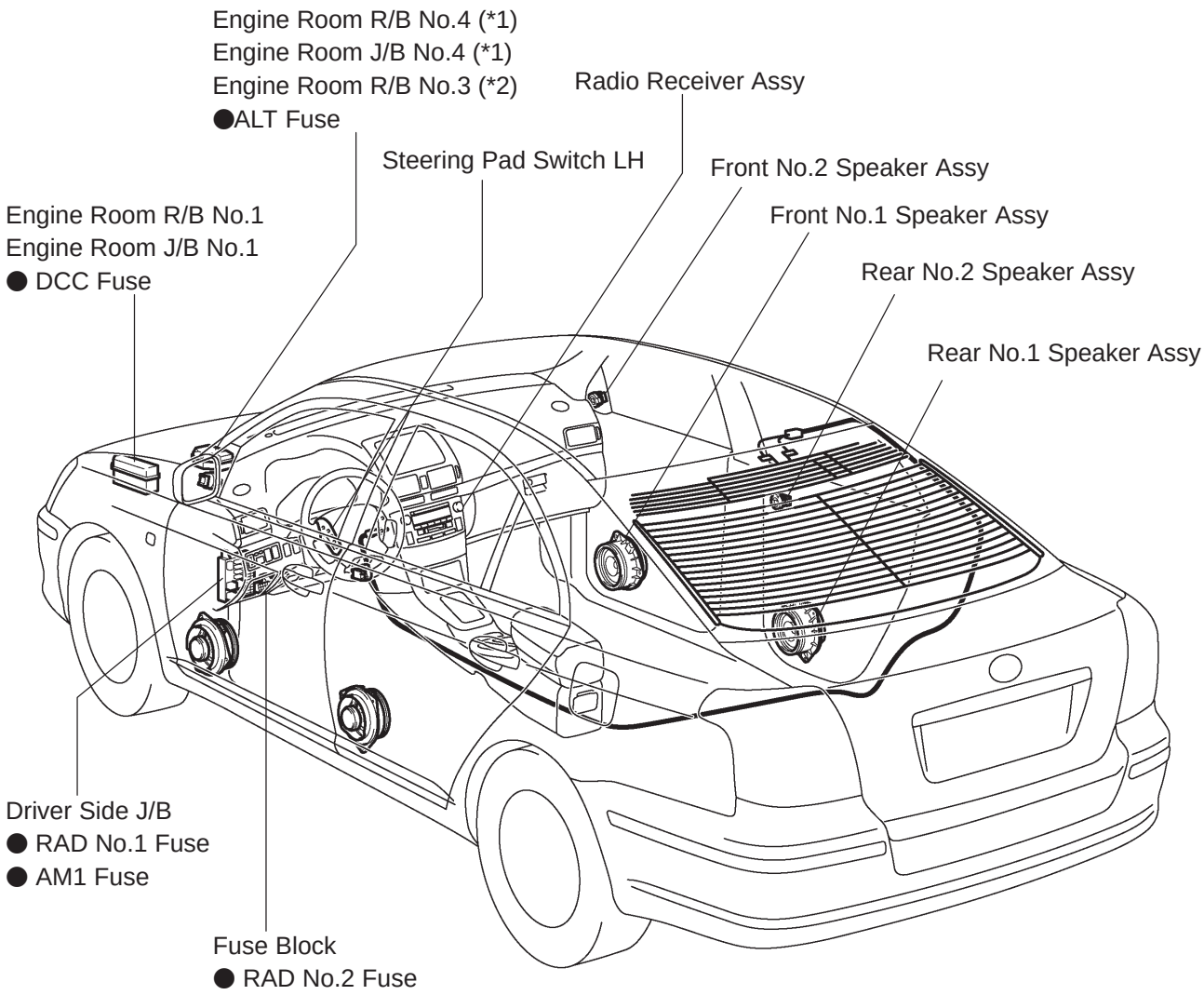
Lift Back:

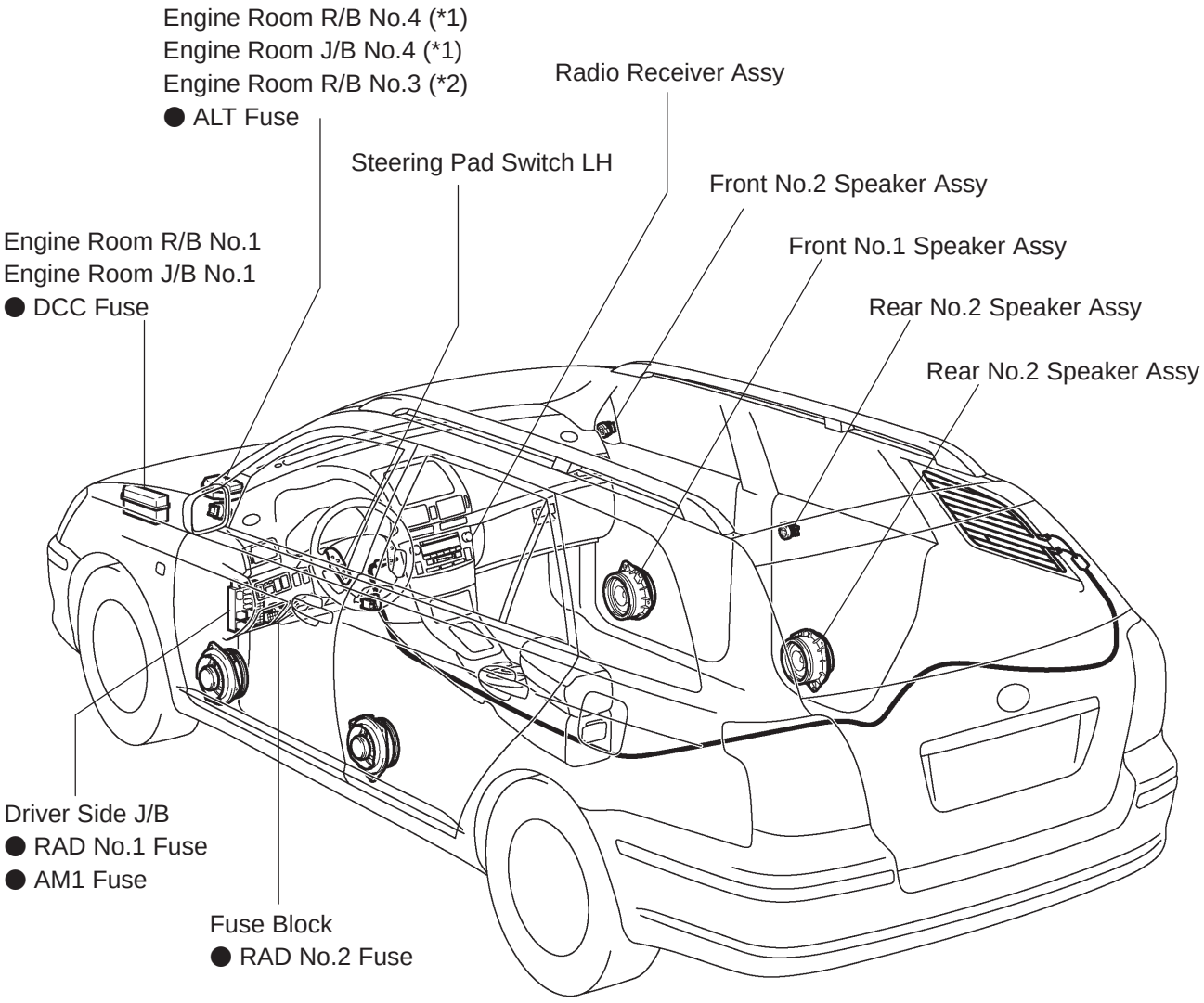


*1: Gasoline
*2: 1CD–FTV

H

I35613

Wagon:



*1: Gasoline
*2: 1CD–FTV

H

I35614

NOISE OCCURS

INSPECTION PROCEDURE

1	CHECK OF SPEAKER INSTALLATION

(a) Check the speaker installation condition.
  (1) Check that each speaker is securely installed.
  Standard: Malfunction disappears.

HINT:

The radio is equipped with the noise prevention system that works against only the excessively large noise, thereby excessively large noise do not occur in the radio. If large noise occurs, check whether or not the earth on the antenna installation part and the proper noise–prevention equipment are all installed, and whether or not the improper wiring is held.

Condition in which noise occurs	Noise type
Depressing the acceleration pedal increases noise, and stopping the engine erases the noise immediately.	Alternator noise
Noise occurs during the A/C or the heater operation.	Blower motor noise
Rapid acceleration during the drive on the unpaved road or after the IG switch is turned ON makes noise.	Fuel pump noise
Pressing and then releasing the horn switch, and keeping pressing the horn switch makes noise.	Horn noise
Stopping the engine erases the small noise that has been heard.	Ignition noise
Noise occurs in turn with the blink of the turn signal flash.	Flasher noise
Noise occurs during the window washer operation.	Washer noise
Noise occurs during the engine running, and it continues to occur after the engine is stopped.	Water temperature sensor noise
Noise occurs during the wiper operation.	Wiper noise
Noise occurs when the brake pedal is depressed.	Stop light switch noise
Others.	Static electricity on the vehicle

HINT:

- Identify the condition under which the noise occurs, and check the noise filter on the related part.
- Make sure first that there is no noise from outside. Failing to do so makes the noise occurrence source detection impossible and leads to misunderstanding.
- The noise should be removed in descending order of loudness.

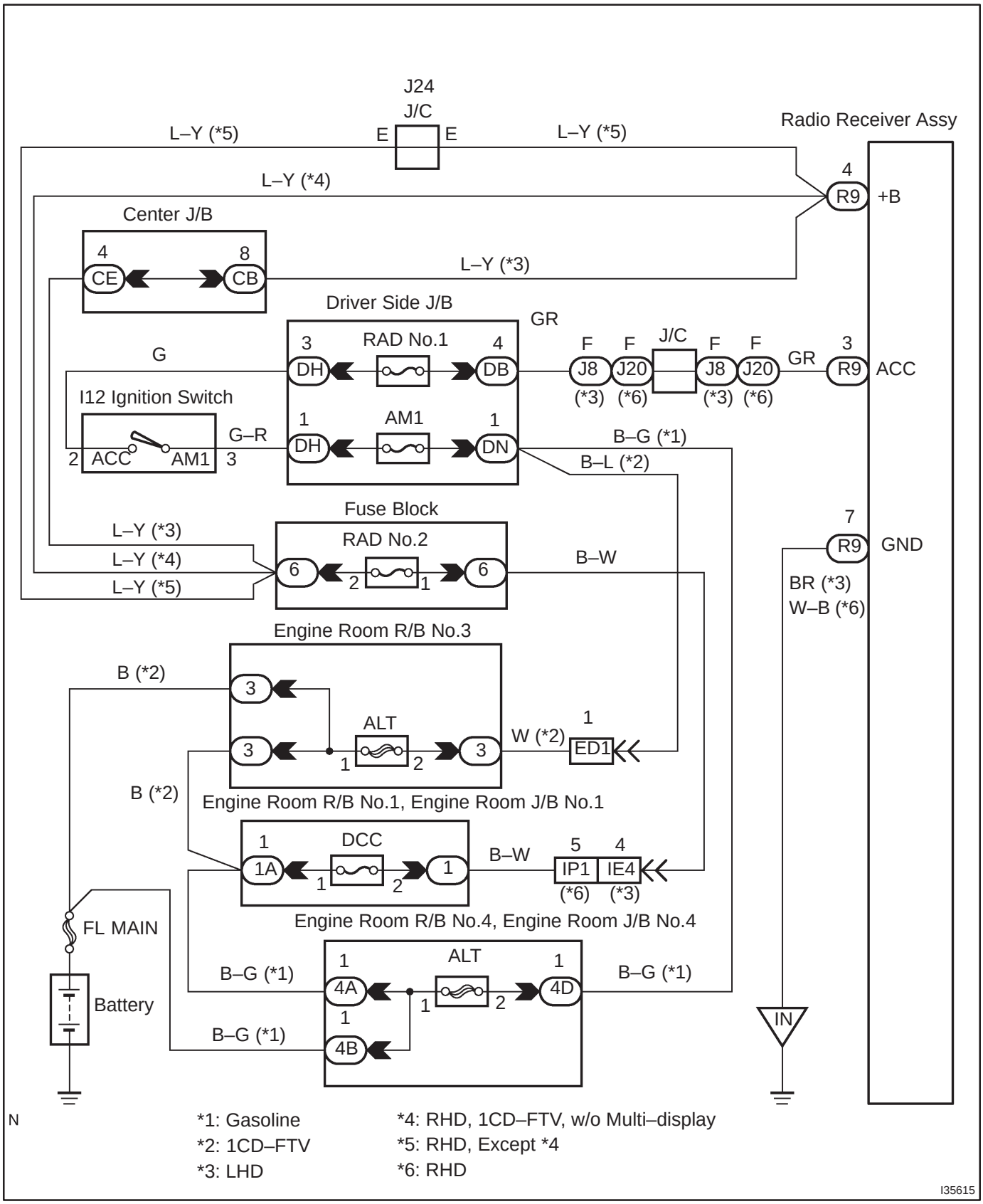
NG → **INSTALL IT PROPERLY**

OK

IDENTIFICATION OF NOISE SOURCE

POWER SOURCE CIRCUIT (RADIO RECEIVER ASSY)

WIRING DIAGRAM



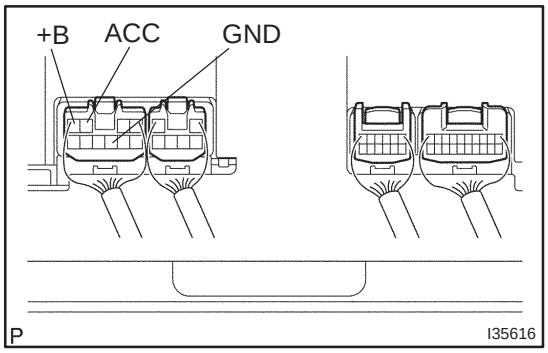
N

*1: Gasoline
*2: 1CD–FTV
*3: LHD
*4: RHD, 1CD–FTV, w/o Multi–display
*5: RHD, Except *4
*6: RHD

I35615

INSPECTION PROCEDURE

1 INSPECT RADIO RECEIVER ASSY(BU, ACC, GND)



(a) Remove the radio receiver assy.

(b) Check continuity between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND – Body ground	Always	Continuity

(c) Check the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
+B – GND	Always	10 to 14 V
ACC – GND	Ignition SW ACC	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–32)**

OK

2 CHECK FOR PROBLEM SYMPTOMS TABLE

(a) Check problem symptoms table (See page 05–1412).

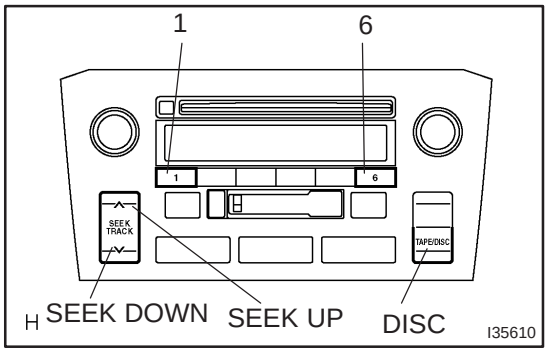
Suspected areas are cleared	A
Suspected areas still exist	B

B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1412)**

A

REPLACE RADIO RECEIVER ASSY

0549I–12



PRE–CHECK

1. DIAGNOSIS CHECK

(a) Starting Diagnosis Mode (All elements are lighting in the SW check mode).

(1) Turn off the audio system and turn the IG switch to ACC. While pressing the preset switches ”1” and ”6” at the same time, press ”DISC” 3 times.

(2) Reference:

- When the system enters the Diagnosis Mode, a ”beep” tone is emitted 3 times and all the elements are lighting in the SW check mode.
- It takes about 40 seconds to complete the check.
- Turn all the elements in the LCD on.
- When pressing the switch, comfirm a beep tone is emitted.
- Press ”SEEK TRACK UP” button switches to enter the ”Service Check Screen”.

(b) Service Check Screen.

(1) Reference

- In the service check mode, the system check and the diagnosis memory check are performed, and the check results are displayed in ascending order of the device codes (physical address.)

Terms	Meaning
Component code (Physical address)	Three–digit code (In hexadecimal) given to each device comprising AVC–LAN. Corresponding to its function, individual symbol is provided.
Logical address	Two–digit code (In hexadecimal) given to each function and device unit in each device comprising AVC–LAN.

Code No. (physical address) List

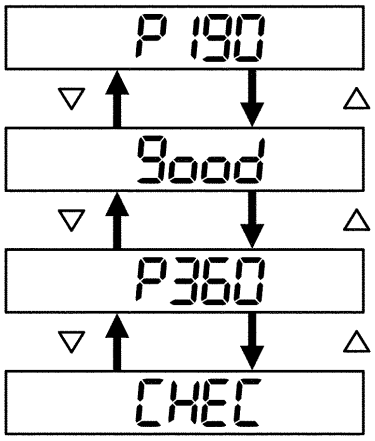
Code No. (physical address)	Equipment name
190	Radio receiver assy (Audio head unit)

(c) Finishing Diagnosis Mode.

(1) Press ”DISC” for 2 seconds or more, or turn the IG switch OFF.

(d) Service Check Mode Result Display (for checking the current and the past system conditions).

(1) Press the ”SEEK TRACK” switch to see the check result of each device.



P——indicates physical address
190——physical address

good——”The component is normal”.

P——indicates physical address
360——physical address

CHEC——”Check needed”.

△ : SEEK TRACK UP

▽ : SEEK TRACK DOWN

The illustration shows the case that the system has 2 devices with codes 190 and 360, and the device (code 360) requires a check.
The check result is displayed in ascending order of device code. The device code is displayed first, and then the check result.

P I34696

(2) Check Result Display.

Display	Original Language	Meaning	Action to be taken
good	Good (normal)	No DTCs are detected in both ”System Check Mode” and ”Diagnosis Memory Mode”.	–
NCON	No connection	The system recognized the component when it was registered, but the component gives no response to the ”Diagnosis Mode ON Request”.	Check the power source circuit and the communication circuit of the device indicated by the device code (physical address).
ECHN	Exchange	One or more DTC for ”Exchange” is detected in either ”System Check Mode” or ”Diagnosis Memory Mode”.	Go to the detail information mode to check the trouble area referring to the DTC list.
CHEC	Check	When no DTCs are detected for ”Exchange”, one or more DTC for ”Check is detected in either ”System Check Mode” or ”Diagnosis Memory Mode”.	Go to the detail information mode to check the trouble area referring to the DTC list.

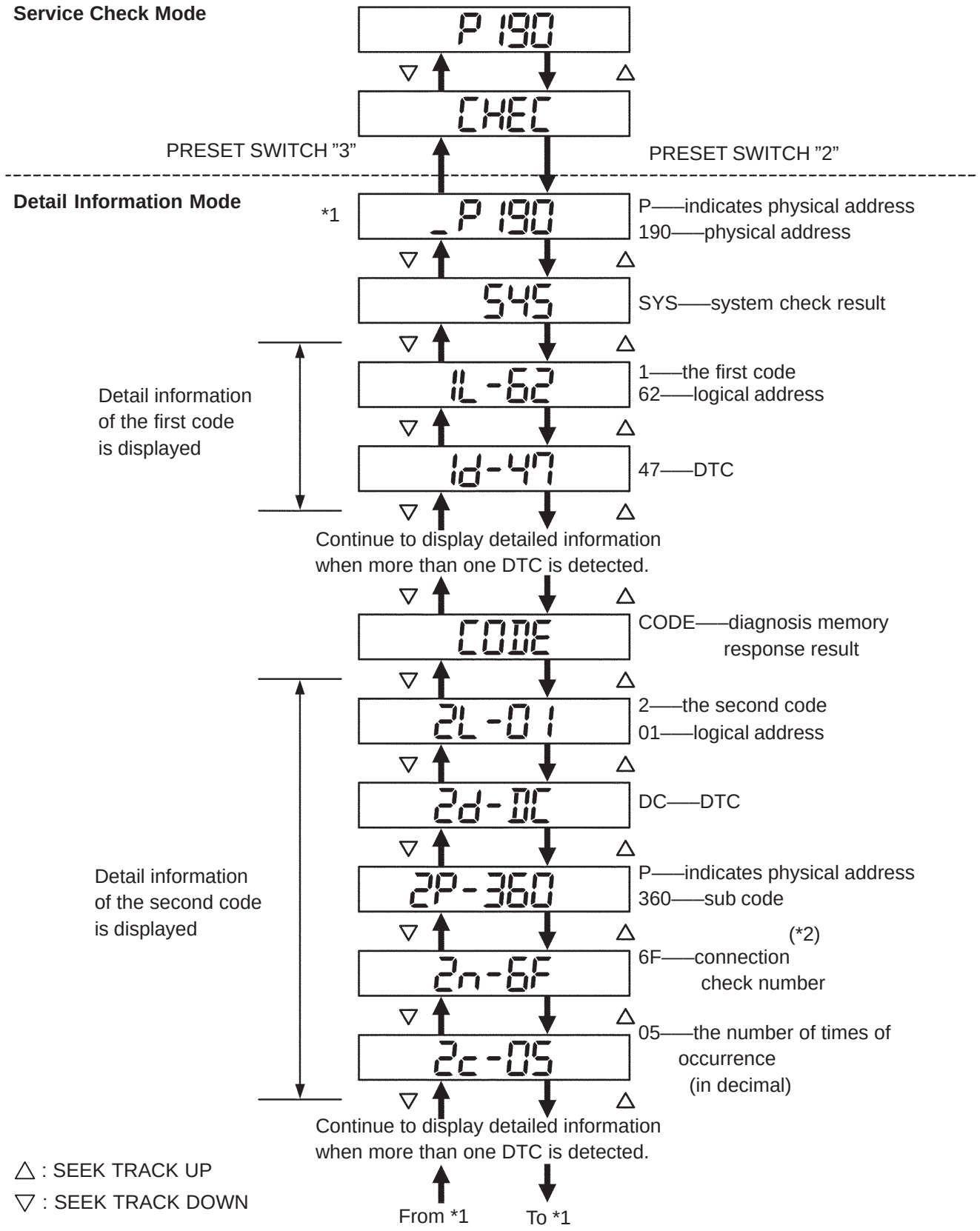
Display	Original Language	Meaning	Action to be taken
OLD	Old version	Old DTC application is identified and DTC is detected in either ”System Check Mode” or ”Diagnosis Memory Mode”.	–
NRES	No response	The device gives no response to any one of ”System Check Mode ON Request”, ”System Check Result Request” and ”Diagnosis Memory Request”.	Check the power source circuit and the communication circuit of the device indicated by the device code (physical code).

(3) To perform the Service Check again, press the preset switch ”1”.

(e) Detailed information Mode (when displaying the troubled device’s DTC)

(1) With ”CHEC” or ”ECHN” being displayed, press the preset switch ”2” to go to the detailed information mode.

(2) Press the ”SEEK TRACK” switch to display ”System Check Result (SYS)” and ”Diagnosis Memory Response (CODE)”.



The illustration shows the case that the component with code 190 has DTC "47" and "dC" as a result of the system check and the diagnosis memory response.
The detailed information mode shows the system check result first, then the diagnosis memory response result.
(*2): As for the DTCs that do not have any sub code, sub code is not displayed.

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(3) Displayed Items in Detailed Information Mode

Division Code for DTC display	Meaning	The order of detailed information displayed when the "SEEK TRACK UP" switch is pressed. (The order is reversed when the "SEEK TRACK DOWN" switch is pressed.)
SYS	System check result is displayed.	Logical address → DTC
CODE	Diagnosis memory check result is displayed.	Logical address→ DTC→ Sub code→ Connection confirmation number→ The number of times of occurrence

(4) Check the trouble area referring to the DTC list.

(5) To return to the service check mode, press the preset switch "3".

(f) Clearing Individual DTC Memory (when clearing the memory of the DTC detected in the past individually)

(1) Press the preset switch "5" for 2 seconds or more while the "ECHN" is displayed in the service check mode or during the detail information mode.

HINT:

- Beep sound is emitted once when the DTC memory is completely cleared.
- When the DTC memory is cleared, only the component code (physical address) is displayed for the target component.
- To check the DTC, press the preset switch "1" and perform the service check again.

(g) Clearance of all the DTC memory (when clearing all the memory of the DTC detected in the past)

(1) Start the diagnosis mode after repairing the trouble area.

(2) Press the preset switch "5" for 2 seconds or more. ("CLR" is displayed at this time.)

HINT:

- Beep sound is given once when the DTC memory is completely cleared.
- When the DTCs memory for all the device is cleared, only the component codes (physical address) are displayed.

(3) Press the preset switch "1" to perform the service check again, and check that no DTCs are displayed for all the component codes (physical address).

2. IDENTIFICATION OF NOISE SOURCE

(a) Identify the condition under which the noise occurs, and check the noise filter on the related part.

Condition in which noise occurs	Noise Source
Depressing the acceleration pedal increases noise, and stopping the engine erases the noise immediately.	Generator
Noise occurs during the A/C or the heater operation.	Blower motor
Rapid acceleration while driving on the unpaved road or after the IG switch is turned ON makes noise.	Fuel pump
Pressing and then releasing the horn switch, and keeping pressing the horn switch makes unusual noise.	Horn
Stopping the engine erases small noise that has been heard.	Ignition
Noise occurs synchronously with the turn signal flash.	Flasher
Noise occurs during the window washer operation.	Washer
Noise occurs during the engine running, and it continues after the engine stops.	Engine coolant temperature sensor
Noise occurs during the wiper operation.	Wiper
Noise occurs when the brake pedal is depressed.	Stop light switch
Others.	Static electricity stored on the vehicle

(b) Reference:

- Make sure first that there is no noise from outside. Failing to do so makes the noise source detection difficult and leads to misunderstanding.
- The noise should be removed in descending order of loudness.
- Setting the radio untuned makes noise noticeable, making the recognition of the phenomenon easier.

0549M–11

PROBLEM SYMPTOMS TABLE

RADIO RECEIVER ASSY

Symptom	Suspect Area	See page
Pressing power switch does not start system.	5. Power source circuit (radio receiver assy)	05–1413
Sound quality is bad in all modes. (volume is too low)	1. Power source circuit (radio receiver assy) 2. Sound quality is bad in all modes (volume is too low)	05–1413 05–1415
Noise occurs.	–	05–1419
Radio broadcast cannot be received. (bad reception)	–	05–1420
CD cannot be inserted or is ejected right after insertion.	1. Power source circuit (radio receiver assy) 2. CD cannot be inserted or is ejected right after insertion	05–1413 05–1422
CD cannot be ejected.	1. Power source circuit (radio receiver assy) 2. CD cannot be ejected	05–1413 05–1424
Sound quality is bad only when CD is played.(volume is too low)	–	05–1425
CD sound skips.	–	05–1426
Cassette tape cannot be inserted or played.	1. Power source circuit (radio receiver assy) 2. Cassette tape cannot be inserted or played	05–1413 05–1428
Cassette tape cannot be ejected.	1. Power source circuit (radio receiver assy) 2. Cassette tape cannot be ejected	05–1413 05–1429
Sound quality is bad only when playing tape.	–	05–1430
Tape is tangled due to incorrect tape speed or auto–reverse malfunction.	–	05–1431

STEERING PAD SWITCH

Symptom	Suspect Area	See page
A audio system cannot be operated with steering pad switch	–	05–1432

RADIO BROADCAST CANNOT BE RECEIVED (BAD RECEPTION)

INSPECTION PROCEDURE

1	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

(a) Check if the radio auto–search functions properly.
  (1) Perform the auto–search of the radio and check that it functions normally.
  Standard: The radio auto–search functions properly.

OK → **REPLACE RADIO RECEIVER ASSY**

NG

2	CHECK OPTIONAL COMPONENT

(a) Check optional component (Sun shade film, telephone antenna etc.).
  (1) Check whether or not any optional component is installed, such as the sunshade film and the telephone antenna.
  Standard: Optional component is installed.

OK → **EFFECT FROM OPTIONAL COMPONENT**

NG

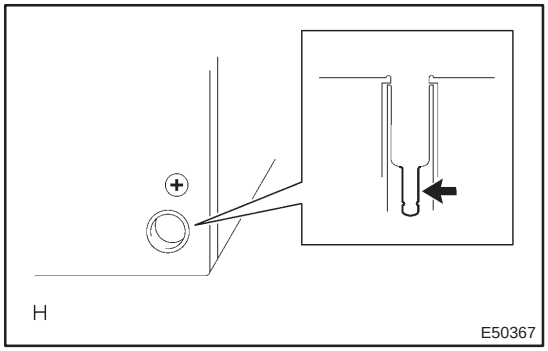
3	CHECK ANTENNA FOR NOISE PRODUCTION

(a) Noise Check with Antenna.
  (1) With the ignition switch in ACC, turn on the radio and choose the AM mode.
  (2) Place a tip of a screwdriver or the antenna of the antenna assembly w/ holder and check that the noise heard from the speaker.
  Standard: Noise occurs.

OK → **REPLACE RADIO RECEIVER ASSY**

NG

4	INSPECT RADIO RECEIVER ASSY(ANTENNA)



(a) Preparation for Check
  (1) Remove the antenna plug of the radio receiver assy.

(b) Noise Check
  (1) With the radio receiver assy connector connected, turn the ignition switch to ACC.
  (2) Turn on the radio and choose the AM mode.
  (3) Place a flat–head screwdriver or a metal such as a thin wire on the antenna jack of the radio receiver assy and check that the noise heard from the speaker.

Standard: Noise occurs.

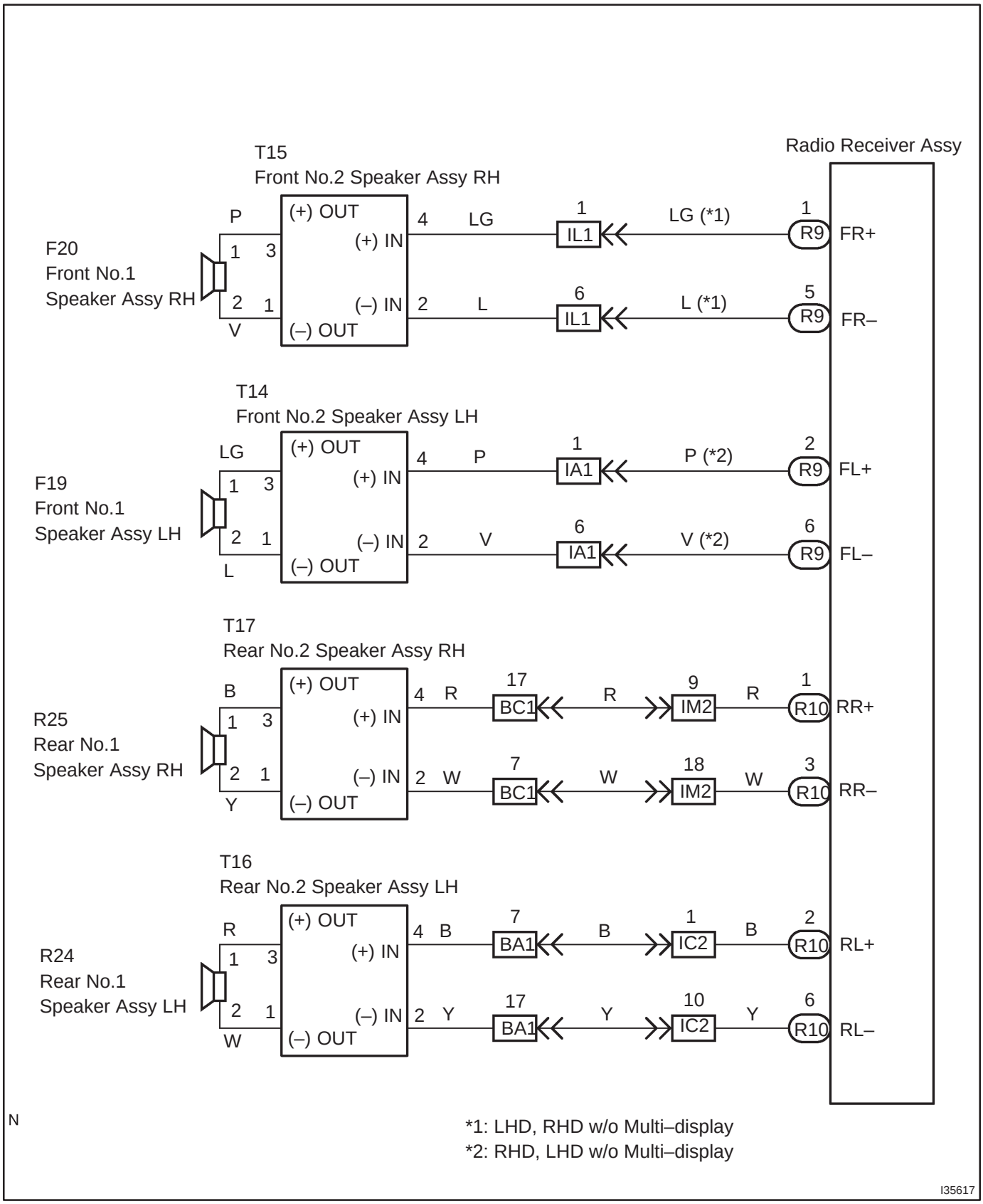
OK → **REPLACE RADIO RECEIVER ASSY**

NG

REPLACE ANTENNA CORD SUB–ASSY

SOUND QUALITY IS BAD IN ALL MODES (VOLUME IS TOO LOW)

WIRING DIAGRAM



N

INSPECTION PROCEDURE

1	ADJUST SOUND QUALITY

(a) Adjust the sound quality.
(1) Operate the radio receiver assy to adjust the sound quality.
Standard: Malfunction disappears.

OK	BAD SOUND QUALITY

NG

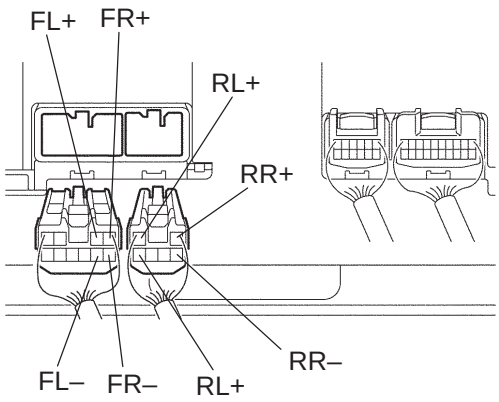
2	COMPARE IT WITH ANOTHER CAR OF SAME MODEL

(a) Compare it with another vehicle of the same models.
(1) Compare with the vehicle of the same type which does not have a trouble to see if there is any difference in the condition of trouble occurrence.
Standard: No difference found.

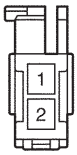
OK	SETTING

NG

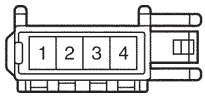
3	CHECK HARNESS AND CONNECTOR(RADIO RECEIVER ASSY – SPEAKER ASSY)



Front No.1 Speaker Assy
Rear No.1 Speaker Assy



Front No.2 Speaker Assy
Rear No.2 Speaker Assy



P I35618

(a) Disconnect the connectors from the radio receiver assy and speakers.

(1) Check continuity between terminals at each condition, as shown in the chart.

Tester connection	Specified condition
FL+ – 1 (Front No.1 speaker assy LH)	Continuity
FL– – 2 (Front No.1 speaker assy LH)	Continuity
FR+ – 1 (Front No.1 speaker assy RH)	Continuity
FR– – 2 (Front No.1 speaker assy RH)	Continuity
FL+ – 4 (Front No.2 speaker assy LH)	Continuity
FL– – 2 (Front No.2 speaker assy LH)	Continuity
FR+ – 4 (Front No.2 speaker assy RH)	Continuity
FR– – 2 (Front No.2 speaker assy RH)	Continuity
RL+ – 1 (Rear No.1 speaker assy LH)	Continuity
RL– – 2 (Rear No.1 speaker assy LH)	Continuity
RR+ – 1 (Rear No.1 speaker assy RH)	Continuity
RR– – 2 (Rear No.1 speaker assy RH)	Continuity
RL+ – 4 (Rear No.2 speaker assy LH)	Continuity
RL– – 2 (Rear No.2 speaker assy LH)	Continuity
RR+ – 4 (Rear No.2 speaker assy RH)	Continuity
RR– – 2 (Rear No.2 speaker assy RH)	Continuity

(2) Check for a short between terminals at each condition, as shown in the chart.

Tester connection	Specified condition
FL+ – Body ground	No Continuity
FL– – Body ground	No Continuity
FR+ – Body ground	No Continuity
FR– – Body ground	No Continuity
RL+ – Body ground	No Continuity
RL– – Body ground	No Continuity
RR+ – Body ground	No Continuity
RR– – Body ground	No Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR(See page 01–32)**

OK

4	INSPECT FRONT NO.1 SPEAKER ASSY

(a) Resistance check.
(1) Check the resistance between the terminals of the speaker.

NOTICE:
The speaker should not be removed for checking.

Standard value: 4 Ω

NG → **REPLACE FRONT NO.1 SPEAKER ASSY**

OK

5	INSPECT FRONT NO.2 SPEAKER ASSY

(a) Check that malfunction disappears when a known good speaker is installed.
Standard: Malfunction disappears.

HINT:
Connect the all connectors of speakers.

NG → **REPLACE FRONT NO.2 SPEAKER ASSY**

OK

6	INSPECT REAR NO.1 SPEAKER ASSY

(a) Resistance check.
(1) Check the resistance between the terminals of the speaker.

NOTICE:
The speaker should not be removed for checking.

Standard value: 4 Ω

NG → **REPLACE REAR NO.1 SPEAKER ASSY**

OK

7	INSPECT REAR NO.2 SPEAKER ASSY

(a) Check that malfunction disappears when a known good speaker is installed.
Standard: Malfunction disappears.

HINT:
Connect the all connectors of speakers.

NG → **REPLACE REAR NO.2 SPEAKER ASSY**

OK

REPLACE RADIO RECEIVER ASSY

SOUND QUALITY IS BAD ONLY WHEN CD IS PLAYED (VOLUME IS TOO LOW)

INSPECTION PROCEDURE

1	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
  (1) Check the installation condition of the radio receiver assembly.
  Standard: Malfunction disappears.

OK → **CD FAULTY**

NG

REPLACE RADIO RECEIVER ASSY

SOUND QUALITY IS BAD ONLY WHEN PLAYING TAPE

INSPECTION PROCEDURE

1	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK

(a) Replace the cassette tape with another and recheck.
(1) Replace the cassette tape with another normal one to see if the same trouble occurs again.
Standard: Malfunction disappear.

OK → **CASSETTE TAPE FAULTY**

NG

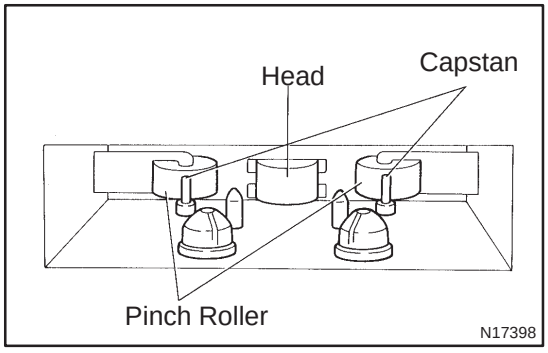
2	CHECK FOR ANY FOREIGN OBJECT

(a) Check for foreign objects.
(1) Check that no foreign material and troubles are detected in the radio receiver assembly cassette tape player.
Standard: No foreign objects or defects detected.

NG → **REMOVE FOREIGN OBJECT**

OK

3	CLEAN HEAD AND CHECK OPERATION



(a) Head cleaning
(1) Raise the cassette door with your finger. Next, using a pencil or similar object, push in the guide.
(2) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.
(3) Check that the same trouble occurs again.
Standard: Malfunction disappears.

OK → **HEAD DIRTY**

NG

REPLACE RADIO RECEIVER ASSY

TAPE IS TANGLED DUE TO INCORRECT TAPE SPEED OR AUTO–REVERSE MALFUNCTION

INSPECTION PROCEDURE

1	CHECK FOR ANY FOREIGN OBJECT

(a) Check for any foreign objects.
  (1) Check that no foreign objects or defects are detected in the cassette tape player of radio receiver assy.

Standard: No foreign objects or defects detected.

NG → **REMOVE FOREIGN OBJECT**

OK

2	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK(BELOW 90 MIN.)

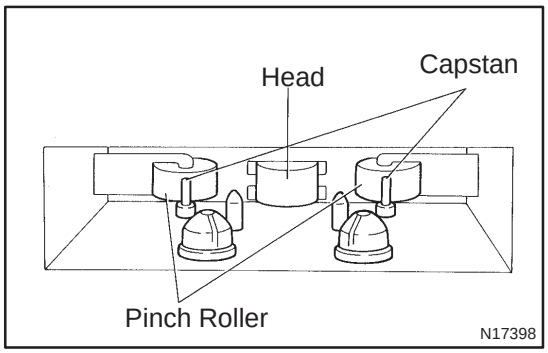
(a) Replace the cassette tape with another and recheck.
  (1) Replace the cassette tape with another normal one (90min or less) to see if the same trouble occurs again.

Standard: Malfunction disappears.

OK → **CASSETTE TAPE FAULTY**

NG

3	CLEAN HEAD AND CHECK OPERATION



(a) Head cleaning
  (1) Raise the cassette door with your finger. Next, using a pencil or similar object, push in the guide.
  (2) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.
  (3) Check that the same trouble occurs again.

Standard: Malfunction disappears.

OK → **HEAD DIRTY**

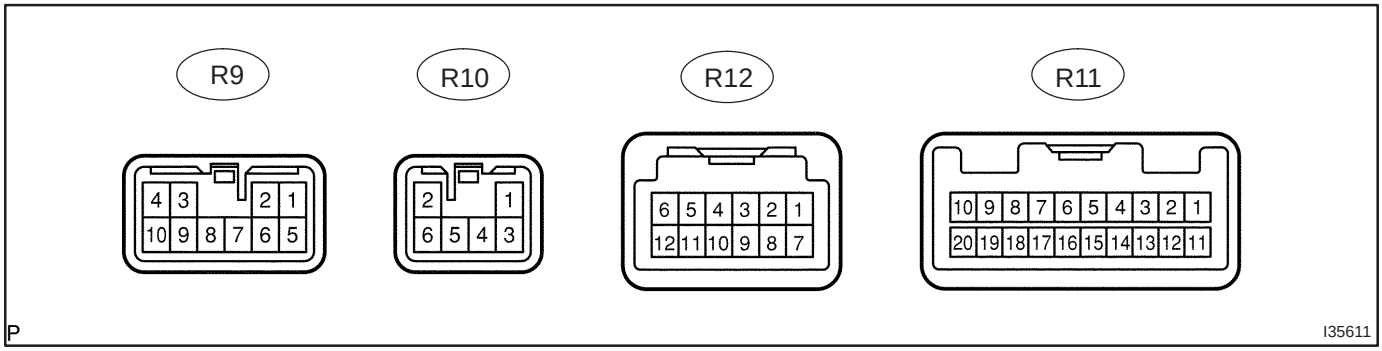
NG

REPLACE RADIO RECEIVER ASSY

05C4Y–01

TERMINALS OF ECU

1. RADIO RECEIVER ASSY



Terminal No. (Symbols)	Wiring Color	Condition	STD Voltage (V)
R9–1(FR+) – R9–7(GND)	LG – BR*1 LG – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R9–2(FL+) – R9–7(GND)	P – BR*1 P – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R9–3(ACC) – R9–7(GND)	GR – BR*1 GR – W–B*2	Ignition switch to ACC	10 to 14
R9–4(+B) – R9–7(GND)	L–Y – BR*1 L–Y – W–B*2	Always	10 to 14
R9–5(FR–) – R9–7(GND)	L – BR*1 L – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R9–6(FL–) – R9–7(GND)	V – BR*1 V – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R9–7(GND) – Body ground	BR*1 – Body ground W–B*2 – Body ground	Always	Continuity
R9–8(ANT) – R9–7(GND)	B – BR*1 B – W–B*2	Radio switch ON and AM or FM	10 to 14
R9–10(ILL+) – R9–7(GND)	G – BR*1 G – W–B*2	Light control switch TAIL	10 to 14
R10–1(RR+) – R9–7(GND)	B – BR*1 R – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R10–2(RL+) – R9–7(GND)	B – BR*1 B – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R10–3(RR–) – R9–7(GND)	W – BR*1 W – W–B*1	Audio system is playing	A waveform synchronized with sounds is output
R10–6(RL–) – R9–7(GND)	Y – BR*1 Y – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R11–6(GND) – R9–7(GND)	W–R – BR*1 W–R – W–B*2	Always	Below 1.0
R11–7(SW1) – R9–7(GND)	LG – BR*1 LG – W–B*2	Steering pad switch not operating. →SEEK+ switch push →SEEK– switch push →VOL+ switch push →VOL– switch push	4 or more →Approx. 0.5 →Approx. 0.9 →Approx. 2.0 →Approx. 3.4

R11–8(SW2) – R9–7(GND)	P – BR*1 P – W–B*2	Steering pad switch is not operating →MODE switch push	4 or more → Below 2.5
R12–9 (TX+)	P	See "Service Check Mode"	–
R12–10 (TX–)	LG	See "Service Check Mode"	–

*1: LHD

*2: RHD

05C4F–01

CUSTOMER PROBLEM ANALYSIS CHECK

COMBINATION METER SYSTEM Check Sheet

Inspector's name:

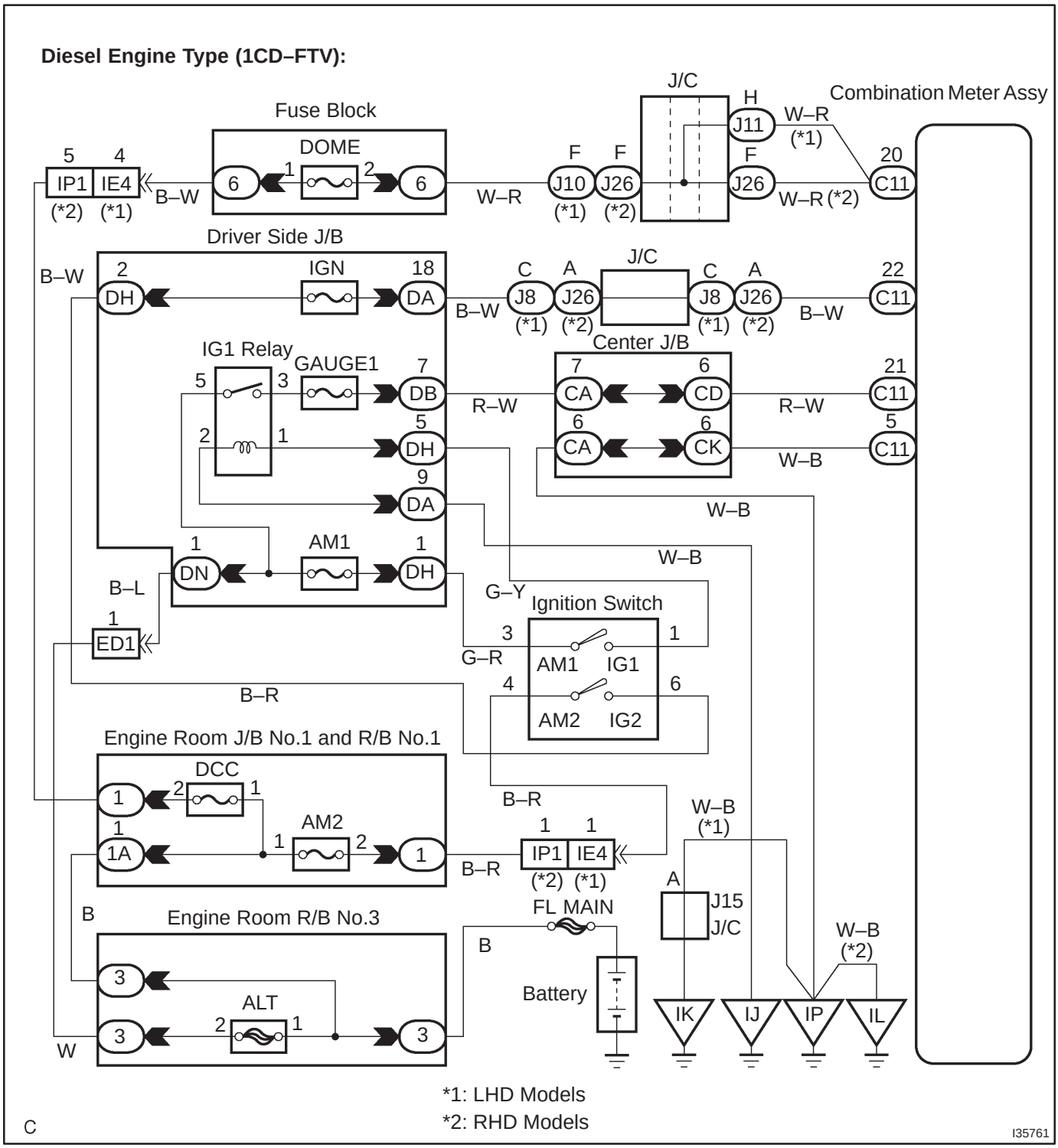
Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date of Vehicle Brought In	/ /	**Odometer Reading**	**km** **Mile**

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constantly ☐ Sometimes (Times per day, month) ☐ Once only
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outside temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F (°C))

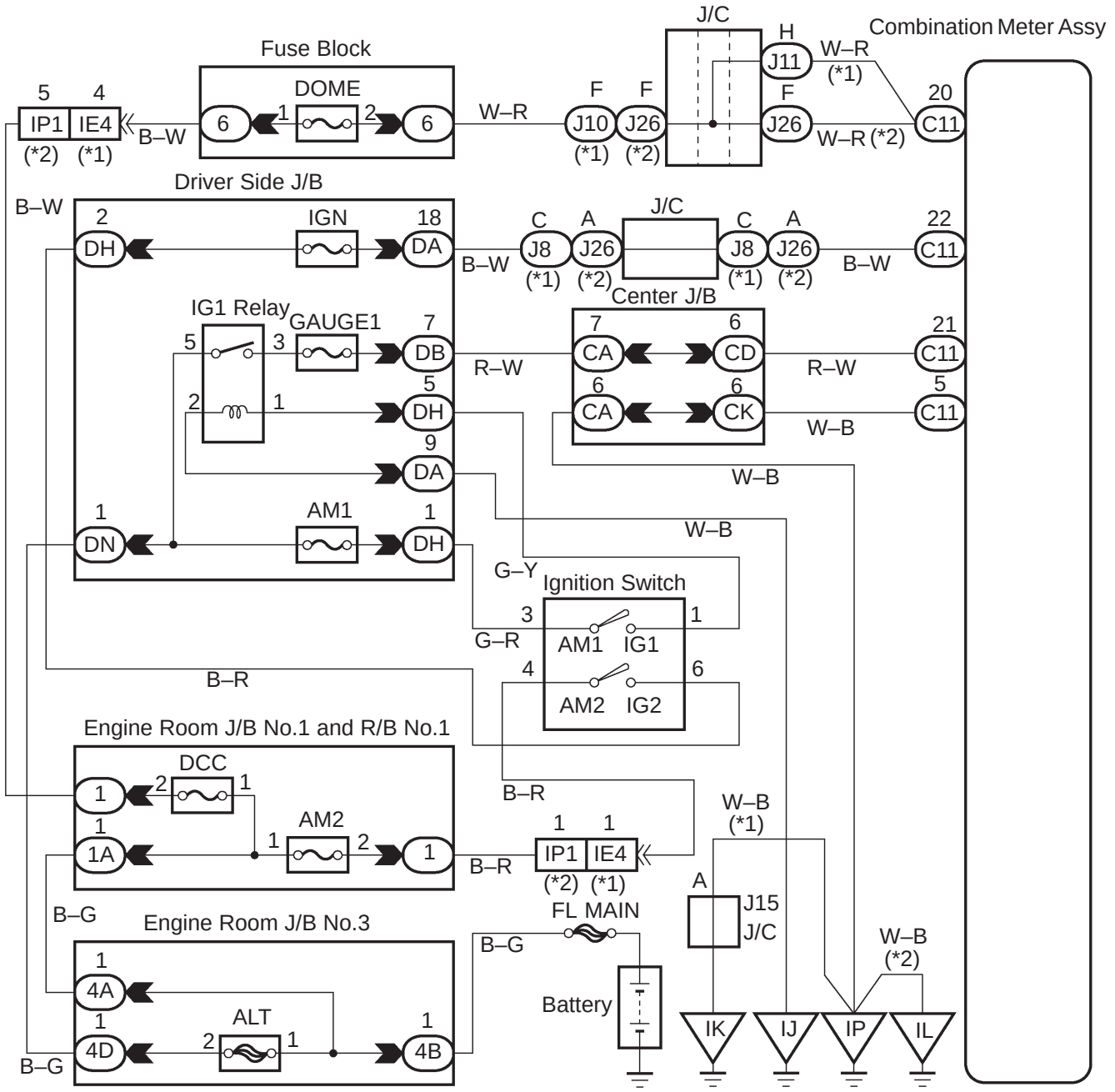
Problem Symptom	**Gauge**	☐ Malfunction in speedometer
		☐ Malfunction in tachometer
		☐ Malfunction in water temperature receiver gauge
		☐ Malfunction in fuel receiver gauge
	Others	☐ Entire combination meter does not operate
		☐ Buzzer does not sound
		☐ Seat belt warning lamp for driver's seat does not come on
		☐ Seat belt warning lamp for front passenger's seat does not come on
		☐ The ambient temperature is not displayed

ENTIRE COMBINATION METER DOES NOT OPERATE

WIRING DIAGRAM



Gasoline Engine Type:



INSPECTION PROCEDURE

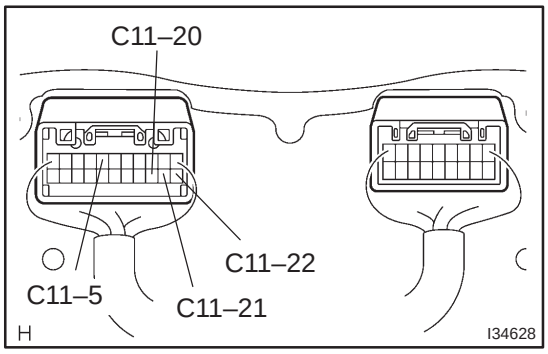
1	INSPECT FUSE(GAUGE2, ECU–B)

(a) Check continuity in the GAUGE, DOME fuse.

NG → **REPLACE FUSE**

OK

2	CHECK COMBINATION METER ASSY(POWER SOURCE AND GROUND CIRCUIT)



(a) Remove the combination meter assy.
(b) Check continuity.
  (1) Check continuity between the terminal C11–5 of the combination meter connector and the body ground.

  Standard: Continuity.
(c) Check the voltage.
  (1) Measure the voltage between the terminal C11–20 of the combination meter connector and the body ground.

  Standard voltage: 10 – 14 V
  (2) Turn the ignition switch to ON.
  (3) Measure the voltage between the terminal C11–21, 22 of the combination meter connector and the body ground.

  Standard voltage: 10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE COMBINATION METER ASSY

COMBINATION METER

HOW TO PROCEED WITH TROUBLESHOOTING

056Q7–04

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–1498)

3	Check multiplex communication system (See page 05–1654)

(a) Check the DTC output.

- DTC outputs (Proceed to "BODY MULTIPLEX COMMUNICATION SYSTEM)
- DTC does not output (Go to step 4)

4	Problem Symptom Confirmation (See page 05–1509)

5	Circuit Inspection (See page 05–1510 – 05–1522)

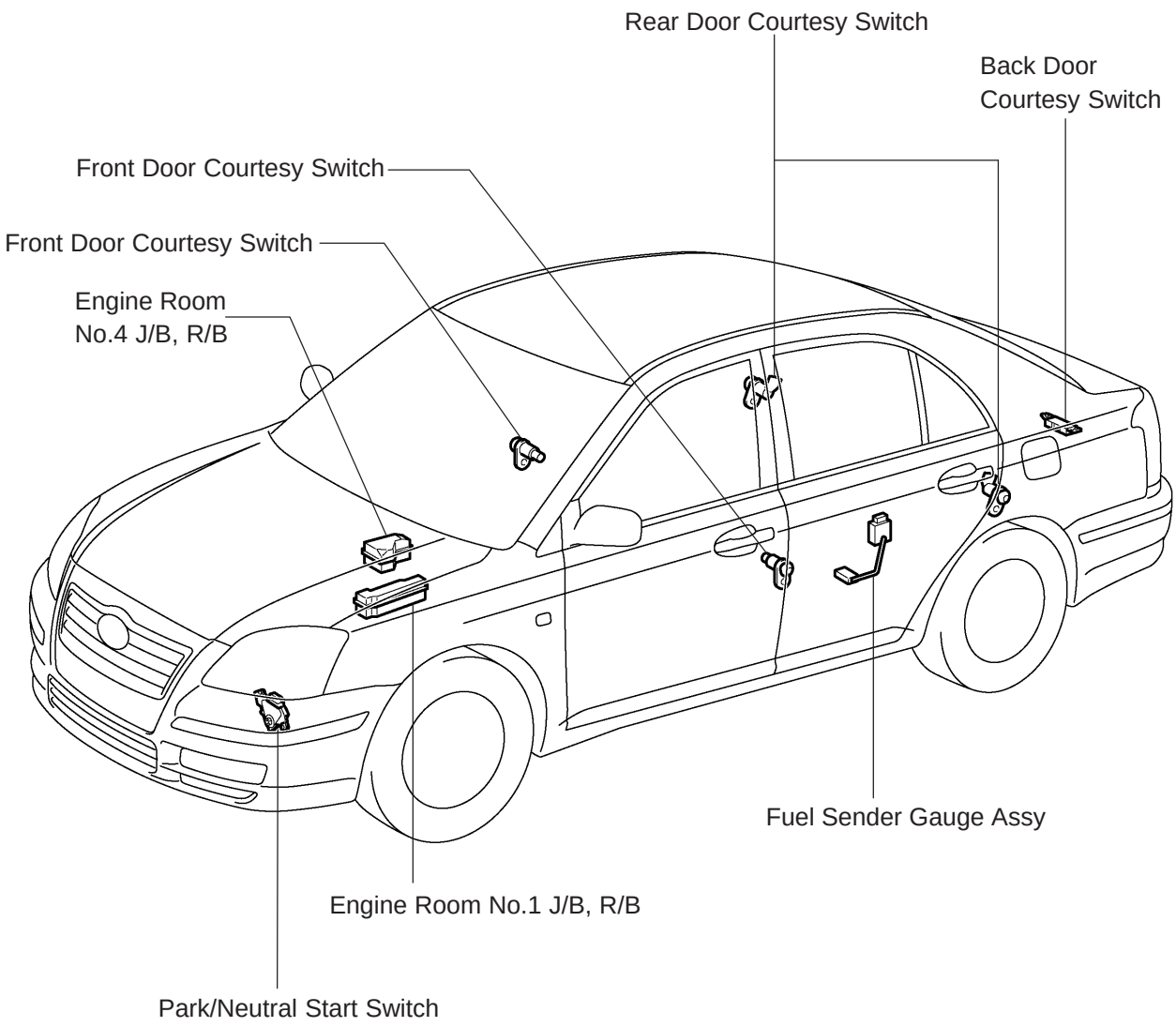
6	Repair or Replace

7	Confirmation Test

8	End

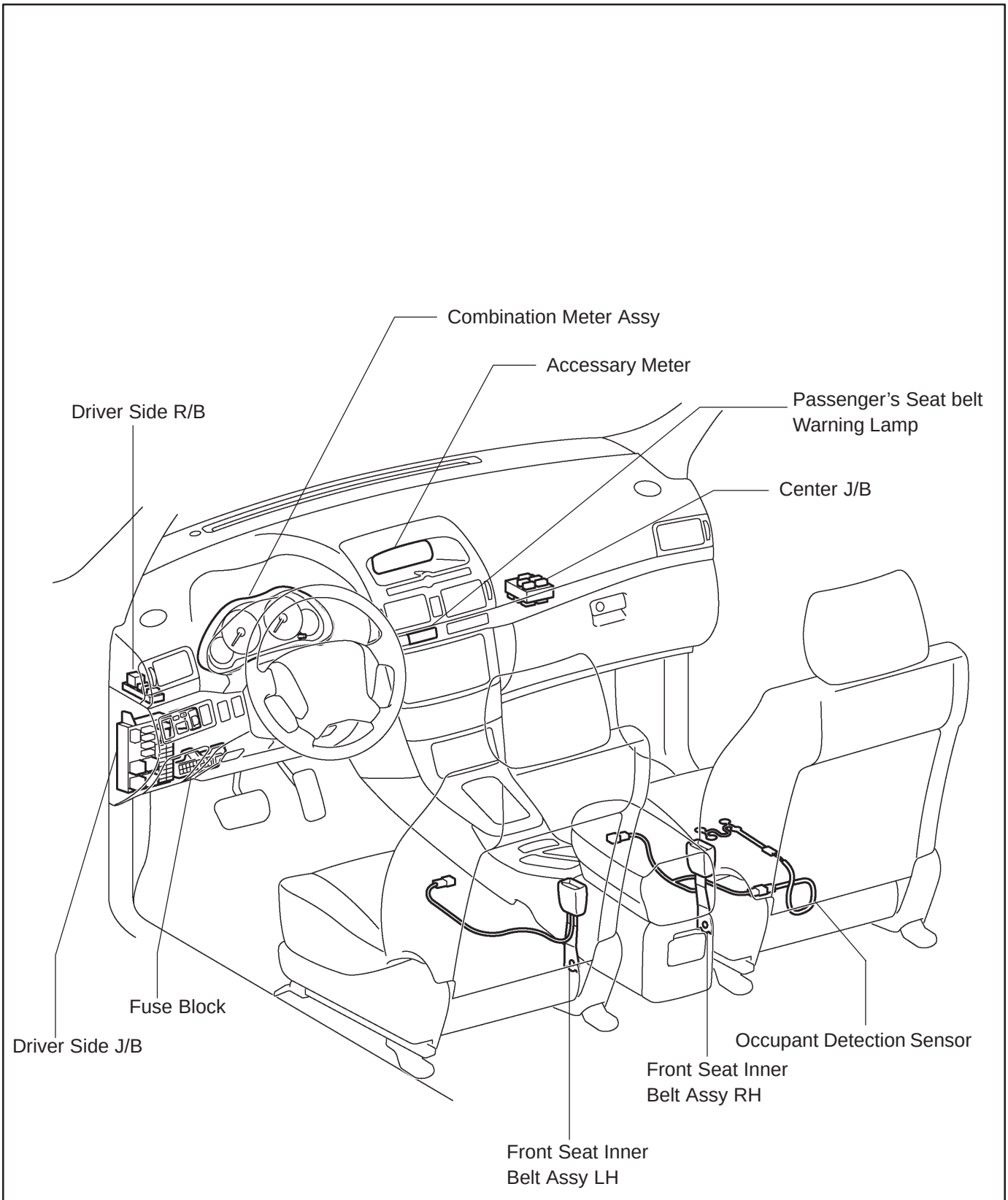
056QA–03

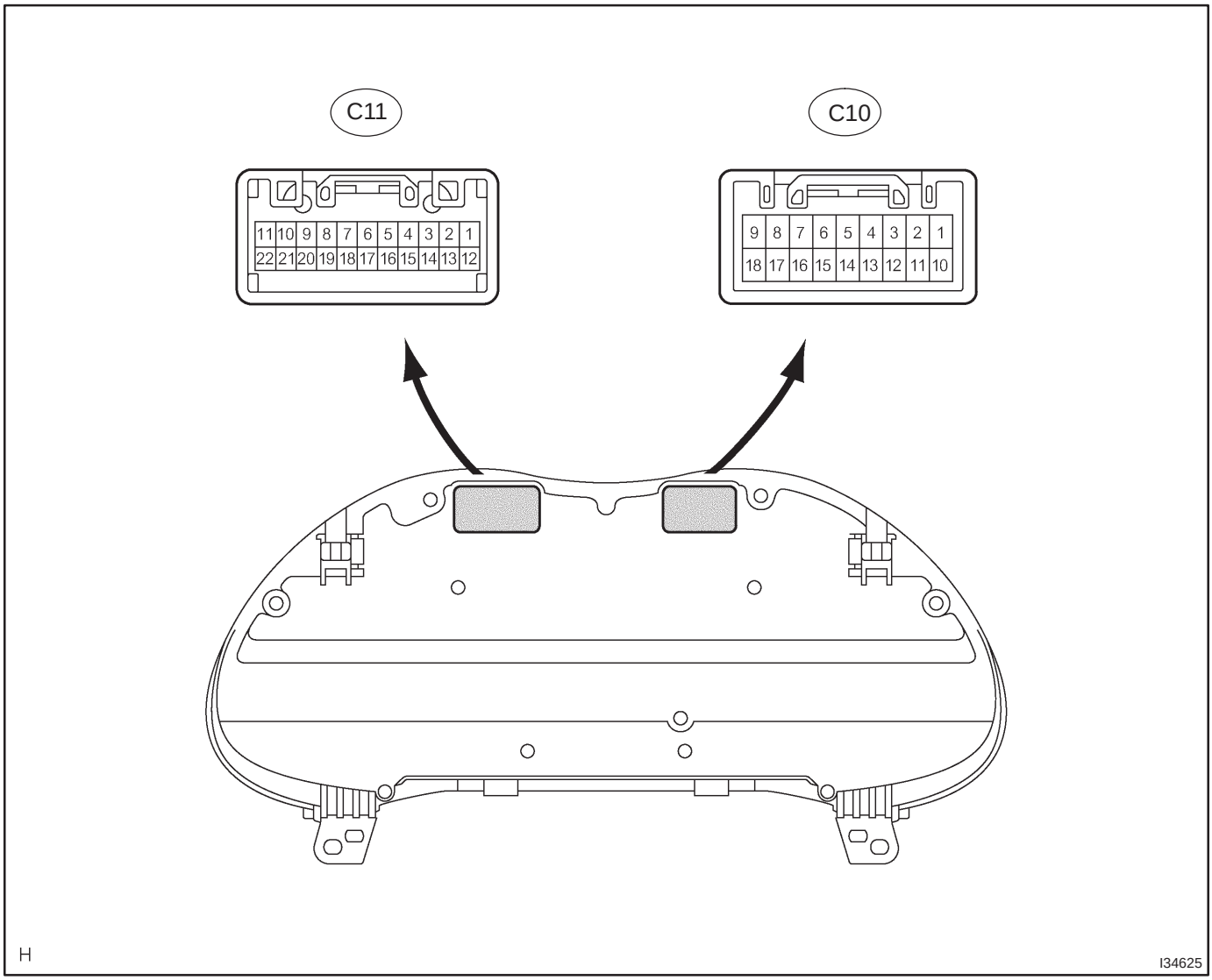
LOCATION

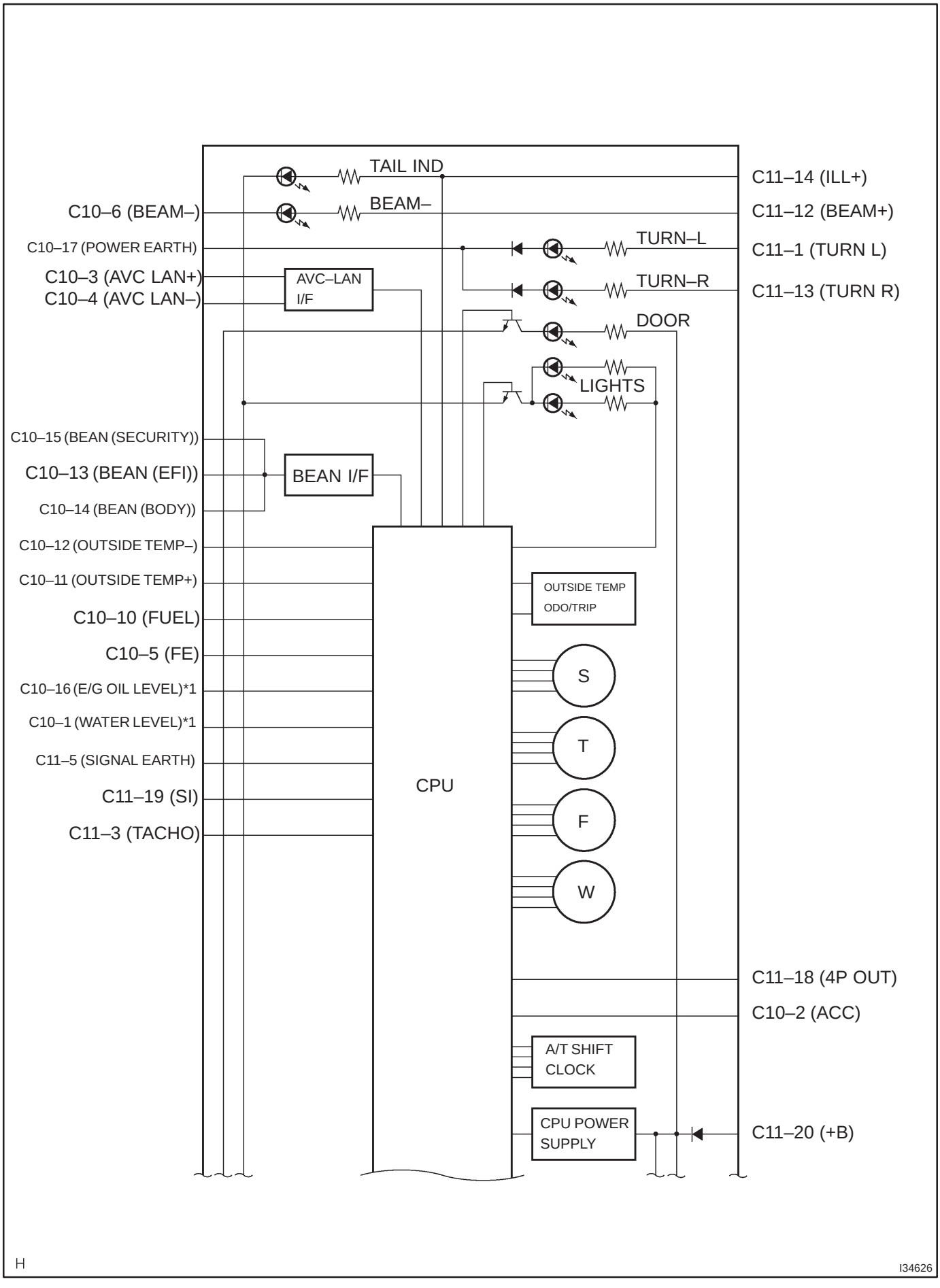


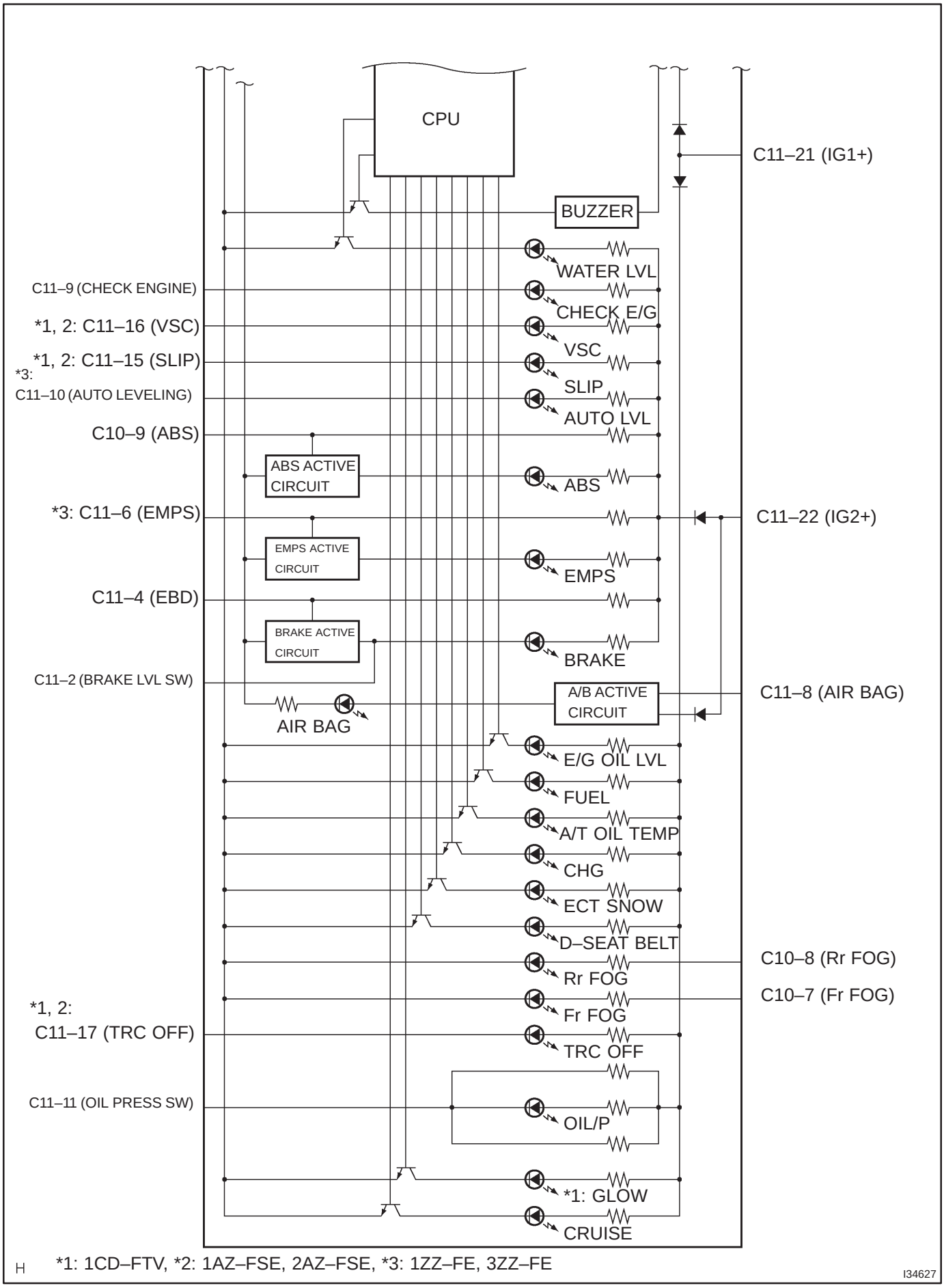
H

I34623


Combination Meter Assy
Accessary Meter
Passenger's Seat belt Warning Lamp
Driver Side R/B
Center J/B
Fuse Block
Driver Side J/B
Occupant Detection Sensor
Front Seat Inner Belt Assy RH
Front Seat Inner Belt Assy LH
H
I34624


C11
C10
11 10 9 8 7 6 5 4 3 2 1
22 21 20 19 18 17 16 15 14 13 12
9 8 7 6 5 4 3 2 1
18 17 16 15 14 13 12 11 10
H
I34625


TAIL IND
BEAM–
TURN–L
TURN–R
DOOR
LIGHTS
C10–6 (BEAM–)
C10–17 (POWER EARTH)
C10–3 (AVC LAN+)
C10–4 (AVC LAN–)
AVC–LAN I/F
C10–15 (BEAN (SECURITY))
C10–13 (BEAN (EFI))
C10–14 (BEAN (BODY))
BEAN I/F
C10–12 (OUTSIDE TEMP–)
C10–11 (OUTSIDE TEMP+)
C10–10 (FUEL)
C10–5 (FE)
C10–16 (E/G OIL LEVEL)*1
C10–1 (WATER LEVEL)*1
C11–5 (SIGNAL EARTH)
C11–19 (SI)
C11–3 (TACHO)
CPU
OUTSIDE TEMP
ODO/TRIP
S
T
F
W
A/T SHIFT
CLOCK
CPU POWER
SUPPLY
C11–14 (ILL+)
C11–12 (BEAM+)
C11–1 (TURN L)
C11–13 (TURN R)
C11–18 (4P OUT)
C10–2 (ACC)
C11–20 (+B)
H
I34626

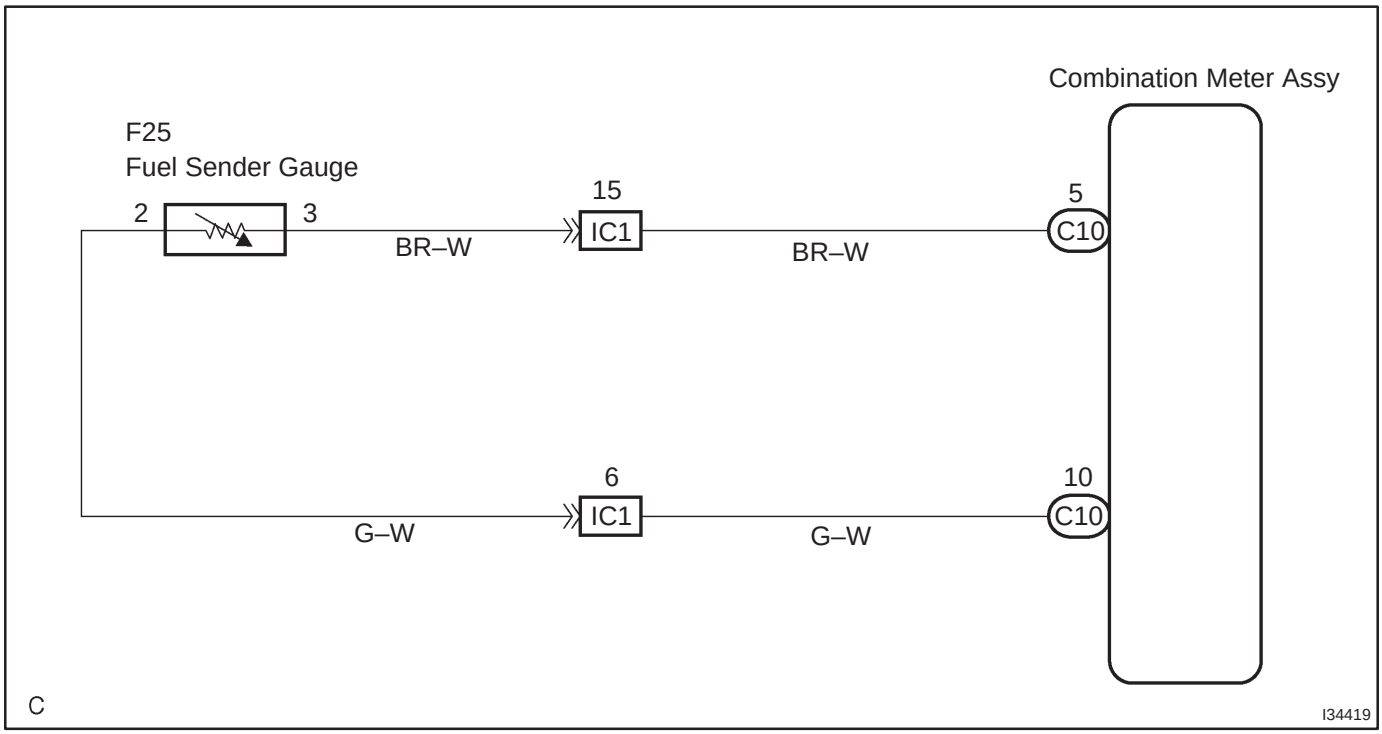

CPU
C11–21 (IG1+)
BUZZER
WATER LVL
C11–9 (CHECK ENGINE)
CHECK E/G
*1, 2: C11–16 (VSC)
VSC
*1, 2: C11–15 (SLIP)
SLIP
*3:
C11–10 (AUTO LEVELING)
AUTO LVL
C10–9 (ABS)
ABS ACTIVE CIRCUIT
ABS
*3: C11–6 (EMPS)
C11–22 (IG2+)
EMPS ACTIVE CIRCUIT
EMPS
C11–4 (EBD)
BRAKE ACTIVE CIRCUIT
BRAKE
C11–2 (BRAKE LVL SW)
A/B ACTIVE CIRCUIT
C11–8 (AIR BAG)
AIR BAG
E/G OIL LVL
FUEL
A/T OIL TEMP
CHG
ECT SNOW
D–SEAT BELT
C10–8 (Rr FOG)
Rr FOG
C10–7 (Fr FOG)
Fr FOG
*1, 2:
C11–17 (TRC OFF)
TRC OFF
C11–11 (OIL PRESS SW)
OIL/P
*1: GLOW
CRUISE
H
*1: 1CD–FTV, *2: 1AZ–FSE, 2AZ–FSE, *3: 1ZZ–FE, 3ZZ–FE
I34627

Terminal No.		Wire harness side
C10	1	Fuse Filter Warning Switch (*1)
	2	RAD No.1 Fuse
	3	Multi Display
	4	Multi Display
	5	Fuel Sender Gauge
	6	GND
	7	Front Fog Light Relay
	8	Rear Fog Light Relay
	9	Skid Control ECU with Actuator
	10	Fuel Sensor Gauge
	11	Ambient Temp. Sensor
	12	Ambient Temp. Sensor
	13	Engine ECU
	14	Integration Relay
	15	Security ECU
	16	Engine Oil Level Sensor
	17	GND
	18	–
C11	1	Turn Signal Flasher Relay
	2	Brake Fluid Level Warning Switch
	3	Engine ECU
	4	Skid Control ECU with Actuator
	5	GND
	6	EMPS ECU
	7	–
	8	Airbag Sensor Assembly
	9	Engine ECU
	10	Headlight Beam Level Control ECU
	11	Oil Pressure Switch
	12	H–HI RH Fuse/H–LP RH Fuse
	13	Turn Signal Flasher Relay
	14	TAIL Fuse
	15	Skid Control ECU with Actuator
	16	Skid Control ECU with Actuator
	17	Skid Control ECU with Actuator
	18	4P OUT (Other Parts)
	19	Skid Control ECU with Actuator
	20	DOME Fuse
	21	GAUGE1 Fuse
	22	IGN Fuse

*1: 1CD–FTV

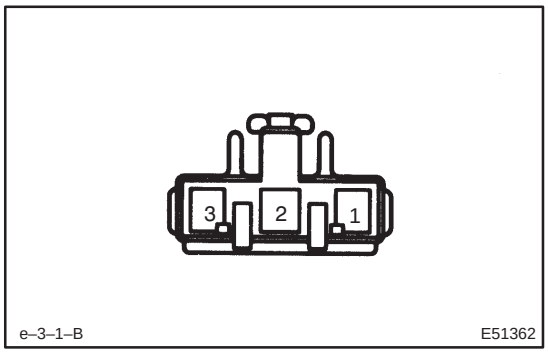
MALFUNCTION IN FUEL RECEIVER GAUGE

WIRING DIAGRAM



INSPECTION PROCEDURE

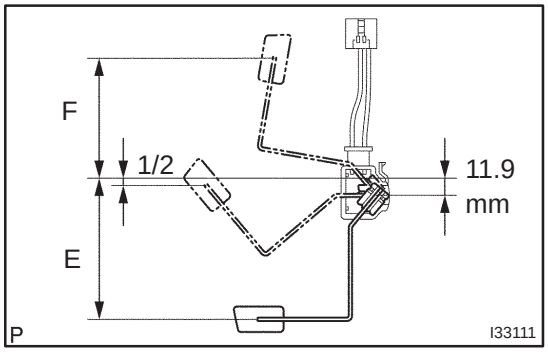
1	INSPECT FUEL SENDER GAUGE ASSY



(a) Remove the fuel sender gauge assy.
(b) Check that the float position is between E and F and measure resistance between the terminal 2 and 3 of the connector.
(c) Check that the resistance value changes continuously.

Standard:

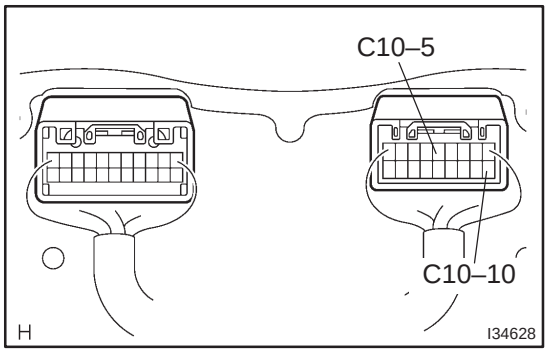
Float level	Float position mm (in.)	Resistance (Ω)
F	88.6 (3.49) ± 3 (0.12)	4.0 ± 1.5
1/2	6.4 (0.25) ± 3 (0.12)	50.5 ± 2.6
E	102.9 (4.05) ± 3 (0.12)	110.0 ± 3.0



NG → **REPLACE FUEL SENDER GAUGE ASSY**

OK

2	CHECK HARNESS AND CONNECTOR(BETWEEN FUEL SENDER GAUGE ASSY AND COMBINATION METER)



(a) Remove the combination assy and fuel sender gauge.
(b) Check the continuity between the terminal 3 of the fuel sender gauge and the terminal C10–5 of the combination meter assy.
Standard: Continuity.
(c) Check continuity between the terminal 2 of the fuel sender gauge and the terminal C10–10 of the combination meter assy.
Standard: Continuity.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

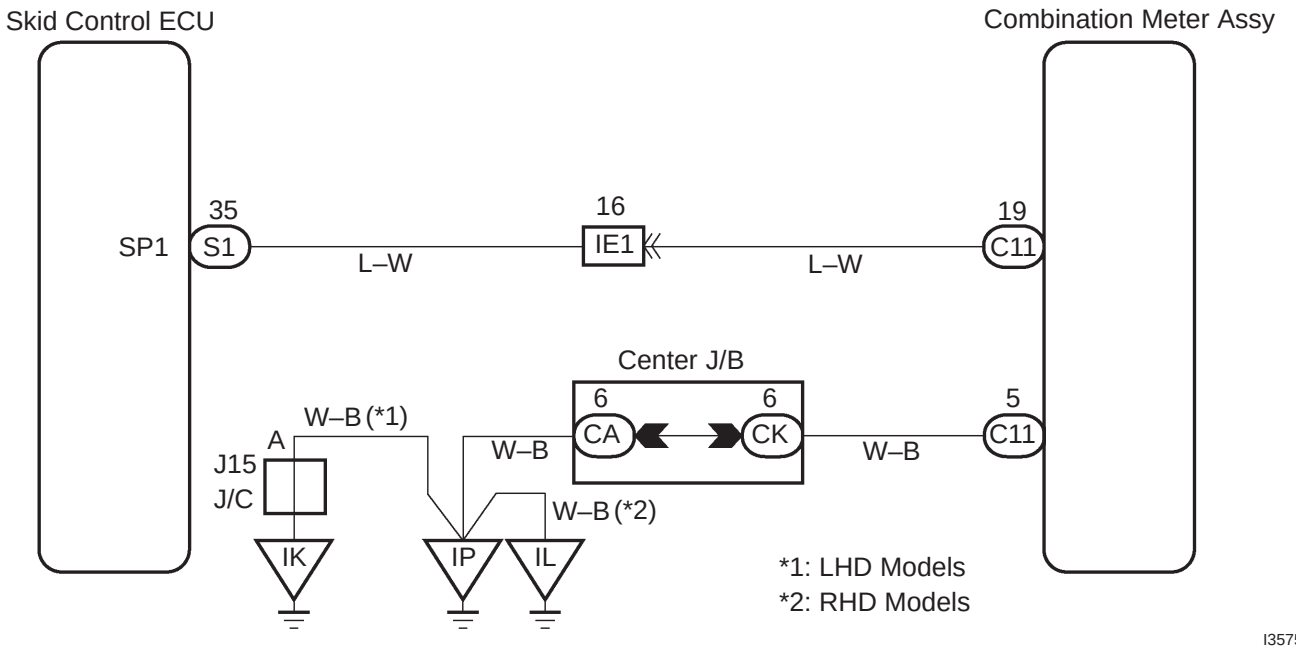
OK

CHECK AND REPLACE COMBINATION METER ASSY

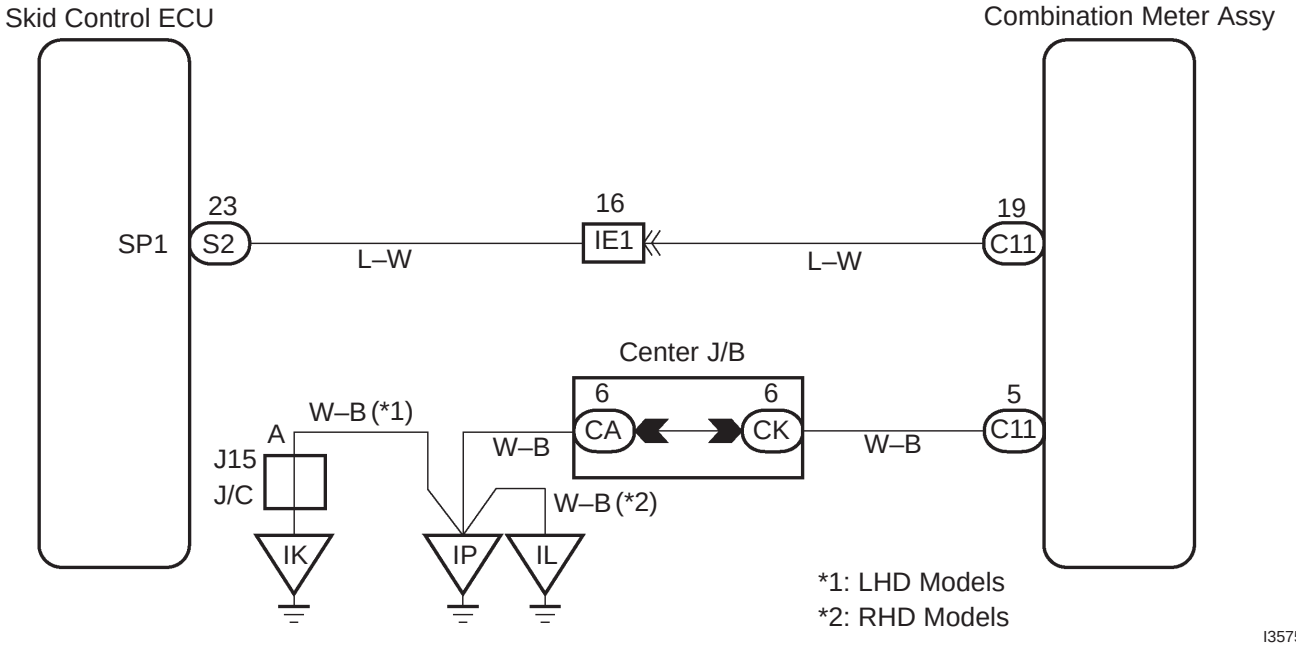
MALFUNCTION IN SPEEDOMETER

WIRING DIAGRAM

w/ VSC:



w/o VSC:



INSPECTION PROCEDURE

1	READ VALUE OF HAND–HELD TESTER(SKID CONTROL ECU)

(a) Operate the hand–held tester according to the steps on the display and select ”DATA LIST”.

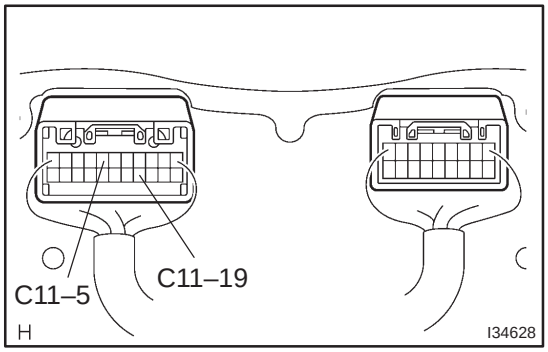
ALL(ECM):

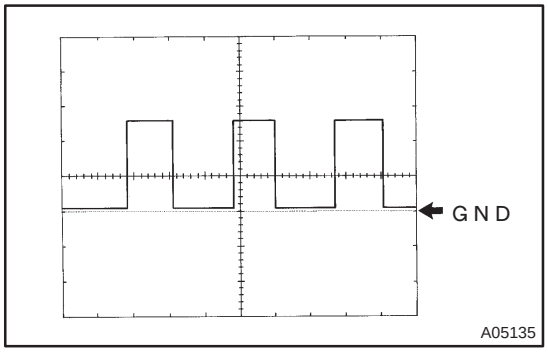
Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
VEHICLE SPEED	Vehicle speed / Min.: 0 km/h, Max.: 255 km/h	Almost same at the meter speed (When driving)	–

NG → **GO TO BRAKE SYSTEM**

OK

2	INSPECT COMBINATION METER ASSY





(REFERENCE) INSPECTION USING OSCILLOSCOPE

(a) Check the input signal waveform.
  (1) Remove the combination meter assy.
  (2) Connect the oscilloscope to the terminal C11–19 and C11–5 of the combination meter assy.
  (3) Start the engine.
  (4) Check the signal waveform.

Item	Contents
Tool setting	5 V/ DIV, 20 ms/ DIV
Vehicle condition	Driving at approx. 20Km/h

HINT:

As the vehicle speed becomes higher, the cycle of the signal waveform becomes shorter.

OK → **CHECK AND REPLACE COMBINATION METER ASSY**

NG

3	CHECK HARNESS AND CONNECTOR(BETWEEN SKID CONTROL ECU AND COMBINATION METER ASSY)

(a) Disconnect the connector from the combination meter assy.
(b) Disconnect the connector from the skid control ECU.
(c) Check continuity between the terminal S1–35 (SP1)/S2–23 (SP1) of the skid control ECU and the terminal C11–19 of the combination meter connector (See Page 05–770).
Standard: Continuity.

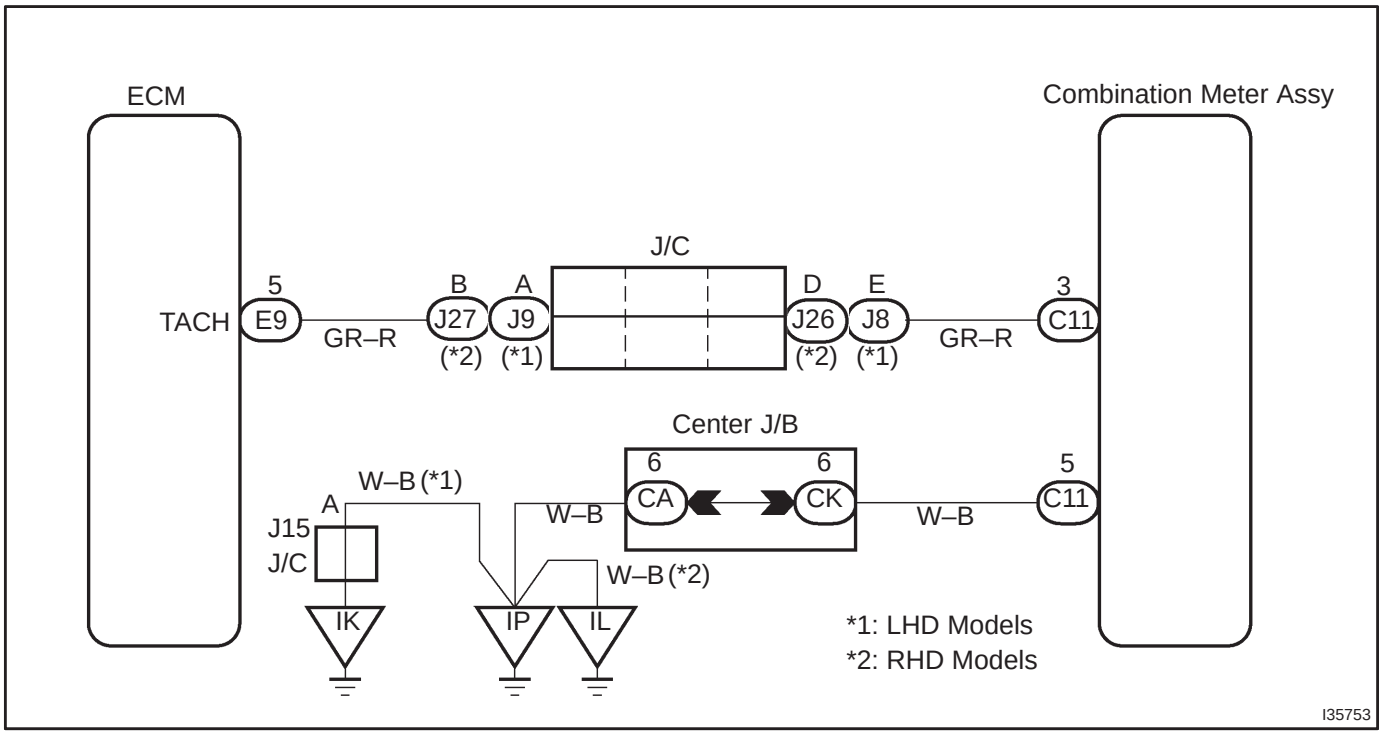
OK → **CHECK AND REPLACE SKID CONTROL ECU**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

MALFUNCTION IN TACHOMETER

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE OF HAND–HELD TESTER(ECM)

(a) Operate the hand–held tester according to the steps on the display and select ”DATE LIST”.

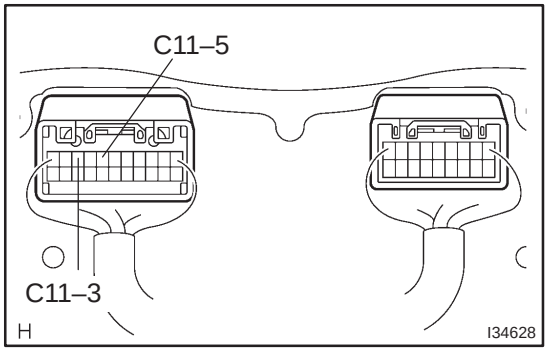
ALL(ECM):

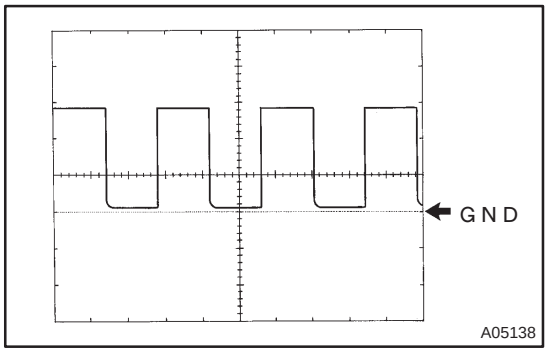
Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
ENGINE SPEED	Engine speed / Min.: 0 rpm, Max.: 16,383 rpm	Almost same at the meter rpm (When engine is running)	–

NG → **GO TO ENGINE CONTROL SYSTEM**

OK

2	INSPECT COMBINATION METER ASSY





(REFERENCE) INSPECTION USING OSCILLOSCOPE

(a) Check the input signal waveform.

(1) Remove the combination meter assy.

(2) Connect the oscilloscope to the terminals C11–3 and C11–5 of the combination meter connector.

(3) Start the engine.

(4) Check the signal waveform.

Item	Contents
Tool setting	5 V/ DIV, 10 ms/ DIV
Vehicle condition	Engine idle speed

OK → **CHECK AND REPLACE COMBINATION METER ASSY**

NG

3	CHECK HARNESS AND CONNECTOR(BETWEEN ECM AND COMBINATION METER ASSY)

(a) Disconnect the connector from the combination meter assy.

(b) Disconnect the connector from the ECM.

(c) Check continuity between the terminal E9–5 (TACH) of ECM and the terminal C11–3 of the combination meter connector (See Page 05–1506).

Standard: Continuity.

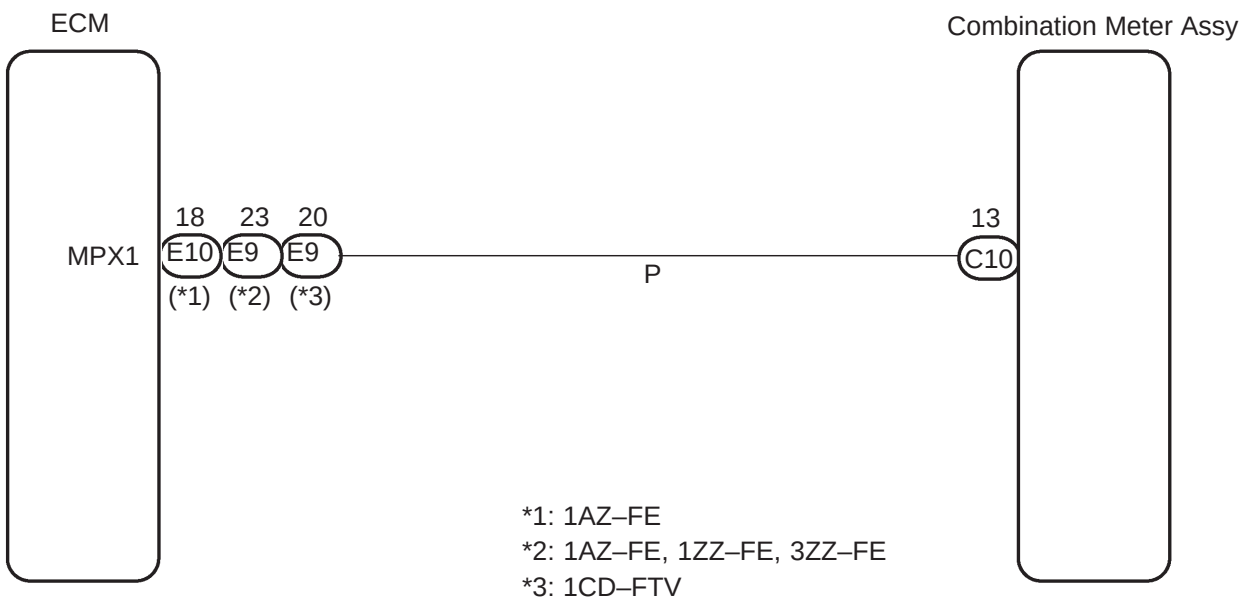
OK → **CHECK AND REPLACE ECM**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

MALFUNCTION IN WATER TEMPERATURE RECEIVER GAUGE

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The ECM sends information on the water temperature sensor to the meter through the Bean. If there is on open or short circuit in the water temperature sensor circuit, the ECM outputs DTCs. Perform troubleshooting with the ”Engine system”.

1	READ VALUE OF HAND–HELD TESTER

(a) Operate the hand–held tester according to the steps on the display and select ”DATA LIST”.

ALL(ECM):

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
COOLANT TEMP	Coolant Temperature / Min.: –40°C, Max.: 140°C	After warming up: 80 – 95˚C (176 – 203˚F)	If the value is ”–40 °C” or ”140 °C”, sensor circuit is open or shorted.

NG → **GO TO ENGINE CONTROL SYSTEM**

OK

2	CHECK THAT MALFUNCTION DISAPPEARS A KNOWN GOOD COMBINATION METER IS INSTALLED

NG → **CHECK AND REPLACE ECM**

OK

CHECK AND REPLACE COMBINATION METER ASSY

056Q9–02

PRE–CHECK

1. DATA LIST

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten work time.

(a) Warm up the engine.
(b) Turn the ignition switch to OFF.
(c) Connect the hand–held tester to DLC3.
(d) Turn the ignition switch to ON.
(e) Operate the hand–held tester according to the steps on the display and select ”DATA LIST”.

ALL(ECM):

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
VEHICLE SPEED	Vehicle speed / Min.: 0 km/h, Max.: 255 km/h	Almost same at the meter speed (When driving)	–
ENGINE SPEED	Engine speed / Min.: 0 rpm, Max.: 16,383 rpm	Almost same at the meter rpm (When engine is running)	–
COOLANT TEMP	Coolant Temperature / Min.: –40°C, Max.: 140°C	After warming up: 80 – 95°C (176 – 203°F)	If the value is ”–40 °C” or ”140 °C”, sensor circuit is open or shorted.

2. SET BUZZER OFF MODE (SEAT BELT)

(a) Within 6 seconds after turning ignition switch to the ON position, depress the ODO/TRIP switch for 10 seconds or more, and fasten the driver’s seat belt to enter the buzzer ON/OFF mode.

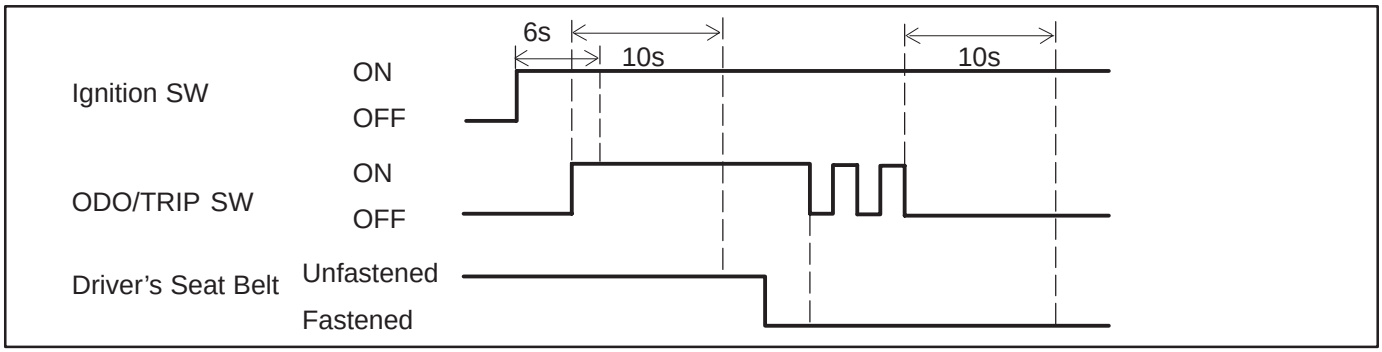
HINT:

This procedure can be performed when the display shows the ”ODO” mode.

(b) When entering the buzzer ON/OFF mode, current buzzer condition is shown on the display. According to the display, select the buzzer OFF mode by operating the ODO/TRIP switch.

HINT:

- After entering the buzzer ON/OFF mode, when the ODO/TRIP switch is not operated for 10 seconds or more, the display returns to the normal mode.
- When the negative (–) terminal cable is disconnected from the battery, the buzzer setting returns to buzzer ON mode.



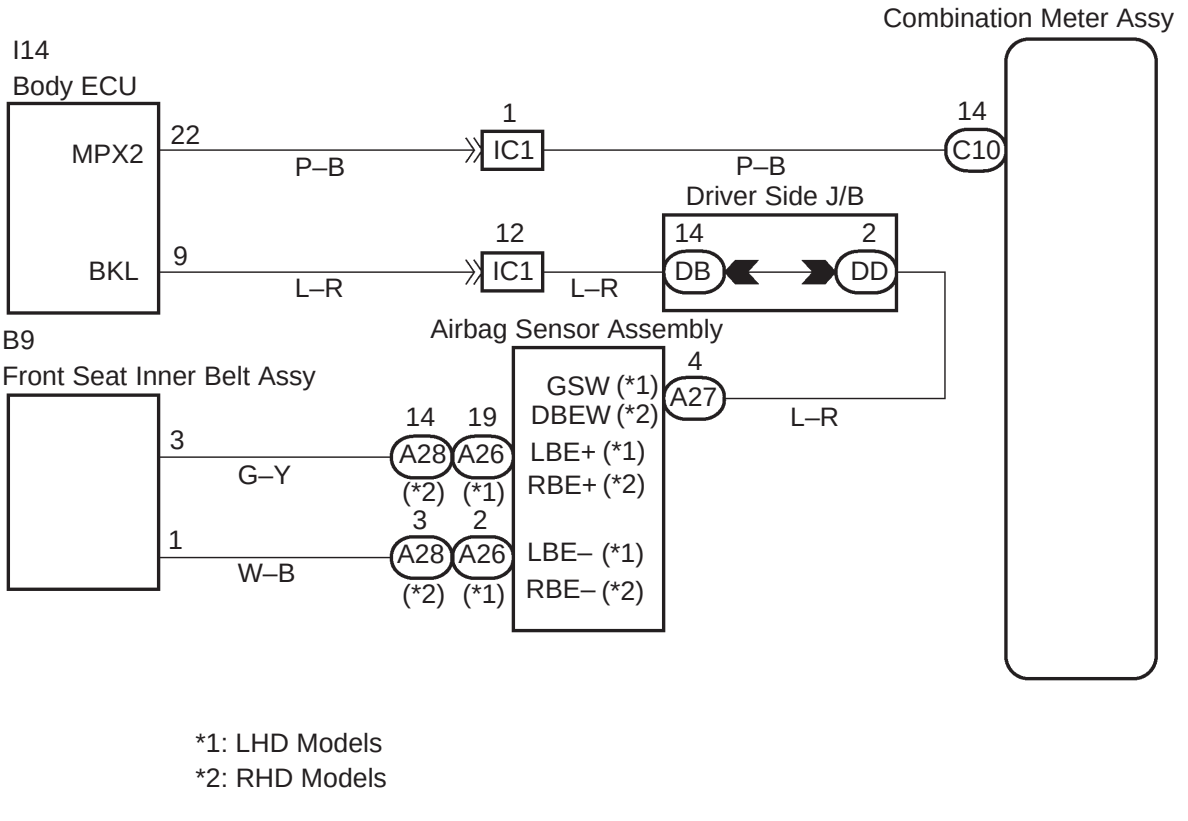
056QC–04

PROBLEM SYMPTOMS TABLE

Chart No.	Symptom	See page
1	Malfunction in speedometer	05–1510
2	Malfunction in tachometer	05–1513
3	Malfunction in water temperature receiver gauge	05–1515
4	Malfunction in fuel receiver gauge	05–1517
5	Entire combination meter does not operate	05–1519
6	Seat belt warning lamp for driver's seat does not operate	05–1522
7	Seat belt warning lamp for front passenger's seat does not flash	05–1524
8	The ambient temperature does not display	05–1527
9	Warning buzzer does not sound	05–1530

SEAT BELT WARNING LAMP FOR DRIVER'S SEAT DOES NOT OPERATE

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE OF HAND–HELD TESTER

(a) Operate the hand–held tester according to the steps on the display and select "DATA LIST".

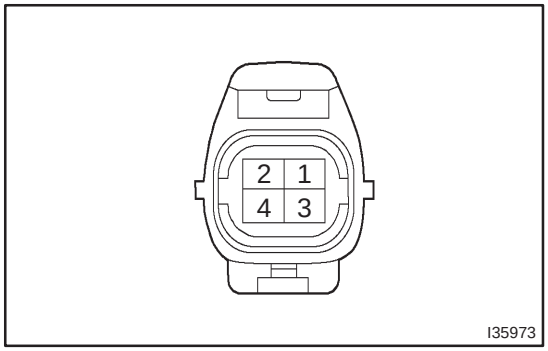
BGW(Body):

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
D SEAT BUCKL SW	Driver seat belt buckle switch ON / OFF	ON: Fasten the driver seat belt OFF: Unfasten the driver seat belt	–

OK → **CHECK AND REPLACE COMBINATION METER ASSY**

NG

2	CHECK FRONT SEAT INNER BELT ASSY



(a) Check resistance.
  (1) Disconnect the connector from front seat inner belt assy.
  (2) Check resistance between the terminal 3 and 1 of the front seat inner belt assy.

Standard:

Condition	Specified Condition
Seat belt is fastened	No continuity
Seat belt is unfastened	Continuity

NG → **REPLACE FRONT SEAT INNER BELT ASSY**

OK

3	CHECK HARNESS OR CONNECTOR(BODY ECU–FRONT SEAT INNER BELT ASSY)

(a) Check continuity between the terminal I14–9 of body ECU and the terminal A27–4 of airbag sensor assembly.
(b) Check continuity between the terminal A28–14 (A26–19) / A28–3 (A26–2)of airbag sensor assembly and the terminal B9–3 / B9–1 of front seat inner belt assy.
  ( ): LHD Models
  Standard: Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK THAT MALFUNCTION DISAPPEARS A KNOWN GOOD COMBINATION METER IS INSTALLED

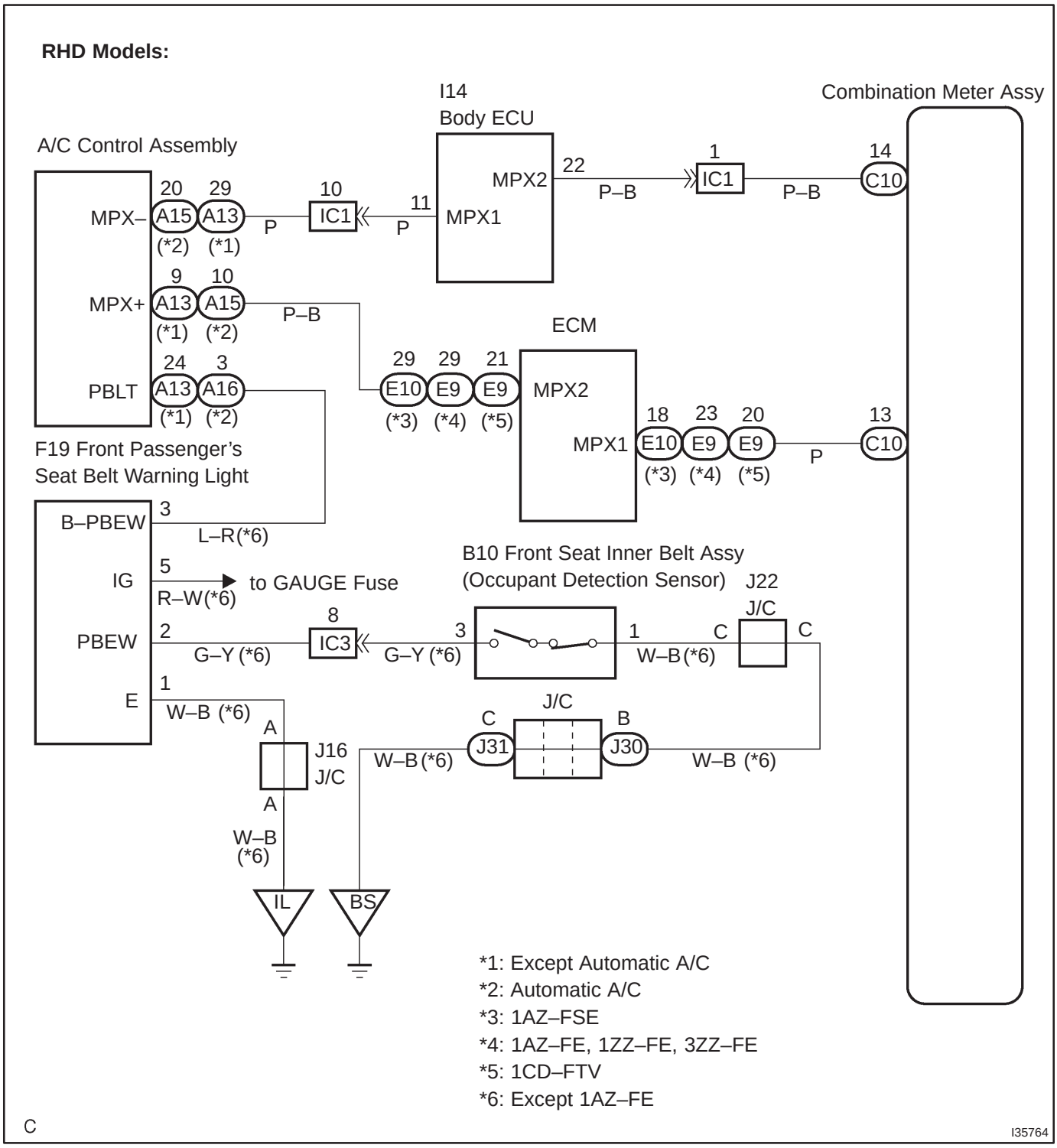
NG → **CHECK AND REPLACE BODY ECU**

OK

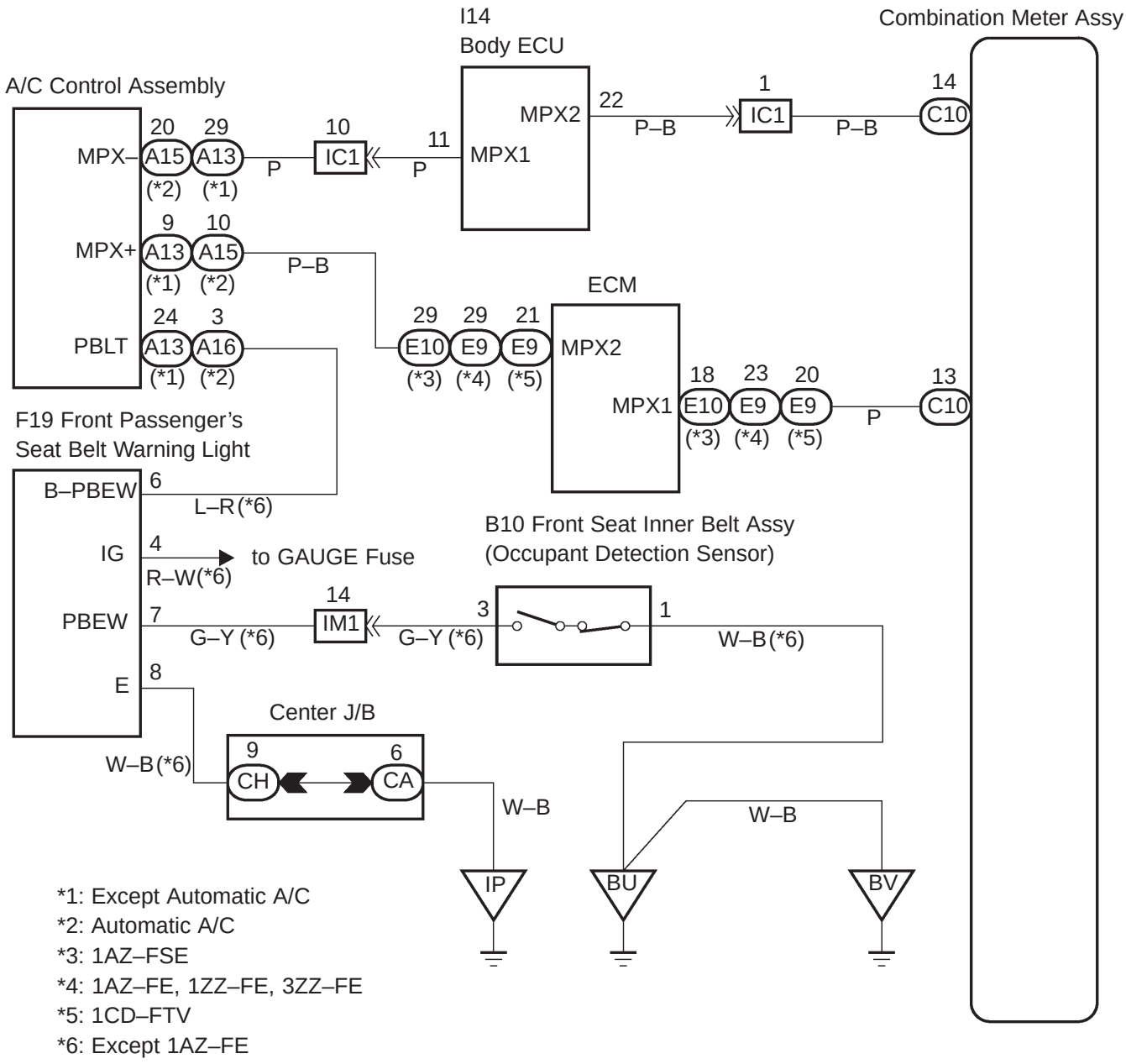
CHECK AND REPLACE COMBINATION METER ASSY

SEAT BELT WARNING LAMP FOR FRONT PASSENGER'S SEAT DOES NOT FLASH

WIRING DIAGRAM

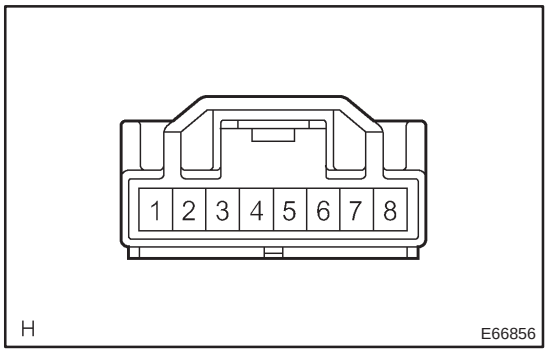


LHD Models:


I14
Body ECU
Combination Meter Assy
A/C Control Assembly
MPX2
MPX1
22
1
14
IC1
C10
P–B
P–B
MPX–
20
29
10
11
A15
A13
IC1
P
P
(*2)
(*1)
MPX+
9
10
A13
A15
P–B
(*1)
(*2)
ECM
PBLT
24
3
29
29
21
A13
A16
E10
E9
E9
MPX2
(*1)
(*2)
(*3)
(*4)
(*5)
MPX1
18
23
20
13
E10
E9
E9
C10
P
(*3)
(*4)
(*5)
F19 Front Passenger's
Seat Belt Warning Light
B10 Front Seat Inner Belt Assy
(Occupant Detection Sensor)
B–PBEW
6
L–R (*6)
IG
4
R–W (*6)
to GAUGE Fuse
PBEW
7
14
3
1
G–Y (*6)
IM1
G–Y (*6)
W–B (*6)
E
8
Center J/B
W–B (*6)
9
6
CH
CA
W–B
W–B
IP
BU
BV
*1: Except Automatic A/C
*2: Automatic A/C
*3: 1AZ–FSE
*4: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*5: 1CD–FTV
*6: Except 1AZ–FE
C
I35765

INSPECTION PROCEDURE

1	CHECK FRONT SEAT INNER BELT ASSY



(a) Check resistance.
  (1) Disconnect the connector from front seat inner belt assy.
  (2) Check resistance between the terminal 3 and 1 of the front seat inner belt assy.

Standard:

Condition	Specified Condition
Seat belt is fastened	No continuity
Seat belt is unfastened	Continuity

NG → **REPLACE FRONT SEAT INNER BELT ASSY**

OK

2	CHECK HARNESS OR CONNECTOR(A/C CONTROL ASSEMBLY–FRONT SEAT INNER BELT ASSY)

(a) Check continuity between the terminal A13–24 / A16–3 of A/C control assembly and the terminal F19–3 (6) of front passenger's seat belt warning light.
  ( ): LHD models

(b) Check continuity between the terminal F19–2 (F19–7)of front passenger's seat belt warning light and the terminal B10–3 of front seat inner belt assy.
  ( ): LHD models
  Standard: Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK THAT MALFUNCTION DISAPPEARS A KNOWN GOOD COMBINATION METER IS INSTALLED

NG → **CHECK AND REPLACE AIR CONDITIONER CONTROL ASSEMBLY**

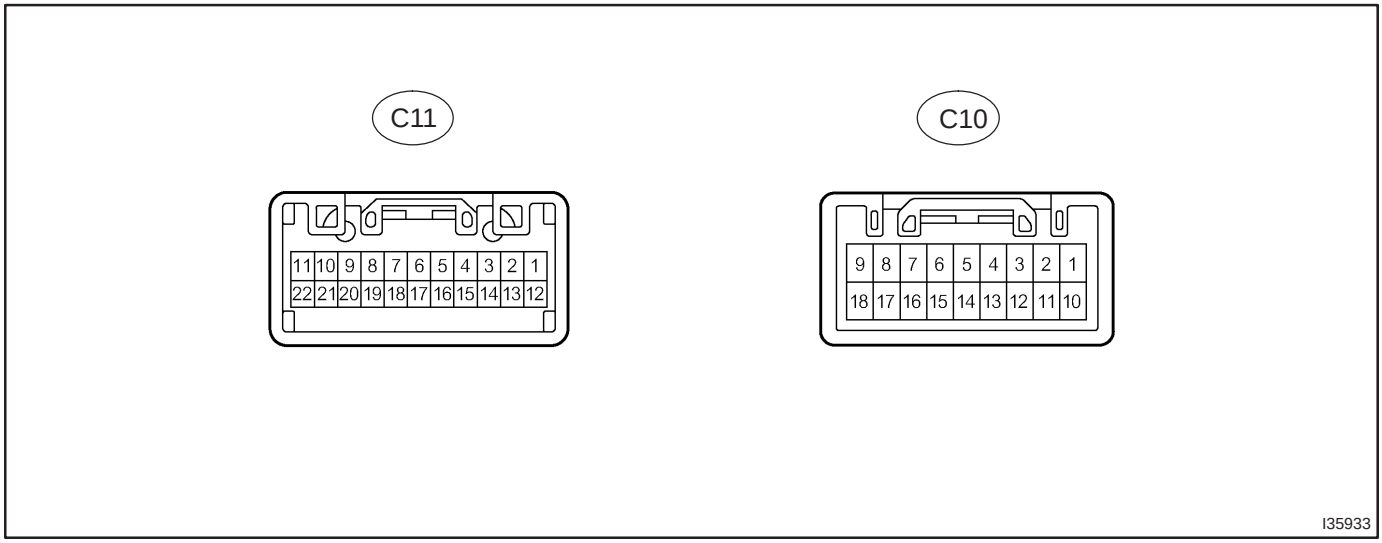
OK

CHECK AND REPLACE COMBINATION METER ASSY

05C4G–01

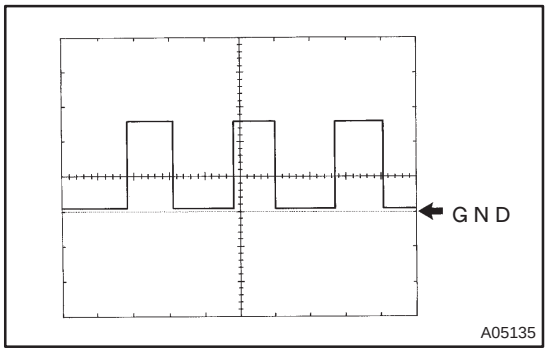
TERMINALS OF ECU

COMBINATION METER ASSY



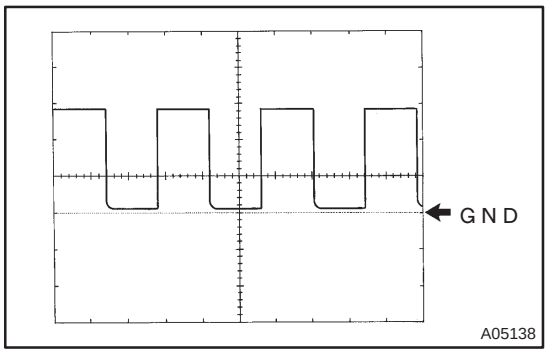
Terminal No.	Wiring color	Condition	Specified condition
C11–1 – Body ground (TURN L – Body ground)	G–W – Body ground	Turn signal LH indicator light OFF → ON	Below 1 V → 10 to 14 V
C11–2 – Body ground (BRAKE LVL SW – Body ground)	R–W – Body ground	Brake fluid level warning switch ON	Below 1 V
C11–3 – Body ground (TACHO – Body ground)	GR–R – Body ground	Ignition switch OFF → ON, Engine idle speed	Puls generation (*2)
C11–5 – Body ground (SIGNAL EARTH – Body ground)	W–B – Body ground	Constant	Continuity
C11–6 – Body ground (EMPS – Body ground)	B–W – Body ground	Ignition switch ON and EMPS Indicator OFF → ON	10 to 14 V → Below 1 V
C11–8 – Body ground (AIRBAG – Body ground)	B–Y – Body ground	Ignition switch ON and AIRBAG Indicator OFF → ON	10 to 14 V → Below 1 V
C11–9 – Body ground (CHECK ENGINE – Body ground)	W – Body ground	Engine running and CHECK ENGINE indicator OFF	9 to 14 V
C11–10 – Body ground (AUTO LEVELING – Body ground)	LG – Body ground	Ignition switch ON and AUTO LEVERING Indicator OFF → ON	10 to 14 V → Below 1 V
C11–11 – Body ground (OIL PRESS SW – Body ground)	Y–B – Body ground	Engine running → Stopped	No continuity → Continuity
C11–12 – Body ground (BEAM+ – Body ground)	R–W (w/HID), R (w/o HID) – Body ground	Headlight OFF → ON	Below 1 V → 10 to 14 V
C11–13 – Body ground (TURN R – Body ground)	G–Y – Body ground	Turn signal RH indicator light OFF → ON	Below 1 V → 10 to 14 V
C11–14 – Body ground (ILL+ – Body ground)	G – Body ground	Combination switch OFF → ON	Below 1 V → 10 to 14 V
C11–15 – Body ground (SLIP – Body ground)	LG – Body ground	Ignition switch ON and SLIP Indicator OFF → ON	10 to 14 V → Below 1 V
C11–16 – Body ground (VSC – Body ground)	W–R – Body ground	Ignition switch ON and VSC Indicator OFF → ON	10 to 14 V → Below 1 V

C11–17 – Body ground (TRC OFF – Body ground)	LG–B – Body ground	Ignition switch ON and TRC OFF Indicator OFF → ON	10 to 14 V → Below 1 V
C1–19 – Body ground (SI – Body ground)	L–W – Body ground	Ignition switch ON and turn the wheel slowly	Puls generation (*1)
C11–20 – Body ground (+B – Body ground)	W–R – Body ground	Any Contents	10 to 14 V
C11–21 – Body ground (IG1+ – Body ground)	R–W – Body ground	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
C11–22 – Body ground (IG2+ – Body ground)	B–W – Body ground	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
C10–1 – Body ground (WATER LEVEL – Body ground)	Y–R – Body ground	Fuel filter warning switch ON	Below 1 V
C10–2 – Body ground (ACC – Body ground)	GR – Body ground	Ignition switch OFF → ACC	Below 1 V → 10 to 14 V
C10–3 – Body ground (AVC LAN+ – Body ground)	G–Y – Body ground	Communication circuit	–
C10–4 – Body ground (AVC LAN– – Body ground)	G – Body ground	Communication circuit	–
C10–5 – Body ground (FE – Body ground)	BR–W – Body ground	Constant	Continuity
C10–6 – Body ground (BEAM– – Body ground)	W–B (DRL) R–W (w/ HID) R– (w/o HID) – Body ground	Headlight ON, Hi–beam indicator OFF → ON	No continuity → Continuity
C10–7 – Body ground (Fr FOG – Body ground)	G – Body ground	Ignition switch ON, Fr fog light indicator ON → OFF	10 to 14 V → Below 1 V
C10–8 – Body ground (Rr FOG – Body ground)	R–W – Body ground	Ignition switch ON, Rr fog light indicator ON → OFF	10 to 14 V → Below 1 V
C10–9 – Body ground (ABS – Body ground)	R–Y – Body ground	Ignition switch ON and ABS Indicator OFF → ON	10 to 14 V → Below 1 V
C10–10 – Body ground (FUEL – Body ground)	G–W – Body ground	Fuel sender gauge is F position → E position	4.0 Ω → 110.0 Ω
C10–11 – Body ground (OUTSIDE TEMP+ – Body ground)	W–R – Body ground	Ignition switch ON	3.31 V (–9°C) 0.8 V (43°C)
C10–12 – Body ground (OUTSIDE TEMP– – Body ground)	W – Body ground	Constant	Continuity
C10–13 – Body ground (BEAN (EFI) – Body ground)	P – Body ground	Communication circuit	–
C10–14 – Body ground (BEAN (BODY) – Body ground)	P–B – Body ground	Communication circuit	–
C10–15 – Body ground (BEAN (SECURITY) – Body ground)	P–L – Body ground	Communication circuit	–
C10–16 – Body ground (E/G OIL LEVEL – Body ground)	Y–G – Body ground	OIL LEVEL switch ON	No continuity
C10–17 – Body ground (POWER EARTH – Body ground)	W–B – Body ground	Constant	Continuity



*1: Reference: Using oscilloscope:

Item	Contents
Tool setting	5 V/ DIV, 20 ms/ DIV
Vehicle condition	Driving at approx. 20Km/h

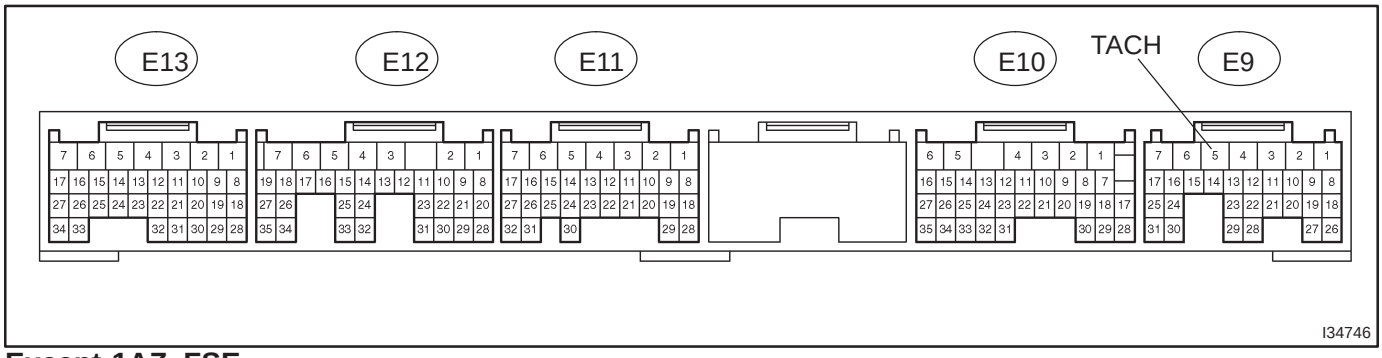


*2: Reference: Using oscilloscope:

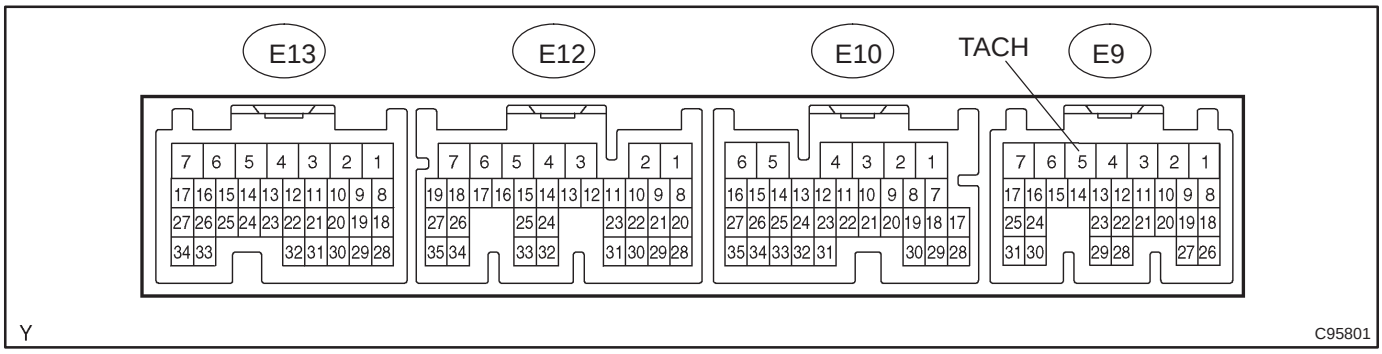
Item	Contents
Tool setting	5 V/ DIV, 10 ms/ DIV
Vehicle condition	Engine idle speed

ENGINE ECU

1AZ–FSE:

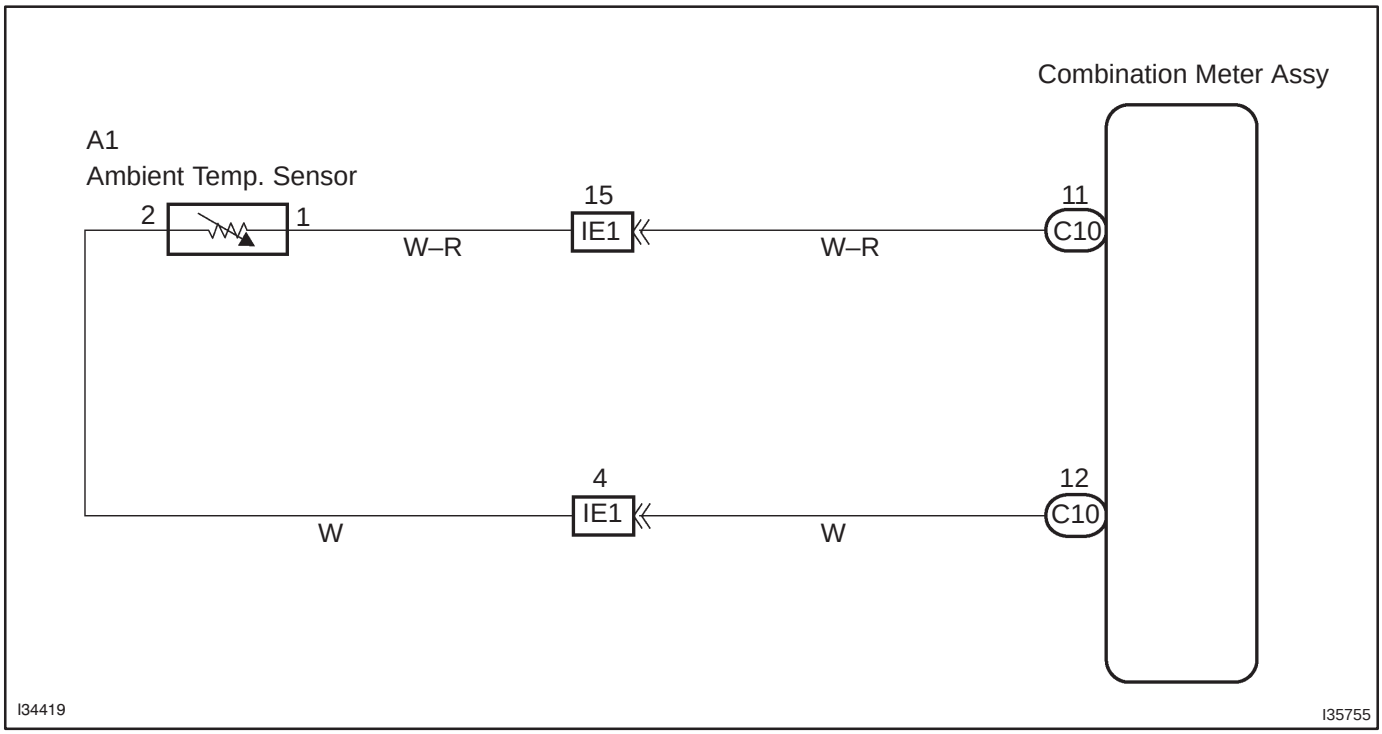


Except 1AZ–FSE:



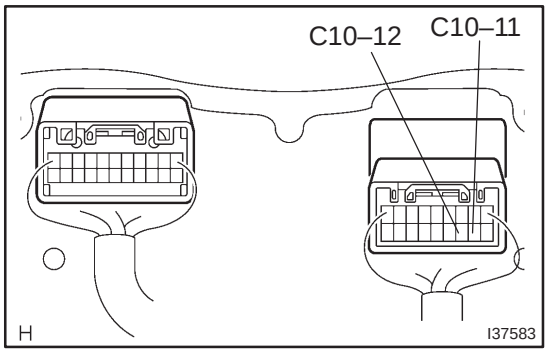
THE AMBIENT TEMPERATURE DOES NOT DISPLAY

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK COMBINATION METER ASSY



(a) Disconnect the connector from the combination meter assy.

(b) Measure resistance between the terminal C10–11 and C10–12 of the ambient temp. sensor connector at each temperature.

Resistance:

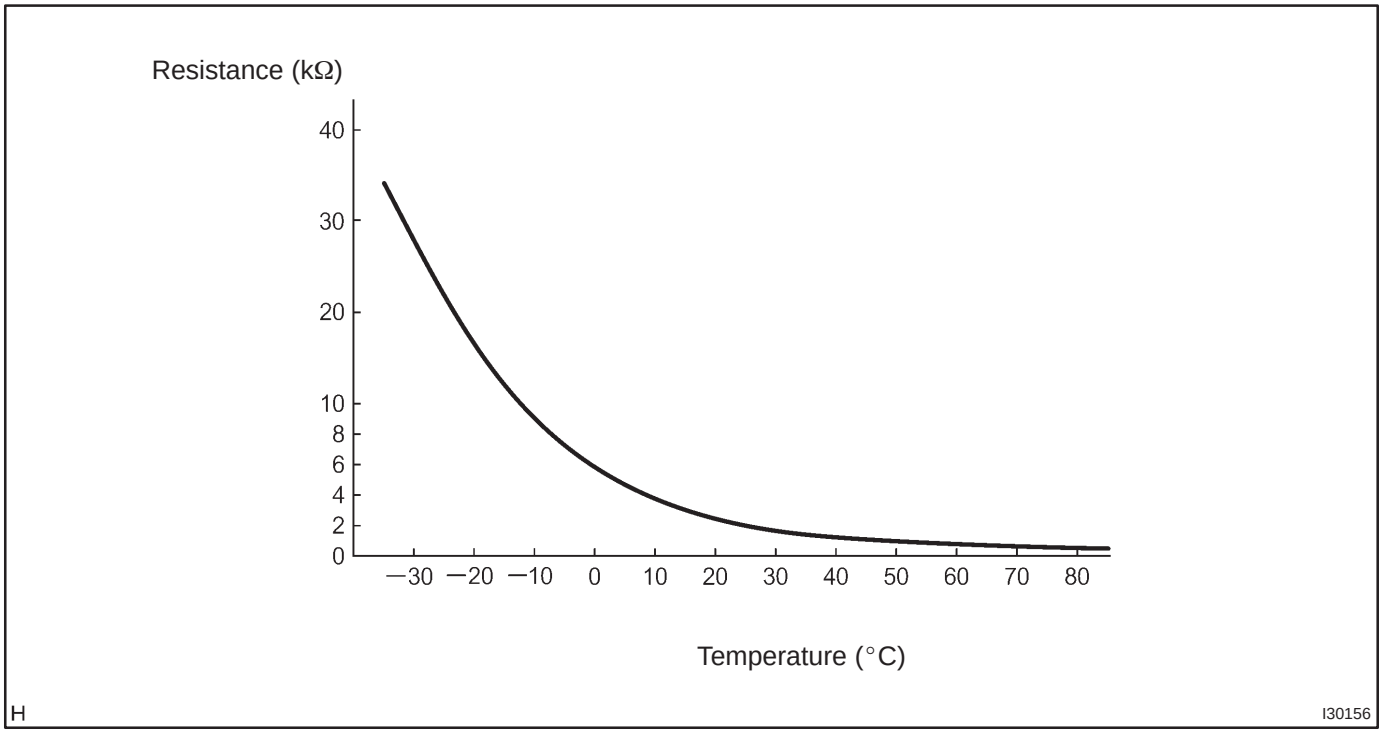
9.0 to 9.8 kΩ: at 0°C (0°F)

2.7 to 2.9 kΩ: at 25°C (77°F)

HINT:

As the temperature increases, resistance decreases.

Resistance:



OK → **REPLACE COMBINATION METER ASSY**

NG

2	CHECK HARNESS OR CONNECTOR

(a) Disconnect the connector from ambient temp. sensor.
(b) Check continuity between the terminal C10–11 (12) of combination meter assy and the terminal A1–1 (2) of ambient temp. sensor connector.
Standard: Continuity.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

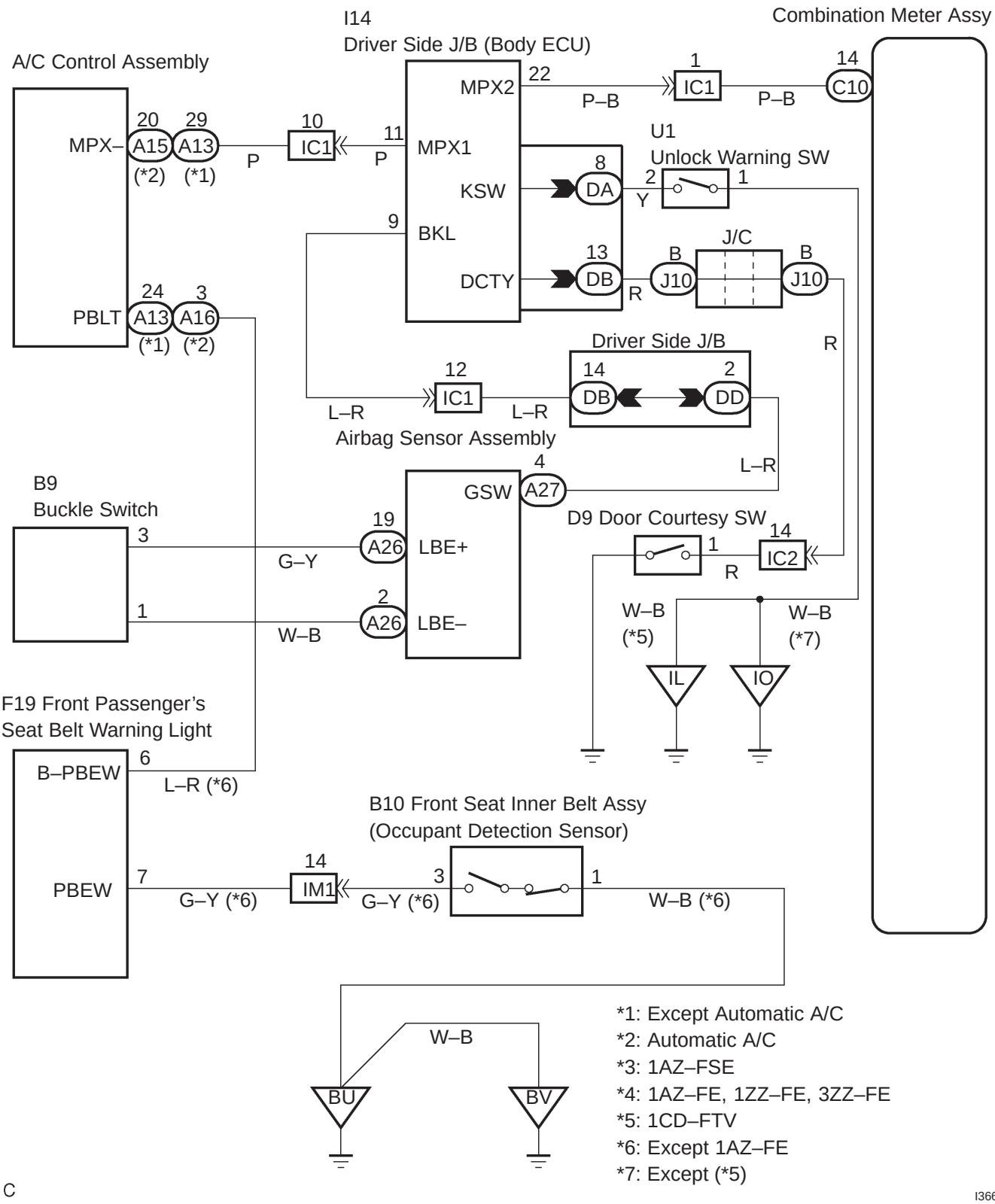
OK

REPLACE OUTER AMBIENT TEMPERATURE SENSOR

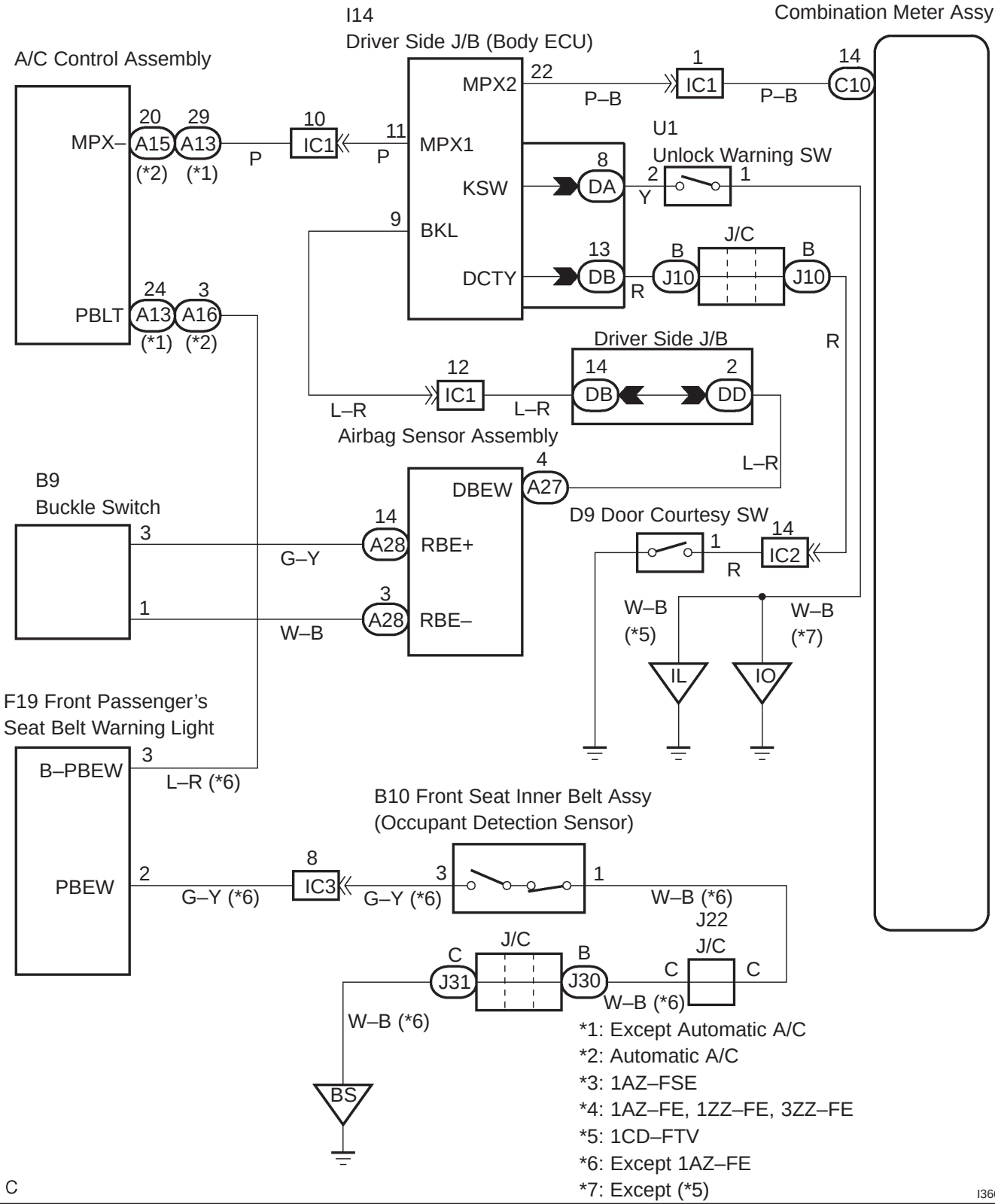
WARNING BUZZER DOES NOT SOUND

WIRING DIAGRAM

LHD Models:



RHD Models:


I14
Driver Side J/B (Body ECU)
Combination Meter Assy
A/C Control Assembly
MPX2
22
P–B
1
IC1
P–B
14
C10
MPX–
20
A15
29
A13
(*2)
(*1)
P
10
IC1
11
P
MPX1
U1
Unlock Warning SW
KSW
8
DA
2
Y
1
9
BKL
J/C
DCTY
13
DB
B
J10
R
B
J10
PBLT
24
A13
3
A16
(*1)
(*2)
Driver Side J/B
R
12
IC1
L–R
L–R
14
DB
2
DD
Airbag Sensor Assembly
L–R
4
A27
DBEW
B9
Buckle Switch
D9 Door Courtesy SW
3
G–Y
14
A28
RBE+
1
IC2
R
1
W–B
3
A28
RBE–
W–B
(*5)
W–B
(*7)
IL
IO
F19 Front Passenger's
Seat Belt Warning Light
B–PBEW
3
L–R (*6)
B10 Front Seat Inner Belt Assy
(Occupant Detection Sensor)
PBEW
2
G–Y (*6)
8
IC3
3
G–Y (*6)
1
W–B (*6)
J22
J/C
J/C
C
J31
B
J30
C
C
W–B (*6)
W–B (*6)
BS
*1: Except Automatic A/C
*2: Automatic A/C
*3: 1AZ–FSE
*4: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*5: 1CD–FTV
*6: Except 1AZ–FE
*7: Except (*5)
C
I36642

INSPECTION PROCEDURE

1	CHECK BUZZER

Buzzer does not sound.	A
Only seat belt buzzer does not sound.	B

HINT:

Perform the buzzer OFF mode check, when only the seat belt buzzer does not sound. If the seat belt buzzer still does not sound even after the check, proceed to step 2.

B → SYSTEM CHECK MODE(SEE PAGE 05–1499)

A

2	READ VALUE OF HAND–HELD TESTER

(a) Operate the hand–held tester according to the display and select the ”DATA LIST”.

Key reminder buzzer:

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
KEY UNLOCK WRN SW	Key unlock warning switch OFF / ON	Key unlock warning switch ON	–
D DOOR CTY SW	D door courtesy switch OFF / ON	D door courtesy switch ON	–
IG SW	Ignition switch OFF / ON	Ignition switch OFF	–

Light reminder buzzer:

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
KEY UNLOCK WRN SW	Key unlock warning switch OFF / ON	Key unlock warning switch ON	–
D DOOR CTY SW	D door courtesy switch OFF / ON	D door courtesy switch ON	–
IG SW	Ignition switch OFF / ON	Ignition switch OFF	–

Seat belt buzzer:

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
D SEAT BUCKL SW	Driver seat buckle switch is OFF / ON	Driver seat buckle switch is OFF position	–
P SEAT BUCKL SW	Passenger seat buckle switch is OFF / ON	Passenger seat buckle switch is OFF position	–
IG SW	Ignition switch OFF / ON	Ignition switch OFF	–
VEHICLE SPD	Vehicle speed / Min.: 0 km/h, Max.: 255 km/h	Vehicle speed ≧15 km/h	Almost same at the meter speed (When driving)

HINT:

When the vehicle speed is not displayed on the hand–held tester, refer to ”Malfunction in speedometer” (See Page 05–1510).

Result:

NG (Seat belt buzzer does not operate)	A
NG (Key reminder / Light reminder buzzer does not operate)	B
OK	C

B	Go to step 5
C	CHECK AND REPLACE COMBINATION METER ASSY

A

3	INSPECT FRONT SEAT INNER BELT ASSY(D–SEAT)(SEE PAGE 05–1594)

NG	CHECK AND REPLACE FRONT SEAT INNER BELT ASSY

OK

4	INSPECT FRONT SEAT INNER BELT ASSY(P–SEAT)(SEE PAGE 05–1594)

NG	CHECK AND REPLACE FRONT SEAT INNER BELT ASSY

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

5	INSPECT IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH(SEE PAGE 05–1594)

NG	CHECK AND REPLACE IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH

OK

6	INSPECT DOOR COURTESY LAMP SWITCH ASSY(SEE PAGE 05–1594)

NG	CHECK AND REPLACE DOOR COURTESY LAMP SWITCH ASSY

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

05C7U–01

CUSTOMER PROBLEM ANALYSIS CHECK

AIR CONDITIONING SYSTEM Check Sheet

Inspector's name:

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date vehicle Brought In	/ /	**Odometer Reading**	**km Miles**

Date of Problem Occurrence	/ /
How Often does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)
Weather	☐ Fine ☐ Cloudy ☐ Snowy ☐ Various / Other
Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F °C)

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

I35990

05C7W–01

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the appropriate page.

DTC No.	Description of fault	Comment / Remedy
000	No malfunction	–
010 011	Overvoltage shutoff Undervoltage shutoff	Voltage between 1 and 5 at connector A > 16 V Voltage between 1 and 5 at connector A < 10.2 V (Voltage values must be present > 20 seconds) Check battery, regulator and electrical leads.
012	Overheating	Check temperature at temperature or overheating sensor > 125 °C Check water circuit.
014	Possible overheating detected (Hardware threshold value)	Difference of measured values at temperature sensor > 15 °C (min. 70 °C water temperature and metering pump in operation); Check temperature sensor and overheating sensor, replace if necessary.
017	Overheating detected (Hardware threshold value)	Temperature at temperature or overheating sensor > 130 °C, emergency OFF if DTC No. 012 or 014 not is applicable; Check water circuit, temperature sensor and overheating sensor, replace if necessary.
020	Glow plug break	Check glow plug, replace if necessary.
021	Glow plug output overload	Check glow plug, replace if necessary.
030	Combustion air blower motor EMF outside perm. range.	Blower impeller or burner motor fammed (frozen solid, dirty, etc.) Remedy jam, replace burner motor if necessary.
031	Combustion air blower motor break	Check the lead to combustion air motor (burner motor) for continuity, replace if necessary.
032	Combustion air blower motor short–circuit	Check combustion air blower motor (burner motor), replace if necessary. Check supply lead (chafed, etc.).
047	Metering pump short–circuit	Check the supply lead to metering pump for short–circuit, check metering pump, replace if necessary.
048	Metering pump break	Check the supply lead to metering pump for continuity, remedy break, replace metering pump if necessary.
051	Cold blow time exceeded	At start, if flame sensor above 70 °C, > 240 sec.; Check exhaust gas combustion air supply, check flame sensor, replace if necessary.
052	Safety time exceeded	When all perm. start attempts used up; Check the fuel delivery and fuel supply. Check exhaust gas and combustion air ducts.
054	Flame cutout, High setting	Check the fuel delivery and fuel supply. Check exhaust gas combustion air ducts. If combustion OK → Check the flame sensor, replace if necessary.
056	Flame cutout, LOW setting	
060	Temperature conrol sensor break	Check connecting leads. Resistance value between 2 and 10 connector B > 2 MΩ (if break)
061	Temperature control sensor short–circuit	Check connecting leads. Resistance value between 2 and 10 at connector B < 2 MΩ (If short– circuit)
064	Flame sensor break	Check connecting leads. Resistance value between 7 and 14 at connector B > 3,040 Ω (If break)
065	Flame sensor short–circuit	Check connecting leads. Resistance value between 7 and 14 at connector B > 780 Ω (If short–circuit)

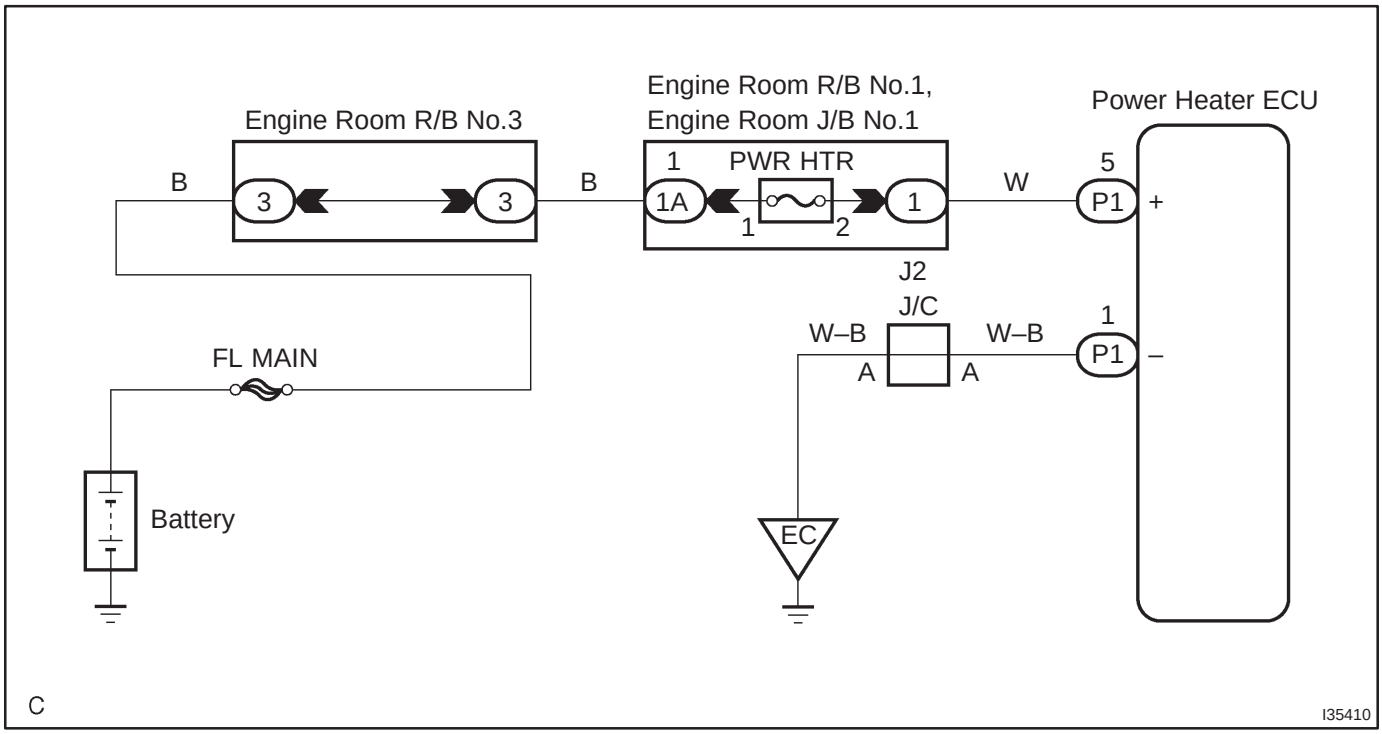
DTC No.	Description of fault	Comment / Remedy
071	Surface sensor break	Check connecting leads. Resistance value between 4 and 11 at connector B > 2 MΩ (If break)
072	Surface sensor short–circuit	Check connecting leads. Resistance value between 4 and 11 at connector B > 50 Ω (If short–circuit)
090 092 093	Control unit detective (Internal fault / Reset) Control unit detective (ROM error) Control unit detective (RAM error)	Control unit malfunction due to interference voltage from vehicle electrical system; possible causes low batteries, chargers, other sources of interference; eliminate interference voltages. Internal faults detected in microprocessor / memory detected. Replace control unit.
097	Internal control unit faults	Other faults which cannot lead to DTC No. 90, 92 and 93, replace control unit.

ECU POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This is power source for the power heater ECU and power heater fuel pump.

WIRING DIAGRAM



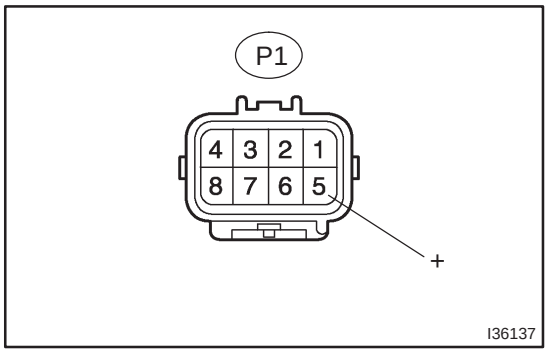
1	CHECK FUSE(PWR HTR)

(a) Remove the PWR HTR from the engine room J/B or R/B No.1.
(b) Check that the continuity exists of PWR HTR fuse.

NG → REPAIR OR REPLACE FUSE

OK

2	INSPECT POWER HEATER ECU(+)

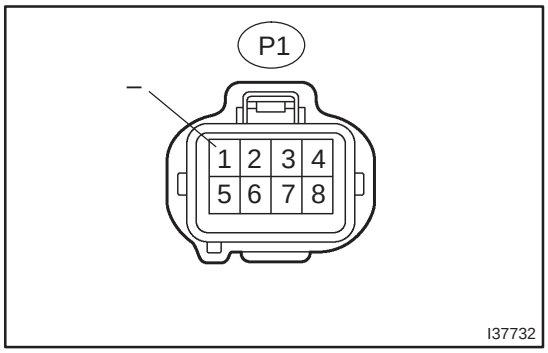


(a) Remove the power heater ECU with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between terminal "+" of the power heater ECU and body ground.
Standard: 10 to 14 V

NG → REPAIR OR REPLACE WIRE HARNESS

OK

3	CHECK HARNESS AND CONNECTOR(POWER HEATER ECU – BODY GROUND)



(a) Check for an open or short circuit in harness and connector between the power heater ECU and body ground (See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

COMBUSTION TYPE POWER HEATER SYSTEM

05C7T–01

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORK SHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1163)

3	CHECK AND CLEAR DTC (See page 05–1164)

4	PROBLEM SYMPTOM CONFIRMATION

SYMPTOM OCCUR (GO TO STEP 6)

SYMPTOM DOES NOT OCCUR (GO TO STEP 5)

5	SYMPTOM SIMULATION (See page 01–22)

6	DTC CHECK (See page 05–1164)

7	DTC CHART (See page 05–1166)

8	PROBLEM SYMPTOMS TABLE (See page 05–1170)

9	CIRCUIT INSPECTION (See page 05–1171 to 05–1179)

10	IDENTIFICATION OF PROBLEM

11	PARTS INSPECTION

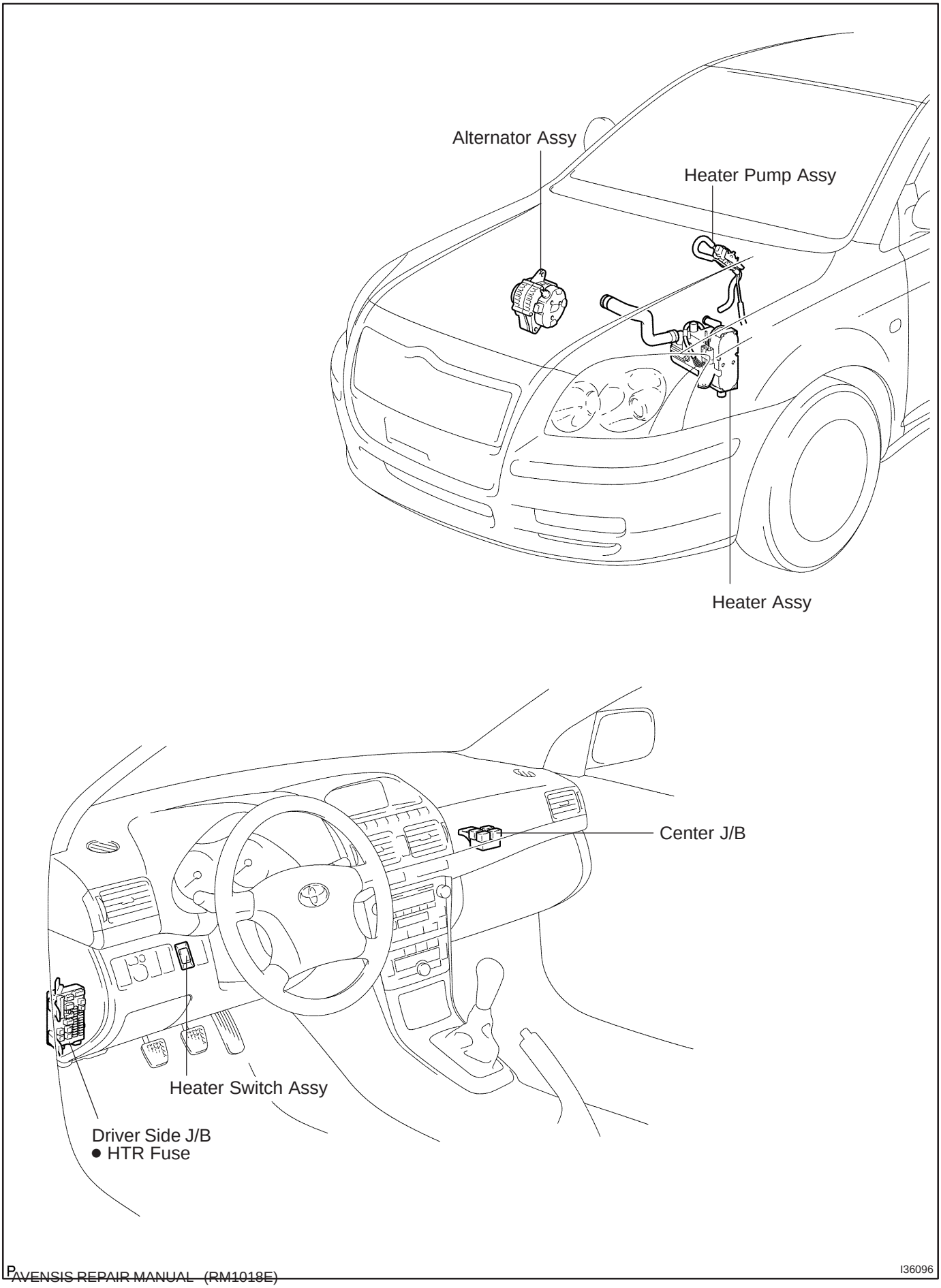
12	REPAIR

13	CONFIRMATION TEST

14	END

05C7X–01

LOCATION



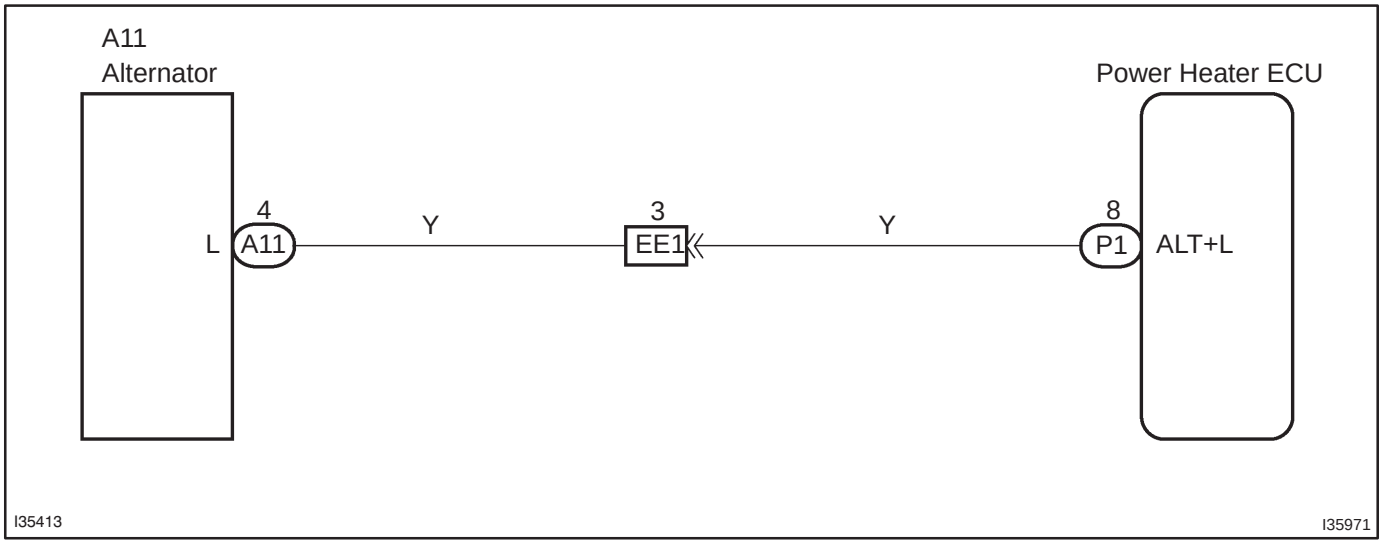
I36096

POWER HEATER ALTERNATOR CIRCUIT

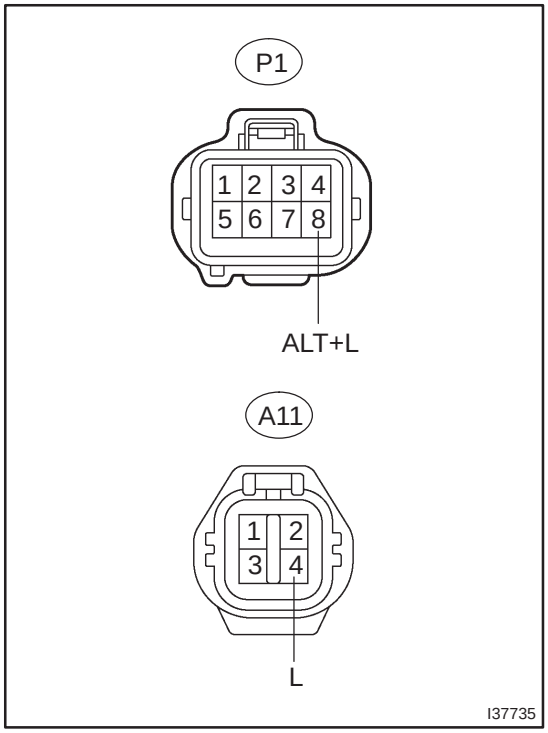
CIRCUIT DESCRIPTION

Turning on the alternator allows current to flow from the alternator to the power heater. As a result, the power heater ECU control the expanded power of the combustion type power heater.

WIRING DIAGRAM



1	CHECK WIRE HARNESS(POWER HEATER ECU – ALTERNATOR)



(a) Check for an open or short circuit in harness and connector between terminal ALT+L of power heater ECU and terminal L of alternator (See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

2	CHECK AND REPLACE GENERATOR W/CLUTCH PULLEY

NG → REPAIR OR REPLACE GENERATOR W/CLUTCH PULLEY

OK

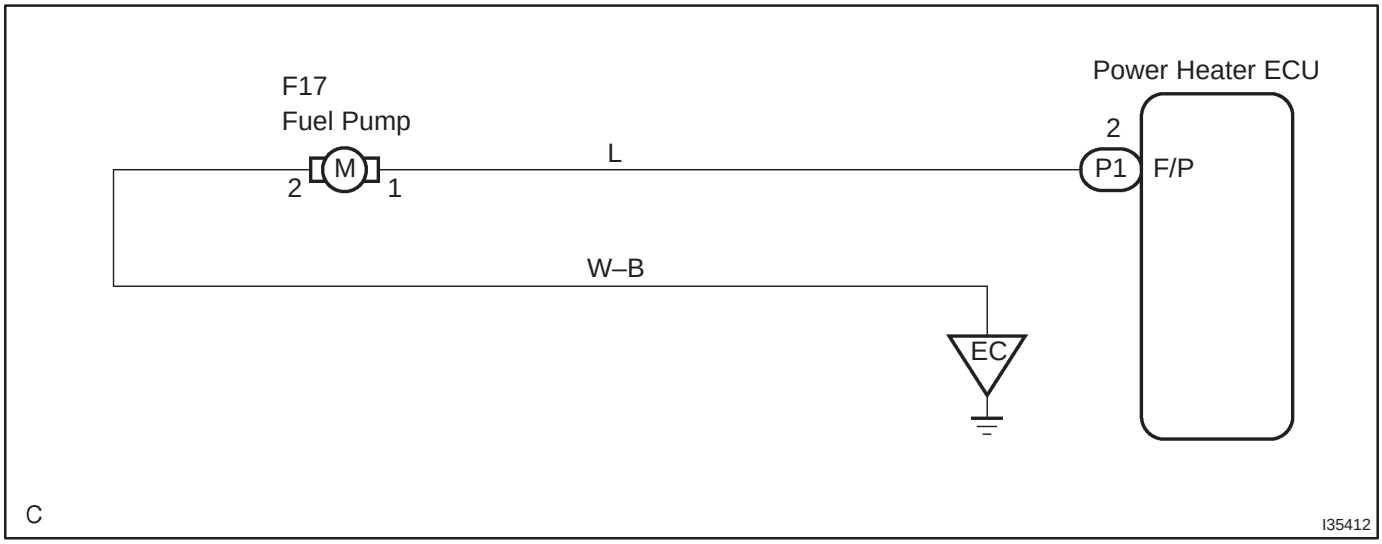
REPAIR OR REPLACE POWER HEATER ECU

POWER HEATER FUEL PUMP CIRCUIT

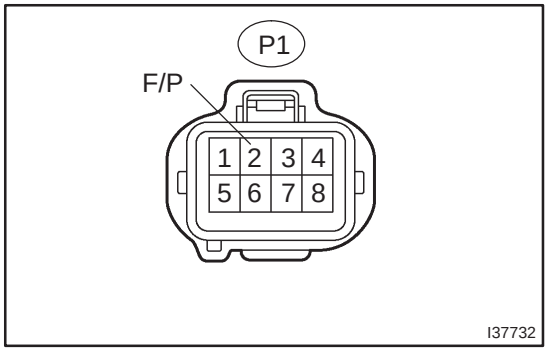
CIRCUIT DESCRIPTION

When the power heater switch is turned on, the fuel pump receives the drive voltage from the power heater ECU, causing the combustion type power heater to operate.

WIRING DIAGRAM



1	CHECK WIRE HARNESS(POWER HEATER ECU – BODY GROUND)

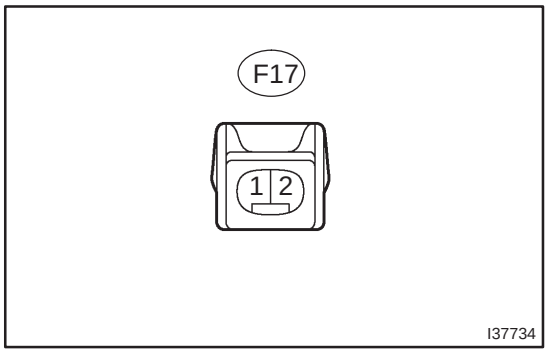


(a) Check for short circuit in harness and connector between terminal F/P of power heater ECU and body ground (See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

2	CHECK WIRE HARNESS(POWER HEATER ECU – POWER HEATER FUEL PUMP)

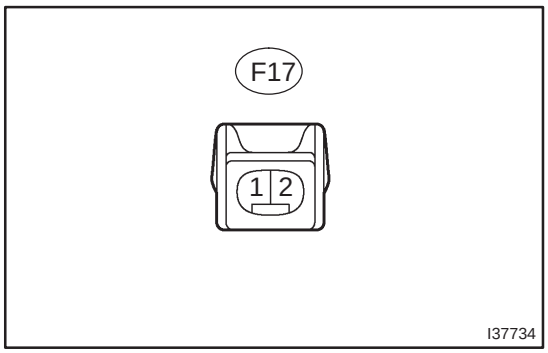


(a) Check for an open or short circuit in harness and connector betwen terminal 1 of power heater ECU and power heater fuel pump (See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

3	CHECK WIRE HARNESS(POWER HEATER FUEL PUMP – BODY GROUND)

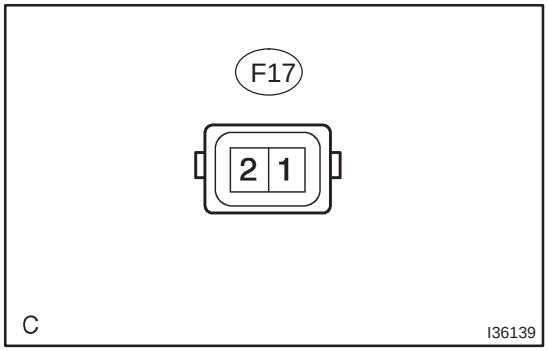


(a) Check for an open circuit in harness and connector between terminal 2 of power heater fuel pump and body ground (See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

4	INSPECT POWER HEATER FUEL PUMP



(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) to terminal 2 with the power heater turned on and check the pressure of the hose by hand.
Standard: The pressure is applied to the hose.

NG → **REPAIR OR REPLACE POWER HEATER FUEL PUMP**

OK

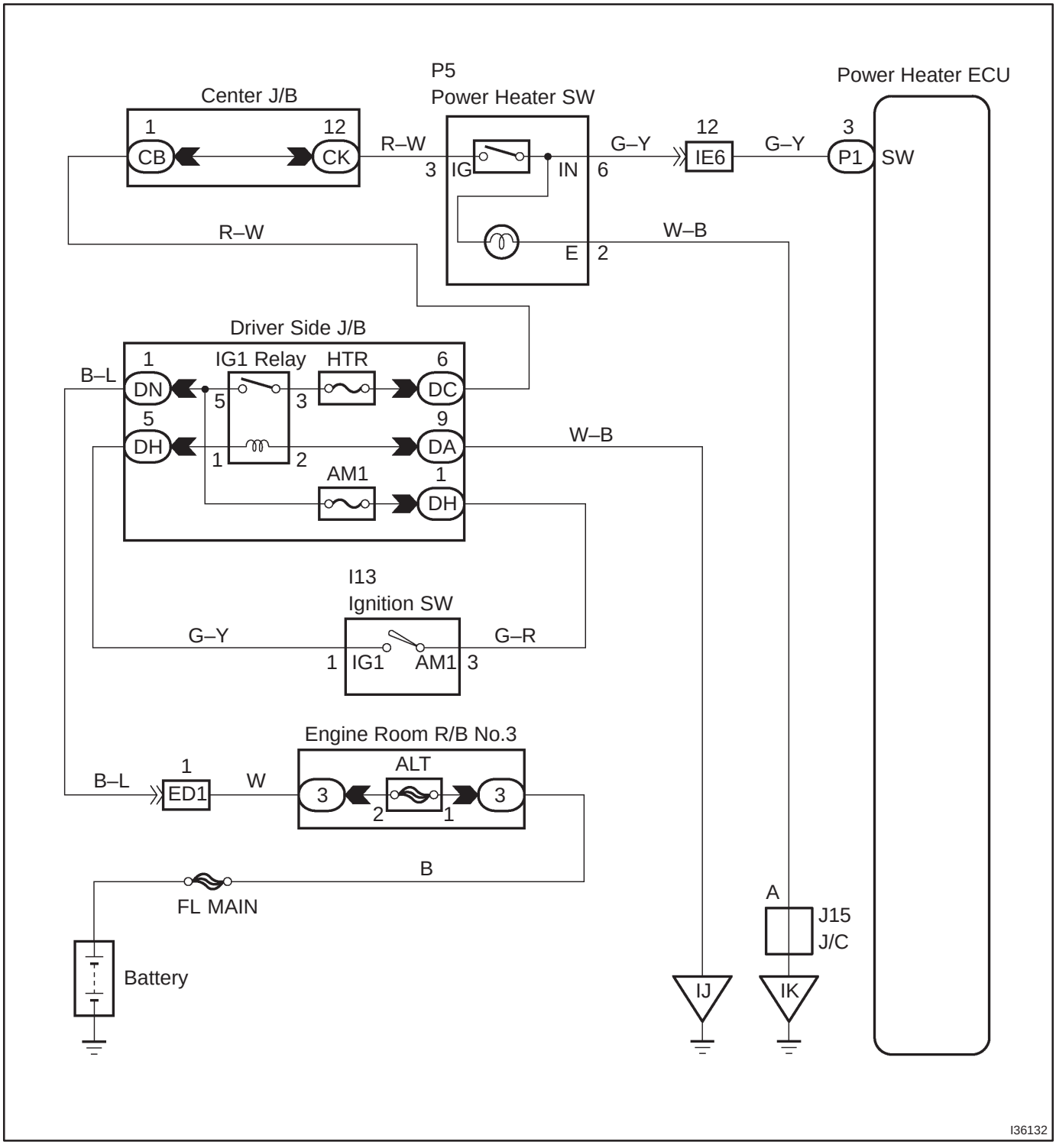
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

POWER HEATER SWITCH CIRCUIT

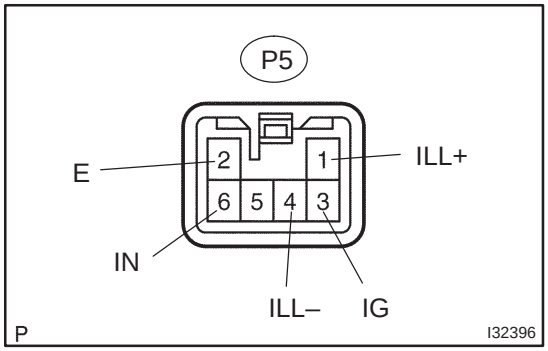
CIRCUIT DESCRIPTION

When the power heter switch is turned on, the power heater ECU sends the drive signal to the fuel pump, causing the combustion type power heater to operate.

WIRING DIAGRAM



1 INSPECT HETER SWITCH ASSY



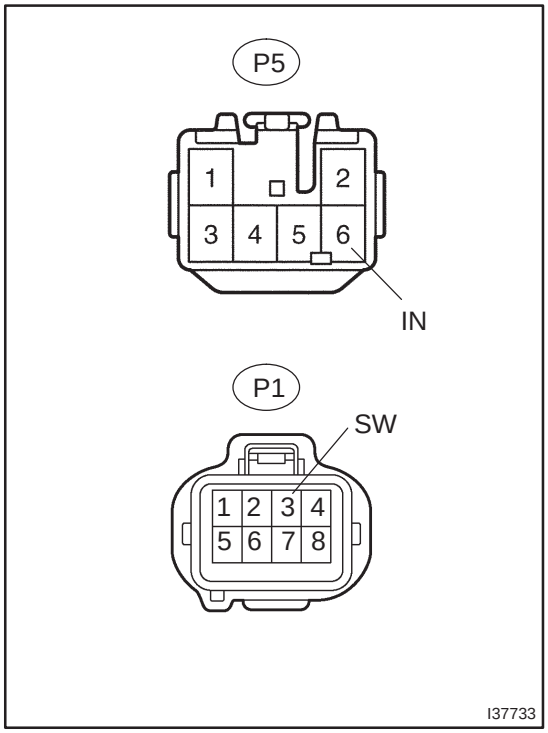
(a) Check that the continuity when connecting the positive tester lead (+) and the negative tester lead (–) to the following terminals.

Heater switch condition	Connectiong terminals	Standard Value
ON	IG – IN	Continuity
OFF	IG – IN	No Continuity
ON	IG – E	Continuity
OFF	IG – E	No Continuity
ON	ILL+ – ILL–	Continuity
OFF	ILL+ – ILL–	Continuity

NG → **REPLACE HETER SWITCH ASSY**

OK

2 CHECK WIRE HARNESS(HETER SWITCH ASSY – POWER HEATER ECU)



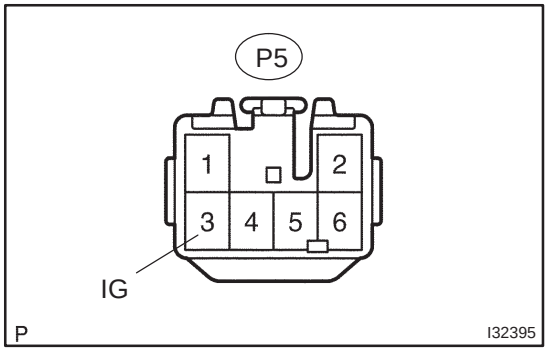
(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between terminal IN of the heater switch and SW of the power heater ECU.

Heater switch condition	Standard value
ON	10 to 14 V
OFF	0 V

NG → **REPAIR OR REPLACE WIRE HARNESS**

OK

3	CHECK WIRE HARNESS(HETER SWITCH ASSY – BATTERY)

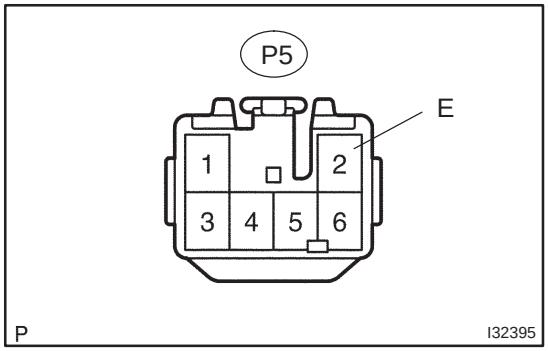


(a) Check for an open and short circuit in harness and connector between heater switch and battery
(See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

4	CHECK WIRE HARNESS(HETER SWITCH ASSY – BODY GROUND)



(a) Check for an open circuit in henees and connector between heater swith and body ground
(See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

05C7V–01

PRE–CHECK

NOTICE:

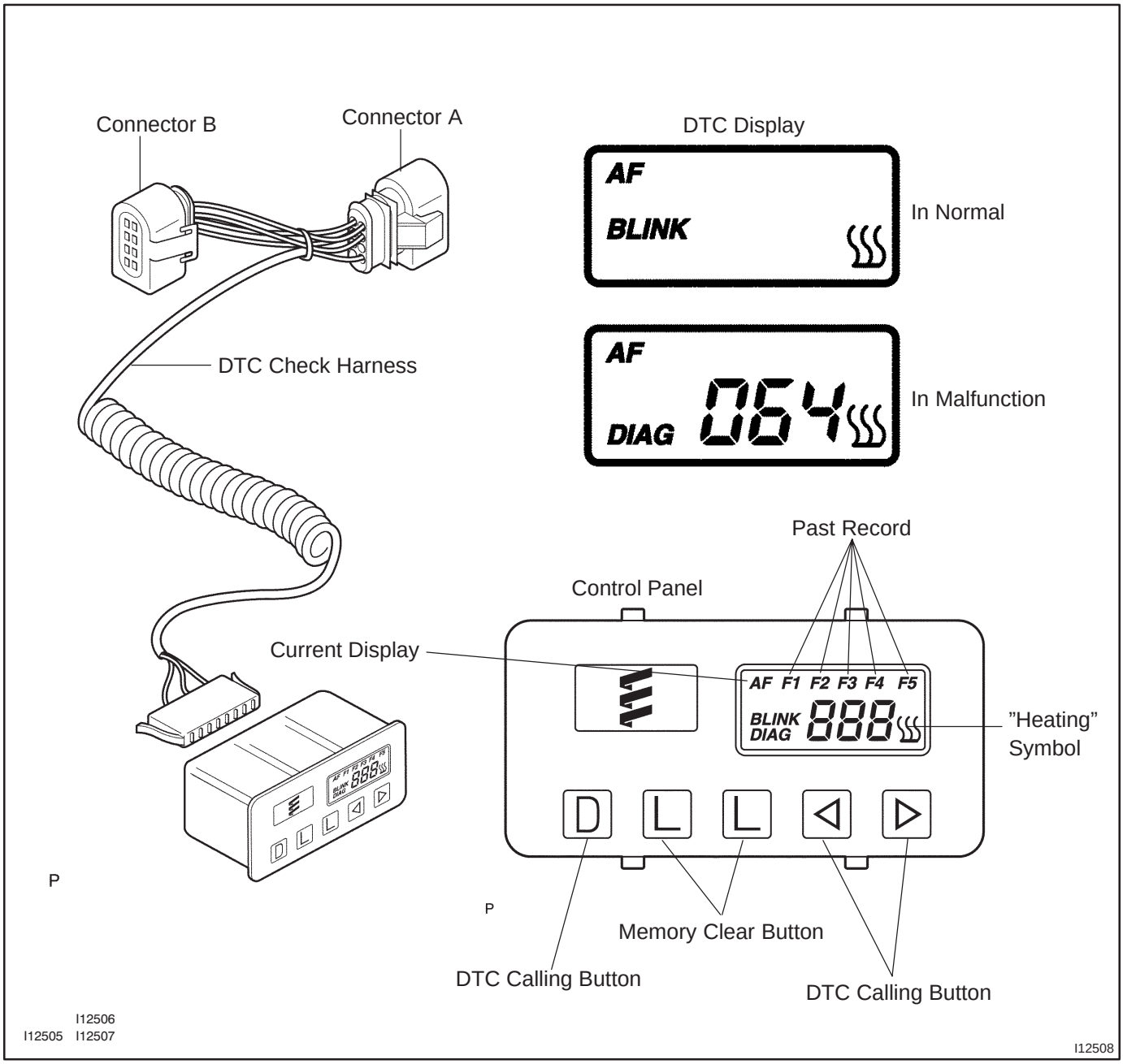
- **If the glow plug breaks, the ECU detects the breakage and stops the automatic operation, so the burner heater does not activate. (For other failures, similarly activated.)**
- **The cause of failures (such as voltage malfunction, overheating malfunction, short–circuit or breakage of functional components, etc.) and repair methods are shown by connecting the DTC tester and reading the DTC.**

1. DIAGNOSTICS FUNCTION

(a) Connect the DTC tester between the connector A (Vehicle harness) of DTC check harness and connector B (Power heater harness).

(b) Start the engine.

(c) Pressing the DTC calling button displays a 3–digit number DTC.



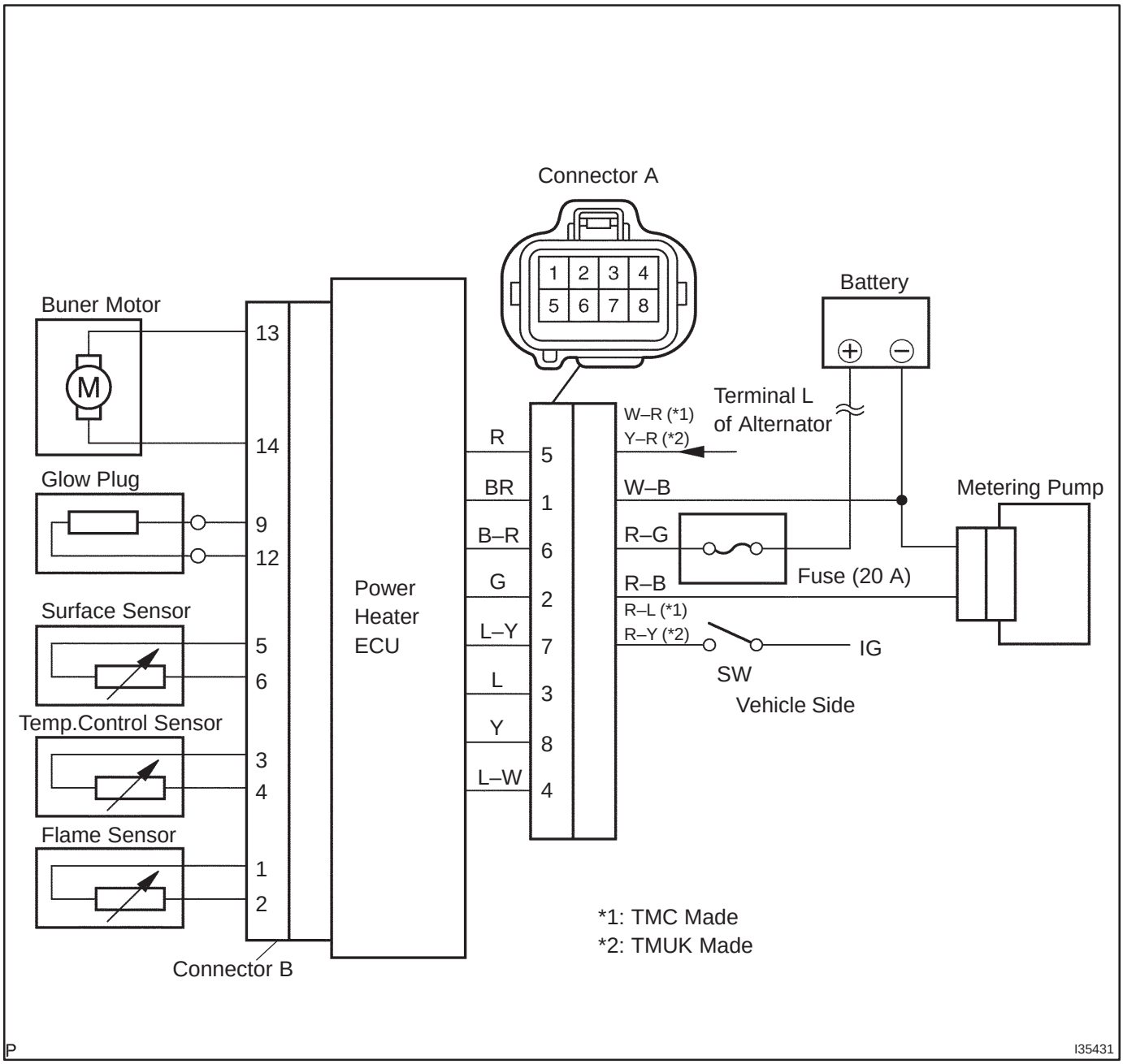
2. DESCRIPTION OF DISPLAY AND BUTTONS

(a) AF: Current Value Malfunction (Blinking at current failure)
Diag: DTC (Example: 064 Flame sensor break)
Memory Clear button: Deletion of faulty memory (Press both buttons together for longer than 2 sec.)
> Button: Scroll up of faulty memory (The past 5 codes can be stored.)
< Button: Scroll down of faulty memory (The past 5 codes can be stored.)

3. FAULTY MEMORY

(a) The ECU is able to store upto 5 pieces of faulty memory. If it is full, the new data is written over F5.

4. WIRING DIAGRAM



05C7Z–01

PROBLEM SYMPTOMS TABLE

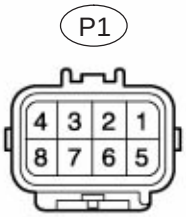
If the normal code is displayed during DTC check although the problem still occurs, check the circuits for each problem symptom in the order given in the table below, and proceed to the relevant troubleshooting.

Symptom	Suspect Area	See page
The combustion type power heater does not operate	1. ECU power source circuit	05–1171
	2. Power heater switch circuit	05–1173
	3. Power heater fuel pump circuit	05–1176
	4. Power heater alternator circuit	05–1179

05C7Y–01

TERMINALS OF ECU

1. POWER HEATER ECU



I36138

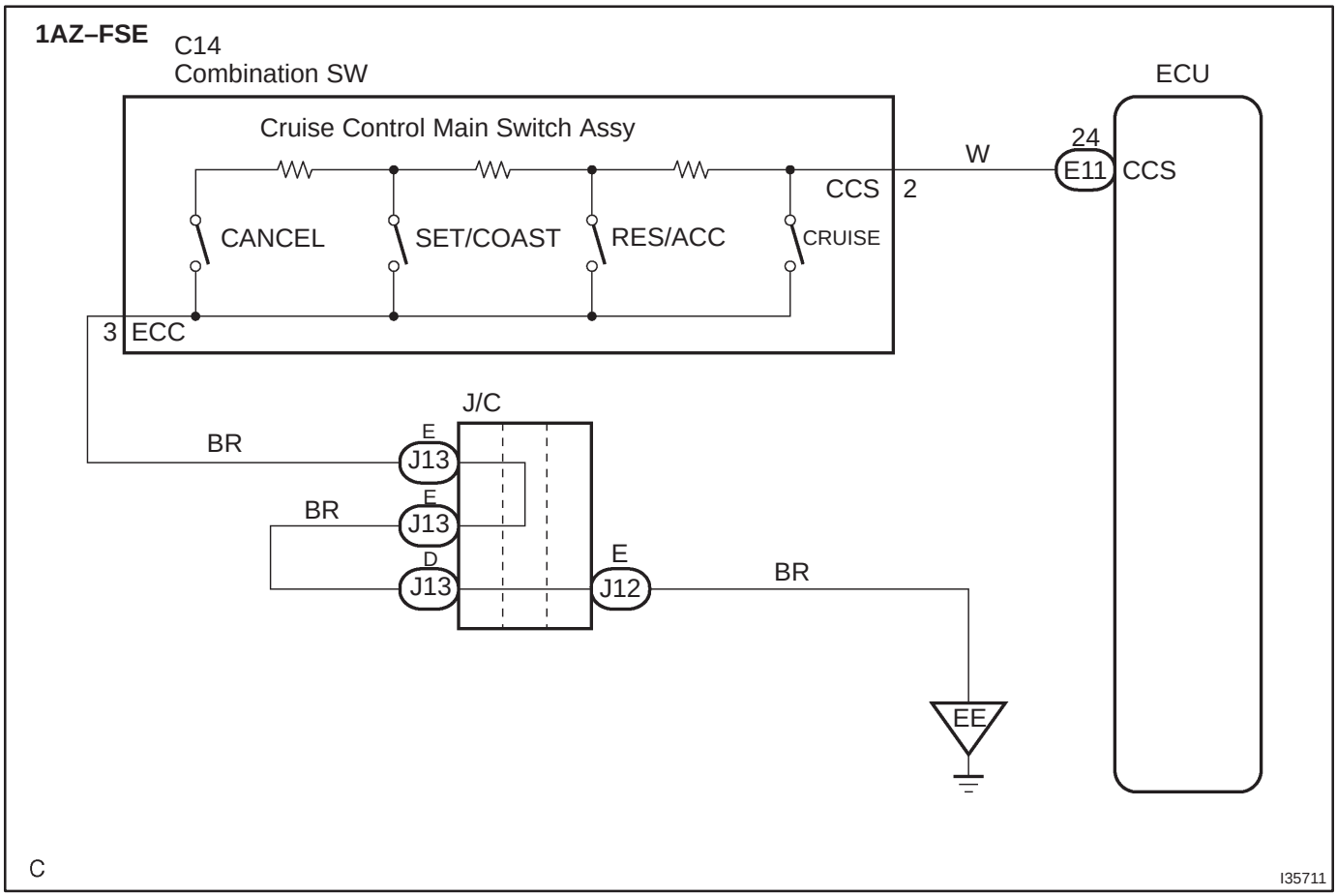
Terminal No. (Symbols)	Wiring Color	Condition	Specification
P1–1 (–) – Body ground	W–B – Body ground	Always	Continuity
P1–2 (F/P) – Body ground	L – Body ground	Always	Continuity
P1–3 (SW) – Body ground	G–Y – Body ground	IG SW: ON Power heater SW: ON	10 to 14
P1–5 (+) – Body ground	W – Body ground	Always	Continuity
P1–8 (ALT +L) – Body ground	Y – Body ground	Alternator: Operate	Pulse generation

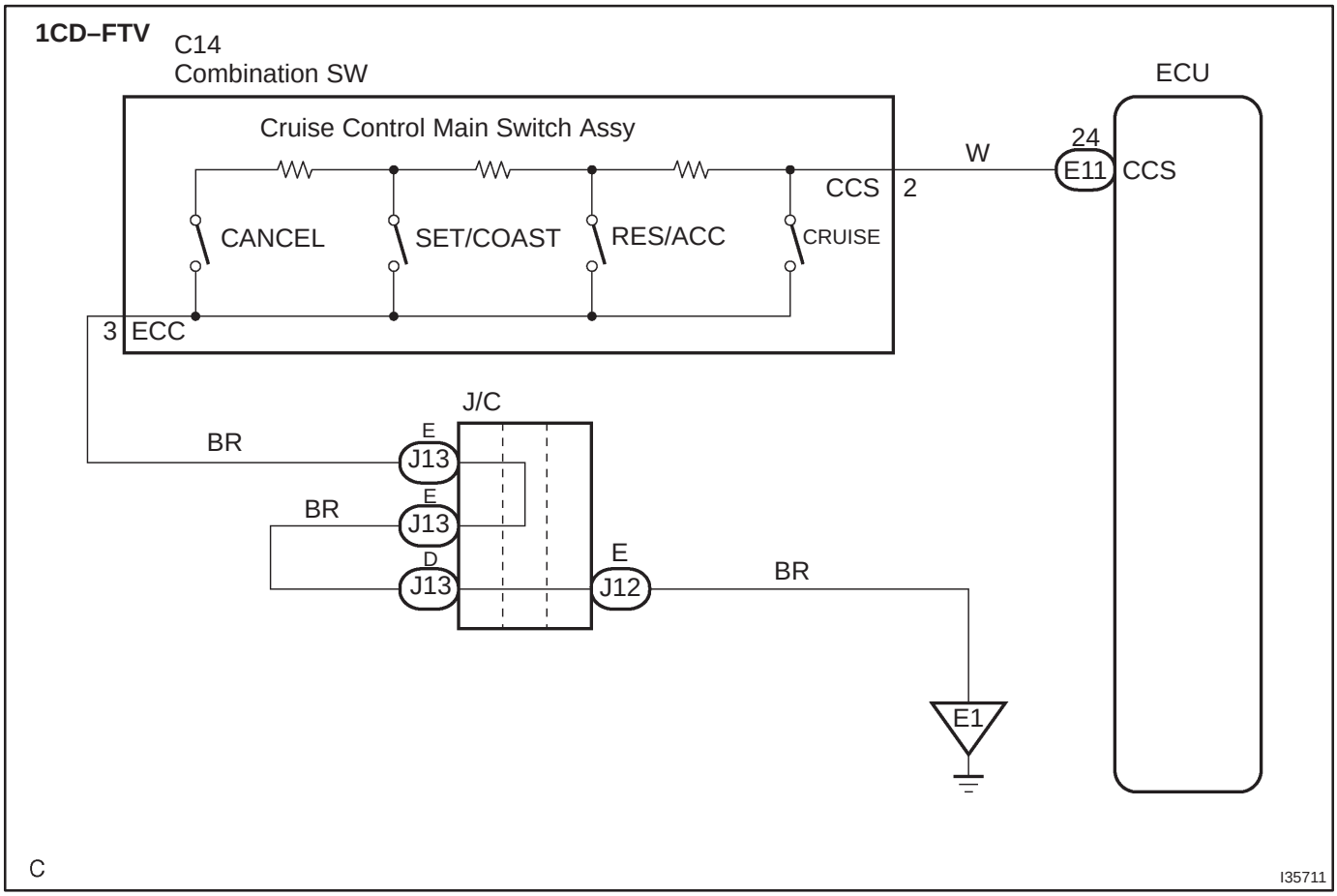
CRUISE CONTROL SWITCH CIRCUIT

CIRCUIT DESCRIPTION

This circuit carries the SET/COAST, RES/ACC and CANCEL signals (each voltage) to the ECM.

WIRING DIAGRAM




1CD–FTV
C14
Combination SW
Cruise Control Main Switch Assy
CANCEL
SET/COAST
RES/ACC
CRUISE
CCS
2
3
ECC
W
ECU
24
E11
CCS
J/C
E
J13
BR
E
J13
BR
D
J13
E
J12
BR
E1
C
I35711

INSPECTION PROCEDURE

HINT:
In case of using the hand–held tester, start the inspection from step 1, and in case of not using the hand–held tester, start from step 2.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position, and turn the hand–held tester main switch ON.
(c) Select the item ”CCS READY” in the DATA LIST and read its prompts displayed on the hand–held tester.

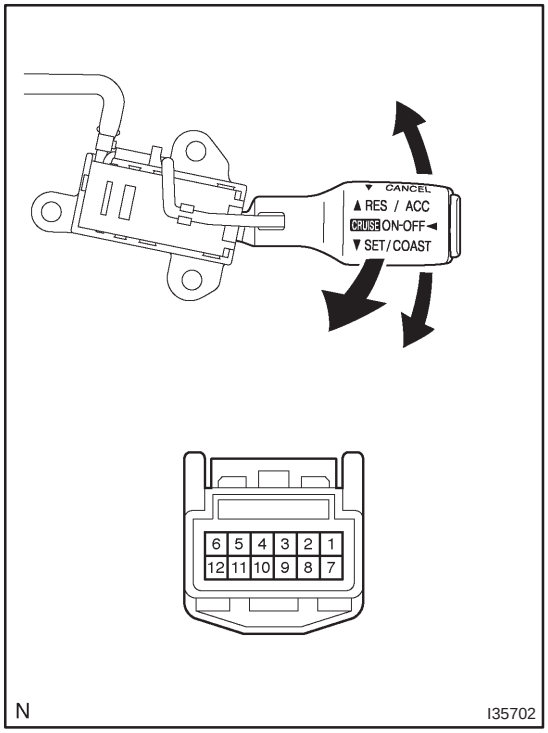
Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
CCS READY M	Cruise control system standby condition (Main CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”
CCS READY S	Cruise control system standby condition (Sub CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”

NG → **Go to step 2**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

2 INSPECT CRUISE CONTROL MAIN SWITCH ASSY



(a) Remove the horn button assy.
(b) Disconnect the cruise control main switch connector.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

Switch condition	Tester connection	Resistance(Ω)
Neutral	2 – 3	∞ (No continuity)
RES/ACC	2 – 3	210 to 270
SET/COAST	2 – 3	560 to 700
CANCEL	2 – 3	1,380 to 1,700

(d) Measure the resistance according to the value(s) in the table below.

Standard:

Switch condition	Tester connection	Specification
OFF	2 – 3	10 kΩ or higher
ON	2 – 3	1 Ω or less

HINT:
When malfunction is found with the cruise control main switch assy, replace the steering wheel assy.

NG → **REPLACE STEERING WHEEL ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(CRUISE CONTROL MAIN SWITCH, BODY GROUND – ECM)

(a) Disconnect the cruise control switch connector and ECM connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specification
CCS (S14 – 2) – CCS (E11 – 24)	Always	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specification
CCS (E11 – 24) – Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

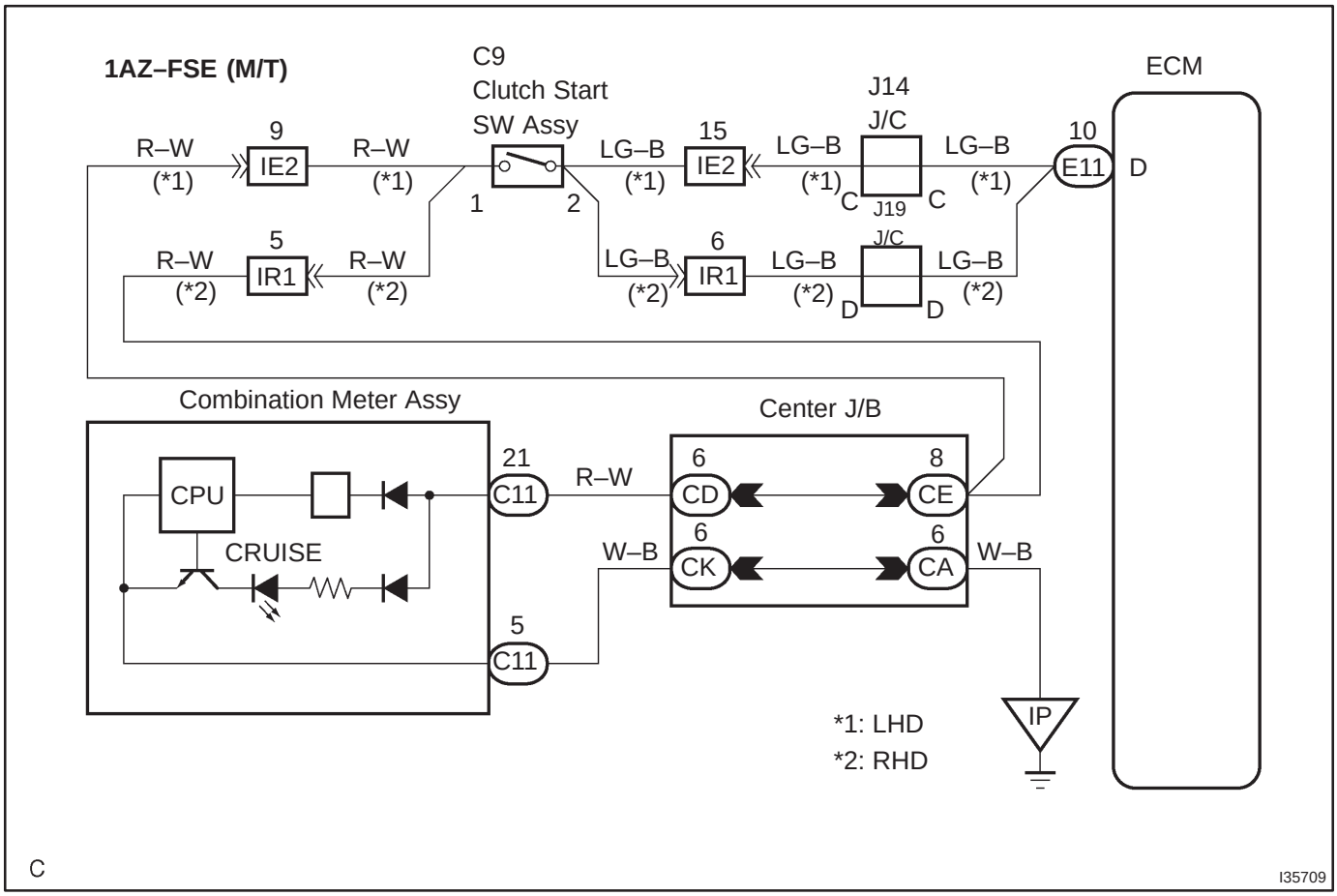
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1709)

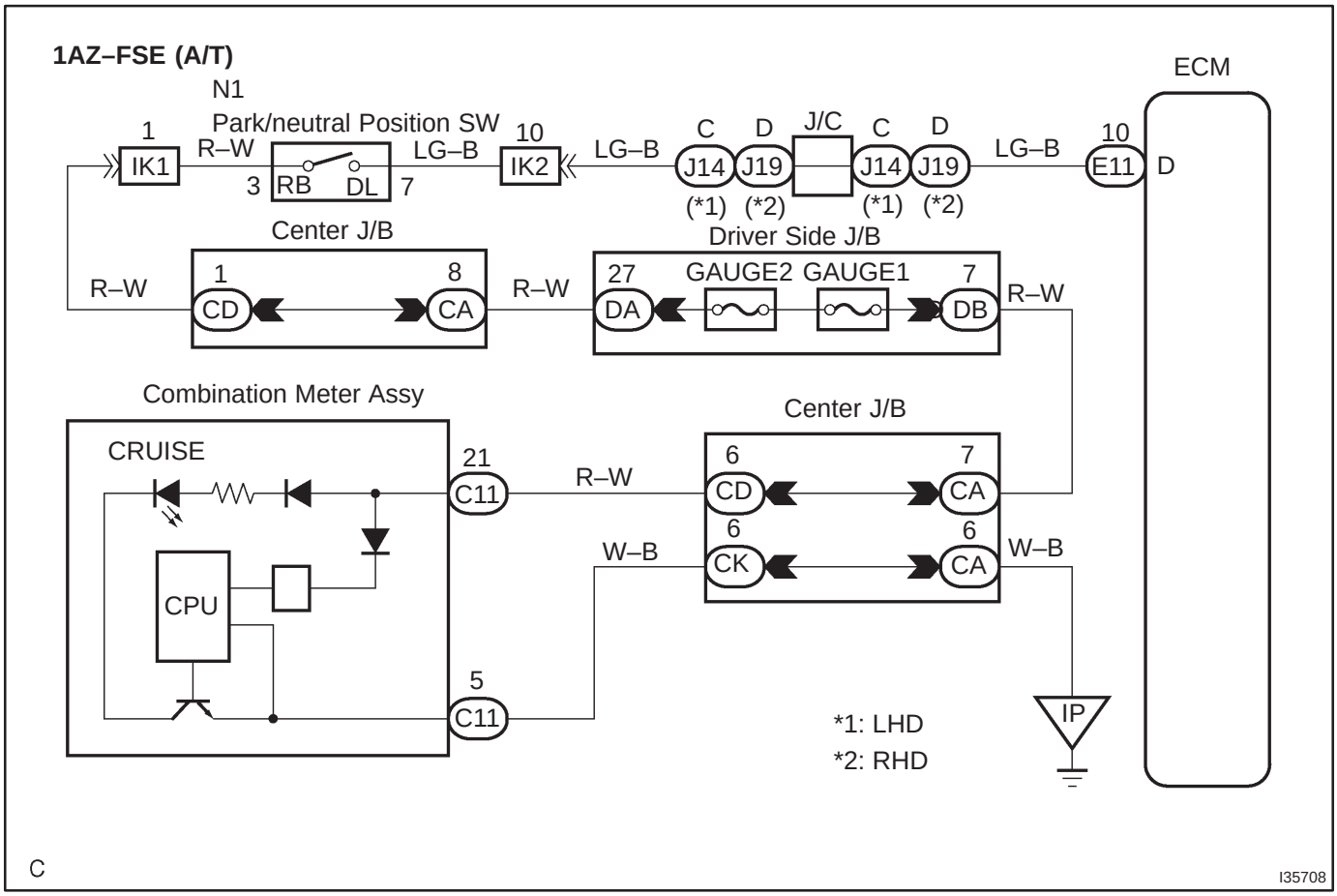
CRUISE MAIN INDICATOR LIGHT CIRCUIT

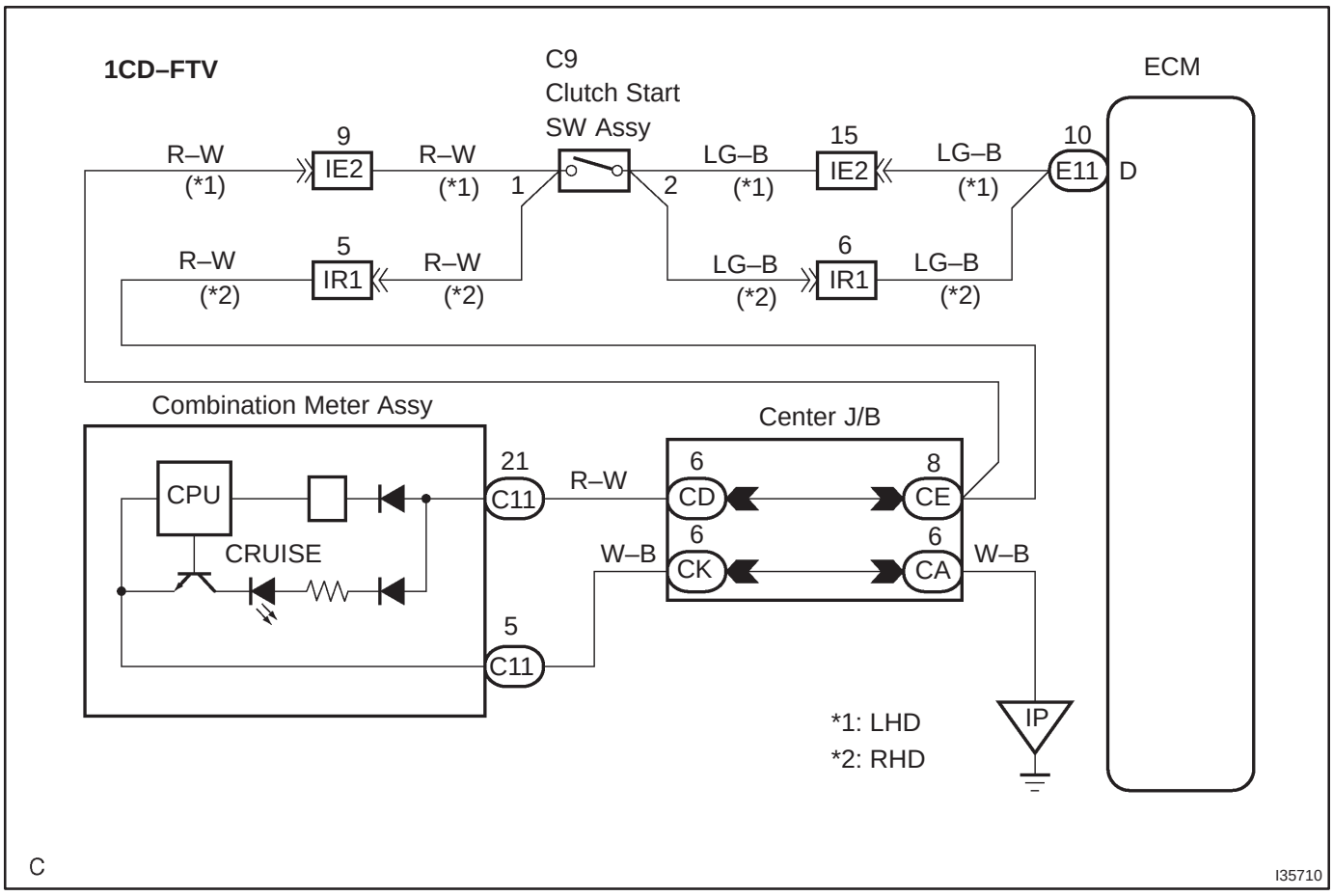
CIRCUIT DESCRIPTION

When the cruise control main switch is turned off, the cruise control does not operate.

WIRING DIAGRAM




1AZ–FSE (A/T)
N1
Park/neutral Position SW
ECM
1
IK1
R–W
3
RB
DL
7
10
IK2
LG–B
LG–B
C
D
J/C
C
D
J14
J19
J14
J19
(*1)
(*2)
(*1)
(*2)
LG–B
10
E11
D
Center J/B
Driver Side J/B
R–W
1
CD
8
CA
R–W
27
DA
GAUGE2
GAUGE1
7
DB
R–W
Combination Meter Assy
Center J/B
CRUISE
21
C11
R–W
6
CD
7
CA
6
CK
6
CA
W–B
W–B
CPU
5
C11
*1: LHD
*2: RHD
IP
C
I35708


1CD–FTV
C9
Clutch Start
SW Assy
ECM
R–W
(*1)
9
IE2
R–W
(*1)
1
2
LG–B
(*1)
15
IE2
LG–B
(*1)
10
E11
D
R–W
(*2)
5
IR1
R–W
(*2)
LG–B
(*2)
6
IR1
LG–B
(*2)
Combination Meter Assy
Center J/B
CPU
CRUISE
21
C11
R–W
6
CD
8
CE
6
CK
6
CA
W–B
W–B
5
C11
*1: LHD
*2: RHD
IP
C
I35710

INSPECTION PROCEDURE

HINT:

In case of using the hand–held tester, start the inspection from step 1, and in case of not using the hand–held tester, start from step 2.

1	READ VALUE OF HAND–HELD TESTER

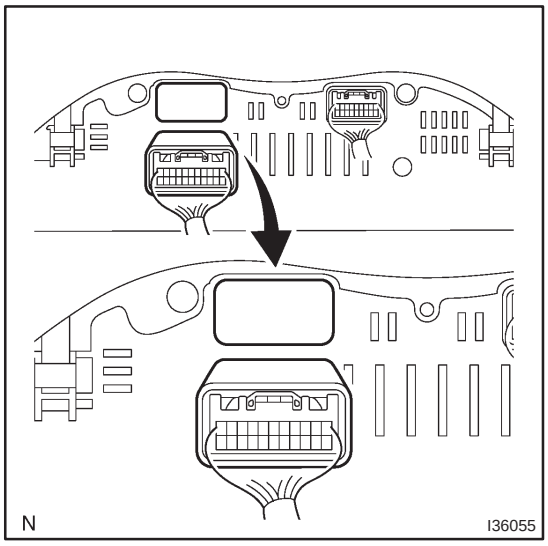
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position, and turn the hand–held tester main switch ON.
(c) Select the item ”CCS READY” in the DATA LIST and read its prompts displayed on the hand–held tester.

Item	Measurement Item / Display (Range)	Normal Condition
CCS READY M	Cruise control system standby condition (Main CPU) / ON or OFF	ON ⇔ OFF: Change ON/OFF each time Main SW is pushed in.
CCS READY S	Cruise control system standby condition (Sub CPU) / ON or OFF	ON ⇔ OFF: Change ON/OFF each time Main SW is pushed in.

NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1709)**

OK

2	INSPECT COMBINATION METER ASSY



(a) Disconnect the C11connector from combination meter assy.
(b) Measure voltage according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
Terminal 21 (C11) – Body ground	10 to 14 V

Result:

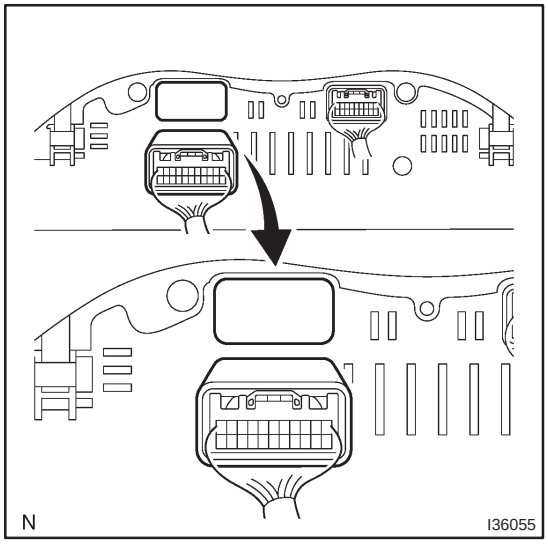
OK	A
NG (M/T)	B
NG (A/T)	C

B → **Go to step 4**

C → **Go to step 7**

A

3 INSPECT COMBINATION METER ASSY



(a) Disconnect the C11 connector from the combination meter.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

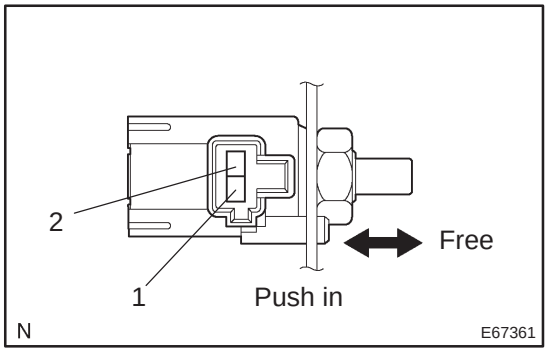
Tester Connection	Specified Condition
Terminal 5 (C11) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPAIR OR REPLACE COMBINATION METER ASSY

4 INSPECT CLUTCH START SWITCH ASSY



(a) Disconnect the clutch start switch assy connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Switch condition	Tester connection	Specification
Switch pin free	1 – 2	10 kΩ or higher
Switch pin pushed in	1 – 2	1 Ω or less

NG → **INSPECT CLUTCH START SWITCH ASSY**

OK

5	CHECK HARNESS AND CONNECTOR(COMBINAITION METER ASSY – CLUTCH START SWITCH ASSY)

(a) Disconnect the combination meter connector and clutch start switch connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Combination meter (C11–21) – Clutch start switch (C9–1)	Always	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Clutch start switch (C9–1) – Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6	CHECK HARNESS AND CONNECTOR(CLUTCH START SWITCH ASSY – ECM)

(a) Disconnect the clutch start switch connector and ECM connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Clutch start switch (C9–2) – D (E11–10)	Always	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.
Standard:

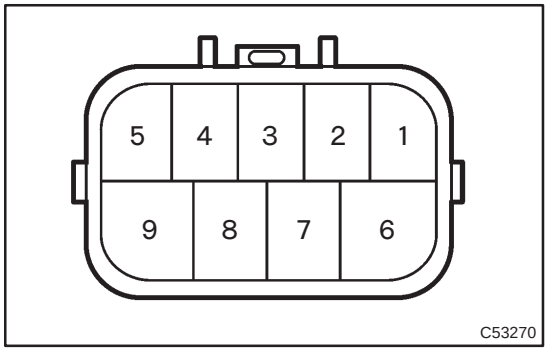
Tester connection	Condition	Specification
D (E11–10) – Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1709)

7	INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.
(b) Shift the shift lever to the D range.
(c) Check continuity between terminal 3 and terminal 7.
Standard:
There is continuity.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY**

OK

8	CHECK HARNESS AND CONNECTOR(COMBINAITION METER ASSY – PARK/NEUTRAL POSITION SWITCH ASSY)

(a) Disconnect the combination meter connector and park/neutral position switch connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Park/neutral start switch (N1–3) – Combination meter (C11–21)	Always	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Combination meter (C11–21) – Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

9	CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH ASSY – ECM)

(a) Disconnect the ECM connector and park/neutral position switch connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Park/neutral start switch (N1–7) – D (E11–10)	Always	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
D (E11–10) – Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE
(See page 05–1709)

05ADJ–04

CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date of Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

Condition of Problem Occurrence	**Date of Problem Occurrence**	/ /
	Frequency Problem Occurs?	☐ Continuous ☐ Intermittent (Times a day)
	Vehicle Speed when Problem Occurred	**km Mile**

Symptoms	☐ Auto cancel occurs	● Driving condition ☐ City driving ☐ Freeway ☐ Up hill ☐ Down hill ● After cancel occurred, did the driver activate cruise control again? ☐ Yes ☐ No
	☐ Cancel does not occur	☐ With brake ON ☐ Clutch pedal depressed (M/T) ☐ Except D range shift (A/T) ☐ When control SW turns to CANCEL position
	☐ Cruise control malfunction	☐ Slip to acceleration side ☐ Slip to deceleration side ☐ Hunting occurs ☐ O/D cut off does not occur (A/T) ☐ O/D does not return (A/T)
	☐ Switch malfunction	☐ SET ☐ 'ACCEL' ☐ 'COAST' ☐ RESUME ☐ CANCEL
	☐ CRUISE MAIN indicator light	☐ Remains ON ☐ Does not light up ☐ Blinks

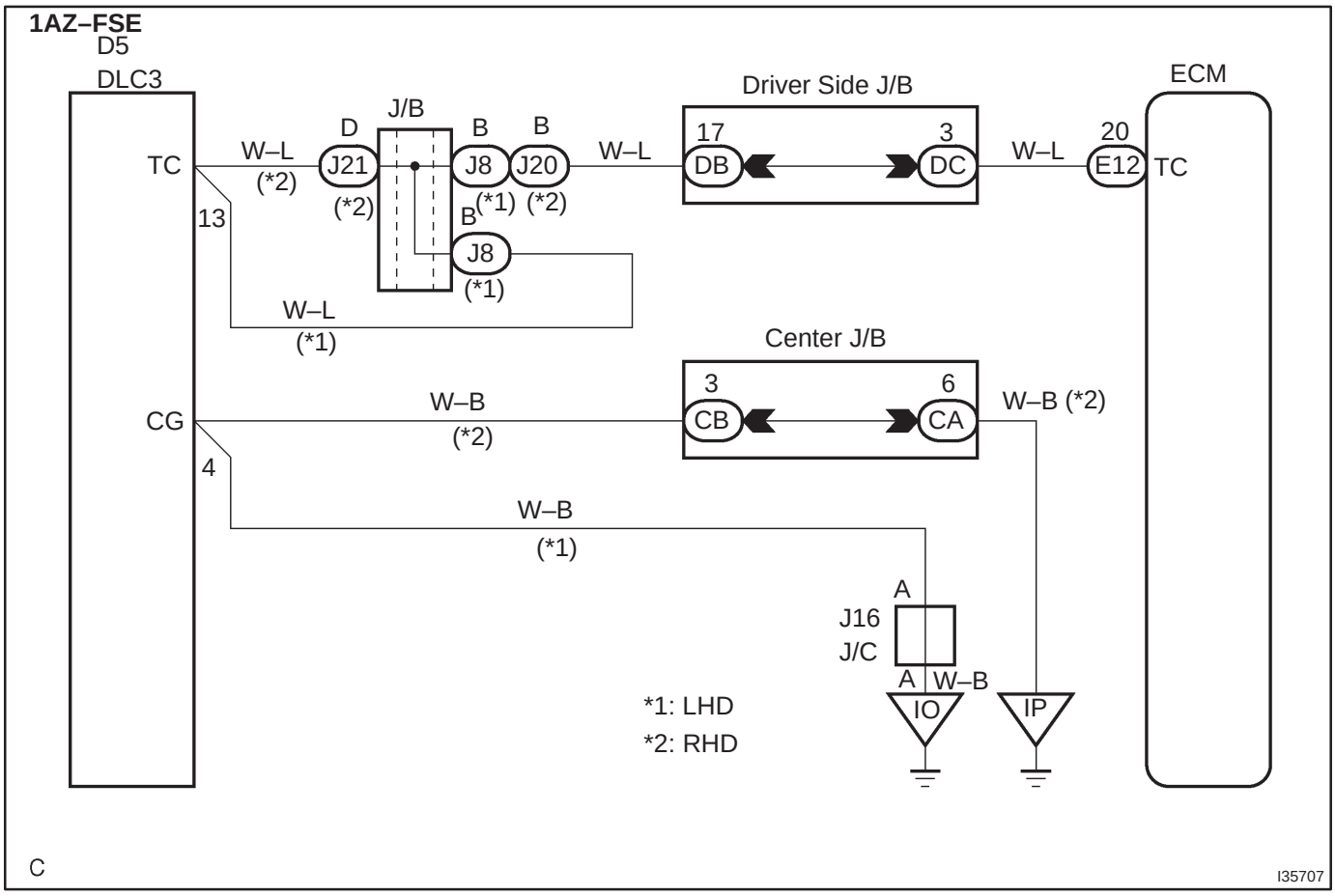
DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

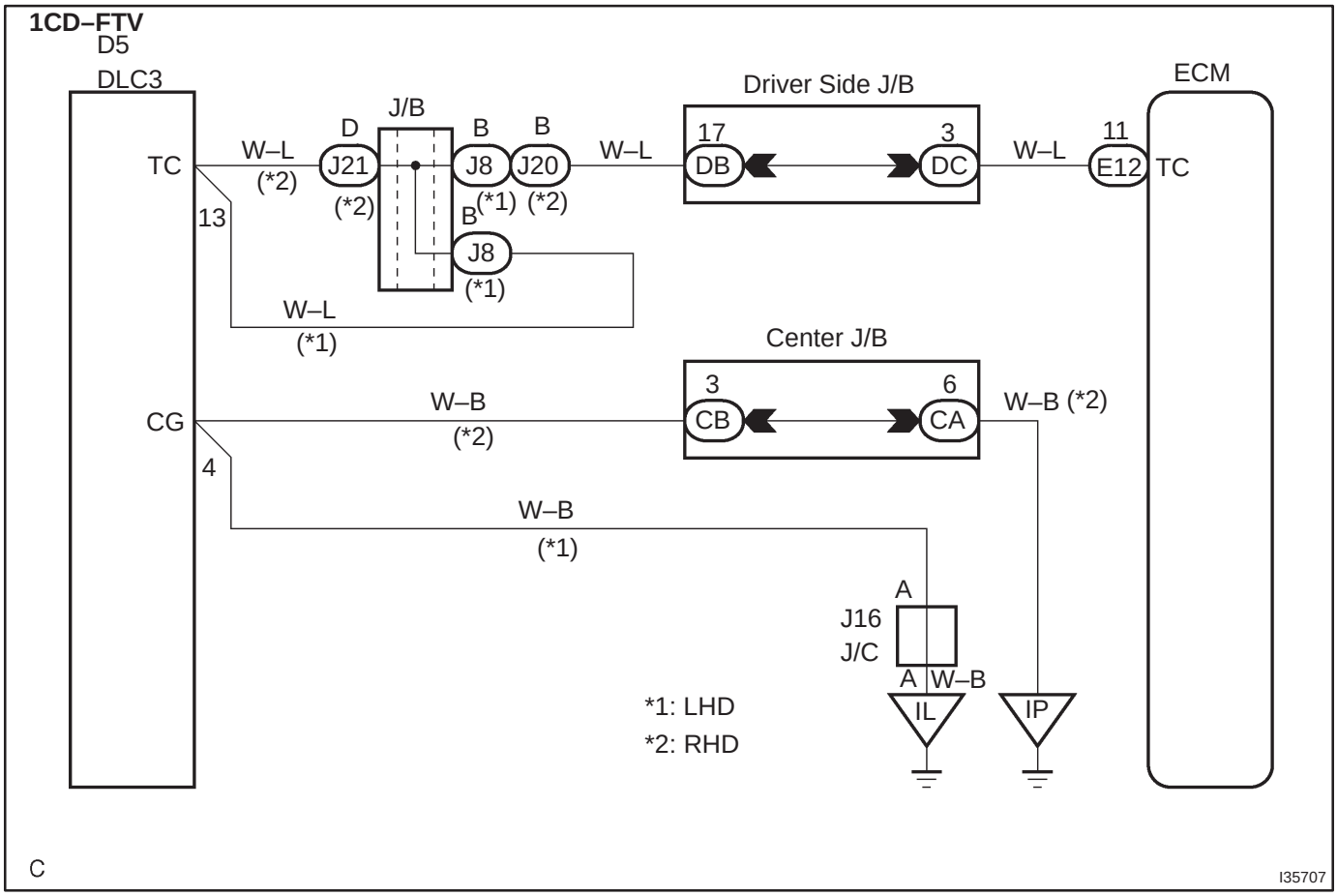
DIAGNOSIS CIRCUIT

CIRCUIT DESCRIPTION

Making short circuit between terminal TC and CG of DLC3 will output DTC from the DLC3.

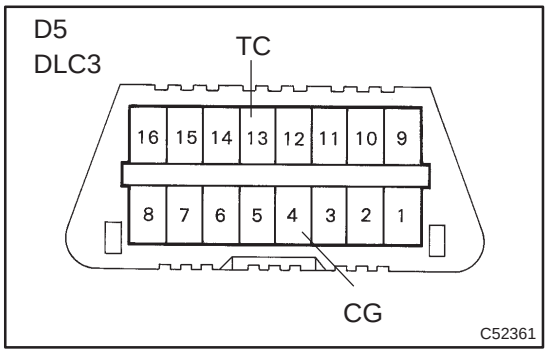
WIRING DIAGRAM





INSPECTION PROCEDURE

1	INSPECT DLC3(TC TERMINAL VOLTAGE)



(a) Turn the ignition switch to the ON position.

(b) Measure the voltage according to the value(s) in the table below.

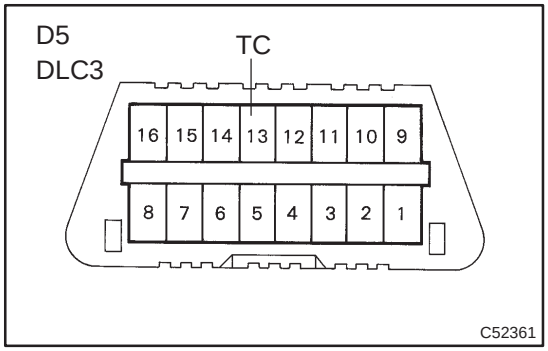
Standard:

Tester Connection	Specified Condition
TC (D5 – 13) – CG (D5 – 4)	10 to 14 V

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR(DLC3 – ECM)



(a) Disconnect the ECM connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

1AZ–FSE

Tester Connection	Specified Condition
TC (D5 – 13) – TC (E12 – 20)	1 Ω or less

1CD–FTV

Tester Connection	Specified Condition
TC (D5 – 13) – TC (E12 – 11)	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.
Standard:

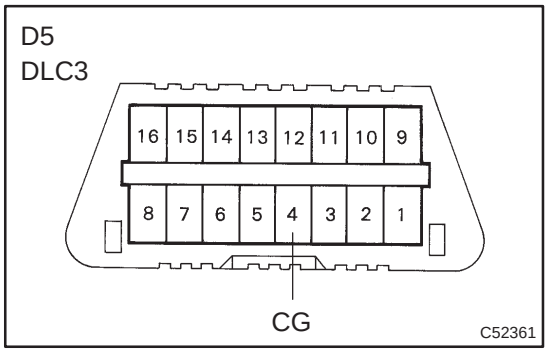
Tester Connection	Specified Condition
TC (E12 – 20) – Body ground	10 kΩ or higher
TC (E12 – 11) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 01–32)

3 CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)



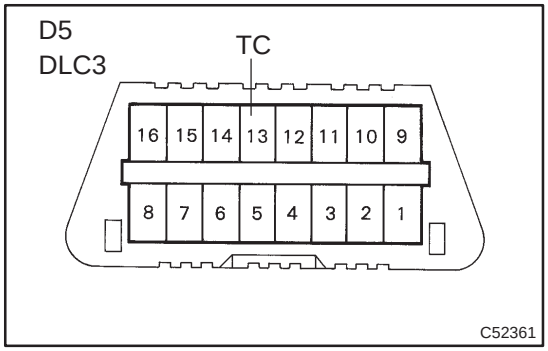
(a) Disconnect the ECM connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
CG (D5 – 4) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK HARNESS AND CONNECTOR(DLC3 – ECM)



(a) Disconnect the ECM connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

1AZ–FSE

Tester Connection	Specified Condition
TC (D5 – 13) – TC (E12 – 20)	1 Ω or less

1CD–FTV

Tester Connection	Specified Condition
TC (D5 – 13) – TC (E12 – 11)	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
TC (E12 – 20) – Body ground	10 kΩ or higher
TC (E12 – 11) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 01–32)

056HG–05

PRE–CHECK

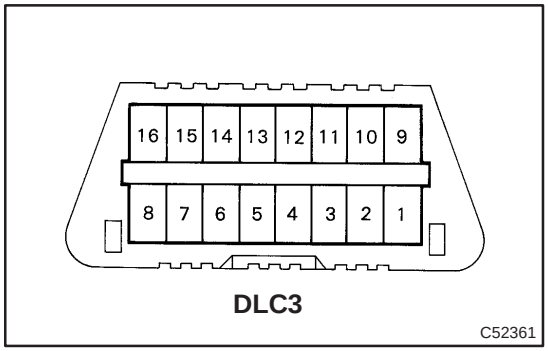
1. DIAGNOSIS SYSTEM

(a) Description

ECM controls of the cruise control the function on a vehicle.

Data stored in the cruise control memory and on the DTC can be read from the DLC3 on the vehicle. If CRUISE MAIN indicator light does not come on after the DTC check, there is a malfunction of the cruise control.

Use the hand–held tester or SST to check and solve the problem.



DLC3

(b) Check the DLC3.

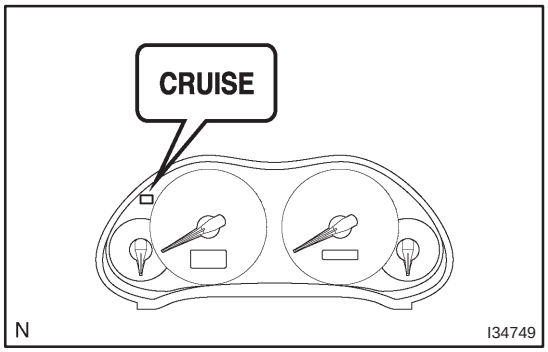
The vehicle's ECM uses ISO 9141–2(Euro–OBD)/ISO 14230 (M–OBD) for communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–3 and matches the ISO 9141–2 / ISO 14230 format.

Terminal No.	Connection/SpecifiedCondition	Condition
4	Chassis Ground ↔ Body Ground / 1 Ω or less	Always
7	Bus ⊕ Line / Pulse Generation	DuringCommunication
16	Battery Positive – Body Ground / 9 to 14 V	Always

HINT:

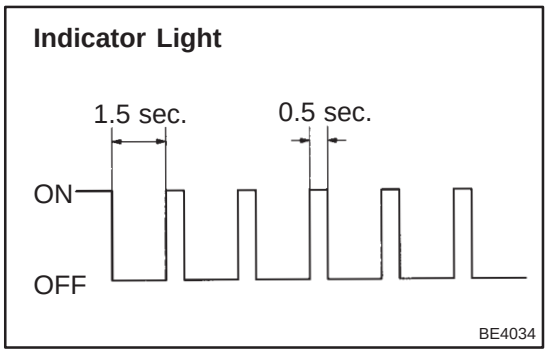
If the display shows "UNABLE TO CONNECT TO VEHICLE" after connecting the hand–held tester to the DLC3 and turning the ignition ON, there is a problem either with the vehicle or with the tool.

- If communication is normal when connecting the tool to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when connecting the tool to another vehicle, the problem is probably in the tool itself. Consult the Service Department listed in the tool's instruction manual.



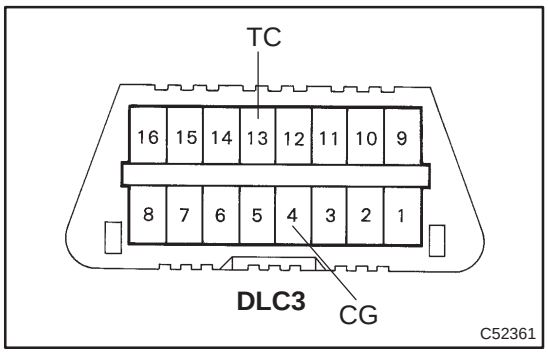
(c) Check the indicator.
(1) Turn the ignition switch to the ON position.
(2) Check that the CRUISE MAIN indicator light comes on when the main switch is ON, and that the indicator light goes off when the main switch is OFF.

HINT:
If there is a problem with the indicator, inspect the cruise main indicator light circuit (See page 05–1722).

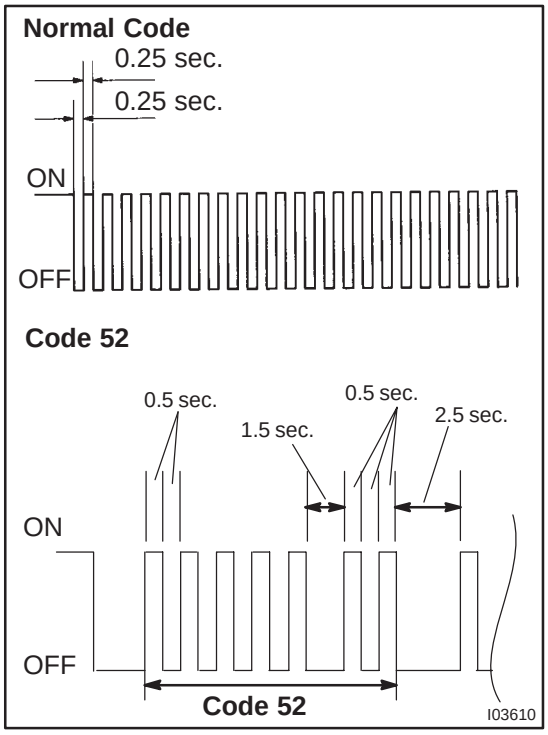


(d) Check the DTC.

HINT:
If a malfunction occurs in the vehicle speed sensors or stop lamp switch assy, etc. during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and then the CRUISE MAIN indicator light will start to blink, informing the driver of a malfunction. At the same time, data of the malfunction is stored as a diagnostic trouble code, or DTC.



(e) Output of the DTC using diagnosis check wire.
(1) Using SST, connect terminals TC and CG of DLC3.
SST 09843–18040
(2) Turn the ignition switch to the ON position.
(3) Read the DTC on the CRUISE MAIN indicator light.



HINT:
If the DTC is not output, inspect the cruise main indicator light circuit (See page 05–1722) and diagnosis circuit (See page 05–1729).
For example, the normal blinking pattern and the blinking pattern for code 52 are shown in the illustration.

2. USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:
Hand–held tester has a ”Snapshot” function which records the monitored data.
Refer to the hand–held tester operator’s manual for further details.

3. DATA LIST

HINT:
From the DATA LIST displayed by the the hand–held tester, you can read the value of the switch, the sensor and so on without removing parts. Reading the DATA LIST as the first step to troubleshooting is one way to shorten labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position.
(c) According to the display on the tester, read the ”DATA LIST”.

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
VEHICLE SPD	Vehicle speed / min.: 0 km/h (0 mph), max.: 255 km/h (158 mph)	Actual vehicle speed	–
MEMORY SPD	Stored vehicle speed / min.: 36 km/h (22 mph), max.: 200 km/h (124 mph)	Actual stored vehicle speed	–
THROTTLE	Required throttle opening angle / min.: 0°, max.: 125°	Actual required throttle opening	–
CRUISE CONTROL	Cruise control system active condition / ON or OFF	ON : Cruise control activated OFF : Cruise control inactivated	–
MAIN SW (MAIN)	Main SW signal (Main CPU) / ON or OFF	ON : Main SW ON (Pushed in) OFF: Main SW OFF (Pushed out)	”3”
MAIN SW (SUB)	Main SW signal (Sub CPU) / ON or OFF	ON : Main SW ON (Pushed in) OFF: Main SW OFF (Pushed out)	”3”
CCS READY M	Cruise control system standby condition (Main CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”
CCS READY S	Cruise control system standby condition (Sub CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”
CCS INDICATOR M	Cruise indicator signal (Main CPU) / ON or OFF	ON : ”CCS READY” ON OFF : ”CCS READY” OFF	”2”
CCS INDICATOR S	Cruise indicator signal (Sub CPU) / ON or OFF	ON : ”CCS READY” ON OFF : ”CCS READY” OFF	”2”
CANCEL SW	CANCEL SW signal / ON or OFF	ON : CANCEL SW ON OFF : CANCEL SW OFF	–
SET/COAST SW	COAST/SET SW signal / ON or OFF	ON : COAST/SET SW ON OFF : COAST/SET SW OFF	–
RES/ACC SW	ACCEL/RES SW signal / ON or OFF	ON : ACCEL/RES SW ON OFF : ACCEL/RES SW OFF	–
STP LIGHT SW2 M	Stop lamp SW signal (Main CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
STP LIGHT SW2 S	Stop lamp SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–

STP LIGHT SW1 S	Stop light SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
SHIFT D POS	PNP SW signal (D position) / ON or OFF	ON : Shift D position OFF : Except shift D position	–

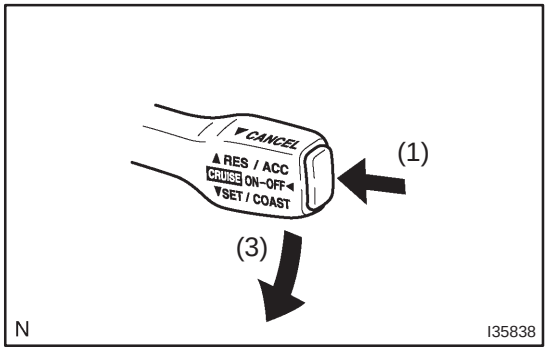
HINT:
”3” is OK but ”1” is NG → ECM failure
”1” is OK but ”2” is NG → DTC output or ECM failure
”3” is OK but cruise indicator does not turn on → CRUISE MAIN indicator or wire harness or ECM failure

4. DTC CLEAR

(a) The following methods will erase the DTCs and freeze frame data.
  (1) The hand–held tester can be used to erase the codes.
  (2) Disconnecting the battery terminals or EFI No.1 fuse can also erase the codes (1AZ–FSE). Disconnecting the battery terminals or EFI the fuse (1CD–FTV).

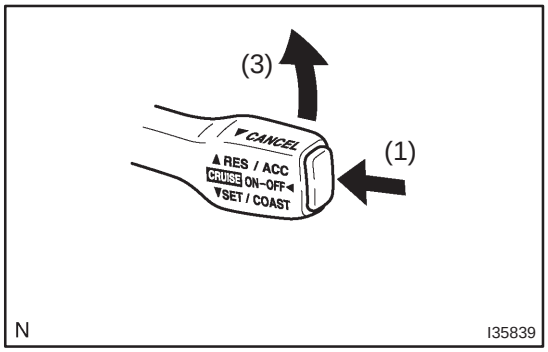
(b) After completing repairs, the DTC retained in the memory can be cleared by removing the EFI No.1 fuse for 1 minute or more with the ignition switch to the OFF position.

(c) Check that the normal code is displayed after connecting the fuse.

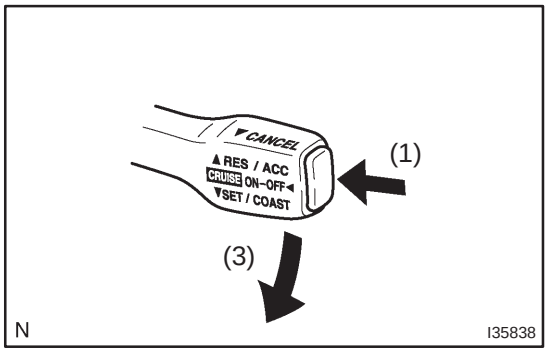


5. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)

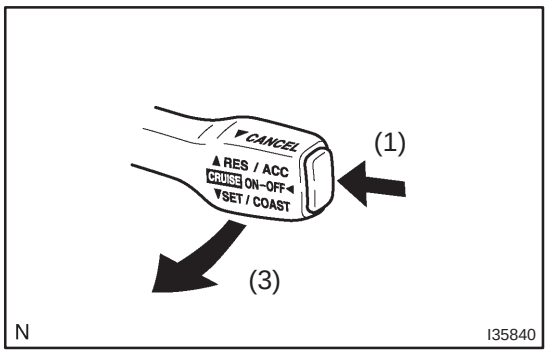
(a) Inspect the SET switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Push down the control switch to the SET/COAST position.
  (4) After releasing the switch, check that the vehicle cruises at the desired speed.



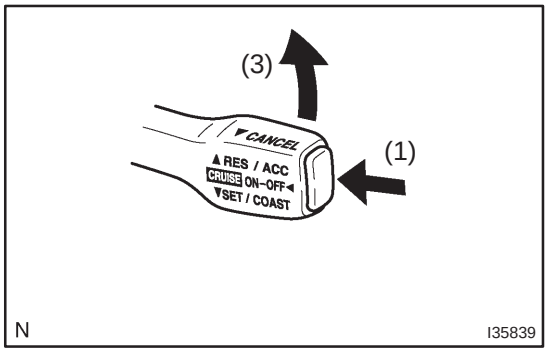
(b) Inspect the ’ACC’ switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Check that the vehicle speed increases when the control switch is pushed up to RES/ACC, and that the vehicle cruises at the set speed when the switch is released.
  (4) Push the control switch to RES/ACC, and then immediately release it. Check that the vehicle speed increases by about 1.6 km/h (Tap–up function).



(c) Inspect the 'COAST' switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) Check that the vehicle speed decreases while the control switch is pushed down to SET/COAST, and the vehicle cruises at the set speed when the switch is released.
(4) Push the control switch to SET/COAST, and then immediately release it. Check that the vehicle speed decreases by about 1.6 km/h (Tap–down function).



(d) Inspect the CANCEL switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) After doing one of the following, check that the cruise control system is cancelled and that the normal driving mode is resumed.
- Depressing the brake pedal.
- Depressing the clutch pedal (M/T).
- Shifting to any gear besides D (A/T).
- Pushing the main switch button to OFF.
- Pulling the control switch to CANCEL.



(e) Inspect the RESUME switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) After doing one of the following, check that the cruise control system is cancelled and that the normal driving mode is resumed.
- Depressing the brake pedal.
- Depressing the clutch pedal (M/T).
- Shift to any gear besides D (A/T).
- Pulling the control switch to CANCEL.

(4) After the control switch is press towards RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle resumes the same speed maintained before the cancellation.

CRUISE CONTROL SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

05ADI–04

1	VEHICLE BROUGHT TO WORK SHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1699)

3	CHECK AND CLEAR DTCS (See page 05–1700)

4	PROBLEM SYMPTOM CONFIRMATION

- SYMPTOM DOES NOT OCCUR (GO TO STEP 5)
- SYMPTOM OCCURS (GO TO STEP 6)

5	SYMPTOM SIMULATION (See page 01–22)

6	DTC CHECK (See page 05–1700)

- MALFUNCTION CODE (GO TO STEP 7)
- NORMAL CODE (GO TO STEP 8)

7	DTC CHART (See page 05–1705)

GO TO STEP 9

8	PROBLEM SYMPTOMS TABLE (See page 05–1709)

9	CIRCUIT INSPECTION (See page 05–453)

10	TERMINAL OF ECM (See page 05–1707)

11	INDEMNIFICATION OF PROBLEM

12	REPAIR OR REPLACE

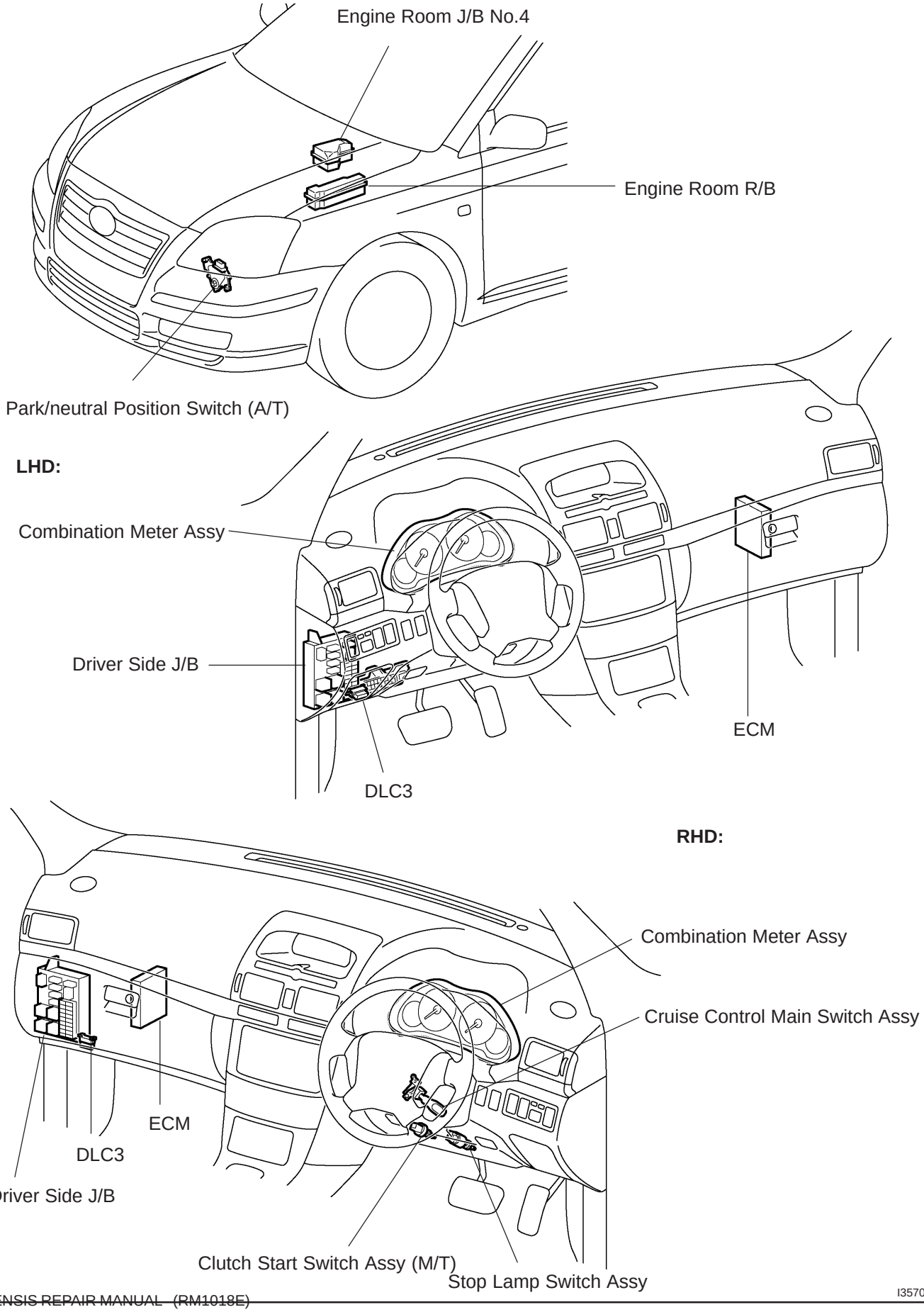
13	CONFIRMATION TEST

END

HINT:
Step 3, 6, 9, 13:
Diagnostic steps permit the use of the hand–held tester.

05ADK–04

LOCATION



I35700

DTC	P0500/21	VEHICLE SPEED SENSOR ”A”

DTC	P0503/23	VEHICLE SPEED SENSOR ”A” INTERMITTENT/ERRATIC/HIGH

CIRCUIT DESCRIPTION

See page 05–453. (1AZ–FSE) See page 05–640. (1CD–FTV)

DTC No.	DTC Detection Condition	Trouble Area
P0500/21	The malfunction code is output when the vehicle speed signal from the vehicle speed sensor is cut for 0.14 sec. or more while cruise control is in operation.	• Combination meter • Vehicle speed sensor • Vehicle speed sensor • ECM
P0503/23	Momentary interruption and noise malfunction codes are output when a rapid change of vehicle speed occurs while cruise control is in operation.	

WIRING DIAGRAM

See page 05–453. (1AZ–FSE) See page 05–640. (1CD–FTV)

INSPECTION PROCEDURE

See page 05–453. (1AZ–FSE) See page 05–640. (1CD–FTV)

DTC P0571/52 BRAKE SWITCH ”A” CIRCUIT

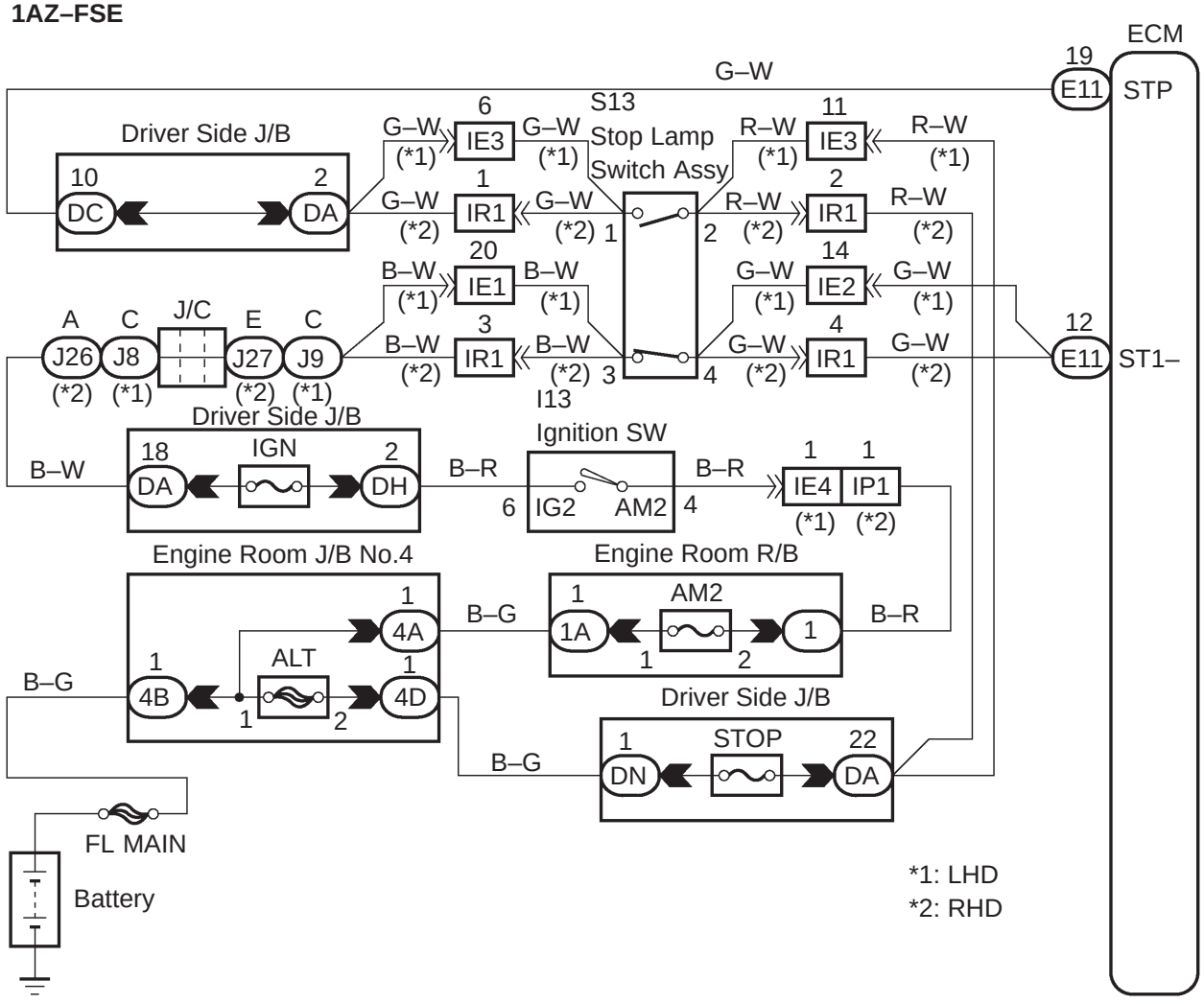
CIRCUIT DESCRIPTION

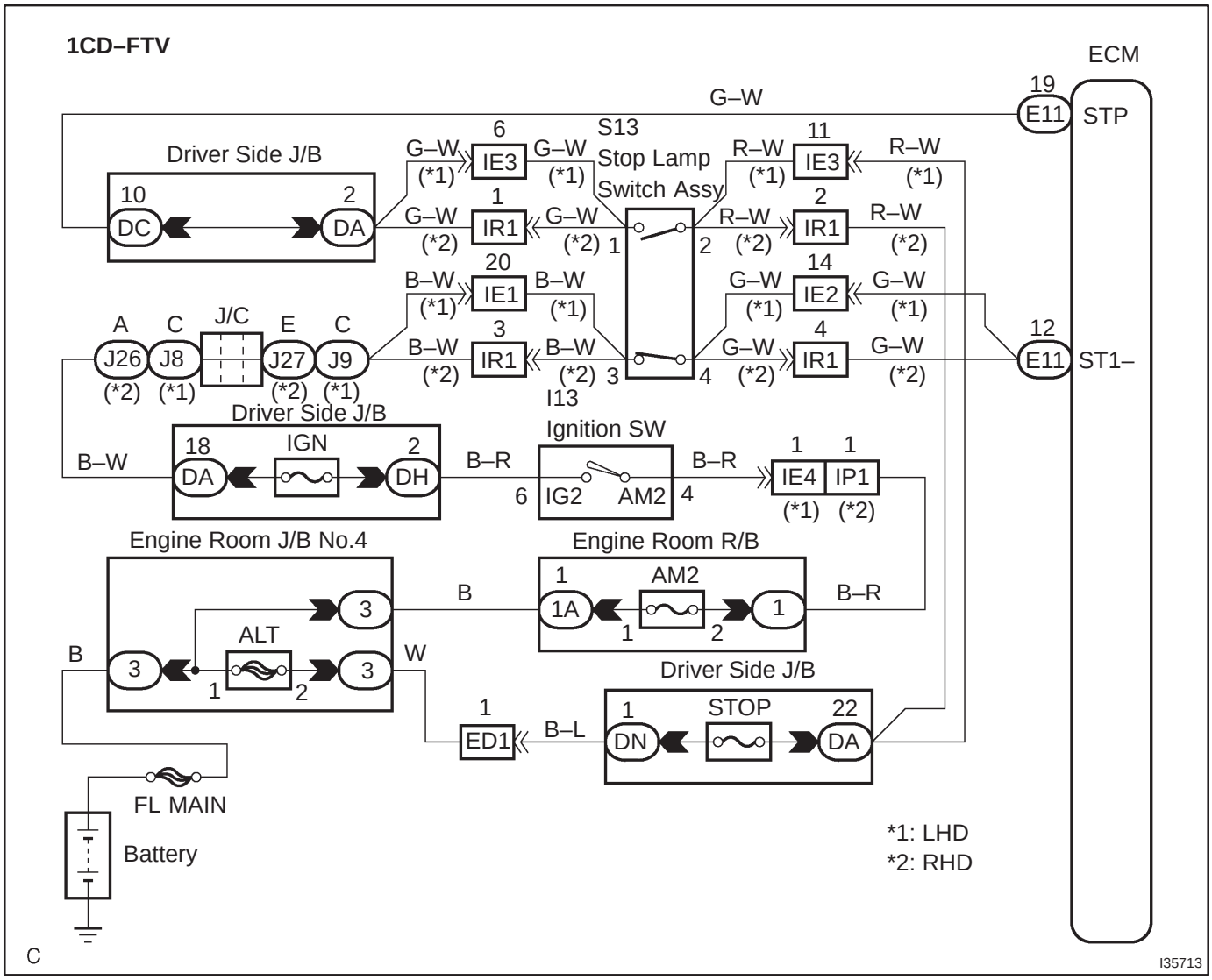
When the brake pedal is depressed, the stop lamp switch assy sends a signal to the ECM. When the ECM receives this signal, it cancels the cruise control.
A fail–safe function is provided so that it functions normally, even if there is a malfunction in the stop lamp signal circuit.
The cancel condition occurs when battery positive voltage is supplied to terminal STP.
When the brake is on, battery positive voltage is normally applied through the STOP fuse and the stop lamp switch assy to terminal STP of the ECM, and the ECM turns the cruise control OFF.
If the harness connected to terminal STP has an open circuit, terminal STP will have battery positive voltage and the cruise control will be turned OFF.

DTC No.	DTC Detection Condition	Trouble Area
P0571/52	The malfunction code is output when the voltage of the STP terminal and that of the ST1 terminal on the ECM are less than 1 V for 0.5 sec. or more. When the following conditions are realized, a malfunction is detected. • The STP terminal voltage is less than 1 V. • The ST1 terminal voltage is less than 1 V. • For more than 0.5 sec. or more.	• Stop lamp switch assy • Stop lamp switch assy circuit • ECM

WIRING DIAGRAM

1AZ–FSE




1CD–FTV
ECM
19
E11
STP
G–W
Driver Side J/B
10
DC
2
DA
G–W
(*1)
6
IE3
G–W
(*1)
S13
Stop Lamp
Switch Assy
R–W
(*1)
11
IE3
R–W
(*1)
G–W
(*2)
1
IR1
G–W
(*2)
1
2
R–W
(*2)
2
IR1
R–W
(*2)
B–W
(*1)
20
IE1
B–W
(*1)
G–W
(*1)
14
IE2
G–W
(*1)
A
J26
(*2)
C
J8
(*1)
J/C
E
J27
(*2)
C
J9
(*1)
B–W
(*2)
3
IR1
B–W
(*2)
3
4
G–W
(*2)
4
IR1
G–W
(*2)
12
E11
ST1–
I13
Driver Side J/B
Ignition SW
B–W
18
DA
IGN
2
DH
B–R
6
IG2
AM2
4
B–R
1
IE4
(*1)
1
IP1
(*2)
Engine Room J/B No.4
Engine Room R/B
3
B
1
1A
AM2
1
2
B–R
B
3
ALT
1
2
3
W
Driver Side J/B
1
ED1
B–L
1
DN
STOP
22
DA
FL MAIN
Battery
*1: LHD
*2: RHD
C
I35713

INSPECTION PROCEDURE

HINT:

In case of using the hand–held tester, start the inspection from step1, and in case of not using the hand–held tester, start from step 2.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position and turn the hand–held tester main switch ON.
(c) Select the item ”STOP LIGHT SW” in the DATA LIST and read the displayed value.

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
STP LIGHT SW2 M	Stop lamp SW signal (Main CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
STP LIGHT SW2 S	Stop lamp SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–

Standard:
Brake pedal depressed: OK
Brake pedal released: OFF

NG → **Go to step 2**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

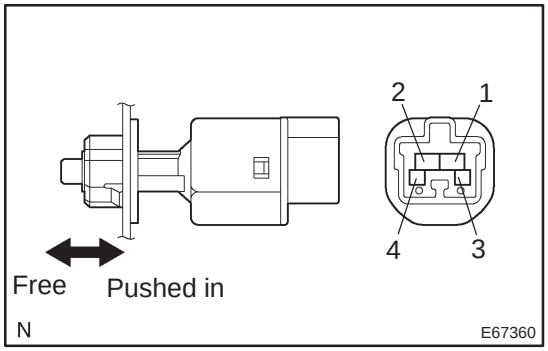
2	INSPECT STOP LAMP SWITCH OPERATION

(a) Check that the stop lamp lights up when brake pedal is depressed, and goes off when the brake pedal is released.

NG → **INSPECT STOP LAMP SWITCH CIRCUIT**

OK

3 INSPECT STOP LAMP SWITCH ASSY



(a) Disconnect the stop lamp switch assy connector.
(b) Measure the resistance according to the value(s) in the table below.

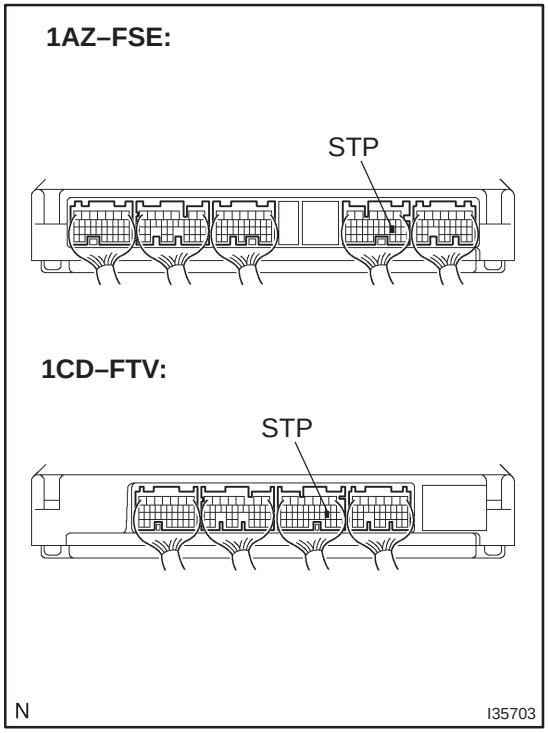
Standard:

Switch condition	Tester connection	Specification
Switch pin free	1 – 2	1 Ω or less
Switch pin free	3 – 4	10 kΩ or higher
Switch pin pushed in	1 – 2	10 kΩ or higher
Switch pin pushed in	3 – 4	1 Ω or less

NG → **REPLACE STOP LAMP SWITCH ASSY**

OK

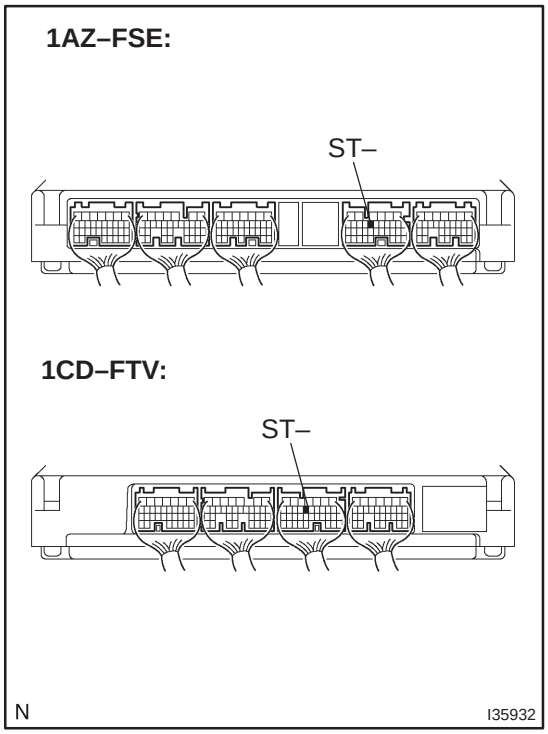
4 INSPECT ECM



(a) Remove the ECM with connectors.
(b) Turn the ignition switch to the ON position.
(c) Measure the voltage between terminal STP of ECM connector and body ground when the brake pedal is depressed and released.

Standard:

Pedal condition	Tester connection	Specification
Depressed	STP (E11–19) – Body ground	10 to 14 V
Released	STP (E11–19) – Body ground	1 V or less



(d) Measure the voltage between terminal ST1– of ECM connector and body ground when the brake pedal is depressed and released.

Standard:

Pedal condition	Tester connection	Specification
Depressed	ST– (E11–12) – Body ground	1 V or less
Released	ST– (E11–12) – Body ground	10 to 14 V

NG → **REPLACE ECM (See page 01–32)**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC	P0607/54	CONTROL MODULE PERFORMANCE

CIRCUIT DESCRIPTION

This DTC indicates the internal abnormalities of ECM.

DTC No.	Detection Item	Trouble Area
P0607/54	The ECM has a supervisory CPU and control ECU inside. When each input STP signal is different for 0.15 sec. or more, the malfunction code is output. The malfunction code is output after 0.4 sec. have passed from the time the cruise cancel input signal (STP input) is input into the ECM. HINT: • When a malfunction code is detected, the fail safe must be kept on until the ignition switch is turned off.	• ECM

INSPECTION PROCEDURE

1	**REPLACE ECM (See page 01–32)**

056HG–05

PRE–CHECK

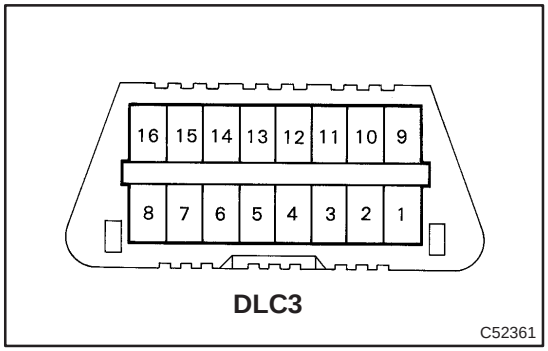
1. DIAGNOSIS SYSTEM

(a) Description

ECM controls of the cruise control the function on a vehicle.

Data stored in the cruise control memory and on the DTC can be read from the DLC3 on the vehicle. If CRUISE MAIN indicator light does not come on after the DTC check, there is a malfunction of the cruise control.

Use the hand–held tester or SST to check and solve the problem.



DLC3

(b) Check the DLC3.

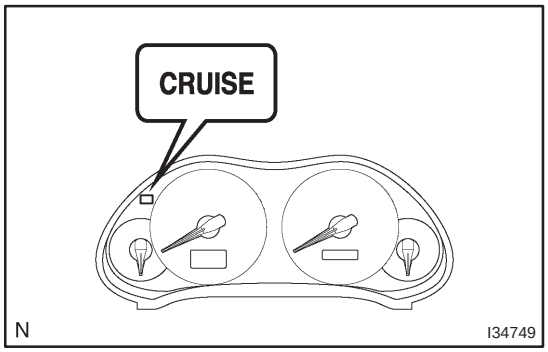
The vehicle's ECM uses ISO 9141–2(Euro–OBD)/ISO 14230 (M–OBD) for communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–3 and matches the ISO 9141–2 / ISO 14230 format.

Terminal No.	Connection/SpecifiedCondition	Condition
4	Chassis Ground ↔ Body Ground / 1 Ω or less	Always
7	Bus ⊕ Line / Pulse Generation	DuringCommunication
16	Battery Positive – Body Ground / 9 to 14 V	Always

HINT:

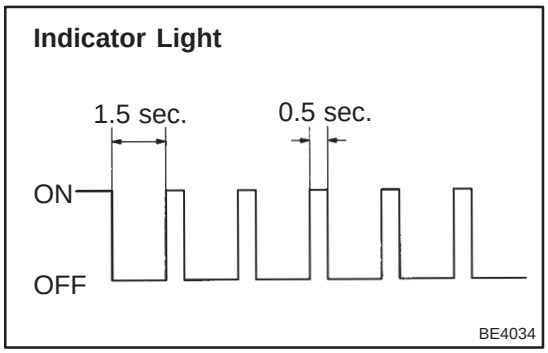
If the display shows "UNABLE TO CONNECT TO VEHICLE" after connecting the hand–held tester to the DLC3 and turning the ignition ON, there is a problem either with the vehicle or with the tool.

- If communication is normal when connecting the tool to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when connecting the tool to another vehicle, the problem is probably in the tool itself. Consult the Service Department listed in the tool's instruction manual.



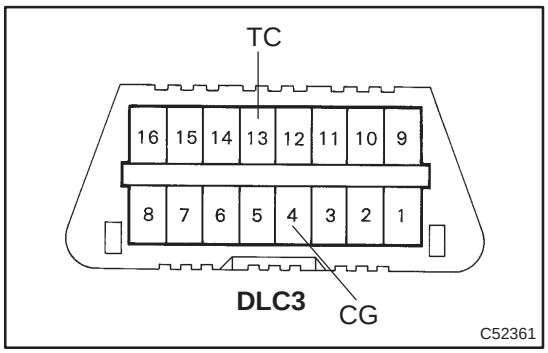
(c) Check the indicator.
(1) Turn the ignition switch to the ON position.
(2) Check that the CRUISE MAIN indicator light comes on when the main switch is ON, and that the indicator light goes off when the main switch is OFF.

HINT:
If there is a problem with the indicator, inspect the cruise main indicator light circuit (See page 05–1722).

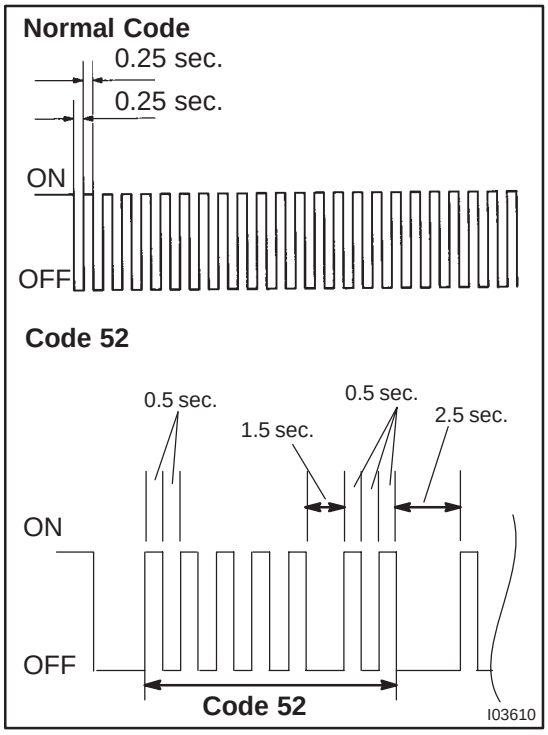


(d) Check the DTC.

HINT:
If a malfunction occurs in the vehicle speed sensors or stop lamp switch assy, etc. during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and then the CRUISE MAIN indicator light will start to blink, informing the driver of a malfunction. At the same time, data of the malfunction is stored as a diagnostic trouble code, or DTC.



(e) Output of the DTC using diagnosis check wire.
(1) Using SST, connect terminals TC and CG of DLC3.
SST 09843–18040
(2) Turn the ignition switch to the ON position.
(3) Read the DTC on the CRUISE MAIN indicator light.



HINT:
If the DTC is not output, inspect the cruise main indicator light circuit (See page 05–1722) and diagnosis circuit (See page 05–1729).
For example, the normal blinking pattern and the blinking pattern for code 52 are shown in the illustration.

2. USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:
Hand–held tester has a ”Snapshot” function which records the monitored data.
Refer to the hand–held tester operator’s manual for further details.

3. DATA LIST

HINT:
From the DATA LIST displayed by the the hand–held tester, you can read the value of the switch, the sensor and so on without removing parts. Reading the DATA LIST as the first step to troubleshooting is one way to shorten labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position.
(c) According to the display on the tester, read the ”DATA LIST”.

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
VEHICLE SPD	Vehicle speed / min.: 0 km/h (0 mph), max.: 255 km/h (158 mph)	Actual vehicle speed	–
MEMORY SPD	Stored vehicle speed / min.: 36 km/h (22 mph), max.: 200 km/h (124 mph)	Actual stored vehicle speed	–
THROTTLE	Required throttle opening angle / min.: 0°, max.: 125°	Actual required throttle opening	–
CRUISE CONTROL	Cruise control system active condition / ON or OFF	ON : Cruise control activated OFF : Cruise control inactivated	–
MAIN SW (MAIN)	Main SW signal (Main CPU) / ON or OFF	ON : Main SW ON (Pushed in) OFF: Main SW OFF (Pushed out)	”3”
MAIN SW (SUB)	Main SW signal (Sub CPU) / ON or OFF	ON : Main SW ON (Pushed in) OFF: Main SW OFF (Pushed out)	”3”
CCS READY M	Cruise control system standby condition (Main CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”
CCS READY S	Cruise control system standby condition (Sub CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”
CCS INDICATOR M	Cruise indicator signal (Main CPU) / ON or OFF	ON : ”CCS READY” ON OFF : ”CCS READY” OFF	”2”
CCS INDICATOR S	Cruise indicator signal (Sub CPU) / ON or OFF	ON : ”CCS READY” ON OFF : ”CCS READY” OFF	”2”
CANCEL SW	CANCEL SW signal / ON or OFF	ON : CANCEL SW ON OFF : CANCEL SW OFF	–
SET/COAST SW	COAST/SET SW signal / ON or OFF	ON : COAST/SET SW ON OFF : COAST/SET SW OFF	–
RES/ACC SW	ACCEL/RES SW signal / ON or OFF	ON : ACCEL/RES SW ON OFF : ACCEL/RES SW OFF	–
STP LIGHT SW2 M	Stop lamp SW signal (Main CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
STP LIGHT SW2 S	Stop lamp SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–

STP LIGHT SW1 S	Stop light SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
SHIFT D POS	PNP SW signal (D position) / ON or OFF	ON : Shift D position OFF : Except shift D position	–

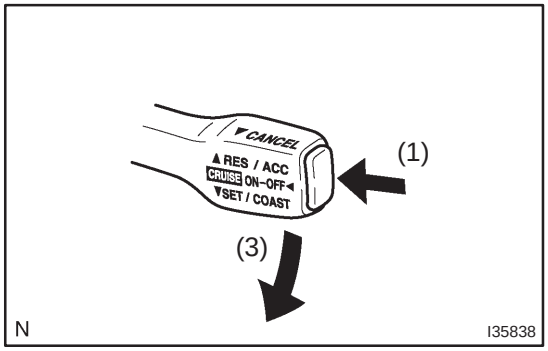
HINT:
”3” is OK but ”1” is NG → ECM failure
”1” is OK but ”2” is NG → DTC output or ECM failure
”3” is OK but cruise indicator does not turn on → CRUISE MAIN indicator or wire harness or ECM failure

4. DTC CLEAR

(a) The following methods will erase the DTCs and freeze frame data.
  (1) The hand–held tester can be used to erase the codes.
  (2) Disconnecting the battery terminals or EFI No.1 fuse can also erase the codes (1AZ–FSE). Disconnecting the battery terminals or EFI the fuse (1CD–FTV).

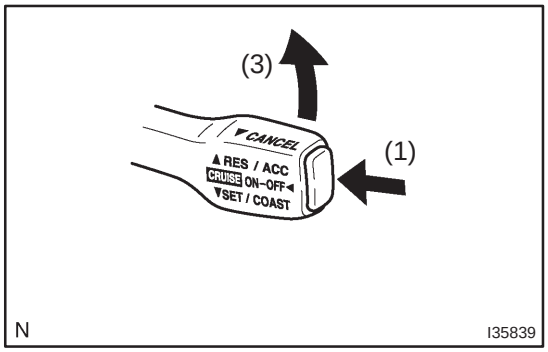
(b) After completing repairs, the DTC retained in the memory can be cleared by removing the EFI No.1 fuse for 1 minute or more with the ignition switch to the OFF position.

(c) Check that the normal code is displayed after connecting the fuse.

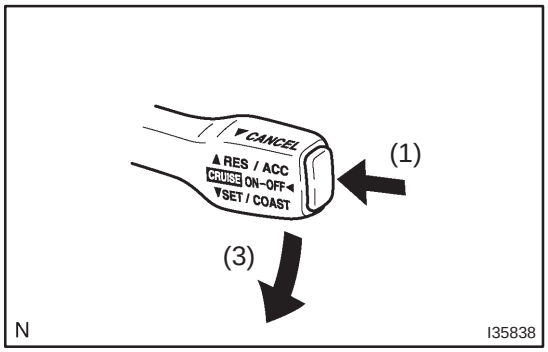


5. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)

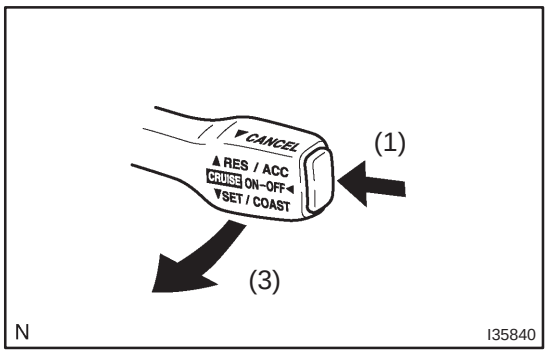
(a) Inspect the SET switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Push down the control switch to the SET/COAST position.
  (4) After releasing the switch, check that the vehicle cruises at the desired speed.



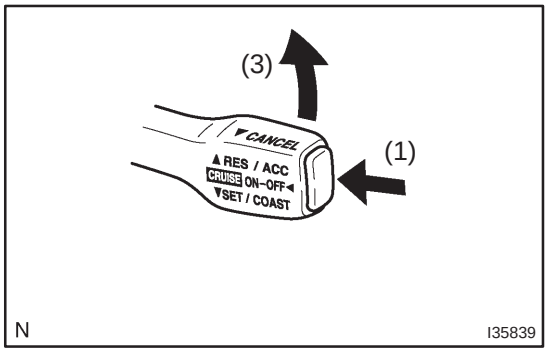
(b) Inspect the ’ACC’ switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Check that the vehicle speed increases when the control switch is pushed up to RES/ACC, and that the vehicle cruises at the set speed when the switch is released.
  (4) Push the control switch to RES/ACC, and then immediately release it. Check that the vehicle speed increases by about 1.6 km/h (Tap–up function).



(c) Inspect the 'COAST' switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) Check that the vehicle speed decreases while the control switch is pushed down to SET/COAST, and the vehicle cruises at the set speed when the switch is released.
(4) Push the control switch to SET/COAST, and then immediately release it. Check that the vehicle speed decreases by about 1.6 km/h (Tap–down function).



(d) Inspect the CANCEL switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) After doing one of the following, check that the cruise control system is cancelled and that the normal driving mode is resumed.
- Depressing the brake pedal.
- Depressing the clutch pedal (M/T).
- Shifting to any gear besides D (A/T).
- Pushing the main switch button to OFF.
- Pulling the control switch to CANCEL.



(e) Inspect the RESUME switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) After doing one of the following, check that the cruise control system is cancelled and that the normal driving mode is resumed.
- Depressing the brake pedal.
- Depressing the clutch pedal (M/T).
- Shift to any gear besides D (A/T).
- Pulling the control switch to CANCEL.

(4) After the control switch is press towards RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle resumes the same speed maintained before the cancellation.

056HK–05

PROBLEM SYMPTOMS TABLE

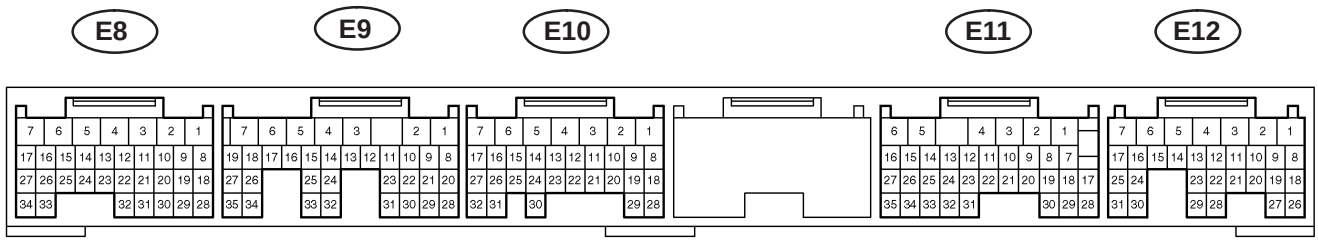
If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the related troubleshooting page.

Symptom	Suspect Area	See page
Main switch cannot be turned ON. (Cruise indicator light in combination meter is not lit.)	1. Cruise control switch circuit 2. CRUISE MAIN indicator light circuit 3. ECM	05–1718 05–1722 01–32
Setting of vehicle speed cannot be done. (Although indicator light in combination meter is lit when the main switch is turned ON, they go off when vehicle speed is set.)	1. Cruise control switch circuit 2. ECM	05–1718 01–32
Setting cannot be done. (Indicator light in combination meter is lit when the main switch is turned ON and they remain ON while setting.)	1. Cruise control switch circuit 2. Stop lamp switch circuit 3. Combination meter system 4. ECM	05–1718 05–1711 71–1 01–32
While the vehicle is driving with cruise control, the set control is canceled. (Indicator light and CRUISE remain ON.)	1. Cruise control switch circuit 2. Vehicle speed sensor circuit 3. Stop lamp switch circuit 4. CRUISE MAIN indicator light circuit 5. ECM	05–1718 05–1710 05–1711 05–1722 01–32
Hunting (Speed is not constant.)	1. Vehicle speed sensor circuit 2. ECM	05–1710 01–32
Setting cannot be cancelled. (When Coast, Acceleration, Resume, Set speed change and Control switch are operated.)	1. Cruise control switch circuit 2. CRUISE MAIN indicator light circuit 3. ECM	05–1718 05–1722 01–32
DTC is not output, or is output when should not be.	1. Diagnosis circuit 2. CRUISE MAIN indicator light circuit 3. ECM	05–1729 05–1722 01–32
CRUISE MAIN indicator light does not light up.	1. Cruise control switch circuit 2. CRUISE MAIN indicator light circuit 3. ECM 4. Combination meter	05–1718 05–1722 01–32 71–1

05ADL–02

TERMINALS OF ECM

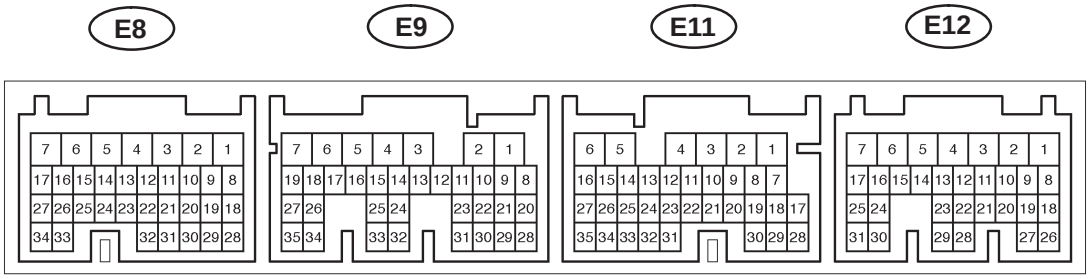
1AZ–FSE:



I34746

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
TC – E1 (E12–20 – E10–1)	W–L – BR	Ignition switch ON	10 to 14 V
		Ignition switch ON Connect terminals TC and CG of DLC3	Below 2 V
STP – E1 (E11–19 – E10–1)	G–W – BR	Ignition switch ON Depress brake pedal	10 to 14 V
		Ignition switch ON Release brake pedal	Below 1 V
IGSW – E1 (E12–9 – E10–1)	B–W – BR	Ignition switch ON Cruise control main switch ON	0 to 3 V
		Ignition switch ON Cruise control main switch OFF	9 to 14 V
ST1– – E1 (E11–12 – E10–1)	G–W – BR	Ignition switch ON Depress brake pedal	Below 1 V
		Ignition switch ON Release brake pedal	10 to 14 V
CCS – E1 (E11–24 – E10–1)	W – BR	Ignition switch ON	9 to 14 V
		Ignition switch ON CANCEL switch hold ON	6 to 10.1 V
		Ignition switch ON SET/COAST switch hold ON	4 to 7.1 V
		Ignition switch ON RES/ACC switch hold ON	2.1 to 4 V
		Ignition switch ON MAIN switch hold ON	Below 1 V

1CD–FTV:



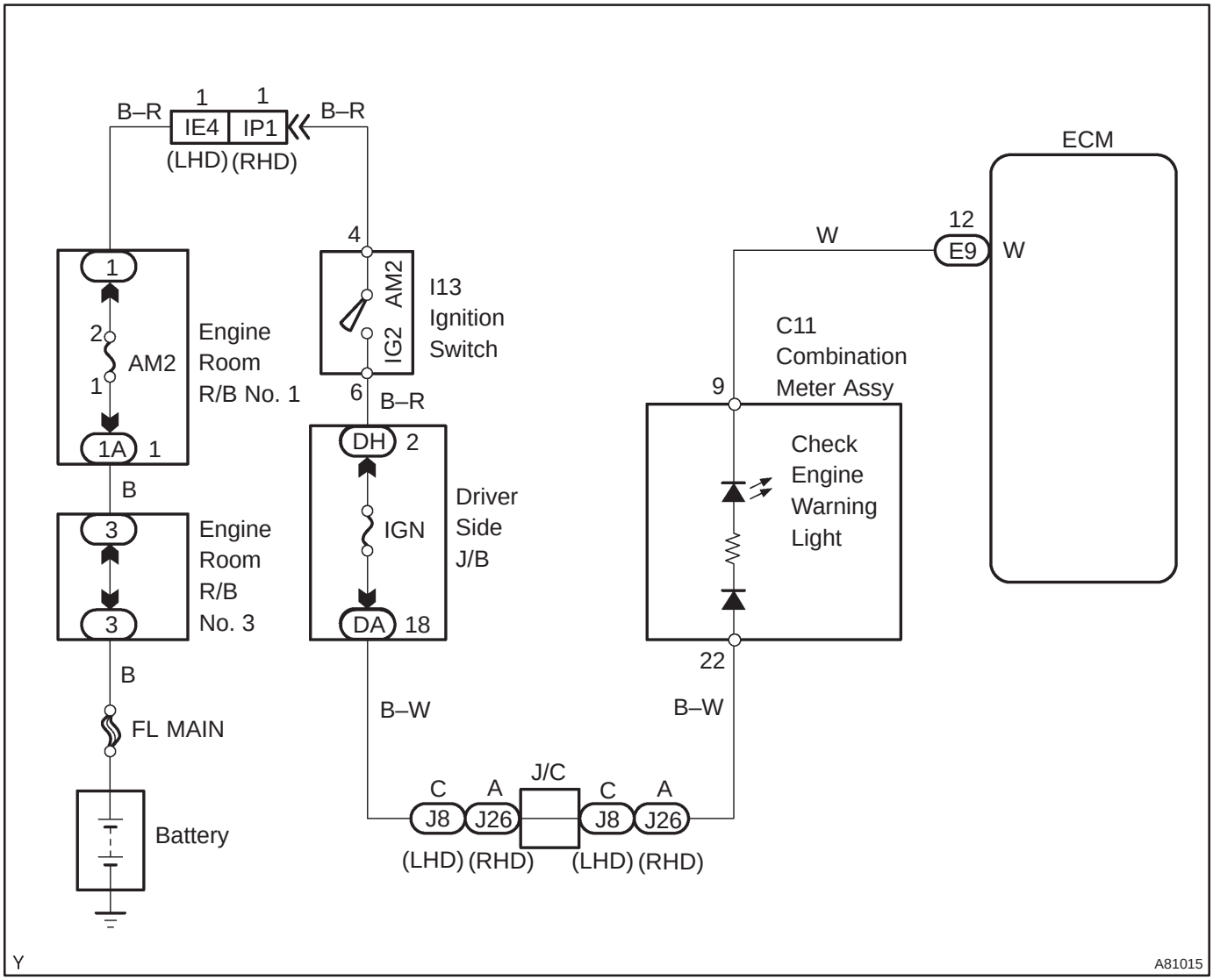
Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
STP – E1 (E11–19 – E9–7)	G–W – BR	Ignition switch ON Depress brake pedal	10 to 14 V
		Ignition switch ON Release brake pedal	Below 1 V
ST1– – E1 (E11–12 – E9–7)	G–W – BR	Ignition switch ON Depress brake pedal	Below 1 V
		Ignition switch ON Release brake pedal	10 to 14 V
CCS – E1 (E11–24 – E9–7)	W – BR	Ignition switch ON	9 to 14 V
		Ignition switch ON CANCEL switch hold ON	6 to 10.1 V
		Ignition switch ON SET/COAST switch hold ON	4 to 7.1 V
		Ignition switch ON RES/ACC switch hold ON	2.1 to 4 V
		Ignition switch ON MAIN switch hold ON	Below 1 V
M/T: D – E1 (E11–10 – E9–7)	LG–B – BR	Ignition switch ON Depress clutch pedal	Below 1 V
		Ignition switch ON Release clutch pedal	10 to 14 V
TC – E1 (E12–11 – E9–7)	W–L – BR	Ignition switch ON	10 to 14 V
		Ignition switch ON Connect terminals TC and CG of DLC3	Below 2 V

CHECK ENGINE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

If the ECM detects a trouble, the CHK ENG is illuminated. At this time, the ECM records the DTC in its memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below .

CHK ENG remains on	Start inspection from step 1
CHK ENG is not illuminated	Start inspection from step 3

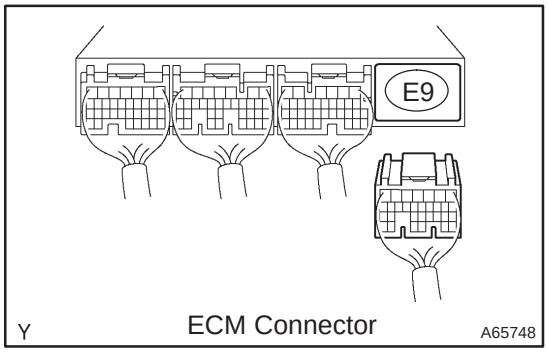
1	CLEAR DTC

(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Read the DTC (See page 05–528).
(d) Clear the DTC (See page 05–528).
(e) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated

OK → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE (See page 05–544)**

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E9 ECM connector.
(b) Turn the ignition switch ON.
(c) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated

OK → **REPLACE ECM (See page 10–65)**

NG

CHECK AND REPAIR HARNESS AND CONNECTOR

3	CHECK ENGINE WARNING LIGHT CONDITION

(a) Check that the CHK ENG is illuminated when the ignition switch is turned ON.
Standard: CHK ENG is illuminated

OK → **SYSTEM OK**

NG

4	INSPECT COMBINATION METER ASSY(CHECK ENGINE WARNING LIGHT CIRCUIT)

(a) See the combination meter troubleshooting on page 05–1509.

NG → **REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER – ECM)

054JC–04

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

Customer's Name		VIN	
Driver's Name		Production Date	
Date Vehicle Brought in		Licence No.	
License No.		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx.____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of check engine warning light (CHK ENG)		☐ Remains on	☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre–check)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

ECD SYSTEM (1CD–FTV)

05CP9–01

DESCRIPTION

1. COMMON RAIL SYSTEM

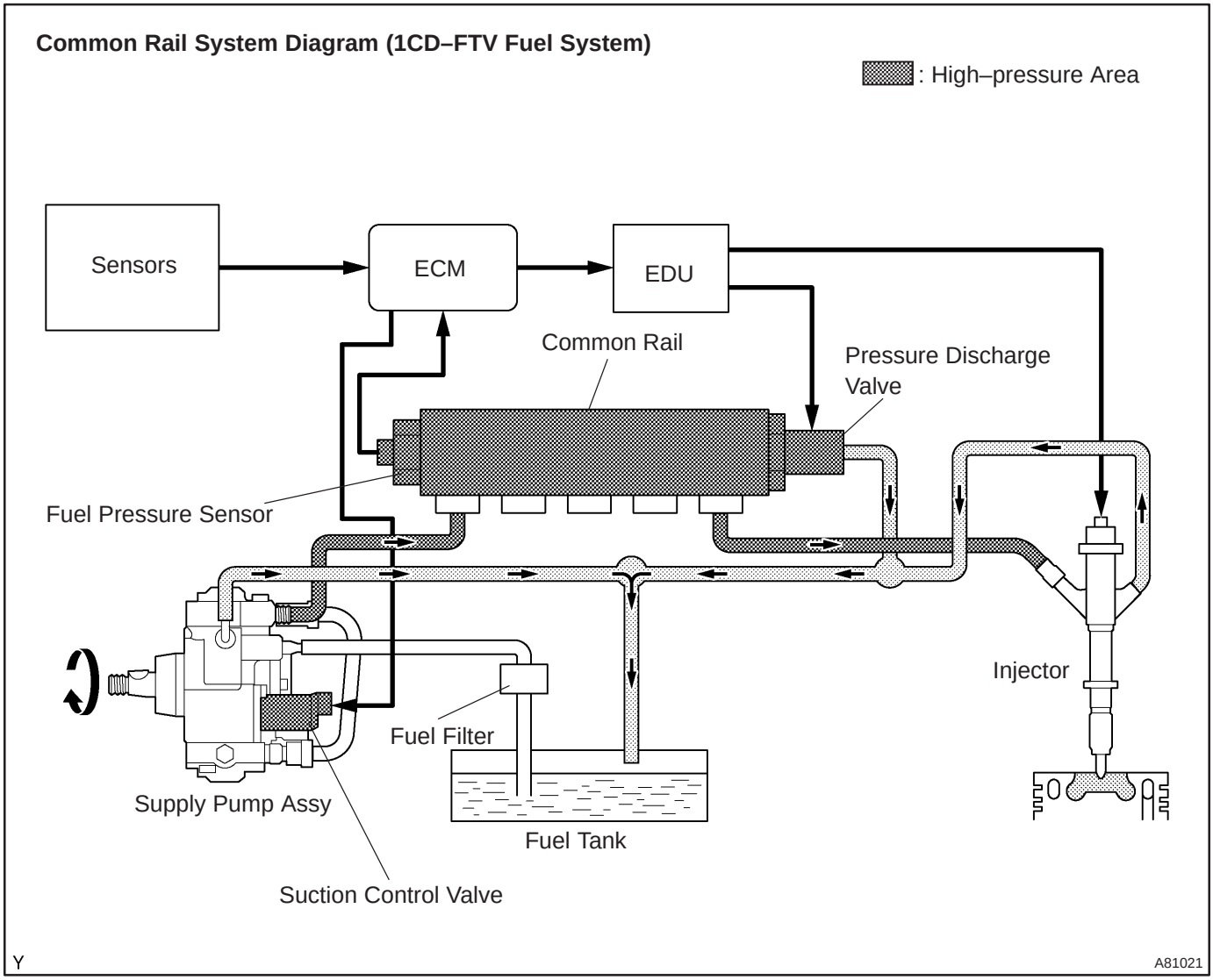
The common rail system stores high–pressure fuel supplied from the supply pump in the common rail and injects it using the injector. Fuel injection timing and fuel injection volume are regulated by the ECM; it provides an electric current to the solenoid valve of the injector with the EDU to regulate them.

By storing high–pressure fuel produced in the supply pump in the common rail, this system can always offer stable fuel injection pressure regardless of the engine speed and engine load, even if a driving speed is low. In addition, this system uses the injector that opens and closes its fuel passage with the Two–Way–Valve (TWV) therefore both the fuel injection time and volume are precisely regulated by the ECM.

The ECM monitors internal fuel pressure of the common rail with the fuel pressure sensor and commands the supply pump to supply fuel to obtain a target internal pressure (approximately 30 to 180 MPa (306 to 1,835 kgf/cm^2, 4,351 to 26,106 psi)). The ECM opens and closed the pressure discharge valve to improve controllability for the common rail internal fuel pressure.

This system has two divisional fuel injections. It performs ”pilot–injection” as subsidiary fuel injection prior to the main fuel injection to make combustion soft, and this helps to reduce engine vibration and noise.

Common Rail System Diagram (1CD–FTV Fuel System)

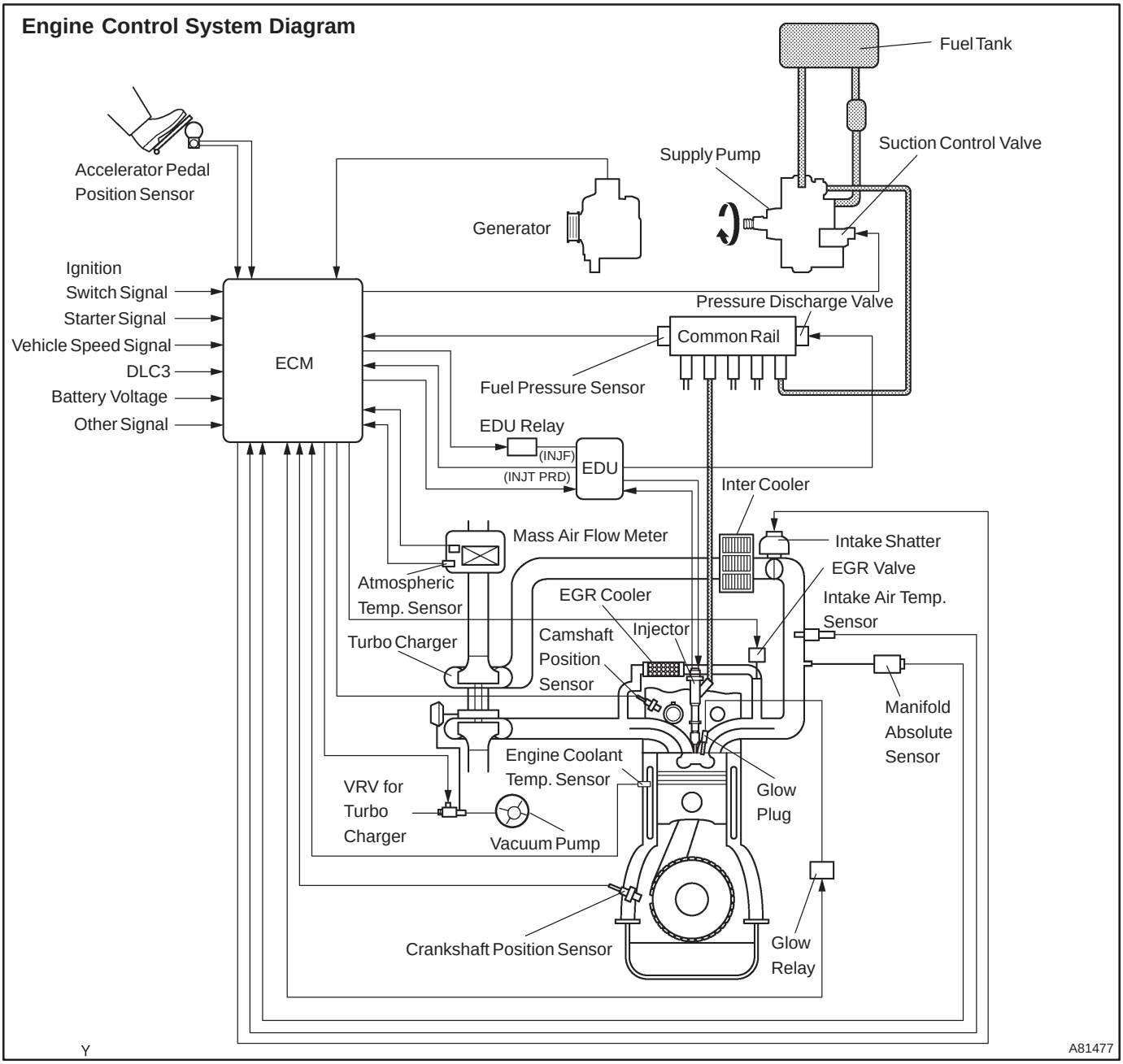


COMMON RAIL SYSTEM COMPONENTS:

Component	Description
Common rail	Store high–pressure fuel produced by the supply pump
Supply pump	Operated by the crankshaft, and supply high–pressure fuel to the common rail
Injector	Inject fuel to the combustion room based on signals from the ECM
Fuel pressure sensor	Monitor internal fuel pressure of the common rail and send signals to the ECM
Pressure discharge valve	Based on signals from the ECM, open the valve when sudden deceleration is occurred, or when the ignition switch is OFF to prevent the fuel pressure from being too high
Suction control valve	Based on signals from the ECM, adjust fuel volume supplied to the common rail and regulate the internal fuel pressure

2. ENGINE CONTROL SYSTEM

Engine Control System Diagram

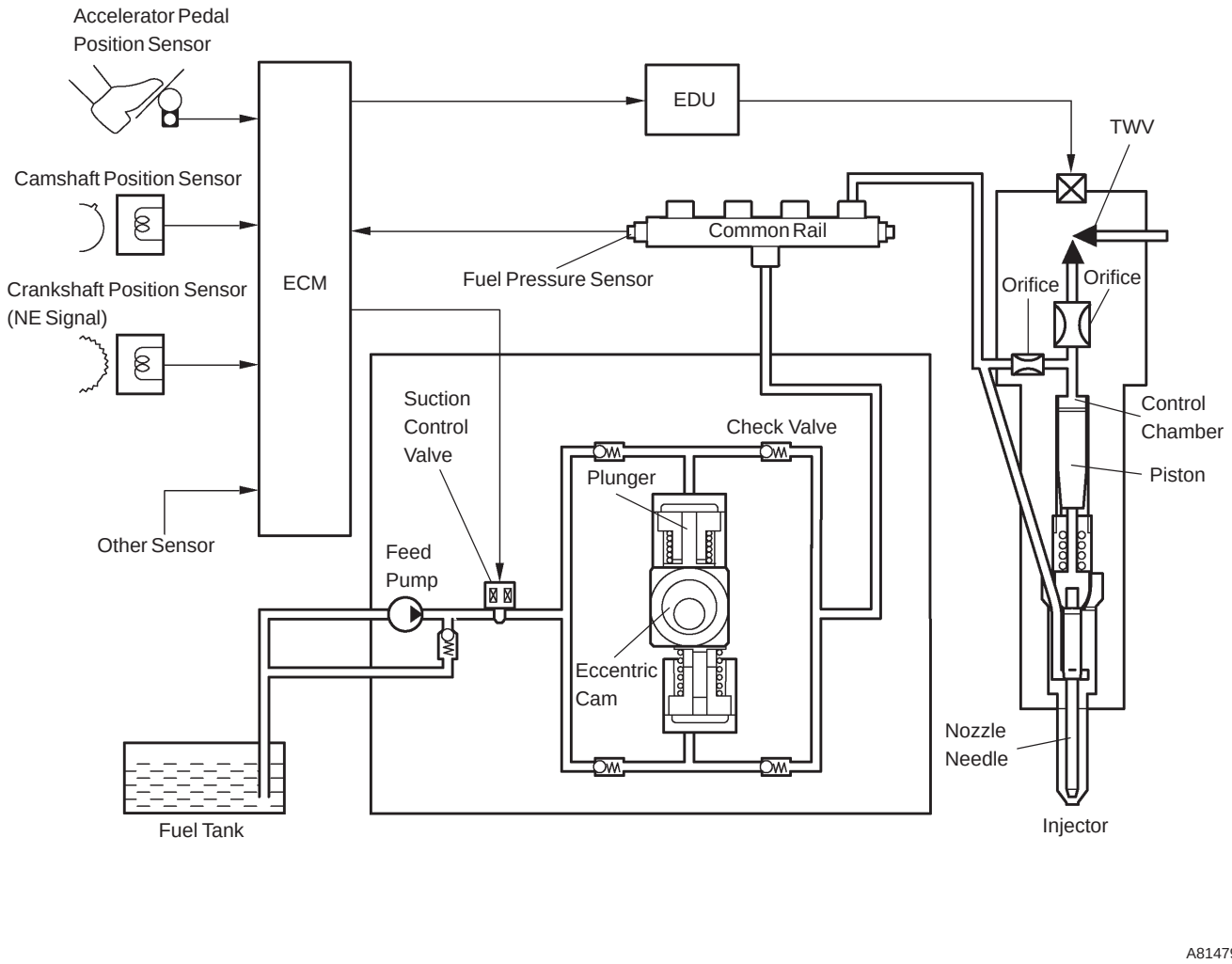


3. INJECTION CONTROL SYSTEM

The ECM controls the fuel injection system using the injector and the supply pump. The ECM determines the fuel injection volume and injection timing by controlling duration and timing of the energizing to the solenoid valve of the injector, and determines injection pressure by controlling the Suction Control Valve located on the supply pump.

The feed pump is used to pump fuel from the fuel tank into the supply pump.

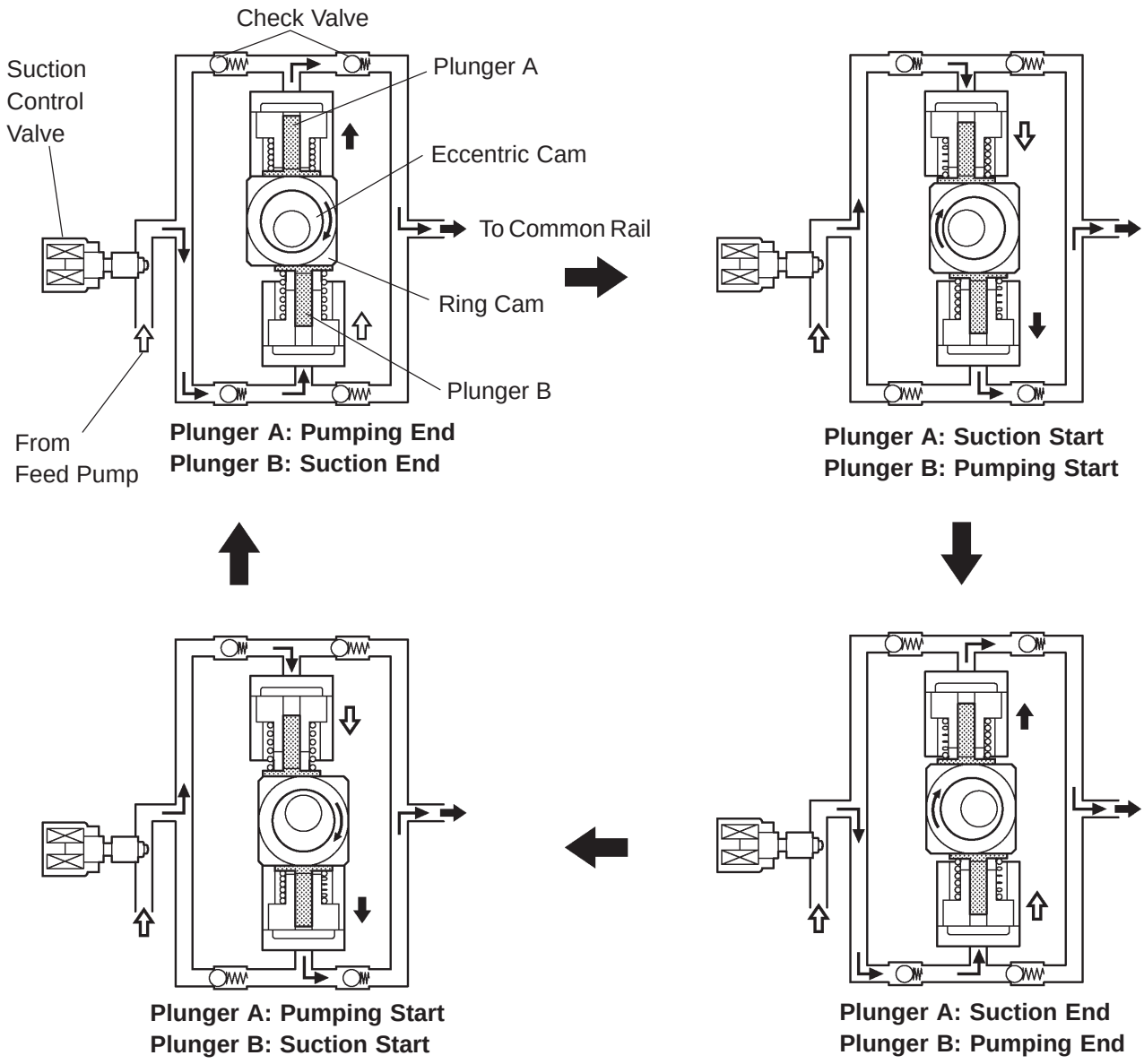
Injection Control Diagram



4. SUPPLY PUMP OPERATION SYSTEM

The rotation of the eccentric cam causes the ring cam pushes plunger A upward as illustrated below. The spring force pulls plunger B (which is located on opposite of plunger A) upward. As a result, plunger B draws fuel in, and plunger A pumps fuel at the same time.

Supply Pump Operation Diagram



5. SUCTION CONTROL VALVE OPERATION SYSTEM

HINT:

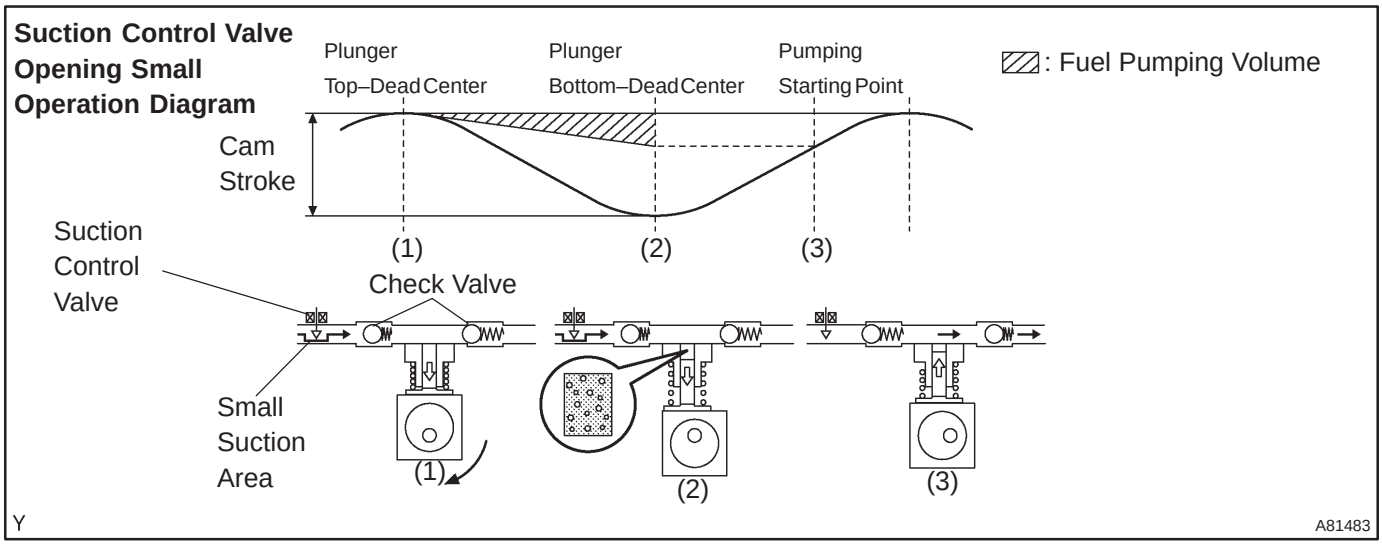
The ECM controls the suction control valve operation to regulate the fuel volume that is pumped by the supply pump to the common rail. Consequently, the fuel pressure in the common rail is controlled to the target injection pressure.

(a) Suction control valve opening small:

(1) When the opening of the suction control valve is small, the fuel suction area is kept small, therefore the transferble fuel volume is decreased.

(2) The suction volume becomes small due to the small suction area, despite the plunger stroke is full. Therefore, the difference of the volume between the geometry volume and the suction volume is in vacuum condition.

(3) Pumping will start at the time when the fuel pressure has become higher than the common rail pressure.

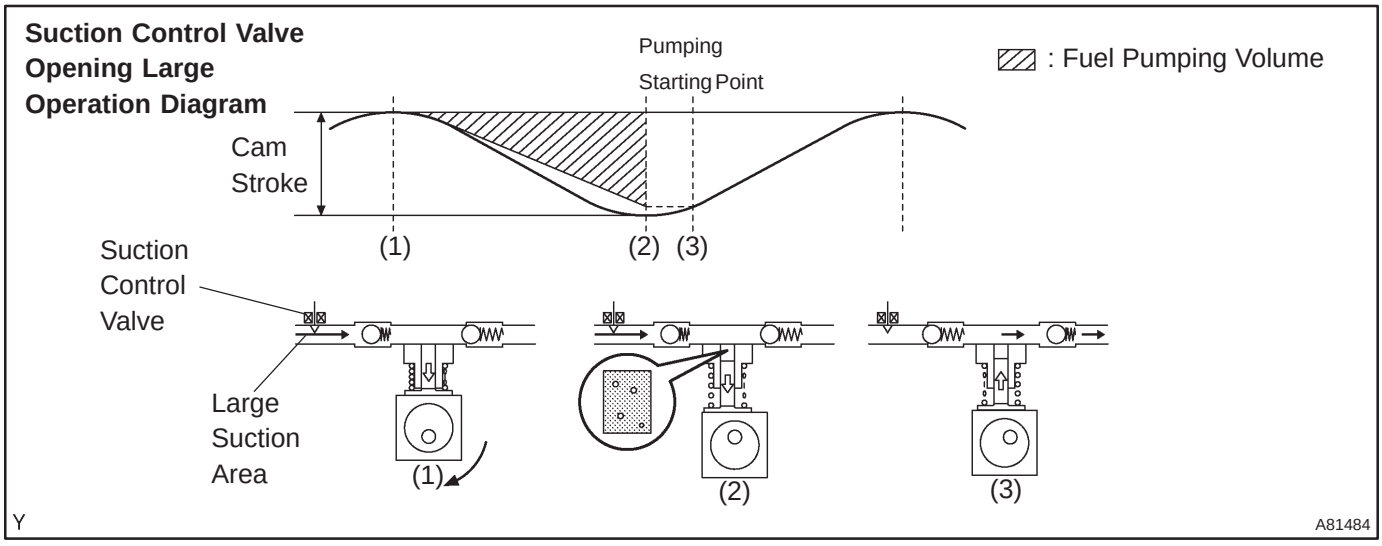


(b) Suction control valve opening large:

(1) When the opening of the suction control valve is large, the fuel suction area is kept large, therefore the transferble fuel volume is increased.

(2) If the plunger strokes fully, the suction volume will increase because the suction area is large.

(3) Pumping will start at the time when the fuel pressure has become higher than the common rail pressure.



6. DIAGNOSTICS TROUBLE CODE MATRIX FOR FUEL SYSTEM

HINT:

This matrix indicates typical DTC codes combinations for each malfunction occurrence.

( ): Potential DTC codes

DTC No.	A	B	C	D	E	F	G	H	I	J	K	L
P0087 (See page 05–557)				●								
P0088 (See page 05–563)					(●)		(●)	(●)	(●)			
P0093 (See page 05–570)	(●)	●			(●)	●					(●)	●
P0190 (See page 05–557)				●								
P0191 (See page 05–603)				●								
P0192 (See page 05–557)				●								
P0193 (See page 05–557)				●								
P0200 (See page 05–604)	●										(●)	
P0627 (See page 05–655)								●				
P1229 (See page 05–563)					(●)			●	●			
P1238 (See page 05–658)	●	●	●								(●)	
P1271 (See page 05–663)					●						(●)	
P1272 (See page 05–663)					●		●				(●)	

Trouble area	Malfunction	Refer to
Injector	Open or short in injector circuit	A
	Stuck open	B
	Stuck close	C
Fuel pressure sensor	Open or short in fuel pressure sensor circuit or pressure sensor output fixed	D
Pressure discharge valve	Open or short in pressure discharge valve circuit	E
	Stuck open	F
	Stuck close	G
Suction control valve	Open or short in suction control valve circuit	H
	Stuck open	I
	Stuck close	J
EDU	Faulty EDU	K
Common rail system (Fuel system)	Fuel leaks in high–pressure area	L

7. DIAGNOSTICS TROUBLE CODE DESCRIPTION

DTC No.	Description
P0087	Fuel pressure sensor output status at fixed value
P0088	Internal fuel pressure too high (200 MPa (2,039 kgf/cm^2, 29,007 psi) or more)
P0093	Fuel leaks in high–pressure area
P0190	Open or short in fuel pressure sensor circuit (Low or high output)
P0191	Fuel pressure sensor out of range (Low output)
P0192	Open or short in fuel pressure sensor circuit (High output)
P0193	Open or short in fuel pressure sensor circuit (Sensor 1 and/or 2 relation)
P0200	Open or short in EDU or injector circuit
P0627	Open or short in suction control valve circuit
P1229	Fuel over fed
P1238	Injection malfunction, exclude open or short in injector circuit
P1271	Open or short in pressure discharge valve circuit
P1272	Closed malfunction of the pressure discharge valve

054JD–04

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your readings due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in the check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the ''See page '' under the respective ''DTC No.'' in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0045 (05–554)	Turbo/Super Charger Boost Control Solenoid Circuit / Open	• VRV • Open or short in VRV circuit • ECM	○	○
P0087 (05–557)	Fuel Rail/System Pressure – Too Low	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM	○	○
P0088 (05–563)	Fuel Rail/System Pressure – Too High	• Supply pump • Pressure discharge valve • Short in Supply pump (suction control valve)circuit • Open pressure discharge valve circuit • ECM	○	○
P0093 (05–570)	Fuel System Leak Detected – Large Leak	• Fuel line between supply pump and common rail • Fuel line between common rail and injector • Supply pump • Common rail • Injector (P1238 is set simultaneously) • Pressure discharge valve • Open or short in EDU circuit (P0200 is set simultaneously) • Open or short in injector circuit (P0200 and P1238 are set simultaneously) • EDU (P0200 is set simultaneously) • ECM	○	○
P0095 (05–573)	Intake Air Temperature Sensor 2 Circuit	• Open or short in diesel turbo inlet air temp. sensor circuit • Diesel turbo inlet air temperature sensor • ECM	○	○
P0097 (05–573)	Intake Air Temperature Sensor 2 Circuit Low		○	○
P0098 (05–573)	Intake Air Temperature Sensor 2 Circuit High		○	○
P0100 (05–577)	Mass or Volume Air Flow Circuit	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (05–583)	Mass or Volume Air Flow Circuit Range/PerformanceProblem	• Mass air flow meter	○	○
P0102 (05–577)	Mass or Volume Air Flow Meter Circuit Low Input	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0103 (05–577)	Mass or Volume Air Flow Meter Circuit High Input		○	○
P0105 (05–584)	Manifold Absolute Pressure/ Barometric Pressure Circuit	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • Turbocharger assy • EGR valve assy • ECM	○	○
P0106 (05–588)	Manifold Absolute Pressure/ Barometric Pressure Circuit Range/PerformanceProblem	• Manifold absolute pressure sensor	○	○

P0107 (05–584)	Manifold Absolute Pressure/ Barometric Pressure Circuit Low Input	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • Turbocharger assy • EGR valve assy • ECM	○	○
P0108 (05–584)	Manifold Absolute Pressure/ Barometric Pressure Circuit High Input		○	○
P0110 (05–589)	Intake Air Temperature Circuit	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0112 (05–589)	Intake Air Temperature Circuit Low Input		○	○
P0113 (05–589)	Intake Air Temperature Circuit High Input		○	○
P0115 (05–593)	Engine Coolant Temperature Circuit	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0116 (05–597)	Engine Coolant Temperature Circuit Range/Performance Problem	• Cooling system • Engine coolant temperature sensor • Thermostat	○	○
P0117 (05–593)	Engine Coolant Temp. Circuit Low Input	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0118 (05–593)	Engine Coolant Temp. Circuit High Input		○	○
P0168 (05–598)	Fuel Temperature Too High	• Fuel temperature sensor	○	○
P0180 (05–599)	Fuel Temperature Sensor "A" Circuit	• Open or short in fuel temp. sensor circuit • Fuel temperature sensor • ECM	○	○
P0182 (05–599)	Fuel Temperature Sensor "A" Circuit Low Input		○	○
P0183 (05–599)	Fuel Temperature Sensor "A" Circuit High Input		○	○
P0190 (05–557)	Fuel Rail Pressure Sensor Circuit	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM	○	○
P0191 (05–603)	Fuel Rail Pressure Sensor CircuitRange/Performance	• Fuel pressure sensor	○	○
P0192 (05–557)	Fuel Rail Pressure Sensor Circuit Low Input	• Open or short in fuel pressure sensor • Fuel pressure sensor • ECM	○	○
P0193 (05–557)	Fuel Rail Pressure Sensor Circuit High Input		○	○
P0200 (05–604)	Injector Circuit / Open	• Open or short in EDU circuit • Injector • EDU • ECM	○	○
P0234 (05–612)	Turbo/Super Charger Overboost Condition	• VRV • Open or short in VRV circuit • Turbocharger • EGR valve • Vacuum hose • ECM	○	○
P0299 (05–612)	Turbo/Super Charger Underboost		○	○
P0335 (05–616)	Crankshaft Position Sensor "A" Circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft timing pulley) • ECM	○	○
P0339 (05–616)	Crankshaft Position Sensor "A" CircuitIntermittent		—	○
P0340 (05–620)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • ECM	○	○

P0380 (05–622)	Glow Plug/Heater Circuit "A"	• Open or short in glow plug circuit • Glow fuse • Glow relay • Glow plug • ECM	○	○
P0400 (05–629)	Exhaust Gas Recirculation Flow	• EGR valve assy • EGR passage • Open or short in EGR circuit • ECM	○	○
P0403 (05–629)	Exhaust Gas Recirculation Control Circuit		○	○
P0488 (05–633)	Exhaust Gas Recirculation Throttle Position Control Range/ Performance	• Open or short in intake shutter circuit • Open or short in fully opened switch circuit • Intake shutter • ECM	○	○
P0500 (05–640)	Vehicle Speed Sensor "A"	• Open or short in speed sensor circuit • Speed sensor • Combinationmeter • ECM • Skid control ECU	○	○
P0504 (05–643)	Brake Switch "A"/"B" Correlation	• Short in stop lamp switch signal circuit • Stop lamp switch • ECM	—	○
P0560 (05–647)	System Voltage	• Open in back–up power source circuit • ECM	○	○
P0606 (05–650)	ECM/PCM Processor	• ECM	—	—
P0607 (05–650)	Control Module Performance		○	○
P0622 (05–651)	Generator Field "F" Terminal Circuit	• Open in generator circuit • Generator • Drive belt • ECM	○	○
P0627 (05–655)	Fuel Pump Control Circuit / Open	• Open or shot in suction control valve circuit • Suction control valve • ECM	○	○
P1229 (05–563)	Fuel Pump System	• Short in supply pump (suction control valve) circuit • Suction control valve • ECM	○	○
P1238 (05–658)	Injector Malfunction	• Injector • EDU (P0200 is set simultaneously) • Open or short in engine wire (P0200 is set simultaneously) • Connector connection (P0200 is set simultaneously) • Compression pressure • Valve clearance • Valve timing • ECM	○	○
P1251 (05–612)	Turbo/Super Charger Overboost Condition (Too High)	• VRV • Open or short in VRV circuit • Turbocharger • EGR valve • Vacuum hose • ECM	○	○
P1271 (05–663)	Fuel Regulator Circuit Malfunction (EDU Drive)	• Open or short in pressure discharge valve circuit • Open or short in pressure discharge valve it self • EDU • ECM	○	○
P1272 (05–663)	Fuel Pressure Regulator Malfunction	• Open or short in pressure discharge valve circuit (P1271 is set simultaneously) • Pressure discharge valve • Supply pump • ECM	○	○

P1601 (05–673)	Injector Correction Circuit Malfunction (EEPROM)	• Injector compensation code • ECM	○	○
P1611 (05–650)	IC Circuit Malfunction	• ECM	○	○
P2120 (05–674)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P2121 (05–681)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	• Accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P2122 (05–674)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P2123 (05–674)	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input		○	○
P2125 (05–674)	Throttle/Pedal Position Sensor/ Switch "E" Circuit		○	○
P2127 (05–674)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input		○	○
P2128 (05–674)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input		○	○
P2138 (05–674)	Throttle/Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation		○	○
P2226 (05–684)	Barometric Pressure Circuit	• ECM	○	○
P2227 (05–685)	Barometric Pressure Circuit Range/Performance		○	○
P2228 (05–685)	Barometric Pressure Circuit Low Input		○	○
P2229 (05–685)	Barometric Pressure Circuit High Input		○	○
B2799 (05–1625)	Engine Immobiliser System Malfunction	• Immobiliser system	—	○

*1: Check engine warning light (CHK ENG) is illuminated

ECM POWER SOURCE CIRCUIT

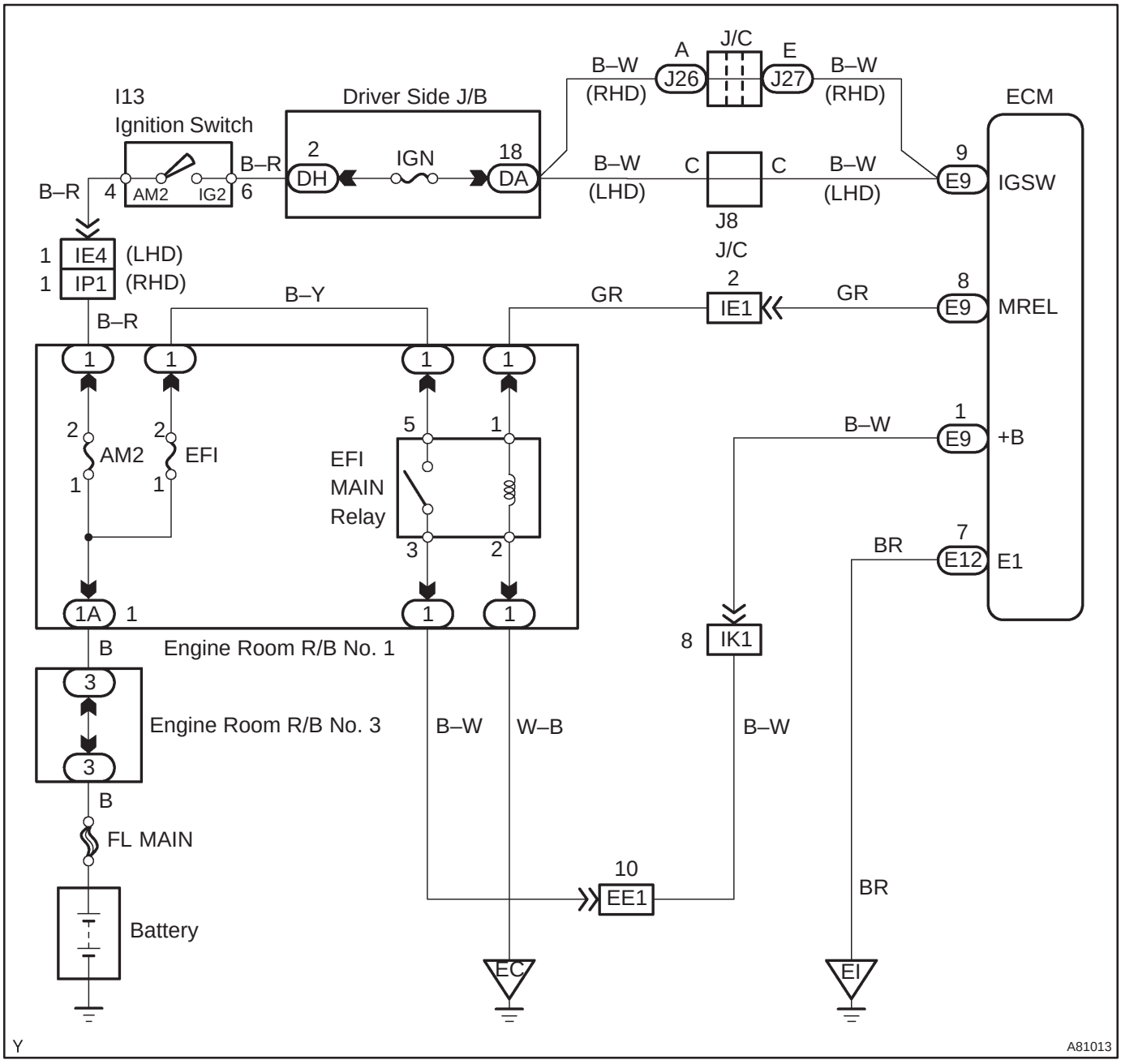
CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to terminal IGSW of the ECM and the EFI MAIN relay (Marked: EFI MAIN) control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EFI MAIN relay.

This signal causes current to flow to the coil, closing the contacts of the EFI MAIN relay and supplying power to terminal +B of the ECM.

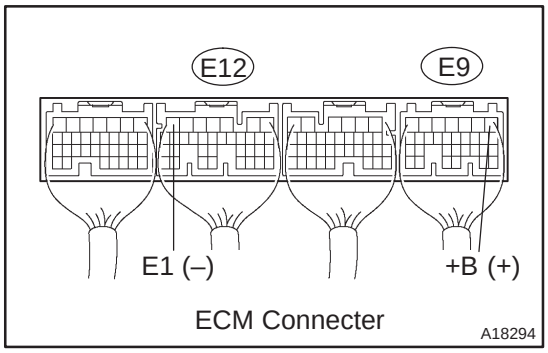
If the ignition switch is turned off, the ECM continues to switch on the EFI MAIN relay for a maximum of 2 seconds for the initial setting of the throttle valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM(+B VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 and E12 ECM connectors.

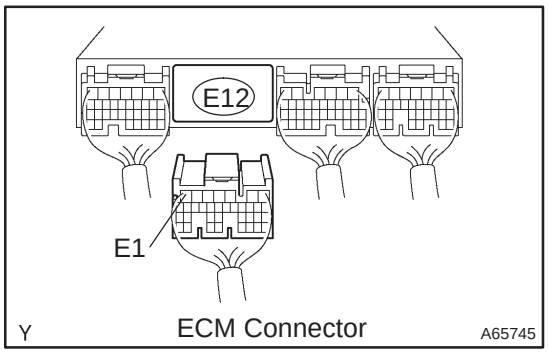
Standard:

Symbols (Terminal No.)	Specified condition
+B (E9–1) – E1 (E12–7)	9 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–551)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM – BODY GROUND)



(a) Disconnect the E12 ECM connector.
(b) Check for continuity between the wire harness side connectors.

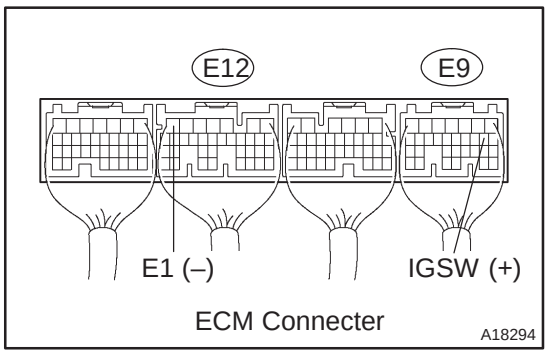
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
E1 (E12–7) – Body ground	Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM(IGSW VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 and E12 ECM connectors.

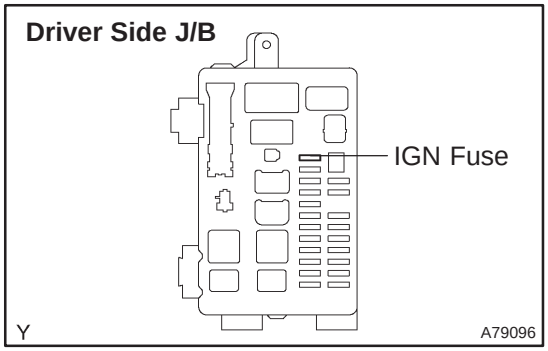
Standard:

Symbols (Terminal No.)	Specified condition
IGSW (E9–9) – E1 (E12–7)	9 to 14 V

OK → **Go to step 6**

NG

4 CHECK FUSE(IGN FUSE)

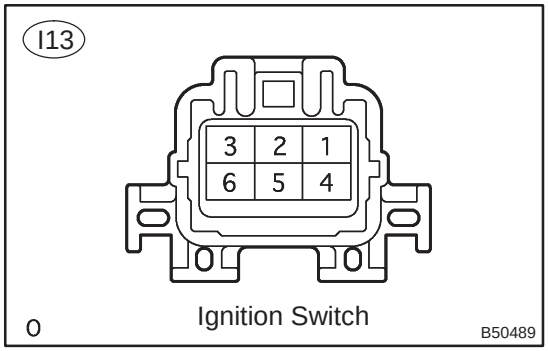


(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

5 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Measure the for continuity between the connector terminals shown in the chart below.

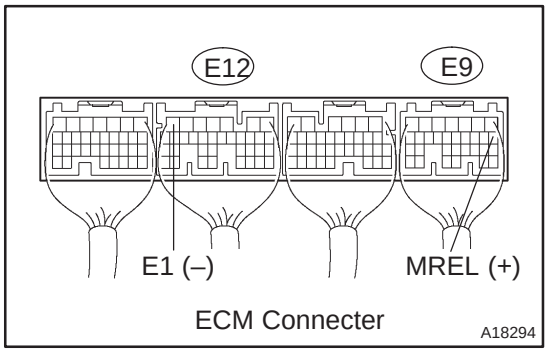
Switch	Terminal No.	Resisitance
LOCK	All Terminals	No continuity
ACC	1–3	Continuity
ON	1–2, 1–3, 2–3, 5–6	Continuity
START	4–5, 4–6, 5–6, 1–2	Continuity

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (BATTERY – IGNITION SWITCH, IGNITION SWITCH – ECM)

6 INSPECT ECM(MREL VOLTAGE)



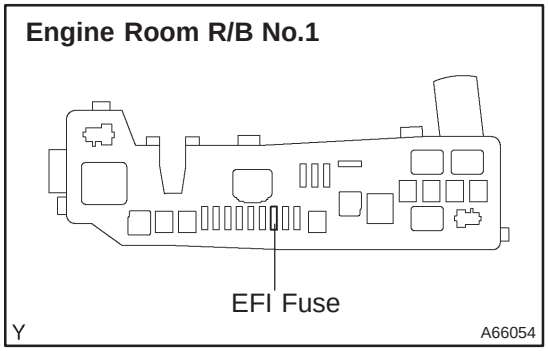
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 and E12 ECM connectors.
Standard:

Symbols (Terminal No.)	Specified condition
MREL (E9–8) – E1 (E12–7)	9 to 14 V

NG → **REPLACE ECM (See page 10–65)**

OK

7 CHECK FUSE(EFI FUSE)

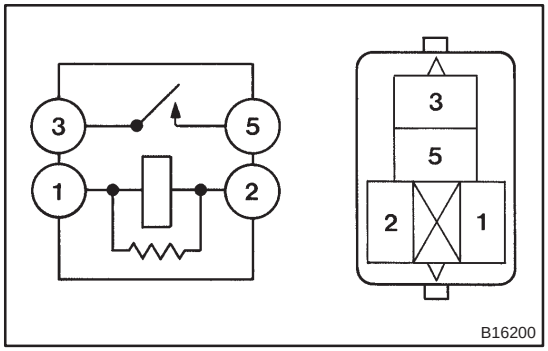


(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

8 INSPECT EFI MAIN RELAY



(a) Remove the EFI MAIN relay from the engine room R/B No.1.
(b) Inspect the EFI MAIN relay.
Standard:

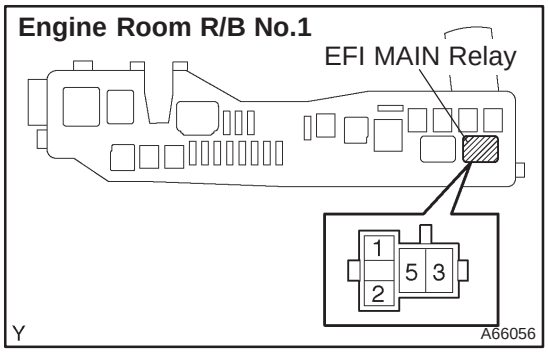
Terminal No.	Condition	Specified condition
1 – 2	Constant	Continuity
3 – 5	Usually	No Continuity
	Apply B+ between Terminals 1 and 2	Continuity

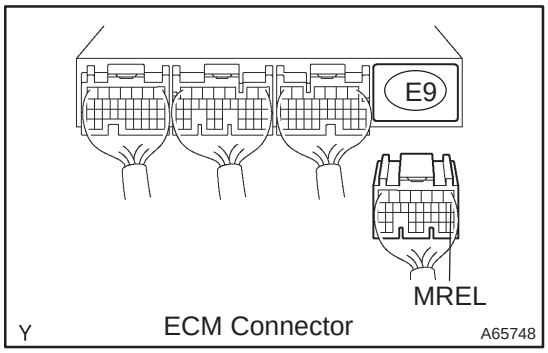
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI MAIN RELAY**

OK

9	CHECK HARNESS AND CONNECTOR(EFI MAIN RELAY – ECM, EFI MAIN RELAY – BODY GROUND)





(a) Check the harness and connector between the EFI MAIN relay and ECM connector.
  (1) Remove the EFI MAIN relay from the engine room R/B No.1.
  (2) Disconnect the E9 ECM connector.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI MAIN relay (1) – MREL (E9–8)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI MAIN relay (1) or MREL (E9–8) – Body ground	No continuity

(b) Check the harness and connector between the EFI MAIN relay and body ground.
  (1) Remove the EFI MAIN relay from the engine room R/B No.1.
  (2) Check for continuity between the wire harness side connector and body ground.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI MAIN relay (2) – Body ground	Continuity

OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

CHECK AND REPAIR HARNESS AND CONNECTOR (TERMINAL +B OF ECM – BATTERY POSITIVE TERMINAL)

054JB–04

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–527)

3	CONNECT THE HAND–HELD TESTER TO DLC3

HINT:
If the display indicates a communication fault in the tool, inspect DLC3.

4	CHECK DTC AND FREEZE FRAME DATA (See page 05–528)

HINT:
Record or print DTC and freeze frame data, if needed.

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05–528)

6	VISUAL INSPECTION

7	SETTING THE CHECK (TEST) MODE DIAGNOSIS (See page 05–528)

8	PROBLEM SYMPTOM CONFIRMATION

HINT:
If the engine does not start, perform steps 10 and 12 first.

A	Malfunction does not occur
B	Malfunction occurs

B	GO TO STEP 10

A

9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05–528)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	DTC CHART (See page 05–544)

GO TO STEP 14

12	BASIC INSPECTION (See page 05–528)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	PROBLEM SYMPTOMS TABLE (See page 05–551)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05–686)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)

GO TO STEP 18

17	PARTS INSPECTION

18	IDENTIFICATION OF PROBLEM

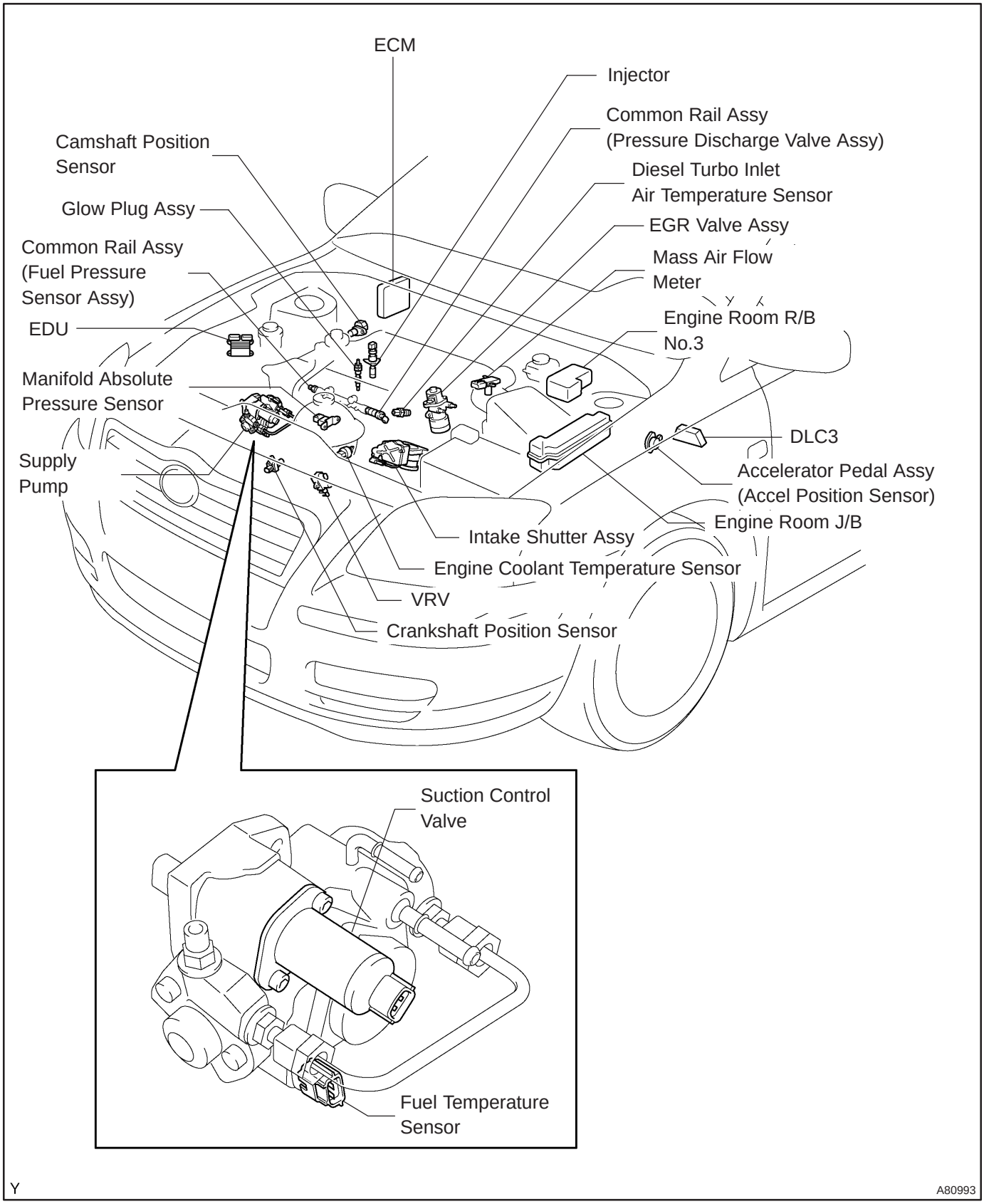
19	ADJUSTMENT, REPAIR

20	CONFIRMATION TEST

END

054JE–04

LOCATION



Y

A80993

DTC	P0045	TURBO/SUPER CHARGER BOOST CONTROL SOLENOID CIRCUIT / OPEN

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0045	Open or short in VRV circuit for 0.5 sec. or more (1 trip detection logic)	• VRV • Open or short in VRV circuit • ECM

WIRING DIAGRAM

Refer to DTC P0234 on page 05–612.

INSPECTION PROCEDURE

HINT:

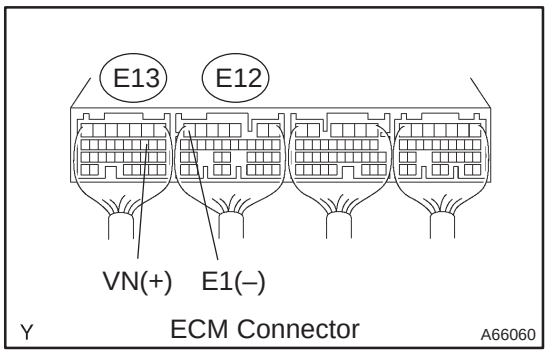
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	INSPECT VACUUM REGULATING VALVE ASSY (See page 12–16)

NG → REPLACE VACUUM REGULATING VALVE ASSY

OK

2	INSPECT ECM(VN VOLTAGE)

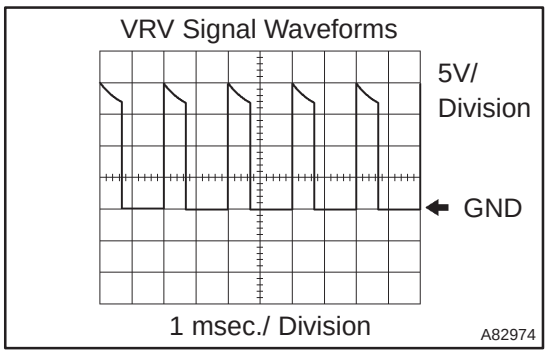


(a) Inspect using the oscilloscope.

(b) During idling, check the waveform between terminals E12 and E13 of the ECM connectors.

Standard:

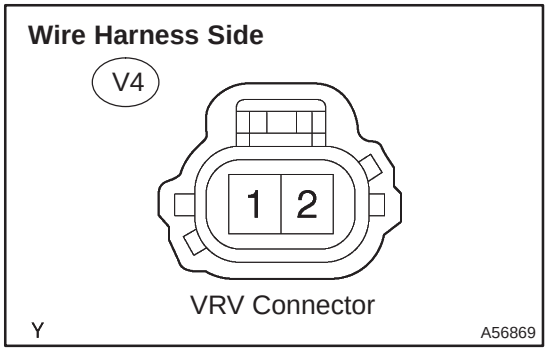
Symbols (Terminal No.)	Specified condition
VN (E13–10) – E1 (E12–7)	Correct waveform is as shown

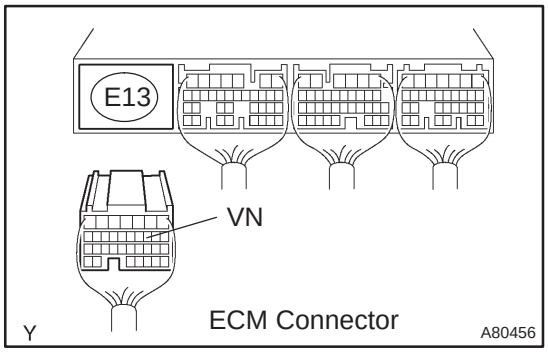


NG → REPLACE ECM (See page 10–65)

OK

3 CHECK HARNESS AND CONNECTOR(VRV – ECM)





(a) Disconnect the V4 VRV connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VN (E13–10) – (V4–2)	Continuity

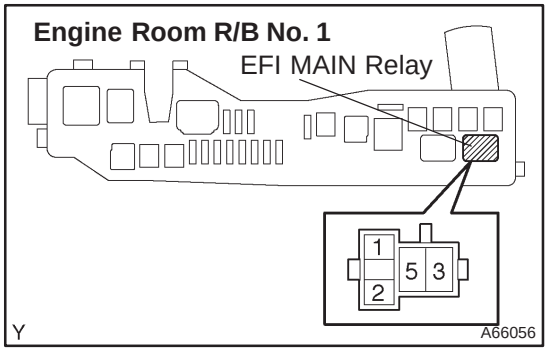
Standard (Check for short):

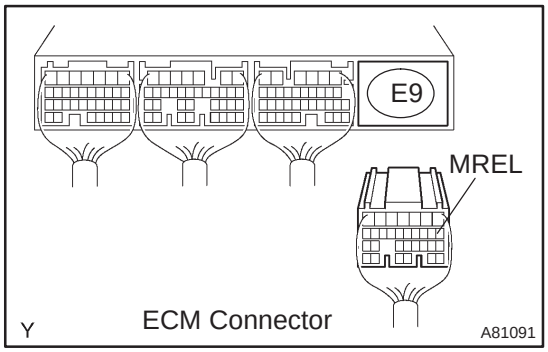
Symbols (Terminal No.)	Specified condition
VN (E13–10) or (V4–2) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 CHECK HARNESS AND CONNECTOR(VRV – EFI MAIN RELAY)





(a) Check the harness and connector between the EFI main relay and ECM connector.

(1) Remove the EFI MAIN relay from the engine room R/B No. 1.

(2) Disconnect the E9 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI main relay (1) – MREL (E9–8)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI main relay (1) or MREL (E9–8) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–65)

DTC	P0087	FUEL RAIL/SYSTEM PRESSURE – TOO LOW

DTC	P0190	FUEL RAIL PRESSURE SENSOR CIRCUIT

DTC	P0192	FUEL RAIL PRESSURE SENSOR CIRCUIT LOW INPUT

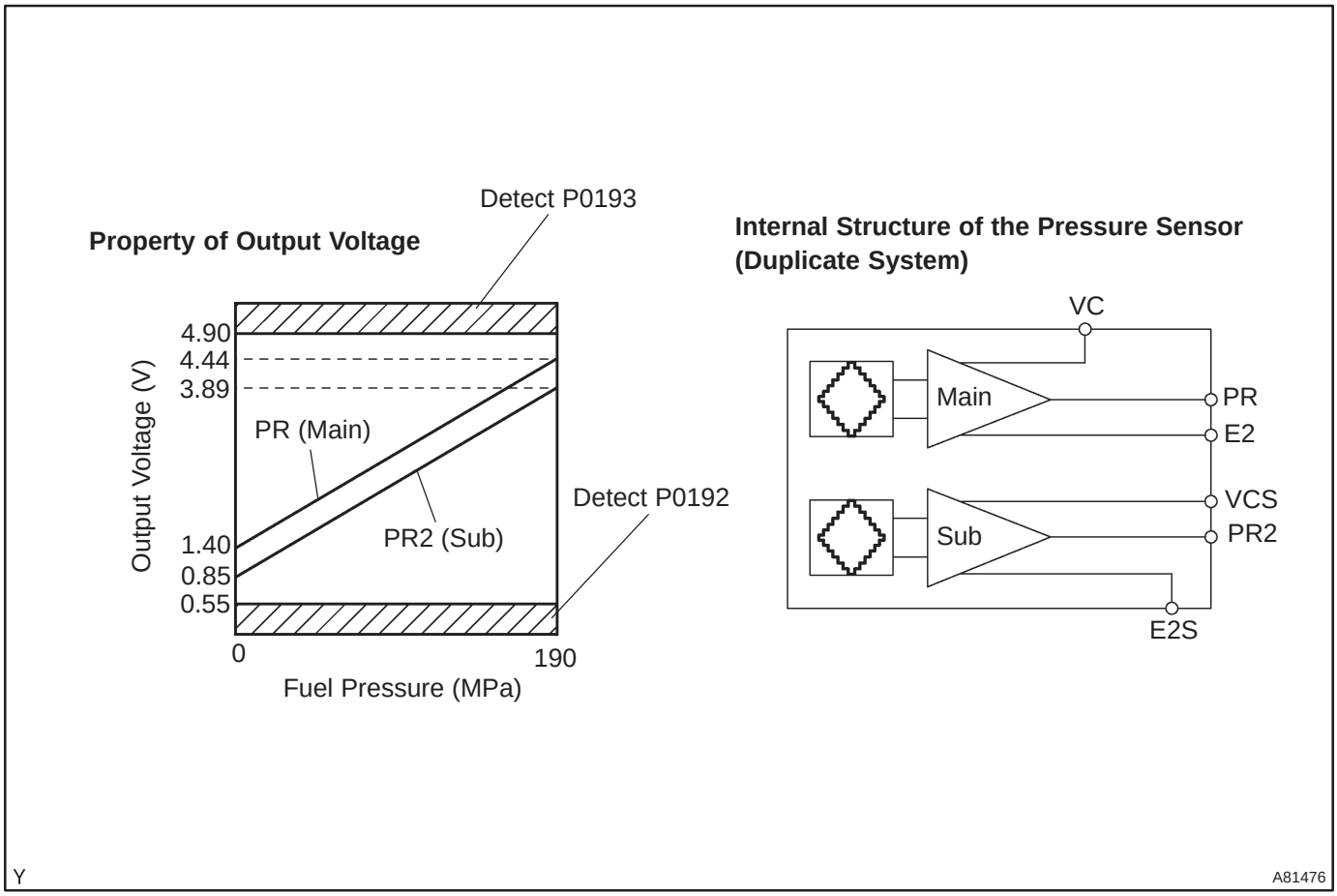
DTC	P0193	FUEL RAIL PRESSURE SENSOR CIRCUIT HIGH INPUT

HINT:

- For more information on the fuel pressure sensor and the common rail system, see page 05–517.
- If P0087, P0190, P0192 and/or P0193 are present, use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

The ECM monitors internal fuel pressure of common rail using the fuel pressure sensor and controls the suction control valve to regulate the internal pressure to the target pressure(approx. 30 to 180 MPa (306 to 1,835 kgf/cm^2, 4.351 to 26,106 psi)).
The pressure sensor is a semiconductor pressure sensor that varies electric resistance when applying pressure to its silicon. This sensor outputs voltage in proportion to the internal fuel pressure. The sensor has been designed as a duplicate circuit, and its main (PR) circuit is used under normal condition. Even if either sensor is failed, another normal sensor will be used to monitor the internal fuel pressure.



DTC No.	DTC Detection Condition	Trouble Area
P0087	Fuel pressure sensor output stays at fixed value.	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM
P0190	Condition (a) continues for 0.5 sec.: (c) Fuel pressure sensor output voltage is "0.55 V or less" or "4.9 V or more".	
P0192	Condition (a) continues for 0.5 sec.: (a) Fuel pressure sensor output voltage is 0.55 V or less.	
P0193	Condition (a) continues for 0.5 sec.: (a) Fuel pressure sensor output voltage is 4.9 V or more.	

HINT:
After confirming DTC "P0087, P0190, P0192 and P0193", use the hand–held tester to confirm internal the fuel pressure of the common rail from the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS".

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

MONITOR DESCRIPTION

P0087 (Fuel pressure sensor output stays at fixed value):

Under normal condition, internal fuel pressure of the common rail usually fluctuates 1 to 2 MPa (10 to 20 kgf/cm^2, 145 to 290 psi) even if the driving condition is constant. The internal fuel pressure is approximately 30 to 40 MPa (306 to 408 kgf/cm^2, 4,351 to 5,801 psi) at idling, and it increases to approx. 50 to 100 MPa (510 to 1,020 kgf/cm^2, 7,251 to 14,503 psi) when running the engine at 2,500 rpm. This DTC code is set if there is no fluctuation at the internal fuel pressure.

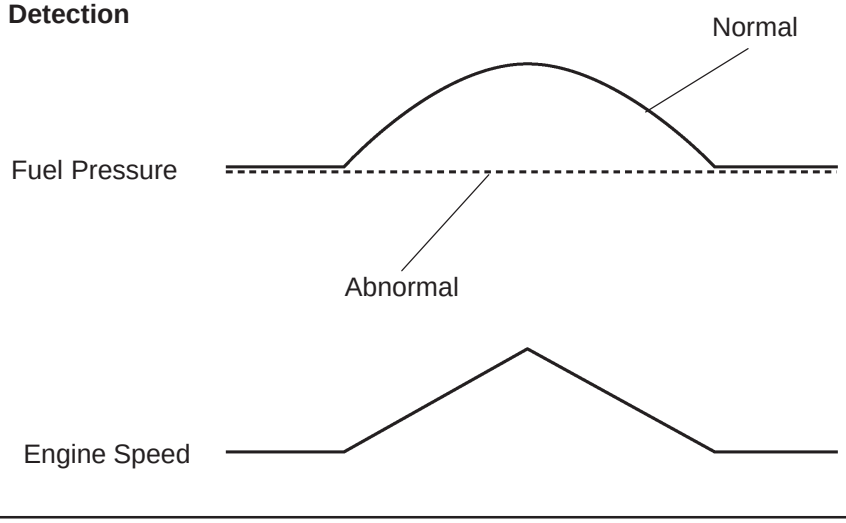
If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

P0190, P0192 and P0193 (Open or short in fuel pressure sensor circuit):

These DTCs are set if the fuel pressure sensor output voltage is out of the standard range. The DTCs stand for open or short malfunction of the sensor circuit.

If these DTCs are present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

P0087 Malfunction Detection



MONITOR STRATEGY

P0087:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 sec.
CHK ENG operation	1 driving cycle

P0190:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	0.5 sec.
CHK ENG operation	1 driving cycle

P0192:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	0.5 sec.
CHK ENG operation	1 driving cycle

P0193:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	0.5 sec.
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

P0087:

Item	Specification	
	Minimum	Maximum
Engine speed	500 rpm	–
Battery voltage	8 V	–
Fuel quantify	5 mm^3/st	–
The monitor will not run if the fuel pressure sensor circuit (P0190, P0192 and P0193) is malfunction		

TYPICAL MALFUNCTION THRESHOLDS

P0087:

Detection Criteria	Threshold
Changing value of fuel pressure	Virtually no fluctuation

P0190:

Detection Criteria	Threshold
Fuel pressure sensor output voltage	Less than 0.55 V or more than 4.9 V

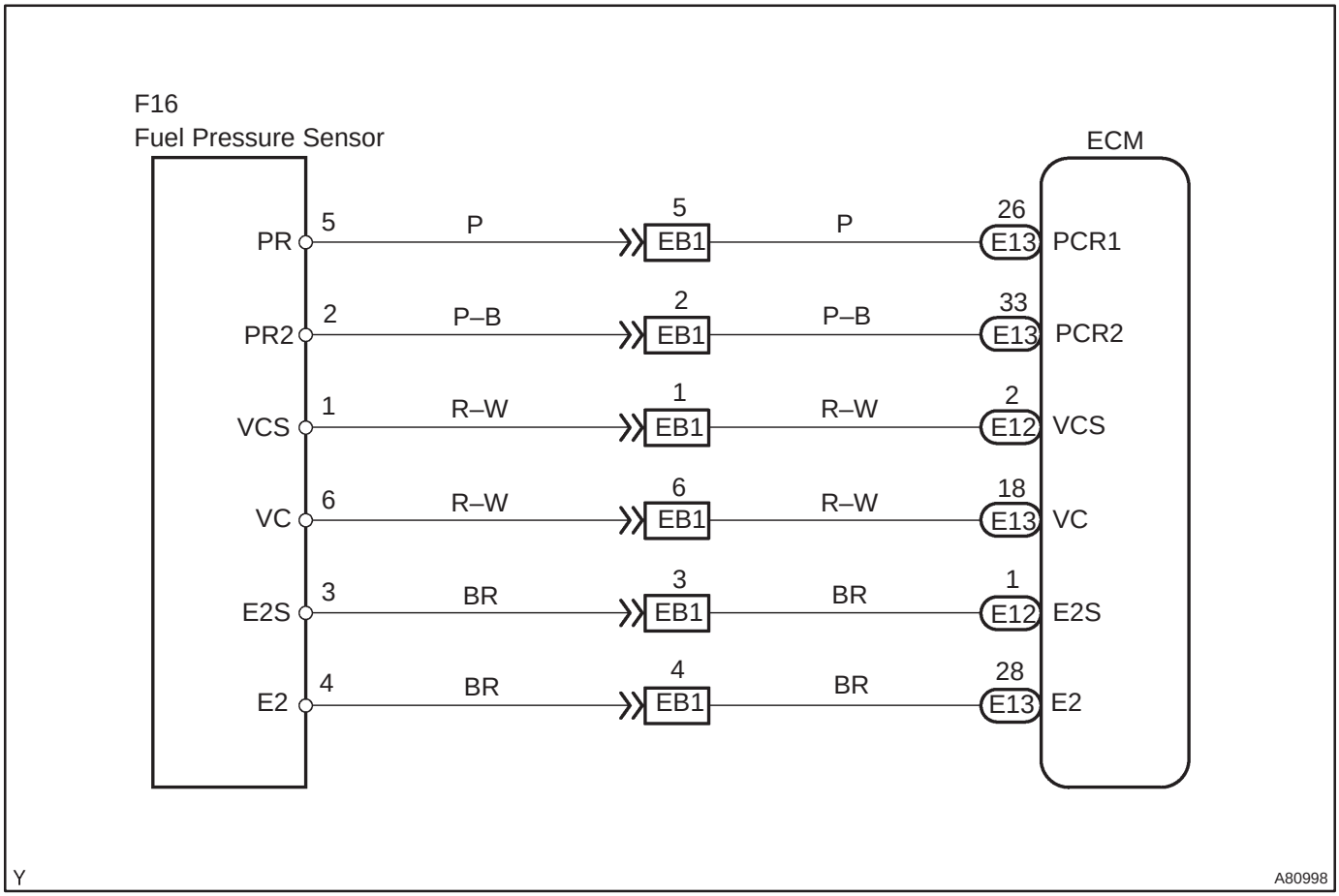
P0192:

Detection Criteria	Threshold
Fuel pressure sensor output voltage	Less than 0.55 V

P0193:

Detection Criteria	Threshold
Fuel pressure sensor output voltage	More than 4.9 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- After completing repair, confirm P0087 is not set again.
- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(FUEL PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.
(e) Check that internal fuel pressure of the common rail is within specification below.
Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

NG → **Go to step 3**

OK

2 READ OUTPUT DTC(FUEL PRESSURE SENSOR DTCS ARE OUTPUT AGAIN)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES”.
(d) Clear the DTCs.
(e) Let the engine idle for 60 seconds and perform quick acceleration to 2,500 rpm for 30 seconds.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(g) Read the DTCs.

Result:

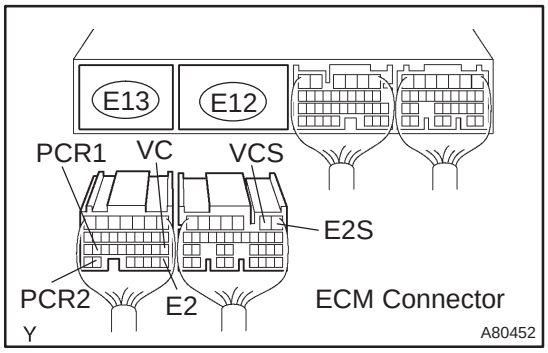
Display (DTC output)	Proceed to
DTC ”P0087, P0190, P0192 and/or P0193” are output.	A
DTC ”P0087, P0190, P0192 and/or P0193” are not output.	B

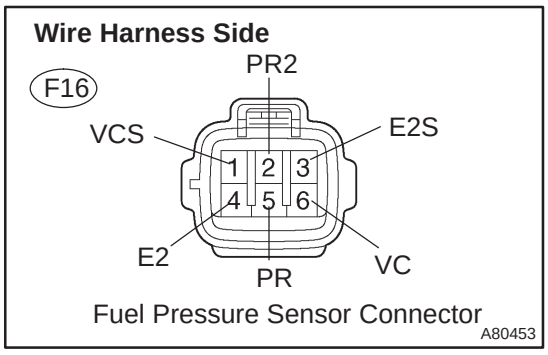
B → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

A

REPLACE ECM (See page 10–65)

3 CHECK HARNESS AND CONNECTOR(FUEL PRESSURE SENSOR – ECM)





(a) Disconnect the F16 fuel pressure sensor connector.
(b) Disconnect the E12 and E13 ECM connectors.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PCR1 (E13–26) – PR (F16–5)	Continuity
PCR2 (E13–33) – PR2 (F16–2)	
VCS (E12–2) – VCS (F16–1)	
VC (E13–18) – VC (F16–6)	
E2 (E13–28) – E2 (F16–4)	
E2S (E12–1) – E2S (F16–3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PCR1 (E13–26) or PR (F16–5) – Body ground	No continuity
PCR2 (E13–33) or PR2 (F16–2) – Body ground	
VCS (E12–2) or VCS (F16–1) – Body ground	
VC (E13–18) or VC (F16–6) – Body ground	
E2 (E13–28) or E2 (F16–4) – Body ground	
E2S (E12–1) or E2S (F16–3) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR) (See page 11–78)

DTC	P0088	FUEL RAIL/SYSTEM PRESSURE – TOO HIGH

DTC	P1229	FUEL PUMP SYSTEM

HINT:

- For more information on the supply pump (suction control valve) and the common rail system, see page 05–517.
- If P0088 and/or P1229 are present, use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

Refer to description on page 05–517.

DTC No.	DTC Detection Condition	Trouble Area
P0088	Internal fuel pressure of the common rail is too high. The fuel pressure exceeds 200 MPa (2,039 kgf/cm^2, 29,007 psi).	• Supply pump (Suction control valve) • Pressure discharge valve • Short in supply pump (Suction control valve) circuit • Open in pressure discharge valve circuit • ECM
P1229	Fuel over fed. Internal fuel pressure is beyond the target fuel pressure despite the ECM closing the suction control valve.	• Short in supply pump (Suction control valve) circuit • Supply pump (Suction control valve) • ECM

HINT:

After confirming DTC ”P0088 and P1229”, use the hand–held tester to confirm the fuel rail pressure from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

MONITOR DESCRIPTION

P0088 (Internal fuel pressure too high):

The ECM will set this DTC if the fuel pressure inside the common rail is beyond 200 MPa (2,039 kgf/cm^2, 29,007 psi). This DTC indicates that the suction control valve may be stuck open, or there may be short in its circuit, and the pressure discharge valve may be stuck close, or there may be open in its circuit.

If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

P1229 (Fuel over fed):

The ECM will set this DTC if the actual fuel pressure inside the common rail stays higher than the target fuel pressure, despite the ECM closing the suction control valve. This DTC code represents that the suction control valve may be stuck open, or there may be short in its circuit. Under this condition, the pressure discharge valve will operate quite often.

If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

MONITOR STRATEGY

P0088:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 sec.
CHK ENG operation	1 driving cycle

P1229:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 min.
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

P0088:

Specification
The monitor will not run if the fuel pressure sensor, or suction control valve circuit, or pressure discharge valve is malfunctioning

P1229:

Item	Specification
Target fuel pressure variation is small	–
The monitor will not run if the fuel pressure sensor, or suction control valve circuit, or pressure discharge valve is malfunctioning	

TYPICAL MALFUNCTION THRESHOLDS

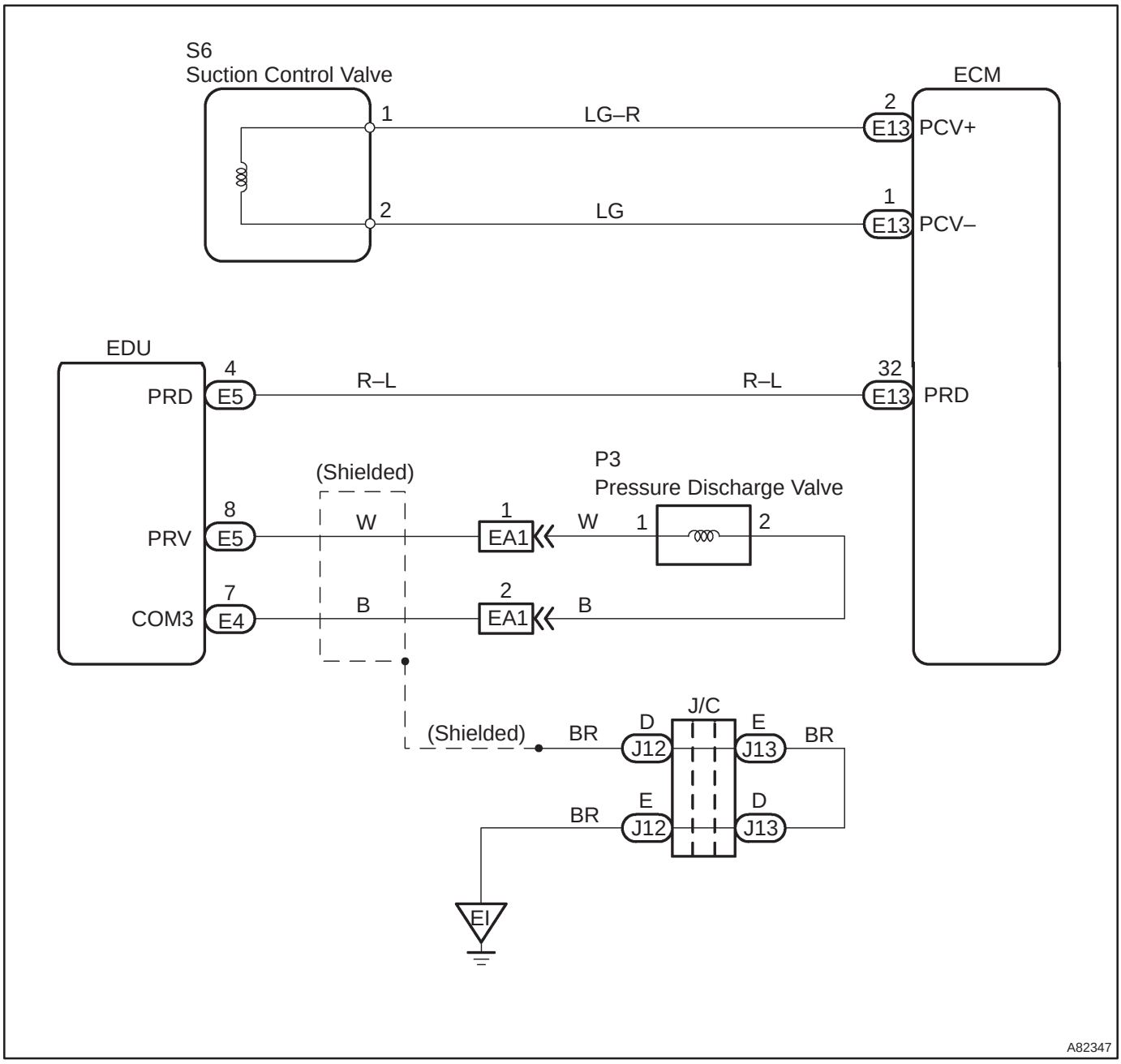
P0088:

Detection Criteria	Threshold
Fuel pressure sensor	200 MPa (2,039 kgf/cm^2, 29,007 psi) or more

P1229:

Threshold
Internal fuel pressure of the common rail stays higher than the target fuel pressure, despite the ECM closing the suction control valve, and also the pressure discharge valve is frequently operating

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDS DTC P0088 AND/OR P1229)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
”Only DTC P0088” or ”DTC P0088 and P1229” are output	A
Only DTC P1229 is output	B
DTC ”P0190, P0191, P0192, P0193 and/or P1271” are output	C
Only DTC P1272 is output	D

B → **Go to step 4**

C → **GO TO RELEVANT DTC CHART** (See page 05–544)

D → **Go to step 3**

A

2	READ OUTPUT DTC(DTC P1272 OUTPUT)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES”.
(d) Clear the DTCs.
(e) Start the engine and turn the ignition switch OFF. Wait for 10 seconds and then restart the engine and turn the ignition switch OFF again.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(g) Read the DTCs.

Result:

Display (DTC output)	Proceed to
DTC P1272 is output	A
DTC P1272 is not output	B

B → **Go to step 4**

A

3	READ VALUE OF HAND–HELD TESTER(FUEL PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" and read its value displayed on the hand–held tester.
(e) Check that the internal fuel pressure of the common rail drops below approximately 5 MPa within approximately 1 second as the ignition switch is turned OFF at the engine in an idle.

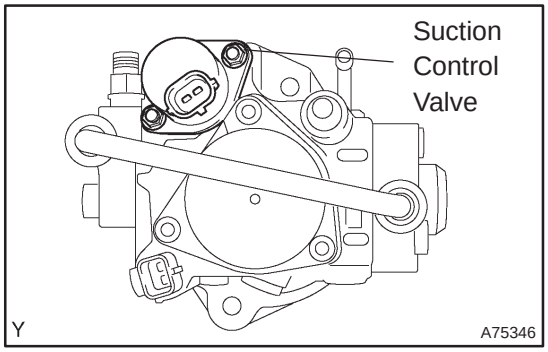
Result:

Pressure Displayed (MPa)	Proceed to
Approx. 5 or less	A
Approx. 5 or more	B

B → **REPLACE COMMON RAIL ASSY (PRESSURE DISCHARGE VALVE) (See page 14–286)**
PROCEED TO STEP 4 AFTER REPLACEMENT

A

4	CHECK INJECTION OR SUPPLY PUMP ASSY(SUCTION CONTROL VALVE)



(a) Check the suction control valve for resistance.
(1) Measure the resistance between the terminals.
Resistance: 1.9 to 2.3 Ω at 20°C (68°F)

NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11–69)**

OK

5 READ OUTPUT DTC(DTC P1229 OUTPUT)

(a) Disconnect the suction control valve connector and then start the engine. Wait for 1 minute.
HINT:
If the engine does not start, the suction control valve is normal. Therefore proceed to step 6.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES".
(e) Clear the DTCs.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(g) Read the DTCs.

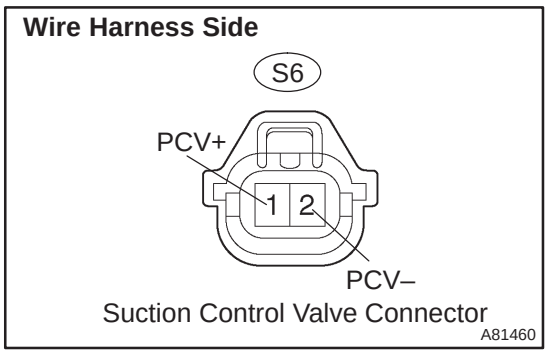
Result:

Display (DTC output)	Proceed to
DTC P1229 is not output	A
DTC P1229 is output	B

B → **REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11–69)**

A

6 CHECK HARNESS AND CONNECTOR(SUCTION CONTROL VALVE – ECM)



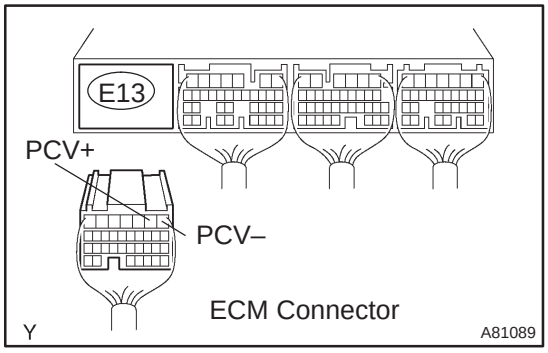
(a) Disconnect the S6 suction control valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PCV+ (S6–1) – PCV+ (E13–2)	Continuity
PCV– (S6–2) – PCV– (E13–1)	

Standard (Check for short):

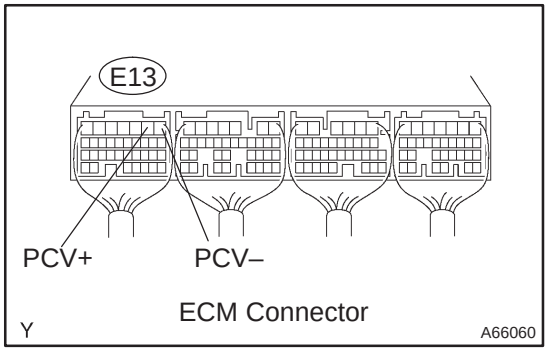
Symbols (Terminal No.)	Specified condition
PCV+ (S6–1) or PCV+ (E13–2) – Body ground	No continuity
PCV– (S6–2) or PCV– (E13–1) – Body ground	



NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

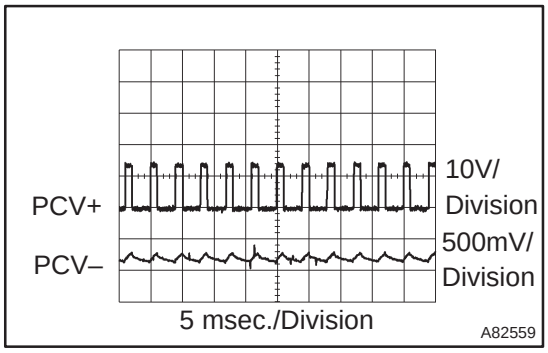
7 INSPECT ECM(PCV VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During cranking or idling, check the waveform between the specified terminals of the E13 ECM connector.

Standard :

Symbols (Terminal No.)	Specified condition
PCV+ (E13–2) – PCV– (E13–1)	Correct waveform is as shown



NG → **REPLACE ECM (See page 10–65)**

OK

CHECK DTC OUTPUT RECUR (DTC P0088 AND/OR P1229 OUTPUT AGAIN)

HINT:
After clearing the DTC, drive the vehicle at 50 km/h (31 mph) for 5 minutes, and then confirm P0088 and/or P1229 is not set again.

DTC	P0093	FUEL SYSTEM LEAK DETECTED – LARGE LEAK

HINT:
- For more information on the common rail system, see page 05–517.
- If P0093 is present, use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

Refer to description on page 05–517.

DTC No.	DTC Detection Condition	Trouble Area
P0093	Fuel leaks in high–pressure area.	• Fuel line between supply pump and common rail • Fuel line between common rail and injector • Supply pump • Common rail • Injector (P1238 is set simultaneously) • Pressure discharge valve • Open or short in EDU circuit (P0200 is set simultaneously) • Open or short in injector circuit (P0200 and P1238 are set simultaneously) • EDU (P0200 is set simultaneously) • ECM

HINT:
After confirming DTC P0093, use the hand–held tester to confirm the fuel rail pressure from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

MONITOR DESCRIPTION

P0093 (Fuel leaks in high–pressure area):

This DTC stands for fuel leaks is existing in high–pressure area in the common rail system. The ECM constantly monitors the internal fuel pressure of the common rail after the engine is started, and the ECM then will set this DTC if the decreasing rate of the internal fuel pressure is large when injecting the fuel.
In the common rail system, high–pressure fuel (approx. 30 to 180 MPa (306 to 1,835 kgf/cm^2, 4.351 to 26,106 psi)) is always applied to the high–pressure area including the supply pump, common rail, injector and piping. The ECM adjusts the suction control valve opening angle to obtain the target internal fuel pressure.
If this DTC is present, the ECM enters fail–safe mode and permits driving the vehicle for extra 1 minute before stopping both the fuel injection and supply pump operation, then stops the engine. The fail–safe mode will continue until the ignition switch is turned OFF.

MONITOR STRATEGY

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 sec.
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine speed	600 rpm	–
The monitor will not run if the fuel pressure sensor, or suction control valve circuit, or pressure discharge valve is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

Threshold
Drop rate in the internal fuel pressure is large when injecting fuel

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0093)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.

Result:

Display (DTC output besides DTC P0093)	Proceed to
Only DTC P0093 is output	A
DTC P1238 is output	B
DTC ”P0200 and/or P1271” are output	C

HINT:

If any other codes besides ”P0093” are output, perform the troubleshooting for those DTCs first.

B → **Go to step 3**

C → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

2	CHECK FUEL LEAKAGE(INSPECT HIGH–PRESSURE FUEL PARTS AND AREA FOR FUEL LEAKS)

(a) Visually check the supply pump, injector and fuel line located between the supply pump and the common rail for fuel leaks or fuel pressure leaks. Also, perform the same on the fuel line between the common rail and the injector (See page 11–69, 11–60).

HINT:

Fuel leaks inside the components (Supply pump, etc) may result.

NG → **REPAIR OR REPLACE**

OK

3	READ VALUE OF HAND–HELD TESTER(COMPENSATION OF INJECTION QUANTIFY BETWEEN CYLINDERS)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB” and read its value displayed on the hand–held tester.
Result:
STD – 3 to 3 mm^3/st
Maximum – 4.9 to 4.9 mm^3/st

NG → **REPLACE INJECTOR ASSY (See page 11–60)**

OK

4	PERFORM ACTIVE TEST USING HAND–HELD TESTER(FUEL LEAK TEST)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / FUEL LEAK TEST”.
(e) Check for fuel leaks in high–pressure area.

GO

CHECK DTC OUTPUT RECUR (DTC P0093 OUTPUT AGAIN)

HINT:
- After clearing the DTC, let the engine idle for 1 minute and then run it at 2,500 rpm for 30 seconds.
- At the same time, use the hand–held tester to confirm the fuel pressure inside the common rail from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.
  Internal fuel pressure of the common rail must be stable under each driving condition.

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

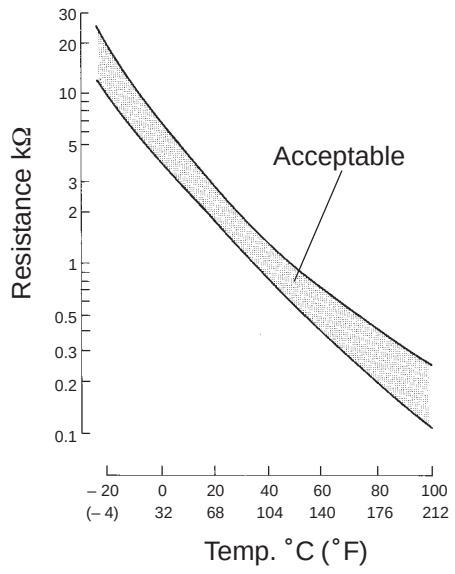
DTC	P0095	INTAKE AIR TEMPERATURE SENSOR 2 CIRCUIT

DTC	P0097	INTAKE AIR TEMPERATURE SENSOR 2 CIRCUIT LOW

DTC	P0098	INTAKE AIR TEMPERATURE SENSOR 2 CIRCUIT HIGH

CIRCUIT DESCRIPTION

(Fig. 1)



The inlet air temperature sensor is built into the intake air connector and senses the inlet air temperature. A thermistor built in the sensor changes the resistance value according to the inlet air temperature. The lower the inlet air temperature, the greater the thermistor resistance value, and the higher the inlet air temperature, the lower the thermistor resistance value (See Fig. 1).

The inlet air temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the inlet air temperature sensor from terminal THIA via a resistor R. That is the resistor R and the inlet air temperature sensor are connected in series. When the resistance value of the inlet air temperature sensor changes in accordance with changes in the inlet air temperature, the potential at the terminal THIA also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability with a cold engine.

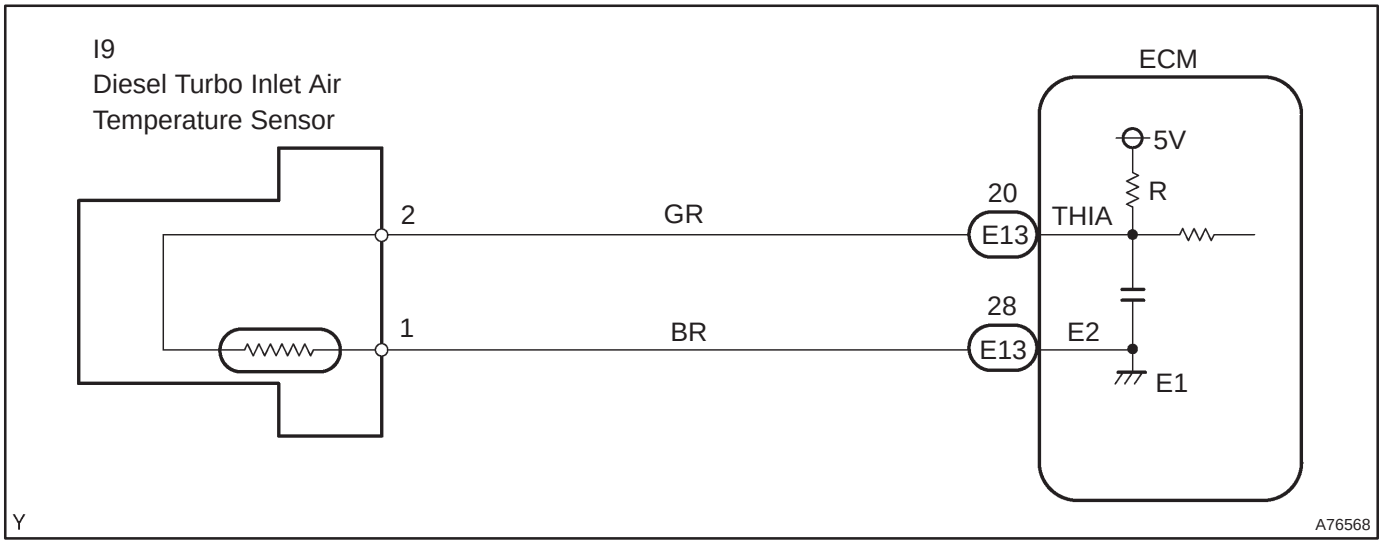
DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0095	Step 1	Open or short in diesel turbo inlet air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	• Open or short in diesel turbo inlet air temp. sensor circuit • Diesel turbo inlet air temperature sensor • ECM
P0097	Step 4	Short in diesel turbo inlet air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	
P0098	Step 2	Open in diesel turbo inlet air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	

HINT:

After confirming DTC ”P0095, P0097 or P0098”, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(INLET AIR TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual diesel turbo inlet air temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

HINT:

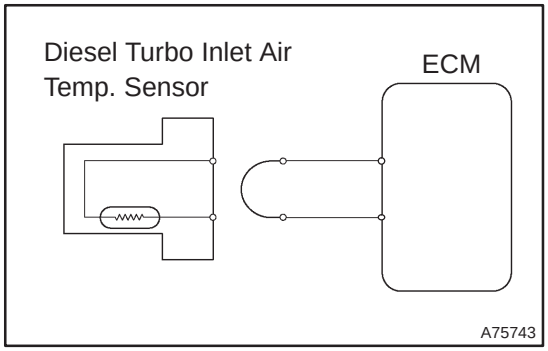
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B → **Go to step 4**

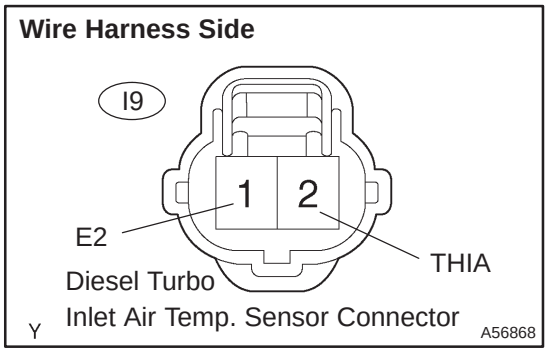
C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



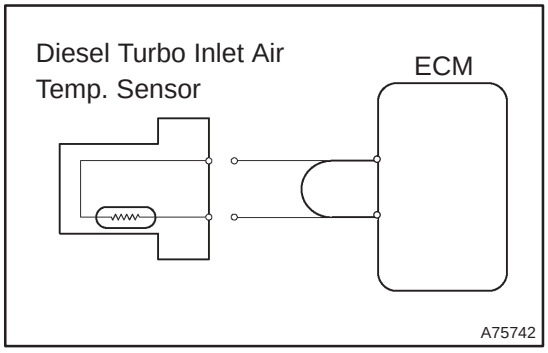
(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Connect terminals THIA and E2 of the diesel turbo inlet air temperature sensor wire harness side connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE DIESEL TURBO INLET AIR TEMPERATURE SENSOR**

NG

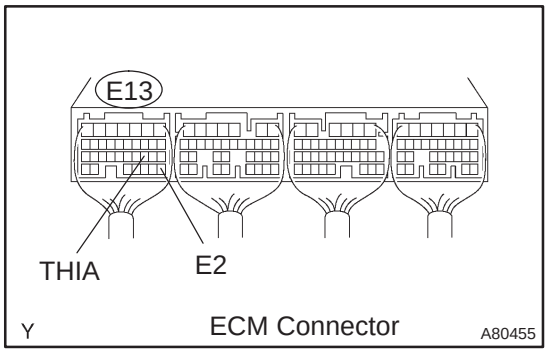
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Connect terminals THIA and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more

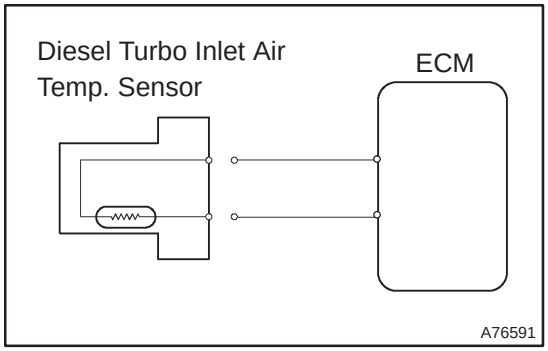


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10–65)

4 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

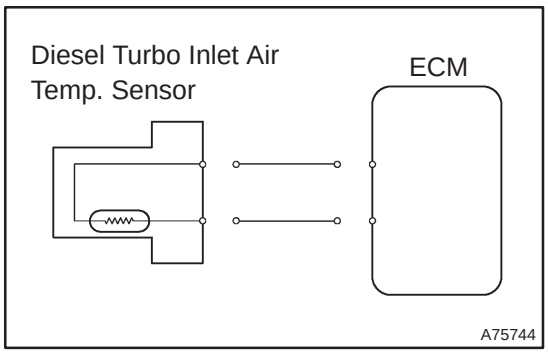


(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

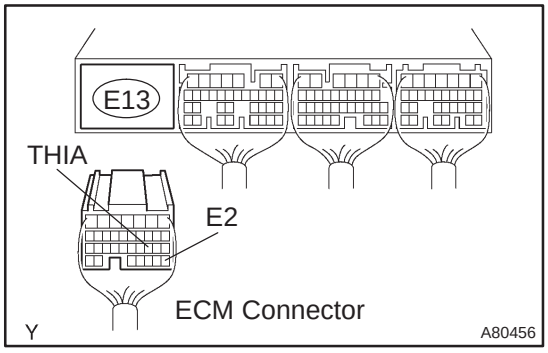
OK	**REPLACE DIESEL TURBO INLET AIR TENPERATURE SENSOR**

NG

5 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)



OK	**REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

REPLACE ECM (See page 10–65)

DTC	P0100	MASS OR VOLUME AIR FLOW CIRCUIT

DTC	P0102	MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

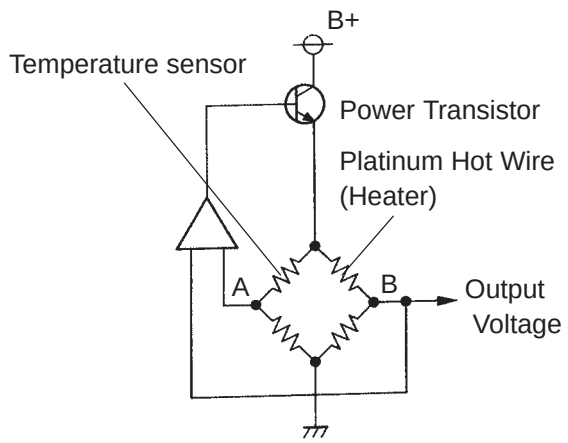
DTC	P0103	MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

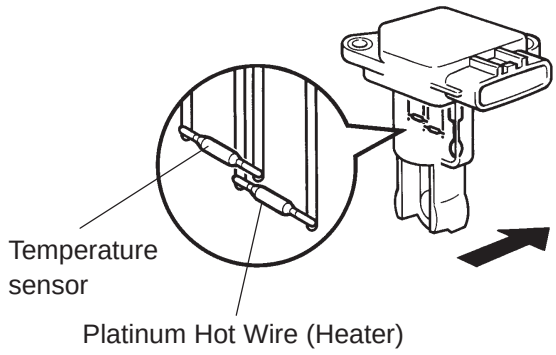
The mass air flow meter uses a platinum hot wire. The hot wire mass air flow meter consists of a platinum hot wire, a temperature sensor and a control circuit installed in a plastic housing. The hot wire mass air flow meter works on the principle that the hot wire and temperature sensor located in the intake air bypass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the mass air flow meter.

The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



FI6929
A09074



A53295

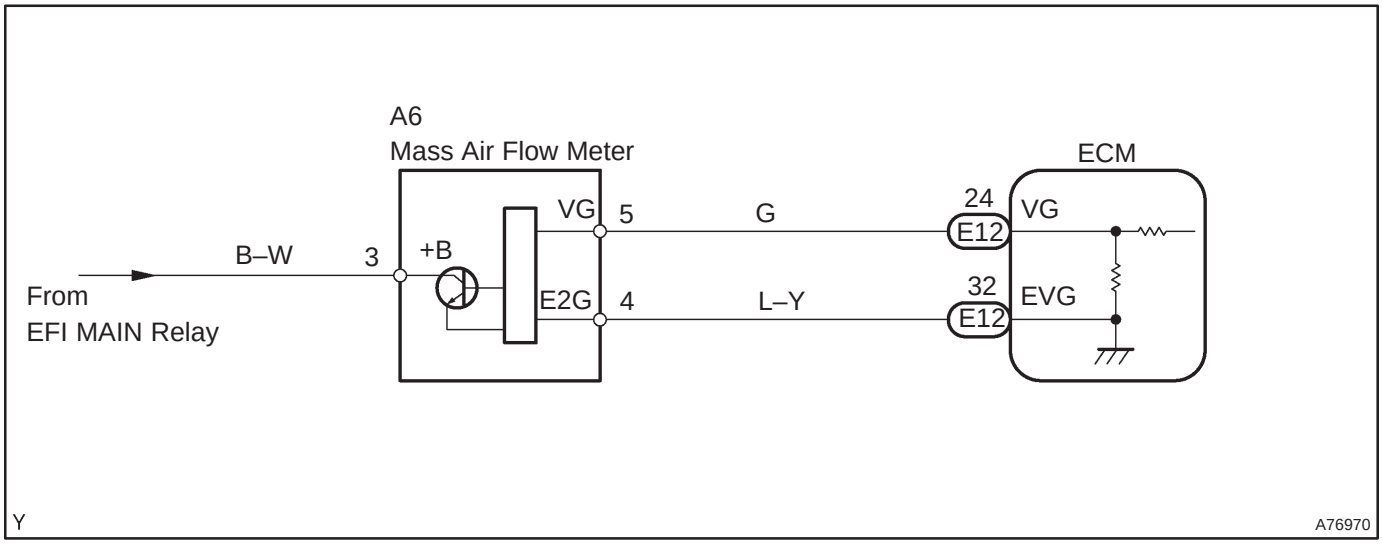
DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit for more than 3 sec. with engine speed 4,000 rpm or less (1 trip detection logic)	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P0102	Open in mass air flow meter circuit for more than 3 sec. with engine speed 4,000 rpm or less (1 trip detection logic)	
P0103	Short in mass air flow meter circuit for more than 3 sec. with engine speed 4,000 rpm or less (1 trip detection logic)	

HINT:

After confirming DTC ”P0100, P0102 or P0103”, use the hand–held tester to confirm the mass air flow ratio from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF”.

Air Flow Value (gm/s)	Malfunction
Approx. 0.0	• Mass air flow meter power source circuit open • VG circuit open or short
174.0 or more	• EVG circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

Result:

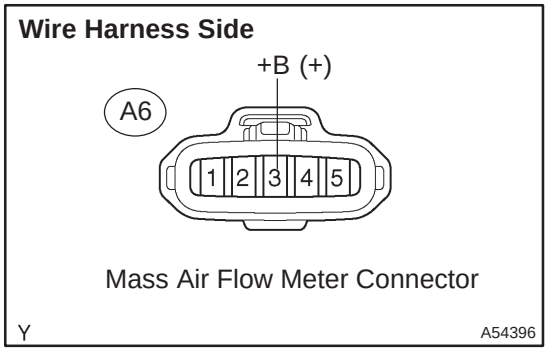
Air flow rate (gm/s)	Proceed to
0.0	A
174.0 or more	B
1 ≦ Mass Air Flow Rate ≦ 173.0 or more (*1)	C

*1: The value must be changed when the throttle valve is opened or closed.

B	**Go to step 6**
C	**CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

A

2 INSPECT MASS AIR FLOW METER(POWER SOURCE)



(a) Turn the ignition switch ON.
(b) Disconnect the A6 mass air flow meter connector.
(c) Measure the voltage between the terminal of the wire harness side connector and the body ground.

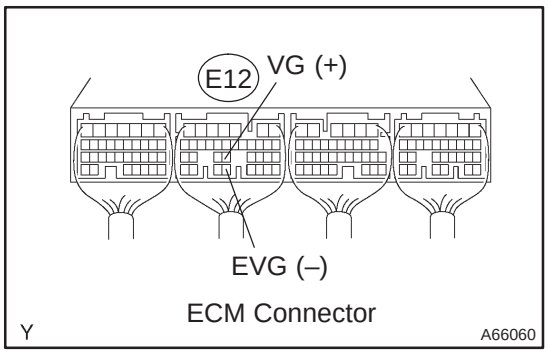
Standard:

Symbols (Terminal No.)	Specified condition
+B (A6–3) – Body ground	9 to 14 V

NG → **Go to step 5**

OK

3 INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E12 ECM connector.

HINT:
The A/C switch should be turned OFF.

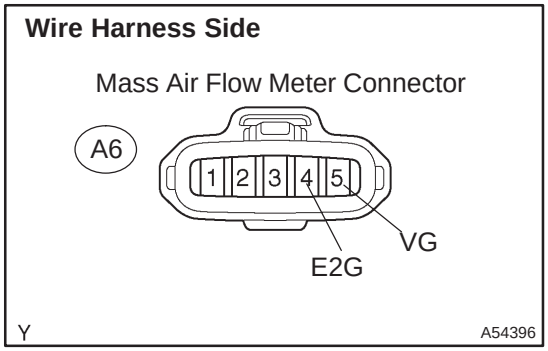
Standard:

Symbols (Terminal No.)	Condition	Specified condition
VG (E12–24) – EVG (E12–32)	Engine is idling	0.5 to 3.4 V

OK → **REPLACE ECM (See page 10–65)**

NG

4 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)



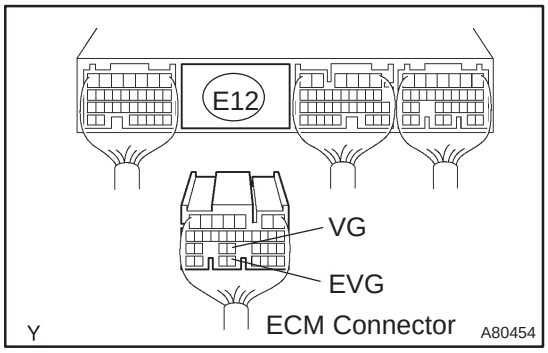
(a) Disconnect the A6 mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–5) – VG (E12–24)	Continuity
E2G (A6–4) – EVG (E12–32)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–5) or VG (E12–24) – Body ground	No continuity

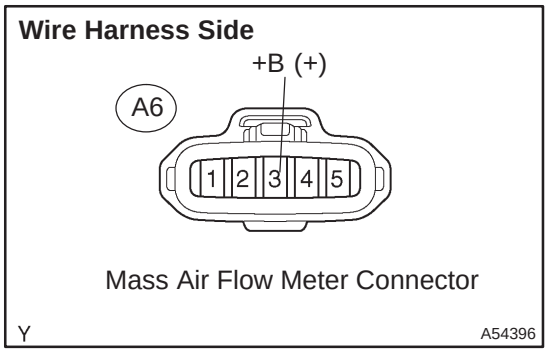


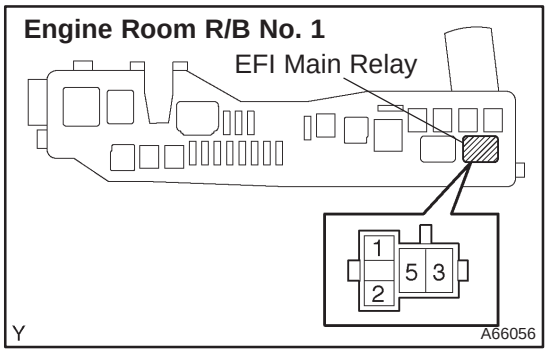
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

5 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – EFI MAIN RELAY)





(a) Disconnect the A6 mass air flow meter connector.
(b) Remove the EFI main relay from the engine room R/B No. 1.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (A6–3) – EFI main relay (3)	Continuity

Standard (Check for short):

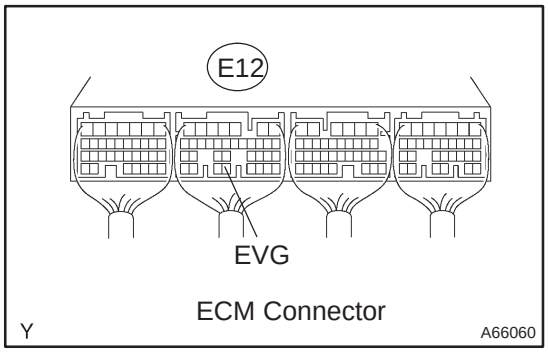
Symbols (Terminal No.)	Specified condition
+B (A6–3) or EFI main relay (3) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–686)

6 INSPECT ECM(SENSOR GROUND)



(a) Check for continuity between the terminal of the E12 ECM connector and body ground.

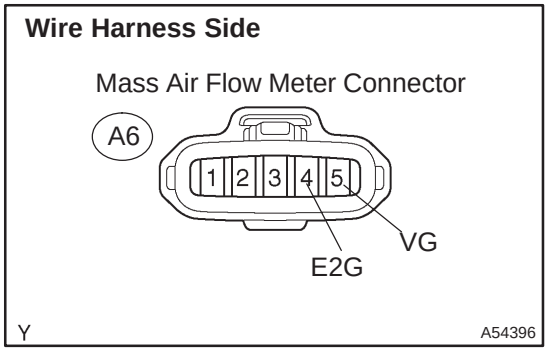
Standard:

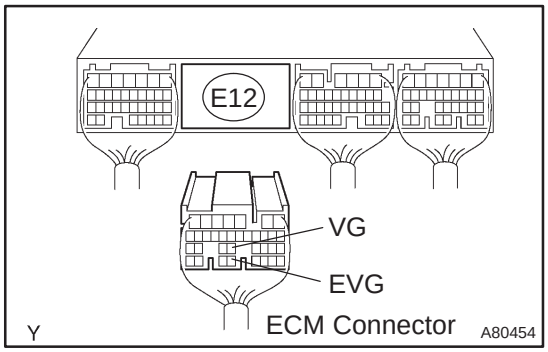
Symbols (Terminal No.)	Specified condition
EVG (E12–32) – Body ground	Continuity

NG → **REPLACE ECM (See page 10–65)**

OK

7 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)





(a) Disconnect the A6 mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–5) – VG (E12–24)	Continuity
E2G (A6–4) – EVG (E12–32)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–5) or VG (E12–24) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

DTC	P0101	MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page 05–577.

DTC No.	DTC Detection Condition	Trouble Area
P0101	After engine is warmed up, condition (a) continues for more than 10 sec. at idling: (2 trip detection logic) (a) Mass air flow meter output greater than 2.2 V	• Mass air flow meter
	Conditions (a) and (b) continue for more than 6 sec. with engine speed 2000 rpm or more: (2 trip detection logic) (a) VTA greater than 0.1 V (b) Mass air flow meter output less than 0.25 V	

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0101)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
P0101 and other DTCs are output	A
Only P0101 is output	B

HINT:

If any other codes besides P0101 are output, perform the troubleshoot for those DTCs first.

B → REPLACE MASS AIR FLOW METER

A

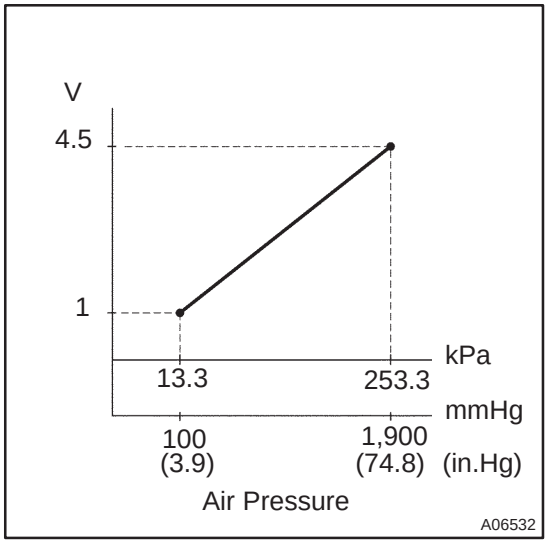
GO TO RELEVANT DTC CHART (See page 05–544)

DTC	P0105	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT

DTC	P0107	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC	P0108	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION



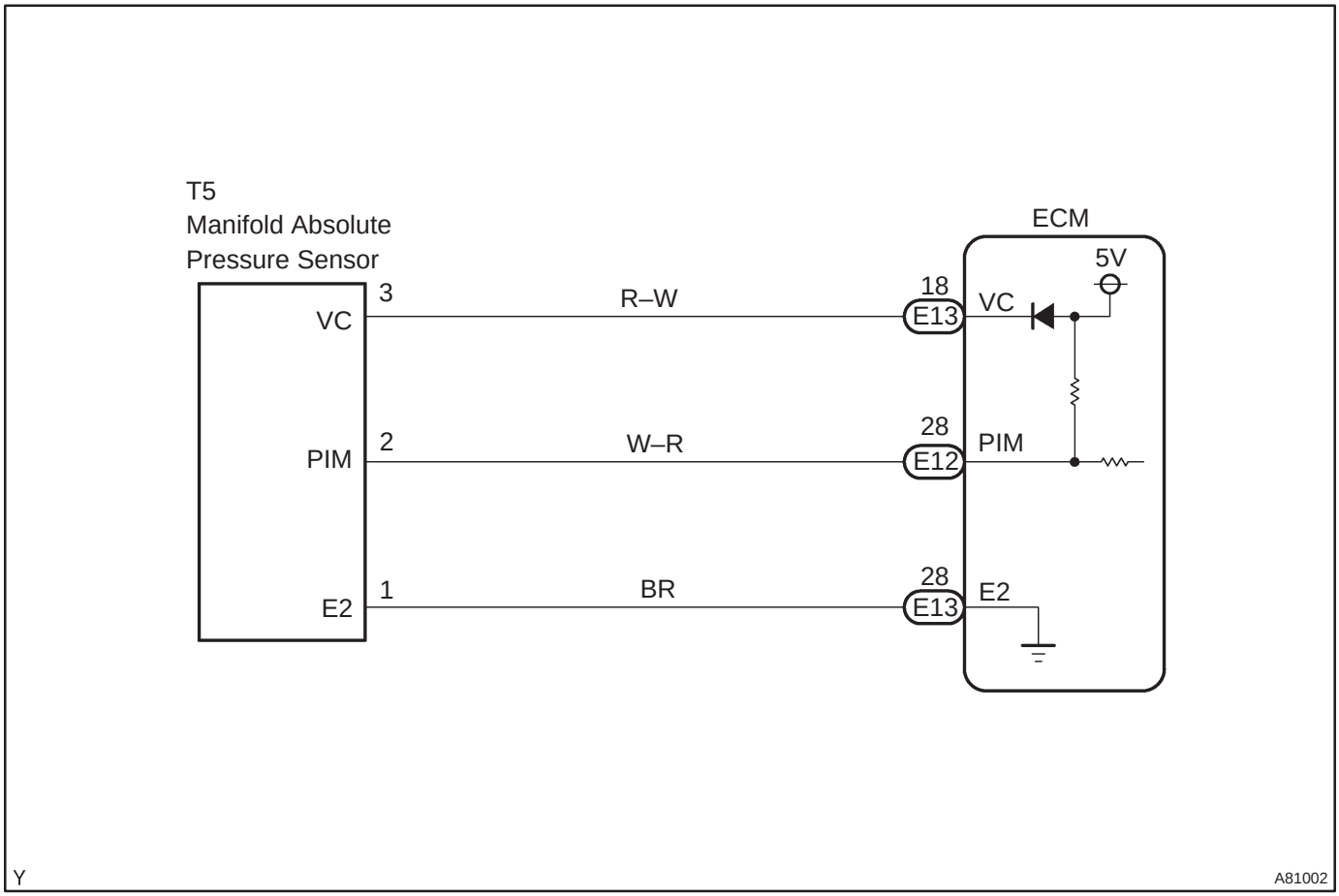
By a built–in sensor unit, the manifold absolute pressure sensor detects the intake manifold pressure as a voltage. The ECM then determines the basic injection duration and basic ignition advance angle based on this voltage.
Since the manifold absolute pressure sensor does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake manifold (the pressure in proportion to the preset absolute vacuum 0), it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. This permits it to control the air fuel ratio at the proper level under all conditions.

DTC No.	DTC Detection Condition	Trouble Area
P0105 P0107 P0108	Open or short in manifold absolute pressure sensor circuit for 0.5 sec. or more (1 trip detection logic)	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • Turbocharger assy • EGR valve assy • ECM

HINT:
After confirming DTC ”P0105, P0107 or P0108”, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / PIM”.

Intake Manifold Pressure (kPa)	Malfunction
Approx. 0	• PIM circuit short
250 or more	• VC circuit open or short • PIM circuit open • E2 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

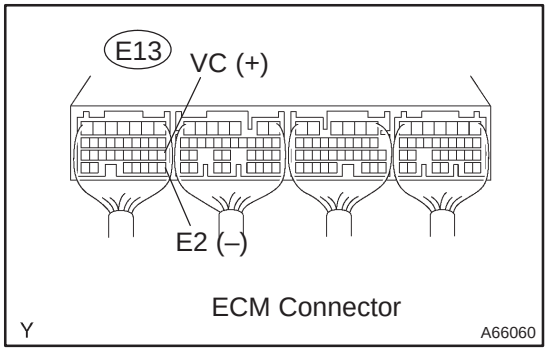
1	READ VALUE OF HAND–HELD TESTER(MANIFOLD ABSOLUTE PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / PIM” and read its value displayed on the hand–held tester.
Pressure: Same value as the actual atmospheric pressure.

NG → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

OK

2 INSPECT ECM(VC VOLTAGE)



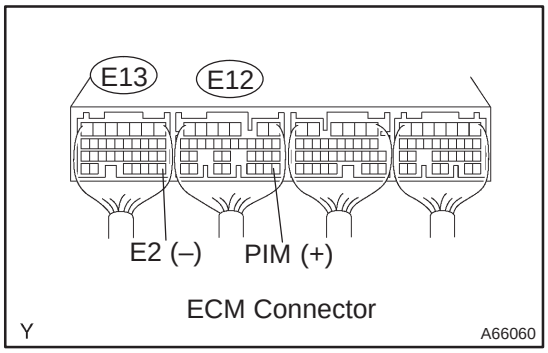
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.
Voltage:

Symbols (Terminal No.)	Specified condition
VC (E13–18) – E2 (E13–28)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10–65)**

OK

3 INSPECT ECM(PIM VOLTAGE)



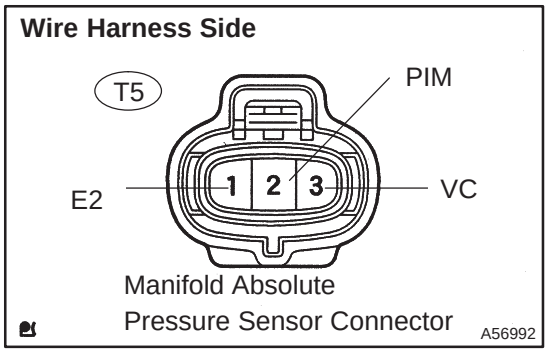
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E12 and E13 ECM connectors.
Voltage:

Symbols (Terminal No.)	Condition	Specified condition
PIM (E12–28) – E2 (E13–28)	Applied negative pressure of 40kPa (300 mmHg, 11.8 in.Hg)	0.2 to 0.8 V
PIM (E12 – 28) – E2 (E13–28)	Same as atmosphere	1.3 to 1.9 V
PIM (E12 – 28) – E2 (E13–28)	Applied positive pressure of 69kPa (0.7 kg/cm^{3}, 10.0 psi	3.2 to 3.8 V

NG → **REPLACE ECM (See page 10–65)**

OK

4	CHECK HARNESS AND CONNECTOR(MANIFOLD ABSOLUTE PRESSURE SENSOR – ECM)



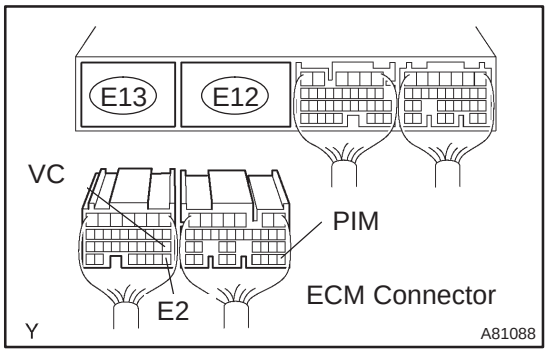
(a) Disconnect the T5 manifold absolute pressure sensor connector.
(b) Disconnect the E12 and E13 ECM connectors.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PIM (T5–2) – PIM (E12–28)	Continuity
VC (T5–3) – VC (E13–18)	
E2 (T5–1) – E2 (E13–28)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PIM (T5–2) or PIM (E12–28) – Body ground	No continuity
VC (T5–3) or VC (E13–18) – Body ground	
E2 (T5–1) or E2 (E13–28) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	CHECK TURBOCHARGER SUB–ASSY (See page 13–7)

NG → **REPLACE TURBOCHARGER SUB–ASSY (See page 13–11)**

OK

6	CHECK EGR VALVE ASSY (See page 12–18)

NG → **REPLACE EGR VALVE ASSY (See page 14–286)**

OK

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

DTC	P0106	MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT RANGE/ PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0105 on page 05–584.

DTC No.	DTC Detection Condition	Trouble Area
P0106	Voltage output of the manifold absolute pressure sensor is out of the standard range. (2 trip detection logic)	• Manifold absolute pressure sensor

INSPECTION PROCEDURE

HINT:

- If DTCs ”P0105, P0107, and P0108” are output simultaneously, manifold absolute pressure sensor circuit may be open or short. Perform the troubleshooting of DTC ”P0105, P0107 or P0108” first.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0106)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only P0106 are output	A
P0106 and other DTCs are output	B

HINT:

If any other codes besides ”P0106” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

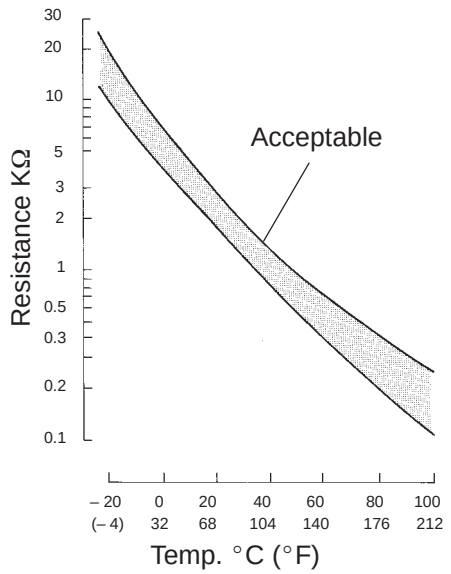
DTC	P0110	INTAKE AIR TEMPERATURE CIRCUIT

DTC	P0112	INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC	P0113	INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Fig.1)



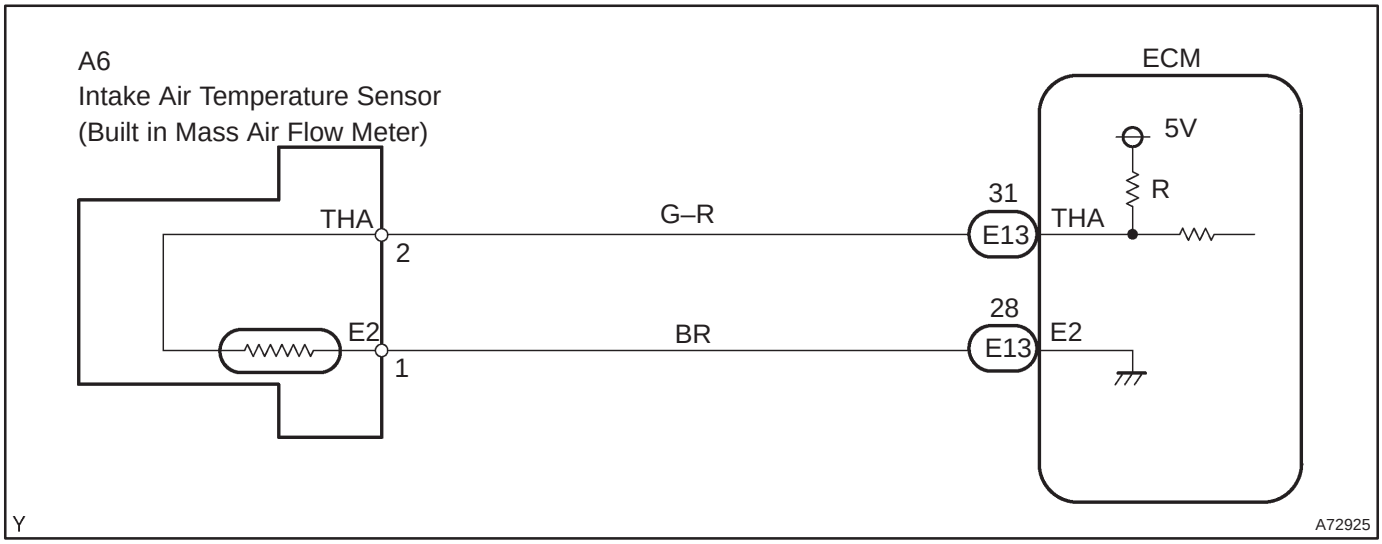
The intake air temperature sensor is built in the mass air flow meter and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature is, the greater the thermistor resistance value becomes, and the higher the intake air temperature is, the lower the thermistor resistance value becomes (See Fig. 1).
The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.
The resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability with a cold engine.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0112	Step 4	Short in intake air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	
P0113	Step 2	Open in intake air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	

HINT:
After confirming DTC ”P0110, P0112 or P0113, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

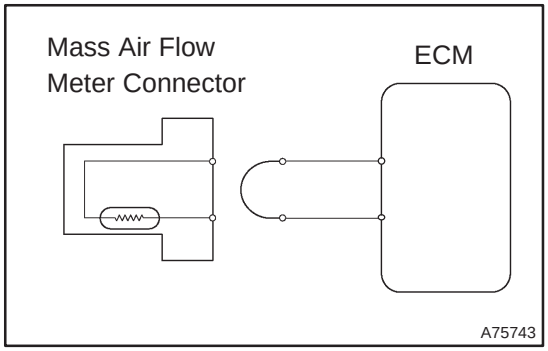
HINT:

- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

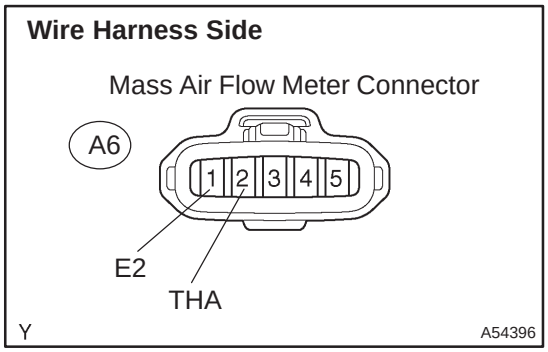
B	**Go to step 4**
C	**CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



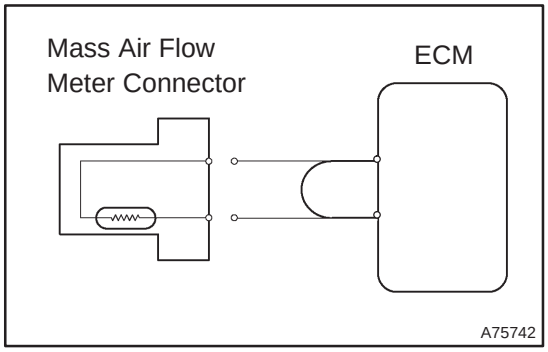
(a) Disconnect the A6 mass air flow meter connector.
(b) Connect terminals THA and E2 of the mass air flow meter wire harness side connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE MASS AIR FLOW METER**

NG

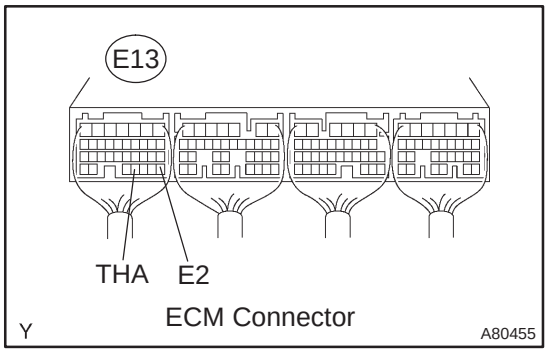
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the A6 mass air flow meter connector.
(b) Connect terminals THA and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more

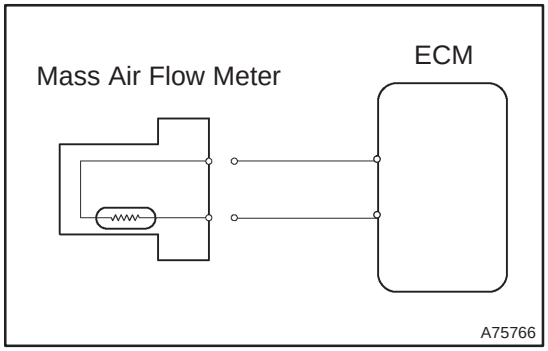


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10–65)

4	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

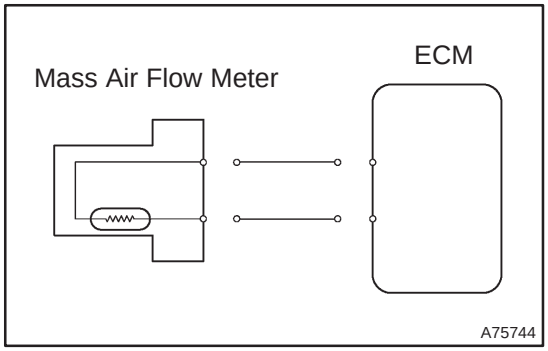


(a) Disconnect the A6 mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

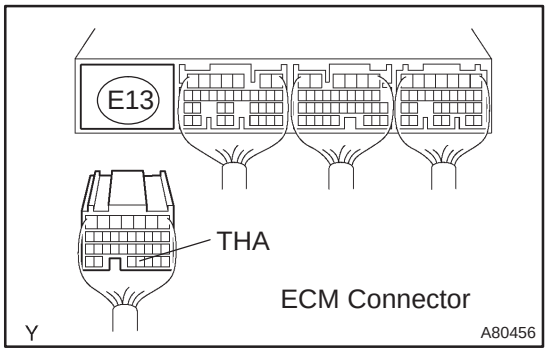
OK	REPLACE MASS AIR FLOW METER

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)



OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

REPLACE ECM (See page 10–65)

DTC	P0115	ENGINE COOLANT TEMPERATURE CIRCUIT

DTC	P0117	ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC	P0118	ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

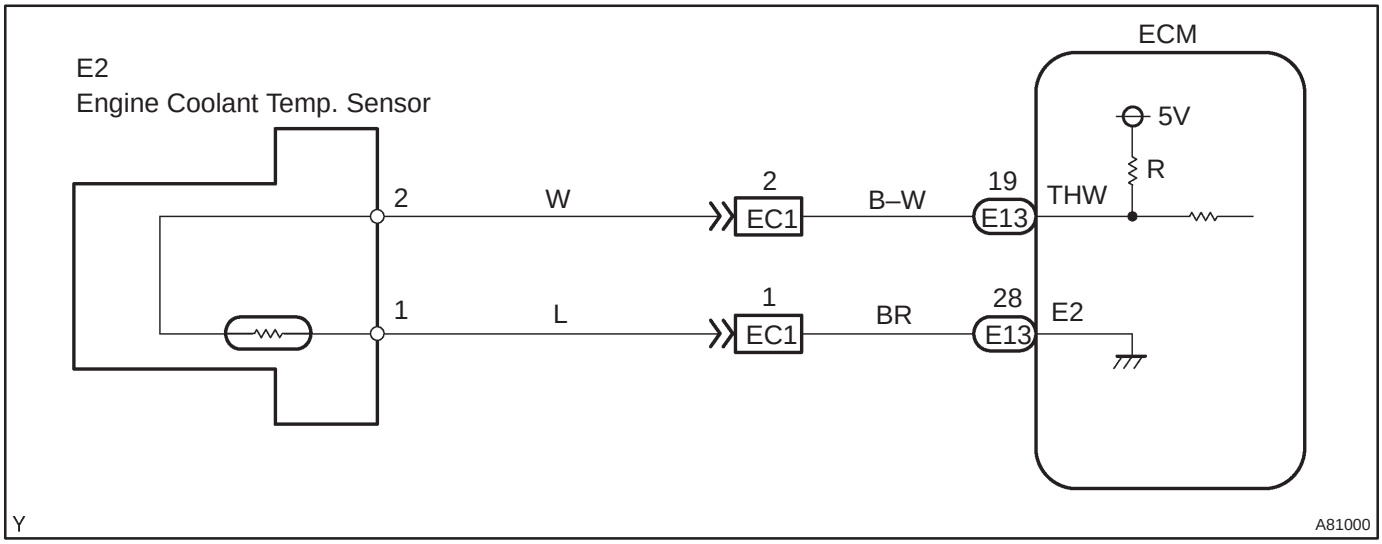
A thermistor is built in the engine coolant temperature sensor and changes the resistance value according to the engine coolant temperature.
The structure of the sensor and connection to the ECM is the same as those of the intake air temperature sensor.
HINT:
If the ECM detects DTC ”P0115, P0117 or P0118” it enters the fail–safe mode in which the engine coolant temperature is assumed to be 80 °C (176 °F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115	Step 1	Open or short in engine coolant temp. sensor circuit for 0.5 sec. (1 trip detection logic)	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM
P0117	Step 4	Short in engine coolant temp. sensor circuit for 0.5 sec. (1 trip detection logic)	
P0118	Step 2	Open in engine coolant temp. sensor circuit for 0.5 sec. (1 trip detection logic)	

HINT:
After confirming DTC ”P0115, P0117 or P0118”, use the hand–held tester to confirm the engine coolant temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(ENGINE COOLANT TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

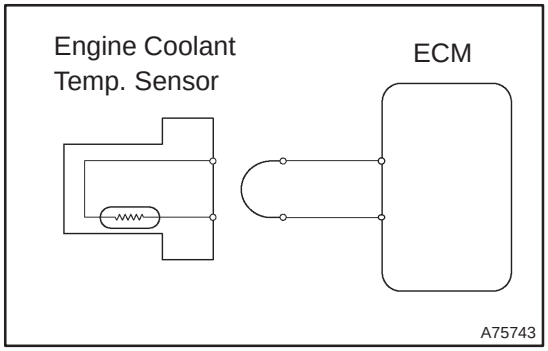
HINT:

- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

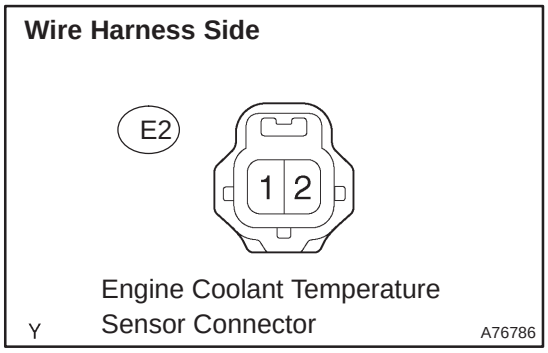
B	**Go to step 4**
C	**CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



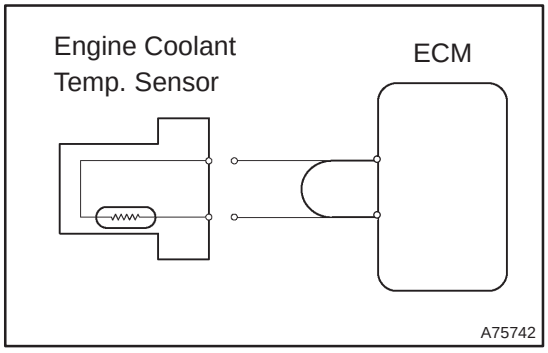
(a) Disconnect the E2 engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor wire harness side connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE ENGINE COOLANT TEMP. SENSOR**

NG

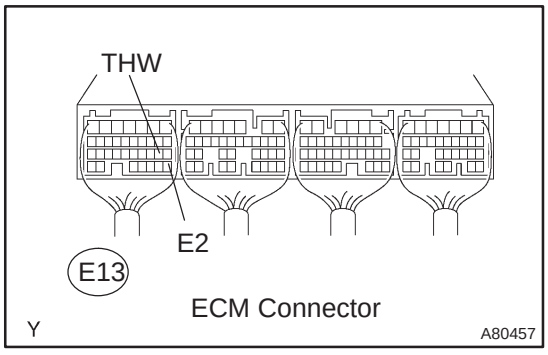
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the E2 engine coolant temperature sensor connector.
(b) Connect terminals THW and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more

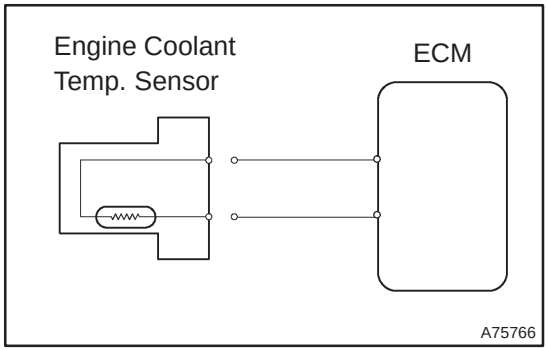


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10–65)

4	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

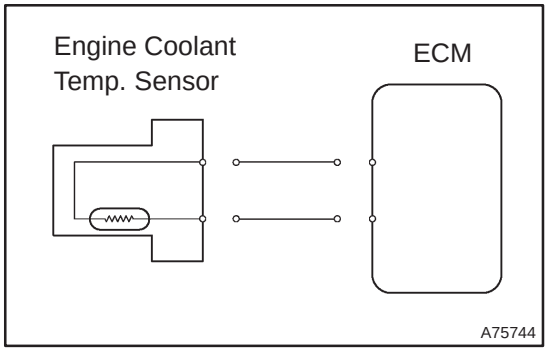


(a) Disconnect the E2 engine coolant temperature sensor connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

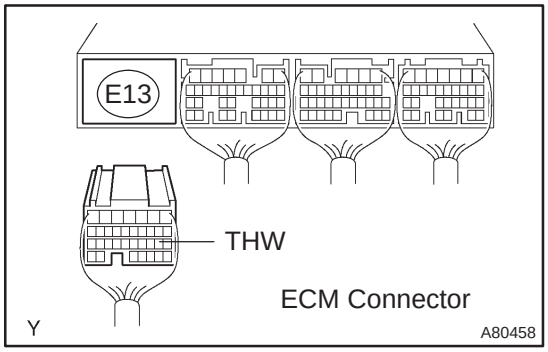
OK → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

REPLACE ECM (See page 10–65)

DTC	P0116	ENGINE COOLANT TEMPERATURE CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05–593.

DTC No.	DTC Detection Condition	Trouble Area
P0116	When THW greater than –40°C (–40°F) and less than 60°C (140°F), and THA greater than –6.7°C (20°F), and when starting engine, conditions (a) and (b) continue (2 trip detection logic): (a) Vehicle speed is changing (Not stable) (b) THW change is lower than 3°C (5.4°F) after engine was started.	• Cooling system • Engine coolant temperature sensor • Thermostat
	In case that reading value of engine coolant temp. sensor will not change more than 1°C (1.8°F) even after repeating 6 trips (detection logic) of adjusting speed pattern with THW more than 90°C (194°F) after engine was started.	

INSPECTION PROCEDURE

HINT:

- If DTCs ”P0115, P0116, P0117 and P0118” are output simultaneously, engine coolant temperature sensor circuit may be open or short. Perform the troubleshooting of DTC ”P0115, P0117 or P0118” first.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(BESIDES DTC P0116)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
Only P0116 are output	A
P0116 and other DTCs are output	B

HINT:

If any other codes besides ”P0116” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

2 INSPECT THERMOSTAT (See page 16–39)

NG → **REPLACE THERMOSTAT (See page 16–50)**

OK

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

DTC P0168 FUEL TEMPERATURE TOO HIGH

CIRCUIT DESCRIPTION

Refer to DTC P0180 on page 05–599.

DTC No.	DTC Detection Condition	Trouble Area
P0168	When THF greater than 35˚C (95˚F) and less than 60˚C (140˚F), and THF ≧ –6.7˚C (20˚F), and when starting engine, conditions (a) and (b) continue (1 trip detection logic): (a) Vehicle speed is changing (Not stable) (b) THF change is lower than 3˚C (5.4˚F) after the engine was started.	• Fuel temperature sensor
	In case that reading value of fuel temp. sensor will not change more than 1˚C (1.8˚F) even after repeating 6 trips (detection logic) of adjusting speed pattern with THF more than 60˚C (140˚F) after the engine was started.	

INSPECTION PROCEDURE

HINT:

- If DTCs ”P0180, P0182 and P0183” are output simultaneously, fuel temperature sensor circuit may be open or short. Perform the troubleshooting of DTC ”P0180, P0182 or P0183” first.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(BESIDES DTC P0168)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only P0168 are output	A
P0168 and other DTCs are output	B

HINT:

If any other codes besides ”P0168” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

REPLACE FUEL TEMPERATURE SENSOR

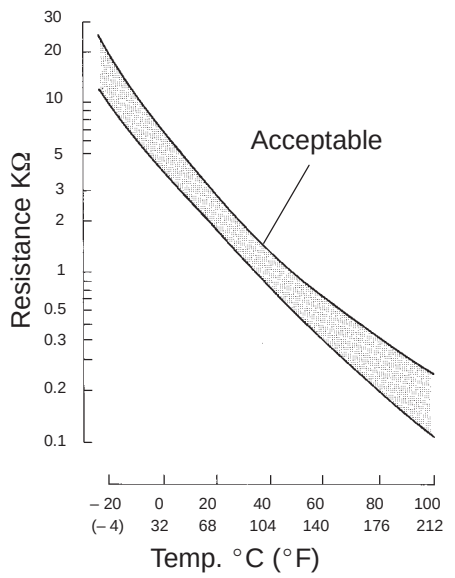
DTC	P0180	FUEL TEMPERATURE SENSOR ”A” CIRCUIT

DTC	P0182	FUEL TEMPERATURE SENSOR ”A” CIRCUIT LOW INPUT

DTC	P0183	FUEL TEMPERATURE SENSOR ”A” CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Fig.1)



The fuel temperature sensor senses the fuel temperature. A thermistor built into the sensor changes the resistance value according to the fuel temperature. The lower the fuel temperature is, the greater the thermistor resistance becames, and the higher the fuel temperature is, the lower the thermistor resistance becomes (See Fig. 1).

The fuel temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the fuel temperature sensor from terminal THF via a resistor R. The resistor R and the fuel temperature sensor are connected in series. When the resistance value of the fuel temperature sensor changes in accordance with changes in the fuel temperature, the potential at terminal THF also changes. Based on this signal, the ECM performs the pressure control compensation of the supply pump and error detection compensation of the highly pressurized fuel system.

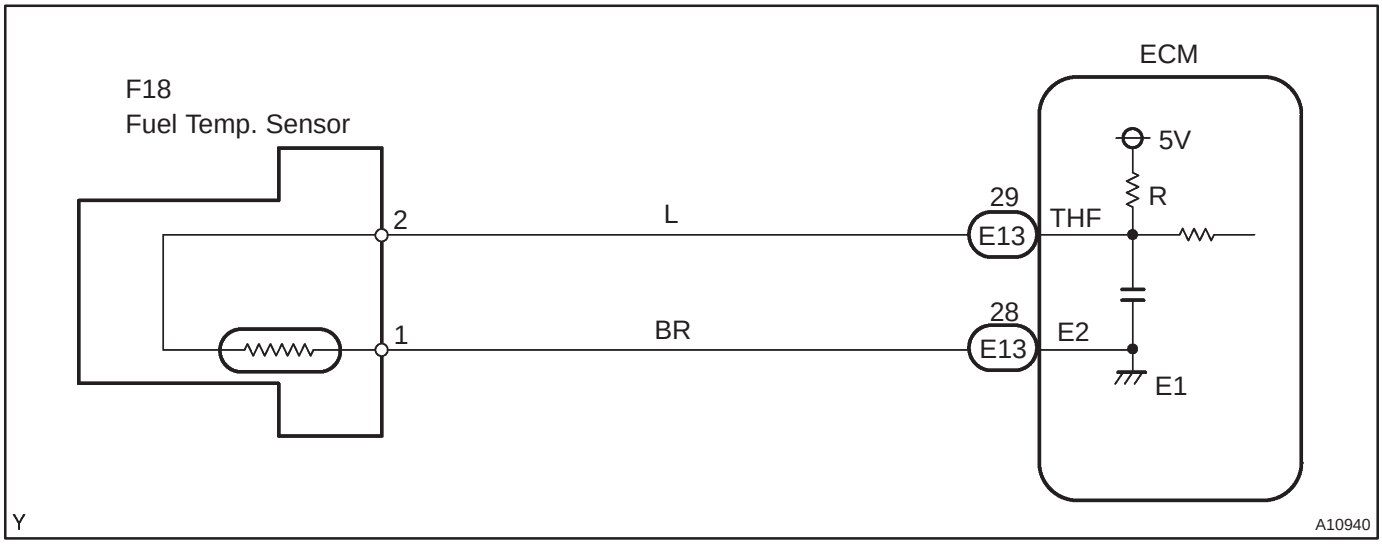
DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0180	Step 1	Open or short in fuel temp. sensor circuit for 0.5 sec. (1 trip detection logic)	• Open or short in fuel temp. sensor circuit • Fuel temperature sensor • ECM
P0182	Step 4	Short in fuel temp. sensor circuit for 0.5 sec. (1 trip detection logic)	
P0183	Step 2	Open in fuel temp. sensor circuit for 0.5 sec. (1 trip detection logic)	

HINT:

After confirming DTC ”P0180, P0182 or P0183”, use the hand–held tester to confirm the fuel temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(FUEL TEMPARATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual fuel temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

HINT:

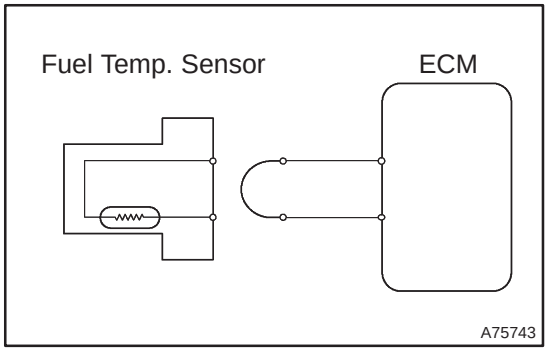
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B	Go to step 4

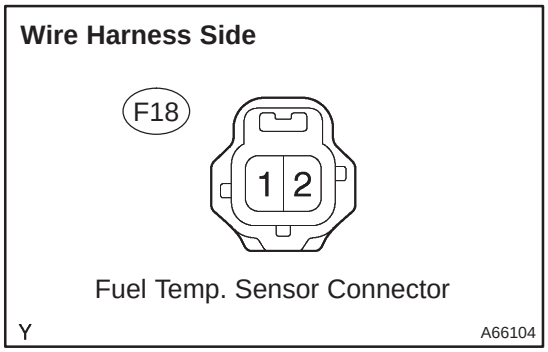
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



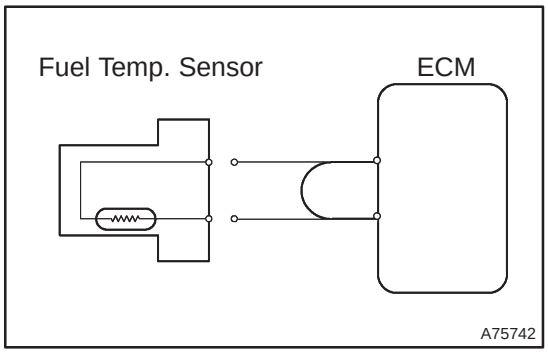
(a) Disconnect the F18 fuel temperature sensor connector.
(b) Connect terminals 1 and 2 of the fuel temperature sensor wire harness side connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE FUEL TEMPERATURE SENSOR**

NG

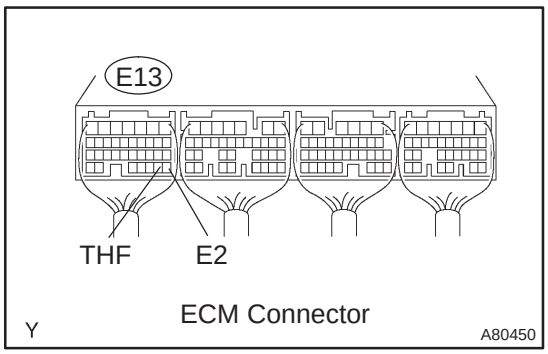
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the F18 fuel temperature sensor connector.
(b) Connect terminals THF and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more

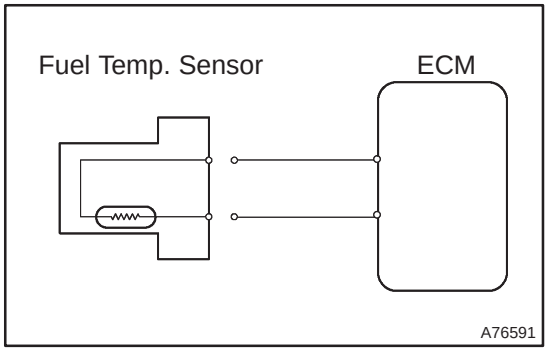


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM
(See page 10–65)

4 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

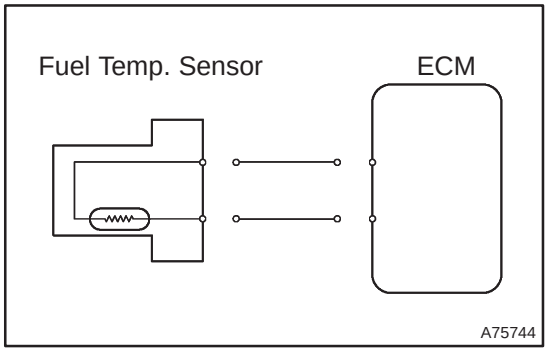


(a) Disconnect the F18 fuel temperature sensor connector.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

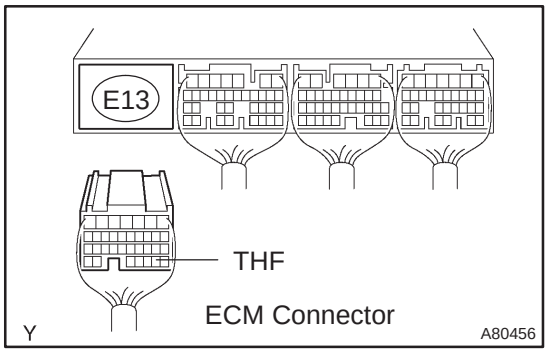
OK → **REPLACE FUEL TEMPERATURE SENSOR**

NG

5 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

REPLACE ECM (See page 10–65)

DTC	P0191	FUEL RAIL PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTCs P0087 on page 05–557.

INSPECTION PROCEDURE

HINT:

- If DTCs ”P0087, P0190, P0192, and P0193” are output simultaneously, manifold absolute pressure sensor circuit may be open or short. Perform the troubleshooting of DTC ”P0087, P0190, P0192, and P0193” first.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

DTC No.	DTC Detection Condition	Trouble Area
P0191	Voltage output of the fuel pressure sensor for the common rail is out of the standard range. (1 trip detection logic)	• Fuel pressure sensor

1	CHECK OTHER DTC OUTPUT(BESIDS DTC P0191)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only P0191 is output	A
P0191 and other DTCs are output	B

HINT:
If any other codes besides P0191 are output, perform the troubleshoot for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR) (See page 11–78)

DTC	P0200	INJECTOR CIRCUIT / OPEN

HINT:

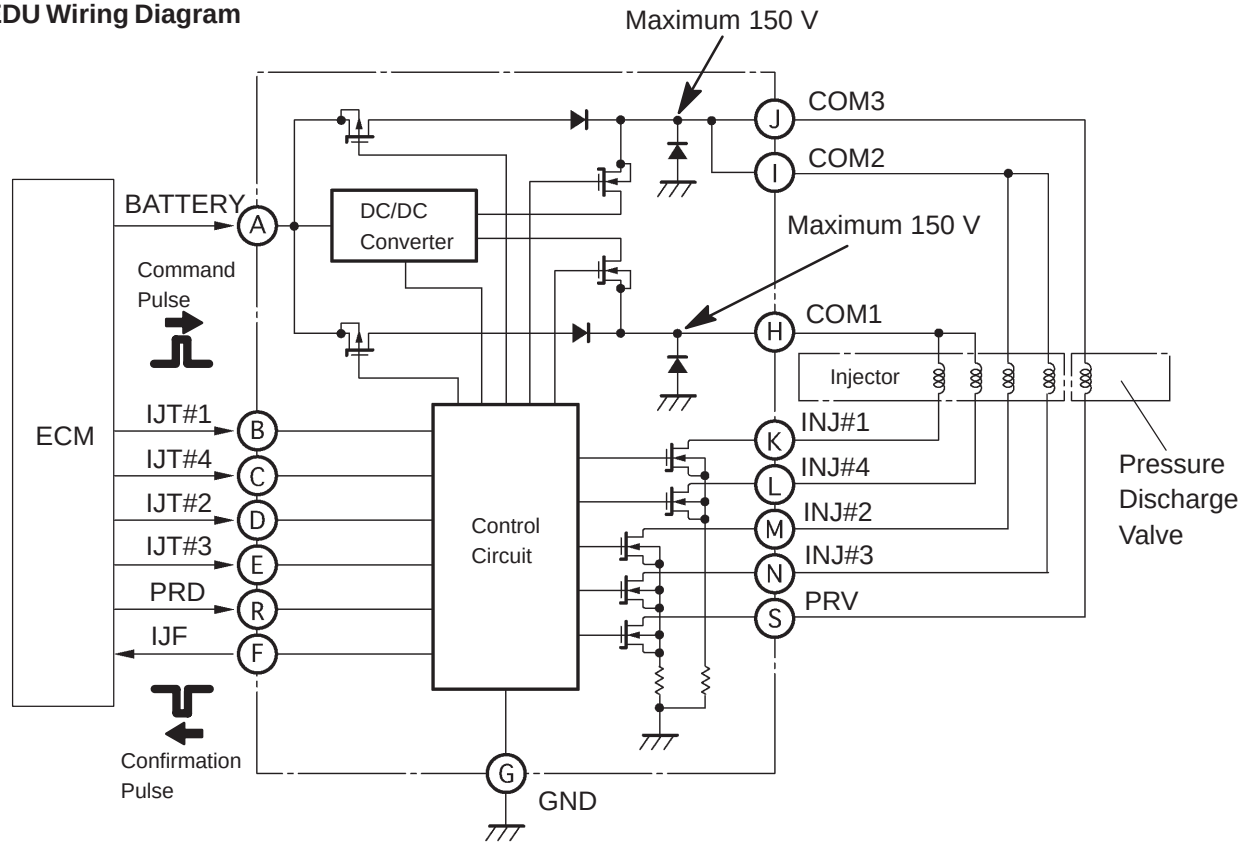
- For more information on the EDU, see page 05–517.
- If P0200 are present, Use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

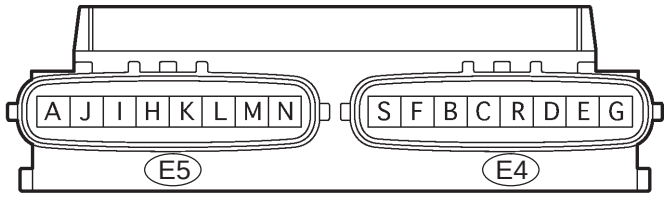
The EDU has been adopted to drive the injector at high speeds. The EDU has realized high–speed driving under high fuel pressure conditions using the DC/DC converter that provides a high–voltage, quick–charging system.

Soon after the EDU receives an injection command signal (IJT) from the ECM, the EDU responds to the command with injector injection confirmation signal (IJF) when the current is applied to the injector.

EDU Wiring Diagram



EDU Connector



Warning: Terminal J, I, H, K, L, M, N and S are high voltage

Y A81481

DTC No.	DTC Detection Condition	Trouble Area
P0200	Open or short in EDU or injector circuit. After engine is started, there is no injection confirmation signal (IJF) from EDU to ECM, despite the ECM sending injection command signal (IJT) to the EDU.	• Open or short in EDU circuit • Injector • EDU • ECM

MONITOR DESCRIPTION

P0200 (Open or short in EDU or injector circuit):

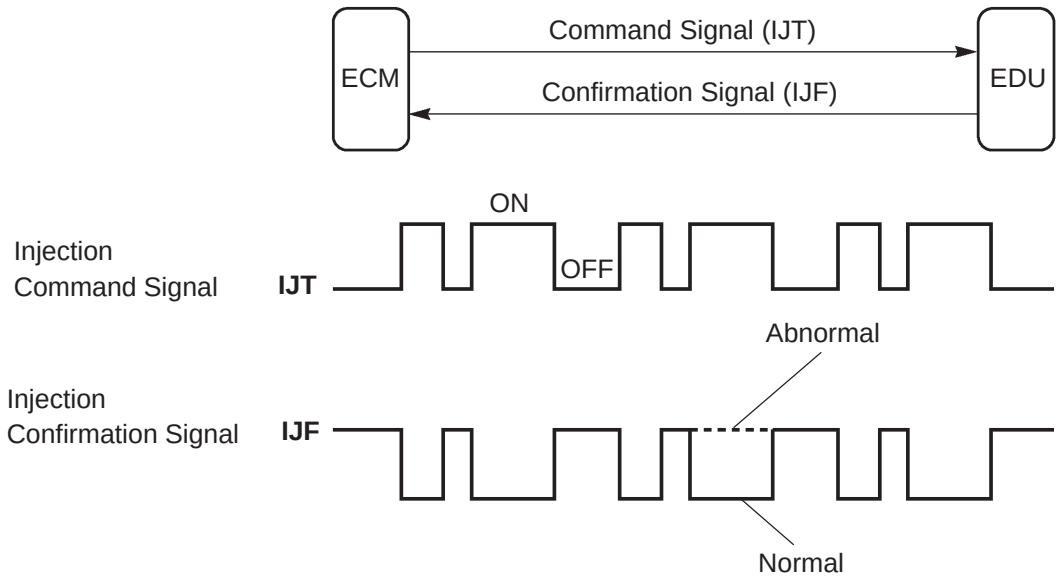
The ECM always monitors both the injection command signal (IJT) and injection confirmation signal (IJF). This DTC will be set if the ECM judged that the number of IJT signals and IJF signals are inconsistent.

The EDU monitors a drive current supplied to the injector and interprets the IJF signal as low if the current exceeds the specified level, and then it indicates that there is the current in the injector.

P0200 refers to malfunction of injector drive circuit or injector circuit.

If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

Malfunction Detection



MONITOR STRATEGY

Required sensors	IJF signal from EDU
Frequency of operation	Continuous
Duration	10 sec.
CHK ENG operation	1 driving cycle

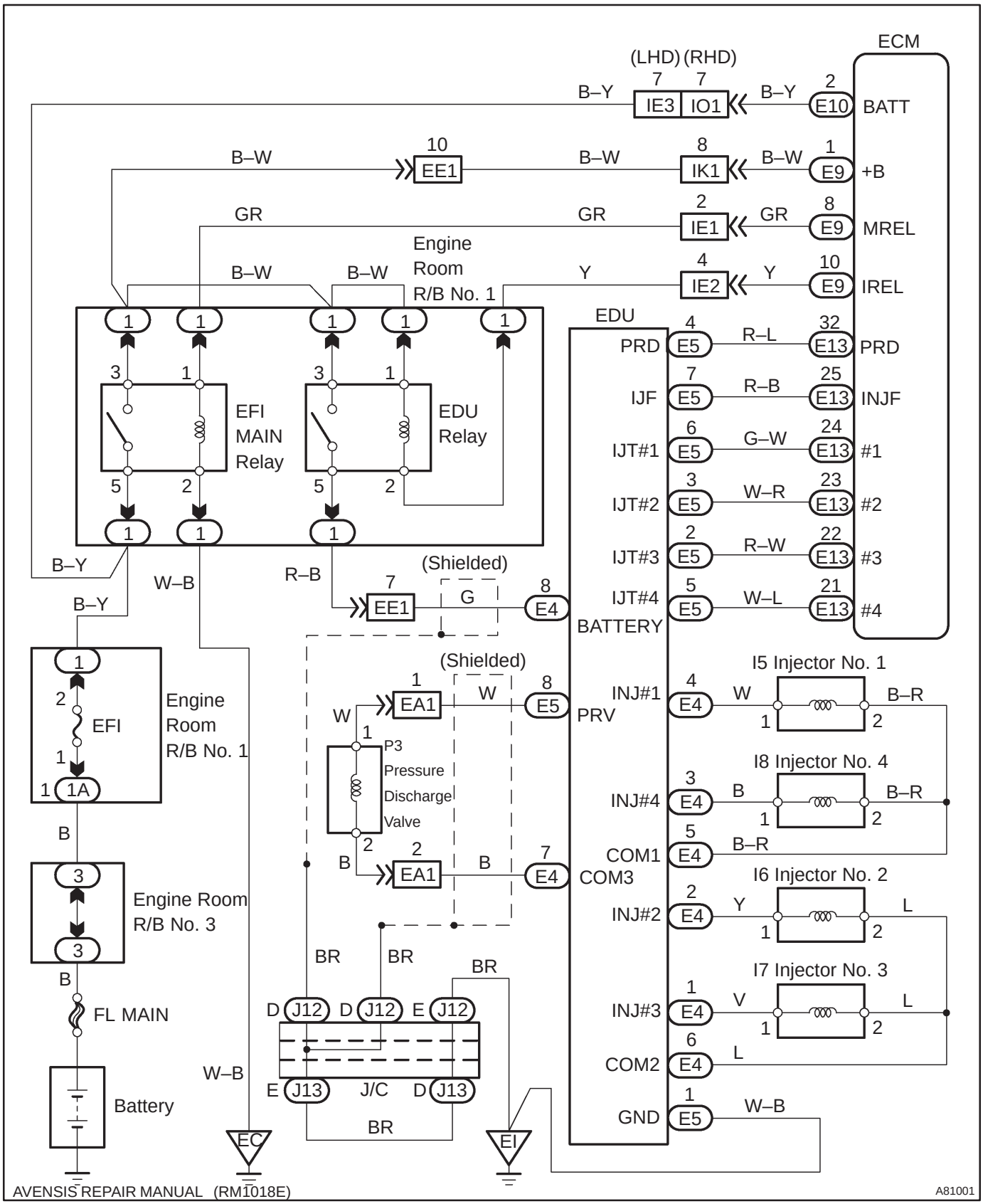
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine speed	500 rpm	–
Battery voltage	11 V	–
Ignition switch	ON	

TYPICAL MALFUNCTION THRESHOLDS

Threshold
If injection missing counter* is accumulated a specified number of times successively, or if injection missing counter for either one of the cylinders is accumulated a specified number of times successively (Approximately 1 second or more). *: Injection missing counter increments when no IJF signal from the EDU despite the ECM sending the IJT signal.

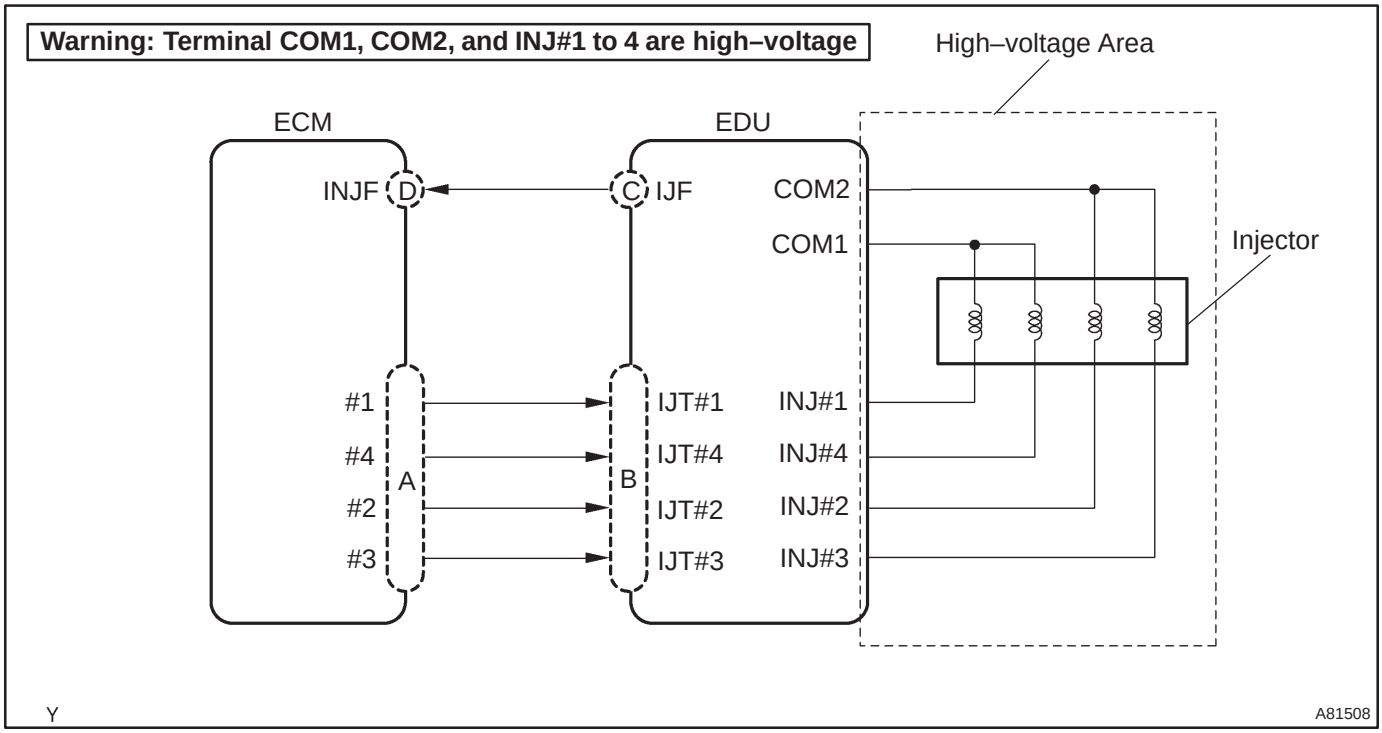
WIRING DIAGRAM



PULSE GENERATION INSPECTION

HINT:

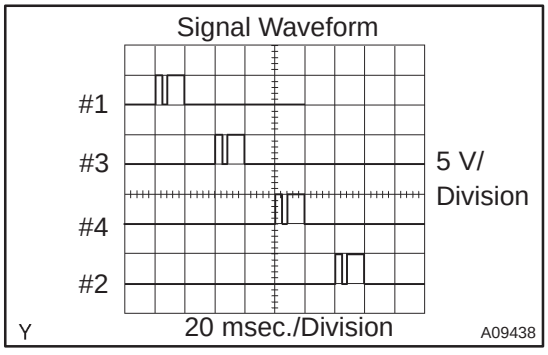
Problem area can be identified by inspecting waveform at the following inspection points.



HINT:

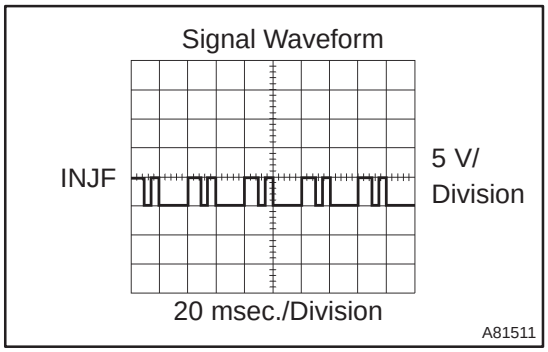
Inspect the following inspection points ”A and D” or ” B and C” at the same time.

Malfunction point	Trouble area
A	• ECM
B (if A is normal)	• Open or short in ”#1 to #4 (ECM)” – ”IJT#1 to #4 (EDU)” harness or connector.
C (if A and B are normal)	• Open or short in ”INJ#1 to #4 (EDU)” – ”COM1 and/or COM2” (EDU) circuit. • Injector • EDU
D (if A, B and C are normal)	• Open or short in ”IJF (EDU)” – ”INJF (ECM)” circuit. (P1271 is set simultaneously)



(a) Reference: Inspect using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Inspection Points	Specified Condition
A and B	Correct waveform is as shown



(b) Reference: Inspect using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Inspection Points	Specified Condition
C and D	Correct waveform is as shown

INSPECTION PROCEDURE

HINT:

- If P0200 and P1271 are present simultaneously, there is open in the INJF wire harness between the EDU and ECM, or there is open in the wire harness for both of the injector the pressure discharge valve.
- Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0200)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.
Result:

Display (DTC output)	Proceed to
DTC P0200 and P1238 are output	A
Only DTC P0200 is output	B

B → **Go to step 3**

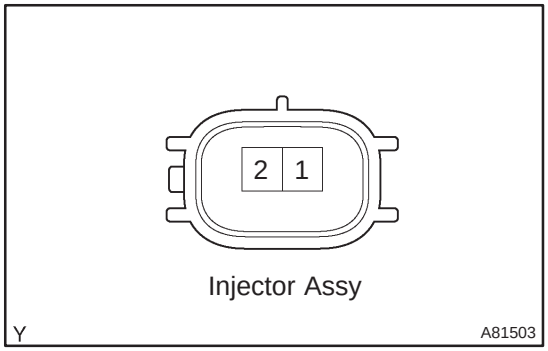
A

2	READ VALUE OF HAND–HELD TESTER(COMPENSATION OF INJECTION QUANTIFY BETWEEN CYLINDERS)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB” and read its value displayed on the hand–held tester.
Result:
STD – 3 to 3 mm^3/st
Maximum – 4.9 to 4.9 mm^3/st
(e) The cylinder that has a misspecification compensation value is a faulty cylinder, use the following flow-chart to inspect and repair the cylinder.

GO

3 INSPECT INJECTOR ASSY

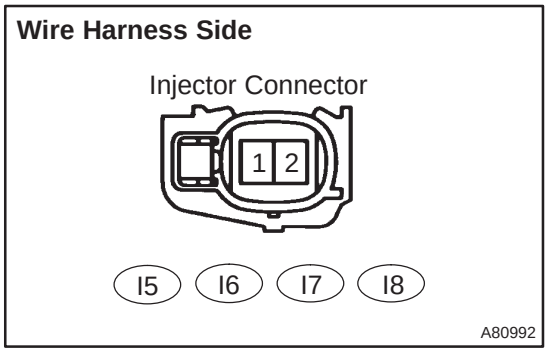


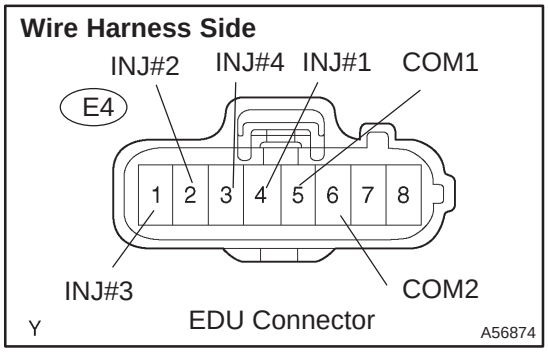
(a) Check the injector for resistance.
(1) Measure the resistance between the terminals.
Resistance: 0.85 to 1.05 Ω at 20°C (68°F)

NG → **REPLACE INJECTOR ASSY (See page 11–60)**

OK

4 CHECK HARNESS AND CONNECTOR(EDU – INJECTOR ASSY)





(a) Check the harness and connector between the injector and EDU (INJ# terminal).
(1) Disconnect the I5, I6, I7, or I8 injector connector.
(2) Disconnect the E4 EDU connector.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Injector (I5–1) – INJ#1 (E4–4)	Continuity
Injector (I6–1) – INJ#2 (E4–2)	
Injector (I7–1) – INJ#3 (E4–1)	
Injector (I8–1) – INJ#4 (E4–3)	
Injector (I5–2) – COM1 (E4–5)	
Injector (I6–2) – COM2 (E4–6)	
Injector (I7–2) – COM2 (E4–6)	
Injector (I8–2) – COM1 (E4–5)	

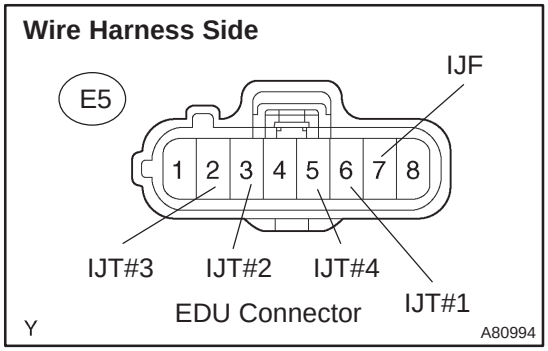
Standard (Check for short):

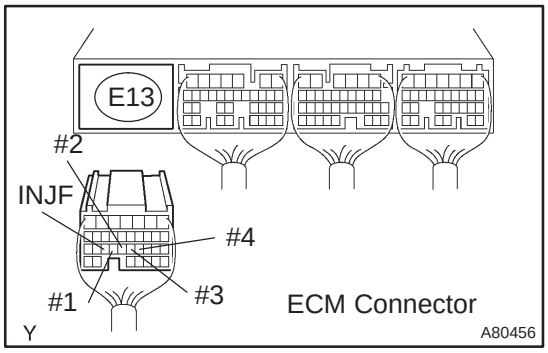
Symbols (Terminal No.)	Specified condition
Injector (I5–1) or INJ#1 (E4–4) – Body ground	No continuity
Injector (I6–1) or INJ#2 (E4–2) – Body ground	
Injector (I7–1) or INJ#3 (E4–1) – Body ground	
Injector (I8–1) or INJ#4 (E4–3) – Body ground	
Injector (I5–2) or COM1 (E4–5) – Body ground	
Injector (I6–2) or COM2 (E4–6) – Body ground	
Injector (I7–2) or COM2 (E4–6) – Body ground	
Injector (I8–2) or COM1 (E4–5) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 CHECK HARNESS AND CONNECTOR(EDU – ECM)





(a) Disconnect the E5 EDU connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the terminals of the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IJT#1 (E5–6) – #1 (E13–24)	Continuity
IJT#2 (E5–3) – #2 (E13–23)	
IJT#3 (E5–2) – #3 (E13–22)	
IJT#4 (E5–5) – #4 (E13–21)	
IJF (E5–7) – INJF (E13–25)	

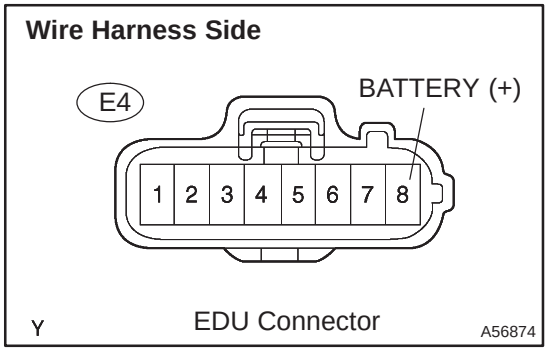
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
#1 (E13–24) or IJT#1 (E5–6) – Body ground	No continuity
#2 (E13–23) or IJT#2 (E5–3) – Body ground	
#3 (E13–22) or IJT#3 (E5–2) – Body ground	
#4 (E13–21) or IJT#4 (E5–5) – Body ground	
INJF (E13–25) or IJF (E5–7) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

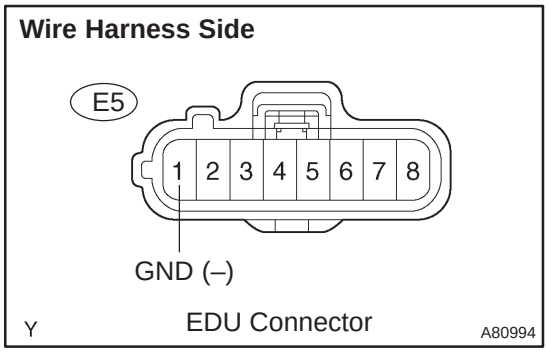
6 INSPECT INJECTOR DRIVER(BATTERY VOLTAGE)



(a) Disconnect the E4 and E5 EDU connectors.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the specified terminals of the EDU connector.

Voltage:

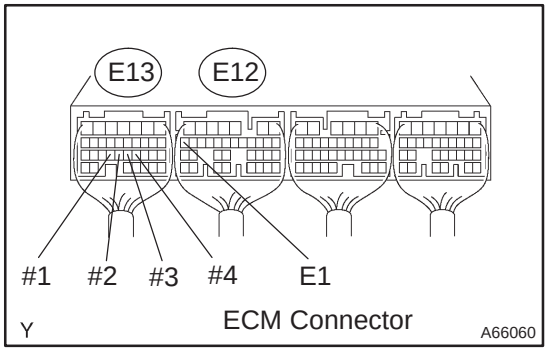
Symbols (Terminal No.)	Specified condition
BATTERY (E4–8) – GND (E5–1)	9 to 14 V



NG → **CHECK INJECTOR DRIVER POWER SOURCE CIRCUIT (BATTERY – EDU)**

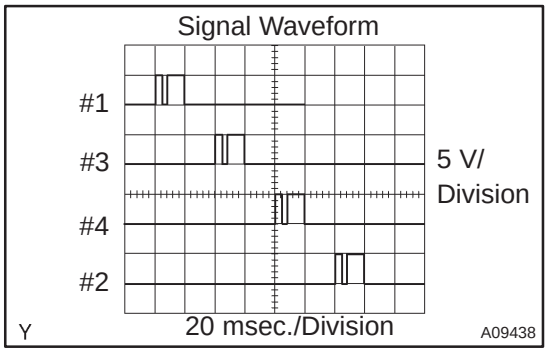
OK

7 INSPECT ECM(INJECTOR VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E12 and E13 ECM connectors.
Standard:

Symbols (Terminal No.)	Specified condition
#1 (E13–24) – E1 (E12–7)	Correct waveform is as shown
#2 (E13–23) – E1 (E12–7)	
#3 (E13–22) – E1 (E12–7)	
#4 (E13–21) – E1 (E12–7)	



NG → **REPLACE ECM(See page 10–65)**

OK

8 REPLACE INJECTOR DRIVER

GO

CHECK DTC OUTPUT RECUR (DTC P0200 OUTPUT AGAIN)

HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds, and then confirm P0200 is not set again.

DTC	P0234	TURBO/SUPER CHARGER OVERBOOST CONDITION

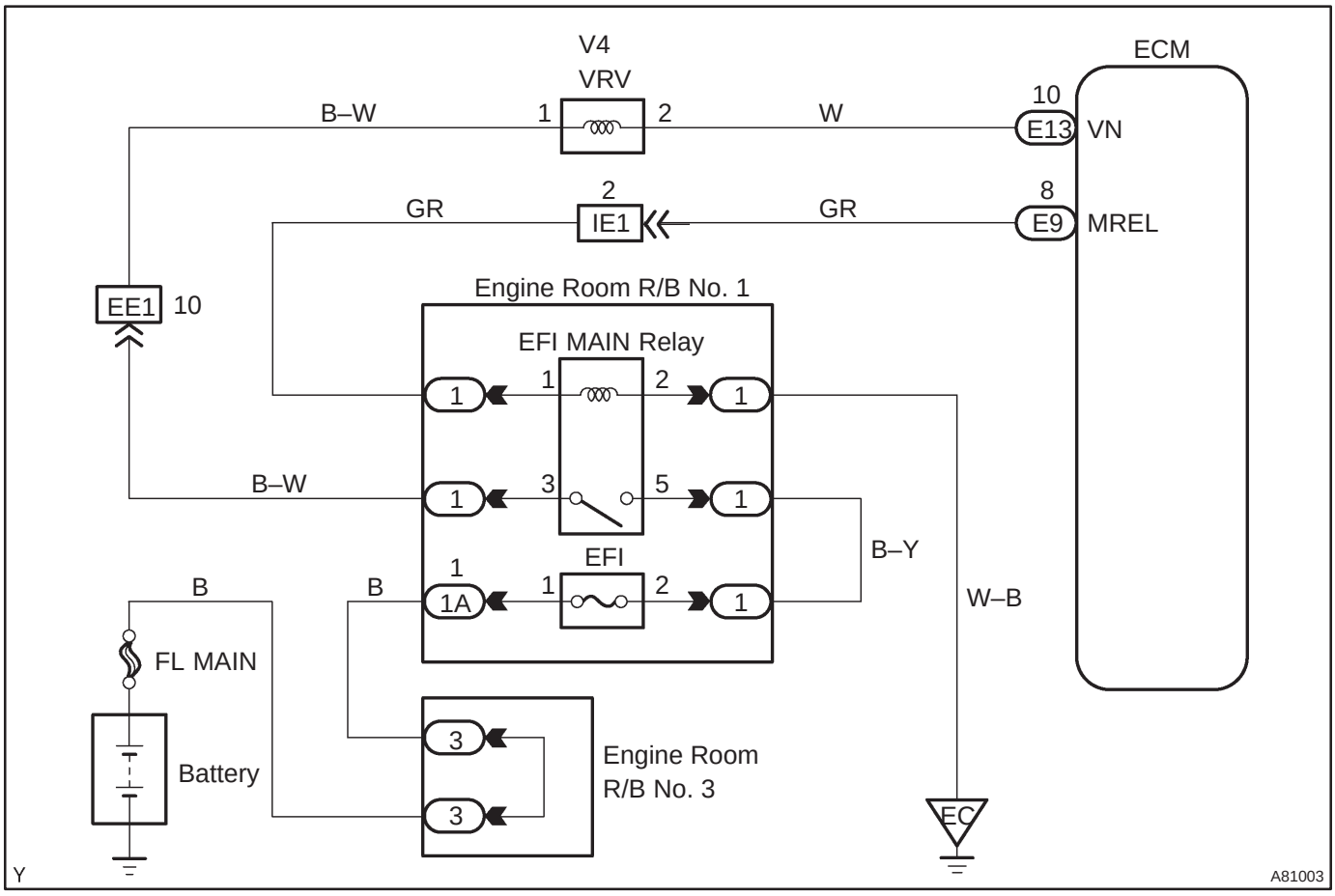
DTC	P0299	TURBO/SUPER CHARGER UNDERBOOST

DTC	P1251	TURBO/SUPER CHARGER OVERBOOST CONDITION (TOO HIGH)

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0234 P0299 P1251	When the condition that the turbocharger pressure exceeds the standard value for 0.5 sec. or more. (1 trip detection logic)	• VRV • Open or short in VRV circuit • Turbocharger • Vacuum hose • EGR valve • ECM
	Actual turbocharger pressure is deviated 20 kPa (0.2 kgf/cm^2, 2.9 psi) or more from the simulated target pressure based on the engine speed and fue injection volume for 60 seconds.	

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0234, P0299 AND/OR P1251)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
”P0234, P0299 and/or P1251” are output	A
”P0234, P0299 and/or P1251 and other DTCs are output	B

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

2	CHECK CONNECTION OF VACUUM HOSE

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

3	CHECK VACUUM HOSE(CHECK VACUUM BETWEEN TURBOCHARGER – VRV FOR INTAKE PRESURE CHANGE AT 900 RPM)

(a) Using a 3–way connector, connect a vacuum gauge to the hose between the E–VRV and turbocharger.

(b) Warm up the engine to above 80˚C (176˚F).

(c) Check the vacuum at 900 rpm.

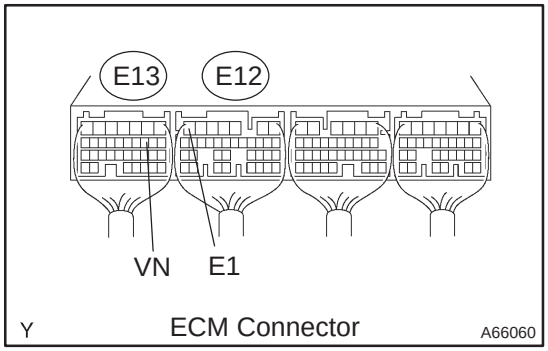
Result:

Proceed to	Vacuum
A	0 kPa (0 mmHg, 0 in.Hg) to 50 kPa (375 mmHg, 14.8 in.Hg)
B	Above 50 kPa (375 mmHg, 14.8 in.Hg)

B → **Go to step 8**

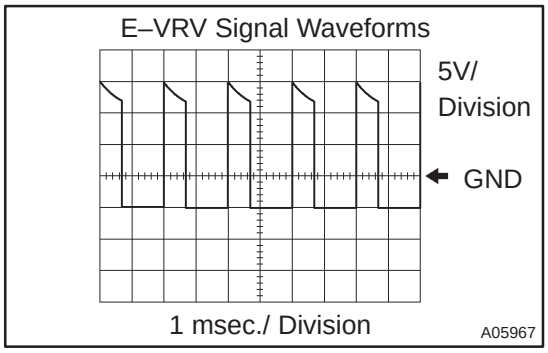
A

4 INSPECT ECM(VN VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E12 and E13 ECM connectors.
Standard:

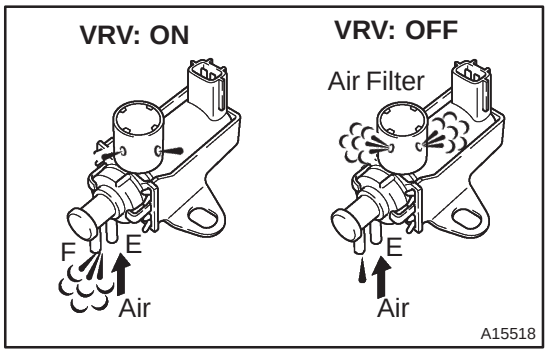
Symbols (Terminal No.)	Specified condition
VN (E13–10) – E1 (E12–7)	Correct waveform is as shown



NG → **REPLACE ECM (See page 10–65)**

OK

5 INSPECT VACUUM REGULATING VALVE ASSY(OPERATION)



(a) Disconnect the vacuum hoses from the VRV.
(b) Turn the ignition switch ON.
(c) Check for operation of the E–VRV when it is operated by the hand–held tester.
VRV ON:
Air from port E flows out through port F.
VRV OFF:
Air from port E flows out through air filter.

NG → **REPLACE VACUUM REGULATING VALVE ASSY**

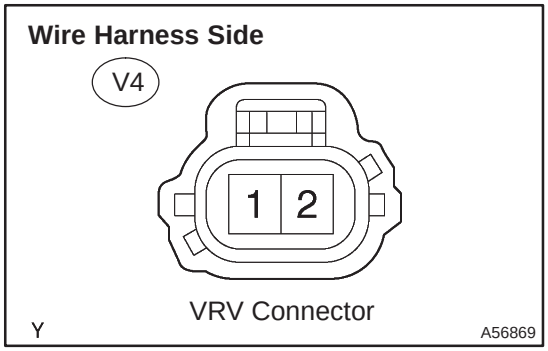
OK

6 INSPECT VACUUM REGULATING VALVE ASSY(RESISTANCE) (See page 12–16)

NG → **REPLACE VACUUM REGULATING VALVE ASSY**

OK

7	CHECK HARNESS AND CONNECTOR(VRV – ECM)



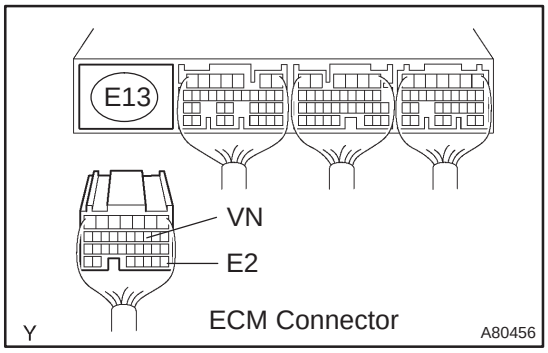
(a) Disconnect the V4 VRV connector.
(b) Disconnect the E13 ECM connector.
(c) Check the continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VN (E13–10) – (V4–2)	Continuity
E2 (E13–28) – (V4–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VN (E13–10) or (V4–2) – Body ground	No continuity
E2 (E13–28) or (V4–1) – Body ground	



NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

8	INSPECT TURBOCHARGER SUB–ASSY (See page 13–7)

NG → **REPLACE TURBOCHARGER SUB–ASSY (See page 13–11)**

OK

9	INSPECT EGR VALVE ASSY (See page 12–18)

NG → **REPLACE EGR VALVE ASSY (See page 14–286)**

OK

REPLACE ECM (See page 10–65)

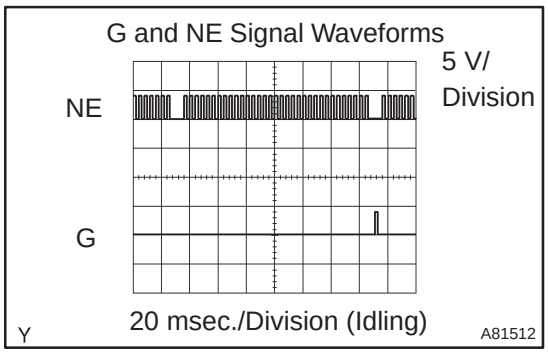
DTC	P0335	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT

DTC	P0339	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT INTERMITTENT

CIRCUIT DESCRIPTION

Crankshaft position sensor (NE signal) consists of a magnet, iron core and pickup coil.
The NE signal plate has 34 teeth and is installed the crankshaft timing pulley. The NE signal sensor generates 34 signals of every engine revolution. The ECM detects the standard crankshaft angle based on the G signal, and the actual crankshaft angle and the engine speed by the NE signal.

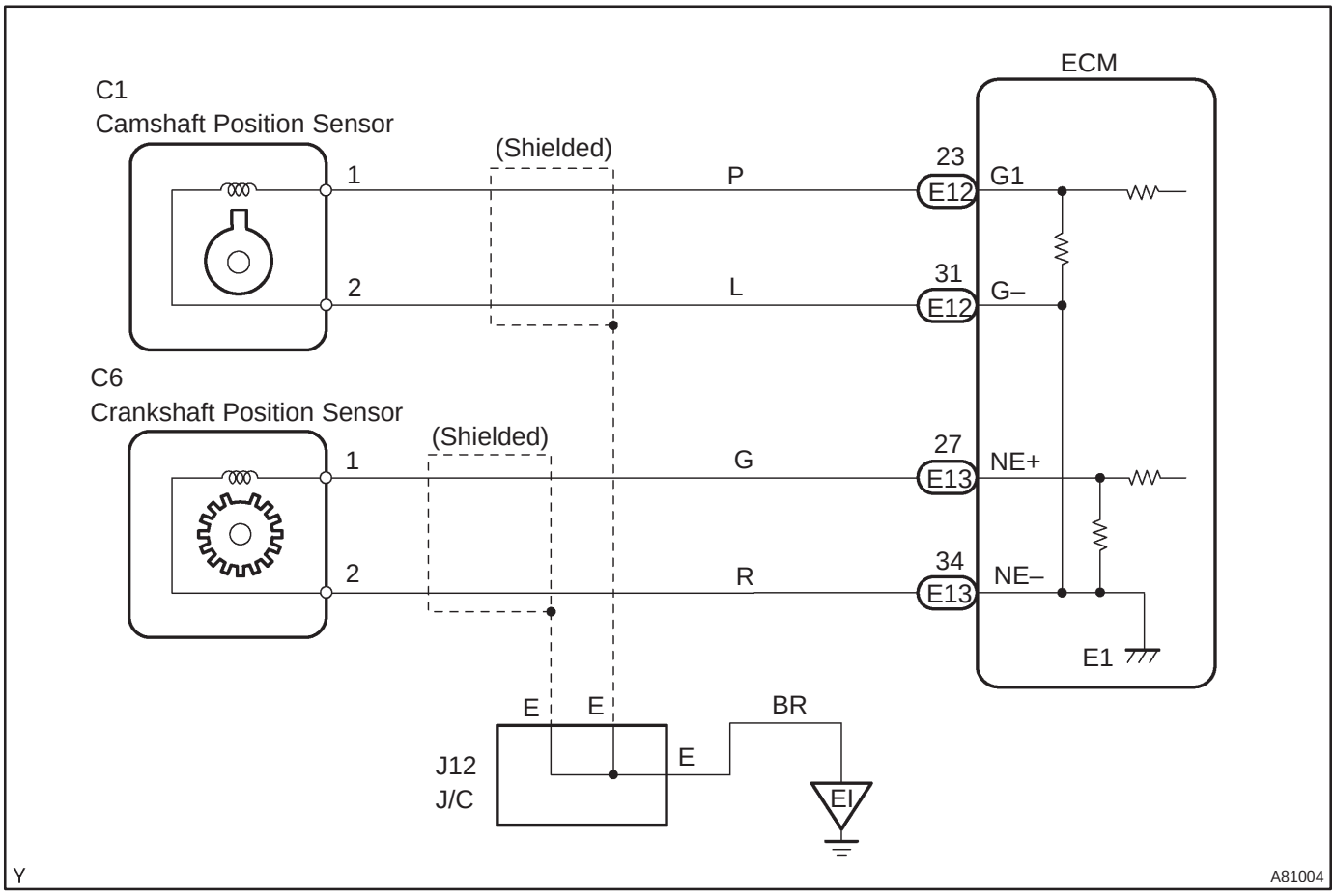
DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft timing pulley) • ECM
	No crankshaft position sensor signal to ECM with engine speed 650 rpm or more (2 trip detection logic)	
P0339	In conditions (a), (b) and (c), when no crankshaft position sensor (NE) signal is input for 0.05 sec. or more. (1 trip detection logic) (a) Engine revolution 1,000 rpm or more (b) STA signal is OFF (c) 3 sec. or more has lapsed after STA signal is switched from ON to OFF.	



Reference: Inspection using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Symbols (Terminal No.)	Specified condition
NE+ (E13–27) – NE– (E13–34)	Correct waveform is as shown

WIRING DIAGRAM

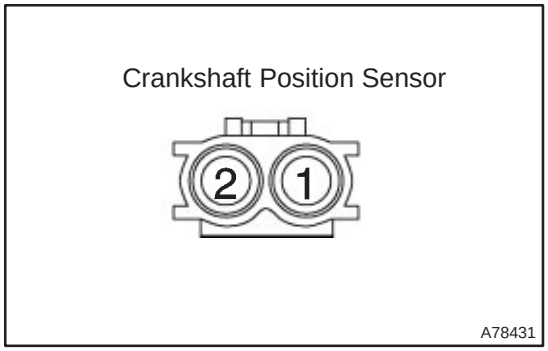


INSPECTION PROCEDURE

HINT:

- Perform troubleshooting of DTC P0335 first. If no trouble is found, troubleshoot the engine mechanical systems.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 INSPECT CRANKSHAFT POSITION SENSOR(RESISTANCE)



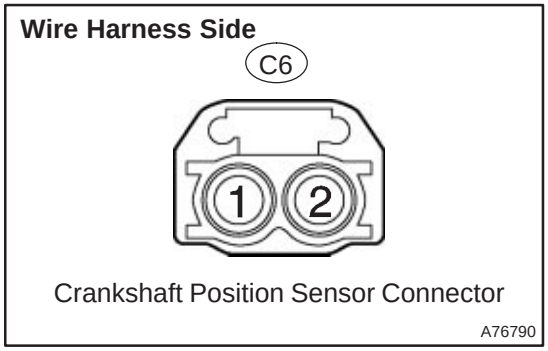
(a) Measure the resistance between terminals 1 and 2.
Resistance:
1,630 to 2,740 Ω at cold
2,065 to 3,225 Ω at hot

NOTICE:
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50 °C (122 °F) and "Hot" is from 50 °C (122 °F) to 100 °C (212 °F).

NG → **REPLACE CRANKSHAFT POSITION SENSOR (See page 10–64)**

OK

2 CHECK HARNESS AND CONNECTOR(CRANKSHAFT POSITION SENSOR – ECM)



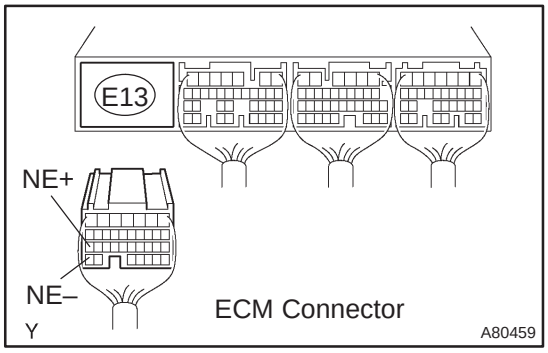
(a) Disconnect the C6 crankshaft position sensor connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Crankshaft position sensor (C6–1) – NE+ (E13–27)	Continuity
Crankshaft position sensor (C6–2) – NE– (E13–34)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Crankshaft position sensor (C6–1) or NE+ (E13–27) – Body ground	No continuity
Crankshaft position sensor (C6–2) or NE– (E13–34) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)

NG → **TIGHTEN SENSOR**

OK

4	CHECK CRANKSHAFT POSITION SENSOR PLATE(TEETH OF SENSOR PLATE(CRANKSHAFT TIMING PULLEY))

(a) Check the teeth of the sensor plate.

NG → REPLACE CRANKSHAFT POSITION SENSOR PLATE (CAMSHAFT TIMING PULLEY)

OK

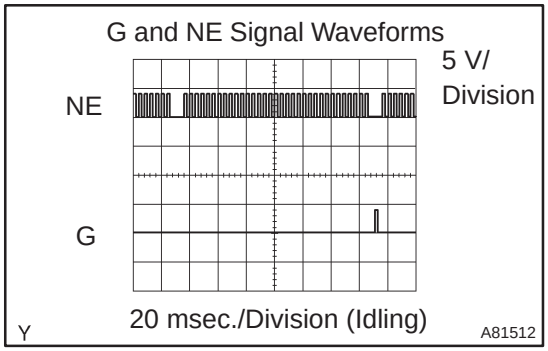
REPLACE ECM (See page 10–65)

DTC	P0340	CAMSHAFT POSITION SENSOR ”A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

Camshaft position sensor (G signal) consists of a magnet, iron core and pickup coil.
The G signal plate has one tooth on its outer circumference and is installed on the camshaft timing pulley. When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft timing pulley. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the standard crankshaft angle based on the G signal and the actual crankshaft angle and the engine speed by the NE signal.

DTC No.	DTC Detection Condition	Trouble Area
P0340	• No camshaft position sensor signal to ECM during cranking (2 trip detection logic) • No camshaft position sensor signal to ECM with engine speed 650 rpm or more (1 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • ECM



Reference: Inspection using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Symbols (Terminal No.)	Specified condition
G1 (E12–23) – G– (E12–31)	Correct waveform is as shown

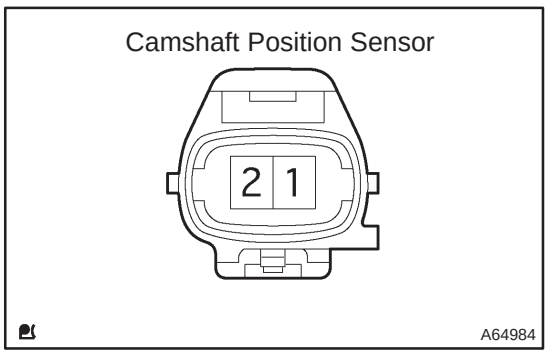
WIRING DIAGRAM

Refer to DTC P0335 on page 05–616.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	INSPECT CAMSHAFT POSITION SENSOR



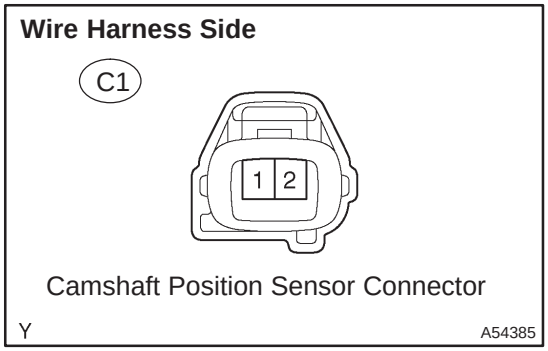
(a) Measure the resistance between terminals 1 and 2.
Resistance:
1,630 to 2,740 Ω at cold
2,065 to 3,225 Ω at hot

NOTICE:
”Cold” and ”Hot” shown above mean the temperature of the coils themselves. ”Cold” is from –10°C (14°F) to 50 °C (122 °F) and ”Hot” is from 50 °C (122 °F) to 100 °C (212 °F).

NG → **REPLACE CAMSHAFT POSITION SENSOR (See page 10–63)**

OK

2 CHECK HARNESS AND CONNECTOR(CAMSHAFT POSITION SENSOR – ECM)



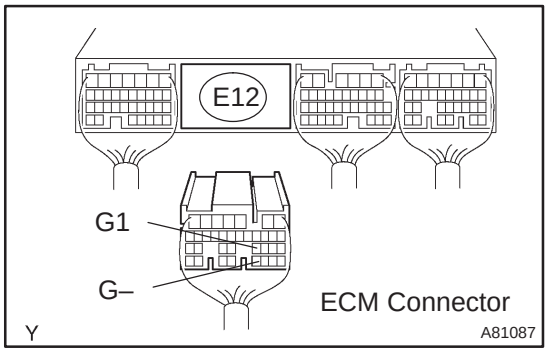
(a) Disconnect the C1 camshaft position sensor connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Camshaft position sensor (C1–1) – G1 (E12–23)	Continuity
Camshaft position sensor (C1–2) – G– (E12–31)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Camshaft position sensor (C1–1) or G1 (E12–23) – Body ground	No continuity
Camshaft position sensor (C1–2) or G– (E12–31) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CAMSHAFT POSITION SENSOR)

NG → **TIGHTEN SENSOR**

OK

4 CHECK CAMSHAFT TIMING PULLEY(TEETH OF PLATE)

(a) Check the teeth of the signal plate.

NG → **REPLACE CAMSHAFT TIMING PULLEY**

OK

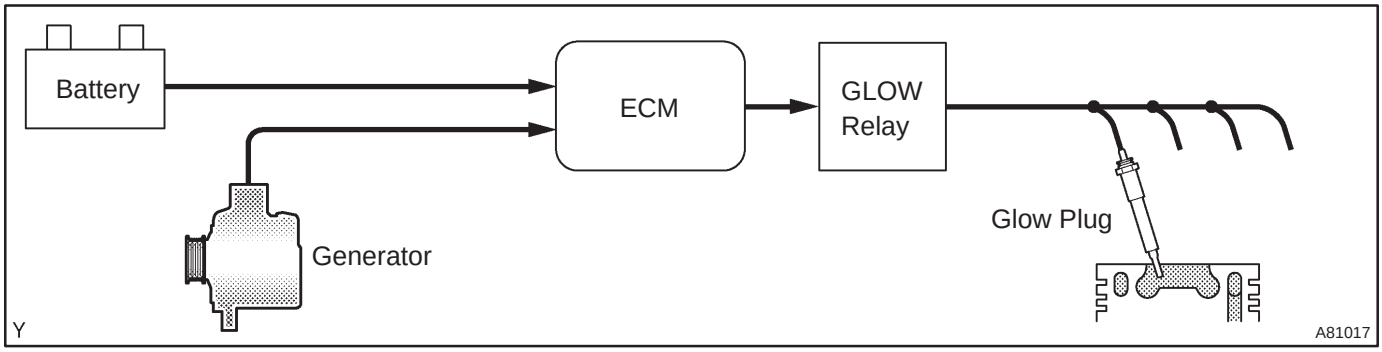
REPLACE ECM (See page 10–65)

DTC	P0380	GLOW PLUG/HEATER CIRCUIT ”A”

CIRCUIT DESCRIPTION

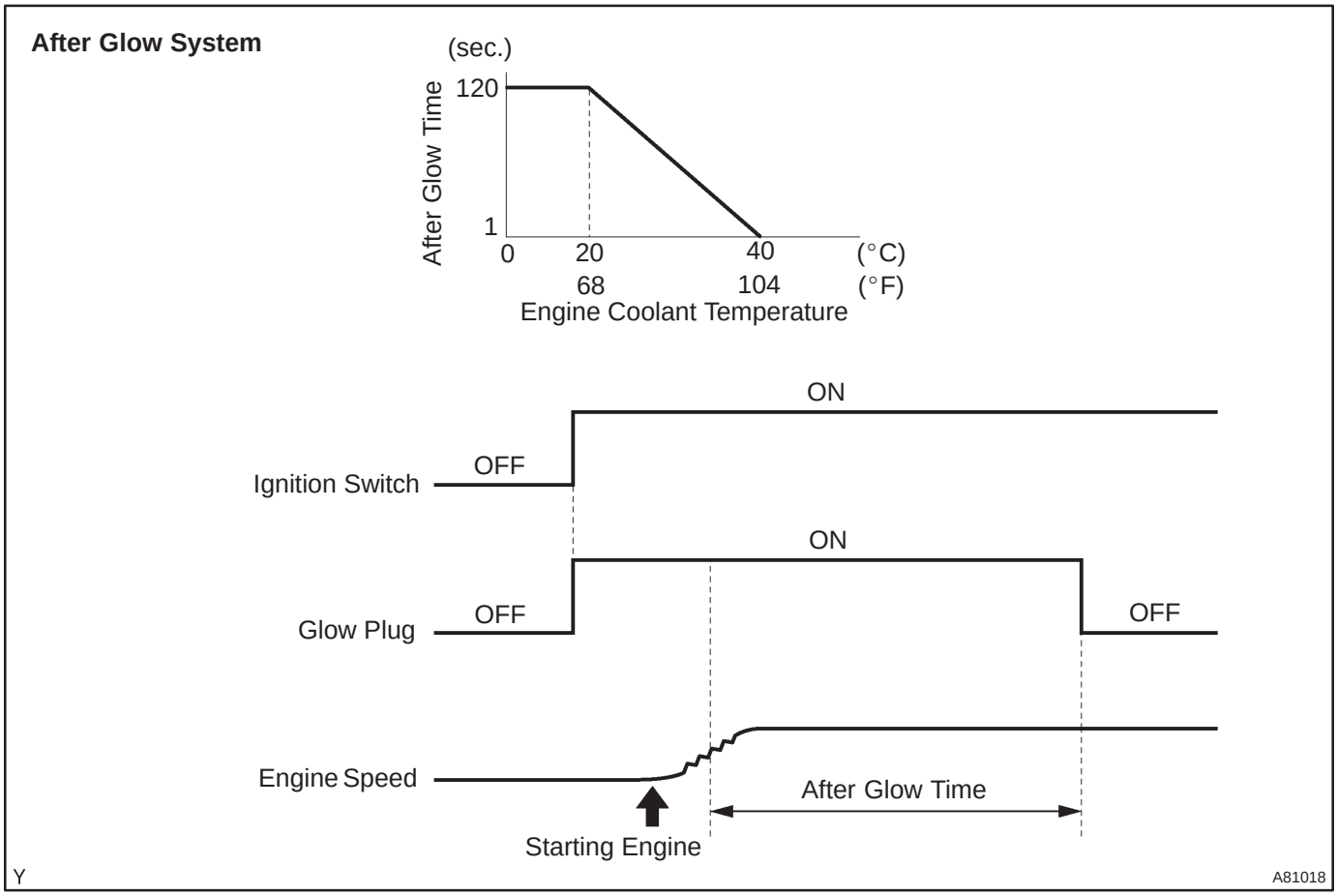
The glow plug is mounted inside the engine combustion room. To ensure efficient engine starting with a cold engine, the ECM calculates time the current needs to flow into the glow plug depending on the engine coolant temperature after the ignition switch is turned ON. The ECM then turns on the glow relay and permits the current to flow into the glow plug. The glow plug is then heated and enhances fuel combustion with the cold engine.

This DTC will be set if there is open in glow plug itself or its circuit.



The ECM performs the after glow for a certain period of time depending on the engine coolant temperature after the engine has been started. After glow reduces a diesel engine knocking, a white smoke, and etc with a cold engine.

After Glow System



DTC No.	DTC Detection Condition	Trouble Area
P0380	When the glow plug is turned from ON to OFF, or vice–versa, conditions (a) and (b) are satisfied: (a) Battery voltage dos not change (b) Duty signal from terminal M of the generator does not change	• Open or short in glow plug circuit • Glow fuse • Glow relay • Glow plug • ECM

MONITOR DESCRIPTION

When starting a cold engine, the ECM supplies the current to the glow plug for a certain period of time. As the supplying current to the glow plug is terminated, the large current is suddenly cut off, therefore the battery voltage then varies and also terminal M output (duty ratio) of the generator varies. If these variations are not occurred when the glow plug is turned from ON to OFF, or vice–versa, the ECM realizes that the current has not been supplied to the glow plug, and interprets this as open malfunction of the glow plug or glow plug circuit.

MONITOR STRATEGY

Required sensors	Glow plug circuit
Frequency of operation	Twice per driving cycle
Duration	3 min.
CHK ENG operation	2 driving cycles

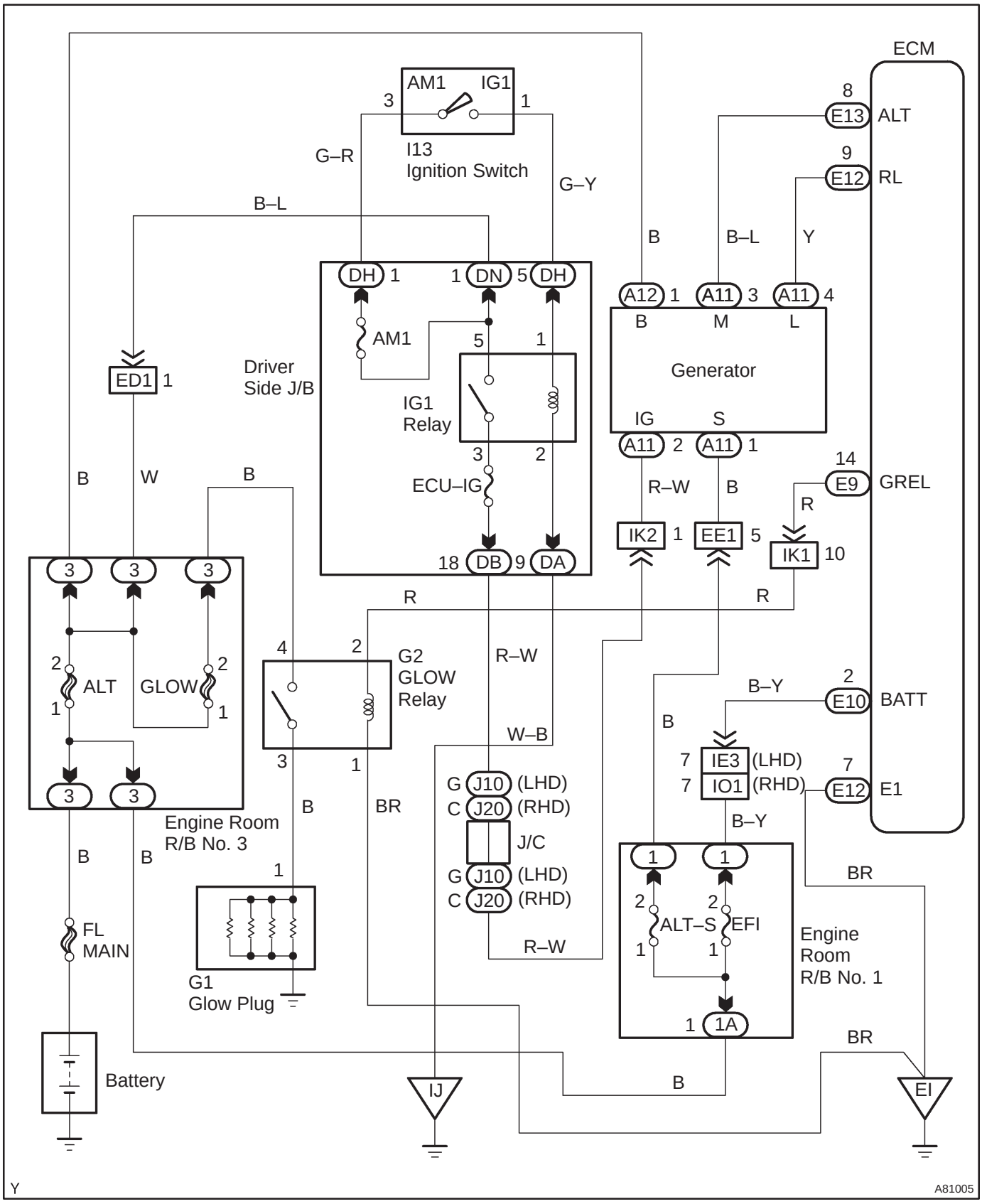
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Battery voltage	11 V	–
Engine speed	700 rpm	2,000 rpm
Engine coolant temperature	–	40°C (104°F)
Engine speed is stable	–	
Time after engine start	8 sec.	–
Any switches that vary electrical load have not been being operated	–	
The monitor will not run if the generator circuit is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

Threshold
When the battery voltage, or terminal M output (duty ratio) of the generator does not change, despite turning the glow plug from ON to OFF, or vice–versa

WIRING DIAGRAM

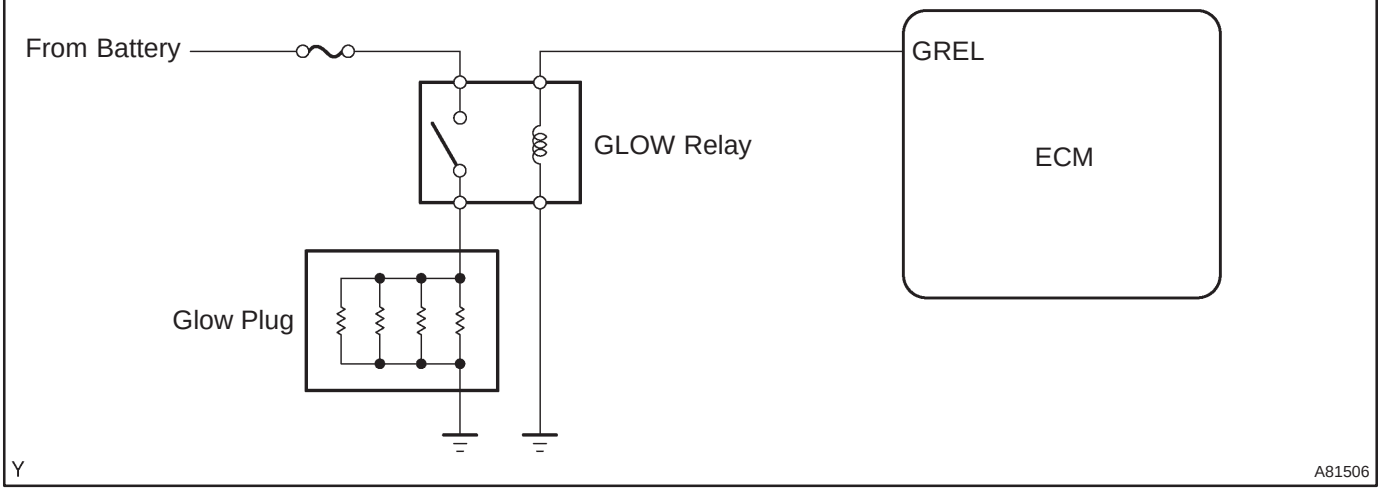


INSPECTION PROCEDURE

HINT:

- After completing repair, confirm P0380 is not set again.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

Glow System Wiring Diagram



1	CHECK OTHER DTC OUTPUT(BESIDS DTC P0380)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.

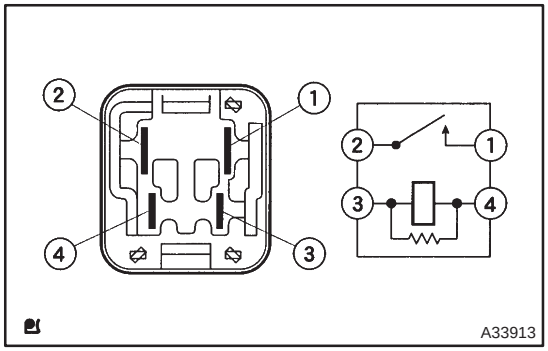
Result:

Display (DTC output)	Proceed to
Only P0380 are output	A
P0380 and P0622 are output	B

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

2 CHECK GLOW PLUG RELAY ASSY



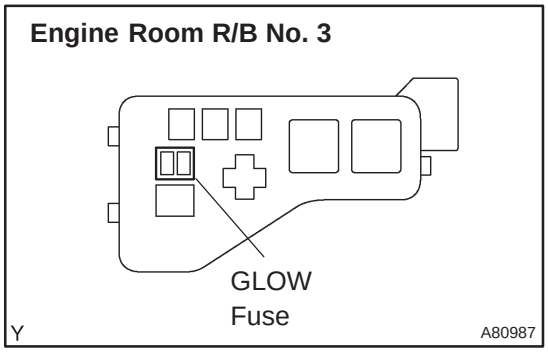
(a) Check the glow plug relay for continuity.
(1) Check that there is continuity between and terminal.
Specified condition:

Between terminal	Specified condition
1 – 2	No continuity
	Continuity (Apply battery voltage terminals 3 and 4)
3 – 4	Continuity

NG → **REPLACE GLOW PLUG RELAY ASSY**

OK

3 CHECK FUSE(GLOW FUSE)

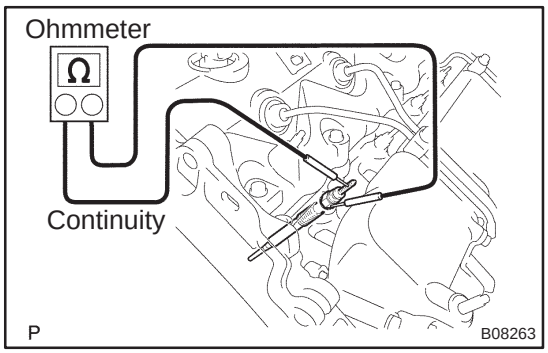


(a) Remove the GLOW fuse from the engine room R/B No. 3.
(b) Check for continuity in the GLOW fuse.
Result: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

4 INSPECT GLOW PLUG ASSY



(a) Check the glow plug for resistance.
(1) Check that there is resistance between the glow plug terminal and ground.
Standard resistance: Approx. 1.1 Ω at 20°C (68°F)

NOTICE:

- **Be careful not to damage the glow plug pipes as it could cause an open circuit or shorten life of the glow plugs.**
- **Avoid getting oil and fuel on the glow plug when cleaning.**
- **During inspection, be sure to wipe off any oil of the terminal and bakelite washer with a dry cloth.**
- **Do not apply more than 11 V to the glow plug as it could cause an open circuit.**

NG → **REPLACE GLOW PLUG ASSY** **(See page 19–33)**

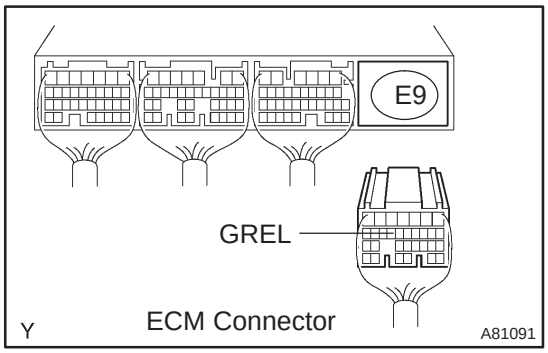
OK

5	INSPECT GLOW PLUG ASSY(INSTALLATION)

NG → TIGHTEN GLOW PLUG

OK

6	CHECK HARNESS AND CONNECTOR(GLOW PLUG RELAY – ECM, AND GLOW PLUG RELAY – BODY GROUND)



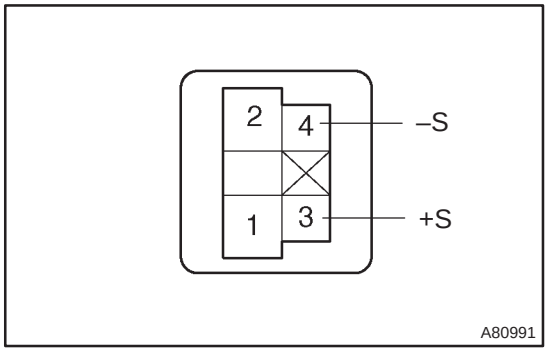
(a) Disconnect the E9 ECM connector.
(b) Remove the glow plug relay.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+S (Glow plug relay terminal 3) – GREL (E9–14)	Continuity
–S (Glow plug relay terminal 4) – Body ground	

Standard (Check for short):

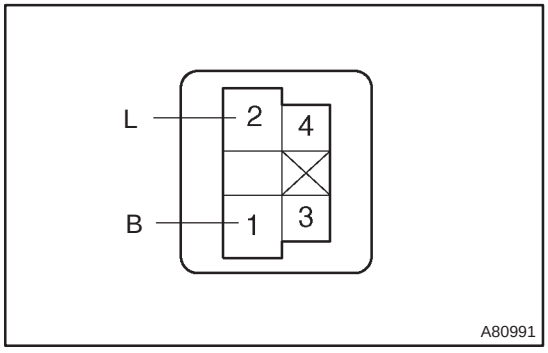
Symbols (Terminal No.)	Specified condition
GREL (E9–14) – Body ground	No Continuity



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	CHECK HARNESS AND CONNECTOR(GLOW PLUG RELAY – GLOW PLUG, AND GLOW PLUG RELAY – BATTERY)



(a) Remove the glow plug relay.
(b) Disconnect the glow plug wire.
(c) Check for continuity between the wire harness.

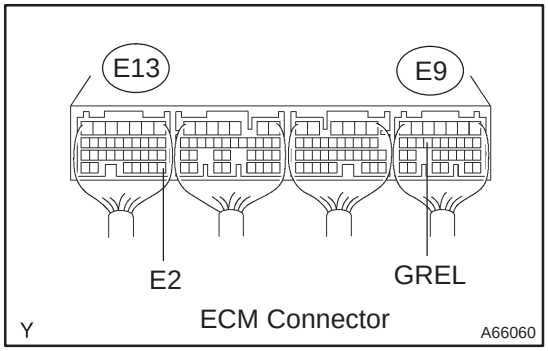
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
L (Glow plug relay terminal 2) – Glow plug wire	Continuity
B (Glow plug relay terminal 1) – Positive terminal of the battery	

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8 INSPECT ECM(GREL VOLTAGE)



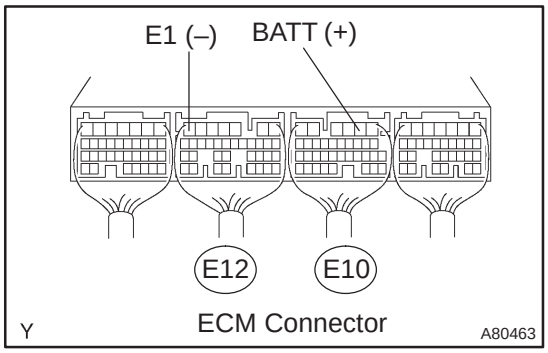
(a) Turn the ignition switch START.
(b) Measure the voltage between the specified terminals of the E9 and E13 ECM connectors.
Voltage:

Symbols (Terminal No.)	Condition	Specified Condition
GREL (E9–14) – E2 (E13–28)	Engine coolant temp. is 40°C (104°F) or less	9 to 14 V

NG → **REPLACE ECM (See page 10–65)**

OK

9 INSPECT ECM(BATT VOLTAGE)



(a) Measure the voltage between the specified terminals of the E10 and E12 ECM connectors.
Standard:

Symbols (Terminal No.)	Specified Condition
BATT (E10–2) – E1 (E12–7)	9 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (BATTERY – ECM)**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)

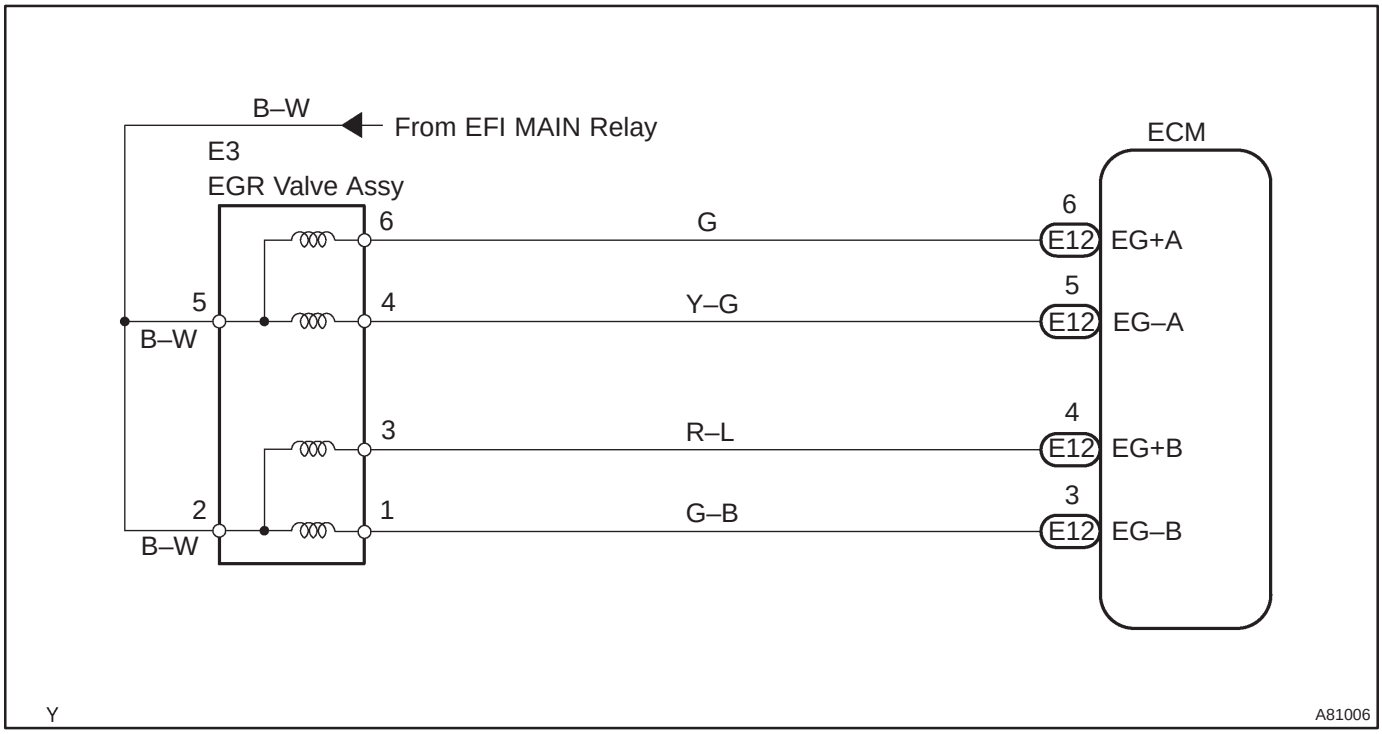
DTC	P0400	EXHAUST GAS RECIRCULATION FLOW

DTC	P0403	EXHAUST GAS RECIRCULATION CONTROL CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0400	Mass air flow rate is not changed when turning on EGR valve	• EGR valve assy • Open or short in EGR circuit • EGR passage • ECM
P0403	EGR valve assy motor malfunction	

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES P0400 AND/OR P0403)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed
P0400 and/or P0403 are output	A
P0400 and/or P0403 and other DTCs are output	B

HINT:

If any other codes besides P0400 and/or P0403 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

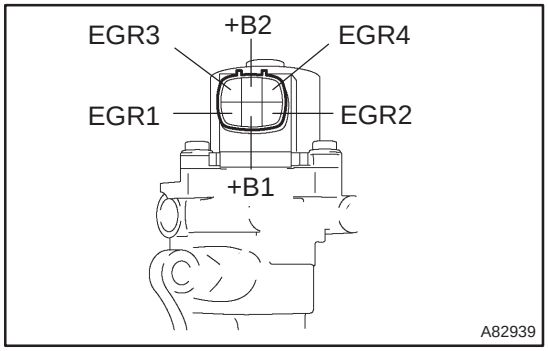
2	READ VALUE OF HAND–HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Warm up the engine, the engine coolant temperature should be above 75°C (167°F) and bellow 90°C (194°F).
(e) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF”.
(f) Check that the MAF reading during idling.
Result: MAF greater than 4 g/s but less than 16 g/s
(g) Force the EGR valve to operate with a hand–held tester, make the valve opening 0, and check that the AFM reading during idling.
Result: MAF greater than 10 g/s but less than 16 g/s

NG → **REPLACE EGR VALVE ASSY (See page 14–286)**

OK

3	INSPECT EGR VALVE ASSY



(a) Check the EGR valve for resistance.
(1) Measure the resistance between the specified terminals.

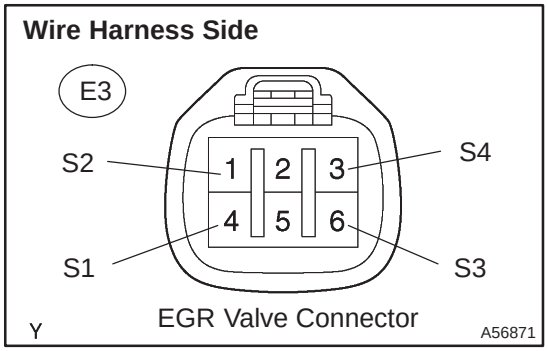
Resistance:

Terminal No.	Specified condition
+B1 – EGR1	19.6 ± 1.4 Ω
+B1 – EGR2	19.6 ± 1.4 Ω
+B2 – EGR3	19.6 ± 1.4 Ω
+B2 – EGR4	19.6 ± 1.4 Ω

NG → **REPLACE EGR VALVE ASSY (See page 14–286)**

OK

4 CHECK HARNESS AND CONNECTOR(EGR VALVE ASSY – ECM)



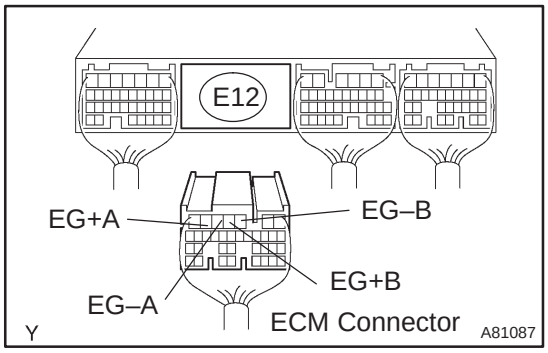
(a) Disconnect the E2 EGR valve connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EG+A (E12–6) – S3 (E3–6)	Continuity
EG–A (E12–5) – S1 (E3–4)	
EG+B (E12–4) – S4 (E3–3)	
EG–B (E12–3) – S2 (E3–1)	

Standard (Check for short):

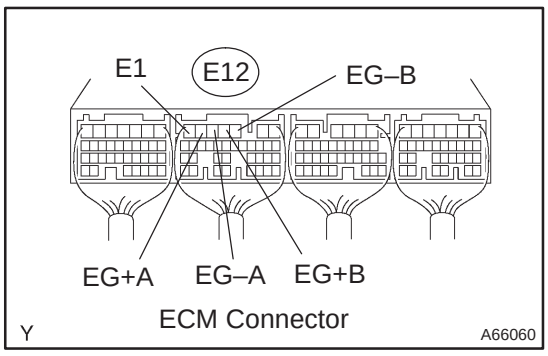
Symbols (Terminal No.)	Specified condition
EG+A (E12–6) or S3 (E3–6) – Body ground	No continuity
EG–A (E12–5) or S1 (E3–4) – Body ground	
EG+B (E12–4) or S4 (E3–3) – Body ground	
EG–B (E12–3) or S2 (E3–1) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

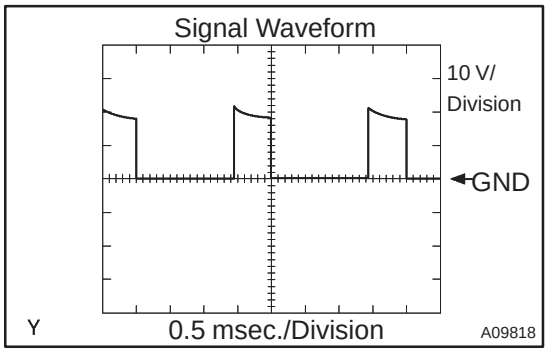
5 INSPECT ECM(EGR VALVE ASSY VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E12 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
EG+A (E12–6) – E1 (E12–7)	Correct waveform is as shown
EG–A (E12–5) – E1 (E12–7)	
EG+B (E12–4) – E1 (E12–7)	
EG–B (E12–3) – E1 (E12–7)	



NG → **REPLACE ECM (See page 10–65)**

OK

6	CHECK DEPOSIT(EGR VALVE ASSY)

NG → REMOVE FOREIGN OBJECT AND CLEAN EGR VALVE

OK

7	CHECK DEPOSIT(EGR PASSAGE)

NG → REPAIR OR REPLACE

OK

8	CHECK FOR EXHAUST GAS LEAKS

NG → REPAIR EXHAUST GAS LEAKAGE POINT

OK

REPLACE ECM (See page 10–65)

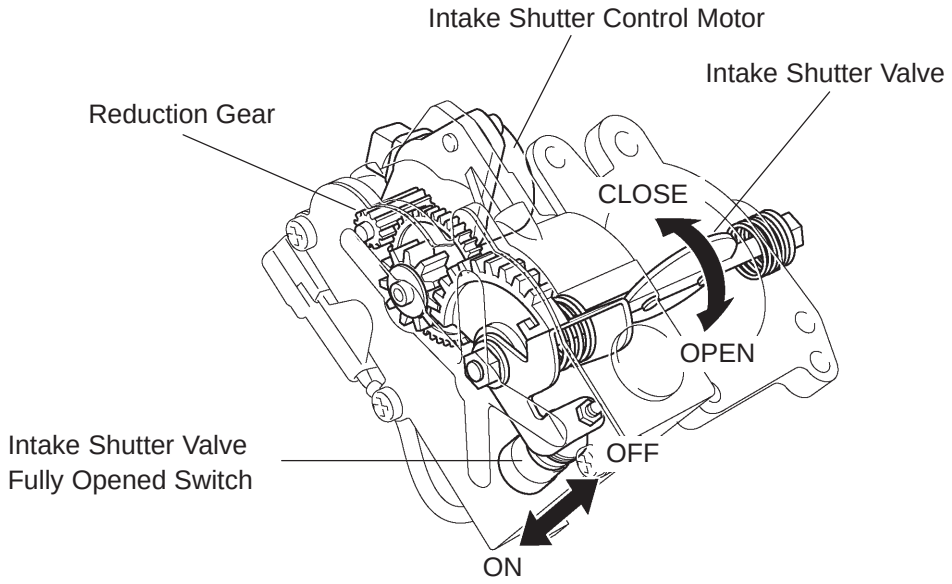
DTC	P0488	EXHAUST GAS RECIRCULATION THROTTLE POSITION CONTROL RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The ECM opens and closes the intake shutter valve using the step motor. Upon opening and closing the valve, the exhaust gas recirculation volume is properly controlled. Also, the engine vibration and noise will be reduced by closing the valve when the engine is stopped.

The ECM detects fully opened of the intake shutter valve with the intake shutter valve fully opened switch

Intake Shutter Internal Structure



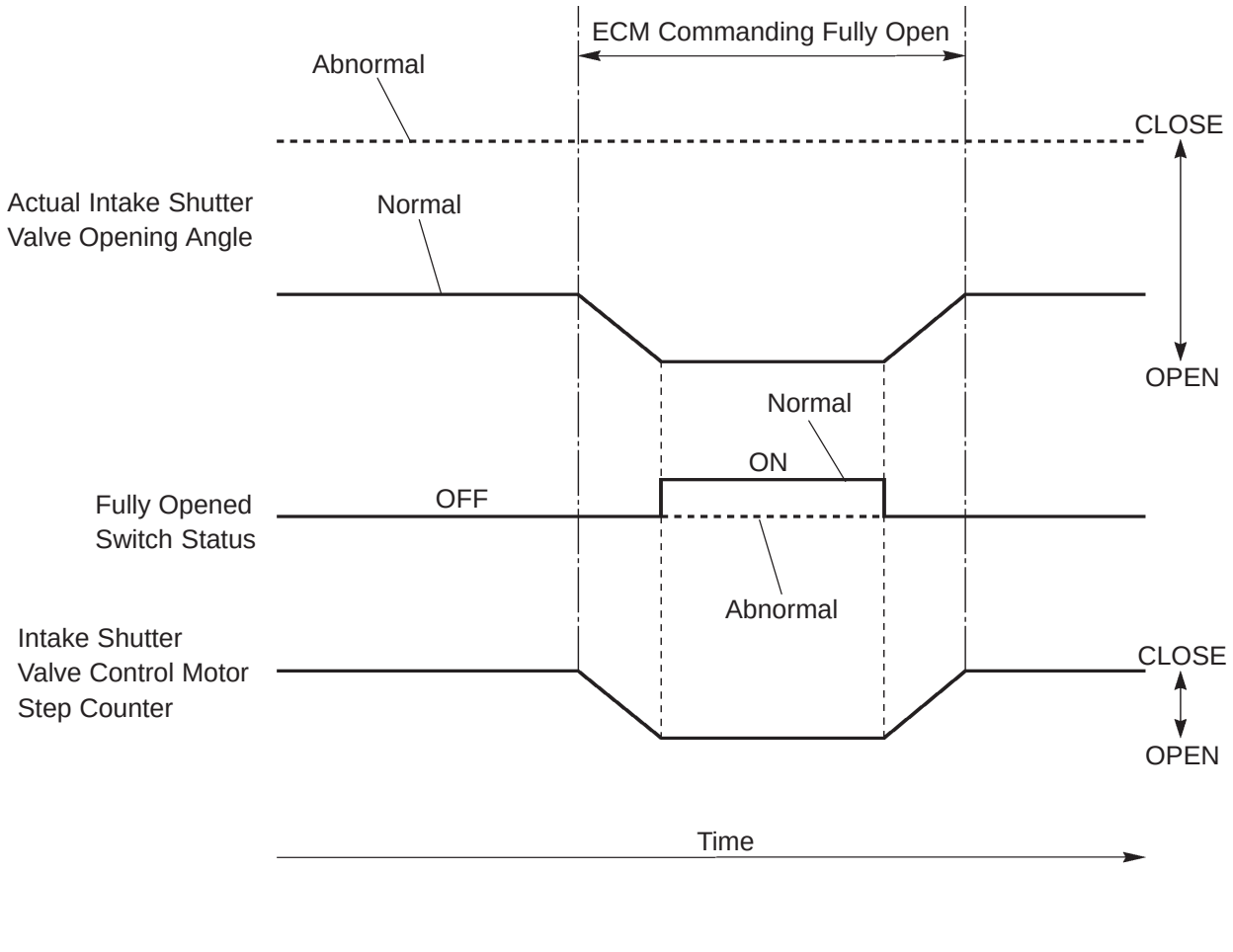
A81482

DTC No.	DTC Detection Condition	Trouble Area
P0488	Intake shutter valve fully opened switch is not turned on, despite forcing the intake shutter valve to fully open.	• Open or short in intake shutter circuit • Open or short in fully opened switch circuit • Intake shutter • ECM

MONITOR DESCRIPTION

This DTC will be set if the actual opening angle of the intake shutter valve varies from the target opening angle. The ECM forces the valve to fully open within 2 to 3 seconds as the ignition switch is turned ON, and then checks if the intake shutter valve fully opened switch is turned on. In addition, the ECM also forces the valve to fully open when accelerating the engine (high engine load) and checks if the switch is turned ON. When starting and/or accelerating the engine, the ECM sets this DTC if the switch is not turned on.
If the DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

Malfunction Detection



MONITOR STRATEGY

Required sensors	Intake shutter valve fully opened switch
Frequency of operation	Continuous
Duration	3 sec.
CHK ENG operation	1 driving cycle

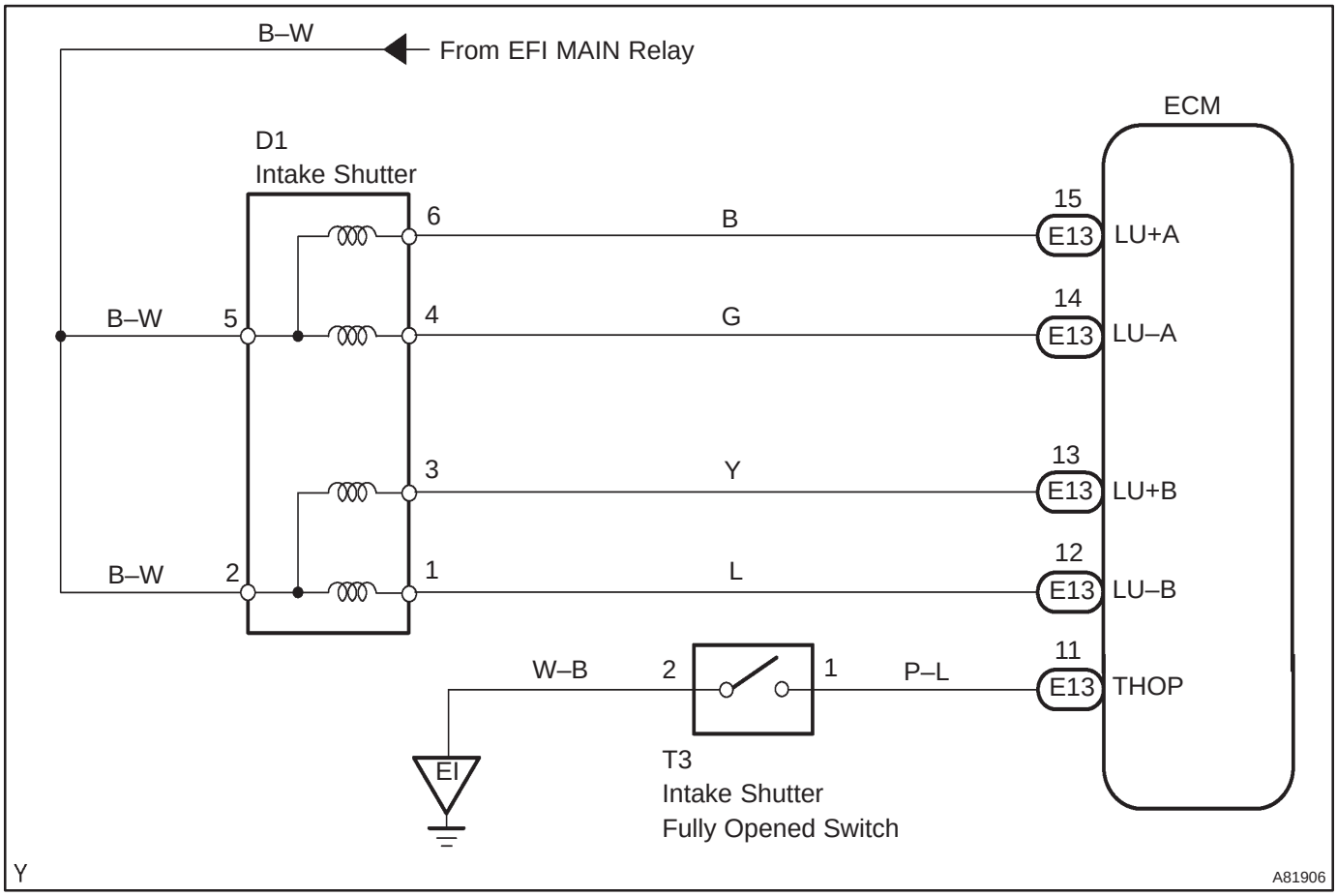
TYPICAL ENABLING CONDITIONS

Specification
Start the engine and let it idle for 30 seconds and accelerate the vehicle speed to 60 km/h (37 mph) with the accelerator pedal opened more than the half angle

TYPICAL MALFUNCTION THRESHOLDS

Threshold
Intake shutter valve fully opened switch is not turned ON, despite the ECM commanding the intake shutter valve to open fully

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK INTAKE SHUTTER ASSY

(a) Visually check that the intake shutter valve moves within approximately 2 to 3 seconds after the ignition switch is turned ON.

Intake shutter	Proceed to
Does not move	A
Smoothly move to full–open position	B

B → **Go to step 6**

A

2 CHECK INTAKE SHUTTER ASSY

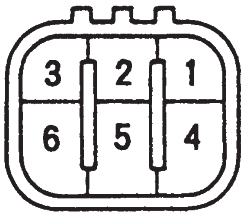
(a) Check if the intake shutter valve moves as the lever is rotated by hand.

Intake shutter	Proceed to
Smoothly moved	A
Difficult to move smoothly	B

B → **REPLACE INTAKE SHUTTER ASSY (See page 10–61)**

A

3 INSPECT INTAKE SHUTTER ASSY



Intake Shutter Assy
A31135

(a) Check the intake shutter for resistance.
(1) Measure the resistance between the terminals.

RHD Resistance:

Terminals	Temperature	Resistance
1 – 2	at 20°C (68°F)	18 to 22 Ω
1 – 3		
4 – 5		
4 – 6		

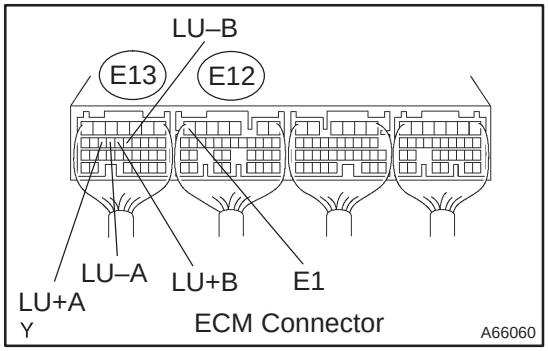
LHD Resistance:

Terminals	Temperature	Resistance
1 – 3	at 20°C (68°F)	18 to 22 Ω
2 – 3		
4 – 6		
5 – 6		

NG → **REPLACE INTAKE SHUTTER ASSY (See page 10–61)**

OK

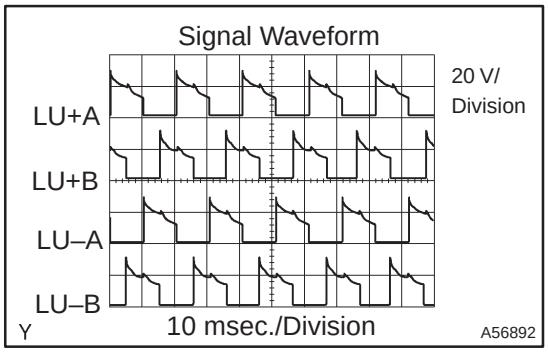
4 INSPECT ECM(LU VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E12 and E13 ECM connectors.

Standard:

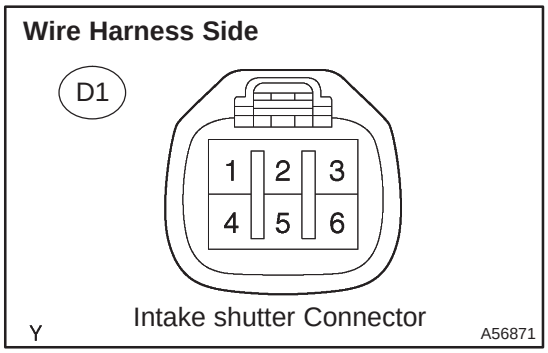
Symbols (Terminal No.)	Specified condition
LU+A (E13–15) – E1 (E12–7)	Correct waveform is as shown
LU–A (E13–14) – E1 (E12–7)	
LU+B (E13–13) – E1 (E12–7)	
LU–B (E13–12) – E1 (E12–7)	



NG → **REPLACE ECM (See page 10–65)**

OK

5 CHECK HARNESS AND CONNECTOR(INTAKE SHUTTER ASSY – ECM)



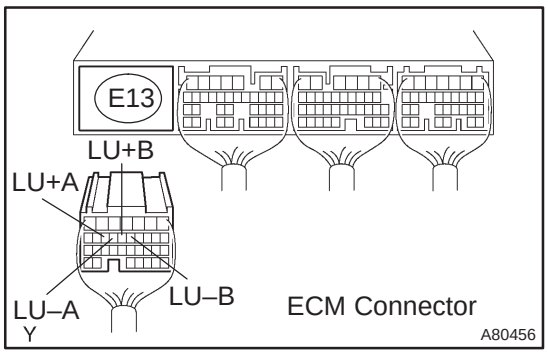
(a) Disconnect the D1 intake shutter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
LU+A (E13–15) – Intake shutter (D1–6)	Continuity
LU–A (E13–14) – Intake shutter (D1–4)	
LU+B (E13–13) – Intake shutter (D1–3)	
LU–B (E13–12) – Intake shutter (D1–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
LU+A (E13–15) or Intake shutter (D1–6) – Body ground	No continuity
LU–A (E13–14) or Intake shutter (D1–4) – Body ground	
LU+B (E13–13) or Intake shutter (D1–3) – Body ground	
LU–B (E13–12) or Intake shutter (D1–1) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Fully open the intake shutter valve by hand.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / ACCEL OPEN SW” and read its value displayed on the hand–held tester.

Result:

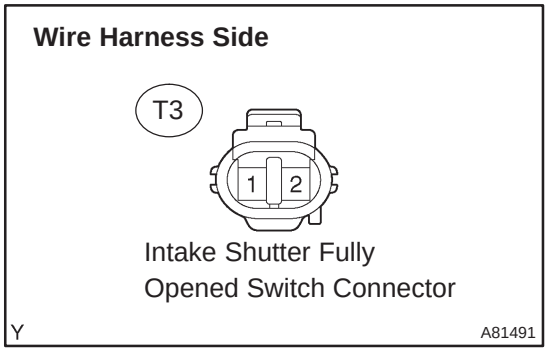
Switch Condition Displayed	Proceed to
OFF	A
ON	B

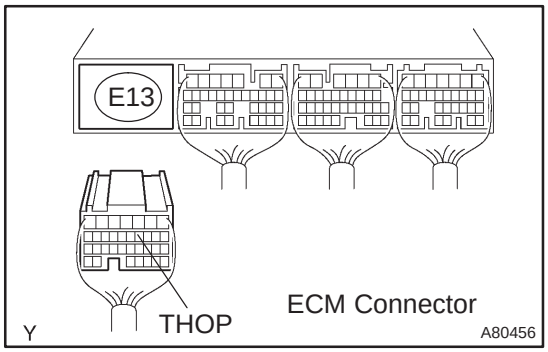
B → **CHECK DTC OUTPUT RECUR (DTC P0488 OUTPUT AGAIN)**

HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds and accelerate the vehicle speed to 60 km/h (37 mph) with the accelerator pedal opened more than the half angle, then confirm P0488 is not set again.

A

7 CHECK HARNESS AND CONNECTOR(FULLY OPENED SWITCH – ECM)





(a) Disconnect T3 the intake shutter fully opened switch connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
THOP (E13–11) – Intake shutter (T3–1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
THOP (E13–11) or Intake shutter (T3–1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK DTC OUTPUT RECUR (DTC P0488 OUTPUT AGAIN)

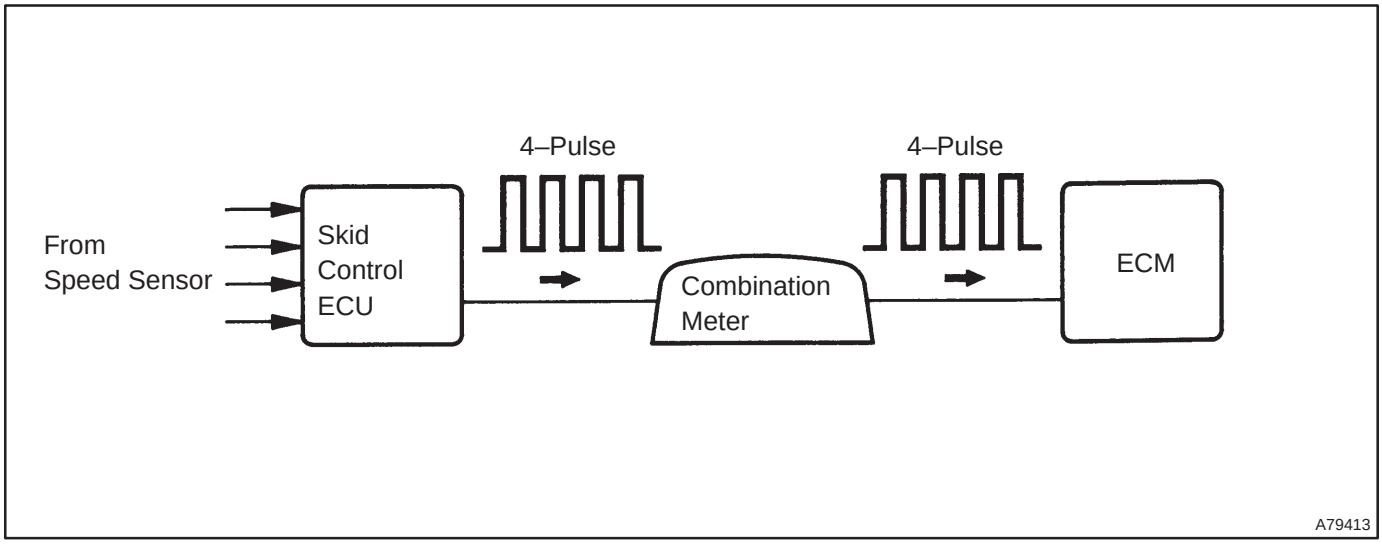
HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds and accelerate the vehicle speed to 60 km/h (37 mph) with the accelerator pedal opened more than the half angle, then confirm P0488 is not set again.

DTC	P0500	VEHICLE SPEED SENSOR ”A”

CIRCUIT DESCRIPTION

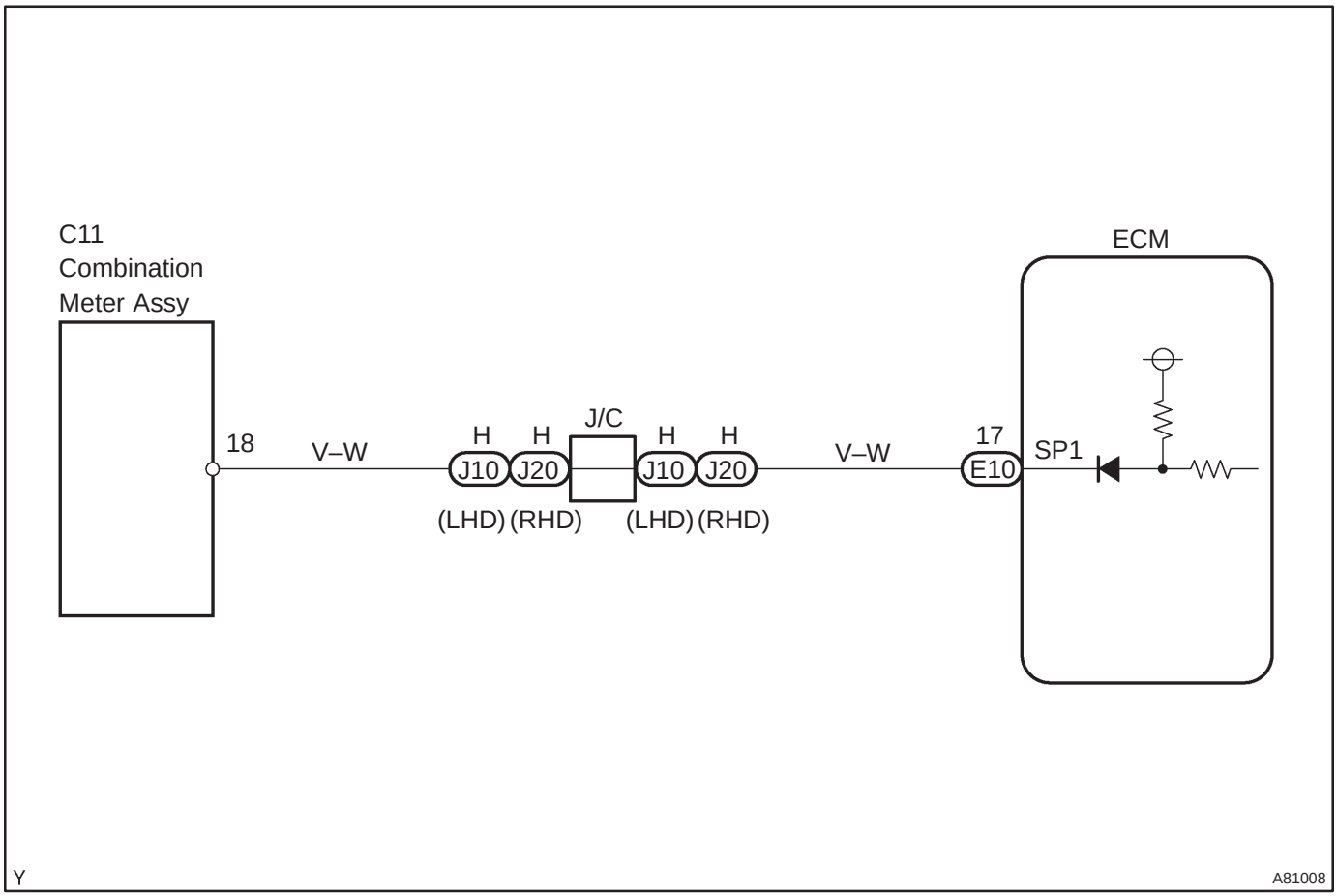
The speed sensor for skid control ECU detects the wheel speed and sends the appropriate signals to the skid control ECU.

The skid control ECU converts these signals into a 4–pulse signal and outputs it to the combination meter. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500	Conditions (a) and (b) continue for 7 sec. or more (2 trip detection logic): (a) THW less than 70°C (158°F) (b) Engine speed is greater than 2,000 rpm but less than 3,500 rpm	• Open or short in speed sensor circuit • Speed sensor • Combination meter • ECM • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OPERATION OF SPEEDOMETER

(a) Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

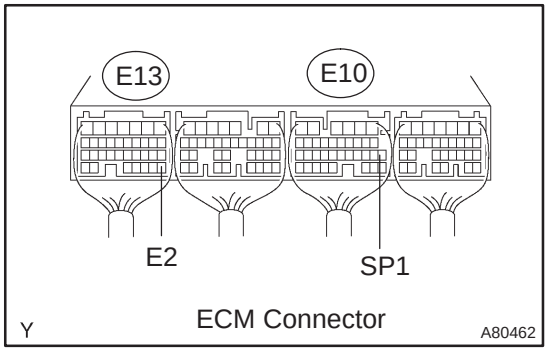
HINT:

The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **CHECK SPEEDOMETER CIRCUIT** (See page 05–1510)

OK

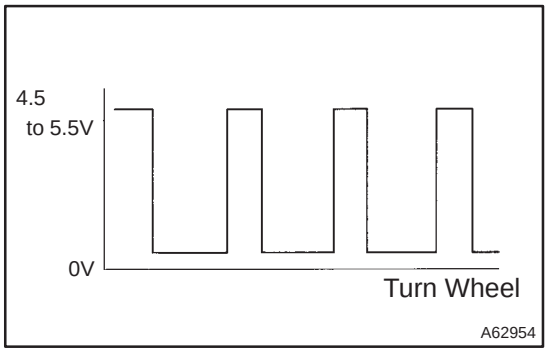
2 INSPECT ECM(SP1 VOLTAGE)



(a) Shift the transmission to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch ON.
(d) Measure the voltage between the specified terminals of the E10 and E13 ECM connectors as the wheel is turned slowly.

Standard:

Symbols (Terminal No.)	Specified condition
SP1 (E10–17) – E2 (E13–28)	Generated intermittently



HINT:
The output voltage should fluctuate ups and downs similarly to the diagram on the left when the wheel is turned slowly.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–65)

DTC P0504 BRAKE SWITCH ”A”/”B” CORRELATION

CIRCUIT DESCRIPTION

In this system, the signal of the stop lamp switch is used to judge whether the acceleration system is abnormal or not.

The stop lamp switch has a duplex system (signals STP and ST1–) to memorize the abnormality when the signals of depressing and releasing the brake pedal are detected simultaneously.

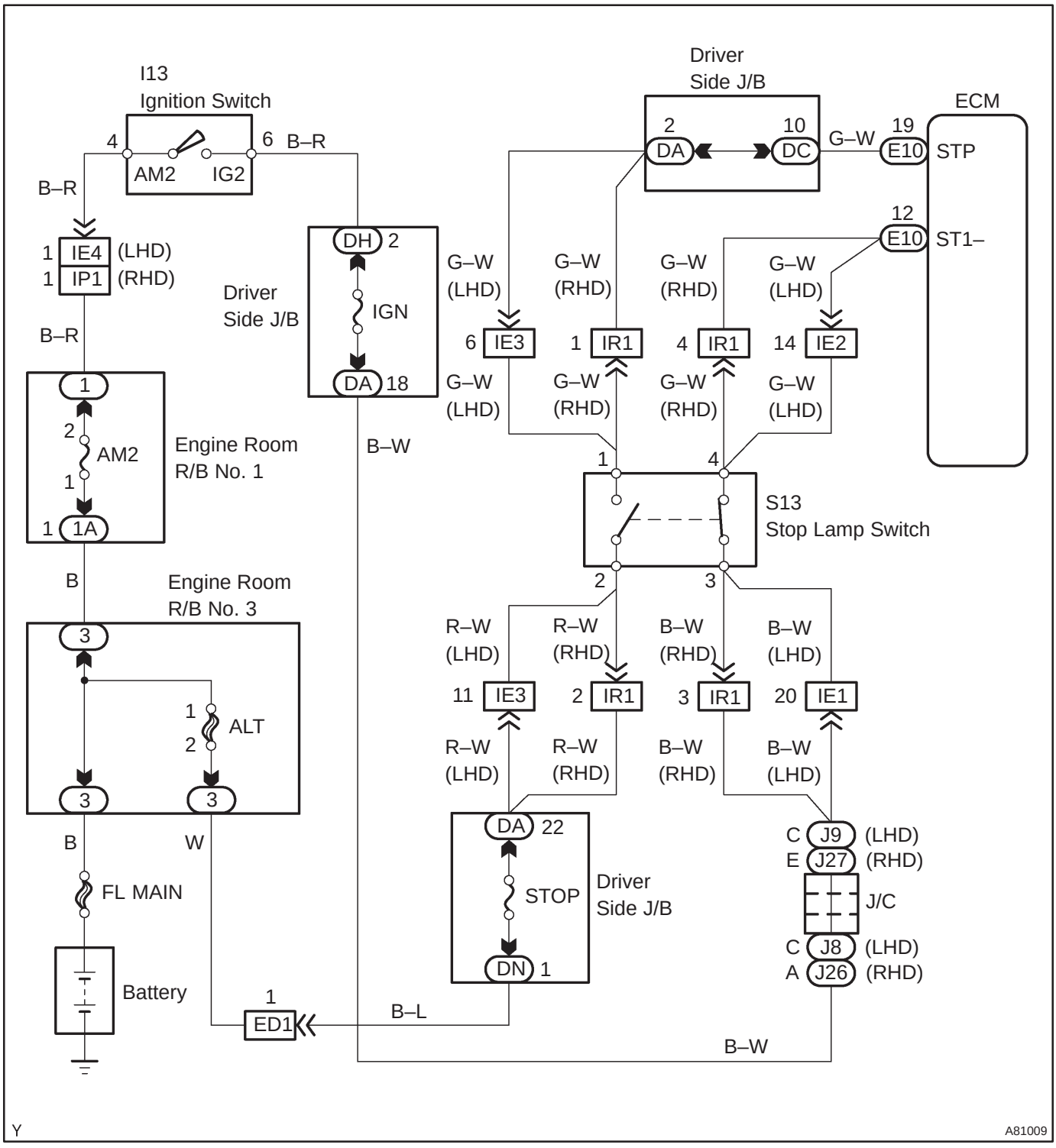
HINT:

Normal condition is as shown in the table.

Signal	Brake pedal released	In transition	Brake pedal depressed
STP	OFF	ON	ON
ST1–	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P0504	Conditions (a), (b) and (c) continue for 0.5 sec. or more (1 trip detection logic): (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the ST1– signal is OFF	• Short in stop lamp switch signal circuit • Stop lamp switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

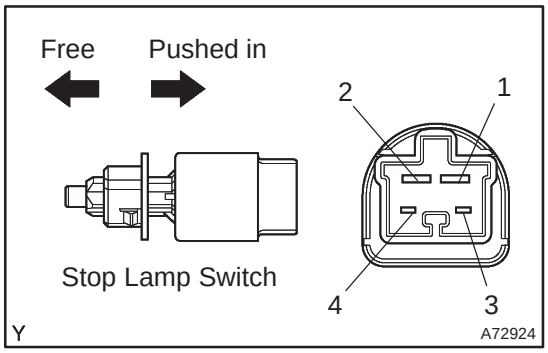
1 CHECK OPERATION OF STOP LIGHT

(a) Check if the stop lights go on and off normally when the brake pedal is depressed and released.

NG → **REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT**

OK

2 INSPECT STOP LAMP SWITCH ASSY



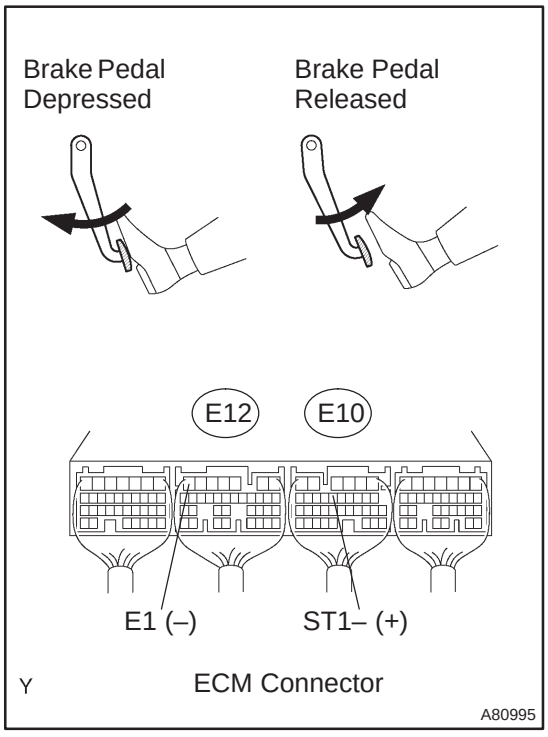
(a) Check for continuity between each pair of the terminals.
Standard:

Switch position	Terminals No.	Specified condition
Switch pin free	1 – 2	Continuity
	3 – 4	No continuity
Switch pin pushed in	1 – 2	No continuity
	3 – 4	Continuity

NG → **REPLACE STOP LAMP SWITCH ASSY**

OK

3 READ VALUE OF HAND–HELD TESTER(STP SIGNAL AND ST1– VOLTAGE)



(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW” and read its value displayed on the hand–held tester.
Standard:

Brake Pedal	Specified condition
Depressed	STP Signal ON
Released	STP Signal OFF

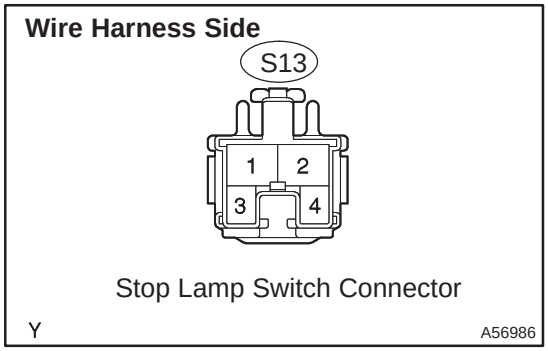
(c) Measure the voltage between the specified terminals of the E10 and E12 ECM connectors.
Standard:

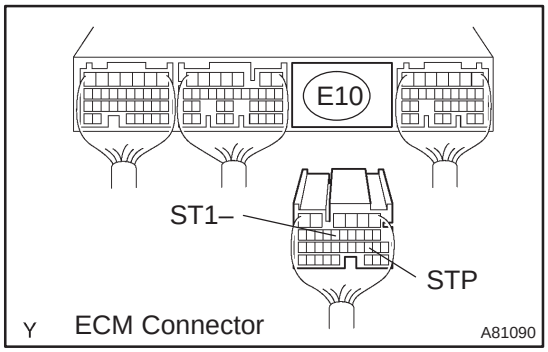
Symbols (Terminal No.)	Brake pedal	Specified condition
ST1– (E10–12) – E1 (E12–7)	Depressed	Below 1.5 V
	Released	7.5 to 14 V

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

NG

4 CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH – ECM)





(a) Disconnect the S13 stop lamp switch connector.
(b) Disconnect the E10 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Stop lamp switch (S13–1) – STP (E10–19)	Continuity
Stop lamp switch (S13–4) – ST1– (E10–12)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Stop lamp switch (S13–1) or STP (E10–19) – Body ground	No continuity
Stop lamp switch (S13–4) or ST1– (E10–12) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM(See page 10–65)

DTC	P0560	SYSTEM VOLTAGE

CIRCUIT DESCRIPTION

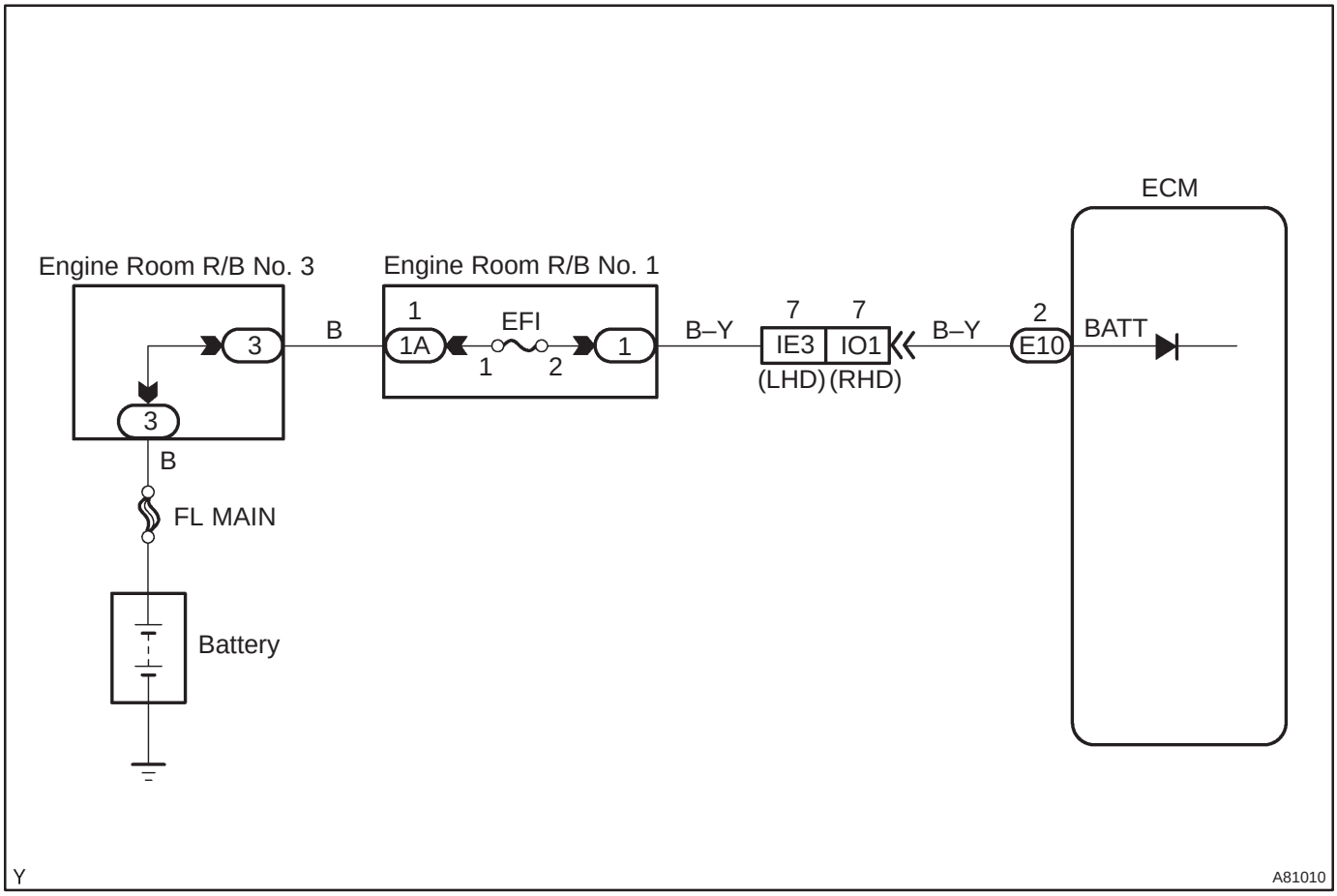
While the ignition switch is OFF, the battery positive voltage is supplied to terminal BATT of the ECM for the DTCs memory and air–fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in back–up power source circuit (1 trip detection logic).	• Open in back–up power source circuit • ECM

HINT:

If DTC P0560 appears, the ECM does not store other DTC.

WIRING DIAGRAM

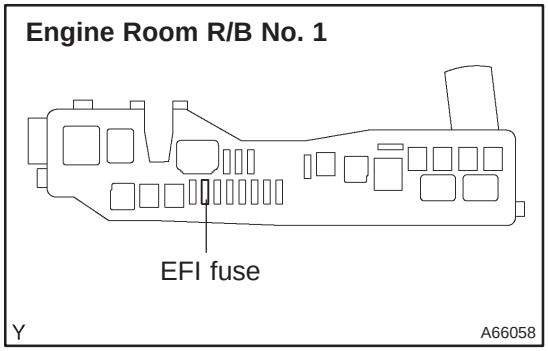


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 CHECK FUSE(EFI FUSE)

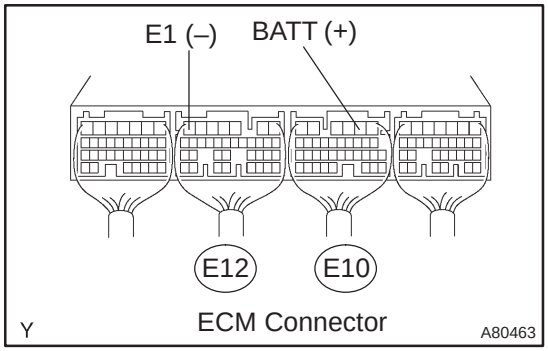


(a) Remove the EFI fuse from the engine room R/B No. 1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

2 INSPECT ECM(BATT VOLTAGE)



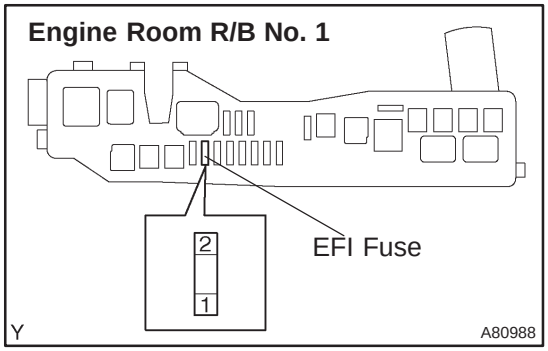
(a) Measure the voltage between the specified terminals of the E10 and E12 ECM connectors.
Standard:

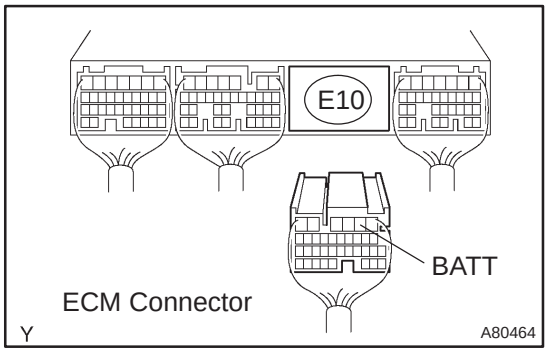
Symbols (Terminal No.)	Specified condition
BATT (E10–2) – E1 (E12–7)	9 to 14 V

OK → **REPLACE ECM (See page 10–65)**

NG

3 CHECK HARNESS AND CONNECTOR(EFI FUSE – ECM, EFI FUSE – BATTERY)





(a) Check the harness and connector between the EFI fuse and ECM.

(1) Remove the EFI fuse from the engine room R/B No. 1.

(2) Disconnect the E10 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) – BATT (E10–2)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) or BATT (E10–2) – Body ground	No continuity

(b) Check the harness and connector between the EFI fuse and battery.

(1) Remove the EFI fuse from the engine room R/B No. 1.

(2) Disconnect the battery positive terminal.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Battery positive terminal – EFI fuse (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Battery positive terminal or EFI fuse (1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE JUNCTION BLOCK

DTC	P0606	ECM/PCM PROCESSOR

DTC	P0607	CONTROL MODULE PERFORMANCE

DTC	P1611	IC CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0606 P0607 P1611	ECM inside error (1 trip detection logic)	• ECM

INSPECTION PROCEDURE

HINT:

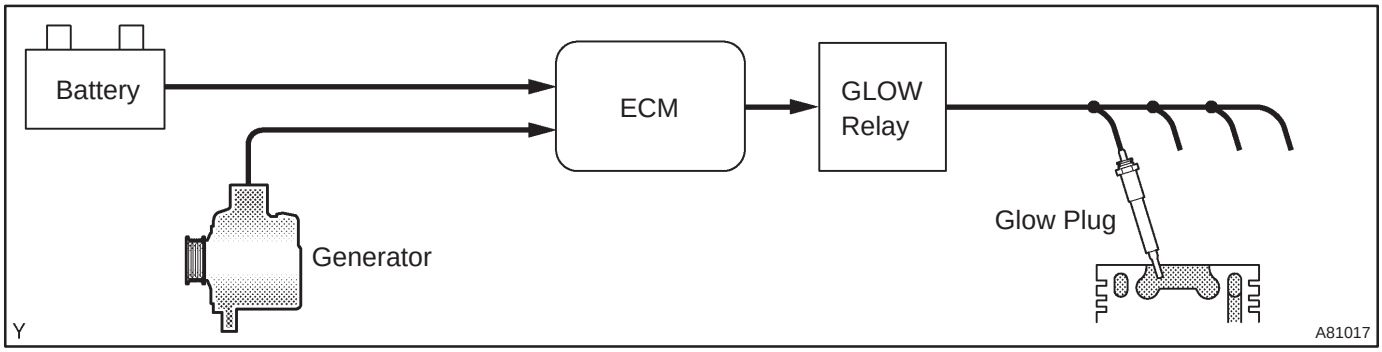
Read freeze frame data using the hand–held tester,. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

REPLACE ECM (See page 10–65)

DTC P0622 GENERATOR FIELD "F" TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

While the generator is generating the current, the duty signal is sent from terminal M of the generator to the ECM terminal ALT. The duty signal is used for detecting the open malfunction of the generator circuit and DTC P0380.



DTC No.	DTC Detection Condition	Trouble Area
P0622	Generator terminal M duty signal is not output while engine is running.	• Open in generator circuit • Generator • Driver belt • ECM

MONITOR DESCRIPTION

The ECM will detect a generator failure or an open malfunction of the circuit, if the duty signal is not output from terminal M of the generator despite the engine running.

MONITOR STRATEGY

Required sensors	Generator circuit
Frequency of operation	Continuous
Duration	10 sec.
CHK ENG operation	1 driving cycle

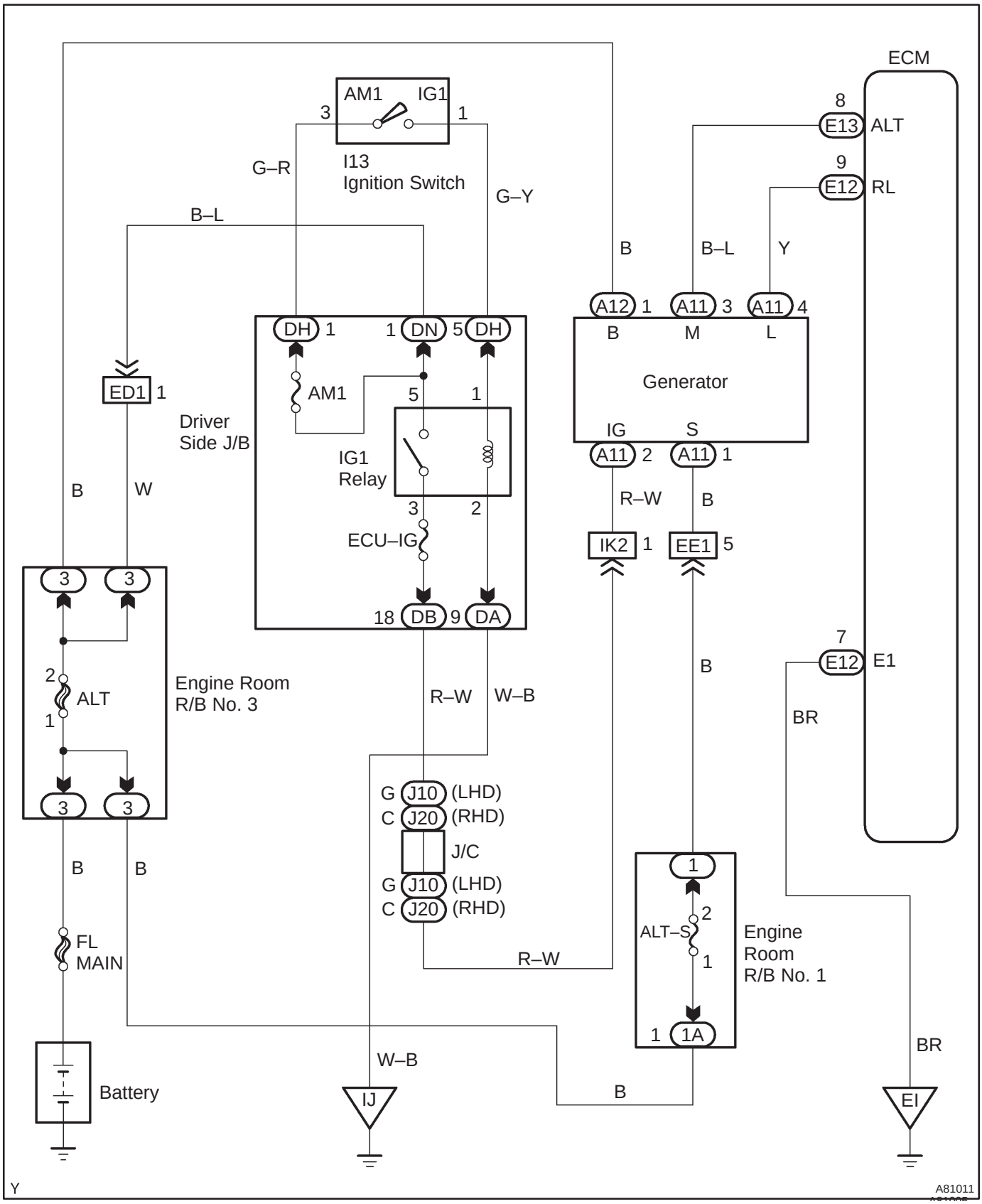
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Battery voltage	11 V	–
Engine speed	700 rpm	2,000 rpm

TYPICAL MALFUNCTION THRESHOLDS

Threshold
There is no signal output from terminal M of the generator

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK IF CHARGE LAMP IS ILLUMINATED

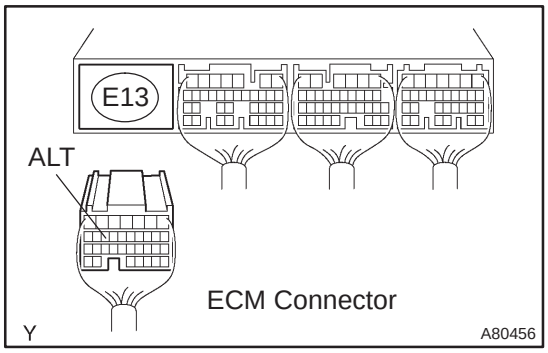
HINT:

Run the engine at 2,000 rpm, and check if the charge lamp located in the combination meter is OFF.

YES → **Go to step 3**

NO

2	CHECK HARNESS AND CONNECTOR(GENERATOR – ECM)



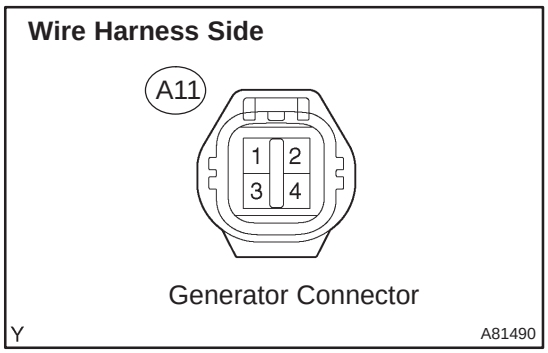
(a) Disconnect the E13 ECM connector.
(b) Disconnect the A11 generator connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
ALT (E13–8) – M (A11–3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
ALT (E13–8) or M (A11–3) – Body ground	No continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT DRIVE BELT (See page 14–266)

NG → **REPAIR OR REPLACE DRIVE BELT (See page 14–269)**

OK

4	**INSPECT CHARGING SYSTEM (See page 19–26)**

GO

CHECK DTC OUTPUT RECUR (DTC P0622 OUTPUT AGAIN)

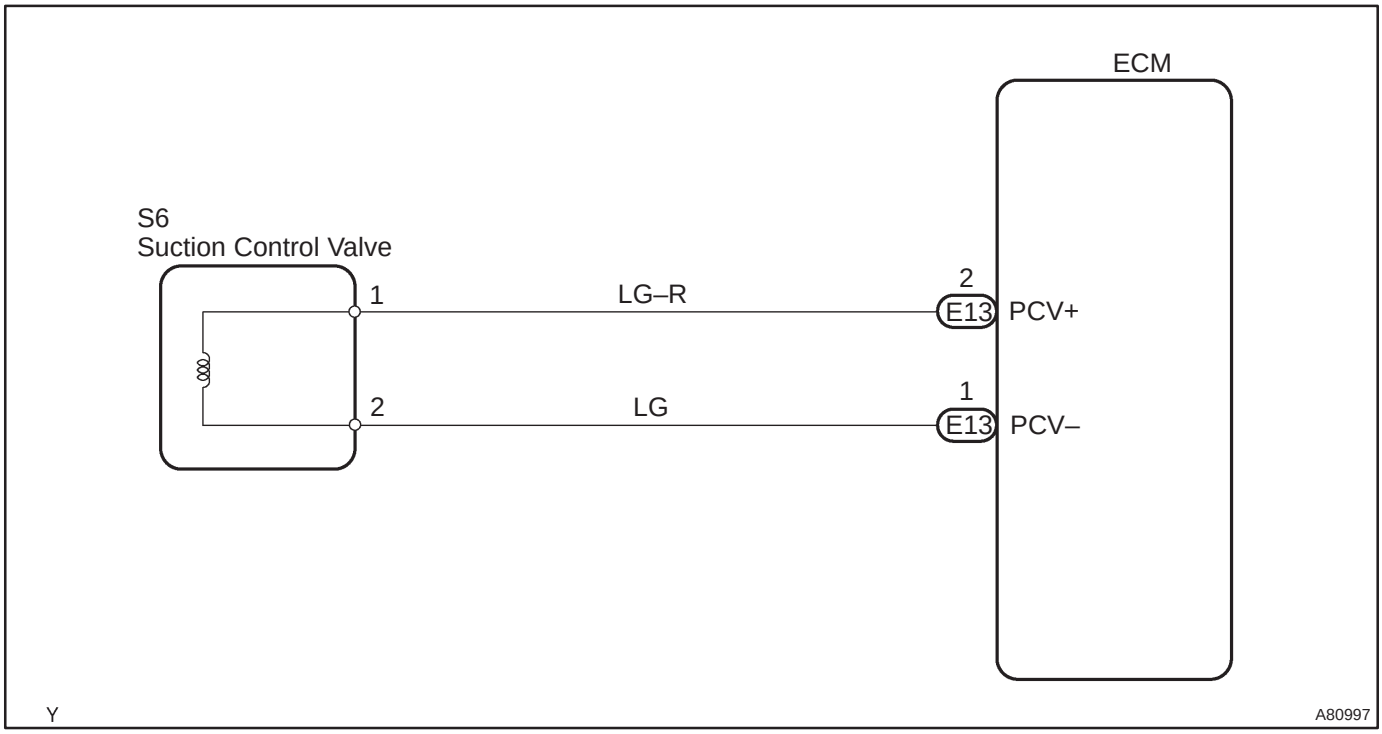
HINT:
After clearing the DTC, start the engine and let it idle for 10 seconds, and then confirm P0622 is not set again.

DTC	P0627	FUEL PUMP CONTROL CIRCUIT / OPEN

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0627	Open or short in suction control valve circuit for more than 0.5 sec. (1 trip detection logic).	• Open or short in suction control valve circuit • Suction control valve • ECM

WIRING DIAGRAM

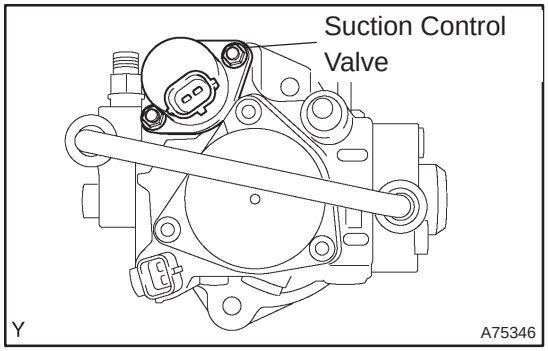


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 CHECK INJECTION OR SUPPLY PUMP ASSY

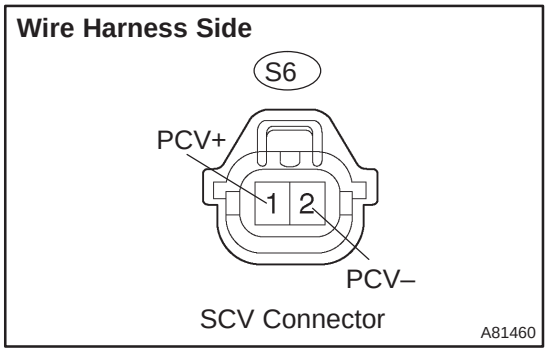


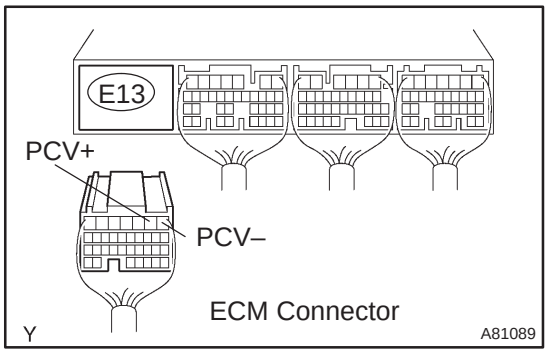
(a) Check the suction control valve for resistance.
(1) Measure the resistance between the terminals.
Resistance: 1.9 to 2.3 Ω at 20°C (68°F)

NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11–69)**

OK

2 CHECK HARNESS AND CONNECTOR(SUCTION CONTROL VALVE – ECM)





(a) Disconnect the S6 suction control valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PCV+ (S6–1) – PCV+ (E13–2)	Continuity
PCV– (S6–2) – PCV– (E13–1)	

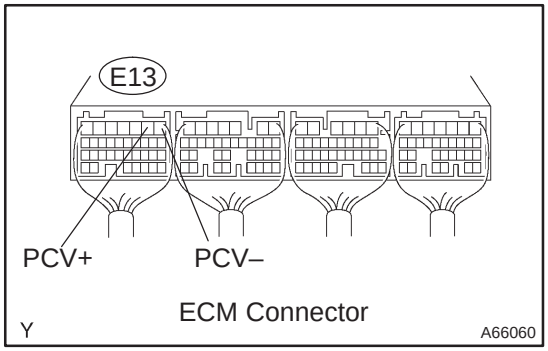
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PCV+ (S6–1) or PCV+ (E13–2) – Body ground	No continuity
PCV– (S6–2) or PCV– (E13–1) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

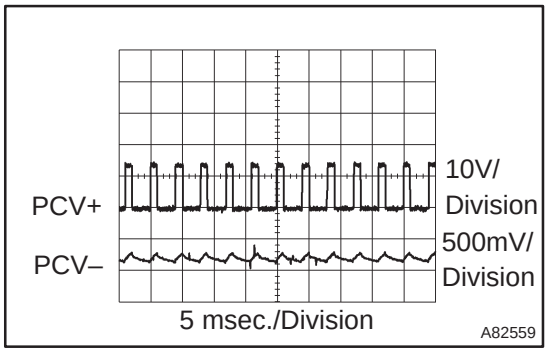
3 INSPECT ECM(PCV VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During cranking or idling, check the waveform between the specified terminals of the E13 ECM connector.

Standard :

Symbols (Terminal No.)	Specified condition
PCV+ (E13–2) – PCV– (E13–1)	Correct waveform is as shown



NG → **REPLACE ECM (See page 10–65)**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)

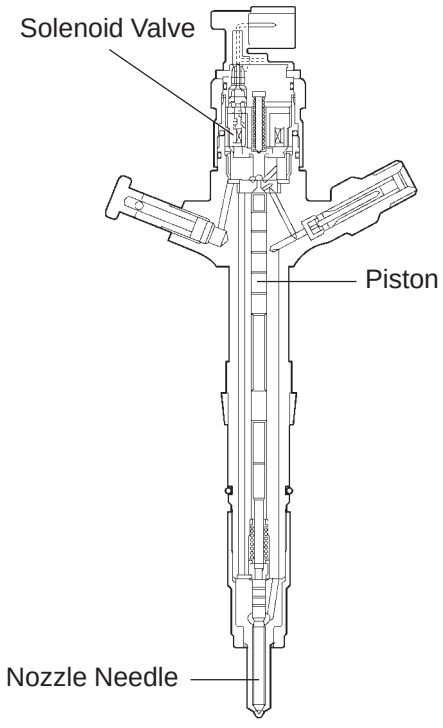
DTC	P1238	INJECTOR MALFUNCTION

HINT:
- For more information on the injector and the common rail system, see page 05–517.
- If P1238 is present, use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

The ECM detects combustion deterioration for specific cylinder.
HINT:
- The cylinder that has compensation learned value for INJ VOL varies from other cylinders may be malfunctioning.
- If DTC P0093 (Fuel leaks in high–pressure area) is present simultaneously, leakage malfunction of the cylinder probably be occurred.
- If DTC P0200 (Open or short in EDU or injector circuit) is present simultaneously, there probably be faulty circuit located between the ECM and the injector including the EDU.
- If only DTC P1238 (Injector malfunction) is present, probably the injector is mechanical malfunction or insufficient compression (valve clearance, etc) has occurred, not an open or short malfunction of the ECM, EDU and injector circuit.
- Solenoid valve of the injector is the same type of the pressure discharge valve.

Injector Cross Section Diagram



DTC No.	DTC Detection Condition	Main Trouble Area	Related Trouble Area
P1238	Engine speed variation is large when idling.	• Injector • EDU (P0200 is set simultaneously) • Open or short in engine wire (P0200 is set simultaneously) • Connector connection (P0200 is set simultaneously) • Compression pressure • Valve clearance	• Valve timing • ECM

HINT:
After confirming DTC P1238, use the hand–held tester to confirm the fuel pressure inside the common rail in the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

MONITOR DESCRIPTION

P1238 (Injection malfunction, exclude open or short in injector circuit):
This DTC will be set if the engine speed variations between each cylinder is large. The ECM monitors changes in the crankshaft rotation speed using the crankshaft position sensor for detecting poor combustion. Also, it identifies faulty cylinder using the camshaft position sensor. The fluctuation counter increments when irregular crankshaft rotation speed variation exceeds the threshold at idling. Therefore, either one of the cylinders has very poor combustion (Rough idle), the ECM sets this DTC.

MONITOR STRATEGY

Required sensors	Crankshaft position sensor
Frequency of operation	Continuous
Duration	10 min.
CHK ENG operation	2 driving cycles

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine	At idling	
Engine speed	500 rpm	–
Engine coolant temperature	20°C (68°F)	

TYPICAL MALFUNCTION THRESHOLDS

Threshold
The number of irregular changes in the crankshaft rotation speed

HINT:
The number of irregular changes in the crankshaft rotation speed indicates the insufficient combustion cylinder.

WIRING DIAGRAM

Refer to DTC P0200 on page 05–604.

INSPECTION PROCEDURE

HINT:

- If DTCs other than P1238 are present simultaneously, first perform the troubleshooting for them.
- Read freeze frame data using the hand−held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P1238)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
Only P1238 is output	A
P1238 and other DTCs are output	B

HINT:
If any other codes besides P1238 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

2	CHECK WIRE HARNESS AND CONNECTOR IN ENGINE ROOM

HINT:
Check the wire harness and connector connections.

NG → **REPAIR OR REPLACE**

OK

3	READ VALUE OF HAND–HELD TESTER(COMPENSATION OF INJECTION QUANTIFY BETWEEN CYLINDERS FOR MALFUNCTION CYLINDER)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB" and read its value displayed on the hand–held tester.
Result:
STD – 3 to 3 mm^3/st
Maximum – 4.9 to 4.9 mm^3/st
(d) Cylinders that have a compensation value which is outside of the specification range are considered to be faulty cylinders. Use the following flowchart to inspect and repair the cylinder.
Result:

Result	Proceed to
Faulty cylinder can not identified	A
Faulty cylinder can be identified	B

B → **Go to step 5**

A

4	PERFORM ACTIVE TEST USING HAND–HELD TESTER(INJECTION CUT FOR MALFUNCTION CYLINDER)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / INJECTOR CUT #1, #2, #3 and #4".
(e) Check for the 4 cylinders in the sequence and then performs the power balance inspection to identify faulty cylinder (If there is no changes in the engine speed even though the fuel injection is cut off during idling, the cylinder is malfunctioning).

GO

5	CHECK CYLINDER COMPRESSION PRESSURE OF MALFUNCTION CYLINDER (See page 14–266)

NG → **REPAIR OR REPLACE**

OK

6	CHECK VALVE CLEARANCE OF MALFUNCTION CYLINDER (See page 14–266)

NG → **ADJUST VALVE CLEARANCE (See page 14–270)**

OK

7	READ OUTPUT DTC (DTC P1238 OUTPUT AGAIN)

HINT:
After clearing the DTC, let the engine idle for 10 minutes after it was warmed up, and confirm P1238 is not set again.

OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)

NG

8	REPLACE INJECTOR ASSY (See page 11–60)

GO

CHECK DTC OUTPUT RECUR (DTC P1238 OUTPUT AGAIN)

HINT:
After clearing the DTC, let the engine idle for 10 minutes after it was warmed up, and confirm P1238 is not set again.

DTC	P1271	FUEL REGULATOR CIRCUIT MALFUNCTION (EDU DRIVE)

DTC	P1272	FUEL PRESSURE REGULATOR MALFUNCTION

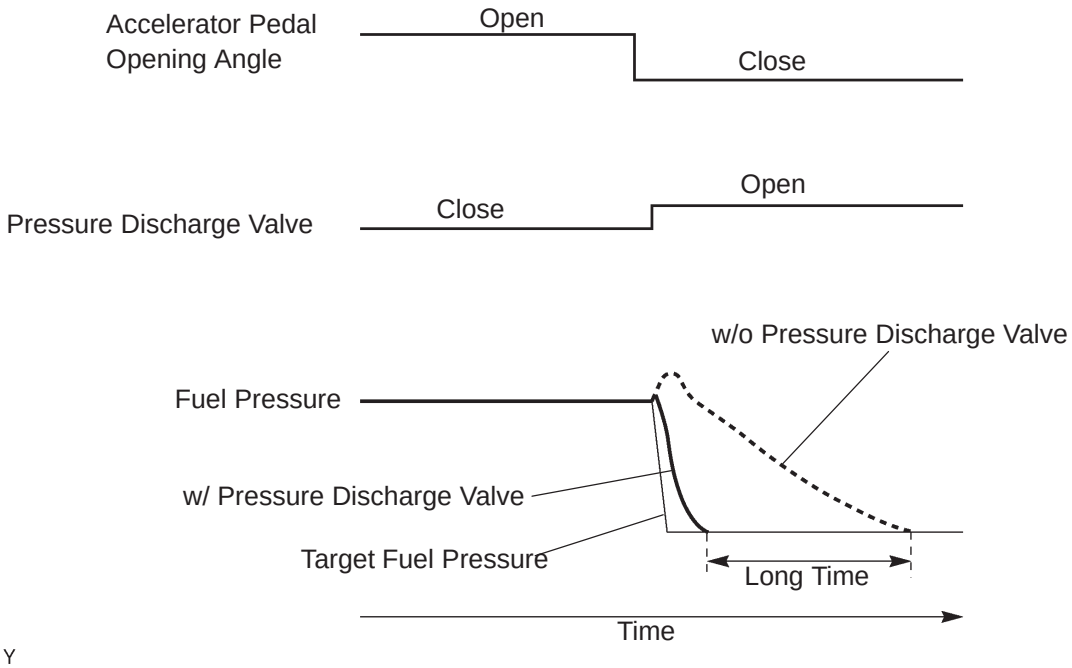
HINT:

- For more information on the pressure discharge valve and the common rail system, see page 05–517.
- For more information on the EDU, see page 05–604.
- If P1271 and/or P1272 are present, use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

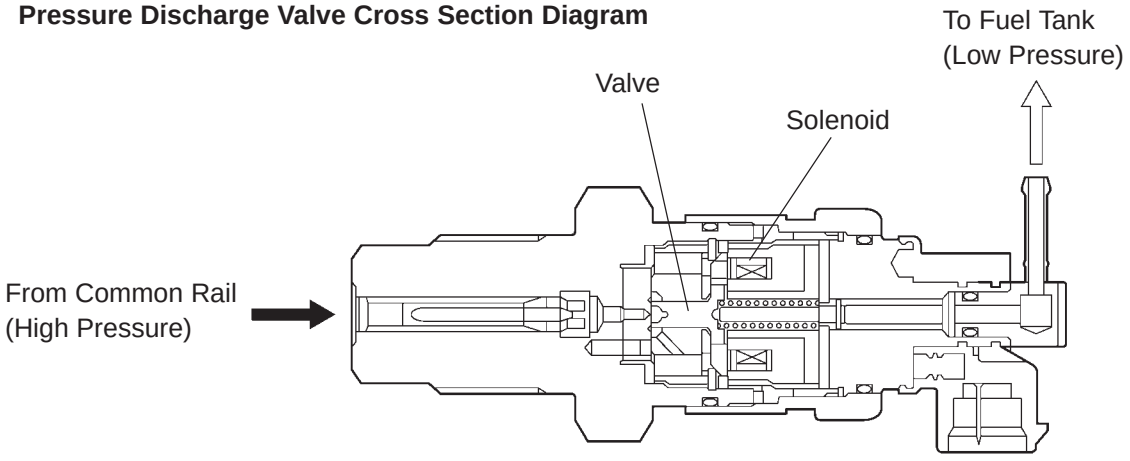
The ECM controls the internal fuel pressure of the common rail by opening and closing the pressure discharge valve. When sudden deceleration is occurred, the internal fuel pressure will temporarily become higher than usual and combustion noise may result, therefore the ECM will open the valve temporarily to discharge the pressure inside the common rail. Also, the pressure discharge valve opens when the ignition switch is turned OFF, and the internal pressure is then promptly discharged.

Pressure Discharge Valve Operation Under Sudden Deceleration



HINT:
The solenoid valve of the pressure discharge valve is the same type of the injector solenoid valve.

Pressure Discharge Valve Cross Section Diagram



DTC No.	DTC Detection condition	Trouble Area
P1271	Open or short in pressure discharge valve circuit. There is no valve opening confirmation signal (IJF) from EDU to ECM, despite the ECM sending valve opening command signal (PRD) after the engine has been started (1 trip detection).	• Open or short in pressure discharge valve circuit • Open or short in pressure discharge valve itself • EDU • ECM
P1272	Pressure discharge valve closed malfunction. Actual pressure decreasing rate deviates from the simulated pressure drop rate by the ECM after the ignition switch is turned OFF (2 trip detection).	• Open or short in pressure discharge valve circuit (P1271 is set simultaneously) • Pressure discharge valve • Supply pump • ECM

HINT:
After confirming DTC ”P1271 and/or P1272”, use the hand–held tester to confirm the fuel pressure inside common rail in the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

MONITOR DESCRIPTION

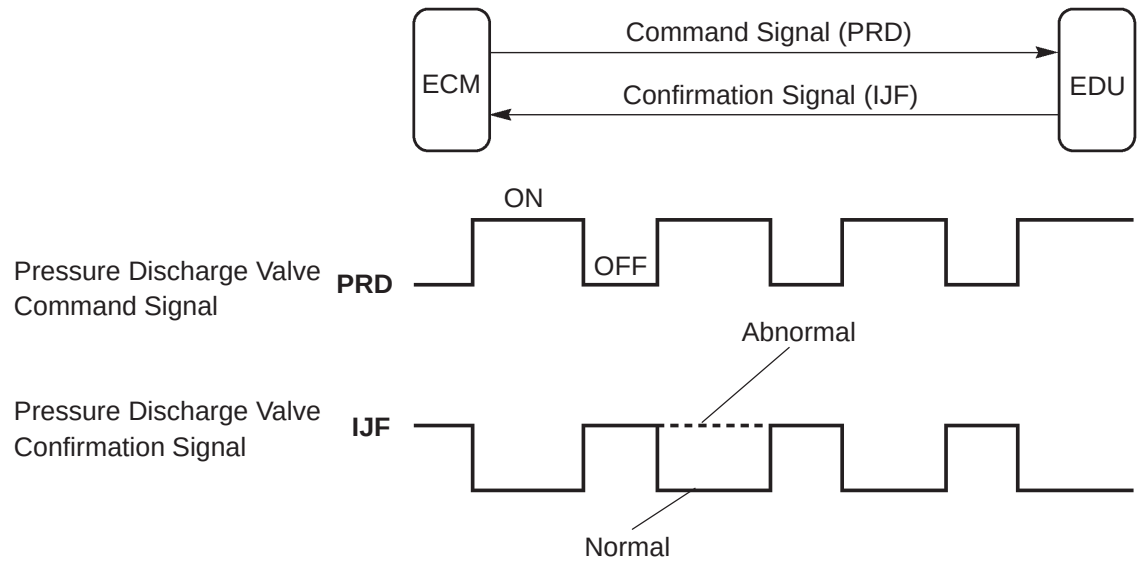
P1271 (Open or short in pressure discharge valve circuit):

This DTC will be set if there is no valve opening confirmation signal (IJF) from the EDU to the ECM, despite the ECM commanding the pressure discharge valve to open with the EDU. This DTC refers to open or short malfunction of the pressure discharge valve circuit, therefore the malfunction that the valve is stuck open or closed can be excluded.

The EDU monitors the current supplied to the pressure discharge valve, and the EDU interprets the IJF signal is low if the current exceeds the specified level, and the EDU indicates that there is the current in the pressure discharge valve.

If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

P1271 Malfunction Detection



P1272 (Closed malfunction of the pressure discharge valve):

The pressure discharge valve will open and discharge the internal fuel pressure of the common rail to the fuel tank when the ignition switch is turned OFF. In this event, the ECM compares the actual dropping rate of the internal fuel pressure and the simulated dropping rate. If the ECM judges the actual dropping rate is smaller than the simulation, the ECM then interprets this as the valve has stuck closed and set this DTC. This DTC detection will be activated if the internal fuel pressure does not drop below the specified level after the ignition switch has been turned OFF.

If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

MONITOR STRATEGY

P1271:

Required sensors	EDU
Frequency of operation	Continuous
Duration	3 sec.
CHK ENG operation	1 driving cycles

P1272:

Required sensors	Fuel pressure sensor
Frequency of operation	Once per driving cycle
Duration	1 sec.
CHK ENG operation	2 driving cycles

TYPICAL ENABLING CONDITIONS

P1271:

Specification
Drive the vehicle at 50 km/h with the 3 rd transmission gear and then decelerate it by completly releasing the accelerator pedal

P1272:

Item	Specification	
	Minimum	Maximum
Fuel pressure	30 MPa (306 kgf/cm^2, 4,351 psi)	–
Fuel temperature	0°C	–
Battery voltage	11 V	–
The monitor will not run if the fuel pressure sensor, or pressure discharge valve circuit, or fuel temp. sensor is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

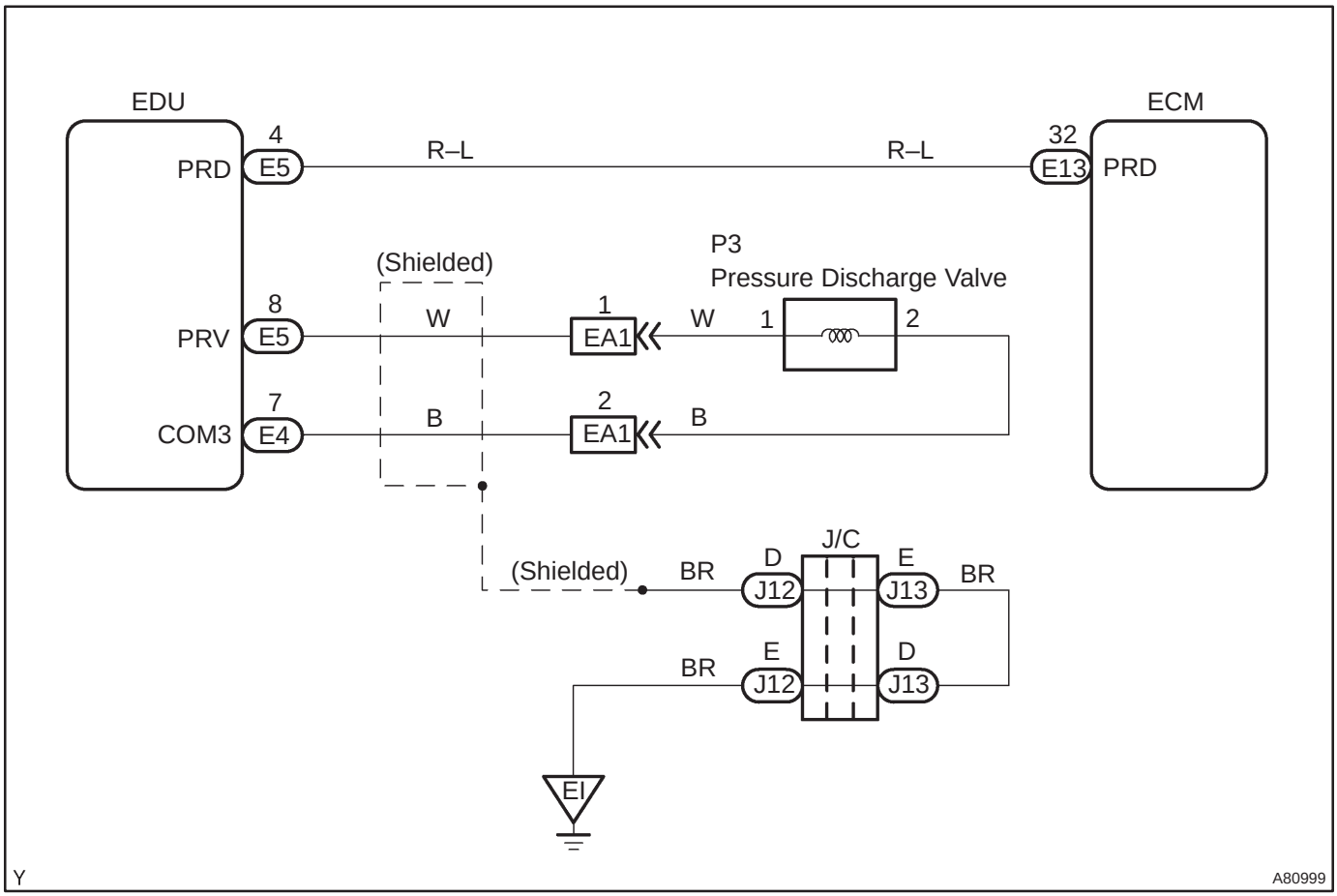
P1271:

Threshold
If the confirmation signals from the EDU is not present, despite the ECM sending the command signals regularly during decelerating

P1272:

Threshold
If the internal pressure stays beyond the specified level after the ignition switch was turned OFF

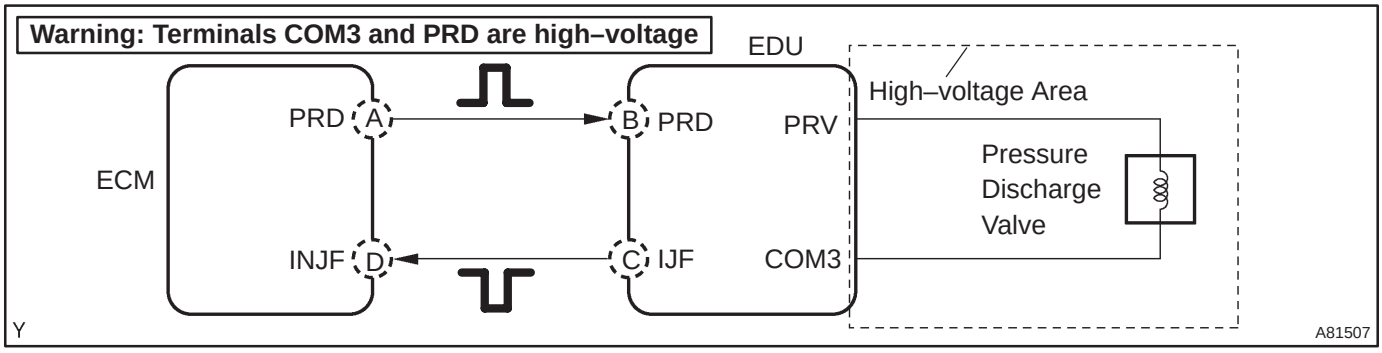
WIRING DIAGRAM



PULSE GENERATION INSPECTION

HINT:

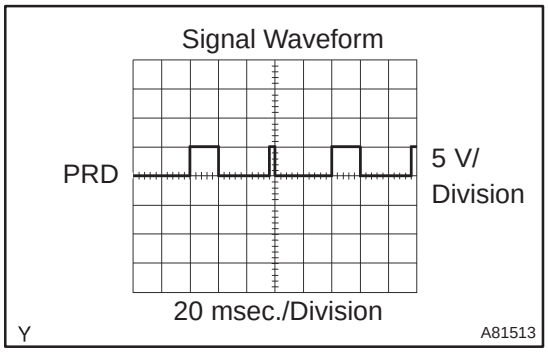
Problem area can be identified by inspecting waveform at the following inspection points.



HINT:

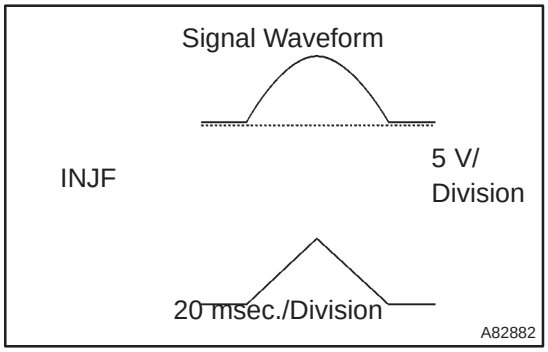
Inspect the following inspection points ”A and D” or ”B and C” at the same time.

Malfunction point	Trouble area
A	• ECM
B (If A is normal)	• Open or short in ”PRD (ECM)” – ”PRD (EDU)” circuit.
C (If A and B are normal)	• Open or short in ”PRV (EDU)” – ”COM3 (EDU)” circuit. • Pressure discharge valve • EDU
D (If A, B and C are normal)	• Open or short in ”IJF (EDU)” – ”INJF (ECM)” circuit. (P0200 is set simultaneously)



(a) Reference: Inspect using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Inspection point	Specified condition
A and B	Correct waveform is as shown



(b) Reference: Inspect using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Inspection point	Specified condition
C and D	Correct waveform is as shown

INSPECTION PROCEDURE

HINT:

- After completing repair, confirm P1271 and/or P1272 is not set again.
- If P0200 and P1271 are present simultaneously, there is open in the INJF wire harness between the EDU and ECM, or there is open in the wire harness for both of the injector the pressure discharge valve.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ OUTPUT DTC(DTC P1271 AND/OR P1272)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.

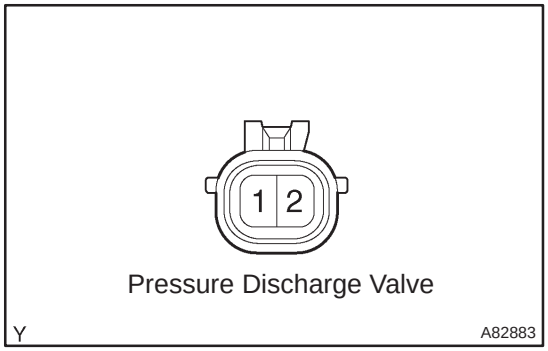
Result:

Display (DTC output)	Proceed to
”Only DTC P1271” or ”P1271 and P1272” are output	A
Only DTC P1272 is output	B

B → **Go to step 8**

A

2 INSPECT COMMON RAIL ASSY (PRESSURE DISCHARGE VALVE)

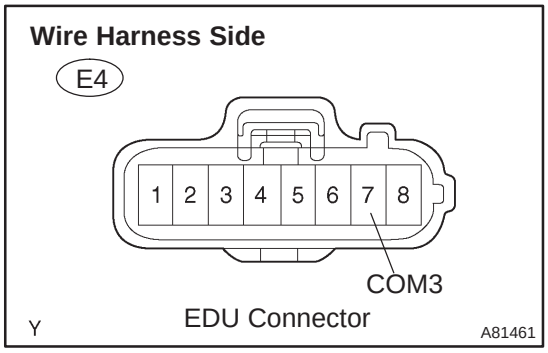


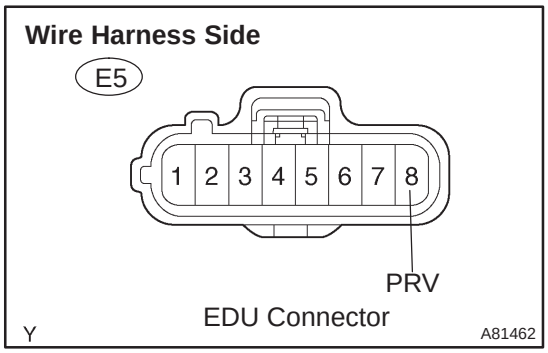
(a) Check the pressure discharge valve for resistance.
(1) Measure the resistance between the terminals.
Resistance: 0.85 to 1.05 Ω at 20°C (68°F)

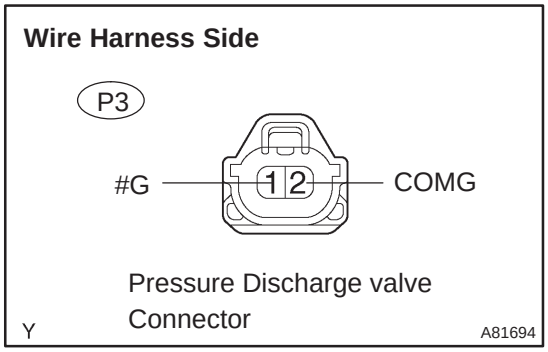
NG → **REPLACE COMMON RAIL ASSY (PRESSURE DISCHARGE VALVE) (See page 14–286)**

OK

3 CHECK HARNESS AND CONNECTOR(PRESSURE DISCHARGE VALVE – EDU)







(a) Disconnect the E4 and E5 EDU connectors.
(b) Disconnect the P3 pressure discharge valve connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
COM3 (E4–7) – COMG (P3–2)	Continuity
PRV (E5–8) – #G (P3–1)	

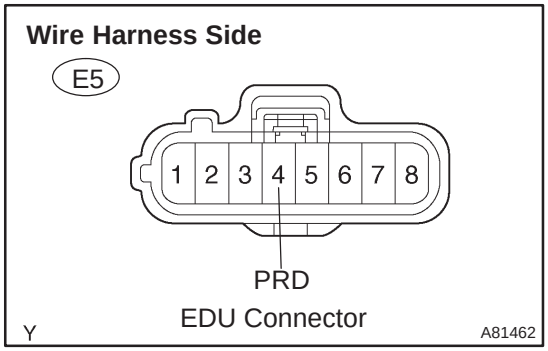
Standard (Check for short):

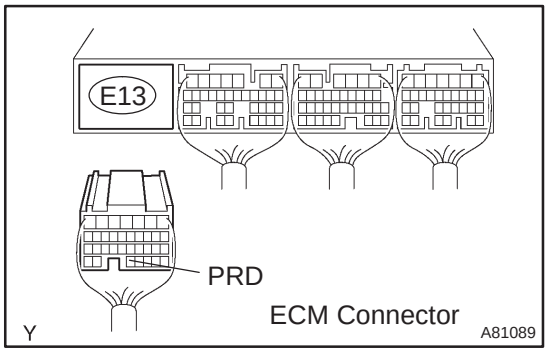
Symbols (Terminal No.)	Specified condition
COM3 (E4–7) or COMG (P3–2) – Body ground	No continuity
PRV (E5–8) or #G (P3–1) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 CHECK HARNESS AND CONNECTOR(EDU – ECM)





(a) Disconnect the E5 EDU connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PRD (E5–4) – PRD–(E13–32)	Continuity

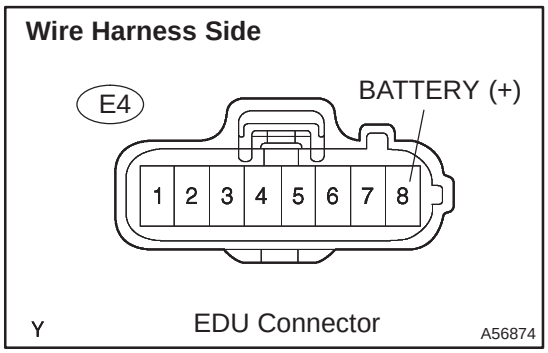
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PRD (E5–4) or PRD (E13–32) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

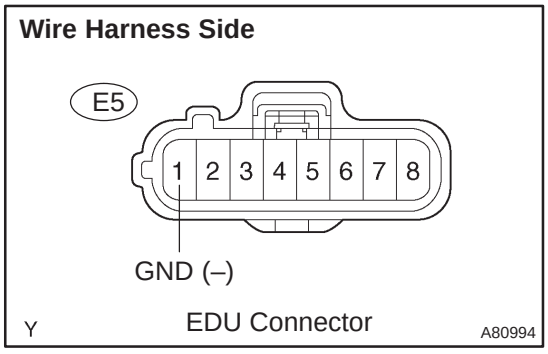
5 INSPECT INJECTOR DRIVER(BATTERY VOLTAGE)



(a) Disconnect the E4 and E5 EDU connectors.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the specified terminals of the EDU connector.

Voltage:

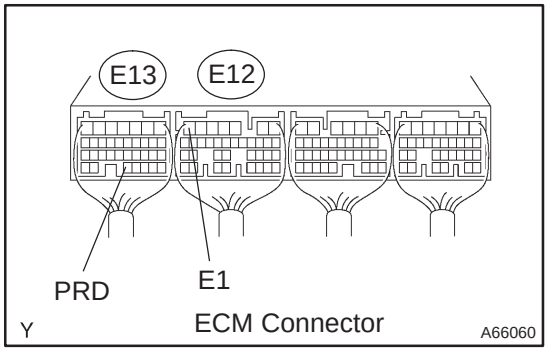
Symbols (Terminal No.)	Specified condition
BATTERY (E4–8) – GND (E5–1)	9 to 14 V

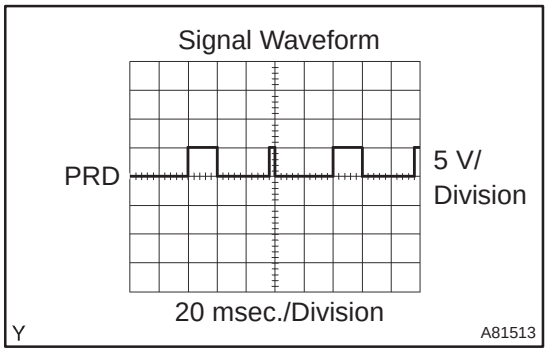


NG → **CHECK INJECTOR DRIVER POWER SOURCE CIRCUIT (EDU – BATTERY)**

OK

6 INSPECT ECM(PRD VOLTAGE)





(a) Inspect using the oscilloscope.
(b) Drive the vehicle at 50 km/h (31 mph) with the 3rd transmission gear and then decelerate by releasing the accelerator pedal, and check the waveform between the specified terminals of the E12 and E13 ECM connectors.

Standard:

Symbols (Terminal No.)	Specified condition
PRD (E13–4) – E1 (E12–7)	Correct waveform is as shown

HINT:
It may be that the following method is the alternative inspection: Run the engine at 2,500 rpm for 10 seconds and then decrease to idle speed with accelerator pedal completely released.

NG → **REPLACE ECM (See page 10–65)**

OK

7 REPLACE INJECTOR DRIVER

GO

CHECK DTC OUTPUT RECUR (DTC P1271 AND/OR P1272)

HINT:
P1271:
After clearing the DTC, drive the vehicle at 50 km/h (31 mph) with the 3rd transmission gear and then decelerate by releasing the accelerator pedal, then confirm P1271 is not set again.
P1272:
After clearing the DTC, turn the ignition switch OFF after the engine was started, and restart the engine and then turn the ignition switch OFF, and then confirm P1272 is not set again.

8	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" and read its value displayed on the hand–held tester.
(e) Check if the internal fuel pressure of the common rail drops below approximately 5 MPa within approximately 1 second after the ignition switch is turned OFF at idling.

Result:

Pressure Displayed	Proceed to
5 MPa or more	A
5 MPa or less	B

B → **CHECK DTC OUTPUT RECUR (DTC P1271 AND/OR P1272)**

HINT:
P1271:
After clearing the DTC, drive the vehicle at 50 km/h (31 mph) with the 3rd transmission gear and then decelerate by releasing the accelerator pedal, then confirm P1271 is not set again.
P1272:
After clearing the DTC, turn the ignition switch OFF after the engine was started, and restart the engine and then turn the ignition switch OFF, and then confirm P1272 is not set again.

A

9	REPLACE COMMON RAIL ASSY(PRESSURE DISCHARGE VALVE) (See page 11–78)

GO

CHECK DTC OUTPUT RECUR (DTC P1271 AND/OR P1272)

HINT:
P1271:
After clearing the DTC, drive the vehicle at 50 km/h (31 mph) with the 3rd transmission gear and then decelerate by releasing the accelerator pedal, then confirm P1271 is not set again.
P1272:
After clearing the DTC, turn the ignition switch OFF after the engine was started, and restart the engine and then turn the ignition switch OFF, and then confirm P1272 is not set again.

DTC	P1601	INJECTOR CORRECTION CIRCUIT MALFUNCTION (EEPROM)

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P1601	• Injector compensation value is not registered (1 trip detection logic) • Wrong injector compensation value is registered (1 trip detection logic)	• Injector compensation code • ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK INJECTOR COMPENSATION CODE (See page 05–528)

NG → SET INJECTOR COMPENSATION CODE (See page 05–528)

OK

REPLACE ECM (See page 10–65)

DTC	**P2120**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT**

DTC	**P2122**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT LOW INPUT**

DTC	**P2123**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT HIGH INPUT**

DTC	**P2125**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT**

DTC	**P2127**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT LOW INPUT**

DTC	**P2128**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT HIGH INPUT**

DTC	**P2138**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D”/”E” VOLTAGE CORRELATION**

HINT:
This is procedure of accelerator pedal position sensor.

CIRCUIT DESCRIPTION

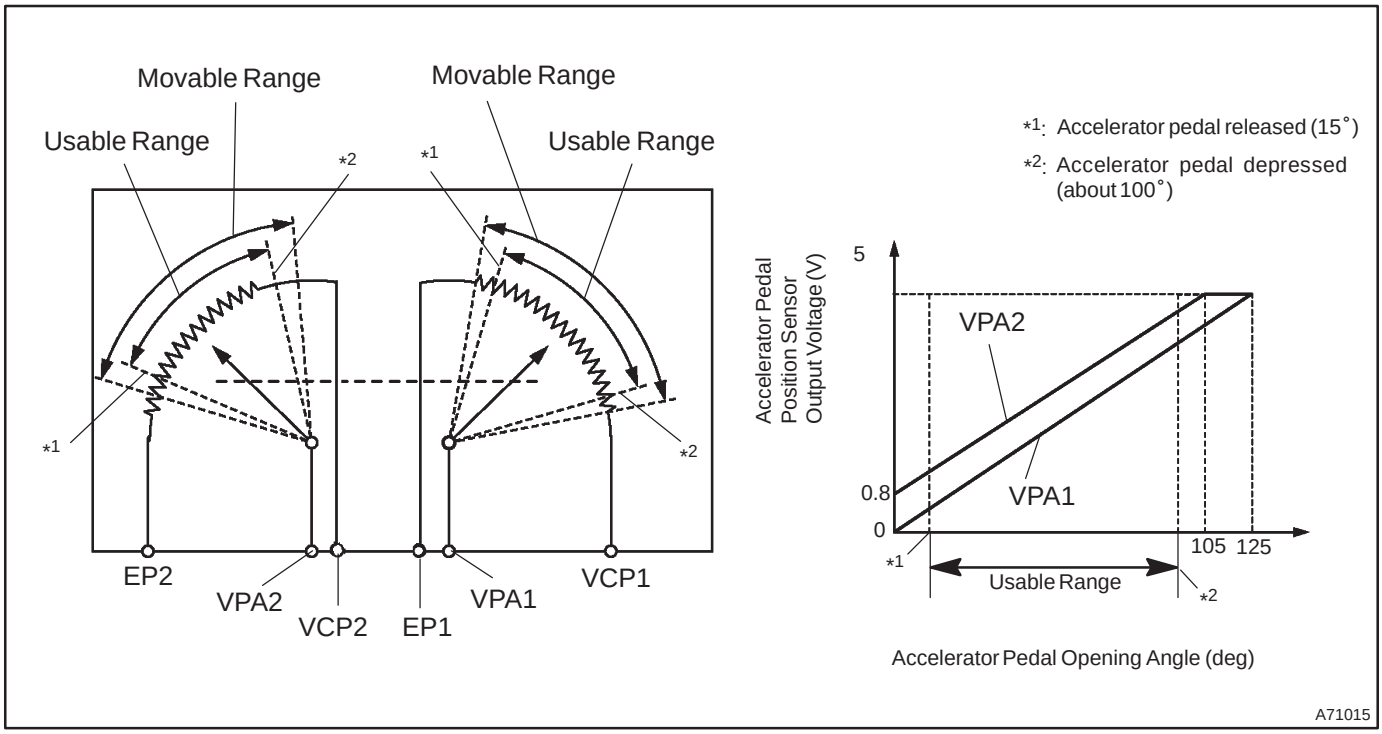
HINT:

This electrical throttle system does not use a throttle cable.

The accelerator pedal position sensor is mounted on the accelerator pedal bracket and it has the 2 sensors to detect the accelerator position and a malfunction of the accelerator position sensor.

In the accelerator pedal position sensor, the voltage applied to pedal terminals VPA1 and VPA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the accelerator pedal. The VPA1 is a signal to indicate the actual accelerator pedal opening angle which is used for the engine control, and the VPA2 is a signal to indicate the information about the opening angle which is used for detecting a malfunction.

The ECM judges the current accelerator pedal opening angle with the signals from terminals VPA1 and VPA2, and the ECM controls the throttle motor based on these signals.



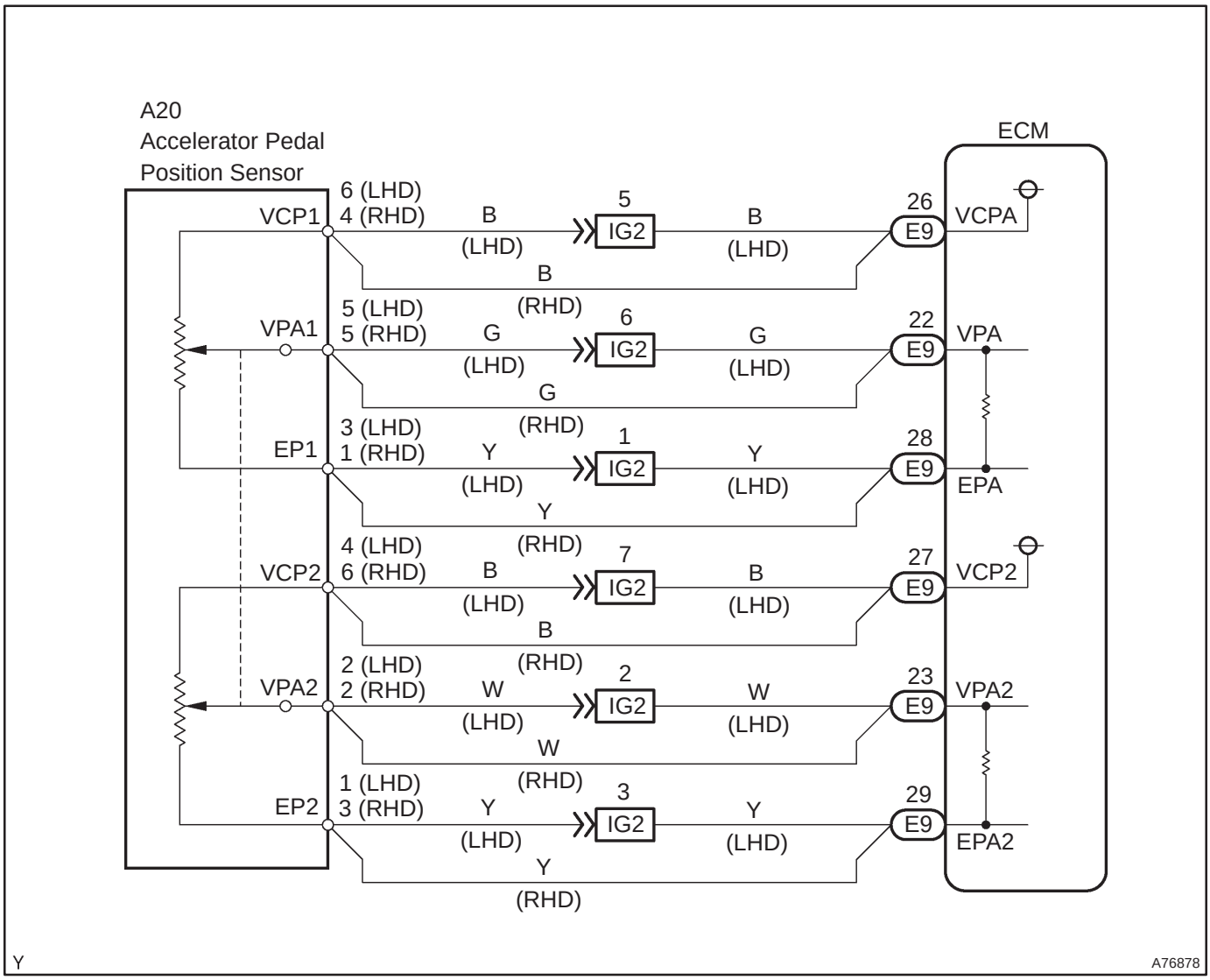
DTC No.	DTC Detecting Condition	Trouble Area
P2120	Condition (a) continues for 0.5 sec. or more: (a) VPA less than 0.2 V and VPA2 greater than 0.97 deg, or VPA greater than 4.8 V	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM
P2122	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA less than 0.2 V (b) VPA2 greater than 0.97 deg	
P2123	Condition (a) continues for 2.0 sec. or more: (a) VPA greater than 4.8 V	
P2125	Condition (a) continues for 0.5 sec. or more: (a) VPA2 less than 0.5 V and VPA greater than 0.97 deg, or VPA2 greater than 4.8 V and VPA greater than 0.2 V but les than 3.45 V	
P2127	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA2 less than 0.5 V (b) VPA greater than 0.97 deg	
P2128	Conditions (a) and (b) continue for 2.0 sec. or more: (a) VPA2 greater than 4.8 V (b) VPA greater than 0.2 V but less than 3.45 V	
P2138	Condition (a) or (b) continues for 2.0 sec. or more: (a) Difference between VPA and VPA2 less than 0.02 V (b) VPA less than 0.2 V and VPA2 less than 0.5 V	

HINT:

After confirming ”DTC P2120, P2122, P2123, P2125, P2127, P2128 and P2138”, use the hand–held tester to confirm the accelerator pedal position sensor output voltage.

Trouble area	Accelerator pedal position expressed as voltage output			
	Accelerator pedal released		Accelerator pedal depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VC circuit open	0 V	0 V	0 V	0 V
VPA circuit open or ground short	0 V	1.5 to 2.9 V	0 V	3.5 to 5.5 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 V	2.5 to 4.6 V	0 V
EP circuit open	5 V	5 V	5 V	5 V

WIRING DIAGRAM

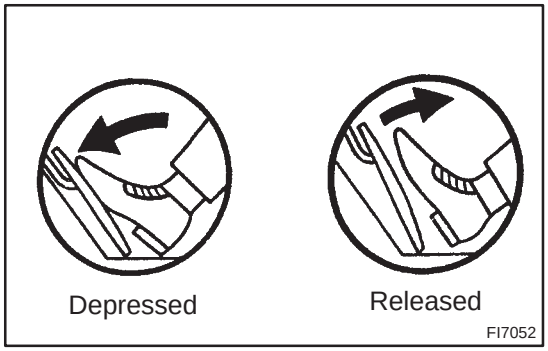


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 READ VALUE OF HAND–HELD TESTER(ACCEL POS #1 AND ACCEL POS #2)



(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2" and read its value displayed on the hand–held tester.

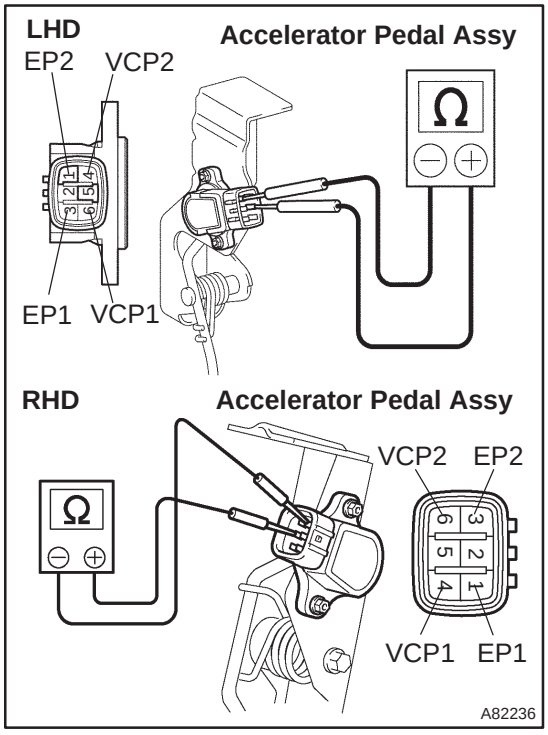
Standard:

Accelerator pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

OK → **REPLACE ECM (See page 10–65)**

NG

2 INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the accelerator pedal position sensor connector.
(b) Measure the resistance between each terminal.

Standard (LHD):

Symbols (Terminal No.)	Resistance
EP1 (3) – VCP1 (6)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (1) – VCP2 (4)	

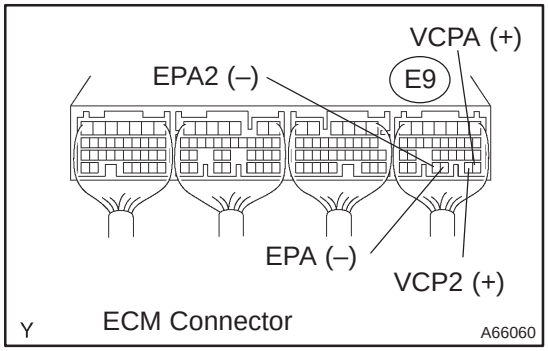
Standard (RHD):

Symbols (Terminal No.)	Resistance
EP1 (1) – VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) – VCP2 (6)	

NG → **REPLACE ACCELERATOR PEDAL ASSY (See page 10–66)**

OK

3 INSPECT ECM(VCPA AND VCP2 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

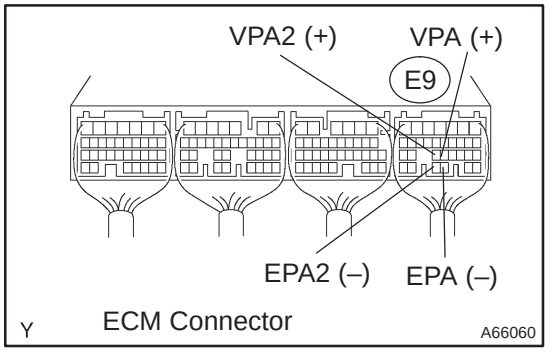
Standard:

Symbols (Terminal No.)	Specified condition
VCPA (E9–26) – EPA (E9–28)	4.5 to 5.5 V
VCP2 (E9–27) – EPA2 (E9–29)	

NG → **REPLACE ECM (See page 10–65)**

OK

4 INSPECT ECM(VPA AND VPA2 VOLTAGE)



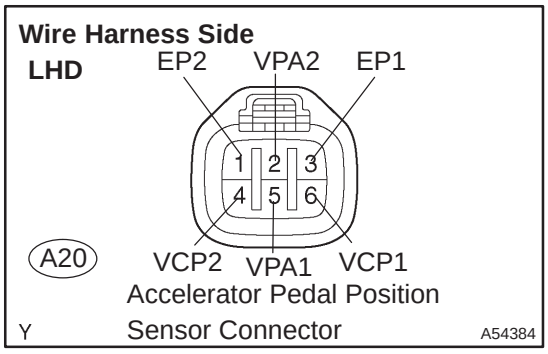
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

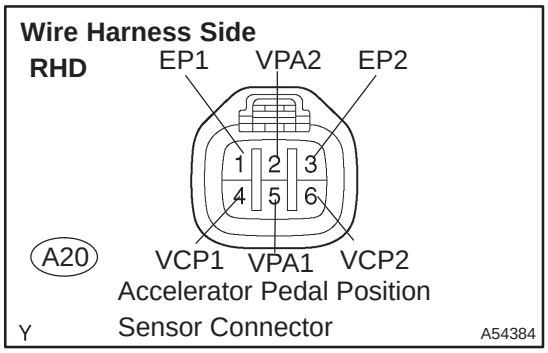
Accelerator pedal position	Symbols (Terminal No.) VPA (E9–22) – EPA (E9–28)	Symbols (Terminal No.) VPA2 (E9–23) – EPA2 (E9–29)
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

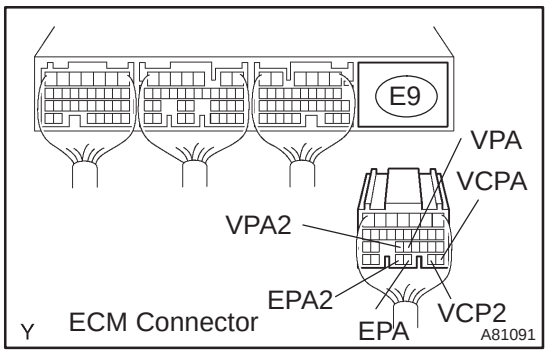
OK → **REPLACE ECM (See page 10–65)**

NG

5	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)







(a) Disconnect the A20 accelerator pedal position sensor connector.

(b) Disconnect E9 the ECM connector.

(c) Check for continuity between the wire harness side connectors.

Standard (LHD):

(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–3) – EPA (E9–28)	
VCP1 (A20–6) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–1) – EPA2 (E9–29)	
VCP2 (A20–4) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–3) or EPA (E9–28) – Body ground	
VCP1 (A20–6) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–1) or EPA2 (E9–29) – Body ground	
VCP2 (A20–4) or VCP2 (E9–27) – Body ground	

Standard (RHD):

(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–1) – EPA (E9–28)	
VCP1 (A20–4) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–3) – EPA2 (E9–29)	
VCP2 (A20–6) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–1) or EPA (E9–28) – Body ground	
VCP1 (A20–4) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–3) or EPA2 (E9–29) – Body ground	
VCP2 (A20–6) or VCP2 (E9–27) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–65)

DTC	P2121	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page 05–492.

DTC No.	DTC Detection Condition	Trouble Area
P2121	Conditions (a) and (B) continue for 0.5 sec.: (a) Difference between VPA and VPA2 exceeds the threshold (b) IDL is OFF	• Accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM

WIRING DIAGRAM

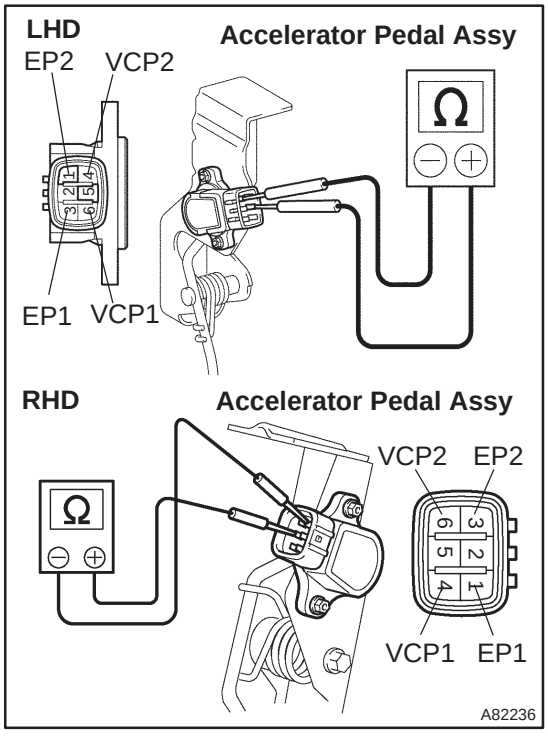
Refer to DTC P2120 on page 05–492.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A20 accelerator pedal position sensor connector.

(b) Measure the resistance between each terminal.

Standard (LHD):

Symbols (Terminal No.)	Resistance
EP1 (3) – VCP1 (6)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (1) – VCP2 (4)	

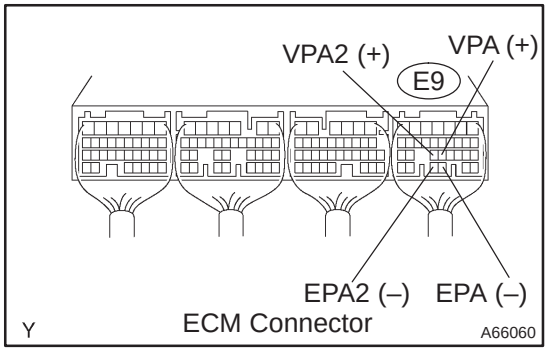
Standard (RHD):

Symbols (Terminal No.)	Resistance
EP1 (1) – VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) – VCP2 (6)	

NG → **REPLACE ACCELERATOR PEDAL ASSY (See page 10–66)**

OK

2 INSPECT ECM(VPA AND VPA2 VOLTAGE)



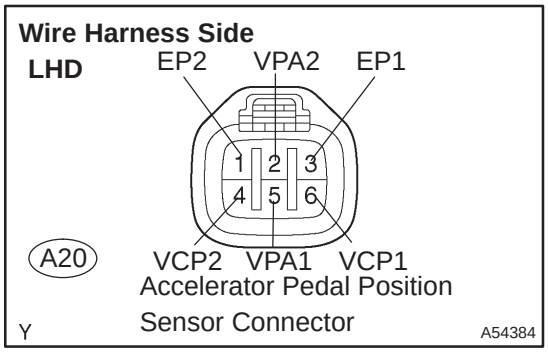
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

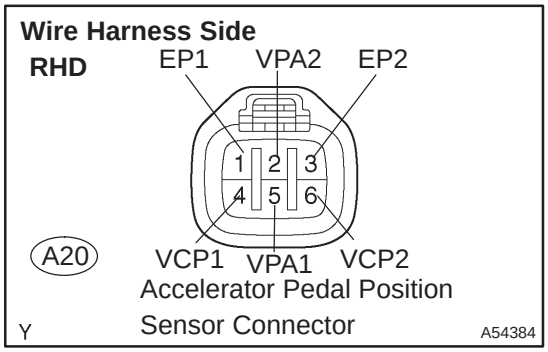
Accelerator pedal position	Symbols (Terminal No.)	Symbols (Terminal No.)
	VPA (E9–22) – EPA (E9–28)	VPA2 (E9–23) – EPA2 (E9–29)
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

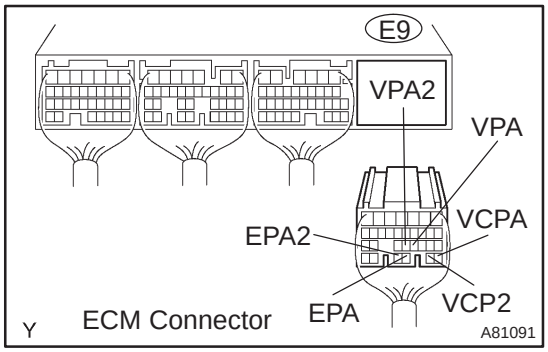
OK → **REPLACE ECM (See page 10–65)**

NG

3 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)







(a) Disconnect the A20 accelerator pedal position sensor connector.
(b) Disconnect the E9 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (LHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–3) – EPA (E9–28)	
VCP1 (A20–6) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–1) – EPA2 (E9–29)	
VCP2 (A20–4) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–3) or EPA (E9–28) – Body ground	
VCP1 (A20–6) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–1) or EPA2 (E9–29) – Body ground	
VCP2 (A20–4) or VCP2 (E9–27) – Body ground	

Standard (RHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–1) – EPA (E9–28)	
VCP1 (A20–4) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–3) – EPA2 (E9–29)	
VCP2 (A20–6) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–1) or EPA (E9–28) – Body ground	
VCP1 (A20–4) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–3) or EPA2 (E9–29) – Body ground	
VCP2 (A20–6) or VCP2 (E9–27) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ACCELERATOR PEDAL ASSY (See page 10–66)

DTC	P2226	BAROMETRIC PRESSURE CIRCUIT

DTC	P2228	BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC	P2229	BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

Detect the atmospheric pressure using the atmospheric pressure sensor. Followed by the atmospheric pressure, correct the injection timing, the injection volume and the amount of common rail internal fuel pressure and then they create optimum combustion.

DTC No.	DTC Detection Condition	Trouble Area
P2226 P2228 P2229	ECM malfunction (1 trip detection logic)	• ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

REPLACE ECM (See page 10–65)

DTC	P2227	BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Detect the atmospheric pressure using the atmospheric pressure sensor. Followed by the atmospheric pressure, correct the injection timing, the injection volume and the amount of common rail internal fuel pressure and then they create optimum combustion.

DTC No.	DTC Detection Condition	Trouble Area
P2227	Atmospheric pressure sensor malfunction (2 trip detection logic)	• ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P2227)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
P2227 and other DTCs are output	A
Only P2227 is output	B

HINT:

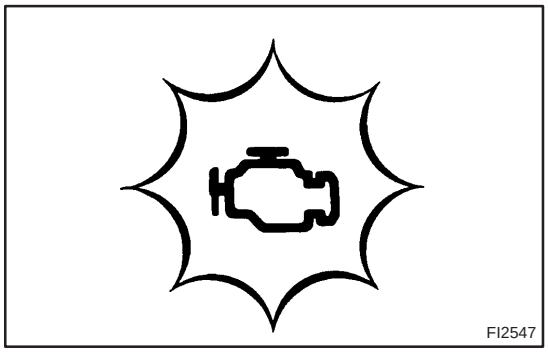
If any other codes besides P2227 are output, perform the troubleshooting for those DTCs first.

B → **REPLACE ECM (See page 10–65)**

A

GO TO RELEVANT DTC CHART (See page 05–544)

05CPB–01

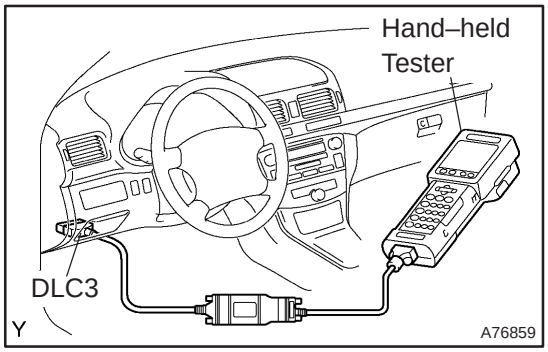

FI2547

PRE–CHECK

1. DIAGNOSIS SYSTEM

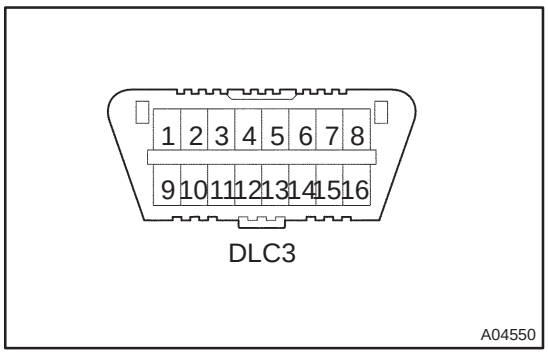
(a) Description for Euro–OBD

- When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect an OBD scan tool complying with ISO 15031–4 or a hand–held tester to the vehicle, and read the various data output from the vehicle's ECM.
- Euro–OBD regulations require that the vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the emission control system / components or in the power train control components which affect vehicle emissions, or a malfunction in the computer. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO 15031–4 are recorded in the ECM memory (See page 05–544). If the malfunction does not reoccur in 3 consecutive trips, the CHK ENG goes off automatically but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect the OBD scan tool or hand–held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check the freeze frame data and various forms of engine data. (For operating instructions, see the OBD scan tool's instruction book.)
- DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–544).
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).

- * 2 trip detection logic
  When a logic malfunction is first detected, the pending fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  The freeze frame data records the engine conditions (fuel system, calculator load, engine coolant temperature, engine speed, vehicle speed, etc.) when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.
- Priorities for troubleshooting:
  If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.



(b) Check the DLC3.
The vehicle's ECM uses the ISO 9141–2(Euro–OBD) communication protocol. The terminal arrangement of the DLC3 complies with ISO 15031–03 and matches the ISO 9141–2 format.

Terminal No.	Connection / Voltage or Residence	Condition
7	Bus + Line / Pulse generation+	During transmission
4	Chassis Ground – Body Ground / 1 Ω or less	Always
16	Battery Positive – Body Ground / 9 to 14 V	Always

HINT:
If the display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Deparment listed in the tool's instruction manual.

(c) Inspect the battery voltage.
Battery voltage: 11 to 14 V

If voltage is below 11V, recharge the battery before proceeding.

(d) Check the CHK ENG.
(1) The CHK ENG lamp comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the CHK ENG is not illuminate, troubleshoot the combination meter.

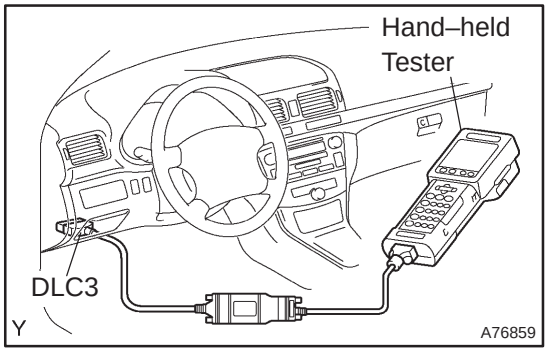
(2) When the engine is started, the CHK ENG should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

2. DTC CHECK (Normal Mode):

NOTICE:

Hand–held tester only:

When the diagnosis system is switched from the normal mode to the check mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and then write them down.



(a) Checking DTCs using the hand–held tester.
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch ON and switch the hand–held tester main switch ON.
(3) Use the hand–held tester to check the DTCs and freeze frame data and then write them down. If you need help with the hand–held tester, refer to the hand–held tester's instruction book).
(4) See page 05–544 to confirm the details of the DTCs.

(b) Clearing the DTCs using the hand–held tester:
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) When operating the hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester:
(1) Disconnect the battery terminal or remove the EFI and ETCS fuses from the engine room R/B for more than 60 seconds.

3. DTC CHECK (Check Mode):

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has more sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

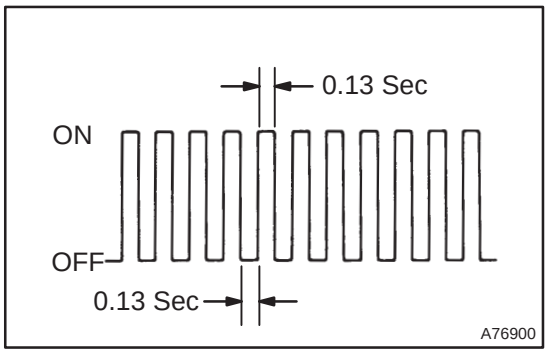
(a) Procedure for Check Mode using the hand–held tester.

(1) Check the initial conditions.
- Battery positive voltage 11V or more.
- Throttle valve fully closed.
- Transmission in the ”N” position.
- A/C switched OFF.

(2) Turn the ignition switch OFF.

(3) Connect the hand–held tester to the DLC3.

(4) Turn the ignition switch ON and switch the hand–held tester main switch ON.



(5) Switch the hand–held tester from the normal mode to the check mode. The CHK ENG blinks in 0.13 sec intervals as shown in the illustration.

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(6) Start the engine. (The CHK ENG goes off after the engine start.)

(7) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTC, etc.

(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the normal mode and will result in all of the DTCs and freeze frame data being erased.

(9) After checking the DTC, inspect the applicable circuit.

(b) Clearing the DTCs using the hand–held tester:

(1) Connect the hand–held tester to the DLC3.

(2) Turn the ignition switch ON.

(3) When operating the hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester’s instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester:
(1) Disconnect the battery terminal or remove the EFI and ETCS fuses from the engine room R/B for more than 60 seconds.

4. FAIL–SAFE CHART

If any of the following codes are recorded, the ECM enters the fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0087	VTA is fixed at 10 %	Ignition switch OFF
P0088	VTA is fixed at 10 %	Ignition switch OFF
P0093	After fail safe driving control is performed for 1 minute, engine stalls	Ignition switch OFF
P0095 P0097 P0098	Intake air temp. is fixed at 145°C (293°F)	Return to normal condition
P0105 P0107 P0108	Turbo pressure is set at fixed value	Return to normal condition
P0115 P0117 P0118	When fuel temp. sensor operates normal and intake air temp. is less than 15°C (59°F), value of fuel temp. sensor is substituted When fuel temp. sensor operates normal and intake air temp. is more than 20°C (68°F), value is fixed at 120°C (248°F) When the fuel temp. sensor is abnormal, value is fixed at 40°C (104°F)	Return to normal condition
P0168	Output limit	Return to normal condition
P0180 P0182 P0183	Fuel temp. is fixed at 40°C (104°F)	Return to normal condition
P0190 P0191 P0192 P0193	VTA is fixed at 10 %	Ignition switch OFF
P0200	VTA is fixed at 25 %	Ignition switch OFF
P0335	Output limit	Return to normal condition
P0488	VTA is fixed at 25 %	Ignition switch OFF
P0500	Vehicle speed is fixed at 0 km/h (0 mph)	Vehicle speed less than 10 km/h (6 mph)
P1229	VTA is fixed at 10 %	Ignition switch OFF
P1271	VTA is fixed at 25 %	Ignition switch OFF
P1272	VTA is fixed at 25 %	Ignition switch OFF
P2120 P2122 P2123 P2125 P2127 P2128 P2138	Output limit	Ignition switch OFF

5. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:

By putting the vehicle's ECM in the check mode, the 1 trip detection logic is possible instead of the 2 trip detection logic, and the sensitivity to detect faults is increased. This makes it easier to detect intermittent problems.

(a) Clear the DTCs (See step 2).
(b) Set the check mode (See step 3).

(c) Perform a simulation test (See page 01–22).
(d) Check the connector and terminal (See page 01–32).
(e) Wiggle the harness and connector (See page 01–32).

6. DATA LIST

HINT:
Using the DATA LIST displayed by the hand–held tester, you can read the value of the switches, sensors, actuators and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one method to shorten diagnostic time.

NOTICE:
The values given below for "Normal Condition" are representative values. A vehicle may still be normal even if its value differs from those listed here. Do not solely depend on the "Normal Condition" here when deciding whether a part is faulty or not.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand–held tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST".
(g) According to the display on tester, read the "DATA LIST".

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *	Diagnostic Note
INJ VOLUME	Injection volume/ Min.: 0 mm^3, Max.: 1279.98 mm^3	Idling: 3 to 10 mm^3	—
INJ TIMING	Injection timing/ Min.: 0°CA, Max.: 51°CA	Idling: –1 to 5°CA	—
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16383.75 rpm	Idling: 750 to 850 rpm	—
MAF	Air flow rate from MAF sensor status/ Min.: 0 gm/s, Max.: 655.35 gm/s	• Idling: 3.2 to 4.7 gm/s • Running without load (2,500 rpm): 13.1 to 18.9 gm/s	If the value is Approximately 0.0 gm/s: • Mass air flow meter power source circuit open • VG circuit open or short If the valve is 160 gm/s or more: • E2G circuit open
PIM	Absolute pressure inside intake manifold/ Min.: 0 kPa, Max.: 255 kPa	Idling: 85 to 110 kPa	—
COOLANT TEMP	Coolant temperature/ Min.: –40 °C, Max.: 215 °C	After warming up: 80 to 95°C (176 to 203°F)	If the value is "–40 °C" or "140 °C", sensor circuit is open or shorted.
INTAKE AIR	Intake air temperature/ Min.: –40 °C, Max.: 215 °C	Equivalent to Ambient Temp.	
FUEL TEMP	Fuel temperature status/ Min.: –40 °C, Max.: 215 °C	Actual fuel temp.	
ACCEL POSITION	Accel position status/ Min.: 0 %, Max.: 100 %	• Accelerator pedal released: 10 to 22 % • Accelerator pedal depressed: 52 to 90 %	Read the value with ignition switch ON (Do not start engine).
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Actual vehicle speed	Speed indicated on speedometer
THROTTLE POS	Throttle step position status/ Min.: 1 step, Max.: 255 step	• Throttle fully closed: 1 step • Throttle fully open: 255 step	Read the value with ignition switch ON (Do not start engine).
COMN RAIL PRESS	Common rail pressure status/ Min.: 0 MPa, Max.: 255 MPa	Idling: 30 to 40 MPa	—

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *	Diagnostic Note
AMBI TEMP SENS	Ambient temperature sensor status/ Min.: –40 °C, Max.: 215 °C	Actual atmosphere	If the value is ”–40 °C” or ”140 °C”, sensor circuit is open or shorted.
INJ VOL FB #1	Revised injection volume of the cylinder 1/ Min.: –10 mm^3, Max.: 40 mm^3	Idling: –3.0 to 3.0 mm^3	—
INJ VOL FB #2	Revised injection volume of the cylinder 2/ Min.: –10 mm^3, Max.: 40 mm^3	Idling: –3.0 to 3.0 mm^3	—
INJ VOL FB #3	Revised injection volume of the cylinder 3/ Min.: –10 mm^3, Max.: 40 mm^3	Idling: –3.0 to 3.0 mm^3	—
INJ VOL FB #4	Revised injection volume of the cylinder 4/ Min.: –10 mm^3, Max.: 40 mm^3	Idling: –3.0 to 3.0 mm^3	—
PUMP VCM ANGLE	Pump vacuum angle status/ Min.: 0 °CA, Max.: 255 °CA	Idling: 70 to 90˚CA	—
M–INJ/PILOT ON	M–INJ/PILOT ON/ Min.: 0 us, Max.: 65,535 us	Idling: 600 to 1,200 us	—
M–INJ/PILOT OFF	M–INJ/PILOT OFF/ Min.: 0 us, Max.: 65,535 us	Idling: 0 us	—
PILOT–INJ	Pilot–Injection/ Min.: 0 us, Max.: 65,535 us	Idling: 400 to 700 us	—
INJ FB VALUE	Injection volume feedback learning value/ Min.: –10 mm^3, Max.: 9,092 mm^3	Idling: –4.0 to 4.0 mm^3	—
STOP LIGHT SW	Stop light switch/ ON or OFF	• Brake pedal depressed: ON • Brake pedal released: OFF	—
STARTER SIG	Starter signal/ ON or OFF	Cranking: ON	—
A/C CUT SIG	A/C cut signal/ ON or OFF	A/C ON: OFF	—
EGR SYSTEM	EGR system status/ ON or OFF	Idling: ON	—
ACCEL OPEN SW	Accel open switch/ ON or OFF	Accelerator pedal fully opened: ON	—
CHECK MODE	Check mode/ ON or OFF	Check mode ON: ON	—
EGR STEP POS	EGR step position status/ Min: 0 step, Max: 125 step	Idling: 0 to 125 step	—

*: If no conditions are specifically stated for ”ldling”, it means the A/C switch is OFF and all accessory switches are OFF.

7. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the methods to shorten diagnostic time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST”

(g) According to the display on tester, perform the ”ACTIVE TEST”.

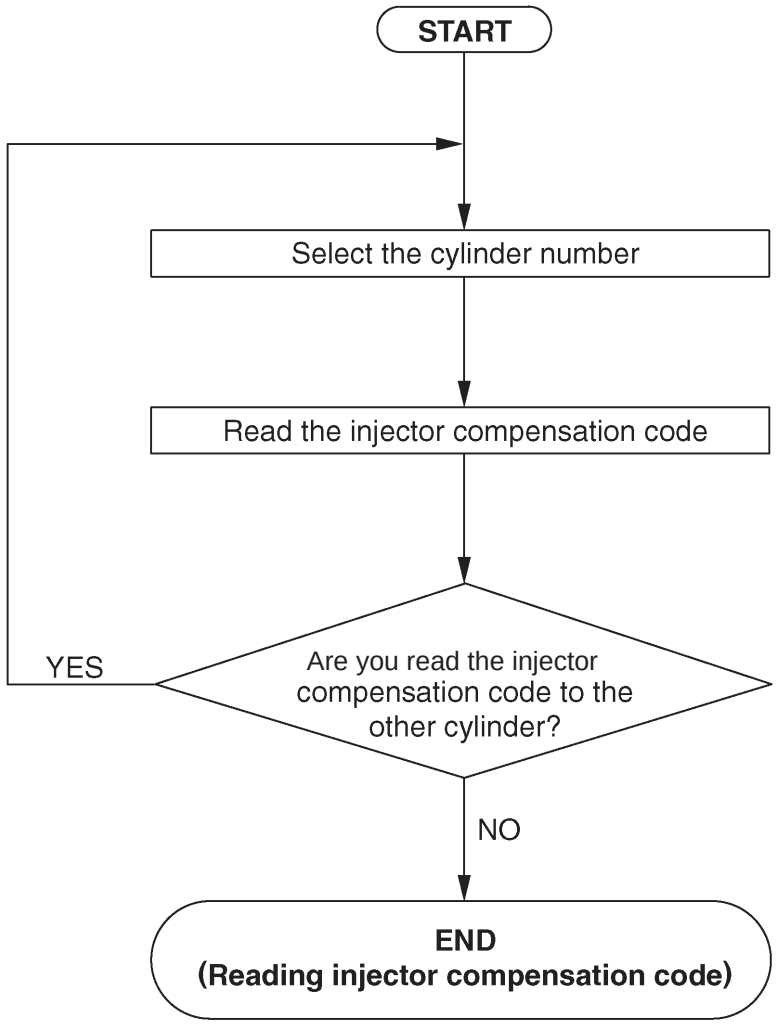
Hand–held Tester Display	Test Details	Diagnostic Note
EGR STEP POS	[Test Details] Change step of EGR motor Min: 0 step, Max: 125 step	—
TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	—
FUEL LEAK TEST	[Test Details] Fuel leak test ON or OFF	—
INJECTOR CUT #1	[Test Details] Injector cut #1 ON or OFF	—
INJECTOR CUT #2	[Test Details] Injector cut #2 ON or OFF	—
INJECTOR CUT #3	[Test Details] Injector cut #3 ON or OFF	—
INJECTOR CUT #4	[Test Details] Injector cut #4 ON or OFF	—

8. READ INJECTOR COMPENSATION CODE

HINT:

This operation is useful when confirming the compensation code of each injector or when DTC P1601 is present.

Reading flowchart:



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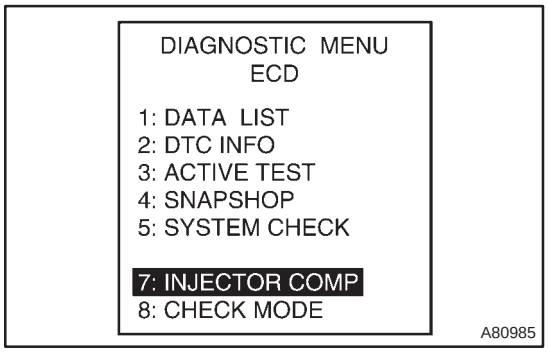
(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON.
(c) Turn the main switch of the hand–held tester ON.

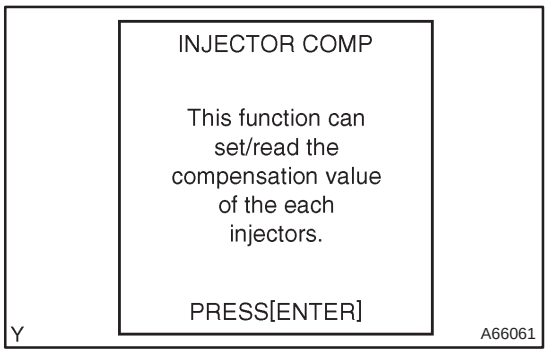
NOTICE:

Do not start the engine in this operation.

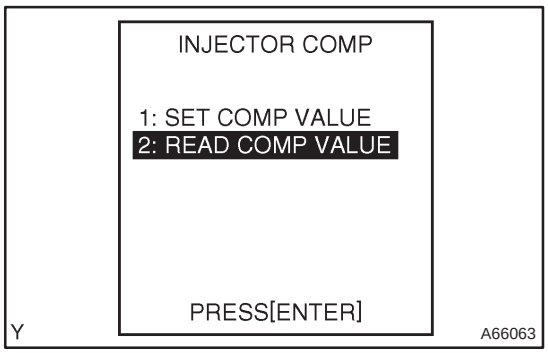


(d) Enter ”DIAGNOSIS / OBD/MOBD / DIAGNOSTIC MENU ECD” and select the item ”INJECTOR COMP.”

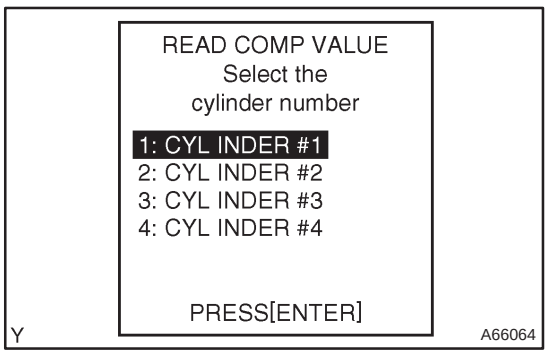
(e) Press the ”ENTER” button on the hand–held tester.



(f) Press the ”ENTER” button again.

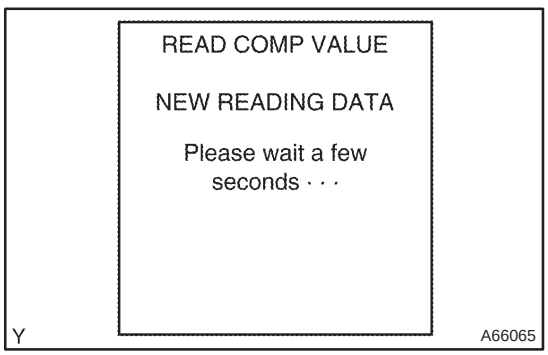


(g) Select ”READ COMP VALUE” and press the ”ENTER” button.

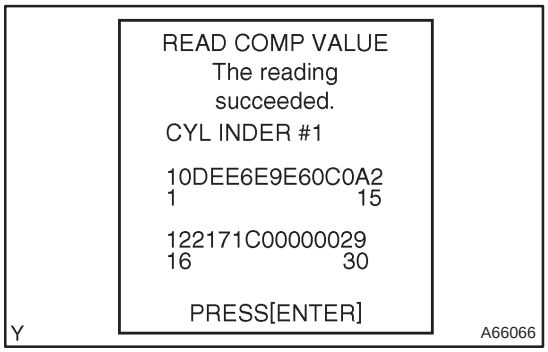


(h) Select a cylinder number which you want to read the compensation code.

(i) Press the ”ENTER” button.



(j) Wait until the next screen comes up.

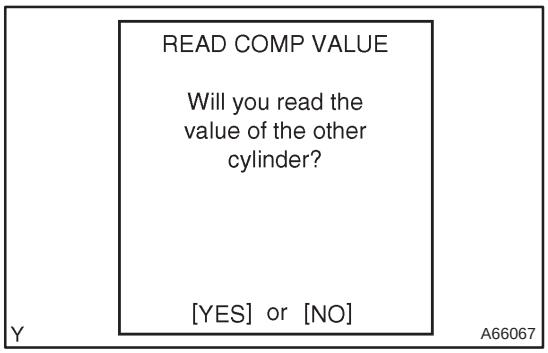


(k) Confirm the 30–digit–alphanumeric code which is displayed on the hand–held tester. This is the injection compensation code for the cylinder.

HINT:

The code shown in the illustration is an example.

(l) Press the ”ENTER” button to exit this screen.



(m) Press the ”NO” button to complete the confirmation.

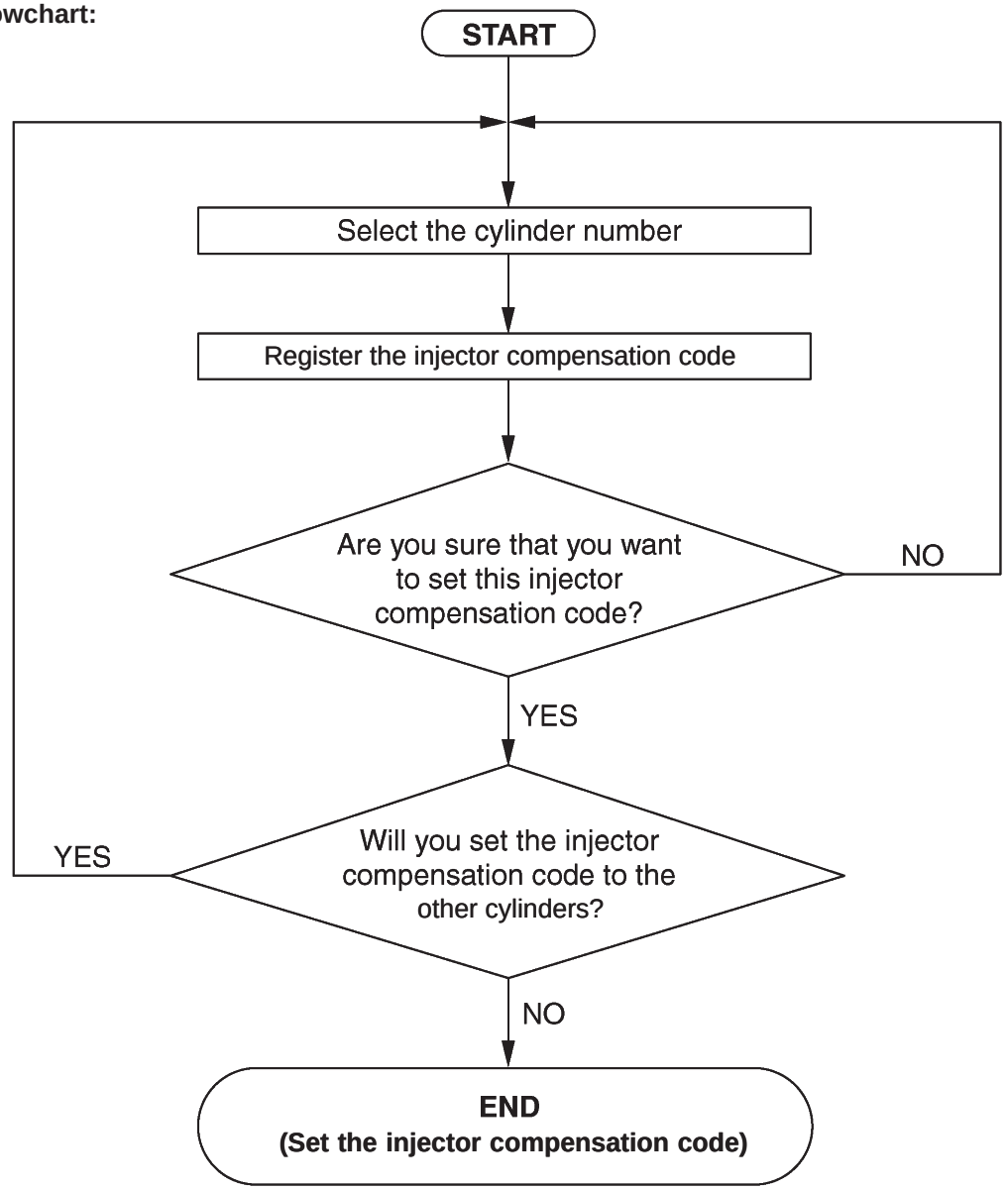
HINT:

- If you want to read other compensation codes for other cylinders, press the ”YES” button instead of ”NO.”
- By pressing the ”NO” button, the hand–held tester returns to the ”DIAGNOSTIC MENU ECD” screen.

9. SET INJECTOR COMPENSATION CODE

HINT:
This operation must be done when replacing the ECM or the injectors.

Setting flowchart:



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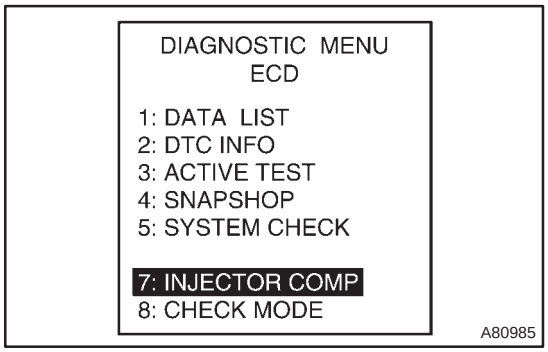
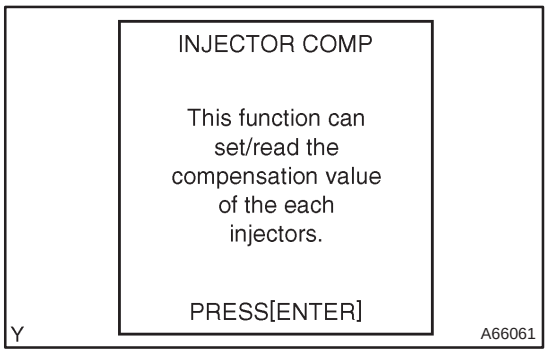
(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON.
(c) Turn the main switch of the hand–held tester ON.

NOTICE:
Do not start the engine in this operation.

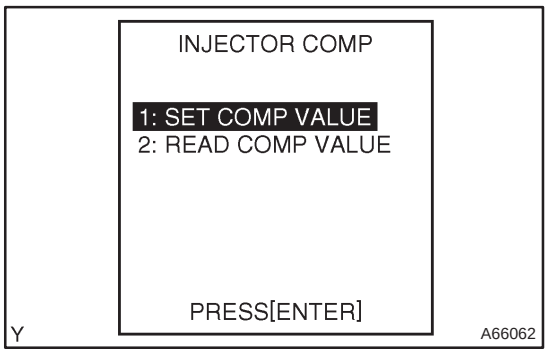


(d) Enter ”DIAGNOSIS / OBD/MOBD / DIAGNOSTIC MENU ECD” and select the item ”INJECTOR COMP.”

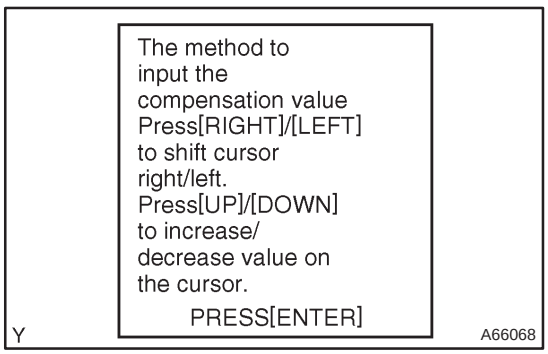
(e) Press the ”ENTER” button on the hand–held tester.



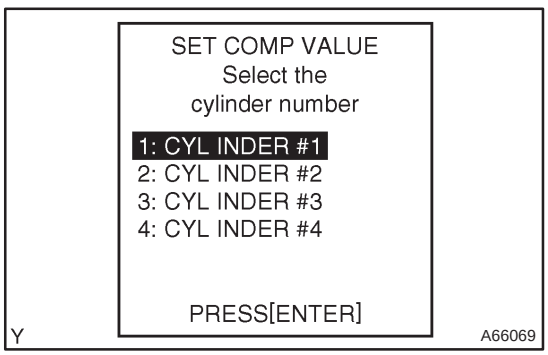
(f) Press the ”Enter” button again.



(g) Select ”SET COMP VALUE” and press the ”ENTER” button.

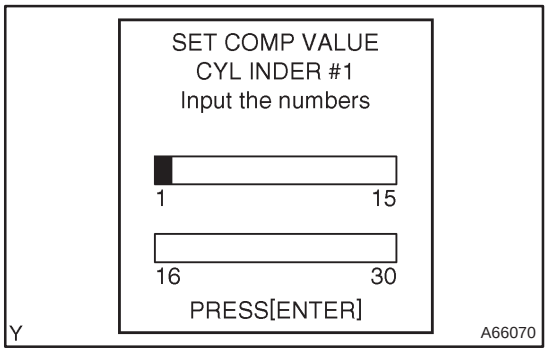


(h) Press the ”ENTER” button.



(i) Select a cylinder number which you want to register the compensation code.

(j) Press the ”ENTER” button.



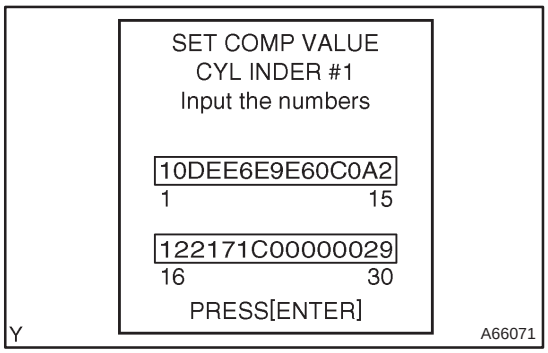
(k) Input the 30–digit–alphanumeric code with the hand–held tester to register the compensation code to the ECM.

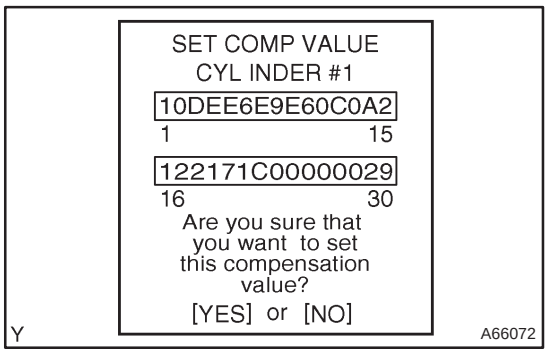
NOTICE:

Be careful not to register a wrong compensation code to the ECM. The compensation code which stored in the ECM must be consistent with the compensation code of the injector assembly. If a wrong code was set to the ECM, rough idling or engine rattling may result. In addition, it may be a cause of the engine failure or short–life.

(l) After inputting, press the ”ENTER” button.

(m) Press the ”ENTER” button again.





(n) Confirm the injection compensation code which is displayed on the hand–held tester.

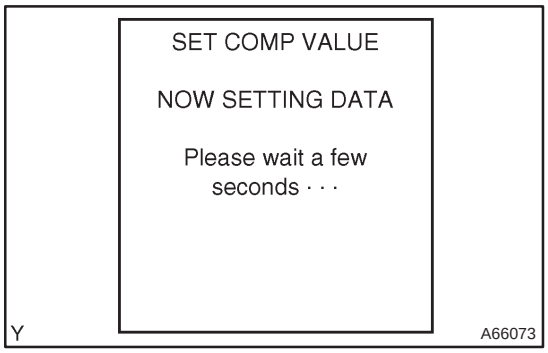
HINT:

The code shown in the illustration is an example.

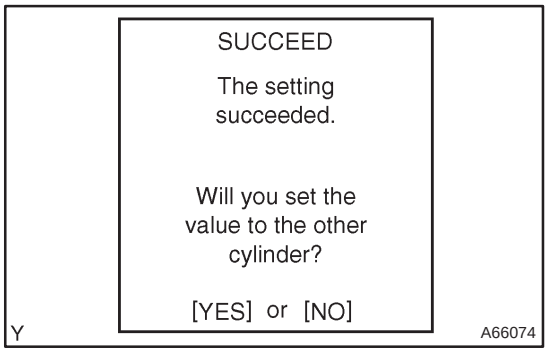
NOTICE:

- **Make sure the correct compensation code is entered on the hand–held tester before pressing YES button.**
- **If a wrong compensation code was entered on the hand–held tester, select the ”NO” button to correct the error (Back to step (g)).**

(o) Press the ”YES” button to set the code to the ECM.



(p) Wait until the next screen comes up.



(q) Press the ”NO” button to complete the registration.

HINT:

- If you want to register other compensation code for other cylinders, press the ”YES” button instead of ”NO.”
- By pressing the ”NO” button, the hand–held tester returns to the ”DIAGNOSTIC MENU ECD” screen.

BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	CHECK BATTERY VOLTAGE

NOTICE:

Carry out this check with the engine stopped and ignition switch OFF.

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → **CHARGE OR REPLACE BATTERY**

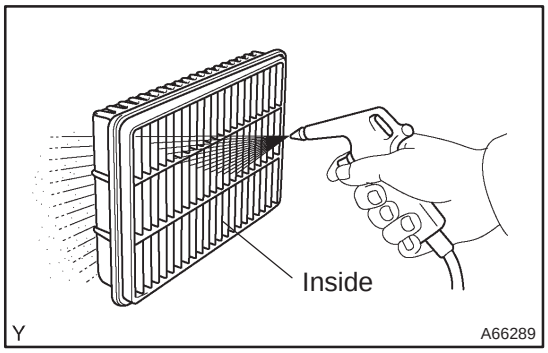
OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–551**

OK

3	CHECK AIR FILTER



(a) Visually check that the air filter is not excessively dirty or oily.

NOTICE:

If necessary, clean the filter with compressed air. First blow from the inside thoroughly, then blow from the outside of the filter.

NG → **CLEAN OR REPLACE**

OK

4	CHECK FUEL QUALITY

(a) Check that only diesel fuel is used
(b) Check that the fuel does not contain any impurity.

NG → REPLACE FUEL

OK

5	CHECK ENGINE OIL (See page 17–20)

NG → ADD OR REPLACE

OK

6	CHECK ENGINE COOLANT (See page 16–37)

NG → REPLACE ENGINE COOLANT (See page 16–44)

OK

7	CHECK IDLE SPEED AND MAXIMUM SPEED (See page 14–266)

NG → REPAIR OR REPLACE INJECTION PUMP (See page 11–69)

OK

8	CHECK DIAGNOSTIC CIRCUIT

NG → REPAIR OR REPLACE

OK

9	CHECK VACUUM PUMP

NG → REPAIR OR REPLACE VACUUM PUMP

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE (See page 05–551)

05CPA–01

PRECAUTION

1. **Since each injector has a characteristic fuel injecting behavior, the ECM compensates such behavior by adjusting an injection time for each injector to optimize the fuel injection volume. Compensating data for the optimum injection volume, which has converted into a 30–digit–alphanumeric value, has been imprinted on a head potion of the injector as the injection compensation code.**
2. **The injection compensation code will be required to register to the ECM when replacing the injectors or the ECM.**
3. **If an incorrect injection compensation value was registered to the ECM, the engine assembly may rattle or the engine idling may be rough. In addition, it may be a cause of the engine failure or short–life.**

054JF–04

PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed the DTC check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform troubleshooting according to the numbered order given in the table below.

Symptom	Suspect Area	See page
Does not crank (Difficult to start)	2. Starter 3. Starter relay 4. Engine coolant temperature sensor	19–22 19–22 10–56
Difficult to start with a cold engine	1. STA signal circuit 2. Injector 3. Fuel filter 4. Compression 5. ECM 6. Supply pump 7. Fuel pressure sensor 8. Diesel throttle 9. Glow plug system	05–691 11–56 11–82 14–266 10–56 10–56 10–56 10–56 10–56
Difficult to start with a warm engine	1. STA signal circuit 2. Injector 3. Fuel filter 4. Compression 5. ECM 6. Supply pump 7. Fuel pressure sensor 8. Diesel throttle	05–691 11–56 11–82 14–266 10–56 10–56 10–56 10–56
Engine stalls soon after starting	1. Fuel filter 2. Injector 3. ECM power source circuit 4. ECM 5. Supply pump 6. Fuel pressure sensor 7. Diesel throttle	11–82 11–56 05–686 10–56 10–56 10–56 10–56
Engine stalls (Other than conditions listed abobe)	1. ECM power source circuit 2. Injector 3. ECM 4. Supply pump 5. Fuel pressure sensor 6. Diesel throttle	05–686 11–56 10–56 10–56 10–56 10–56
Incorrect first idle (Poor idling)	1. Fuel filter 2. Injector 3. ECM 4. Supply pump 5. Fuel pressure sensor	11–82 11–56 10–56 10–56 10–56
High engine idle speed (Poor idling)	1. A/C signal circuit 2. Injector 3. STA signal circuit 4. ECM 5. Supply pump 6. Fuel pressure sensor	55–3 11–56 05–691 10–56 10–56 10–56

Lower engine idle speed (Poor idling)	1. A/C signal circuit 2. Injector 3. EGR system 4. Compression 5. Valve clearance 6. Fuel line (Air bleed) 7. ECM 8. Supply pump 9. Fuel pressure sensor 10. Diesel throttle	55–3 11–56 12–16 14–266 14–270 – 10–56 10–56 10–56 10–56
Rough idling (Poor idling)	1. Injector 2. Fuel line (Air bleed) 3. EGR system 4. Compression 5. Valve clearance 6. ECM 7. Supply pump 8. Fuel pressure sensor 9. Diesel throttle	11–56 – 12–16 14–266 14–270 10–56 10–56 10–56 10–56
Hunting at hot engine (Poor idling)	1. Injector 2. ECM power source circuit 3. Compression 4. Fuel line (Air bleed) 5. Valve clearance 6. ECM 7. Supply pump 8. Fuel pressure sensor 9. Diesel throttle	11–56 05–686 14–266 – 14–270 10–56 10–56 10–56 10–56
Hunting at cold engine (Poor idling)	1. Injector 2. ECM power source circuit 3. Compression 4. Fuel line (Air bleed) 5. Valve clearance 6. ECM 7. Supply pump 8. Fuel pressure sensor 9. Diesel throttle	11–56 05–686 14–266 – 14–270 10–56 10–56 10–56 10–56
Hesitation/ Poor acceleration (Poor driveability)	1. Injector 2. Fuel filter 3. EGR system 4. Compression 5. ECM 6. Supply pump 7. Fuel pressure sensor 8. Diesel throttle	11–56 11–82 12–16 14–266 10–56 10–56 10–56 10–56
Knocking (Poor driveability)	1. Injector 2. EGR system 3. ECM 4. Supply pump 5. Fuel pressure sensor	11–56 12–16 10–56 10–56 10–56
Black smoke (Poor driveability)	1. Injector 2. EGR system 3. ECM 4. Supply pump 5. Fuel pressure sensor 6. Diesel throttle	11–56 12–16 10–56 10–56 10–56 10–56

White smoke (Poor driveability)	1. EGR system 2. Injector 3. Fuel filter 4. ECM 5. Supply pump 6. Fuel pressure sensor 7. Diesel throttle	12–16 11–56 11–82 10–56 10–56 10–56 10–56
Surging/ Hunting (Poor driveability)	1. Injector 2. ECM 3. Supply pump 4. Fuel pressure sensor	11–56 10–56 10–56 10–56

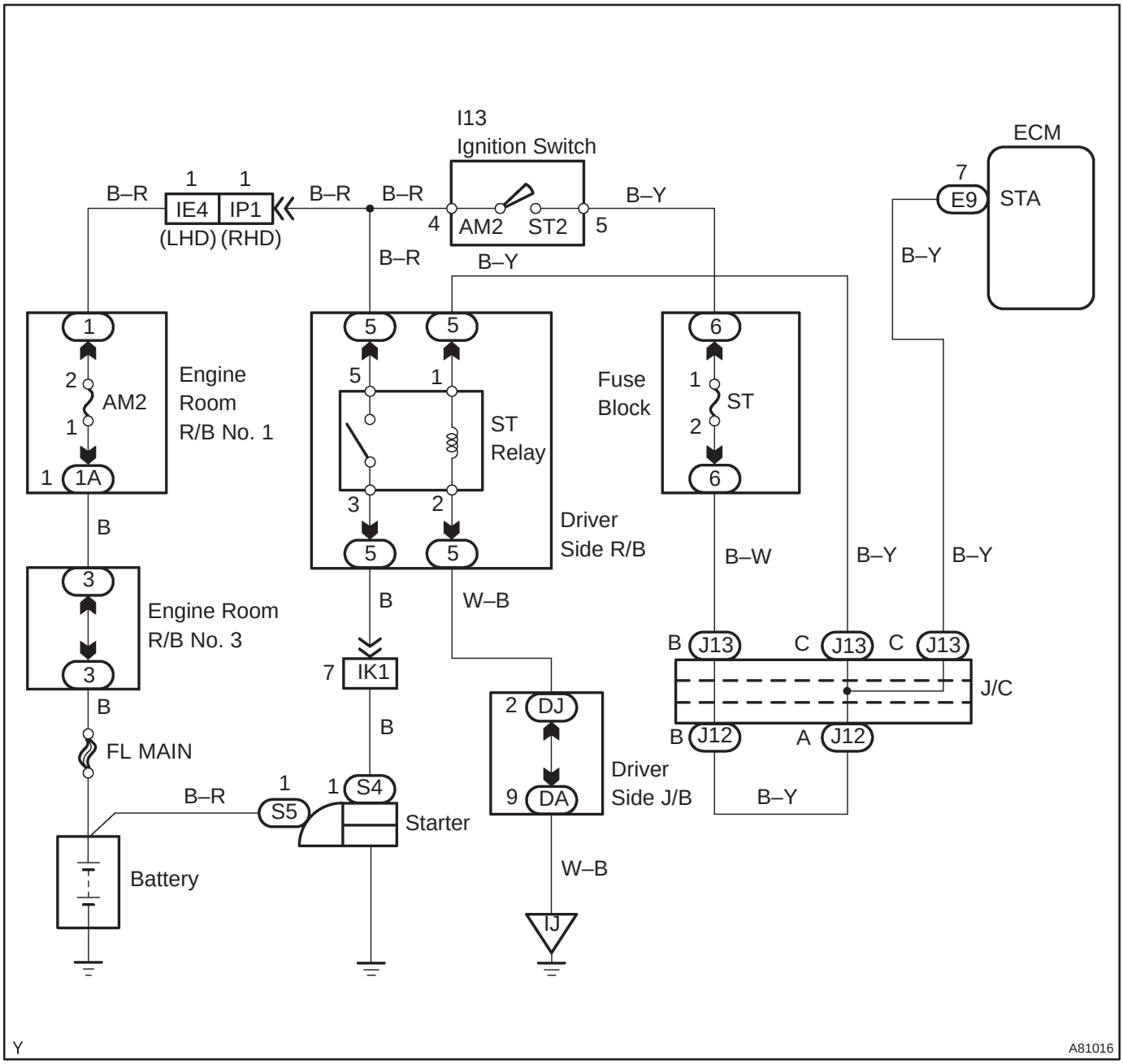
STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

HINT:

While the engine is being cranked, current flows from terminal ST2 of the ignition switch to the ST relay coil and also current flows to terminal STA of the ECM (STA signal).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

This chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05–551.

1	READ VALUE OF HAND–HELD TESTER(STA SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG” and read its value displayed on the hand–held tester.

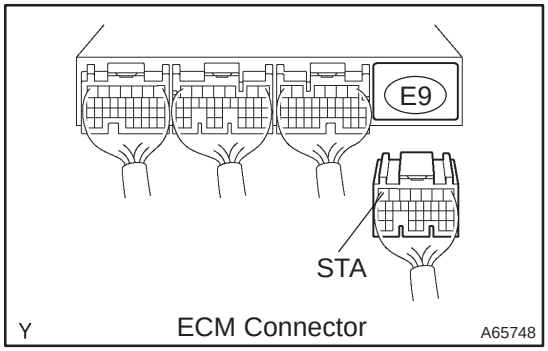
Standard:

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–551)**

NG

2 INSPECT HARNESS AND CONNECTOR(ECM – ST RELAY)



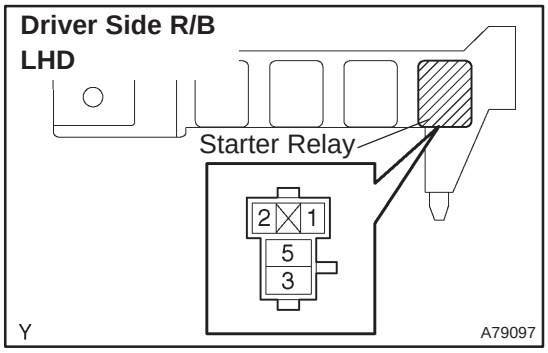
(a) Disconnect the E9 ECM connector.
(b) Remove the ST relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

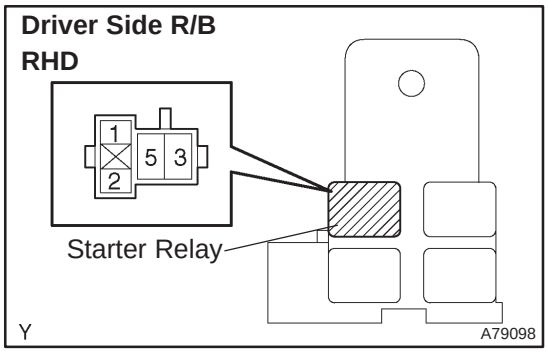
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
ST relay (1) – STA (E9–7)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
ST relay (1) or STA (E9–7) – Body ground	No continuity





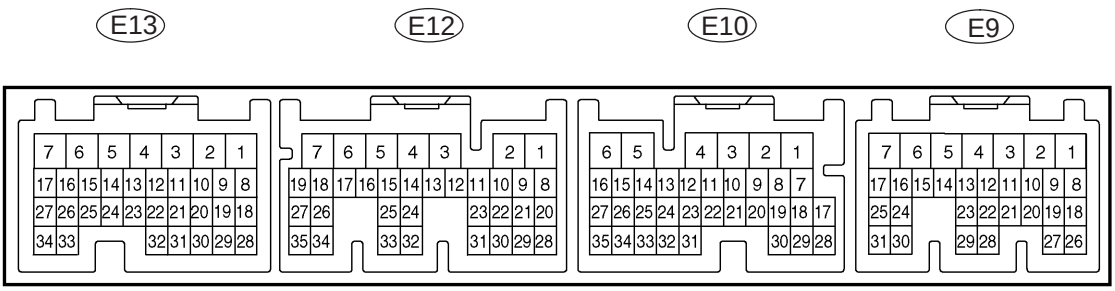
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

REPLACE ECM (See page 10–65)

054KK–04

TERMINALS OF ECM



Y

A66714

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E10–2) – E1 (E12–7)	B–Y – BR	Always	9 to 14
IGSW (E9–9) – E1 (E12–7)	B–W – BR	IG switch ON	9 to 14
+B (E9–1) – E1 (E12–7)	B–W – BR	IG switch ON	9 to 14
MREL (E9–8) – E1 (E12–7)	GR – BR	IG switch ON	9 to 14
		IG switch OFF	0 to 1.5
VC (E13–18) – E1 (E12–7)	R–W – BR	IG switch ON	4.5 to 5.5
VPA (E9–22) – EPA (E9–28)	G – Y	IG switch ON, accelerator pedal fully released	0.5 to 1.1
		IG switch ON, accelerator pedal fully depressed	3.0 to 4.6
VPA2 (E9–23) – EPA2 (E9–29)	W – Y	IG switch ON, accelerator pedal fully released	0.9 to 2.3
		IG switch ON, accelerator pedal fully depressed	3.4 to 5.0
VCPA (E9–26) – EPA (E9–28)	B – Y	IG switch ON	4.5 to 5.5
VCP2 (E9–27) – EPA2 (E9–29)	B – Y	IG switch ON	4.5 to 5.5
VG (E12–24) – EVG (E12–32)	G – L–Y	Idling	0.5 to 3.4
THA (E13–31) – E2 (E13–28)	G–R – BR	Idling, intake air temp. at 20 °C (68 °F)	0.5 to 3.4
THW (E13–19) – E2 (E13–28)	B–W – BR	Idling, engine coolant temp. at 80°C (176°F)	0.2 to 1.0
STA (E9–7) – E1 (E12–7)	B–Y – BR	Cranking	6.0 or more
#1 (E13–24) – E1 (E12–7) #2 (E13–23) – E1 (E12–7) #3 (E13–22) – E1 (E12–7) #4 (E13–21) – E1 (E12–7)	G–W – BR W–R – BR R–W – BR W–L – BR	Idling	Pulse generation (See page 05–604)
G1 (E12–23) – G– (E12–31)	P – L	Idling	Pulse generation (See page 05–616)
NE+ (E13–27) – NE– (E13–34)	G – R	Idling	Pulse generation (See page 05–616)
STP (E10–19) – E1 (E12–7)	G–W – BR	IG switch on, brake pedal is depressed	7.5 to 14
		IG switch on, brake pedal is released	0 to 1.5
ST1– (E10–12) – E1 (E12–7)	G–W – BR	Brake pedal is depressed	0 to 1.5
		Brake pedal is released	7.5 to 14
TC (E9–11) – E1 (E12–7)	W–L – BR	IG switch ON	9 to 14
W (E9–12) – E1 (E12–7)	W – BR	Idling	9 to 14
		IG switch ON	0 to 3
SP1 (E10–17) – E1 (E12–7)	V–W – BR	IG switch ON, rotate driving wheel slowly	Pulse generation (See page 05–640)
SIL (E9–18) – E1 (E12–7)	W–G – BR	Connect the hand–held tester to the DLC3	Pulse generation

PIM (E12–28) – E2 (E13–28)	W–R – BR	Applied negative pressure of 40 kPa (300 mmHg, 11.8 in. hg)	0.2 to 0.8
		Same as atmosphere	1.3 to 1.9
		Applied positive pressure of 69kPa (0.7 kg/cm^{3}, 10.0 psi)	3.2 to 3.8
IREL (E9–10) – E1 (E12–7)	Y – BR	IG switch OFF	9 to 14
		Idling	0 to 1.5
TACH (E9–5) – E1 (E12–7)	GR–R – BR	Idling	Pulse generation
VCS (E12–2) – E1 (E12–7)	R–W – BR	IG switch ON	4.5 to 5.5
GREL (E9–14) – E1 (E12–7)	R – BR	Cranking	9 to 14
		Idling	0 to 1.5
FAN (E9–3) – E1 (E12–7)	W – BR	Fan OFF	9 to 14
		Fan ON	0 to 1.5
THIA (E13–20) – E2 (E13–28)	GR – BR	Idling, intake air temp. at 80 °C (176 °F)	0.5 to 3.4
THF (E13–29) – E2 (E13–28)	L – BR	IG switch ON	0.5 to 3.4
PCR1 (E13–26) – E2 (E13–28)	P – BR	Idling	1.8 to 2.1
PCR2 (E13–33) – E2 (E13–28)	P–B – BR	Idling	1.2 to 1.5
ALT (E13–8) – E1 (E12–7)	B–L – BR	Idling	Pulse generation
RL (E12–9) – E1 (E12–7)	Y – BR	Idling	9 to 14
		IG switch ON	0 to 3
PCV+ (E13–2) – PCV– (E13–1)	LG–R – LG	Idling	Pulse generation (See page 05–563)
PRD (E13–32) – E1 (E12–7)	R–L – BR	IG switch OFF	4 to 6.5
INJF (E13–25) – E1 (E12–7)	R–B – BR	Idling	Pulse generation (See page 05–604)
EG+A (E12–6) – E1 (E12–7) EG–A (E12–5) – E1 (E12–7) EG+B (E12–4) – E1 (E12–7) EG–B (E12–3) – E1 (E12–7)	G – BR Y–G – BR R–L – BR G–B – BR	Idling	Pulse generation (See page 05–629)
LU+A (E13–15) – E1 (E12–7) LU–A (E13–14) – E1 (E12–7) LU+B (E13–13) – E1 (E12–7) LU–B (E13–12) – E1 (E12–7)	B – BR G – BR Y – BR L – BR	Racing	Pulse generation (See page 05–633)
THOP (E13–11) – E1 (E12–7)	P–L – BR	Idling	9 to 14
		IG switch ON	0 to 3
VN (E13–10) – E1 (E12–7)	W – BR	IG switch ON	Pulse generation (See page 05–554)

0567O–10

CUSTOMER PROBLEM ANALYSIS CHECK

Transmission Control System Check Sheet	Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move (☐ Any range ☐ Particular range)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)
	☐ No down–shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ No up–shift (S range)
	☐ No down–shift (S range)
	☐ Lock–up malfunction
	☐ Shift point too high or too low
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive range)
	☐ Slip or shudder
	☐ No kick–down
	☐ Others ( )

Check Item	MIL	☐ Normal ☐ Remains ON

DTC Check	1st Time	☐ Normal code ☐ Malfunction code (DTC)
	2nd Time	☐ Normal code ☐ Malfunction code (DTC)

0567Q–08

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.

*1 : – ... MIL does not light /● ... MIL light up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *	Memory
P0500/42 (05–240)	Vehicle Speed Sensor ”A”	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	●	○
P0710/38 (05–882)	Transmission Fluid Temperature Sensor ”A” Circuit	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM	●	○
P0712/38 (05–882)	Transmission Fluid Temperature Sensor ”A” Circuit Low Input		●	○
P0713/38 (05–882)	Transmission Fluid Temperature Sensor ”A” Circuit High Input		●	○
P0717/37 (05–884)	Turbine Speed Sensor Circuit No Signal	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transaxle assembly	●	○
P0748/62 (05–886)	Pressure Control Solenoid ”A” Electrical (Shift Solenoid Valve SL1)	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM	●	○
P0778/63 (05–886)	Pressure Control Solenoid ”B” Electrical (Shift Solenoid Valve SL2)	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM	●	○
P0793/67 (05–892)	Intermediate Shaft Speed Sensor ”A”	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM	●	○
P0982/65 (05–886)	Shift Solenoid ”D” Control Circuit Low (Shift Solenoid Valve S4)	• Open or short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM	●	○
P0983/65 (05–886)	Shift Solenoid ”D” Control Circuit High (Shift Solenoid Valve S4)		●	○
P2716/77 (05–894)	Pressure Contorl Solenoid ”D” Electrical (Shift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	–	○
P2769/64 (05–897)	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL)	• Open or short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM	–	○
P2770/64 (05–897)	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL)		–	○

ELECTRONIC CONTROLLED AUTOMATIC TRANSAXLE [ECT] (U241E(1AZ–FE))

0567N–11

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

The ECM of this system is connected to the multiplex communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the multiplex communication system.

When using hand–held tester, troubleshoot in accordance with the procedure on the following pages.

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–862)

3	Connect the hand–held tester to DLC3

4	Check and Clear DTC and Freeze Frame Data (See page 05–863)

5	Visual Inspection

6	Setting the Check Mode Diagnosis (See page 05–863)

7	Problem Symptom Confirmation

- Symptom does not occur: Go to step 8
- Symptom occur: Go to step 9

8	Symptom Simulation (See page 01–22)

9	DTC Check (See page 05–863)

DTC is not output: Go to step 10

DTC is output: Go to step 17

10	Basic Inspection (See page 40–2, 40–8 and 40–69)

NG: Go to step 19

OK

11	Mechanical System Test (See page 05–863)

NG: Go to step 16

OK

12	Manual Shifting Test (See page 05–863)

NG: Go to step 14

OK

13	Problem Symptoms Table Chapter 1 (See page 05–879)

NG: Go to step 18

OK

14	Problem Symptoms Table Chapter 2 (See page 05–879)

NG: Go to step 16

OK

15	Problem Symptoms Table Chapter 3 (See page 05–879)

NG

16	Part Inspection

Go to step 19

17	DTC Chart (See page 05–876)

18	Circuit Inspection (See page 05–882)

19	Identification of Problem

20	Repair

21	Confirmation Test

End

When not using hand–held tester, troubleshoot in accordance with the procedure on the following pages.

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–862)

3	Check and Clear DTCs (See page 05–863)

4	Problem Symptom Confirmation

Symptom does not occur: Go to step 5

Symptom occur: Go to step 6

5	Symptom Simulation (See page 01–22)

6	DTC Check (See page 05–863)

DTC is not output: Go to step 7

DTC is output: Go to step 14

7	Basic Inspection (See page 40–2, 40–8 and 40–69)

NG → Go to step 16

OK

8	Mechanical System Test (See page 05–863)

NG → Go to step 13

OK

9	Manual Shifting Test (See page 05–863)

NG → Go to step 11

OK

10	Problem Symptoms Table Chapter 1 (See page 05–879)

NG → Go to step 15

OK

11	Problem Symptoms Table Chapter 2 (See page 05–879)

NG → Go to step 13

OK

12	Problem Symptoms Table Chapter 3 (See page 05–879)

NG

13	Part Inspection

Go to step 16

14	DTC Chart (See page 05–876)

15	Circuit Inspection (See page 05–882)

16	Identification of Problem

17	Repair

18	Confirmation Test

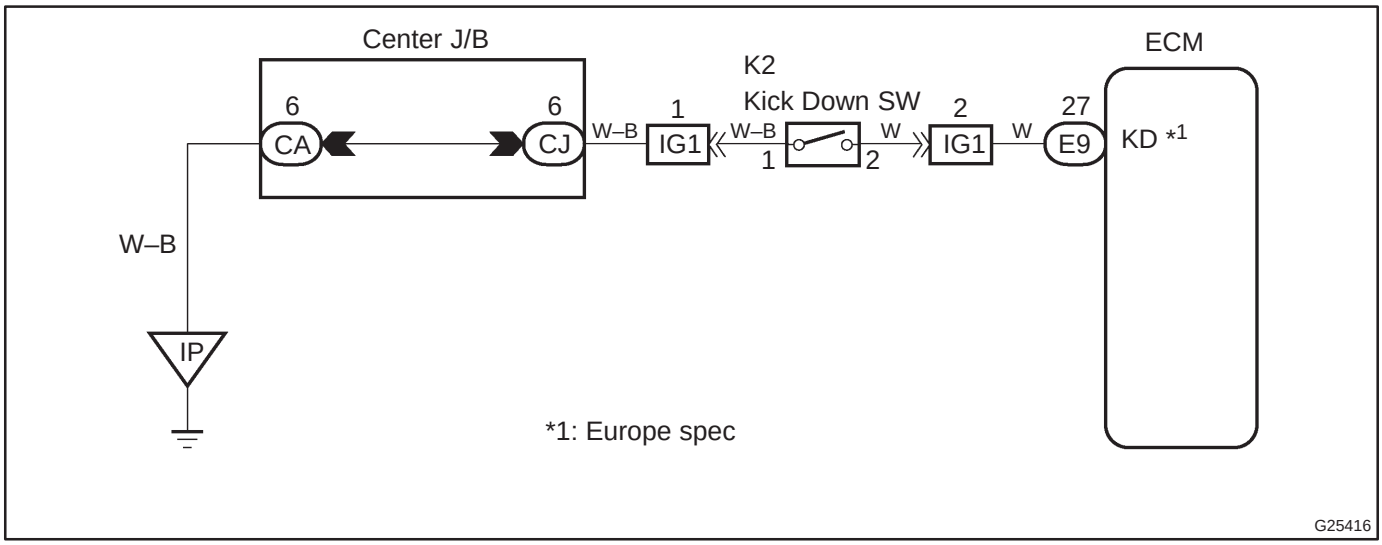
End

KICK DOWN SWITCH CIRCUIT

CIRCUIT DESCRIPTION

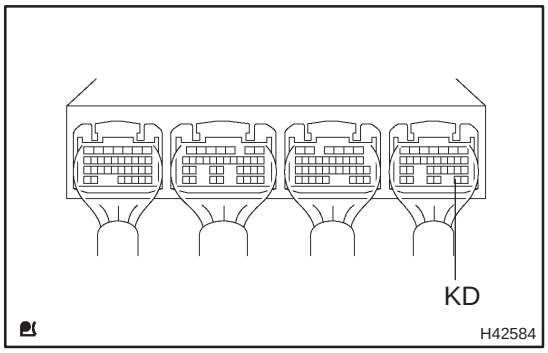
The kick–down switch is turned ON when the accelerator pedal is depressed to the full throttle and sends signals to ECM.
When the kick–down switch is turned ON, the ECM controls gear shifting according to the programmed shift diagrams.
If a short circuit develops in the kick–down switch, the ECM disregards the kick–down signals and controls shifting at the normal shift points.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TERMINAL VOLTAGE



(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminal KD of ECM and body ground when accelerator pedal is fully depressed or not.

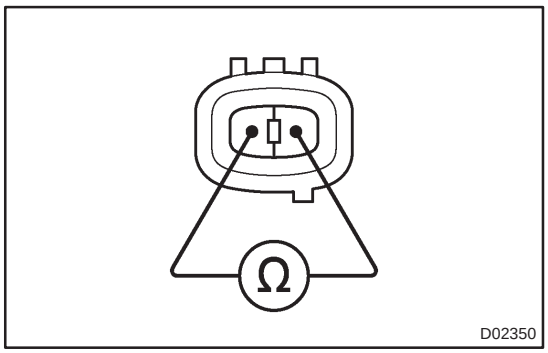
OK:

Accelerator pedal	Voltage
Fully depressed (Kick–down switch is ON)	Below 1 V
Released (Kick–down switch is OFF)	10 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2 INSPECT KICK DOWN SWITCH



(a) Disconnect the kick–down switch connector.
(b) Measure the continuity between terminals of the kick–down switch connector when kick–down switch is ON and OFF.

OK:

Kick–down switch	Continuity
ON	Continuity
OFF	No continuity

NG → **REPLACE KICK DOWN SWITCH**

OK

3 CHECK HARNESS AND CONNECTOR

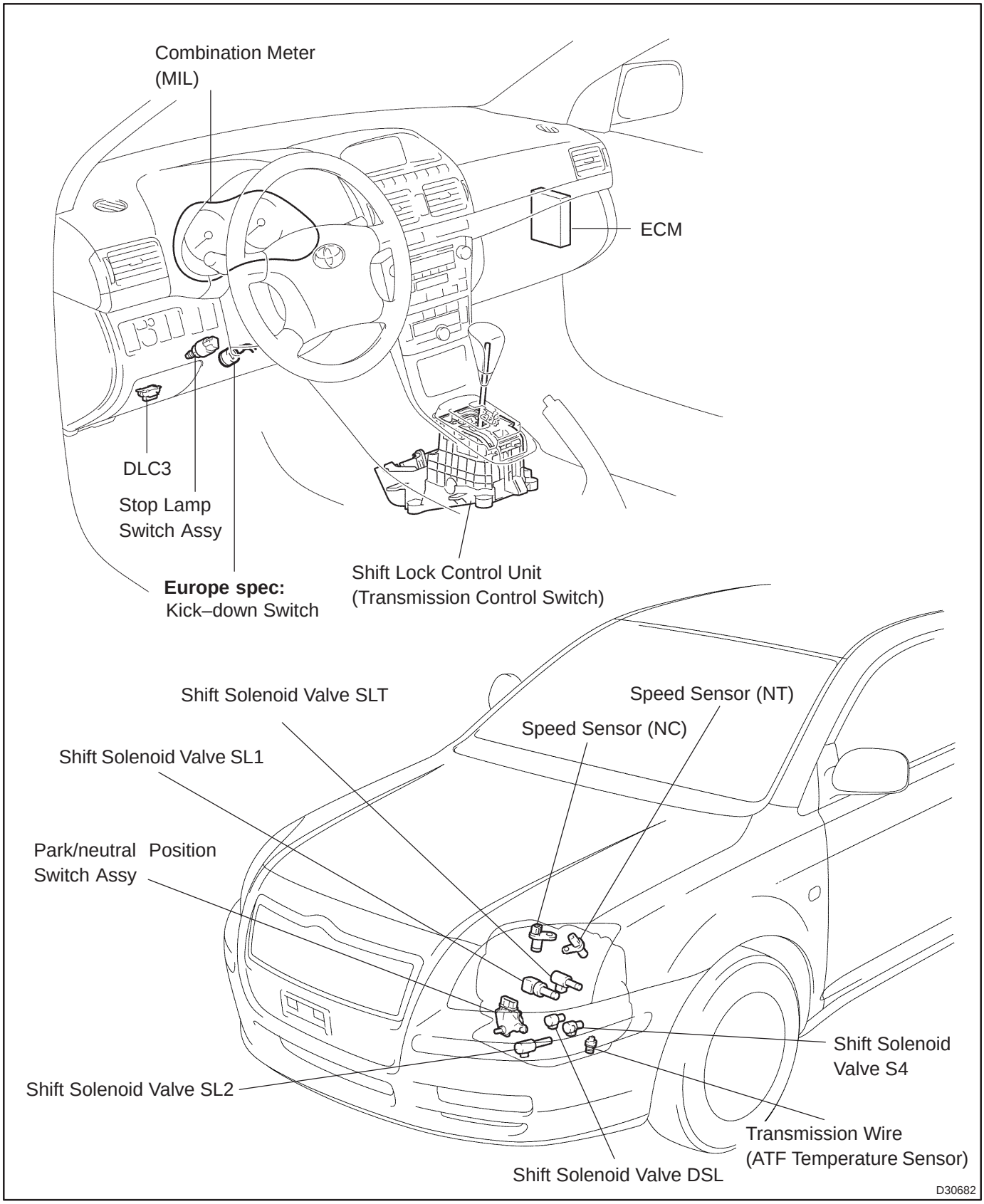
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

0567R–11

LOCATION



DTC	P0710/38	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT

DTC	P0712/38	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT LOW INPUT

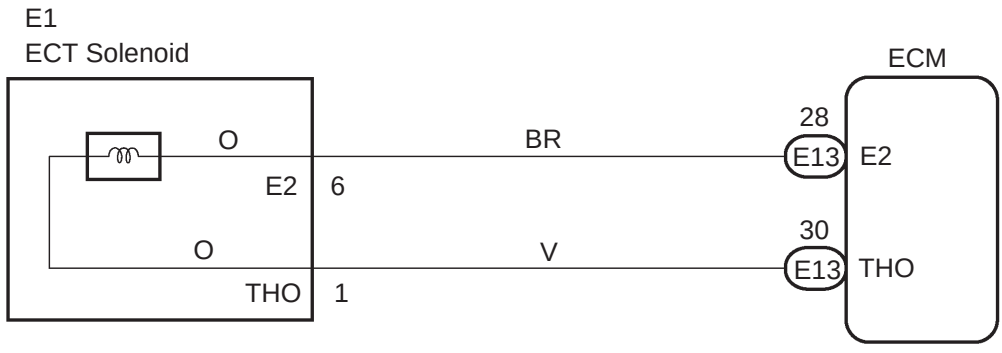
DTC	P0713/38	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0710/38	(a) and (b) is detected momentary within 0.5 sec. when neither P0712 or P0713 is not detected (1–trip detection logic) (a) ATF temperature sensor resistance is less than 79 Ω. (b) ATF temperature sensor resistance is more than 156 kΩ. HINT: Wthin 0.5 sec. the malfunction switches from (a) to (b) or from (b) to (a)	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM
P0712/38	ATF temperature sensor resistance is less than 79 Ω. for 0.5 sec. or more (1–trip detection logic)	
P0713/38	DTC is detected for 0.5 sec. or more (1–trip detection logic) ATF temperature sensor resistance is more than 156 kΩ. after started engine for 15 minutes or more	

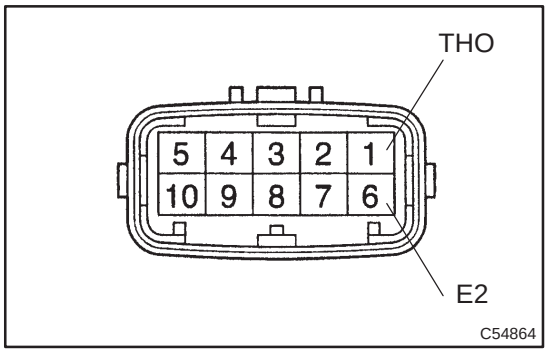
WIRING DIAGRAM



D26545

INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



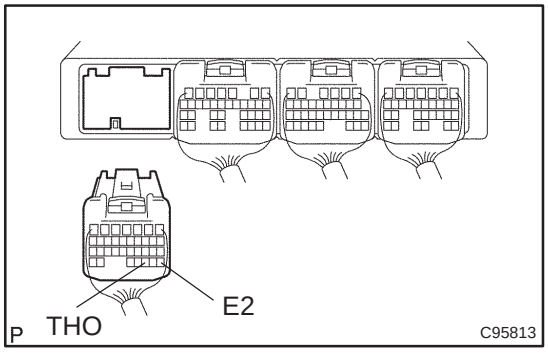
(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminals THO and E2.
OK:
Resistance: 79 Ω to 156 kΩ
(c) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals THO and E2.
OK:
Resistance: 79 Ω to 156 kΩ
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

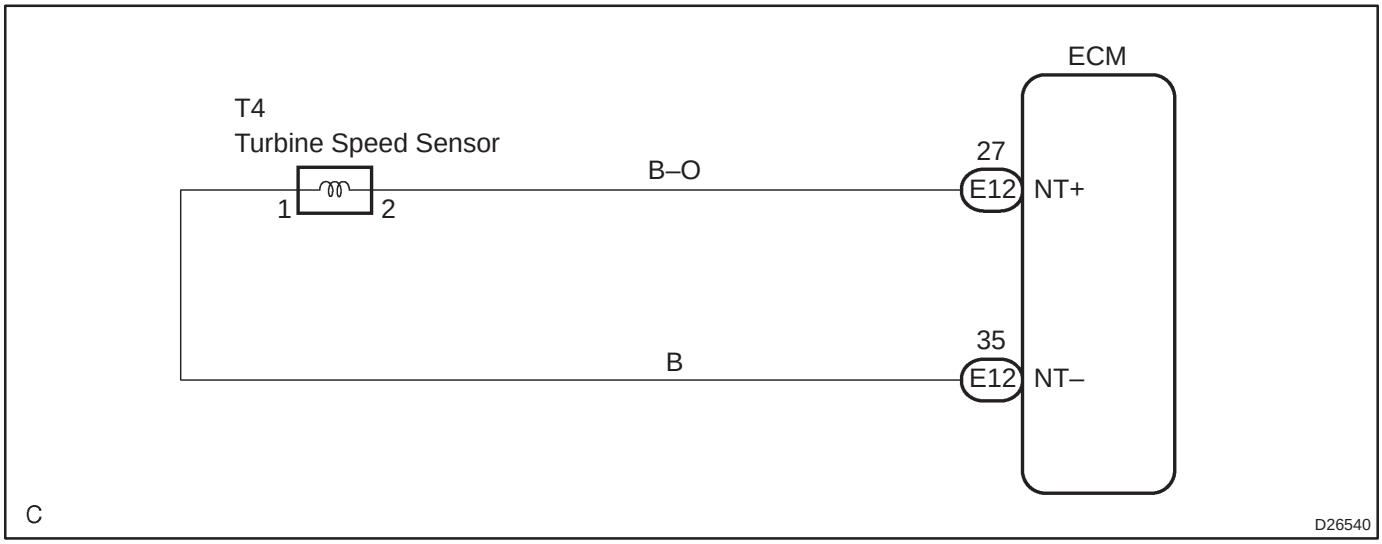
DTC	P0717/37	TURBINE SPEED SENSOR CIRCUIT NO SIGNAL

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the input turbine. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (NC), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

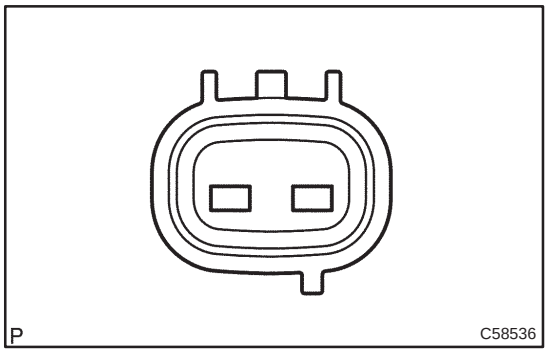
DTC No.	DTC Detection Condition	Trouble Area
P0717/37	ECM detects conditions (a), (b), (c) and (d) continuity for 5 sec. or more: (2 trip detection logic) (a) Vehicle speed: 50 km/h (20 mph) or more (b) 2nd, 3rd or O/D gear (c) Solenoid valves and park/neutral position switch are normal (d) NT < 300 rpm	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(NT)

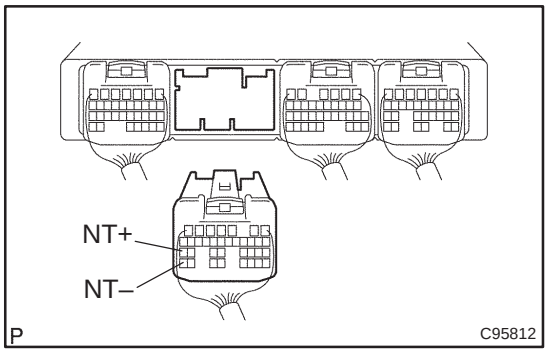


(a) Disconnect the speed sensor connector from the transaxle.
(b) Measure the resistance between terminals of speed sensor.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)

NG → **REPLACE SPEED SENSOR(NT)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



(a) Connect the speed sensor connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NT+ and NT–.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)
(d) Measure the resistance between body ground and that NT+ as well as NT– of the ECM connector.
OK:
Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0748/62	PRESSURE CONTROL SOLENOID ”A” ELECTRICAL (SHIFT SOLENOID VALVE SL1)

DTC	P0778/63	PRESSURE CONTROL SOLENOID ”B” ELECTRICAL (SHIFT SOLENOID VALVE SL2)

DTC	P0982/65	SHIFT SOLENOID ”D” CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE S4)

DTC	P0983/65	SHIFT SOLENOID ”D” CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE S4)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF operation of the shift solenoid valves SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

DTC No.	DTC Detection Condition	Trouble Area
P0748/62	ECM checks for an open or short circuit in shift solenoid valves SL1 (1–trip detection logic) (a) When solenoid is energized, duty ratio exceeds 75% (b) When solenoid is not energized, duty ratio is less than 3%	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM
P0778/63	ECM checks for an open or short circuit in shift solenoid valves SL2 (1–trip detection logic) (a) When solenoid is energized, duty ratio exceeds 75% (b) When solenoid is not energized, duty ratio is less than 3%	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM
P0982/65	ECM detects short in solenoid valve S4 circuit 4 times when solenoid valve S4 is operated (1–trip detection logic)	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983/65	ECM detects open in solenoid valve S4 circuit 4 times when solenoid valve S4 is not operated (1–trip detection logic)	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

HINT:

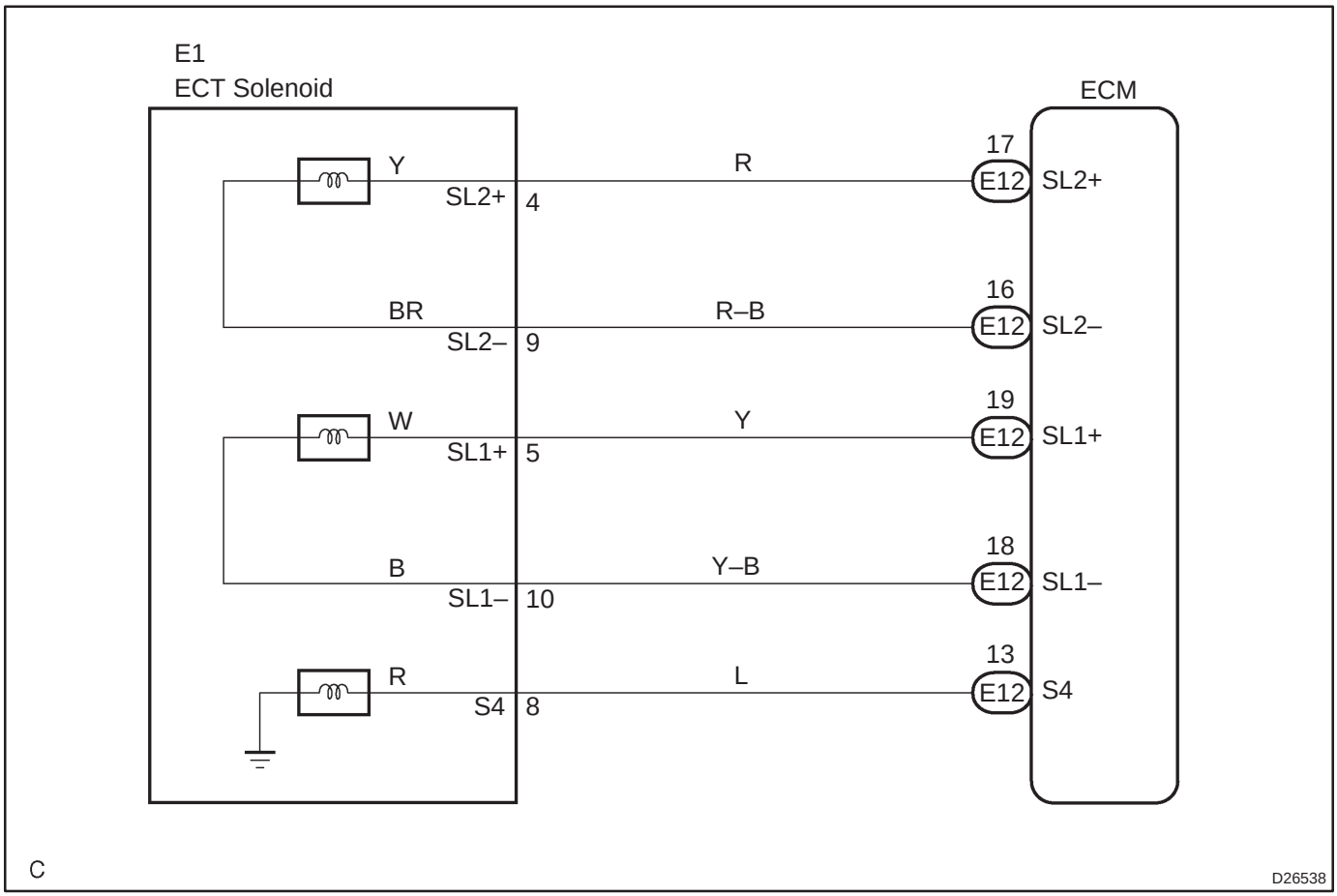
Check the shift solenoid valve SL1 when DTC P0748/62 is output, check the shift solenoid valve SL2 when DTC P0778/63 is output and check the shift solenoid valve S4 when DTC P0982/65 and P0983/65 is output.

Fail safe function:
If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid ON and OFF in order to shift into the gear positions shown in the table below. The ECM also turns the shift solenoid valve SL OFF at the same time. If both solenoids malfunction, hydraulic control cannot be performed electronically, and so it must be done manually.
Manual shifting as shown in the following table must be done (In case of a short circuit, the ECM stops sending the current to the short circuit solenoid).

NORMAL				SHIFT SOLENOID SL1 MALFUNCTIONING				SHIFT SOLENOID SL2 MALFUNCTIONING				SHIFT SOLENOID S4 MALFUNCTIONING			
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
ON	ON	OFF	1st	X	ON	OFF	2nd	ON ↓ OFF	X	OFF	3rd	ON	ON	X	1st
OFF	ON	OFF	2nd	X	ON	OFF	2nd	OFF	X	OFF	3rd	OFF	ON	X	2nd
OFF	OFF	OFF	3rd	X	OFF ↓ ON	OFF ↓ ON	3rd	OFF	X	OFF	3rd	OFF	OFF	X	3rd
OFF	OFF	ON	O/D	X	OFF ↓ ON	ON	3rd	OFF	X	ON	O/D	OFF	OFF	X	3rd

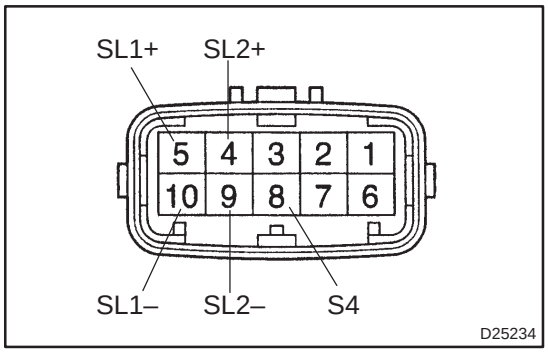
SHIFT SOLENOID SL1 AND SL2 MALFUNCTIONING				SHIFT SOLENOID SL1 AND S4 MALFUNCTIONING				SHIFT SOLENOID SL2 AND S4 MALFUNCTIONING				SHIFT SOLENOID SL1, SL2 AND S4 MALFUNCTIONING			
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
X	X	OFF	3rd	X	ON	X	2nd	ON ↓ OFF	X	X	3rd	X	X	X	3rd
X	X	OFF	3rd	X	ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd
X	X	OFF	3rd	X	OFF ↓ ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd
X	X	ON	O/D	X	OFF ↓ ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SL1/SL2/S4)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals SLT1+ and SL1– of the transmission wire connector.

OK:

Resistance: 5.0 to 5.6 Ω at 20°C (68°F)

(c) Measure the resistance between body ground and that SL1+ as well as SL1– of the transmission wire connector.

OK:

Resistance: 1MΩ or higher

NG	Go to step 3

(d) Measure the resistance between terminals SL2+ and SL2–.

OK:

Resistance: 5.1 to 5.5 Ω at 20°C (68°F)

(e) Measure the resistance between body ground and that SL2+ as well as SL2– of the transmission wire connector.

OK:

Resistance: 1MΩ or higher

NG	Go to step 4

(f) Measure the resistance between terminal S4 of the transmission wire connector and body ground.

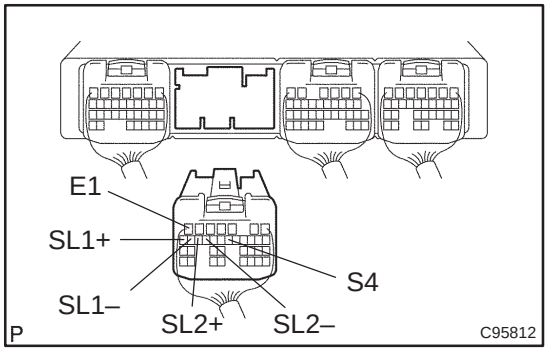
OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

NG	Go to step 5

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



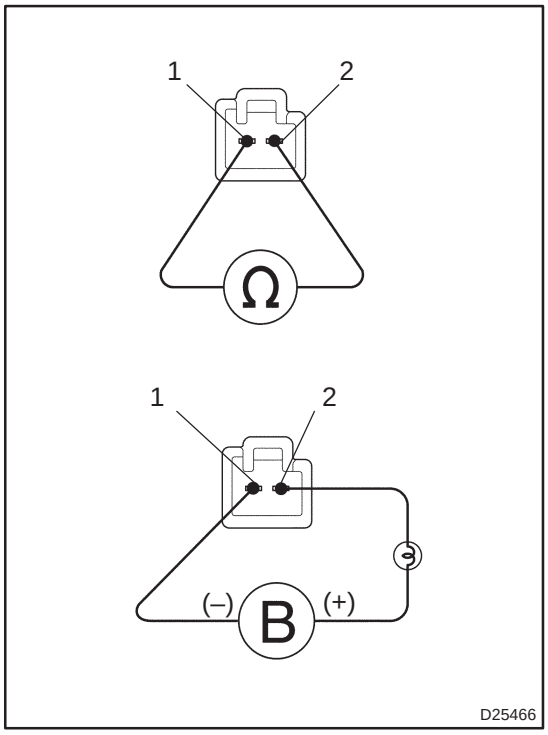
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the connector from the ECM.
(c) Measure the resistance between terminals.
OK:
Resistance:
SL1+ – SL1–: 5.0 to 5.6 Ω at 20°C (68°F)
SL2+ – SL2–: 5.1 to 5.5 Ω at 20°C (68°F)
S4 – E1: 11 to 15 Ω at 20°C (68°F)
(d) Measure the resistance between terminals SL1+, SL1–, SL2+ and SL2– of the ECM connector and body ground.
OK:
Resistance: 1MΩ or higher

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(SL1)



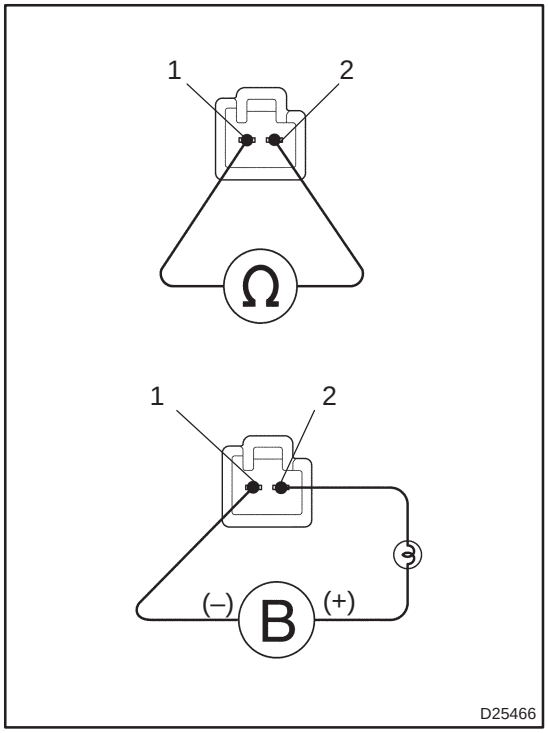
(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance between terminals of the shift solenoid valve SL1.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG	REPLACE SHIFT SOLENOID VALVE(SL1)

OK

REPAIR OR REPLACE TRANSMISSION WIRE

4 INSPECT SHIFT SOLENOID VALVE(SL2)



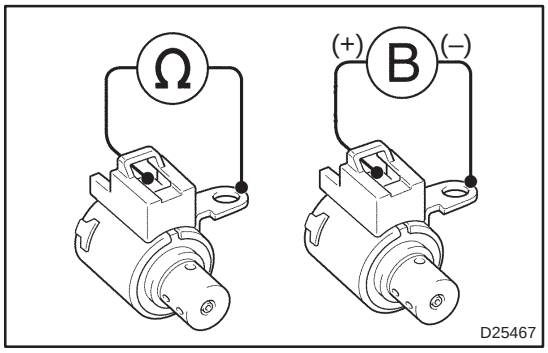
(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance between terminals of the shift solenoid valve SL2.
OK:
Resistance: 5.1 to 5.5 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL2)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

5 INSPECT SHIFT SOLENOID VALVE(S4)



(a) Remove the shift solenoid valve S4.
(b) Measure the resistance between the solenoid connector and the solenoid body.
OK:
Resistance: 11 to 15 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid body.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(S4)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

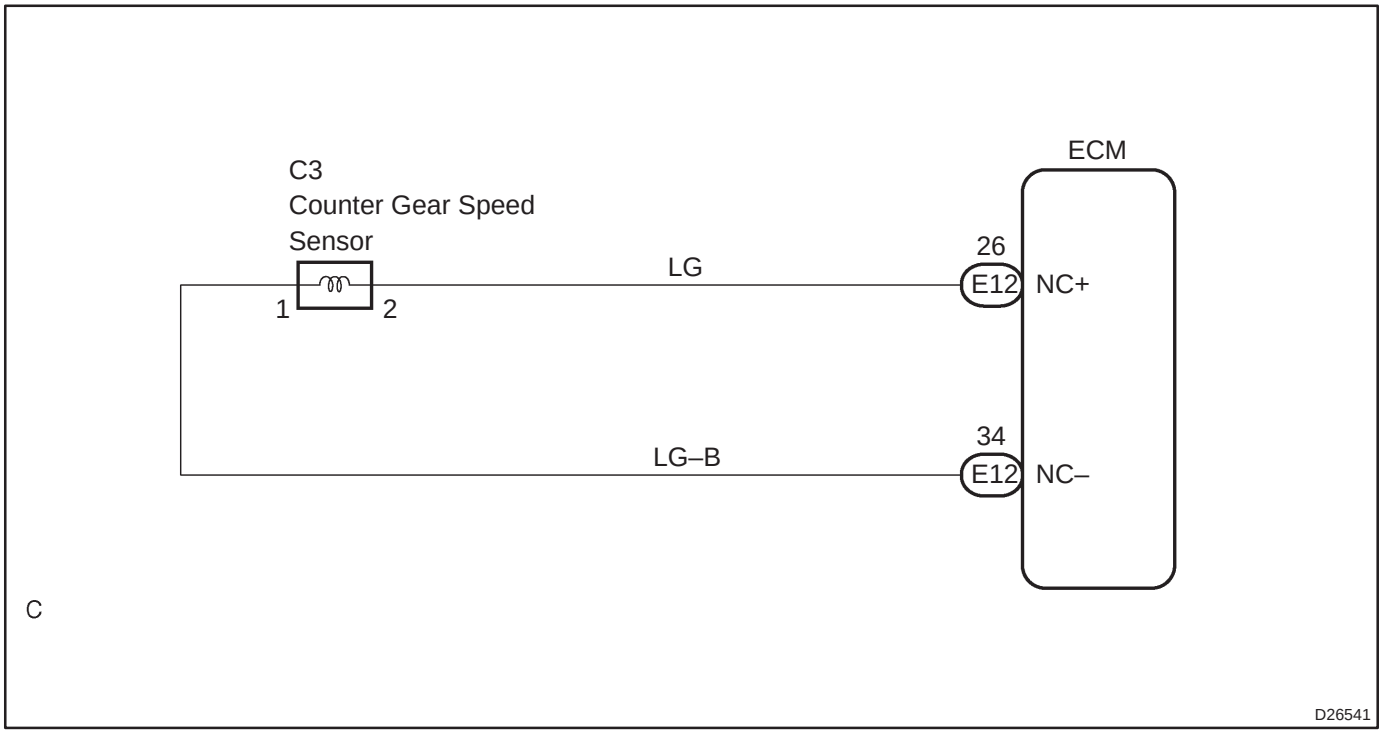
DTC	P0793/67	INTERMEDIATE SHAFT SPEED SENSOR ”A”

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the counter gear. By comparing the counter gear speed signal (NC) with the direct clutch speed sensor signal (NT), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

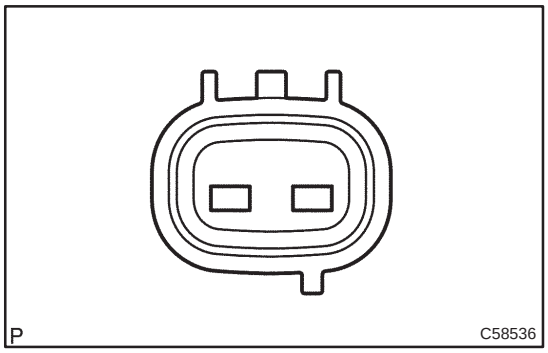
DTC No.	DTC Detection Condition	Trouble Area
P0793/67	ECM detects conditions (a), (b), (c) and (d) continuity for 5 sec. or more: (2 trip detection logic) (a) Vehicle speed: 50 km/h (20 mph) or more (b) 2nd, 3rd or O/D gear (c) Solenoid valves and park/neutral position switch are normal (d) NC < 300 rpm	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(NC)

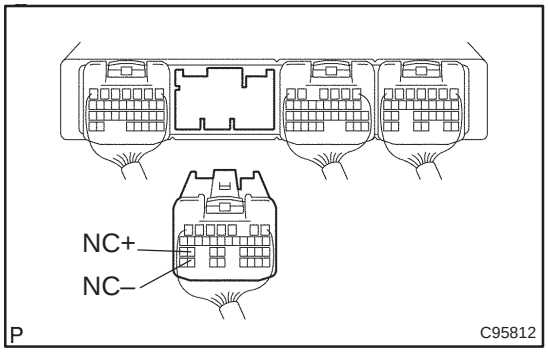


(a) Disconnect the speed sensor (NC) connector from the transaxle.
(b) Measure the resistance between terminals of speed sensor.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)

NG → **REPLACE SPEED SENSOR(NC)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



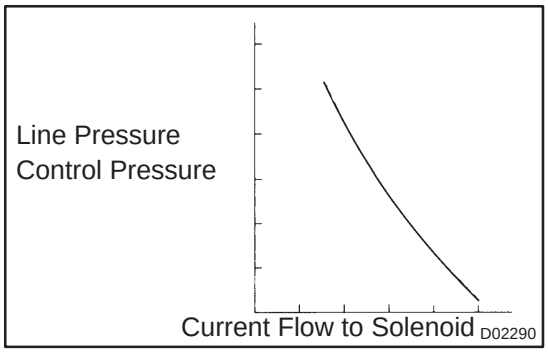
(a) Connect the speed sensor (NC) connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NC+ and NC– of the ECM connector.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)
(d) Measure the resistance between body ground and that NC+ as well as NC– of the ECM connector.
OK:
Resistance: 1MΩ or higher

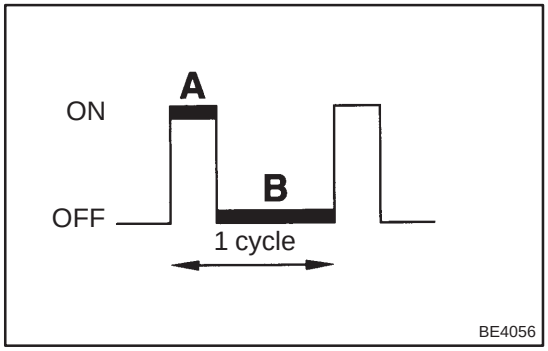
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P2716/77	PRESSURE CONTROL SOLENOID ”D” ELECTRICAL (SHIFT SOLENOID SLT)





CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates the line pressure) causes the solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate the line pressure according to the extent of the accelerator pedal depressed or the output of engine power.

This controls the line pressure and provides smooth shifting.

Upon receiving a signal of the throttle valve opening angle, the ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure and generating throttle pressure.

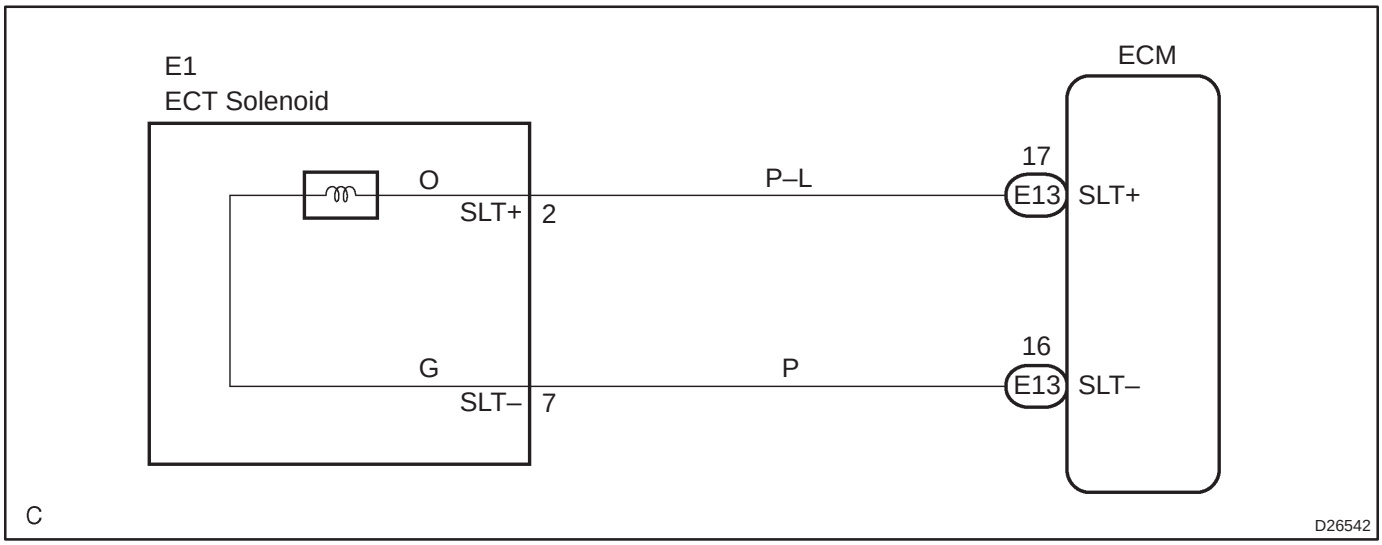
(*): Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

Duty Ratio=A/(A+B) x 100 (%)

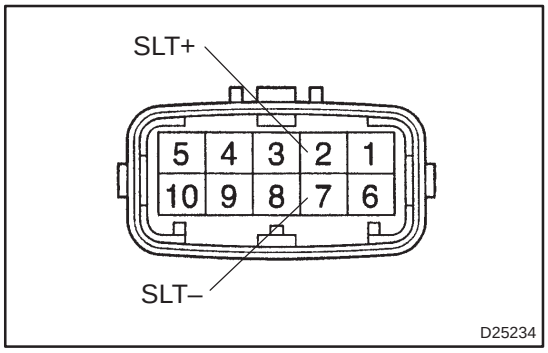
DTC No.	DTC Detection Condition	Trouble Area
P2716/77	Condition (a) or (b) below is detected 1 sec. or more: (1 trip detection logic) (a) SLT– terminal: 0V (b) SLT– terminal: 12V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SLT)



(a) Disconnect the transmission wire connector from the transaxle.

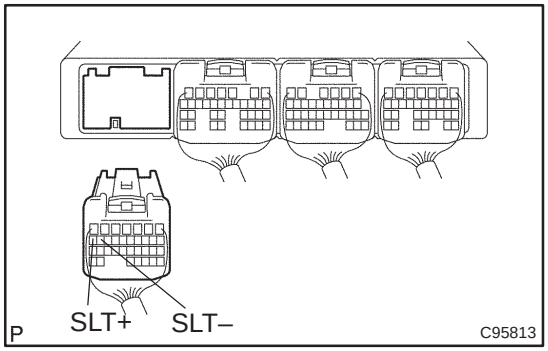
(b) Measure the resistance between terminals SLT+ and SLT– of the transmission wire connector.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

(c) Measure the resistance between body ground and that SLT+ as well as SLT– of the transmission wire connector.
OK:
Resistance: 1MΩ or higher

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



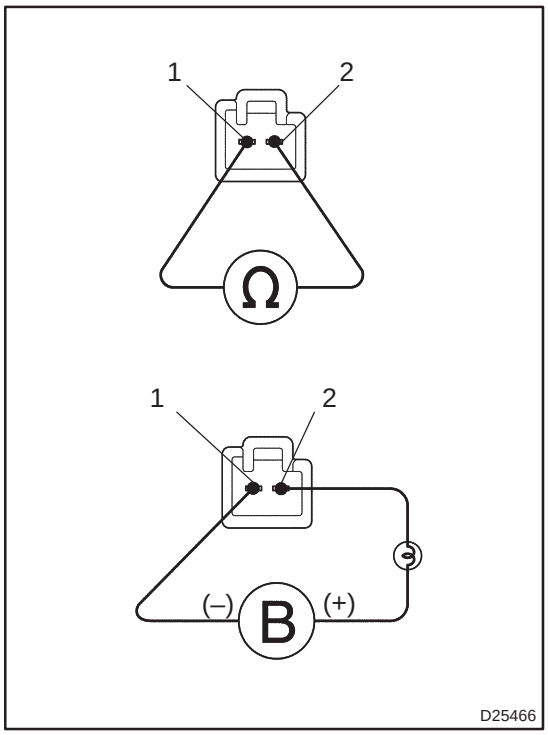
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals SLT+ and SLT– of the ECM connector.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(d) Measure the resistance between body ground and that SLT+ as well as SLT– of the ECM connector.
OK:
Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(SLT)



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance between terminals of the shift solenoid valve SLT.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SLT)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P2769/64	TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT LOW (SHIFT SOLENOID VALVE DSL)

DTC	P2770/64	TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT HIGH (SHIFT SOLENOID VALVE DSL)

CIRCUIT DESCRIPTION

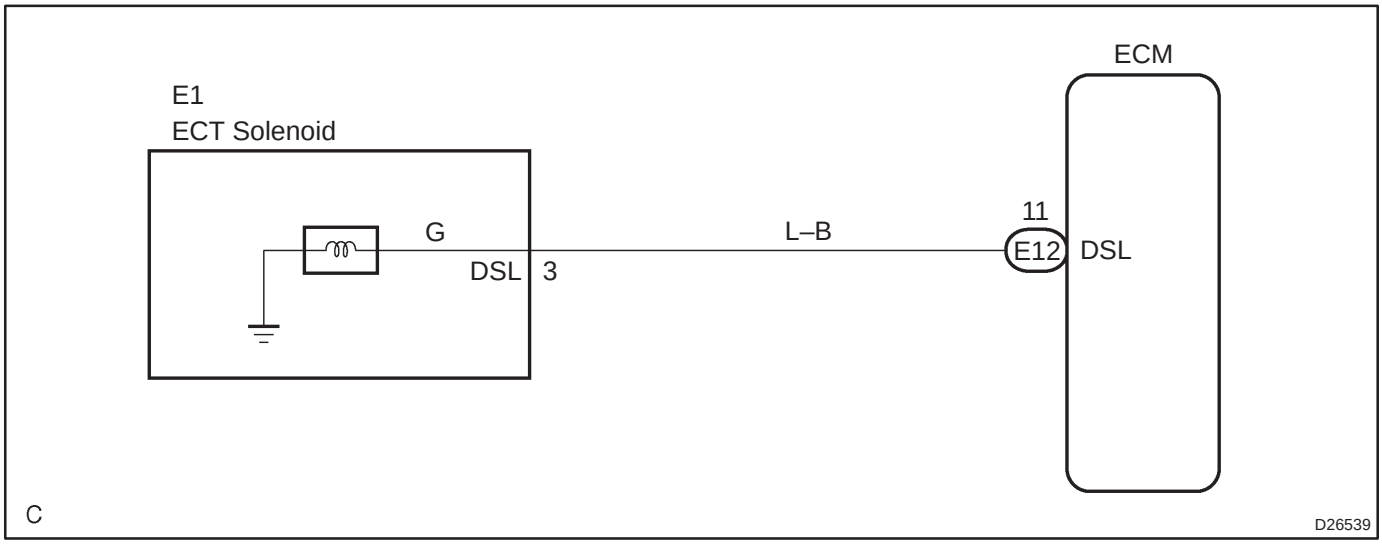
The shift solenoid valve DSL is turned ON and OFF by signals from the ECM in order to control the hydraulic pressure operation the lock–up relay valve, which then the controls operation of the lock–up clutch.

DTC No.	DTC Detection Condition	Trouble Area
P2769/64	ECM detects short in solenoid valve DSL circuit 4 times when solenoid valve DSL is operated (2 trip detection logic)	• Short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM
P2770/64	ECM detects open in solenoid valve DSL circuit 4 times when solenoid valve DSL is not operated (2 trip detection logic)	• Open in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM

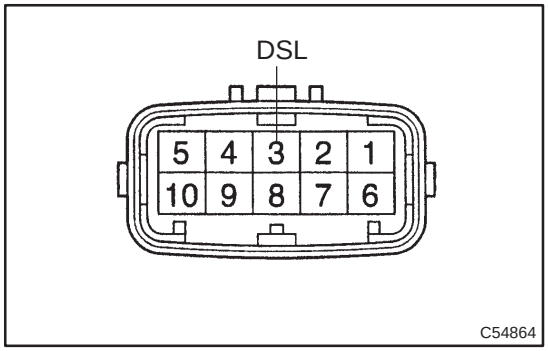
Fail safe function:

If the ECM detects a malfunction, it turns the shift solenoid valve DSL OFF.

WIRING DIAGRAM



1	INSPECT TRANSMISSION WIRE(DSL)

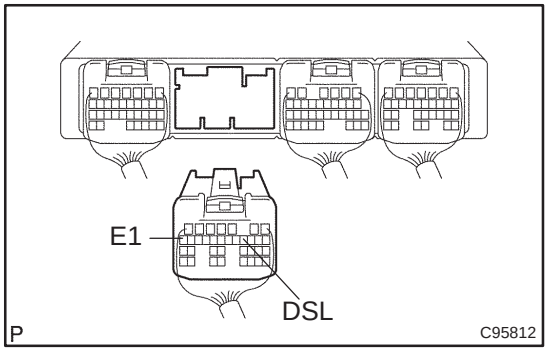


(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminal DSL of the transmission wire connector and body ground.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



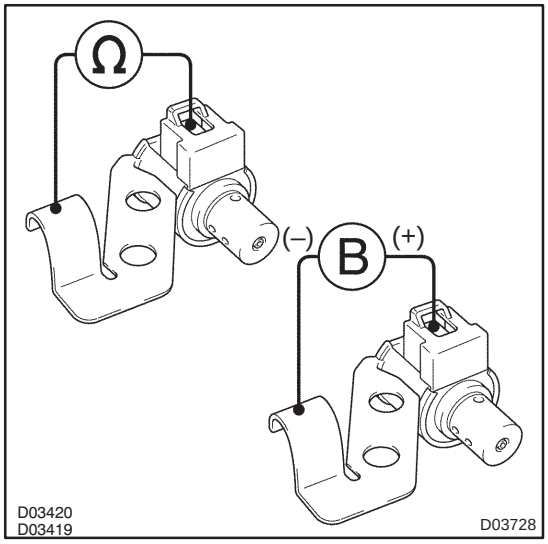
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals DSL and E1 of the ECM connector.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(DSL)



(a) Remove the shift solenoid valve DSL.

(b) Measure the resistance between terminal DSL of shift solenoid valve DSL and the solenoid body.

OK:

Resistance: 11 to 13 Ω at 20°C (68°F)

(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid body.

OK:

The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(DSL)**

OK

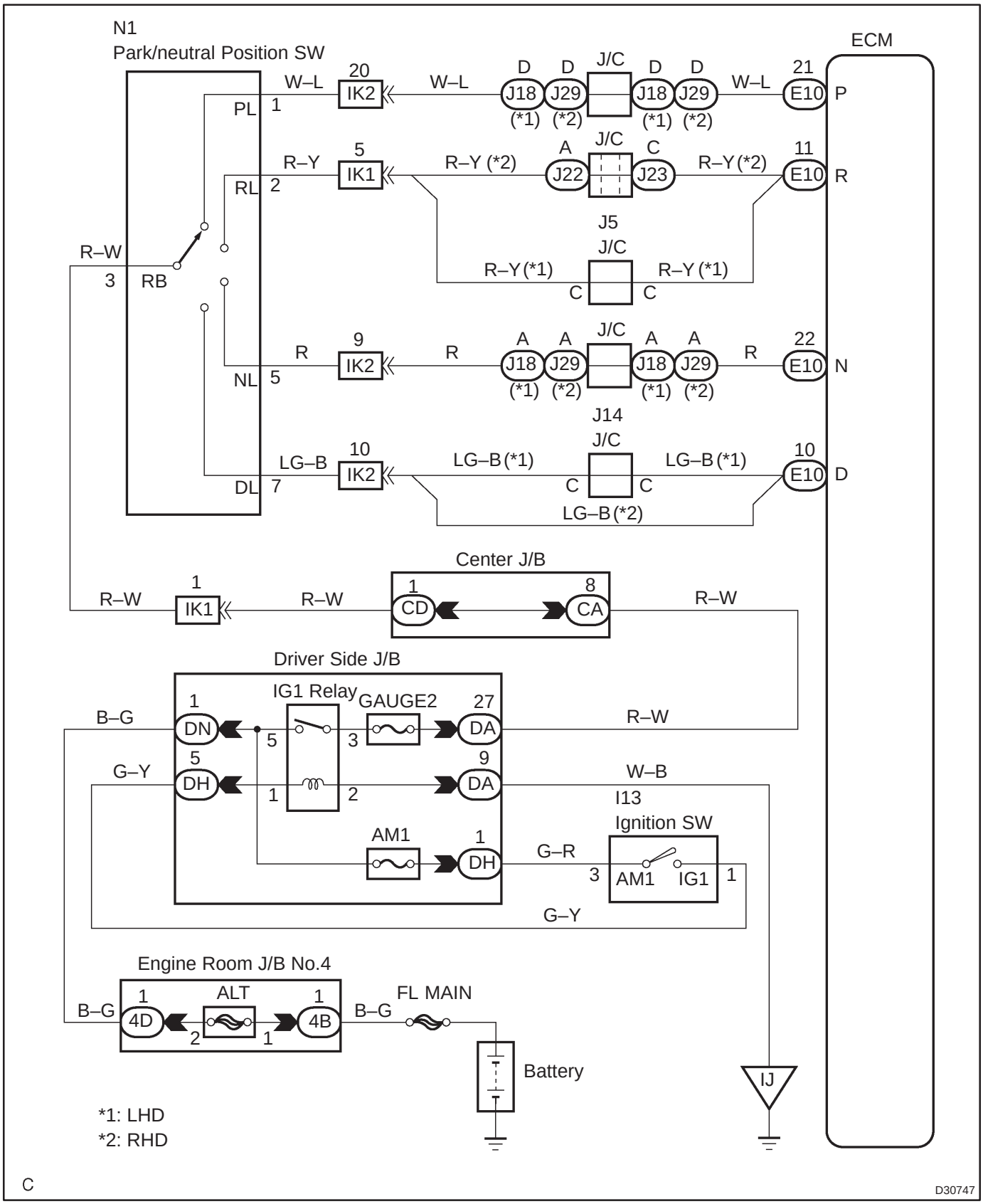
REPAIR OR REPLACE TRANSMISSION WIRE

PARK/NEUTRAL POSITION SWITCH CIRCUIT

CIRCUIT DESCRIPTION

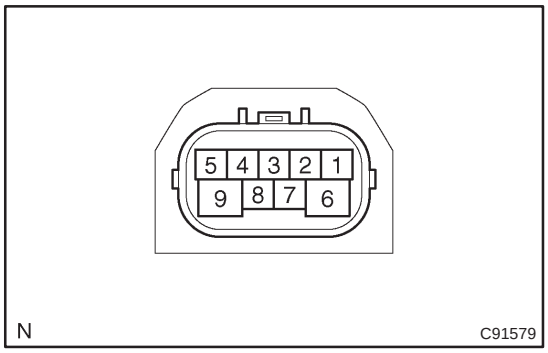
The park/neutral position switch detects the shift lever position and sends signals to the ECM.
The ECM receives signals (REVERSE and DRIVE) from the park/neutral position switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.
(b) Check the continuity between each terminal shown below when the shift lever is moved to each position.

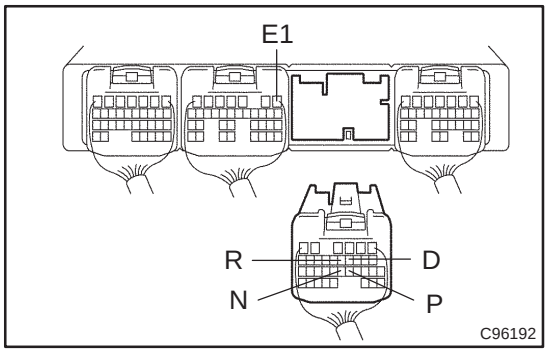
Shift Position	Terminal No. to continuity	
P	1 – 3	6 – 9
R	2 – 3	–
N	3 – 5	6 – 9
D	3 – 7	–

OK:
There is continuity.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY**

OK

2 CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – ECM)



(a) Connect the park/neutral position switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminals E1 and that P, R, N as well as D of the ECM connector when the shift lever is shifted to the following position.

OK:

Shift range	Terminal	Voltage (V)
P	P – E1	7.5 to 14
R	R – E1	7.5 to 14
N	N – E1	7.5 to 14
D	D – E1	7.5 to 14

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

05C8R–02

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description for Euro–OBD

(1) When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to the OBD scan tool complying with ISO 15031–4 or hand–held tester, and read off various data output from the vehicle's ECM.

(2) Euro–OBD regulations require that the vehicle's on–board computer illuminates the Check Engine Warning Light (Malfunction Indicator Lamp)/CHK ENG (MIL) on the instrument panel when the computer detects a malfunction in the emission control system/components or in the driving system components which affect vehicle emissions, or a malfunction in the computer. In addition to CHK ENG (MIL) illuminating when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO15031–6 are recorded in the ECM memory.

If the malfunction does not occur in 3–trip, the CHK ENG (MIL) goes off but the DTCs remain recorded in the ECM memory.

(3) To check the DTCs, connect the OBD scan tool or hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data (For operating instructions, see the OBD scan tool's instruction book.).

(4) DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–876).

(5) The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic (*) to prevent erroneous detection, and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, technicians can cause the CHK ENG (MIL) to light up for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 2).

(6) *2 trip detection logic:
When a malfunction is first detected, the malfunction code is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG (MIL) to illumenate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and the 2nd trip.).

(b) Description M–OBD

(1) When troubleshooting Multiplex (M–OBD) vehicles, the only difference from the usual troubleshooting procedure is that you connect the hand–held tester to the vehicle, and read off various data output from the vehicle's ECM.

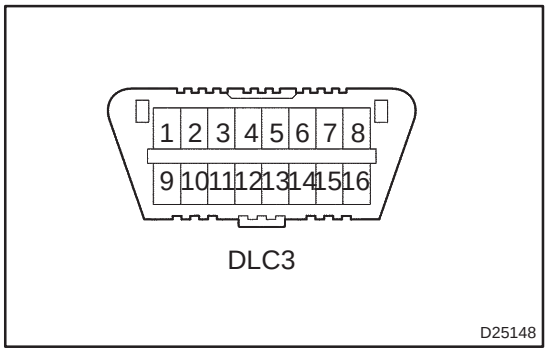
(2) The vehicle's on–board computer illuminates the MIL on the instrument panel when the computer detects a malfunction in the computer itself or in driving system components. In addition to the MIL illuminating when a malfunction is detected, the applicable DTCs are recorded in the ECM memory.

If the malfunction does not occur in 3–trip, the CHK ENG (MIL) goes off but the DTCs remain recorded in the ECM memory.

(3) To check the DTCs, connect the hand–held tester to DLC3 on the vehicle or read the number of blinks of the MIL when TC and CG terminals on the DLC3 are connected. The hand–held tester also enables you to erase the DTCs and activate the several actuators and check freeze frame data and various forms of engine data (For instruction book).

(4) The diagnosis system operates in normal mode during normal vehicle use, and also has a check (test) mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2–trip detection logic (*) to prevent erroneous detection and ensure thorough malfunction detection. By switching the ECM to check (test) mode using the hand–held tester when troubleshooting, the technician can cause the MIL to illuminate for a malfunction that is only detected once or momentarily.

*2–trip detection logic:
When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the 2nd test drive, this 2nd detection causes the MIL to illuminate.



(c) Inspect the DLC3.

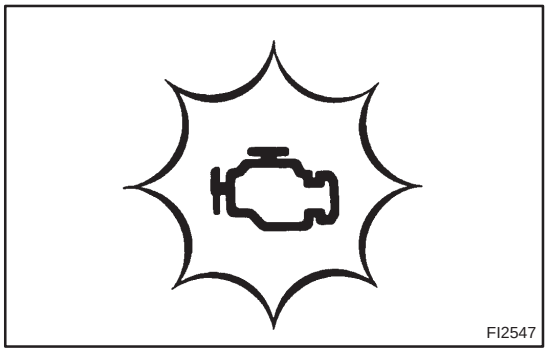
(1) The vehicle's ECM uses the ISO 9141–2 (Euro–OBD)/ISO 14230 (M–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–3 and matches the ISO 9141–2/ISO 14230 format.

Terminal No.	Connection	Voltage or Resistance	Condition
7	Bus ⊕ Line	Pulse generation	During communication
4	Chassis Ground	↔ Body Ground / 1 Ω or less	Always
16	Battery Positive	↔ Body Ground / 9 – 14 V	Always

HINT:

If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of hand–held tester to DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. INSPECT DIAGNOSIS (NORMAL MODE)

(a) Check the MIL.

(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:

If the MIL does not come on, troubleshoot the combination meter.

(2) When the engine is started, the MIL should go off. If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC, using the hand–held tester.

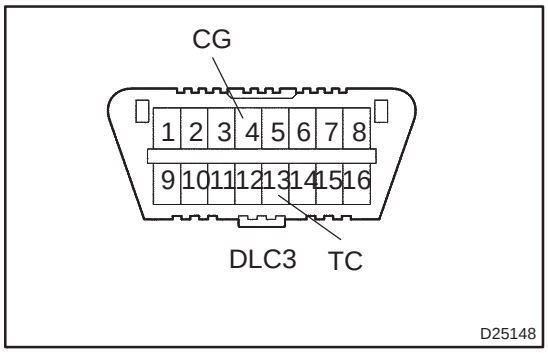
NOTICE:

Hand–held tester only:

When the diagnostic system is switched from normal mode to check (test) mode, it erases all DTCs and freeze frame data recorded in normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.

(1) Use the hand–held tester to check the DTCs and instructions, see the hand–held tester instruction book.

(2) See page 05–876 to confirm the details of the DTCs.

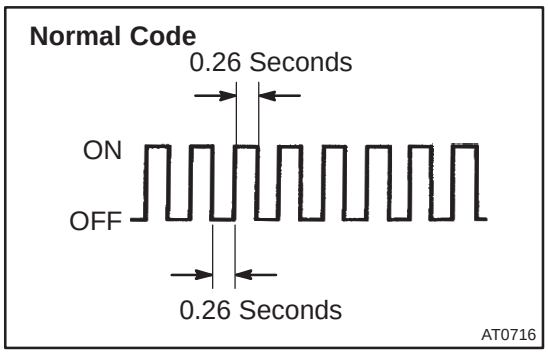


(c) Check the DTC (Not using the hand–held tester).

(1) Turn the ignition switch ON, but do not start the engine.

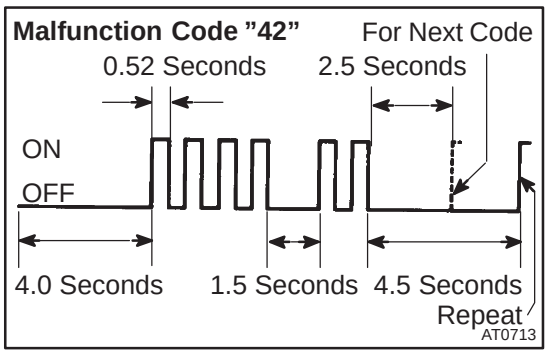
(2) Using SST, connect terminals 13 (TC) and 4 (CG) of DLC3.

SST 09843–18040



(3) Read the DTC indicated by the number of times of the MIL blinks.

HINT:
If the system is operating normally, the light will blink 2 times per second.



(4) The malfunction code is indicated, as shown in the chart on the left (DTC ”42” is shown as an example).

HINT:
When 2 or more malfunction codes are stored in memory, the lower–numbered code is displayed first.

3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has high sensing ability to detect malfunctions.

Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

(a) Check the DTC.

(1) Check the initial conditions.

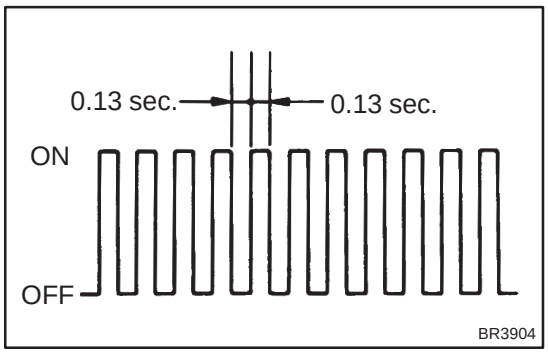
- Battery voltage 11 V or more
- Throttle valve fully closed
- Shift lever in P range
- Air conditioning switched OFF

(2) Turn the ignition switch OFF.

(3) Prepare the hand–held tester.

(4) Connect the hand–held tester to DLC3.

(5) Turn the ignition switch ON and switch the hand–held tester ON.



(6) Switch the hand–held tester from Normal mode to Check mode (Check that the MIL flashes).

(7) Start the engine (MIL goes out after the engine starts).

(8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Take care not to turn the ignition switch OFF, as turning it off switches the diagnosis system from Check mode to Normal mode, which all DTCs etc. are erased.

(10) After checking the DTC, inspect the applicable circuit.

(b) Clear the DTC.

(1) When using hand–held tester:

The following operation will erase the DTC and freeze frame data. Operate a hand–held tester to erase the codes.

(2) When not using the hand–held tester:

Remove the EFI fuse from engine room J/B for 10 seconds or more.

4. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one of the methods to shorten the work time.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) According to the display on tester, read the ”DATA LIST”.

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	←
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th (O/D)	Shift lever Range is; • D: 1st, 2nd, 3rd or 4th (O/D)	←
SPD (NC)	Counter Gear Speed display: 50 r/min	D Range is warmed up,4th (O/D); Same as input shaft speed	←
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	←
KICKDOWN SW	Kick down SW Status/ ON or OFF	• Accelerator Pedal is depressed: ON • Accelerator Pedal is released: OFF	←
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever range is; P or N: ON Except P or N: OFF	The shift lever range and these values are different, there are failures of the PNP switch or shift cable adjustment.
REVERSE	PNP SW Status/ ON or OFF	Shift lever range is; R: ON Except R: OFF	
DRIVE	PNP SW Status/ ON or OFF	Shift lever range is; D and 3: ON Except D and 3: OFF	
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: –40°C (–40°F) max.: 215°C (419°F)	80°C (176°F) (After Stall Test)	If the value is ”–40°C (–40°F)” or ”215°C (419°F)”, ATF temp. sensor circuit is opened or shorted.

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one of the method to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) According to the display on tester, perform the ”ACTIVE TEST”.

Item	Test Details	Diagnostic Note
LINE PRESS UP	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [Others] ON: Line pressure up. OFF: No action (normal operation)	–
LOCK UP	[Test Details] Control the shift solenoid DSL to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 60 km/h (37 mph) or more	Possible to check the DSL operation.
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift range by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid values.

6. PROBLEM SYMPTOM CONFIRMATION

(a) Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

7. ROAD TEST

NOTICE:

Conduct the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).

(a) D range test

Shift into the D range and fully depress the accelerator pedal and check the following points:

(1) Check up–shift operation.

Check to see that 1 → 2, 2 → 3 and 3 → O/D up–shift take place, and that the shift points conform to the automatic shift schedule (See page 03–45).

HINT:

- O/D Gear Up–shift Prohibition Control (1. Water temp. is 60˚C (140˚F) or less. 2. If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.)
- O/D Gear Lock–up Prohibition Control (1. Brake pedal is depressed. 2. Water temp. is 60˚C (140˚F) or lower)

(2) Check for shift shock and slip.
Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shift.

(3) Check for abnormal noise and vibration.
Run in D range lock–up or O/D gear and check for abnormal noise and vibration.

HINT:
The check for the cause of abnormal noise and vibration must be done very thoroughly as it could also be sure to loss of balance in the differential, torque converter, etc.

(4) Check kick–down operation.
While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated in the automatic shift schedule (See page 03–45).

(5) Check for abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.
- Drive in D range O/D gear, at a steady speed (lock–up ON) of about 60 km/h (37 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(b) S range test
Shift to the S range, depress the accelerator pedal and check the following points:
Shift operations.
- Shifting the shift lever to ”+” or ”–” changes the shift range on the combination meter.

HINT:
Manual shift prohibition control is performed when:
- Down–shifting causes engine overrun.
- Down–shifting is required continuously, down–shifting to 1st gear may not be performed.

(c) R range test
Shift into the R range and fully depress the accelerator pedal and check for slipping.

CAUTION:
Before conducting this test, ensure that the test area is free from people and obstruction.

(d) P range test
Stop the vehicle on a grade (more than 5°) and after shifting into the P range, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

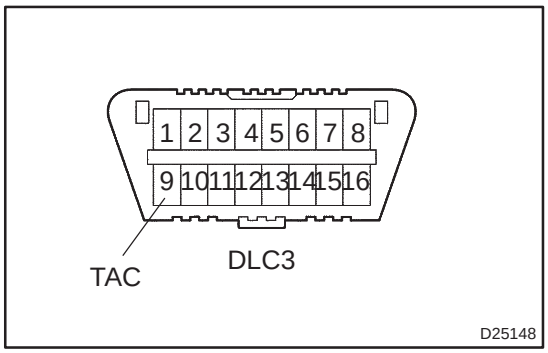
8. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R ranges.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Do not continuously run this test for longer than 5 seconds.**
- **To ensure safety, do this test in a wide, clear level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**



(1) Chock the 4 wheels.

(2) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

SST 09843–18030

(3) Fully apply the parking brake.

(4) Keep your left foot pressing firmly on the brake pedal.

(5) Start the engine.

(6) Shift into the D range. Press all the way down on the accelerator pedal with your right foot.

(7) Quickly read the stall speed at this time.

Stall speed: 2,550 ± 150 rpm

(8) Do the same test in the R range.

Stall speed: 2,550 ± 150 rpm

Evaluation:

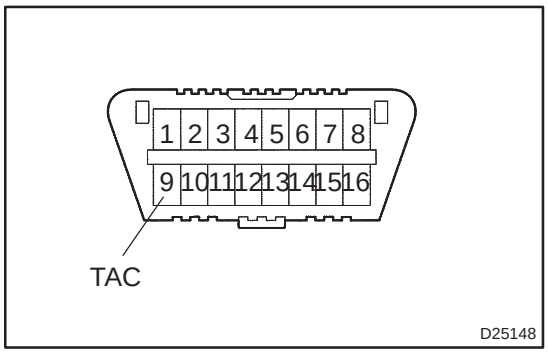
Problem	Possible cause
(a) Stall speed low in D and R ranges	• Engine output may be insufficient • Stator one–way clutch not operating properly HINT: If more than 600 rpm below the specified value, the torque converter could be faulty.
(b) Stall speed high in D range	• Line pressure too low • Forward clutch slipping • No. 2 one–way clutch not operating properly • U/D clutch slipping
(c) Stall speed high in R range	• Line pressure too low • Direct clutch slipping • 1st & reverse brake slipping • U/D clutch slipping
(d) Stall speed high in D and R ranges	• Line pressure too low • Improper fluid level • U/D one–way clutch not operating properly

(b) Measure the time lag.

(1) When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the direct clutch, forward clutch, and 1st and reverse brake.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**



(2) Chock the 4 wheels.

(3) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

SST 09843–18030

(4) Start engine and check idle speed.

Idle speed: 650 ± 50 rpm (In N range and A/C OFF)

(5) Shift the lever from N to D range. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag: N → D less than 1.2 seconds

(6) In the same way, measure the time lag for N → R.

Time lag: N → R less than 1.5 seconds

Evaluation (If N → D or N → R time lag is longer than the specified):

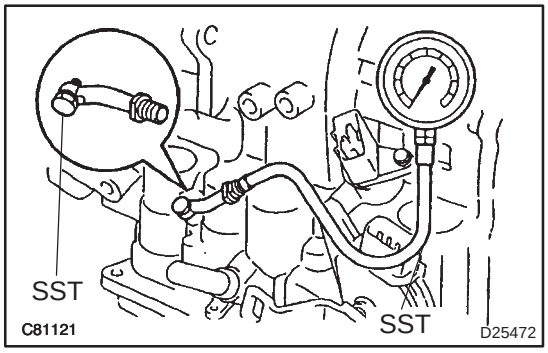
Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • U/D one–way clutch not operating properly
N → R time lag is longer	• Line pressure too low • Direct clutch worn • 1st and reverse brake worn • U/D one–way clutch not operating properly

9. HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **Do the test at normal operation ATF temperature 50 to 80˚C (122 to 176˚F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stopper outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**



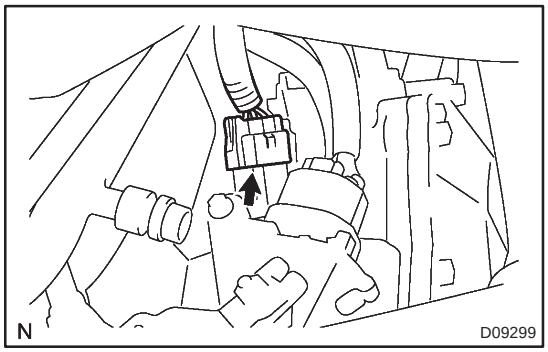
(1) Warm up the ATF.
(2) Remove the test plug on the rear side of the transaxle case and connect SST.
SST 09992–00095 (09992– 00231, 09992–00271)
(3) Fully apply the parking brake and chock the 4 wheels.
(4) Connect the hand–held tester to DLC3.
(5) Start the engine and check idling speed.
(6) Keep your left foot pressing firmly on the brake pedal and shift into D range.
(7) Measure the line pressure when the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(9) In the same way, do the test in R range.

Specified line pressure:

Condition	D range kPa (kgf / cm^2, psi)	R range kPa (kgf / cm^2, psi)
Idling	372 to 412 (3.8 to 4.2, 54 to 60)	672 to 742 (6.9 to 7.6, 98 to 108)
Stall	931 to 1,031 (9.5 to 10.5, 135 to 150)	1,768 to 1,968 (18.0 to 20.1, 256 to 285)

Evaluation:

Problem	Possible cause
If the measured values at all ranges are higher	• Line pressure control solenoid (SLT) defective • Regulator valve detective
If the measured values at all ranges are lower	• Line pressure control solenoid (SLT) defective • Regulator valve detective • Oil pump defective
If pressure is low in the D range only	• D range circuit fluid leak • Forward clutch defective
If pressure is low in the R range only	• R range circuit fluid leak • Direct clutch defective • 1st & reverse brake defective



10. MANUAL SHIFTING TEST

HINT:

By this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transaxle.

(a) Disconnect the solenoid wire.

(b) Inspect the manual driving operation.

Check that the shift and gear ranges correspond to the table below.

While driving, shift through the D range.

Check that the gear change corresponds to the shift range.

Shift range	Gear position
D	3rd
R	Reverse
P	Pawl Lock

HINT:

If the gear positions of the D are difficult to distinguish, do the above road test.

If any abnormality is found in the above test, the problem is in the transaxle itself.

(c) Connect the solenoid wire.

(d) Cancel out the DTC.

11. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

NOTICE:

Hand–held tester only

(a) Turn the ignition switch to OFF.

(b) Connect the hand–held tester to the DLC3.

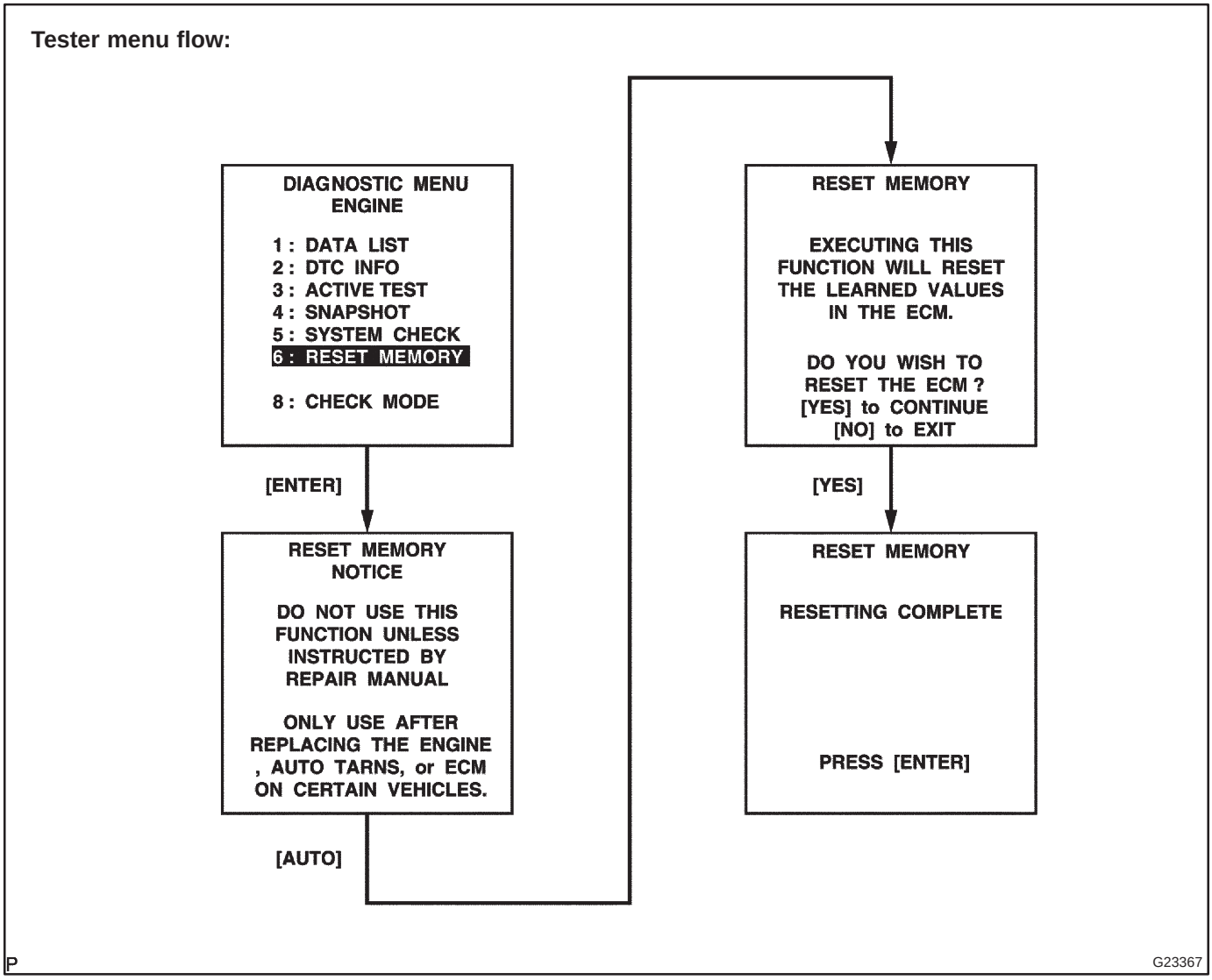
(c) Turn the ignition switch to ON.

(d) Perform the reset memory procedure from the ENGINE menu.

CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

Tester menu flow:



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PRECAUTION

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

HINT:

Initialization can not be completed by only removing the battery.

0567W–11

PROBLEM SYMPTOMS TABLE

HINT:

If a normal code is displayed during the DTC check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for trouble-shooting.

The Matrix Chart is divided into 3 chapters.

- If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.
- If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM.

CHAPTER 1: ELECTRONIC CIRCUIT MATRIX CHART

Symptom	Suspect Area	See page
No up–shift (A particular gear, from 1st to O/D gear, is not up–shifted)	ECM	01–32
No down–shift (A particular gear, from O/D to 1st gear, is not down–shifted)	ECM	01–32
No lock–up or No lock–up off	4. Stop light switch circuit 5. Engine coolant temp. sensor circuit 6. Throttle position sensor circuit 7. ECM	05–905 05–161 05–161 01–32
Shift point too high or too low	ECM	01–32
No gear change by shifting into ”+” or ”–” while the shift lever is in the Sposition	1. Transmission control switch circuit 2. ECM	05–910 01–32
Up–shift to O/D from 3rd while engine is cold	1. Engine coolant temp. sensor circuit 2. ATF temp. sensor circuit 3. ECM	05–161 05–882 01–32
Harsh engagement (N → D)	ECM	01–32
Harsh engagement (Lock–up)	ECM	01–32
Harsh engagement (Any driving range)	ECM	01–32
Poor acceleration	ECM	01–32
Engine stalls when starting off or stopping	ECM	01–32
No kick–down	1. Kick–down switch circuit 2. ECM	05–908 01–32

Chapter 2: On–vehicle Repair
(★: U241E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM840U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward range or reverse range	1. Manual valve 2. Primary regulator valve 3. Off–vehicle repair matrix chart	★ ★ –
Vehicle does not move in R range	Off–vehicle repair matrix chart	–
No up–shift (1st → 2nd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (2nd → 3rd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (3rd → O/D)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No down–shift (O/D → 3rd)	Valve body assy	★
No down–shift (3rd → 2nd)	Valve body assy	★
No down–shift (2nd → 1st)	Valve body assy	★
No lock–up or No lock–up off	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Off–vehicle repair matrix chart 3. Valve body assy	★ – ★
Harsh engagement (N → R)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (Lock–up)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (2nd → 3rd)	Valve body assy	★
Harsh engagement (3rd → O/D)	Valve body assy	★
Harsh engagement (O/D → 3rd)	Valve body assy	★
Slip or shudder (Forward and reverse)	1. Oil strainer 2. Off–vehicle repair matrix chart	40–47 –
No kick–down	Valve body assy	★

Chapter 3: Off–vehicle Repair
(★: U241E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM840U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward range or reverse range	1. Front and rear planetary gear 2. U/D planetary gear 3. U/D one–way clutch (F_2) 4. Forward clutch (C_1) 5. U/D brake (B_3)	★ ★ ★ ★ ★
Vehicle does not move in R range	1. Front and rear planetary gear unit 2. U/D planetary gear 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. 1st & reverse brake (B_2)	★ ★ ★ ★ ★
No up–shift (1st → 2nd)	1. No.1 one–way clutch (F_1) 2. 2nd brake (B_1)	★ ★
No up–shift (2nd → 3rd)	Direct clutch (C_2)	★
No up–shift (3rd → O/D)	U/D clutch (C_3)	★
No lock–up or No lock–up off	Torque converter clutch	40–37
Harsh engagement (N → D)	1. Forward clutch (C_1) 2. U/D one–way clutch (F_2) 3. No.1 one–way clutch (F_1)	★ ★ ★
Harsh engagement (N → R)	1. Direct clutch (C_2) 2. 1st & reverse brake (B_2)	★ ★
Harsh engagement (Lock–up)	Torque converter clutch	40–37
Slip or shudder (Forward position: After warm–up)	1. Torque converter clutch 2. Forward clutch (C_1) 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. No.1 one–way clutch (F_1) 6. U/D one–way clutch (F_2)	40–37 ★ ★ ★ ★ ★
Slip or shudder (R range)	1. Direct clutch (C_2) 2. 1st & reverse brake (B_2)	★ ★
Slip or shudder (1st)	No.1 one–way clutch (F_1)	★
Slip or shudder (2nd)	1. U/D one–way clutch (F_2) 2. 2nd brake (B_1)	★ ★
Slip or shudder (3rd)	Direct clutch (C_2)	★
Slip or shudder (O/D)	U/D clutch (C_3)	★
No engine braking (1st – 3rd: D range)	U/D brake (B_3)	★
Poor acceleration (All range)	1. Torque converter clutch 2. U/D planetary gear	40–37 ★
Poor acceleration (O/D)	1. U/D clutch (C_3) 2. U/D planetary gear	★ ★
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	40–37

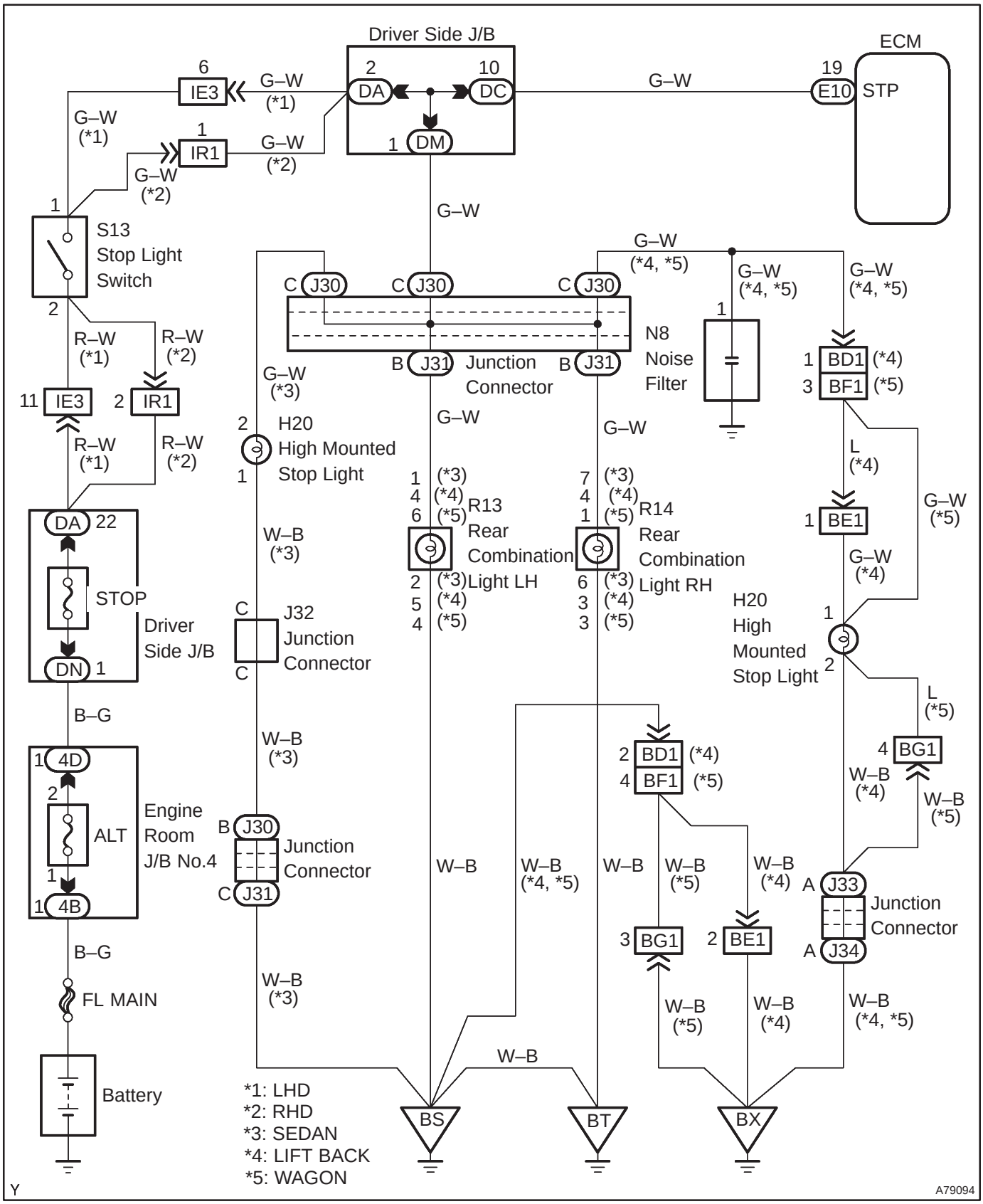
STOP LIGHT SWITCH SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in lock–up condition, when brakes are suddenly applied.

When the brake pedal is depressed, this switch sends a signals to the ECM. Then the ECM cancels the operation of the lock–up clutch while braking is in progress.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT STOP LAMP SWITCH ASSY

NG → REPLACE STOP LAMP SWITCH ASSY

OK

2	CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH ASSY – ECM)

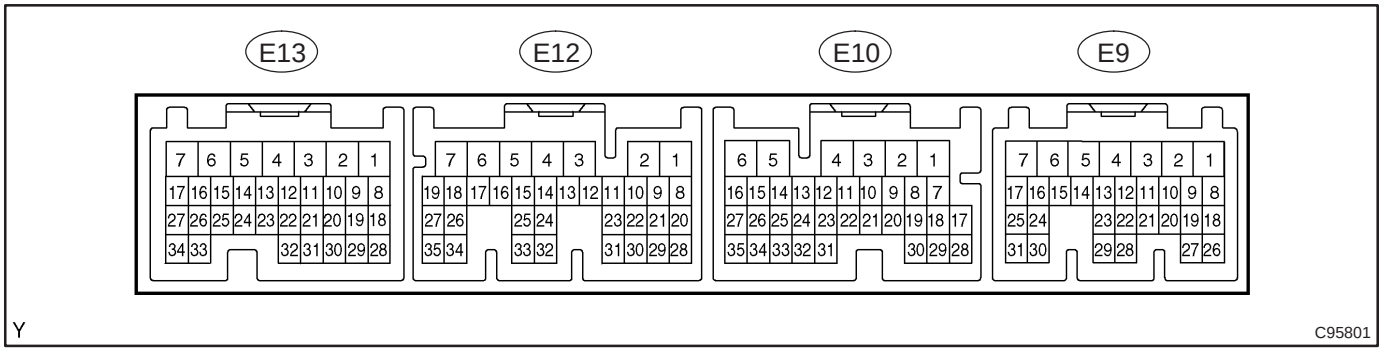
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPAIR OR REPLACE ECM

05C8S–01

TERMINALS OF ECM



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
SLT+ (E13–17) – SLT– (E13–16)	P–L – P	IG switch ON	10 to 14
THO (E13–30) – E2 (E13–28)	V – BR	IG switch ON and ATF temperature 110°C (230°F)	Below 1
DSL (E12–11) – E1 (E12–7)	L–B – BR	IG switch ON	Below 1
		Vehicle driving under lock–up range	10 to 14
S4 (E12–13) – E1 (E12–7)	L – BR	IG switch ON	Below 1
		O/D gear	10 to 14
		Except O/D gear	Below 1
SL2+ (E12–17) – SL2– (E12–16)	R – R–B	IG switch ON	Below 1
		1st or 2nd gear	10 to 14
		3rd or O/D gear	Below 1
SL1+ (E12–19) – SL1– (E12–18)	Y – Y–B	IG switch ON	10 to 14
		1st gear	10 to 14
		Except 1st gear	Below 1
NC+ (E12–26) – NC– (E12–34)	LG – LG–B	Engine is running	Below 1 and 4 to 5
NT+ (E12–27) – NT– (E12–35)	B–O – B	Engine is running	Below 1 and 4 to 5
D (E10–10) – E1 (E12–7)	LG–B – BR	IG switch ON Shift lever D range	10 to 14
		IG switch ON Shift lever other than D range	Below 1
R (E10–11) – E1 (E12–7)	R–Y – BR	IG switch ON Shift lever R range	10 to 14
		IG switch ON Shift lever other than R range	Below 1
SPD (E10–17) – E1 (E12–7)	V–W – BR	IG switch ON	4.5 to 5.5
SPT1 (E10–20) – E1 (E12–7)	L – BR	IG switch ON and shift lever S position	7.5 to 14
		IG switch ON and shift lever except for S position	Below 1
SFTD (E9–21) – E1 (E12–7)	B – BR	IG switch ON and shift lever S position	7.5 to 14
		IG switch ON and shift lever "–" position (Down shift)	Below 1.5
SFTU (E9–22) – E1 (E12–7)	R – BR	IG switch ON and shift lever S position	7.5 to 14
		IG switch ON and shift lever "+" position (Up shift)	Below 1.5
KD*1 (E9–27) – E1 (E12–7)	W – BR	IG switch ON and kick–down switch ON	Below 1
		IG switch ON and kick–down switch OFF	10 to 14

*1: Europe

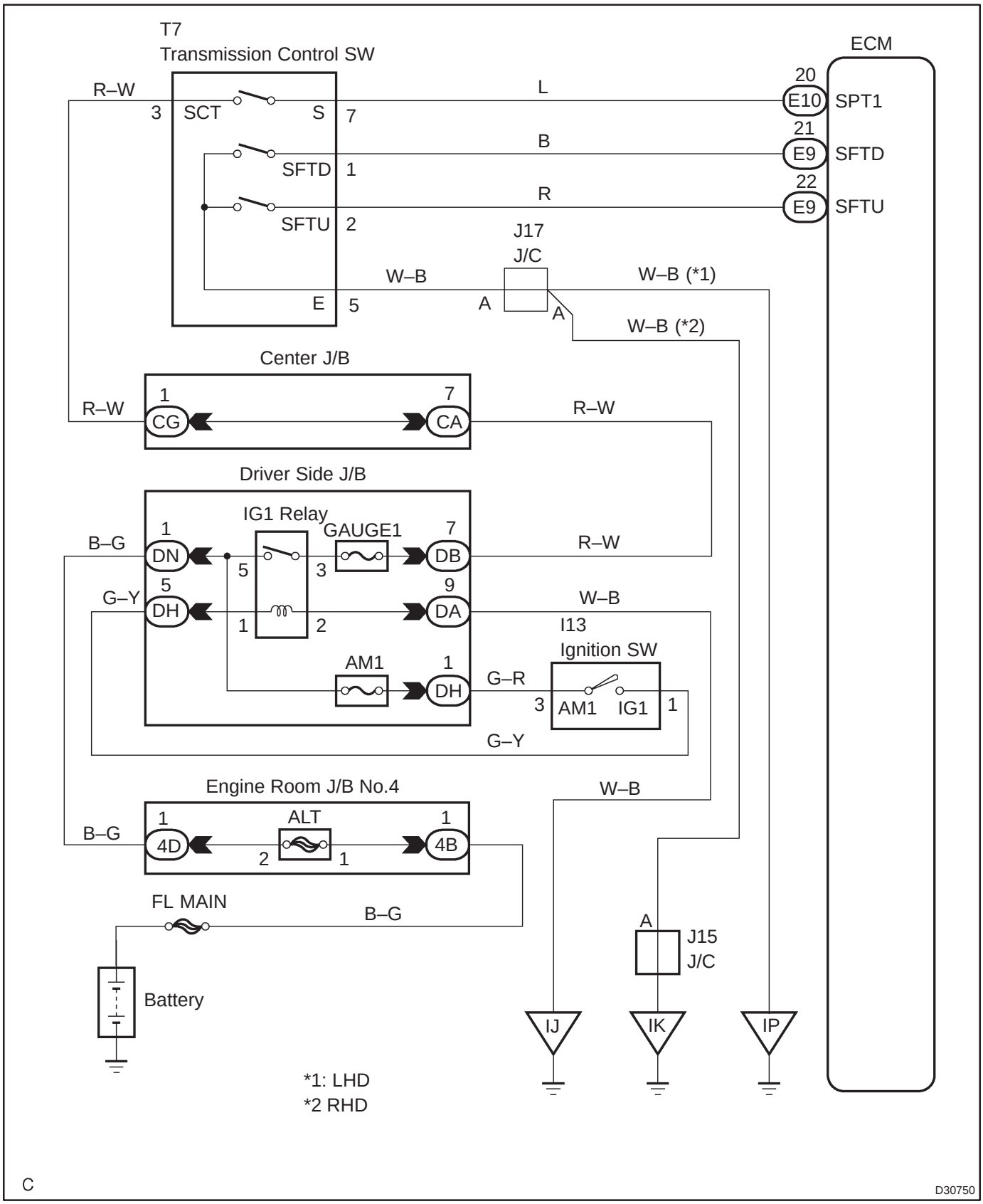
TRANSMISSION CONTROL SWITCH CIRCUIT

CIRCUIT DESCRIPTION

When shifting the shift lever into S range using the transmission control switch, it is possible to shift in 1 to 4 positions.

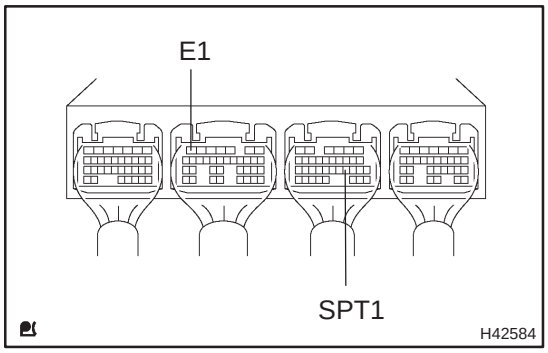
Shifting ”+” once changes up 1 shift range position, ”–” once changes down 1 shift range position respectively.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK ECM



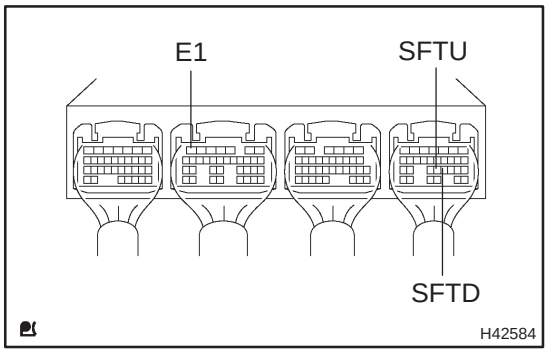
(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminals SPT1 and E1 of the ECM.
OK:

Shift position	Specified condition
Except S position	Below 1 V
S position	7.5 to 14 V

NG → **Go to step 6**

OK

2 CHECK ECM



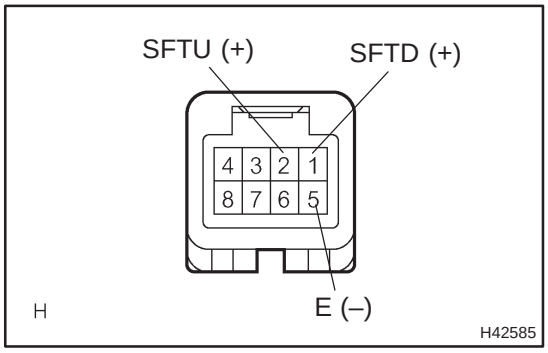
(a) Measure the voltage between terminals E1 and that SFTU as well as SFTD of the ECM.
OK:

Shift position	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E1	Below 1.5 V
S position	SFTU – E1	7.5 to 14 V
Shift to "–" (Down shift)	SFTD – E1	Below 1.5 V
S position	SFTD – E1	7.5 to 14 V

OK → **NORMAL**

NG

3 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



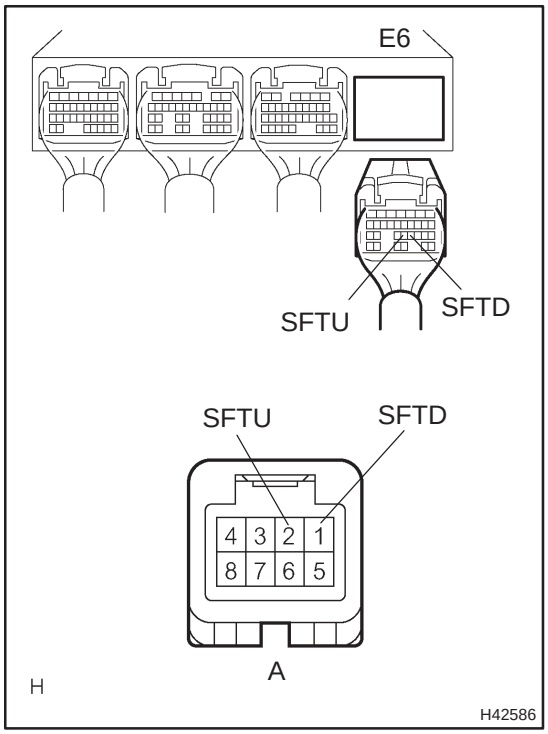
(a) Turn the ignition switch to LOCK.
(b) Disconnect the transmission control switch connector.
(c) Check the continuity between terminals E and that SFTU as well as SFTD of the transmission control switch connector.
OK:

Shift position	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E	Continuity
S position	SFTU – E	No continuity
Shift to "–" (Down shift)	SFTD – E	Continuity
S position	SFTD – E	No continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

4	CHECK HARNESS AND CONNECTOR(ECM – TRANSMISSION CONTROL SWITCH)



(a) Disconnect the ECM connector.
(b) Check the continuity between ECM and transmission control switch.
OK:

Tester connection	Specified condition
SFTU (E6–22) – SFTU (A–2)	Continuity
SFTD (E6–28) – SFTD (A–1)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR(TRANSMISSION COTROL SWITCH – BODY GROUND)

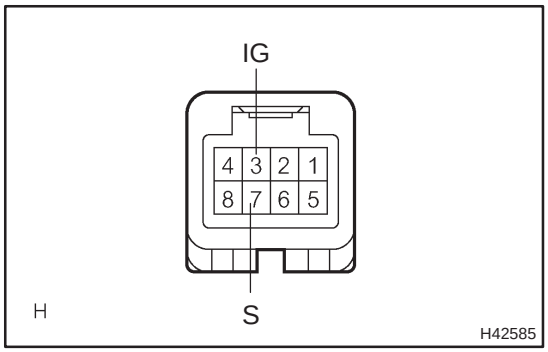
(a) Check the continuity between body ground and E of the transmission control switch connector (wire harness side).
OK:
Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

6 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



(a) Turn the ignition switch to LOCK.
(b) Disconnect the transmission control switch connector.
(c) Check the continuity between terminal IG and S of the transmission control switch.

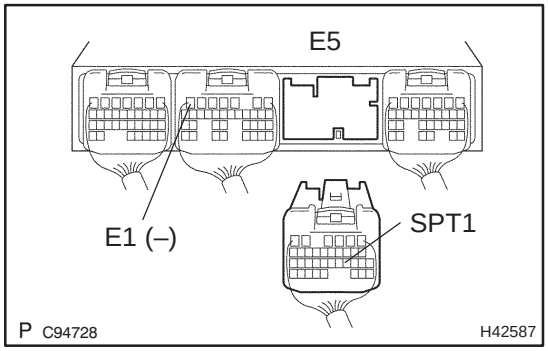
OK:

Shift position	Tester connection	Specified condition
Except S position	IG – S	No continuity
S position	IG – S	Continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

7 CHECK HARNESS AND CONNECTOR



(a) Connect the transmission control switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminal SPT1 and E1 of the ECM connector.

OK:

Shift position	Tester connection	Specified condition
Except S position	SPT1 – E1	Below 1 V
S position	SPT1 – E1	7.5 to 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

TRANSMISSION FLUID TEMPERATURE SENSOR NO.2 CIRCUIT

CIRCUIT DESCRIPTION

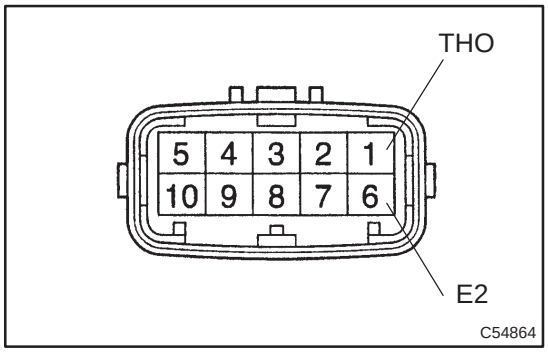
The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

WIRING DIAGRAM

See page 05–882.

INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals THO and E2.

OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(c) Check the continuity between the wire harness side connectors.

OK:

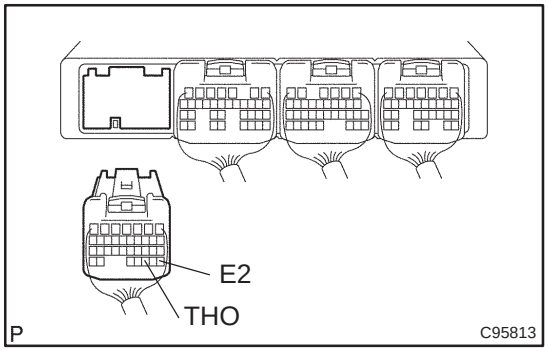
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals THO and E2.
OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

0567O–11

CUSTOMER PROBLEM ANALYSIS CHECK

Transmission Control System Check Sheet	Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move (☐ Any range ☐ Particular range)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)
	☐ No down–shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ No up–shift (S range)
	☐ No down–shift (S range)
	☐ Lock–up malfunction
	☐ Shift point too high or too low
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive range)
	☐ Slip or shudder
	☐ No kick–down
	☐ Others ( )

Check Item	MIL	☐ Normal ☐ Remains ON

DTC Check	1st Time	☐ Normal code ☐ Malfunction code (DTC)
	2nd Time	☐ Normal code ☐ Malfunction code (DTC)

0567Q–09

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.

*1 : – ... MIL does not light /● ... MIL light up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *	Memory
P0500 (05–453)	Vehicle Speed Sensor "A"	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	●	○
P0705 (05–938)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	●	○
P0710 (05–941)	Transmission Fluid Temperature Sensor "A" Circuit	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM	●	○
P0711 (05–943)	Transmission Fluid Temperature Sensor "A" Performance		●	○
P0712 (05–941)	Transmission Fluid Temperature Sensor "A" Circuit Low Input		●	○
P0713 (05–941)	Transmission Fluid Temperature Sensor "A" Circuit High Input		●	○
P0717 (05–945)	Turbine Speed Sensor Circuit No Signal	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transaxle assembly	●	○
P0724 (05–947)	Brake Switch "B" Circuit High	• Short in stop light switch circuit • Stop light switch • ECM	●	○
P0741 (05–948)	Torque Converter Clutch Solenoid Perfomance (Shift Solenoid Valve DSL)	• Shift solenoid valve DSL is stuck open or closed • Valve body is blocked up or stuck • Shift solenoid valve DSL • ECM	●	○
P0743 (05–951)	Torque Converter Clutch Circuit Electrical (Shift Solenoid Valve DSL)	• Open or short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM	●	○
P0746 (05–954)	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)	• Shift solenoid valve SL1 is stuck open or closed • Valve body is blocked up or stuck • Shift solenoid valve SL1 • ECM	●	○
P0748 (05–956)	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM	●	○
P0766 (05–962)	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	• Shift solenoid valve S4 is stuck open or closed • Valve body is blocked up or stuck • Shift solenoid valve S4 • ECM	●	○
P0776 (05–963)	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	• Shift solenoid valve SL2 is stuck open or closed • Valve body is blocked up or stuck • Shift solenoid valve SL2 • ECM	●	○

P0778 (05–956)	Pressure Control Solenoid ”B” Electrical (Shift Solenoid Valve SL2)	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM	●	○
P0793 (05–965)	Intermediate Shaft Speed Sensor ”A”	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM	●	○
P0982 (05–956)	Shift Solenoid ”B” Control Circuit Low (Shift Solenoid Valve S4)	• Open or short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM	●	○
P0983 (05–956)	Shift Solenoid ”B” Control Circuit High (Shift Solenoid Valve S4)		●	○
P2716 (05–967)	Pressure Contorl Solenoid ”D” Electrical (Shift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	●	○

ELECTRONIC CONTROLLED AUTOMATIC TRANSAXLE [ECT] (U241E(1AZ–FSE))

0567N–12

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

The ECM of this system is connected to the multiplex communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the multiplex communication system.

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–919)

3	Connect the hand–held tester to DLC3

4	Check and Clear DTC and Freeze Frame Data (See page 05–920)

5	Visual Inspection

6	Setting the Check Mode Diagnosis (See page 05–920)

7	Problem Symptom Confirmation

- Symptom does not occur: Go to step 8
- Symptom occur: Go to step 9

8	Symptom Simulation (See page 01–22)

9	DTC Check (See page 05–920)

- DTC is not output: Go to step 10
- DTC is output: Go to step 17

10	Basic Inspection (See page 40–2, 40–8 and 40–69)

NG → Go to step 19

OK

11	Mechanical System Test (See page 05–920)

NG → Go to step 16

OK

12	Manual Shifting Test (See page 05–920)

NG → Go to step 14

OK

13	Problem Symptoms Table Chapter 1 (See page 05–935)

NG → Go to step 18

OK

14	Problem Symptoms Table Chapter 2 (See page 05–935)

NG → Go to step 16

OK

15	Problem Symptoms Table Chapter 3 (See page 05–935)

NG

16	Part Inspection

→ Go to step 19

17	DTC Chart (See page 05–931)

18	Circuit Inspection (See page 05–938)

19	Identification of Problem

20	Repair

21	Confirmation Test

End

KICK DOWN SWITCH CIRCUIT

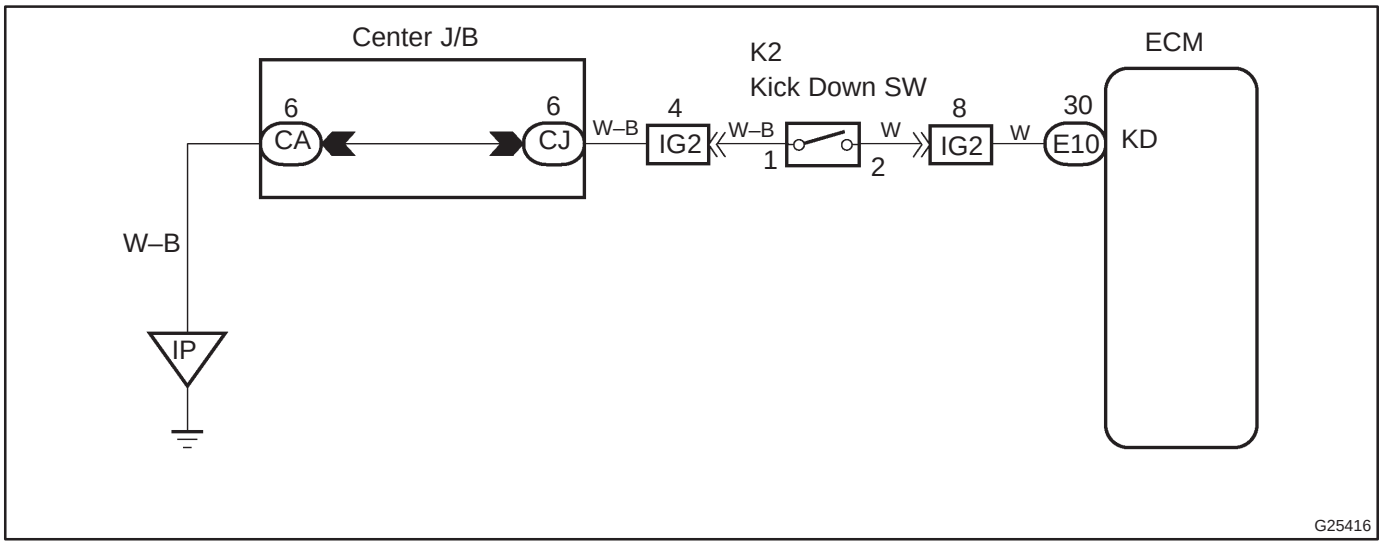
CIRCUIT DESCRIPTION

The kick–down switch is turned ON when the accelerator pedal is depressed to the full throttle and sends signals to ECM.

When the kick–down switch is turned ON, the ECM controls gear shifting according to the programmed shift diagrams.

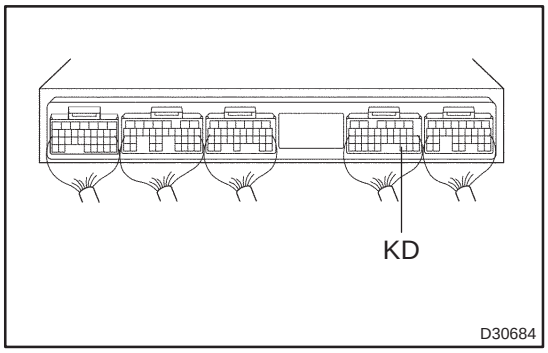
If a short circuit develops in the kick–down switch, the ECM disregards the kick–down signals and controls shifting at the normal shift points.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TERMINAL VOLTAGE



(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminal KD of ECM and body ground when accelerator pedal is fully depressed or not.

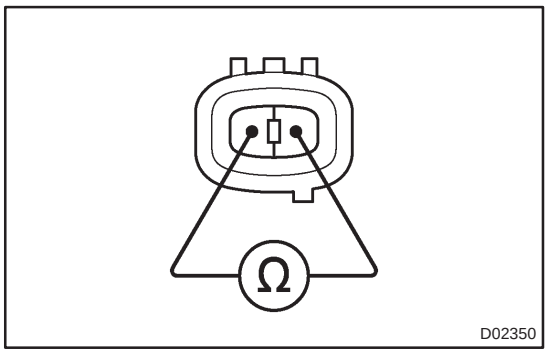
OK:

Accelerator pedal	Voltage
Fully depressed (Kick–down switch is ON)	Below 1 V
Released (Kick–down switch is OFF)	10 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2 INSPECT KICK DOWN SWITCH



(a) Disconnect the kick–down switch connector.
(b) Check the continuity between terminals 1 and 2 of the kick–down switch when kick–down switch is ON and OFF.

OK:

Kick–down switch	Continuity
ON	Continuity
OFF	No continuity

NG → **REPLACE KICK DOWN SWITCH**

OK

3 CHECK HARNESS AND CONNECTOR

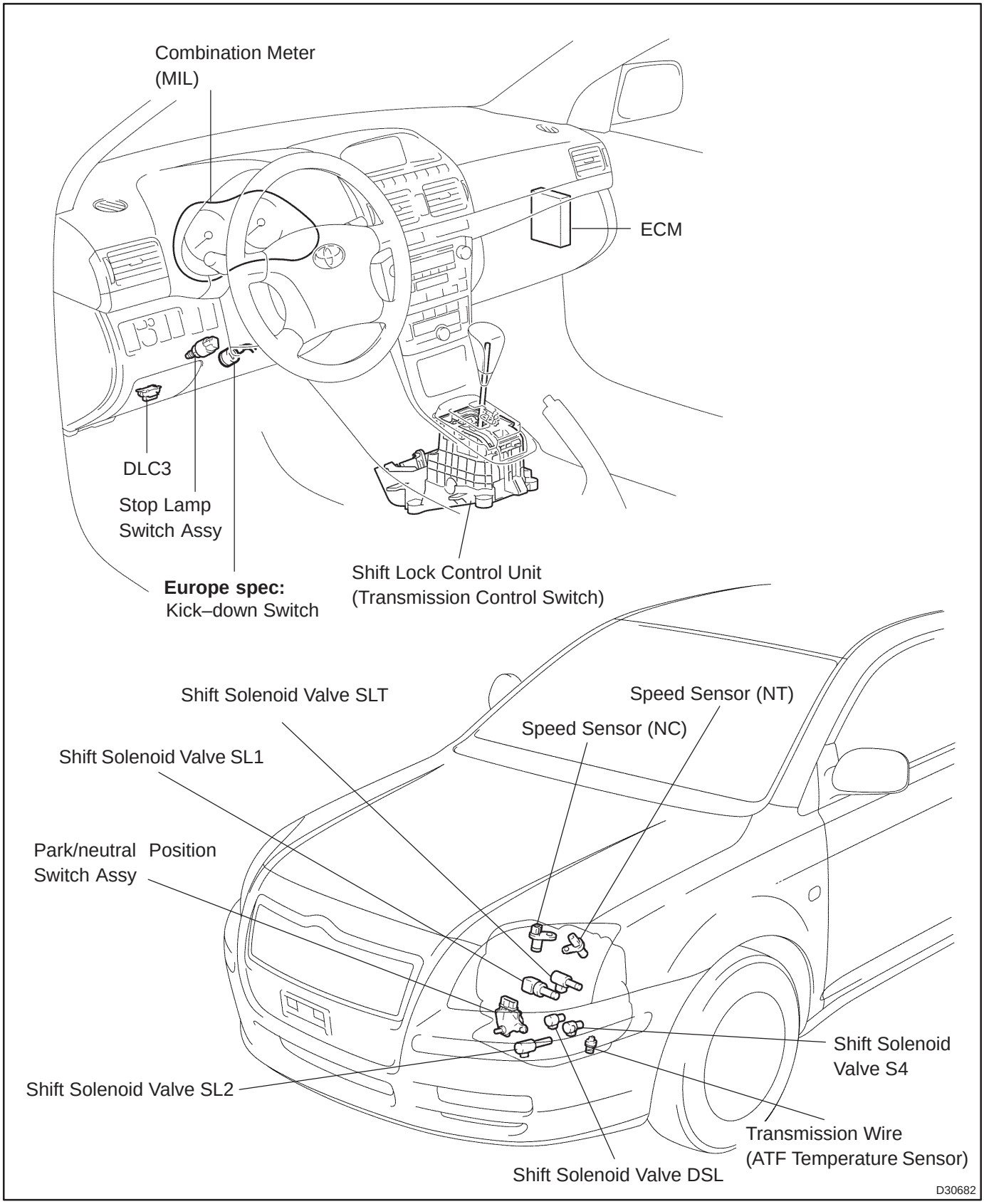
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

0567R–12

LOCATION



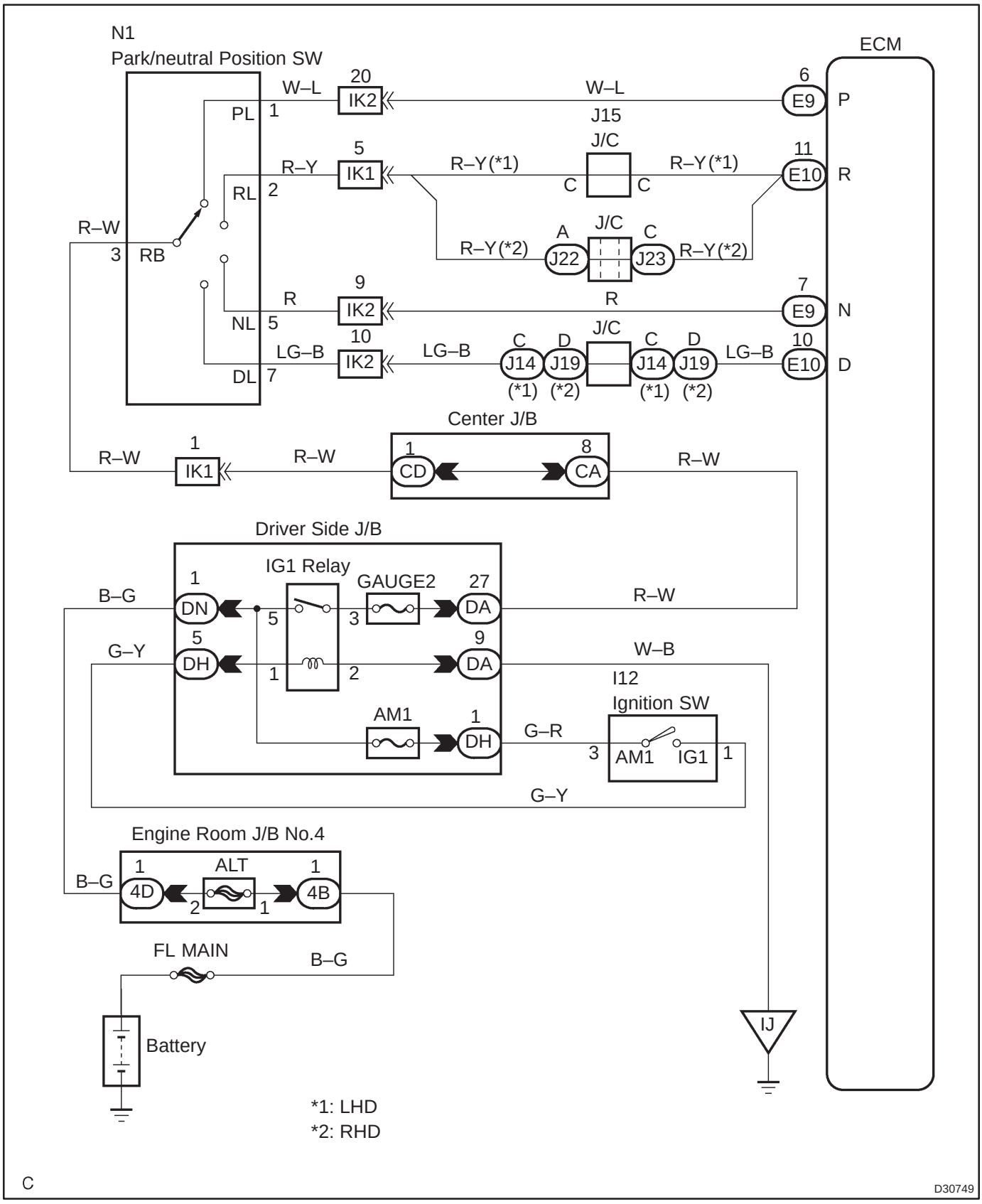
DTC	P0705	TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.

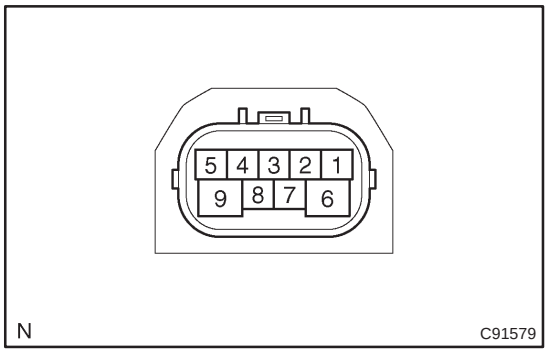
DTC No.	DTC Detecting Condition	Trouble Area
P0705	DTC is detected for 500 msec. or more (2–trip detection logic). • 2 or more switches are ON simultaneously for P, R, N and D position.	• Short in park/neutral position switch circuit • Park/neutral position switch assy • ECM
	When any of following conditions for 500 msec. or more in the S position (2–trip detection logic). (a) P position input signal is ON. (b) N position input signal is ON. (c) R position input signal is ON.	

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.
(b) Check the continuity between each terminal shown below when the shift lever is moved to each position.

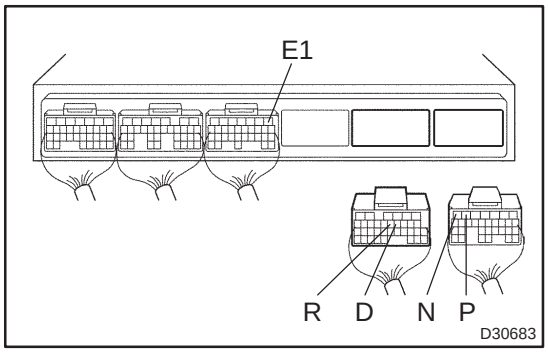
Shift Position	Terminal No. to continuity	
P	1 – 3	6 – 9
R	2 – 3	–
N	3 – 5	6 – 9
D	3 – 7	–

OK:
There is continuity.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY**

OK

2 CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – ECM)



(a) Connect the park/neutral position switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminals E1 and that P, R, N as well as D of the ECM connector when the shift lever is shifted to the following range.

OK:

Shift range	Terminal	Voltage (V)
P	P – E1	7.5 to 14
R	R – E1	7.5 to 14
N	N – E1	7.5 to 14
D	D – E1	7.5 to 14

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0710	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT

DTC	P0712	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT LOW INPUT

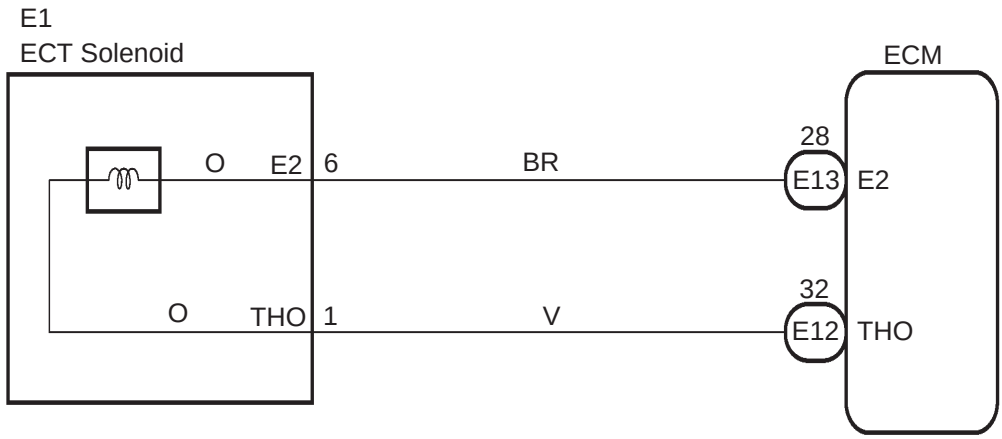
DTC	P0713	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

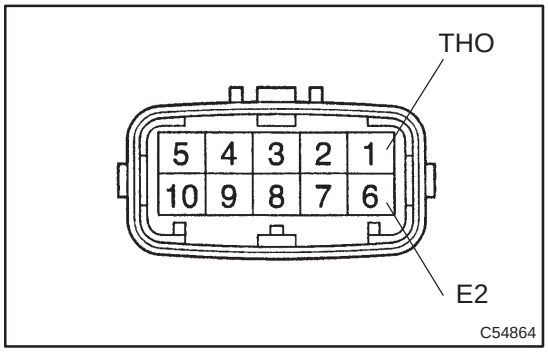
DTC No.	DTC Detection Condition	Trouble Area
P0710	(a) and (b) is detected momentary within 0.5 sec. when neither P0712 or P0713 is not detected (1–trip detection logic) (a) ATF temperature sensor resistance is less than 79 Ω. (b) ATF temperature sensor resistance is more than 156 kΩ. HINT: Wthin 0.5 sec. the malfunction switches from (a) to (b) or from (b) to (a)	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM
P0712	ATF temperature sensor resistance is less than 79 Ω. for 0.5 sec. or more (1–trip detection logic)	
P0713	DTC is detected for 0.5 sec. or more (1–trip detection logic) ATF temperature sensor resistance is more than 156 kΩ. after started engine for 15 minutes or more	

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals THO and E2.

OK:

Resistance: 79 Ω to 156 kΩ

(c) Check the continuity between the wire harness side connectors.

OK:

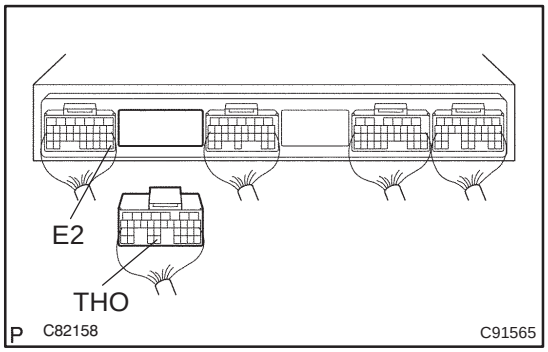
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector from the transaxle.

(b) Disconnect the ECM connector.

(c) Measure the resistance between terminals THO and E2.

OK:

Resistance: 79 Ω to 156 kΩ

(d) Check the continuity between the wire harness side connectors.

OK:

Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0711	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” PERFORMANCE

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

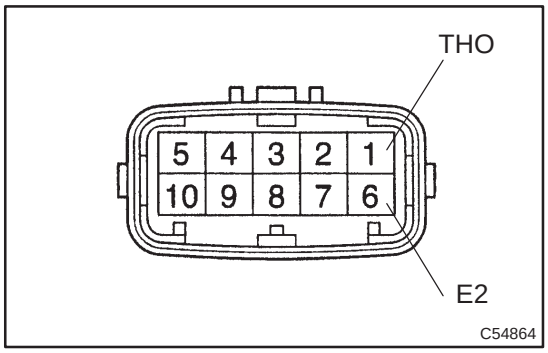
DTC No.	DTC Detection Condition	Trouble Area
P0711	Both (a) and (b) are detected: (2–trip detection logic) (a) After 12 sec. of engine start, temp. of atmosphere and that of engine coolant is more than –10˚C (b) After normal driving for over 20 min. and 10 km, ATF temp. is less than 10˚C	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM

WIRING DIAGRAM

See page 05–941.

INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals THO and E2.

OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(c) Measure the resistance between body ground and that THO as well as E2 of the transmission wire connector.

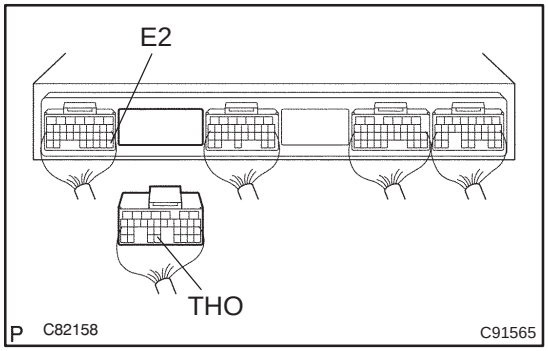
OK:

Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals THO and E2.
OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(d) Measure the resistance between body ground and that THO as well as E2 of the ECM connector.
OK:
Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

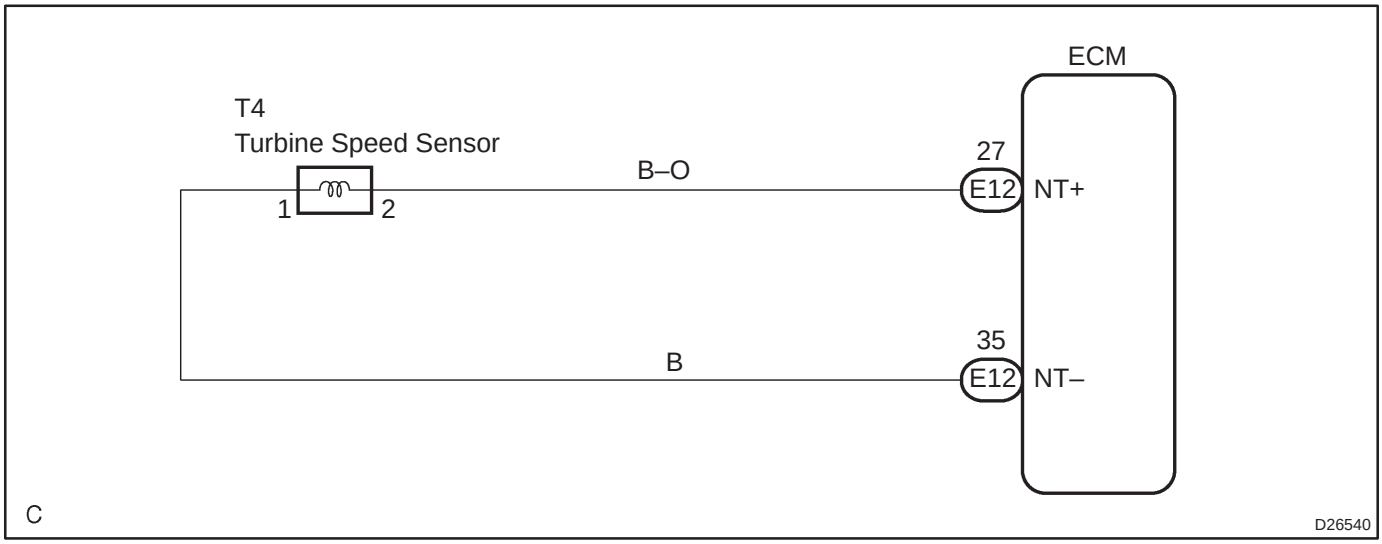
DTC	P0717	TURBINE SPEED SENSOR CIRCUIT NO SIGNAL

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the input turbine. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (NC), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

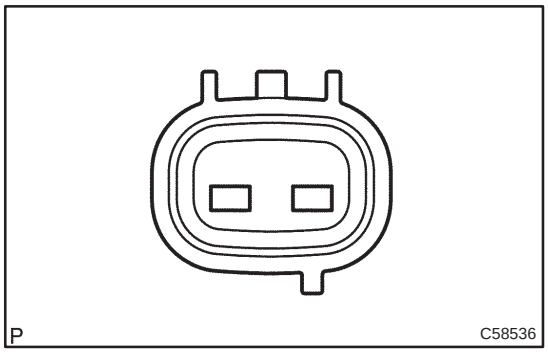
DTC No.	DTC Detection Condition	Trouble Area
P0717	ECM detects conditions (a), (b), (c) and (d) continuity for 5 sec. or more: (1 trip detection logic) (a) Vehicle speed: 50 km/h (20 mph) or more (b) 2nd, 3rd or O/D gear (c) Solenoid valves and park/neutral position switch are normal (d) NT < 300 rpm	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(NT)

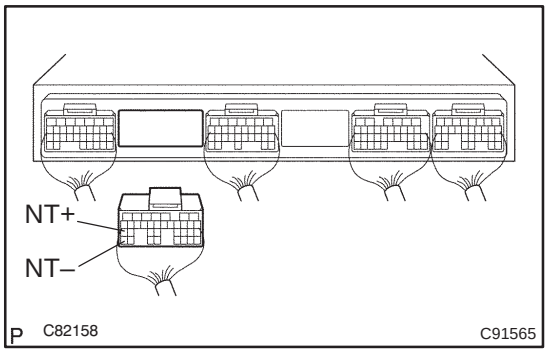


(a) Disconnect the speed sensor connector from the transaxle.
(b) Measure the resistance between terminals of speed sensor.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)

NG → **REPLACE SPEED SENSOR(NT)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



(a) Connect the speed sensor connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NT+ and NT–.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)
(d) Measure the resistance between body ground and that NT+ as well as NT– of the ECM connector.
OK:
Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0724	BRAKE SWITCH ”B” CIRCUIT HIGH

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in lock–up condition, when brakes are suddenly applied.
When the brake pedal is depressed, this switch sends signals to the ECM. Then the ECM cancels the operation of the lock–up clutch while braking is in progress.

DTC No.	DTC Detecting Condition	Trouble Area
P0724	The stop light switch does not turn off even once the vehicle is driven (2–trip detection logic).	• Short in stop light switch signal circuit • Stop light switch • ECM

WIRING DIAGRAM

See page 05–475.

INSPECTION PROCEDURE

1	INSPECT STOP LAMP SWITCH ASSY

NG → REPLACE STOP LAMP SWITCH ASSY

OK

2	CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH ASSY – ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPAIR OR REPLACE ECM

DTC	P0741	TORQUE CONVERTER CLUTCH SOLENOID PERFORMANCE (SHIFT SOLENOID VALVE SL)

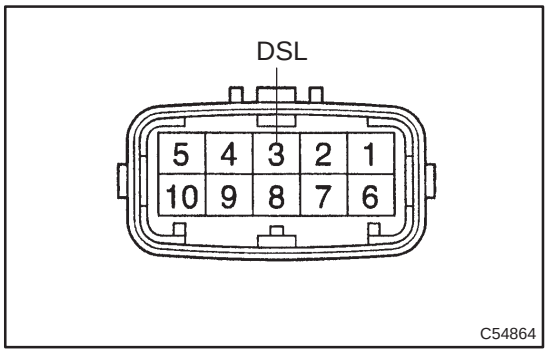
SYSTEM DESCRIPTION

The ECM uses the signals from the throttle position sensor, Air–flow meter and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.
Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect a mechanical trouble of the shift solenoid valve DSL, valve body and torque converter clutch.

DTC No.	DTC Detection Condition	Trouble Area
P0741	Lock–up does not occur when driving in lock–up range (normal driving at 80 km/h [50 mph]), or lock–up remains ON in lock–up OFF range (2 trip detection logic)	• Shift solenoid valve DSL is stuck open or closed • Valve body blocked or stuck • Shift solenoid valve DSL • Lock–up clutch

INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE(DSL)

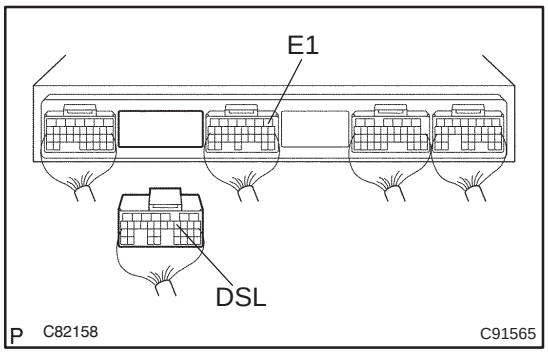


(a) Disconnect the transmission wire connector connector from the transaxle.
(b) Measure the resistance between the terminal 3 and the body ground.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSIONWIRE – ECM)



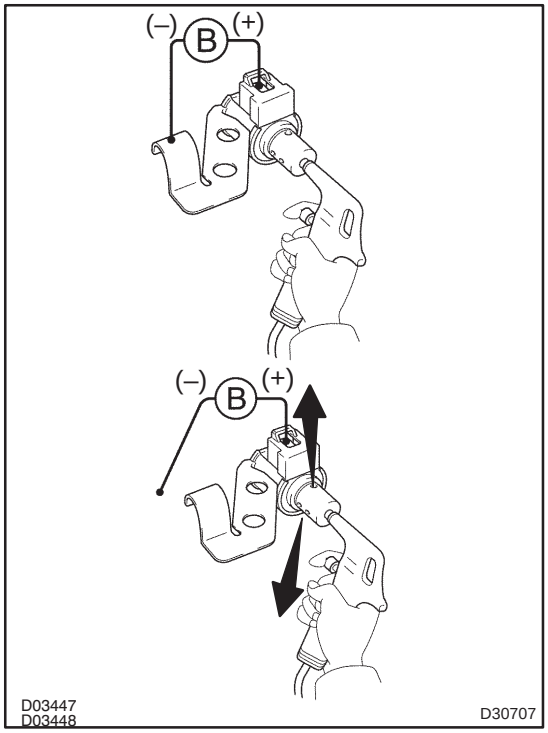
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals DSL and E1.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

OK → **Go to step 3**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

3 INSPECT SHIFT SOLENOID VALVE(DSL)



(a) Remove the shift solenoid valve DSL.

(b) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does not leak the air.

OK:

Solenoid valve does not leak air.

(c) When battery voltage is supplied to the shift solenoid valve, check that the valve opens.

OK:

Solenoid valve opens.

(d) Measure the resistance between the terminal DSL of shift solenoid valve DSL and the solenoid body.

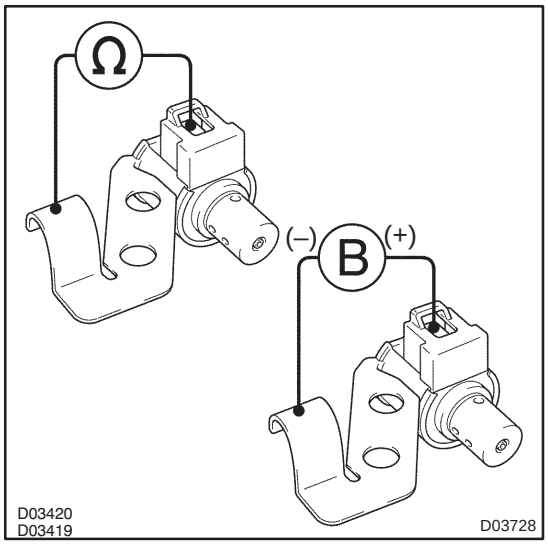
OK:

Resistance: 11 to 13 Ω at 20°C (68°F)

(e) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid body.

OK:

The solenoid valve makes operation noise.



NG → **REPLACE SHIFT SOLENOID VALVE(DSL)**

OK

4 CHECK TRANSMISSION WIRE

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

5	INSPECT TRANSMISSION VALVE BODY ASSY

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY

OK

6	INSPECT TORQUE CONVERTER CLUTCH ASSY

NG → REPLACE TORQUE CONVERTER CLUTCH ASSY

OK

REPAIR AUTOMATIC TRANSAXLE ASSY

DTC	P0743	TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL (SHIFT SOLENOID VALVE DSL)

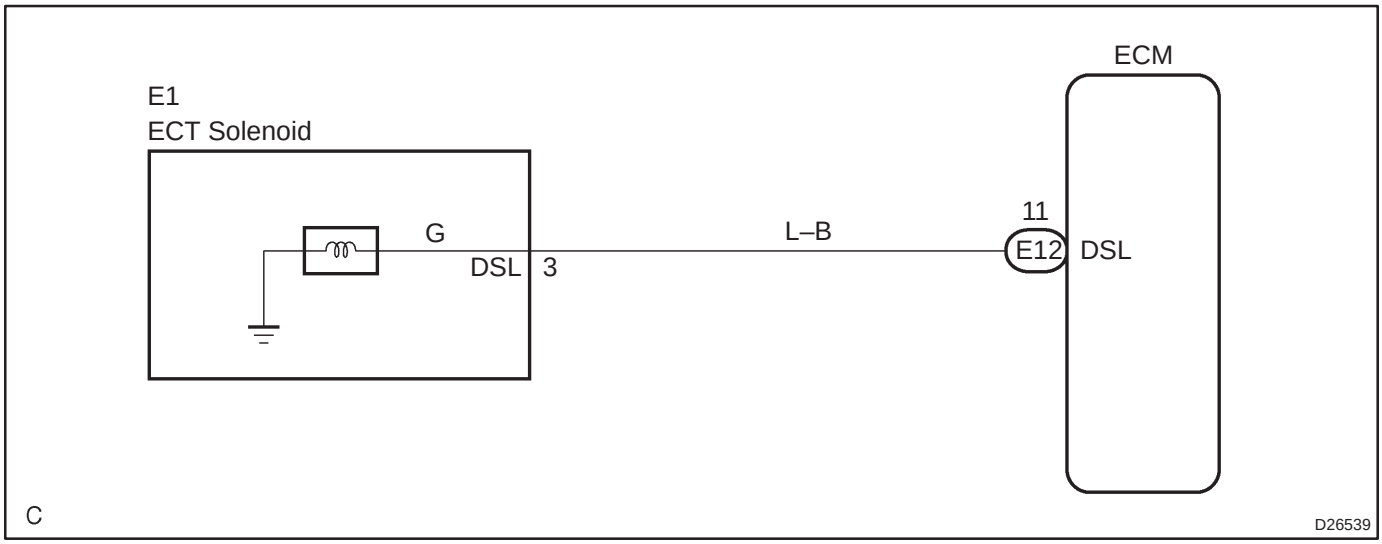
CIRCUIT DESCRIPTION

The shift solenoid valve DSL is turned ON and OFF by signals from the ECM in order to control the hydraulic pressure operation the lock–up relay valve, which then the controls operation of the lock–up clutch.

DTC No.	DTC Detection Condition	Trouble Area
P0743	Either (a) or (b) is detected at 1 time: (2 trip detection logic) (a) Solenoid resistance is 8 Ω or less short circuit when solenoid is energized (b) Solenoid resistance is 100 kΩ or more open circuit when solenoid is not energized	• Open or short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM

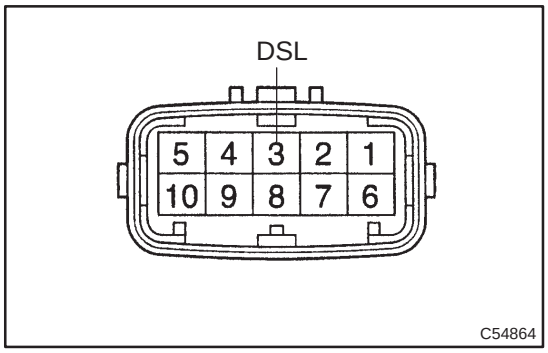
Fail safe function:
If the ECM detects a malfunction, it turns the shift solenoid valve DSL OFF.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(DSL)

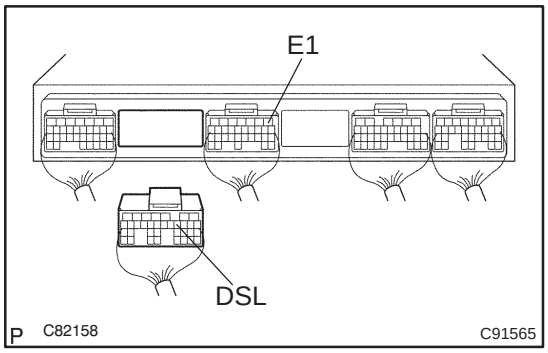


(a) Disconnect the solenoid connector from the transaxle.
(b) Measure the resistance between the terminal 3 and the body ground.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



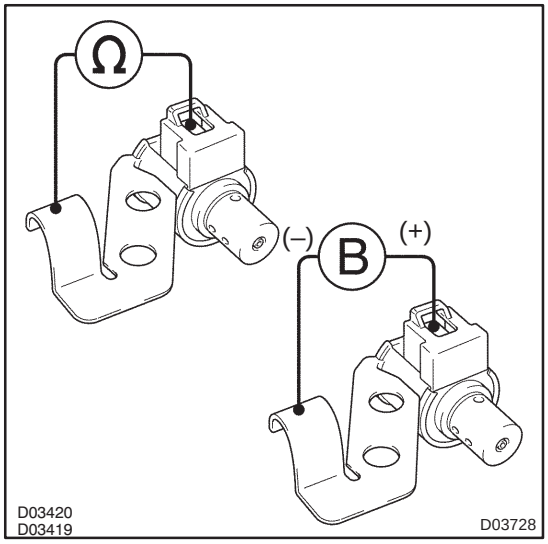
(a) Connect the transmission wire connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminal DSL and E1.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(DSL)



(a) Remove the shift solenoid valve DSL.

(b) Measure the resistance between the terminals DSL of shift solenoid valve and the solenoid valve body.

OK:

Resistance: 11 to 13 Ω at 20°C (68°F)

(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid valve body.

OK:

The solenoid valve makes operation noise.

NG → **REPLACE SHIFT SOLENOID VALVE(DSL)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0746	PRESSURE CONTROL SOLENOID ”A” PERFORMANCE (SHIFT SOLENOID VALVE SL1)

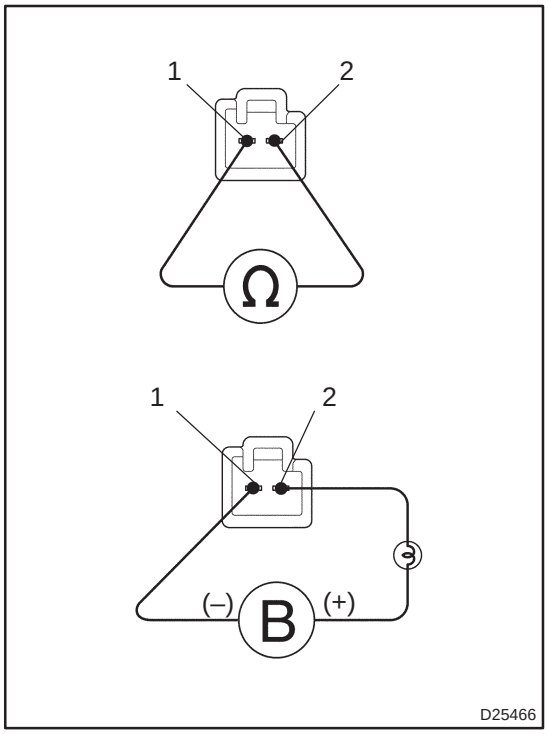
SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical troubles of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0746	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	• Shift solenoid valve SL1 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(SL1)



(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance between terminals of the shift solenoid valve SL1.
OK:
Resistance: 5.0 to 5.6 Ω at 20°C (68°F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL1)**

OK

2	INSPECT TRANSMISSION VALVE BODY ASSY

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY**

OK

3	INSPECT TORQUE CONVERTER CLUTCH ASSY

NG → REPLACE TORQUE CONVERTER CLUTCH ASSY

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSY

DTC	P0748	PRESSURE CONTROL SOLENOID ”A” ELECTRICAL (SHIFT SOLENOID VALVE SL1)

DTC	P0778	PRESSURE CONTROL SOLENOID ”B” ELECTRICAL (SHIFT SOLENOID VALVE SL2)

DTC	P0982	SHIFT SOLENOID ”D” CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE S4)

DTC	P0983	SHIFT SOLENOID ”D” CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE S4)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF operation of the shift solenoid valves SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

DTC No.	DTC Detection Condition	Trouble Area
P0748	ECM checks for an open or short circuit in shift solenoid valves SL1 (1–trip detection logic) (a) When solenoid is energized, duty ratio exceeds 75% (b) When solenoid is not energized, duty ratio is less than 3%	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM
P0778	ECM checks for an open or short circuit in shift solenoid valves SL2 (1–trip detection logic) (a) When solenoid is energized, duty ratio exceeds 75% (b) When solenoid is not energized, duty ratio is less than 3%	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM
P0982	ECM detects short in solenoid valve No. 4 circuit 4 times when solenoid valve No. 4 is operated (1–trip detection logic)	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	ECM detects open in solenoid valve No. 4 circuit 4 times when solenoid valve No. 4 is not operated (1–trip detection logic)	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

HINT:

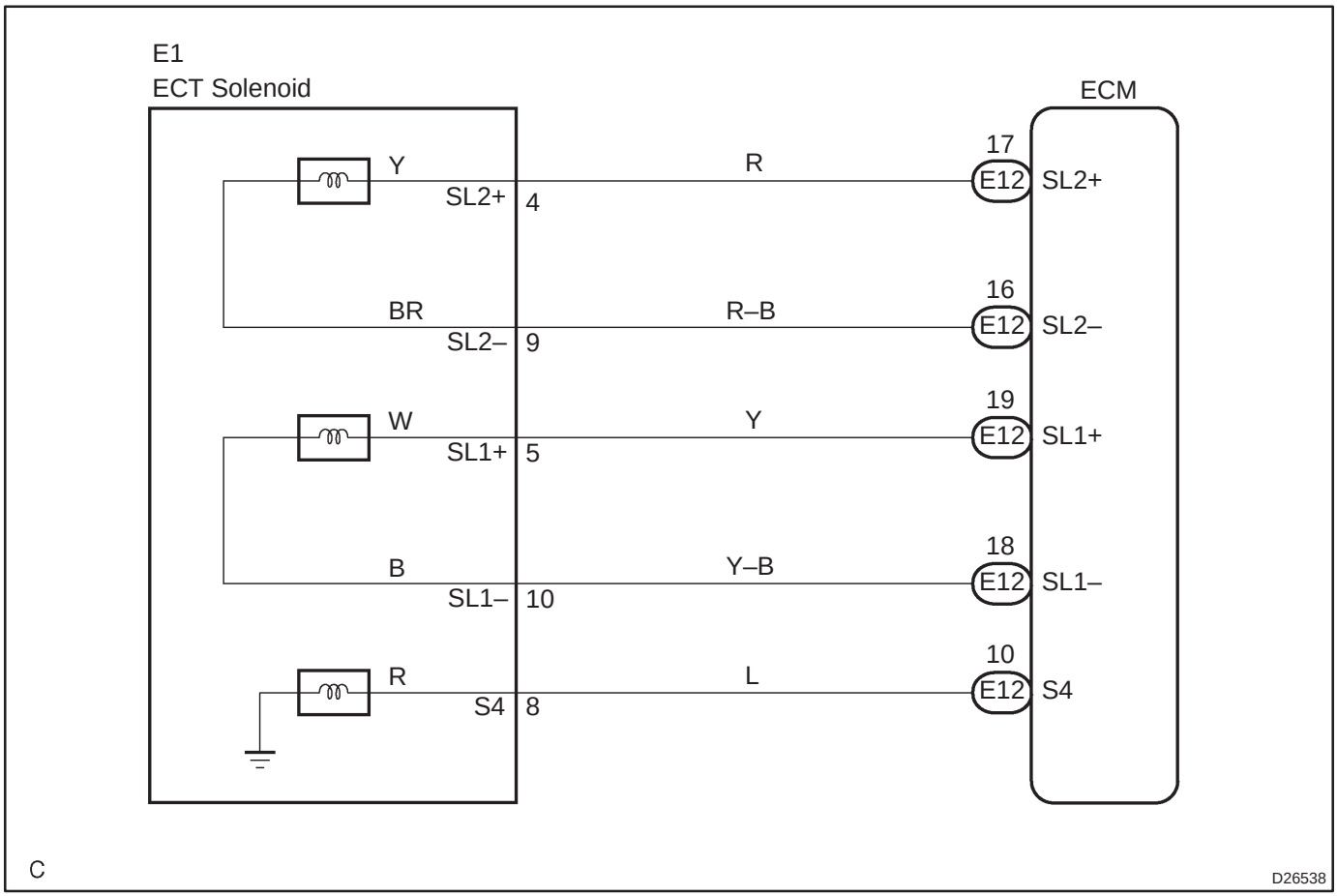
Check the shift solenoid valve SL1 when DTC P0748 is output, check the shift solenoid valve SL2 when DTC P0778 is output and check the shift solenoid valve S4 when DTC P0982 and P0983 is output.

Fail safe function:
If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid ON and OFF in order to shift into the gear positions shown in the table below. The ECM also turns the shift solenoid valve SL OFF at the same time. If both solenoids malfunction, hydraulic control cannot be performed electronically, and so it must be done manually.
Manual shifting as shown in the following table must be done (In case of a short circuit, the ECM stops sending the current to the short circuit solenoid).

NORMAL				SHIFT SOLENOID SL1 MALFUNCTIONING				SHIFT SOLENOID SL2 MALFUNCTIONING				SHIFT SOLENOID S4 MALFUNCTIONING			
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
ON	ON	OFF	1st	X	ON	OFF	2nd	ON ↓ OFF	X	OFF	3rd	ON	ON	X	1st
OFF	ON	OFF	2nd	X	ON	OFF	2nd	OFF	X	OFF	3rd	OFF	ON	X	2nd
OFF	OFF	OFF	3rd	X	OFF ↓ ON	OFF ↓ ON	3rd	OFF	X	OFF	3rd	OFF	OFF	X	3rd
OFF	OFF	ON	O/D	X	OFF ↓ ON	ON	3rd	OFF	X	ON	O/D	OFF	OFF	X	3rd

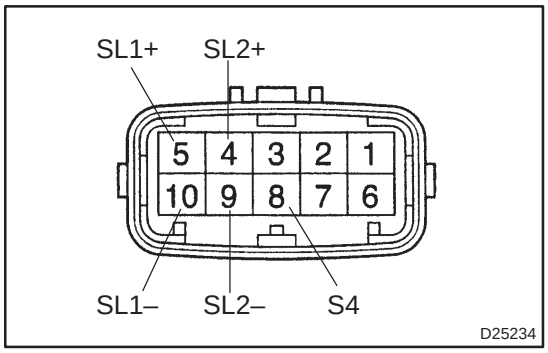
SHIFT SOLENOID SL1 AND SL2 MALFUNCTIONING				SHIFT SOLENOID SL1 AND S4 MALFUNCTIONING				SHIFT SOLENOID SL2 AND S4 MALFUNCTIONING				SHIFT SOLENOID SL1, SL2 AND S4 MALFUNCTIONING			
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
X	X	OFF	3rd	X	ON	X	2nd	ON ↓ OFF	X	X	3rd	X	X	X	3rd
X	X	OFF	3rd	X	ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd
X	X	OFF	3rd	X	OFF ↓ ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd
X	X	ON	O/D	X	OFF ↓ ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SL1/SL2/S4)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals 5 and 10.
OK:
Resistance: 5.0 to 5.6 Ω at 20°C (68°F)

(c) Measure the resistance between terminals 5 and 10 of the transmission wire connector and body ground.
OK:
Resistance: 1MΩ or higher

NG → **Go to step 3**

(d) Measure the resistance between terminals 4 and 9.
OK:
Resistance: 5.1 to 5.5 Ω at 20°C (68°F)

(e) Measure the resistance between terminals 4 and 9 of the transmission wire connector and body ground.
OK:
Resistance: 1MΩ or higher

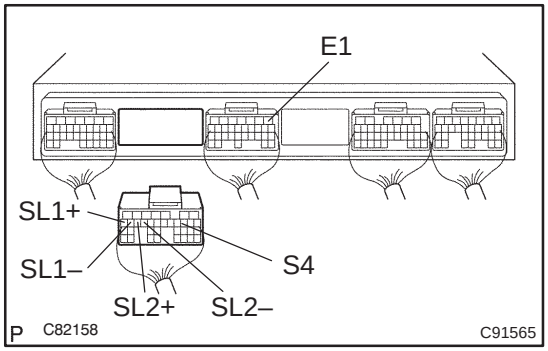
NG → **Go to step 4**

(f) Measure the resistance between terminal 8 and body ground.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 5**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



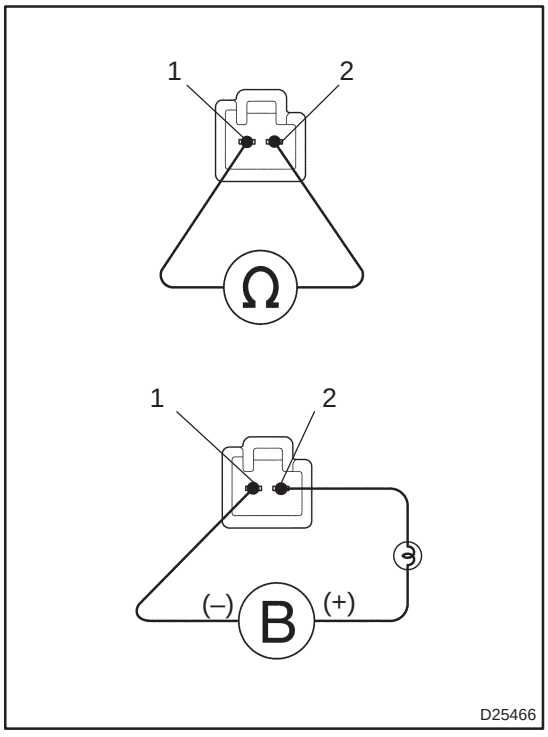
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the connector from the ECM.
(c) Measure the resistance between terminals of the ECM connector.
OK:
Resistance:
SL1+ – SL1–: 5.0 to 5.6 Ω at 20°C (68°F)
SL2+ – SL2–: 5.1 to 5.5 Ω at 20°C (68°F)
S4 – E1: 11 to 15 Ω at 20°C (68°F)
(d) Measure the resistance between terminals SL1+, SL1–, SL2+ and SL2– of the ECM connector and body ground.
OK:
Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(SL1)



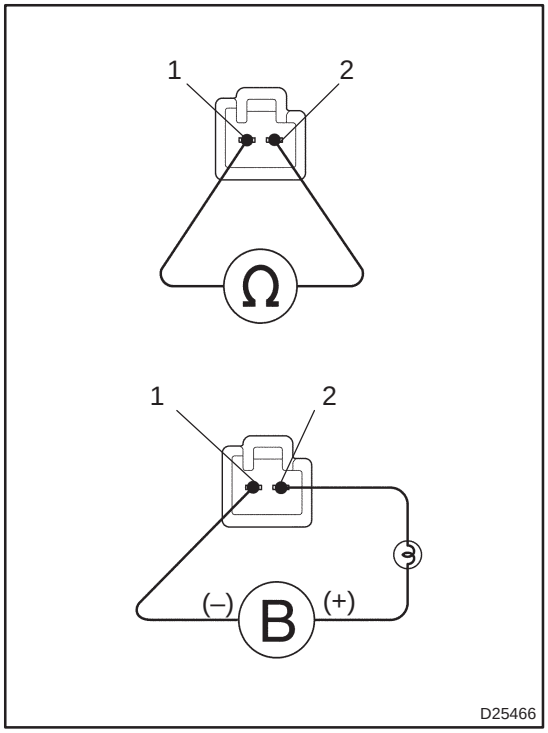
(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance between terminals of the shift solenoid valve SL1.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL1)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

4 INSPECT SHIFT SOLENOID VALVE(SL2)



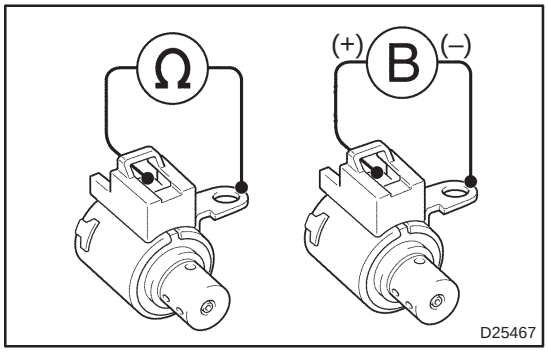
(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance between terminals of the shift solenoid valve SL2.
OK:
Resistance: 5.1 to 5.5 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL2)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

5 INSPECT SHIFT SOLENOID VALVE(S4)



(a) Remove the shift solenoid valve S4.
(b) Measure the resistance between the solenoid connector and the solenoid valve body.
OK:
Resistance: 11 to 15 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid valve body.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(S4)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0766	SHIFT SOLENOID ”D” PERFORMANCE (SHIFT SOLENOID VALVE S4)

SYSTEM DESCRIPTION

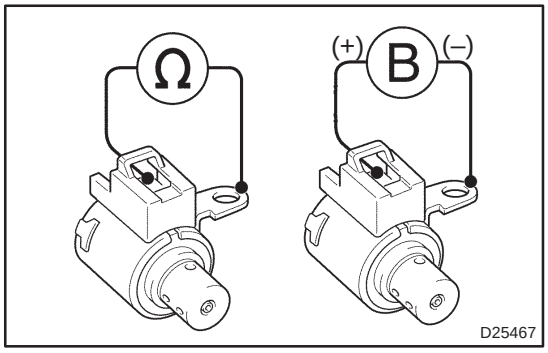
The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical troubles of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0766	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	• Shift solenoid valve S4 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)

INSPECTION PROCEDURE

1 INSPECT SHIFT SOLENOID VALVE(S4)



(a) Remove the shift solenoid valve S4.

(b) Measure the resistance between the solenoid connector and the solenoid body.

OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid body.

OK:

The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(S4)**

OK

2 INSPECT TRANSMISSION VALVE BODY ASSY

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY**

OK

3 INSPECT TORQUE CONVERTER CLUTCH ASSY

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSY

DTC	P0776	PRESSURE CONTROL SOLENOID ”B” PERFORMANCE (SHIFT SOLENOID VALVE SL2)

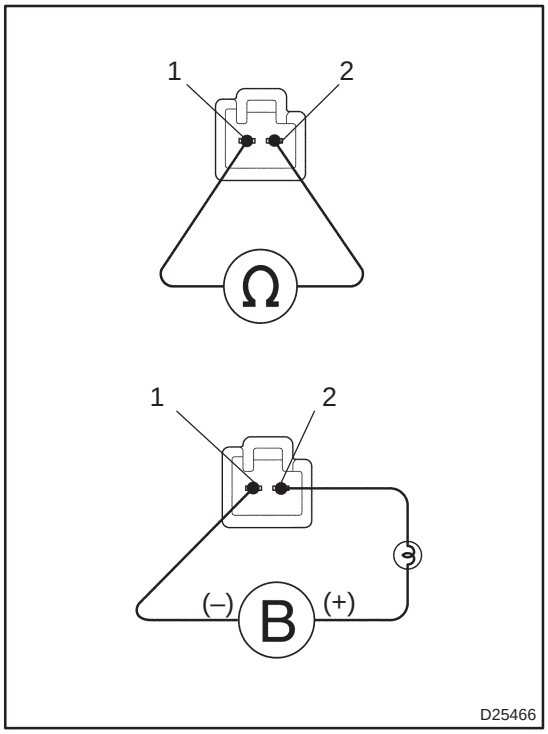
SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical troubles of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0776	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	• Shift solenoid valve SL2 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(SL2)



(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance between terminals.
OK:
Resistance: 5.1 to 5.5 Ω at 20°C (68°F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL2)**

OK

2	INSPECT TRANSMISSION VALVE BODY ASSY

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY**

OK

3	INSPECT TORQUE CONVERTER CLUTCH ASSY

NG → REPLACE TORQUE CONVERTER CLUTCH ASSY

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSY

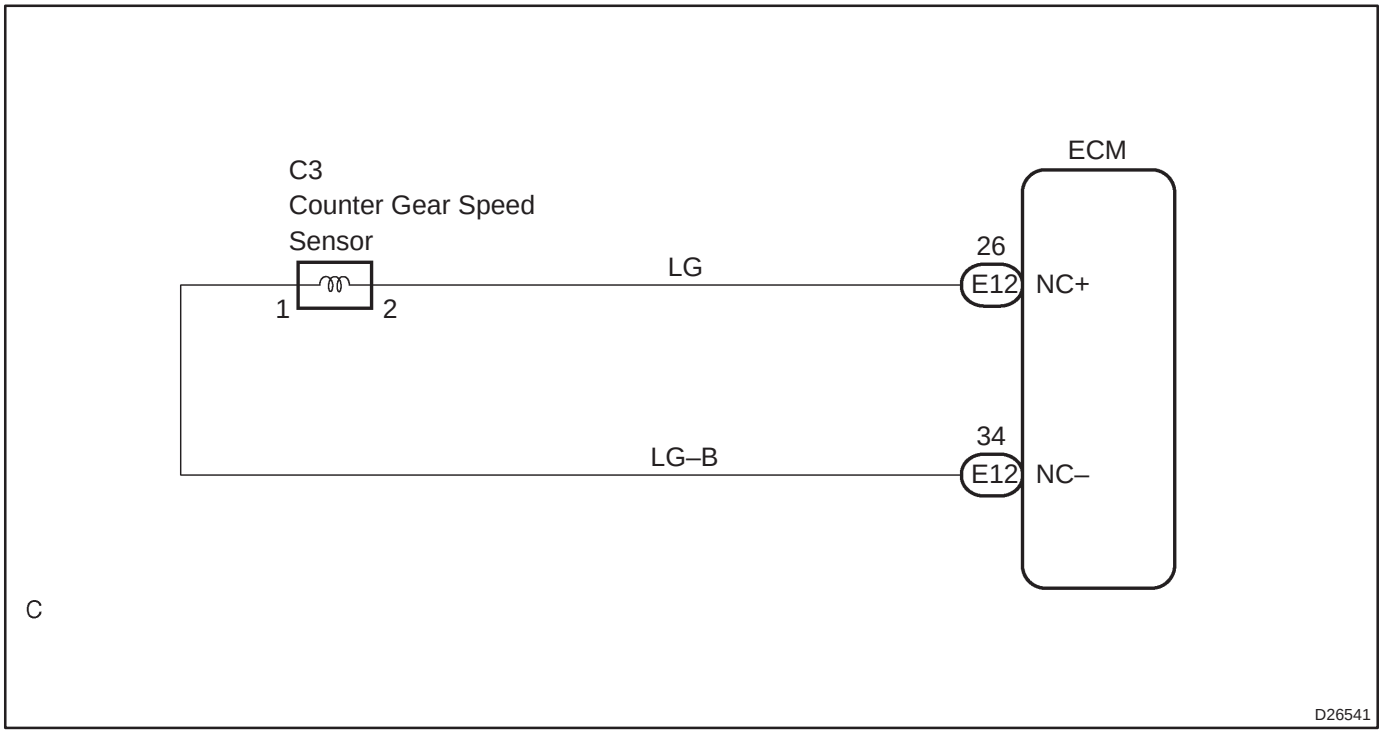
DTC	P0793	INTERMEDIATE SHAFT SPEED SENSOR ”A”

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the counter gear. By comparing the counter gear speed signal (NC) with the direct clutch speed sensor signal (NT), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

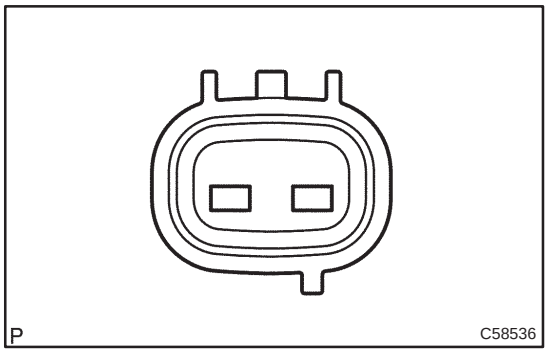
DTC No.	DTC Detection Condition	Trouble Area
P0793	ECM detects conditions (a), (b), (c) and (d) continuity for 5 sec. or more: (1 trip detection logic) (a) Vehicle speed: 50 km/h (20 mph) or more (b) 2nd, 3rd or O/D gear (c) Solenoid valves and park/neutral position switch are normal (d) NC < 300 rpm	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(NC)

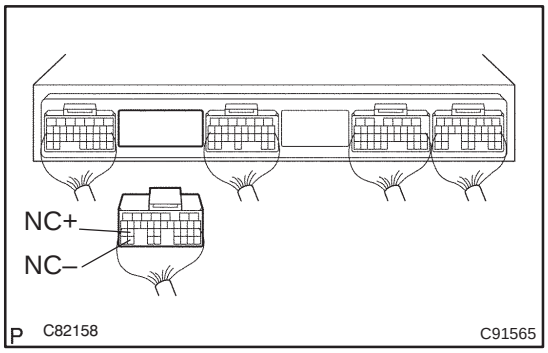


(a) Disconnect the speed sensor (NC) connector from the transaxle.
(b) Measure the resistance between terminals of the speed sensor.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)

NG → **REPLACE SPEED SENSOR(NC)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



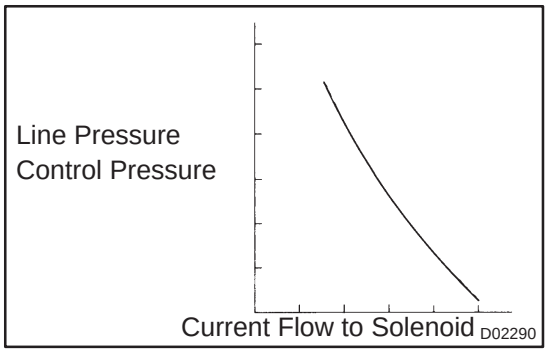
(a) Connect the speed sensor (NC) connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NC+ and NC–.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)
(d) Measure the resistance between terminals NC+ and NC– of the ECM connector and body ground.
OK:
Resistance: 1MΩ or higher

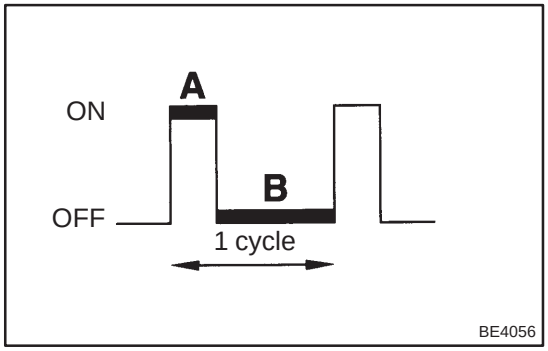
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P2716	PRESSURE CONTROL SOLENOID ”D” ELECTRICAL (SHIFT SOLENOID SLT)





CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates the line pressure) causes the solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate the line pressure according to the extent of the accelerator pedal depressed or the output of engine power.

This controls the line pressure and provides smooth shifting.

Upon receiving a signal of the throttle valve opening angle, the ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure and generating throttle pressure.

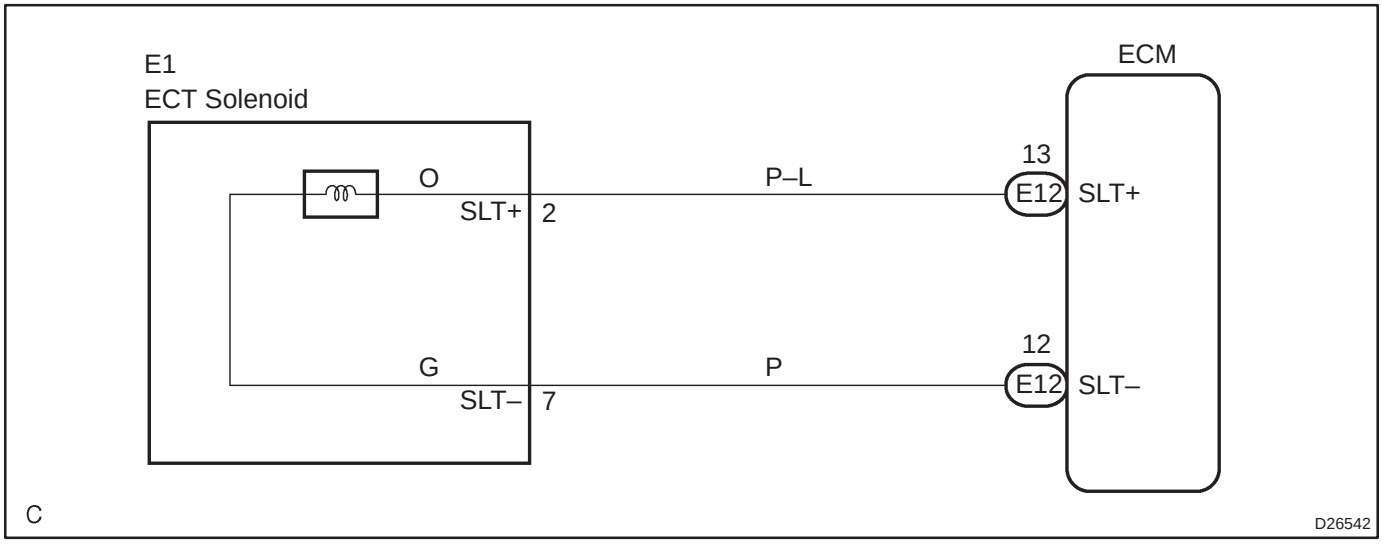
(*): Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

Duty Ratio=A/(A+B) x 100 (%)

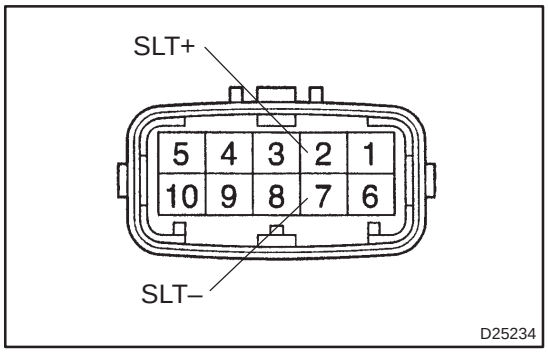
DTC No.	DTC Detection Condition	Trouble Area
P2716	Condition (a) or (b) below is detected 1 sec. or more: (1–trip detection logic) (a) SLT– terminal: 0V (b) SLT– terminal: 12V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SLT)

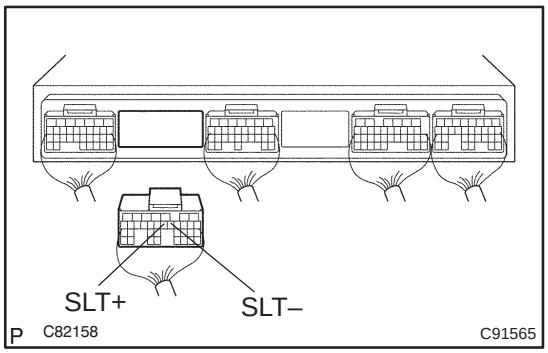


(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminals SLT+ and SLT–.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Measure the resistance between terminals SLT+ and SLT– of the transmission wire connector and body ground.
OK:
Resistance: 1MΩ or higher

NG	Go to step 3

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



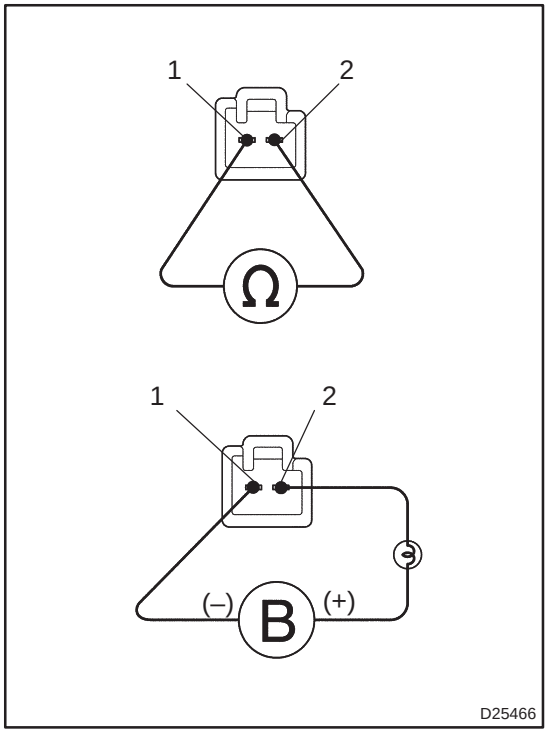
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals SLT+ and SLT– of ECM connector.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(d) Measure the resistance between terminals SLT+ and SLT– of the ECM connector and body ground.
OK:
Resistance: 1MΩ or higher

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(SLT)



(a) Remove the shift solenoid valve SLT.

(b) Measure the resistance between terminals of the shift solenoid valve SLT.

OK:

Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.

OK:

The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SLT)**

OK

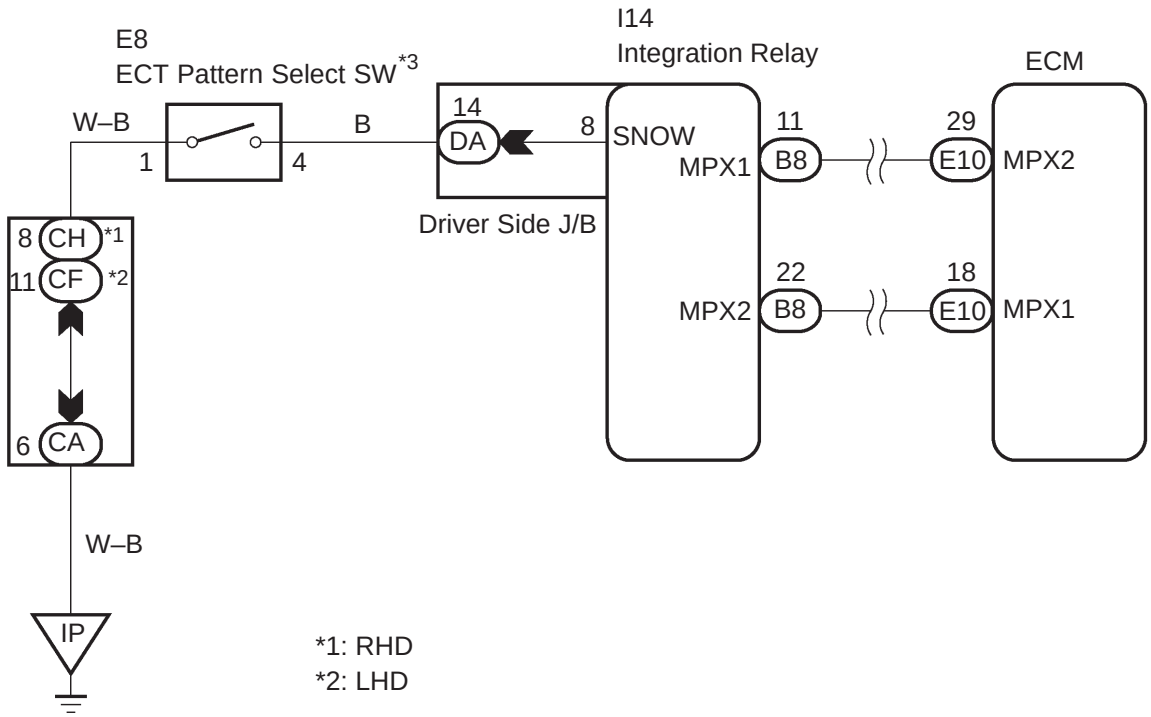
REPAIR OR REPLACE TRANSMISSION WIRE

PATTERN SELECT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

ECT SNOW is the system that operates the throttle motor to control engine output to reduce skidding of the driving wheels, guarantee takeoff acceleration, driving straightness and turning stability.

WIRING DIAGRAM



(*3) Pattern Select Switch (ECT SNOW Switch)
When the ECT SNOW switch is pushed, the switch contact is made and the ECT SNOW mode is selected. To cancel the ECT SNOW mode, push the ECT SNOW switch once again. The ECT SNOW mode is automatically cancelledout when the ignition switch is turned ”OFF”.

C

D30688

INSPECTION PROCEDURE

1	DRIVING TEST

(a) Start the engine.
(b) Turn the ECT SNOW switch ”OFF”.
(c) Confirm vehicle response by driving from a parked position to fully depressing the accelerator pedal.
(d) Turn the ECT SNOW switch on and perform the same check as (c).
Confirm that there is a difference between ECT SNOW switch ”ON” and ”OFF”.

HINT:
- Driving test should be done on a paved road (a nonskid road).
- Make sure not to use the TRAC system when testing a vehicle equipped with one.

Standard:
There is a difference in acceleration between ”ON” and ”OFF”.

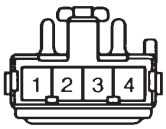
NG → **Go to step 2**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page xx–xxx)

2	CHECK HARNESS AND CONNECTOR(PATTERN SELECT SWITCH ASSY – BODY GROUND)

Wire Harness Side:



B59192

(a) Disconnect the connector of pattern select switch (ECT SNOW switch).
(b) Measure the resistance between 4 of the wire harness connector and body ground.
Standard:

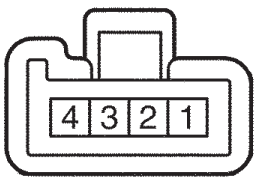
Tester connection	Specified condition
4 – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3	INSPECT PATTERN SELECT SWITCH ASSY

Switch Side:



D30685

(a) Measure the resistance between terminals 1 and 4 of pattern select switch (ECT SNOW switch).
Standard:

Switch condition	Tester connection	Specified condition
Press continuously Pattern select switch	1 – 4	Continuity
Release Pattern select switch	1 – 4	No continuity

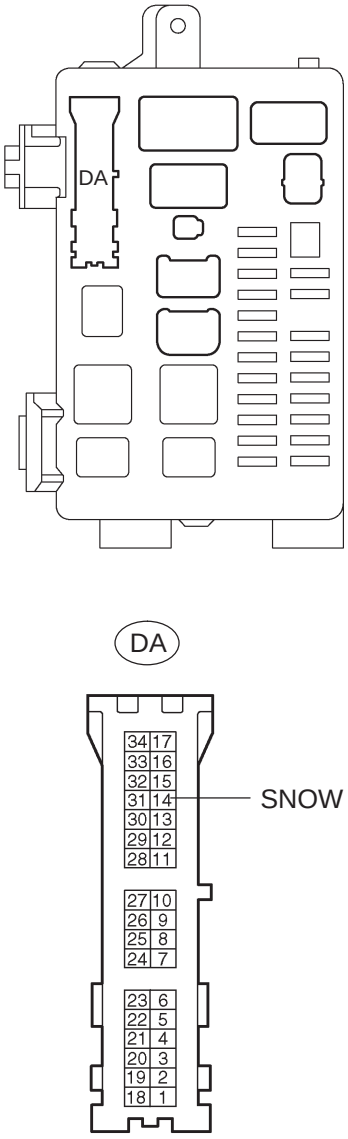
NG → **REPLACE PATTERN SELECT SWITCH ASSY**

OK

4	CHECK HARNESS AND CONNECTOR(PATTERN SELECT SWITCH ASSY – INTEGRATION RELAY)

Instrument Panel J/B Assy

Vehicle Front Side:



(a) Connect the connector of pattern select switch (ECT SNOW switch).

(b) Disconnect the instrument panel J/B assy (integration relay) connector.

(c) Measure the resistance between terminal SNOW of instrument panel J/B assy (integration relay) and body ground.

Standard:

Switch condition	Tester connection	Specified condition
Press continuously Pattern select switch	DA–14 (SNOW) – Body ground	Below 1 Ω
Release Pattern select switch	DA–14 (SNOW) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page xx–xxx)

05C94–02

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

(1) When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to the OBD scan tool complying with ISO 15031–4 or hand–held tester, and read off various data output from the vehicle's ECM.

(2) Euro–OBD regulations require that the vehicle's on–board computer illuminates the Check Engine Warning Light (Malfunction Indicator Lamp)/CHK ENG (MIL) on the instrument panel when the computer detects a malfunction in the emission control system/components or in the driving system components which affect vehicle emissions, or a malfunction in the computer. In addition to CHK ENG (MIL) illuminating when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO15031–6 are recorded in the ECM memory.

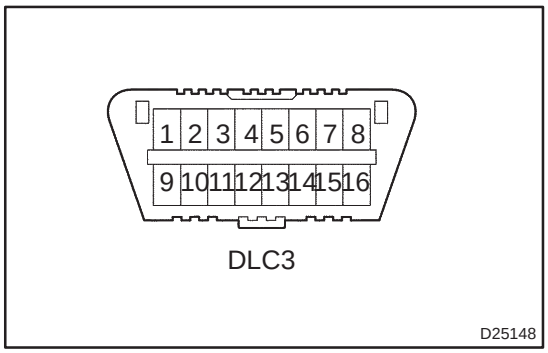
If the malfunction does not occur in 3–trip, the CHK ENG (MIL) goes off but the DTCs remain recorded in the ECM memory.

(3) To check the DTCs, connect the OBD scan tool or hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data (For operating instructions, see the OBD scan tool's instruction book.).

(4) DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–931).

(5) The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic (*) to prevent erroneous detection, and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, technicians can cause the CHK ENG (MIL) to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 2).

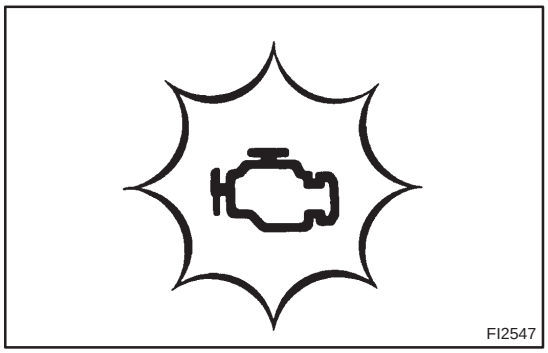
(6) *2 trip detection logic:
When a malfunction is first detected, the malfunction code is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG (MIL) to illumenate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and the 2nd trip.).



(b) Inspect the DLC3.
(1) The vehicle's ECM uses ISO 9141–2 (Euro–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–3 and matches the ISO 9141–2 format.

Terminal No.	Connection	Voltage or Resistance	Condition
7	Bus ⊕ Line	Pulse generation	During communication
4	Chassis Ground	↔ Body Ground / 1 Ω or less	Always
16	Battery Positive	↔ Body Ground / 9 to 14 V	Always

HINT:
If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of hand–held tester to DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.
- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. INSPECT DIAGNOSIS (NORMAL MODE)

(a) Check the MIL.
(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the MIL does not come on, troubleshoot the combination meter.

(2) When the engine is started, the MIL should go off. If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC, using the hand–held tester.

NOTICE:

Hand–held tester only:

When the diagnostic system is switched from normal mode to check (test) mode, it erases all DTCs and freeze frame data recorded in normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.

(1) Use the hand–held tester to check the DTCs and instructions, see the hand–held tester instruction book.

(2) See page 05–931 to confirm the details of the DTCs.

(c) Clear the DTC.

(1) When using the hand–held tester:
The following operation will erase the DTC and freeze frame data. Operate the hand–held tester to erase the codes.

(2) When not using the hand–held tester:
Remove the EFI fuse from engine room J/B for 60 seconds or more.

3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has high sensing ability to detect malfunctions.

Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

(a) Check the DTC.

(1) Check the initial conditions.

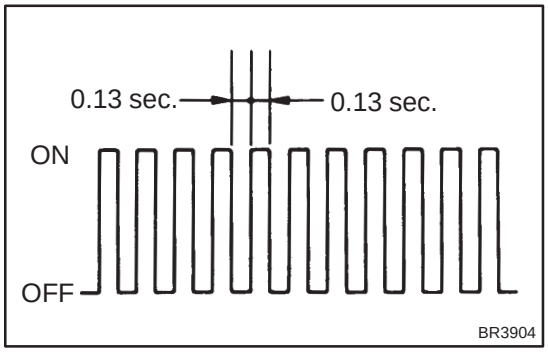
- Battery voltage 11 V or more
- Throttle valve fully closed
- Shift lever in P range
- Air conditioning switched OFF

(2) Turn the ignition switch OFF.

(3) Prepare the hand–held tester.

(4) Connect the hand–held tester to DLC3.

(5) Turn the ignition switch ON and switch the hand–held tester ON.



(6) Switch the hand–held tester from Normal mode to Check mode (Check that the MIL flashes).

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(7) Start the engine (MIL goes out after the engine starts).

(8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Take care not to turn the ignition switch OFF, as turning it off switches the diagnosis system from Check mode to Normal mode, which all DTCs etc. are erased.

(10) After checking the DTC, inspect the applicable circuit.

(b) Clear the DTC.

When using the hand–held tester:

The following operation will erase the DTC and freeze frame data. Operate the hand–held tester to erase the codes.

(c) Clear the DTC.

When not using the hand–held tester:

Remove the EFI fuse from engine room J/B for 10 seconds or more.

4. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one of the methods to shorten the work time.

(a) Warm up the engine.

(b) Turn the ignition switch OFF.

(c) Connect the hand–held tester to the DLC3.

(d) Turn the ignition switch ON.

(e) According to the display on tester, read the ”DATA LIST”.

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	←
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th (O/D)	Shift lever Range is; • D: 1st, 2nd, 3rd or 4th (O/D)	←
SPD (NC)	Counter Gear Speed display: 50 r/min	D Range is warmed up,4th (O/D); Same as input shaft speed	←
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	←
KICKDOWN SW	Kick down SW Status/ ON or OFF	• Accelerator Pedal is depressed: ON • Accelerator Pedal is released: OFF	←

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever range is; P or N: ON Except P or N: OFF	The shift lever range and these values are different, there are failures of the PNP switch or shift cable adjustment.
REVERSE	PNP SW Status/ ON or OFF	Shift lever range is; R: ON Except R: OFF	
DRIVE	PNP SW Status/ ON or OFF	Shift lever range is; D and 3: ON Except D and 3: OFF	
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: –40°C (–40°F) max.: 215°C (419°F)	80°C (176°F) (After Stall Test)	If the value is "–40°C (–40°F)" or "215°C (419°F)", ATF temp. sensor circuit is opened or shorted.

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one of the methods to shorten the work time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) According to the display on tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
LINE PRESS UP	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [Others] ON: Line pressure up. OFF: No action (normal operation)	–
LOCK UP	[Test Details] Control the shift solenoid DSL to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 60 km/h (37 mph) or more	Possible to check the DSL operation.
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift range by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid values.

6. PROBLEM SYMPTOM CONFIRMATION

(a) Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

7. ROAD TEST

NOTICE:

Conduct the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).

(a) D range test

Shift into the D range and fully depress the accelerator pedal and check the following points:

(1) Check up–shift operation.

Check to see that 1 → 2, 2 → 3 and 3 → O/D up–shift take place, and that the shift points conform to the automatic shift schedule (See page 03–45).

HINT:

- O/D Gear Up–shift Prohibition Control (1. Water temp. is 60˚C (140˚F) or less. 2. If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.)
- O/D Gear Lock–up Prohibition Control (1. Brake pedal is depressed. 2. Water temp. is 60˚C (140˚F) or lower)

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shift.

(3) Check for abnormal noise and vibration.

Run in D range lock–up or O/D gear and check for abnormal noise and vibration.

HINT:

The check for the cause of abnormal noise and vibration must be done very thoroughly as it could also be sure to loss of balance in the differential, torque converter, etc.

(4) Check kick–down operation.

While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated in the automatic shift schedule (See page 03–45).

(5) Check for abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.

- Drive in D range O/D gear, at a steady speed (lock–up ON) of about 60 km/h (37 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(b) S range test

Shift to the S range, depress the accelerator pedal and check the following points:

Shift operations.

- Shifting the shift lever to ”+” or ”–” changes the shift range on the combination meter.

HINT:

Manual shift prohibition control is performed when:

- The ATF temperature is low.
- Down–shifting causes engine overrun.
- Down–shifting is required continuously. (Down–shifting to 1st gear may not be performed.)

(c) R range test

Shift into the R range and fully depress the accelerator pedal and check for slipping.

CAUTION:

Before conducting this test, ensure that the test area is free from people and obstruction.

(d) P range test

Stop the vehicle on a grade (more than 5˚) and after shifting into the P range, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

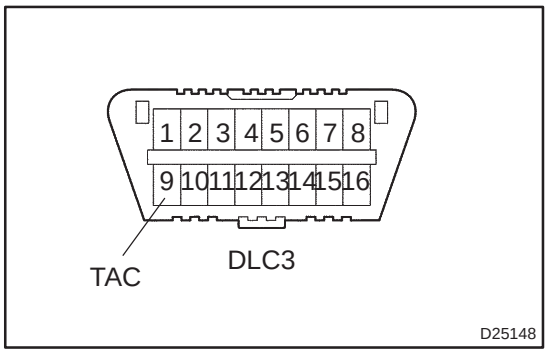
8. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R ranges.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Do not continuously run this test for longer than 5 seconds.**
- **To ensure safety, do this test in a wide, clear level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**



(1) Chock the 4 wheels.

(2) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

SST 09843–18030

(3) Fully apply the parking brake.

(4) Keep your left foot pressing firmly on the brake pedal.

(5) Start the engine.

(6) Shift into the D range. Press all the way down on the accelerator pedal with your right foot.

(7) Quickly read the stall speed at this time.

Stall speed: 2,550 ± 150 rpm

(8) Do the same test in the R range.

Stall speed: 2,550 ± 150 rpm

Evaluation:

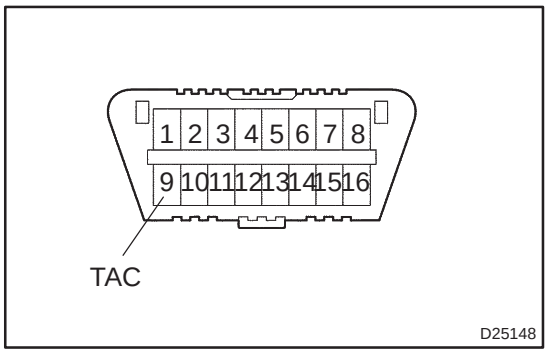
Problem	Possible cause
(a) Stall speed low in D and R ranges	• Engine output may be insufficient • Stator one–way clutch not operating properly HINT: If more than 600 rpm below the specified value, the torque converter could be faulty.
(b) Stall speed high in D range	• Line pressure too low • Forward clutch slipping • No. 2 one–way clutch not operating properly • U/D clutch slipping
(c) Stall speed high in R range	• Line pressure too low • Direct clutch slipping • 1st and reverse brake slipping • U/D clutch slipping
(d) Stall speed high in D and R ranges	• Line pressure too low • Improper fluid level • U/D one–way clutch not operating properly

(b) Measure the time lag.

(1) When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the direct clutch, forward clutch, and 1st and reverse brake.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**



(2) Chock the 4 wheels.

(3) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

SST 09843–18030

(4) Start engine and check idle speed.

Idle speed: 650 ± 50 rpm (In N range and A/C OFF)

(5) Shift the lever from N to D range. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag: N → D less than 1.2 seconds

(6) In the same way, measure the time lag for N → R.

Time lag: N → R less than 1.5 seconds

Evaluation (If N → D or N → R time lag is longer than the specified):

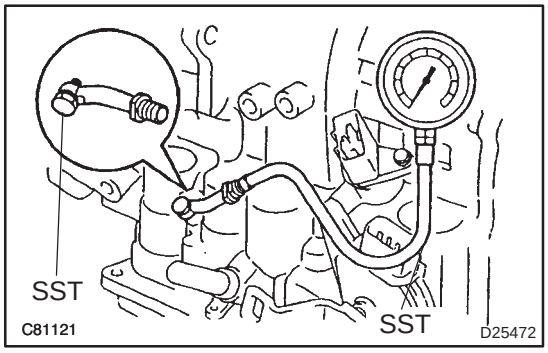
Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • U/D one–way clutch not operating properly
N → R time lag is longer	• Line pressure too low • Direct clutch worn • 1st and reverse brake worn • U/D one–way clutch not operating properly

9. HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **Do the test at normal operation ATF temperature 50 to 80˚C (122 to 176˚F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stopper outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**



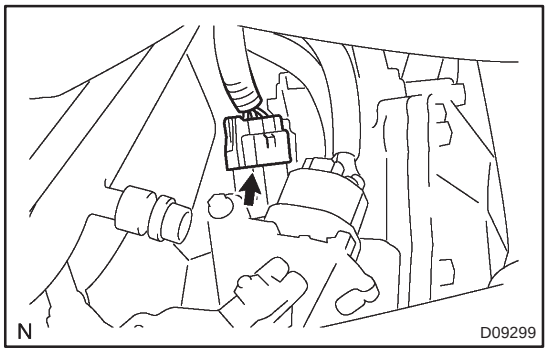
(1) Warm up the ATF.
(2) Remove the test plug on the rear side of the transaxle case and connect SST.
SST 09992–00095 (09992– 00231, 09992–00271)
(3) Fully apply the parking brake and chock the 4 wheels.
(4) Connect the hand–held tester to DLC3.
(5) Start the engine and check idling speed.
(6) Keep your left foot pressing firmly on the brake pedal and shift into D range.
(7) Measure the line pressure when the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(9) In the same way, do the test in R range.

Specified line pressure:

Condition	D range kPa (kgf / cm^2, psi)	R range kPa (kgf / cm^2, psi)
Idling	372 to 412 (3.8 to 4.2, 54 to 60)	672 to 742 (6.9 to 7.6, 98 to 108)
Stall	931 to 1,031 (9.5 to 10.5, 135 to 150)	1,768 to 1,968 (18.0 to 20.1, 256 to 285)

Evaluation:

Problem	Possible cause
If the measured values at all ranges are higher	• Shift solenoid valve SLT defective • Regulator valve detective
If the measured values at all ranges are lower	• Shift solenoid valve SLT defective • Regulator valve detective • Oil pump defective
If pressure is low in the D range only	• D range circuit fluid leak • Forward clutch defective
If pressure is low in the R range only	• R range circuit fluid leak • Direct clutch defective • 1st and reverse brake defective



10. MANUAL SHIFTING TEST

HINT:

By this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transaxle.

(a) Disconnect the transmission wire.

(b) Inspect the manual driving operation.

Check that the shift and gear ranges correspond to the table below.

While driving, shift through the D range.

Check that the gear change corresponds to the shift range.

Shift range	Gear position
D	3rd
R	Reverse
P	Pawl Lock

HINT:

If the gear positions of the D are difficult to distinguish, do the above road test.

If any abnormality is found in the above test, the problem is in the transaxle itself.

(c) Connect the transmission wire.

(d) Cancel out the DTC.

11. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

NOTICE:

Hand–held tester only

(a) Turn the ignition switch to OFF.

(b) Connect the hand–held tester to the DLC3.

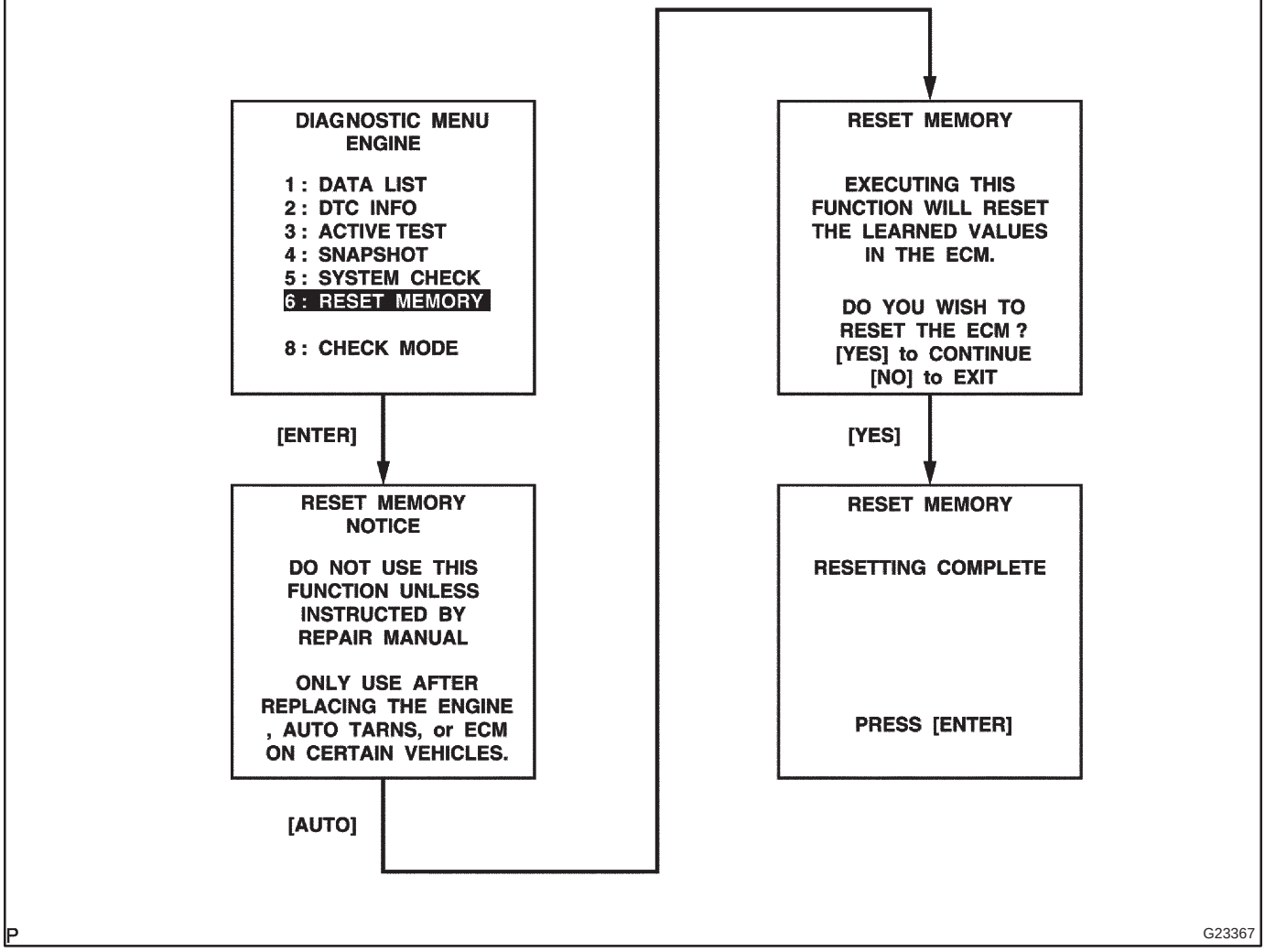
(c) Turn the ignition switch to ON.

(d) Perform the reset memory procedure from the ENGINE menu.

CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

Tester menu flow:



05CBY–01

PRECAUTION

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

HINT:

Initialization can not be completed by only removing the battery.

0567W–12

PROBLEM SYMPTOMS TABLE

HINT:

If a normal code is displayed during the DTC check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for trouble-shooting.

The Matrix Chart is divided into 3 chapters.

- If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.
- If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM.

CHAPTER 1: ELECTRONIC CIRCUIT MATRIX CHART

Symptom	Suspect Area	See page
No up–shift (A particular gear, from 1st to O/D gear, is not up–shifted)	ECM	01–32
No down–shift (A particular gear, from O/D to 1st gear, is not down–shifted)	ECM	01–32
No lock–up or No lock–up off	1. Stop light switch circuit 2. Engine coolant temp. sensor circuit 3. Throttle position sensor circuit 4. ECM	05–947 05–309 05–309 01–32
Shift point too high or too low	ECM	01–32
No gear change by shifting into ”+” or ”–” while the shift lever is in the Sposition	1. Transmission control switch circuit 2. ECM	05–972 01–32
Up–shift to O/D from 3rd while engine is cold	1. Engine coolant temp. sensor circuit 2. ATF temp. sensor circuit 3. ECM	05–309 05–941 05–943 01–32
Harsh engagement (N → D)	ECM	01–32
Harsh engagement (Lock–up)	ECM	01–32
Harsh engagement (Any driving range)	ECM	01–32
Poor acceleration	ECM	01–32
Engine stalls when starting off or stopping	ECM	01–32
No kick–down	1. Kick–down switch circuit 2. ECM	05–970 01–32

Chapter 2: On–vehicle Repair
(★: U241E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM840U)

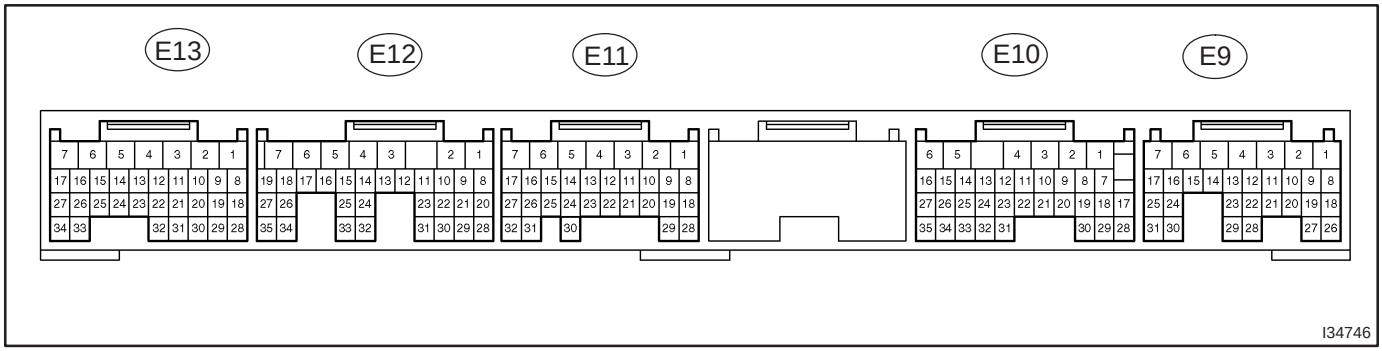
Symptom	Suspect Area	See page
Vehicle does not move in any forward range or reverse range	1. Manual valve 2. Primary regulator valve 3. Off–vehicle repair matrix chart	★ ★ –
Vehicle does not move in R range	Off–vehicle repair matrix chart	–
No up–shift (1st → 2nd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (2nd → 3rd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (3rd → O/D)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No down–shift (O/D → 3rd)	Valve body assy	★
No down–shift (3rd → 2nd)	Valve body assy	★
No down–shift (2nd → 1st)	Valve body assy	★
No lock–up or No lock–up off	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Off–vehicle repair matrix chart 3. Valve body assy	★ – ★
Harsh engagement (N → R)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (Lock–up)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (2nd → 3rd)	Valve body assy	★
Harsh engagement (3rd → O/D)	Valve body assy	★
Harsh engagement (O/D → 3rd)	Valve body assy	★
Slip or shudder (Forward and reverse)	1. Oil strainer 2. Off–vehicle repair matrix chart	40–47 –
No kick–down	Valve body assy	★

Chapter 3: Off–vehicle Repair
(★: U241E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM840U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward range or reverse range	1. Front and rear planetary gear 2. U/D planetary gear 3. U/D one–way clutch (F_2) 4. Forward clutch (C_1) 5. U/D brake (B_3)	★ ★ ★ ★ ★
Vehicle does not move in R range	1. Front and rear planetary gear unit 2. U/D planetary gear 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. 1st and reverse brake (B_2)	★ ★ ★ ★ ★
No up–shift (1st → 2nd)	1. No.1 one–way clutch (F_1) 2. 2nd brake (B_1)	★ ★
No up–shift (2nd → 3rd)	Direct clutch (C_2)	★
No up–shift (3rd → O/D)	U/D clutch (C_3)	★
No lock–up or No lock–up off	Torque converter clutch	40–37
Harsh engagement (N → D)	1. Forward clutch (C_1) 2. U/D one–way clutch (F_2) 3. No.1 one–way clutch (F_1)	★ ★ ★
Harsh engagement (N → R)	1. Direct clutch (C_2) 2. 1st and reverse brake (B_2)	★ ★
Harsh engagement (Lock–up)	Torque converter clutch	40–37
Slip or shudder (Forward position: After warm–up)	1. Torque converter clutch 2. Forward clutch (C_1) 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. No.1 one–way clutch (F_1) 6. U/D one–way clutch (F_2)	40–37 ★ ★ ★ ★ ★
Slip or shudder (R range)	1. Direct clutch (C_2) 2. 1st and reverse brake (B_2)	★ ★
Slip or shudder (1st)	No.1 one–way clutch (F_1)	★
Slip or shudder (2nd)	1. U/D one–way clutch (F_2) 2. 2nd brake (B_1)	★ ★
Slip or shudder (3rd)	Direct clutch (C_2)	★
Slip or shudder (O/D)	U/D clutch (C_3)	★
No engine braking (1st – 3rd: D range)	U/D brake (B_3)	★
No engine braking (1st: L range)	1st and reverse brake (B_2)	★
No engine braking (2nd: 2 range)	2nd brake (B_1)	★
Poor acceleration (All range)	1. Torque converter clutch 2. U/D planetary gear	40–37 ★
Poor acceleration (O/D)	1. U/D clutch (C_3) 2. U/D planetary gear	★ ★
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	40–37

05C95–01

TERMINALS OF ECM



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
S4 (E12–10) – E1 (E11–1)	L – BR	IG switch ON	Below 1
		O/D gear	10 – 14
		Except O/D gear	Below 1
DSL (E12–11) – E1 (E11–1)	L–B – BR	IG switch ON	Below 1
		Vehicle driving under lock–up range	10 – 14
SLT+ (E12–13) – SLT– (E12–12)	P–L – P	IG switch ON	10 – 14
SL2+ (E12–17) – SL2– (E12–16)	R – R–B	IG switch ON	Below 1
		1st or 2nd gear	10 – 14
		3rd or O/D gear	Below 1
SL1+ (E12–19) – SL1– (E12–18)	Y – Y–B	IG switch ON	10 – 14
		1st gear	10 – 14
		Except 1st gear	Below 1
NC+ (E12–26) – NC– (E12–34)	LG – LG–B	Engine is running	Below 1 and 4 – 5
NT+ (E12–27) – NT– (E12–35)	B–O – B	Engine is running	Below 1 and 4 – 5
THO (E12–32) – E2 (E13–28)	V – BR	ATF temperature: 115 °C (239 °F) or more	Below 1.5
D (E10–10) – E1 (E11–1)	LG–B – BR	IG switch ON and Shift lever D range	10 – 14
		IG switch ON and Shift lever other than D range	Below 1
R (E10–11) – E1 (E11–1)	R–Y – BR	IG switch ON and Shift lever R range	10 – 14
		IG switch ON and Shift lever other than R range	Below 1
SPD (E10–17) – E1 (E11–1)	V–W – BR	IG switch ON	4.5 – 5.5
SPT1 (E10–20) – E1 (E11–1)	L – BR	IG switch ON and Shift lever S position	7.5 – 14
		IG switch ON and Shift lever except for S position	Below 1
SFTD (E10–21) – E1 (E11–1)	B – BR	IG switch ON and Shift lever S position	7.5 – 14
		IG switch ON and Shift lever "–" position (Down shift)	Below 1.5
SFTU (E10–22) – E1 (E11–1)	R – BR	IG switch ON and Shift lever S position	7.5 – 14
		IG switch ON and Shift lever "+" position (Up shift)	Below 1.5
KD*1 (E10–30) – E1 (E11–1)	W*1 ⇔ BR	IG switch ON and kick–down switch ON	Below 1
		IG switch ON and kick–down switch OFF	10 – 14

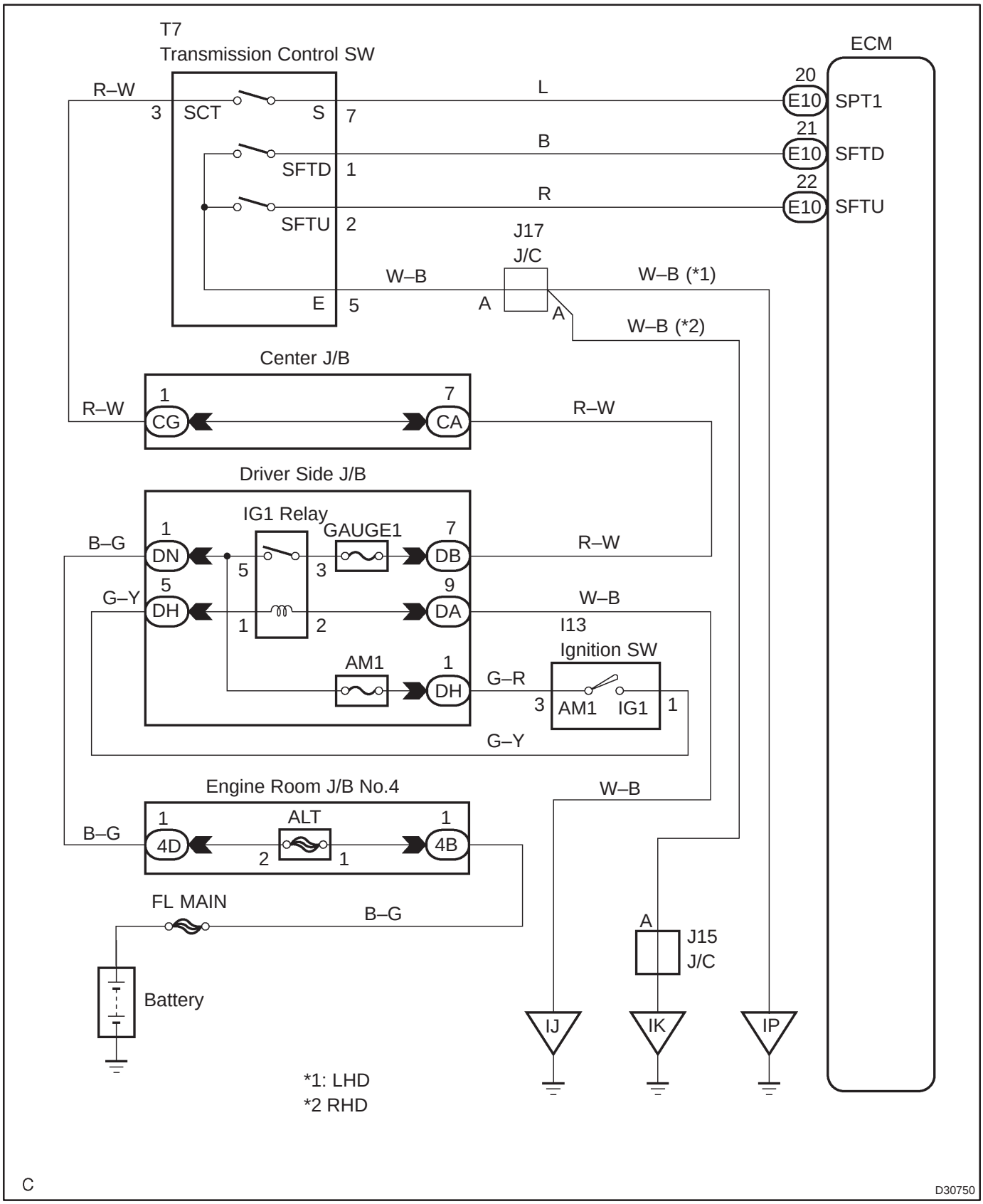
*1: LHD

TRANSMISSION CONTROL SWITCH CIRCUIT

CIRCUIT DESCRIPTION

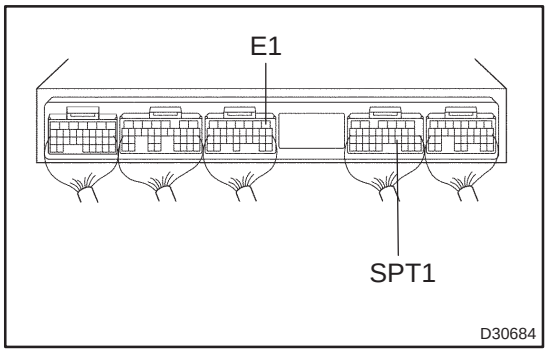
When shifting the shift lever into S position using the transmission control switch, it is possible to shift in 1 to 4 positions.
Shifting ”+” once changes up 1 shift range position, ”–” once changes down 1 shift range position respectively.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK ECM



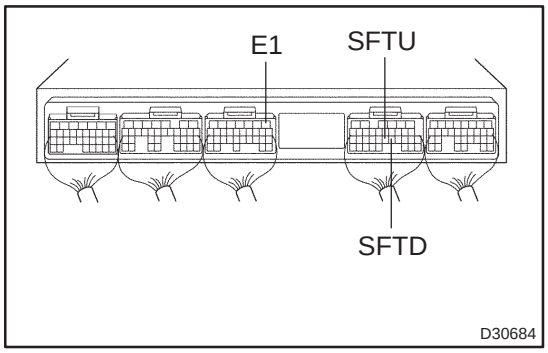
(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminals SPT1 and E1 of the ECM.
OK:

Shift range	Specified condition
Except S position	Below 1 V
S position	7.5 to 14 V

NG → **Go to step 6**

OK

2 CHECK ECM



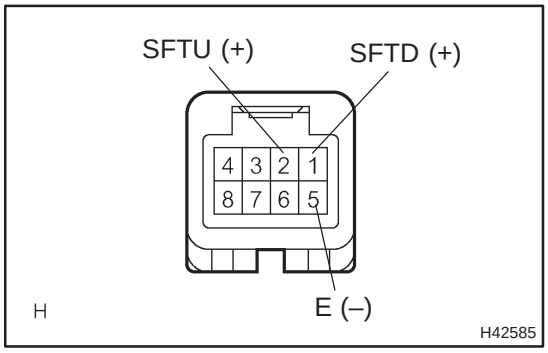
(a) Measure the voltage between terminals E1 and that SFTU as well as SFTD of the ECM.
OK:

Shift range	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E1	Below 1.5 V
S position	SFTU – E1	7.5 to 14 V
Shift to "–" (Down shift)	SFTD – E1	Below 1.5 V
S position	SFTD – E1	7.5 to 14 V

OK → **NORMAL**

NG

3 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



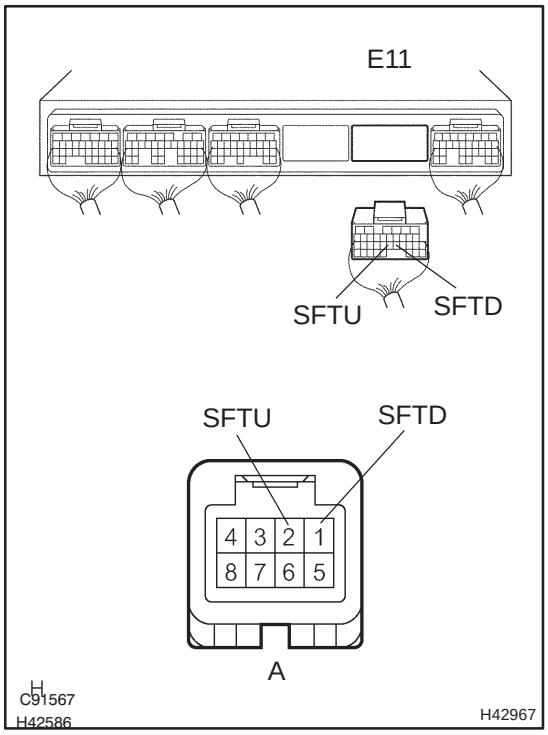
(a) Turn the ignition switch to OFF.
(b) Disconnect the transmission control switch connector.
(c) Measure the resistance between terminals E and SFTU as well as SFTD of the transmission control switch connector.
OK:

Shift range	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E	Continuity
S position	SFTU – E	No continuity
Shift to "–" (Down shift)	SFTD – E	Continuity
S position	SFTD – E	No continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

4	CHECK HARNESS AND CONNECTOR(ECM – TRANSMISSION CONTROL SWITCH)



(a) Disconnect the ECM connector.

(b) Check the continuity between ECM and transmission control switch.

OK:

Tester connection	Specified condition
SFTU (E11–22) – SFTU (A–2)	Continuity
SFTD (E11–21) – SFTD (A–1)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR(TRANSMISSION COTROL SWITCH – BODY GROUND)

(a) Check the continuity between body ground and E of the transmission control switch connector (wire harness side).

OK:

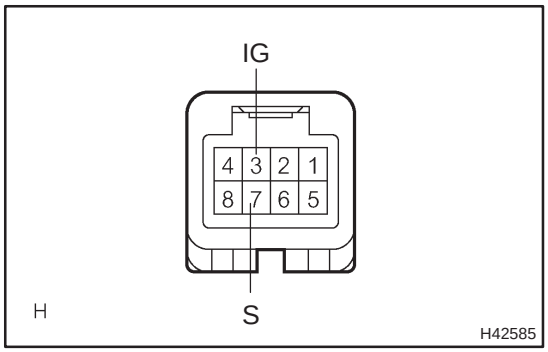
Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

6 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



(a) Turn the ignition switch to OFF.
(b) Disconnect the transmission control switch connector.
(c) Check the continuity between terminal IG and S of the transmission control switch.

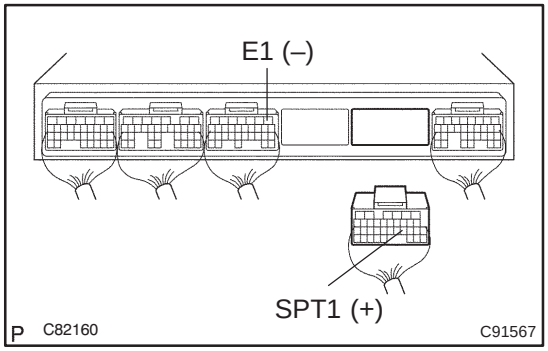
OK:

Shift range	Tester connection	Specified condition
Except S position	IG – S	No continuity
S position	IG – S	Continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

7 CHECK HARNESS AND CONNECTOR



(a) Connect the transmission control switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminal SPT1 and E1 of the ECM connector.

OK:

Shift range	Tester connection	Specified condition
Except S position	SPT1 – E1	Below 1 V
S position	SPT1 – E1	7.5 to 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

0567O–09

CUSTOMER PROBLEM ANALYSIS CHECK

Transmission Control System Check Sheet	Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move (☐ Any range ☐ Particular range)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)
	☐ No down–shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ No up–shift (S range)
	☐ No down–shift (S range)
	☐ Lock–up malfunction
	☐ Shift point too high or too low
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive range)
	☐ Slip or shudder
	☐ No kick–down
	☐ Others ( )

Check Item	MIL	☐ Normal ☐ Remains ON

DTC Check	1st Time	☐ Normal code ☐ Malfunction code (DTC)
	2nd Time	☐ Normal code ☐ Malfunction code (DTC)

0567Q–07

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.

*1 : ● ... MIL light up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *1	Memory
P0500 (05–98)	Vehicle Speed Sensor Malfunction	• Combination meter • Open or short in speed sensor circuit • Speed sensor • ECM	●	○
P0710 (05–1003)	Transmission Fluid Temperature Sensor Circuit Malfunction (ATF Temperature Sensor)	• Open or short in ATF temp. sensor circuit • Transmission wire (ATF temperature sensor) • ECM	●	○
P0711 (05–1005)	Transmission Fluid Temperature Sensor Circuit Range/Performance (ATF Temperature Sensor)		●	○
P0750 (05–1007)	Shift Solenoid "A" Malfunction (Shift Solenoid Valve S1)	• Shift solenoid valve S1 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)	●	○
P0753 (05–1010)	Shift Solenoid "A" Electrical (Shift Solenoid Valve S1)	• Open or short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM	●	○
P0755 (05–1007)	Shift Solenoid "B" Malfunction (Shift Solenoid Valve S2)	• Shift solenoid valve S2 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)	●	○
P0758 (05–1010)	Shift Solenoid "B" Electrical (Shift Solenoid Valve S2)	• Open or short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM	●	○
P0770 (05–1013)	Shift Solenoid "E" Malfunction (Shift Solenoid Valve SL)	• Shift solenoid valve SL is stuck open or closed • Valve body blocked or stuck • Shift solenoid valve SL • Torque converter clutch • Automatic transaxle (clutch, brake or gear etc.)	●	○
P0773 (05–1015)	Shift Solenoid "E" Electrical (Shift Solenoid Valve SL)	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM	●	○
P1520 (05–1018)	Stop Light Switch Circuit	• Open or short in stop light switch circuit • Stop lamp switch assy • ECM	●	○
P1725 (05–1019)	NT Revolution Sensor Circuit Malfunction (Input Turbine Speed Sensor)	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM	●	○
P1760 (05–1021)	Linear Solenoid for Line Pressure Control Circuit Malfunction (Shift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	●	○
P1780 (05–1024)	Park/Neutral Position Switch Malfunction	• Short in park/neutral position switch circuit • Park/Neutral position switch assy • ECM	●	○
P1790 (05–1027)	ST Solenoid Circuit Malfunction (Shift Solenoid Valve ST)	• Open or short in shift solenoid valve ST circuit • Shift solenoid valve ST • ECM	●	○
P1798 (05–1030)	SB Solenoid Circuit Malfunction (Shift Solenoid Valve SB)	• Open or short in shift solenoid valve SB circuit • Shift solenoid valve SB • ECM	●	○

HINT:
This DTC may be output when the clutch, brake and gear components, etc. inside the automatic transmission are damaged.

ELECTRONIC CONTROLLED AUTOMATIC TRANSAXLE [ECT] (U341E)

0567N–10

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

The ECM of this system is connected to the multiplex communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the multiplex communication system.

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–984)

3	Connect the hand–held tester to DLC3

4	Check and Clear DTC and Freeze Frame Data (See page 05–985)

5	Visual Inspection

6	Setting the Check Mode Diagnosis (See page 05–985)

7	Problem Symptom Confirmation

- Symptom does not occur: Go to step 8
- Symptom occur: Go to step 9

8	Symptom Simulation (See page 01–22)

9	DTC Check (See page 05–996)

- DTC is not output: Go to step 10
- DTC is output: Go to step 17

10	Basic Inspection (See page 40–2, 40–8 and 40–69)

NG → Go to step 19

OK

11	Mechanical System Test (See page 05–985)

NG → Go to step 16

OK

12	Manual Shifting Test (See page 05–985)

NG → Go to step 14

OK

13	Problem Symptoms Table Chapter 1 (See page 05–1000)

NG → Go to step 18

OK

14	Problem Symptoms Table Chapter 2 (See page 05–1000)

NG → Go to step 16

OK

15	Problem Symptoms Table Chapter 3 (See page 05–1000)

NG

16	Part Inspection

→ Go to step 19

17	DTC Chart (See page 05–996)

18	Circuit Inspection (See page 05–1003)

19	Identification of Problem

20	Repair

21	Confirmation Test

End

KICK DOWN SWITCH CIRCUIT

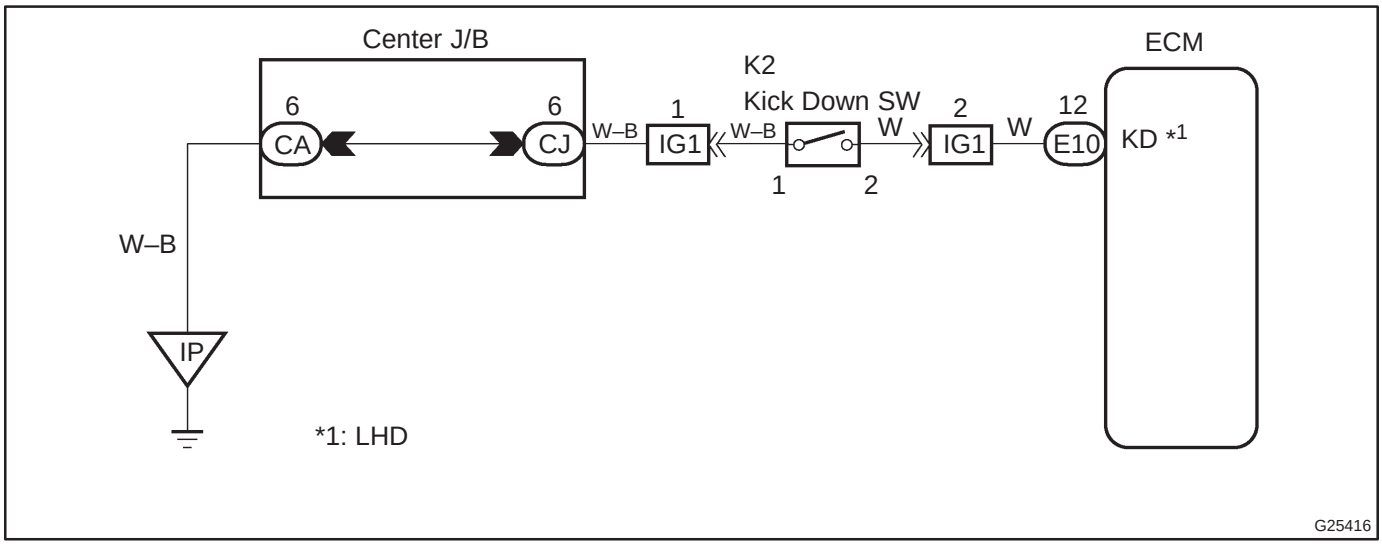
CIRCUIT DESCRIPTION

The kick–down switch is turned ON when the accelerator pedal is depressed to the full throttle and sends signals to ECM.

When the kick–down switch is turned ON, the ECM controls gear shifting according to the programmed shift diagrams.

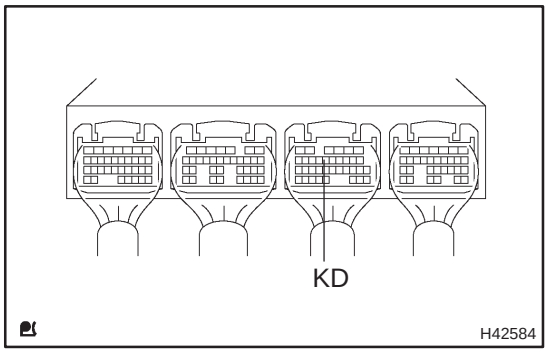
If a short circuit develops in the kick–down switch, the ECM disregards the kick–down signals and controls shifting at the normal shift points.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TERMINAL VOLTAGE



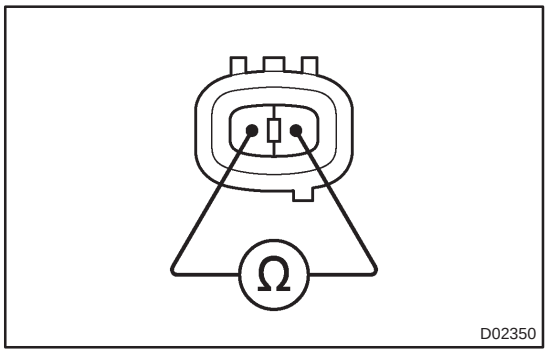
(a) Turn the ignition switch ON.
(b) Measure voltage between terminal KD of ECM and body ground when accelerator pedal is fully depressed or not.
OK:

Accelerator pedal	Voltage
Fully depressed (Kick–down switch is ON)	Below 1 V
Released (Kick–down switch is OFF)	10 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT KICK DOWN SWITCH



(a) Disconnect the kick–down switch connector.
(b) Check continuity between terminals of the kick–down switch connector when kick–down switch is ON and OFF.
OK:

Kick–down switch	Continuity
ON	Continuity
OFF	No continuity

NG → **REPLACE KICK DOWN SWITCH**

OK

3	CHECK HARNESS AND CONNECTOR

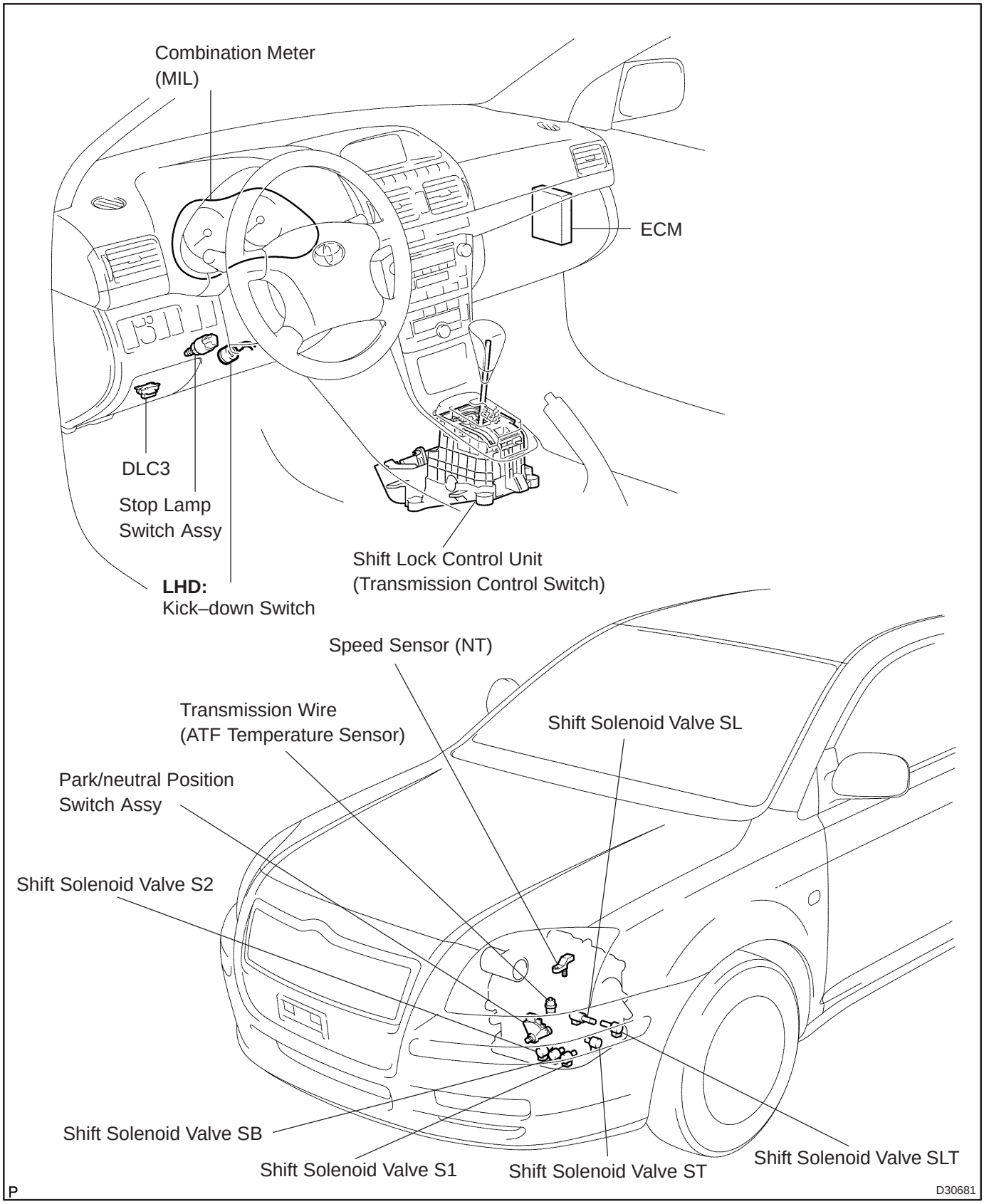
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

0567R–10

LOCATION



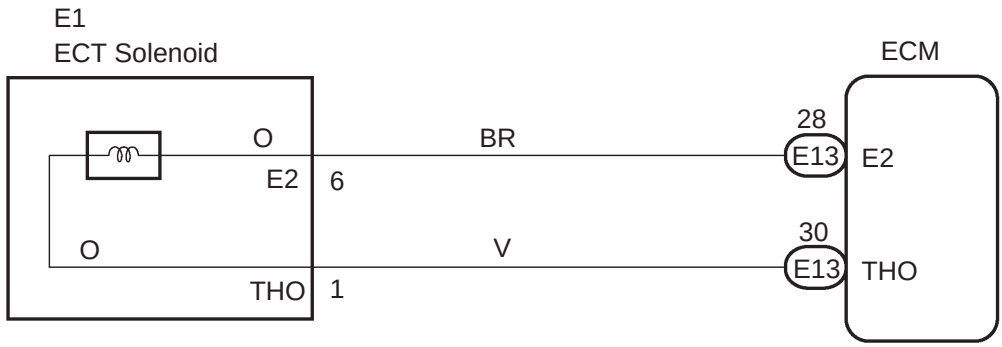
DTC	P0710	TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

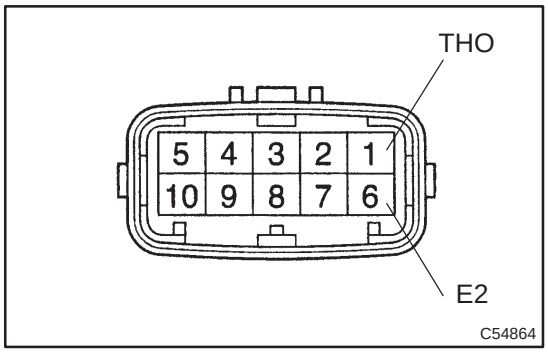
DTC No.	DTC Detection Condition	Trouble Area
P0710	Either (a) or (b) is detected for 0.5 sec. or more: (1 trip detection logic) (c) Temp. sensor resistance is less than 79 Ω (d) After engine has been operating for 15 min. or more, resistance at temp. sensor is more than 156 kΩ	• Open or short in ATF temp. sensor circuit • Transmission wire (ATF temperature sensor) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



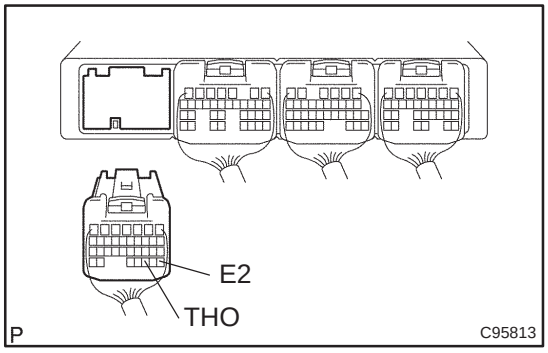
(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminals THO and E2.
OK:
Resistance: 79 Ω to 156 kΩ
(c) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals THO and E2.
OK:
Resistance: 79 Ω to 156 kΩ
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0711	TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

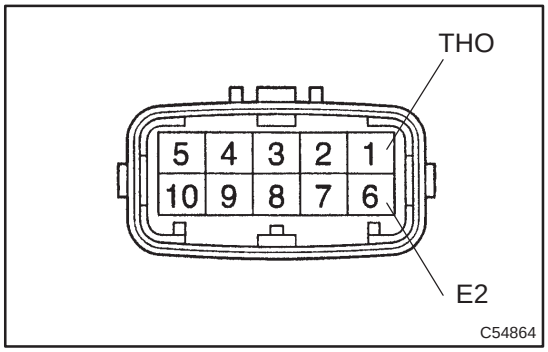
DTC No.	DTC Detection Condition	Trouble Area
P0711	Both (a) and (b) are detected: (2–trip detection logic) (a) After 12 sec. of engine start, temp. of atmosphere and that of engine coolant is more than –10°C (b) After normal driving for over 20 min. and 10 km, ATF temp. is less than 10°C	• Open or short in ATF temp. sensor circuit • Transmission wire (ATF temperature sensor) • ECM

WIRING DIAGRAM

See page 05–1003.

INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals THO and E2.

OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(c) Check the continuity between the wire harness side connectors.

OK:

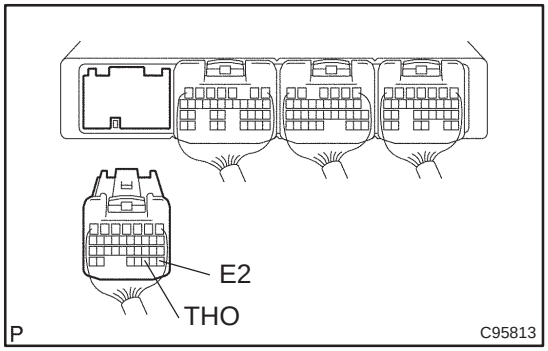
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals THO and E2.
OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0750	SHIFT SOLENOID ”A” MALFUNCTION (SHIFT SOLENOID VALVE S1)

DTC	P0755	SHIFT SOLENOID ”B” MALFUNCTION (SHIFT SOLENOID VALVE S2)

SYSTEM DESCRIPTION

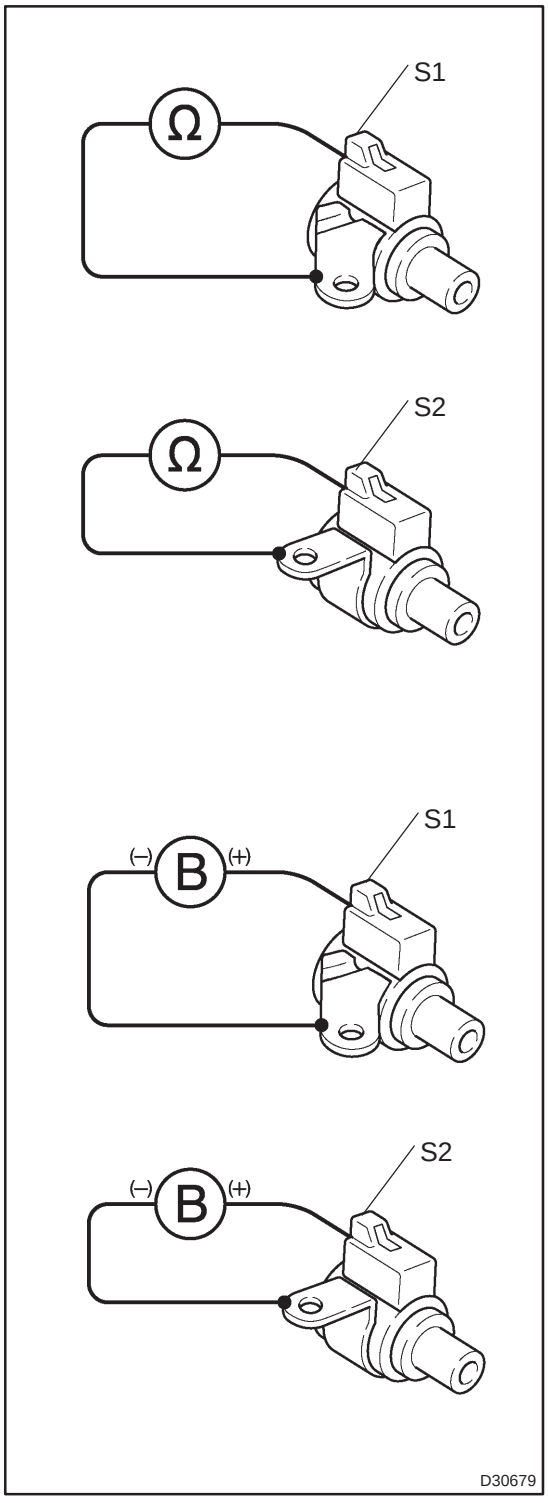
The ECM uses signals from the vehicle speed sensor and speed sensor NT to detect the actual gear position (1st, 2nd, 3rd or O/D gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect the mechanical trouble of the shift solenoid valves, the valve body or automatic transaxle (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0750	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	• Shift solenoid valve S1 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)
P0755		• Shift solenoid valve S2 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(S1/S2)



(a) Remove the shift solenoid valve S1/S2.

(b) Measure the resistance between the solenoid connector and the solenoid valve body.

OK:

Resistance: 11 to 15 Ω at 20˚C (68˚F)

(c) Connect the positive (+) lead to the terminal of solenoid valve connector and the negative (–) lead to the solenoid valve body.

OK:

The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(S1/S2)**

OK

2	**INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table)**

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSY

DTC	P0753	SHIFT SOLENOID ”A” ELECTRICAL (SHIFT SOLENOID VALVE S1)

DTC	P0758	SHIFT SOLENOID ”B” ELECTRICAL (SHIFT SOLENOID VALVE S2)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF operation of the shift solenoid valves S1 and S2 controlled by ECM. If an open or short circuit occurs in either of the solenoid valves, the ECM controls the remaining normal solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

Fail safe function:

If either of the solenoid valve circuits develops an open or short, the ECM turns the other solenoid valve ON and OFF to shift to the gear positions shown in the table below. The ECM also turns the shift solenoid valve ST OFF at the same time. If both solenoids malfunction, hydraulic control cannot be performed electronically and must be done manually.

Manual shifting as shown in the above table must be done (In the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

Range	NORMAL			SHIFT SOLENOID VALVE S1 MALFUNCTIONING			SHIFT SOLENOID VALVE S2 MALFUNCTIONING			BOTH SHIFT SOLENOID VALVES MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	S1	S2		S1	S2		S1	S2		
D	ON	ON	1st	X	OFF	3rd	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd
	OFF	OFF	3rd	X	OFF	3rd	OFF	X	3rd	3rd
	OFF	ON	O/D	X	ON	O/D	OFF	X	3rd	3rd
2 (S range)	ON	ON	1st	X	OFF	3rd	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd
	OFF	OFF	3rd	X	OFF	3rd	OFF	X	3rd	3rd
1 (S range)	ON	ON	1st	X	OFF	O/D	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd

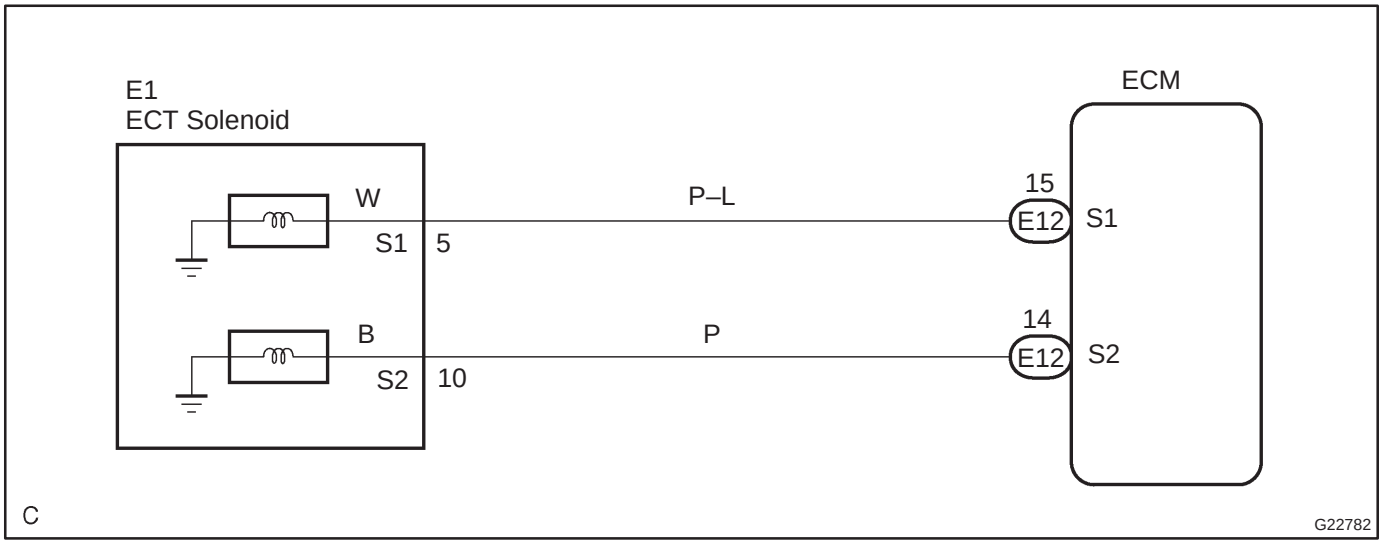
X: Malfunctions

DTC No.	DTC Detection Condition	Trouble Area
P0753 P0758	ECM checks for an open or short circuit in shift solenoid valve S1 or S2 circuit when it changes ECM records DTC P0753 or P0758 if condition (a) or (b) is detected: (a) When solenoid is energized, solenoid resistance is 8 Ω or less and it is counted (b) When solenoid is not energized, solenoid resistance is 100 kΩ or more and it is counted	• Open or short in shift solenoid valve S1/S2 circuit • Shift solenoid valve S1/S2 • ECM

HINT:

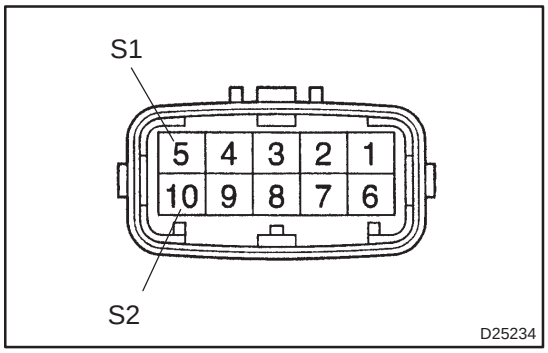
Check the shift solenoid valve S1 when DTC P0753 is output and check the shift solenoid valve S2 when DTC P0758 is output.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(S1/S2)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminal S1/S2 of transmission wire connector and body ground.

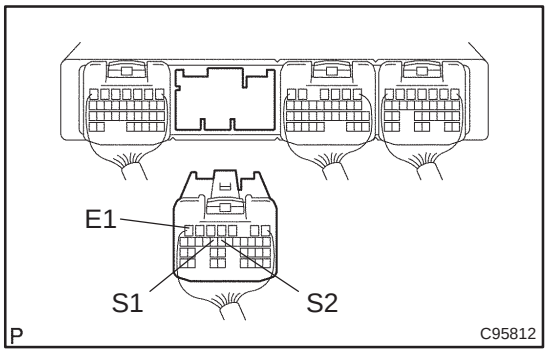
OK:

Resistance: 11 to 15 Ω at 20˚C (68˚F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.

(b) Disconnect the ECM connector.

(c) Measure the resistance between terminals.

OK:

Resistance:

S1 – E1: 11 to 15 Ω at 20˚C (68˚F)

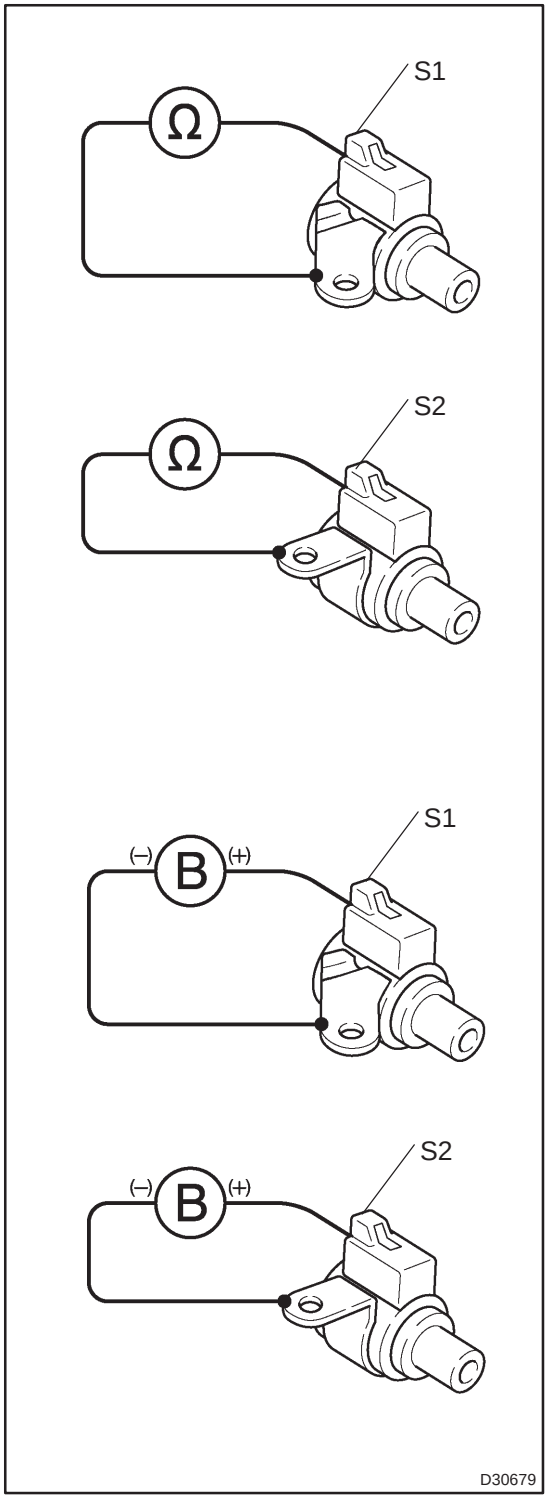
S2 – E1: 11 to 15 Ω at 20˚C (68˚F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(S1/S2)



(a) Remove the shift solenoid valve S1/S2.

(b) Measure the resistance between the solenoid valve connector and the solenoid valve body.

OK:

Resistance: 11 to 15 Ω at 20˚C (68˚F)

(c) Connect the positive (+) lead to the terminal of solenoid valve connector and the negative (–) lead to the solenoid valve body.

OK:

The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(S1/S2)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0770	SHIFT SOLENOID ”E” MALFUNCTION (SHIFT SOLENOID VALVE SL)

SYSTEM DESCRIPTION

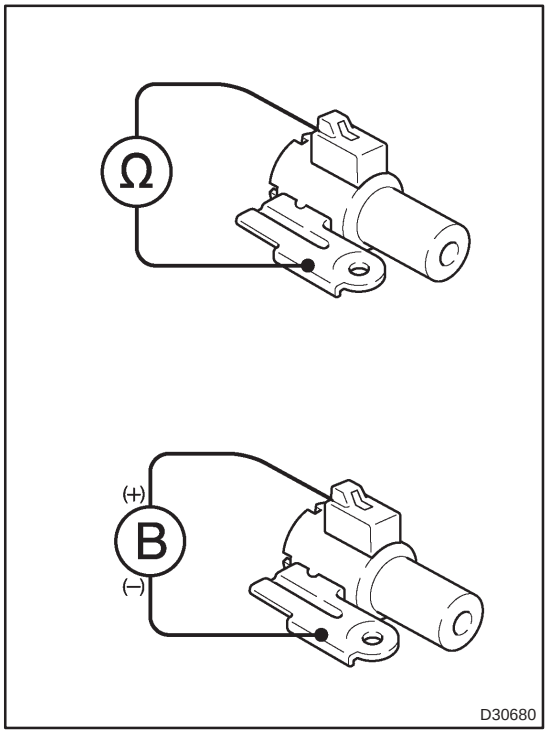
The ECM uses the signals from the throttle position sensor, air–flow meter and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.

Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SL, valve body and torque converter clutch or automatic transaxle (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0770	• Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h [50 mph]), or lock–up remains ON in the lock–up OFF range. (2–trip detection logic) • When lock–up is ON, clutch or brake slips or gear is broken. (2–trip detection logic)	• Shift solenoid valve SL is stuck open or closed • Valve body blocked or stuck • Shift solenoid valve SL • Torque converter clutch • Automatic transaxle (clutch, brake or gear etc.)

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(SL)



(a) Remove the shift solenoid valve SL.

(b) Measure the resistance between terminal SL of shift solenoid valve and the solenoid valve body.

OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

(c) Connect the positive (+) lead to the terminal of solenoid valve connector and the negative (–) lead to the solenoid valve body.

OK:

The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL)**

OK

2	INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table)

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY**

OK

3	INSPECT TORQUE CONVERTER CLUTCH ASSY

NG → REPLACE TORQUE CONVERTER CLUTCH ASSY

OK

REPAIR AUTOMATIC TRANSAXLE ASSY

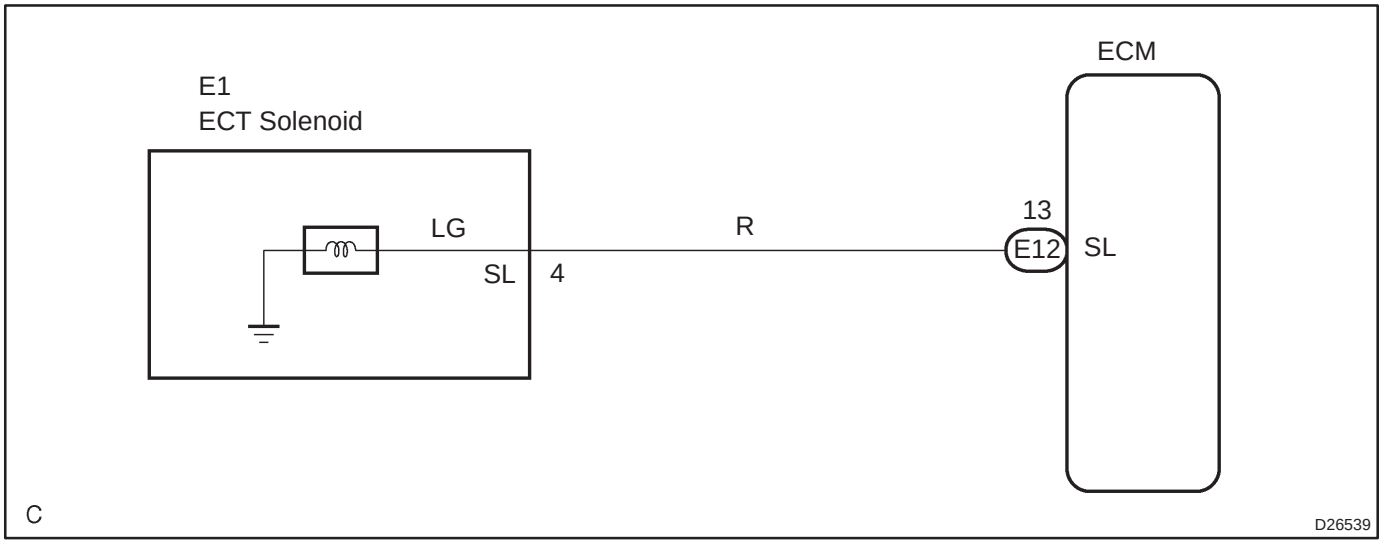
DTC	P0773	SHIFT SOLENOID ”E” ELECTRICAL (SHIFT SOLENOID VALVE SL)

CIRCUIT DESCRIPTION

The shift solenoid valve SL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock–up relay valve, which then controls operation of the lock–up clutch.
Fail safe function:
If the ECM detects a malfunction, it turns the shift solenoid valve SL OFF.

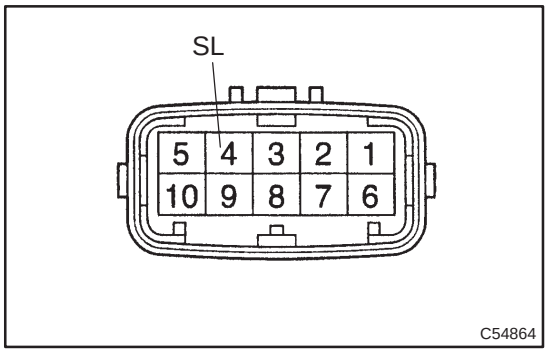
DTC No.	DTC Detecting Condition	Trouble Area
P0773	Either (a) or (b) is detected for 1 time. (2–trip detection logic) (a) Solenoid resistance is 8 Ω or less when solenoid is energized. (b) Solenoid resistance is 100 kΩ or more when solenoid is not energized.	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SL)

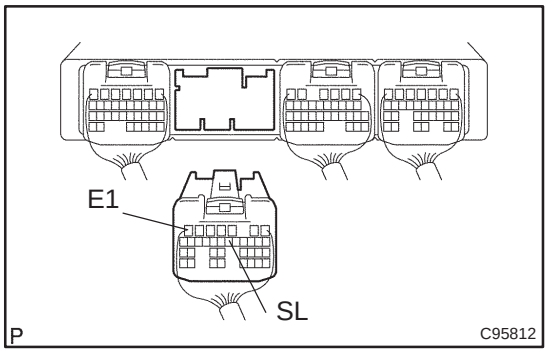


(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminal SL and the body ground.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE–ECM)



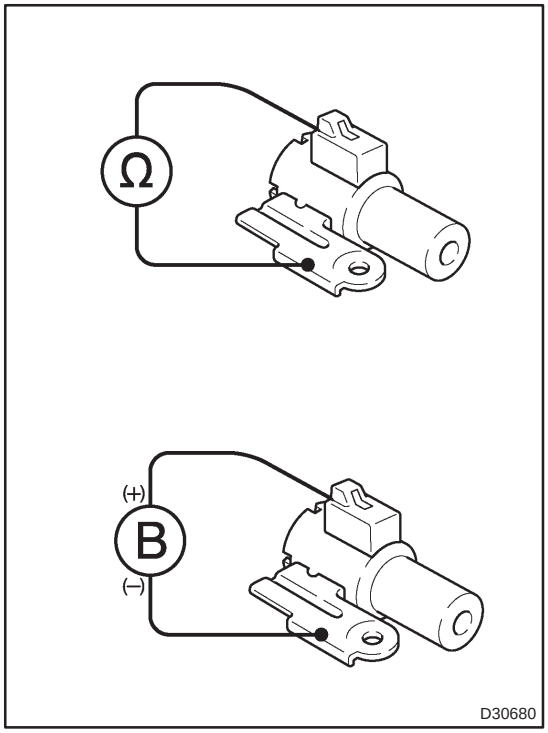
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals SL and E1.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE(SL)



(a) Remove the shift solenoid valve SL.

(b) Measure the resistance between terminal SL of shift solenoid valve and the solenoid valve body.

OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

(c) Connect the positive (+) lead to the terminal of solenoid valve connector and the negative (–) lead to the solenoid valve body.

OK:

The solenoid valve makes an operating noise.

OK → **REPAIR OR REPLACE TRANSMISSION WIRE**

NG

REPLACE SHIFT SOLENOID VALVE(SL)

DTC	P1520	STOP LIGHT SWITCH CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in lock–up condition, when brakes are suddenly applied.
When the brake pedal is depressed, this switch sends signals to the ECM. Then the ECM cancels the operation of the lock–up clutch while braking is in progress.

DTC No.	DTC Detection Condition	Trouble Area
P1520	Stop light switch remains ON while vehicle running (1–trip detection logic)	• Short in stop lamp switch signal circuit • Stop lamp switch • ECM

WIRING DIAGRAM

See page 05–115.

INSPECTION PROCEDURE

1	INSPECT STOP LAMP SWITCH ASSY

NG → REPLACE STOP LAMP SWITCH ASSY

OK

2	CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH ASSY – ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM

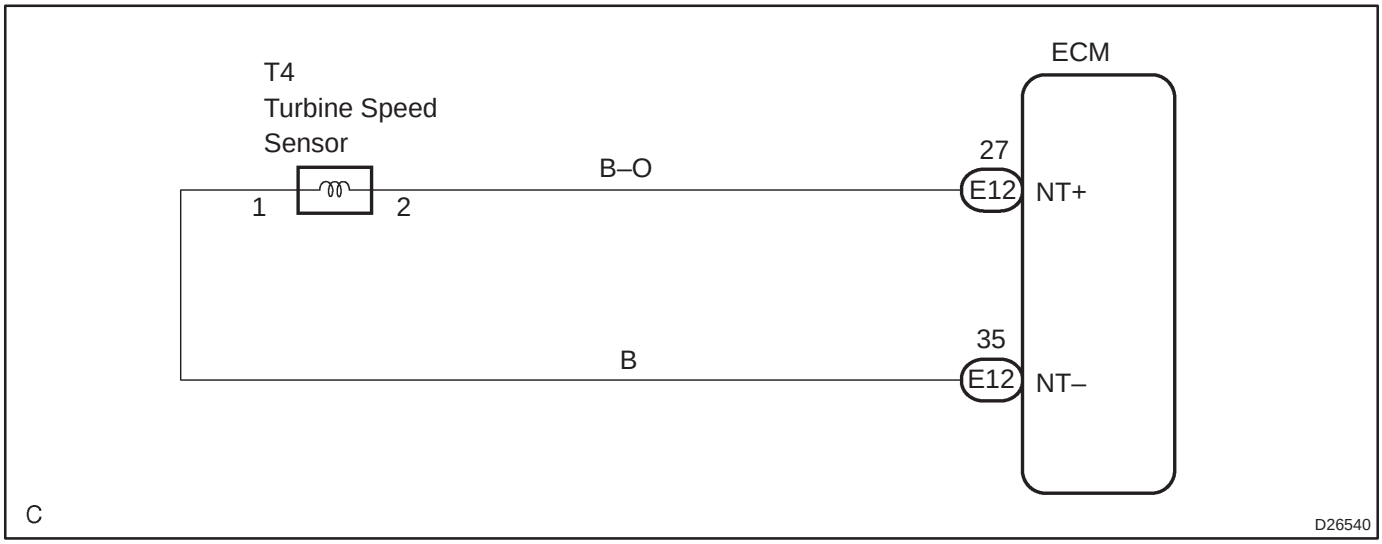
DTC	P1725	NT REVOLUTION SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the input turbine. By comparing the input turbine speed signal (NT) with the vehicle speed sensor signal, the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

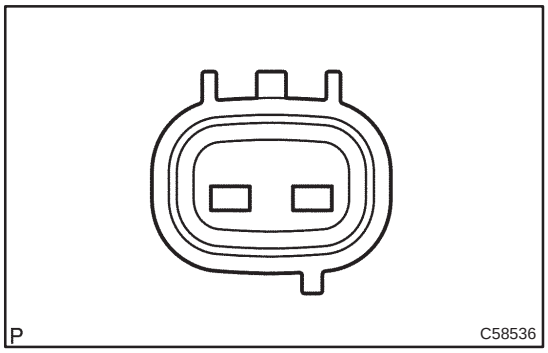
DTC No.	DTC Detection Condition	Trouble Area
P1725	ECM detects conditions (a), (b), (c) and (d) continuity for 5 sec. or more: (1 – trip detection logic) (a) Vehicle speed: 50 km/h (20 mph) or more (b) 2nd, 3rd or O/D gear (c) Solenoid valves and Park/neutral position switch are normal (d) NT < 300 rpm	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(NT)

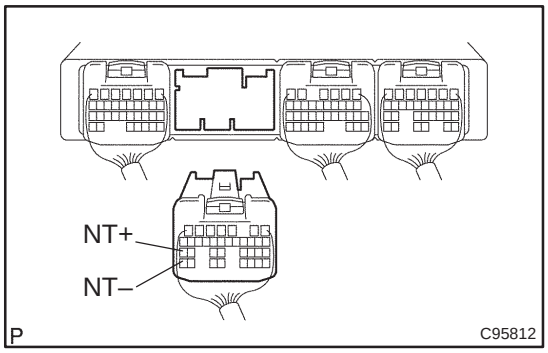


(a) Disconnect the sensor connector from the transaxle.
(b) Measure the resistance between terminals of speed sensor (NT).
OK:
Resistance: 560 to 680 Ω at 20°C (68°F)

NG → **REPLACE SPEED SENSOR(NT)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR–ECM)



(a) Connect the speed sensor (NT) connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NT+ and NT–.
OK:
Resistance: 560 to 680 Ω at 20°C (68°F)
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for short):

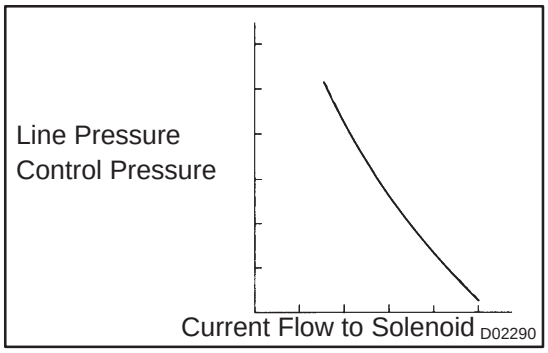
Symbols	Specified condition
NT+ – Body ground	No continuity
NT– – Body ground	

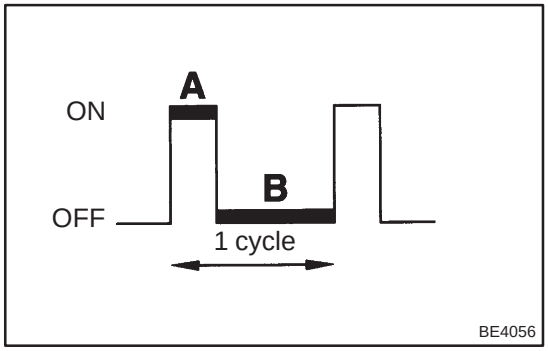
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P1760	LINEAR SOLENOID FOR LINE PRESSURE CONTROL CIRCUIT MALFUNCTION





CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates the line pressure) causes the solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate the line pressure according the extent of the accelerator pedal depressed or the output of engine power.

This reduces the function of the line pressure and provides smooth shifting.

Upon receiving a signal of the throttle valve opening angle, the ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure and generating throttle pressure.

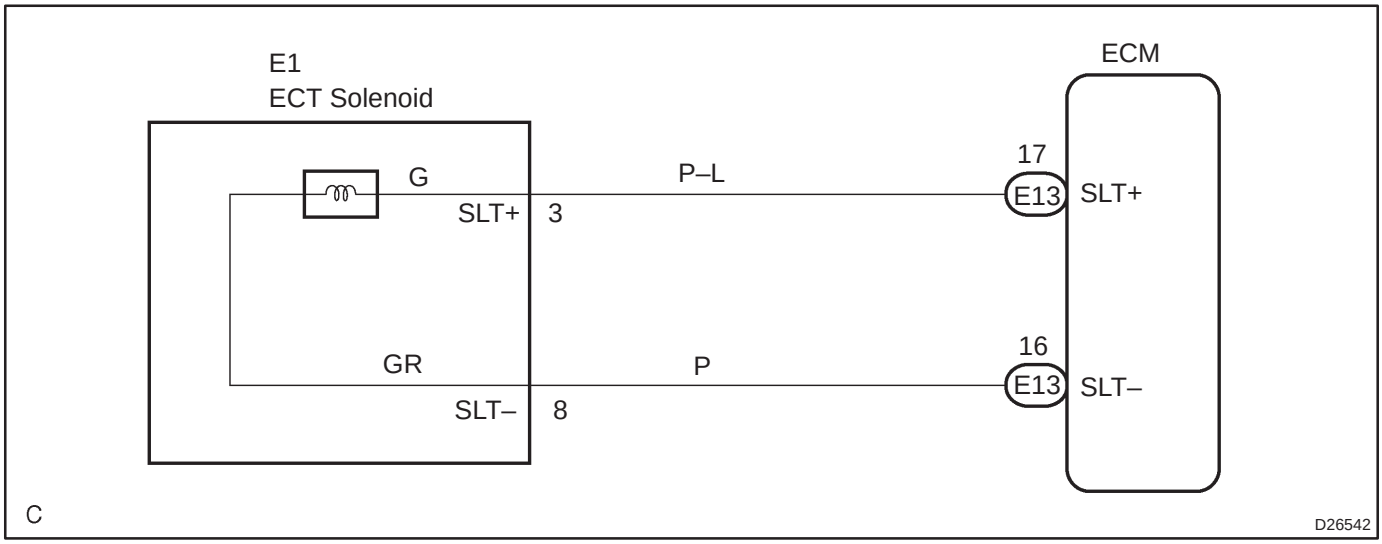
(*): Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

Duty Ratio=A/(A+B) x 100 (%)

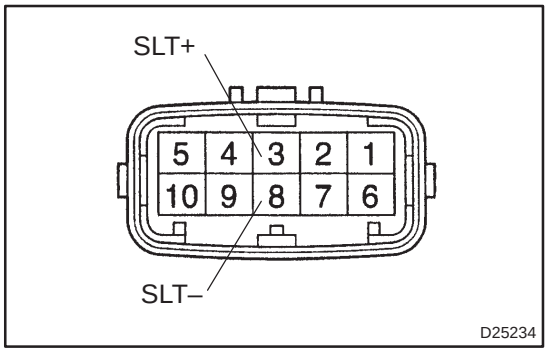
DTC No.	DTC Detection Condition	Trouble Area
P1760	Condition (a) or (b) below is detected 1 sec. or more: (a) SLT– terminal: 0 V (b) SLT– terminal: 12 V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SLT)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure resistance between terminals SLT+ and SLT–.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

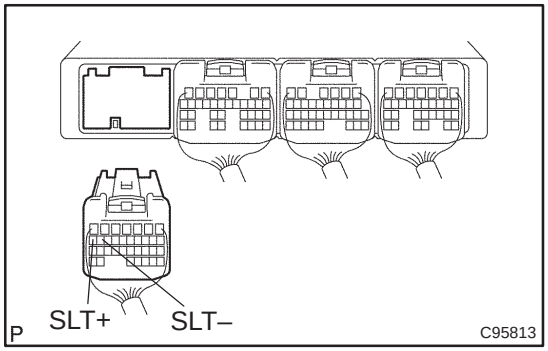
(c) Check continuity between the wire harness side connectors.
OK:
Standard (Check for short):

Symbols	Specified condition
SLT+ – Body ground	No continuity
SLT– – Body ground	

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE–ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals SLT+ and SLT– of ECM connector.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for short):

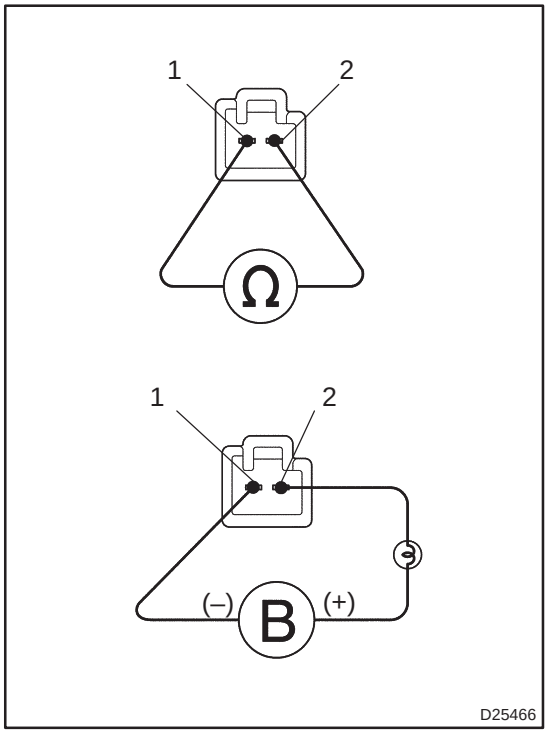
Symbols	Specified condition
SLT+ – Body ground	No continuity
SLT– – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(SLT)



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance between terminals.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SLT)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

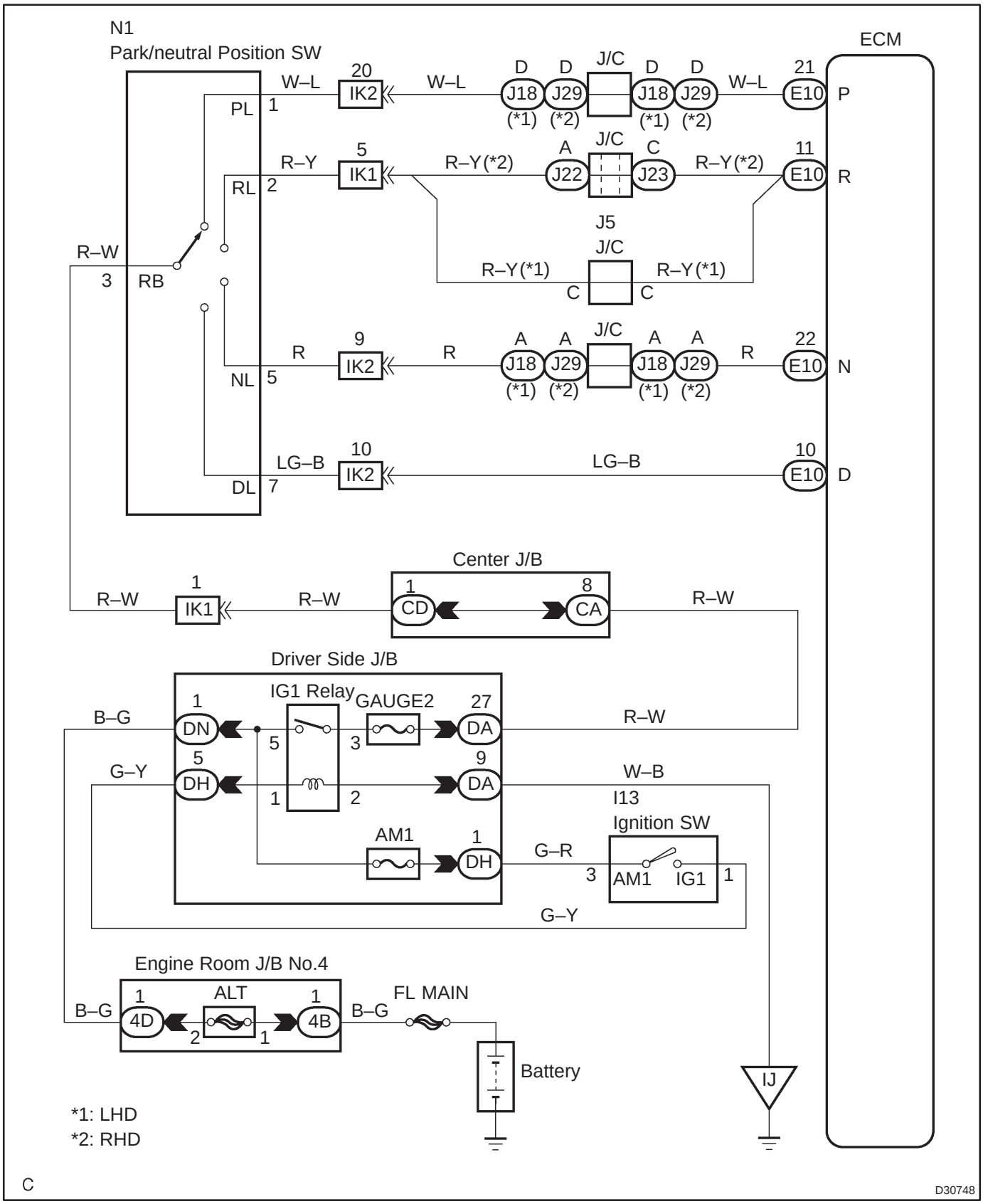
DTC	P1780	PARK/NEUTRAL POSITION SWITCH MALFUNCTION

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends the signals to the ECM.

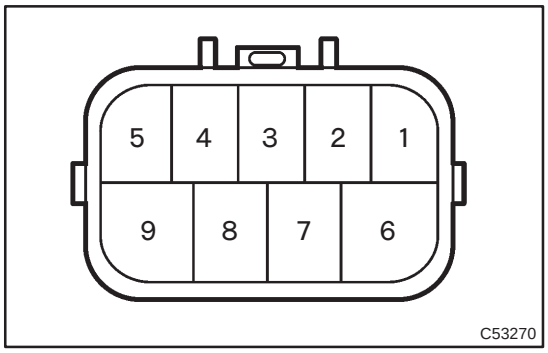
DTC No.	DTC Detecting Condition	Trouble Area
P1780	DTC is detected for 500 msec. or more (2–trip detection logic). • 2 or more switches are ON simultaneously for P, R, N and D position.	• Short in park/neutral position switch circuit • Park/neutral position switch assy • ECM
	When any of following conditions for 500 msec. or more in the S position (2–trip detection logic). (a) P position input signal is ON. (b) N position input signal is ON. (c) R position input signal is ON.	

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.
(b) Check the continuity between each terminals shown below when the shift lever is moved to each range.

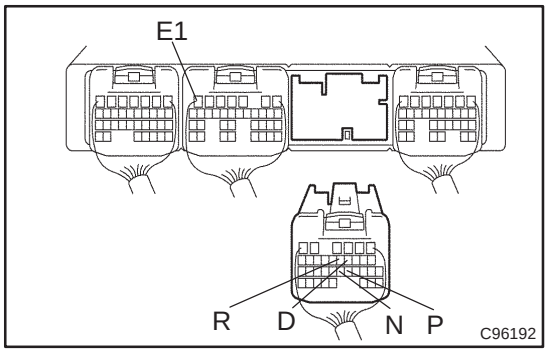
Shift Range	Terminal No. to continuity	
P	1 – 3	6 – 9
R	2 – 3	–
N	3 – 5	6 – 9
D	3 – 7	–

OK:
There is continuity.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY**

OK

2 CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – ECM)



(a) Connect the park/neutral position switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminals E1 and that R as well as D, P and N of the ECM when the shift lever is shifted to the following range.

OK:

Shift Range	Terminal	Voltage (V)
P	P – E1	10 to 14
R	R – E1	10 to 14
N	N – E1	10 to 14
D	D – E1	10 to 14

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

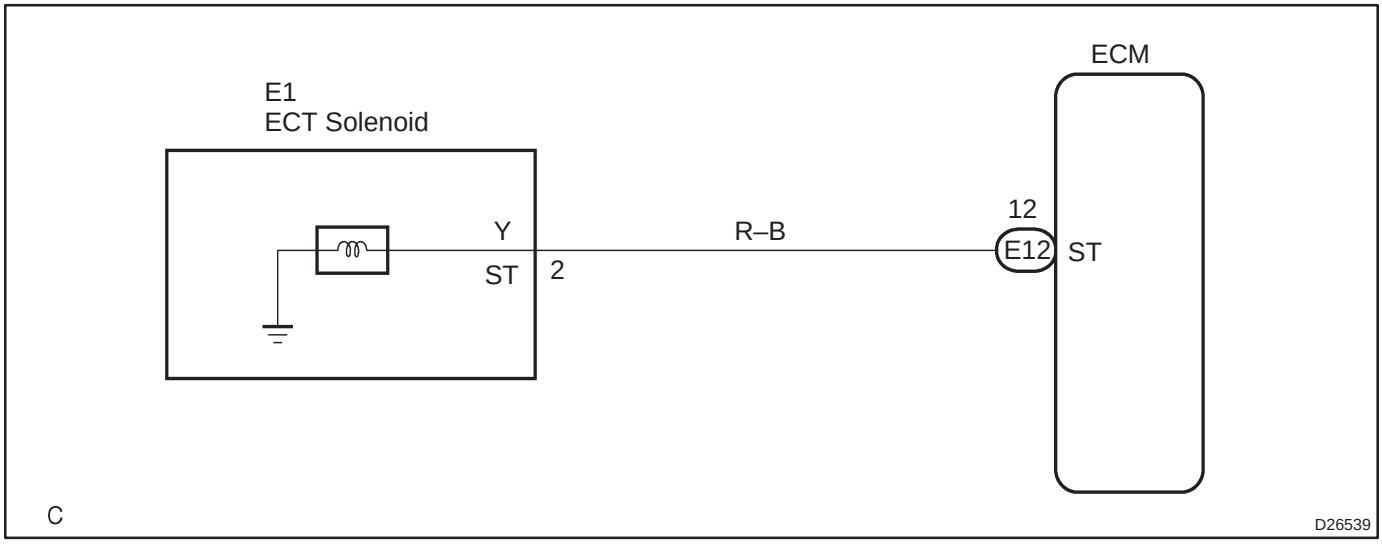
DTC P1790 ST SOLENOID CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

Shift solenoid valve ST is switched ON–OFF by a signal from ECM so that let in or out timing of O/D and 2nd brake is adjusted by operating orifice control valve. Therefore, shift solenoid valve ST operates when letting in or out reverse clutch.
If it is broken, the shift shock becomes big.

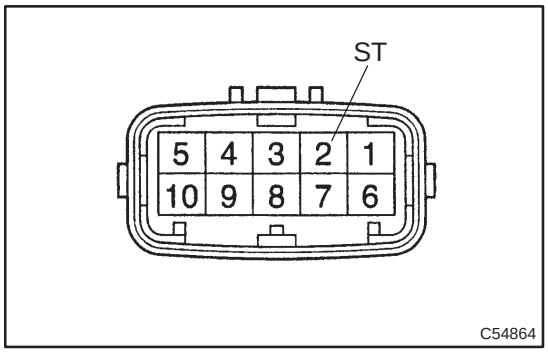
DTC No.	DTC Detection Condition	Trouble Area
P1790	ECM memorizes DTC P1790 if (a) or (b) condition below is detected once or more. (a) Solenoid resistance is 30 Ω or lower (short circuit) when solenoid is energized. (b) Solenoid resistance is 100 kΩ or higher (open circuit) when solenoid is not energized.	• Open or short in shift solenoid valve ST circuit • Shift solenoid valve ST • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(ST)

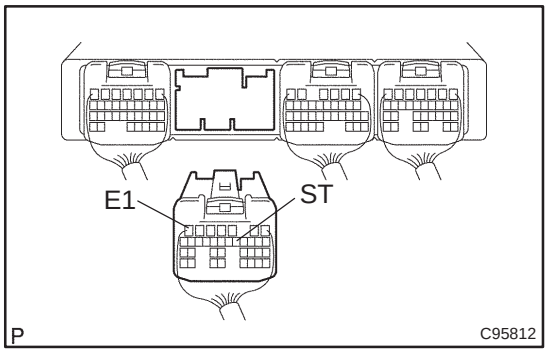


(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminal ST and body ground.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



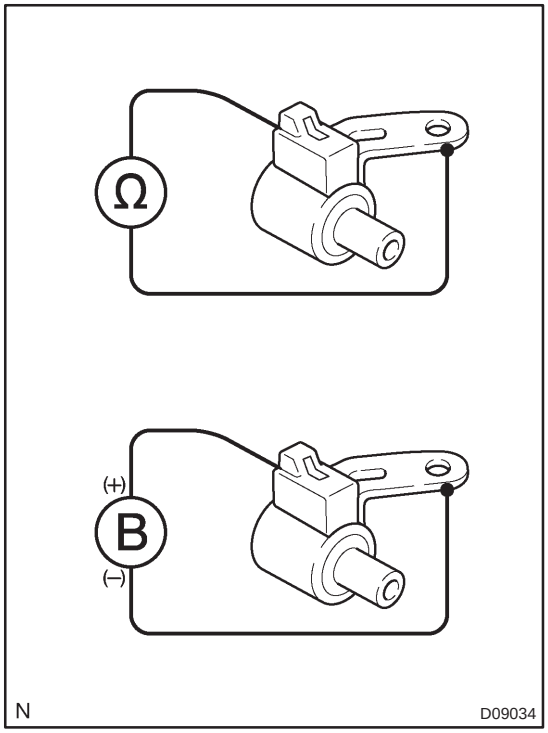
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals ST and E1.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE(ST)



(a) Remove the shift solenoid valve ST.
(b) Measure the resistance between the solenoid connector and the solenoid valve body.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)
(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid valve body.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(ST)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P1798	SB SOLENOID CIRCUIT MALFUNCTION (SHIFT SOLENOID VALVE SB)

CIRCUIT DESCRIPTION

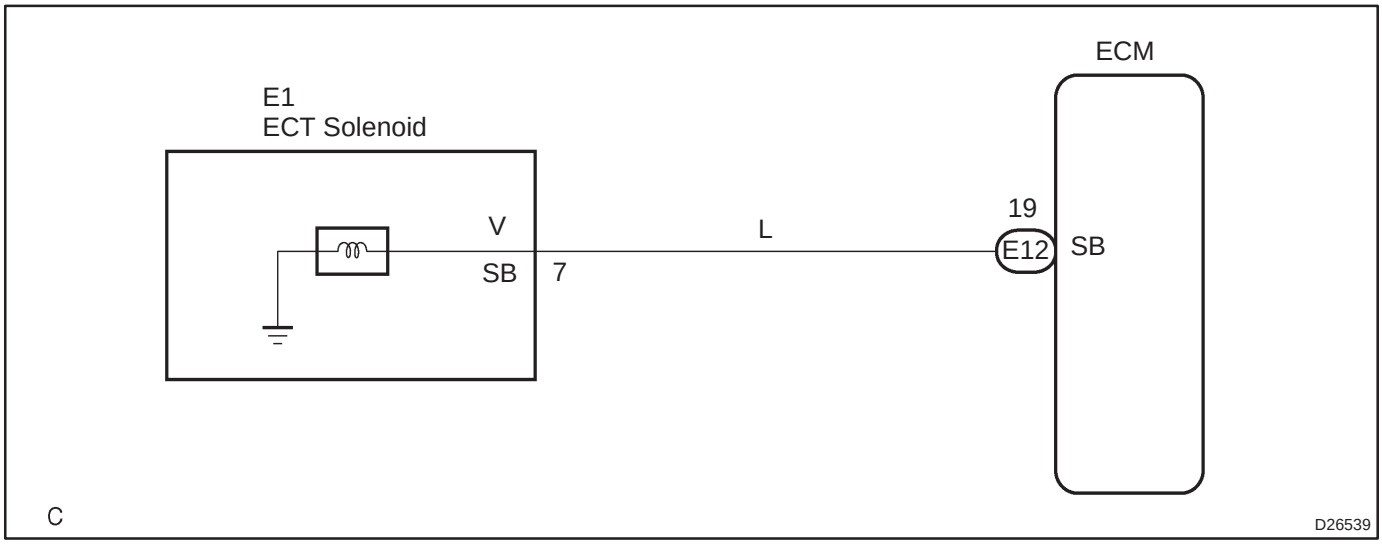
Shift solenoid valve SB controls the 2nd brake (B1) and 1st and reverse brake pressures and performs the 1st and 2nd engine brake control.

Fail safe function:

- S shift control prohibition.
- On activating the fail–safe function during S shift, the driving mode turns to the ordinal D range.

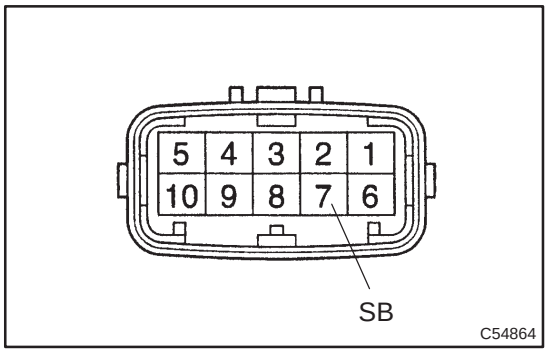
DTC No.	DTC Detection Condition	Trouble Area
P1798	ECM memorizes DTC P1798 if (a) or (b) condition below is detected once or more. (a) Solenoid resistance is 30 Ω or lower (short circuit) when solenoid is energized. (b) Solenoid resistance is 100 kΩ or higher (open circuit) when solenoid is not energized.	• Open or short in shift solenoid valve SB circuit • Shift solenoid valve SB • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SB)

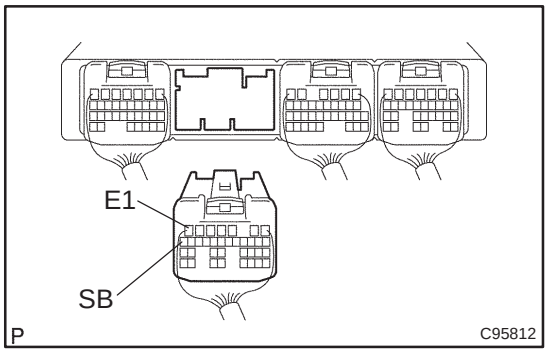


(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure resistance between terminal 7 and body ground.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



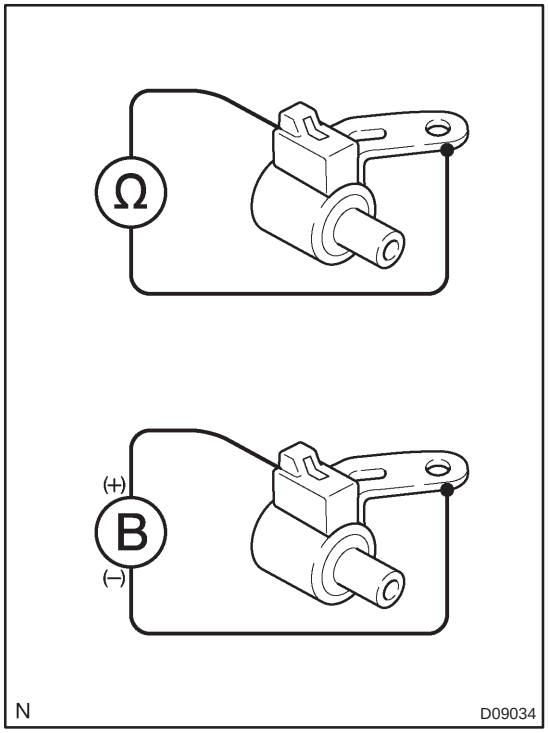
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure resistance between terminals SB and E1.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE(SB)



(a) Remove the shift solenoid valve SB.
(b) Measure resistance between the solenoid connector and the solenoid body.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)
(c) Connect the positive (+) lead to the terminal of solenoid valve connector and the negative (–) lead to the solenoid valve body.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SB)**

OK

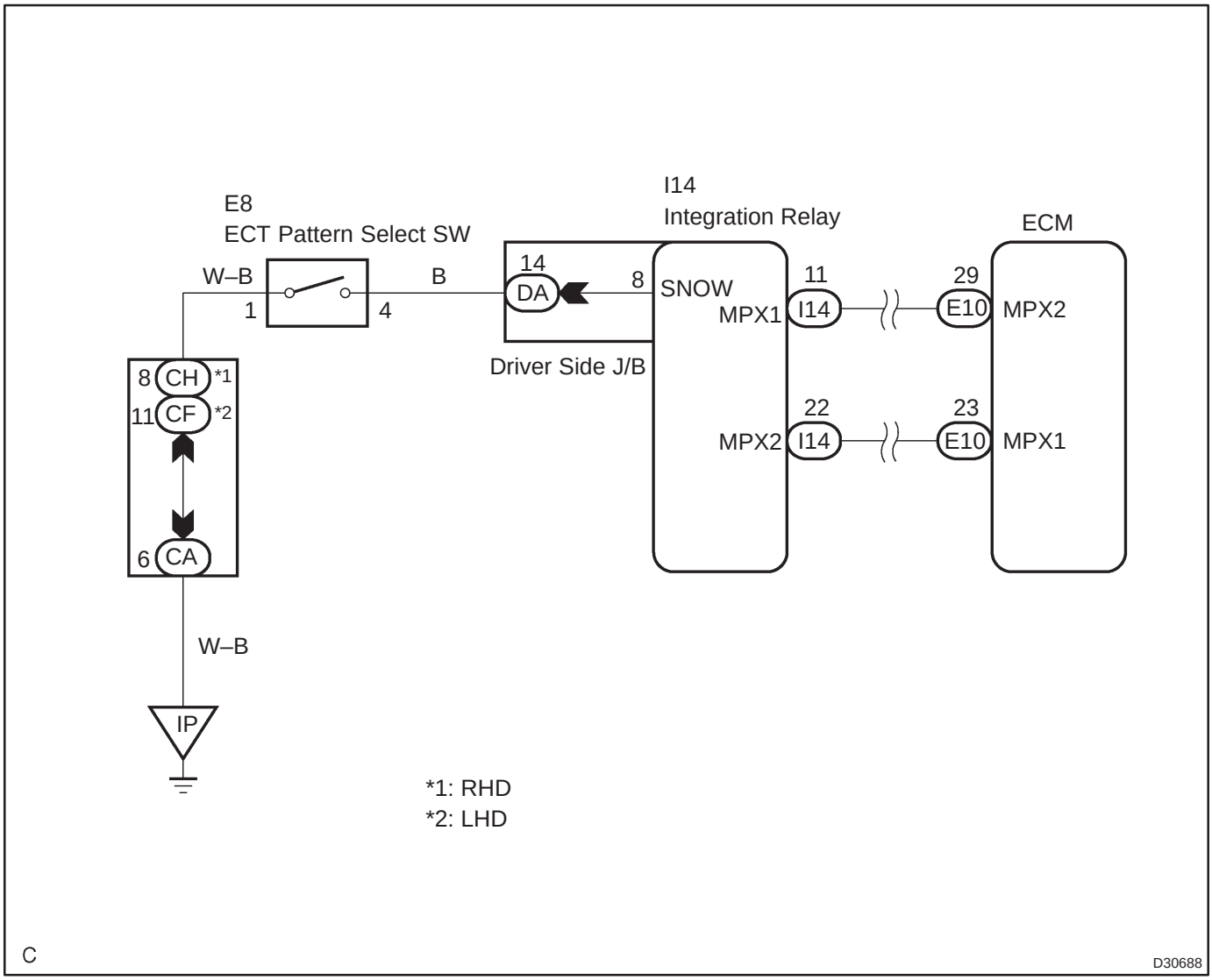
REPAIR OR REPLACE TRANSMISSION WIRE

PATTERN SELECT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

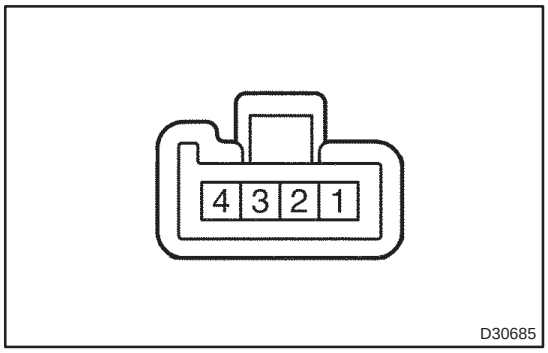
When SNOW mode is selected with the pattern select switch, the ECM controls the solenoid valves and the transmission starts from 2nd gear.
In D range, the transmission automatically shifts up through 3rd to O/D as usual.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT PATTERN SELECT SWITCH ASSY



(a) Disconnect the connector of pattern select switch.
(b) Check the continuity between terminals 1 and 4 of the pattern select switch.

OK:

Pattern select switch	Specified condition
Press continuously Pattern select switch	Continuity
Release Pattern select switch	No continuity

NG → **REPLACE PATTERN SELECT SWITCH ASSY**

OK

2	CHECK HARNESS AND CONNECTOR(PATTERN SELECT SWITCH – INTEGRATION RELAY, PATTERN SELECT SWITCH – BODY GROUND)

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

05C8E–01

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

(1) When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to the OBD scan tool complying with ISO 15031–4 or hand–held tester, and read off various data output from the vehicle's ECM.

(2) Euro–OBD regulations require that the vehicle's on–board computer illuminates the Check Engine Warning Light (Malfunction Indicator Lamp)/CHK ENG (MIL) on the instrument panel when the computer detects a malfunction in the emission control system/components or in the driving system components which affect vehicle emissions, or a malfunction in the computer. In addition to CHK ENG (MIL) illuminating when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO15031–6 are recorded in the ECM memory.

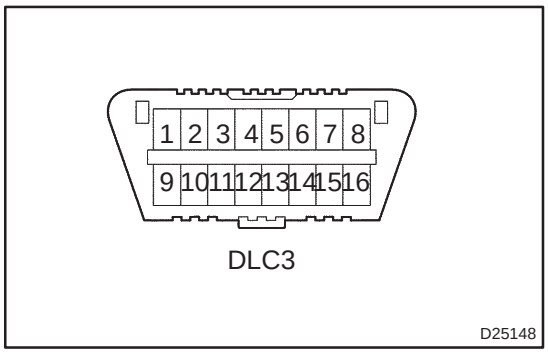
If the malfunction does not occur in 3–trip, the CHK ENG (MIL) goes off but the DTCs remain recorded in the ECM memory.

(3) To check the DTCs, connect the OBD scan tool or hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data (For operating instructions, see the OBD scan tool's instruction book.).

(4) DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–996).

(5) The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic (*) to prevent erroneous detection, and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, technicians can cause the CHK ENG (MIL) to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 2).

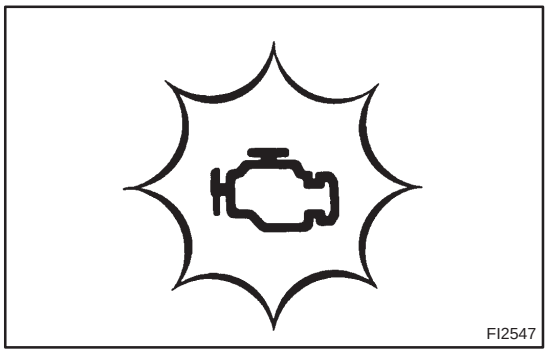
(6) *2 trip detection logic:
When a malfunction is first detected, the malfunction code is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG (MIL) to illumenate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and the 2nd trip.).



(b) Inspect the DLC3.
(1) The vehicle's ECM uses ISO 9141–2 (Euro–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–3 and matches the ISO 9141–2 format.

Terminal No.	Connection	Voltage or Resistance	Condition
7	Bus ⊕ Line	Pulse generation	During communication
4	Chassis Ground	↔ Body Ground / 1 Ω or less	Always
16	Battery Positive	↔ Body Ground / 9 to 14 V	Always

HINT:
If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of hand–held tester to DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.
- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. INSPECT DIAGNOSIS (NORMAL MODE)

(a) Check the MIL.
(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the MIL does not come on, troubleshoot the combination meter.

(2) When the engine is started, the MIL should go off. If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC, Using the hand–held tester.

NOTICE:

Hand–held tester only:

When the diagnostic system is switched from normal mode to check (test) mode, it erases all DTCs and freeze frame data recorded in normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.

(1) Use the hand–held tester to check the DTCs and instructions, see the hand–held tester instruction book.

(2) See page 05–996 to confirm the details of the DTCs.

(c) Clear the DTC.

(1) When using the hand–held tester:
The following operation will erase the DTC and freeze frame data. Operate the hand–held tester to erase the codes.

(2) When not using the hand–held tester:
Remove the EFI fuse from engine room J/B for 60 seconds or more.

3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has high sensing ability to detect malfunctions.

Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

(a) Check the DTC.

(1) Check the initial conditions.

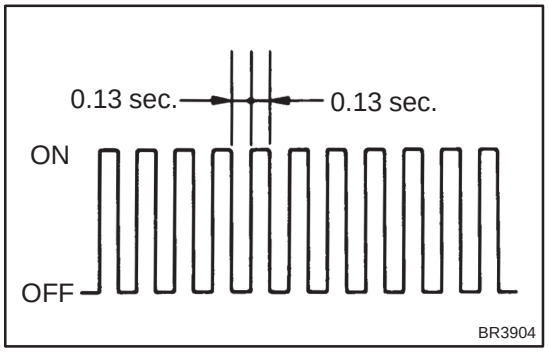
- Battery voltage 11 V or more
- Throttle valve fully closed
- Shift lever in P or N range
- Air conditioning switched OFF

(2) Turn the ignition switch OFF.

(3) Prepare the hand–held tester.

(4) Connect the hand–held tester to DLC3.

(5) Turn the ignition switch ON and switch the hand–held tester ON.



(6) Switch the hand–held tester from Normal mode to Check mode (Check that the MIL flashes).

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(7) Start the engine (MIL goes off after the engine starts).

(8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Take care not to turn the ignition switch OFF, as turning it off switches the diagnosis system from Check mode to Normal mode, which all DTCs etc. are erased.

(10) After checking the DTC, inspect the applicable circuit.

(b) Clear the DTC.

(1) When using the hand–held tester:
The following operation will erase the DTC and freeze frame data. Operate the hand–held tester to erase the codes.

(2) When not using the hand–held tester:
Remove the EFI fuse from engine room J/B for 60 seconds or more.

4. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one of the methods to shorten the work time.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) According to the display on tester, read the ”DATA LIST”.

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	←
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th (O/D)	Shift lever Range is; • D: 1st, 2nd, 3rd or 4th (O/D)	←
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	←
KICKDOWN SW	Kick down SW Status/ ON or OFF	• Accelerator Pedal is depressed all the way down: ON • Accelerator Pedal is released: OFF	←
SNOW SW	Pattern SW (2nd) Status/ ON or OFF	• IG SW ON: OFF ↓ • Pattern SW (2nd) Push: ON ↓ • Pattern SW (2nd) Push: OFF	←

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever range is; P or N: ON Except P or N: OFF	The shift lever range and these values are different, there are failures of the PNP switch or shift cable adjustment.
REVERSE	PNP SW Status/ ON or OFF	Shift lever range is; R: ON Except R: OFF	
DRIVE	PNP SW Status/ ON or OFF	Shift lever range is; D and S: ON Except D and S: OFF	
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: –40°C (–40°F) max.: 215°C (419°F)	80°C (176°F) (After Stall Test)	If the value is "–40°C (–40°F)" or "215°C (419°F)", ATF temp. sensor circuit is opened or shorted.

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one of the method to shorten the work time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) According to the display on tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
LINE PRESS UP	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [Others] ON: Line pressure up. OFF: No action (normal operation)	–
LOCK UP	[Test Details] Control the shift solenoid SL to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 60 km/h (37 mph) or more	Possible to check the SL operation.
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift range by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid values.

6. PROBLEM SYMPTOM CONFIRMATION

(a) Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

7. ROAD TEST

NOTICE:

Conduct the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).

(a) D range test

Shift into the D range and fully depress the accelerator pedal and check the following points:

(1) Check up–shift operation.

Check that 1 → 2, 2 → 3 and 3 → O/D up–shift take place, and that the shift points conform to the automatic shift schedule (See page 03–45).

HINT:

O/D Gear Up–shift Prohibition Control

- Coolant temp. is 60˚C (140˚F) or less and vehicle speed is 70 km/h (43 mph) or less.
- ATF temp. is 10˚C (50˚F) or less.

O/D and 3rd Gear Lock–up Prohibition Control

- Brake pedal is depressed.
- Accelerator pedal is released.
- ATF temp. is 10˚C (50˚F) or less.
- Coolant temp. is 60˚C (140˚F) or less.

When the 2nd start switch is on, there is no 1 → 2 up–shift and 2 → 1 down–shift.

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shift.

(3) Check for abnormal noises and vibration.

Run in D range lock–up or O/D gear and check for abnormal noise and vibration.

HINT:

The check for the cause of abnormal noise and vibration must be done very thoroughly as it could also be sure to loss of balance in the differential, torque converter, etc.

(4) Check kick–down operation.

While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated in the automatic shift schedule (See page 03–45).

(5) Check for abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.

- Drive in D range O/D gear, at a steady speed (lock–up ON) of about 70 km/h (43 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(b) S range test

Shift to the S range, depress the accelerator pedal and check the following points:

Shift operations.

- Shifting the shift lever to ”+” or ”–” changes the shift range on the combination meter.

HINT:

Manual shift prohibition control is performed when:

- Down–shifting causes engine overrun.
- Down–shifting is required continuously. (Down–shifting to 1st gear may not be performed.)

(c) R range test

Shift into the R range and fully depress the accelerator pedal and check for slipping.

CAUTION:

Before conducting this test, ensure that the test area is free from people and obstruction.

(d) P range test

Stop the vehicle on a grade (more than 5˚) and after shifting into the P range, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

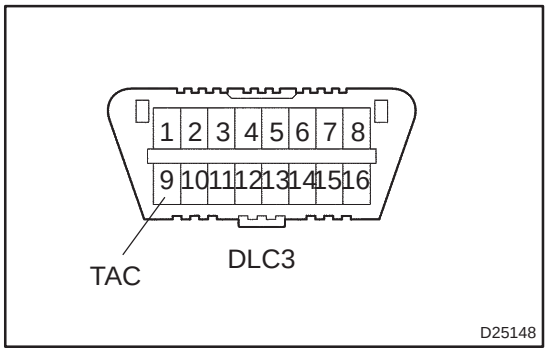
8. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R ranges.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Do not continuously run this test for longer than 5 seconds.**
- **To ensure safety, do this test in a wide, clear level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**



(1) Chock the 4 wheels.
(2) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

SST 09843–18030

(3) Fully apply the parking brake.
(4) Keep your left foot pressing firmly on the brake pedal.
(5) Start the engine.
(6) Shift into the D range. Press all the way down on the accelerator pedal with your right foot.
(7) Quickly read the stall speed at this time.

Stall speed: 2,400 ± 150 rpm

(8) Do the same test in the R range.

Stall speed: 2,400 ± 150 rpm

Evaluation:

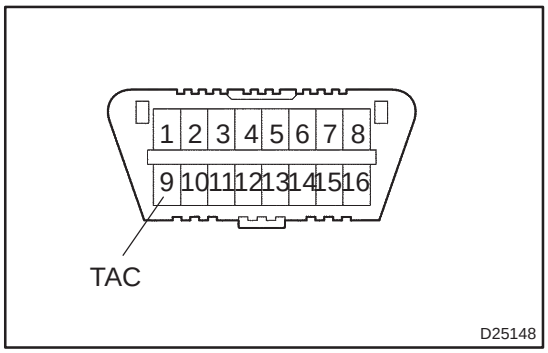
Problem	Possible cause
(a) Stall speed low in D and R ranges	• Engine output may be insufficient • Stator one–way clutch not operating properly HINT: If the value is larger or smaller than the specified value by 600 rpm or more, the torque converter could be faulty.
(b) Stall speed high in D range	• Line pressure too low • Forward clutch slipping • One–way clutch No.2 not operating properly
(c) Stall speed high in R range	• Line pressure too low • Reverse clutch slipping • 1st and reverse brake slipping
(d) Stall speed high in D and R ranges	• Line pressure too low • Improper fluid level

(b) Measure the time lag.

(1) When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the reverse clutch, forward clutch, and 1st and reverse brake.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**



(2) Chock the 4 wheels.

(3) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

SST 09843–18030

(4) Start engine and check idle speed.

Idle speed: 650 ± 50 rpm (In N range and A/C OFF)

(5) Shift the lever from N to D range. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag: N → D less than 1.2 seconds

(6) In the same way, measure the time lag for N → R.

Time lag: N → R less than 1.5 seconds

Evaluation (If N → D or N → R time lag is longer than the specified):

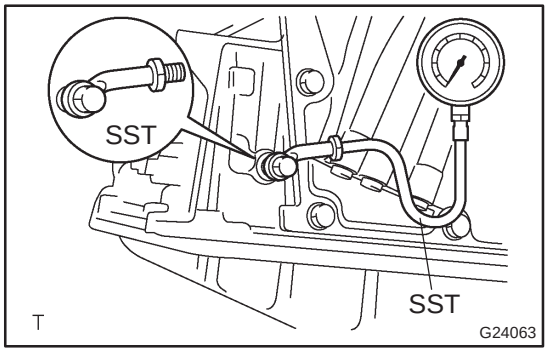
Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • One–way clutch No.2 not operating properly
N → R time lag is longer	• Line pressure too low • Reverse clutch worn • 1st and reverse brake worn

9. HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **Do the test at normal operation ATF temperature 50 to 80˚C (122 to 176˚F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stopper outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**



(1) Warm up the ATF.
(2) Remove the test plug on the left side of the transaxle case and connect SST.

SST 09992–00095 (09992– 00231, 09992–00271)

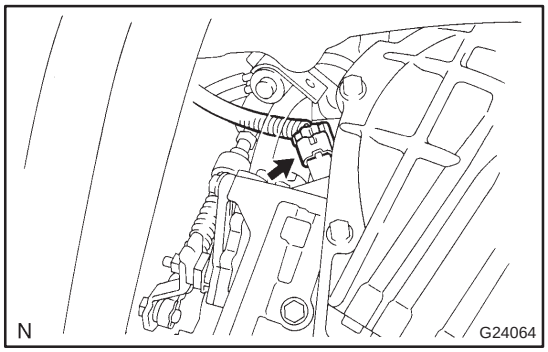
(3) Fully apply the parking brake and chock the 4 wheels.
(4) Connect the hand–held tester to DLC3.
(5) Start the engine and check idling speed.
(6) Keep your left foot pressing firmly on the brake pedal and shift into D range.
(7) Measure the line pressure when the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(9) In the same way, do the test in R range.

Specified line pressure:

Condition	D range kPa (kgf / cm^2, psi)	R range kPa (kgf / cm^2, psi)
Idling	370 to 410 (3.8 to 4.2, 54 to 60)	540 to 640 (5.5 to 6.5, 78 to 92)
Stall	1,110 to 1,230 (11.3 to 12.5, 161 to 178)	1,700 to 1,810 (17.3 to 18.5, 246 to 263)

Evaluation:

Problem	Possible cause
If the measured values at all ranges are higher	• Shift solenoid valve SLT defective • Regulator valve detective
If the measured values at all ranges are lower	• Shift solenoid valve SLT defective • Regulator valve detective • Oil pump defective
If pressure is low in the D range only	• D range circuit fluid leak • Forward clutch defective
If pressure is low in the R range only	• R range circuit fluid leak • Reverse clutch defective • 1st and reverse brake defective



10. MANUAL SHIFTING TEST

HINT:

By this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transaxle.

(a) Disconnect the transmission wire connector.

(b) Inspect the manual driving operation.

Check that the shift and gear ranges correspond to the table below.

While driving, shift through the D range.

Check that the gear change corresponds to the shift range.

Shift range	Gear position
D	3rd
R	Reverse
P	Pawl Lock

HINT:

If the gear positions of the D are difficult to distinguish, do the above road test.

If any abnormality is found in the above test, the problem is in the transaxle itself.

(c) Connect the transmission wire connector.

(d) Clear the DTC.

11. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

NOTICE:

Hand–held tester only

(a) Turn the ignition switch to OFF.

(b) Connect the hand–held tester to the DLC3.

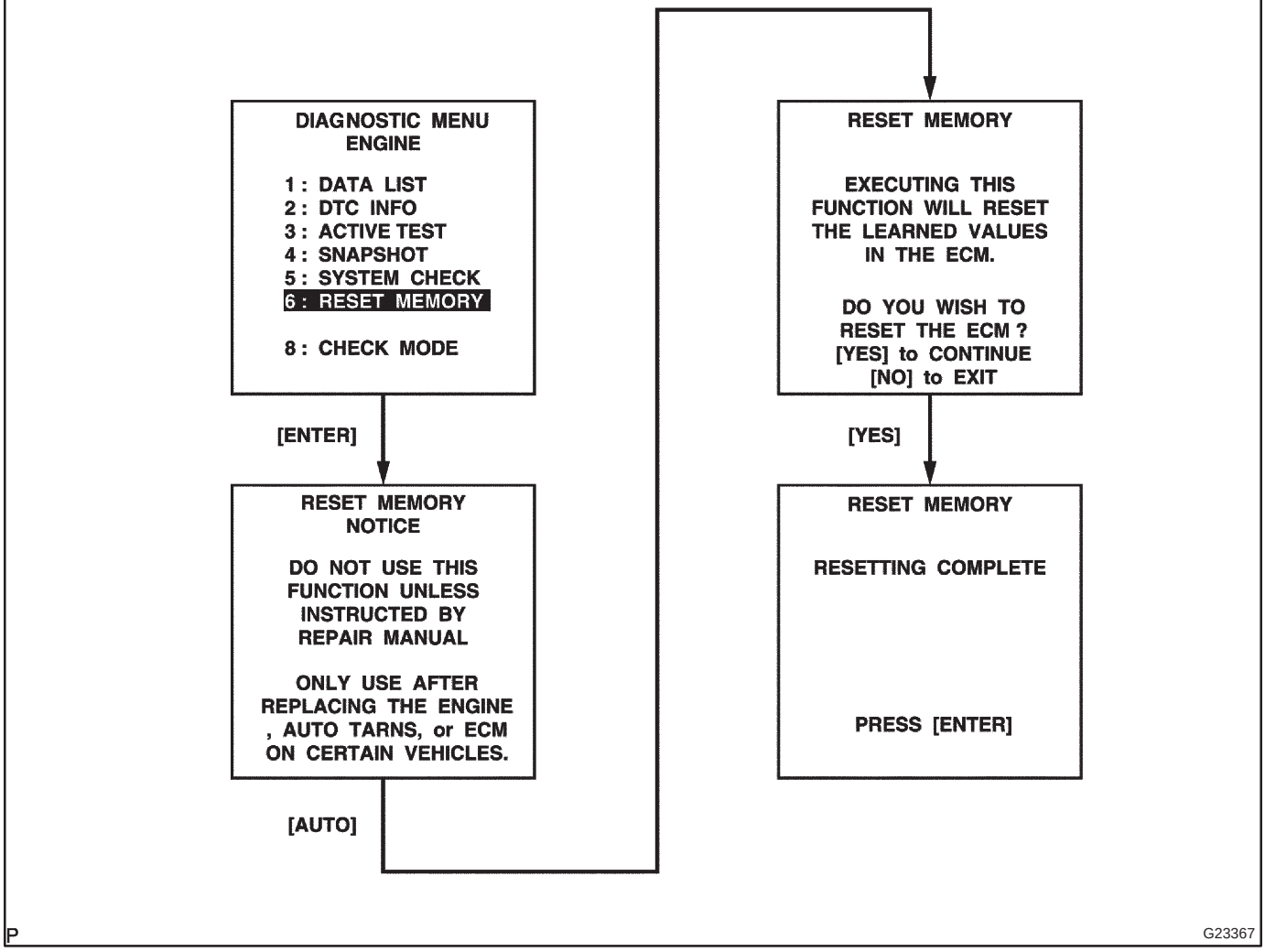
(c) Turn the ignition switch to ON.

(d) Perform the reset memory procedure from the ENGINE menu.

CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

Tester menu flow:



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PRECAUTION

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

HINT:

Initialization can not be completed by only removing the battery.

0567W–10

PROBLEM SYMPTOMS TABLE

HINT:

If a normal code is displayed during the DTC check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for trouble-shooting.

The Matrix Chart is divided into 3 chapters.

- If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.
- If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM.

CHAPTER 1: ELECTRONIC CIRCUIT MATRIX CHART

Symptom	Suspect Area	See page
No up–shift (A particular gear, from 1st to O/D gear, is not up–shifted)	ECM	01–32
No down–shift (A particular gear, from O/D to 1st gear, is not down–shifted)	ECM	01–32
No lock–up or No lock–up off	3. Stop light switch circuit 4. Engine coolant temp. sensor circuit 5. Throttle position sensor circuit 6. ECM	05–1018 05–16 05–16 01–32
Shift point too high or too low	1. Engine coolant temp. sensor circuit 2. Throttle position sensor circuit 3. ECM	05–16 05–16 01–32
No gear change by shifting into ”+” or ”–” while the shift lever is in the Sposition	1. Transmission control switch circuit 2. ECM	05–1035 01–32
Up–shift to O/D from 3rd while engine is cold	1. Engine coolant temp. sensor circuit 2. ATF temp. sensor circuit 3. ECM	05–16 05–1003 05–1005 01–32
Harsh engagement (N → D)	ECM	01–32
Harsh engagement (Lock–up)	ECM	01–32
Harsh engagement (Any driving range)	ECM	01–32
Poor acceleration	1. Pattern select switch circuit (ECT SNOW switch) 2. Instrument panel J/B assy (Integration relay) 3. ECM	05–1040 01–32
Engine stalls when starting off or stopping	ECM	01–32
No kick–down	1. Kick–down switch circuit 2. ECM	05–1033 01–32
No 2nd start	1. Pattern select switch circuit (ECT SNOW switch) 2. Transmission control switch circuit 3. Park/neutral position switch circuit 4. Instrument panel J/B assy (Integration relay) 5. ECM	05–1040 05–1035 05–1024 05–1040 01–32

Chapter 2: On–vehicle Repair
(★: U340E, U341E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM824E)

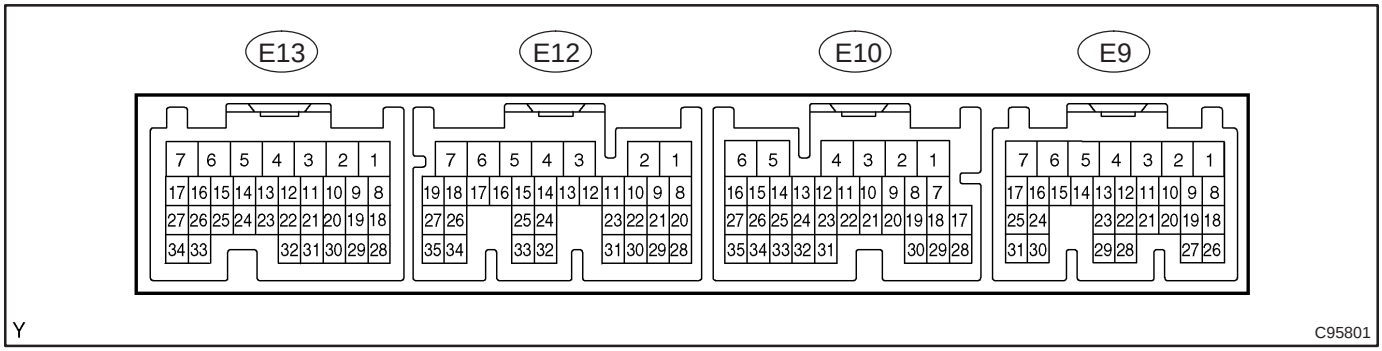
Symptom	Suspect Area	See page
Vehicle does not move in any forward range and reverse range	1. Manual valve 2. Primary regulator valve 3. Secondary regulator valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Vehicle does not move in R range	1. Manual valve 2. Off–vehicle repair matrix chart	★ –
No up–shift (1st → 2nd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (2nd → 3rd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (3rd → O/D)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No down–shift (O/D → 3rd)	Valve body assy	★
No down–shift (3rd → 2nd)	Valve body assy	★
No down–shift (2nd → 1st)	Valve body assy	★
No lock–up or No lock–up off	1. Lock–up relay valve 2. Solenoid relay valve 3. Solenoid modulator valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Accumulator control valve 3. Off–vehicle repair matrix chart	★ ★ –
Harsh engagement (N → R)	1. C_3 accumulator 2. Accumulator control valve 3. Reverse control valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Harsh engagement (Lock–up)	1. Lock–up relay valve 2. Accumulator control valve 3. Off–vehicle repair matrix chart	★ ★ –
Harsh engagement (1st → 2nd)	1. B_2 accumulator 2. Accumulator control valve	★ ★
Harsh engagement (2nd → 3rd)	1. C_2 accumulator 2. Accumulator control valve	★ ★
Harsh engagement (3rd → O/D)	1. B_1 accumulator 2. Accumulator control valve 3. 3–4 shift timing valve	★ ★ ★
Harsh engagement (O/D → 3rd)	Valve body assy	★
Harsh engagement (D, 2, L)	Coat relay valve	★
Slip or shudder (Forward and reverse)	1. Oil strainer 2. Off–vehicle repair matrix chart	40–42 –
No kick–down	Valve body assy	★
Poor acceleration	SLT damper	★

Chapter 3: Off–vehicle Repair
(★: U340E, U341E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM824E)

Symptom	Suspect Area	See page
Vehicle does not move in any forward range and reverse range	1. Planetary gear unit 2. Forward clutch 3. One–way clutch No.2 4. Reverse Clutch 5. 1st and reverse brake	★ ★ ★ ★ ★
Vehicle does not move in R range	1. Planetary gear unit 2. Reverse Clutch 3. 1st and reverse brake	★ ★ ★
No up–shift (1st → 2nd)	1. 2nd brake 2. One–way clutch No.1	★ ★
No up–shift (2nd → 3rd)	Direct clutch	★
No up–shift (3rd → O/D)	O/D and 2nd brake	★
No lock–up or No lock–up off	Torque converter clutch	40–37
Harsh engagement (N → D)	1. Forward clutch 2. One–way clutch No.2	★ ★
Harsh engagement (N → R)	1. Reverse clutch 2. 1st and reverse brake	★ ★
Harsh engagement (Lock–up)	Torque converter clutch	40–37
Harsh engagement (1st → 2nd)	1. 2nd brake 2. One–way clutch No.1	★ ★
Harsh engagement (2nd → 3rd)	Direct clutch	★
Harsh engagement (3rd → O/D)	O/D and 2nd brake	★
Slip or shudder (Forward range)	1. Torque converter clutch 2. Forward clutch 3. Direct clutch 4. O/D and 2nd brake 5. 2nd brake 6. One–way clutch No.1 7. One–way clutch No.2	40–37 ★ ★ ★ ★ ★ ★
Slip or shudder (Reverse range)	1. Reverse clutch 2. 1st and reverse brake	★ ★
Slip or shudder (1st)	One–way clutch No.2	★
Slip or shudder (2nd)	1. 2nd brake 2. One–way clutch No.1	★ ★
Slip or shudder (3rd)	Direct clutch	★
Slip or shudder (O/D)	O/D and 2nd brake	★
No engine braking (1st)	1st and reverse brake	★
No engine braking (2nd)	O/D and 2nd brake	★
Poor acceleration (All range)	Torque converter clutch	40–37
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	40–37

05C8F–01

TERMINALS OF ECM



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
SLT^{+} (E13–17) – SLT^{-} (E13–16)	P–L – P	IG switch ON	10 to 14
THO (E13–30) – E2 (E13–28)	V – BR	IG switch ON and ATF temperature 110 ˚C (230 ˚F)	Below 1
ST (E12–12) – E1 (E12–7)	R–B – BR	IG switch ON	Below 1
		IG switch ON and R gear	10 to 14
SL (E12–13) – E1 (E12 – 7)	R – BR	IG switch ON	Below 1
		Vehicle driving under lock–up position	10 to 14
S2 (E12–14) – E1 (E12–7)	P – BR	IG switch ON	Below 1
		1st or O/D gear	10 to 14
		2nd or 3rd gear	Below 1
S1 (E12–15) – E1 (E12–7)	P–L – BR	IG switch ON	10 to 14
		1st or 2nd gear	10 to 14
		3rd or O/D gear	Below 1
SB (E12–19) – E1 (E12–7)	L – BR	IG switch ON	Below 1
NT^{+} (E12–27) – NT^{-} (E12–35)	B–O – B	Engine is running	Pulse signal is output Below 1 ↔ 4 to 5
SPT (E10–8) – E1 (E12–7)	L – BR	IG switch ON and Shift lever S position	7.5 to 14
		IG switch ON and Shift lever except for S position	Below 1
D (E10–10) – E1 (E12–7)	LG–B – BR	IG switch ON and Shift lever D position	10 to 14
		IG switch ON and Shift lever other than D position	Below 1
R (E10–11) – E1 (E12–7)	R–Y – BR	IG switch ON and Shift lever R position	10 to 14
		IG switch ON and Shift lever other than R position	Below 1
KD*1 (E10–12) – E1 (E12–7)	W*1 – BR	IG switch ON and Kick–down switch ON	Below 1
		IG switch ON and Kick–down switch OFF	10 to 14
SPD (E10–17) – E1 (E12–7)	V–W – BR	IG switch ON and rotate driving wheel slowly	Pulse signal is output
SFTU (E10–23) – E1 (E12–7)	R – BR	IG switch ON and Shift lever S position	7.5 to 14
		IG switch ON and Shift lever "+" position (Up shift)	Below 1.5
SFTD (E10–30) – E1 (E12–7)	B – BR	IG switch ON and Shift lever S position	7.5 to 14
		IG switch ON and Shift lever "–" position (Down shift)	Below 1.5

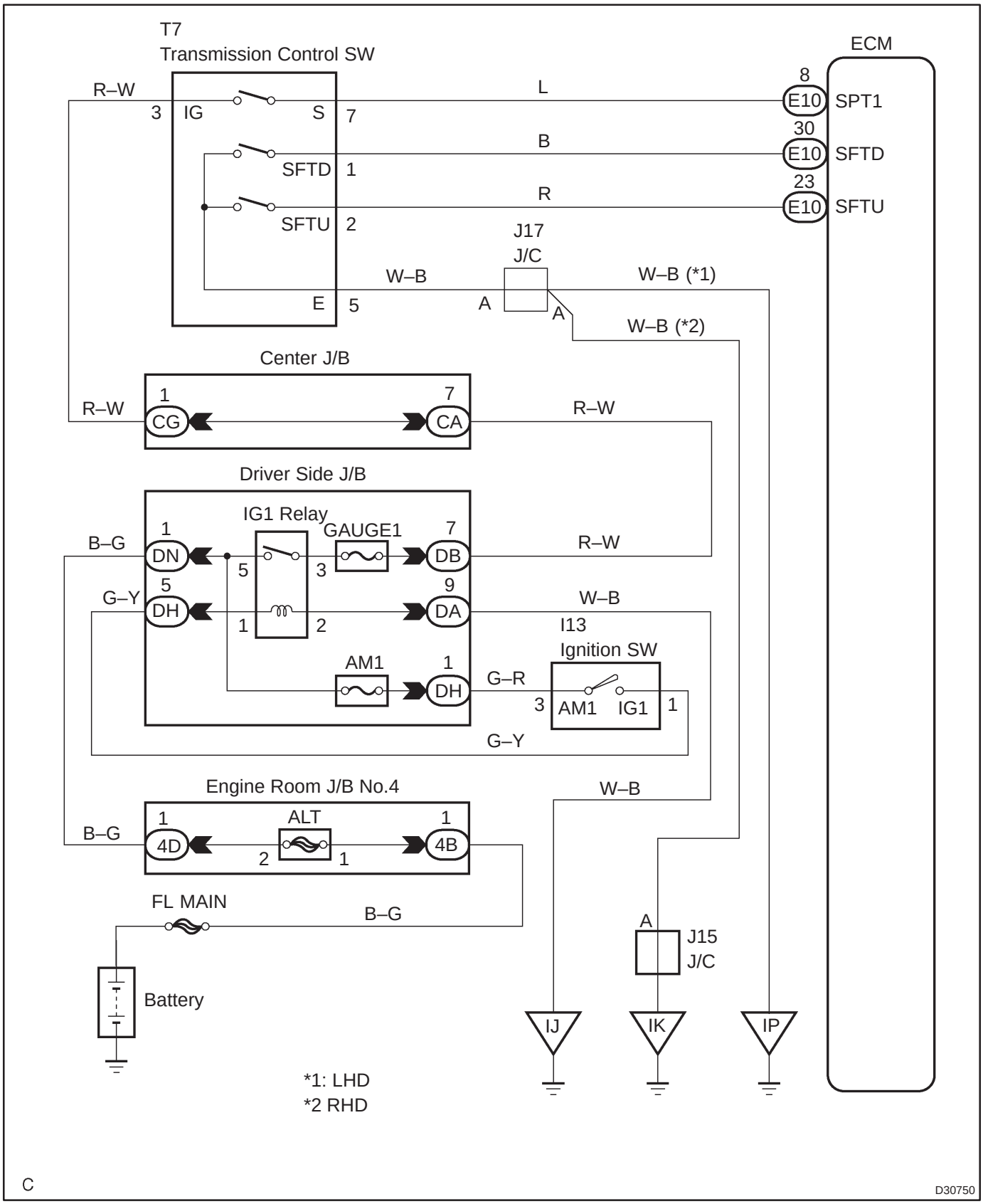
*1: LHD

TRANSMISSION CONTROL SWITCH CIRCUIT

CIRCUIT DESCRIPTION

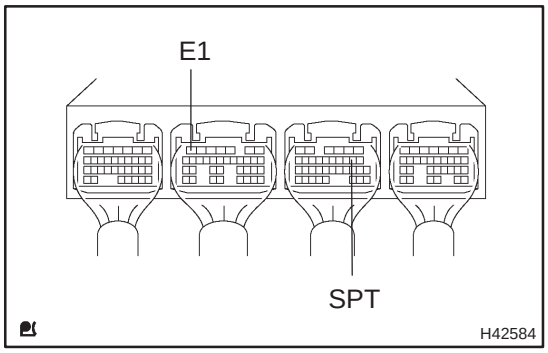
When shifting the shift lever into S range using the transmission control switch, it is possible to shift in 1 to 4 positions.
Shifting ”+” once changes up 1 shift range position, ”–” once changes down 1 shift range position respectively.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK ECM



(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminals SPT and E1 of the ECM.

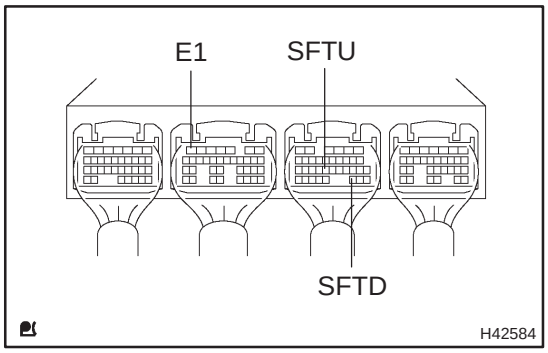
OK:

Shift position	Specified condition
Except S position	Below 1 V
S position	7.5 to 14 V

NG → **Go to step 6**

OK

2 CHECK ECM



(a) Measure the voltage between terminals E1 and that SFTU as well as SFTD of the ECM.

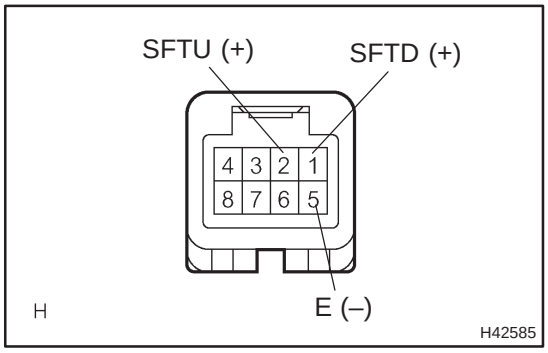
OK:

Shift position	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E1	Below 1.5 V
S position	SFTU – E1	7.5 to 14 V
Shift to "–" (Down shift)	SFTD – E1	Below 1.5 V
S position	SFTD – E1	7.5 to 14 V

OK → **NORMAL**

NG

3 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



(a) Turn the ignition switch to OFF.
(b) Disconnect the transmission control switch connector.
(c) Measure the resistance between terminals E and that SFTU as well as SFTD of the transmission control switch connector.

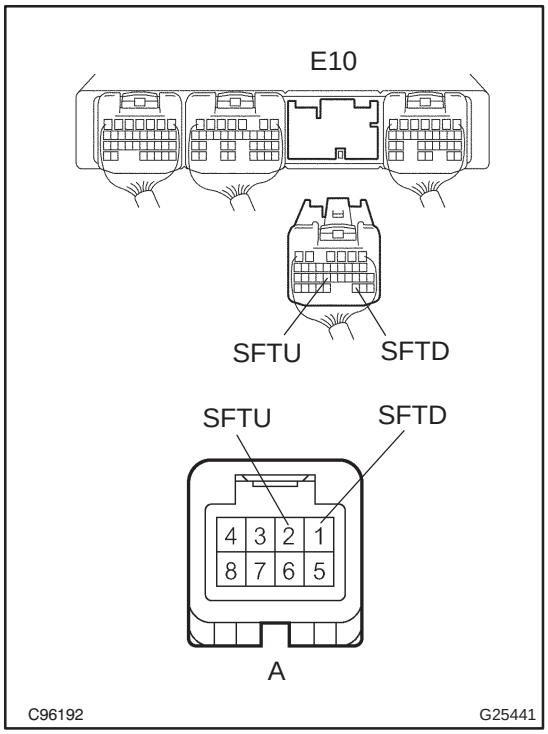
OK:

Shift position	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E	Continuity
S position	SFTU – E	No continuity
Shift to "–" (Down shift)	SFTD – E	Continuity
S position	SFTD – E	No continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

4	CHECK HARNESS AND CONNECTOR(ECM – TRANSMISSION CONTROL SWITCH)



(a) Disconnect the ECM connector.
(b) Check the continuity between ECM and transmission control switch.
OK:

Tester connection	Specified condition
SFTU (E10–23) – SFTU (A–2)	Continuity
SFTD (E10–30) – SFTD (A–1)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR(TRANSMISSION COTROL SWITCH – BODY GROUND)

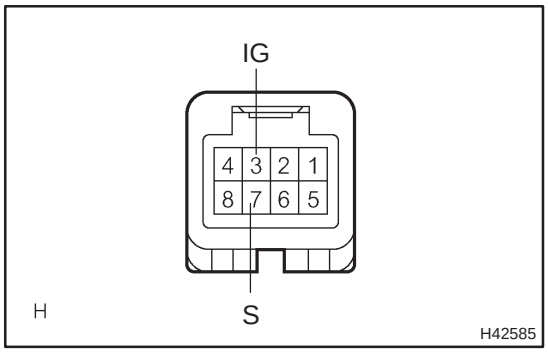
(a) Check the continuity between body ground and E of the transmission control switch connector (wire harness side).
OK:
Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

6 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



(a) Turn the ignition switch to OFF.
(b) Disconnect the transmission control switch connector.
(c) Check the continuity between terminals IG and S of the transmission control switch.

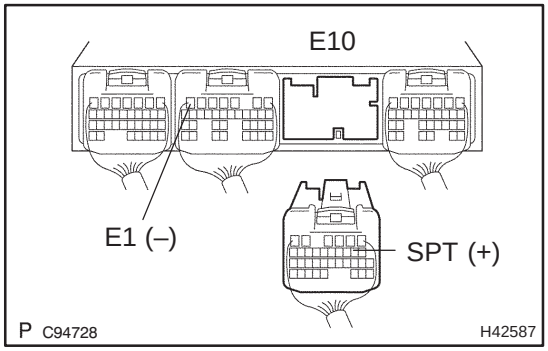
OK:

Shift position	Tester connection	Specified condition
Except S position	IG – S	No continuity
S position	IG – S	Continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

7 CHECK HARNESS AND CONNECTOR



(a) Connect the transmission control switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminals SPT and E1 of the ECM connector.

OK:

Shift position	Tester connection	Specified condition
Except S position	SPT – E1	Below 1 V
S position	SPT – E1	7.5 to 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	C1511/11	Torque Sensor Circuit Malfunction

DTC	C1512/12	Torque Sensor Circuit Malfunction

DTC	C1513/13	Torque Sensor Circuit Malfunction

DTC	C1514/14	Torque Sensor Power Source Circuit Malfunction

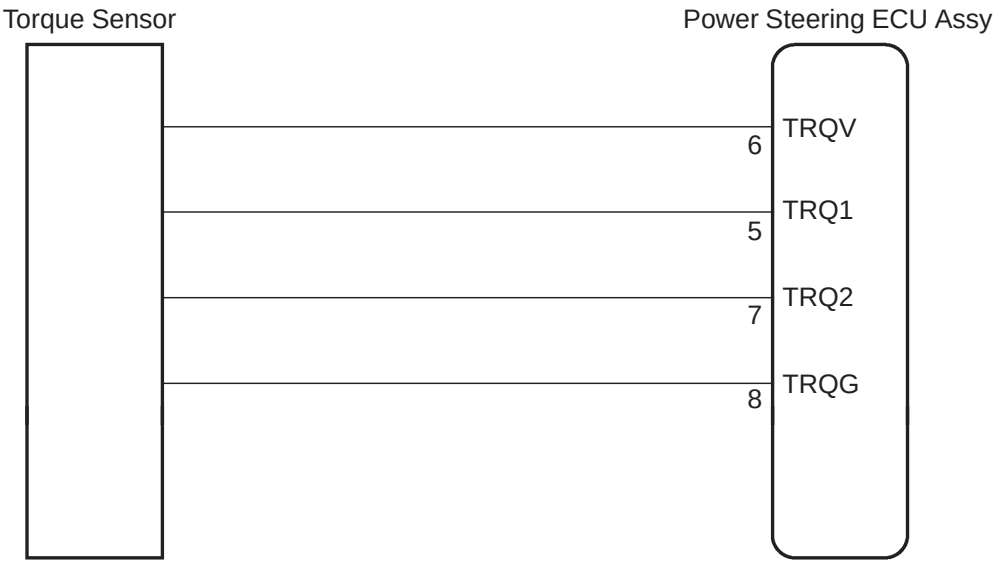
DTC	C1517/17	Torque Sensor Hold Malfunction

CIRCUIT DESCRIPTION

The torque sensor converts the power input in the steering wheel into electric signals, and sends them to the ECU.

DTC No.	DTC Detecting Condition	Trouble Area
C1511/11	Torque sensor circuit malfunction	• Steering column assy • Power steering ECU assy
C1512/12		
C1513/13		
C1514/14	Torque sensor power source circuit malfunction	
C1517/17	Torque sensor hold malfunction	

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

HINT:

Start the inspection from the step 1 with using hand–held tester. Start from step 2 without using hand–held tester.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch to ON and push the hand–held tester main switch ON.

(c) Select the item ”TRQ1” and ”TRQ2” in the DATA LIST and read its value displayed on the hand–held tester.

(d) Check the values on the ”TRQ1” and ”TRQ2” of the data monitor with the steering wheel being in the center value position (no load).

Standard:

2.3 to 2.7 V

(e) Check the difference of the values between ”TRQ1” and ”TRQ2” with the steering wheel being in the center value position (no load).

Standard:

Voltage: 0.3 V or less

(f) Check the values of the torque sensor on the data monitor when turning steering wheel.

(1) Turn the steering wheel to the right end from the center value position, and check the values on the ”TRQ1” and ”TRQ2” of the data monitor.

Standard:

2.5 to 4.7 V

(2) Turn the steering wheel to the left end from the center value position, and check the values on the ”TRQ1” and ”TRQ2” of the data monitor.

Standard:

0.3 to 2.5 V

(3) Check the difference of the values between ”TRQ1” and ”TRQ2”.

Standard:

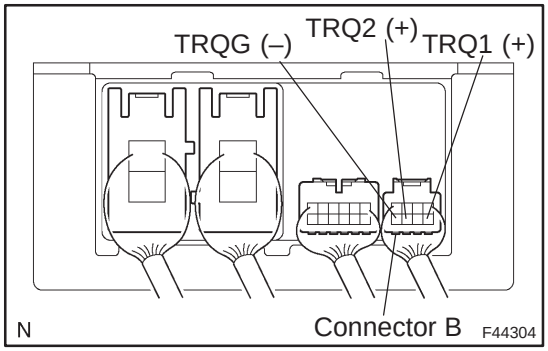
Voltage: 0.3 V or less

NG → **Go to step 3**

OK

REPLACE POWER STEERING ECU ASSY (See page 50–20)

2 INSPECT STEERING COLUMN ASSY(TORQUE SENSOR)



(a) Measure the voltage between terminals TRQ1 and TRQG, TRQ2 and TRQG of power steering ECU assy connector.

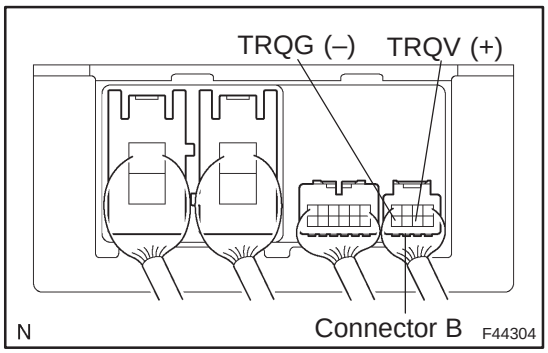
Standard:

Steering position	TRQ1	TRQ2
Center position	2.3 to 2.7 V	2.3 to 2.7 V
Right turned	2.5 to 4.7 V	2.5 to 4.7 V
Left turned	0.3 to 2.5 V	0.3 to 2.5 V

OK → **REPLACE POWER STEERING ECU ASSY (See page 50–20)**

NG

3 INSPECT POWER STEERING ECU ASSY



(a) Measure the voltage between terminals TRQV and TRQG of power steering ECU assy connector.

Standard:

7.5 to 8.5 V

OK → **REPLACE STEERING COLUMN ASSY (See page 50–9)**

NG

REPLACE POWER STEERING ECU ASSY (See page 50–20)

DTC	C1515/15	Torque Sensor Zero Point Calbration Not Performed

CIRCUIT DESCRIPTION

This DTC does not indicate trouble. Perform calibration of torque sensor zero point to delete DTC.

DTC No.	DTC Detecting Condition	Trouble Area
C1515/15	When torque sensor zero point calibration is not performed, this DTC is detected.	Sensor zero point calibration is not performed.

INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check the DTCs (See page 05–1045).
(b) Is DTC excepted for C1515/15 outputed?

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

2	PERFORM CALIBRATION OF TORQUE SENSOR ZERO POINT(See page 05–1045)

3	RECONFIRM DTC

(a) Check the DTC (See page 05–1045).
(b) Is DTC C1516/16 outputed?

NO → END

YES

REPAIR CIRCUIT INDICATED BY DTC C1516/16(See page 05–1063)

DTC	C1516/16	Calibration of Sensor Zero Point Not Completed

CIRCUIT DESCRIPTION

This DTC does not indicate trouble. This is detected when the torque sensor zero point calibration is not completed normally.

DTC No.	DTC Detecting Condition	Trouble Area
C1516/16	The torque sensor zero point calibration is not completed normally.	Sensor zero point calibration failure.

INSPECTION PROCEDURE

1	CLEAR DTC(See page 05–1045)

2	PERFORM CALIBRATION OF TORQUE SENSOR ZERO POINT(See page 05–1045)

3	RECONFIRM DTC

(a) Check the DTCs (See page 05–1045).

(A): DTC C1516/16 output after attempted 3 time or more.

(B): Normal code output.

HINT:

If the DTC code is output in spite of conducting the steering zero point calibration, replace the steering column assy.

(A) → **REPLACE STEERING COLUMN ASSY**

(B)

END

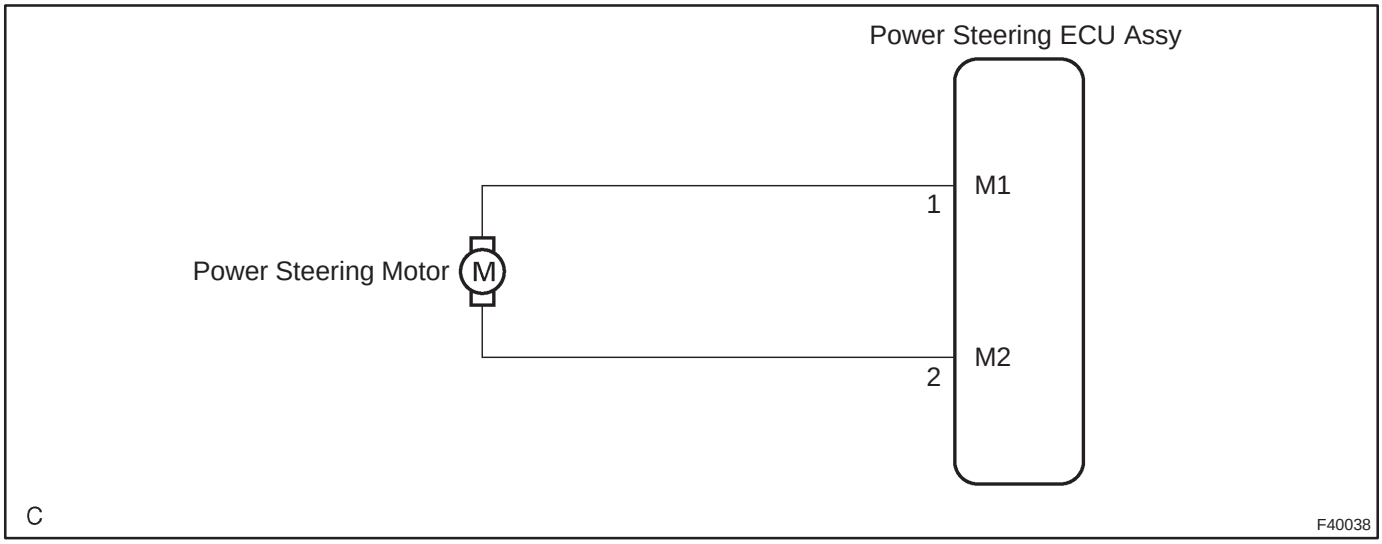
DTC	C1523/23	Motor Circuit Malfunction

DTC	C1524/24	Motor Circuit Malfunction

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1523/23	Short circuit of motor terminal or abnormal voltage or current in motor circuit.	• Steering column assy • Power steering ECU assy
C1524/24		

WIRING DIAGRAM

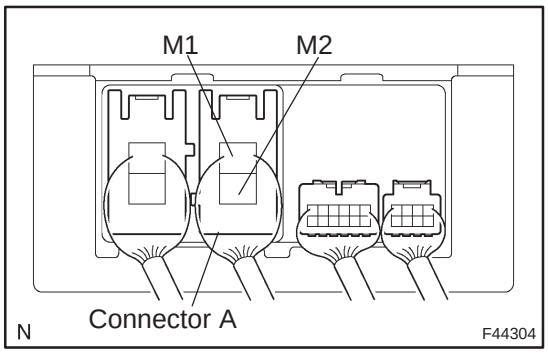


INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

1	INSPECT POWER STEERING ECU ASSY



(a) Turn the ignition switch ON.

(b) Turn the steering wheel to the left and right and measure the voltage between terminals M1 and M2 of power steering ECU assy connector.

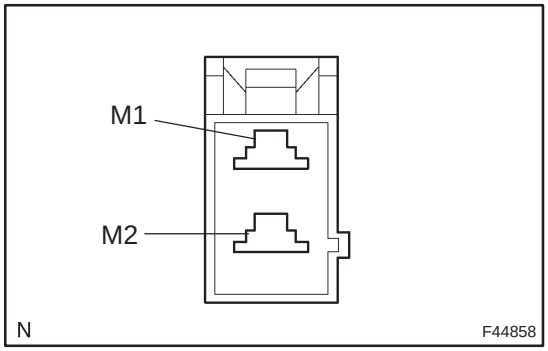
Standard:

Voltage changes when steering wheel is turned.

NG → **REPLACE POWER STEERING ECU ASSY(See page 50–20)**

OK

2	INSPECT STEERING COLUMN ASSY(POWER STEERING MOTOR)



(a) Disconnect the connector from the power steering motor.

(b) Measure the resistance between terminals M1 and M2 of power steering motor connector.

Standard:

Resistance: 0.07 to 1 Ω

NG → **REPLACE STEERING COLUMN ASSY (See page 50–9)**

OK

REPLACE POWER STEERING ECU ASSY(See page 50–20)

DTC	C1531/31	EMPS ECU Circuit Malfunction

DTC	C1532/32	EMPS ECU Circuit Malfunction

DTC	C1533/33	EMPS ECU Circuit Malfunction

DTC	C1534/34	EMPS ECU Circuit Malfunction

DTC	C1581/81	Assist Map Un–written

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1531/31	Power steering ECU assy malfunction	Power steering ECU assy
C1532/32		
C1533/33		
C1534/34		
C1581/81	Assist map un–written	

INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check the DTCs (See page 05–1045).

(b) Is DTC except for C1531/31, C1532/32, C1533/33, C1534/34 and/or C1581/81 output?

YES → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

NO

REPLACE POWER STEERING ECU ASSY (See page 50–20)

DTC	C1541/41	Speed Sensor Malfunction

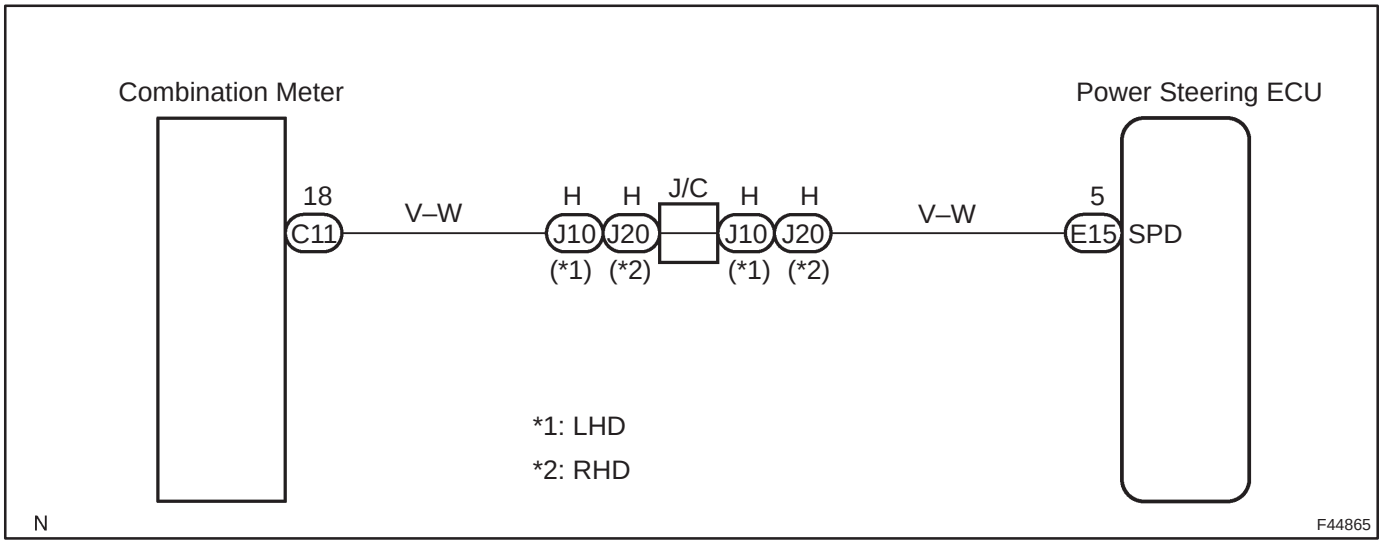
DTC	C1542/42	Speed Sensor Malfunction

DTC	C1571/71	Speed Sensor Malfunction (Test mode)

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1541/41	Speed sensor malfunction	• Speed sensor • Speed sensor circuit • Skid control ECU assy • Combination meter assy • Power steering ECU assy
C1542/42		
C1571/71	Speed sensor malfunction (Test mode)	

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

HINT:

Start the inspection from the step 1 with using hand–held tester. Start from step 2 without using hand–held tester.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON, and turn the hand–held tester main switch to ON.
(c) Select the item ”SPD” in the DATA LIST and read its value displayed on the hand–held tester.
(d) Check that there is no difference between the speed value output from the speedometer displayed by the hand–held tester and the speed value displayed by the speedometer when driving the vehicle.
OK:
There is almost no difference in the displayed speed values.

HINT:

There is tolerance of ±10 % in the speedometer indication.

OK → **REPLACE POWER STEERING ECU ASSY(See page 50–20)**

NG

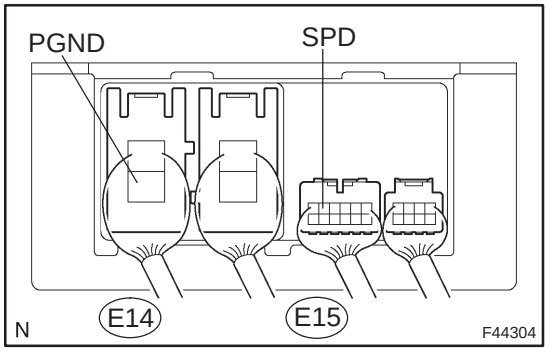
2	CHECK DIAGNOSTIC CODE OUTPUT

(a) Check that DTC for brake system output the normal code.

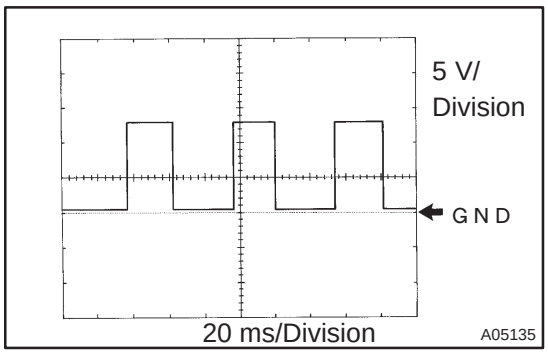
NG → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

OK

3	INSPECT POWER STEERING ECU ASSY(METER SPEED SIGNAL)



(a) Turn the ignition switch ON.
(b) Connect an oscilloscope to terminals SPD and PGND of the power steering ECU assy connector.



(c) Driving at about 20 km/h (12 mph), check the signal waveform.
Standard:
Signal waveform as shown in the illustration.

HINT:
As the vehicle speed becomes high, the waveform cycle narrows.

OK	REPLACE POWER STEERING ECU ASSY(See page 50–20)

NG

4	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – COMBINATION METER ASSY)

(a) Check for an open or short circuit in harness and connector between power steering ECU assy and combination meter assy (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

GO TO COMBINATION METER SYSTEM(See page 05–1510)

DTC	C1544/44	Engine Revolution Signal Malfunction

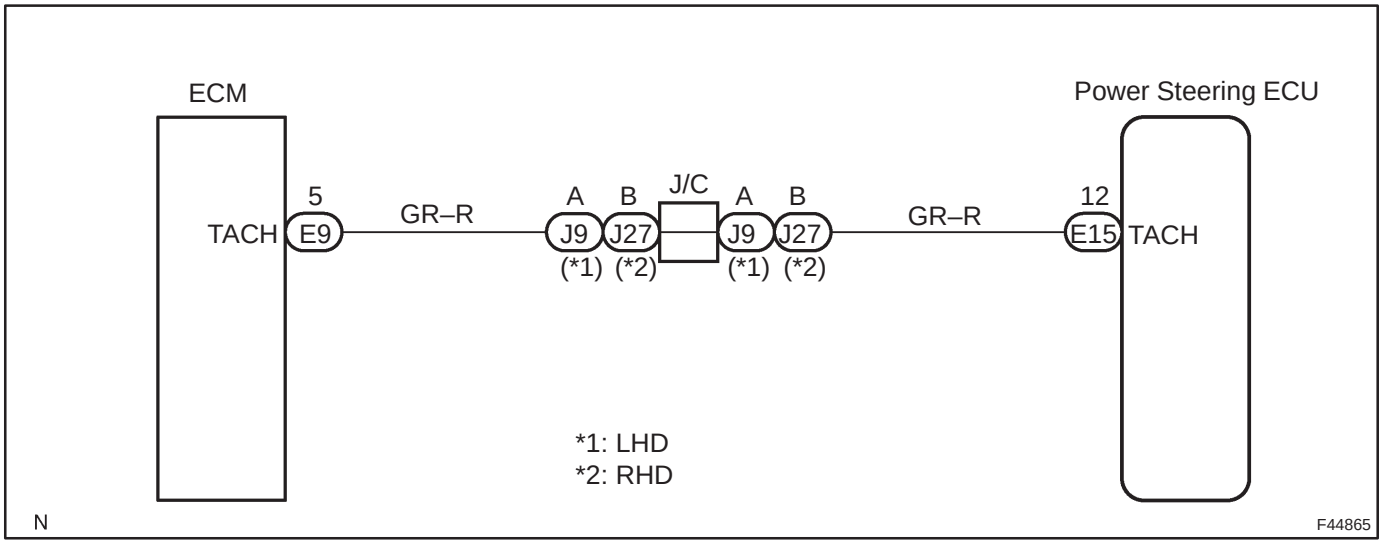
DTC	C1545/45	Engine Revolution Signal Malfunction

DTC	C1573/73	Engine Revolution Signal Malfunction (Test Mode)

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1544/44	Engine revolution signal malfunction	• Engine revolution signal circuit • ECM • Power steering ECU assy
C1545/45		
C1573/73	Engine revolution signal malfunction (Test mode)	

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

HINT:

Start the inspection from the step 1 with using hand–held tester. Start from step 2 without using hand–held tester.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON, and turn the hand–held tester main switch to ON.
(c) Select the item ”ENGINE REV” in the DATA LIST and read its value displayed on the hand–held tester.
(d) Check that there is no difference between the engine revolution value output from the tachometer displayed by the hand–held tester and the engine revolution value displayed by the tachometer when engine is idle.

OK:

There is almost no difference in the displayed engine revolution values.

HINT:

There is tolerance of ±10 % in the tachometer indication.

OK	REPLACE POWER STEERING ECU ASSY(See page 50–20)

NG

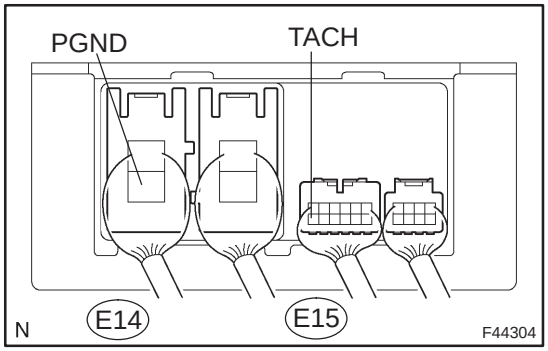
2	CHECK DIAGNOSTIC CODE OUTPUT

(a) Check that the DTC for engine output the normal code.

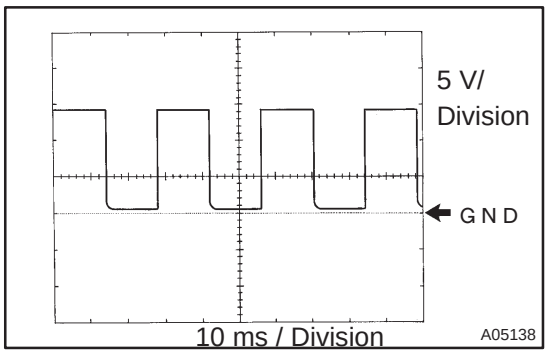
NG	REPAIR CIRCUIT INDICATED BY OUTPUT CODE

OK

3	INSPECT POWER STEERING ECU ASSY(ENGINE REVOLUTION SIGNAL)



(a) Turn the ignition switch ON.
(b) Connect an oscilloscope to terminals TACH and PGND of the power steering ECU assy connector.



(c) With the engine idling, check the signal waveform.
Standard:
Signal waveform as shown in the illustration.

HINT:
As the engine revolution becomes high, the waveform cycle narrows.

OK → **REPLACE POWER STEERING ECU ASSY(See page 50–20)**

NG

4	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – ECM)

(a) Check for an open or short circuit in harness and connector between power steering ECU assy and ECM (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

GO TO ENGINE CONTROL SYSTEM

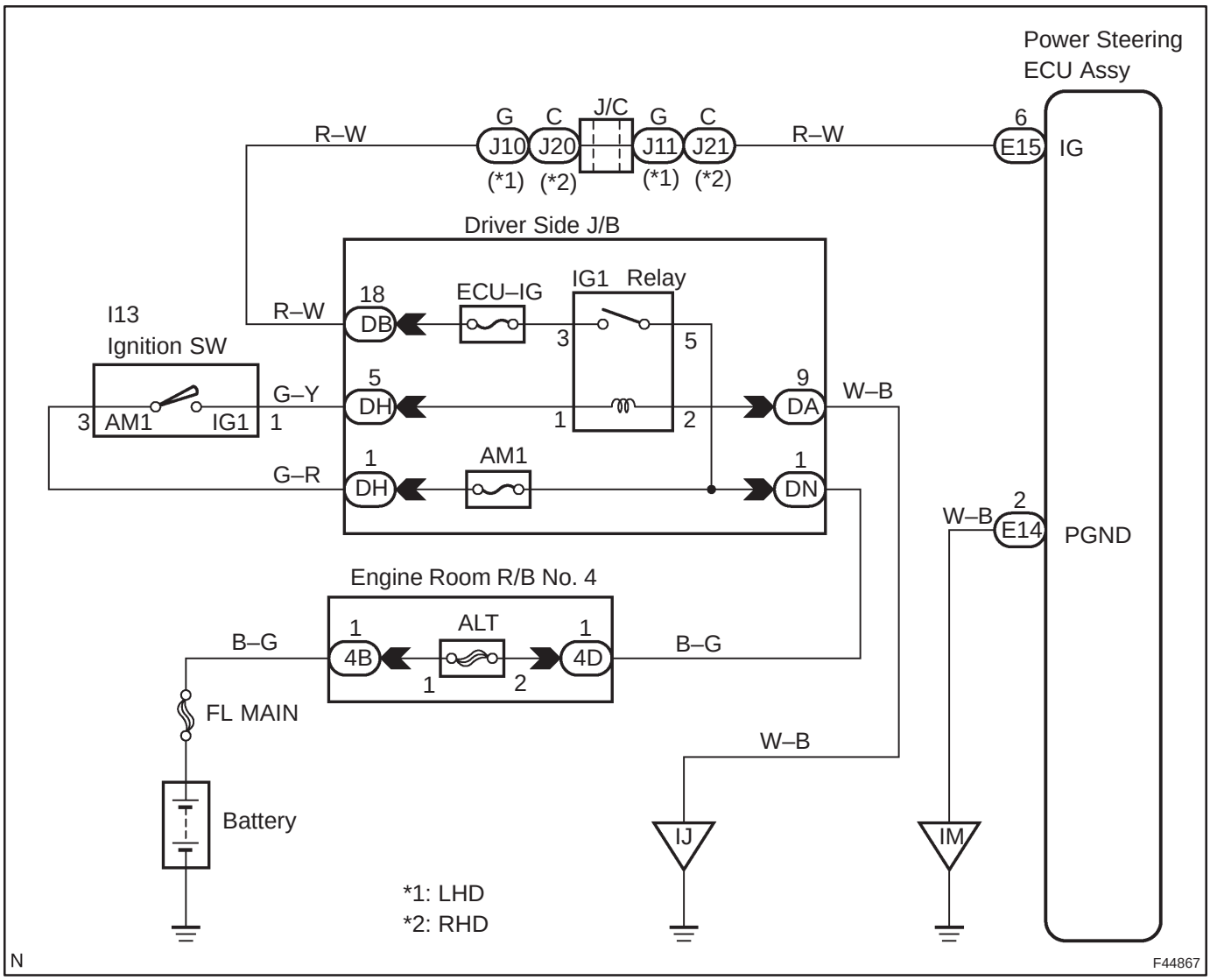
DTC C1551/51 IG Power Source Circuit Malfunction

CIRCUIT DESCRIPTION

The power steering ECU assy identifies ON or OFF status of the ignition switch by this circuit.

DTC No.	DTC Detecting Condition	Trouble Area
C1551/51	Unusual IG voltage value which exceeds the specification is inputed to power steering ECU assy.	• ECU–IG fuse • IG power source circuit • Charging system • Power steering ECU assy

WIRING DIAGRAM

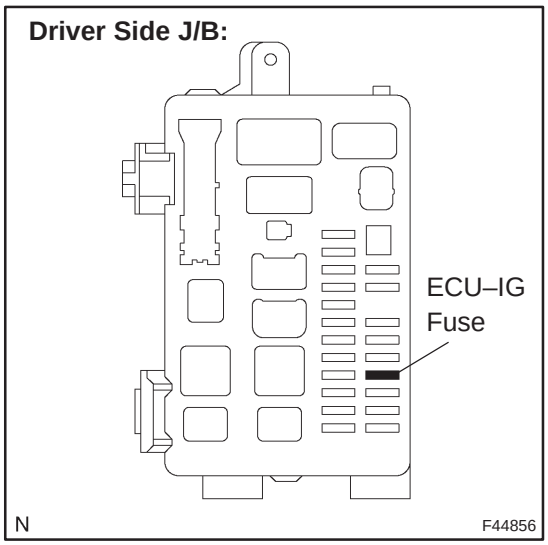


INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

1	INSPECT FUSE(ECU–IG)



(a) Remove the ECU–IG fuse from the driver side J/B.

(b) Check the continuity of the ECU–IG fuse.

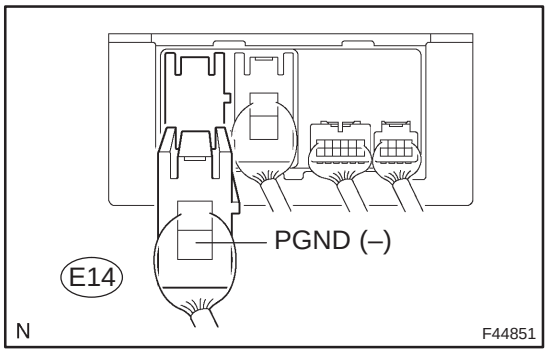
Standard:

Continuity

NG → **INSPECT FOR SHORT CIRCUIT IN ALL HARNESS AND COMPONENTS CONNECTED TO ECU–IG FUSE**

OK

2	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – BODY GROUND)



(a) Disconnect the E14 connector from the power steering ECU assy.

(b) Measure the resistance between terminal PGND of E14 connector and body ground.

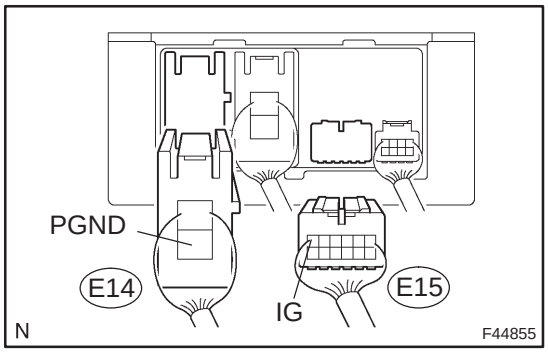
Standard:

Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – DRIVER SIDE J/B)



(a) Disconnect the E14 and E15 connectors from the power steering ECU assy.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG and PGND of the E14 and E15 connectors.
Standard:
Voltage: 10 to 16 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE POWER STEERING ECU ASSY (See page 50–20)

DTC	C1552/52	PIG Power Source Circuit

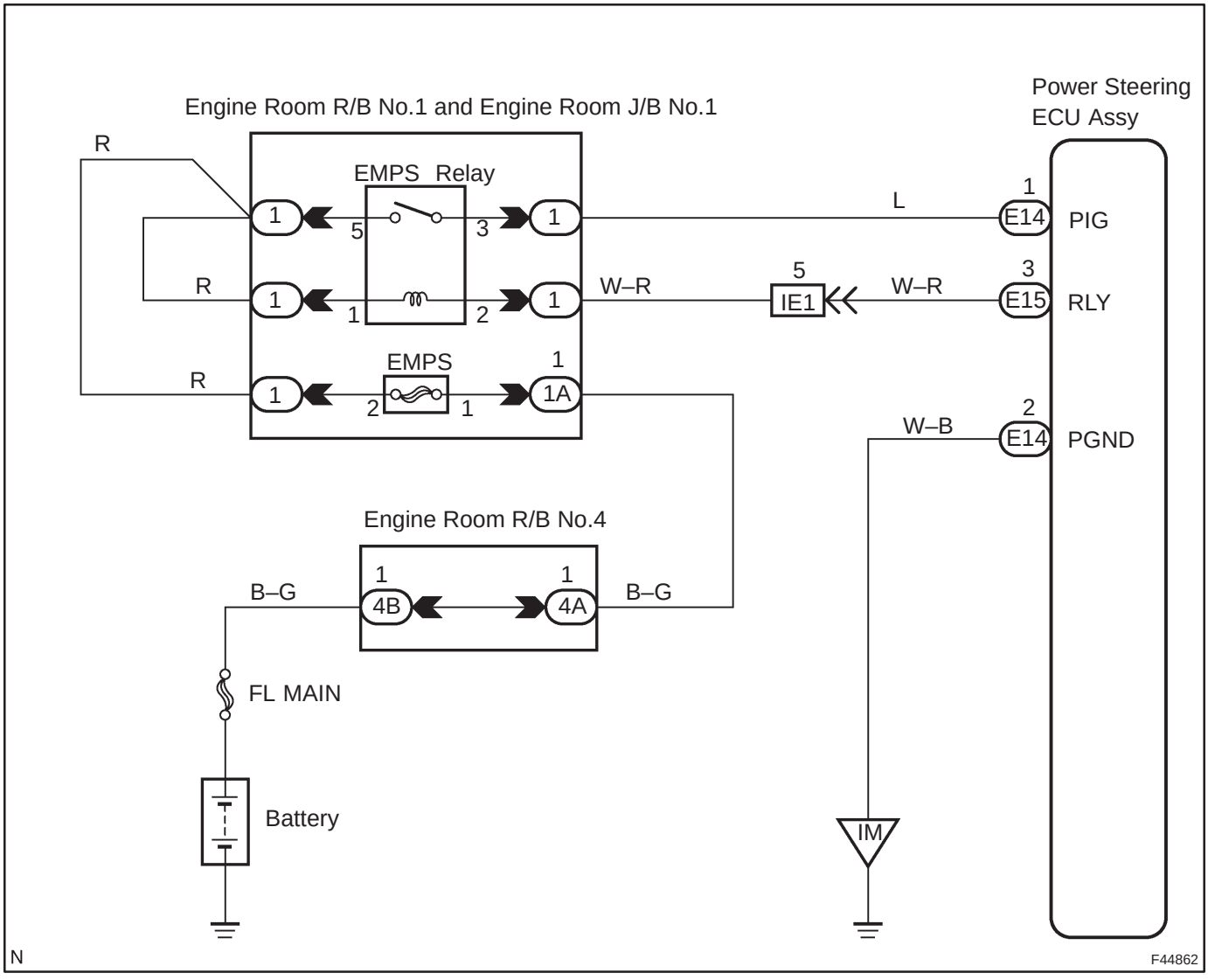
DTC	C1554/54	EMPS Relay Circuit

CIRCUIT DESCRIPTION

When turning the ignition switch to ON, battery voltage is supplied to terminal PIG of the power steering ECU assy by EMPS relay operations. If a malfunction occurs in the system, the system prohibits the steering assist by interrupting the circuits of the EMPS relay and the motor relay (built in the power steering ECU assy).

DTC No.	DTC Detecting Condition	Trouble Area
C1552/52	Unusual motor power source voltage value which is not within the specification is input to power steering ECU assy.	• EMPS fuse • EMPS relay • PIG power source circuit • Power steering ECU assy
C1554/54	Open or short circuit of EMPS relay circuit is detected.	

WIRING DIAGRAM



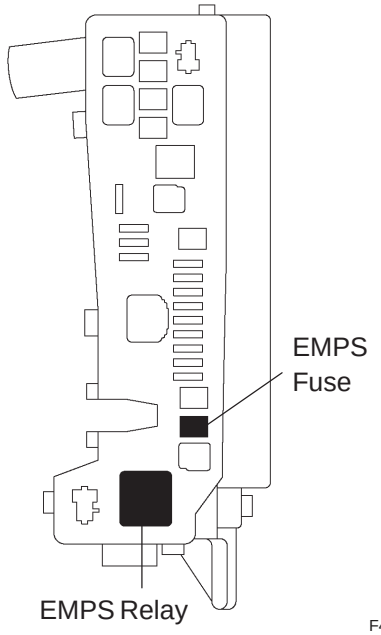
INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

1	INSPECT FUSE(EMPS)

Engine Room R/B No.1 and Engine Room J/B No.1:



(a) Remove the EMPS fuse from the engine room R/B No.1 and J/B No.1.

(b) Check the continuity of the EMPS fuse.

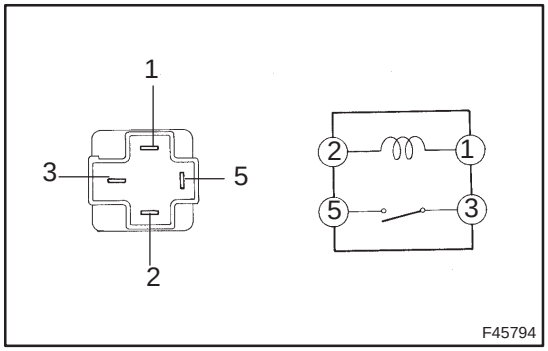
Standard:

Continuity

NG → **INSPECT FOR SHORT CIRCUIT IN HARNESS AND ALL COMPONENTS CONNECTED TO EMPS FUSE**

OK

2	INSPECT EMPS RELAY



(a) Remove the EMPS relay from the engine room R/B No. 1 and J/B No. 1.

(b) Check operation of the EMPS relay.

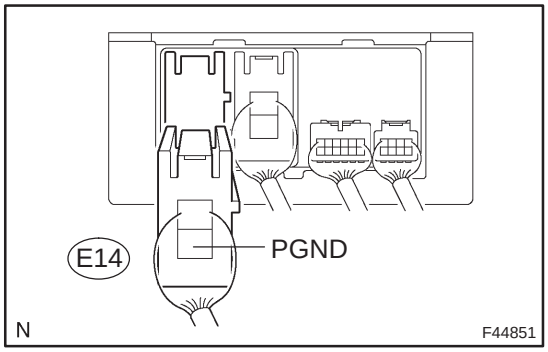
Standard:

Terminal No.	Specified condition
3 – 5	10 kΩ or higher
3 – 5	Below 1 Ω (When battery voltage is applied to terminals 1 and 2)

NG → **REPLACE EMPS RELAY**

OK

3	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – BODY GROUND)



(a) Disconnect the E14 connector from the power steering ECU assy.

(b) Measure the resistance between the terminal PGND of the E14 connector and body ground.

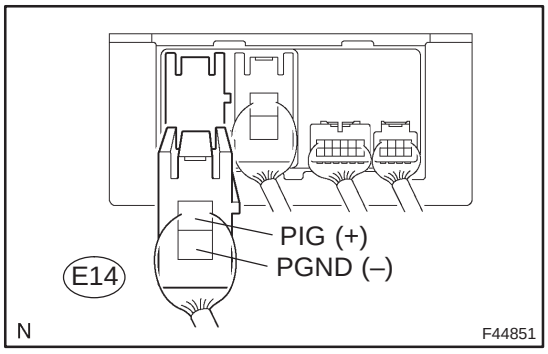
Standard:

Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – ENGINE ROOM R/B AND J/B)



(a) Disconnect the E14 connector from the power steering ECU assy.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals PIG and PGND of the E14 connector.
Standard:
Voltage: 10 to 16 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE POWER STEERING ECU ASSY(See page 50–20)

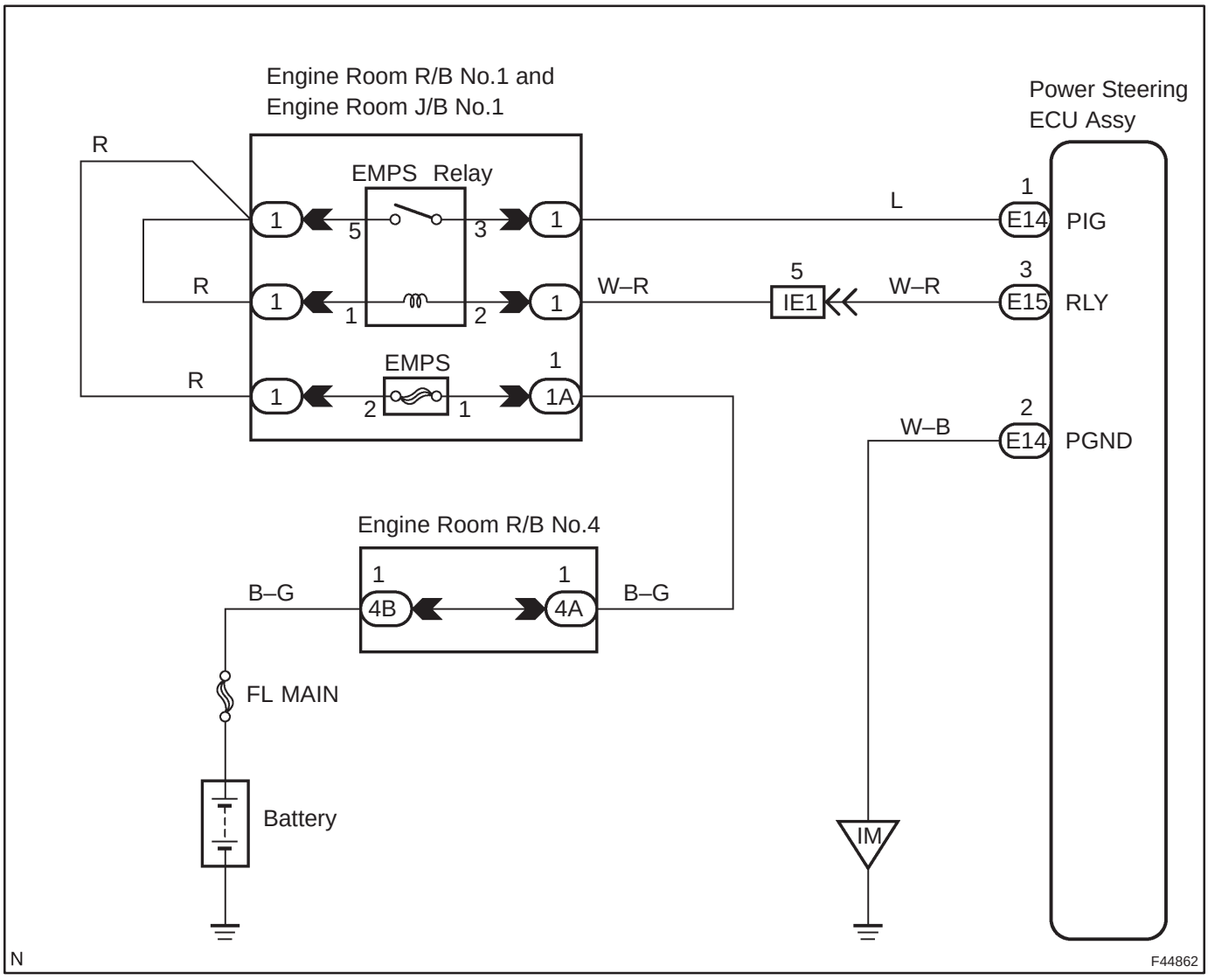
DTC C1555/55 EMPS Motor Relay Circuit

CIRCUIT DESCRIPTION

If a malfunction occurs in the system, the system prohibits the steering assist by interrupting the circuits of the EMPS relay and the motor relay (built in the power steering ECU assy).

DTC No.	DTC Detecting Condition	Trouble Area
C1555/55	Open or short circuit of EMPS motor relay in the ECU circuit is detected.	Power steering ECU assy

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

HINT:

Start the inspection from the step 1 with using hand–held tester. Start from step 2 without using hand–held tester.

1 READ VALUE OF HAND–HELD TESTER

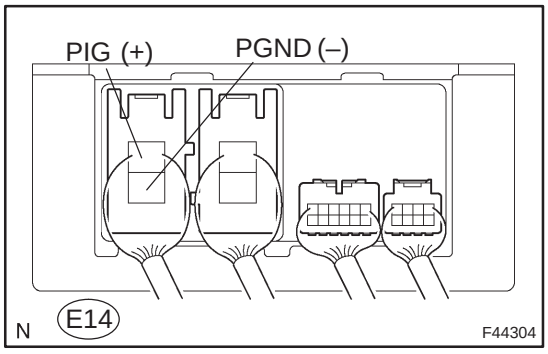
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester main switch to ON.
(c) Select the item ”PIG SUPPLY” in the FREEZE FRAME DATA and read its value displayed on the hand–held tester.
(d) Check that the power supply voltage value of the drive motor displayed by the hand–held tester.
Standard:
Voltage: 10 to 16 V

OK → **Go to step 3**

NG

GO TO RELEVANT DTC CHART

2 INSPECT POWER STEERING ECU ASSY(PIG TERMINAL VOLTGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals PIG and PGND of power steering ECU assy connector.
Standard:
Voltage: 10 to 16 V

NG → **GO TO RELEVANT DTC CHART (See page 05–1076)**

OK

3 RECONFIRM DTC

(a) Check the DTCs (See page 05–1045).
(b) Is DTC except for C1552/52 output?

YES → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

NO

REPLACE POWER STEERING ECU ASSY(See page 50–20)

050Y7–04

CUSTOMER PROBLEM ANALYSIS CHECK

EMPS Check Sheet

Inspector's :
Name

Customer's Name		**VIN**	
		Production Date	/ /
Vehicle Model		**Licence No.**	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ / (Engine ☐ Cooled ☐ Warmed up)
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Steering operation is heavy.	
	☐ Steering force to the right and left differs, or steering force is uneven.	
	☐ While running, the steering force does not alter corresponding the vehicle speed.	
	☐ The steering returns unwell.	
	☐ Vibration or strange sound comes from the steering column assy.	
	☐ When a trouble happens (☐ During turning ☐ During vehicle stop ☐ Always)	
	☐ Others	
	PS Warning Light Abnormal	☐ Remains ON ☐ Does not come on

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data
A malfunction code is outputed at the first time, record the freeze frame data as well (as the DTCs).

050WM–04

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- Using SST 09843–18040, connect terminals Tc and CG of the DLC3.
- If a malfunction code is displayed during the DTC check, check the circuit listed for the code. For details of each code, proceed the page referred to under the ”See page” for respective ”DTC No.” in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area
C1511/11 (05–1059)	Torque sensor circuit malfunction	• Steering column assy • Power steering ECU assy
C1512/12 (05–1059)		
C1513/13 (05–1059)		
C1514/14 (05–1059)	Torque sensor power source circuit malfunction	
C1515/15 (05–1062)	Calibration of torque sensor zero point is not performed	Sensor zero point calibration is not preformed.
C1516/16 (05–1063)	Calibration of torque sensor zero point is not completed	Sensor zero point calibration failure.
C1517/17 (05–1059)	Torque sensor hold malfunction	• Steering column assy • Power steering ECU assy
C1523/23 (05–1064)	Motor circuit malfunction	• Steering column assy • Power steering ECU assy
C1524/24 (05–1064)		
C1531/31 (05–1066)	Power steering ECU assy malfunction	Power steering ECU assy
C1532/32 (05–1066)		
C1533/33 (05–1066)		
C1534/34 (05–1066)		
C1541/41 (05–1067)	Speed sensor malfunction	• Speed sensor • Speed sensor circuit • Skid control ECU • Combination meter assy • Power steering ECU assy
C1542/42 (05–1067)		
C1544/44 (05–1070)	Engine revolution signal malfunction	• Engine revolution signal circuit • ECM • Power steering ECU assy
C1545/45 (05–1070)		
C1551/51 (05–1073)	IG power source circuit malfunction	• ECU–IG fuse • Power steering relay • IG power source circuit • Charging system • Power steering ECU assy
C1552/52 (05–1076)	PIG power source circuit malfunction	• EMPS fuse • EMPS relay • PIG power source circuit • Power steering ECU assy
C1554/54 (05–1076)	EMPS relay circuit malfunction	

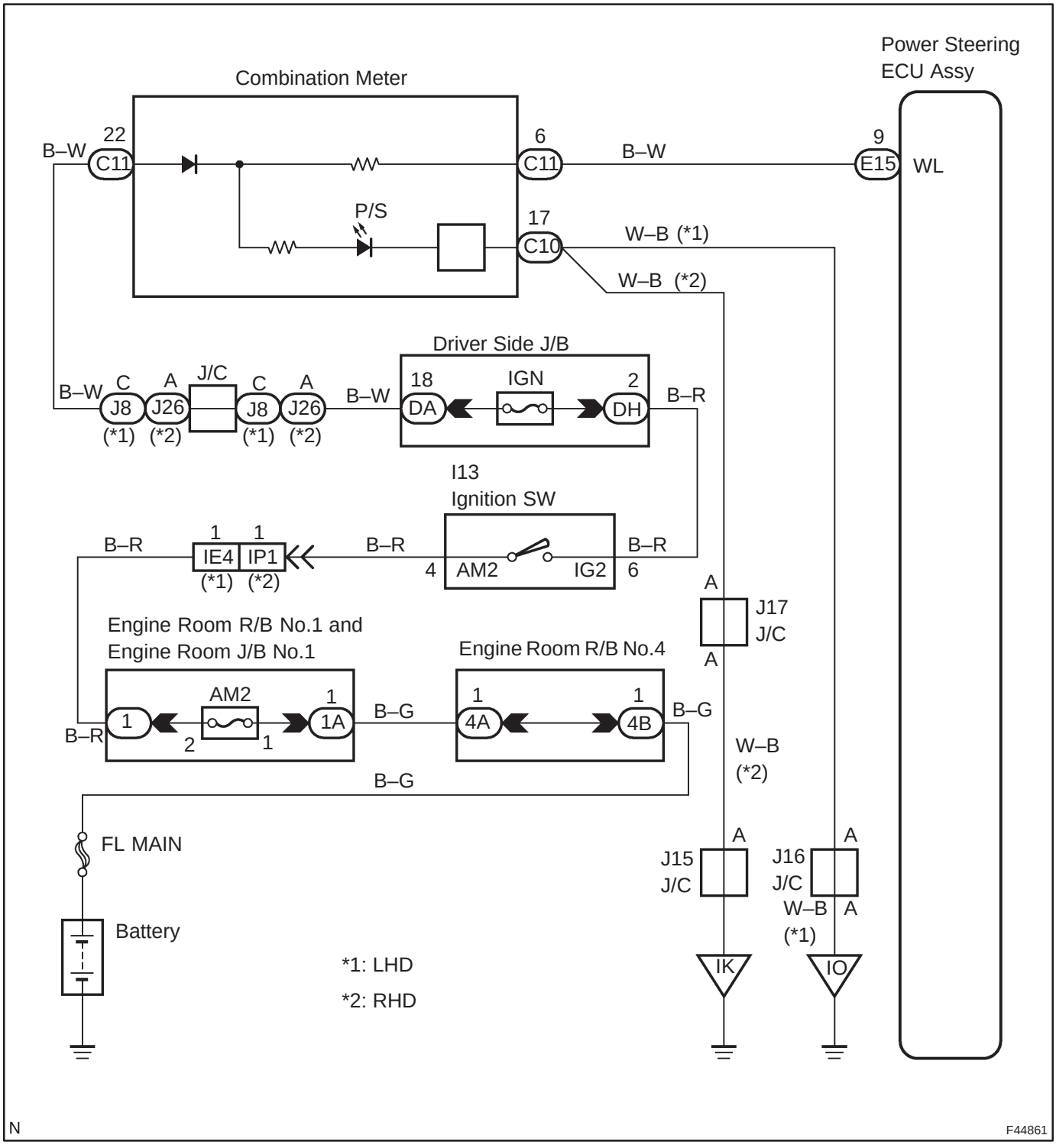
C1555/55 (05–1080)	EMPS motor relay circuit malfunction	Power steering ECU assy
C1581/81 (05–1066)	Assist map un–written	Power steering ECU assy

EMPS Warning Light Circuit

CIRCUIT DESCRIPTION

If the power steering ECU assy detects a trouble, the PS warning lights up. At this time, the power steering ECU assy records a DTC in memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

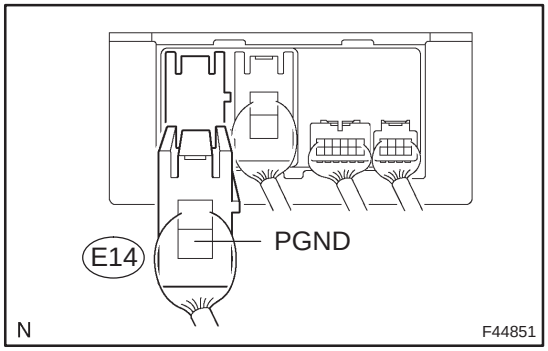
1	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – COMBINATION METER ASSY)

(a) Check for an open or short circuit in harness and connector between power steering ECU assy and combination meter assy (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – BODY GROUND)



(a) Disconnect the E14 connector from the power steering ECU assy.

(b) Check the continuity between the terminal PGND of the E14 connector and body ground.

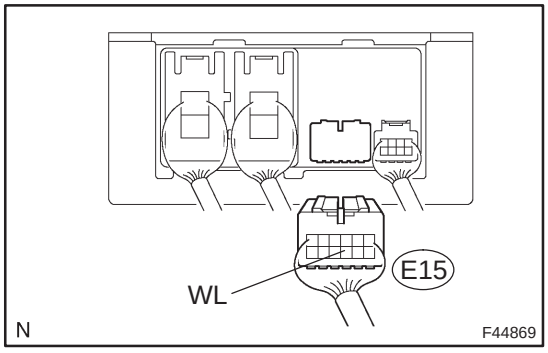
Standard:

Continuity

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	INSPECT POWER STEERING ECU ASSY



(a) Turn the ignition switch ON.

(b) Disconnect the E15 connector from the power steering ECU assy, and check the P/S warning light comes on.

(c) Using a service wire, ground the terminal WL of the E15 connector, and check the P/S warning light goes off.

Standard:

P/S warning light comes on and then goes off

NG	REPLACE POWER STEERING ECU ASSY (See page 50–20)

OK

CHECK GO TO COMBINATION METER SYSTEM

ELECTRONIC MOTOR POWER STEERING SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

050Y2–04

Perform troubleshooting in accordance with the procedure on the following pages.

HINT:

- See the indicated pages for detailed explanation.
- The hand–held tester can be used at step 3, 6, 9, 12.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS(See page 05–1044)

3	CHECK AND CLEAR DTCS AND FREEZE FRAME DATA

(a) After the completion of the DTC and freeze frame data check, clear the DTCs (See page 05–1045).

4	PROBLEM SYMPTOM CONFIRMATION

- SYMPTOM DOES NOT OCCUR(Go to step 5)
- SYMPTOM OCCURS(Go to step 6)

5	SYMPTOM SIMULATION(See page 01–22)

6	DTC CHECK(See page 05–1045)

- NORMAL CODE(Go to step 7)
- MALFUNCTION CODE(Go to step 8)

7	PROBLEM SYMPTOMS TABLE(See page 05–1058)

8	DTC CHART(See page 05–1054)

9	CIRCUIT INSPECTION(See page 05–1059 to 05–1086)

10	IDENTIFYING PROBLEMS

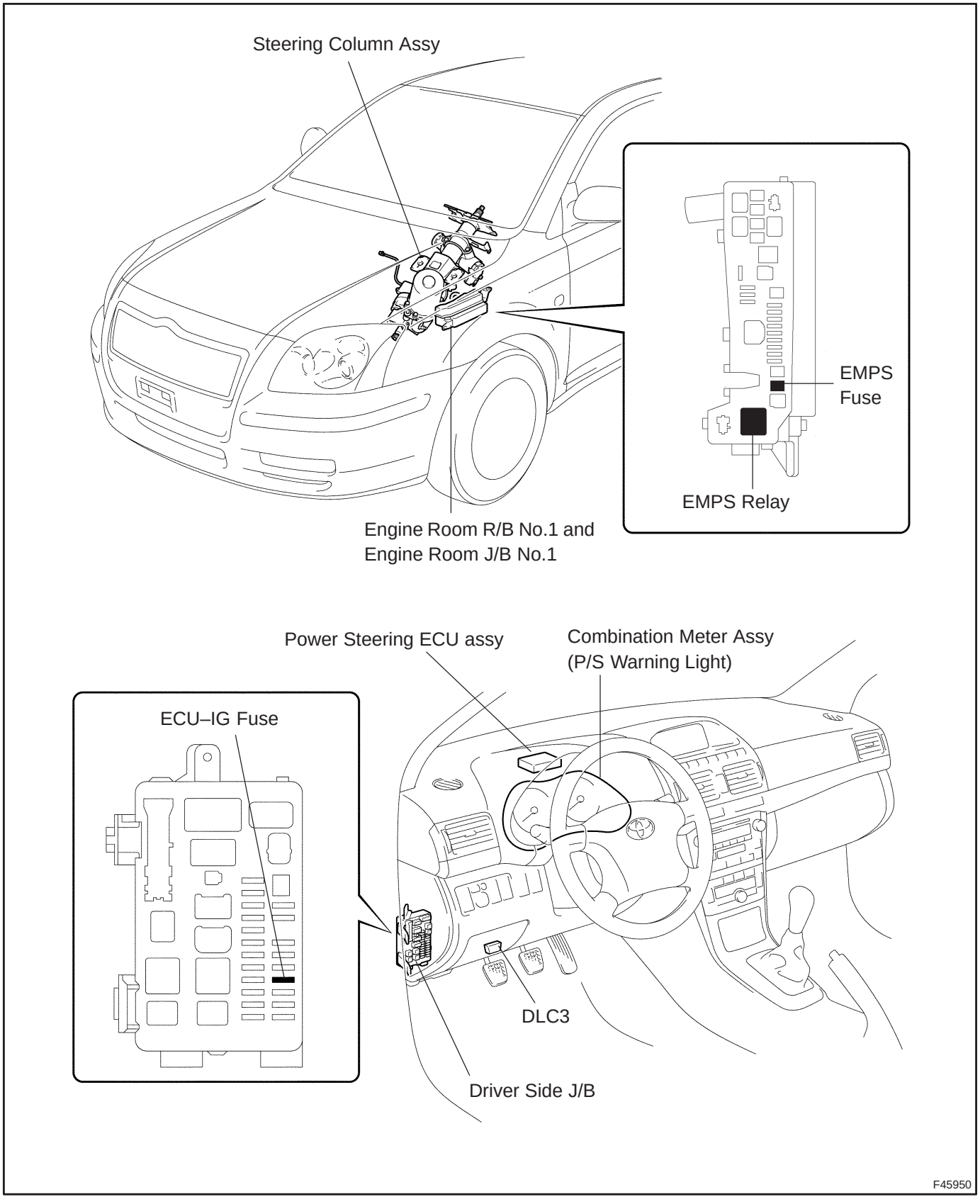
11	REPAIR

12	CONFIRMATION TEST

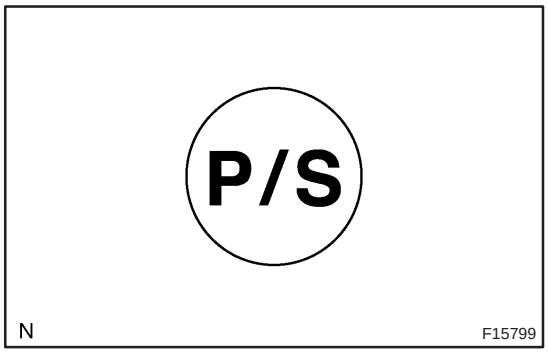
END

050WN–04

LOCATION



PRE–CHECK



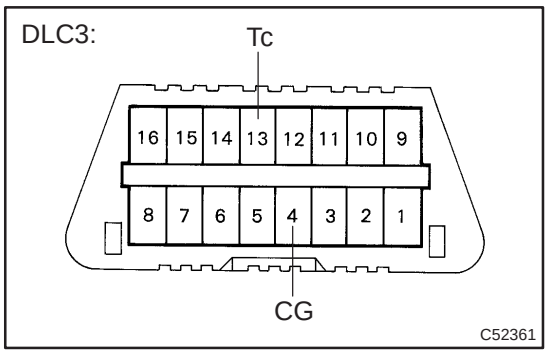
1. DIAGNOSIS SYSTEM

(a) Check the PS warning light.

(1) When the ignition switch is turned ON, check that the PS warning light goes on for 2 seconds.

HINT:

If the indicator check result is not normal, proceed to trouble-shooting for the PS warning light circuit (See page 05–1082).



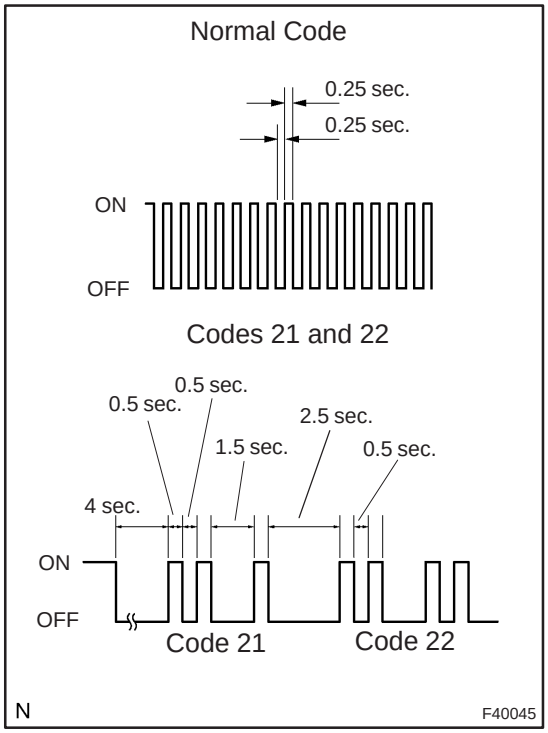
2. DTC CHECK (USING SST CHECK WIRE)

(a) Checking DTCs using a SST check wire.

SST 09843–18040

(1) Using SST, connect terminals Tc and CG of the DLC3.

(2) Turn the ignition switch to ON.



(3) Read and record any DTCs from the P/S warning light on the combination meter. Refer to the chart on the left for examples of a normal code and codes 21 and 22.

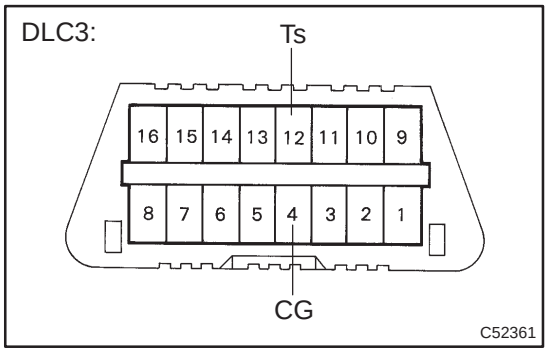
HINT:

- If the P/S warning light does not blink any DTC codes or the normal code, inspect the circuit shown in the charts below.

Trouble Area	
Tc Terminal Circuit	05–1084
P/S Warning Light Circuit	05–1082

- If 2 or more malfunctions are detected at the same time, DTC will be displayed in the ascending order.

(4) Refer to the Diagnostic Trouble Code Chart (See page 05–1054) for DTC information.



(b) Clearing the DTCs using the SST check wire.
SST 09843–18040
(1) Using SST, connect terminals Ts and CG of the DLC3.
(2) Turn the ignition switch to ON.
(3) Disconnect and connect the SST check wire from the CG terminal 4 times or more in 8 seconds ending with it connected.
(4) Check that the P/S warning light blinks a normal code.
(5) Turn the ignition switch to OFF.
(6) Remove the SST from the DLC3.
SST 09843–18040

3. DTC CHECK (USING HAND–HELD TESTER)

(a) Checking DTCs using the hand–held tester.
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch to ON.
(3) Read the DTCs by following the prompts on the tester screen.

HINT:
Refer to the hand–held tester operator's manual for further details.

(b) Clearing the DTCs using the hand–held tester.
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch to ON.
(3) Clear the DTCs by following the prompts on the tester screen.

HINT:
Refer to the hand–held tester operator's manual for further details.

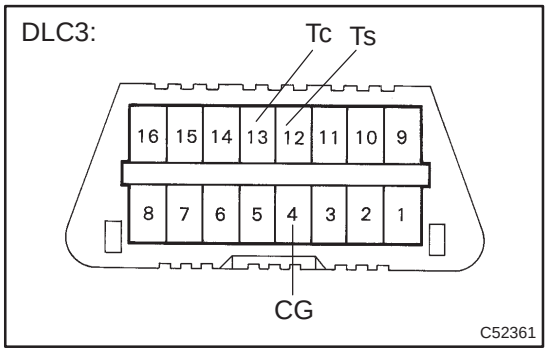
4. DATA LIST AND FREEZE FRAME DATA

HINT:
Ignition switch must be turned ON, and the vehicle should be placed on a leveled ground to observe data by using a hand–held tester.

Data List (*: with freeze frame data):

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
TRQ1 (*)	Show the output states in the torque sensor / Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V Steering wheel right turned: 2.5 to 4.7 V Steering wheel left turned: 0.3 to 2.5 V	–
TRQ2 (*)	Show the output states in the torque sensor / Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V Steering wheel right turned: 2.5 to 4.7 V Steering wheel left turned: 0.3 to 2.5 V	–

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
TRQ3 (*)	Show the output states in the torque sensor / Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V Steering wheel right turned: 2.5 to 4.7 V Steering wheel left turned: 0.3 to 2.5 V	–
SPD (*)	Show the vehicle speed on the speedometer / Min.: 0 km/h (0 mph), Max.: 255 km/h (158 mph)	Actual vehicle speed	Vehicle speed indicated on speedometer
ENGINE REV (*)	Show the engine revolution / Min.: 0 rpm Max.: 8,192 rpm	Actual engine speed	–
MOTOR ACTUAL (*)	Show the current flowing motor / Min.: –128 A, Max.: 128 A	0 to 65 A	–
COMMAND VALUE (*)	Show the specified current value / Min.: –128 A, Max.: 128 A	0 to 65 A	–
THERMISTOR TEMP (*)	Show the temperature of the thermistor / Min.: –50 °C, Max.: 205 °C	–	–
PIG SUPPLY (*)	Show the power supply voltage for driving motor / Min.: 0 V, Max.: 25 V	10 to 16 V	While power steering operated
IG SUPPLY (*)	Show the power supply condition / Min.: 0 V, Max.: 25 V	10 to 16 V	–
TRQ1 ZERO VAL (*)	Show the torque sensor/ Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V	–
TRQ2 ZERO VAL (*)	Show the torque sensor/ Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V	–
TRQ3 ZERO VAL (*)	Show the torque sensor/ Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V	–
MTR OVERHEAT	Record of continuous overheat preventive control / record or un–record	Un–record	–
MTR LOW POWER	Record of low motor power supply voltage / record or un–record	Un–record	–
MTR HIGH POWER	Record of high motor power supply voltage / record or un–record	Un–record	
#CODES	Number of DTC recorded / Min.: 0, Max.: 255	Min.: 0, Max.: XX	–
ASSIST MAP	Show the selected condition of the assist map / 01, 02, 03, 11 or 12	–	–
ECU ID	Show the identified information of ECU / 01, 02, 03, 04 or 05	–	–
TEST MODE STAT	Test mode status / NORMAL or TEST	NORMAL: Normal mode TEST: During test mode	–



5. INPUT SIGNAL CHECK (TEST MODE) (USING SST CHECK WIRE)

(a) Check the input signal using a SST check wire.

(1) Using SST, connect terminals Ts and CG of DLC3.
SST 09843–18040

(2) Turn the ignition switch to ON.

(3) Check that the PS warning light shows the normal code.

(4) Check that the PS warning light goes off while driving the vehicle more than 10 km/h (6 mph) and the engine speed more than 300 rpm.

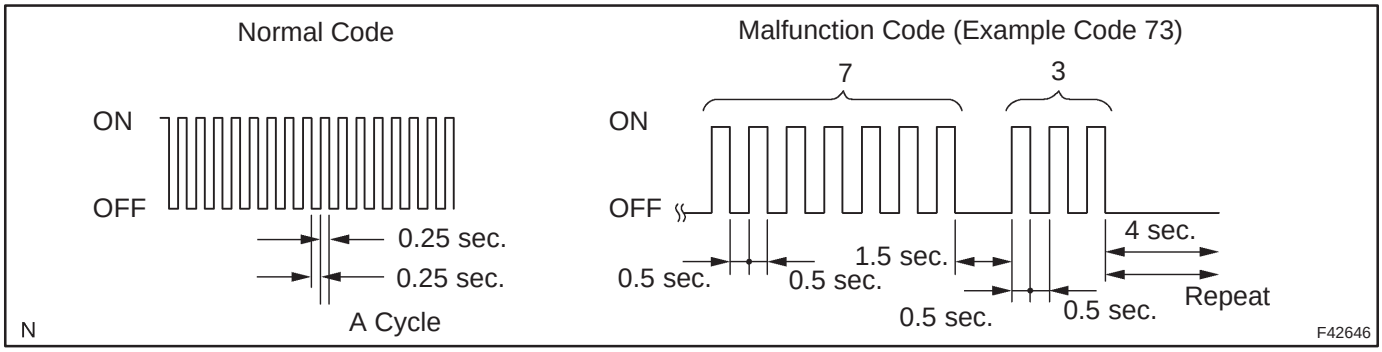
HINT:
If the PS warning light goes off during driving, the sensor is judged to be normal.

(5) Stop the vehicle.

(6) Using SST, connect terminals Tc and CG of DLC3.
SST 09843–18040

(7) Read the number of blinks of the PS warning light.

HINT:
- See the list of DTC shown in the table below.
- Even if a sensor is normal, it output codes 71 and 73 during test mode.



DTC of input signal check function:

Code No. (See page)	Diagnosis	Trouble Area
C1571/71 (05–1067)	Speed sensor signal check 1 (Test mode)	• Speed sensor • Speed sensor circuit • Skid control ECU assy • Combination meter assy • Power steering ECU assy
C1573/73 (05–1070)	Engine revolution signal check (Test mode)	• Engine revolution signal circuit • ECM • Power steering ECU assy

(8) After checking, disconnect the SST from the terminal Ts and CG, Tc and CG of DLC3, and turn the ignition switch to OFF.
SST 09843–18040

6. INPUT SIGNAL CHECK (TEST MODE) (USING HAND–HELD TESTER)

(a) Check the input signal using the hand–held tester.
  (1) Connect the hand–held tester to the DLC3.
  (2) Check that the warning light goes off with driving the vehicle more than 10 km/h (6 mph) and engine speed more than 300 rpm.
  (3) Read the DTC by following the prompts on the tester screen.

HINT:
- Refer to the hand–held tester operator's manual for further details.
- See the list of DTC shown in the table below.
- Even if a sensor is normal, it outputs codes C1571/71 and C1573/73 during test mode.

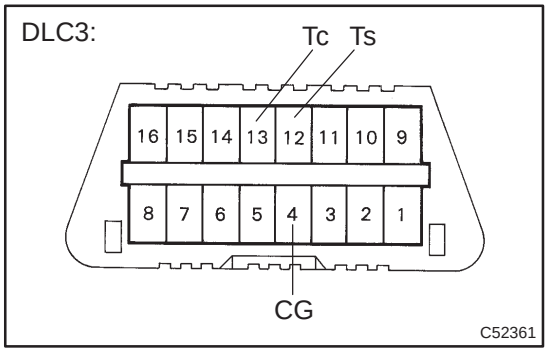
DTC of input signal check function:

Code No. (See page)	Diagnosis	Trouble Area
C1571/71 (05–1067)	Speed sensor signal check 1 (Test mode)	• Speed sensor • Speed sensor circuit • Skid control ECU assy • Combination meter assy • Power steering ECU assy
C1573/73 (05–1070)	Engine revolution signal check (Test mode)	• Engine revolution signal circuit • ECM • Power steering ECU assy

7. CALIBRATION OF TORQUE SENSOR ZERO POINT (USING SST CHECK WIRE)

HINT:
Perform this operation in the following cases.
- When removing and installing "steering wheel assembly", "tilt steering column assembly" and "steering gear assembly".
- When replacing power steering ECU assy.

(a) Place front wheels and steering wheel facing straight ahead.



(b) Perform the torque sensor zero point initialization.

HINT:
If the power steering ECU assy is replaced, initialization is not necessary.
  (1) Stop the vehicle and turn the ignition switch OFF.
  (2) Using SST, connect terminals Ts and CG of DLC3.
  SST 09843–18040
  (3) Using SST, connect terminals Tc and CG of DLC3.
  SST 09843–18040
  (4) Turn the ignition switch ON.

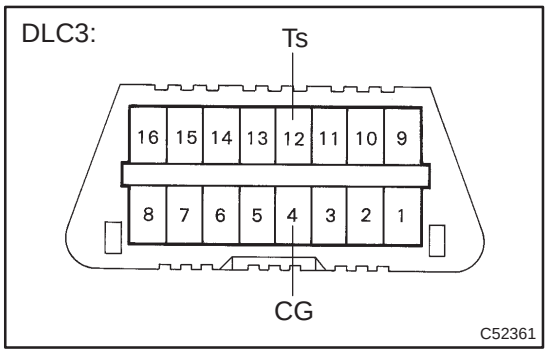
(5) Disconnect and connect the terminal Tc of DLC3 20 times within 20 seconds.
(6) Check the DTC C1515/15 output.

(c) Perform the torque sensor zero point calibration.

HINT:

- Do not touch the steering wheel.
- Check that the DTC for except C1515/15 is not output.

(1) Stop the vehicle and turn the ignition switch to OFF.



(2) Using SST, connect terminals Ts and CG of DLC3 and turn the ignition switch to ON.

SST 09843–18040

(3) Disconnect the SST.

SST 09843–18040

(4) Check the DTC is not output.

8. CALIBRATION OF TORQUE SENSOR ZERO POINT (USING HAND–HELD TESTER)

HINT:

Perform this operation in the following cases.

- When removing and installing ”steering wheel assembly”, ”tilt steering column assembly” and ”steering gear assembly”.
- When replacing power steering ECU assy.

(a) Place front wheels and steering wheel facing straight ahead.

(b) Perform the torque sensor zero point initialization.

HINT:

If the power steering ECU assy is replaced, initialization is not necessary.

(1) Stop the vehicle.
(2) Connect the hand–held tester to the DLC3.
(3) Select the ”TRQ SENS ADJUST” mode on the hand–held tester.
(4) Select the ”ZERO POINT INITIALIZE”.
(5) Following the screen instructions, perform the torque sensor zero point initialization.

(c) Perform the torque sensor zero point calibration.

HINT:

Do not touch the steering wheel.

(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Select the ”TRQ SENS ADJUST” mode on the hand–held tester.
(4) Select the ”ZERO POINT ADJUST”.
(5) Following the screen instructions, perform the torque sensor zero point calibration.

9. REPLACE POWER STEERING ECU ASSY

NOTICE:

Thoroughly check the procedures for removing and installing the power steering ECU assy when replacing it. Do the same operation or procedure for the removing and installing the steering column assy.

(a) Remove the power steering ECU assy (See page 50–20).

(1) Mark the clamp position on the torque sensor wire harness in order to reinstall the wire harness as shown in the illustration.

(2) Disconnect the torque sensor wire harness from the clamp.

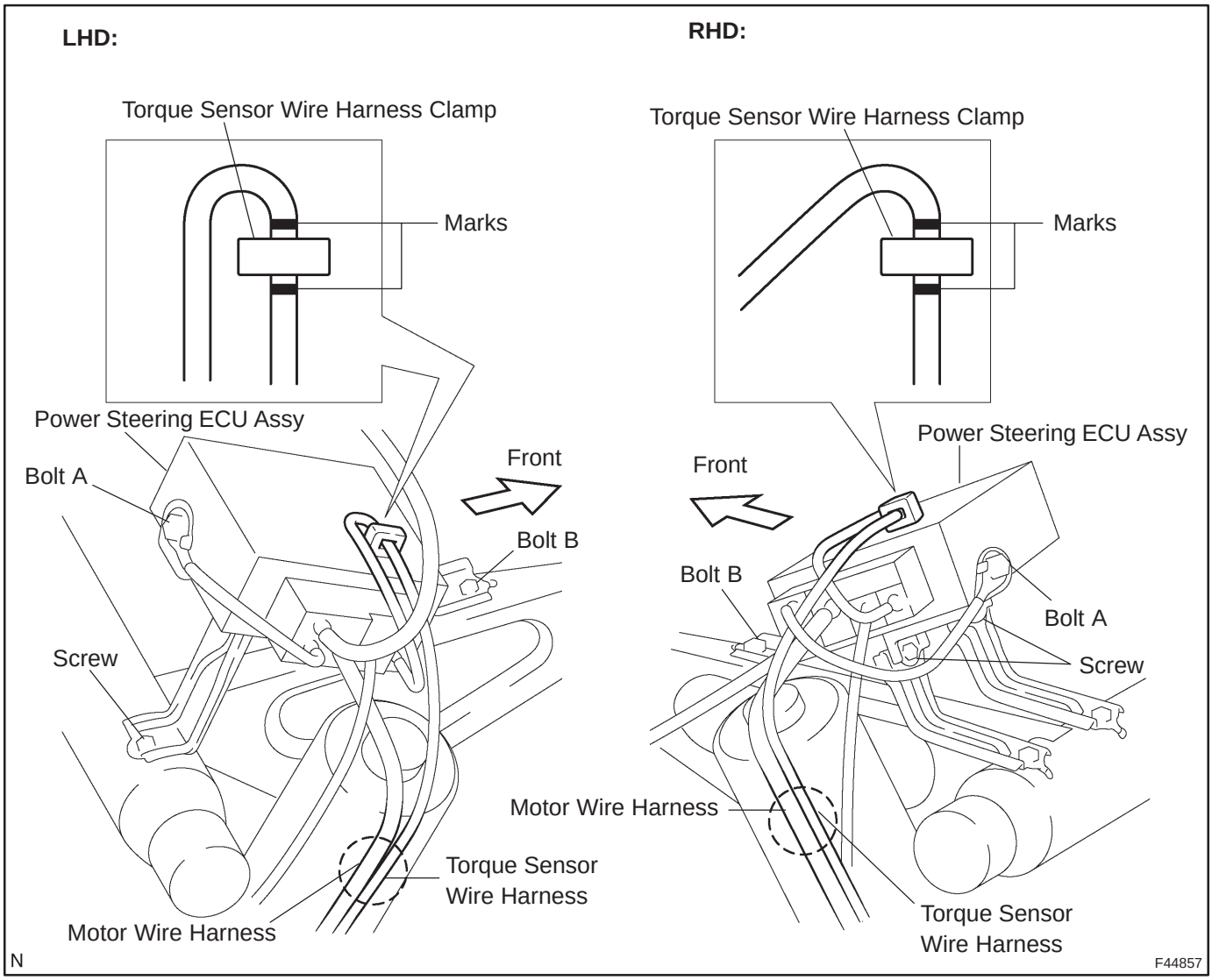
NOTICE:

In case the clamp will be reused, pay attention so as not to damage it.

(3) Disconnect the connectors.

(4) LHD:
Remove the 2 bolts, screw and power steering ECU assy.

(5) RHD:
Remove the 2 bolts, 2 screws and power steering ECU assy.



(b) Install the power steering ECU assy (See page 50–20).

(1) LHD:

Install the power steering ECU assy with the 2 bolts and screw.

Torque:
Bolt A: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
Bolt B: 15.5 N·m (158 kgf·cm, 11 ft·lbf)

(2) RHD:

Install the power steering ECU assy with the 2 bolts and 2 screws.

Torque:
Bolt A: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
Bolt B: 15.5 N·m (158 kgf·cm, 11 ft·lbf)

(3) Connect the connectors.

(4) Align the marks on the torque sensor wire harness with the clamp, as shown in the illustration.

NOTICE:

- **When reusing the clamp, check that there is no damage on it.**
- **When reinstalling the wire harness, make sure there is no twist in the harness or with other wire harness.**

10. FAIL SAFE FUNCTION

(a) If the power steering ECU assy detects a trouble, the ECU assy halt, fix or lower the steering power assist in order to protect the system.

HINT:

Repeating the steering operation when stopping or driving at low speed, or leaving the steering wheel turn fully for long hours will lower the amount of power assist in order to prevent power steering ECU assy from heating up. In this case, not operating the steering for about 10 minutes with engine idle will lead the fail safe function to return the normal state.

050WP–04

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

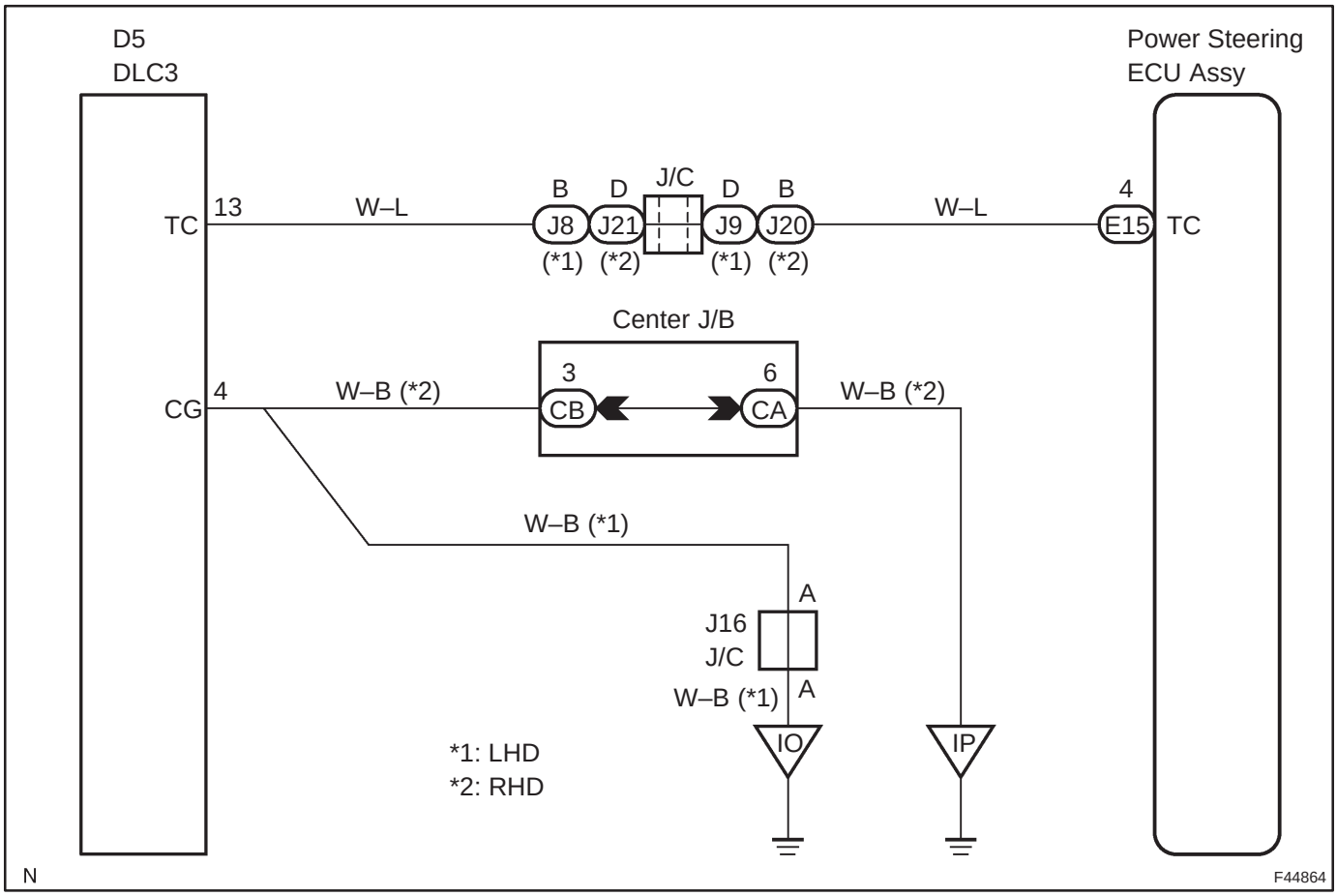
Symptom	Suspected Area	See page
At the time of idling, steering control force is great.	1. Check the DTC reconfirming that the normal code is output. 2. IG Power source circuit 3. Front tire (Worn or improperly inflated) 4. Front wheel alignment (Incorrect) 5. Steering column assy 6. Power steering ECU assy	05–1045 05–1073 28–1 26–6 50–9 01–32
Even if the vehicle speed is increased, appropriate steering resistance cannot be felt.	1. Check the DTC reconfirming that the normal code is output. 2. Combination meter assy 3. Steering column assy 4. Power steering ECU assy	05–1045 71–21 50–9 01–32
P/S warning light faulty.	1. P/S warning light circuit 2. Power steering ECU assy	05–1082 01–32
DTC check cannot be done.	1. P/S warning light circuit 2. Tc terminal circuit 3. Power steering ECU assy	05–1082 05–1084 01–32
Input signal check cannot be done.	1. Ts terminal circuit 2. Power steering ECU assy 3. Combination meter assy	05–1086 01–32 71–21
Unusual noise.	1. Steering column assy 2. Power steering ECU assy 3. Steering gear assy	50–9 01–32 51–28

TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

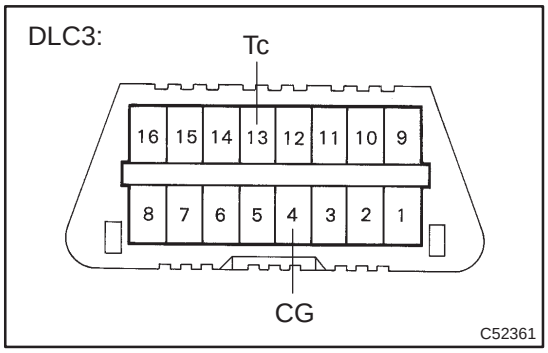
When the terminals Tc and CG of DLC3 are connected, the power steering ECU assy displays the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Tc TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Tc and CG of DLC3.
OK:
Voltage: 5 to 16 V

OK → **Go to step 3**

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminals CG of DLC3 and body ground (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK HARNESS AND CONNECTOR(DLC3 – POWER STEERING ECU ASSY)

(a) Check for an open or short circuit in harness and connector between terminals Tc of DLC3 and power steering ECU assy (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

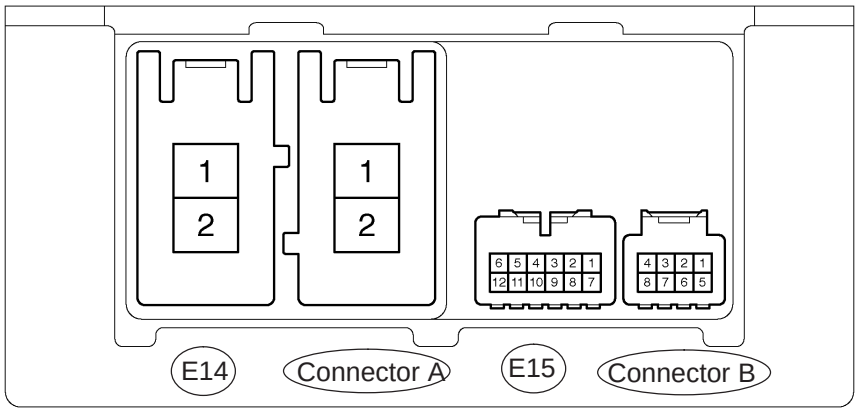
OK

REPLACE POWER STEERING ECU ASSY(See page 50–20)

050WO–04

TERMINALS OF ECU

POWER STEERING ECU ASSY



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NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

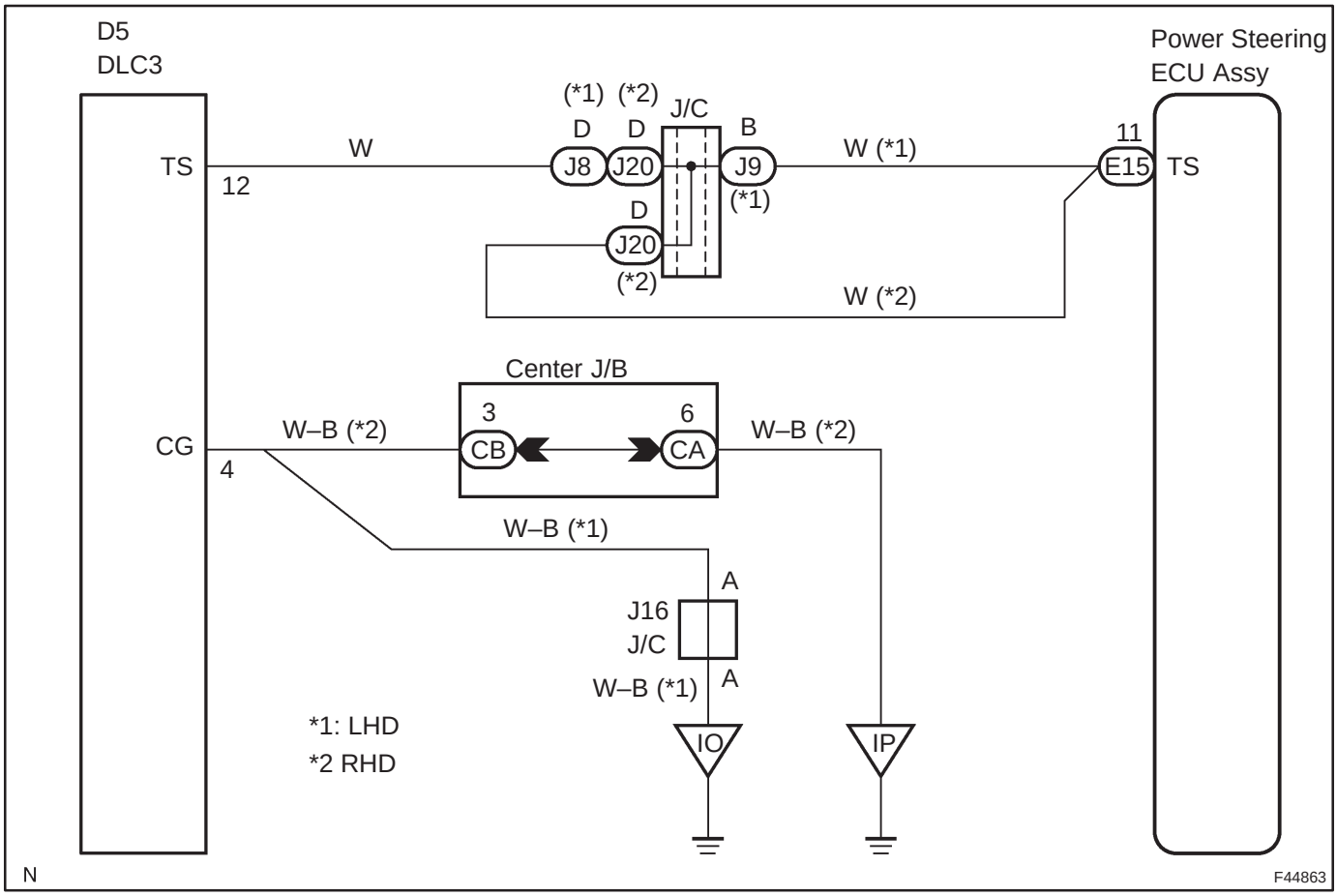
Symbols (Terminal No.)	Wiring Color	Condition	Specified condition
PIG (E14–1) – PGND (E14–2)	L – W–B	IG switch ON	10 to 16 V
PGND (E14–2) – Body Ground	W–B – Body Ground	Always	Below 1.0 V
M1 (A–1) – PGND (E14–2)	– – W–B	IG switch ON, turn the steering wheel to left	Below 1.0 V
		IG switch ON, turn the steering wheel to right	10 to 16 V
M2 (A–2) – PGND (E14–2)	– – W–B	IG switch ON, turn the steering wheel to left	10 to 16 V
		IG switch ON, turn the steering wheel to right	Below 1.0 V
SIL (E15–2) – PGND (E14–2)	W–G – W–B	IG switch ON	10 to 16 V
RLY (E15–3) PGND (E14–2)	W–R – W–B	IG switch ON, after 1 sec. or more	Below 2.0 V
Tc (E15–4) – PGND (E14–2)	W–L – W–B	IG switch ON	5 to 16 V
		IG switch ON, short circuit Tc and CG terminals of DLC3	Below 1.0 V
SPD (E15–5) – PGND (E14–2)	V–W – W–B	IG switch ON	Pulse generation
IG (E15–6) – PGND (E14–2)	R–W – W–B	IG switch ON	10 to 16 V
IDUP (E15–8) – PGND (E14–2)	GR – W–B	IG switch ON	5 to 16 V
WL (E15–9) – PGND (E14–2)	B–W – W–B	IG switch ON, P/S warning light goes off	10 to 16 V
		IG switch ON, P/S warning light comes on	Below 1.0 V
Ts (E15–11) – PGND (E14–2)	W – W–B	IG switch ON	5 to 16 V
		IG switch ON, short circuit Ts and CG terminals of DLC3	Below 1.0 V
TACH (E15–12) – PGND (E14–2)	GR–R – W–B	IG switch ON	Pulse generation
TRQ1 (B–5) – PGND (E14–2)	– – W–B	IG switch ON, turn the steering wheel to left and right	0.3 to 4.7 V
TRQV (B–6) – PGND (E14–2)	– – W–B	IG switch ON	7.5 to 8.5 V
TRQ2 (B–7) – PGND (E14–2)	– – W–B	IG switch ON, turn the steering wheel to left and right	0.3 to 4.7 V
TRQG (B–8) – PGND (E14–2)	– – W–B	IG switch ON	Below 1.0 V

TS TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

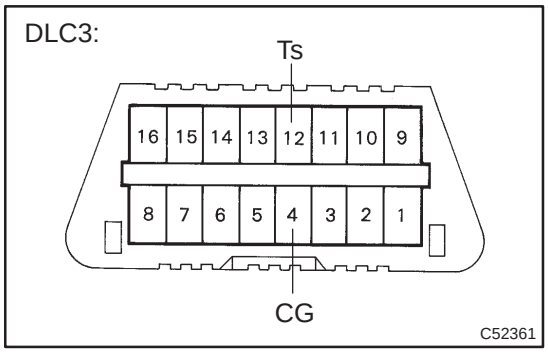
After making short circuit between terminal Ts and CG of DLC3 with turning the ignition switch OFF, the mode will change from the normal mode to test mode when the ignition switch is turned ON. After the ignition switch is turned ON, there will be DTC output from Tc terminal of DLC3.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Ts TERMINAL) (Ts – CG)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Ts and CG of DLC3.
OK:
Voltage: 5 to 16 V

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminal CG of DLC3 and body ground (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – DLC3)

(a) Check for an open or short circuit in harness and connector between terminal Ts of DLC3 and power steering ECU assy (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE POWER STEERING ECU ASSY(See page 50–20)

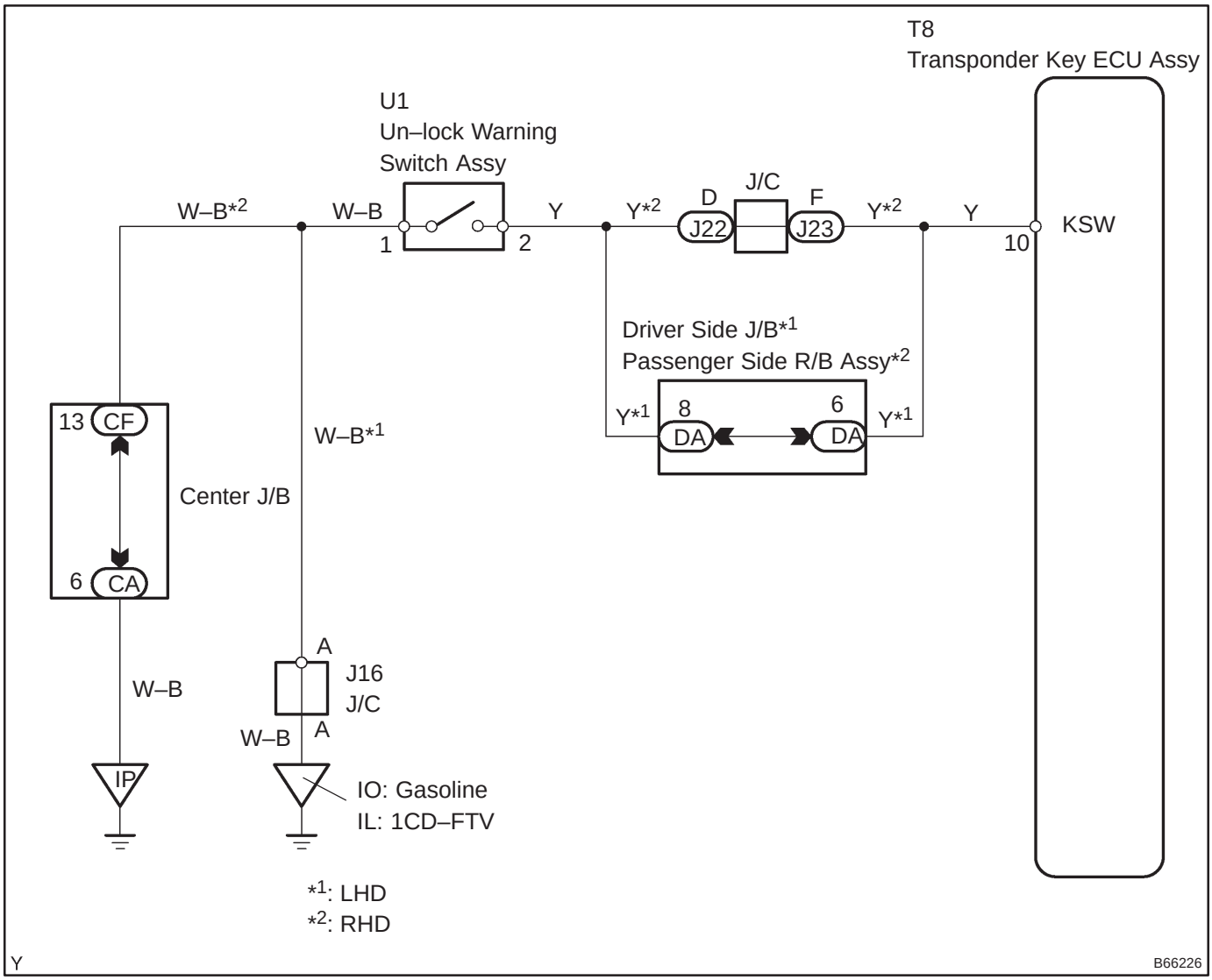
DTC	B2780	PUSH SWITCH/KEY UNLOCK WARNING SWITCH MALFUNCTION

CIRCUIT DESCRIPTION

This DTC will be output if the transponder key ECU does not detect that the unlock warning switch is ON even when the ignition switch is ON (Under normal conditions, the unlock warning switch is ON when the ignition switch is ON).

DTC No.	DTC Detection Condition	Trouble Area
B2780	Unlock warning switch ON is not detected when ignition switch is ON	• Unlock warning switch assy • Wire harness • Transponder key ECU assy

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 when using the hand–held tester and start from step 2 when not using the hand–held tester.

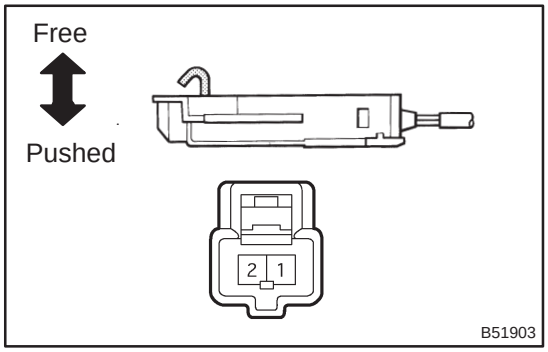
1	READ VALUE OF HAND–HELD TESTER (TRANSPONDER KEY ECU (SWITCH CONDITION))

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key that will not start the engine.
(c) Select the item KEY SW on the hand–held tester.
OK:
OFF → Key is in ignition key cylinder
ON → No key is in ignition key cylinder

OK → **REPLACE TRANSPONDER KEY ECU ASSY**

NG

2	INSPECT UNLOCK WARNING SWITCH ASSY



(a) Remove the unlock warning switch.
(b) Inspect the unlock warning switch resistance.
Standard:

Tester Connection	Switch Position	Specified Condition
1 – 2	Switch pushed (Key set)	Below 1 Ω
	Switch free (Key removed)	10 kΩ or higher

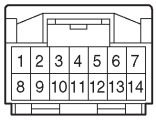
NG → **REPLACE UNLOCK WARNING SWITCH ASSY**

OK

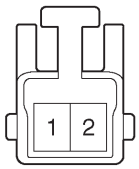
3	**CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY – UNLOCK WARNING SWITCH ASSY) (UNLOCK WARNING SWITCH ASSY – BODY GROUND)**

Wire Harness Side

T8
Transponder Key ECU Assy



U1
Unlock Warning Switch Assy



B63404
B65748
B65751

(a) Disconnect the T8 ECU and U1 switch connectors.
(b) Check the resistance between the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
T8–10 (KSW) – U1–2	Below 1 Ω
U1–1 – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE TRANSPONDER KEY ECU ASSY

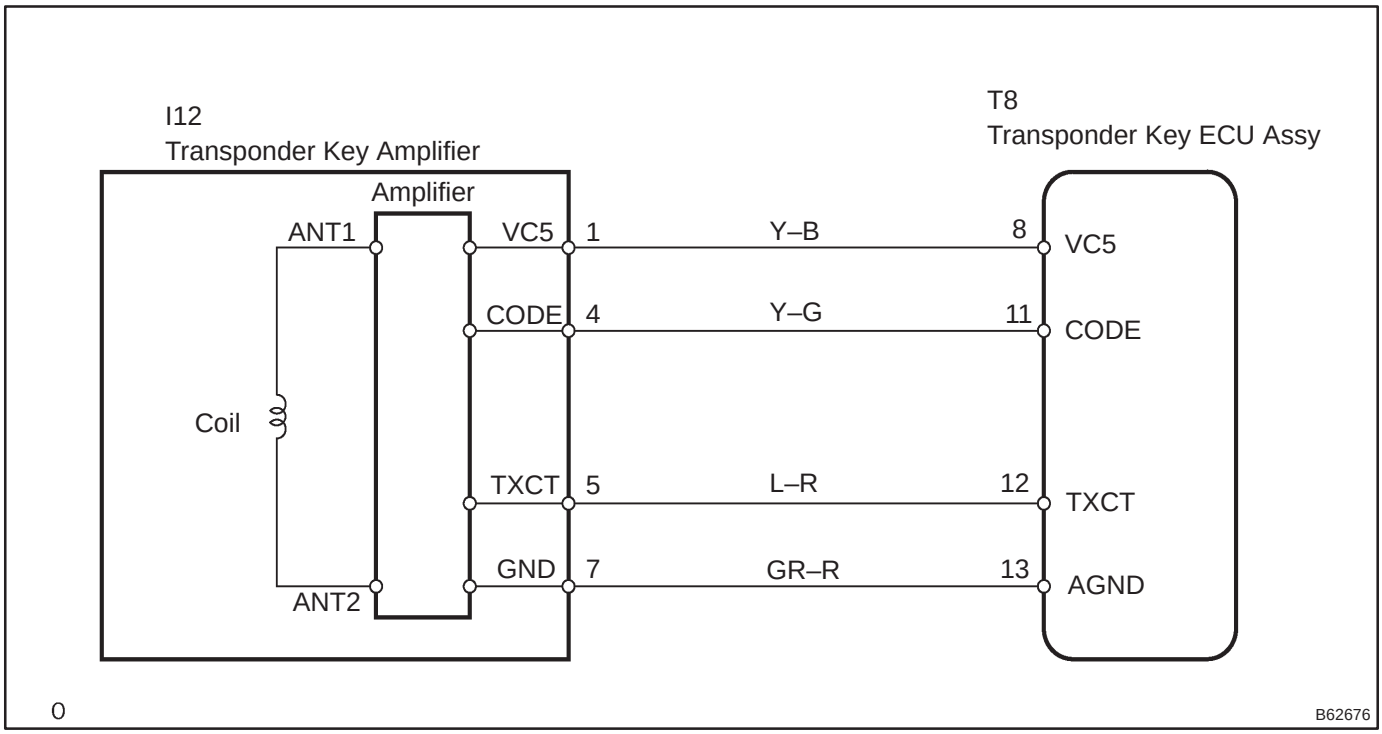
DTC B2784 ANTENNA COIL OPEN/SHORT

CIRCUIT DESCRIPTION

The transponder key coil is built into the transponder key amplifier and receives a key code signal from the transponder chip in the key. This signal is amplified by the amplifier and then output to the transponder key ECU.

DTC No.	DTC Detection Condition	Trouble Area
B2784	Antenna coil is open/short	• Wire harness • Transponder key amplifier • Transponder key ECU assy

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 when using the hand–held tester and start from step 2 when not using the hand–held tester.

1	**READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))**

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key that will not start the engine.
(c) Select the item ANTENNA COIL on the hand–held tester.
OK: NORMAL
NG: FAIL

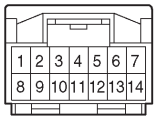
OK → **CHECK AND REPLACE TRANSPONDER KEY ECU ASSY**

NG

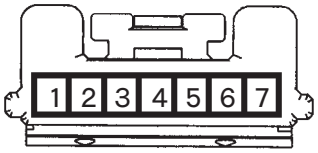
2	**CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY – TRANSPONDER KEY AMPLIFIER) (TRANSPONDER KEY ECU ASSY OR TRANSPONDER KEY AMPLIFIER – BODY GROUND)**

Wire Harness Side

T8
Transponder Key ECU Assy



I12
Transponder Key Amplifier



B63404
B55013
B64974

(a) Disconnect the T8 ECU and I12 amplifier connectors.
(b) Check the resistance of the wire harness side connectors.
Standard:

Tester Connection	Specified Condition
T8–8 (VC5) – I12–1 (VC5)	Below 1 Ω
T8–11 (CODE) – I12–4 (CODE)	
T8–12 (TXCT) – I12–5 (TXCT)	
T8–13 (AGND) – I12–7 (GND)	
T8–8 (VC5) or I12–1 (VC5) – Body ground	10 kΩ or higher
T8–11 (CODE) or I12–4 (CODE) – Body ground	
T8–12 (TXCT) or I12–5 (TXCT) – Body ground	
T8–13 (AGND) or I12–7 (GND) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE TRANSPONDER KEY AMPLIFIER

DTC B2793 TRANSPONDER CHIP MALFUNCTION

CIRCUIT DESCRIPTION

This DTC is output when a malfunction is found in a key during the key code registration or the key code is not registered normally. Replace the key when the key code registration is not performed normally and this DTC is detected.

DTC No.	DTC Detection Condition	Trouble Area
B2793	Transponder chip malfunction	• Key

INSPECTION PROCEDURE

1 CHECK DTC

(a) Delete the DTC (See page 05–1602).
(b) Insert the key into the ignition key cylinder.
(c) Check that no code is output.

OK → **NO PROBLEM**

NG

2 RE–REGISTER KEY

(a) Delete the DTC (See page 05–1602).
(b) Re–register the key and check that the engine starts with the key.

OK → **NORMAL**

NG

REPLACE KEY

DTC	B2794	UNMATCHED ENCRYPTION CODE

CIRCUIT DESCRIPTION

This DTC is output when a key with an incomplete key code is inserted into the ignition key cylinder.

DTC No.	DTC Detection Condition	Trouble Area
B2794	Key with incomplete key code is inserted	• Key

INSPECTION PROCEDURE

1	**REPLACE KEY**

DTC	B2795	UNMATCHED KEY CODE

CIRCUIT DESCRIPTION

This DTC is output when a key with a key code that has not been registered in the ECU is inserted into the ignition key cylinder.

DTC No.	DTC Detection Condition	Trouble Area
B2795	Key with unregistered key code is inserted	• Key

INSPECTION PROCEDURE

1	DELETE DTC AND INSERT ALL PRESENTLY AVAILABLE KEYS TO CHECK WHETHER ENGINE STARTS OR NOT

OK → NO PROBLEM (BECAUSE OF KEY RE–REGISTRATION)

NG

REPLACE KEY THAT WILL NOT START ENGINE

DTC	B2796	NO COMMUNICATION IN IMMOBILISER SYSTEM

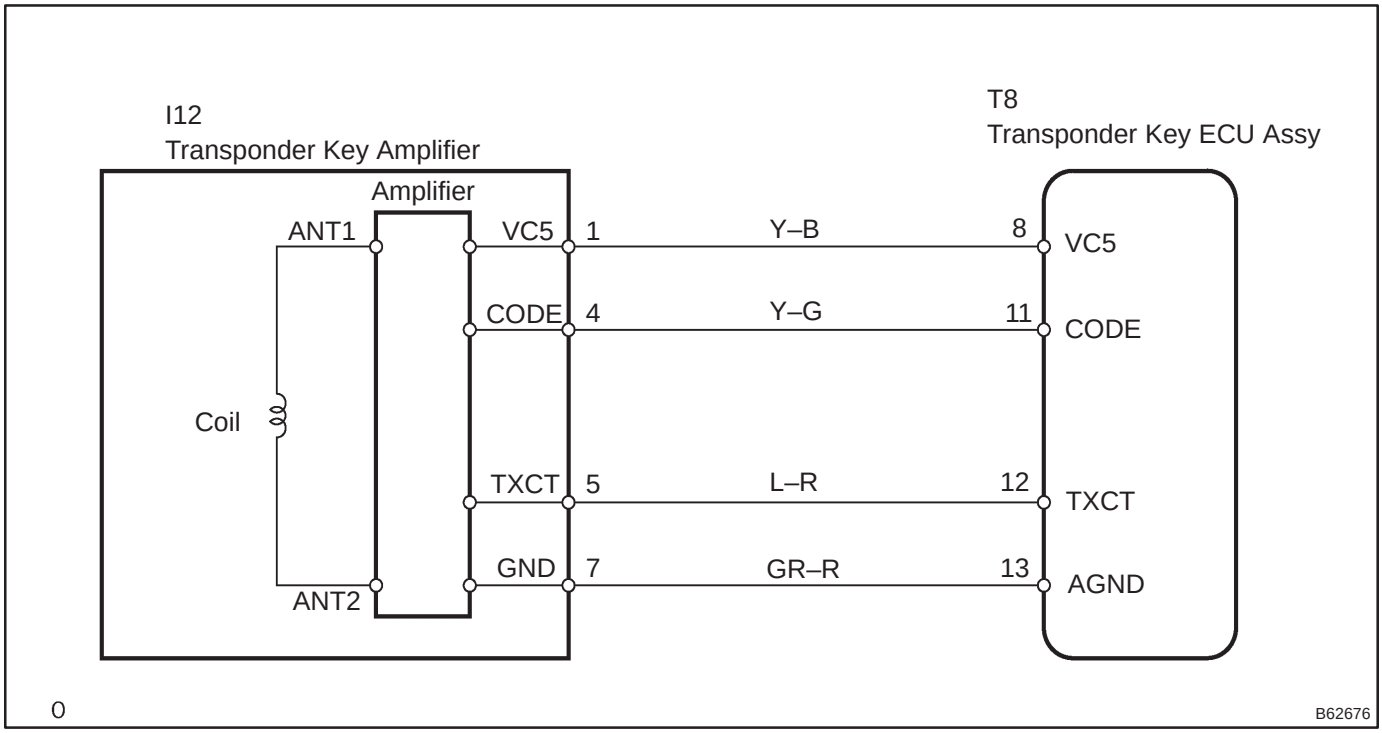
DTC	B2798	COMMUNICATION MALFUNCTION NO.2

CIRCUIT DESCRIPTION

This code is stored in the memory when a key that does not have a transponder chip is inserted or if communication between the key and transponder key ECU is impossible.

DTC No.	DTC Detection Condition	Trouble Area
B2796	No communication	• Key • Wire harness • Transponder key amplifier (Transponder key coil) • Transponder key ECU assy
B2798	Communication error	• Key

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 when using the hand–held tester and start from step 2 when not using the hand–held tester.

1	**READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))**

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key that will not start the engine.
(c) Select IMMOBILISER on the hand–held tester.
OK:
SET → Ignition switch ON
UNSET → Without key

OK → **NORMAL**

NG

2	**CHECK WHETHER ENGINE STARTS WITH OTHER KEYS**

(a) Check whether the engine starts with the other keys for the vehicle.

OK → **RE–REGISTER OR REPLACE KEY THAT WILL NOT START ENGINE**

NG

HINT:
Start the inspection from step 3 when using the hand–held tester and start from step 4 when not using the hand–held tester.

3	**READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))**

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key that will does not start the engine.
(c) Select the item ANTENNA COIL on the hand–held tester.
OK: NORMAL
NG: FAIL

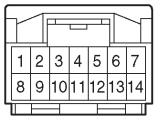
NG → **CHECK AND REPLACE TRANSPONDER KEY ECU ASSY**

OK

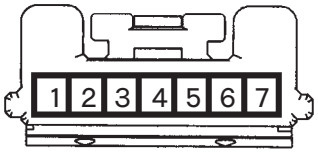
4	CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY – TRANSPONDER KEY AMPLIFIER) (TRANSPONDER KEY ECU ASSY OR TRANSPONDER KEY AMPLIFIER – BODY GROUND)

Wire Harness Side

T8
Transponder Key ECU Assy



I12
Transponder Key Amplifier



B63404
B55013
B64974

(a) Disconnect the T8 ECU and I12 amplifier connectors.
(b) Check the resistance of the wire harness side connectors.
Standard:

Tester Connection	Specified Condition
T8–8 (VC5) – I12–1 (VC5)	Below 1 Ω
T8–11 (CODE) – I12–4 (CODE)	
T8–12 (TXCT) – I12–5 (TXCT)	
T8–13 (AGND) – I12–7 (GND)	
T8–8 (VC5) or I12–1 (VC5) – Body ground	10 kΩ or higher
T8–11 (CODE) or I12–4 (CODE) – Body ground	
T8–12 (TXCT) or I12–5 (TXCT) – Body ground	
T8–13 (AGND) or I12–7 (GND) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5	CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After replacing the transponder key amplifier, check that the engine starts.

NG → **NORMAL (TRANSPONDER KEY AMPLIFIER DEFECTIVE)**

OK

REPLACE TRANSPONDER KEY ECU ASSY

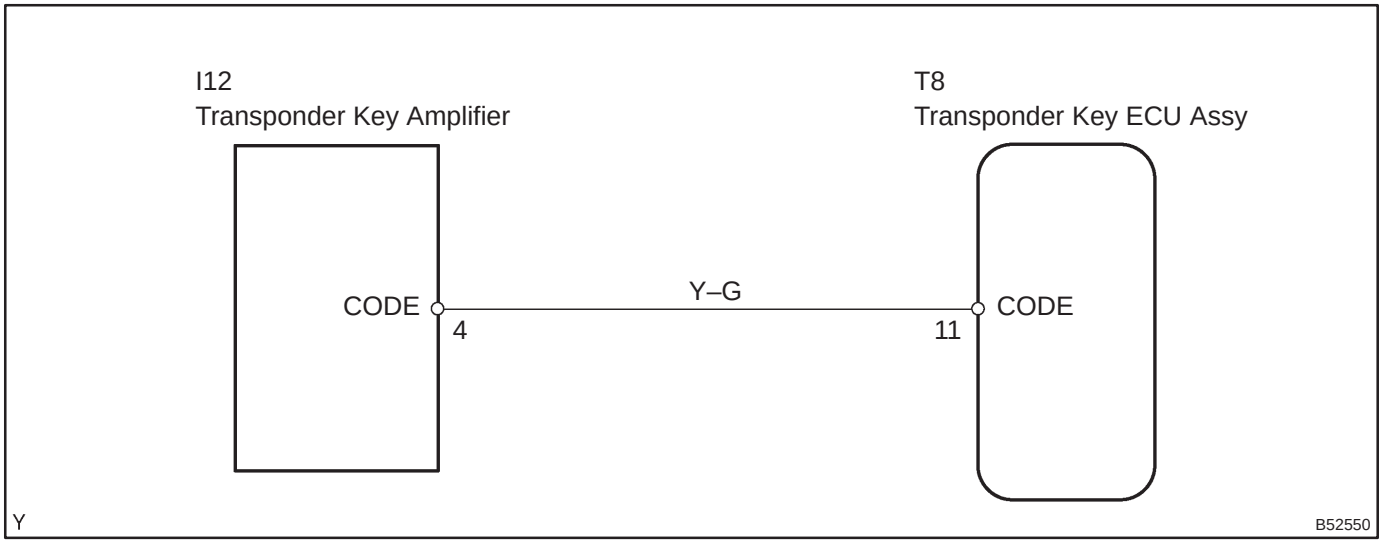
DTC B2797 COMMUNICATION MALFUNCTION NO.1

CIRCUIT DESCRIPTION

This DTC is output when an error occurs in normal communication.
HINT:
Some noise is found in the communication line.

DTC No.	DTC Detection Condition	Trouble Area
B2797	Keys are positioned too close to each other or noise occurred in communication line	• Key • Wire harness • Transponder key amplifier • Transponder key ECU assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After replacing the transponder key amplifier, check that the engine starts.

OK → **NORMAL (TRANSPONDER KEY AMPLIFIER DEFECTIVE)**

NG

REPLACE TRANSPONDER KEY ECU ASSY

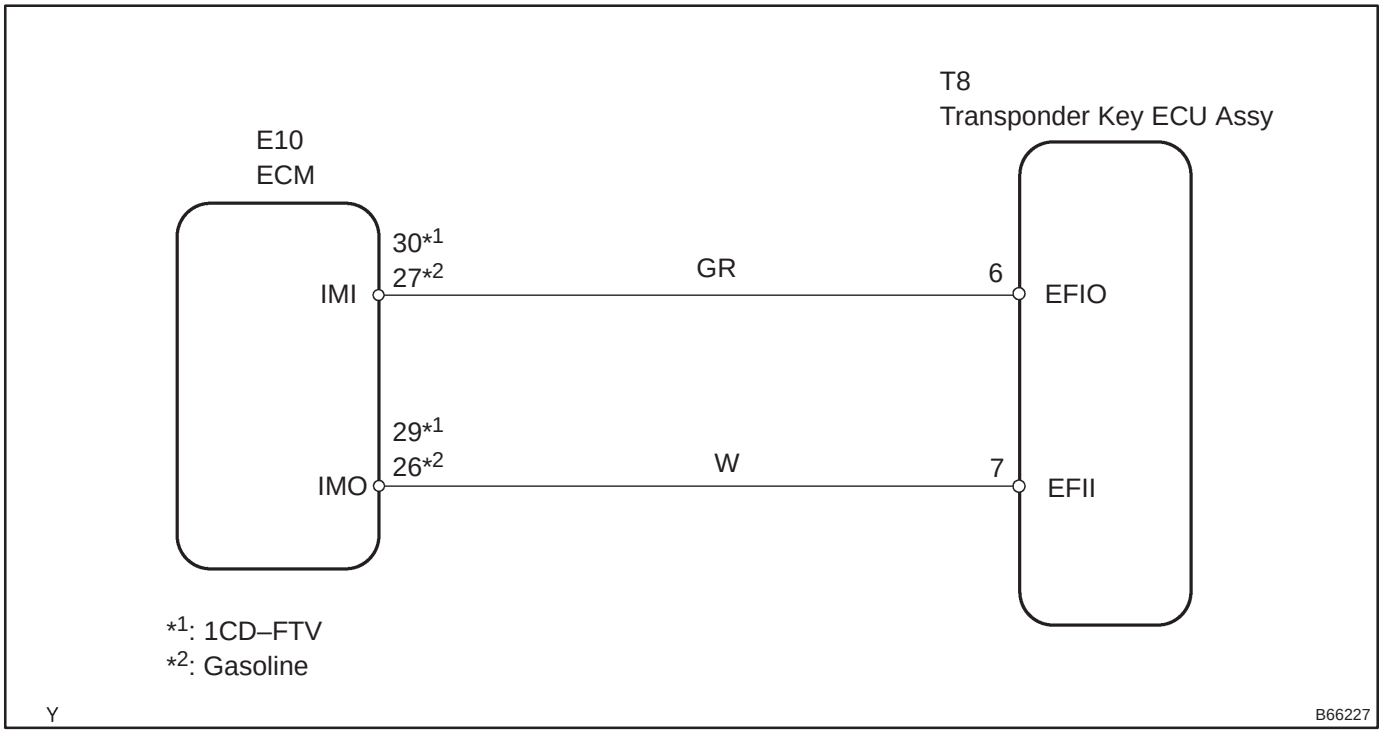
DTC	B2799	ENGINE IMMOBILISER SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

This DTC is output when the ECM detects errors in communication between the transponder key ECU assy and the ECM or in the communication lines.
This DTC is also output when an engine start is attempted while the ECU communication ID between the transponder key ECU and the ECM are different.
Before troubleshooting for this DTC, make sure that there is no DTC detected in the transponder key ECU. If there is a key code–related DTC detected in the transponder key ECU, repair it first.

DTC No.	DTC Detection Condition	Trouble Area
B2799	• Error in communication between ECM and transponder key ECU, and in communication line • Communication ID is different during communication with transponder key ECU	• Wire harness • Transponder key ECU assy • Transponder key amplifier • ECM

WIRING DIAGRAM

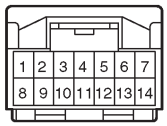


INSPECTION PROCEDURE

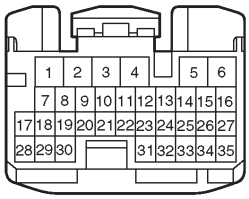
1	CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY – ECM) (TRANSPONDER KEY ECU ASSY OR ECM – BODY GROUND)

Wire Harness Side

T8
Transponder Key ECU Assy



E10
ECM



Y B66220 B66229

(a) Disconnect the T8 ECU and E10 ECM connectors.
(b) Check the resistance of the wire harness side connectors.

Standard:

1CD–FTV

Terminal No.	Specified Condition
T8–6 (EFIO) – E10–30 (IMI)	Below 1 Ω
T8–7 (EFII) – E10–29 (IMO)	
T8–6 (EFIO) or E10–30 (IMI) – Body ground	10 kΩ or higher
T8–7 (EFII) or E10–29 (IMO) – Body ground	

Gasoline

Terminal No.	Specified Condition
T8–6 (EFIO) – E10–27 (IMI)	Below 1 Ω
T8–7 (EFII) – E10–26 (IMO)	
EFIO (T8–6) or IMI (E10–27) – Body ground	10 kΩ or higher
EFII (T8–7) or IMO (E10–26) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2	CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After replacing the transponder key amplifier, check that the engine starts.

NG → **NORMAL (TRANSPONDER KEY AMPLIFIER DEFECTIVE)**

OK

REPLACE TRANSPONDER KEY ECU ASSY

054CG–07

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE IMMOBILISER SYSTEM Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Intermittent (times a day) ☐ Only once
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °C (°F)

Symptoms	☐ Immobiliser is not set (Engine starts with key codes other than registered key code)
	☐ Engine does not start

DTC Check	**1st Time**	☐ Normal code ☐ Malfunction code (Code)
	2nd Time	☐ Normal code ☐ Malfunction code (Code)

054CI–07

DIAGNOSTIC TROUBLE CODE CHART

1. TRANSPONDER KEY ECU DTC CHART

DTC No. (See Page)	Detection Item	Trouble Area
*B2780 (05–1613)	Push Switch/Key Unlock Warning Switch Malfunction	• Unlock warning switch • Wire harness • Transponder key ECU assy
B2784 (05–1616)	Antenna Coil Open/Short	• Wire harness • Transponder key amplifier • Transponder key ECU assy
B2793 (05–1618)	Transponder Chip Malfunction	• Key
B2794 (05–1619)	Unmatched Encryption Code	• Key
B2795 (05–1620)	Unmatched Key Code	• Key
B2796 (05–1621)	No Communication in Immobiliser System	• Key • Transponder key amplifier • Wire harness • Transponder key ECU assy
B2797 (05–1624)	Communication Malfunction No. 1	• Key • Wire harness • Transponder key amplifier • Transponder key ECU assy
B2798 (05–1621)	Communication Malfunction No. 2	• Key

HINT:

*: Except for 1AZ–FE engine

2. ECM DTC CHART

NOTICE:

The DTC for the immobiliser system is specified. If the other codes are output, check the DTC chart of the engine control system.

DTC No. (See Page)	Detection Item	Trouble Area
B2799 (05–1625)	Engine Immobiliser System Malfunction	• Wire harness • Key • Transponder key ECU assy • Transponder key amplifier • ECM

ENGINE IMMOBILISER SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

054CF–07

HINT:

- Use this procedure to troubleshoot the engine immobiliser system.
- The hand–held tester should be used in step 4, 5 and 7.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM CHECK (See page 05–1601)

3	CRANK ENGINE FOR MORE THAN 10 SECONDS

4	CHECK FOR DTC

(a) Check for DTCs and note any codes that are output.
(b) Delete the DTC.
(c) Recheck for DTCs. Try to prompt the DTC (SFI system and engine immobiliser system) by simulating the original activity that the DTC suggested.
  (1) If the DTC does not reoccur, proceed to A.
  (2) If the DTC (SFI system) reoccurs, proceed to B.
  (3) If the DTC (engine immobiliser system) reoccurs, proceed to C.

B	Go to SFI or ECD SYSTEM (See page 05–290 or 05–517)

C	Go to step 8

A

5	READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item KEY SW in the DATA LIST and read its value displayed on the hand–held tester.
Transponder key ECU:

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
KEY SW	Un–lock warning switch signal /ON or OFF	ON: Key is in ignition key cylinder OFF: No key is in ignition key cylinder	–

NG	Go to DTC B2780 (See page 05–1613)

OK

6	PROBLEM SYMPTOMS TABLE (See page 05–1612)

(a) When problem is not listed on problem symptoms table, proceed to A.
(b) When problem is listed on problem symptoms table, proceed to B.

B → Go to step 8

A

7	PERFORM TROUBLESHOOTING ACCORDING TO MALFUNCTION SYMPTOM

(a) Pre–check (See page 05–1602)
  (1) Inspect with the hand–held tester (ECU data monitor).
  (2) Inspect with the hand–held tester (ACTIVE TEST).
(b) Terminals of ECU (See page 05–1607)

8	ADJUST, REPAIR OR REPLACE

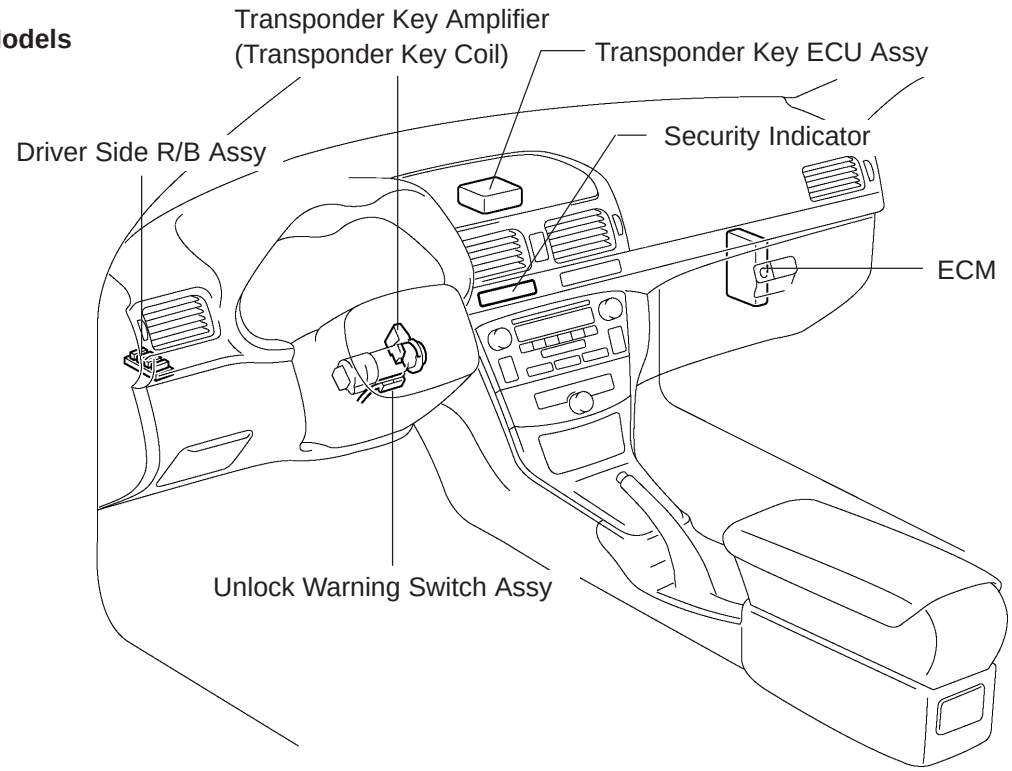
9	CONFIRMATION TEST

END

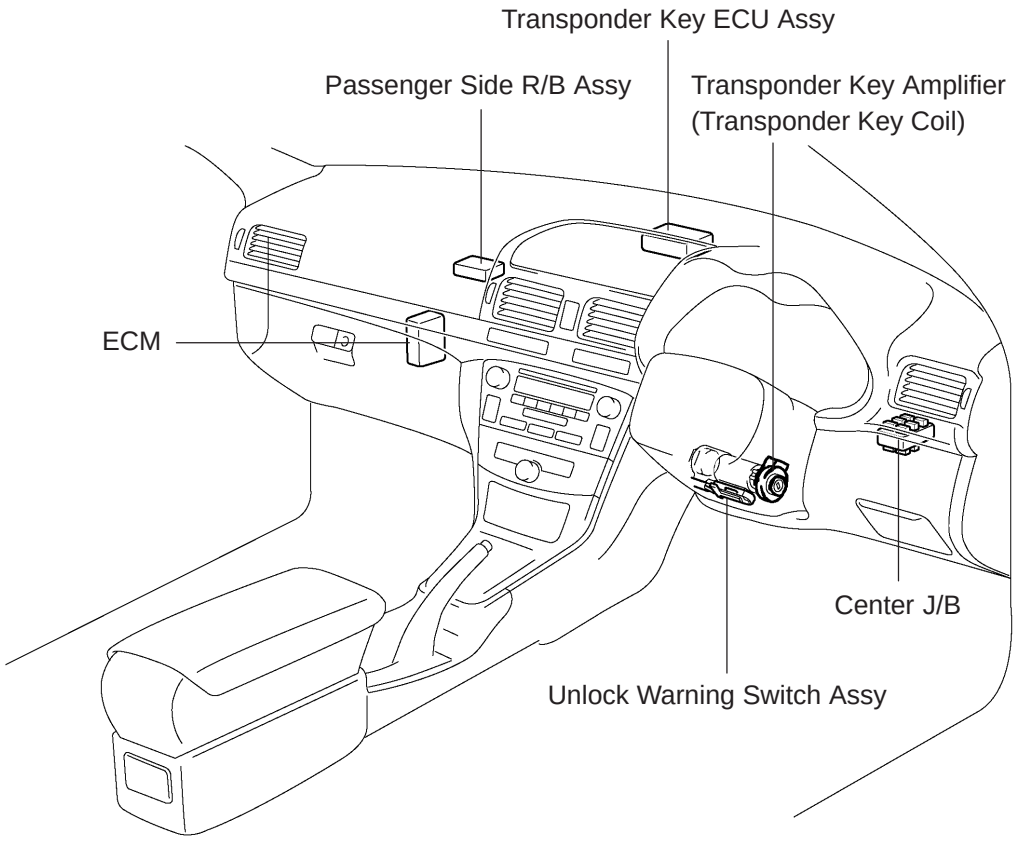
054CM–07

LOCATION

LHD Models



RHD Models



Y

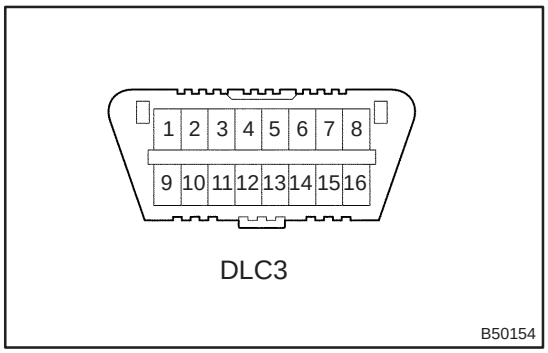
B65753

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

(1) The ECM controls the function of the immobiliser system on the vehicle.
Data of the immobiliser system and the Diagnostic Trouble Code (DTC) can be read in the Data Link Connector 3 (DLC3) of the vehicle. When trouble occurs in the immobiliser system, even though the security indicator lamp does not come on, DTCs can be checked.
Therefore, the immobiliser system seems to be malfunctioning, use the hand–held tester to check for a malfunction and repair it.



(b) Inspect the DLC3.
The vehicle's ECM uses the ISO 9141–2 (Euro–OBD)/ISO 14230 (M–OBD) communication protocol.
The terminal arrangement of the DLC3 complies with the ISO 15031–3 and matches the ISO 9141–2/ISO 14230 format.

Standard:

Tester Connection	Condition	Specified Condition
7 (Bus + line) – 5 (Signal ground)	During communication	Pulse generation
4 (Chassis ground) – Body ground	Always	Below 1 Ω
5 (Signal ground) – Body ground	Always	Below 1 Ω
16 (B+) – Body ground	Always	10 to 14 V

HINT:
If the screen displays UNABLE TO CONNECT TO VEHICLE after you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and used the hand–held tester, the problem may be on the vehicle side or the tester side.

- If communication is normal when the tester is connected to other vehicle, inspect the DLC3 of the original vehicle.
- If communication is still impossible when the tester is connected to another vehicle, the problem may be in the tester itself, so consult the Service Department listed in the tester's instruction manual.

2. Using hand–held tester:

CHECK DTC

(a) Checking DTCs.

(1) Connect the hand–held tester to DLC3.
(2) Turn the ignition switch ON.
(3) Read DTCs by following the prompts on the tester screen.

HINT:
Refer to the hand–held tester operator's manual for further details.

(b) Clear the DTCs from memory.

(1) Connect the hand–held tester to DLC3.
(2) Turn the ignition switch ON.
(3) Erase DTCs by following the prompts on the tester screen.

HINT:
Refer to the hand–held tester operator's manual for further details.

3. CHECK DIAGNOSIS

(a) Using the hand–held tester, check for DTCs.

NOTICE:

Hand–held tester only:

When the diagnosis system is switched from normal mode to check mode, all the DTCs and freeze frame data recorded in normal mode are erased. So before switching modes, always check the DTCs and freeze frame data, and make a note of them.

(1) Prepare the hand–held tester.
(2) Connect the hand–held tester to the DLC3 under the instrument panel lower pad.
(3) Turn the ignition switch ON and push the hand–held tester switch ON.
(4) Use the hand–held tester to check for DTCs and freeze frame data, and make a note of them (For operating instructions, see the hand–held tester instruction book).
(5) Confirm the details of the DTCs.

(b) Either of the following procedures will erase the DTCs and freeze frame data.
(1) Operating the hand–held tester to erase the codes (See the hand–held tester instruction book for operating instructions).
(2) Disconnecting the battery terminals or ECU–B fuse.

4. DATA LIST

HINT:

Using the DATA LIST displayed on the hand–held tester, you can read the value of the switch, sensor, actuator, etc. without parts removal. Reading the DATA LIST as the first step of troubleshooting is one way to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Read the DATA LIST, according to the display on the tester.

Transponder key ECU:

Item	Measurement Item/ Display (Range)	Normal Condition
KEY SW	Un–lock warning switch signal/ ON or OFF	OFF: Key is in Ignition key cylinder ON: No key is in Ignition key cylinder
IG SW	Ignition switch signal/ ON or OFF	OFF: Ignition switch is ON or START position ON: Ignition switch is OFF or ON position
IMMOBILISER	Immobiliser system status/ SET or UNSET	UNSET: Without key SET: Ignition switch ON
RESPONSE	Transponder chip data/ NG or OK	NG: Data error OK: Data OK
FRAME	Transponder chip data/ NG or OK	NG: Data error OK: Data OK
SERIAL NUMBER	Transponder chip data/ NG or OK	NG: Data error OK: Data OK
ENCRYPT CODE	Transponder chip data/ NG or OK	NG: Data error OK: Data OK
STATUS	Transponder chip data/ NG or OK	NG: Data error OK: Data OK
BCC	Transponder chip signal/ NG or OK	NG: Incorrect data sending OK: Correct data sending
SUB KEY	Sub key code signal/ NOMATCH or MATCH	NOMATCH: Nomatch sub–key code is sent MATCH: Sub key code is sent
MASTER KEY	Master key code signal/ NOMATCH or MATCH	NOMATCH: Nomatch Master key code is sent MATCH: Master key code is sent
REGIST SUB CODE	Number of registered sub–key/ min. 0, max. 15	Number of registered sub–key
REGIST MAS CODE	Number of registered master key/ min. 0, max. 15	Number of registered master key

Item	Measurement Item/ Display (Range)	Normal Condition
REG CODE SPACE	Memory space for key codes registration/ NOT FUL or FULL	NOT FUL: Possible to resister more key code FULL: Impossible to register key code any more
ANTENNA COIL	Antenna coil condition/ NORMAL or FAIL	Normal: Antenna coil is normal FAIL: Antenna coil is abnormal

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows you to operate the relay, VSV, actuator, etc. without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one way to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) Perform the ACTIVE TEST, according to the display on the tester.

Transponder key ECU:

Item	Test Details
SECURITY INDIC	Turn security indicator ON/OFF

054CK–07

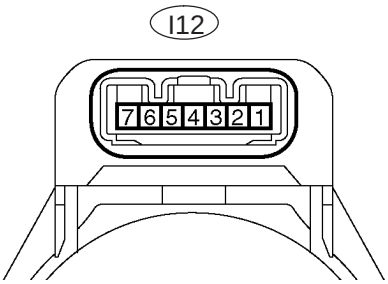
PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
Engine does not start	1. Key	05–1618 05–1619 05–1620 05–1621 05–1624 05–1625
	2. Transponder key amplifier	05–1616 05–1621 05–1624 05–1625
	3. Transponder key ECU assy	05–1613 05–1616 05–1621 05–1624 05–1625

05B0B–02

TERMINALS OF ECU

1. CHECK TRANSPONDER KEY AMPLIFIER (COIL)



B65593

(a) Disconnect the I12 amplifier connector and check the resistance between the terminal of the wire harness side connector and body ground.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
GND (I12–7) – Body ground	GR–R – Body ground	Constant	Below 1 Ω

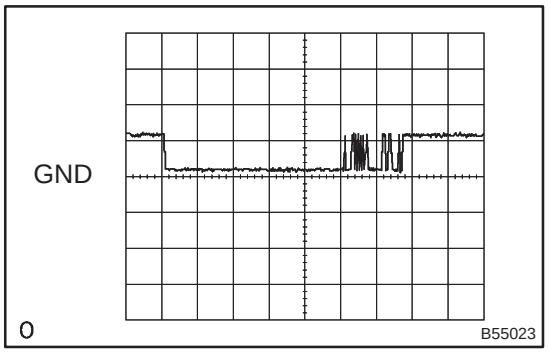
If the result is not as specified, there may be a malfunction on the wire harness side.

(b) Reconnect the I12 amplifier connector and check the resistance or voltage of each terminal of the connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
VC5 (I12–1) – GND (I12–7)	Y–B – GR–R	No key in ignition key cylinder → With key	0 V → 10 to 14 V
CODE(I12–4) – GND (I12–7)	Y–G – GR–R	No key in ignition key cylinder → With key	Waveform 1
TXCT (I12–5) – GND (I12–7)	L–R – GR–R	No key in ignition key cylinder → With key	Waveform 2
GND (I12–7) – Body ground	GR–R – Body ground	Constant	Below 1 Ω

If the result is not as specified, the amplifier may have a malfunction.

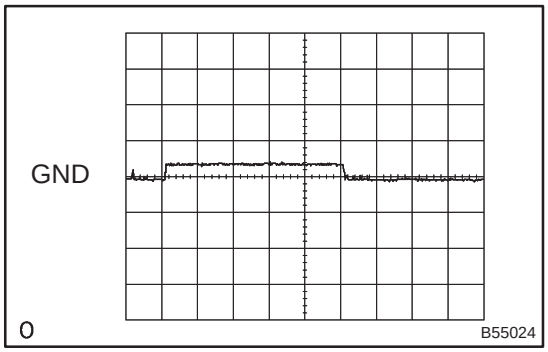


B55023

(c) Inspect using an oscilloscope.

Waveform 1 (Reference):

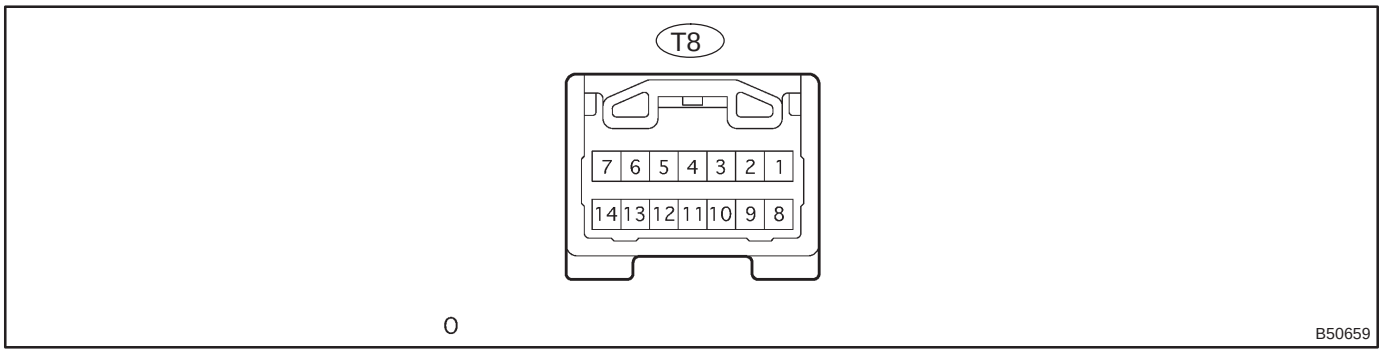
Terminal	CODE – GND
Tool Setting	10 V/DIV., 10 ms/DIV.
Condition	Ignition switch ON



Waveform 2 (Reference):

Terminal	TXCT – GND
Tool Setting	10 V/DIV., 10 ms/DIV.
Condition	Ignition switch ON

2. CHECK TRANSPONDER KEY ECU ASSY



(a) Disconnect the T8 ECU connector and check the voltage and resistance between each terminal of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
AGND (T8–13) – Body ground	GR–R – Body ground	Constant	Below 1 Ω
+B (T8–1) – GND (T8–14)	W–R – W–B	Constant	10 to 14 V
IG (T8–2) – AGND (T8–13)	B–W – GR–R	Ignition switch OFF → ON	0 V → 10 to 14 V
KSW (T8–10) – AGND (T8–13)	Y – GR–R	No key in ignition key cylinder → With key	10 kΩ or higher → Below 1 Ω

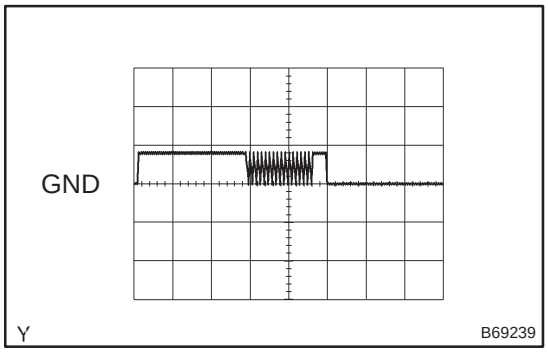
If the result is not as specified, there may be a malfunction on the wire harness side.

(b) Reconnect the T8 ECU connector and check the voltage between each terminal of the connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
KSW (T8–10) – AGND (T8–13)	Y – GR–R	No key in ignition key cylinder → With key	10 to 14 V → 0 V
VC5 (T8–8) – AGND (T8–13)	Y–B – GR–R	Ignition switch OFF → ON	0 V → 4.6 to 5.4 V
TXCT (T8–12) – AGND (T8–13)	L–R – GR–R	Ignition switch OFF → ON	Waveform 1
CODE (T8–11) – AGND (T8–13)	Y–G – GR–R	Ignition switch OFF → ON	Waveform 2
EFIO (T8–6) – AGND (T8–13)	GR – GR–R	Ignition switch OFF → ON	Waveform 3
EFII (T8–7) – AGND (T8–13)	W – GR–R	Ignition switch OFF → ON	Waveform 4

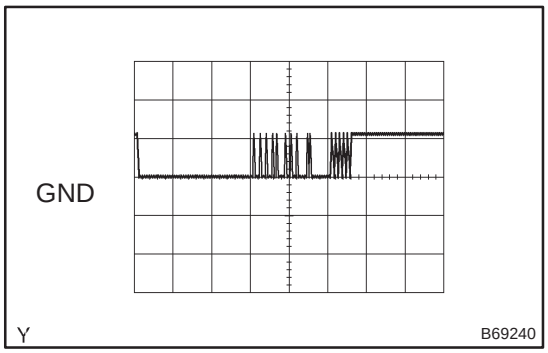
If the result is not as specified, the ECU may have a malfunction.



(c) Inspect using an oscilloscope.

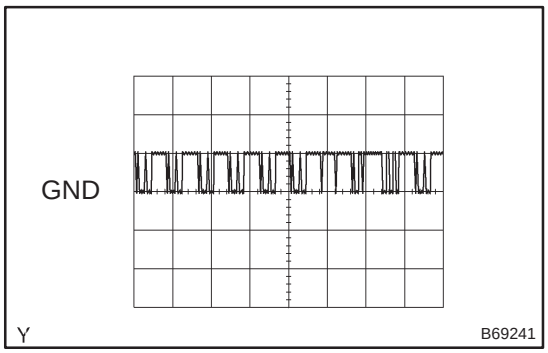
Waveform 1 (Reference):

Terminal	TXCT – GND
Tool Setting	5 V/DIV., 20 ms/DIV.
Condition	Ignition switch ON



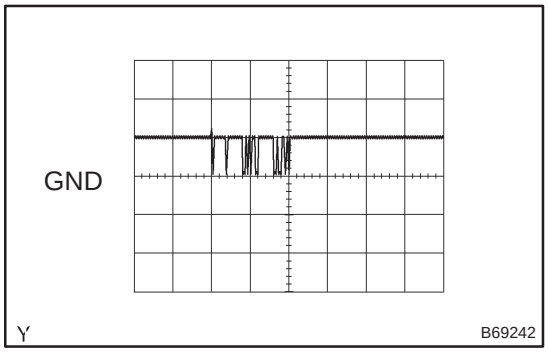
Waveform 2 (Reference):

Terminal	CODE – GND
Tool Setting	10 V/DIV., 20 ms/DIV.
Condition	Ignition switch ON



Waveform 3 (Reference):

Terminal	EFIO – GND
Tool Setting	5 V/DIV., 50 ms/DIV.
Condition	Ignition switch ON

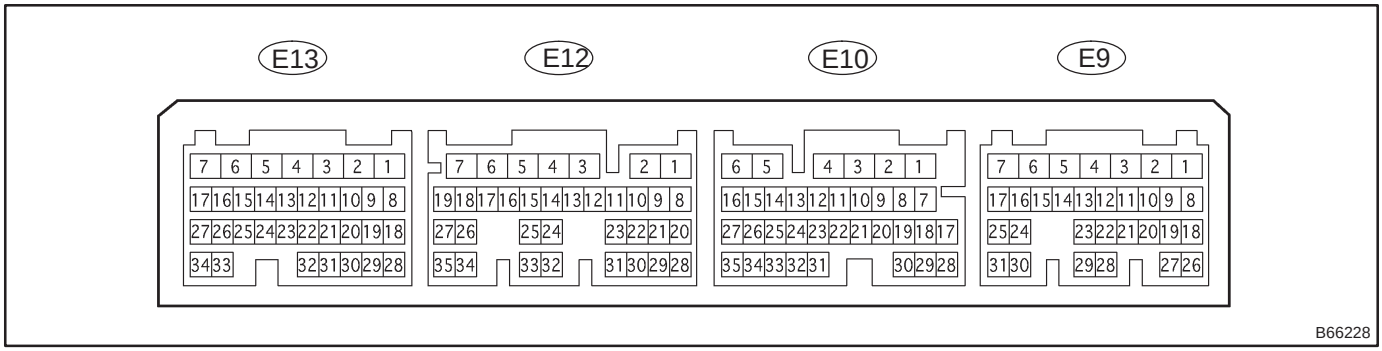


Waveform 4 (Reference):

Terminal	EFII – GND
Tool Setting	5 V/DIV., 50 ms/DIV.
Condition	Constant

3. CHECK ECM

3ZZ–FE, 1ZZ–FE , 1AZ–FE engine:

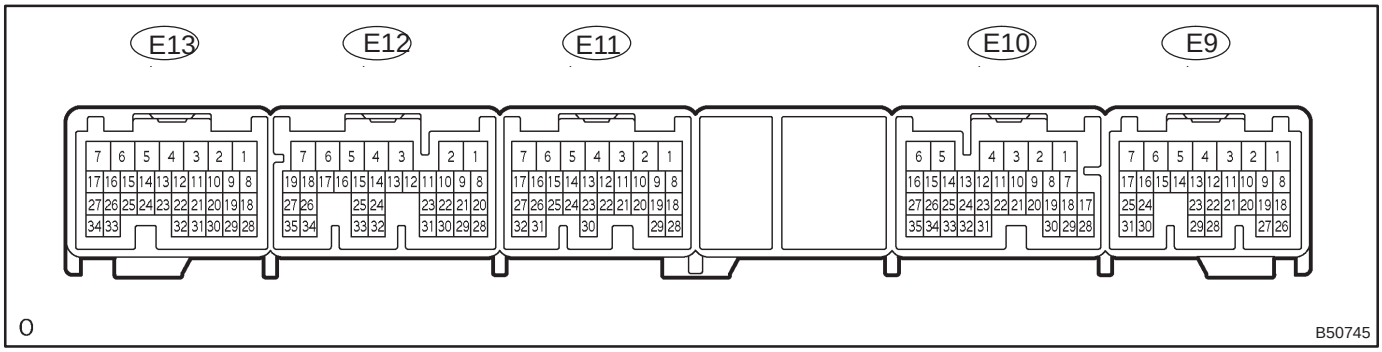


(a) Disconnect the E10 and E12 ECM connectors and check the voltage or resistance between each terminal of the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
IMI (E10–27) – E1 (E12–7)	GR–R – BR	No key in ignition key cylinder → With key	Waveform 1
IMO (E10–26) – E1 (E12–7)	W – BR	No key in ignition key cylinder → With key	Waveform 2
E1 (E12–1) – Body ground	BR – Body ground	Constant	Below 1 Ω

1CD–FTV, 1AZ–FSE engine:

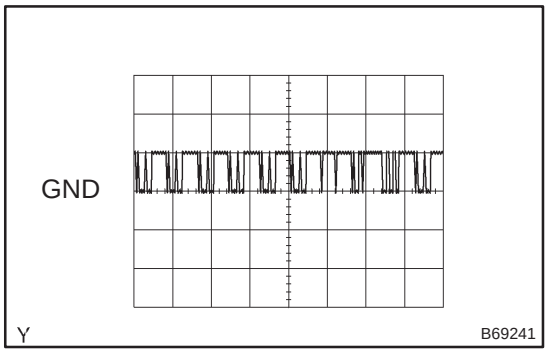


(b) Disconnect the E10 and E11 or E12 ECM connectors and check the voltage or continuity between each terminal of the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
*1 IMI (E10–30) – E1 (E12–7)	GR – BR	No key in ignition key cylinder → With key	Waveform 1
*2 IMI (E10–27) – E1 (E11–1)	GR – BR	No key in ignition key cylinder → With key	Waveform 1
*1 IMO (E10–29) – E1 (E12–7)	W – BR	No key in ignition key cylinder → With key	Waveform 2
*2 IMO (E10–26) – E1 (E11–1)	W– BR	No key in ignition key cylinder → With key	Waveform 2
*1 E1 (E12–7) – Body ground	BR – Body ground	Constant	Below 1 Ω
*2 E1 (E11–1)) – Body ground	BR – Body ground	Constant	Below 1 Ω

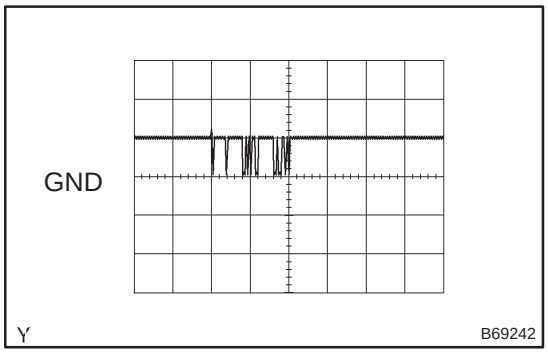
HINT:
*1: 1CD–FTV engine
*2: 1AZ–FSE engine
If the result is not as specified, there may be a malfunction on the wire harness side.



(c) Inspect using an oscilloscope.

Waveform 1 (Reference):

Terminal	IMI – GND
Tool Setting	5 V/DIV., 50 ms/DIV.
Condition	Ignition switch ON



Waveform 2 (Reference):

Terminal	IMO – GND
Tool Setting	5 V/DIV., 50 ms/DIV.
Condition	Constant

05AEZ–02

CUSTOMER PROBLEM ANALYSIS CHECK

KEY REMINDER WARNING SYSTEM Check Sheet

Inspector's name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	km miles

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Intermittent (times a day) ☐ Only once
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °C (°F))

Problem Symptoms	☐ Key reminder buzzer does not sound

KEY REMINDER WARNING SYSTEM

05AEY–02

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:
Use this procedure to troubleshoot the key reminder warning system.
The hand–held tester should be used in step 3 and 4.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND PROBLEM SYMPTOM

3	DTC CHECK (MULTIPLEX COMMUNICATION SYSTEM) (See page 05–1656)

(a) Check for DTCs and note any codes that are output.
(b) Delete the DTC.
(c) Recheck for DTCs. Try to prompt the DTC by simulating the original activity that the DTC suggests.
  (1) If the DTC does not reoccur, proceed to A.
  (2) If the DTC reoccurs, proceed to B.

B	GO TO MULTIPLEX COMMUNICATION SYSTEM (See page 05–1656)

A

4	PROBLEM SYMPTOMS TABLE (See page 05–1593)

(a) If the fault is not listed on the symptoms table, proceed to A.
(b) If the fault is listed on the symptoms table, proceed to B.

B	Go to step 5

A

5	PERFORM TROUBLESHOOTING ACCORDING TO MALFUNCTION SYMPTOM

(a) Pre–check (See page 05–1655).
  (1) Inspection with the hand–held tester (ECU DATA MONITOR).
(b) Terminals of ECU (See page 05–1659).
(c) On–vehicle inspection (See page 73–26).

6	ADJUST, REPAIR OR REPLACE

7	CONFIRMATION TEST

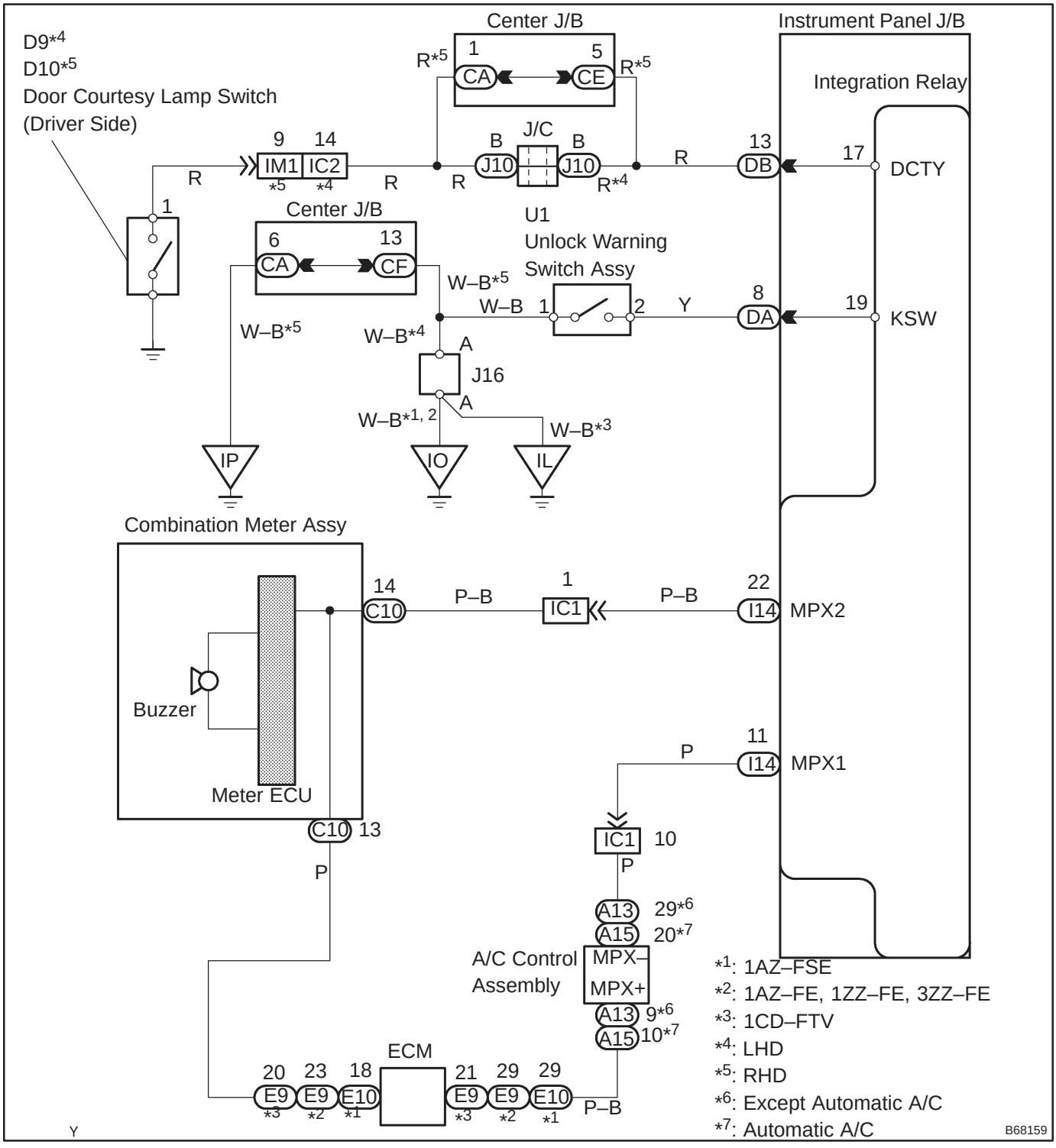
END

KEY REMINDER BUZZER DOES NOT SOUND

CIRCUIT DESCRIPTION

When the ignition switch is OFF, the key is in the ignition key cylinder and the driver side door is open the integration relay activates the combination meter to cause the buzzer to sound.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT FRONT DOOR COURTESY LAMP SWITCH ASSY (DRIVER SIDE)

(a) When using hand–held tester, proceed to A.
(b) When not using hand–held tester, proceed to B.

B → **Go to step 3**

A

2	READ VALUE OF HAND–HELD TESTER (COURTESY LAMP SWITCH)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item D DOR CTY SW in the DATA LIST and read its value displayed on the hand–held tester.
Standard:
ON: Driver side door is open
OFF: Driver side door is closed

OK → **Go to step 6**

NG → **Go to step 4**

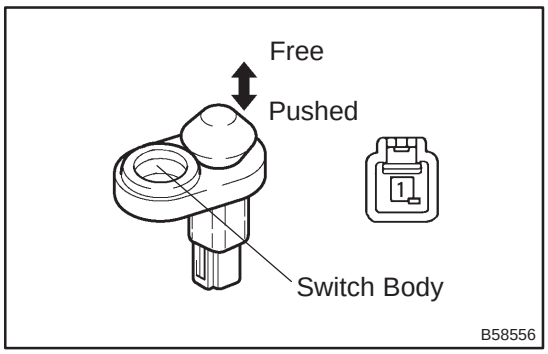
3	CHECK FRONT DOOR COURTESY LAMP SWITCH ASSY

(a) Put the dome lamp No. 2 switch in the door position and open the driver side door. Then check that the courtesy lamp comes on.

OK → **Go to step 7**

NG

4	INSPECT FRONT DOOR COURTESY LAMP SWITCH ASSY (DRIVER SIDE)



(a) Remove the courtesy lamp switch.
(b) Check the switch resistance.
Standard:

Twster Connection	Swicth	Specified Condition
1 – Swicth Body	Switch Free	10 kΩ or higher
	Switch Pushed	Below 1 Ω

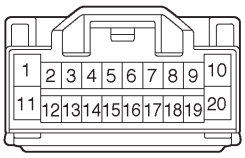
NG → **REPLACE FRONT DOOR COURTESY LAMP SWITCH ASSY**

OK

5	CHECK WIRE HARNESS (INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY) – FRONT DOOR COURTESY LAMP SWITCH ASSY)

Wire Harness Side

DB
Instrument Panel J/B Assy



D9*1
D10*2
Y Front Door Courtesy Lamp Switch Assy

Y B68145

(a) Disconnect the DB J/B connector.
(b) Disconnect the D9 or D10 switch connector.
(c) Check the resistance of the wire harness side connectors.

Standard

Tester Connection	Specified Condition
*1 DB–13 (DCTY) – D9–1 *2 DB–13 (DCTY) – D10–1	Below 1 Ω
DB–13 (DCTY) – Body ground	10 kΩ or higher

HINT:
*1: RHD
*2: LHD

OK → **REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY**

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

6	READ VALUE OF HAND–HELD TESTER (UNLOCK WARNING SWITCH ASSY)

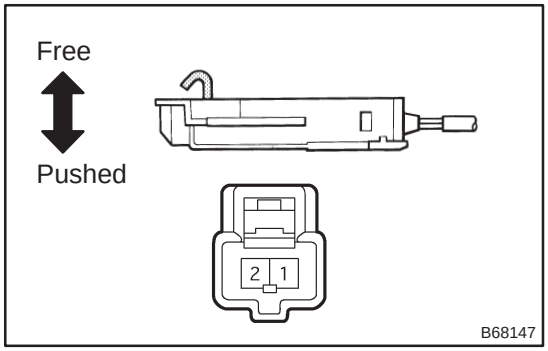
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item KEY UNLK WRN SW in the DATA LIST and read its value displayed on the hand–held tester.

Standard:
ON: The key is in the ignition key cylinder
OFF: No key is in the ignition key cylinder

OK → **Go to step 9**

NG

7 INSPECT UNLOCK WARNING SWITCH ASSY



(a) Remove the unlock warning switch.
(b) Check the switch resistance.

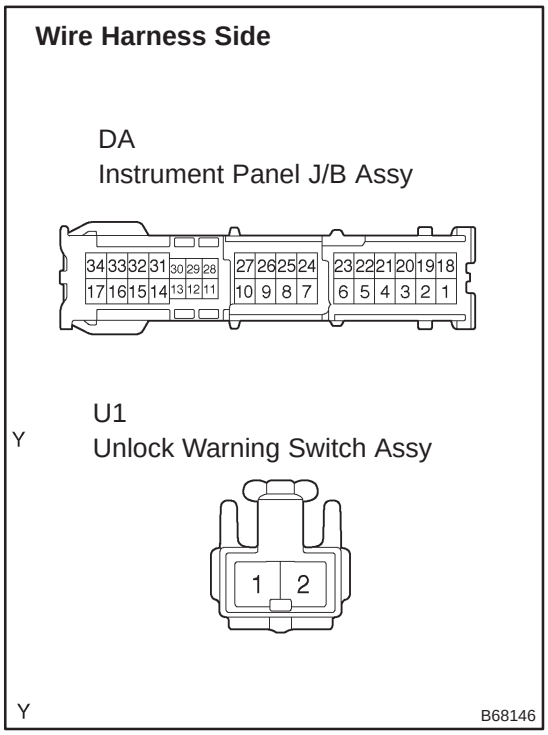
Standard:

Tester Connection	Switch Position	Specified Condition
1 – 2	Free	10 kΩ or higher
	Pushed	Below 1 Ω

NG → **REPLACE UNLOCK WARNING SWITCH ASSY**

OK

8 CHECK WIRE HARNESS (INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY) – UNLOCK WARNING SWITCH ASSY) (UNLOCK WARNING SWITCH ASSY – BODY GROUND)



(a) Disconnect the DA J/B connector.
(b) Disconnect the U1 switch connector.
(c) Check the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
DA–8 (KSW) – U1–2	Below 1 Ω
U1–1 – Body ground	
DA–8 (KSW) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

9	CHECK BUZZER (COMBINATION METER)

(a) Check if the seat belt warning buzzer sounds when the vehicle speed is 15 km/h (9 mph) or more (See page 05–1509).

HINT:

When the seat belt warning buzzer sounds, the instrument panel J/B is abnormal.

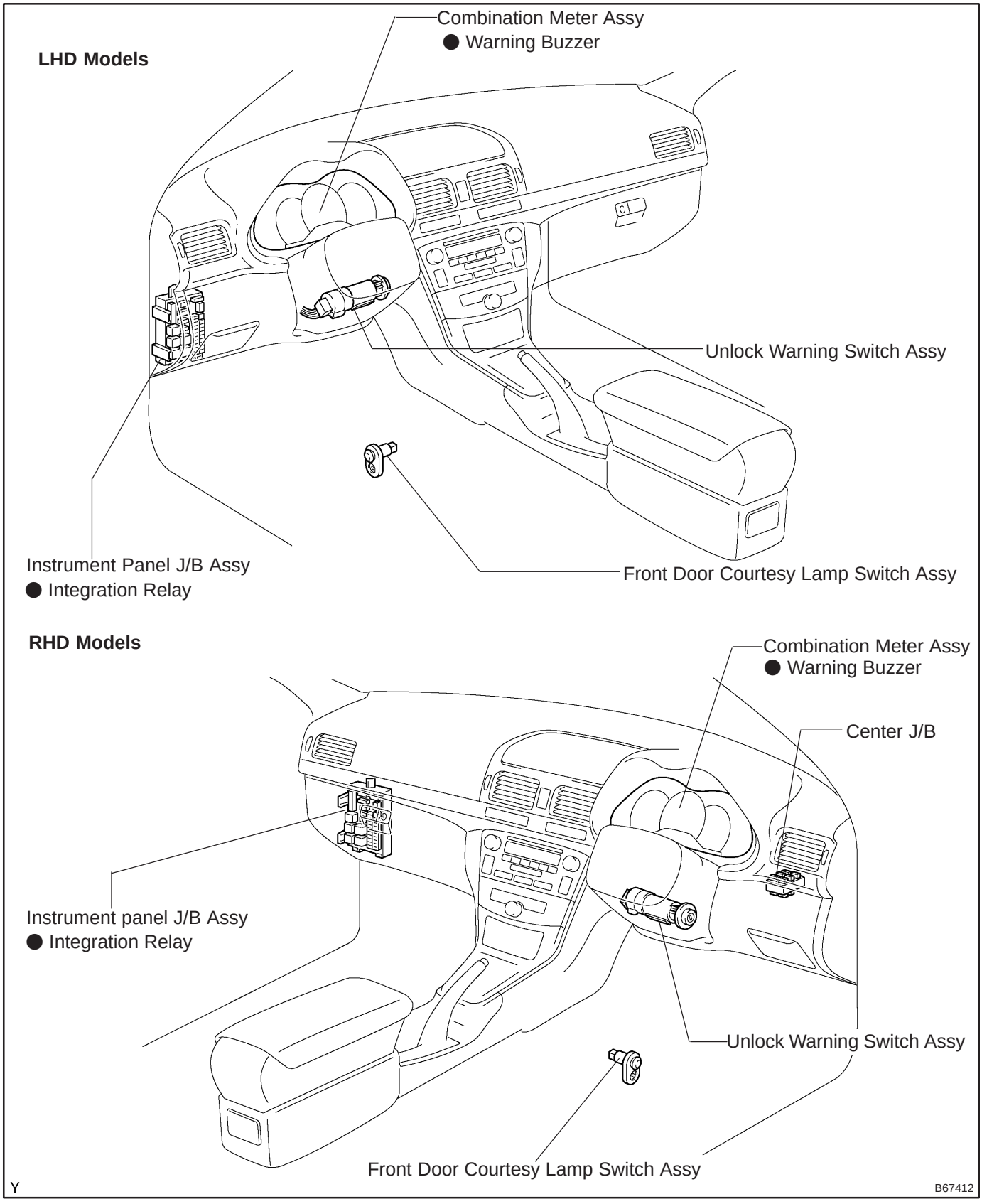
NG → REPLACE COMBINATION METER ASSY

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

05AF5–02

LOCATION



05AF0–02

PRE–CHECK

1. USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.

(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:

The hand–held tester has a ”Snapshot” function which records the monitored data.

Refer to the hand–held tester operator’s manual for further details.

2. DATA LIST

HINT:

Using the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator etc. without parts removal. Reading the DATA LIST as the first step of troubleshooting is one way to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) Read the DATA LIST according to the display on tester.

Standard (Integuration relay):

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
KEY UNLK WRN SW	Unlock warning switch signal/ ON or OFF	ON: Key is in ignition key cylinder OFF: No key is in ignition key cylinder	–
D DOOR CTY SW	Driver side door courtesy switch signal/ ON or OFF	ON: Driver side door is open OFF: Driver side door is closed	–

05AF2–02

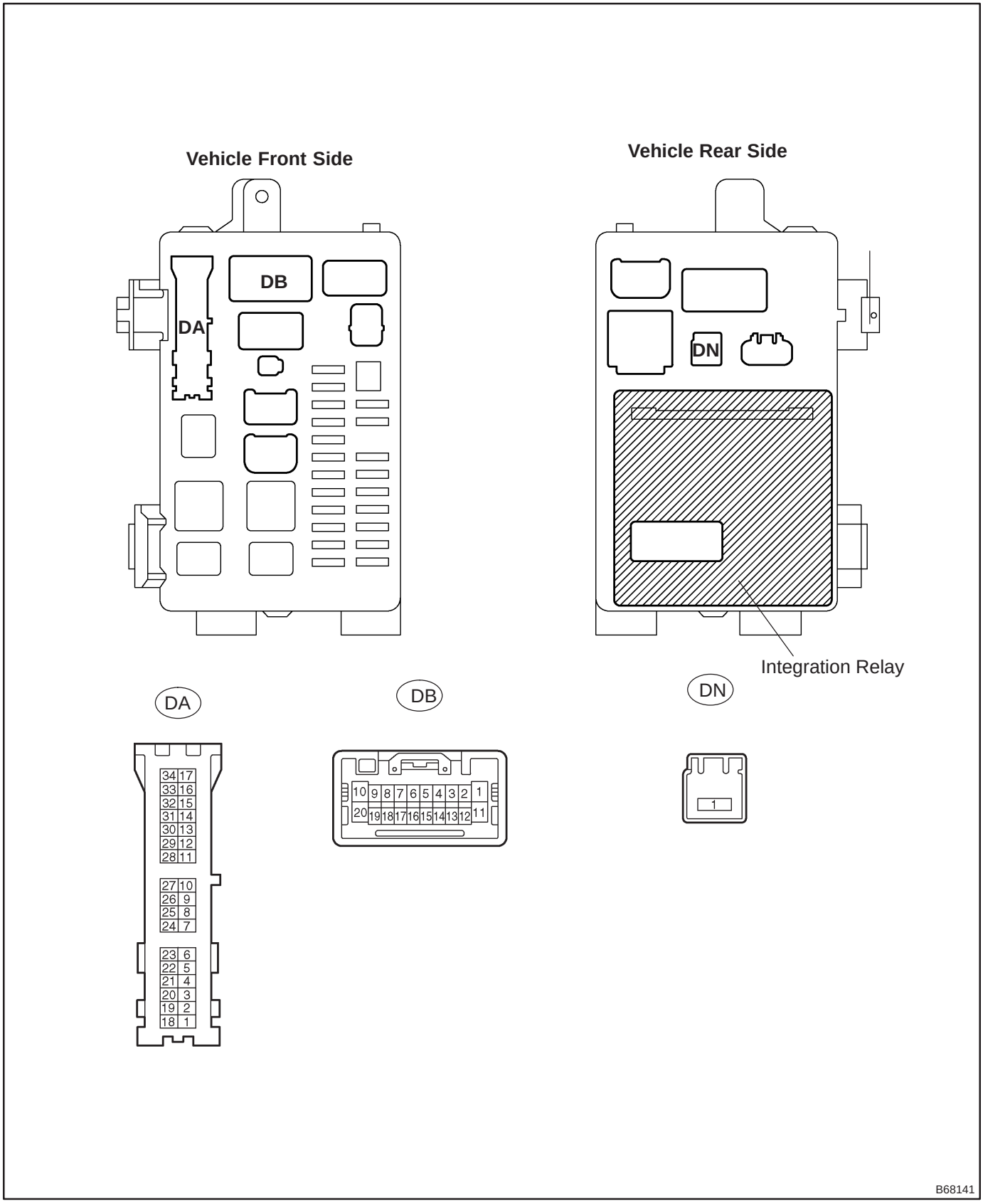
PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
Key reminder buzzer does not sound	1. Unlock warning switch assy	05–1594
	2. Front door courtesy lamp switch (Driver side)	05–1594
	3. Instrument panel junction block assy (Integration relay)	05–1591
	4. Combination meter	–
	5. Wire harness	–

05AF1–02

TERMINALS OF ECU

1. INSPECT INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY)



(a) Disconnect the DA, DB and DN J/B connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connectors.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
B (DB–16) – Body ground	W–R – Body ground	Constant	10 to 14 V
B (DN–1) – Body ground	*1 B–G – Body ground		
	*2 B–L – Body ground		10 to 14 V
E (DA–9) – Body ground	W–B – Body ground	Constant	Below 1Ω
KSW (DA–8) – Body ground	Y – Body ground	No key is inserted in ignition key cylinder → Key inserted	10 kΩ or higher → Below 1Ω

HINT:
*1: Except 1CD–FTV
*2: 1CD–FTV
If the result is not as specified, there may be a malfunction on the wire harness side.
(c) Reconnect the DA, DB and DN J/B connectors.
(d) Check the voltage of each terminal of the connectors.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
DCTY (DB–13) – Body ground	R – Body ground	Drive side door CLOSED → OPEN	10 to 14 V → Below 1 V

If the result is not as specified, the J/B may have a malfunction.

DTC	B1214	DOOR SYSTEM COMMUNICATION BUS MALFUNCTION (+B SHORT)

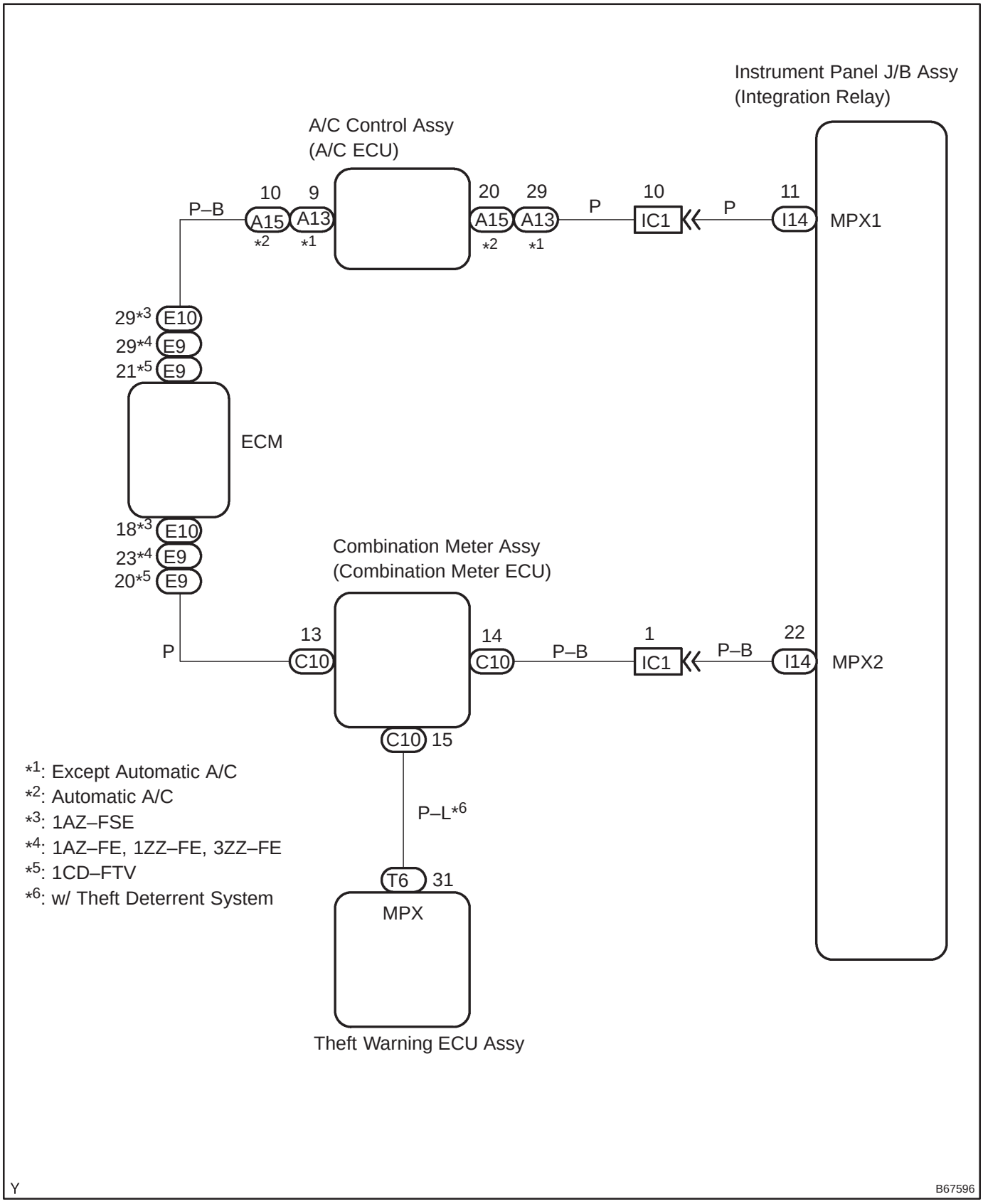
DTC	B1215	DOOR SYSTEM COMMUNICATION BUS MALFUNCTION (GND SHORT)

CIRCUIT DESCRIPTION

DTCs B1214 and B1215 are output when +B and the body ground is short–circuited on the communication bus. Detecting this condition disables all the BEAN communication and outputs some DTCs.

DTC No.	DTC Detection Condition	Trouble Area
B1214	Communication circuit and +B battery system short	• ECM • A/C control assy (A/C ECU) • Combination meter assy • Theft warning ECU assy • Wire harness • Instrument panel J/B assy (Integration relay)
B1215	Communication circuit and body ground short	• ECM • A/C control assy (A/C ECU) • Combination meter • Theft warning ECU assy • Wire harness • Instrument panel J/B assy (Integration relay)

WIRING DIAGRAM



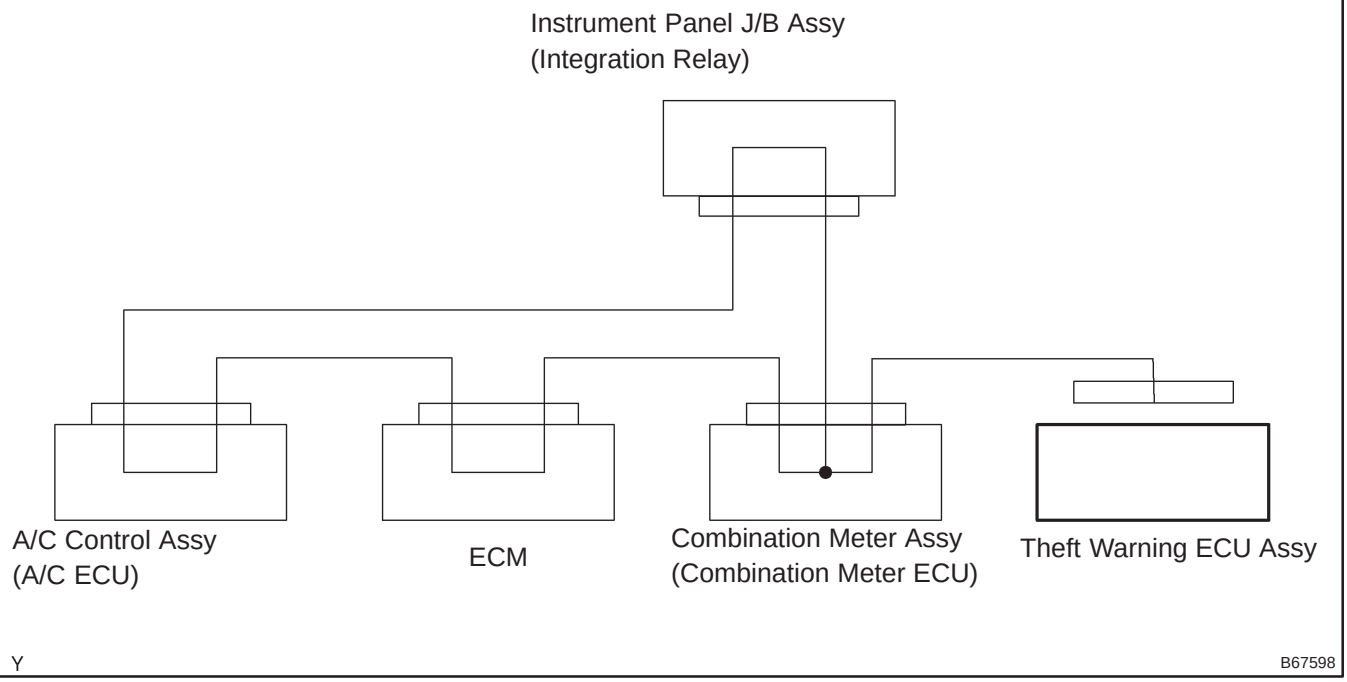
INSPECTION PROCEDURE

NOTICE:

Disconnect connectors in operational sequence and start the next operation after the connector is connected.

1	CHECK DTC (THEFT WARNING ECU ASSY)

(a) Check whether the outputs of the DTC stops when the theft warning ECU connector is disconnected.



HINT:

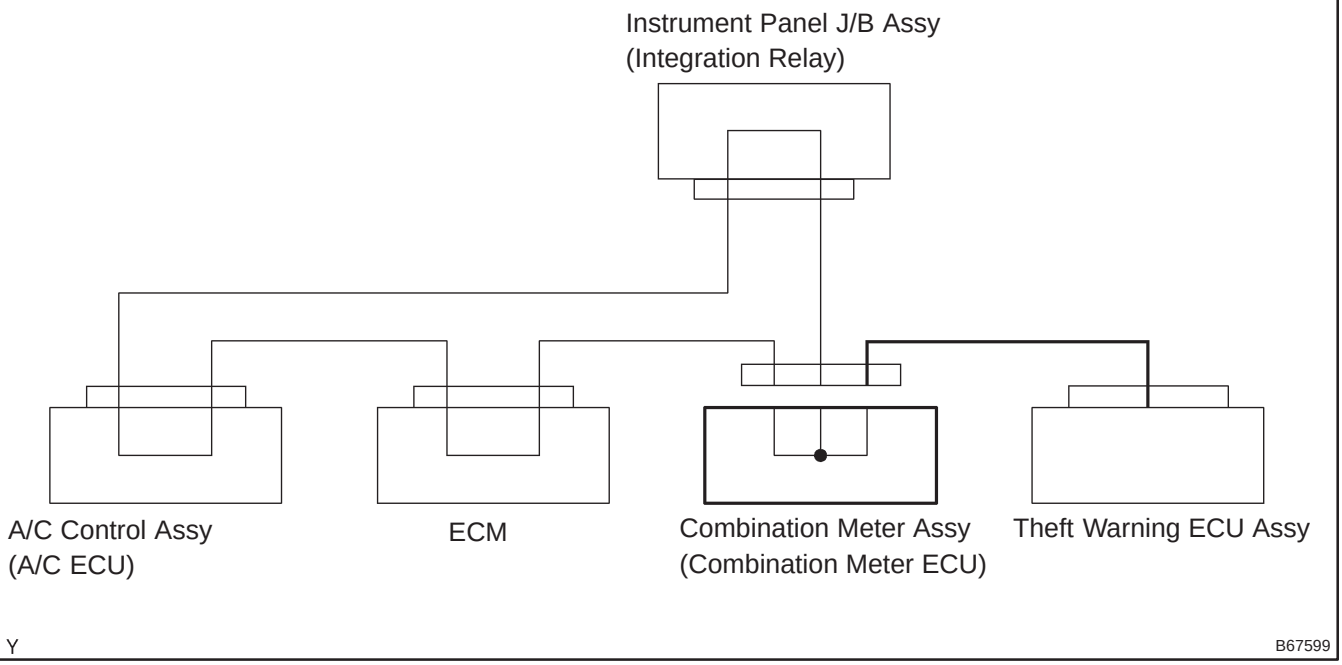
When the output of the DTC stops, the theft warning ECU is malfunctioning.

YES → **REPLACE THEFT WARNING ECU ASSY**

NO

2	CHECK DTC (COMBINATION METER ECU AND WIRE HARNESS)

(a) Check whether the outputs of the DTC stops when the combination meter ECU connector is disconnected.



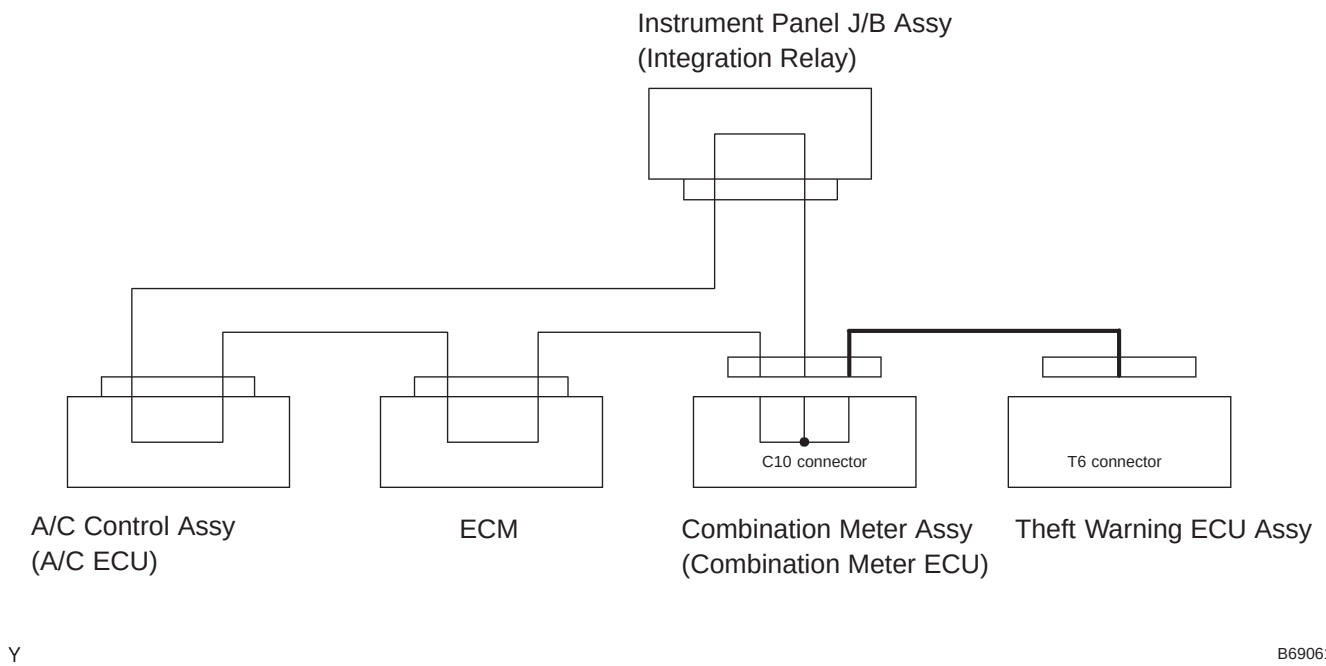
HINT:
When the output of the DTC stops, the combination meter ECU itself or the wire harness between the combination meter ECU and the theft warning ECU is malfunctioning.

NO → **Go to step 4**

YES

3	CHECK WIRE HARNESS (COMBINATION METER ECU – THEFT WARNING ECU ASSY)

(a) Disconnect the combination meter ECU and theft warning ECU connectors.
(b) Check the wire harness (MPX line) between the combination ECU and theft warning ECU.



(1) Turn the ignition switch ON.
(2) Check the voltage between the wire harness (MPX line) and the body ground.

Standard:

Tester Condition	Specified Condition
BEAN (SECURITY) (C10–15) or MPX (T6–31) – Body ground	0 V

If the output voltage is not 0 V, the wire harness (MPX line) may be short–circuited with +B.

(3) Check the resistance between the wire harness (MPX line) and the body ground.

Standard:

Tester Condition	Specified Condition
BEAN (SECURITY) (C10–15) or MPX (T6–31) – Body ground	10 kΩ or higher

When the resistance is 10 kΩ or higher, the wire harness (MPX line) and body ground may be short–circuited with the body ground.

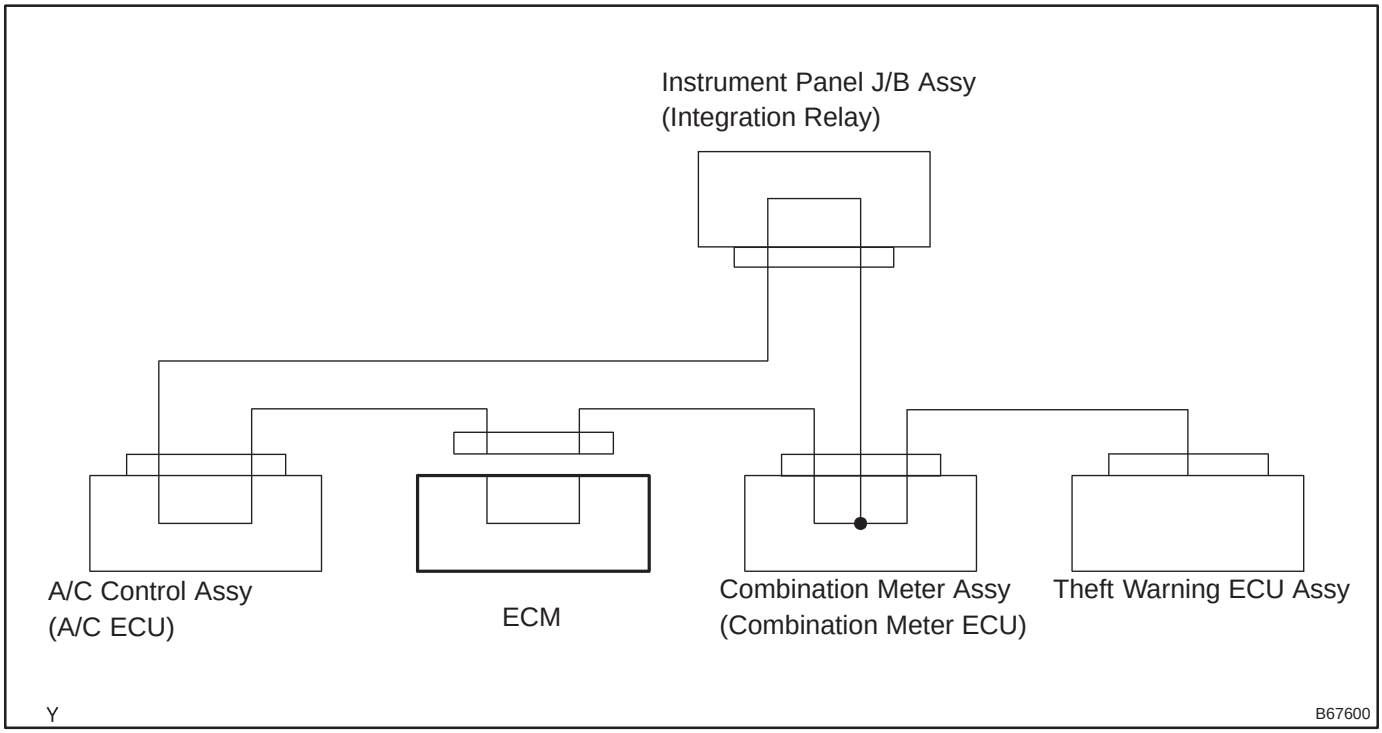
NO → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

YES

REPLACE COMBINATION METER ASSY (COMBINATION METER ECU)

4	CHECK DTC (ECM)

(a) Check whether the output of the DTC stops when the ECM connector is disconnected.



HINT:

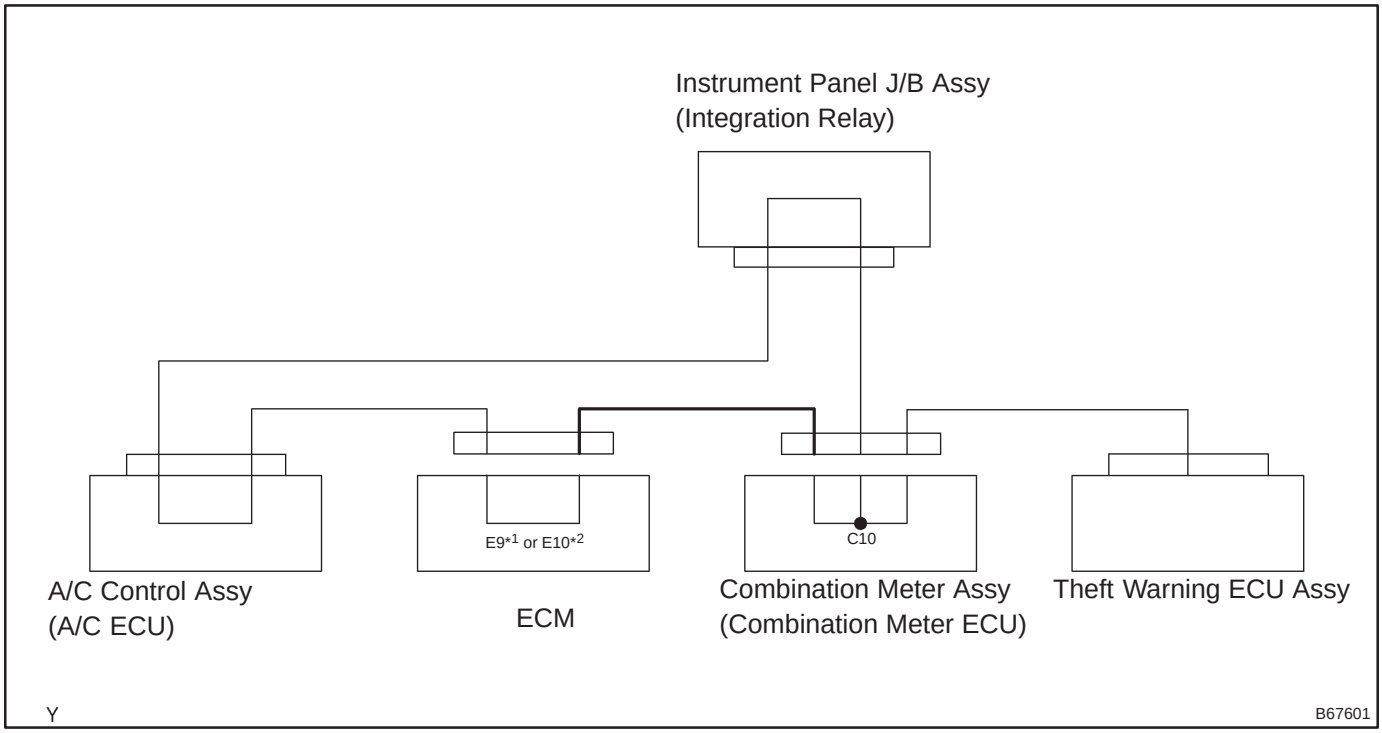
When the output of the DTC stops, the ECM is malfunctioning.

YES → **REPLACE ECM**

NO

5	CHECK WIRE HARNESS (COMBINATION METER ECU – ECM)

(a) Check whether the output of the DTC stops when the E10*1 or E9*2 connector of the ECM and the C10 connector of the combination meter ECU are disconnected.



HINT:

When the output of the DTC stops, the wire harness between the E10*1 or E9*2 connector of the ECM and the C10 connector of the combination meter ECU is malfunctioning.

*1: 1AZ–FSE

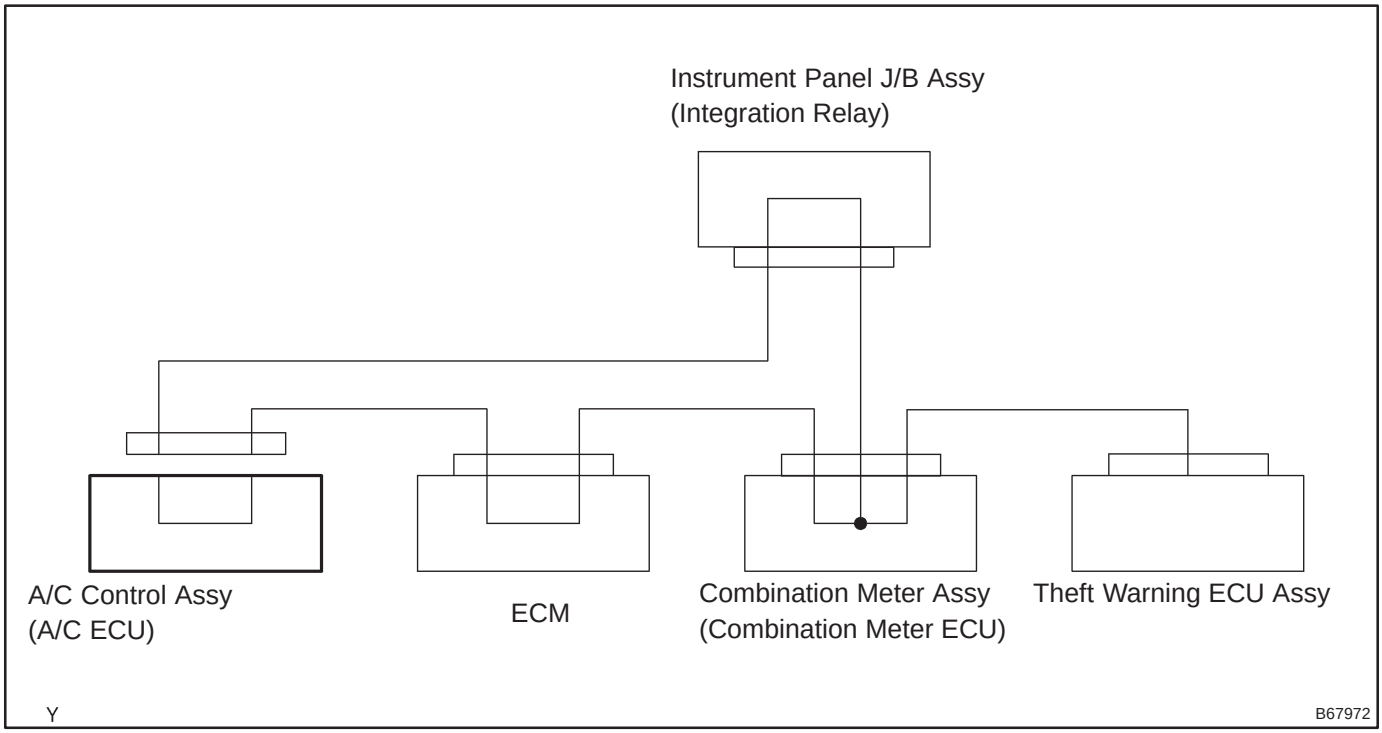
*2: Except 1AZ–FSE

YES → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

NO

6	CHECK DTC (A/C ECU)

(a) Check whether the output of the DTC stops when the A/C ECU connector is disconnected.



HINT:

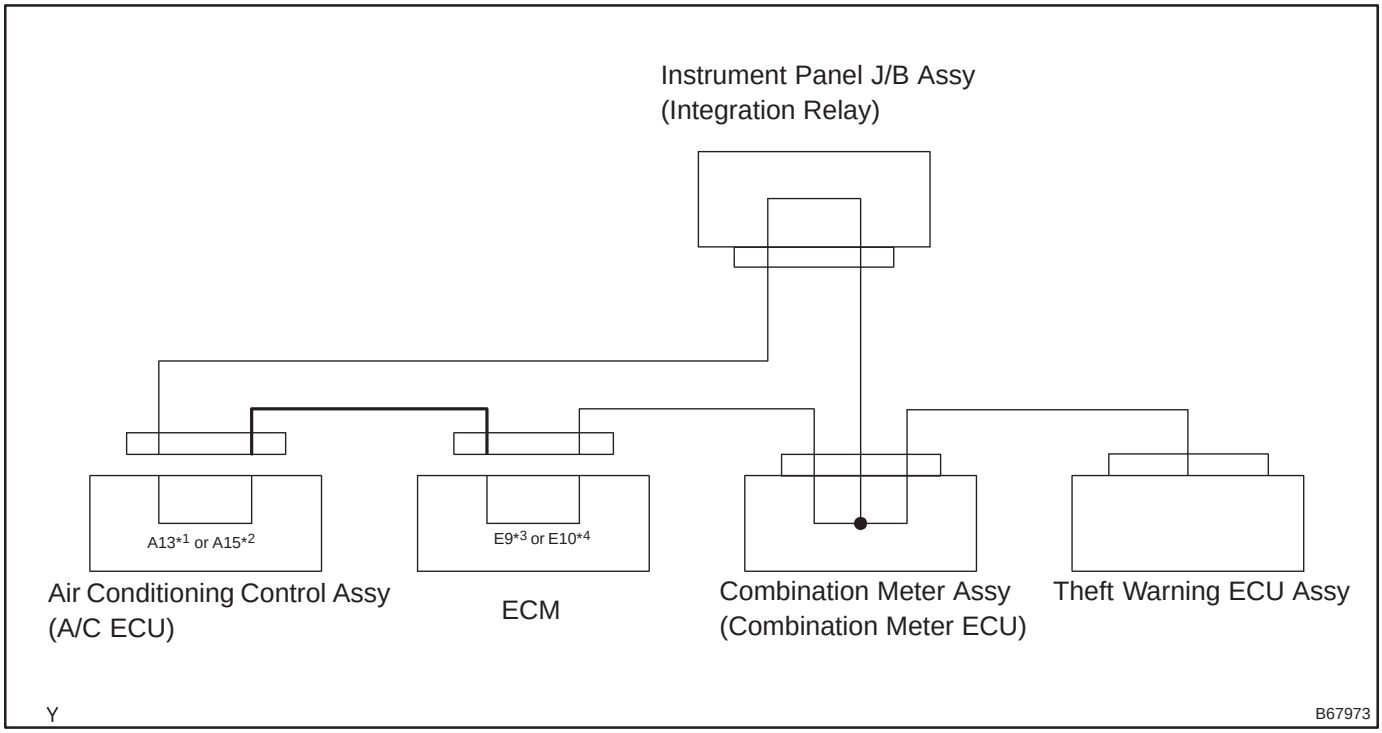
When the output of the DTC stops, the A/C ECU is malfunctioning.

YES → **REPLACE AIR CONDITIONING CONTROL ASSY (A/C ECU)**

NO

7	CHECK WIRE HARNESS (A/C ECU – ECM)

(a) Check whether the output of the DTC stops when the A13*1 or A15*2 connector of the A/C ECU and the E10*3 or E9*4 connector of the ECM are disconnected.



HINT:

When the output of the DTC stops, the wire harness between the A13*1 or A15*2 connector of the A/C ECU and the E10*3 or E9*4 connector of the ECM is malfunctioning.

*1: Except Automatic A/C

*2: Automatic A/C

*3: 1AZ–FSE

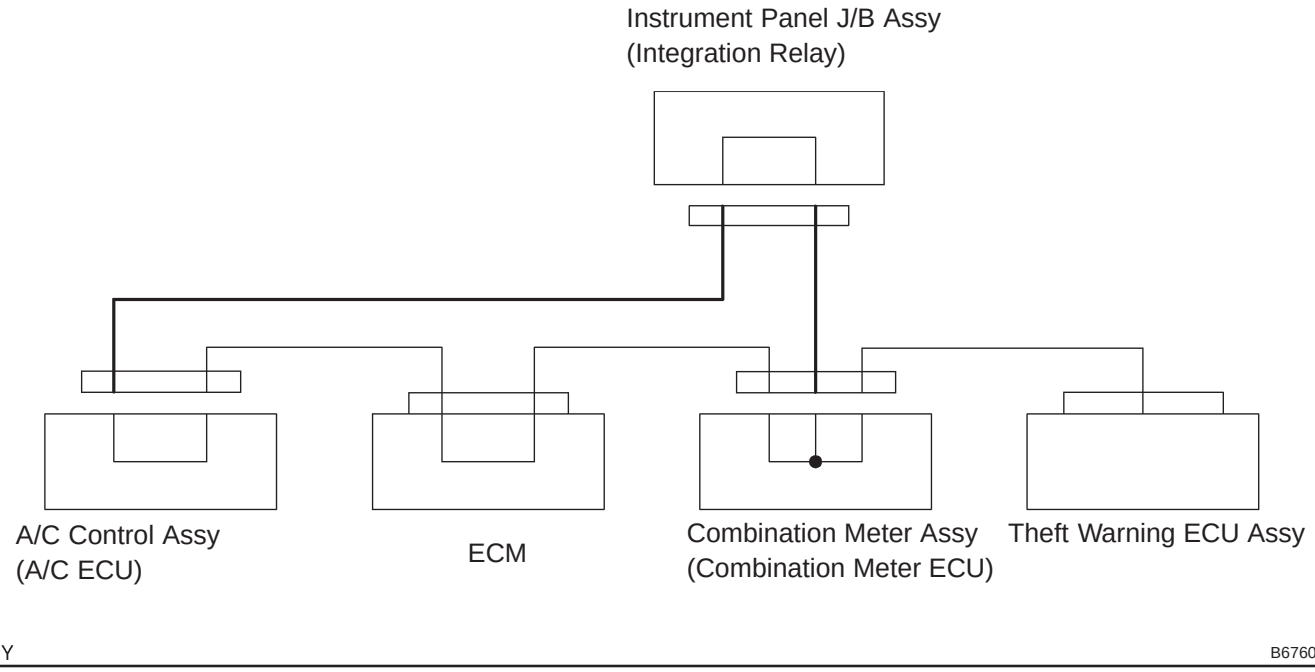
*4: Except 1AZ–FSE

YES → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

NO

8	CHECK WIRE HARNESS (INTEGRATION RELAY – A/C ECU) (INTEGRATION RELAY – COMBINATION METER ECU)

(a) Disconnect the A/C ECU, combination meter ECU and integration relay connectors.
(b) Check the wire harness (MPX lines) between the integration relay and A/C ECU as well as in between the integration relay and combination ECU.



(1) Turn the ignition switch ON.
(2) Check the voltage between the wire harness (MPX lines) and the body ground.

Standard:

Tester Condition	Specified Condition
Integration relay or A/C ECU – Body ground	0 V
Integration relay or combination meter ECU – Body ground	

If the output voltage is not 0 V, the wire harness (MPX line) may be short–circuited with +B.

(3) Check the resistance between the wire harness (MPX lines) and the body ground.

Standard:

Tester Condition	Specified Condition
Integration relay or A/C ECU – Body ground	10 kΩ or higher
Integration relay or combination meter ECU – Body ground	

When the resistance is 10 kΩ or higher, the wire harness (MPX line) and body ground may be short–circuited with the body ground.

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY (INTEGRATION RELAY)

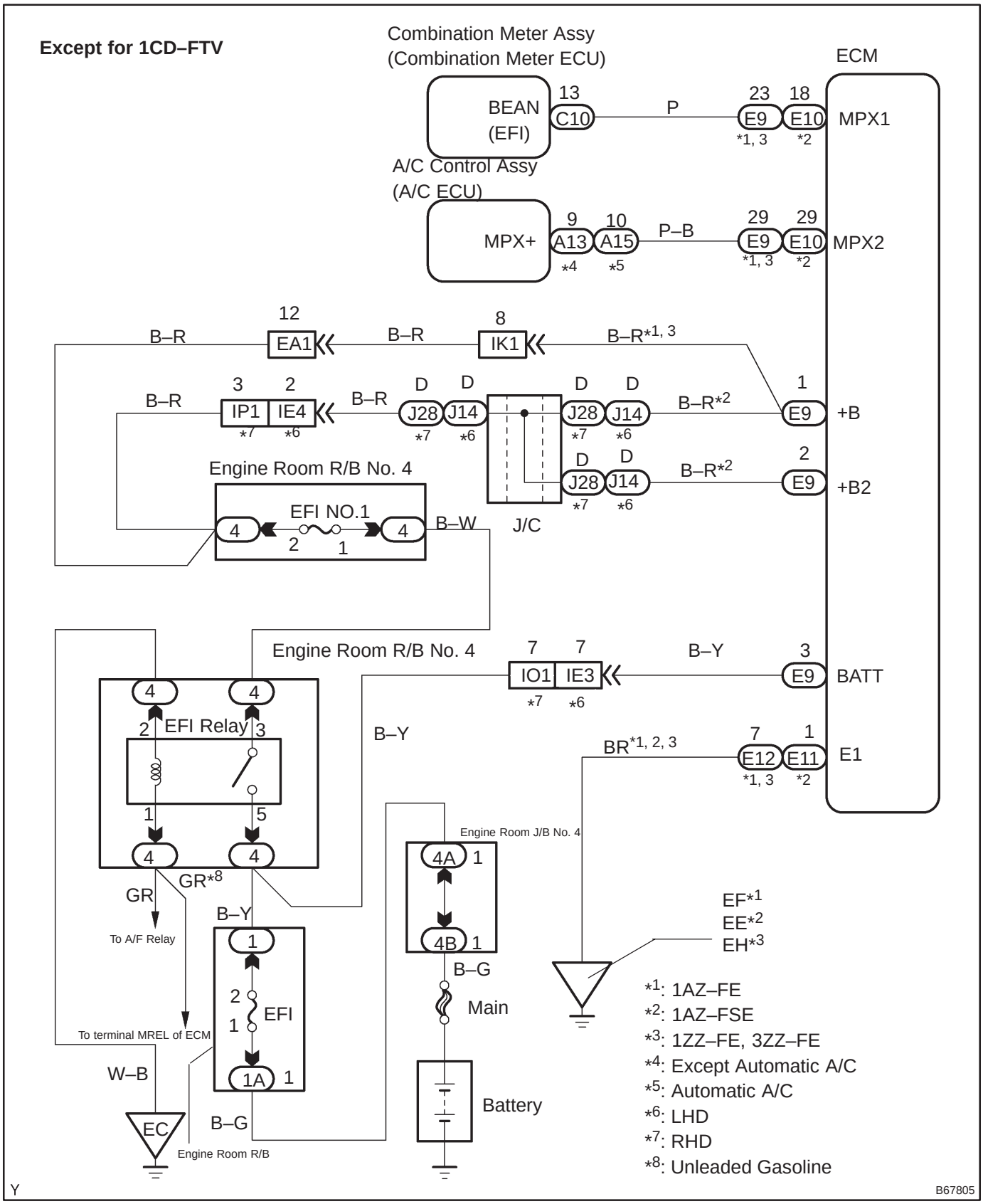
DTC	B1261	ECM (ENGINE ECU) COMMUNICATION STOP

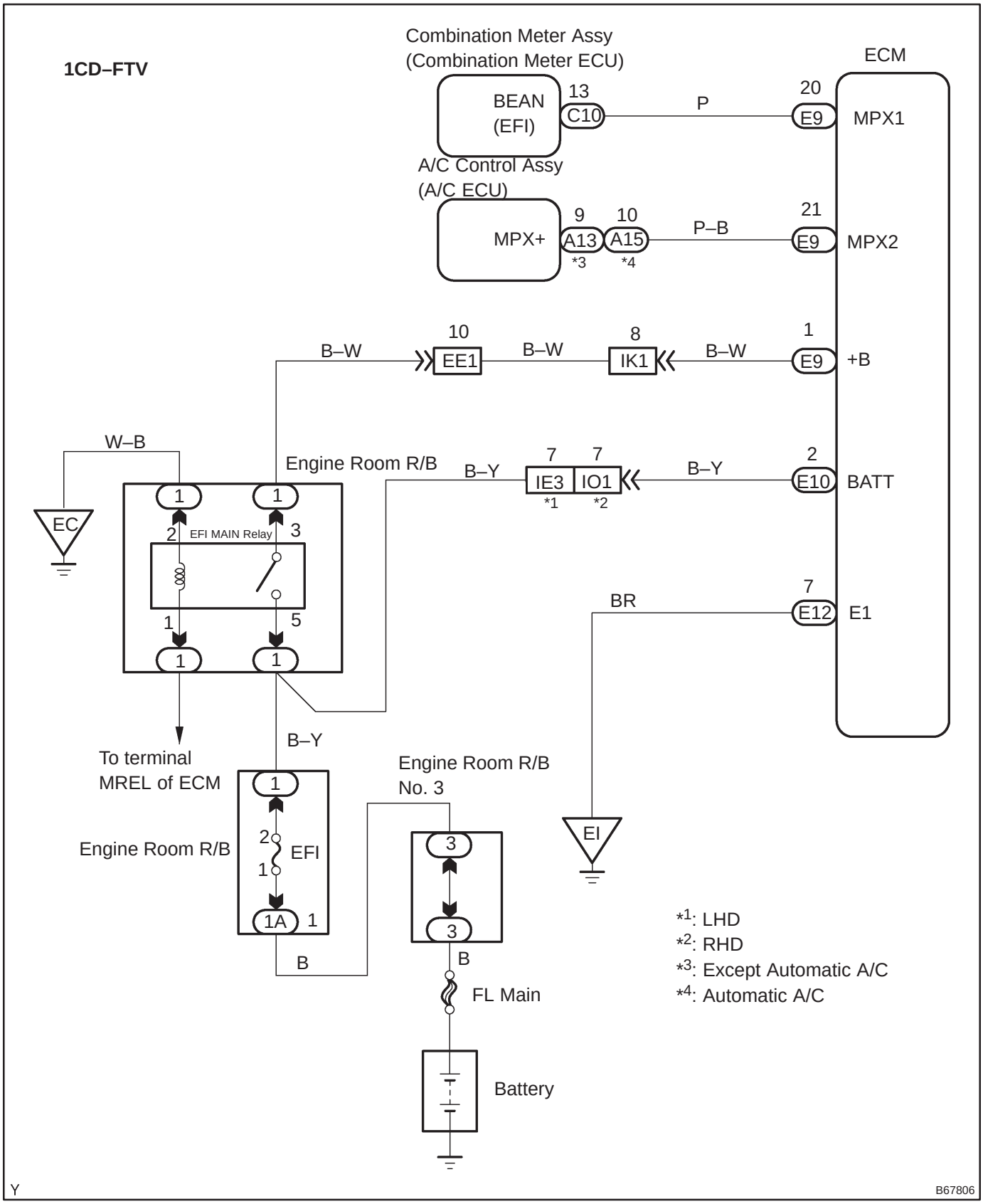
CIRCUIT DESCRIPTION

DTC B1261 is output when communication between the ECM and integration relay stops for more than 10 seconds.

DTC No.	DTC Detection Condition	Trouble Area
B1261	No communication from ECM for more than 10 seconds	• ECM • Wire harness

WIRING DIAGRAM

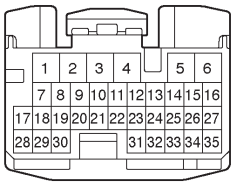



1CD–FTV
Combination Meter Assy
(Combination Meter ECU)
BEAN
(EFI)
13
C10
P
20
E9
ECM
MPX1
A/C Control Assy
(A/C ECU)
MPX+
9
A13
*3
10
A15
*4
P–B
21
E9
MPX2
10
EE1
B–W
B–W
8
IK1
B–W
1
E9
+B
W–B
Engine Room R/B
B–Y
7
IE3
*1
7
IO1
*2
B–Y
2
E10
BATT
EC
EFI MAIN Relay
2
3
1
5
1
1
1
1
BR
7
E12
E1
To terminal
MREL of ECM
B–Y
Engine Room R/B
No. 3
Engine Room R/B
2
EFI
1
1A
1
B
3
3
B
FL Main
Battery
EI
*1: LHD
*2: RHD
*3: Except Automatic A/C
*4: Automatic A/C
Y
B67806

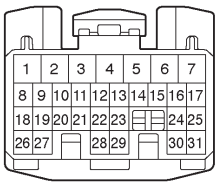
1 CHECK RESISTANCE OF COMMUNICATION LINE

Wire Harness Side

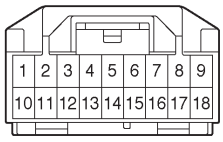
E10*2
ECM



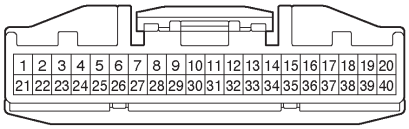
Y E9*1, 3, 4
ECM



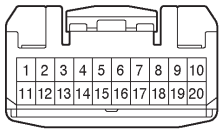
Y C10
Combination Meter Assy
(Combination Meter ECU)



Y A13*5
A/C Control Assy
(A/C ECU)



Y A15*6
A/C Control Assy
(A/C ECU)



B68027

(a) Disconnect the E9 or E10 ECM, C10 and A13 or A15 ECU connectors.

(b) Check the resistance between wire harness side connectors.

Standard:

1AZ–FSE

Tester Connection	Specified Condition
E10–18 (MPX1) – C10–13 (BEAN)	Below 1 Ω
*5 E10–29 (MPX2) – A13–9 (MPX+)	
*6 E10–29 (MPX2) – A15–10 (MPX+)	

1AZ–FE, 1ZZ–FE, 3ZZ–FE

Tester Connection	Specified Condition
E9–23 (MPX1) – C10–13 (BEAN)	Below 1 Ω
*5 E9–29 (MPX2) – A13–9 (MPX+)	
*6 E9–29 (MPX2) – A15–10 (MPX+)	

1CD–FTV

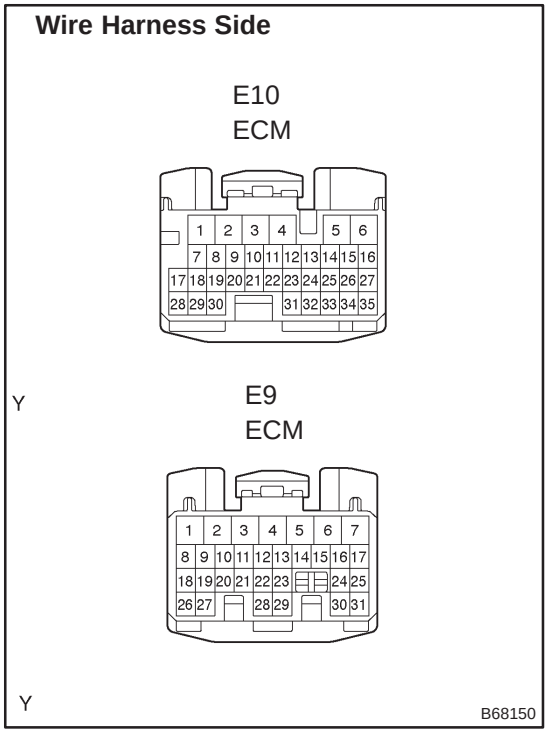
Tester Connection	Specified Condition
E9–20 (MPX1) – C10–13 (BEAN)	Below 1 Ω
*5 E9–21 (MPX2) – A13–9 (MPX+)	
*6 E9–21 (MPX2) – A15–10 (MPX+)	

HINT:
*1: 1AZ–FE
*2: 1AZ–FSE
*3: 1ZZ–FE, 3ZZ–FE
*4: 1CD–FTV
*5: Except Automatic A/C
*6: Automatic A/C

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 CHECK ECM (POWER SOURCE)



(a) Disconnect the E10 or E9 ECM connector.
(b) Check the voltage between the wire harness side connectors and the body ground.

Standard:

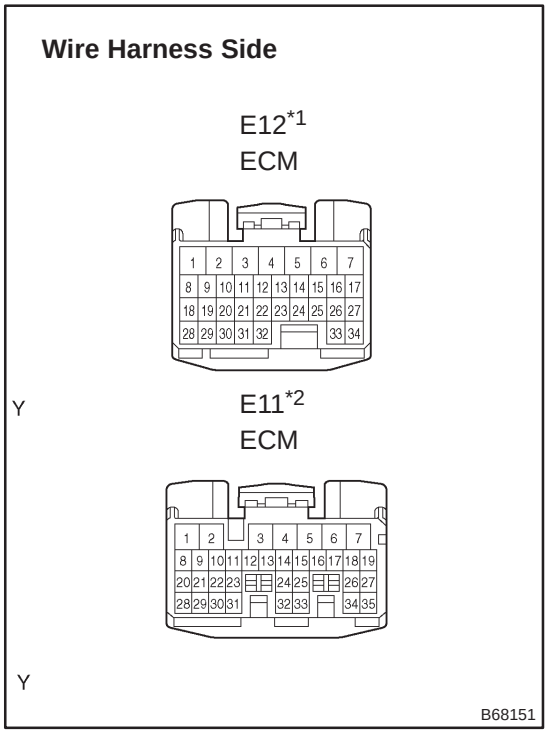
Tester Connection	Specified Condition
+B (E9–1) – Body ground	10 to 14 V
*1 +B2 (E9–2) – Body ground	
*1 BATT (E9–3) – Body ground	
*2 BATT (E10–2) – Body ground	

HINT:
*1: Except 1CD–FTV
*2: 1CD–FTV

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK ECM (GROUND)



(a) Disconnect the E12 or E11 ECM connector.
(b) Check the resistance between the wire harness side connectors and the body ground.

Standard:

Tester Connection	Specified Condition
*1 E12–7 (E1) – Body ground	Below 1 Ω
*2 E11–1 (E1) – Body ground	

HINT:
*1: Except 1AZ–FSE
*2:1AZ–FSE

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

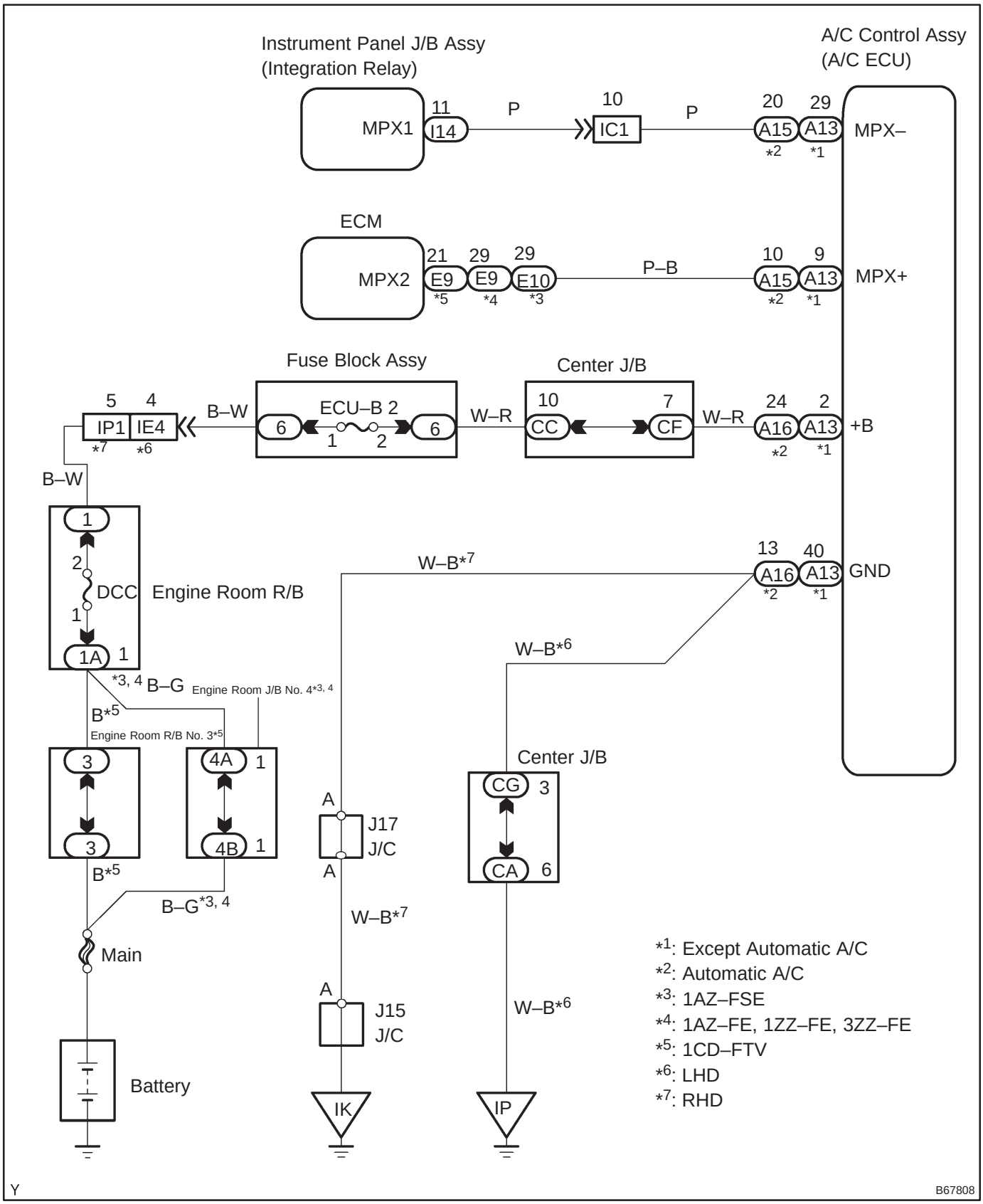
DTC B1262 A/C ECU COMMUNICATION STOP

CIRCUIT DESCRIPTION

DTC B1262 will be output when the communication between the A/C ECU and the integration relay stops for more than 10 seconds.

DTC No.	DTC Detection Condition	Trouble Area
B1262	No communication from A/C ECU for more than 10 seconds	• A/C control assy (A/C ECU) • Wire harness

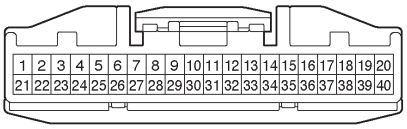
WIRING DIAGRAM



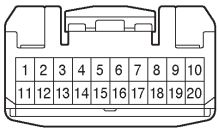
1 CHECK RESISTANCE OF COMMUNICATION LINE

Wire Harness Side

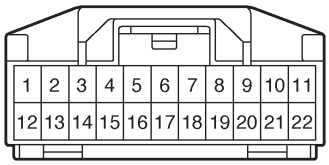
A13*1
Air Conditioning Control Assy



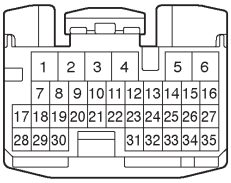
A15*2
Y Air Conditioning Control Assy



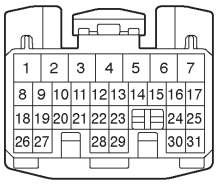
I14
Y Instrument Panel J/B Assy
(Integration Relay)



E10*3
ECM



E9*4, 5
Y ECM



Y

B68152

(a) Disconnect the A13 or A15, E10 or E9 and I14 connectors.

(b) Check the resistance between wire harness side connectors.

Standard:

1AZ–FSE

Tester Connection	Specified Condition
*1 A13–29 (MPX–) – I14–11 (MPX1)	Below 1 Ω
*2 A15–20 (MPX–) – I14–11 (MPX1)	
*1 A13–9 (MPX+) – E10–29 (MPX2)	
*2 A15–10 (MPX+) – E10–29 (MPX2)	

1AZ–FE, 1ZZ–FE, 3ZZ–FE

Tester Connection	Specified Condition
*1 MPX– (A13–29) – MPX1 (I14–11)	Below 1 Ω
*2 MPX– (A15–20) – MPX1 (I14–11)	
*1 MPX+ (A13–9) – MPX2 (E9–29)	
*2 MPX+ (A15–10) – MPX2 (E9–29)	

1CD–FTV

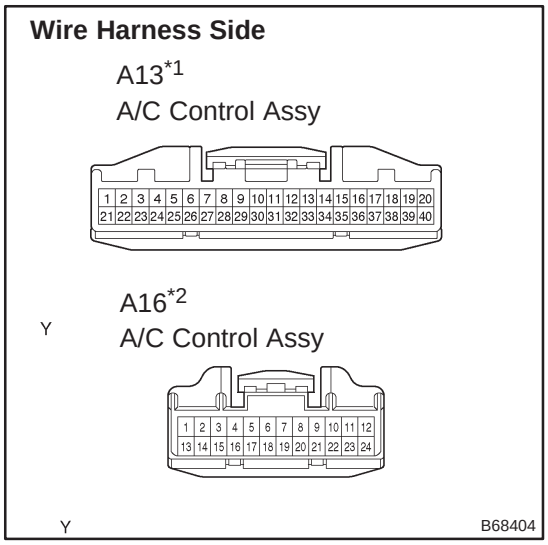
Tester Connection	Specified Condition
*1 MPX– (A13–29) – MPX1 (I14–11)	Below 1 Ω
*2 MPX– (A15–20) – MPX1 (I14–11)	
*1 MPX+ (A13–9) – MPX2 (E9–21)	
*2 MPX+ (A15–10) – MPX2 (E9–21)	

HINT:
*1: Except automatic A/C
*2: Automatic A/C
*3: 1AZ–FSE
*4: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*5: 1CD–FTV

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 CHECK AIR CONDITIONING CONTROL ASSY (A/C ECU) (POWER SOURCE)



(a) Disconnect the A13 or A16 ECU connector.
(b) Check the voltage between the wire harness side connectors and the body ground.

Standard:

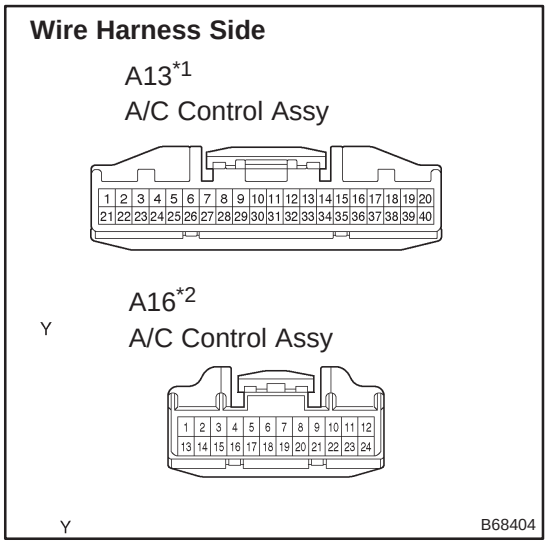
Tester Connection	Specified Condition
*1 A13–2 (+B) – Body ground	10 to 14 V
*2 A16–24 (+B) – Body ground	

*1: Except Automatic A/C
*2: Automatic A/C

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK AIR CONDITIONING CONTROL ASSY (A/C ECU) (GROUND)



(a) Disconnect the A13 or A16 ECU connector.
(b) Check the voltage between the wire harness side connectors and the body ground.

Standard:

Tester Connection	Specified Condition
*1 A13–40 (GND) – Body ground	10 to 14 V
*2 A16–3 (GND) – Body ground	

*1: Except Automatic A/C
*2: Automatic A/C

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE AIR CONDITIONING CONTROL ASSY

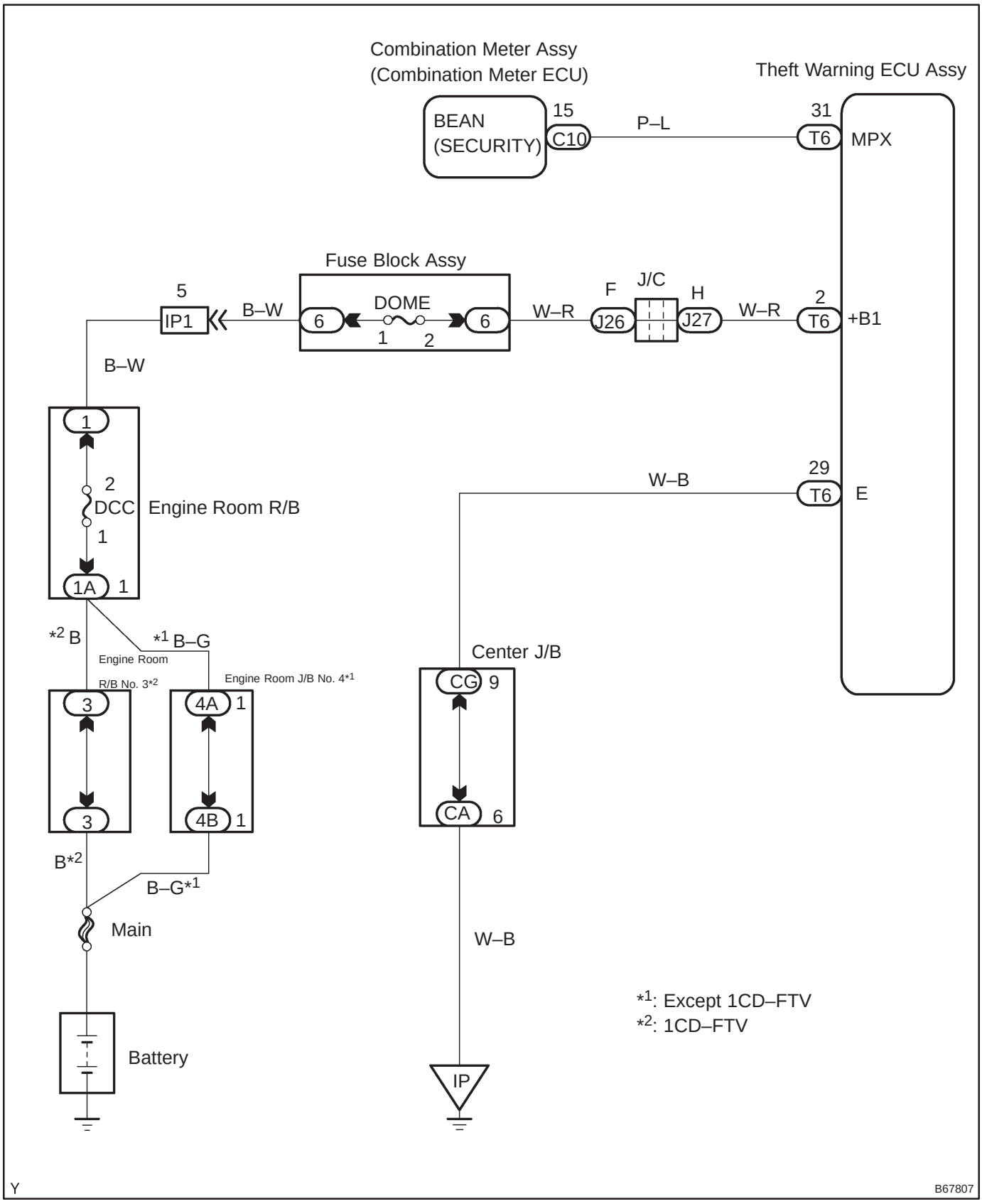
DTC	B1269	THEFT DETERRENT ECU COMMUNICATION STOP

CIRCUIT DESCRIPTION

DTC B1269 is output when communication between the theft warning ECU and the combination meter stops for more than 10 seconds.

DTC No.	DTC Detection Condition	Trouble Area
B1269	No communication from theft deterrent ECU for more than 10 seconds	• Theft warning ECU assy • Wire harness

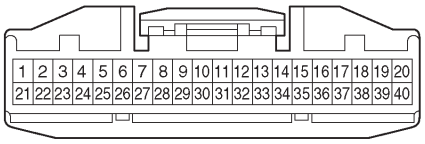
WIRING DIAGRAM



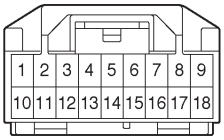
1 CHECK RESISTANCE OF COMMUNICATION LINE

Wire Harness Side

T6
Theft Warning ECU Assy



C10
Combination Meter Assy
(Combination Meter ECU)



Y

B68155

(a) Disconnect the T6 and C10 ECU connectors.
(b) Check the resistance between wire harness side connectors.

Standard:

Tester Connection	Specified Condition
T6–31 (MPX) – C10–15 (BEAN) (Security)	Below 1 Ω

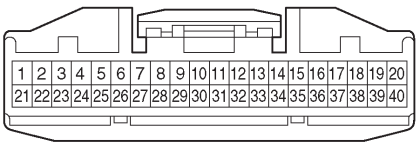
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 CHECK THEFT WARNING ECU ASSY (POWER SOURCE)

Wire Harness Side

T6
Theft Warning ECU Assy



B65849

(a) Disconnect the T6 ECU connector.
(b) Check the voltage between the wire harness side connector and the body ground.

Standard:

Tester Connection	Specified Condition
T6–2 (+B1) – Body ground	10 to 14 V

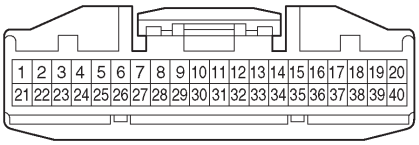
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK THEFT WARNING ECU ASSY (GROUND)

Wire Harness Side

T6
Theft Warning ECU Assy



B65849

(a) Disconnect the T6 ECU connector.
(b) Check the resistance between the wire harness side connector and the body ground.

Standard:

Tester Connection	Specified Condition
T6–29 (E) – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE THEFT WARNING ECU ASSY

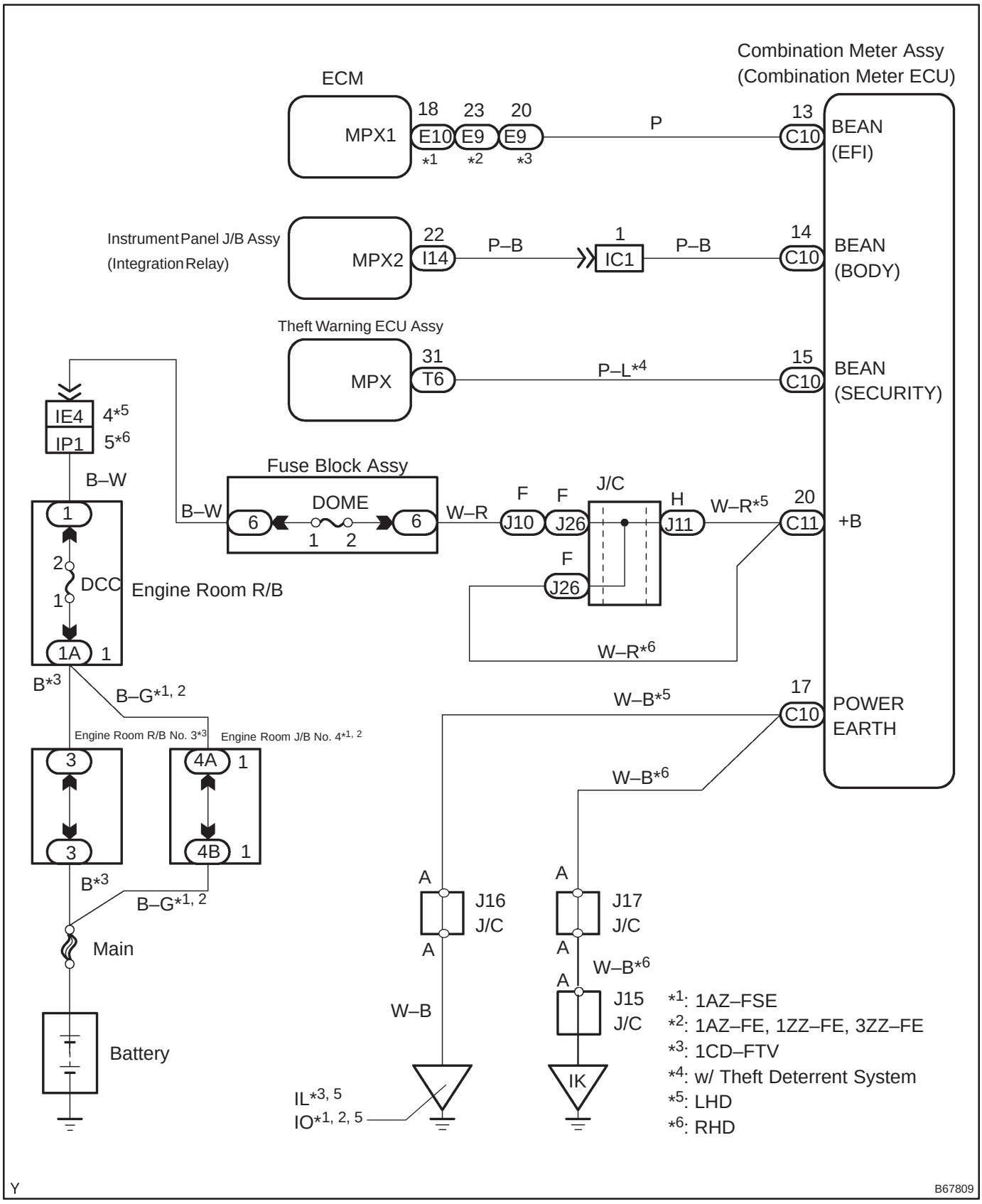
DTC	B1271	COMBINATION METER ECU COMMUNICATION STOP

CIRCUIT DESCRIPTION

DTC B1271 is output when communication between the combination meter and integration relay stops for more than 10 seconds.

DTC No.	DTC Detection Condition	Trouble Area
B1271	No communication from Combination meter ECU for more than 10 seconds	• Combination meter assy (Combination meter ECU) • Wire harness

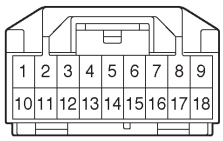
WIRING DIAGRAM



1 CHECK RESISTANCE OF COMMUNICATION LINE

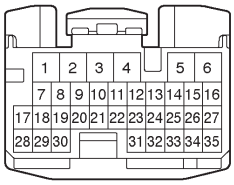
Wire Harness Side

C10
Combination Meter Assy
(Combination Meter ECU)



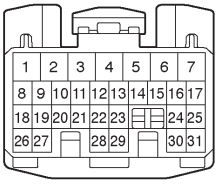
Y

E10*1
ECM



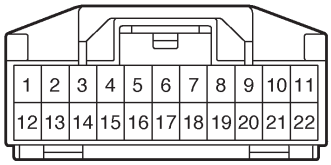
Y

E9*2, 3
ECM

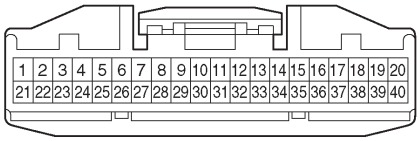


Y

I14
Instrument Panel J/B Assy
(Integration Relay)



T6
Theft Warning ECU Assy



B68156

(a) Disconnect the C10, E10 or E9, T6 and I14 connectors.
(b) Check the resistance between wire harness side connectors.

Standard:

Tester Connection	Specified Condition
*1 C10–13 (BEAN) (EFI) – E10–18 (MPX1)	Below 1 Ω
*2 C10–13 (BEAN) (EFI) – E9–23 (MPX1)	
*3 C10–13 (BEAN) (EFI) – E9–20 (MPX1)	
C10–14 (BEAN) (BODY) – I14–22 (MPX2)	
C10–15 (BEAN) (SECURITY) – T6–31 (MPX)	

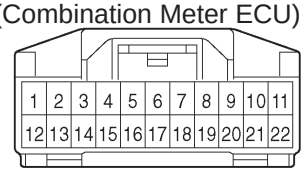
HINT:
*1: 1AZ–FSE
*2: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*3: 1CD–FTV

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 CHECK COMBINATION METER ASSY (COMBINATION METER ECU) (POWER SOURCE)

Wire Harness Side
C11
Combination Meter Assy
(Combination Meter ECU)



Y B67965

(a) Disconnect the C11 ECU connector.
(b) Check the voltage between the wire harness side connector and the body ground.

Standard:

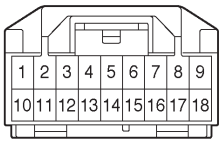
Tester Connection	Specified Condition
C11–20 (+B) – Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK COMBINATION METER ASSY (COMBINATION METER ECU) (GROUND)

Wire Harness Side
C10
Combination Meter Assy
(Combination Meter ECU)



B68158

(a) Disconnect the C10 ECU connector.
(b) Check the resistance between the wire harness side connector and the body ground.

Standard:

Tester Connection	Specified Condition
C10–17 (POWER EARTH) – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE COMBINATION METER ASSY (COMBINATION METER ECU) (See page 05–1509)

05AEQ–02

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the chart below (Proceed to the page given for that circuit).

DTC No. (See Page)	Detection Item	Trouble Area
B1214 (05–1670)	Door System Communication Bus Malfunction (+B Short)	• Wire harness • ECM • A/C control assy (A/C ECU) • Theft warning ECU assy • Combination meter assy (Combination meter ECU) • Instrument panel J/B assy (Integration relay)
B1215 (05–1670)	Door System Communication Bus Malfunction (GND Short)	• Wire harness • ECM • A/C control assy (A/C ECU) • Theft warning ECU assy • Combination meter assy (Combination meter ECU) • Instrument panel J/B assy (Integration relay)
B1261 (05–1680)	ECM Communication Stop	• Wire harness • ECM
B1262 (05–1685)	A/C ECU Communication Stop	• Wire harness • A/C assy (A/C ECU)
B1269 (05–1689)	Theft Deterrent ECU Communication Stop	• Wire harness • Theft warning ECU assy
B1271 (05–1693)	Combination Meter ECU Communication Stop	• Wire harness • Combination meter assy (Combination meter ECU)

MULTIPLEX COMMUNICATION SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

05AEO–02

HINT:

- Use this procedure to troubleshoot the key reminder warning system.
  The hand–held tester should be used at step 3 and 4.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM

3	DTC CHECK (See page 05–1656)

(a) Check for DTCs and note any codes that are output.
(b) Delete the DTC.
(c) Recheck for DTCs. Try to prompt the DTC by simulating the original activity that the DTC suggests.
  (1) If the DTC does not reoccur, proceed to A.
  (2) If the DTC reoccurs, proceed to B.

B	Go to step 5

A

4	PERFORM TROUBLESHOOTING ACCORDING TO MALFUNCTION SYMPTOM

(a) Pre–check (See page 05–1655).
(b) Terminals of ECU (See page 05–1659).

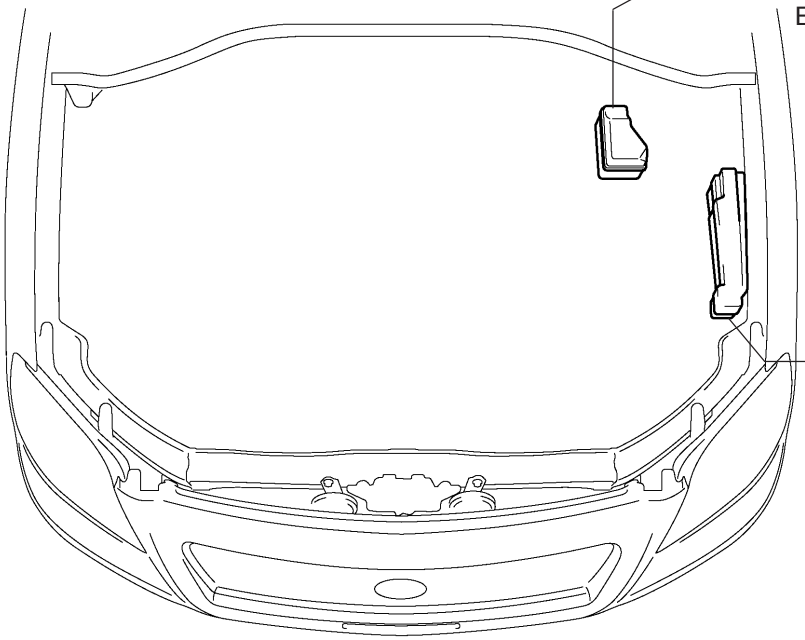
5	ADJUST, REPAIR OR REPLACE

END

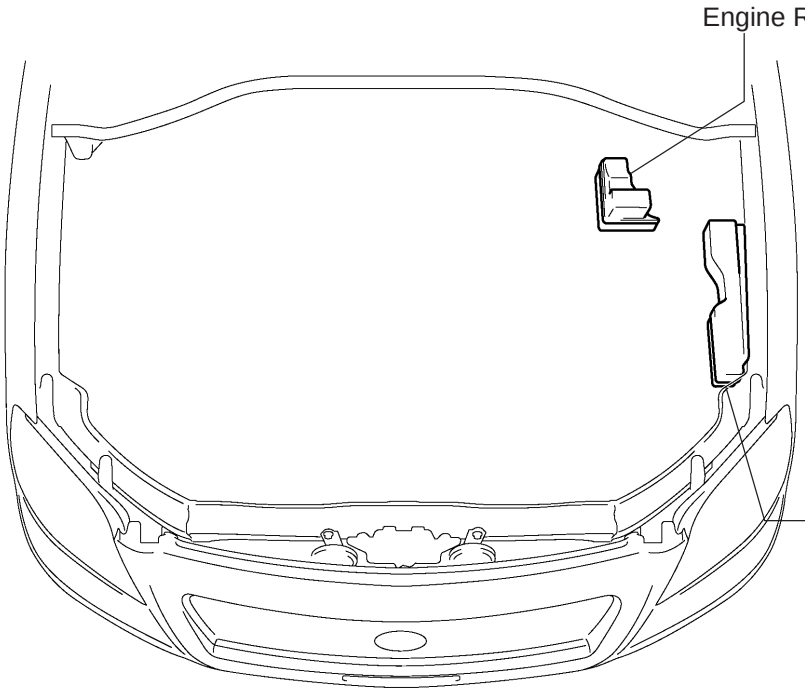
05C5K–01

LOCATION

Gasoline

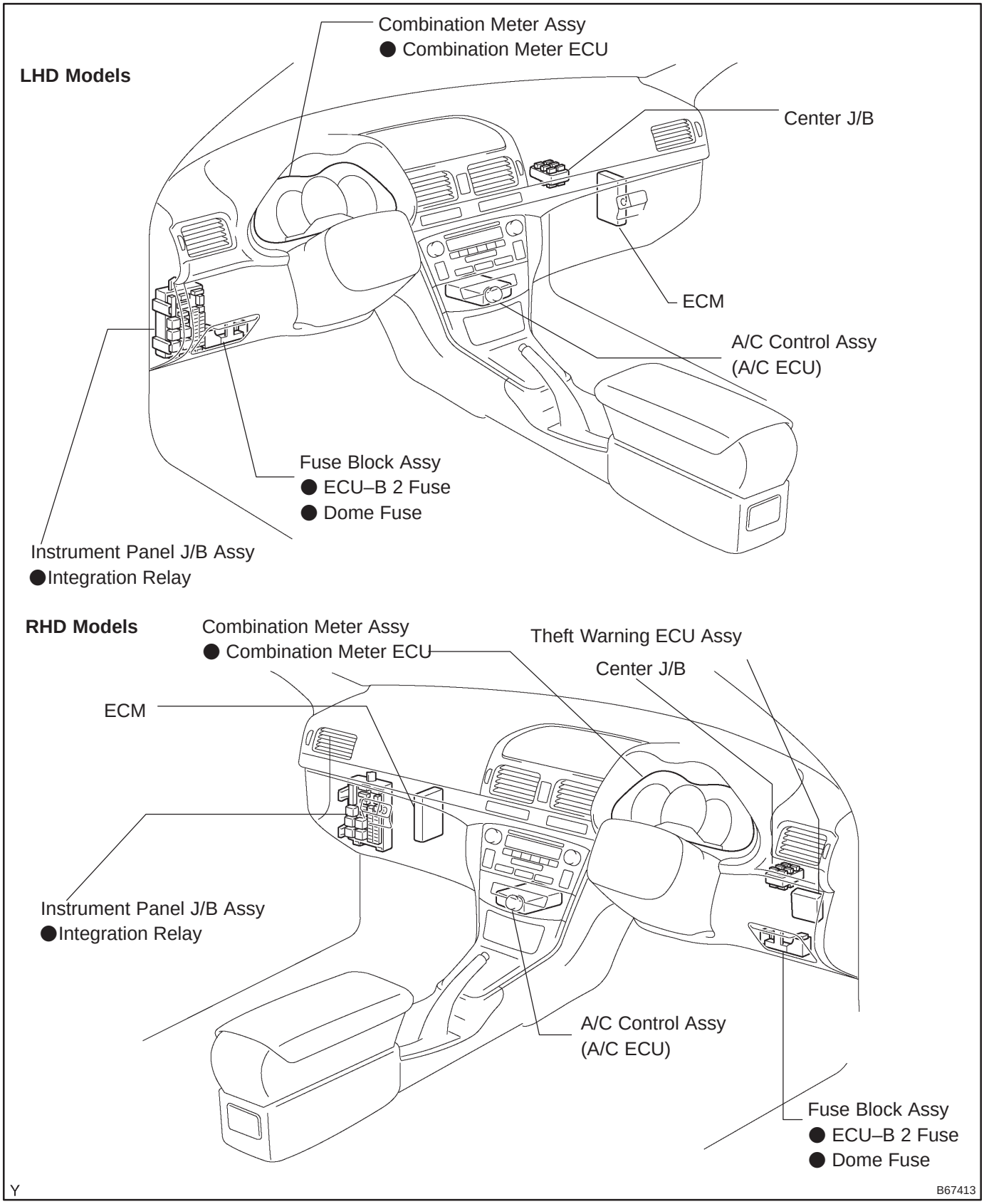


1CD–FTV



Y

B70602


LHD Models
Combination Meter Assy
● Combination Meter ECU
Center J/B
ECM
A/C Control Assy
(A/C ECU)
Fuse Block Assy
● ECU–B 2 Fuse
● Dome Fuse
Instrument Panel J/B Assy
●Integration Relay
RHD Models
Combination Meter Assy
● Combination Meter ECU
Theft Warning ECU Assy
Center J/B
ECM
Instrument Panel J/B Assy
●Integration Relay
A/C Control Assy
(A/C ECU)
Fuse Block Assy
● ECU–B 2 Fuse
● Dome Fuse
Y
B67413

05AEP–02

PRE–CHECK

1. MULTIPLEX COMMUNICATION SYSTEM (BEAN)

(a) The BEAN communication line is used to control the ECM, the A/C control assy (A/C ECU), the combination meter assy (combination meter ECU) and the theft warning ECU, which are connected to the instrument panel J/B assy (integration relay). If there is a short–circuit (bus–down) in the line, the communication to the system that has a short–circuit (bus–down)will be disabled and the DTC concerning the system will be output from the instrument panel J/B assy (integration relay).

2. CHECK COMMUNICATION FUNCTION

(a) Check the battery voltage.

Standard: 10 to 14 V

(b) Inspect the DTC output.

(1) Check a DTC for the instrument panel J/B assy (integration relay) by connecting the hand–held tester to the DLC3 and turning the ignition switch ON.

HINT:

- When DTC check is impossible, check the following items.
- The display shows communication error (refer to new diagnostic system and the operations when an error occurrs.)

(2) When the display shows DTCs of the ECU unconnected and the communication bus defective, perform the inspection depending on the type of troubleshooting.

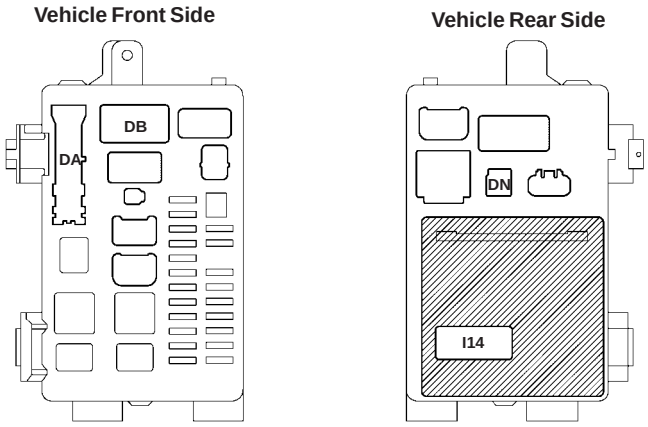
HINT:

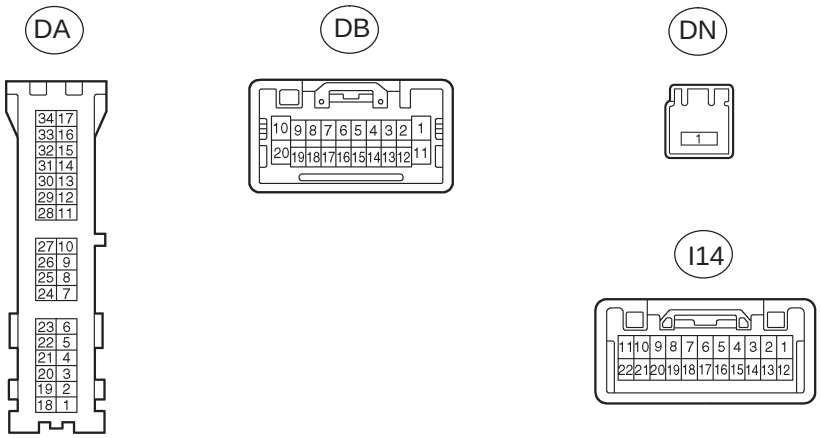
If another DTC is output, refer to the DTC chart and check the applicable section.

TERMINALS OF ECU

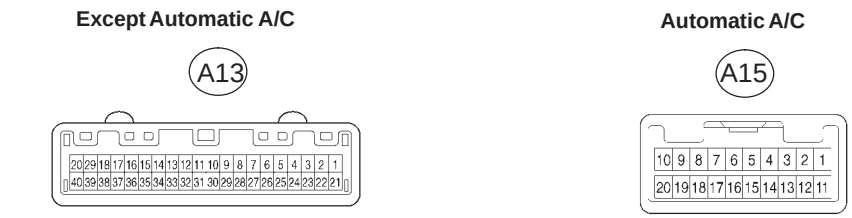
1. CHECK INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY)

Instrument Panel J/B Assy
(Integuration Relay)

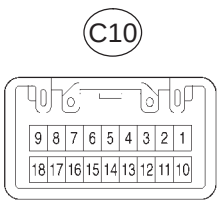




A/C Control Assy
(A/C ECU)



Combination Meter Assy
(Combination Meter ECU)



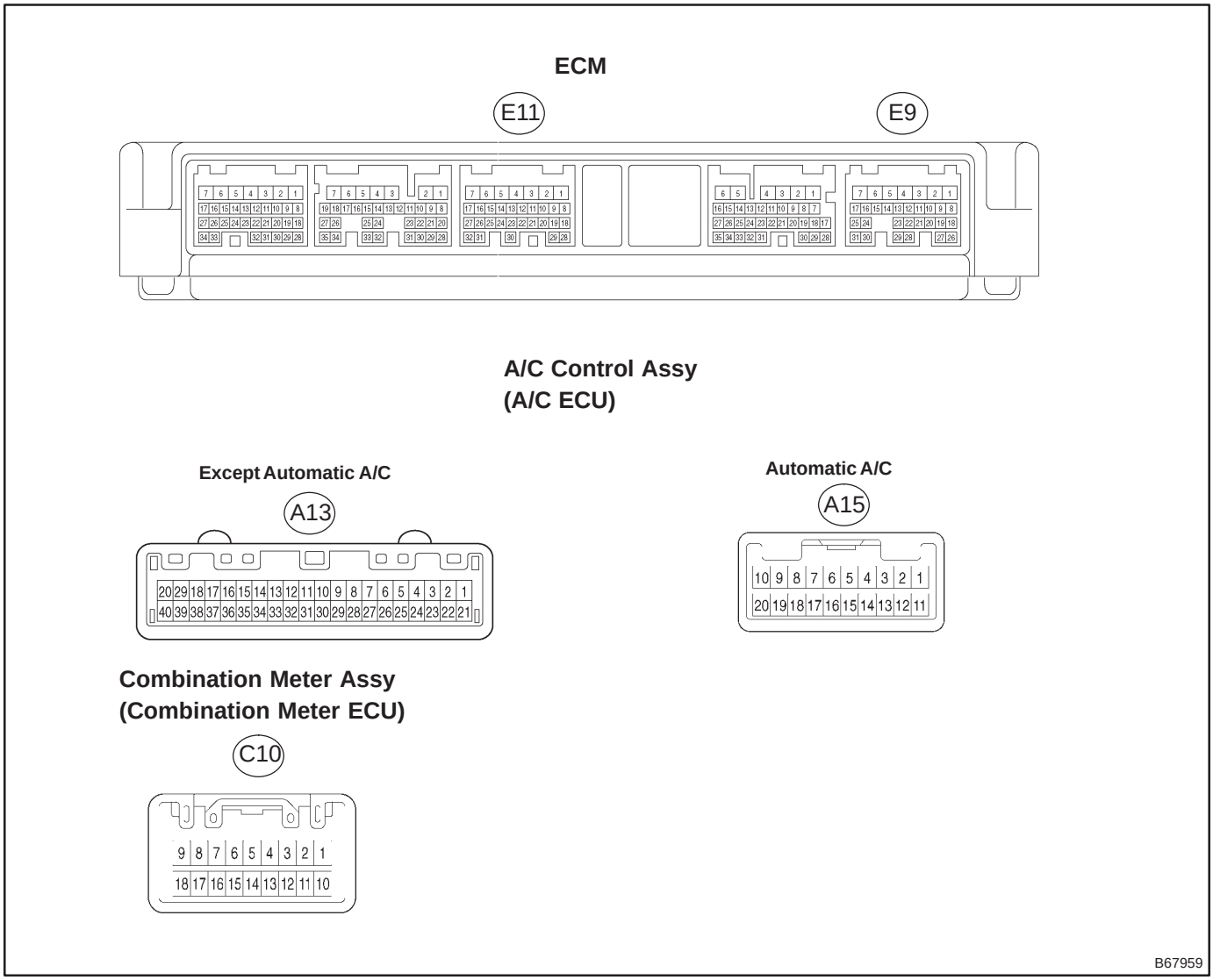
B67982

(a) Disconnect the DA, DB, DN, I14 J/B, A13 or A15 and C10 ECU connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connectors.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
B (DN–1) – Body ground	*1 B–G – Body ground	Constant	10 to 14 V
	*2 B–L – Body ground	Constant	10 to 14 V
B (DB–16) – Body ground	W–R – Body ground	Constant	10 to 14 V
E (DA–9) – Body ground	W–B – Body ground	Constant	Below 1 Ω
*3 MPX1 (I14–11) – MPX– (A13–29)	P – P		
*4 MPX1 (I14–11) – MPX– (A15–20)			
MPX2 (I14–22) – BEAN (BODY) (C10–14)	P–B – P–B		

HINT:
*1: Gasoline
*2: 1CD–FTV
*3: Except automatic A/C
*4: Automatic A/C
If the result is not as specified, there may be a malfunction on the wire harness side.

2. CHECK ECM FOR 1AZ–FSE



(a) Disconnect the A13 or A15, C10 ECU, E9, E10 and E11 ECM connectors.

(b) Check the voltage and resistance of each terminal of the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
E1 (E11–1) – Body ground	BR – Body ground	Constant	Below 1 Ω
+B (E9–1) – E1 (E11–1)	B–R – BR	Constant	10 to 14 V
+B2 (E9–2) – E1 (E11–1)	B–R – BR		
BATT (E9–3) – E1 (E11–1)	B–Y – BR		
MPX1 (E10–18) – BEAN (C10–13)	P – P	Constant	Below 1 Ω
*1 MPX2 (E10–29) – MPX+ (A13–9)	P–B – P–B		
*2 MPX2 (E10–29) – MPX+ (A15–10)			

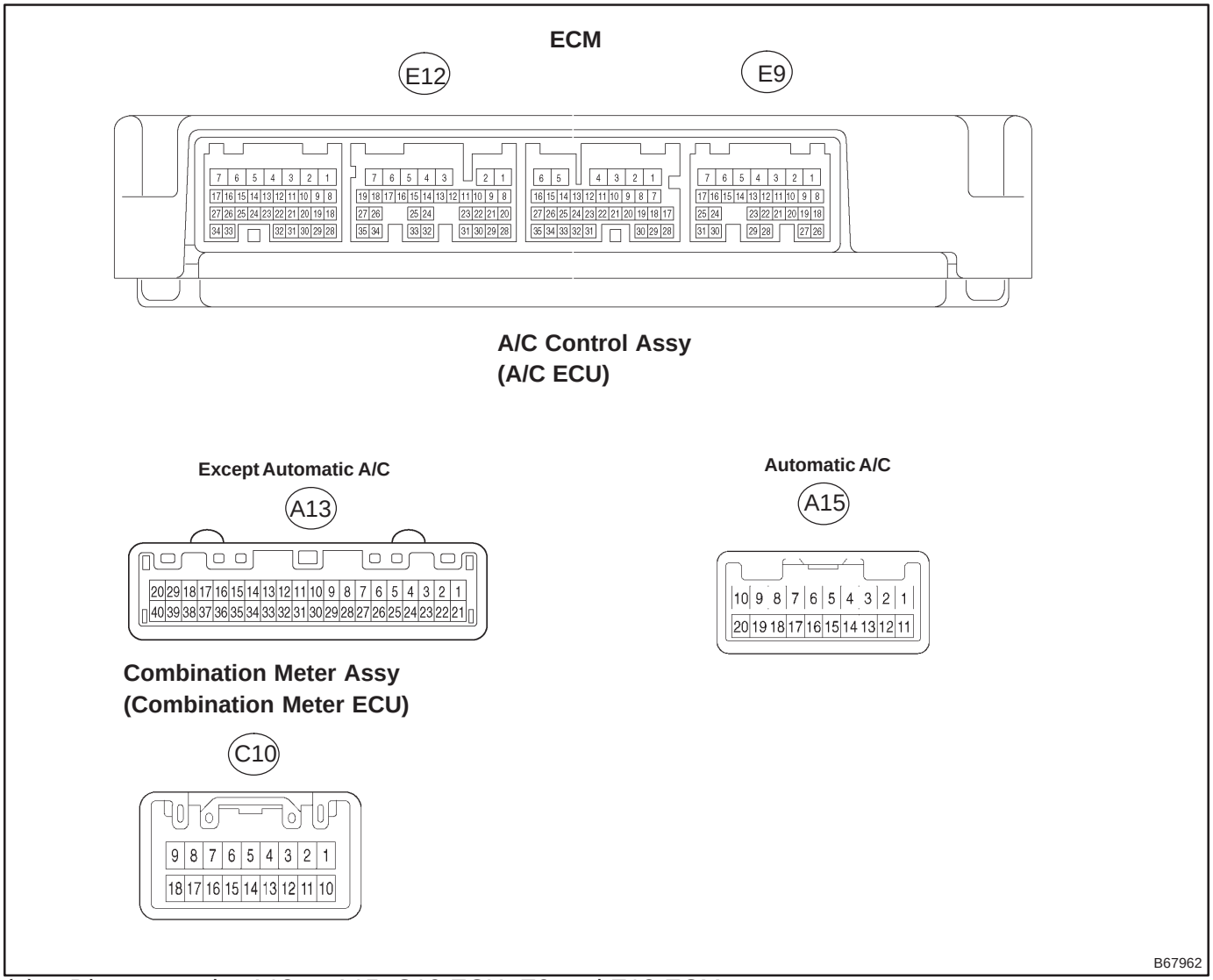
HINT:

*1: Except Automatic A/C

*2: Automatic A/C

If the result is not as specified, there may be a malfunction on the wire harness side.

3. CHECK ECM FOR 1AZ–FE, 1ZZ–FE, 3ZZ–FE



(a) Disconnect the A13 or A15, C10 ECU, E9 and E12 ECM connectors.

(b) Check the voltage or resistance of each terminal of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
E1 (E12–7) – Body ground	BR – Body ground	Constant	Below 1 Ω
+B (E9–1) – E1 (E12–7)	B–R – BR	Constant	10 to 14 V
BATT (E9–3) – E1 (E12–7)	B–Y – BR		
MPX1 (E9–23) – BEAN (C10–13)	P – P	Constant	Below 1 Ω
*1 MPX2 (E9–29) – MPX+ (A13–9)	P–B – P–B		
*2 MPX2 (E9–29) – MPX+ (A15–10)			

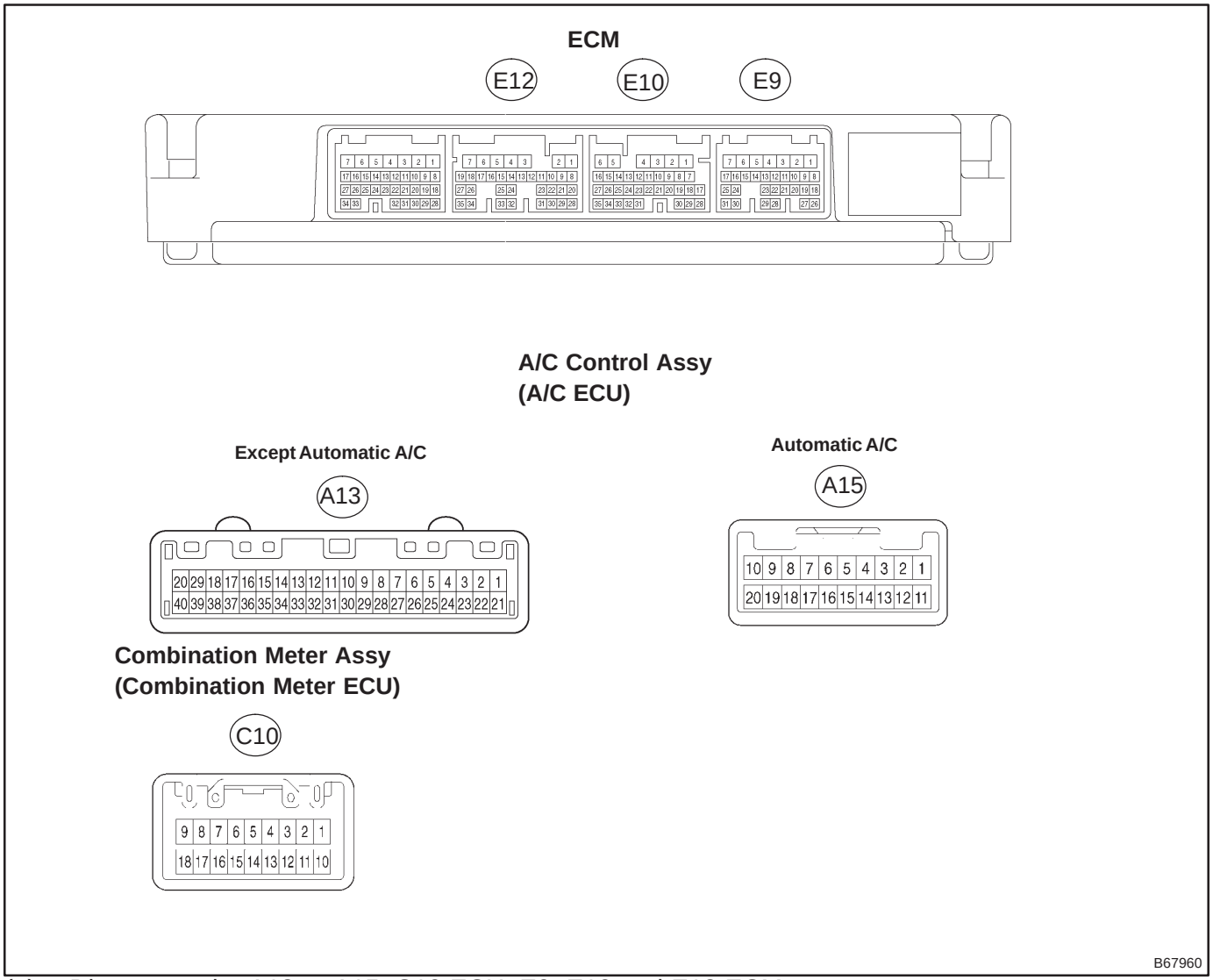
HINT:

*1: Except Automatic A/C

*2: Automatic A/C

If the result is not as specified, there may be a malfunction on the wire harness side.

4. CHECK ECM FOR 1CD–FTV



(a) Disconnect the A13 or A15, C10 ECU, E9, E10 and E12 ECM connectors.

(b) Check the voltage or resistance of each terminal of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
E1 (E12–7) – Body ground	BR – Body ground	Constant	Below 1 Ω
+B 〈E9–1) – E1 (E12–7)	B–W – BR	Constant	10 to 14 V
BATT (E10–2) – E1 (E12–7)	B–Y – BR		
MPX1 (E9–20) – BEAN (C10–13)	P – P	Constant	Below 1 Ω
*1 MPX2 (E9–21) – MPX+ (A13–9)	P–B – P–B		
*2 MPX2 (E9–21) – MPX+ (A15–10)			

HINT:

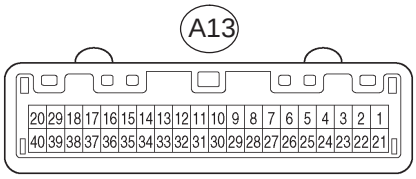
*1: Except Automatic A/C

*2: Automatic A/C

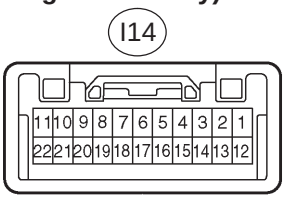
If the result is not as specified, there may be a malfunction on the wire harness side.

5. CHECK A/C CONTROL ASSY EXCEPT AUTO (A/C ECU)

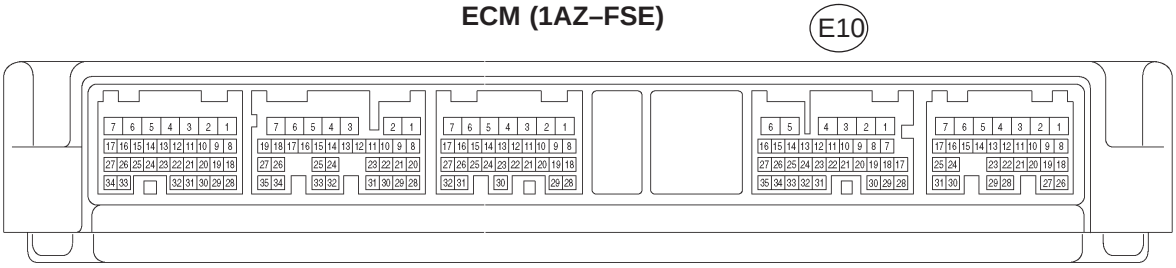
A/C Control Assy
(A/C ECU)



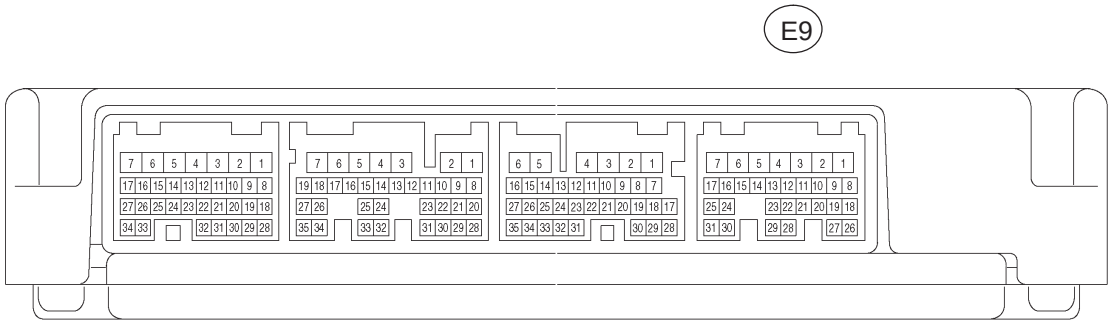
Instrument Panel J/B Assy
(Integration Relay)



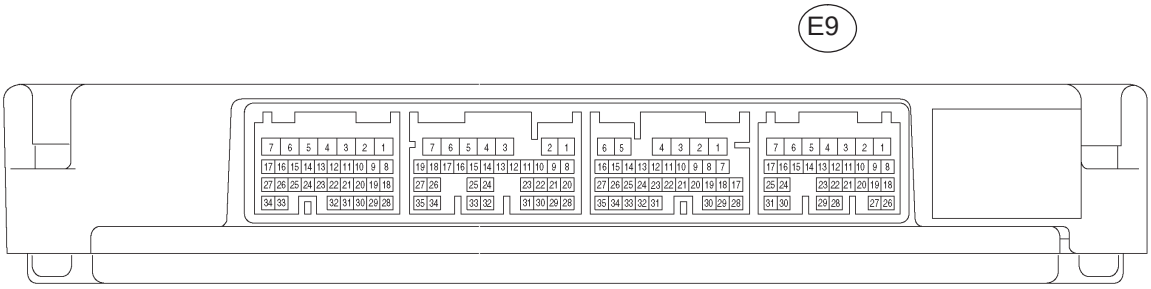
ECM (1AZ–FSE)



ECM (1AZ–FE, 1ZZ–FE, 3ZZ–FE)



ECM (1CD–FTV)



B67983

(a) Disconnect the A13 ECU, E9 or E10 ECM and I14 J/B connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connector.
Standard:

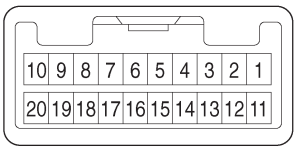
Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
GND (A13–40) – Body ground	W–B – body ground	Constant	Below 1 Ω
+B ⟨A13–2) – GND (A13–40)	W–R – W–B	Constant	10 to 14 V
MPX– (A13–29) – MPX1 (I14–11)	P – P	Constant	Below 1 Ω
*1 MPX+ (A13–9) – MPX2 (E10–29)	P–B – P–B		
*2 MPX+ (A13–9) – MPX2 (E9–29)	P–B – P–B		
*3 MPX+ (A13–9) – MPX2 (E9–21)	P–B – P–B		

HINT:
*1: 1AZ–FSE
*2: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*3: 1CD–FTV
If the result is not as specified, there may be a malfunction on the wire harness side.

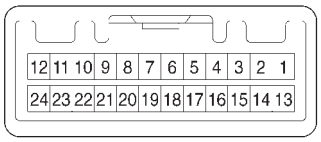
6. CHECK A/C CONTROL ASSY FOR AUTO (A/C ECU)

A/C Control Assy (A/C ECU)

A15

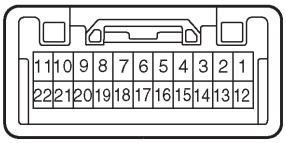


A16



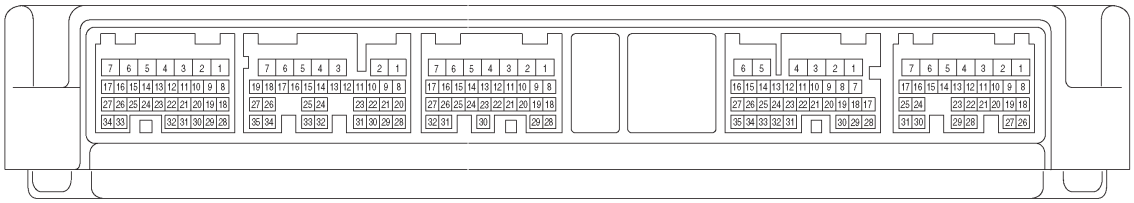
Instrument Panel J/B Assy (Integration Relay)

I14



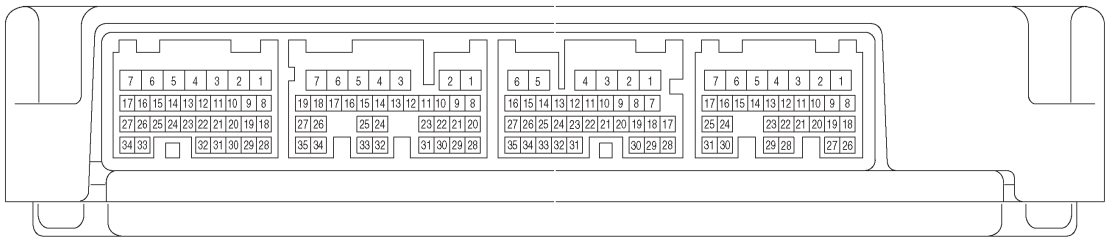
ECM (1AZ–FSE)

E10



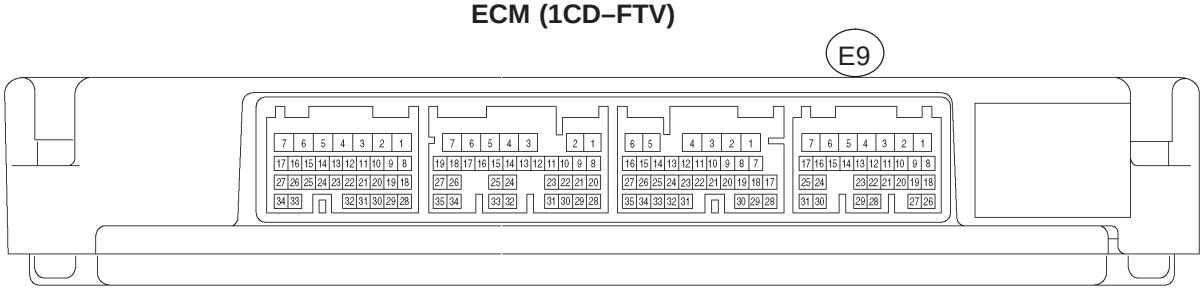
ECM (1AZ–FE, 1ZZ–FE, 3ZZ–FE)

E9



ECM (1CD–FTV)

E9



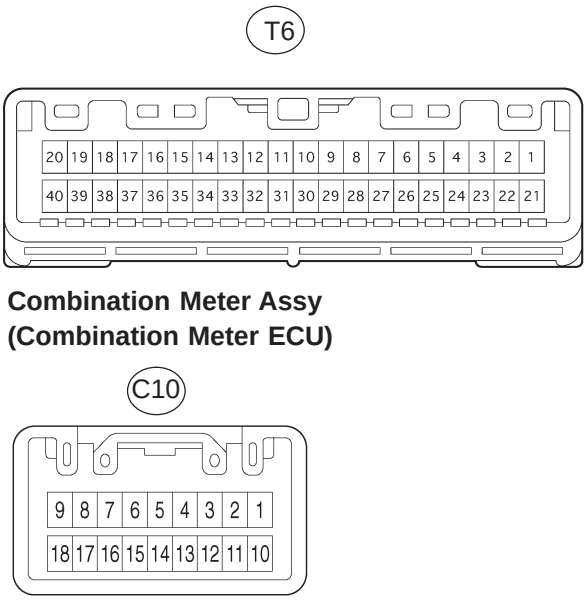
B67984

(a) Disconnect the A15, A16 ECU, E9 or E10 ECM and I14 J/B connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connector.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
GND (A16–13) – Body ground	W–B – Body ground	Constant	Below 1 Ω
+B (A16–24) – GND (A16–13)	W–R – W–B	Constant	10 to 14 V
MPX– (A15–20) – MPX1 (I14–11)	P – P	Constant	Below 1 Ω
*1 MPX+ (A15–10) – MPX2 (E10–29)	P–B – P–B		
*2 MPX+ (A15–10) – MPX2 (E9–29)	P–B – P–B		
*3 MPX+ (A15–10) – MPX2 (E9–21)	P–B – P–B		

HINT:
*1: 1AZ–FSE
*2: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*3: 1CD–FTV
If the result is not as specified, there may be a malfunction on the wire harness side.

7. CHECK THEFT WARNING ECU ASSY



(a) Disconnect the T6 and C10 ECU connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connector.
Standard:

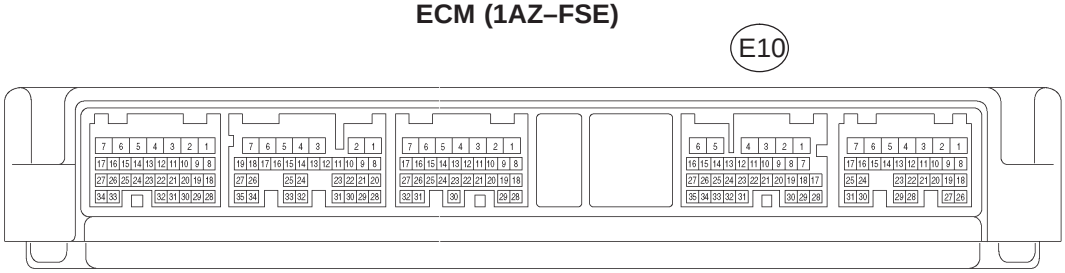
Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
E (T6–29) – Body ground	W–B – Body ground	Constant	Below 1 Ω
+B1 (T6–2) – E (T6–29)	W–R – W–B	Constant	10 – 14 V
MPX (T6–31) – BEAN (Security)(C10–15)	P–L – P–L	Constant	Below 1 Ω

If the result is not as specified, there may be a malfunction on the wire harness side.

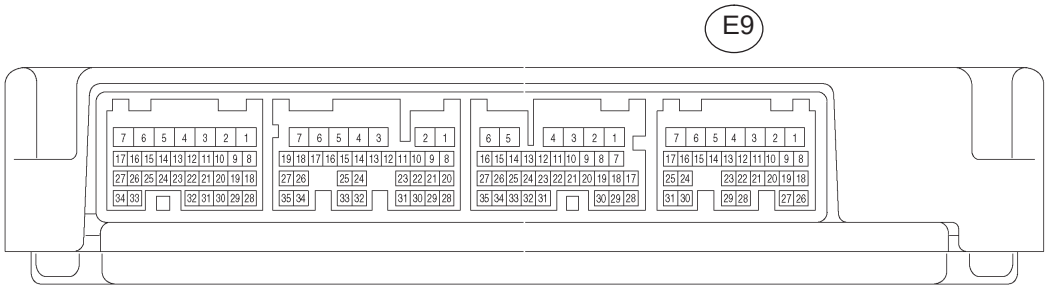
8. CHECK COMBINATION METER ASSY (COMBINATION METER ECU)

Combination Meter Assy (Conbination Meter ECU)

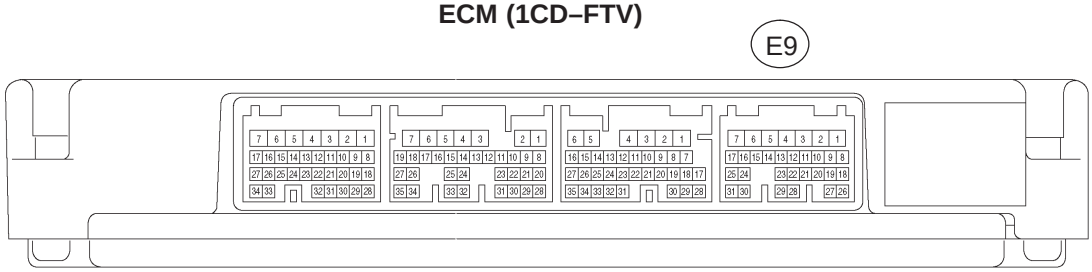
ECM (1AZ–FSE)



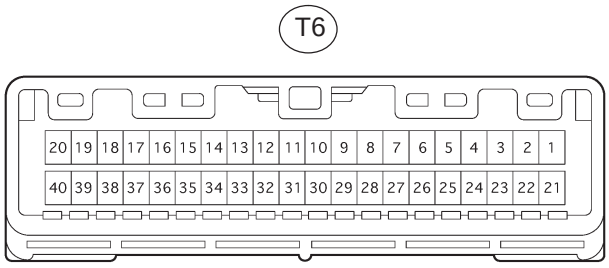
ECM (1AZ–FE, 1ZZ–FE, 3ZZ–FE)



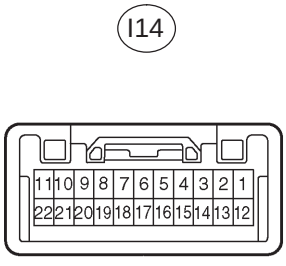
ECM (1CD–FTV)



Theft Warning ECU Assy



Instrument Panel J/B Assy (Integration Relay)



B67985

(a) Disconnect the C10, C11, T6, ECU, E10 or E9 ECM and I14 connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connector.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
POWER EARTH (C10–17) – Body ground	W–B – Body ground	Constant	Below 1 Ω
+B 〈C11–20) – POWER EARTH (C10–17)	W–R – W–B	Constant	10 to 14 V
*1 BEAN (EFI) (C10–13) – MPX1 (E10–18)	P – P	Constant	Below 1 Ω
*2 BEAN (EFI) (C10–13) – MPX1 (E9–23)	P – P		
*3 BEAN (EFI) (C10–13) – MPX1 (E9–20)	P – P		
BEAN (BODY) (C10–14) – MPX2 (I14–22)	P–B – P–B		
*4 BEAN (SECURITY) (C10–15) – MPX (T6–31)	P–L – P–L		

HINT:
*1: 1AZ–FSE
*2: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*3: 1CD–FTV
*4: w/ Theft deterrent system
If the result is not as specified, there may be a malfunction on the wire harness side.

A NAVIGATION CONTROLLER ASSY DOES NOT OPERATE

INSPECTION PROCEDURE

1	CHECK MALFUNCTION SYMPTOMS

(a) Check obstruction.
(1) Check that there are no obstructions between the navigation controller assy and the infrared ray light emission portion of the multi–display (CRT display) display.
Standard: Normally returns

OK → **SYSTEM OK**

NG

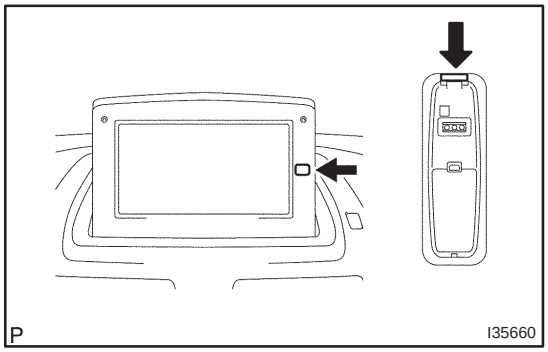
2	CHECK BATTERY(NAVIGATION CONTROLLER ASSY)

(a) Check battery.
(1) Check that the dry–cell battery used for the navigation controller assy is not dead.
Standard: It is not dead

NG → **BATTERY IS DEAD**

OK

3	CLEAN THE INFRARED RAY EMITTED PORTION



(a) Clean the infrared ray emitted portion.
(1) Clean the infrared ray emitted portion on the multi–display (CRT display) display and navigation controller assy.
(2) Check whether the same malfunction occurs.
Standard: The function returns to normal.

OK → **DIRT AT THE INFRARED RAY EMITTED PORTION**

NG

4	REPLACE NAVIGATION CONTROLLER ASSY

Standard: Normally returns

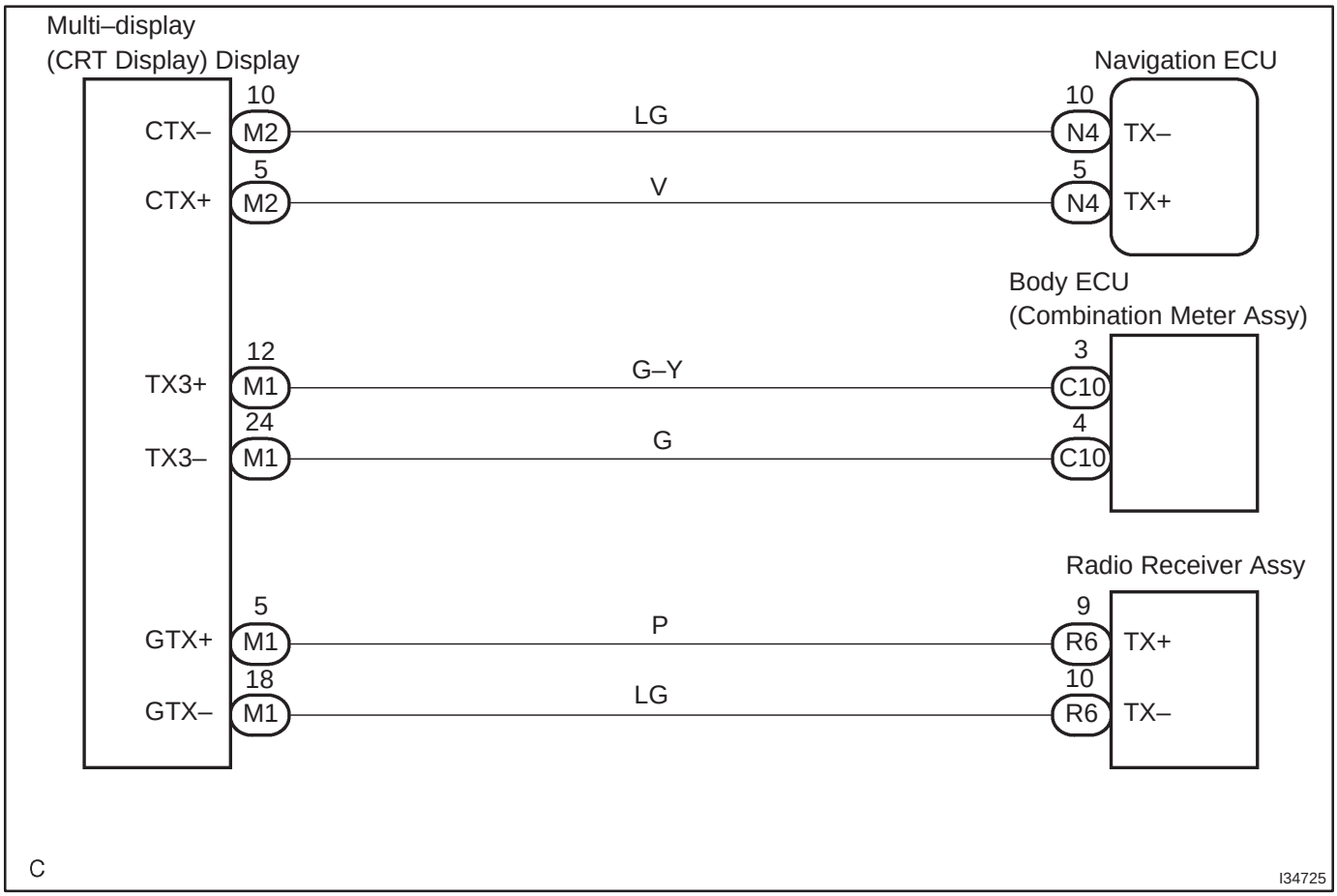
OK → **SYSTEM OK**

NG

REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)

AVC–LAN CIRCUIT

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT APPARATUS

(a) Choose the apparatus to be inspected.

Apparatus	Go to step
Radio receiver assy	A
Navigation ECU	B
Body ECU (Combination Meter Assy)	C

B → **Go to step 4**

C → **Go to step 6**

A

2	SERVICE CHECK MODE(RADIO RECEIVER ASSY)

(a) Perform the service check.
(1) Start the diagnosis system and read the check result for the radio receiver assy.
Standard:

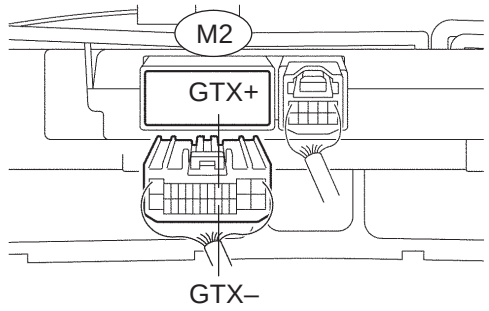
A	”NCON” is displayed or nothing is displayed (AUDIO H/U)
B	”GOOD” is displayed

B → **REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)**

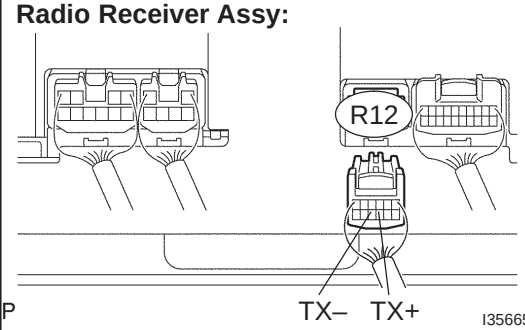
A

3	CHECK HARNESS AND CONNECTOR(MULTI–DISPLAY (CRT DISPLAY) DISPLAY – RADIO RECEIVER ASSY)

Multi–display (CRT Display) Display:



Radio Receiver Assy:



(a) Disconnect the connectors from the multi–display (CRT display) display and radio receiver assy.
(1) Check continuity between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
GTX+ – TX+	Continuity
GTX– – TX–	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
GTX+ – Body ground	No continuity
GTX– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE RADIO RECEIVER ASSY (See page 67–5)

4	SERVICE CHECK MODE(NAVIGATION ECU)

(a) Perform the service check.
(1) Start the diagnosis system and read the check result for the navigation ECU.
Standard:

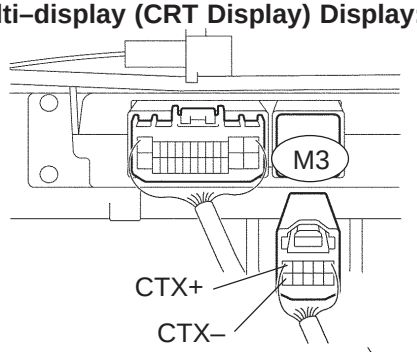
A	”NCON” is displayed or nothing display (NAVI)
B	”GOOD” is display

B → **REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)**

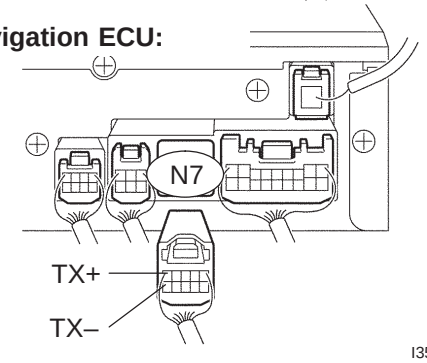
A

5	CHECK HARNESS AND CONNECTOR(MULTI–DISPLAY (CRT DISPLAY) DISPLAY – NAVIGATION ECU)

Multi–display (CRT Display) Display:



Navigation ECU:



P I35666

(a) Disconnect the connectors from the multi–display (CRT display) display and navigation ECU.
(1) Check continuity between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
CTX+ – TX+	Continuity
CTX– – TX–	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
CTX+ – Body ground	No continuity
CTX– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE NAVIGATION ECU (See page 67–27)

6	SERVICE CHECK MODE(BODY ECU)

(a) Perform the service check.
(1) Start the diagnosis system and read check result for body ECU.
Standard:

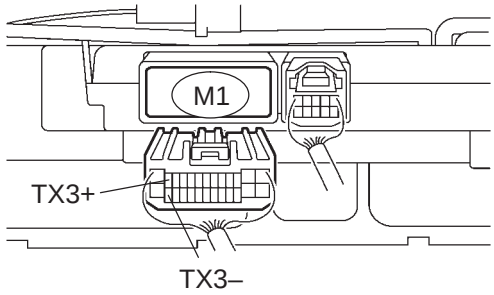
A	”NCON” is displayed or nothing display (BODY)
B	”GOOD” is display

B → **REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)**

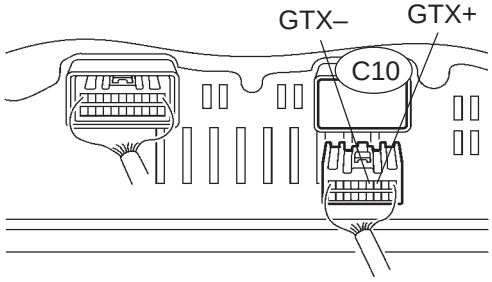
A

7	CHECK HARNESS AND CONNECTOR(MULTI–DISPLAY (CRT DISPLAY) DISPLAY – BODY ECU)

Multi–display (CRT Display) Display:



Body ECU (Combination Meter Assy):



C

I35875

(a) Disconnect the connectors from the multi–display (CRT display) display and body ECU (Combination meter assy).
(1) Check continuity between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
TX3+ – GTX+	Continuity
TX3– – GTX–	Continuity

(2) Check short between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
TX3+ – Body ground	No continuity
TX3– – Body ground	No continuity

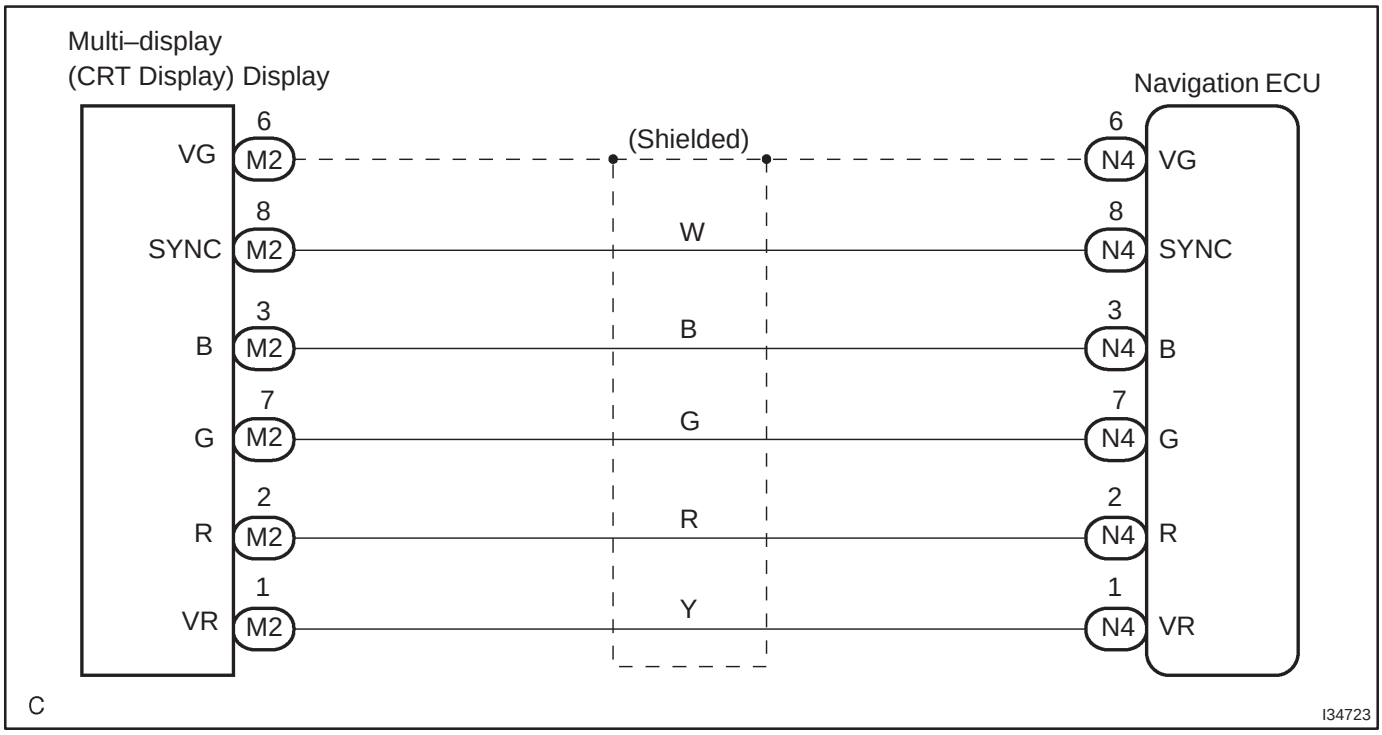
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE COMBINATION METER ASSY (See page 71–21)

COLOR ON NAVIGATION SCREEN IS UNUSUAL (RGB SIGNAL ERROR)

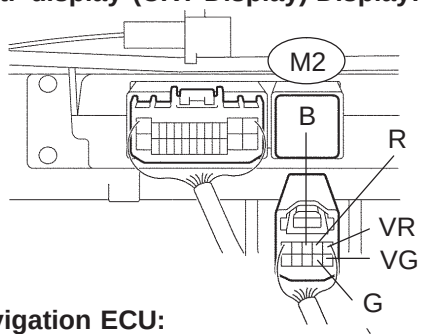
WIRING DIAGRAM



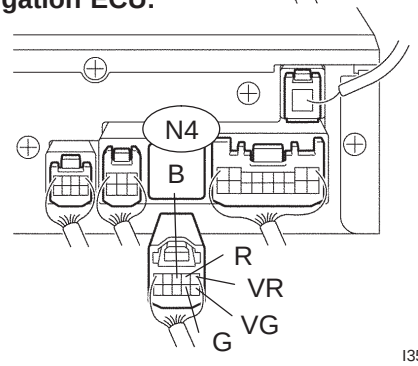
INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(MULTI–DISPLAY (CRT DISPLAY)DISPLAY – NAVIGATION ECU)

Multi–display (CRT Display) Display:



Navigation ECU:



(a) Disconnect the connectors from the multi–display (CRT display)display and navigation ECU.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
VG – VG	Continuity
VR – VR	Continuity
R – R	Continuity
G – G	Continuity
B – B	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
VG – Body ground	Continuity
VR – Body ground	Continuity
R – Body ground	No continuity
G – Body ground	No continuity
B – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2	REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)

Standard: Normally returns.

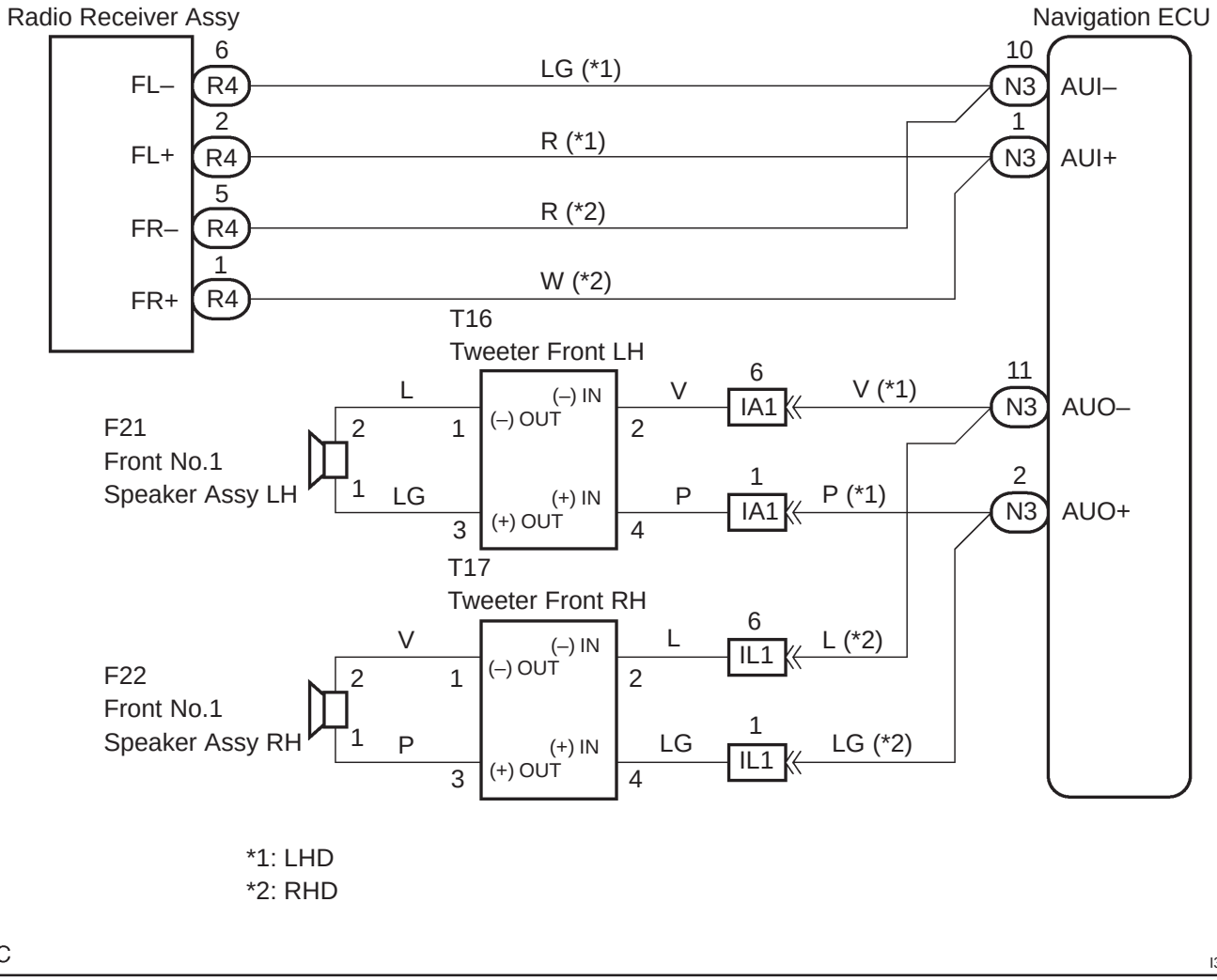
NG → **REPLACE NAVIGATION ECU (See page 67–27)**

OK

SYSTEM OK

FRONT SPEAKER (DRIVER SIDE) ONLY IS NOT HEARD

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK SETTING(THE VOLUME OF THE NAVIGATION VOICE SOUND)

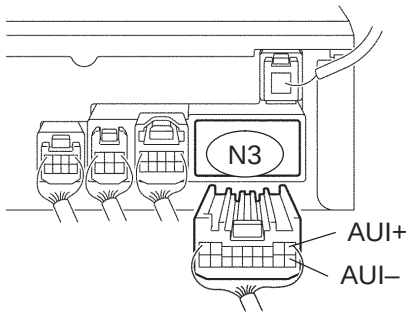
(a) Check the settings.
(1) Set the volume MAX at the voice sound settings on the menu.
Standard: "This system will guide you in this volume" is produced.

OK → **Go to step 4**

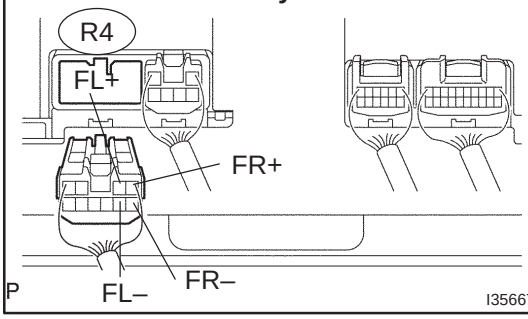
NG

2	CHECK HARNESS AND CONNECTOR(NAVIGATION ECU – RADIO RECEIVER ASSY)

Navigation ECU:



Radio Receiver Assy:



(a) Disconnect the connector between the navigation ECU and radio receiver assy.
(1) Check continuity between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
FL+*1, FR+*2 – AUI+	Continuity
FL–*1, FR–*2 – AUI–	Continuity

*1: LHD Models
*2: RHD Models

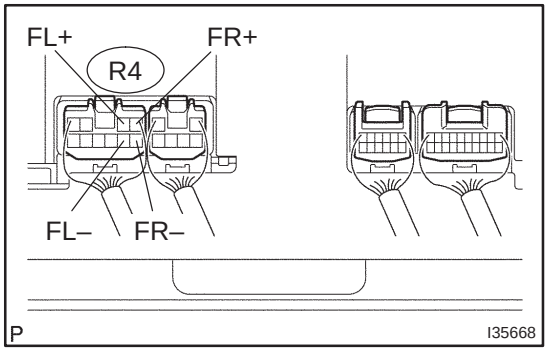
(2) Check for a short between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
AUI+ – Body ground	No continuity
AUI– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT RADIO RECEIVER ASSY(FL+(*1), FL–(*1), FR+(*2), FR–(*2), GND)



(a) Remove the radio receiver assy.
(b) Using an oscilloscope, check the signal waveform between the terminals FL+*1, FL–*1, FR+*2, FR–*2 and GND of stereo component amplifier assy.
*1: LHD Models
*2: RHD Models

Standard:

Tester connection	Condition	Specified condition
FL+*1, FR+*2 – GND	While voice sound is being produced	A waveform synchronized with sound is output
FL–*1, FL–*2 – GND	While voice sound is being produced	A waveform synchronized with sound is output

NG → **REPLACE RADIO RECEIVER ASSY (See page 67–5)**

OK

4 INSPECT FRONT NO.1 SPEAKER ASSY

(a) Resistance check
(1) Check resistance between the terminals of the front No.1 speaker assy.
Standard: 4 Ω

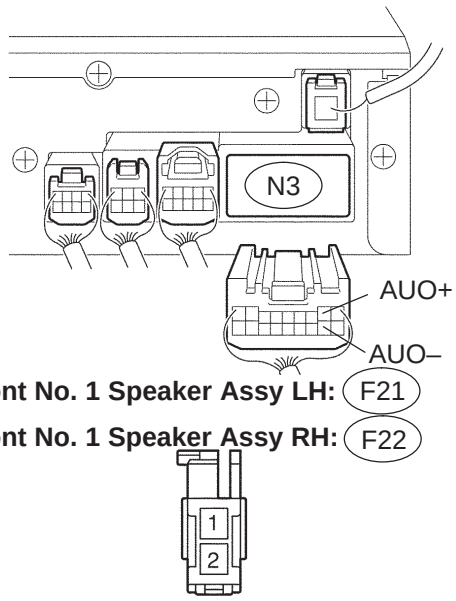
NOTICE:
The speaker should not be removed for checking

NG → **REPLACE FRONT NO.1 SPEAKER ASSY (See page 67–10)**

OK

5	CHECK HARNESS AND CONNECTOR(NAVIGATION ECU – FRONT NO. 1 SPEAKER ASSY)

Navigation ECU:



(a) Disconnect the connectors from the navigation ECU and front No.1 speaker assy.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
AUO+ – 1	Continuity
AUO– – 2	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
AUO+ – Body ground	No continuity
AUO– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE NAVIGATION ECU (See page 67–27)

05C3E–01

DIAGNOSTIC TROUBLE CODE CHART

Terms	Meaning
Physical address	Three–digit code (shown in hexadecimal) which is given to each component comprising the AVC–LAN. Corresponding to the function, individual symbols are specified.
Logical address	Two–digit code (shown in hexadecimal) which is given to each function comprising the inner system of the AVC–LAN.

1. RADIO RECEIVER ASSY (Physical address: 190)

HINT:

- *1: Even if no failure is detected, this code may be stored depending on the battery condition or voltage for starting an engine.
- *2: This code is stored in 180 sec. after the power supply connector is pulled out after engine start.
- *3: This code may be stored when the ignition switch is turned again after engine start.
- *4: This code may be stored when the ignition switch is turned again in 1 min. after engine start.

(a) Logical address: 01 (Communication control)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
D5 *1	Registered component disconnected	Component shown by sub–code is or was disconnected from system with ignition switch ACC or ON. Communication with component shown by sub–code is not ensured when engine is started.	• Check harness for power supply of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition switch ACC or ON. Or, when this code was recorded, multi–display (CRT display) display was disconnected.	• Check harness for power supply system of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display.
D8 *2	No response to connection check	Component shown by sub–code is or was disconnected from system after engine is started.	• Check harness for power supply of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
D9 *1	Last Mode Error	Component operated (sound and/or image was provided) before engine stop is or was disconnected with ignition switch ACC or ON.	• Check harness for power supply of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
DA	No Response to ON/OFF Instruction	No response is identified when changing mode (audio and visual mode change). Detected when sound and picture does not change by button operation	• Check harness for power supply system of component shown by sub–code. • Check harness for communication system of component shown by sub–code. • If error occurs again, replace component shown by auxiliary code
DB *1	Mode Status Error	Dual alarm is detected.	• Check harness for power supply system of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
DC *4	Transmission Error	Transmission to component shown by sub–code has been failed. (This code does not necessarily mean actual failure.)	If same sub–code is recorded in other component(s), check harness for power supply and communication system of all components shown by code.
DD *4	Master Reset (Momentary Interruption)	After engine is started, multi–display (CRT display) display was disconnected from system.	• Check harness for power supply system of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • If this error occurs frequently, replace multi–display (CRT display) display.

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
DE *3	Slave Reset (Momentary Interruption)	After engine start, slave component has been disconnected.	• Check harness for power supply system of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
DF *5	Master Error	Due to defective condition of component with a display, master function is switched to audio equipment. Error occurs in communication between sub–master (audio) and master component.	• Check harness for power supply of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display.
E0 *1	Registration Completion Instruction Error	”Registration Completion Instruction” command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E1 *1	Audio processor ON error	While source equipment is operating, AMP output is stopped.	• Check harness for power supply of radio receiver assy. • Check harness for communication system of radio receiver assy.
E2	ON/OFF Instruction Parameter Error	Error occurs in ON/OFF controlling command from multi–display (CRT display) display.	Replace multi–display (CRT display) display.
E3 *1	Registration Request Transmission	Registration Request command is output from slave component. Receiving Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E4 *1	Multiple Frame Abort	Multiple frame transmission is aborted.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

(b) Logical address: 21 (Switch)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
10	Panel Switch Error	Error in panel switch input part is detected. (Error in switch control part, or internal communication error with switch control part is detected.)	• Inspect all switches on panel switch test screen in display check mode. If any of them does not function, replace radio receiver assy. • If all switches function without problem, observe them for a while.
11	Touch Switch Error	Error in touch switch sensor is detected. (Light level of LED is detected to be less than a fixed value.)	• Inspect all touch switches on touch switch test screen in display check mode. If any of lines do not react, replace radio receiver assy. • If all of vertical and horizontal lines react normally, observe them for a while.

(c) Logical address: 61 (Cassette tape player’s switch)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
40	Mechanical Error of Media	Malfunction due to mechanical failure is identified. Or cassette tape is cut or entangled.	• Inspect cassette tape. • Replace radio receiver assy.

(d) Logical address: 62 (CD player)

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
42	No Disc Readout	Disc cannot be read.	• Inspect CD. • Replace radio receiver assy.
44	CD player Error	Error is detected in CD player.	Replace radio receiver assy.
45	EJECT Error	Magazine cannot be ejected.	Replace radio receiver assy.
46	Scratched/Reversed Disc	Scratches or dirt is found on CD surface or CD is set upside down.	Inspect CD.

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
47	CD Player Temp. Too High	Readout cannot be done because temperature around player's pick–up (reading part) is too high.	With IG switch OFF, leave vehicle in cool shaded place for a while and recheck. After deleting the DTC memory, if same code is detected, replace radio receiver assy.
48	CD Player Excess Current	Excess current is applied radio receiver assy.	Replace radio receiver assy.

2. NAVIGATION ECU (Physical address: 178)

HINT:

- *1: Even if no failure is detected, this code may be stored depending on the battery condition or voltage for starting the engine.
- *2: This code is stored in 210 seconds after the master component is turned off with the ignition switch ACC or ON.
- *3: This code may be stored when the ignition switch is turned in 1 min. again after engine start.
- *4: This code may be stored when the ignition switch is turned again after engine start.

(a) Logical address: 01 (Communication control)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition switch ACC or ON. Or, when this code was recorded, multi–display (CRT display) display was disconnected.	• Check harness for power supply system of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • Check harness for power supply system of navigation ECU. • Check harness for communication system of navigation ECU.
D7 *2	Connection Check Error	Component in which this code is recorded has been disconnected from system with ignition switch ACC or ON. Or, when this code was recorded, multi–display (CRT display) display was disconnected.	• Check harness for power supply system of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • Check harness for power supply system of navigation ECU. • Check harness for communication system of navigation ECU.
DC *3	Transmission Error	Transmission to component shown by sub–code has been failed. (This code does not necessarily mean actual failure.)	If same sub–code is recorded in other component(s), check harness for power supply and communication system of all components shown by code.
DD *4	Master Reset (Momentary Interruption)	Component that is to be master has been disconnected after engine start.	• Check harness for power supply system of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • If error occurs frequently, replace multi–display (CRT display) display.
E0 *1	Registration Completion Instruction Error	"Registration Completion Instruction" command from master cannot be received.	Since this DTC is provided for engineering, it may be detected when no actual failure exists.
E2	ON/OFF Instruction Parameter Error	Error is detected in ON/OFF control command from multi–display (CRT display) display .	Replace multi–display (CRT display) display.
E3 *1	Registration Request Transmission	• Registration Request command is output from slave component. • Registration Request command is output from sub–master component.	Since this DTC is provided for engineering, it may be detected when no actual failure exists.

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
DF *4	Master Error	Due to defective condition of component with a display, master function is switched to audioequipment. Error occurs in communication between sub–master (audio) and master component.	• Check harness for power supply of radio receiver assy. • Check harness for communication system of radio receiver assy.
E4 *1	Multiple Frame Abort	Multiple frame transmission is aborted.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

(b) Logical address: 58 (Navigation ECU)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
10	Gyro Error	Error in gyro sensor is detected. (Abnormal value in voltage output from sensor is detected for more than specified time.)	Replace navigation ECU.
42	Map Disc Error	Data cannot be read for a certain time due to scratches or dirt on disc surface or insertion of wrong disc.	Inspect disc and replace as necessary. (Visually check disc surface and wipe it with a soft cloth.)
43	Vehicle Signal Error	Input error of vehicle signal is detected. (When no vehicle signal has been input for a certain time.)	• Inspect wire harness. • If wire harness is normal, replace navigation ECU.

(c) Logical address: 58 (GPS receiver)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
11	GPS Receiver Error	Operation error of GPS receiver is detected.	At an outdoor site with a clear view, operate the system to display GPS data. If GPS mark is not properly displayed after 15 min. or more, replace navigation ECU.
40	GPS Antenna Error	Open condition of GPS antenna is detected. (Open circuit, connection failure of connectors, etc.)	Inspect antenna and replace as necessary.
41	Power Supply Error of GPS Antenna	Abnormal voltage of GPS antenna cable or short circuit is detected.	• Inspect GPS antenna and replace as necessary. (When no continuity is identified between connector's core and sealed part, GPS antenna is normal.) • If GPS antenna is normal, replace navigation ECU.

3. MULTI–DISPLAY (CRT DISPLAY) DISPLAY (Physical address: 110)

HINT:

- *1: Even if no failure is detected, it may be stored depending on the battery condition or voltage for starting an engine.
- *2: It is stored in 180 sec. after the power supply connector is pulled out after engine start.
- *3: It may be stored when the ignition switch is turned again after engine start.
- *4: It may be stored when the ignition switch is turned in 1 min. again after engine start.

(a) Logical address: 01 (Communication control)

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
21	ROM Error	Abnormal condition of ROM is detected.	Replace multi–display (CRT display) display.
22	RAM Error	Abnormal condition of RAM is detected.	Replace multi–display (CRT display) display.
D5 *1	Registered component disconnected	Component shown by auxiliary code is or was disconnected from system with ignition switch ACC or ON. Communication with component shown by auxiliary code is not ensured when engine is started.	• Check harness for power supply of component shown by auxiliary code. • Check harness for communication system of component shown by auxiliary code.
D8 *2	No response to connection check	Component shown by auxiliary code is or was disconnected from system after engine start.	• Check harness for power supply of component shown by sub– code. • Check harness for communication system of component shown by auxiliary code.

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
D9 *1	Last Mode Error	Component operated (sound and/or image was provided) before engine stop is or was disconnected with ignition switch ACC or ON.	• Check harness for power supply of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
DB *1	Mode Status Error	Dual alarm is detected.	• Check harness for power supply system of component shown by sub–auxiliary code. • Check harness for communication system of component shown by sub–code.
DC *4	Transmission Error	Transmission to component shown by auxiliary code has been failed. (This code does not necessarily mean actual failure.)	If same auxiliary code is recorded in order component(s), check harness for power supply and communication system of all components shown by code.
DE *3	Slave Reset (Momentary Interruption)	After engine start, slave component has been disconnected. DB	• Check harness for power supply system of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
E2	ON/OFF Instruction Parameter Error	Error is detected in ON/OFF control command from radio receiver assy.	Replace radio receiver assy.
E3 *1	Registration Request Transmission	• Registration Request command is output from slave component. • By reception of connection check instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering, it may be detected when no actual failure exists.

(b) Logical address: 21 (Switch)

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
10	Panel Switch Error	Error in panel switch input part is detected. (Error in switch control part, or internal communication error with switch control part is detected.)	• Inspect all switches on panel switch test screen in display check mode. If any of them do not function, replace multi–display (CRT display) display. • If all switches function without problem, observe them for a while.
11	Touch Switch Error	Error in touch switch sensor is detected. (Light level of LED is detected to be less than a fixed value.)	• Inspect all touch switches on touch switch test screen in display check mode. If any of lines does not react, replace multi–display (CRT display) display. • If all of vertical and horizontal lines react normally, observe them for a while.

(c) Logical address: 34 (Front passenger monitor)

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
10	Error in Picture Circuit	Error in power supply system for picture circuit (abnormal voltage) is detected.	Replace multi–display (CRT display) display.
11	Back–light Error (No current)	Decline in power output from inverter circuit for back–light.	Replace multi–display (CRT display) display.
12	Back–light Error (Excess current)	Excess power output from inverter circuit for back–light.	Replace multi–display (CRT display) display.

4. BODY ECU (COMBINATION METER) (Physical address: 1EC)

HINT:

- *1: Even if no failure is detected, it may be stored depending on the battery condition or voltage for starting an engine.
- *2: It may be stored when the ignition switch is turned in 1 min. again after the engine starts.
- *3: It may be stored when the ignition switch is turned again after the engine starts.
- *4: This code is stored in 210 sec. after the master components is turned off with the ignition switch ACC or ON.

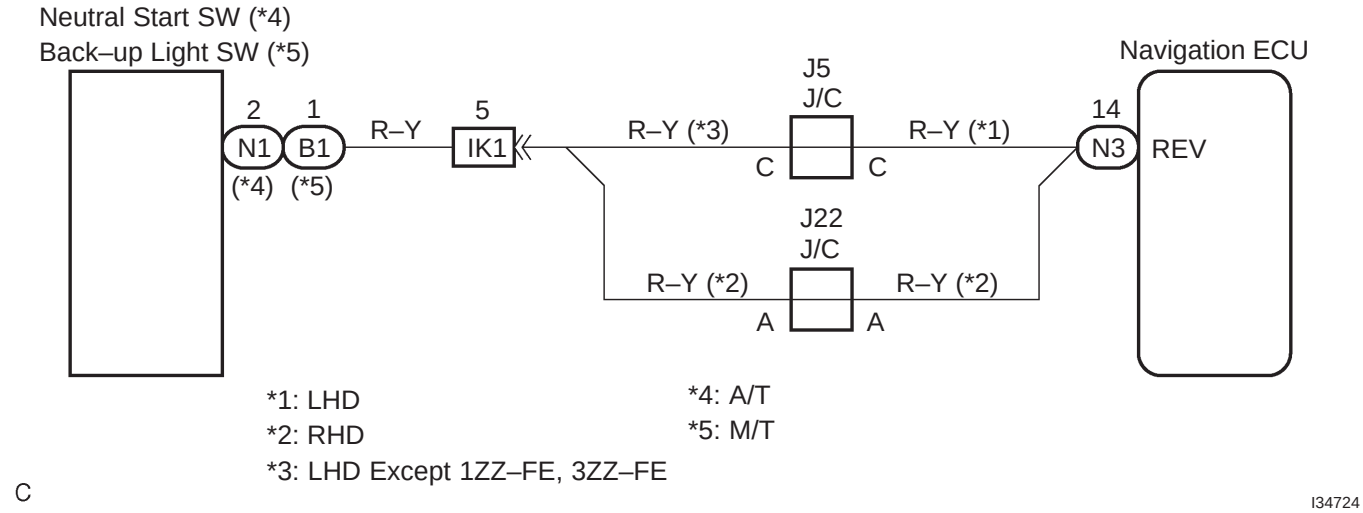
Logical address: 01 (Communication control)

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition ACC or ON. Or, when this code was recorded, multi–display (CRT display) display was disconnected.	• Check harness for power supply of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • Check harness for power supply of body ECU. • Check harness for communication system of body ECU.
D7	Communication Check Error	Component in which this code is recorded is or was disconnected from system after engine start. Or, when recording this code, multi–display (CRT display) display was disconnected.	• Check harness for power supply of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • Check harness for power supply of body ECU. • Check harness for communication system of body ECU.
DC *2	Transmission Error	Transmission to component shown by auxiliary code has been failed. (Detecting this DTC does not necessarily mean actual failure.)	If same auxiliary code is recorded in other components, check harness for power supply and communication system of all components shown by code.
DD *3	Master Reset (Momentary Interruption)	After engine was started, multi–display (CRT display) display was disconnected from system	• Check harness for power supply of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • If this error occurs frequently, replace multi–display (CRT display) display.
DF *4	Master Error	Due to defective condition of component with a display, master function is switched to audioequipment. Error occurs in communication between sub–master (audio) and master component.	• Check harness for power supply of radio receiver assy. • Check harness for communication system of multi–display (CRT display) display. • Check harness for communication system between radio receiver assy and multi–display (CRT display) display.
E0 *1	Registration Completion Instruction Error	”Registration Completion Instruction” command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E1 *1	Audio processor ON error	While source equipment is operating, AMP output is stopped.	• Check harness for power supply of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display.

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
E2	ON/OFF Instruction Parameter Error	Error occurs in ON/OFF controlling command from stereo component amplifier assy.	Replace radio receiver assy.
E3 *1	Registration Request Transmission	• Registration Request command is output from slave component. • Registration Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

DRIVING DIRECTIONS ARE OPPOSITE TO MOVING DIRECTION OF VEHICLE POSITION MARK

WIRING DIAGRAM



INSPECTION PROCEDURE

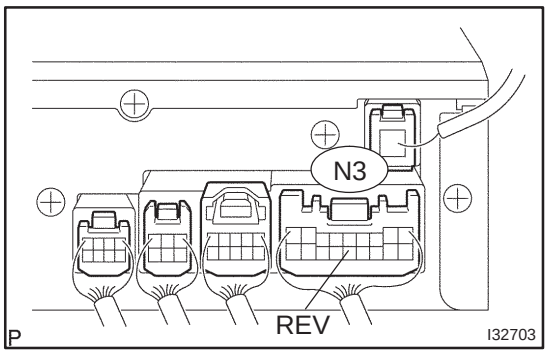
1	NAVIGATION CHECK MODE(VEHICLE SENSORS)

(a) Check the vehicle input signals.
(1) Start up the diagnosis system and read the REV signal in vehicle sensors mode.
Standard: Input signal is normal (REV)

OK → **REPLACE NAVIGATION ECU (See page 67–27)**

NG

2	INSPECT NAVIGATION ECU(REV)



(a) Remove the navigation ECU.
(b) Check the voltage.
(1) Measure the voltage between the terminal REV of navigation ECU and body ground.
Voltage:

Terminal	Condition	Voltage (V)
REV – Body ground	Turn ignition switch ON and put gear shift in R range	10 to 14

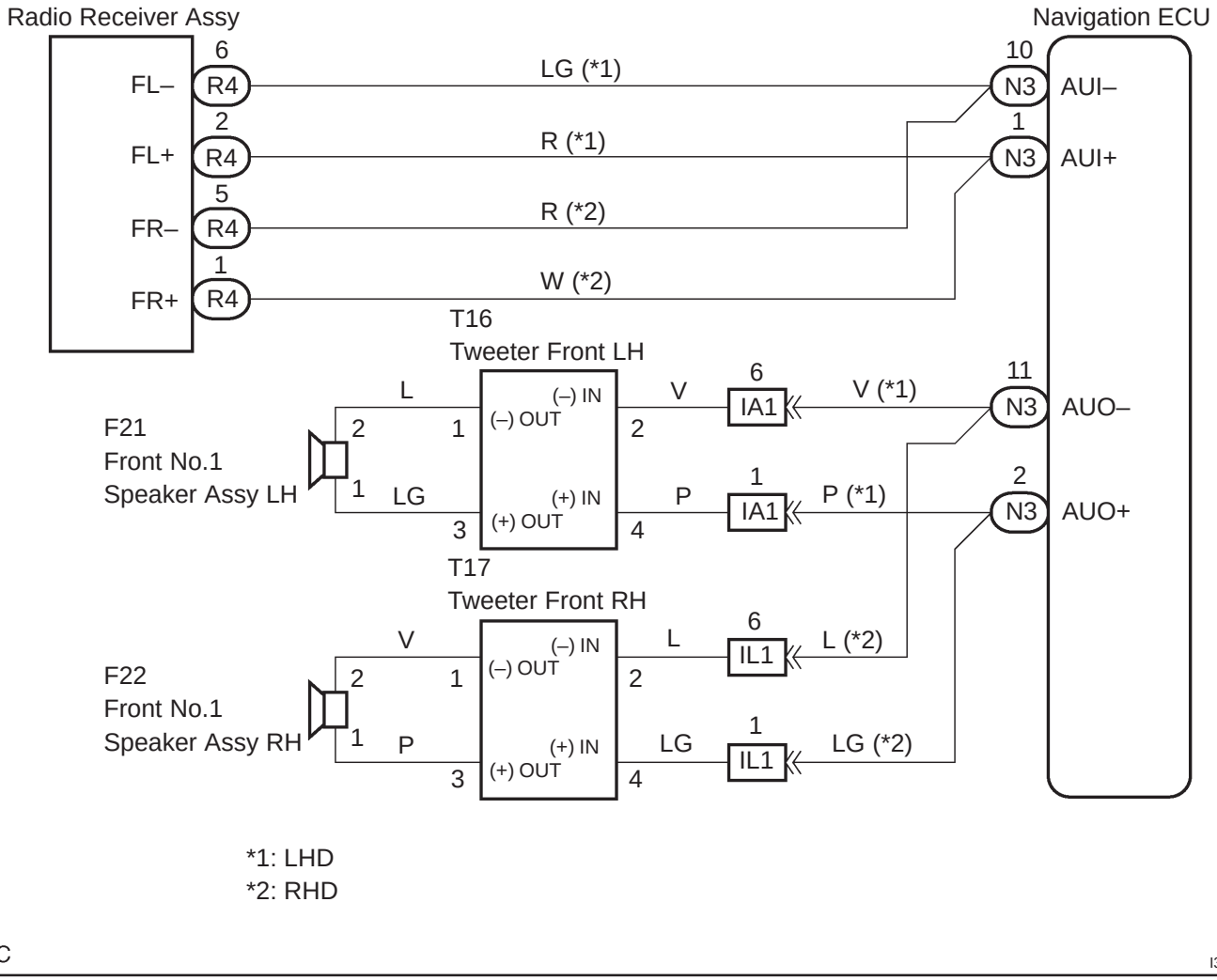
OK → **REPLACE NAVIGATION ECU (See page 67–27)**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

FRONT SPEAKER (DRIVER SIDE) ONLY IS NOT HEARD

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK SETTING(THE VOLUME OF THE NAVIGATION VOICE SOUND)

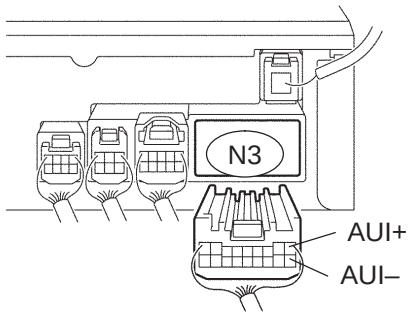
(a) Check the settings.
(1) Set the volume MAX at the voice sound settings on the menu.
Standard: "This system will guide you in this volume" is produced.

OK → **Go to step 4**

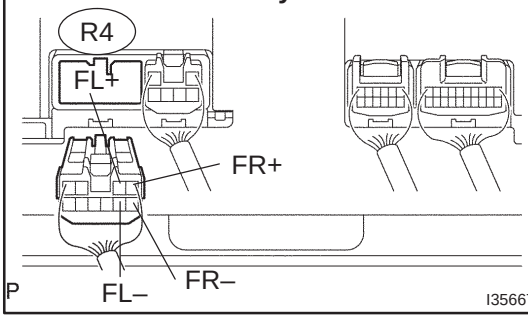
NG

2	CHECK HARNESS AND CONNECTOR(NAVIGATION ECU – RADIO RECEIVER ASSY)

Navigation ECU:



Radio Receiver Assy:



(a) Disconnect the connector between the navigation ECU and radio receiver assy.
(1) Check continuity between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
FL+*1, FR+*2 – AUI+	Continuity
FL–*1, FR–*2 – AUI–	Continuity

*1: LHD Models
*2: RHD Models

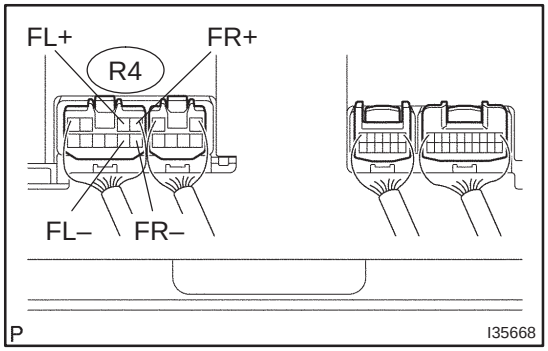
(2) Check for a short between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
AUI+ – Body ground	No continuity
AUI– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT RADIO RECEIVER ASSY(FL+(*1), FL–(*1), FR+(*2), FR–(*2), GND)



(a) Remove the radio receiver assy.
(b) Using an oscilloscope, check the signal waveform between the terminals FL+*1, FL–*1, FR+*2, FR–*2 and GND of stereo component amplifier assy.
*1: LHD Models
*2: RHD Models

Standard:

Tester connection	Condition	Specified condition
FL+*1, FR+*2 – GND	While voice sound is being produced	A waveform synchronized with sound is output
FL–*1, FL–*2 – GND	While voice sound is being produced	A waveform synchronized with sound is output

NG → **REPLACE RADIO RECEIVER ASSY (See page 67–5)**

OK

4 INSPECT FRONT NO.1 SPEAKER ASSY

(a) Resistance check
(1) Check resistance between the terminals of the front No.1 speaker assy.
Standard: 4 Ω

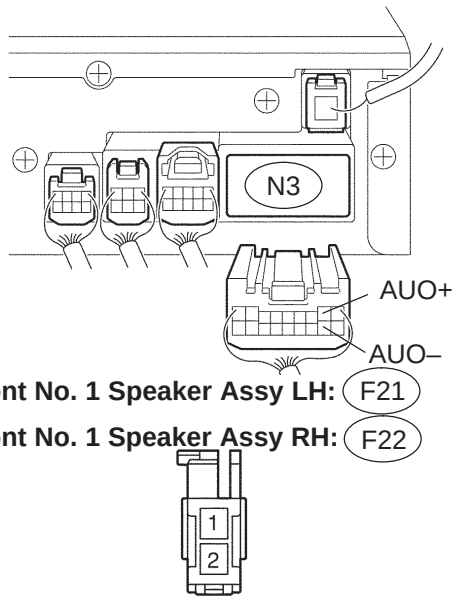
NOTICE:
The speaker should not be removed for checking

NG → **REPLACE FRONT NO.1 SPEAKER ASSY (See page 67–10)**

OK

5	CHECK HARNESS AND CONNECTOR(NAVIGATION ECU – FRONT NO. 1 SPEAKER ASSY)

Navigation ECU:



(a) Disconnect the connectors from the navigation ECU and front No.1 speaker assy.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
AUO+ – 1	Continuity
AUO– – 2	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
AUO+ – Body ground	No continuity
AUO– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE NAVIGATION ECU (See page 67–27)

GPS MARK DOES NOT APPEAR

INSPECTION PROCEDURE

1	CHECK MARK DISPLAY

(a) Check that the malfunction disappears when placing the vehicle outdoors with a good view.
Standard: GPS mark is displayed.

HINT:
At the place surrounded by the architecture, the vehicle cannot receive the GPS radio wave.

OK → **SYSTEM OK**

NG

2	CHECK OPTIONAL COMPONENT

(a) Check for optional component.
(1) Check if there are any optional components on the vehicle.
Standard: There are no optional components on the vehicle.
(2) Check if there is anything such as film stuck to the window or any metal objects on the instrument panel.
Standard: There is nothing such as film stuck to the window or any metal objects on the instrument panel.

NG → **EFFECT FROM OPTIONAL COMPONENT**

OK

3	REPLACE NAVIGATION ANTENNA ASSY (See page 67–28)

Standard: Normally returns.

NG → **REPLACE NAVIGATION ECU (See page 67–27)**

OK

SYSTEM OK

NAVIGATION SYSTEM

05C3B–01

HOW TO PROCEED WITH TROUBLESHOOTING

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–1437)

3	Problem Symptom Confirmation

- Symptom does not occur (Go to step 4)
- Symptom occurs (Go to step 5)

4	Symptom Simulation (See page 01–32)

5	DTC Check (See page 05–1438)

- Normal code (Go to step 7)
- Malfunction code (Go to step 6)

6	DTC Chart (See page 05–1453)

- Go to step 8

7	Problem Symptoms Table (See page 05–1464)

8	Circuit Inspection and Part Inspection

9	Indemnification of Problem

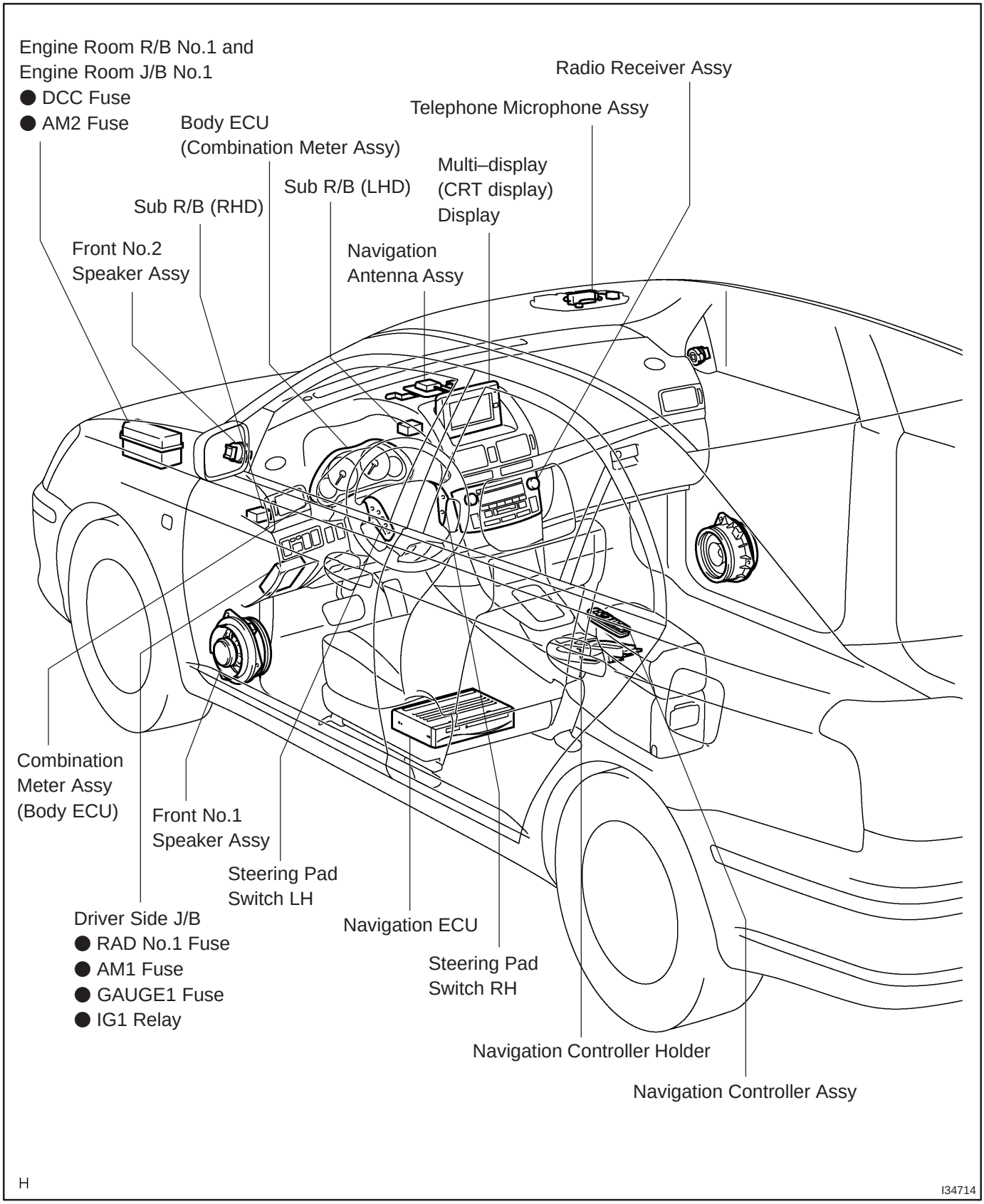
10	**Repair or Replace**

11	**Confirmation Test**

End

05C3F–01

LOCATION



MAP IS DISPLAYED IN WHITE OR BLUE SCREEN (SWITCHED AND VEHICLE POSITION MARK ARE DISPLAYED)

INSPECTION PROCEDURE

1	CHECK SETTING

(a) Check the settings.
(1) Check that the map display is normal when the map scale is set to the widest area.
Standard: Map display is normal

OK → **SYSTEM OK**

NG

2	CHECK AND OPERATE AGAIN

(a) Clean the map disc.
(1) After wiping the map disc in the circumference direction with a soft cloth, insert it again.

OK → **SYSTEM OK**

NG

3	REPLACE DISC PLAYER DISC

Standard: Normally returns

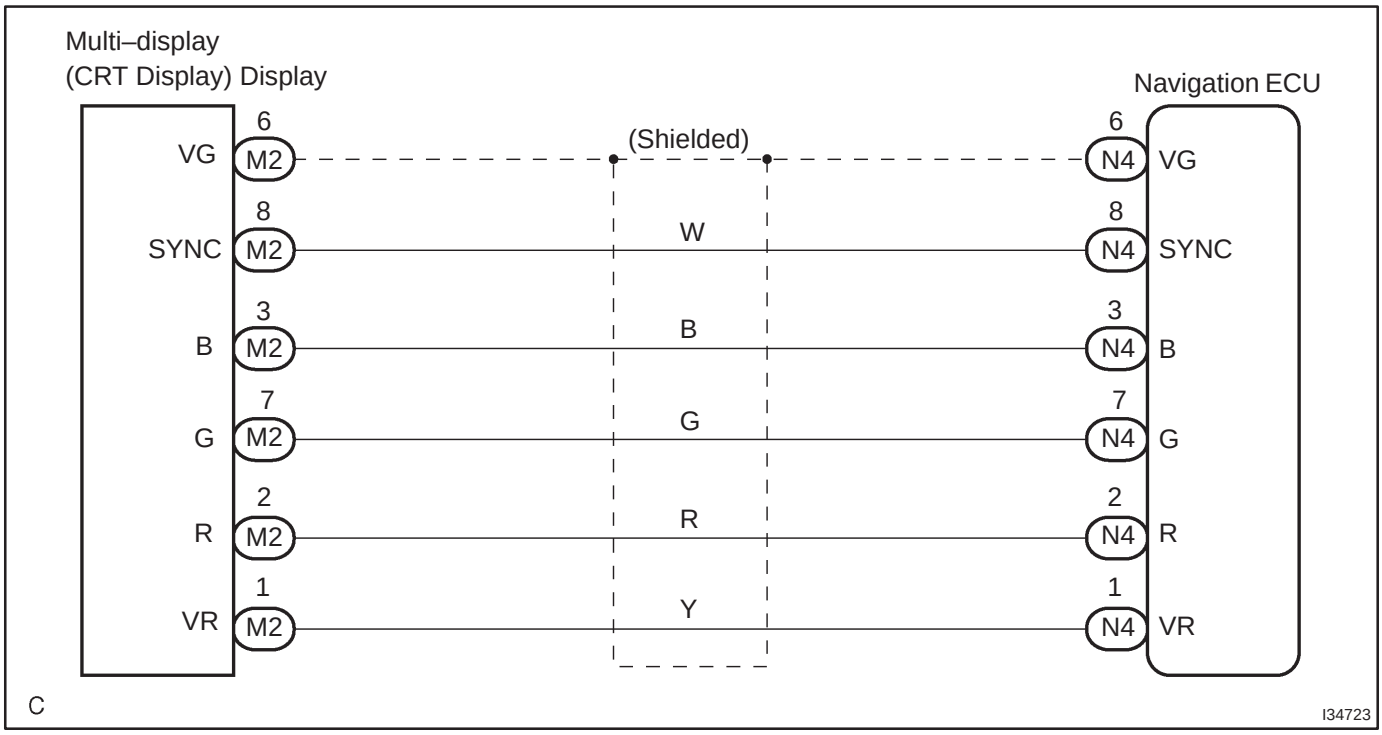
OK → **SYSTEM OK**

NG

REPLACE NAVIGATION ECU (See page 67–27)

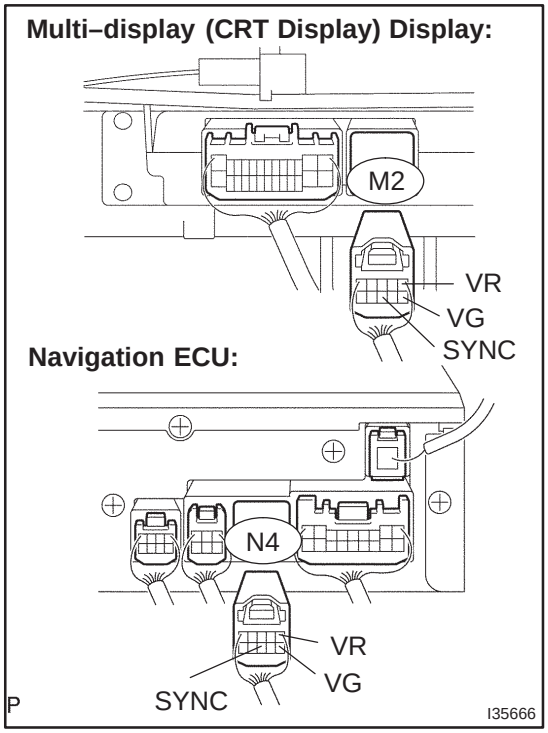
NAVIGATION SCREEN IS NOT STABILIZED (SYNCRONOUS ERROR)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(MULTI–DISPLAY (CRT DISPLAY)DISPLAY – NAVIGATION ECU)



(a) Disconnect the connectors from the multi–display (CRT display)display and navigation ECU.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
VG – VG	Continuity
VR – VR	Continuity
SYNC – SYNC	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
VG – Body ground	Continuity
VR – Body ground	Continuity
SYNC – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2	REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)

Standard: Normally returns.

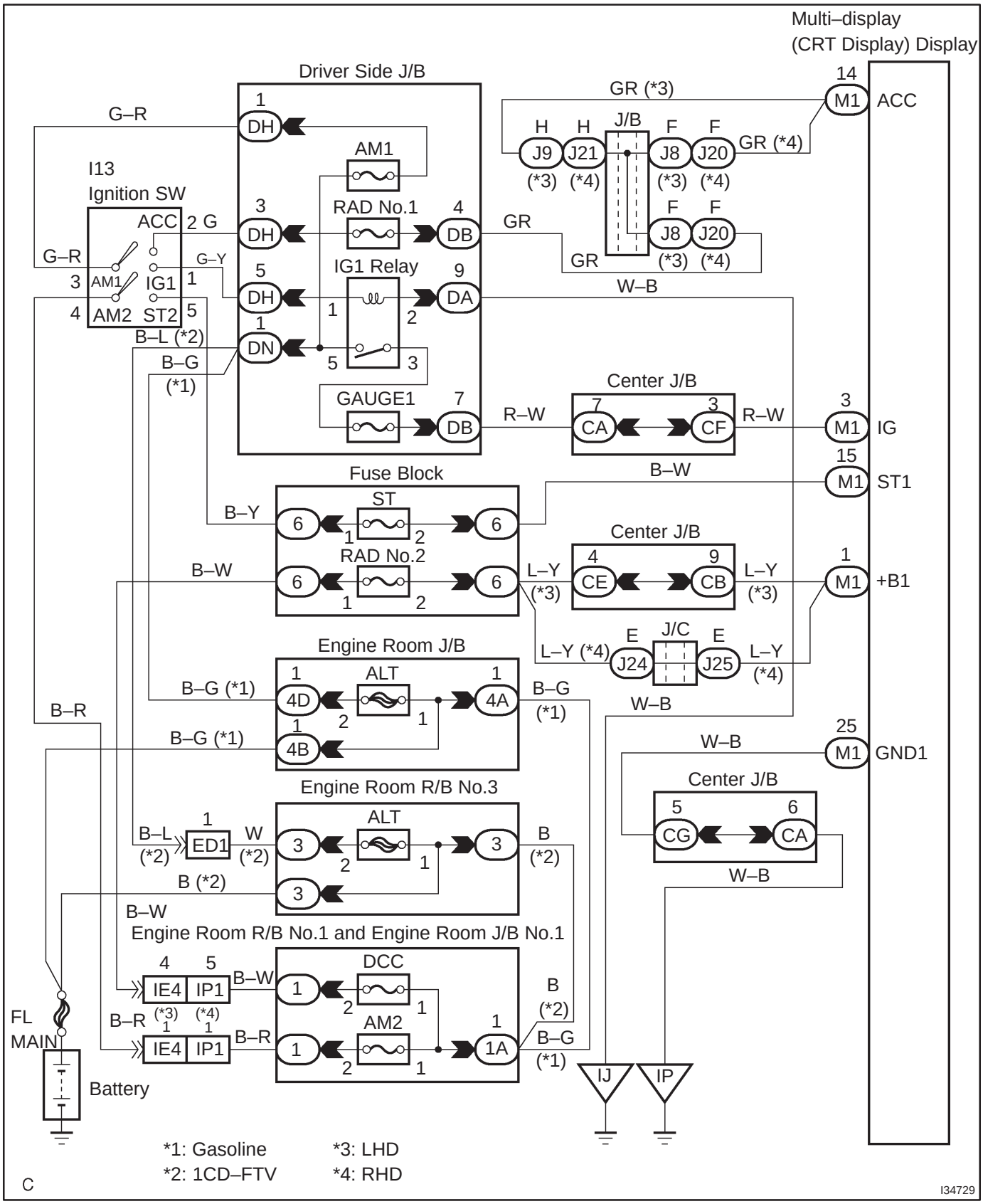
NG → **REPLACE NAVIGATION ECU (See page 67–27)**

OK

SYSTEM OK

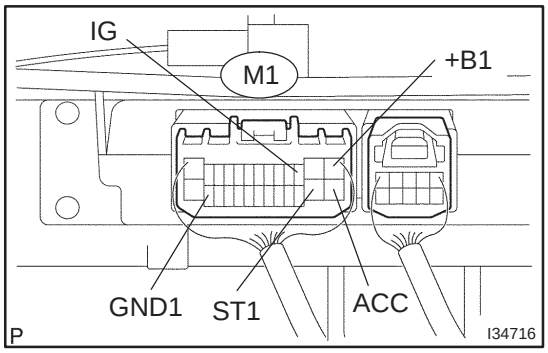
POWER SOURCE CIRCUIT (MULTI–DISPLAY (CRT DISPLAY) DISPLAY)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT MULTI–DISPLAY (CRT DISPLAY) DISPLAY(ACC, IG, ST1, +B1, GND1)



(a) Remove the multi–display (CRT display) display.

(b) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND1 – Body ground	Always	Continuity

(c) Check the voltage between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
+B1 – GND1	Always	10 to 14 V
IG – GND1	Ignition SW ON	10 to 14 V
ACC – GND1	Ignition SW ACC	10 to 14 V
ST1 – GND1	Ignition SW ON	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2	CHECK FOR PROBLEM SYMPTOMS TABLE

(a) Check the problem symptoms table (See page 05–1464).

A	Suspected areas are cleared
B	Suspected areas still exist

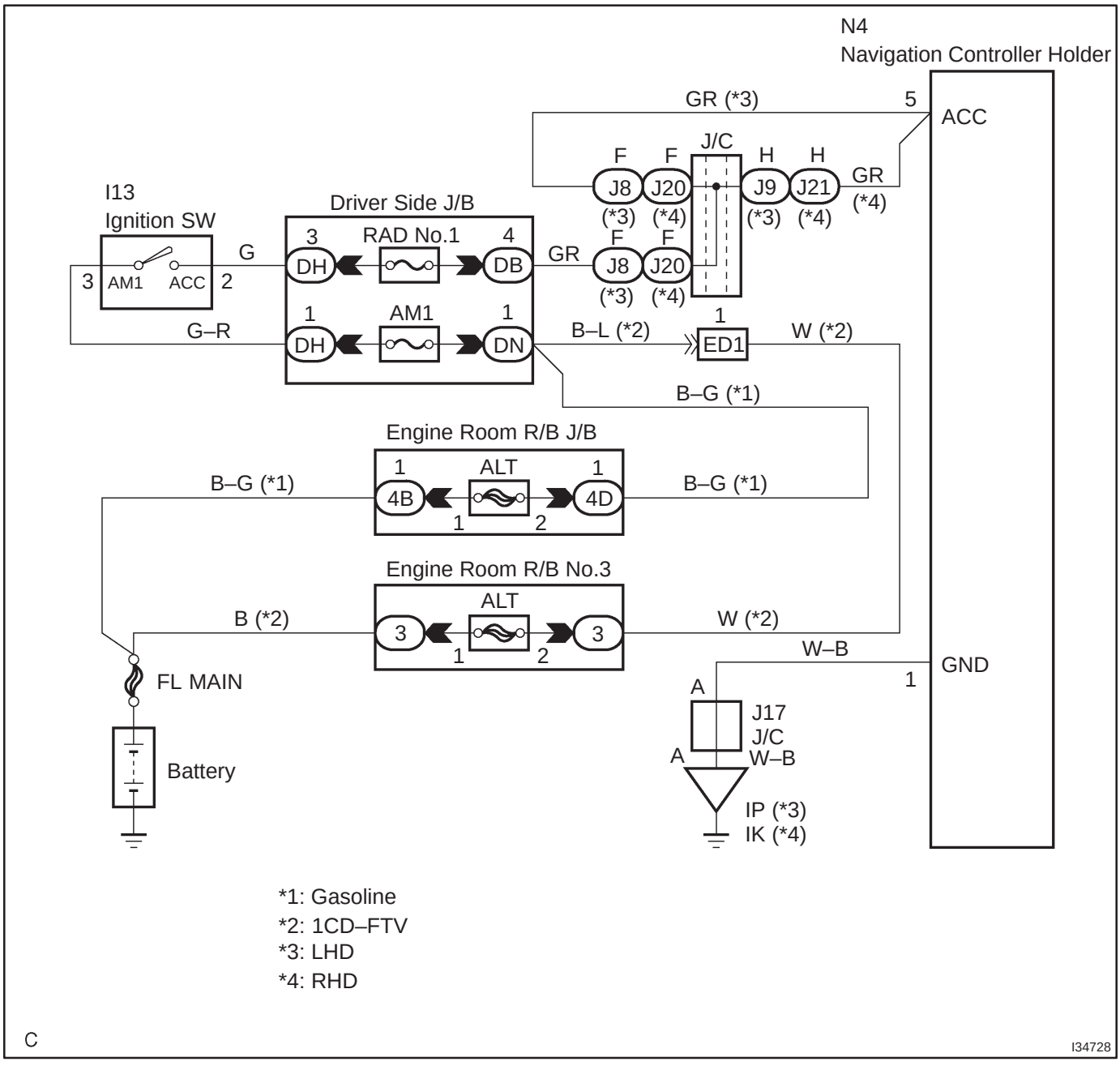
B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1464)**

A

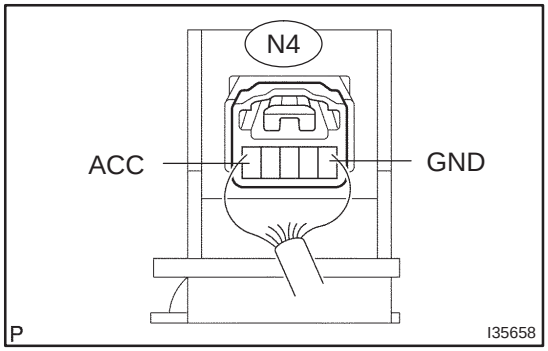
REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)

POWER SOURCE CIRCUIT (NAVIGATION CONTROLLER HOLDER)

WIRING DIAGRAM



1 INSPECT NAVIGATION CONTROLLER HOLDER(ACC, GND)



(a) Remove the navigation controller holder.

(b) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND – Body ground	Constant	Continuity

(c) Check the voltage between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
ACC – GND	Ignition SW ACC	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 CHECK FOR PROBLEM SYMPTOMS TABLE

(a) Check the problem symptoms table (See page 05–1464).

A	Suspected areas are cleared
B	Suspected areas still exist

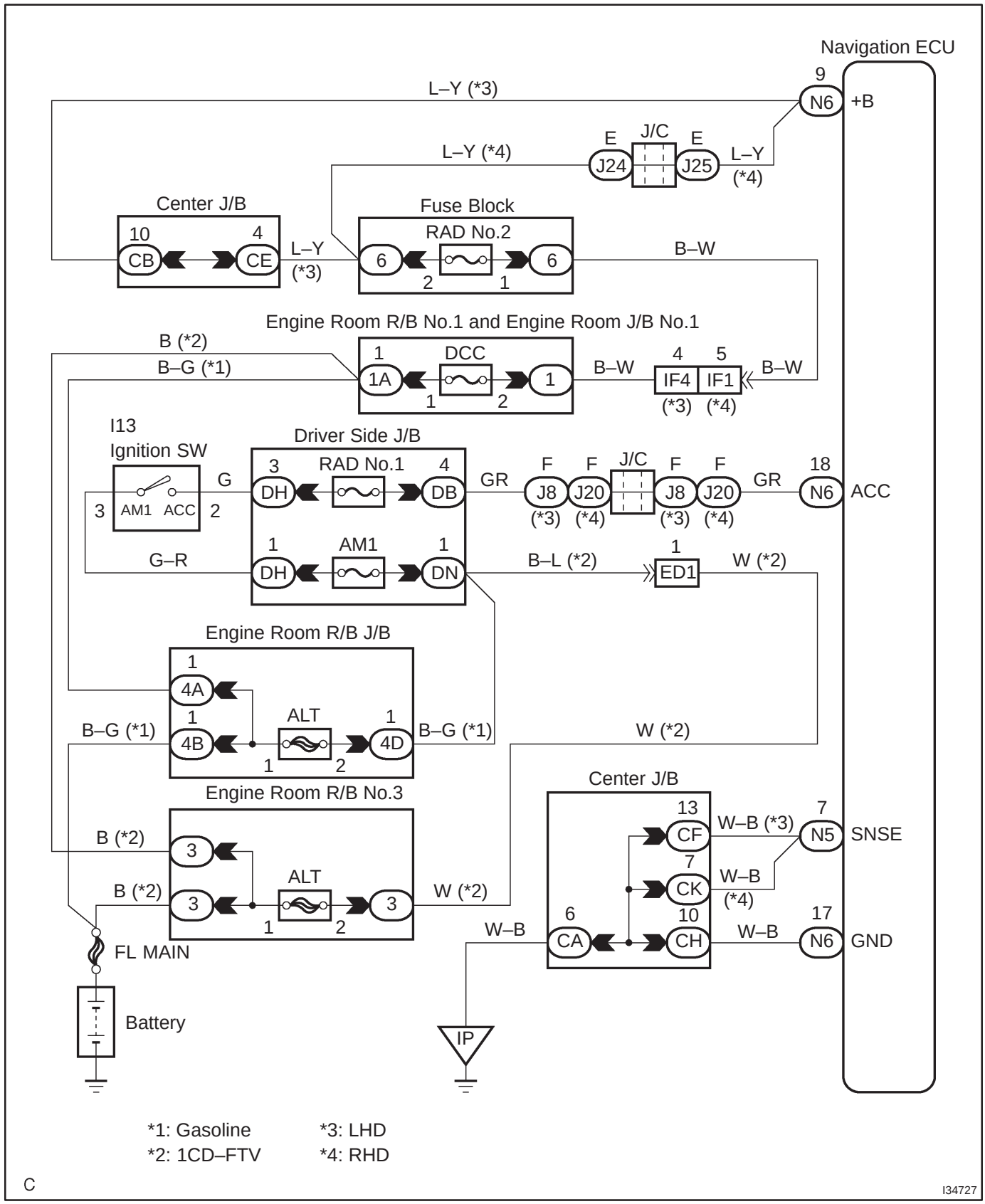
B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1464)**

A

REPLACE NAVIGATION CONTROLLER HOLDER

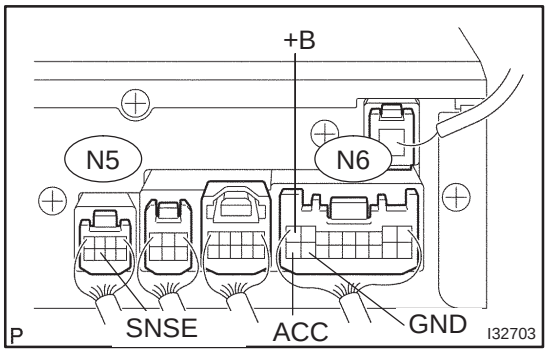
POWER SOURCE CIRCUIT (NAVIGATION ECU)

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT NAVIGATION ECU(+B, ACC, SNSE, GND)



(a) Remove the navigation ECU.

(b) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND – Body ground	Always	Continuity
SNSE – Body ground	Always	Continuity

(c) Check the voltage between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
+B – GND	Always	10 to 14 V
ACC – GND	Ignition SW ACC, ON	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 CHECK FOR PROBLEM SYMPTOMS TABLE

(a) Check the problem symptoms table (See page 05–1464).

A	Suspected areas are cleared
B	Suspected areas still exist

B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1464)**

A

REPLACE NAVIGATION ECU (See page 67–27)

05C3G–01

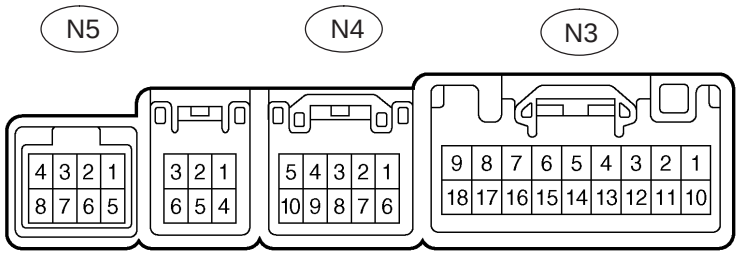
PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Black screen	1. RAD No.2 fuse 2. Power source circuit (multi–display (CRT display)display) 3. AVC–LAN circuit	01–5 05–1465 05–1471
Navigation screen display nothing	1. RAD No.2 fuse 2. Power source circuit (navigation ECU) 3. AVC–LAN circuit	01–5 05–1467 05–1471
Navigation screen is not stabilized (Synchronous error)	1. RAD No.2 fuse 2. Power source circuit (navigation ECU) 3. Navigation screen is not stabilized (Synchronous error)	01–5 05–1467 05–1475
Color on navigation screen is unusual (RGB signal error)	1. RAD No.2 fuse 2. Power source circuit (navigation ECU) 3. Color on navigation screen is unusual (RGB signal error)	01–5 05–1467 05–1477
Front speaker (driver side) only is not heard	–	05–1479
Map disc cannot be inserted	1. RAD No.2 fuse 2. Power source circuit (navigation ECU)	01–5 05–1467
Current position cannot be displayed on screen (disc caution screen does not change)	–	05–1483
Map is displayed in white or blue screen (switched and vehicle position mark are displayed)	–	05–1484
Vehicle position is deviated from correct point badly	1. Vehicle position is deviated from correct point badly. 2. GPS mark does not appear.	05–1485 05–1487
GPS mark does not appear	–	05–1487
Vehicle position mark rotates without control (map rotates without control)	–	05–1488
Driving directions are opposite to moving direction of vehicle position mark	–	05–1490
A navigation controller assy does not operate	1. A navigation controller assy does not operate 2. The system cannot be operated by the voice sound	05–1491 05–1494
When mount the navigation controller to the navigation controller system, it cannot be operated	1. RAD No.2 fuse 2. Power source circuit (navigation controller holder) 3. When mount the navigation controller holder to the navigation controller system, it cannot be operated 4. The system cannot be operated by the voice sound	01–5 05–1469 05–1492 05–1494
The system cannot be operated by the voice sound	1. The system cannot be operated by the voice sound 2. AVC–LAN circuit	05–1494 05–1471

05C3X–01

TERMINALS OF ECU

1. NAVIGATION ECU



C

I35876

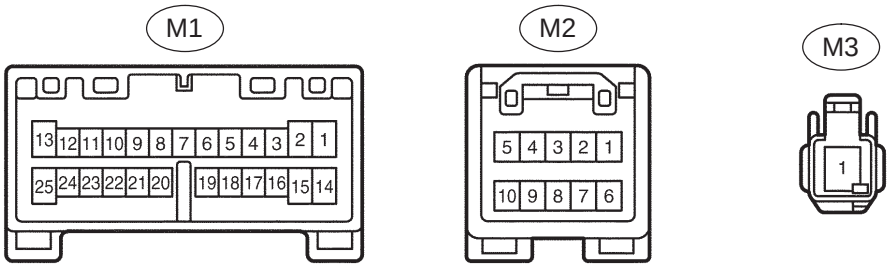
Symbols (Terminals No.)	Wiring Color	Condition	Specification
N5–3 (MIC+) – N5–6 (SGND)	B – BR	Audio system is playing	A waveform synchronized with sounds is output
N5–4 (MACC) – N5–6 (SGND)	R – BR	Ignition switch ACC	4 to 6 V
N5–5 (MIC–) – N5–6 (SGND)	BR – BR	Always	Continuity
N5–6 (SGND) – Body ground	BR – Body ground	Always	Continuity
N5–7 (SNSE) – Body ground	W–B – Body ground	Always	Continuity
N3–1 (AUI+) – N3–17 (GND)	R*1, W*2 – W–B	Audio system is sounding	A waveform synchronized with sounds is output
N3–2 (AUO+) – N3–17 (GND)	P*1, LG*2 – W–B	Sound quality test	–
N3–5 (SPD) – N3–17 (GND)	V–W – W–B	See ”Vehicle Signal Check Mode”	–
N3–9 (+B) – N3–17 (GND)	L–Y – W–B	Always	Below 1 V
N3–10 (AUI–) – N3–17 (GND)	LG*1, R*2 – W–B	Audio system is playing	A waveform synchronized with sounds is output
N3–11 (AUO–) – N3–17 (GND)	V*1, L*2 – W–B	Sound quality test	–
N3–14 (REV) – N3–17 (GND)	R–Y – W–B	See ”Vehicle Signal Check Mode”	–
N3–17 (GND) – Body ground	W–B – Body ground	Always	Continuity
N3–18 (ACC) – N3–17 (GND)	GR – W–B	Ignition switch ACC	10 to 14 V
N4–1 (VR) – N4–6 (VG)	Y – Shielded	Ignition switch OFF	Below 1 V
N4–2 (R) – N4–6 (VG)	R – Shielded	Navigation display is displayed	Pulse generation *2
N4–3 (B) – N4–6 (VG)	B – Shielded	Navigation display is displayed	Pulse generation *2
N4–5 (TX+)	V	See ”Service Check Mode”	–
N4–6 (VG) – Body ground	Shielded – Body ground	Always	Continuity
N4–7 (G) – N4–6 (VG)	G – Shielded	Navigation display is displayed	Pulse generation *2

Symbols (Terminals No.)	Wiring Color	Condition	Specification
N4–8 (SYNC) – N4–6 (VG)	W – Shielded	Navigation display is displayed	Pulse generation *1
N4–10 (TX–)	LG	See "Service Check Mode"	–

*1: LHD

*2: RHD

2. MULTI–DISPLAY (CRT DISPLAY) DISPLAY



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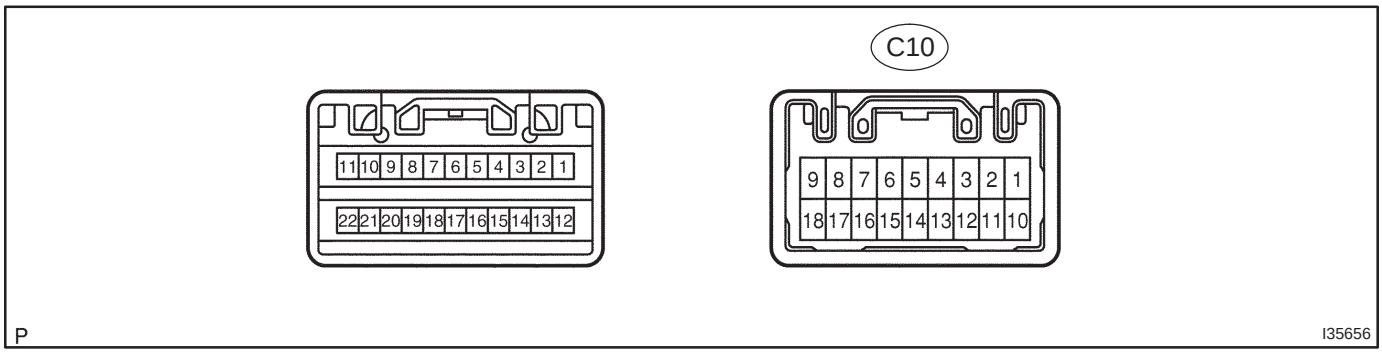
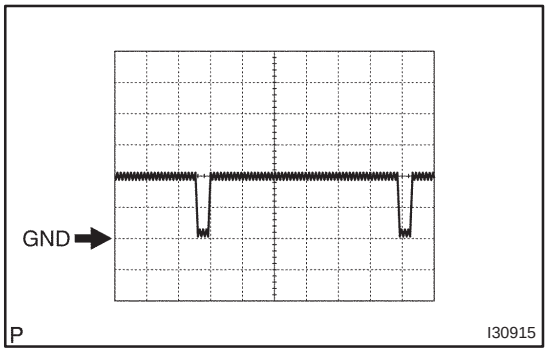
Symbols (Terminals No.)	Wiring Color	Condition	Specification
M1–1 (+B1) – M2–1 (GND2)	L–Y – W–B	Always	10 to 14 V
M1–3 (IG) – M2–1 (GND2)	R–W – W–B	Ignition switch ON	10 to 14 V
M1–4 (SPD) – M2–1 (GND2)	V–W – W–B	See "Vehicle Signal Check"	–
M1–5 (GTX+)	P	See "Service Check Mode"	–
M1–10 (RE1) – M1–22 (SGD1)	R – Shielded	Ignition switch ACC	Approx. 3.3 V
M1–12 (TX3+)	G–Y	See "Service Check Mode"	–
M1–14 (ACC) – M2–1 (GND2)	GR – W–B	Ignition switch ACC	10 to 14 V
M1–15 (ST1) – M2–1 (GND2)	B–W – W–B	Ignition switch START	10 to 14 V
M1–16 (TC) – M2–1 (GND2)	W–L – W–B	Ignition switch OFF and connect terminals TC and GND1 of check connector	Continuity
M1–17 (PKB) – M2–1 (GND2)	B–W – W–B	See "Vehicle Signal Check Mode"	–
M1–18 (GTX–)	LG	See "Service Check Mode"	–
M1–22 (SGD1) – Body ground	Shielded – Body ground	Always	Continuity
M1–24 (TX3–)	G	See "Service Check Mode"	–
M1–25 (GND1) – Body ground	W–B – Body ground	Always	Continuity
M2–1 (GND1) – M1–6 (VG)	Y – Shielded	Ignition switch OFF	Below 1 V
M2–2 (R) – M1–6 (VG)	R – Shielded	Navigation display is displayed	Pulse generation *2
M–2 (B) – M1–6 (B – VG)	B – Shielded	Navigation display is displayed	Pulse generation *2
M2–5 (CTX+)	V	See "Service Check Mode"	–
M2–6 (VG) – Body ground	Shielded – Body ground	Always	Continuity
M2–7 (G) – M1–6 (VG)	G – Shielded	Navigation display is displayed	Pulse generation *2

Symbols (Terminals No.)	Wiring Color	Condition	Specification
M2–8 (SYNC) – M1–6 (VG)	W – Shielded	Navigation display is displayed	Pulse generation *1
M2–10 (CTX–)	LG	See "Service Check Mode"	–
M3–1 (GND2) – Body ground	W–B – Body ground	Always	Continuity

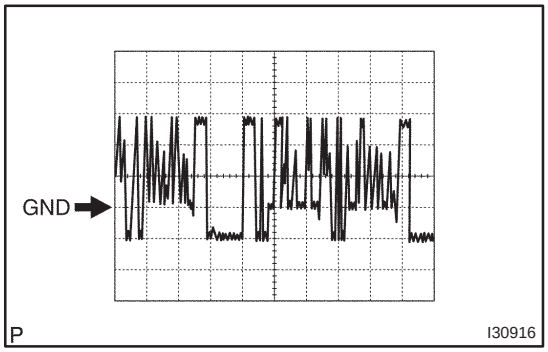
3. BODY ECU (COMBINATION METER ASSY)



Symbols (Terminals No.)	Wiring Color	Condition	Specification
C10–3 (GTX+)	G–Y	See "Service Check Mode"	–
C10–4 (GTX–)	G	See "Service Check Mode"	–



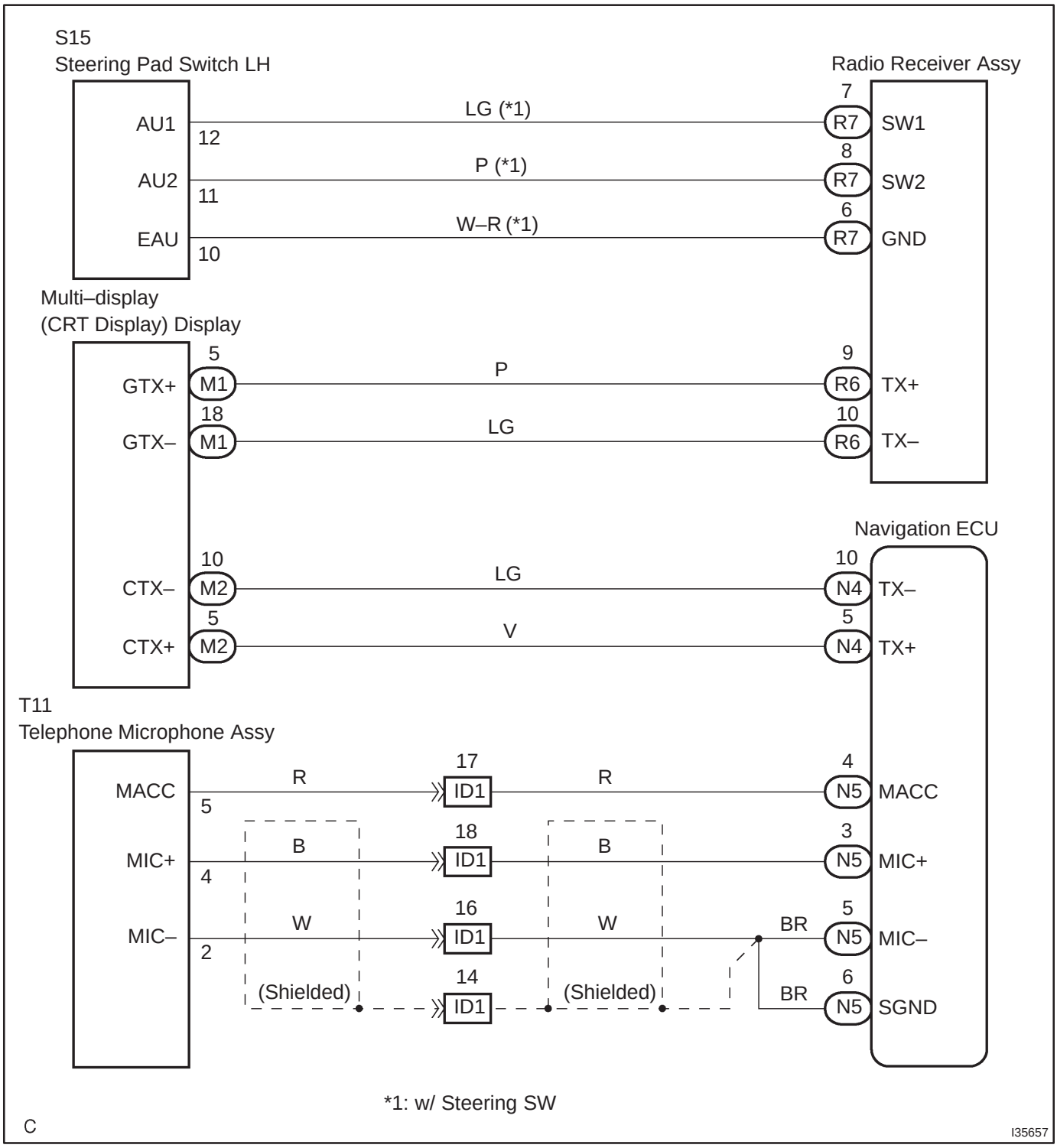
(a) *1: Oscilloscope wave
Terminal to be measured: SYNC – GND
Setting for measurement: 500 mV/DIV10– μs/DIV
Condition: Navigation display is displayed.



(b) *2: Oscilloscope wave
Terminal to be measured: R, G, B – GND
Setting for measurement: 200 mV/DIV10– μs/DIV
Condition: Navigation map is switched.

THE SYSTEM CANNOT BE OPERATED BY THE VOICE SOUND

WIRING DIAGRAM



INSPECTION PROCEDURE

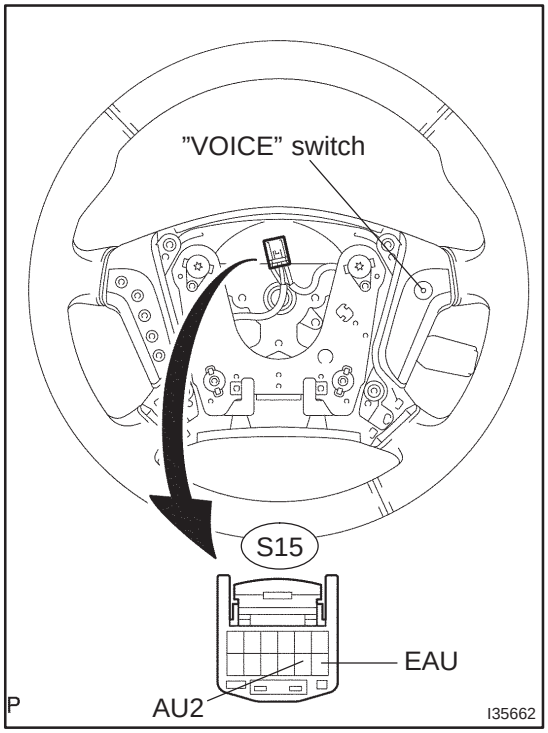
1	INSPECT STEERING WHEEL ASSY(BEEP SOUND)

(a) Check the switch (Beep sound).
(1) Press steering pad switch LH to check that the beep sound is produced.

OK → **Go to step 3**

NG

2	INSPECT STEERING WHEEL ASSY(AU2, EAU)



(a) Remove the horn button assy(See page 50–9).
(b) Check continuity between the terminals at each condition, as shown in the chart.

Tester connection	Condition	Specified condition
AU2 – EAU	Do not switch position	Approx. 100 kΩ
AU2 – EAU	VOICE switch: push	Approx. 3.1 k

NG → **REPLACE STEERING WHEEL ASSY (See page 50–9)**

OK

3	CHECK TALK BACK

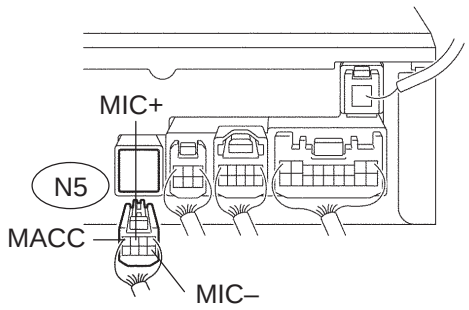
(a) Check whether the system performs talk back or not.
Standard: The system performs talk back.

OK → **SYSTEM OK**

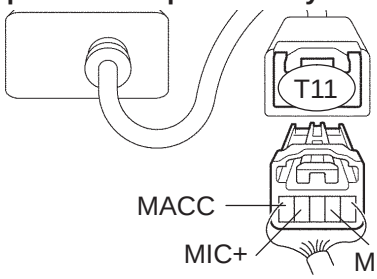
NG

4	CHECK HARNESS AND CONNECTOR(NAVIGATION ECU – TELEPHONE MICROPHONE ASSY)

Navigation ECU:



Telephone Microphone Assy:



P I35670

(a) Disconnect the connectors from the navigation ECU and telephone microphone assy.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
MACC – MACC	Continuity
MIC+ – MIC+	Continuity
MIC– – MIC–	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
MACC – Body ground	No continuity
MIC+ – Body ground	No continuity
MIC– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	REPLACE TELEPHONE MICROPHONE ASSY

Standard: Normally returns

NG → **REPLACE NAVIGATION ECU (See page 67–27)**

OK

SYSTEM OK

VEHICLE POSITION IS DEVIATED FROM CORRECT POINT BADLY

INSPECTION PROCEDURE

1	CHECK DISPLAY(GPS MARK DISPLAY)

(a) Preparation for the pre–check.
  (1) Place the vehicle outdoors with a good view of the GPS mark.
(b) Check the screen display.
  (1) Turn the ignition switch ON.
  (2) Turn the power switch of the radio receiver assy ON to display the map.
  Standard: ”GPS” mark appears

NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1464)**

OK

2	CHECK WHEN THIS HAPPENS

(a) Check the abnormal condition.
  (1) Check the point in which the trouble occurs.
  Standard:

A	The trouble occurs outside the specific area
B	The trouble occurs in the specific area

HINT:
At the place difficult to specify the vehicle position (a by–pass road, a overhand road, a loop road, or several–storied car park, etc.), the vehicle position may be out of the point due to the wrong matching.

B → **SYSTEM OK**

A

3	CHECK DISPLAY(AUTOMATIC CALIBRATION)

(a) Check the screen display.
  (1) Check the color of ”Automatic calibration” switch at the distance correction screen.
  Standard: Green (”Automatic calibration” switch)

OK → **SYSTEM OK**

NG

4	NAVIGATION CHECK MODE(VEHICLE SENSORS)

(a) Check the vehicle input signals.
(1) Start up the diagnosis system and read the SPEED signal in vehicle signal check mode.
Standard: Input signal is normal (SPEED)

NG → **Go to step 6**

OK

5	CHECK AND OPERATE AGAIN

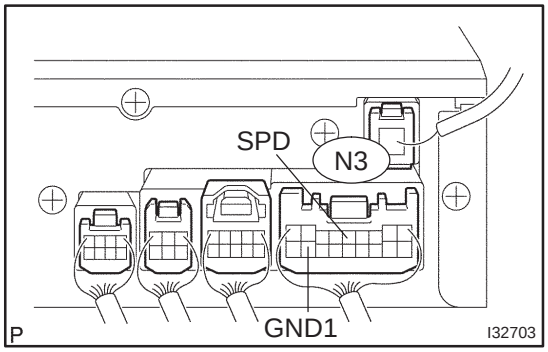
Standard: Normally returns

OK → **SYSTEM OK**

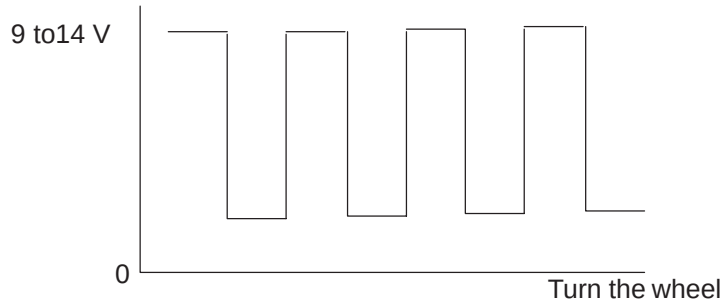
NG

REPLACE NAVIGATION ECU (See page 67–27)

6	INSPECT NAVIGATION ECU(SPD, GND1)



(a) Remove the navigation ECU.
(b) Check the voltage.
(1) Shift the shift lever to neutral.
(2) Jack up either one of the front wheels.
(3) Turn ignition switch ON.
(4) Measure the voltage between the terminal SPD and GND1 of navigation ECU when the front wheels are turned slowly.
Standard: Voltage is pulsed.



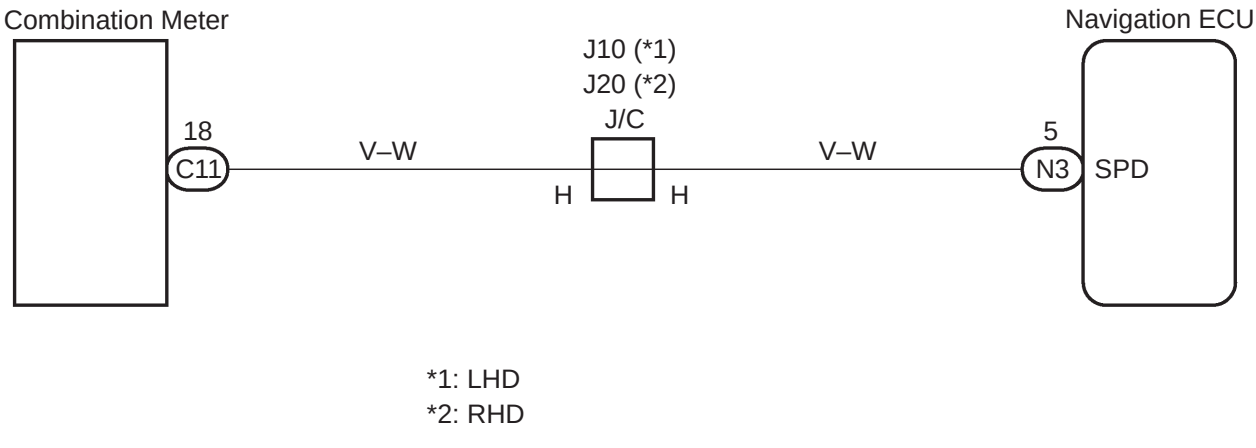
OK → **REPLACE NAVIGATION ECU (See page 67–27)**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

VEHICLE POSITION MARK ROTATES ARBITRARILY (MAP ROTATES ARBITRARILY)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK AND OPERATE AGAIN

(a) Turn the ignition switch from OFF to ON, check that the malfunction disappears.
Standard: Malfunction disappears

HINT:
Even if the system works correctly, the following conditions may be seen: vehicle position mark turns, or the map turns unwillingly. (It is because by turning the IG switch to ACC or ON during turning, navigation system stores based on the angular speed). In that case, turn the IG switch from OFF to ACC or ON to return the correct function.

OK	SYSTEM OK

NG

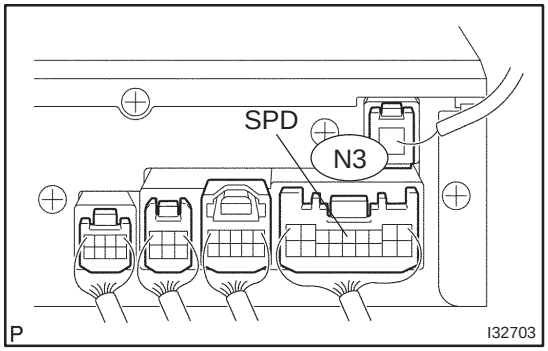
2	NAVIGATION CHECK MODE(VEHICLE SENSORS)

(a) Check the vehicle input signals.
(1) Start up the diagnosis system and read the ”SPD” signal in vehicle sensors mode.
Standard: Input signal is normal

OK	REPLACE NAVIGATION ECU (See page 67–27)

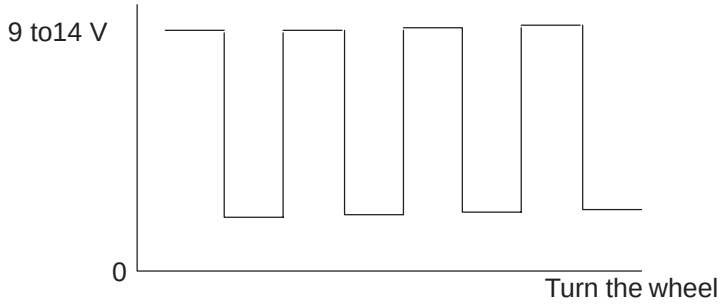
NG

3	INSPECT NAVIGATION ECU(SPD)



(a) Remove the navigation ECU.
(b) Check the voltage.
  (1) Shift the shift lever to neutral.
  (2) Jack up either one of the front wheels.
  (3) Turn ignition switch ON.
  (4) Measure the voltage between the terminal SPD of navigation ECU and body ground when the front wheel are turned slowly.

Standard: Voltage is pulsed.



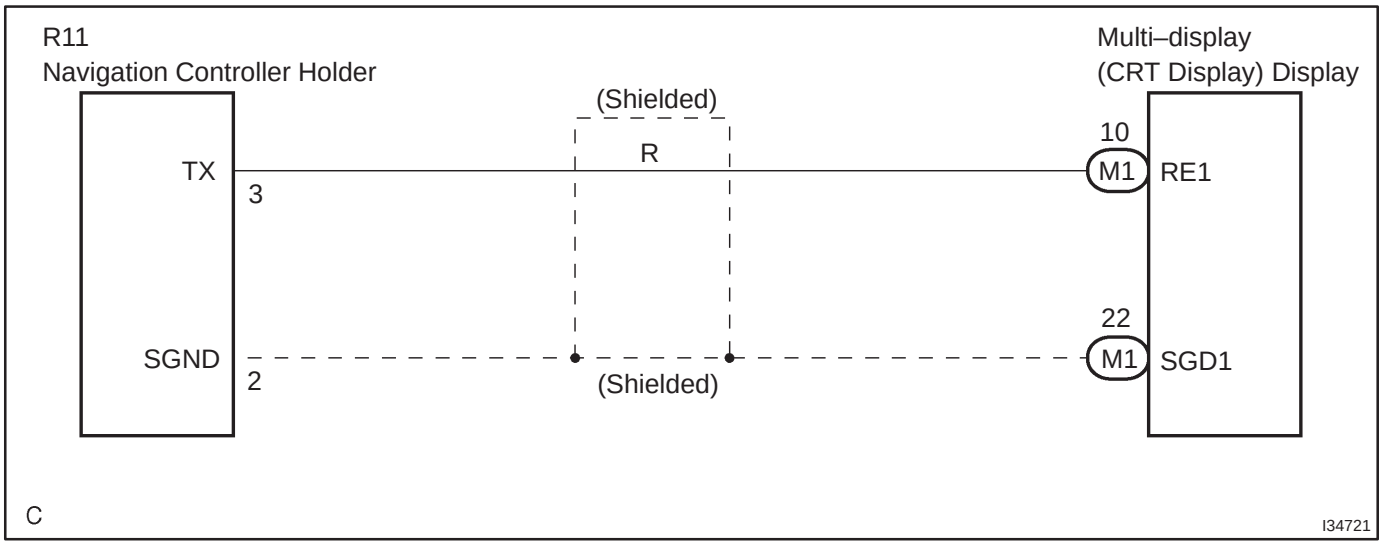
OK → **REPLACE NAVIGATION ECU**
(See page 67–27)

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

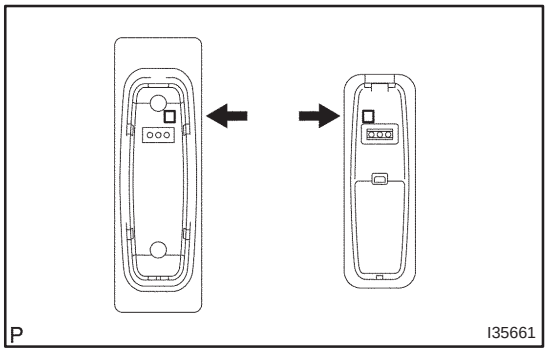
WHEN MOUNT THE NAVIGATION CONTROLLER ASSY TO THE NAVIGATION CONTROLLER HOLDER, IT CANNOT BE OPERATED

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CLEAN THE INFRARED RAY EMITTED PORTION



(a) Clean the infrared ray emitted portion.
  (1) Clean the infrared ray emitted portion on the navigation controller holder and navigation controller assy.
  (2) Check whether the same malfunction occurs.

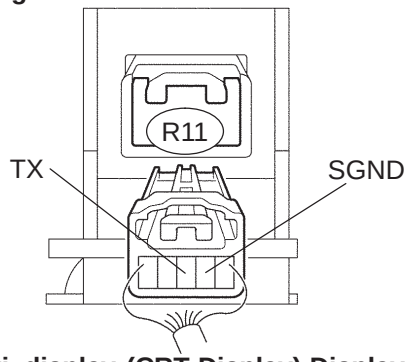
Standard: The function returns to normal.

OK	**DIRT AT THE INFRARED RAY EMITTED PORTION**

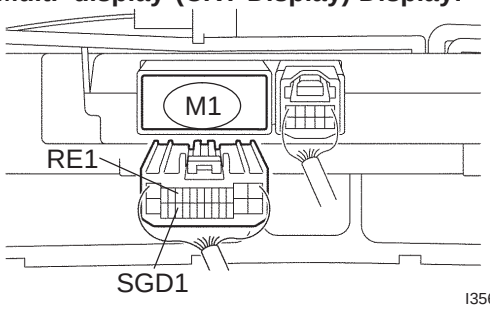
NG

2	CHECK HARNESS OR CONNECTOR(NAVIGATION CONTROLLER HOLDER – MULTI–DISPLAY (CRT DISPLAY) DISPLAY)

Navigation Controller Holder:



Multi–display (CRT Display) Display:



(a) Disconnect the connectors from the navigation controller assy and multi–display (CRT display) display.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connecter	Specified condition
TX – RE1	Continuity
SGND – SGD1	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart

Standard:

Tester connecter	Specified condition
TX – Body ground	No continuity
SGND – Body ground	Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	REPLACE NAVIGATION CONTROLLER HOLDER

Standard: Normally returns.

OK → **SYSTEM OK**

NG

4	REPLACE NAVIGATION CONTROLLER ASSY

Standard: Normally returns.

OK → **SYSTEM OK**

NG

REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)

05C8A–01

PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
All doors cannot be locked/unlocked at once	3. DOOR fuse 4. ECU–B 2 fuse 5. Power window regulator master switch assy 6. Front door lock assy LH, RH (Driver side) 7. Instrument panel J/B assy (Integration relay) 8. Wire harness	05–1546
Key lock–in prevention function does not work properly (Manual operation and operation interlocked with key are active)	1. Unlock warning switch assy 2. Courtesy lamp switch assy LH, RH (Driver side) 3. Instrument panel J/B assy (Integration relay) 4. Wire harness	05–1555
w/ Double lock: Double lock function does not operate properly	1. Wireless system 2. DOOR fuse 3. ECU–B 2 fuse 4. Front door lock assy LH, RH 5. Rear door lock assy LH, RH 6. Instrument panel J/B assy (Integration relay) 7. Wire harness	05–1560

05C85–01

CUSTOMER PROBLEM ANALYSIS CHECK

POWER DOOR LOCK CONTROL SYSTEM Check Sheet

Inspector's name:_____

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	km miles

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Sometimes (Times per day, month) ☐ Once only
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outdoor temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °C (°F))

Problem Symptoms	☐ Malfunction in Door Lock/Unlock Operation Using Door Lock Control Switch	☐ Driver side door lock control switch	☐ Driver side door ☐ Passenger side door ☐ Rear left door ☐ Rear right door ☐ Luggage door ☐ Back door
	☐ Malfunction in Door Lock/Unlock Operation Using Key	☐ Driver side door key lock and unlock control switch	☐ Driver side door ☐ Passenger side door ☐ Rear left door ☐ Rear right door ☐ Luggage door ☐ Back door
	☐ Malfunction in Key Lock–in Prevention Function		
	☐ w/ Double Lock: Malfunction in Double Locking Function System		
	☐ Others		

05C87–01

CUSTOMIZE PARAMETERS

HINT:

The following items can be customized.

NOTICE:

- **After confirming whether the items requested by the customer are applicable or not for customization, perform the customize operation.**
- **Be sure to record the current settings before customizing.**
- **When troubleshooting, make sure that the item in question is not set to ”OFF” as a result of customization.**

Standard (Integration relay):

DISPLAY (ITEM)	DEFAULT	CONTENTS	SETTING
AUTO LOCK DELAY	30s	Function that selects AUTO LOCK time 30 sec. or 60 sec.	30s/60s
ALL UNLK/OPN–CL (All unlock w/ D door open–close)	OFF	Function that unlocks all other doors when opening driver side door within 10 seconds after turning the ignition switch to OFF from ON	ON/OFF

DOUBLE LOCK FUNCTION DOES NOT OPERATE PROPERLY

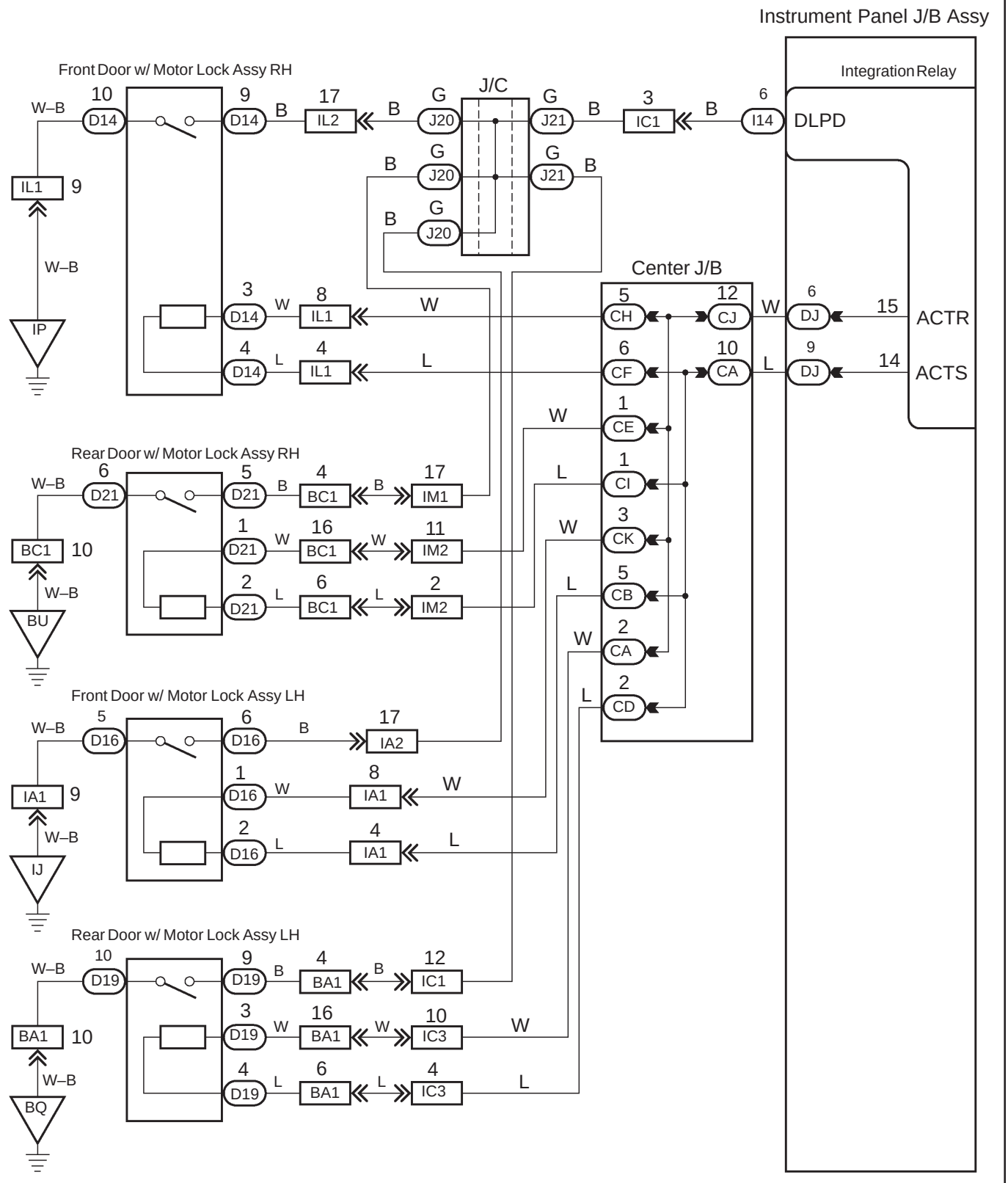
CIRCUIT DESCRIPTION

RHD Models w/ Double Lock Only:

All the doors except the back door have the double locking system. This system is set and unset by the integration relay. When the integration relay receives a request signal from the wireless transmitter (See page 73–1) to set or unset the double locking system, it drives the double lock motor built into each door lock according to the condition of all the double lock position switches, thus causing the double locking system to be set and unset.

WIRING DIAGRAM

RHD Models w/ Double Lock Only



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INSPECTION PROCEDURE

1	INSPECT WIRELESS DOOR LOCK OPERATION

(a) Check that the doors can be normally locked and unlocked by the wireless operation.

NG → **GO TO WIRELESS DOOR CONTROL SYSTEM (See page 05–1568)**

OK

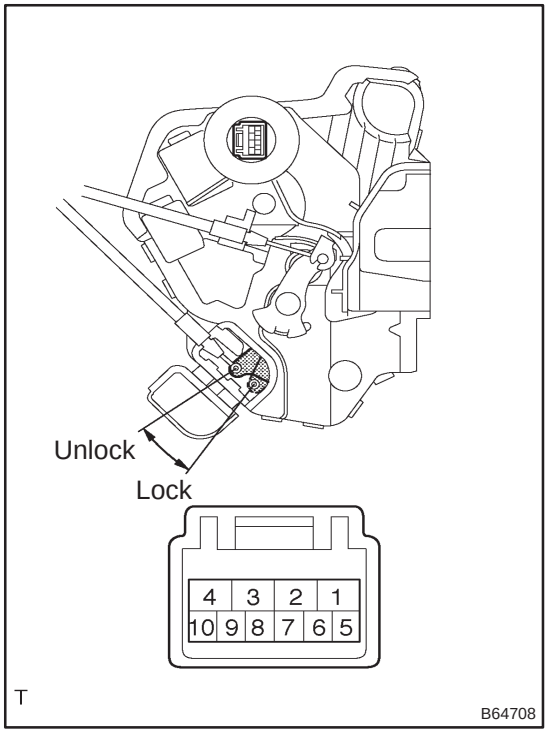
2	INSPECT FUSE (ECU–B 2, DOOR)

(a) Inspect the ECU–B 2 and DOOR fuses (See page 68–1).

NG → **REPLACE FUSE**

OK

3 INSPECT FRONT DOOR W/MOTOR LOCK ASSY RH



(a) Front Door w/ Motor Lock Assy RH:
Inspect operation of the double lock motor.

(1) Apply battery voltage and set the door lock motor to set.

(2) Apply battery voltage to the double lock motor and inspect operation.

Standard:

Measurement Condition	Specified Condition
Battery positive (+) → Terminal 4 Battery negative (–) → Terminal 3	Double locking system is Set
Battery positive (+) → Terminal 3 Battery negative (–) → Terminal 4	Double locking system is Unset

(3) Check that the doors cannot be unlocked by operating the control cable while the double locking system is set.

(4) Inspect the resistance of the double lock position switch.

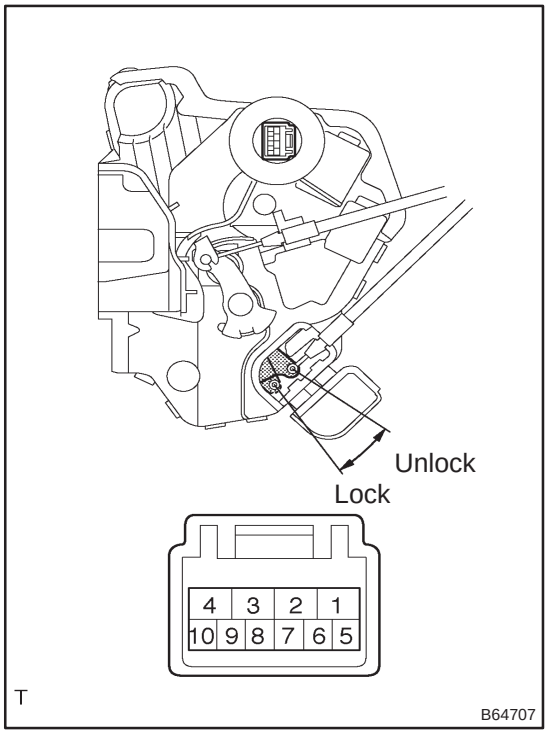
Standard:

Tester Connection	Double Lock Position	Specified Condition
9 – 10	SET	Below 1 Ω
	UNSET	10 kΩ or higher

NG → **REPLACE FRONT DOOR W/MOTOR LOCK ASSY RH**

OK

4 INSPECT FRONT DOOR W/MOTOR LOCK ASSY LH



(a) Front Door w/ Motor Lock Assy LH:
Inspect operation of the double lock motor.
(1) Apply battery voltage and set the door lock motor to set.
(2) Apply battery voltage to the double lock motor and inspect operation.

Standard:

MeasurementCondition	SpecifiedCondition
Battery positive (+) → Terminal 2 Battery negative (–) → Terminal 1	Double locking system is Set
Battery positive (+) → Terminal 1 Battery negative (–) → Terminal 2	Double locking system is Unset

(3) Check that the doors cannot be unlocked by operating the control cable while the double locking system is set.
(4) Inspect the resistance of the double lock position switch.

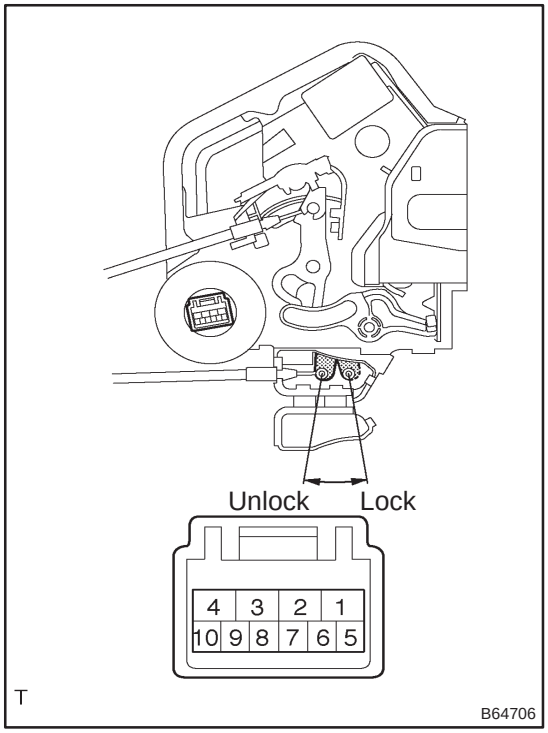
Standard:

Tester Connection	Double Lock Position	SpecifiedCondition
5 – 6	SET	Below 1 Ω
	UNSET	10 kΩ or higher

NG → **REPLACE FRONT DOOR W/MOTOR LOCK ASSY LH**

OK

5 INSPECT REAR DOOR W/MOTOR LOCK ASSY RH



(a) Rear Door w/ Motor Lock Assy RH:
Inspect operation of the double lock motor.

(1) Apply battery voltage and set the door lock motor to set.

(2) Apply battery voltage to the double lock motor and inspect operation.

Standard:

Measurement Condition	Specified Condition
Battery positive (+) → Terminal 2 Battery negative (–) → Terminal 1	Double locking system is Set
Battery positive (+) → Terminal 1 Battery negative (–) → Terminal 2	Double locking system is Unset

(3) Check that the doors cannot be unlocked by operating the control cable while the double locking system is set.

(4) Inspect the resistance of the double lock position switch.

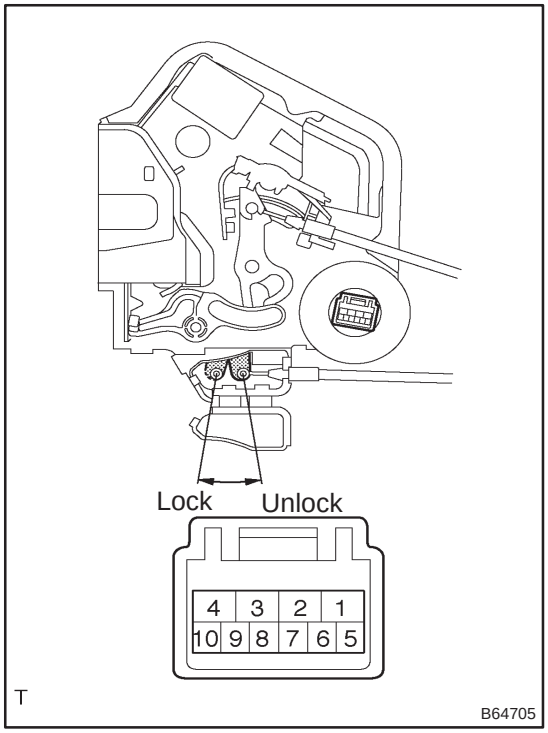
Standard:

Tester Connection	Double Lock Position	Specified Condition
5 – 6	SET	Below 1 Ω
	UNSET	10 kΩ or higher

NG → **REPLACE REAR DOOR W/MOTOR LOCK ASSY RH**

OK

6 INSPECT REAR DOOR W/MOTOR LOCK ASSY LH



(a) Rear Door w/ Motor Lock Assy LH:
Inspect operation of the double lock motor.

(1) Apply battery voltage and set the door lock motor to set.

(2) Apply battery voltage to the double lock motor and inspect operation.

Standard:

Measurement Condition	Specified Condition
Battery positive (+) → Terminal 4 Battery negative (–) → Terminal 3	Double locking system is Set
Battery positive (+) → Terminal 3 Battery negative (–) → Terminal 4	Double locking system is Unset

(3) Check that the doors cannot be unlocked by operating the control cable while the double locking system is set.

(4) Inspect the resistance of the double lock position switch.

Standard:

Tester Connection	Double Lock Position	Specified Condition
9 – 10	SET	Below 1 Ω
	UNSET	10 kΩ or higher

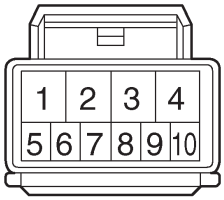
NG → **REPLACE REAR DOOR W/MOTOR LOCK ASSY LH**

OK

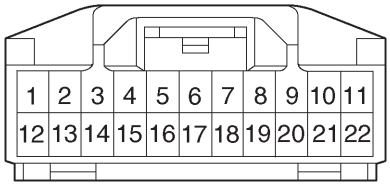
7	CHECK WIRE HARNESS (DOOR LOCK – INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY))

Wire Harness Side

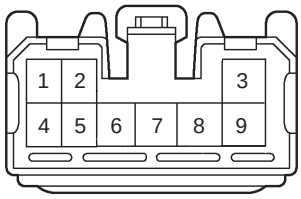
D14*1, D21*2, D16*3, D19*4
Door Lock



I14
Instrument Panel J/B Assy
(Integration Relay)



DJ
Instrument Panel J/B Assy



T *1 Driver side *2 Passenger side
*3 Rear right side *4 Rear left side

B70501

(a) Disconnect the D14, D21, D16 or D19 door lock and the I14 and DJ J/B connectors.

(b) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
D14–9 – I14–6 (DLPD)	Below 1 Ω
D21–5 – I14–6 (DLPD)	
D16–6 – I14–6 (DLPD)	
D19–9 – I14–6 (DLPD)	
D14–4 – DJ–8 (ACTS)	
D21–2 – DJ–8 (ACTS)	
D16–2 – DJ–8 (ACTS)	
D19–4 – DJ–8 (ACTS)	
D14–3 – DJ–9 (ACTR)	
D21–1 – DJ–9 (ACTR)	
D16–1 – DJ–9 (ACTR)	
D19–3 – DJ–9 (ACTR)	

(c) Check the resistance between the D14, D21, D16 or D19 door lock connector and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
D14–10 – Body ground	Below 1 Ω
D21–6 – Body ground	
D16–5 – Body ground	
D19–10 – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

POWER DOOR LOCK CONTROL SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

05C84–01

HINT:

Troubleshoot in accordance with the procedures on the following pages.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND PROBLEM SYMPTOM

3	PROBLEM SYMPTOMS TABLE (See page 05–1545)

(a) When problem is not listed on problem symptoms table, proceed to A.

(b) When problem is listed on problem symptoms table, proceed to B.

B → Go to step 6

A

4	PERFORM TROUBLESHOOTING ACCORDING TO MALFUNCTION SYMPTOM

(a) Pre–check (See page 05–1536).
  (1) Inspection with the hand–held tester (ECU DATA LIST).
  (2) Inspection with the hand–held tester (ACTIVE TEST).

(b) On–vehicle inspection (See page 73–1).

(c) Inspection (See page 73–3).

(d) Terminals of ECU (See page 05–1542).

5	ADJUST, REPAIR OR REPLACE

END

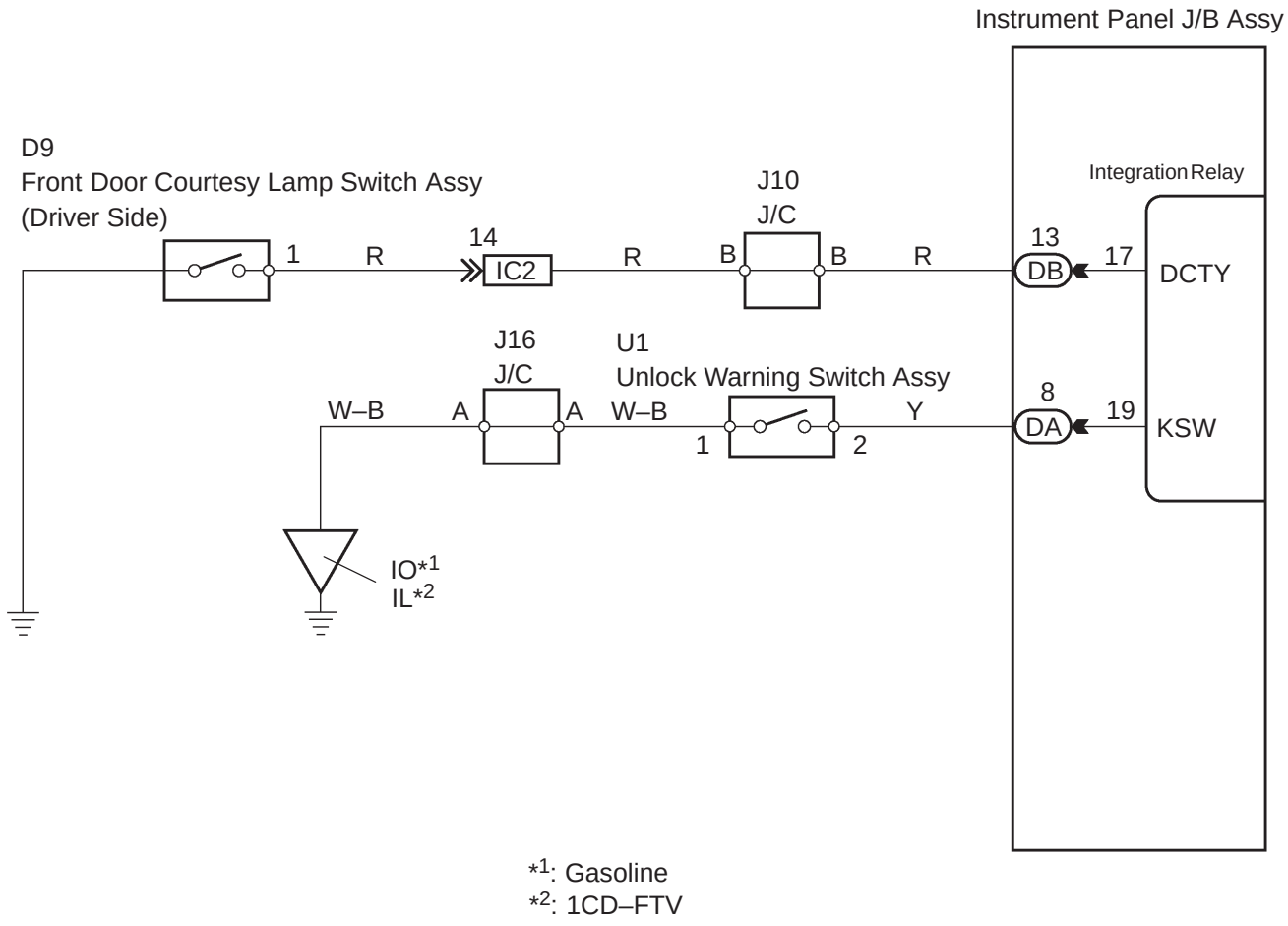
KEY LOCK–IN PREVENTION FUNCTION DOES NOT WORK PROPERLY (MANUAL OPERATION AND OPERATION INTERLOCKED WITH KEY ARE ACTIVE)

CIRCUIT DESCRIPTION

The unlock warning switch turns ON when the key is inserted into the ignition key cylinder. The courtesy lamp switch turns ON when the driver side door is opened. These 2 switches are monitored by the integration relay. In order to prevent the key from being locked in, the integration relay controls door locking operation according to the conditions of these switches so that the doors are not locked with the key locked in.

WIRING DIAGRAM

LHD models



*1: Gasoline
*2: 1CD–FTV

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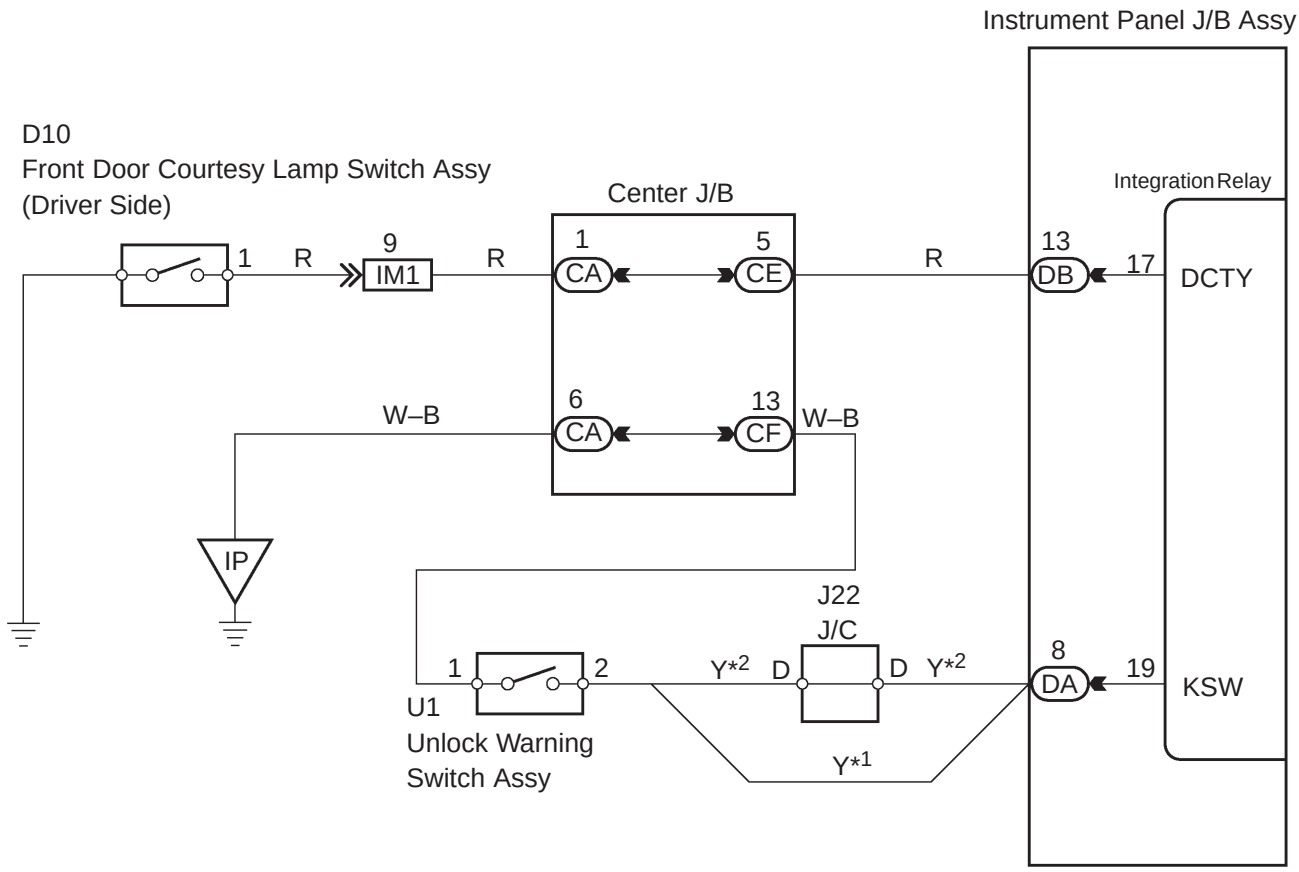
RHD models



*1: 1AZ–FE
*2: Except 1AZ–FE

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INSPECTION PROCEDURE

1 READ VALUE OF HAND–HELD TESTER

(a) Using the hand–held tester, check that the unlock warning switch signal is output when the switch is operated.

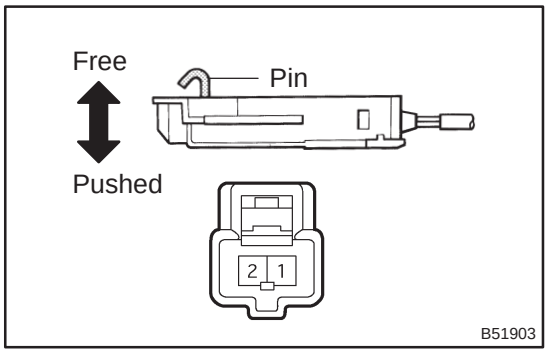
Standard (Integration relay):

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
KEY UNLK WRN SW	Unlock warning switch signal /ON or OFF	ON: Key is in ignition key cylinder OFF: No key is in ignition key cylinder	–

OK → **Go to step 4**

NG

2 INSPECT UNLOCK WARNING SWITCH ASSY



(a) Remove the unlock warning switch.

(b) Inspect the resistance of the switch.

Standard:

Tester Connection	Switch Position	Specified Condition
1 – 2	Free (Key removed)	10 kΩ or higher
	Pushed (Key set)	Below 1 Ω

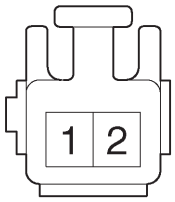
NG → **REPLACE UNLOCK WARNING SWITCH ASSY**

OK

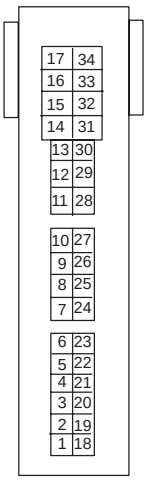
3 CHECK WIRE HARNESS (UNLOCK WARNING SWITCH ASSY – INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY))

Wire Harness Side

U1
Unlock Warning Switch Assy



DA
Instrument Panel J/B Assy



B70499

(a) Disconnect the U1 switch and DA J/B connectors.
(b) Check the continuity between the wire harness connectors.

Standard (Check for open):

Tester Connection	Specified Condition
U1–2 – DA–8 (KSW)	Below 1 Ω

(c) Check the resistance between the U1 switch connector and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
U1–1 – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

4 READ VALUE OF HAND–HELD TESTER

(a) Using the hand–held tester, check that the driver side door courtesy lamp switch signal is output when the switch is operated.

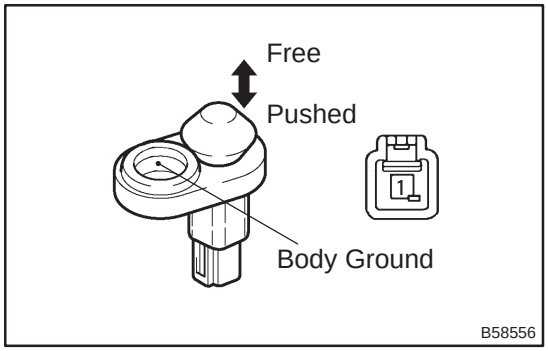
Standard (Integration relay):

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
D DOR CTY SW	Driver side door courtesy switch signal /ON or OFF	ON: Driver side door is open OFF: Driver side door is closed	–

OK → **REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY**

NG

5 INSPECT FRONT DOOR COURTESY LAMP SWITCH ASSY (DRIVER SIDE)



(a) Remove the courtesy lamp switch.
(b) Inspect the resistance of the switch.

Standard:

Tester Connection	Switch Position	Specified Condition
1 – Body ground	Free	Below 1 Ω
	Pushed	10 kΩ or higher

NG → **REPLACE FRONT DOOR COURTESY LAMP SWITCH ASSY (DRIVER SIDE)**

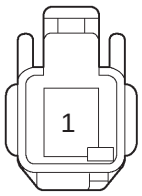
OK

6 CHECK WIRE HARNESS (COURTESY LAMP SWITCH (DRIVER SIDE) – INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY), BODY GROUND)

Wire Harness Side

D9*1, D10*2

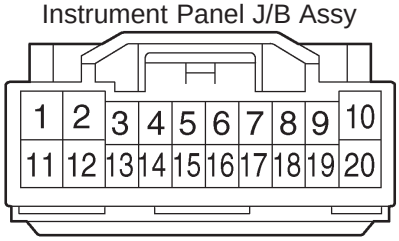
Courtesy Lamp Switch (Driver Side)



*1LHD models
*2RHD models

DB

Instrument Panel J/B Assy



B70500

(a) Disconnect the D9, D10 switch and the DB J/B connectors.
(b) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
D9, D10–1 – DB–13 (DCTY)	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

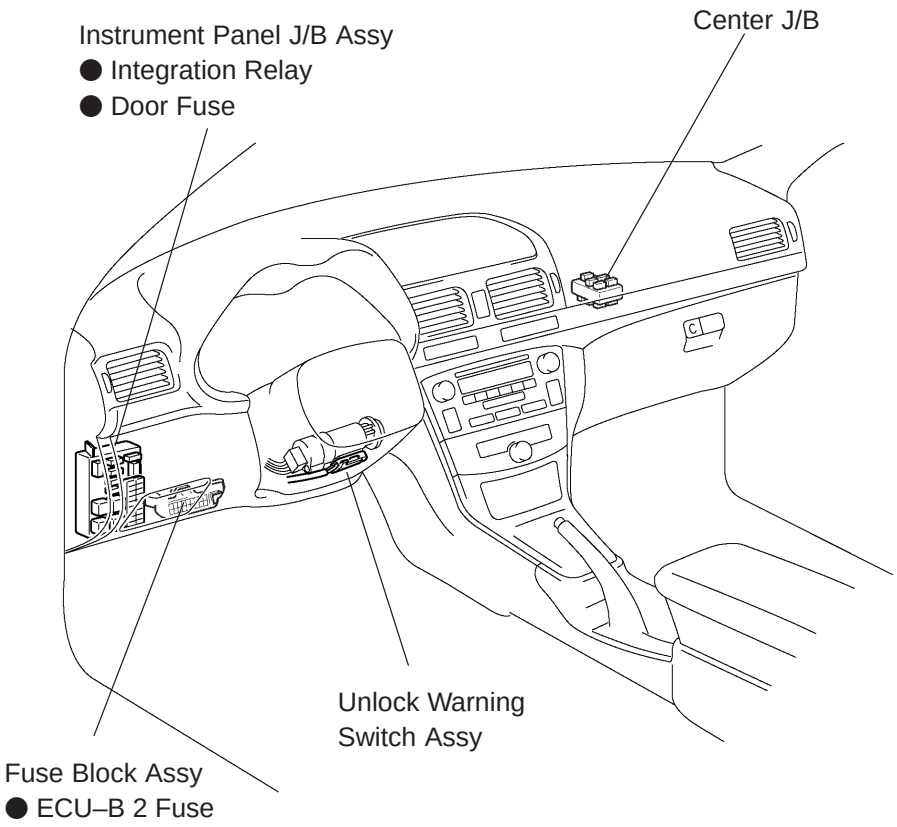
OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

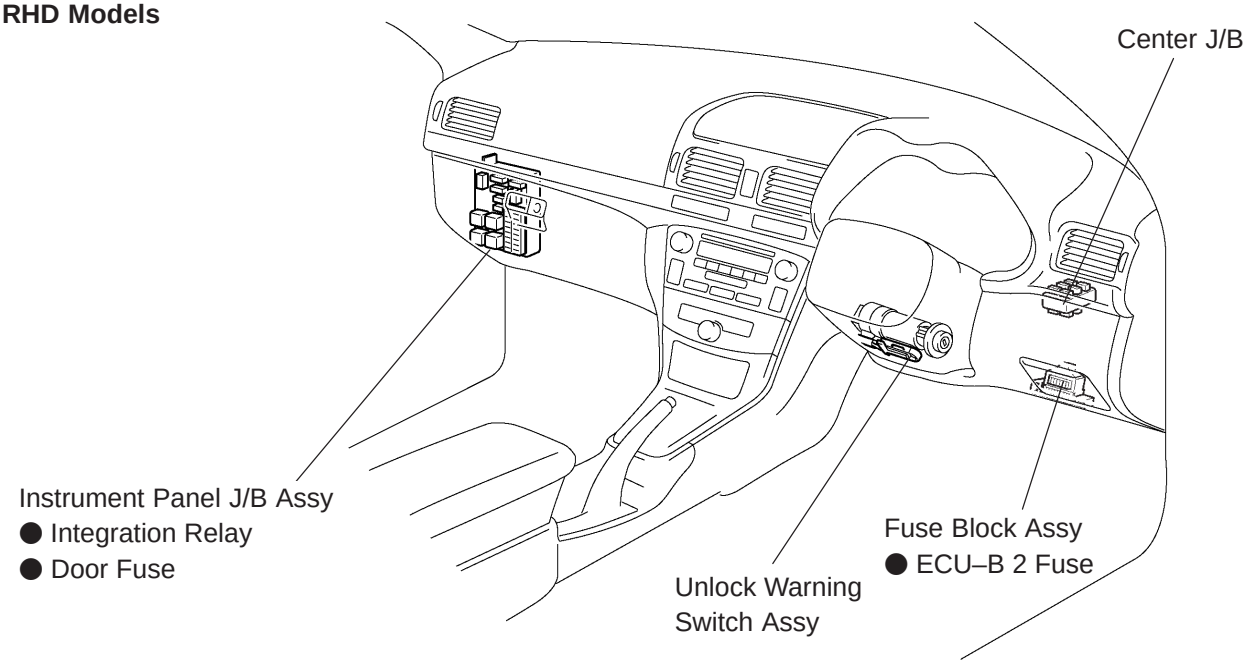
05C88–01

LOCATION

LHD Models



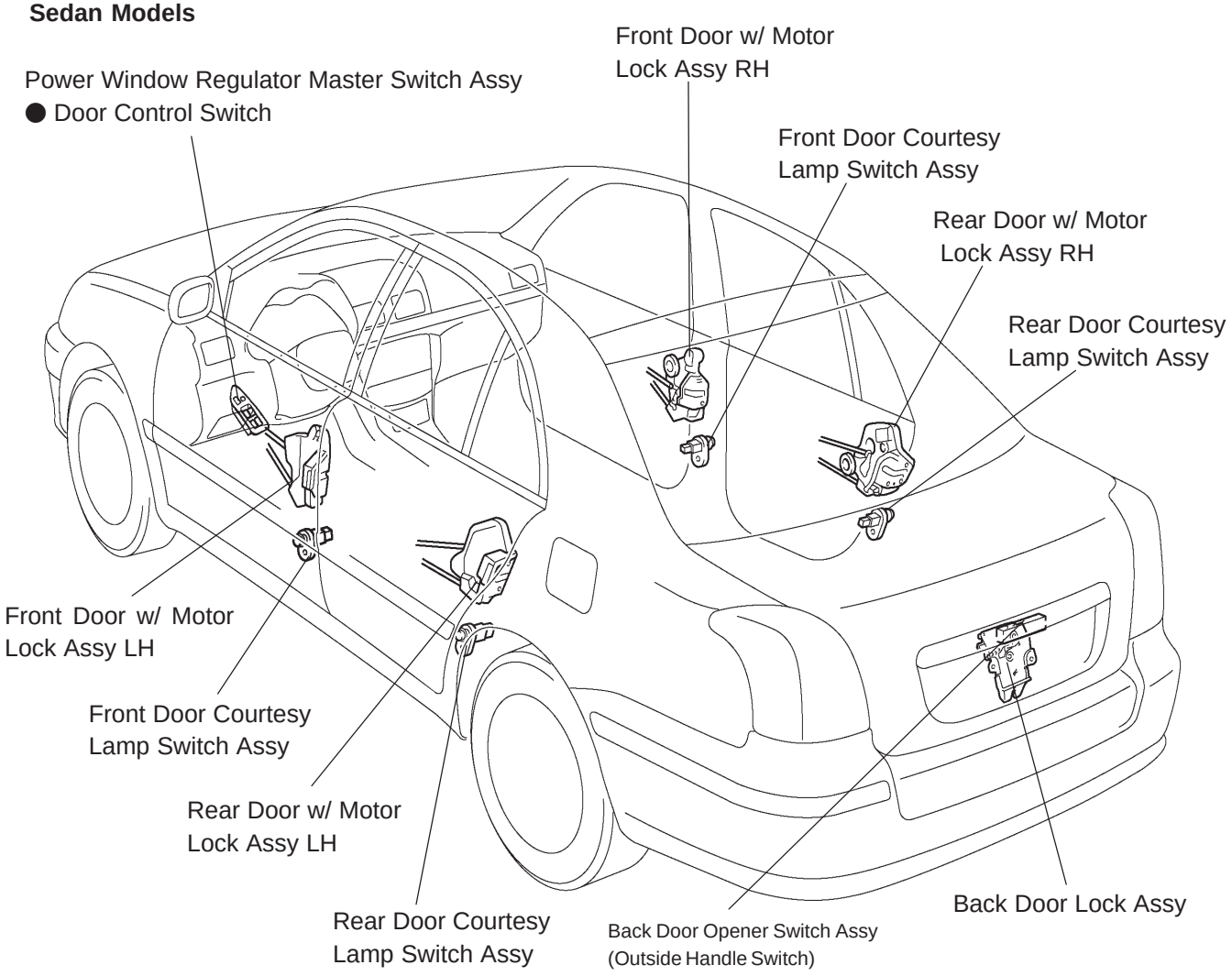
RHD Models



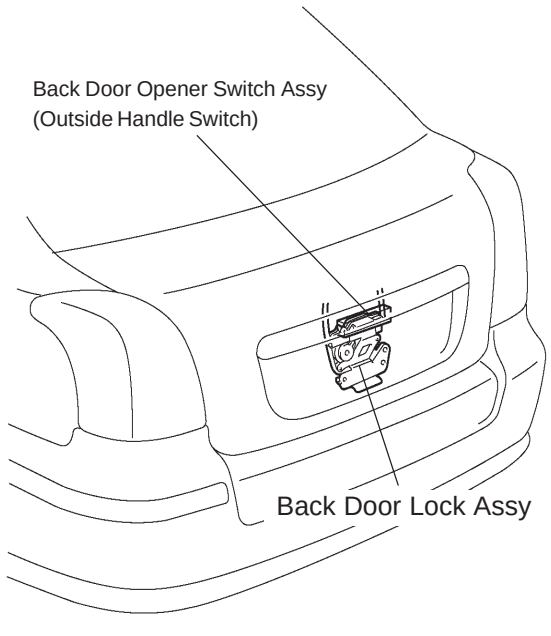
B68459
B70503
B70504
Y

B70813

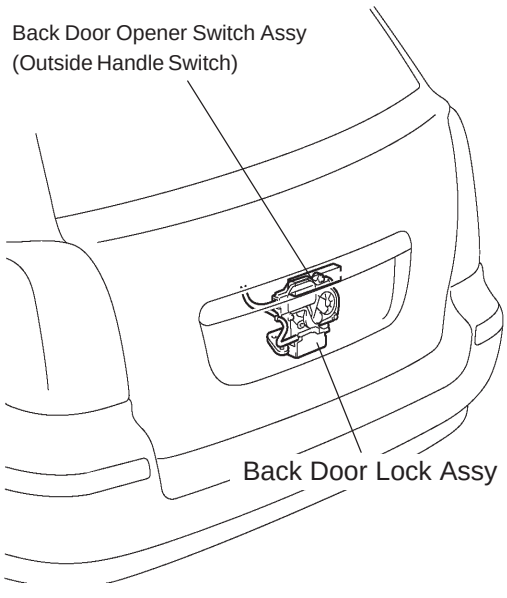
Sedan Models



Liftback Models



Wagon Models



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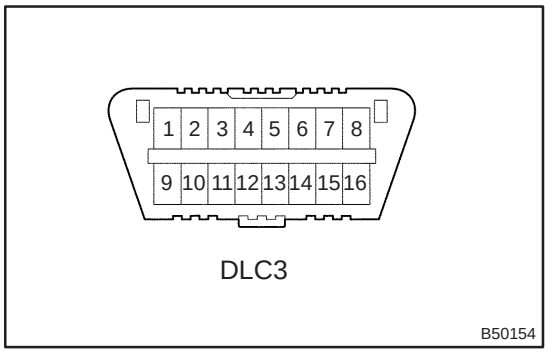
PRE–CHECK



1. DIAGNOSIS SYSTEM

(a) Inspect the DLC3.

HINT:

The vehicle's ECM uses the ISO 14230 (M–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–03 and matches the ISO 14230 format.

Tester Connection	Condition	Specified Condition
7 (Bus + line) – 5 (Signal ground)	During communication	Pulse generation
4 (Chassis ground) – Body ground	Constant	Below 1 Ω
5 (Signal ground) – Body ground	Constant	Below 1 Ω
16 (B+) – Body ground	Constant	9 to 14 V

HINT:

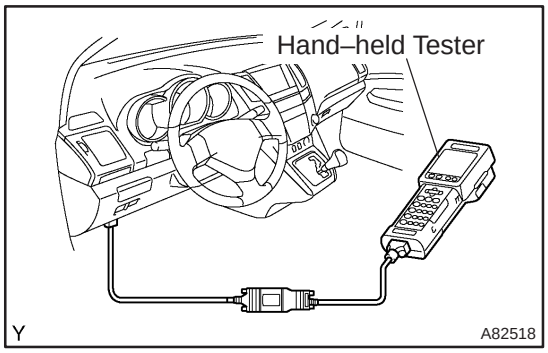
If the display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and used the hand–held tester, there is a problem on the vehicle side or tester side.

- If communication is normal when the tester is connected to another vehicle, inspect the DLC3 of the original vehicle.
- If communication is still impossible when the tester is connected to another vehicle, the problem is probably in the tester itself, so consult the Service Department listed in the tester's manual.

(b) Check the battery voltage.

Battery voltage: 11 to 14 V

If voltage is below 11V, recharge the battery before proceeding.



2. USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.

(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:

The hand–held tester has a "Snapshot" function which records the monitored data.

Refer to the hand–held tester operator's manual for further details.

3. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator, etc. without parts removal. Reading the DATA LIST as the first step of troubleshooting is one way to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) Read the DATA LIST according to the display on the tester.

Standard (Integration relay):

Item	MeasurementItem/Display (Range)	NormalCondition	Diagnostic Note
KEY UNLK WRN SW	Unlock warning switch signal /ON or OFF	ON: Key is in ignition key cylinder OFF: No key is in ignition key cylinder	–
D DOR CTY SW	Driver side door courtesy switch signal /ON or OFF	ON: Driver side door is open OFF: Driver side door is closed	–
P DOR CYT SW	Passenger side door courtesy switch signal /ON or OFF	ON: Passenger side door is open OFF: Passenger side door is closed	–
Rr DOR CTY SW	Rear door courtesy switch signal /ON or OFF	ON: Either right or left rear door is open OFF: Both right and left rear doors are closed	–
P LOCK POS SW	Passenger side door lock position switch signal /ON or OFF	ON: Passenger side door lock is in unlock position OFF: Passenger side door lock is in lock position	–
Rr LOCK POS SW	Rear door lock position switch signal /ON or OFF	ON: Rear door lock is in unlock position OFF: Rear door lock is in lock position	–
IG SW	IG switch signal /ON or OFF	ON: Key is in ON or START position OFF: Key is in OFF or ACC position	–
D LOCK POS SW	Driver side door lock position switch signal /ON or OFF	ON: Driver side door lock is in unlock position OFF: Driver side door lock is in lock position	–
D/L SW–LOCK	Manual door lock switch LOCK signal /ON or OFF	ON: Manual door lock switch is in lock position OFF: Manual door lock switch is in original position (Common to driver side and passenger side model)	–
D/L SW–UNLOCK	Manual door lock switch UNLOCK signal /ON or OFF	ON: Manual door lock switch is in unlock position OFF: Manual door lock switch is in original position (Common to driver side and passenger side model)	–
DOR KEY SW–LOCK	Key operation door lock switch signal /ON or OFF	ON: Key operation door lock switch is in lock position OFF: Key operation door lock switch is in original position (Common to driver side and passenger side model)	–
P DOR KEY SW–UL	Key operation passenger door unlock switch signal /ON or OFF	ON: Passenger key operation door lock switch is in unlock position OFF: Passenger key operation door lock switch is in neutral position	–
D DOR KEY SW–UL	Key operation driver door unlock switch signal /ON or OFF	ON: Driver key operation door lock switch is in unlock position OFF: Driver key operation door lock switch is in original position	–
ALL UNLK/OPN–CL	Driver side door courtesy switch signal /ON or OFF	ON: All doors unlock when driver side door is opened OFF: Other doors do not unlock when driver side door is opened	–
OPEN DOOR WARN	Door courtesy switch signal /ON or OFF	ON: Either door is open OFF: All doors are closed	–
AUTO LOCK DELAY	Door courtesy switch signal /60s or 30s	60s: Door auto locking time is 60 sec. 30s: Door auto locking time is 30 sec.	–

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
DOOR HANDLE SW	Back door opener switch signal (Outside handle switch) /ON or OFF	ON: Back door opener switch is pushed OFF: Back door opener switch is not pushed	–
LOCK STATUS	Back door position switch signal /UNLOCK or LOCK	UNLOCK: Back door is unlock LOCK: Back door is lock	–

4. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows you to operate the relay, VSV, actuator, etc. without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one way to shorten the labor time. It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) According to the display on the tester, perform the ACTIVE TEST.

Standard (Integration relay):

Item	Test Details	Diagnostic Note
DOOR LOCK	Operate door lock motor for all doors LOCK/OFF	–
DOOR LOCK	Operate door lock motor for all doors UNLOCK/OFF	–

05C8A–01

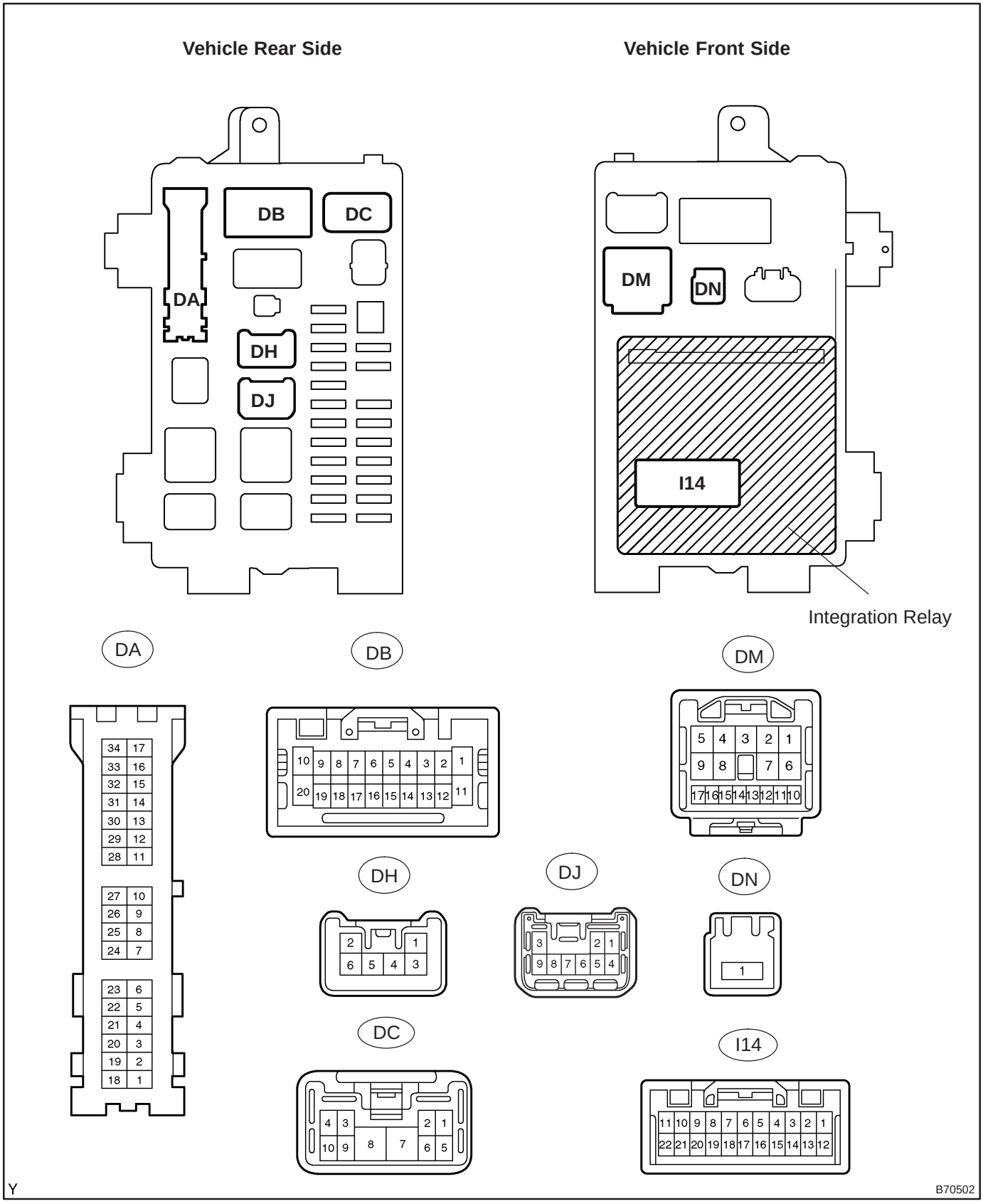
PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
All doors cannot be locked/unlocked at once	3. DOOR fuse 4. ECU–B 2 fuse 5. Power window regulator master switch assy 6. Front door lock assy LH, RH (Driver side) 7. Instrument panel J/B assy (Integration relay) 8. Wire harness	05–1546
Key lock–in prevention function does not work properly (Manual operation and operation interlocked with key are active)	1. Unlock warning switch assy 2. Courtesy lamp switch assy LH, RH (Driver side) 3. Instrument panel J/B assy (Integration relay) 4. Wire harness	05–1555
w/ Double lock: Double lock function does not operate properly	1. Wireless system 2. DOOR fuse 3. ECU–B 2 fuse 4. Front door lock assy LH, RH 5. Rear door lock assy LH, RH 6. Instrument panel J/B assy (Integration relay) 7. Wire harness	05–1560

05C89–01

TERMINALS OF ECU

1. CHECK INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY)



(a) Disconnect the DA, DB, DC, DM, DN and I14 J/B connectors.
(b) Check the voltage or continuity between each terminal of the wire harness side connectors and the body ground.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
KSW (DA–8) – Body ground	Y – Body ground	No key in ignition key cylinder → Key inserted	No continuity → Continuity
E (DA–9) – Body ground	W–B – Body ground	Constant	Continuity
B (DB–16) – Body ground	W–R – Body ground	Constant	10 to 14 V
B (DN–1) – Body ground	*1 B–G – Body ground	Constant	10 to 14 V
	*2 B–L – Body ground		
L1 (DA–29) – Body Ground	BR–W – Body ground	Door control switch (Master switch) OFF → LOCK	No continuity → Continuity
UL1 (DA–13) – Body Ground	G–W – Body ground	Door control switch (Master switch) OFF → UNLOCK	
L2 (I14–4) – Body Ground	*3 L–Y – Body ground	Driver door key cylinder OFF → LOCK	
	*4 L–R – Body ground		
UL2 (I14–5) – Body Ground	L – Body ground	Driver door key cylinder OFF → UNLOCK	
*3 BDSU (I14–10) – Body Ground	L–B – Body ground	*3 Luggage component door opener switch FREE → PUSHED *4 Back door opener switch FREE → PUSHED	
DCTY (DB–13) – Body Ground	R – Body ground	Driver door CLOSED → OPEN	10 kΩ or higher → Below 1 Ω
PCTY (DC–9) – Body Ground	R – Body ground	Passenger door CLOSED → OPEN	
RCTY (DM–12) – Body Ground	W–G – Body ground	Rear left door CLOSED → OPEN	
RCTY (DM–13) – Body Ground	W–G – Body ground	Rear right door CLOSED → OPEN	
*3 LGCY (I14–1) – Body Ground	R–Y – Body ground	Luggage door CLOSED → OPEN	
*4 BDCY (I14–12) – Body Ground	R–Y – Body ground	Back door CLOSED → OPEN	

HINT:
*1: Gasoline *2: 1CD–FTV engine *3: Sedan *4: Liftback and Wagon
If the result is not as specified, there may be a malfunction on the wire harness side.

(c) Reconnect the J/B connectors.

(d) Check the voltage between each terminal of the connectors and the body ground.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
ACC (DH–3) – Body ground	G – Body ground	Ignition switch ACC	10 to 14 V
ACT+ (DJ–1) – Body Ground	L–R – Body ground	Door control switch (master switch) or door key cylinder OFF → LOCK	Below 1 V → 10 to 14 V → Below 1 V
ACT+ (DM–7) – Body Ground	L–R – Body ground		
ACT+ (DB–20) – Body Ground	L–R – Body ground		
ACT– (DJ–4) – Body Ground	L–B – Body ground	Door control switch (master switch) or door key cylinder OFF → UNLOCK	
ACT– (DM–6) – Body Ground	L–B – Body ground		
ACT– (DB–10) – Body Ground	L–B – Body ground		
LACT (DM–3) – Body Ground	L – Body ground	Back door opener switch (outside handle switch) OFF → ON	
LSWD (I14–3) – Body Ground	LG – Body ground	Driver door UNLOCK → LOCK	Below 1 V → 10 to 14 V
* LSWP (DB–8) – Body Ground	LG–B – Body ground	Passenger door UNLOCK → LOCK	
* LSWP (DA–20) – Body Ground	LG–B – Body ground	Rear right door UNLOCK → LOCK	
* LSWP (DM–10) – Body Ground	LG–B – Body ground	Rear left door UNLOCK → LOCK	
DLPD (I14–6) – Body Ground	B – Body ground	Double lock UNSET → SET	More than 5 V → Less than 1 V
* ACTS (DJ–8) – Body Ground	L – Body ground	Double lock UNSET → SET	Below 1 V → 10 to 14 V
* ACTR (DJ–9) – Body Ground	W – Body ground	Double lock SET → UNSET	

HINT:

*: Double Lock

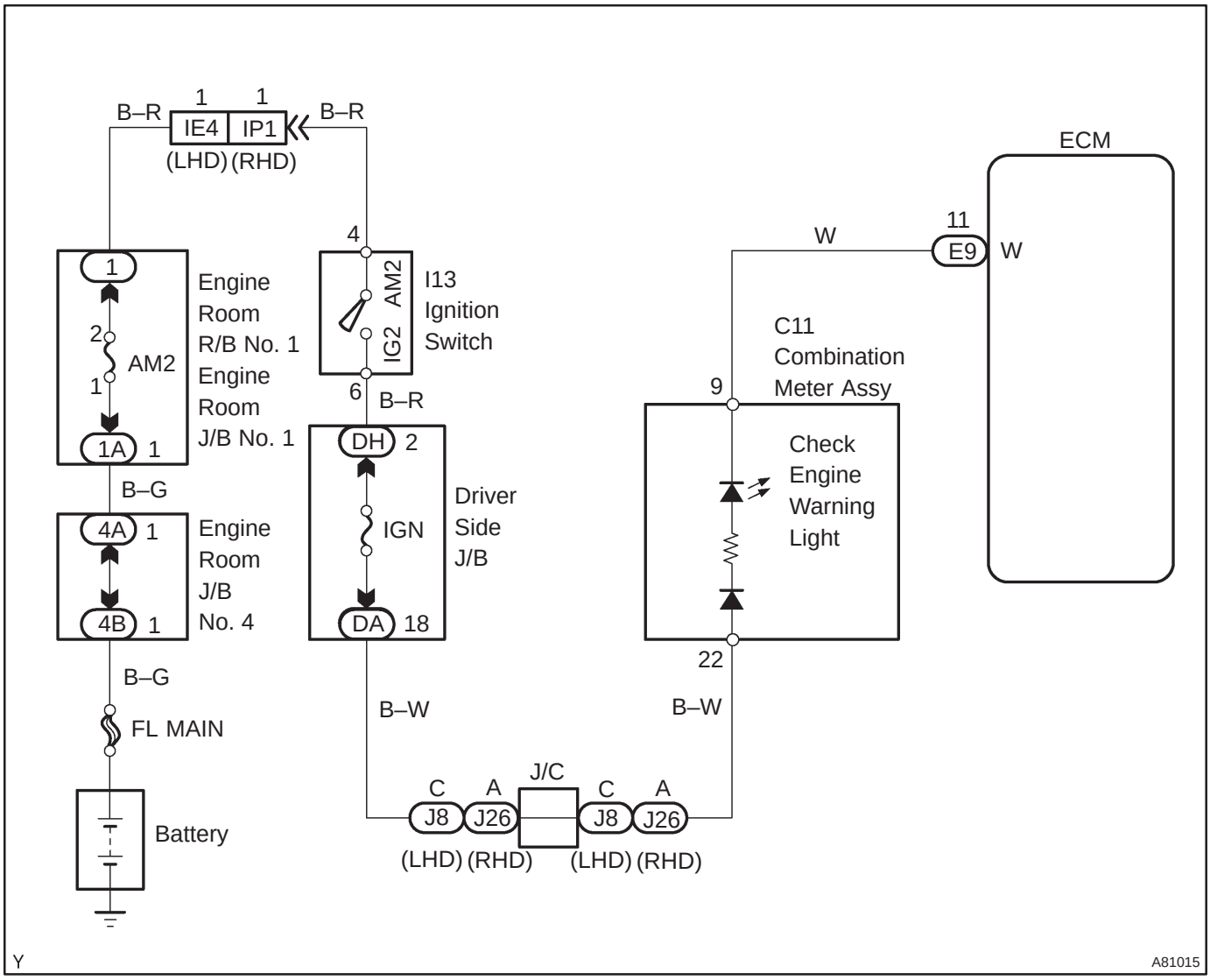
If the result is not as specified, the J/B assy (integration relay) may have a malfunction.

CHECK ENGINE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

If the ECM detects a trouble, the CHK ENG is illuminated. At this time, the ECM records a DTC in the memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below .

CHK ENG remains on	Start inspection from step 1
CHK ENG is not illuminate	Start inspection from step 3

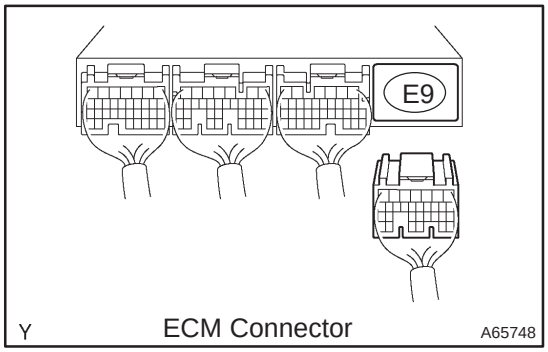
1	CLEAR DTC

(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Read the DTC (See page 05–149).
(d) Clear the DTC (See page 05–149).
(e) Check that the CHK ENG is OFF.
Standard: CHK ENG is OFF

OK → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE (See page 05–161)**

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E9 ECM connector.
(b) Turn the ignition switch ON.
(c) Check that the CHK ENG is OFF.
Standard: CHK ENG is OFF

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

CHECK AND REPAIR HARNESS AND CONNECTOR

3	CHECK CHK ENG CONDITION

(a) Check that the CHK ENG is illuminated when turning the ignition switch ON.
Standard: CHK ENG is illuminated

OK → **CHECK AND REPAIR HARNESS AND CONNECTOR**

NG

4	INSPECT COMBINATION METER ASSY(CHK ENG CIRCUIT)

(a) See the combination meter troubleshooting on page 05–1509.

NG → **REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLYSYSTEM OK**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR

05C6L–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

Customer's Name		VIN	
Driver's Name		Production Date	
Date Vehicle Brought in		Licence No.	
License No.		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx.____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of check engine warning light (CHK ENG)		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre–check)	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

05C6N–01

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your readings due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in the check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the ”See page ” under the respective ”DTC No.” in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0010/39 *4 (05–169)	Camshaft Position ”A” Actuator Circuit (Bank 1)	• Open or short in oil control valve (OCV) circuit • Oil control valve • ECM	○	○
P0011/59 *4 (05–174)	Camshaft Position ”A” –Timing Over–Advanced or System Performance (Bank 1)	• Valve timing • Oil control valve (OCV) • Camshaft timing gear assy • ECM	—	○
P0012/59 *4 (05–174)	Camshaft Position ”A” –Timing Over– Retarded (Bank 1)		—	○
P0016/18 *4 (05–181)	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM	—	○
P0031/21 *2, *4 (05–182)	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 1 Sensor 1)	• Open or short in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM	—	○
P0032/21 *2, *4 (05–182)	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 1 Sensor 1)		—	○
P0051/28 *2, *4 (05–182)	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 2 Sensor 1)		—	○
P0052/28 *2, *4 (05–182)	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 2 Sensor 1)		—	○
P0100/31 (05–186)	Mass Air Flow Circuit	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0102/31 (05–186)	Mass or volume Air Flow Circuit Low Input		○	○
P0103/31 (05–186)	Mass or volume Air Flow Circuit High Input		○	○
P0110/24 (05–194)	Intake Air Temperature Circuit	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built in mass air flow meter) • ECM	—	○
P0112/24 (05–194)	Intake Air Temperature Circuit Low Input		—	○
P0113/24 (05–194)	Intake Air Temperature Circuit High Input		—	○
P0115/22 (05–199)	Engine Coolant Temperature Circuit	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0117/22 (05–199)	Engine Coolant Temperature Circuit Low Input		○	○
P0118/22 (05–199)	Engine Coolant Temperature Circuit High Input		○	○
P0120/41 (05–204)	Throttle/Pedal Position Sensor/ Switch ”A” Circuit	• Throttle position sensor (built in throttle body) • ECM	—	○
P0122/41 (05–204)	Throttle/Pedal Position Sensor/ Switch ”A” Circuit Low Input	• Throttle position sensor (built in throttle body) • Short in VTA1 circuit • Open in VC circuit • ECM	—	○

P0123/41 (05–204)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	• Throttle position sensor (built in throttle body) • Open in VTA1 circuit • open in E2 circuit • VC and VTA1 circuit are short–circuited • ECM	—	○
P0136/27*4 (05–211)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay	—	○
P0141/27*4 (05–218)	Oxygen Sensor Heater Circuit malfunction (Bank 1 Sensor 2)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	—	○
P0156/29*4 (05–211)	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay	—	○
P0161/29*4 (05–218)	Oxygen Sensor Heater Circuit (Bank 2 Sensor 2)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	—	○
P0325/52 (05–222)	Knock Sensor 1 Circuit (Bank 1 or Single Sensor)	• Knock sensor 1 • Knock sensor 1 (under–torqued or loose) • ECM	○	○
P0327/52 (05–222)	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	• Short in knock sensor 1 circuit • Knock sensor 1 • ECM	○	○
P0328/52 (05–222)	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	• Open in knock sensor 1 circuit • Knock sensor 1 • ECM	○	○
P0335/12, 13 (05–226)	Crankshaft Position Sensor "A" Circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft) • ECM	○	○
P0339/13 (05–226)	Crankshaft Position Sensor "A" Circuit Intermittent		—	○
P0340/12 (05–229)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has jumped a tooth • ECM	○	○
P0341/12 (05–229)	Camshaft Position Sensor "A" CircuitRange/Performance (Bank 1 or Single Sensor)		○	○
P0351/14*3 (05–232)	Ignition Coil "A" Primary/Secondary Circuit	• Ignition system • Open or short in IGF or IGT1 to 4 circuit from ignition coil with igniter to ECM • No. 1 to No. 4 ignition coil with igniter • IG2 relay • ECM	○	○
P0352/15*3 (05–232)	Ignition Coil "B" Primary/Secondary Circuit		○	○
P0353/14*3 (05–232)	Ignition Coil "C" Primary/Secondary Circuit		○	○
P0354/15*3 (05–232)	Ignition Coil "D" Primary/Secondary Circuit		○	○
P0500/42 (05–240)	Vehicle Speed Sensor "A"	• Open or short in speed sensor circuit • Speed sensor • Combinationmeter • ECM • Skid control ECU	○	○
P0511/33 (05–243)	Idle Air Control Circuit	• Open or short in idle speed control (ISC) valve circuit • Idle speed control (ISC) valve is stuck or closed • A/C switch circuit • Air induction system • ECM	○	○
P0606/89 (05–247)	ECM/PCM Processor	• ECM	○	○

P0710/38 (05–882)	Transmission Fluid Temperature Sensor "A" Circuit	• Electronic controlled automatic transmission (ECT)	○	○
P0712/38 (05–882)	Transmission Fluid Temperature Sensor "A" Circuit Low Input		○	○
P0713/38 (05–882)	Transmission Fluid Temperature Sensor "A" Circuit High Input		○	○
P0717/37 (05–884)	Input/Turbine Speed Sensor "A" Circuit No Signal		○	○
P0748/62 (05–886)	Pressure Control Solenoid "A" Electrocal (Shift Solenoid Valve SL1)		○	○
P0778/63 (05–886)	Pressure Control Solenoid "B" Electrocal (Shift Solenoid Valve SL2)		○	○
P0793/67 (05–892)	Intermediate Shaft Speed Sensor "A"		○	○
P0982/65 (05–886)	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)		○	○
P0983/65 (05–886)	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)		○	○
P2237/21 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit/ Open (for A/F sensor) (Bank 1 Sensor 1)	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • A/F sensor heater relay • A/F sensor heater and relay circuit • ECM	—	○
P2238/21 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit Low (for A/F sensor) (Bank 1 Sensor 1)		—	○
P2239/21 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit High (for A/F sensor) (Bank 1 Sensor 1)		—	○
P2240/28 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit/ Open (for A/F sensor) (Bank 2 Sensor 1)		—	○
P2241/28 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit Low (for A/F sensor) (Bank 2 Sensor 1)		—	○
P2242/28 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit High (for A/F sensor) (Bank 2 Sensor 1)		—	○
P2251/21 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit/ Open (for A/F senor) (Bank 1 Sensor 1)		—	○
P2252/21 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit Low (for A/F senor) (Bank 1 Sensor 1)		—	○
P2253/21 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit High (for A/F senor) (Bank 1 Sensor 1)		—	○
P2254/28 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit/ Open (for A/F senor) (Bank 2 Sensor 1)		—	○
P2255/28 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit Low (for A/F senor) (Bank 2 Sensor 1)		—	○
P2256/28 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit High (for A/F senor) (Bank 2 Sensor 1)		—	○

P2716/77 (05–894)	Pressure Control Solenoid "D" Electrical	• Electronic controlled automatic transmission (ECT)	—	○
P2769/64 (05–897)	DSL Solenoid Circuit Low (Shift Solenoid Valve DSL)		—	○
P2770/64 (05–897)	DSL Solenoid Circuit High (Shift Solenoid Valve DSL)		—	○
B2799/99 (05–1625)	Engine Immobilizer System Malfunction	• Immobilizer system	—	○

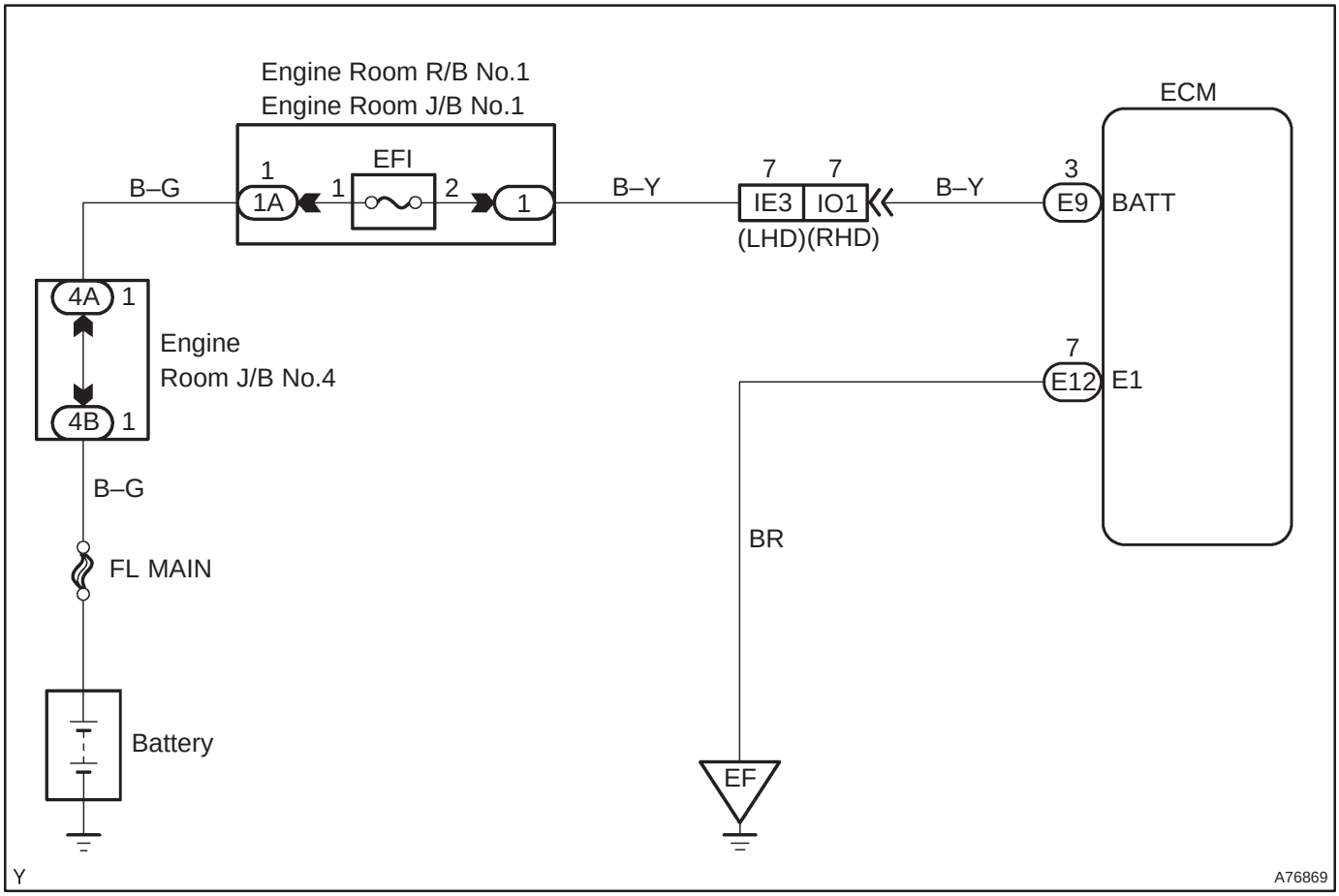
*1: ○ ... CHK ENG is illuminated. — ... CHK ENG is not illuminated.
*2: This DTC is related to A/F sensor, although the caption is heated oxygen sensor.
*3: This DTC indicate a malfunction related to primary circuit.
*4: For European spec. only

ECM BACK–UP POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

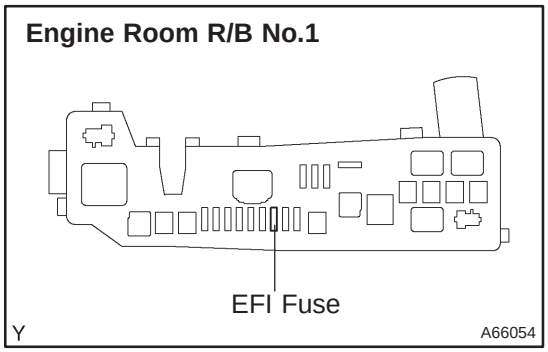
While the ignition switch is OFF, the battery positive voltage is supplied to terminal BATT of the ECM for the DTCs memory and air–fuel ratio adaptive control value memory, etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FUSE(EFI FUSE)

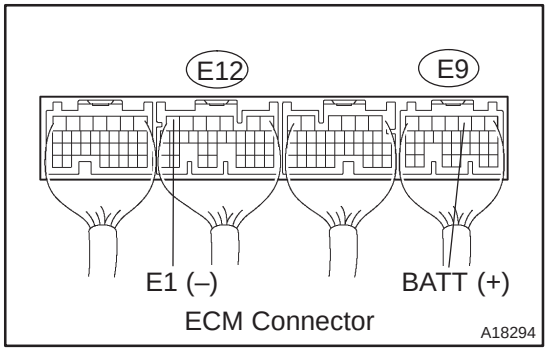


(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

2 INSPECT ECM(BATT VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.

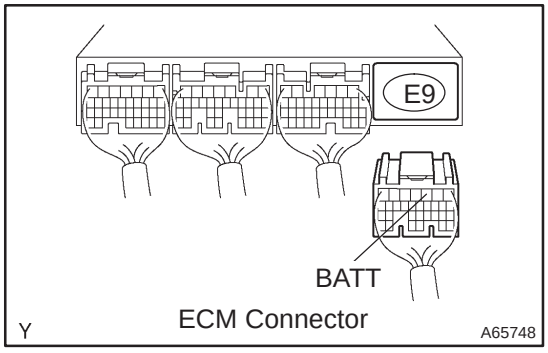
Standard:

Symbols (Terminal No.)	Specified condition
BATT (E9–3) – E1 (E12–7)	8 to 14 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

3 CHECK HARNESS AND CONNECTOR(ECM – EFI FUSE, EFI FUSE – BATTERY)



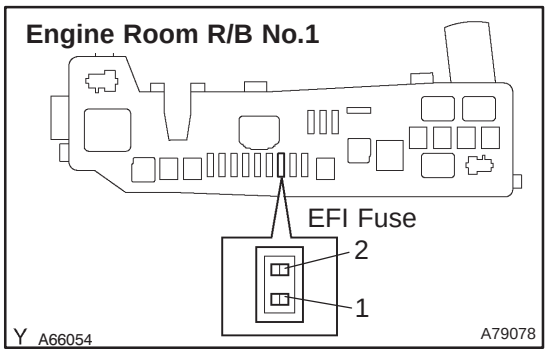
(a) Check the harness and connector between the EFI fuse and ECM.
(1) Remove the EFI fuse from the engine room R/B.
(2) Disconnect the E9 ECM connector.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) – BATT (E9–3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) or BATT (E9–3) – Body ground	No continuity



(b) Check the harness and connector between the EFI fuse and battery.
(1) Remove the EFI fuse from the engine room R/B.
(2) Disconnect the battery positive terminal.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Battery positive terminal – EFI fuse (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Battery positive terminal or EFI fuse (1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ENGINE ROOM RELAY BLOCK

ECM POWER SOURCE CIRCUIT

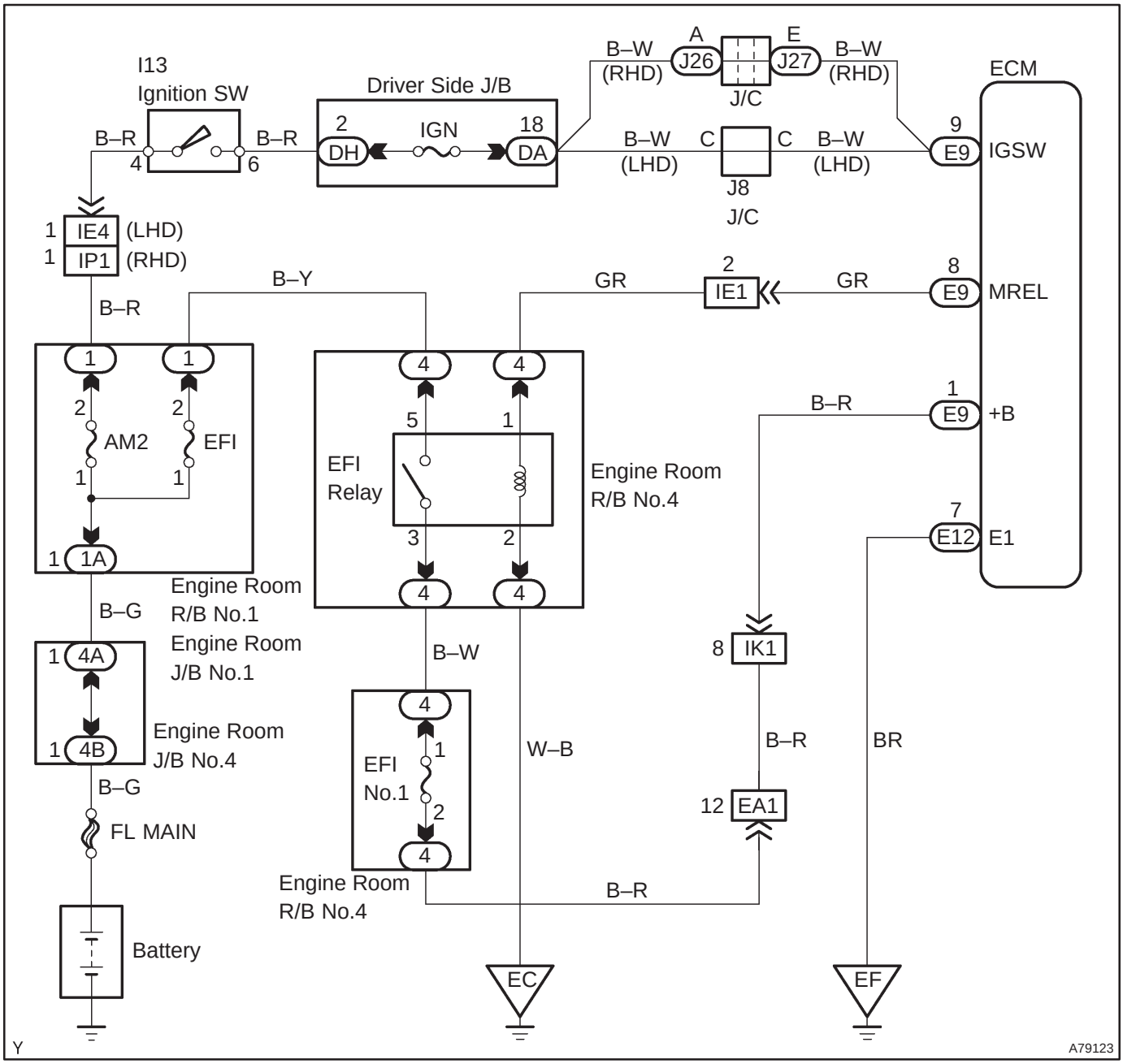
CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to terminal IGSW of the ECM and the EFI relay (Marking: EFI) control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EFI relay.

This signal causes current to flow to the coil, closing the contacts of the EFI relay and supplying power to terminal +B of the ECM.

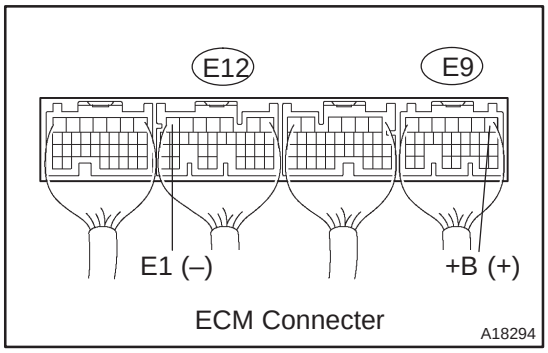
If the ignition switch is turned off, the ECM continues to switch on the EFI relay for a maximum of 2 seconds for the initial setting of the throttle valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM(+B VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.

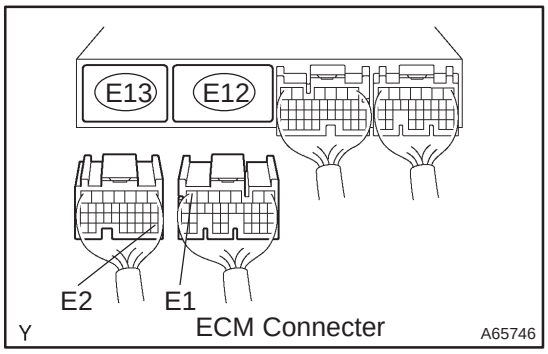
Standard:

Symbols (Terminal No.)	Specified condition
+B (E9–1) – E1 (E12–7)	9 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–168)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM – BODY GROUND)



(a) Disconnect the negative (–) battery terminal.
(b) Disconnect the E12 and E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

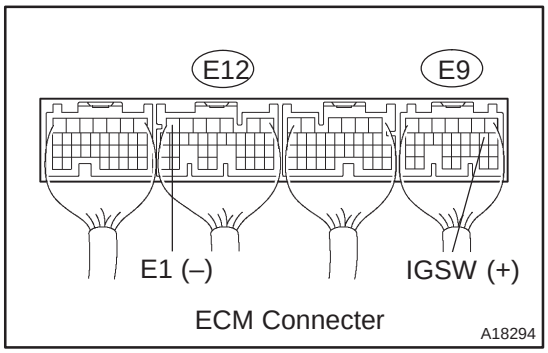
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
E1 (E12–7) – Body ground	Continuity
E2 (E13–28) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM(IGSW VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.

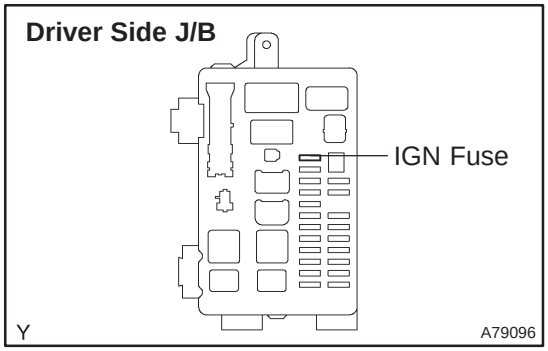
Standard:

Symbols (Terminal No.)	Specified condition
IGSW (E9–9) – E1 (E12–7)	9 to 14 V

OK → **Go to step 6**

NG

4 CHECK FUSE(IGN FUSE)

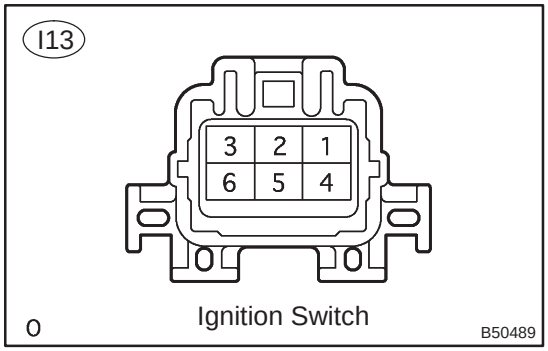


(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

5 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Measure the resistance between the connector terminals shown in the chart below.

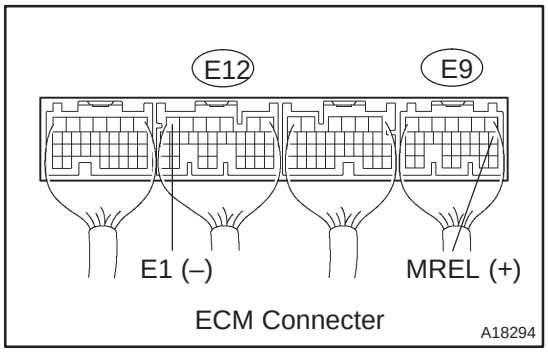
Switch	Terminal No.	Resisitance
LOCK	All Terminals	1MΩ or more
ACC	1–3	1Ω or less
ON	1–2, 1–3, 2–3, 5–6	1Ω or less
START	4–5, 4–6, 5–6, 1–2	1Ω or less

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (BATTERY – IGNITION SWITCH, IGNITION SWITCH – ECM)

6 INSPECT ECM(MREL VOLTAGE)



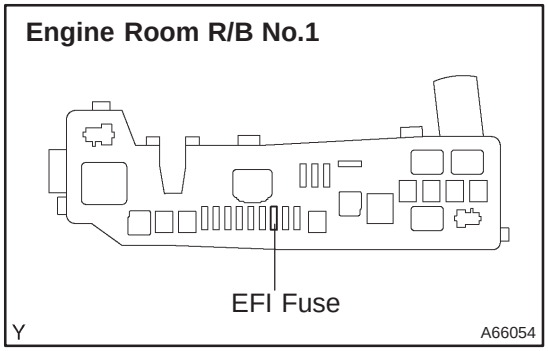
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
MREL (E9–8) – E1 (E12–7)	9 to 14 V

NG → **CHECK AND REPLACE ECM**

OK

7 CHECK FUSE(EFI FUSE)

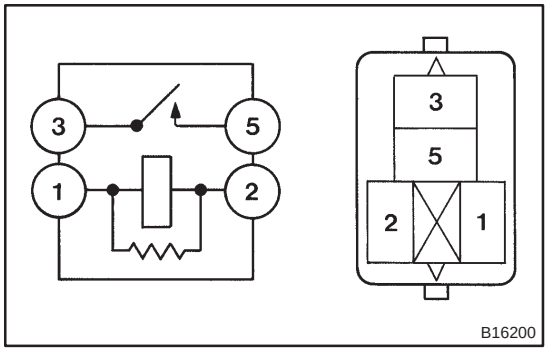


(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

8 INSPECT EFI RELAY



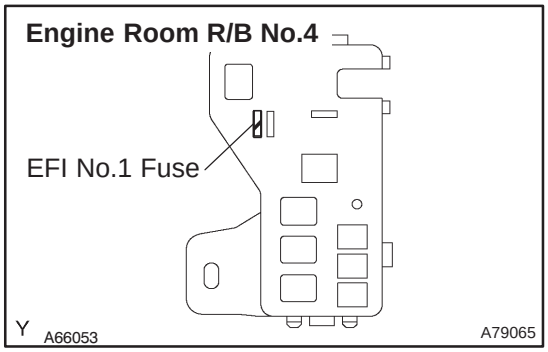
(a) Remove the EFI relay from the engine room R/B No.4.
(b) Inspect the EFI relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

9 CHECK FUSE(EFI No,1 FUSE)

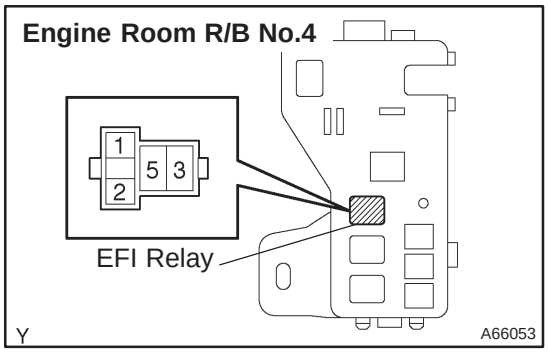


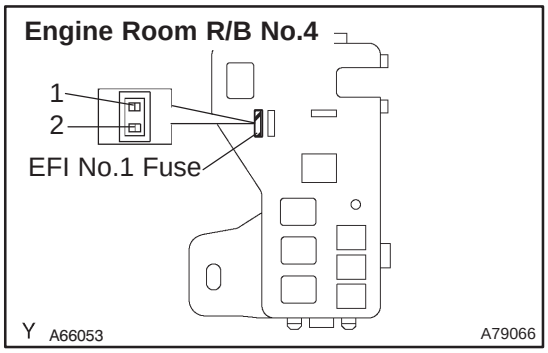
(a) Remove the EFI No.4 fuse from the engine room R/B No.4.
(b) Check for continuity in the EFI No.4 fuse.
Standard: Continuity

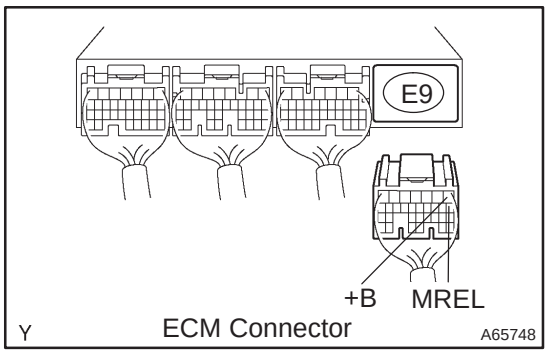
NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

10	CHECK HARNESS AND CONNECTOR(EFI RELAY – ECM, EFI RELAY – BODY GROUND)







(a) Check the harness and connector between the EFI relay and ECM connector.

(1) Remove the EFI relay from the engine room R/B No.4.

(2) Remove the EFI No.1 fuse from the engine room R/B No.4.

(3) Disconnect the E9 ECM connector.

(4) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (1) – MREL (E9–8)	Continuity
EFI relay (3) – EFI No.1 fuse (1)	
EFI No.1 fuse (2) – +B (E9–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (1) or MREL (E9–8) – Body ground	No continuity
EFI relay (3) or EFI No.1 fuse (1) – Body ground	
EFI No.1 fuse (2) or +B (E9–1) – Body ground	

(b) Check the harness and connector between the EFI relay and body ground.

(1) Remove the EFI relay from the engine room J/B No.4.

(2) Check for continuity between the wire harness side connector and the body ground.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (2) – Body ground	Continuity

OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

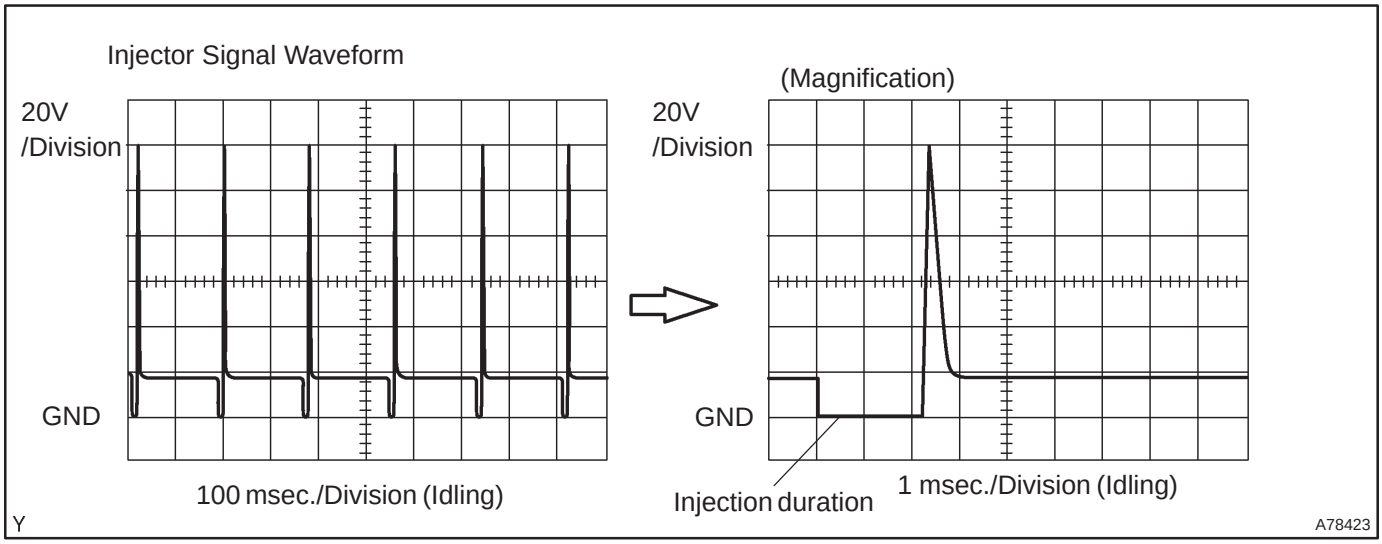
CHECK AND REPAIR HARNESS AND CONNECTOR (TERMINAL +B OF ECM – BATTERY POSITIVE TERMINAL)

FUEL INJECTOR CIRCUIT

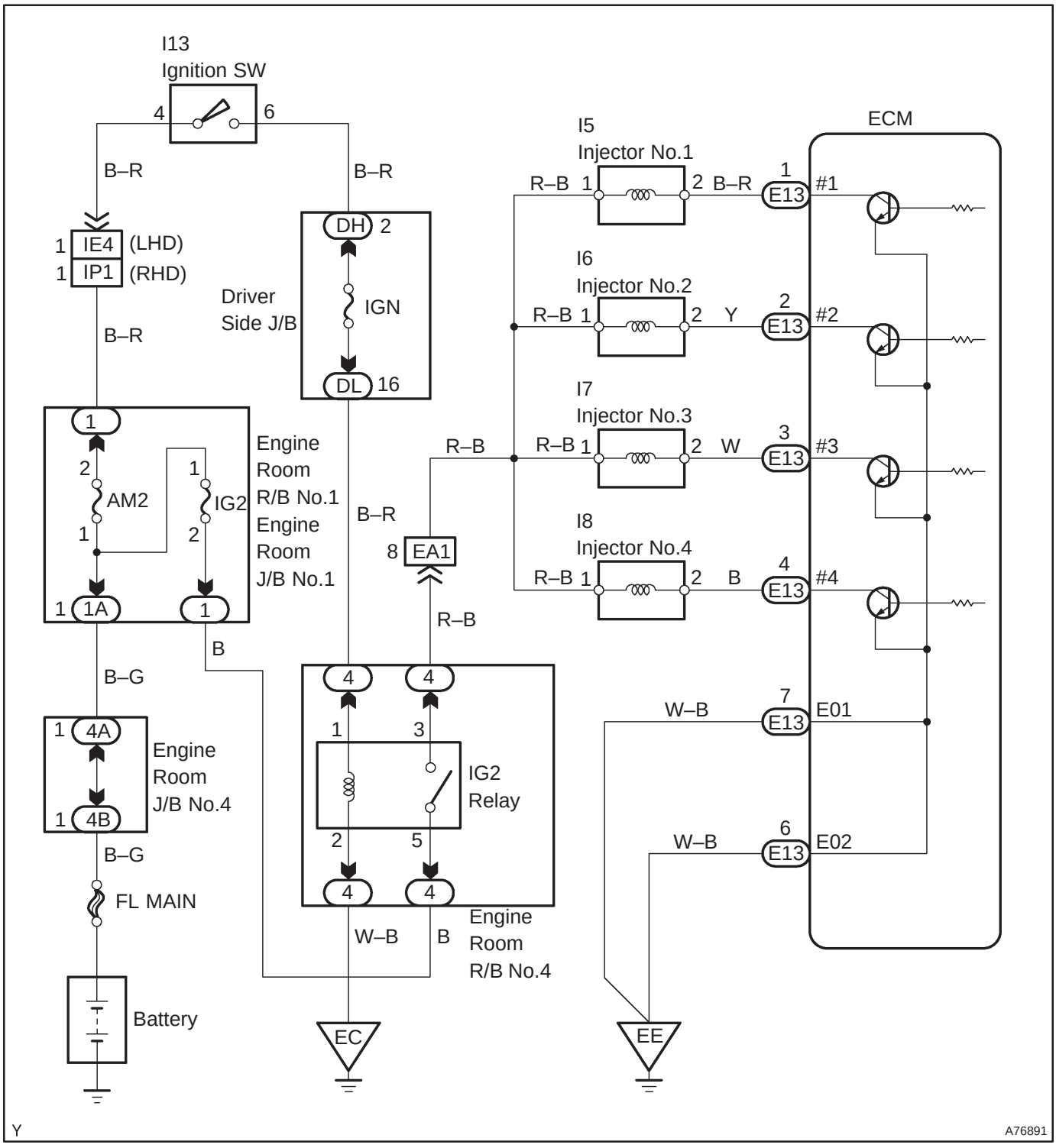
CIRCUIT DESCRIPTION

The fuel injectors are located on the intake manifold.
They inject fuel into the cylinders based on the signals from the ECM.
Reference: Inspection using oscilloscope
With the engine idling, check the waveform between terminals #1 to #4 and E01 of the ECM connectors.
HINT:

The correct waveform is as shown in the diagram below.

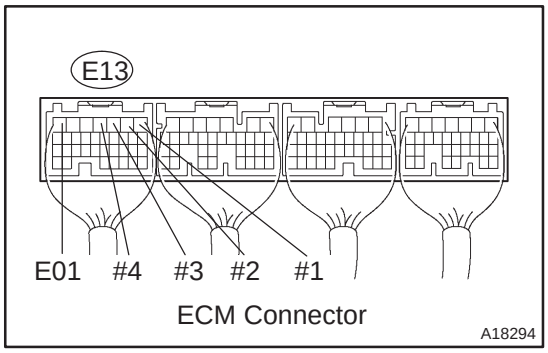


WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM(#1, #2, #3 OR #4 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E13 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
#1 (E13–1) – E01 (E13–7)	9 to 14 V
#2 (E13–2) – E01 (E13–7)	
#3 (E13–3) – E01 (E13–7)	
#4 (E13–4) – E01 (E13–7)	

OK → **Go to step 7**

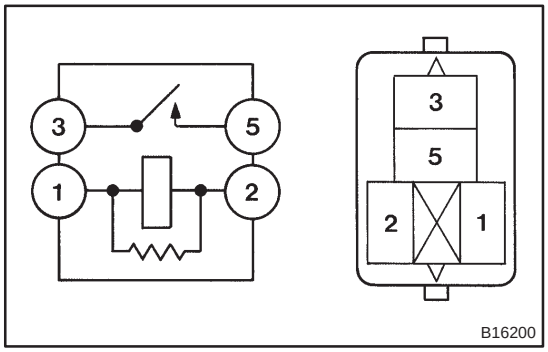
NG

2 INSPECT FUEL INJECTOR ASSY(CHECK RESISTANCE) (See page 11–22)

NG → **REPLACE FUEL INJECTOR ASSY**

OK

3 INSPECT IG2 RELAY



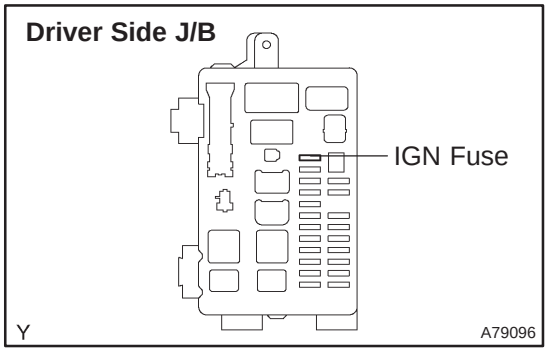
(a) Remove the IG2 relay from the engine room R/B No.4.
(b) Inspect the IG2 relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE IG2 RELAY**

OK

4 CHECK FUSE(IGN FUSE)

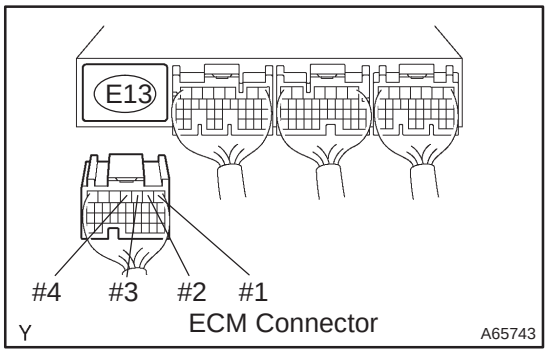


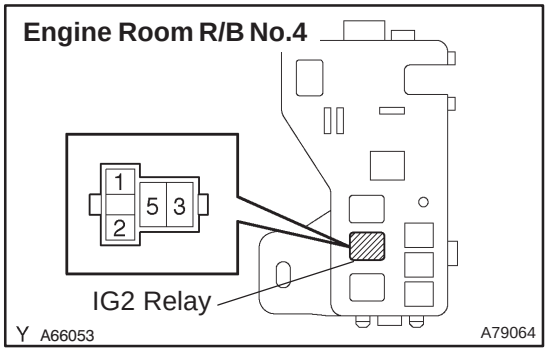
(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity

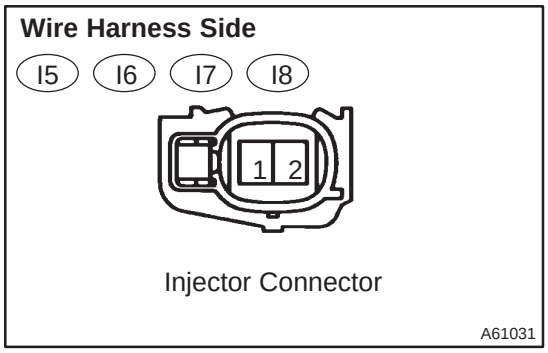
NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

5	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(INJECTOR – ECM, INJECTOR – IG2 RELAY)







(a) Check the harness and connector between the injector connector and ECM connector.
(1) Disconnect the I5, I6, I7 or I8 injector connector.
(2) Disconnect the E13 ECM connector.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Injector (I5–1) – #1 (E13–1)	Continuity
Injector (I6–1) – #2 (E13–2)	
Injector (I7–1) – #3 (E13–3)	
Injector (I8–1) – #4 (E13–4)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Injector (I5–1) or #1 (E13–1) – Body ground	No continuity
Injector (I6–1) or #2 (E13–2) – Body ground	
Injector (I7–1) or #3 (E13–3) – Body ground	
Injector (I8–1) or #4 (E13–4) – Body ground	

(b) Check the harness and connector between the injector connector and ignition switch connector.
(1) Disconnect the I5, I6, I7 or I8 injector connector.
(2) Remove theIG2 relay from the engine room R/B No.4.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Injector (I5–2) – IG2 Relay (3)	Continuity
Injector (I6–2) – IG2 Relay (3)	
Injector (I7–2) – IG2 Relay (3)	
Injector (I8–2) – IG2 Relay (3)	

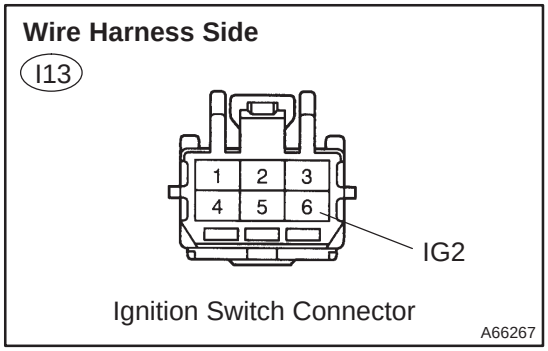
Standard (Check for short):

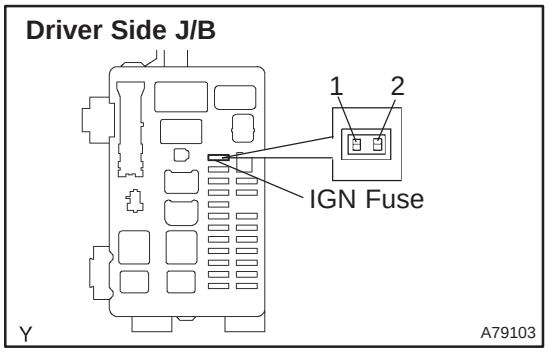
Symbols (Terminal No.)	Specified condition
Injector (I5–2) or IG2 Relay (3) – Body ground	No continuity
Injector (I6–2) or IG2 Relay (3) – Body ground	
Injector (I7–2) or IG2 Relay (3) – Body ground	
Injector (I8–2) or IG2 Relay (3) – Body ground	

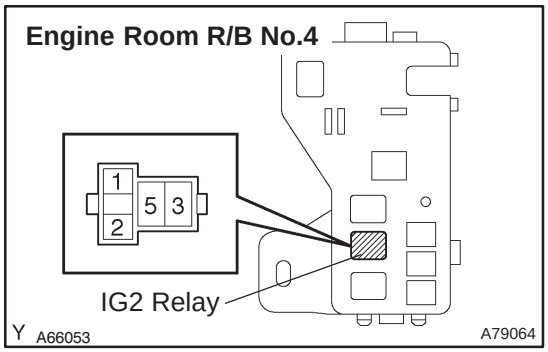
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 CHECK HARNESS AND CONNECTOR(IGNITION SWITCH – IG2 RELAY)







(a) Disconnect the battery negative (–) terminal.
(b) Disconnect the ignition switch connector.
(c) Remove the IGN fuse from the driver side J/B.
(d) Remove the IG2 relay from the engine room R/B No.4.
(e) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) – IGN fuse (1)	Continuity
IGN fuse (2) – IG2 relay (1)	

Standard (Check for short):

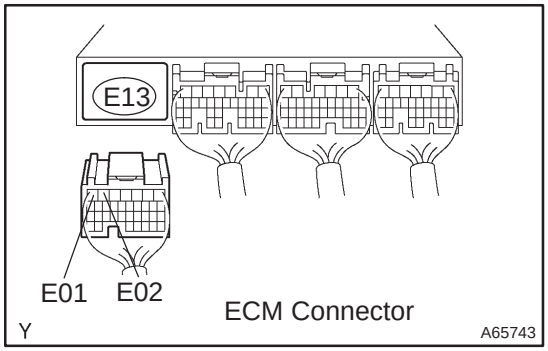
Symbols (Terminal No.)	Specified condition
IG2 (I13–6) or IGN fuse (1) – Body ground	No continuity
IGN fuse (2) or IG2 relay (1) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR ECM POWER SOURCE CIRCUIT

7	INSPECT ECM



(a) Disconnect the ECM E13 connector.
(b) Check for continuity between the ECM connector and body ground.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
E01 (E13–7) – Body ground	Continuity
E02 (E13–6) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8	INSPECT FUEL INJECTOR ASSY(CHECK INJECTOR VOLUME) (See page 11–22)

NG → **REPLACE FUEL INJECTOR ASSY**

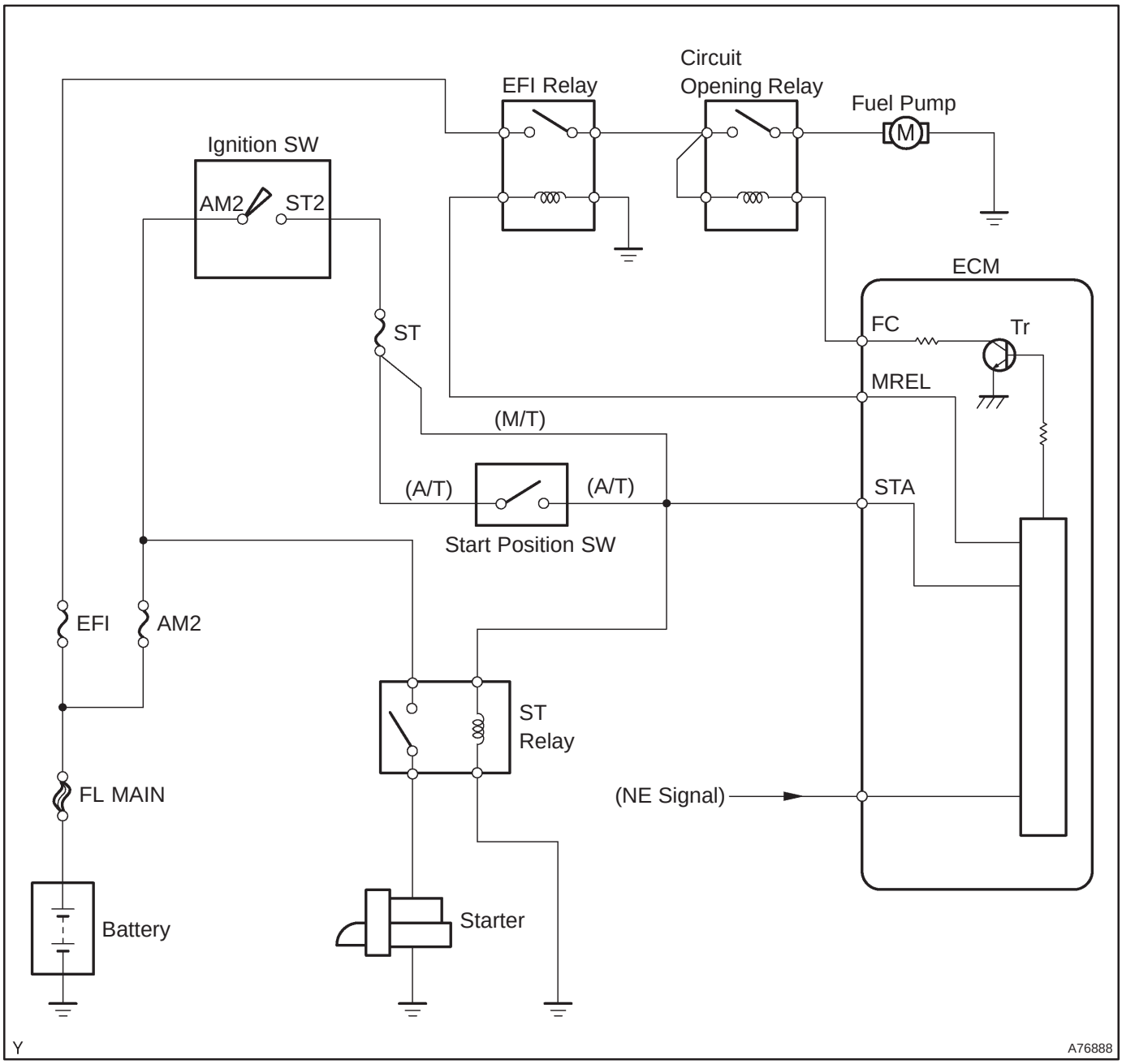
OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–168)

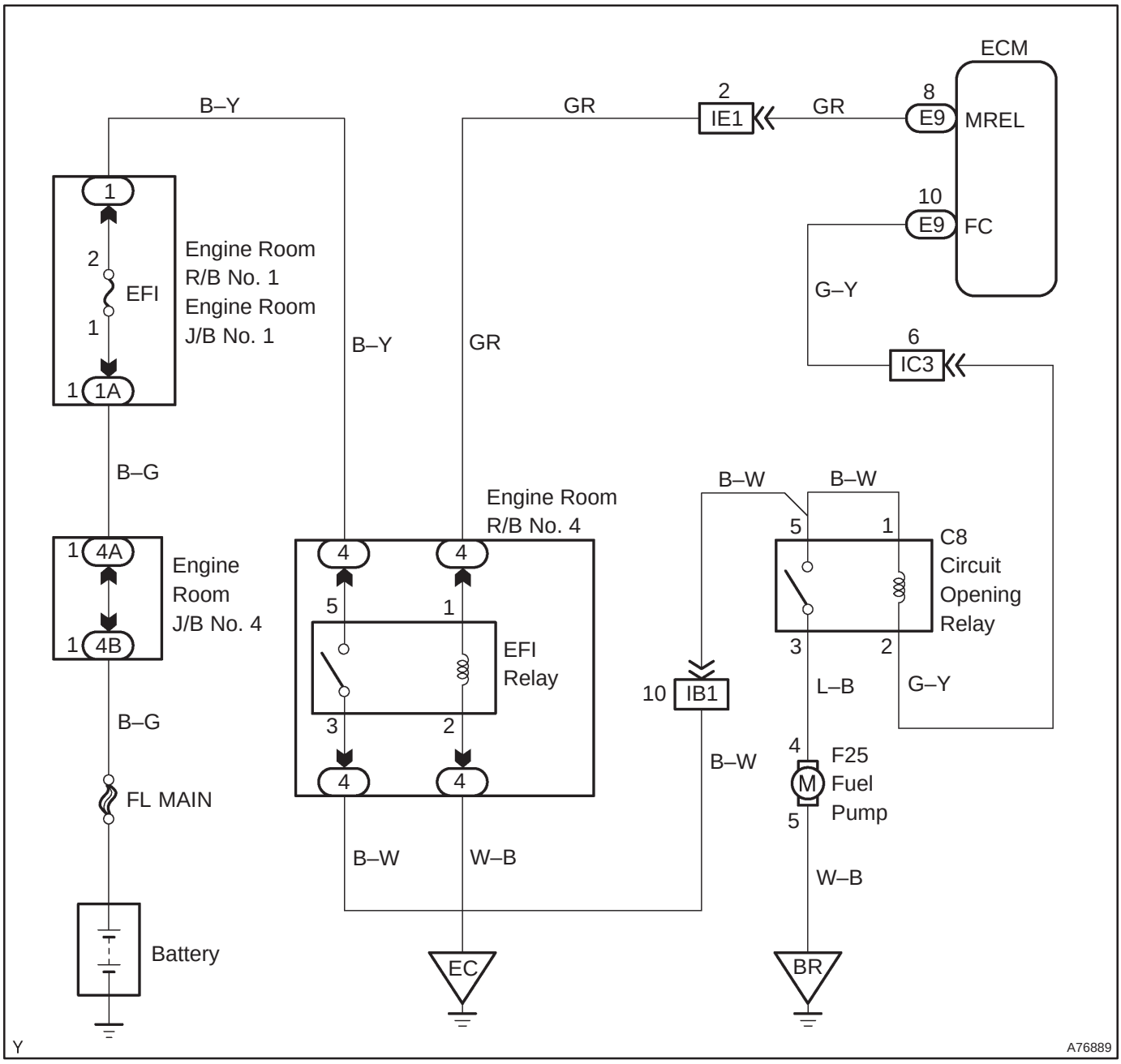
FUEL PUMP CONTROL CIRCUIT

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST2 of the ignition switch to the starter relay coil and also current flows to terminal STA of the ECM (STA signal).
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to the coil of the E.F.I. circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates.
While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



WIRING DIAGRAM



INSPECTION PROCEDURE

When using hand–held tester:

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATION OF CIRCUIT OPENING RELAY)

(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / FUEL PUMP / SPD”.
(c) Perform the active test with the engine stopped.
Result: The circuit opening relay operates.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

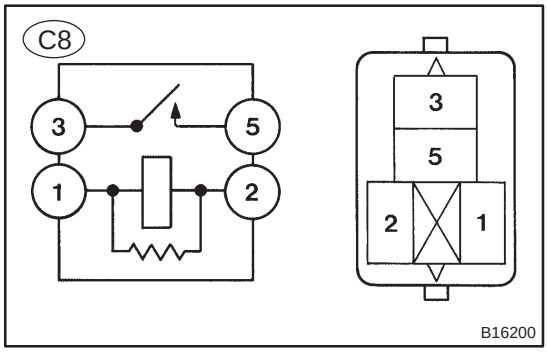
NG

2	CHECK ECM POWER SOURCE CIRCUIT (See page 05–257)

NG → **REPAIR OR REPLACE POWER SOURCE CIRCUIT**

OK

3	INSPECT CIRCUIT OPENING RELAY



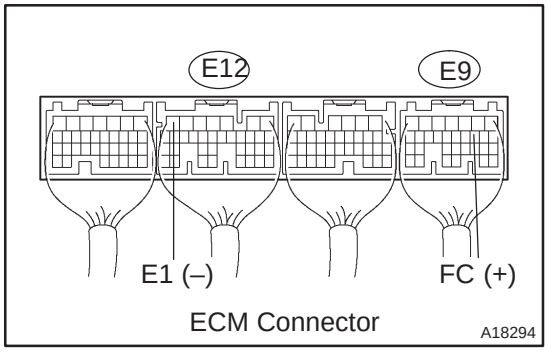
(a) Remove the circuit opening relay.
(b) Inspect the circuit opening relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE CIRCUIT OPENING RELAY**

OK

4	INSPECT ECM(CHECK VOLTAGE)



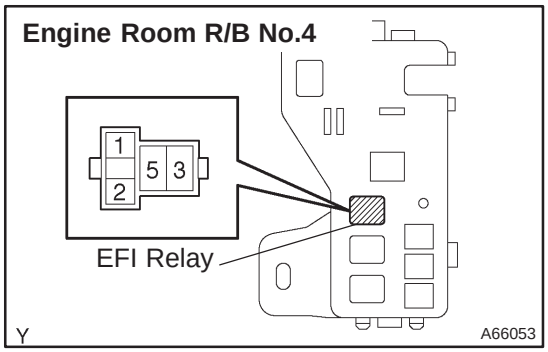
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
FC (E9–10) – E1 (E12–7)	8 to 14 V

OK → **Go to step 6**

NG

5	CHECK HARNESS AND CONNECTOR(EFI RELAY – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – ECM)



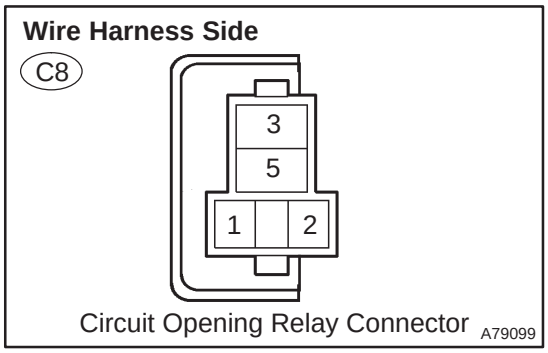
(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the circuit opening relay.
(c) Disconnect the E9 ECM connector.
(d) Check for continuity between the wire harness side connectors.

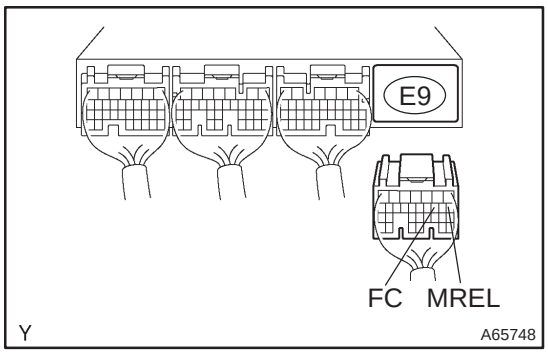
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – Circuit opening relay (C8–1)	Continuity
Circuit opening relay (C8–2) – FC (E9–10)	
EFI relay (1) – MREL (E9–8)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or Circuit opening relay (C8–1) – Body ground	No continuity
Circuit opening relay (C8–2) or FC (E9–10) – Body ground	
EFI relay (1) or MREL (E9–8) – Body ground	





NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

6	INSPECT FUEL PUMP ASSY (See page 11–22)

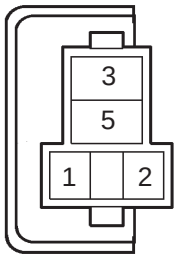
NG → **REPAIR OR REPLACE FUEL PUMP ASSY**

OK

7	CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP, FUEL PUMP – BODY GROUND)

Wire Harness Side

C8



Circuit Opening Relay Connector

A79099

(a) Remove the circuit opening relay.
(b) Disconnect the fuel pump connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) – Fuel pump (F25–4)	Continuity
Fuel pump (F25–5) – Body ground	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) or Fuel pump (F25–4) – Body ground	No continuity

Wire Harness Side

F25

Fuel Pump Connector

A66276

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1	CHECK OPERATION OF FUEL PUMP (See page 11–19)

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

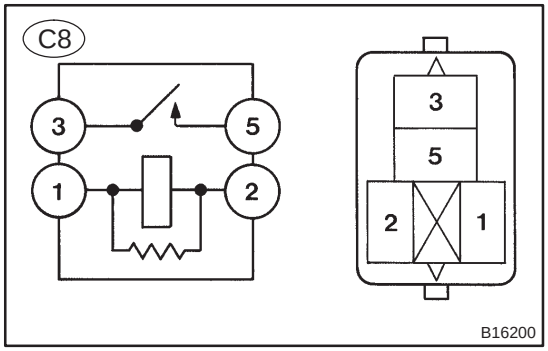
NG

2	CHECK ECM POWER SOURCE CIRCUIT (See page 05–257)

NG → **CHECK FOR ECM POWER SOURCE CIRCUIT**

OK

3 INSPECT CIRCUIT OPENING RELAY



(a) Remove the circuit opening relay.
(b) Inspect the circuit opening relay.

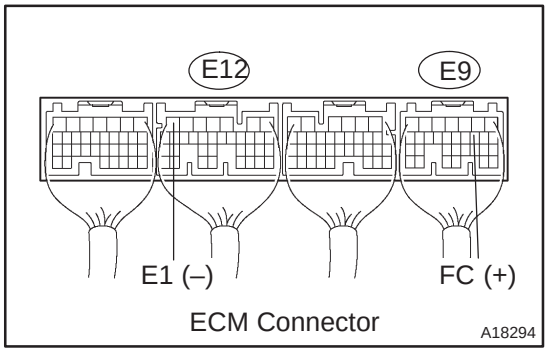
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE CIRCUIT OPENING RELAY**

OK

4 INSPECT ECM(CHECK VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.

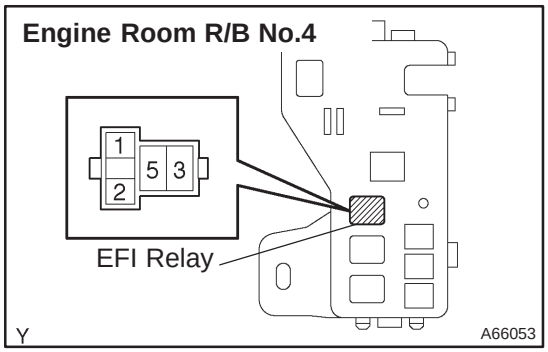
Standard:

Symbols (Terminal No.)	Specified condition
FC (E9–10) – E1 (E12–7)	8 to 14 V

OK → **Go to step 6**

NG

5	CHECK HARNESS AND CONNECTOR(EFI RELAY – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – ECM)



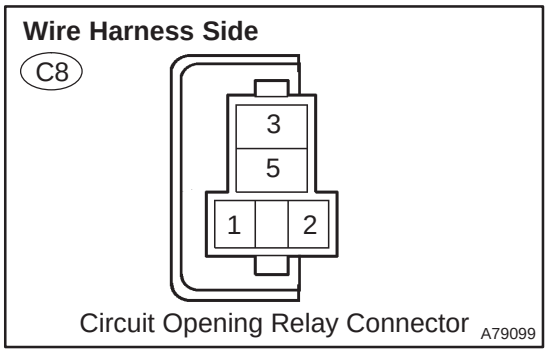
(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the circuit opening relay.
(c) Disconnect the E9 ECM connector.
(d) Check for continuity between the wire harness side connectors.

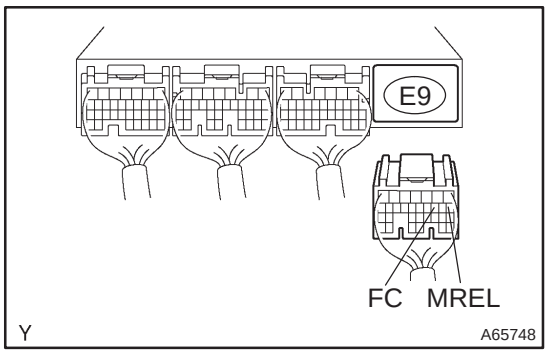
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – Circuit opening relay (C8–1)	Continuity
Circuit opening relay (C8–2) – FC (E9–10)	
EFI relay (1) – MREL (E9–8)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or Circuit opening relay (C8–1) – Body ground	No continuity
Circuit opening relay (C8–2) or FC (E9–10) – Body ground	
EFI relay (1) or MREL (E9–8) – Body ground	





NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

6	INSPECT FUEL PUMP ASSY (See page 11–22)

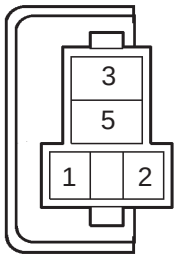
NG → **REPAIR OR REPLACE FUEL PUMP ASSY**

OK

7	CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP, FUEL PUMP – BODY GROUND)

Wire Harness Side

C8



Circuit Opening Relay Connector

A79099

(a) Remove the circuit opening relay.
(b) Disconnect the fuel pump connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) – Fuel pump (F25–4)	Continuity
Fuel pump (F25–5) – Body ground	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) or Fuel pump (F25–4) – Body ground	No continuity

Wire Harness Side

F25

Fuel Pump Connector

A66276

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE ECM (See page 01–32)

SFI SYSTEM (1AZ–FE)

HOW TO PROCEED WITH TROUBLESHOOTING

05C7H–01

When using hand–held tester, troubleshoot in accordance with the procedure shown below.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–148)

3	CONNECT THE HAND–HELD TESTER TO DLC3

HINT:
If the display indicates a communication fault in the tool, inspect DLC3.

4	CHECK DTC AND FREEZE FRAME DATA (See page 05–149)

HINT:
Record or print DTC and freeze frame data, if needed.

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05–149)

6	VISUAL INSPECTION

7	SETTING THE CHECK (TEST) MODE DIAGNOSIS (See page 05–149)

8	PROBLEM SYMPTOM CONFIRMATION

HINT:
If the engine does not start, perform steps 10 and 12 first.

A	Malfunction does not occur
B	Malfunction occurs

B → GO TO STEP 10

A

9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05–149)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	DTC CHART (See page 05–161)

GO TO STEP 14

12	BASIC INSPECTION (See page 05–149)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	PROBLEM SYMPTOMS TABLE (See page 05–168)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05–257)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)

GO TO STEP 18

17	PARTS INSPECTION

18	IDENTIFICATION OF PROBLEM

19	ADJUSTMENT, REPAIR

20	CONFIRMATION TEST

END

When not using hand–held tester, troubleshoot in accordance with the procedure shown below.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–148)

3	CHECK AND CLEAR DTC (See page 05–149)

4	PROBLEM SYMPTOM CONFIRMATION

A	Malfunction occurs
B	Malfunction does not occur

B → SYMPTOM SIMULATION (See page 01–22)

A

5	DTC CHECK (See page 05–149)

A	Malfunction code
B	No code

B → GO TO STEP 7

A

6	DTC CHART (See page 05–161)

GO TO STEP 9

7	BASIC INSPECTION (See page 05–149)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 12

A

8	PROBLEM SYMPTOMS TABLE (See page 05–168)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 12

A

9	CHECK ECM POWER SOURCE CIRCUIT (See page 05–257)

10	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 13

A

11	CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)

GO TO STEP 13

12	PARTS INSPECTION

13	IDENTIFICATION OF PROBLEM

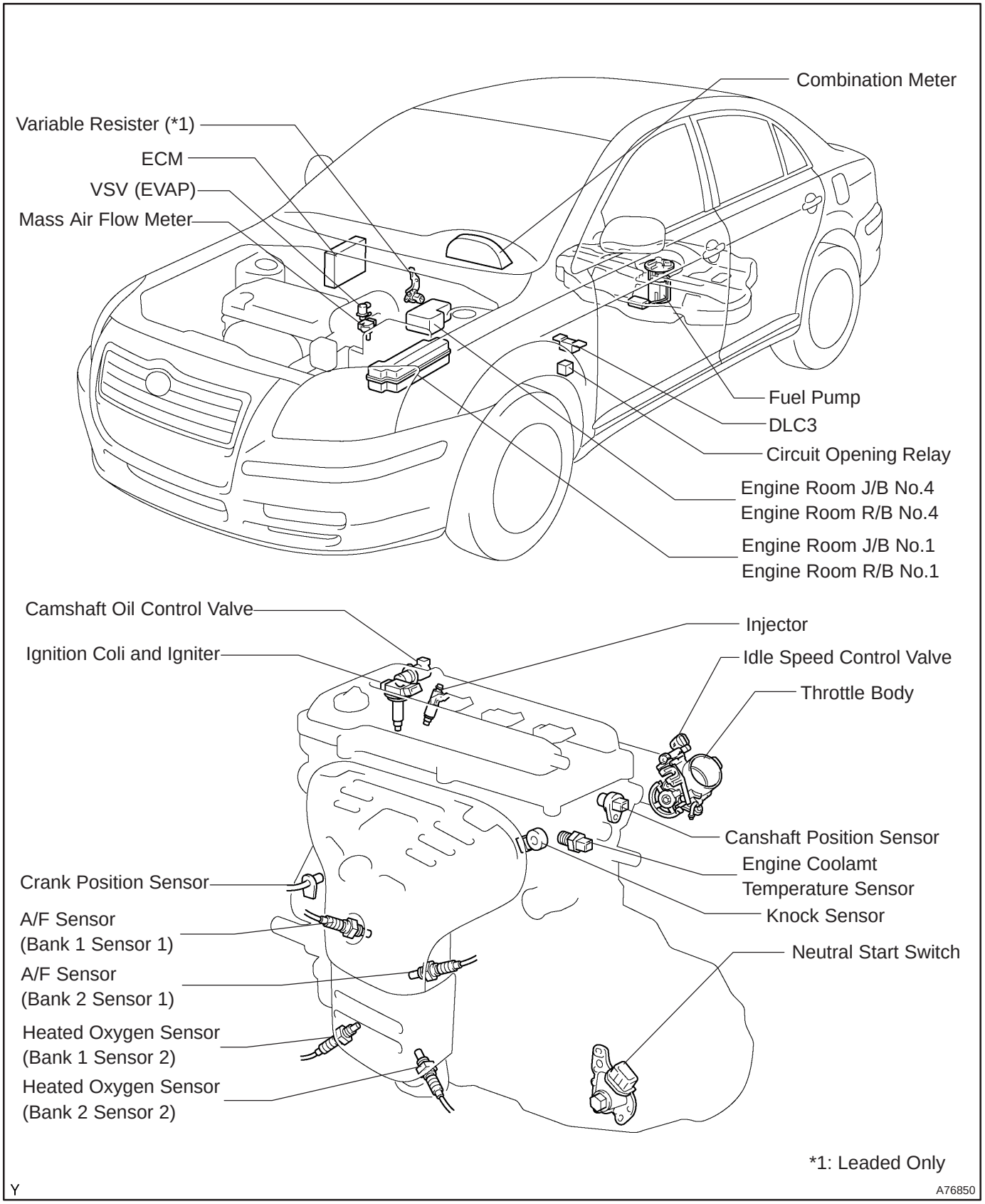
14	ADJUSTMENT, REPAIR

15	CONFIRMATION TEST

END

05C6O–01

LOCATION

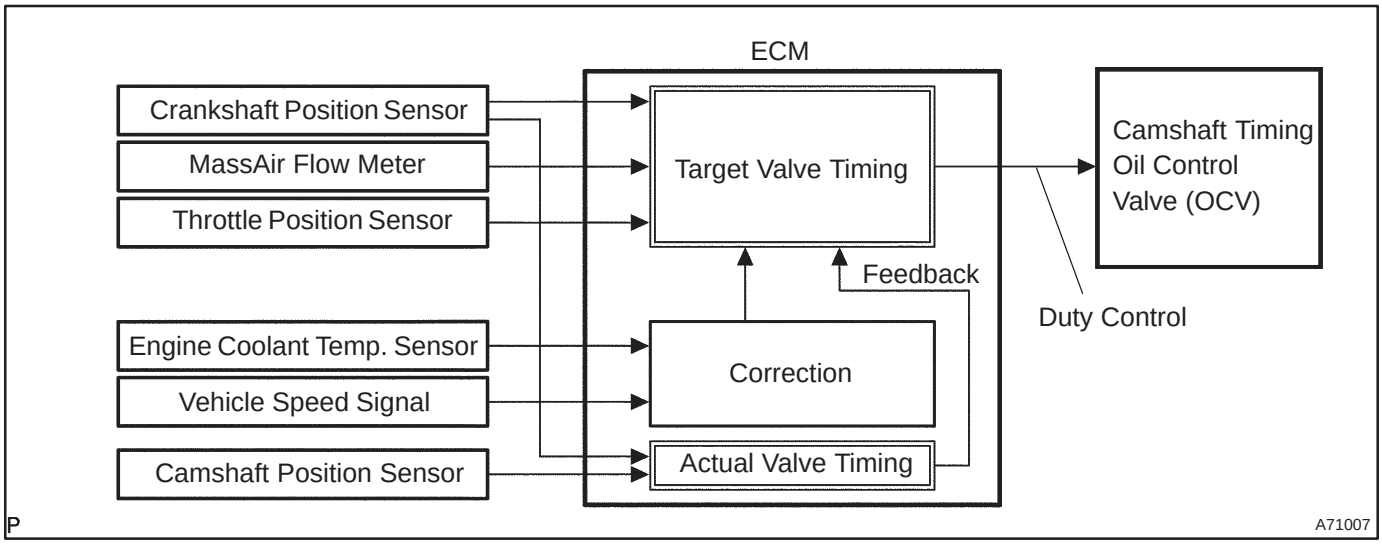


DTC	P0010/39	CAMSHAFT POSITION ”A” ACTUATOR CIRCUIT (BANK 1)

CIRCUIT DESCRIPTION

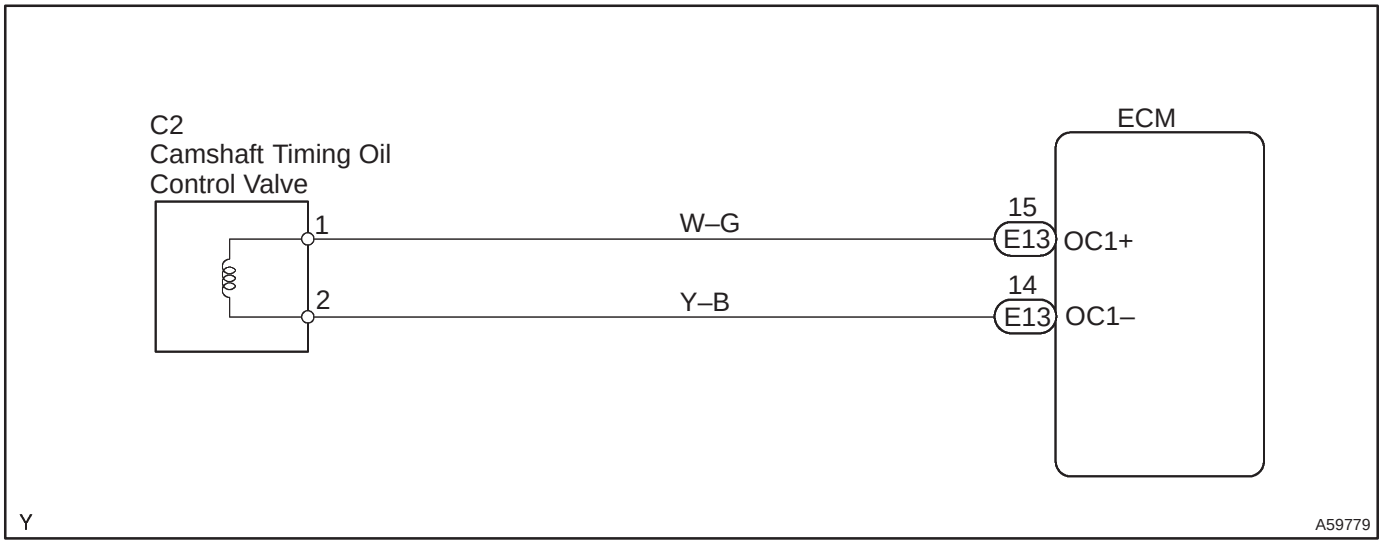
The VVT system controls the intake camshaft to provide the optimal valve timing for every driving condition. This control is performed based on the signals, such conditions as intake air volume, throttle position and engine coolant temperature.

The ECM controls the oil control valve (OCV), based on the signals output from the sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the oil control valve (OCV). As result, the relative position between the camshaft and the crankshaft becomes optimal, and the engine torque improves, fuel economy improves, exhaust emissions decrease under overall driving conditions. Also, the ECM detects the actual valve timing using the signals from the camshaft position sensor and the crankshaft position sensor, and performs feedback control. This is how target valve timing is achieved by the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0010/39	Open or short in oil control valve (OCV) circuit	• Open or short in oil control valve circuit • Oil control valve • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OCV OPERATION)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD/ ACTIVE TEST / VVT CTRL B1 or VVT CTRL B2”.
(e) Check the engine speed when operating the OCV by the hand–held tester.

Standard:

Tester operation	Specified condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

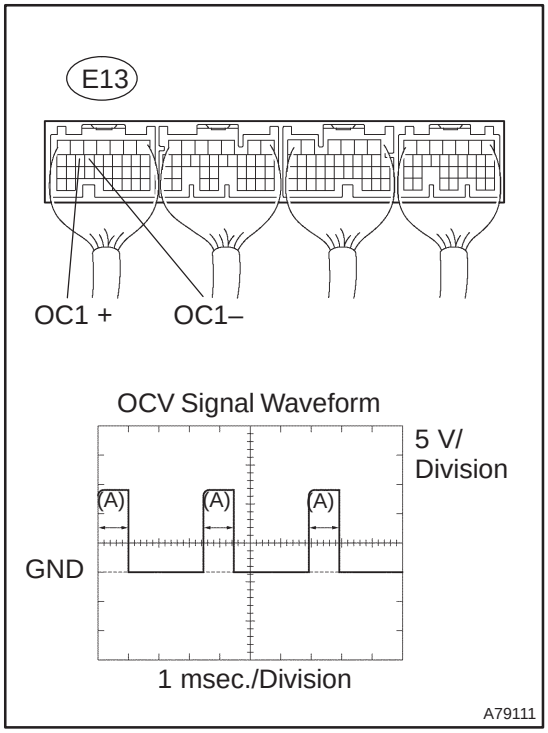
NG

2	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY (See page 10–20)

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

OK

3 INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E13 ECM connector.

Standard:

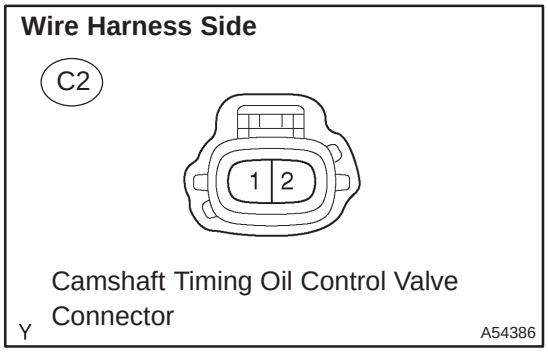
Symbols (Terminal No.)	Specified condition
OC1+ (E13–15) – OC1– (E13–14)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

4 CHECK HARNESS AND CONNECTOR(ECM – OCV)



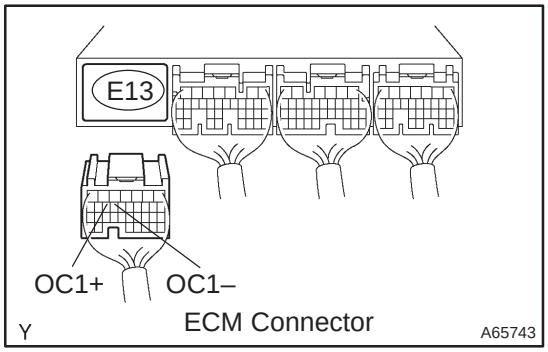
(a) Disconnect the camshaft timing oil control valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) – OC1+ (E13–15)	Continuity
Oil control valve (C2–2) – OC1– (E13–14)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) or OC1+ (E13–15) – Body ground	No continuity
Oil control valve (C2–2) or OC1– (E13–14) – Body ground	



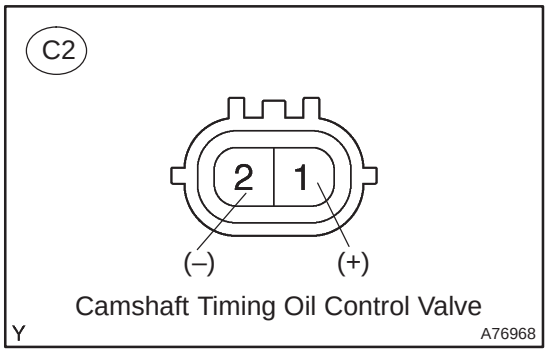
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR INTERMITTENT PROBLEMS

When not using hand–held tester:

1	CHECK OPERATION OF OCV

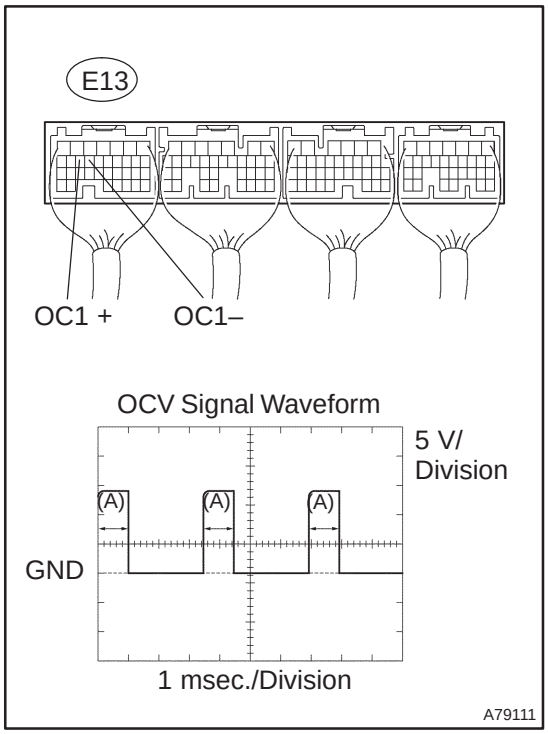


(a) Disconnect the camshaft timing oil control valve connector.
(b) Apply battery positive voltage between the terminals of the camshaft timing oil control valve.
(c) Check the engine speed.
Standard:
Engine speed is rough idle or engine is stalled.

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

OK

2	INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E13 ECM connector.
Standard:

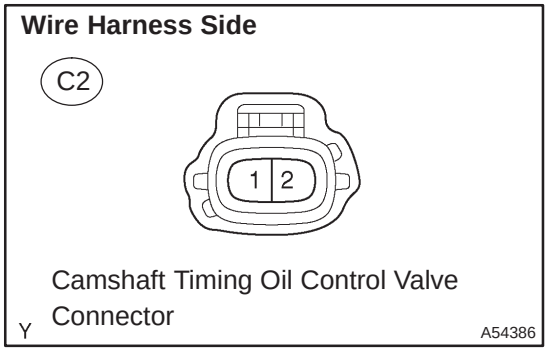
Symbols (Terminal No.)	Specified condition
OC1+ (E13–15) – OC1– (E13–14)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page)**

OK

3 CHECK HARNESS AND CONNECTOR(ECM – OCV)



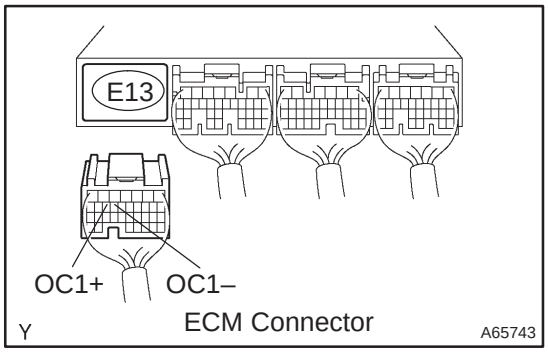
(a) Disconnect the camshaft timing oil control valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) – OC1+ (E13–15)	Continuity
Oil control valve (C2–2) – OC1– (E13–14)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) or OC1+ (E13–15) – Body ground	No continuity
Oil control valve (C2–2) or OC1– (E13–14) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)

DTC	P0011/59	CAMSHAFT POSITION ”A” –TIMING OVER–ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC	P0012/59	CAMSHAFT POSITION ”A” –TIMING OVER–RETARDED (BANK 1)

CIRCUIT DESCRIPTION

Refer to DTC P0010/39 on page 05–169.

DTC No.	DTC Detection Condition	Trouble Area
P0011/59	Condition (a) or (b) continues after engine is warmed up and engine speed at 400 to 4,000 rpm (Problem of the advanced oil control valve.): (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	• Valve timing • Oil control valve • Camshaft timing gear assy • ECM
P0012/59	Condition (a) or (b) continues after engine is warmed up and engine speed at 400 to 4,000 rpm (Problem of the retarded oil control valve.): (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	

WIRING DIAGRAM

Refer to DTC P0010/39 on page 05–169.

INSPECTION PROCEDURE

HINT:

Advanced timing over (Valve timing is out of specified range)	P0011/59
Retarded timing over (Valve timing is out of specified range)	P0012/59

- If DTC ”P0011/59 or P0012/59” is displayed, check VVT system circuit.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	CHECK VALVE TIMING (See page 14–139)

NG → ADJUST VALVE TIMING (See page 14–139)

OK

2	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATION OF OCV)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / VVT CTRL B1”.
(e) Check the engine speed when operating the OCV by the hand–held tester.
Standard:

Tester operation	Specified condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK → **Go to step 4**

NG

3	READ OUTPUT DTC(CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
  (1) Operating the hand–held tester to erase the codes, or disconnecting the battery terminal or the EFI and ECTS fuses for more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.

Standard: No DTC output.

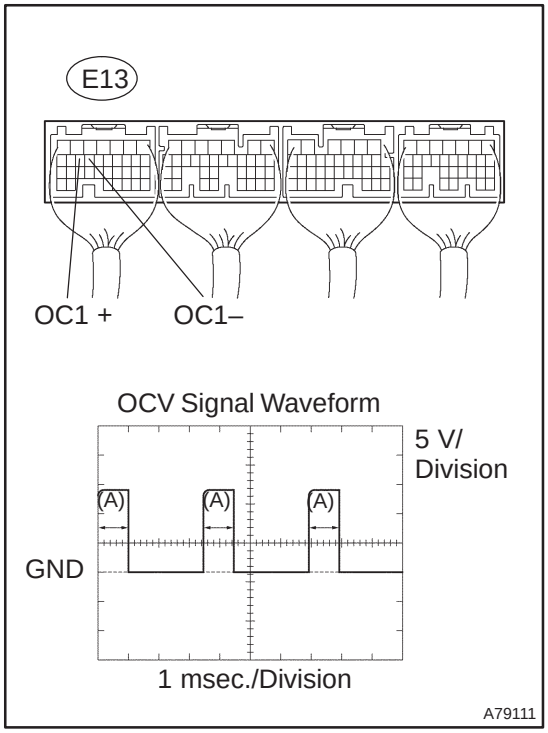
HINT:

*: DTCs P0011/59 or P0012/59 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → **VVT SYSTEM OK***

NG

4	CHECK ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
OC1+ (E13–15) – OC1– (E13–14)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

5	CHECK OIL CONTROL VALVE FILTER

NG → **REPLACE OIL CONTROL VALVE FILTER**

OK

6	CHECK CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–20)

OK → **Go to step 8**

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	CHECK CAMSHAFT TIMING GEAR ASSY (See page 14–171)

OK → **Go to step 10**

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK FOR BLOCKAGE(OCV, OIL CHECK VALVE AND OIL HOLE)

NG → REPAIR OR REPLACE

OK

11	READ OUTPUT DTC(CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
  (1) Operating the hand–held tester to erase the codes, or disconnecting the battery terminal or the EFI and ECTS fuses for more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.

Standard: No DTC output.

HINT:

*: DTCs P0011/59 or P0012/59 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → VVT SYSTEM OK*

NG

CHECK AND REPLACE ECM (See page 01–32)

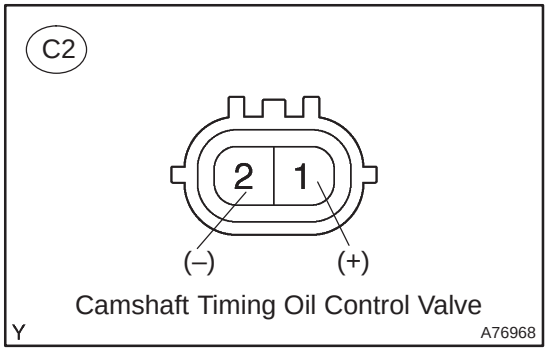
When not using hand–held tester:

1	CHECK VALVE TIMING (See page 14–139)

NG → ADJUST VALVE TIMING (See page 14–139)

OK

2 CHECK OPERATION OF OCV



(a) Start the engine.
(b) Check the engine speed with conditions (1) and then (2).
  (1) Disconnect the camshaft timing oil control valve connector.
  (2) Apply battery positive voltage between the terminals of the camshaft timing oil control valve.

Result:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Conditions other than A	

B → **Go to step 4**

A

3 READ OUTPUT DTC(CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
  (1) Disconnecting the battery terminal or removing the EFI and ECTS fuses for more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC.

Standard: No DTC output.

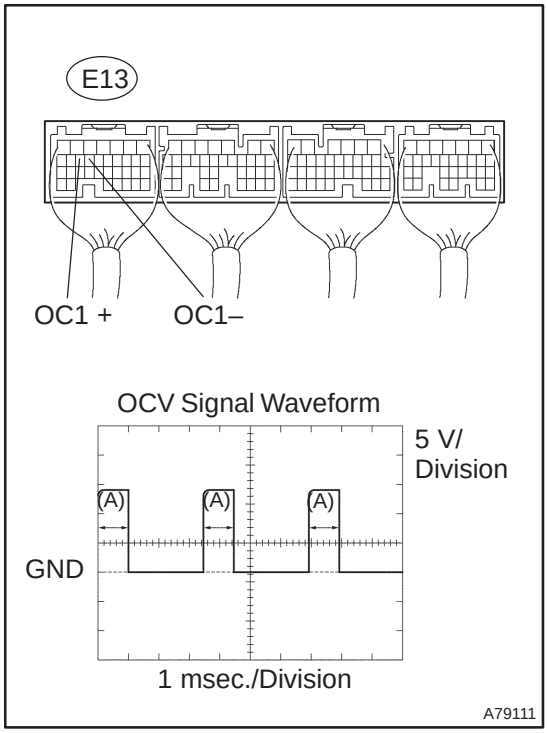
HINT:

*: DTCs P0011/59 or P0012/59 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → **VVT SYSTEM OK***

NG

4	CHECK ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
OC1+ (E13–15) – OC1– (E13–14)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

5	CHECK OIL CONTROL VALVE FILTER

NG → **REPLACE OIL CONTROL VALVE FILTER**

OK

6	CHECK CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–20)

OK → **Go to step 8**

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	CHECK CAMSHAFT TIMING GEAR ASSY (See page 14–171)

OK → **Go to step 10**

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK FOR BLOCKAGE(OCV, OIL CHECK VALVE AND OIL HOLE)

NG → REPAIR OR REPLACE

OK

11	READ OUTPUT DTC(CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
  (1) Disconnecting the battery terminal or removing the EFI and ECTS fuses for more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC.

Standard: No DTC output.

HINT:

*: DTCs P0011/59 or P0012/59 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → VVT SYSTEM OK*

NG

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0016/18	CRANKSHAFT POSITION –CAMSHAFT POSITION CORRELATION (BANK 1 SENSOR A)

CIRCUIT DESCRIPTION

Refer to DTC P0335/12, 13 and P0339/13 on page 05–226.

DTC No.	DTC Detection Condition	Trouble Area
P0016/18	Deviation in crankshaft position sensor signal and VVT sensor 1 signal (2 trip detection logic)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM

WIRING DIAGRAM

Refer to DTC P0335/12, 13 and P0339/13 on page 05–226.

INSPECTION PROCEDURE

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK VALVE TIMING (See page 14–139)

NG → ADJUST VALVE TIMING (See page 14–139)

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0031/21	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC	P0032/21	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC	P0051/28	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

DTC	P0052/28	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

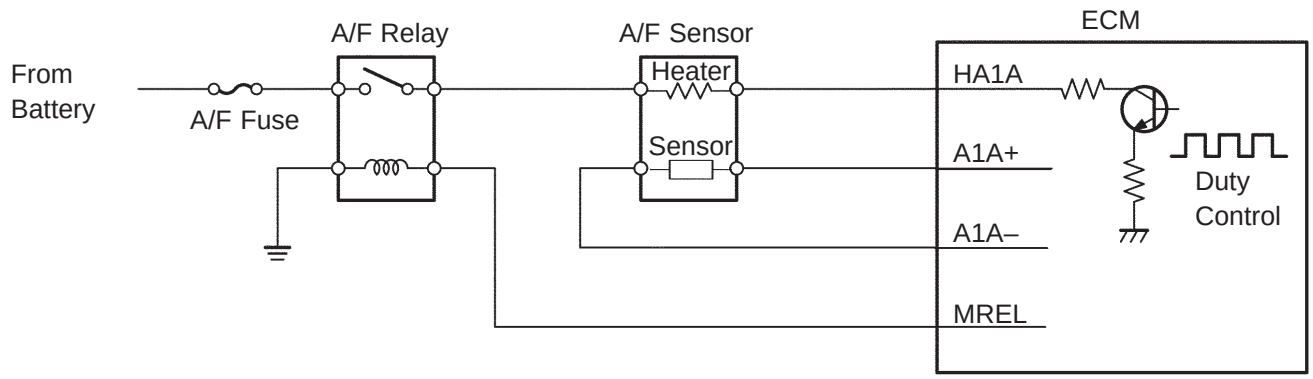
CIRCUIT DESCRIPTION

Refer to DTC P2237/21 on page 05–248.

HINT:

- These DTCs are related to the air fuel raito (A/F) sensor, although the caption is the heated oxygen sensor.
- The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 1 System Drawing)



DTC No.	DTC Detection Condition	Trouble Area
P0031/21 P0051/28	Heated current is 0.8 A or less when heater operates (1 trip detection logic)	• Open or short in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM
P0032/21 P0052/28	When the heater operates, heated current exceeds 19.7 A (1 trip detection logic)	

HINT:

- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that does not include cylinder No.1.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

WIRING DIAGRAM

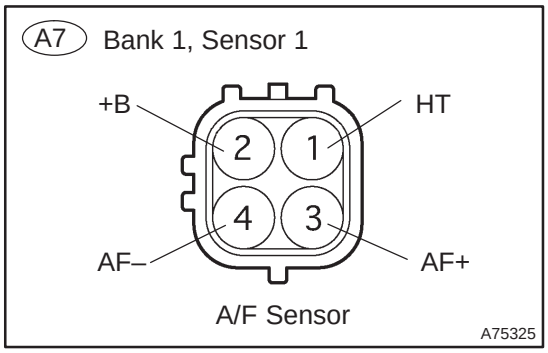
Refer to DTC P2237/21 on page 05–248.

INSPECTION PROCEDURE

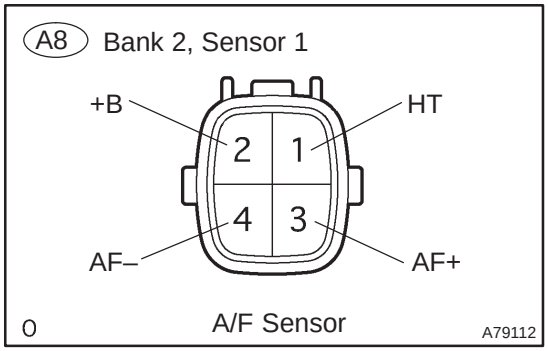
HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



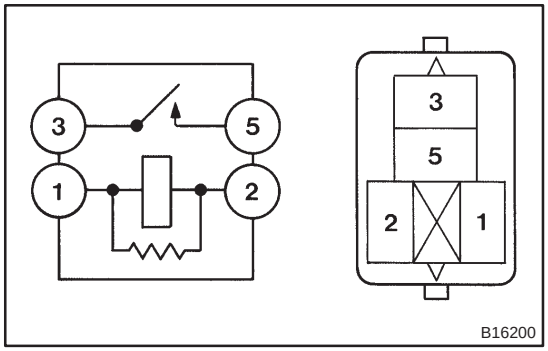
(a) Disconnect the A/F sensor connector.
(b) Measure resistance between terminals HT and +B of the A/F sensor.
Resistance: 1.8 to 3.4 Ω (20 °C)



NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

2	INSPECT A/F RELAY



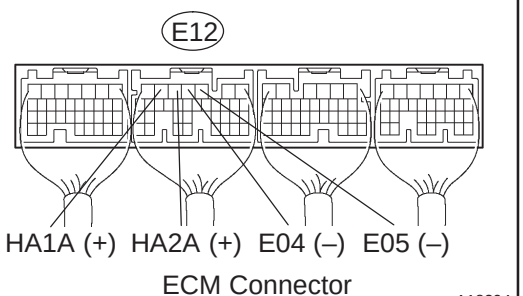
(a) Remove the A/F relay from the engine room R/B No.4.
(b) Inspect the A/F relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE A/F RELAY**

OK

3 INSPECT ECM(VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the applicable terminals of the E12 ECM connectors.

Standard:

Symbols (Terminal No.)	Specified condition
HA1A (E12–6) – E04 (E12–4)	9 to 14 V
HA2A (E12–5) – E05 (E12–3)	

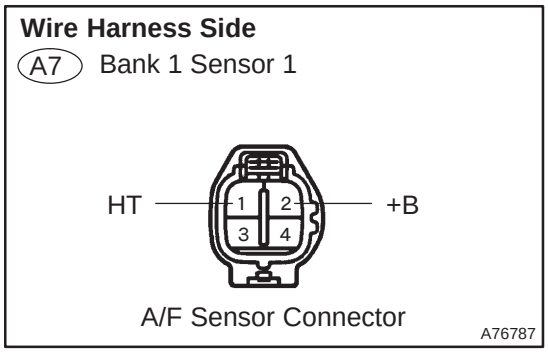
HINT:

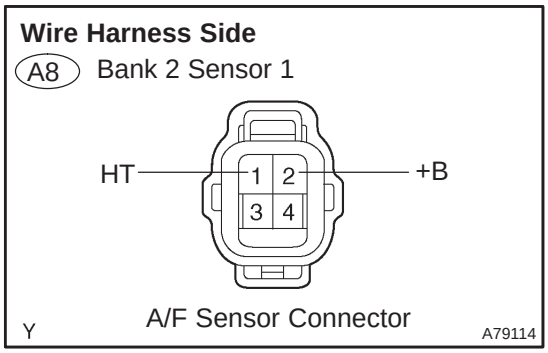
- The HA1A means the heated oxygen sensor bank 1 sensor 1.
- The HA2A means the heated oxygen sensor bank 2 sensor 1.

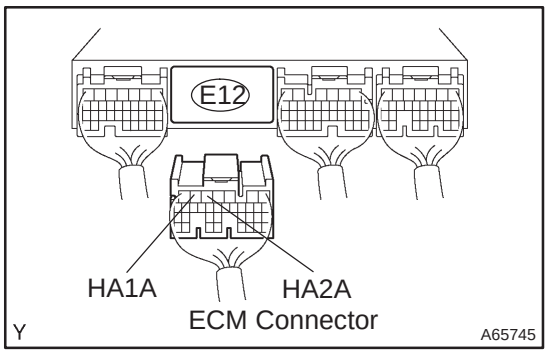
OK → **CHECK AND REPLACE ECM (See page 01–32)**

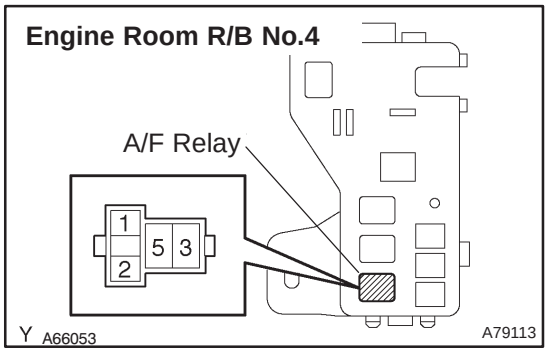
NG

4 CHECK HARNESS AND CONNECTOR(A/F SENSOR – ECM, A/F SENSOR – A/F RELAY)









(a) Check the harness and connector between the ECM and A/F sensor connectors.

(1) Disconnect the A7 or A8 A/F sensor connector.

(2) Disconnect the E12 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
HT (A7–1) – HA1A (E12–6)	Continuity
HT (A8–1) – HA2A (E12–5)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
HT (A7–1) or HA1A (E12–6) – Body ground	No continuity
HT (A8–1) or HA2A (E12–5) – Body ground	

(b) Check the harness and connector between the A/F sensor connector and A/F relay.

(1) Disconnect the A7 or A8 A/F sensor connector.

(2) Remove the A/F relay from the engine room R/B No.4.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (A7–2) – A/F relay (3)	Continuity
+B (A8–2) – A/F relay (3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (A7–2) or A/F relay (3) – Body ground	No continuity
+B (A8–2) or A/F relay (3) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0100/31	MASS OR VOLUME AIR FLOW CIRCUIT

DTC	P0102/31	MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

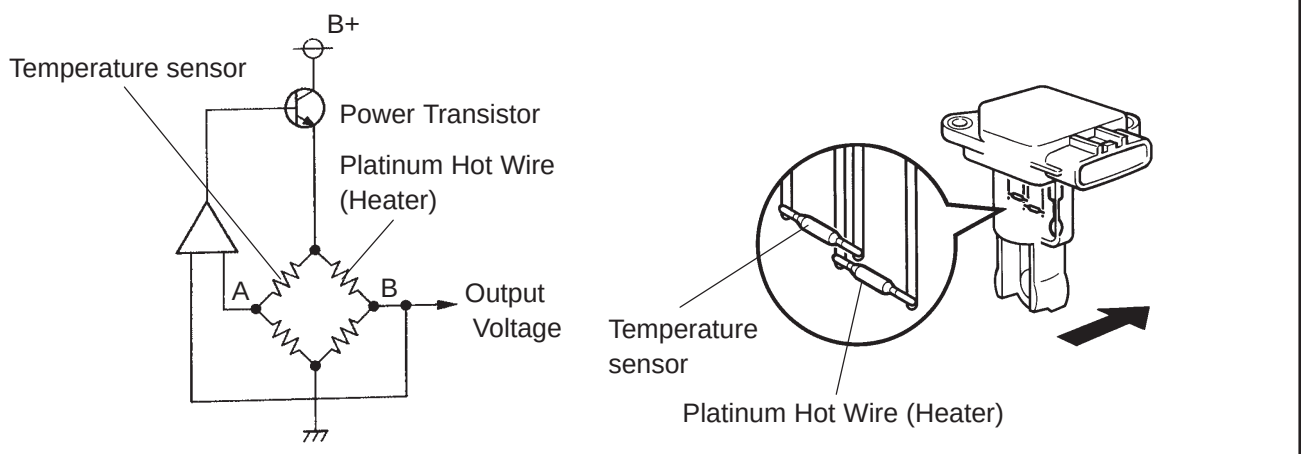
DTC	P0103/31	MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire. The hot wire mass air flow meter consists of a platinum hot wire, a temperature sensor and a control circuit installed in a plastic housing. The hot wire mass air flow meter works on the principle that the hot wire and temperature sensor located in the intake air bypass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the mass air flow meter.

The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



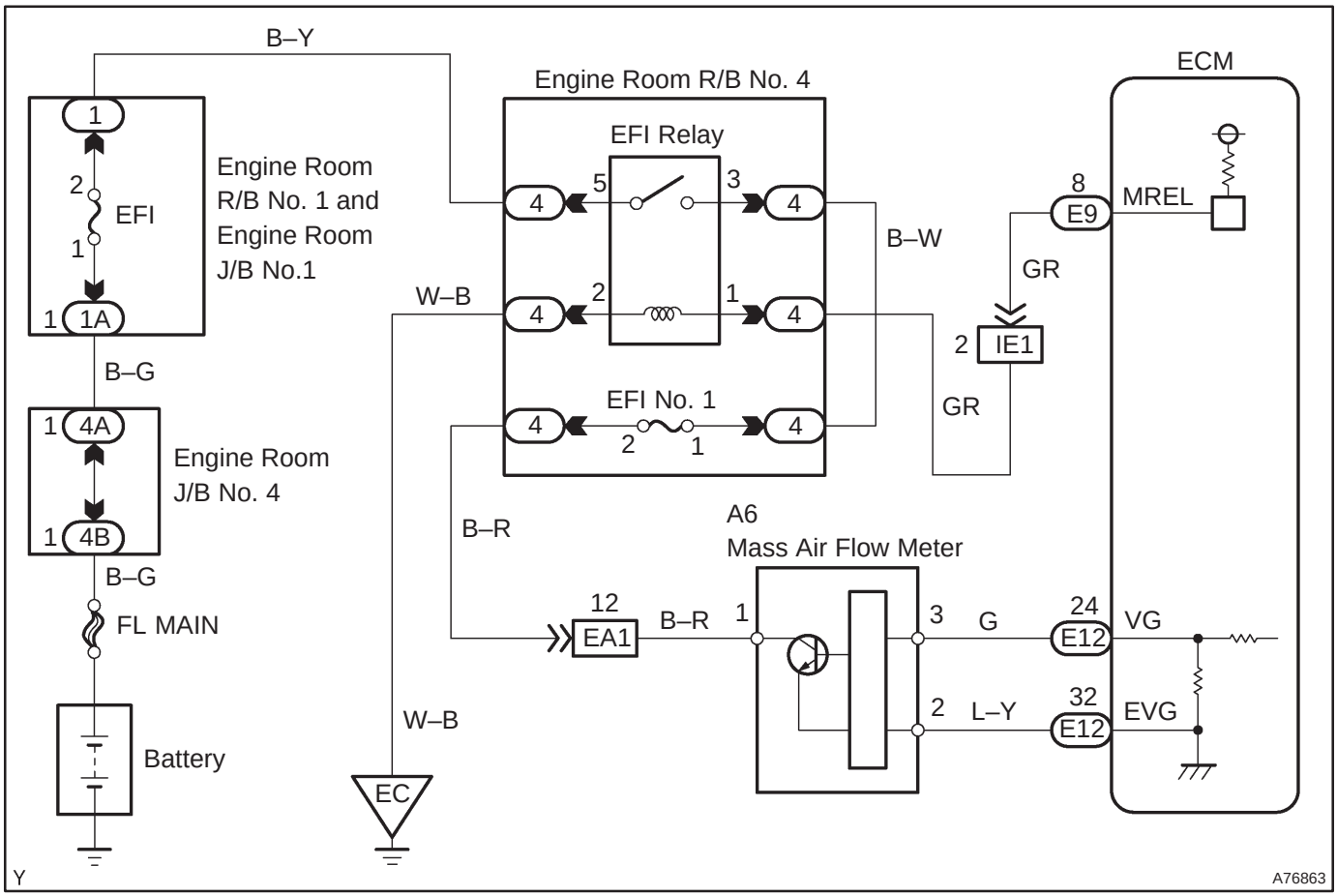
DTC No.	DTC Detection Condition	Trouble Area
P0100/31	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 sec.	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P0102/31	Open in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 sec.	
P0103/31	Short in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 sec. (+B circuit)	

HINT:

After confirming DTC ”P0100/31, P0102/31 or P0103/31”, use the hand–held tester to confirm the mass air flow ratio in the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Air Flow Value (gm/s)	Malfunction
Approx. 0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• E2G circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

Result:

Air flow rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
1 ≦ Mass Air Flow Rate ≦ 270.0 or more (*1)	C

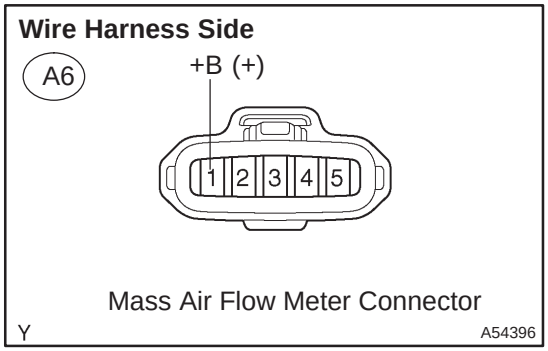
*1: The value must be changed when the throttle valve is opened or closed.

B → **Go to step 6**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

A

2	INSPECT MASS AIR FLOW METER(POWER SOURCE)



(a) Turn the ignition switch ON.
(b) Disconnect the mass air flow meter connector.
(c) Measure the voltage between the terminal of the wire harness side connector and the body ground.

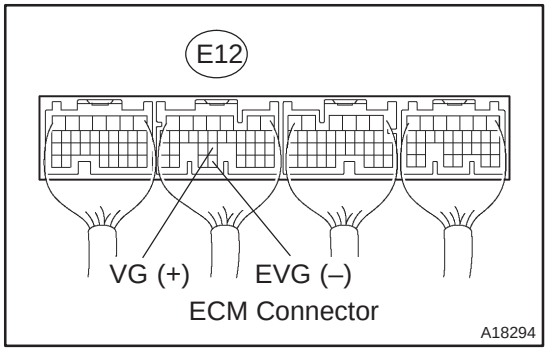
Standard:

Symbols (Terminal No.)	Specified condition
+B (A6–1) – Body ground	9 to 14 V

NG → **Go to step 5**

OK

3 INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the terminals of the E12 ECM connector.

HINT:
The shift position should be P or N and the A/C switch should be turned OFF.

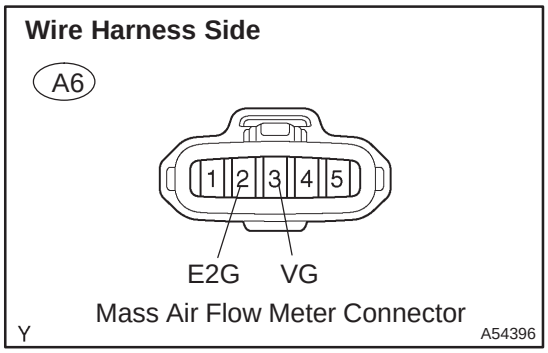
Standard:

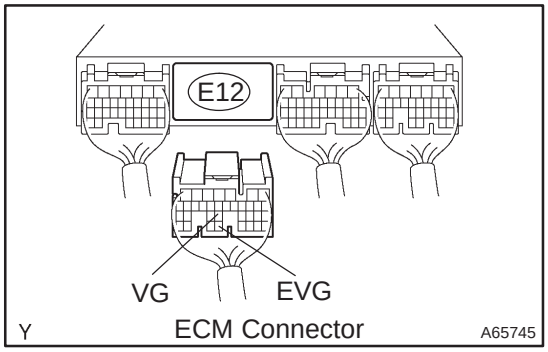
Symbols (Terminal No.)	Condition	Specified condition
VG (E12–24) – EVG (E12–32)	Engine is idling	0.5 to 3.0 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

4 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E12–24)	Continuity
E2G (A6–2) – EVG (E12–32)	

Standard (Check for short):

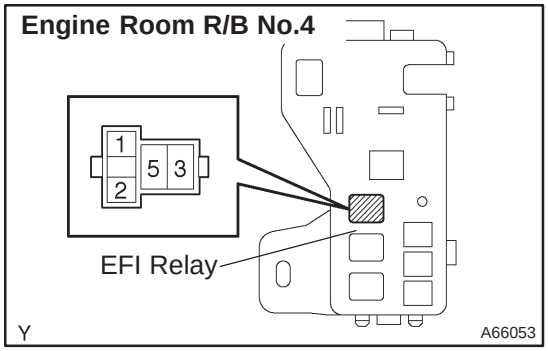
Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E12–24) – Body ground	No continuity

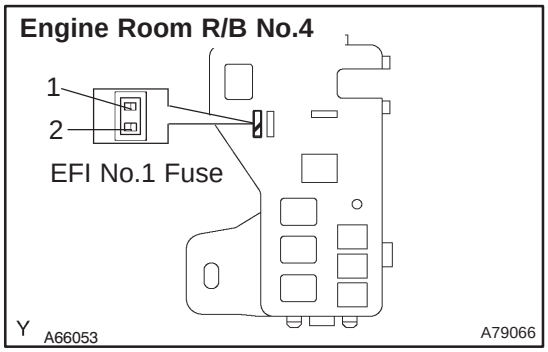
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

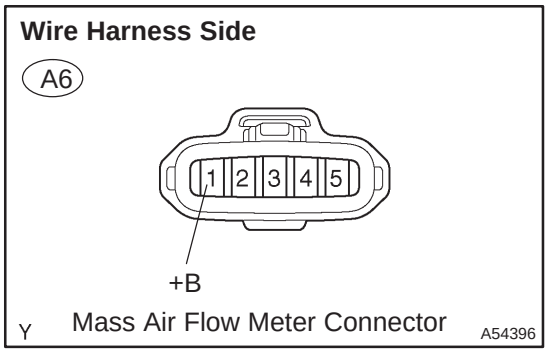
OK

REPLACE MASS AIR FLOW METER

5 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – EFI RELAY)







(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the EFI No.1 fuse from the engine room R/B No.4.
(c) Disconnect the mass air flow meter connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – EFI No.1 fuse (1)	Continuity
EFI No.1 fuse (2) – +B (A6–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or EFI No.1 fuse (1) – Body ground	No continuity
EFI No.1 fuse (2) or +B (A6–1) – Body ground	

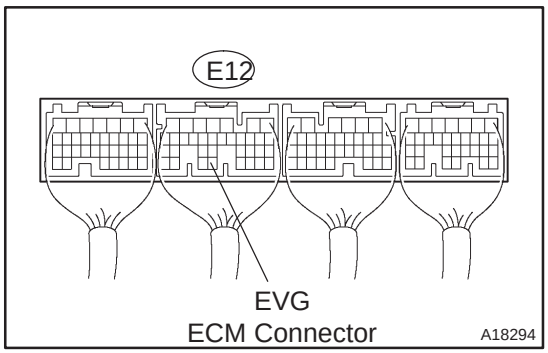
NOTICE:
Do not insert the tester leads hard in the procedure (c), the holder may be damaged.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–257)

6 INSPECT ECM(SENSOR GROUND)



(a) Check for continuity between the terminal of the E12 ECM connector and the body ground.

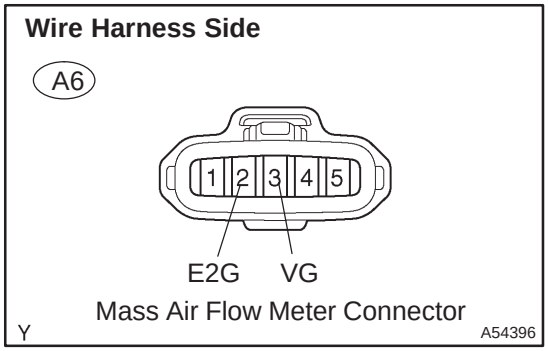
Standard:

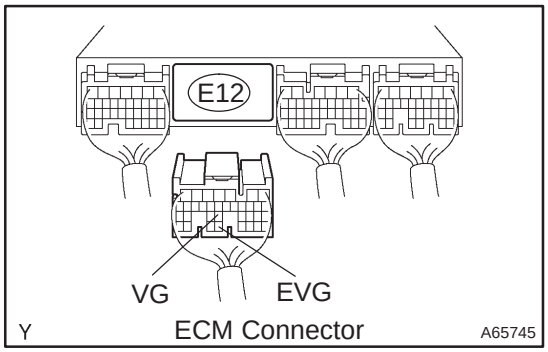
Symbols (Terminal No.)	Specified condition
EVG (E12–32) – Body ground	Continuity

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

7	CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E12–24)	Continuity
E2G (A6–2) – EVG (E12–32)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E12–24) – Body ground	No continuity

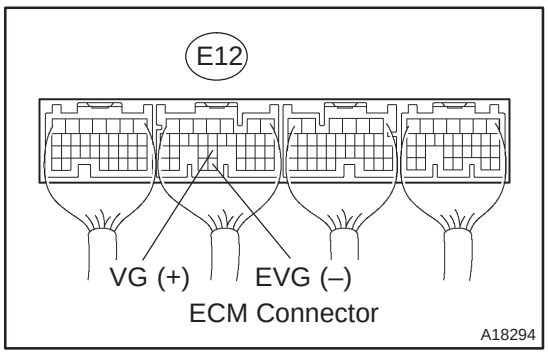
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

When not using hand–held tester:

1	INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the terminals of the E12 ECM connector.

HINT:
The shift position should be P or N and the A/C switch should be turned OFF.

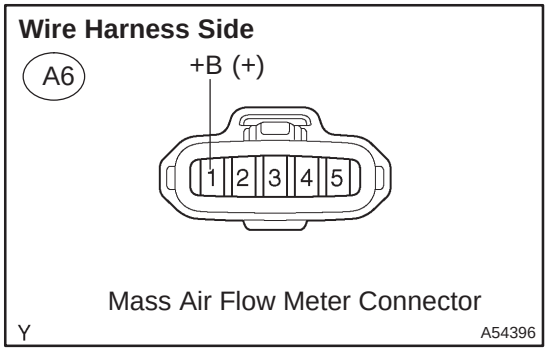
Standard:

Symbols (Terminal No.)	Condition	Specified condition
VG (E12–24) – EVG (E12–32)	Engine is idling	0.5 to 3.0 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

2 INSPECT MASS AIR FLOW METER(POWER SOURCE)



(a) Turn the ignition switch ON.
(b) Disconnect the mass air flow meter connector.
(c) Measure the voltage between the terminal of the wire harness side connector and the body ground.

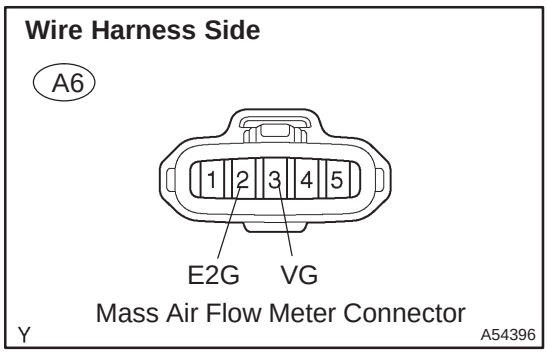
Standard:

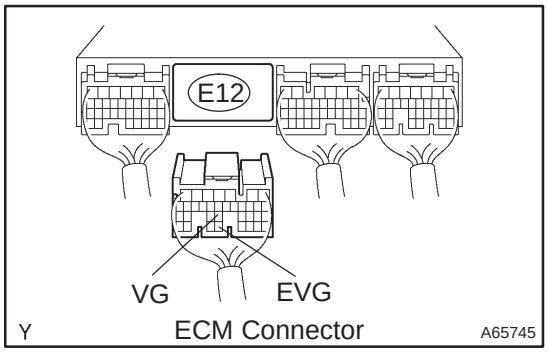
Symbols (Terminal No.)	Specified condition
+B (A6–1) – Body ground	9 to 14 V

NG → **Go to step 4**

OK

3 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E12–24)	Continuity
E2G (A6–2) – EVG (E12–32)	

Standard (Check for short):

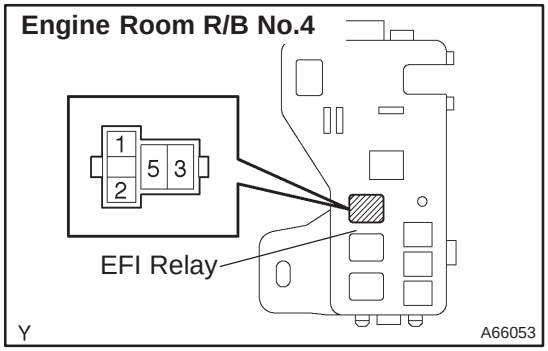
Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E12–24) – Body ground	No continuity

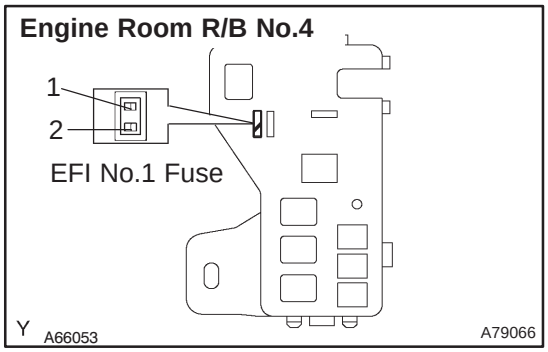
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

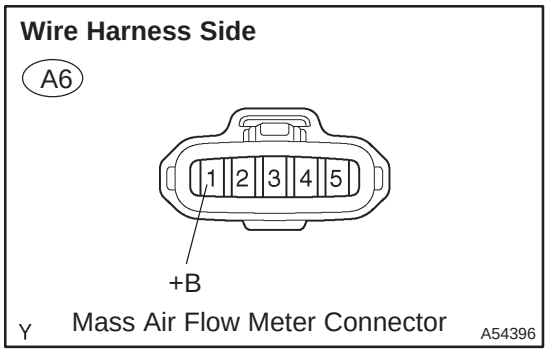
OK

REPLACE MASS AIR FLOW METER

4 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – EFI RELAY)







(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the EFI No.1 fuse from the engine room R/B No.4.
(c) Disconnect the mass air flow meter connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – EFI No.1 fuse (1)	Continuity
EFI No.1 fuse (2) – +B (A6–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or EFI No.1 fuse (1) – Body ground	No continuity
EFI No.1 fuse (2) or +B (A6–1) – Body ground	

NOTICE:
Do not insert the tester leads hard in the procedure (c), the holder may be damaged.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–257)

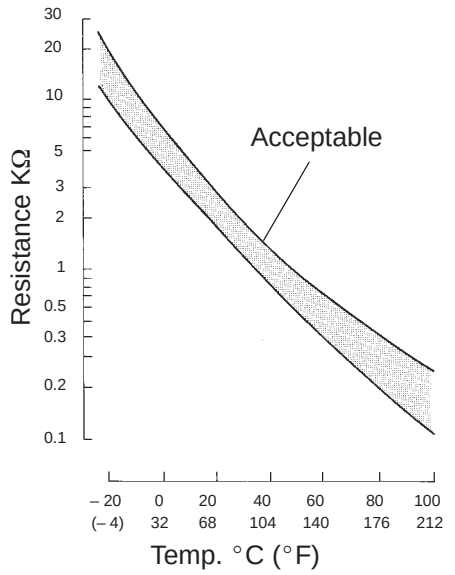
DTC	P0110/24	INTAKE AIR TEMPERATURE CIRCUIT MALFUNCTION

DTC	P0112/24	INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC	P0113/24	INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Fig.1)



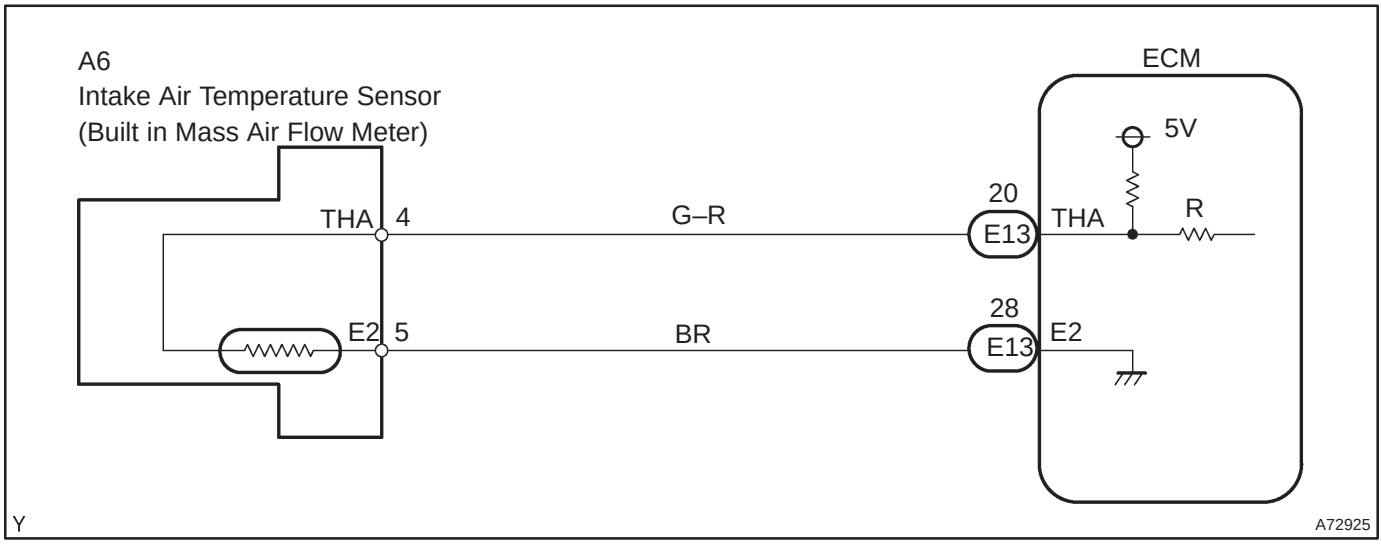
The intake air temperature sensor is built in the mass air flow meter and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature is the greater the thermistor resistance value becomes and the higher the intake air temperature is the lower the thermistor resistance value becomes (See Fig. 1).
The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.
That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110/24	Step 1	Open or short in intake air temp. sensor circuit for 0.5 sec.	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0112/24	Step 4	Short in intake air temp. sensor circuit for 0.5 sec.	
P0113/24	Step 2	Open in intake air temp. sensor circuit for 0.5 sec.	

After confirming DTC ”P0110/24, P0112/24 or P0113/24”, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

HINT:

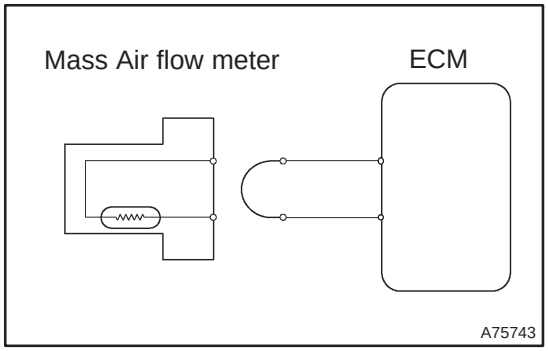
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B → **Go to step 4**

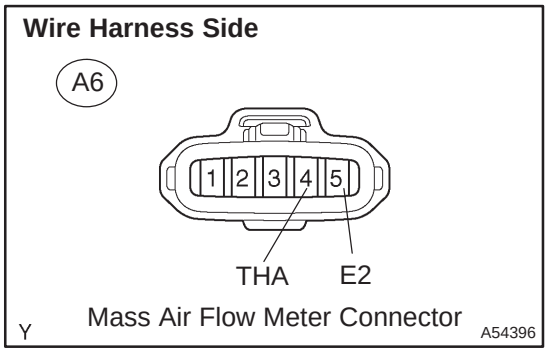
C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



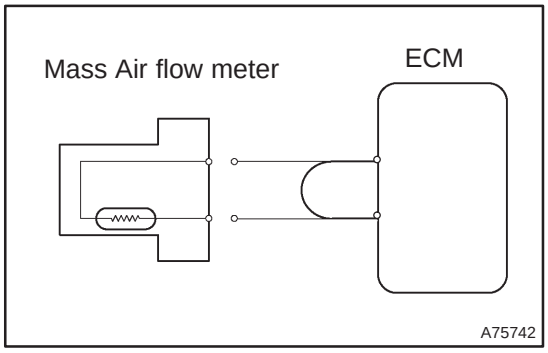
(a) Disconnect the mass air flow meter connector.
(b) Connect terminals THA and E2 of the mass air flow meter connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE MASS AIR FLOW METER**

NG

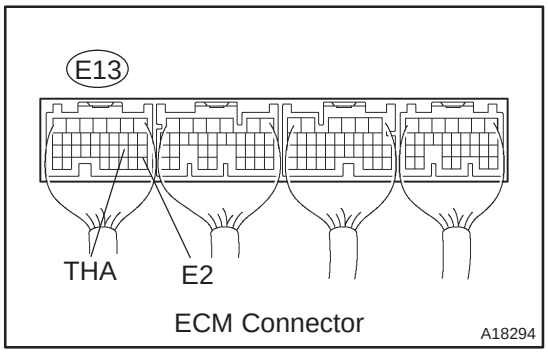
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the mass air flow meter connector.
(b) Connect terminals THA and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more

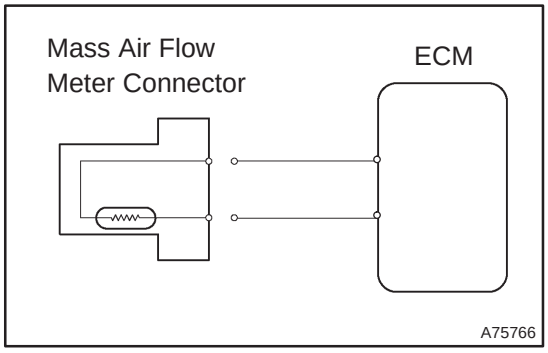


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM (See page 01–32)

4	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

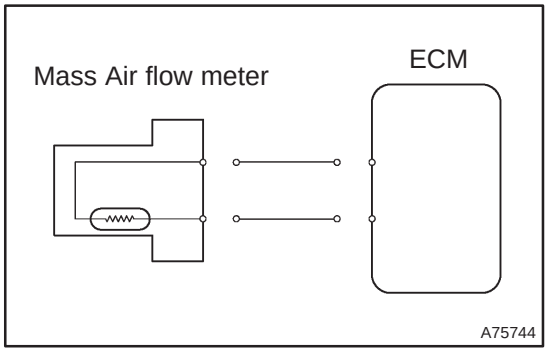


(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)

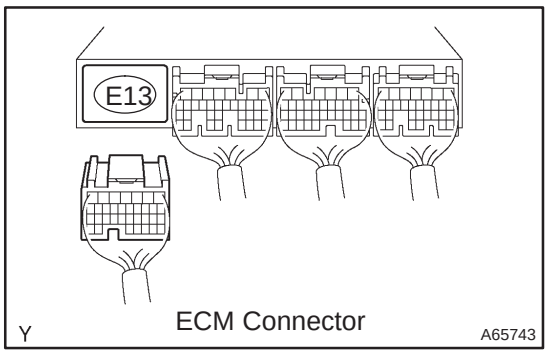
OK → **REPLACE MASS AIR FLOW METER**

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)



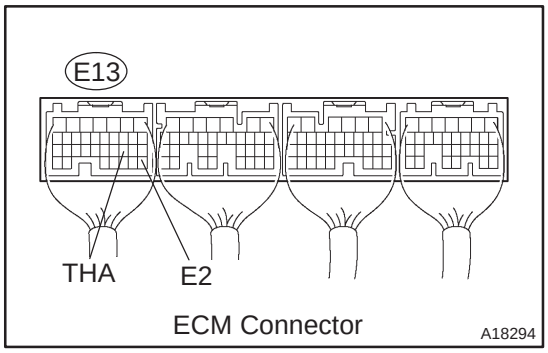
OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1	INSPECT ECM(THA VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals THA and E2 of the E13 ECM connector.

Voltage:

Intake air temp.	Voltage
20 °C (68 °F)	0.5 to 3.4 V
60 °C (140 °F)	0.2 to 1.0 V

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

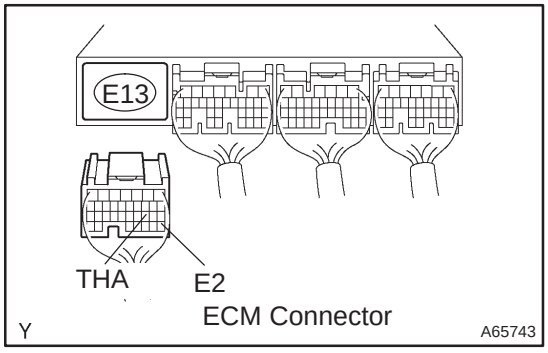
NG

2	INSPECT MASS AIR FLOW METER (See page 10–20)

NG → **REPLACE MASS AIR FLOW METER**

OK

3	CHECK HARNESS AND CONNECTOR(ECM – MASS AIR FLOW METER)



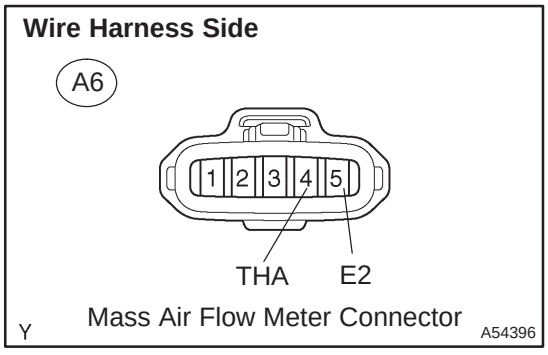
(a) Disconnect the E13 ECM connector.
(b) Disconnect the mass air flow meter connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
THA (E13–20) – THA (A6–4)	Continuity
E2 (E13–28) – E2 (A6–5)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
THA (E13–20) or THA (A6–4) – Body ground	Continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0115/22	ENGINE COOLANT TEMPERATURE CIRCUIT

DTC	P0117/22	ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC	P0118/22	ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

A thermistor is built in the engine coolant temperature sensor and changes the resistance value according to the engine coolant temperature.

The structure of the sensor and connection to the ECM is the same as those of the intake air temperature sensor.

HINT:

If the ECM detects the DTC ”P0115/22, P0117/22 or P0118/22” it enters the fail–safe mode in which the engine coolant temperature is assumed to be 80 °C (176 °F).

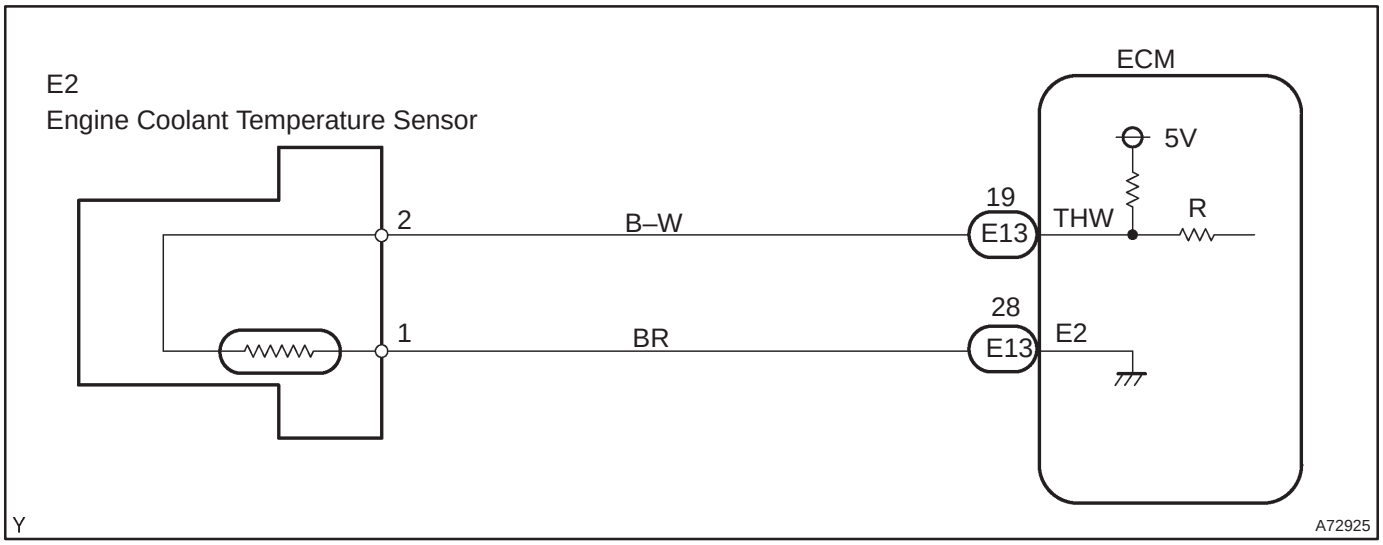
DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115/22	Step 1	Open or short in engine coolant temp. sensor circuit for 0.5 sec.	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM
P0117/22	Step 4	Short in engine coolant temp. sensor circuit for 0.5 sec.	
P0118/22	Step 2	Open in engine coolant temp. sensor circuit for 0.5 sec.	

HINT:

After confirming DTC ”P0115/22, P0117/22 or P0118/22”, use the hand–held tester to confirm the engine coolant temperature in the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(ENGINE COOLANT TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

HINT:

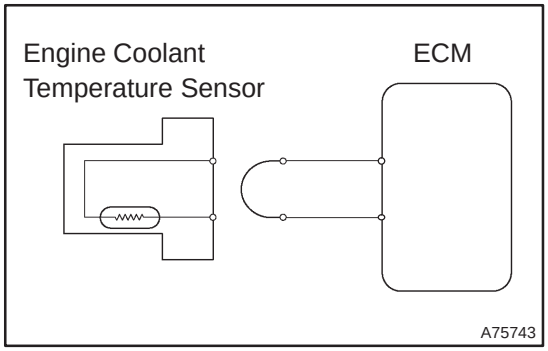
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B → **Go to step 4**

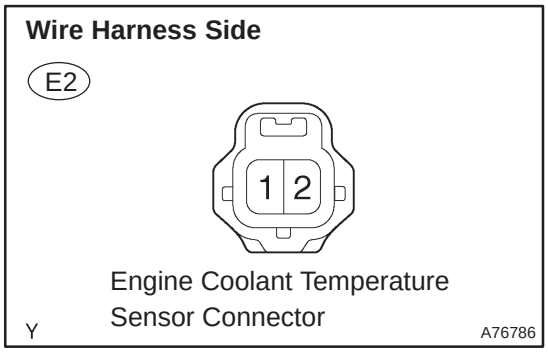
C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



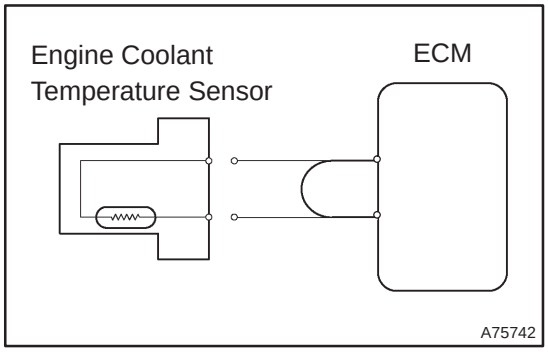
(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor connector.
(c) Turn the ignition switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE WATER TEMP. SENSOR**

NG

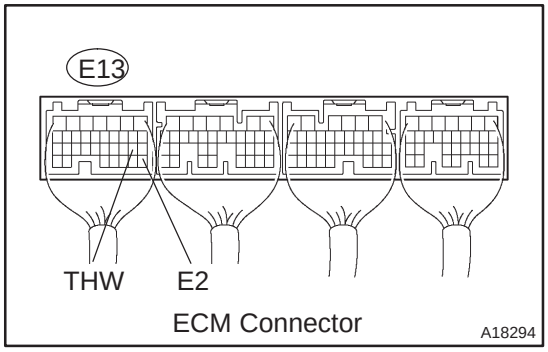
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect terminals THW and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more

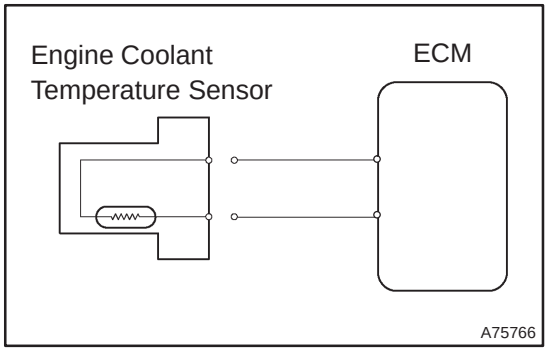


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM (See page 01–32)

4	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

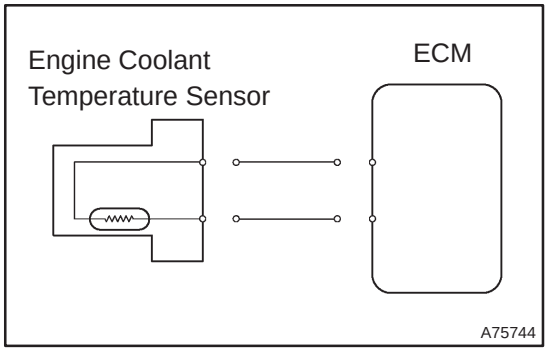


(a) Disconnect the engine coolant temperature sensor connector.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)

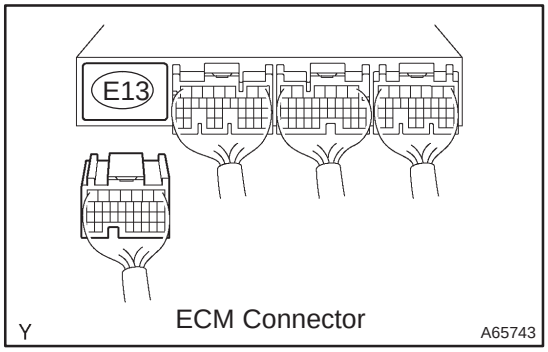
OK → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Disconnect the engine coolant temperature sensor connector.
(c) Turn the ignition switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)



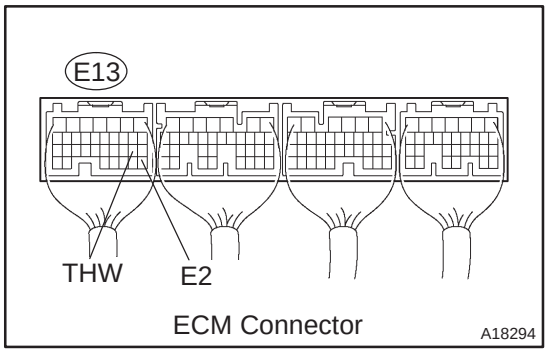
OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1 INSPECT ECM(THW VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals THW and E2 of the ECM connector.

Voltage:

Intake air temp.	Voltage
20 °C (68 °F)	0.5 to 3.4 V
60 °C (140 °F)	0.2 to 1.0 V

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

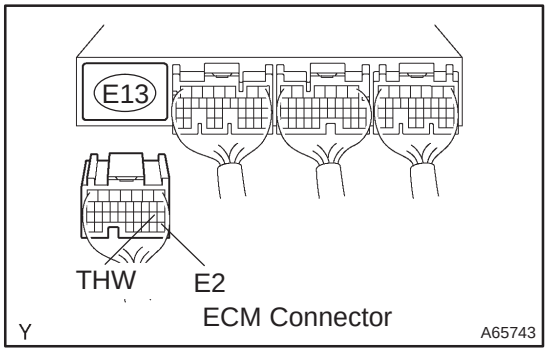
NG

2 INSPECT ENGINE COOLANT TEMPERATURE SENSOR (See page 10–20)

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

3 CHECK HARNESS AND CONNECTOR(ECM – EFI WATER TEMP. SENSOR)



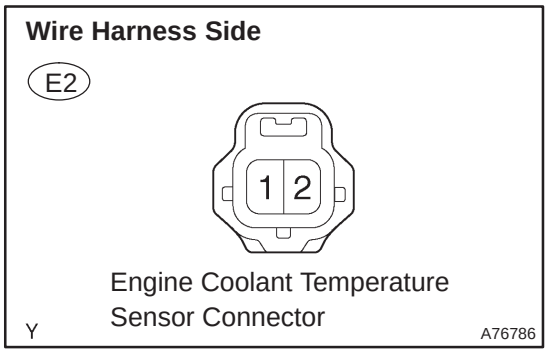
(a) Disconnect the E13 ECM connector.
(b) Disconnect the engine coolant temperature sensor connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
THW (E13–19) – Engine coolant temperature sensor (E2–2)	Continuity
E2 (E13–28) – Engine coolant temperature sensor (E2–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
THW (E13–19) or Engine coolant temperature sensor (E2–2) – Body ground	Continuity



MG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

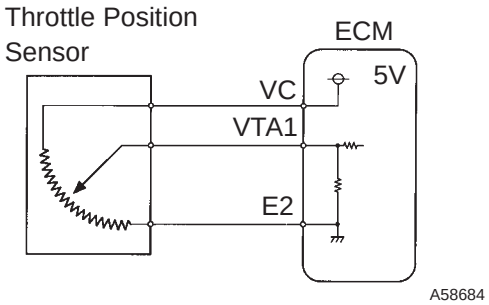
CHECK AND REPLACE ECM (See page 01–32)

DTC	P0120/41	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT

DTC	P0122/41	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT LOW INPUT

DTC	P0123/41	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION



The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle.
When the throttle valve is fully closed, a voltage of approximately 0.7 V is applied to terminal VTA1 of the ECM. The voltage applied to terminal VTA1 of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.5 to 5.0 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from terminal VTA1, uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc.

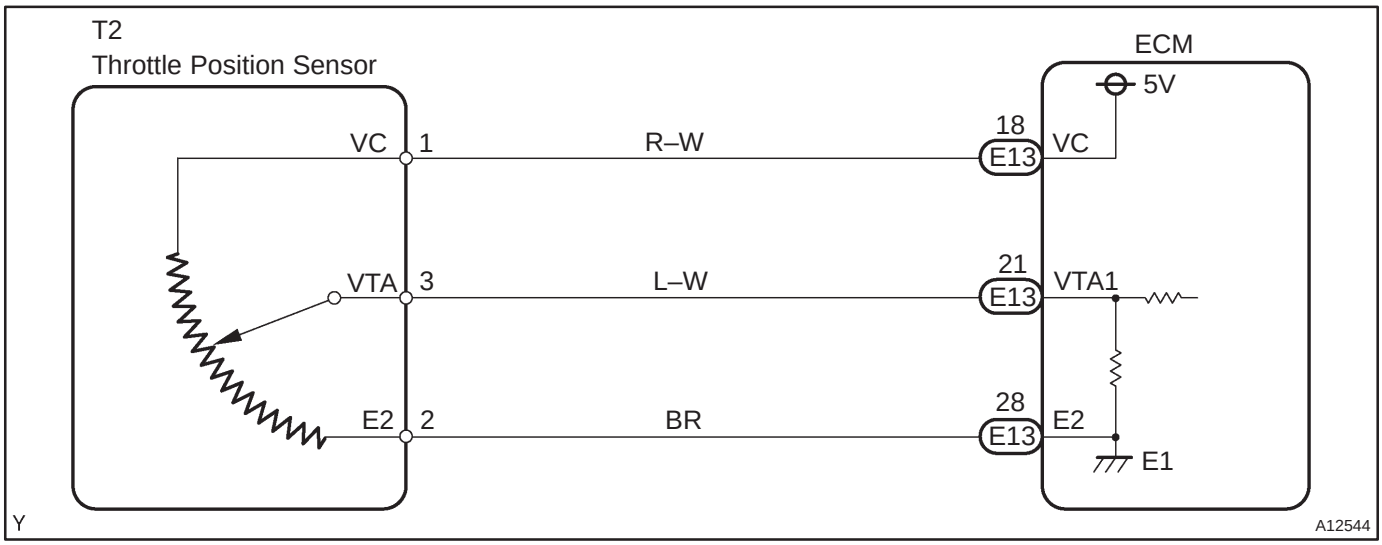
DTC No.	DTC Detection Condition	Trouble Area
Condition (a) of DTC P0120/41, P0122/41 or P0123/41 continues for 2 sec. (Open or short in throttle position sensor circuit)		
P0120/41	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied (a) VTA1 less than 0.1 V, or VTA1 greater than 4.9 V	• Throttle position sensor (built in throttle body) • ECM
P0122/41	(a) VTA1 less than 0.1 V	• Throttle position sensor (built in throttle body) • Short in VTA1 circuit • Open in VC circuit • ECM
P0123/41	(a) VTA1 greater than 4.9 V	• Throttle position sensor (built in throttle body) • Open in VTA1 circuit • Open in E2 circuit • VC and VTA1 circuit are short–circuited • ECM

NOTICE:
When a malfunction is detected, the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.
HINT:

- After confirming DTCs, use the hand–held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve fully closed	Throttle valve fully open	
0 %	0 %	VC circuit open VTA circuit open or short
Approx. 100 %	Approx. 100 %	E2 circuit open

WIRING DIAGRAM



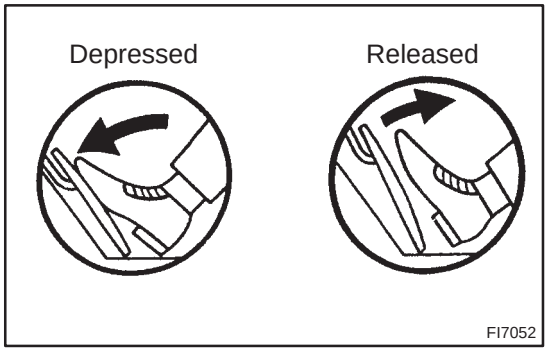
INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand−held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

When using hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(THROTTLE VALVE OPENING PERCENTAGE)



(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / THROTTLE POS” and read its value displayed on the hand–held tester.

Result:

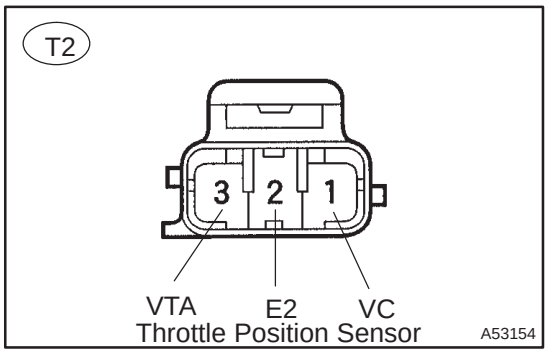
Accelerator pedal operation	Throttle valve opening position expressed as percentage	Proceed to
Released→Depressed	0 %	A
	Approx. 10 %→ Approx. 75 %	B
	Approx. 100 %	C

B → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

C → **Go to step 4**

A

2	INSPECT THROTTLE POSITION SENSOR



(a) Disconnect the throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

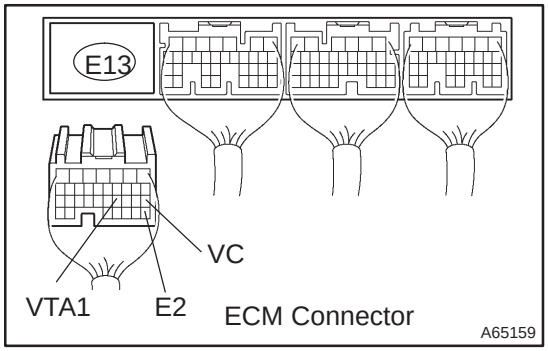
Standard:

Symbols (Terminal No.)	Throttle Valve	Resistance
VC (T2–1) – E2 (T2–2)	—	2.5 to 5.9 kΩ
VTA (T2–3) – E2 (T2–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG → **REPLACE THROTTLE POSITION SENSOR**

OK

3 INSPECT ECM



(a) Reconnect the throttle position sensor connector.
(b) Disconnect the E13 ECM connector.
(c) Measure the resistance between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Throttle valve	Resistance
VC (E13–18) – EC (E13–28)	—	2.5 to 5.9 kΩ
VTA1 (E13–21) – E2 (E13–28)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

(d) Check for continuity between the terminals of the E13 ECM connector.

Standard (Check for short):

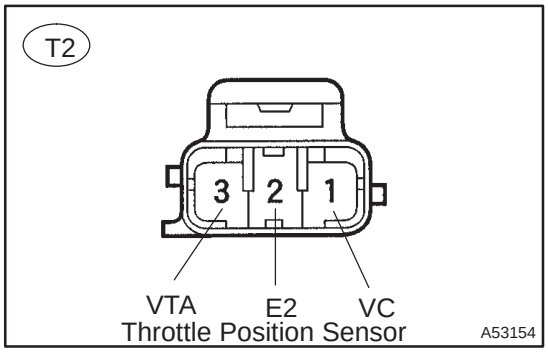
Symbols (Terminal No.)	Specified condition
VC (E13–18) – Body ground	No Continuity
VTA1 (E13–21) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

4 INSPECT THROTTLE POSITION SENSOR



(a) Disconnect the throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

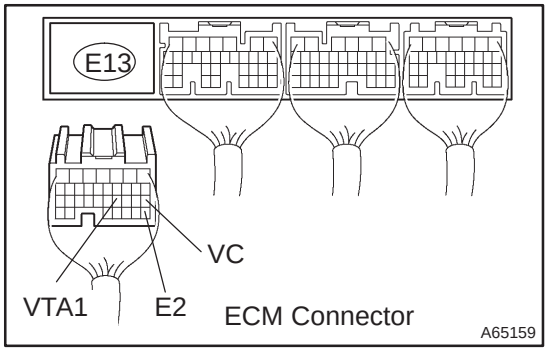
Standard:

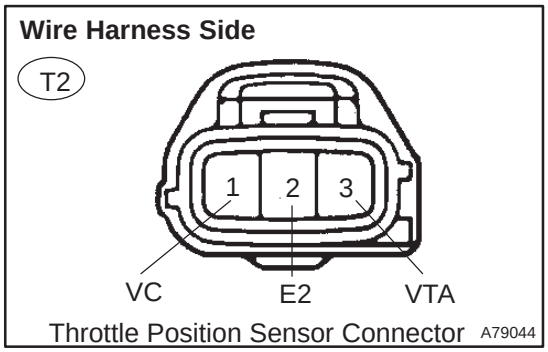
Symbols (Terminal No.)	Throttle Valve	Resistance
VC (T2–1) – E2 (T2–2)	—	2.5 to 5.9 kΩ
VTA (T2–3) – E2 (T2–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG → **REPLACE THROTTLE POSITION SENSOR**

OK

5 CHECK HARNESS AND CONNECTOR(ECM – THROTTLE POSITION SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the throttle position sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (T2–1) – VC (E13–18)	Continuity
VTA (T2–3) – VTA1 (E13–21)	
E2 (T2–2) – E2 (E13–28)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (T2–1) or VC (E13–18) – Body ground	No continuity
VTA (T2–3) or VTA1 (E13–21) – Body ground	

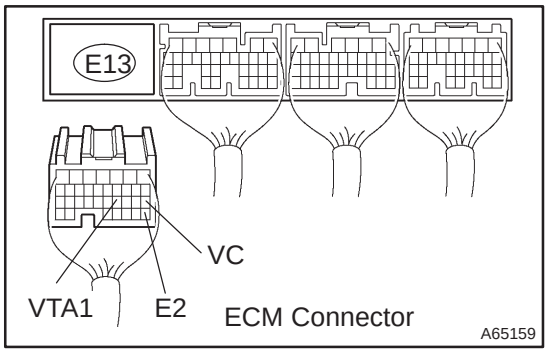
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1 CHECK HARNESS AND CONNECTOR(THROTTLE POSITION SENSOR – ECM)



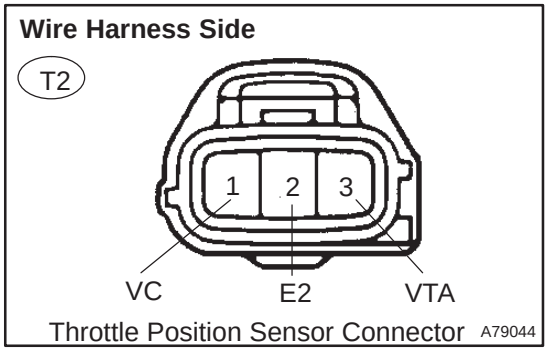
(a) Disconnect the E13 ECM connector.
(b) Disconnect the throttle position sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (T2–1) – VC (E13–18)	Continuity
VTA (T2–3) – VTA1 (E13–21)	
E2 (T2–2) – E2 (E13–28)	

Standard (Check for short):

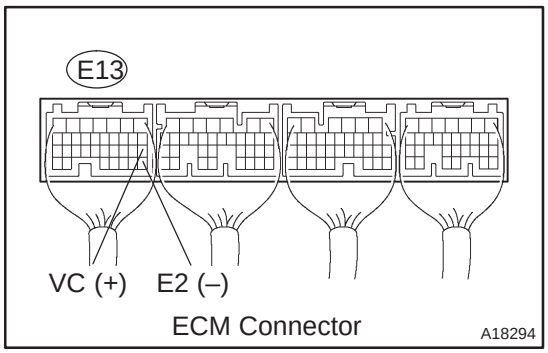
Symbols (Terminal No.)	Specified condition
VC (T2–1) or VC (E13–18) – Body ground	No continuity
VTA (T2–3) or VTA1 (E13–21) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 INSPECT ECM(VC VOLTAGE)



(a) Disconnect the throttle position sensor connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
VC (E13–18) – E2 (E13–28)	4.5 to 5.5 V

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

3 REPLACE THROTTLE BODY ASSY

GO

4	READ OUTPUT DTC(THROTTLE POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (See page 05–149).
(b) Start the engine.
(c) Run the engine at idle for more than 15 seconds.
(d) Read the DTC (See page 05–149).

Result:

Display (DTC output)	Proceed to
”P0120/41, P0122/41 or P0123/41” is output again	A
”P0120/41, P0122/41 or P0123/41” is not output again	B

B → **SYSTEM OK**

A

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0136/27	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

DTC	P0156/29	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 2 SENSOR 2)

CIRCUIT DESCRIPTION

The heated oxygen sensor is the lamination type. Compared to the conventional type, the sensor and heater portions of the lamination type are narrower overall. Because the heat of the heater acts directly on the alumina and zirconia (of the sensor portion) it accelerates the activation of the sensor.

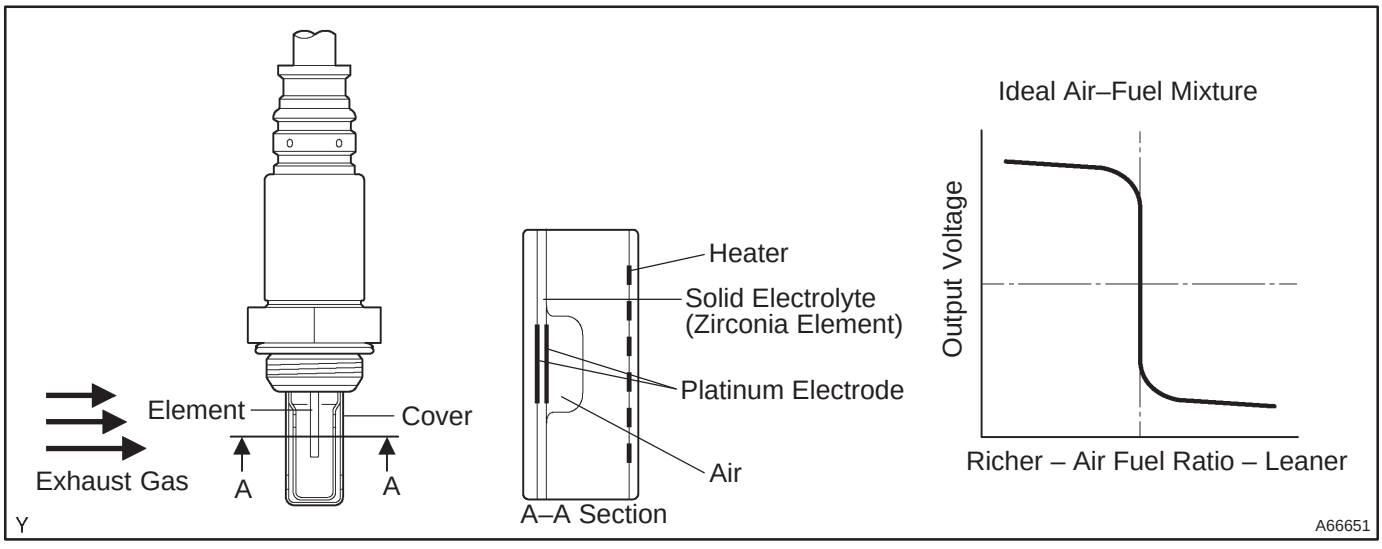
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used. But for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.

The heated oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and provide the ECM with feedback control the air–fuel ratio.

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust gas increases. And the heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i.e. less than 0.45 V).

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio, the oxygen concentration in the exhaust gas is reduced. And the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i.e. more than 0.45 V). The ECM judges by the voltage output from the heated oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if the malfunction of the heated oxygen sensor causes an output of abnormal voltage, the ECM becomes unable to perform accurate air–fuel ratio control.

The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), current flows to the heater in order to heat the sensor for the accurate oxygen concentration detection.

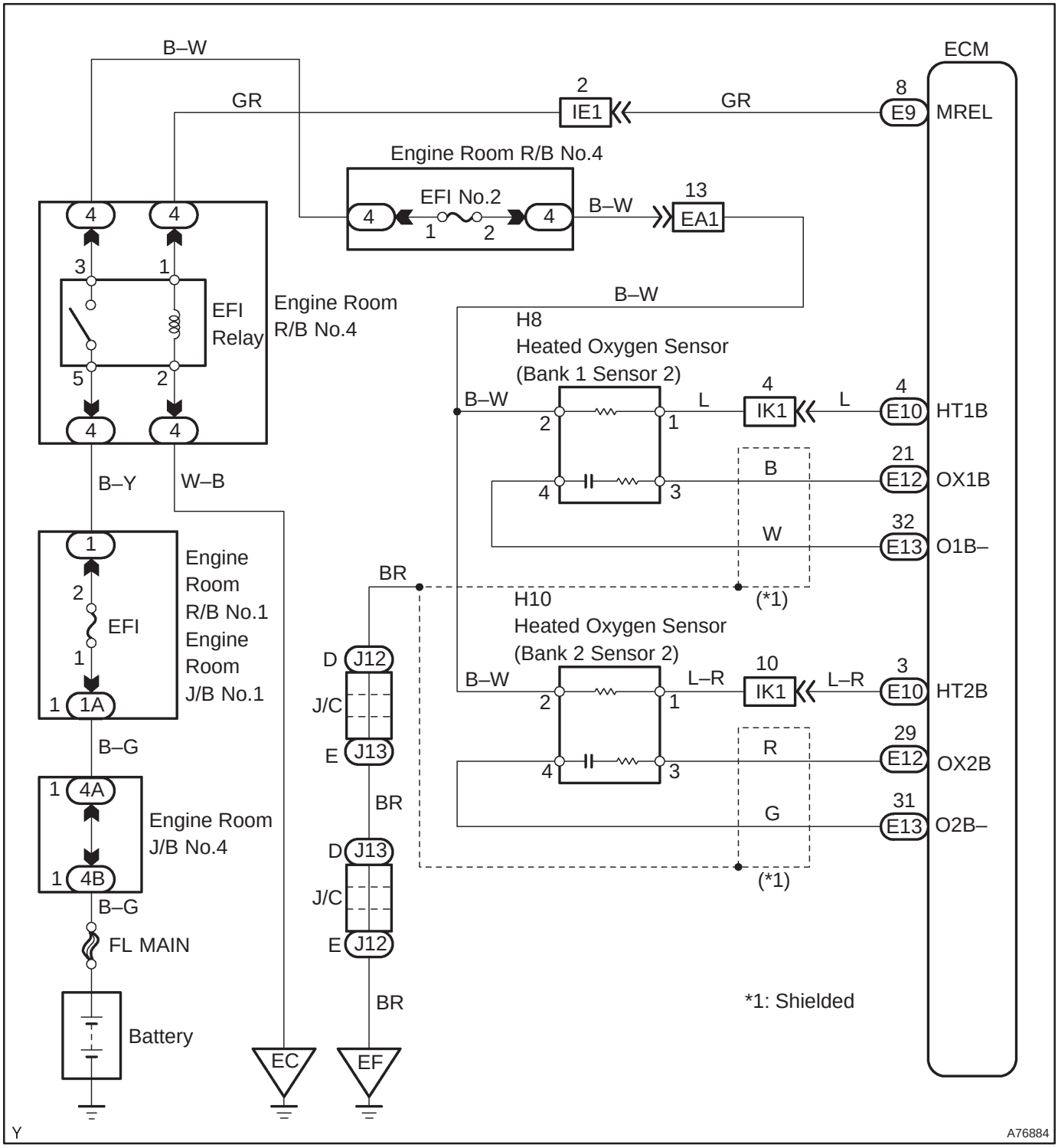


DTC No	DTC Detection Condition	Trouble Area
P0136/27 P0156/29	The following condition continues for 480 sec. or more: • During driving with the engine warmed up, voltage output of the heated oxygen sensor remains at 0.45 V or more, or 0.60 V or less.	• Open or short in heated oxygen sensor (bank 1, 2 sensor 2) circuit • Heated oxygen sensor (bank 1, 2 sensor 2) • Heated oxygen sensor heater (bank 1, 2 sensor 2) • EFI relay

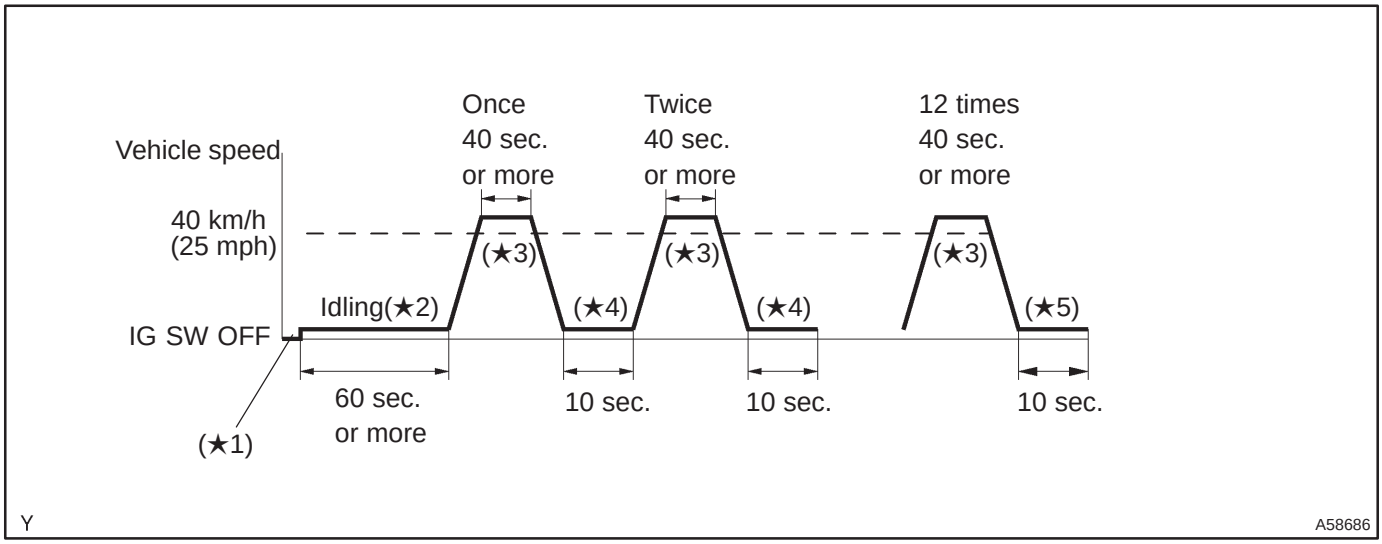
HINT:

- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that does not include cylinder No.1.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



1. **Connect the hand–held tester to the DLC3. (★1)**
2. **Switch the hand–held tester from the normal mode to the check mode (See page 05–149). (★1)**
3. **Start the engine and let the engine idle for 60 seconds or more. (★2)**
4. **Drive the vehicle at 40 km/h (25 mph) or more for 40 seconds or more. (★3)**
5. **Let the engine idle for 10 seconds or more. (★4)**
6. **Perform steps 4 to 5 12 times. (★5)**

HINT:

If a malfunction exists, the CHK ENG will be illuminated on the multi–information display during step 6.

NOTICE:

If the conditions in this test are not strictly followed, detection of the malfunction will be impossible. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from 3 to 6, then perform steps from 3 to 6 again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (A/F sensor, heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

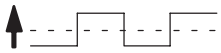
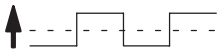
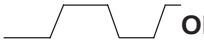
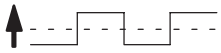
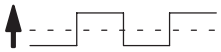
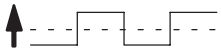
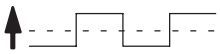
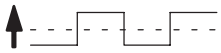
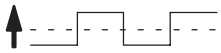
”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately. 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: Less than 3.0 V
–12.5 % → lean output: More than 3.35 V
Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:
There is a few second delay in the A/F sensor output, and there is about 20 seconds delay in the heated oxygen sensor output.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 3.35 V Less than 3.0 V **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	A/F sensor (A/F sensor, heater, A/F sensor circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 3.35 V Less than 3.0V **OK**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following procedure of A/F CONTROL enables the technician to check and graph the voltage outputs of both the A/F sensor and heated oxygen sensor.
For displaying the graph indication, enter ”ACTIVE TEST/ A/F CONTROL/USER DATA”, then select ”AFS B1S1 and O2S B1S2” or ”AFS B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand−held tester Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ OUTPUT DTC(BESIDES DTC P0136/27)

(a) Read the DTC.
Result:

Display (DTC output)	Proceed to
Only ”P0136/27” is output	A
”P0136/27” and other DTCs are output	B

HINT:
If any other codes besides ”P0136/27” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–161)**

A

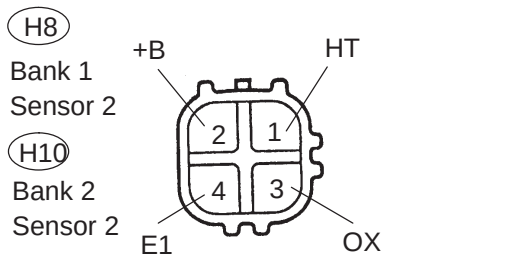
2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.
(b) Read the output voltage of the heated oxygen sensor when the engine rpm is suddenly increased.
HINT:
Quickly accelerate the engine to 4,000 rpm 3 times by using the accelerator pedal.
Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0.5 V or more.

OK → **Go to step 6**

NG

3	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



Heated Oxygen Sensor Connector
A79117

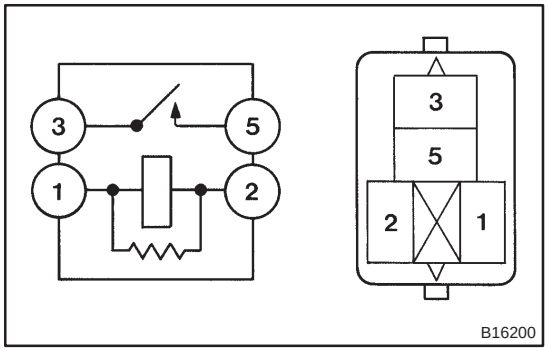
(a) Disconnect the heated oxygen sensor connector.
(b) Inspect the heated oxygen sensor.
Standard:

Symbols (Terminal No.)	Condition	Specified condition
HT (H8–1) – +B (H8–2)	20°C (68°F)	11 to 16 Ω
HT (H8–1) – E1 (H8–4)	—	No Continuity
HT (H10–1) – +B (H10–2)	20°C (68°F)	11 to 16 Ω
HT (H10–1) – E1 (H10–4)	—	No Continuity

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No.4.
(b) Inspect the EFI relay.

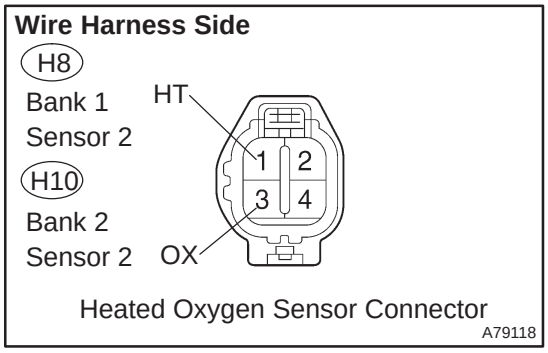
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

5 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)



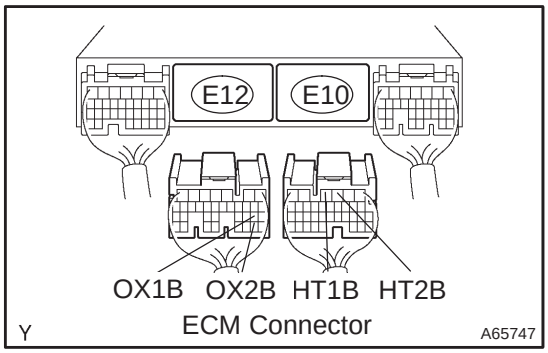
(a) Disconnect the H8 or H10 heated oxygen sensor connector.
(b) Disconnect the E10 and E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

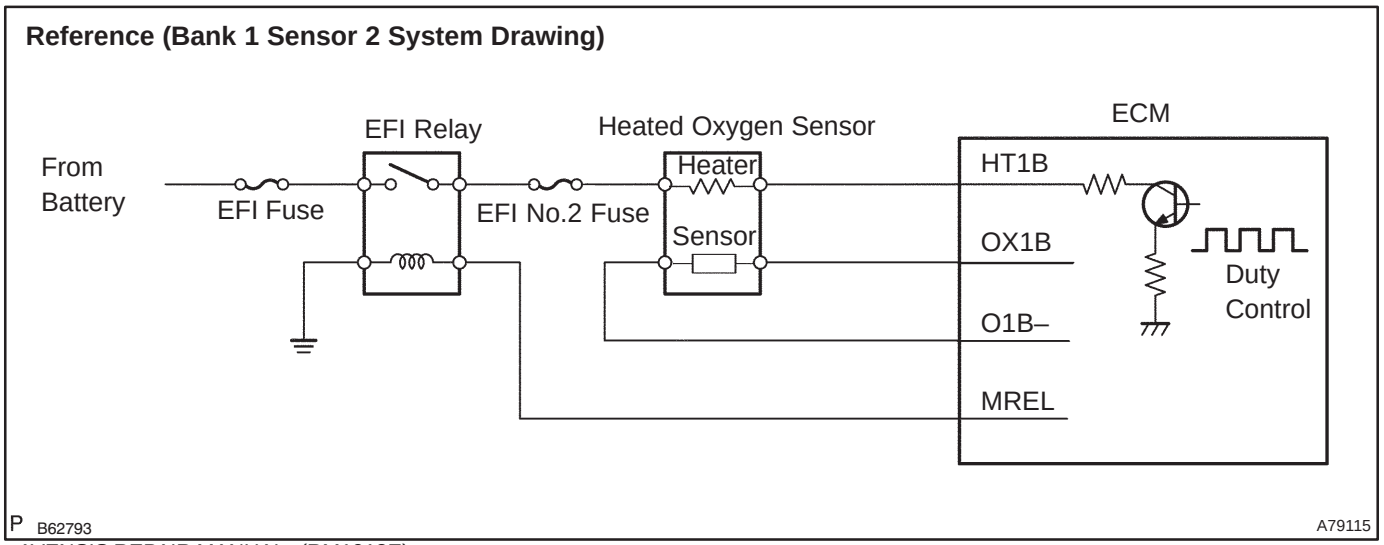
Symbols (Terminal No.)	Specified condition
OX (H8–3) – OX1B (E12–21)	Continuity
HT (H8–1) – HT1B (E10–4)	
OX (H10–3) – OX2B (E12–29)	
HT (H10–1) – HT2B (E10–3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H8–3) or OX1B (E12–21) – Body ground	No continuity
HT (H8–1) or HT1B (E10–4) – Body ground	
OX (H10–3) or OX2B (E12–29) – Body ground	
HT (H10–1) or HT2B (E10–3) – Body ground	



Reference (Bank 1 Sensor 2 System Drawing)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE HEATED OXYGEN SENSOR

6	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to perform the confirmation driving pattern.

GO

7	READ OUTPUT DTC(DTC P0136/27 IS OUTTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0136/27” is not output again	A
”P0136/27” is output again	B

B → REPLACE HEATED OXYGEN SENSOR

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)

DTC	P0141/27	OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

DTC	P0161/29	OXYGEN SENSOR HEATER CIRCUIT (BANK 2 SENSOR 2)

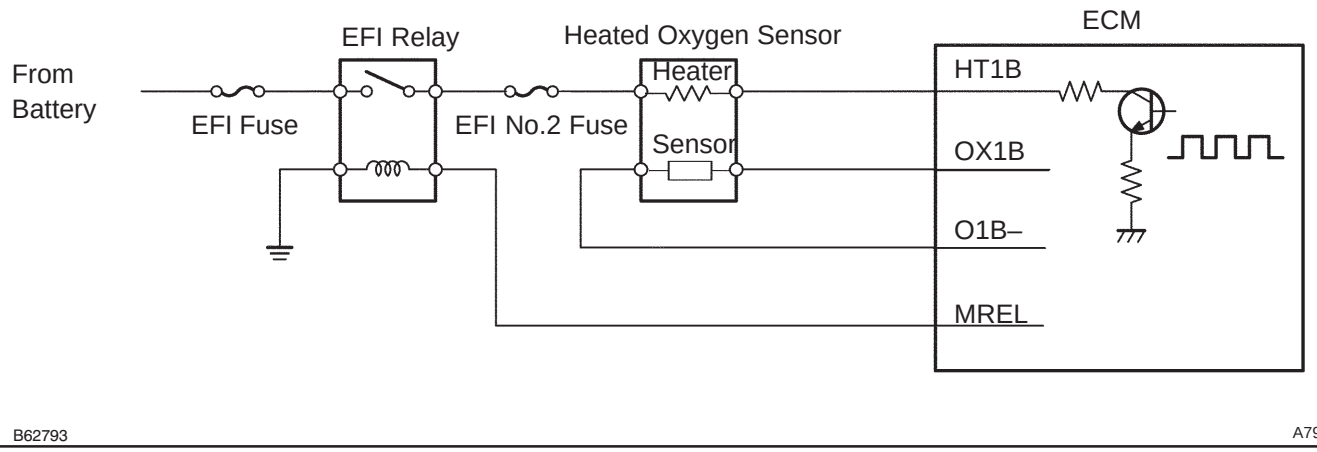
CIRCUIT DESCRIPTION

Refer to DTC P0136/27 on page 05–211.

HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 2 System Drawing)



DTC No.	DTC Detection Condition	Trouble Area
P0141/27 P0161/29	Heated current is 0.2 A or less when heater operates (1 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM
	When heater operates, heated current exceeds 2 A (1 trip detection logic)	

HINT:

- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that does not include cylinder No.1.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

WIRING DIAGRAM

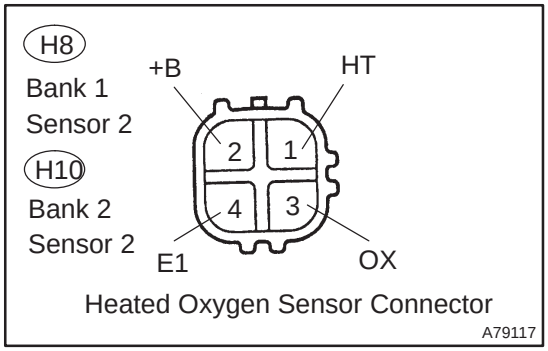
Refer to DTC P0136/27 on page 05–211.

INSPECTION PROCEDURE

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the heated oxygen sensor connector.
(b) Inspect the heated oxygen sensor.

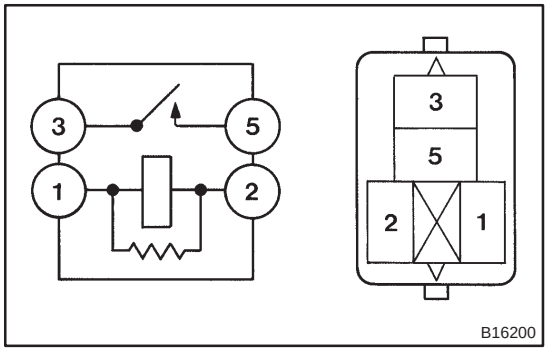
Standard:

Symbols (Terminal No.)	Condition	Specified condition
HT (H8–1) – +B (H8–2)	20°C (68°F)	11 to 16 Ω
HT (H8–1) – E1 (H8–4)	—	No Continuity
HT (H10–1) – +B (H10–2)	20°C (68°F)	11 to 16 Ω
HT (H10–1) – E1 (H10–4)	—	No Continuity

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

2 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.
(b) Inspect the EFI relay.

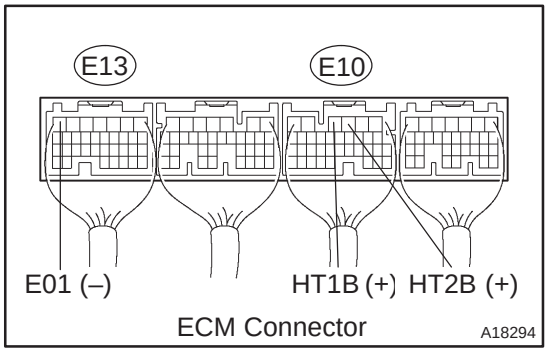
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

3 INSPECT ECM(HT1B OR HT2B VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the applicable terminals of the E10 and E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
HT1B (E10–4) – E01 (E13–7)	9 to 14 V
HT2B (E10–3) – E01 (E13–7)	

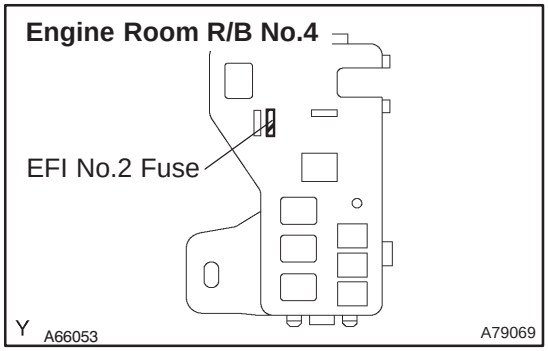
HINT:

- The HT1B means the heated oxygen sensor bank 1 sensor 2.
- The HT2B means the heated oxygen sensor bank 2 sensor 2.

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

4	CHECK FUSE(EFI No.2)



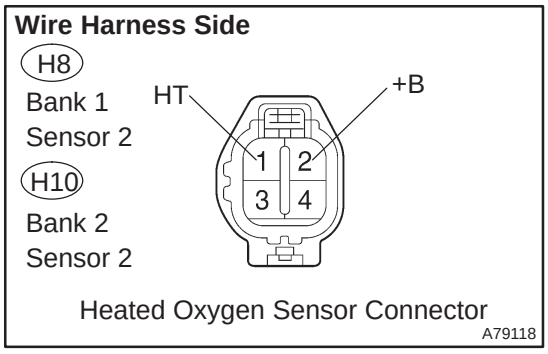
(a) Remove the EFI No.2 fuse from the engine room R/B No.4.

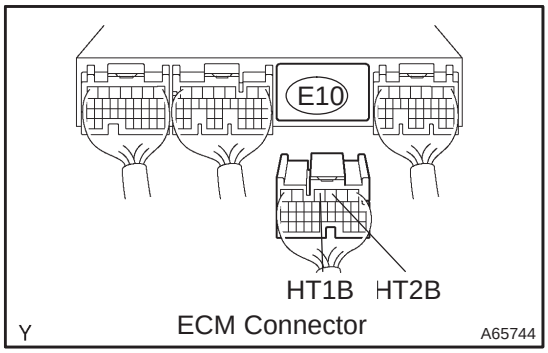
(b) Check for continuity in the EFI No.4 fuse.
Standard: Continuity

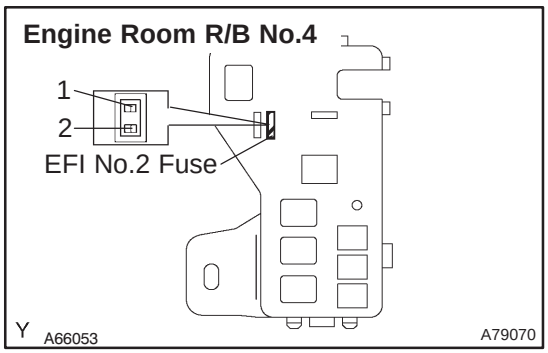
NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

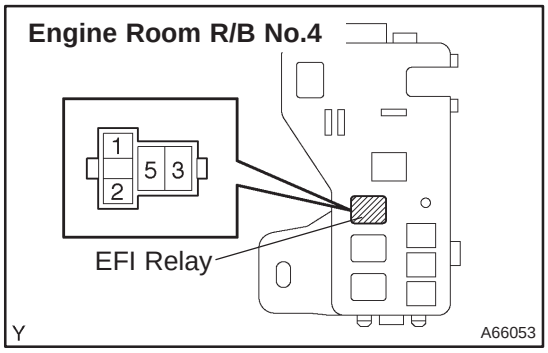
OK

5 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM, HEATED OXYGEN SENSOR – EFI RELAY)









(a) Check the harness and connector between the ECM and heated oxygen sensor connectors.

(1) Disconnect the H8 or H10 heated oxygen sensor connector.

(2) Disconnect the E10 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
HT (H8–1) – HT1B (E10–4)	Continuity
HT (H10–1) – HT2B (E10–3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
HT (H8–1) or HT1B (E10–4) – Body ground	No continuity
HT (H10–1) or HT2B (E10–3) – Body ground	

(b) Check the harness and connector between the heated oxygen sensor connector and EFI relay.

(1) Disconnect the H8 or H10 heated oxygen sensor connector.

(2) Remove the EFI No.2 fuse from the engine room R/B No.4.

(3) Remove the EFI relay from the engine room R/B No.4.

(4) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (H8–2) – EFI No.2 fuse (2)	Continuity
+B (H10–2) – EFI No.2 fuse (2)	
EFI No.2 fuse (1) – EFI relay (3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (H8–2) or EFI No.2 fuse (2) – Body ground	No continuity
+B (H10–2) or EFI No.2 fuse (2) – Body ground	
EFI No.2 fuse (1) or EFI relay (3) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0325/52	KNOCK SENSOR 1 CIRCUIT (BANK 1 OR SINGLE SENSOR)

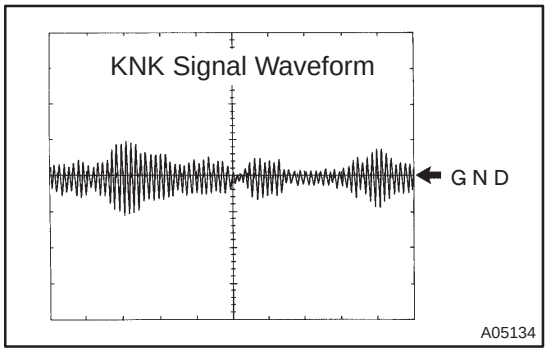
DTC	P0327/52	KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

DTC	P0328/52	KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

A flat type knock sensor (non–resonant type) has the structure that can detect the vibration in a wider band of frequency from about 6 kHz to 15 kHz and has the following features.
Knock sensors are fitted on the cylinder block to detect the engine knocking.
Sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is retarded to suppress it.

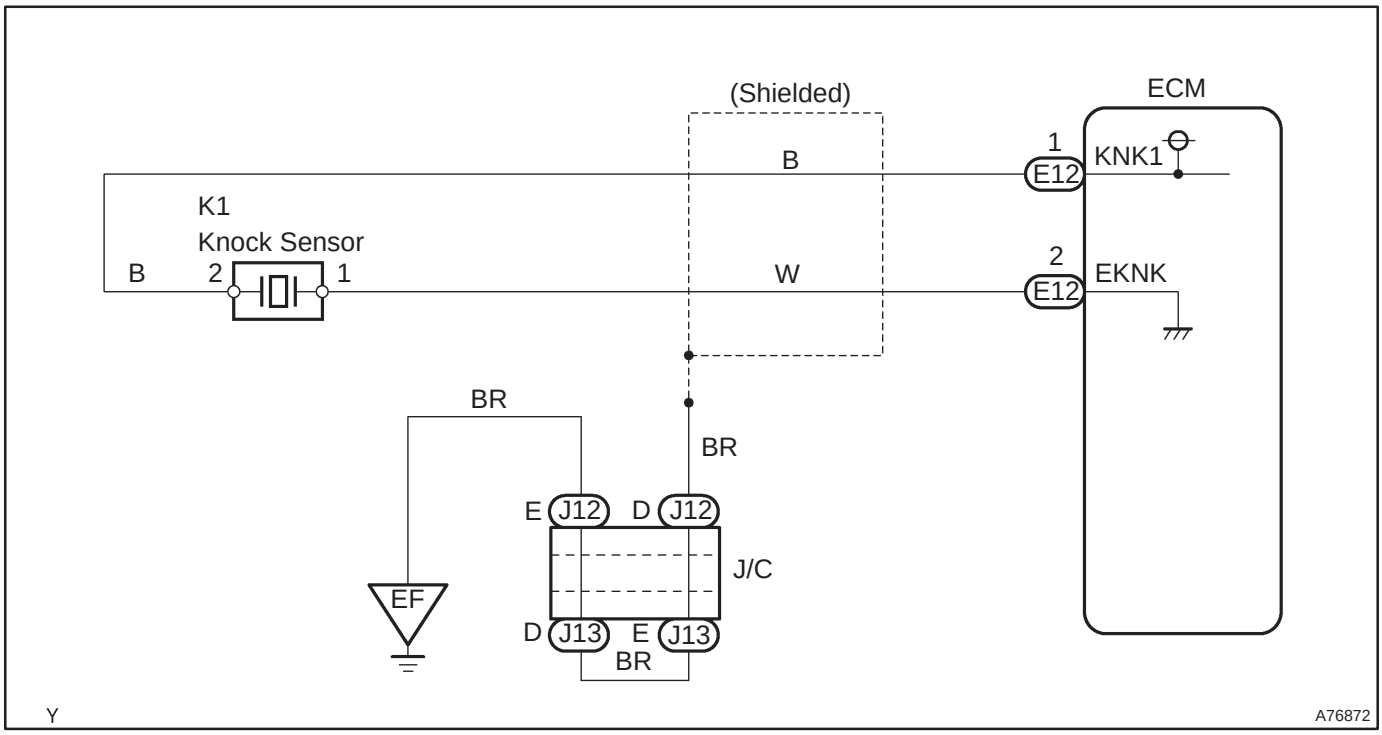
DTC No.	DTC Detection Condition	Trouble Area
P0325/52	Output voltage of the knock sensor 1 decreases beyond a threshold. (Threshold varies according to an engine speed.)	• Knock sensor 1 • Knock sensor 1 (under–torqued or loose) • ECM
P0327/52	Output voltage the knock sensor 1 is 0.5 V or less.	• Short in knock sensor 1 circuit • Knock sensor 1 • ECM
P0328/52	Output voltage the knock sensor 1 is 4.5 V or more.	• Open in knock sensor 1 circuit • Knock sensor 1 • ECM



Reference:
The correct waveform is as shown.

Item	Contents
Terminal	KNK1 – EKNK
Equipment Set	0.01 to 10 V/ DIV, 0.01 to 10 msec./ DIV
Condition	After warming up the engine, keep the engine speed 4,000 rpm.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ OUTPUT DTC

(a) Clear the DTC (See page 05–149).
(b) Warm up the engine.
(c) Accelerate the engine to 3,000 rpm for 10 seconds or more.
(d) Read the DTC (See page 05–149).

Result :

Display (DTC output)	Proceed to
Only "P0325/52" is output again	A
"P0325/52, P0327/52 and/or P0328/52" are output again	B

B → **Go to step 3**

A

2 CHECK KNOCK SENSOR

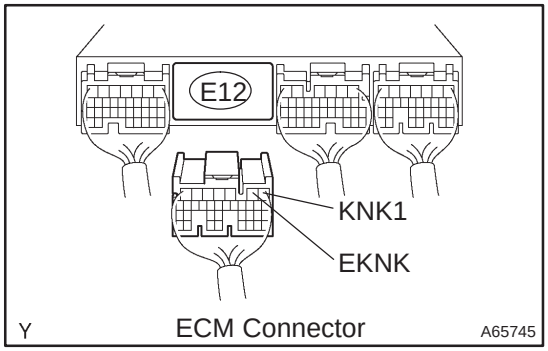
(a) Check the knock sensor installation.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

NG → **TIGHTEN SENSOR**

OK

REPLACE KNOCK SENSOR

3 CHECK HARNESS AND CONNECTOR(ECM – KNOCK SENSOR)



(a) Disconnect the E12 ECM connector.
(b) Disconnect the knock sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
KNK1 (E12–1) – Knock sensor (K1–2)	Continuity
EKNK (E12–2) – Knock sensor (K1–1)	

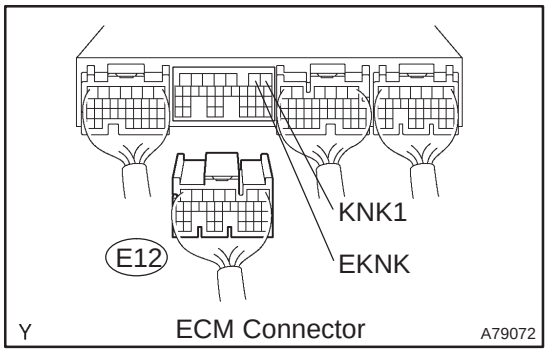
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
KNK1 (E12–1) or Knock sensor (K1–2) – Body ground	No continuity
EKNK (E12–2) or Knock sensor (K1–1) – Body ground	

NG → **Go to step 5**

OK

4 INSPECT ECM(KNK1 VOLTAGE)



(a) Disconnect the E12 ECM connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E12 ECM side terminals.

Standard:

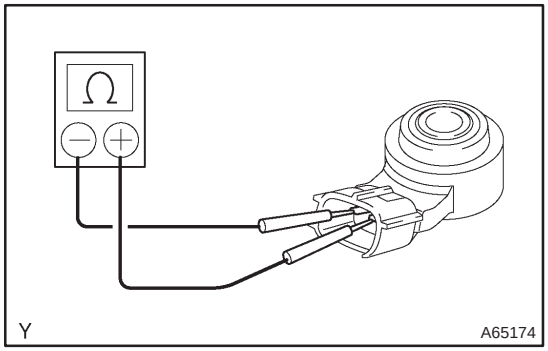
Symbols (Terminal No.)	Specified condition
KNK1 (E12–1) – EKNK (E12–2)	4.5 to 5.5 V

NG → **REPLACE ECM**

OK

CHECK AND REPLACE ECM (See page 01–32)

5 INSPECT KNOCK SENSOR



(a) Remove knock sensor.
(b) Measure the resistance between the terminals.
Standard:

Symbols (Terminal No.)	Condition	Specified condition
FKN+ (1) – FKN– (2)	20 °C (68 °F)	120 to 280 Ω

NG → **REPLACE KNOCK SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC	P0335/12	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT

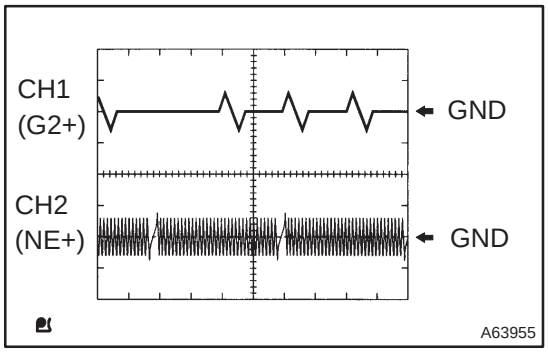
DTC	P0335/13	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT

DTC	P0339/13	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT INTERMITTENT

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a magnet, iron core and pickup coil.
The NE signal plate (crankshaft position sensor plate) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signal, and the cylinder and the angle of the VVT based on the combination of the G and NE signal.

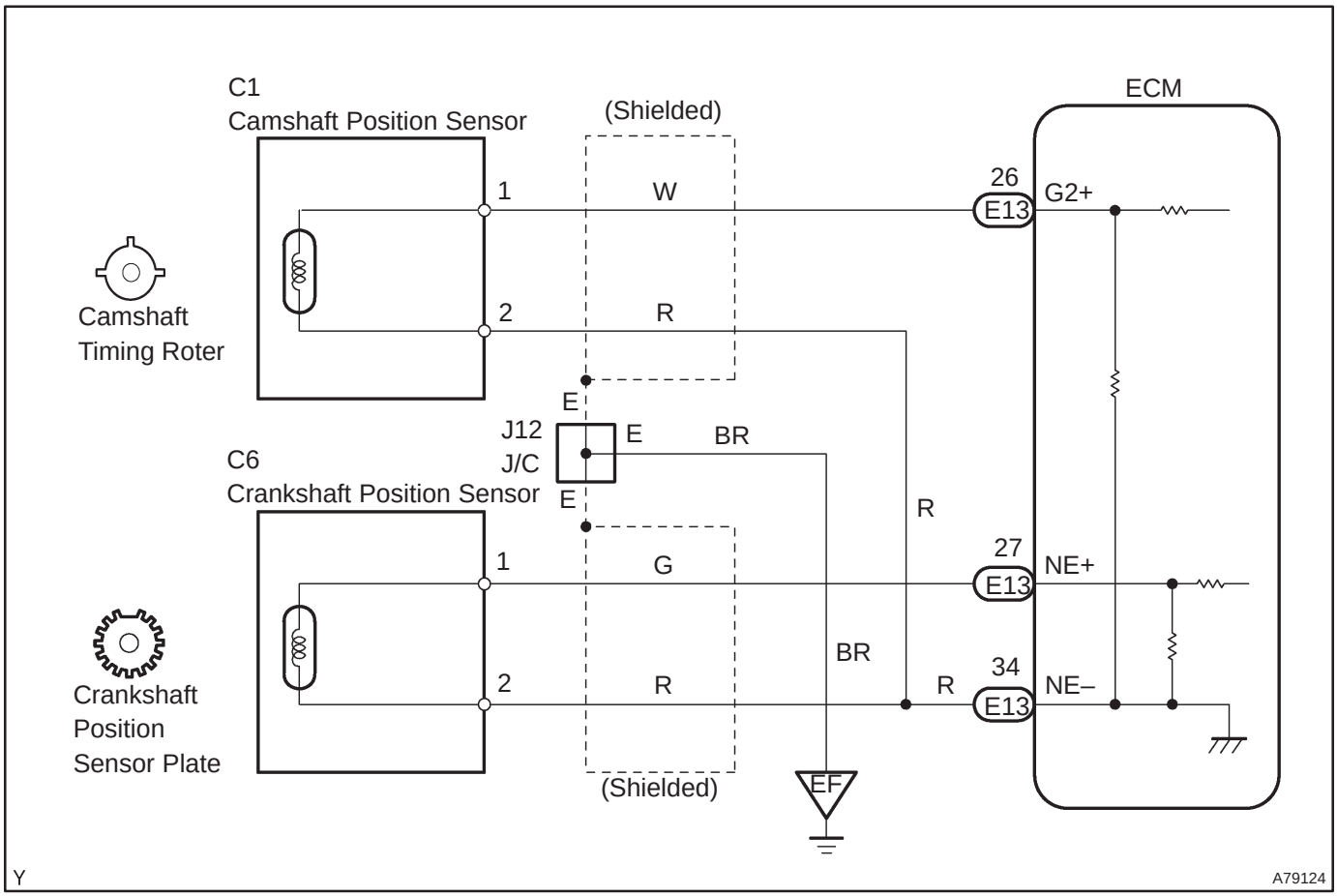
DTC No.	DTC Detection Condition	Trouble Area
P0335/12	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft) • ECM
P0335/13	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (1 trip detection logic)	
P0339/13	In condition (a), (b) and (c), when no crankshaft position sensor (NE) signal is input for 0.05 sec. or more. (a) Engine revolution 1,000 rpm or more (b) STA signal is OFF (c) 3 sec. or more has lapsed after STA signal is switched from ON to OFF.	



Reference: Inspection using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G2+ – NE– CH2: NE+ – NE–
Equipment Set	5V/DIV, 20ms/DIV
Condition	During cranking or idling

WIRING DIAGRAM

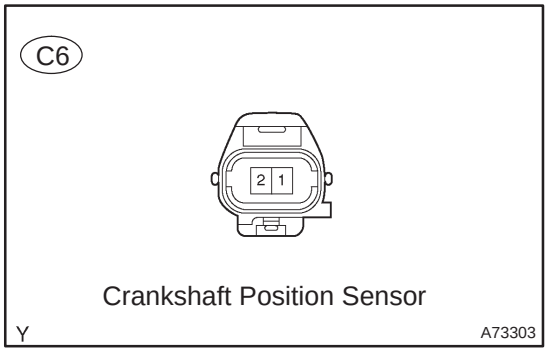


INSPECTION PROCEDURE

HINT:

- Perform troubleshooting of DTC P0335/12, 13 first. If no trouble is found, troubleshoot the engine mechanical systems.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT CRANKSHAFT POSITION SENSOR(RESISTANCE)



(a) Measure the resistance between the terminals of the crankshaft posision sensor connector.

Resistance:

985 to 1,600 Ω at cold

1,265 to 1,890 Ω at hot

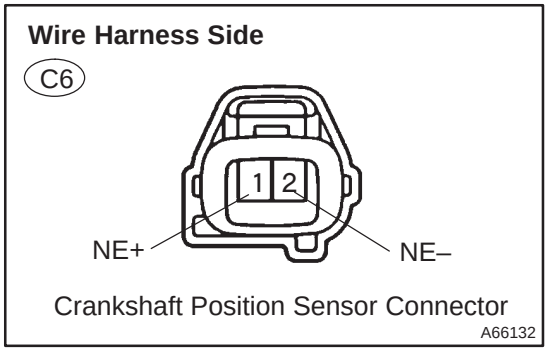
NOTICE:

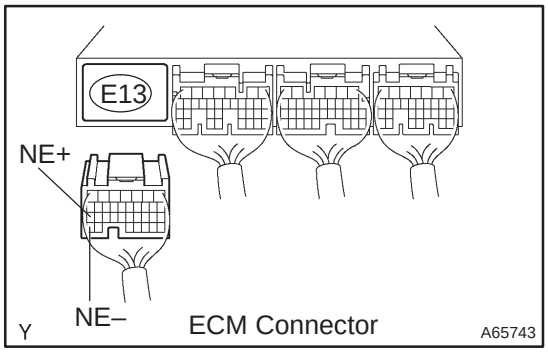
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50 °C (122 °F) and "Hot" is from 50 °C (122 °F) to 100 °C (212 °F).

NG → **REPLACE CRANKSHAFT POSITION SENSOR**

OK

2	CHECK HARNESS AND CONNECTOR(CRANKSHAFT POSITION SENSOR – ECM)





(a) Disconnect the crankshaft position sensor connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
NE+ (C6–1) – NE+ (E13–27)	Continuity
NE– (C6–2) – NE– (E13–34)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
NE+ (C6–1) or NE+ (E13–27) – Body ground	No continuity
NE– (C6–2) or NE– (E13–34) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)

(a) Check the crankshaft position sensor installation .

NG → **TIGHTEN SENSOR**

OK

4	CHECK CRANKSHAFT POSITION SENSOR PLATE(TEETH OF SENSOR PLATE(CRANKSHAFT))

(a) Check the teeth of the sensor plate.

NG → **REPLACE CRANKSHAFT POSITION SENSOR PLATE (CRANKSHAFT)**

OK

CHECK AND REPLACE ECM (See page 01–32)

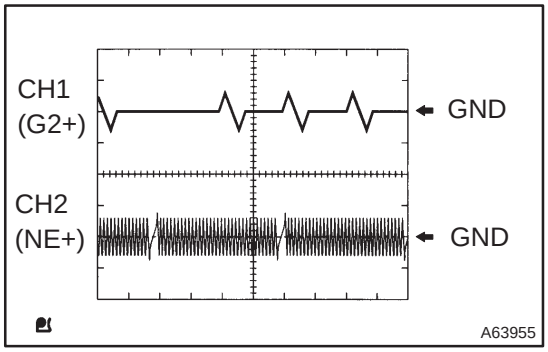
DTC	P0340/12	CAMSHAFT POSITION SENSOR ”A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0341/12	CAMSHAFT POSITION SENSOR ”A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

The camshaft position sensor (G signal) consists of a magnet, iron core and pickup coil.
The G signal rotor has 3 teeth on its outer circumference and is installed on the intake camshaft.
When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil changes, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate (crankshaft position sensor plate) has 34 teeth and is installed to the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signals, and the cylinder and the angle of the VVT based on the combination of the G and NE signals.

DTC No.	DTC Detection Condition	Trouble Area
P0340/12	• No camshaft position sensor signal to ECM during cranking (1 trip detection logic) • No camshaft position sensor signal to ECM with engine speed 600 rpm or more (1 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has jumped a tooth • ECM
P0341/12	While crankshaft rotates twice, camshaft position sensor signal is input to ECM 12 times or more (1 trip detection logic)	



Reference: Inspection using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G2+ – NE– CH2: NE+ – NE–
Equipment Set	5V/DIV, 20ms/DIV
Condition	During cranking or idling

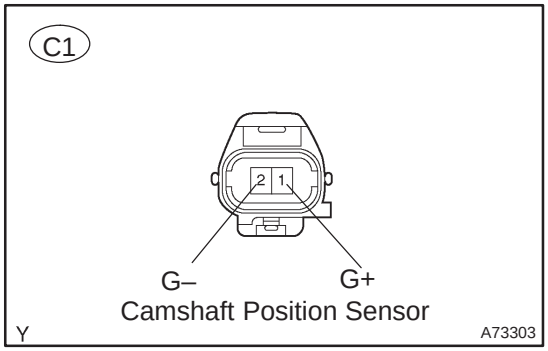
WIRING DIAGRAM

Refer to DTC P0335/12, 13 and P0339/13 on page 05–226.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT CAMSHAFT POSITION SENSOR



(a) Measure the resistance between the terminals of camshaft posision sensor connector.

Resistance:

835 to 1,400 Ω (Cold)

1,060 to 1,645 Ω (Hot)

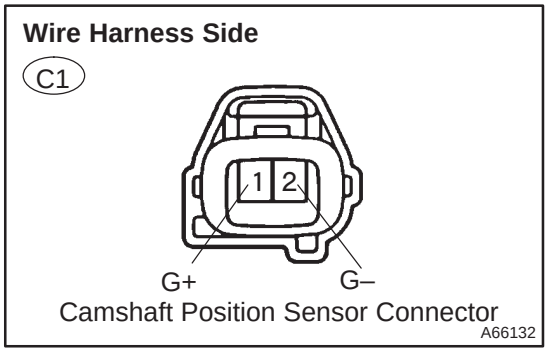
NOTICE:

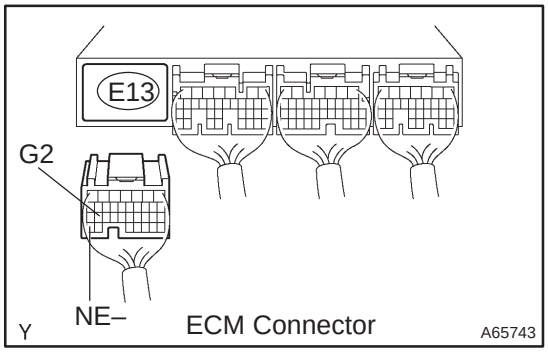
"Cold" and "Hot" mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **REPLACE CAMSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(ECM – CAMSHAFT POSITION SENSOR)





(a) Disconnect the camshaft position sensor connector.

(b) Disconnect the E13 ECM connector.

(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
G+ (C1–1) – G2 (E13–26)	Continuity
G– (C1–2) – NE– (E13–34)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
G+ (C1–1) or G2+ (E13–26) – Body ground	No continuity
G– (C1–2) or NE– (E13–34) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CAMSHAFT POSITION SENSOR)

(a) Check the camshaft position sensor installation.

NG → **TIGHTEN SENSOR**

OK

4	INSPECT CAMSHAFT

(a) Check the teeth of the signal plate.

NG → REPLACE CAMSHAFT

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0351/14	IGNITION COIL ”A” PRIMARY/SECONDARY CIRCUIT

DTC	P0352/15	IGNITION COIL ”B” PRIMARY/SECONDARY CIRCUIT

DTC	P0353/14	IGNITION COIL ”C” PRIMARY/SECONDARY CIRCUIT

DTC	P0354/15	IGNITION COIL ”D” PRIMARY/SECONDARY CIRCUIT

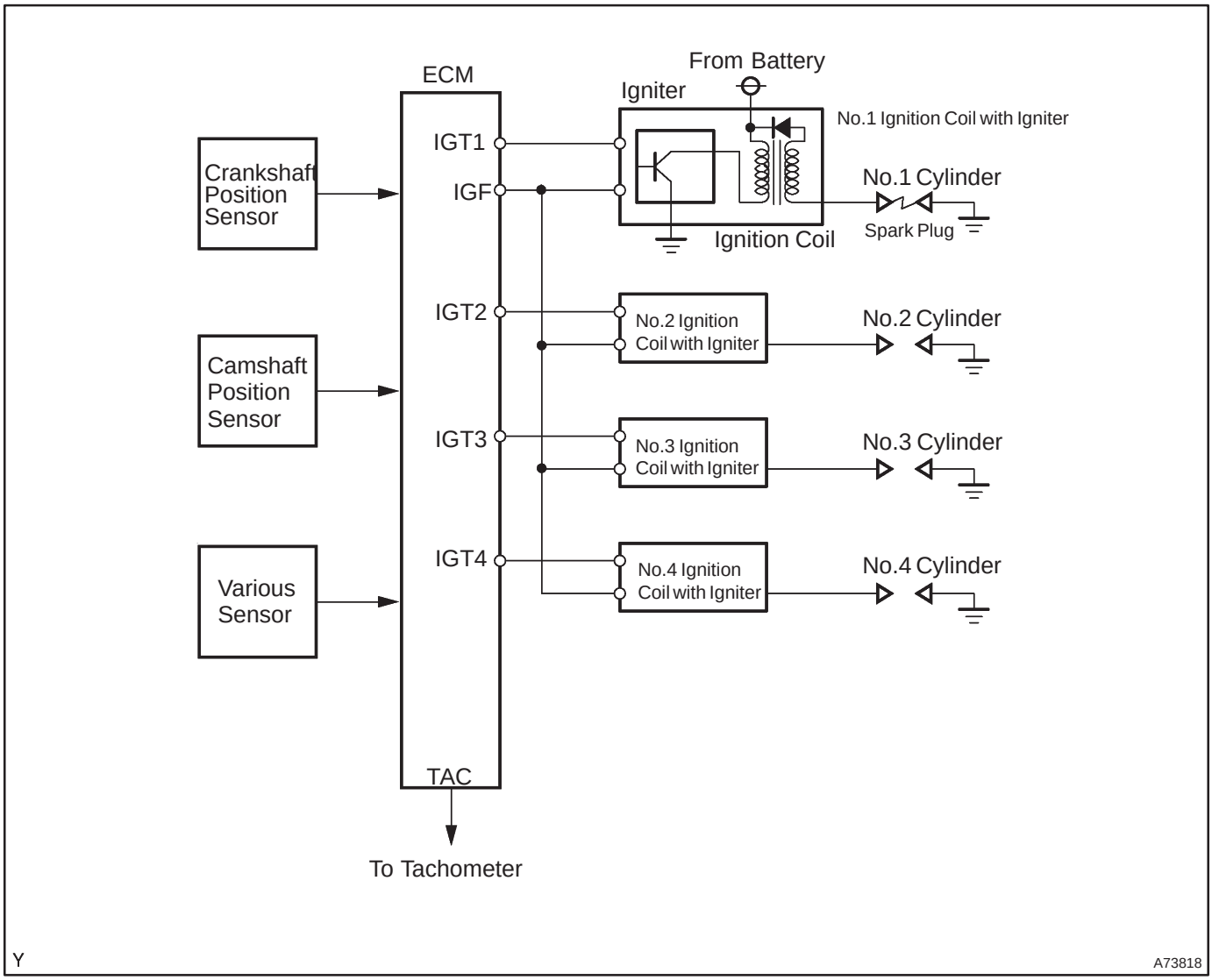
CIRCUIT DESCRIPTION

HINT:

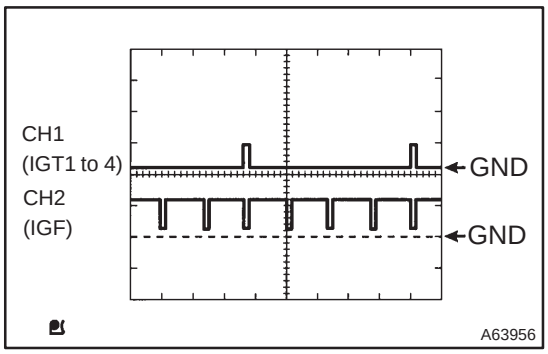
- These DTCs indicate a malfunction related to primary circuit.
- If DTC P0351/14 is displayed, check No.1 ignition coil with igniter circuit.
- If DTC P0352/15 is displayed, check No.2 ignition coil with igniter circuit.
- If DTC P0353/14 is displayed, check No.3 ignition coil with igniter circuit.
- If DTC P0354/15 is displayed, check No.4 ignition coil with igniter circuit.

A Direct Ignition System (DIS) has been adopted. The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.

The ECM determines the ignition timing and outputs the ignition (IGT) signals for each cylinder. Based on the IGT signals, the power transistors in the igniter cut off the current to the primary coil in the ignition coil is supplied to the spark plug that is connected to the end of the secondary coil. At the same time, the igniter also sends an ignition confirmation (IGF) signal as a fail–safe measure to the ECM.

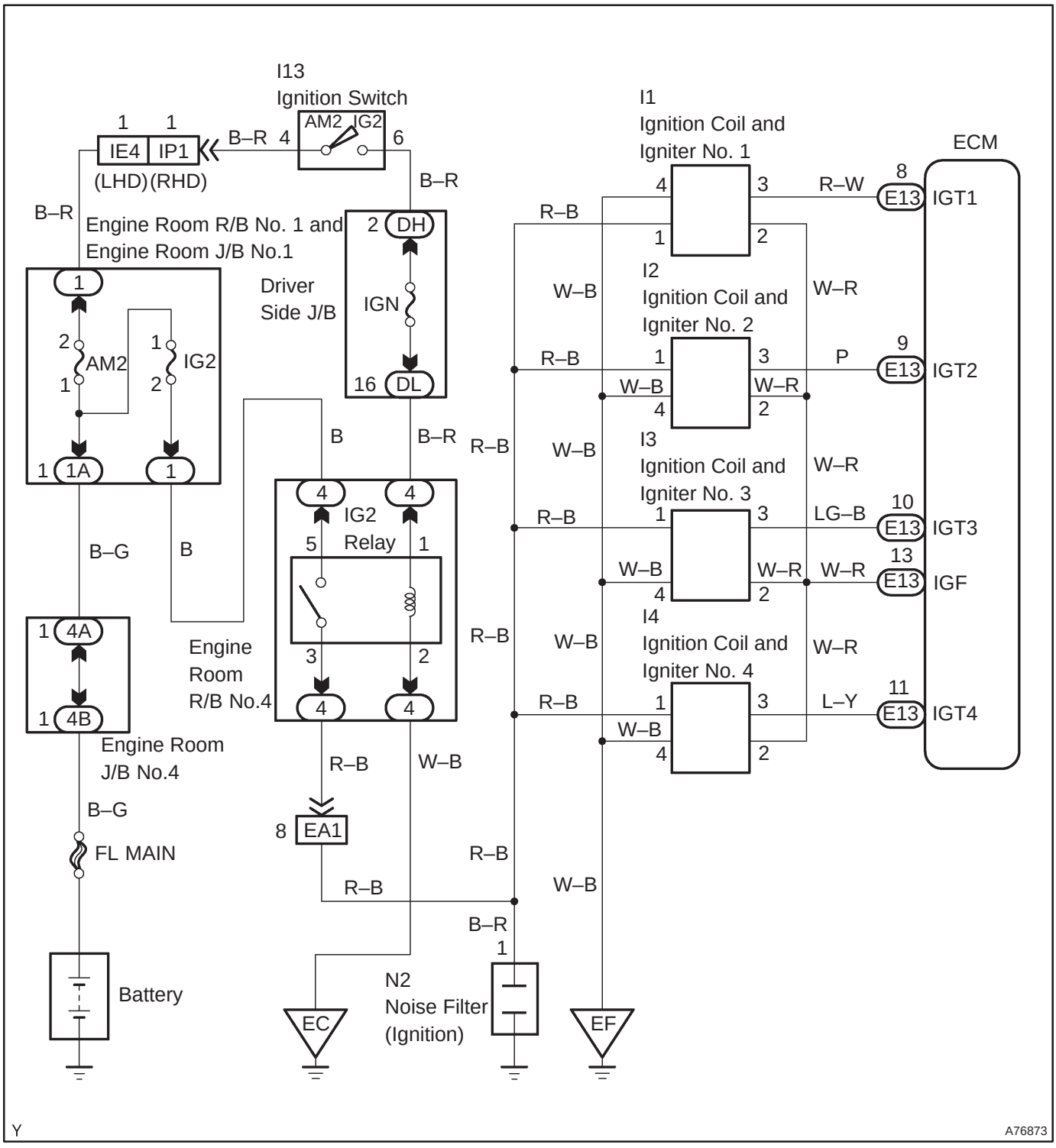


DTC No.	DTC Detection Condition	Trouble Area
P0351/14 P0352/15 P0353/14 P0354/15	No IGF signal to ECM while engine is running	• Ignition system • Open or short in IGF and IGT1 to 4 circuit from ignition coil with igniter to ECM • No. 1 to 4 ignition coil with igniter • IG2 relay • ECM



Reference: Inspection using the oscilloscope.
During cranking or idling, check the waveform between terminals IGT1 to IGT4 and E1, and IGF and E1 of the E4 and ECM connectors.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

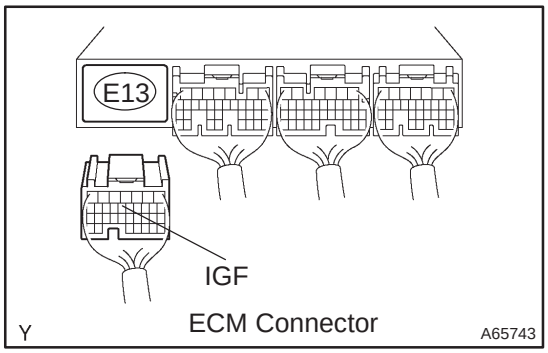
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

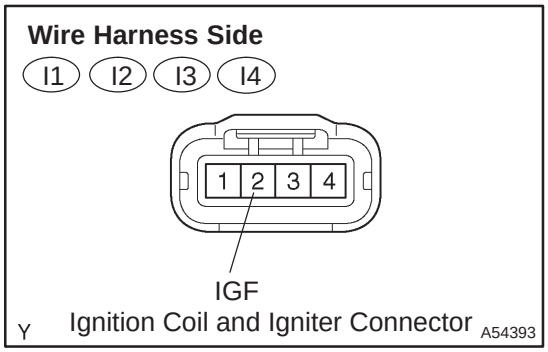
1	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER

NG → Go to step 4

OK

2	CHECK HARNESS AND CONNECTOR(ECM – IGNITION COIL)





(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IGF (I1–2) – IGF (E13–13)	Continuity
IGF (I2–2) – IGF (E13–13)	
IGF (I3–2) – IGF (E13–13)	
IGF (I4–2) – IGF (E13–13)	

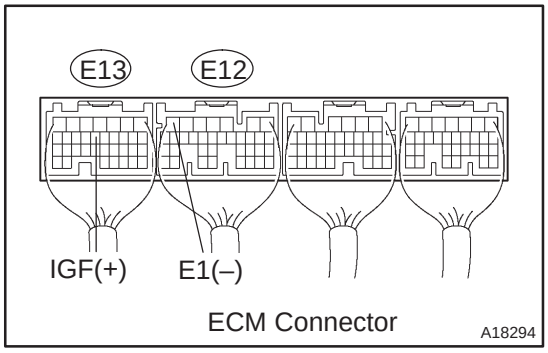
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IGF (I1–2) or IGF (E13–13) – Body ground	No continuity
IGF (I2–2) or IGF (E13–13) – Body ground	
IGF (I3–2) or IGF (E13–13) – Body ground	
IGF (I4–2) or IGF (E13–13) – Body ground	

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	INSPECT ECM



(a) Disconnect the ignition coil and igniter connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E12 and E13 ECM connector.

Standard:

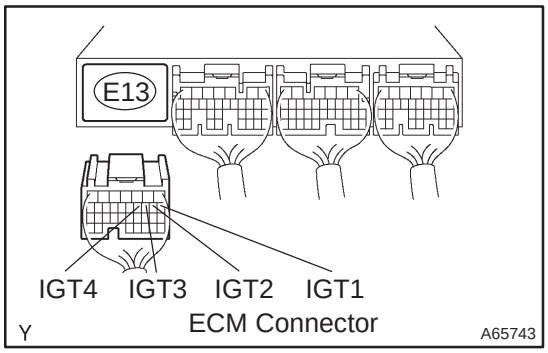
Symbols (Terminal No.)	Specified condition
IGF (E13–13) – E1 (E12–7)	4.5 to 5.5 V

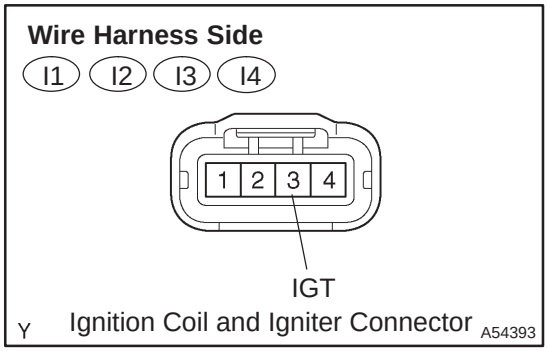
NG → CHECK AND REPLACE ECM (See page 01–32)

OK

REPLACE IGNITION COIL ASSY

4 CHECK HARNESS AND CONNECTOR(ECM (IGT TERMINAL) – IGNITION COIL)





(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IGT (I1–3) – IGT1 (E13–8)	Continuity
IGT (I2–3) – IGT2 (E13–9)	
IGT (I3–3) – IGT3 (E13–10)	
IGT (I4–3) – IGT4 (E13–11)	

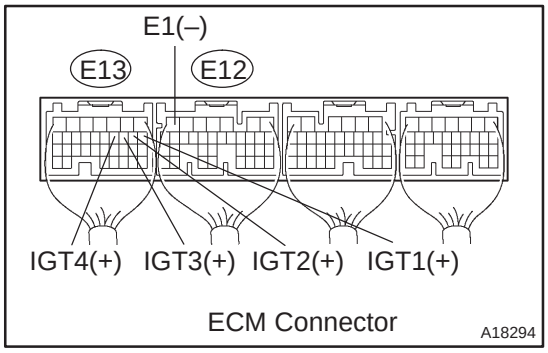
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IGT (I1–3) or IGT1 (E13–8) – Body ground	No continuity
IGT (I2–3) or IGT2 (E13–9) – Body ground	
IGT (I3–3) or IGT3 (E13–10) – Body ground	
IGT (I4–3) or IGT4 (E13–11) – Body ground	

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

5 INSPECT ECM(IGT1, IGT2, IGT3 AND IGT4 VOLTAGE)



(a) Measure the voltage between the terminals of the E12 and E13 ECM connectors when the engine is cranked.

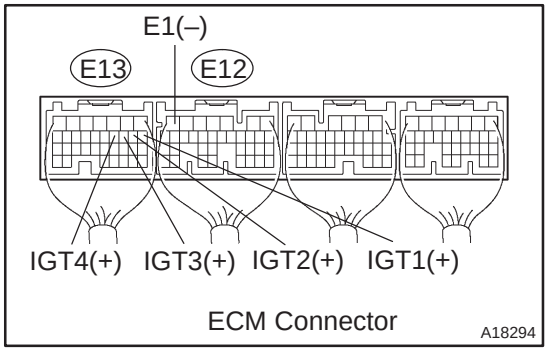
Standard:

Symbols (Terminal No.)	Specified condition
IGT1 (E13–8) – E1 (E12–7)	Between 0.1 V and 4.5 V
IGT2 (E13–9) – E1 (E12–7)	
IGT3 (E13–10) – E1 (E12–7)	
IGT4 (E13–11) – E1 (E12–7)	

NG → CHECK AND REPLACE ECM (See page 01–32)

OK

6 INSPECT ECM(IGT1, IGT2, IGT3 AND IGT4 VOLTAGE)



(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.

(b) Measure the voltage between the terminals of the E12 and E13 ECM connectors when the engine is cranked.

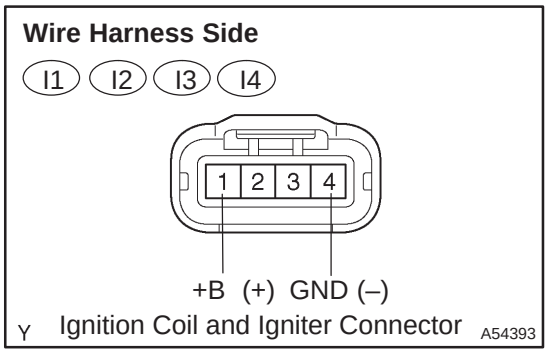
Standard:

Symbols (Terminal No.)	Specified condition
IGT1 (E13–8) – E1 (E12–7)	4.5 V or more
IGT2 (E13–9) – E1 (E12–7)	
IGT3 (E13–10) – E1 (E12–7)	
IGT4 (E13–11) – E1 (E12–7)	

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

7 INSPECT IGNITION COIL ASSY(POWER SOUSE CIRCUIT)



(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.

(b) Turn the ignition switch ON position.

(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

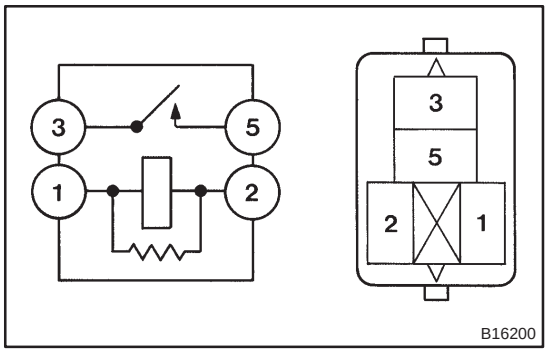
Standard:

Symbols (Terminal No.)	Specified condition
+B (I1–1) – GND (I1–4)	9 to 14 V
+B (I2–1) – GND (I2–4)	
+B (I3–1) – GND (I3–4)	
+B (I4–1) – GND (I4–4)	

OK → **REPLACE IGNITION COIL ASSY**

NG

8 INSPECT IG2 RELAY



(a) Remove the IG2 relay from the engine room R/B No.4.

(b) Inspect the IG2 relay.

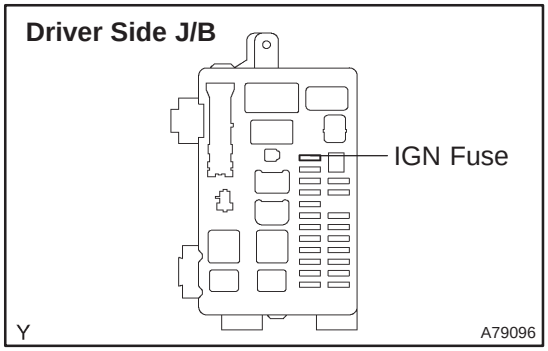
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE IG2 RELAY**

OK

9 CHECK FUSE(IGN)

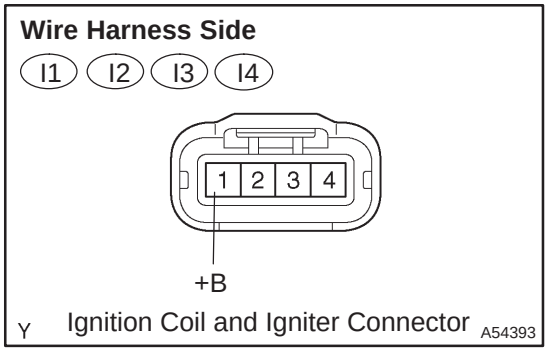


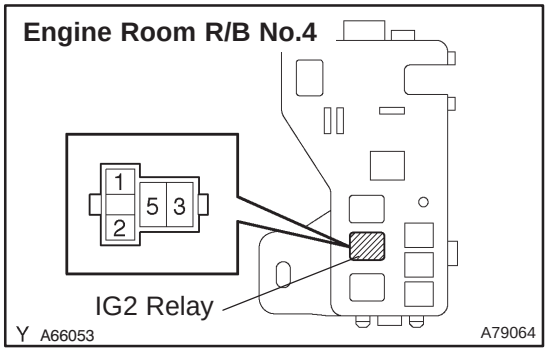
(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

10 CHECK HARNESS AND CONNECTOR(IG2 RELAY – IGNITION COIL AND IGNITER)





(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.
(b) Remove the IG2 relay from the engine room R/B No.4.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (I1–1) – IG2 relay (3)	Continuity
+B (I2–1) – IG2 relay (3)	
+B (I3–1) – IG2 relay (3)	
+B (I4–1) – IG2 relay (3)	

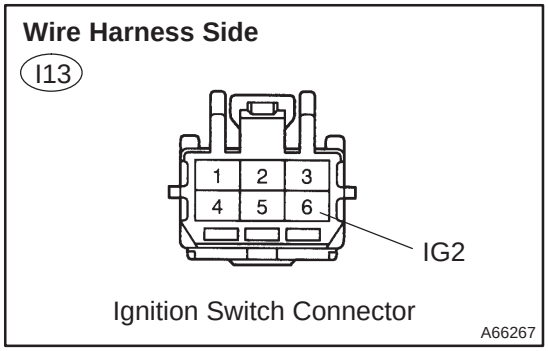
Standard (Check for short):

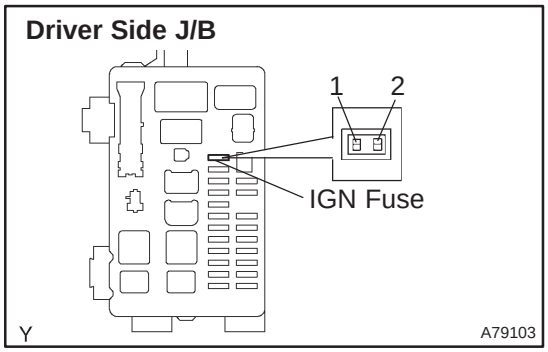
Symbols (Terminal No.)	Specified condition
+B (I1–1) or IG2 relay (3) – Body ground	No continuity
+B (I2–1) or IG2 relay (3) – Body ground	
+B (I3–1) or IG2 relay (3) – Body ground	
+B (I4–1) or IG2 relay (3) – Body ground	

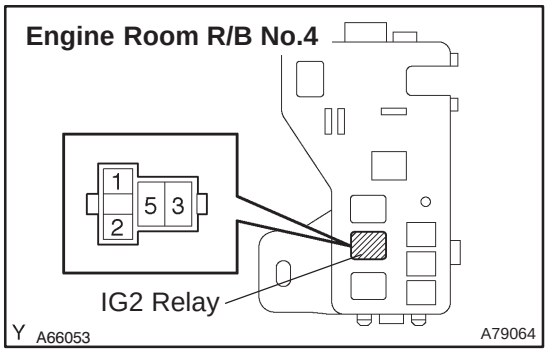
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

11 CHECK HARNESS AND CONNECTOR(IGNITION SWITCH – IG2 RELAY)







(a) Disconnect the battery negative (–) terminal.
(b) Disconnect the ignition switch connector.
(c) Remove the IGN fuse from the driver side J/B.
(d) Remove the IG2 relay from the engine room R/B No.4.
(e) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) – IGN fuse (1)	Continuity
IGN fuse (2) – IG2 relay (1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) or IGN fuse (1) – Body ground	No continuity
IGN fuse (2) or IG2 relay (1) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

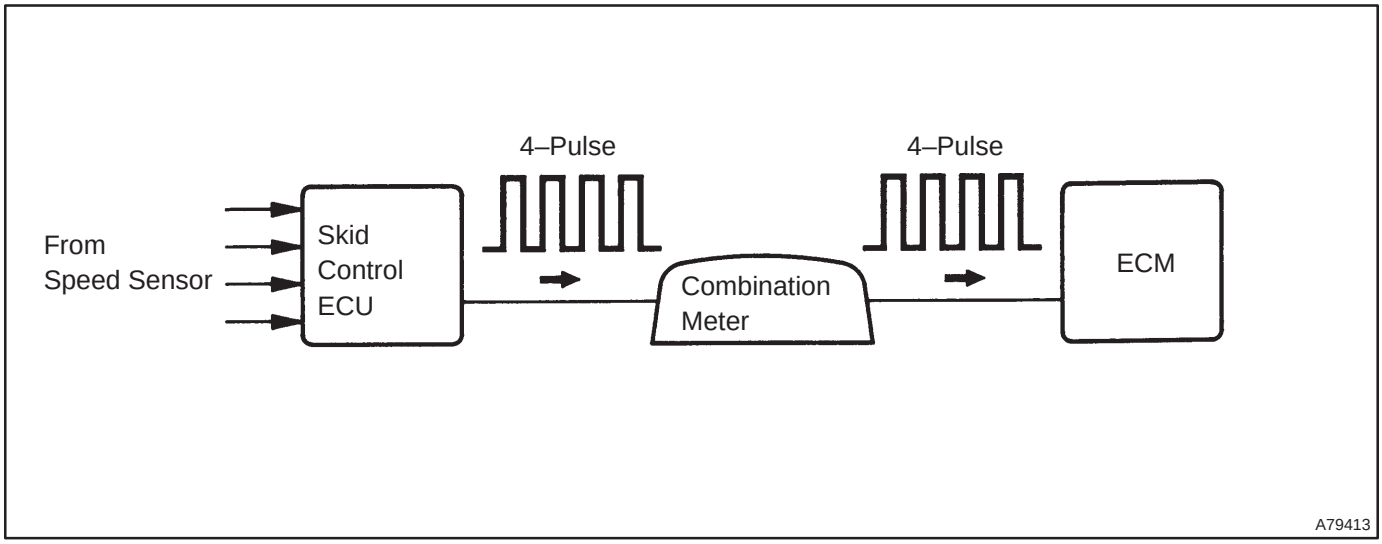
CHECK AND REPLACE POWER SOURCE CIRCUIT

DTC	P0500/42	VEHICLE SPEED SENSOR ”A”

CIRCUIT DESCRIPTION

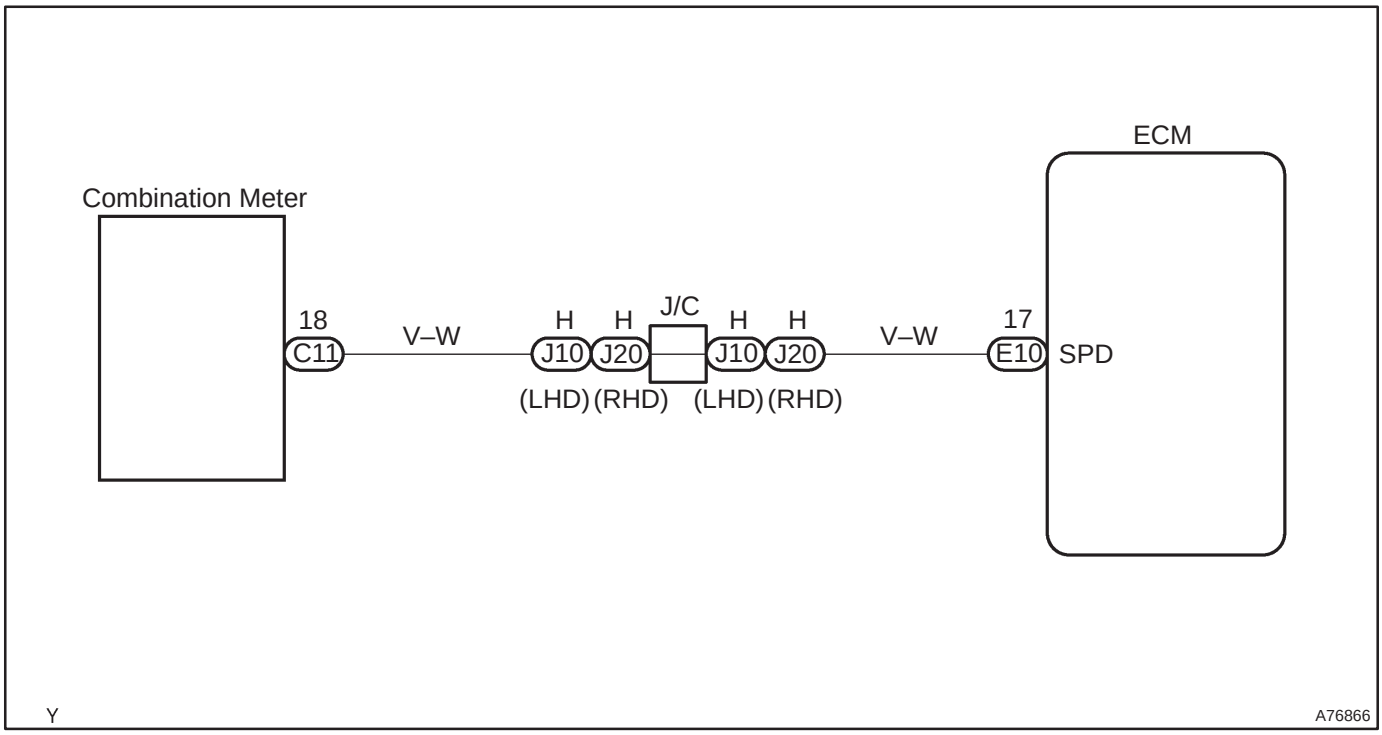
The speed sensor for skid control ECU detects the wheel speed and sends the appropriate signals to the skid control ECU.

The skid control ECU converts these signals into a 4–pulse signal and outputs it to the combination meter. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500/42	During the vehicle is being driven, no vehicle speed sensor signal to the ECM (2 trip detection logic)	• Open or short in speed sensor circuit • Speed sensor • Combination meter • ECM • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OPERATION OF SPEEDOMETER

(a) Drive the vehicle and check that the operation of the speedometer in the combination meter is normal.

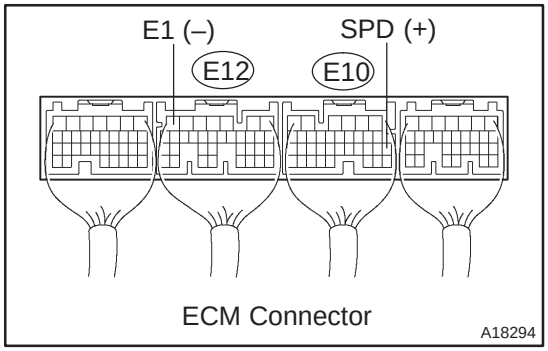
HINT:

The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **CHECK SPEEDOMETER CIRCUIT (See page 05–1500)**

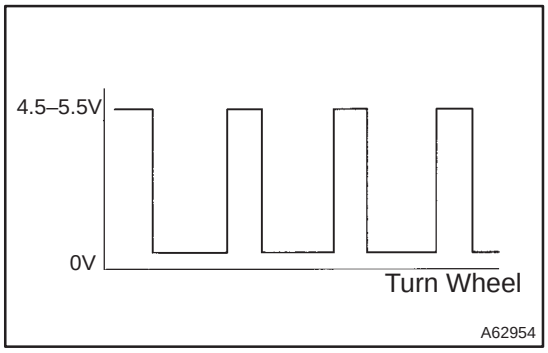
OK

2 INSPECT ECM



(a) Shift the lever to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch ON.
(d) Measure the voltage between the terminals of the E10 and E12 ECM connectors as the wheel is turned slowly.
Standard:

Symbols (Terminal No.)	Specified condition
SPD (E10–17) – E1 (E12–7)	Generated intermittently



HINT:
The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.

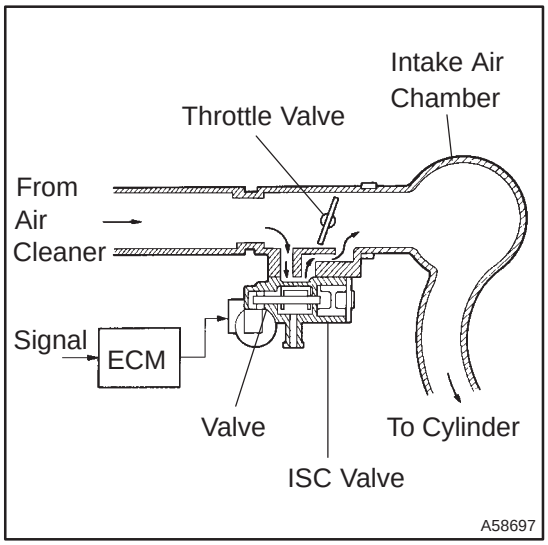
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC P0511/33 IDLE AIR CONTROL CIRCUIT

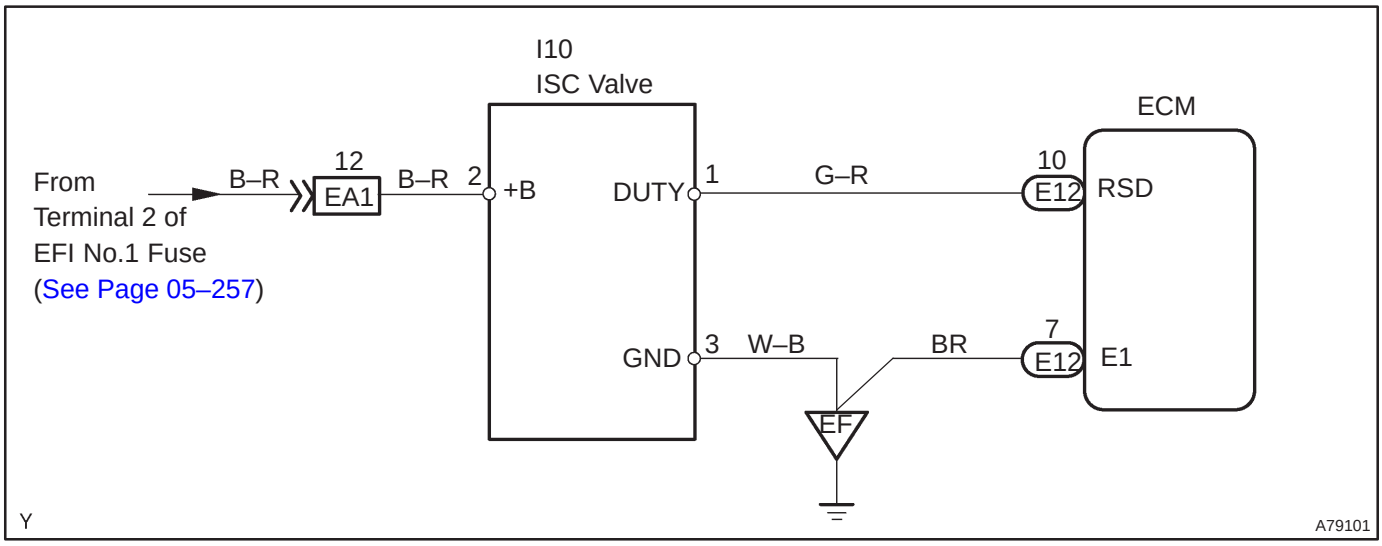
CIRCUIT DESCRIPTION



The rotary solenoid type idle speed control (ISC) valve is located under the throttle body and intake air bypassing the throttle valve is directed to the idle speed control (ISC) valve through the passage.
In this way the intake air volume bypassing the throttle valve is regulated, controls the engine speed.
The ECM operates the idle speed control (ISC) valve only to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detecting Condition	Trouble Area
P0511/33	Idle speed continues to vary greatly from target speed (1 trip detection logic)	• Open or short in idle speed control (ISC) valve circuit • Idle speed control (ISC) valve is stuck or closed • A/C switch circuit • Air induction system • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

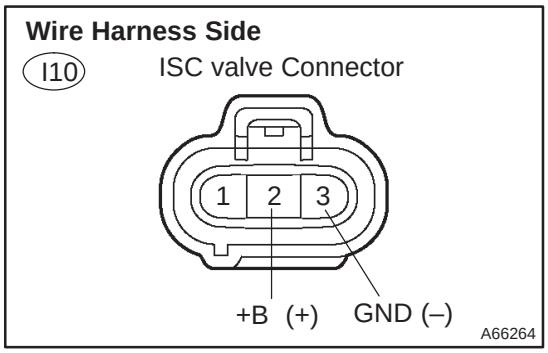
1	PERFORM ACTIVE TEST USING HAND–HELD TESTER(CHECK ISC VALVE OPERATION)

(a) Warm up the engine to the normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the A/C.
(d) Shift the lever to the neutral position.
(e) Connect the hand–held tester to the DLC3 on the vehicle.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / ISC DUTY RATIO”.
(g) Check that the engine RPM varies when changing the ISC duty ratio.
Engine RPM:
Engine RPM fluctuates ups and downs in respose to the ISC duty ratio variation.

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

NG

2	CHECK HARNESS AND CONNECTOR



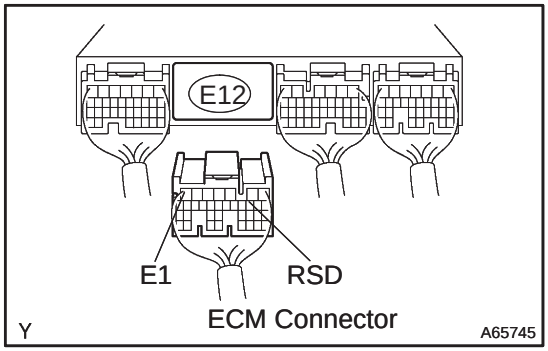
(a) Disconnect the ISC valve connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the ISC valve wire harness side connector.
Standard:

Symbols (Terminal No.)	Specified condition
+B (I10–2) – GND (I10–3)	9 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK HARNESS AND CONNECTOR(RSD CIRCUIT)



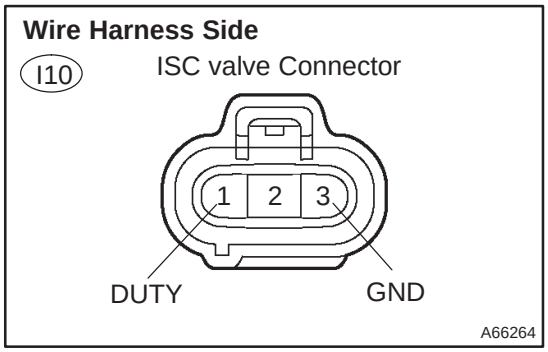
(a) Disconnect the ISC valve connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
DUTY (I10–1) – RSD (E12–10)	Continuity
GND (I10–3) – E1 (E12–7)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
DUTY (I10–1) or RSD (E12–10) – Body groundr	No continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY (See page 10–18)

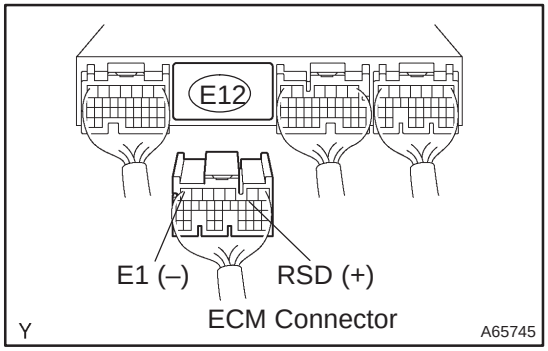
NG → **REPLACE THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY**

OK

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1	INSPECT ECM



(a) Disconnect the E12 ECM connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E4 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
RSD (E12–10) – E1 (E12–7)	9 to 14 V

OK → **Go to step 3**

NG

2	INSPECT THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY (See page 10–18)

NG → REPAIR OR REPLACE THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

3	INSPECT THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY (See page 10–18)

NG → REPAIR OR REPLACE THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY

OK

4	CHECK BLOCKAGE OF ISC VALVE AND PASSAGE TO BYPASS THROTTLE VALVE

NG → REPAIR OR REPLACE THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0606/89	ECM/PCM PROCESSOR

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0606/89	ECM inside error	• ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

CHECK AND REPLACE ECM (See page 01–32)

DTC	P2237/21	OXYGEN SENSOR PUMPING CURRENT CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2238/21	OXYGEN SENSOR PUMPING CURRENT CIRCUIT LOW (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2239/21	OXYGEN SENSOR PUMPING CURRENT CIRCUIT HIGH (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2240/28	OXYGEN SENSOR PUMPING CURRENT CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2241/28	OXYGEN SENSOR PUMPING CURRENT CIRCUIT LOW (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2242/28	OXYGEN SENSOR PUMPING CURRENT CIRCUIT HIGH (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2251/21	OXYGEN SENSOR REFERENCE GROUND CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2252/21	OXYGEN SENSOR REFERENCE GROUND CIRCUIT LOW (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2253/21	OXYGEN SENSOR REFERENCE GROUND CIRCUIT HIGH (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2254/28	OXYGEN SENSOR REFERENCE GROUND CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2255/28	OXYGEN SENSOR REFERENCE GROUND CIRCUIT LOW (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2256/28	OXYGEN SENSOR REFERENCE GROUND CIRCUIT HIGH (FOR A/F SENSOR)(BANK 2 SENSOR 1)

CIRCUIT DESCRIPTION

HINT:

This DTC is recorded when A/F sensor has a malfunction, although the caption is healed oxygen sensor. The air–fuel ratio sensor are the lamination type. Compared to the conventional type, the sensor and heater portions of the lamination type are narrower overall. Because the heat of the heater acts directly on the alumina and zirconia (of the sensor portion) it accelerates the activation of the sensor.

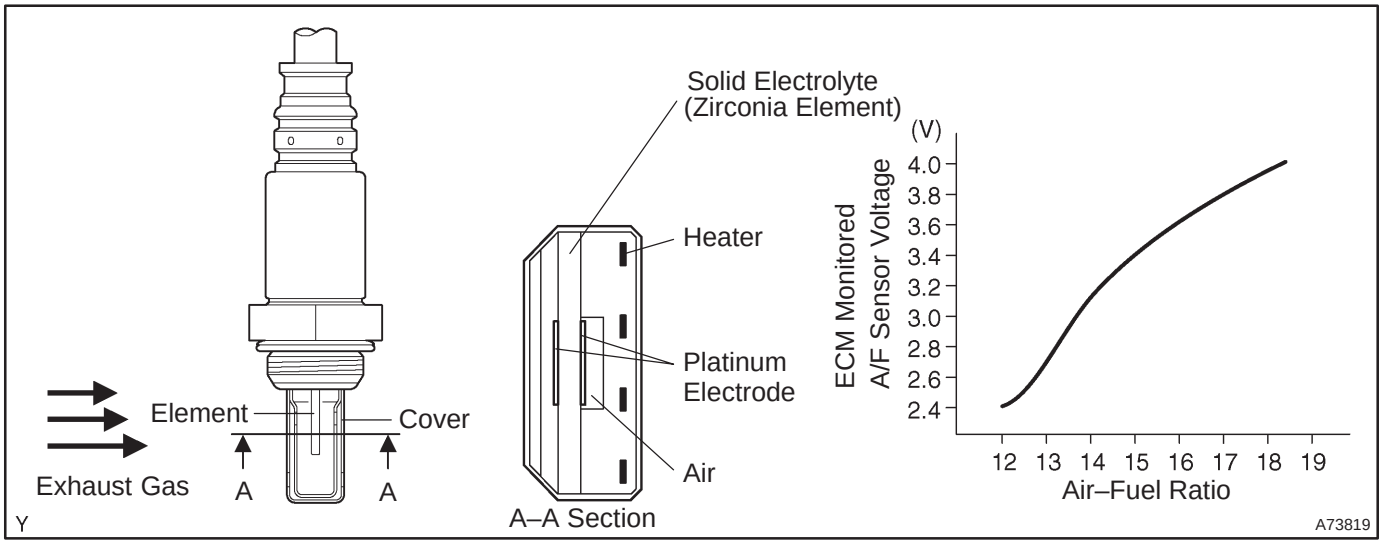
To obtain a high purification rate of the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used. For the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.

The A/F sensor has the characteristic that it provides output voltage* being approximately proportional to the existing air–fuel ratio. The A/F sensor output voltage* is used to provide feedback for the ECM to control the air–fuel ratio.

By the A/F sensor output, the ECM can determine the deviation amount from the stoichiometric air–fuel ratio and control the proper injection time immediately. If the A/F sensor is out of order, ECM is unable to perform the accurate air–fuel ratio control.

The A/F sensor is equipped with a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), the current flows to the heater to heat the sensor for the accurate oxygen concentration detection.

*: The voltage value changes at the inside of the ECM only.

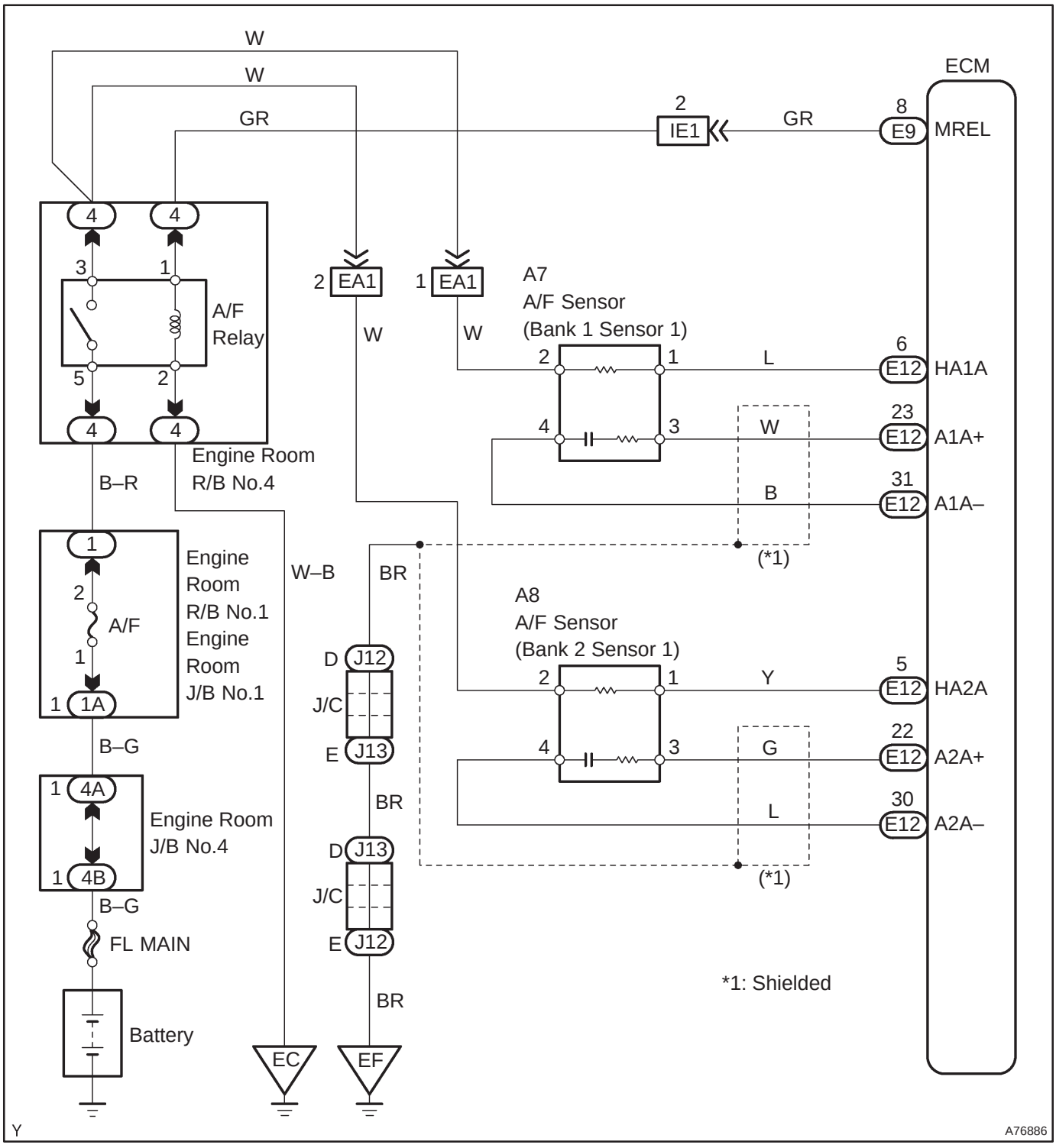


DTC No.	DTC Detecting Condition	Trouble Area
P2237/21 P2240/28	A/F sensor circuit (bank 1 sensor 1)	HINT : Main trouble area • Open or short in A/F sensor circuit
	Conditions (a) and (b) continue for 5.0 sec. or more : (a) AF+ less than 0.5 V (b) AF+ greater than 4.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • A/F sensor heater relay • A/F sensor heater and relay circuit • ECM
	Conditions (a) and (b) continue for 5.0 sec. or more : (a) (AF+) – (AF–) less than 0.1 V (b) (AF+) – (AF–) greater than 0.8 V	
P2238/21 P2241/28	A/F sensor circuit low (bank 1 sensor 1)	HINT : Main trouble area • Open in A/F sensor circuit
	Condition (a) continues for 5.0 sec. or more : (a) AF+ less than 0.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • A/F sensor heater relay • A/F sensor heater and relay circuit • ECM
	Condition (a) continues for 5.0 sec. or more : (a) (AF+) – (AF–) less than 0.1 V	
P2239/21 P2242/28	A/F sensor circuit high (bank 1 sensor 1)	HINT : Main trouble area • Short in A/F sensor circuit
	Condition (a) continue for 5.0 sec. or more : (a) AF+ greater than 4.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • A/F sensor heater relay • A/F sensor heater and relay circuit • ECM
	Condition (a) continue for 5.0 sec. or more : (a) (AF+) – (AF–) greater than 0.8 V	
P2251/21 P2254/28	Conditions (a) and (b) continue for 5.0 sec. or more : (a) AF– less than 0.5 V (b) AF– greater than 4.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • A/F sensor heater relay • A/F sensor heater and relay circuit • ECM
P2252/21 P2255/28	Condition (a) continue for 5.0 sec. or more : (a) AF– less than 0.5 V	
P2253/21 P2256/28	Condition (a) continue for 5.0 sec. or more : (b) AF– greater than 4.5 V	

HINT:

- DTC P2237/28, P2238/28, P2239/28, P2251/28, P2252/28 and P2253/28 means malfunction related to bank 1 A/F sensor circuit.
- DTC P2240/21, P2241/21, P2242/21, P2254/21, P2255/21 and P2256/21 means malfunction related to bank 2 A/F sensor circuit.
- Bank 1 refers to the bank that includes cylinder No. 1.
- Bank 2 refers to the bank that includes cylinder No. 2.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (A/F sensor, heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:

+25 % → rich output: Less than 3.0 V

–12.5 % → lean output: More than 3.35 V

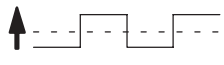
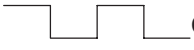
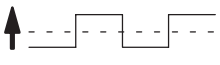
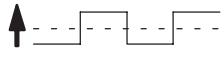
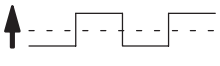
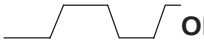
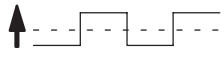
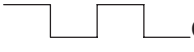
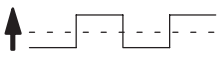
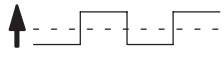
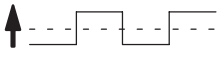
Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:

+25 % → rich output: More than 0.55 V

–12.5 % → lean output: Less than 0.4 V

NOTICE:

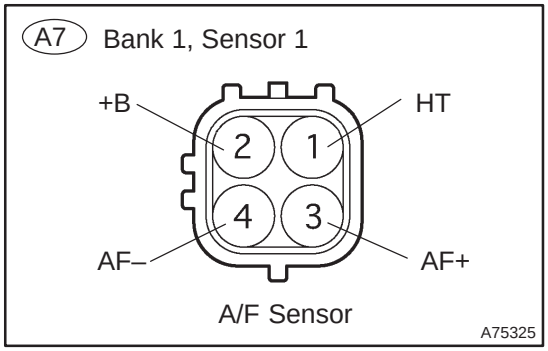
There is a few second delay in the A/F sensor output, and there is about 20 seconds delay in the heated oxygen sensor output.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 3.35 V Less than 3.0 V  **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	A/F sensor (A/F sensor, heater, A/F sensor circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 3.35 V Less than 3.0V  **OK**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

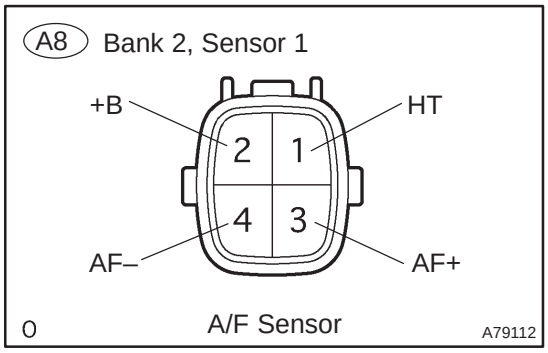
The following procedure of A/F CONTROL enables the technician to check and graph voltage output of both the A/F sensor and heated oxygen sensor.
For displaying the graph indication, enter ”ACTIVE TEST/ A/F CONTROL/USER DATA”, then select ”AFS B1S1 and O2S B1S2” or ”AFS B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If DTC P2237/21, P2238/21, P2239/21, P2251/21, P2252/21 or P2253/21 is displayed, check bank 1 sensor 1 circuit.
- If DTC P2240/28, P2241/28, P2242/28, P2254/28, P2255/28 or P2256/28 is displayed, check bank 2 sensor 1 circuit.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



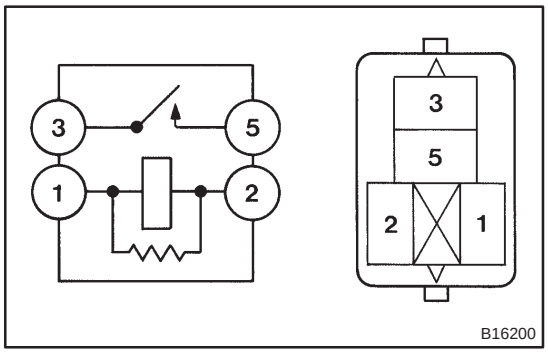
(a) Disconnect the A/F sensor connector.
(b) Measure resistance between terminals HT and +B of the A/F sensor.
Resistance: 1.8 to 3.4 Ω (20°C)



NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

2 INSPECT A/F RELAY



(a) Remove the A/F sensor heater relay from the engine room R/B.
(b) Inspect the A/F senor heater relay.
Standard:

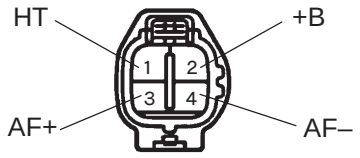
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE A/F RELAY**

OK

3 CHECK HARNESS AND CONNECTOR(ECM – A/F SENSOR)

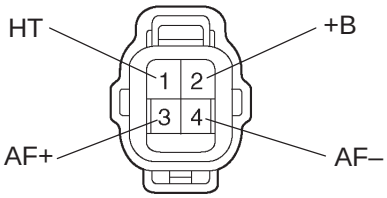
Wire Harness Side
A7 Bank 1 Sensor 1



A/F Connector

A76787

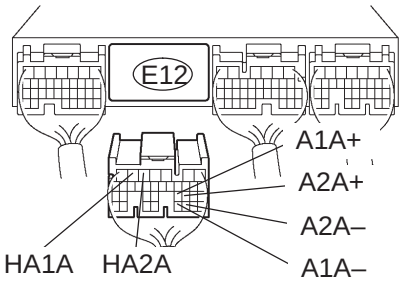
Wire Harness Side
A8 Bank 2 Sensor 1



A/F Connector

Y

A79114



Y

A65745

(a) Disconnect the A7 or A8 A/F sensor connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

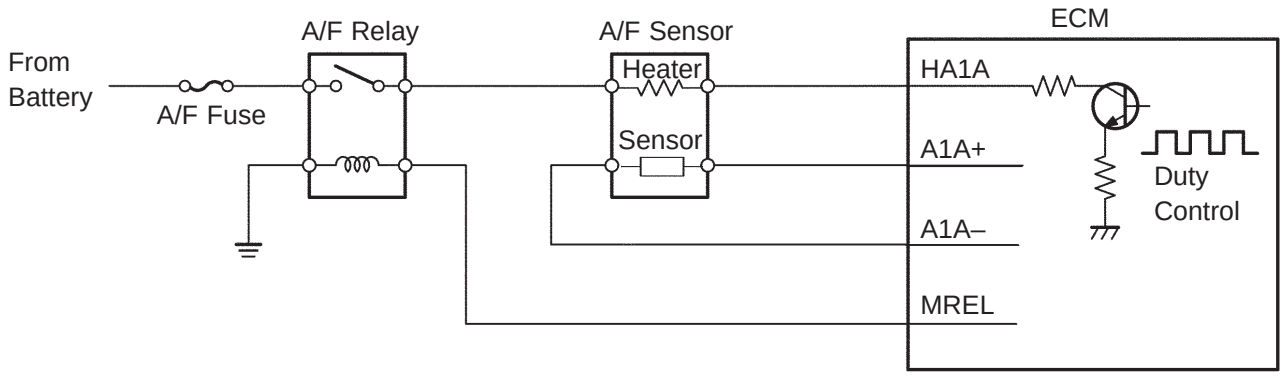
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
AF+ (A7–3) – A1A+ (E12–23)	Continuity
AF– (A7–4) – A1A– (E12–31)	
HT (A7–1) – HA1A (E12–6)	
AF+ (A8–3) – A2A+ (E12–22)	
AF– (A8–4) – A2A– (E12–30)	
HT (A8–1) – HA2A (E12–5)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
AF+ (A7–3) or A1A+ (E12–23) – Body ground	No continuity
AF– (A7–4) or A1A– (E12–31) – Body ground	
HT (A7–1) or HA1A (E12–6) – Body ground	
AF+ (A8–3) or A2A+ (E12–22) – Body ground	
AF– (A8–4) or A2A– (E12–30) – Body ground	
HT (A8–1) or HA2A (E12–5) – Body ground	

Reference (Bank 1 Sensor 1 System Drawing)



P

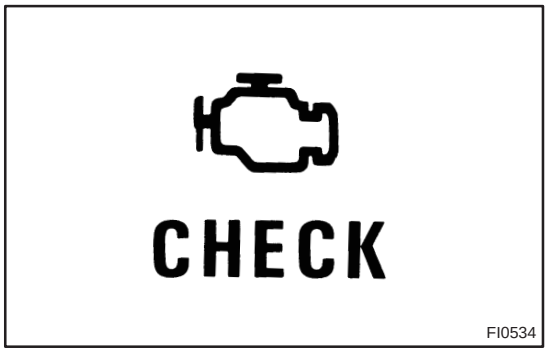
B62793

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM (See page 01–32)

05C6M–01

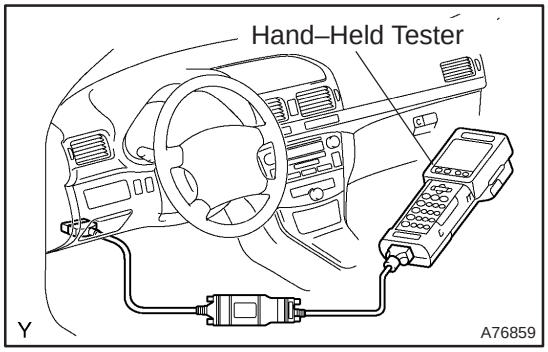


PRE–CHECK

1. DIAGNOSIS SYSTEM

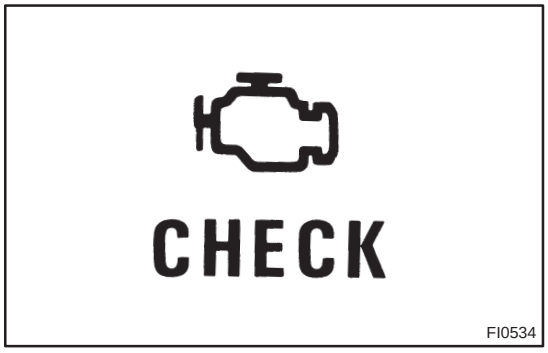
(a) Description for Euro–OBD (European spec.)

- When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to the OBD scan tool complying with ISO 15031–4 or hand–held tester, and read the various data output from the vehicle's ECM.
- Euro–OBD regulations require that the vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the emission control system / components or in the power train control components which affect vehicle emissions, or a malfunction in the computer. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTC) prescribed by ISO 15031–4 are recorded in the engine ECU memory (See page 05–161). If the malfunction does not reoccur in 3 consecutive trips, the CHK ENG goes off automatically but the DTCs remain recorded in the ECM memory.



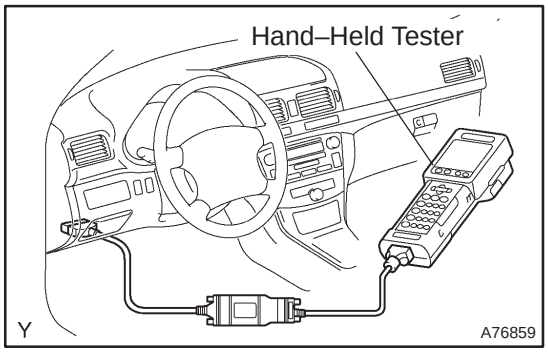
- To check the DTCs, connect the OBD scan tool or hand–held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data. (For operating instructions, see the OBD scan tool's instruction book.)
  DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–161).
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).

- * 2 trip detection logic
  When a logic malfunction is first detected, the pending fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTCs P0300 – P0304) or fuel trim malfunction (DTCs P0171) or other malfunction (first malfunction only), is detected.
  Because freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- Priorities for troubleshooting:
  If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.

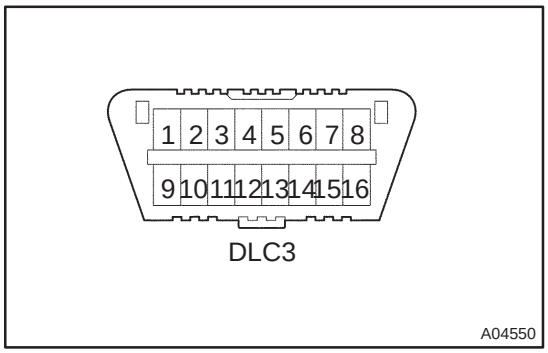


(b) Description for M–OBD (Except European spec.)

- When troubleshoot Multiplex OBD (M–OBD) vehicles, the only difference from the usual troubleshooting procedure is that you connect the hand–held tester to the vehicle, and read the various data output from the vehicle's ECM.
- The vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) are recorded in the ECM memory (See page 05–161). When the malfunction does not reoccur, the CHK ENG is indicated until the ignition switch is turned off, and then the CHK ENG is not indicated when the ignition switch is turned on but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect the hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle or read the DTC which is indicated on the multi information display when TC and CG terminals on the DLC3 are connected. The hand–held tester also enables you to erase the DTCs and check the freeze frame data and various forms of engine data. (for operating instructions, see the instruction book.)
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).
- * 2 trip detection logic
  When a logic malfunction is first detected, the pending fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  Freeze frame data records the engine conditions (fuel system, calculator load, water temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.



(c) Check the DLC3.
The vehicle's ECM uses the ISO 14230(M–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–03 and matches the ISO 14230 format.

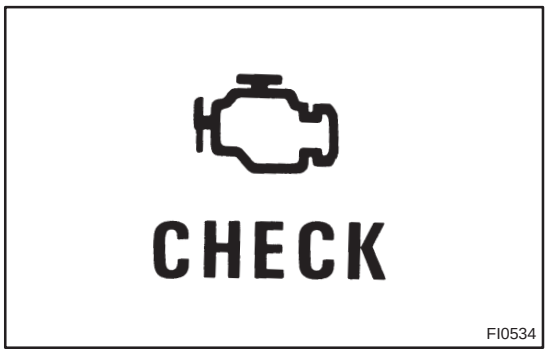
Terminal No.	Connection / Voltage or Residence	Condition
7	Bus + Line / Pulse generation+	During transmission
4	Chassis Ground – Body Ground / 1 Ω or less	Always
16	Battery Positive – Body Ground / 9 to 14 V	Always

HINT:
If the display shows ”UNABLE TO CONNECT TO VEHICLE” when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Deparment listed in the tool’s instruction manual.

(d) Inspect the battery voltage.
Battery voltage: 11 to 14 V

If voltage is below 11V, recharge the battery before proceeding.



(e) Check the CHK ENG.
(1) The CHK ENG lamp comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the CHK ENG lamp is not illuminated, troubleshoot the combination meter.

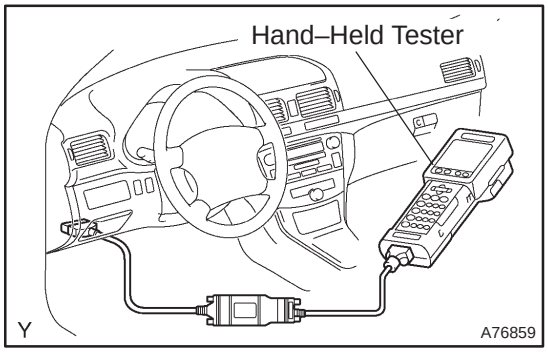
(2) When the engine is started, the CHK ENG should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

2. DTC CHECK (Nomal Mode) :

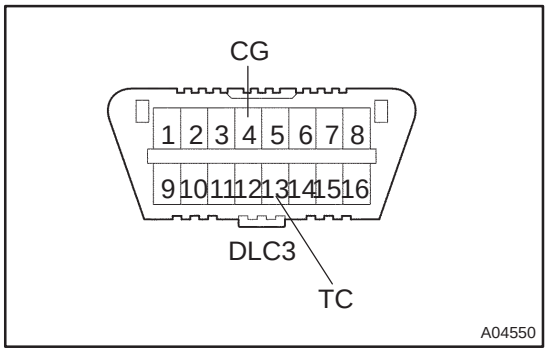
NOTICE:

Hand–held tester only:

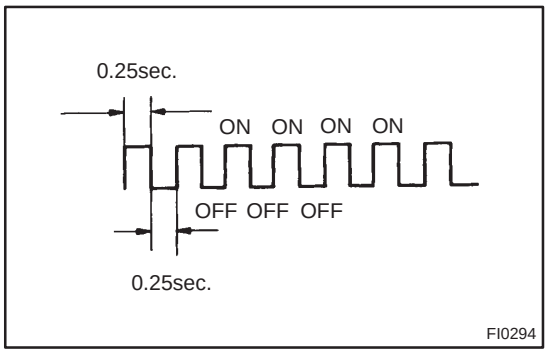
When the diagnosis system is switched from the normal mode to the check (test) mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and then write them down.



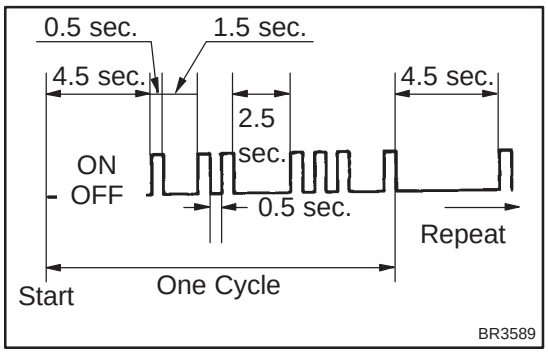
(a) Checking DTCs using the hand–held tester.
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch ON and switch the hand–held tester main switch ON.
(3) Use the hand–held tester to check the DTCs and freeze frame data and then write them down. The hand–held tester’s instruction book.
(4) See page 05–161 to confirm the details of the DTCs.



(b) If you have no hand–held tester, perform the following steps (1) to (6).
(1) Turn the ignition switch ON.
(2) Using SST, connect between terminals 13 (TC) and 4 (CG) of the DLC3.
SST 09843–18040



(3) Read DTC by observing the CHK ENG lamp. If any DTC is not detected, the CHK ENG lamp blinks as shown in the illustration.



(4) Example
If DTC 12 and DTC 31 are detected, the CHK ENG flashes 1 time (for 0.5 sec) and flashes 2 times after the 1.5 sec interval, then flashes 3 times after a 2.5 sec interval from the previous DTC and flashes 1 time.
If the interval between the previous DTC and the next DTC is 4.5 sec, it means the previous DTC is the last one of the multiple string DTCs. The CHK ENG lamp repeats the indication of DTCs from the initial cycle. (Refer to the illustration on the left)
(5) Check the details of the malfunction using the DTC chart on page 05–16.
(6) After completing the check, disconnect terminals 13 (TC) and 4 (CG) and turn off the display.

HINT:
In the event that 2 or more DTCs are detected, the CHK ENG lamp will indicate the smaller number DTC first.

(c) Clearing the DTCs using the hand–held tester:
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) When operating hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(d) Clearing the DTCs not using the hand–held tester:
(1) Disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.

3. DTC CHECK (Check Mode):

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has more sensing ability to detect malfunctions.

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check (test) mode.

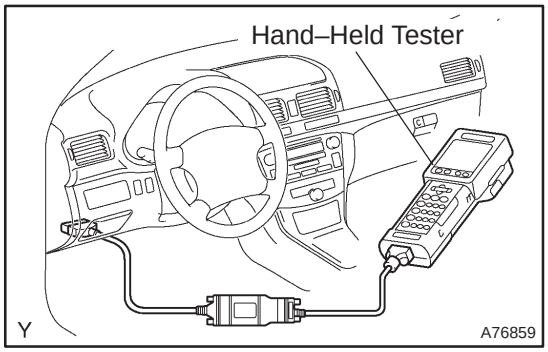
(a) Proceduce for check mode using hand–held tester.

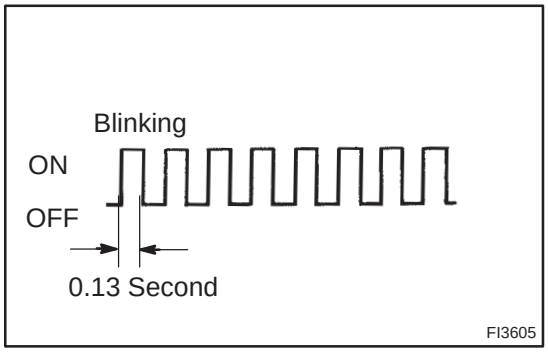
(1) Check the initial conditions
- Battery positive voltage 11V or more.
- Throttle valve fully closed.
- Transmission in the ”P” or ”N” position.
- Air conditioning switched OFF.

(2) Turn the ignition switch OFF.

(3) Connect the hand–held tester to the DLC3.

(4) Turn the ignition switch and the hand–held tester main switch ON.





(5) Switch the hand–held tester from the normal mode to the check (test) mode. The CHK ENG blinks in 0.13 sec interval as shown in the illustration.

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(6) Start the engine. (The CHK ENG lamp goes out after the engine start.)

(7) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTC, etc.

(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the nomal mode and will result in all of the DTCs and freeze frame data being erased.

(9) After checking the DTCs, inspect the applicable circuit.

(b) Clearing the DTCs using the hand–held tester
(1) Connect the hand–held tester to DLC3.
(2) Turn the ignition switch ON.
(3) When operating hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester:
(1) Disconnecting the battery terminal or remove the EFI fuse for more than 60 seconds.

4. FAIL–SAFE CHART

If any of the following codes are recorded, the engine ECM enters the fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0031/21 P0032/21 P0051/28 P0052/28	The heater circuit in which the abnormality is detected is turned off	Ignition switch OFF
P0100/31 P0102/31 P0103/31	Ignition timing is calculated from engine speed and a throttle angle	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0110/24 P0112/24 P0113/24	Intake air temp. is fixed at 20°C (68°F)	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0115/22 P0117/22 P0118/22	Engine coolant temp. is fixed at 80°C (176°F)	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0120/41 P0122/41 P0123/41	Fuel cut intermittently while idling	Returned to normal condition and ignition switch OFF
P0325/52 P0327/52 P0328/52	Max. timing retardation	Ignition switch OFF
P0351/14 P0352/15 P0353/14 P0354/15	Fuel cut	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".

5. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:

By putting the vehicle's engine ECM in check (test) mode, 1 trip detection logic is possible instead of 2 trip detection logic, and sensitivity to detect faults is increased. This makes it easier to detect intermittent problems.

(a) Clear the DTC. (See step 3.)
(b) Set the check (test) mode. (See step 3.)
(c) Perform a simulation test. (See page 01–22)
(d) Check the connector and terminal. (See page 01–32)
(e) Wiggle the harness and the connector. (See page 01–32)

6. DATA LIST

HINT:

Using the DATA LIST displayed by the hand–held tester, you can read the value of the switches, sensors, actuators and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten diagnostic time.

NOTICE:

The values given below for ”Normal Condition” are representative values. A vehicle may still be normal even if the measured values are a little different from those listed here. Do not decide whether a part is faulty or not solely according to the ”Normal Condition” here.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the Hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.
(g) According to the display on tester, read the ”DATA LIST”.

Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition	Diagnostic Note
INJECTOR	Injection period/ Min.: 0 ms, Max.: 32.64 ms	Idling: 1.92 to 3.37 ms	—
IGN ADVANCE	Ignition timing advance/ Min.: –64 deg., Max.: 63.5 deg.	Idling: BTDC 5 to 15 deg.	—
CALC LOAD	Calculated load by engine ECM/ Min.: 0 %, Max.: 100 %	• Idling: 3.3 to 26.7 % • Running without load (2,500 rpm): 12.0 to 14.7 %	—
MAF	Air flow rate from MAF sensor/ Min.: 0 gm/s, Max.: 655 gm/s	• Idling: M/T 0.54 to 4.33 gm/sec. A/T 0.58 to 4.67 gm/sec. • Runnning without load (2,500 rpm): 3.33 to 9.17 gm/sec.	—
ENGINE SPD	Engine Speed/ Min.: 0 rpm, Max.: 16,383 rpm	Idling: M/T 650 to 750 rpm A/T 550 to 750 rpm	—
COOLANT TEMP	Coolant temperature/ Min.: –40 °C, Max.: 140 °C	After warming up: 80 to 95°C (176 to 203°F)	If the value is ”–40 °C” or ”140 °C”, sensor circuit is open or shorted.
INTAKE AIR	Intake air temperature/ Min.: –40 °C, Max.: 140 °C	Equivalent to ambient temp.	
THROTTLE POS	Absolute throttle position sensor/ Min.: 0 %, Max.: 100 %	• Throttle fully closed: 6 to 16 % • Throttle fully open: 64 to 98 %	Read the value with ignition switch ON (Do not start engine)
CTP SW	Closed throttle position switch/ ON or OFF	• Throttle fully closed: ON • Throttle open: OFF	—
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Vehicle stopped: 0 km/h (0 mph)	—
O2S B1 S2	Oxygen sensor output voltage of the bank 1 sensor 2/ Min.: 0 V, Max.: 1.275 V	Idling: 0.1 to 0.9 V	—
AFS B1 S1	A/F sensor output voltage of the bank 1 sensor 1/ Min.: 0 V, Max.: 7.999 V	Idling: 2.8 to 3.8 V	—

SHORT FT #1	Short term fuel trim of bank 1/ Min.: –100 %, Max.: 100%	0 ± 20 %	—
LONG FT #1	Long term fuel trim of bank 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	—
TOTAL FT #1	Total fuel trim of bank 1/ Min.: 0.5, Max.: 1.496	Idling: 0.5 to 1.4	—
TOTAL FT #2	Total fuel trim of bank 2/ Min.: 0.5, Max.: 1.496	Idling: 0.5 to 1.4	—
AF FT B1 S1	Short term fuel trim associated with the bank 1, sensor 1/ Min.: 0, Max.: 1.999	• Lean: 0 < 1 • Stoichiometric Air–Fuel Ratio = 1 • Rich: 1 < 1.999	—
FUEL SYS #1	Fuel system status (Bank1) / OL or CL or OLDRIVE or OLFAULT or CLFAULT	Idling after warming up: CL	• OL: Open Loop–has not yet satisfied conditions to go closed loop. • CL: Closed Loop–using oxygen sensor(s) as feed back for fuel control. • OL DRIVE: Open loop due to driving conditions. (power enrichment, deceleration enleanment) • OL FAULT: Open loop due to detected system fault. • CL FAULT: Closed loop, but fault with at least one oxygen sensor may be using single oxygen sensor for fuel control.
FC IDL	Idle fuel cut / ON or OFF	Fuel cut operation: ON	—
CHK ENG	CHK ENG status / ON or OFF	CHK ENG ON: ON	—
STARTER SIG	Starter signal / ON or OFF	Cranking: ON	—
A/C SIG	A/C signal / ON or OFF	A/C ON: ON	—
PNP SW [NSW]	Neutral position switch signal / ON or OFF	P or N position: ON	—
ELECT LOAD SIG	Electrical load signal / ON or OFF	Defogger switch ON: ON	—
STOP LIGHT SW	Stop light switch / ON or OFF	• Brake pedal depressed: ON • Brake pedal released: OFF	—
PS OIL PRESS SW	Power steering signal / ON or OFF	Steering position is; center: OFF Except center:ON	—
PS SIGNAL	Power steering signal/ ON or OFF	• After engine start: OFF • After steer the steering: ON	—
FUEL PUMP / SPD	Fuel pump / speed status / ON/H or OFF/M,L	Idling: ON	—
EVAP VSV	VSV status for EVAP control / ON or OFF	VSV operating: ON	—
VVT CTRL B1	VVT control status / ON or OFF	VVT system operation: ON	—
IGNITION	Ignition counter/ Min.: 0, Max.: 400	0 to 400	—
CYL #1, #2, #3, #4	Misfire ratio of the cylinder 1/ Min.: 0 %, Max.: 50 %	0 %	—

THROTTLE POS	Throttle position sensor output voltage/ Min.: 0 V, Max.: 5 V	• Throttle fully closed: 0.3 to 0.8 V • Throttle fully open: 3.2 to 4.9 V	Read the value with ignition switch ON (Do not start engine)
THROTTLE TARGT	Target position of throttle valve/ Min.: 0 V, Max.: 5 V	Idling: 0.4 to 1.0 V	Read the value with ignition switch ON (Do not start engine)

If no conditions are specifically stated for ”Idling”, it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

7. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten diagnostic time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST”.
(g) According to the display on tester, perform the ”ACTIVE TEST”.

Hand–held Tester Display	Test Details	Diagnostic Note
INJ VOL	[Test Details] Control the injection volume Min.: –12.5 %, Max.: 25 % [Vehicle Condition] Engine speed: 3000 rpm or less.	• All injectors are tested at once. • Injection volume is gradually changed between –12.5 and 25%.
A/F CONTROL	[Test Details] Control the injection volume –12.5 % ⇔ 25 % (Change the injection volume –12.5 % or 25 %.) [Vehicle Condition] Engine speed: 3000 rpm or less.	The following procedure of A/F CONTROL enables the technician to check and graph the voltage outputs of both the A/F sensor and heated oxygen sensor. To display the graph indication, select O2S B1 S1 or A/F B1S1 and press button ”4” after selecting ”ACTIVE TEST/A/F CONTROL/ USER DATA”.
EVAP VSV (ALONE)	[Test Details] Activate the VSV for EVAP control. ON or OFF	—
FUEL PUMP / SPD	[Test Details] Control the fuel pump. ON or OFF	—
VVT CTRL B1	[Test Details] Activate the VVT system. ON or OFF	• ON: Rough idle or engine stall. • OFF: Normal engine speed.
TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	—
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit ON or OFF	—

BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	CHECK BATTERY VOLTAGE

NOTICE:
Carry out this check with the engine stopped and ignition switch off.

Reference:

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → **CHARGE OR REPLACE BATTERY**

OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–168**

OK

3	CHECK IF ENGINE STARTS

NG → **GO TO STEP 6**

OK

4	CHECK AIR FILTER

(a) Visually check that the air filter is not excessively dirty or oily.

HINT:
If necessary, clean the filter with compressed air. First blow from the inside thoroughly, then blow from the outside of filter.

NG → **REPAIR OR REPLACE**

OK

5	CHECK IDLE SPEED (See page 14–101)

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–168**

OK

6	CHECK FUEL PRESSURE (See page 11–19)

NG → PROCEED TO PAGE 11–15 AND CONTINUE TO TROUBLESHOOT

OK

7	CHECK FOR SPARK (See page 18–7)

NG → PROCEED TO PAGE 18–7 AND CONTINUE TO TROUBLESHOOT

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE

05C6Q–01

PROBLEM SYMPTOMS TABLE

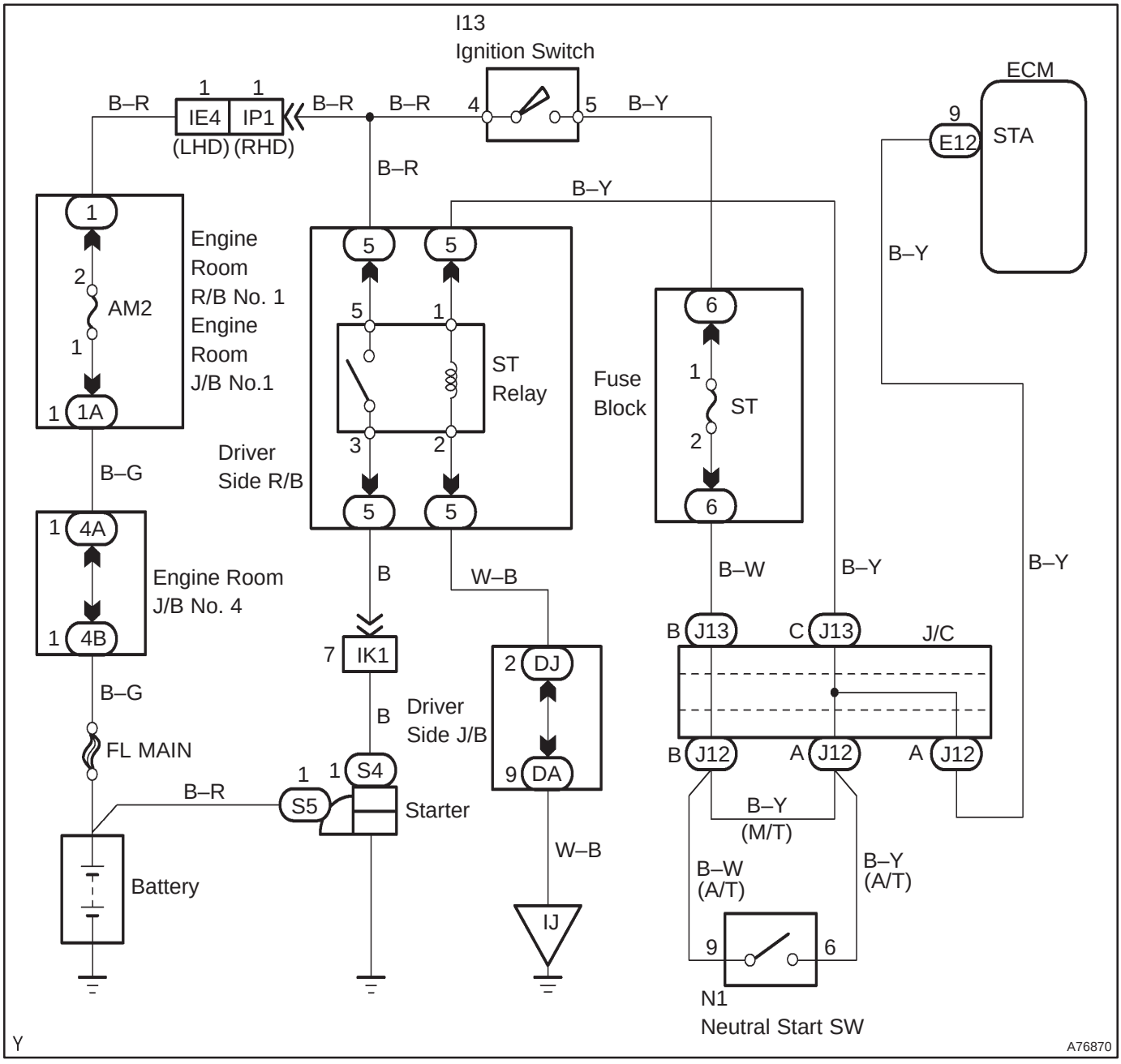
Symptom	Suspected Area	See page
Engine does not crank (Does not start)	1. Starter 2. Starter relay	19–8 19–8
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. ECM	05–257 05–264 01–32
No complete combustion (Does not start)	1. Fuel pump control circuit	05–264
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	05–278 05–264 14–101
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	05–278 05–264
Hot engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	05–278 05–264
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	– 05–257
Low engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Fuel pump control circuit	– 05–264
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	14–101 05–264
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	05–257 05–264
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	05–264 05–879
Surging (Poor driveability)	1. Fuel pump control circuit	05–264
Engine stalls soon after starting	1. Fuel pump control circuit	05–264
Engine stalls during A/C operation	1. A/C signal circuit (Compressor circuit) 2. ECM	– 01–32
Unable to refuel/Difficult to refuel	1. ORVR system	–

STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow becomes slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

This chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05–168.

When using hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(STA SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG” and read its value displayed on the hand–held tester.

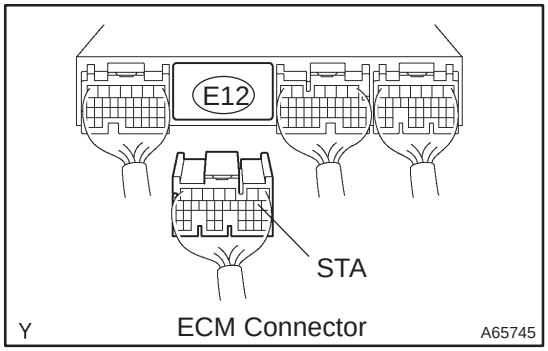
Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–149)**

NG

2	CHECK HARNESS AND CONNECTOR



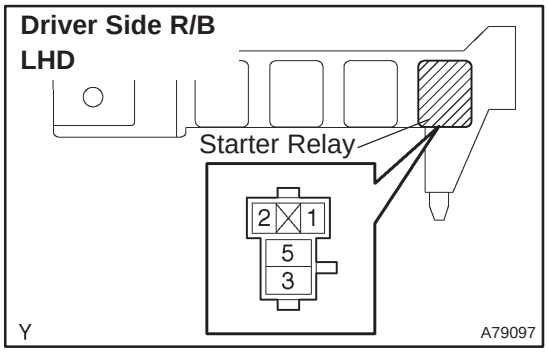
(a) Disconnect the E12 ECM connector.
(b) Remove the starter relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

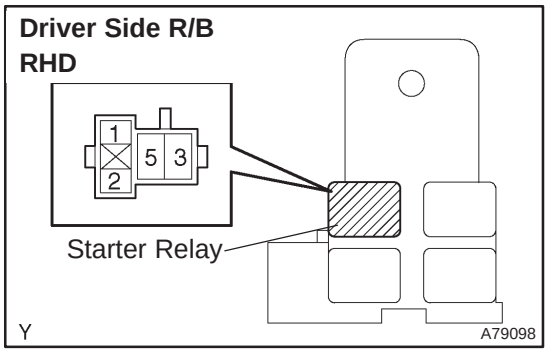
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Starter relay (1) – STA (E12–9)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Starter relay (1) or STA (12–9) – Body ground	No continuity





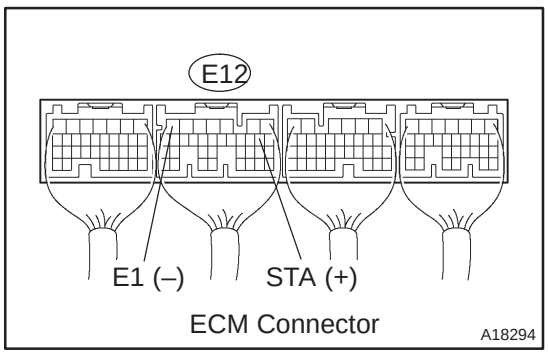
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1	INSPECT ECM(STA VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E12 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
STA (E12–9) – E1 (E12–7)	0 V

(c) Measure the voltage between the terminals of the E12 ECM connector when the engine is cranked.

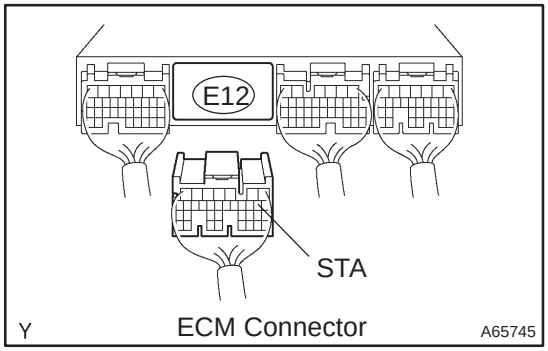
Standard:

Symbols (Terminal No.)	Specified condition
STA (E12–9) – E1 (E12–7)	6 V or more

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–149)**

NG

2 CHECK HARNESS AND CONNECTOR



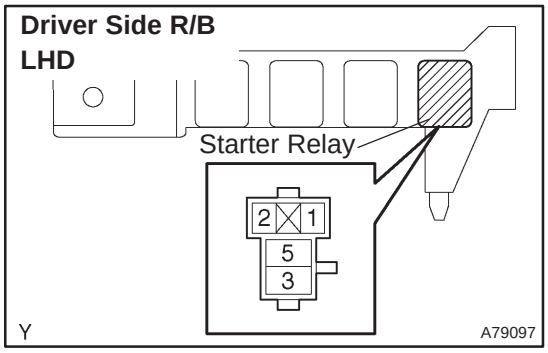
(a) Disconnect the E12 ECM connector.
(b) Remove the starter relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

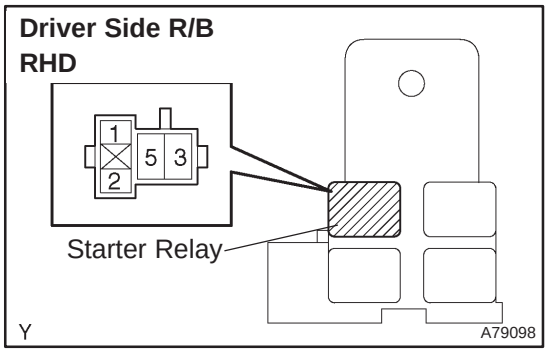
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Starter relay (1) – STA (E12–9)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Starter relay (1) or STA (12–9) – Body ground	No continuity





NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

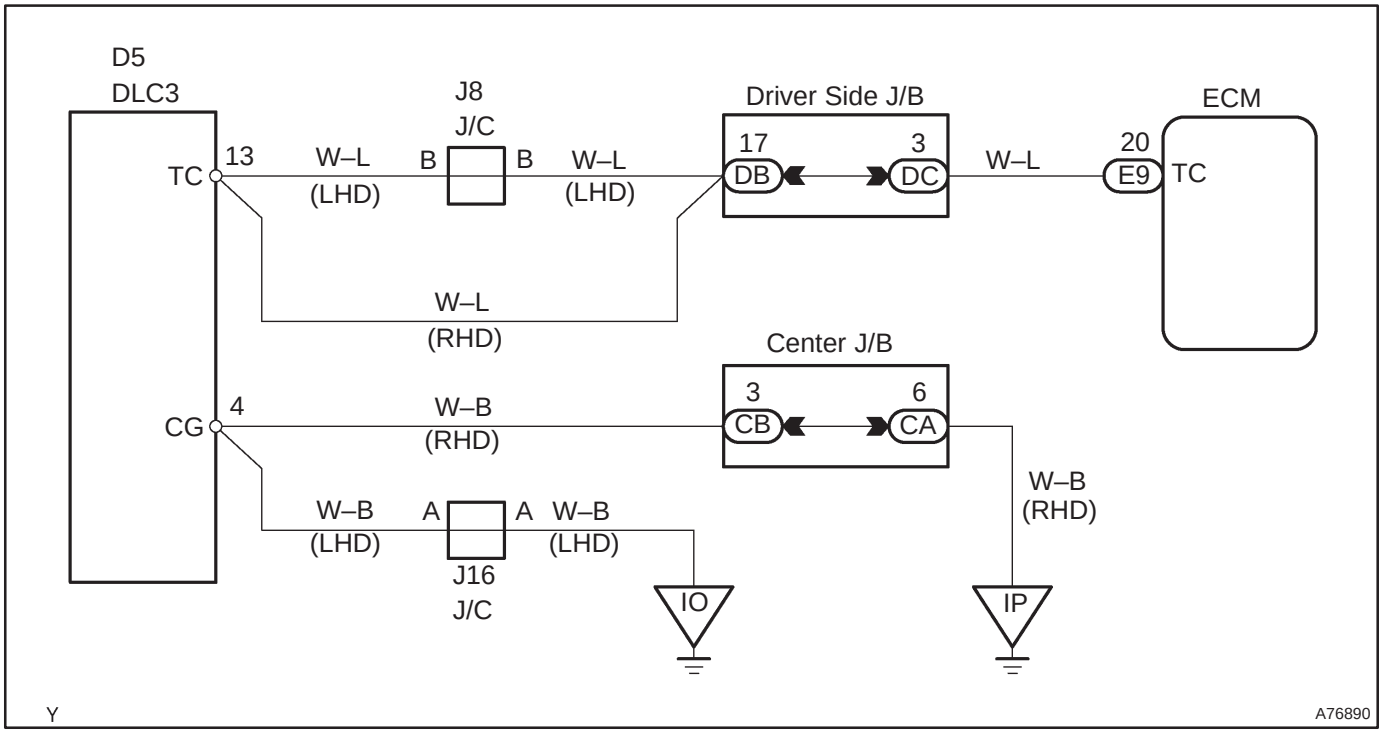
CHECK AND REPLACE ECM (See page 01–32)

TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

Terminals TC and CG are located in the DLC3. When connecting these terminals, DTCs in normal mode or check mode can be read through the CHK ENG flashing in the combination meter.

WIRING DIAGRAM

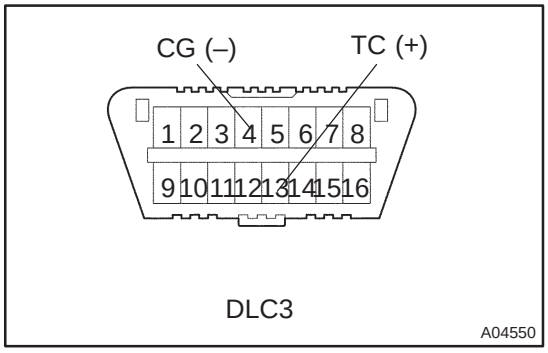


INSPECTION PROCEDURE

HINT:

- Even though terminal TC is not connected to terminal CG, the CHK ENG blinks.
- For the above phenomenon, an open or short in the wire harness, or malfunction inside the ECM is the likely cause.

1	CHECK DLC3(TC VOLTAGE)



(a) Turn the ignition switch ON.

(b) Measure the voltage between the terminals of the DLC3.

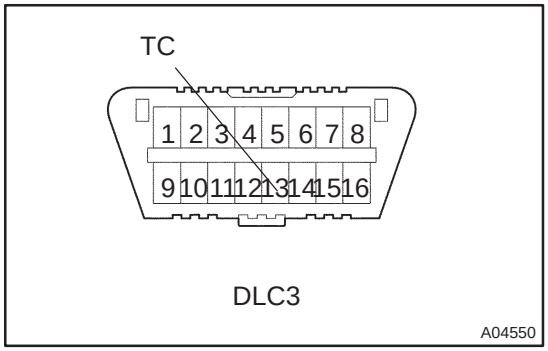
Standard:

Symbols (Terminal No.)	Specified condition
TC (13) – CG (4)	9 to 14 V

OK → **Go to step 3**

NG

2 CHECK HARNESS AND CONNECTOR(DLC3 – ECM)



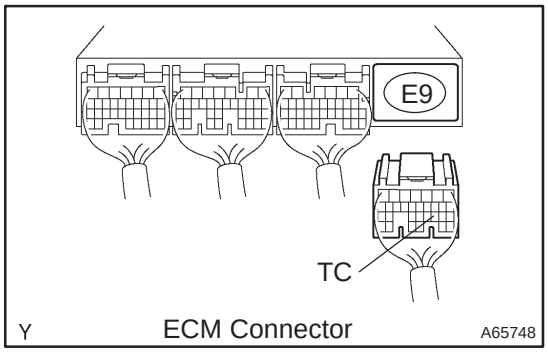
(a) Disconnect the E9 ECM connector.
(b) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
TC (13) – TC (E9–20)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
TC (13) or TC (E9–20) – Body ground	No continuity



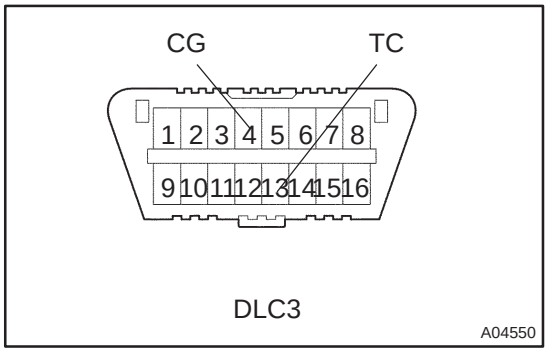
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR

3 CHECK CHK ENG CONDITION

SST 09843–18040



(a) Turn the ignition switch ON.
(b) Connect between terminals TC and CG of the DLC3 connector.
(c) Check that the CHK ENG blinks.

Standard: CHK ENG blinks

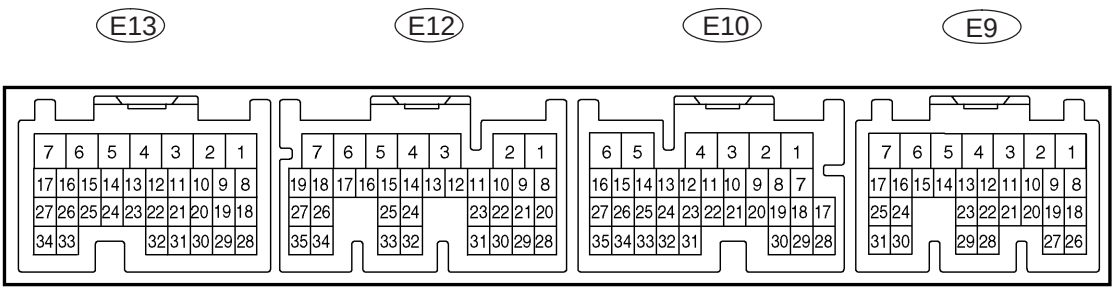
NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

NO PROBLEM

05C6P–01

TERMINALS OF ECM



Y

A66714

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E9 – 3) – E1 (E12 – 7)	B–Y – BR	Always	8 to 14
FC (E9 – 10) – E1 (E12 – 7)	G–Y – BR	IG switch ON	8 to 14
		Idling	Below 1.5
W (E9 – 11) – E1 (E12 – 7)	W – BR	Idling	8 to 14
		IG switch ON	Below 3.5
+B (E9 – 1) – E1 (E12 – 7)	B–R – BR	IG switch ON	8 to 14
STP (E10 – 19) – E1 (E12 – 7)	G–W – BR	IG switch ON, brake pedal depressed	8 to 14
		IG switch ON, brake pedal released	Below 1.5
F/PS (E9 – 14) – E1 (E12 – 7)	LG–B – BR	IG switch ON	Pulse generation
STA (E12 – 9) – E1 (E12 – 7)	B–Y – BR	Cranking	5.5 or more
HA1A (E12 – 6) – E04 (E12 – 4) *1	L – W–B	Idling	Below 3.0
		IG switch ON	9 to 14
A1A+ (E12 – 23) – E1 (E12 – 7) *1	W – BR	IG switch ON	3.0 to 3.6
A1A– (E12 – 31) – E1 (E12 – 7) *1	B – BR	IG switch ON	2.7 to 3.3
HA2A (E12 – 5) – E05 (E12 – 3) *1	Y – W–B	Idling	Below 3.0
		IG switch ON	9 to 14
A2A+ (E12 – 22) – E1 (E12 – 7) *1	G – BR	IG switch ON	3.0 to 3.6
A2A– (E12 – 30) – E1 (E12 – 7) *1	L – BR	IG switch ON	2.7 to 3.3
HT1B (E10 – 4) – E01 (E13 – 7) *1	L – W–B	Idling	Below 3.0
		IG switch ON	9 to 14
OX1B (E12 – 21) – 01B (E13 – 32) *1	B – BR	IG switch ON	0 to 1.0
O1B– (E13 – 32) – E1 (E12 – 7) *1	W – BR	IG switch ON	0.4 to 1.1
HT2B (E10 – 3) – E01 (E13 – 7) *1	L–R – W–B	Idling	Below 3.0
		IG switch ON	9 to 14
OX2B (E12 – 29) – 01B (E13 – 32) *1	R – BR	IG switch ON	0 to 1.0
O2B– (E13 – 31) – E1 (E12 – 7) *1	G – BR	IG switch ON	0.4 to 1.1

SPD (E10 – 17) – E1 (E12 – 7)	V–W – BR	IG switch ON, rotate driving wheel slowly	Pulse generation (See page 05–240)
TACH (E9 – 5) – E1 (E12 – 7)	GR–R – BR	Idling	Pulse generation
VC (E13 – 18) – E2 (E13 – 28)	R–W – BR	IG switch ON	4.5 to 5.5
PRG (E13 – 12) – E01 (E13 – 7)	W–G – W–B	IG switch ON	8 to 14
VG (E12 – 24) – EVG (E12 – 32)	G – L–Y	Idling, A/C switch OFF	1.1 to 1.5
THW (E13 – 19) – E2 (E13 – 28)	B–W – BR	Idling, Engine coolant temp. at 80°C (176°F)	0.2 to 1.0
G2+ (E13 – 26) – NE– (E13 – 34)	W – R	Idling	Pulse generation (See page 05–229)
NE+ (E13 – 27) – NE– (E13 – 34)	G – R	Idling	Pulse generation (See page 05–226)
THA (E13 – 20) – E2 (E13 – 28)	G–R – BR	Idling, intake air temp. at 20 °C (68 °F)	0.5 to 3.4
VTA1 (E13 – 21) – E2 (E13 – 28)	L–W – BR	IG switch ON, throttle valve fully closed	0.3 to 1.0
		IG switch ON, throttle valve fully open	3.2 to 4.9
#1 (E13 – 1) – E01 (E13 – 7) #2 (E13 – 2) – E01 (E13 – 7) #3 (E13 – 3) – E01 (E13 – 7) #4 (E13 – 4) – E01 (E13 – 7)	B–R – W–B Y – W–B W – W–B B – W–B	IG switch ON	8 to 14
IGT1 (E13 – 8) – E1 (E12 – 7) IGT2 (E13 – 9) – E1 (E12 – 7) IGT3 (E13 – 10) – E1 (E12 – 7) IGT4 (E13 – 11) – E1 (E12 – 7)	R–W – BR P – BR LG–B – BR L–Y – BR	Idling	Pulse generation (See page 05–232)
IGF (E13 – 13) – E1 (E12 – 7)	W–R – BR	IG switch ON	4.5 to 5.5
		Idling	Pulse generation (See page 05–232)
RSD (E12 – 10) – E1 (E12 – 7)	G–R – W–B	IG switch ON	9 to 14
OC1+ (E13 – 15) – OC1– (E13 – 14) *1	W–G – Y–B	IG switch ON	Pulse generation (See page 05–169)
KNK1 (E12 – 1) – EKNK (E12 – 2)	B – W	Idling	Pulse generation (See page 05–222)
ELS2 (E9 – 13) – E1 (E12 – 7)	G – BR	Defoger switch ON	9 to 14
		IG switch ON	Below 3.0
MREL (E9 – 8) – E1 (E12 – 7)	GR – BR	IG switch ON	9 to 14
IGSW (E9 – 9) – E1 (E12 – 7)	B–W – BR	IG switch ON	9 to 14
TC (E9 – 20) – E1 (E12 – 7)	W–L – BR	IG switch ON	9 to 14
SIL (E9 – 18) – E1 (E12 – 7)	W–G – BR	Connect hand–held tester to DLC3	Pulse generation
ELS (E9 – 12) – E1 (E12 – 7)	G – BR	Taillight ON	9 to 14
		IG switch ON	Below 3.0
VAF (E13 – 32) – E2 (E13 – 28) *2	P – BR	IG switch ON	2.0 to 3.5

*1: For European spec. only

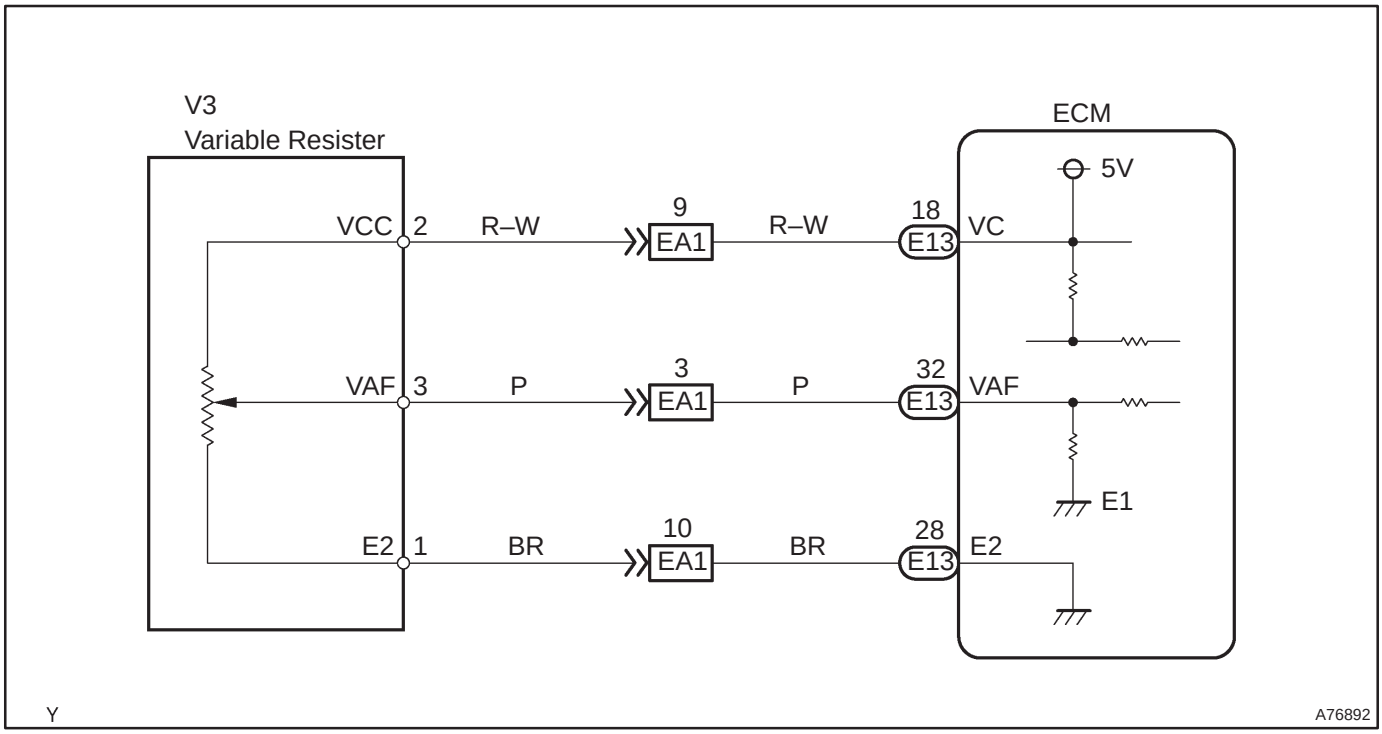
*2: Leaded only

VARIABLE RESISTOR CIRCUIT

CIRCUIT DESCRIPTION

The variable resister has been adopted to leaded–type vehicle only.
This resistor is used change the air–fuel ratio of the air–fuel mixture.
The idle mixture is adjusted using this resistor.
Turning the idle mixture adjusting screw clockwise moves the contacts inside the resistor, raising the terminal VAF voltage. Conversely, turning the screw counterclockwise lowers the terminal VAF voltage.
When the terminal VAF voltage rises, the ECM increases the injection volume slightly, marking the air–fuel mixture a little richer.

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

Always use a CO meter when adjusting the idle mixture. If a CO meter is not available, DO NOT ATTEMPT TO ADJUST IDLE MIXTURE.

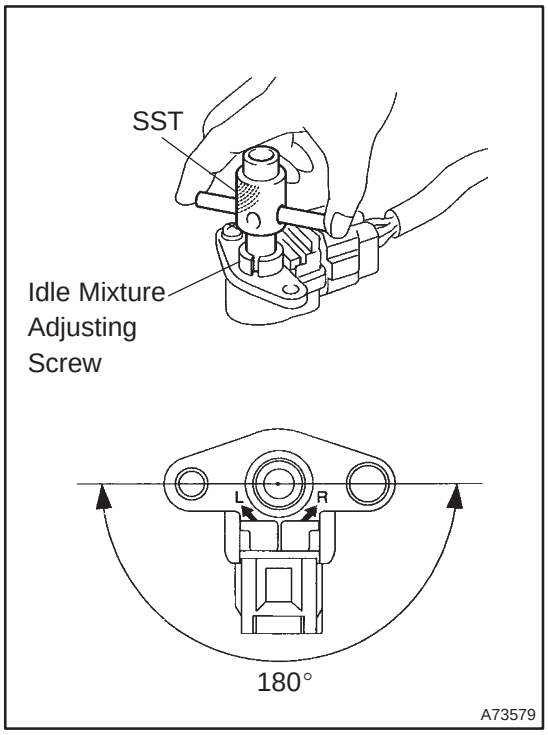
1	CHECK CO/HC (See page 14–101)

OK → CHECK FOR PROBLEM SYMPTOMS TABLE (See page 05–168)

NG

2	ADJUST CO CONCENTRATION

SST 09243–00020



(a) Same condition as step 1 this chart.

(b) Using SST, adjusting the idle mixture by turning the idle mixture adjusting screw in the variable resistor.

Result:

Result	Proceed
Connection: 1.5 ± 0.5 %	B
Change in CO connection	C
No change in CO connection	A

HINT:

- Always check idle speed after turning the idle mixture adjusting screw. If it is incorrect, readjust idle speed.
- Adjustable range of the idle mixture adjust to turn this screw is 180 degrees. Do not turn this screw more than it.

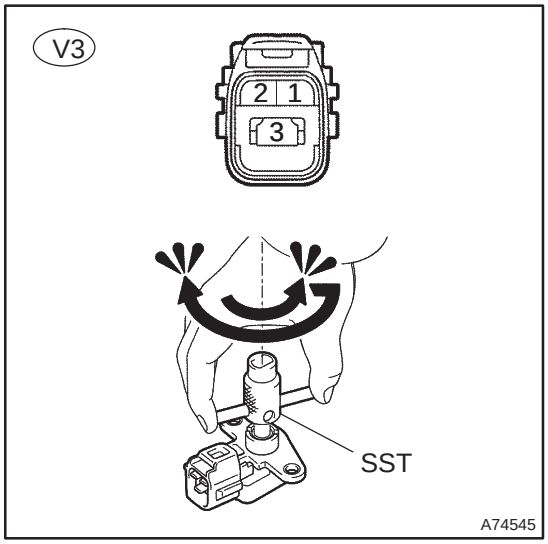
B → ADJUSTMENT COMPLETE

C → CHECK CO/HC (See page 14–101)

A

3 INSPECT VARIABLE RESISTOR

SST 09243–00020



(a) Measure the resistance between the terminals.
Resistance:

Symbols (Terminal No.)	Specified condition
1 – 2	3.5 – 6.5 Ω

(b) Measure the resistance between terminals 2 and 3 when turning the idle mixture adjusting screw fully clockwise and counterclockwise using SST
Resistance:

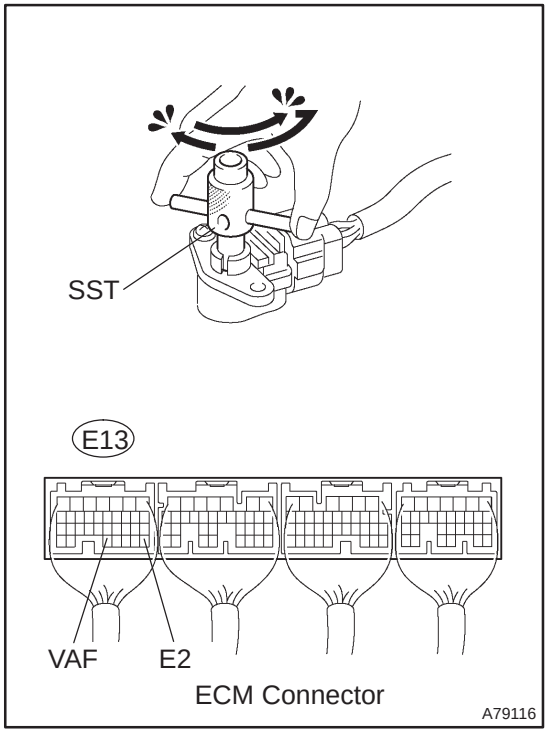
Symbols (Terminal No.)	Specified condition
2 – 3	Change from about 5 kΩ to 0 kΩ accordingly

NG → **REPLACE VARIABLE RESISTOR**

OK

4 CHECK ECM

SST 09243–00020



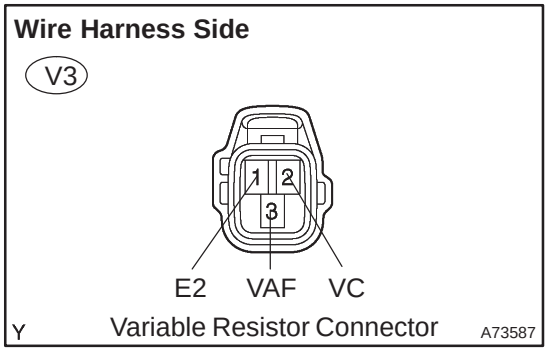
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E13 ECM connector while slowly turning the idle mixture adjusting screw first fully counterclockwise and then fully clockwise, using SST.
Voltage:

Symbols (Terminal No.)	Specified condition
VAF (E13–32) – E2 (E13–28)	Voltage changes smoothly from 0 V to about 5 V, i.e. does not suddenly jump up to 5 V down to 0 V

OK → **CHECK AND REPLACE ECM** **(See page 01–32)**

NG

5 CHECK HARNESS AND CONNECTOR(ECM – VARIABLE RESISTOR)



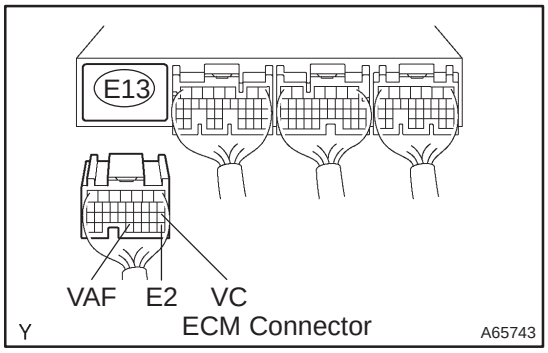
(a) Disconnect the V3 variable resistor connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (V3–2) – VC (E13–18)	Continuity
VAF (V3–3) – VAF (E13–32)	
E2 (V3–1) – E2 (E13–28)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (V3–2) or VC (E13–18) – Body ground	No continuity
VAF (V3–3) or VAF (E13–32) – Body ground	



OK

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

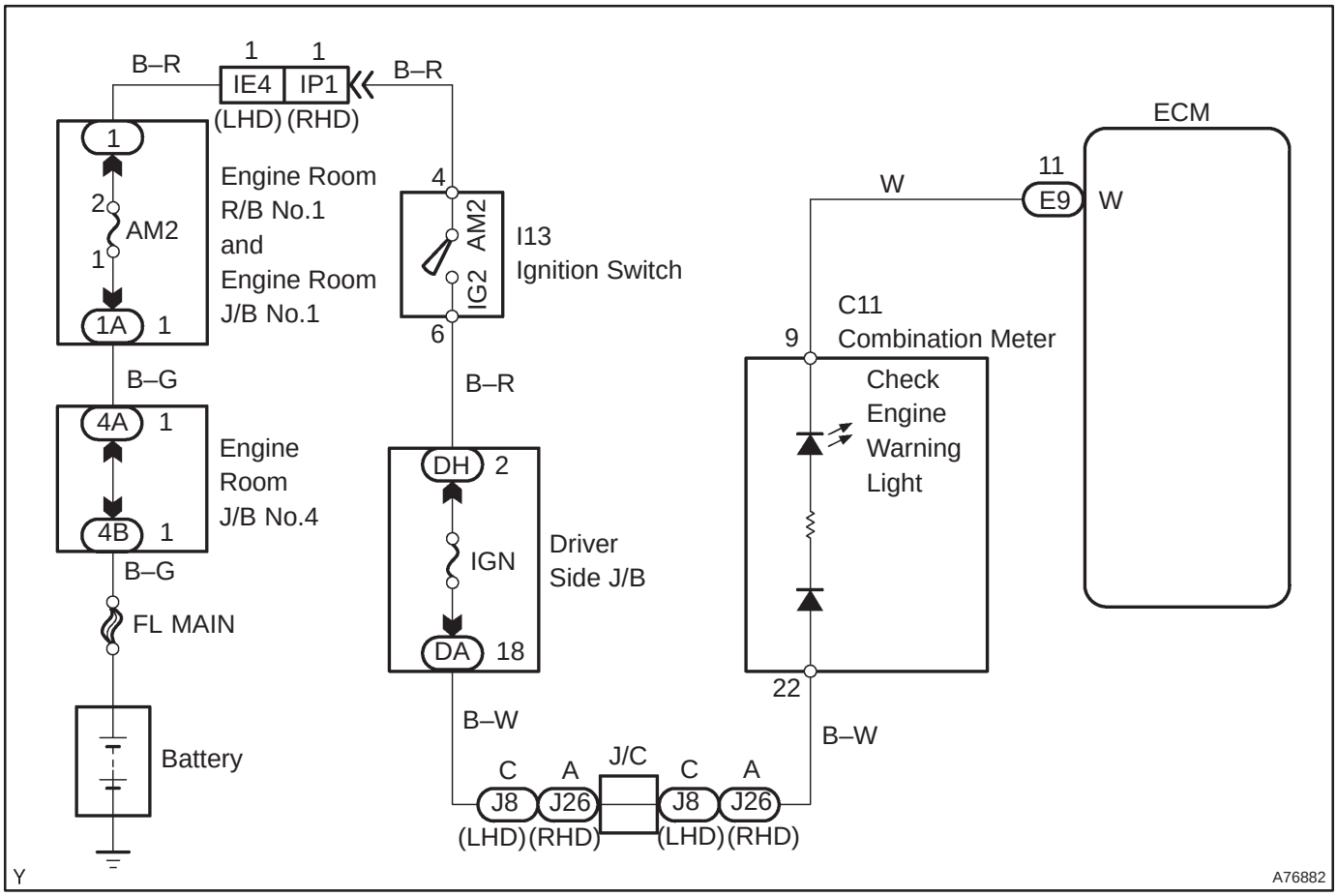
CHECK AND REPLACE ECM (See page 01–32)

CHECK ENGINE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

If the ECM detects a trouble, it illuminates CHK ENG. At this time, the ECM sets a DTC in the memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below .

CHK ENG remains on	Start inspection from step 1
CHK ENG is not illuminated	Start inspection from step 3

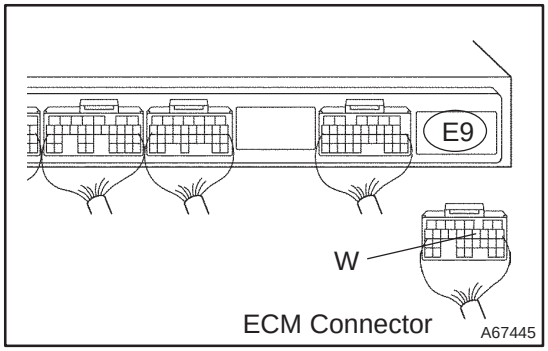
1 CLEAR DTC

(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Read the DTC (See page 05–294).
(d) Clear the DTC (See page 05–294).
(e) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated

OK → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE (See page 05–309)**

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E9 ECM connector.
(b) Turn the ignition switch ON.
(c) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

3	CHECK CHK ENG CONDITION

(a) Check that the CHK ENG is illuminated when turning the ignition switch ON.
Standard: CHK ENG is illuminated

OK → **SYSTEM OK**

NG

4	INSPECT COMBINATION METER ASSY(CHK ENG CIRCUIT)

(a) See the combination meter troubleshooting on page 05–1509.

NG → **REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER – ECM)

05CDT–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name _____

Customer's Name		VIN	
Driver's Name		Production Date	
Date Vehicle Brought in		Licence No.	
License No.		Odometer Reading	km / miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx.____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of check engine warning light (CHK ENG)		☐ Remains on	☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre–check)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

05CID–01

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your readings due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in the check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the ”See page ” under the respective ”DTC No.” in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0010 (05–322)	Camshaft Position ”A” Actuator Circuit (Bank 1)	• Open or short in OCV circuit • OCV • ECM	○	○
P0011 (05–325)	Camshaft Position ”A” –Timing Over– Advanced or System Performance (Bank 1)	• Valve timing • OCV • VVT controller assembly • ECM	○	○
P0012 (05–325)	Camshaft Position ”A” –Timing Over– Retarded (Bank 1)		○	○
P0016 (05–329)	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM	○	○
P0031 (05–330)	Oxygen Sensor Heater Circuit Low (Bank 1 Sensor 1)	• Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • EFI fuse • EFI No. 2 fuse • ECM	○	○
P0032 (05–330)	Oxygen Sensor Heater Circuit High (Bank 1 Sensor 1)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0037 (05–330)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)	• Same as DTC No. P0031	○	○
P0038 (05–330)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)	• Same as DTC No. P0032	○	○
P0051 (05–330)	Oxygen Sensor Heater Circuit Low (Bank 2 Sensor 1)	• Same as DTC No. P0031	○	○
P0052 (05–330)	Oxygen Sensor Heater Circuit High (Bank 2 Sensor 1)	• Same as DTC No. P0032	○	○
P0057 (05–330)	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 2)	• Same as DTC No. P0031	○	○
P0058 (05–330)	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 2)	• Same as DTC No. P0032	○	○
P0100 (05–336)	Mass or volume Air Flow Circuit	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0102 (05–336)	Mass or volume Air Flow Circuit Low Input		○	○
P0103 (05–336)	Mass or volume Air Flow Circuit High Input		○	○
P0105 (05–342)	Manifold Absolute Pressure/ Barometric Pressure Circuit	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM	○	○
P0107 (05–342)	Manifold Absolute Pressure/ Barometric Pressure Circuit Low Input		○	○
P0108 (05–342)	Manifold Absolute Pressure/ Barometric Pressure Circuit High Input		○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0110 (05–347)	Intake Air Temperature Circuit	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0112 (05–347)	Intake Air Temperature Circuit Low Input	• Short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0113 (05–347)	Intake Air Temperature Circuit High Input	• Open in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0115 (05–351)	Engine Coolant Temperature Circuit	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0116 (05–355)	Engine Coolant Temperature Circuit Range/Performance Problem	• Cooling system • Engine coolant temperature sensor • Thermostat	○	○
P0117 (05–351)	Engine Coolant Temperature Circuit Low Input	• Short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0118 (05–351)	Engine Coolant Temperature Circuit High Input	• Open in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0120 (05–356)	Throttle/Pedal Position Sensor/ Switch "A" Circuit	• Throttle position sensor (built in throttle body) • ECM	○	○
P0121 (05–362)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Range/Performance Problem	• Throttle position sensor (built in throttle body)	○	○
P0122 (05–356)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low Input	• Throttle position sensor (built in throttle body) • VTA1 circuit short • VC circuit open • ECM	○	○
P0123 (05–356)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	• Throttle position sensor (built in throttle body) • VTA1 circuit open • E2 circuit open • VC and VTA1 circuit are short–circuited • ECM	○	○
P0130 *3 (05–363)	Oxygen Sensor Circuit (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay • Air induction system • Fuel pressure • Injector • ECM	○	○
P0133 *3 (05–374)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay • Air induction system • Fuel pressure • Injector • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0134 (05–381)	Oxygen Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay • Air induction system • Fuel pressure • Injector • Gas leakage in exhaust system • PCV valve and hose • PCV hose connection • ECM	○	○
P0136 *3 (05–388)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay	○	○
P0150 *3 (05–363)	Oxygen Sensor Circuit (Bank 2 Sensor 1)	• Same as DTC No. P0130	○	○
P0153 *3 (05–374)	Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 1)	• Same as DTC No. P0133	○	○
P0154 (05–381)	Oxygen Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	• Same as DTC No. P0134	○	○
P0156 *3 (05–388)	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)	• Same as DTC No. P0136	○	○
P0171 *3 (05–394)	System too Lean (Bank 1)	• Air induction system • Injector blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • PCV valve and hose • PCV hose connection • ECM	○	○
P0172 *3 (05–394)	System too Rich (Bank 1)	• Injector leak, blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0174 *3 (05–394)	System too Lean (Bank2)	• Air induction system • Injector blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 2 sensor 1) circuit • Heated oxygen sensor (bank 2 sensor 1) • Heated oxygen sensor heater (bank 2 sensor 1) • EFI relay • PCV valve and hose • PCV hose connection • ECM	○	○
P0175 *3 (05–394)	System too Rich (Bank2)	• Injector leak, blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 2 sensor 1) circuit • Heated oxygen sensor (bank 2 sensor 1) • ECM	○	○
P0190 (05–406)	Fuel Rail Pressure Sensor Circuit	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM	○	○
P0191 (05–410)	Fuel Rail Pressure Sensor Circuit Range/Performance	• Open or short in high–pressure fuel pump (spill valve) circuit • High–pressure fuel pump • Low–pressure fuel pump • Fuel pipe • Fuel relief valve • Fuel pressure regulator • ECM	○	○
P0200 (05–415)	Injector Circuit/Open	• Open or short in EDU circuit • EDU (Injector driver) • Fuel injector assy • ECM	○	○
P0201 (05–415)	Injector Circuit/Open – (Cylinder 1)		○	○
P0202 (05–415)	Injector Circuit/Open – (Cylinder 2)		○	○
P0203 (05–415)	Injector Circuit/Open – (Cylinder 3)		○	○
P0204 (05–415)	Injector Circuit/Open – (Cylinder 4)		○	○
P0220 (05–356)	Throttle/Pedal Position Sensor/ Switch "B" Circuit	• Throttle position sensor (built in throttle body) • ECM	○	○
P0222 (05–356)	Throttle/Pedal Position Sensor/ Switch "B" Circuit Low Input	• Throttle position sensor (built in throttle body) • VTA2 circuit short • VC circuit open • ECM	○	○
P0223 (05–356)	Throttle/Pedal Position Sensor/ Switch "B" Circuit High Input	• Throttle position sensor (built in throttle body) • VTA2 circuit open • E2 circuit open • VC and VTA2 circuit are short–circuited • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0300 *3 (05–420)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • PCV hose • ECM	○*2	○
P0301 *3 (05–420)	Cylinder 1 Misfire Detected		○*2	○
P0302 *3 (05–420)	Cylinder 2 Misfire Detected		○*2	○
P0303 *3 (05–420)	Cylinder 3 Misfire Detected		○*2	○
P0304 *3 (05–420)	Cylinder 4 Misfire Detected		○*2	○
P0325 (05–429)	Knock Sensor 1 Circuit (Bank 1 or Single Sensor)	• Knock sensor • Knock sensor (under–torqued or loose) • ECM	○	○
P0327 (05–429)	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	• Short in knock sensor circuit • Knock sensor • ECM	○	○
P0328 (05–429)	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	• Open in knock sensor circuit • Knock sensor • ECM	○	○
P0335 (05–433)	Crankshaft Position Sensor "A" Circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft position sensor plate No. 1) • ECM	○	○
P0339 (05–433)	Crankshaft Position Sensor "A" Circuit Intermittent		—	○
P0340 (05–436)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing gear • Timing chain has jumped a tooth • ECM	○	○
P0341 (05–436)	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)		○	○
P0351 (05–439)	Ignition Coil "A" Primary/Secondary Circuit	• Ignition system • Open or short in IGF and IGT circuit from ignition coil with igniter to ECM (ignition coil circuit 1 through 4) • Ignition coil with igniter (ignition coil 1 through 4) • IG2 relay • ECM	○	○
P0352 (05–439)	Ignition Coil "B" Primary/Secondary Circuit		○	○
P0353 (05–439)	Ignition Coil "C" Primary/Secondary Circuit		○	○
P0354 (05–439)	Ignition Coil "D" Primary/Secondary Circuit		○	○
P0420 *3 (05–446)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage in exhaust system • Heated oxygen sensor • Three–way catalytic converter (inside exhaust manifold)	○	○
P0430 *3 (05–446)	Catalyst System Efficiency Below Threshold (Bank 2)		○	○
P0443 (05–449)	Evaporative Emission Control System Purge Control Valve Circuit	• Open of short in VSV circuit for EVAP • VSV for EVAP • ECM	○	○
P0500 (05–453)	Vehicle Speed Sensor "A"	• Combination meter • Open or short in speed sensor circuit • Vehicle speed sensor • ECM • Skid control ECU • Clutch or brake slips or gear is broken	○	○
P0504 (05–455)	Brake Switch Correlation	• Short in stop light switch signal circuit • Stop light switch • ECM	—	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0555 (05–459)	Brake Booster Pressure Sensor Circuit	• Open or short in brake booster pressure sensor circuit • Brake booster pressure sensor • Vacuum hose • ECM	○	○
P0556 (05–462)	Brake Booster Pressure Sensor CircuitRange/Performance	• Vacuum hose (between the brake booster and intake manifold, the brake booster and brake booster pressure sensor, and the intake manifold and manifold absolute pressure sensor) • Open or short in brake booster pressure sensor circuit • Brake booster pressure sensor • Manifold absolute pressure sensor • Brake booster • Open or short in stop light switch circuit • Stop light switch • ECM	○	○
P0557 (05–459)	Brake Booster Pressure Sensor Circuit Low Input	• Same as DTC No. P0555	○	○
P0558 (05–459)	Brake Booster Pressure Sensor Circuit High Input	• Same as DTC No. P0555	○	○
P0560 (05–467)	System Voltage	• Open in back–up power source circuit • ECM	○	○
P0571 (05–1711)	Brake Switch "A" Circuit	• Cruise control system	—	○
P0604 (05–470)	Internal Control Module Random Access Memory (RAM) Error	• ECM	○	○
P0606 (05–470)	ECM/PCM Processor		○	○
P0607 (05–470)	Control Module Performance		○	○
P0617 (05–471)	Starter Relay Circuit High	• Short in park/neutral position switch (A/T) • Park/neutral position switch (A/T) • Ignition switch • ECM	○	○
P0657 (05–470)	Actuator Supply Voltage Circuit / Open	• ECM	○	○
P0705 *4 (05–474)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	○	○
P0710 *4 (05–941)	Transmission Fluid Temperature Sensor "A" circuit	• Electronic controlled automatic transmission (ECT)	○	○
P0711 *3,4 (05–943)	Transmission Fluid Temperature Sensor "A" Performance	• Electronic controlled automatic transmission (ECT)	○	○
P0712 *4 (05–941)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	• Electronic controlled automatic transmission (ECT)	○	○
P0713 *4 (05–941)	Transmission Fluid Temperature Sensor "A" Circuit High Input	• Electronic controlled automatic transmission (ECT)	○	○
P0717 *4 (05–945)	Input/Turbine Speed Sensor "A" Circuit No Signal	• Electronic controlled automatic transmission (ECT)	○	○
P0724 *4 (05–947)	Brake Switch "B" Circuit High	• Short in stop light switch signal circuit • Stop light switch • ECM	○	○
P0741 *3,4 (05–948)	Torque Converter Clutch Circuit Performance or Stuck Off	• Electronic controlled automatic transmission (ECT)	○	○
P0743 *4 (05–951)	Torque Converter Clutch Circuit Electrical	• Electronic controlled automatic transmission (ECT)	○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0746 *3,4 (05–954)	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)	• Electronic controlled automatic transmission (ECT)	○	○
P0748 *4 (05–956)	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	• Electronic controlled automatic transmission (ECT)	○	○
P0766 *3,4 (05–962)	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	• Electronic controlled automatic transmission (ECT)	○	○
P0776 *3,4 (05–963)	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	• Electronic controlled automatic transmission (ECT)	○	○
P0778 *4 (05–956)	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	• Electronic controlled automatic transmission (ECT)	○	○
P0793 *4 (05–965)	Intermediate Shaft Speed Sensor "A" Circuit No Signal	• Electronic controlled automatic transmission (ECT)	○	○
P0982 *4 (05–956)	Shift Solenoid "D" Control Low	• Electronic controlled automatic transmission (ECT)	○	○
P0983 *4 (05–956)	Shift Solenoid "D" Control High	• Electronic controlled automatic transmission (ECT)	○	○
P1235 (05–477)	High Pressure Fuel Pump Circuit	• Open or short in fuel pump (high pressure) • Fuel pump (high pressure) • ECM	○	○
P2008 (05–480)	Intake Manifold Runner Control Circuit/Open (Bank 1)	• Open of short in VSV for IACV circuit • VSV for IACV • ECM	○	○
P2102 (05–483)	Throttle Actuator Control Motor Circuit Low	• Open in throttle control motor circuit • Throttle control motor • ECM	○	○
P2103 (05–483)	Throttle Actuator Control Motor Circuit High	• Short in throttle control motor circuit • Throttle control motor • ECM	○	○
P2111 (05–485)	Throttle Actuator Control System – Stuck Open	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve	○	○
P2112 (05–485)	Throttle Actuator Control System – Stuck Closed		○	○
P2118 (05–487)	Actuator Control Motor Current Range/Performance	• Open in ETCS power source circuit • ECM	○	○
P2119 (05–490)	Throttle Actuator Control Throttle Body Range/Performance	• Electric throttle control system • ECM	○	○
P2120 (05–492)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P2121 (05–499)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P2122 (05–492)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	• Same as DTC No. P2120	○	○
P2123 (05–492)	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input		○	○
P2125 (05–492)	Throttle/Pedal Position Sensor/ Switch "E" Circuit		○	○
P2127 (05–492)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input		○	○
P2128 (05–492)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input		○	○
P2135 (05–356)	Throttle Pedal Position Sensor/ Switch "A"/"B" Voltage Correlation	• VTA1 and VTA2 circuit are short–circuited • Throttle position sensor (built in throttle body) • ECM	○	○
P2138 (05–492)	Throttle Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	• Same as DTC No. P2120	○	○
P2195 *3 (05–363)	Oxygen Sensor Signal Stuck Lean (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM	○	○
P2196 *3 (05–363)	Oxygen Sensor Signal Stuck Rich (Bank 1 Sensor 1)		○	○
P2197 *3 (05–363)	Oxygen Sensor Signal Stuck Lean (Bank 2 Sensor 1)		○	○
P2198 *3 (05–363)	Oxygen Sensor Signal Stuck Rich (Bank 2 Sensor 1)		○	○
P2716 *4 (05–967)	Pressure Control Solenoid "D" Electrical	• Electronic controlled automatic transmission (ECT)	○	○
B2799 (05–1625)	Engine Immobiliser System Malfunction	• Immobiliser system	—	○

*1: CHK ENG (Check engine warning light) is illuminated
*2: CHK ENG (Check engine warning light) is illuminated or blinks
*3: For Euro–OBD vehicles only.
*4: For A/T only.

DTC	P2121	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page 05–492.

DTC No.	DTC Detection Condition	Trouble Area
P2121	Conditions (a) and (b) continue for 0.5 seconds: (a) Difference between VPA and VPA2 exceeds the threshold (b) IDL is OFF	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM

WIRING DIAGRAM

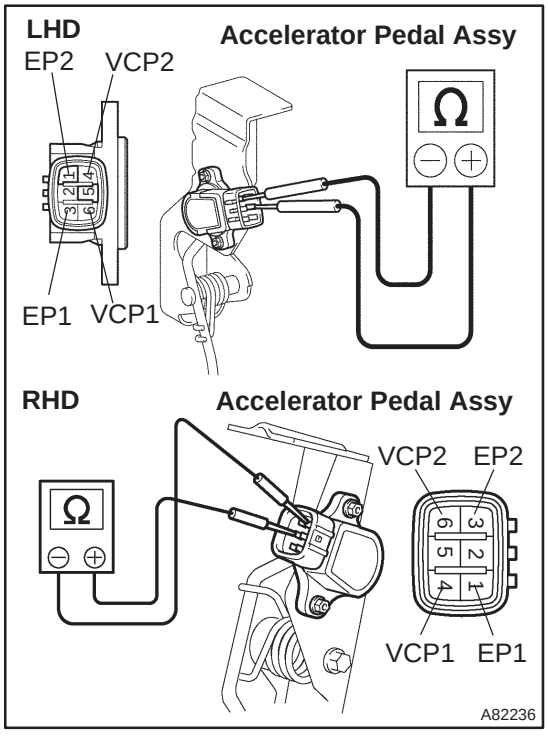
Refer to DTC P2120 on page 05–492.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A20 accelerator pedal position sensor connector.

(b) Measure the resistance between each terminal.

Standard (LHD):

Symbols (Terminal No.)	Resistance
EP1 (3) – VCP1 (6)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (1) – VCP2 (4)	

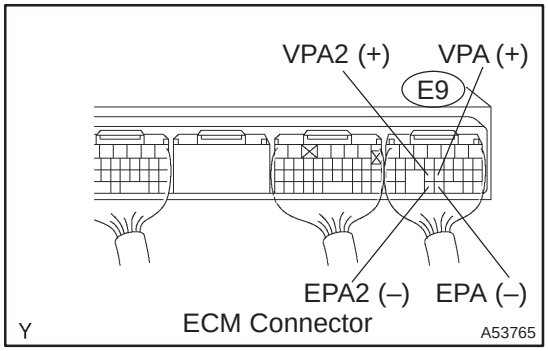
Standard (RHD):

Symbols (Terminal No.)	Resistance
EP1 (1) – VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) – VCP2 (6)	

NG → **REPLACE ACCELERATOR PEDAL ASSY**

OK

2 INSPECT ECM(VPA AND VPA2 VOLTAGE)



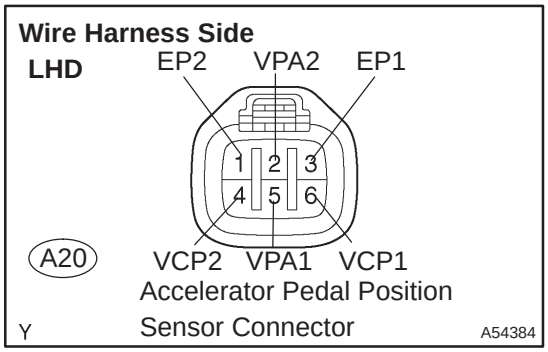
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

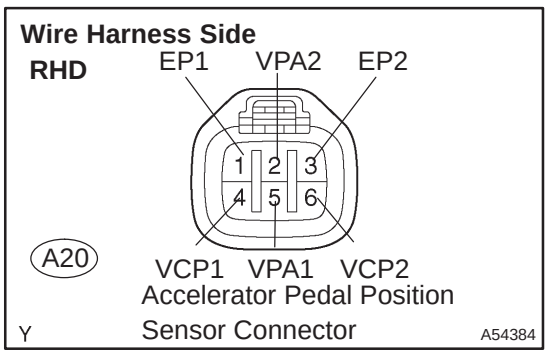
Accelerator pedal position	Symbols (Terminal No.)	Symbols (Terminal No.)
	VPA (E9–22) – EPA (E9–28)	VPA2 (E9–23) – EPA2 (E9–29)
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

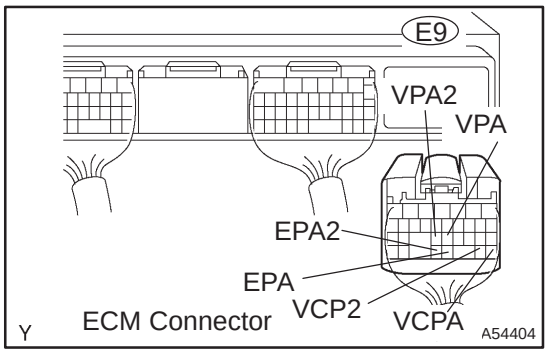
OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

3 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)







(a) Disconnect the accelerator pedal position sensor connector.
(b) Disconnect the E9 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (LHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–3) – EPA (E9–28)	
VCP1 (A20–6) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–1) – EPA2 (E9–29)	
VCP2 (A20–4) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–3) or EPA (E9–28) – Body ground	
VCP1 (A20–6) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–1) or EPA2 (E9–29) – Body ground	
VCP2 (A20–4) or VCP2 (E9–27) – Body ground	

Standard (RHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–1) – EPA (E9–28)	
VCP1 (A20–4) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–3) – EPA2 (E9–29)	
VCP2 (A20–6) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–1) or EPA (E9–28) – Body ground	
VCP1 (A20–4) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–3) or EPA2 (E9–29) – Body ground	
VCP2 (A20–6) or VCP2 (E9–27) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

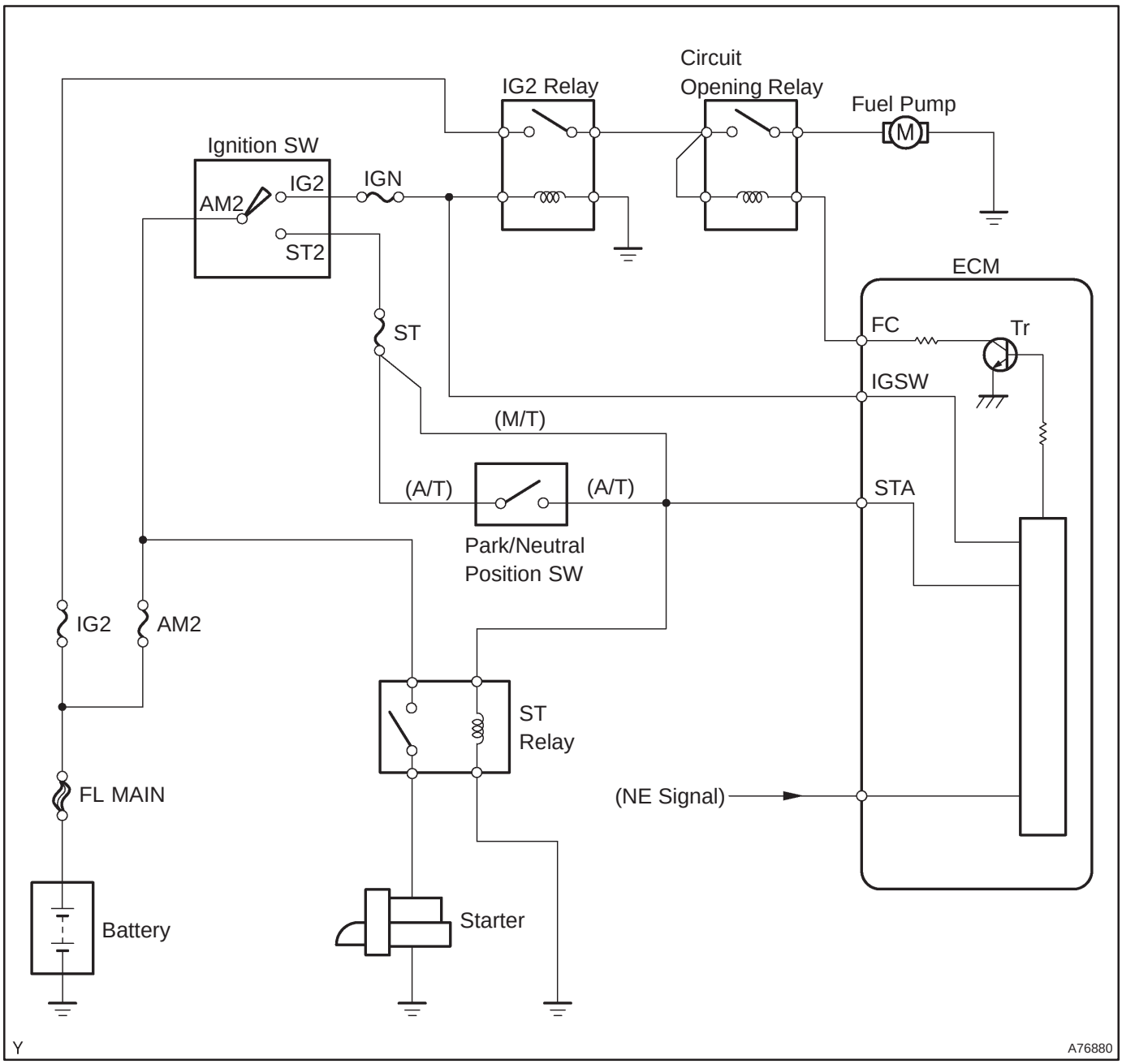
OK

REPLACE ACCELERATOR PEDAL ASSY (See page 10–66)

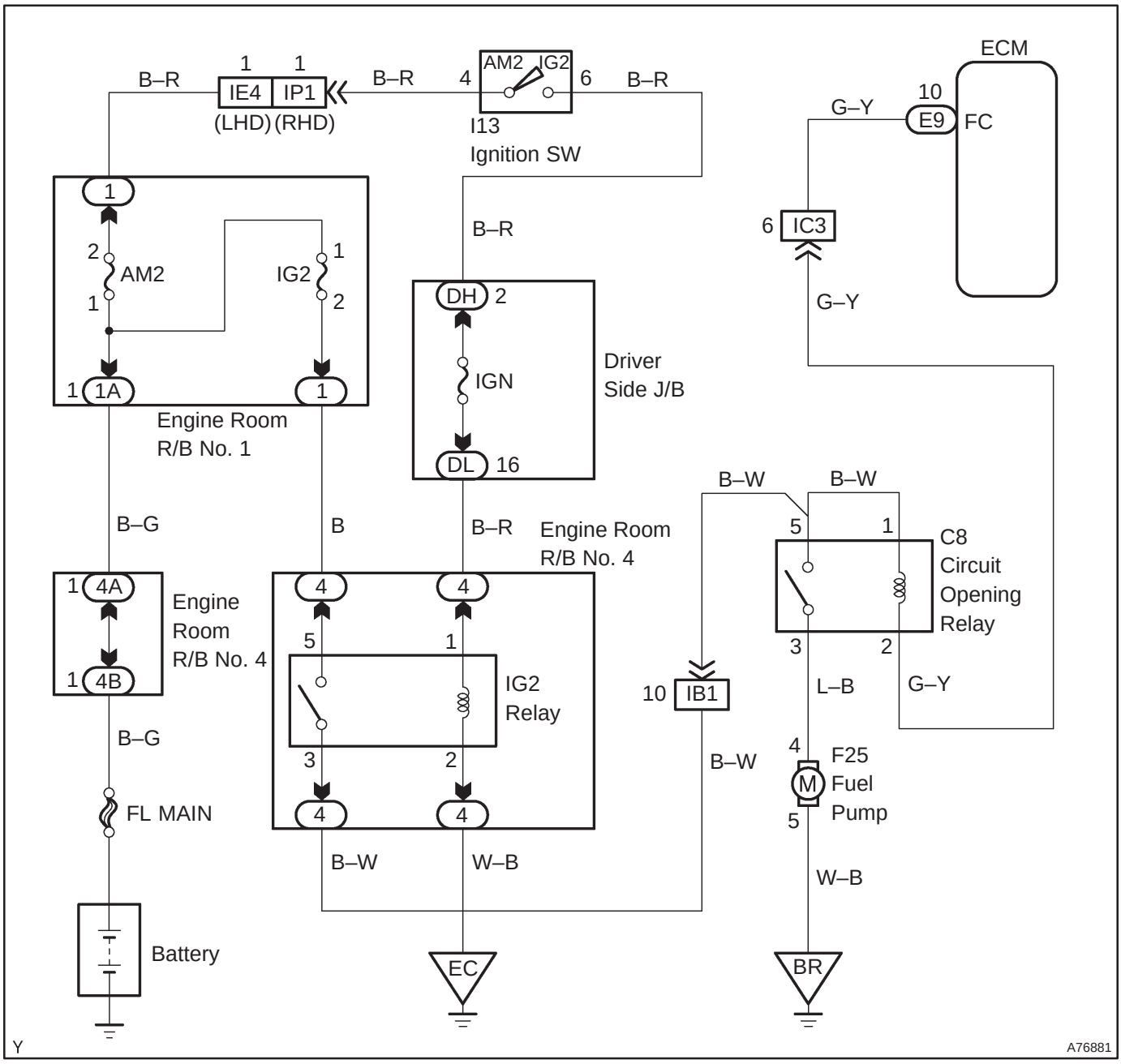
FUEL PUMP CONTROL CIRCUIT

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST2 of the ignition switch to the starter relay coil and also current flows to terminal STA of ECM (STA signal).
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to the coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates. While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



WIRING DIAGRAM



INSPECTION PROCEDURE

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATION OF CIRCUIT OPENING RELAY)

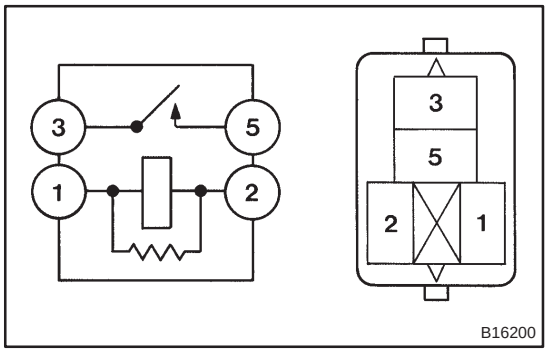
(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / FUEL PUMP/SPD”.
(c) Perform the ACTIVE TEST with the engine stopped.
Result: The circuit opening relay operates.

NG → **Go to step 2**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–320)

2	INSPECT CIRCUIT OPENING RELAY



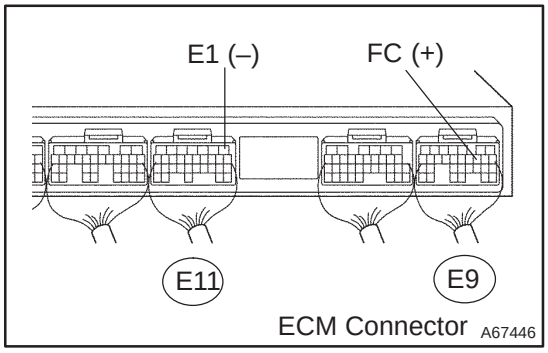
(a) Remove the circuit opening relay.
(b) Inspect the circuit opening relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE CIRCUIT OPENING RELAY**

OK

3	INSPECT ECM(FC VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 and E11 ECM connectors.
Standard:

Symbols (Terminal No.)	Specified condition
FC (E9–10) – E1 (E11–1)	9 to 14 V

NG → **Go to step 6**

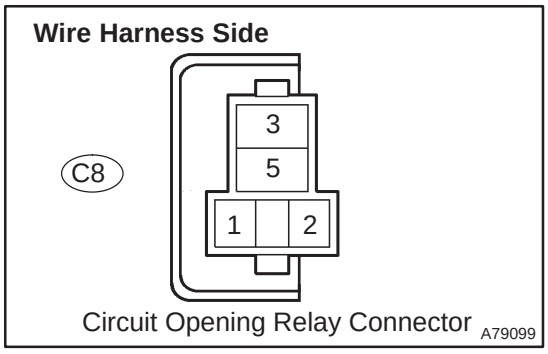
OK

4	INSPECT FUEL PUMP ASSY (See page 11–36)

NG → **REPLACE FUEL PUMP ASSY**

OK

5	CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP, FUEL PUMP – BODY GROUND)



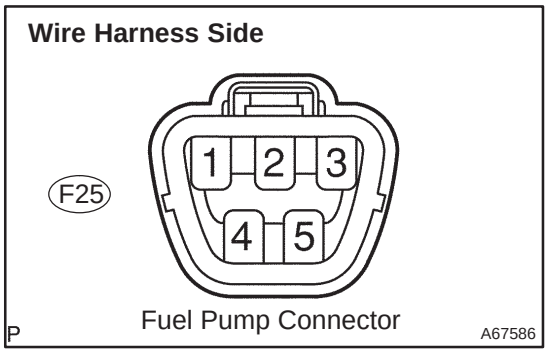
(a) Remove the circuit opening relay.
(b) Disconnect the F25 fuel pump connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) – Fuel pump (F25–4)	Continuity
Fuel pump (F25–5) – Body ground	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) or Fuel pump (F25–4) – Body ground	No continuity

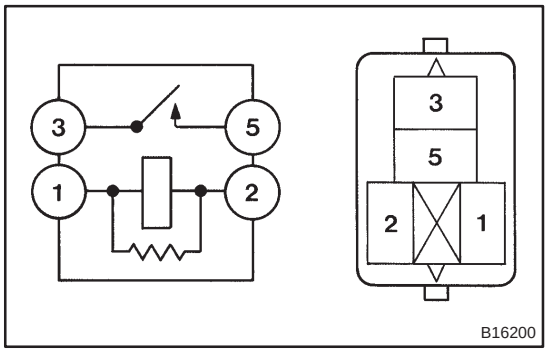


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

6	INSPECT IG2 RELAY



(a) Remove the IG2 relay from the engine room R/B No. 4.
(b) Inspect the IG2 relay.

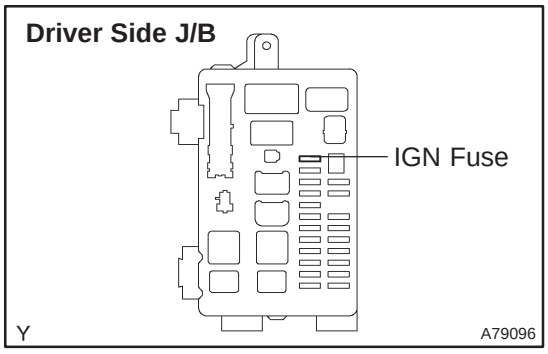
Standard:

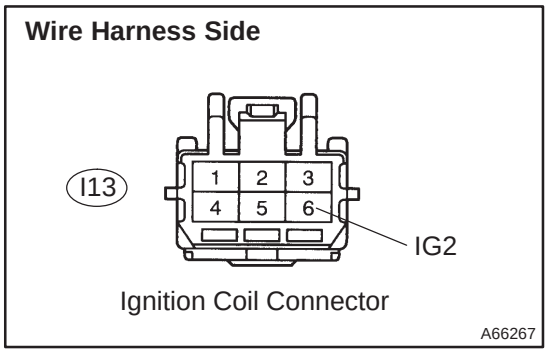
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

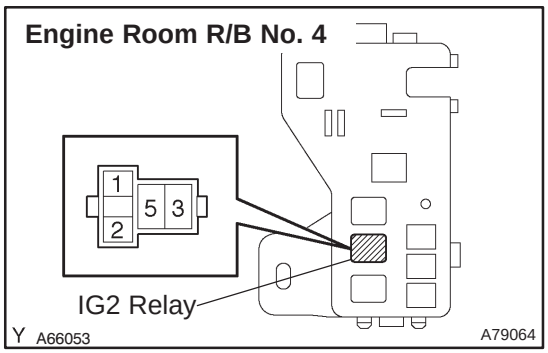
NG → **REPLACE IG2 RELAY**

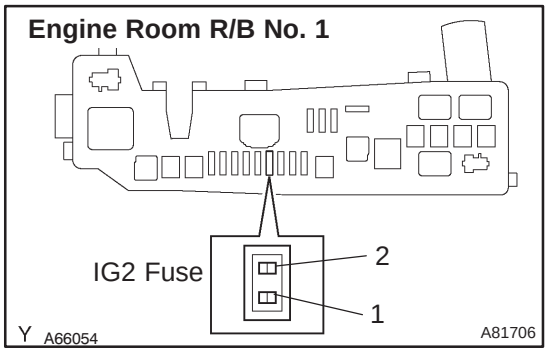
OK

7 CHECK HARNESS AND CONNECTOR(IGNITION SWITCH – IG2 RELAY, IG2 FUSE – IG2 RELAY)









(a) Check harness and connector between the IG2 relay and ignition switch.

(1) Inspect the IGN fuse.

- Remove the IGN fuse from the driver side J/B.
- Check for continuity in the IGN fuse.

Standard: Continuity

- Reinstall the IGN fuse.

(2) Disconnect the I13 ignition switch connector.

(3) Remove the IG2 relay.

(4) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) – IG2 relay (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) or IG2 relay (1) – Body ground	No continuity

(b) Check harness and connector between the IG2 relay and the IG2 fuse.

(1) Inspect the IG2 fuse.

- Remove the IG2 fuse from the engine room R/B No. 1.
- Check for continuity in the IG2 fuse.

Standard: Continuity

(2) Remove the IG2 relay from the engine room R/B No. 4.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 fuse (2) – IG2 relay (5)	Continuity

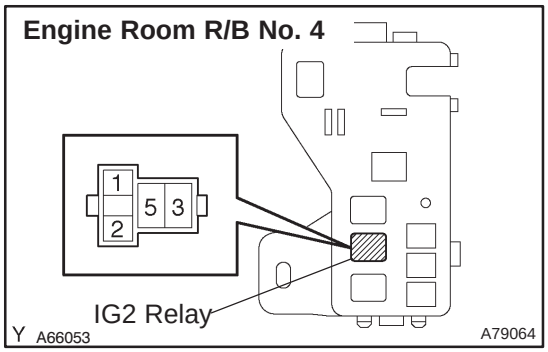
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 fuse (2) or IG2 relay (5) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8	CHECK HARNESS AND CONNECTOR(IG2 RELAY – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – ECM)



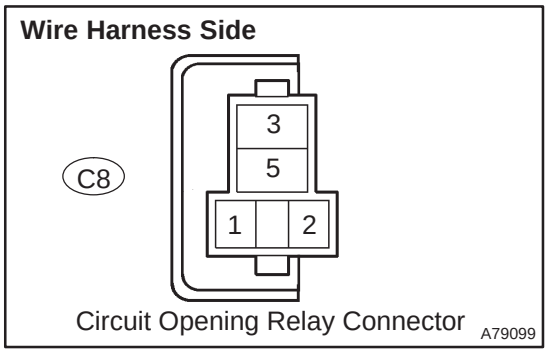
(a) Remove the IG2 relay from the engine room R/B No. 4.
(b) Remove the circuit opening relay.
(c) Disconnect the E9 ECM connector.
(d) Check for continuity between the wire harness side connectors.

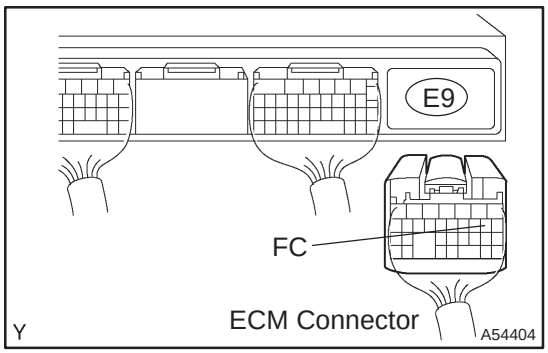
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 relay (3) – Circuit opening relay (C8–1)	Continuity
Circuit opening relay (C8–2) – FC (E9–10)	
IG2 relay (2) – Body ground	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 relay (3) or Circuit opening relay (C8–1) – Body ground	No continuity
Circuit opening relay (C8–2) or FC (E9–10) – Body ground	





NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE ECM (See page 01–32)

SFI SYSTEM (1AZ–FSE)

05CDS–01

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–293)

3	CONNECT THE HAND–HELD TESTER TO DLC3

HINT:
If the display indicates a communication fault in the tool, inspect the DLC3.

4	CHECK DTC AND FREEZE FRAME DATA (See page 05–294)

HINT:
Record or print DTC and freeze frame data, if needed.

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05–294)

6	VISUAL INSPECTION

7	SETTING THE CHECK (TEST) MODE DIAGNOSIS (See page 05–294)

8	PROBLEM SYMPTOM CONFIRMATION

HINT:
If the engine does not start, perform steps 10 and 12 first.

A	Malfunction does not occur
B	Malfunction occurs

B → GO TO STEP 10

A

9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05–294)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	DTC CHART (See page 05–309)

GO TO STEP 14

12	BASIC INSPECTION (See page 05–294)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	PROBLEM SYMPTOMS TABLE (See page 05–320)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05–502)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05–294)

GO TO STEP 18

17	PARTS INSPECTION

18	IDENTIFICATION OF PROBLEM

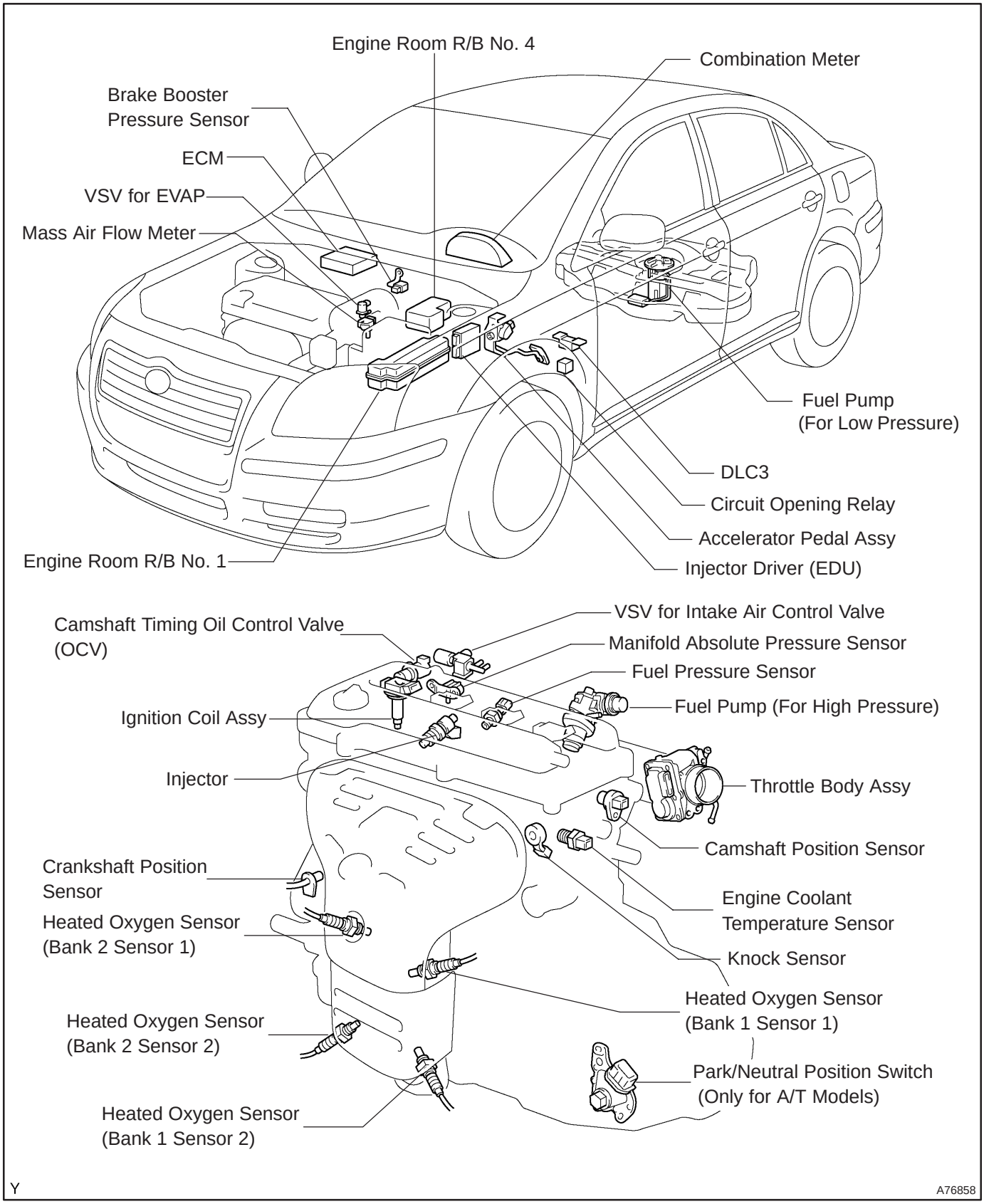
19	ADJUSTMENT, REPAIR

20	CONFIRMATION TEST

END

05CDV–01

LOCATION

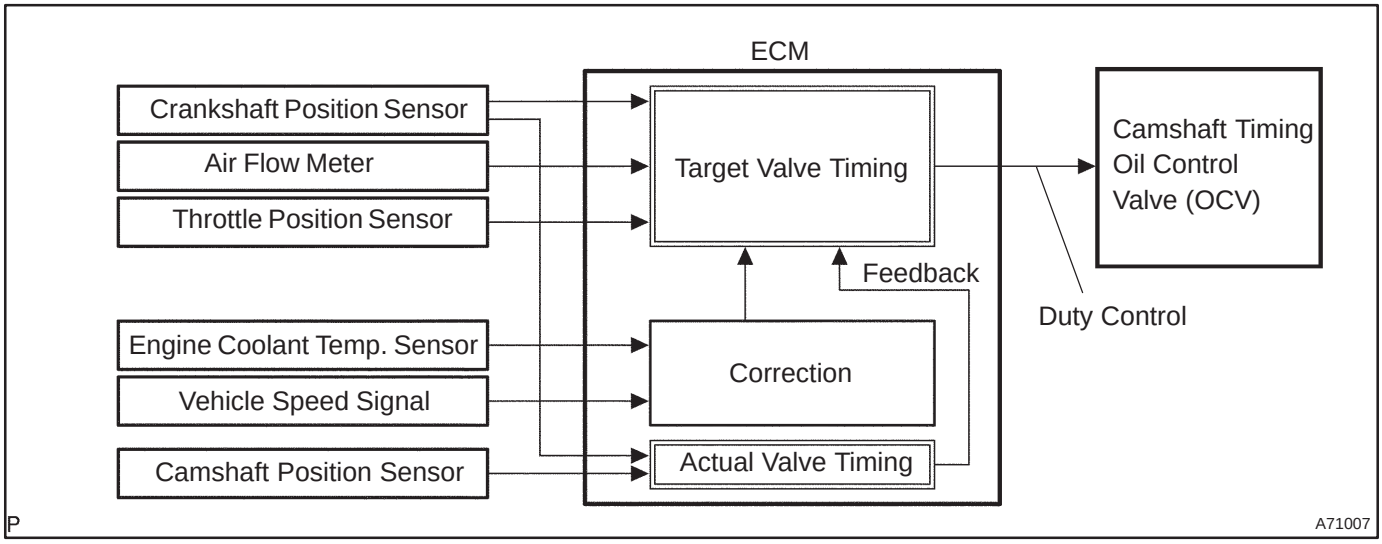


DTC	P0010	CAMSHAFT POSITION ”A” ACTUATOR CIRCUIT (BANK 1)

HINT:
This is the procedure of oil control valve (OCV).

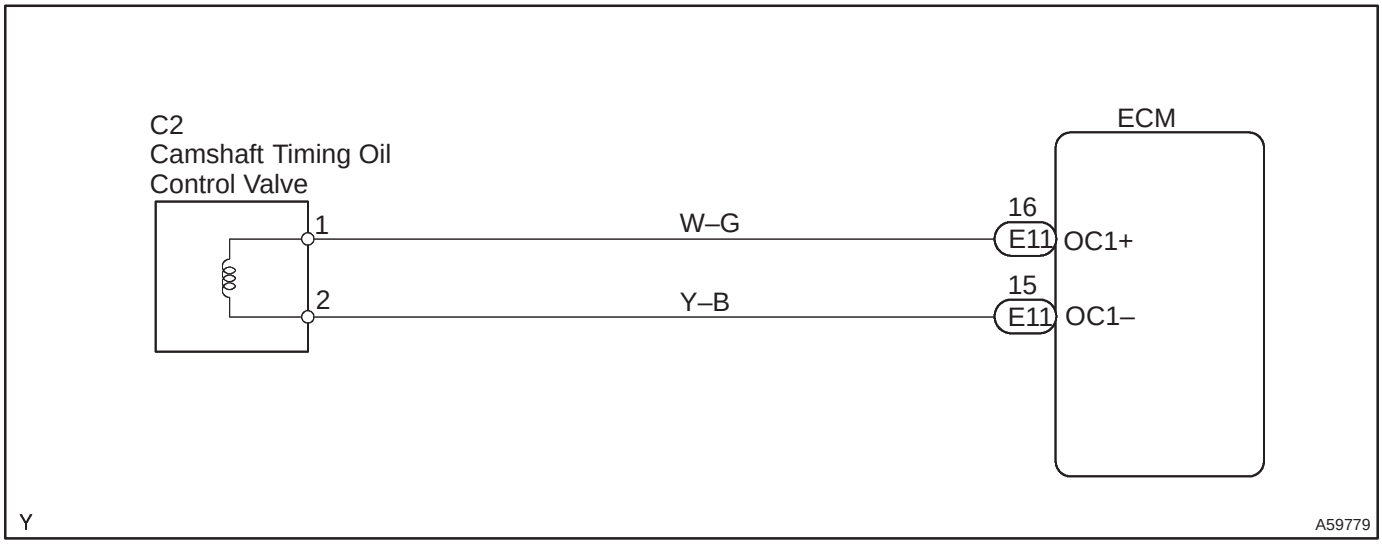
CIRCUIT DESCRIPTION

The VVT system controls the intake camshaft to provide the optimal valve timing for every driving condition. This control is performed based on the signals, such conditions as intake air volume, throttle position and engine coolant temperature.
The ECM controls the oil control valve (OCV), based on the signals output from the sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As result, the relative position between the camshaft and the crankshaft becomes optimal, and the engine torque improves, fuel economy improves, exhaust emissions decrease under overall driving conditions. Also, the ECM detects the actual valve timing using the signals from the camshaft position sensor and the crankshaft position sensor, and performs feedback control. This is how target valve timing is achieved by the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0010	Open or short in OCV circuit	• Open or short in OCV circuit • OCV • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE OCV)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / VVT CTRL B1”.
(e) Check the engine speed when operating the OCV by the hand–held tester.
Standard:

Tester operation	Specified condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK → CHECK FOR INTERMITTENT PROBLEMS

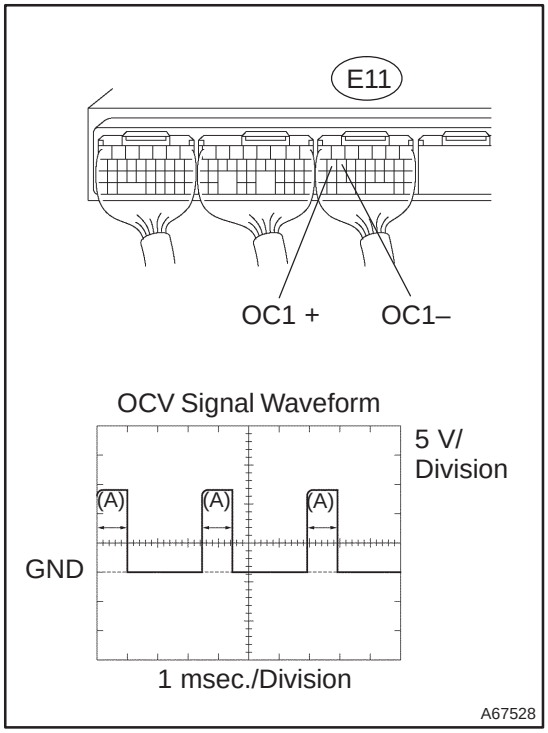
NG

2	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–39)

NG → REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY

OK

3 INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E11 ECM connector.

Standard:

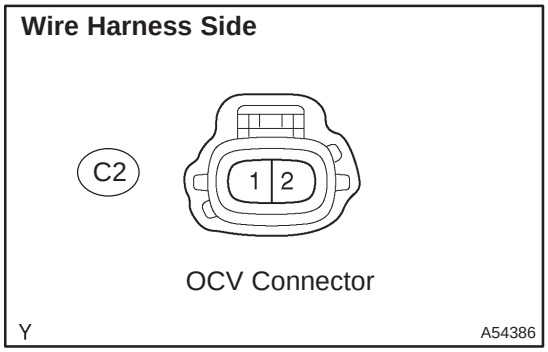
Symbols (Terminal No.)	Specified condition
OC1+ (E11–16) – OC1– (E11–15)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

4 CHECK HARNESS AND CONNECTOR(ECM – OCV)



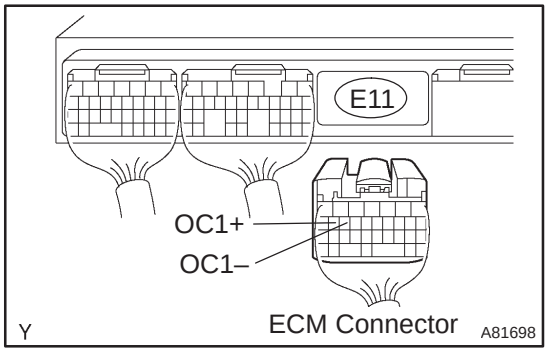
(a) Disconnect the C2 OCV connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OCV (C2–1) – OC1+ (E11–16)	Continuity
OCV (C2–2) – OC1– (E11–15)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OCV (C2–1) or OC1+ (E11–16) – Body ground	No continuity
OCV (C2–2) or OC1– (E11–15) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR INTERMITTENT PROBLEMS

DTC	P0011	CAMSHAFT POSITION ”A” –TIMING OVER–ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC	P0012	CAMSHAFT POSITION ”A” –TIMING OVER–RETARDED (BANK 1)

CIRCUIT DESCRIPTION

Refer to DTC P0010 on page 05–322.

DTC No.	DTC Detection Condition	Trouble Area
P0011	Condition (a) or (b) continues after engine is warmed up and engine speed at 400 to 4,000 rpm (Problem of the advanced OCV.): (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	• Valve timing • OCV • Camshaft timing gear assy • ECM
P0012	Condition (a) or (b) continues after engine is warmed up and engine speed at 400 to 4,000 rpm (Problem of the retarded OCV.): (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	

WIRING DIAGRAM

Refer to DTC P0010 on page 05–322.

INSPECTION PROCEDURE

HINT:

Advanced timing over (Valve timing is out of specified range)	P0011
Retarded timing over (Valve timing is out of specified range)	P0012

- If DTC ”P0011 or P0012” is displayed, check VVT system circuit.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK VALVE TIMING (See page 14–186)

NG → ADJUST VALVE TIMING (See page 14–186)

OK

2	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE OCV)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / VVT CTRL B1”.
(e) Check the engine speed when operating the OCV by the hand–held tester.
Standard:

Tester operation	Specified condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

NG → **Go to step 4**

OK

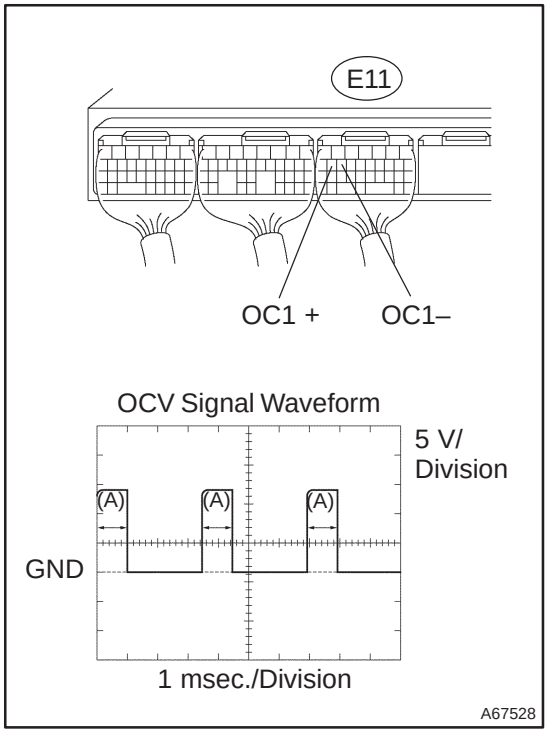
3	CHECK IF DTC OUTPUTS REOCCUR

(a) Clear the DTC.
(1) Operating the hand–held tester to erase the codes, or disconnecting the battery terminal or the EFI and ETCS fuses for 60 seconds or more.
(b) Start the engine and warm it up.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.
Standard: No DTC output.
HINT:
*: DTCs P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → **VVT SYSTEM OK ***

NG

4	INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E11 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
OC1+ (E11–16) – OC1– (E11–15)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

5	INSPECT OIL CONTROL VALVE FILTER

NG → **REPLACE OIL CONTROL VALVE FILTER**

OK

6	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–39)

OK → **Go to step 8**

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	INSPECT CAMSHAFT TIMING GEAR ASSY (See page 14–240)

OK → **Go to step 10**

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY (See page 14–240)

GO

10	CHECK BLOCKAGE(OCV, OIL CHECK VALVE AND OIL HOLE)

NG → REPAIR OR REPLACE

OK

11	CHECK IF DTC OUTPUTS REOCCUR

(a) Clear the DTC.
  (1) Operating the hand–held tester to erase the codes, or disconnecting the battery terminal or the EFI and ETCS fuses for 60 seconds or more.
(b) Start the engine and warm it up.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.

Standard: No DTC output.

HINT:

*: DTCs P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → VVT SYSTEM OK

NG

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0016	CRANKSHAFT POSITION –CAMSHAFT POSITION CORRELATION (BANK 1 SENSOR A)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page 05–433.

DTC No.	DTC Detection Condition	Trouble Area
P0016	Deviation in crankshaft position sensor signal and camshaft position sensor (bank 1) signal (2 trip detection logic)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM

WIRING DIAGRAM

Refer to DTC P0335 on page 05–433.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK VALVE TIMING (See page 14–186)

(a) Check for loose and jumping teeth of timing chain.

NG → ADJUST VALVE TIMING (See page 14–186) (REPAIR OR REPLACE TIMING CHAIN)

OK ↓

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0031	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC	P0032	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC	P0037	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

DTC	P0038	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC	P0051	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

DTC	P0052	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

DTC	P0057	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2)

DTC	P0058	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2)

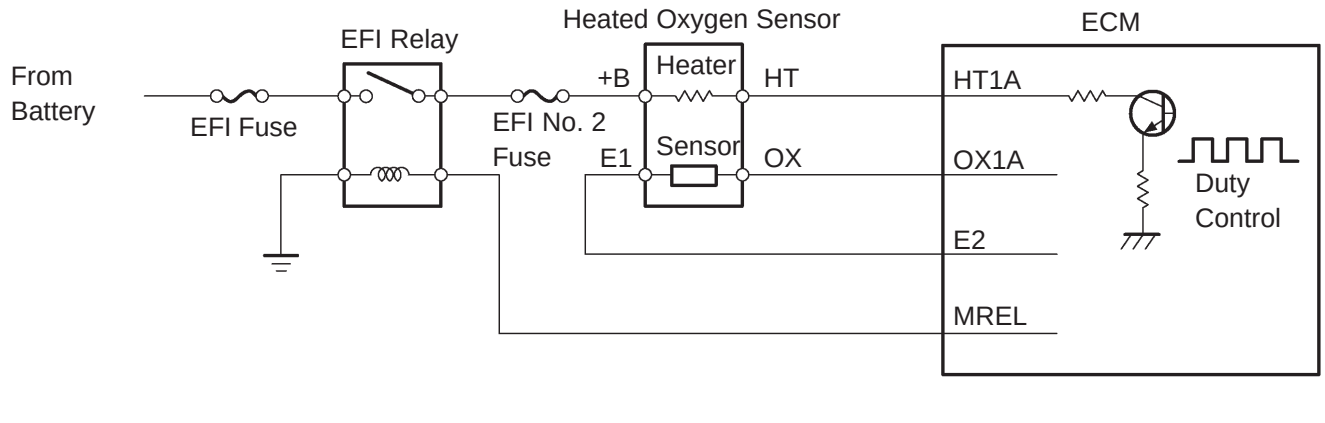
CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–363.

HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 1 System Drawing)



DTC No.	DTC Detection Condition	Trouble Area
P0031 P0037 P0051 P0057	Heated current is 0.2 A or less when heater operates with +B > 10.5 V and < 11.5 V (1 trip detection logic)	• Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • EFI fuse • EFI No. 2 fuse • ECM
	Heated current is 0.25 A or less when heater operates with +B ≧ 11.5 V (1 trip detection logic)	
P0032 P0038 P0052 P0058	Heated current exceeds 2 A when heater operates. (1 trip detection logic)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM

HINT:

- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

WIRING DIAGRAM

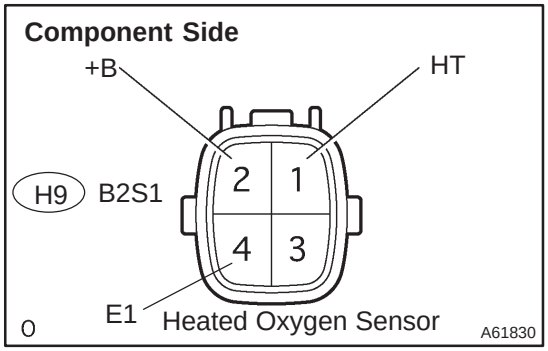
Refer to DTC P0130 on page 05–363.

INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H7, H8, H9 or H10 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

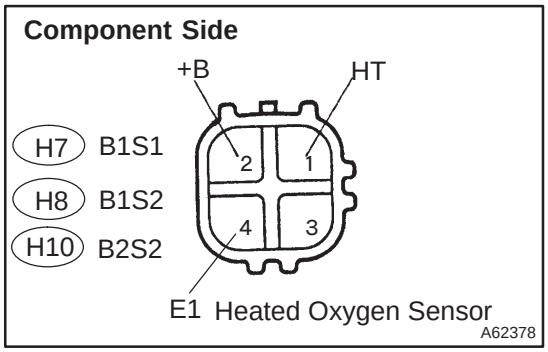
Standard (Bank 2 sensor 1):

Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity

(c) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Except Bank 2 sensor 1):

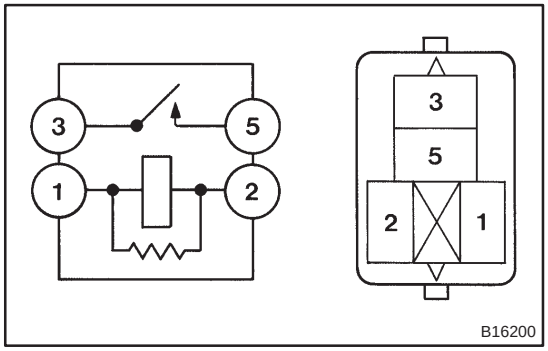
Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity



NG → **REPLACE HEATED OXYGEN SENSOR**

OK

2 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No. 4.

(b) Inspect the EFI relay.

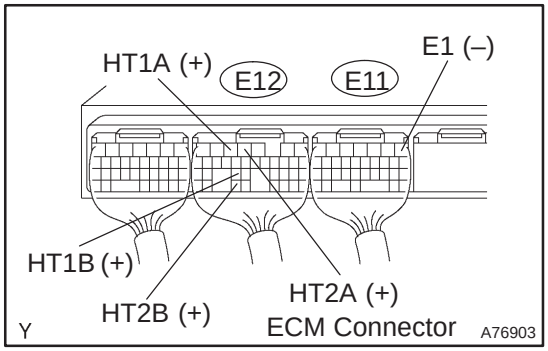
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

3 INSPECT ECM(HT1A, HT1B, HT2A OR HT2B VOLTAGE)



(a) Turn the ignition switch ON.

(b) Measure the voltage between the applicable terminals of the E11 and E12 ECM connectors.

Standard:

Symbols (Terminal No.)	Specified condition
HT1A (E12–5) – E1 (E11–1)	9 to 14 V
HT1B (E12–25) – E1 (E11–1)	
HT2A (E12–4) – E1 (E11–1)	
HT2B (E12–33) – E1 (E11–1)	

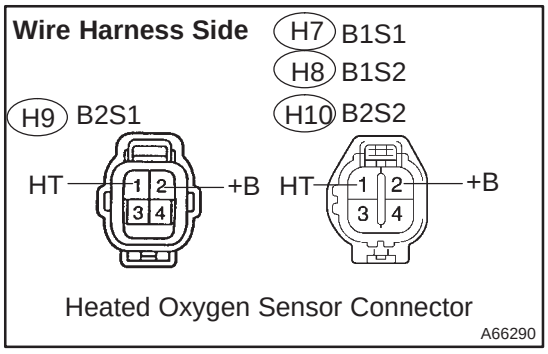
HINT:

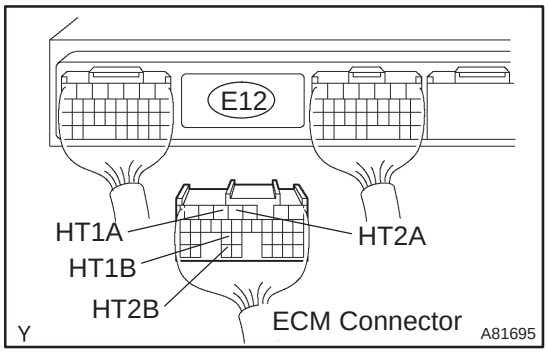
- The HT1A means the heated oxygen sensor bank 1 sensor 1.
- The HT1B means the heated oxygen sensor bank 1 sensor 2.
- The HT2A means the heated oxygen sensor bank 2 sensor 1.
- The HT2B means the heated oxygen sensor bank 2 sensor 2.

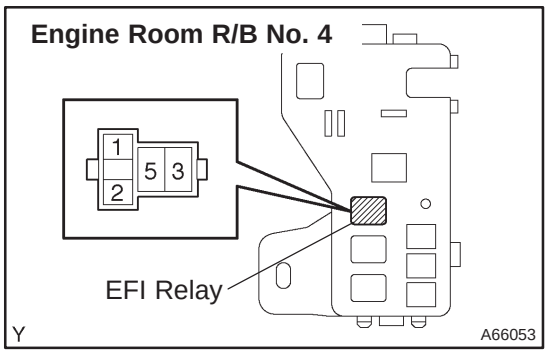
OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

4 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM, HEATED OXYGEN SENSOR – EFI RELAY)







(a) Check the harness and connector between the ECM and heated oxygen sensor connectors.

(1) Disconnect the H7, H8, H9 or H10 heated oxygen sensor connector.

(2) Disconnect the E12 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
HT (H7–1) – HT1A (E12–5)	Continuity
HT (H8–1) – HT1B (E12–25)	
HT (H9–1) – HT2A (E12–4)	
HT (H10–1) – HT2B (E12–33)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
HT (H7–1) or HT1A (E12–5) – Body ground	No continuity
HT (H8–1) or HT1B (E12–25) – Body ground	
HT (H9–1) or HT2A (E12–4) – Body ground	
HT (H10–1) or HT2B (E12–33) – Body ground	

(b) Check the harness and connector between the heated oxygen sensor connector and EFI relay.

(1) Inspect the EFI No.2 fuse.

- Remove the EFI No.2 fuse from the engine room R/B No. 4.
- Check for continuity in the EFI No.2 fuse.

Standard: Continuity

(2) Disconnect the H7, H8, H9 or H10 heated oxygen sensor connector.

(3) Remove the EFI relay from the engine room R/B No. 4.

(4) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (H7–2) – EFI relay (3)	Continuity
+B (H8–2) – EFI relay (3)	
+B (H9–2) – EFI relay (3)	
+B (H10–2) – EFI relay (3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (H7–2) or EFI relay (3) – Body ground	No continuity
+B (H8–2) or EFI relay (3) – Body ground	
+B (H9–2) or EFI relay (3) – Body ground	
+B (H10–2) or EFI relay (3) – Body ground	

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0100	MASS OR VOLUME AIR FLOW CIRCUIT

DTC	P0102	MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

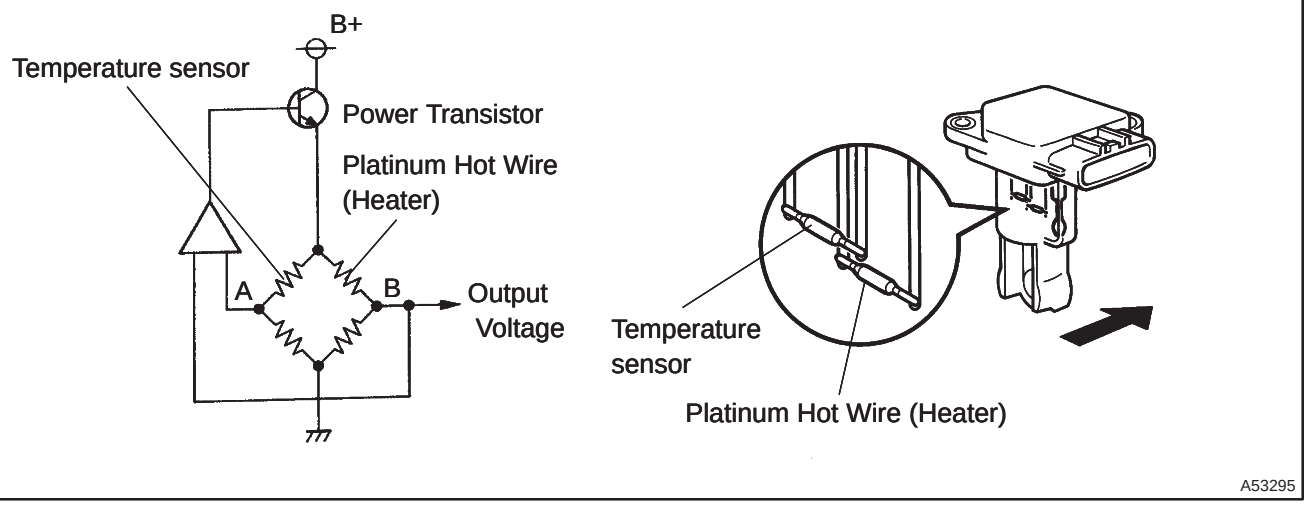
DTC	P0103	MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire. The hot wire mass air flow meter consists of a platinum hot wire, a temperature sensor and a control circuit installed in a plastic housing. The hot wire mass air flow meter works on the principle that the hot wire and temperature sensor located in the intake air bypass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the mass air flow meter.

The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



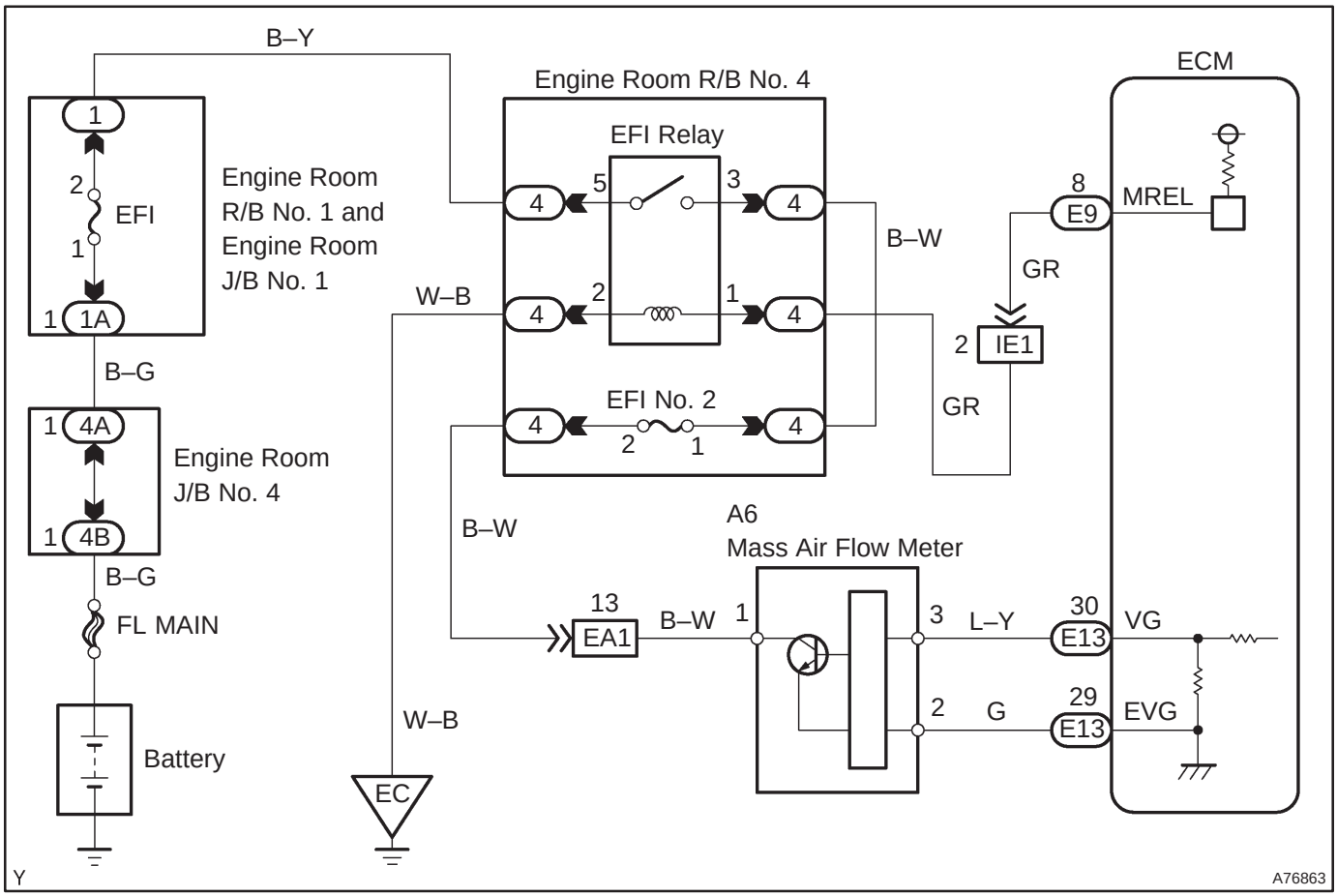
DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 seconds.	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P0102	Open in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 seconds.	
P0103	Short in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 seconds.	

HINT:

After confirming DTC ”P0100, P0102 or P0103”, use the hand–held tester to confirm the air flow rate from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Air flow rate (gm/s)	Malfunction
Approximately 0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• EVG circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

Result:

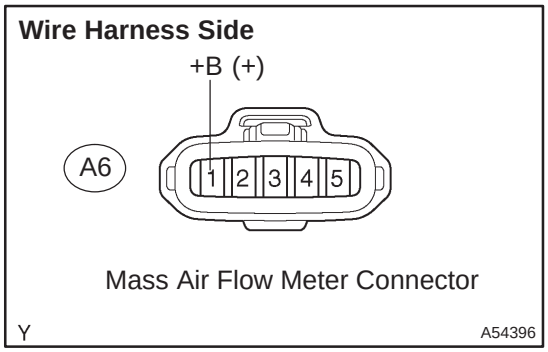
Air flow rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
1 ≦ Mass Air Flow Rate ≦ 270.0 (*1)	C

*1: The value must be changed when the throttle valve is opened or closed.

B	Go to step 5
C	CHECK FOR INTERMITTENT PROBLEMS

A

2 INSPECT MASS AIR FLOW METER(POWER SOURCE)



(a) Disconnect the A6 mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

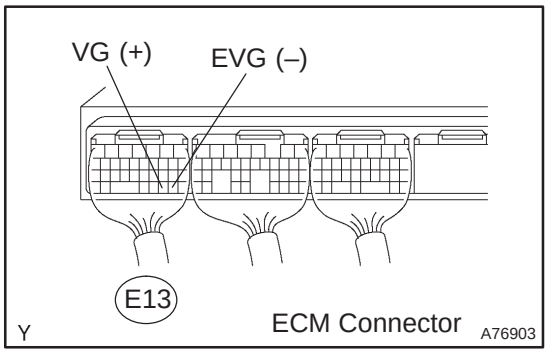
Standard:

Symbols (Terminal No.)	Specified condition
+B (A6–1) – Body ground	9 to 14 V

NG	Go to step 7

OK

3 INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

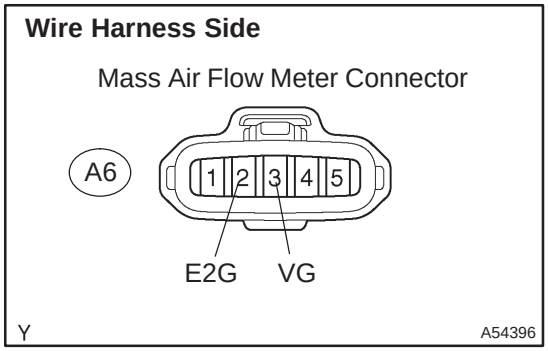
Symbols (Terminal No.)	Condition	Specified condition
VG (E13–30) – EVG (E13–29)	Engine is idling	0.5 to 3.0 V

HINT:
The shift position should be P or N and the A/C switch should be turned OFF.

OK	CHECK AND REPLACE ECM (See page 01–32)

NG

4 CHECK HARNESS AND CONNECTOR(ECM – MASS AIR FLOW METER)



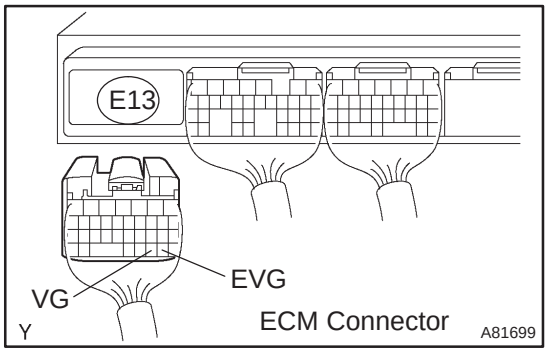
(a) Disconnect the A6 mass air flow meter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E13–30)	Continuity
E2G (A6–2) – EVG (E13–29)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E13–30) – Body ground	No continuity

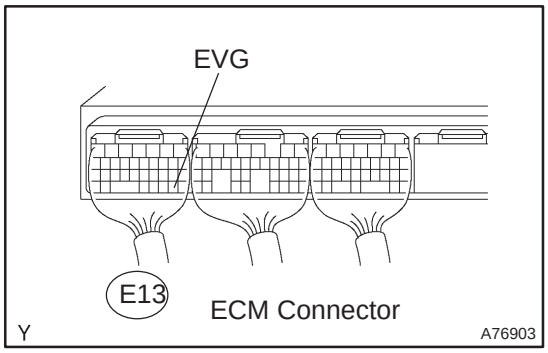


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

5 INSPECT ECM(SENSOR GROUND)



(a) Check for continuity between the terminal of the E13 ECM connector and body ground.

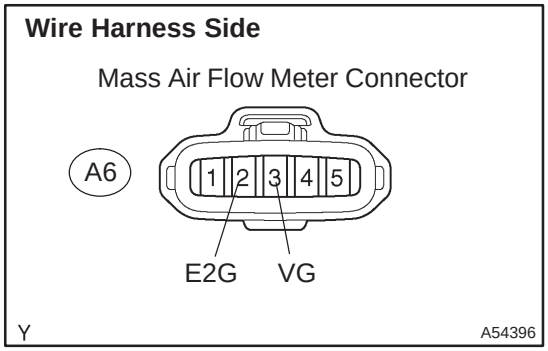
Standard:

Symbols (Terminal No.)	Specified condition
EVG (E13–29) – Body ground	Continuity

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

6 CHECK HARNESS AND CONNECTOR(ECM – MASS AIR FLOW METER)



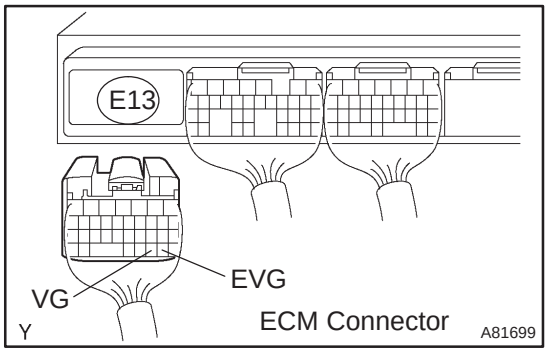
(a) Disconnect the A6 mass air flow meter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E13–30)	Continuity
E2G (A6–2) – EVG (E13–29)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E13–30) – Body ground	No continuity

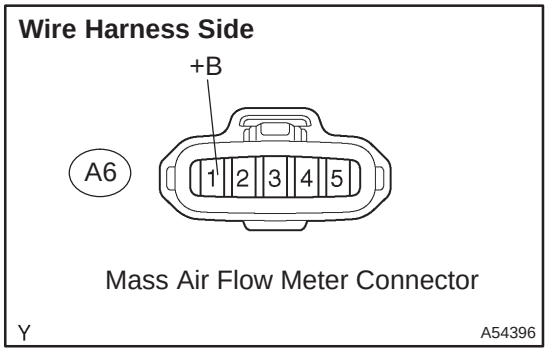


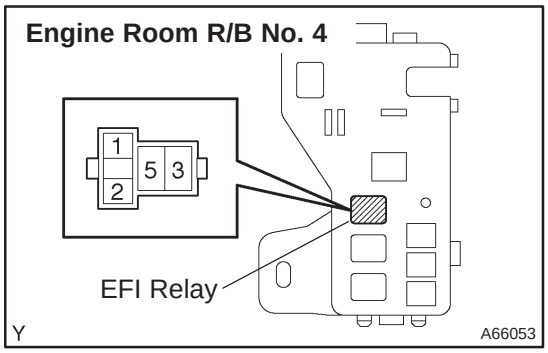
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

7	CHECK HARNESS AND CONNECTOR(EFI RELAY – MASS AIR FLOW METER)





(a) Inspect the EFI No. 2 fuse.
  (1) Remove the EFI No. 2 fuse from the engine room R/B No. 4.
  (2) Check for continuity in the EFI No. 2 fuse.

Standard: Continuity

(b) Disconnect the A6 mass air flow meter connector.

(c) Remove the EFI relay from the engine room R/B No. 4.

(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (A6–1) – EFI relay (3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (A6–1) or EFI relay (3) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

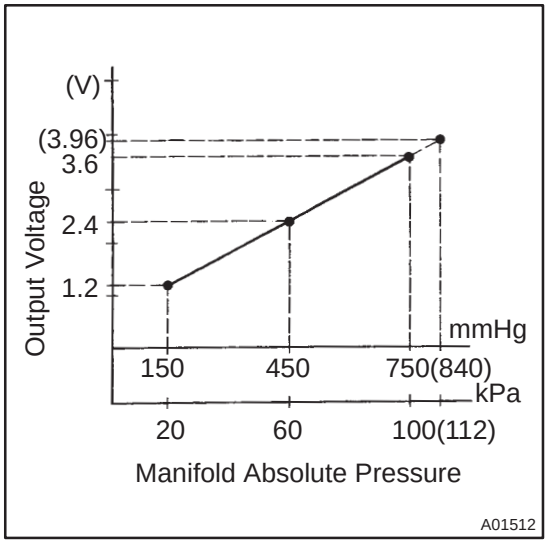
CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–502)

DTC	P0105	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT

DTC	P0107	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC	P0108	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION



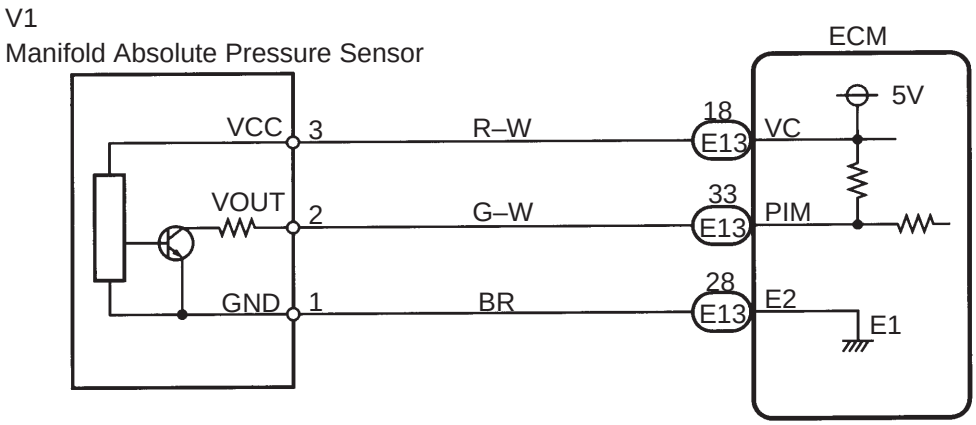
By a built–in sensor unit, the manifold absolute pressure sensor detects the intake manifold pressure as a voltage. The ECM then determines the basic injection duration and basic ignition advance angle based on this voltage.
Since the manifold absolute pressure sensor does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake manifold (the pressure in proportion to the preset absolute vacuum 0), it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. This permits it to control the air fuel ratio at the proper level under all conditions.
If the ECM detects the DTC ”P0105, P0107 or P0108”, it operates the fail–safe function, keeping the ignition timing and fuel injection volume constant and making it possible to drive the vehicle.

DTC No.	DTC Detection Condition	Trouble Area
P0105	Open or short in manifold absolute pressure sensor circuit for 0.5 sec. or more	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM
P0107	Open in manifold absolute pressure sensor circuit for 0.5 sec. or more	
P0108	Short in manifold absolute pressure sensor circuit for 0.5 sec. or more	

HINT:
After confirming DTC ”P0105, P0107 or P0108”, use the hand–held tester to confirm the manifold absolute pressure from ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Manifold Absolute Pressure (kPa)	Malfunction
Approximately 0	• PIM circuit short
142 or more	• VC circuit open or short • PIM circuit open • E2 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**READ VALUE OF HAND–HELD TESTER(INTAKE MANIFOLD ABSOLUTE PRESSURE)**

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAP” and read its value displayed on the hand–held tester.
Pressure: Same as the atmospheric pressure
Result:

Manifold Absolute Pressure (kPa)	Proceed to
142 or more	A
0.0	B
OK (Same as present pressure) (*1)	C

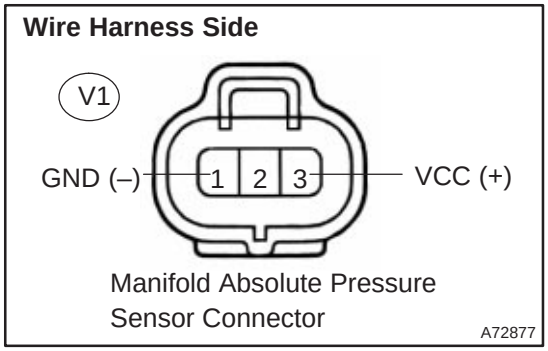
*1: The value must be changed when the engine is run or stopped.

B → **Go to step 3**

C → **CHECK FOR INTERMITTENT PROBLEMS**

A

2 INSPECT MANIFOLD ABSOLUTE PRESSURE SENSOR(VCC VOLTAGE)



(a) Disconnect the V1 manifold absolute pressure sensor connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the specified terminals of the V1 manifold absolute pressure sensor connector.

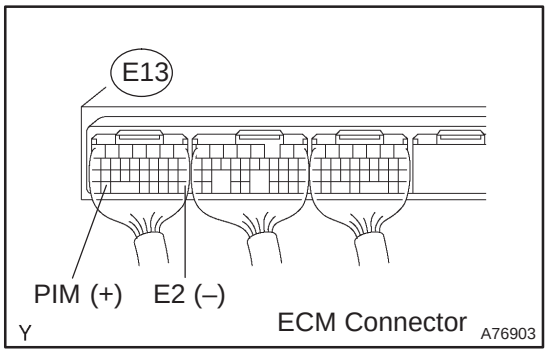
Standard:

Symbols (Terminal No.)	Specified condition
VCC (V1–3) – GND (V1–1)	4.5 to 5.5 V

NG → **Go to step 4**

OK

3 INSPECT ECM(PIM VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

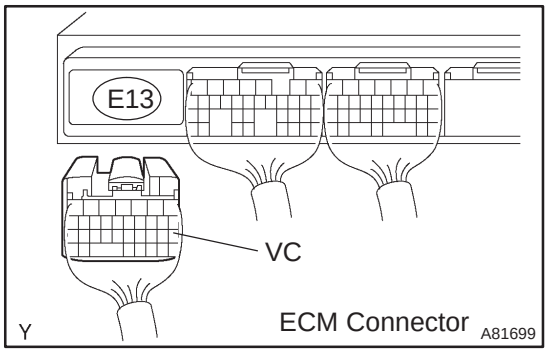
Symbols (Terminal No.)	Specified condition
PIM (E13–33) – E2 (E13–28)	3.4 to 3.8 V

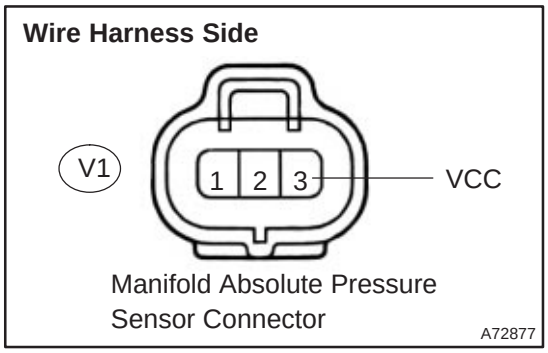
NG → **Go to step 5**

OK

CHECK AND REPLACE ECM (See page 01–32)

4 CHECK HARNESS AND CONNECTOR(ECM – MANIFOLD ABSOLUTE PRESSURE SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the V1 manifold absolute pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (E13–18) – VCC (V1–3)	Continuity

Standard (Check for short):

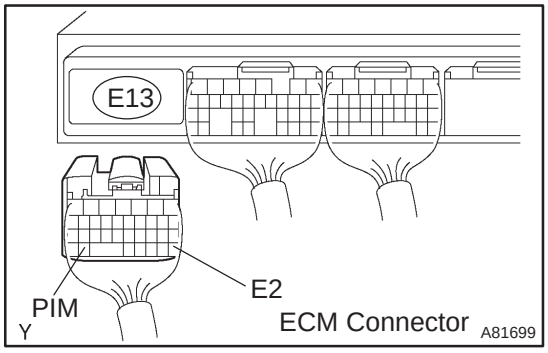
Symbols (Terminal No.)	Specified condition
VC (E13–18) or VCC (V1–3) – Body ground	No continuity

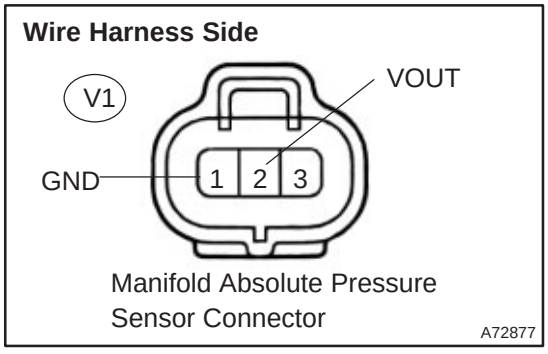
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

5 CHECK HARNESS AND CONNECTOR(ECM – MANIFOLD ABSOLUTE PRESSURE SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the V1 manifold absolute pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PIM (E13–33) – VOUT (V1–2)	Continuity
E2 (E13–28) – GND (V1–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PIM (E13–33) or VOUT (V1–2) – Body ground	No continuity

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

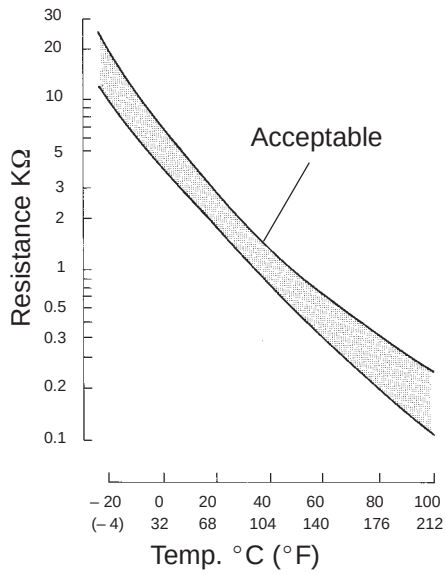
DTC	P0110	INTAKE AIR TEMPERATURE CIRCUIT

DTC	P0112	INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC	P0113	INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Fig.1)



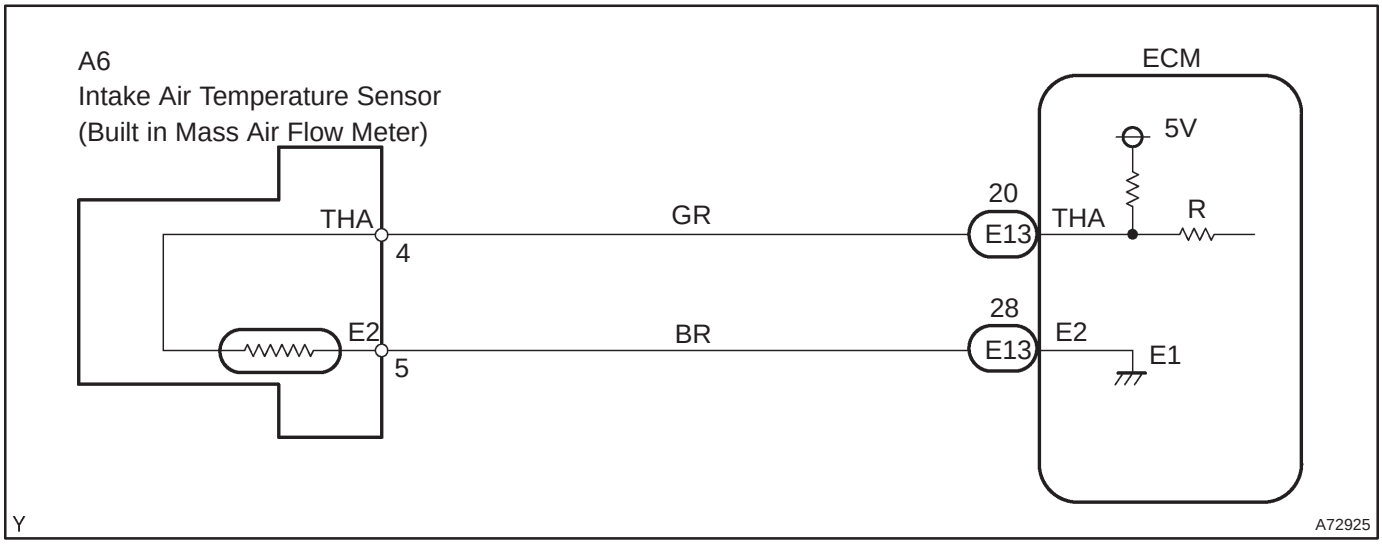
The intake air temperature sensor is built in the mass air flow meter and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature is the greater the thermistor resistance value becomes and the higher the intake air temperature is the lower the thermistor resistance value becomes (See Fig. 1).
The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA via resistor R.
That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.
If the ECM detects the DTC ”P0110, P0112 or P0113”, it operates the fail–safe functions in which the intake air temperature is assumed to be 20°C (68°F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temp. sensor circuit for 0.5 sec.	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0112	Step 4	Short in intake air temp. sensor circuit for 0.5 sec.	• Short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0113	Step 2	Open in intake air temp. sensor circuit for 0.5 sec.	• Open in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM

HINT:
After confirming DTC ”P0110, P0112 or P0113”, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual intake air temperature
Result:

Display	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

HINT:

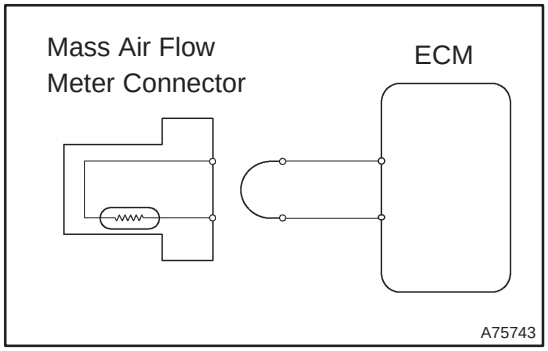
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

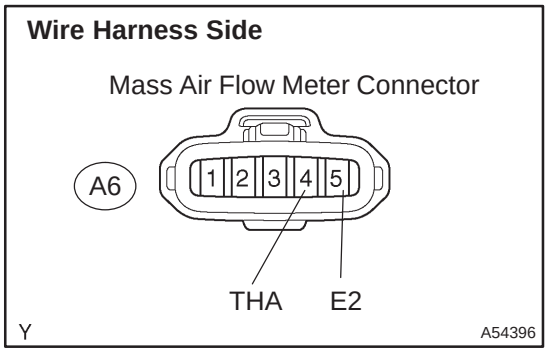
B → **Go to step 4**

C → **CHECK FOR INTERMITTENT PROBLEMS**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN HARNESS)



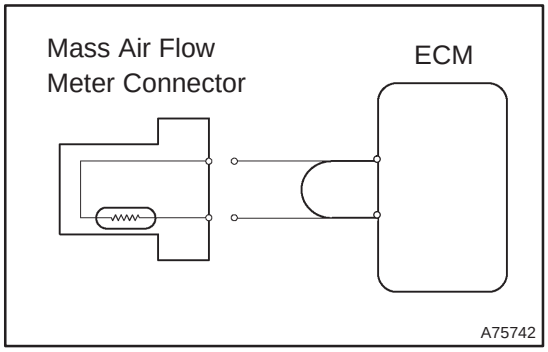


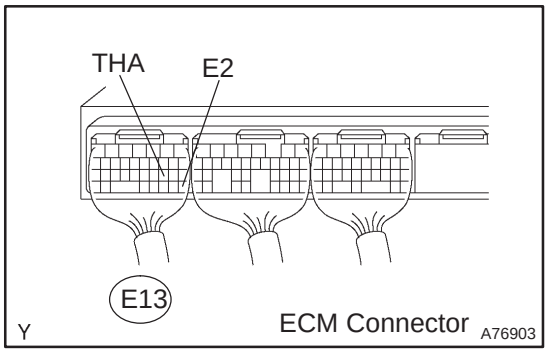
(a) Disconnect the A6 mass air flow meter connector.
(b) Connect the terminals THA and E2 of the mass air flow meter wire harness side connector.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the hand–held tester main switch ON.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more

OK	**CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE MASS AIR FLOW METER**

NG

3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)





(a) Disconnect the A6 mass air flow meter connector.
(b) Connect terminals THA and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

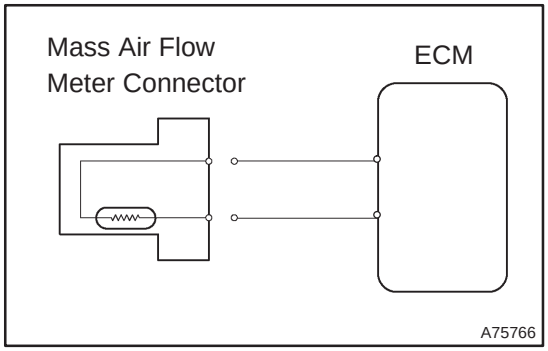
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the hand–held tester main switch ON.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more

OK	**REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM (See page 01–32)

4	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN HARNESS)

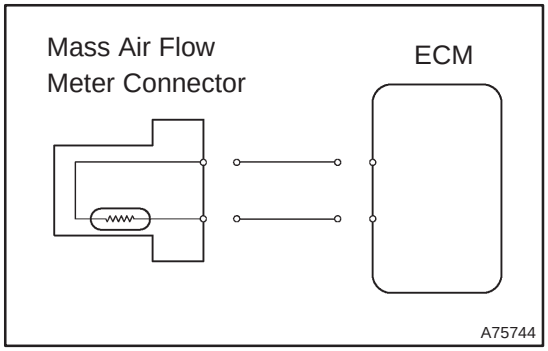


(a) Disconnect the A6 mass air flow meter connector.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON.
(d) Push the hand–held tester main switch ON.
(e) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)

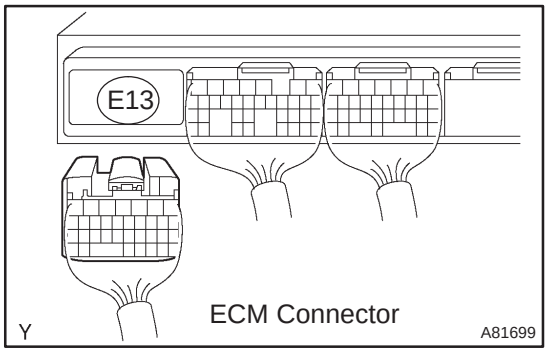
OK → **REPLACE MASS AIR FLOW METER**

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON.
(d) Push the hand–held tester main switch ON.
(e) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0116	ENGINE COOLANT TEMP. CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05–351.

DTC No.	DTC Detection Condition	Trouble Area
P0116	When THW is greater than –40°C (–40°F) but less than 60°C (140°F), and THA is greater than –6.7°C (20°F), and when starting engine, conditions (a) and (b) continue (2 trip detection logic): (a) Vehicle speed is changing (Not stable) (b) THW change is lower than 3°C (5.4°F) from THW since when starting engine	• Cooling system • Engine coolant temperature sensor • Thermostat

INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ OUTPUT DTC(IN ADDITION TO P0116)

(a) Read the DTC using the hand–held tester.

Result:

Display	Proceed to
Only ”P0116” is output.	A
”P0116” and other DTCs are output.	B

HINT:

If any other codes besides ”P0116” are output, perform the troubleshooting for those DTCs first.

B → GO TO RELEVANT DTC CHART (See page 05–309)

A

2	INSPECT THERMOSTAT (See page 16–27)

NG → REPLACE THERMOSTAT (See page 16–35)

OK

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

DTC	P0120	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT

DTC	P0122	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT LOW INPUT

DTC	P0123	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT HIGH INPUT

DTC	P0220	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT

DTC	P0222	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT LOW INPUT

DTC	P0223	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT HIGH INPUT

DTC	P2135	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A”/”B” VOLTAGE CORRELATION

HINT:
This is repair procedure of ”throttle position sensor”.

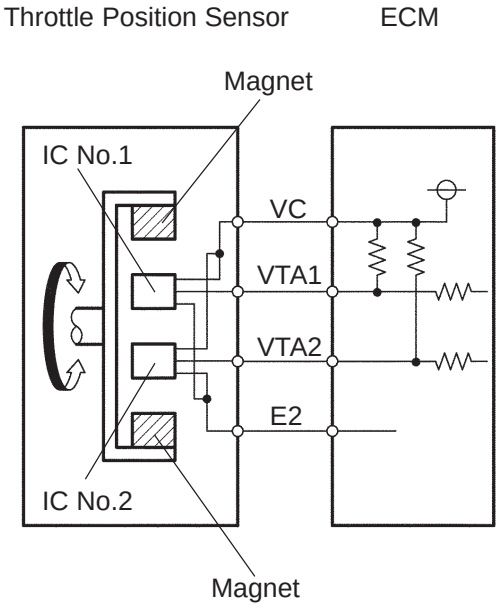
CIRCUIT DESCRIPTION

HINT:

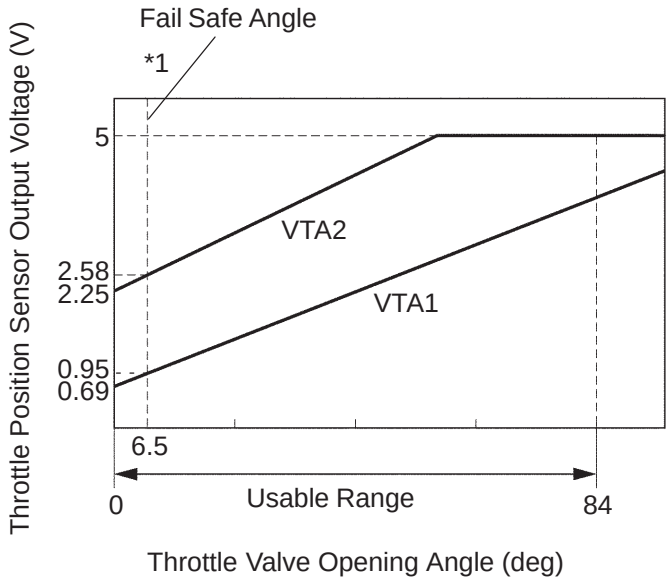
- This electrical throttle system is no used throttle cable.
- This throttle position sensor is non–contact type.

The throttle position sensor is mounted on the throttle body to detect the opening angle of the throttle valve. Since this sensor is electronically controlled with hall elements, accurate control and reliability can be obtained. It has 2 sensors to detect the throttle opening angle and a malfunction of the throttle position sensor. The voltage is applied to the terminals VTA1 and VTA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the throttle valve. The VTA1 is a signal to indicate the actual throttle valve opening angle which is used for the engine control, and the VTA2 is a signal to indicate the information about the opening angle which is used for detecting a malfunction.

The ECM judges the current opening angle of the throttle valve from these signals input from terminals VTA1 and VTA2, and the ECM controls the throttle motor to make the throttle valve angle properly in response to the driving condition.



A19755



A19802

Throttle Valve Fully Closed
(Throttle Position Opening Position Expressed as Percentage
(VTA1) 10 to 24 %)

Throttle Valve Fully Opened
(Throttle Position Opening Position Expressed as Percentage
(VTA1) 64 to 96 %)

*1: Fail Safe Angle 6.5°
(Throttle Position Opening Position Expressed as Percentage
(VTA1) about 16 %)

DTC No.	DTC Detection Condition	Trouble Area
Condition (a) of DTC P0120, P0122, P0123, P0220, P0222 or P0223 continues for 2 sec. (Open or short in throttle position sensor circuit)		
P0120	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied (a) VTA1 ≦ 0.2 V or VTA1 ≧ 4.8 V	• Throttle position sensor (built in throttle body) • ECM
P0122	(a) VTA1 ≦ 0.2 V	• Throttle position sensor (built in throttle body) • VTA1 circuit short • VC circuit open • ECM
P0123	(a) VTA1 ≧ 4.8 V	• Throttle position sensor (built in throttle body) • VTA1 circuit open • E2 circuit open • VC and VTA1 circuit are short–circuited • ECM
P0220	Detection conditions for DTCs P0222 and P0223 are not satisfied but condition (a) is satisfied (a) VTA2 ≦ 0.5 V or VTA2 ≧ 4.97 V and 0.2 V ≦ VTA1 ≦ 1.8 V	• Throttle position sensor (built in throttle body) • ECM
P0222	(a) VTA2 ≦ 0.5 V	• Throttle position sensor (built in throttle body) • VTA2 circuit short • VC circuit open • ECM
P0223	(a) VTA2 ≧ 4.97 V and 0.2 V ≦ VTA1 ≦ 1.8 V	• Throttle position sensor (built in throttle body) • VTA2 circuit open • E2 circuit open • VC and VTA2 circuit are short–circuited • ECM
P2135	Condition (a) continues for 0.5 sec. or more, or condition (b) continues for 0.4 sec. or more: (a) |VTA1 – VTA2| ≦ 0.02 V (b) VTA1 ≦ 0.2 V and VTA2 ≦ 0.5 V	• VTA1 and VTA2 circuit are short–circuited • Throttle position sensor (built in throttle body) • ECM

NOTICE:

When a malfunction is detected, the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.

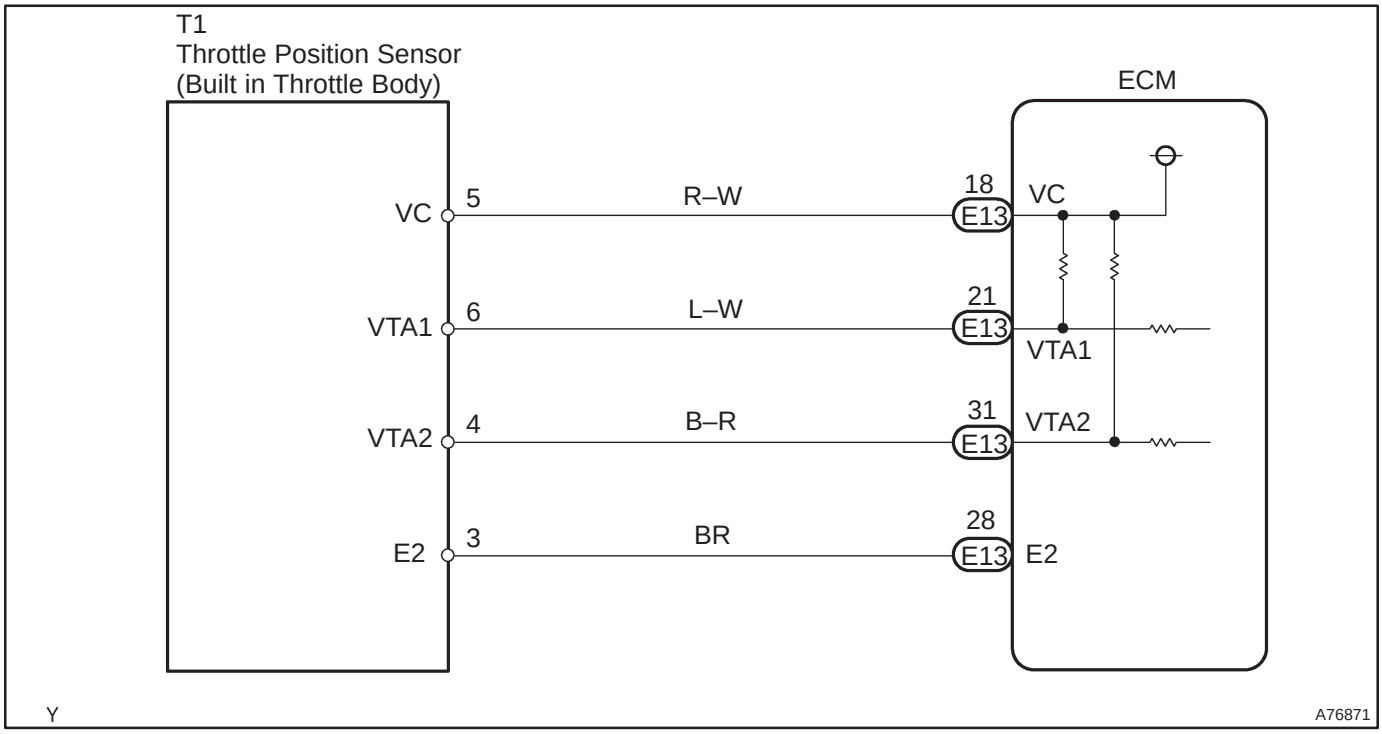
HINT:

- After confirming DTCs, use the hand–held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.
- The THROTTLE POS means VTA1 signal as well as the THROTTLE POS #2 for the VTA2 signal.

Reference (Normal condition):

Tester display	Accelerator pedal fully released	Accelerator pedal fully depressed
THROTTLE POS	10 to 24 %	64 to 96 %
THROTTLE POS #2	2.1 to 3.1 V	4.5 to 5.5 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**READ VALUE OF HAND–HELD TESTER(THROTTLE POS AND THROTTLE POS #2)**

(a) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ETCS / THROTTLE POS and THROTTLE POS #2” and read its value displayed on the hand–held tester.

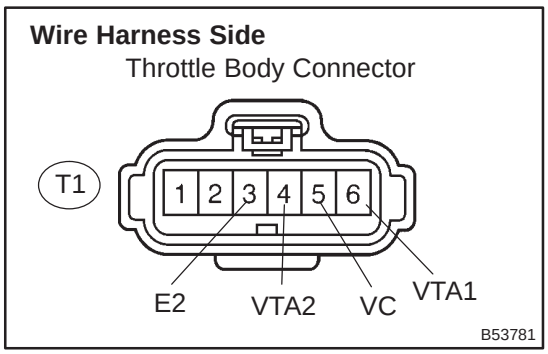
Result:

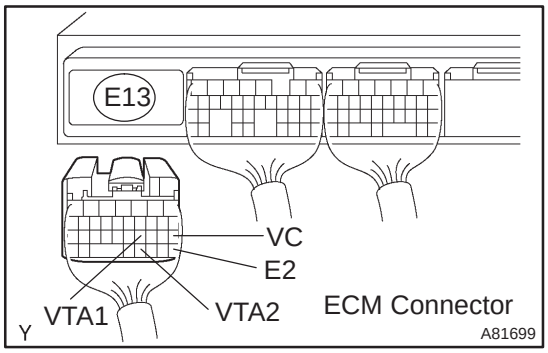
Throttle position expressed as percentage and voltage				Trouble area	Proceed to
Accelerator pedal released		Accelerator pedal depressed			
THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)	THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)		
0 %	0 to 0.2 V	0 %	0 to 0.2 V	VC circuit open	A
100 %	4.5 to 5.5 V	100 %	4.5 to 5.5 V	E2 circuit open	
0 % or 100 %	2.1 to 3.1 V (Fail safe)	0 % or 100 %	2.1 to 3.1 V (Fail safe)	VTA1 circuit open or ground short	
About 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	About 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	VTA2 circuit open or ground short	
10 to 24 %	2.1 to 3.1 V	64 to 96 % (Does not fail safe)	4.5 to 5.5 V (Does not fail safe)	Throttle position sensor circuit is normal	B

B	Go to step 5

A

2 CHECK HARNESS AND CONNECTOR(THROTTLE POSITION SENSOR – ECM)





(a) Disconnect the T1 throttle body connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (T1–5) – VC (E13–18)	Continuity
VTA1 (T1–6) – VTA1 (E13–21)	
VTA2 (T1–4) – VTA2 (E13–31)	
E2 (T1–3) – E2 (E13–28)	

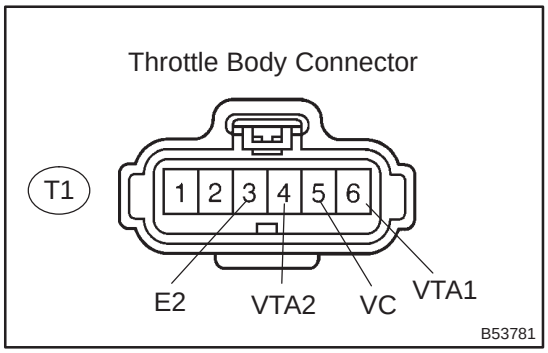
Standard (Check for short):

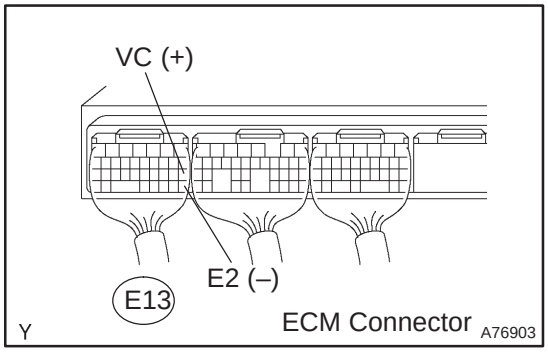
Symbols (Terminal No.)	Specified condition
VC (T1–5) or VC (E13–18) – Body ground	No continuity
VTA1 (T1–6) or VTA1 (E13–21) – Body ground	
VTA2 (T1–4) or VTA2 (E13–31) – Body ground	

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3 INSPECT ECM(VC VOLTAGE)





(a) Disconnect the T1 throttle body connector.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
VC (E13–18) – E2 (E13–28)	4.5 to 5.5 V

NG → CHECK AND REPLACE ECM (See page 01–32)

OK

4	REPLACE THROTTLE BODY ASSY

GO

5	READ OUTPUT DTC(THROTTLE POSTION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (See page 05–294).
(b) Start the engine.
(c) Run the engine at idle for 15 sec. or more.
(d) Read the DTC (See page 05–294).

Result:

Display (DTC output)	Proceed to
”P0120, P0122, P0123, P0220, P0222, P0223 and/or P2135” are output again	A
No DTC output	B

B → SYSTEM OK

A

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0121	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT RANGE/PERFORMANCE PROBLEM

HINT:
This is the procedure of the ”throttle position sensor”.

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page 05–356.

DTC No.	DTC Detection Condition	Trouble Area
P0121	Condition (a) continues for 2.0 seconds: (a) Difference between VTA1 and VTA2 is out of threshold	Throttle position sensor (built in throttle body)

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

REPLACE THROTTLE BODY ASSY

DTC	P0130	OXYGEN SENSOR CIRCUIT (BANK 1 SENSOR 1)

DTC	P0150	OXYGEN SENSOR CIRCUIT (BANK 2 SENSOR 1)

DTC	P2195	OXYGEN SENSOR SIGNAL STUCK LEAN (BANK 1 SENSOR 1)

DTC	P2196	OXYGEN SENSOR SIGNAL STUCK RICH (BANK 1 SENSOR 1)

DTC	P2197	OXYGEN SENSOR SIGNAL STUCK LEAN (BANK 2 SENSOR 1)

DTC	P2198	OXYGEN SENSOR SIGNAL STUCK RICH (BANK 2 SENSOR 1)

CIRCUIT DESCRIPTION

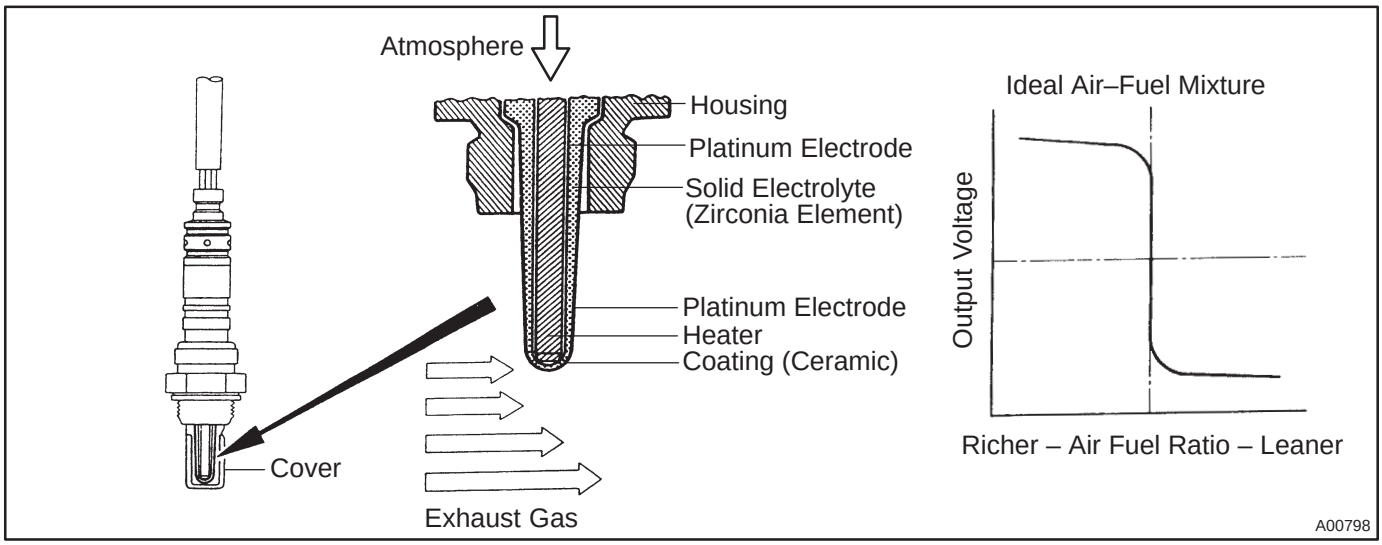
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used. For the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.

The heated oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and provide the ECM with feedback control the air–fuel ratio.

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust gas increases. And the heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i.e. less than 0.45 V).

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio, the oxygen will be vanished from the exhaust gas. And the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i.e. more than 0.45 V). The ECM judges by the voltage output from the heated oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. If the malfunction of the heated oxygen sensor causes an output of abnormal voltage, the ECM becomes unable to perform accurate air–fuel ratio control.

The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), current flows to the heater in order to heat the sensor for the accurate oxygen concentration detection.

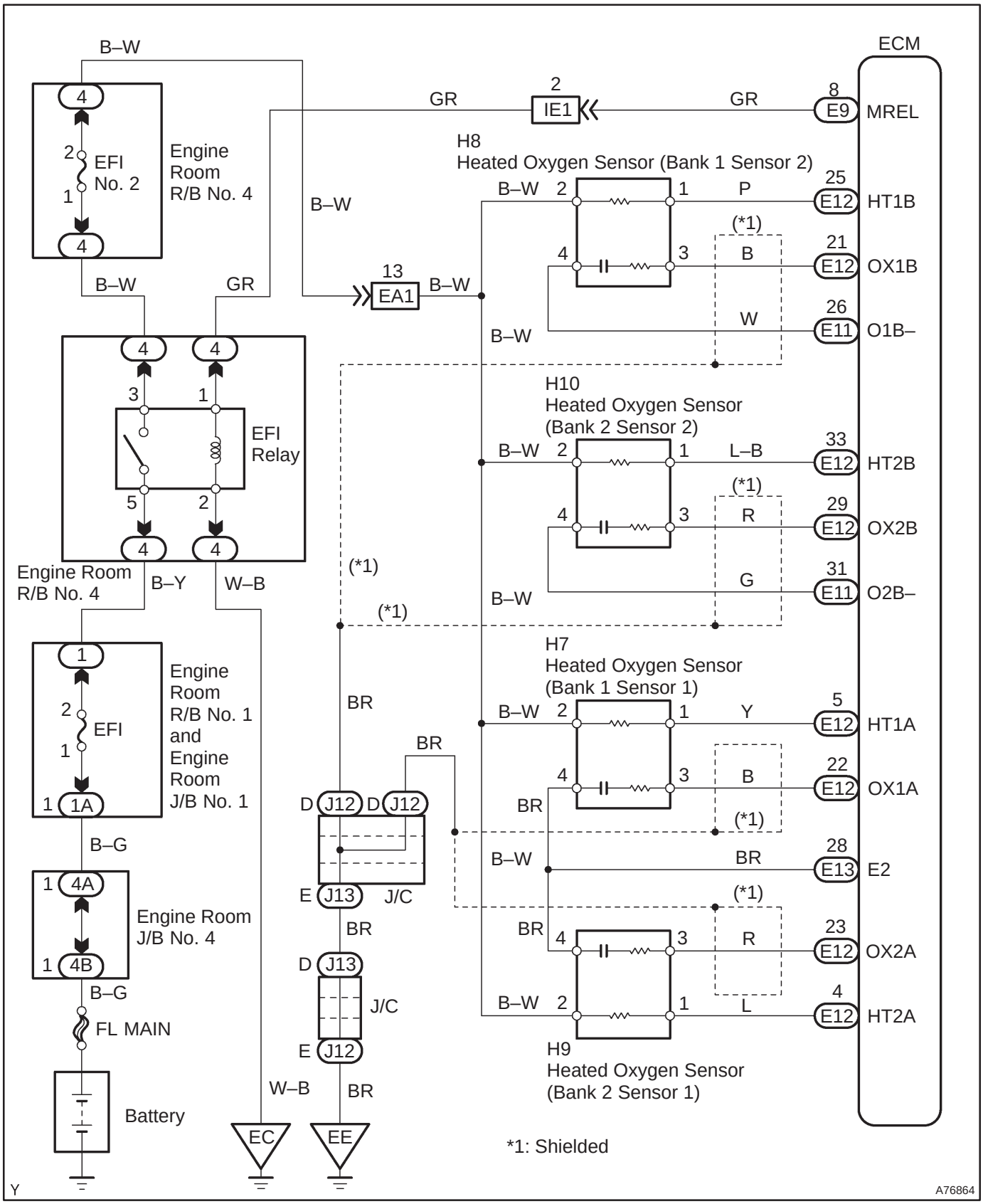


DTC No.	DTC Detection Condition	Trouble Area
P0130 P0150	Output voltage of heated oxygen sensor (sensor 1) remains at 0.4 V or more, or 0.55 V or less, during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM
P2195 P2197	Output voltage of heated oxygen sensor (sensor 1) remains at 0.55 V or less, during idling after engine is warmed up (2 trip detection logic)	
P2196 P2198	Output voltage of heated oxygen sensor (sensor 1) remains at 0.4 V or more, during idling after engine is warmed up (2 trip detection logic)	

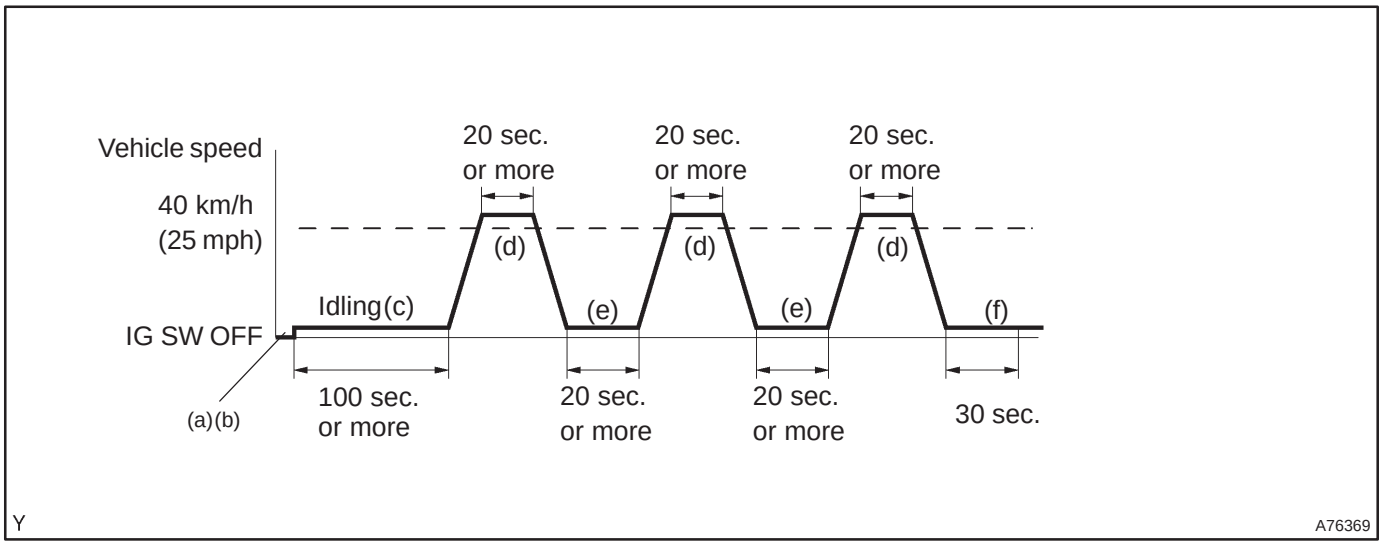
HINT:

- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 1 refers to the sensor closest to the engine assembly.
- The output voltage of the heated oxygen sensor and the short–term fuel trim value can be read using the hand–held tester.

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the ”normal mode” to the ”check mode” (See page 05–294).
(c) Start the engine and let the engine idle for 100 seconds or more.
(d) Drive the vehicle at 40 km/h (25 mph) or more for 20 seconds or more.
(e) Let the engine idle for 20 seconds or more. Perform steps from (d) to (e) 3 times.
(f) Let the engine idle for 30 seconds.

HINT:
If a malfunction exists, the CHK ENG will be illuminated on the multi information display during step (f).

NOTICE:
If the conditions in this test are not strictly followed, detection of a malfunction will not occur.
If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing the ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few seconds delay in the sensor 1 (front sensor) output. And there is about 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs will be recorded, and the CHK ENG then comes on.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	**CHECK OTHER DTC OUTPUT(IN ADDITION TO HEATED OXYGEN SENSOR DTCS)**

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0130, P0150, P2195, P2196, P2197 and/or P2198” are output	A
”P0130, P0150, P2195, P2196, P2197 or P2198” and other DTCs are output	B

HINT:

- If any other codes besides ”P0130, P0150, P2195, P2196, P2197 and/or P2198” are output, perform the troubleshooting for those DTCs first.
- If a misfiring DTC(s) is present, record the DTC(s) that indicates misfiring cylinder(s), then proceed to A.

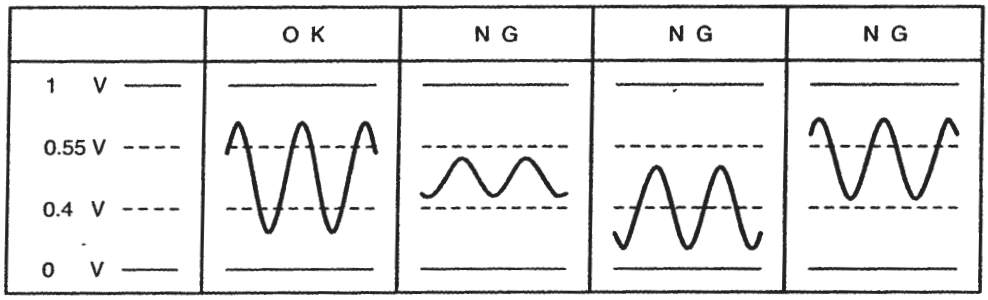
B → **GO TO RELEVANT DTC CHART**
(See page 05–309)

A

2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Warm up the heated oxygen sensor (sensor 1) with the engine speed at 2,500 rpm for approximately 90 seconds.

(b) Read the output voltage of the heated oxygen sensor during idling.
Heated oxygen sensor (sensor 1) output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



P18349

NG → **Go to step 5**

OK

3	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

4	READ OUTPUT DTC(HEATED OXYGEN SENSOR DTCS ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

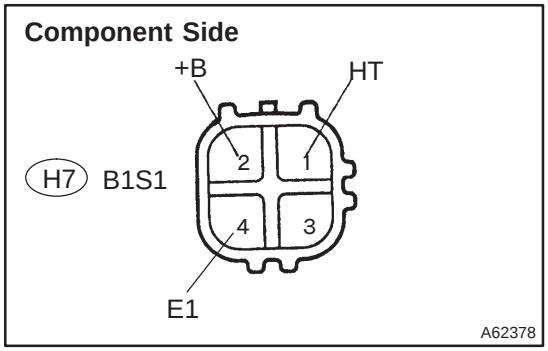
Display (DTC output)	Proceed to
”P0130, P0150, P2195, P2196, P2197 and/or P2198” are output again	A
”P0130, P0150, P2195, P2196, P2197 and/or P2198” are not output again	B

B → **CHECK FOR INTERMITTENT PROBLEMS**

A

REPLACE HEATED OXYGEN SENSOR

5 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)

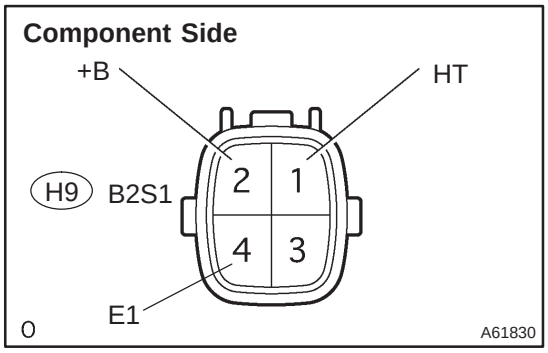


(a) Disconnect the H7 or H9 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 Sensor 1):

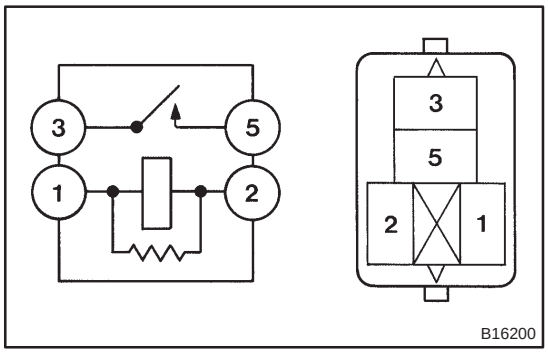
Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity



NG → **REPLACE HEATED OXYGEN SENSOR**

OK

6 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No. 4.

(b) Inspect the EFI relay.

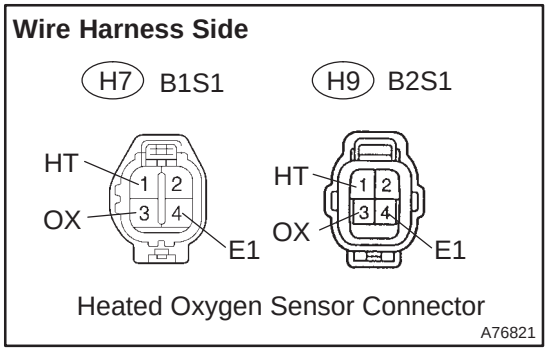
Standard:

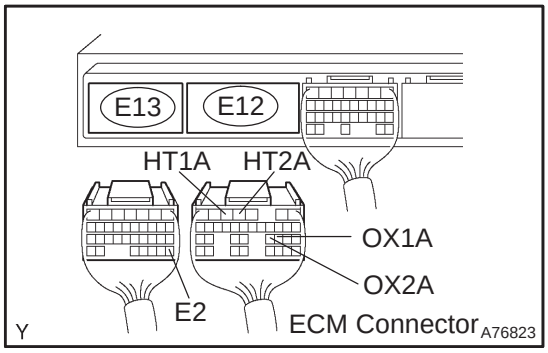
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

7 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H7 or H9 heated oxygen sensor connector.

(b) Disconnect the E12 and E13 ECM connectors.

(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OX (H7–3) – OX1A (E12–22)	Continuity
HT (H7–1) – HT1A (E12–5)	
E1 (H7–4) – E2 (E13–28)	
OX (H8–3) – OX2A (E12–23)	
HT (H8–1) – HT2A (E12–4)	
E1 (H8–4) – E2 (E13–28)	

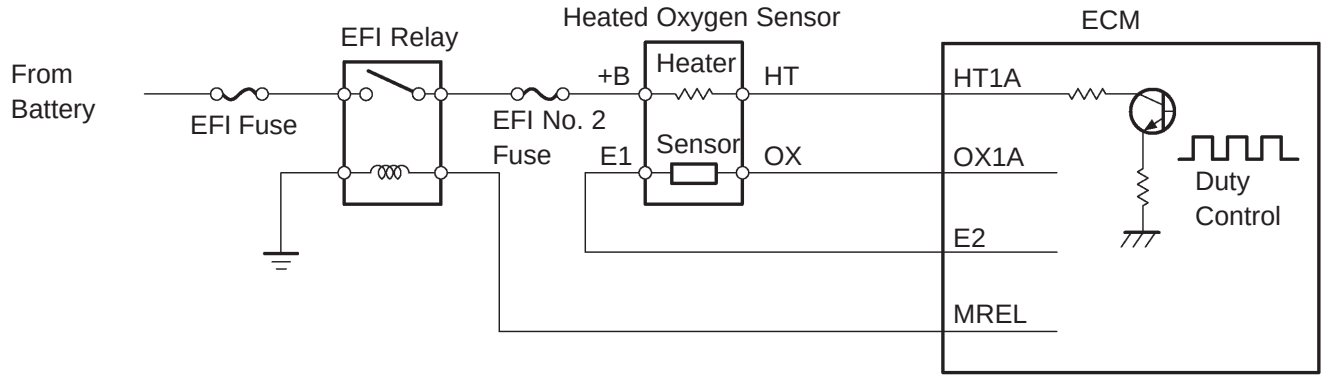
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H7–3) or OX1A (E12–22) – Body ground	No continuity
HT (H7–1) or HT1A (E12–5) – Body ground	
OX (H8–3) or OX2A (E12–23) – Body ground	
HT (H8–1) or HT2A (E12–4) – Body ground	

HINT:

- The OX1A and HT1A means the heated oxygen sensor bank 1 sensor 1.
- The OX2A and HT2A means the heated oxygen sensor bank 2 sensor 1.

Reference (Bank 1 Sensor 1 System Drawing)



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

9	CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

10	CHECK FUEL PRESSURE(HIGH PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, FUEL PRESSURE SENSOR, WIRING AND FUEL LEAKAGE

OK

11	CONFIRM IF ANY MISFIRING DTCS WERE PRESENT AT STEP 1

(a) Misfiring DTC ”P0301, P0302, P0303 and/or P0304” was present at step 1.

NO → REPLACE HEATED OXYGEN SENSOR

YES

12	REPLACE FUEL INJECTOR ASSY (See page 11–42)

HINT:
If one or more the misfiring DTCs ”P0301, P0302, P0303 and/or P0304” were present at step 1, replace the injector(s) mounted on the misfiring cylinder(s) that is referred by the DTC(s) with normal injector(s).

GO

13	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

14	READ OUTPUT DTC(HEATED OXYGEN SENSOR DTCS ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0130, P0150, P2195, P2196, P2197 and/or P2198” are output again	A
”P0130, P0150, P2195, P2196, P2197 and/or P2198” are not output again	B

B → **REPLACE FUEL INJECTOR ASSY**

A

REPLACE HEATED OXYGEN SENSOR

DTC	P0133	OXYGEN SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC	P0153	OXYGEN SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–363.

DTC No.	DTC Detection Condition	Trouble Area
P0133 P0153	Response time for output voltage of heated oxygen sensor (sensor 1) to change from rich to lean, or from lean to rich, is 1.0 sec. or more during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM

HINT:

- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 1 refers to the sensor closest to the engine assembly.

WIRING DIAGRAM

Refer to DTC P0130 on page 05–363.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing the ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

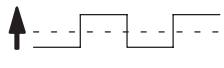
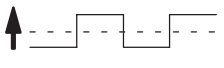
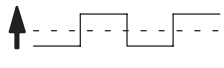
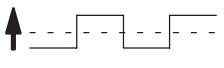
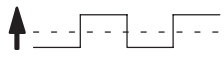
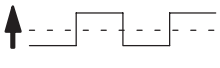
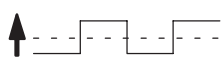
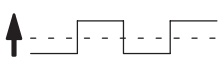
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few seconds delay in the sensor 1 (front sensor) output. And there is about 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and DTCs P0133 and/or P0153 will be recorded, and the CHK ENG then comes on.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0133 AND/OR P0153)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0133 and/or P0153” are output	A
”P0133 or P0153” and other DTCs are output	B

HINT:

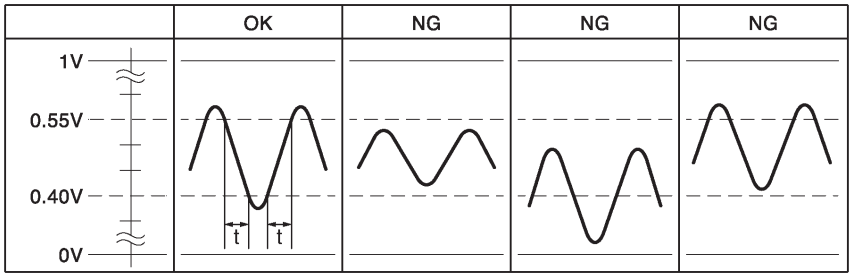
- If any other codes besides ”P0133 and/or P0153” are output, perform the troubleshooting for those DTCs first.
- If a misfiring DTC(s) is present, record the DTC(s) that indicates misfiring cylinder(s), then proceed to A.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	READ VALUE OF HAND–HELD TESTER(HEATED OXYGEN SENSOR DURING IDLING)

(a) Warm up the heated oxygen sensor (sensor 1) with the engine speed at 2,500 rpm for approximately 90 seconds.
(b) Read the output voltage of the heated oxygen sensor (sensor 1) during idling.
Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V, and period of ”t” must exist less than 1.0 sec. (See the following table).



N A73686

NG → **Go to step 5**

OK

3	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

4 READ OUTPUT DTC(DTC P0133 AND/OR P0153 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

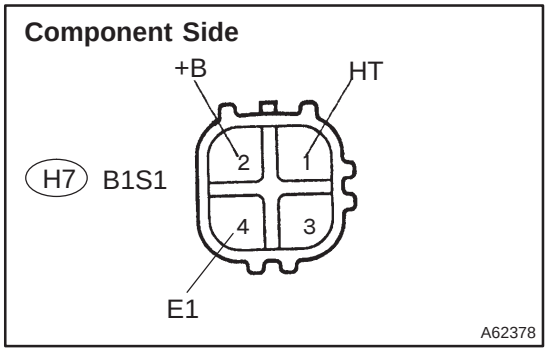
Display (DTC output)	Proceed to
”P0133 and/or P0153” are output again	A
”P0133 and/or P0153” are not output again	B

B → **CHECK FOR INTERMITTENT PROBLEMS**

A

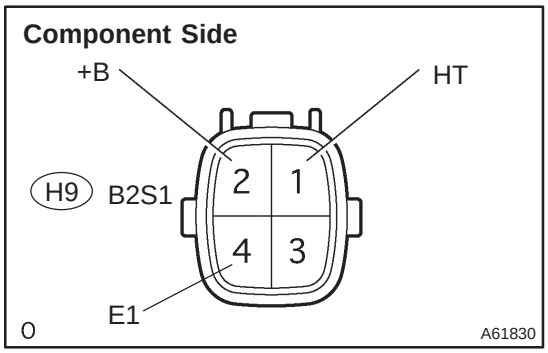
REPLACE HEATED OXYGEN SENSOR

5 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H7 or H9 heated oxygen sensor connector.
(b) Measure the resistance between the terminals of the heated oxygen sensor connector.
Standard (Bank 1, 2 Sensor 1):

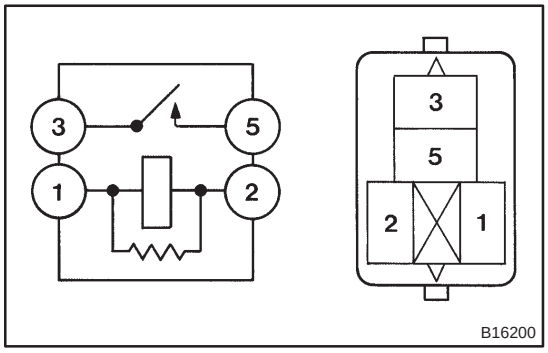
Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity



NG → **REPLACE HEATED OXYGEN SENSOR**

OK

6 INSPECT EFI RELAY



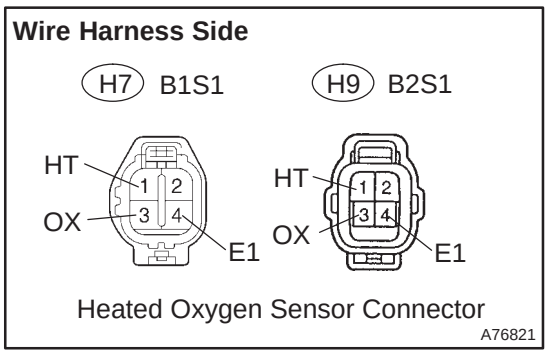
(a) Remove the EFI relay from the engine room R/B No. 4.
(b) Inspect the EFI relay.
Standard:

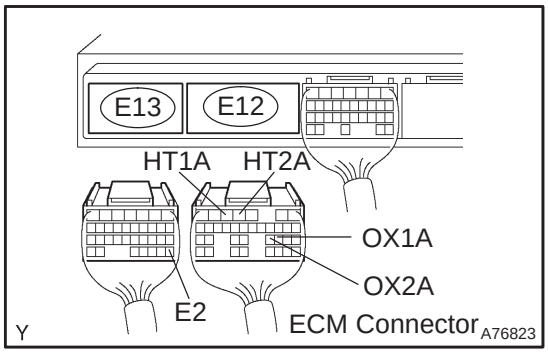
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → REPLACE EFI RELAY

OK

7 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H7 or H9 heated oxygen sensor connector.
(b) Disconnect the E12 and E13 ECM connectors.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OX (H7–3) – OX1A (E12–22)	Continuity
HT (H7–1) – HT1A (E12–5)	
E1 (H7–4) – E2 (E13–28)	
OX (H8–3) – OX2A (E12–23)	
HT (H8–1) – HT2A (E12–4)	
E1 (H8–4) – E2 (E13–28)	

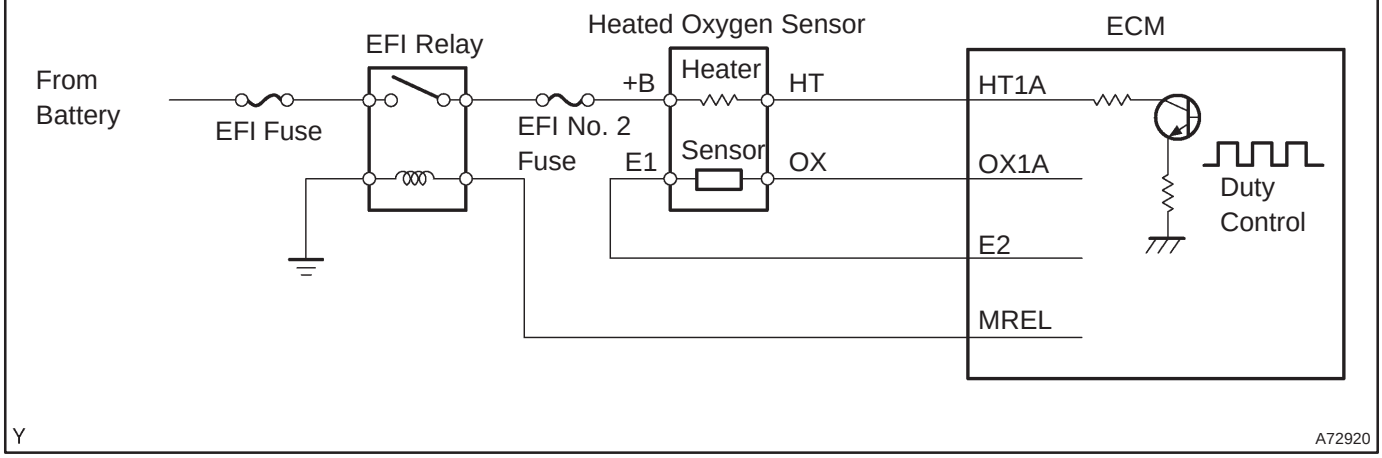
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H7–3) or OX1A (E12–22) – Body ground	No continuity
HT (H7–1) or HT1A (E12–5) – Body ground	
OX (H8–3) or OX2A (E12–23) – Body ground	
HT (H8–1) or HT2A (E12–4) – Body ground	

HINT:

- The OX1A and HT1A means the heated oxygen sensor bank 1 sensor 1.
- The OX2A and HT2A means the heated oxygen sensor bank 2 sensor 1.

Reference (Bank 1 Sensor 1 System Drawing)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

9	CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

10	CHECK FUEL PRESSURE(HIGH PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

11	CONFIRM IF ANY MISFIRING DTCS WERE PRESENT AT STEP 1

(a) Misfiring DTC ”P0301, P0302, P0303 and/or P0304” was present at step 1.

NO → REPLACE HEATED OXYGEN SENSOR

YES

12	REPLACE FUEL INJECTOR ASSY (See page 11–42)

HINT:
If one or more the misfiring DTCs ”P0301, P0302, P0303 and/or P0304” were present at step 1, replace the injector(s) mounted on the misfiring cylinder(s) that is referred by the DTC(s) with normal injector(s).

GO

13	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

14	READ OUTPUT DTC(DTC P0133 AND/OR P0153 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0133 and/or P0153” are output again	A
”P0133 and/or P0153” are not output again	B

B → **REPLACE FUEL INJECTOR ASSY**

A

REPLACE HEATED OXYGEN SENSOR

DTC	P0134	OXYGEN SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

DTC	P0154	OXYGEN SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–363.

DTC No.	DTC Detection Condition	Trouble Area
P0134 P0154	After engine is warmed up, heated oxygen sensor (sensor 1) output does not indicate RICH (≧ 0.45 V) even once when conditions (a), (b), (c) and (d) continue for at least 65 sec.: (a) Engine speed: 1,400 rpm or more (b) Vehicle speed: 130 km/h (81 mph) (c) Throttle valve is not fully closed (d) 180 sec. or more after starting engine	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • Air induction system • Fuel pressure • PCV hose connection • PCV valve and hose • Injector • Gas leakage in exhaust system • ECM

HINT:

- After confirming DTCs ”P0134 and P0154”, use the hand–held tester to confirm the output voltage of the heated oxygen sensor (bank 1, 2 sensor 1) from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”. If the output voltage of the heated oxygen sensor is less than 0.1 V, the heated oxygen sensor circuit may be open or short.
- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 1 refers to the sensor closest to the engine assembly.

WIRING DIAGRAM

Refer to DTC P0130 on page 05–363.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing the ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:
There is a few seconds delay in the sensor 1 (front sensor) output. And there is about 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0134 AND/OR P0154)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0134 and/or P0154” are output	A
”P0134 or P0154” and other DTCs are output	B

HINT:
- If any other codes besides ”P0134 and/or P0154” are output, perform the troubleshooting for those DTCs first.
- If a misfiring DTC(s) is present, record the DTC(s) that indicates misfiring cylinder(s), then proceed to A.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Warm up the engine to the normal operating temperature above 75°C (169°F).
(b) Read the output voltage of the heated oxygen sensor (sensor 1) when the engine rpm is suddenly increased.

HINT:
Quickly accelerate the engine to 4,000 rpm 3 times using the accelerator pedal.
Standard:
Heated oxygen sensor (sensor 1) outputs a RICH signal (0.45 V or more) at least once.

NG → **Go to step 6**

OK

3	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

4	READ OUTPUT DTC(DTC P0134 AND/OR P0154 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0134 and/or P0154” are not output again	A
”P0134 and/or P0154” are output again	B

B → **CHECK AND REPLACE ECM (See page 01–32)**

A

5	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS

YES

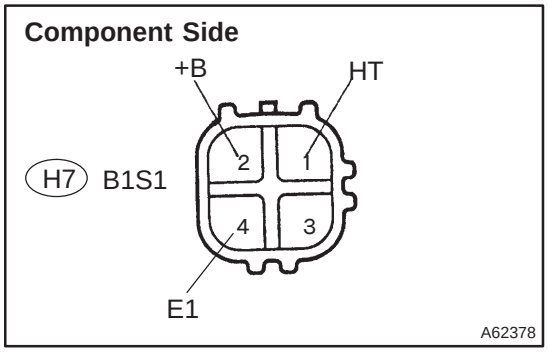
DTC IS CAUSED BY RUNNING OUT OF FUEL (DTC P0134 AND/OR P0154)

6	CHECK CONNECTION OF PCV HOSE

NG → REPAIR OR REPLACE PCV HOSE

OK

7	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)

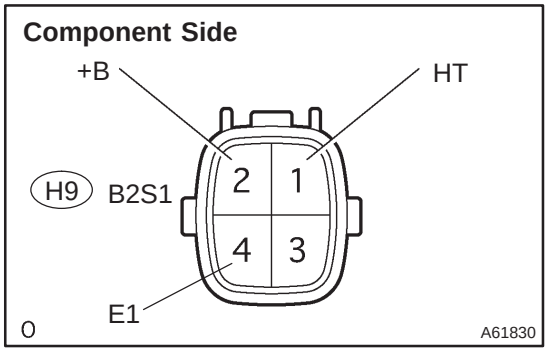


(a) Disconnect the H7 or H9 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 Sensor 1):

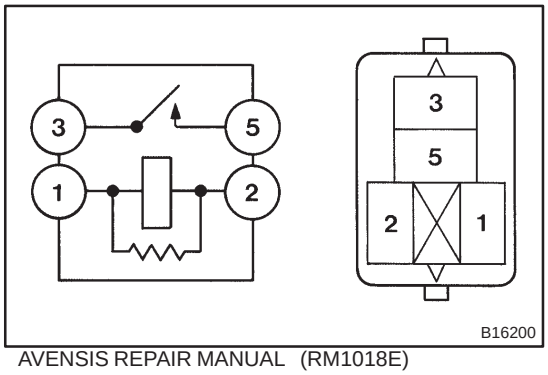
Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity



NG → REPLACE HEATED OXYGEN SENSOR

OK

8	INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No. 4.

(b) Inspect the EFI relay.

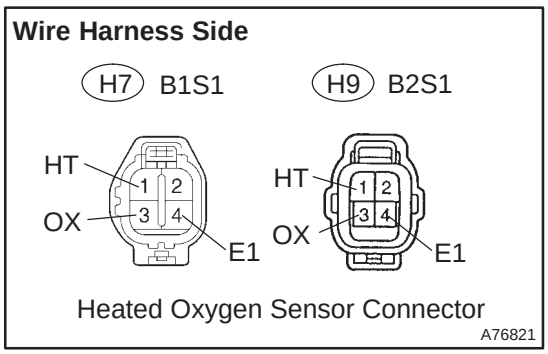
Standard:

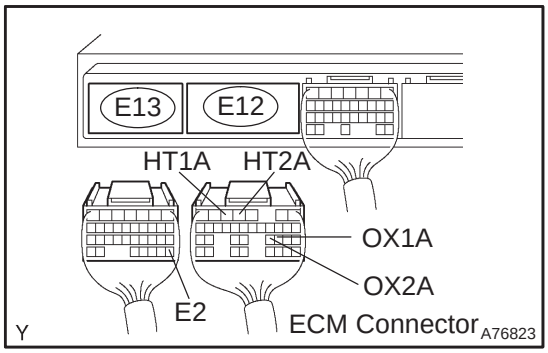
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → REPLACE EFI RELAY

OK

9 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H7 or H9 heated oxygen sensor connector.
(b) Disconnect the E12 and E13 ECM connectors.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OX (H7–3) – OX1A (E12–22)	Continuity
HT (H7–1) – HT1A (E12–5)	
E1 (H7–4) – E2 (E13–28)	
OX (H8–3) – OX2A (E12–23)	
HT (H8–1) – HT2A (E12–4)	
E1 (H8–4) – E2 (E13–28)	

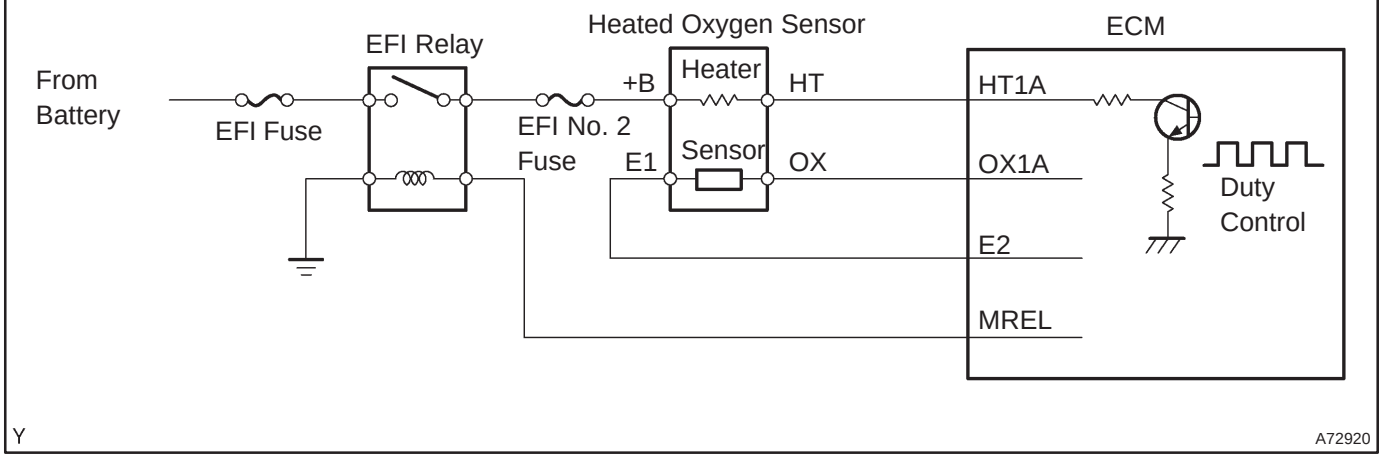
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H7–3) or OX1A (E12–22) – Body ground	No continuity
HT (H7–1) or HT1A (E12–5) – Body ground	
OX (H8–3) or OX2A (E12–23) – Body ground	
HT (H8–1) or HT2A (E12–4) – Body ground	

HINT:

- The OX1A and HT1A means the heated oxygen sensor bank 1 sensor 1.
- The OX2A and HT2A means the heated oxygen sensor bank 2 sensor 1.

Reference (Bank 1 Sensor 1 System Drawing)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

10	CHECK WHETHER MISFIRE IS OCCURRED OR NOT BY MONITORING DTC AND DATA LIST

NG → PERFORM TROUBLESHOOTING FOR MISFIRE (See page 05–294)

OK

11	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

12	CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

13	CHECK FUEL PRESSURE(HIGH PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, FUEL PRESSURE SENSOR, WIRING AND FUEL LEAKAGE

OK

14	CHECK FOR EXHAUST GAS LEAK

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK

15	CONFIRM IF ANY MISFIRING DTCS WERE PRESENT AT STEP 1

(a) Misfiring DTC ”P0301, P0302, P0303 and/or P0304” was present at step 1.

NO → REPLACE HEATED OXYGEN SENSOR

YES

16	REPLACE FUEL INJECTOR ASSY (See page 11–42)

HINT:
If one or more the misfiring DTCs ”P0301, P0302, P0303 and/or P0304” were present at step 1, replace the injector(s) mounted on the misfiring cylinder(s) that is referred by the DTC(s) with normal injector(s).

GO

17	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

18	READ OUTPUT DTC(DTC P0134 AND/OR P0154 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0134 and/or P0154” are not output again	A
”P0134 and/or P0154” are output again	B

B → REPLACE FUEL INJECTOR ASSY

A

REPLACE HEATED OXYGEN SENSOR

DTC	P0136	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

DTC	P0156	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 2 SENSOR 2)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–363.

DTC No	DTC Detection Condition	Trouble Area
P0136 P0156	If the following two conditions are satisfied at a time (2 trip detection logic): (a) The ECM records cycles which the vehicle driving and stops 8 times or more. (b) There was no change in the rich and lean outputs from heated oxygen sensor (sensor 2) for the 360 seconds under air fuel ratio feedback control. (Throttle was not closed)	• Open or short in heated oxygen sensor (bank 1, 2 sensor 2) circuit • Heated oxygen sensor (bank 1, 2 sensor 2) • Heated oxygen sensor heater (bank 1, 2 sensor 2) • EFI relay

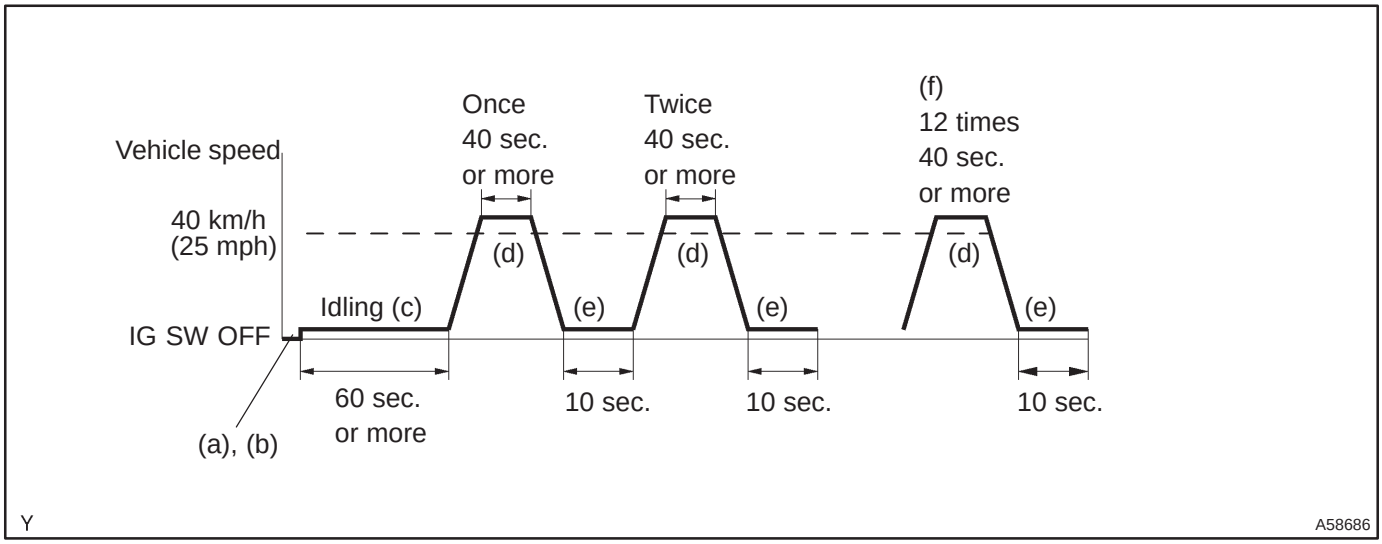
HINT:

- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

WIRING DIAGRAM

Refer to DTC P0130 on page 05–363.

CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the normal mode to the check (test) mode (See page 05–294).
(c) Start the engine and let the engine idle for 60 seconds or more.
(d) Drive the vehicle at 40 km/h (25 mph) or more for 40 seconds or more.
(e) Let the engine idle for 10 seconds or more.
(f) Perform steps (d) and (e) 12 times.

HINT:

If a malfunction exists, the CHK ENG will be illuminated on the multi information display during step (f).

NOTICE:

If the conditions in this test are not strictly followed, detection of a malfunction will not occur. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing the ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:
There is a few seconds delay in the sensor 1 (front sensor) output. And there is about 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0136 AND/OR P0156)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0136 and/or P0156” are output	A
”P0136 or P0156” and other DTCs are output	B

HINT:
If any other codes besides ”P0136 and/or P0156” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.
(b) Read the output voltage of the heated oxygen sensor (sensor 2) when the engine rpm is suddenly increased.

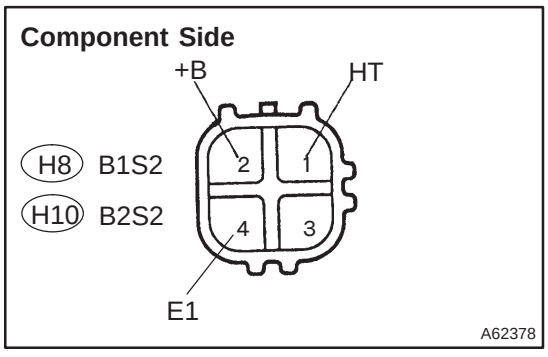
HINT:
Quickly accelerate the engine to 4,000 rpm 3 times by using the accelerator pedal.

The output voltage of heated oxygen sensor (sensor 2): Alternates from 0.4 V or less to 0.5 V or more.

OK → **Go to step 6**

NG

3	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



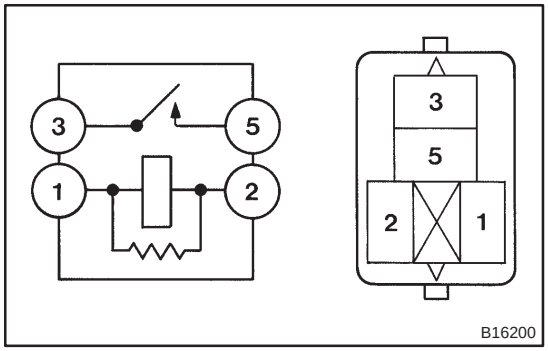
(a) Disconnect the H8 or H10 heated oxygen sensor connector.
(b) Measure the resistance between the terminals of the heated oxygen sensor connector.
Standard (Bank 1, 2 Sensor 2):

Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No. 4.
(b) Inspect the EFI relay.

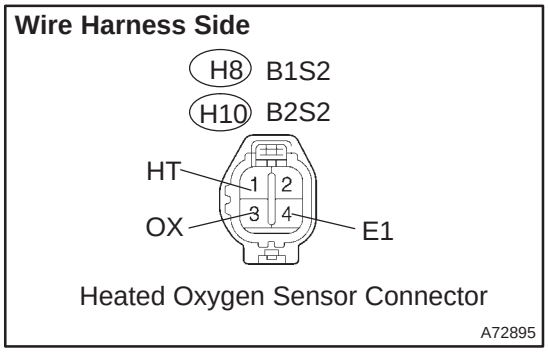
Standard:

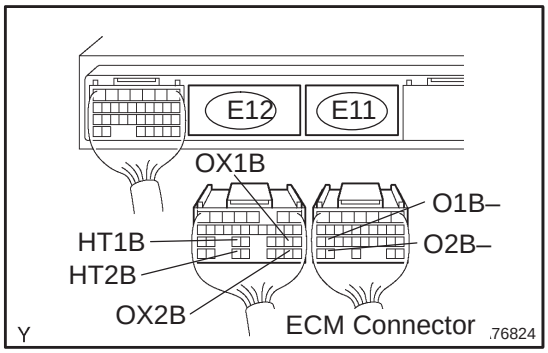
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

5 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H8 or H10 heated oxygen sensor connector.
(b) Disconnect the E11 and E12 ECM connectors.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OX (H8–3) – OX1B (E12–21)	Continuity
HT (H8–1) – HT1B (E12–25)	
E1 (H8–4) – O1B– (E11–26)	
OX (H10–3) – OX2B (E12–29)	
HT (H10–1) – HT2B (E12–33)	
E1 (H10–4) – O2B– (E11–31)	

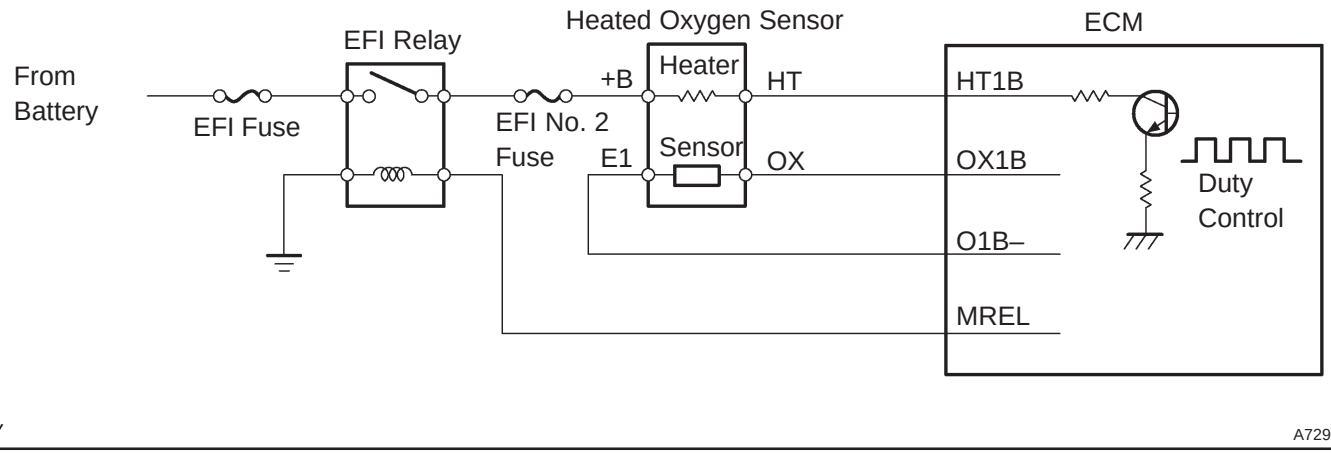
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H8–3) or OX1B (E12–21) – Body ground	No continuity
HT (H8–1) or HT1B (E12–25) – Body ground	
OX (H10–3) or OX2B (E12–29) – Body ground	
HT (H10–1) or HT2B (E12–33) – Body ground	

HINT:

- The OX1B and HT1B means the heated oxygen sensor bank 1 sensor 2.
- The OX2B and HT2B means the heated oxygen sensor bank 2 sensor 2.

Reference (Bank 1 Sensor 2 System Drawing)



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE HEATED OXYGEN SENSOR

6	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

7	READ OUTPUT DTC(DTC P0136 AND/OR P0156 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0136 and/or P0156” are not output again	A
”P0136 and/or P0156” are output again	B

B → **REPLACE HEATED OXYGEN SENSOR**

A

CHECK FOR INTERMITTENT PROBLEMS

DTC	P0171	SYSTEM TOO LEAN (BANK 1)

DTC	P0172	SYSTEM TOO RICH (BANK 1)

DTC	P0174	SYSTEM TOO LEAN (BANK 2)

DTC	P0175	SYSTEM TOO RICH (BANK 2)

CIRCUIT DESCRIPTION

The fuel trim is related to the feedback compensation value, not to the basic injection time. The fuel trim includes the short–term fuel trim and the long–term fuel trim.

The short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the stoichiometric air–fuel ratio. This variance triggers a reduction in the fuel volume if the air–fuel ratio is RICH, and an increase in the fuel volume if it is LEAN.

The long–term fuel trim is the overall fuel compensation carried out in long–term to compensate for a continual deviation of the short–term fuel trim from the central value, due to individual engine differences, wear overtime and changes in the operating environment.

If both the short–term fuel trim and the long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the CHK ENG is illuminated.

DTC No.	DTC Detection Condition	Trouble Area
P0171 P0174	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on LEAN side (2 trip detection logic)	• Air induction system • Injector blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • PCV valve and hose • PCV hose connection • ECM
P0172 P0175	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Injector leakage blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • ECM

HINT:

- When DTC ”P0171 or P0174” is recorded, the actual air–fuel ratio is on the LEAN side. When DTC ”P0172 or P0175” is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC ”P0171 or P0174” is recorded. The CHK ENG then comes on.

- If the total of the short–term fuel trim value and long–term fuel trim value is within ± 25 % (Engine coolant temperature is greater than 75°C), the system is functioning normally.
- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.

WIRING DIAGRAM

Refer to DTC P0130 on page 05–363.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing the ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

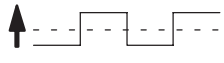
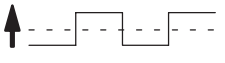
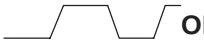
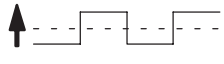
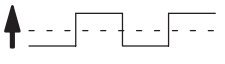
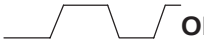
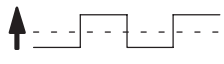
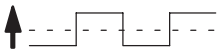
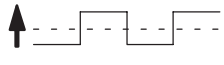
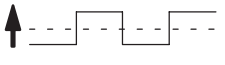
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few seconds delay in the sensor 1 (front sensor) output. And there is about 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0171, P0172, P0174 AND/OR P0175)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0171, P0172, P0174 and/or P0175” are output	A
”P0171, P0172, P0174 or P0175” and other DTCs are output	B

HINT:

- If any other codes besides ”P0171, P0172, P0174 and/or P0175” are output, perform the troubleshooting for those DTCs first.
- If a misfiring DTC(s) is present, record the DTC(s) that indicates misfiring cylinder(s), then proceed to A.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in air the induction system.

NG → **REPAIR OR REPLACE AIR INDUCTION SYSTEM**

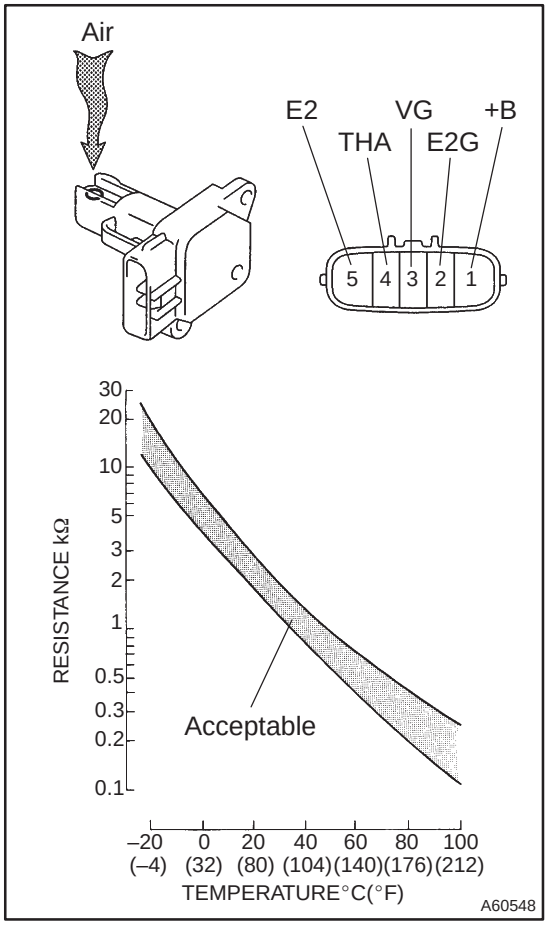
OK

3	CHECK CONNECTION OF PCV HOSE

NG → **REPAIR OR REPLACE PCV HOSE**

OK

4 INSPECT MASS AIR FLOW METER



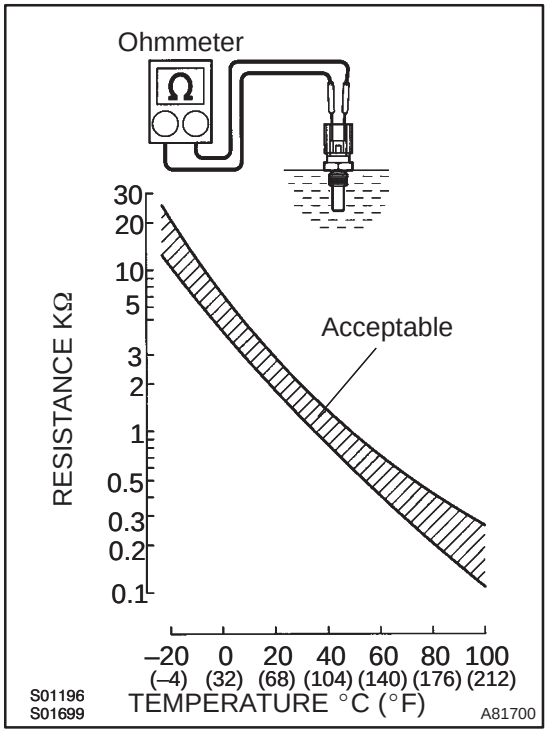
(a) Remove the mass air flow meter.
(b) Output voltage inspection.
  (1) Apply battery voltage across terminals +B and E2G.
  (2) Connect the positive (+) tester prove to terminal VG, and negative (–) tester prove to terminal E2G.
  (3) Blow air into the mass air flow meter, and check that the voltage fluctuates.
(c) Resistance inspection.
  (1) Measure the resistance between terminals THA and E2.

Resistance:
13.6 to 18.4 kΩ at –20°C (–4°F)
2.21 to 2.69 kΩ at 20°C (68°F)
0.49 to 0.67 kΩ at 60°C (140°F)

NG → **REPLACE MASS AIR FLOW METER**

OK

5	INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE)



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals.
Resistance:
2.32 to 2.59 kΩ at 20°C (68°F)
0.310 to 0.326 kΩ at 80°C (176°F)

NOTICE:
In case of checking the engine coolant temperature sensor in the water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:
Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK ↓

6	CHECK FOR SPARK AND IGNITION (See page 18–12)

NG → **REPAIR OR REPLACE**

OK ↓

7	CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → **CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER**

OK ↓

8	CHECK FUEL PRESSURE(HIGH PRESSURE) (See page 11–33)

NG → **CHECK AND REPLACE FUEL PUMP, FUEL PRESSURE SENSOR, WIRING AND FUEL LEAKAGE**

OK ↓

9	CHECK FOR EXHAUST GAS LEAKAGE

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT (See page 15–6)

OK

10	CONFIRM IF ANY MISFIRING DTCS WERE PRESENT AT STEP 1

(a) Misfiring DTC ”P0301, P0302, P0303 and/or P0304” was present at step 1.

NO → Go to step 14

YES

11	REPLACE FUEL INJECTOR ASSY (See page 11–42)

HINT:
If one or more the misfiring DTCs ”P0301, P0302, P0303 and/or P0304” were present at step 1, replace the injector(s) mounted on the misfiring cylinder(s) that is referred by the DTC(s) with normal injector(s).

GO

12	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

13	READ OUTPUT DTC(DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC ”P0171, P0172, P0174 and/or P0175” are output again	A
DTC ”P0171, P0172, P0174 and/or P0175” are not output again	B

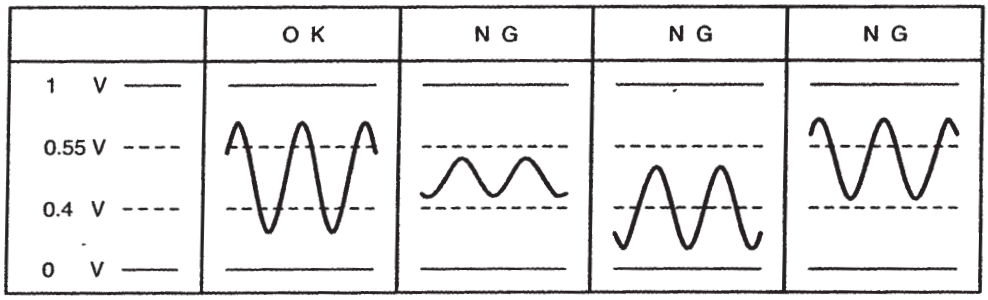
B → REPLACE FUEL INJECTOR ASSY

A

14	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR (BANK 1, 2 SENSOR 1))

(a) Warm up the heated oxygen sensor (sensor 1) with the engine speed at 2,500 rpm for approximately 90 seconds.

(b) Read the output voltage of the heated oxygen sensor (sensor 1) during idling.
The output voltage of heated oxygen sensor (sensor 1):
Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



P18349

NG → **Go to step 21**

OK

15	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

16	READ OUTPUT DTC(DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC "P0171, P0172, P0174 and/or P0175" are output again	A
DTC "P0171, P0172, P0174 and/or P0175" are not output again	B

B → **Go to step 20**

A

17	REPLACE HEATED OXYGEN SENSOR

GO

18	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

19	READ OUTPUT DTC(DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC "P0171, P0172, P0174 and/or P0175" are not output again	A
DTC "P0171, P0172, P0174 and/or P0175" are output again	B

B → CHECK AND REPLACE ECM (See page 01–32) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

A

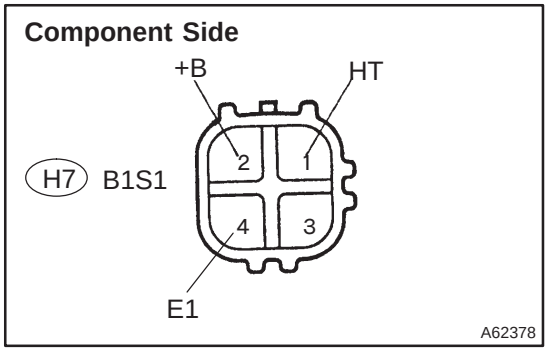
20	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL (DTCS P0171, P0172, P0174 AND/OR P0175)

21 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)

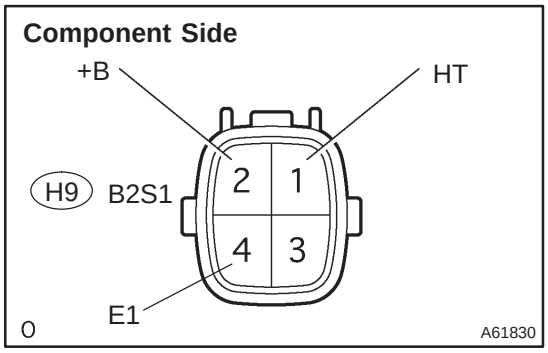


(a) Disconnect the H7 or H9 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 Sensor 1):

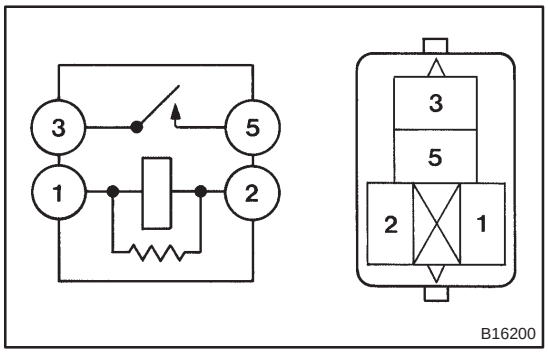
Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity



NG → **REPLACE HEATED OXYGEN SENSOR**

OK

22 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No. 4.

(b) Inspect the EFI relay.

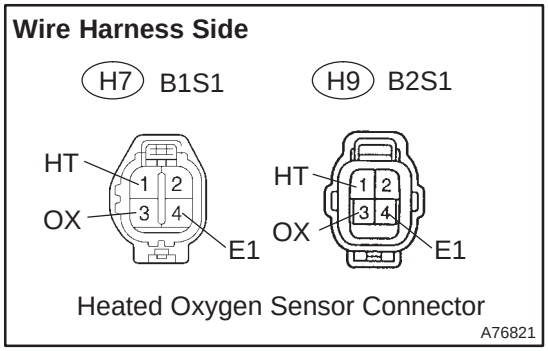
Standard:

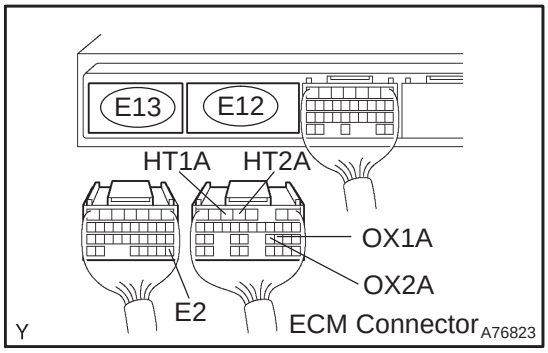
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

23 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H7 or H9 heated oxygen sensor connector.

(b) Disconnect the E12 and E13 ECM connectors.

(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OX (H7–3) – OX1A (E12–22)	Continuity
HT (H7–1) – HT1A (E12–5)	
E1 (H7–4) – E2 (E13–28)	
OX (H8–3) – OX2A (E12–23)	
HT (H8–1) – HT2A (E12–4)	
E1 (H8–4) – E2 (E13–28)	

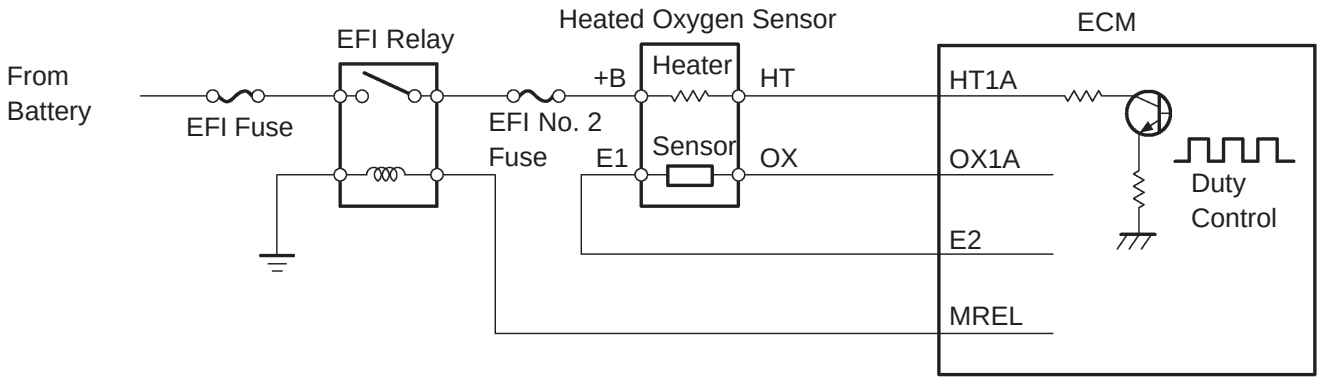
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H7–3) or OX1A (E12–22) – Body ground	No continuity
HT (H7–1) or HT1A (E12–5) – Body ground	
OX (H8–3) or OX2A (E12–23) – Body ground	
HT (H8–1) or HT2A (E12–4) – Body ground	

HINT:

- The OX1A and HT1A means the heated oxygen sensor bank 1 sensor 1.
- The OX2A and HT2A means the heated oxygen sensor bank 2 sensor 1.

Reference (Bank 1 Sensor 1 System Drawing)



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

24 REPLACE HEATED OXYGEN SENSOR

GO

25	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

26	READ OUTPUT DTC(DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC "P0171, P0172, P0174 and/or P0175" are not output again	A
DTC "P0171, P0172, P0174 and/or P0175" are output again	B

B → CHECK AND REPLACE ECM (See page 01–32) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

A

27	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

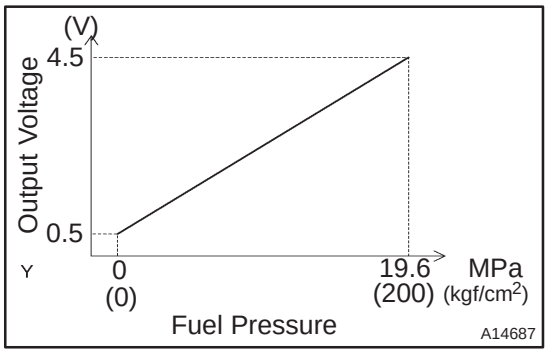
NO → CHECK FOR INTERMITTENT PROBLEMS

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL (DTCS P0171, P0172, P0174 AND/OR P0175)

DTC P0190 FUEL RAIL PRESSURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION



The fuel pressure sensor is installed on a fuel delivery pipe and detects the fuel pressure. It controls of feedback the pump discharge in order to keep the fuel at target pressure 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi) by the ECM.

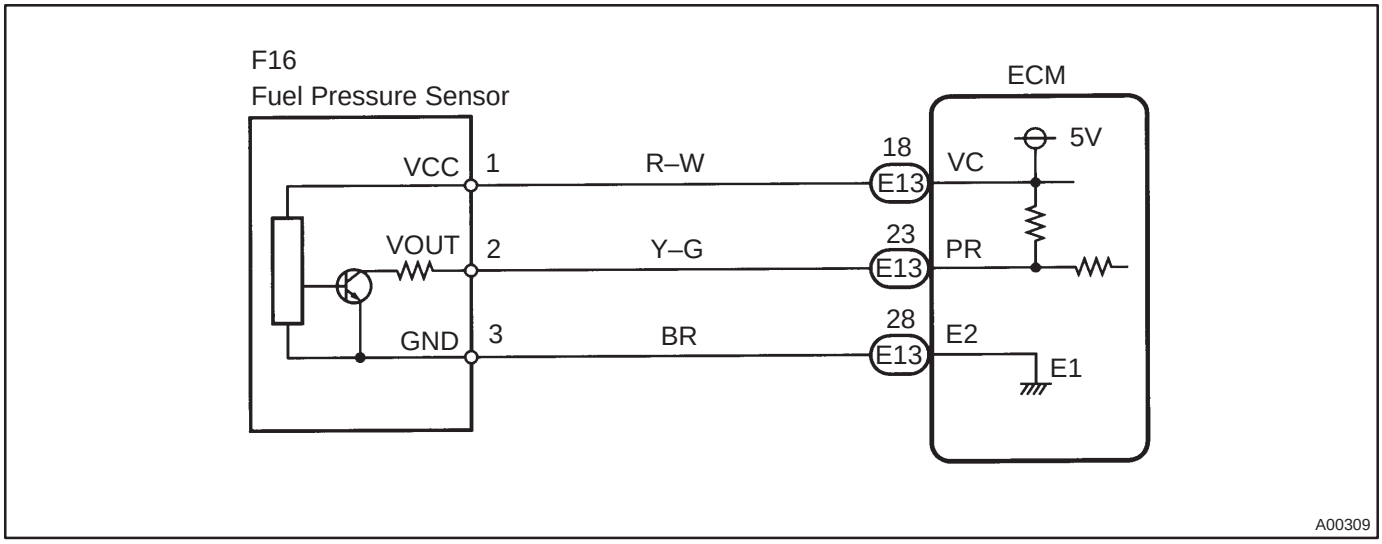
DTC No.	DTC Detection Condition	Trouble Area
P0190	Open or short in fuel pressure sensor circuit	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM

HINT:

After confirming DTC ”P0190”, use the hand–held tester to confirm the delivery pipe pressure from ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Fuel Pressure (MPa)	Malfunction
Approximately 0	• PR circuit short
19.6 or more	• VC circuit open or short • PR circuit open • E2 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 READ VALUE OF HAND–HELD TESTER(FUEL PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL PRESS” and read its value displayed on the hand–held tester.
Pressure: 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi)
Result:

Fuel Pressure (MPa)	Proceed to
19.6 or more	A
0.0	B
OK (8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi)) (*1)	C

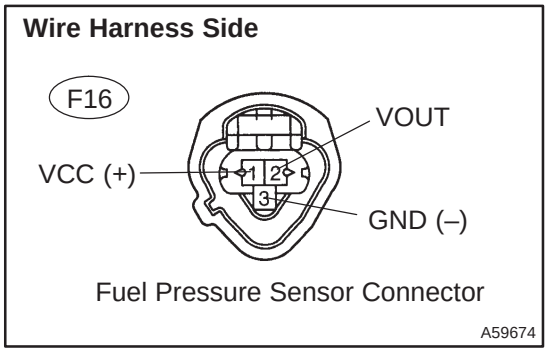
*1: The value must be changed when the engine is run or stopped.

B → **Go to step 3**

C → **CHECK FOR INTERMITTENT PROBLEMS**

A

2 INSPECT FUEL PRESSURE SENSOR(VCC VOLTAGE)



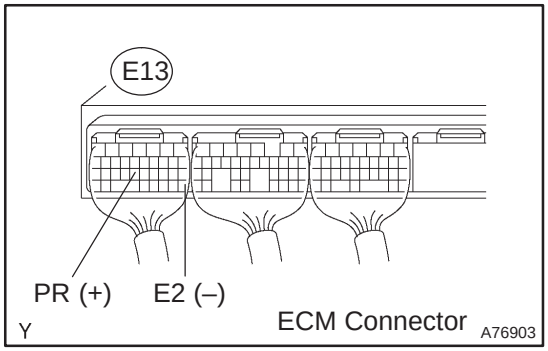
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the F16 fuel pressure sensor connector.
Standard:

Symbols (Terminal No.)	Specified condition
VCC (F16–1) – GND (F16–3)	4.5 to 5.5 V

NG → **Go to step 4**

OK

3 INSPECT ECM(PR VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
PR (E13–23) – E2 (E13–28)	2.1 to 3.2 V at 25°C (77°F)

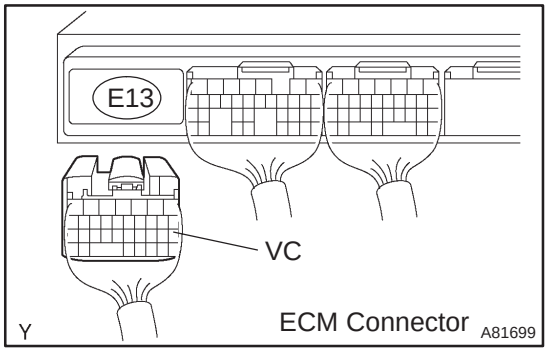
HINT:
The fuel pressure in the delivery pipe is 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi)

NG → **Go to step 5**

OK

CHECK AND REPLACE ECM (See page 01–32)

4 CHECK HARNESS AND CONNECTOR(ECM – FUEL PRESSURE SENSOR)



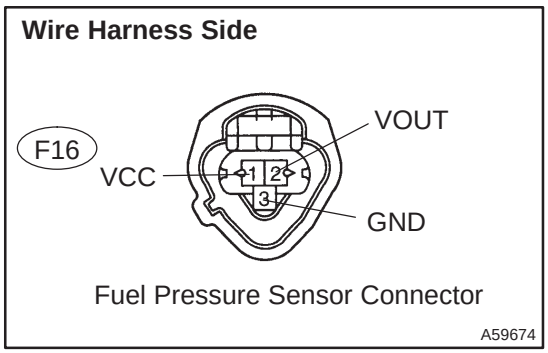
(a) Disconnect the E13 ECM connector.
(b) Disconnect the F16 fuel pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (E13–18) – VCC (F16–1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (E13–18) or VCC (F16–1) – Body ground	No continuity

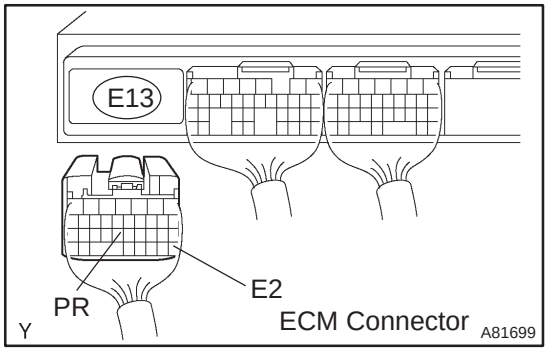


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

5 CHECK HARNESS AND CONNECTOR(ECM – FUEL PRESSURE SENSOR)



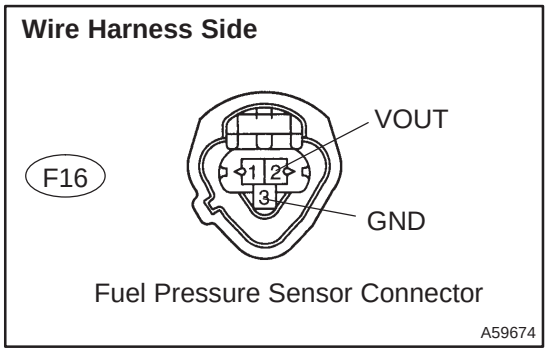
(a) Disconnect the E13 ECM connector.
(b) Disconnect the F16 fuel pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PR (E13–23) – VOUT (F16–2)	Continuity
E2 (E13–28) – GND (F16–3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PR (E13–23) or VOUT (F16–2) – Body ground	No continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

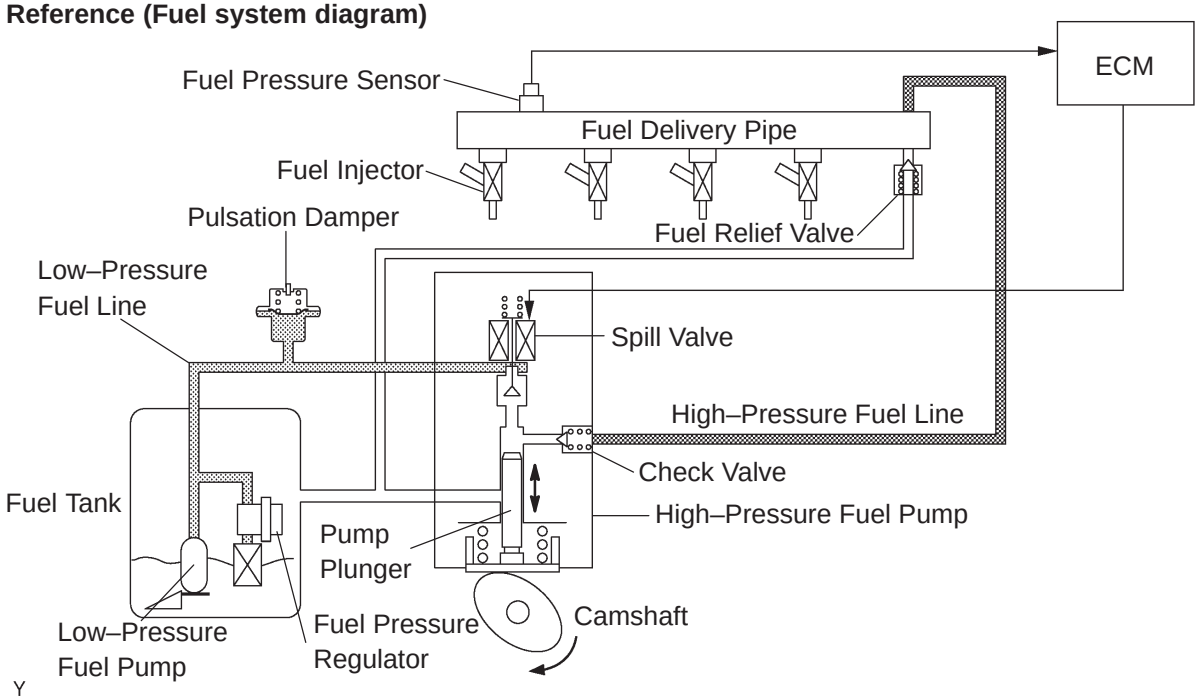
REPLACE FUEL PRESSURE SENSOR

DTC	P0191	FUEL RAIL PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The high–pressure fuel system consists of the spill valve, pump plunger, check valve, fuel relief valve and fuel pressure sensor. The spill valve opens and closes the low–pressure fuel line (from the fuel tank), the pump plunger operated by the camshaft pressurizes fuel, the check valve mechanically opens and closes the high–pressure fuel line (to the fuel delivery pipe), the fuel relief valve prevents fuel pressure from becoming extremely high, and the fuel pressure sensor located on the fuel delivery pipe monitors fuel pressure.
The high–pressure fuel pump is mounted on the cylinder head cover, and its plunger is operated by the cam located between #3 and #4 on the intake camshaft. Let the plunger moves up and down by the camshaft rotations, it produces vacuum to suck fuel and pressurizes the fuel. This fuel then pushes the check valve open and flows into the fuel delivery pipe. The ECM opens and closes the spill valve to regulate the fuel pressure to the target fuel pressure 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi). In order to obtain and maintain the target pressure, the ECM monitors the fuel pressure using the fuel pressure sensor and performs the feedback control.
If the internal fuel pressure of the fuel delivery pipe exceeds beyond the standard pressure 14 MPa (142.8 kgf/cm^2, 2,030 psi), the fuel relief valve installed on gateway of the fuel delivery pipe discharges the fuel pressure and then returns the fuel back to the fuel tank.

Reference (Fuel system diagram)



DTC No.	DTC Detection Condition	Trouble Area
P0191	After the fuel pressure is stable for 3 seconds or more, the following condition (a) or (b) continues for more than 10 seconds: (a) ECM did not command the high–pressure fuel pump to open the spill valve, but fuel pressure increases 3 MPa (30.6 kgf/cm^2, 435 psi). (b) Despite ECM commanded the high–pressure fuel pump to open the spill valve, fuel pressure decreases 5 MPa (51.0 kgf/cm^2, 725 psi).	• Open or short in high–pressure fuel pump (spill valve) circuit • High–pressure fuel pump • Low–pressure fuel pump • Fuel pipe • Fuel relief valve • Fuel pressure regulator • ECM

WIRING DIAGRAM

Refer to DTC P1235 on page 05–477.

INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0191)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0191” is output	A
”P0191” and other DTCs are output	B

HINT:
If any other codes besides ”P0191” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2 READ VALUE OF HAND–HELD TESTER(FUEL PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL PRESS” and read its value displayed on the hand–held tester.
Pressure: 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi)

NG → **Go to step 10**

OK

3 CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → **Go to step 12**

OK

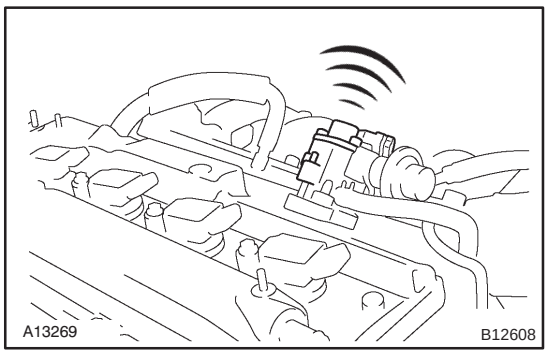
4 CHECK FOR FUEL LEAKS(HIGH PRESSURE)

(a) Check if there is leakage in the fuel pipe located between the high–pressure fuel pump and the injectors.

NG → REPAIR OR REPLACE A PLACE FUEL LEAKS

OK

5 CHECK FUEL PUMP(HIGH PRESSURE)



(a) With the engine running or cranking, use a sound scope to check that there is the normal operating sounds of the fuel pump (high–pressure) when it is operated.

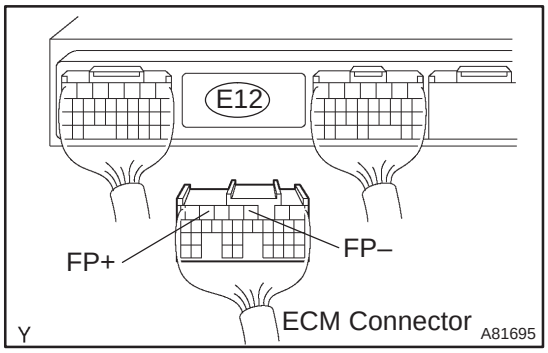
Standard:

There is the operating sounds of the fuel pump (high–pressure).

NG → REPAIR OR REPLACE FUEL PUMP ASSY

OK

6 CHECK HARNESS AND CONNECTOR(ECM – HIGH PRESSURE FUEL PUMP (SPILL VALVE))



(a) Disconnect the E12 ECM connector.

(b) Disconnect the S3 high–pressure fuel pump (spill valve) connector.

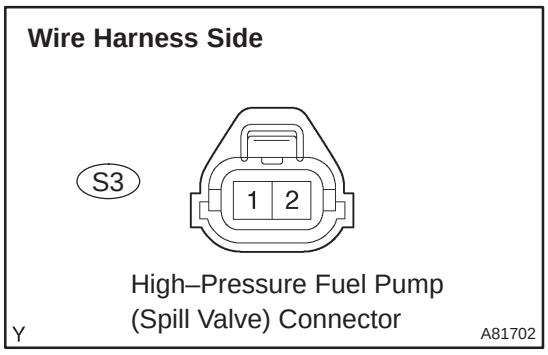
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
FP+ (E12–6) – Fuel pump (S3–1)	Continuity
FP– (E12–3) – Fuel pump (S3–2)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
FP+ (E12–6) or Fuel pump (S3–1) – Body ground	No continuity
FP– (E12–3) or Fuel pump (S3–2) – Body ground	



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	CHECK IF DTC OUTPUTS REOCCUR(DTC P0191 IS OUTPUT AGAIN)

(a) Clear the DTC (See page 05–294).
(b) Warm up the engine.
(c) Let the engine idle for 30 seconds or more.
(d) Read the DTC (See page 05–294).

Result:

Display (DTC output)	Proceed to
”P0191” is output again	A
No DTC output	B

B → CHECK FOR INTERMITTENT PROBLEMS

A

8	REPLACE FUEL RELIEF VALVE ASSY

GO

9	CHECK IF DTC OUTPUTS REOCCUR(DTC P0191 IS OUTPUT AGAIN)

(a) Clear the DTC (See page 05–294).
(b) Warm up the engine.
(c) Let the engine idle for 30 seconds or more.
(d) Read the DTC (See page 05–294).

Result:

Display (DTC output)	Proceed to
”P0191” is output again	A
No DTC output	B

B → SYSTEM OK

A

REPLACE FUEL PUMP ASSY (HIGH PRESSURE)

10	CHECK OPERATION OF FUEL PUMP(LOW PRESSURE) (See page 11–33)

OK → Go to step 3

NG

11	CHECK VOLTAGE FUEL PUMP(LOW PRESSURE) (See page 05–507)

OK → Go to step 3

NG

CHECK FOR FUEL PUMP CONTROL CIRCUIT (See page 05–507)

12	CHECK FOR FUEL LEAKS(LOW PRESSURE)

(a) Check if there is leakage in the fuel pipe located between the fuel tank and the high–pressure fuel pump.

NG → REPAIR OR REPLACE A PLACE FUEL LEAKS

OK

REPLACE FUEL PRESSURE REGULATOR ASSY

DTC	P0200	INJECTOR CIRCUIT / OPEN

DTC	P0201	INJECTOR CIRCUIT / OPEN – (CYLINDER 1)

DTC	P0202	INJECTOR CIRCUIT / OPEN – (CYLINDER 2)

DTC	P0203	INJECTOR CIRCUIT / OPEN – (CYLINDER 3)

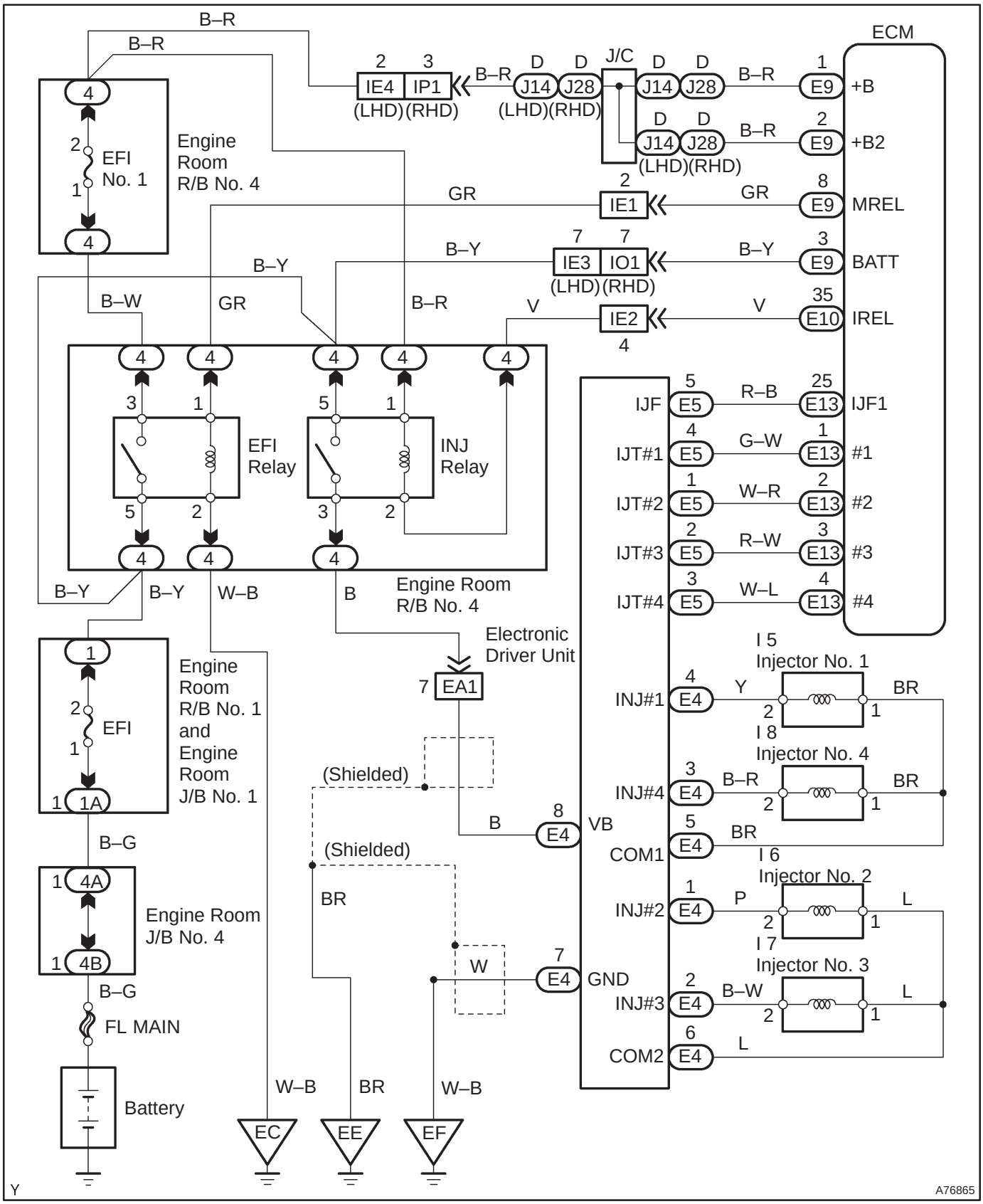
DTC	P0204	INJECTOR CIRCUIT / OPEN – (CYLINDER 4)

CIRCUIT DESCRIPTION

The Electronic Driver Unit (EDU) has been adopted to operate the injector at high speed. The EDU enables the injector to drive in high–speed rate under high–pressure fuel condition using its internal DC/DC converter that provides high voltage and quick–charging system.
The ECM constantly monitors the EDU. If the ECM detects abnormal condition, it will stop the engine.

DTC No.	DTC Detection Condition	Trouble Area
P0200	No IJF signals to ECM despite crankshaft rotating 10 times (1 trip detection logic).	• Open or short in EDU circuit • EDU (Injector driver) • Fuel injector assy • ECM
	No IJF signals to ECM despite crankshaft rotating 20 times during cranking (2 trip detection logic).	
P0201 P0202 P0203 P0204	No IJF signals of each cylinder to ECM 20 times successively (1 trip detection logic).	

WIRING DIAGRAM

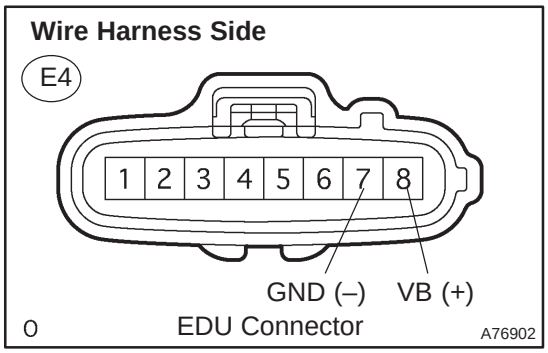


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK INJECTOR DRIVER(POWER SOURCE OF EDU)



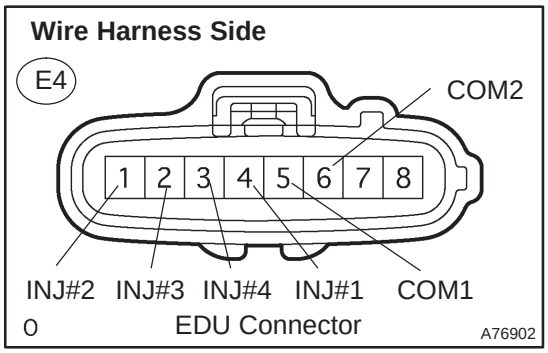
(a) Disconnect the E4 EDU connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the specified terminals of the EDU connector.

Symbols (Terminal No.)	Specified condition
VB (E4–8) – GND (E4–7)	9 to 14 V

NG → CHECK EDU POWER SOURCE CIRCUIT

OK

2 CHECK HARNESS AND CONNECTOR(EDU – FUEL INJECTOR)



(a) Disconnect the E4 EDU connector.
(b) Measure the resistance between the specified terminals of the EDU connector.

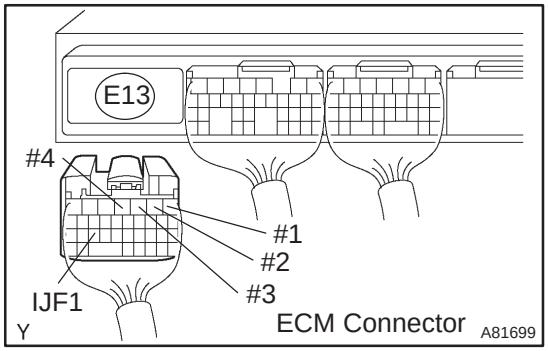
Standard:

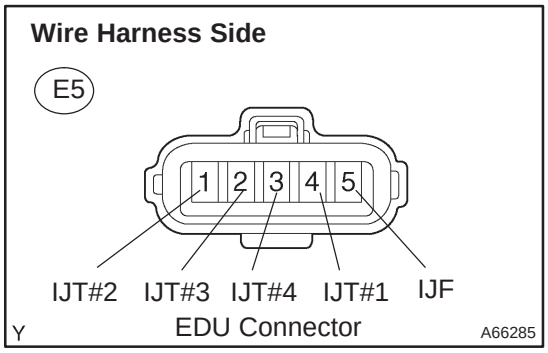
Symbols (Terminal No.)	Specified condition
INJ#1 (E4–4) – COM1 (E4–5)	2.55 to 2.85 Ω at 20 °C (68 °F)
INJ#2 (E4–1) – COM2 (E4–6)	
INJ#3 (E4–2) – COM2 (E4–6)	
INJ#4 (E4–3) – COM1 (E4–5)	

NG → Go to step 6

OK

3 CHECK HARNESS AND CONNECTOR(ECM – EDU)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the E5 EDU connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IJF1 (E13–25) – IJF (E5–5)	Continuity
#1 (E13–1) – IJT#1 (E5–4)	
#2 (E13–2) – IJT#2 (E5–1)	
#3 (E13–3) – IJT#3 (E5–2)	
#4 (E13–4) – IJT#4 (E5–3)	

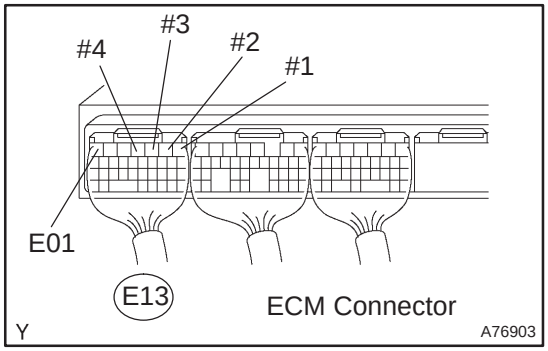
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IJF1 (E13–25) or IJF (E5–5) – Body ground	No continuity
#1 (E13–1) or IJT#1 (E5–4) – Body ground	
#2 (E13–2) or IJT#2 (E5–1) – Body ground	
#3 (E13–3) or IJT#3 (E5–2) – Body ground	
#4 (E13–4) or IJT#4 (E5–3) – Body ground	

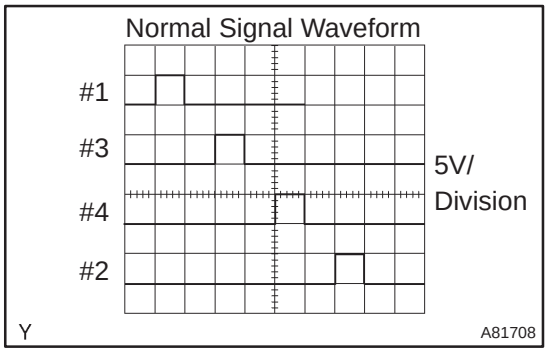
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 CHECK ECM(#1, #2, #3 AND #4 VOLTAGE)



(a) Connect an oscilloscope to terminals #1 – #4 and E01 of the E13 ECM harness side connector.



(b) With the engine cranking or idling, check the signal waveform.

Standard:

Signal waveform appears as shown in the illustration.

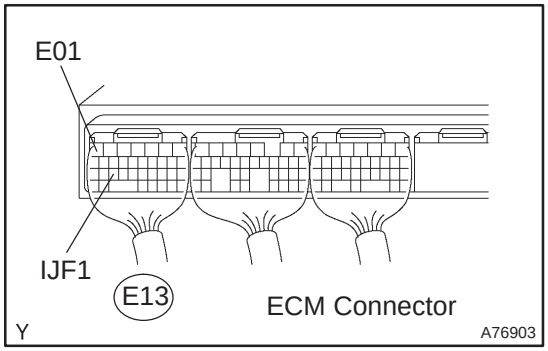
HINT:

Check the waveform before the ECM detects the DTC(s) and enters the fail–safe mode, because the ECM will no more indicate the voltage output once it enters the fail–safe mode.

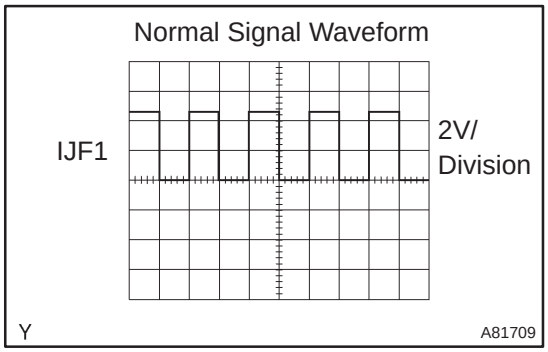
NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

5	CHECK ECM(IJF1 VOLTAGE)



(a) Connect an oscilloscope to terminals IJF1 and E01 of the E13 ECM harness side connector.



(b) With the engine cranking or idling, check the signal waveform.

Standard:

Signal waveform appears as shown in the illustration.

HINT:

Check the waveform before the ECM detects the DTC(s) and enters the fail–safe mode, because the EDU will no more indicate the voltage output once the ECM enters the fail–safe mode.

NG → **REPLACE INJECTOR DRIVER**

OK

CHECK FOR INTERMITTENT PROBLEMS

6	INSPECT FUEL INJECTOR ASSY (See page 11–36)

NG → **REPLACE FUEL INJECTOR ASSY**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC	P0300	RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED

DTC	P0301	CYLINDER 1 MISFIRE DETECTED

DTC	P0302	CYLINDER 2 MISFIRE DETECTED

DTC	P0303	CYLINDER 3 MISFIRE DETECTED

DTC	P0304	CYLINDER 4 MISFIRE DETECTED

CIRCUIT DESCRIPTION

Misfire: The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation for each cylinder.

The ECM counts the number of times the engine speed change rate indicates that misfire has occurred. And when the misfire rate equals to or exceeds the count of indicating that the engine condition has deteriorated, the CHK ENG is illuminated.

If the misfire rate is high enough and the driving conditions will cause the catalyst to overheat, the CHK ENG blinks when misfiring occurs.

HINT:

- For any particular 200 revolutions of the engine, misfiring which would result in overheating of catalyst is detected. This cause CHK ENG to blink (1 trip detection logic).
- For any particular 1,000 revolutions of engine, misfiring which would result in a deterioration of emissions. This illuminates CHK ENG (2 trip detection logic).

DTC No.	DTC Detection Condition	Trouble Area
P0300	Misfiring of random cylinders is detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • PCV hose • ECM
P0301 P0302 P0303 P0304	Misfiring of each cylinder is detected	

HINT:

When codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires have been detected and recorded at different times.

WIRING DIAGRAM

Refer to DTC P0200 on page 05–415 for the wiring diagram of the injector system.
Refer to DTC P0351 on page 05–439 for the wiring diagram of the ignition system.

CONFIRMATION DRIVING PATTERN

(a) Connect the hand–held tester to the DLC3.
(b) Record the DTC and freeze frame data.
(c) Use the hand–held tester to set to the check (test) mode (See page 05–294).
(d) Read the value on the misfire counter for each cylinder when idling. If the value is displayed on the misfire counter, skip the following procedure of confirmation driving.
(e) Drive the vehicle several times with the engine speed, load and its surrounding range shown with ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the DATA LIST.

If you have no hand–held tester, turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again.
HINT:
In order to memorize the DTC of misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD for the following period of time in the DATA LIST. Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check (test) mode to normal mode. So all DTCs, etc., will be erased.

Engine Speed	Time
Idling	3 minutes and 30 seconds or more
1,000 rpm	3 minutes or more
2,000 rpm	1 minutes and 30 seconds or more
3,000 rpm	1 minute or more

(f) Check whether there is misfire or not by monitoring the DTC and the freeze frame data, and then, record them.
(g) Turn the ignition switch OFF and wait at least for 5 seconds.

INSPECTION PROCEDURE

HINT:

- If DTCs besides misfire are memorized simultaneously, first perform the troubleshooting for them.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If the misfire does not occur when the vehicle is brought to the workshop, misfire can be confirmed by reproducing the condition of the freeze frame data. Also, after finishing the repair, confirm that there is no misfire (See confirmation driving pattern).
- When either of SHORT FT #1, LONG FT #1, SHORT FT #2 or LONG FT #2 in the freeze frame data is over the range of ±20 %, there is a possibility that the air–fuel ratio is inclining either to ”RICH” (–20 % or less) or ”LEAN” (+20 % or more).
- When COOLANT TEMP in the freeze frame data is less than 80˚C (176˚F), there is a possibility of misfire only during warming up the engine.
- If the misfire cannot be reproduced, the reason may be because of the driving the vehicle with lack of fuel, the use of improper fuel, a stain on the ignition plug, etc.
- Be sure to check the value on the misfire counter after the repair.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO MISFIRE DTCS)

(a) Read the DTC using the hand–held tester.
Result :

Display	Proceed to
DTC "P0300, P0301, P0302, P0303 and/or P0304" are output.	A
DTC "P0300, P0301, P0302, P0303 or P0304" and other codes are output.	B

HINT:
If any other codes besides "P0300, P0301, P0302, P0303 and/or P0304" are output, perform the trouble-shooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	CHECK WIRE HARNESS, CONNECTOR AND VACUUM HOSE IN ENGINE ROOM

(a) Check the connection conditions of the wire harness and connector.
(b) Check the disconnection, piping and break of the vacuum hose.

NG → **REPAIR OR REPLACE, THEN CONFIRM THAT THERE IS NO MISFIRE**

OK

3	CHECK CONNECTION OF PCV HOSE

NG → **REPAIR OR REPLACE PCV HOSE**

OK

4	READ VALUE OF HAND–HELD TESTER(NUMBER OF MISFIRE)

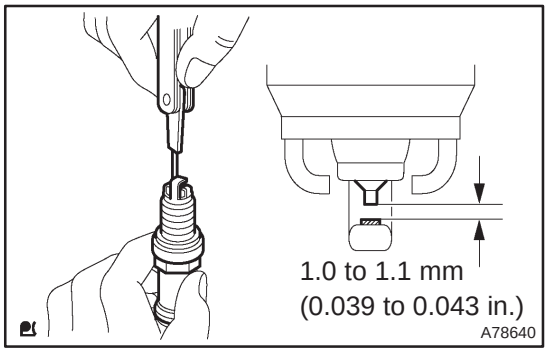
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / CYL#1 – CYL#4".
(e) Read the number of misfire on the hand–held tester.
HINT:
When a misfire is not reproduced, be sure to branch below based on the stored DTC.
Result:

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → **Go to step 12**

A

5	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER



(a) Remove the ignition coil with igniter assy.
(b) Remove the spark plug.
(c) Check the spark plug type.
Recommended spark plug:

DENSO made	SK20BR11

(d) Check the spark plug electrode gap.
Electrode gap: 1.0 to 1.1 mm (0.039 to 0.043 in.)
Maximum electrode gap: 1.3 mm (0.051 in.)

NOTICE:
If adjusting the gap of a new spark plug, bend only the base the ground electrode. Do not touch the tip. Never attempt to adjust the gap on a used plug.

(e) Check the electrode for carbon deposits.
(f) Perform a spark test.

CAUTION:
Each injector connector must be disconnected.
NOTICE:
Do not crank the engine for more than 2 seconds.

(1) Install the spark plug to the ignition coil with igniter, and connect the ignition coil with igniter connector.
(2) Disconnect the injector connectors.
(3) Ground the spark plug.
(4) Check if spark occurs while the engine is being cranked.

Standard: Spark jumps across electrode gap.

NG → **Go to step 19**

OK

6	CHECK CYLINDER COMPRESSION PRESSURE OF MISFIRING CYLINDER (See page 14–181)

NG → **REPAIR OR REPLACE**

OK

7	CHECK VALVE CLEARANCE OF MISFIRING CYLINDER (See page 14–186)

NG → **ADJUST VALVE CLEARANCE (See page 14–186)**

OK

8	REPLACE FUEL INJECTOR OF MISFIRING CYLINDER

(a) Read the DTC and check which of the cylinders causes the misfiring DTC (See page 05–294).
(b) Remove the injector of the misfiring cylinder and other normal injector (See page 11–42).
(c) Swap the injector of misfiring cylinder for the normal injector.

GO

9	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

10	READ OUTPUT DTC(MISFIRE DTCS ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
The same DTC is output again	A
The other DTC is output	B

B → REPLACE FUEL INJECTOR ASSY

A

11	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)

- If the result of step 4 is ”1 or 2 cylinders”, proceed to A.
- If the result of step 4 is ”more than 3 cylinders”, proceed to B.

B → CHECK FOR INTERMITTENT PROBLEMS

A

12	CHECK VALVE TIMING(CHECK FOR LOOSE AND JUMPING TEETH)

NG → ADJUST VALVE TIMING

OK

13	CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

14	CHECK FUEL PRESSURE(HIGH PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, FUEL PRESSURE SENSOR, WIRING AND FUEL LEAKAGE

OK

15	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE AND MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Check the intake air temperature.
  (1) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.

  Temperature: Equivalent to ambient temperature
(d) Check the air flow rate.
  (1) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

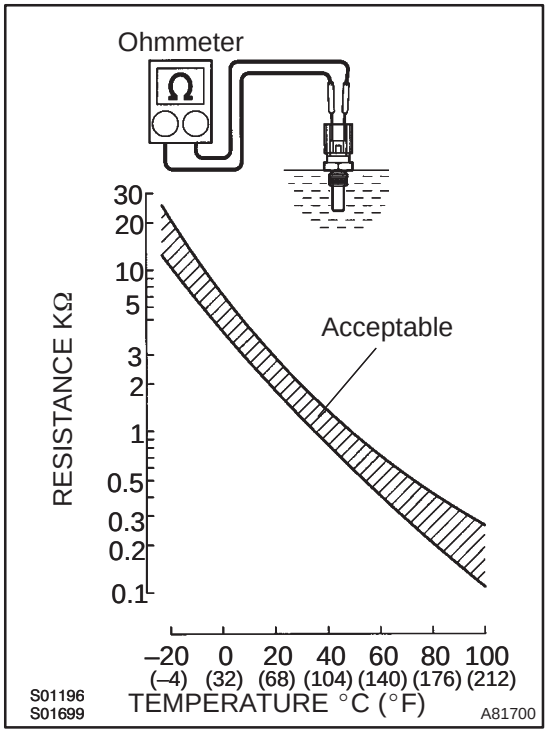
  Standard:

Condition	Air flow rate (gm/s)
Ignition switch ON (do not start engine)	0
Idling	4 to 6
Running without load (2,500 rpm)	13 to 20
Idling – Running	Air flow rate fluctuates

NG → REPLACE MASS AIR FLOW METER

OK

16	INSPECT ENGINE COOLANT TEMPERATURE SENSOR



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals.
Resistance:
2.32 to 2.59 kΩ at 20°C (68°F)
0.310 to 0.326 kΩ at 80°C (176°F)

NOTICE:
In case of checking the engine coolant temperature sensor in the water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:
Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

17	INSPECT MANIFOLD ABSOLUTE PRESSURE SENSOR (See page 05–342)

NG → **REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR**

OK

18	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)

- If the result of step 4 is ”1 or 2 cylinders”, proceed to A.
- If the result of step 4 is ”more than 3 cylinders”, proceed to B.

B → **AGAIN GO TO STEP 5**

A

CHECK FOR INTERMITTENT PROBLEMS

19	INSPECT CHANGE NORMAL SPARK PLUG AND CHECK SPARK OF MISFIRING CYLINDER

(a) Change to the normal spark plug.
(b) Perform a spark test.

CAUTION:
Each injector connector must be disconnected.
NOTICE:
Do not crank the engine for more than 2 seconds.

(1) Install the spark plug to the ignition coil, and connect the ignition coil connector.
(2) Disconnect the injector connectors.
(3) Ground the spark plug.
(4) Check if spark occurs while the engine is being cranked.

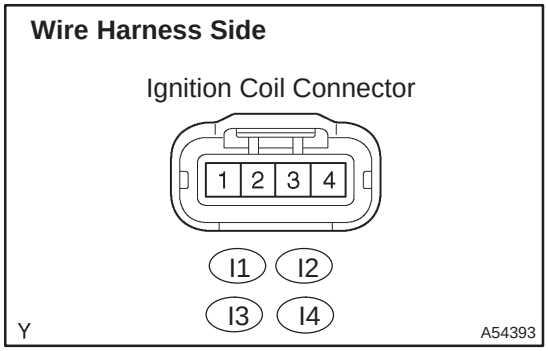
Standard: Spark jumps across electrode gap.

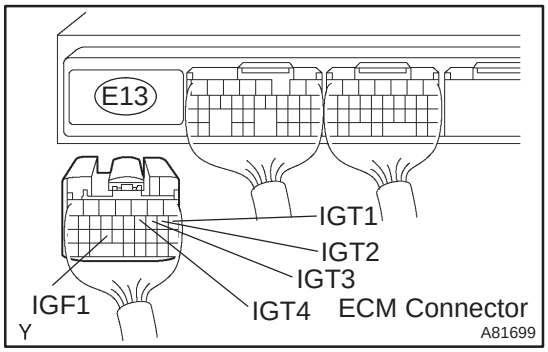
NG → **Go to step 20**

OK

REPLACE SPARK PLUG

20	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(IGNITION COIL ASSY – ECM)





(a) Check the harness and connector between the ignition coil and ECM (IGF terminal) connectors
(1) Disconnect the I1, I2, I3 or I4 ignition coil connector.
(2) Disconnect the E13 ECM connector.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–2) – IGF1 (E13–24)	Continuity
Ignition coil (I2–2) – IGF1 (E13–24)	
Ignition coil (I3–2) – IGF1 (E13–24)	
Ignition coil (I4–2) – IGF1 (E13–24)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–2) or IGF1 (E13–24) – Body ground	No continuity
Ignition coil (I2–2) or IGF1 (E13–24) – Body ground	
Ignition coil (I3–2) or IGF1 (E13–24) – Body ground	
Ignition coil (I4–2) or IGF1 (E13–24) – Body ground	

(b) Check the harness and connector between the ignition coil and ECM (IGT terminal) connectors
(1) Disconnect the I1, I2, I3 or I4 ignition coil connector.
(2) Disconnect the E13 ECM connector.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–3) – IGT1 (E13–8)	Continuity
Ignition coil (I2–3) – IGT2 (E13–9)	
Ignition coil (I3–3) – IGT3 (E13–10)	
Ignition coil (I4–3) – IGT4 (E13–11)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–3) or IGT1 (E13–8) – Body ground	No continuity
Ignition coil (I2–3) or IGT2 (E13–9) – Body ground	
Ignition coil (I3–3) or IGT3 (E13–10) – Body ground	
Ignition coil (I4–3) or IGT4 (E13–11) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE IGNITION COIL ASSY (THEN CONFIRM THAT THERE IS NO MISFIRE)

DTC	P0325	KNOCK SENSOR 1 CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0327	KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

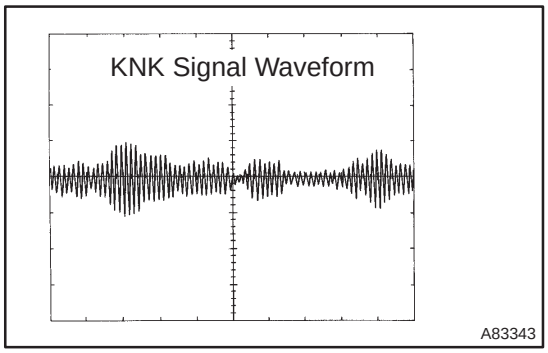
DTC	P0328	KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

A flat type knock sensor (non–resonant type) has a structure that can detect vibrations in a wide frequency range, from about 6 kHz to 15 kHz, and has the following features.
Knock sensor is fitted on the cylinder block to detect the engine knocking.
The knock sensor contains a piezoelectric element which generates a voltage when it becomes deformed. This occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is retarded to suppress it.

DTC No.	DTC Detection Condition	Trouble Area
P0325	Output voltage of the knock sensor decreases beyond a threshold. (Threshold varies according to an engine speed.)	• Knock sensor • Knock sensor (under–torqued or loose) • ECM
P0327	Output voltage of the knock sensor is 0.5 V or less.	• Short in knock sensor circuit • Knock sensor • ECM
P0328	Output voltage of the knock sensor is 4.5 V or more.	• Open in knock sensor circuit • Knock sensor • ECM

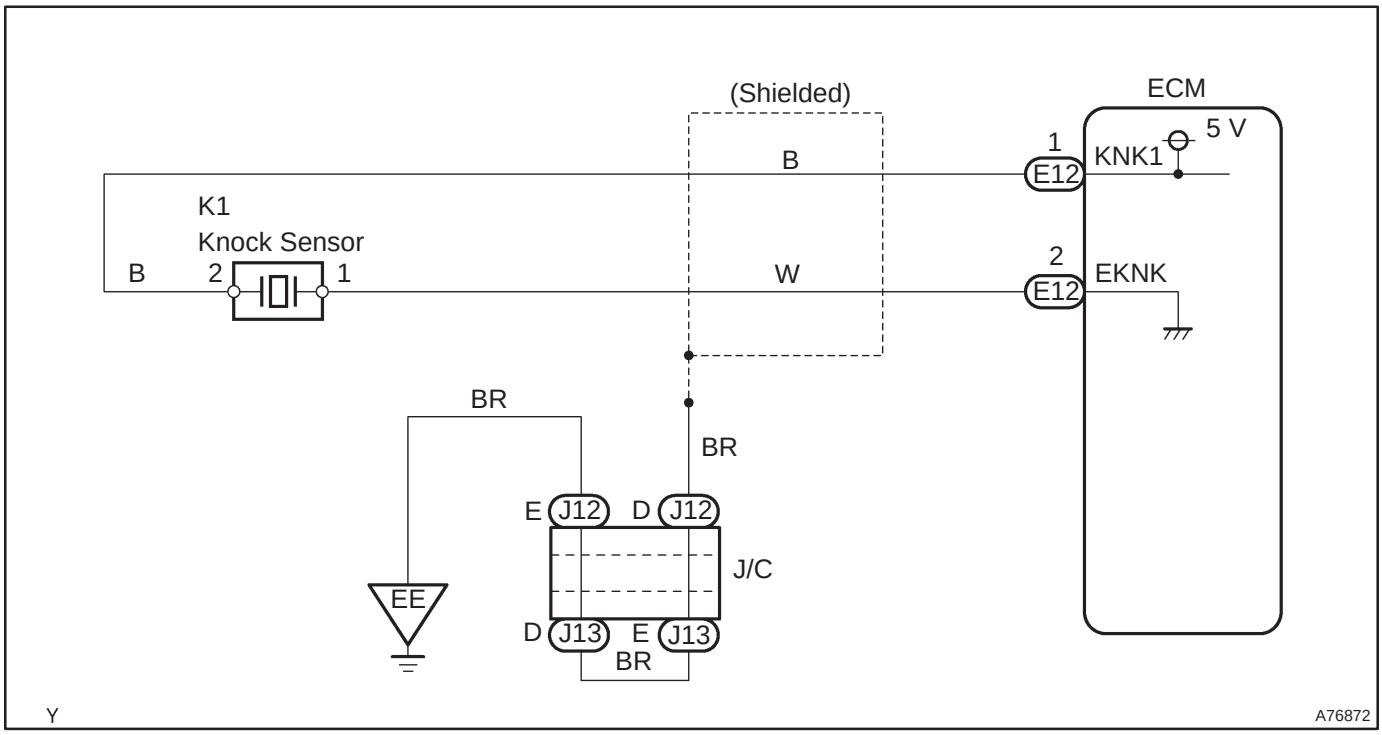
HINT:
If the ECM detects above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.



Reference:
The correct waveform is shown in the diagram on the left.

Item	Details
Terminal	KNK1 – EKNK
Equipment Settings	0.01 to 10 V/ Division, 0.01 to 10 msec./ Division
Condition	After warming up the engine, keep the engine speed at 4,000 rpm.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ OUTPUT DTC

(a) Clear the DTC (See page 05–294).
(b) Warm up the engine.
(c) Run the engine at 3,000 rpm for 10 seconds or more.
(d) Read the DTC (See page 05–294).

Result :

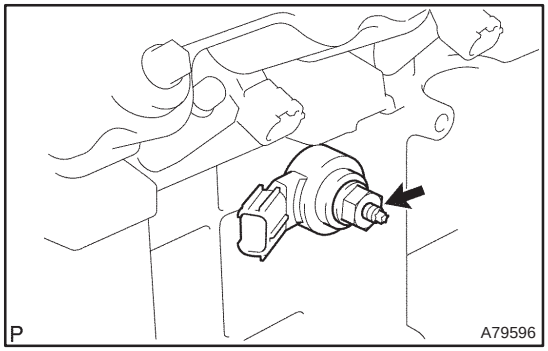
Display (DTC output)	Proceed to
Only ”P0325” is output again	A
”P0325, P0327 and/or P0328” are output again	B
”P0325, P0327 and/or P0328” are not output again	C

B	Go to step 3

C	CHECK FOR INTERMITTENT PROBLEMS

A

2 CHECK KNOCK SENSOR



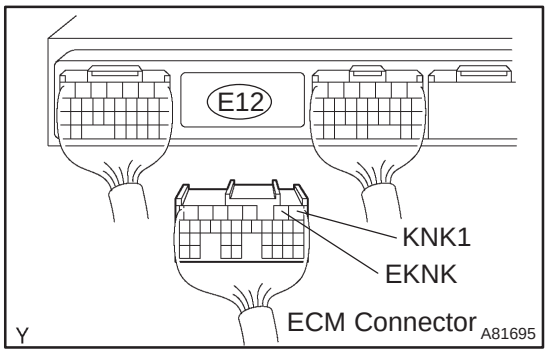
(a) Check the knock sensor installation.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

NG → **TIGHTEN SENSOR**

OK

REPLACE KNOCK SENSOR

3 CHECK HARNESS AND CONNECTOR(ECM – KNOCK SENSOR)

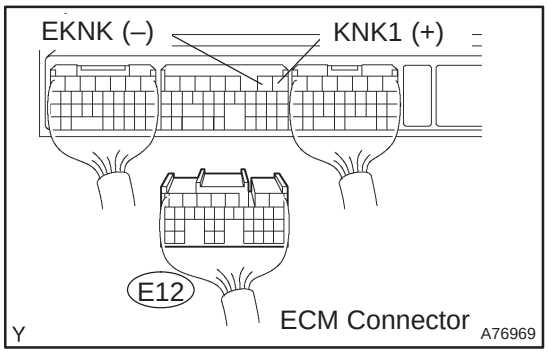


(a) Disconnect the E12 ECM connector.
(b) Measure the resistance between terminals KNK1 (E12–1) and EKNK (E12–2) of the ECM connector.
Resistance: 120 to 280 kΩ at 20°C (68°F)

NG → **Go to step 5**

OK

4 INSPECT ECM(KNK1 VOLTAGE)



(a) Disconnect the E12 ECM connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals KNK1 (E12–1) and EKNK (E12–2) of the ECM terminals.
Voltage: 4.5 to 5.5 V

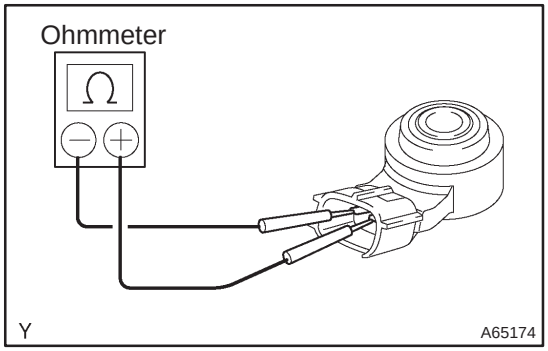
NG → **REPLACE ECM (See page 10–65)**

OK

CHECK FOR INTERMITTENT PROBLEMS

NOTICE:
Fault may be intermittent. Check harness and connectors carefully and result.

5	INSPECT KNOCK SENSOR



(a) Remove the knock sensor.
(b) Measure the resistance between the terminals.
Resistance: 120 to 280 kΩ at 20°C (68°F)

NG → **REPLACE KNOCK SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

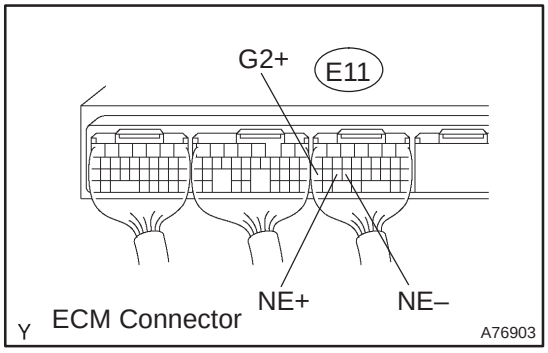
DTC	P0335	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT

DTC	P0339	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT INTERMITTENT

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a magnet, iron core and pick up coil.
The NE signal plate (crankshaft position sensor plate No. 1) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signal, and the cylinder and the angle of the VVT based on the combination of the G2 and NE signal.

DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor (NE) signal to ECM during cranking for 3 sec. or more (2 trip detection logic).	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft position sensor plate No. 1) • ECM
	No crankshaft position sensor (NE) signal to ECM with engine speed 600 rpm or more (2 trip detection logic).	
P0339	In condition (a), (b) and (c), when no crankshaft position sensor (NE) signal is input for 0.05 sec. or more (1 trip detection logic): (a) Engine revolution 1,000 rpm or more (b) STA signal is OFF (c) 3 sec. or more has been lapsed after STA signal is switched from ON to OFF.	

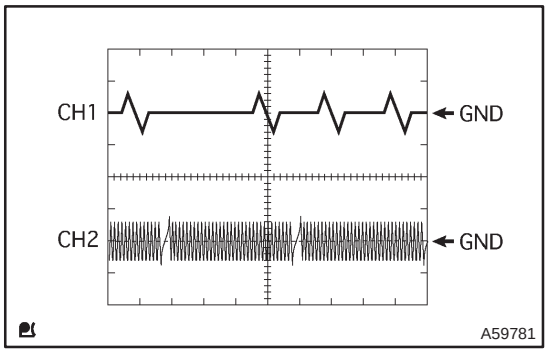


Reference: Inspection using the oscilloscope.

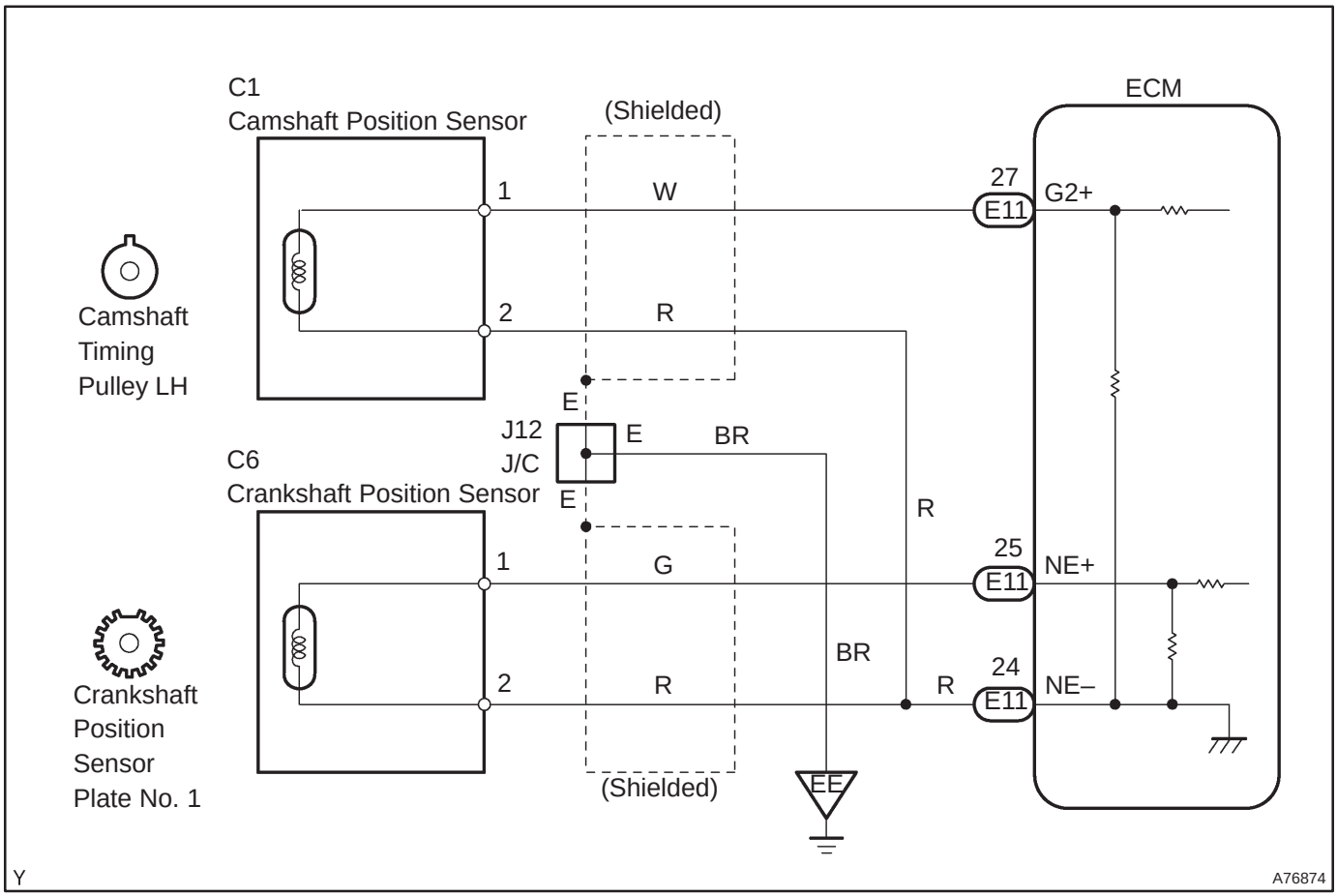
(1) During cranking or idling, check the waveform between the terminals of the ECM connector.

Item	Details
Terminal	CH1: G2+ – NE– CH2: NE+ – NE–
Equipment Setting	5 V/Division, 20 ms/Division
Condition	During Cranking or idling

HINT:
The correct waveforms are as shown in the left.



WIRING DIAGRAM



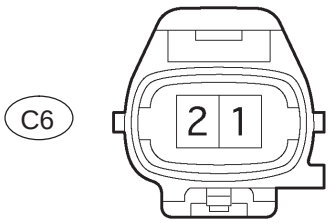
INSPECTION PROCEDURE

HINT:

- Perform troubleshooting of DTC P0335 first. If no trouble is found, troubleshoot the engine mechanical system.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT CRANKSHAFT POSITION SENSOR(RESISTANCE)

Component Side



Crankshaft Position Sensor

A64984

(a) Disconnect the C6 crankshaft position sensor connector.
(b) Measure the resistance between the terminals of the crankshaft position sensor.

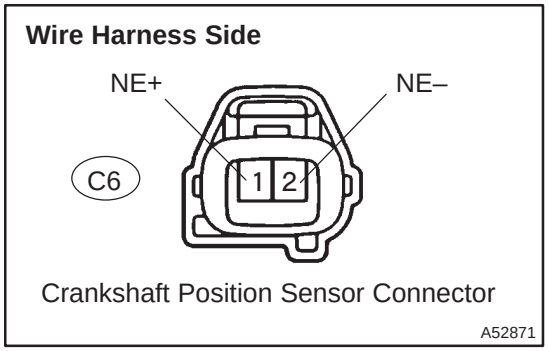
Resistance:
985 to 1,600 Ω at cold
1,265 to 1,890 Ω at hot

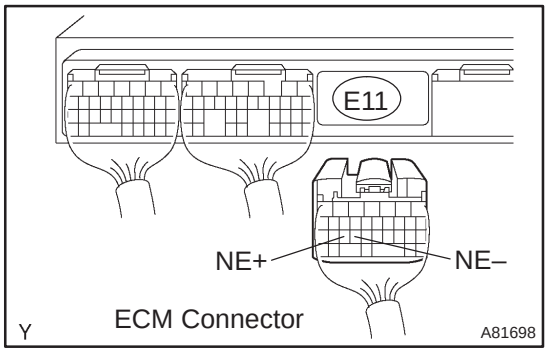
NOTICE:
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **REPLACE CRANKSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(ECM – CRANKSHAFT POSITION SENSOR)





(a) Disconnect the C6 crankshaft position sensor connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Crankshaft position sensor (C6–1) – NE+ (E11–25)	Continuity
Crankshaft position sensor (C6–2) – NE– (E11–24)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Crankshaft position sensor (C6–1) or NE+ (E11–25) – Body ground	No continuity
Crankshaft position sensor (C6–2) or NE– (E11–24) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)

(a) Check the crankshaft position sensor installation.

NG → **TIGHTEN SENSOR**

OK

4 INSPECT CRANKSHAFT POSITION SENSOR PLATE NO.1(TEETH OF SIGNAL PLATE)

(a) Remove the crankshaft position sensor plate No. 1 (See page 14–222).
(b) Check the teeth of the signal plate.

NG → **REPLACE CRANKSHAFT POSITION SENSOR PLATE NO.1**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0340	CAMSHAFT POSITION SENSOR ”A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0341	CAMSHAFT POSITION SENSOR ”A” CIRCUIT RANGE/PERFORMANCE (BANK 1 SINGLE SENSOR)

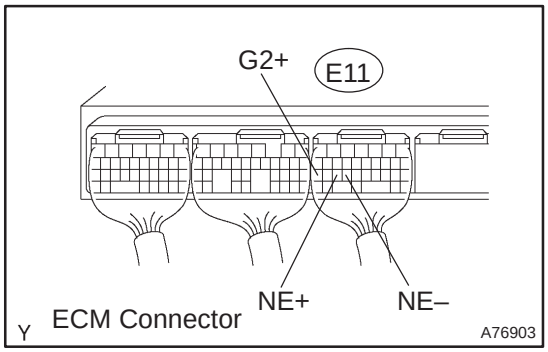
CIRCUIT DESCRIPTION

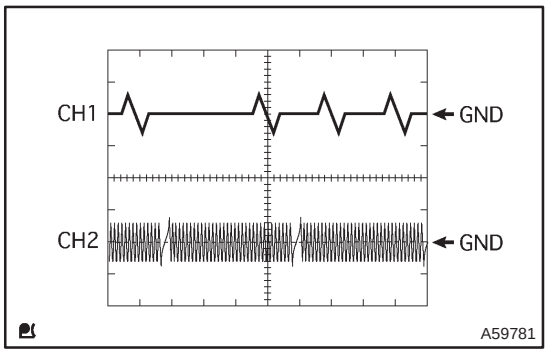
The camshaft position sensor (G2 signal) consists of a magnet, iron core and pickup coil.
The G2 signal rotor has 3 teeth on the outside and is mounted on the intake camshaft.
When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil changes, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate (crankshaft position sensor plate No. 1) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signal, and the cylinder and the angle of the VVT based on the combination of the G2 and NE signal.

DTC No.	DTC Detection Condition	Trouble Area
P0340	No camshaft position sensor (G2) signal to ECM during cranking for 4 sec. or more (2 trip detection logic).	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing gear • Timing chain has jumped a tooth • ECM
	No camshaft position sensor (G2) signal to ECM with engine speed 600 rpm or more for 5 sec. or more (1 trip detection logic).	
P0341	While crankshaft rotates twice, camshaft position sensor (G2) signal will be input to ECM 12 times or more (1 trip detection logic).	

HINT:

- DTC P0340 indicate a malfunction related to the camshaft position sensor (+) circuit. (Wire harness (ECM – camshaft position sensor) and camshaft position sensor)
- DTC P0341 indicate a malfunction related to the camshaft position sensor (–) circuit. (Wire harness (ECM – camshaft position sensor) and camshaft position sensor)





Reference: Inspection using the oscilloscope.

(1) During cranking or idling, check the waveform between the terminals of the ECM connector.

Item	Details
Terminal	CH1: G2+ – NE– CH2: NE+ – NE–
Equipment Setting	5 V/Division, 20 ms/Division
Condition	During Cranking or idling

HINT:

The correct waveforms are as shown in the left.

WIRING DIAGRAM

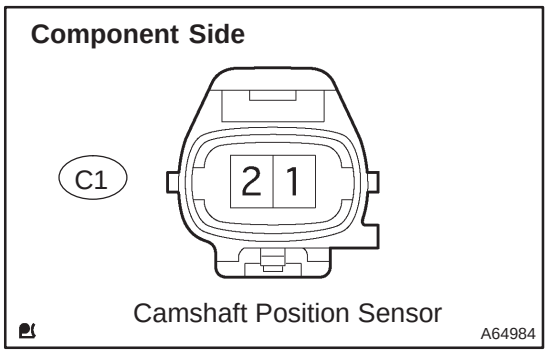
Refer to DTC P0335 on page 05–433.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT CAMSHAFT POSITION SENSOR(RESISTANCE)



(a) Disconnect the C1 camshaft position sensor connector.

(b) Measure the resistance between the terminals of the camshaft position sensor.

Resistance:

835 to 1,400 Ω at cold

1,060 to 1,645 Ω at hot

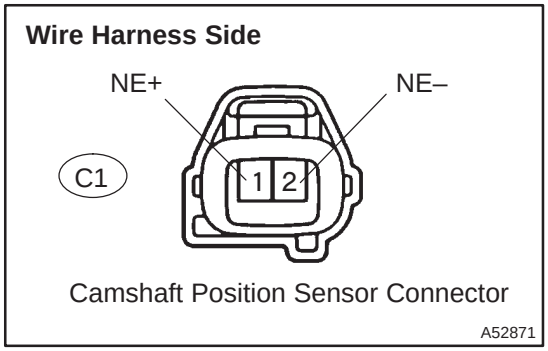
NOTICE:

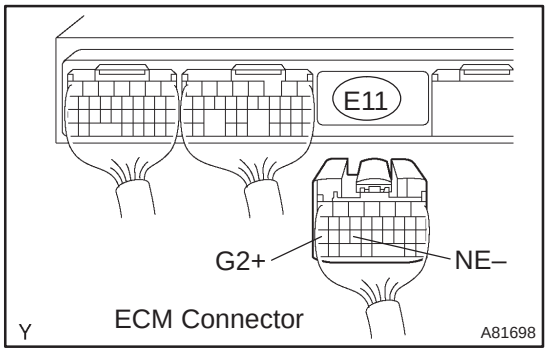
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **REPLACE CAMSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(ECM – CAMSHAFT POSITION SENSOR)





(a) Disconnect the C1 camshaft position sensor connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Camshaft position sensor (C1–1) – G2+ (E11–27)	Continuity
Camshaft position sensor (C1–2) – NE– (E11–24)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Camshaft position sensor (C1–1) or G2+ (E11–27) – Body ground	No continuity
Camshaft position sensor (C1–2) or NE– (E11–24) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CAMSHAFT POSITION SENSOR)

(a) Inspect the camshaft position sensor installation.

NG → **TIGHTEN SENSOR**

OK

4 INSPECT CAMSHAFT

(a) Remove the camshafts (See page 14–240).
(b) Check the camshaft lobes.

NG → **REPLACE CAMSHAFT**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0351	IGNITION COIL ”A” PRIMARY/SECONDARY CIRCUIT

DTC	P0352	IGNITION COIL ”B” PRIMARY/SECONDARY CIRCUIT

DTC	P0353	IGNITION COIL ”C” PRIMARY/SECONDARY CIRCUIT

DTC	P0354	IGNITION COIL ”D” PRIMARY/SECONDARY CIRCUIT

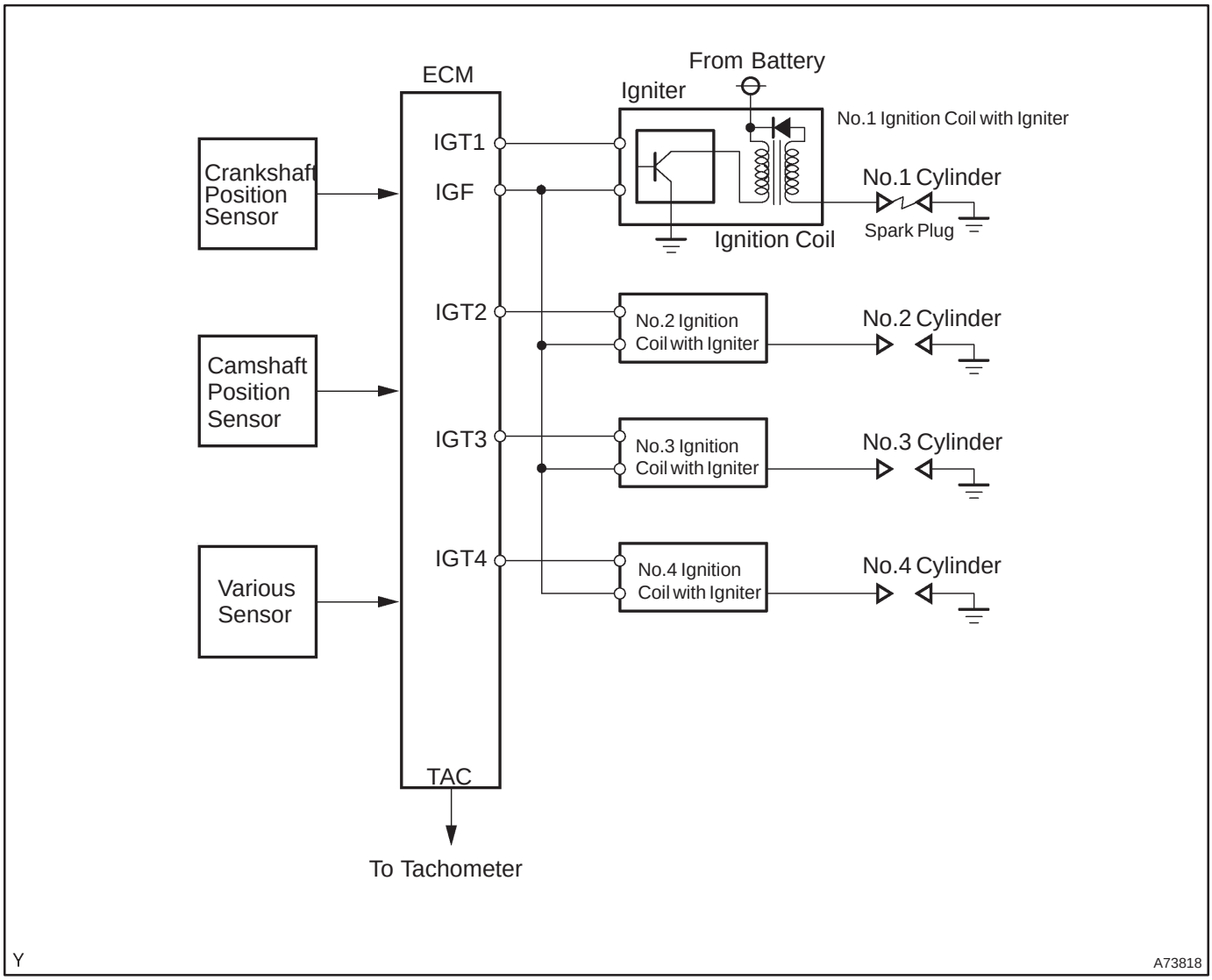
HINT:

- These DTCs indicate a malfunction related to primary circuit.
- If DTC P0351 is displayed, check No. 1 ignition coil with igniter circuit.
- If DTC P0352 is displayed, check No. 2 ignition coil with igniter circuit.
- If DTC P0353 is displayed, check No. 3 ignition coil with igniter circuit.
- If DTC P0354 is displayed, check No. 4 ignition coil with igniter circuit.

CIRCUIT DESCRIPTION

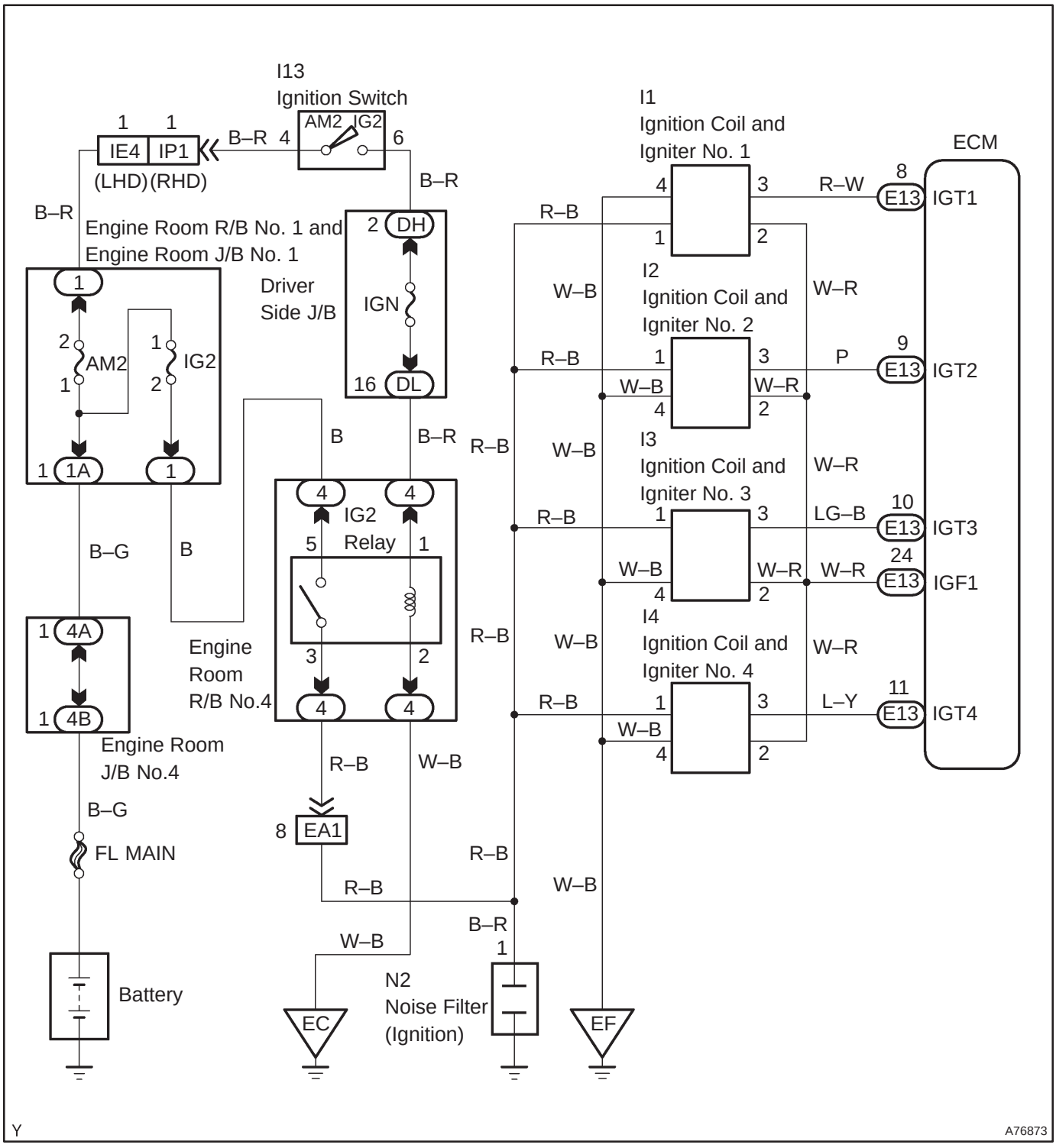
A Direct Ignition System (DIS) has been adopted. The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.

The ECM determines the ignition timing and outputs the ignition signals (IGT) for each cylinder. Based on the IGT signals, the power transistors in the igniter cut off the current to the primary coil in the ignition coil is supplied to the spark plug that is connected to the end of the secondary coil. At the same time, the igniter also sends an ignition confirmation signal (IGF) as a fail–safe measure to the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0351 P0352 P0353 P0354	No IGF signal to ECM while engine is running	• Ignition system • Open or short in IGF and IGT circuit from ignition coil with igniter to ECM (ignition coil circuit 1 through 4) • Ignition coil with igniter (ignition coil 1 through 4) • IG2 relay • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	PERFORM SIMULATION TEST(CHECK DTC)

(a) Read the DTC and check which of the cylinders causes the DTC (See page 05–294).
(b) Clear the DTC (See page 05–294).
(c) Swap the ignition coil with igniter of the cylinder that is referred by the DTC for the others.

NOTICE:

Do not swap the ignition coil with igniter connector for the others.

(d) Start the engine.
(e) Read the DTC (See page 05–294).

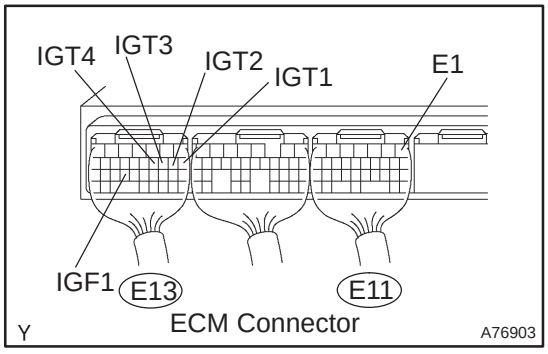
Result:

Display (DTC output)	Proceed to
The same DTC is output again	A
The other DTC is output	B

B → REPLACE IGNITION COIL ASSY

A

2	INSPECT ECM(IGT1, IGT2, IGT3 OR IGT4 VOLTAGE)

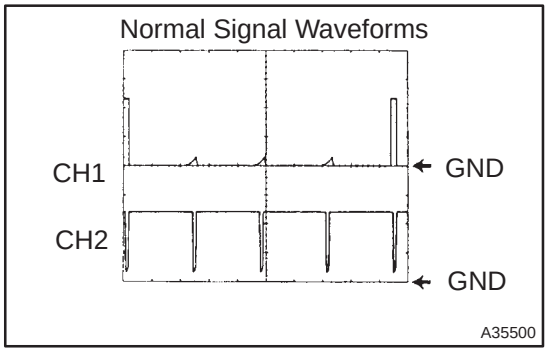


(a) During cranking or idling, check the waveform between terminals IGT1 to IGT4 and E1, and IGF1 and E1 of the ECM connector.

Item	Details
Terminal	CH1: IGT1, IGT2, IGT3, IGT4 – E1 CH2: IGF1 – E1
Equipment Settings	2 V/Division, 20 ms/Division
Condition	While the engine is cranking or idling

HINT:

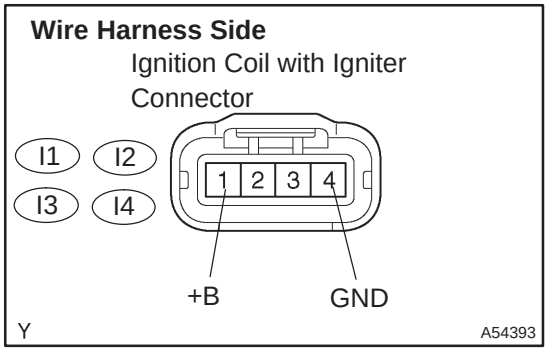
Correct waveform appears as shown, with rectangle waves.



OK → CHECK AND REPLACE ECM (See page 01–32)

NG

3 CHECK IGNITION COIL ASSY(POWER SOURSE)



(a) Disconnect the I1, I2, I3 or I4 ignition coil with igniter connector.

(b) Check for open between terminal GND of the ignition coil with igniter connector and body ground.

Resistance: 1 Ω or less

(c) Turn the ignition switch ON.

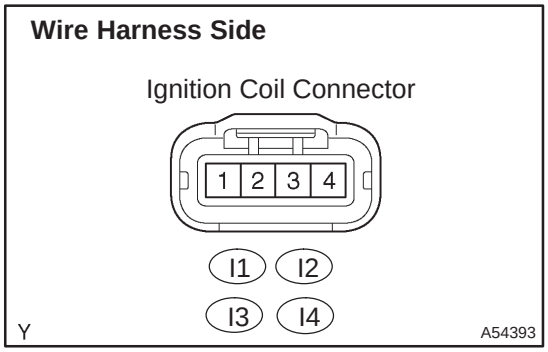
(d) Measure the voltage between terminals +B and GND of the ignition coil with igniter connector.

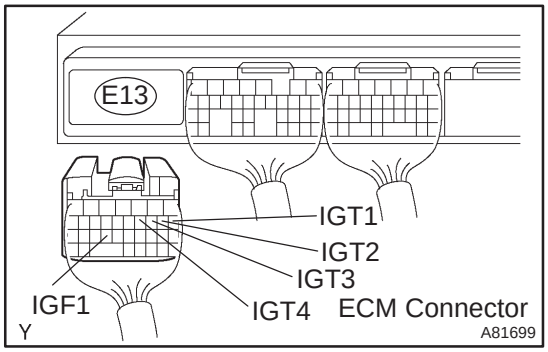
Voltage: 9 to 14 V

NG → **Go to step 5**

OK

4 CHECK HARNESS AND CONNECTOR(ECM – IGNITION COIL)





(a) Check the harness and connector between the ignition coil and ECM (IGF terminal) connectors

(1) Disconnect the I1, I2, I3 or I4 ignition coil connector.

(2) Disconnect the E13 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–2) – IGF1 (E13–24)	Continuity
Ignition coil (I2–2) – IGF1 (E13–24)	
Ignition coil (I3–2) – IGF1 (E13–24)	
Ignition coil (I4–2) – IGF1 (E13–24)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–2) or IGF1 (E13–24) – Body ground	No continuity
Ignition coil (I2–2) or IGF1 (E13–24) – Body ground	
Ignition coil (I3–2) or IGF1 (E13–24) – Body ground	
Ignition coil (I4–2) or IGF1 (E13–24) – Body ground	

(b) Check the harness and connector between the ignition coil and ECM (IGT terminal) connectors

(1) Disconnect the I1, I2, I3 or I4 ignition coil connector.

(2) Disconnect the E13 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–3) – IGT1 (E13–8)	Continuity
Ignition coil (I2–3) – IGT2 (E13–9)	
Ignition coil (I3–3) – IGT3 (E13–10)	
Ignition coil (I4–3) – IGT4 (E13–11)	

Standard (Check for short):

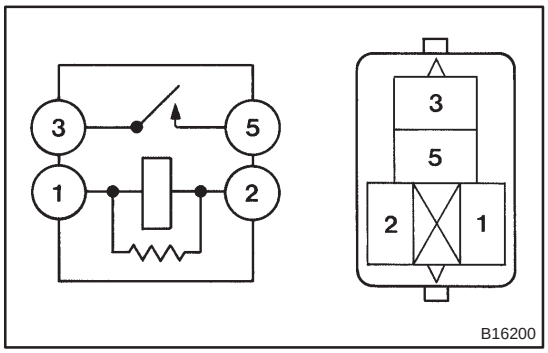
Symbols (Terminal No.)	Specified condition
Ignition coil (I1–3) or IGT1 (E13–8) – Body ground	No continuity
Ignition coil (I2–3) or IGT2 (E13–9) – Body ground	
Ignition coil (I3–3) or IGT3 (E13–10) – Body ground	
Ignition coil (I4–3) or IGT4 (E13–11) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE IGNITION COIL ASSY

5 INSPECT IG2 RELAY



(a) Remove the IG2 relay from the engine room R/B No. 4.
(b) Inspect the IG2 relay.

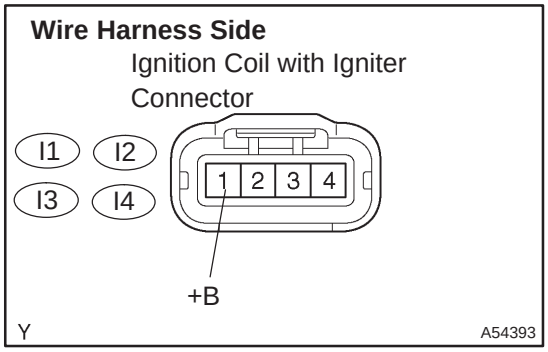
Standard:

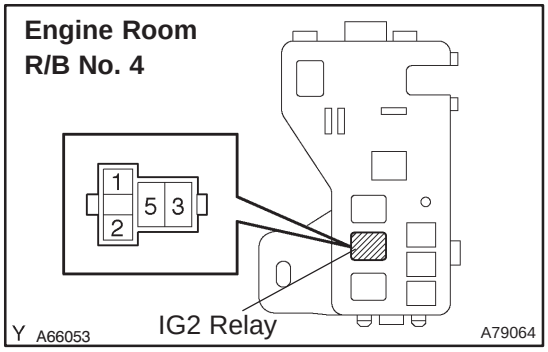
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE IG2 RELAY**

OK

6 CHECK HARNESS AND CONNECTOR(IG2 RELAY – IGNITION COIL)





(a) Disconnect the I1, I2, I3 or I4 ignition coil with igniter connector.
(b) Remove the IG2 relay from the engine room R/B No. 4.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–1) – IG2 relay (3)	Continuity
Ignition coil (I2–1) – IG2 relay (3)	
Ignition coil (I3–1) – IG2 relay (3)	
Ignition coil (I4–1) – IG2 relay (3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–1) or IG2 relay (3) – Body ground	No continuity
Ignition coil (I2–1) or IG2 relay (3) – Body ground	
Ignition coil (I3–1) or IG2 relay (3) – Body ground	
Ignition coil (I4–1) or IG2 relay (3) – Body ground	

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK FOR FUEL PUMP CONTROL CIRCUIT (See page 05–507)

DTC	P0420	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC	P0430	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 2)

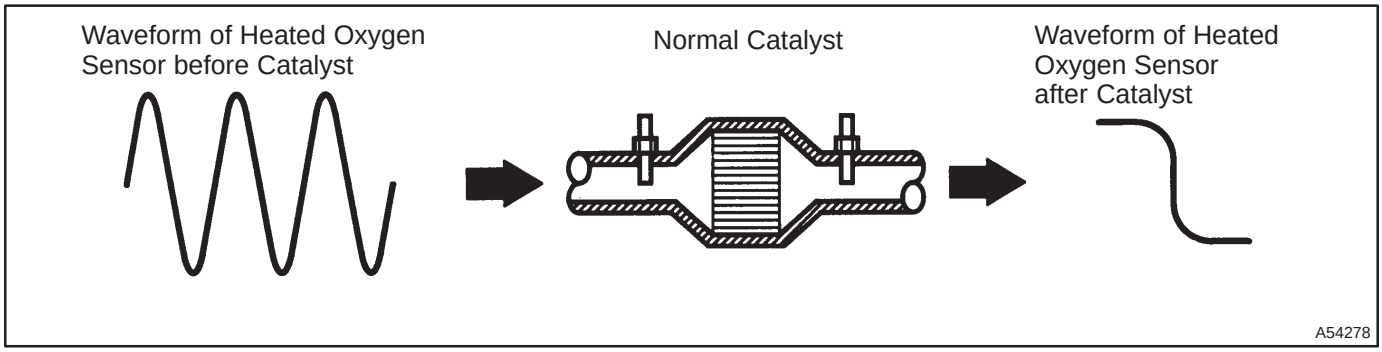
CIRCUIT DESCRIPTION

The ECM compares the waveform of the heated oxygen sensor located before the catalyst with the waveform of the heated oxygen sensor located after the catalyst to determine whether or not the catalyst performance has deteriorated.

The air–fuel ratio feedback compensation keeps the waveform of the heated oxygen sensor before the catalyst repeatedly changing back and forth from rich to lean.

If the catalyst is functioning normally, the waveform of the heated oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the heated oxygen sensor before the catalyst.

But when both waveforms change at a similar rate, it indicates that the catalyst performance has deteriorated.

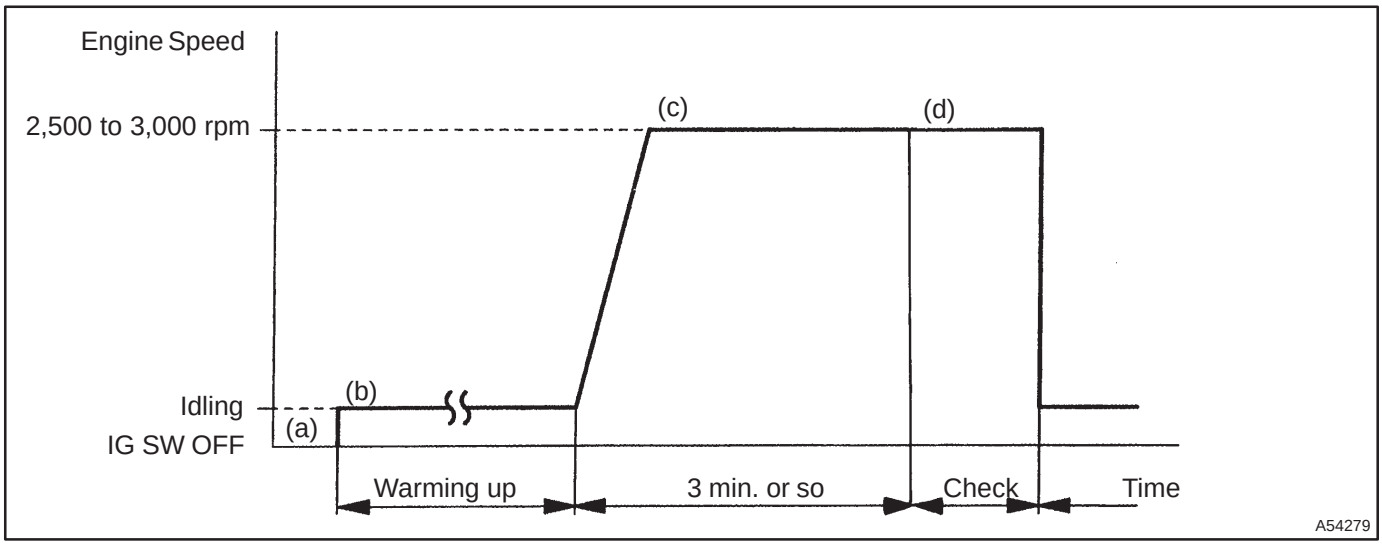


DTC No.	DTC Detection Condition	Trouble Area
P0420 P0430	After engine and catalyst are warmed up, and while vehicle is driven within set value and engine speed range, waveforms of heated oxygen sensors have the same amplitude (2 trip detection logic)	• Gas leakage in exhaust system • Heated oxygen sensor • Three–way catalytic converter (inside exhaust manifold)

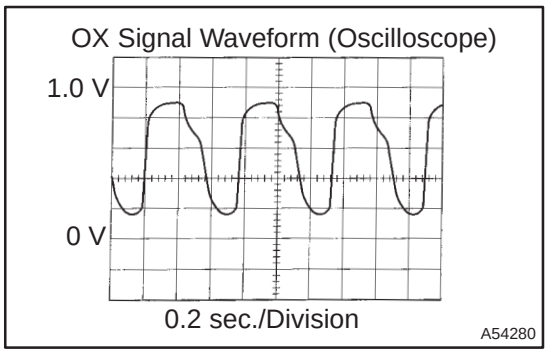
HINT:

- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

CONFIRMATION ENGINE RACING PATTERN



(a) Connect the hand–held tester to the DLC3, or connect the probe of the oscilloscope between terminals OX1A, OX2A, OX1B or OX2B and E2 of the ECM connectors.
(b) Start the engine and warm it up with all the accessories switched OFF until the engine coolant temperature is stable.
(c) Run the engine at 2,500 to 3,000 rpm for about 3 minutes.
(d) After confirming that the waveforms of the heated oxygen sensor (bank 1, 2 sensor 1 (OX1A, OX2A)) which oscillates around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor (bank 1, 2 sensor 2 (OX1B, OX2B)).



HINT:
If there is a malfunction in the system, the waveform of the heated oxygen sensor (bank 1, 2 sensor 2 (OX1B, OX2B)) is almost the same as that of the heated oxygen sensor (bank 1, 2 sensor 1 (OX1A, OX2A)) on the left.
There are some cases where, even though a malfunction exists, the CHK ENG may either light up or not light up.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO P0420 AND/OR P0430)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0420 and/or P0430” are output	A
”P0420 or P0430” and other DTCs are output	B

HINT:
If any other codes besides ”P0420 and/or P0430” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	CHECK FOR EXHAUST GAS LEAKS

NG → **REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT**

OK

3	CHECK HEATED OXYGEN SENSOR(BANK 1, 2 SENSOR 1) (See page 05–363)

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4	CHECK HEATED OXYGEN SENSOR(BANK 1, 2 SENSOR 2) (See page 05–388)

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

REPLACE THREE–WAY CATALYTIC CONVERTER (EXHAUST MANIFOLD)

DTC	P0443	EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT

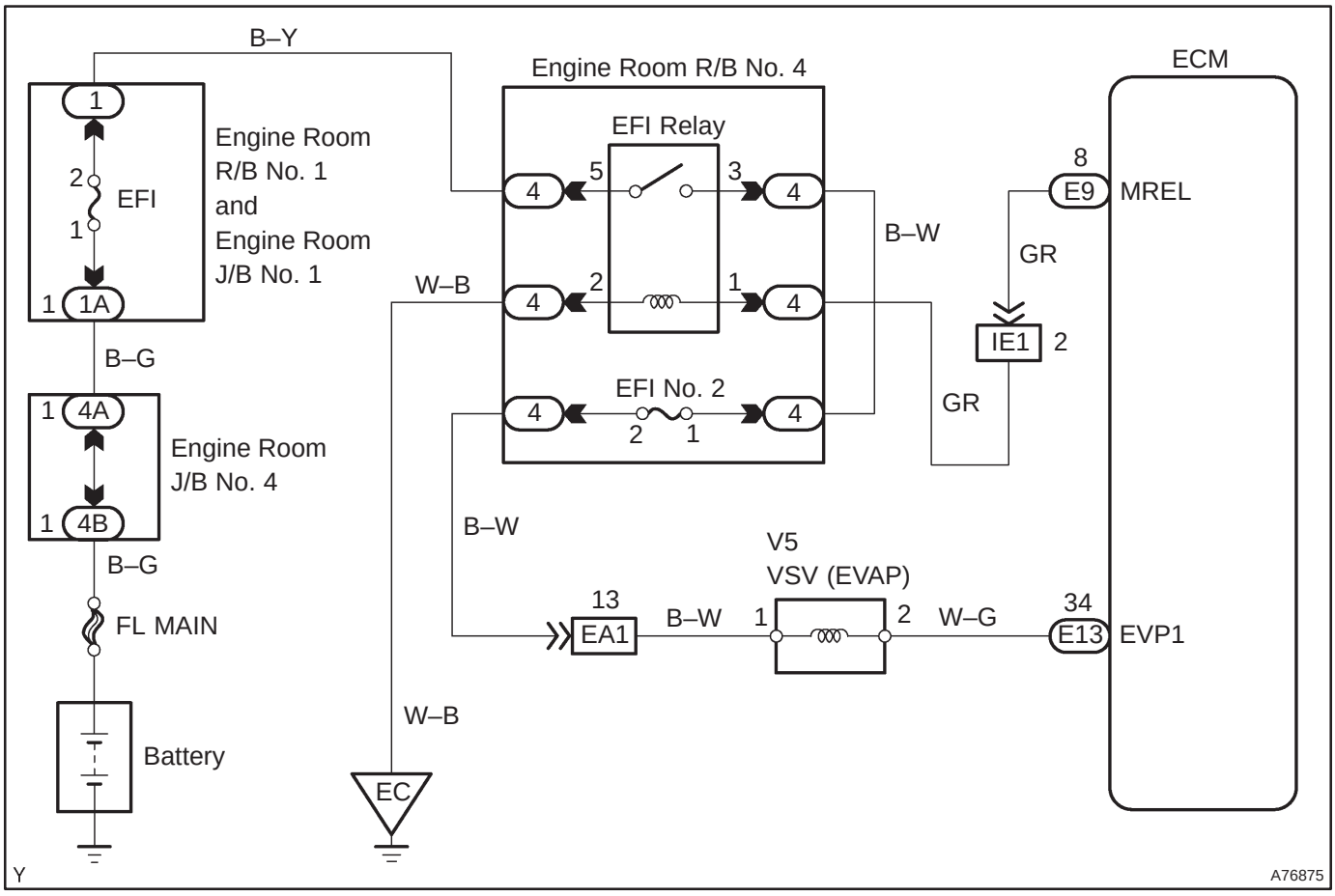
CIRCUIT DESCRIPTION

To reduce HC emissions, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

The ECM changes the duty signal to the VSV for the EVAP so that the intake quantity of HC emissions is appropriate for the driving conditions (engine load, engine speed, vehicle speed, etc.) after the engine is warmed up.

DTC No.	DTC Detection Condition	Trouble Area
P0443	Proper response to ECM command does not occur	• Open of short in VSV circuit for EVAP • VSV for EVAP • ECM

WIRING DIAGRAM

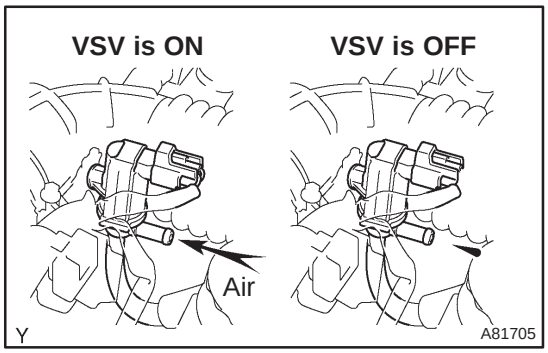


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR EVAP)



(a) Disconnect the vacuum hose from the VSV for EVAP.
(b) Start the engine.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / EVAP VSV” (press the right or left button).
(d) When the VSV for EVAP is operated by the hand–held tester, check whether the disconnected hose applies suction to your finger.

Standard:

Tester operation	Specified condition
VSV is ON	Disconnected hose applies suction to your finger
VSV is OFF	Disconnected hose applies no suction to your finger

OK → **CHECK FOR INTERMITTENT PROBLEMS**

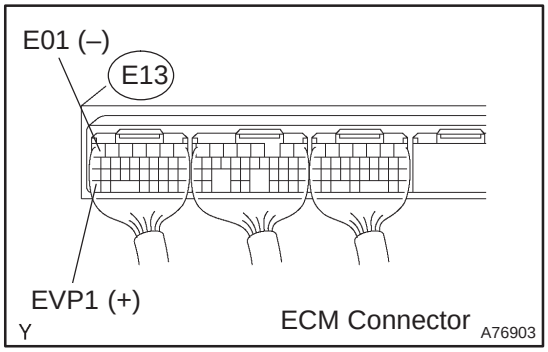
NG

2	INSPECT VACUUM SWITCHING VALVE ASSY NO.1(VSV FOR EVAP) (See page 12–13)

NG → **REPLACE VACUUM SWITCHING VALVE ASSY NO.1 (VSV FOR EVAP)**

OK

3	INSPECT ECM(EVP1 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

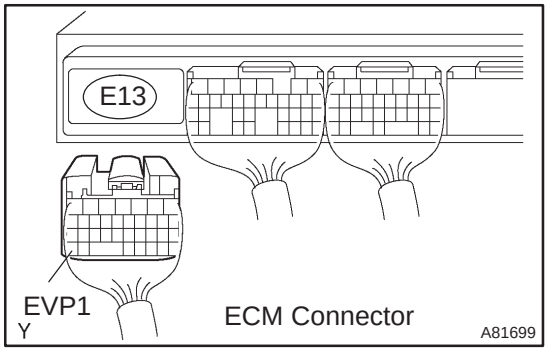
Standard:

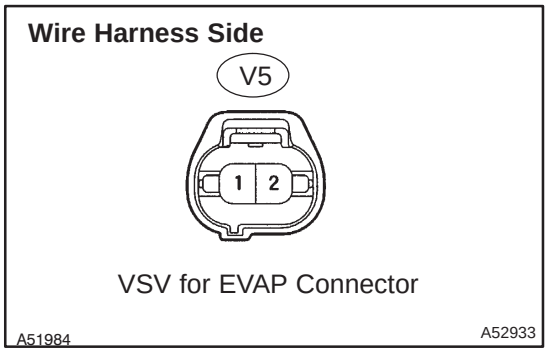
Symbols (Terminal No.)	Specified condition
EVP1 (E13–34) – E01 (E13–7)	9 to 14 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

4 CHECK HARNESS AND CONNECTOR(ECM – VSV FOR EVAP)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the V5 VSV for EVAP connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV for EVAP (V5–2) – EVP1 (E13–34)	Continuity

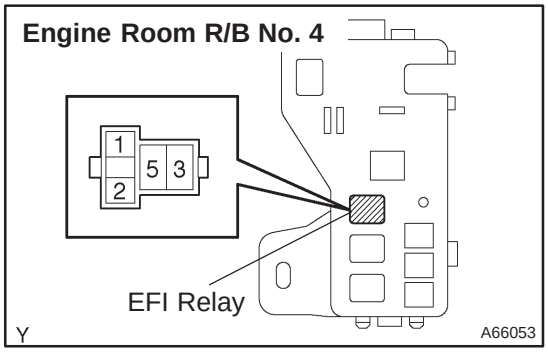
Standard (Check for short):

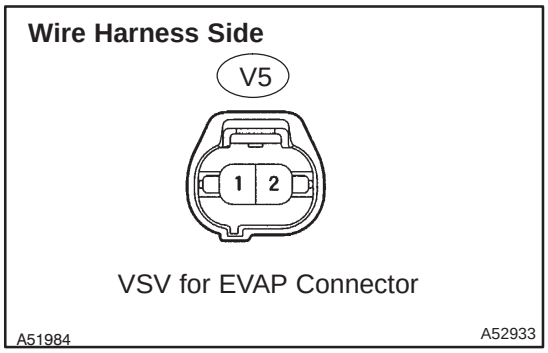
Symbols (Terminal No.)	Specified condition
VSV for EVAP (V5–2) or EVP1 (E13–34) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR(EFI RELAY – VSV FOR EVAP)





(a) Inspect the EFI No. 2 fuse.
  (1) Remove the EFI No. 2 fuse from the engine room R/B No. 4.
  (2) Check for continuity in the EFI No. 2 fuse.

Standard: Continuity

(b) Remove the EFI relay from the engine room R/B No. 4.

(c) Disconnect the V5 VSV for EVAP connector.

(d) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – VSV for EVAP (V5–1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or VSV for EVAP (V5–1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

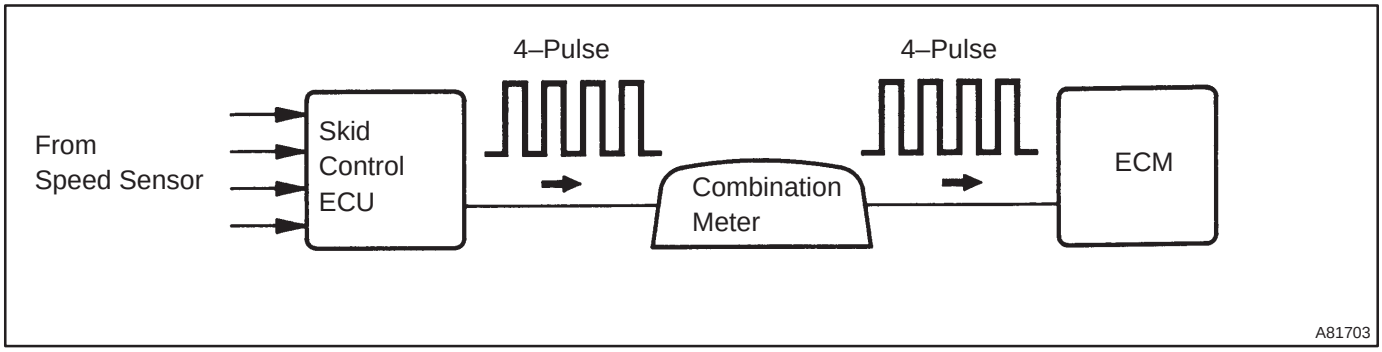
CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–502)

DTC	P0500	VEHICLE SPEED SENSOR ”A”

CIRCUIT DESCRIPTION

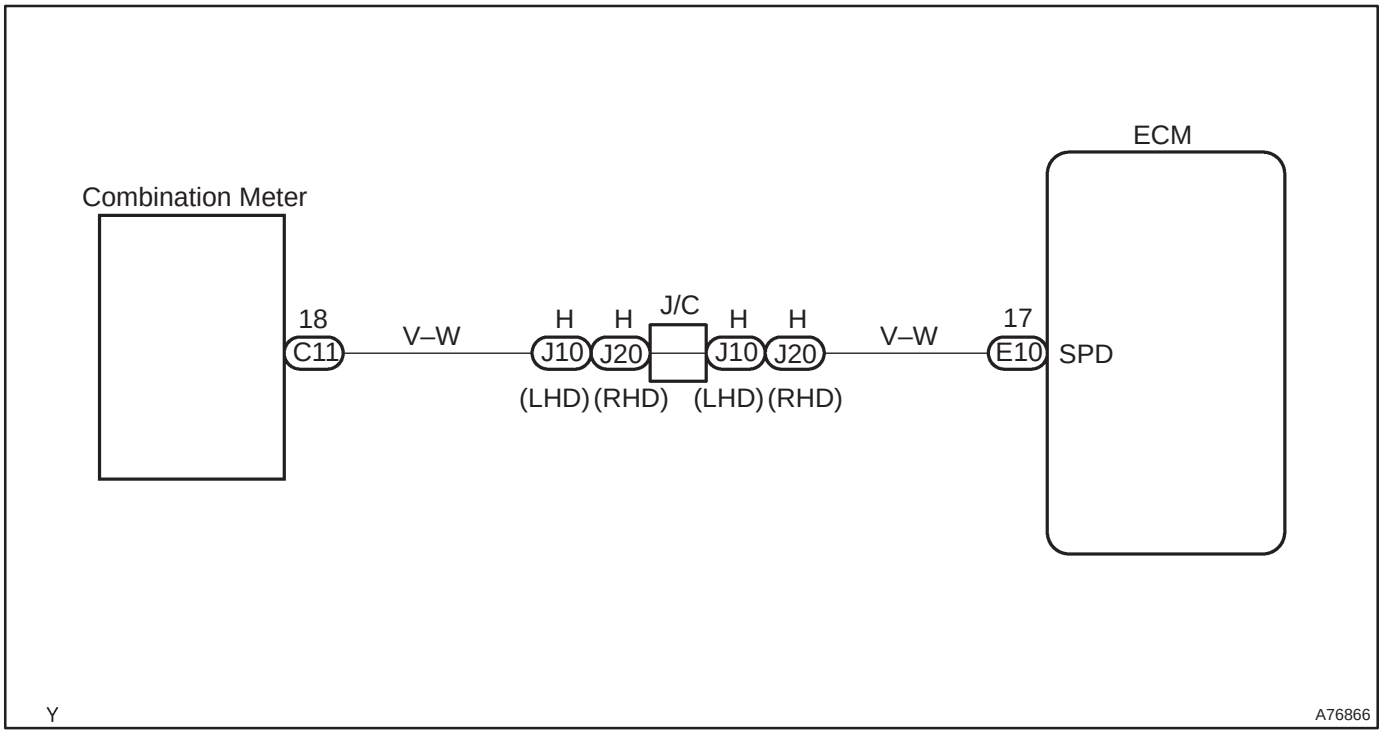
The speed sensor for skid control ECU detects the wheel speed and sends the appropriate signals to the skid control ECU.

The skid control ECU converts these signals into a 4–pulse signal and outputs it to the combination meter. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter,it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM under the following condition (1 trip (A/T) or 2 trip (M/T) detection logic): (a) Vehicle is being driven	• Combination meter • Open or short in speed sensor circuit • Vehicle speed sensor • ECM • Skid control ECU • Clutch or brake slips or gear is broken

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

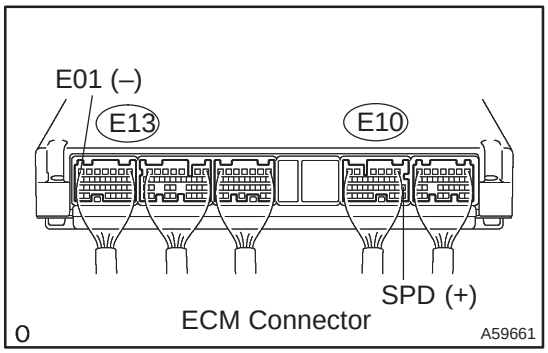
1	CHECK OPERATION OF SPEEDOMETER

(a) Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.
HINT:
The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **CHECK SPEEDOMETER CIRCUIT (See page 05–1510)**

OK

2	INSPECT ECM(SPD VOLTAGE)

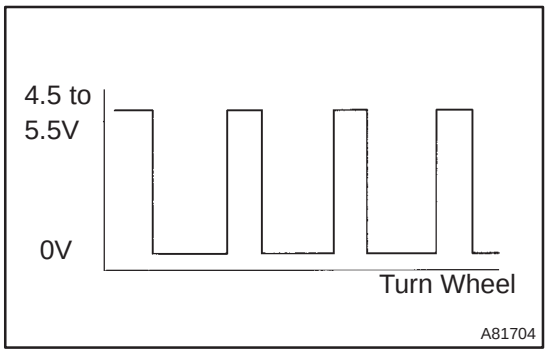


(a) Shift the lever to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch ON.
(d) Measure the voltage between the specified terminals of the E10 and E13 ECM connectors as the wheel is turned slowly.

Standard:

Symbols (Terminal No.)	Specified condition
SPD (E10–17) – E01 (E13–7)	Generated intermittently

HINT:
The output voltage should fluctuate ups and downs similarly to the diagram on the left as the wheel is turned slowly.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC P0504 BRAKE SWITCH "A"/"B" CORRELATION

CIRCUIT DESCRIPTION

In this system, the signal of the stop light switch is used to judge whether the acceleration system is abnormal or not.

The stop light switch has a duplex system (signals STP and ST1–) to memorize the abnormality when the signals of depressing and releasing the brake pedal are detected simultaneously.

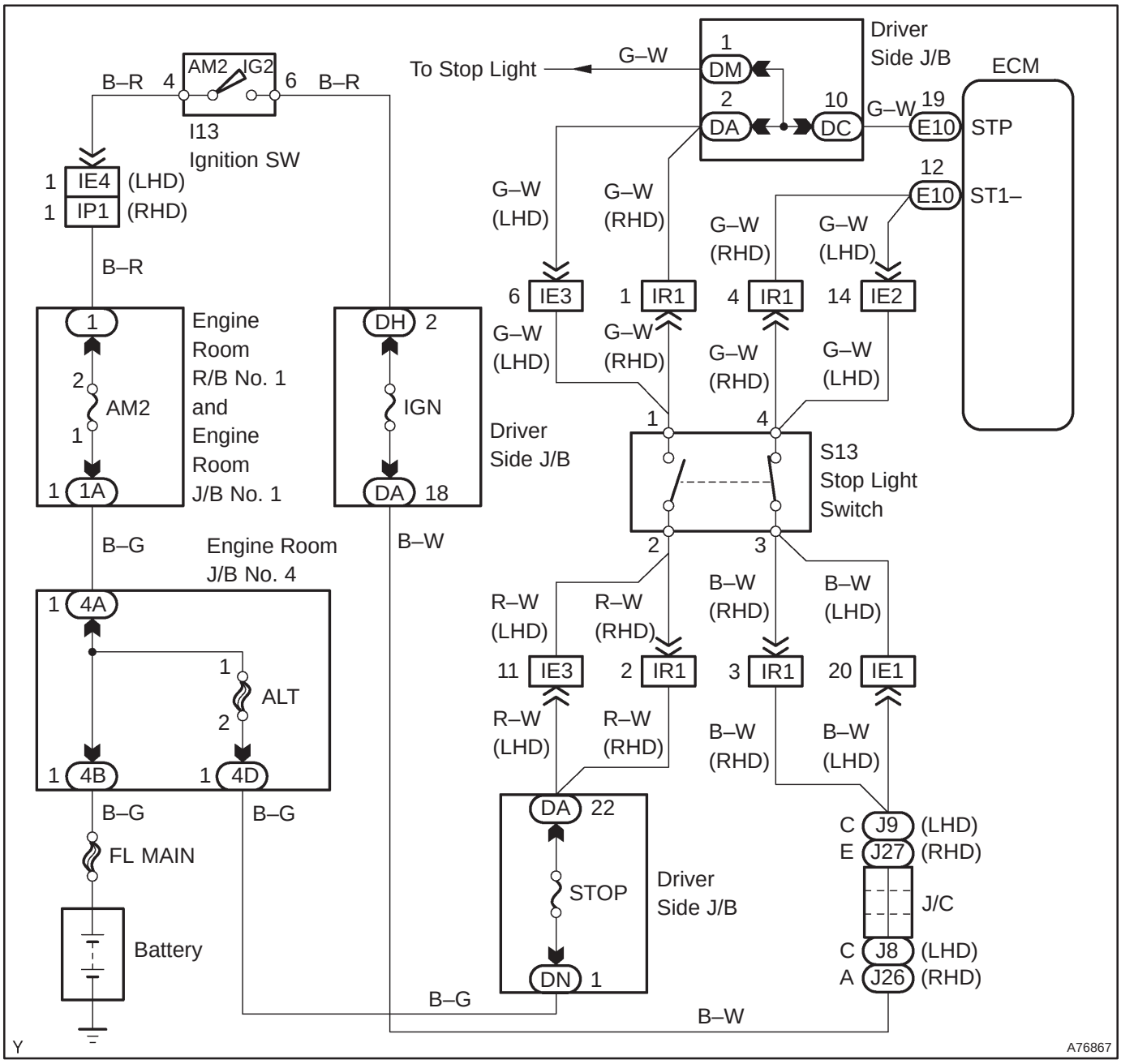
HINT:

Normal condition is as shown in the table.

Signal	Brake pedal released	In transition	Brake pedal depressed
STP	OFF	ON	ON
ST1–	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P0504	Condition (a), (b) and (c) continue for 0.5 sec. or more: (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the ST1– signal is OFF	• Short in stop light switch signal circuit • Stop light switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

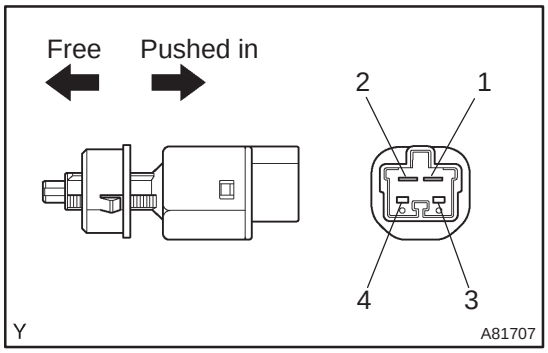
1	CHECK OPERATION OF STOP LIGHT

(a) Check if the stop lights go on and off normally when the brake pedal is depressed and released.

NG → **REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT**

OK

2	INSPECT STOP LIGHT SWITCH ASSY



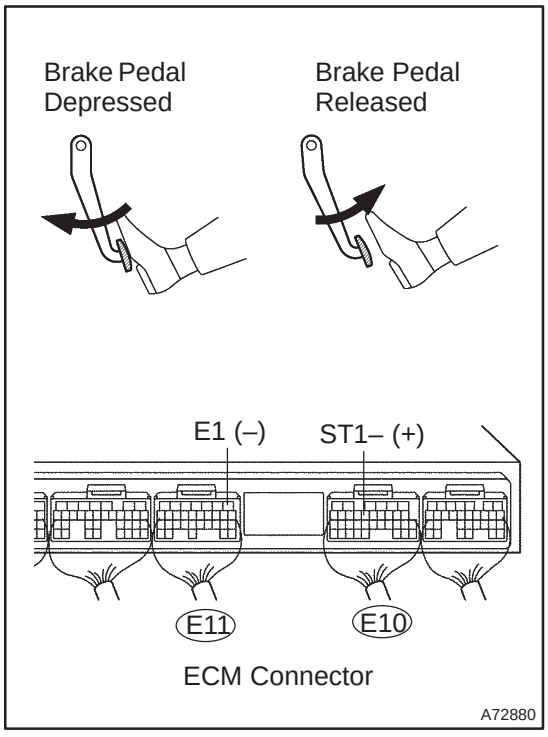
(a) Check for continuity between each pair of the terminals.
Standard:

Switch position	Terminal No.	Specified condition
Switch pin free	1 – 2	Continuity
	3 – 4	No continuity
Switch pin pushed in	1 – 2	No continuity
	3 – 4	Continuity

NG → **REPLACE STOP LIGHT SWITCH ASSY**

OK

3	READ VALUE OF HAND–HELD TESTER(STP SIGNAL AND ST1– VOLTAGE)



(a) Turn the ignition switch ON.
(b) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW" and read its value displayed on the hand–held tester.
Standard:

Brake Pedal	Specified condition
Depressed	STP Signal ON
Released	STP Signal OFF

(c) Measure the voltage between the specified terminals of the E10 and E11 ECM connectors.
Standard:

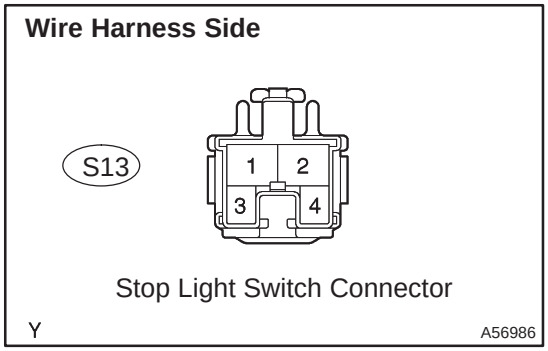
Symbols (Terminal No.)	Brake pedal	Specified condition
ST1– (E10–12) – E1 (E11–1)	Depressed	Below 1.5 V
	Released	7.5 to 14 V

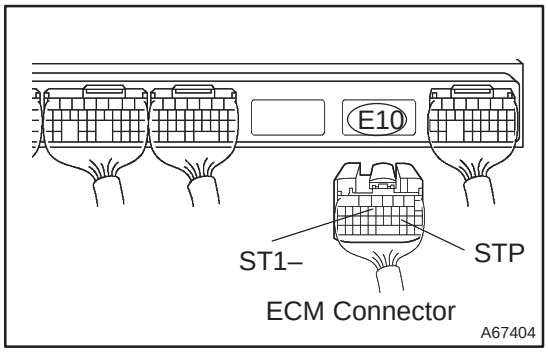
NG → **Go to step 4**

OK

CHECK FOR INTERMITTENT PROBLEMS

4 CHECK HARNESS AND CONNECTOR(ECM – STOP LIGHT SWITCH)





(a) Disconnect the S13 stop light switch connector.
(b) Disconnect the E10 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) – STP (E10–19)	Continuity
Stop light switch (S13–4) – ST1– (E10–12)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) or STP (E10–19) – Body ground	No continuity
Stop light switch (S13–4) or ST1– (E10–12) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0555	BRAKE BOOSTER PRESSURE SENSOR CIRCUIT

DTC	P0557	BRAKE BOOSTER PRESSURE SENSOR CIRCUIT LOW INPUT

DTC	P0558	BRAKE BOOSTER PRESSURE SENSOR CIRCUIT HIGH INPUT

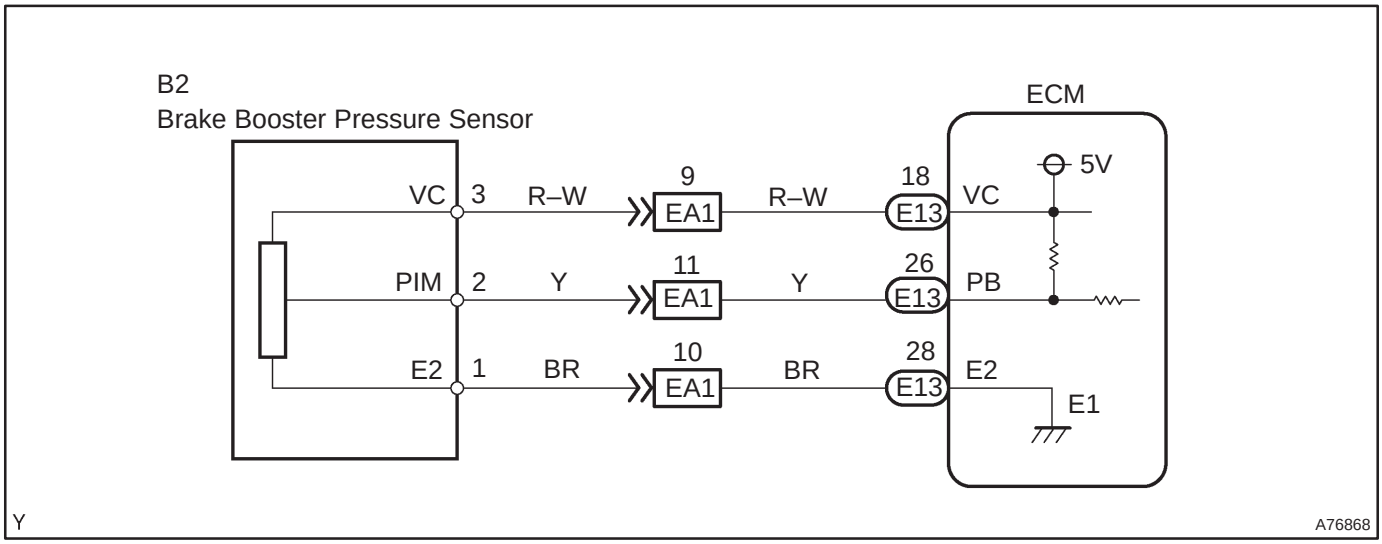
CIRCUIT DESCRIPTION

The brake booster pressure sensor detects internal pressure of the brake booster as voltage. A structure of the sensor and its connection to the ECM are the same as ones for the intake air pressure sensor. (Refer to DTC P0105 on page 05–342).

In order to purify emission gas when starting a cold engine, drastically retard the ignition timing to quickly activate tha catalyst. Upon this, the throttle valve is opened larger than the throttle opening angle with a warm engine, therefore the intake manifold pressure will be closer to atmospheric pressure. If the negative pressure (vacuum) applied inside the brake booster drops, the ECM cancels the drastic retarding timing and introduces the negative pressure (vacuum) into the intake manifold, and the ECM then resumes the drastic retarding timing after the brake booster negative pressure (vacuum) is ensured at required level.

DTC No.	DTC Detection Condition	Trouble Area
P0555	Open or short in brake booster pressure sensor circuit for 5 sec. or more	• Open or short in brake booster pressure sensor circuit • Brake booster pressure sensor • Vacuum hose • ECM
P0557	Open in brake booster pressure sensor circuit for 5 sec. or more	
P0558	Short in brake booster pressure sensor circuit for 5 sec. or more	

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

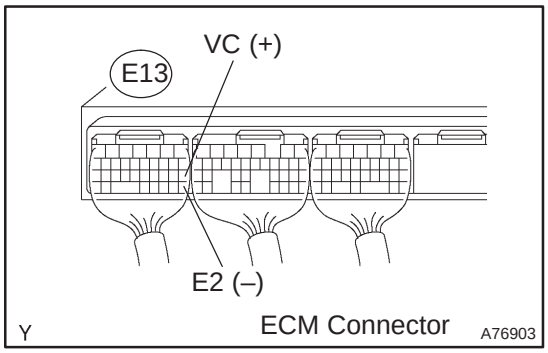
1	CHECK VACUUM HOSE(BRAKE BOOSTER PRESSURE SENSOR – BRAKE BOOSTER, INTAKE MANIFOLD – BRAKE BOOSTER)

(a) Check that the vacuum hoses are connected correctly.
(b) Check that the vacuum hoses are not loose or disconnected.
(c) Check the vacuum hoses and tubes for clogs, cracks, holes, damage, or blockage.

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

2	INSPECT ECM(VC VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

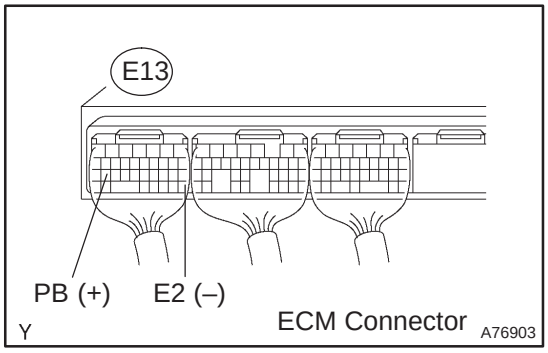
Standard:

Symbols (Terminal No.)	Specified condition
VC (E13–18) – E2 (E13–28)	4.5 to 5.5 V

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

3	INSPECT ECM(PB VOLTAGE)



(a) Measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

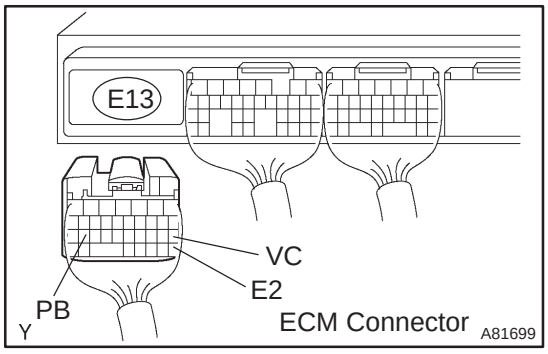
Symbols (Terminal No.)	Condition	Specified condition
PB (E13–26) – E2 (E13–28)	Ignition switch ON (do not start engine)	0.5 to 4.5 V
	Idling	

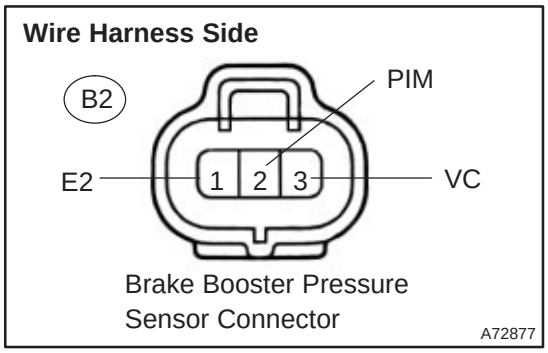
NG → **Go to step 4**

OK

CHECK FOR INTERMITTENT PROBLEMS

4	CHECK HARNESS AND CONNECTOR(ECM – BRAKE BOOSTER PRESSURE SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the B2 brake booster pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (E13–18) – VC (B2–3)	Continuity
PB (E13–26) – PIM (B2–2)	
E2 (E13–28) – E2 (B2–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (E13–18) or VC (B2–3) – Body ground	No continuity
PB (E13–26) or PIM (B2–2) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

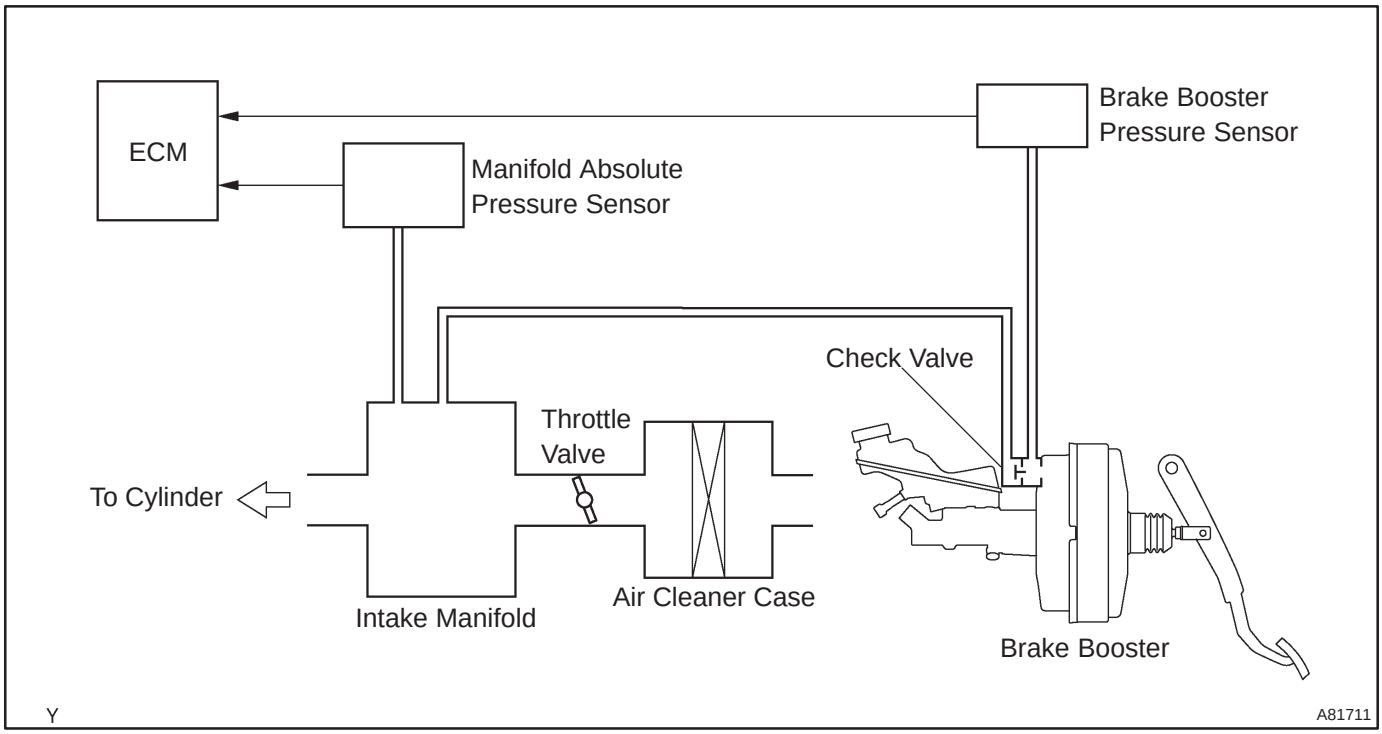
OK

REPLACE BRAKE BOOSTER PRESSURE SENSOR

DTC	P0556	BRAKE BOOSTER PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P0555 on page 05–459.



DTC No.	DTC Detection Condition	Trouble Area
P0556	When either one of the following conditions (a), (b), (c) or (d) is satisfied (1 trip detection logic): (a) If pressure inside the intake manifold is low, the brake booster internal pressure is 38 kPa (285 mmHg, 11.2 in.Hg) or more higher than the intake manifold internal pressure and this condition remains for more than 10 sec. (Pressure leaks caused by hose disconnection, etc). (b) Pressure inside the brake booster stays low or at fixed level, despite the vehicle has driven and stopped 10 times (Vacuum stuck caused by hose clogged, etc). (c) While the brake pedal is released, the pressure inside the brake booster is 32 kPa (240 mmHg, 9.4 in.Hg) or more higher than the intake manifold internal pressure and this condition remains for more than 1 sec. (Pressure leaks). (d) After running the engine for more than 100 sec. with the brake pedal released and the negative pressure (vacuum) has accumulated in the brake booster, the following two conditions are satisfied despite depressing the brake pedal for more than 1 sec. (Vacuum stuck): • Internal pressure of the brake booster does not increase • Internal pressure of the brake booster is 32 kPa (240 mmHg, 9.4 in.Hg) or more lower than the internal pressure of the intake manifold	• Vacuum hose (between the brake booster and intake manifold, the brake booster and brake booster pressure sensor, and the intake manifold and manifold absolute pressure sensor) • Open or short in brake booster pressure sensor circuit • Brake booster pressure sensor • Manifold absolute pressure sensor • Brake booster • Open or short in stop light switch circuit • Stop light switch • ECM

WIRING DIAGRAM

Refer to DTC P0555 on page 05–459.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO P0556)

(a) Read the DTC using the hand–held tester.

Result :

Display	Proceed to
Only ”P0556” is output.	A
”P0556” and other DTCs are output.	B

HINT:

If any other codes besides ”P0556” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	READ VALUE OF HAND–HELD TESTER(INTAKE MANIFOLD ABSOLUTE PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Warm up the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAP” and read its value displayed on the hand–held tester with the shift lever is the ”N” position.

Standard :

Condition	Intake Manifold Absolute Pressure
Ignition switch ON (do not start engine)	70 to 110 kPa (525 to 825 mmHg, 20.7 to 32.5 in.Hg)
Running without load (2,500 rpm)	20 to 35 kPa (150 to 263 mmHg, 5.9 to 10.4 in.Hg)

NG → **Go to step 7**

OK

3	READ VALUE OF HAND–HELD TESTER(STOP LIGHT SWITCH)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW” and read its value displayed on the hand–held tester.

Result :

Brake Pedal	STP Signal
Depressed	ON
Released	OFF

NG → CHECK AND REPAIR STOP LIGHT SWITCH CIRCUIT

OK

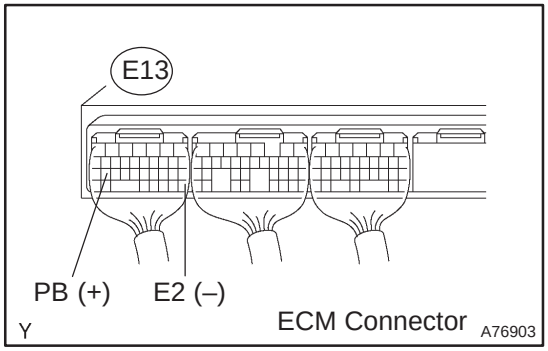
4	CHECK VACUUM HOSE(BRAKE BOOSTER PRESSURE SENSOR – BRAKE BOOSTER, INTAKE MANIFOLD – BRAKE BOOSTER)

(a) Check that the vacuum hoses are connected correctly.
(b) Check that the vacuum hoses are not loose or disconnected.
(c) Check the vacuum hoses and tubes for clogs, cracks, holes, damage, or blockage.

NG → REPAIR OR REPLACE VACUUM HOSE

OK

5	INSPECT ECM(PB VOLTAGE)



(a) Disconnect the vacuum hose from the brake booster pressure sensor.
(b) Turn the ignition switch ON.
(c) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum to the brake booster pressure sensor, measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

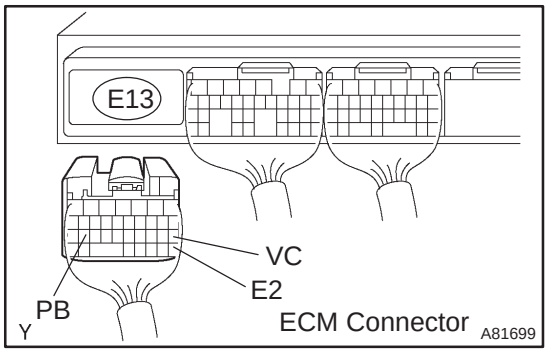
Symbols (Terminal No.)	Vacuum pump operation	Specified condition
PB (E13–26) – E2 (E13–28)	0 kPa (0 mmHg, 0 in.Hg)	3.3 to 3.9 V
	40 kPa (300 mmHg, 11.8 in.Hg)	2.1 to 2.7 V
	80 kPa (600 mmHg, 23.6 in.Hg)	0.9 to 1.5 V

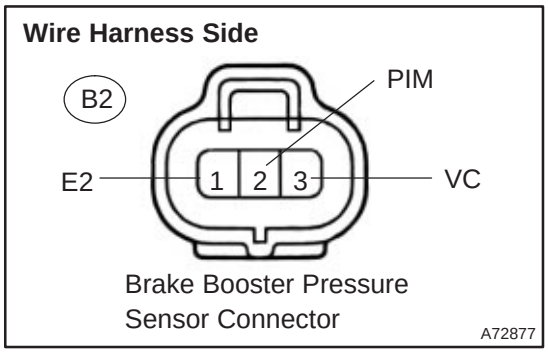
NG → Go to step 6

OK

CHECK FUNCTION OF BRAKE BOOSTER (See page 32–17, 32–21)

6	CHECK HARNESS AND CONNECTOR(ECM – BRAKE BOOSTER PRESSURE SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the B2 brake booster pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (E13–18) – VC (B2–3)	Continuity
PB (E13–26) – PIM (B2–2)	
E2 (E13–28) – E2 (B2–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (E13–18) or VC (B2–3) – Body ground	No continuity
PB (E13–26) or PIM (B2–2) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE BRAKE BOOSTER PRESSURE SENSOR

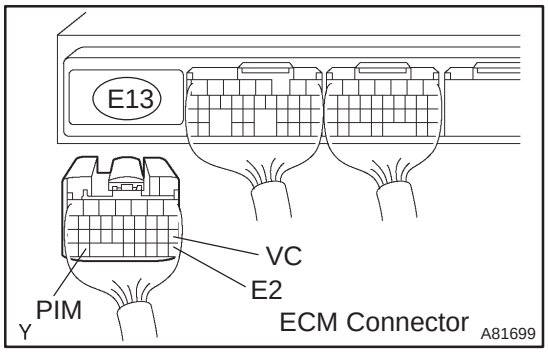
7	CHECK VACUUM HOSE(MANIFOLD ABSOLUTE PRESSURE SENSOR – INTAKE MANIFOLD)

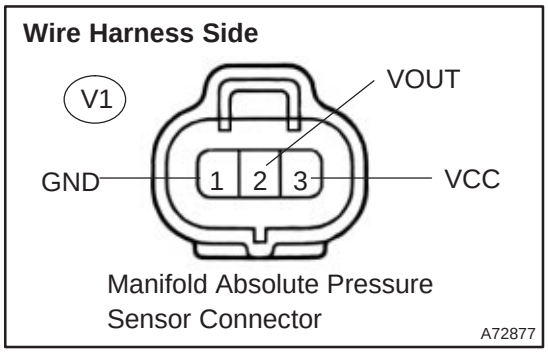
(a) Check that the vacuum hose is connected correctly.
(b) Check that the vacuum hose is not loose or disconnected.
(c) Check the vacuum hose for clogs, cracks, holes, damage, or blockage.

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

8	CHECK HARNESS AND CONNECTOR(ECM – MANIFOLD ABSOLUTE PRESSURE SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the V1 manifold absolute pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (E13–18) – VCC (V1–3)	Continuity
PIM (E13–33) – VOUT (V1–2)	
E2 (E13–28) – GND (V1–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (E13–18) or VCC (V1–3) – Body ground	No continuity
PIM (E13–33) or VOUT (V1–2) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

DTC	P0560	SYSTEM VOLTAGE

CIRCUIT DESCRIPTION

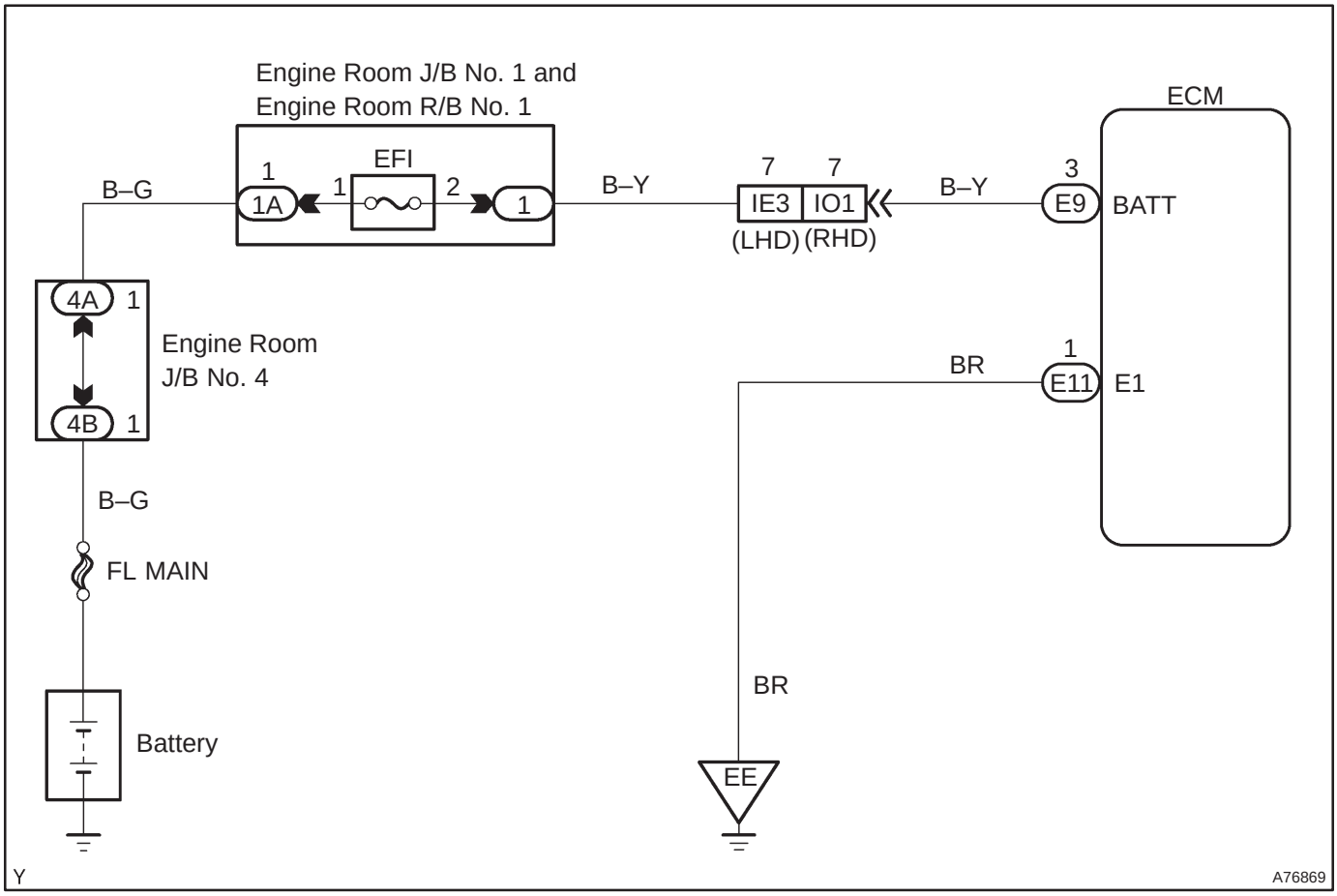
While the ignition switch is OFF, the battery positive voltage is supplied to terminal BATT of the ECM for the DTCs memory and air–fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in back–up power source circuit	• Open in back–up power source circuit • ECM

HINT:

If DTC P0560 is present, the ECM is unable to store other DTCs.

WIRING DIAGRAM

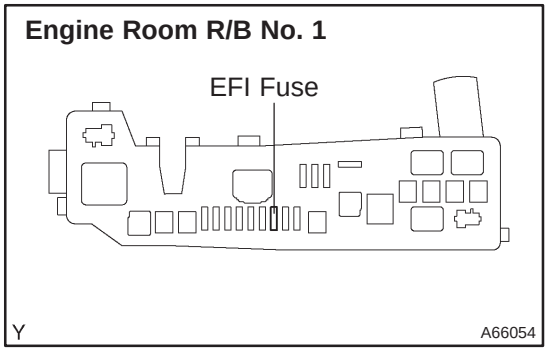


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK FUSE(EFI FUSE)

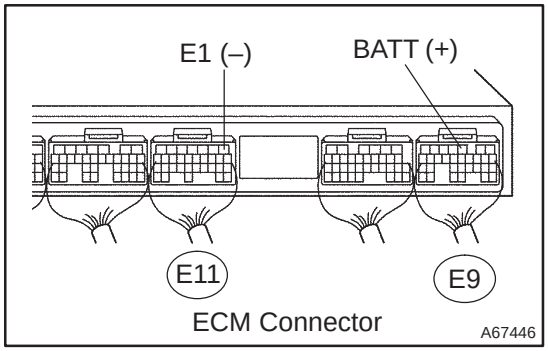


(a) Remove the EFI fuse from the engine room R/B No. 1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED EFI FUSE**

OK

2 INSPECT ECM(BATT VOLTAGE)



(a) Measure the voltage between the specified terminals of the E9 and E11 ECM connectors.
Standard:

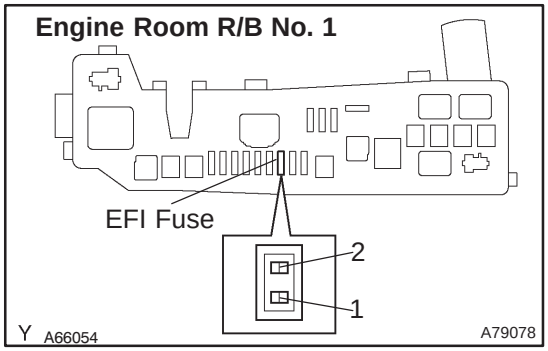
Symbols (Terminal No.)	Specified condition
BATT (E9–3) – E1 (E11–1)	9 to 14 V

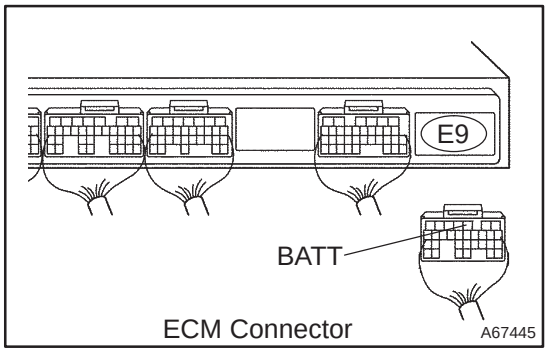
NG → **Go to step 3**

OK

CHECK AND REPLACE ECM (See page 01–32)

3 CHECK HARNESS AND CONNECTOR(ECM – EFI FUSE, EFI FUSE – BATTERY)





(a) Check the harness and connector between the EFI fuse and ECM.
  (1) Remove the EFI fuse from the engine room R/B No.1.
  (2) Disconnect the E9 ECM connector.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) – BATT (E9–3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) or BATT (E9–3) – Body ground	No continuity

(b) Check the harness and connector between the EFI fuse and battery.
  (1) Remove the EFI fuse from the engine room R/B No.1.
  (2) Disconnect the battery positive terminal.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Battery positive terminal – EFI fuse (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Battery positive terminal or EFI fuse (1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ENGINE ROOM RELAY BLOCK

DTC	P0604	INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC	P0606	ECM/PCM PROCESSOR

DTC	P0607	CONTROL MODULE PERFORMANCE

DTC	P0657	ACTUATOR SUPPLY VOLTAGE CIRCUIT/OPEN

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0604 P0606 P0607 P0657	ECM inside error	• ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

REPAIR OR REPLACE ECM (See page 01–32)

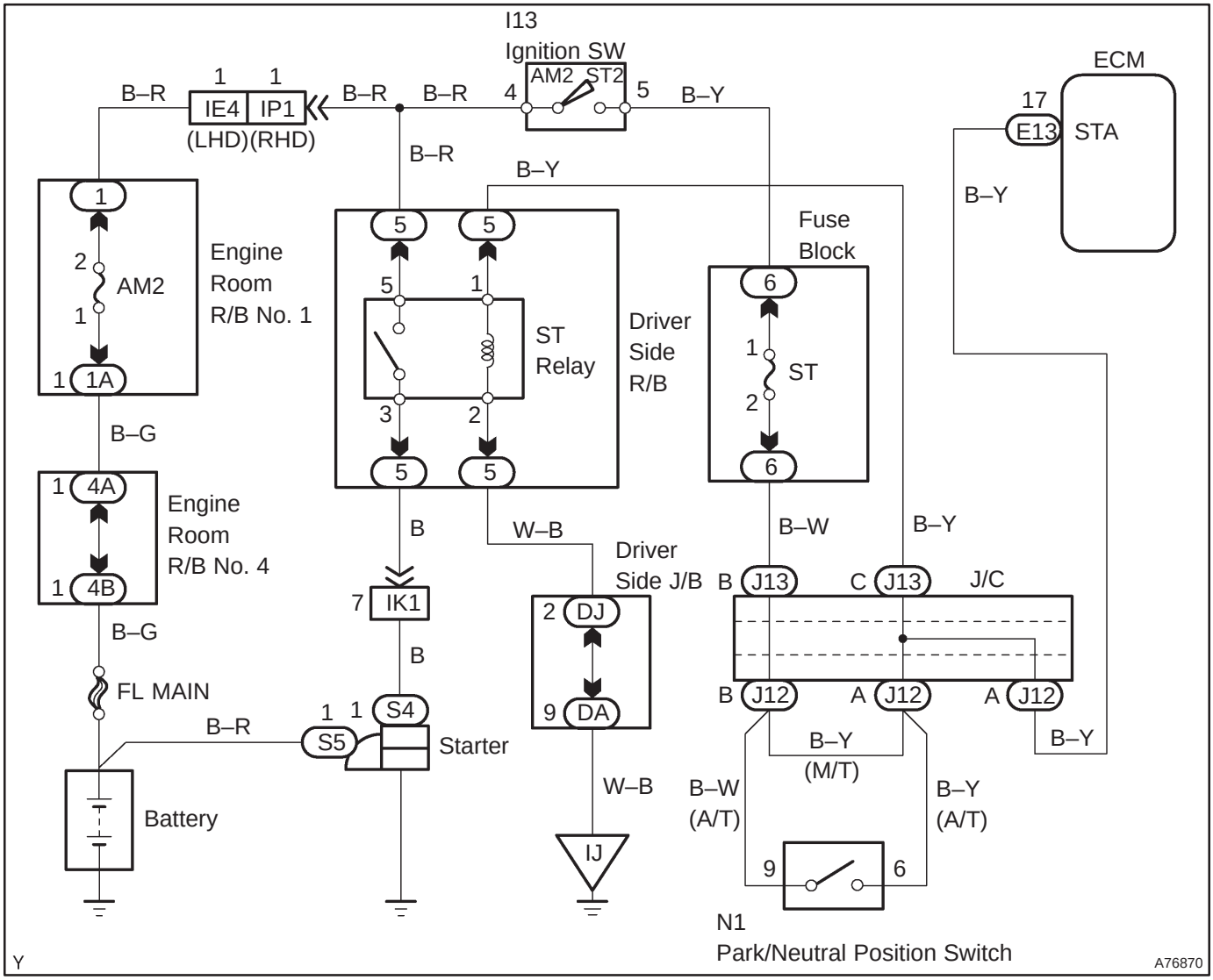
DTC	P0617	STARTER RELAY CIRCUIT HIGH

CIRCUIT DESCRIPTION

While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0617	When all conditions (a), (b) and (c) are satisfied with battery (+B) voltage 10.5 V or more for 20 sec. (a) Vehicle speed greater than 20 km/h (b) Engine revolution greater than 1,000 rpm (c) STA signal ON	• Short in park/neutral position switch (A/T) • Park/neutral position switch (A/T) • Ignition switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG" and read its value displayed on the hand–held tester.

Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

2	INSPECT PARK/NEUTRAL POSITION SWITCH ASSY

(a) Inspect the park/neutral position switch (A/T) (See page 05–938).

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY (See page 40–8) (GO TO NEXT STEP 3 AFTER THE REPLACEMENT)**

OK

3	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG" and read its value displayed on the hand–held tester.

Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **SYSTEM OK**

NG

4	INSPECT IGNITION OR STARTER SWITCH ASSY (See page 80–2)

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY (GO TO NEXT STEP 5 AFTER THE REPLACEMENT)**

OK

5	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG" and read its value displayed on the hand–held tester.

Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **SYSTEM OK**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC	P0705	TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)

CIRCUIT DESCRIPTION

The park/neutral position switch goes on when the shift lever is in the N or P shift position. If the shift lever is moved from the N position to the D position, this signal is used for air–fuel ratio correction and for idle speed control (estimated control), etc.

DTC No.	DTC Detection Condition	Trouble Area
P0705	2 or more switches are ON simultaneously for N, P, D and R positions (2 trip detection logic)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM

HINT:

After confirming DTC P0705, use the hand–held tester to confirm the park/neutral position switch signal from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

WIRING DIAGRAM

Refer to DTC P0705 on page 05–938.

INSPECTION PROCEDURE

Refer to DTC P0705 on page 05–938.

DTC	P0724	BRAKE SWITCH ”B” CIRCUIT HIGH

CIRCUIT DESCRIPTION

This STP signal is used to detect that the brakes have been applied. The STP signal voltage is the same as the one supplied to the stop lights.
The STP signal is used mainly to control the fuel cut–off engine speed (The fuel cut–off engine speed is reduced slightly when the vehicle is braking).

DTC No.	DTC Detection Condition	Trouble Area
P0724	The stop light switch does not turn off even the vehicle is driven. (2 trip detection logic)	• Short in stop light switch signal circuit • Stop light switch • ECM

WIRING DIAGRAM

Refer to DTC P0504 on page 05–455.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OPERATION OF STOP LIGHT

(a) Check if the stop lights go on and off normally when the brake pedal is operated and released.

NG → **REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT**

OK

2	READ VALUE OF HAND–HELD TESTER(STOP LIGHT SWITCH)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW” and read its value displayed on the hand–held tester.

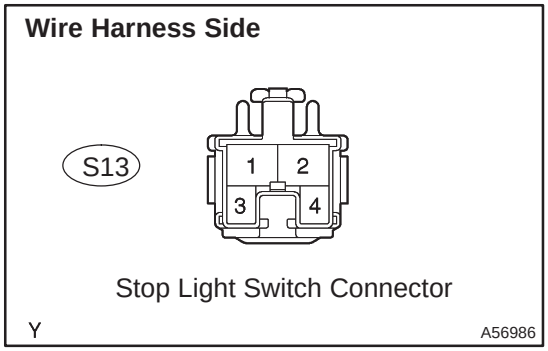
Result:

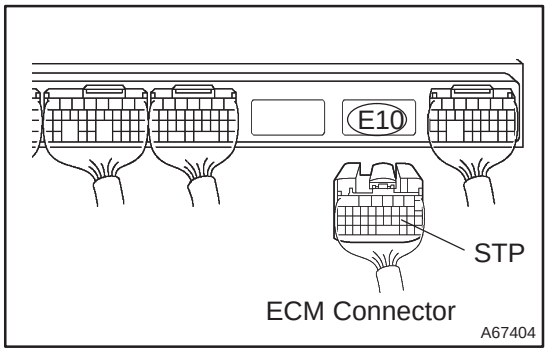
Brake Pedal	STP Signal
Depressed	ON
Released	OFF

OK → **CHECK FOR INTERMITTENT PROBLEMS**

NG

3 CHECK HARNESS AND CONNECTOR(ECM – STOP LIGHT SWITCH)





(a) Disconnect the S13 stop light switch connector.
(b) Disconnect the E10 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) – STP (E10–19)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) or STP (E10–19) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

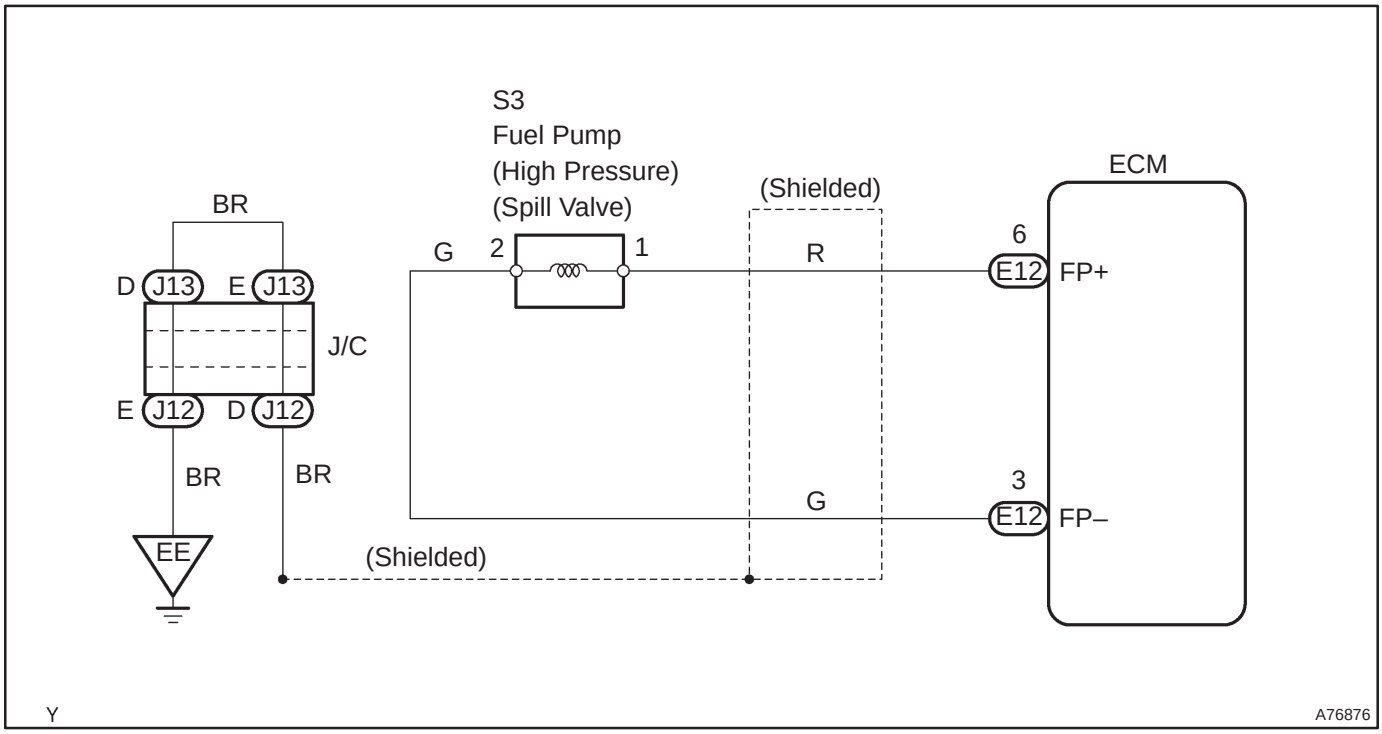
DTC	P1235	HIGH PRESSURE FUEL PUMP CIRCUIT

CIRCUIT DESCRIPTION

The fuel pump (high pressure) is an electronically controlled plunger type fuel pump (high pressure) which is driven by the cam provided on the intake cam shaft rear end on the cylinder head.
The fuel pump (high pressure) increases the pressure of the fuel fed from the fuel pump (low pressure) in the fuel tank at 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi) according to the operating condition, and it feeds the fuel to the fuel delivery pipe.

DTC No.	DTC Detection condition	Trouble Area
P1235	Open or short in fuel pump (high pressure) circuit for 1sec. or more	• Open or short in fuel pump (high pressure) • Fuel pump (high pressure) • ECM

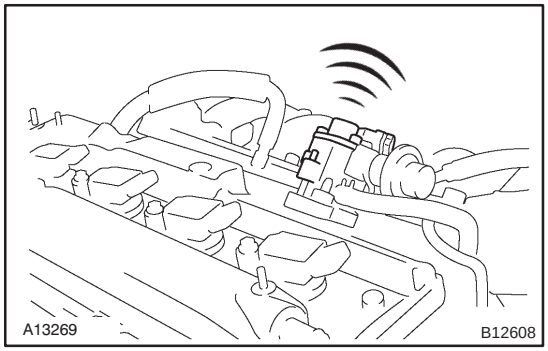
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester. Freeze frame data records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OPERATION OF FUEL PUMP(HIGH PRESSURE)



(a) With the engine running or cranking, use a sound scope to check that there is the normal operating sounds of the fuel pump (high–pressure) when it is operated.

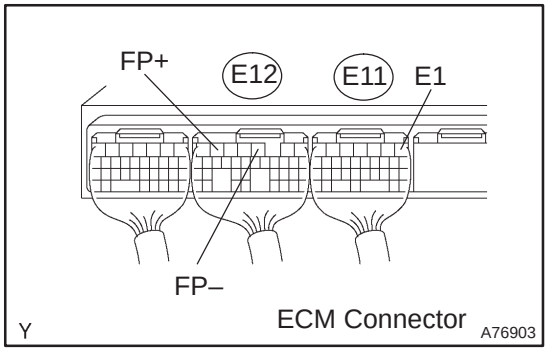
Standard:

There is the operating sounds of the fuel pump (high–pressure).

NG → **REPLACE FUEL PUMP (HIGH PRESSURE)**

OK

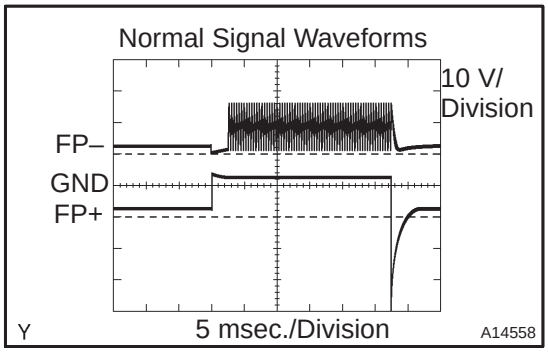
2 INSPECT ECM(FP+ AND FP– VOLTAGE)



(a) Turn the ignition switch ON, and check the waveforms between terminals FP+ and E1, and FP– and E1 of the E11 and E12 ECM connectors.

HINT:

The correct waveform is as shown in the illustration.



NG → **CHECK AND REPLACE ECM (See page 01–32)**

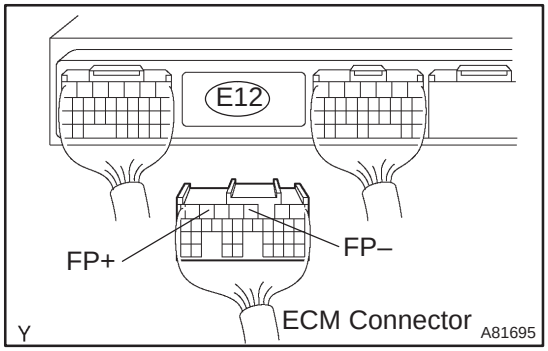
OK

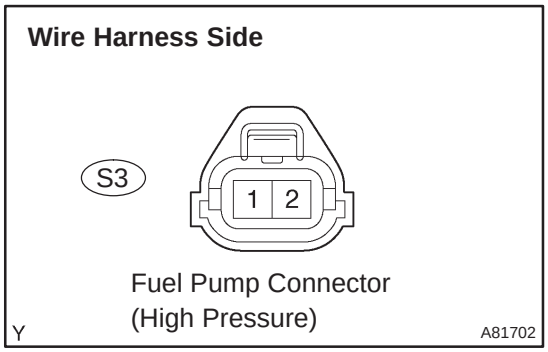
3 CHECK FUEL PUMP(HIGH PRESSURE) (See page 11–33)

NG → **REPLACE FUEL PUMP(HIGH PRESSURE)**

OK

4 CHECK HARNESS AND CONNECTOR(FUEL PUMP (HIGH PRESSURE) – ECM)





(a) Disconnect the E12 ECM connector.
(b) Disconnect the S3 fuel pump (high pressure) connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
FP+ (E12–6) – Fuel pump (S3–1)	Continuity
FP– (E12–3) – Fuel pump (S3–2)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
FP+ (E12–6) or Fuel pump (S3–1) – Body ground	No continuity
FP– (E12–3) or Fuel pump (S3–2) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK FOR INTERMITTENT PROBLEMS

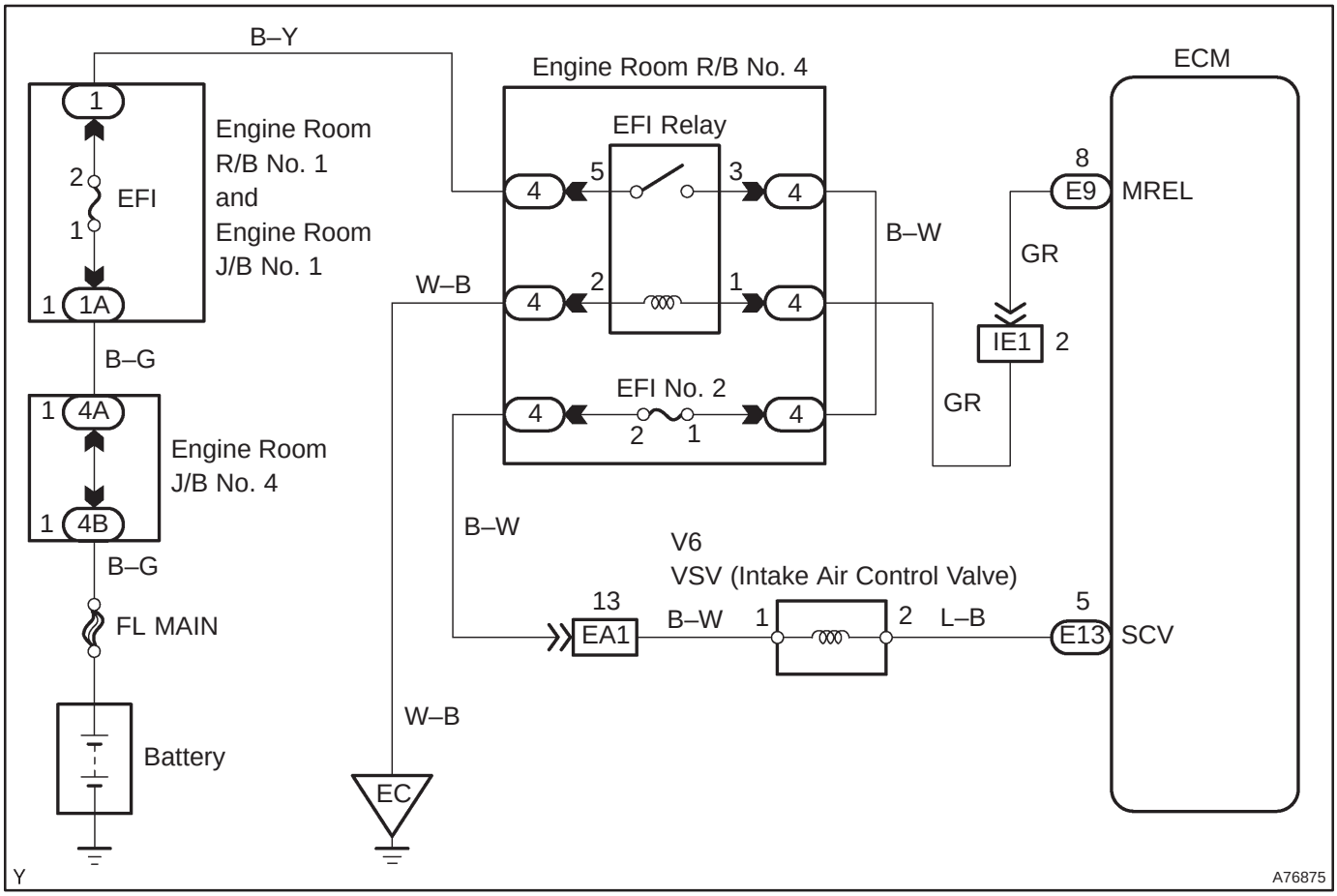
DTC	P2008	INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

CIRCUIT DESCRIPTION

The Intake Air Control valve (IACV) is opened and shut by the actuator with intake manifold vacuum. It stabilizes the engine combustion. The IACV operation generates swirl air flow in the cylinder.

DTC No.	DTC Detection Condition	Trouble Area
P2008	Open or short in VSV for IACV circuit 0.5 sec. or more (2 trip detection logic)	• Open of short in VSV for IACV circuit • VSV for IACV • ECM

WIRING DIAGRAM

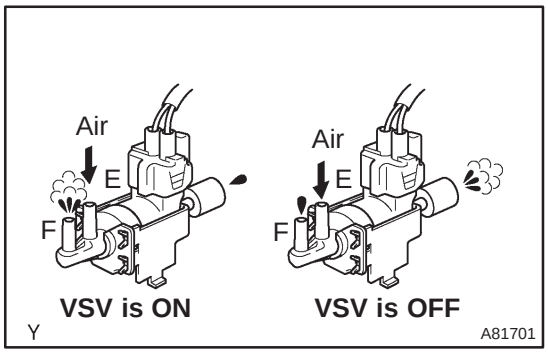


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR IACV)



(a) Disconnect the vacuum hose from the VSV for IACV.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / SCV VSV" (press the right or left button).
(d) Check the VSV for IACV operation when it is operated by the hand–held tester.

Standard:

Tester operation	Specified condition
VSV is ON	Air from port E flows out through port F.
VSV is OFF	Air does not flow from port E to port F.

NG → **Go to step 2**

OK

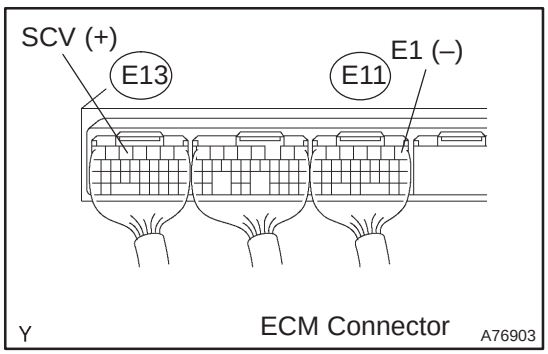
CHECK FOR INTERMITTENT PROBLEMS

2	INSPECT VACUUM SWITCHING VALVE ASSY NO.1(VSV FOR IACV) (See page 13–2)

NG → **REPLACE VACUUM SWITCHING VALVE ASSY NO.1 (VSV FOR IACV)**

OK

3	INSPECT ECM(SCV VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E11 and E13 ECM connectors.

Standard:

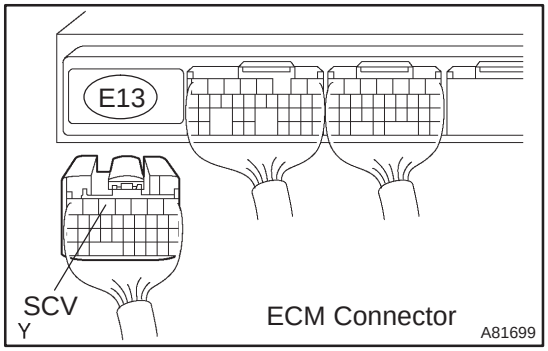
Symbols (Terminal No.)	Specified condition
SCV (E13–5) – E1 (E11–1)	9 to 14 V

NG → **Go to step 4**

OK

CHECK AND REPLACE ECM (See page 01–32)

4 CHECK HARNESS AND CONNECTOR(ECM – VSV FOR IACV)



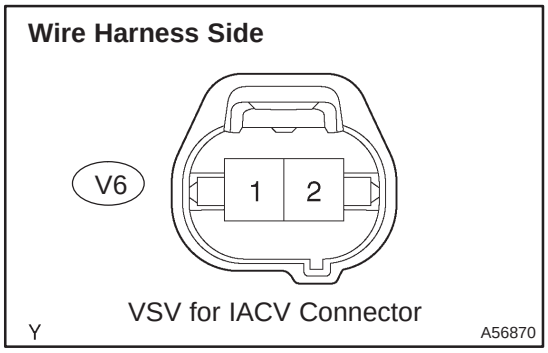
(a) Disconnect the V6 VSV for IACV connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV for IACV (V6–2) – SCV (E13–5)	Continuity

Standard (Check for short):

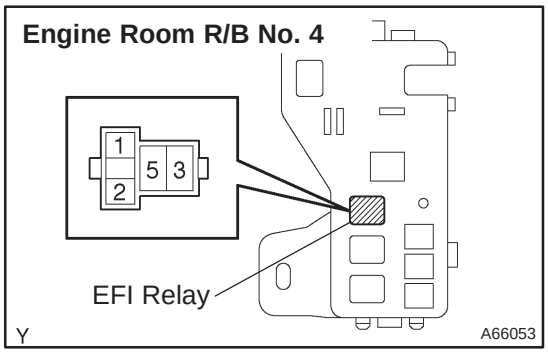
Symbols (Terminal No.)	Specified condition
VSV for IACV (V6–2) or SCV (E13–5) – Body ground	No continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 CHECK HARNESS AND CONNECTOR(EFI RELAY – VSV FOR IACV)



(a) Inspect the EFI No. 2 fuse.
  (1) Remove the EFI No. 2 fuse from the engine room R/B No. 4.
  (2) Check the continuity of the EFI No. 2 fuse.

Standard: Continuity

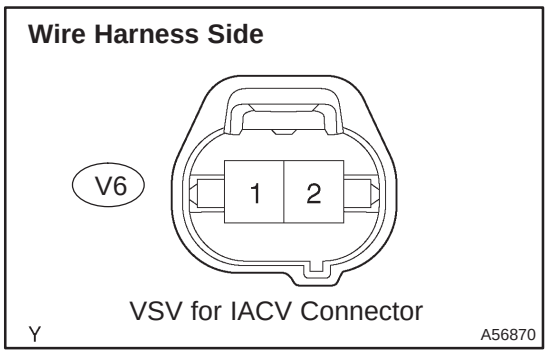
(b) Remove the EFI relay from the engine room R/B No. 4.
(c) Disconnect the V6 VSV for IACV connector.
(d) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV for IACV (V6–1) – EFI relay (3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VSV for IACV (V6–1) or EFI relay (3) – Body ground	No continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–502)

DTC	P2102	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

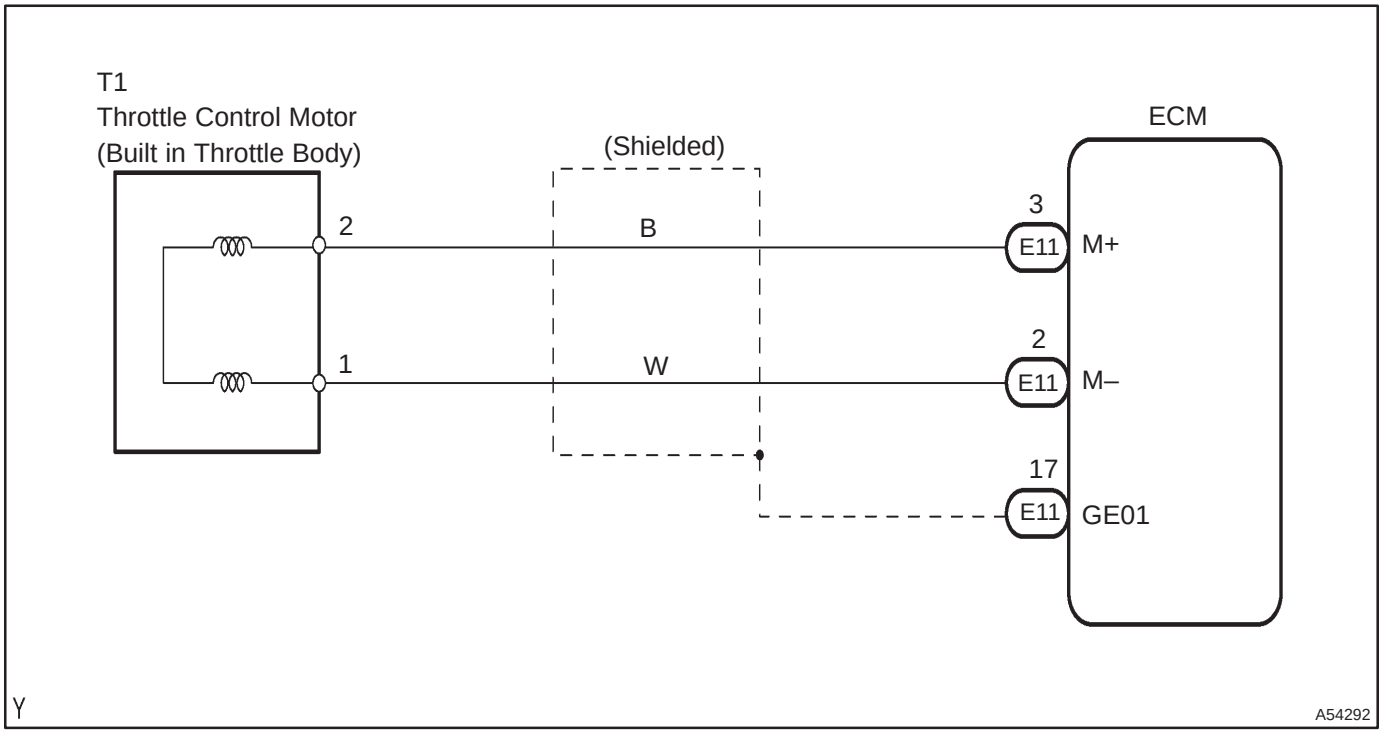
DTC	P2103	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM and it opens and closes the throttle valve.
The opening angle of the throttle valve is detected by the throttle position sensor which is mounted on the throttle body. It provides feedback to the ECM to control the throttle motor in order to regulate the throttle valve opening angle properly in response to the driving condition.
If this malfunction is detected, the ECM shuts down the power for the throttle motor, and the throttle valve is closed by the return spring. And the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.
HINT:
This electrical throttle system does not use the throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2102	Conditions (a) and (b) continue for 2.0 seconds: (a) Throttle control motor output duty greater than 80 % (b) Throttle control motor current less than 0.5 A	• Open in throttle control motor circuit • Throttle control motor • ECM
P2103	Throttle control motor current greater than 10 A	• Short in throttle control motor circuit • Throttle control motor • ECM
	Condition (a) continues for 0.6 seconds: (a) Throttle control motor current greater than 7 A	

WIRING DIAGRAM

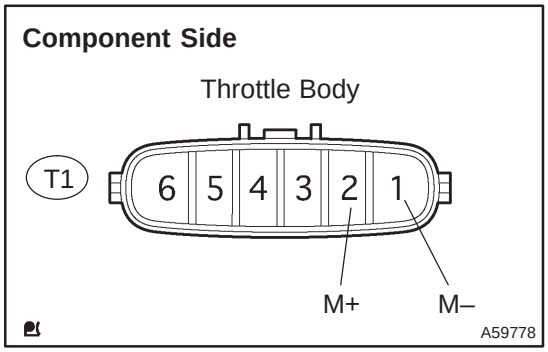


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT THROTTLE BODY ASSY(RESISTANCE OF THROTTLE CONTROL MOTOR)

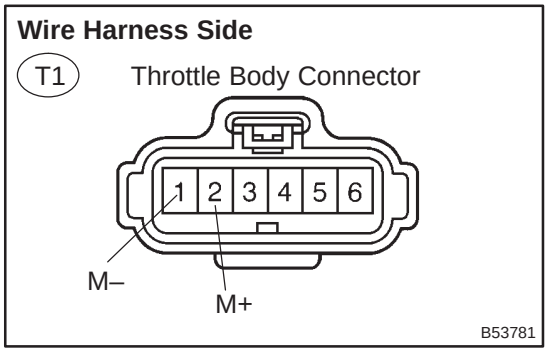


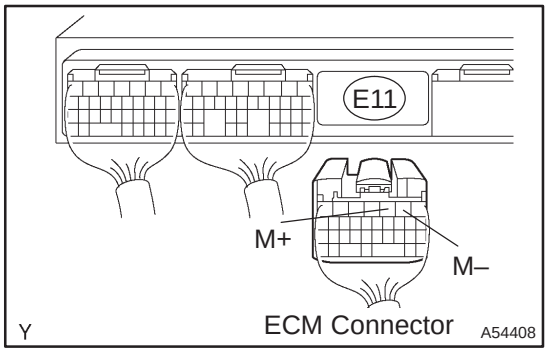
(a) Disconnect the T1 throttle body connector.
(b) Measure the motor resistance between terminals M+ and M–.
Motor resistance: 0.3 to 100 Ω at 20°C (68°F)

NG → **REPLACE THROTTLE BODY ASSY (See page 10–44)**

OK

2	CHECK HARNESS AND CONNECTOR(THROTTLE CONTROL MOTOR – ECM)





(a) Disconnect the T1 throttle body connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
M+ (T1–2) – M+ (E11–3)	Continuity
M– (T1–1) – M– (E11–2)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
M+ (T1–2) or M+ (E11–3) – Body ground	No continuity
M– (T1–1) or M– (E11–2) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P2111	THROTTLE ACTUATOR CONTROL SYSTEM – STUCK OPEN

DTC	P2112	THROTTLE ACTUATOR CONTROL SYSTEM – STUCK CLOSED

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM and it opens and closes the throttle valve using gears. The opening angle of the throttle valve is detected by the throttle position sensor which is mounted on the throttle body. And, it provides feedback to the ECM to control the throttle motor in order to make the throttle valve opening angle properly in response to the driving condition. If this malfunction is detected, the ECM shuts down the power for the throttle motor, and the throttle valve is closed by the return spring. And the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.

HINT:

This electrical throttle system is no used throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2111	The throttle motor locked during control by the ECM (Stuck open)	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve
P2112	The throttle motor locked during control by the ECM (Stuck closed)	

WIRING DIAGRAM

Refer to DTC P2102 on page 05–483.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

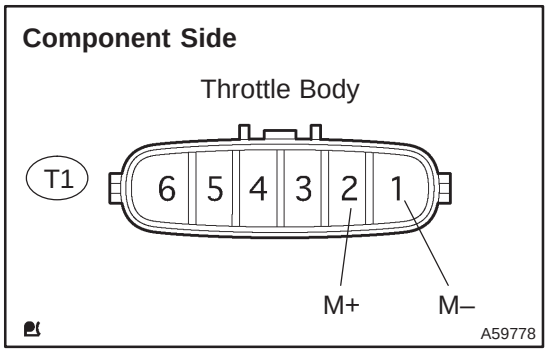
1	INSPECT THROTTLE BODY ASSY(VISUALLY CHECK THROTTLE VALVE)

(a) Check it a foreign object has been caught between the throttle valve and the housing.

NG → REMOVE FOREIGN OBJECT AND CLEAN THROTTLE BODY

OK

2 INSPECT THROTTLE BODY ASSY(RESISTANCE OF THROTTLE CONTROL MOTOR)

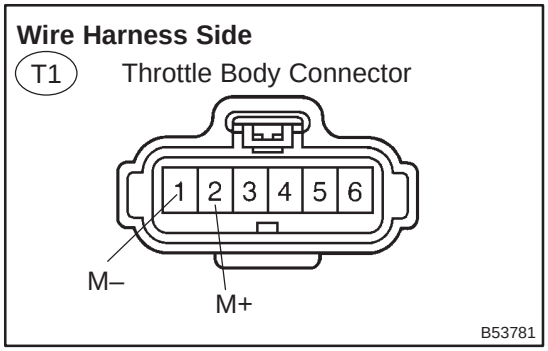


(a) Disconnect the T1 throttle body connector.
(b) Measure the motor resistance between terminals M+ and M–.
Motor resistance: 0.3 to 100 Ω at 20°C (68°F)

NG → **REPLACE THROTTLE BODY ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(THROTTLE CONTROL MOTOR – ECM)



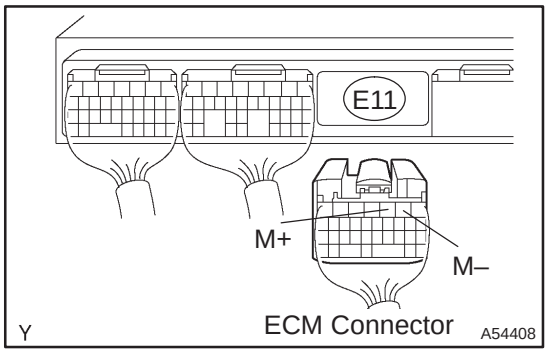
(a) Disconnect the T1 throttle body connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
M+ (T1–2) – M+ (E11–3)	Continuity
M– (T1–1) – M– (E11–2)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
M+ (T1–2) or M+ (E11–3) – Body ground	No continuity
M– (T1–1) or M– (E11–2) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR INTERMITTENT PROBLEMS

DTC	P2118	THROTTLE ACTUATOR CONTROL MOTOR CURRENT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

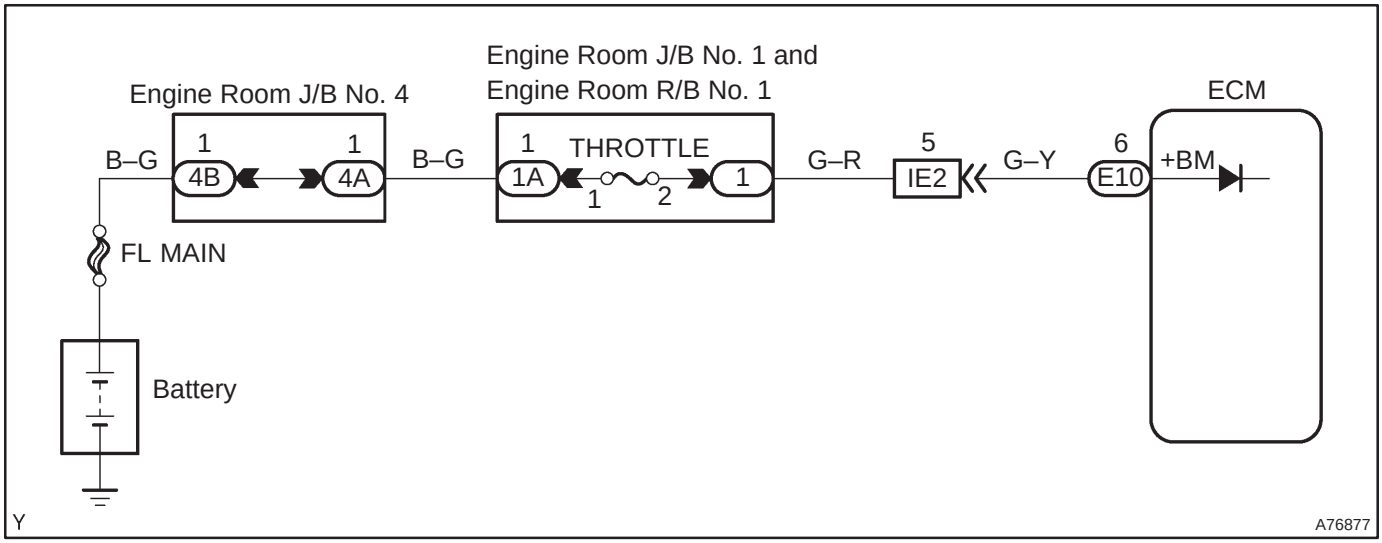
If this DTC is detected, the ECM shuts down the power for the throttle motor, and the throttle valve is closed by the return spring. And the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.

HINT:

This electrical throttle control system (ETCS) does not use the throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2118	Open in ETCS power source circuit	• Open in ETCS power source circuit • ECM

WIRING DIAGRAM

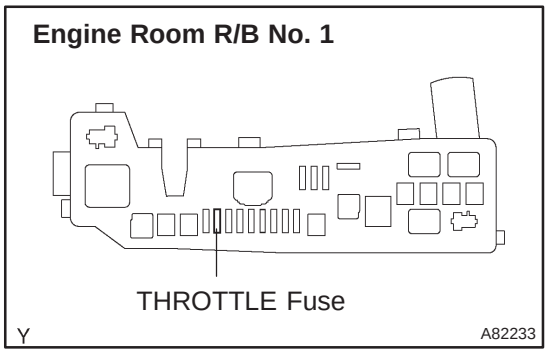


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK FUSE(THROTTLE FUSE)



(a) Remove the THROTTLE fuse from the engine room R/B No. 1.

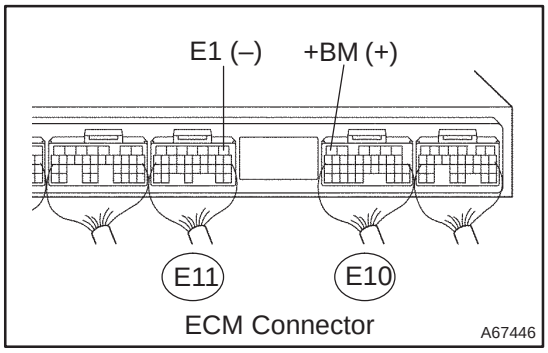
(b) Check for continuity in the THROTTLE fuse.

Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

2 INSPECT ECM(+BM VOLTAGE)



(a) Check the voltage between the specified terminals of the E10 and E11 ECM connectors.

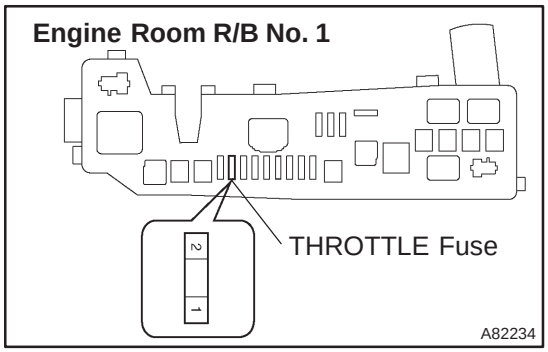
Standard:

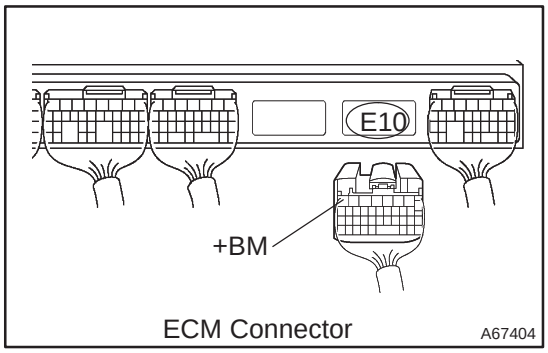
Symbols (Terminal No.)	Specified condition
+BM (E10–6) – E1 (E11–1)	9 to 14 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

3	CHECK HARNESS AND CONNECTOR(ECM – THROTTLE FUSE, THROTTLE FUSE – BATTERY)





(a) Check the harness and the connector between the THROTTLE fuse and the ECM.
  (1) Remove the THROTTLE fuse from the engine room R/B No. 1.
  (2) Disconnect the E10 ECM connector.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
THROTTLE fuse (2) – +BM (E10–6)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
THROTTLE fuse (2) or +BM (E10–6) – Body ground	No continuity

(b) Check the harness and the connector between the THROTTLE fuse and the battery.
  (1) Remove the THROTTLE fuse from the engine room R/B No. 1.
  (2) Disconnect the battery positive terminal.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Battery positive terminal – THROTTLE fuse (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Battery positive terminal or THROTTLE fuse (1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ENGINE ROOM RELAY BLOCK

DTC	P2119	THROTTLE ACTUATOR CONTROL THROTTLE BODY RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The Electric Throttle Control System (ETCS) is composed of the throttle motor that operates the throttle valve, the throttle position sensor that detects the opening angle of the throttle valve, the accelerator pedal position sensor that detects the accelerator pedal position, the ECM that controls the ETCS, and the one valve type throttle body.
The ECM controls the throttle motor to provide the proper throttle valve opening angle in response to the driving condition.
The throttle position sensor which is mounted on the throttle body detects the opening angle of the throttle valve, and it provides feedback to the ECM to control the throttle motor.
If the ETCS has a malfunction, the ECM shuts down the power for the throttle motor, and the throttle valve is closed by the return spring. And the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.

DTC No.	DTC Detection Condition	Trouble Area
P2119	Throttle opening angle continues to vary greatly from target throttle opening angle	• Electric throttle control system • ECM

WIRING DIAGRAM

Refer to DTC P2102 on page 05–483.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P2119)

(a) Read the DTC using hand–held tester.
Result:

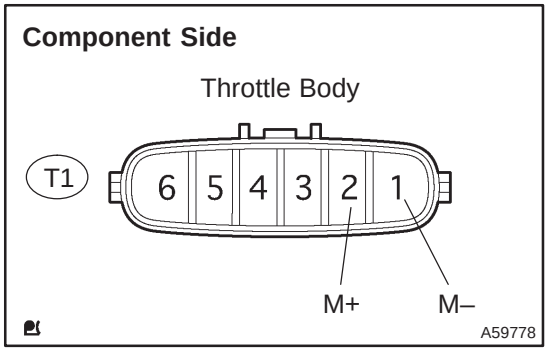
Display (DTC output)	Proceed to
Only P2119 is output	A
P2119 and other DTCs are output	B

HINT:
If any other codes besides P2119 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2 INSPECT THROTTLE BODY ASSY



(a) Disconnect the T1 throttle body connector.
(b) Measure the motor resistance between terminals M+ and M–.
Motor resistance: 0.3 to 100 Ω at 20°C (68°F)

NG → **REPLACE THROTTLE BODY ASSY**

OK

3 REPLACE ECM AND CLEAR DTC(CHECK IF DTC OUTPUTS REOCCUR)

(a) Replace the ECM.
(b) Clear the DTC (See page 05–294).
(c) Start and warm up the engine.
(d) Run the engine at idle for 15 sec. or more.
(e) Read the DTC (See page 05–294).
Standard: No DTC output.

OK → **NORMAL**

NG

REPLACE THROTTLE BODY ASSY

DTC	P2120	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT

DTC	P2122	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT LOW INPUT

DTC	P2123	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT HIGH INPUT

DTC	P2125	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT

DTC	P2127	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT LOW INPUT

DTC	P2128	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT HIGH INPUT

DTC	P2138	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D”/”E” VOLTAGE CORRELATION

HINT:
This is procedure of accelerator pedal position sensor.

CIRCUIT DESCRIPTION

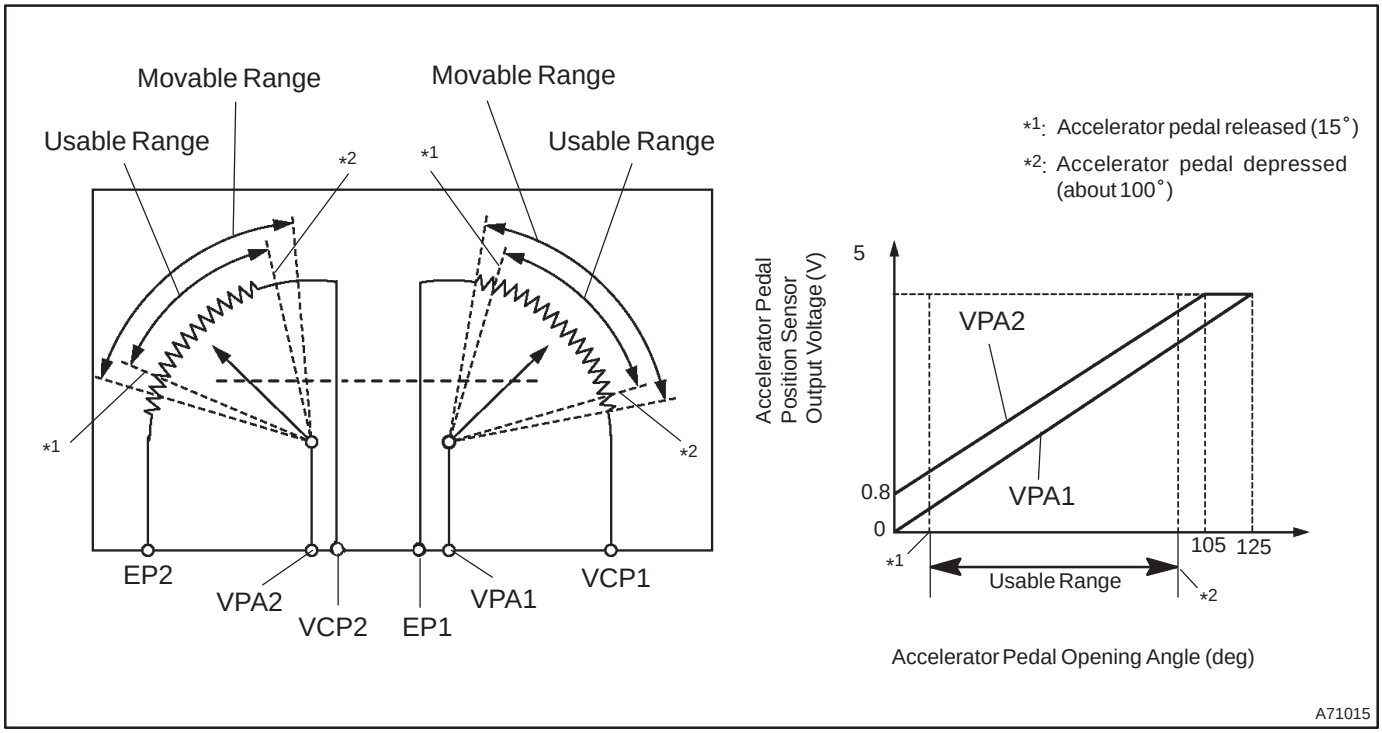
HINT:

This electrical throttle system is no used throttle cable.

The accelerator pedal position sensor is mounted on the accelerator pedal bracket and it have the 2 sensors to detect the accelerator position and a malfunction of the accelerator position sensor.

In the accelerator pedal position sensor, the voltage applied to VPA1 and VPA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the accelerator pedal. The VPA1 is a signal to indicate the actual accelerator pedal opening angle which is used for the engine control, and the VPA2 is a signal to indicate the information about VPA1 which is used for detecting a malfunction in VPA1.

The ECM monitors the current opening angle of the accelerator pedal from these signals input from VPA1 and VPA2, and controls the throttle motor based on these signals.



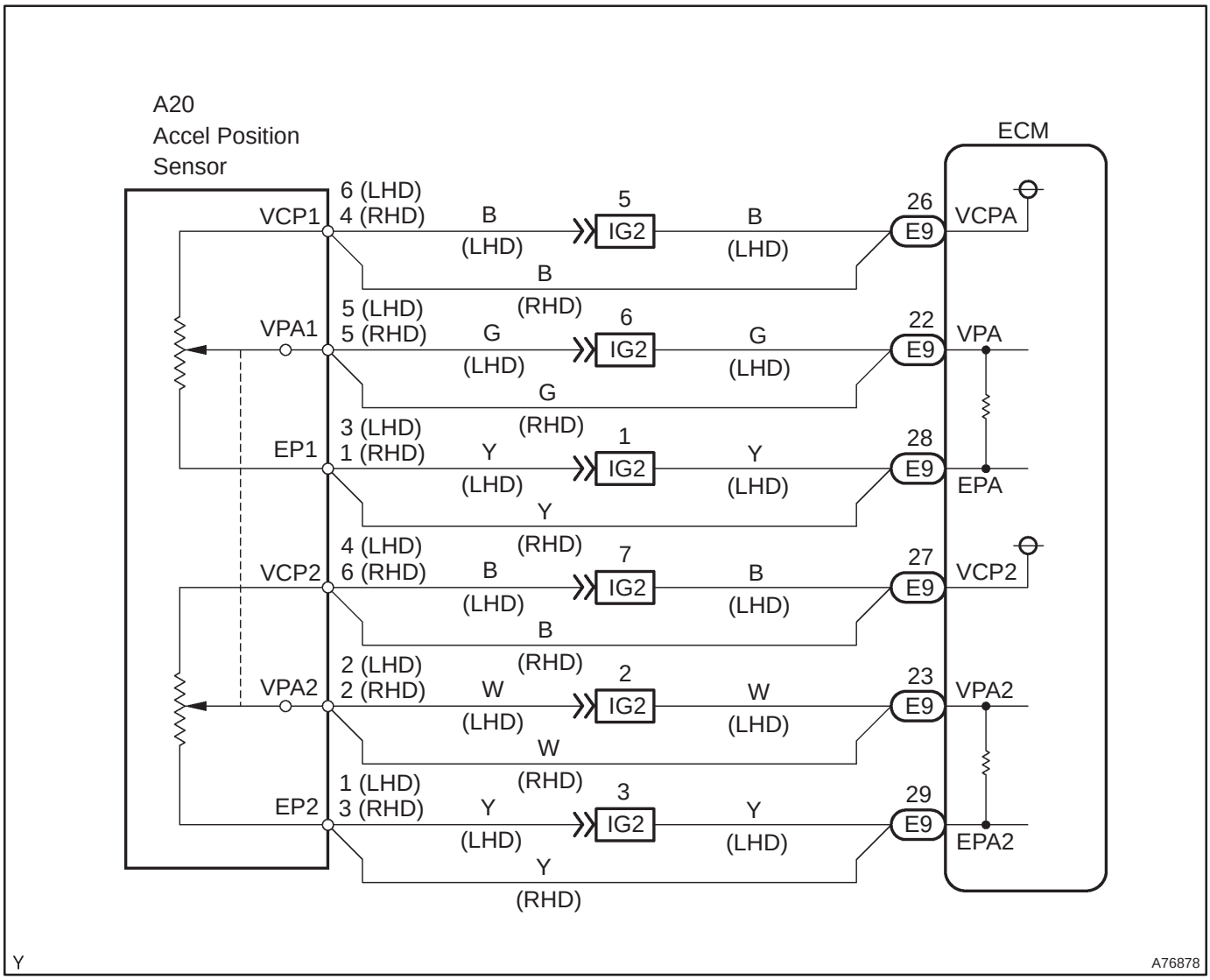
DTC No.	DTC Detection Condition	Trouble Area
P2120	Condition (a) continues for 0.5 sec. or more: (a) VPA less than 0.2 V and VPA2 greater than 0.97 deg, or VPA greater than 4.8 V	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM
P2122	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA less than 0.2 V (b) VPA2 greater than 0.97 deg	
P2123	Condition (a) continues for 2.0 sec. or more: (a) VPA greater than 4.8 V	
P2125	Condition (a) continues for 0.5 sec. or more: (a) VPA2 less than 0.5 V and VPA greater than 0.97 deg, or VPA2 greater than 4.8 V and VPA greater than 0.2 V but less than 3.45 V	
P2127	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA2 less than 0.5 V (b) VPA greater than 0.97 deg	
P2128	Conditions (a) and (b) continue for 2.0 sec. or more: (a) VPA2 greater than 4.8 V (b) VPA greater than 0.2 V but less than 3.45 V	
P2138	Condition (a) or (b) continues for 2.0 sec. or more: (a) Difference between VPA and VPA2 less than 0.02 V (b) VPA less than 0.2 V and VPA2 less than 0.5 V	

HINT:

After confirming ”DTC P2120, P2122, P2123, P2125, P2127, P2128 and P2138”, use the hand–held tester to confirm the accelerator pedal position sensor output voltage.

Trouble area	Accelerator pedal position expressed as voltage output			
	Accelerator pedal released		Accelerator pedal depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VCP circuit open	0 V	0 V	0 V	0 V
VPA circuit open or ground short	0 V	1.5 to 2.9 V	0 V	3.5 to 5.5 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 V	2.5 to 4.6 V	0 V
EP circuit open	5 V	5 V	5 V	5 V

WIRING DIAGRAM

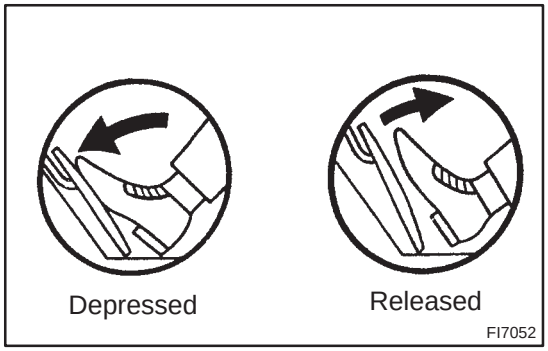


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 READ VALUE OF HAND–HELD TESTER(ACCEL POS #1 AND ACCEL POS #2)



(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2” and read its value displayed on the hand–held tester.

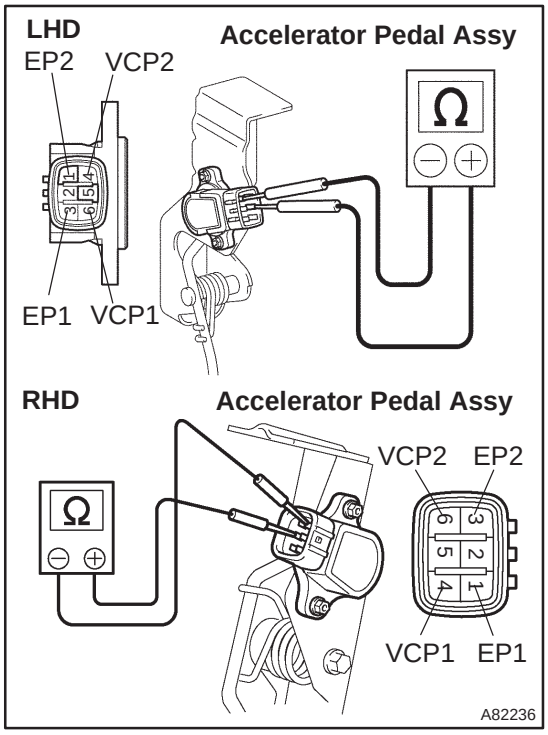
Standard:

Accelerator pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

2 INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A20 accelerator pedal position sensor connector.
(b) Measure the resistance between each terminal.

Standard (LHD):

Symbols (Terminal No.)	Resistance
EP1 (3) – VCP1 (6)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (1) – VCP2 (4)	

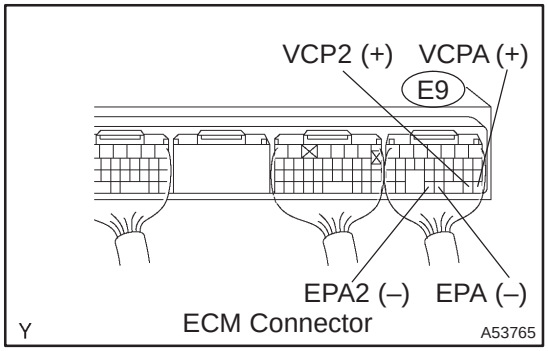
Standard (RHD):

Symbols (Terminal No.)	Resistance
EP1 (1) – VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) – VCP2 (6)	

NG → **REPLACE ACCELERATOR PEDAL ASSY**

OK

3 INSPECT ECM(VCPA AND VCP2 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

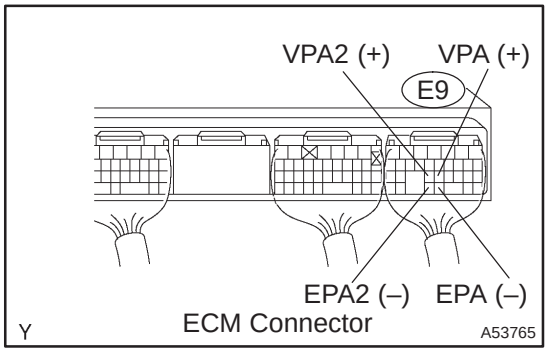
Standard:

Symbols (Terminal No.)	Specified condition
VCPA (E9–26) – EPA (E9–28)	4.5 to 5.5 V
VCP2 (E9–27) – EPA2 (E9–29)	

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

4 INSPECT ECM(VPA AND VPA2 VOLTAGE)



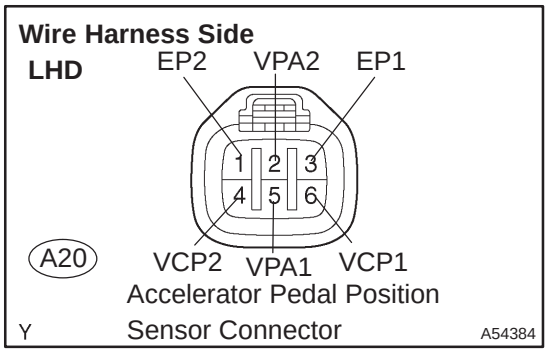
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

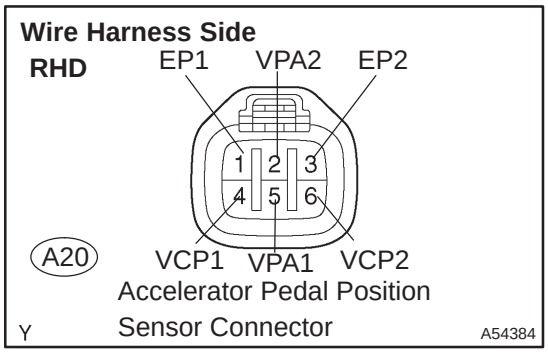
Accelerator pedal position	Symbols (Terminal No.) VPA (E9–22) – EPA (E9–28)	Symbols (Terminal No.) VPA2 (E9–23) – EPA2 (E9–29)
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

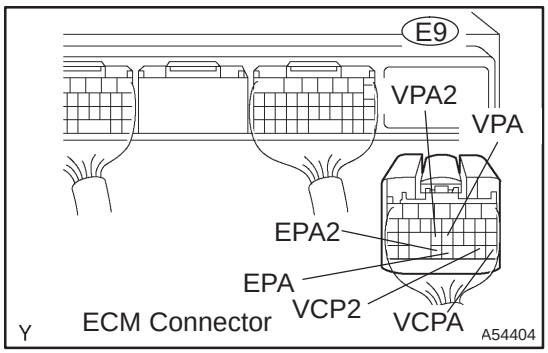
OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

5 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)







(a) Disconnect the A20 accelerator pedal position sensor connector.

(b) Disconnect the E9 ECM connector.

(c) Check for continuity between the wire harness side connectors.

Standard (LHD):

(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–3) – EPA (E9–28)	
VCP1 (A20–6) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–1) – EPA2 (E9–29)	
VCP2 (A20–4) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–3) or EPA (E9–28) – Body ground	
VCP1 (A20–6) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–1) or EPA2 (E9–29) – Body ground	
VCP2 (A20–4) or VCP2 (E9–27) – Body ground	

Standard (RHD):

(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–1) – EPA (E9–28)	
VCP1 (A20–4) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–3) – EPA2 (E9–29)	
VCP2 (A20–6) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–1) or EPA (E9–28) – Body ground	
VCP1 (A20–4) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–3) or EPA2 (E9–29) – Body ground	
VCP2 (A20–6) or VCP2 (E9–27) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P2121	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page 05–492.

DTC No.	DTC Detection Condition	Trouble Area
P2121	Conditions (a) and (b) continue for 0.5 seconds: (a) Difference between VPA and VPA2 exceeds the threshold (b) IDL is OFF	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM

WIRING DIAGRAM

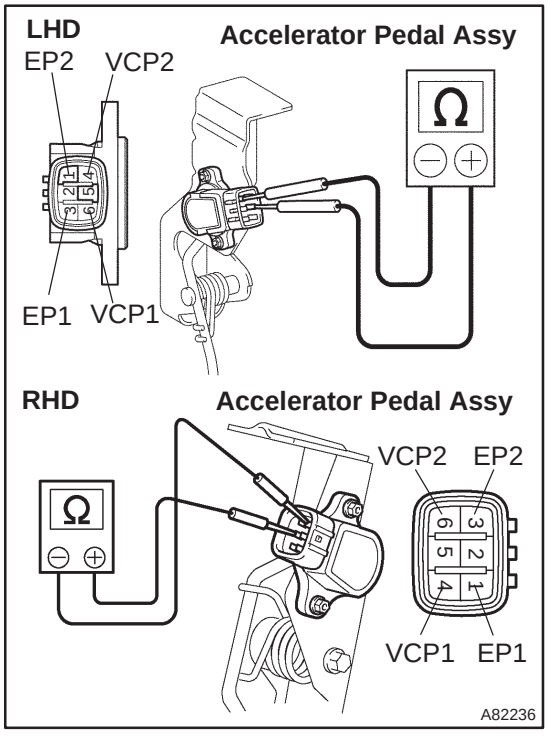
Refer to DTC P2120 on page 05–492.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A20 accelerator pedal position sensor connector.

(b) Measure the resistance between each terminal.

Standard (LHD):

Symbols (Terminal No.)	Resistance
EP1 (3) – VCP1 (6)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (1) – VCP2 (4)	

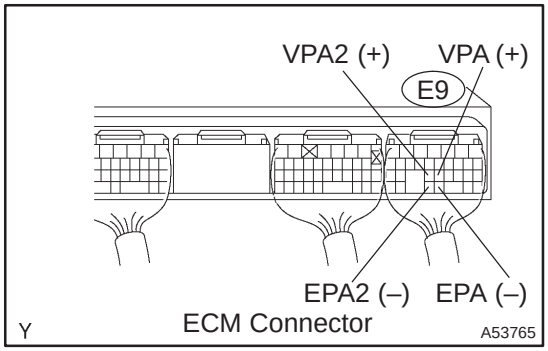
Standard (RHD):

Symbols (Terminal No.)	Resistance
EP1 (1) – VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) – VCP2 (6)	

NG → **REPLACE ACCELERATOR PEDAL ASSY**

OK

2 INSPECT ECM(VPA AND VPA2 VOLTAGE)



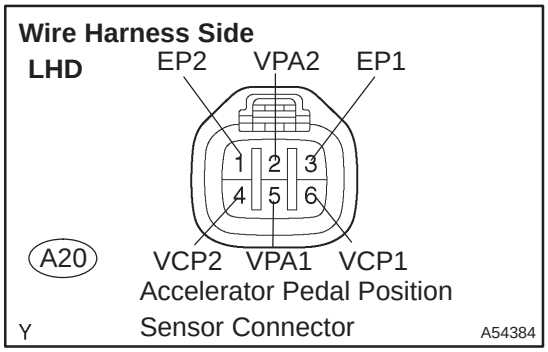
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

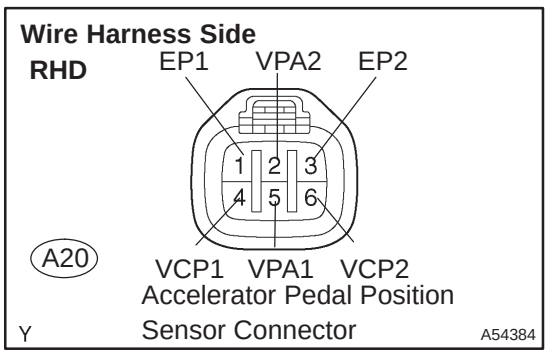
Accelerator pedal position	Symbols (Terminal No.)	Symbols (Terminal No.)
	VPA (E9–22) – EPA (E9–28)	VPA2 (E9–23) – EPA2 (E9–29)
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

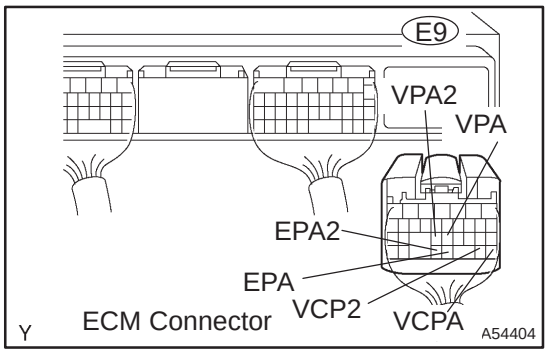
OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

3 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)







(a) Disconnect the accelerator pedal position sensor connector.
(b) Disconnect the E9 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (LHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–3) – EPA (E9–28)	
VCP1 (A20–6) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–1) – EPA2 (E9–29)	
VCP2 (A20–4) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–3) or EPA (E9–28) – Body ground	
VCP1 (A20–6) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–1) or EPA2 (E9–29) – Body ground	
VCP2 (A20–4) or VCP2 (E9–27) – Body ground	

Standard (RHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–1) – EPA (E9–28)	
VCP1 (A20–4) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–3) – EPA2 (E9–29)	
VCP2 (A20–6) – VCP2 (E9–27)	

(Check for Short)

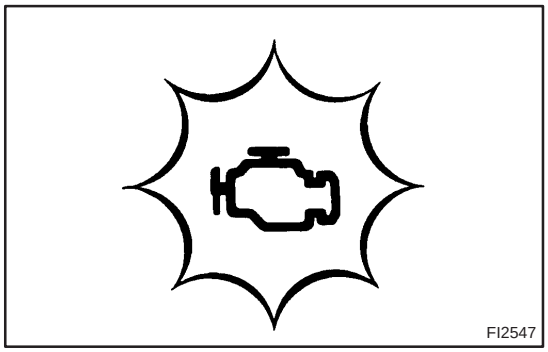
Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–1) or EPA (E9–28) – Body ground	
VCP1 (A20–4) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–3) or EPA2 (E9–29) – Body ground	
VCP2 (A20–6) or VCP2 (E9–27) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ACCELERATOR PEDAL ASSY (See page 10–66)

05CDU–01

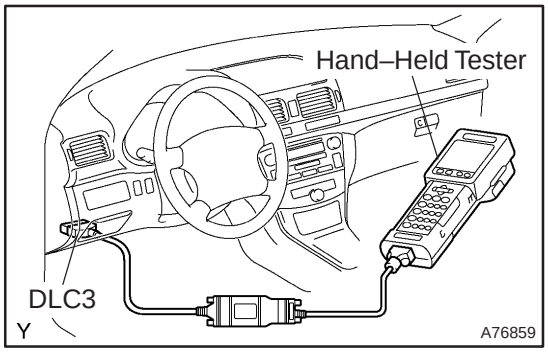

FI2547

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description for Euro–OBD (European spec.)

- When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect an OBD scan tool complying with ISO 15031–4 or a hand–held tester to the vehicle, and read off various data output from the vehicle's ECM.
- Euro–OBD regulations require that the vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the emission control system / components or in the power train control components which affect vehicle emissions, or a malfunction in the computer. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO 15031–4 are recorded in the ECM memory (See page 05–309). If the malfunction does not reoccur in 3 consecutive trips, the CHK ENG goes off automatically but the DTCs remain recorded in the ECM memory.

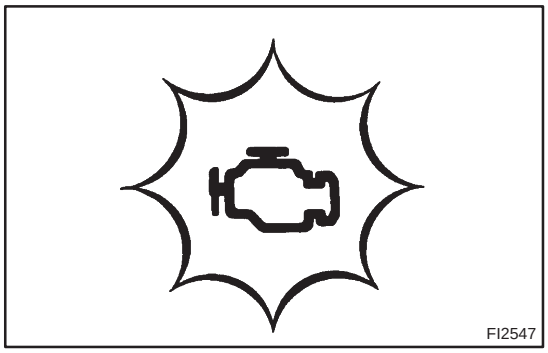


- To check the DTCs, connect the OBD scan tool or hand–held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data. (For operating instructions, see the OBD scan tool's instruction book.)
  DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–309).
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).

- * 2 trip detection logic
  When a logic malfunction is first detected, the malfunction is temporally stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTCs P0300 – P0304) or fuel trim malfunction (DTCs P0171, P0172, P0174 and P0175) or other malfunction (first malfunction only) is detected.
  Because freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- Priorities for troubleshooting:
  If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.

If no instructions are given, troubleshoot according to the following priorities.

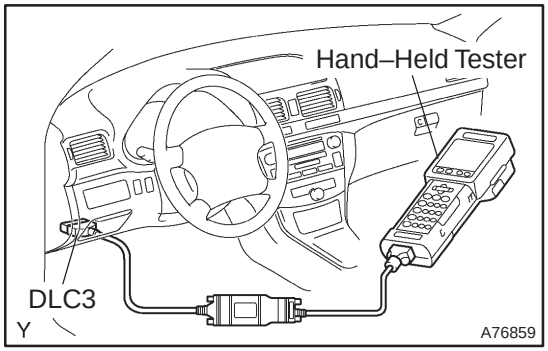
(1) DTCs other than fuel trim malfunction (DTCs P0171, P0172, P0174 and P0175) and misfire (DTCs P0300 – P0304).
(2) Fuel trim malfunction (DTCs P0171, P0172, P0174 and P0175).
(3) Misfire (DTCs P0300 – P0304).


FI2547

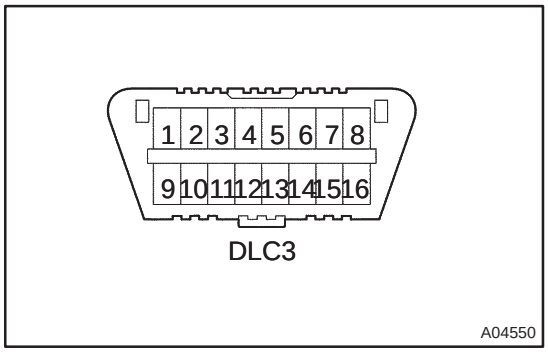
(b) Description for M–OBD (Except European spec.)

- When troubleshoot Multiplex OBD (M–OBD) vehicles, the only difference from the usual troubleshooting procedure is that you connect the hand–held tester to the vehicle, and read off various data output from the vehicle's ECM.

- The vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) are recorded in the ECM memory (See page 05–309). If the malfunction does not recur, the CHK ENG lamp will be disappeared by turning off the ignition switch but the recorded DTC will be remaining in the ECM memory.



- To check the DTCs, connect the hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The hand–held tester also enables you to erase the DTCs and check the freeze frame data and various forms of engine data. (for operating instructions, see the instruction book.)
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).
- * 2 trip detection logic
  When a logic malfunction is first detected, the malfunction is temporally stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  Freeze frame data records the engine conditions (fuel system, calculator load, water temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.



(c) Check the DLC3.
The vehicle's ECM uses the ISO 9141–2 (Euro–OBD)/ ISO 14230(M–OBD) communication protocol. The terminal arrangement of the DLC3 complies with ISO 15031–03 and matches the ISO 9141–2/ ISO 14230 format.

Symbol	Terminal No.	Connection/Voltage or Resistance	Condition
SIL	7	Bus + Line/Pulse generation	During transmission
CG	4	Chassis Ground – Body Ground/1 Ω or less	Always
SG	5	Signal Ground – Body Ground/1 Ω or less	Always
BAT	16	Battery Positive – Body Ground/9 to 14 V	Always

HINT:
If the display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

(d) Inspect the battery voltage.
Battery voltage: 11 to 14 V

If voltage is below 11 V, recharge the battery before proceeding.

(e) Check the CHK ENG.
(1) The CHK ENG lamp comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the CHK ENG is not illuminated, troubleshoot the combination meter.

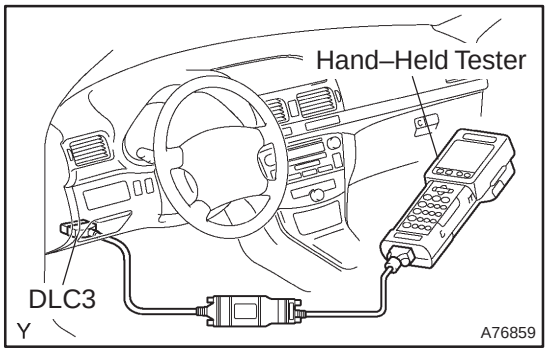
(2) When the engine is started, the CHK ENG should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

2. DTC CHECK (Normal Mode)

NOTICE:

Hand–held tester only:

When the diagnosis system is switched from the normal mode to the check (test) mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.



(a) Checking the DTCs using the hand–held tester.
  (1) Connect the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON and switch the hand–held tester main switch ON.
  (3) Use the hand–held tester to check the DTCs and freeze frame data and note them down (for operating instructions, see the hand–held tester's instruction book).
  (4) See page 05–309 to confirm the details of the DTCs.

HINT:
In the event that 2 or more DTCs are detected, the CHK ENG lamp will indicate the smaller number DTC first.

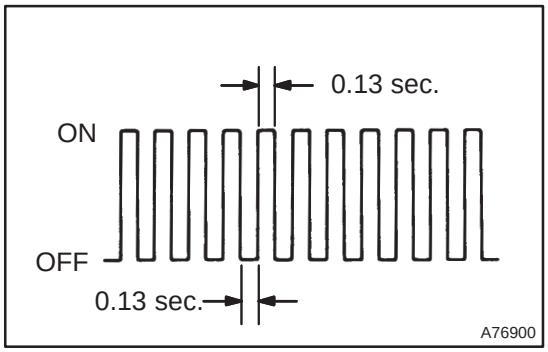
(b) Clearing the DTCs using the hand–held tester.
  (1) Connect the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON.
  (3) When operating the hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester.
  (1) Disconnect the battery terminal or remove the EFI and THROTTLE fuses from the engine room R/B No. 1 for more than 60 seconds.

3. DTC CHECK (Check Mode)

HINT:
Hand–held tester only:
Compared to the normal mode, the check mode has more sensing ability to detect malfunctions.
Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check (test) mode.

(a) Procedure for check mode using the hand–held tester.
  (1) Check the initial conditions
    - Battery positive voltage 11 V or more.
    - Throttle valve fully closed.
    - Transmission in the "P" or "N" position.
    - Air conditioning switched OFF.
  (2) Turn the ignition switch OFF.
  (3) Connect the hand–held tester to the DLC3.
  (4) Turn the ignition switch ON and switch the hand–held tester main switch ON.



(5) Switch the hand–held tester from the normal mode to the check (test) mode. The CHK ENG blinks in 0.13 sec. intervals as shown in the illustration.

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(6) Start the engine. (The CHK ENG goes off after the engine start.)

(7) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTC, etc.

(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the normal mode and will result in all of the DTCs and freeze frame data being erased.

(9) After checking the DTC, inspect the applicable circuit.

(b) Clearing the DTCs using the hand–held tester.

(1) Connect the hand–held tester to the DLC3.

(2) Turn the ignition switch ON.

(3) When operating the hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester.

(1) Disconnect the battery terminal or remove the EFI and THROTTLE fuses from the engine room R/B No. 1 for more than 60 seconds.

4. FAIL–SAFE CHART

If any of the following codes is recorded, the ECM enters into the fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0031 P0032 P0037 P0038 P0051 P0052 P0057 P0058	Faulty heater circuit is turned off.	Ignition switch is OFF.
P0100 P0102 P0103	Ignition timing is calculated based on an engine speed and a throttle opening angle.	”Pass” detection has occurred. Upon this occurrence, the ECM will return to normal mode.
P0105 P0107 P0108	• Intake air pressure is controlled with a calculated value in proportion to the throttle opening angle and the engine speed. • Limit the engine speed to 3,000 rpm or less.	”Pass” detection has occurred. Upon this occurrence, the ECM will return to normal mode.
P0110 P0112 P0113	Intake air temperature is fixed at 20°C (68°F)	”Pass” detection has occurred. Upon this occurrence, the ECM will return to normal mode.
P0115 P0117 P0118	Engine coolant temperature is fixed at 80°C (176°F)	”Pass” detection has occurred. Upon this occurrence, the ECM will return to normal mode.
P0120 P0121 P0122 P0123 P0220 P0222 P0223 P2135	Turn off the power for the throttle motor, return the throttle valve in position using the return spring, and fuel cut intermittent.	Repeat the following conditions at least 2 seconds or more with the throttle position switch closed: • VTA is more than 0.1 V but less than 0.95 V • Engine speed is 0 km/h
P0190 P0191	• Stop the high–pressure pump operation. • Limit the engine speed to 2,000 rpm or less.	After it is returned to normal condition, turn the ignition switch ON.
P0200	Turn off the INJ relay and cut the power for the EDU.	After it is returned to normal condition, turn the ignition switch ON.
P0201 P0202 P0203 P0204	• Stop fuel injection for an abnormal cylinder and related other cylinders. • Limit the engine speed to 3,000 rpm or less.	
P0325 P0327 P0328	Maximum timing retardation	Ignition switch is OFF.
P0351 P0352 P0353 P0354	Stop fuel injection for all the cylinders.	”Pass” detection has occurred. Upon this occurrence, the ECM will return to normal mode.
P0604 P0606 P0607 P0657	Turn off the power for the throttle motor, return the throttle valve in position using the return spring, and fuel cut intermittent.	After it is returned to normal condition, turn the ignition switch ON.
P1235	• Stop the high–pressure pump operation. • Limit the engine speed to 2,000 rpm or less.	After it is returned to normal condition, turn the ignition switch ON.
P2008	Force IACV to close.	After it is returned to normal condition, turn the ignition switch ON.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P2102 P2103 P2111 P2112 P2118 P2119	Turn off the power for the throttle motor, return the throttle valve in position using the return spring, and fuel cut intermittent.	After it is returned to normal condition, turn the ignition switch ON.
P2120 P2121 P2122 P2123 P2125 P2127 P2128 P2138	• If both VPA1 and VPA2 are malfunctioning: Fixed at idle • If either of VPA1 or VPA2 is malfunctioning: Fuel cut intermittently	After it is returned to normal condition, turn the ignition switch ON.

5. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:

By putting the vehicle's ECM in the check mode, the 1 trip detection logic is possible instead of the 2 trip detection logic, and the sensitivity to detect faults is increased. This makes it easier to detect intermittent problems.

(a) Clear the DTCs (See step 2).
(b) Set the check mode (See step 3).
(c) Perform a simulation test (See page 01–22).
(d) Check the connector and terminal (See page 01–32).
(e) Wiggle the harness and the connector (See page 01–32).

6. DATA LIST

HINT:

Using the DATA LIST displayed by the hand–held tester, you can read the value of the switches, sensors, actuators and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one method to shorten diagnostic time.

NOTICE:

The values given below for "Normal Condition" are representative values. A vehicle may still be normal even if its value differs from those listed here. So, do not solely depend on the "Normal Condition" here when deciding whether a part is faulty or not.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand–held tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST".
(g) According to the display on tester, read the "DATA LIST".

Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *1	Diagnostic Note
INJECTOR	Injection period of the No. 1 cylinder/ Min.: 0 ms, Max.: 32.64 ms	Idling: 0.40 to 0.78 ms	—
IGN ADVANCE	Ignition timing advance for No. 1 cylinder/ Min.: –64 deg., Max.: 63.5 deg.	Idling: BTDC 5 to 23°	—
CALC LOAD	Calculated load by ECM/ Min.: 0 %, Max.: 100 %	• Idling: 21.6 to 31.4 % • Running without load (2,500 rpm): 19.6 to 29.4 %	—

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *1	Diagnostic Note
MAF	Air flow rate from MAF sensor/ Min.: 0 gm/s, Max.: 655 gm/s	• Idling: 3.2 to 4.7 gm/s • Running without load (2,500 rpm): 13.1 to 18.9 gm/s	If the value is Approximately 0.0 gm/s: • Mass air flow meter power source circuit open • VG circuit open or short If the value is 160.0 gm/s or more: • E2G circuit open
MAP	Absolute pressure inside intake manifold/ Min.: 0 kPa, Max.: 224 kPa	• Idling: 22 to 32 kPa • Running without load (2,500 rpm): 20 to 30 kPa	If the value is Approximately 0.0 kPa: • PIM circuit short If the value is 142.0 kPa or more: • VC circuit open or short • PIM circuit open • E2 circuit open
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16383 rpm	Idling: 625 to 725 rpm	—
COOLANT TEMP	Coolant temperature/ Min.: –40°C, Max.: 140°C	After warming up: 80 to 95°C (176 to 203°F)	If the value is –40°C (–40°F): • Sensor circuit is open. If the value is 140°C (284°F): • Sensor circuit is shorted.
INTAKE AIR	Intake air temperature/ Min.: –40°C, Max.: 140°C	Equivalent to Ambient Temp.	
THROTTLE POS	Absolute throttle position sensor/ Min.: 0 %, Max.: 100 %	• Throttle fully closed: 10 to 24 % • Throttle fully open: 64 to 96 %	Read the value with ignition switch ON (Do not start engine).
CTP SW	Closed throttle position switch/ ON or OFF	• Throttle fully closed: ON • Throttle open: OFF	—
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Actual vehicle speed	Speed indicated on speedometer
ACCEL POS #1	Accelerator pedal position sensor No.1 output voltage/ Min.: 0 V, Max.: 5 V	• Accelerator pedal released: 0.5 to 1.1 V • Accelerator pedal depressed: 2.5 to 4.6 V	Read the value with ignition switch ON (Do not start engine).
ACCEL POS #2	Accelerator pedal position sensor No.2 output voltage/ Min.: 0 V, Max.: 5 V	• Accelerator pedal released: 1.5 to 2.9 V • Accelerator pedal depressed: 3.5 to 5.5 V	Read the value with ignition switch ON (Do not start engine).
THROTTLE POS #2	Throttle position sensor No.2 output voltage/ Min.: 0 V, Max.: 5 V	• Throttle fully closed: 2.1 to 3.1 V • Throttle fully open: 4.5 to 5.5 V	Read the value with ignition switch ON (Do not start engine).
THROTTLE TARGT	Target position of throttle valve/ Min.: 0 V, Max.: 5 V	Idling: 0.4 to 1.1 V	—
THROTTLE OPN DUTY	Throttle motor opening duty ratio/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 0 %	• When accelerator pedal is depressed, duty ratio is increased. • Read the value with ignition switch ON (Do not start engine)
THROTTLE CLS DUTY	Throttle motor closed duty ratio/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 0 %	• When accelerator pedal is released quickly, duty ratio is increased. • Read the value with ignition switch ON (Do not start engine)
THROTTLE MOT	Whether or not throttle motor control is permitted/ ON or OFF	Idling: ON	—
+BM	Whether or not electric throttle control system power is inputted/ ON or OFF	Idling: ON	—

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *1	Diagnostic Note
ACCEL IDL POS	Whether or not accelerator pedal position sensor is detecting idle/ ON or OFF	Idling: ON	—
THROTTLE IDL POS	Whether or not throttle position sensor is detecting idle/ ON or OFF	Idling: ON	—
FAIL #1	Whether or not fail safe function is executed/ ON or OFF	ETCS has failed: ON	—
FAIL #2	Whether or not fail safe function is executed/ ON or OFF	ETCS has failed: ON	—
THROTTLE INITIAL	Throttle fully closed learned value Min.: 0 V, Max.: 5 V	0.5 to 0.9 V	—
ACCEL LEARN VAL	Accelerator fully closed learned value Min.: 0 V, Max.: 5 V	0.4 to 1.4 V	—
THROTTLE MOT	Throttle motor current Min.: 0 A, Max.: 20 A	Idling: 0 to 3.0 A	—
O2S B1 S1	Heated oxygen sensor output voltage for bank 1 sensor 1/ Min.: 0 V, Max.: 1.0 V	Driving (50 km/h, 31 mph): 0.1 to 0.9 V	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the user to check the voltage output of each sensor.
O2S B1 S2	Heated oxygen sensor output voltage for bank 1 sensor 2/ Min.: 0 V, Max.: 1.0 V		
O2S B2 S1	Heated oxygen sensor output voltage for bank 2 sensor 1/ Min.: 0 V, Max.: 1.0 V		
O2S B2 S2	Heated oxygen sensor output voltage for bank 2 sensor 2/ Min.: 0 V, Max.: 1.0 V		
SHORT FT #1	Short term fuel trim of bank 1/ Min.: –100 %, Max.: 100%	0 ± 20 %	This item is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio
LONG FT #1	Long term fuel trim of bank 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is the overall fuel compensation carried out in long–term to compensate for a continual deviation of the short–term fuel trim from the central value.
TOTAL FT #1	Total fuel trim bank 1: Average value for fuel trim system of bank 1/ Min.: 0.5, Max.: 1.496	Idling: 0.5 to 1.4	—
SHORT FT #2	Short term fuel trim of bank 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio
LONG FT #2	Long term fuel trim of bank 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is the overall fuel compensation carried out in long–term to compensate for a continual deviation of the short–term fuel trim from the central value.
TOTAL FT #2	Total fuel trim bank 2: Average value for fuel trim system of bank 2/ Min.: 0.5, Max.: 1.496	Idling: 0.5 to 1.4	—

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *1	Diagnostic Note
O2FT B1 S1	Short term fuel trim associated with the bank 1 sensor 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #1
O2FT B1 S2	Short term fuel trim associated with the bank 1 sensor 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #1
O2FT B2 S1	Short term fuel trim associated with the bank 2 sensor 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #2
O2FT B2 S2	Short term fuel trim associated with the bank 2 sensor 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #2
FUEL SYS #1	Fuel system status (Bank1) / OL or CL or OL DRIVE or OL FAULT or CL FAULT	Idling after warming up: CL	• OL: Open Loop–has not yet satisfied conditions to go closed loop. • CL: Closed Loop–using heated oxygen sensor(s) as feed back for fuel control. • OL DRIVE: Open loop due to driving conditions. (fuel enrichment) • OL FAULT: Open loop due to detected system fault. • CL FAULT: Closed loop but one of heated oxygen sensors, which is used for fuel control, is functioningimproperly.
FUEL SYS #2	Fuel system status (Bank2) / OL or CL or OL DRIVE or OL FAULT or CL FAULT		
FC IDL	Fuel cut idle/ ON or OFF	Fuel cut operation: ON	FC IDL= ”ON” when throttle valve fully closed and engine speed is over 1,500 rpm.
MIL	MIL status/ ON or OFF	MIL ON: ON	—
O2 LR B1 S1	Oxygen sensor lean rich bank 1 sensor 1: Response time for oxygen sensor output to switch from lean to rich/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 msec.	—
O2 LR B2 S1	Oxygen sensor lean rich bank 2 sensor 1: Response time for oxygen sensor output to switch from lean to rich/ Min.: 0 ms, Max.: 16,711 ms		
O2 RL B1 S1	Oxygen sensor rich lean bank 1 sensor 1: Response time for oxygen sensor output to switch from rich to lean/ Min.: 0 ms, Max.: 16,711 ms		
O2 RL B2 S1	Oxygen sensor rich lean bank 2 sensor 1: Response time for oxygen sensor output to switch from rich to lean/ Min.: 0 ms, Max.: 16,711 ms		
STARTER SIG	Starter signal/ ON or OFF	Cranking: ON	—
A/C SIG	A/C signal/ ON or OFF	A/C ON: ON	—
PNP SW [NSW] *2	Park/neutral position switch signal/ ON or OFF	P or N position: ON	—

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *1	Diagnostic Note
ELECT LOAD SIG	Electrical load signal/ ON or OFF	• Tail light switch ON: ON • Defogger switch ON: ON	—
STOP LIGHT SW	Stop light switch/ ON or OFF	• Brake pedal depressed: ON • Brake pedal released: OFF	—
PS OIL PRESS SW	Power steering signal/ ON or OFF	• While turning the steering wheel: ON • While not turning the steering wheel: OFF	The idle–up control is performed when PS is ON.
PS SIGNAL	Power steering signal/ ON or OFF	When the steering wheel is turned: ON	This signal is usually ON status until the IG switch is turned OFF.
SCV VSV	VSV status for intake air control valve/ ON or OFF	VSV operation: ON	—
FUEL PUMP / SPD	Fuel pump/speed status/ ON/H or OFF/M,L	Idling: ON	—
EVAP VSV	VSV status for EVAP control/ ON or OFF	VSV operating: ON	VSV for EVAP is controlled by the ECM (ground side duty control)
VVT CTRL B1	VVT control status (bank 1)/ ON or OFF	VVT system operation: ON	—
IGNITION	Ignition counter/ Min.: 0, Max.: 400	0 to 400	—
CYL #1, #2, #3, #4	Misfire ratio of the cylinder 1 to 4/ Min.: 0 %, Max.: 50 %	0 %	This item is displayed in only idling
MISFIRE RPM	Engine RPM for first misfire range/ Min.: 0 rpm, Max.: 6,375 rpm	Misfire 0: 0 rpm	—
FC TAU	Fuel Cut TAU: Fuel cut during very light load/ ON or OFF	Fuel cut operating: ON	The fuel cut is being performed under very light load to prevent the engine combustion from becoming incomplete.
CHECK MODE	Check mode/ ON or OFF	Check mode ON: ON	See step 3
O2 RL B1 S2	Oxygen sensor rich lean bank 1 sensor 2: Response time for oxygen sensor output to switch from rich to lean/ Min.: 0 ms, Max.: 16,702.5 ms	Idling after warming up: 0 to 1,000 msec.	—
O2 RL B2 S2	Oxygen sensor rich lean bank 2 sensor 2: Response time for oxygen sensor output to switch from rich to lean/ Min.: 0 ms, Max.: 16,702.5 ms		
MIL ON RUN DIST	Distance since activation of check engine warning light/ Min.: 0 km, Max.: 65,535 km	When there is no DTC: 0 km	—
FUEL PRESS	Fuel high pressure inside fuel delivery pipe/ Min.: 0 MPa, Max.: 819 MPa	• Idling: 8 to 13 MPa • Running without load (3,000 rpm): 9.5 to 10.5 MPa	—

*1: If no conditions are specifically stated for ”Idling”, it means the shift lever is at the N or P position, the A/C switch is OFF and all accessory switches are OFF.
*2: For A/T only

7. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one method to shorten diagnostic time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST”
(g) According to the display on tester, perform the ”ACTIVE TEST”.

Hand–held Tester Display	Test Details	Diagnostic Note
INJ VOL	[Test Details] Control the injection volume Min.: –12.5 %, Max.: 25 % [Vehicle Condition] Engine speed: 3,000 rpm or less	• All injectors are tested at once. • Injection volume is gradually changed between –12.5 and 25 %.
A/F CONTROL	[Test Details] Control the injection volume –12.5 or 25 % (Change the injection volume –12.5 % or 25 %.) [Vehicle Condition] Engine speed: 3,000 rpm or less	The following procedure of A/F CONTROL enables the user to check its output (show its graph indication) of sensor 1 and sensor 2: For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1 S1 and O2S B1 S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
SCV VSV	[Test Details] Activate the VSV for intake air control valve. ON or OFF	—
EVAP VSV (ALONE)	[Test Details] Activate the VSV for EVAP control ON or OFF	—
FUEL PUMP / SPD	[Test Details] Control the fuel pump ON or OFF	—
VVT CTRL B1	[Test Details] Active the VVT system (Bank 1). ON or OFF	• ON: Rough idle or engine stall. • OFF: Normal engine speed.
TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	—
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit ON or OFF	—

BASIC INSPECTION

When the malfunction code is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problems. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	CHECK BATTERY VOLTAGE

NOTICE:
Carry out this check with the engine stopped and ignition switch OFF.

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → **CHARGE OR REPLACE BATTERY**

OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–320**

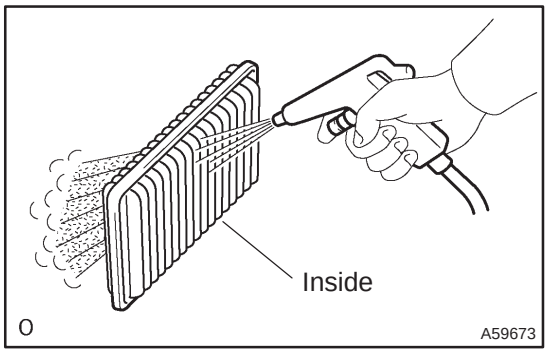
OK

3	CHECK IF ENGINE STARTS

NG → **GO TO STEP 7**

OK

4	CHECK AIR FILTER



(a) Visually check that the air filter is not excessively dirty or oily.

NOTICE:
If necessary, clean the filter with compressed air. First blow from the inside thoroughly, then blow from the outside of the filter.

NG → **CLEAN OR REPLACE**

OK

5	CHECK IDLE SPEED (See page 14–181)

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–320**

OK

6	CHECK IGNITION TIMING (See page 14–181)

NG → PROCEED TO PAGE AND CONTINUE TO TROUBLESHOOT

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–320

7	CHECK FUEL PRESSURE (See page 11–33)

NG → PROCEED TO PAGE 11–33 AND CONTINUE TO TROUBLESHOOT

OK

8	CHECK FOR SPARK (See page 18–12)

NG → PROCEED TO PAGE 18–12 AND CONTINUE TO TROUBLESHOOT

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–320

05CDX–01

PROBLEM SYMPTOMS TABLE

When the malfunction is not confirmed in the DTC check and the problem still can not be confirmed in the basic inspection either, proceed to this problem symptoms table and troubleshoot according to the number given below.

Symptom	Suspected Area	See page
Engine does not crank (Does not start)	2. Starter	19–10
	3. Starter relay	19–10
	4. Park/neutral position switch	40–8
No initial combustion (Does not start)	1. ECM power source circuit	05–502
	2. Ignition coil assy	05–439
	3. Fuel pump control circuit	05–507
	4. Injector circuit	05–415
No complete combustion (Does not start)	1. Ignition coil assy	05–439
	2. Fuel pump control circuit	05–507
	3. Injector circuit	05–415
Engine cranks normally (Difficult to start)	1. Starter signal circuit	05–513
	2. Ignition coil assy	05–439
	3. Spark plug	18–14
	4. Compression	14–181
	5. Injector circuit	05–415
	6. Fuel pump control circuit	05–507
Cold engine (Difficult to start)	1. Starter signal circuit	05–513
	2. Injector circuit	05–415
	3. Ignition coil assy	05–439
	4. Spark plug	18–14
	5. Fuel pump control circuit	05–507
Hot engine (Difficult to start)	1. Starter signal circuit	05–513
	2. Injector circuit	05–415
	3. Ignition coil assy	05–439
	4. Spark plug	18–14
	5. Fuel pump control circuit	05–507
High engine idle speed (Poor idling)	1. ECM power source circuit	05–502
	2. Park/neutral position switch	40–8
	3. Back up power source circuit	05–467
Low engine idle speed (Poor idling)	1. Park/neutral position switch	40–8
	2. Injector circuit	05–415
	3. Back up power source circuit	05–467
	4. Fuel pump control circuit	05–507
Rough idling (Poor idling)	1. Mass air flow meter circuit	05–336
	2. Vacuum sensor circuit	05–342
	3. Injector circuit	05–415
	4. Fuel pump control circuit	05–507
	5. Ignition coil assy	05–439
	6. Compression	14–181
	7. Back up power source circuit	05–467
Hunting (Poor idling)	1. Mass air flow meter circuit	05–336
	2. Vacuum sensor circuit	05–342
	3. ECM power source circuit	05–502
Hesitation/Poor acceleration (Poor driveability)	1. Mass air flow meter circuit	05–336
	2. Vacuum sensor circuit	05–342
	3. Injector circuit	05–415
	4. Ignition coil assy	05–439
	5. Fuel pump control circuit	05–507
Muffler explosion after fire (Poor driveability)	1. Ignition coil assy	05–439
	2. Spark plug	18–14
	3. Injector circuit	05–415

Symptom	Suspected Area	See page
Surging (Poor driveability)	1. Spark plug 2. Injector circuit	18–14 05–415
Engine stall (Soon after starting)	1. Mass air flow meter circuit 2. Vacuum sensor circuit	05–336 05–342
Engine stall (After accelerator pedal depressed)	1. Mass air flow meter circuit 2. Vacuum sensor circuit	05–336 05–342
Engine stall (After accelerator pedal released)	1. Mass air flow meter circuit 2. Vacuum sensor circuit 3. ECM	05–336 05–342 01–32
Engine stall (During A/C operation)	1. A/C signal circuit (Compressor circuit) 2. ECM	05–1100 01–32
Engine stall (When shifting N to D)	1. Park/neutral position switch	40–8

STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM

Refer to DTC P0617 on page 05–471.

INSPECTION PROCEDURE

HINT:

This diagnostic troubleshooting procedure is on the premise that the engine is being cranked under normal conditions. If the engine does not crank, proceed to the problem symptoms table on page 05–320.

1	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG” and read its value displayed on the hand–held tester.

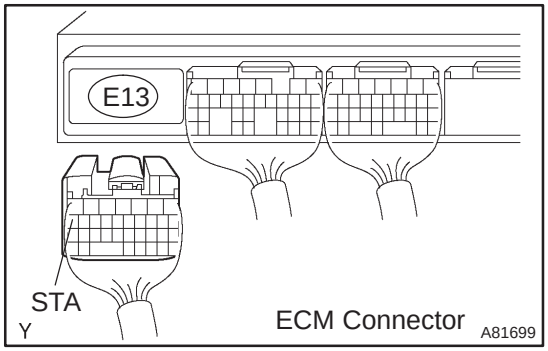
Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–320)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM – STARTER RELAY)



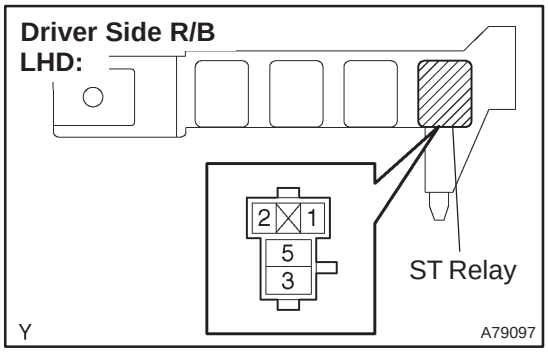
(a) Disconnect the E13 ECM connector.
(b) Remove the ST relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

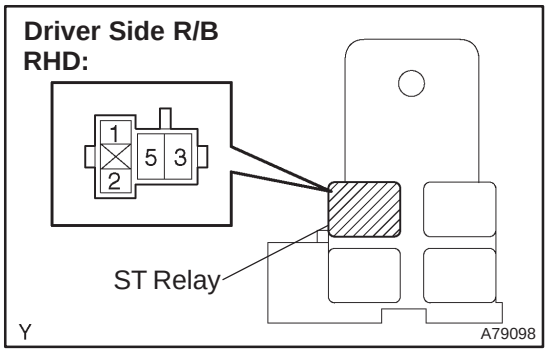
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
STA (E13–17) – ST relay (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
STA (E13–17) or ST relay (1) – Body ground	No continuity





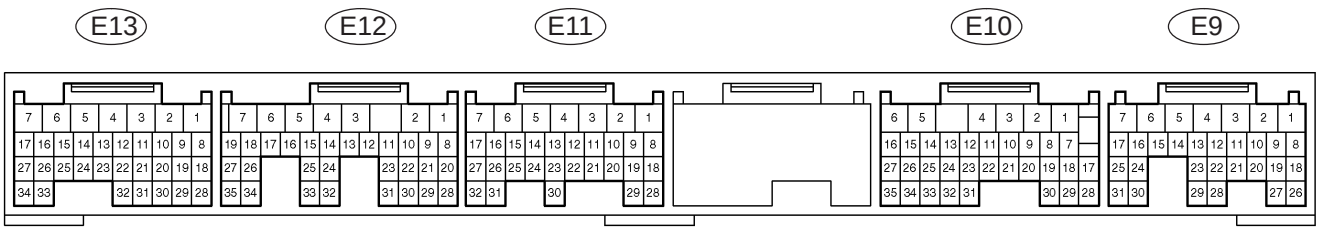
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

05CDW–01

TERMINALS OF ECM



Y

A53766

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E9–3) – E1 (E11–1)	B–Y – BR	Always	9 to 14
+BM (E10–6) – E1 (E11–1)	G–Y – BR	Always	9 to 14
IGSW (E9–9) – E1 (E11–1)	B–W – BR	IG switch ON	9 to 14
+B (E9–1) – E1 (E11–1)	B–R – BR	IG switch ON	9 to 14
+B2 (E9–2) – E1 (E11–1)	B–R – BR	IG switch ON	9 to 14
MREL (E9–8) – E1 (E11–1)	GR – BR	IG switch ON	9 to 14
IREL (E10–35) – E1 (E11–1)	V – BR	IG switch ON	9 to 14
VC (E13–18) – E2 (E13–28)	R–W – BR	IG switch ON	4.5 to 5.5
VTA1 (E13–21) – E2 (E13–28)	L–W – BR	IG switch ON, Accelerator pedal fully released	0.4 to 1.0
		IG switch ON, Accelerator pedal fully depressed	3.2 to 4.8
VTA2 (E13–31) – E2 (E13–28)	B–R – BR	IG switch ON, Accelerator pedal fully released	2.1 to 3.1
		IG switch ON, Accelerator pedal fully depressed	4.5 to 5.5
VPA (E9–22) – EPA (E9–28)	G – Y	IG switch ON, Accelerator pedal fully released	0.5 to 1.1
		IG switch ON, Accelerator pedal fully depressed	2.5 to 4.6
VPA2 (E9–23) – EPA2 (E9–29)	W – Y	IG switch ON, Accelerator pedal fully released	1.5 to 2.9
		IG switch ON, Accelerator pedal fully depressed	3.5 to 5.5
VCPA (E9–26) – EPA (E9–28)	B – Y	IG switch ON	4.5 to 5.5
VCP2 (E9–27) – EPA2 (E9–29)	B – Y	IG switch ON	4.5 to 5.5
VG (E13–30) – EVG (E13–29)	L–Y – G	Idling, P or N position, A/C switch OFF	0.5 to 3.0
THA (E13–20) – E2 (E13–28)	GR – BR	Idling, Intake air temperature 20°C (68°F)	0.5 to 3.4
THW (E13–19) – E2 (E13–28)	B–W – BR	Idling, Coolant temperature 80°C (176°F)	0.2 to 1.0
#1 (E13–1) – E01 (E13–7) #2 (E13–2) – E01 (E13–7) #3 (E13–3) – E01 (E13–7) #4 (E13–4) – E01 (E13–7)	G–W – W–B W–R – W–B R–W – W–B W–L – W–B	IG switch ON	9 to 14
		Idling	Pulse generation (See page 05–415)
IJF1 (E13–25) – E01 (E13–7)	R–B – W–B	Idling	Pulse generation (See page 05–415)
IGT1 (E13–8) – E1 (E11–1) IGT2 (E13–9) – E1 (E11–1) IGT3 (E13–10) – E1 (E11–1) IGT4 (E13–11) – E1 (E11–1)	R–W – BR P – BR LG–B – BR L–Y – BR	Idling	Pulse generation (See page 05–439)
IGF1 (E13–24) – E1 (E11–1)	W–R – BR	IG switch ON	4.5 to 5.5
		Idling	Pulse generation (See page 05–439)
G2+ (E11–27) – NE– (E11–24)	W – R	Idling	Pulse generation (See page 05–436)
NE+ (E11–25) – NE– (E11–24)	G – R	Idling	Pulse generation (See page 05–433)
FC (E9–10) – E1 (E11–1)	G–Y – BR	IG switch ON	9 to 14
M+ (E11–3) – E01 (E13–7) M– (E11–2) – E01 (E13–7)	B – W–B W – W–B	Idling	Pulse generation

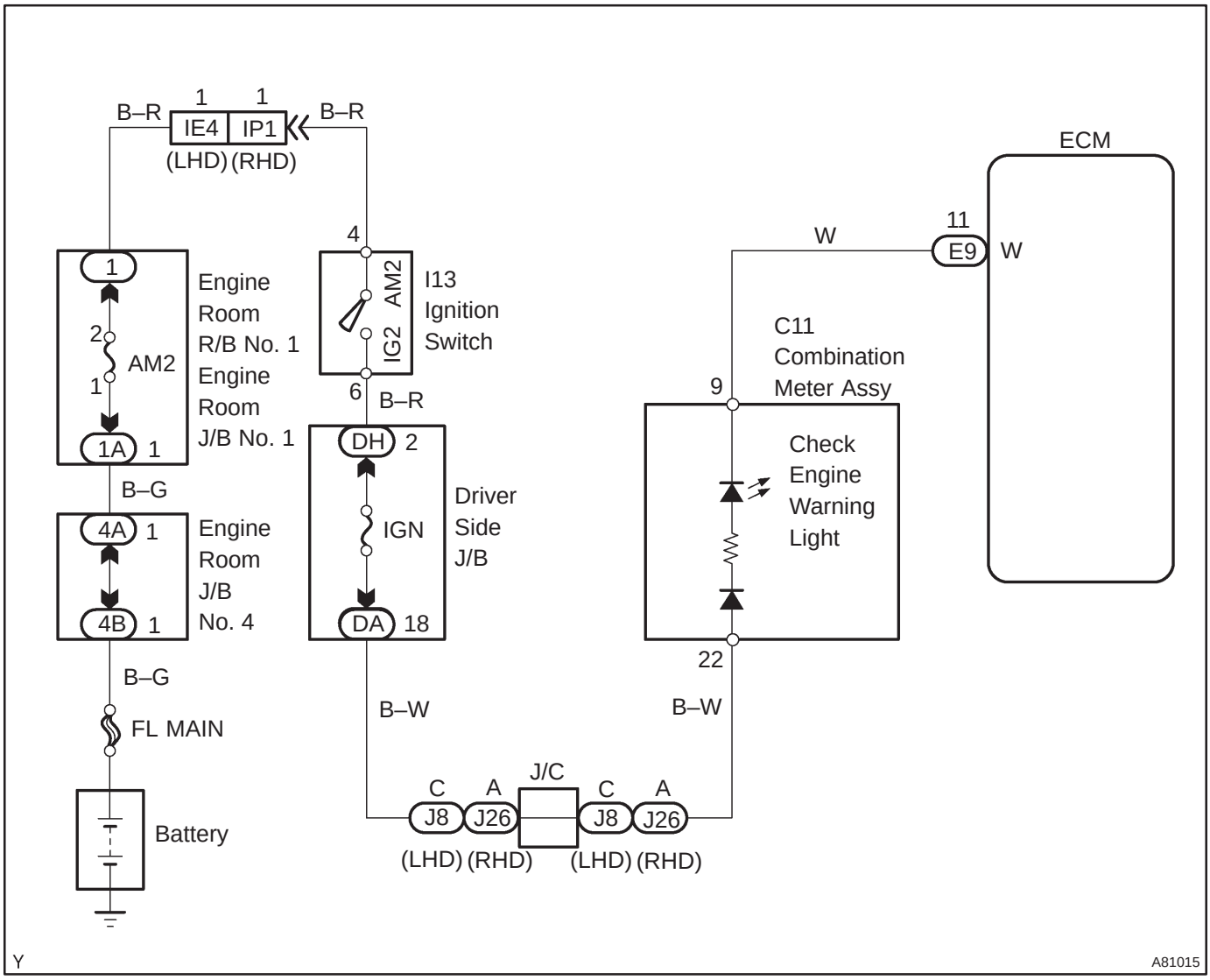
Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
OX1A (E12–22) – E2 (E13–28)	B – BR	Maintain engine speed at 2,500 rpm for 2 minutes after warming up	Pulse generation (See page 05–363)
OX1B (E12–21) – O1B– (E11–26)	B – W		
OX2A (E12–23) – E2 (E13–28)	R – BR		
OX2B (E12–29) – O2B– (E11–31)	R – G		
HT1A (E12–5) – E03 (E11–7) HT1B (E12–25) – E03 (E11–7) HT2A (E12–4) – E03 (E11–7) HT2B (E12–33) – E03 (E11–7)	Y – W–B P – W–B L – W–B L–B – W–B	Idling	Below 3.0
		IG switch ON	9 to 14
KNK1 (E12–1) – EKNK (E12–2)	B – W	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See page 05–429)
OC1+ (E11–16) – OC1– (E11–15)	W–G – Y–B	IG switch ON	Pulse generation (See page 05–322)
EVP1 (E13–34) – E01 (E13–7)	W–G – W–B	IG switch ON	9 to 14
SCV (E13–5) – E1 (E11–1)	L–B – BR	IG switch ON	9 to 14
PIM (E13–33) – E2 (E13–28)	G–W – BR	IG switch ON	3.3 to 3.9
		Apply vacuum 26.7 kPa (200 mmHg, 7.9 in.Hg)	2.6 to 3.0
PB (E13–26) – E2 (E13–28)	Y – BR	IG switch ON	3.3 to 3.9
		Apply vacuum 26.7 kPa (200 mmHg, 7.9 in.Hg)	2.6 to 3.0
PR (E13–23) – E2 (E13–28)	Y–G – BR	Idling	2.1 to 3.2
FP+ (E12–6) – E1 (E11–1) FP– (E12–3) – E1 (E11–1)	R – BR G – BR	Idling	Pulse generation (See page 05–477)
STA (E13–17) – E1 (E11–1)	B–Y – BR	Shift position in neutral, IG switch START	6.0 or more
STP (E10–19) – E1 (E11–1)	G–W – BR	Brake pedal is depressed	9 to 14
		Brake pedal is released	Below 1.5
ST1– (E10–12) – E1 (E11–1)	G–W – BR	IG switch ON, Brake pedal is depressed	Below 1.5
		IG switch ON, Brake pedal is released	7.5 to 14
W (E9–11) – E01 (E13–7)	W – W–B	Idling	9 to 14
		IG switch ON	Below 3.0
ELS (E9–12) – E1 (E11–1)	G – BR	Taillight switch ON, Defogger switch ON	7.5 to 14
		Taillight switch OFF, Defogger switch OFF	0 to 1.5
TACH (E9–5) – E1 (E11–1)	GR–R – BR	Idling	Pulse generation
SPD (E10–17) – E01 (E13–7)	V–W – W–B	IG switch ON	4.5 to 5.5
TC (E9–20) – E1 (E11–1)	W–L – BR	IG switch ON	9 to 14
SIL (E9–18) – E1 (E11–1)	W–G – BR	During charge of gears	Pulse generation
PSW (E11–10) – E1 (E11–1)	G – BR	While turning the steering wheel	Below 1.5
F/PS (E9–14) – E1 (E11–1)	LG–B – BR	IG switch ON	Below 1.5

CHECK ENGINE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

If the ECM detects a trouble, the CHK ENG is illuminated. At this time, the ECM records a DTC in the memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below .

CHK ENG remains on	Start inspection from step 1
CHK ENG is not illuminated	Start inspection from step 3

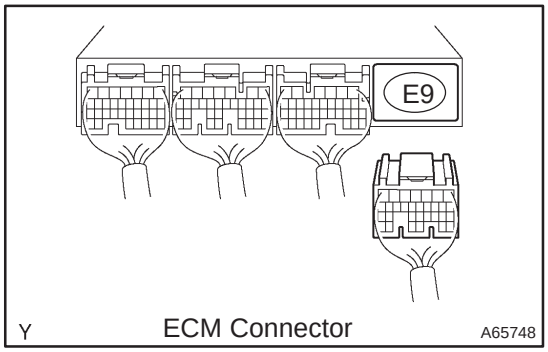
1	CLEAR DTC

(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Read the DTC (See page 05–5).
(d) Clear the DTC (See page 05–5).
(e) Check that the CHK ENG is OFF.
Standard: CHK ENG is OFF

OK	REPAIR CIRCUIT INDICATED BY OUTPUT CODE (See page 05–16)

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E9 ECM connector.
(b) Turn the ignition switch ON.
(c) Check that the CHK ENG is OFF.
Standard: CHK ENG is OFF

OK	CHECK AND REPLACE ECM (See page 01–32)

NG

CHECK AND REPAIR HARNESS AND CONNECTOR

3	CHECK CHK ENG CONDITION

(a) Check that the CHK ENG is illuminated when turning the ignition switch ON.
Standard: CHK ENG is illuminated

OK	SYSTEM OK

NG

4	INSPECT COMBINATION METER ASSY(CHK ENG CIRCUIT)

(a) See the combination meter troubleshooting on page 05–1509.

NG	REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER – ECM)

0505N–04

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

Customer's Name		VIN	
Driver's Name		Production Date	
Date Vehicle Brought in		Licence No.	
License No.		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx.____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of check engine warning light (CHK ENG)		☐ Remains on	☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre–check)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

0505J–04

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in the check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the ”See page ” under the respective ”DTC No.” in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0100 (05–24)	Mass Air Flow Circuit Malfunction	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0110 (05–30)	Intake Air Temperature Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built into mass air flow meter) • ECM	○	○
P0115 (05–34)	Engine Coolant Temperature Circuit Malfunction	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0116 (05–38)	Engine Coolant Temperature Circuit Range/Performance Problem	• Engine coolant temperature sensor • Thermostat	○	○
P0120 (05–39)	Throttle Pedal Position Sensor/ Switch ”A” Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0121 (05–44)	Throttle Pedal Position Sensor/ Switch ”A” Circuit Range/Performance Problem	• Throttle position sensor	○	○
P0125 (05–45)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • Gas leakage on exhaust system • ECM	○	○
P0130*3 (05–54)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector	○	○
P0133*3 (05–60)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM	○	○
P0135 (05–65)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0136 (05–54)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor	○	○
P0141 (05–65)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○

P0171*3 (05–67)	System too Lean (Fuel Trim) (Bank1)	• Air induction system • Injector blockage • PCV hose • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Open or short in heated oxygen sensor circuit • Heated oxygen sensor • ECM	○	○
P0172*3 (05–67)	System too Rich (Fuel Trim) (Bank1)	• Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Open or short in heated oxygen sensor circuit • Gas leakage in exhaust system • Heated oxygen sensor • ECM	○	○
P0300*3 (05–73)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • PCV hose • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • ECM	○	○
P0301*3 (05–73)	Cylinder 1 Misfire Detected			
P0302*3 (05–73)	Cylinder 2 Misfire Detected			
P0303*3 (05–73)	Cylinder 3 Misfire Detected			
P0304*3 (05–73)	Cylinder 4 Misfire Detected			
P0325 (05–81)	Knock Sensor 1 Circuit Malfunction (Bank 1)	• Open or short in knock sensor circuit • Knock sensor (under–torqued or loose) • ECM	○	○
P0335 (05–84)	Crankshaft Position Sensor ”A” Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM	○	○
P0340 (05–88)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Intake camshaft • Timing chain has jumped a tooth • ECM	○	○
P0420*3 (05–91)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage in exhaust system • Heated oxygen sensor • Three–way catalytic converter • ECM	○	○
P0443 (05–94)	Evaporative Emission Control System Purge Control Vent Circuit Malfunction	• Open or short in VSV for EVAP circuit • VSV for EVAP • ECM	○	○
P0500 (05–98)	Vehicle Speed Sensor Malfunction	• Open or short in speed sensor circuit • Speed sensor • Combination meter • ECM • Skid control ECU	○	○

P0505*3 (05–100)	Idle Control System Malfunction	• Open or short in ISC valve circuit • ISC valve is stuck or closed • PCV hose • A/C switch circuit • Air induction system • ECM	○	○
P1300 (05–103)	Igniter Circuit Malfunction (No. 1)	• Ignition system • Open or short in IGF or IGT1 circuit from No. 1 ignition coil with igniter to ECM • No. 1 ignition coil with igniter • ECM	○	○
P1305 (05–103)	Igniter Circuit Malfunction (No. 2)	• Ignition system • Open or short in IGF or IGT2 circuit from No. 2 ignition coil with igniter to ECM • No. 2 ignition coil with igniter • ECM	○	○
P1310 (05–103)	Igniter Circuit Malfunction (No. 3)	• Ignition system • Open or short in IGF or IGT3 circuit from No. 3 ignition coil with igniter to ECM • No. 3 ignition coil with igniter • ECM	○	○
P1315 (05–103)	Igniter Circuit Malfunction (No. 4)	• Ignition system • Open or short in IGF or IGT4 circuit from No. 4 ignition coil with igniter to ECM • No. 4 ignition coil with igniter • ECM	○	○
P1335 (05–84)	Crankshaft Position Sensor Circuit Malfunction (During engine running)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM	—	○
P1346 (05–111)	VVT Sensor/Camshaft Position Sensor Circuit Range/Performance Problem (Bank 1)	• Mechanical system (Timing chain has janped a tooth, chain stretched) • ECM	○	○
P1349 (05–112)	VVT System Malfunction (Bank 1)	• Valve timing • OCV • VVT controller assembly • ECM	○	○
P1520*2 (05–115)	Stop Light Switch Circuit Malfunction	• Open or short in stop light switch signal circuit • Stop light switch • ECM	○	○
P1600 (05–119)	ECM BATT Malfunction	• Open in back up power source circuit • ECM	○	○
P1656 (05–122)	OCV Circuit Malfunction (Bank 1)	• Open or short in OCV circuit • OCV • ECM	○	○

*1: ○ ... CHK ENG is illuminated. — ... CHK ENG is not illuminated.
*2: Only for A/T models.
*3: For European spec. only

ECM POWER SOURCE CIRCUIT

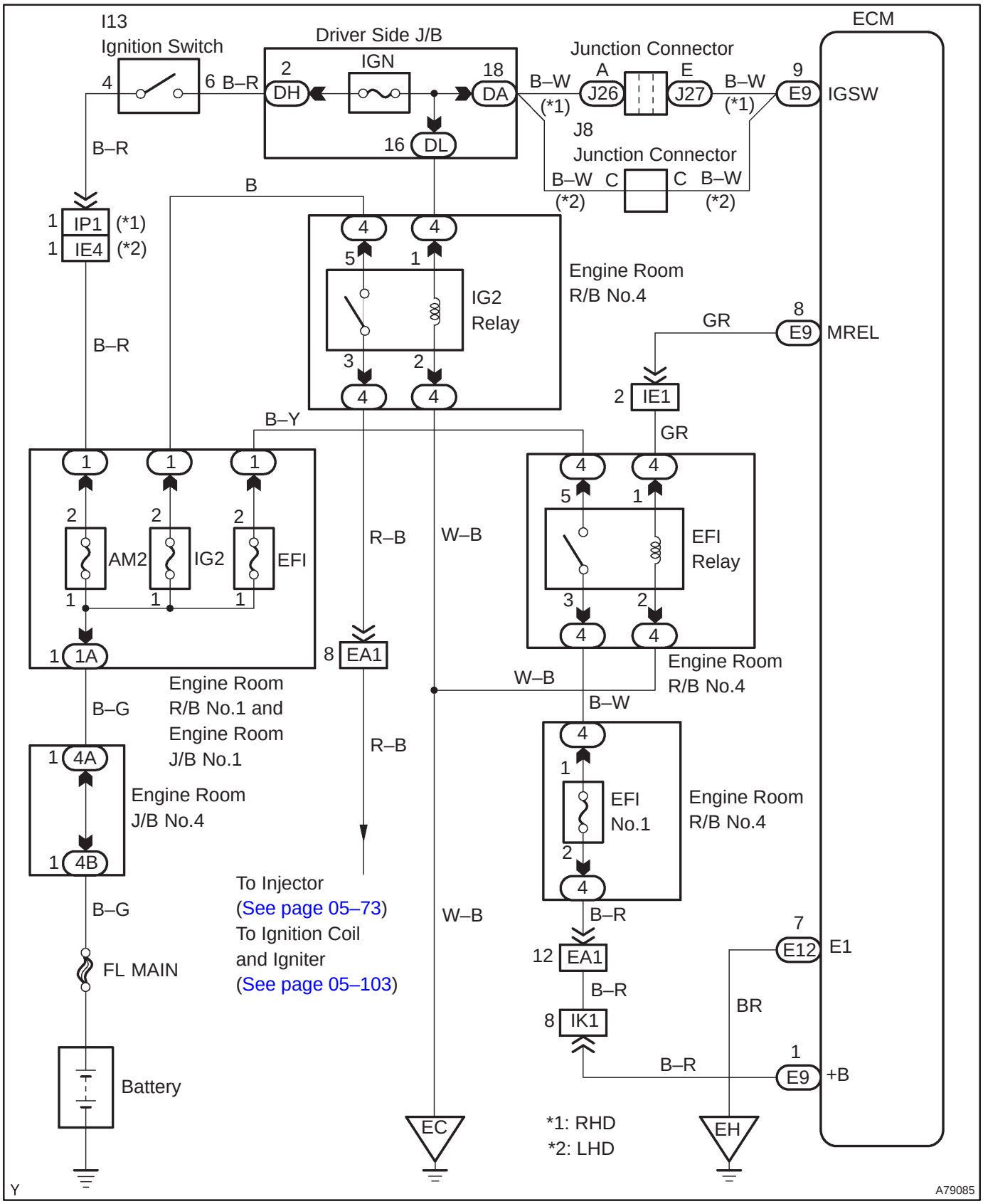
CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to terminal IGSW of the ECM and the EFI relay (Marking: EFI) control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EFI relay.

This signal causes current to flow to the coil, closing the contacts of the EFI relay and supplying power to terminal +B of the ECM.

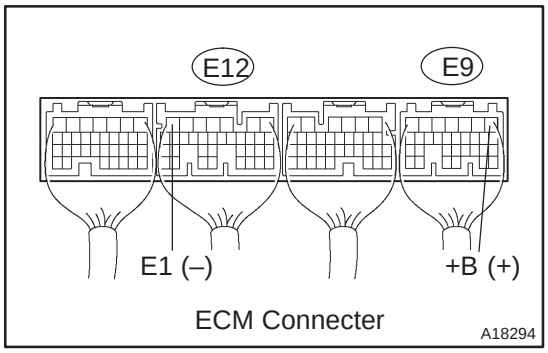
If the ignition switch is turned off, the ECM continues to switch on the EFI relay for a maximum of 2 seconds for the initial setting of the throttle valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM(+B VOLTAGE)



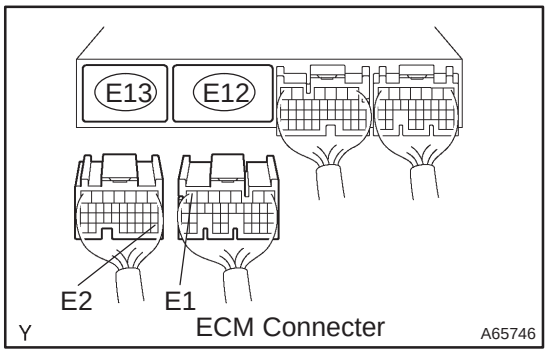
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
+B (E9–1) – E1 (E12–7)	9 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–5)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM – BODY GROUND)



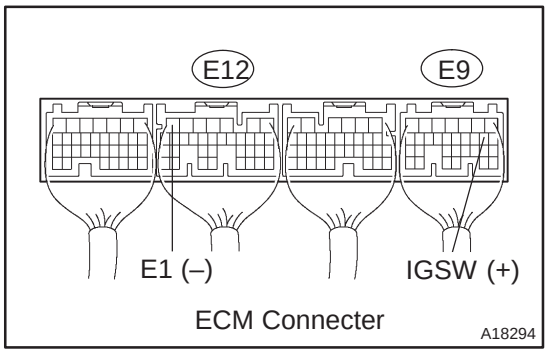
(a) Disconnect the negative (–) battery terminal.
(b) Disconnect the E12 and E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
E1 (E12–7) – Body ground	Continuity
E2 (E13–28) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM(IGSW VOLTAGE)



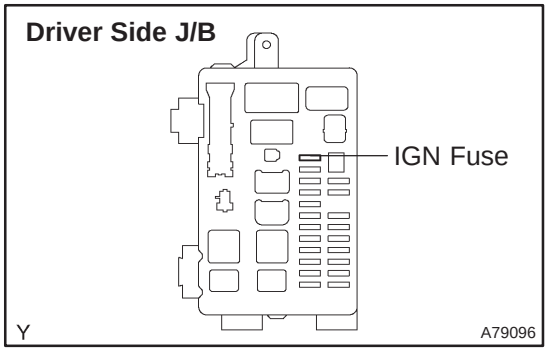
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
IGSW (E9–9) – E1 (E12–7)	9 to 14 V

OK → **Go to step 8**

NG

4 CHECK FUSE(IGN FUSE)

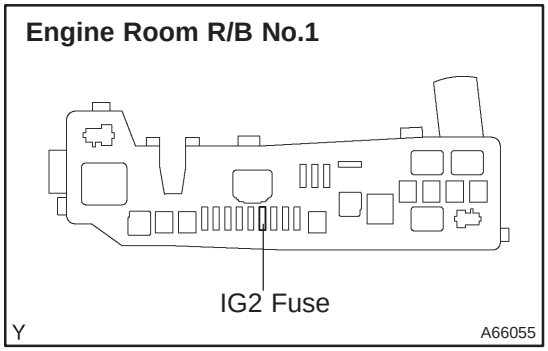


(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

5 CHECK FUSE(IG2 FUSE)

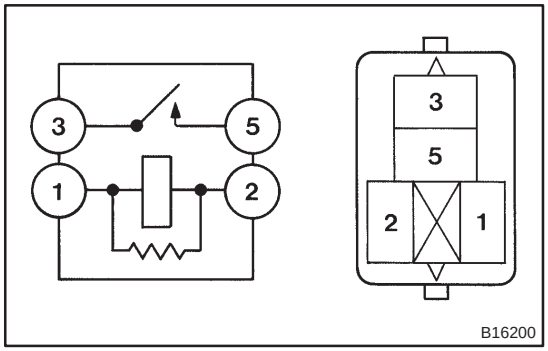


(a) Remove the IG2 fuse from the engine room R/B No.1.
(b) Check for continuity in the IG2 fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

6 INSPECT IG2 RELAY



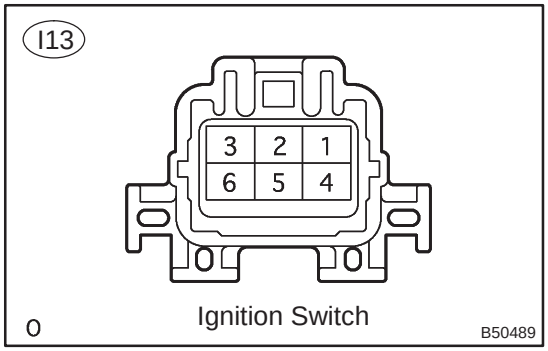
(a) Remove the IG2 relay from the engine room R/B No.4.
(b) Inspect the IG2 relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE IG2 RELAY**

OK

7 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Measure the resistance between the connector terminals shown in the chart below.

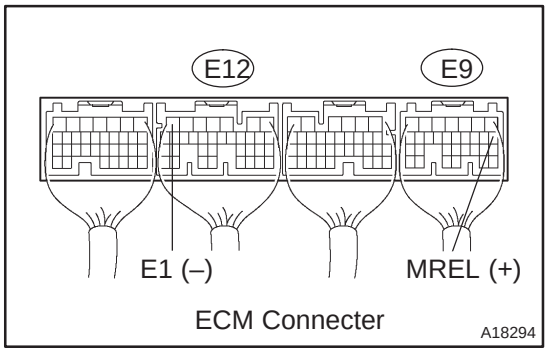
Switch	Terminal No.	Resisitance
LOCK	All Terminals	1MΩ or more
ACC	1–3	1Ω or less
ON	1–2, 1–3, 2–3, 5–6	1Ω or less
START	4–5, 4–6, 5–6, 1–2	1Ω or less

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (BATTERY – IGNITION SWITCH, IGNITION SWITCH – ECM)

8 INSPECT ECM(MREL VOLTAGE)



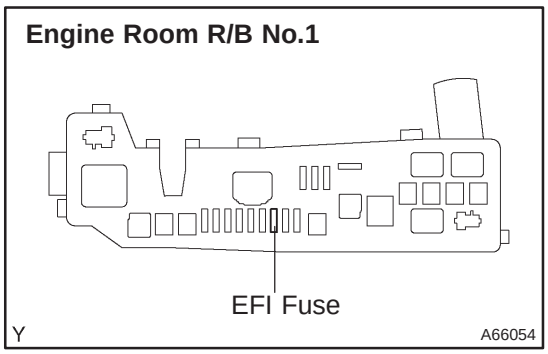
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
MREL (E9–8) – E1 (E12–7)	9 to 14 V

NG → **CHECK AND REPLACE ECM**

OK

9 CHECK FUSE(EFI FUSE)

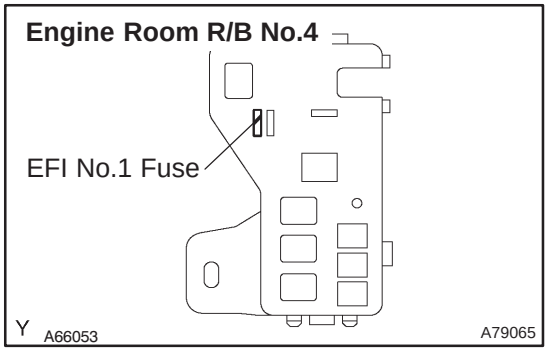


(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

10 CHECK FUSE(EFI No.1 FUSE)

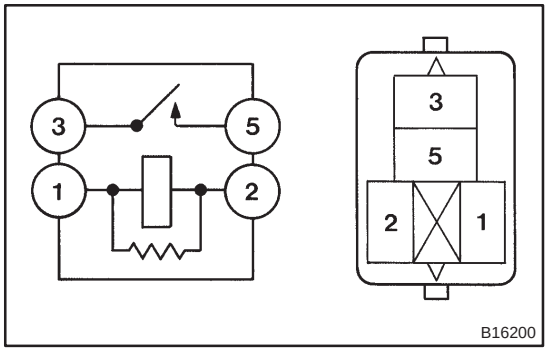


(a) Remove the EFI No.1 fuse from the engine room R/B No.4.
(b) Check for continuity in the EFI No.1 fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

11 INSPECT EFI RELAY



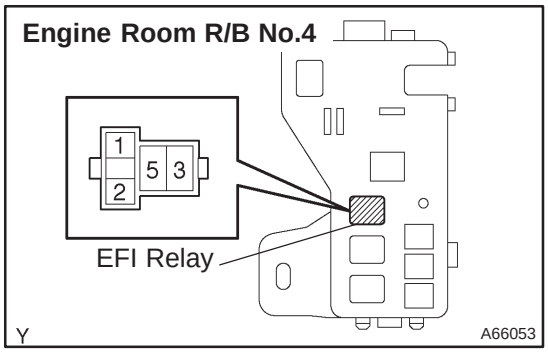
(a) Remove the EFI relay from the engine room R/B No.4.
(b) Inspect the EFI relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

12	CHECK HARNESS AND CONNECTOR(EFI RELAY – ECM, EFI RELAY – BODY GROUND)



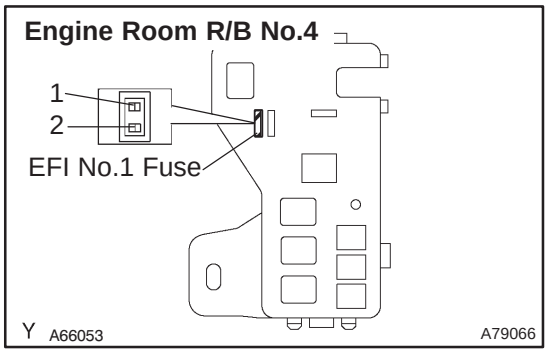
(a) Check the harness and connector between the EFI relay and ECM connector.
(1) Remove the EFI relay from the engine room R/B No.4.
(2) Remove the EFI No.1 fuse from the engine room R/B No.4.
(3) Disconnect the E9 ECM connector.
(4) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (1) – MREL (E9–8)	Continuity
EFI relay (3) – EFI No.1 fuse (1)	
EFI No.1 fuse (2) – +B (E9–1)	

Standard (Check for short):

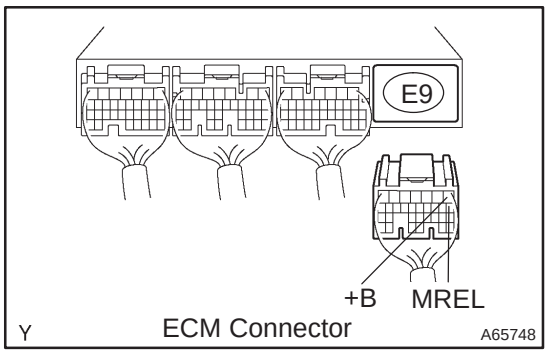
Symbols (Terminal No.)	Specified condition
EFI relay (1) or MREL (E9–8) – Body ground	No continuity
EFI relay (3) or EFI No.1 fuse (1) – Body ground	
EFI No.1 fuse (2) or +B (E9–1) – Body ground	



(b) Check the harness and connector between the EFI relay and body ground.
(1) Remove the EFI relay from the engine room J/B No.4.
(2) Check for continuity between the wire harness side connector and the body ground.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (2) – Body ground	Continuity



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

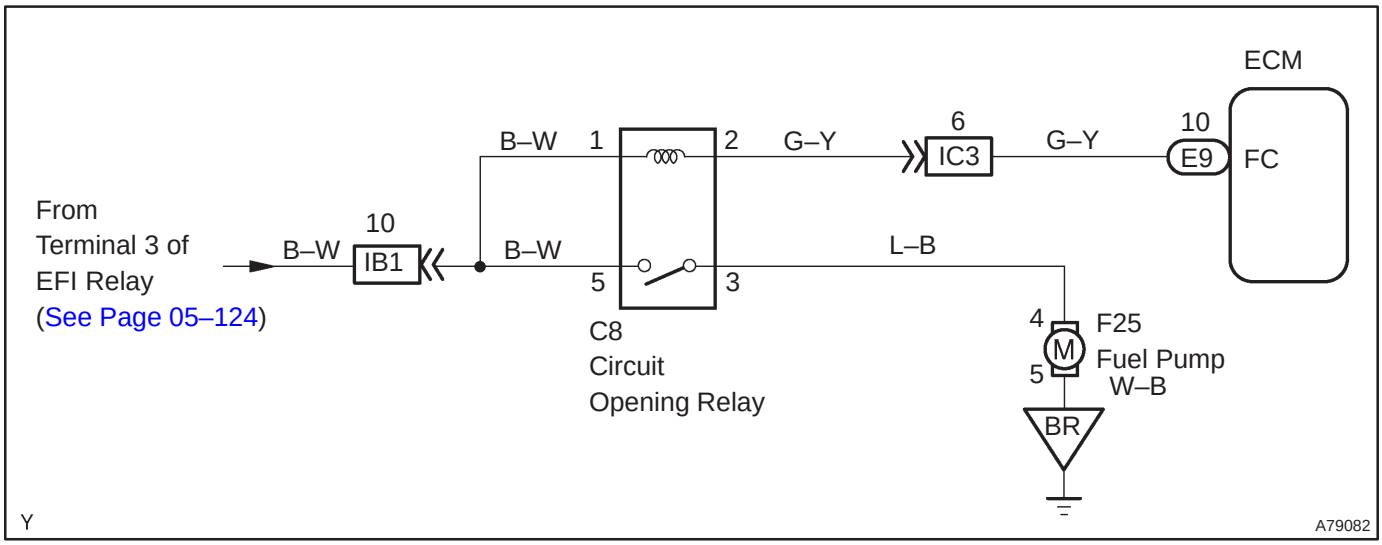
CHECK AND REPAIR HARNESS AND CONNECTOR (TERMINAL +B OF ECM – BATTERY POSITIVE TERMINAL)

FUEL PUMP CONTROL CIRCUIT

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil and also current flows to terminal STA of the ECM (STA signal).
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to the coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates. While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**PERFORM ACTIVE TEST USING HAND–HELD TESTER(OPERATION OF CIRCUIT OPENING RELAY)**

(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / FUEL PUMP / SPD”.
(c) Perform the active test with the engine stopped.
Result: The circuit opening relay operates.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

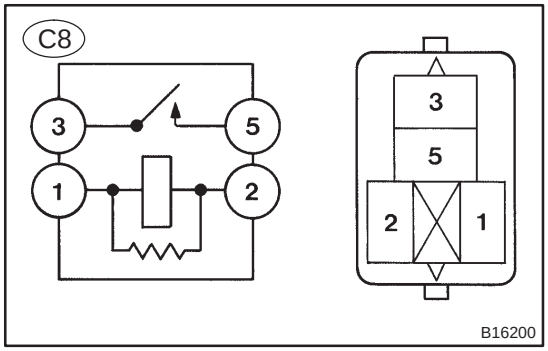
NG

2	**CHECK FOR ECM POWER SOURCE CIRCUIT(See page 05–124)**

NG → **REPAIR OR REPLACE POWER SOURCE CIRCUIT**

OK

3 INSPECT CIRCUIT OPENING RELAY



(a) Remove the circuit opening relay.
(b) Inspect the circuit opening relay.

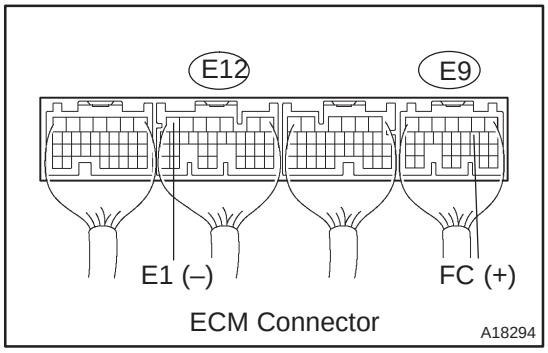
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE CIRCUIT OPENING RELAY**

OK

4 INSPECT ECM



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.

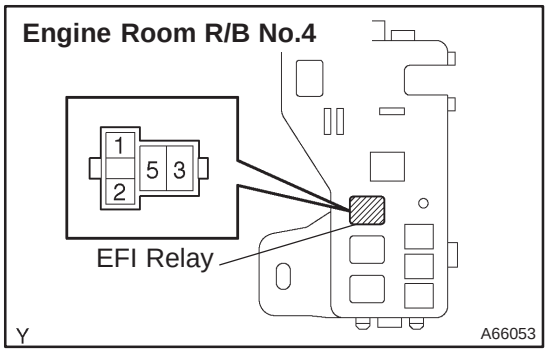
Standard:

Symbols (Terminal No.)	Specified condition
FC (E9–10) – E1 (E12–7)	8 to 14 V

OK → **Go to step 6**

NG

5	CHECK HARNESS AND CONNECTOR(EFI RELAY – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – ECM)



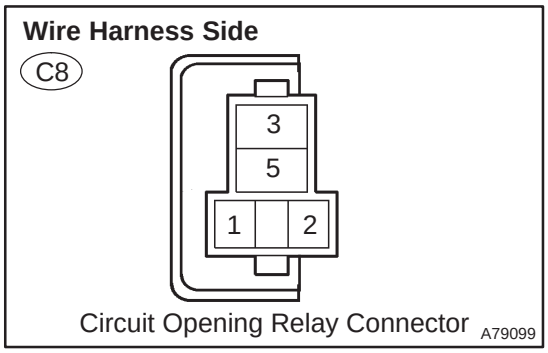
(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the circuit opening relay.
(c) Disconnect the E9 ECM connector.
(d) Check for continuity between the wire harness side connectors.

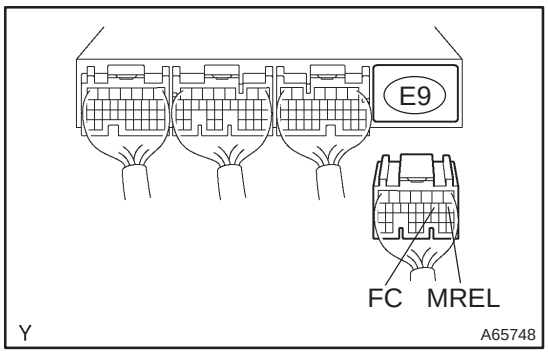
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – Circuit opening relay (C8–1)	Continuity
Circuit opening relay (C8–2) – FC (E9–10)	
EFI relay (1) – MREL (E9–8)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or Circuit opening relay (C8–1) – Body ground	No continuity
Circuit opening relay (C8–2) or FC (E9–10) – Body ground	
EFI relay (1) or MREL (E9–8) – Body ground	





NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

6	INSPECT FUEL PUMP ASSY (See page 11–8)

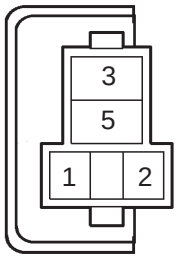
NG → **REPAIR OR REPLACE FUEL PUMP ASSY**

OK

7	CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP, FUEL PUMP – BODY GROUND)

Wire Harness Side

C8



Circuit Opening Relay Connector

A79099

(a) Remove the circuit opening relay.
(b) Disconnect the fuel pump connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) – Fuel pump (F24–4)	Continuity
Fuel pump (F25–5) – Body ground	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) or Fuel pump (F24–4) – Body ground	No continuity

Wire Harness Side

F25

Fuel Pump Connector

A66276

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE ECM (See page 01–32)

SFI SYSTEM (1ZZ–FE/3ZZ–FE)

0505G–04

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–4)

3	CONNECT THE HAND–HELD TESTER TO DLC3

HINT:
If the display indicates a communication fault in the tool, inspect DLC3.

4	CHECK DTC AND FREEZE FRAME DATA (See page 05–5)

HINT:
Record or print DTC and freeze frame data, if needed.

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05–5)

6	VISUAL INSPECTION

7	SETTING THE CHECK (TEST) MODE DIAGNOSIS (See page 05–5)

8	PROBLEM SYMPTOM CONFIRMATION

HINT:
If the engine does not start, perform steps 10 and 12 first.

A	Malfunction does not occur
B	Malfunction occurs

B → GO TO STEP 10

A

9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05–5)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	DTC CHART (See page 05–16)

GO TO STEP 14

12	BASIC INSPECTION (See page 05–5)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	PROBLEM SYMPTOMS TABLE (See page 05–22)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05–124)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)

GO TO STEP 18

17	PARTS INSPECTION

18	IDENTIFICATION OF PROBLEM

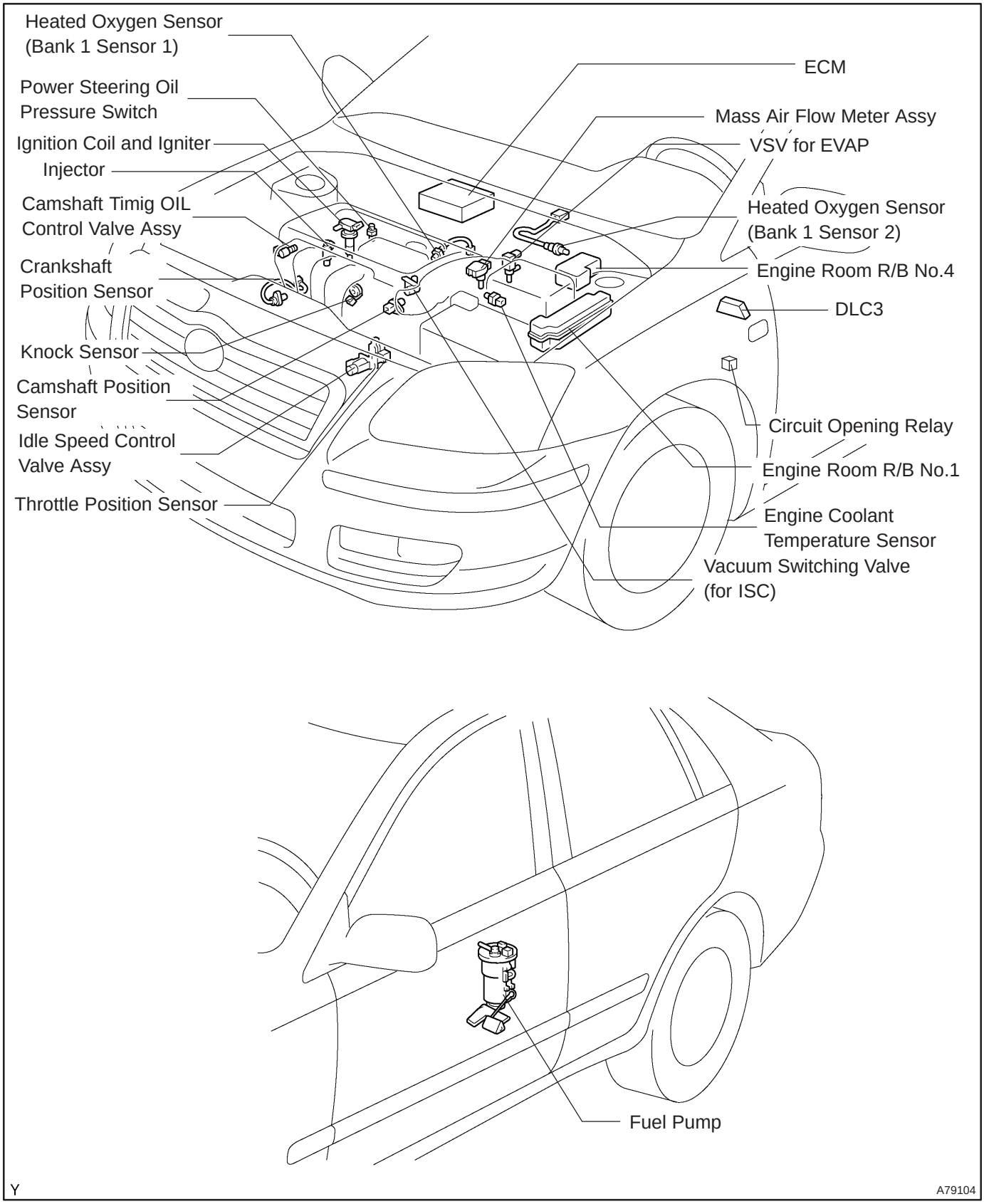
19	ADJUSTMENT, REPAIR

20	CONFIRMATION TEST

END

05B3M–03

LOCATION

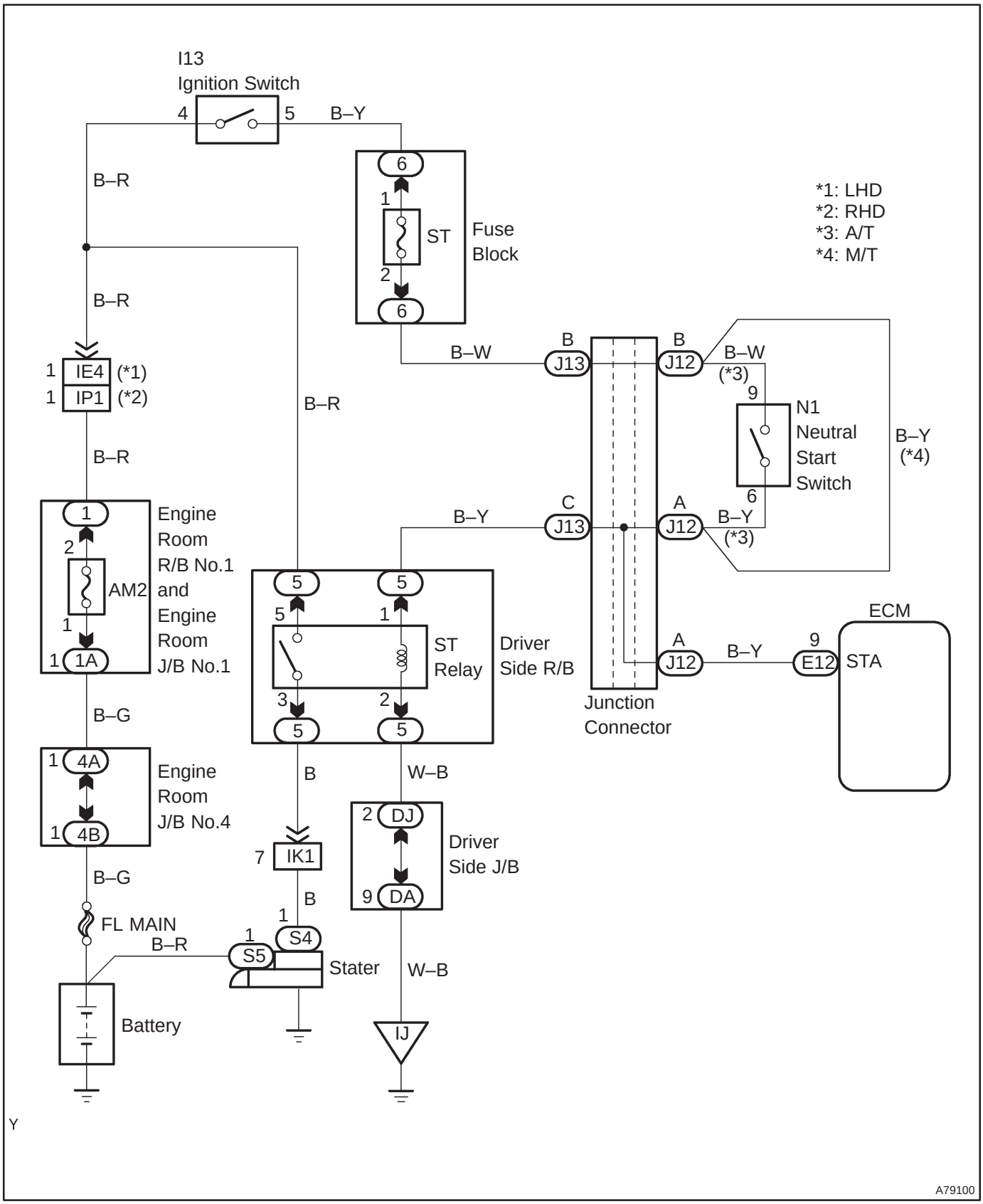


STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow becomes slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM



NSPECTION PROCEDURE

HINT:

This diagnostic chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05–22.

1	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG” and read its value displayed on the hand–held tester.

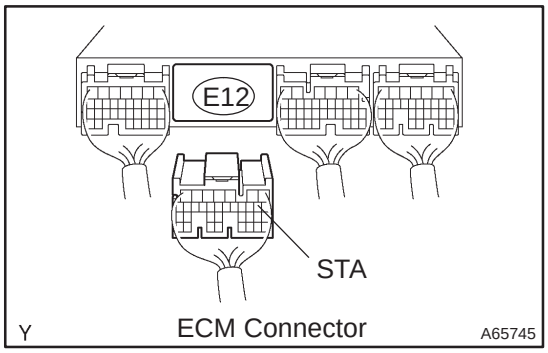
Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	CHECK HARNESS AND CONNECTOR(ECM – STARTER RELAY)



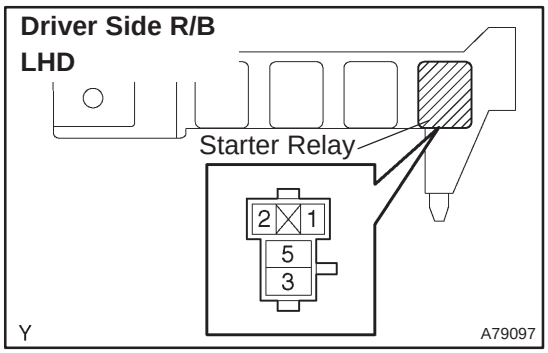
(a) Disconnect the ECM E12 connector.
(b) Remove the starter relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

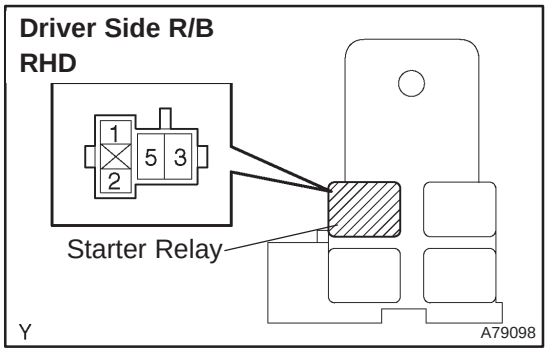
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Starter relay (1) – STA (E12–9)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Starter relay (1) or STA (12–9) – Body ground	No continuity





NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM (See page 01–32)

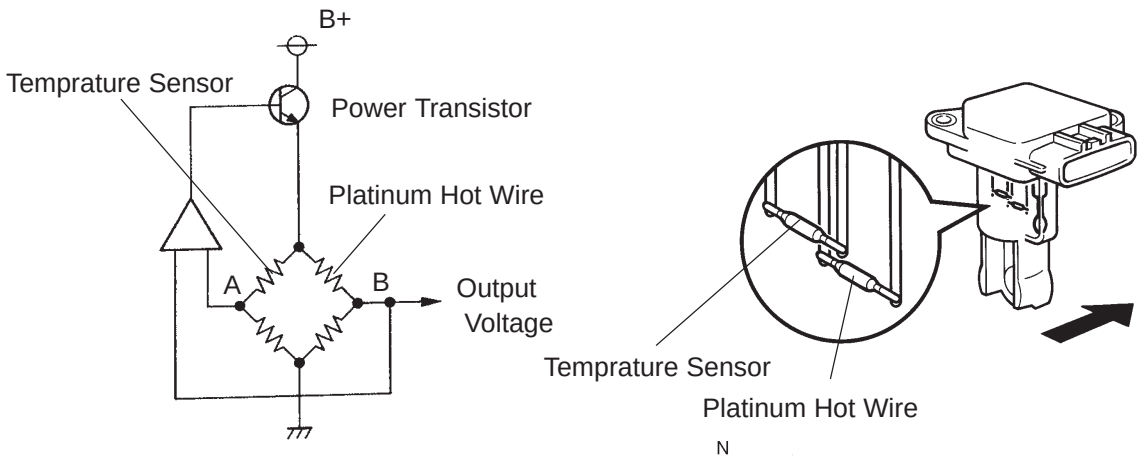
DTC	P0100	MASS AIR FLOW CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire. The hot wire air flow meter consists of a platinum hot wire, temprature sensor and a control circuit installed in a plastic housing. The hot wire air flow meter works on the principle that the hot wire and temprature sensor located in the intake air bypass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the mass air flow meter.

The circuit is constructed so that the platinum hot wire and temprature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



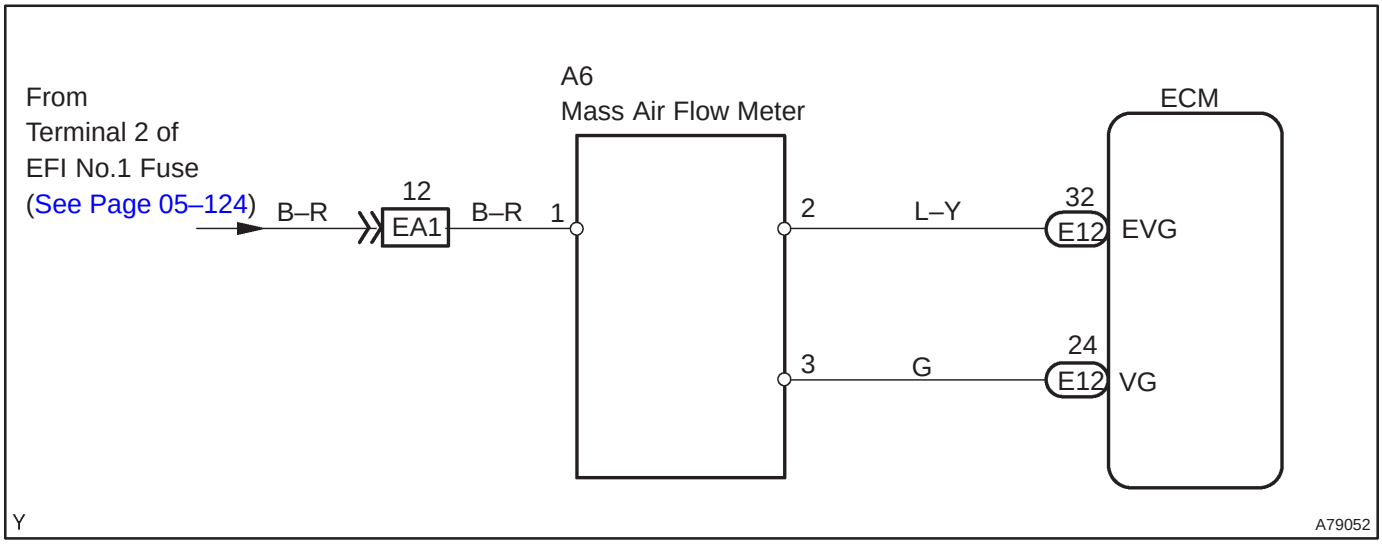
DTC No	DTC Detecting Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with engine speed less than 4,000 rpm for more than 3 sec.	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM

HINT:

After confirming DTC ”P0100”, use the hand–held tester to confirm the air flow ratio in the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Air Flow Value (gm/sec)	Malfunction
Approx. 0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• EVG circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Read air flow rate on the hand–held tester.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

Result:

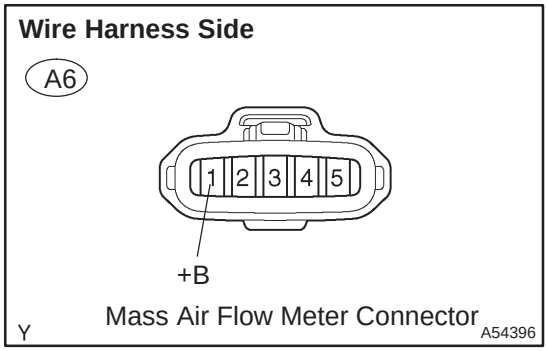
Air flow rate (gm/sec)	Proceed to
0.0	A
271.0 or more	B
1 less than Mass Air Flow Rate less than 270.0 or more (*1)	C

*1: The value must be changed when the throttle valve is opend or closed.

B	**Go to step 6**
C	**CHECK FOR INTERMITTENT PROBLEMS (See Page 05–5)**

A

2 INSPECT MASS AIR FLOW METER(POWER SORUCE VOLTAGE)



(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminal of the wire harness side connector and the body ground.

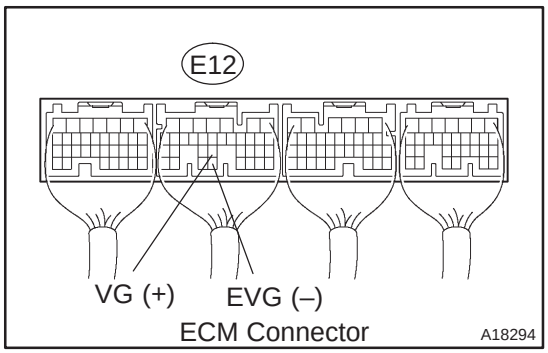
Standard:

Symbols (Terminal No.)	Specified condition
+B (A6–1) – Body ground	9 to 14 V

NG → **Go to step 5**

OK

3 INSPECT ECM



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E12 ECM connector.

HINT:
The shift position should be P or N and the A/C switch should be turned OFF.

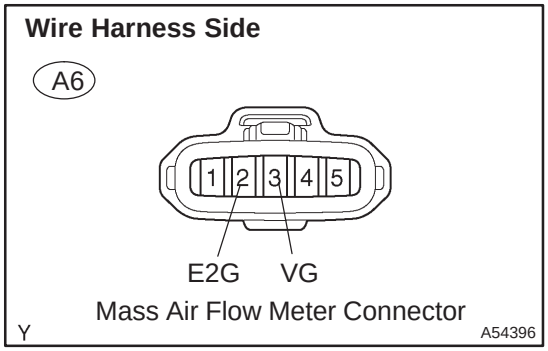
Standard:

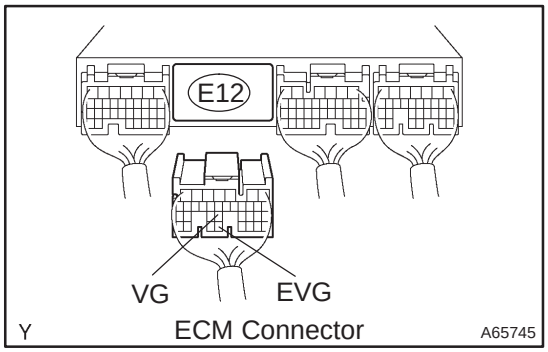
Symbols (Terminal No.)	Condition	Specified condition
VG (E12–24) – EVG (E12–32)	Engine is idling	0.5 to 3.0 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

4 CHECK HARNESS AND CONNECTOR(ECM – MASS AIR FLOW METER)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E12–24)	Continuity
E2G (A6–2) – EVG (E12–32)	

Standard (Check for short):

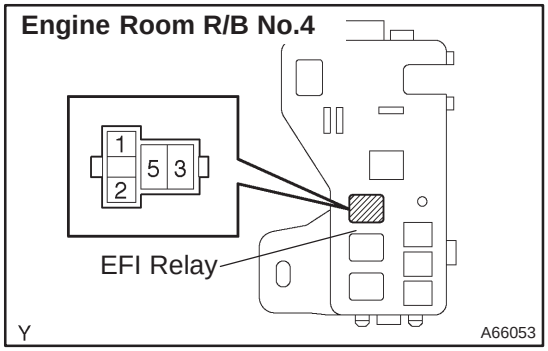
Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E12–24) – Body ground	No continuity

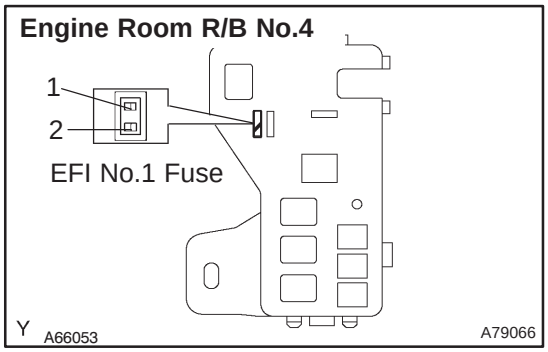
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

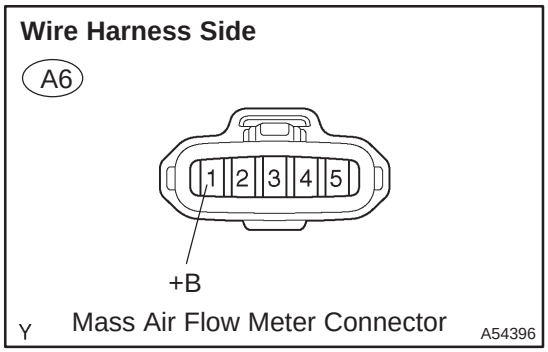
OK

REPLACE MASS AIR FLOW METER

5 CHECK HARNESS AND CONNECTOR(EFI RELAY – MASS AIR FLOW METER)







(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the EFI No.1 fuse from the engine room R/B No.4.
(c) Disconnect the mass air flow meter connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – EFI No.1 fuse (1)	Continuity
EFI No.1 fuse (2) – +B (A6–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or EFI No.1 fuse (1) – Body ground	No continuity
EFI No.1 fuse (2) or +B (A6–1) – Body ground	

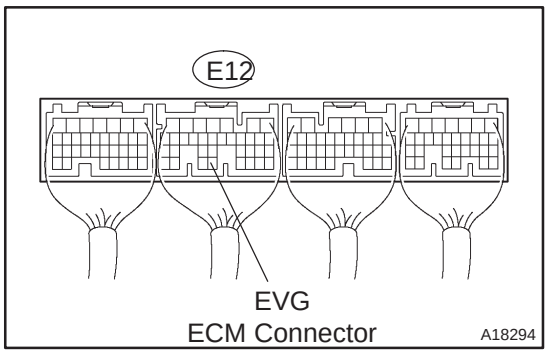
NOTICE:
Do not insert the tester leads hard in the procedure (c), the holder may be damaged.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK ECM POWER SOURCE CIRCUIT (See page 05–124)

6 INSPECT ECM



(a) Check for continuity between the terminal of the E12 ECM connector and the body ground.

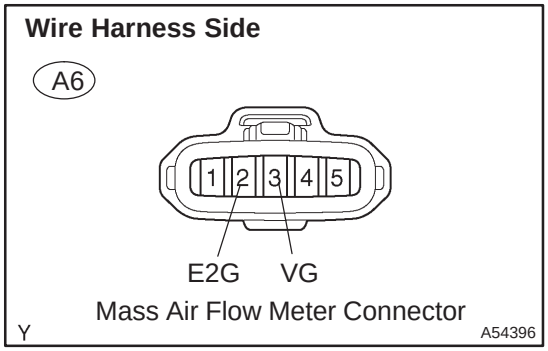
Standard:

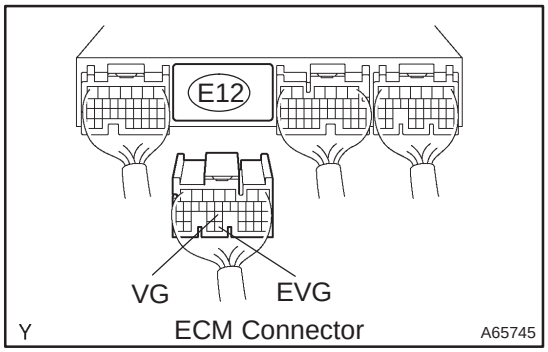
Symbols (Terminal No.)	Specified condition
EVG (E12–32) – Body ground	Continuity

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

7 CHECK HARNESS AND CONNECTOR(ECM – MASS AIR FLOW METER)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E12–24)	Continuity
E2G (A6–2) – EVG (E12–32)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E12–24) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

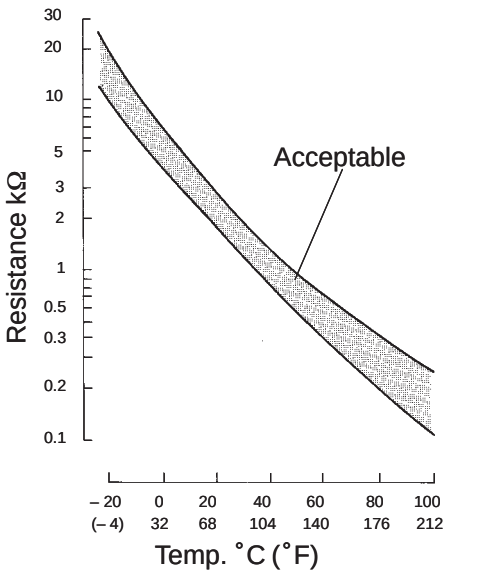
OK

CHECK AND REPLACE ECM (See page 01–32)

DTC P0110 INTAKE AIR TEMPERATURE CIRCUIT

CIRCUIT DESCRIPTION

(fig. 1)



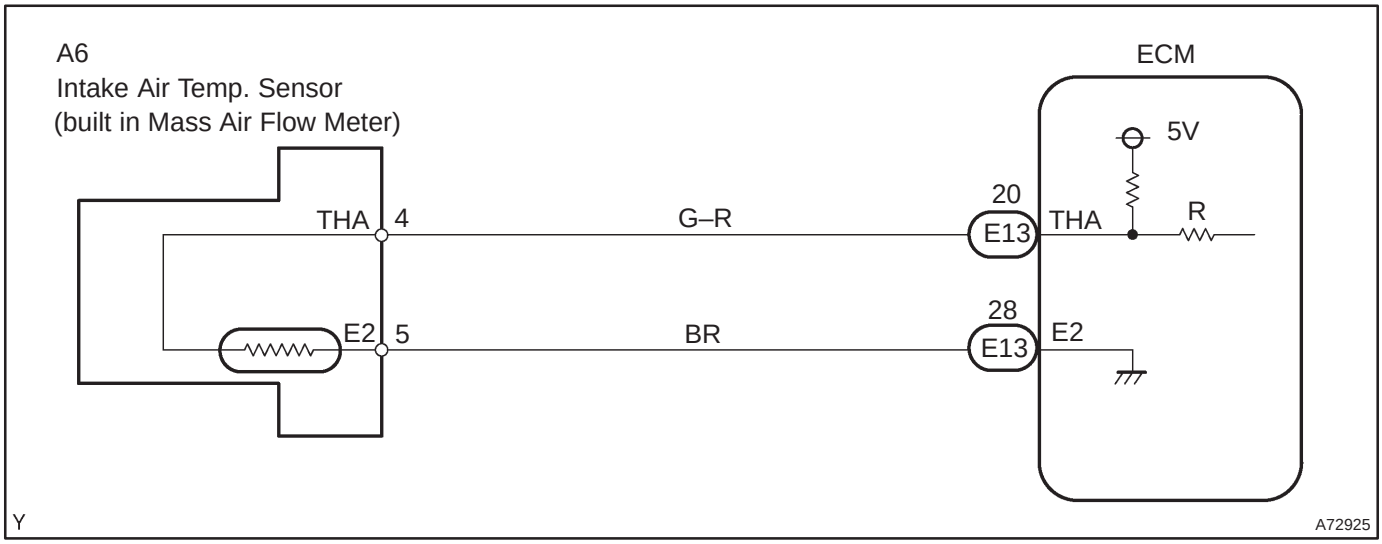
The intake air temperature sensor is built into the mass air flow meter and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature, the lower the thermistor resistance value (See fig. 1).
The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from the terminal THA via resistor R.
That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation.

DTC No.	DTC Detecting Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built into mass air flow meter) • ECM

If the ECM detects the DTC ”P0110”, it enters the fail–safe mode in which the intake air temperature is assumed to be 20 °C (68 °F).
HINT:
After confirming DTC ”P0110”, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40 °C (–40 °F)	Open circuit
140 °C (284 °F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

1	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: The same as actual intake air temperature
Result:

Temperature Displayed	Proceed to
–40 °C (–40 °F)	A
140 °C (284 °F) or more	B
OK (Same as present temperature)	C

HINT:

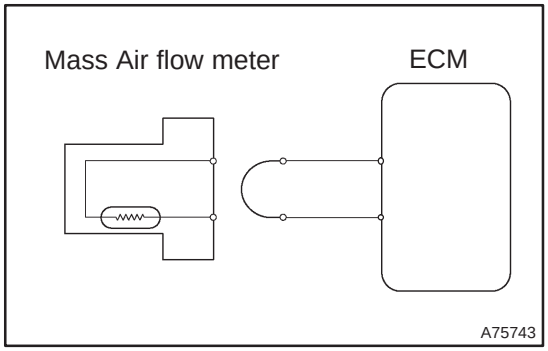
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B → **Go to step 4**

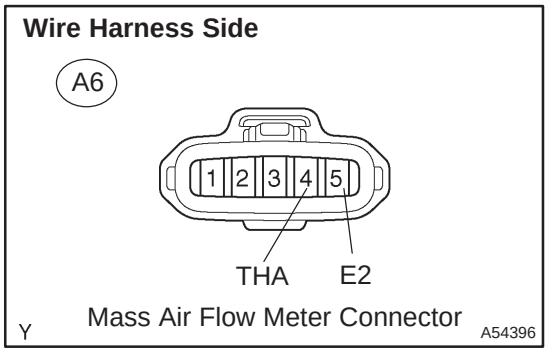
C → **CHECK FOR INTERMITTENT PROBLEMS (See Page 05–5)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN HARNESS)



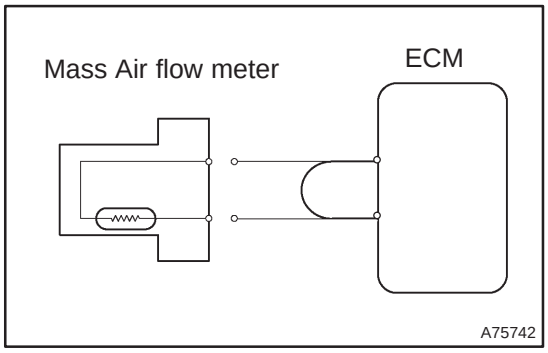
(a) Disconnect the mass air flow meter connector.
(b) Connect terminals THA and E2 of the mass air flow meter connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more



OK → **REPLACE MASS AIR FLOW METER**

NG

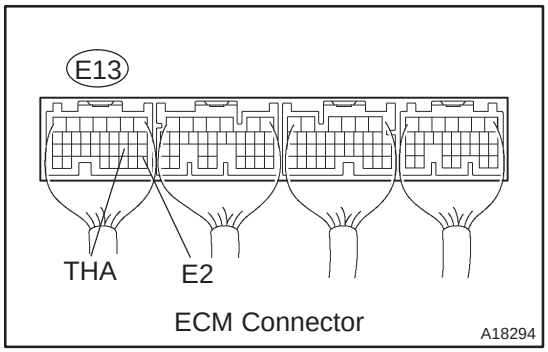
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the mass air flow meter connector.
(b) Connect terminals THA and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more

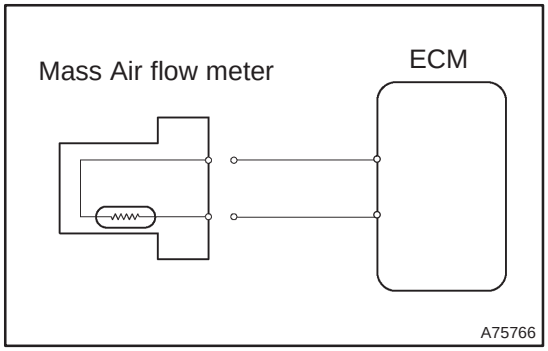


NG → **CHECK AND REPLACE ECM** (See page 01–32)

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

4 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN HARNESS)

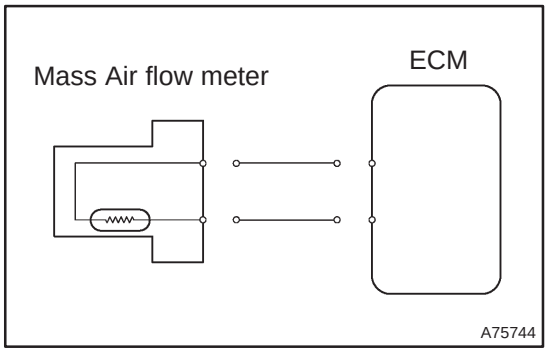


(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

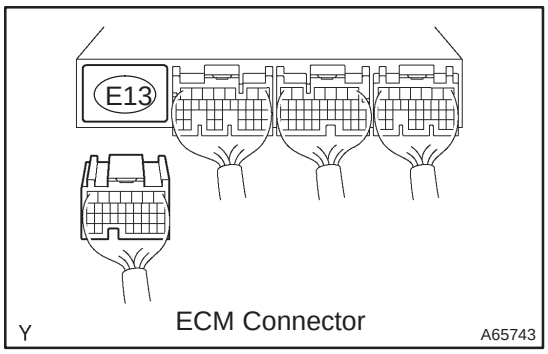
OK → **REPLACE MASS AIR FLOW METER**

NG

5 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM (See page 01–32)

DTC P0115 ENGINE COOLANT TEMPERATURE CIRCUIT

CIRCUIT DESCRIPTION

A thermistor is built into the engine coolant temperature sensor and changes the resistance value according to the engine coolant temperature.

The structure of the sensor and connection to the ECM is the same as the ones of the intake air temperature sensor.

DTC No.	DTC Detecting Condition	Trouble Area
P0115	Open or short in water temp. sensor circuit	• Open or short in Engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM

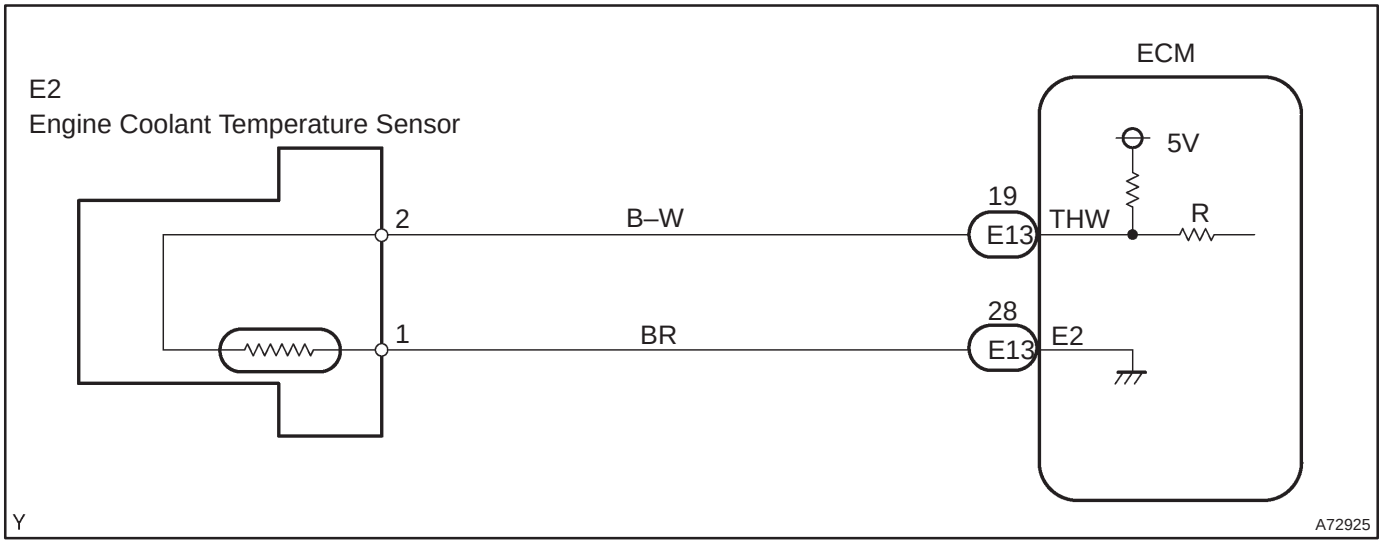
If the ECM detects the DTC ”P0115”, it enters the fail–safe mode in which the engine coolant temperature is assumed to be 80 °C (176 °F).

HINT:

After confirming DTC P0115, use the hand–held tester to confirm the engine coolant temperature in ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40 °C (–40 °F)	Open circuit
140 °C (284 °F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

1 READ VALUE OF HAND–HELD TESTER(WATER TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: Same as actual engine coolant temperature
Result:

Temperature Displayed	Proceed to
–40 °C (–40 °F)	A
140 °C (284 °F) or more	B
OK (Same as present temperature)	C

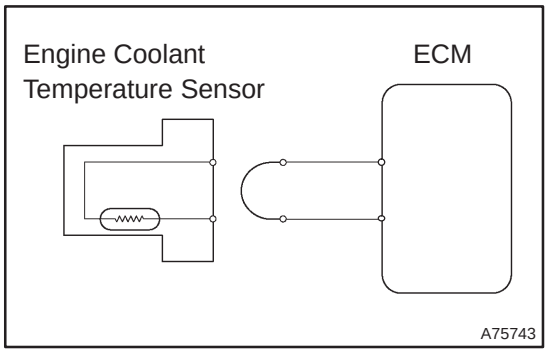
HINT:
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B → **Go to step 4**

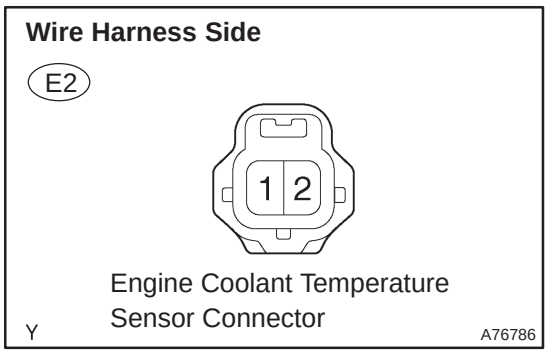
C → **CHECK FOR INTERMITTENT PROBLEMS (See Page 05–5)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN HARNESS)



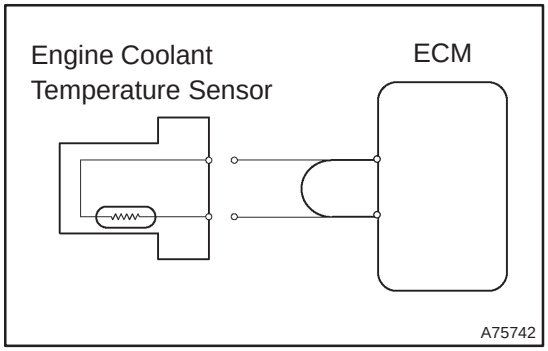
(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: 140 °C (284 °F) or more

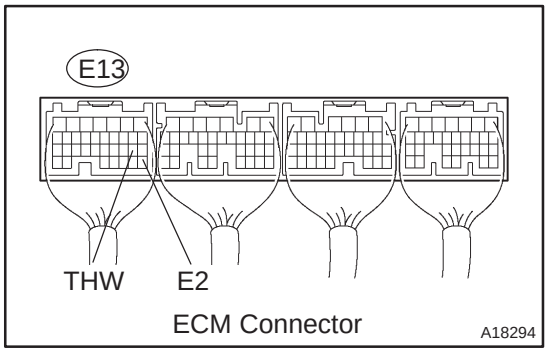


OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE ENGINE COOLANT TEMP. SENSOR**

NG

3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)





(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect terminals THW and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

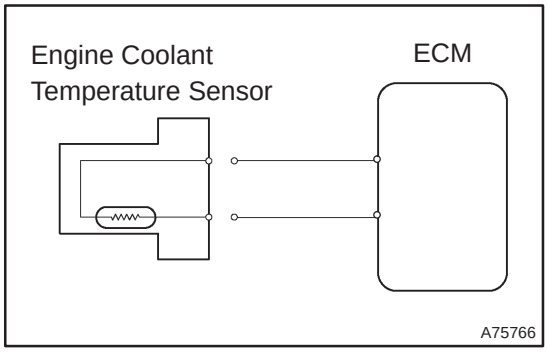
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: 140 °C (284 °F) or more

OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM (See page 01–32)

4 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN HARNESS)

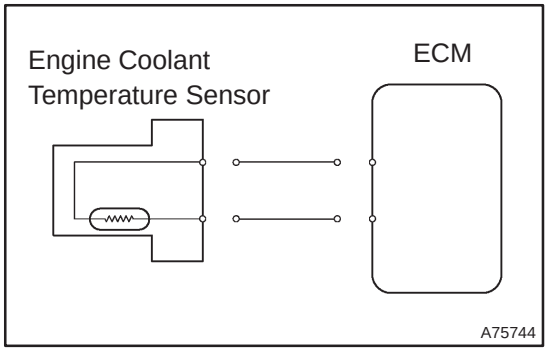


(a) Disconnect the engine coolant temperature sensor connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

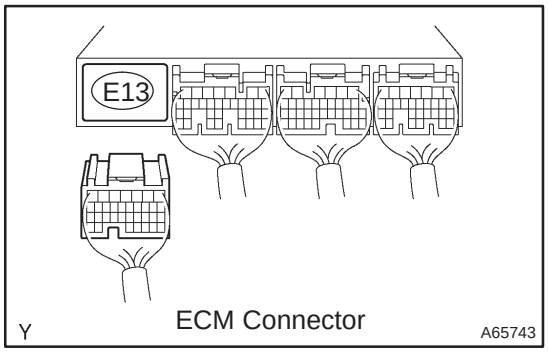
OK → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Disconnect the engine coolant temperature sensor connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: –40 °C (–40 °F)



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0116	ENGINE COOLANT TEMPERATURE CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Rfer to DTC P0115 on page 05–34

DTC No.	DTC Detecting Condition	Trouble Area
P0116	When the temperature of engine coolant is –7 °C (20 °F) with a cold engine, and if the engine coolant temperature sensor value is 20 °C (68 °F) or less even if it has been 20 min or more since the engine was warmed up. (2 trip detection logic)	• Engine coolant temperature sensor • Thermostat

INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different systems are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

1	READ OUTPUT DTC(BESIDES P0116)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0116” is output	A
”P0116” and other DTCs are output	B

HINT:
If any other codes besides ”P0116” are output, perform the troubleshooting for those DTCs first.

B → GO TO RELEVANT DTC CHART

A

2	INSPECT THERMOSTAT (See Page 16–3)

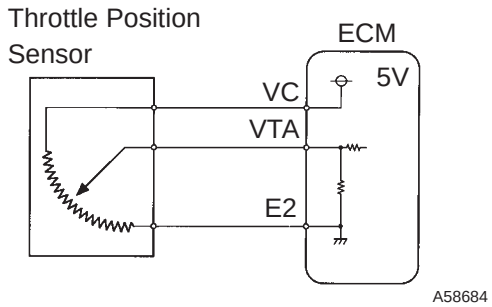
NG → REPLACE THERMOSTAT

OK

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

DTC	P0120	THROTTLE PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



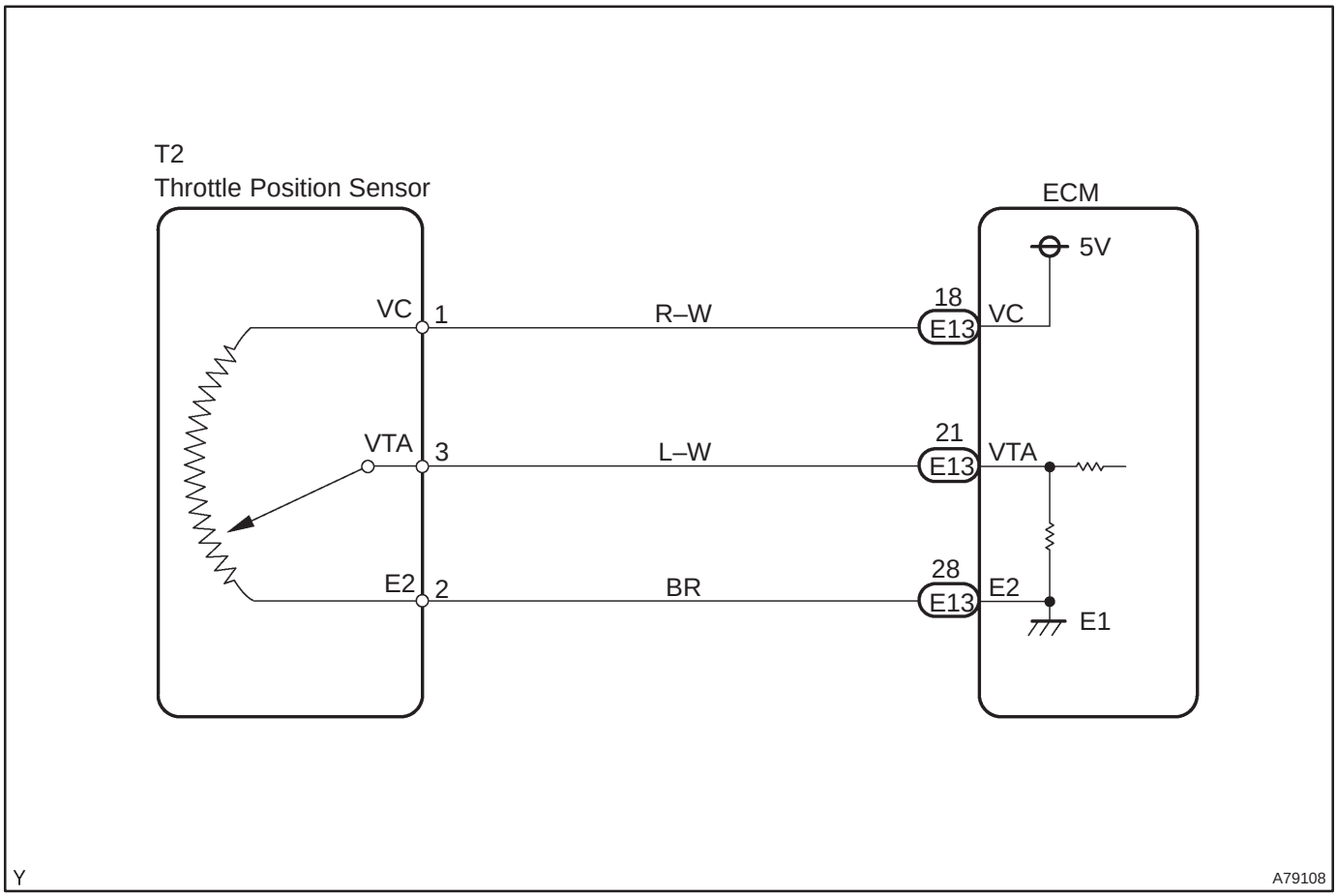
The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle.
When the throttle valve is fully closed, a voltage of approximately 0.7 V is applied to terminal VTA of the ECM. The voltage applied to terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.5 to 5.0 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from terminal VTA, uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc.

DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues for more than 5 sec. (a) VTA is less than 0.1 V (b) VTA is greater than 4.9 V	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

HINT:
After confirming DTC ”P0120”, use the hand–held tester to confirm the throttle valve opening percentage.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve fully closed	Throttle valve fully open	
0 %	0 %	VC circuit open VTA circuit open or short
Approx. 100 %	Approx. 100 %	E2 circuit open

WIRING DIAGRAM

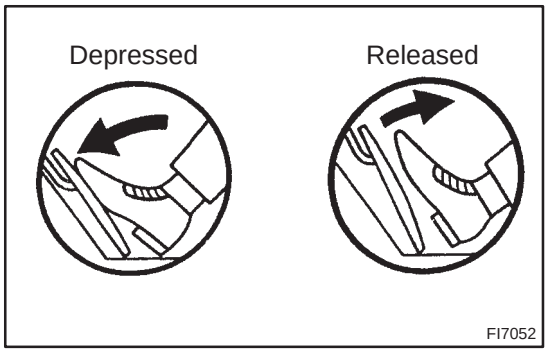


INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

1	READ VALUE OF HAND–HELD TESTER(THROTTLE VALVE OPENING PERCENTAGE)



(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / THROTTLE POS” and read its value displayed on the hand–held tester.

Result:

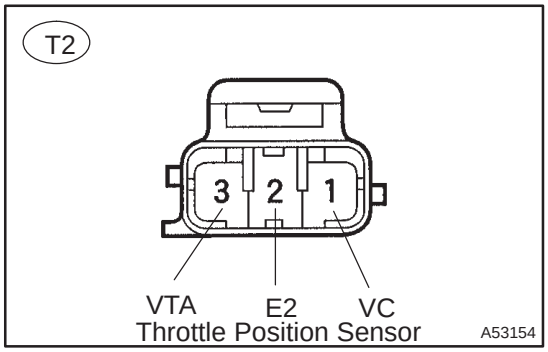
Accelerator pedal operatuin	Throttle valve opening position expressed as percentage	Proceed to
Released→Depressed	0 %	A
	Approx. 10 %→ Approx. 75 %	B
	Approx. 100 %	C

B → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)**

C → **Go to step 4**

A

2	INSPECT THROTTLE POSITION SENSOR



(a) Disconnect the throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

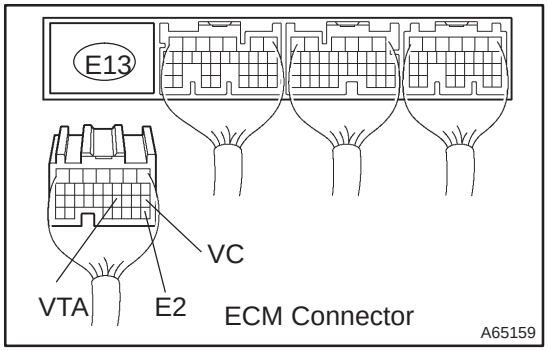
Standard:

Symbols (Terminal No.)	Throttle Valve	Resistance
VC (T2–1) – E2 (T2–2)	—	2.5 to 5.9 kΩ
VTA (T2–3) – E2 (T2–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG → **REPLACE THROTTLE POSITION SENSOR**

OK

3 CHECK HARNESS AND CONNECTOR(ECM – THROTTLE POSITION SENSOR)



(a) Disconnect the E13 ECM connector.
(b) Measure the resistance between the terminals of the E13 ECM connector.
Standard:

Symbols (Terminal No.)	Throttle valve	Resistance
VC (E13–18) – E2 (E13–28)	—	2.5 to 5.9 kΩ
VTA(E13–21) – E2 (E13–28)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

(c) Check for continuity between the terminals of the E13 ECM connector.
Standard (Check for short):

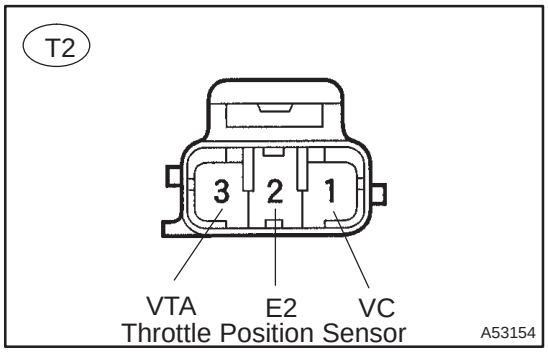
Symbols (Terminal No.)	Specified condition
VC (E13–18) – Body ground	No Continuity
VTA (E13–28) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

4 INSPECT THROTTLE POSITION SENSOR



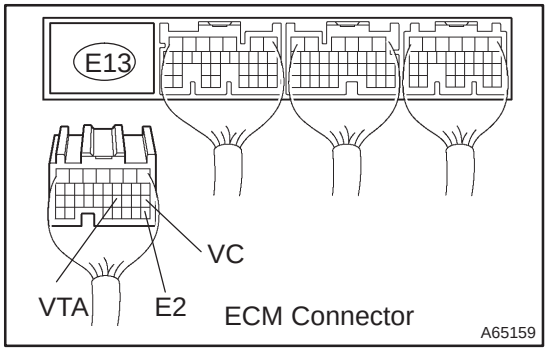
(a) Disconnect the throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.
Standard:

Symbols (Terminal No.)	Throttle Valve	Resistance
VC (T2–1) – E2 (T2–2)	—	2.5 to 5.9 kΩ
VTA (T2–3) – E2 (T2–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG → **REPLACE THROTTLE POSITION SENSOR**

OK

5 CHECK HARNESS AND CONNECTOR(ECM – THROTTLE POSITION SENSOR)



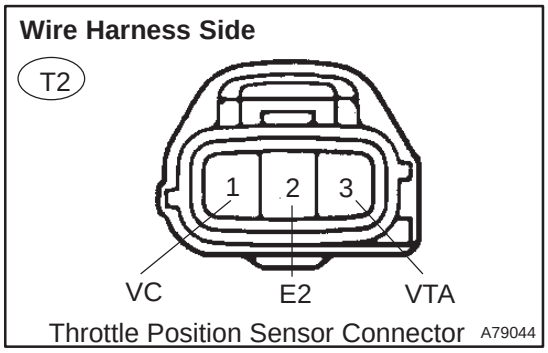
(a) Disconnect the E13 ECM connector.
(b) Disconnect the throttle position sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (T2–1) – VC (E13–18)	Continuity
VTA (T2–3) – VTA (E13–21)	
E2 (T2–2) – E2 (E13–28)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (T2–1) or VC (E13–18) – Body ground	No continuity
VTA (T2–3) or VTA (E13–21) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0121	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page 05–39

HINT:

This is the troubleshooting procedure of the throttle position sensor.

DTC No.	DTC Detecting Condition	Trouble Area
P0121	After the vehicle speed has exceeded 30 km/h (19 mph) once, and an output value of the throttle position sensor is out of the applicable range, althought the vehicle speed is more than 0 km/h (0 mph). (2 trip detection logic)	• Throttle position sensor

INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

1	ARE THERE ANY DTC BEING OUTPUT(BESIDES P0121)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
Only ”P0121” is output	A
”P0121” and other DTCs are output	B

HINT:

If any other codes besides ”P0121” are output, perform the troubleshooting for those DTCs first.

B → GO TO RELEVANT DTC CHART

A

REPLACE THROTTLE POSITION SENSOR

DTC	P0125	INSUFFICIENT COOLANT TEMP. FOR CLOSED LOOP FUEL CONTROL

CIRCUIT DESCRIPTION

The heated oxygen sensor is the planar type. Compared to the conventional type, the sensor element and the heater portions have a narrower overall. The heater can directly conduct its heat to the zirconia element via the alumina, it helps to accerate the sensor activation.

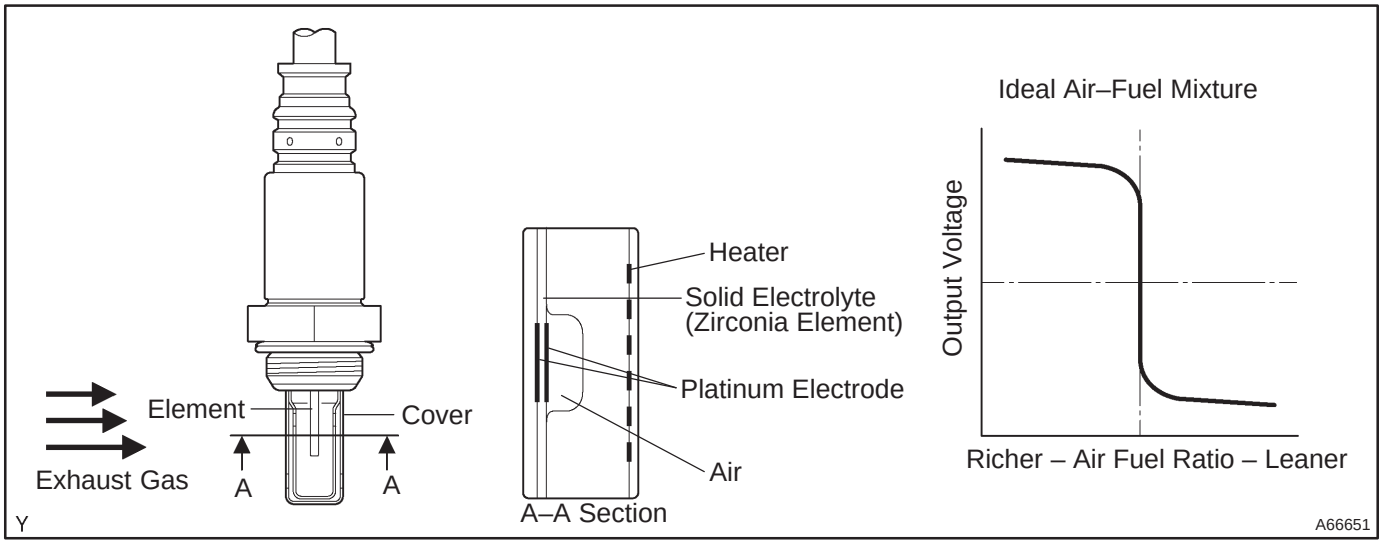
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three – way catalytic converter is used. For the most efficient use of the three – way catalytic converter, the air – fuel ratio must be precisely controlled so that it is always close to the stoichiometric air – fuel ratio.

The heated oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and provide the ECM with feedback control the air–fuel ratio.

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust gas increases. And the heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i. e. less than 0.45 V).

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio, the oxygen concentration in the exhaust gas is reduced. And the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i. e. more than 0.45V). The ECM judges by the voltage output from the heated oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. If the malfunction of the heated oxygen sensor causes an output of abnomal voltage, the ECM becomes unable to perform accurate air–fuel ratio control.

The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), current flows to the heater in order to heat the sensor for the accurate oxygen concentration detection.

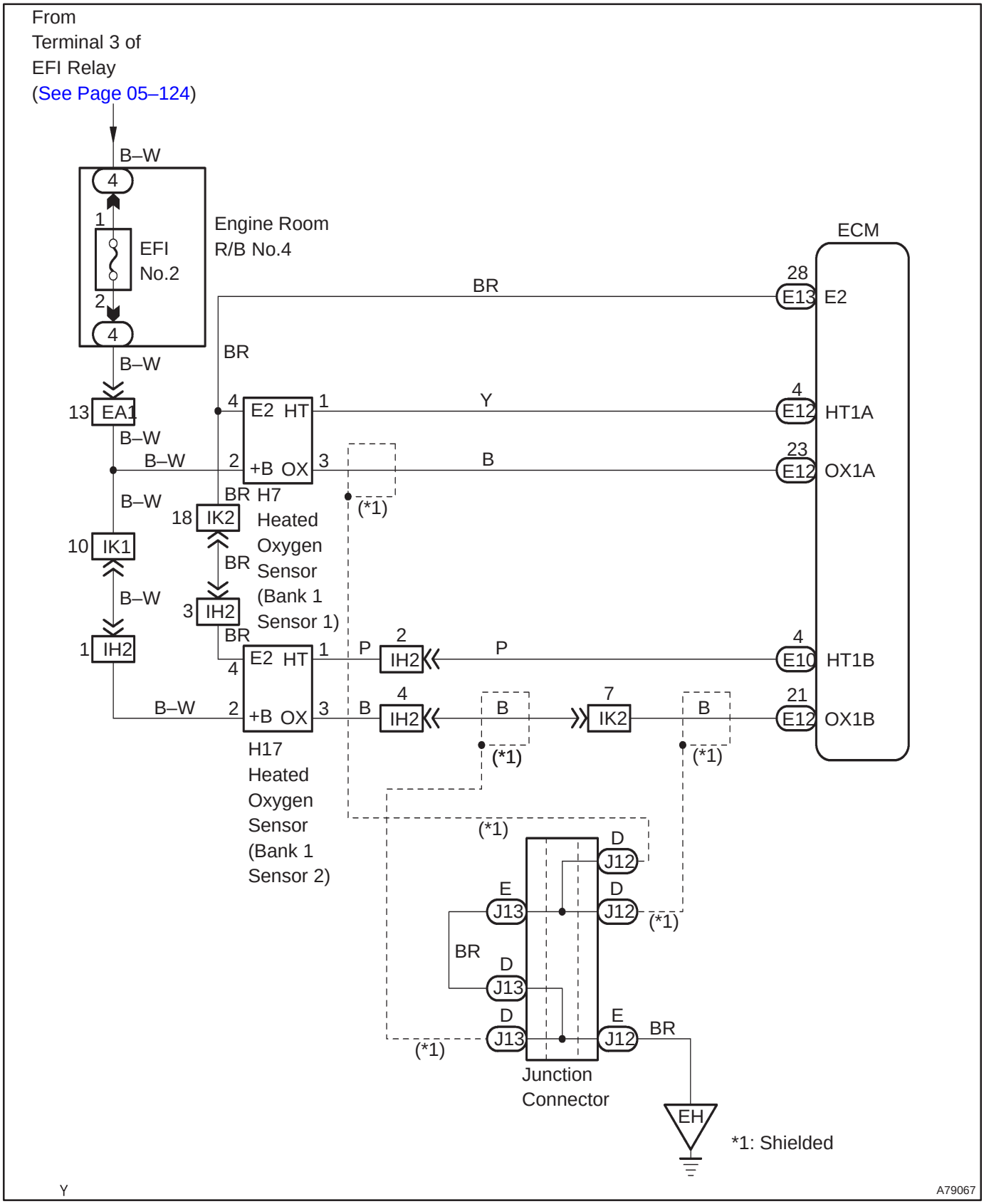


DTC No	DTC Detecting Condition	Trouble Area
P0125	After engine is warmed up, heated oxygen sensor output* does not change when conditions (a), (b), (c) and (d) continue for at least 1.5 min: *: Output value changes at inside of the ECM only (a) Engine speed: 1,400 rpm or more (b) Vehicle speed: 40 to 100 km/h (25 to 62 mph) (c) Throttle valve is not fully closed (d) 180 sec. or more after starting engine	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • Gas leakage in exhaust system • ECM

HINT:

- After confirming DTC ”P0125”, use the hand–held tester to confirm output voltage of the heated oxygen sensor the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST by the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

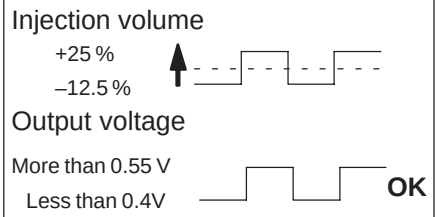
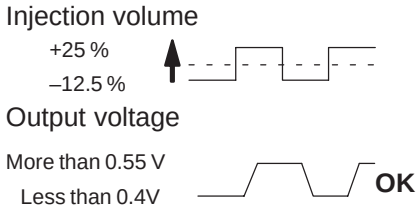
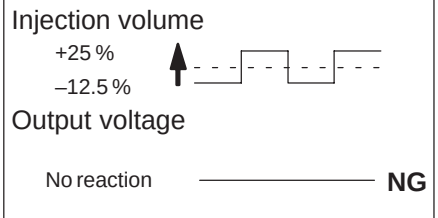
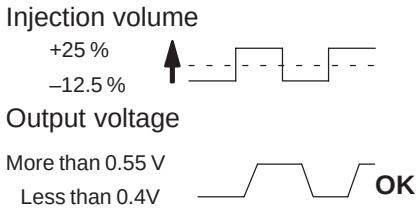
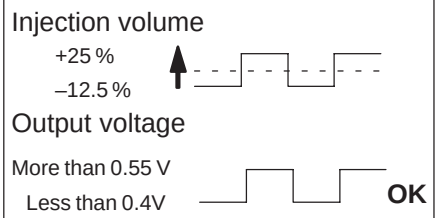
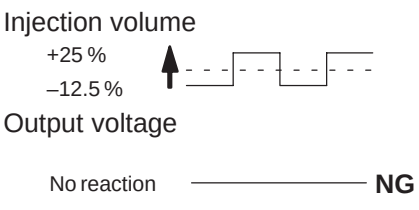
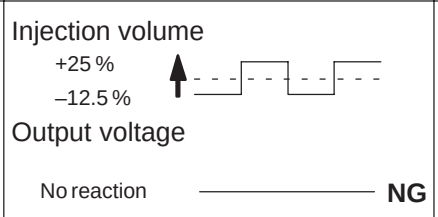
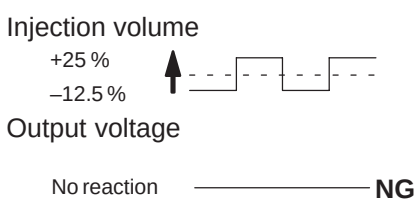
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few second delay in the sensor 1 (front sensor) output, and there is about 20 seconds delay in the sensor 2 (rear sensor)output.

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1			—
Case 2			Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3			Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4			Extremely rich or lean of the actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following procedure of A/F CONTROL enable the technician to check and graph voltage output of the heated oxygen sensor.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0125)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0125” is output	A
”P0125” and other DTCs are output	B

HINT:
If any other codes besides ”P0125” are output, perform the troubleshoot on that DTC before.

B → **GO TO RELEVANT DTC CHART (See page 05–16)**

A

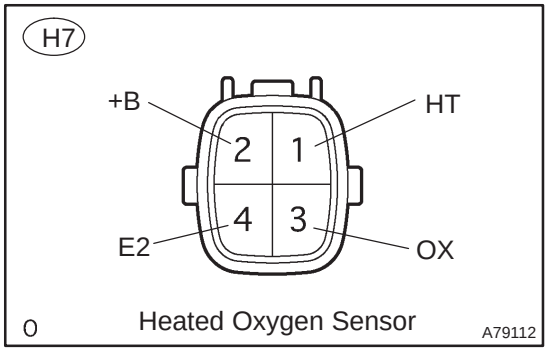
2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Warm up the engine to the normal operating temperature above 75°C (169°F).
(b) Read the output voltage of the heated oxygen sensor when the engine rpm is suddenly increased.
HINT:
Quickly accelerate the engine to 4,000 rpm 3 times using the accelerator pedal.
Standard:
Heated oxygen sensor outputs a RICH signal (0.45 V or more) at least once.

OK → **Go to step 13**

NG

3 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



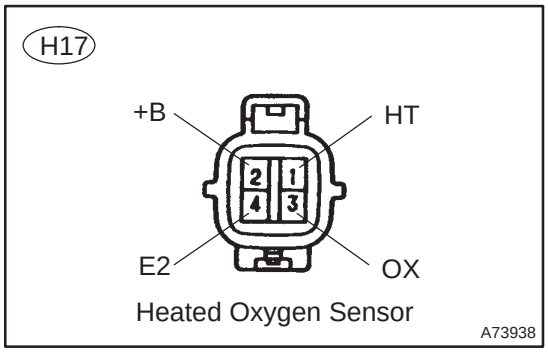
(a) Disconnect the heated oxygen sensor connector.
(b) Inspect the heated oxygen sensor.

Standard: (Bank1 Sensor1)

Symbols (Terminal No.)	Condition	Specified condition
HT (H7–1) – +B (H7–2)	20°C (68°F)	6 to 9 Ω
HT (H7–1) – E2 (H7–4)	—	No Continuity

Standard: (Bank1 Sensor2)

Symbols (Terminal No.)	Condition	Specified condition
HT (H17–1) – +B (H17–2)	20°C (68°F)	11 to 16 Ω
HT (H17–1) – E2 (H17–4)	—	No Continuity



NG → **REPLACE HEATED OXYGEN SENSOR**

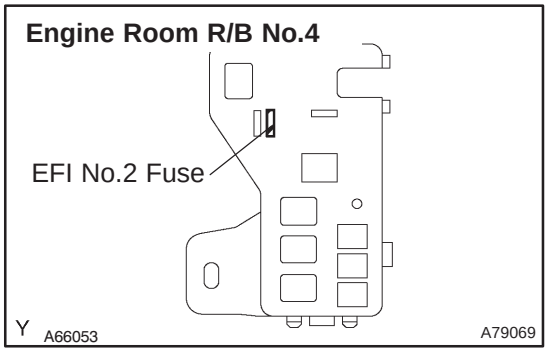
OK

4 INSPECT EFI RELAY (See page 10–3)

NG → **REPLACE EFI RELAY**

OK

5 CHECK FUSE(EFI No.2)



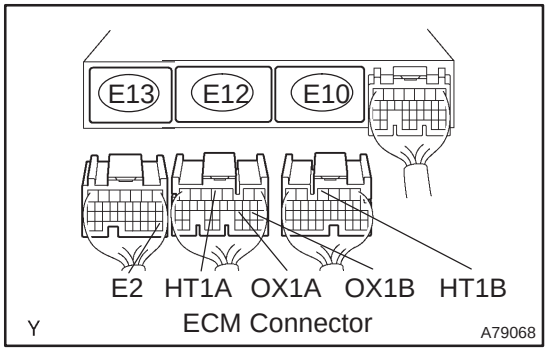
(a) Remove the EFI No.2 fuse from the engine room R/B No.4.
(b) Check for continuity in the EFI fuse.

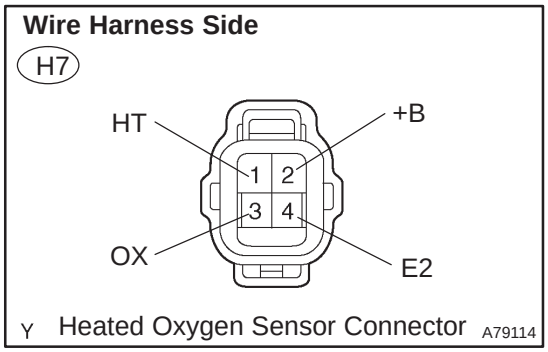
Standard: Continuity

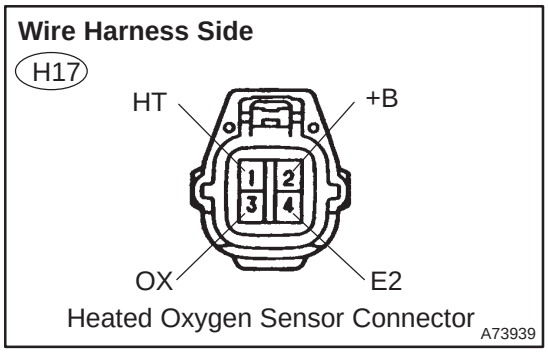
NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

6 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)







(a) Disconnect the heated oxygen sensor connector.
(b) Disconnect the E10, E12 and E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open): (Bank1 Sensor1)

Symbols (Terminal No.)	Specified condition
HT (H7–1) – HT1A (E12–4)	Continuity
OX (H7–3) – OX1A (E12–23)	
E2 (H7–4) – E2 (E13–28)	

Standard (Check for short): (Bank1 Sensor1)

Symbols (Terminal No.)	Specified condition
HT (H7–1) or HT1A (E12–4) – Body ground	No continuity
OX (H7–3) or OX1A (E12–23) – Body ground	

Standard (Check for open): (Bank1 Sensor2)

Symbols (Terminal No.)	Specified condition
HT (H17–1) – HT1B (E10–4)	Continuity
OX (H17–3) – OX1B (E12–21)	
E2 (H17–4) – E2 (E13–28)	

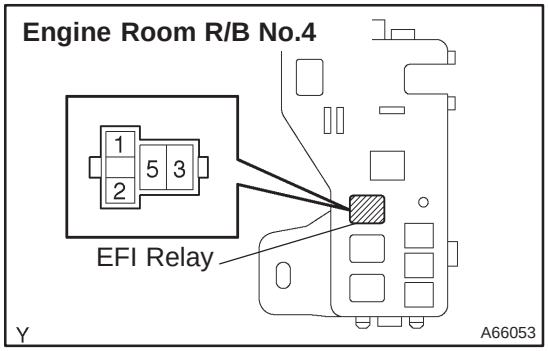
Standard (Check for short): (Bank1 Sensor2)

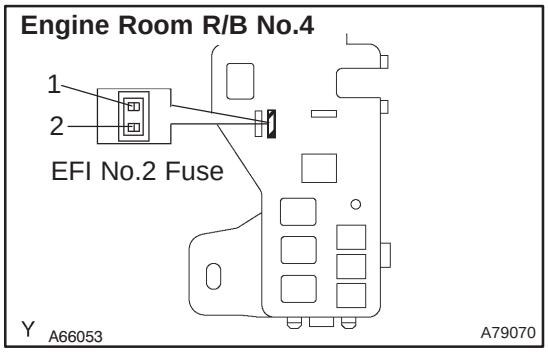
Symbols (Terminal No.)	Specified condition
HT (H17–1) or HT1B (E10–4) – Body ground	No continuity
OX (H17–3) or OX1B (E12–21) – Body ground	

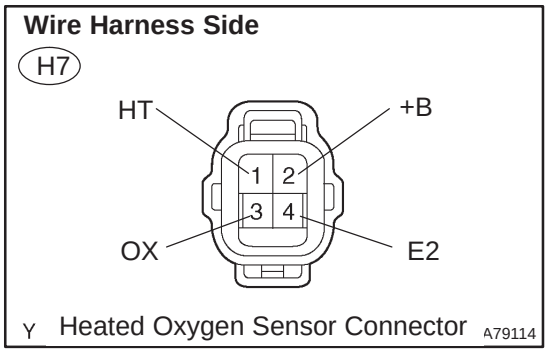
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

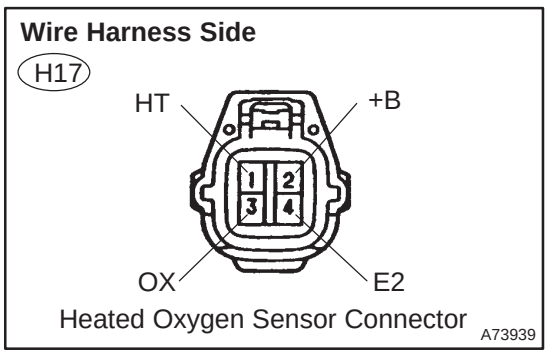
OK

7 CHECK HARNESS AND CONNECTOR(EFI RELAY – HEATED OXYGEN SENSOR)









(a) Remove the EFI relay from the engine room R/BNo.4.
(b) Remove the EFI No.2 fuse from the engine room R/B No.4.
(c) Disconnect the heated oxygen sensor connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – EFI No.2 fuse (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or EFI No.2 fuse (1) – Body ground	No continuity

Standard (Check for open): (Bank1 Sensor1)

Symbols (Terminal No.)	Specified condition
EFI No.2 fuse (2) – +B (H7–2)	Continuity

Standard (Check for short): (Bank1 Sensor1)

Symbols (Terminal No.)	Specified condition
EFI No.2 fuse (2) or +B (H7–2) – Body ground	No continuity

Standard (Check for open): (Bank1 Sensor2)

Symbols (Terminal No.)	Specified condition
EFI No.2 fuse (2) – +B (H17–2)	Continuity

Standard (Check for short): (Bank1 Sensor2)

Symbols (Terminal No.)	Specified condition
EFI No.2 fuse (2) or +B (H17–2) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8	CHECK WHETHER MISFIRE IS OCCURRED OR NOT BY MONITORING DTC AND DATA LIST

NG → PERFORM TROUBLESHOOTING FOR MISFIRE (See page 05–5)

OK

9	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

10	CHECK FUEL PRESSURE (See page 11–5)

(a) Check the fuel pressure (high or low pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

11	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–8)

NG → REPLACE FUEL INJECTOR ASSY

OK

12	CHECK FOR EXHAUST GAS LEAK

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK

REPLACE HEATED OXYGEN SENSOR

13	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)

GO

14	READ OUTPUT DTC(DTC P0125 IS OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0125” is not output again	A
”P0125” is output again	B

B → **CHECK AND REPLACE ECM (See page 01–32)**

A

15	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → **CHECK FOR INTERMITTENT PROBLEMS**

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL

DTC	P0130	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 1)

DTC	P0136	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page 05–45.

DTC No	DTC Detecting Condition	Trouble Area
P0130	Voltage output of heated oxygen sensor remains between 0.40 V and 0.55 V during idling after the engine is warmed up	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM
P0136	Voltage output of heated oxygen sensor remains 0.4 V or more or 0.5 V or less when vehicle is driven at 30 km/h (19 mph) or more after the engine is warmed up (2 trip detection loginc)	• Open or short in heated oxygen sensor circuit • Heated Oxygen sensor

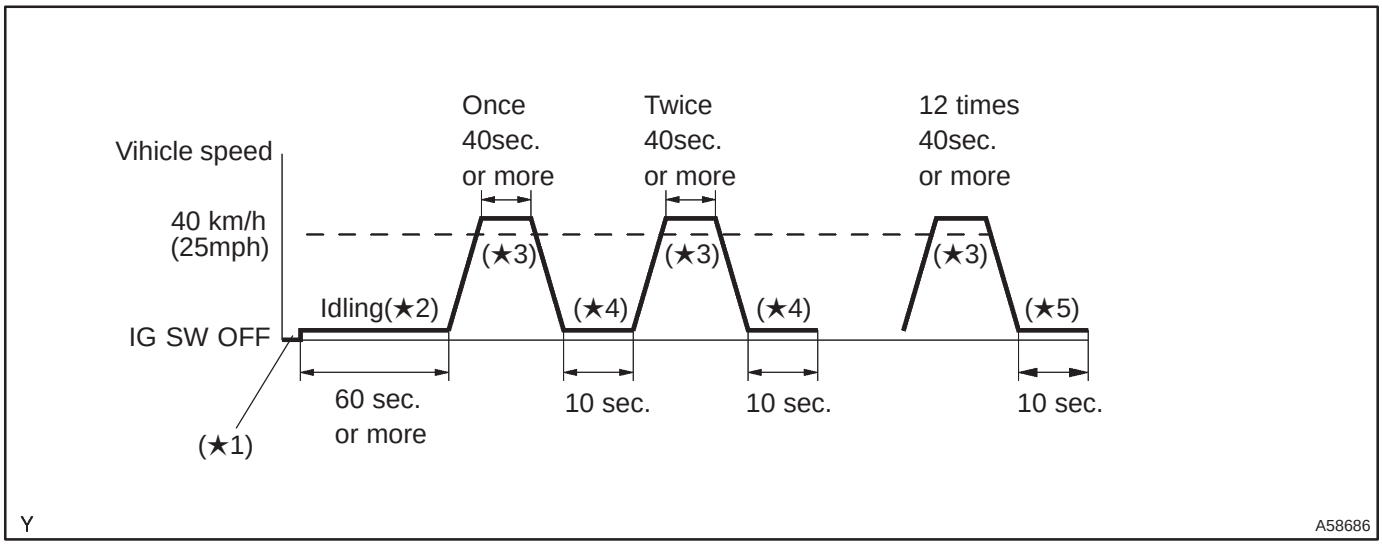
HINT:

- Bank 1 refers to the bank that includes cylinder No. 1.
- Sensor 1 refers to the sensor closer to the engine assembly.
- The heated oxygen sensor output voltage and the short−term fuel trim value can be read using the hand−held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page 05–45.

CONFIRMATION DRIVING PATTERN



1. **Connect the hand–held tester to the DLC3. (★1)**
2. **Switch the hand–held tester from the normal mode to the check mode (See page 05–5). (★1)**
3. **Start the engine and let the engine idle for 60 seconds or more. (★2)**
4. **Drive the vehicle at 40 km/h (25 mph) or more for 40 seconds or more. (★3)**
5. **Let the engine idle for 10 seconds or more. (★4)**
6. **Perform steps 4 to 5 12 times. (★5)**

HINT:

If a malfunction exists, the CHECK ENG will be illuminated on the multi–information display during step 6.

NOTICE:

If the conditions in this test are not strictly followed, detection of the malfunction will not be possible. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from 3 to 6, then perform steps from 3 to 6 again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” whith the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:
There is a few second delay in the sensor 1 (front sensor) output, and there is about 20 seconds delay in the sensor 2 (rear sensor) output.

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Extremely rich or lean of the actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following procedure of A/F CONTROL enable the technician to check and graph voltage output of the heated oxygen sensor.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
NOTICE:
If the vehicle has low fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs will be recorded, and the CHK ENG lamp then comes on.
HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(BESIDES HEATED OXYGEN SENSOR DTCS)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0130 and/or P0136” are output	A
”P0130 and/or P0136” and other DTCs are output	B

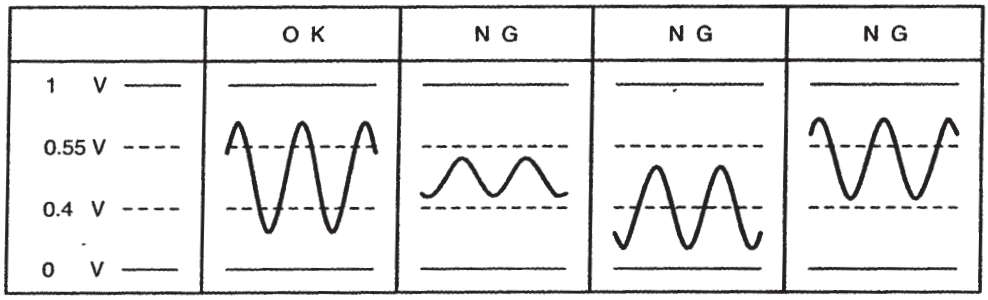
HINT:
If any other codes besides ”P0130 and/or P0136” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–16)**

A

2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.
(b) Read the output voltage of the heated oxygen sensor during idling.
Heated oxygen sensor output voltage:
Alternates less than 0.4 V and more than 0.55 V (See the following table).



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OK → **Go to step 11**

NG

3	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE) (See page 05–45)

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4	INSPECT EFI RELAY (See page 10–3)

NG → **REPLACE EFI RELAY**

OK

5	CHECK FUSE(EFI No.2) (See page 05–45)

NG → CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE

OK

6	CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	CHECK HARNESS AND CONNECTOR(EFI RELAY – HEATED OXYGEN SENSOR) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

9	CHECK FUEL PRESSURE (See page 11–5)

(a) Check the fuel pressure (high or low pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

10	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–8)

NG → REPLACE FUEL INJECTOR ASSY

OK

REPLACE HEATED OXYGEN SENSOR

11	PERFORM CONFIRMATION DRIVING PATTERN

GO

12	READ OUTPUT DTC(HEATED OXYGEN SENSOR DTCS ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0130 and/or P0136” are not output again	A
”P0130 and/or P136” are output again	B

B → **CHECK FOR INTERMITTENT PROBLEMS**

A

REPLACE HEATED OXYGEN SENSOR

DTC	P0133	OXYGEN SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page 05–45.

DTC No	DTC Detecting Condition	Trouble Area
P0133	Response time for heated oxygen sensor voltage output to change from rich to lean, or from lean to rich, is 1.0 sec. or more during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM

HINT:

- Bank 1 refers to bank that includes cylinder No. 1.
- Sensor 1 refers to the sensor closer to the engine assembly.
- The heated oxygen sensor output voltage and the short−term fuel trim value can be read using the hand−held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page 05–45.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

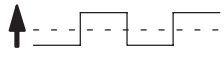
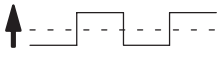
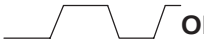
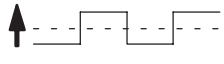
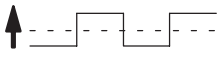
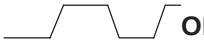
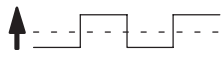
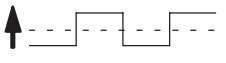
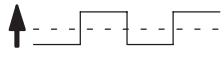
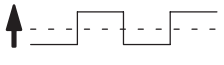
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately. 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few second delay in the sensor 1 (front sensor) output, and there is about 20 seconds delay in the sensor 2 (rear sensor) output.

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Extremely rich or lean of the actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following procedure of A/F CONTROL enable the technician to check and graph volatge output of the heated oxygen sensor.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

NOTICE:

If the vehicle is lack of fuel, the air–fuel ratio becomes LEAN and DTC P0133 will be set, and the CHK ENG then comes on.

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0133)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0133” is output	A
”P0133 or P0133” and other DTCs are output	B

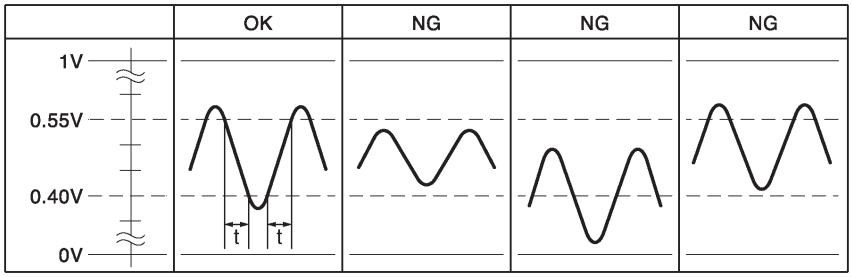
HINT:
If any other codes besides ”P0133” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–16)**

A

2	READ VALUE OF HAND–HELD TESTER(HEATED OXYGEN SENSOR DURING IDLING)

(a) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.
(b) Read the output voltage of the heated oxygen sensor during idling.
Heated oxygen sensor output voltage:
Alternates less than 0.4 V and more than 0.55 V, and duration ”t” must exist more than 0.9 sec. (See the following table).



N

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OK → **Go to step 11**

NG

3	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE) (See page 05–45)

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4	INSPECT EFI RELAY (See page 10–3)

NG → **REPLACE EFI RELAY**

OK

5	CHECK FUSE(EFI No.2) (See page 05–45)

NG → CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE

OK

6	CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	CHECK HARNESS AND CONNECTOR(EFI RELAY – HEATED OXYGEN SENSOR) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

9	CHECK FUEL PRESSURE (See page 11–5)

(a) Check the fuel pressure (high or low pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

10	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–8)

NG → REPLACE HEATED OXYGEN SENSOR

OK

REPLACE HEATED OXYGEN SENSOR

11	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)

GO

12	READ OUTPUT DTC(DTC P0133 IS OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0133” is not output again	A
”P0133” is output again	B

B → **CHECK FOR INTERMITTENT PROBLEMS (See Page 05–5)**

A →

REPLACE HEATED OXYGEN SENSOR

DTC	P0135	OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION (BANK 1 SENSOR 1)

DTC	P0141	OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page 05–45.

DTC No.	DTC Detecting Condition	Trouble Area
P0135	• When the heater operates, heater current exceeds 3.5 A (1 trip detection logic) • Heater current is 0.2 A or less when the heater operates (1 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM
P0141	• When the heater operates, heater current exceeds 2 A (1 trip detection logic) • Heater current is 0.2 A or less when the heater operates (1 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM

WIRING DIAGRAM

Refer to DTC P0125 on page 05–45.

INSPECTION PROCEDURE

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand−held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE) (See page 05–45)

NG → REPLACE HEATED OXYGEN SENSOR

OK

2	INSPECT EFI RELAY (See page 10–3)

NG → REPLACE EFI RELAY

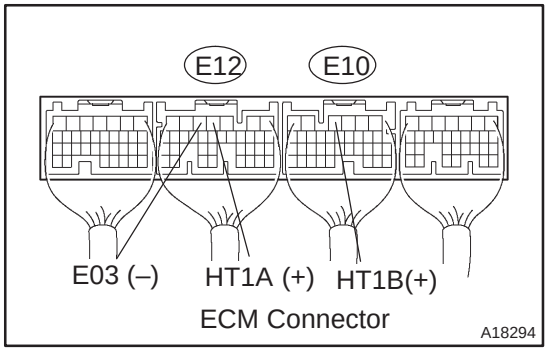
OK

3	CHECK FUSE(EFI No.2) (See page 05–45)

NG → CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE

OK

4	INSPECT ECM(HTL OR HTL2 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E10 and E12 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
HT1A (E12–4) – E03 (E12–5)	9 to 14 V
HT1B (E10–4) – E03 (E12–5)	

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

5	CHECK HARNESS AND CONNECTOR(EFI RELAY – HEATED OXYGEN SENSOR) (See page 05–45)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0171	SYSTEM TOO LEAN (FUEL TRIM) (BANK 1)

DTC	P0172	SYSTEM TOO RICH (FUEL TRIM) (BANK 1)

CIRCUIT DESCRIPTION

Fuel trim refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short–term fuel trim and long–term fuel trim.

Short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the stoichiometric air–fuel ratio, This variance triggers a reduction in fuel volume if the air–fuel ratio is rich, and an increase in the fuel volume if it is lean.

Long–term fuel trim is overall fuel compensation carried out long–term to compensate for a continual deviation of the short–term fuel trim from the central value, due to individual engine differences, wear over time and changes in the operating environment.

If both the short–term fuel trim and long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the CHK ENG is illuminated.

DTC No.	DTC Detecting Condition	Trouble Area
P0171	When air fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on LEAN side (2 trip detection logic)	• Air induction system • Injector blockage • PCV hose • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Open or short in heated oxygen sensor circuit • Heated oxygen sensor • ECM
P0172	When air fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Open or short in heated oxygen sensor circuit • Gas leakage in exhaust system • Heated oxygen sensor • ECM

HINT:

If the total of the short–term fuel trim value and long–term fuel trim value is within ± 25 %, the system is functioning normally.

WIRING DIAGRAM

Refer to DTC P0125 on page 05–45.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

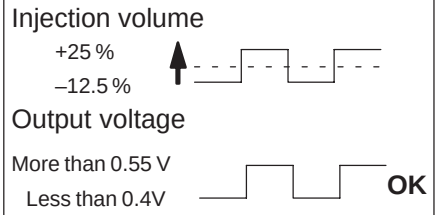
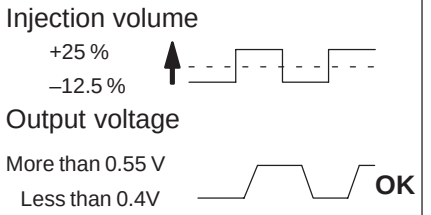
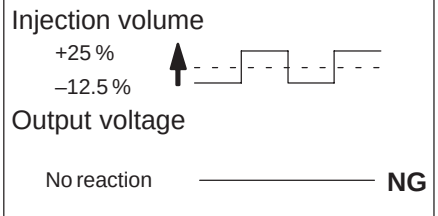
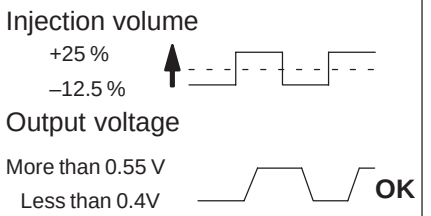
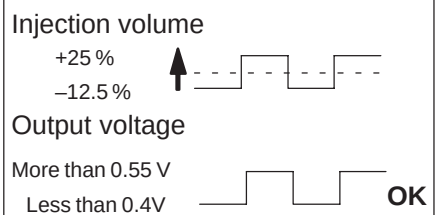
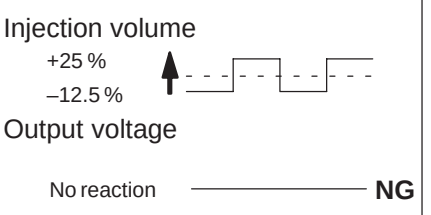
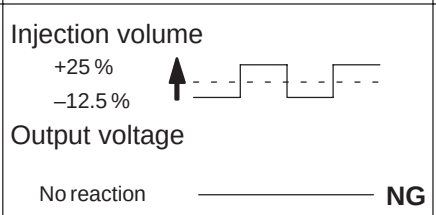
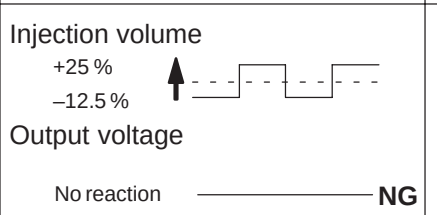
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few second delay in the sensor 1 (front sensor) output, and there is about 20 seconds delay in the sensor 2 (rear sensor) output.

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1			—
Case 2			Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3			Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4			Extremely rich or lean of the actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following procedure of A/F CONTROL enable the technician to check and graph voltage output of the heated oxygen sensor.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

2	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–8)

NG → REPLACE FUEL INJECTOR ASSY

OK

3	INSPECT MASS AIR FLOW METER (See page 10–3)

NG → REPLACE MASS AIR FLOW METER

OK

4	INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE) (See page 10–3)

NG → REPLACE ENGINE COOLANT TEMPERATURE SENSOR

OK

5	CHECK FOR SPARK AND IGNITION (See page 18–1)

NG → REPAIR OR REPLACE

OK

6	CHECK FUEL PRESSURE (See page 11–5)

(a) Check the fuel pressure (high or low pressure).

NG → CHECK AND REPLACE FUEL SYSTEM

OK

7	CHECK FOR EXHAUST GAS LEAKAGE

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK

8	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR) (See page 05–54)

OK → Go to step 18

NG

9	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE) (See page 05–45)

NG → REPLACE HEATED OXYGEN SENSOR

OK

10	INSPECT EFI RELAY (See page 10–3)

NG → REPLACE EFI RELAY

OK

11	CHECK FUSE(EFI No.2) (See page 05–45)

NG → CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE

OK

12	CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

13	CHECK HARNESS AND CONNECTOR(EFI RELAY – HEATED OXYGEN SENSOR) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

14	REPLACE HEATED OXYGEN SENSOR

GO

15	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)

GO

16	READ OUTPUT DTC(DTC P0171 AND/OR P0172 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
DTC ”P0171 and/or P0172” are not output again	A
DTC ”P0171 and/or P0172” are output again	B

B → CHECK AND REPLACE ECM (See page 01–32) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)

A

17	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL (DTCS P0171 AND/OR P0172)

18	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)

GO

19	READ OUTPUT DTC(DTC P0171 AND/OR P0172 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC "P0171 and/or P0172" are not output again	A
DTC "P0171 and/or P0172" are output again	B

B → **Go to step 22**

A

20	REPLACE HEATED OXYGEN SENSOR

GO

21	READ OUTPUT DTC(DTC P0171 AND/OR P0172 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC "P0171 and/or P0172" are not output again	A
DTC "P0171 and/or P0172" are output again	B

B → **CHECK AND REPLACE ECM (See page 01–32) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)**

A

22	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → **CHECK FOR INTERMITTENT PROBLEMS (See Page 05–5)**

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL

DTC	P0300	RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED

DTC	P0301	CYLINDER 1 MISFIRE DETECTED

DTC	P0302	CYLINDER 2 MISFIRE DETECTED

DTC	P0303	CYLINDER 3 MISFIRE DETECTED

DTC	P0304	CYLINDER 4 MISFIRE DETECTED

CIRCUIT DESCRIPTION

Misfire: The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation of each cylinder.

The ECM counts the number of times from the engine speed change rate, indicating that misfire has occurred. When the misfire rate equals to or exceeds the count, indicating that the engine condition has deteriorated, the CHK ENG is illuminated.

If the misfire rate is high enough and the driving conditions causes the catalyst to overheat, the CHK ENG blinks when the misfire occurs.

HINT:

- For any particular 200 revolutions of engine, misfiring which could result in overheating of catalyst is detected. This cause CHK ENG to blink (1 trip detection logic).
- For any particular 1,000 revolutions of engine, misfiring which could result in a deterioration of emissions is detected. This cause CHK ENG to illuminate (2 trip detection logic).

DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • PCV hose • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • ECM
P0301 P0302 P0303 P0304	Misfiring of each cylinder is detected	

HINT:

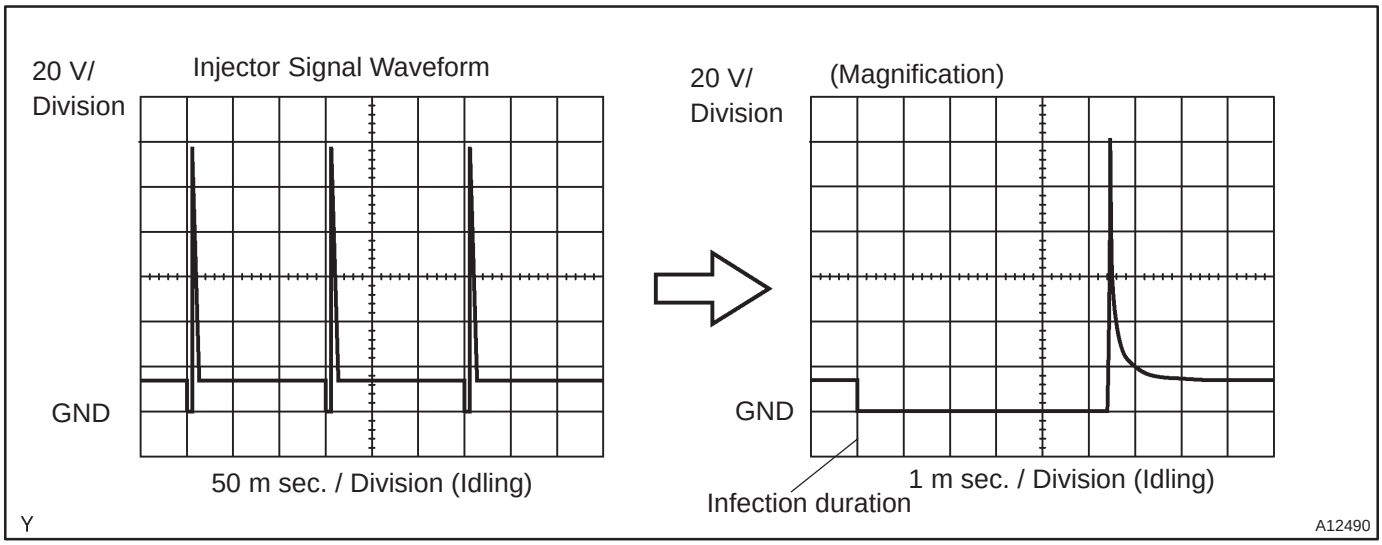
When 2 or more codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it is indicated that the misfires were detected and recorded at different times.

Reference: Inspection using an oscilloscope for injector signal waveform.

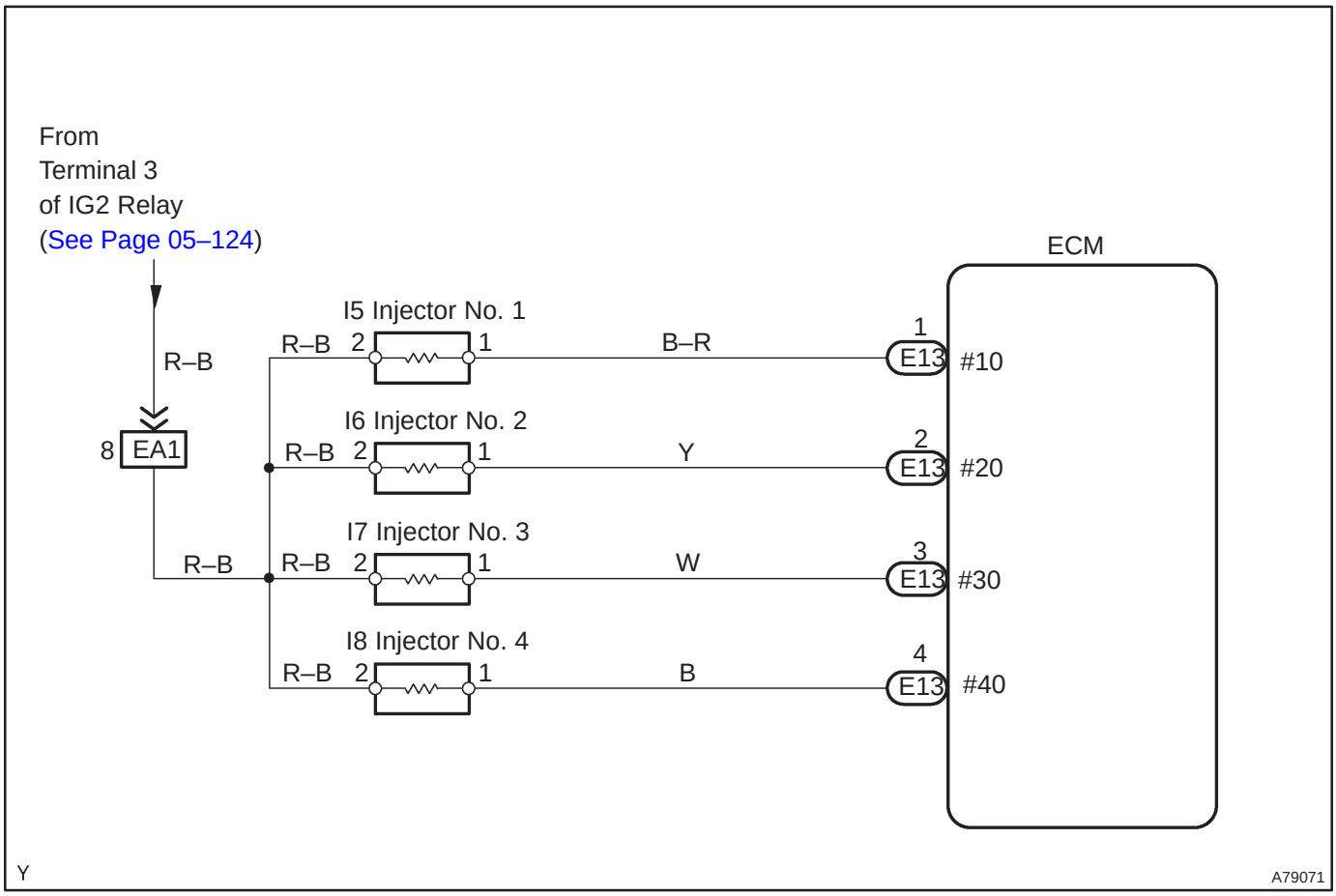
(1) With the engine idling, check the waveforms between terminals #1 – #4 and E1 of the ECM connector.

HINT:

The correct waveforms are shown below.



WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN

(a) Connect the hand–held tester to the DLC3.
(b) Record the DTC and freeze frame data.
(c) Use the hand–held tester to set to the check mode (See page 05–5).
(d) Read the value on the misfire counter for each cylinder when idling. If the value is displayed on the misfire counter, skip the following procedure of confirmation driving.
(e) Drive the vehicle several times with the engine speed, load and its surrounding range shown with ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the data list. If you do not have the hand–held tester, turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again.

HINT:
In order to memorize the DTC of the misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD in the following data list. Be sure not to turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the nomal mode and will result in all of the DTCs and the freeze frame data being erased.

Engine Speed	Time
Idling	5 minutes and 45 seconds or more
1,000 rpm	4 minutes or more
2,000 rpm	2 minutes and 30 seconds or more
3,000 rpm	1 minute and 30 seconds or more

(f) Check if there is misfire by monitoring the DTC and the freeze frame data, and then record them.
(g) Turn the ignition switch OFF and wait for at least 5 seconds.

INSPECTION PROCEDURE

HINT:

- If the other DTCs besides misfire are memorized simultaneously, perform the troubleshooting for them first.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If the misfire is not occured when the vehicle is brought to the workshop, it can be confirmed by reproducing the condition of the freeze frame data. After finishing the repair, confirm that there is no misfire (See the confirmation driving pattern).
- When either of SHORT FT #1 or LONG FT #1 the freeze frame data is over the range of ±20%, there is a possibility that the air–fuel ratio is inclining either to ”RICH” (–20% or less) or ”LEAN” (+20% or more).
- When COOLANT TEMP in the freeze frame data is less than 80˚C (176˚F), there is a possibility of misfire only during warming up.
- In case that the misfire cannot be reproduced, this may be because of the driving with the shortage of fuel, the use of improper fuel, a stain of ignition plug and etc.

1	CHECK OTHER DTC OUTPUT(BESIDES MISFIRE DTCS)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0300, P0301, P0302, P0303 and/or P0304” are output	A
”P0300, P0301, P0302, P0303 and/or P0304” and other DTCs are output	B

HINT:
If any other codes besides ”P0300, P0301, P0302, P0303 and/or P0304” are output, perform the trouble-shooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–16)**

A

2	CHECK WIRE HARNESS, CONNECTOR AND VACUUM HOSE IN ENGINE ROOM

(a) Check the connection of the wire harness and the connector.
(b) Check the vacuum hose for disconnection, blockage and break.

NG → **REPAIR OR REPLACE, THEN CONFIRM THAT THERE IS NO MISFIRE**

OK

3	READ VALUE OF HAND–HELD TESTER(NUMBER OF MISFIRE)

(a) Connect the hand–held teste to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL/CYL#1 – CYL#4”.
(e) Read the number of misfire on the hand–held tester.
HINT:
When a misfire is not reproduced, be sure to branch below based on the stored DTC.
Result:

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → **Go to step 15**

A

4	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER (See page 18–1)

OK → **Go to step 7**

NG

5	CHANGE NORMAL SPARK PLUG AND CHECK SPARK OF MISFIRING CYLINDER (See page 18–1)

OK → REPLACE SPARK PLUG

NG

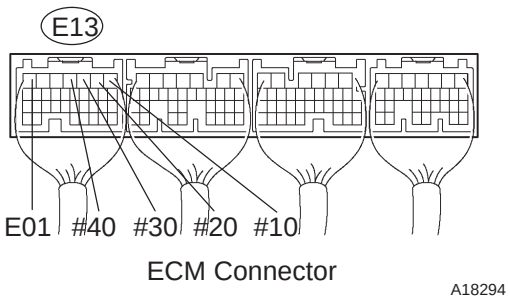
6	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(IGNITION COIL – ECM) (See page 05–103)

OK → REPLACE IGNITION COIL ASSY (THEN CONFIRM THAT THERE IS NO MISFIRE)

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

7	INSPECT ECM TERMINAL OF MISFIRING CYLINDER(#1, #2, #3 OR #4 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
#10 (E13–1) – E01 (E13–7)	8 to 14 V
#20 (E13–2) – E01 (E13–7)	
#30 (E13–3) – E01 (E13–7)	
#40 (E13–4) – E01 (E13–7)	

OK → Go to step 10

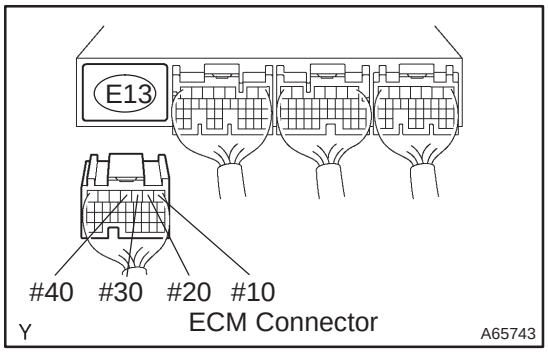
NG

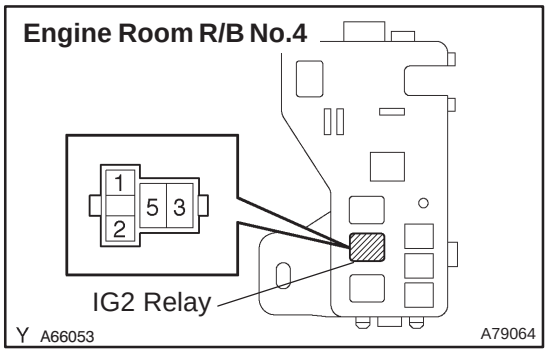
8	INSPECT FUEL INJECTOR RESISTANCE OF MISFIRING CYLINDER (See page 11–8)

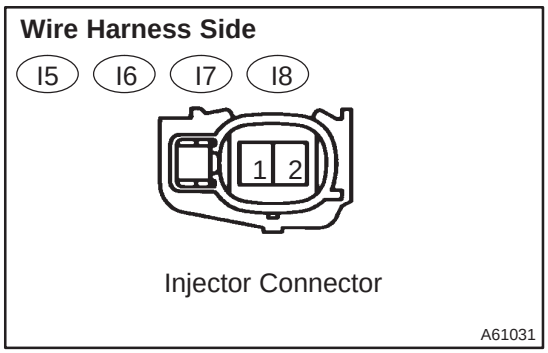
NG → REPLACE FUEL INJECTOR ASSY

OK

9	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(IG2 RELAY – INJECTOR – ECM)







(a) Disconnect the ECM E13 connector.
(b) Remove the IG2 relay from the engine room R/B No.4.
(c) Disconnect the injector connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 Relay (3) – Injector No.1 (I5–2)	Continuity
IG2 Relay (3) – Injector No.2 (I6–2)	
IG2 Relay (3) – Injector No.3 (I7–2)	
IG2 Relay (3) – Injector No.4 (I8–2)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 Relay (3) or Injector No.1 (I5–2) – Body ground	No continuity
IG2 Relay (3) or Injector No.2 (I6–2) – Body ground	
IG2 Relay (3) or Injector No.3 (I7–2) – Body ground	
IG2 Relay (3) or Injector No.4 (I8–2) – Body ground	

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Injector No.1 (I5–1) – #10 (E13–1)	Continuity
Injector No.2 (I6–1) – #20 (E13–2)	
Injector No.3 (I7–1) – #30 (E13–3)	
Injector No.4 (I8–1) – #40 (E13–4)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Injector No.1 (I5–1) or #10 (E13–1) – Body ground	No continuity
Injector No.2 (I6–1) or #20 (E13–2) – Body ground	
Injector No.3 (I7–1) or #30 (E13–3) – Body ground	
Injector No.4 (I8–1) or #40 (E13–4) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

10	INSPECT FUEL INJECTOR INJECTION AND VOLUME OF MISFIRING CYLINDER (See page 11–8)

NG → **REPLACE FUEL INJECTOR ASSY**

OK

11	CHECK CYLINDER COMPRESSION PRESSURE OF MISFIRING CYLINDER (See page 14–1)

NG → **REPAIR OR REPLACE**

OK

12	CHECK VALVE CLEARANCE OF MISFIRING CYLINDER (See page 14–6)

NG → ADJUST VALVE CLEARANCE

OK

13	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → CHECK FOR INTERMITTENT PROBLEMS

A

14	CHECK VALVE TIMING(CHECK FOR LOOSE AND JUMPING TEETH OF TIMING BELT) (See page 14–49)

NG → ADJUST VALVE TIMING

OK

15	CHECK FUEL PRESSURE (See page 11–5)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

16	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE AND MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Check the intake air temperature.
  (1) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.

  Temperature: Equivalent to ambient temperature

(d) Check the air flow rate.
  (1) Select the item ”DIAGNOSIS / OBS/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

  Standard:

Condition	Air flow rate (gm/s)
Ignition switch On (do not start engine)	0
Idling	4 to 6
Running without load (2,500 rpm)	13 to 20
Idling – Running	Air flow rate fluctuates

NG → REPLACE MASS AIR FLOW METER

OK

17	INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE) (See page 10–3)

NG → REPLACE ENGINE COOLANT TEMPERATURE SENSOR

OK

18	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → AGAIN GO TO STEP5

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)

DTC	P0325	KNOCK SENSOR 1 CIRCUIT MALFUNCTION (BANK 1)

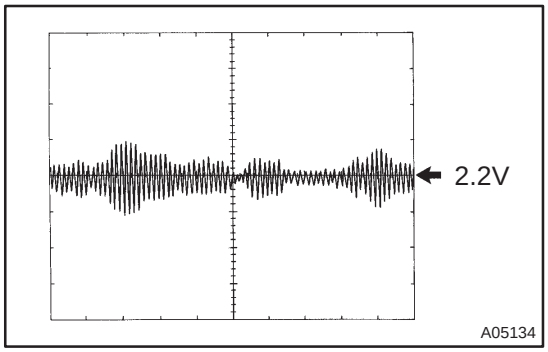
CIRCUIT DESCRIPTION

Knock sensor is fitted on the cylinder block to detect the engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is delayed to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor signal to the ECM with engine speed 3,000 rpm or more	• Open or short in knock sensor circuit • Knock sensor (under–torqued or loose) • ECM

HINT:

If the ECM detects the DTC "P0325", it enters the fail–safe mode in which the corrective retarded angle value is set to the maximum value.



Reference:

Inspection using the oscillascope.

(1) Run the engine at 4,000 rpm, check the waveform between terminal KNKL of the ECM connector and body ground.

HINT:

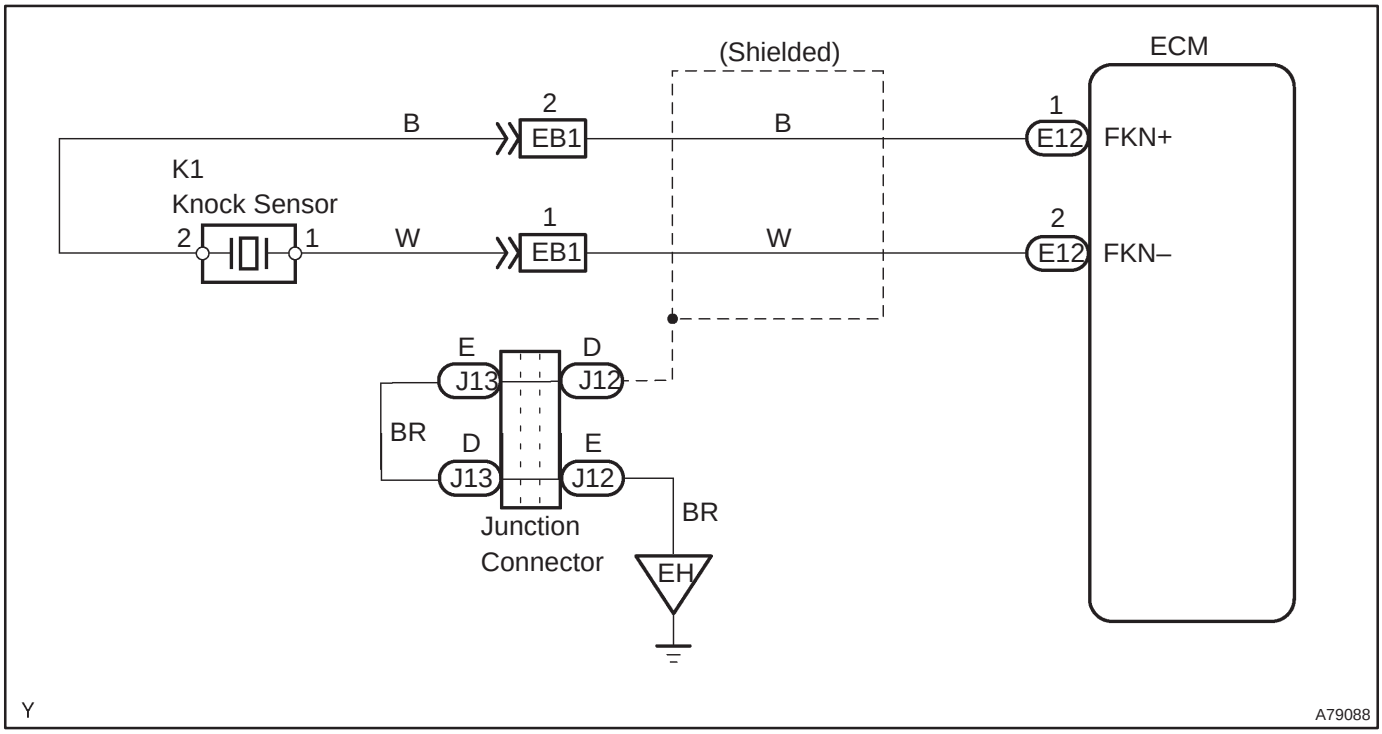
The correct waveform is as shown on the left.

(2) Spread the time on the horizontal axis, and confirm that period of the wave is 80 μ seconds (Normal mode vibration frequency of knock sensor: 11.7 kHz).

HINT:

If the vibration frequency in the normal mode is not 11.7 kHz, the sensor is out of order.

WIRING DIAGRAM

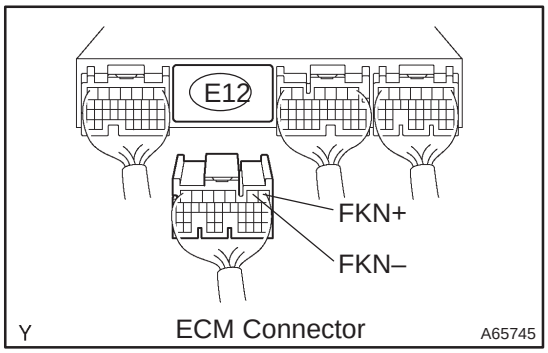


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK HARNESS AND CONNECTOR



(a) Disconnect the E12 ECM connector.
(b) Check for continuity between the wire harness side connectors.

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
FKN+ (E12–1) – FKN– (E12–2)	No continuity

OK → **Go to step 3**

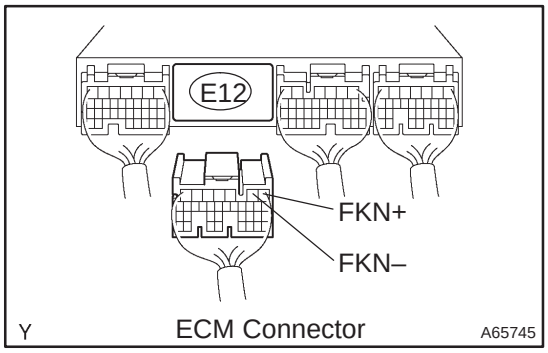
NG

2	INSPECT KNOCK SENSOR (See page 10–3)

NG → **REPLACE KNOCK SENSOR**

OK

3	CHECK HARNESS AND CONNECTOR(ECM – KNOCK SENSOR)



(a) Disconnect the E12 ECM connector.
(b) Disconnect the knock sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
FKN+ (E12–1) – Knock sensor (K1–2)	Continuity
FKN– (E12–2) – Knock sensor (K1–1)	

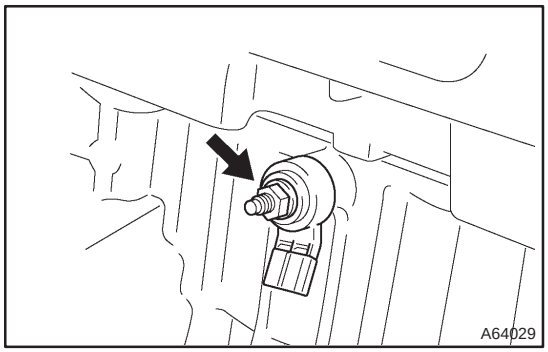
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
FKN+ (E12–1) or Knock sensor (K1–2) – Body ground	No continuity
FKN– (E12–2) or Knock sensor (K1–1) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CONFIRM THE MALFUNCTION DISAPPEAR WHEN A GOOD KNOCK SENSOR IS INSTALLED



(a) Change the knock sensor to a new one.
  (1) Remove the knock sensor.
  (2) Install a new knock sensor.
  Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
(b) Clear the DTC (See page 05–5).
(c) Perform the driving test.
(d) Read the DTC using the hand–held tester (See page 05–5).

Result:

Display (DTC output)	Proceed to
”P0325” is output	A
”P0325” is not output	B

B → **REPLACE KNOCK SENSOR**

A

CHECK AND REPLACE ECM(See page 01–32)

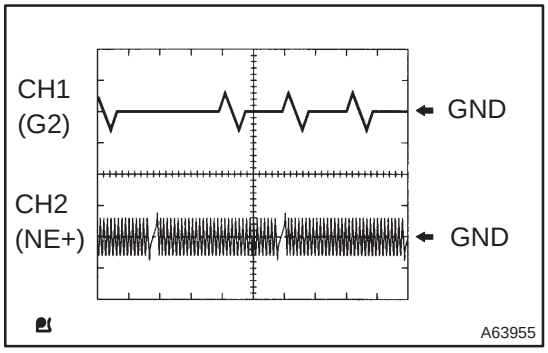
DTC	P0335	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT MALFUNCTION

DTC	P1335	CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION (DURING ENGINE RUNNING)

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a magnet, iron core and pick up coil.
The NE signal plate (crankshaft timing pulley) has 34 teeth and is installed to the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signals, and the cylinder and the angle of the VVT based on the combination of the G2 and NE signals.

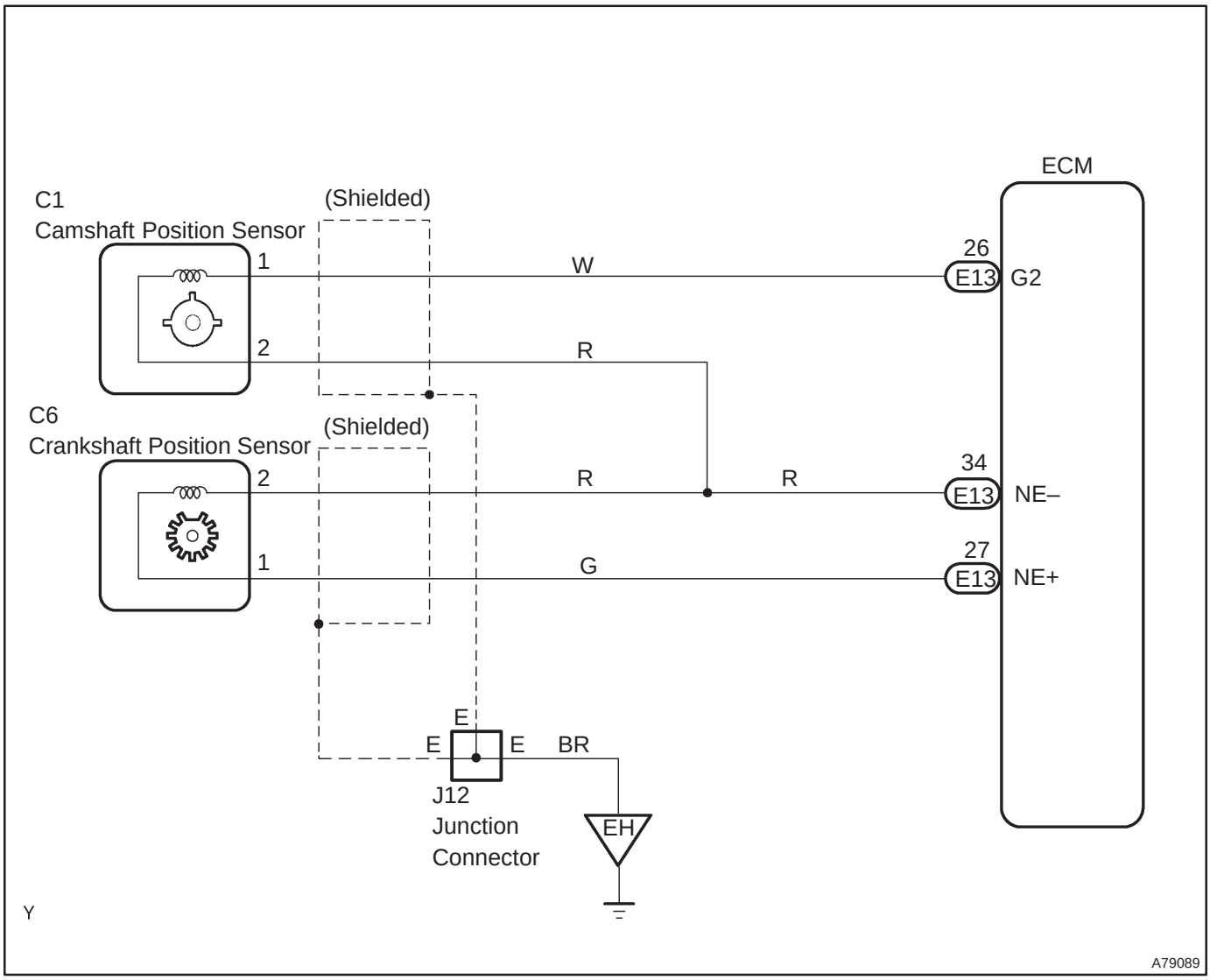
DTC No.	DTC Detecting Condition	Trouble Area
P0335	• No crankshaft position sensor signal to the ECM during cranking • Open in NE– circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM
P1335	If conditions from (a) through (c) are met: (a) NE greater than 1,000 rpm (b) NE signal is not detected for over 0.05 sec. (c) Not during cranking	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM



Reference: Inspection using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G2 – NE– CH2: NE+ – NE–
Equipment Set	5V/DIV, 20ms/DIV
Condition	During cranking or idling

WIRING DIAGRAM

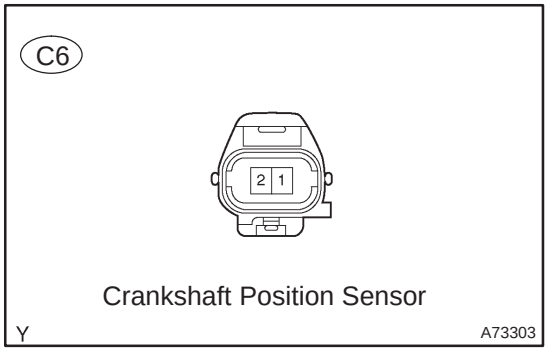


INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- Perform troubleshooting on ”DTC P0335” first. If no trouble is found, troubleshoot the following mechanical system.

1 INSPECT CRANKSHAFT POSITION SENSOR(CHECK RESISTANCE)



(a) Measure the resistance between the terminals of the crankshaft posision sensor connector.

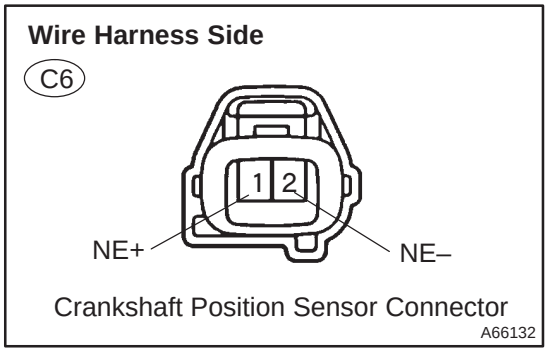
Resistance:
985 to 1,600 Ω (Cold)
1,265 to 1,890 Ω (Hot)

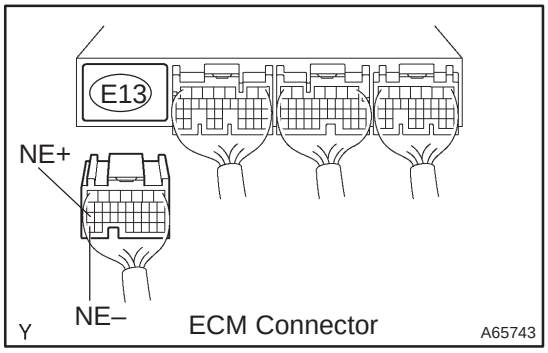
NOTICE:
"Cold" and "Hot" mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **REPLACE CRANKSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(ECM – CRANKSHAFT POSITION SENSOR)





(a) Disconnect the crankshaft position sensor connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
NE+ (C6–1) – NE+ (E13–27)	Continuity
NE– (C6–2) – NE– (E13–34)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
NE+ (C6–1) or NE+ (E13–27) – Body ground	No continuity
NE– (C6–2) or NE– (E13–34) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION

(a) Check the crankshaft position sensor installation .

NG → **TIGHTEN SENSOR**

OK

4	INSPECT CRANKSHAFT(TEETH OF SIGNAL PLATE)

(a) Remove the oil pump assembly. (See page 17–3)
(b) Check the teeth of the signal plate.

NG → REPAIR OR REPLACE CRANKSHAFT

OK

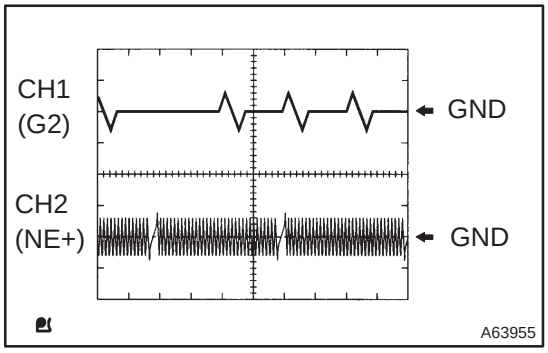
CHECK AND REPLACE ECM (See page 01–32)

DTC	P0340	CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

The camshaft position sensor (G2 signal) consists of a magnet, iron core and pickup coil.
The G2 signal plate has 3 teeth on its outer circumference and is installed on the camshaft timing pulley. When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil changes, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate (crankshaft timing pulley) has 34 teeth and is installed to the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signals, and the cylinder and the angle of the VVT based on the combination of the G2 and NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0340	• No camshaft position sensor signal to the ECM during cranking • Open in NE– circuit	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Intake camshaft • Timing chain has jumped a tooth • ECM



Reference: Inspection using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G2 – NE– CH2: NE+ – NE–
Equipment Set	5V/DIV, 20ms/DIV
Condition	During cranking or idling

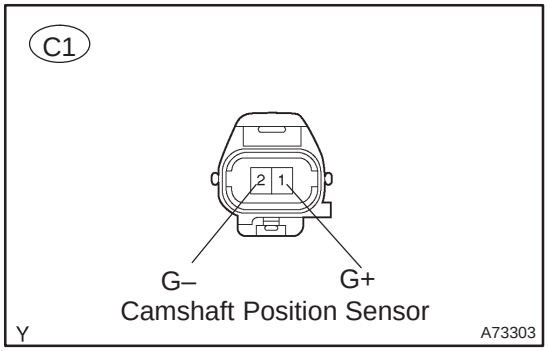
WIRING DIAGRAM

Refer to DTC P0335 on page05–84.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT CAMSHAFT POSITION SENSOR(CHECK RESISTANCE)



(a) Measure the resistance between the terminals of the camshaft posision sensor connector.

Resistance:

1,630 to 2,740 Ω (Cold)

2,065 to 3,225 Ω (Hot)

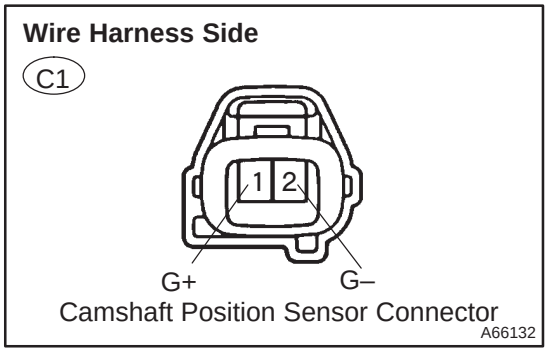
NOTICE:

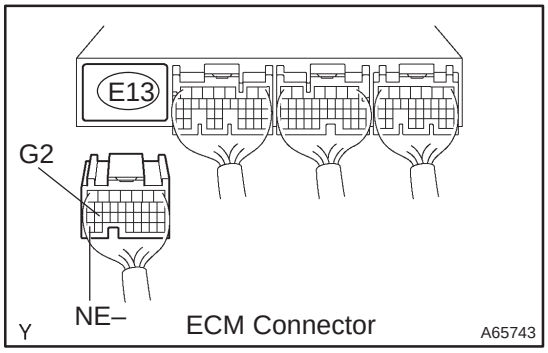
"Cold" and "Hot" mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **REPLACE CAMSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(ECM – CAMSHAFT POSITION SENSOR)





(a) Disconnect the camshaft position sensor connector.

(b) Disconnect the E13 ECM connector.

(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
G+ (C1–1) – G2 (E13–26)	Continuity
G– (C1–2) – NE– (E13–34)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
G+ (C1–1) or G2+ (E13–26) – Body ground	No continuity
G– (C1–2) or NE– (E13–34) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION

(a) Check the camshaft position sensor installation.

NG → **TIGHTEN SENSOR**

OK

4	INSPECT CAMSHAFT

(a) Check the teeth of the signal plate.

NG → **REPAIR OR REPLACE CAMSHAFT**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0420	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

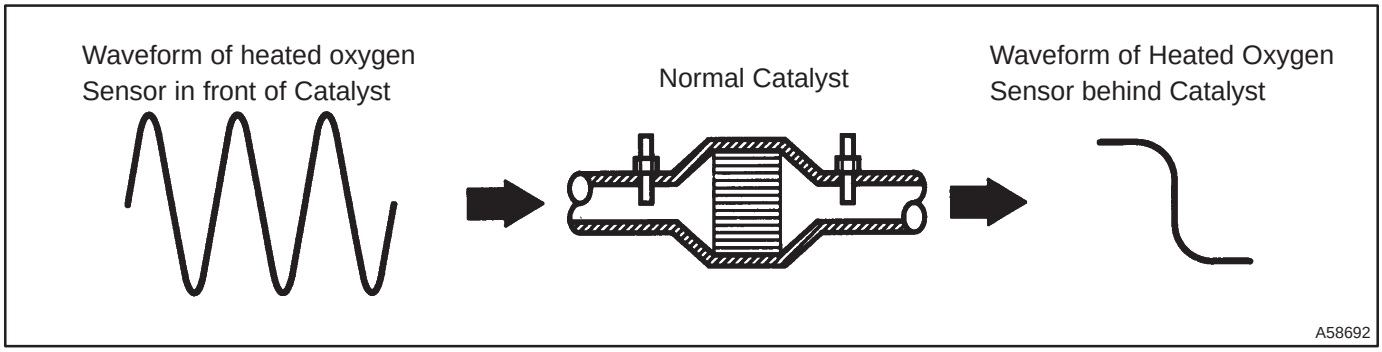
CIRCUIT DESCRIPTION

The ECM compares the 2 waveforms of the heated oxygen sensors located before and after the catalyst to determine whether or not the catalyst performance has deteriorated.

Air–fuel ratio feedback compensation keeps the waveform of the heated oxygen sensor in front of the catalyst alternates between back and forth, from rich to lean.

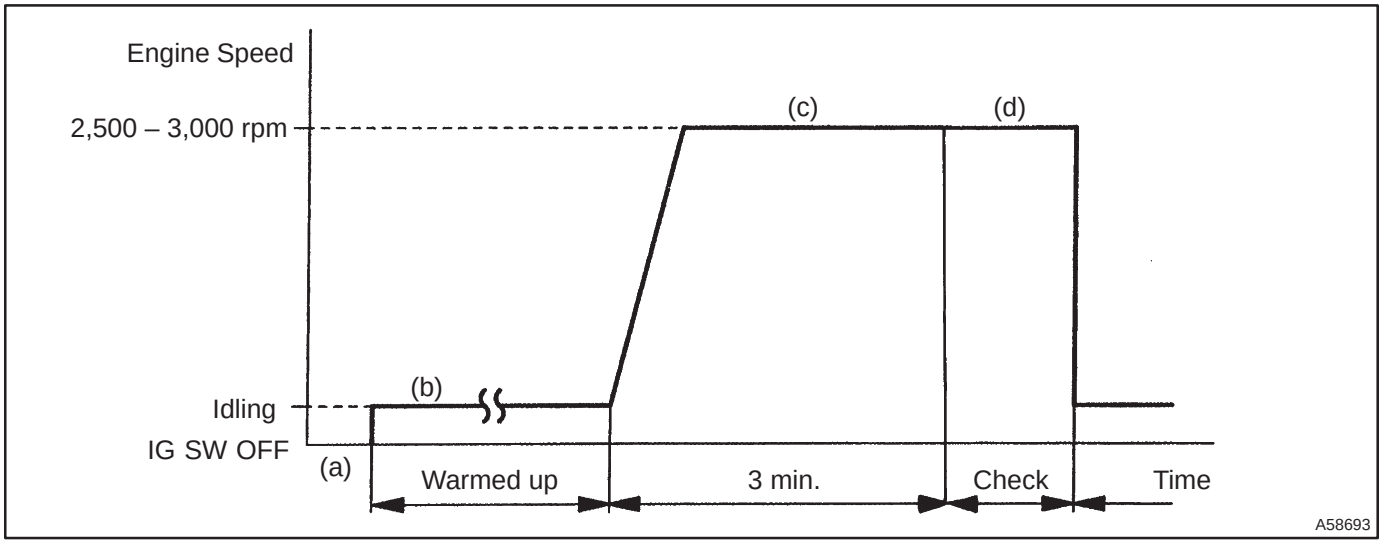
If the catalyst is functioning normally, the waveform of the heated oxygen sensor behind the catalyst switches back and forth between rich and lean much more slowly than the waveform of the heated oxygen sensor in front of the catalyst.

When both waveforms change at a similar rate, it indicates that the catalyst performance has deteriorated.



DTC No.	DTC Detecting Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, waveforms of heated oxygen sensors have same amplitude (2 trip detection logic)	• Gas leakage in exhaust system • Heated oxygen sensor • Three–way catalytic converter • ECM

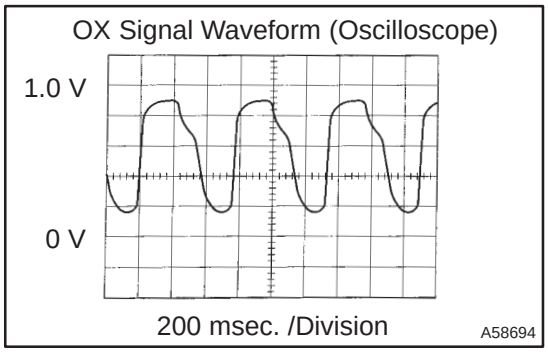
CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3, or connect the probe of the oscilloscope between terminals HT1A, HT1B, OX1A, OX1B and E1 of the ECM connector.
(b) Start the engine and warm it up with all the accessories switched OFF until the engine coolant temperature is stable.
(c) Run the engine at 2,500 to 3,000 rpm for about 3 min.
(d) After confirming that the waveform of the heated oxygen sensor (bank 1 sensor 1 (OX)) which oscillates around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor (bank 1 sensor 2 (OX)).

HINT:

- If there is a malfunction in the system, the waveform of the heated oxygen sensor (bank 1 sensor 2 (OX)) is similar to the wave from of the heated oxygen sensor (bank 1 sensor 1 (OX)) snown in the diagram on the left.
- There are some cases that, even though a malfunction exists, the CHK ENG may not be illuminated.



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ OUTPUT DTC(BESIDES P0420)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0420” is output	A
”P0420” and other DTCs are output	B

HINT:
If any other codes besides ”P0420” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–16)**

A

2	CHECK FOR EXHAUST GAS LEAKS

NG → REPAIR OR REPLACE

OK

3	INSPECT HEATED OXYGEN SENSOR(BANK 1 SENSOR 1) (See Page 12–3)

NG → REPAIR OR REPLACE HEATED OXYGEN SENSOR

OK

4	INSPECT HEATED OXYGEN SENSOR(BANK 1 SENSOR 2) (See Page 12–3)

NG → REPAIR OR REPLACE HEATED OXYGEN SENSOR

OK

REPLACE THREE–WAY CATALYTIC CONVERTER

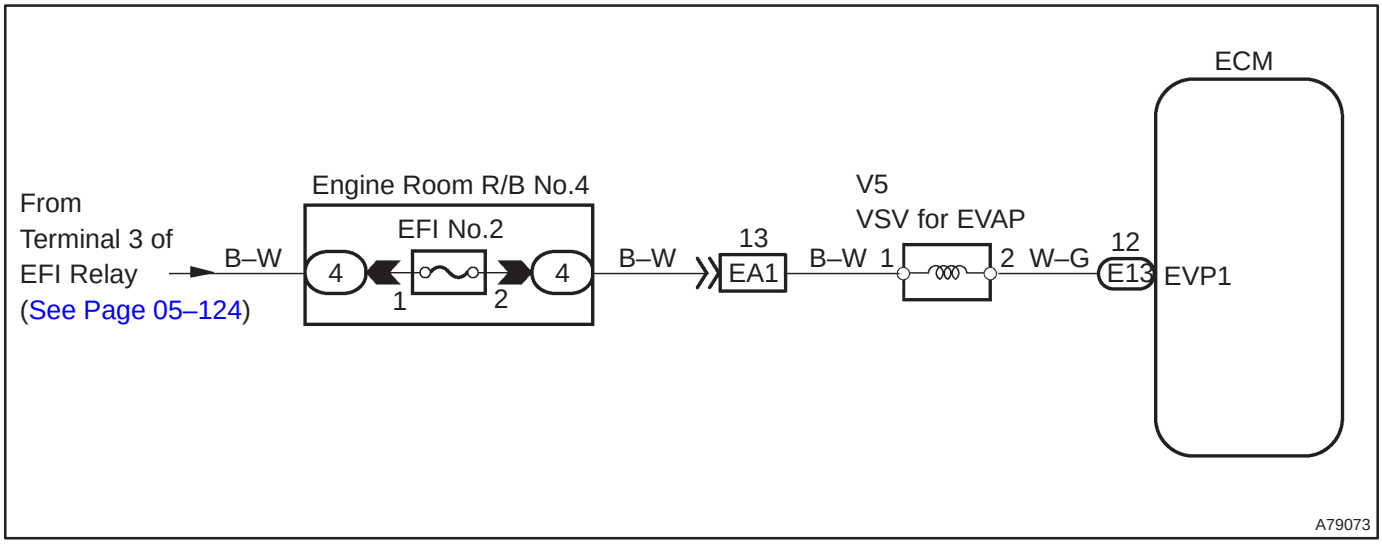
DTC	P0443	EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

To reduce HC emissions, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.
The ECM changes the duty signal to the VSV for EVAP so that the intake quantity of HC emissions becomse properly for the driving conditions (engine load, engine speed, vehicle speed, etc.) after the engine is warmed up.

DTC No.	DTC Detecting Condition	Trouble Area
P0443	Proper response to ECM command does not occur (1 trip detection logic)	• Open or short in VSV for EVAP circuit • VSV for EVAP • ECM

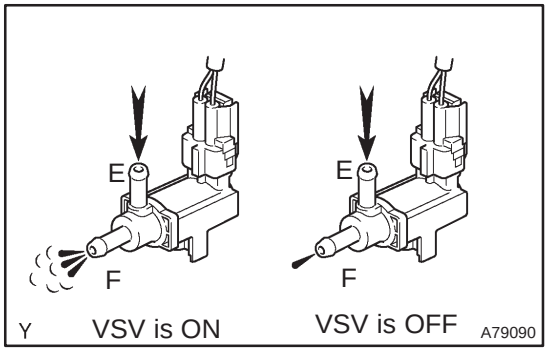
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR EVAP)



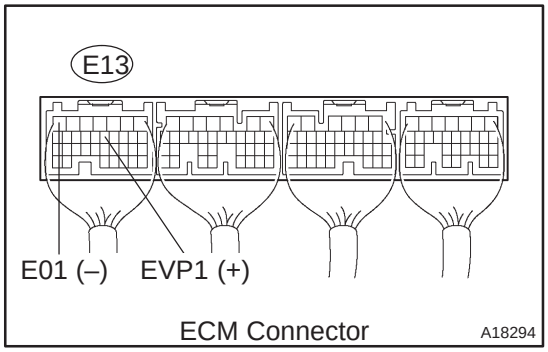
(a) Select the ACTIVE TEST mode on the hand–held tester.
(b) Disconnect the vacuum hose from the VSV for EVAP.
(c) Start the engine.
(d) When the VSV for EVAP is operated by the hand–held tester, apply the disconnected hose to your finger to check the suction.

Result:
VSV is ON: Disconnected port sucks.
VSV is OFF: Disconnected port does not suck.

OK → **CHECK FOR INTERMITTENT PROBLEMS**

NG

2 INSPECT ECM(CHECK VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
EVP1 (E13–12) – E01 (E13–7)	8 to 14 V

OK → **CHECK AND REPLACE ECM**

NG

3 INSPECT VACUUM SWITCHING VALVE ASSY NO.1

NG → **REPLACE VACUUM SWITCHING VALVE ASSY NO.1**

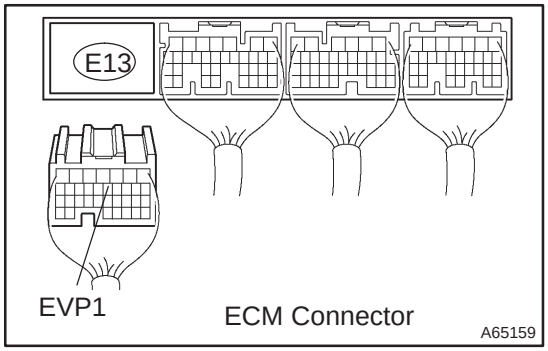
OK

4 CHECK FUSE(EFI No.2) (See page 05–45)

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

5 CHECK HARNESS AND CONNECTOR(ECM – VSV FOR EVAP)



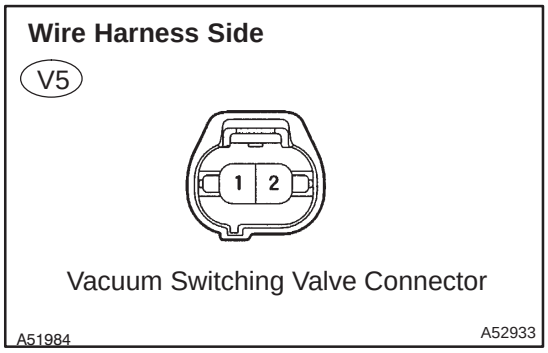
(a) Disconnect the E13 ECM connector.
(b) Disconnect the VSV connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV (V5–2) – EVP1 (E13–12)	Continuity

Standard (Check for short):

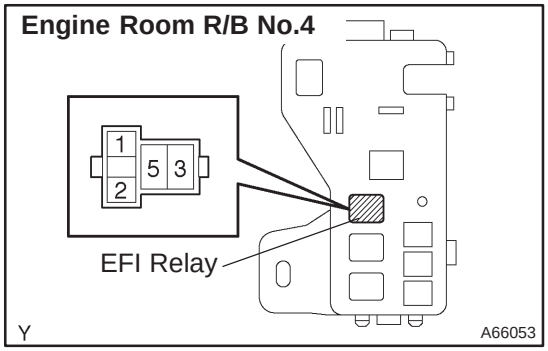
Symbols (Terminal No.)	Specified condition
VSV (V5–2) or EVP1 (E13–12) – Body ground	No continuity

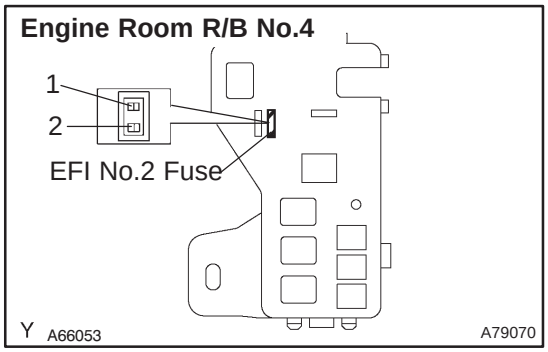


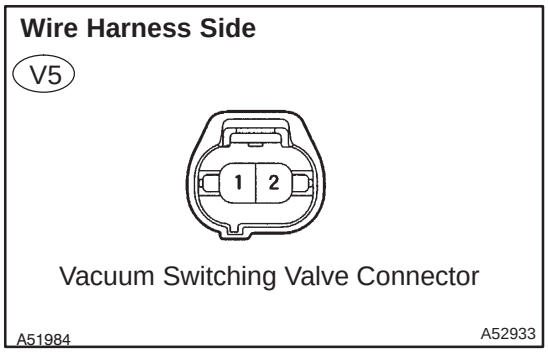
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 CHECK HARNESS AND CONNECTOR(EFI RELAY – VSV FOR EVAP)







(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the EFI No.2 fuse from the engine room R/B No.4.
(c) Disconnect the VSV connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – EFI No.2 fuse (1)	Continuity
EFI No.2 fuse (2) – VSV (V5–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or EFI No.2 fuse (1) – Body ground	No continuity
EFI No.2 fuse (2) or VSV (V5–1) – Body ground	

NOTICE:
Do not insert the tester leads hard in the procedure (c), the holder may be damaged.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

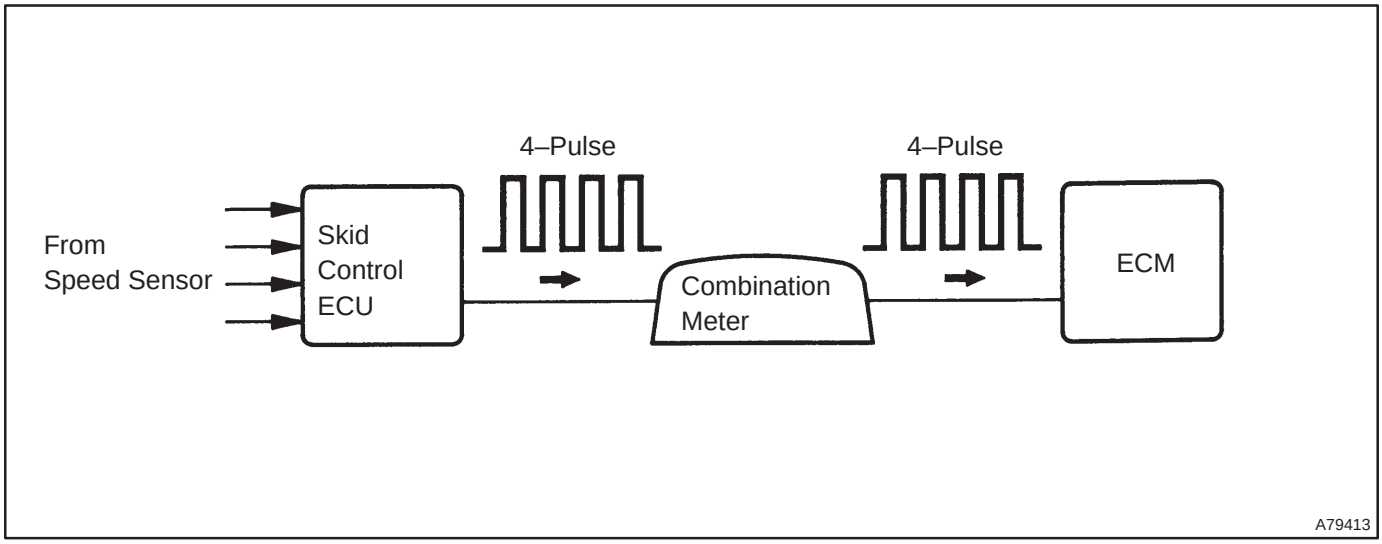
CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–124)

DTC	P0500	VEHICLE SPEED SENSOR MALFUNCTION

CIRCUIT DESCRIPTION

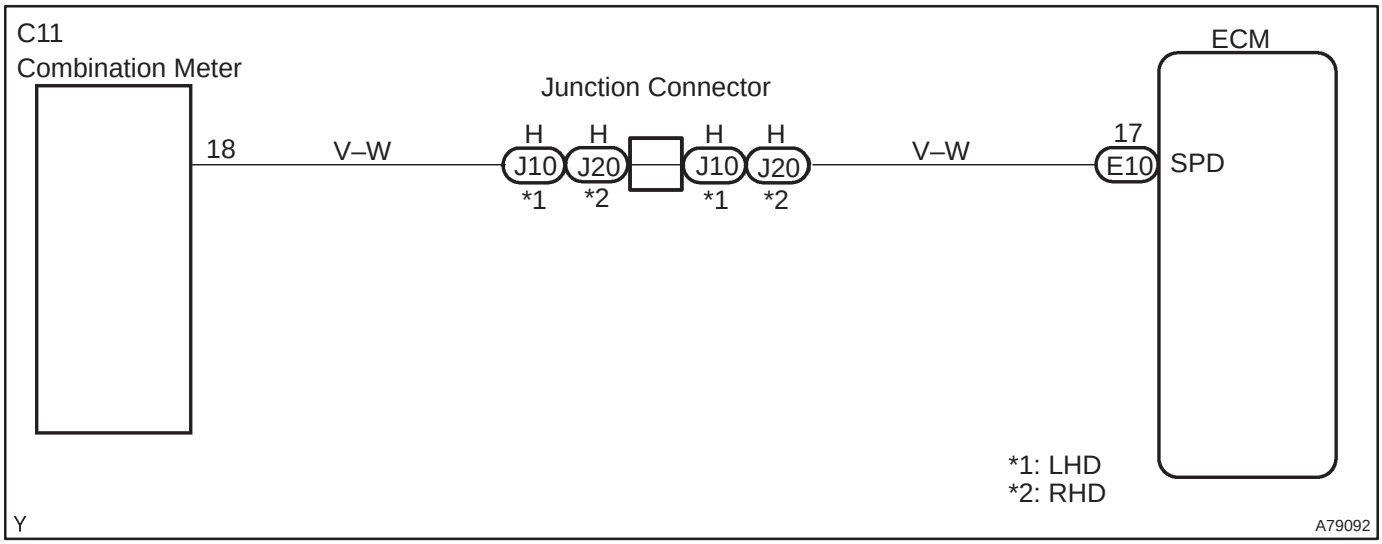
The speed sensor for skid control ECU detects the wheel speed and sends the appropriate signals to the skid control ECU.

The skid control ECU converts these signals into a 4–pulse signal and outputs it to the combination meter. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	During the vehicle is being driven, no vehicle speed sensor signal to the ECM (1 trip detection logic: A/T) (2 trip detection logic: M/T)	• Open or short in speed sensor circuit • Speed sensor • Combination meter • ECM • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OPERATION OF SPEEDOMETER(SPEEDOMETER OPERATION)

(a) Drive the vehicle and check that the operation of the speedometer in the combination meter is normal.

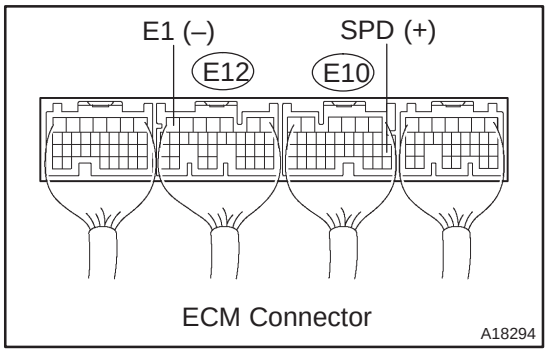
HINT:

The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → CHECK SPEEDOMETER CIRCUIT

OK

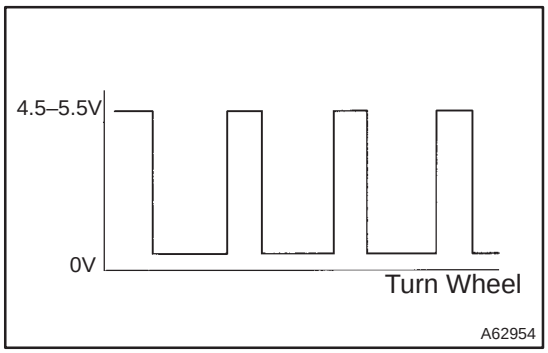
2	INSPECT ECM(CHECK VOLTAGE)



(a) Shift the lever to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch ON.
(d) Measure the voltage between the terminals of the E10 and E12 ECM connectors as the wheel is turned slowly.

Standard:

Symbols (Terminal No.)	Specified condition
SPD (E10–17) – E1 (E12–7)	Generated intermittently



HINT:

The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.

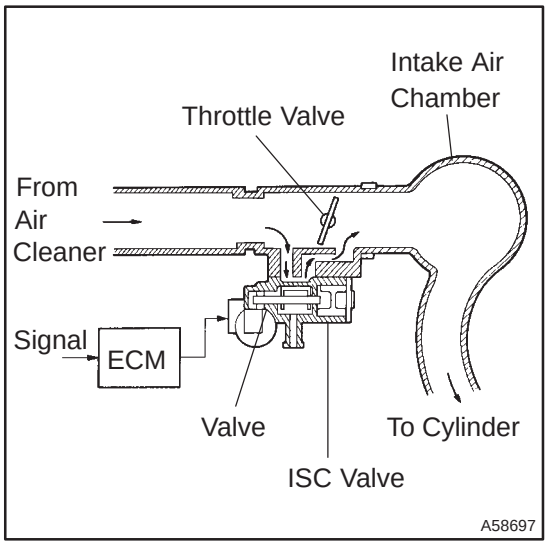
NG → REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC P0505 IDLE CONTROL SYSTEM MALFUNCTION

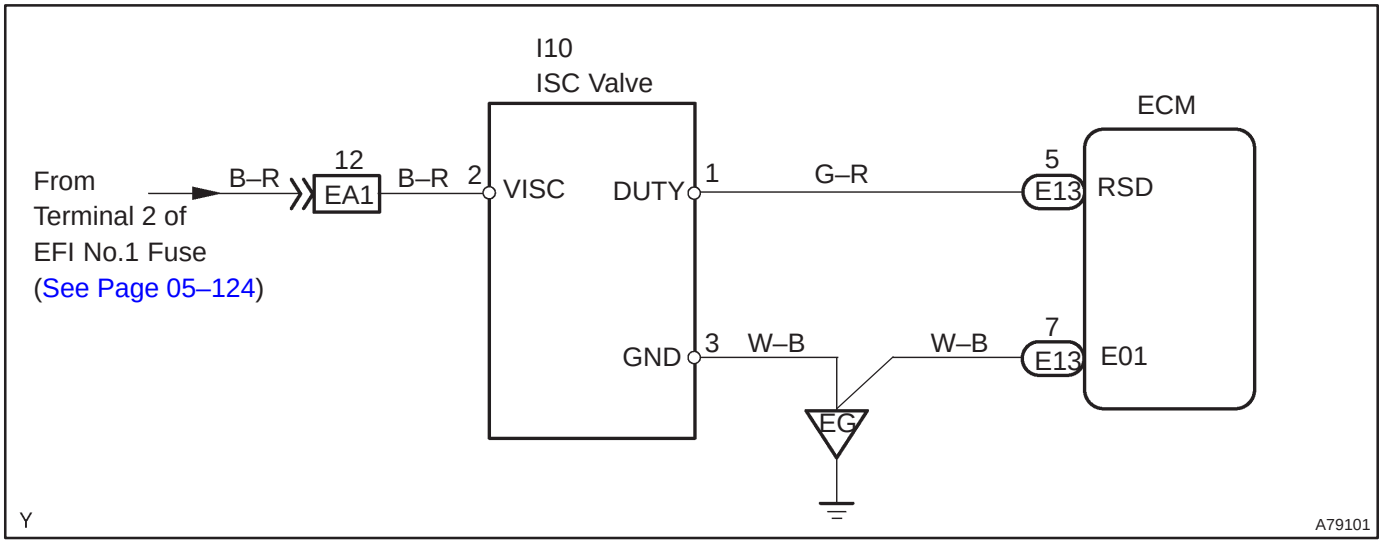
CIRCUIT DESCRIPTION



The rotary solenoid type of the idle speed control (ISC) valve is located under the throttle body and intake air bypassing the throttle valve is directed to the ISC valve through the passage. In this way the intake air volume bypassing the throttle valve is regulated, controls the engine speed.
The ECM operates the ISC valve only to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (1 trip detection logic)	• Open or short in ISC valve circuit • ISC valve is stuck or closed • PCV hose • A/C switch circuit • Air induction system • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

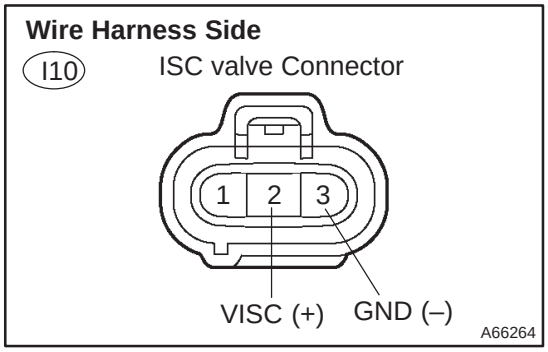
1	PERFORM ACTIVE TEST USING HAND–HELD TESTER(CHECK ISC VALVE OPERATION)

(a) Warm up the engine to the normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the A/C.
(d) Shift the lever to the neutral position.
(e) Connect the hand–held tester to the DLC3 on the vehicle.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / ISC DUTY RATIO”.
(g) Check that the engine RPM varies when changing the ISC duty ratio.
Engine RPM:
Engine RPM fluctuates ups and downs in respose to the ISC duty ratio variation.

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)**

NG

2	CHECK HARNESS AND CONNECTOR



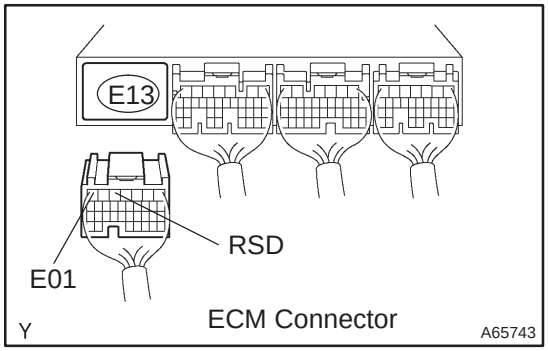
(a) Disconnect the ISC valve connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the ISC valve wire harness side connector.
Standard:

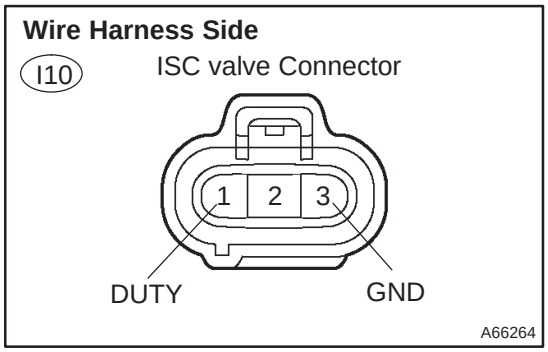
Symbols (Terminal No.)	Specified condition
VISC (I10–2) – GND (I10–3)	9 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK HARNESS AND CONNECTOR(RSD CIRCUIT)





(a) Disconnect the ISC valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
DUTY (I10–1) – RSD (E13–5)	Continuity
GND (I10–3) – E01 (E13–7)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
DUTY (I10–1) or RSD (E13–5) – Body groundr	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY (See page 10–1)

NG → **REPLACE THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P1300	IGNITER CIRCUIT MALFUNCTION (NO.1)

DTC	P1305	IGNITER CIRCUIT MALFUNCTION (NO.2)

DTC	P1310	IGNITER CIRCUIT MALFUNCTION (NO.3)

DTC	P1315	IGNITER CIRCUIT MALFUNCTION (NO.4)

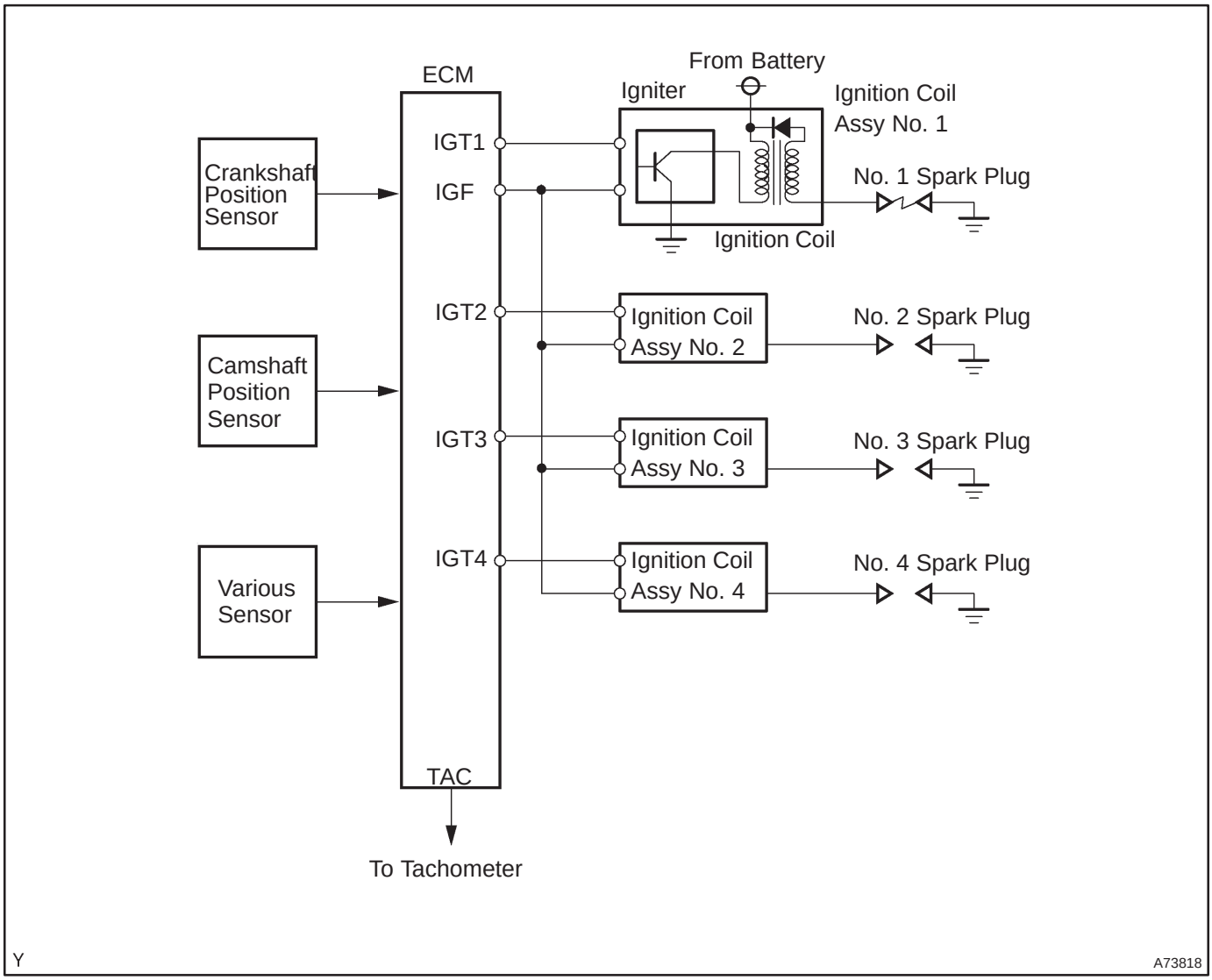
CIRCUIT DESCRIPTION

HINT:

- If DTC P1300 is displayed, check No.1 ignition coil with igniter circuit.
- If DTC P1305 is displayed, check No.2 ignition coil with igniter circuit.
- If DTC P1310 is displayed, check No.3 ignition coil with igniter circuit.
- If DTC P1315 is displayed, check No.4 ignition coil with igniter circuit.

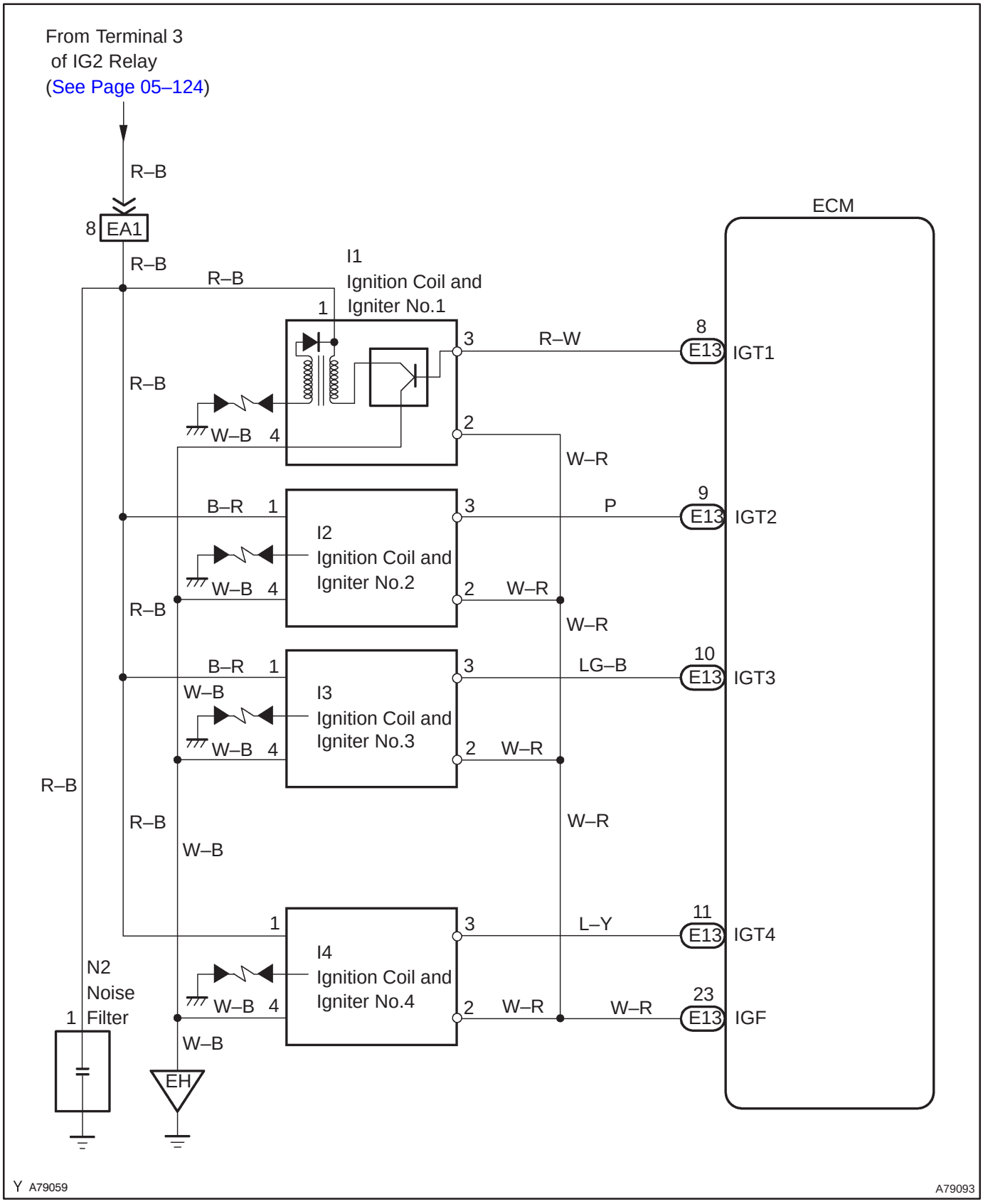
A Direct Ignition System (DIS) has been adopted. The DIS improves the ignition timing accuracy, reduces the high–voltage loss, and enhances overall reliability of the ignition system by eliminating the distributor. The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the spark plug is connected to the end of the secondary coil. High voltage generated in the secondary coil is applied directly to the spark plug. The spark of the spark plug passes through from the center electrode to the ground electrode.

The ECM determines ignition timing and outputs the ignition (IGT) signals of each cylinder. Based on IGT signals, the power transistors cut off the current to the primary coil in the ignition coil. At the same time, the igniter also sends an ignition confirmation (IGF) signal as a fail–safe measurement to the ECM.



DTC No.	DTC Detecting Condition	Trouble Area
P1300 P1305 P1310 P1315	No IGF signal to the ECM while engine is running	• Ignition system • Open or short in IGF or IGT1 circuit from No. 1 ignition coil with igniter to ECM • No.1 – No.4 ignition coil with igniter • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 PERFORM SIMULATION TEST

(a) Clear the DTC (See page 05–5)

(b) Shuffle arrangement of the ighition coil and igniters.

NOTICE:

Do not shuffle the connectors.

(c) Perform the simulation test.

(d) Clear the DTC (See page 05–5)

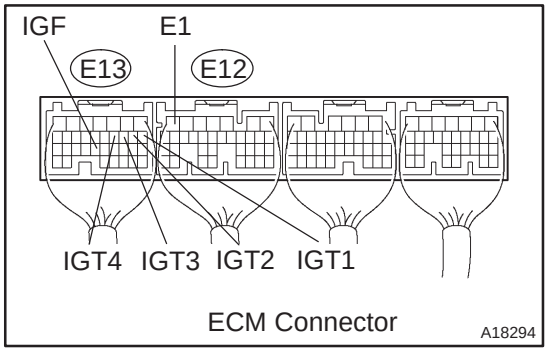
Result:

Display (DTC output)	Proceed to
The same DTC is output again	A
The other DTC is output	B

B → **REPLACE IGNITION COIL**

A

2 INSPECT ECM(IGT1, IGT2, IGT3, IGT4 AND IGF SIGNAL)



(a) Inspection using the oscilloscope.

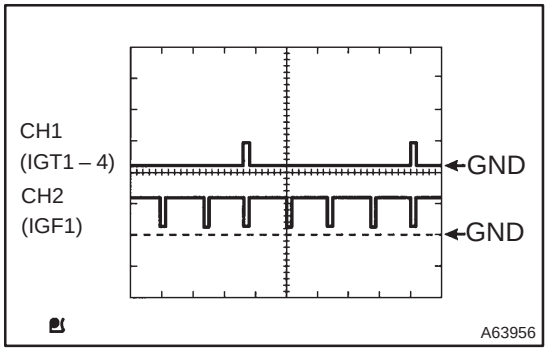
(b) During cranking or idling, check the waveform between terminals IGT1 to IGT4 and E1, and IGF1 and E1 of the ECM connector.

Standard:

Item	Contents
Terminal	CH1: IGT1, IGT2, IGT3, IGT4 – E1 CH2: IGF – E1
Equipment Set	2V/DIV, 20ms/DIV
Condition	While the engine is cranking or idling

HINT:

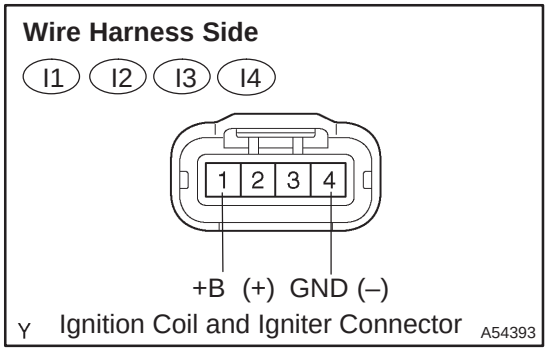
Correct waveform is as shown in the diagram on the left.



NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

3 INSPECT IGNITION COIL(POWER SOURCE)



(a) Disconnect the ignition coil and igniter connector.
(b) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
GND (I1–4) – Body ground	Continuity
GND (I2–4) – Body ground	
GND (I3–4) – Body ground	
GND (I4–4) – Body ground	

(c) Turn the ignition switch ON.
(d) Measure the voltage between the terminals of the ignition coil and igniter connector.

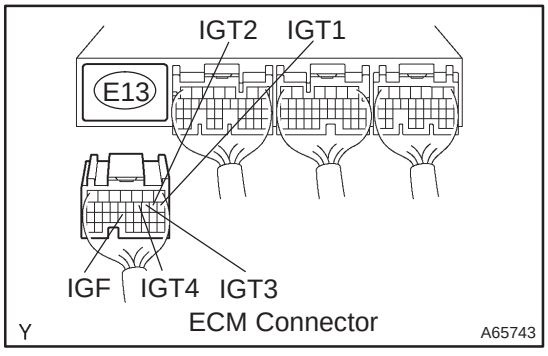
Standard:

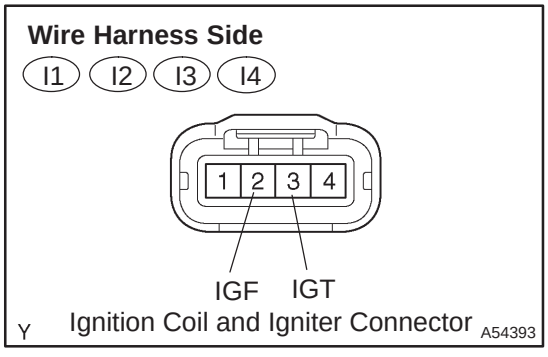
Symbols (Terminal No.)	Specified condition
+B (I1–1) – GND (4)	9 to 14 V
+B (I2–1) – GND (4)	
+B (I3–1) – GND (4)	
+B (I4–1) – GND (4)	

NG → **Go to step 5**

OK

4 CHECK HARNESS AND CONNECTOR(ECM – IGNITION COIL)





HINT:
The procedure below is for No.1 cylinder. If a malfunction is found on other cylinders, check the circuit for the cylinder with referring to this procedure.

(a) Disconnect the ignition coil and igniter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IGT (I1–3) – IGT1 (E13–8)	Continuity
IGT (I2–3) – IGT2 (E13–9)	
IGT (I3–3) – IGT3 (E13–10)	
IGT (I4–3) – IGT4 (E13–11)	
IGF (I1–2) – IGF (E13–23)	
IGF (I2–2) – IGF (E13–23)	
IGF (I3–2) – IGF (E13–23)	
IGF (I4–2) – IGF (E13–23)	

Standard (Check for short):

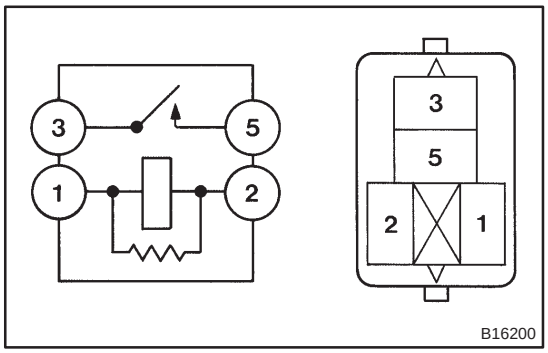
Symbols (Terminal No.)	Specified condition
IGT (I1–3) or IGT1 (E13–8) – Body ground	No continuity
IGT (I2–3) or IGT2 (E13–9) – Body ground	
IGT (I3–3) or IGT3 (E13–10) – Body ground	
IGT (I4–3) or IGT4 (E13–11) – Body ground	
IGF (I1–2) or IGF (E13–23) – Body ground	
IGF (I2–2) or IGF (E13–23) – Body ground	
IGF (I3–2) or IGF (E13–23) – Body ground	
IGF (I4–2) or IGF (E13–23) – Body ground	

NG → **REPLACE HARNESS OR CONNECTOR**

OK

REPLACE IGNITION COIL

5 INSPECT IG2 RELAY



(a) Remove the IG2 relay from the engine room R/B No.4.
(b) Inspect the IG2 relay.

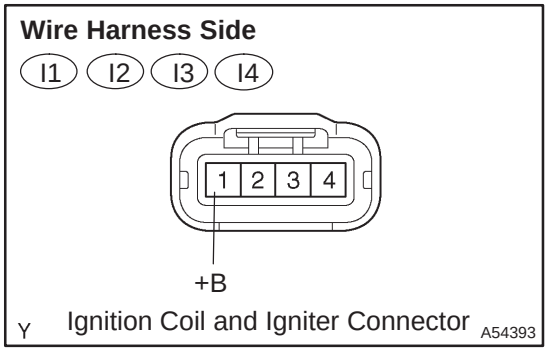
Standard:

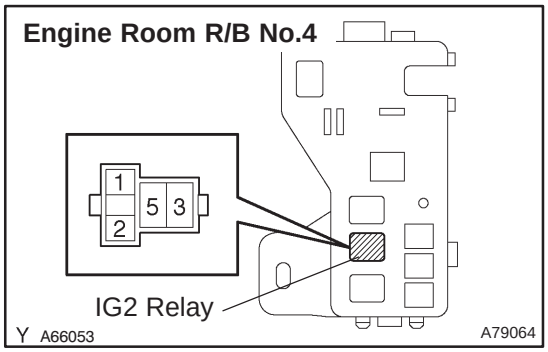
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE IG2 RELAY**

OK

6 CHECK HARNESS AND CONNECTOR(IG2 RELAY – IGNITION COIL)





(a) Disconnect the ignition coil and igniter connector.
(b) Remove the IG2 relay from the engine room R/B No.4.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (I1–1) – IG2 relay (3)	Continuity
+B (I2–1) – IG2 relay (3)	
+B (I3–1) – IG2 relay (3)	
+B (I4–1) – IG2 relay (3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (I1–1) or IG2 relay (3) – Body ground	No continuity
+B (I2–1) or IG2 relay (3) – Body ground	
+B (I3–1) or IG2 relay (3) – Body ground	
+B (I4–1) or IG2 relay (3) – Body ground	

NG → **REPLACE HARNESS OR CONNECTOR**

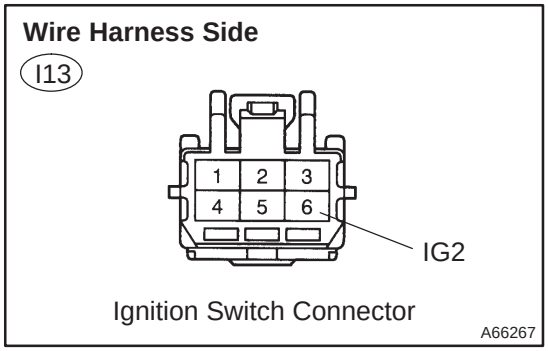
OK

7 CHECK FUSE(IGN FUSE) (See page 05–124)

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

8 CHECK HARNESS AND CONNECTOR(IGNITION SWITCH – IG2 RELAY)



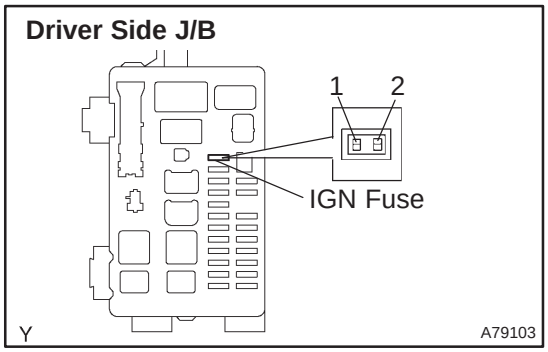
(a) Disconnect the battery negative (–) terminal.
(b) Disconnect the ignition switch connector.
(c) Remove the IGN fuse from the driver side J/B.
(d) Remove the IG2 relay from the engine room R/B No.4.
(e) Check for continuity between the wire harness side connectors.

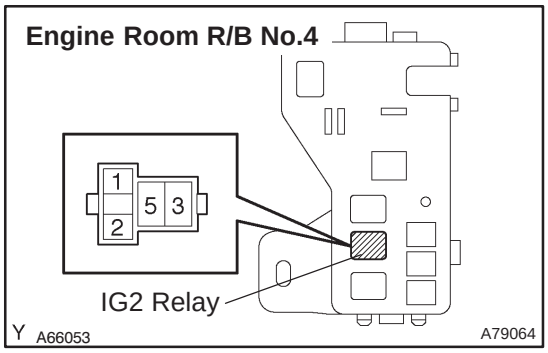
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) – IGN fuse (1)	Continuity
IGN fuse (2) – IG2 relay (1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) or IGN fuse (1) – Body ground	No continuity
IGN fuse (2) or IG2 relay (1) – Body ground	





NG → **REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE POWER SOURCE CIRCUIT

DTC	P1346	VVT SENSOR/CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (BANK 1)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page 05–84

DTC No.	Detection Item	Trouble Area
P1346	Deviation in crankshaft position sensor signal and camshaft position sensor signal (2 trip detection logic)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM

WIRING DIAGRAM

Refer to DTC P0335 on page 05–84

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK VALVE TIMING (See page 14–49)

NG → ADJUST VALVE TIMING (See page 14–49)

OK

CHECK AND REPLACE ECM (See page 01–32)

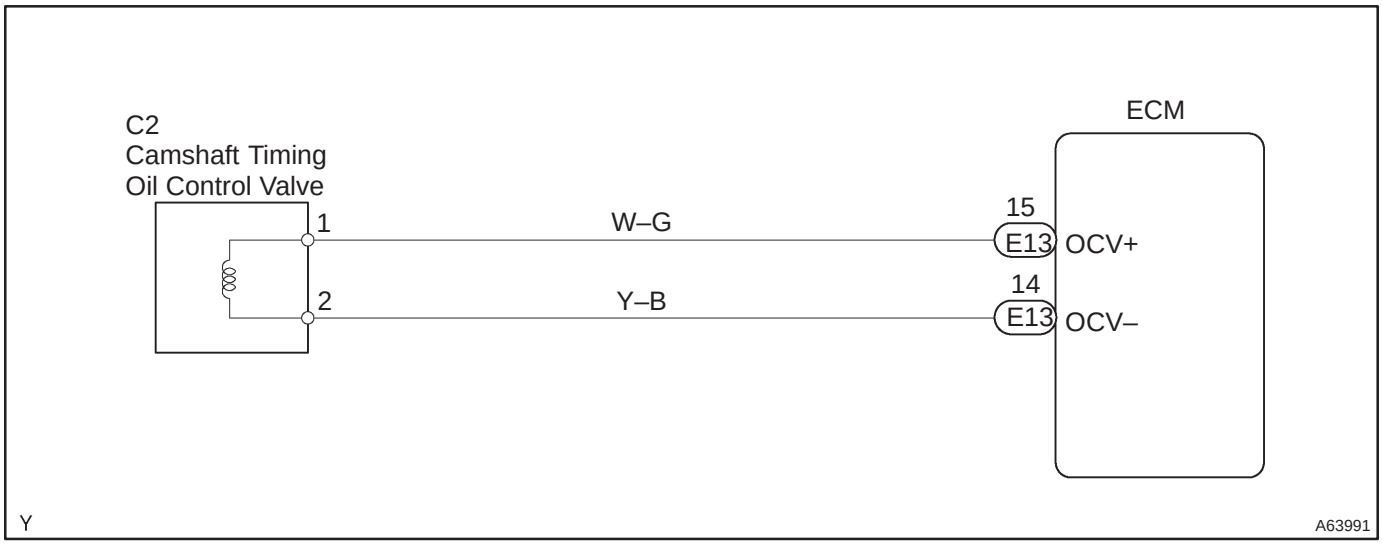
DTC	P1349	VVT SYSTEM MALFUNCTION (BANK 1)

CIRCUIT DESCRIPTION

VVT system controls the intake valve timing to proper timing in response to driving condition.
The ECM controls the oil control valve (OCV) to make the intake valve timing properly, oil pressure regulated by the OCV is supplied to the valiable valve timing (VVT) controller, and then the VVT controller changes relative position between the camshaft and the crankshaft.

DTC No.	DTC Detecting Condition	Trouble Area
P1349	Condition (a) or (b) continues with engine speed at 400 to 4,000 rpm after the engine is warmed up (a) Valve timing does not change from the current valve timing (b) Current valve timing is fixed	• Valve timing • OCV • VVT controller assembly • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK VALVE TIMING (See page 14–49)

NG → ADJUST VALVE TIMING (See page 14–49)

OK

2	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE OF OCV)

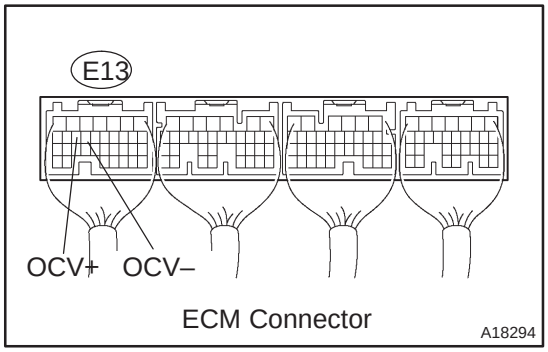
(a) Start the engine and warm it up.
(b) Connect the hand–held tester and select VVT from the ACTIVE TEST menu.
(c) Check the engine speed while operating the OCV by the hand–held tester.
OCV is OFF: Normal engine speed
OCV is ON: Rough idle or engine stall

HINT:
DTC P1349 is also output when a foreign object is detected in some parts of the system in engine oil, and then the system returns to normal in a short time. There is also no problem on the VVT as the oil filter should catch the foreign object in engine oil.

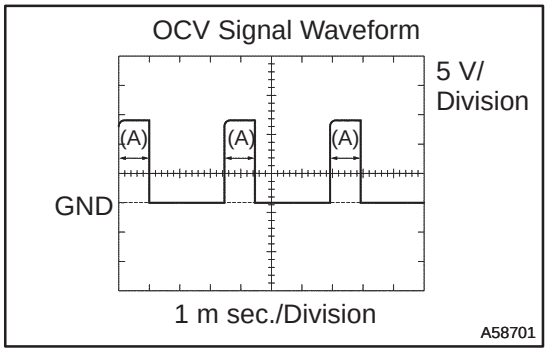
OK	VVT SYSTEM OK

NG

3	INSPECT ECM(CHECK VOLTAGE)



(a) Turn the ignition switch ON.
(b) Check the waveform between terminals OCV+ and OCV– of the E13 ECM connector.



HINT:
- The correct waveform is as shown on the left.
- The waveform frequency (A) becomes longer as the engine speed becomes higher.

NG	CHECK AND REPLACE ECM (See page 01–32)

OK

4	INSPECT CAMSHAFT TIMING GEAR ASSY (See page14–64)

NG	REPLACE VVT CONTROLLER ASSEMBLY, AND THEN GO TO NEXT STEP

OK

5	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY (See page 10–3)

NG → REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY, AND THEN GO TO NEXT STEP

OK

6	CHECK OIL CONTROL VALVE FILTER(CHECK BLOCKAGE)

NG → REPAIR OR REPLACE OIL CONTROL VALVE FILTER

OK

7	PERFORM SIMULATION TEST(DTC CHECK)

(a) Clear the DTC (See page 05–5).
(b) Perform the simulation test.
(c) Check whether or not DTC P1349 is stored (See page 05–5).
Result:

DTC	Proceed to
”P1349” is output.	A
”P1349” is not output.	B

HINT:
DTC P1349 is also output when a foreign object is detected in some parts of the system in engine oil, and then the system returns to normal in a short time. There is also no problem on the VVT as the oil filter should catch the foreign object in the engine oil.

B → VVT SYSTEM OK

A

CHECK AND REPLACE ECM (See page 01–32)

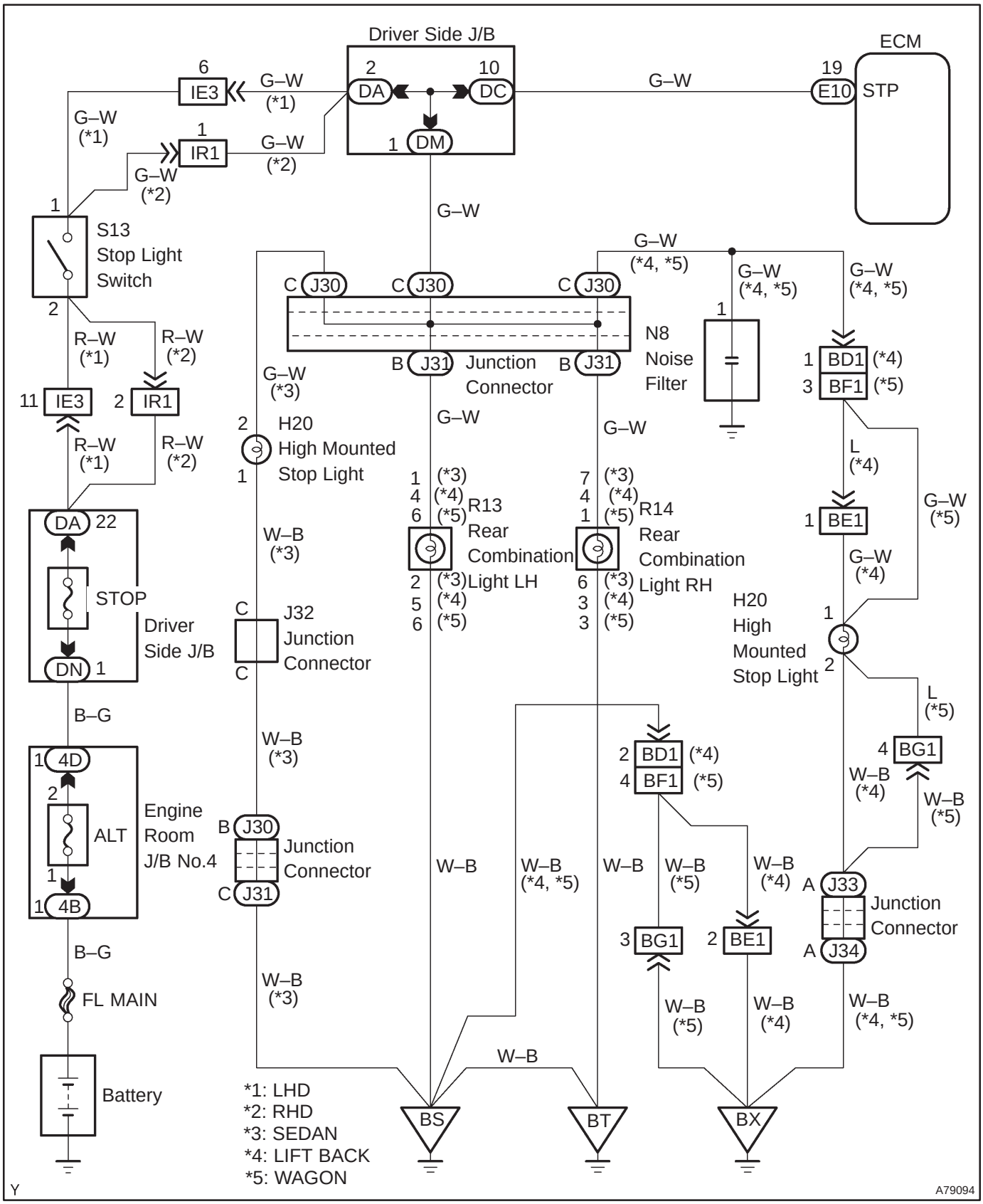
DTC	P1520	STOP LIGHT SWITCH CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

This signal is used to detect that the brakes have been applied. The STP signal voltage is the same as the one supplied to the stop lights.
The STP signal is used mainly to control the fuel cut–off engine speed (The fuel cut–off engine speed is reduced slightly when the vehicle is braking.).

DTC No.	DTC Detecting Condition	Trouble Area
P1520	Condition (a), (b) and (c) continue for 0.5 sec. or more: (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the STP signal is OFF	• Open or short in stop light switch signal circuit • Stop light switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OPERATION OF STOP LIGHT

(a) Check if the stop lights go on and off normally when the brake pedal is depressed and released.

NG → **REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT**

OK

2	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW” and read its value displayed the hand–held tester.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Read the STP signal on the hand–held tester.

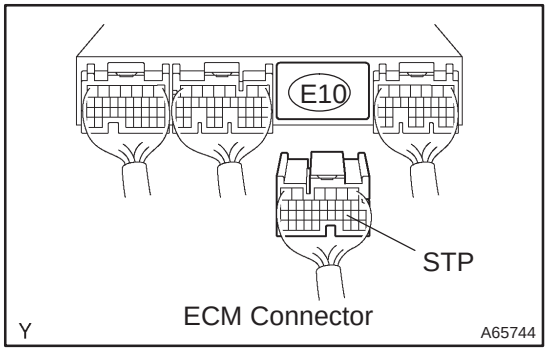
Result:

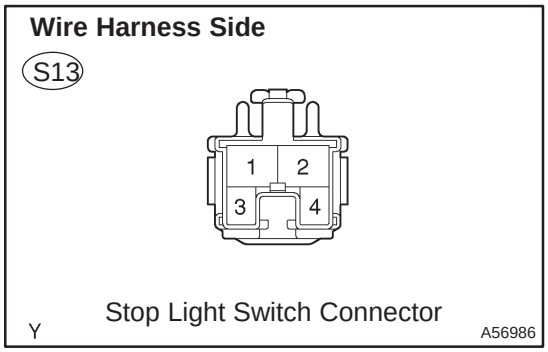
Brake Pedal	STP Signal
Depressed	ON
Released	OFF

OK → **CHECK FOR INTERMITTENT PROBLEMS**

NG

3	CHECK WIRE HARNESS OR CONNECTOR(ECM – STOP LIGHT SWITCH)





(a) Disconnect the stop light switch connector.
(b) Disconnect the the E10 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) – STP (E10–19)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) or STP (E10–19) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P1600	ECM BATT MALFUNCTION

CIRCUIT DESCRIPTION

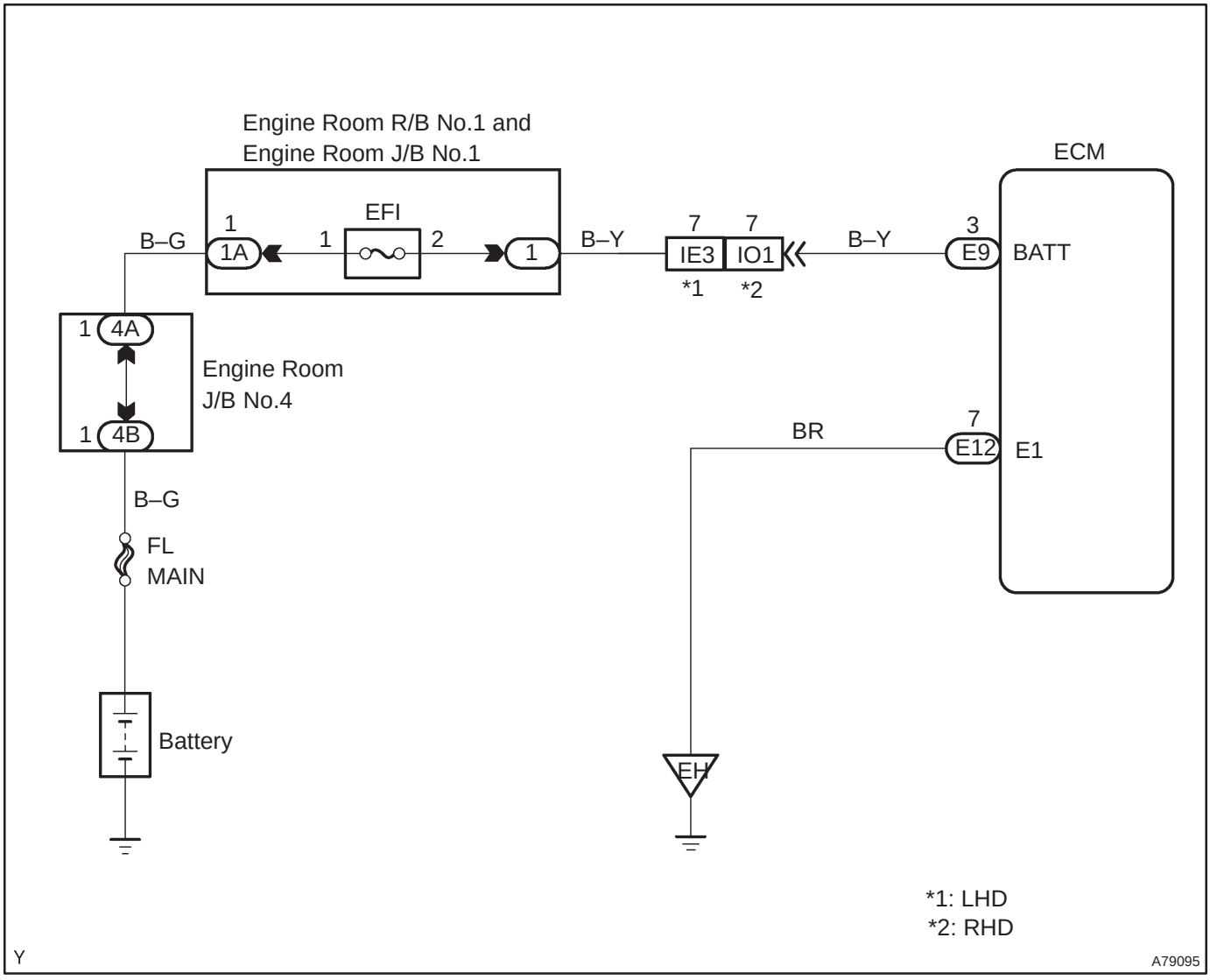
Battery positive voltage is applied to terminal BATT of the ECM even the ignition switch is OFF for the DTC memory and air–fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1600	Open in back up power source circuit	• Open in back up power source circuit • ECM

HINT:

If DTC P1600 is displayed, the ECM does not store other DTCs.

WIRING DIAGRAM

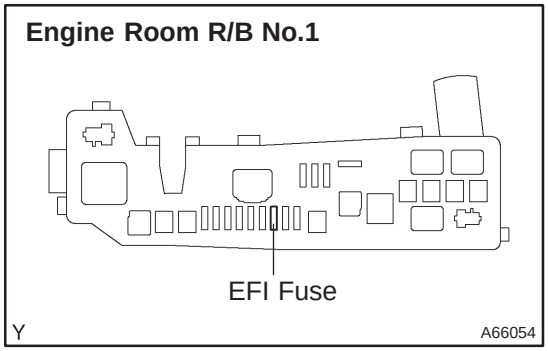


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK FUSE(EFI FUSE)

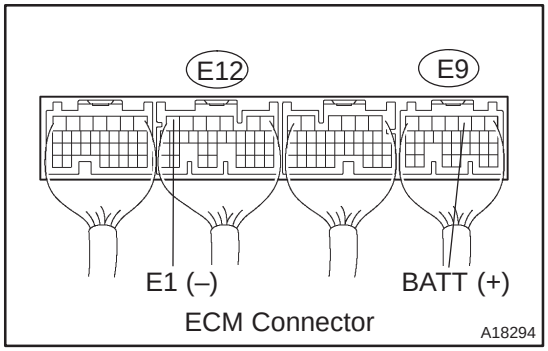


(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

2 INSPECT ECM(CHECK VOLTAGE)



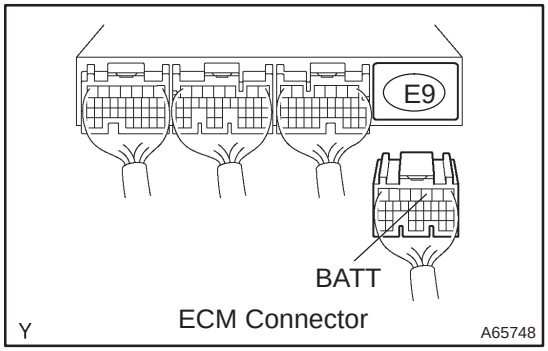
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

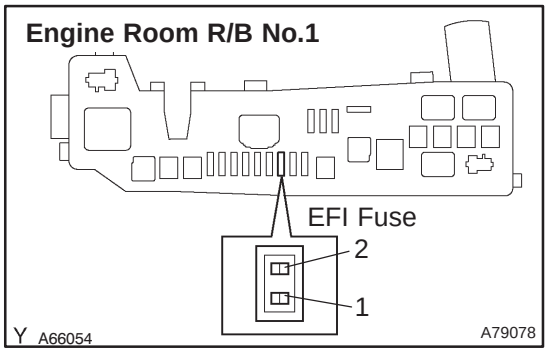
Symbols (Terminal No.)	Specified condition
BATT (E9–3) – E1 (E12–7)	8 to 14 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

3 CHECK WIRE HARNESS OR CONNECTOR(EFI FUSE – ECM)





(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Disconnect the ECM E9 connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) – BATT (E9–3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) or BATT (E9–3) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE HARNESS OR CONNECTOR (BATTERY – EFI FUSE)

DTC	P1656	OCV CIRCUIT MALFUNCTION (BANK 1)

CIRCUIT DESCRIPTION

Refer to DTC P1349 on page 05–112.

DTC No.	DTC Detecting Condition	Trouble Area
P1656	Open or short in oil control valve (OCV) circuit	• Open or short in OCV circuit • OCV • ECM

WIRING DIAGRAM

Refer to DTC P1349 on page 05–112.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OCV OPERATION)

(a) Start the engine and warm it up.
(b) Connect the hand–held tester and select the VVT on the ACTIVE TEST menu.
(c) Check the engine speed while operating the OCV by using the hand–held tester.

Result:

VVT system is OFF (OCV is OFF): Normal engine speed
VVT system is ON (OCV is ON): Rough idle or engine stalled

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)**

NG

2	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY (See page 10–3)

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

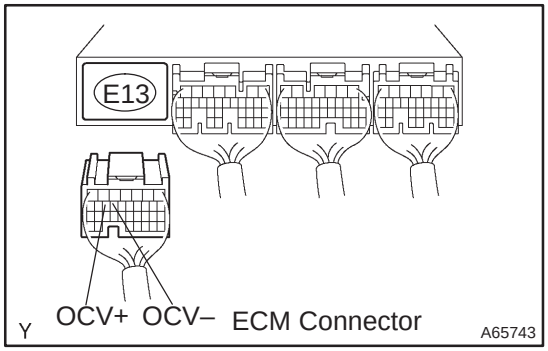
OK

3	INSPECT ECM(CHECK VOLTAGE) (See page 05–20)

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

4 CHECK HARNESS AND CONNECTOR(ECM – OCV)



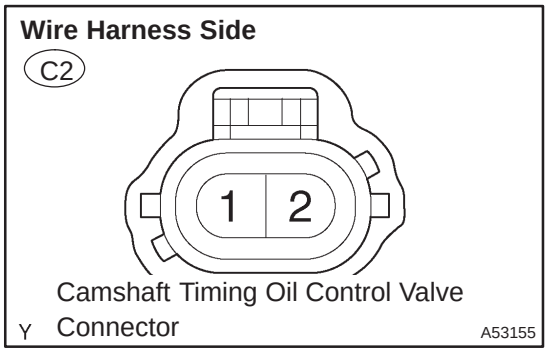
(a) Disconnect the camshaft timing oil control valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) – OCV+ (E13–14)	Continuity
Oil control valve (C2–2) – OCV– (E13–15)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) or OCV+ (E13–14) – Body ground	No continuity
Oil control valve (C2–2) or OCV– (E13–15) – Body ground	

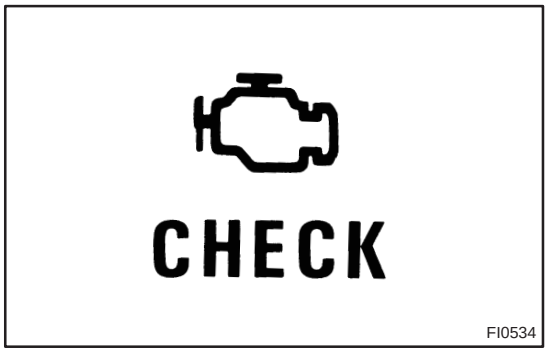


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)

05C66–01

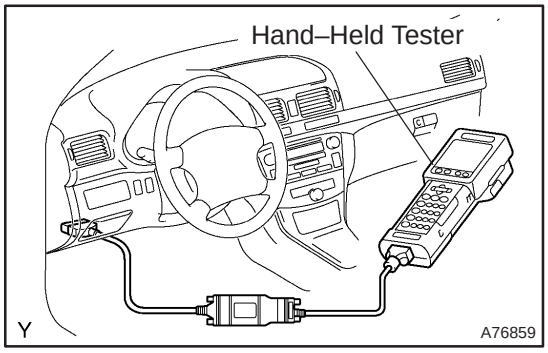


PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description for Euro–OBD (European spec.)

- When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to the OBD scan tool complying with ISO 15031–4 or hand–held tester, and read the various data output from the vehicle's ECM.
- Euro–OBD regulations require that the vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the emission control system / components or in the power train control components which affect vehicle emissions, or a malfunction in the computer. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTC) prescribed by ISO 15031–4 are recorded in the engine ECU memory (See page 05–16). If the malfunction does not reoccur in 3 consecutive trips, the CHK ENG goes off automatically but the DTCs remain recorded in the ECM memory.



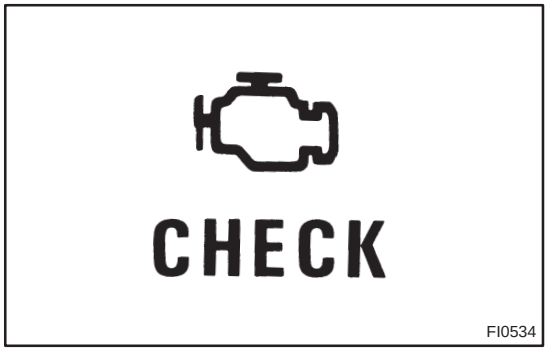
- To check the DTCs, connect the OBD scan tool or hand–held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data. (For operating instructions, see the OBD scan tool's instruction book.)
  DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–16).
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).
- * 2 trip detection logic
  When a logic malfunction is first detected, the pend-

ing fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).

- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTCs P0300 – P0304) or fuel trim malfunction (DTCs P0171) or other malfunction (first malfunction only), is detected.
  Because freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- Priorities for troubleshooting:
  If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.

If no instructions are given, troubleshoot according to the following priorities.

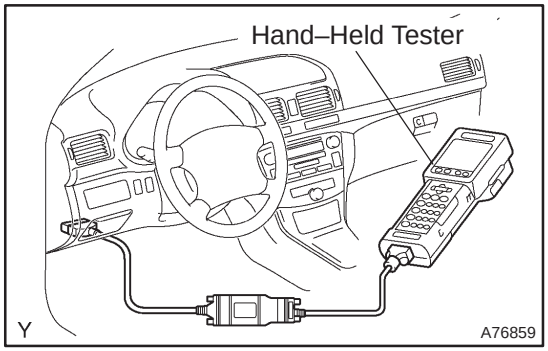
(1) DTCs other than fuel trim malfunction (DTCs P0171) and misfire (DTCs P0300 – P0304).
(2) Fuel trim malfunction (DTCs P0171).
(3) Misfire (DTCs P0300 – P0304).



(b) Description for M–OBD (Except European spec.)

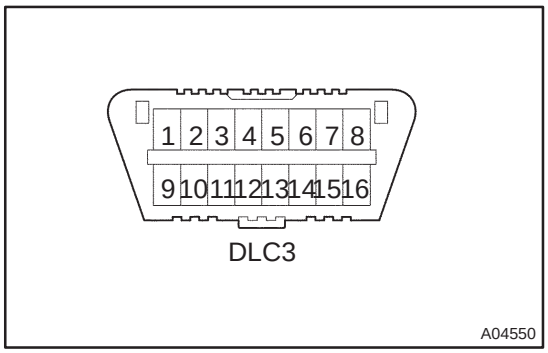
- When troubleshoot Multiplex OBD (M–OBD) vehicles, the only difference from the usual troubleshooting procedure is that you connect the hand–held tester to the vehicle, and read the various data output from the vehicle's ECM.

- The vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) are recorded in the ECM memory (See page 05–16). When the malfunction does not reoccur, the CHK ENG is indicated until the ignition switch is turned off, and then the CHK ENG is not indicated when the ignition switch is turned on but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect the hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle or read the DTC which is indicated on the multi information display when TC and CG terminals on the DLC3 are connected. The hand–held tester also enables you to erase the DTCs and check the freeze frame data and various forms of engine data. (for operating instructions, see the instruction book.)
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).
- * 2 trip detection logic
  When a logic malfunction is first detected, the pending fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).

- Freeze frame data:
  Freeze frame data records the engine conditions (fuel system, calculator load, water temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.



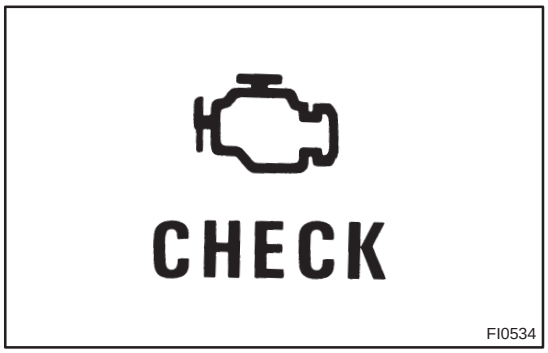
(c) Check the DLC3.
The vehicle's ECM uses the ISO 9141–2 (Euro–OBD)/ ISO 14230(M–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–03 and matches the ISO 9141–2/ ISO 14230 format.

Terminal No.	Connection / Voltage or Residence	Condition
7	Bus + Line / Pulse generation+	During transmission
4	Chassis Ground – Body Ground / 1 Ω or less	Always
16	Battery Positive – Body Ground / 9 to 14 V	Always

HINT:
If the display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible is when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Deparment listed in the tool's instruction manual.

(d) Inspect the battery voltage.
Battery voltage: 11 to 14 V
If voltage is below 11V, recharge the battery before proceeding.



(e) Check the CHK ENG.
(1) The CHK ENG lamp comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the CHK ENG lamp is not illuminated, troubleshoot the combination meter.

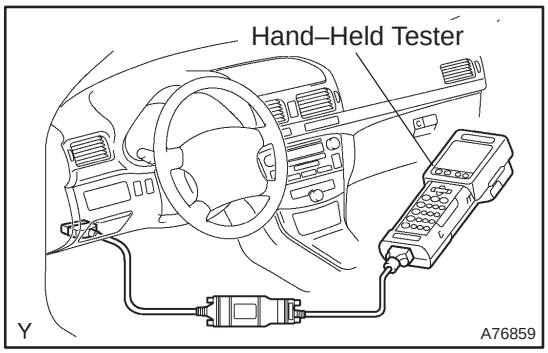
(2) When the engine is started, the CHK ENG should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

2. DTC CHECK (Nomal Mode) :

NOTICE:

Hand–held tester only:

When the diagnosis system is switched from the normal mode to the check (test) mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and then write them down.



(a) Checking DTCs using the hand–held tester.
  (1) Connect the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON and switch the hand–held tester main switch ON.
  (3) Use the hand–held tester to check the DTCs and freeze frame data and then write them down. The hand–held tester's instruction book.
  (4) See page 05–16 to confirm the details of the DTCs.

(b) Clearing the DTCs using the hand–held tester:
  (1) Connect the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON.
  (3) When operating hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester:
  (1) Disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.

3. DTC CHECK (Check Mode):

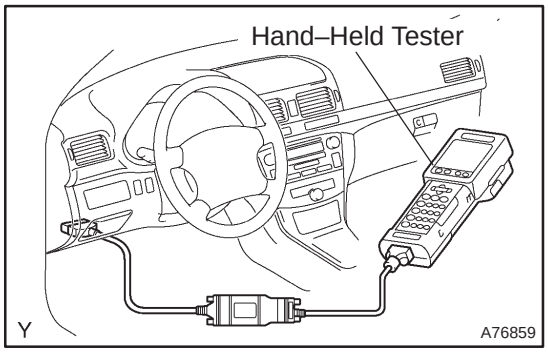
HINT:

Hand–held tester only:

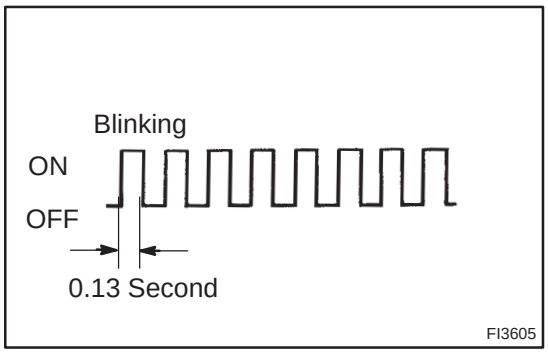
Compared to the normal mode, the check mode has more sensing ability to detect malfunctions.

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check (test) mode.

(a) Proceduce for check mode using hand–held tester.
  (1) Check the initial conditions
    - Battery positive voltage 11V or more.
    - Throttle valve fully closed.
    - Transmission in the "P" or "N" position.
    - Air conditioning switched OFF.
  (2) Turn the ignition switch OFF.



(3) Connect the hand–held tester to the DLC3.
(4) Turn the ignition switch and the hand–held tester main switch ON.



(5) Switch the hand–held tester from the normal mode to the check (test) mode. The CHK ENG blinks in 0.13 sec interval as shown in the illustration.

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(6) Start the engine. (The CHK ENG lamp goes out after the engine start.)
(7) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTC, etc.

(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the nomal mode and will result in all of the DTCs and freeze frame data being erased.

(9) After checking the DTCs, inspect the applicable circuit.

(b) Clearing the DTCs using the hand–held tester
(1) Connect the hand–held tester to DLC3.
(2) Turn the ignition switch ON.
(3) When operating hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester:
(1) Disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.

4. FAIL–SAFE CHART

If any of the following codes are recorded, the engine ECM enters the fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0100	Ignition timing is fixed at 5° BTDC	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0110	Intake air temperature is fixed at 20°C (68°F)	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0115	Water temperature is fixed at 80°C (176°F)	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0120	VTA is fixed at 0°	The following condition must be repeated at least 2 times consecutively when closed throttle position switch is OFF: VTA greater than 0.1 V and less than 0.95 V
P0135 P0141	The heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0325	Max. timing retardation	Ignition switch OFF
P1300 P1305 P1310 P1315	Fuel cut	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P1656	It cut electrically the circuit in which an abnormality is detected	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".

5. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:

By putting the vehicle's engine ECM in check (test) mode, 1 trip detection logic is possible instead of 2 trip detection logic, and sensitivity to detect faults is increased. This makes it easier to detect intermittent problems.

(a) Clear the DTC. (See step 3.)
(b) Set the check (test) mode. (See step 3.)
(c) Perform a simulation test. (See page 01–32)
(d) Check the connector and terminal. (See page 01–32)
(e) Wiggle the harness and the connector. (See page 01–32)

6. DATA LIST

HINT:

Using the DATA LIST displayed by the hand–held tester, you can read the value of the switches, sensors, actuators and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten diagnostic time.

NOTICE:

The values given below for "Normal Condition" are representative values. A vehicle may still be normal even if the measured values are a little different from those listed here. Do not decide whether a part is faulty or not solely according to the "Normal Condition" here.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the Hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand–held tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL".
(g) According to the display on tester, read the "DATA LIST".

Hand–held tester display	MeasurementItem/Range (Display)	Normal Condition*1	Diagnostic Note
FUEL SYS #1	Fuel System Bank 1 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warming up: CLOSED	—
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 3.3 to 26.7 % Runnig without load (2,500rpm): 12.0 to 14.7 %	—
COOLANT TEMP	Coolanttemperature/ Min.: –40 °C, Max.: 140 °C	After warming up: 80 to 95°C (176 to 203°F)	If the value is "–40 °C" or "140 °C", sensor circuit is open or shorted.
INTAKE AIR	Intake air temperature/ Min.: –40 °C, Max.: 140 °C	Equivalent to Ambient Temp.	
SHORT FT #1	Short–term Fuel Trim Bank 1	0 ± 20%	—
LONG FT #1	Long–term Fuel Trim Bank 1	0 ± 20%	—
MAF/AFM	Air flow rate from mass air flow Meter	Idling: M/T 0.54 to 4.33 gm/sec. A/T 0.58 to 4.67 gm/sec. Running without load (2,500 rpm): 3.33 to 9.17 gm/sec.	—
ENGINE SPD	Engine Speed	Idling: 600 to 700 rpm	—
VEHICLE SPD	Vehicle Speed	Actual vehicle speed	Speed indicated on speedmeter.
IGN ADVANCE	Ignition Advance: Ignition Timing of Cylinder No. 1	Idling: BTDC 5 to 15°	—
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage: 0 V → 0%, 5 V → 100%	Throttle Fully Closed: 6 to 16 % Throttle Fully Open: 64 to 98 %	Read the value with ignition switch ON (Do not start engine)
O2S B1, S1	Voltage Output of Heated Oxygen Sensor Bank 1, Sensor 1	Idling: 0.05 to 0.95 V	—
O2FT B1, S1	Heated Oxygen Sensor Fuel Trim Bank 1, Sensor 1 (Same as SHORT FT #1)	0 ± 20 %	—
INJECTOR	Fuel injection time for cylinder No.1	Idling: 1.0 to 3.0 ms	—
ISC DUTY RATIO	Intake Air Control Valve duty ratio Opening ratio rotary solenoid type ISC valve	Idling: 20 to 40 %	—
STARTER SIG	Starter Signal	Cranking: ON	—
CTP SW	Closed Throttle Position Switch Signal	Cranking: ON	—
A/C SIG	A/C Switch Signal	A/C ON: ON	—
STOP LIGHT SW *2	Stop Light Switch Signal	Stop light switch ON: ON	—
FC IDL	Fuel Cut Idle: Fuel cut when throttle valve fully closed, during deceleration	Fuel cut operating: ON	—
PNP SW/NSW *2	Neutral start switch signal	P or N position: ON	—
FC TAU	Fuel Cut TAU: Fuel cut during very light load	Fuel cut operating: ON	—
CYL#1, CYL#2, CYL#3, CYL#4	Abnormal revolution variation for each cylinder	0 %	—
FUEL PUMP	Fuel Pump Signal	Idling: ON	—
EVAP (PURGE) VSV	EVAP VSV Signal	VSV operation: Above 30 %	—

*1: If no conditions are specifically stated for ”Idling”, it means the shift lever is in the N or P position, the A/C switch is OFF and all accessory switches are OFF.
*2: A/T only

7. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST”.
(g) According to the display on tester, perform the ”ACTIVE TEST”.

Hand–held Tester Display	Test Details	Diagnostic Note
INJ VOL	[Test Details] Control the injection volume Min.: –12.5 %, Max.: 25 % [Vehicle Condition] Engine speed: 3,000 rpm or less	• All injectors are tested at once. • Injection volume is gradually changed between –12.5 and 25%.
A/F CONTROL	[Test Details] Control the injection volume –12.5 or 25 % (Change the injection volume –12.5 % or 25 %.) [Vehicle Condition] Engine speed: 3,000 rpm or less	The following procedure of A/F CONTROL enables the technician to check and graph voltage outputs of the heated oxygen sensor. To display the graph indication, select O2S B1 S1 and press button ”F4” after selecting ”ACTIVE TEST/A/F CONTROL/USER DATA”.
ISC DUTY RATIO	[Test Details] Control the ISC duty ratio 0 to 90 % [Vehicle Condition] • Engine speed: 3,000 rpm or less • Vehicle speed: 0 km/h (0 mph) • Battery voltage: 8.5 V or more	—
EVAP VSV (ALONE)	[Test Details] Activate the VSV for EVAP control ON or OFF	—
FUEL PUMP / SPD	[Test Details] Control the fuel pump ON or OFF	—
TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	—
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit ON or OFF	—

BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	CHECK BATTERY VOLTAGE

NOTICE:
Carry out this check with the engine stopped and ignition switch off.

Reference:

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → **CHARGE OR REPLACE BATTERY**

OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–22**

OK

3	CHECK IF ENGINE STARTS

NG → **GO TO STEP 6**

OK

4	CHECK AIR FILTER

(a) Visually check that the air filter is not excessively dirty or oily.

HINT:
If necessary, clean the filter with compressed air. First blow from the inside thoroughly, then blow from the outside of filter.

NG → **REPAIR OR REPLACE**

OK

5	CHECK IDLE SPEED (See page 14–1)

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–22**

OK

6	CHECK FUEL PRESSURE (See page 11–5)

NG → PROCEED TO PAGE 11–1 AND CONTINUE TO TROUBLESHOOT

OK

7	CHECK FOR SPARK (See page 18–1)

NG → PROCEED TO PAGE 18–1 AND CONTINUE TO TROUBLESHOOT

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–22

0505L–04

PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still can not be confirmed in the basic inspection, proceed to this problem symptoms tables and troubleshoot according to the numbered order given below.

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay 2. Neutral start switch circuit*	19–1 —
No initial combustion (Does not start)	1. ECM power source circuit 2. Ignition coil (w/ Igniter) circuit 3. Fuel pump control circuit 4. Fuel system	05–124 05–103 05–131 11–1
No complete combustion (Does not start)	1. Fuel pump control circuit 2. Ignition coil (w/ Igniter) circuit 3. Fuel system	05–131 05–103 11–1
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. ISC valve circuit 3. Fuel pump control circuit 4. Ignition coil (w/ Igniter) 5. Spark plug 6. Compression 7. Fuel system	05–135 05–100 05–131 05–103 18–3 14–1 11–1
Cold engine (Difficult to start)	1. Starter signal circuit 2. ISC valve circuit 3. Fuel pump control circuit 4. Fuel system 5. Ignition coil (w/ Igniter) 6. Spark plug	05–135 05–100 05–131 11–1 05–103 18–3
Hot engine (Difficult to start)	1. Starter signal circuit 2. ISC valve circuit 3. Fuel pump control circuit 4. Fuel system 5. Ignition coil (w/ Igniter) 6. Spark plug	05–135 05–100 05–131 11–1 05–103 18–3
Incorrect first idle (Poor idling)	1. ISC valve circuit	05–100
High engine idle speed (Poor idling)	1. ISC valve circuit 2. ECM power source circuit 3. Neutral start switch circuit*	05–100 05–124 —
Low engine idle speed (Poor idling)	1. ISC valve circuit 2. Neutral start switch circuit* 3. Fuel pump control circuit 4. Fuel system	05–100 — 05–131 11–1
Rough idling (Poor idling)	1. ISC valve circuit 2. ECM power source circuit 3. Fuel pump control circuit	05–100 05–124 05–131
Hunting (Poor idling)	1. ISC valve circuit 2. ECM power source circuit 3. Fuel pump control circuit	05–100 05–124 05–131
Hesitation/Poor acceleration (Poor drivability)	1. Fuel system 2. Fuel pump control circuit 3. Ignition coil (w/ Igniter) circuit	11–1 05–131 05–103
Muffler explosion, after fire (Poor drivability)	1. Ignition coil (w/ Igniter) circuit 2. Spark plug 3. Fuel system	05–103 18–3 11–1
Surging (Poor drivability)	1. Fuel pump control circuit 2. Spark plug 3. Fuel system	05–131 18–3 11–1

Engine stall (Soon after starting)	1. Fuel pump control circuit 2. ISC valve circuit	05–131 05–100
Engine stall (After accelerator pedal released)	1. Injector circuit 2. ISC valve circuit 3. ECM	11–8 05–100 05–20
Engine stall (When shifting from N to D)	1. Neutral start switch circuit 2. ISC valve circuit	— 05–100

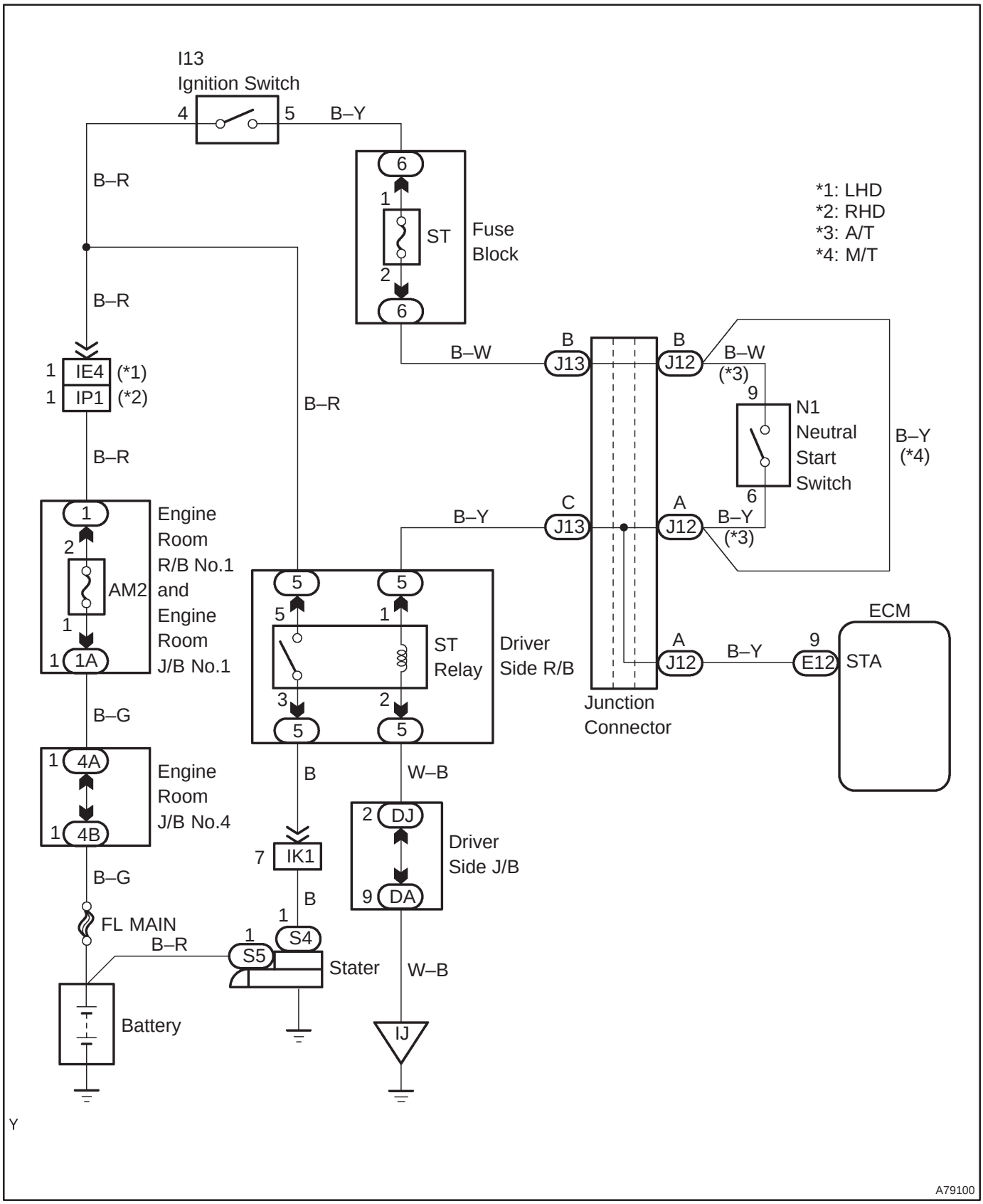
*: A/T only.

STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow becomes slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM



NSPECTION PROCEDURE

HINT:

This diagnostic chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05–22.

1	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG” and read its value displayed on the hand–held tester.

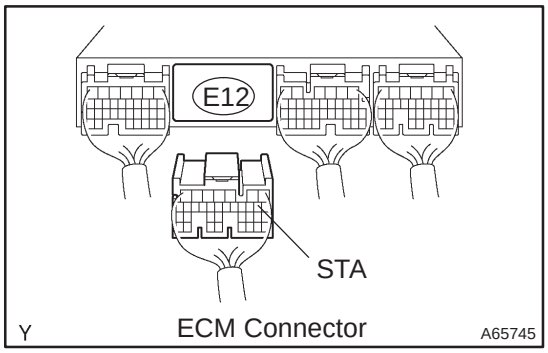
Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	CHECK HARNESS AND CONNECTOR(ECM – STARTER RELAY)



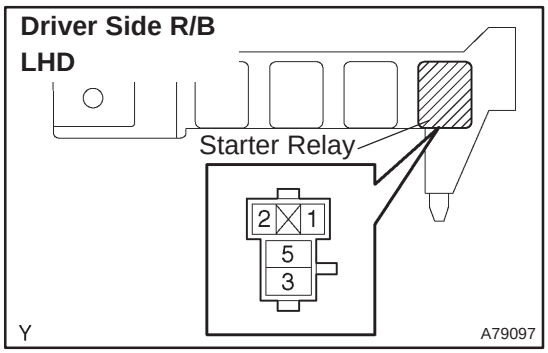
(a) Disconnect the ECM E12 connector.
(b) Remove the starter relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

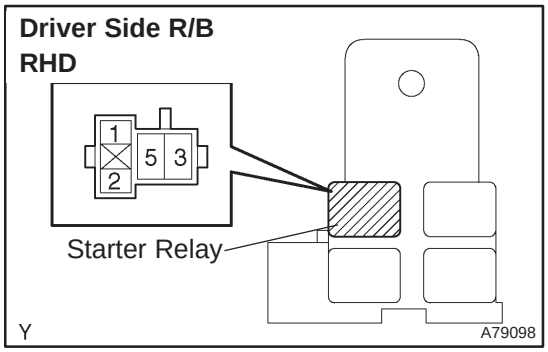
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Starter relay (1) – STA (E12–9)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Starter relay (1) or STA (12–9) – Body ground	No continuity





NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

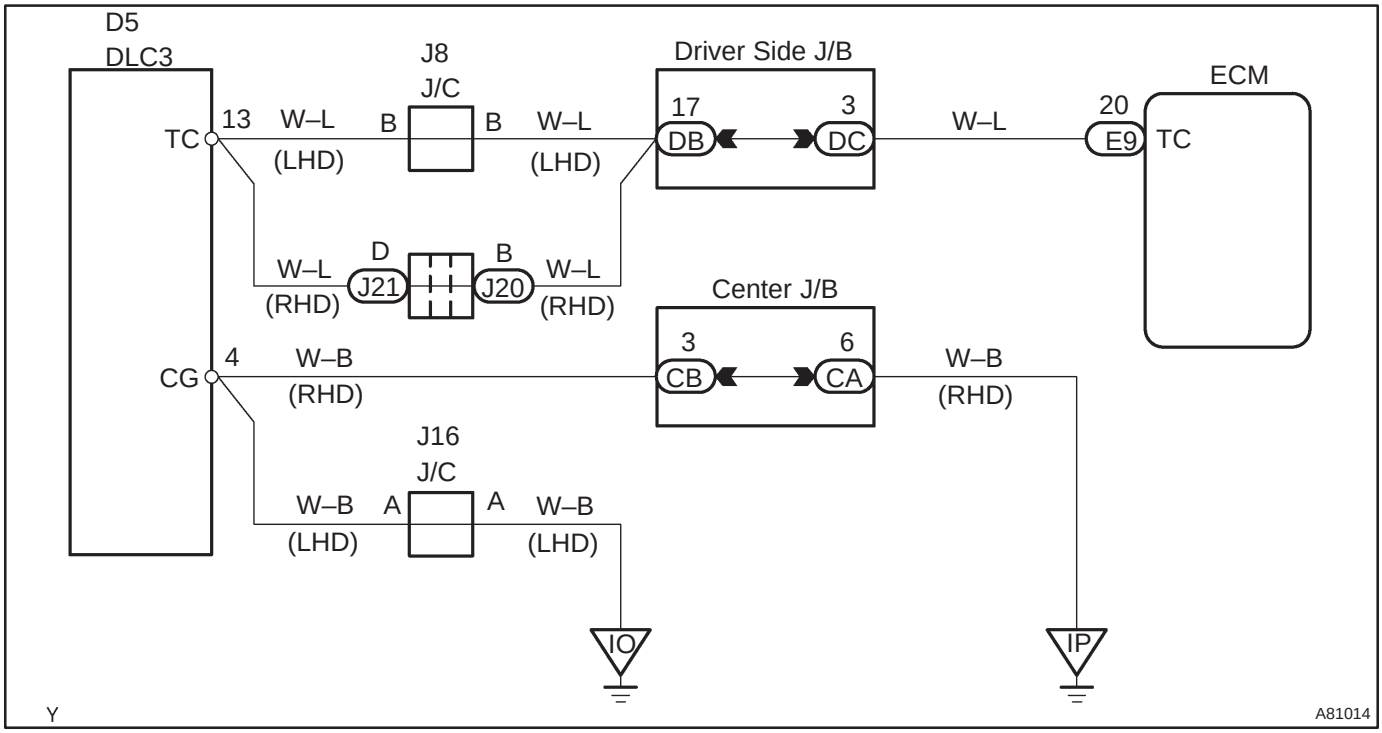
CHECK AND REPLACE ECM (See page 01–32)

TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

Terminals TC and CG are located in the DLC3. When connecting these terminals, DTCs in normal mode or check mode can be read through the CHK ENG flashing in the combination meter.

WIRING DIAGRAM

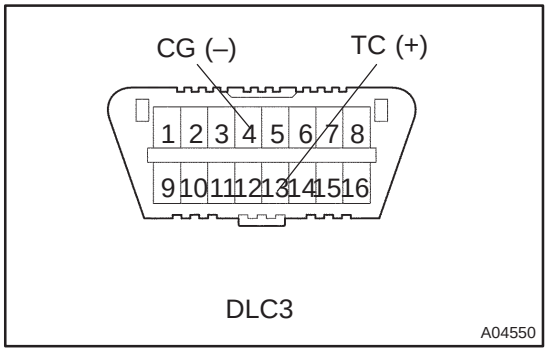


INSPECTION PROCEDURE

HINT:

- Even though terminal TC is not connected to terminal CG, the CHK ENG blinks.
- For the above phenomenon, an open or short in the wire harness, or malfunction inside the ECM is the likely cause.

1	CHECK DLC3(TC VOLTAGE)



(a) Turn the ignition switch ON.

(b) Measure the voltage between the terminals of the DLC3.

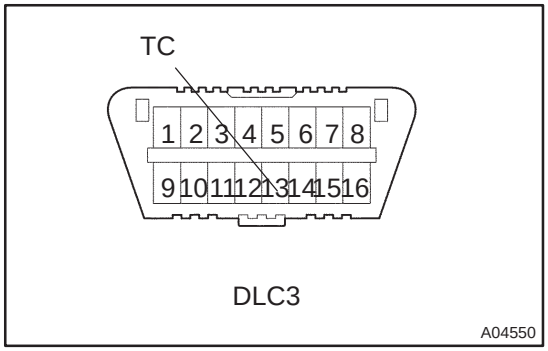
Standard:

Symbols (Terminal No.)	Specified condition
TC (13) – CG (4)	9 to 14 V

OK → **Go to step 3**

NG

2 CHECK HARNESS AND CONNECTOR(DLC3 – ECM)



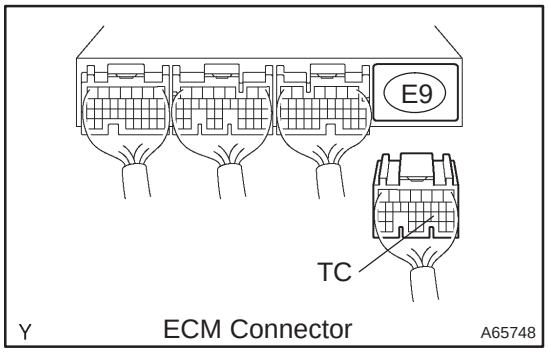
(a) Disconnect the E9 ECM connector.
(b) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
TC (13) – TC (E9–20)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
TC (13) or TC (E9–20) – Body ground	No continuity



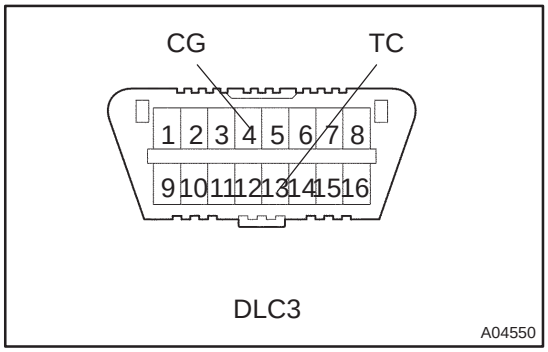
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (DLC3 – BODY GROUND)

3 CHECK CHK ENG CONDITION

SST 09843–18040



(a) Turn the ignition switch ON.
(b) Connect between terminals TC and CG of the DLC3 connector.
(c) Check that the CHK ENG blinks.

Standard: CHK ENG blinks

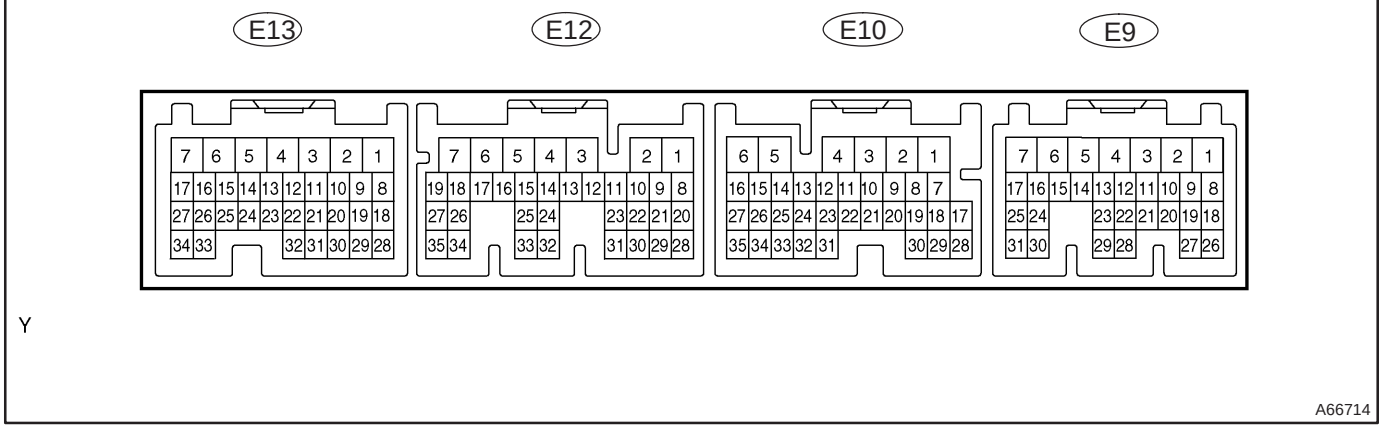
NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

NO PROBLEM

05C67–01

TERMINALS OF ECM



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E9 – 3) – E1 (E12 – 7)	B–Y – BR	Always	8 to 14
FC (E9 – 10) – E1 (E12 – 7)	G–Y – BR	IG switch ON	8 to 14
FC (E9 – 10) – E1 (E12 – 7)	G–Y – BR	Idling	Below 1.5
W (E9 – 11) – E1 (E12 – 7)	W – BR	Idling	8 to 14
W (E9 – 11) – E1 (E12 – 7)	W – BR	IG switch ON	Below 3.5
+B (E9 – 1) – E1 (E12 – 7)	B–R – BR	IG switch ON	8 to 14
STP (E10 – 19) – E1 (E12 – 7)	G–W – BR	IG switch ON, brake pedal depressed	8 to 14
STP (E10 – 19) – E1 (E12 – 7)	G–W – BR	IG switch ON, brake pedal released	Below 1.5
F/PS (E9 – 14) – E1 (E12 – 7)	LG–B – BR	IG switch ON	Pulse generation
STA (E12 – 9) – E1 (E12 – 7)	B–Y – BR	Cranking	5.5 or more
HT1B (E10 – 4) – E03 (E12 – 5)	P – W–B	Idling	Below 3.0
HT1B (E10 – 4) – E03 (E12 – 5)	P – W–B	IG switch ON	9 to 14
EMPS (E12 – 29) – E1 (E12 – 7)	GR – BR	IG switch ON	8 to 14
SPD (E10 – 17) – E1 (E12 – 7)	V–W – BR	IG switch ON, rotate driving wheel slowly	Pulse generation (See page 05–98)
OX1B (E12 – 21) – E2 (E13 – 28)	B – BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page 05–91)
TACH (E9 – 5) – E1 (E12 – 7)	GR–R – BR	Idling	Pulse generation
VC (E13 – 18) – E2 (E13 – 28)	R–W – BR	IG switch ON	4.5 to 5.5
HT1A (E12 – 4) – E03 (E12 – 5)	Y – W–B	Idling	Below 3.0
HT1A (E12 – 4) – E03 (E12 – 5)	Y – W–B	IG switch ON	9 to 14
EVP1 (E13 – 12) – E01 (E13 – 7)	W–G – W–B	IG switch ON	8 to 14
VG (E12 – 24) – EVG (E12 – 32)	G – L–Y	Idling, A/C switch OFF	1.1 to 1.5
OX1A (E12 – 23) – E2 (E13 – 28)	B – BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page 05–91)
THW (E13 – 19) – E2 (E13 – 28)	B–W – BR	Idling, Engine coolant temp. at 80°C (176°F)	0.2 to 1.0
G2 (E13 – 26) – NE– (E13 – 34)	W – R	Idling	Pulse generation (See page 05–84)
NE+ (E13 – 27) – NE– (E13 – 34)	G – R	Idling	Pulse generation (See page 05–84)
THA (E13 – 20) – E2 (E13 – 28)	G–R – BR	Idling, intake air temp. at 20 °C (68 °F)	0.5 to 3.4

VTA (E13 – 21) – E2 (E13 – 28)	L–W – BR	IG switch ON, throttle valve fully closed	0.3 to 1.0
VTA (E13 – 21) – E2 (E13 – 28)	L–W – BR	IG switch ON, throttle valve fully open	3.2 to 4.9
#10 (E13 – 1) – E01 (E13 – 7)	B–R – W–B	IG switch ON	8 to 14
#20 (E13 – 2) – E01 (E13 – 7)	Y – W–B	IG switch ON	8 to 14
#30 (E13 – 3) – E01 (E13 – 7)	W – W–B	IG switch ON	8 to 14
#40 (E13 – 4) – E01 (E13 – 7)	B – W–B	IG switch ON	8 to 14
IGT1 (E13 – 8) – E1 (E12 – 7)	R–W – BR	Idling	Pulse generation (See page 05–103)
IGT2 (E13 – 9) – E1 (E12 – 7)	P – BR	Idling	Pulse generation (See page 05–103)
IGT3 (E13 – 10) – E1 (E12 – 7)	LG–B – BR	Idling	Pulse generation (See page 05–103)
IGT4 (E13 – 11) – E1 (E12 – 7)	L–Y – BR	Idling	Pulse generation (See page 05–103)
IGF (E13 – 23) – E1 (E12 – 7)	W–R – BR	IG switch ON	4.5 to 5.5
IGF (E13 – 23) – E1 (E12 – 7)	W–R – BR	Idling	Pulse generation (See page 05–103)
RSO (E13 – 5) – E01 (E13 – 7)	G–R – W–B	IG switch ON	9 to 14
OCV+ (E13 – 15) – OCV– (E13 – 14)	W–G – Y–B	IG switch ON	Pulse generation (See page 05–112)
FKN+ (E12 – 1) – FKN– (E12 – 2)	B – W	Idling	Pulse generation (See page 05–81)
ELS2 (E9 – 13) – E1 (E12 – 7)	G – BR	Defoger switch ON	9 to 14
ELS2 (E9 – 13) – E1 (E12 – 7)	G – BR	IG switch ON	Below 3.0
MREL (E9 – 8) – E1 (E12 – 7)	GR – BR	IG switch ON	9 to 14
IGSW (E9 – 9) – E1 (E12 – 7)	B–W – BR	IG switch ON	9 to 14
TC (E9 – 20) – E1 (E12 – 7)	W–L – BR	IG switch ON	9 to 14
SIL (E9 – 18) – E1 (E12 – 7)	W–G – BR	Connect hand–held tester to DLC3	Pulse generation

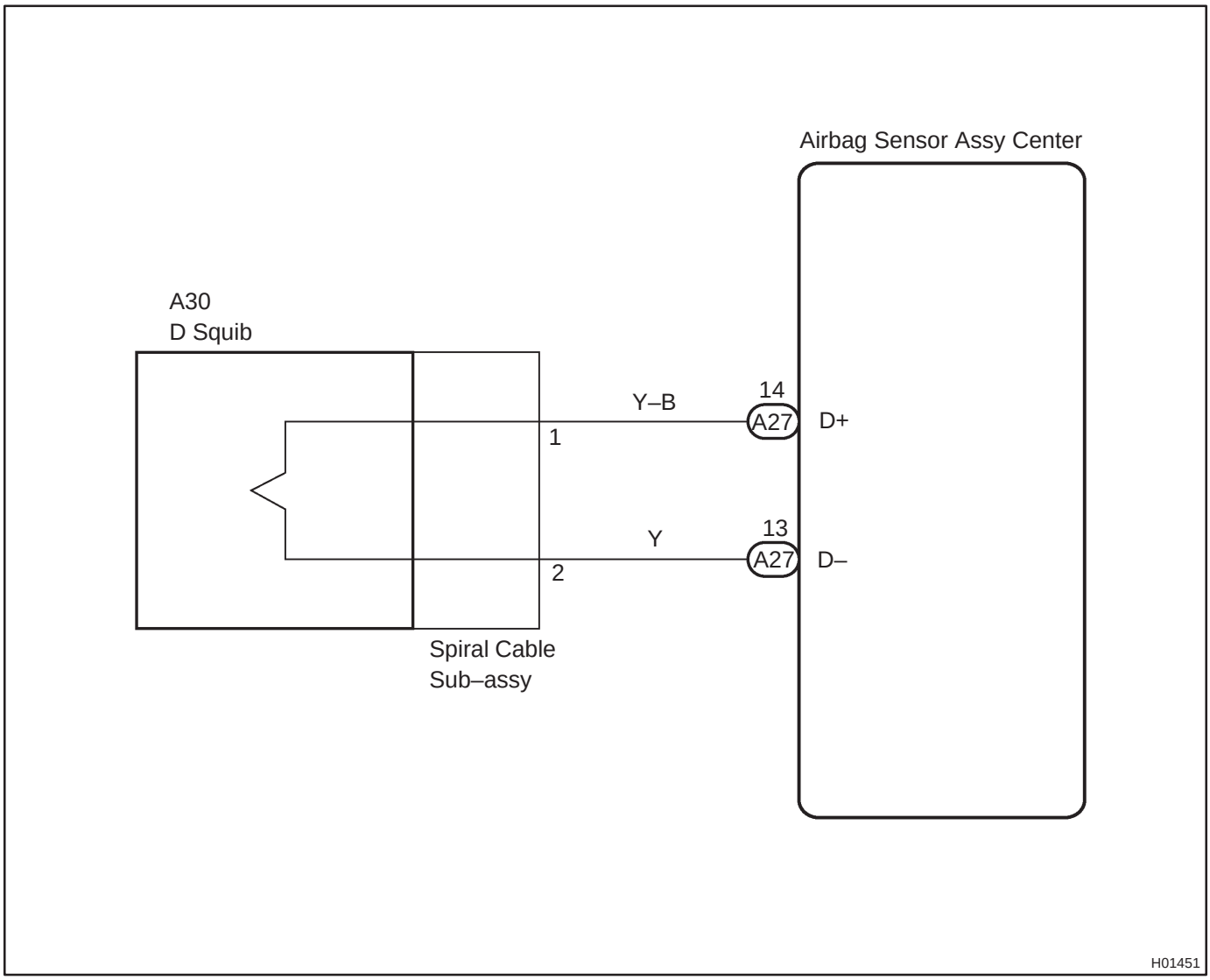
DTC B0100/13 SHORT IN D SQUIB CIRCUIT

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0100/13 is recorded when a short circuit is detected in the D squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0100/13	• Short circuit between D+ wire harness and D– wire harness of D squib • D squib malfunction • Spiral cable sub–assy malfunction • Airbag sensor assy center malfunction	• Horn button assy (D squib) • Spiral cable sub–assy • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM



INSPECTION PROCEDURE

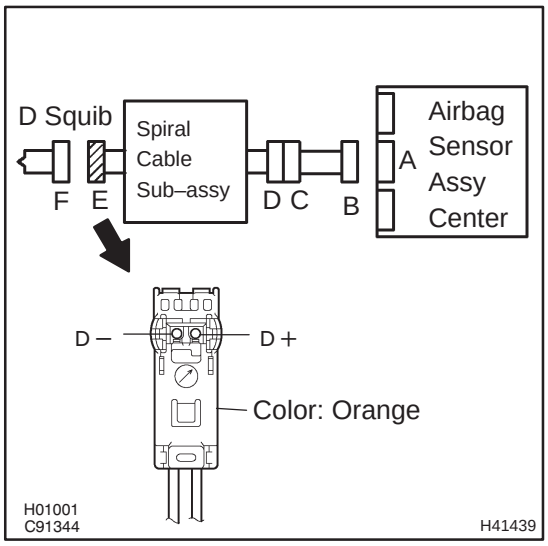
1	CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the horn button assy.
(d) Check that the spiral cable sub–assy connectors (on the horn button assy side) are not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

2	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)

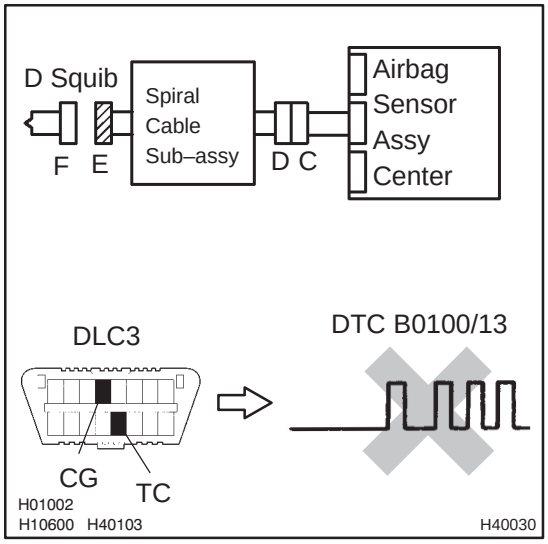


(a) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(b) Measure the resistance between D+ and D– of the connector "E".
OK:
Resistance: 1 MΩ or Higher

NG → **Go to step 5**

OK

3 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).

OK:

DTC B0100/13 is not output.

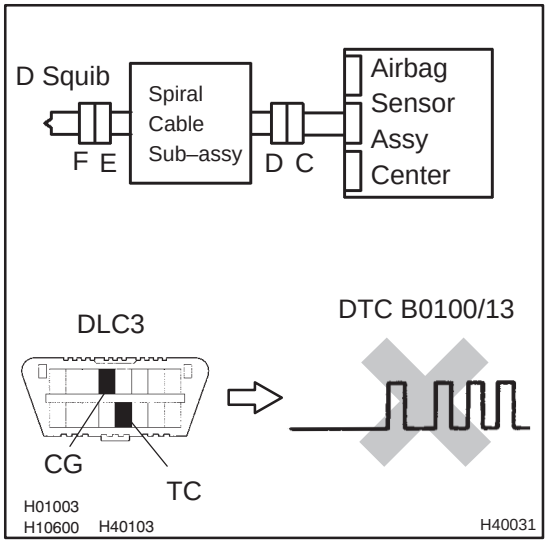
HINT:

Codes other than code B0100/13 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

4 CHECK HORN BUTTON ASSY(D SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the horn button assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).

OK:

DTC B0100/13 is not output.

HINT:

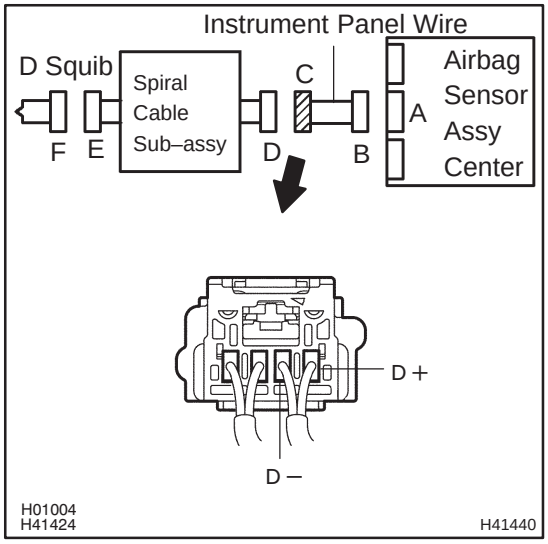
Codes other than code B0100/13 may be output at this time, but they are not related to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

USE SIMULATION METHOD TO CHECK

5 CHECK INSTRUMENT PANEL WIRE



(a) Disconnect the instrument panel wire connector from the spiral cable sub–assy.

(b) Release the activation prevention mechanism built in the connector of the connector "B" (See page 05–1184).

(c) Measure the resistance between D+ and D– of the connector "C".

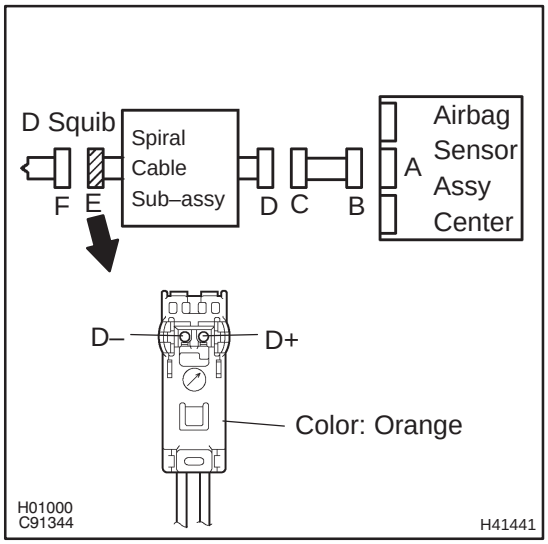
OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

6 CHECK SPIRAL CABLE SUB–ASSY



(a) Release the activation prevention mechanism built in the connector "D" (See page 05–1184).

(b) Measure the resistance between D+ and D– of the connector "E".

OK:

Resistance: 1 MΩ or Higher

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC B0101/14 OPEN IN D SQUIB CIRCUIT

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.

This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.

DTC B0101/14 is recorded when an open circuit is detected in the D squib circuit.

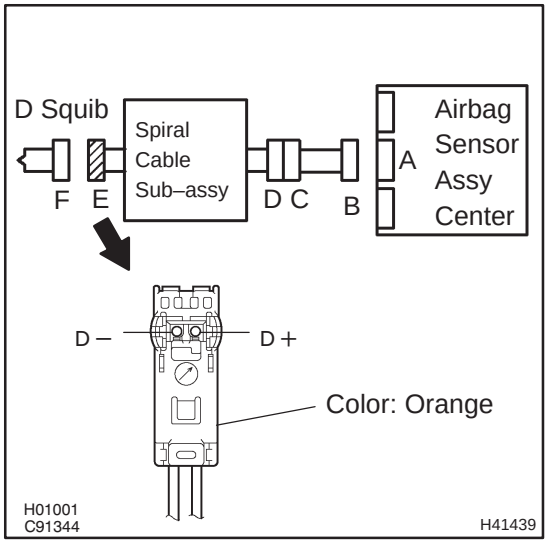
DTC No.	DTC Detecting Condition	Trouble Area
B0101/14	• Open circuit in D+ wire harness or D– wire harness of D squib • D squib malfunction • Spiral cable sub–assy malfunction • Airbag sensor assy center malfunction	• Horn button assy (D squib) • Spiral cable sub–assy • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1198.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)



(a) Turn the ignition switch to the LOCK position.

(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.

(c) Disconnect the connectors from the airbag sensor assy center and the horn button assy.

(d) Measure the resistance between D+ and D– of the connector ”E”.

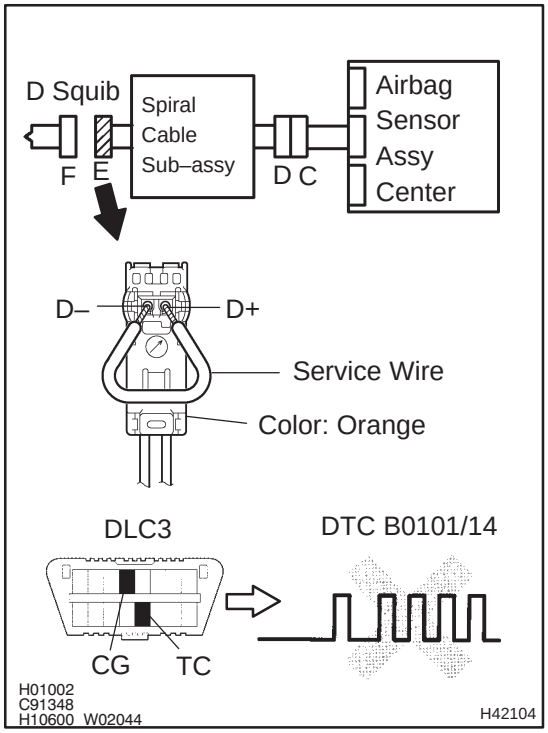
OK:

Resistance: Below 1 Ω

NG → **Go to step 4**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect D+ and D– of the connector "E".

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0101/14 is not output.

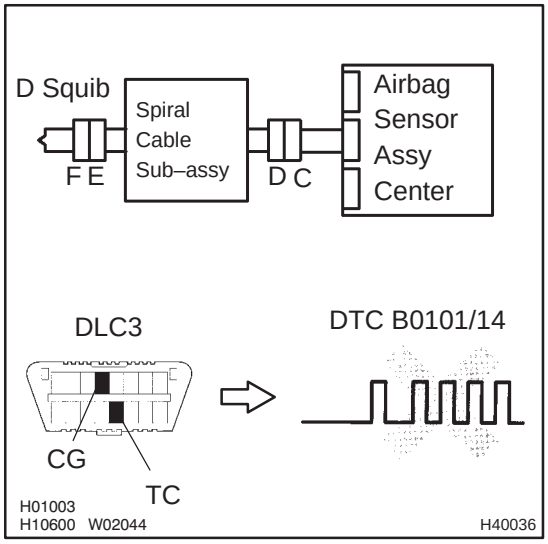
HINT:

Codes other than code B0101/14 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK HORN BUTTON ASSY(D SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the horn button assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0101/14 is not output.

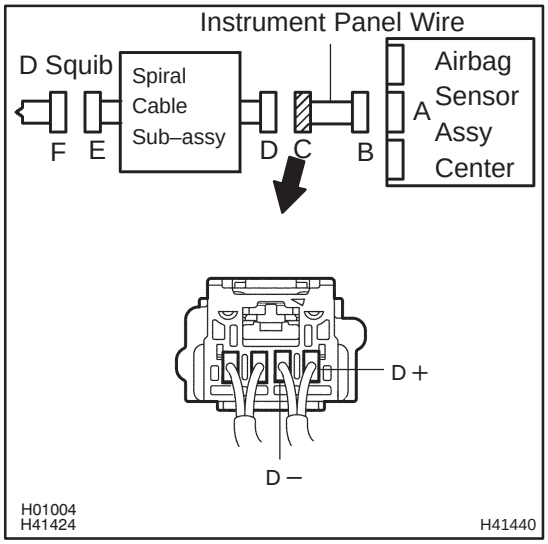
HINT:
Codes other than code B0101/14 may be output at this time, but they are not related to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

USE SIMULATION METHOD TO CHECK

4 CHECK INSTRUMENT PANEL WIRE

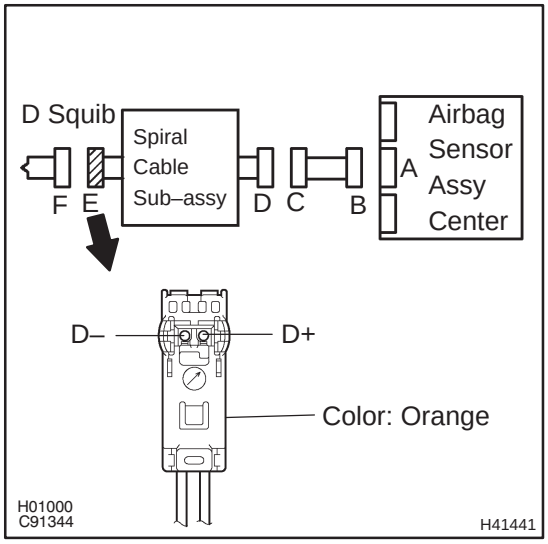


(a) Disconnect the instrument panel wire connector from the spiral cable sub–assy.
(b) Measure the resistance between D+ and D– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

5	CHECK SPIRAL CABLE SUB–ASSY



(a) Measure the resistance between D+ and D– of the connector ”E”.

OK:

Resistance: Below 1 Ω

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC B0102/11 SHORT IN D SQUIB CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0102/11 is recorded when a short to ground is detected in the D squib circuit.

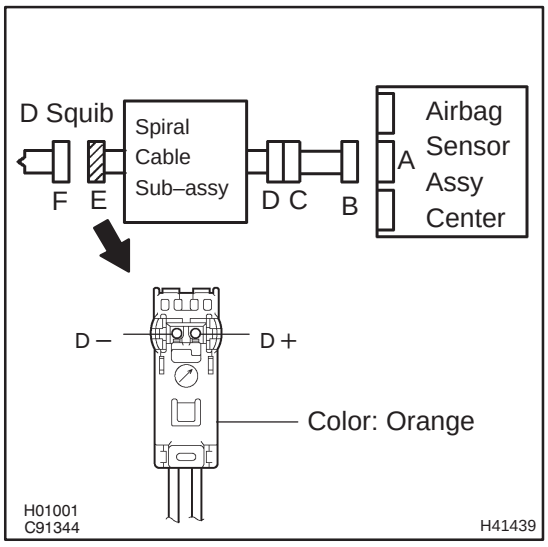
DTC No.	DTC Detecting Condition	Trouble Area
B0102/11	• Short circuit in D squib wire harness (to ground) • D squib malfunction • Spiral cable sub–assy malfunction • Airbag sensor assy center malfunction	• Horn button assy (D squib) • Spiral cable sub–assy • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1198.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)

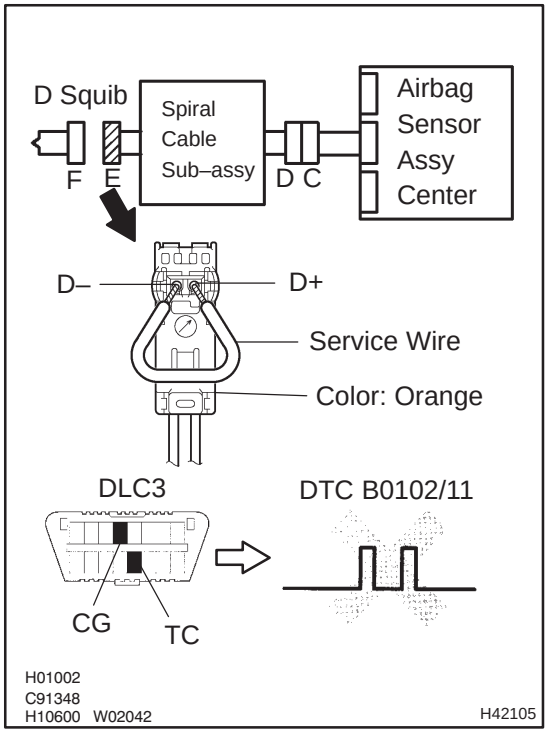


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the horn button assy.
(d) Measure the resistance between the body ground and D+ of the connector "E".
OK:
Resistance: 1 MΩ or Higher

NG → **Go to step 5**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect D+ and D– of the connector "E".

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0102/11 is not output.

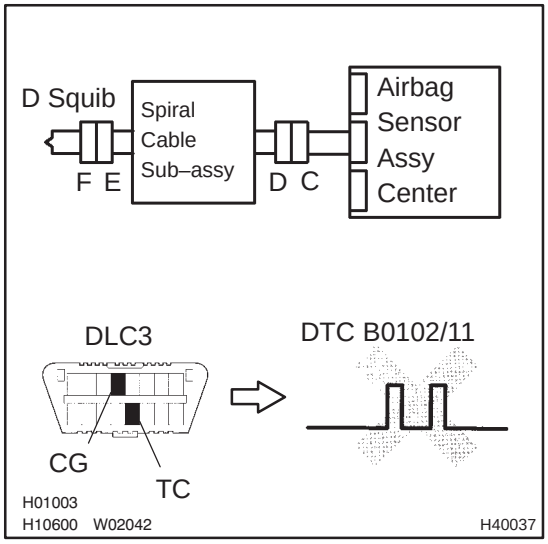
HINT:

Codes other than code B0102/11 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK HORN BUTTON ASSY(D SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the horn button assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).

OK:
DTC B0102/11 is not output.

HINT:
Codes other than code B0102/11 may be output at this time, but they are not related to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

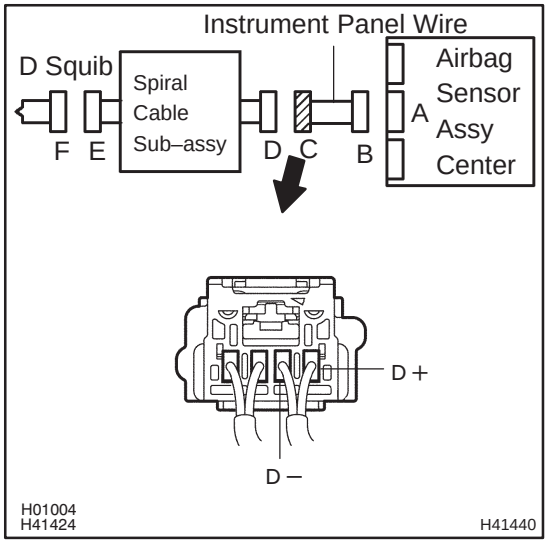
4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

5 CHECK INSTRUMENT PANEL WIRE



(a) Disconnect the instrument panel wire connector from the spiral cable sub–assy.

(b) Measure the resistance between the body ground and D+ of the connector "C".

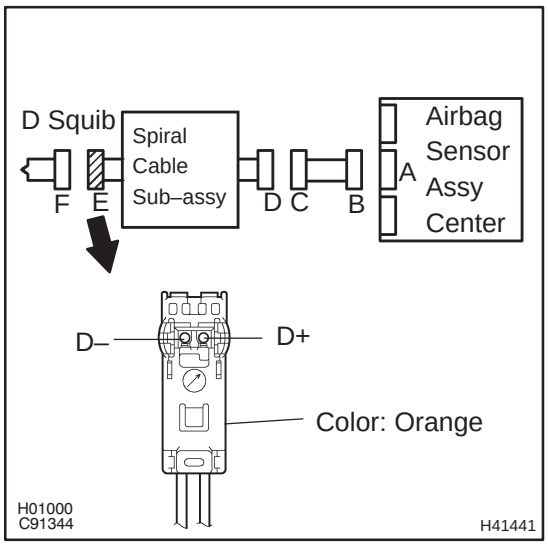
OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

6 CHECK SPIRAL CABLE SUB–ASSY



(a) Measure the resistance between the body ground and D+ of the connector "E".

OK:

Resistance: 1 MΩ or Higher

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

7 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC B0103/12 SHORT IN D SQUIB CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0103/12 is recorded when a short to B+ is detected in the D squib circuit.

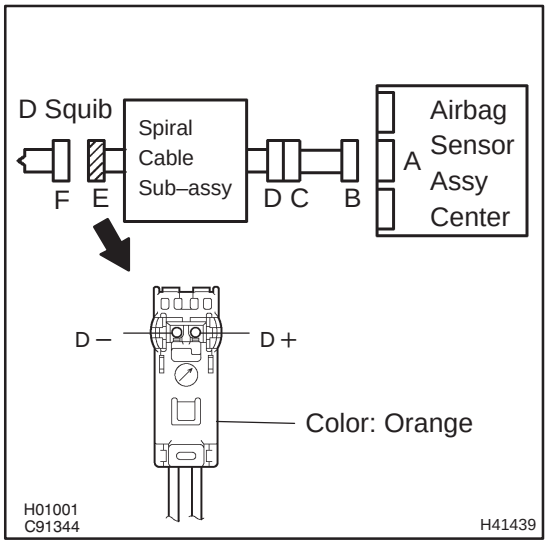
DTC No.	DTC Detecting Condition	Trouble Area
B0103/12	• Short circuit in D squib wire harness (to B+) • D squib malfunction • Spiral cable sub–assy malfunction • Airbag sensor assy center malfunction	• Horn button assy (D squib) • Spiral cable sub–assy • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1198.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)

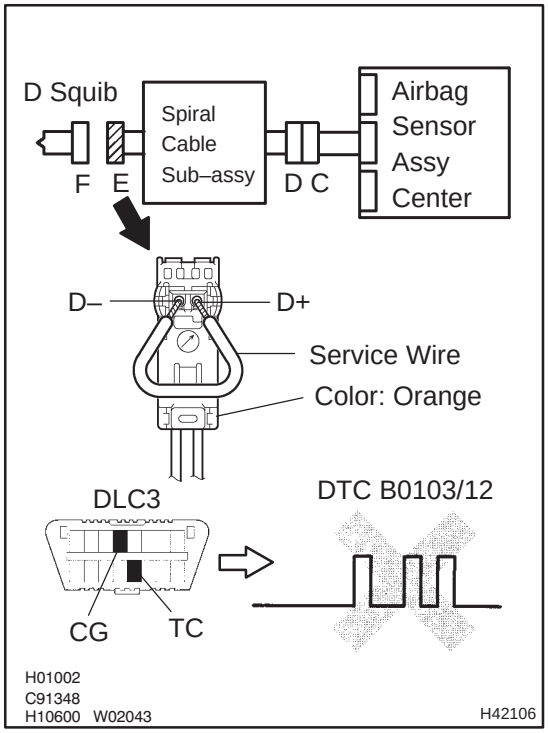


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the horn button assy.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and D+ of the connector "E".
OK:
Voltage: Below 1 V

NG → **Go to step 5**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect D+ and D– of the connector "E".

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

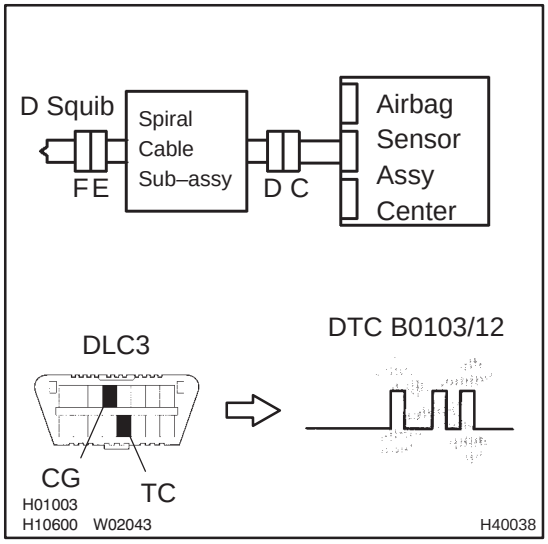
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0103/12 is not output.

HINT:
Codes other than code B0103/12 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK HORN BUTTON ASSY(D SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the horn button assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).

OK:
DTC B0103/12 is not output.

HINT:
Codes other than code B0103/12 may be output at this time, but they are not related to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

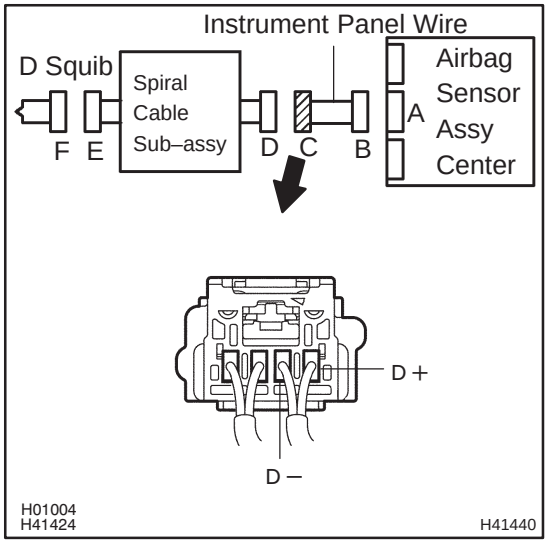
4 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

5 CHECK INSTRUMENT PANEL WIRE

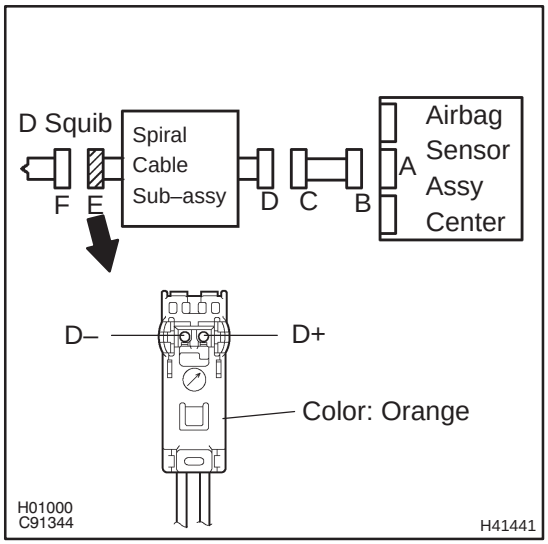


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the instrument panel wire connector from the spiral cable sub–assy.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and D+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG	REPAIR OR REPLACE INSTRUMENT PANEL WIRE

OK

6 CHECK SPIRAL CABLE SUB–ASSY



(a) Turn the ignition switch to the LOCK position.
(b) Turn the ignition switch to the ON position.
(c) Measure the voltage between the body ground and D+ of the connector ”E”.
OK:
Voltage: Below 1 V

NG	REPLACE SPIRAL CABLE SUB–ASSY

OK

7 USE SIMULATION METHOD TO CHECK

NG	Go to step 1

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

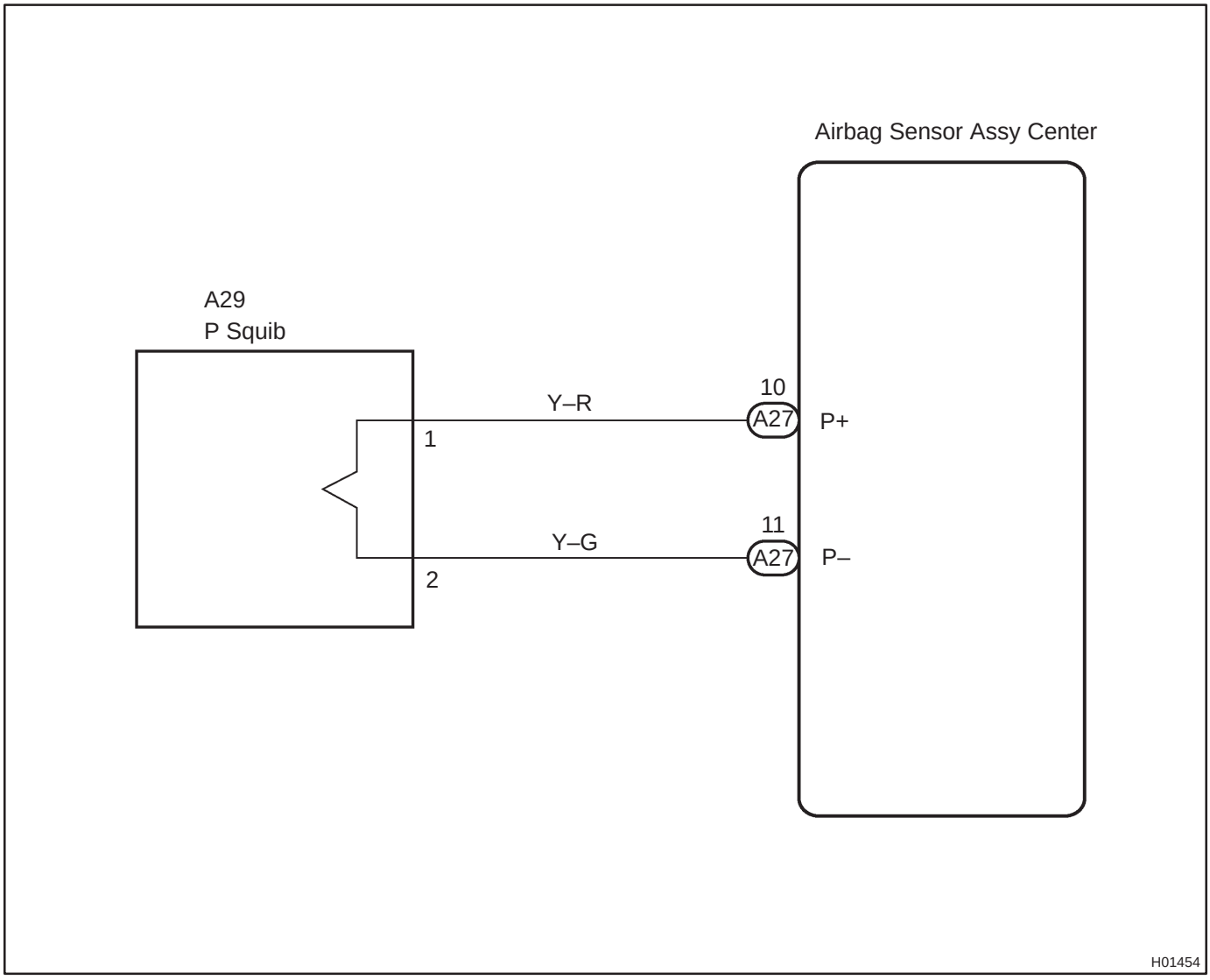
DTC B0105/53 SHORT IN P SQUIB CIRCUIT

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instrument panel passenger airbag assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0105/53 is recorded when a short circuit is detected in the P squib circuit.

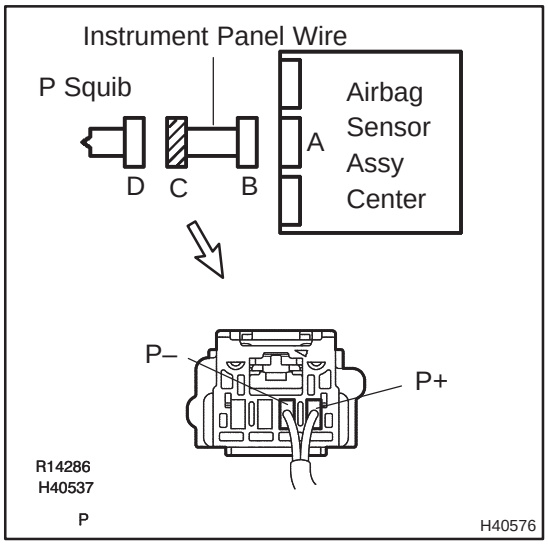
DTC No.	DTC Detecting Condition	Trouble Area
B0105/53	• Short circuit between P+ wire harness and P– wire harness of P squib • P squib malfunction • Airbag sensor assy center malfunction	• Instrument panel passenger airbag assy (P squib) • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)

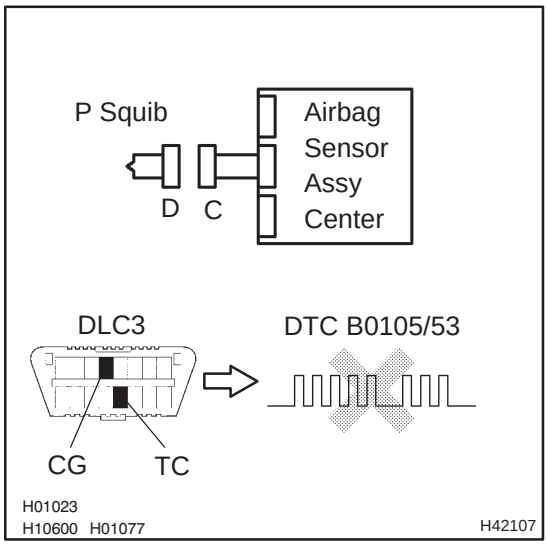


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors between the airbag sensor assy center and the instrument panel passenger airbag assy.
(d) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(e) Measure the resistance between P+ and P– of the connector "E".
OK:
Resistance: 1 MΩ or Higher

NG	REPAIR OR REPLACE INSTRUMENT PANEL WIRE

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



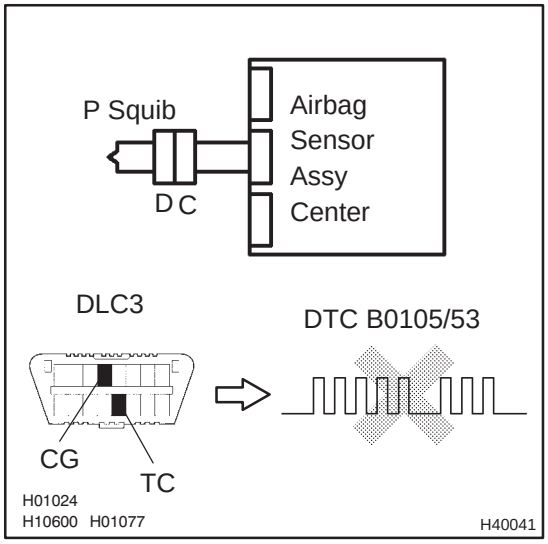
(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B0105/53 is not output.

HINT:
Codes other than code B0105/53 may be output at this time, but they are not related to this check.

NG	REPLACE AIR BAG SENSOR ASSY CENTER

OK

3	CHECK INSTRUMENT PANEL PASSENGER AIR BAG ASSY(P SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the instrument panel passenger airbag assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0105/53 is not output.

HINT:
Codes other than code B0105/53 may be output at this time, but they are not related to this check.

NG → **REPLACE INSTRUMENT PANEL PASSENGER AIR BAG ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC B0106/54 OPEN IN P SQUIB CIRCUIT

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instrument panel passenger airbag assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0106/54 is recorded when an open circuit is detected in the P squib circuit.

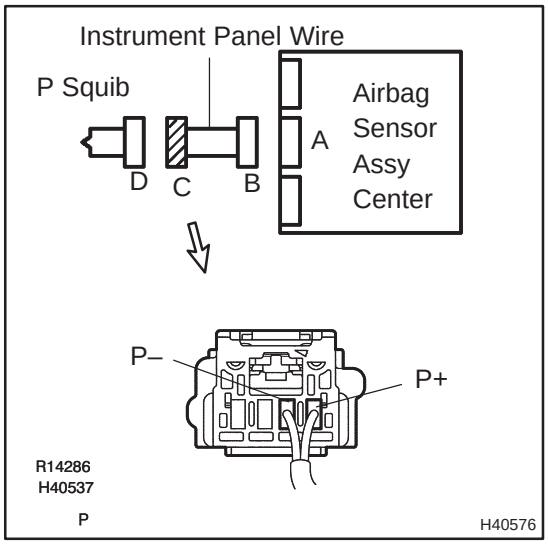
DTC No.	DTC Detecting Condition	Trouble Area
B0106/54	• Open circuit in P+ wire harness or P– wire harness of P squib • P squib malfunction • Airbag sensor assy center malfunction	• Instrument panel passenger airbag assy (P squib) • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1214.

INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)

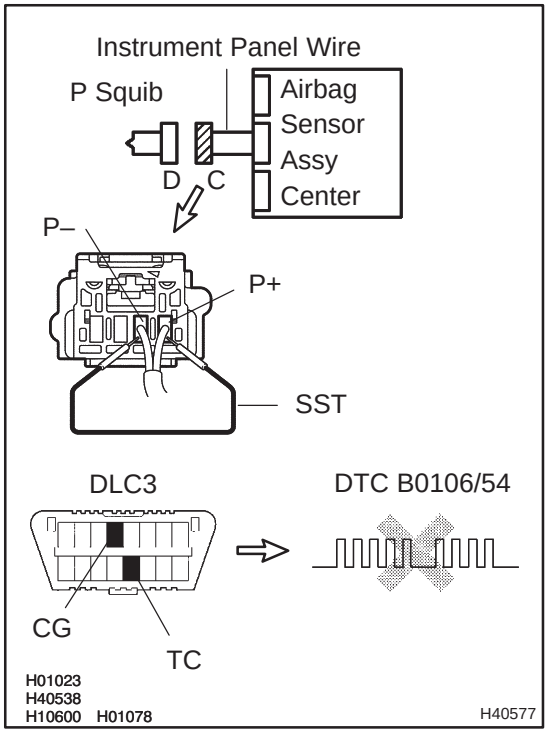


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the instrument panel passenger airbag assy.
(d) Measure the resistance between P+ and P– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



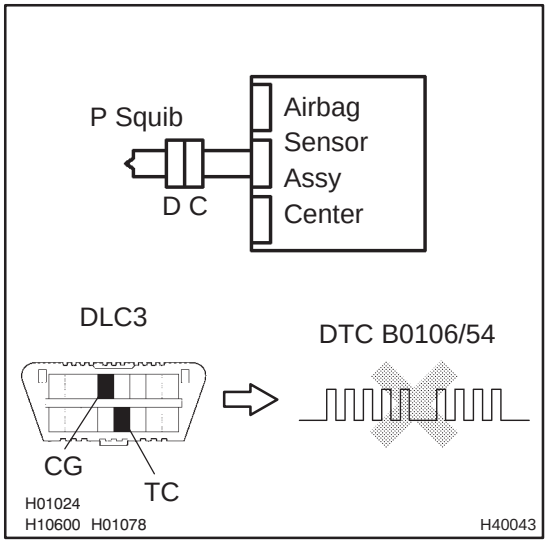
(a) Connect the connector to the airbag sensor assy center.
(b) Using SST, connect P+ and P– of the connector ”C”.
SST 09843–18040
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B0106/54 is not output.

HINT:
Codes other than code B0106/54 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK INSTRUMENT PANEL PASSENGER AIR BAG ASSY(P SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the instrument panel passenger airbag assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0106/54 is not output.

HINT:
Codes other than code B0106/54 may be output at this time, but they are not related to this check.

NG → **REPLACE INSTRUMENT PANEL PASSENGER AIR BAG ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC B0107/51 SHORT IN P SQUIB CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instrument panel passenger airbag assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0107/51 is recorded when a short to ground is detected in the P squib circuit.

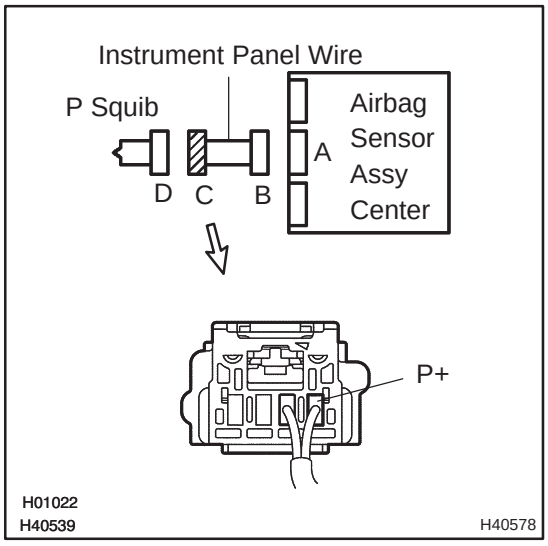
DTC No.	DTC Detecting Condition	Trouble Area
B0107/51	• Short circuit in P squib wire harness (to ground) • P squib malfunction • Airbag sensor assy center malfunction	• Instrument panel passenger airbag assy (P squib) • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1214.

INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)

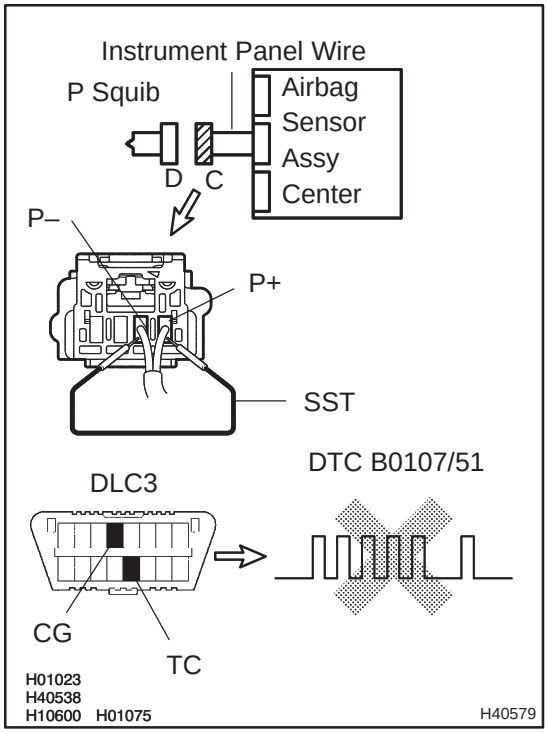


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the instrument panel passenger airbag assy.
(d) Measure the resistance between the body ground and P+ of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



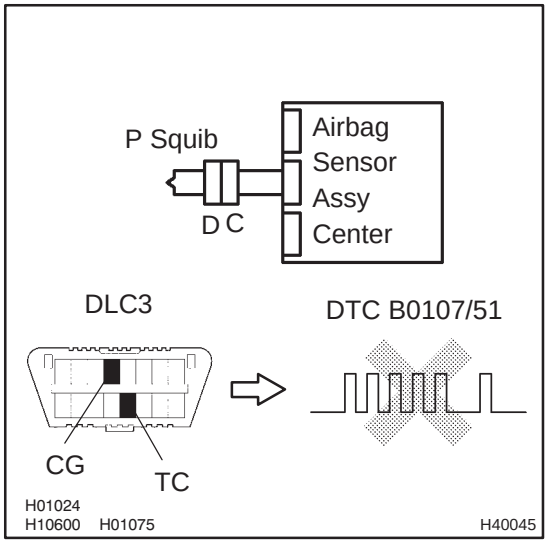
(a) Connect the connector to the airbag sensor assy center.
(b) Using SST, connect P+ and P– of the connector ”C”.
SST 09843–18040
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B0107/51 is not output.

HINT:
Codes other than code B0107/51 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK INSTRUMENT PANEL PASSENGER AIR BAG ASSY(P SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the instrument panel passenger airbag assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0107/51 is not output.

HINT:
Codes other than code B0107/51 may be output at this time, but they are not related to this check.

NG → **REPLACE INSTRUMENT PANEL PASSENGER AIR BAG ASSY**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC B0108/52 SHORT IN P SQUIB CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instrument panel passenger airbag assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0108/52 is recorded when a short to B+ is detected in the P squib circuit.

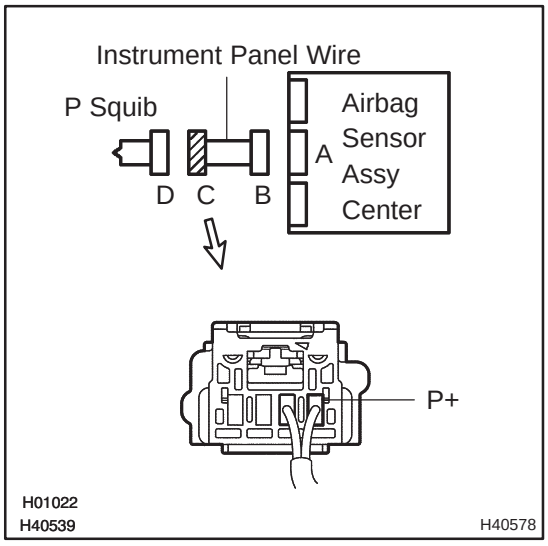
DTC No.	DTC Detecting Condition	Trouble Area
B0108/52	• Short circuit in P squib wire harness (to B+) • P squib malfunction • Airbag sensor assy center malfunction	• Instrument panel passenger airbag assy (P squib) • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1214.

INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)

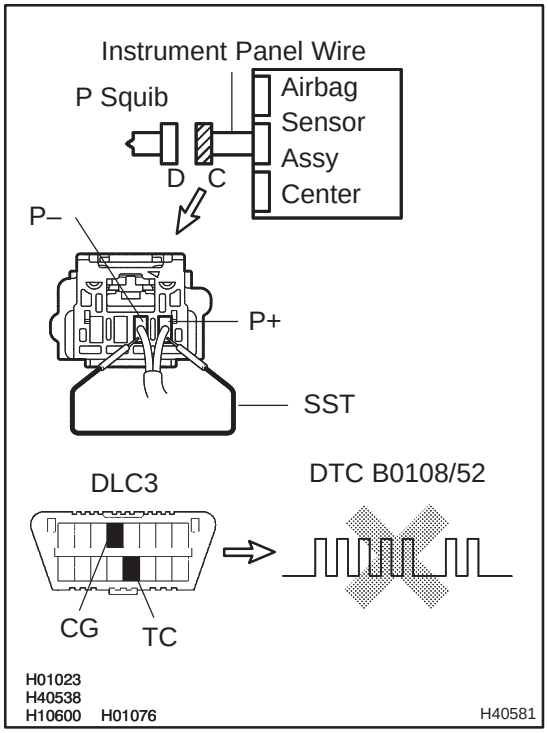


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the instrument panel passenger airbag assy.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and P+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



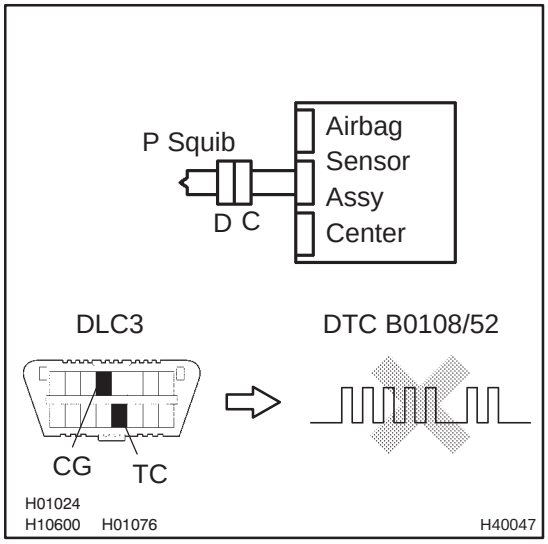
(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using SST, connect P+ and P– of the connector ”C”.
SST 09843–18040
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0108/52 is not output.

HINT:
Codes other than code B0108/52 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK INSTRUMENT PANEL PASSENGER AIR BAG ASSY(P SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the instrument panel passenger airbag assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0108/52 is not output.

HINT:
Codes other than code B0108/52 may be output at this time, but they are not related to this check.

NG → **REPLACE INSTRUMENT PANEL PASSENGER AIR BAG ASSY**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

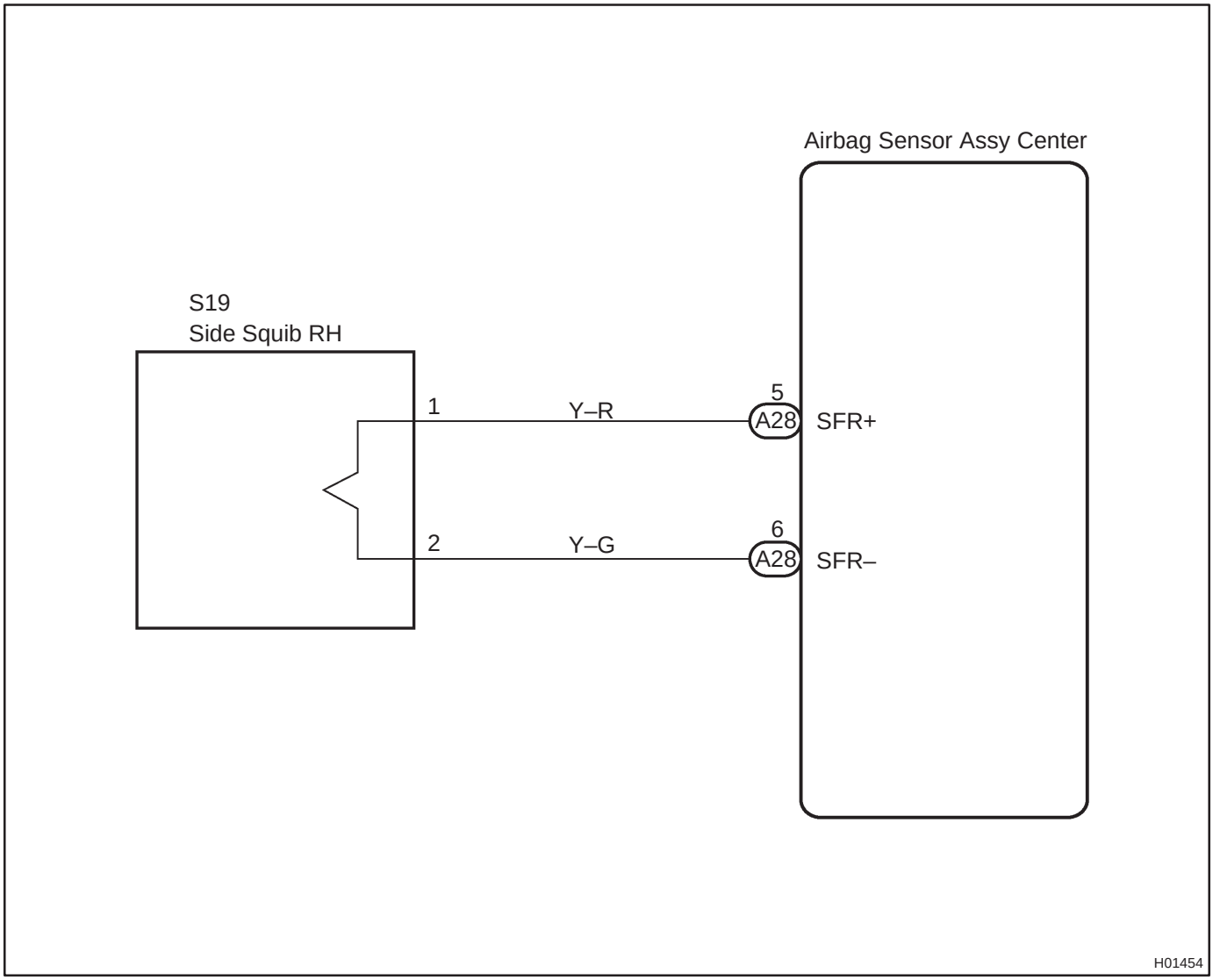
DTC B0110/43 SHORT IN SIDE SQUIB (RH) CIRCUIT

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0110/43 is recorded when a short circuit is detected in the side squib RH circuit.

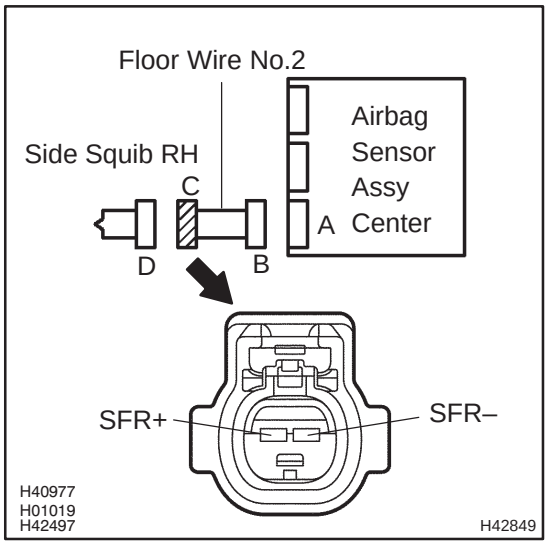
DTC No.	DTC Detecting Condition	Trouble Area
B0110/43	• Short circuit between SFR+ wire harness and SFR– wire harness of side squib RH • Side squib RH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK FLOOR WIRE NO.2(SIDE SQUIB RH CIRCUIT)

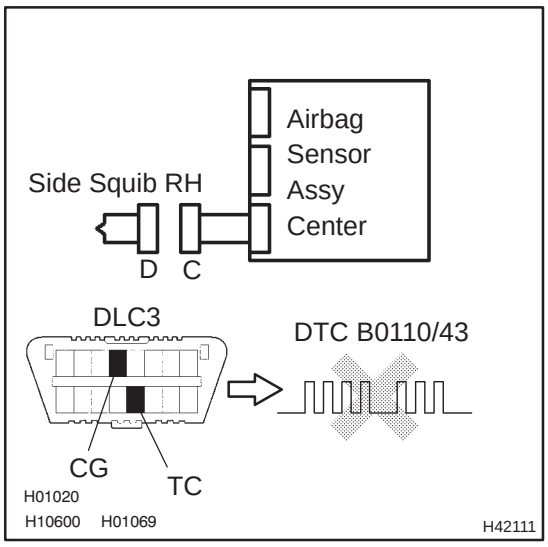


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib RH).
(d) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(e) Measure the resistance between SFR+ and SFR– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



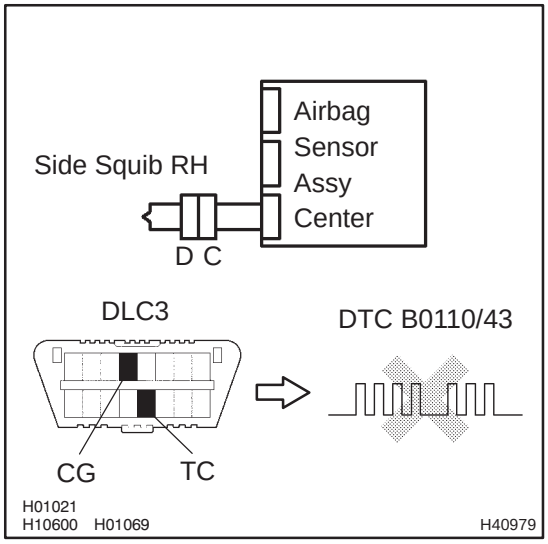
(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B0110/43 is not output.

HINT:
Codes other than code B0110/43 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib RH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0110/43 is not output.

HINT:
Codes other than code B0110/43 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC B0111/44 OPEN IN SIDE SQUIB (RH) CIRCUIT

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0111/44 is recorded when an open circuit is detected in the side squib RH circuit.

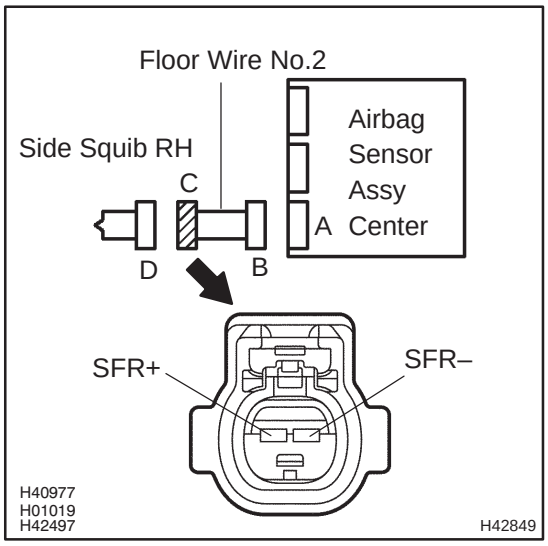
DTC No.	DTC Detecting Condition	Trouble Area
B0111/44	• Open circuit in SFR+ wire harness or SFR– wire harness of side squib RH • Side squib RH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1226.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE NO.2(SIDE SQUIB RH CIRCUIT)

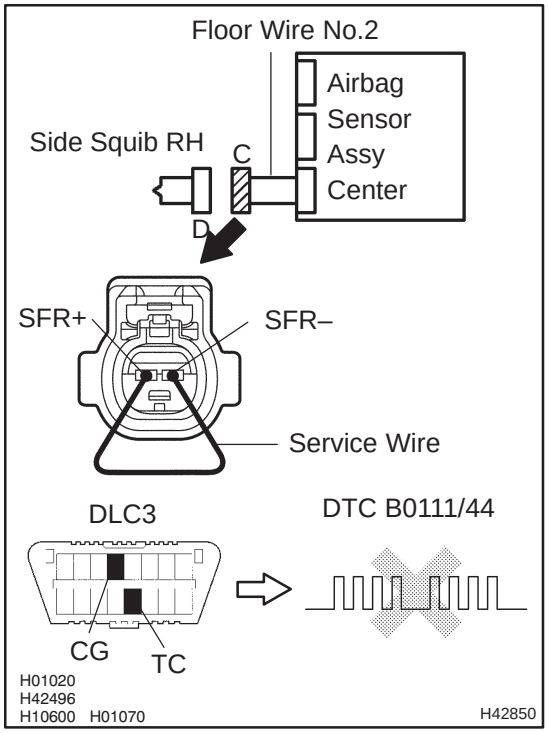


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib RH).
(d) Measure the resistance between SFR+ and SFR– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFR+ and SFR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0111/44 is not output.

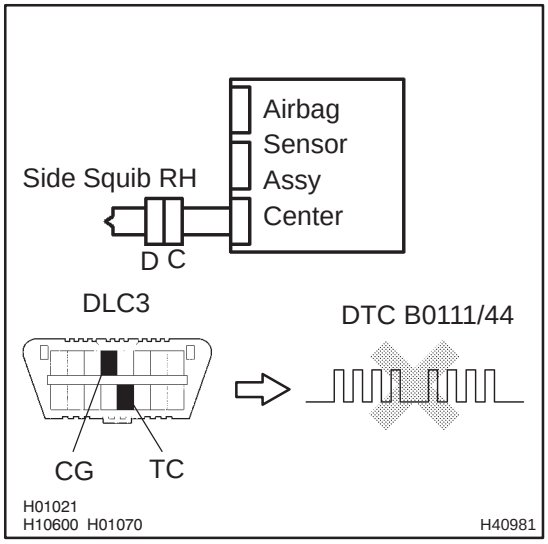
HINT:

Codes other than code B0111/44 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib RH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0111/44 is not output.

HINT:
Codes other than code B0111/44 may be output at this time, but they are not related to this check.

NG	**REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC	B0112/41	SHORT IN SIDE SQUIB (RH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0112/41 is recorded when a short to ground is detected in the side squib RH circuit.

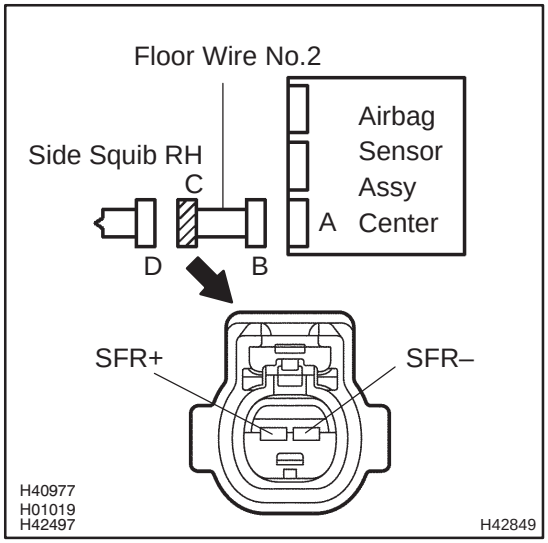
DTC No.	DTC Detecting Condition	Trouble Area
B0112/41	• Short circuit in side squib RH wire harness (to ground) • Side squib RH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1226.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(SIDE SQUIB RH CIRCUIT)

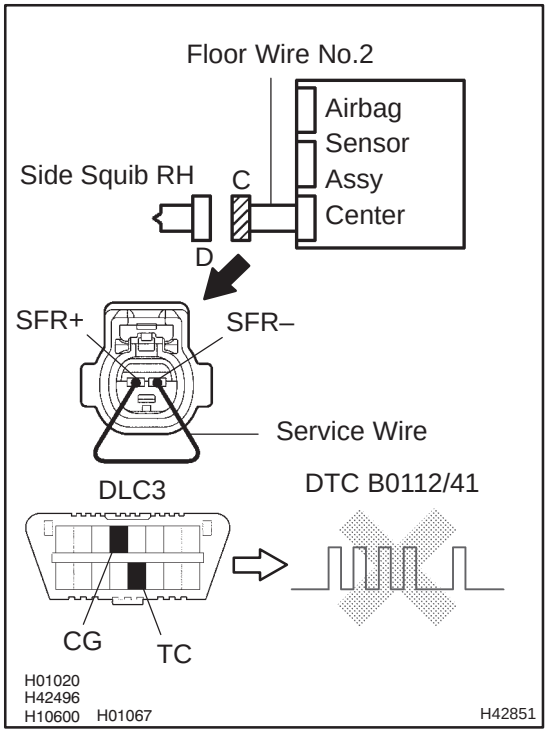


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib RH).
(d) Measure the resistance between the body ground and SFR+ of the connector ”C”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFR+ and SFR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0112/41 is not output.

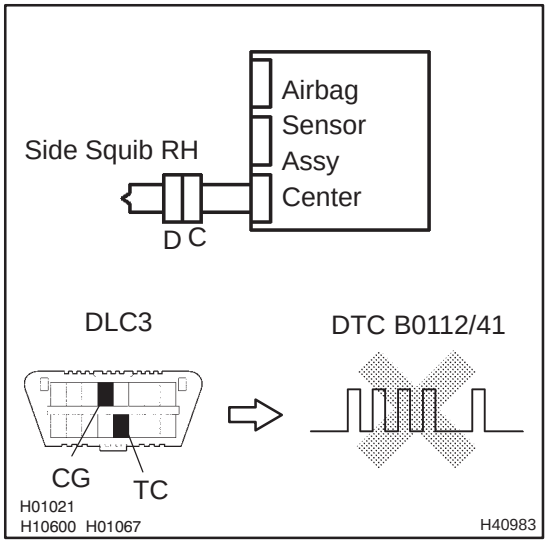
HINT:

Codes other than code B0112/41 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib RH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0112/41 is not output.

HINT:
Codes other than code B0112/41 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

4 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B0113/42	SHORT IN SIDE SQUIB (RH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0113/42 is recorded when a short to B+ is detected in the side squib RH circuit.

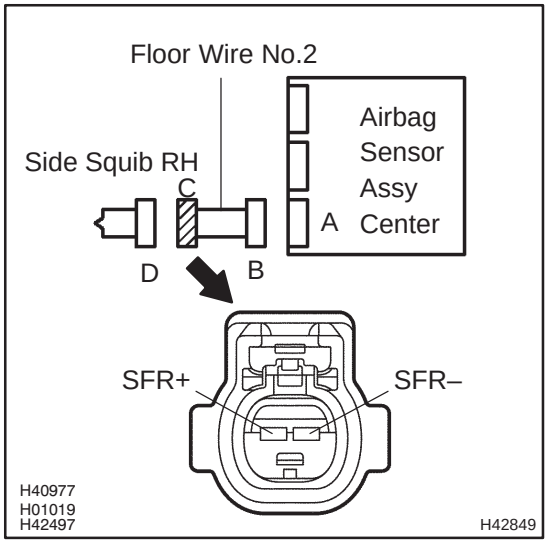
DTC No.	DTC Detecting Condition	Trouble Area
B0113/42	• Short circuit in side squib RH wire harness (to B+) • Side squib RH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1226.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(SIDE SQUIB RH CIRCUIT)

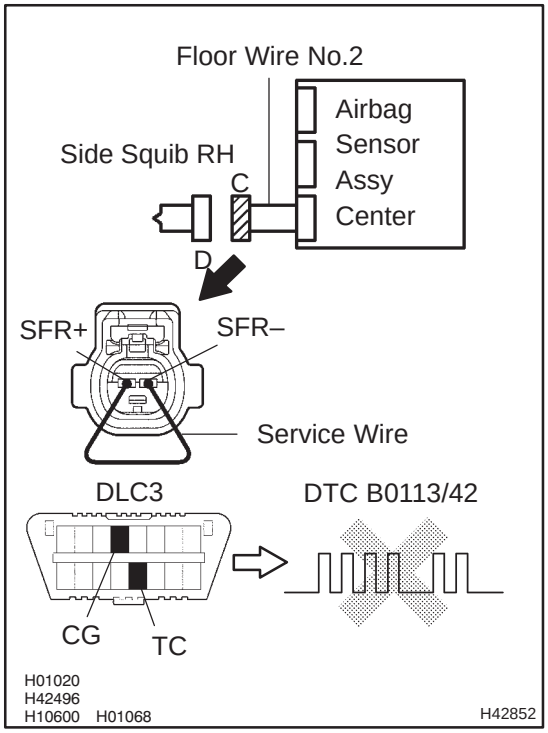


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib RH).
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and SFR+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect SFR+ and SFR– of the connector "C".

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

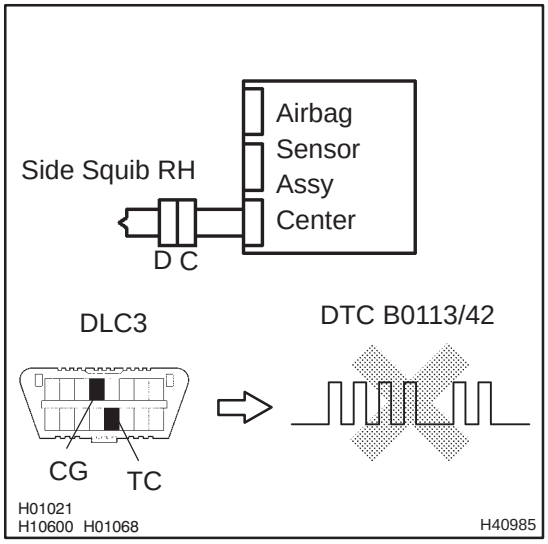
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0113/42 is not output.

HINT:
Codes other than code B0113/42 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib RH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0113/42 is not output.

HINT:
Codes other than code B0113/42 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

4 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

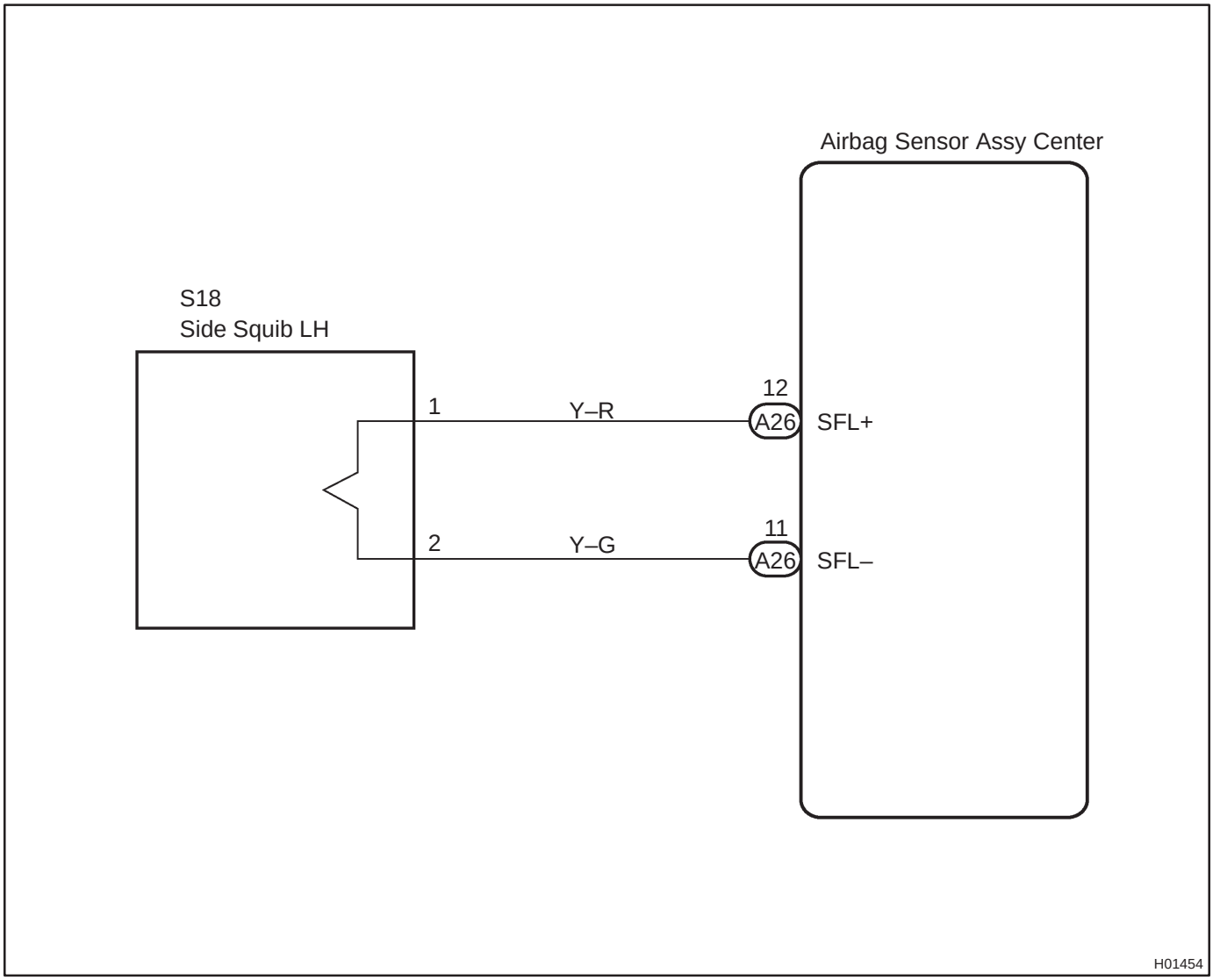
DTC B0115/47 SHORT IN SIDE SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0115/47 is recorded when a short circuit is detected in the side squib LH circuit.

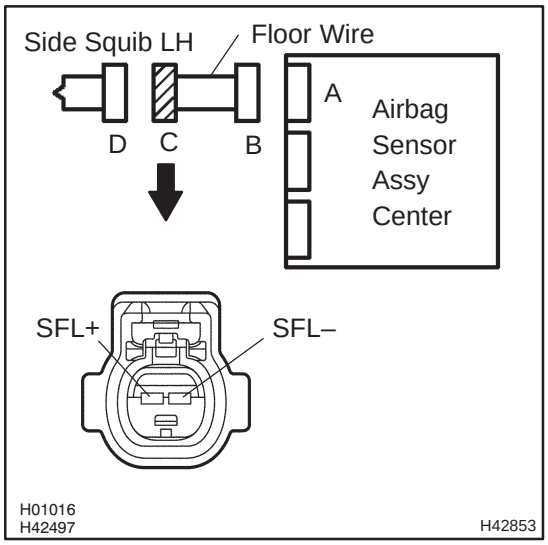
DTC No.	DTC Detecting Condition	Trouble Area
B0115/47	• Short circuit between SFL+ wire harness and SFL– wire harness of side squib LH • Side squib LH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK FLOOR WIRE(SIDE SQUIB LH CIRCUIT)

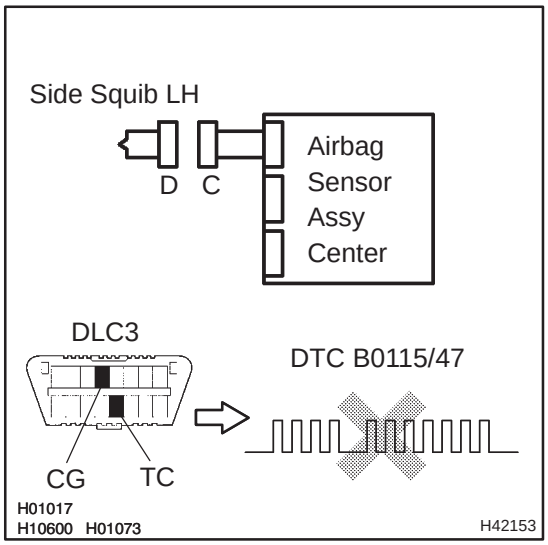


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib LH).
(d) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(e) Measure the resistance between SFL+ and SFL– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



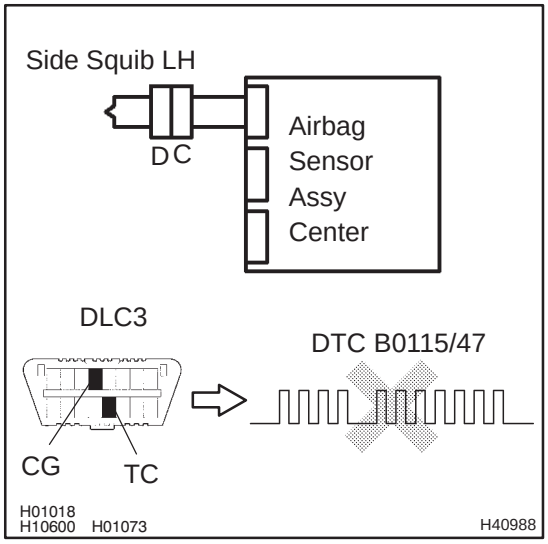
(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B0115/47 is not output.

HINT:
Codes other than code B0115/47 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib LH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0115/47 is not output.

HINT:
Codes other than code B0115/47 may be output at this time, but they are not related to this check.

NG	REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY

OK

USE SIMULATION METHOD TO CHECK

DTC B0116/48 OPEN IN SIDE SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib LH).
This circuit the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0116/48 is recorded when an open circuit is detected in the side squib LH circuit.

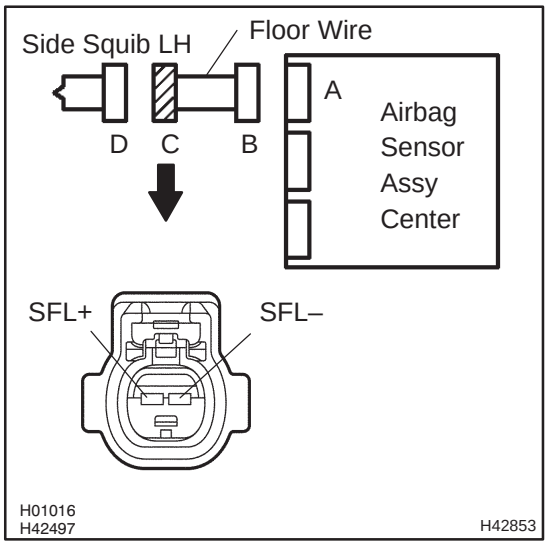
DTC No.	DTC Detecting Condition	Trouble Area
B0116/48	• Open circuit in SFL+ wire harness or SFL– wire harness of side squib LH • Side squib LH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1238.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE(SIDE SQUIB LH CIRCUIT)

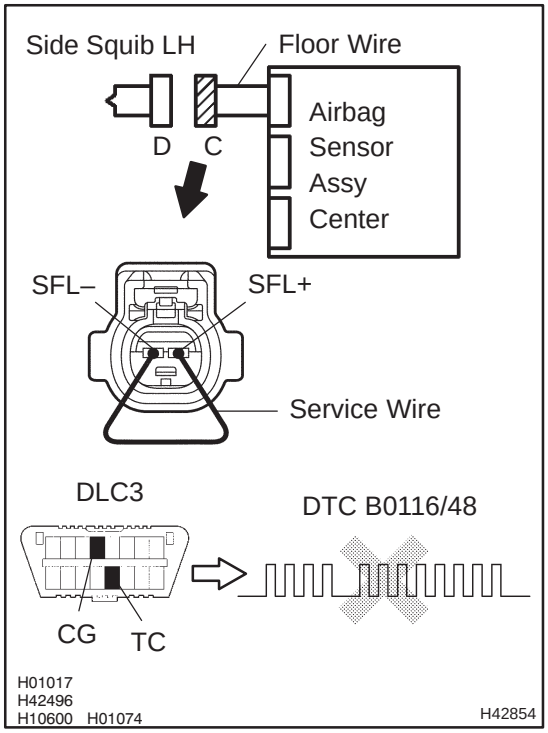


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib LH).
(d) Measure the resistance between SFL+ and SFL– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFL+ and SFL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0116/48 is not output.

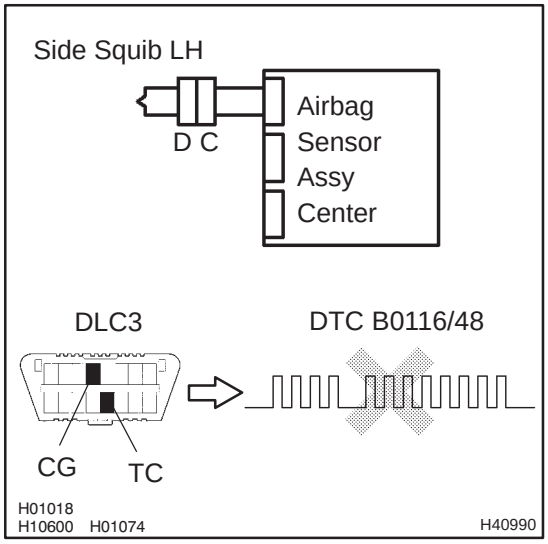
HINT:

Codes other than code B0116/48 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib LH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0116/48 is not output.

HINT:
Codes other than code B0116/48 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK →

USE SIMULATION METHOD TO CHECK

DTC	B0117/45	SHORT IN SIDE SQUIB (LH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0117/45 is recorded when a short to ground is detected in the side squib LH circuit.

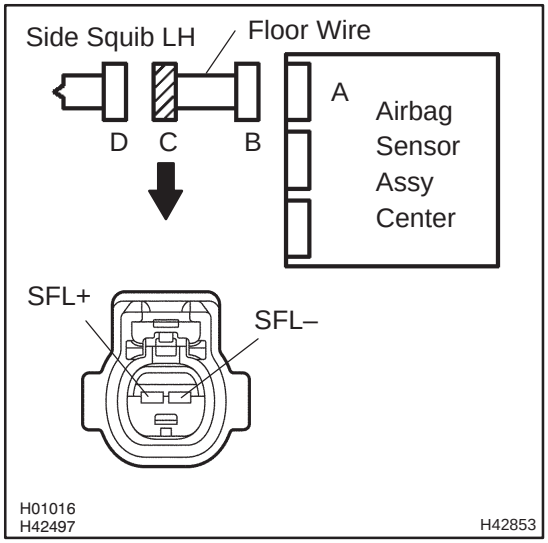
DTC No.	DTC Detecting Condition	Trouble Area
B0117/45	• Short circuit in side squib LH wire harness (to ground) • Side squib LH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1238.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(SIDE SQUIB LH CIRCUIT)

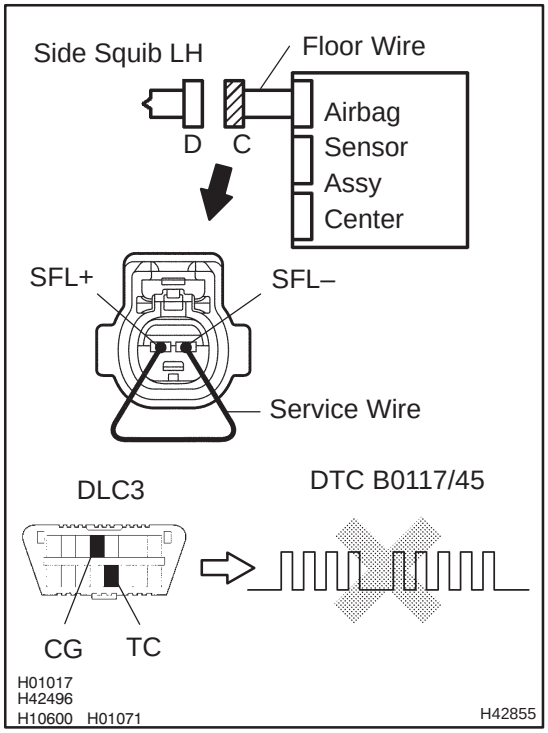


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib LH).
(d) Measure the resistance between the body ground and SFL+ of the connector ”C”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFL+ and SFL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0117/45 is not output.

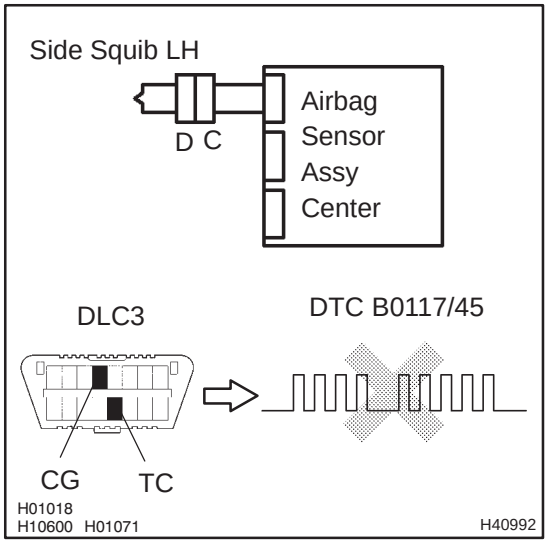
HINT:

Codes other than code B0117/45 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib LH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0117/45 is not output.

HINT:
Codes other than code B0117/45 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

4 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B0118/46	SHORT IN SIDE SQUIB (LH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0118/46 is recorded when a short to B+ is detected in the side squib LH circuit.

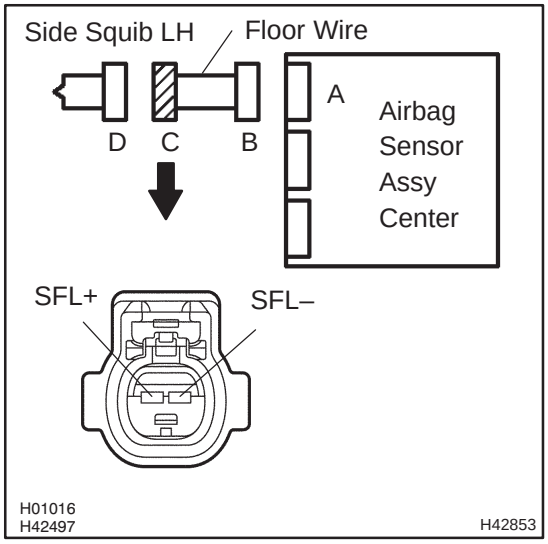
DTC No.	DTC Detecting Condition	Trouble Area
B0118/46	• Short circuit in side squib LH wire harness (to B+) • Side squib LH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1238.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(SIDE SQUIB LH CIRCUIT)

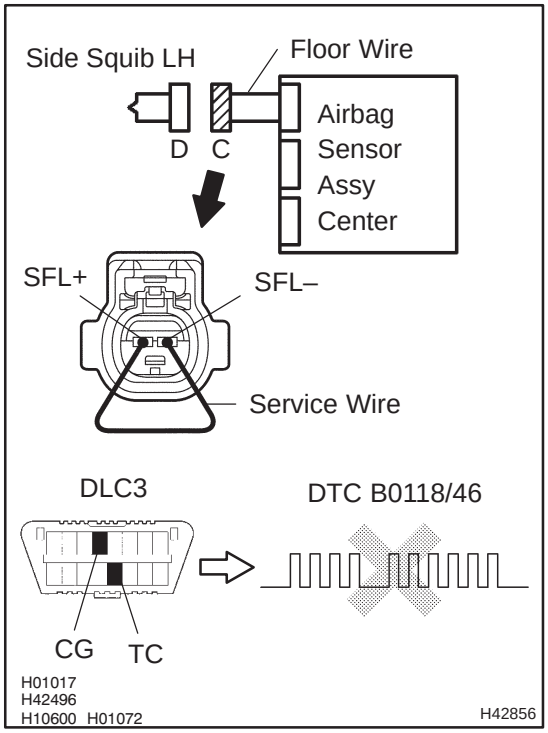


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib LH).
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and SFL+ of the connector "C".
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect SFL+ and SFL– of the connector ”C”.

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

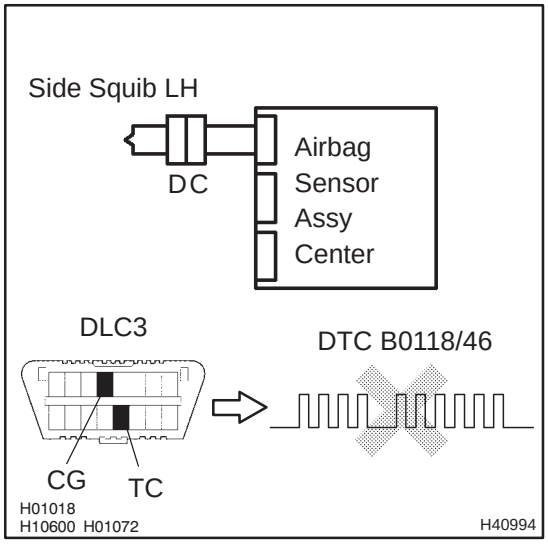
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0118/46 is not output.

HINT:
Codes other than code B0118/46 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib LH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0118/46 is not output.

HINT:
Codes other than code B0118/46 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B0121/26	SEAT BELT BUCKLE SWITCH (RH) MALFUNCTION

DTC	B0122/26	SEAT BELT BUCKLE SWITCH (RH) MALFUNCTION

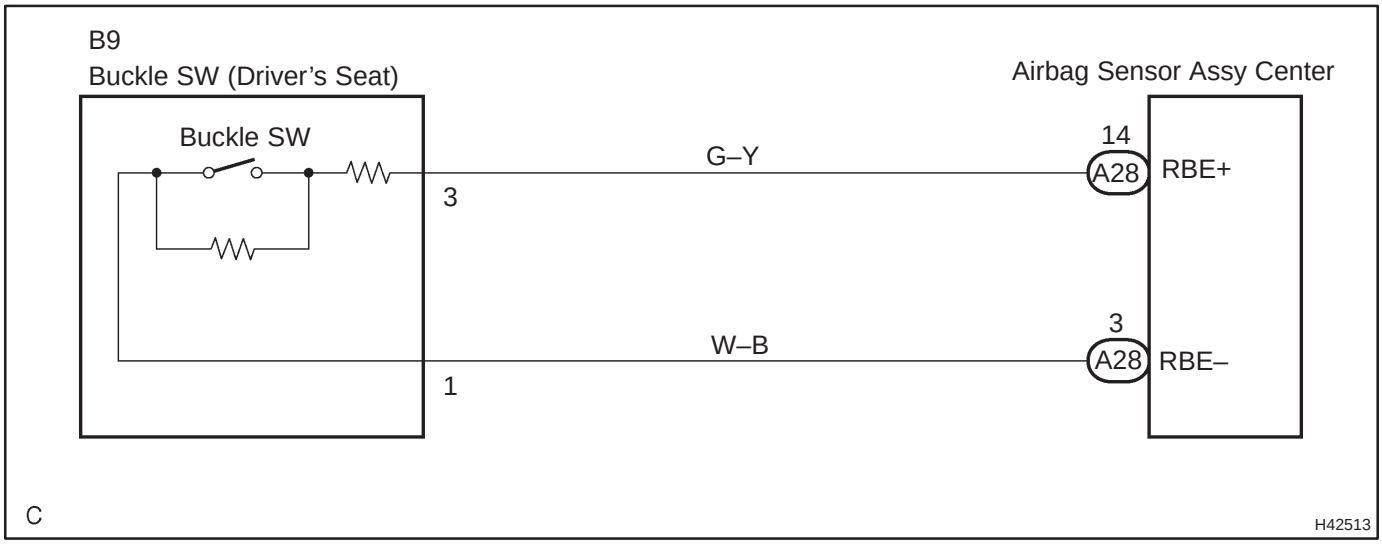
CIRCUIT DESCRIPTION

The seat belt buckle switch RH circuit consists of the airbag sensor assy center and the front seat inner belt assy RH (seat belt buckle switch RH).
DTC B0121/26 or B0122/26 is recorded when a malfunction is detected in the seat belt buckle switch RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0121/B0122/26	• Short circuit in seat belt buckle switch RH wire harness (to ground) • Short circuit in seat belt buckle switch RH wire harness (to B+) • Seat belt buckle switch RH malfunction • Airbag sensor assy center	• Front seat inner belt assy RH (Seat belt buckle switch RH) • Airbag sensor assy center • Floor wire No.2

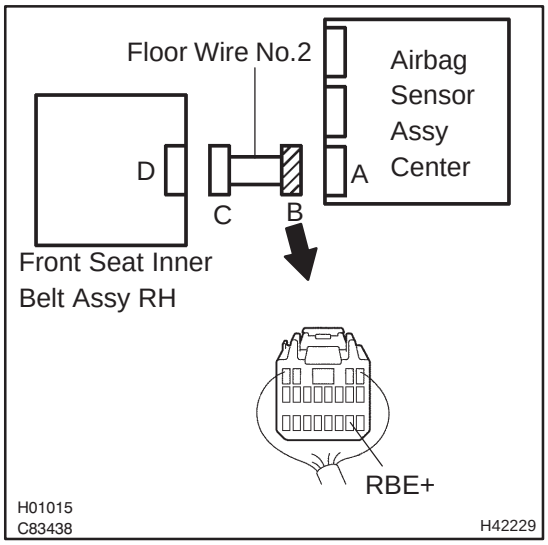
HINT:
DTC B0121/26 or B0122/26 is indicated only for the RHD vehicle.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(TO B+)

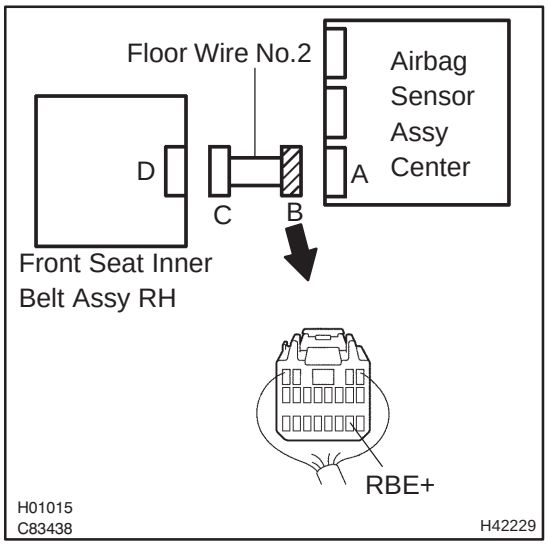


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat inner belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and RBE+ of the connector ”B”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2	CHECK FLOOR WIRE NO.2(TO GROUND)

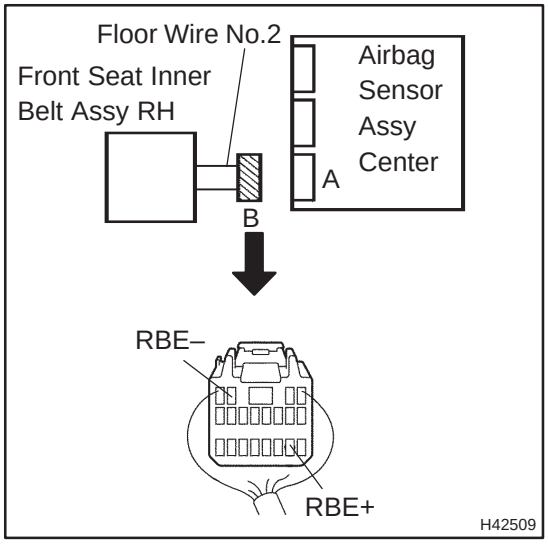


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and RBE+ of the connector ”B”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

3 CHECK FRONT SEAT INNER BELT ASSY RH

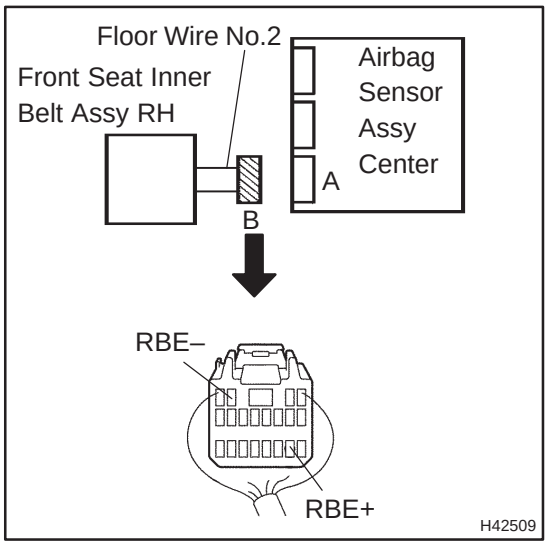


(a) Connect the connector to the front seat inner belt assy RH.
(b) Unlock the seat belt at the front seat RH.
(c) Measure the resistance between RBE+ and RBE– of the connector ”B”.
OK:
Resistance: 1.0 kΩ to 1.6 kΩ

NG → **REPLACE FRONT SEAT INNER BELT ASSY RH**

OK

4 CHECK FRONT SEAT INNER BELT ASSY RH

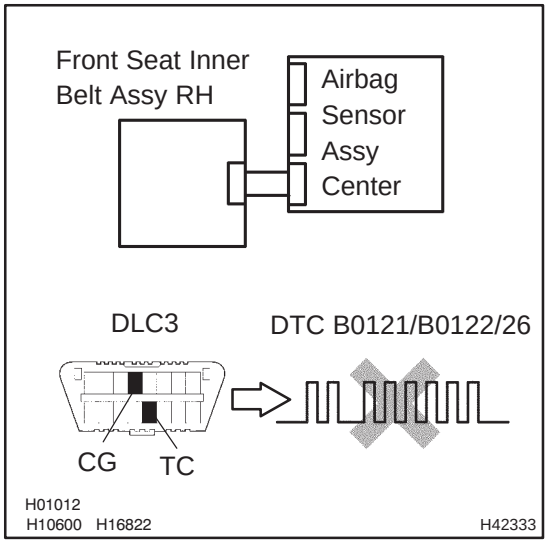


(a) Lock the seat belt at the front seat RH.
(b) Measure the resistance between the RBE+ and RBE– of the connector ”B”.
OK:
Resistance: 100 Ω to 500 Ω

NG → **REPLACE FRONT SEAT INNER BELT ASSY RH**

OK

5	CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B0121/26 or B0122/26 is not output.

HINT:
Codes other than code B0121/26 or B0122/26 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

DTC	B0126/27	SEAT BELT BUCKLE SWITCH (LH) MALFUNCTION

DTC	B0127/27	SEAT BELT BUCKLE SWITCH (LH) MALFUNCTION

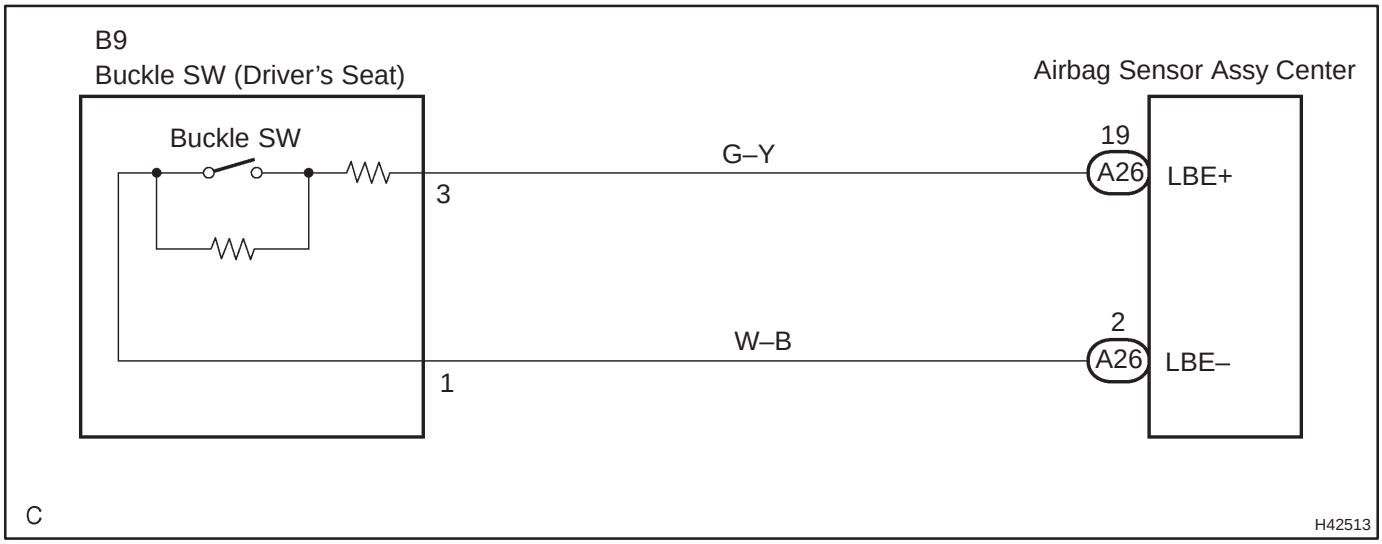
CIRCUIT DESCRIPTION

The seat belt buckle switch LH circuit consists of the airbag sensor assy center and the front seat inner belt assy LH (seat belt buckle switch LH).
DTC B0126/27 or B0127/27 is recorded when a malfunction is detected in the seat belt buckle switch LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0126/B0127/27	• Short circuit in seat belt buckle switch LH wire harness (to ground) • Short circuit in seat belt buckle switch LH wire harness (to B+) • Front seat inner belt assy LH malfunction • Airbag sensor assy center malfunction	• Front seat inner belt assy LH (Seat belt buckle switch LH) • Airbag sensor assy center • Floor wire

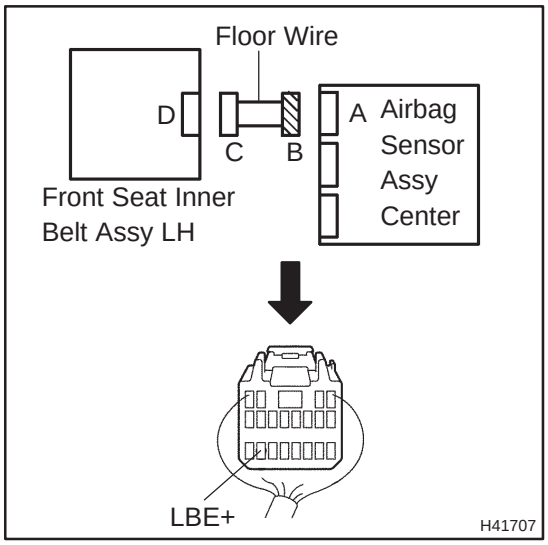
HINT:
DTC B0126/27 or B0127/27 is indicated only for the LHD vehicle.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(TO B+)

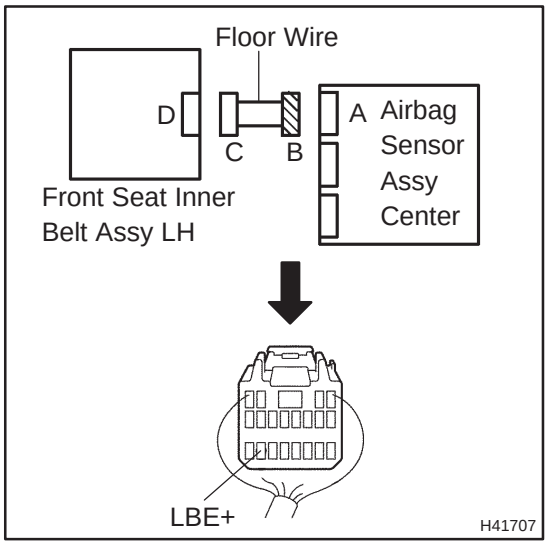


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat inner belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and LBE+ of the connector ”B”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2	CHECK FLOOR WIRE(TO GROUND)

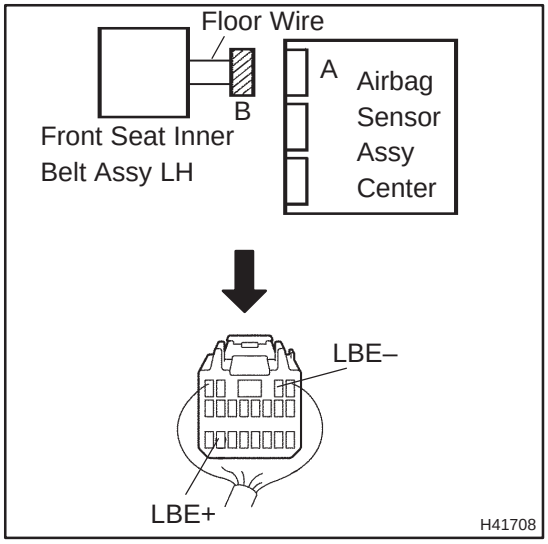


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and LBE+ of the connector ”B”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

3 CHECK FRONT SEAT INNER BELT ASSY LH

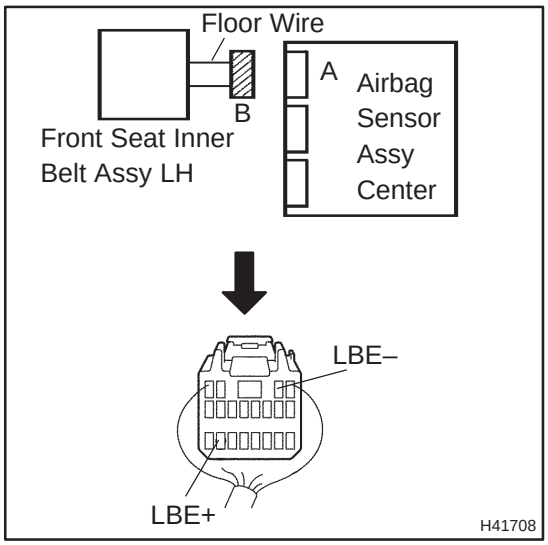


(a) Connect the connector to the front seat inner belt assy LH.
(b) Unlock the seat belt at the front seat LH.
(c) Measure the resistance between LBE+ and LBE– of the connector ”B”.
OK:
Resistance: 1.0 kΩ to 1.6 kΩ

NG → **REPLACE FRONT SEAT INNER BELT ASSY LH**

OK

4 CHECK FRONT SEAT INNER BELT ASSY LH

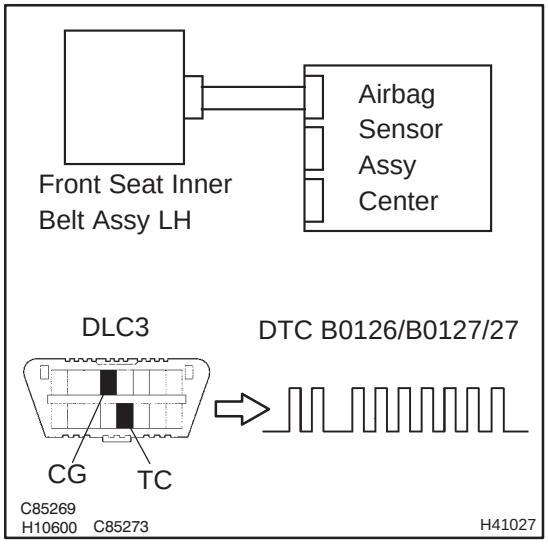


(a) Lock the seat belt at the front seat LH.
(b) Measure the resistance between LBE+ and LBE– of the connector ”B”.
OK:
Resistance: 100 Ω to 500 Ω

NG → **REPLACE FRONT SEAT INNER BELT ASSY LH**

OK

5	CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).

OK:

DTC B0126/27 or B0127/27 is not output.

HINT:

Codes other than code B0126/27 or B0127/27 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

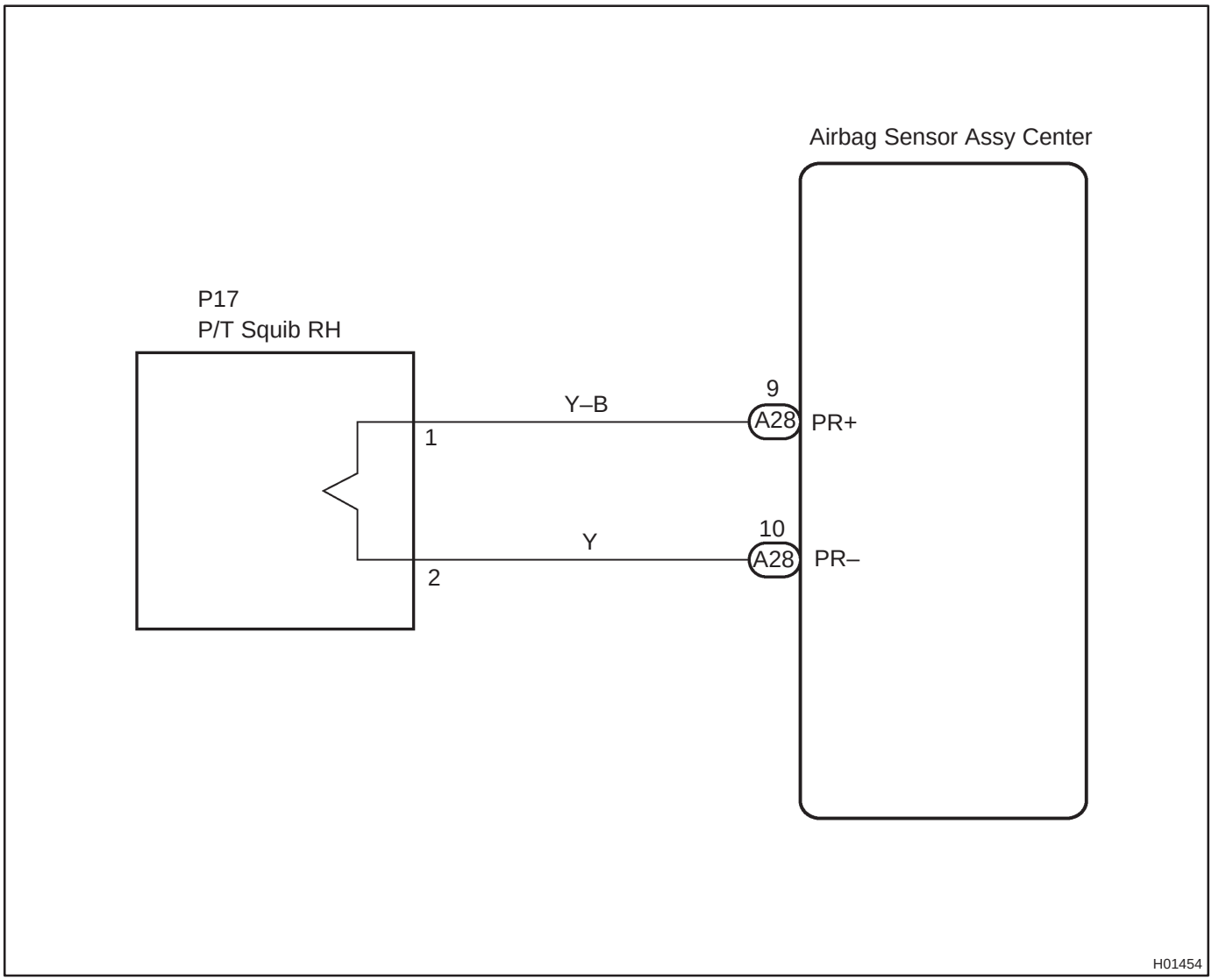
DTC B0130/63 SHORT IN P/T SQUIB (RH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the front seat outer belt assy RH (seat belt pretensioner RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0130/63 is recorded when a short circuit is detected in the P/T squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0130/63	• Short circuit between PR+ wire harness and PR– wire harness of P/T squib RH • P/T squib RH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy RH (P/T squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM



INSPECTION PROCEDURE

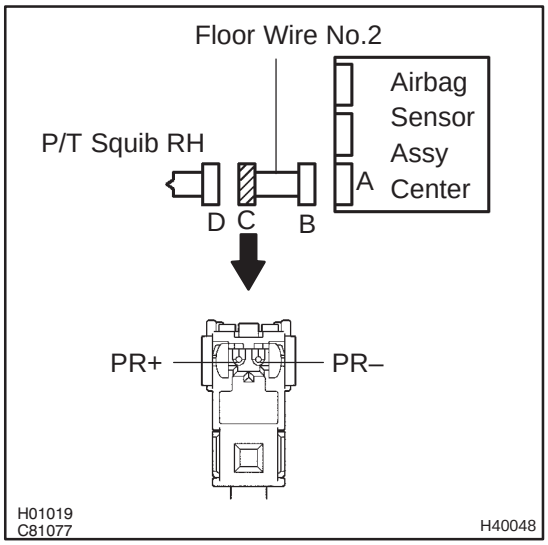
1	CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag assy center and the front seat outer belt assy RH.
(d) Check that the floor wire No.2 connector (on the front seat outer belt assy RH side) is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2	CHECK FLOOR WIRE NO.2(P/T SQUIB RH CIRCUIT)

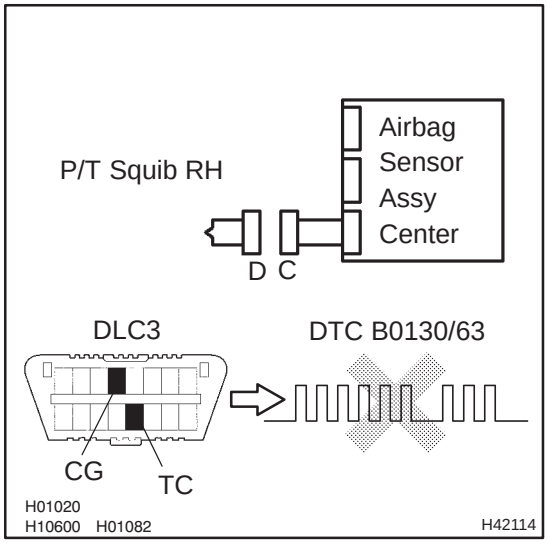


(a) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(b) Measure the resistance between PR+ and PR– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

3 CHECK AIR BAG SENSOR ASSY CENTER



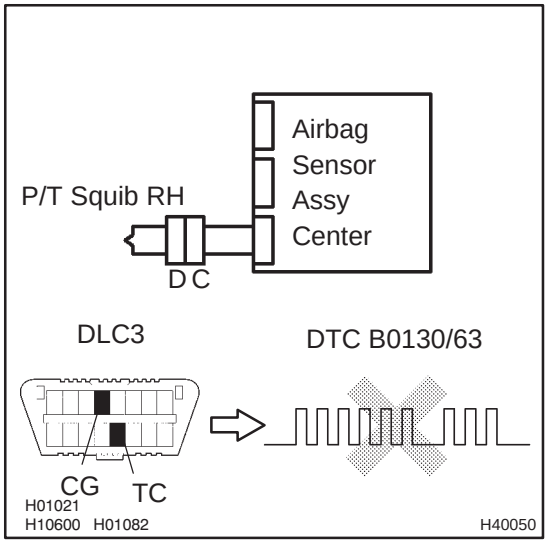
(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B0130/63 is not output.

HINT:
Codes other than code B0130/63 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

4 CHECK FRONT SEAT OUTER BELT ASSY RH(P/T SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0130/63 is not output.

HINT:
Codes other than code B0130/63 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

USE SIMULATION METHOD TO CHECK

DTC B0131/64 OPEN IN P/T (RH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the front seat outer belt assy RH (seat belt pretensioner RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0131/64 is recorded when an open circuit is detected in the P/T squib RH circuit.

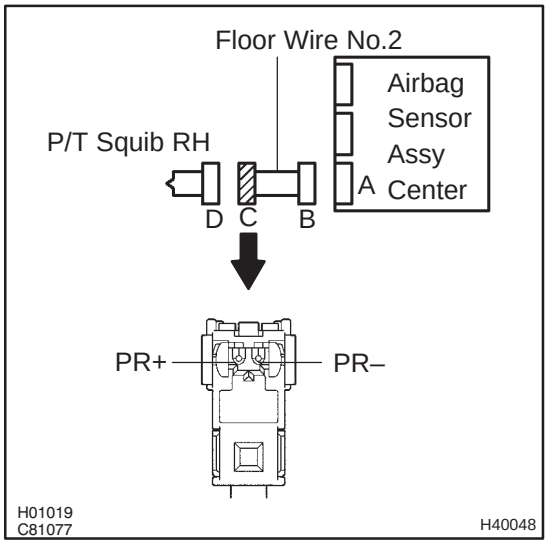
DTC No.	DTC Detecting Condition	Trouble Area
B0131/64	• Open circuit in PR+ wire harness or PR– wire harness of P/T squib RH • P/T squib RH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy RH (P/T squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1258.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE NO.2(P/T SQUIB RH CIRCUIT)

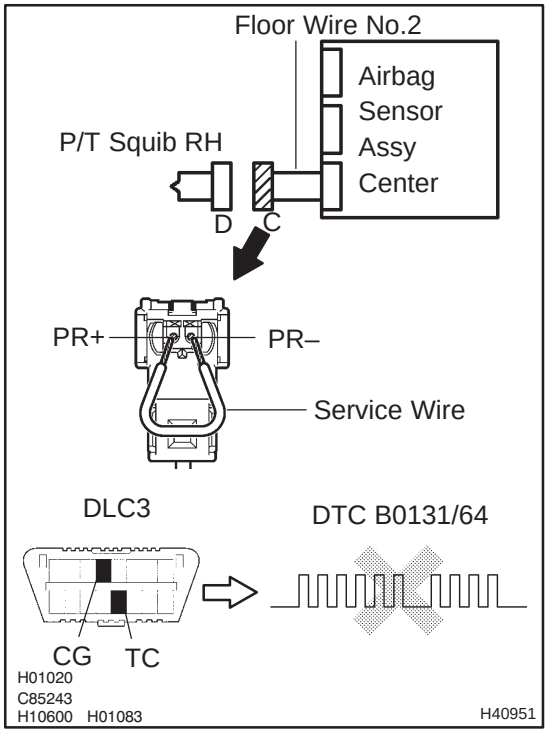


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy RH.
(d) Measure the resistance between PR+ and PR– of the connector "C".
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PR+ and PR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0131/64 is not output.

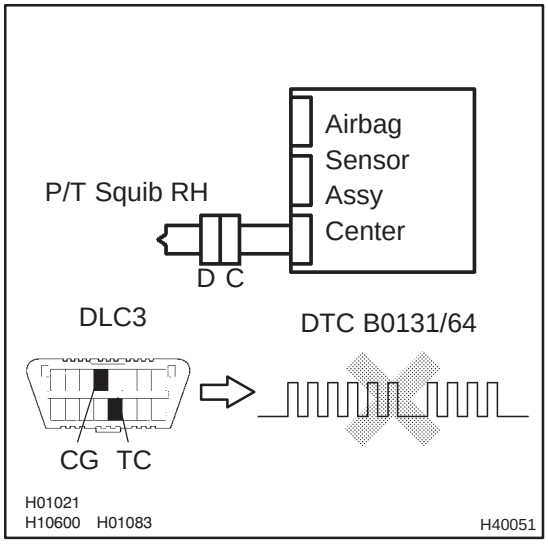
HINT:

Codes other than code B0131/64 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK FRONT SEAT OUTER BELT ASSY RH(P/T SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0131/64 is not output.

HINT:
Codes other than code B0131/64 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B0132/61	SHORT IN P/T SQUIB (RH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the front seat outer belt assy RH (seat belt pretensioner RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0132/61 is recorded when a short to ground is detected in the P/T squib RH circuit.

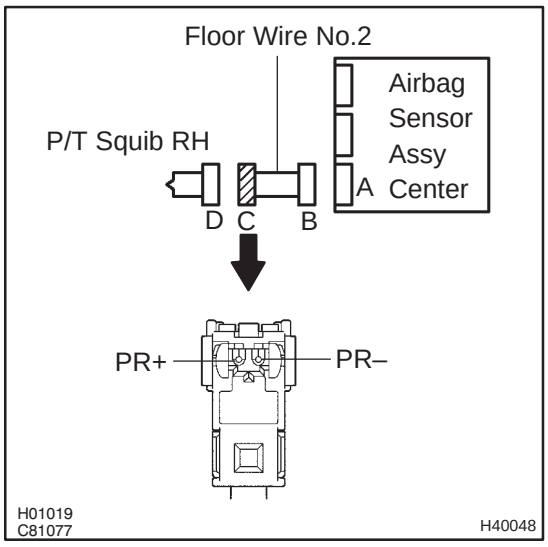
DTC No.	DTC Detecting Condition	Trouble Area
B0132/61	• Short circuit in P/T squib RH wire harness (to ground) • P/T squib RH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy RH (P/T squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1258.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(P/T SQUIB RH CIRCUIT)

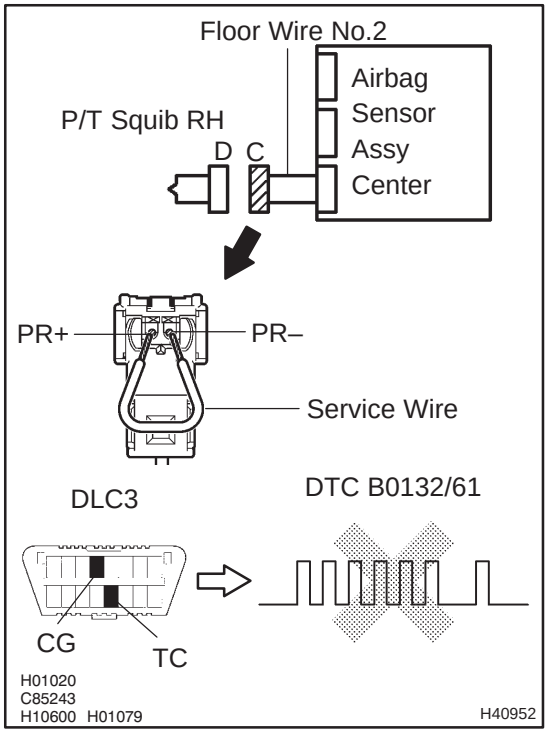


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy RH.
(d) Measure the resistance between the body ground and PR+ of the connector ”C”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PR+ and PR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0132/61 is not output.

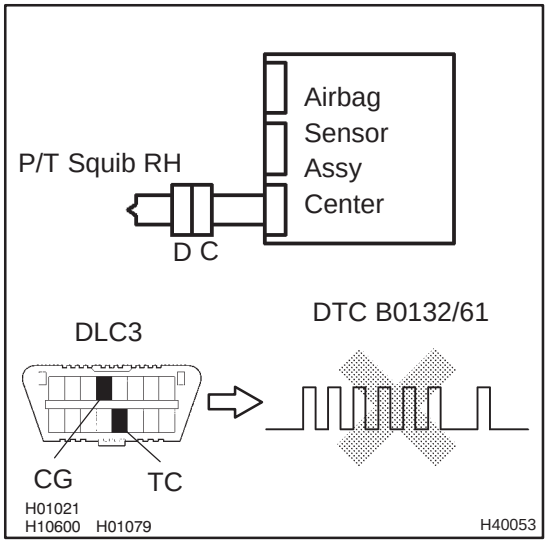
HINT:

Codes other than code B0132/61 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK FRONT SEAT OUTER BELT ASSY RH(P/T SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0132/61 is not output.

HINT:
Codes other than code B0132/61 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC B0133/62 SHORT IN P/T SQUIB (RH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the front seat outer belt assy RH (seat belt pretensioner RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0133/62 is recorded when a short to B+ is detected in the P/T squib RH circuit.

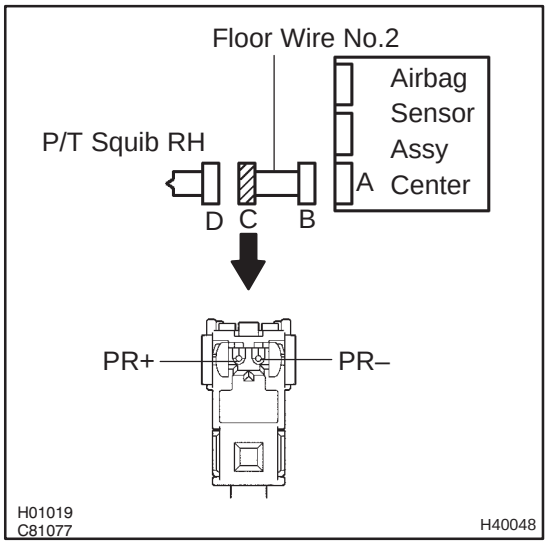
DTC No.	DTC Detecting Condition	Trouble Area
B0133/62	• Short circuit in P/T squib RH wire harness (to B+) • P/T squib RH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy RH (P/T squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1258.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE NO.2(P/T SQUIB RH CIRCUIT)

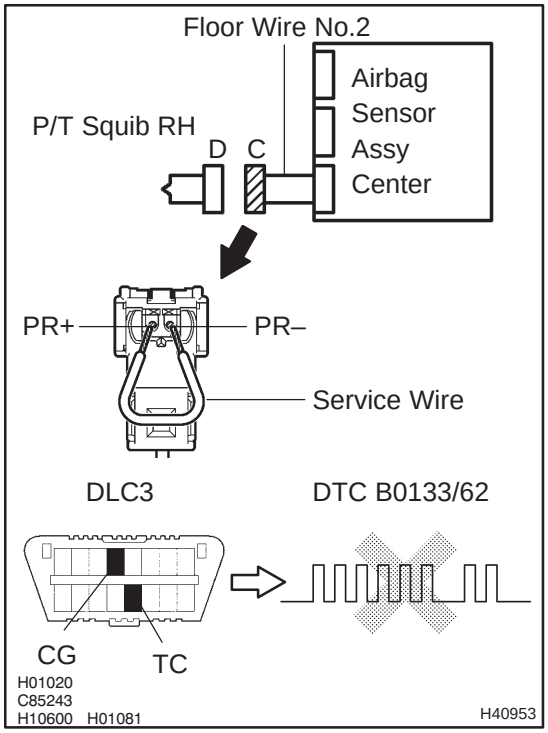


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and PR+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect PR+ and PR– of the connector ”C”.

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

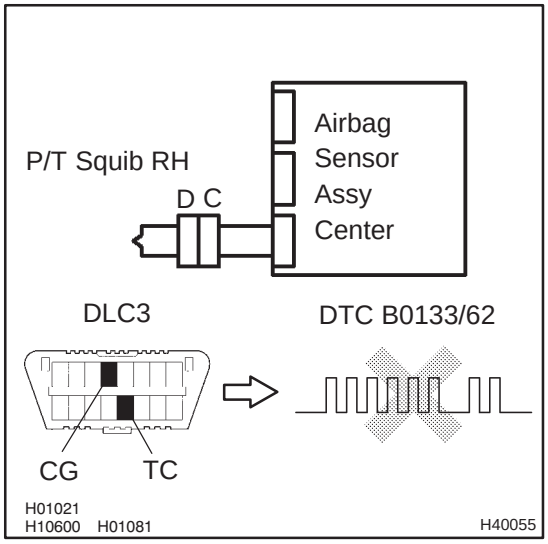
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0133/62 is not output.

HINT:
Codes other than code B0133/62 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK FRONT SEAT OUTER BELT ASSY RH(P/T SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0133/62 is not output.

HINT:
Codes other than code B0133/62 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

4 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

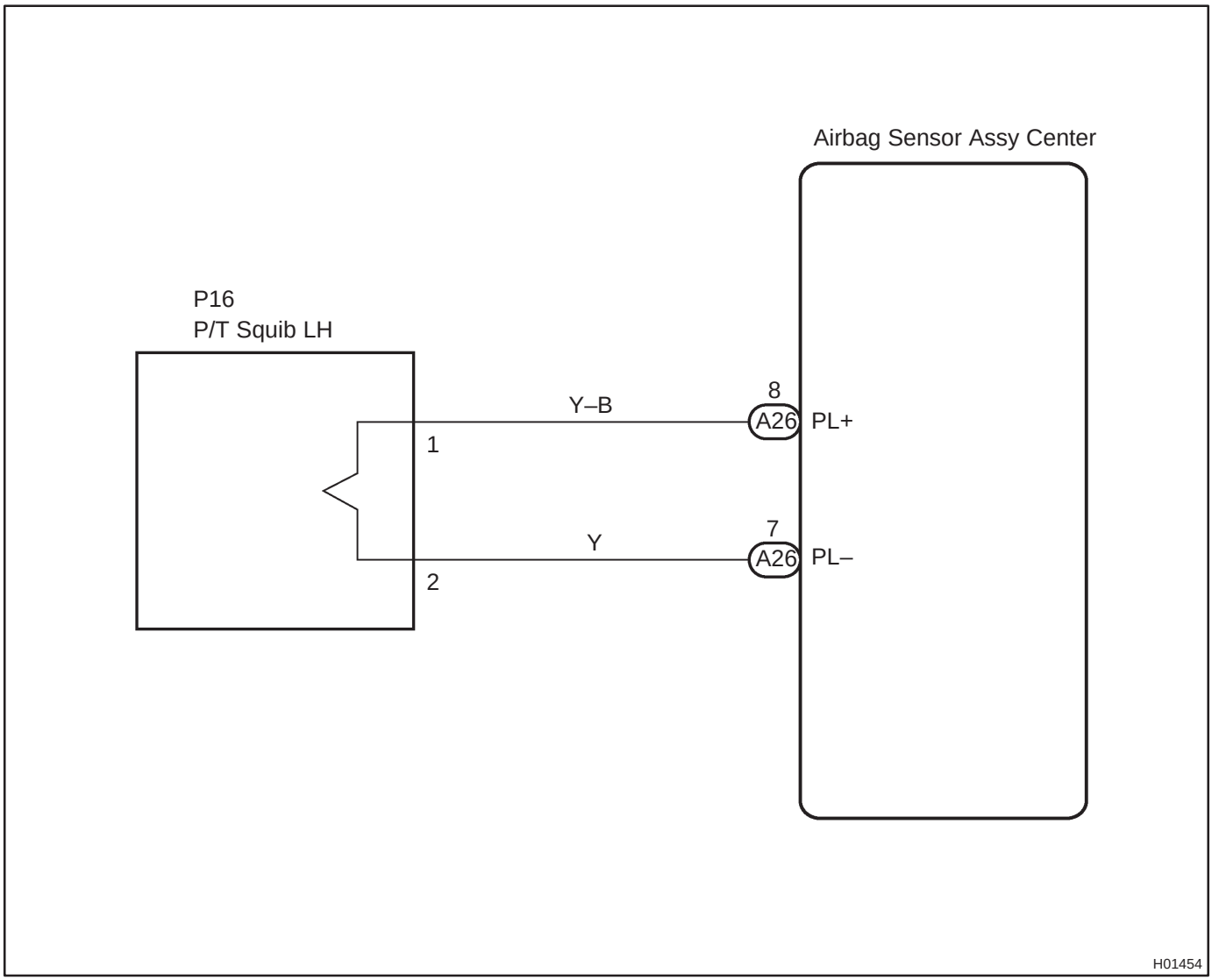
DTC B0135/73 SHORT IN P/T SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the front seat outer belt assy LH (seat belt pretensioner LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0135/73 is recorded when a short circuit is detected in the P/T squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0135/73	• Short circuit between PL+ wire harness and PL– wire harness of P/T squib LH • P/T squib LH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy LH (P/T squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM



INSPECTION PROCEDURE

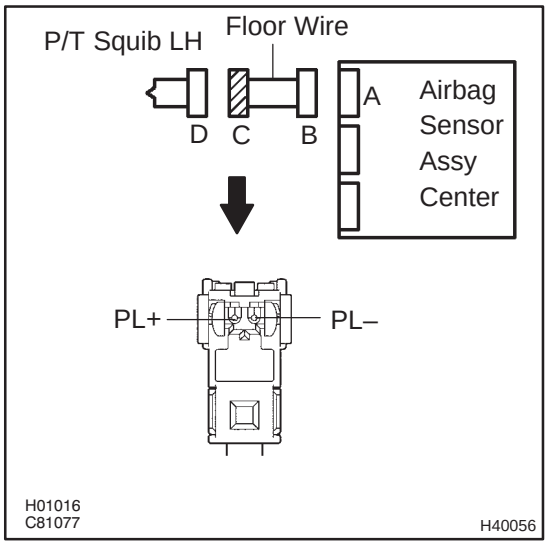
1	CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Disconnect the connector from the airbag sensor assy center and the front seat outer belt assy LH.
(d) Check that the floor wire connector (on the front seat outer belt assy LH side) is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2	CHECK FLOOR WIRE(P/T SQUIB LH CIRCUIT)

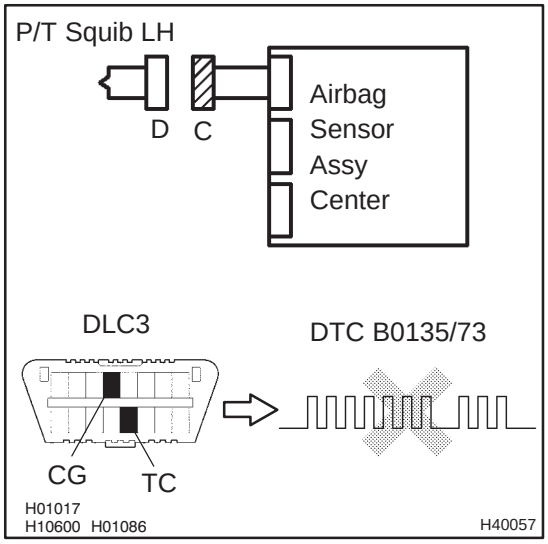


(a) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(b) Measure the resistance between PL+ and PL– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

3 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).

OK:

DTC B0135/73 is not output.

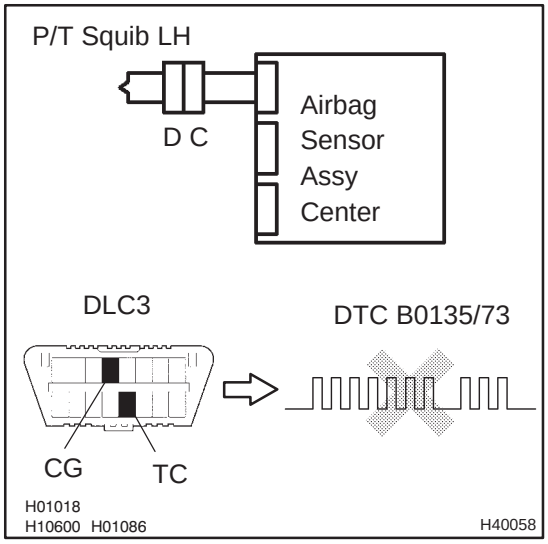
HINT:

Codes other than code B0135/73 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

4 CHECK FRONT SEAT OUTER BELT ASSY LH(P/T SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).

OK:

DTC B0135/73 is not output.

HINT:

Codes other than code B0135/73 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

DTC B0136/74 OPEN IN P/T SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the front seat outer belt assy LH (seat belt pretensioner LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0136/74 is recorded when an open circuit is detected in the P/T squib LH circuit.

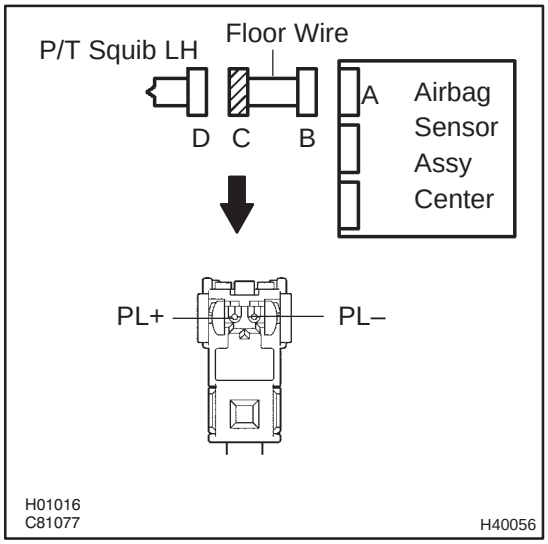
DTC No.	DTC Detecting Condition	Trouble Area
B0136/74	• Open circuit in PL+ wire harness or PL– wire harness of P/T squib LH • P/T squib LH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy LH (P/T squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1270.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE(P/T SQUIB LH CIRCUIT)

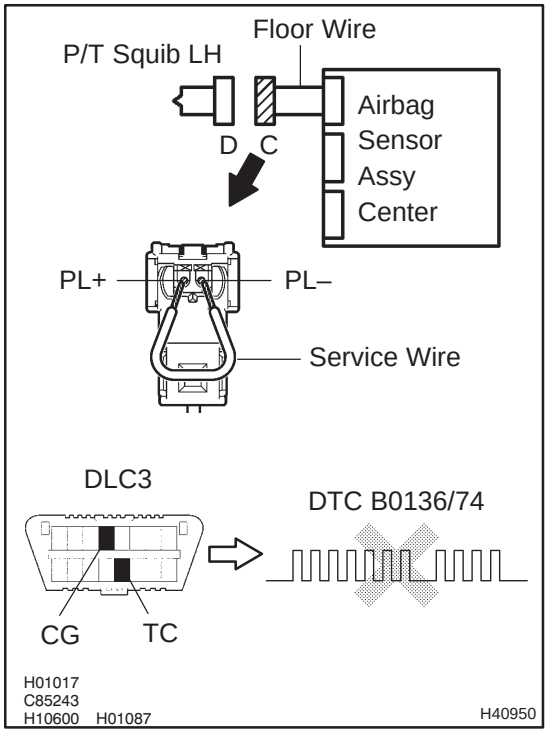


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy LH.
(d) Measure the resistance between PL+ and PL– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PL+ and PL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0136/74 is not output.

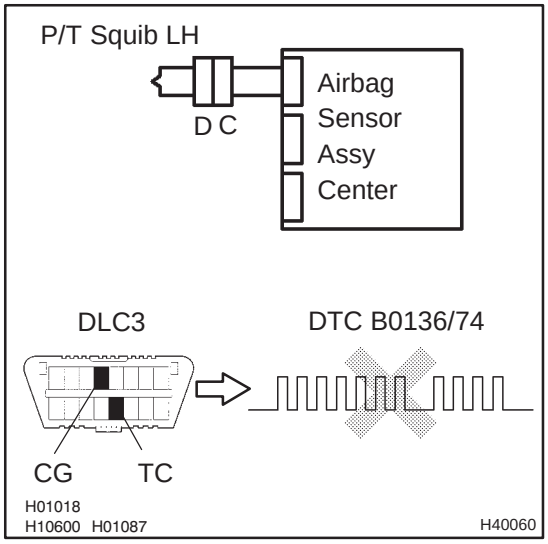
HINT:

Codes other than code B0136/74 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK FRONT SEAT OUTER BELT ASSY LH(P/T SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0136/74 is not output.

HINT:
Codes other than code B0136/74 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B0137/71	SHORT IN P/T SQUIB (LH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the front seat outer belt assy LH (seat belt pretensioner LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0137/71 is recorded when a short to ground is detected in the P/T squib LH circuit.

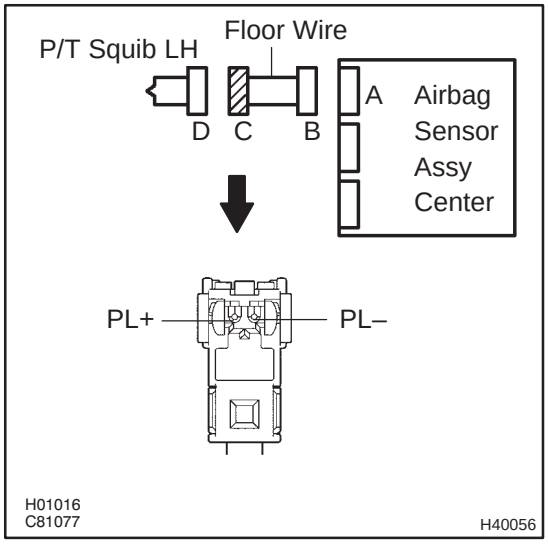
DTC No.	DTC Detecting Condition	Trouble Area
B0137/71	• Short circuit in P/T squib LH wire harness (to ground) • P/T squib LH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy LH (P/T squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1270.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(P/T SQUIB LH CIRCUIT)

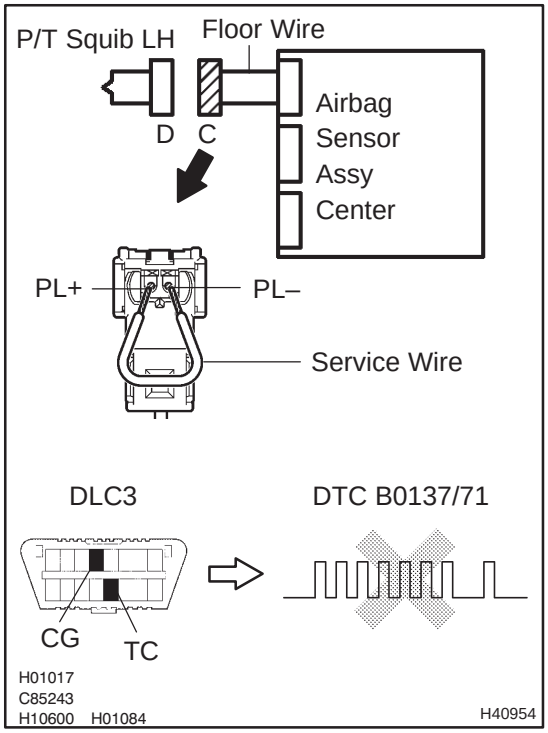


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy LH.
(d) Measure the resistance between the body ground and PL+ of the connector ”C”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PL+ and PL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0137/71 is not output.

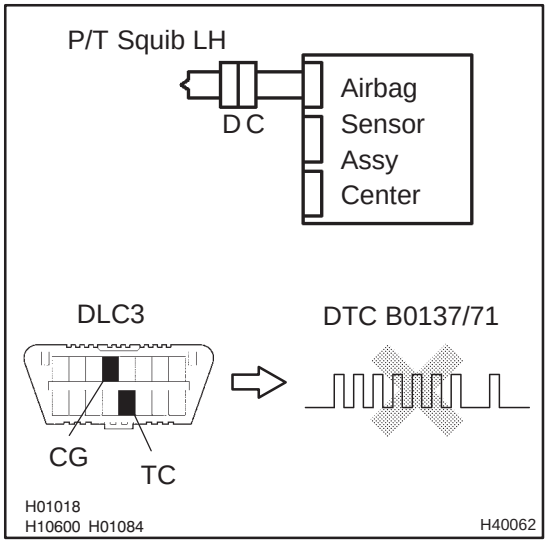
HINT:

Codes other than code B0137/71 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK FRONT SEAT OUTER BELT ASSY LH(P/T SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0137/71 is not output.

HINT:
Codes other than code B0137/71 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC B0138/72 SHORT IN P/T SQUIB (LH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the front seat outer belt assy LH (seat belt pretensioner LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0138/72 is recorded when a short to B+ is detected in the P/T squib LH circuit.

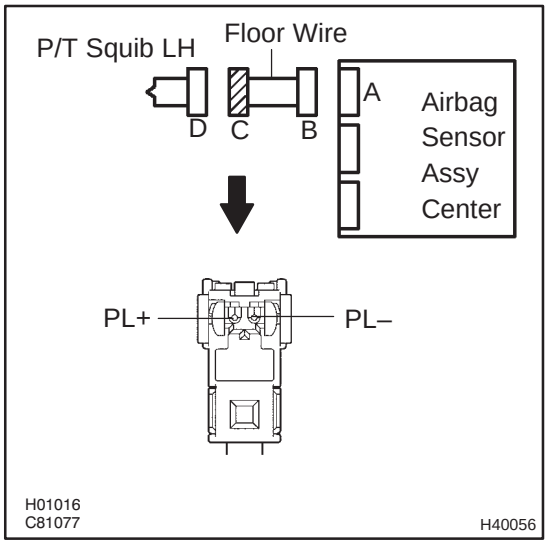
DTC No.	DTC Detecting Condition	Trouble Area
B0138/72	• Short circuit in P/T squib LH wire harness (to B+) • P/T squib LH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy LH (P/T squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1270.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE(P/T SQUIB LH CIRCUIT)

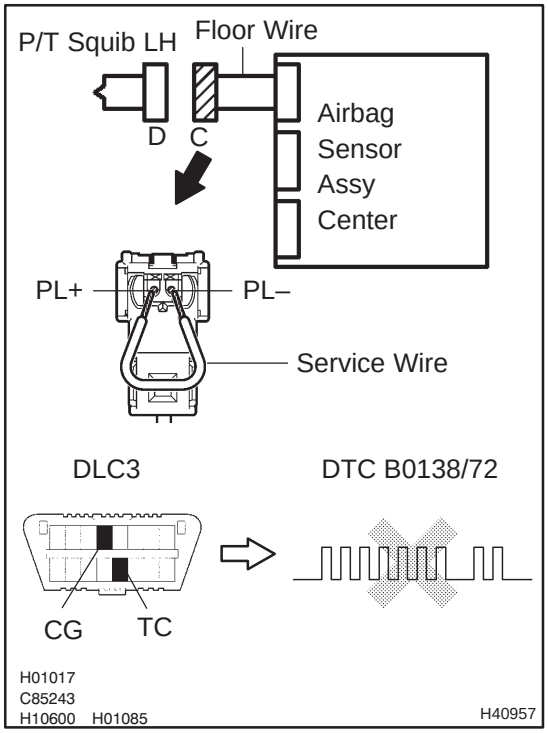


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and PL+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect PL+ and PL– of the connector ”C”.

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

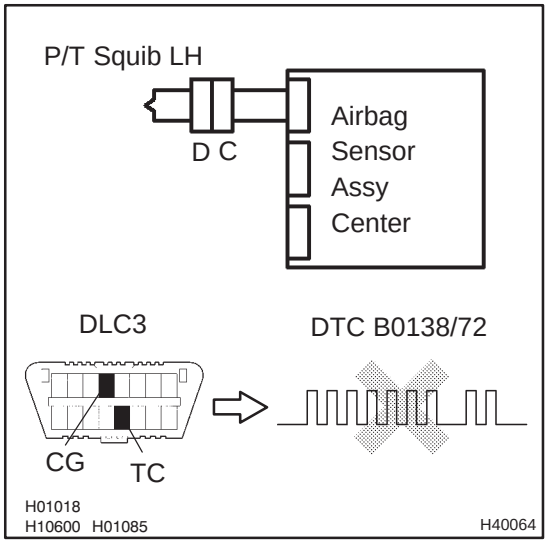
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0138/72 is not output.

HINT:
Codes other than code B0138/72 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK FRONT SEAT OUTER BELT ASSY LH(P/T SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0138/72 is not output.

HINT:
Codes other than code B0138/72 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B1100/31	AIRBAG SENSOR ASSY CENTER MALFUNCTION

CIRCUIT DESCRIPTION

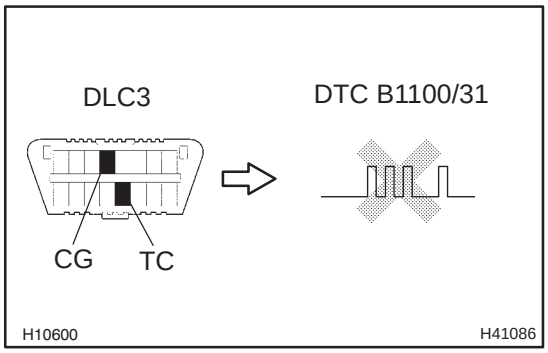
The airbag sensor assy center consists of the airbag sensor, the safing sensor, the drive circuit, the diagnosis circuit and the ignition control, etc.
If the airbag sensor assy center receives signals from the airbag sensor, it judges whether or not the SRS should be activated.
DTC B1100/31 is recorded when a malfunction in the airbag sensor assy center is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1100/31	• Airbag sensor assy center malfunction • Half connection detection malfunction	• Airbag sensor assy center • Airbag sensor assy center connector

HINT:
When a malfunction code other than code B1100/31 is displayed at the same time, first repair the malfunction indicated by the malfunction code other than code B1100/31.

INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1100/31 is not output.

HINT:
Codes other than code B1100/31 may be output at this time, but they are not related to this check.

NG	Go to step 2

OK

USE SIMULATION METHOD TO CHECK

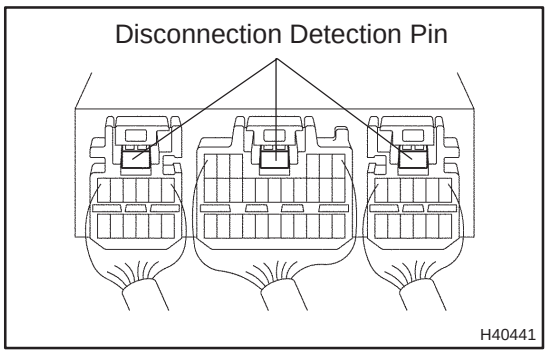
2 CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check the connection of the airbag sensor assy center connectors.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS, THEN GO TO STEP 1**

OK

3 PERFORM A VISUAL CHECK OF THE DISCONNECTION DETECTION PIN

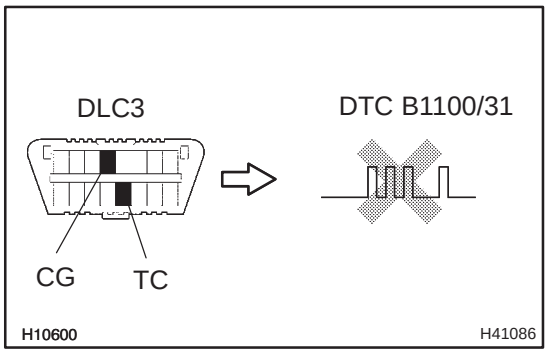


(a) Check that the disconnection detection pin is not deformed.
OK:
The connectors are not deformed.

NG → **REPAIR OR REPLACE AIRBAG SENSOR ASSY CENTER CONNECTOR**

OK

4 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(b) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(c) Clear the stored DTCs in the memory (See page 05–1184).
(d) Turn the ignition switch to the LOCK position.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Check the DTCs (See page 05–1184).
OK:
DTC B1100/31 is not output.

HINT:
Codes other than code B1100/31 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1140/32	SIDE AIRBAG SENSOR ASSY (RH) MALFUNCTION

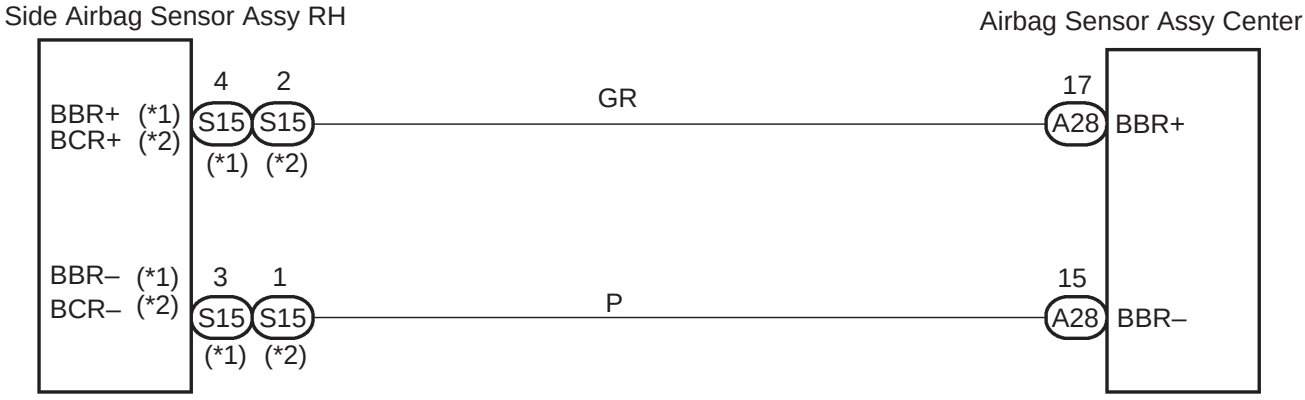
CIRCUIT DESCRIPTION

The side airbag sensor assy RH consists of the diagnosis circuit and the lateral deceleration sensor, etc. If the airbag sensor assy center receives signals from the lateral deceleration sensor, it judges whether or not the SRS should be activated.

DTC B1140/32 is recorded when a malfunction in the side airbag sensor assy RH is detected.

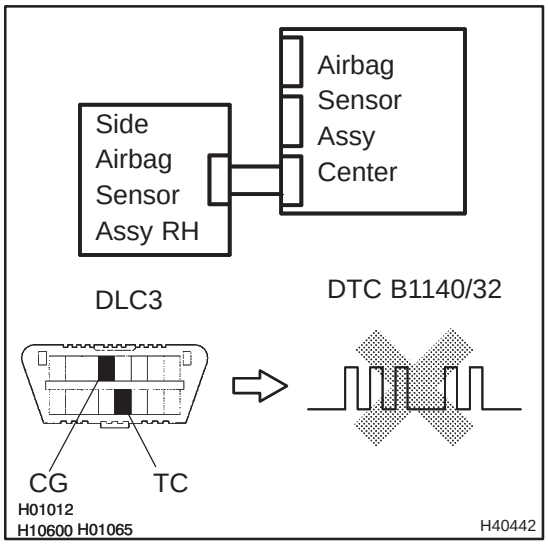
DTC No.	DTC Detecting Condition	Trouble Area
B1140/32	• Short circuit in side airbag sensor assy RH wire harness (to B+) • Short circuit in side airbag sensor assy RH wire harness (to ground) • Open circuit in BBR+ wire harness or BBR– wire harness of side airbag sensor assy RH • Side airbag sensor assy RH malfunction • Airbag sensor assy center malfunction	• Side airbag sensor assy RH • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1140/32 is not output.

HINT:
Codes other than code B1140/32 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

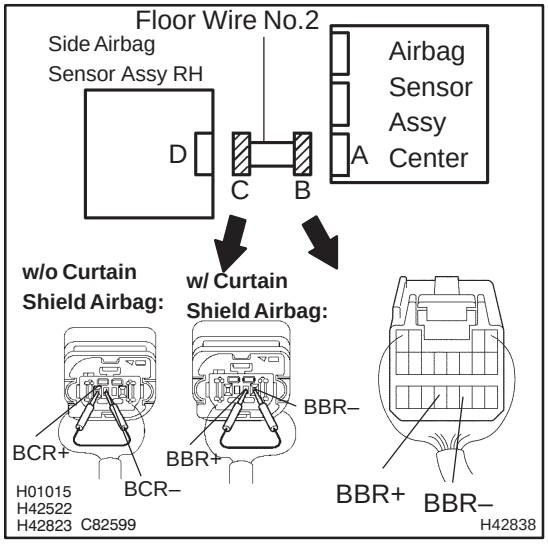
2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the side airbag sensor assy RH.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FLOOR WIRE NO.2(OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the side airbag sensor assy RH.

(b) w/o Curtain shield airbag:
Using a service wire, connect BCR+ and BCR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) w/ Curtain shield airbag:
Using a service wire, connect BBR+ and BBR– of the connector ”C”.

NOTICE:

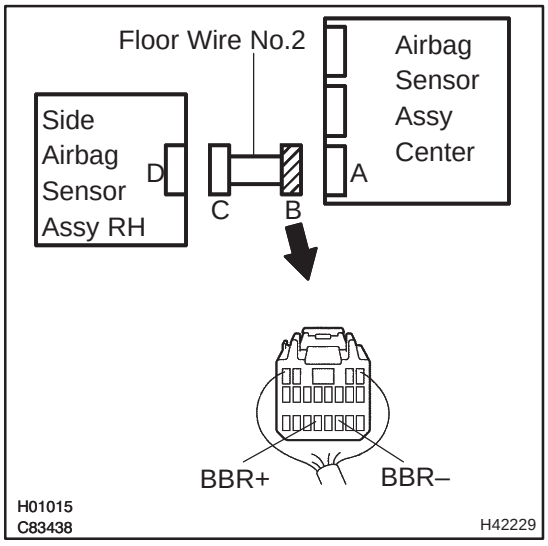
Do not forcibly insert a service wire into the terminal of the connector when connecting.

(d) Measure the resistance between BBR+ and BBR– of the connector ”B”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

4 CHECK FLOOR WIRE NO.2(TO B+)



(a) Disconnect the service wire from the connector ”C”.

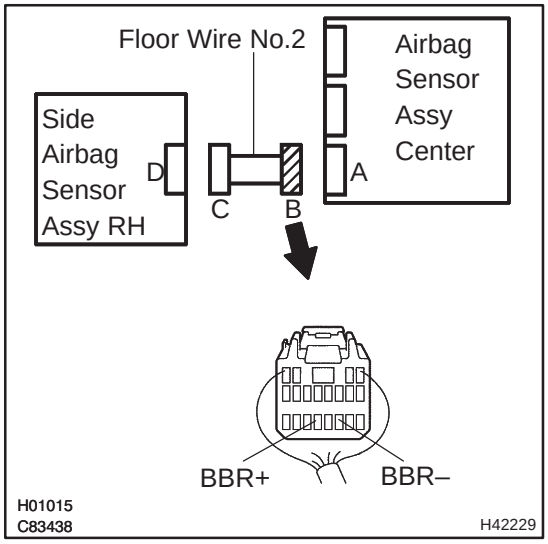
(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of BBR+ and BBR– of the connector ”B”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

5 CHECK FLOOR WIRE NO.2(TO GROUND)

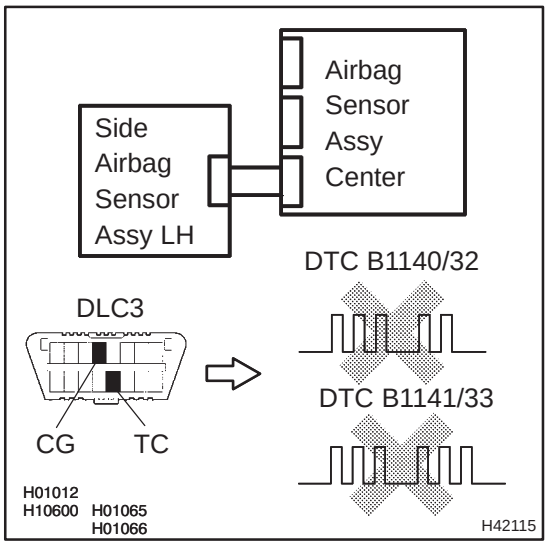


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of BBR+ and BBR– of the connector "C".
OK:
Resistance: 10 kΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

6 CHECK SIDE AIR BAG SENSOR ASSY RH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Interchange the side airbag sensor assy RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
A: DTC B1140/32 is not output.
B: DTC B1141/33 is not output.

NG:A → **REPLACE SIDE AIR BAG SENSOR ASSY RH**

NG:B → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1141/33	SIDE AIRBAG SENSOR ASSY (LH) MALFUNCTION

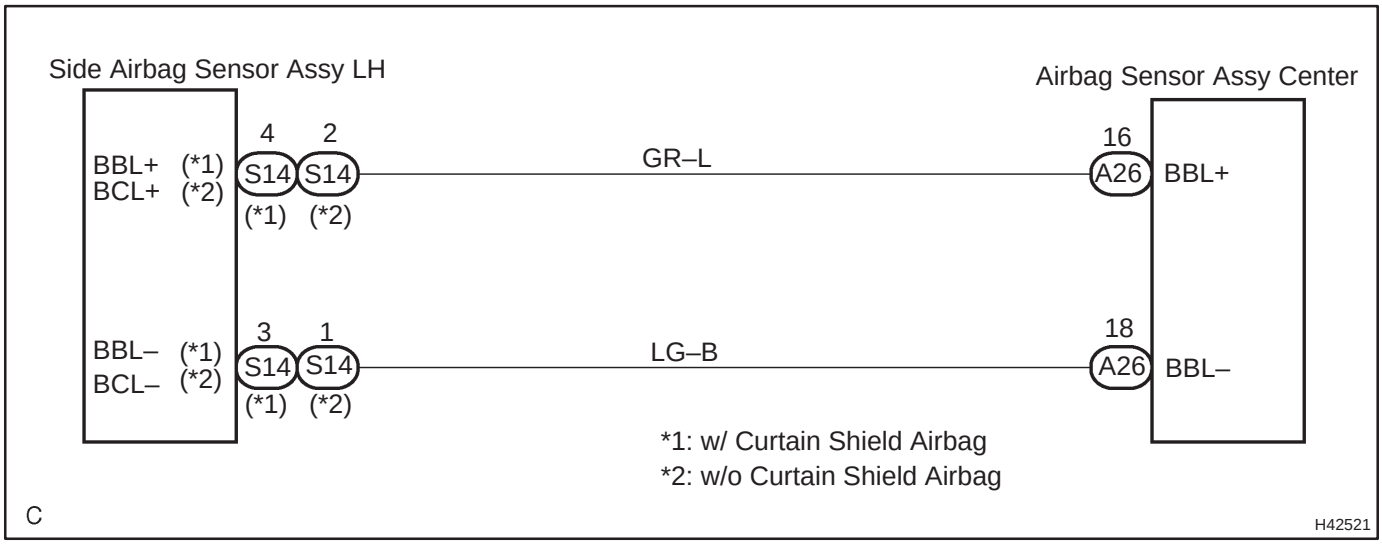
CIRCUIT DESCRIPTION

The side airbag sensor assy LH consists of the diagnosis circuit and the lateral deceleration sensor, etc. If the airbag sensor assy center receives signals from the lateral deceleration sensor, it judges whether or not the SRS should be activated.

DTC B1141/33 is recorded when a malfunction in the side airbag sensor assy LH is detected.

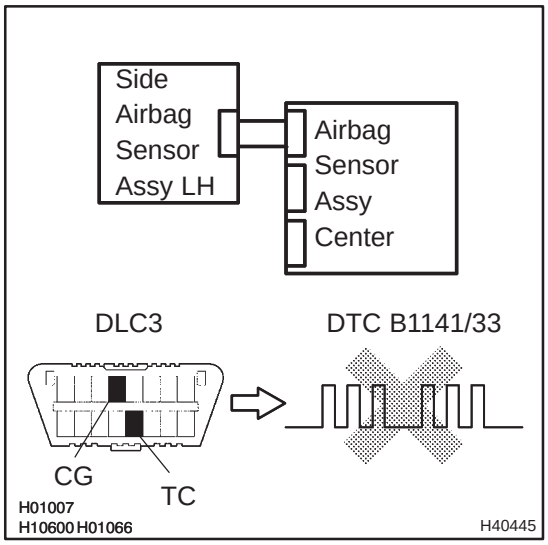
DTC No.	DTC Detecting Condition	Trouble Area
B1141/33	• Short circuit in side airbag sensor assy LH wire harness (to B+) • Short circuit in side airbag sensor assy LH wire harness (to ground) • Open circuit in BBL+ wire harness or BBL– wire harness of side airbag sensor assy LH • Side airbag sensor assy LH malfunction • Airbag sensor assy center malfunction	• Side airbag sensor assy LH • Airbag sensor assy center • Floor wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1141/33 is not output.

HINT:

Codes other than code B1141/33 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the side airbag sensor assy LH.

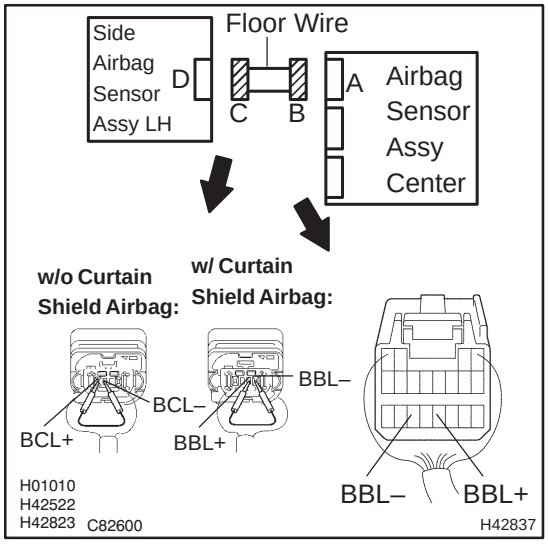
OK:

The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FLOOR WIRE(OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the side airbag sensor assy RH.

(b) w/ Curtain shield airbag:
Using a service wire, connect BCL+ and BCL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) w/o Curtain shield airbag:
Using a service wire, connect BBL+ and BBL– of the connector ”C”.

NOTICE:

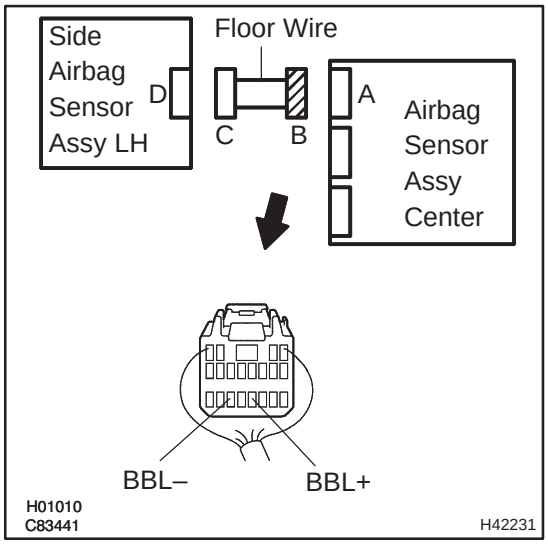
Do not forcibly insert a service wire into the terminal of the connector when connecting.

(d) Measure the resistance between BBL+ and BBL– of the connector ”B”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

4 CHECK FLOOR WIRE(TO B+)



(a) Disconnect the service wire from the connector ”C”.

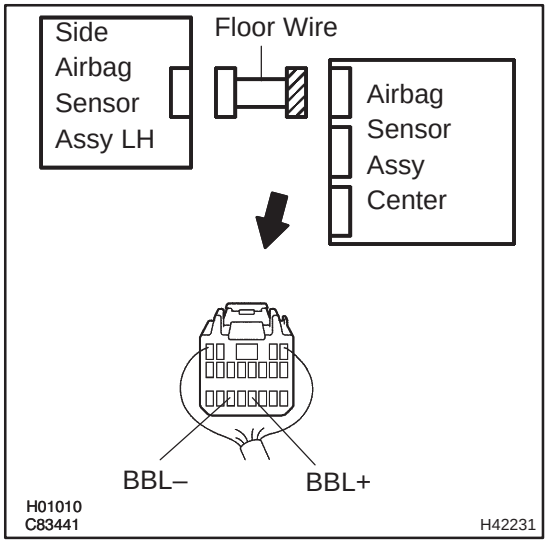
(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of BBL+ and BBL– of the connector ”B”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

5 CHECK FLOOR WIRE(TO GROUND)

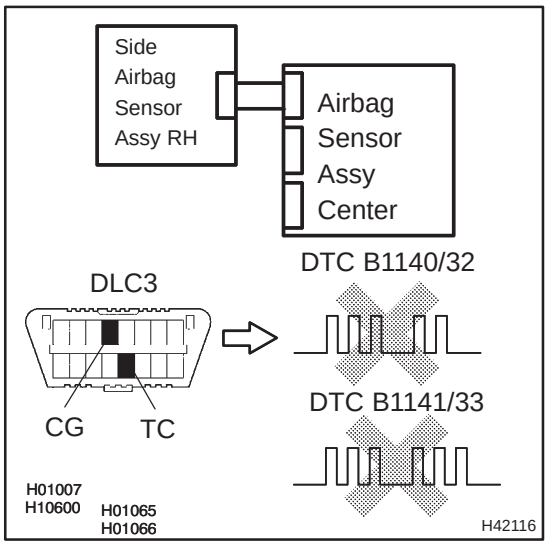


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of BBL+ and BBL– of the connector "B".
OK:
Resistance: 10 kΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

6 CHECK SIDE AIR BAG SENSOR ASSY LH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Interchange the side airbag sensor assy RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
A: DTC B1140/32 is not output.
B: DTC B1141/33 is not output.

NG:A → **REPLACE AIR BAG SENSOR ASSY CENTER**

NG:B → **REPLACE SIDE AIR BAG SENSOR ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

DTC B1148/36 FRONT AIRBAG SENSOR (RH) MALFUNCTION

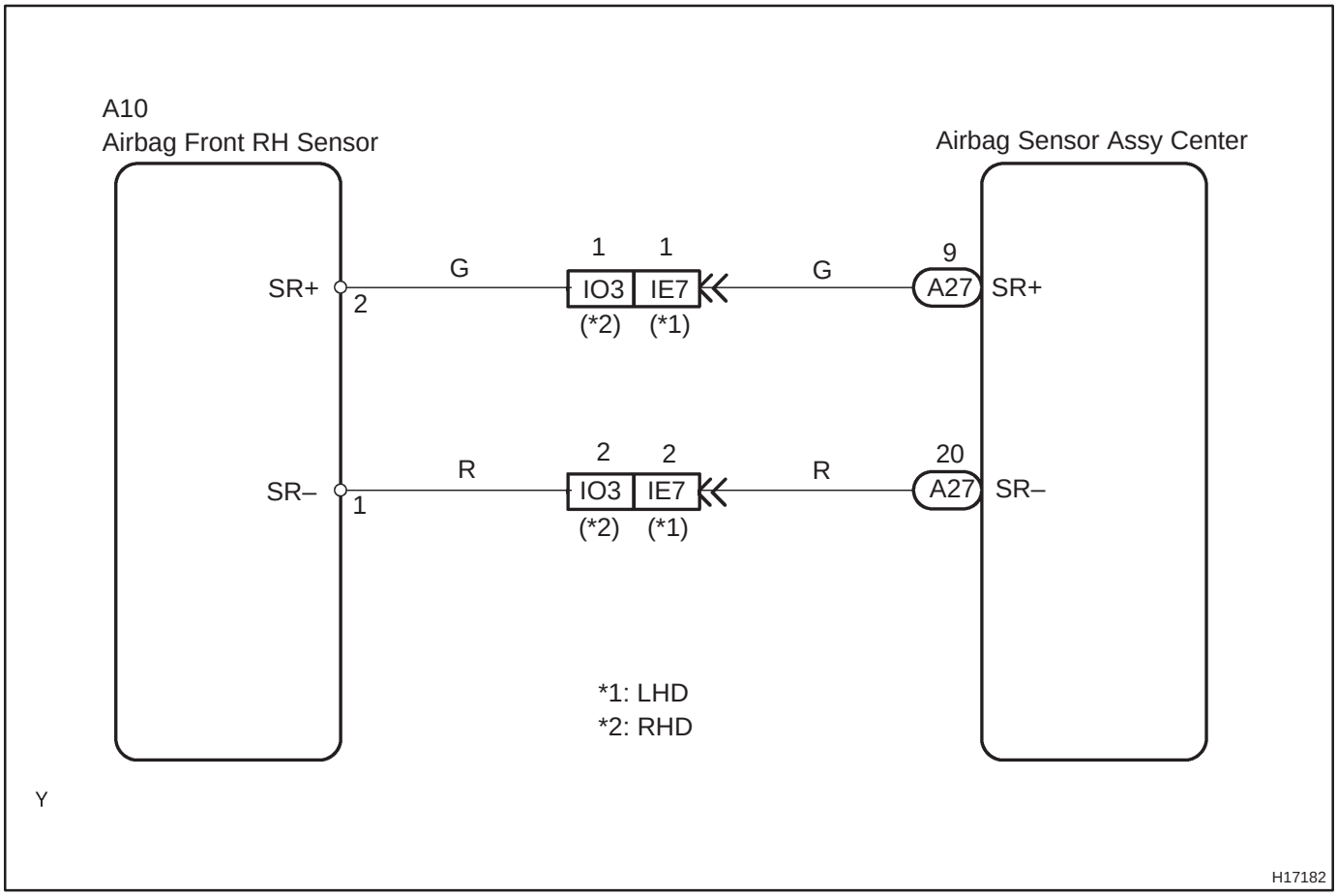
CIRCUIT DESCRIPTION

The airbag front RH sensor circuit consists of the diagnosis circuit and the frontal deceleration sensor, etc. If the airbag sensor assy center receives signals from the frontal deceleration sensor, it judges whether or not the SRS should be activated.

DTC B1148/36 is recorded when a malfunction in the airbag front RH sensor is detected.

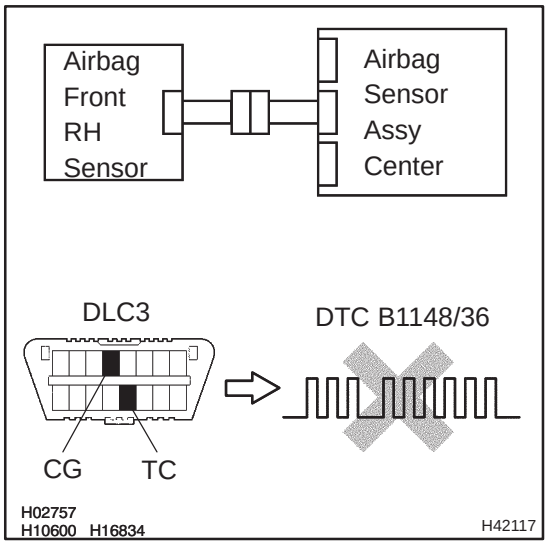
DTC No.	DTC Detecting Condition	Trouble Area
B1148/36	• Open circuit in SR+ wire harness or SR– wire harness of front airbag sensor RH • Short circuit in airbag front RH sensor wire harness (to B+) • Short circuit in airbag front RH sensor wire harness (to ground) • Airbag front RH sensor malfunction • Airbag sensor assy center malfunction	• Airbag front RH sensor • Airbag sensor assy center • Instrument panel wire • Engine room main wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1148/36 is not output.

HINT:
Codes other than code B1148/36 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

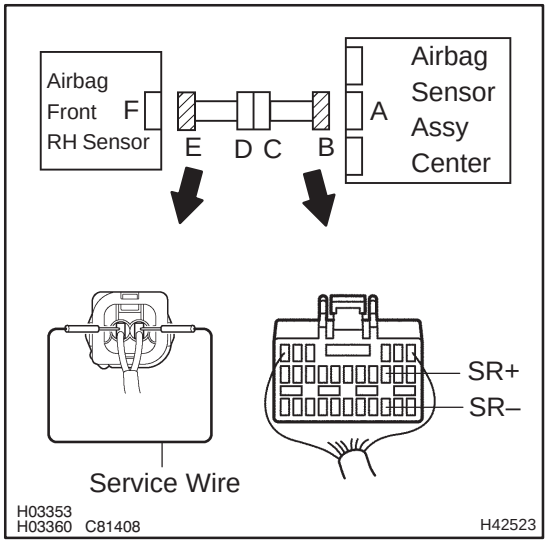
2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the airbag front RH sensor.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the airbag front RH sensor.

(b) Using a service wire, connect SR+ and SR– of the connector ”E”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between SR+ and SR– of the connector ”B”.

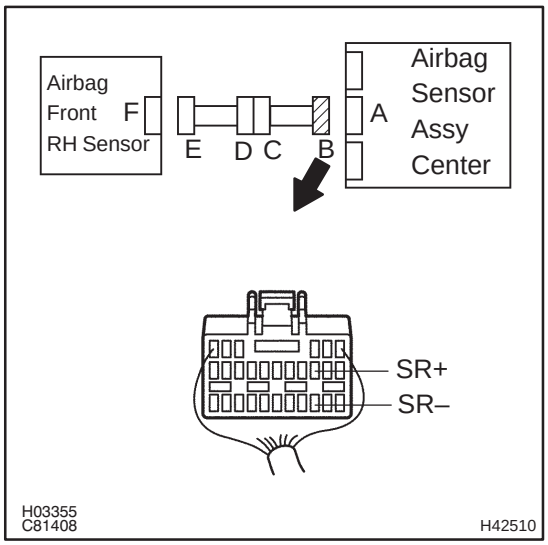
OK:

Resistance: Below 1 Ω

NG	**Go to step 7**

OK

4 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (TO B+)



(a) Disconnect the service wire from the connector ”E”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of SR+ and SR– of the connector ”B”.

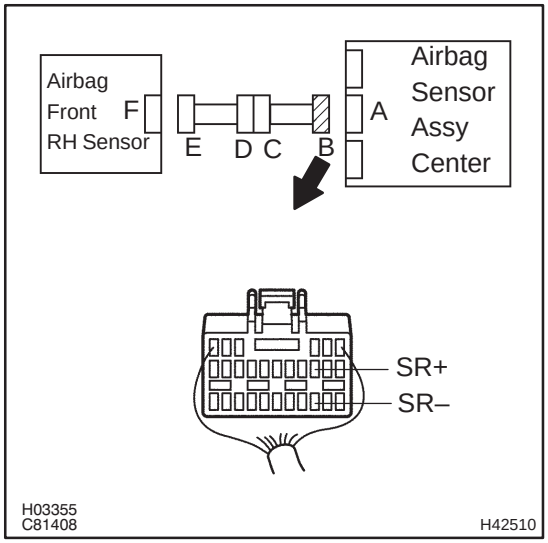
OK:

Voltage: Below 1 V

NG	**Go to step 8**

OK

5 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (TO GROUND)

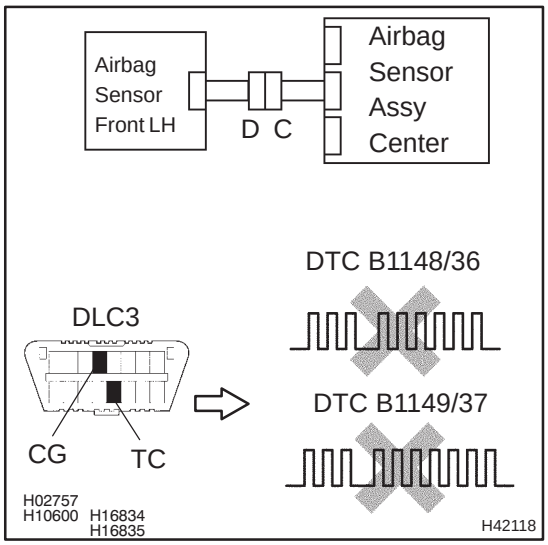


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of SR+ and SR– of the connector "B".
OK:
Resistance: 1 MΩ or Higher

NG → **Go to step 9**

OK

6 CHECK AIR BAG FRONT RH SENSOR



(a) Connect the connector to the airbag sensor assy center.
(b) Interchange the airbag front RH sensor with the airbag sensor front LH and connect the connectors to them.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
A: DTC B1148/36 is not output.
B: DTC B1149/37 is not output.

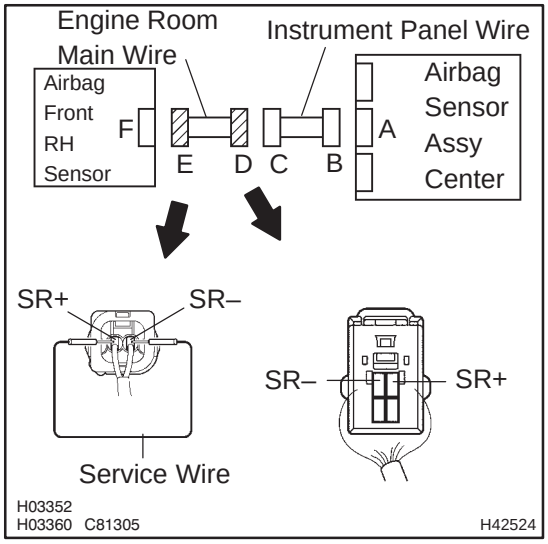
NG:A → **REPLACE AIR BAG FRONT RH SENSOR**

NG:B → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

7 CHECK ENGINE ROOM MAIN WIRE(OPEN)



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Using a service wire, connect SR+ and SR– of the connector ”E”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between SR+ and SR– of the connector ”D”.

OK:

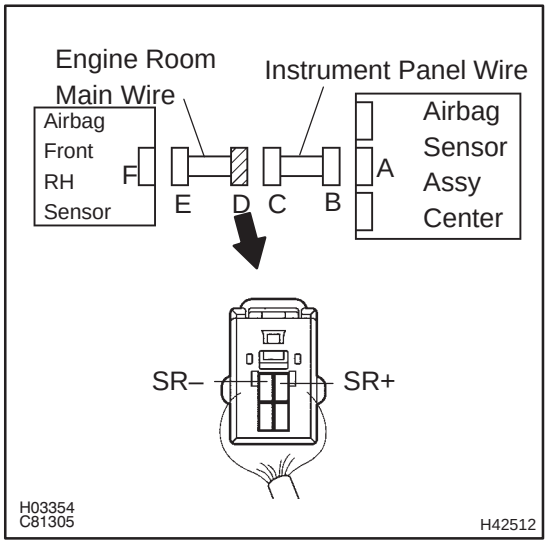
Resistance: Below 1 Ω

NG	**REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

8 CHECK ENGINE ROOM MAIN WIRE(TO B+)



(a) Turn the ignition switch to the LOCK position.

(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.

(c) Disconnect the engine room main wire connector from the instrument panel wire.

(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(e) Measure the voltage between the body ground and each of SR+ and SR– of the connector ”D”.

OK:

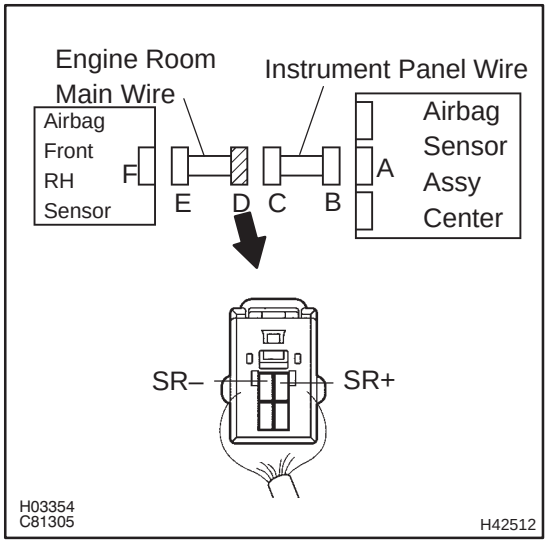
Voltage: Below 1 V

NG	**REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

9	CHECK ENGINE ROOM MAIN WIRE(TO GROUND)



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Measure the resistance between the body ground and each of SR+ and SR– of the connector ”D”.

OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

DTC B1148/36 FRONT AIRBAG SENSOR (RH) MALFUNCTION

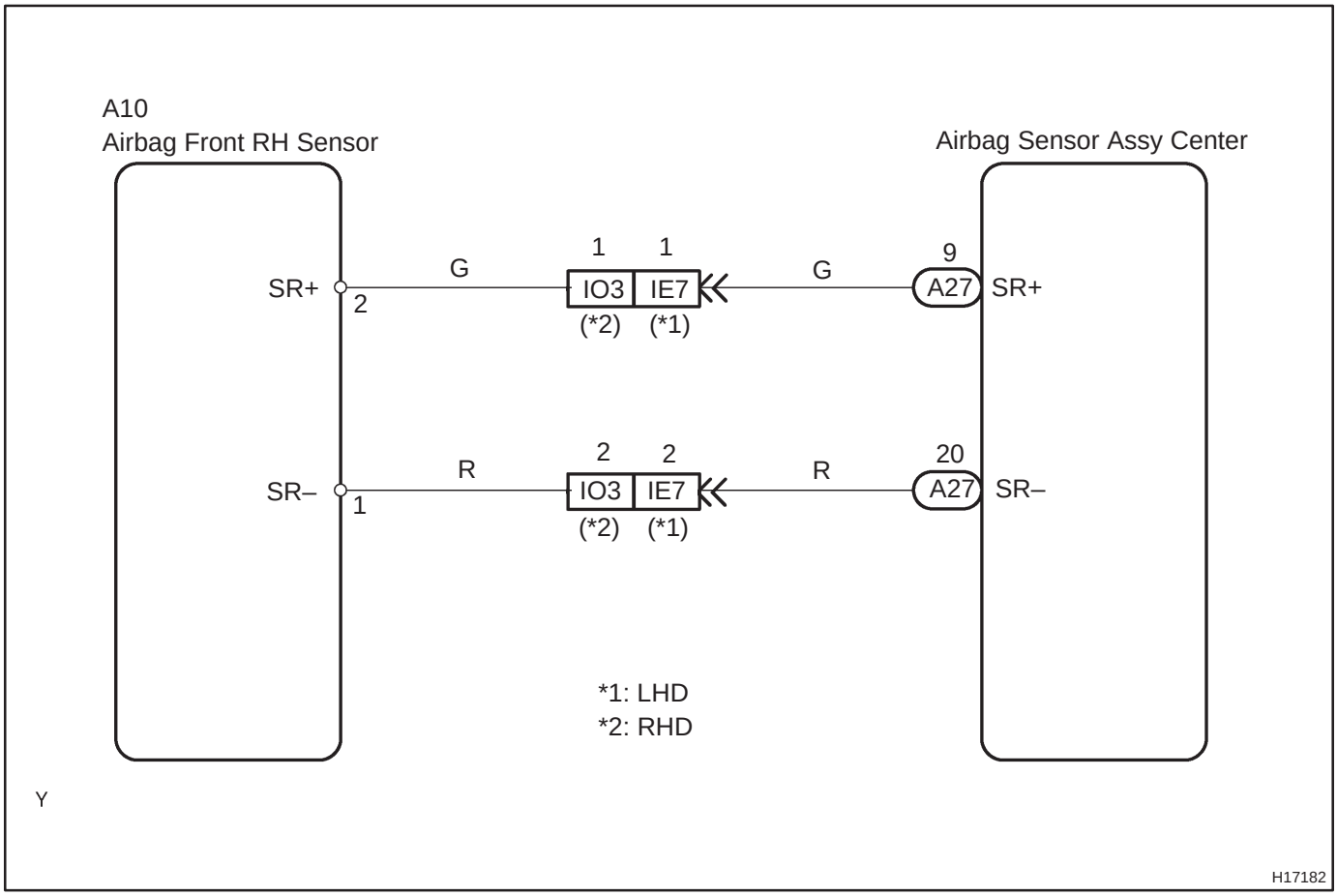
CIRCUIT DESCRIPTION

The airbag front RH sensor circuit consists of the diagnosis circuit and the frontal deceleration sensor, etc. If the airbag sensor assy center receives signals from the frontal deceleration sensor, it judges whether or not the SRS should be activated.

DTC B1148/36 is recorded when a malfunction in the airbag front RH sensor is detected.

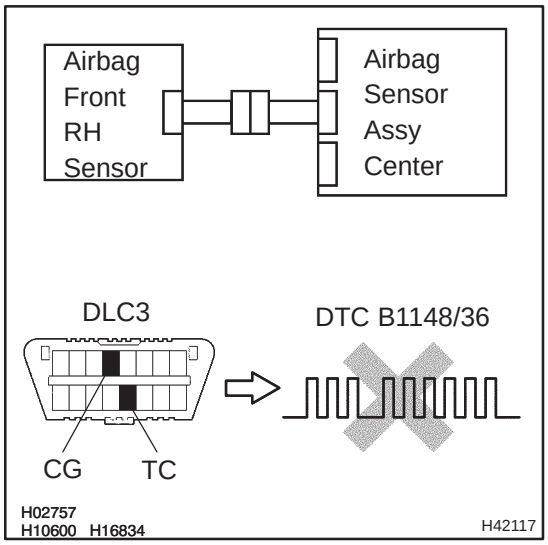
DTC No.	DTC Detecting Condition	Trouble Area
B1148/36	• Open circuit in SR+ wire harness or SR– wire harness of front airbag sensor RH • Short circuit in airbag front RH sensor wire harness (to B+) • Short circuit in airbag front RH sensor wire harness (to ground) • Airbag front RH sensor malfunction • Airbag sensor assy center malfunction	• Airbag front RH sensor • Airbag sensor assy center • Instrument panel wire • Engine room main wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1148/36 is not output.

HINT:
Codes other than code B1148/36 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

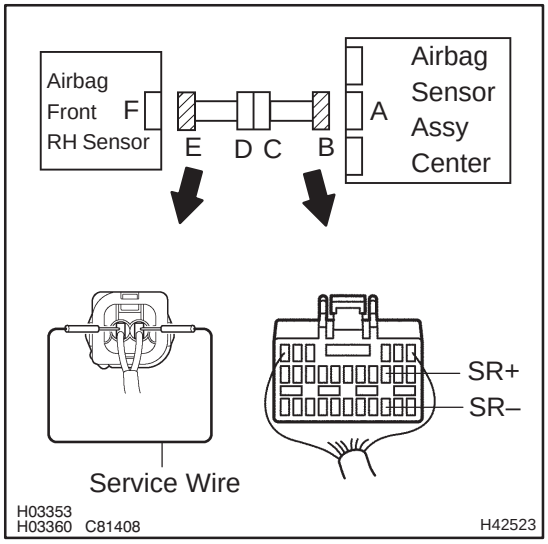
2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the airbag front RH sensor.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the airbag front RH sensor.

(b) Using a service wire, connect SR+ and SR– of the connector ”E”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between SR+ and SR– of the connector ”B”.

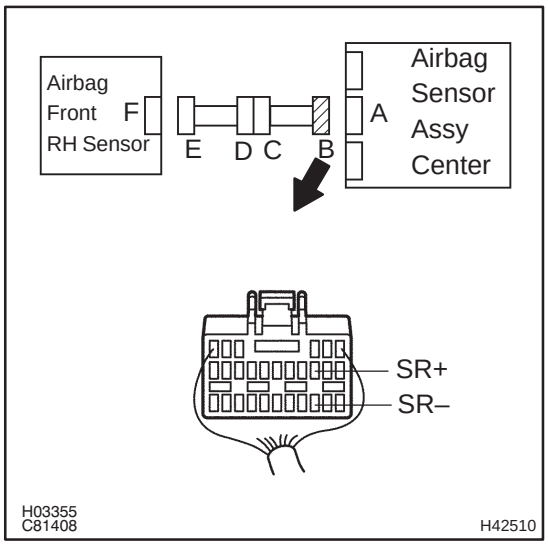
OK:

Resistance: Below 1 Ω

NG	**Go to step 7**

OK

4 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (TO B+)



(a) Disconnect the service wire from the connector ”E”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of SR+ and SR– of the connector ”B”.

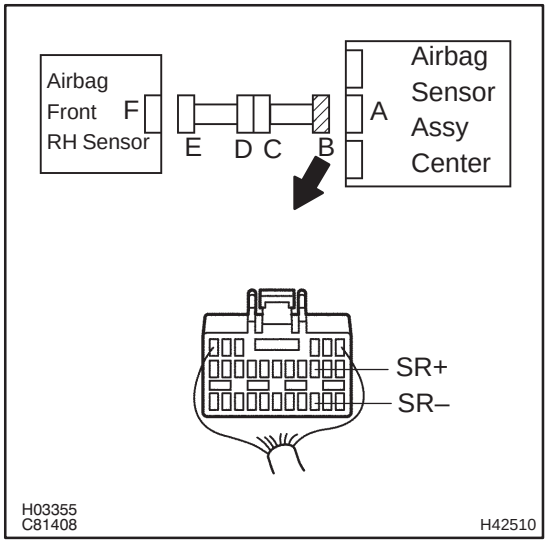
OK:

Voltage: Below 1 V

NG	**Go to step 8**

OK

5 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (TO GROUND)

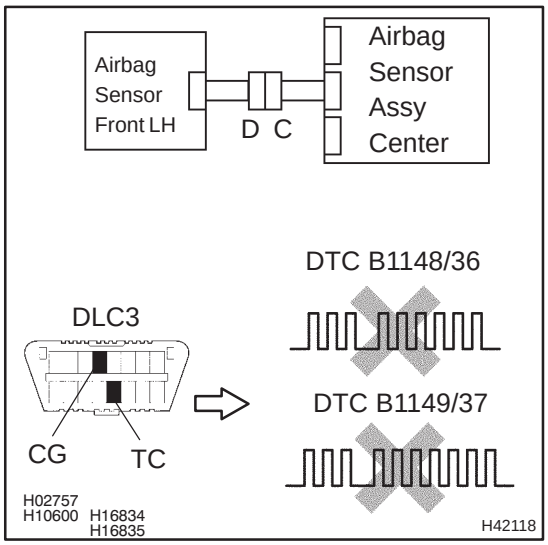


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of SR+ and SR– of the connector "B".
OK:
Resistance: 1 MΩ or Higher

NG → **Go to step 9**

OK

6 CHECK AIR BAG FRONT RH SENSOR



(a) Connect the connector to the airbag sensor assy center.
(b) Interchange the airbag front RH sensor with the airbag sensor front LH and connect the connectors to them.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
A: DTC B1148/36 is not output.
B: DTC B1149/37 is not output.

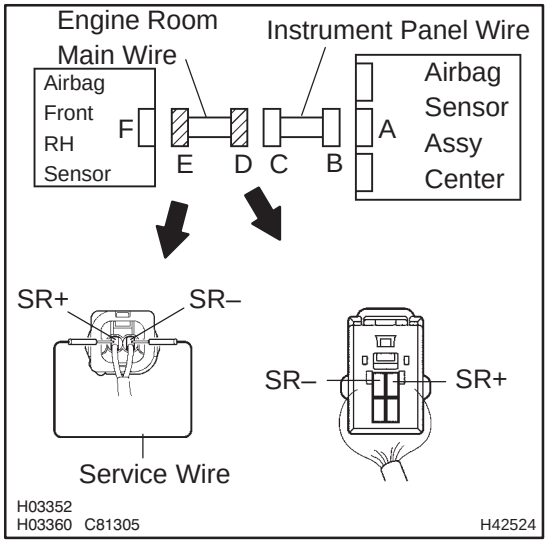
NG:A → **REPLACE AIR BAG FRONT RH SENSOR**

NG:B → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

7 CHECK ENGINE ROOM MAIN WIRE(OPEN)



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Using a service wire, connect SR+ and SR– of the connector ”E”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between SR+ and SR– of the connector ”D”.

OK:

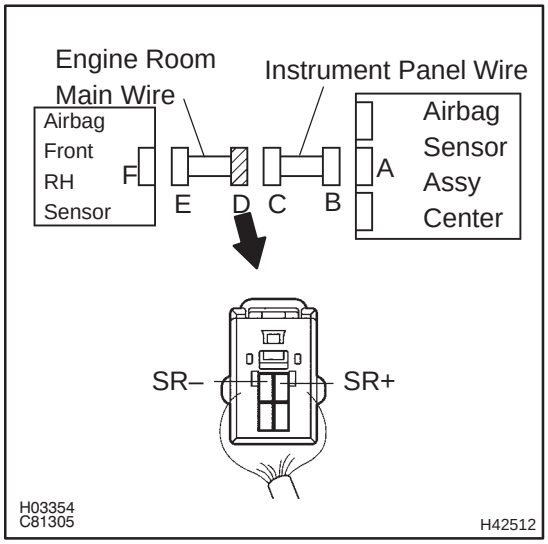
Resistance: Below 1 Ω

NG	**REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

8 CHECK ENGINE ROOM MAIN WIRE(TO B+)



(a) Turn the ignition switch to the LOCK position.

(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.

(c) Disconnect the engine room main wire connector from the instrument panel wire.

(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(e) Measure the voltage between the body ground and each of SR+ and SR– of the connector ”D”.

OK:

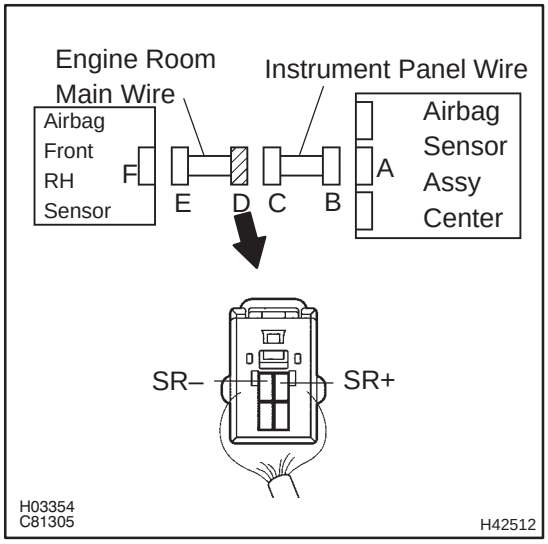
Voltage: Below 1 V

NG	**REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

9	CHECK ENGINE ROOM MAIN WIRE(TO GROUND)



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Measure the resistance between the body ground and each of SR+ and SR– of the connector ”D”.

OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

DTC	B1149/37	FRONT AIRBAG SENSOR (LH) MALFUNCTION

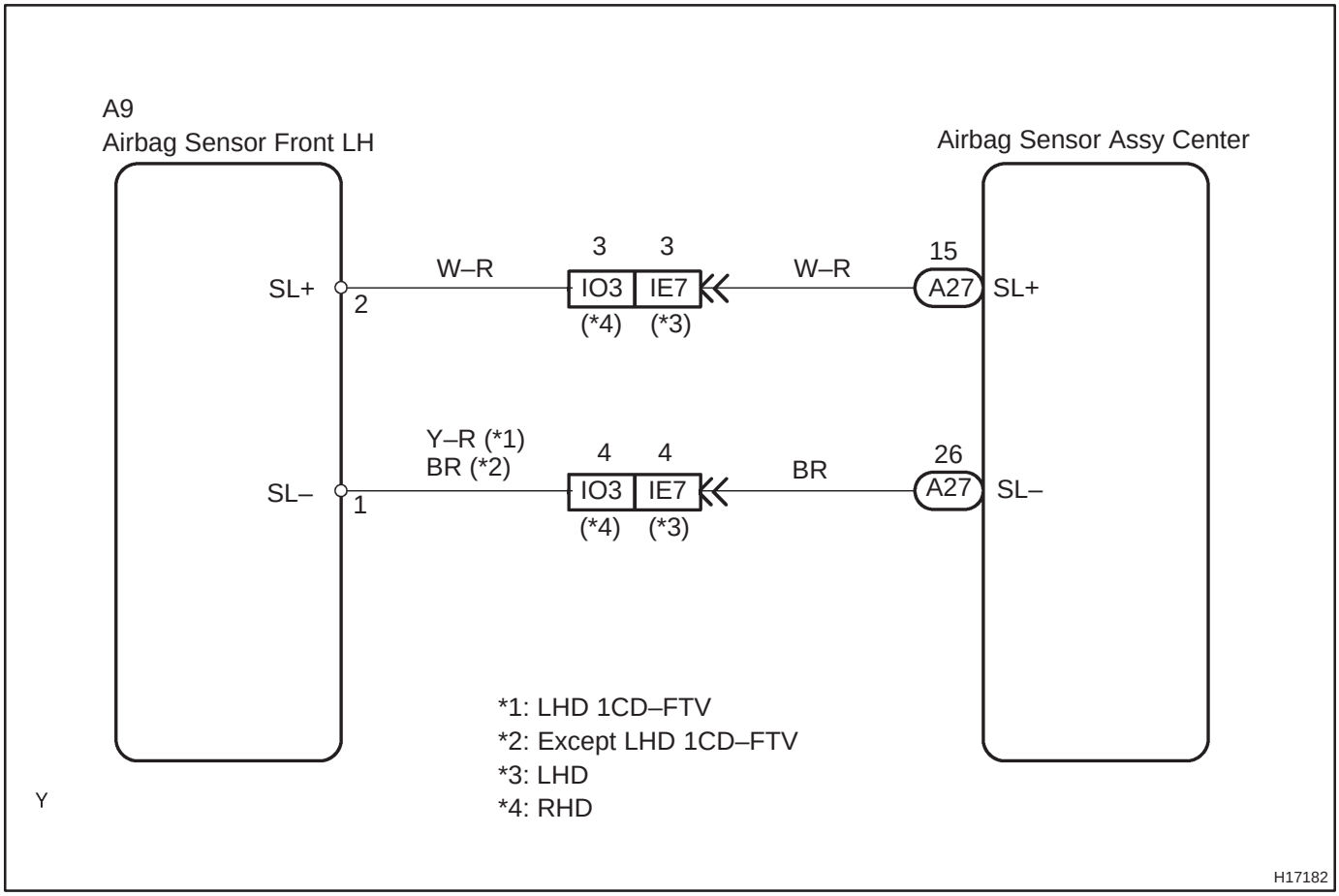
CIRCUIT DESCRIPTION

The airbag sensor front LH circuit consists of the diagnosis circuit and the frontal deceleration sensor, etc.

If the airbag sensor assy center receives signals from the frontal deceleration sensor, it judges whether or not the SRS should be activated.
DTC B1149/37 is recorded when malfunction is detected in the airbag sensor front LH circuit.

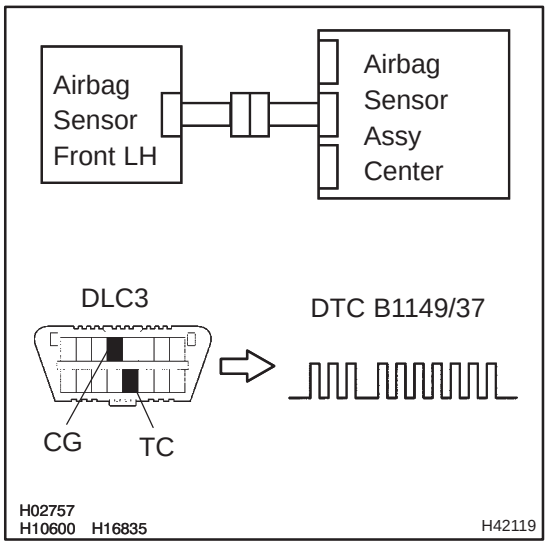
DTC No.	DTC Detecting Condition	Trouble Area
B1149/37	• Open circuit in SL+ wire harness or SL– wire harness of airbag sensor front LH • Short circuit in airbag sensor front LH wire harness (to B+) • Short circuit in airbag sensor front LH wire harness (to ground) • Airbag sensor front LH malfunction • Airbag sensor assy center malfunction	• Airbag sensor front LH • Airbag sensor assy center • Instrument panel wire • Engine room main wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1149/37 is not output.

HINT:

Codes other than code B1149/37 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the airbag sensor front LH.

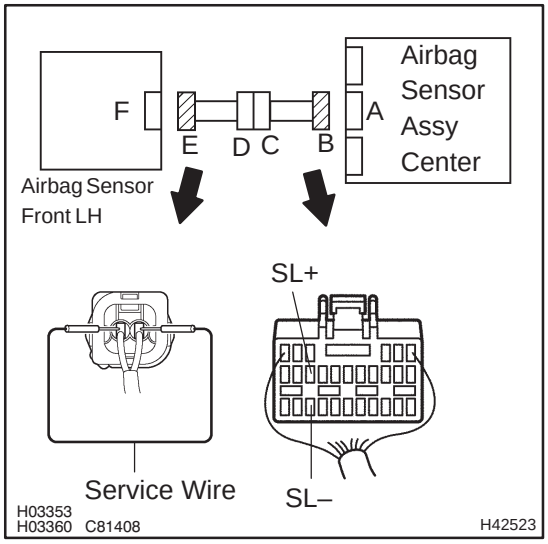
OK:

The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FRONT AIRBAG SENSOR (LH) CIRCUIT (OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the airbag sensor front LH.

(b) Using a service wire, connect SL+ and SL– of the connector ”E”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between SL+ and SL– of the connecter ”B”.

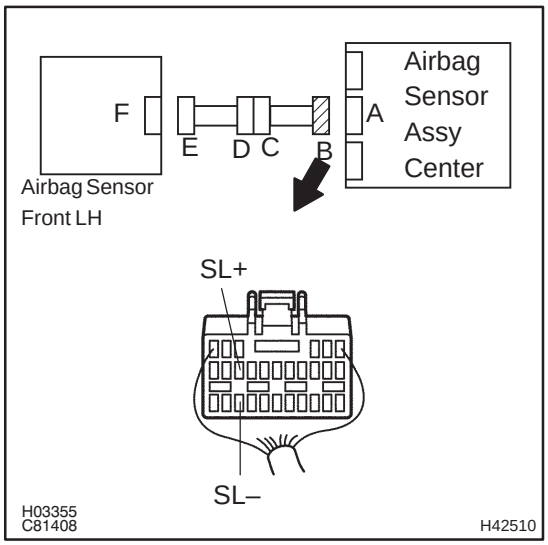
OK:

Resistance: Below 1 Ω

NG	**Go to step 7**

OK

4 CHECK FRONT AIRBAG SENSOR (LH) CIRCUIT (TO B+)



(a) Disconnect the service wire from the connector ”E”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of SL+ and SL– of the connector ”B”.

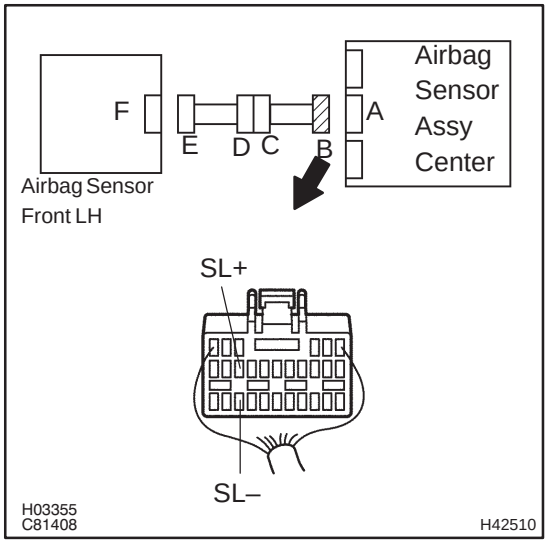
OK:

Voltage: Below 1 V

NG	**Go to step 8**

OK

5 CHECK FRONT AIRBAG SENSOR (LH) CIRCUIT (TO GROUND)

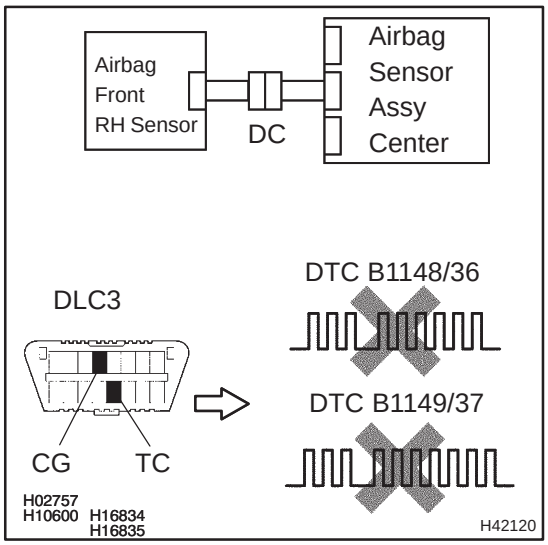


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of SL+ and SL– of the connector "B".
OK:
Resistance: 1 MΩ or Higher

NG → **Go to step 9**

OK

6 CHECK AIR BAG SENSOR FRONT LH



(a) Connect the connector to the airbag sensor assy center.
(b) Interchange the airbag front sensor RH with the airbag sensor front LH and connect the connectors to them.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
A: DTC B1148/36 is not output.
B: DTC B1149/37 is not output.

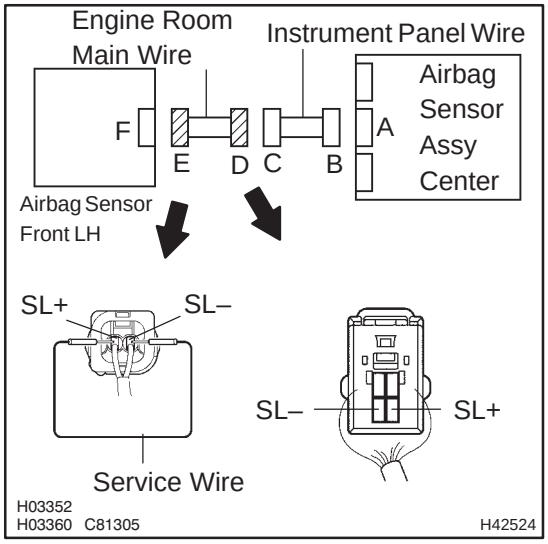
NG:A → **REPLACE AIR BAG SENSOR ASSY CENTER**

NG:B → **REPLACE AIR BAG SENSOR FRONT LH**

OK

USE SIMULATION METHOD TO CHECK

7 CHECK ENGINE ROOM MAIN WIRE(OPEN)



(a) Disconnect the engine room main wire connect from the instrument panel wire.
(b) Using a service wire, connect SL+ and SL– of the connector ”E”.

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

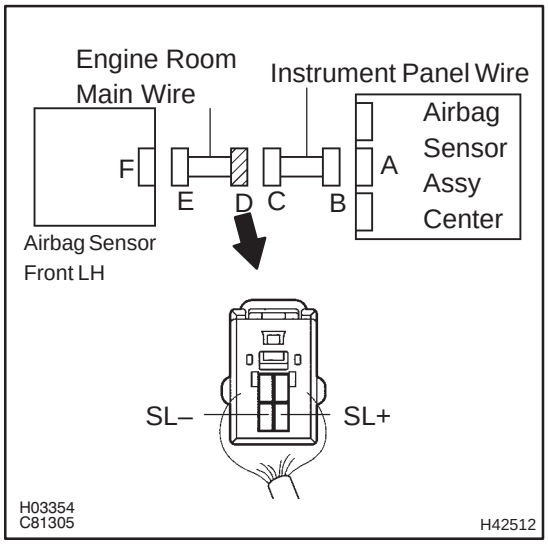
(c) Measure the resistance between SL+ and SL– of the connector ”D”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

8 CHECK ENGINE ROOM MAIN WIRE(TO B+)



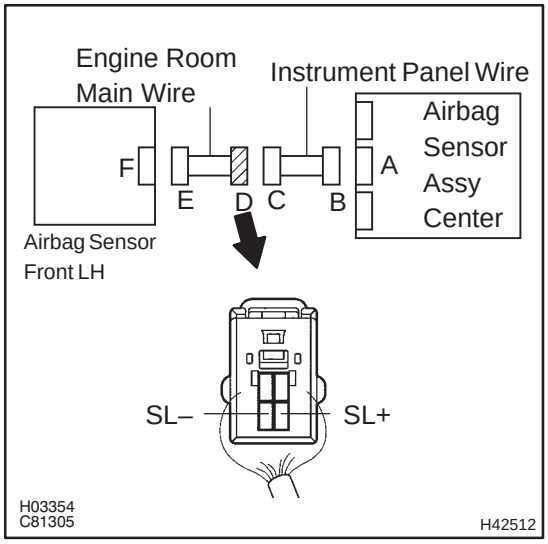
(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the engine room main wire connector from the instrument panel wire.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and each of SL+ and SL– of the connector ”D”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

9	CHECK ENGINE ROOM MAIN WIRE(TO GROUND)



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Measure the resistance between the body ground and each of SL+ and SL– of the connector ”D”.

OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

DTC	B1153/25	SEAT POSITION AIRBAG SENSOR MALFUNCTION

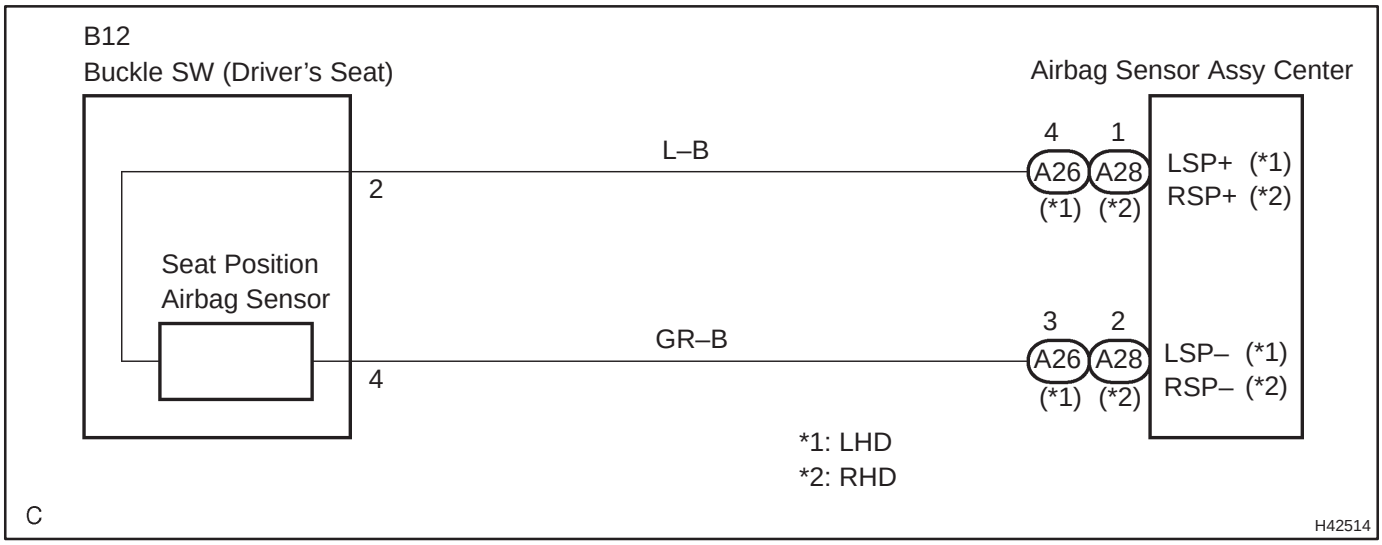
CIRCUIT DESCRIPTION

The seat position airbag sensor circuits consists of the airbag sensor assy center and the seat position airbag sensor.

DTC B1153/25 is recorded when a malfunction is detected in the seat position airbag sensor circuit.

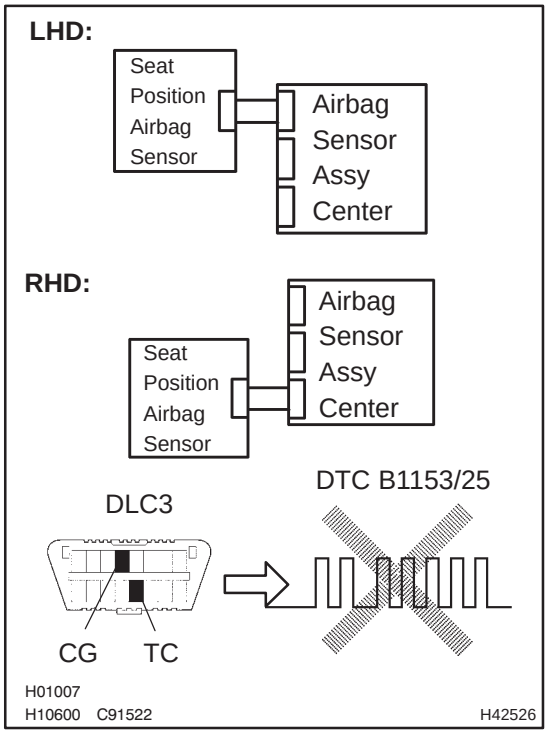
DTC No.	DTC Detecting Condition	Trouble Area
B1153/25	• Open circuit in LSP+ (RSP+) wire harness or LSP– (RSP–) wire harness of seat position airbag sensor • Short circuit in seat position airbag sensor wire harness (to ground) • Short circuit in seat position airbag sensor wire harness (to B+) • Seat position airbag sensor malfunction • Airbag sensor assy center malfunction	• Seat position airbag sensor • Airbag sensor assy center • Floor wire (LHD) • Floor wire No.2 (RHD)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1153/25 is not output.

HINT:
Codes other than code B1153/25 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the seat position airbag sensor.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

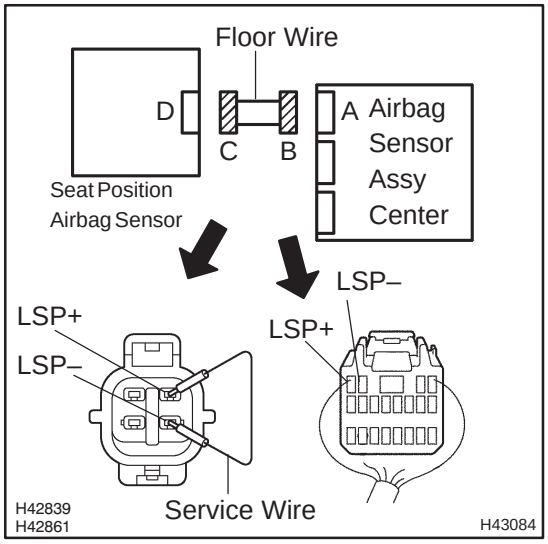
3	CHECK VEHICLE CONDITION

(a) Check the vehicle steering position.

RHD → **Go to step 10**

LHD

4 CHECK FLOOR WIRE(OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the seat position airbag sensor.

(b) Using a service wire, connect between LSP+ and LSP– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between LSP+ and LSP– of the floor wire connector on the airbag sensor assy center side.

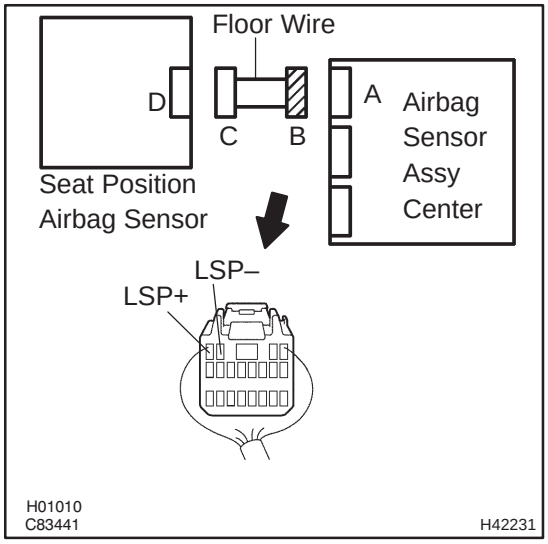
OK:

Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

5 CHECK FLOOR WIRE(TO B+)



(a) Disconnect the service wire from the connector ”C”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of LSP+ and LSP– of the connector ”B”.

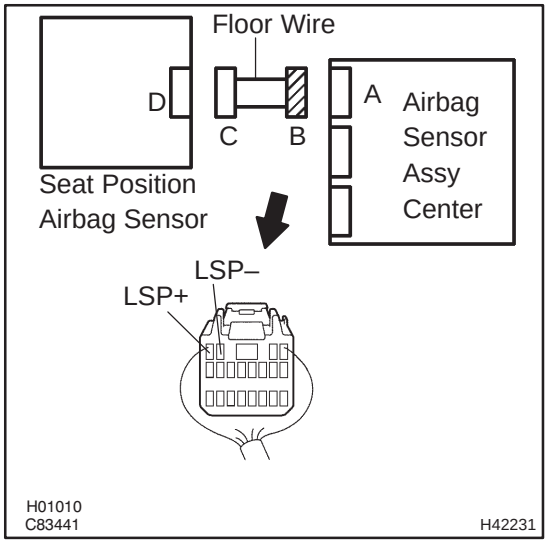
OK:

Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

6 CHECK FLOOR WIRE(TO GROUND)

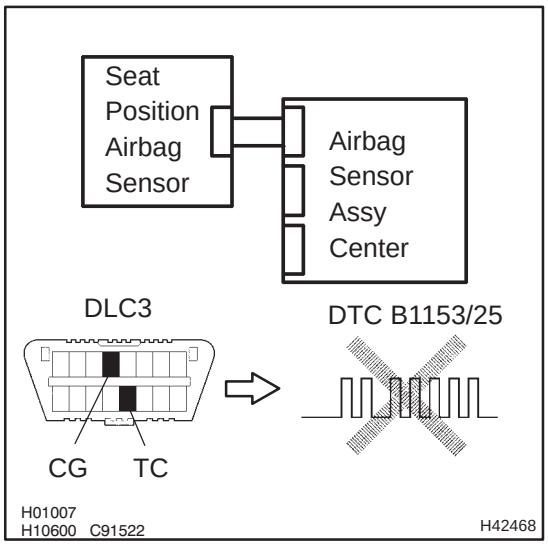


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of LSP+ and LSP– of the connector "B".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

7 CHECK SEAT POSITION AIR BAG SENSOR



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the seat position airbag sensor and the airbag sensor assy center.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1153/25 is not output.

HINT:
Codes other than code B1153/25 may be output at this time, but they are not related to this check.

NG → **Go to step 8**

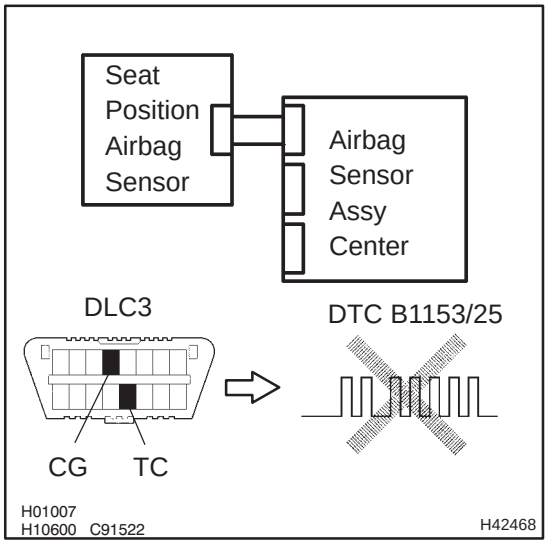
OK

USE SIMULATION METHOD TO CHECK

8	REPLACE SEAT POSITION AIRBAG SENSOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Replace the seat position airbag sensor (See page 60–70).

9	RECHECK DTC



(a) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(b) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(c) Clear the stored DTCs in the memory (See page 05–1184).
(d) Turn the ignition switch to the LOCK position.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Check the DTCs (See page 05–1184).
OK:
DTC B1153/25 is not output.

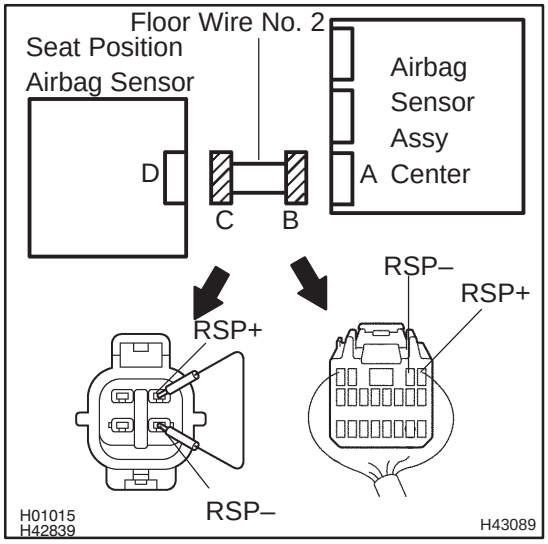
HINT:
Codes other than code B1153/25 may be output at this time, but they are not related to this check.

NG	REPLACE AIR BAG SENSOR ASSY CENTER

OK

USE SIMULATION METHOD TO CHECK

10 CHECK FLOOR WIRE NO.2(OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the seat position airbag sensor.

(b) Using a service wire, connect between RSP+ and RSP– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between RSP+ and RSP– of the connector ”B”.

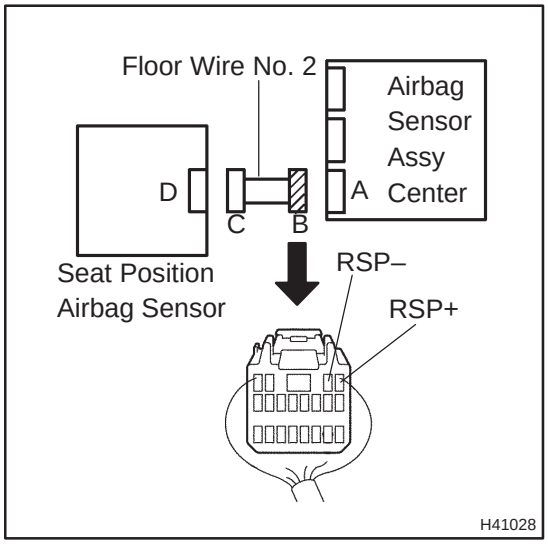
OK:

Resistance: Below 1 Ω

NG	**REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

11 CHECK FLOOR WIRE NO.2(TO B+)



(a) Disconnect the service wire from the connector ”C”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of RSP+ and RSP– of the connector ”B”.

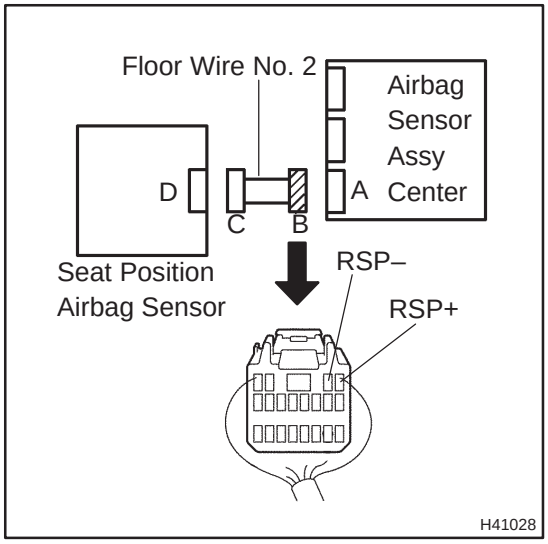
OK:

Voltage: Below 1 V

NG	**REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

12 CHECK FLOOR WIRE NO.2(TO GROUND)

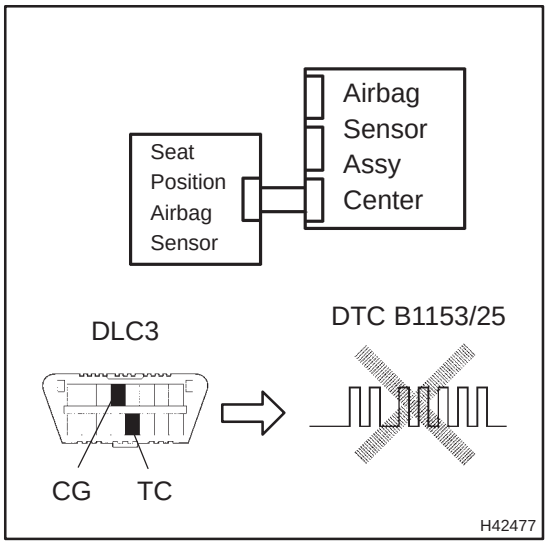


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of RSP+ and RSP– of the connector "B".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

13 CHECK SEAT POSITION AIR BAG SENSOR



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the seat position airbag sensor and the airbag sensor assy center.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1153/25 is not output.

HINT:
Codes other than code B1153/25 may be output at this time, but they are not related to this check.

NG → **Go to step 14**

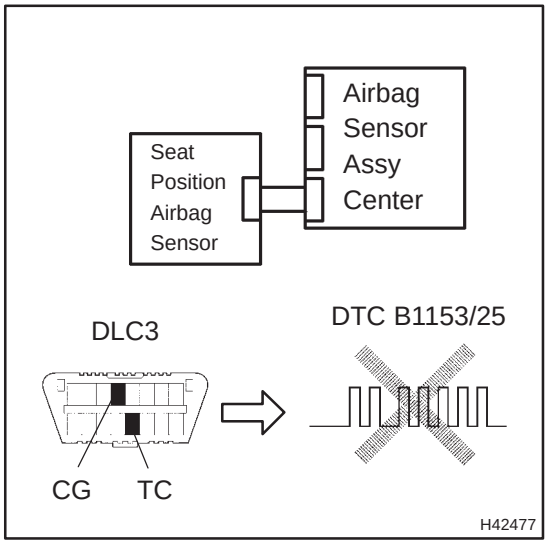
OK

USE SIMULATION METHOD TO CHECK

14	REPLACE SEAT POSITION AIR BAG SENSOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Replace the seat position airbag sensor (See page 60–70).

15	RECHECK DTC



(a) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(b) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(c) Clear the stored DTCs in the memory (See page 05–1184).
(d) Turn the ignition switch to the LOCK position.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Check the DTCs (See page 05–1184).
OK:
DTC B1153/25 is not output.

HINT:
Codes other than code B1153/25 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1154/38	AIRBAG SENSOR REAR (RH) MALFUNCTION

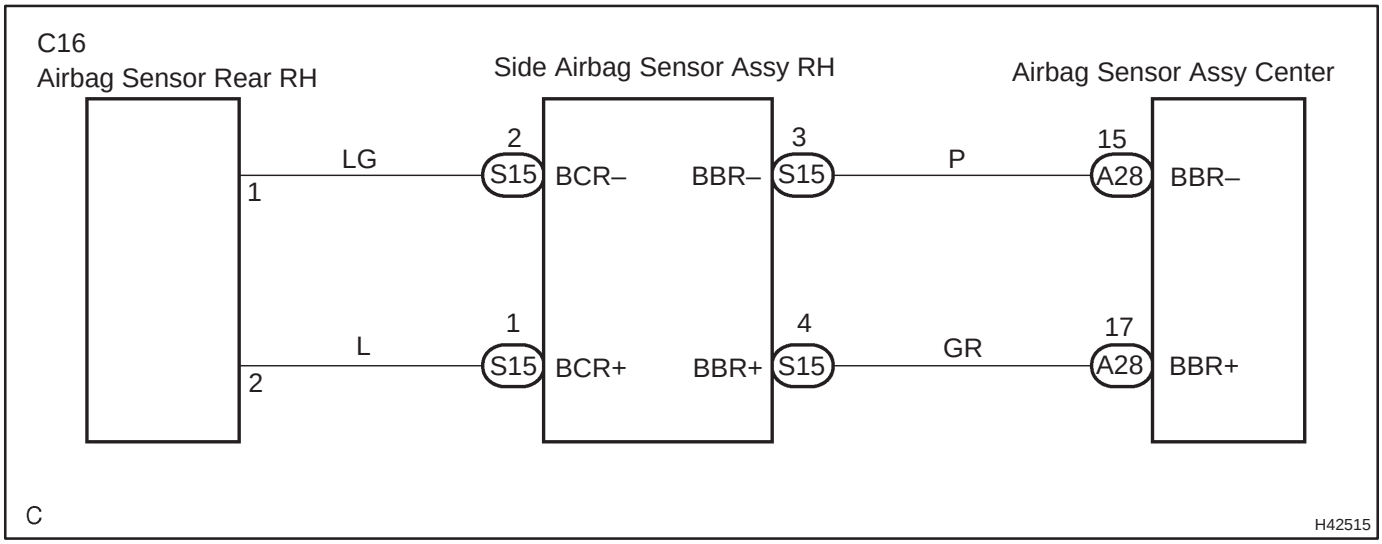
CIRCUIT DESCRIPTION

The airbag sensor rear RH consists of the diagnosis circuit and the lateral deceleration sensor, etc.
If the airbag sensor assy center receives the signal from the lateral deceleration sensor signal in the airbag sensor rear RH, it judges whether or not the SRS should be activated.
DTC B1154/38 is recorded when a malfunction in the airbag sensor rear RH is detected.

DTC No.	DTC Detection Condition	Trouble Area
B1154/38	• Short circuit in airbag sensor rear RH wire harness (to ground) • Short circuit in airbag sensor rear RH wire harness (to B+) • Open circuit in BCR+ wire harness or BCR– wire harness of airbag sensor rear RH • Airbag sensor rear RH malfunction • Side airbag sensor assy RH malfunction • Airbag sensor assy center malfunction	• Airbag sensor rear RH • Side airbag sensor assy RH • Airbag sensor assy center • Floor wire No.2

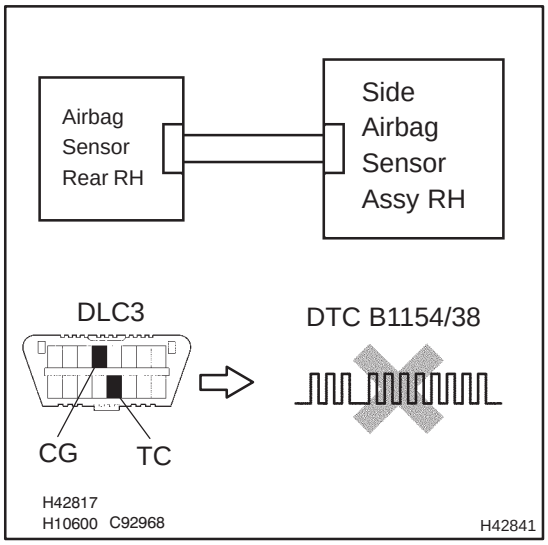
HINT:
DTC B1154/38 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1154/38 is not output.

HINT:

Codes other than code B1154/38 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the side airbag sensor assy RH and the airbag sensor rear RH.

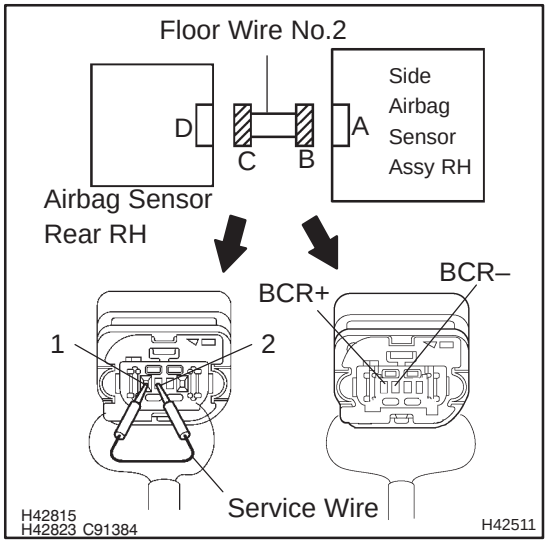
OK:

The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FLOOR WIRE NO.2(OPEN)



(a) Disconnect the connectors from the side airbag sensor assy RH and the airbag sensor rear RH.

(b) Using a service wire, connect 1 and 2 of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between BCR+ and BCR– of the connector ”B”.

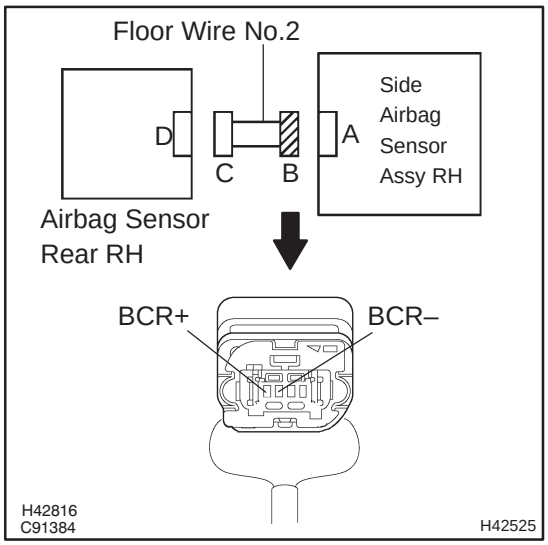
OK:

Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

4 CHECK FLOOR WIRE NO.2(TO B+)



(a) Disconnect the service wire from the connector ”C”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of BCR+ and BCR– of the connector ”B”.

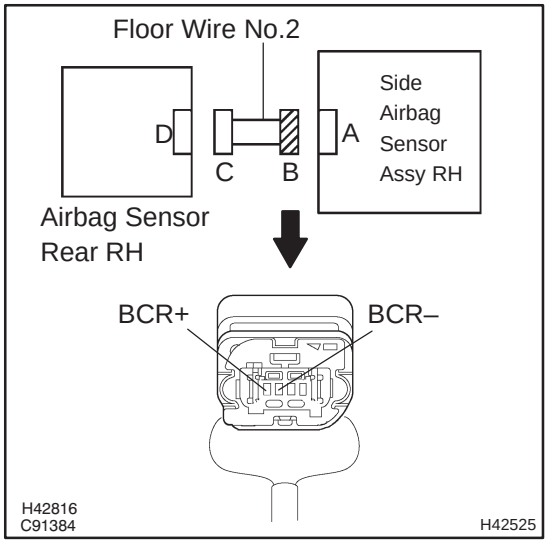
OK:

Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

5 CHECK FLOOR WIRE NO.2(TO GROUND)

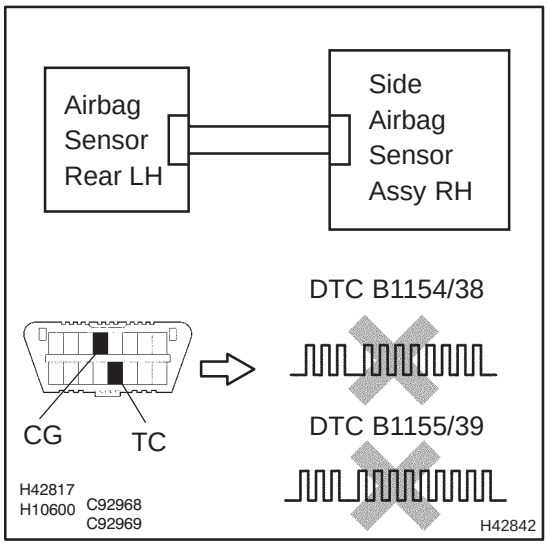


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of BCR+ and BCR– of the connector "B".
OK:
Resistance: 10 kΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

6 CHECK AIR BAG SENSOR REAR RH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the side airbag sensor assy RH.
(d) Interchange the airbag sensor rear RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
A: DTC B1154/38 is not output.
B: DTC B1155/39 is not output.

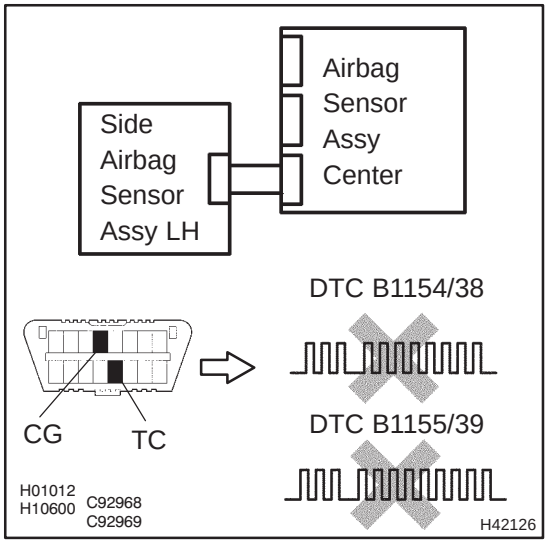
NG:A → **Go to step 7**

NG:B → **REPLACE AIR BAG SENSOR REAR RH**

OK

USE SIMULATION METHOD TO CHECK

7	CHECK SIDE AIR BAG SENSOR ASSY RH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Return the interchanged airbag sensor rear RH and LH to the original condition and connect the connectors to them.
(d) Interchange the side airbag sensor assy RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Tune the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).

OK:
A: DTC B1154/38 is not output.
B: DTC B1155/39 is not output.

NG:A	REPLACE AIR BAG SENSOR ASSY CENTER

NG:B	REPLACE SIDE AIR BAG SENSOR ASSY RH

OK

USE SIMULATION METHOD TO CHECK

DTC	B1155/39	AIRBAG SENSOR REAR (LH) MALFUNCTION

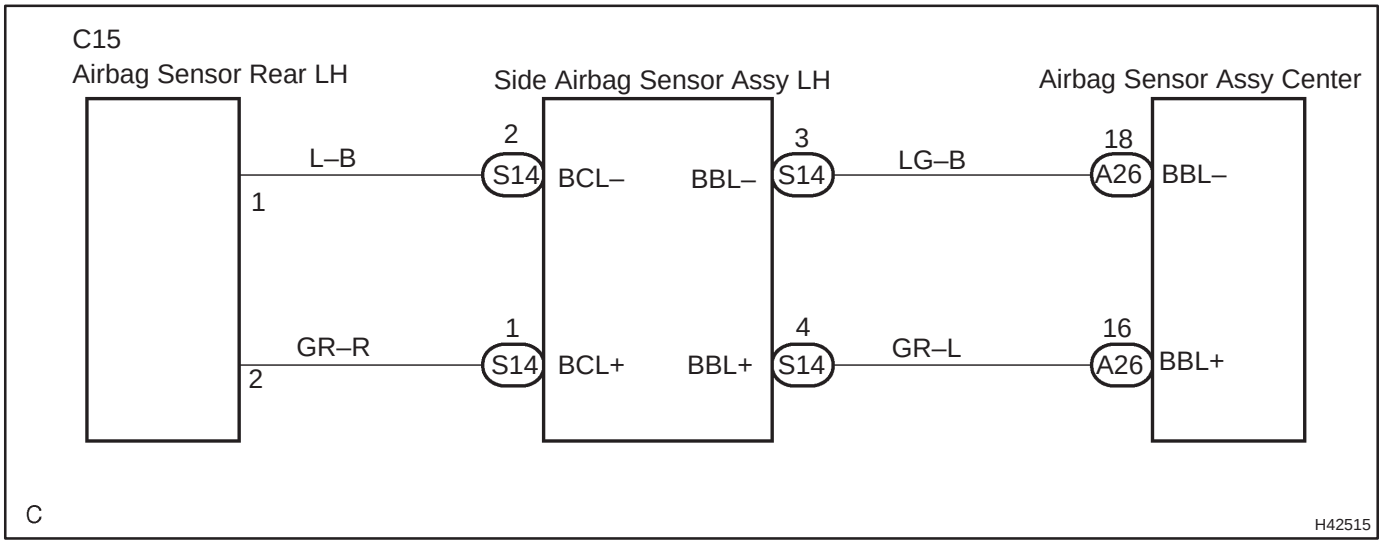
CIRCUIT DESCRIPTION

The airbag sensor rear LH consists of the diagnosis circuit and the lateral deceleration sensor, etc.
If the airbag sensor assy center receives the signal from the lateral deceleration sensor signal in the airbag sensor rear LH, it judges whether or not the SRS should be activated.
DTC B1155/39 is recorded when a malfunction in the airbag sensor rear LH is detected.

DTC No.	DTC Detection Condition	Trouble Area
B1155/39	• Short circuit in airbag sensor rear LH wire harness (to ground) • Short circuit in airbag sensor rear LH wire harness (to B+) • Open circuit in BCL+ wire harness or BCL– wire harness of airbag sensor rear LH • Airbag sensor rear LH malfunction • Side airbag sensor assy LH malfunction • Airbag sensor assy center malfunction	• Airbag sensor rear LH • Side airbag sensor assy LH • Airbag sensor assy center • Floor wire

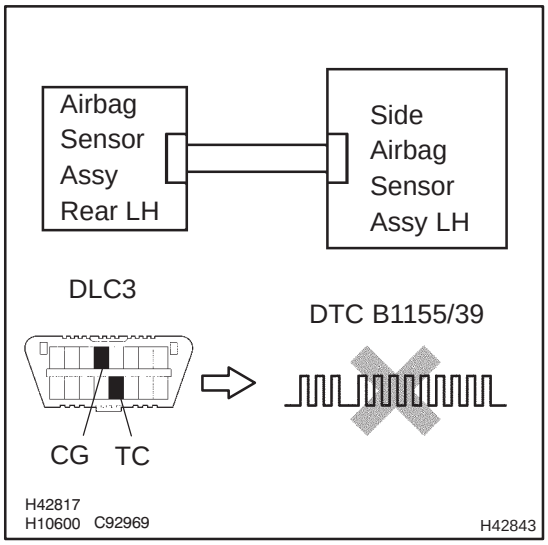
HINT:
DTC B1155/39 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1155/39 is not output.

HINT:
Codes other than code B1155/39 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

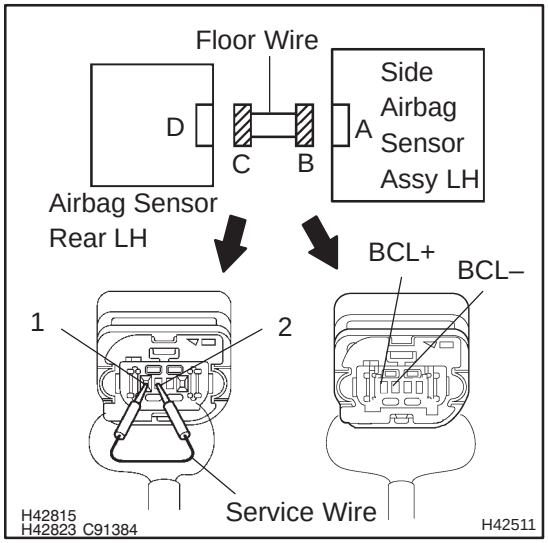
2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–)terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the side airbag sensor assy LH and the airbag sensor rear LH.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FLOOR WIRE(OPEN)



(a) Disconnect the connectors from the side airbag sensor assy LH and the airbag sensor rear LH.

(b) Using a service wire, connect 1 and 2 of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between BCL+ and BCL– of the connector ”B”.

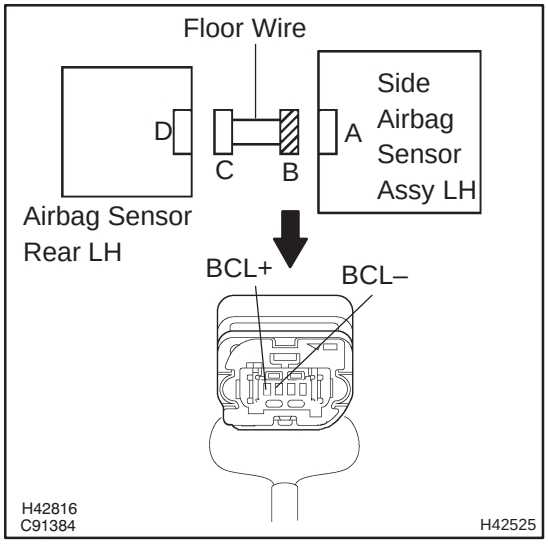
OK:

Resistance: Below 1 Ω

NG	**REPAIR OR REPLACE FLOOR WIRE**

OK

4 CHECK FLOOR WIRE(TO B+)



(a) Disconnect the service wire from the connector ”C”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of BCL+ and BCL– of the connector ”B”.

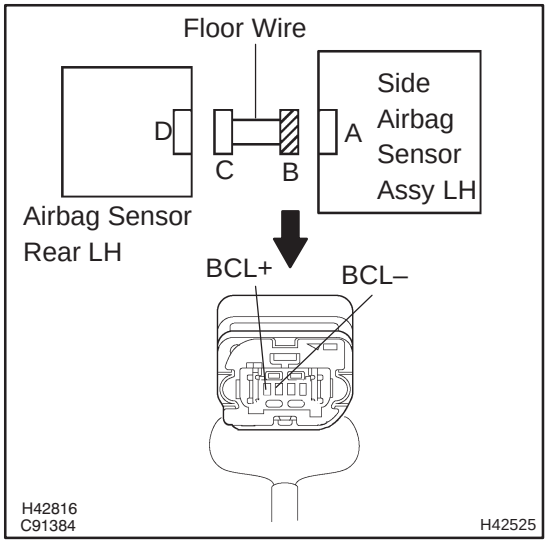
OK:

Voltage: Below 1 V

NG	**REPAIR OR REPLACE FLOOR WIRE**

OK

5 CHECK FLOOR WIRE(TO GROUND)

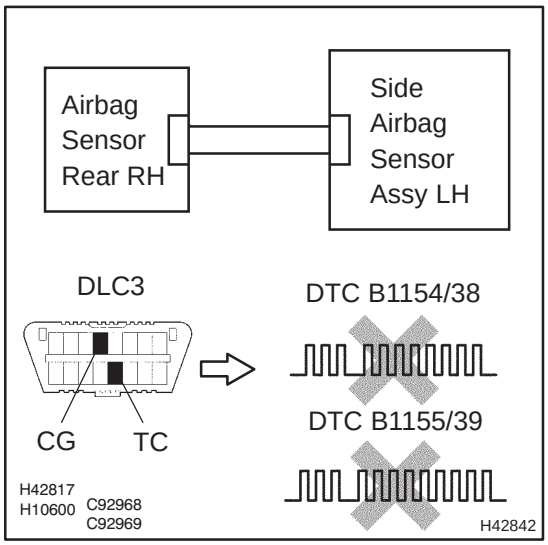


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of BCL+ and BCL– of the connector "B".
OK:
Resistance: 10 kΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

6 CHECK AIR BAG SENSOR REAR LH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the side airbag sensor assy LH.
(d) Interchange the airbag sensor rear RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
A: DTC B1154/38 is not output.
B: DTC B1155/39 is not output.

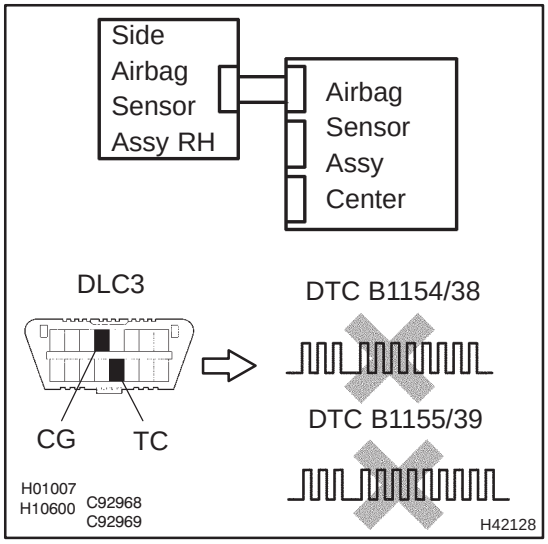
NG:A → **Go to step 7**

NG:B → **REPLACE AIR BAG SENSOR REAR LH**

OK

USE SIMULATION METHOD TO CHECK

7 CHECK SIDE AIR BAG SENSOR ASSY LH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Return the interchanged airbag sensor rear RH and LH to the original condition and connect the connectors to them.
(d) Interchange the side airbag sensor assy RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Tune the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).

OK:
A: DTC B1154/38 is not output.
B: DTC B1155/39 is not output.

NG:A	**REPLACE AIR BAG SENSOR ASSY CENTER**
NG:B	**REPLACE SIDE AIR BAG SENSOR ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1160/83	SHORT IN CURTAIN SHIELD SQUIB (RH) CIRCUIT

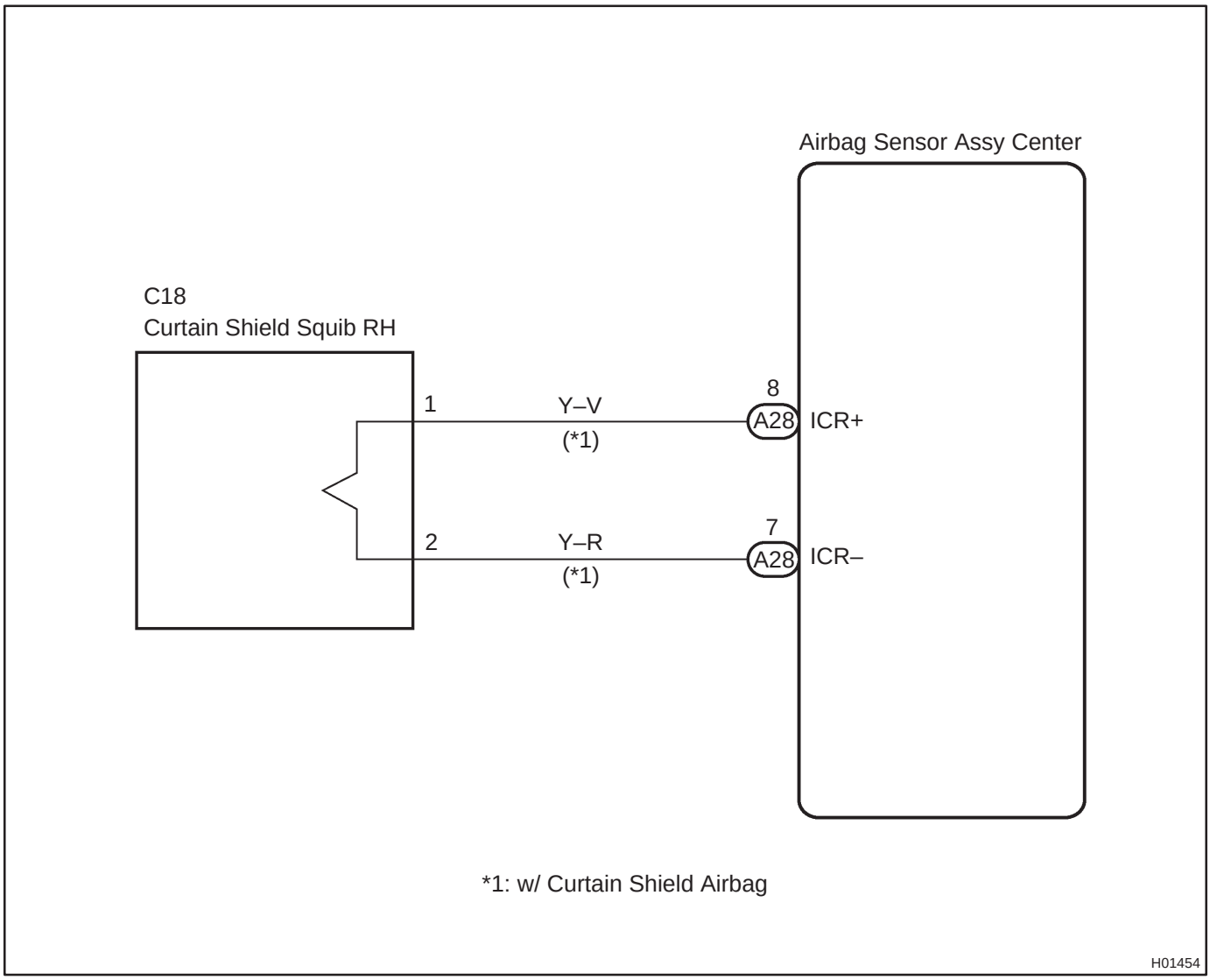
CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1160/83 is recorded when a short circuit is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1160/83	• Short circuit between ICR+ wire harness and ICR– wire harness of curtain shield squib RH • Curtain shield squib RH malfunction • Airbag sensor assy center malfunction	• Curtain shield airbag assy RH (Curtain shield squib RH) • Airbag sensor assy center • Floor wire No.2

HINT:
DTC B1160/83 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM



INSPECTION PROCEDURE

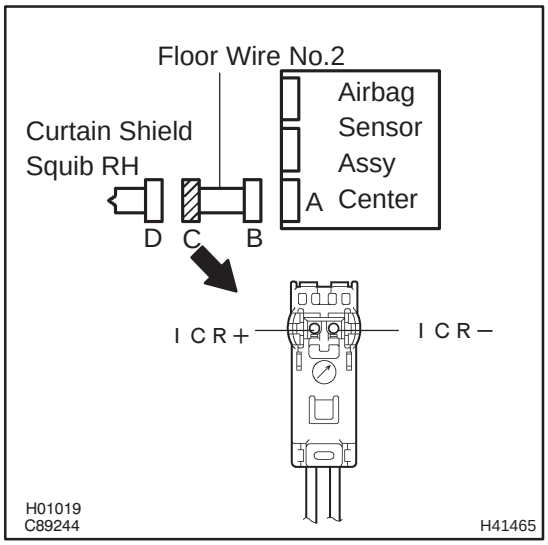
1	CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(d) Check that the floor wire No.2 connector (on the curtain shield airbag assy RH side) is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB RH CIRCUIT)

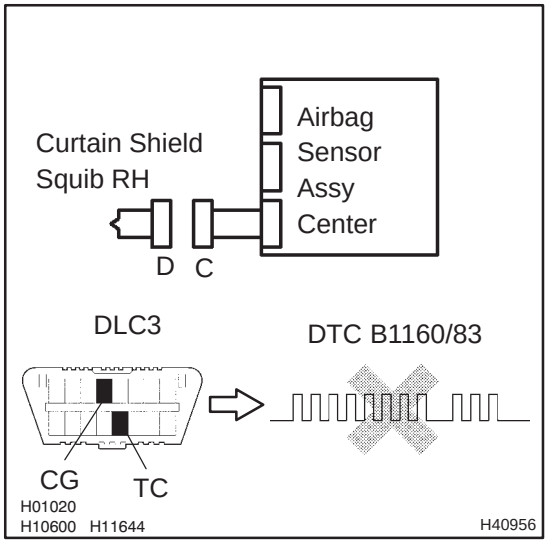


(a) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(b) Measure the resistance between ICR+ and ICR– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

3 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).

OK:

DTC B1160/83 is not output.

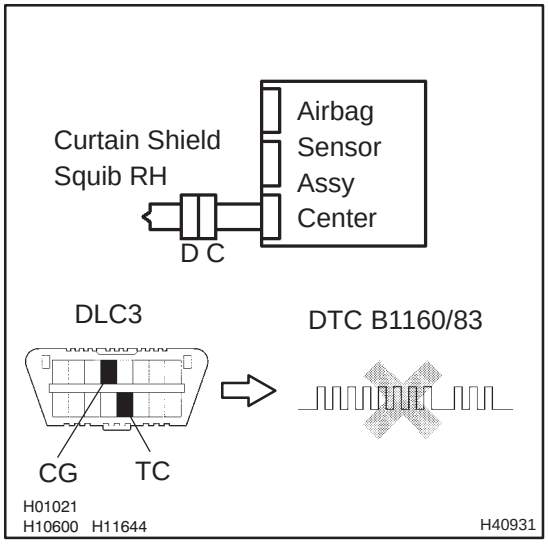
HINT:

Codes other than code B1160/83 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

4 CHECK CURTAIN SHIELD AIR BAG ASSY RH(CURTAIN SHIELD SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).

OK:

DTC B1160/83 is not output.

HINT:

Codes other than code B1160/83 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY RH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1161/84	OPEN IN CURTAIN SHIELD SQUIB (RH) CIRCUIT

CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1161/84 is recorded when an open circuit is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1161/84	• Open circuit in ICR+ wire harness or ICR– wire harness of curtain shield squib RH • Curtain shield squib RH malfunction • Airbag sensor assy center malfunction	• Curtain shield airbag assy RH (Curtain shield squib RH) • Airbag sensor assy center • Floor wire No.2

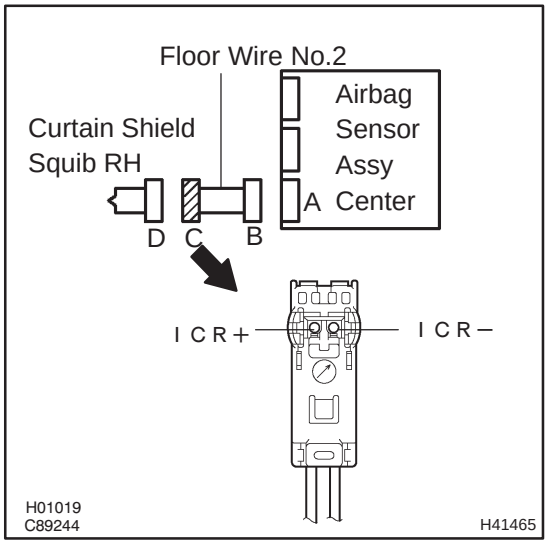
HINT:
DTC B1161/84 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM

See page 05–1322.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB RH CIRCUIT)

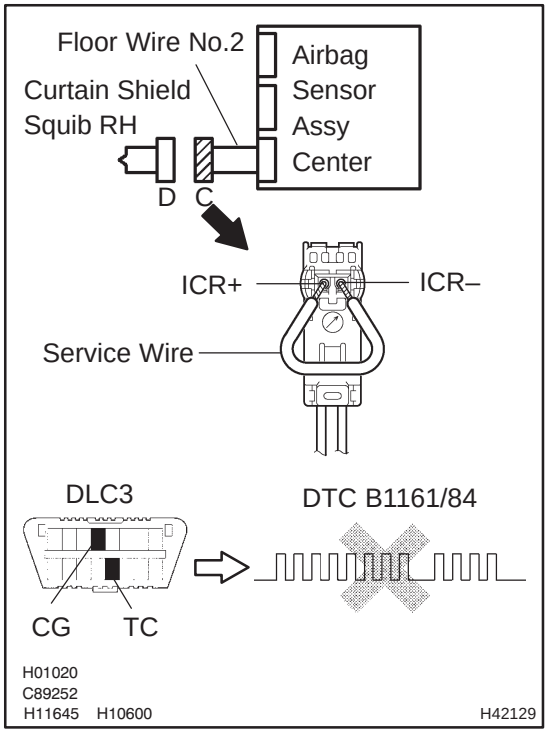


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(d) Measure the resistance between ICR+ and ICR– of the connector "C".
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect ICR+ and ICR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1161/84 is not output.

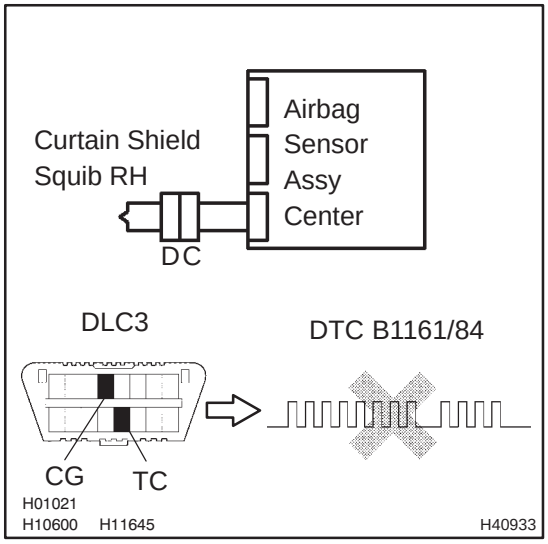
HINT:

Codes other than code B1161/84 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK CURTAIN SHIELD AIR BAG ASSY RH(CURTAIN SHIELD SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1161/84 is not output.

HINT:
Codes other than code B1161/84 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY RH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1162/81	SHORT IN CURTAIN SHIELD SQUIB (RH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1162/81 is recorded when a short to ground is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1162/81	• Short circuit in curtain shield squib RH wire harness (to ground) • Curtain shield squib RH malfunction • Airbag sensor assy malfunction	• Curtain shield airbag assy RH (Curtain shield squib RH) • Airbag sensor assy center • Floor wire No.2

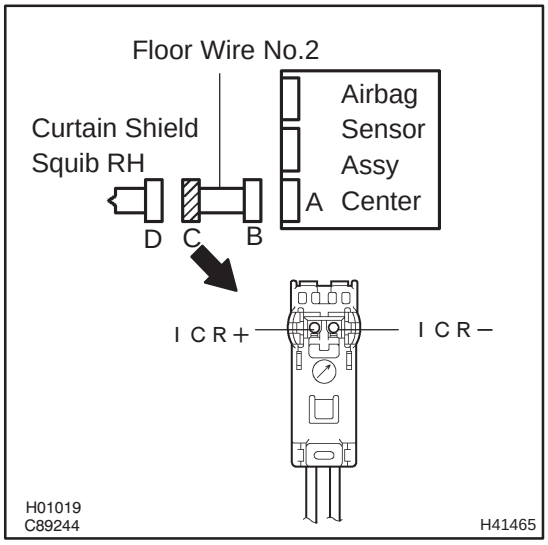
HINT:
DTC B1162/81 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM

See page 05–1322.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB RH CIRCUIT)

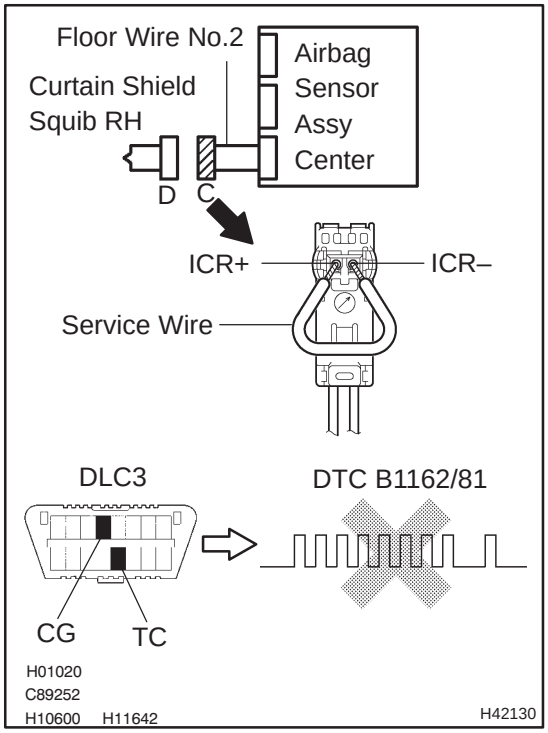


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(d) Measure the resistance between the body ground and ICR+ of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect ICR+ and ICR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1162/81 is not output.

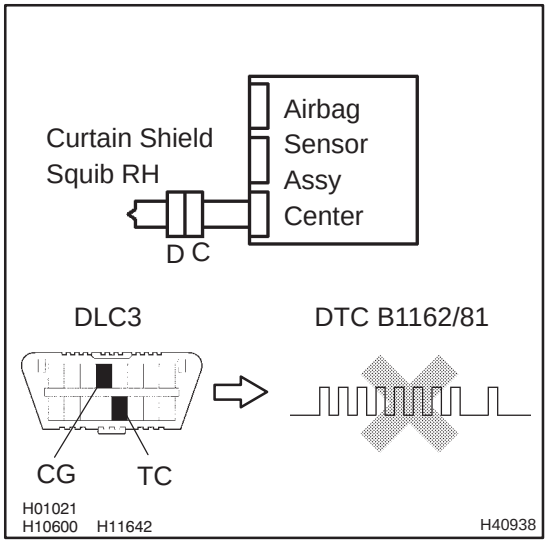
HINT:

Codes other than code B1162/81 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK CURTAIN SHIELD AIR BAG ASSY RH(CURTAIN SHIELD SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1162/81 is not output.

HINT:
Codes other than code B1162/81 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY RH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B1163/82	SHORT IN CURTAIN SHIELD SQUIB (RH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1163/82 is recorded when a short to B+ is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1163/82	• Short circuit in curtain shield squib RH wire harness (to B+) • Curtain shield squib RH malfunction • Airbag sensor assy center malfunction	• Curtain shield airbag assy RH (Curtain shield squib RH) • Airbag sensor assy center • Floor wire No.2

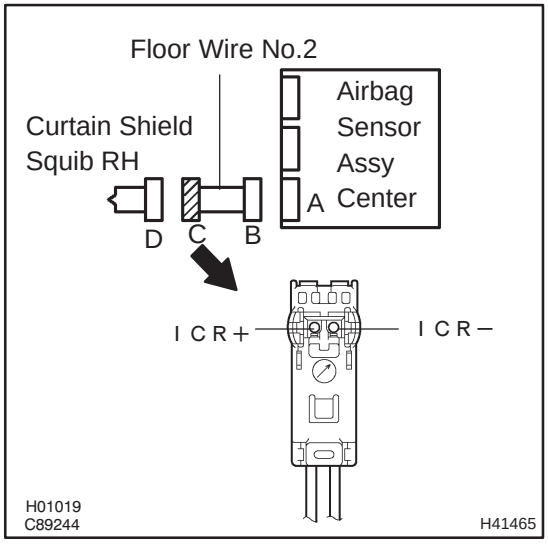
HINT:
DTC B1163/82 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM

See page 05–1322.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB RH CIRCUIT)

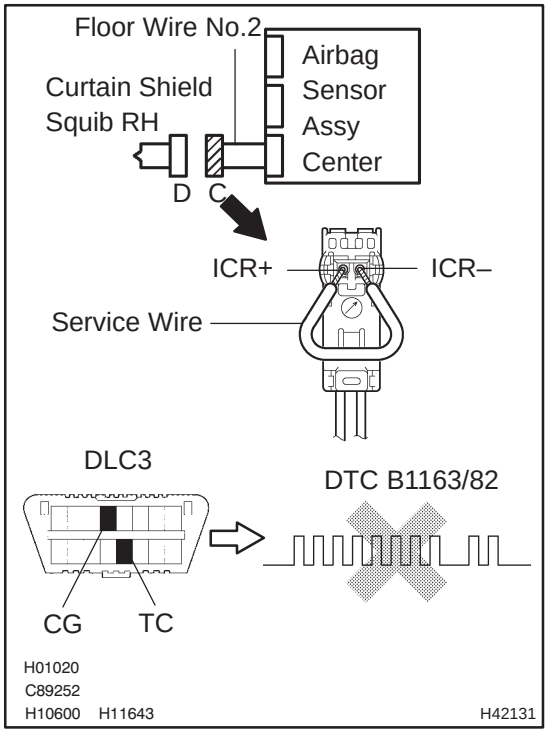


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and ICR+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect ICR+ and ICR– of the connector ”C”.

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

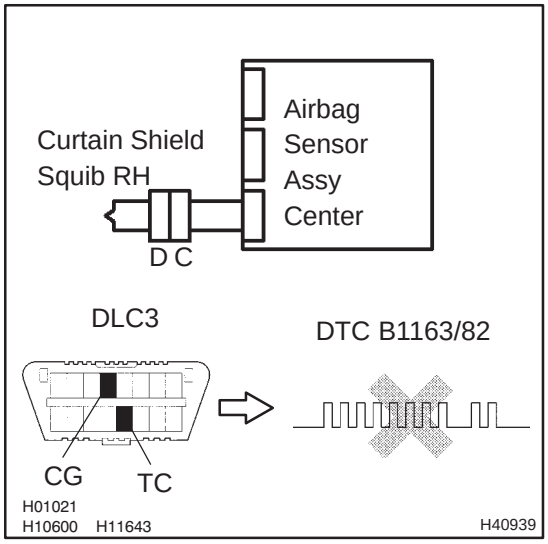
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B1163/82 is not output.

HINT:
Codes other than code B1163/82 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK CURTAIN SHIELD AIR BAG ASSY RH(CURTAIN SHIELD SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1163/82 is not output.

HINT:
Codes other than code B1163/82 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY RH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B1165/87	SHORT IN CURTAIN SHIELD SQUIB (LH) CIRCUIT

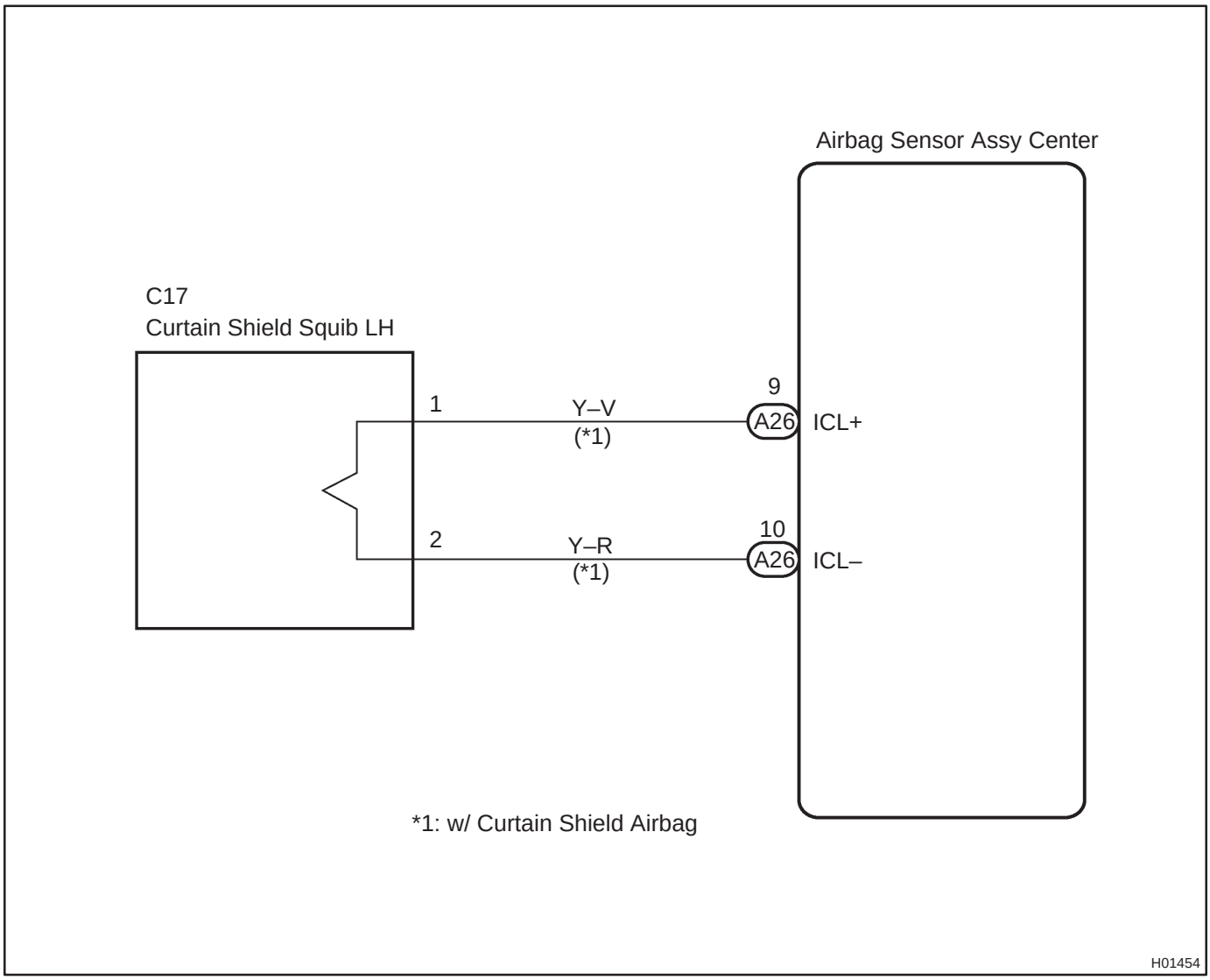
CIRCUIT DESCRIPTION

The curtain shield squib LH circuit consists of the airbag sensor assy center and the curtain shield airbag assy LH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1165/87 is recorded when a short circuit is detected in the curtain shield squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1165/87	• Short circuit between ICL+ wire harness and ICL– wire harness of curtain shield squib LH • Curtain shield squib LH malfunction • Airbag sensor assy center malfunction	• Curtain shield airbag assy LH (Curtain shield squib LH) • Airbag sensor assy center • Floor wire

HINT:
DTC B1165/87 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM



INSPECTION PROCEDURE

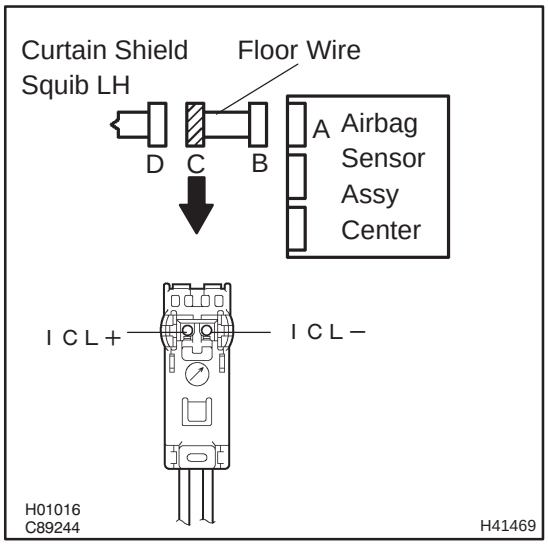
1	CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) DIsconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy LH.
(d) Check that the floor wire connector (on the curtain shield airbag assy LH side) is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2	CHECK FLOOR WIRE(CURTAIN SHIELD SQUIB LH CIRCUIT)

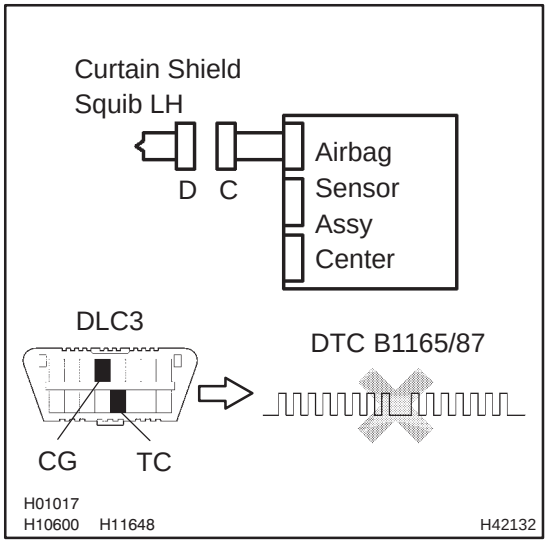


(a) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(b) Measure the resistance between ICL+ and ICL– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

3 CHECK AIR BAG SENSOR ASSY CENTER



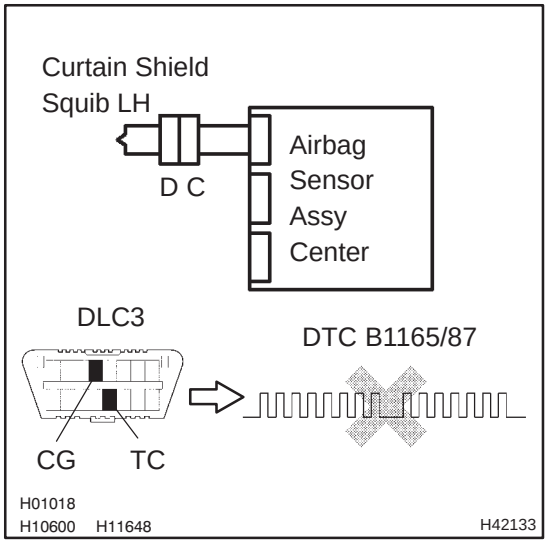
(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B1165/87 is not output.

HINT:
Codes other than code B1165/87 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

4 CHECK CURTAIN SHIELD AIR BAG ASSY LH(CURTAIN SHIELD SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1165/87 is not output.

HINT:
Codes other than code B1165/87 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1166/88	OPEN IN CURTAIN SHIELD SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The curtain shield squib LH circuit consists of the airbag sensor assy center and the curtain shield airbag assy LH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1166/88 is recorded when an open circuit is detected in the curtain shield squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1166/88	• Open circuit in ICL+ wire harness or ICL– wire harness of curtain shield squib LH • Curtain shield squib LH malfunction • Airbag sensor assy center malfunction	• Curtain shield airbag assy LH (Curtain shield squib LH) • Airbag sensor assy center • Floor wire

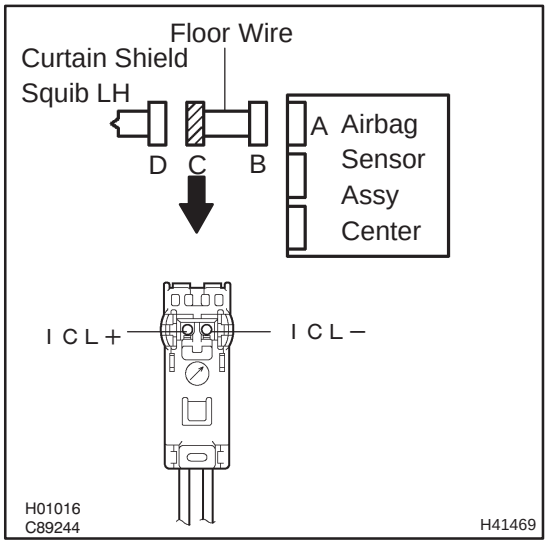
HINT:
DTC B1166/88 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM

See page 05–1184.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(CURTAIN SHIELD SQUIB LH CIRCUIT)

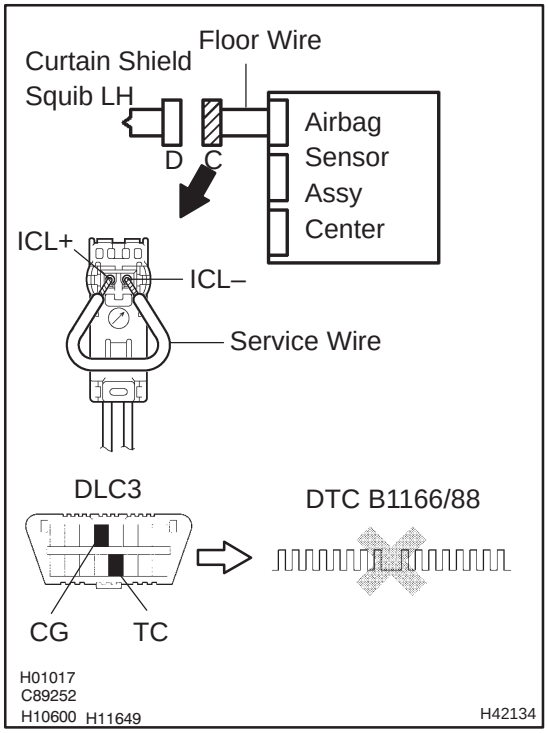


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy LH.
(d) Measure the resistance between ICL+ and ICL– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect ICL+ and ICL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1166/88 is not output.

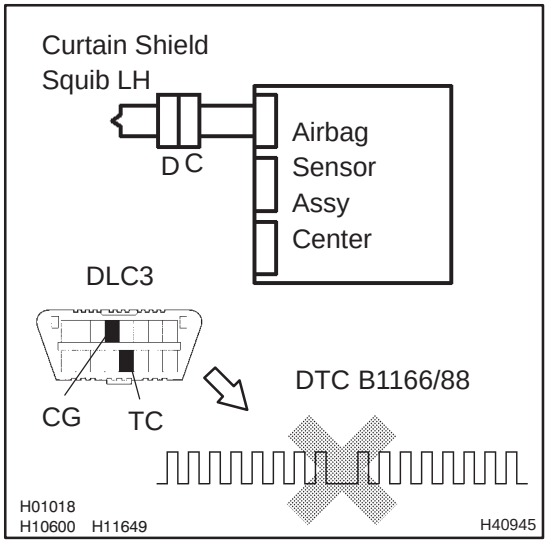
HINT:

Codes other than code B1166/88 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK CURTAIN SHIELD AIR BAG ASSY LH(CURTAIN SHIELD SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1166/88 is not output.

HINT:
Codes other than code B1166/88 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1167/85	SHORT IN CURTAIN SHIELD SQUIB (LH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The curtain shield squib LH circuit consists of the airbag sensor assy center and the curtain shield airbag assy LH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1167/85 is recorded when a short to ground is detected in the curtain shield squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1167/85	• Short circuit in curtain shield squib LH wire harness (to ground) • Curtain shield squib LH malfunction • Airbag sensor assy malfunction	• Curtain shield airbag assy LH (Curtain Shield Squib LH) • Airbag sensor assy center • Floor wire

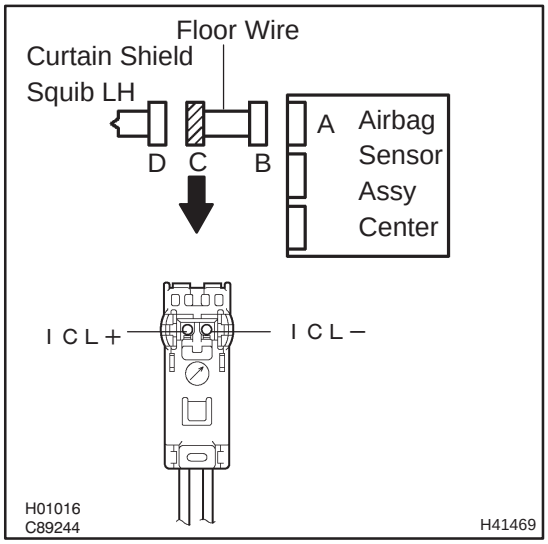
HINT:
DTC B1167/85 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM

See page 05–1334.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(CURTAIN SHIELD SQUIB LH CIRCUIT)

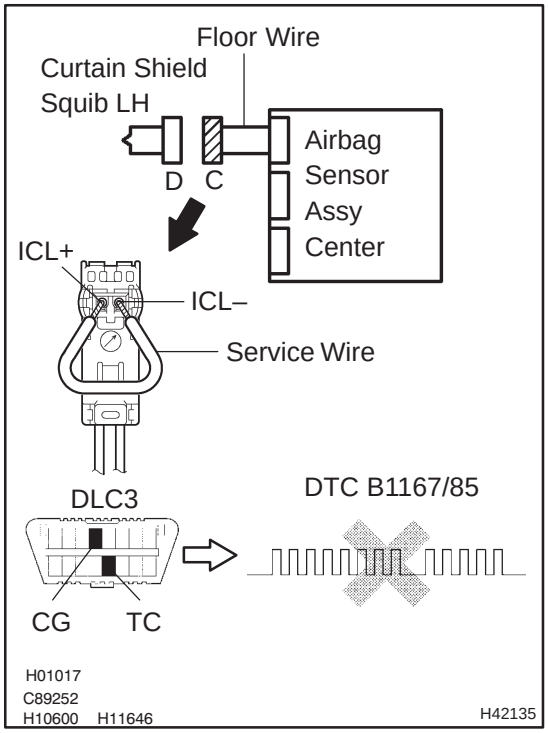


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy LH.
(d) Measure the resistance between the body ground and ICL+ of the connector ”C”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect ICL+ and ICL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1167/85 is not output.

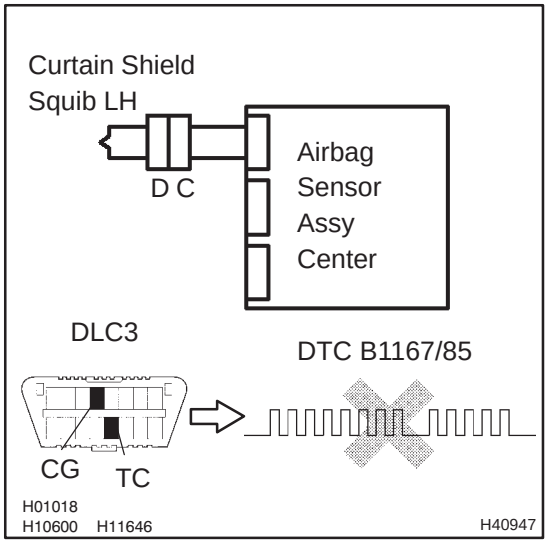
HINT:

Codes other than code B1167/85 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK CURTAIN SHIELD AIR BAG ASSY LH(CURTAIN SHIELD SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1167/85 is not output.

HINT:
Codes other than code B1167/85 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY LH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

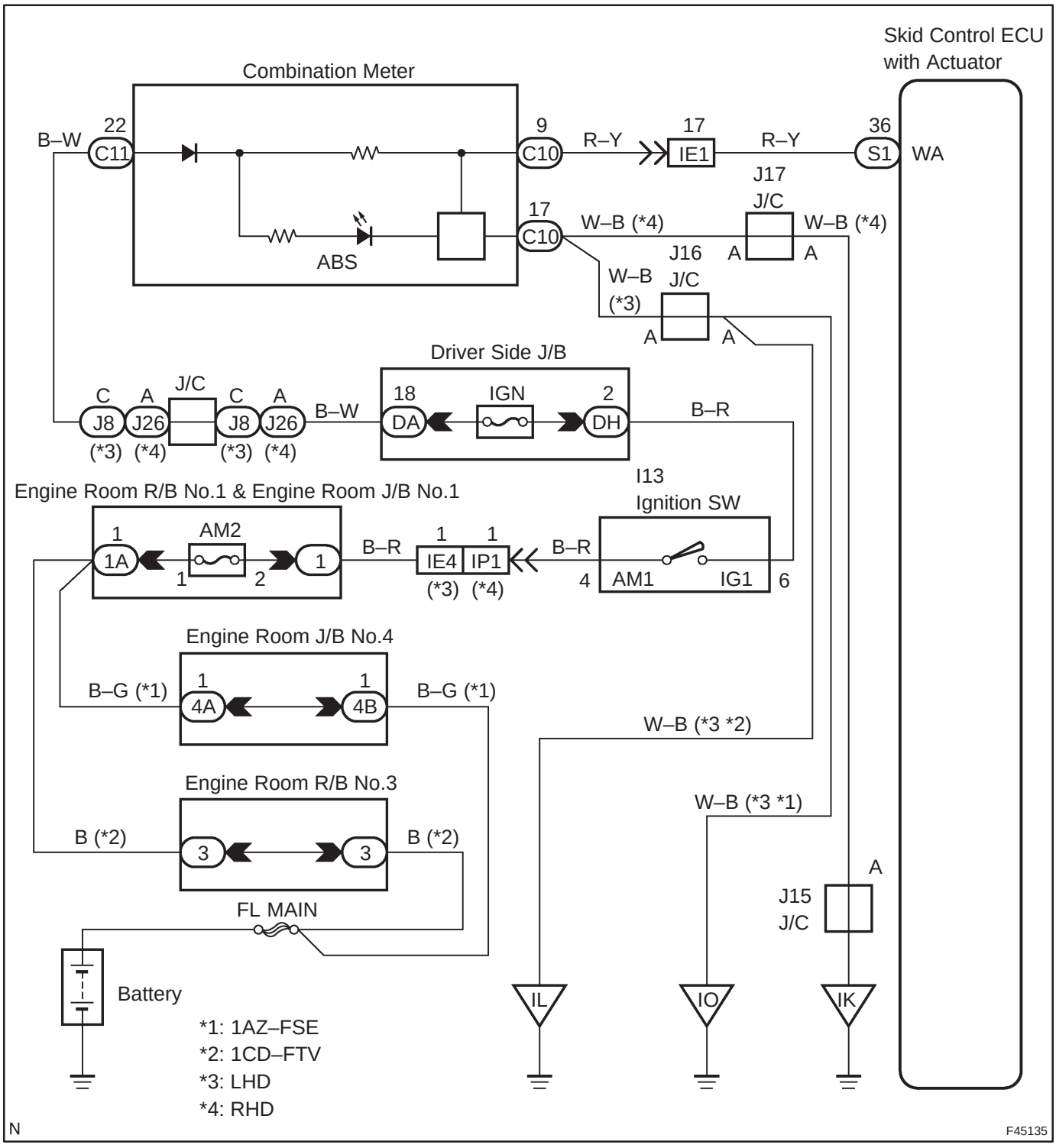
REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

ABS WARNING LIGHT CIRCUIT (DOES NOT LIGHT UP)

CIRCUIT DESCRIPTION

If the ECU detects trouble, it will prohibit ABS control, turn on the ABS warning light, and store the DTC. Connect terminals Tc and CG of the DLC3 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(ABS WARNING LIGHT)

(a) Check that ”ON” and ”OFF” of the ABS warning light is shown on the combination meter by the hand–held tester.

OK → REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

2	INSPECT ABS WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTORL ECU – CMBINATION METER)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

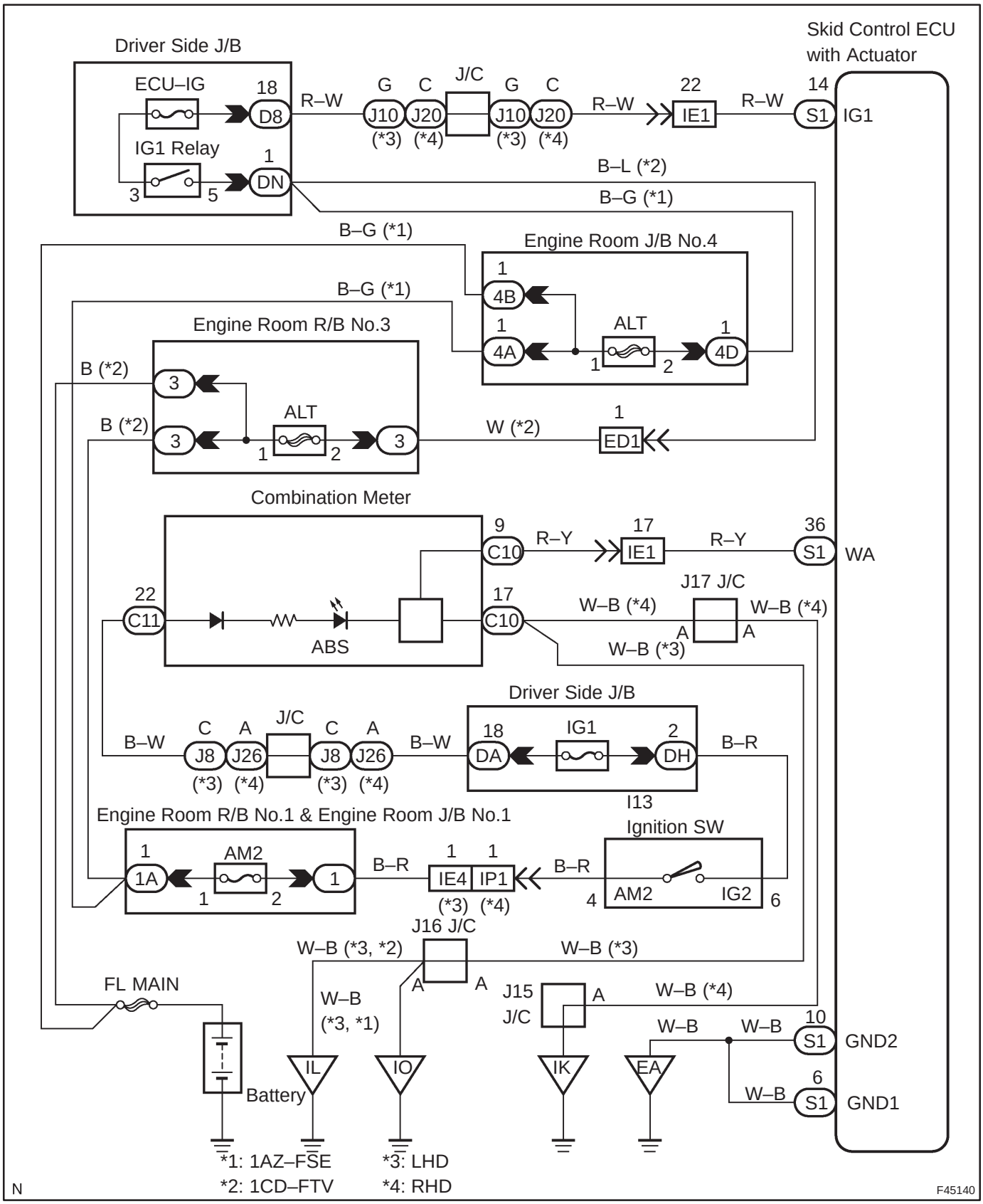
DTC	AlwaysON	MALFUNCTION IN ABS ECU

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Either of the following 1 or 2 is detected: 1. The ECU connectors are disconnected from the ECU. 2. There is a malfunction in the ECU internal circuit. 3. Malfunction in the circuit of meter or ABS warning light circuit.	• Battery • IC regulator • ABS warning light circuit • Power source circuit • Skid control ECU

HINT:
There is a case that hand–held tester cannot be used when ECU is abnormal.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC FOR ABS

(a) Check the DTCs are output (See page 05–756).

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

2	INSPECT SKID CONTROL ECU CONNECTOR SECURELY CONNECTED

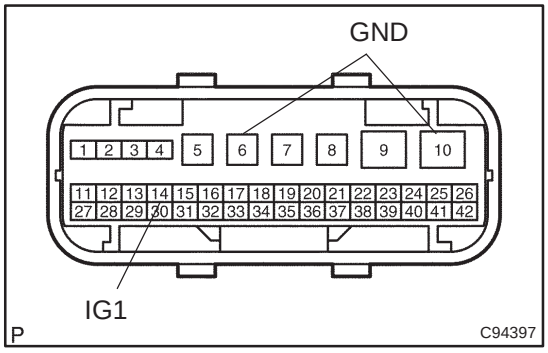
NO → CONNECT CONNECTOR TO ECU

YES

3	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(IG1 TERMINAL)

WITH USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



WITHOUT USING HAND–HELD TESTER:

(a) Disconnect the skid control connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

4	INSPECT BATTERY

OK:
Voltage: 10 to 14 V

NG → INSPECT CHARGING SYSTEM

OK

5	CHECK HARNESS AND CONNECTOR(DLC3 – SKID CONTROL ECU)

(a) Check for a short circuit in harness and connector between terminal Tc of the DLC3 and skid control ECU (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6	INSPECT ABS WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

7	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

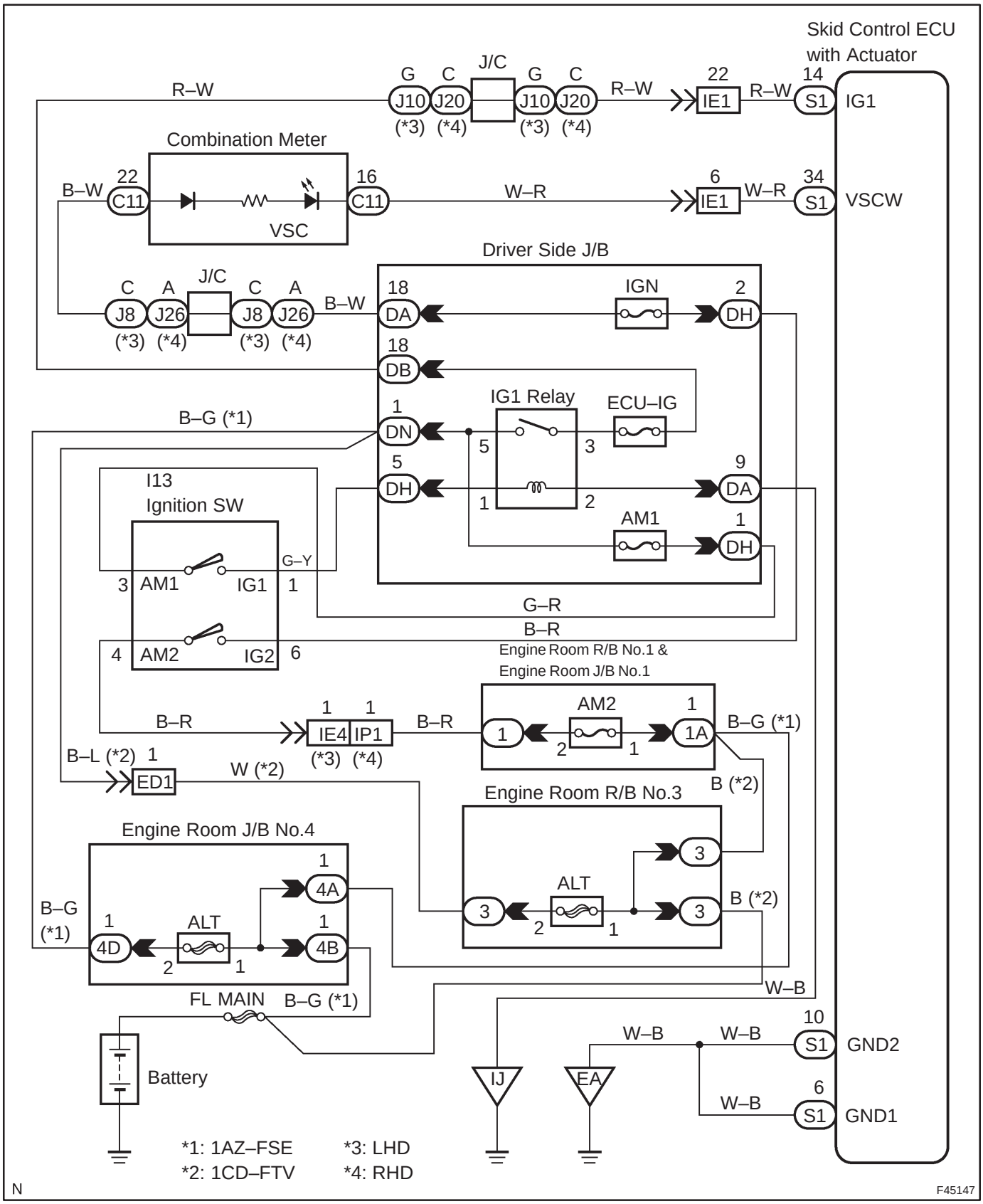
DTC	AlwaysON	MALFUNCTION IN ECU(VSC WARNING LIGHT)

CIRCUIT DESCRIPTION

When the ECU stores DTC, the VSC warning light illuminates on the combination meter.

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Malfunction in skid control ECU	• Battery • IC regulator • Power source circuit • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC FOR VSC

(a) Check the DTCs are output (See page 05–756).

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

2	INSPECT SKID CONTROL ECU CONNECTOR SECURELY CONNECTED

NO → CONNECT CONNECTOR TO ECU

YES

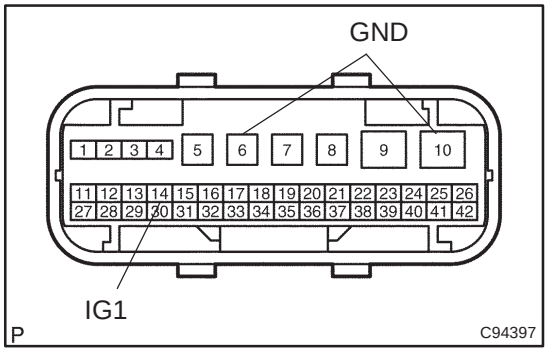
3	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(IG1 TERMINAL)

WITH USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.

OK:

"Normal" is displayed.



WITHOUT USING HAND–HELD TESTER:

(a) Disconnect the skid control connector.

(b) Turn the ignition switch ON.

(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.

OK:

Voltage: 10 to 14 V

OK → REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

4	INSPECT BATTERY

OK:

Voltage: 10 to 14 V

NG → INSPECT CHARGING SYSTEM

OK

5	CHECK HARNESS AND CONNECTOR(DLC3 – SKID CONTROL ECU)

(a) Check for a short circuit in harness and connector between terminal Tc of the DLC3 and skid control ECU (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6	CHECK VSC WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

7	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

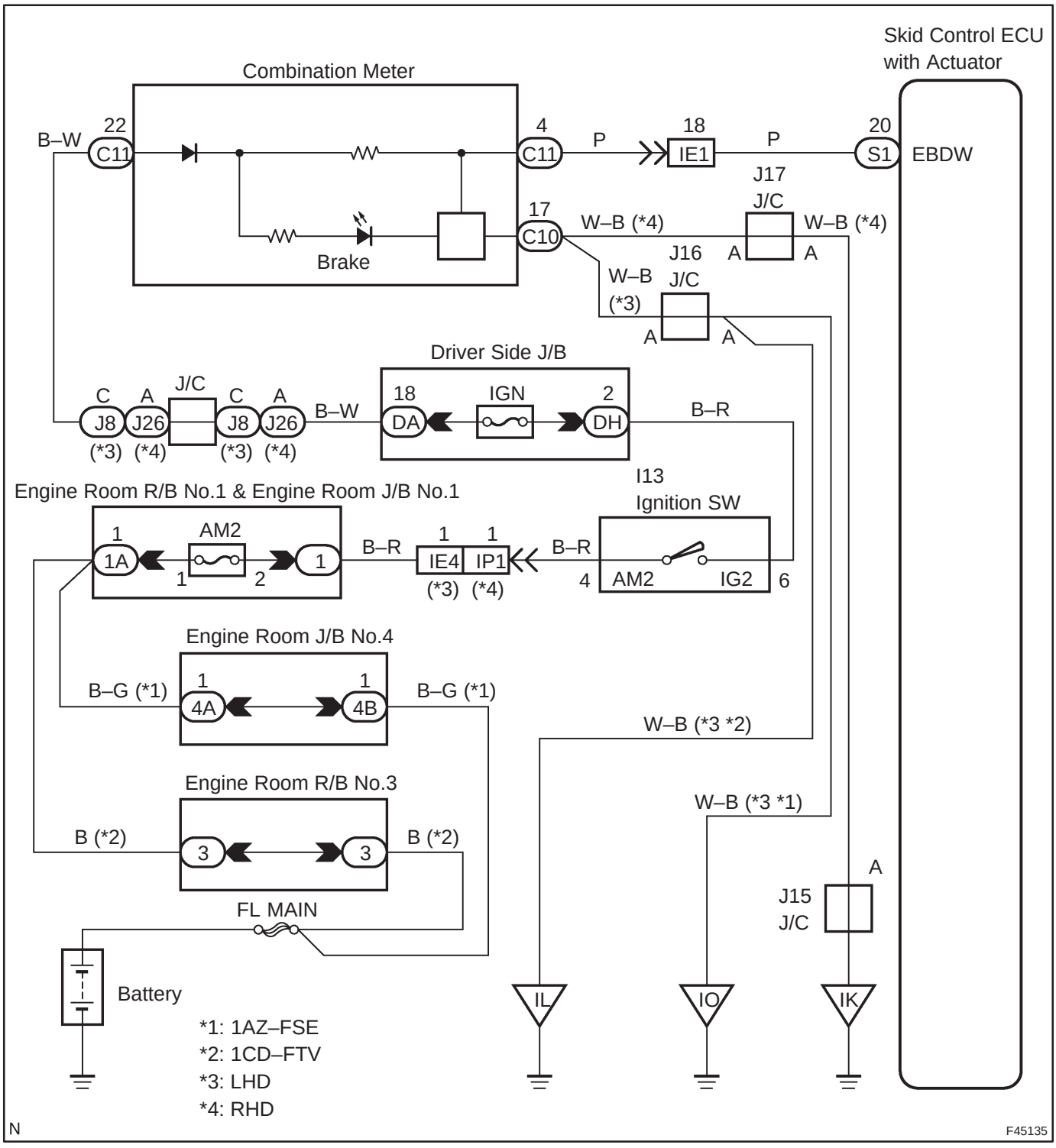
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

BRAKE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

The Brake warning light comes on when the brake fluid is insufficient, the parking brake is applied or the EBD is defective.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(BRAKE WARNING LIGHT)

(a) Check that ”ON” and ”OFF” of the Brake warning light is shown on the combination meter by the hand–held tester.

OK → Go to step 4

NG

2	CHECK DTC FOR ABS

(a) Check the DTC on page 05–756.

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

3	INSPECT BRAKE WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

4	INSPECT PARKING BRAKE SWITCH ASSY(See page 71–3)

NG → REPLACE PARKING BRAKE SWITCH ASSY

OK

5	INSPECT BRAKE FLUID LEVEL WARNING SWITCH(See page 71–3)

NG → REPLACE BRAKE MASTER CYLINDER RESERVOIR SUB–ASSY

OK

6	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – PARKING BRAKE SWITCH)

(a) Check for an open or short circuit in harness and connector between terminal PKB of the skid control ECU and parking brake switch (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – BRAKE FLUID LEVEL WARNING SWITCH)

(a) Check for an open or short circuit in harness and connector between terminal EBDW of the skid control ECU and brake fluid level warning switch (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION MERTER)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

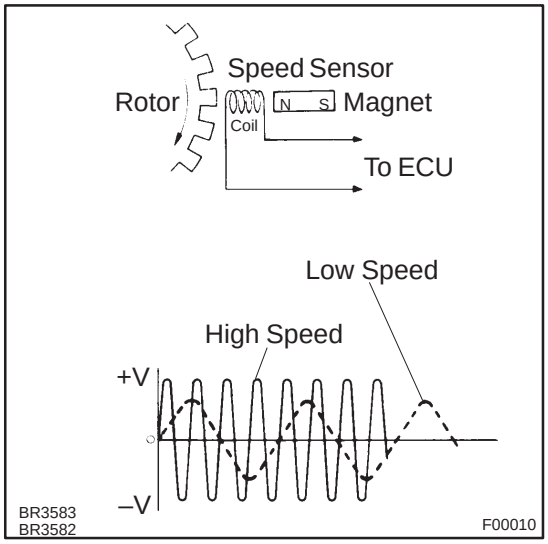
DTC	C0200/31	RIGHT FRONT SPEED SENSOR

DTC	C0205/32	LEFT FRONT SPEED SENSOR

DTC	C1330/35	RIGHT FRONT SPEED SENSOR CIRCUIT

DTC	C1331/36	LEFT FRONT SPEED SENSOR CIRCUIT

CIRCUIT DESCRIPTION

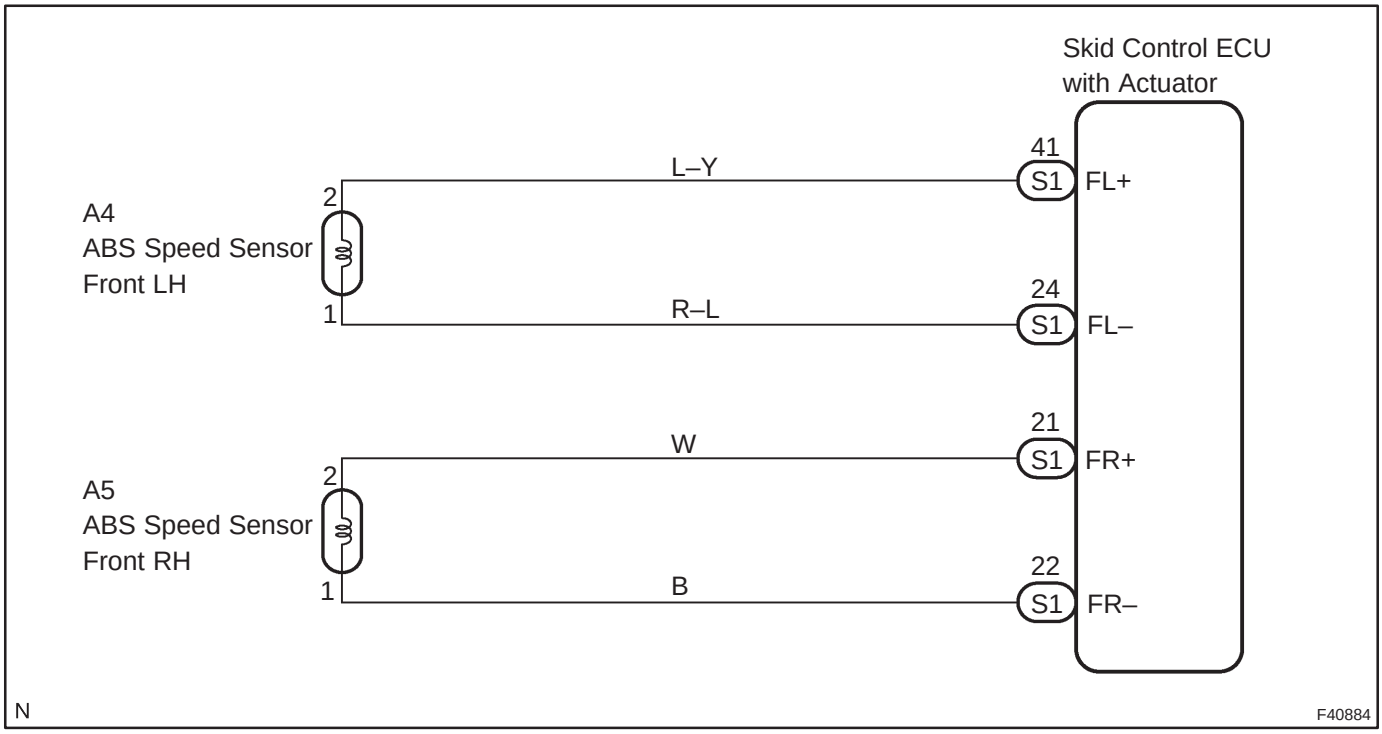


The speed sensor detects wheel speed and transmits the appropriate signals to the ECU. These signals are used for control of the ABS and VSC control systems. Each of the front and rear rotors has 48 serrations.
When the rotors rotate, the magnetic field generated by the permanent magnet in the speed sensor induces an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

DTC No.	DTC Detecting Condition	Trouble Area
C0200/31 C0205/32	When any of the following 1 to 3 is detected : 1. Vehicle speed is more than 40 km/h (25 mph), pulses are not input for 0.01 second. 2. After the initial start or restart and when the vehicle speed has reached 12 km/h (7 mph), the wheel speed of 0 km/h (0 mph) is detected. 3. After the initial start or restart and when the vehicle speed has reached 18 km/h (11 mph), the front wheel speed of 0 km/h (0 mph) is detected.	• Right front and left front speed sensor • Speed sensor rotor
C1330/35 C1331/36	Detecting abnormality in the resistance value of each speed sensor.	• Right front and left front speed sensor • Speed sensor circuit

HINT:
DTC No. C0200/31 and C1330/35 are for the right front speed sensor.
DTC No. C0205/32 and C1331/36 are for the left front speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF HAND–HELD TESTER(FRONT SPEED SENSOR)

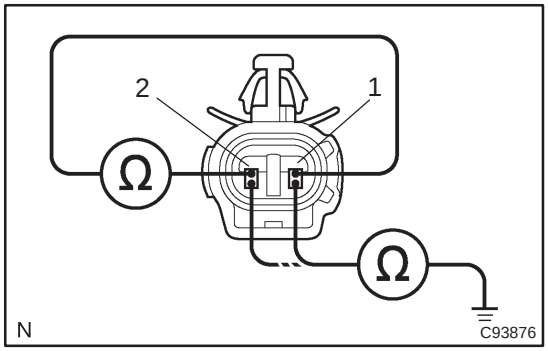
(a) Select the item "WHEEL SPEED FL (FR)" in the DATA LIST and read the value displayed on the hand–held tester.
(b) Check that there is no difference between the speed value output from the speed sensor displayed on the hand–held tester and the speed value displayed on the speedometer when driving the vehicle.
OK:
There is almost no difference in the displayed speed value.

HINT:
There is tolerance of ±10 % in the speedometer indication.

OK → **Go to step 5**

NG

2 INSPECT FRONT SPEED SENSOR



(a) Remove the fender liner.
(b) Disconnect the speed sensor connector.
(c) Measure resistance between terminals 1 and 2 of the speed sensor connector.
OK:
Resistance: 1.2 to 1.6 kΩ at 20°C (68°F)
(d) Measure resistance between each of terminals 1 and 2 of the speed sensor connector and body ground.
OK:
Resistance: 1 MΩ or higher

NG → **REPLACE SPEED SENSOR FRONT RH**

NG → **REPLACE SPEED SENSOR FRONT LH**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

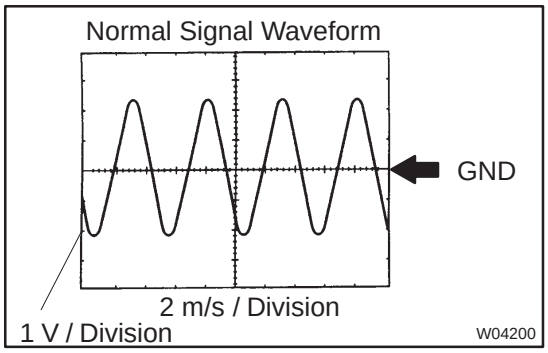
3 CHECK HARNESS AND CONNECTOR(FRONT SPEED SENSOR–SKID CONTROL ECU)

(a) Check for an open and short circuit in harness and connector between each front speed sensor and the skid control ECU connector (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



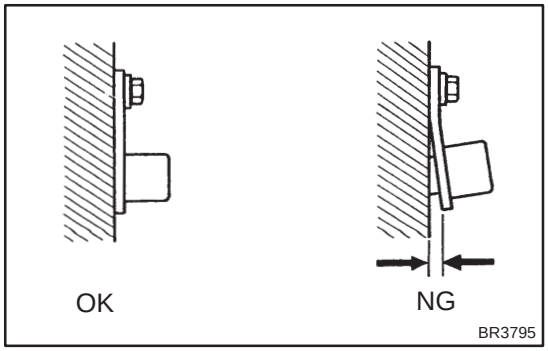
(REFERENCE) INSPECTION USING OSCILLOSCOPE
(a) Connect the oscilloscope to the terminals FR+ – FR– and FL+ – FL– of the skid control ECU.
(b) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

HINT:
- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform becomes shorter and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter deposited on it.

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

5 INSPECT FRONT SPEED SENSOR INSTALLATION



(a) Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and front steering knuckle.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

NG → **REPLACE SPEED SENSOR FRONT RH**

NG → **REPLACE SPEED SENSOR FRONT LH**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

6 INSPECT SPEED SENSOR TIP

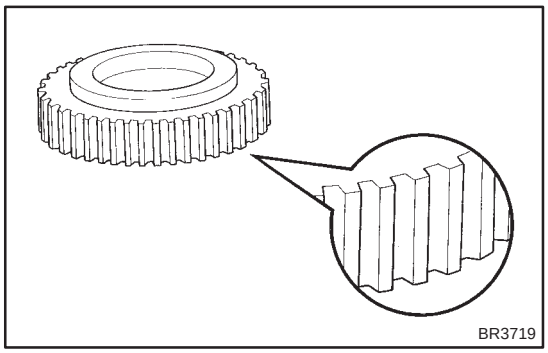
(a) Remove the front speed sensor (See page 32–59).
(b) Check the sensor tip.
OK:
No scratches or foreign objects on the sensor tip.

NG → **CLEAN OR REPAIR SPEED SENSOR**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

7 INSPECT SPEED SENSOR ROTOR



(a) Remove the front speed sensor rotor (See page 30–6).
(b) Check the sensor rotor serrations.
OK:
No scratches, missing teeth or foreign objects.

HINT:
If a foreign object is attached, remove it and after reassembling, check the output waveform.

NG → **CLEAN OR REPAIR SPEED SENSOR ROTOR**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC	C0210/33	RIGHT REAR SPEED SENSOR

DTC	C0215/34	LEFT REAR SPEED SENSOR

DTC	C1332/38	RIGHT REAR SPEED SENSOR CIRCUIT

DTC	C1333/39	LEFT REAR SPEED SENSOR CIRCUIT

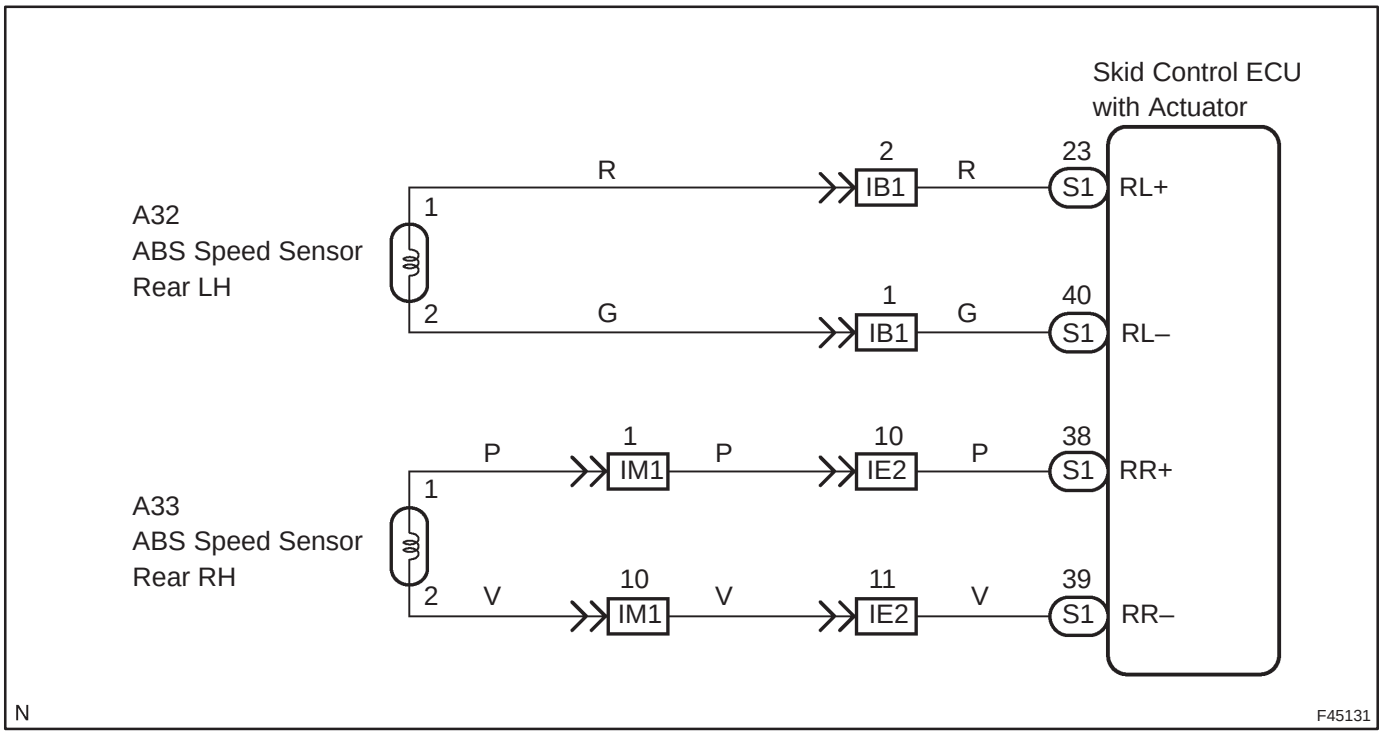
CIRCUIT DESCRIPTION

Refer to DTC C0200/31, C0205/32, C1330/35, C1331/36 on page 05–774.

DTC No.	DTC Detecting Condition	Trouble Area
C0210/33 C0215/34	When any of the following 1 to 3 is detected : 1. Vehicle speed is more than 40 km/h (25 mph), pulses are not input for 0.01 second. 2. After the initial start or restart and when the vehicle speed has reached 12 km/h (7 mph), the wheel speed of 0 km/h (0 mph) is detected. 3. After the initial start or restart and when the vehicle speed has reached 18 km/h (11 mph), the front wheel speed of 0 km/h (0 mph) is detected.	• Right rear and left rear speed sensor • Speed sensor rotor
C1332/38 C1333/39	Detecting abnormality in the resistance value of each speed sensor.	• Right rear and left rear speed sensor • Speed sensor circuit

HINT:
DTC No. C0210/33, C1332/38 are for the right rear speed sensor.
DTC No. C0215/34, C1333/39 are for the left rear speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF HAND–HELD TESTER(REAR SPEED SENSOR)

(a) Select the item "WHEEL SPEED RL (RR)" in the DATA LIST and read the value displayed on the hand–held tester.

(b) Check that there is no difference between the speed value output from the speed sensor displayed on the hand–held tester and the speed value displayed on the speedometer when driving the vehicle.

OK:

There is almost no difference in the displayed speed value.

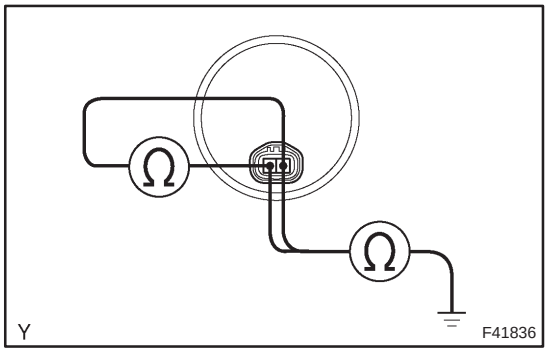
HINT:

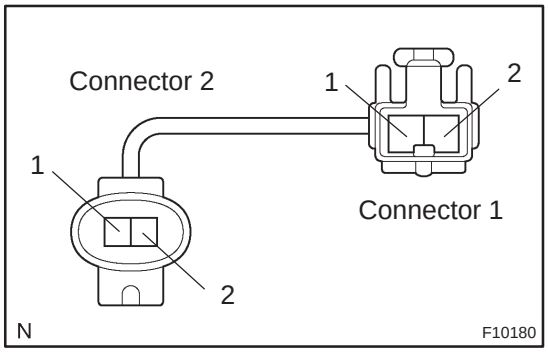
There is tolerance of ± 10 % in the speedometer indication.

OK	Go to step 5

NG

2	INSPECT SKID CONTROL SENSOR





(a) Disconnect the skid control sensor connector.

(b) Measure resistance between terminals 1 and 2 of the speed sensor connector.

OK:

Resistance: 2.2 kΩ or less

(c) Measure resistance between each of terminals 1 and 2 of the skid control sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher

Skid control Sensor Sub–Wire Harness:

(a) Disconnect the sub–wire harness connector from the floor wire harness

(b) Make sure that there is no looseness at the connector lock part and connecting part of the connector.

(c) Measure resistance between terminal 1 of the connector 1 and terminal 2 of the connector 2.

OK: 1 Ω or lower

(d) Measure resistance between terminal 2 of the connector 1 and terminal 1 of the connector 2.

OK: 1 Ω or lower

(e) Measure resistance between terminals 1 and 2 of the speed sensor connector 1 and body ground.

OK: 10 MΩ or higher

NG	REPLACE SKID CONTROL SENSOR

NOTICE:

Check the speed sensor signal last (See page 05–756).

OK

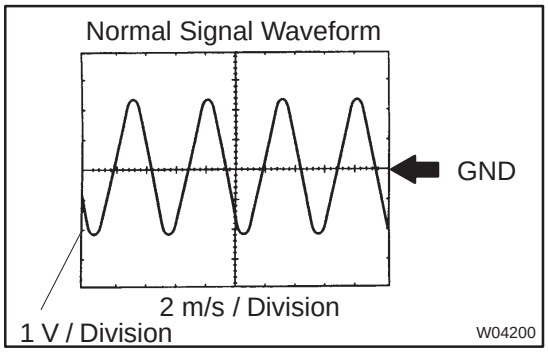
3	CHECK HARNESS AND CONNECTOR(REAR SPEED SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each skid control sensor and the skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



(REFERENCE) INSPECTION USING OSCILLOSCOPE

(a) Connect the oscilloscope to the terminals RR+ – RR– and RL+ – RL– of the skid control ECU.

(b) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

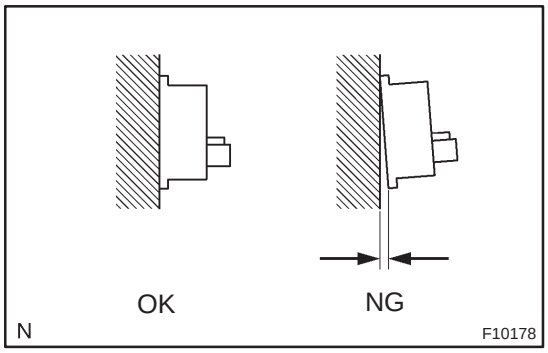
HINT:

- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform becomes shorter and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter deposited on it.

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

5	INSPECT SKID CONTROL SENSOR INSTALLATION



(a) Check the sensor installation.

OK:

There is no clearance between the sensor and rear axle carrier.

NG → **REPLACE SKID CONTROL SENSOR**

NOTICE:

Check the speed sensor signal last (See page 05–756).

OK

6	INSPECT SKID CONTROL SENSOR TIP

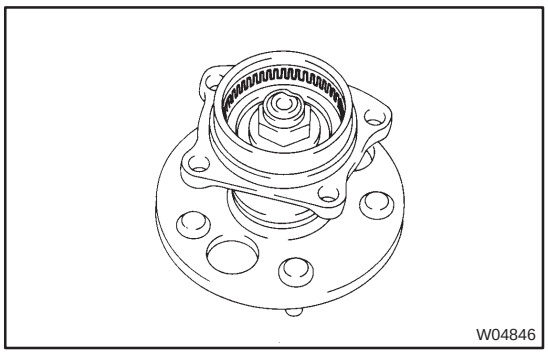
(a) Remove the skid control sensor (See page 32–61).
(b) Check the sensor tip.
OK:
No scratches or foreign objects on the sensor tip.

NG → **CLEAN OR REPAIR SKID CONTORL SENSOR**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

7	INSPECT SENSOR ROTOR



(a) Check the sensor rotor serrations.
OK:
No scratches, missing teeth or foreign objects.

NG → **REPLACE REAR AXLE HUB & BEARING ASSY RH**

NG → **REPLACE REAR AXLE HUB & BEARING ASSY LH**

NOTICE:
Check the speed sensor signal last (See page 05–756).

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

NOTICE:
Do not reuse the skid control sensor.

DTC	C0226/21	SFR SOLENOID CIRCUIT

DTC	C0236/22	SFL SOLENOID CIRCUIT

DTC	C0246/23	SRR SOLENOID CIRCUIT

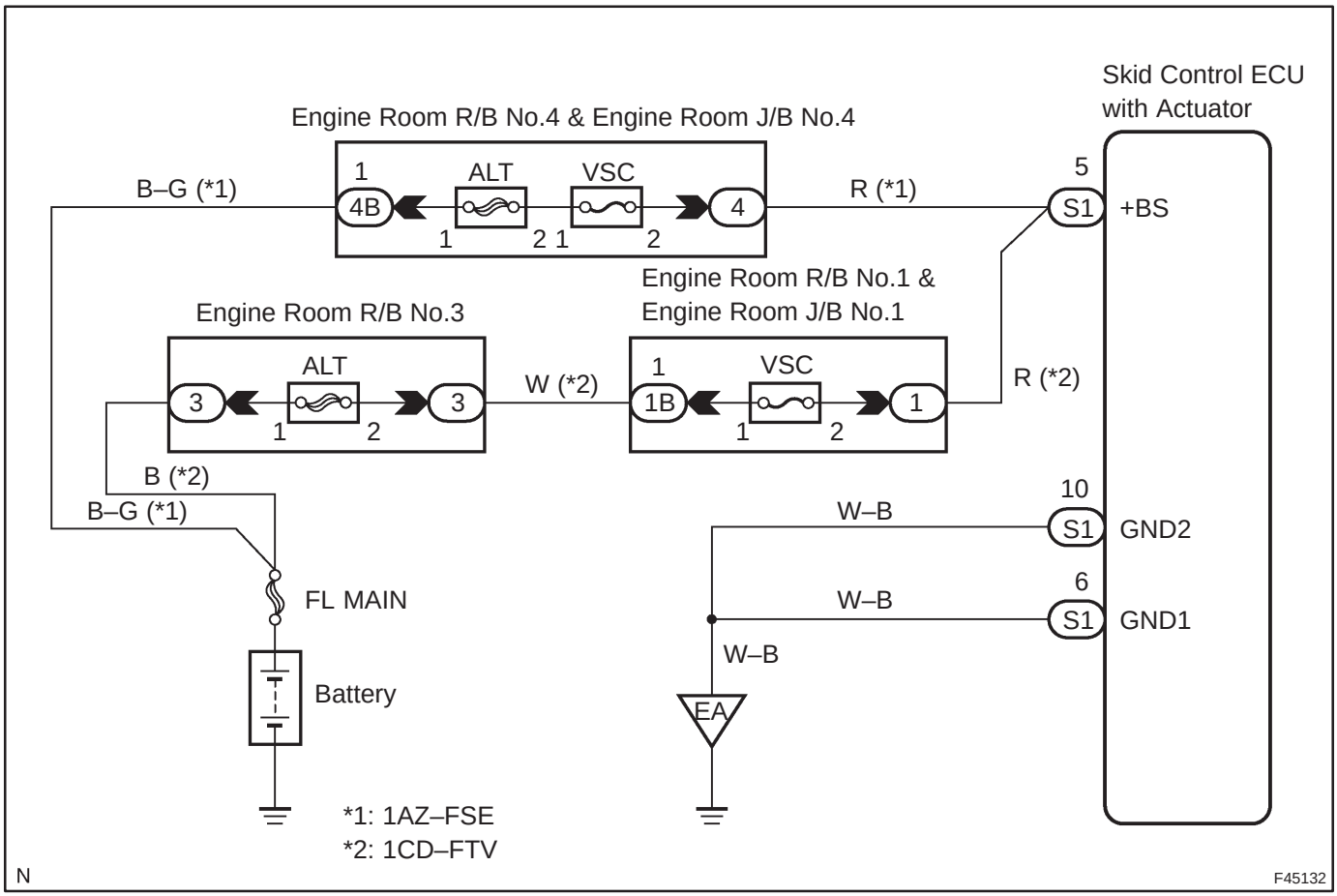
DTC	C0256/24	SRL SOLENOID CIRCUIT

CIRCUIT DESCRIPTION

The solenoid goes on when receiving signals from the ECU and controls the pressure action on the wheel cylinders to control the braking force.

DTC No.	DTC Detecting Condition	Trouble Area
C0226/21 C0236/22 C0246/23 C0256/24	Solenoid valve signal does not match to the check result.	• Each solenoid valve

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check if other DTCs are detected (See page 05–756).

YES → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

NO

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

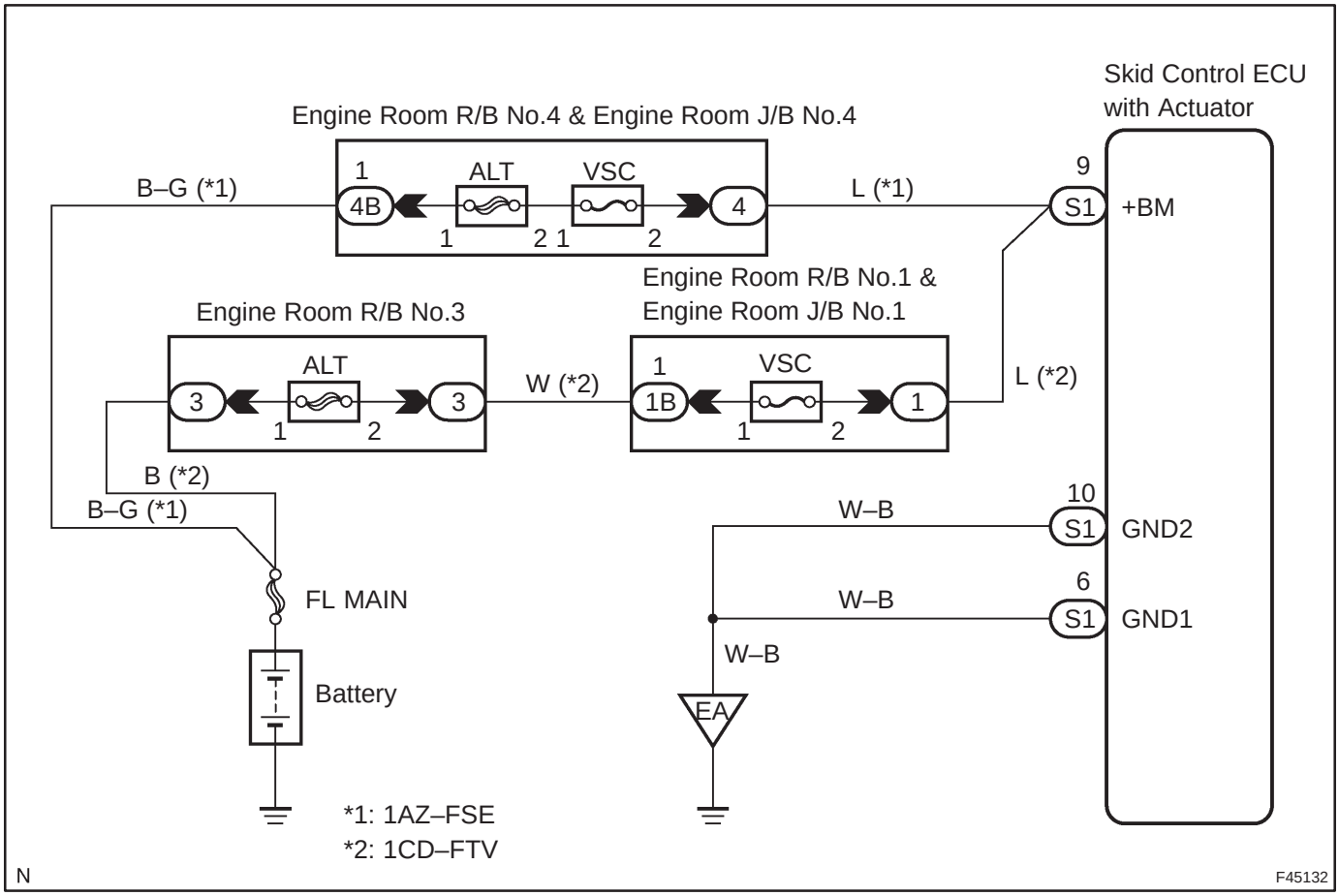
DTC	C0273/13	OPEN OR SHORT CIRCUIT IN ABS MOTOR RELAY CIRCUIT

CIRCUIT DESCRIPTION

The ABS motor relay supplies power to the ABS pump motor. While the ABS & BA & TRC & VSC are activated, the ECU switches the motor relay ON and operates the ABS pump motor.

DTC No.	DTC Detecting Condition	Trouble Area
C0273/13	Detection of any conditions from 1 to 3: 1. After actuation of the motor relay, pump motor voltage is not supplied within 0.08 second. 2. Pump motor voltage is at high level for 2.5 seconds or more although motor relay does not actuate . 3. Pump motor voltage keeps low level for longer than 0.04 second and the pump repeats activating for 0.7 seconds 3 times maximum. At the last time of activation, the pump motor goes dead because of short circuit.	• ABS motor relay • ABS motor relay circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

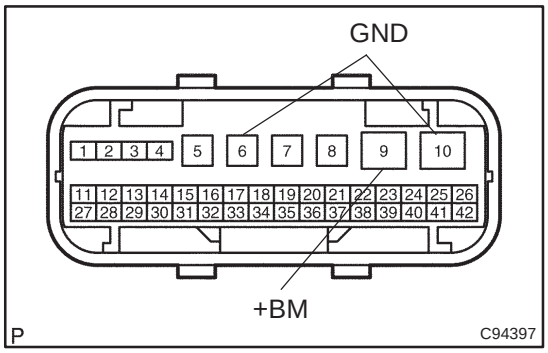
1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(ABS MOTOR RELAY)

(a) Check the operation sound of the ABS motor individually when operating it with the hand–held tester.
OK:
The operation sound of the ABS motor is heard.

OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

2	INSPECT SKID CONTROL ECU CONNECTOR(+BM TERMINAL VOLTAGE)

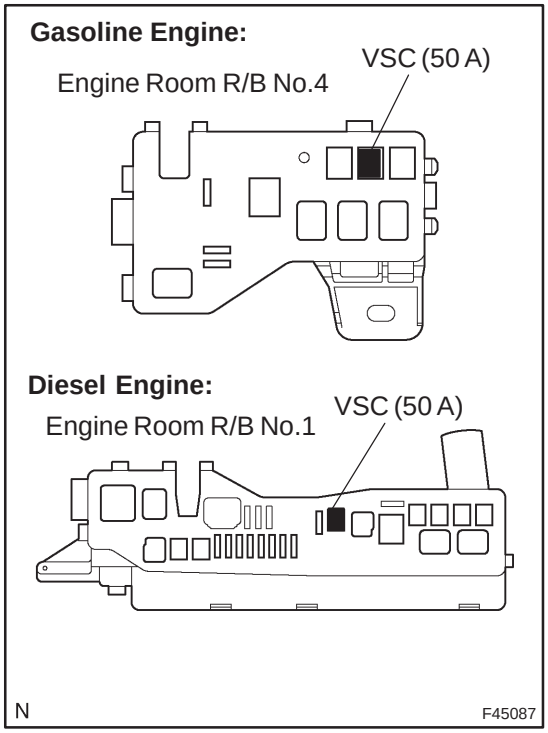


(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminals +BM and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

3 INSPECT FUSE(VSC FUSE)



(a) Remove the VSC (50 A) fuse from the engine room R/B No.4 (Gasoline engine) or engine room R/B No.1 (Diesel engine).

(b) Check continuity of the VSC fuse.

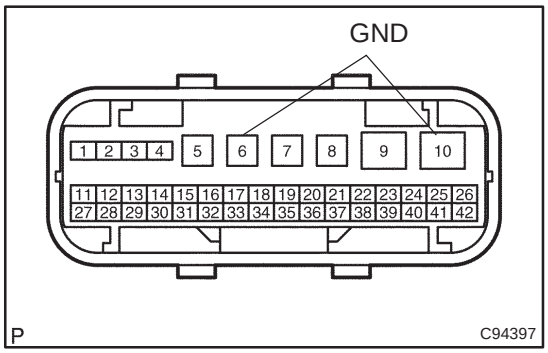
OK:

Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

4 INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – +BM TERMINAL) (See page 01–32)

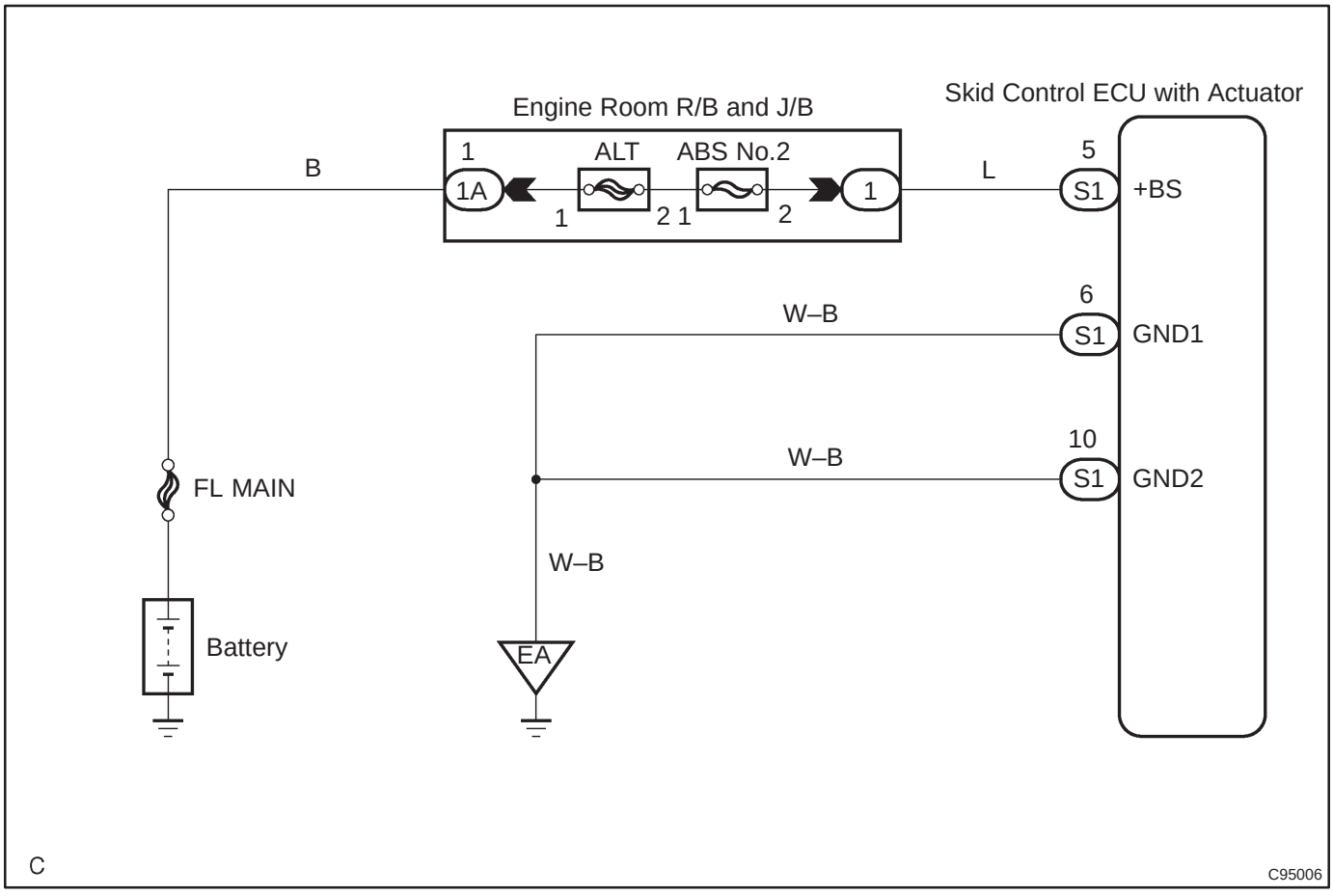
DTC	C0278/11	OPEN OR SHORT CIRCUIT IN ABS SOLENOID RELAY

CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

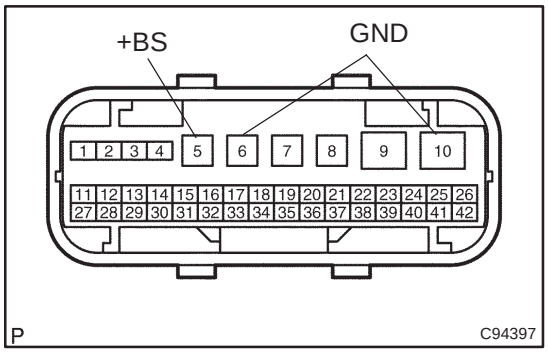
DTC No.	DTC Detecting Condition	Trouble Area
C0278/11	Detection of any conditions from 1 to 3: 1. 3 or more solenoid valves are shown faulty in response and simultaneously valve supply voltage is detected faulty. 2. Solenoid valve relay is not turned OFF.	• ABS solenoid relay • ABS solenoid relay circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT SKID CONTROL ECU CONNECTOR(+BS TERMINAL VOLTAGE)



(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminals +BS and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

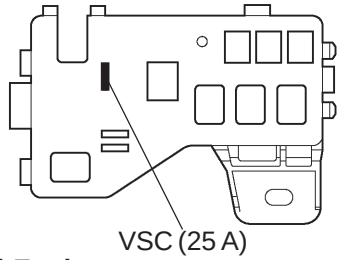
OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

2 INSPECT FUSE(VSC FUSE)

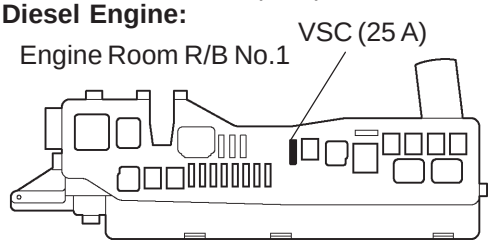
Gasoline Engine:

Engine Room R/B No.4



Diesel Engine:

Engine Room R/B No.1



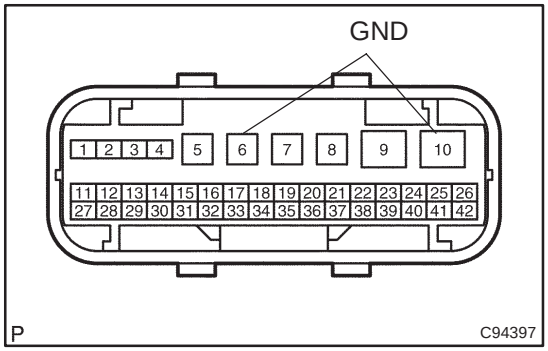
N F45087

(a) Remove the VSC (25 A) fuse from the engine room R/B No.4 (Gasoline engine) or engine room R/B No.1 (Diesel engine).
(b) Check continuity of the VSC fuse.
OK:
Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

3	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

CHECK AND REPLACE HARNESS AND CONNECTOR(BATTERY – +BS TERMINAL) (See page 01–32)

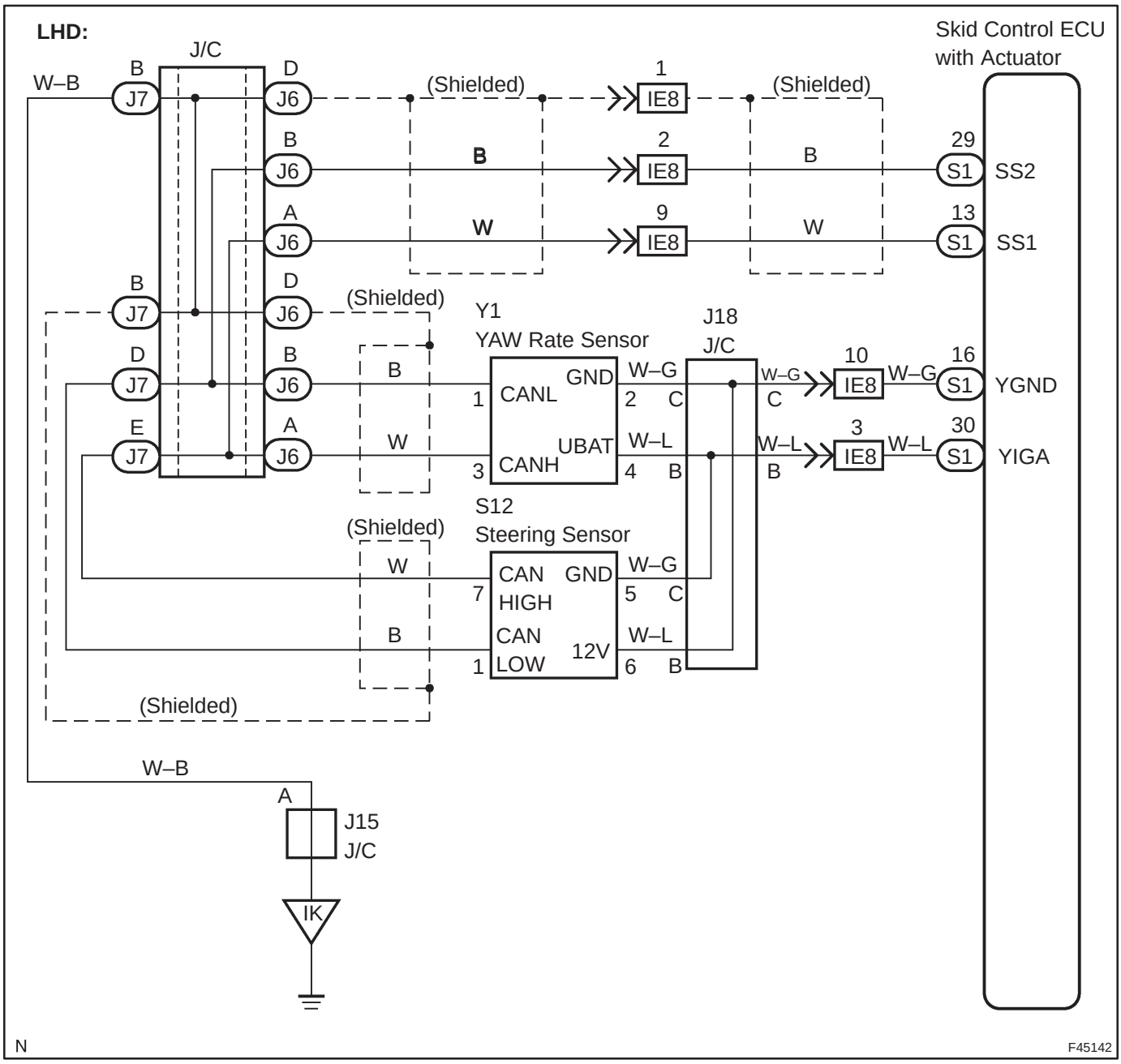
DTC C0365/43 MALFUNCTION IN DECELERATION SENSOR

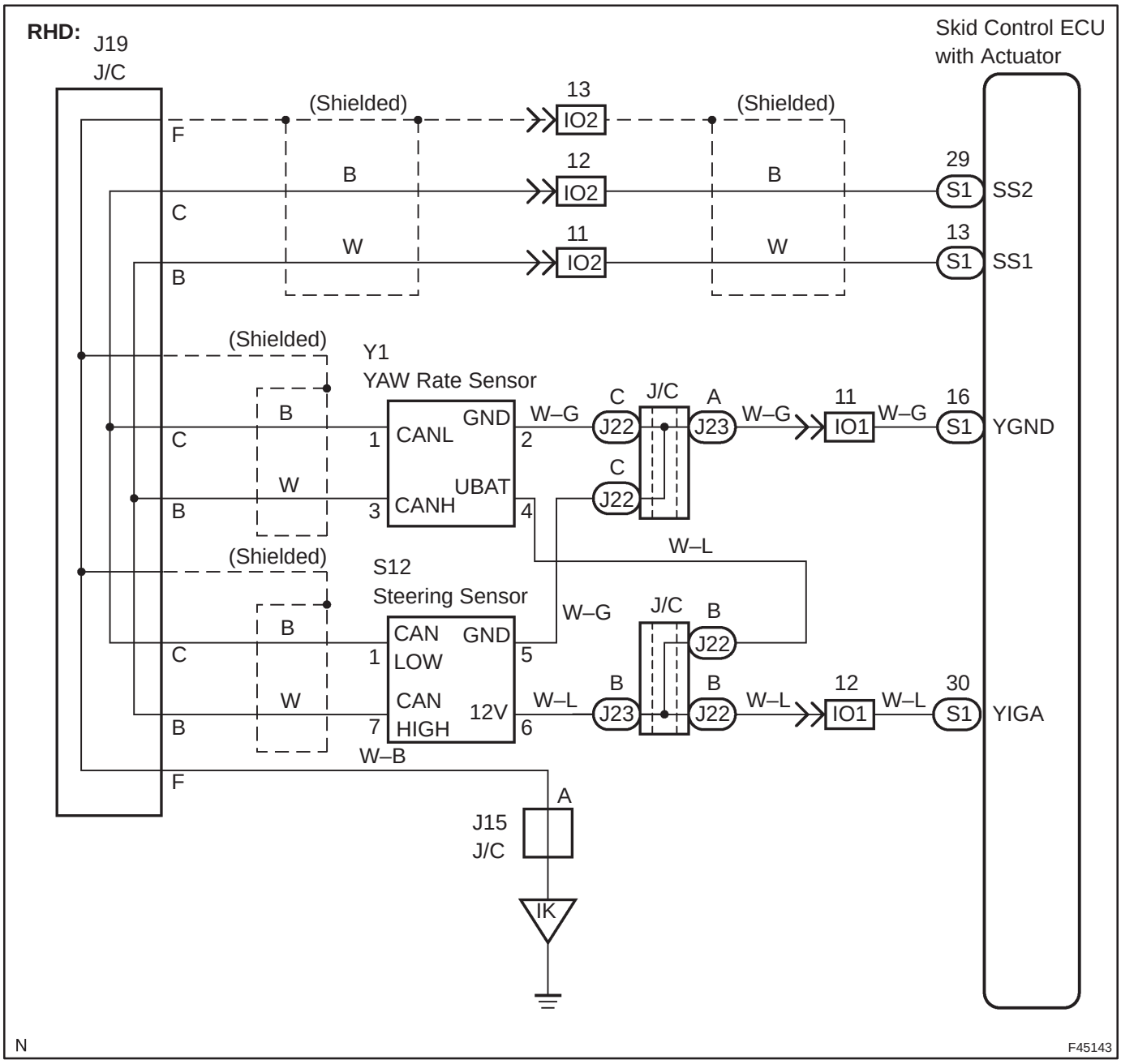
CIRCUIT DESCRIPTION

The lateral acceleration sensor is combined with the yaw rate sensor.

DTC No.	DTC Detecting Condition	Trouble Area
C0365/43	Detection of any of conditions from 1 through 2: 1. Lateral acceleration difference between sensor signal and reference value is large. 2. Offset value of sensor signal is higher than the standard value. 3. Sensor signal is out of range	• Yaw rate sensor • Yaw rate sensor circuit

WIRING DIAGRAM



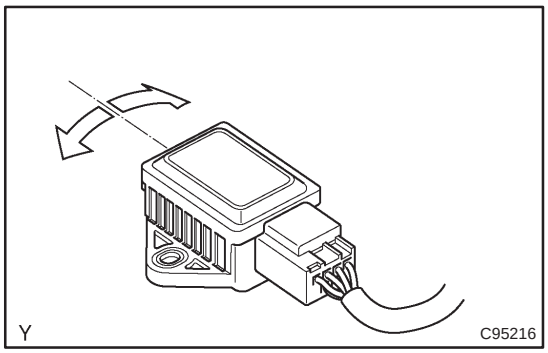

RHD:
J19
J/C
Skid Control ECU
with Actuator
(Shielded)
13
IO2
(Shielded)
F
B
12
IO2
B
29
S1
SS2
C
W
11
IO2
W
13
S1
SS1
B
(Shielded)
Y1
YAW Rate Sensor
B
C
1
CANL
GND
2
W–G
C
J/C
A
11
16
C
J22
J23
W–G
IO1
W–G
S1
YGND
W
B
3
CANH
UBAT
4
C
J22
W–L
(Shielded)
S12
Steering Sensor
B
C
1
CAN
LOW
GND
5
W–G
J/C
B
J22
W
B
7
CAN
HIGH
12V
6
W–L
B
J23
B
J22
W–L
12
IO1
W–L
30
S1
YIGA
W–B
F
A
J15
J/C
IK
N
F45143

INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF YAWRATE SENSOR(INCLUDE LATERAL ACCELERATION SENSOR)



(a) Remove the 2 bolts and lateral acceleration sensor with connector still connected.
(b) Connect the hand–held tester to the DLC3
(c) Turn the ignition switch and hand–held tester main switch ON.
(d) Select the DATALIST mode on the hand–held tester.
(e) Check the lateral acceleration value 0 ± 0.23 G.
(f) Check that the acceleration value displayed on the hand–held tester is changing: Place the yaw rate sensor vertically to the ground and turn the sensor pivoted on its center.

OK:

Lateral acceleration value is changing.

OK	REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

2	CHECK HARNESS AND CONNECTOR(YAW RATE SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each terminal SS1, SS2, YIGA and YGND of the yaw rate sensor and skid control ECU (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

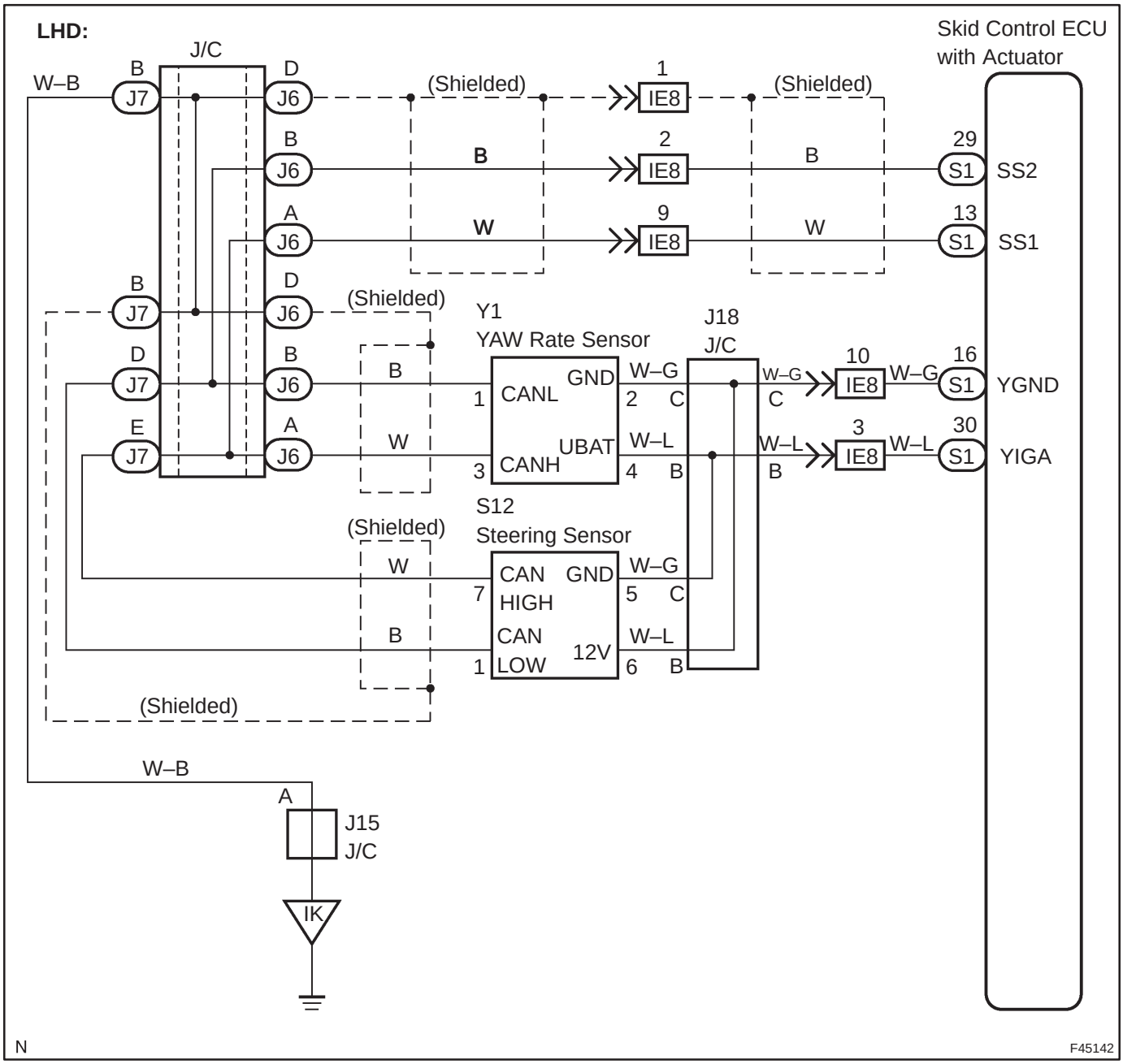
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

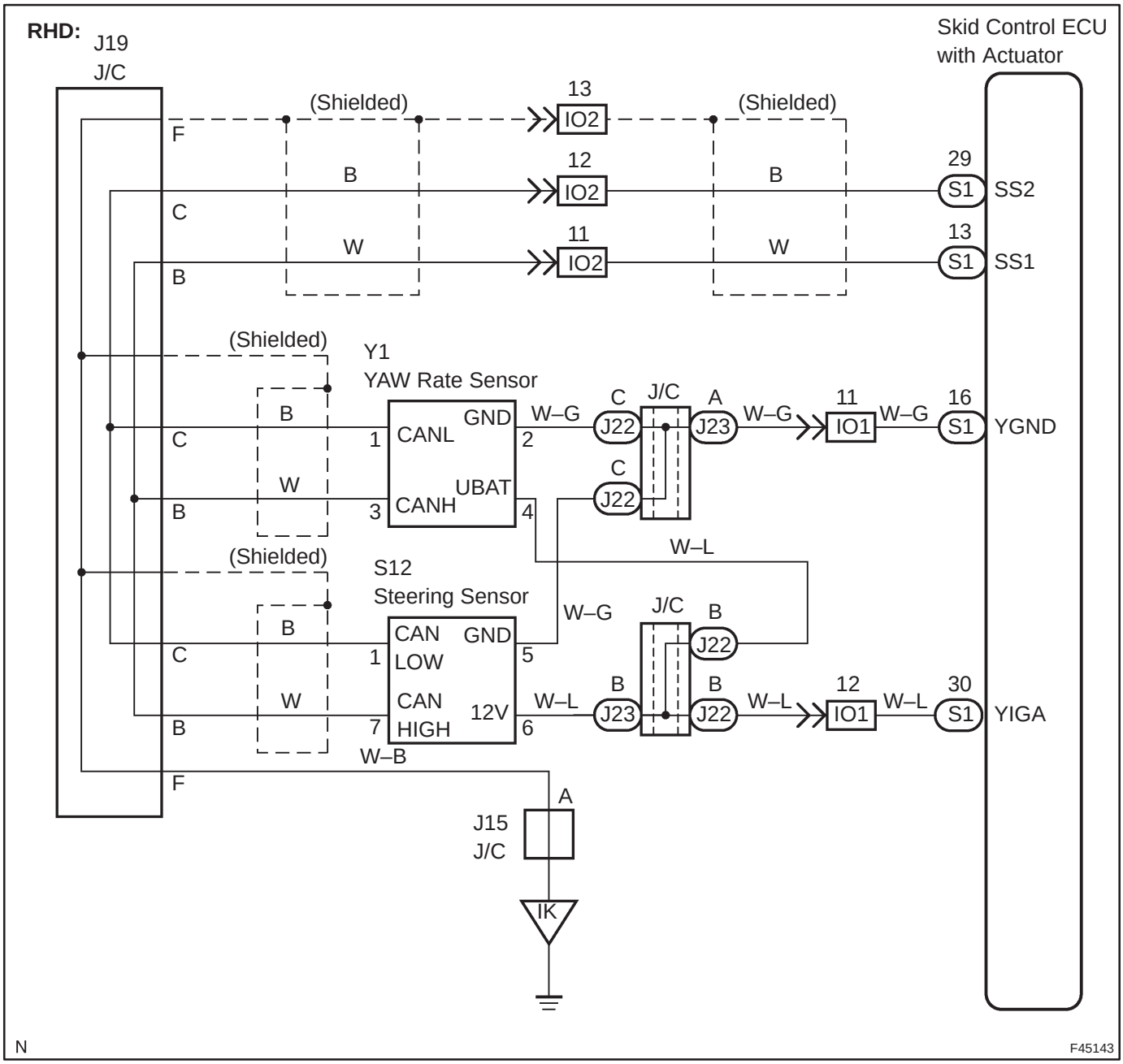
DTC	C0371/55	OPEN OR SHORT CIRCUIT IN YAW RATE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C0371/55	Detection of any of conditions from 1 through 4: 1. The voltage of sensor signal is out of range. 2. The offset value of sensor signal is outside the plausible range. 3. Sensor signal changes rapidly under normal driving. 4. Yaw rate sensor value is considerably different from the reference value of yaw rate during cornering.	• Yaw rate sensor • Yaw rate sensor circuit

WIRING DIAGRAM



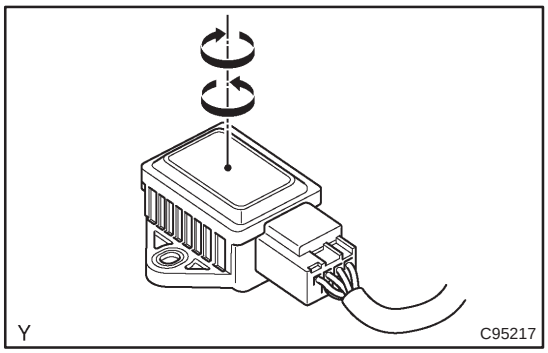

RHD:
J19
J/C
Skid Control ECU
with Actuator
(Shielded)
13
IO2
(Shielded)
F
B
12
IO2
B
29
S1
SS2
C
W
11
IO2
W
13
S1
SS1
B
(Shielded)
Y1
YAW Rate Sensor
B
C
1
CANL
GND
2
W–G
C
J/C
A
W–G
11
W–G
16
S1
YGND
J22
J23
IO1
W
B
3
CANH
UBAT
4
C
J22
W–L
(Shielded)
S12
Steering Sensor
B
C
1
CAN
LOW
GND
5
W–G
J/C
B
J22
W
B
7
CAN
HIGH
12V
6
W–L
B
J23
B
J22
W–L
12
IO1
W–L
30
S1
YIGA
W–B
F
A
J15
J/C
IK
N
F45143

INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF YAWRATE SENSOR



(a) Remove the 2 bolts and yaw rate sensor with connector still connected.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch and hand–held tester main switch ON.
(d) Select the DATALIST mode on the hand–held tester.
(e) Check the yaw rate value 0 ± 5 deg/s.
(f) Check that the yaw rate value of the yaw rate sensor displayed on the hand–held tester is changing: Place the yaw rate sensor vertically to the ground and turn the sensor pivoted on its center.

OK:

Yaw rate value is changing.

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

2	CHECK HARNESS AND CONNECTOR(YAW RATE SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each terminal SS1, SS2, YIGA and YGND of the yaw rate sensor and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC C1201/45 ENGINE CONTROL SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1201/45	A trouble signal in the engine control system is input.	Engine control system

HINT:
If trouble occurs in the engine control system, the ECU prohibits TRC and VSC control.

INSPECTION PROCEDURE

1	CHECK DTC FOR ENGINE

A	Normal Code
B	Malfunction Code

B → REPAIR ENGINE CONTROL SYSTEM ACCORDING TO CODE OUTPUT

A →

REPLACE ECM

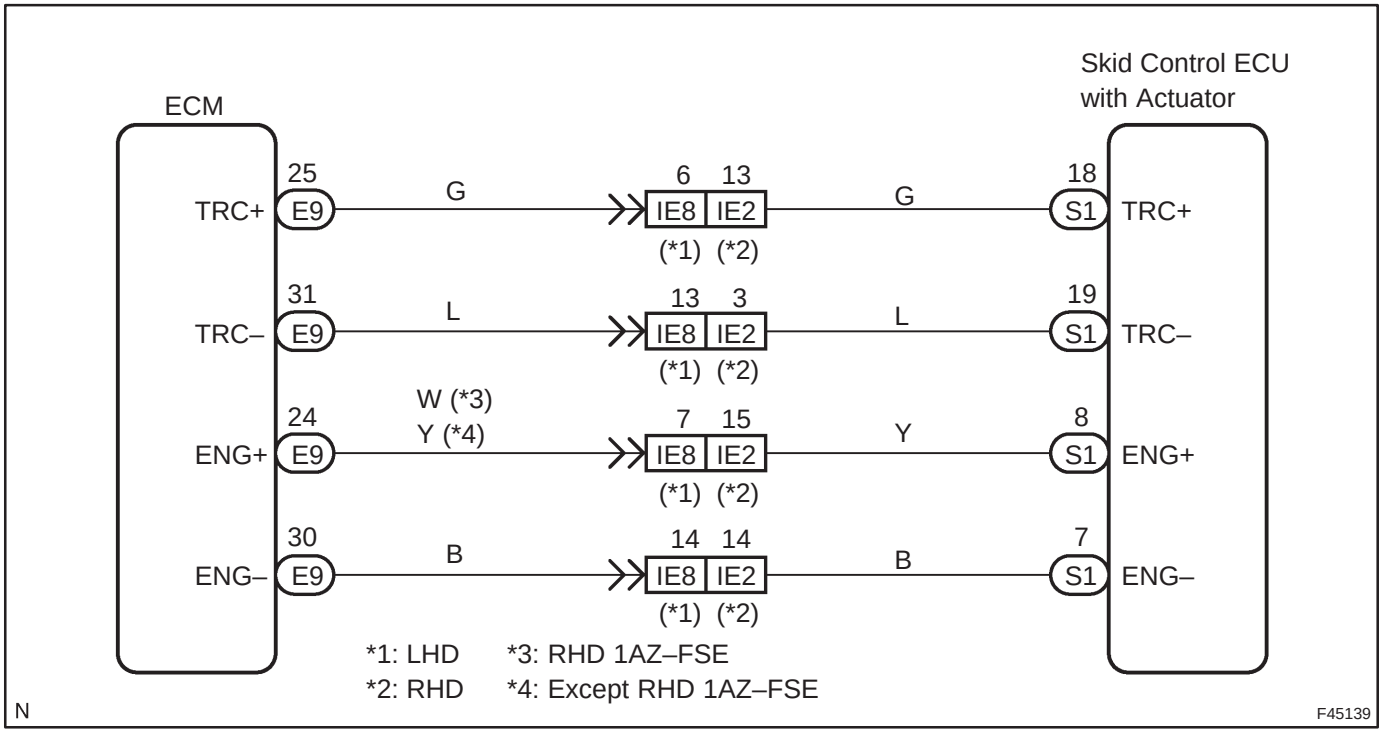
DTC	C1203/59	ECM COMMUNICATOIN CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

This circuit is used to transmit TRC & VSC control information from the skid control ECU to the ECM (TRC+, TRC–), and engine control information from the ECM to the skid control ECU (ENG+, ENG–).

DTC No.	DTC Detecting Condition	Trouble Area
C1203/59	When any of the following 1 through 3 is detected : 1. IG1 voltage is 8.5 V or more, and the condition that data can not be sent to ECM continues for 1.2 seconds or more. 2. IG1 voltage is 8.5 V or more, engine speed is 500 r.p.m or more, vehicle speed is 60 km/h (38 mph) or more, and the condition that data can not be received from ECM continues for 1.2 seconds or more. 3. The condition that data can not be transmitted between the skid control ECU and ECM occurs at least once within 5 seconds continues 10 consecutive times within 60 sec.	• TRC+ or TRC– circuit • ENG+ or ENG– circuit • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(ECM – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each of terminals ENG+, ENG–, TRC+, TRC– of the skid control ECU and the same one of the ECM (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	CHECK OPERATION OF MALFUNCTION INDICATOR

(a) Check the MIL.
(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

NG → CHECK AND REPLACE ECM

OK

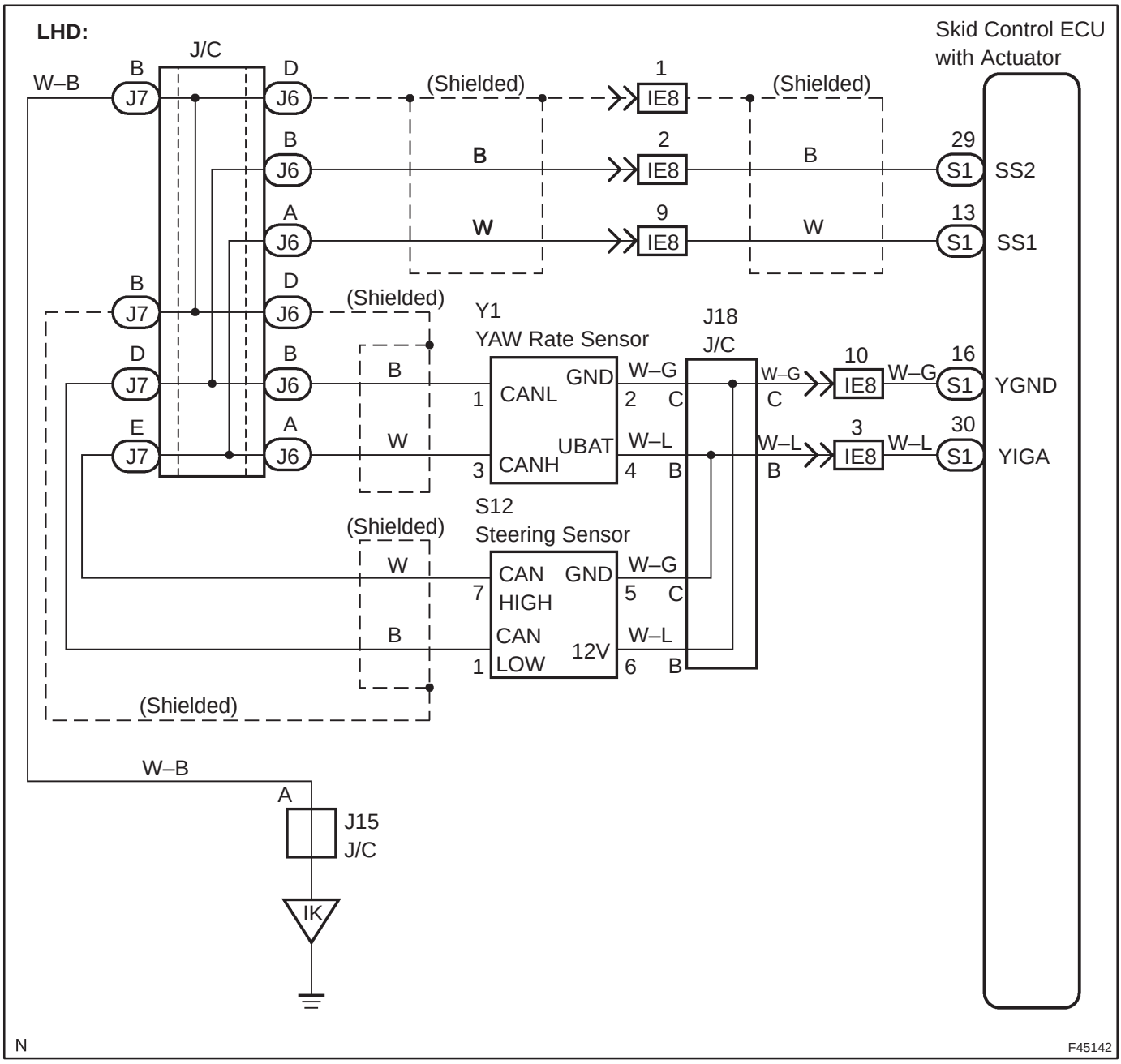
CHECK AND REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

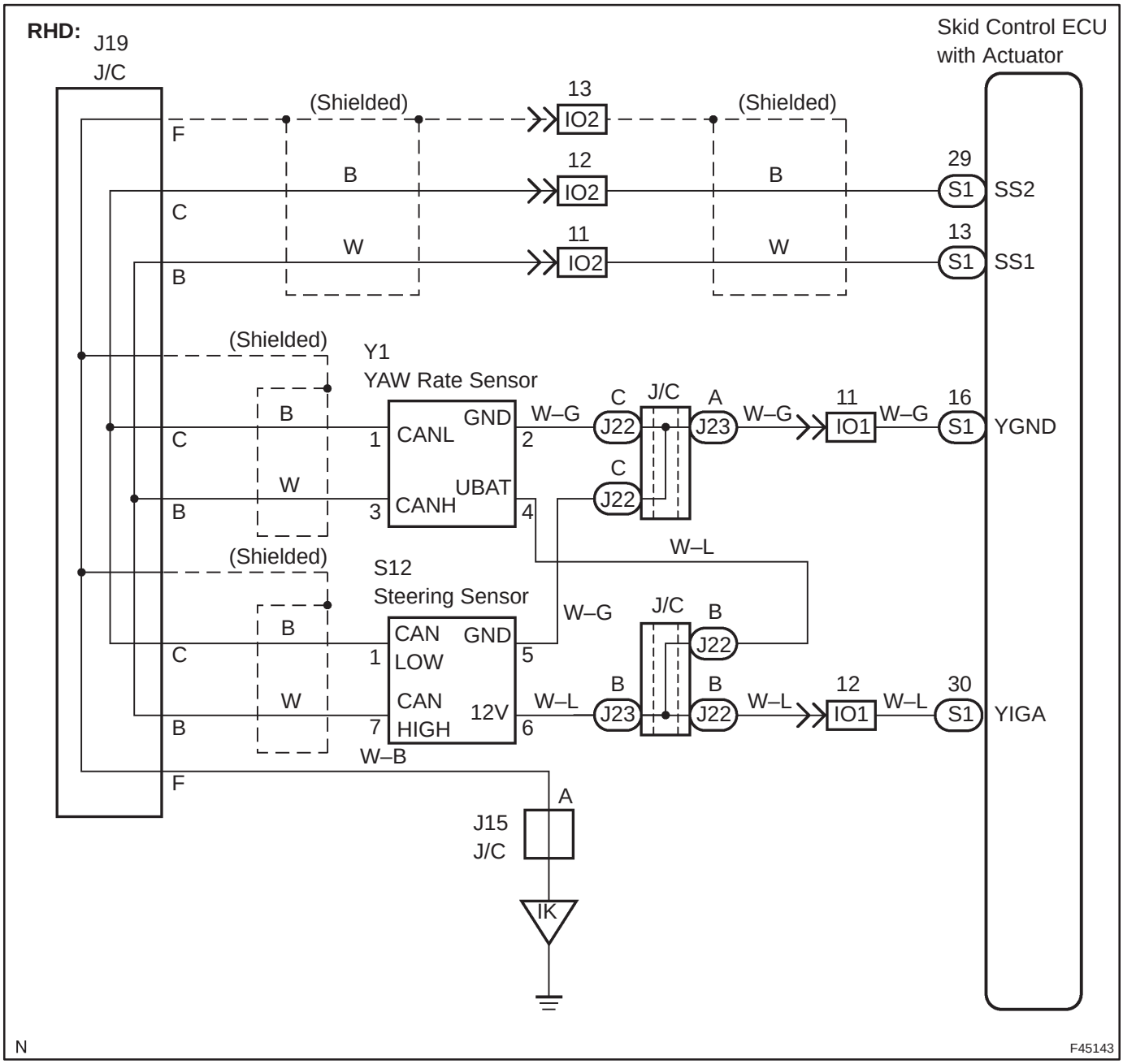
DTC	C1208/54	MALFUNCTION IN STEERING ANGLE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1231/31	Detection of any of conditions 1 through 7: 1. When the condition that ECU terminal IG1 voltage is 9.8 V or more, and does not receive data from steering angle sensor continues. 2. Sensor internal failure. 3. The offset value is out of range. 4. Sensor signal changes too rapidly. 5. Steering angle value difference between measured and reference is out of range. 6. Steering sensor is not centered. 7. Steering sensor signal is out of range. 8. Steering sensor is not calibrated.	• Steering angle sensor • Steering angle sensor circuit

WIRING DIAGRAM




RHD:
J19
J/C
Skid Control ECU
with Actuator
(Shielded)
13
IO2
(Shielded)
F
B
12
IO2
B
29
S1
SS2
C
W
11
IO2
W
13
S1
SS1
B
(Shielded)
Y1
YAW Rate Sensor
B
C
1
CANL
GND
2
W–G
C
J/C
A
W–G
11
W–G
16
S1
YGND
J22
J23
IO1
W
B
3
CANH
UBAT
4
C
J22
W–L
(Shielded)
S12
Steering Sensor
B
C
1
CAN
LOW
GND
5
W–G
J/C
B
J22
W
B
7
CAN
HIGH
12V
6
W–L
B
J23
B
J22
W–L
12
IO1
W–L
30
S1
YIGA
W–B
F
A
J15
J/C
IK
N
F45143

INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF STEERING SENSOR

(a) Select the DATALIST mode on the hand–held tester.

(b) Check that the steering wheel turning angle value of the steering angle position sensor displayed on the hand–held tester is changing when turning the steering wheel.

OK:

Steering wheel turning angle value is changing.

OK → **Go to step 4**

NG

2	CHECK INSTALLATION CONDITION OF STEERING ANGLE SENSOR

NG → **REPLACE STEERING SENSOR(See page 32–65)**

OK

3	CHECK HARNESS AND CONNECTOR(STEERING SENSOR CIRCUIT – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each terminal SS1, SS2, YIGA and YGND of the skid control ECU and steering angle sensor (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CALIBRATE STEERING ANGLE SENSOR(See page 05–756)

NG → **REPLACE STEERING SENSOR**

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

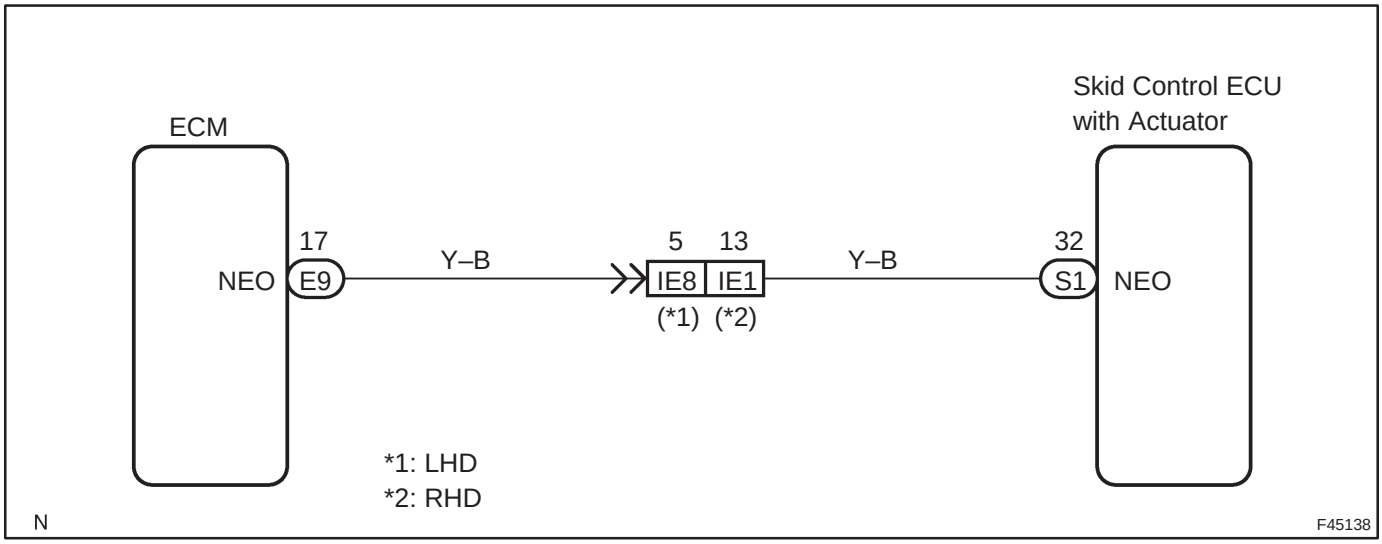
DTC C1204/44 NE SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

The skid control ECU receives engine revolution speed signals (NE signals) from the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
C1202/44	At vehicle speed of 30 km/h (19 mph) or more, when data received from the ECM is in normal condition, engine revolution signal > 0 rpm continues for 5 seconds or more.	• NEO circuit • ECM • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – ECM)

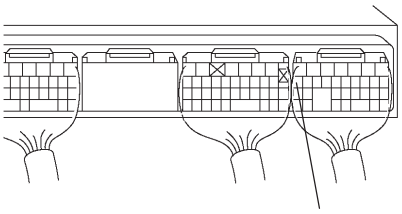
(a) Check for an open or short circuit in harness and connector between terminal NEO of the skid control ECU and ECM (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

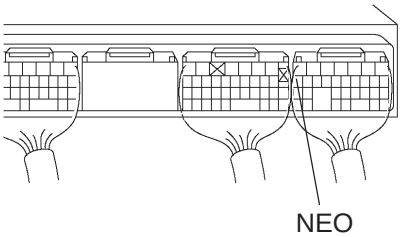
OK

2 INSPECT ECM TERMINAL VOLTAGE(NEO TERMINAL)

Gasoline engine:



Diesel engine:

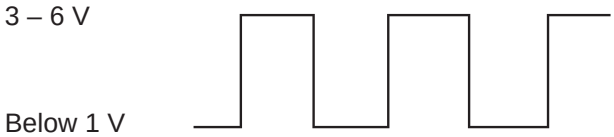


F45092

(a) Remove the ECM with connector still connected.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminal NEO of the ECM and body ground under the engine conditions below.
OK:

Engine condition	Voltage
OFF (IG ON)	3 to 6 V or below 1 V
ON (Idling)	3 to 6 V ⇔ below 1 V (Pulse)

(Reference)



F03007

NG → **REPLACE ECM**

OK

IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION

DTC	C1225/25	SMC SOLENOID CIRCUIT

DTC	C1226/26	SMC SOLENOID CIRCUIT

DTC	C1227/27	SRC SOLENOID CIRCUIT

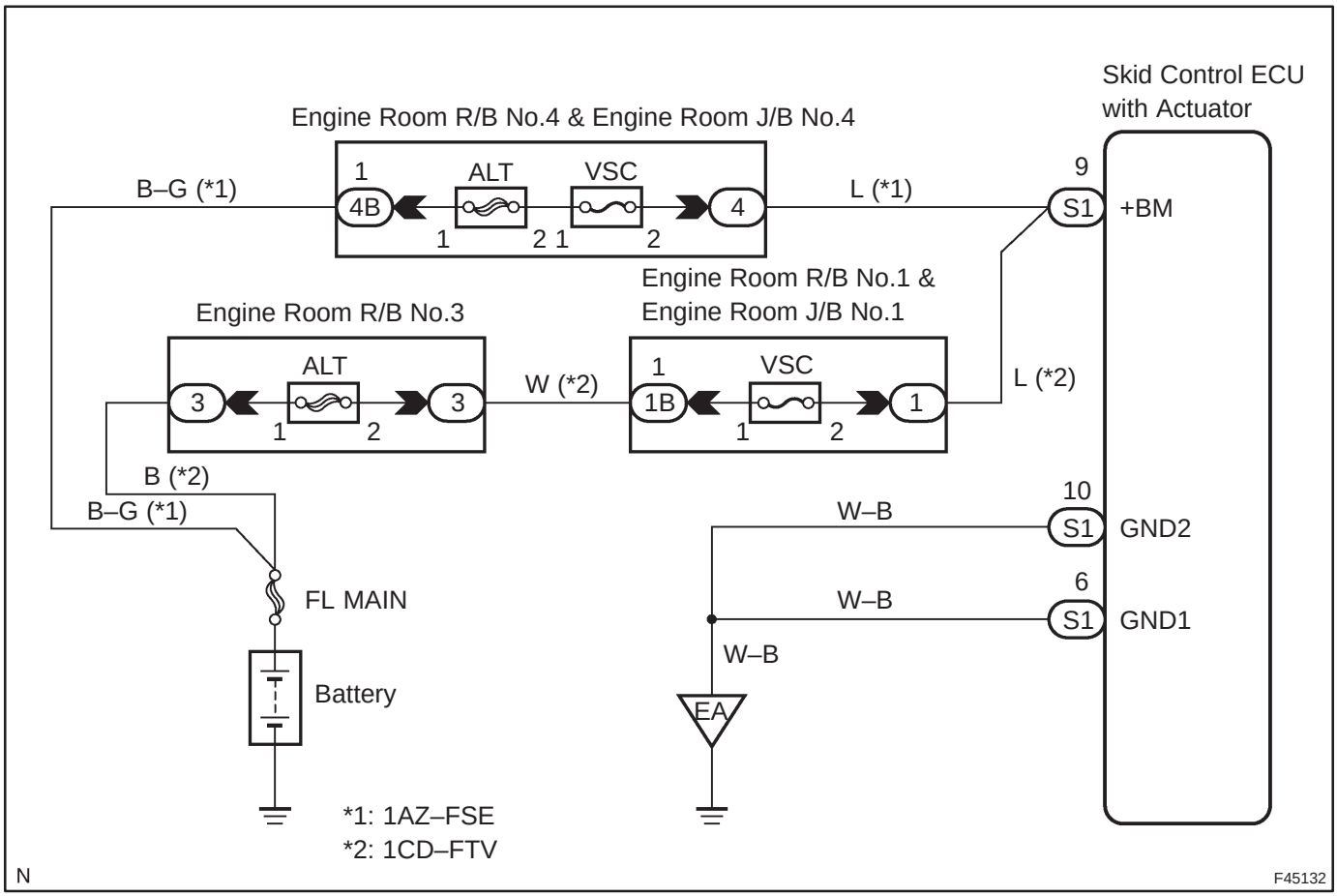
DTC	C1228/28	SRC SOLENOID CIRCUIT

CIRCUIT DESCRIPTION

The solenoid goes on when receiving signals from the ECU and controls the pressure action on the wheel cylinders to control the braking force.

DTC No.	DTC Detecting Condition	Trouble Area
C1225/25	Open or short in SMC1 circuit.	• Brake actuator • SMC1 circuit
C1226/26	Open or short in SMC2 circuit.	• Brake actuator • SMC2 circuit
C1227/27	Open or short in SRC1 circuit.	• Brake actuator • SRC1 circuit
C1228/28	Open or short in SRC2 circuit.	• Brake actuator • SRC2 circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check if other DTCs are detected (See page 05–756).

YES → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

NO

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC C1237/37 TIRES OF DIFFERENT SIZE

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1237/37	Detection of any of conditions from 1 through 4: 1. When the ignition switch is ON, the speed difference between max. and min. wheel speed is 5 % or more for 20 sec. at vehicle speed 20 km/h (12 mph)or more. 2. When the ignition switch is ON, the slip difference be wheels at either side of vehicle 6 % or more (vehicle speed: 100 km/h (62 mph) or more). 3. Continuous ABS control for 60 seconds or more. 4. Interference on 1 or more wheels for 20 seconds with the brake pedal depressed, or for 5 seconds when the brake pedal is not depressed.	• Speed sensor • Sensor rotor

INSPECTION PROCEDURE

1 INSPECT TIRE SIZE

NG → **REPLACE TIRES SO THAT ALL 4 TIRES ARE SAME IN SIZE**

OK

2 INSPECT SPEED SENSOR ROTOR

(a) Check the speed sensor rotors (See page 05–774 or 05–778).

NG → **REPLACE SENSOR ROTOR**

OK

3 INSPECT SPEED SENSOR

(a) Check the speed sensors (See page 05–774 or 05–778).

NG → **REPLACE SPEED SENSOR**

OK

4 CHECK HARNESS AND CONNECTOR(SPEED SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each terminal of the speed sensor and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

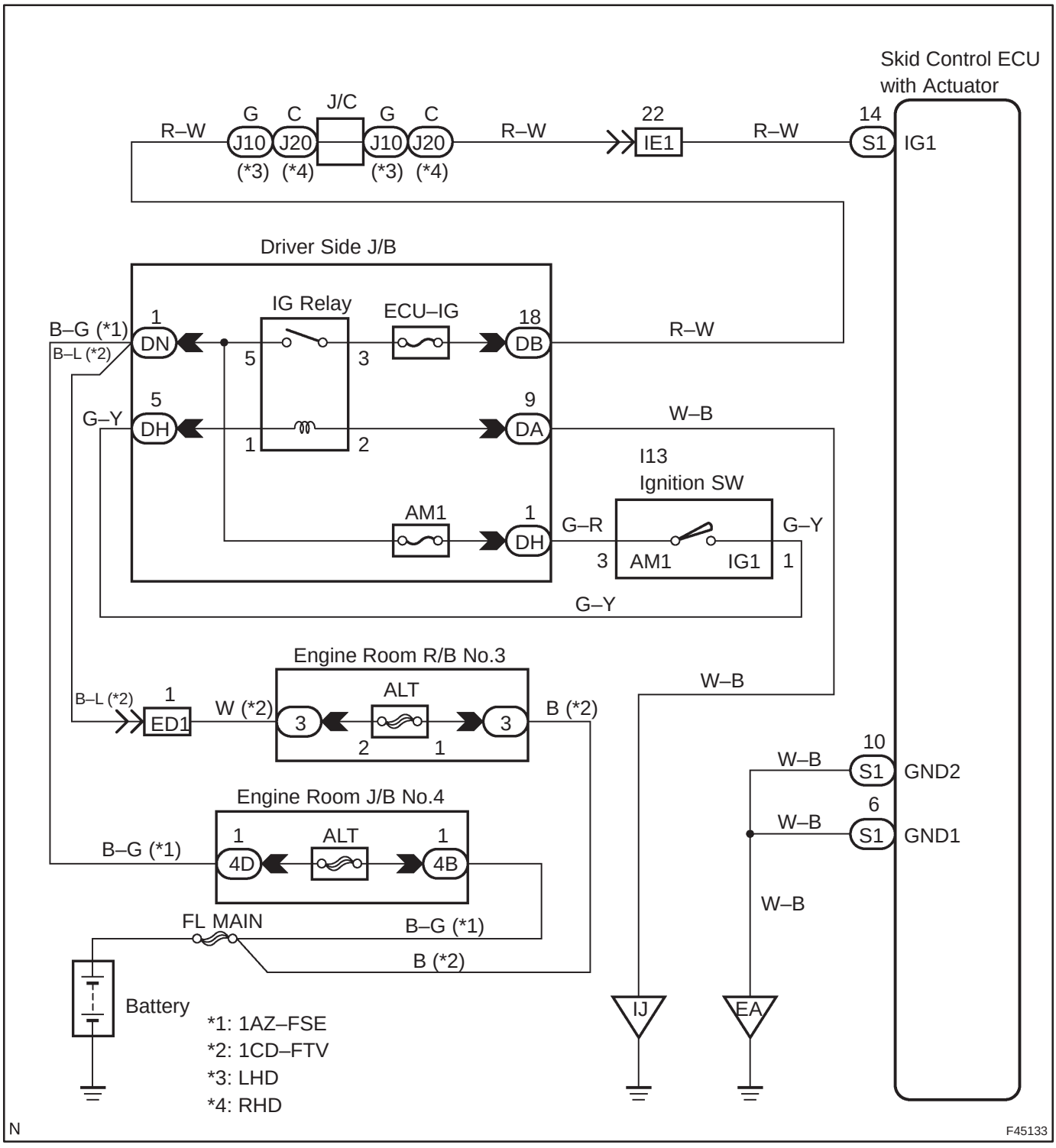
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC	C1241/41	LOW BATTERY POSITIVE VOLTAGE OR ABNORMALLY HIGH BATTERY POSITIVE VOLTAGE

CIRCUIT DESCRIPTION

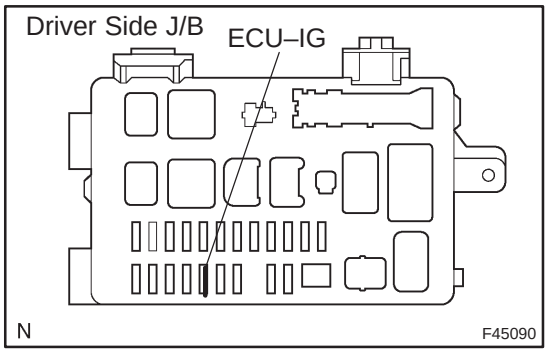
DTC No.	DTC Detecting Condition	Trouble Area
C1241/41	Low battery voltage is less than 9.8 V at the time of non–operation of ABS control or less than 9.4 V at the time of operation of ABS control, or battery voltage is more than 17.4 V.	• Battery • IC regulator • Power source circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT FUSE(ECU–IG FUSE)



(a) Remove the ECU–IG fuse from the driver side J/B.
(b) Check continuity of the ECU–IG fuse.
OK:
Continuity

NG → **INSPECT FOR SHORT CIRCUIT IN ALL HARNESS AND COMPONENTS CONNECTED TO ECU–IG FUSE**

OK

2 INSPECT BATTERY

OK:
Voltage: 10 to 14 V

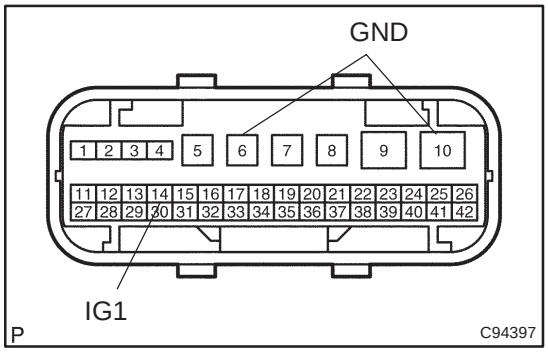
NG → **INSPECT CHARGING SYSTEM**

OK

3 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(IG1 TERMINAL)

IN CASE OF USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



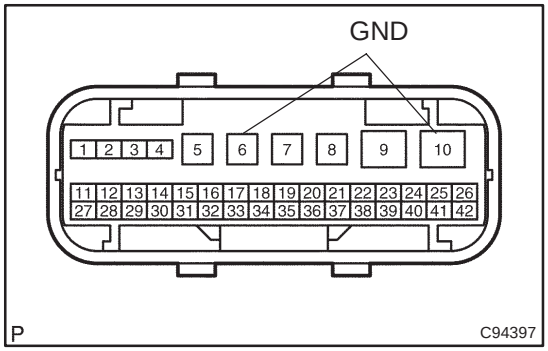
IN CASE OF NOT USING HAND–HELD TESTER:

(a) Disconnect the skid control connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

4 INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Disconnect the skid control ECU connector.
(b) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.
OK:
Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

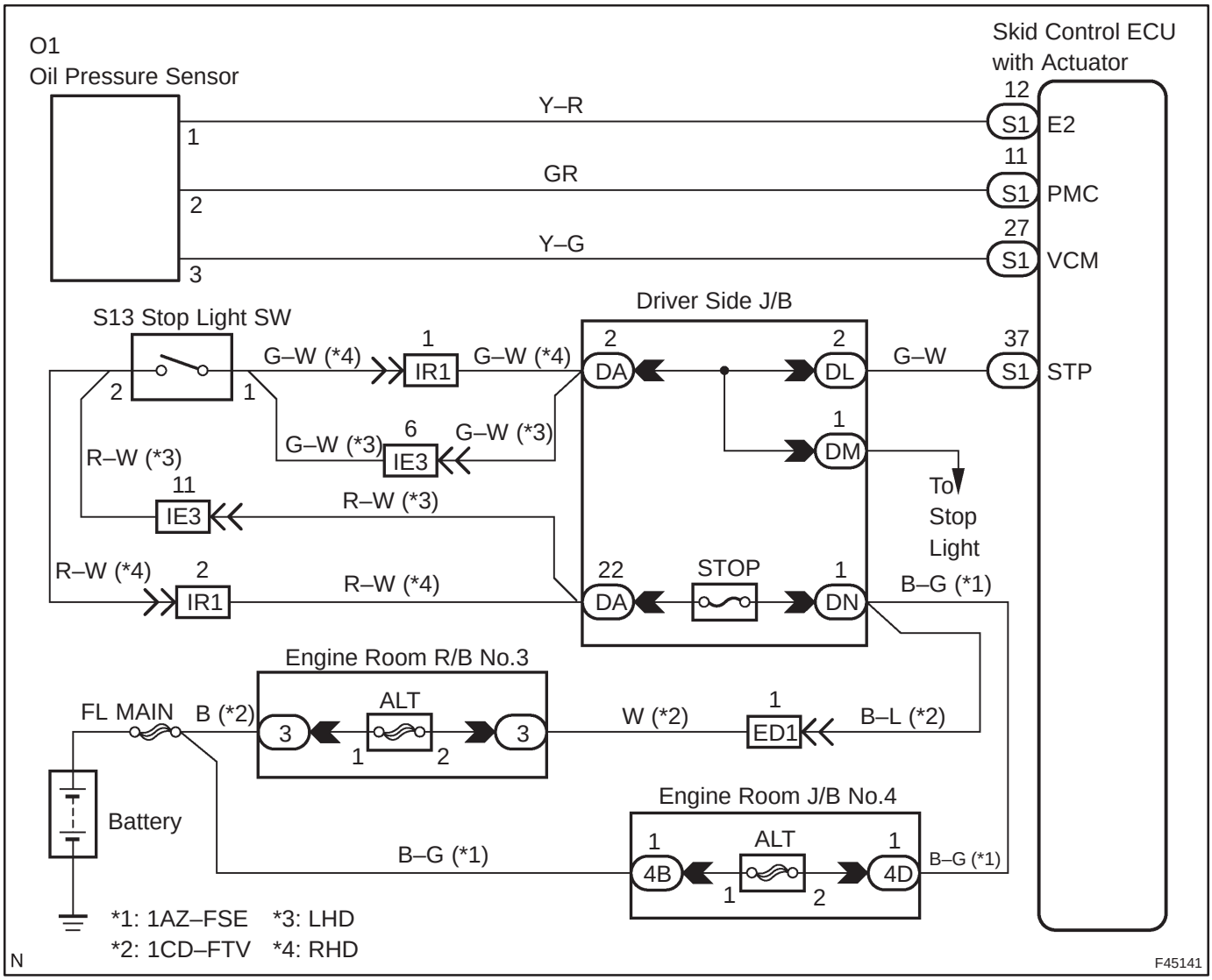
CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – IG1 TERMINAL) (See page 01–32)

DTC	C1246/53	MALFUNCTION IN MASTER CYLINDER PRESSURE SENSOR

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1246/53	When any of the following 1 through 3 is detected: 1. The voltage of sensor signal is out of range (less than 0.3 V, more than 4.7 V). 2. The sensor supply voltage is out of range (above 5.6 V, below 4.4 V). 3. The sensor signal offset value is out of range. 4. Gradient of sensor signal is not within allowed range.	• Master cylinder pressure sensor • Master cylinder pressure sensor circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF MASTER CYLINDER PRESSURE SENSOR

(a) Select the DATALIST mode on the hand–held tester.

(b) Check that the brake fluid pressure value of the No.1 master cylinder pressure sensor and No.2 master cylinder pressure sensor displayed on the hand–held tester changes when depressing the brake pedal.

OK:

Brake fluid pressure value is changing.

OK	Go to step 4

NG

2	INSPECT STOP LAMP SWITCH ASSY

(a) Check that the stop light comes on when the brake pedal is depressed and goes off when the brake pedal is released.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

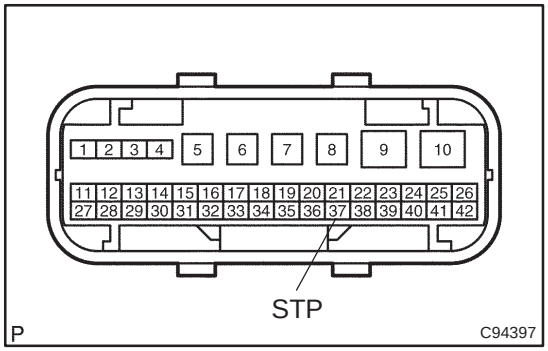
3	CHECK HARNESS AND CONNECTOR(MASTER CYLINDER PRESSUR SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between terminal of the master cylinder pressure sensor and skid control ECU (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(STP TERMINAL)



(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminal STP of the skid control ECU harness side connector and body ground when the brake pedal is depressed.
OK:
Voltage: 8 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

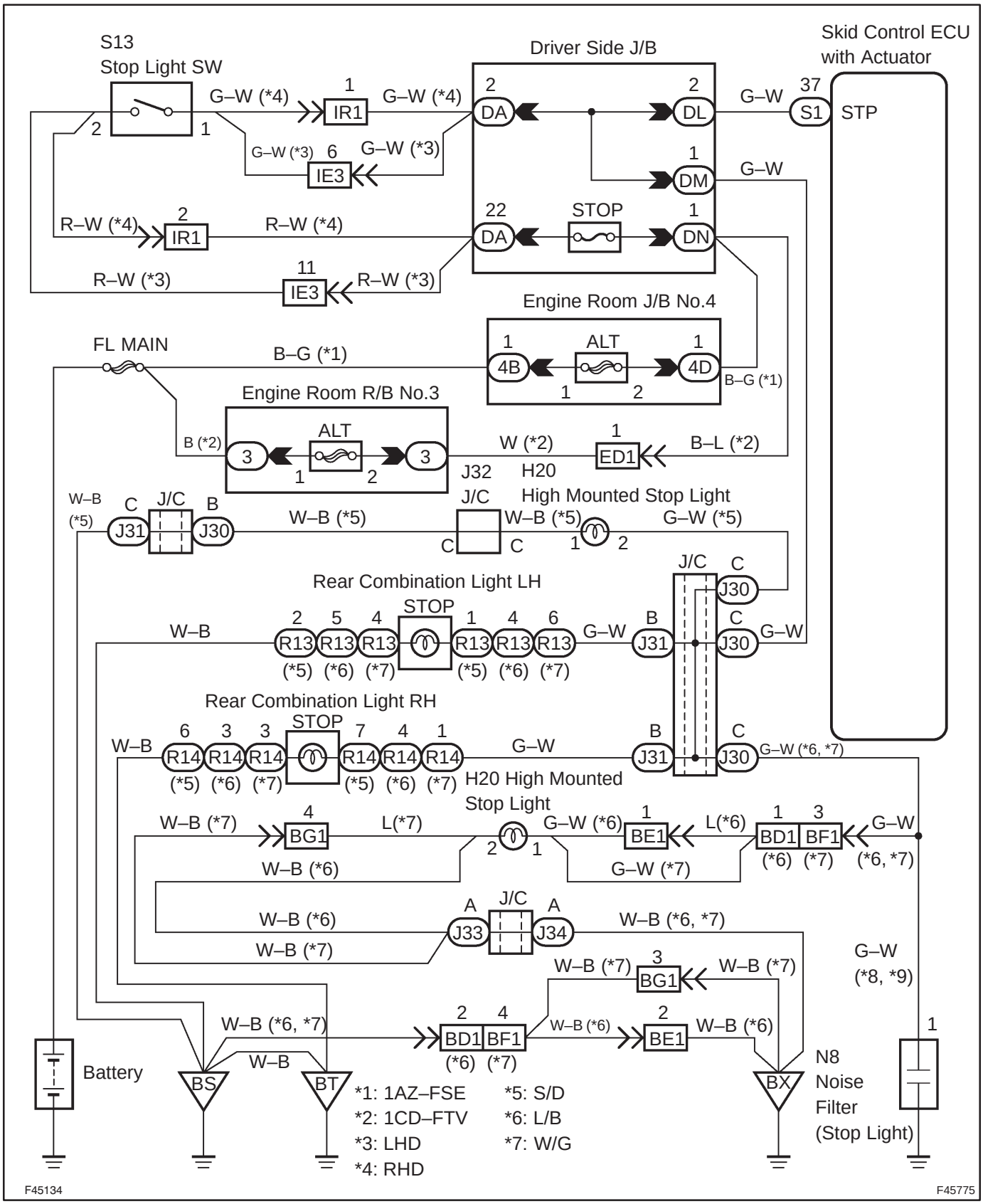
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC C1249/58 STOP LIGHT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1249/58	After the ignition switch is turned ON, the condition that the STP terminal voltage of ECU is 40 % to 67 % of supplied voltage, continues for 1 second or more.	Stop light switch circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

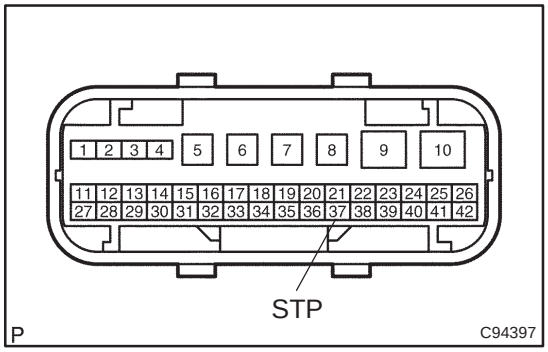
1	INSPECT STOP LAMP SWITCH ASSY

(a) Check that the stop light comes on when the brake pedal is depressed and goes off when the brake pedal is released.

NG → **Go to step 4**

OK

2	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(STP TERMINAL)



(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminal STP of the skid control ECU harness side connector and body ground when the brake pedal is depressed.
OK:
Voltage: 8 to 14 V

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

3	CHECK HARNESS AND CONNECTOR(STOP LIGHT SWITCH – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the stop light switch and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

4	CHECK HARNESS AND CONNECTOR(STOP LIGHT CIRCUIT)

(a) Check for an open or short circuit in harness and connector of the stop light circuit (See page 01–32).

OK → **REPLACE STOP LAMP SWITCH ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC C1288/88 ECU VERSION MISS MATCHI

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1288/88	When either of the following 1 or 2 is detected: 1. ECM does not match. 2. Steering angle sensor is not calibrated.	• ECM • Steering angle sensor calibration.

INSPECTION PROCEDURE

1 PERFORM STEERING ANGLE SENSOR ZERO POINT CALIBRATION

(a) Perform the steering angle sensor zero point calibration (See page 05–756).

2 RECONFIRM DTC

(a) Check if the same DTC is stored in the memory.

NO → **END**

YES

3 CHECK HARNESS AND CONNECTOR(STEERING ANGLE SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the steering angle sensor and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC C1300/62 SKID CONTROL ECU MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1300/62	1. Skid control ECU continuously detects the continuous operation of ABS at all 4 wheels for max. 1.28 sec. 2. Continuos VSC operation for 10 sec. or more. 3. Internal malfunction in ECU.	• ECU

INSPECTION PROCEDURE

1 RECONFIRM DTC

A	DTC C1300/62
B	Except DTC C1300/62

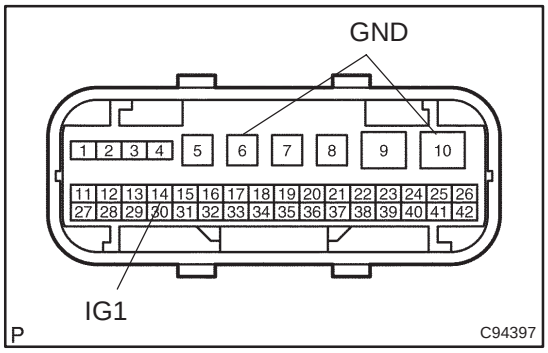
B → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

A

2 INSPECT SKID CONTROL ECU CONNECTOR(IG1 TERMINAL VOLTAGE)

WITH USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



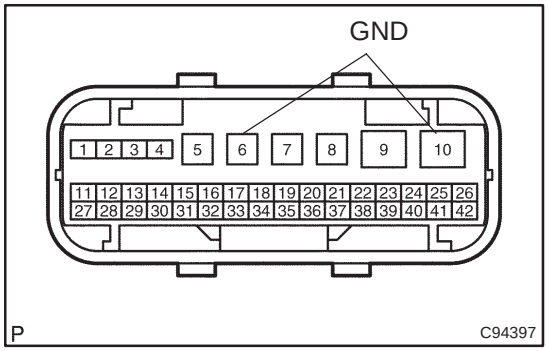
WITHOUT USING HAND–HELD TESTER:

(a) Disconnect the skid control connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

3	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Disconnect the skid control ECU connector.
(b) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.
OK:
Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR

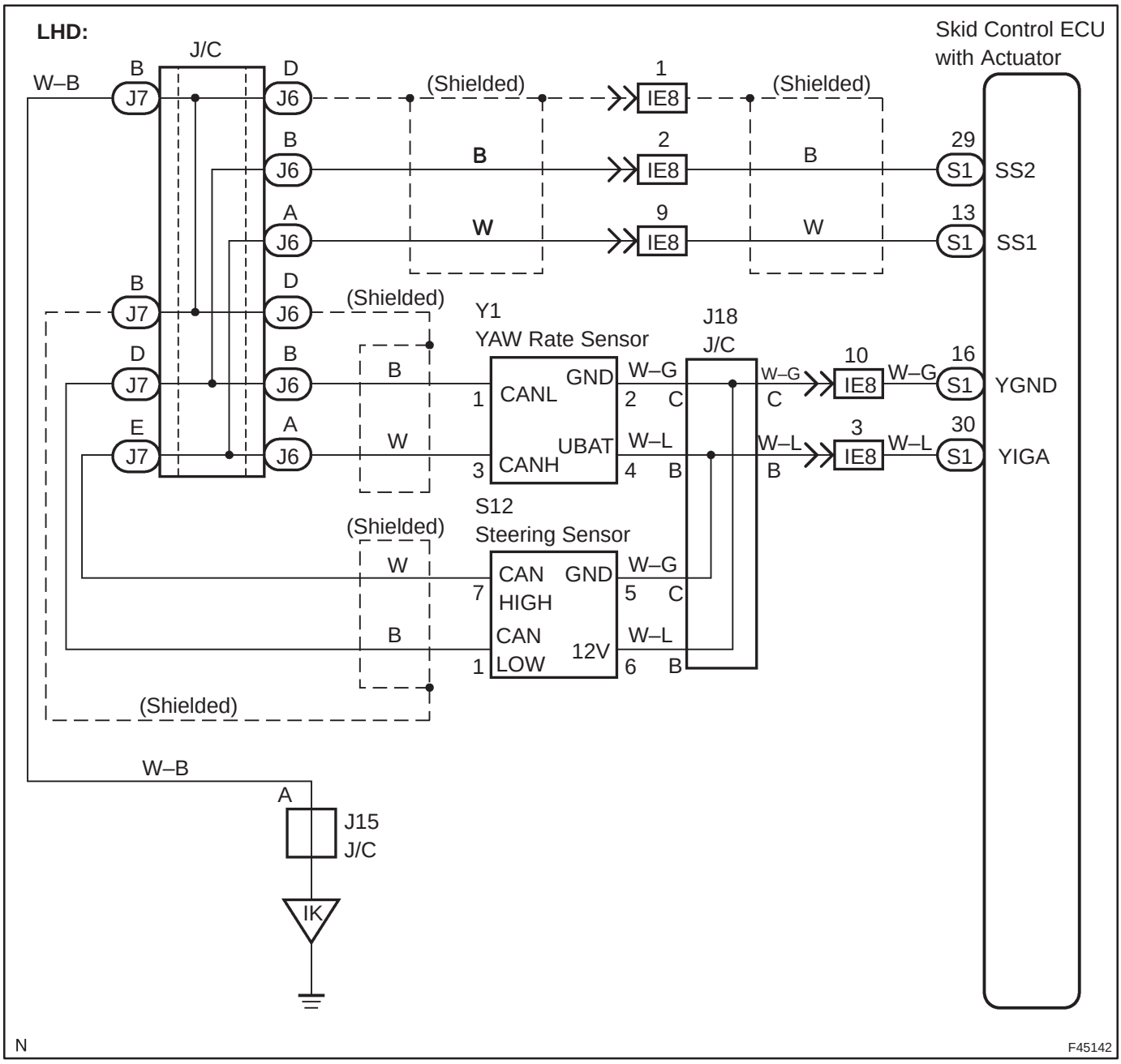
DTC	C1301/42	CAN COMMUNICATION SYSTEM MALFUNCTION

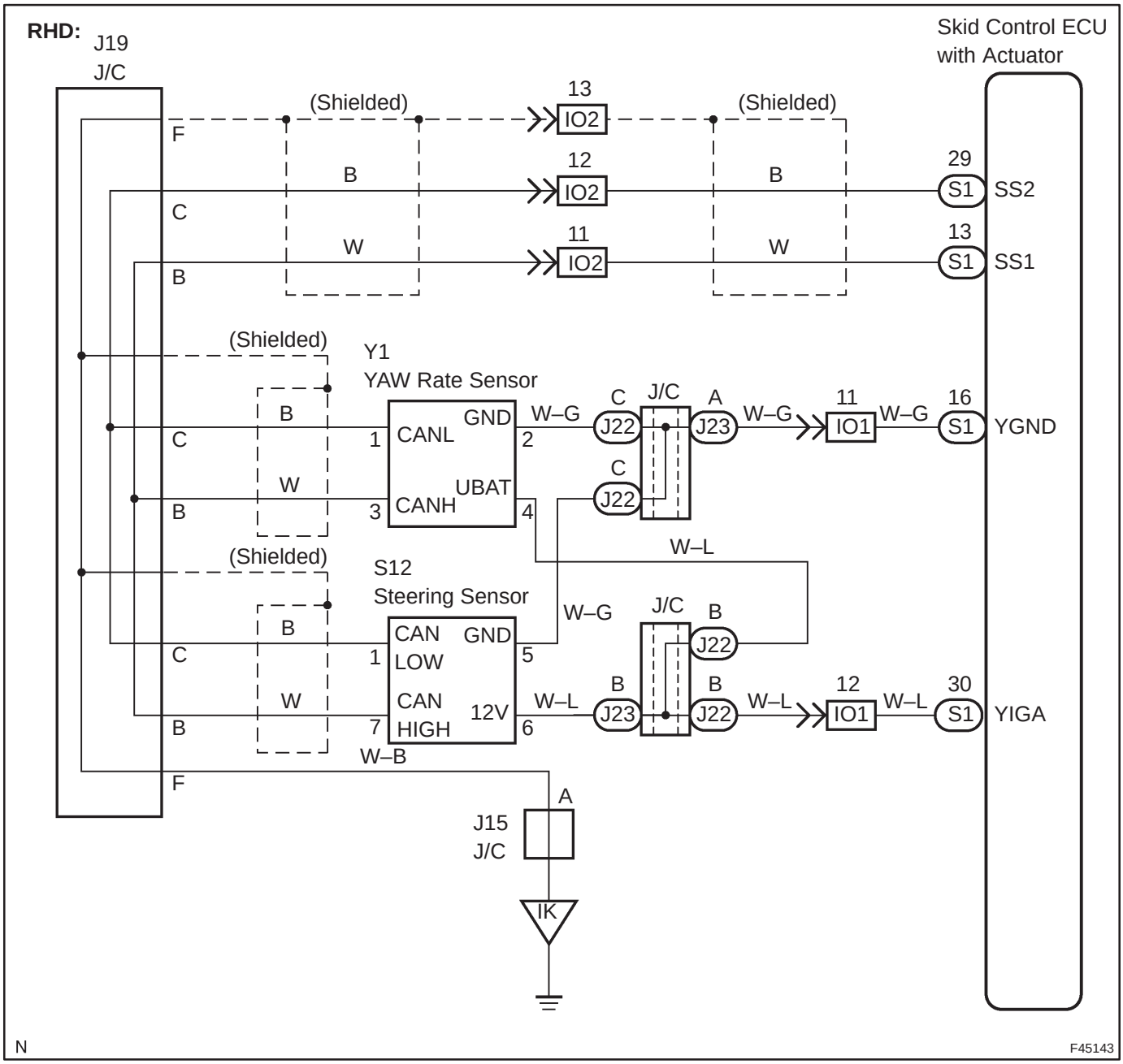
CIRCUIT DESCRIPTION

This circuit is used to send TRC & VSC control information from the yaw rate sensor and steering angle sensor information to the skid control ECU

DTC No.	DTC Detecting Condition	Trouble Area
C1301/42	IG1 voltage is 9.5 V or more, and the condition that data from steering angle sensor or yaw rate sensor can not be received continues for 0.1 seconds or more.	• Yaw rate sensor • Steering angle sensor • Yaw rate sensor circuit • Steering angle sensor circuit

WIRING DIAGRAM




RHD:
J19
J/C
Skid Control ECU
with Actuator
(Shielded)
13
IO2
(Shielded)
F
B
12
IO2
B
29
S1
SS2
C
W
11
IO2
W
13
S1
SS1
B
(Shielded)
Y1
YAW Rate Sensor
B
C
1
CANL
GND
2
W–G
C
J/C
A
W–G
11
W–G
16
S1
YGND
J22
J23
IO1
W
B
3
CANH
UBAT
4
C
J22
W–L
(Shielded)
S12
Steering Sensor
B
C
1
CAN
LOW
GND
5
W–G
J/C
B
J22
W
B
7
CAN
HIGH
12V
6
W–L
B
J23
B
J22
W–L
12
IO1
W–L
30
S1
YIGA
W–B
F
A
J15
J/C
IK
N
F45143

INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(YAW RATE SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the yaw rate sensor and skid control ECU (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	CHECK HARNESS AND CONNECTOR(STEERING ANGLE SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the steering angle sensor and skid control ECU (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

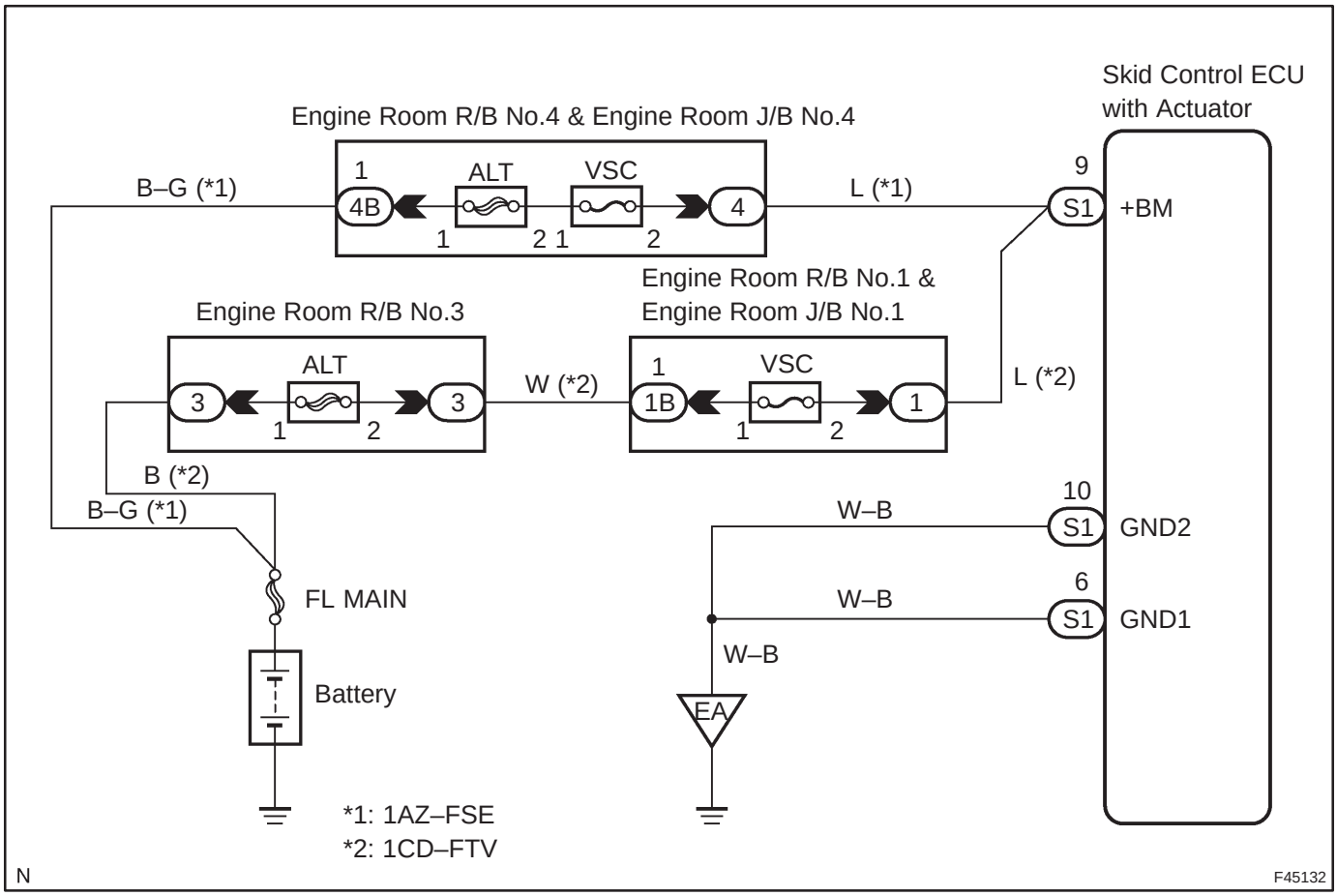
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

DTC	C1350/51	PUMP MOTOR IS LOCKED/OPEN CIRCUIT IN PUMP MOTOR GROUND

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1350/51	When any of the following 1 through 3 is detected. 1. No motor voltage supply within 0.08 sec. after actuation starts the motor relay. 2. A high level of motor voltage when actuation does not starts the motor relay for more than 2.5 sec. 3. The pump motor voltage is high level for a certain time after the motor relay has elapsed.	• Brake actuator pump motor • ABS motor relay circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check if other DTCs are detected (See page 05–756).

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

0542O–04

CUSTOMER PROBLEM ANALYSIS CHECK

ABS & EBD & BA Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	☐ BA does not operate.	
	☐ EBD does not operate.	
	ABS Warning Light	☐ Remains ON ☐ Does not Light Up
	Brake Warning Light (PKB released)	☐ Remains ON ☐ Does not Light Up

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data	STOP LIGHT SW	☐ ON ☐ OFF
	SYSTEM	☐ NO SYS ☐ ABS ☐ BA ☐ FAIL SF
	#IG ON	
	VEHICLE SPD	km/h MPH

TRC & VSC Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ TRAC does not operate. (Wheels spin when starting rapidly.)	
	☐ VSC does not operate. (Wheels sideslip at the time of sharp turning.)	
	TRC OFF Indicator Light	☐ Remains ON ☐ Does not Light Up
	VSC Warning Indicator	☐ Displays ☐ Does not Display
	SLIP Indicator Light	☐ Remains ON ☐ Does not Light Up
	Skid Control Buzzer	☐ Sounds ☐ Does not Sound

Check Item	**ABS Warning Light**	☐ Normal ☐ Malfunction Code (Code)
	Malfunction Indicator Light	☐ Normal ☐ Malfunction Code (Code)

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data	VSC/TRC OFF SW	☐ ON ☐ OFF
	SYSTEM	☐ VSC/TRC
	SHIFT POSITION	☐ P,N ☐ 2 ☐ R ☐ 3 ☐ D ☐ 4 ☐ L ☐ FAIL
	STEERING ANG	deg
	YAW RAT	deg/s
	MAS CYL PRESS	V
	THROTTLE	deg
	MAS PRESS GRADE	MPa/s
	G (RIGHT&LEFT)	G
	G (BACK&FORTH)	G

0542Q–04

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- Using SST 09843–18040, connect the terminal Tc and CG of the DLC3.
- If malfunction is not found when inspecting parts, inspect the ECU and ground points for poor contact.
- If a malfunction code is displayed during the DTC check, check the circuit listed for that code. For details of each code, refer to the "See page" for respective "DTC No." in the DTC chart.
- When 2 or more DTCs are detected, perform circuit inspection one by one until the problem is identified.

DTC chart of ABS system:

DTC No. (See Page)	Detection Item	Trouble Area
C0200 / 31 (05–774)	Right front wheel speed sensor signal malfunction	• Right front speed sensor • Right front speed sensor circuit • Right front speed sensor rotor
C0205 / 32 (05–774)	Left front wheel speed sensor signal malfunction	• Left front speed sensor • Left front speed sensor circuit • Left front speed sensor rotor
C0210 / 33 (05–778)	Right rear wheel speed sensor signal malfunction	• Right rear speed sensor • Right rear speed sensor circuit • Right rear speed sensor rotor
C0215 / 34 (05–778)	Left rear wheel speed sensor signal malfunction	• Left rear speed sensor • Left rear speed sensor circuit • Left rear speed sensor rotor
C0226 / 21 (05–782)	Open or short circuit in brake actuator	• Brake actuator • SFRR or SFRH circuit
C0236 / 22 (05–782)	Open or short circuit in brake actuator	• Brake actuator • SFLR or SFLH circuit
C0246 / 23 (05–782)	Open or short circuit in brake actuator	• Brake actuator • SRRR or SRRH circuit
C0256 / 24 (05–782)	Open or short circuit in brake actuator	• Brake actuator • SRLR or SRLH circuit
C0273 / 13 (05–784)	Open or short circuit in ABS motor relay circuit	• ABS motor relay • ABS motor relay circuit
C0278 / 11 (05–787)	Open or short circuit in ABS solenoid relay circuit	• ABS solenoid relay • ABS solenoid relay circuit
C1237 / 37 (05–807)	Wrong tire size	• Tire size • Speed sensor rotor
C1241 / 41 (05–808)	Low battery positive voltage or abnormally high battery positive voltage	• Battery • Charging system • Power source circuit
C1249 / 58 (05–815)	Open circuit in stop light switch circuit	• Stop lamp switch • Stop lamp switch circuit
C1300 / 62 (05–819)	Malfunction in skid control ECU	• Battery • Skid control ECU
C1330 / 35 (05–774)	Open circuit in right front speed sensor circuit	• Right front speed sensor • Right front speed sensor circuit
C1331 / 36 (05–774)	Open circuit in left front speed sensor circuit	• Left front speed sensor • Left front speed sensor circuit
C1332 / 38 (05–778)	Open circuit in right rear speed sensor circuit	• Right rear speed sensor • Right rear speed sensor circuit

C1333 / 39 (05–778)	Open circuit in left rear speed sensor circuit	• Left rear speed sensor • Left rear speed sensor circuit
Always ON (05–827)	Malfunction in skid control ECU Open circuit in ABS warning light circuit	• Battery • Charging system • Power source circuit • Skid control ECU

DTC chart of VSC system:

DTC No. (See Page)	Detection Item	Trouble Area
C0365 / 43 (05–790)	Malfunction in lateral acceleration sensor (combined in yaw rate sensor)	• Yaw rate sensor • Yaw rate sensor circuit
C0371 / 55 (05–793)	Malfunction in yaw rate sensor circuit	• Yaw rate sensor • Yaw rate sensor circuit
C1224 / 44 (05–797)	Open or short circuit in NE signal circuit	• NEO circuit • ECM • Skid control ECU
C1201/45 (05–796)	VSC shut down due to ECM failure	• ECM
C1203 / 59 (05–799)	ECM communication circuit malfunction	• TRC+ or TRC– circuit • ENG+ or ENG– circuit • ECM
C1208 / 54 (05–801)	Malfunction in steering angle sensor	• Steering angle sensor • Steering angle sensor circuit
C1225 / 25 (05–805)	Open or short circuit in brake actuator solenoid circuit (SMC1 circuit)	• Brake actuator • SMC1 circuit
C1226 / 26 (05–805)	Open or short circuit in brake actuator solenoid circuit (SMC2 circuit)	• Brake actuator • SMC2 circuit
C1227 / 27 (05–805)	Open or short circuit in brake actuator solenoid circuit (SRC1 circuit)	• Brake actuator • SRC1 circuit
C1228 / 28 (05–805)	Open or short circuit in brake actuator solenoid circuit (SRC2 circuit)	• Brake actuator • SRC2 circuit
C1246 / 53 (05–812)	Malfunction in master cylinder pressure sensor	• Master cylinder pressure sensor • Master cylinder pressure sensor circuit
C1288 / 88 (05–818)	Malfunction in ECM version	• Steering angle sensor zero point calibration
C1301 / 42 (05–821)	Malfunction in CAN communication circuit (steering angle sensor circuit, yaw rate sensor circuit)	• Steering angle sensor circuit • Yaw rate sensor circuit
C1350 / 51 (05–825)	Pump motor is locked Open circuit in pump motor ground	• Brake actuator pump motor
Always ON (05–831)	Malfunction in skid control ECU Open circuit in VSC warning light circuit	• Battery • Charging system • Power source circuit • Skid control ECU

DTC of sensor check function :

Code No.	Diagnosis	Trouble Area
C1271/71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation • Sensor rotor
C1272/72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation • Sensor rotor
C1273/73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation • Sensor rotor
C1274/74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation • Sensor rotor
C1275/75	Change in output voltage of right front speed sensor	Right front sensor rotor
C1276/76	Change in output voltage of left front speed sensor	Left front speed sensor rotor
C1277/77	Change in output voltage of right rear speed sensor	Right rear sensor rotor
C1278/78	Change in output voltage of left rear speed sensor	Left rear speed sensor rotor

ABS WITH EBD & BA & TRC & VSC SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

0542N–04

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–754)

3	Check and Clear DTCs and Freeze Frame Data (See page 05–756)

4	Problem Symptom Confirmation

- Symptom does not occur: Go to step 5
- Symptom occurs: Go to step 6

5	Symptom Simulation (See page 01–32)

6	DTC Check (See page 05–756)

- There is no output: Go to step 7
- There is output: Go to step 8

7	Problem Symptoms Table (See page 05–772)

- Check for fluid leakage and Go to step 10

8	DTC Chart (See page 05–766)

9	Circuit Inspection (See page 05–774 – 05–854)

HINT:
When 2 or more DTCs are detected, perform circuit inspection one by one until the problem is identified.

10	Identification of Problem

11	Repair

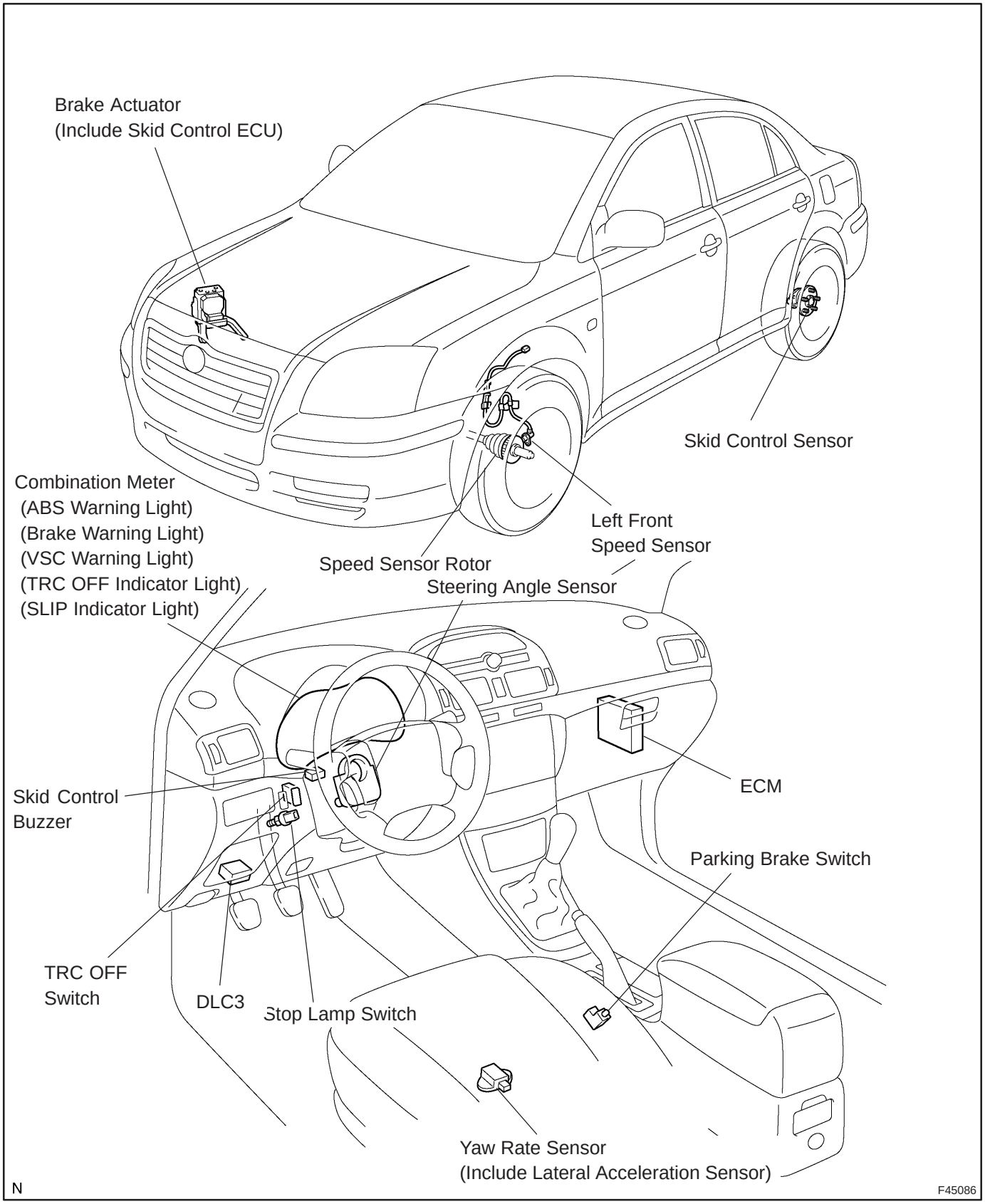
12	Confirmation Test

End

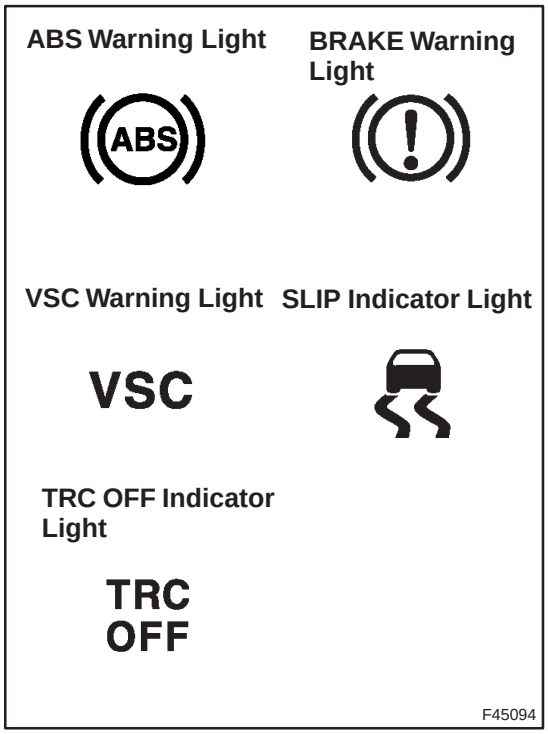
HINT:
Step 3, 6, 9, 12:
Diagnostic steps permitting the use of the hand–held tester.
Fail safe function:
When a failure occurs in the ABS & BA & TRC & VSC systems, the ABS warning light, the VSC warning light and the TRC OFF indicator light come on and the ABS & BA & TRC & VSC operations are prohibited. In addition to this, when the failure that disables the EBD operation occurs, the brake warning light comes on as well and the EBD operation is prohibited.

056T1–03

LOCATION



0577Y–02



PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Check the warning lights.

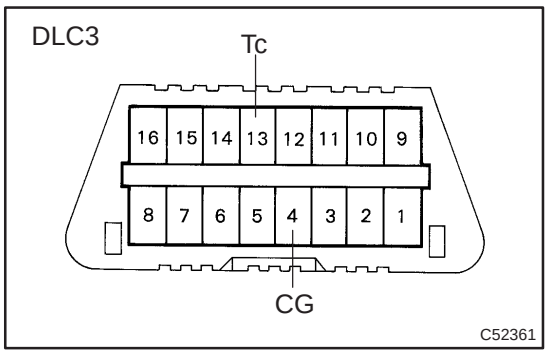
(1) Release the parking brake lever.

(2) When the ignition switch is turned ON, check that the ABS warning light, Brake warning light, VSC warning light, TRC OFF indicator light and SLIP indicator light come on for approx. 3 seconds.

HINT:

- When the parking brake is applied or brake fluid level is low, the Brake warning light comes on.
- If the ECU stores DTC, the ABS warning light , VSC warning light and TRC OFF indicator light come on.
- If the indicator check result is not normal, proceed to troubleshooting for the light circuit.

Trouble Area	See page
ABS warning light circuit	05–827
Brake warning light circuit	05–840
VSC warning light circuit	05–831
TRC OFF indicator light circuit	05–844
SLIP indicator light circuit	05–848



(b) Without using hand–held tester:
Check the DTC.

(1) Using SST, connect terminal Tc and CG of the DLC3.

SST 09843–18040

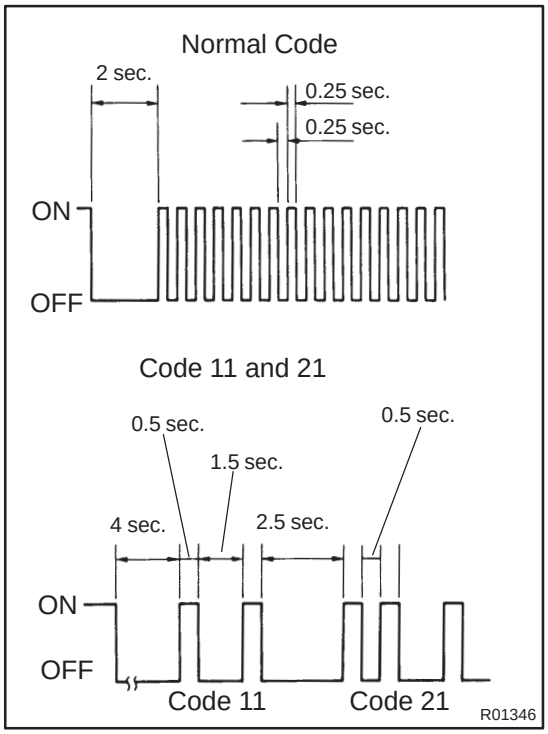
(2) Turn the ignition switch ON.

(3) Read the DTC from the ABS warning light or VSC warning light on the combination meter.

HINT:

- If no code appears, inspect the diagnostic circuit, ABS warning light circuit or VSC warning light circuit.

Trouble Area	See page
Tc terminal circuit	05–852
ABS warning light circuit	05–827
VSC warning light circuit	05–831



- As an example, the blinking patterns for the normal code and codes 11 and 21 are shown on the left.

(4) Codes are explained in the code table on page 05–766.

(5) After completing the check, disconnect terminal Tc and CG of the DLC3, and turn off the display.

If 2 or more DTCs are detected at the same time, the lowest numbered DTC is displayed first.

(c) With using the hand–held tester:

Check the DTC.

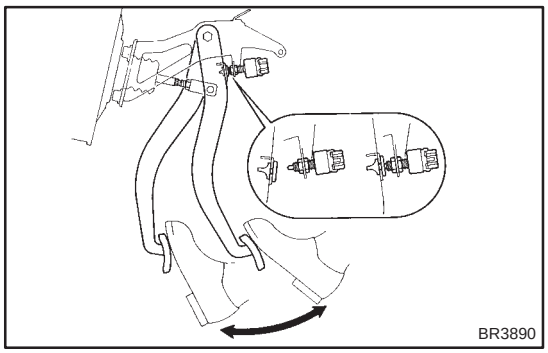
(1) Hook up the hand–held tester to the DLC3.

(2) Turn the ignition switch ON.

(3) Read the DTC by following the prompts on the tester screen.

HINT:

Please refer to the hand–held tester operator's manual for further details.



(d) Without using hand–held tester:

Clear the DTCs.

(1) Using SST, connect the terminal Tc and CG of the DLC3.

SST 09843–18040

(2) Turn the ignition switch ON.

(3) Clear the DTCs stored in the ECU by depressing the brake pedal 8 or more times within 5 seconds.

(4) Check that the ABS warning light and VSC warning light indicates the normal code blinking pattern.

(5) Remove the SST from the DLC3.

SST 09843–18040

HINT:

Disconnecting the battery cable during repairs will not erase the DTCs in the ECU.

(e) With using hand–held tester:

Clear the DTCs.

(1) Turn the ignition switch ON.

(2) Operate the hand–held tester to erase the codes.

HINT:

Please refer to the hand–held tester operator's manual for further details.

2. DATA LIST

HINT:

According to the DATA LIST displayed on the Hand–held tester, you can read the value and status of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of trouble-shooting is one of the methods to shorten the labor time.

(a) Connect the Hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) From the display on the tester, read the ”DATA LIST”.

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
ABS MOT RELAY	ABS motor relay / ON or OFF	ON : Motor relay ON	–
SOL RELAY	Solenoid relay / ON or OFF	ON : Solenoid relay ON	–
VSC / TRC OFF SW	VSC / TRC OFF switch / ON or OFF	ON : Switch ON OFF : Switch OFF	–
STOP LIGHT SW	Stop light switch / ON or OFF	ON : Brake pedal de-pressed OFF : Brake pedal re-leased	–
PKB SW	Parking brake switch / ON or OFF	ON : Parking brake applied OFF : Parking brake re-leased	–
WHEEL SPD FR	Wheel speed sensor (FR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD FL	Wheel speed sensor (FL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD RR	Wheel speed sensor (RR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD RL	Wheel speed sensor (RL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
DECELERAT SENS1	Lateral acceleration sensor 1 reading / min.: –1.869 G, max.: 1.869 G	Approximately 0 ± 0.1G at still condition	Reading changes when vehicle is bounced
IG VOLTAGE	ECU power supply voltage / NORMAL or TOO LOW	NORMAL : 9.8 V or over TOO LOW : Below 9.8 V	–
SFRR	ABS solenoid SFRR / ON or OFF	ON : Operate	–
SFRH	ABS solenoid SFRH / ON or OFF	ON : Operate	–
SFLR	ABS solenoid SFLR / ON or OFF	ON : Operate	–
SFLH	ABS solenoid SFLH / ON or OFF	ON : Operate	–
SRRR (SRR)	ABS solenoid SRRR (SRR) / ON or OFF	ON : Operate	–
SRRH (SRH)	ABS solenoid SRRH (SRH) / ON or OFF	ON : Operate	–

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
SRLR	ABS solenoid SRLR / ON or OFF	ON : Operate	–
SRLH	ABS solenoid SRLH / ON or OFF	ON : Operate	–
SRCF(SA1)	TRC solenoid SRCF(SA1) / ON or OFF	ON : Operate	–
SRCR(SA2)	TRC solenoid SRCR(SA2) / ON or OFF	ON : Operate	–
SRMF(SMCF,SA3)	TRC solenoid SRMF(SMCF,SA3)1 / ON or OFF	ON : Operate	–
SRMR(SMCR,STR)	TRC solenoid SRMR(SMCR,STR) / ON or OFF	ON : Operate	–
ENGINE SPD	Engine Speed/ Min.: 0 rpm, Max.: 6000 rpm	Actual engine speed	–
VEHICLE SPD	Maximum wheel speed sensor reading / min.: 0 km/h (0 MPH), max.: 326 km/h (202 MPH)	Actual vehicle speed	Speed indicated on speedometer
YAW RATE	Yaw rate sensor/ Min.: –128 deg/s, Max.: 128 deg/s		–
YAW ZERO VALUE	Memorized zero value/ Min.: –128 deg/s, Max.: 128 deg/s		–
STEERING ANG	Steering sensor/ Min.: –1152 deg, Max.: 1150.875 deg		–
MAS CYL PRS1	Master cylinder pressure sensor 1 reading / min.: 0 V, max.: 5 V	When brake pedal is released : 0.3 – 0.9 V	Reading increases when brake pedal is depressed
TEST MODE	Test mode / NORMAL or TEST	NORMAL : Normal mode TEST : During test mode	
#CODES	Number of DTC recorded / min.: 0, max.: 255	Min.: 0, max.: 26	

3. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the Hand–held tester allows the relay, solenoid, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the methods to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the Hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) From the display on tester, select the ”ACTIVE TEST”.

HINT:

IG must be turned ON to proceed Active Test using a hand–held tester.

*1: For VSC equipped vehicles only

Item	Vehicle Condition / Test Details	Diagnostic Note
SFRR	Turns ABS solenoid SFRR ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH	Turns ABS solenoid SFRH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR	Turns ABS solenoid SFLR ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLH	Turns ABS solenoid SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRR(SRR)	Turns ABS solenoid SRRR(SRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRH(SRH)	Turns ABS solenoid SRRH(SRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR	Turns ABS solenoid SRLR ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLH	Turns ABS solenoid SRLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRCF(SA1)	Turns TRAC solenoid SRCF (SA1) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRCR(SA2)	Turns TRAC solenoid SRCR (SA2) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRMF(SMCF,SA3)	Turns TRC solenoid SRMF (SMCF,SA3) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRMR(SMCR,STR)	Turns TRC solenoid SRMR(SMCR,STR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRR & SFRH	Turns ABS solenoid SFRR & SFRH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR & SFLH	Turns ABS solenoid SFLR & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard

Item	Vehicle Condition / Test Details	Diagnostic Note
SRH & SRR	Turns ABS solenoid SRH & SRR ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR & SRLH	Turns ABS solenoid SRLR & SRLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH & SFLH	Turns ABS solenoid SFRH & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRCF & SRCR	Turns ABS solenoid SRCF & SRCR ON / OFF	Operation of solenoid (clicking sound) can be heard
SRMF & SRMR	Turns ABS solenoid SRMF & SRMR ON / OFF	Operation of solenoid (clicking sound) can be heard
SOL RELAY	Turns ABS solenoid relay ON / OFF	Operation of solenoid (clicking sound) can be heard
ABS MOT RELAY	Turns ABS motor relay ON / OFF	Operation of motor can be heard
ABS WARN LIGHT	Turns ABS warning light ON / OFF	Observe combination meter
VSC WARN LIGHT	Turns VSC warning light ON / OFF	Observe combination meter
VSC / TRC OFF IND	Turns VSC / TRC OFF indicator ON / OFF	Observe combination meter
SLIP INDI LIGHT	Turns SLIP indicator light ON / OFF	Observe combination meter
BRAKE WRN LIGHT	Turns BRAKE warning light ON / OFF	Observe combination meter
VSC WARN BUZ	Turns VSC warning buzzer ON / OFF	Buzzer can be heard

4. FREEZE FRAME DATA

(a) The vehicle (sensor) status memorized during ABS and/or VSC operation or at the time of error code detection can be displayed using the hand–held tester.

(b) Only one record of the freeze frame data is stored and the freeze frame data generated during ABS and/or VSC operation are constantly updated. Also, the number of the operations of the ignition switch ”ON” after the freeze frame data is stored can be memorized up to 31 and it can be displayed.

HINT:

If the ignition switch ”ON” operation exceeds 31 times, ”31” appears on the display.

(c) If the diagnosis code malfunction occurs, the freeze frame data at the occurrence of the malfunction is stored but the ABS actuation data is deleted.

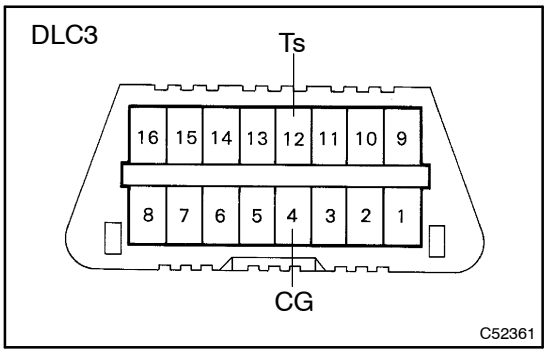
Hand–held tester display	Measurement Item	Reference Value*
VEHICLE SPD	Vehicle speed	Speed indication of a meter
STOP LIGHT SW	Stop light switch signal	Stop light switch ON: ON, OFF: OFF
# IG ON	Numbers of operations of ignition switch ON after memorizing freeze frame data	0 to 31
MAS CYL PRESS	Master cylinder pressure sensor output voltage	Release brake pedal: 0.3 to 0.9 V Depress brake pedal: 1.5 to 4.5 V
MASS PRESS GRADE	Master cylinder pressure sensor changing gradient	–30 to 200 MPa/s
SYSTEM	Operate system	ABS operate: ABS BA operate: BA VSC (TRC) operate: VSC (TRC)
YAW RATE	Yaw rate angle sensor output value	–70 to 70
STEERING ANG	Steering sensor output value	Left turn: Increase Right turn: Drop
THROTTLE	Throttle position sensor output value	Release accelerator pedal: Approx. 0 deg Depress accelerator pedal: Approx. 90 deg
G (RIGHT & LEFT)	Right and left G	–1.869 to 1.869 G
VSC (TRC) OFF SW	TRC OFF switch signal	TRC OFF SW ON: ON OFF: OFF
SHIFT POSITION	Shift lever position	P: P R: R N: N D: D 2: 2 L: L

*: If no conditions are specifically stated for ”Idling”, it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

5. Without using hand–held tester:
ABS SENSOR SIGNAL CHECK (TEST MODE)

NOTICE:
After replacing the steering angle sensor and/or ECU, perform zero point calibration of the steering angle sensor or system decision (When replacing the ECU) (See step 7.).

HINT:
If the ignition switch is turned from ON to ACC or LOCK during test mode, the DTCs will be erased.



(a) Procedures for test mode:
(1) Turn the ignition switch OFF.
(2) Using SST, connect terminal Ts and CG of the DLC3.
SST 09843–18040
(3) Check that the steering wheel is in the straight–ahead position and shift the shift lever to P range.
(4) Turn the ignition switch ON.
(5) Check that the ABS warning light blinks.

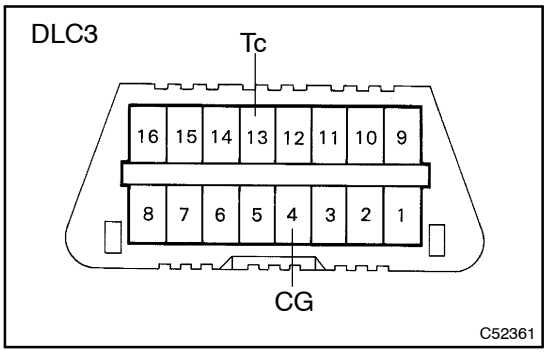
HINT:
If the ABS warning light does not blink, inspect the ABS warning light circuit or Ts terminal circuit.

Trouble area	See Page
Ts terminal circuit	05–854
ABS warning light circuit	05–827

(b) Check the speed sensor signal.
(1) Drive the vehicle straight forward at the speed of 45 km/h (28 mph) or over for several seconds and check that the ABS warning light goes off.

HINT:
The sensor check may not be completed if the wheels spin or the steering wheels are steered during this check.

(c) Stop the vehicle.

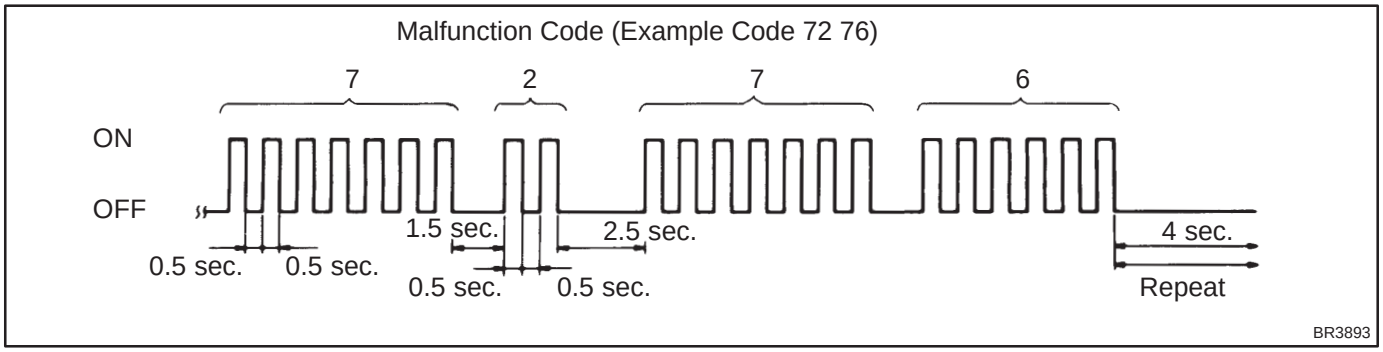


(d) Using SST, connect terminal Tc and CG of the DLC3.
SST 09843–18040

(e) Read the number of blinks of the ABS warning light.

HINT:
- See the list of DTCs on page 05–766.
- If every sensor is normal, the normal code is output (A cycle of 0.25 second ON and 0.25 second OFF is repeated).

- If 2 or more DTCs are detected at the same time, the lowest numbered code is displayed first.



(f) After the check, disconnect the SST from terminal Ts and CG, Tc and CG of DLC3 and turn the ignition switch to OFF.
SST 09843–19040

6. With using hand–held tester:
ABS SENSOR SIGNAL CHECK (TEST MODE)

NOTICE:

After replacing the steering angle sensor and/or ECU, perform zero point calibration of the steering angle sensor or system decision (When replacing the ECU) (See step 7.).

HINT:

If the ignition switch is turned from ON to ACC or LOCK during test mode, the DTCs will be erased.

(a) Hook up the hand–held tester to the DLC3.
(b) Perform step 5. (c) to (d) on the previous page.
(c) Read the DTC by following the prompts on the tester screen.

HINT:

Please refer to the hand–held tester operator's manual for further details.

7. STEERING ANGLE SENSOR ZERO POINT CALIBRATION

NOTICE:

When replacing the steering angle sensor with column assembly or ECU, Engine and ECT ECU (A/T), Engine ECU (M/T) or when adjusting the front wheel alignment or steering wheel center point in accordance with the removing or installing or replacing the suspension, axle or steering parts, make sure to perform steering angle sensor zero point calibration.

(a) Using SST, connect terminals Ts and CG of the DLC3.
SST 09843–18040
(b) Turn the ignition switch ON and keep the shift lever at P range.
(c) Make sure the steering off center angle is less than ±3° when assembling the steering wheels (Smaller value is desirable).
(d) Press the TRC OFF switch and hold it.
(e) Check that the following conditions are satisfied.

HINT:

- Engine warning light comes on.
- ABS warning light is blinking.

(f) Depress the brake pedal 3 times or more within 2 seconds.

(g) Check that the skid control buzzer sounds for 3 seconds.

HINT:

- Press and hold the TRC OFF switch until the skid control buzzer sounds. When it starts sounding, turn off the switch.
- When the skid control buzzer starts sounding, turn off the TRC OFF switch.
- If the skid control buzzer sounds, the sensor calibration is in normal completion.
- If the skid control buzzer does not sound, perform the sensor calibration again.
- If the skid control buzzer still will not sound, there is malfunction in the steering angle sensor, so check the DTC.

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PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

NOTICE:

When replacing the ABS & TRACTION actuator, sensor or etc., turn the ignition switch to OFF.

Symptom	Suspect Area	See page
ABS does not operate BA does not operate EBD does not operate	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. IG power source circuit 3. Speed sensor circuit 4. Check the brake master cylinder with a ABS actuator checker or hand–held tester. If there is malfunction, check the hydraulic circuit for leakage.	 05–756 05–808 05–774 05–778 32–56
ABS does not operate properly BA does not operate properly EBD does not operate properly	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. Speed sensor circuit 3. Stop light switch circuit 4. Check the brake master cylinder with a ABS actuator checker or hand–held tester. If there is malfunction, check the hydraulic circuit for leakage.	 05–756 05–774 05–778 05–815 32–56
ABS warning light malfunction	1. ABS warning light circuit 2. ABS & TRACTION actuator	05–827 –
DTC of ABS check cannot be performed	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. Tc terminal circuit	 05–756 05–852
Sensor signal check cannot be performed	1. Ts terminal circuit 2. ABS & TRACTION actuator	05–854 –
TRC does not operate	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. IG power source circuit 3. Check the hydraulic circuit for leakage. 4. Speed sensor circuit	 05–756 05–808 – 05–774 05–778

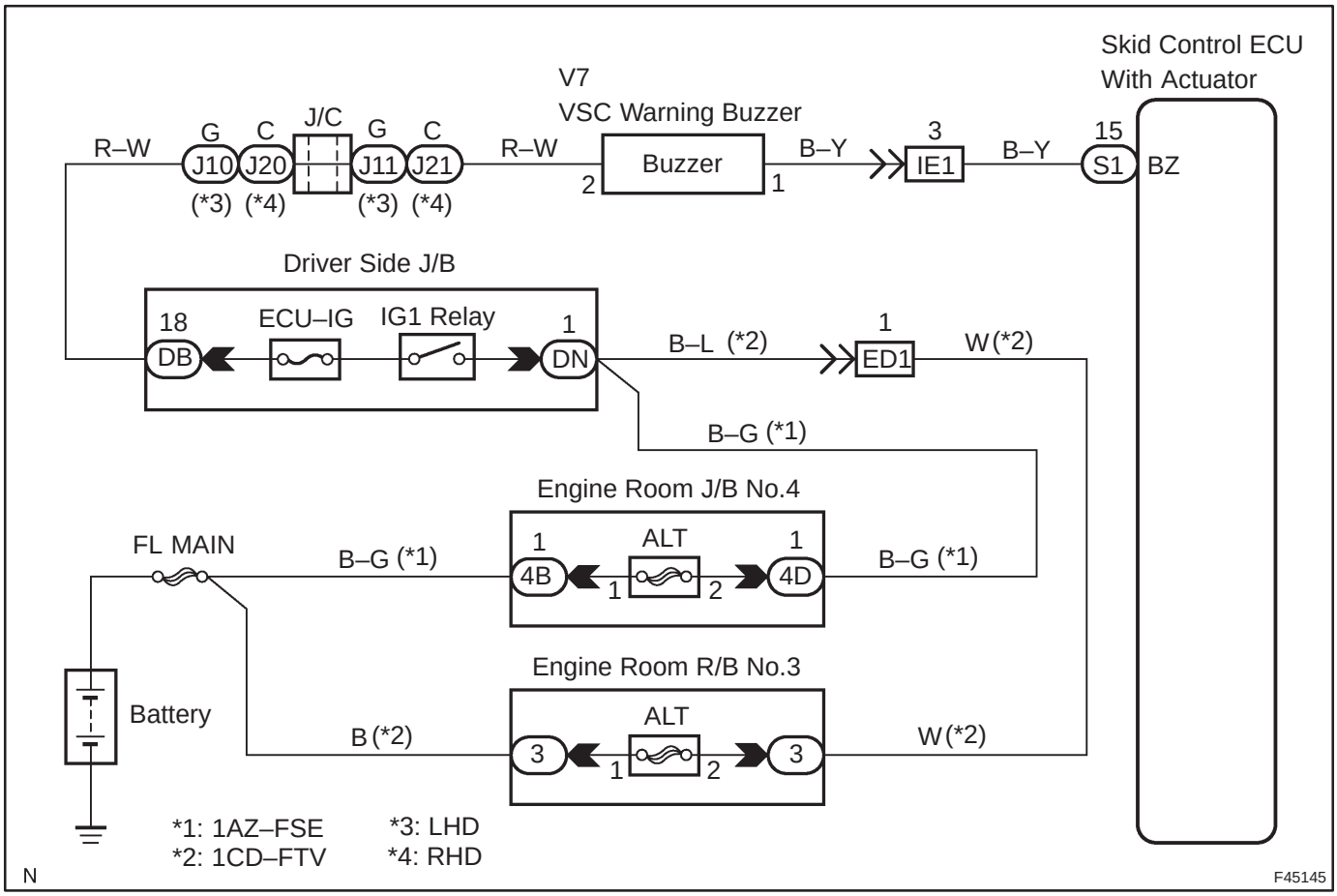
Symptom	Suspect Area	See page
VSC does not operate	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. IG power source circuit 3. Check the hydraulic circuit for leakage. 4. Speed sensor circuit 5. Yaw rate sensor and deceleration sensor circuit 6. Steering angle sensor circuit	 05–756 05–808 – 05–774 05–778 05–790 05–793 05–801
SLIP indicator light malfunction	1. SLIP indicator light circuit 2. ABS & TRACTION actuator	05–848 –
TRC OFF indicator malfunction	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. TRC OFF switch circuit	 05–756 05–844
DTC of VSC check cannot be performed	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. Tc terminal circuit	 05–756 05–852
VSC warning light malfunction	If the symptoms still occur even after the following circuits in suspect areas are inspected and proved to be normal, replace the ABS & TRACTION actuator. 1. Check the DTC again and make sure that the normal code is output. 2. VSC warning circuit	 05–756 05–831

SKID CONTROL BUZZER CIRCUIT

CIRCUIT DESCRIPTION

The skid control buzzer sounds during VSC operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

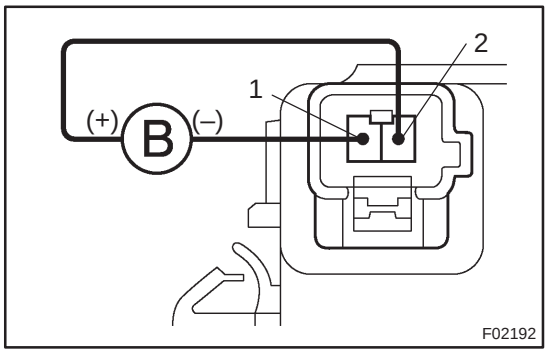
1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(SKID CONTROL BUZZER)

(a) Check that skid control buzzer sounds ”ON” and ”OFF” with the hand–held tester.

OK → REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

2	INSPECT SKID CONTROL BUZZER ASSY



(a) Disconnect the skid control buzzer connector.

(b) Apply battery positive voltage to the terminals 1 and 2 of the skid control buzzer connector, check that the buzzer sounds.

NG → REPLACE SKID CONTROL BUZZER ASSY

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL BUZZER – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between terminal BZ of the skid control ECU and skid control buzzer (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

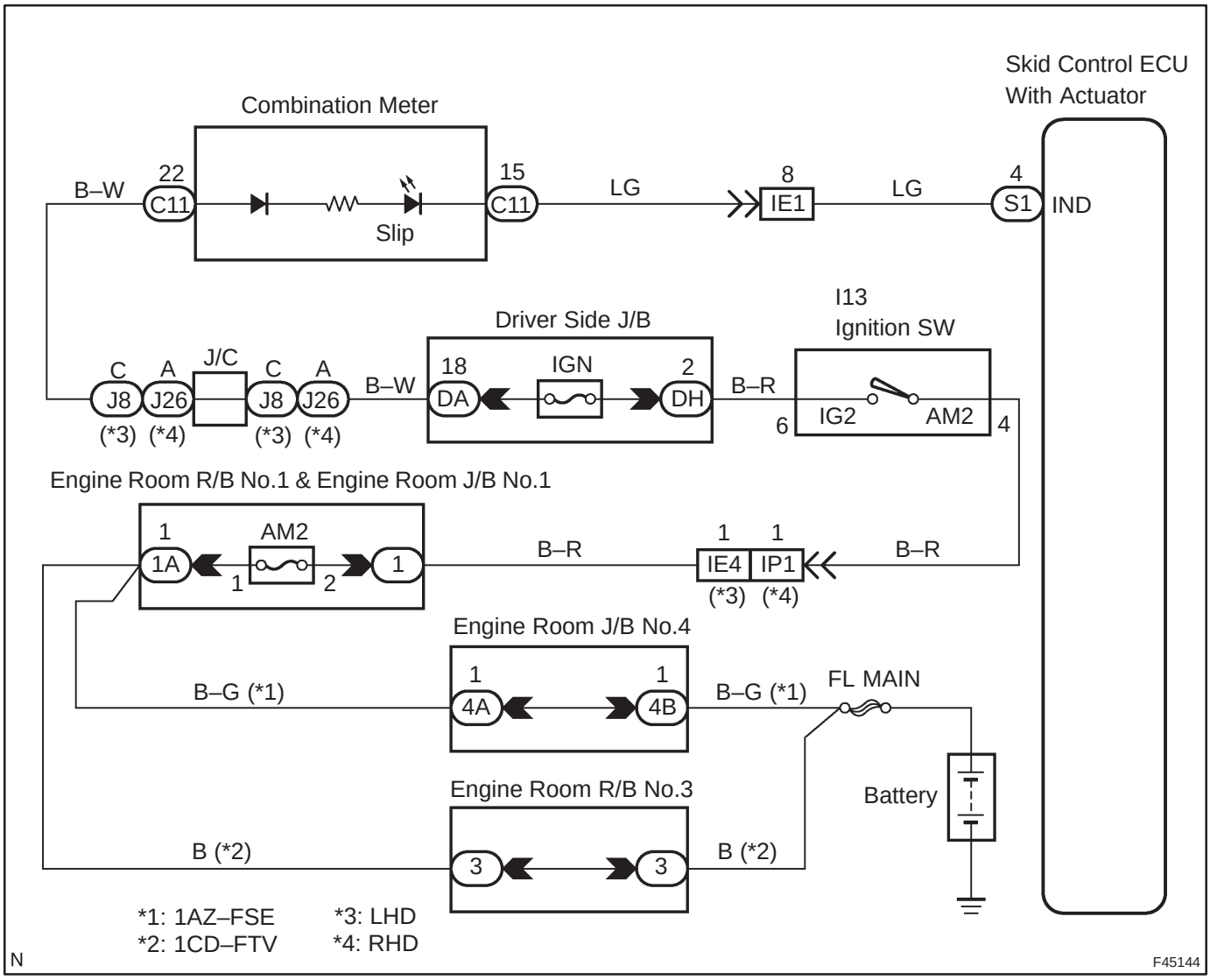
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

SLIP INDICATOR LIGHT CIRCUIT

CIRCUIT DESCRIPTION

The SLIP indicator blinks during TRC & VSC operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(SLIP INDICATOR LIGHT)

(a) Check that ”ON” and ”OFF” of the SLIP indicator light is shown on the combination meter by the hand–held tester.

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

2	INSPECT SLIP INDICATOR LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → **REPAIR OR REPLACE COMBINATION METER ASSEMBLY**

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for an open or short circuit in harness and connector between terminal IND of the skid control ECU and combination meter (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

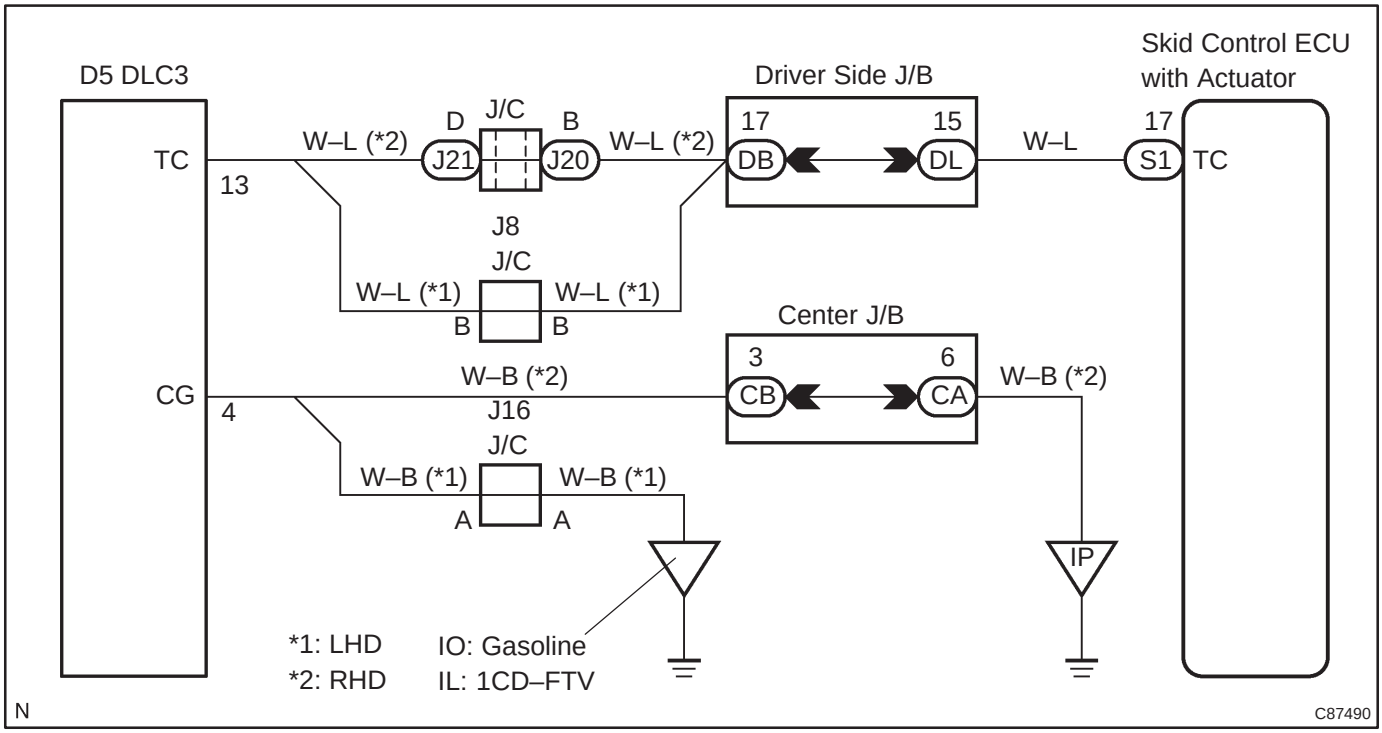
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

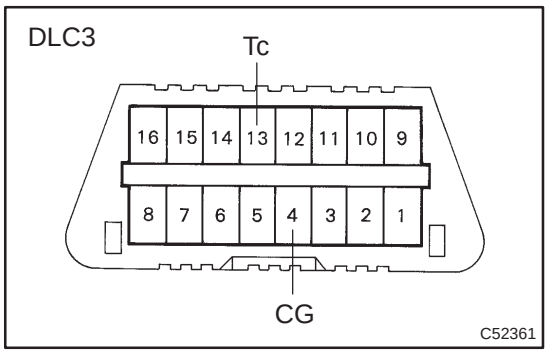
Connecting terminals Tc and CG of the DLC3 causes the ECU to display the DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Tc TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Tc and CG of the DLC3.
OK:
Voltage: 10 to 14 V

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminal CG of the DLC3 and body ground (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – DLC3)

(a) Check for an open or short circuit in harness and connector between terminal Tc of the skid control ECU and DLC3 (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

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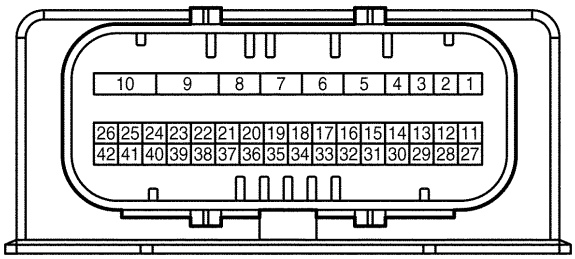
TERMINALS OF ECU



P C94401

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
WT (2) – GND (6, 10)	LG–B – W–B	IG Switch ON, TRAC OFF Light ON	Below 2.0
		IG Switch ON, TRAC OFF Light OFF	10 to 14
IND (4) – GND (6, 10)	LG – W–B	IG Switch ON, SLIP indicator light ON	Below 2.0
		IG Switch ON, SLIP indicator light OFF	10 to 14
+BS (5) – GND (6, 10)	R – W–B	Always	10 to 14
ENG+ (8) – ENG– (7)	Y – B	IG switch ON	Pulse generation
+BM (9) – GND (6, 10)	L – W–B	Always	10 to 14
PMC (11) – E2 (12)	GR – Y–R	IG switch ON, stop light switch OFF	0.3 to 0.9
SS1 (13) – SS2 (29)	W – B	Engine idling, slowly tun steering wheel	Pulse generation
IG1 (14) – GND (6, 10)	R–W – W–B	IG switch ON	10 to 14
BZ (15) – GND (6, 10)	B–Y – W–B	IG switch ON, VSC buzzer is sounded	Below 1.0 ↔ 10 to 14
		IG switch ON, VSC buzzer is not sounded	10 to 14
Tc (17) – GND (6, 10)	W–L – W–B	IG Switch ON	10 to 14
TRC+ (18) – TRC– (19)	G – L	IG switch ON	Pulse generation
EBDW (20) – GND (6, 10)	P – W–B	IG Switch ON, Brake warning light ON	5 to 9
		IG Switch ON, Brake warning light OFF	Below 2.0
FR+ (21) – FR– (22)	W – B	IG switch ON, slowly turn right front wheel	AC generation
RL+ (23) – RL– (40)	R – G	IG switch ON, slowly turn left rear wheel	AC generation
D/G (26) – GND (6, 10)	W–G – W–B	IG switch ON	8 to 12
VCM (27) – GND (6, 10)	Y–G – W–B	IG switch ON	4.5 to 5.5
Ts (28) – GND (6, 10)	W – W–B	IG switch ON	10 to 14
YIGA (30) – YGND (16)	W–L – W–G	IG Switch ON	10 to 14
PKB (31) – GND (6, 10)	B–W – W–B	IG switch ON, parking brake switch ON	Below 1.5
		IG switch ON, parking brake switch OFF	10 to 14
NEO (32) – GND (6, 10)	Y–B – W–B	Engine idling	Pulse generation
VSCW (34) – GND (6, 10)	W–R – W–B	IG Switch ON, VSC warning light ON	5 to 9
		IG Switch ON, VSC warning light OFF	Below 2.0
SP1 (35) – GND (6, 10)	L–W – W–B	Vehicle drives at about 20 km/h (12 mph)	Pulse generation
WA (36) – GND (6, 10)	R–Y – W–B	IG Switch ON, ABS warning light ON	Below 2.0
		IG Switch ON, ABS warning light OFF	10 to 14
STP (37) – GND (6, 10)	G–W – W–B	Stop light switch OFF	Below 1.5
		Stop light switch ON	8 to 14
RR+ (38) – RR– (39)	P – V	IG switch ON, slowly turn right rear wheel	AC generation
FL+ (41) – FL– (24)	L–Y – R–L	IG switch ON, slowly turn left front wheel	AC generation

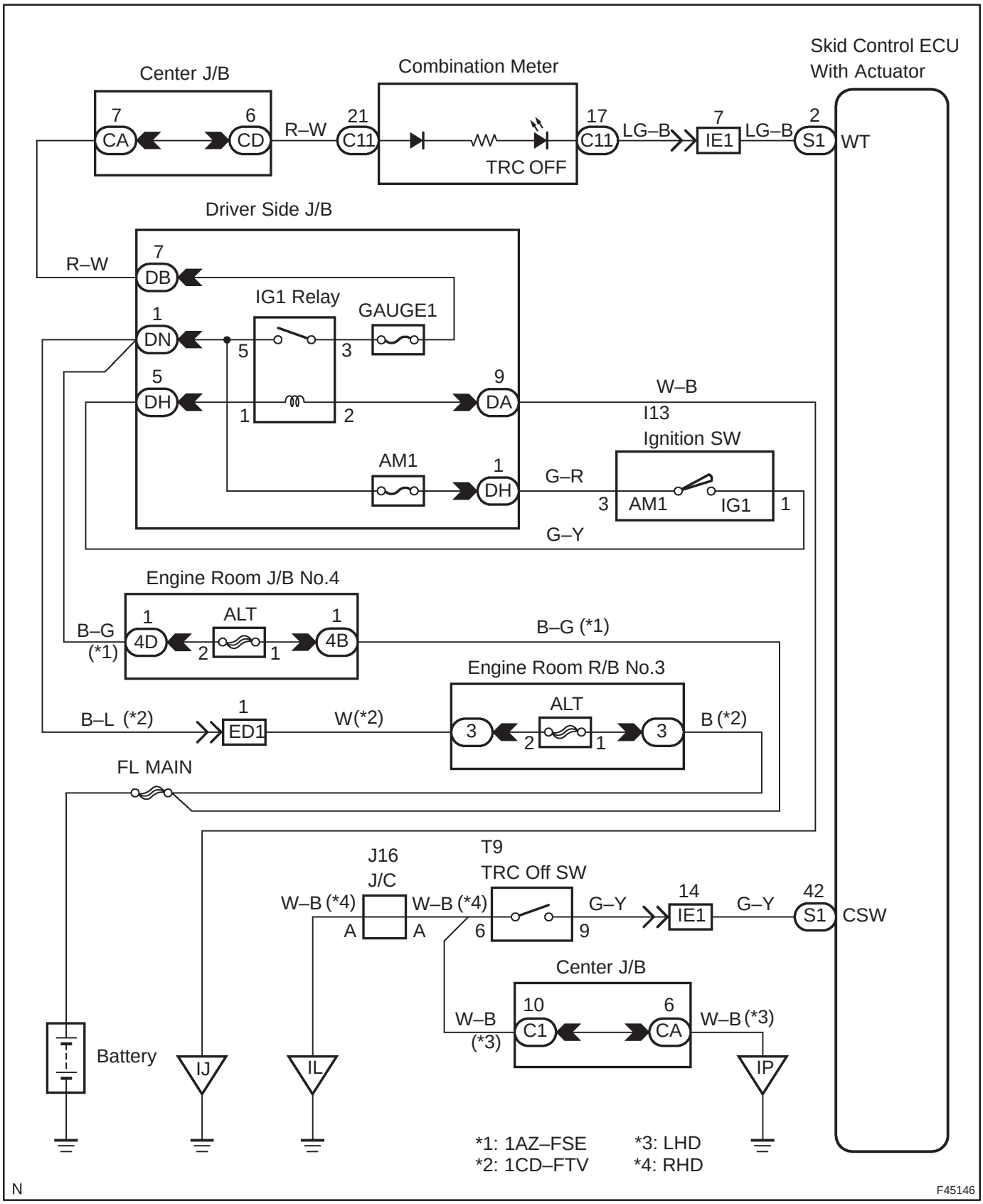
CSW (42) – GND (6, 10)	G–Y – W–B	IG switch ON, TRC OFF switch pressed	Below 1.5
		IG switch ON, TRC OFF switch released	8 to 14

TRC OFF INDICATOR, TRC CUT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

This is the TRC control main switch. When the TRC OFF switch is pressed, TRC control goes off and the TRC OFF indicator illuminates. Also, turn the TRC OFF indicator light to ”ON” when the VSC system is at the fail safe control. If the ignition switch is turned off, TRC control surely comes on the next time the ignition switch is turned ON.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(TRC OFF INDICATOR LIGHT)

(a) Check that ”ON” and ”OFF” of the TRC OFF indicator light is shown on the combination meter by the hand–held tester.

OK → **REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)**

NG

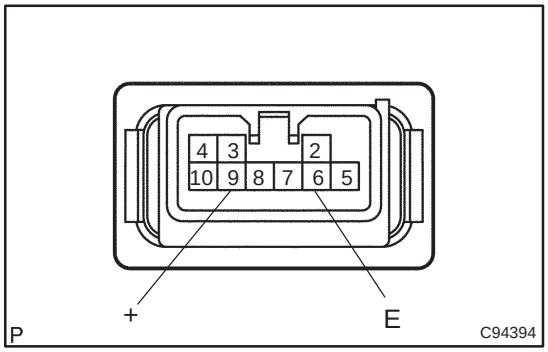
2	INSPECT TRC OFF INDICATOR LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → **REPAIR OR REPLACE COMBINATION METER ASSEMBLY**

OK

3	INSPECT TRACTION CONTROL SWITCH



(a) Remove the TRC OFF switch.
(b) Disconnect the TRC OFF switch connector.
(c) Measure resistance between terminals + and E of the TRC OFF switch when the TRC OFF switch is ON and OFF.

OK:

TRC OFF switch	Resistance
Pushed in	Continuity
Released	1MΩ or higher

NG → **REPLACE TRACTION CONTROL SWITCH**

OK

4	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – TRC OFF SWITCH)

(a) Check for an open or short circuit in harness and connector between terminal CSW of the skid control ECU and TRC OFF switch (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – COMBINATION METER)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

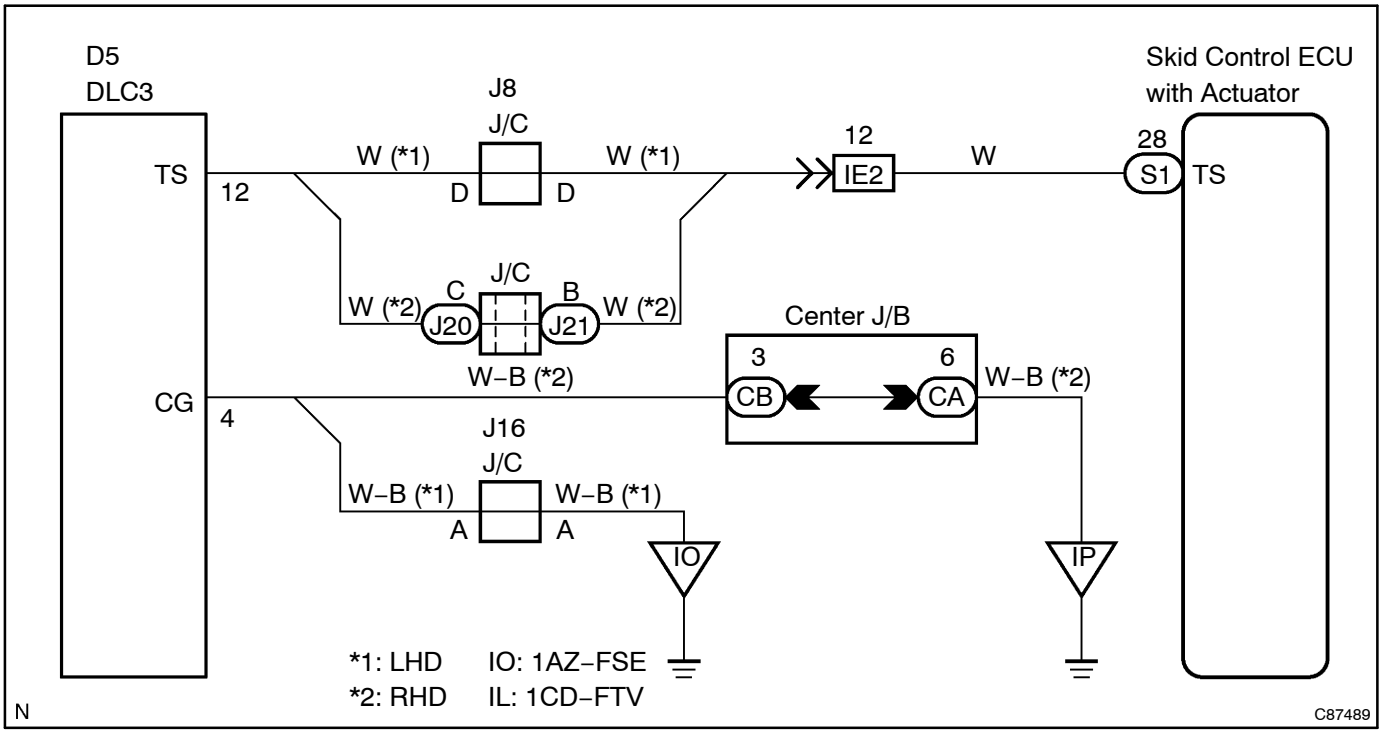
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

TS TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

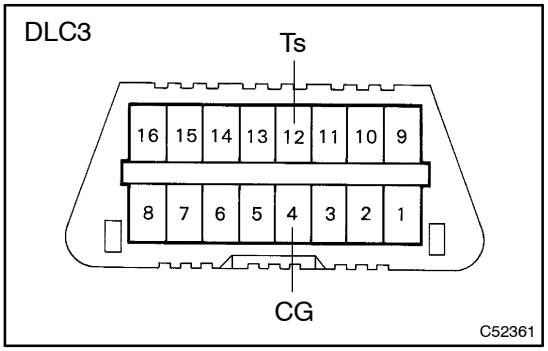
The sensor check circuit detects troubles in the sensor signal which cannot be detected by the DTC check. Connecting terminals Ts and CG of the DLC3 starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Ts TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Ts and CG of the DLC3.
OK:
Voltage: 10 to 14 V

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminal Ts of the DLC3 and skid control ECU (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK AND REPAIR HARNESS AND CONNECTOR(SKID CONTROL ECU – DLC3)

(a) Check for an open or short circuit in harness and connector between terminal CG of the DLC3 and body ground (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

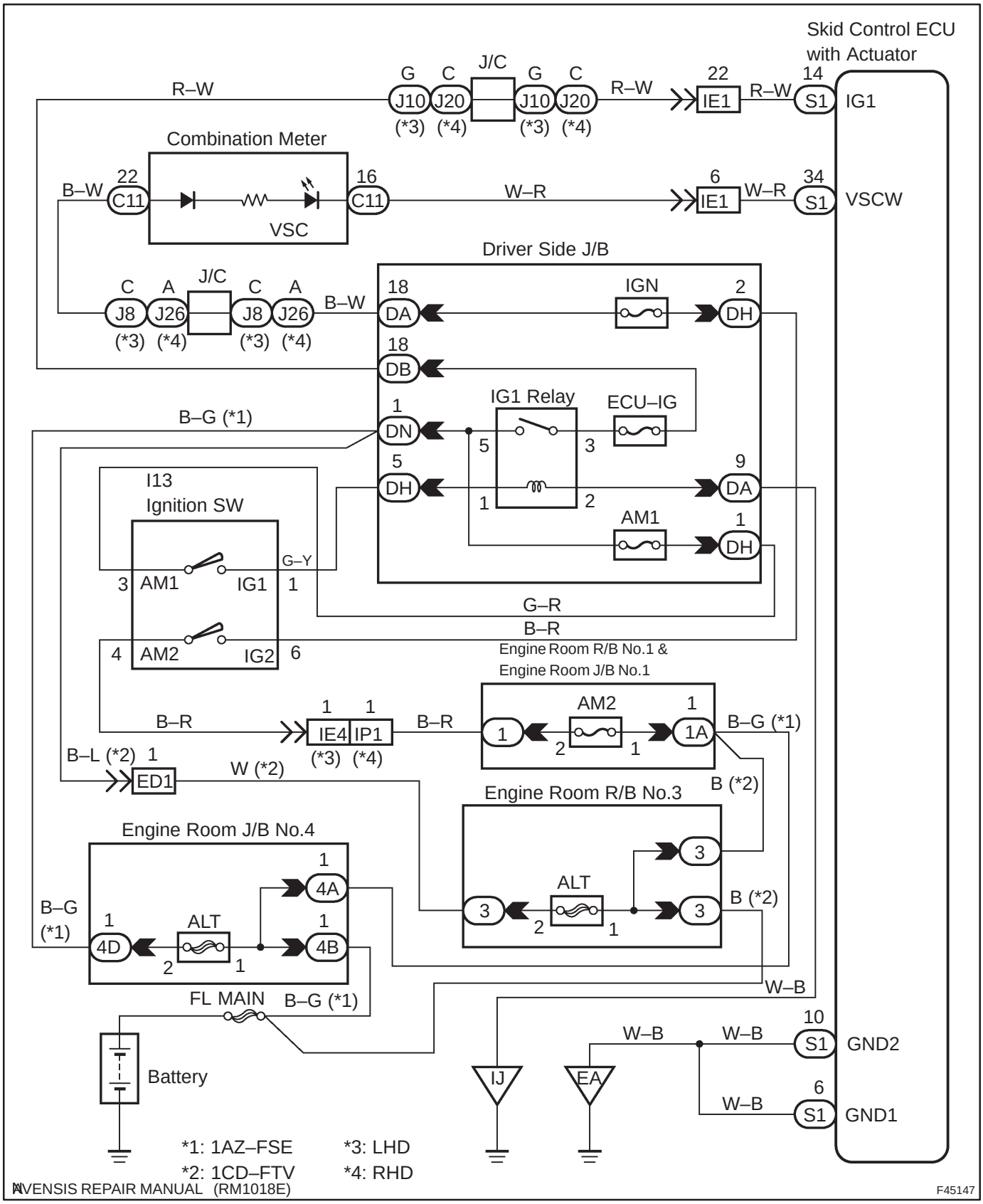
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

VSC WARNING LIGHT CIRCUIT (DOES NOT LIGHT UP)

CIRCUIT DESCRIPTION

When the ECU stores DTC, the VSC warning light illuminates on the combination meter.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSC WARNING LIGHT)

(a) Check that ”ON” and ”OFF” of the VSC warning light is shown on the combination meter by the hand–held tester.

OK → REPLACE ABS & TRACTION ACTUATOR ASSY (See page 32–57)

NG

2	INSPECT VSC WARNING LIGHT

(a) See combination meter troubleshooting on page 71–1.

NG → REPAIR OR REPLACE COMBINATION METER ASSEMBLY

OK

3	CHECK HARNESS AND CONNECTOR(COMBINATION METER – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the skid control ECU and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

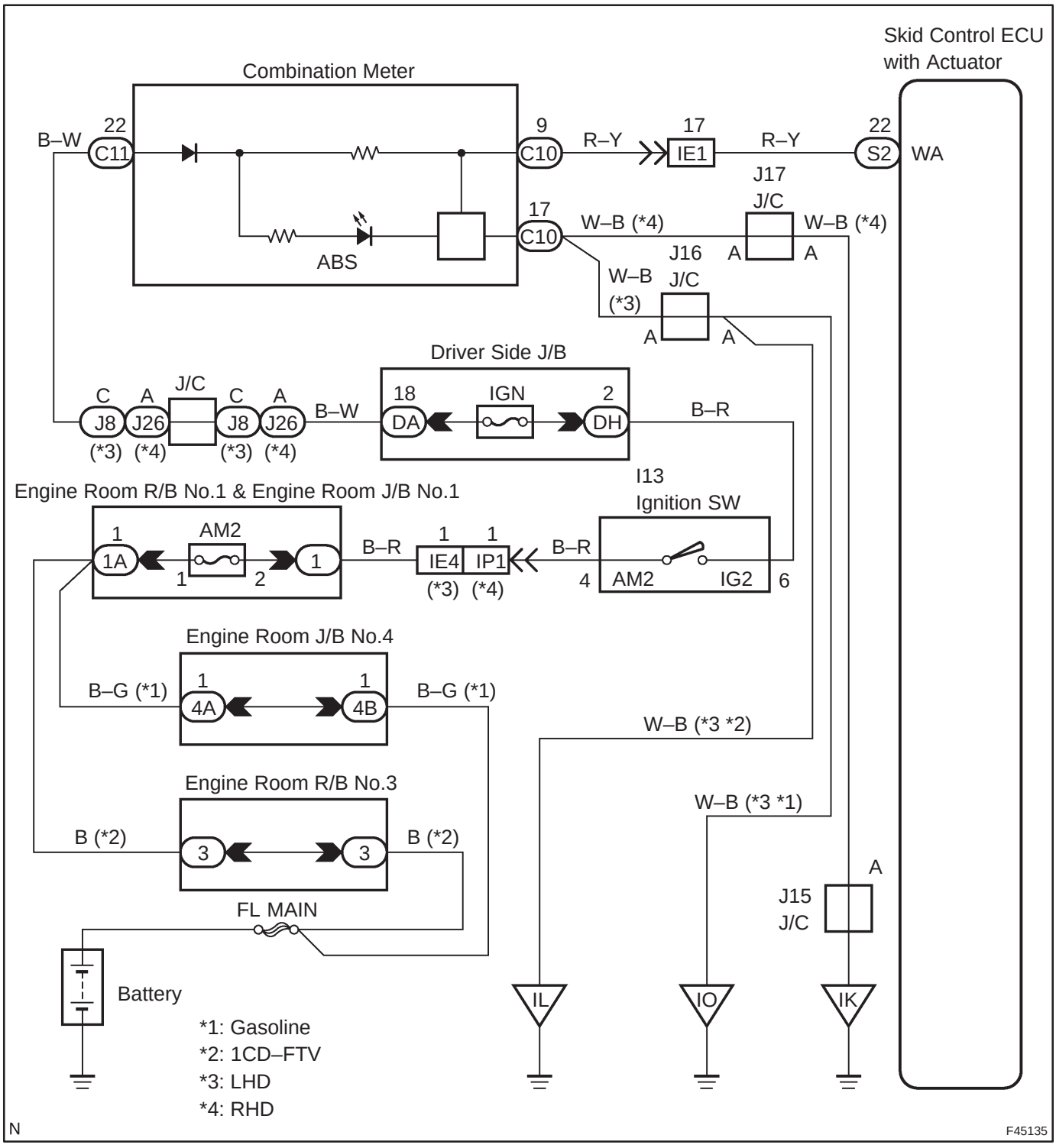
REPLACE ABS & TRACTION ACTUATOR ASSY(See page 32–57)

ABS WARNING LIGHT CIRCUIT (DOES NOT LIGHT UP)

CIRCUIT DESCRIPTION

If the ECU detects trouble, it will prohibit ABS control, turn on ABS warning light, and store the DTC. Connect terminals Tc and CG of the DLC3 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(ABS WARNING LIGHT)

(a) Check that ”ON” and ”OFF” of the ABS warning light is shown on the combination meter by the hand–held tester.

OK → **REPLACE BRAKE ACTUATOR ASSY (See page 32–54)**

NG

2	INSPECT COMBINATION METER ASSY(ABS WARNING LIGHT) (See page 71–1)

(a) Disconnect the connector from the skid control ECU.
(b) Turn the ignition switch ON.
(c) Check the ABS warning light.

OK:

ABS warning light comes on

NG → **REPAIR OR REPLACE COMBINATION METER ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(WA CIRCUIT)

(a) Check for a short circuit in harness and connector between terminal WA of the skid control ECU and combination meter (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

DTC	AlwaysON	MALFUNCTION IN ABS ECU

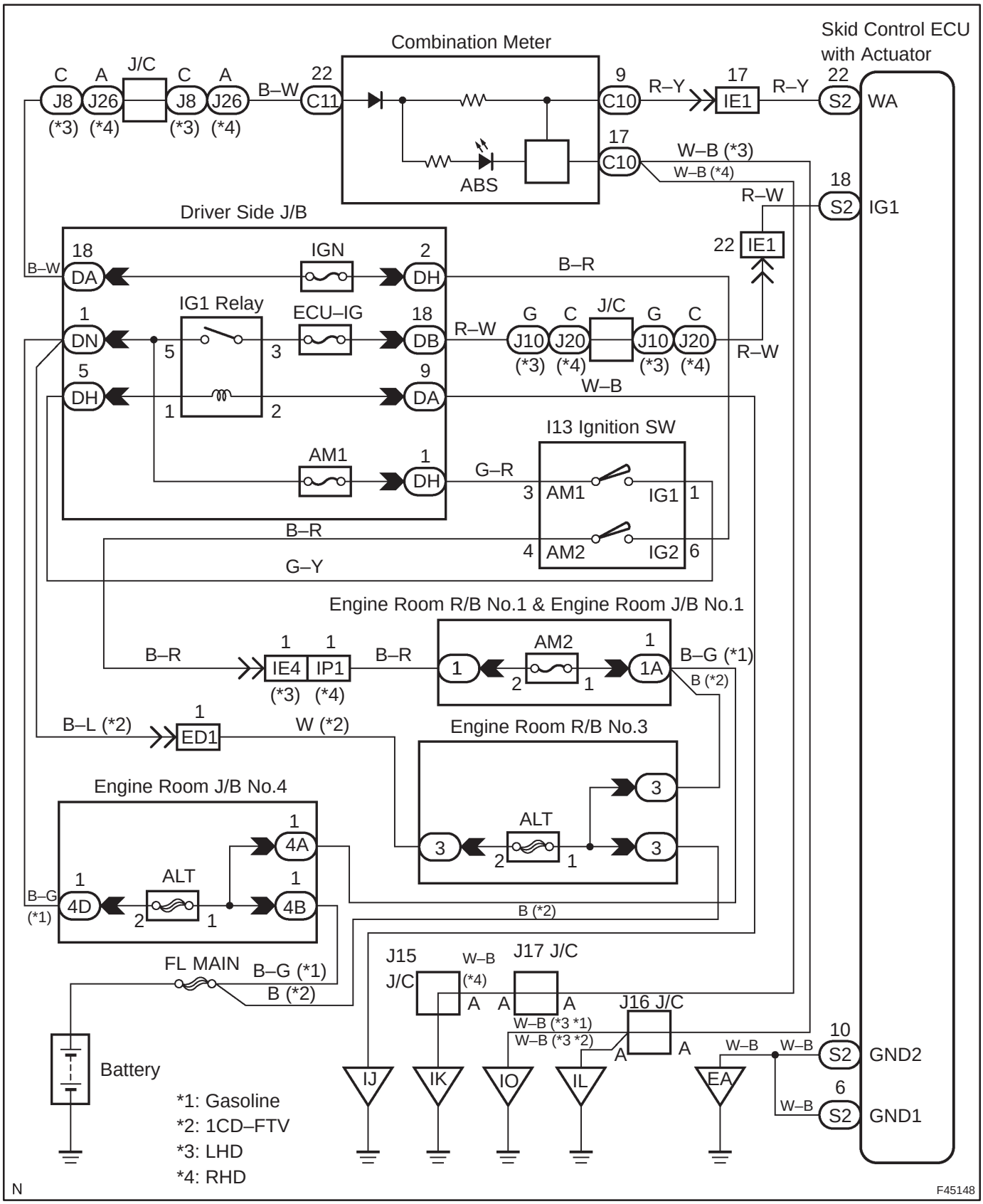
CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Either of the following 1 or 2 is detected: 1. The ECU connectors are disconnected from the ECU. 2. There is a malfunction in the ECU internal circuit.	• Battery • Charging system • Power source circuit • ABS warning light circuit • Skid control ECU

HINT:

There is a case that hand–held tester cannot be used when there is a malfunction in the ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check the DTCs are output (See page 05–699).

YES → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

NO

2	INSPECT SKID CONTROL ECU CONNECTOR SECURELY CONNECTED

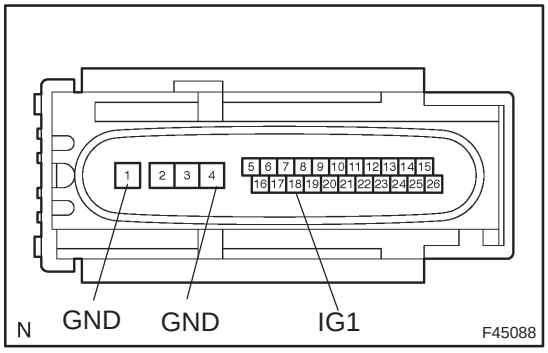
NO → **CONNECT CONNECTOR TO ECU**

YES

3	INSPECT SKID CONTROL ECU CONNECTOR(IG1 TERMINAL VOLTAGE)

IN CASE OF USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



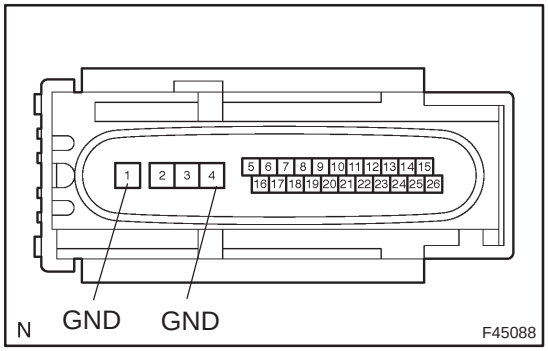
IN CASE OF NOT USING HAND–HELD TESTER:

(a) Disconnect the skid control ECU connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.
Voltage: 10 to 14 V

OK → **Go to step 5**

NG

4 INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



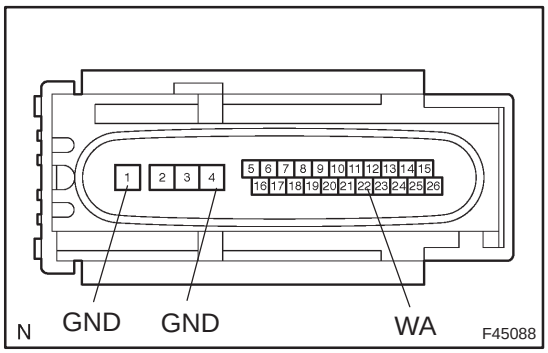
(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.
Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – IG1 TERMINAL) (See page 01–32)

5 INSPECT COMBINATION METER(ABS WARNING LIGHT)



(a) Disconnect the skid control ECU connector.
(b) Using service wire, connect terminals WA and GND of the skid control ECU harness side connector.
(c) Turn the ignition switch ON.
OK:
ABS warning light goes off.

NG → **REPAIR OR REPLACE COMBINATION METER**

OK

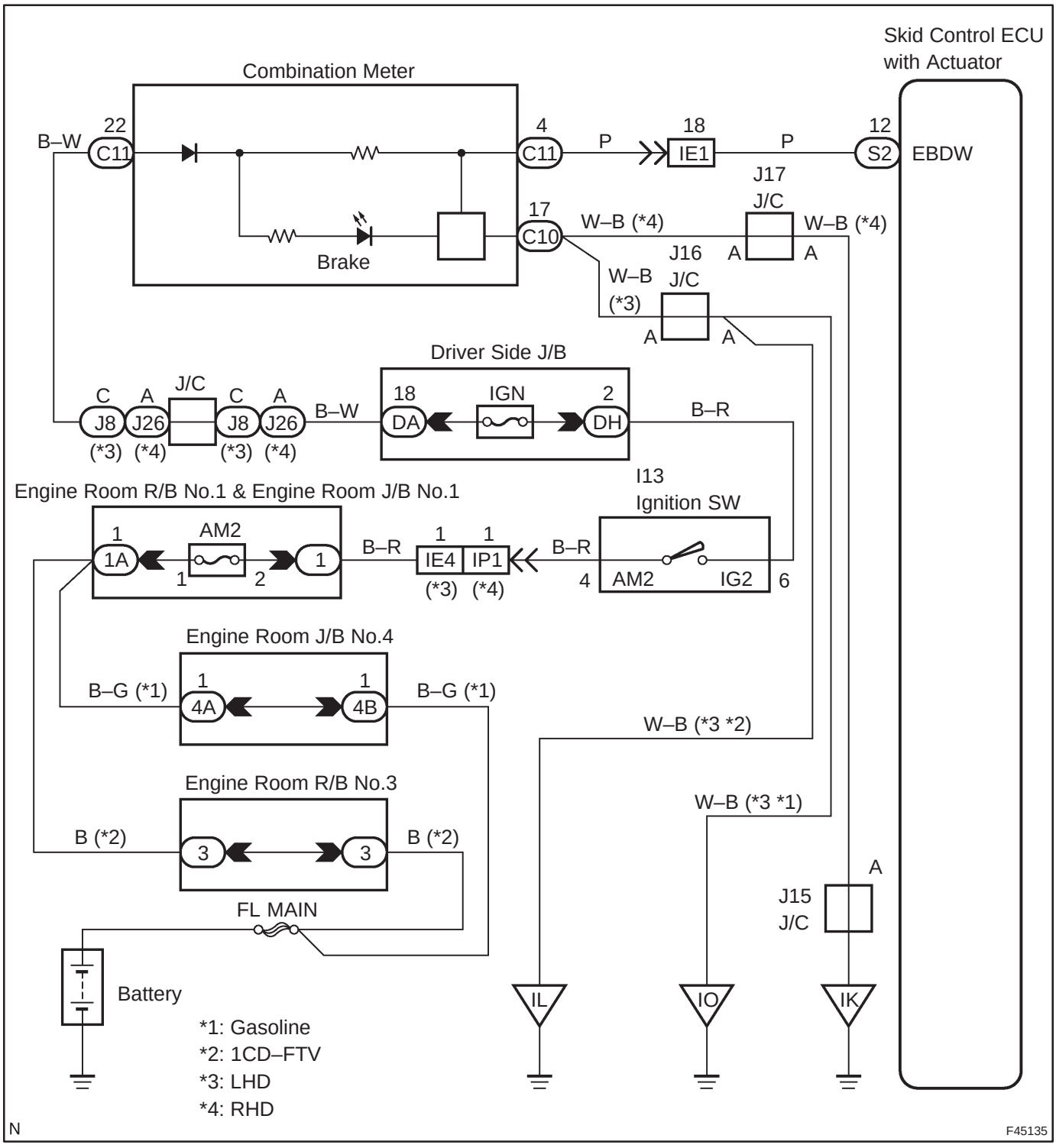
REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

BRAKE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

The Brake warning light comes on when the brake fluid is insufficient, the parking brake is applied or the EBD is defective.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check the DTC (See page 05–699).
OK:
Normal code

NG → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

OK

2	INSPECT PARKING BRAKE SWITCH CIRCUIT

(a) Check for an open or short circuit in the parking brake switch circuit (See page 01–32).

NG → **REPAIR OR REPLACE PARKING BRAKE SWITCH CIRCUIT**

OK

3	INSPECT BRAKE FLUID LEVEL WARNING SWITCH CIRCUIT

(a) Check the brake fluid level in reservoir.
(b) Check for an open or shot circuit in brake fluid level warning switch circuit (See page 01–32).

NG → **REPAIR OR REPLACE BRAKE FLUID LEVEL WARNING SWITCH CIRCUIT**

OK

4	INSPECT VACUUM WARNING SWITCH CIRCUIT

(a) Check for an open or short circuit in harness and connector between the vacuum warning switch and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	INSPECT COMBINATION METER ASSEMBLY(BRAKE WARNING LIGHT CIRCUIT)

(a) Check for an open or short circuit in the combination meter (See page 01–32).

NG → **REPAIR OR REPLACE COMBINATION METER ASSEMBLY**

OK

6	CHECK HARNESS AND CONNECTOR(BRAKE ACTUATOR – COMBINATION METER)

(a) Check for an open or short circuit in harness and connector between the brake actuator and combination meter (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

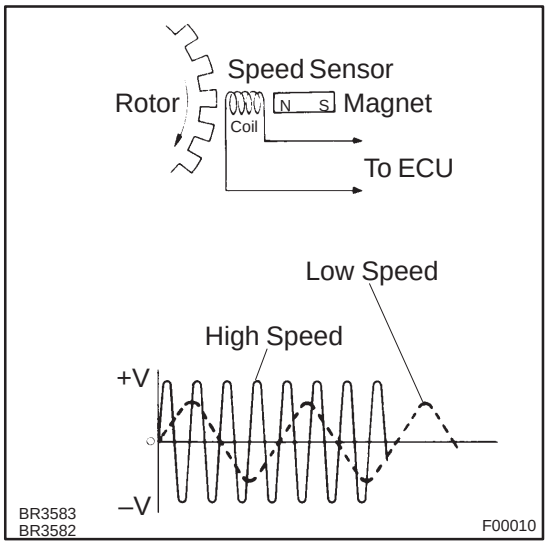
DTC	C0200/31	RIGHT FRONT SPEED SENSOR

DTC	C0205/32	LEFT FRONT SPEED SENSOR

DTC	C1330/35	RIGHT FRONT SPEED SENSOR CIRCUIT

DTC	C1331/36	LEFT FRONT SPEED SENSOR CIRCUIT

CIRCUIT DESCRIPTION



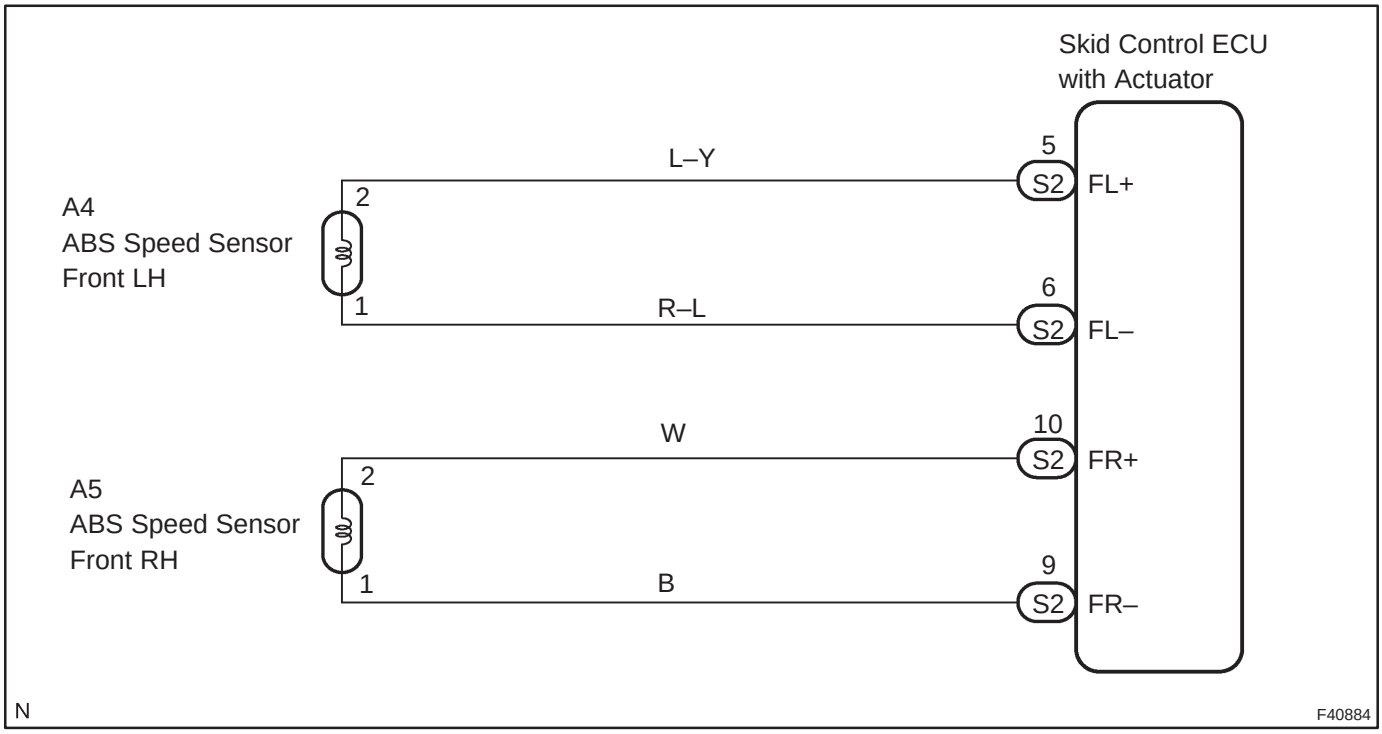
The speed sensor detects wheel speed and transmits the appropriate signals to the ECU. These signals are used for control of the ABS control system. Each of the front and rear rotors has 48 serrations.

When the rotors rotate, the magnetic field generated by the permanent magnet in the speed sensor induces an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

DTC No.	DTC Detecting Condition	Trouble Area
C0200/31 C0205/32	When any of the following 1. to 3. is detected : 1. Non–plausible high frequent signal, high wheel acceleration or high gradient for 20 sec. with the brake pedal applied or for 5 sec. when the brake pedal is not applied. 2. After the initial start or restart and when the vehicle speed has reached 12 km/h (7 mph), the wheel speed of 0 km/h (0 mph) is detected. 3. Deviation of 2 wheel speed.	• Right front and left front speed sensor • Speed sensor rotor
C1330/35 C1331/36	Detecting abnormality in the resistance value of each speed sensor.	• Right front and left front speed sensor • Speed sensor circuit

HINT:
DTC No. C0200/31 and C1330/35 are for the right front speed sensor.
DTC No. C0205/32 and C1331/36 are for the left front speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF HAND–HELD TESTER(FRONT SPEED SENSOR)

(a) Select the item "WHEEL SPEED FL (FR)" in the DATA LIST and read the value displayed on the hand–held tester.

(b) Check that there is no difference between the speed value output from the speed sensor displayed on the hand–held tester and the speed value displayed on the speedometer when driving the vehicle.

OK:

There is almost no difference in the displayed speed value.

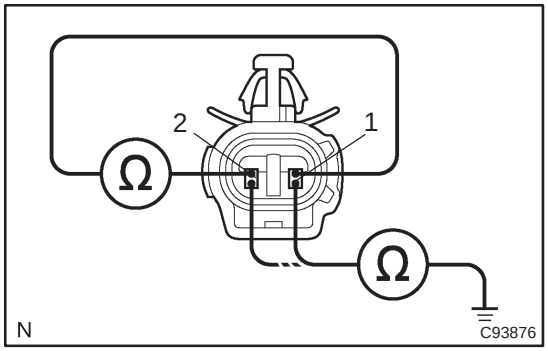
HINT:

There is tolerance of ±10 % in the speedometer indication.

OK	Go to step 5

NG

2 INSPECT FRONT SPEED SENSOR



(a) Remove the fender liner.
(b) Disconnect the speed sensor connector.
(c) Measure resistance between terminals 1 and 2 of the speed sensor connector.
OK:
Resistance: 1.2 to 1.6 kΩ at 20°C (68°F)
(d) Measure resistance between each of terminals 1 and 2 of the speed sensor connector and body ground.
OK:
Resistance: 1 MΩ or higher

NG → **REPLACE SPEED SENSOR FRONT RH**

NG → **REPLACE SPEED SENSOR FRONT LH**

NOTICE:
Check the speed sensor signal last (See page 05–699).

OK

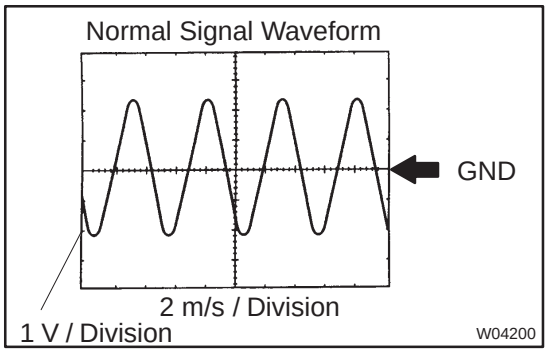
3 CHECK HARNESS AND CONNECTOR(FRONT SPEED SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each front speed sensor and the skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



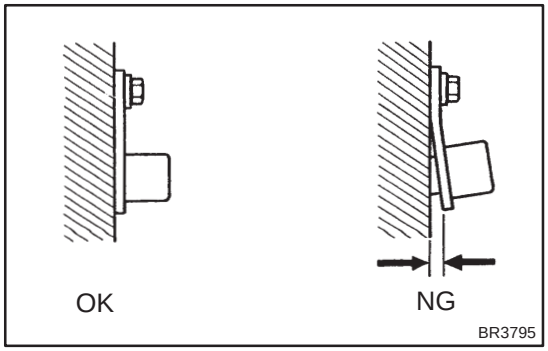
(REFERENCE) INSPECTION USING OSCILLOSCOPE
(a) Connect the oscilloscope to the terminal FR+ – FR– and FL+ – FL– of the skid control ECU.
(b) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

HINT:
- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform becomes shorter and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter deposited on it.

OK → **REPLACE BRAKE ACTUATOR ASSY (See page 32–54)**

NG

5 INSPECT FRONT SPEED SENSOR INSTALLATION



(a) Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and front steering knuckle.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

NG → **REPLACE SPEED SENSOR FRONT RH**

NG → **REPLACE SPEED SENSOR FRONT LH**

NOTICE:
Check the speed sensor signal last (See page 05–699).

OK

6 INSPECT SPEED SENSOR TIP

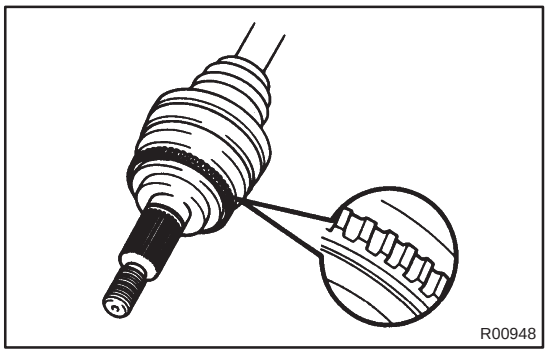
(a) Remove the front speed sensor (See page 32–59).
(b) Check the sensor tip.
OK:
No scratches or foreign objects on the sensor tip.

NG → **CLEAN OR REPAIR SPEED SENSOR**

NOTICE:
Check the speed sensor signal last (See page 05–699).

OK

7 INSPECT SPEED SENSOR ROTOR



(a) Remove the front speed sensor rotor (See page 30–6).
(b) Check the sensor rotor serrations.
OK:
No scratches, missing teeth or foreign objects.

HINT:
If a foreign object is attached, remove it and after reassembling, check the output waveform.

NG → **CLEAN OR REPAIR SPEED SENSOR ROTOR**

NOTICE:
Check the speed sensor signal last (See page 05–699).

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

DTC	C0210/33	RIGHT REAR SPEED SENSOR

DTC	C0215/34	LEFT REAR SPEED SENSOR

DTC	C1332/38	RIGHT REAR SPEED SENSOR CIRCUIT

DTC	C1333/39	LEFT REAR SPEED SENSOR CIRCUIT

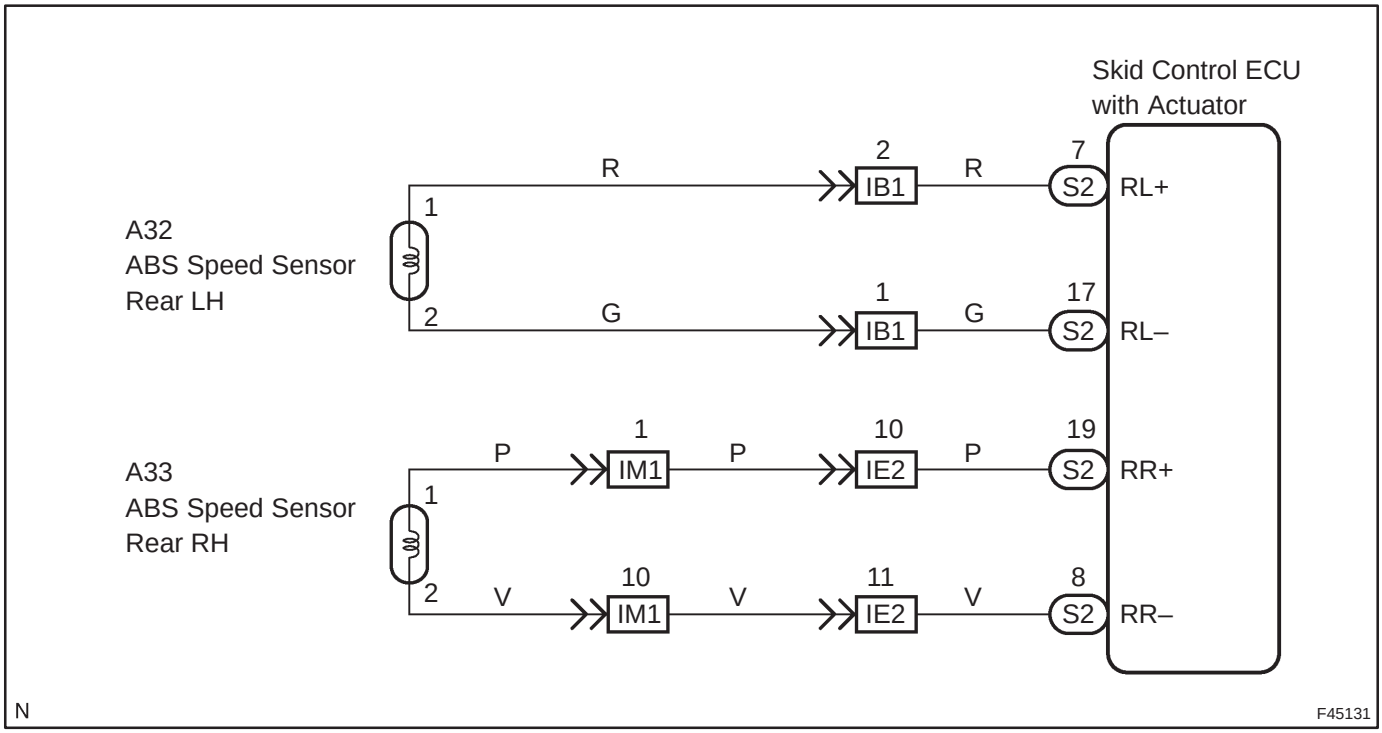
CIRCUIT DESCRIPTION

Refer to DTC C0200/31, C0205/32, C1330/35, C1331/36 on page 05–709.

DTC No.	DTC Detecting Condition	Trouble Area
C0210/33 C0215/34	When any of the following 1 to 3 is detected : 1. Non–plausible high frequent signal, high wheel acceleration or high gradient for 20 sec. with the brake pedal applied or for 5 sec. when the brake pedal is not applied. 2. After the initial start or restart and when the vehicle speed has reached 12 km/h (7 mph), the wheel speed of 0 km/h (0 mph) is detected. 3. Deviation of 2 wheel speed.	• Right rear and left rear speed sensor • Speed sensor rotor
C1332/38 C1333/39	Detecting abnormality in the resistance value of each speed sensor.	• Right rear and left rear speed sensor • Speed sensor circuit

HINT:
DTC No. C0210/33, C1332/38 are for the right rear speed sensor.
DTC No. C0215/34, C1333/39 are for the left rear speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

1	READ VALUE OF HAND–HELD TESTER(REAR SPEED SENSOR)

(a) Select the item "WHEEL SPEED RL (RR)" in the DATA LIST and read the value displayed on the hand–held tester.

(b) Check that there is no difference between the speed value output from the speed sensor displayed on the hand–held tester and the speed value displayed on the speedometer when driving the vehicle.
OK: There is almost no difference in the displayed speed value.

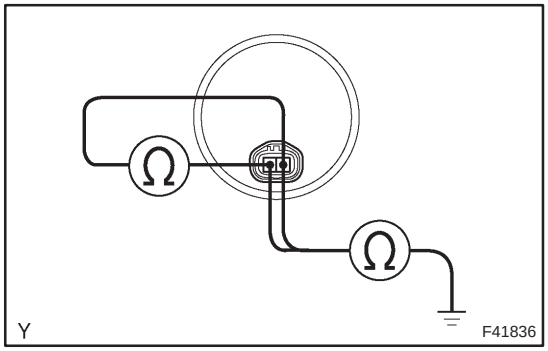
HINT:

There is tolerance of ± 10 % in the speedometer indication.

OK	Go to step 5

NG

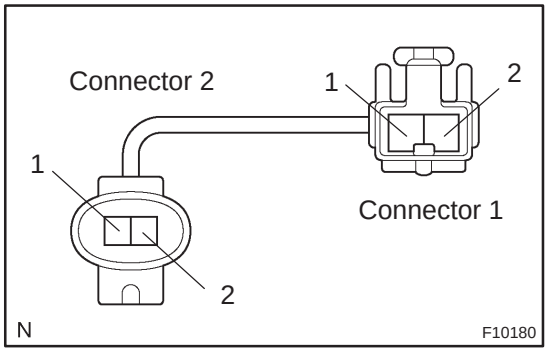
2	INSPECT REAR SPEED SENSOR



(a) Disconnect the skid control sensor connector.

(b) Measure resistance between terminals 1 and 2 of the skid control sensor connector.
OK: Resistance: 2.2 kΩ or less

(c) Measure resistance between each of terminals 1 and 2 of the skid control sensor connector and body ground.
OK: Resistance: 1 MΩ or higher



Skid control Sensor Sub–Wire Harness:

(a) Disconnect the sub–wire harness connector from floor wire harness.

(b) Make sure that there is no looseness at the connector lock part and connecting part of the connector.

(c) Measure resistance between terminal 1 of the connector 1 and terminal 2 of the connector 2.
OK: 1 Ω or lower

(d) Measure resistance between terminal 2 of the connector 1 and terminal 1 of the connector 2.
OK: 1 Ω or lower

(e) Measure resistance between terminals 1 and 2 of the speed sensor connector 1 and body ground.
OK: 10 MΩ or higher

NOTICE:

Check the speed sensor signal last (See page 05–699).

NG	REPLACE SKID CONTROL SENSOR OR SUB–WIRE HARNESS

OK

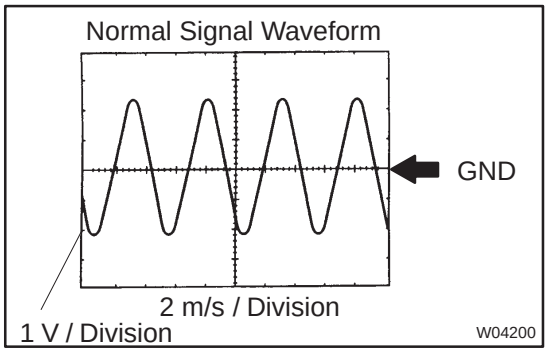
3	CHECK HARNESS AND CONNECTOR(SKID CONTROL SENSOR – SKID CONTROL ECU)

(a) Check for on open or short circuit in harness and connector between each skid control sensor and the skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT SENSOR AND SENSOR ROTOR SERRATIONS



(REFERENCE) INSPECTION USING OSCILLOSCOPE

(a) Connect the oscilloscope to the terminals RR+ – RR– and RL+ – RL– of the skid control ECU.

(b) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

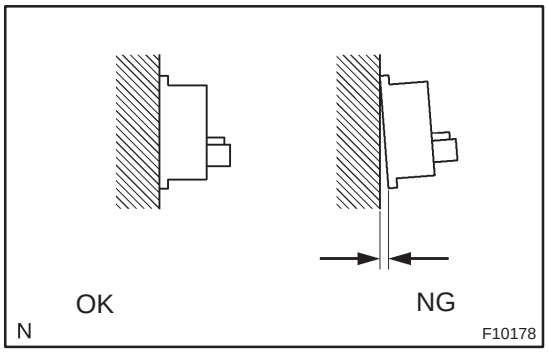
HINT:

- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform becomes shorter and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter deposited on it.

OK → **REPLACE BRAKE ACTUATOR ASSY (See page 32–54)**

NG

5	INSPECT SENSOR INSTALLATION



(a) Check the sensor installation.

OK:

There is no clearance between the sensor and rear axle carrier.

NOTICE:

Check the speed sensor signal last (See page 05–699).

NG → **REPLACE SKID CONTROL SENSOR OR SUB–WIRE HARNESS**

OK

6	INSPECT SPEED SENSOR TIP

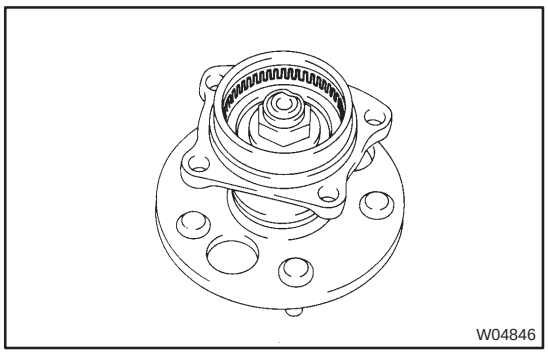
(a) Remove the skid control sensor (See page 32–61).
(b) Check the sensor tip.
OK:
No scratches or foreign objects on the sensor tip.

NOTICE:
Check the speed sensor signal last (See page 05–699).

NG → **CLEAN OR REPAIR SKID CONTORL SENSOR**

OK

7	INSPECT SENSOR ROTOR



(a) Check the sensor rotor serrations.
OK:
No scratches, missing teeth or foreign objects.

NOTICE:
Check the speed sensor signal last (See page 05–699).

NG → **REPLACE REAR AXLE HUB & BEARING ASSY RH**

NG → **REPLACE REAR AXLE HUB & BEARING ASSY LH**

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

DTC	C0226/21	SFR SOLENOID CIRCUIT

DTC	C0236/22	SFL SOLENOID CIRCUIT

DTC	C0246/23	SRR SOLENOID CIRCUIT

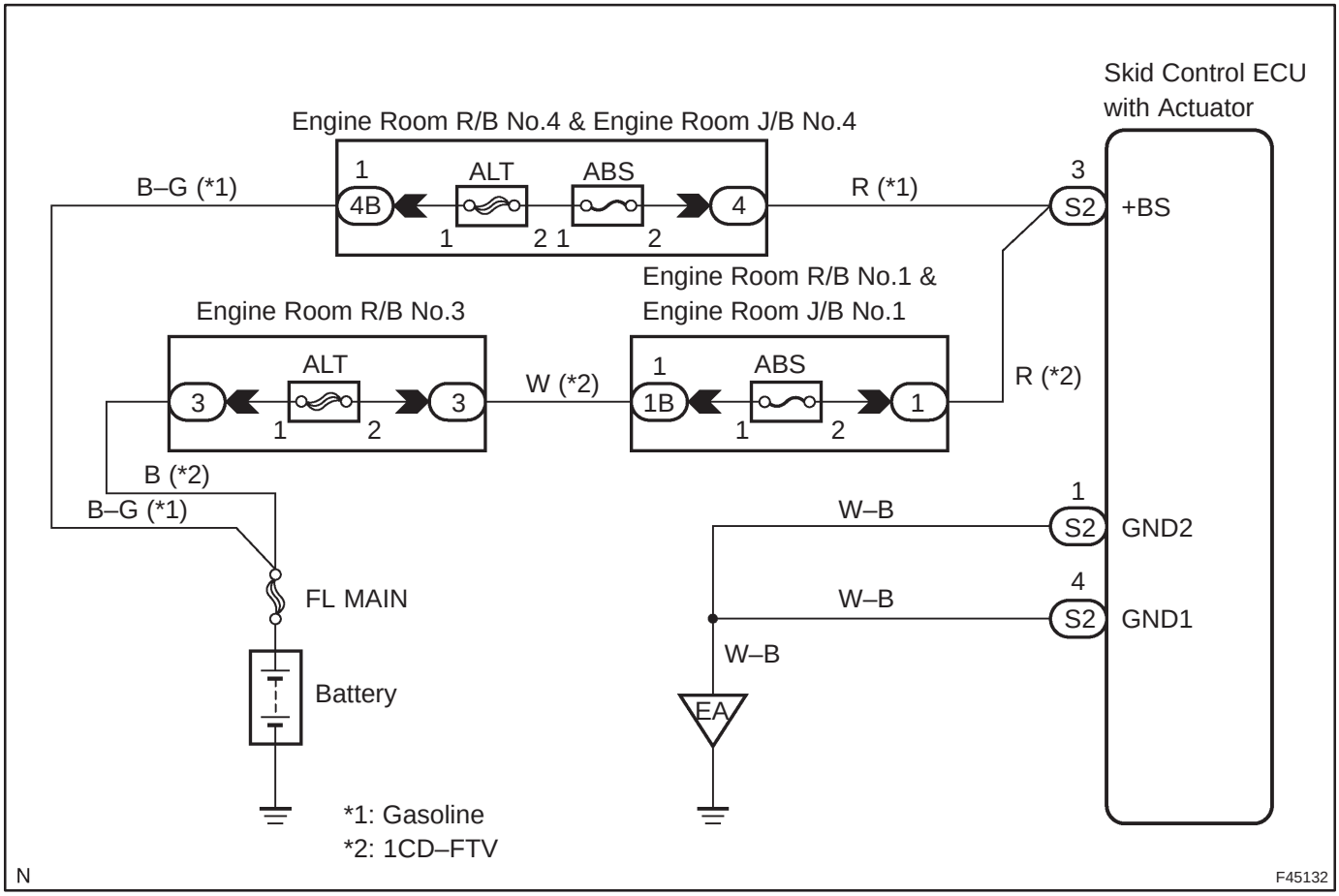
DTC	C0256/24	SRL SOLENOID CIRCUIT

CIRCUIT DESCRIPTION

This solenoid goes on when receiving signals from the ECU and controls the pressure acting on the wheel cylinders to control the braking force.

DTC No.	DTC Detecting Condition	Trouble Area
C0226/21 C0236/22 C0246/23 C0256/24	Solenoid valve signal does not match to the check result.	• Each solenoid circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check if other DTCs are detected (See page 05–699).

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

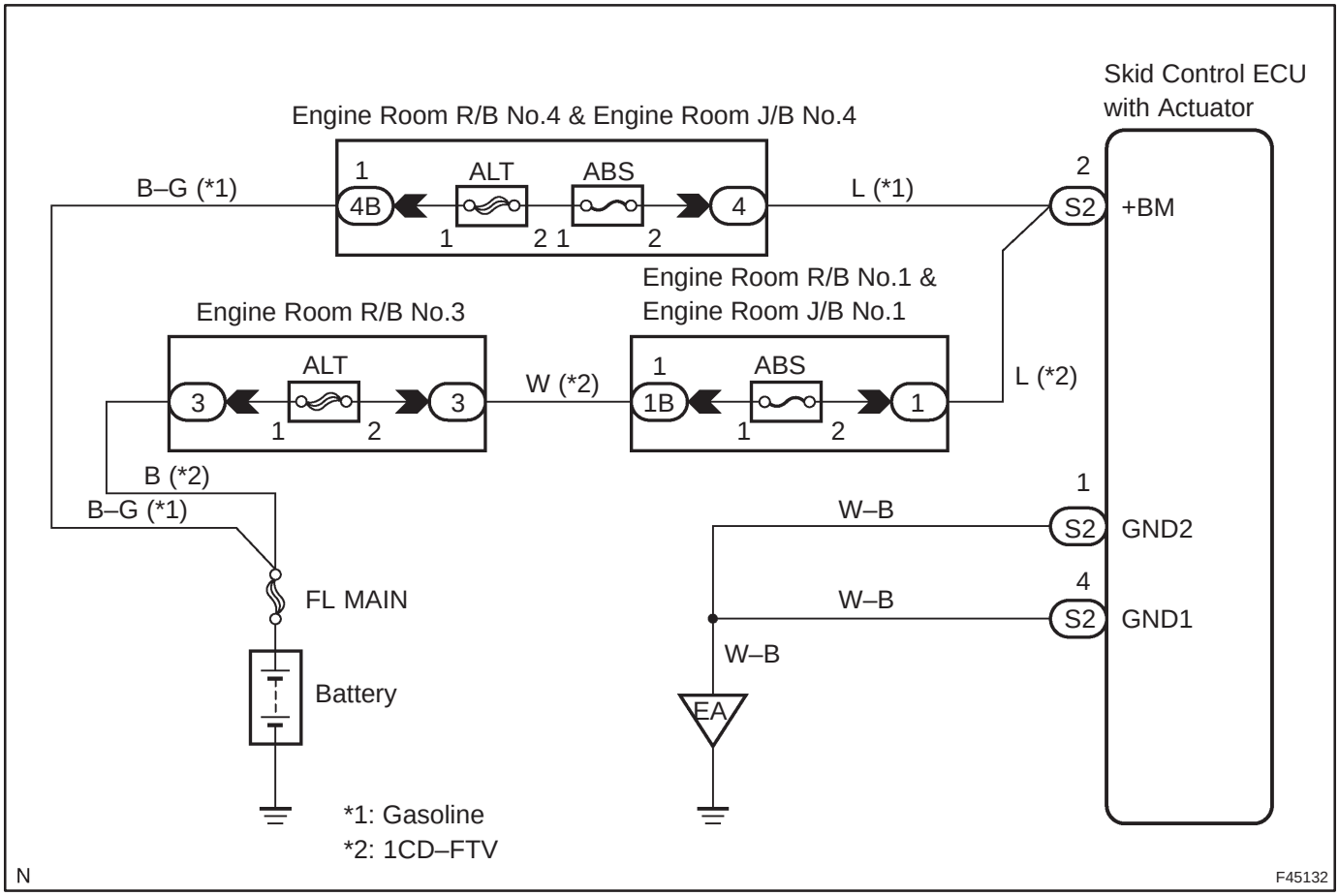
DTC	C0273/13	OPEN OR SHORT CIRCUIT IN ABS MOTOR RELAY CIRCUIT

CIRCUIT DESCRIPTION

The ABS motor relay supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the motor relay ON and operates the ABS pump motor.

DTC No.	DTC Detecting Condition	Trouble Area
C0273/13	Detection of any conditions from 1 to 3: 1. Pump motor voltage is 2.0 V or more for 1 sec. or more at motor relay OFF. 2. Pump motor voltage is (IG – 4.0 V) or less for 0.1 sec. or more at motor relay ON. 3. After the end of the actuation of the motor relay slow down condition of motor does not meet the specification.	• ABS motor relay • ABS motor relay circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 if you are using the hand–held tester and start from step 2 if you are not using the hand–held tester.

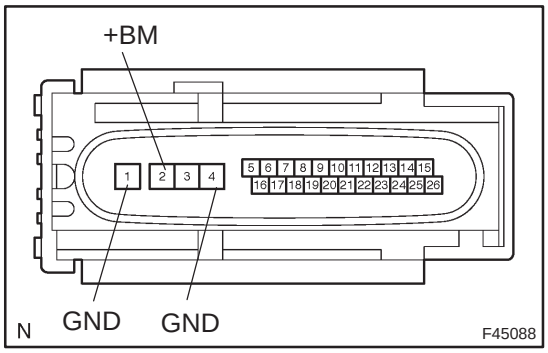
1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(ABS MOTOR RELAY)

(a) Check the operation sound of the ABS motor individually when operating it with the hand–held tester.
OK:
The operation sound of the ABS motor is heard.

OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

2	INSPECT SKID CONTROL ECU CONNECTOR(+BM TERMINAL VOLTAGE)

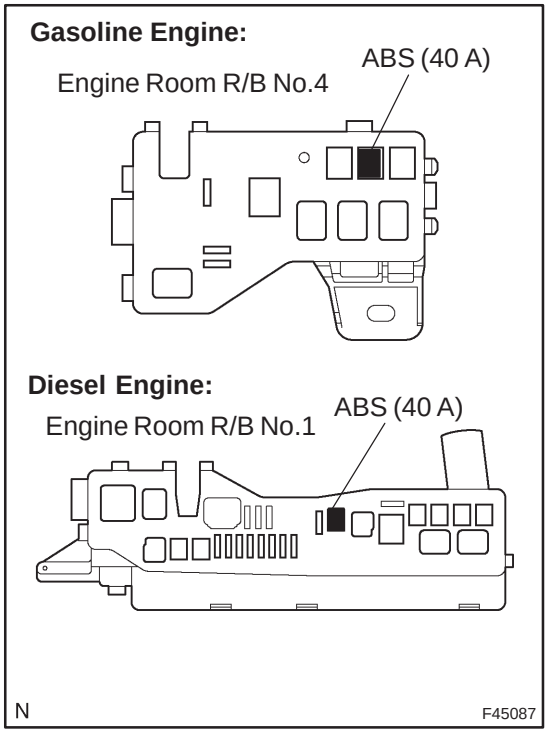


(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminals +BM and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

3 INSPECT FUSE(ABS FUSE)



(a) Remove the ABS (40 A) fuse from the engine room R/B No.4 (Gasoline engine) or engine room R/B No.1 (Diesel engine).

(b) Check continuity of the ABS fuse.

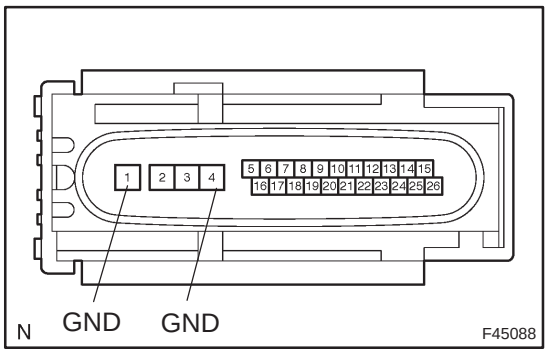
OK:

Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

4 INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

CHECK AND REPLACE HARNESS AND CONNECTOR(BATTERY – +BM TERMINAL) (See page 01–32)

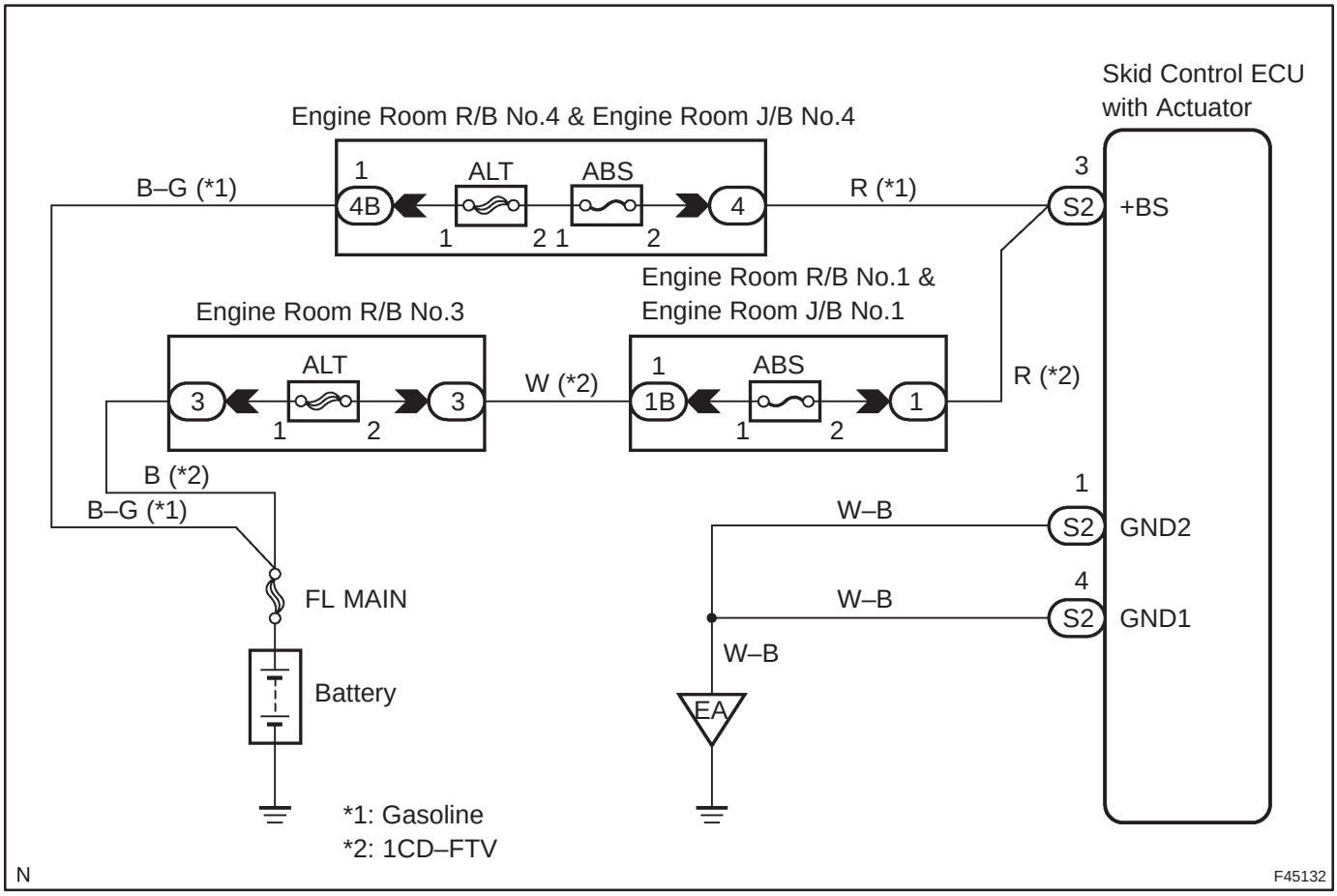
DTC	C0278/11	OPEN OR SHORT CIRCUIT IN ABS SOLENOID RELAY

CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

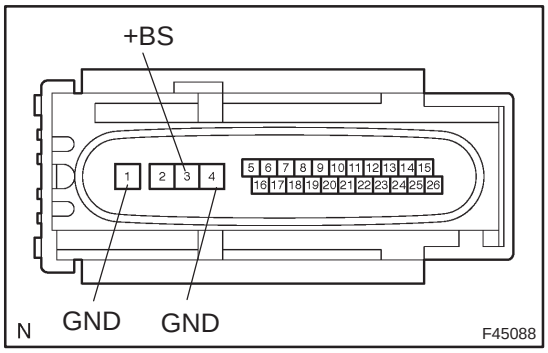
DTC No.	DTC Detecting Condition	Trouble Area
C0278/11	Detection of any conditions from 1 to 3: 1. Internal circuit malfunction in ECU. 2. Valve relay voltage is 0.8 x IG or less for 0.5 sec. 3. Valve relay voltage is high level at valve relay OFF.	• ABS solenoid relay • ABS solenoid relay circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT SKID CONTROL ECU CONNECTOR(+BS TERMINAL VOLTAGE)



(a) Disconnect the skid control ECU connector.
(b) Measure the voltage between terminals +BS and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

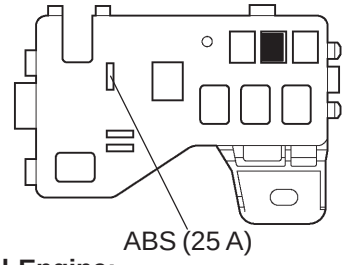
OK → **IF THE SAME CODE IS STILL OUTPUT AFTER THE DTC IS DELETED, CHECK THE CONTACT CONDITION OF EACH CONNECTION**

NG

2 INSPECT FUSE(ABS FUSE)

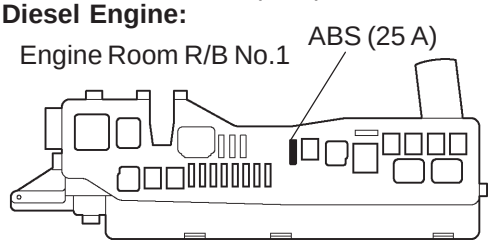
Gasoline Engine:

Engine Room R/B No.4



Diesel Engine:

Engine Room R/B No.1



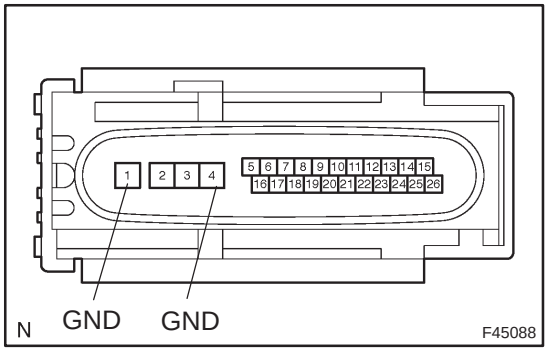
N F45087

(a) Remove the ABS (25 A) fuse from the engine room R/B No.4 (Gasoline engine) or engine room R/B No.1 (Diesel engine).
(b) Check continuity of the ABS fuse.
OK:
Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

3	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR(GND TERMINAL – BODY GROUND) (See page 01–32)**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – +BS TERMINAL) (See page 01–32)

DTC C1237/37 SPEED SENSOR ROTOR FAULTY

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1237/37	Detection of any of conditions from 1 through 4: 1. Wheel speed deviation of unspecified wheel. 2. Wheel sensor signal failure suspicion. 3. Continuous ABS control for 60 sec. or more.	• Speed sensor • Sensor rotor

INSPECTION PROCEDURE

1 INSPECT TIRE SIZE

NG → **REPLACE TIRES SO THAT ALL 4 TIRES ARE SAME IN SIZE**

OK

2 INSPECT SPEED SENSOR ROTOR

NG → **REPLACE SENSOR ROTOR**

OK

3 INSPECT SPEED SENSOR

NG → **REPLACE SPEED SENSOR**

OK

4 CHECK HARNESS AND CONNECTOR(SPEED SENSOR – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between each terminal of speed sensor and the skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

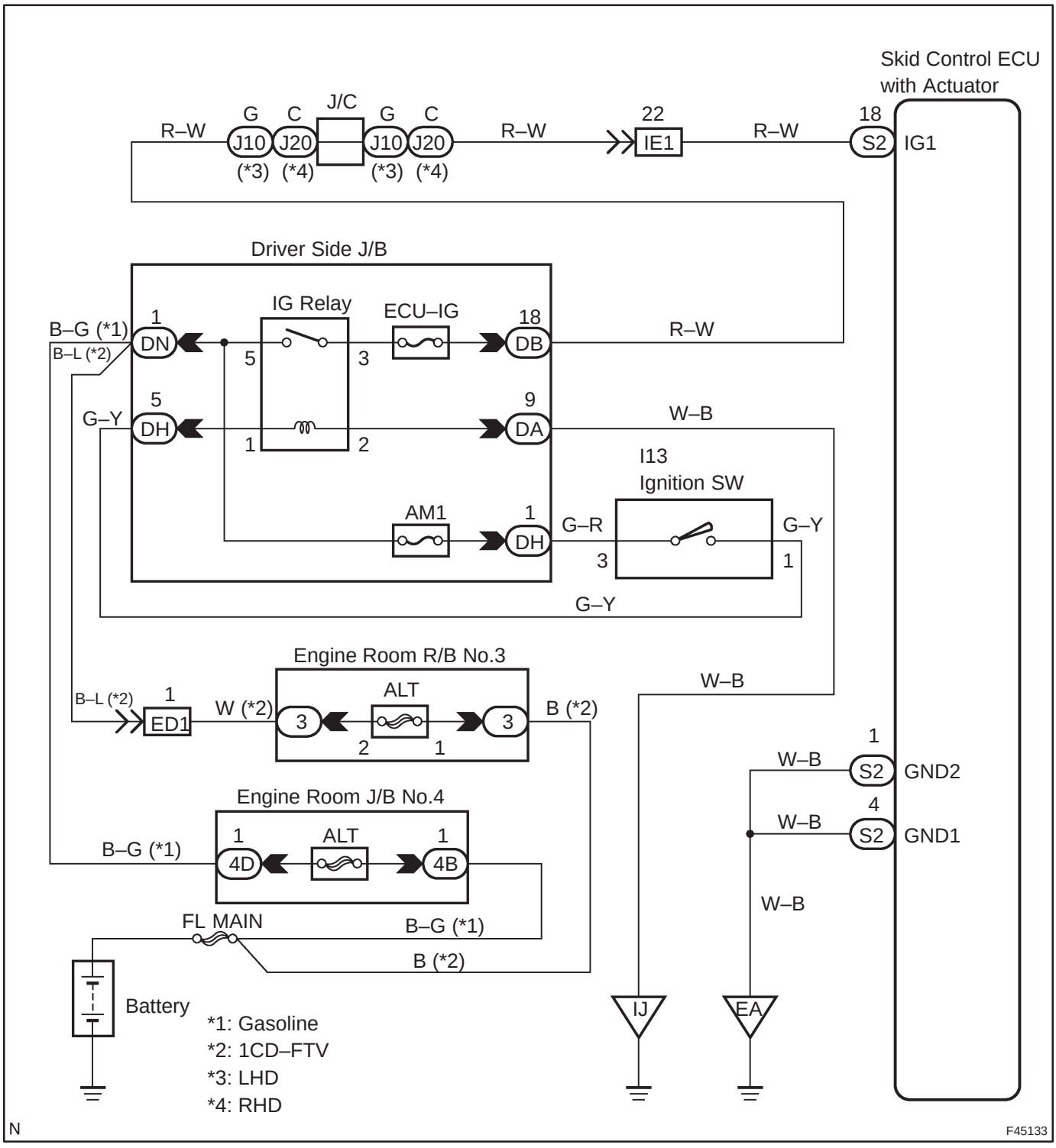
DTC	C1241/41	LOW BATTERY POSITIVE VOLTAGE OR ABNORMALLY HIGH BATTERY POSITIVE VOLTAGE

CIRCUIT DESCRIPTION

This is the power source of the ECU, hence the actuators.

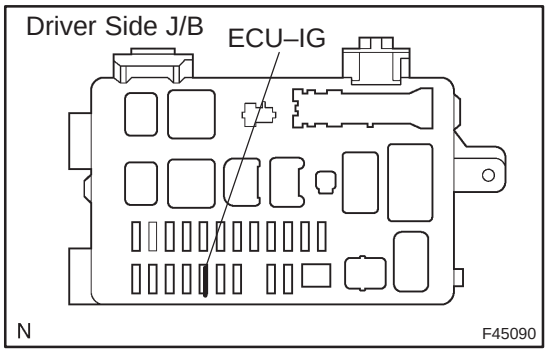
DTC No.	DTC Detecting Condition	Trouble Area
C1241/41	With vehicle speed to about 6 km/h (4 mph), battery voltage is less than 9.4 V at the time of non–operation of ABS control or less than 9.2 V at the time of operation of ABS control, or battery voltage is more than 16.9 V.	• Battery • Charging system • Power source circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT FUSE(ECU–IG FUSE)



(a) Remove the ECU–IG fuse from the driver side J/B.
(b) Check continuity of the ECU–IG fuse.
OK:
Continuity

NG → **INSPECT FOR SHORT CIRCUIT IN ALL HARNESS AND COMPONENTS CONNECTED TO ECU–IG FUSE**

OK

2	INSPECT BATTERY

OK:
Voltage: 10 to 14 V

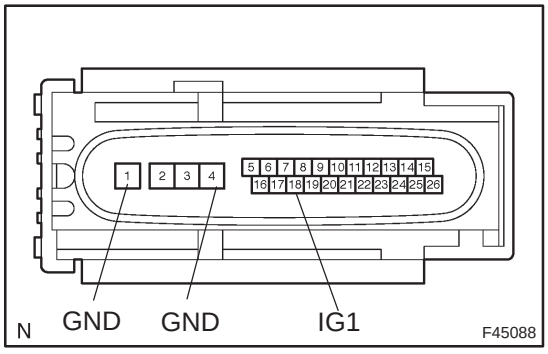
NG → **INSPECT CHARGING SYSTEM**

OK

3	INSPECT SKID CONTROL ECU CONNECTOR(IG1 TERMINAL VOLTAGE)

IN CASE OF USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



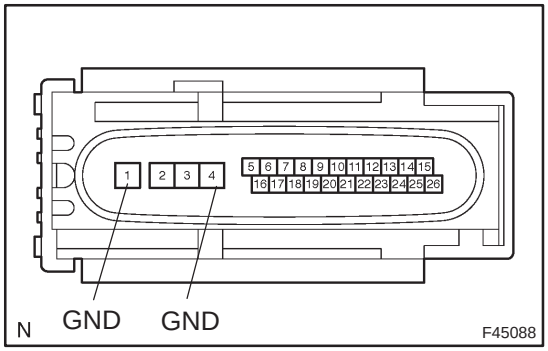
IN CASE OF NOT USING HAND–HELD TESTER:

(a) Disconnect the skid control ECU connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **REPLACE BRAKE ACTUATOR ASSY (See page 32–54)**

NG

4	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

(b)

OK:

Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR(GND TERMINAL – BODY GROUND) (See page 01–32)**

OK

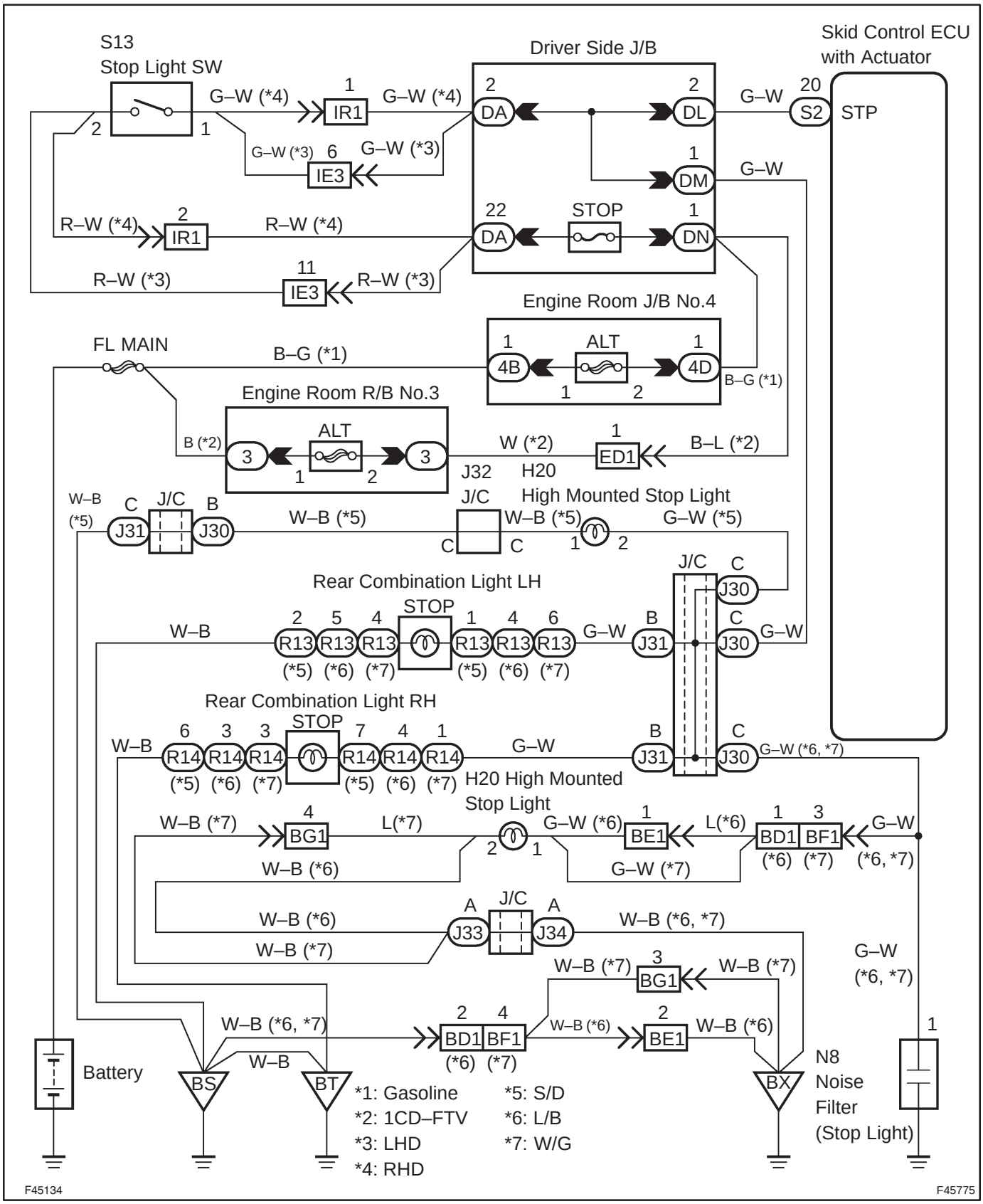
CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – IG1 TERMINAL) (See page 01–32)

DTC C1249/58 STOP LIGHT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1249/58	Stop light switch circuit is open, and stop light switch voltage is in the level between 40 % and 70 % of the battery voltage.	• Stop light switch • Stop light switch circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

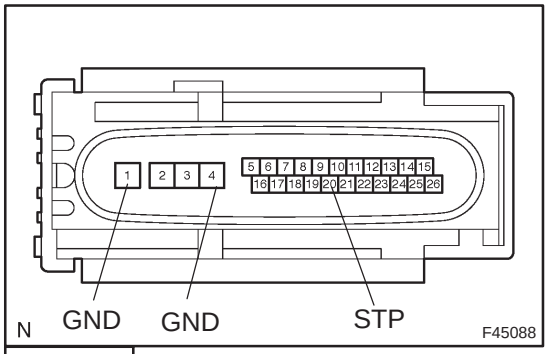
1	INSPECT STOP LAMP SWITCH ASSY

(a) Check that the stop light comes on when the brake pedal is depressed and goes off when the brake pedal is released.

NG → **Go to step 4**

OK

2	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(STP TERMINAL)



(a) Disconnect skid control ECU connector.
(b) Measure the voltage between terminal STP and GND of the skid control ECU harness side connector when the brake pedal is depressed.
OK:
Voltage: 10 to 14 V

OK → **REPLACE BRAKE ACTUATOR ASSY (See page 32–54)**

NG

3	CHECK HARNESS AND CONNECTOR(STOP LIGHT SWITCH – SKID CONTROL ECU)

(a) Check for an open or short circuit in harness and connector between the stop light switch and skid control ECU (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–708)

4	CHECK HARNESS AND CONNECTOR(STOP LIGHT CIRCUIT)

(a) Check for an open or short circuit in harness and connector of the stop light circuit (See page 01–32).

OK → **REPLACE STOP LAMP SWITCH ASSY**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC C1300/62 SKID CONTROL ECU MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1300/62	Internal control unit of skid control ECU failure.	• ECU

INSPECTION PROCEDURE

1	RECONFIRM DTC

A	DTC C1300/62
B	Except DTC C1300/62

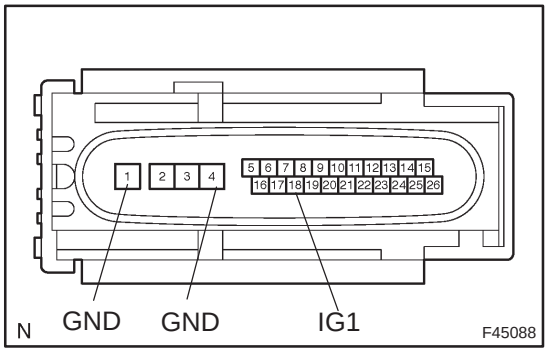
B → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

A

2	INSPECT SKID CONTROL ECU CONNECTOR(IG1 TERMINAL VOLTAGE)

IN CASE OF USING HAND–HELD TESTER:

(a) Check the voltage condition, which is output from the ECU and displayed on the hand–held tester.
OK:
"Normal" is displayed.



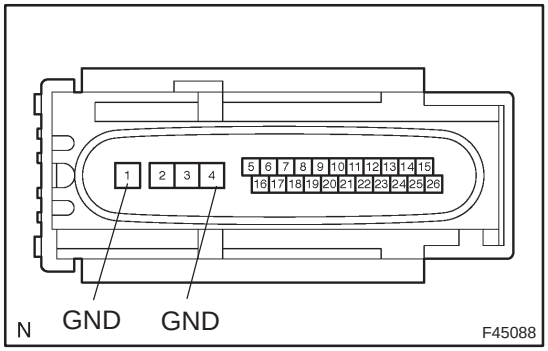
IN CASE OF NOT USING HAND–HELD TESTER:

(a) Disconnect the skid control ECU connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG1 and GND of the skid control ECU harness side connector.
OK:
Voltage: 10 to 14 V

OK → **REPLACE BRAKE ACTUATOR ASSY (See page 32–54)**

NG

3	INSPECT SKID CONTROL ECU CONNECTOR(GND TERMINAL CONTINUITY)



(a) Measure resistance between terminal GND of the skid control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR(GND TERMINAL – BODY GROUND)(See page 01–32)**

OK

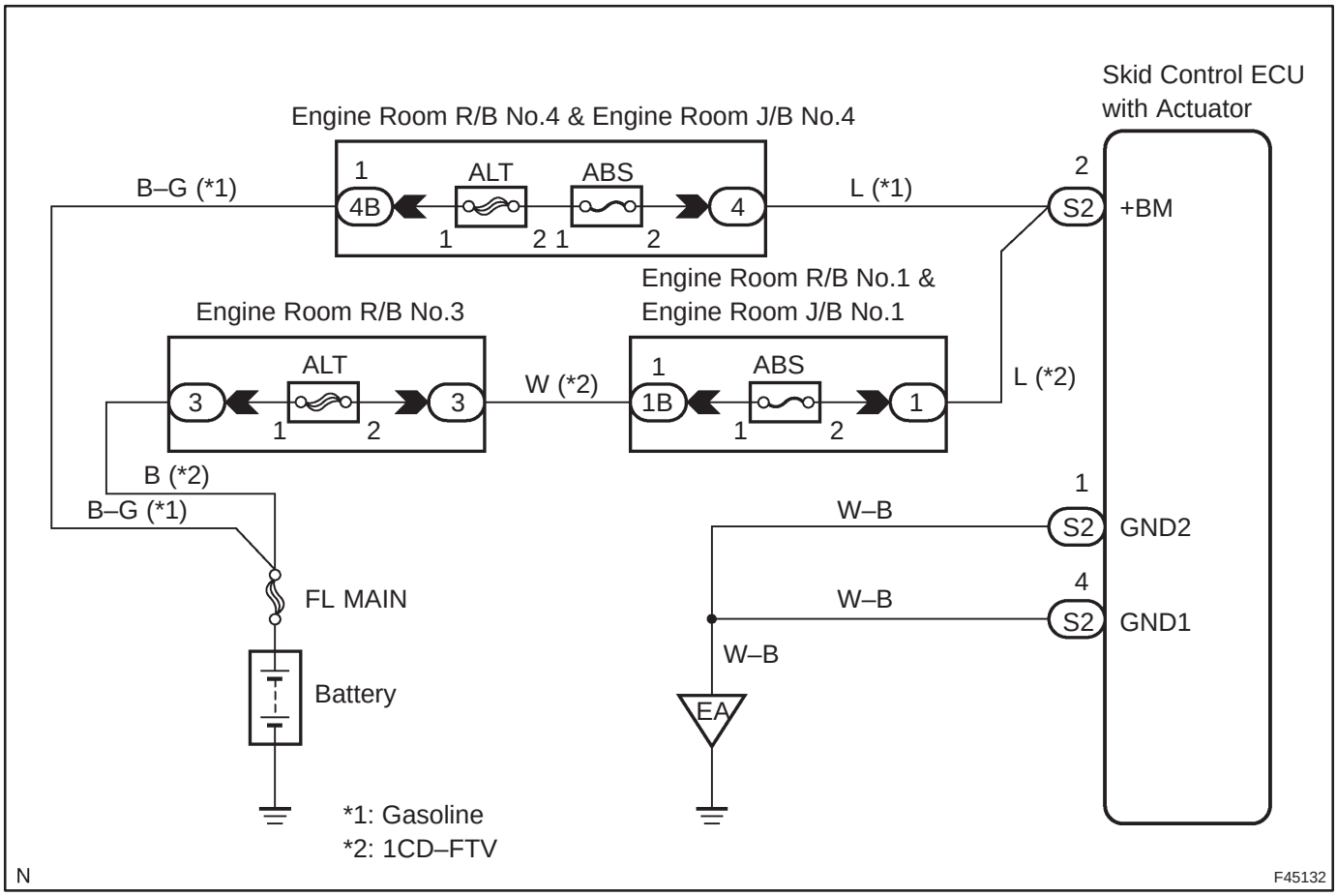
CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY – IG1 TERMINAL) (See page 01–32)

DTC	C1350/51	PUMP MOTOR IS LOCKED/OPEN CIRCUIT IN PUMP MOTOR GROUND

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1350/51	When any of the following 1 through 3 is detected. 1. No motor voltage supply after skid control ECU starts the motor relay. 2. A high level of motor voltage when skid control ECU does not start the motor relay. 3. The pump motor voltage is high level for a certain time after the motor relay has elapsed.	Brake actuator pump motor

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check if other DTCs are detected (See page 05–699).

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

050X4–14

CUSTOMER PROBLEM ANALYSIS CHECK

ABS Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency the Problem Occurs	☐ Continuously ☐ Intermittently (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light	☐ Remains ON ☐ Does not Light Up
	Brake Warning Light	☐ Remains ON ☐ Does not Light Up

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data	STOP LIGHT SW	☐ ON ☐ OFF
	SYSTEM	☐ NO SYS ☐ ABS ☐ FAIL SF
	#IG ON	
	VEHICLE SPD	km/h MPH

050XB–14

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- Using SST 09843–18040, connect the terminal Tc and CG of the DLC3.
- If malfunction is not found when inspecting parts, inspect the ECU and ground points for poor contact.
- If a malfunction code is displayed during the DTC check, check the circuit listed for that code. For details of each code, refer to the "See page" for respective "DTC No." in the DTC chart.
- When 2 or more DTCs are detected, perform circuit inspection one by one until the problem is identified.

DTC No. (See Page)	Detection Item	Trouble Area
C0200/31 (05–709)	Right front wheel speed sensor signal malfunction	• Right front speed sensor • Right front speed sensor rotor
C0205/32 (05–709)	Left front wheel speed sensor signal malfunction	• Left front speed sensor • Left front speed sensor rotor
C0210/33 (05–713)	Right rear wheel speed sensor signal malfunction	• Right rear speed sensor • Right rear speed sensor rotor
C0215/34 (05–713)	Left rear wheel speed sensor signal malfunction	• Left rear speed sensor • Left rear speed sensor rotor
C0226/21 (05–717)	Open or short circuit in ABS actuator solenoid (SFR) circuit	• SFRR or SFRH circuit
C0236/22 (05–717)	Open or short circuit in ABS actuator solenoid (SFL) circuit	• SFLR or SFLH circuit
C0246/23 (05–717)	Open or short circuit in ABS actuator solenoid (SRR) circuit	• SRRR or SRRH circuit
C0256/24 (05–717)	Open or short circuit in ABS actuator solenoid (SRL) circuit	• SRLR or SRLH circuit
C0273/13 (05–719)	Open or short circuit in ABS motor relay circuit	• ABS motor relay • ABS motor relay circuit
C0278/11 (05–722)	Open or short circuit in ABS solenoid relay circuit	• ABS solenoid relay • ABS solenoid relay circuit
C1237/37 (05–725)	Speed sensor rotor is wrong number of teeth on one of the 4 wheels	• Speed sensor • Sensor rotor • Speed sensor circuit
C1241/41 (05–726)	Low battery voltage or abnormally high battery voltage	• Battery • Charging system • Power source circuit
C1249/58 (05–730)	Open circuit in stop light switch circuit	• Stop light switch • Stop light switch circuit
C1300/62 (05–733)	Malfunction in skid control ECU	• Battery • Skid control ECU
C1330/35 (05–709)	Open circuit in right front speed sensor	• Right front speed sensor • Right front speed sensor circuit
C1331/36 (05–709)	Open circuit in left front speed sensor	• Left front speed sensor • Left front speed sensor circuit
C1332/38 (05–713)	Open circuit in right rear speed sensor	• Right rear speed sensor • Right rear speed sensor circuit
C1333/39 (05–713)	Open circuit in left rear speed sensor	• Left rear speed sensor • Left rear speed sensor circuit
C1350 / 51 (05–735)	Pump motor is locked Open circuit in pump motor ground	• Brake actuator pump motor
Always ON (05–737)	Malfunction in ECU	• Battery • Charging system • ABS warning light circuit • Power source circuit • Skid control ECU

DTC of speed sensor check function:

Code No.	Diagnosis	Trouble Area
C1271/71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation • Sensor rotor
C1272/72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation • Sensor rotor
C1273/73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation • Sensor rotor
C1274/74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation • Sensor rotor
C1275/75	Abnormal change in output voltage of right front speed sensor	Right front speed sensor rotor
C1276/76	Abnormal change in output voltage of left front speed sensor	Left front speed sensor rotor
C1277/77	Abnormal change in output voltage of right rear speed sensor	Right rear speed sensor rotor
C1278/78	Abnormal change in output voltage of left rear speed sensor	Left rear speed sensor rotor

ABS WITH EBD SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

050YD–14

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–698)

3	Check and Clear DTCs and Freeze Frame Data (See page 05–699)

4	Problem Symptom Confirmation

- Symptom does not occur: Go to step 5
- Symptom occurs: Go to step 6

5	Symptom Simulation (See page 01–32)

6	DTC Check (See page 05–699)

- There is no output: Go to step 7
- There is output: Go to step 8

7	Problem Symptoms Table (See page 05–708)

- Check for fluid leakage and Go to step 10

8	DTC Chart (See page 05–704)

9	Circuit Inspection (See page 05–709 – 05–750)

HINT:
When 2 or more DTCs are detected, perform circuit inspection one by one until the problem is identified.

10	Identification of Problem

11	Repair

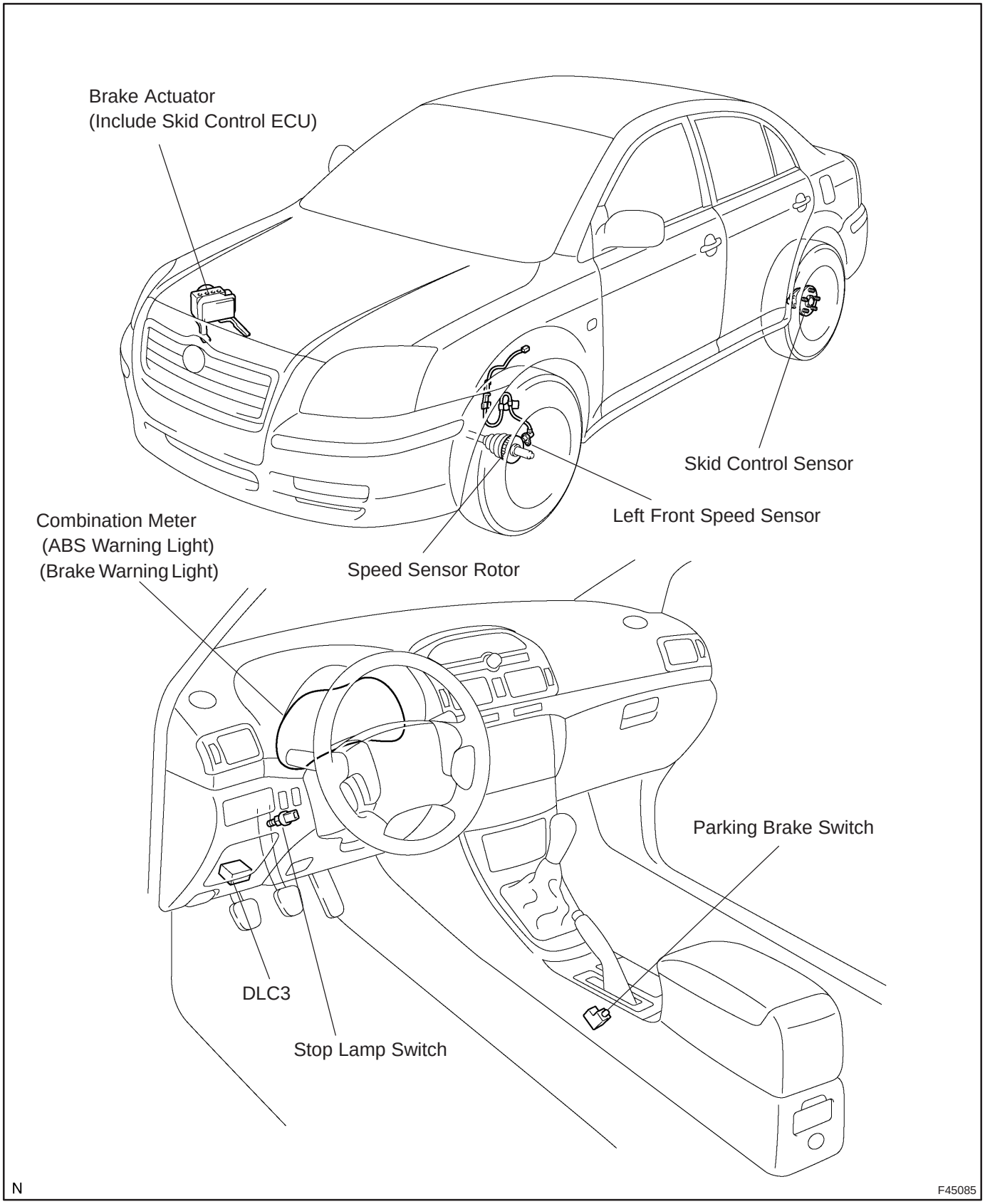
12	Confirmation Test

End

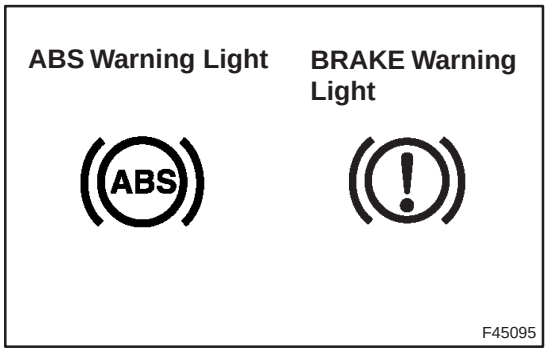
HINT:
Step 3, 6, 9, 12:
Diagnostic steps permitting the use of the hand–held tester.
Fail safe function:
When a failure occurs in the ABS system, the ABS warning light comes on and the ABS operation is prohibited. In addition to this, when the failure which disables the EBD operation occurs, the brake warning light comes on as well and the EBD operation is prohibited.

050XD–10

LOCATION



0577T–04



PRE–CHECK

1. DIAGNOSIS SYSTEM

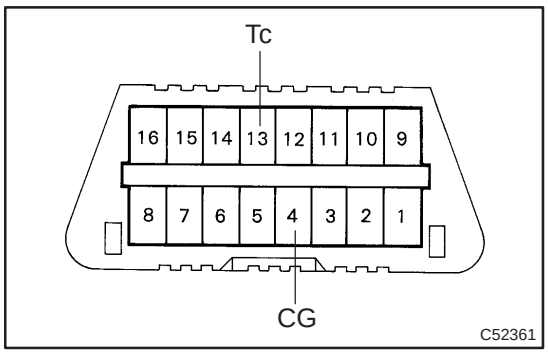
(a) Release the parking brake lever.

(b) Check the warning lights.

When the ignition switch is turned ON, check that the ABS warning light and brake warning light come on for 3 sec.

HINT:

- When the parking brake is applied or the level of the brake fluid is low, the brake warning light comes on.
- If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit (See page 05–737 or 05–741) or brake warning light circuit (See page 05–744).



(c) Without using hand–held tester:

Check the DTC.

(1) Using SST, connect terminal Tc and CG of the DLC3.

SST 09843–18040

(2) Turn the ignition switch ON.

(3) Read the DTC from the ABS warning light on the combination meter.

HINT:

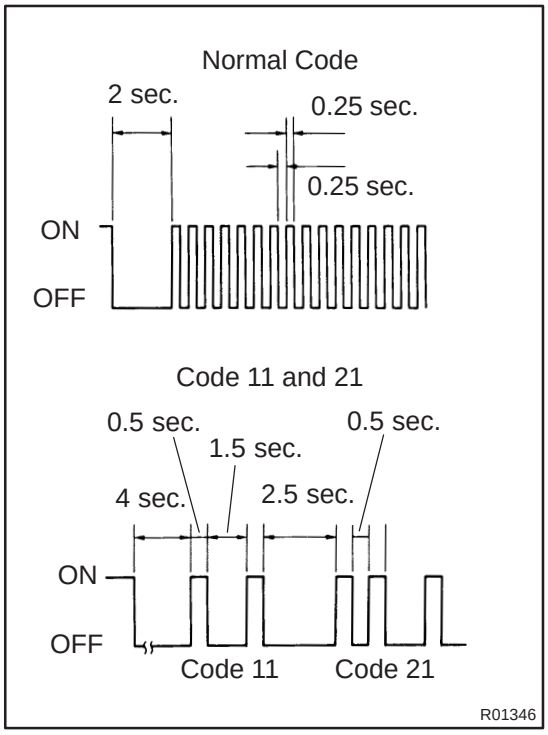
- If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page 05–737 or 05–744).
- As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.

(4) Codes are explained in the code table on page 05–704.

If 2 or more DTCs are detected at the same time, the lowest numbered DTC is displayed 1st.

(5) After completing the check, remove the SST from the DLC3.

SST 09843–18040



(d) With using hand–held tester:

Check the DTC.

(1) Read the DTC by following the prompts on the tester screen.

HINT:

Please refer to the hand–held tester operator's manual for further details.

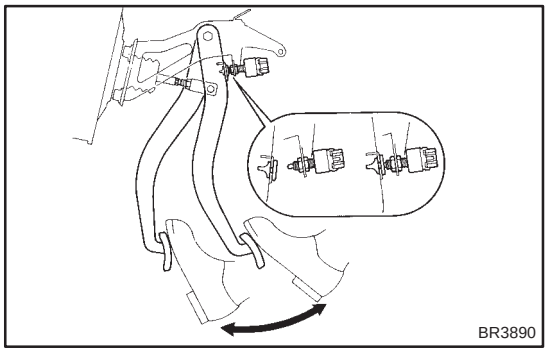
(e) Without using hand–held tester:

Clear the DTCs.

(1) Using SST, connect the terminal Tc and CG of the DLC3.

SST 09843–18040

(2) Turn the ignition switch ON.



(3) Clear the DTCs stored in ECU by depressing the brake pedal 8 or more times within 5 sec.
(4) Check that the ABS warning light indicates the normal code blinking pattern.
(5) Remove the SST from the DLC3.
SST 09843–18040

HINT:
Disconnecting the battery cable during repairs will not erase the DTCs in the ECU.

(f) With using hand–held tester:
Clear the DTCs.
(1) Turn the ignition switch ON.
(2) Operate the hand–held tester to erase the codes.

HINT:
Please refer to the hand–held tester operator's manual for further details.

2. DATA LIST

HINT:
According to the DATA LIST displayed on the Hand–held tester, you can read the value and status of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the methods to shorten the labor time.

(a) Connect the Hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) From the display on the tester, read the "DATA LIST".

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
ABS MOT RELAY	ABS motor relay / ON or OFF	ON : Motor relay ON	–
SOL RELAY	Solenoid relay / ON or OFF	ON : Solenoid relay ON	–
STOP LIGHT SW	Stop light switch / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
PKB SW	Parking brake switch / ON or OFF	ON : Parking brake applied OFF : Parking brake released	–
ABS OPERT FR	ABS operation (FR) / BEFORE or OPERATE	BEFORE : No ABS operation (FR) OPERATE : During ABS operation (FR)	–
ABS OPERT FL	ABS operation (FL) / BEFORE or OPERATE	BEFORE : No ABS operation (FL) OPERATE : During ABS operation (FL)	–
ABS OPERT RR	ABS operation (RR) / BEFORE or OPERATE	BEFORE : No ABS operation (RR) OPERATE : During ABS operation (RR)	Speed indicated on speedometer
ABS OPERT RL	ABS operation (RL) / BEFORE or OPERATE	BEFORE : No ABS operation (RL) OPERATE : During ABS operation (RL)	Speed indicated on speedometer

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
WHEEL SPD FR	Wheel speed sensor (FR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD FL	Wheel speed sensor (FL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD RR	Wheel speed sensor (RR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	–
WHEEL SPD RL	Wheel speed sensor (RL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	–
IG VOLTAGE	ECU power supply voltage / NORMAL or TOO LOW	NORMAL : 9.8 V or over TOO LOW : Below 9.8 V	–
SFRR	ABS solenoid (SFRR) ON / OFF	Operate: ON	–
SFRH	ABS solenoid (SFRH) ON / OFF	Operate: ON	–
SFLR	ABS solenoid (SFLR) ON / OFF	Operate: ON	–
SFLH	ABS solenoid (SFLH) ON / OFF	Operate: ON	–
SRRR (SRR)	ABS solenoid (SRRR (SRR)) ON / OFF	Operate: ON	–
SRRH (SRH)	ABS solenoid (SRRH (SRH)) ON / OFF	Operate: ON	–
SRLR	ABS solenoid (SRLR) ON / OFF	Operate: ON	–
SRLH	ABS solenoid (SRLH) ON / OFF	Operate: ON	–
AIR BLD SUPPORT	Air bleed support / SUPPORT or NOT SUP	Not supported	–
TEST MODE	Test mode / NORMAL or TEST	NORMAL : Normal mode TEST : During test mode	–
#CODES	Number of DTC recorded / min.: 0, max.: 255	Min.: 0, max.: 19	–

3. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the Hand–held tester allows the relay, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the methods to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the Hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) From the display on the tester, select the ”ACTIVE TEST”.

Item	Vehicle Condition / Test Details	Diagnostic Note
SFRR	Turns ABS solenoid (SFRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH	Turns ABS solenoid (SFRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR	Turns ABS solenoid (SFLR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLH	Turns ABS solenoid (SFLH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRR	Turns ABS solenoid (SRRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRH	Turns ABS solenoid (SRRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR	Turns ABS solenoid (SRLR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLH	Turns ABS solenoid (SRLH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRR & SFRH	Turns ABS solenoid SFRR & SFRH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR & SFLH	Turns ABS solenoid SFLR & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRR & SRRH	Turns ABS solenoid SRRR & SRRH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR & SRLH	Turns ABS solenoid SRLR & SRLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH & SFLH	Turns ABS solenoid SFRH & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
ABS MOT RELAY	Turns ABS motor relay ON / OFF	Operation of motor can be heard
ABS WARN LIGHT	Turns ABS warning light ON / OFF	Observe combination meter
BRAKE WRN LIGHT	Turns BRAKE warning light ON / OFF	Observe combination meter

4. FREEZE FRAME DATA

(a) The vehicle (sensor) status memorized during ABS operation or at the time of error code detection can be displayed using the hand–held tester.

(b) Only one record of the freeze frame data is stored and the freeze frame data generated during ABS operation are constantly updated. Also, the number of the operations of the ignition switch ”ON” after the freeze frame data is stored can be memorized up to 31 and it can be displayed.

HINT:

If the ignition switch ”ON” operation exceeds 31 times, ”31” appears on the display.

(c) If the diagnosis code malfunction occurs, the freeze frame data at the occurrence of the malfunction is stored but the ABS actuation data is not stored.

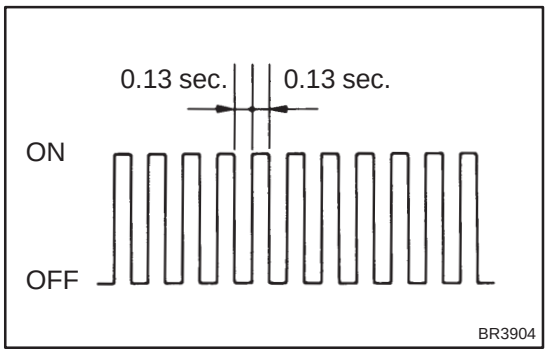
Hand–held tester display	Measurement Item	Reference Value*
VEHICLE SPD	Vehicle speed	Speed indication of a meter
STOP LIGHT SW	Stop light switch signal	Stop light switch ON: ON, OFF: OFF
# IG ON	Numbers of operations of ignition switch ON after memorizing freeze frame data	0 to 31
SYSTEM	Operate system	ABS operate: ABS

*: If no conditions are specifically stated for ”Idling”, it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

5. SPEED SENSOR SIGNAL CHECK

HINT:
If the ignition switch is turned from ON to ACC or LOCK during the test mode, the DTCs of the sensor check function will be erased.

(a) Check the sensor signal.
  (1) Start the engine.
  (2) Connect the hand–held tester to the DLC3.
  (3) Select the TEST MODE.



  (4) Check that the ABS warning light blinks.

HINT:
If the ABS warning light does not blink, inspect the ABS warning light circuit (See page 05–737).

  (5) Drive the vehicle straight forward.

HINT:
- Drive the vehicle faster than 45 km/h (28 mph) for several sec.
- There is a case that the sensor check is not completed if the vehicle has its wheels spun or its steering wheel steered during this check.

  (6) Stop the vehicle.
  (7) Using SST, connect the terminals Tc and CG of the DLC3.

(b) Read the DTC from the hand–held tester screen.

HINT:
- See the list of DTCs shown on the 05–704.
- Please refer to the hand–held tester operator’s manual for further details.

050XH–14

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

NOTICE:

When replacing Skid Control ECU, sensor or etc., turn the ignition switch to OFF.

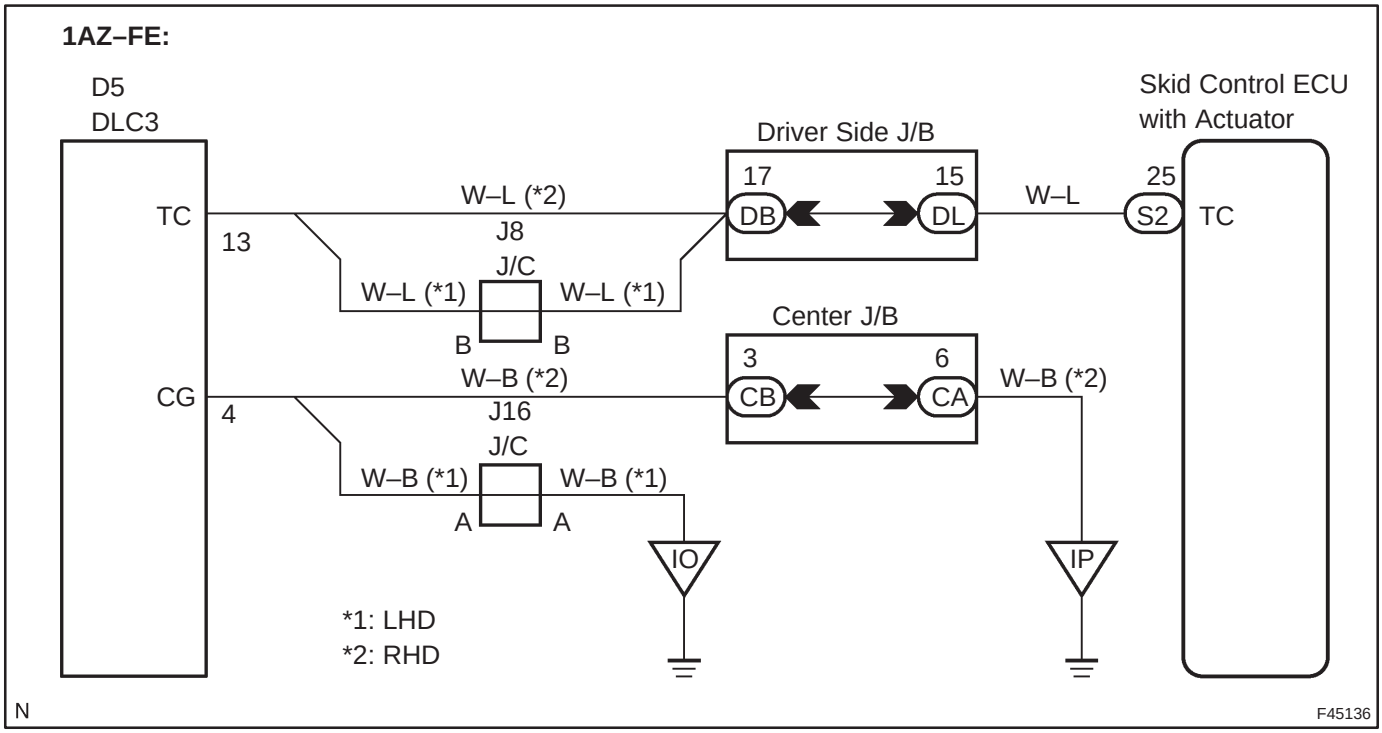
Symptom	Suspect Area	See page
ABS does not operate	1. Check the DTC reconfirming that the normal code is output. 2. IG power source circuit 3. Speed sensor circuit 4. Check the brake actuator with a hand–held tester. If there is malfunction, check the hydraulic circuit for leakage. 5. When the above areas (1. to 4.) are all normal but the problem still occurs, replace the skid control ECU.	05–699 05–709 05–713 32–53
ABS does not operate properly	1. Check the DTC reconfirming that the normal code is output. 2. Speed sensor circuit 3. Stop light switch circuit 4. Check the brake actuator with a hand–held tester. If there is malfunction, check the hydraulic circuit for leakage. 5. When the above areas (1. to 4.) are all normal but the problem still occurs, replace the skid control ECU.	05–699 05–709 05–713 32–53
ABS warning light malfunction	1. ABS warning light circuit 2. Skid control ECU	05–737 –
DTC check cannot be performed	1. ABS warning light circuit 2. Tc terminal circuit 3. When the above areas (1. and 2.) are all normal but the problem still occurs, replace the skid control ECU.	05–737 05–748
Speed sensor signal check cannot be performed	1. D/G terminal circuit 2. Skid control ECU	– –

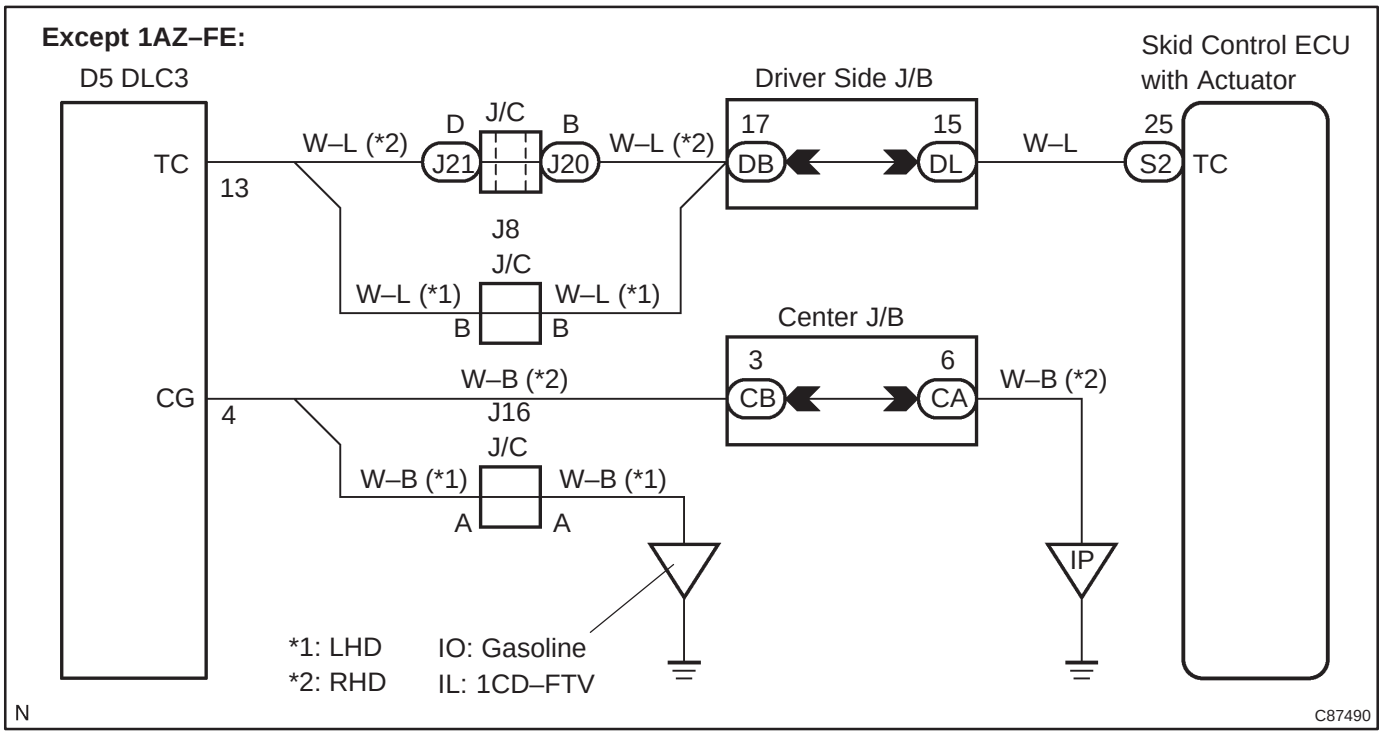
TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

Connecting terminals Tc and CG of the DLC3 causes the ECU to display the DTC by flashing the ABS warning light.

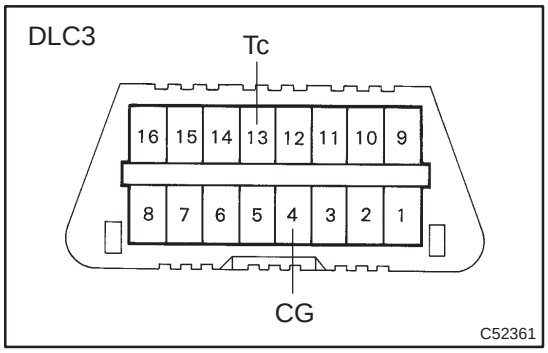
WIRING DIAGRAM





INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Tc TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Tc and CG of the DLC3.
OK:
Voltage: 10 to 14 V

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminal CG of the DLC3 and body ground (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU – DLC3)

(a) Check for an open or short circuit in harness and connector between terminal Tc of the skid control ECU and the DLC3 (See page 01–32).

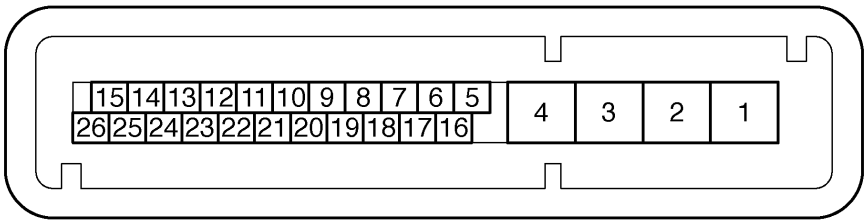
NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE BRAKE ACTUATOR ASSY(See page 32–54)

050XF–14

TERMINALS OF ECU



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F45089

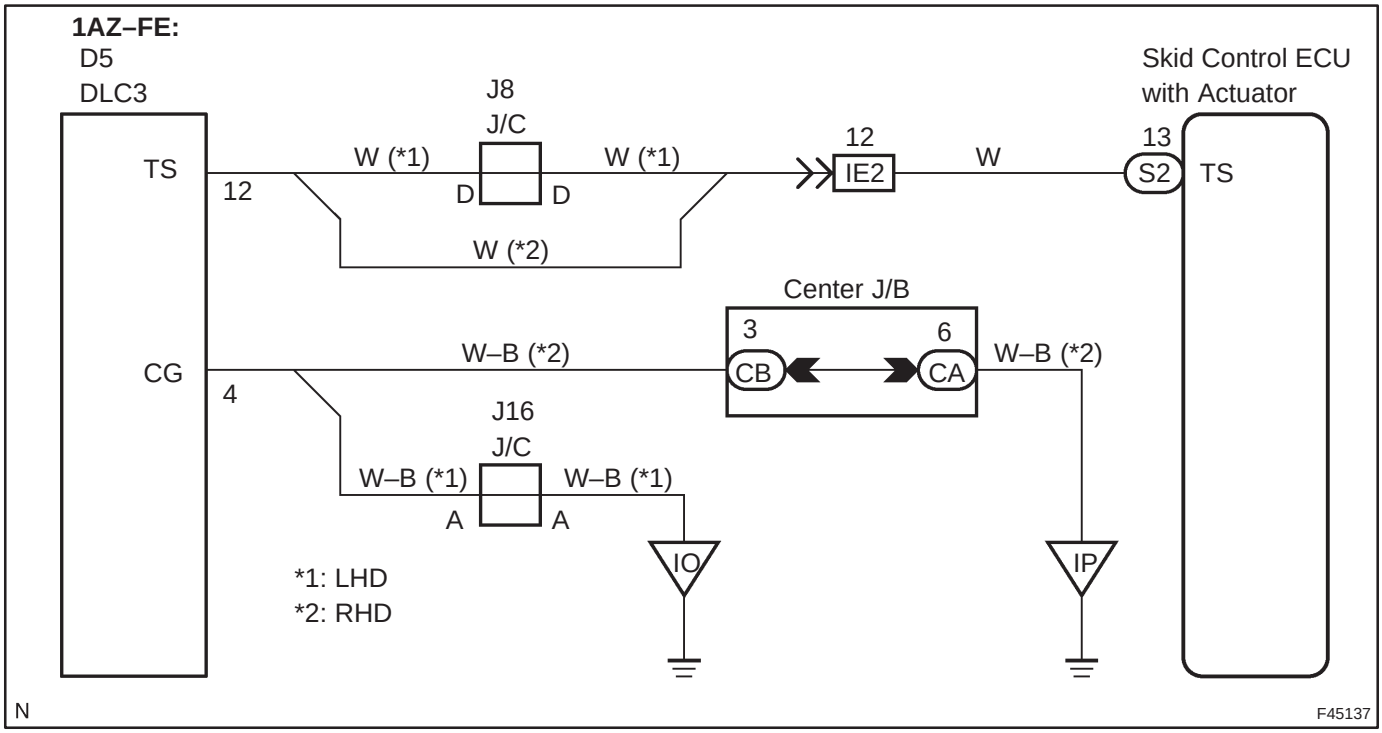
Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
+BM (2) – GND (1, 4)	L – W–B	Always	10 to 14
+BS (3) – GND (1, 4)	R – W–B	Always	10 to 14
FL+ (5) – FL– (6)	L–Y – R–L	IG switch ON Slowly turn left front wheel	AC generation
RL+ (7) – RL– (17)	R – G	IG switch ON Slowly turn left rear wheel	AC generation
FR+ (10) – FR– (9)	W – B	IG switch ON Slowly turn right front wheel	AC generation
D/G (11) – GND (1, 4)	W–G – W–B	IG switch ON, ABS warning light OFF	8 to 12
EBDW (12) – GND (1, 4)	P – W–B	IG switch ON, BRAKE warning light ON	5 to 9
		IG switch ON, BRAKE warning light OFF	Below 2.0
PKB (14) – GND (1, 4)	B–W – W–B	IG switch ON, parking brake switch ON	Below 2.0
		IG switch ON, parking brake switch OFF	10 to 14
IG1 (18) – GND (1, 4)	R–W – W–B	IG switch ON	10 to 14
RR+ (19) – RR– (8)	P – V	IG switch ON Slowly turn right rear wheel	AC generation
STP (20) – GND (1, 4)	G–W – W–B	Stop light switch ON	8 to 14
		Stop light switch OFF	Below 4.0
WA (22) – GND (1, 4)	R–Y – W–B	IG switch ON, ABS warning light ON	5 to 9
		IG switch ON, ABS warning light OFF	Below 2.0
SP1 (23) – GND (1, 4)	L–W – W–B	Vehicle drive at about 20 km/h (12mph)	Pulse generation
Tc (25) – GND (1, 4)	W–L – W–B	IG switch ON	10 to 14

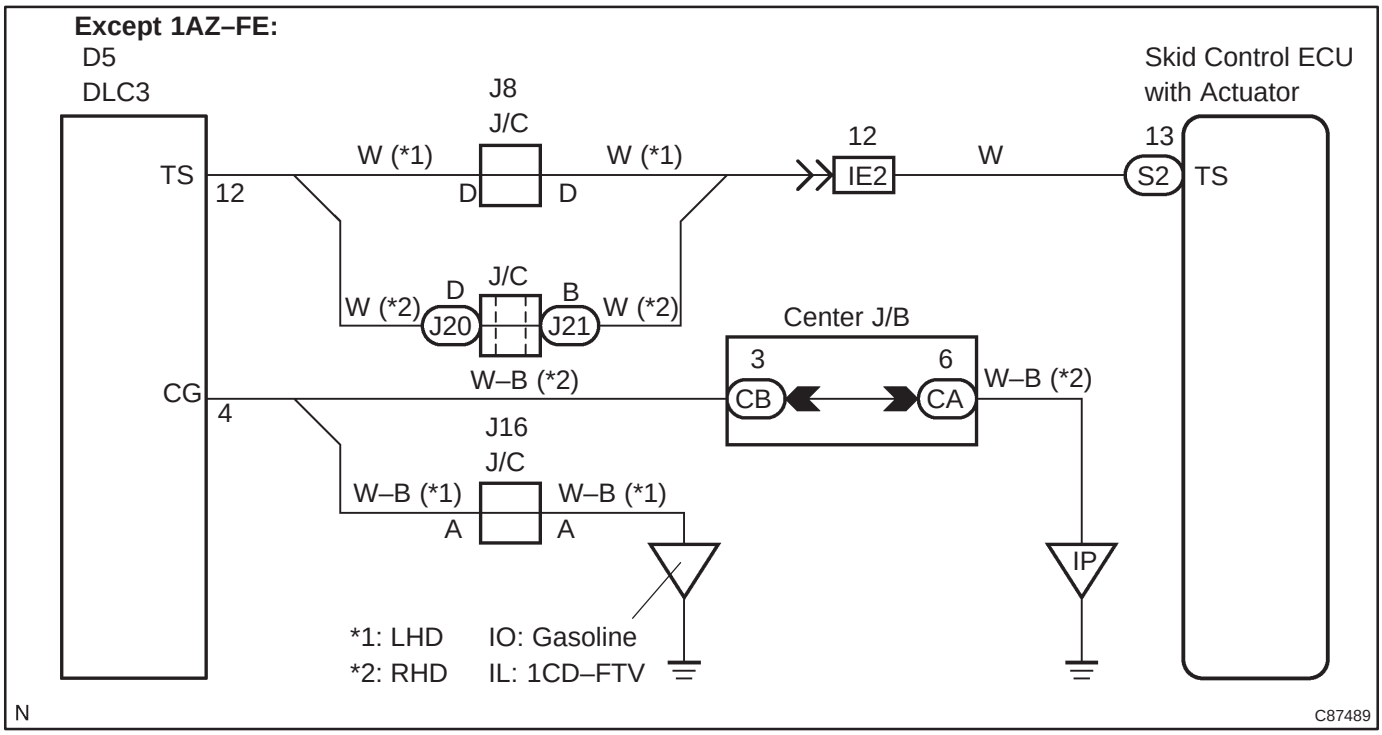
TS TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

The sensor check circuit detects troubles in the sensor signal which cannot be detected by the DTC check. Connecting terminals Ts and CG of the DLC3 starts the check.

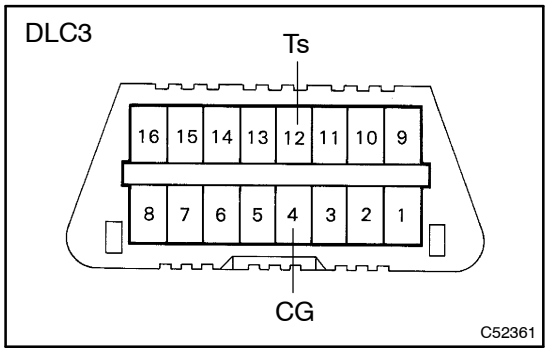
WIRING DIAGRAM





INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Ts TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Ts and CG of the DLC3.
OK:
Voltage: 10 to 14 V

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminal Ts of the DLC3 and the skid control ECU (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK AND REPAIR HARNESS AND CONNECTOR(SKID CONTROL ECU – DLC3)

(a) Check for an open or short circuit in harness and connector between terminal CG of the DLC3 and body ground (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE BRAKE ACTUATOR ASSY (See page 32–54)

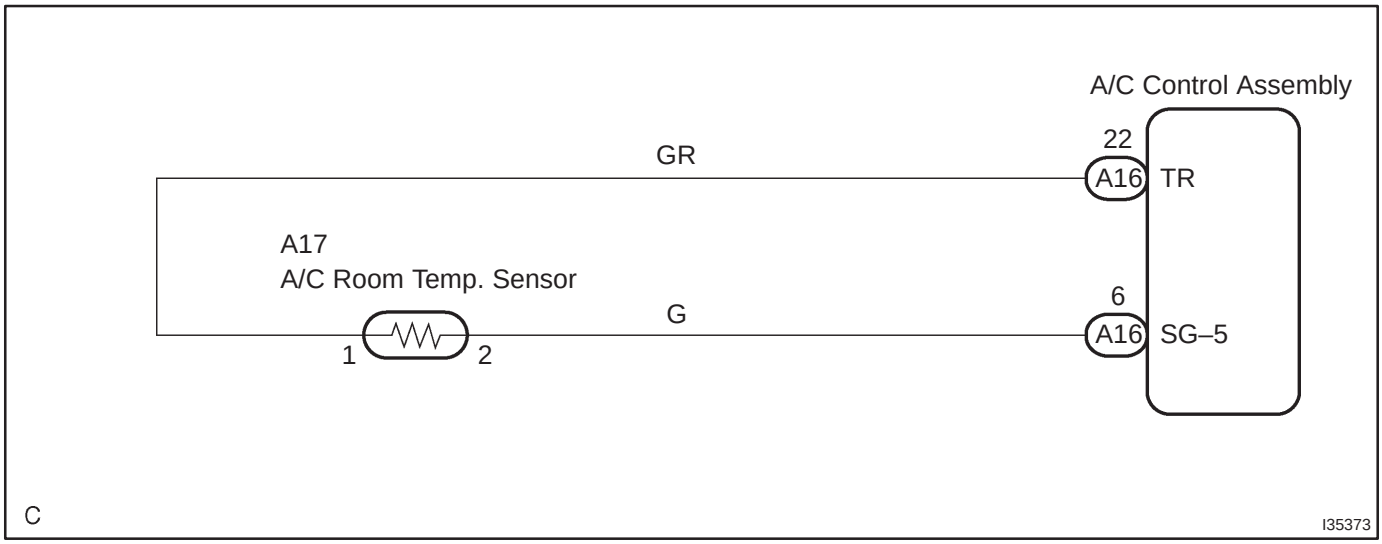
DTC	11	ROOM TEMPERATURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

This sensor detects the temperature inside the cabin and sends the appreciate signals to the A/C amplifier.

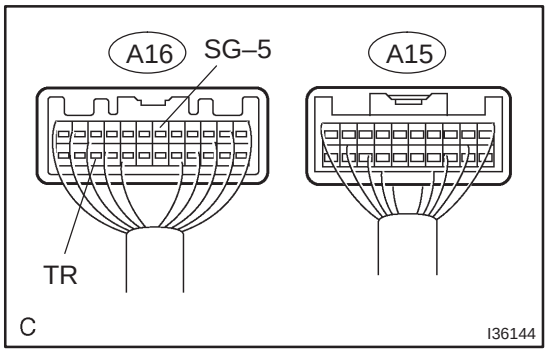
DTC No.	Detection item	Trouble Area
11	Open or short in room temperature sensor circuit	• Cooler thermistor (room temp. sensor) • Harness or connector between cooler thermistor (room temp. sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TR – SG–5)



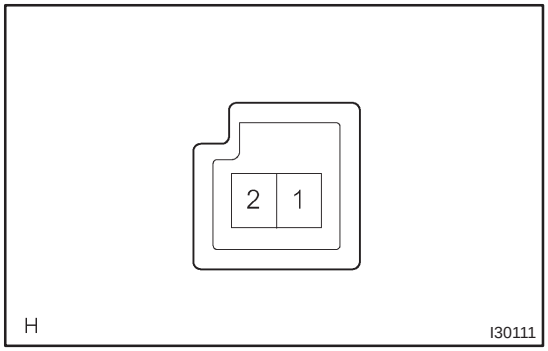
(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between terminal TR and SG–5 of A/C amplifier connector at each temperature.
Standard:
1.8 to 2.2 V at 25°C (77°F)
1.2 to 1.6 V at 40°C (104°F)

HINT:
As the temperature increases, the voltage decreases.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

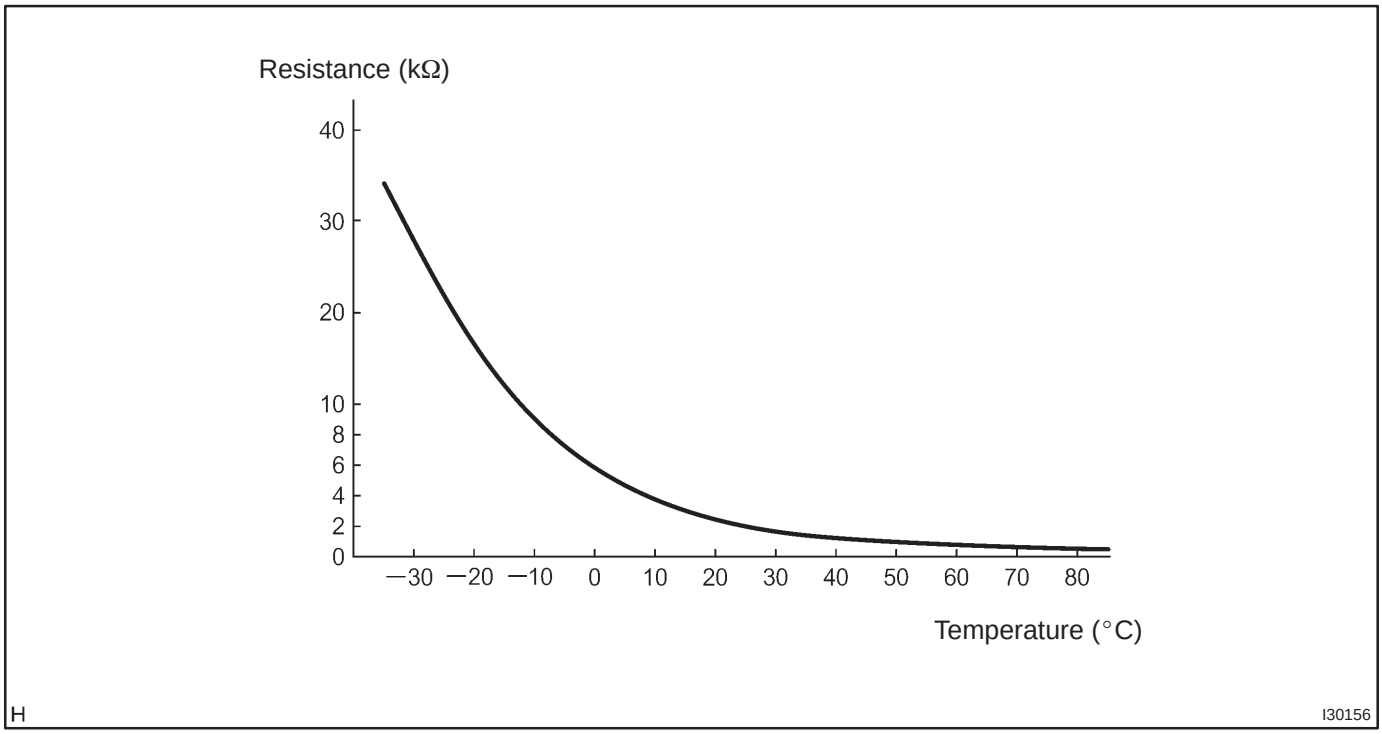
NG

2 INSPECT COOLER (ROOM TEMP. SENSOR) THERMISTOR



(a) Remove cooler the thermistor (room temp. sensor).
(b) Measure the resistance between terminal 1 and 2 of cooler thermistor (room temp. sensor) connector at each temperature.
Standard:
1,615 to 1,785 Ω at 25°C (77°F)

HINT:
As the temperature increases, the resistance decreases.



NG → **REPLACE COOLER (ROOM TEMP. SENSOR) THERMISTOR**

OK

3	CHECK HARNESS AND CONNECTOR(COOLER (ROOM TEMP. SENSOR) THERMISTOR – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between terminal TR and SG–5 of A/C amplifier (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 8.5 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

MG → REPLACE AIR CONDITIONING AMPLIFIER

OK

SYSTEM OK

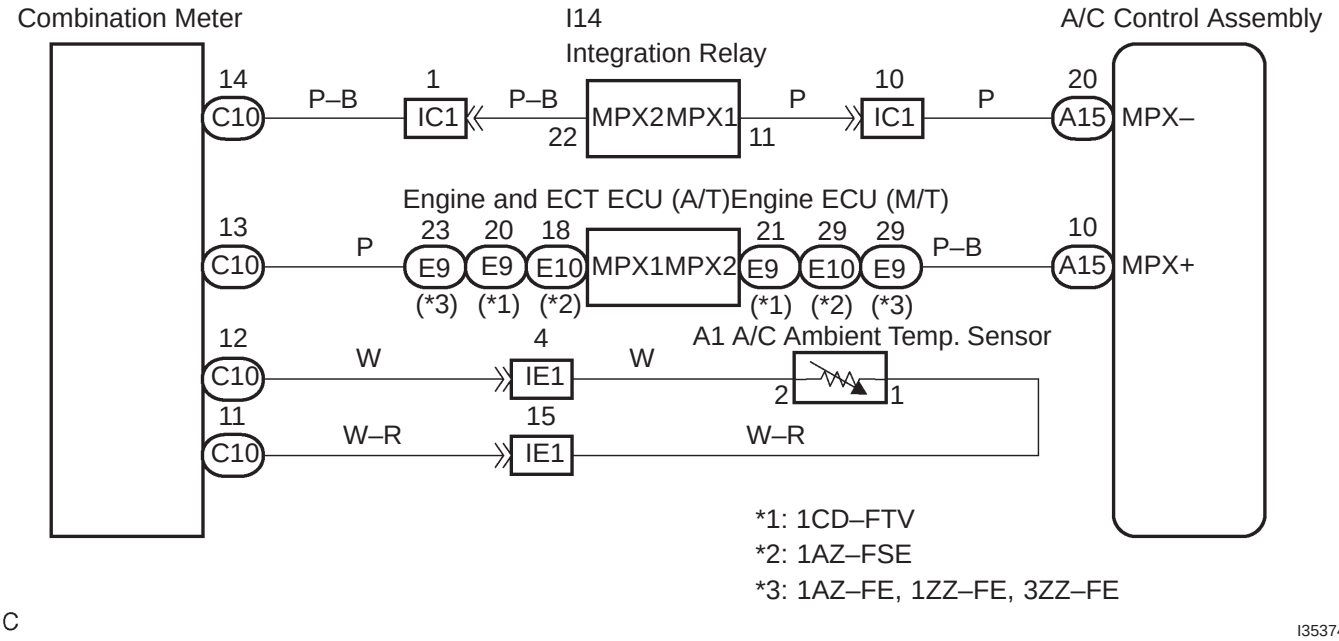
DTC	12	AMBIENT TEMPERATURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

This sensor detects the temperature outside the cabin and sends the appropriate signals to the A/C amplifier.

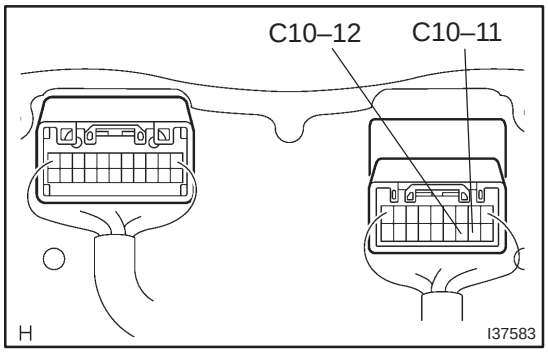
DTC No.	Detection item	Trouble Area
12	Open or short in ambient temperature sensor circuit	• Thermistor assy (ambient temp. sensor) • Harness or connector between thermistor assy (ambient temp. sensor) and combination meter • Combination meter • Harness or connector between combination meter and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT COMBINATION METER ASSY



(a) Disconnect the connector from the combination meter assy.

(b) Measure resistance between the terminal C10–11 and C10–12 of the ambient temp. sensor connector at each temperature.

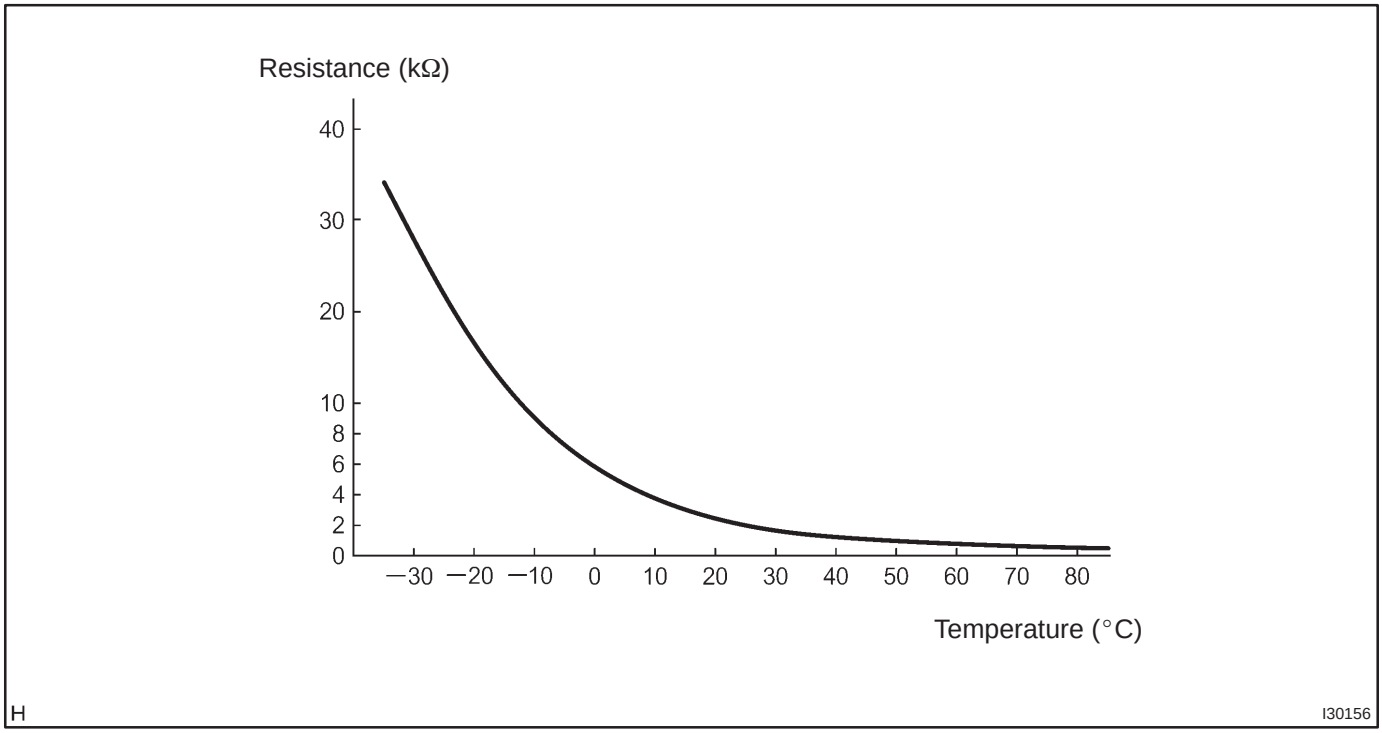
Standard:

9.0 to 9.8 kΩ: at 0°C (0°F)

2.7 to 2.9 kΩ: at 25°C (77°F)

HINT:

As the temperature increases, resistance decreases.



OK → **REPLACE COMBINATION METER ASSY**

NG

2	CHECK HARNESS AND CONNECTOR(COMBINATION METER – OUTER AMBIENT TEMPERATURE SENSOR)

(a) Disconnect the connector from ambient temp. sensor.
(b) Check continuity between the terminal C10–11 (12) of combination meter assy and the terminal A1–1 (2) of ambient temp. sensor connector.
Standard: Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 8.5 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

NG → **REPLACE OUTER AMBIENT TEMPERATURE SENSOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

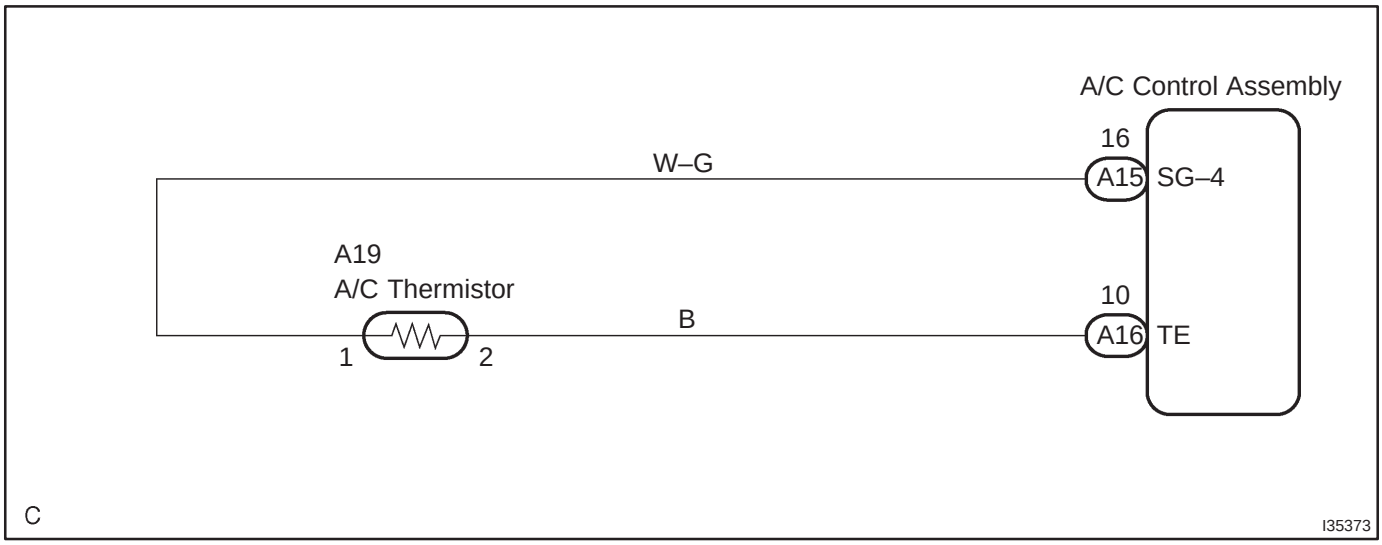
DTC	13	EVAPORATOR TEMPERATURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

This sensor detects the temperature inside the cooling unit and sends the appropriate signals to the A/C amplifier.

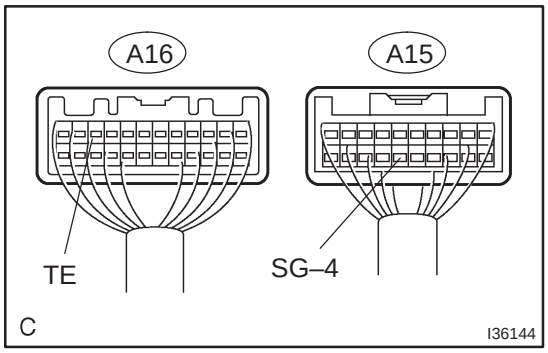
DTC No.	Detection Item	Trouble Area
13	Open or short in evaporator temperature sensor circuit.	• Cooler thermistor No.1 (evaporator temp. sensor) • Harness or connector between cooler thermistor No.1 (evaporator temp. sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TE – SG–4)

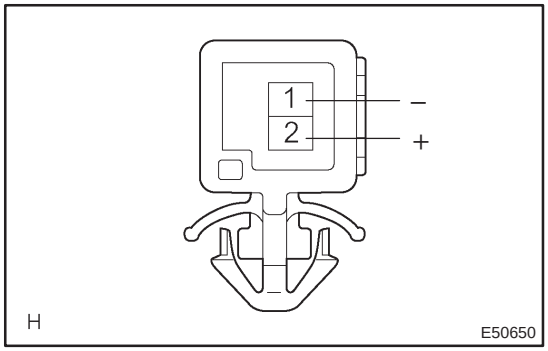


(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between terminal TE and SG–4 of A/C amplifier connector at each temperature.
Standard:
2.0 to 2.4 V at 0°C (32°F)
1.4 to 1.8 V at 15°C (59°F)

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT COOLER THERMISTOR NO.1



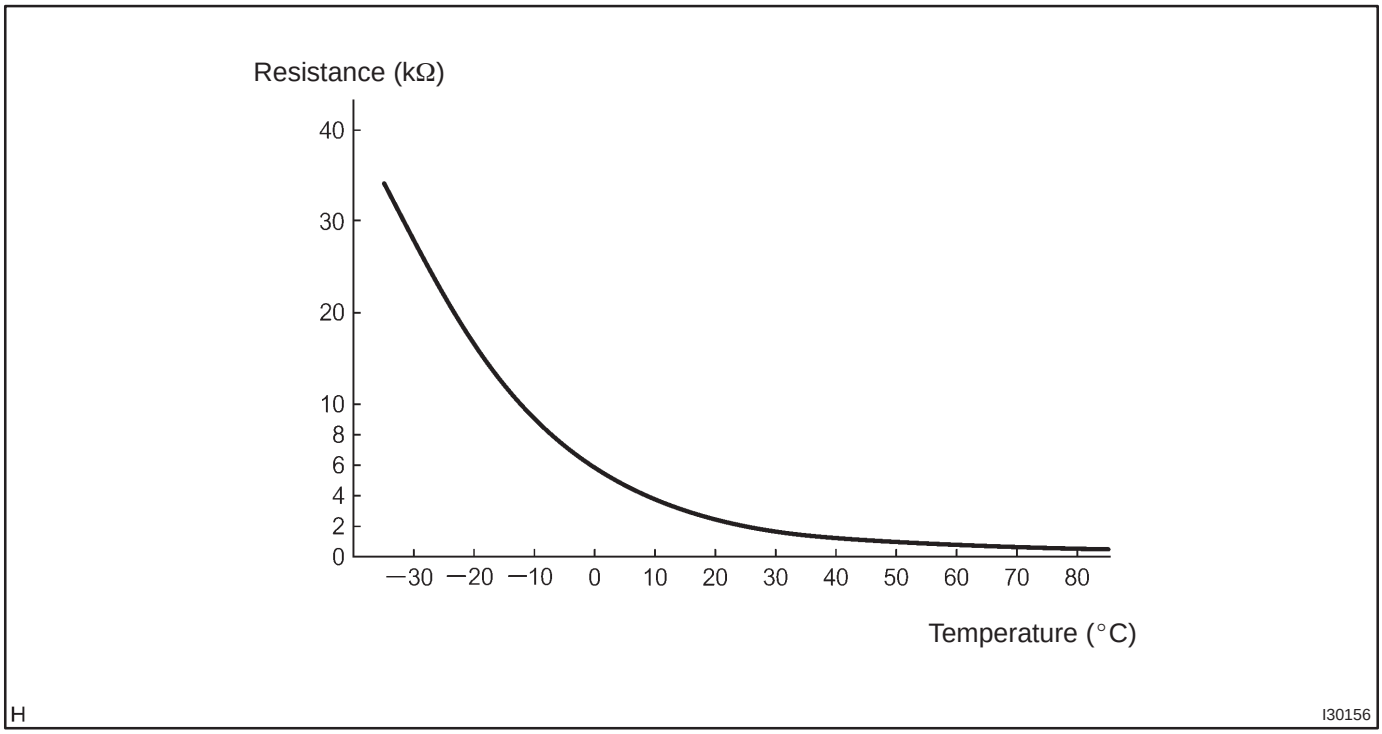
(a) Remove the cooler thermistor No.1 (evaporator temp. sensor).

(b) Check the resistance between terminal 1 and 2 of cooler thermistor No.1 (evaporator temp. sensor) at each temperature, as shown in the chart.

Standard: 1,500 Ω at 25°C (77°F)

HINT:

As the temperature increases, the resistance decreases.



NG → **REPLACE COOLER THERMISTOR NO.1**

OK

3	CHECK HARNESS AND CONNECTOR(COOLER THERMISTOR NO.1 – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between terminal TE and SG–4 of A/C amplifier (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 8.5 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

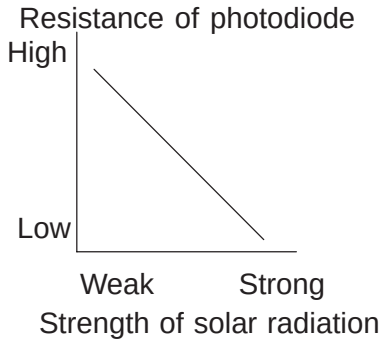
NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

SYSTEM OK

DTC	21	SOLAR SENSOR CIRCUIT(PASSENGER SIDE)

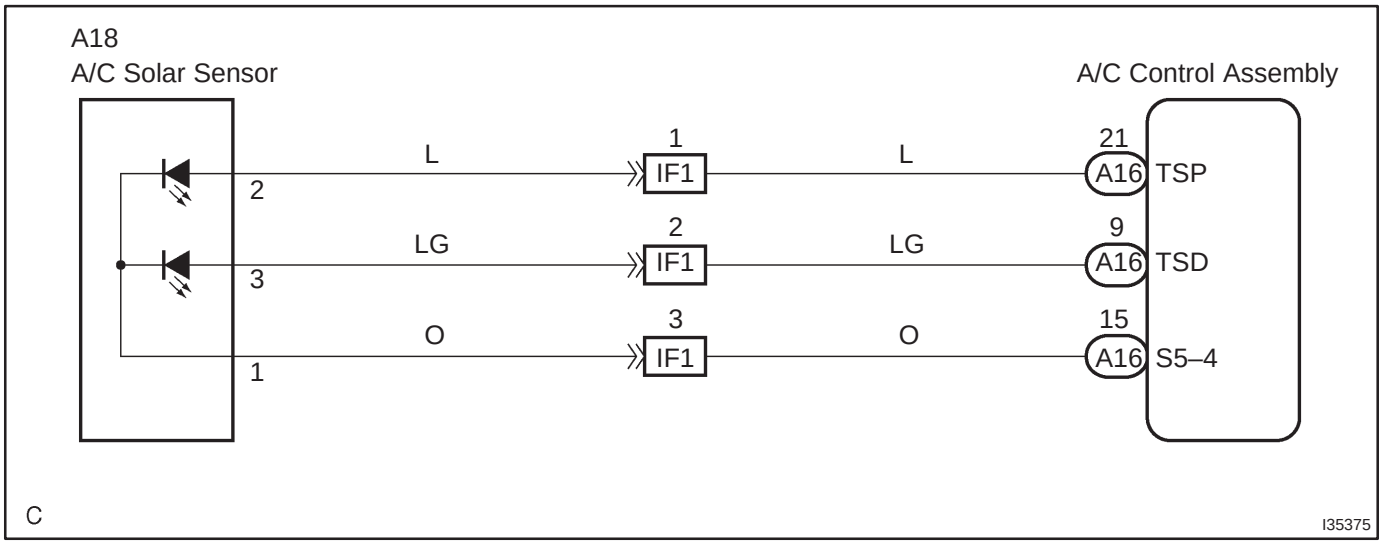
CIRCUIT DESCRIPTION



A photo diode in the solar sensor detects solar radiation and sends signals to the A/C amplifier.

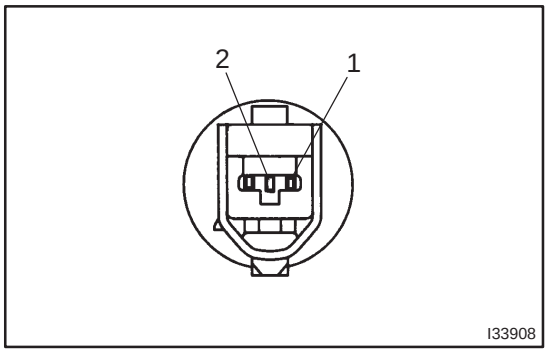
DTC No.	Detection Item	Trouble Area
21	Open or short in solar sensor circuit. (If the checking is being performed in a dark place, DTC 21 could be displayed.)	• Automatic light control sensor (solar sensor) • Harness or connector between automatic light control sensor (solar sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT COOLER (SOLAR SENSOR) THERMISTOR



(a) Remove cooler (solar sensor) thermistor.
(b) Cover the sensor with a cloth, and check the cooler (solar sensor) thermistor resistance.
  (1) Measure resistance between terminals 1 and 2 of the cooler (solar sensor) thermistor.
  Resistance: ∞ Ω (No continuity)

HINT:
Connect the ohmmter positive (+) lead to terminal 2 and the ohmmeter negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

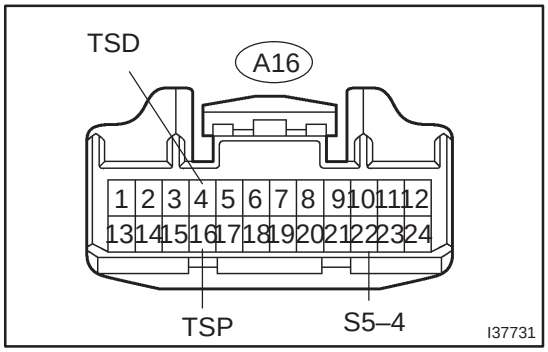
(c) Remove the cloth from the cooler (solar sensor) thermistor, and subject the sensor to the electric light and check the cooler (solar sensor) thermistor resistance.
  (1) Measure resistance between terminal 1 and 2 of the cooler (solar sensor) thermistor.
  Resistance: Approx. 10 kΩ (Continuity)

HINT:
Connect the positive (+) lead to ohmmeter to terminal 2 and negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

NG → **REPLACE COOLER (SOLAR SENSOR) THERMISTOR**

OK

2	CHECK HARNESS AND CONNECTOR(COOLER (SOLAR SENSOR) THERMISTOR – A/C AMPLIFIER)



(a) Check for an open or short circuit in harness and connector between solar sensor and A/C amplifier
(See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 8.5 minutes after turning the ignition switch ON.
Standard: Normal codes are output

NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

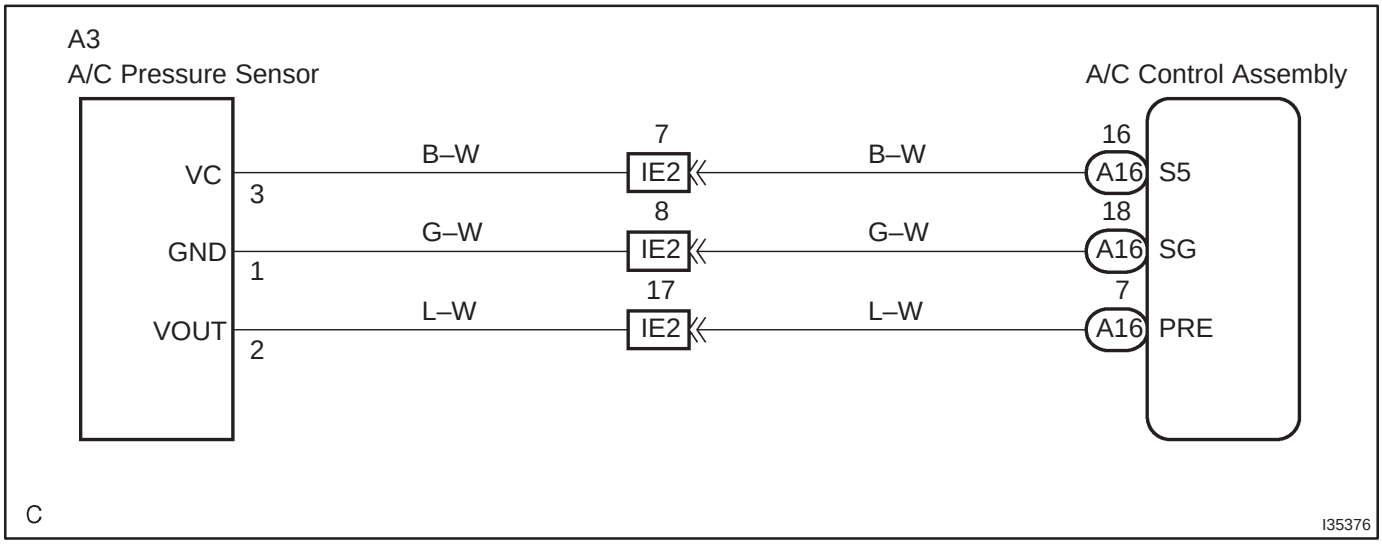
DTC	23	PRESSURE SWITCH CIRCUIT

CIRCUIT DESCRIPTION

The pressure sensor sends the appropriate signals to the A/C amplifier assy when the A/C refrigerant pressure drops too low or rises too high. When the A/C amplifier receives these signals, it outputs signals though the A/C amplifier to switch OFF the compressor relay and turns the magnetic clutch OFF.

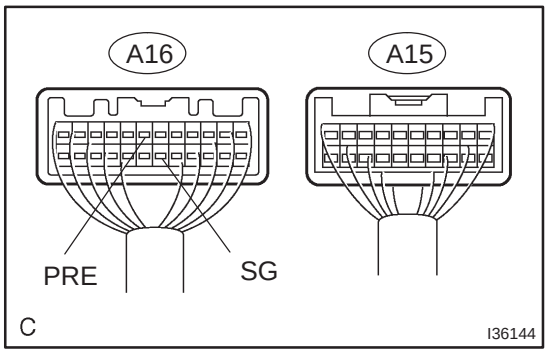
DTC No.	Detection Item	Trouble Area
23	• Open in pressure sensor circuit. • Abnormal refrigerant pressure. below 196 kPa (2.0 kgf/cm^2, 28 psi) over 3,140 kPa (32.0 kgf/cm^2, 455 psi)	• A/C tube assy (pressure sensor) • Harness or connector between A/C tube assy (pressure sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT AIR CONDITIONING AMPLIFIER(PRE)



(a) Install the manifold gauge set.
(b) Remove the A/C amplifier with connectors being connected.
(c) Turn the ignition switch to ON.
(d) Check the voltage between terminal PRE and SG of A/C amplifier connector when refrigerant pressure is changed.
(e) The voltage changes following refrigerant pressure change, as shown in the diagram below.

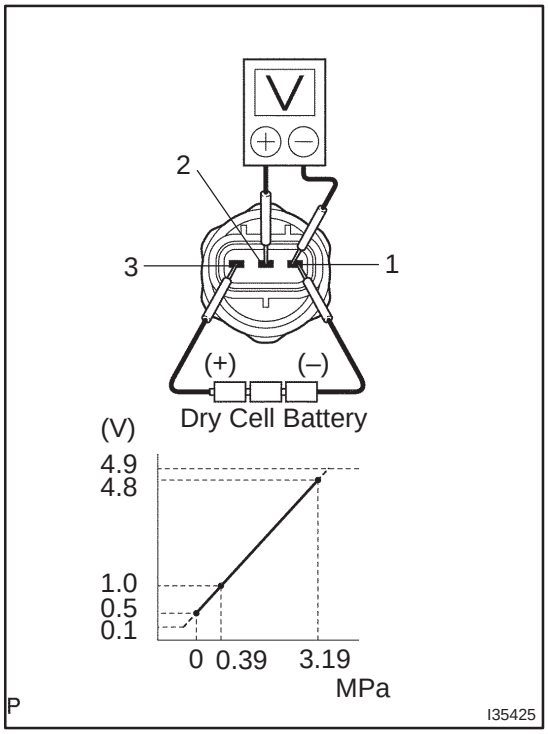
Standard:

Low Pressure Cut Side	Reference : High Pressure Cut Side
ON (0V) 225 kPa 196 kPa OFF (4.5 – 5.5 V)	ON (0V) 2,550 kPa 3,140 kPa OFF (4.5 – 5.5 V)

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2 INSPECT AIR CONDITIOER PRESSURE SENSOR



(a) Disconnect the pressure sensor connector.
(b) Install the manifold gauge set (See page 55–38).
(c) Connect the positive (+) lead from the three 1.5 V dry cell batteries to terminal 3 and negative (–) lead to terminal 1.
(d) Check the voltage between terminals 2 and 1 of pressure sensor.

Standard:

The voltage varies with on the refrigerant pressure as shown in the chart.

NG → **REPLACE AIR CONDITIOER PRESSURE SENSOR**

OK

3	CHECK HARNESS AND CONNECTOR(AIR CONDITIONER PRESSURE SENSOR – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between pressure sensor and A/C amplifier (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) After turning the ignition switch ON, read DTC.
Standard: Normal codes are output.

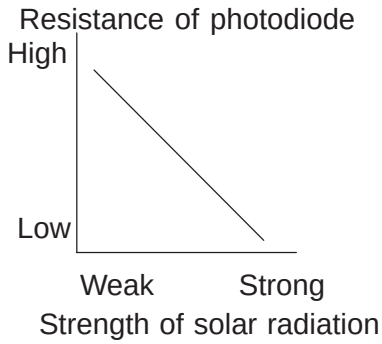
NG → REPLACE AIR CONDITIONING AMPLIFIER

OK

SYSTEM OK

DTC 24 SOLAR SENSOR CIRCUIT (DRIVER SIDE)

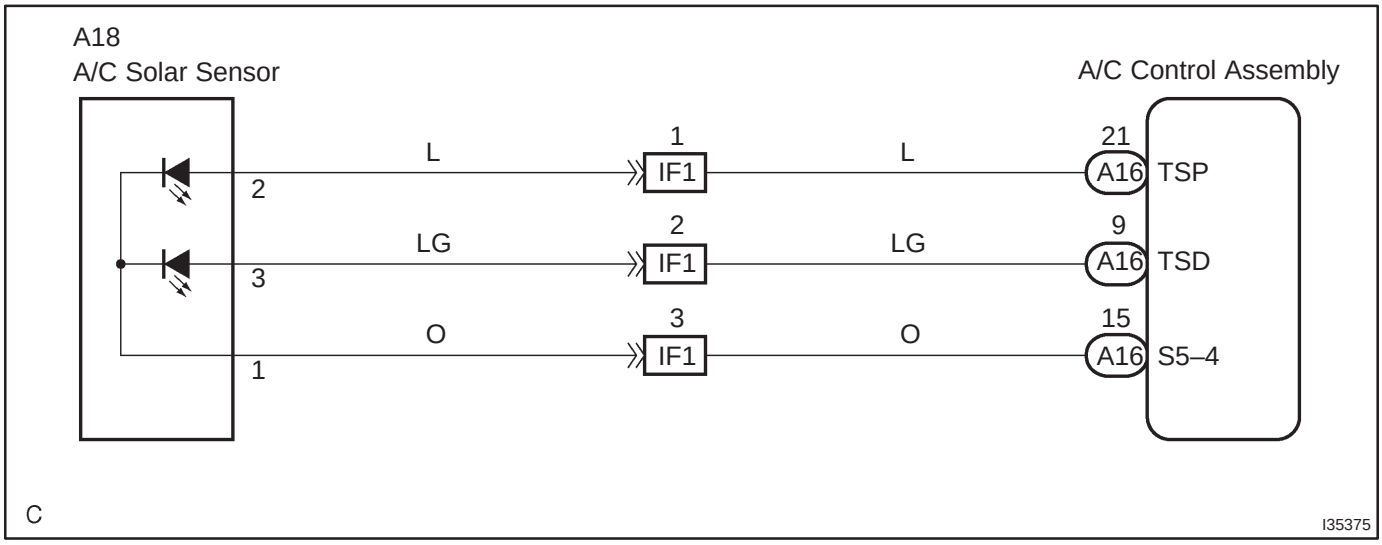
CIRCUIT DESCRIPTION



A photo diode in the solar sensor detects solar radiation and sends signals to the A/C amplifier.

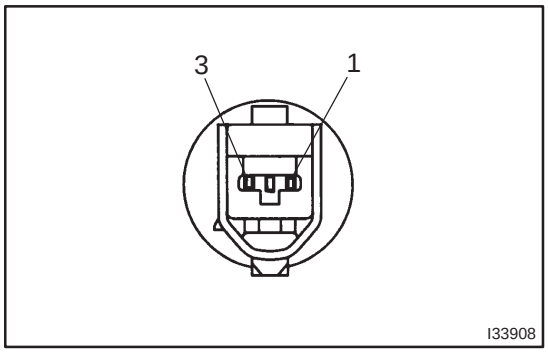
DTC No.	Detection Item	Trouble Area
24	Open or short in solar sensor circuit. (If the checking is being performed in a dark place, DTC 24 could be displayed.)	• Automatic light control sensor (solar sensor) • Harness or connector between automatic light control sensor (solar sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT COOLER (SOLAR SENSOR) THERMISTOR



(a) Remove cooler (solar sensor) thermistor.
(b) Cover the sensor with a cloth, and check the cooler (solar sensor) thermistor resistance.
(1) Measure resistance between terminals 1 and 3 of the cooler (solar sensor) thermistor.
Resistance: ∞ Ω (No continuity)

HINT:
Connect the ohmmter positive (+) lead to terminal 3 and the ohmmeter negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

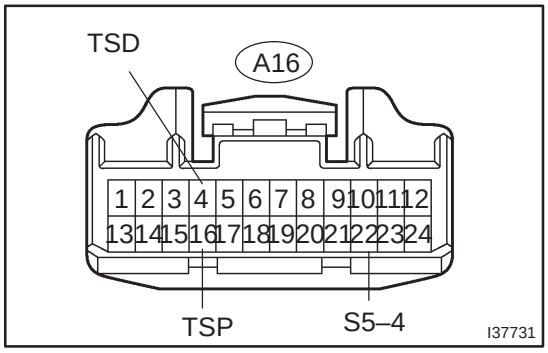
(c) Remove the cloth from the cooler (solar sensor) thermistor, and subject the sensor to the electric light and check the cooler (solar sensor) thermistor resistance.
(1) Measure resistance between terminal 1 and 3 of the cooler (solar sensor) thermistor.
Resistance: Approx. 10 kΩ (Continuity)

HINT:
Connect the positive (+) lead to ohmmeter to terminal 3 and negative (–) lead to terminal 1 of the cooler (solar sensor) thermistor.

NG → **REPLACE COOLER (SOLAR SENSOR) THERMISTOR**

OK

2	CHECK HARNESS AND CONNECTOR(COOLER (SOLAR SENSOR) THERMISTOR – A/C AMPLIFIER)



(a) Check for open or short circuit in harness and connector between solor sansor and A/C amplifier
(See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 8.5 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

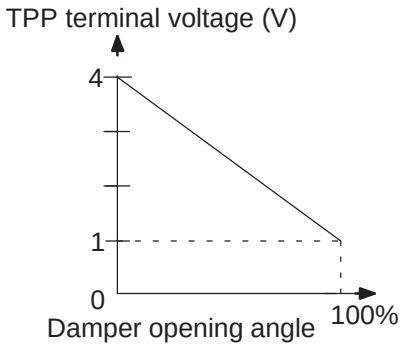
NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

DTC	31	AIR MIX DAMPER POSITION SENSOR CIRCUIT(PASSENGER SIDE)

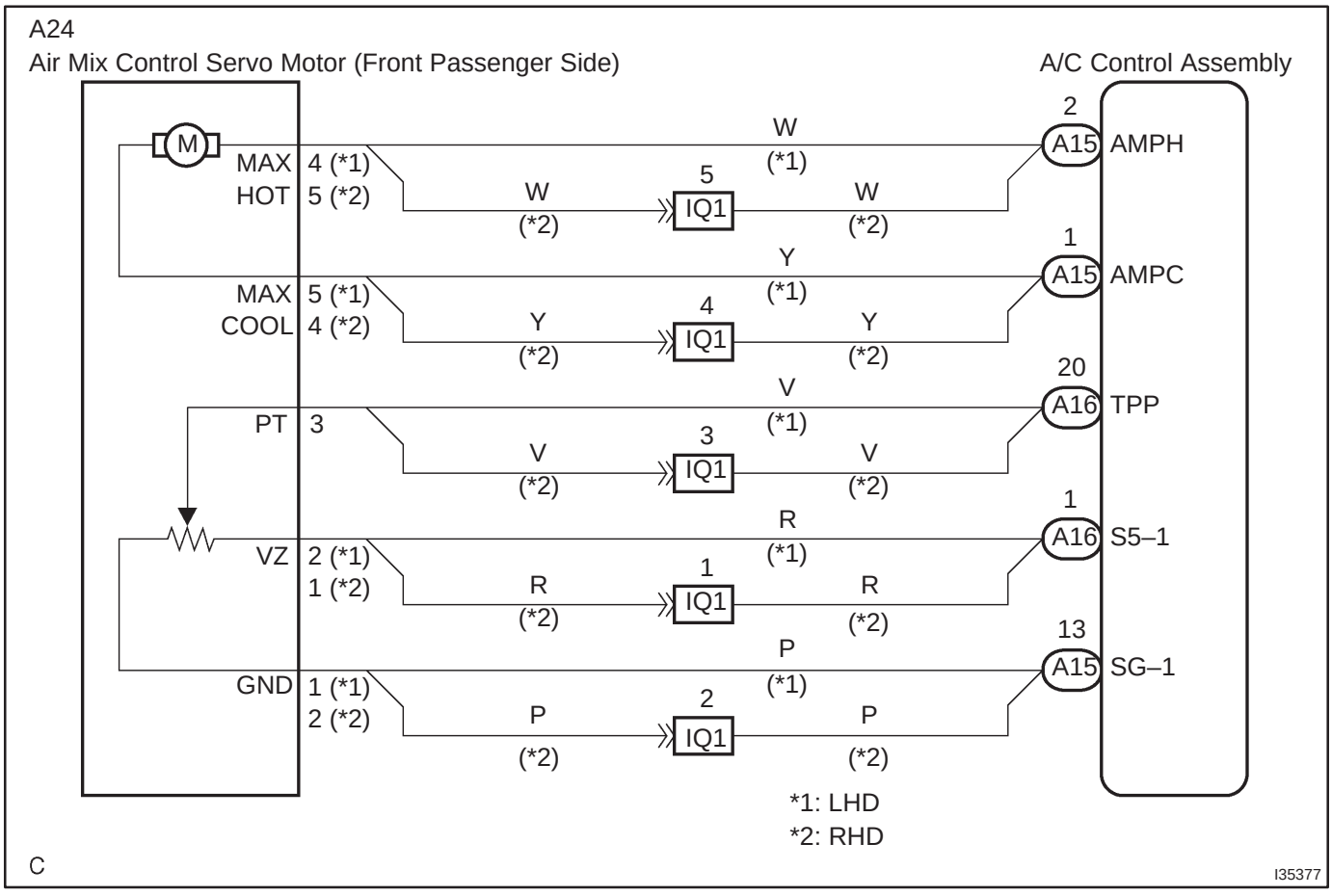
CIRCUIT DESCRIPTION



This sensor detects the position of the air mix damper and sends the appropriate signals to the A/C amplifier. The position sensor is built in the air mix damper servo sub–assy.

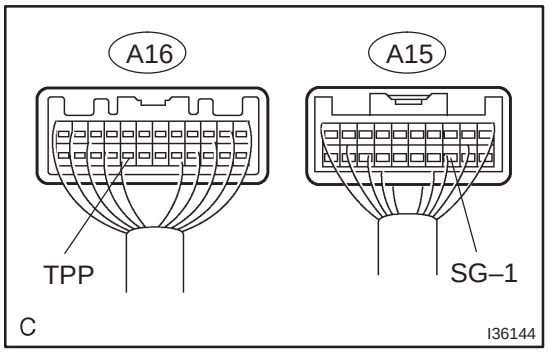
DTC No.	Detection Item	Trouble Area
31	Short to ground or power source circuit in air mix damper position sensor circuit.	• Air mix damper servo sub–assy (air mix damper position sensor) • Harness or connector between air mix damper servo sub–assy (air mix damper position sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TPP – SG–1)



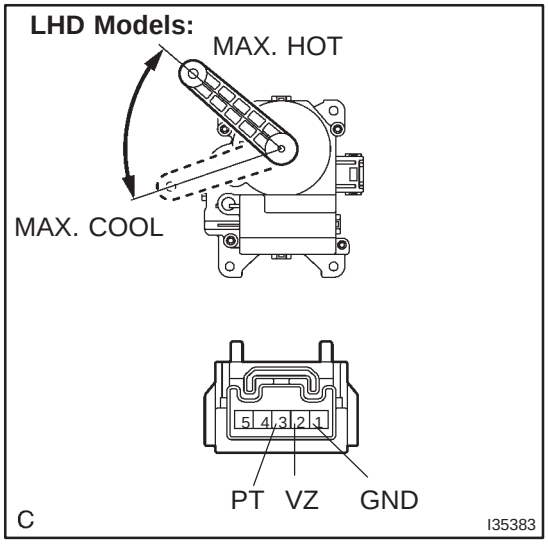
(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Change the set temperature to activate the air mix damper and measure the voltage between terminal TPP and SG–1 of A/C amplifier assy.
Standard:
MAX. COOL: 3.5 to 4.5 V
MAX. HOT: 0.5 to 1.8 V

HINT:
As the set temperature increases, the voltage decreases gradually without interruption.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

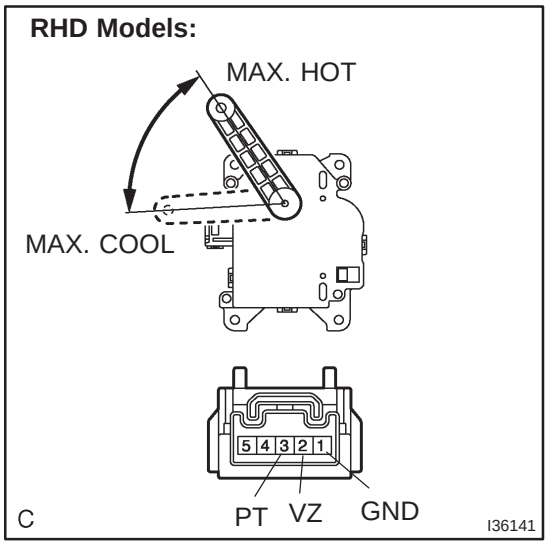
NG

2 INSPECT AIRMIX NO.2 DAMPER SERVO SUB–ASSY



(a) Remove the air mix damper servo sub–assy.
(b) Measure the resistance between terminal VZ and GND of air mix damper servo sub–assy connector.
Resistance: 4.2 to 7.8 kΩ
(c) While operating air mix damper servo sub–assy as shown in the procedure on page 05–1133, measure the resistance between terminal PT and GND of air mix damper servo sub–assy.
Standard:
MAX. HOT: 3.4 to 6.2 V
MAX. COOL: 0.8 to 1.6 V

HINT:
As the air mix damper servo sub–assy moves from COOL side to HOT side, the resistance decreases gradually without interruption.



NG → **REPLACE AIRMIX NO.2 DAMPER SERVO SUB–ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(AIRMIX NO.2 DAMPER SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between air mix damper position sensor and A/C amplifier (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 1.0 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

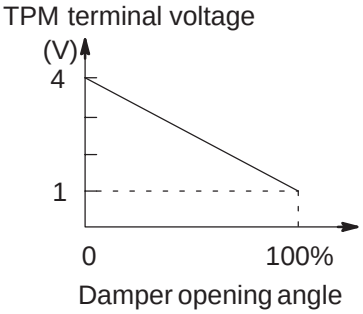
NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

DTC	33	AIR OUTLET DAMPER POSITION SENSOR CIRCUIT

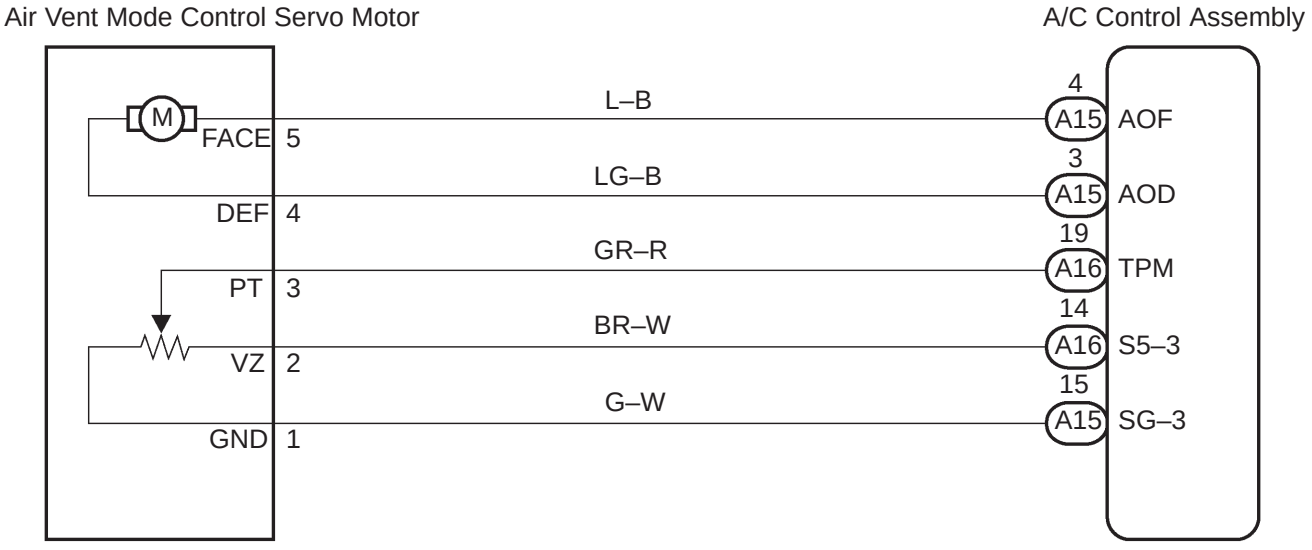
CIRCUIT DESCRIPTION



This sensor detects the position of the mode damper and sends the appropriate signals to the A/C amplifier. The position sensor is built in the mode damper servo sub–assy.

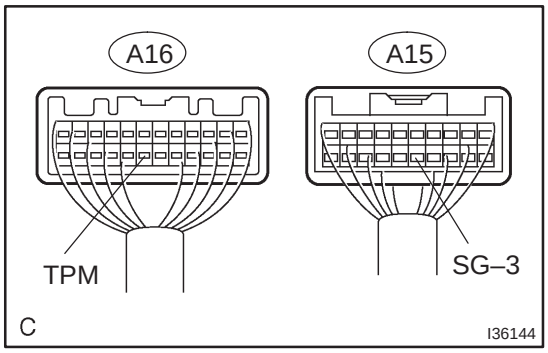
DTC No.	Detection Item	Trouble Area
33	Short to ground or power source circuit in mode damper position sensor circuit.	• Mode damper servo sub–assy (mode damper position sensor) • Harness or connector between mode damper servo sub–assy (mode damper position sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT AIR CONDITIONING AMPLIFIER(TPM – SG–3)



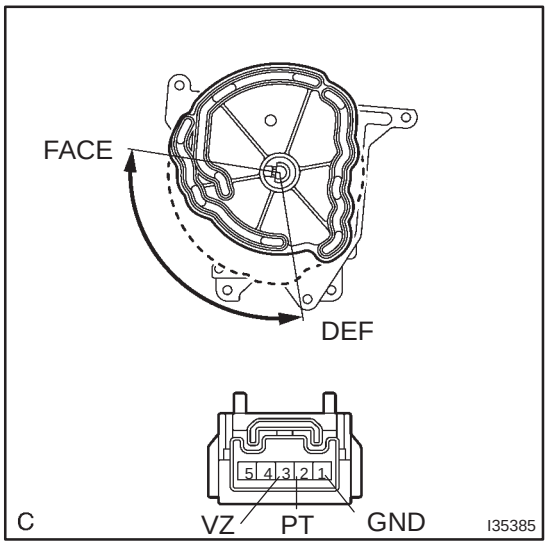
(a) Remove the A/C amplifier with being connectors connected.
(b) Turn the ignition switch to ON.
(c) Change the set to activate the mode damper sub–assy and measure voltage between terminal TPM and SG–3 of A/C amplifier assy.
Standard:
FACE: 3.5 to 4.5 V
DEF: 0.5 to 1.5 V

HINT:
As the is moved from FACE side to DEF side, the voltage decreases gradually with out interruption.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT MODE DAMPER SERVO SUB–ASSY



(a) Remove the mode damper servo sub–assy.
(b) Measure the resistance between terminal VZ and GND of mode damper servo sub–assy connector.
Standard: 4.2 – 7.8 kΩ
(c) While operating mode damper servo sub–assy as in the procedure on page 05–1136, measure the resistance between terminal PT and GND of mode damper servo sub–assy.
Standard:
DEF: 3.4 to 6.2 kΩ
FACE: 0.8 to 1.6 kΩ

HINT:
As the mode damper servo sub–assy moved from DEF side to FACE side, the resistance decreases gradually with out interruption.

NG → **REPLACE MODE DAMPER SERVO SUB–ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(MODE DAMPER SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between mode damper position sensor and A/C amplifier (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 1.0 minutes after turnig the ignition switch ON.
Standard: Normal codes are output.

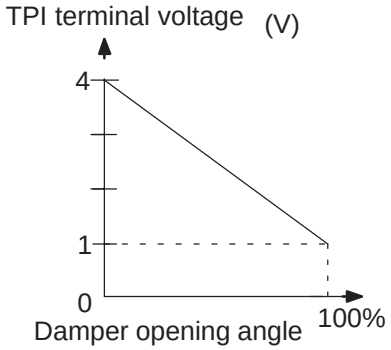
NG → REPLACE AIR CONDITIONING AMPLIFIER

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

DTC	36	AIR MIX DAMPER POSITION SENSOR CIRCUIT (DRIVER SIDE)

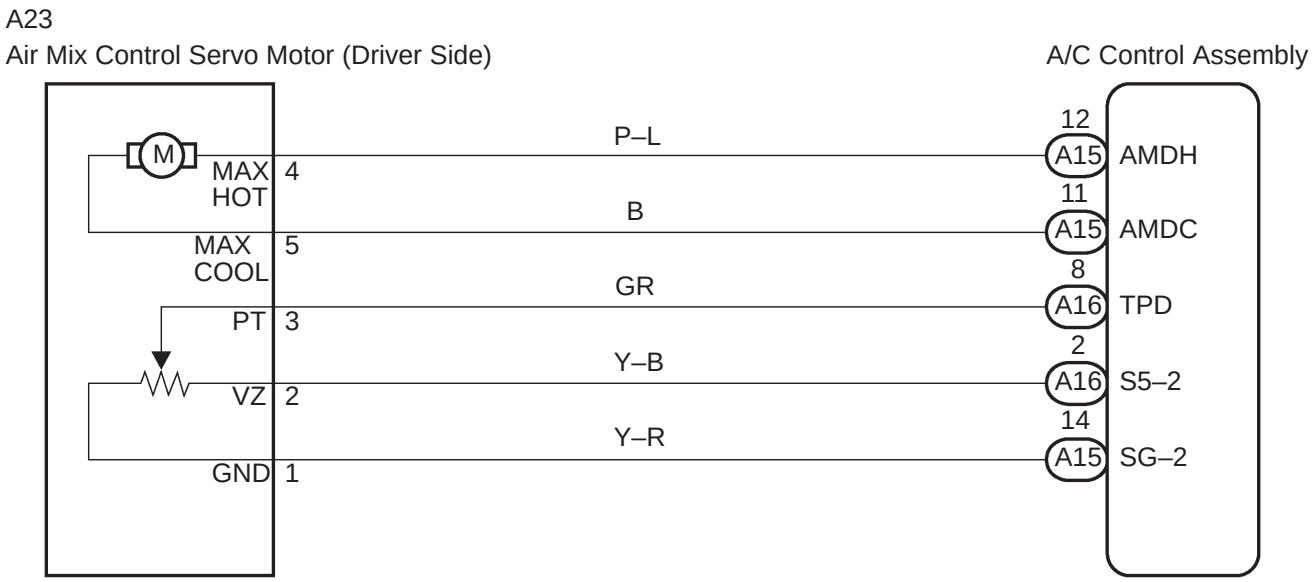
CIRCUIT DESCRIPTION



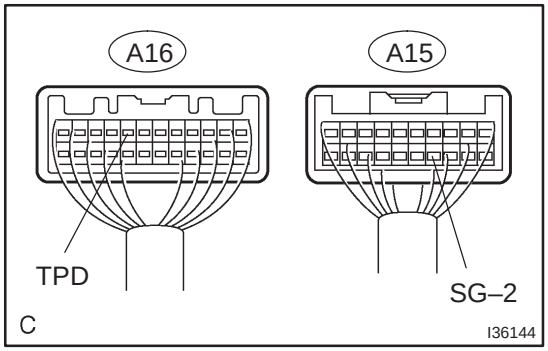
This sensor detects the position of the air mix damper and sends the appropriate signals to the A/C amplifier. The position sensor is built in the air mix damper servo sub–assy.

DTC No.	Detection Item	Trouble Area
36	Short to ground or power source circuit in air mix damper position sensor circuit.	• Air mix damper servo sub–assy (Air mix damper position sensor) • Harness or connector between air mix damper servo sub–assy (air mix damper position sensor) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



1	**INSPECT AIR CONDITIONING AMPLIFIER(TPD – SG–2)**



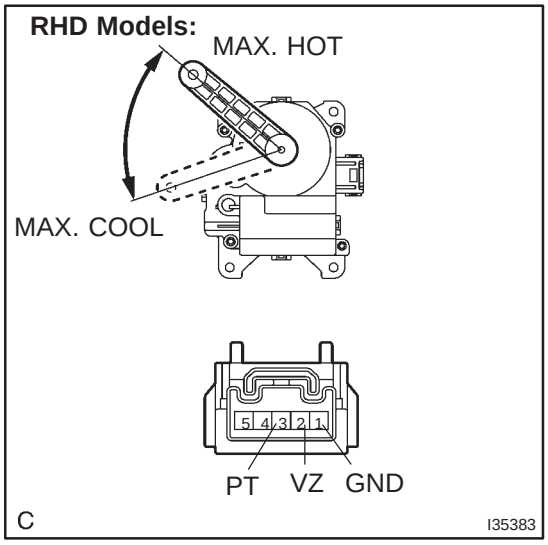
(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Change the set temperature to activate the air mix damper and measure the voltage between terminal TPD and SG–2 of A/C amplifier.
Standard:
MAX. COOL: 3.5 to 4.5 V
MAX HOT: 0.5 to 1.8 V

HINT:
As the set temperature increases, the voltage decreases gradually without interruption.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

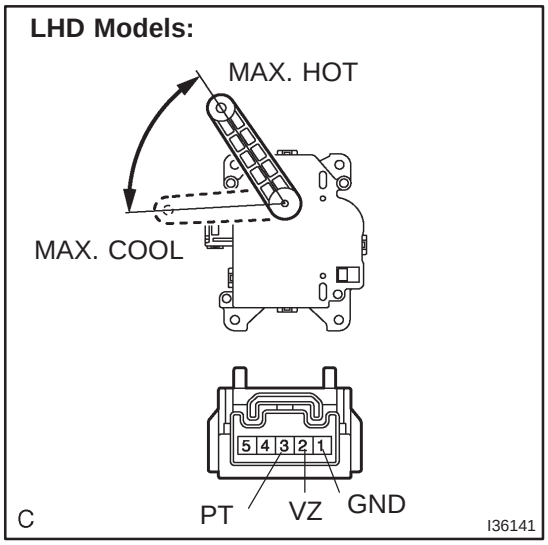
NG

2 INSPECT AIRMIX DAMPER SERVO SUB–ASSY



(a) Remove the air mix damper servo sub–assy.
(b) Measure the resistance between terminal VZ and GND of air mix damper servo sub–assy connector.
Resistance: 4.2 to 7.8 kΩ
(c) While operating air mix damper servo sub–assy as shown in the procedure on page 05–1139, measure resistance between terminal PT and GND of air mix damper servo sub–assy.
Resistance:
MAX. HOT: 3.4 to 6.2 kΩ
MAX. COOL: 0.8 to 1.6 kΩ

HINT:
As the air mix damper servo sub–assy moves from COOL side to HOT side, the resistance decreases gradually without interruption.



NG → **REPLACE AIRMIX DAMPER SERVO SUB–ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(AIRMIX DAMPER SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open and short circuit in harness and connector between air mix damper position sensor and A/C amplifier (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	READ OUTPUT DTC

(a) Clear the DTCs.
(b) Read the DTC at least 1.0 minutes after turning the ignition switch ON.
Standard: Normal codes are output.

NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

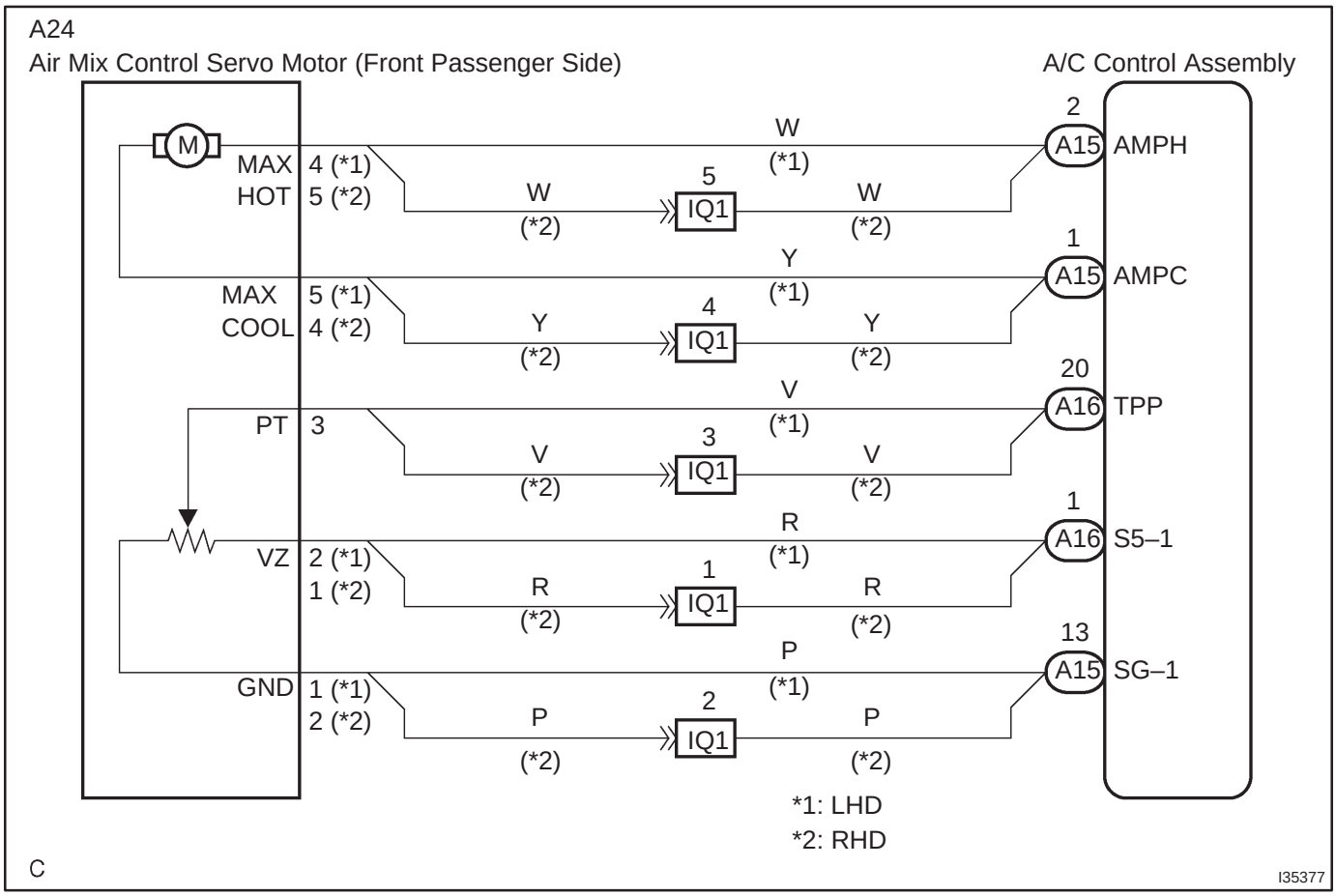
DTC	41	AIR MIX DAMPER CONTROL SERVOMOTOR CIRCUIT(PASSENGER SIDE)

CIRCUIT DESCRIPTION

This air mix damper servo sub–assy is controlled by the A/C amplifier and moves the air mix damper to the desired position.

DTC No.	Detection Item	Trouble Area
41	Air mix damper position sensor value does not change even if A/C amplifier operated air mix damper control servomotor.	• Air mix damper servo sub–assy (air mix damper control) • Harness or connector between air mix damper servo sub–assy (air mix damper control) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	PERFORM ACTUATOR CHECK

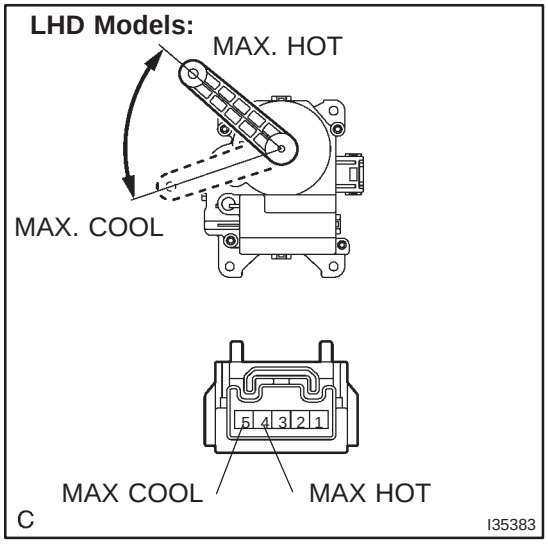
(a) Set the actuator check mode (See page 05–1091).
(b) Press the DEF switch (passenger side) and change to step operation.
(c) Check the air flow temperature by hand.

Display Code	Air Mix Damper Operation
0	COOL side (0% open)
1	COOL side (0% open)
2	COOL side (0% open)
3	COOL side (0% open)
4	COOL/HOT (50% open)
5	COOL/HOT (50% open)
6	HOT side (100% open)
7	HOT side (100% open)
8	HOT side (100% open)
9	HOT side (100% open)

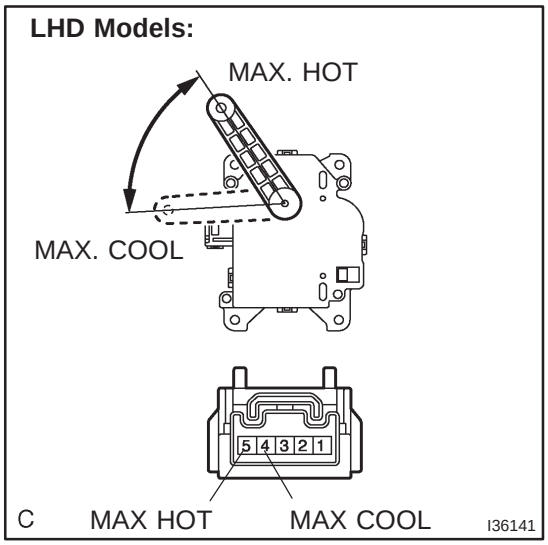
OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT AIRMIX NO.2 DAMPER SERVO SUB–ASSY



(a) Remove the air mix damper servo sub–assy.
(b) Connect the positive (+) lead from the battery to terminal MAX HOT and negative (–) lead to terminal MAX COOL, then check that the lever turns to ”HOT” side smoothly.
(c) Connect the positive (+) lead from the battery to terminal MAX COOL and negative (–) lead to terminal MAX HOT, then check that the lever turns to ”COOL” side smoothly.



NG → **REPLACE AIRMIX NO.2 DAMPER SERVO SUB–ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(AIRMIX DAMPER NO.2 SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between air mix damper control servomotor and A/C amplifier (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE AIR CONDITIONING AMPLIFIER

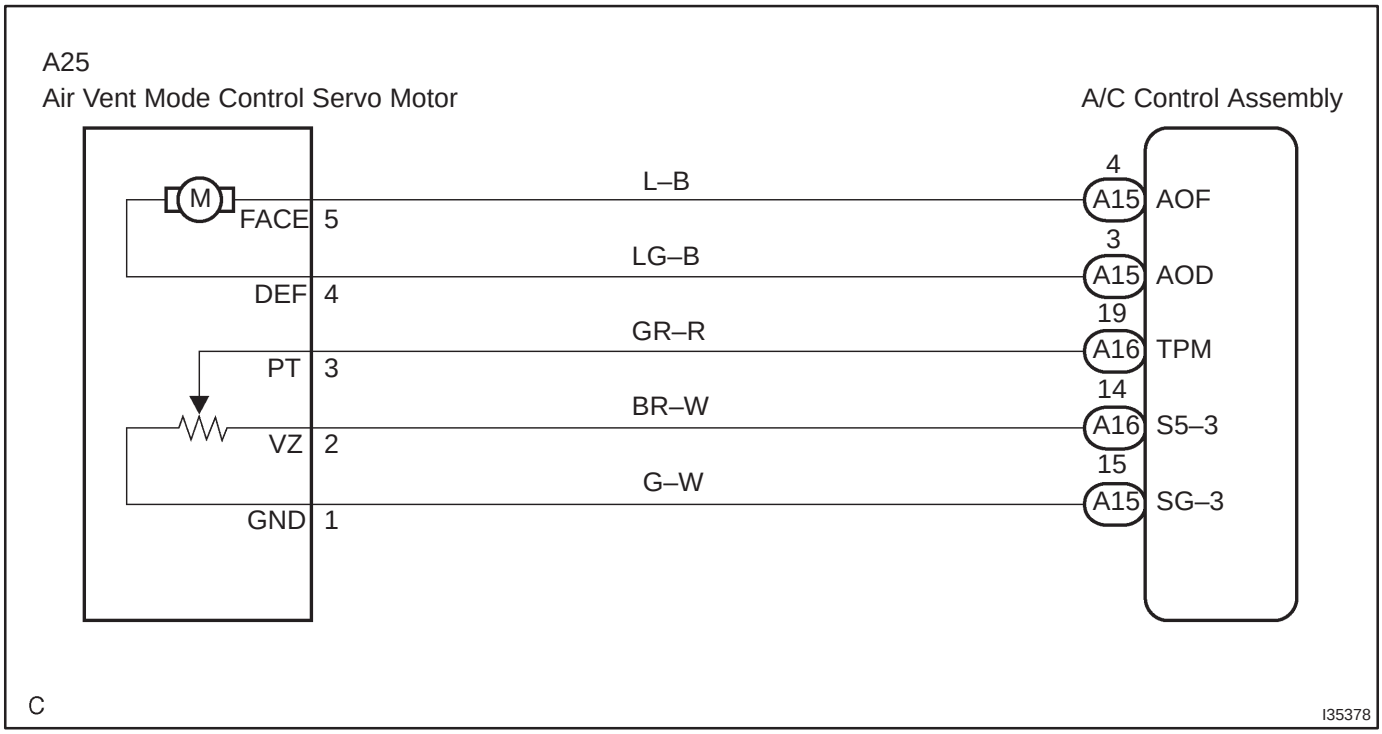
DTC	43	AIR OUTLET DAMPER CONTROL SERVOMOTOR CIRCUIT

CIRCUIT DESCRIPTION

This circuit turns the servomotor and changes each mode damper position by the signals from the A/C amplifier assy. When the AUTO switch is on, the A/C amplifier changes the mode automatically between ”FACE”, ”BI–LEVEL”, ”FOOT” and ”FOOT/DEF” according to the temperature setting.

DTC No.	Detection Item	Trouble Area
43	Air mode damper position sensor value does not change even if A/C amplifier operated mode damper control servomotor.	• Mode damper servo sub–assy (mode damper control) • Harness or connector between mode damper servo sub–assy (mode damper control) and A/C amplifier assy • A/C amplifier assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	PERFORM ACTUATOR CHECK

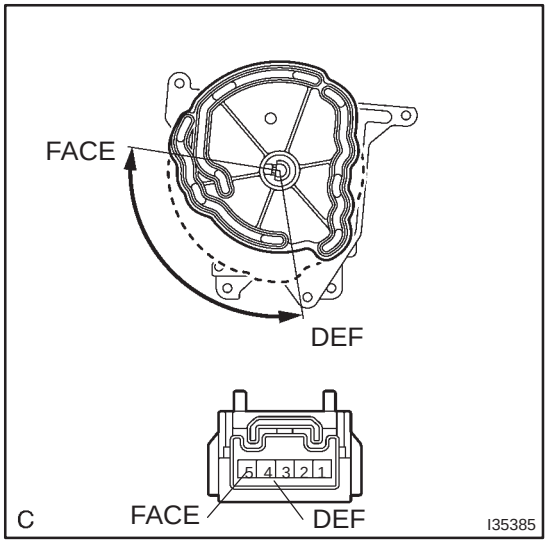
(a) Warm up engine.
(b) Set the actuator check mode (See page 05–1091).
(c) Press the DEF switch and change it to the step operation.
(d) Check the air flow by hand.

Display code	Air flow condition
0	FACE
1	FACE
2	FACE
3	FACE
4	FACE1
5	B/L
6	FOOT1
7	FOOT
8	FOOT/DEF
9	DEF

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT MODE DAMPER SERVO SUB–ASSY



(a) Remove the mode damper servo sub–assy.
(b) Connect the positive (+) lead from the battery to terminal DEF and negative (–) lead to terminal FACE then check that the lever turns to ”DEF” position.
(c) Connect the positive (+) lead from the battery to terminal FACE and negative (–) lead to terminal DEF then check that the lever turn to ”FACE” position.

NG → REPLACE MODE DAMPER SERVO SUB–ASSY

OK

3	CHECK HARNESS AND CONNECTOR(MODE DAMPER SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between mode damper servo sub–assy and A/C amplifier (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER

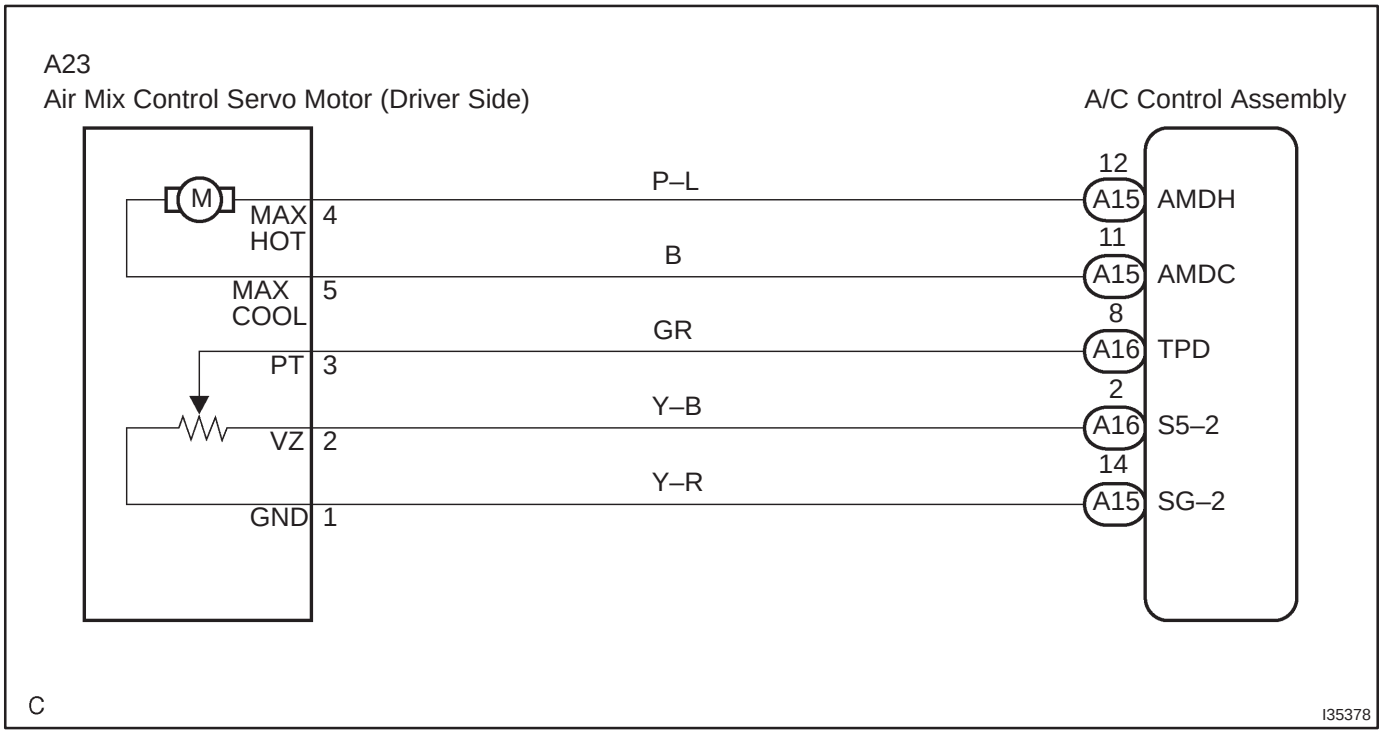
DTC	46	AIR MIX DAMPER CONTROL SERVOMOTOR CIRCUIT (DRIVER SIDE)

CIRCUIT DESCRIPTION

The air mix damper servo sub–assy is controlled by the A/C amplifier and moves the air mix damper to the desired position.

DTC No.	Detection Item	Trouble Area
46	Air mix damper position sensor value does not change even if A/C amplifier operated air mix damper control servomotor.	• Air mix damper servo sub–assy (air mix damper control) • Harness or connector between air mix damper servo sub–assy (air mix damper control servomotor) and A/C amplifier • A/C amplifier assy

WIRING DIAGRAM



1	PERFORM ACTUATOR CHECK

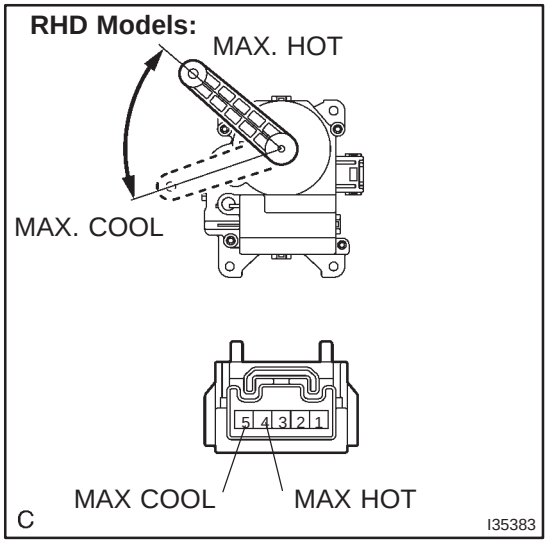
(a) Set the actuator check mode (See page 05–1091).
(b) Press the DEF switch (driver side) and change to the step operation.
(c) Check the air flow temperature by hand.

Display Code	Air Mix Damper Operation
0	COOL side (0 % open)
1	COOL side (0 % open)
2	COOL side (0 % open)
3	COOL side (0 % open)
4	COOL/HOT (50% open)
5	COOL/HOT (50% open)
6	HOT side (100% open)
7	HOT side (100% open)
8	HOT side (100% open)
9	HOT side (100% open)

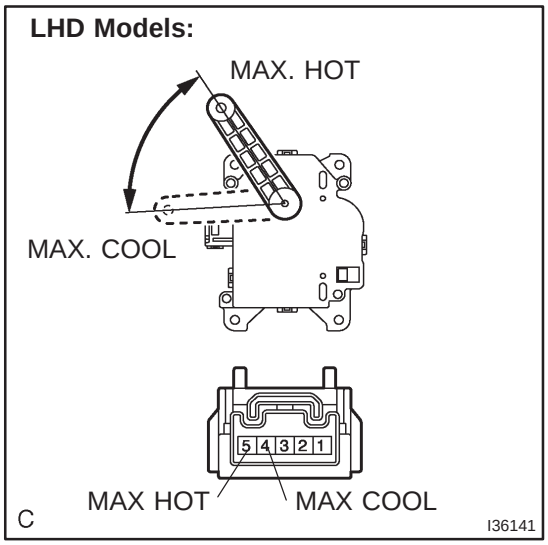
NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

OK

2	INSPECT AIRMIX DAMPER SERVO SUB–ASSY



(a) Remove the air mix damper servo sub–assy.
(b) Connect the positive (+) lead from the battery to terminal MAX HOT and negative (–) lead to terminal MAX COOL, then check that the lever turns to ”HOT” side smoothly.
(c) Connect the positive (+) lead from the battery to terminal MAX COOL and negative (–) lead to terminal MAX HOT, then check that the lever turns to ”COOL” side smoothly.



NG → REPLACE AIRMIX DAMPER SERVO SUB–ASSY

OK

3	CHECK HARNESS AND CONNECTOR(AIRMIX DAMPER SERVO SUB–ASSY – A/C AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between air mix control servomotor and A/C amplifier (See page 01–32).

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

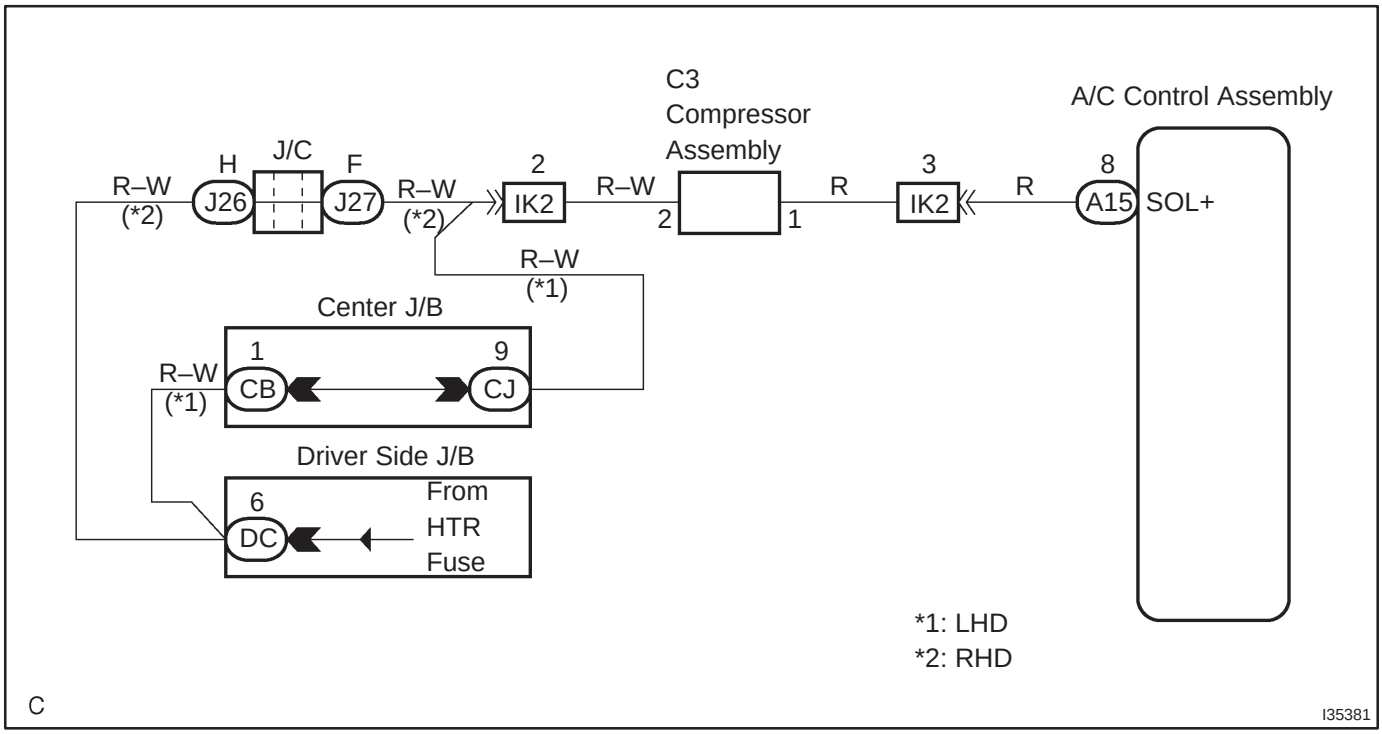
REPLACE AIR CONDITIONING AMPLIFIER

AIR CONDITIONER MAGNETIC VALVE CIRCUIT

CIRCUIT DESCRIPTION

The air conditioner magnetic valve is controlled by A/C amplifier.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 PERFORM ACTUATOR CHECK

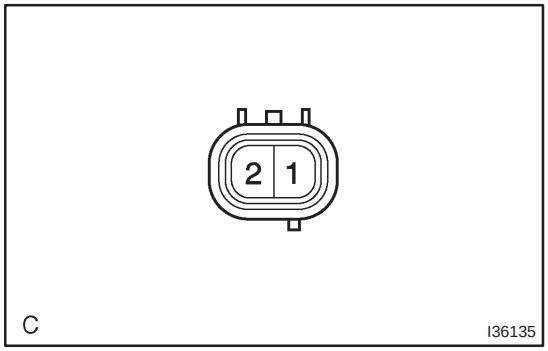
(a) Set the actuator check mode (See page 05–1091).
(b) Press the DEF switch and change to the step operation.
(c) Check the air flow level by hand.

Display Code	Blower level
0	ON
1	ON
2	OFF
3	OFF
4	OFF
5	OFF
6	OFF
7	OFF
8	OFF
9	OFF

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2 INSPECT AIR CONDITIONER MAGNETIC VALVE



(a) Measure the resistance between terminals 1 and 2.
Standard: 10 to 11 Ω at 25 °C (77 °F)

If the resistance is not as specified, replace the compressor assy.

NG → **REPLACE W/PULLEY COMPRESSOR ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(A/C AMPLIFIER – BATTERY)

(a) Check for an open or short circuit in harness and connector between terminal SOL+ of A/C amplifier and battery + terminal (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

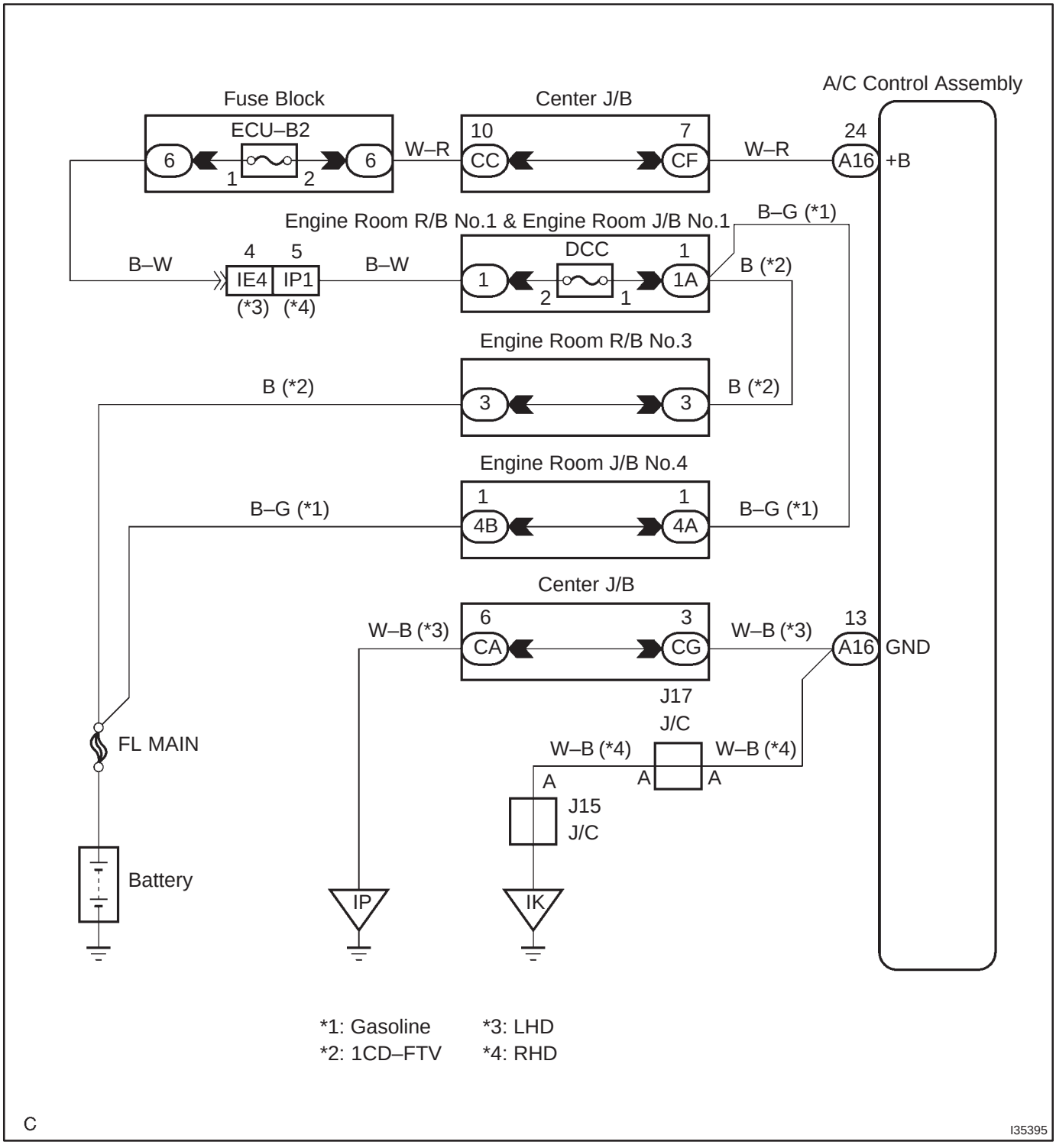
REPLACE AIR CONDITIONING AMPLIFIER

BACK–UP POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This is the back–up power source for the A/C amplifier. Power is supplied even when the ignition switch is off and is used for diagnostic trouble code memory etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

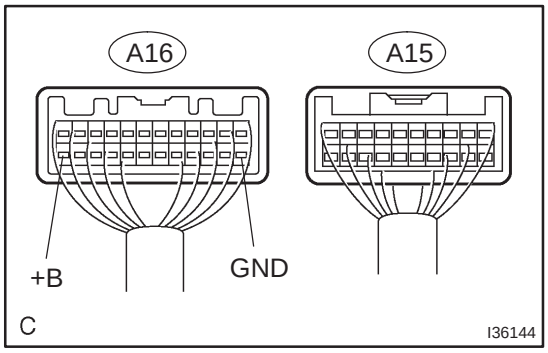
1	CHECK FUSE(ECU–B2, DCC FUSE)

(a) Remove the ECU–B2 fuse and DCC fuse from the fuse block and engine room J/B.
(b) Check for the continuity of ECU–B2 fuse and DCC fuse.

NG → **REPLACE FUSE**

OK

2	CHECK HARNESS AND CONNECTOR(A/C AMPLIFIER – BATTERY)



(a) Remove the A/C amplifier with being connected.
(b) Measure the voltage between terminal +B and GND of A/C amplifier.

Standard: 10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

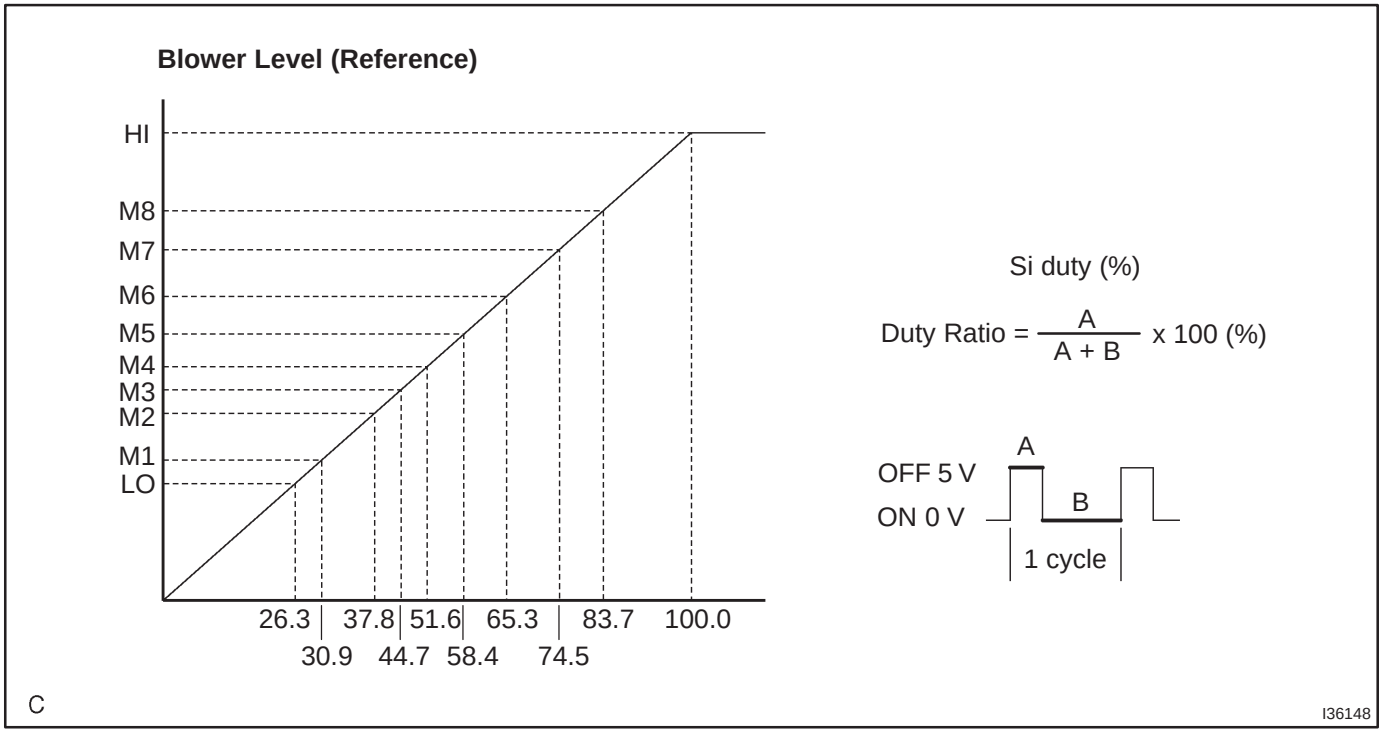
BLOWER MOTOR CIRCUIT

CIRCUIT DESCRIPTION

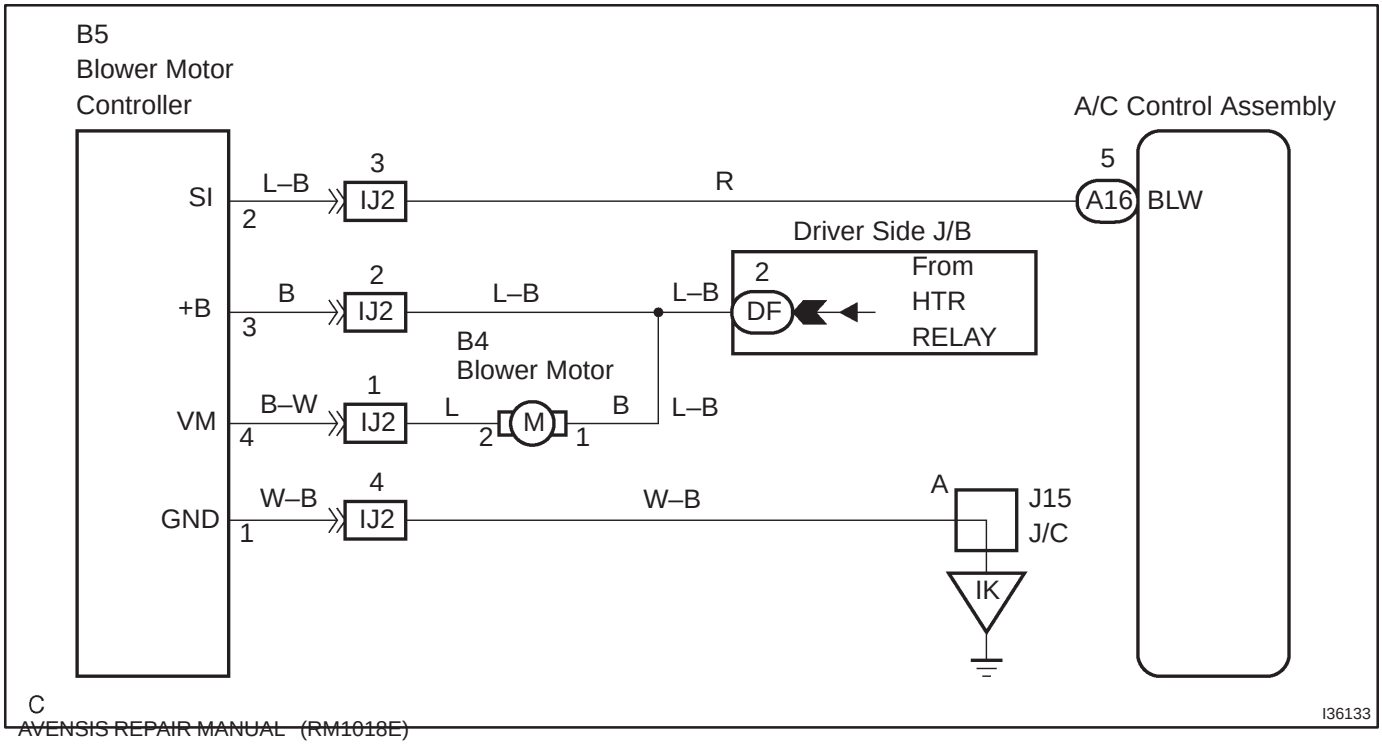
The blower motor is operated by signals from the A/C amplifier. Blower motor speed signals are transmitted by changes in the Duty Ratio.

Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and then B is the period of non–continuity.



WIRING DIAGRAM



INSPECTION PROCEDURE

1	PERFORM ACTUATOR CHECK

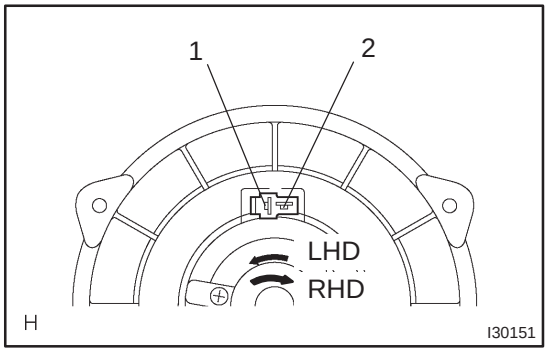
(a) Set to actuator check mode (See page 05–1091).
(b) Press the DEF switch and change to step operation.
(c) Check the air flow level by hand.

Display Code	Blower level
0	0
1	1
2	16
3	16
4	16
5	16
6	16
7	16
8	16
9	31

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT BLOWER W/FAN MOTOR SUB–ASSY



(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) to terminal 2.
Standard: Blower motor operates smoothly.

If operation is not as specified, replace the blower motor.

NG → **REPLACE BLOWER W/FAN MOTOR SUB–ASSY**

OK

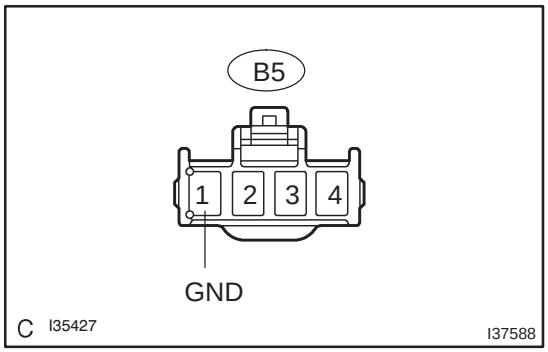
3	CHECK HARNESS AND CONNECTOR(BLOWER W/FAN MOTOR SUB–ASSY – BLOWER MOTOR CONTROL)

(a) Check for an open or short circuit in harness and connector between blower w/fan motor sub–assy and blower motor control (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK HARNESS AND CONNECTOR(BLOWER MOTOR CONTROL – BODY GROUND)

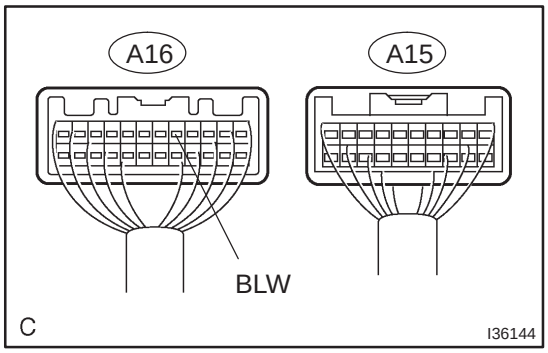


(a) Check for an open circuit in harness and connector between terminal GND of blower motor control and body ground (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

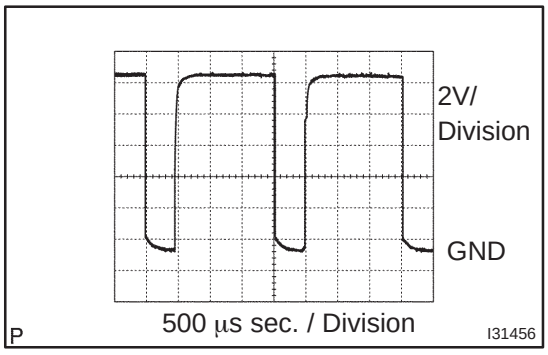
OK

5	INSPECT AIR CONDITIONING AMPLIFIER(BLW)



(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch ON.
(c) Blower switch is ON.
(d) Measure the waveform between terminal BLW of A/C amplifier and body ground.
OK: Pulse generation

HINT:
- The correct waveform is as shown.
- Waveform varies with blower level.



NG → **REPLACE AIR CONDITIONING AMPLIFIER**

OK

6	CHECK HARNESS OR CONNECTOR(A/C AMPLIFIER – BLOWER MOTOR CONTROL)

(a) Check for an open or short circuit in harness and connector between A/C amplifier and blower motor control (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE BLOWER MOTOR CONTROL

050TH–09

CUSTOMER PROBLEM ANALYSIS CHECK

AIR CONDITIONING SYSTEM Check Sheet

Inspector's name:

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date vehicle Brought In	/ /	**Odometer Reading**	**km Miles**

Date of Problem Occurrence	/ /
How Often does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)
Weather	☐ Fine ☐ Cloudy ☐ Snowy ☐ Various / Other
Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F °C)

Symptoms	**Air Flow Control Faulty**	☐ Blower motor does not operate ☐ Blower motor speed does not change (Always Hi, Always Mid, Always Lo)
	Temperature Control Faulty	☐ Cabin temperature does not go down ☐ Cabin temperature does not rise ☐ Response is slow
	Air Inlet Control Faulty	☐ Cannot change between FRS and REC (Always Fresh or always Recirculating)
	Vent Control Faulty	☐ Mode will not change ☐ Will not enter the desired mode

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

I30150

050TJ–13

DIAGNOSTIC TROUBLE CODE CHART

If malfunction code is displayed during the DTC check (sensor check), check the circuit listed for the code in the table below (Proceed to the page given for that circuit).

DTC No. (See Page)	Detection Item	Trouble Area	Memory
00	Normal	–	–
11 *1 (05–1102)	Room temperature sensor circuit (open/short)	• Cooler thermistor (room temp. sensor) • Harness or connector between cooler thermistor (room temp. sensor) and A/C amplifier assy • A/C amplifier assy	○ (8.5 min. or more)
12 *2 (05–1106)	Ambient temperature sensor circuit (open/short)	• Thermistor assy (ambient temp. sensor) • Harness or connector between thermistor assy (ambient temp. sensor) and combination meter • Combination meter • Harness or connector between combination meter and A/C amplifier assy • A/C amplifier assy	○ (8.5 min. or more)
13 (05–1109)	Evaporator temperature sensor circuit (open/short)	• Cooler thermistor No.1 (evaporator temp. sensor) • Harness or connector between cooler thermistor No.1 (evaporator temp. sensor) and A/C amplifier assy • A/C amplifier assy	○ (8.5 min. or more)
21 *3 (05–1113)	Solar sensor circuit (open) (Passenger side)	• Automatic light control sensor (solar sensor) • Harness or connector between automatic light control sensor (solar sensor) and A/C amplifier assy • A/C amplifier assy	○ (8.5 min. or more)
	Solar sensor circuit (short) (Passenger side)		–
23 (05–1116)	Pressure sensor circuit	• A/C tube assy (pressure sensor) • Harness or connector between A/C tube assy (pressure sensor) and A/C amplifier assy • A/C amplifier assy	–
24 *3 (05–1119)	Solar sensor circuit (open) (Driver side)	• Automatic light control sensor (solar sensor) • Harness or connector between automatic light control sensor (solar sensor) and A/C amplifier assy • A/C amplifier assy	○ (8.5 min. or more)
	Solar sensor circuit (short) (Driver side)		–
31 (05–1122)	Air mix damper position sensor circuit (Passenger side)	• Air mix damper servo sub–assy (air mix damper position sensor) • Harness or connector between air mix damper servo sub–assy (air mix damper position sensor) and A/C amplifier assy • A/C amplifier assy	○ (1 min. or more)
33 (05–1126)	Air outlet damper position sensor circuit	• Mode damper servo sub–assy (mode damper position sensor) • Harness or connector between mode damper servo sub–assy (mode damper position sensor) and A/C amplifier assy • A/C amplifier assy	○ (1 min. or more)
36 (05–1129)	Air mix damper position sensor circuit (Driver side)	• Air mix damper servo sub–assy (Air mix damper position sensor) • Harness or connector between air mix damper servo sub–assy (air mix damper position sensor) and A/C amplifier assy • A/C amplifier assy	○ (1 min. or more)
41 (05–1133)	Air mix damper control servomotor (Passenger side)	• Air mix damper servo sub–assy (air mix damper control) • Harness or connector between air mix damper servo sub–assy (air mix damper control) and A/C amplifier assy • A/C amplifier assy	○ (15 sec.)

43 (05–1136)	Air outlet damper control servomotor	• Mode damper servo sub–assy (mode damper control) • Harness or connector between mode damper servo sub–assy (mode damper control) and A/C amplifier assy • A/C amplifier assy	○ (15 sec.)
46 (05–1139)	Air mix damper control servomotor (Driver side)	• Air mix damper servo sub–assy (air mix damper control) • Harness or connector between air mix damper servo sub–assy (air mix damper control servomotor) and A/C amplifier • A/C amplifier assy	○ (15 sec.)

HINT:

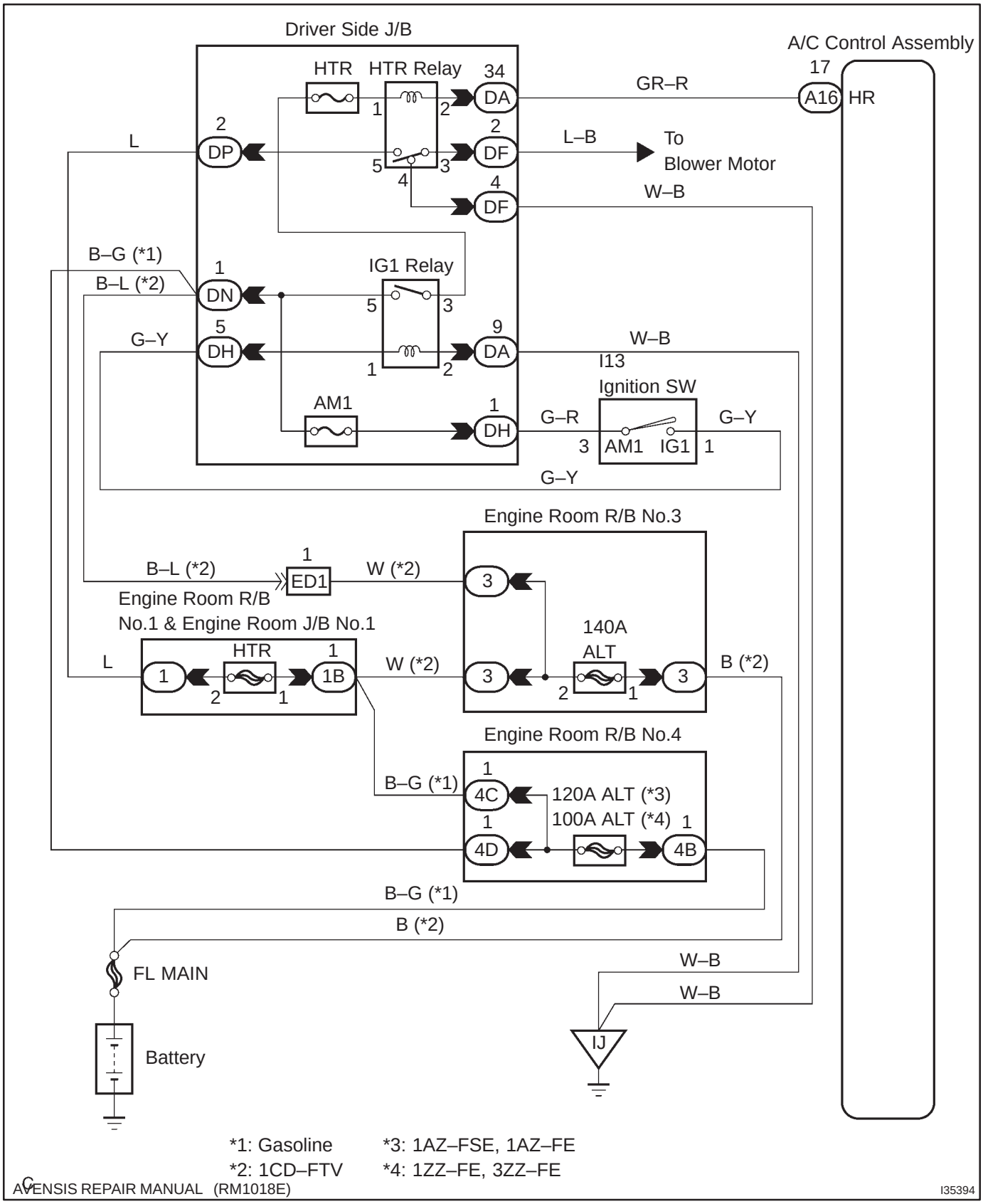
- *1: If the room temp. is approx. –18.6˚C (–3.7˚F) or lower, DTC 11 may be output even though the system is normal.
- *2: If the ambient temp. is approx. –52.9˚C (–61.4˚F) or lower, DTC may be output even though the system is normal.
- *3: If the check is being performed in a dark place, DTC 21 and 24 (solar sensor circuit abnormal) could be displayed.

HEATER RELAY CIRCUIT

CIRCUIT DESCRIPTION

The heater relay is switched on by signals from the A/C amplifier. It supplies power to the blower motor.

WIRING DIAGRAM



INSPECTION PROCEDURE

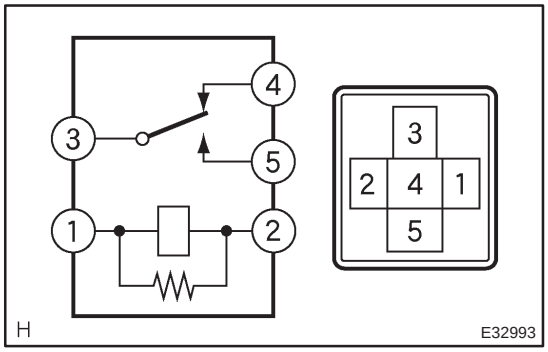
1	CHECK FUSE(HTR FUSE)

(a) Remove the HTR fuse from the driver side J/B and engine room J/B.
(b) Check for the continuity of HTR fuse.

NG → **REPLACE FUSE**

OK

2	INSPECT HEATER RELAY



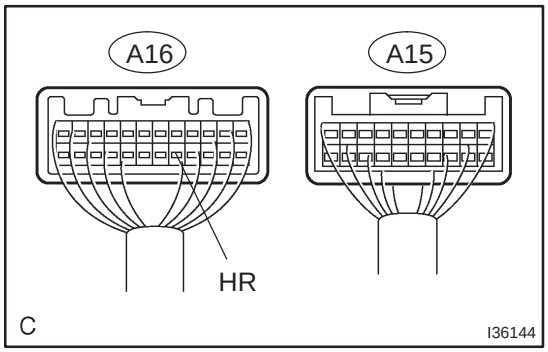
(a) Check for the continuity between each pair of terminals of cooler relay assy, as shown in the chart.
Standard:

Terminal No.	Specified condition
3 – 5	No continuity
	Less than 1 Ω (When battery voltage applied to terminals 1 and 2)
3 – 4	Less than 1 Ω
	No continuity (When battery voltage applied to terminals 1 and 2)
1 – 2	Approx. 1.3 kΩ

NG → **REPLACE HEATER RELAY**

OK

3	CHECK HARNESS AND CONNECTOR(A/C AMPLIFIER – BATTERY)



(a) Remove the A/C amplifier with connectors being connected.
(b) Measure the voltage between terminal HR of A/C amplifier and body ground when ignition switch is ON and OFF.
Standard:

Ignition switch position	Blower switch position	Voltage (V)
OFF	OFF	0
ON	ON	Below 1.0
ON	OFF	10 to 14

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

HOT GAS HEATER MAGNETIC VALVE CIRCUIT

CIRCUIT DESCRIPTION

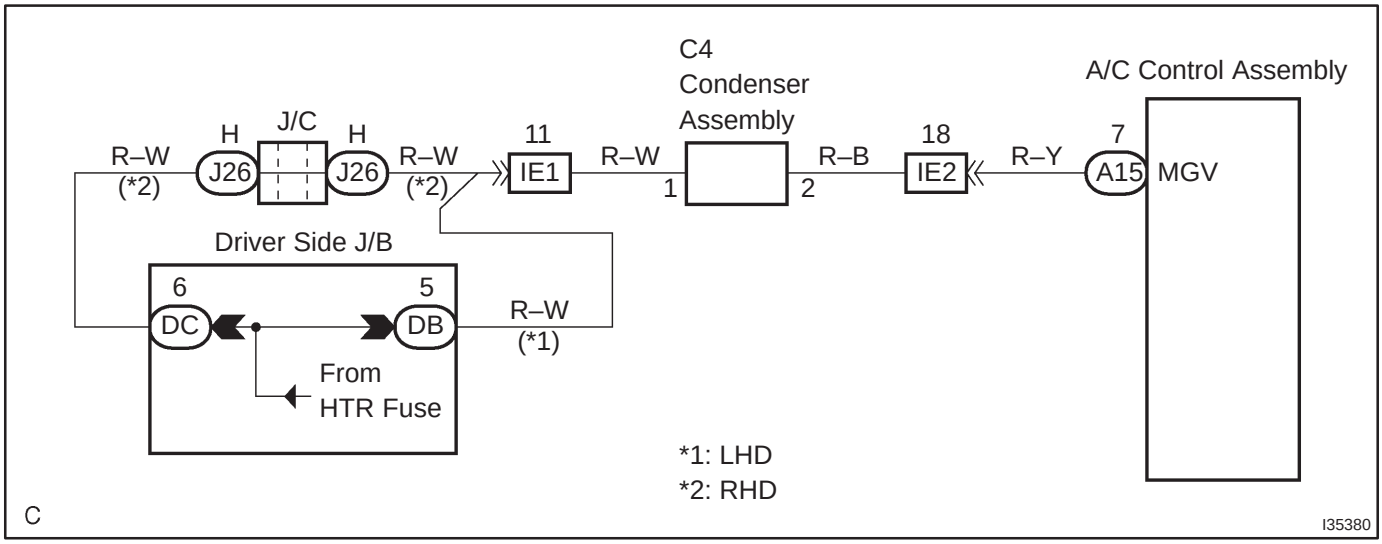
For the hot gas heater, it is necessary to fulfill the following 6 conditions.

- Hot gas heater switch is ON.
- Recirculation damper position is FRS.
- Blower motor switch is in the position other than OFF.
- Ambient temperature varies according to the following condition;

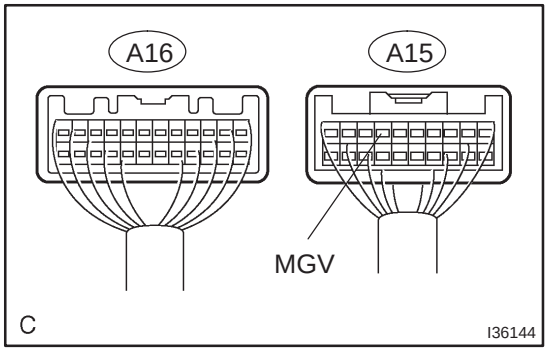
A/C switch ON	Below –1.5°C (32°F)
A/C switch OFF	Below 8°C (46°F)

- Air mix damper position is MAX HOT.
- Water temperature is 70°C (158°F) or less.

WIRING DIAGRAM



1 INSPECT AIR CONDITIONING AMPLIFIER



(a) Remove the A/C amplifier with connectors being connected.

(b) Measure the voltage between terminals MGV of the A/C amplifier and body ground.

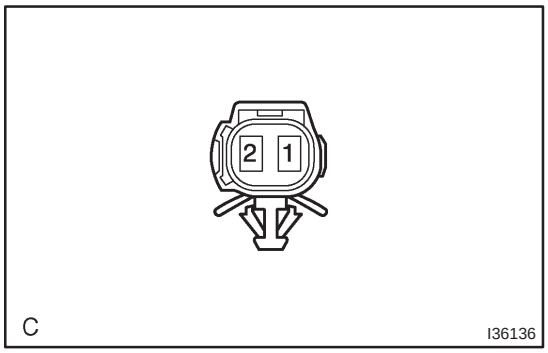
Standard:

Recirculation switch	Voltage (V)
Operate	Below 1.0
Not Operate	No Continuity

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE**

NG

2 INSPECT W/RECEIVER CONDENSER ASSY



(a) Apply voltage between terminals and check that the refrigerant passages switch.

NG → **REPLACE W/RECEIVER CONDENSER ASSY**

OK

3 CHECK WIRE HARNESS(W/RECEIVER CONDENSER ASSY – AIR CONDITIONING AMPLIFIER)

(a) Check for an open or short circuit in harness and connector between w/ receiver condenser assy and A/C amplifier (See page 01–32).

NG → **REPAIR OR REPLACE WIRE HARNESS**

OK

REPLACE AIR CONDITIONING AMPLIFIER

HOT GAS HEATER SWITCH CIRCUIT

CIRCUIT DESCRIPTION

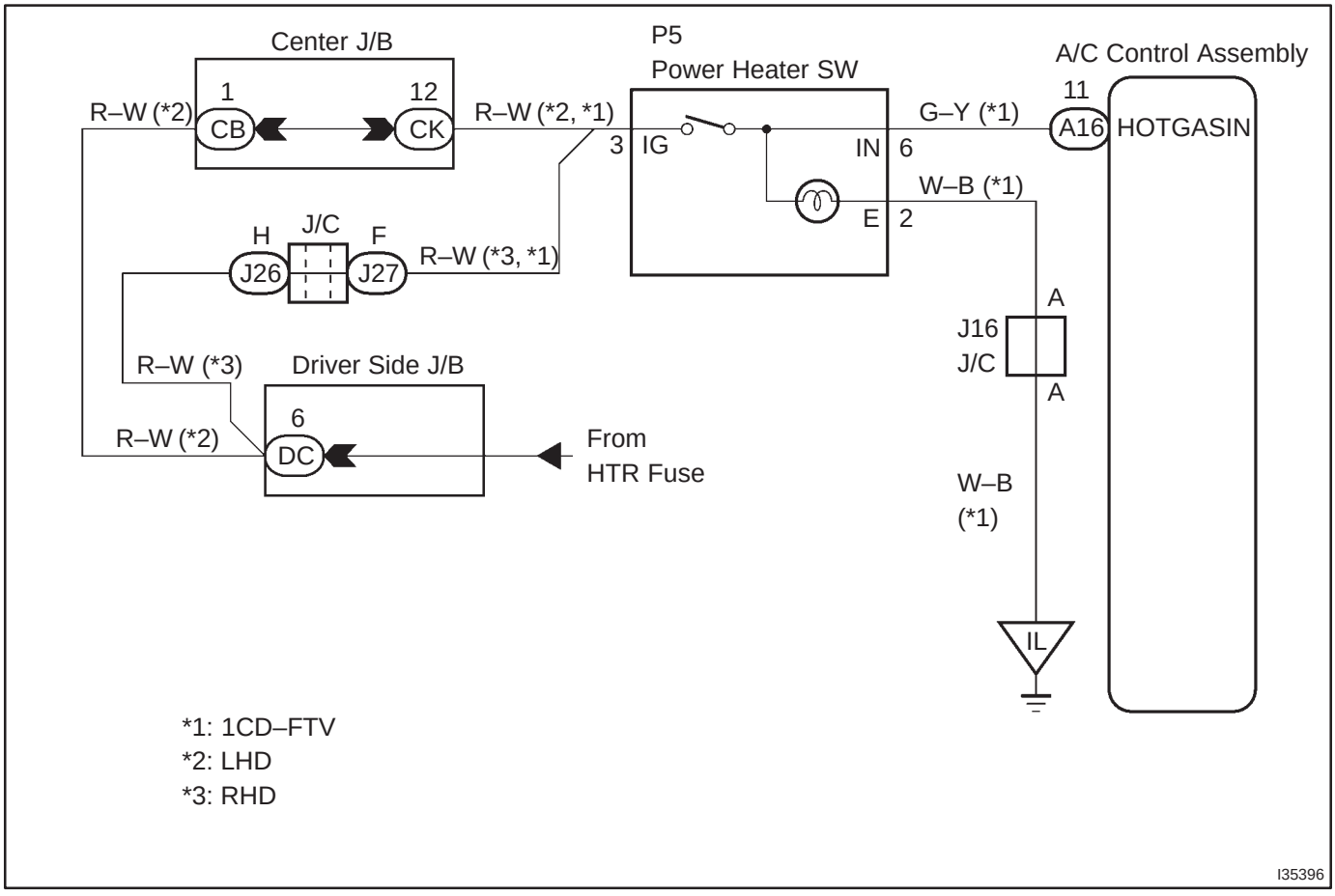
Hot gas heater performs only when its switch turns to ON and fulfill the following 6 conditions.

- Hot gas heater switch is ON.
- Recirculation damper position is FRS.
- Blower motor switch is in the position other than OFF.
- Ambient temperature varies according to the following condition;

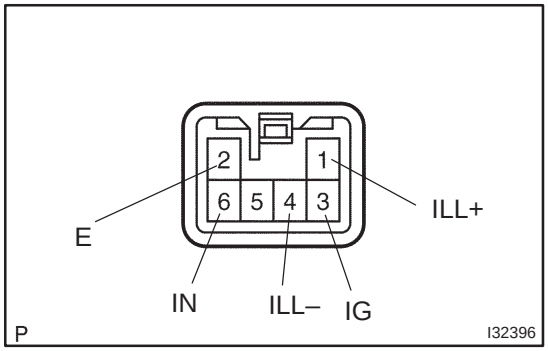
A/C switch ON	Below –1.5°C (32°F)
A/C switch OFF	Below 8°C (46°F)

- Air mix damper position is MAX HOT.
- Water temperature is 70°C (158°F) or less.

WIRING DIAGRAM



1 INSPECT HETER SWITCH ASSY



(a) Check that the continuity when connecting the positive tester lead (+) and the negative tester lead (–) to the following terminals.

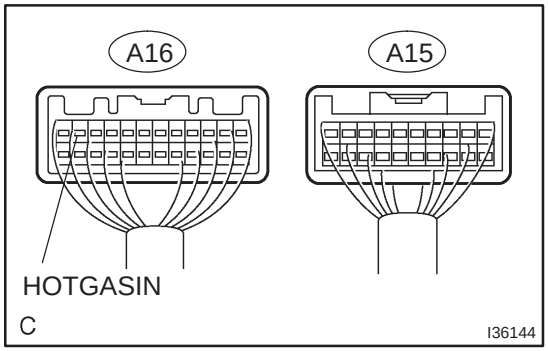
Standard:

Heater switch condition	Connecting terminals	Standard value
ON	IG – IN	Continuity
OFF	IG – IN	No continuity
ON	IG – E	Continuity
OFF	IG – E	No continuity
ON	ILL+ – ILL–	Continuity
OFF	ILL+ – ILL–	Continuity

NG → **REPAIR OR REPLACE HETER SWITCH ASSY**

OK

2 CHECK WIRE HARNESS(A/C CONTROL ASSEMBLY – BATTERY)



(a) Remove the A/C amplifier with connectors being connected.

(b) Turn the ignition switch to ON.

(c) Measure the voltage between terminal HOTGASIN and GND of the A/C amplifier.

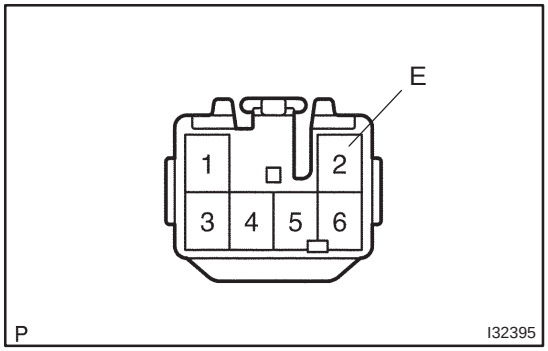
Standard:

Heater switch condition	Standard value
ON	10 to 14 V
OFF	0 V

NG → **REPAIR OR REPLACE WIRE HARNESS**

OK

3 CHECK WIRE HARNESS(HETER SWITCH – BODY GROUND)



(a) Check for an open or short circuit in harness and connector between heater switch and body ground
(See page 01–32).

NG → **REPAIR OR REPLACE WIRE HARNESS**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

AIR CONDITIONING SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

050TG–11

1	VEHICLE BROUGHT TO WORK SHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1090)

3	CHECK AND CLEAR DTC (See page 05–1091)

4	PROBLEM SYMPTOM CONFIRMATION

SYMPTOM OCCUR (GO TO STEP 6)

SYMPTOM DOES NOT OCCUR (GO TO STEP 5)

5	SYMPTOM SIMULATION (See page 01–22)

6	DTC CHECK (See page 05–1091)

MALFUNCTION CODE (GO TO STEP 7)

NORMAL CODE (GO TO STEP 8)

7	DTC CHART (See page 05–1094)

GO TO STEP 10

8	PROBLEM SYMPTOMS TABLE (See page 05–1100)

9	ACTUATOR CHECK (See page 05–1091)

10	CIRCUIT INSPECTION (See page 05–1102 to 05–1159)

11	IDENTIFICATION OF PROBLEM

12	PARTS INSPECTION

13	REPAIR

14	CONFIRMATION TEST

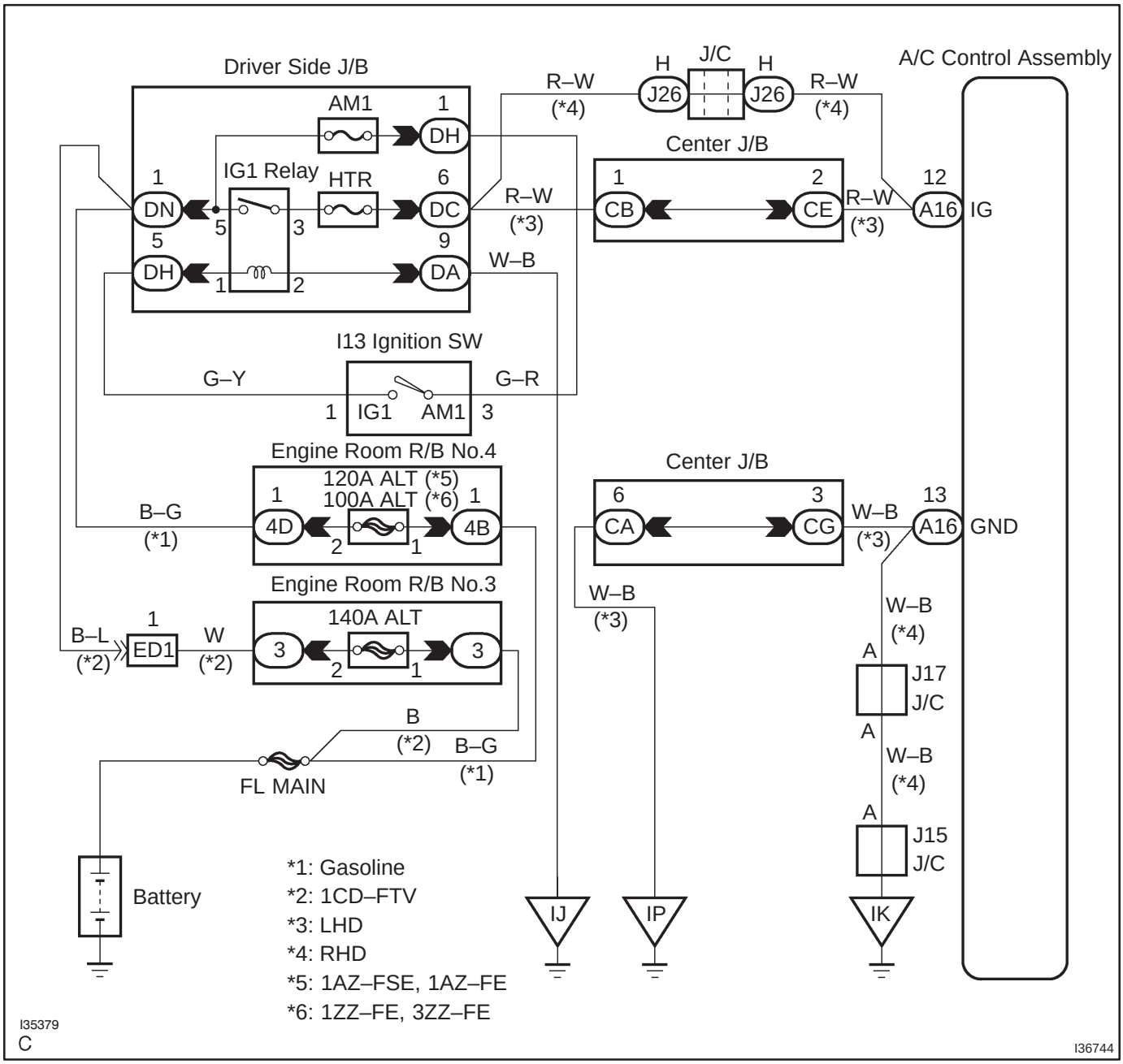
15	END

IG POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This is the power source for the A/C amplifier and servomotor, etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

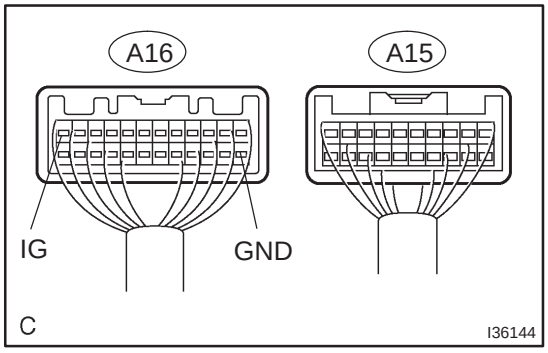
1	CHECK FUSE(HTR FUSE)

(a) Remove the HTR fuse from the driver side J/B.
(b) Check for the continuity of HTR fuse.

NG → **REPLACE FUSE**

OK

2	CHECK HARNESS AND CONNECTOR(A/C AMPLIFIER – BATTERY)



(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between terminal IG and GND of the A/C amplifier.
Standard: 10 to 14 V

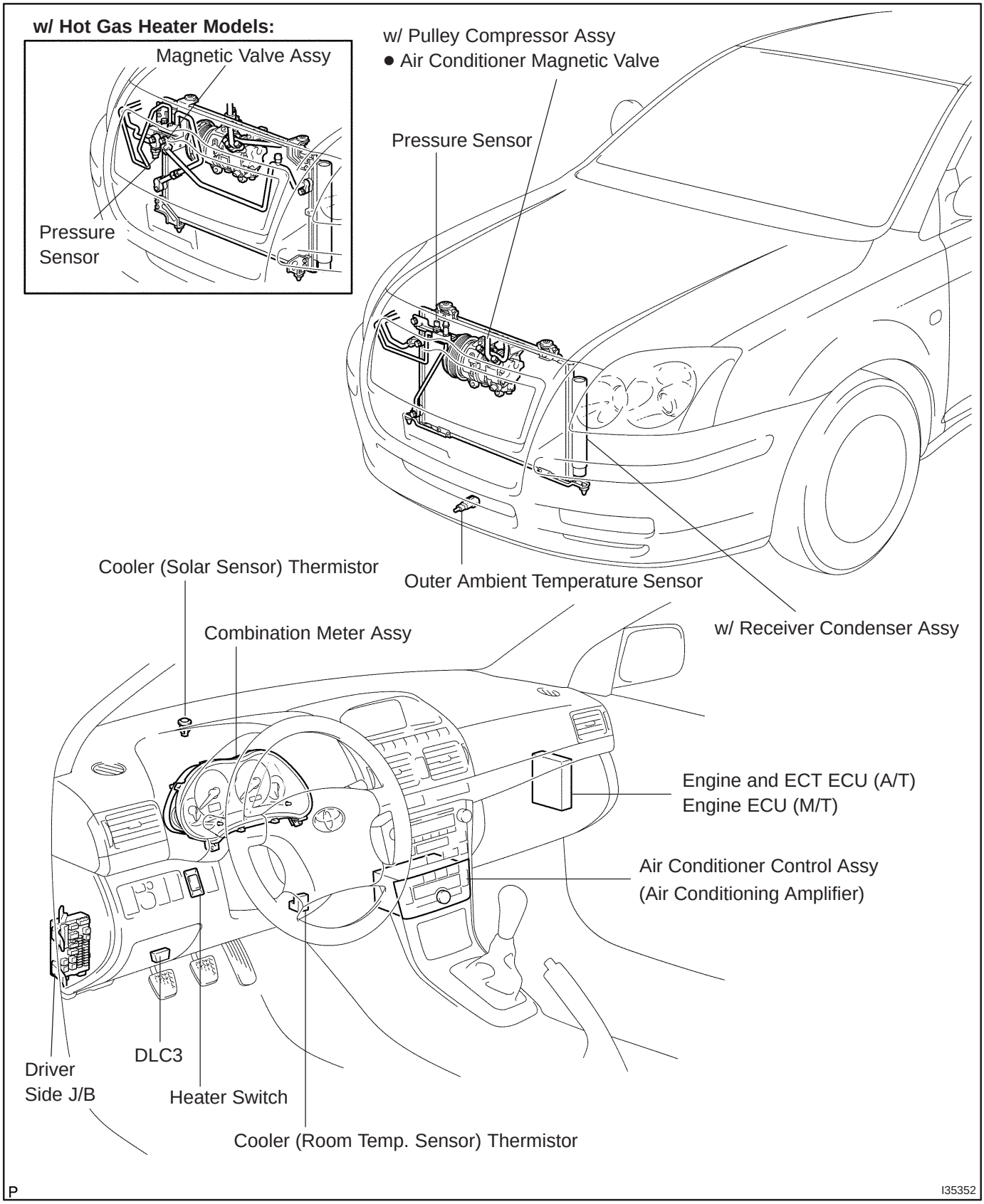
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

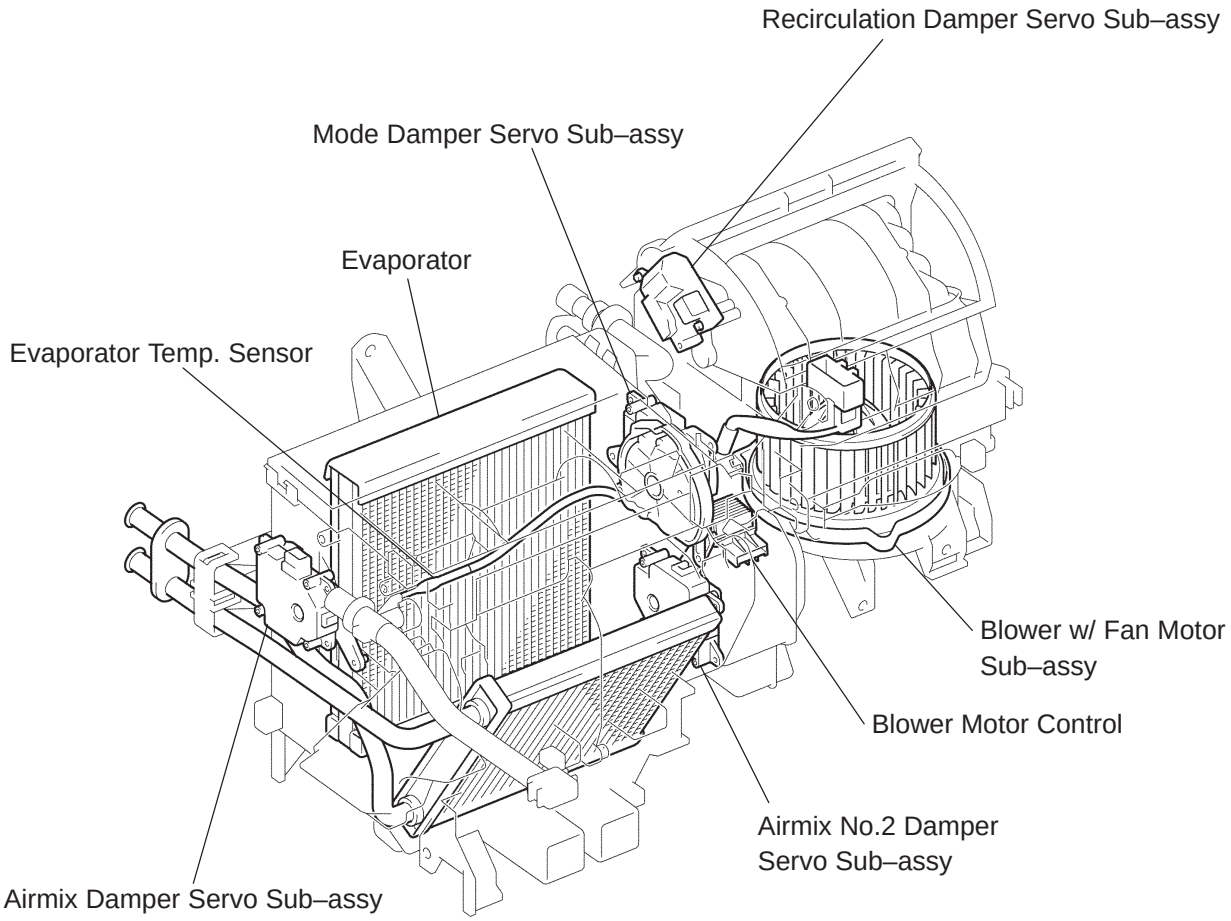
05C7J–01

LOCATION



P

I35352


Recirculation Damper Servo Sub–assy
Mode Damper Servo Sub–assy
Evaporator
Evaporator Temp. Sensor
Blower w/ Fan Motor Sub–assy
Blower Motor Control
Airmix No.2 Damper Servo Sub–assy
Airmix Damper Servo Sub–assy
P
I35353

050TH–09

CUSTOMER PROBLEM ANALYSIS CHECK

AIR CONDITIONING SYSTEM Check Sheet

Inspector's name:

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date vehicle Brought In	/ /	**Odometer Reading**	**km Miles**

Date of Problem Occurrence	/ /
How Often does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)
Weather	☐ Fine ☐ Cloudy ☐ Snowy ☐ Various / Other
Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F °C)

Symptoms	**Air Flow Control Faulty**	☐ Blower motor does not operate ☐ Blower motor speed does not change (Always Hi, Always Mid, Always Lo)
	Temperature Control Faulty	☐ Cabin temperature does not go down ☐ Cabin temperature does not rise ☐ Response is slow
	Air Inlet Control Faulty	☐ Cannot change between FRS and REC (Always Fresh or always Recirculating)
	Vent Control Faulty	☐ Mode will not change ☐ Will not enter the desired mode

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

I30150

050TM–13

PROBLEM SYMPTOMS TABLE

If the normal code is displayed during DTC check although the problem still occurs, check the circuits for each problem symptom in the order given in the table below, and proceed to the relevant troubleshooting.

Symptom	Suspect Area	See page
Whole functions of the A/C system does not operate.	1. IG power source circuit	05–1144
	2. A/C amplifier assy	05–1098
	3. Engine ECU 1AZ–FSE:	05–294
	1AZ–FE:	05–149
	1ZZ–FE/3ZZ–FE:	05–5
	1CD–FTV:	05–528
Air Flow Control : No blower operation	1. Blower motor circuit	05–1148
	2. Heater relay circuit	05–1146
	3. Blower w/fan motor sub–assy	05–1148
	4. A/C amplifier assy	05–1098
Air Flow Control : No blower control	1. Blower motor circuit	05–1148
Air Flow Control : Insufficient air out	1. Blower w/fan motor sub–assy	05–1148
	2. Blower motor circuit	05–1148
	3. A/C amplifier assy	05–1098
Temperature Control : Cool air does not come out	1. Volume of refrigerant	55–24
	2. Drive belt tension	55–46
	3. Refrigerant pressure	55–24
	4. Air conditioner magnetic valve circut	05–1151
	5. Pressure sensor circuit	05–1116
	6. Air mix control servomotor circuit	05–1133
	7. Air mix damper position sensor circuit	05–1122
	8. Room temp. sensor circuit	05–1102
	9. Ambient temp. sensor circuit	05–1106
	10.A/C amplifier assy	05–1098
Temperature Control : Warm air does not come out	1. Air mix control servomotor circuit	05–1133
	2. Air mix damper position sensor circuit	05–1122
	3. Ambient temp. sensor circuit	05–1106
	4. Room temp. sensor circuit	05–1102
	5. A/C amplifier assy	05–1098
	6. Heater radiator	–
Temperature Control : Output air is warmer or cooler than the set temperature or response is slow.	1. Room temp. sensor circuit	05–1102
	2. Ambient temp. sensor circuit	05–1106
	3. Solar sensor circuit	05–1113
	4. Air mix damper position sensor circuit	05–1122
	5. Air mix control servomotor circuit	05–1133
	6. Evaporator temp. sensor circuit	05–1109
	7. A/C amplifier assy	05–1098
Temperature Control : No temperature control (only Max. cool or Max. warm)	1. Room temp. sensor circuit	05–1102
	2. Ambient temp. sensor circuit	05–1106
	3. Solar sensor circuit	05–1113
	4. Air mix damper position sensor circuit	05–1122
	5. Air mix control servomotor circuit	05–1133
	6. Evaporator temp. sensor circuit	05–1109
	7. A/C amplifier assy	05–1098
No air inlet control	1. Recirculation damper servomotor circuit	05–1153
	2. A/C amplifier assy	05–1098
No air outlet control	1. Air outlet damper position sensor circuit	05–1126
	2. Air outlet control servomotor circuit	05–1136
	3. A/C amplifier assy	05–1098

Engine idle up does not occur, or is continuous	1. Air conditioner magnetic valve circut 2. A/C amplifier assy 3. Engine ECU 1AZ–FSE: 1AZ–FE: 1ZZ–FE/3ZZ–FE: 1CD–FTV:	05–1151 05–1098 05–294 05–149 05–5 05–528
Set temperature value displayed does not much up with operation of temperature control switch.	1. Air conditioner magnetic valve circut 2. A/C amplifier assy	05–1151 05–1098
Brightness does not change when light control switch it turned.	1. Illumination light system 2. A/C amplifier assy	– 05–1098
Unable to access the diagnosis mode.	1. A/C amplifier assy	05–1098
DTC is not recorded. Set mode is cleared when IG switch is turned off.	1. Back–up power source circuit 2. A/C amplifier assy	05–1142 05–1098

Hot gas heater:

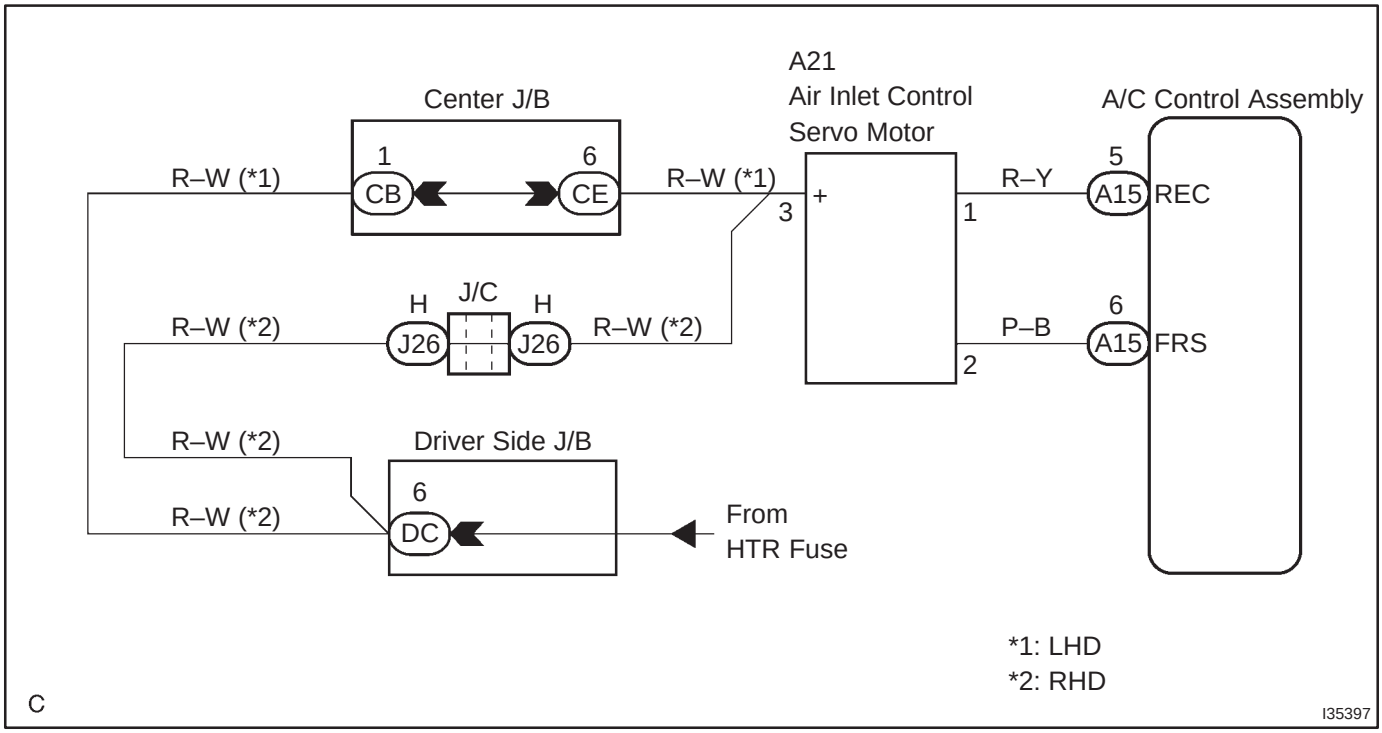
Symptom	Suspect Area	See page
Warm wind does not blow out even if the gas heater switch is turned on before the water temperature rises under the condition where the ordinal A/C correctly operates.	1. Hot gas heater magnetic valve circuit 2. Hot gas heater switch circuit 3. A/C amplifier assy	05–1157 05–1159 05–1098

RECIRCULATION DAMPER SERVOMOTOR CIRCUIT

CIRCUIT DESCRIPTION

The recirculation damper servomotor is controlled by the A/C amplifier and moves the air inlet damper to the desired position.

WIRING DIAGRAM



1	PERFORM ACTUATOR CHECK

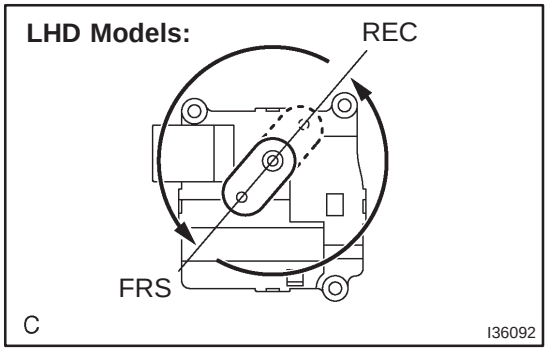
(a) Set to actuator check mode (See page 05–1091).
(b) Press the DEF switch and change to step operation.
(c) Check the air flow temperature by hand.

Display code	Recirculation damper position
0	FRESH
1	FRESH
2	FRESH
3	FRESH
4	RECIRCULATION
5	RECIRCULATION
6	RECIRCULATION
7	RECIRCULATION
8	RECIRCULATION
9	RECIRCULATION

NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

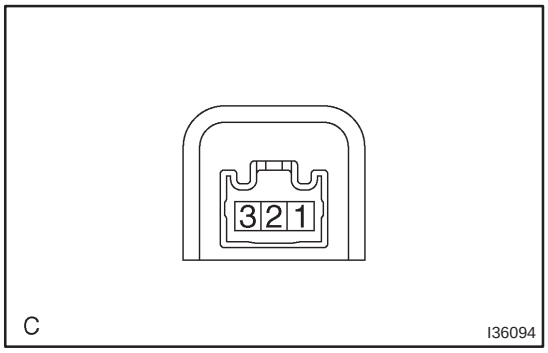
OK

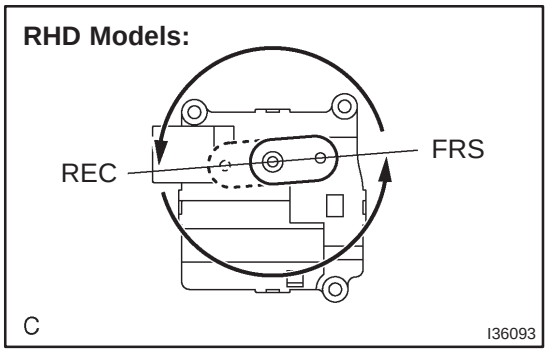
2 INSPECT RECIRCULATION DAMPER SERVO SUB–ASSY

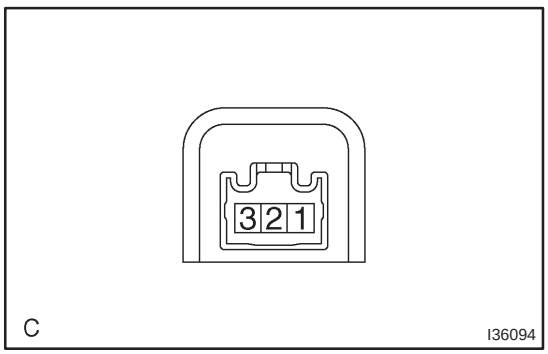


(a) Remove the recirculation damper servo sub–assy.
(b) Connect the positive (+) lead to from the battery to terminal 3 and negative (–) lead to terminal 2, then check that the arm turns to ”FRS” side smoothly.
(c) Connect the positive (+) lead to from the battery to terminal 3 and negative (–) lead to terminal 1, then check that the arm turns to ”REC” side smoothly.

If operattions are not as specified, replace the mode damper servomotor.







NG → **REPLACE RECIRCULATION DAMPER SERVO SUB–ASSY**

OK

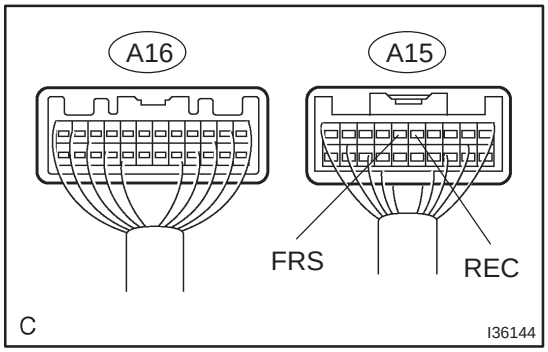
3	CHECK HARNESS AND CONNECTOR(RECIRCULATON DAMPER SERVO SUB–ASSY – BATTERY)

(a) Check for an open or short circuit in harness and connector between recirculation damper and battery + terminal (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT AIR CONDITIONING AMPLIFIER(REC, FRS)



(a) Remove A/C amplifier with connectors being connected.
(b) Measure the voltage between terminal FRS of A/C amplifier and body ground when recirculation switch is operated, as shown in the table.

Standard:

Recirculation switch	Voltage (V)
FRESH	Below 1.0
RECIRCULATION	10 to 14

(c) Measure voltage between terminal REC of A/C amplifier and body ground when recirculation switch is operated, as shown in the table.

Standard:

Recirculation switch	Voltage (V)
FRESH	10 to 14
RECIRCULATION	Below 1.0

NG → **REPLACE AIR CONDITIONING AMPLIFIER**

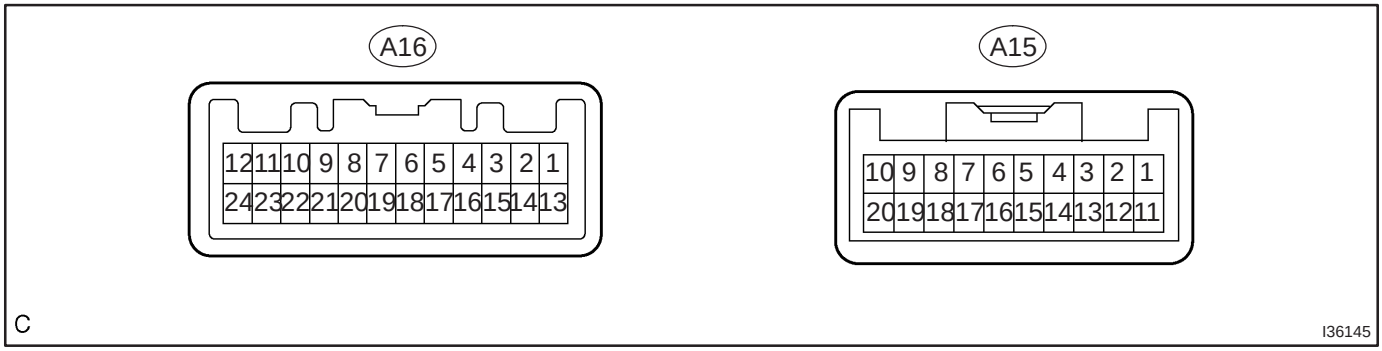
OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

05C7K–01

TERMINALS OF ECU

1. AIR CONDITIONER AMPLIFIER ASSY

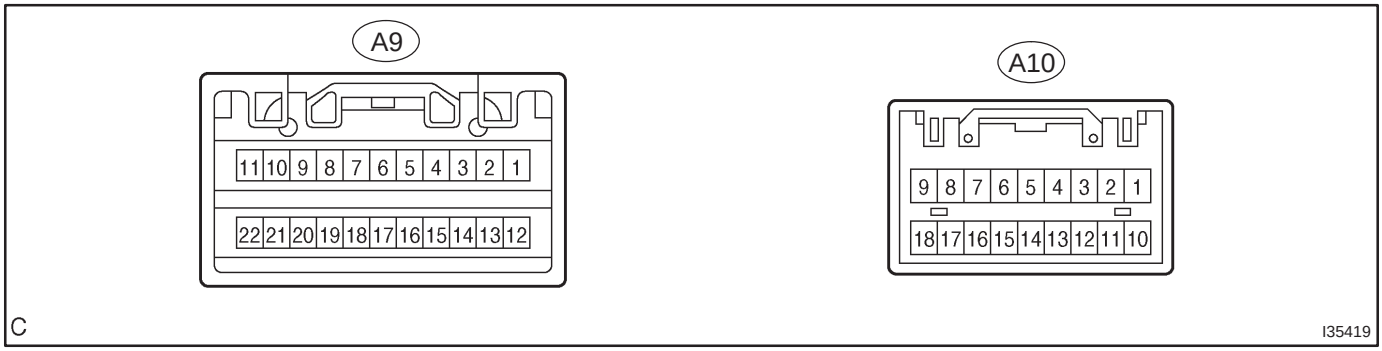


Terminal No. (Symbols)	Wiring Color	Condition	Specification
A16–5 (BLW) – A16–13 (GND)	R – W–B	IG SW: ON Front blower: Operate	Pulse generation
A16–7 (PRE) – A16–18 (SG)	L–W – G–W	Start engine Refrigerant pressure: 0 kPa (0 kgf/cm^2, 0 psi) → 3,138 MPa (32.0 kgf/cm^2, 455 psi)	0.5 → 4.8 V
A15–20 (MPX–) – A16–13 (GND)	P – W–B	Multiplex communication circuit	–
A15–10 (MPX+) – A16–13 (GND)	P–B – W–B	Multiplex communication circuit	–
A15–6 (FRS) – A16–13 (GND)	P–B – W–B	IG SW: ON R/F SW: RECIRCULATION → FRESH	10 to 14 → Below 1.0 V
A15–5 (REC) – A16–13 (GND)	R–Y – W–B	IG SW: ON R/F SW: FRESH → RECIRCULATION	10 to 14 → Below 1.0 V
A16–17 (HR) – A16–13 (GND)	GR–R – W–B	IG SW: ON Front blower: OFF → Operate	10 to 14 → Below 1.0 V
A15–4 (AOF) – A16–13(GND)	L–B – W–B	IG SW: ON Mode switch: DEF. → FACE	Below 1.0 → 10 to 14 V
A15–3 (AOD) – A16–13 (GND)	LG–B – W–B	IG SW: ON Mode switch: FACE → DEF.	Below 1.0 → 10 to 14 V
A16–12 (IG) – A16–13 (GND)	R–W – W–B	IG SW: LOCK → ON	Below 10 to 14 V
A15–2 (AMPH) – A16–13 (GND)	W – W–B	IG SW: ON Set passenger side temp.: MAX. COOL → MAX. HOT	Below 1.0 → 10 to 14 V
A15–1 (AMPC) – A16–13 (GND)	Y – W–B	IG SW: Set passenger side temp.: MAX HOT → MAX. COOL	Below 1.0 → 10 to 14 V
A15–12 (AMDH) – A16–13 (GND)	P–L – W–B	IG SW: Set driver side temp.: MAX. COOL → MAX. HOT	Below 1.0 → 10 to 14 V
A15–11 (AMDC) – A16–13 (GND)	B – W–B	IG SW: Set driver side temp.: MAX HOT → MAX. COOL	Below 1.0 → 10 to 14 V
A16–13 (GND) – Body ground	W–B – Body ground	Always	Continuity
A16–24 (+B) – A16–13 (GND)	W–R – W–B	Always	10 to 14 V
A16–8 (TPD) – A15–14 (SG–2)	GR – Y–R	IG SW: ON Set driver side temp.: MAX HOT → MAX. COOL	1.0 → 4.0 V
A16–20 TPP – A15–13 (SG–1)	V – P	IG SW: ON Set passenger side temp.: MAX HOT → MAX. COOL	1.0 → 4.0 V
A16–9 (TSD) – A16–13 (GND)	LG – W–B	IG SW: ON Solar sensor subject to electric light	0.8 to 3.3 V
A16–21 (TSP) – A16–13 (GND)	L – W–B	IG SW: ON Solar sensor subject to electric light	0.8 to 3.3 V

Terminal No. (Symbols)	Wiring Color	Condition	Specification
A16–22 (TR) – A16–6 (SG–5)	GR – G	IG SW: ON Cabin temp.: 25°C (77°F) → 40°C (104°F)	1.8 to 2.2 → 1.2 to 1.6 V
A16–10 (TE) – A15–16 (SG–4)	B – W–G	Evaporator temp.: 0°C (32°F) → 15°C (59°F)	2.0 to 2.4 → 1.4 to 1.8 V
A16–23 (ILL+) – A16–13 (GND)	G – W–B	Light control switch TAIL or HEAD	10 to 14 V
A16–19 (TPM) – A15–15 (SG–3)	GR–R – G–W	IG SW: ON Set air flow setting: DEF. → FACE	1.0 → 4.0 V
A15–8 (SOL+) – A16–13 (GND)	R – W–B	Start engine Compressor: Operate	Pulse generation
A15–7 (MGV) – A16–13 (GND) (*1)	R–Y – W–B	Start engine Hot gas heater: Operate	10 to 14 → Below 1.0 V
A16–11 (HOTGASIN) – A16–13 (GND) (*1)	G–Y – W–B	IG SW: ON Hot Gas SW: ON	10 to 14 V
A16–16 (S5) – A16–18 (SG)	B–W – G–W	IG SW: LOCK → ON	0 → 5.0 V
A16–1 (S5–1) – A15–13 (SG–1)	R – P	IG SW: LOCK → ON	0 → 5.0 V
A16–2 (S5–2) – A15–14 (SG–2)	Y–B – Y–R	IG SW: LOCK → ON	0 → 5.0 V
A16–14 (S5–3) – A15–15 (SG–3)	BR–W – G–W	IG SW: LOCK → ON	0 → 5.0 V
A16–15 (S5–4) – A16–9 (TSD)	O – LG	IG SW: LOCK → ON	1.7 → 4.2 V
A16–15 (S5–4) – A16–21 (TSP)	O – L	IG SW: LOCK → ON	1.7 → 4.2 V
A15–17 (CFAN) – A16–13 (GND)	W–R – W–B	Start engine Condenser fan: operate	10 to 14 → Below 1.0 V
A16–19 (PBKIG) – A17–13 (GND)	B–W – W–B	IG SW: ON PARKING BRAKE SW: OFF → ON	10 to 14 → Below 1.0 V
A17–3 (PBLT) – A17–13 (GND) (*3)	L–R – W–B	IG SW: ON SEAT BELT SIGNAL: OFF → ON	10 to 14 → Below 1.0 V
A17–4 (RDEFIN) – A17–13 (GND) (*2)	G–W – W–B	IG SW: ON RDEF RELAY : OFF → ON	Below 1.0 → 10 to 14 V

(*1) Diesel (standard) only
(*2) Petrol only
(*3) Except 1AZ–FE

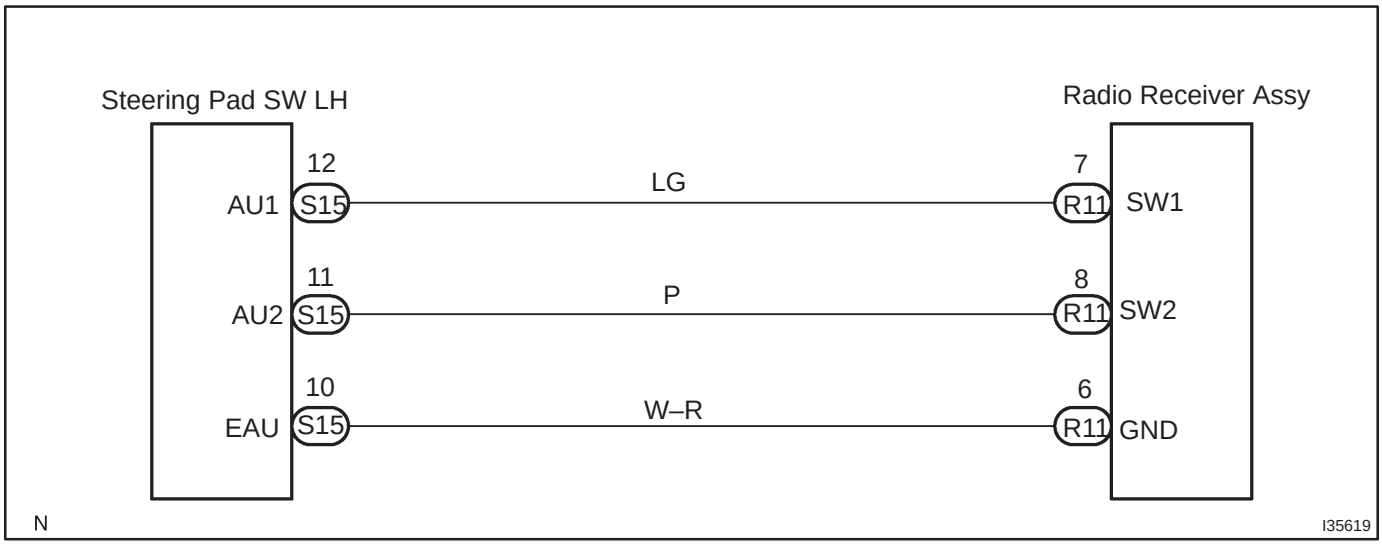
2. COMBINATION METER



Terminal No. (Symbols)	Wiring Color	Condition	Specification
C10–17 (Z1H) – Body ground	W–B – Body ground	Always	Continuity
C10–11 (HAY) – C10–12 (HAZ)	W–R – W	IG SW: ON Ambient temp.: 25°C (77°F) → 40°C (104°F)	1.35 to 1.75 → 0.85 to 1.25 V

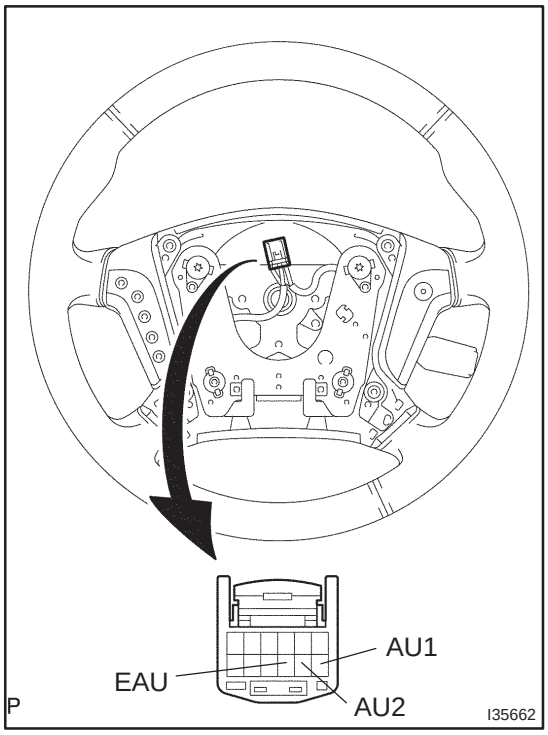
A AUDIO SYSTEM CANNOT BE OPERATED WITH STEERING PAD SWITCH

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT STEERING WHEEL ASSY(AU1, AU2, EAU)



(a) Remove the steering pad switch LH.
(b) Check continuity between terminals at each condition, as shown in the chart.

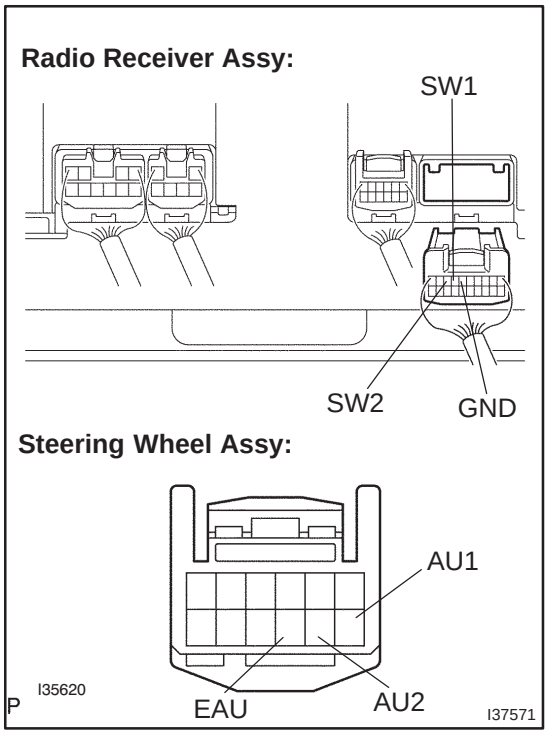
Standard:

Tester connection	Condition	Specified condition
AU1 – EAU	Do not switch position	Approx. 100 kΩ
AU1 – EAU	SEEK+ switch: push	0 Ω
AU1 – EAU	SEEK– switch: push	Approx. 0.3 kΩ
AU1 – EAU	VOL+ switch: push	Approx. 1 kΩ
AU1 – EAU	VOL– switch: push	Approx. 3.2 kΩ
AU1 – EAU	Do not switch position	Approx. 100 kΩ
AU1 – EAU	MODE switch: push	0 Ω

NG → **REPLACE STEERING WHEEL ASSY**

OK

2	CHECK HARNESS AND CONNECTOR(STEERING WHEEL ASSY – RADIO RECEIVER ASSY)



(a) Disconnect the connectors from the steering wheel assy and radio receiver assy.

(1) Check continuity between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
SW1– – AU1	Continuity
SW2 – AU2	Continuity
GND – EAU	Continuity

(2) Check for a short between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
SW1 – Body ground	No continuity
SW2 – Body ground	No continuity
GND – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–32)**

OK

REPLACE RADIO RECEIVER ASSY

CASSETTE TAPE CANNOT BE EJECTED

INSPECTION PROCEDURE

1	PRESS ”EJECT” AND CHECK OPERATION

(a) Press ”EJECT” and check the operation.
  (1) Press the cassette tape EJECT switch of the radio receiver assembly for 2 seconds or more and check that the cassette tape is ejected.
  Standard: The cassette tape is ejected.

NG → **REPLACE RADIO RECEIVER ASSY**

OK

2	CHECK CASSETTE TAPE

(a) Check the cassette tape.
  (1) Check that the ejected cassette tape does not have the label peeled, cassette body deformation or others.
  Standard: No fault on the cassette tape.

NG → **CASSETTE TAPE FAULTY**

OK

3	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK

(a) Replace the cassette tape with another and recheck.
  (1) Replace the cassette tape with another normal one to see if the same trouble occurs again.
  Standard: Malfunction disappears.

OK → **CASSETTE TAPE FAULTY**

NG

REPLACE RADIO RECEIVER ASSY

CASSETTE TAPE CANNOT BE INSERTED OR PLAYED

INSPECTION PROCEDURE

1	CHECK FOR ANY FOREIGN OBJECT

(a) Check for any foreign objects.
(1) Check that no foreign objects or defects are detected in the cassette tape player of radio receiver assy.
Standard: No foreign objects or defects detected.

NG → **REMOVE FOREIGN OBJECT**

OK

2	CHECK CASSETTE TAPE

(a) Check the cassette tape.
(1) Check that the cassette tape is a normal tape to which music or voice is recorded.
Standard: Proper cassette tape to which music or voice is recorded.

NG → **CASSETTE TAPE FAULTY**

OK

3	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK

(a) Replace the cassette tape with another one and recheck.
(1) Replace the cassette tape with another normal one to see if the same trouble occurs again.
Standard: The function is recovered to be normal.

OK → **CASSETTE TAPE FAULTY**

NG

REPLACE RADIO RECEIVER ASSY

CD CANNOT BE EJECTED

INSPECTION PROCEDURE

1	PRESS ”EJECT” AND CHECK OPERATION

(a) Press ”EJECT”and check the operation.
  (1) Press the CD EJECT switch of the radio receiver assembly for 2 seconds or more to see if the CD is ejected.
  Standard: CD is ejected.

Reference:
If the CD is not ejected, send the vehicle for repair.
Do not try to remove it by force.

NG → **REPLACE RADIO RECEIVER ASSY**

OK

2	CHECK IF A PROPER CD IS INSERTED

(a) Check that a proper CD is inserted.
  (1) Check that in what conditions the sound skipping occurs.
  Standard: Driving on the bad road.

NG → **REPLACE RADIO RECEIVER ASSY**

OK

3	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
  (1) Check the installation condition of the radio receiver assembly.
  Standard: Installed properly.

OK → **CD FAULTY**

NG

REPLACE RADIO RECEIVER ASSY

CD CANNOT BE INSERTED OR IS EJECTED RIGHT AFTER INSERTION

INSPECTION PROCEDURE

1	CHECK IF A PROPER CD IS INSERTED

(a) Check if a proper CD is inserted.
  (1) Make sure that the CD is normal audio CD, and that there is no deformation, flaw, stain, burr and other defects on the CD.
  Standard: Normal audio CD.

Reference:
- Translucent or different–shaped CD cannot be played.
- CD–ROM for the computers (with music recorded in) and recorded CD –R may not be played.

NG → **CD FAULTY**

OK

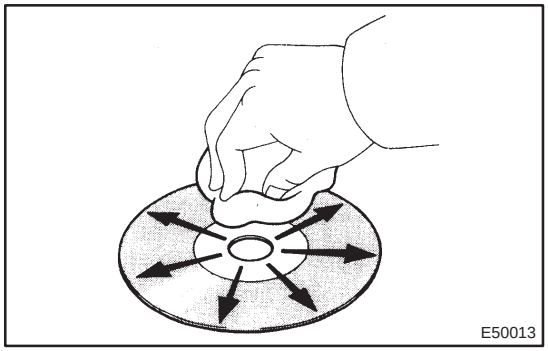
2	CHECK IF A CD IS INSERTED PROPERLY

(a) Check that a CD is inserted properly.
  (1) Check whether or not the CD is inserted upside down.
  Standard: Not upside down.

NG → **SET DISC CORRECTLY**

OK

3	DISC CLEANING


E50013

(a) Disk cleaning
  (1) If the disk gets dirty, clean the disk by wiping the surface from the center to outside in the radial directions with a soft cloth.

NOTICE:
Do not use a conventional record cleaner or anti–static preservative.
  Standard: Malfunction disappears.

OK → **DISC DIRTY**

NG

4	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
  (1) Replace the CD with onother normal one to see if the same trouble occurs again.
  Standard: Malfunction disappears.

OK → **CD FAULTY**

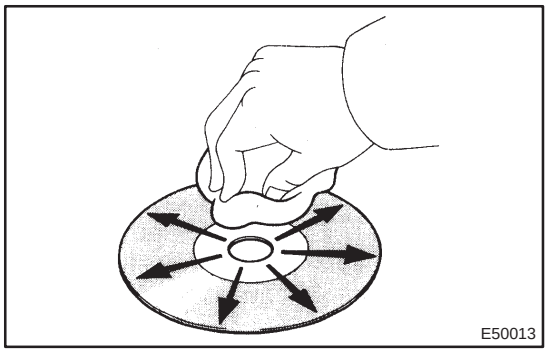
NG

REPLACE RADIO RECEIVER ASSY

CD SOUND SKIPS

INSPECTION PROCEDURE

1	DISC CLEANING



(a) Disk cleaning
  (1) If the disk gets dirty, clean the disk by wiping the surface from the center to outside in the radial directions with a soft cloth.

NOTICE:
Do not use a conventional record cleaner or anti–static preservative.

Standard: Malfunction disappears.

OK > **DISC DIRTY**

NG

2	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
  (1) Replace the CD with onother normal one to see if the same trouble occurs again.
  Standard: Malfunction disappears.

OK > **CD FAULTY**

NG

3	CHECK WHEN THIS HAPPENS

(a) Check when this happens.
  (1) Check that in what condition (place) noise occurs.
  Standard: Driving on the bumpy road.

OK > **Go to step 5**

NG

4	COMPARE IT WITH ANOTHER CAR OF SAME MODEL

(a) Compare it with another vehicle of the same model.
  (1) Compare with the vehicle of the same type which does not have a trouble to see if there is any difference in the condition of trouble occurrence.
  Standard: No difference found.

OK > **SETTING**

NG

5	CHECK OF RADIO RECEIVER ASSEMBLY INSTALLATION

(a) Check of radio receiver assembly installation.
  (1) Check the installation condition of the radio receiver assembly.
  Standard: Installed properly.

NG → **INSTALL THE RADIO RECEIVER ASSEMBLY PROPERLY**

OK

6	DID THE TEMPERATURE IN THE CABIN CHANGE RAPIDLY?

(a) Did the temperature in the cabin change rapidly?
  (1) Check whether or not the rapid temperature change occurred in the cabin.
  Standard: The rapid temperature change occurred.

Reference:
The rapid temperature change creates condensation inside the CD player, which may prevent the CD from being played.

OK → **CONDENSATION DUE TO TEMPERATURE CHANGE (LEAVE IT AS IT IS FOR A WHILE BEFORE USING)**

NG

REPLACE RADIO RECEIVER ASSY

05C4W–01

CUSTOMER PROBLEM ANALYSIS CHECK

AUDIO SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Brought–in Date	/ /	**Odometer Reading**	**km Mile**

Date of First Occurrence	/ /
Frequency of Problem Occurrence	☐ Constant ☐ Intermittent (Times a day)

Problem Symptom	☐ **Switch**
	☐ **Radio**
	☐ **CD**
	☐ **Noise**

DTC Check	**Parts name**	**DTC (1st time).**	**DTC (2nd time).**
	Radio receiver assy		

I30195

AUDIO SYSTEM

DESCRIPTION

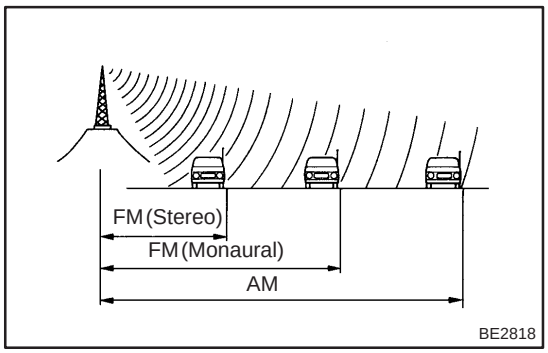
0549F–10

1. RADIO WAVE BAND

The radio wave bands used in radio broadcasting are as follows:

Frequency	30 kHz	300 kHz	3 MHz	30 MHz	300 MHz
Designation	LF	MF	HF	VHF	
Radio wave		AM ⟷		FM ⟷	
Modulation	Amplitude modulation			Frequency modulation	

LF: Low Frequency
MF: Medium Frequency
HF: High Frequency
VHF: Very High Frequency



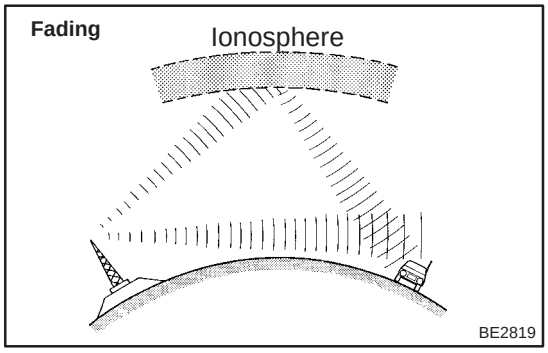
2. SERVICE AREA

There are great differences in the size of the service area for AM and FM broadcasting. Sometimes FM stereo broadcast cannot be received even through AM can be received very clearly. FM stereo has the smaller service area, but it also picks up static and other types of interference (”noise”) easily.

3. RECEPTION PROBLEMS

HINT:

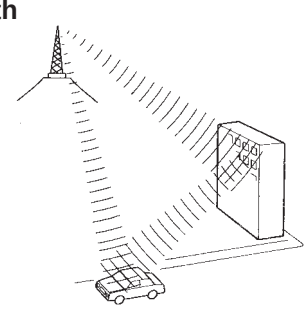
Besides the problem of static, there are some move problems called ”fading”, ”multipath” and ”fade out”. These problems are caused not by electrical noise but by the nature of the radio waves themselves.



(a) Fading

Besides electrical interference, AM broadcasts are also susceptible to other types of interference, especially at night. This is because AM radio waves bounce off the ionosphere at night. These radio waves then interfere with the signals that reach the vehicle’s antenna directly from the same transmitter. This type of interference is called ”fading”.

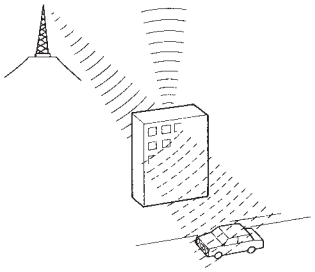
Multipath



BE2820

(b) Multipath
Interference caused by reflection of radio waves against obstructions is called ”Multipath”. Multipath occurs when radio signals emitted from the broadcast transmitter antenna are reflected against tall buildings or mountains and interferes with other signals which are to be received directly.

Fade Out



BE2821

(c) Fade Out
Because FM frequency is higher than that of AM, FM radio wave tends to be reflected against obstructions such as tall buildings or mountains. For this reason, FM signals often seems to gradually disappear or fade away as the vehicle goes behind those obstructions. This phenomenon is called ”fade out”.

4. NOISE PROBLEMS

(a) It is very important for noise troubleshooting to understand a customer’s claim clearly. Use the following table to diagnose the phenomenon.

Radio wave	Condition in which noise occurs	Probable cause
AM	Noise occurs at a specific place.	Strong possibility of foreign noise.
	Noise occurs when listening to faint broadcasting.	The same program may be broadcasted from some local stations. If the program is the same, one of those may be tuned in.
	Noise occurs only at night.	Strong possibility of beat from a distant broadcasting.
FM	Noise occurs at a specific place while driving.	Strong possibility of multipath noise and fading noise caused by changes of FM frequency.

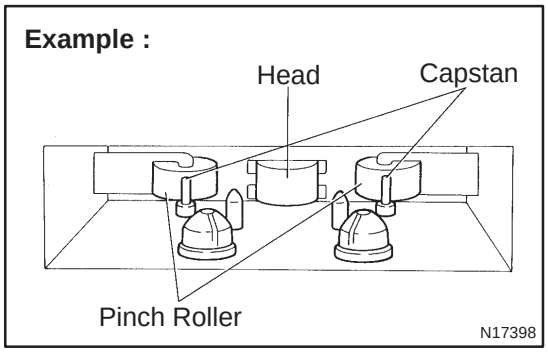
HINT:
If the condition where the noise occurs does not meet any of the above, find out the cause based on ”Reception Problems”. Refer to the description about Multipath and Fading mentioned previously.

5. COMPACT DISC PLAYER

(a) Compact Disc (hereafter called ”CD”) Players use a laser beam pick–up to read the digital signals recorded on the CD and reproduce analog signals of the music, etc. 4.7 in. (12 cm) and 3.2 in. (8 cm) discs are available for the CD player.

HINT:
Never attempt to disassemble or apply oil to any part of the player unit. Do not insert any object into the magazine except for a disc.

NOTICE:
CD players use an invisible laser beam which could cause hazardous radiation exposure. Be sure to operate the player correctly as instructed.

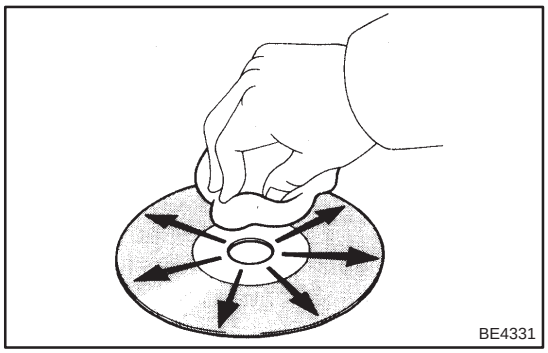


6. MAINTENANCE

Tape Player / Head Cleaning:

(a) Raise the slot cover with your finger.
Using a pencil or similar object, push in the guide.

(b) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.



7. MAINTENANCE

CD Player / Disc Cleaning:

If the disc gets dirty, clean the disc by wiping the surface from the center to outside in the radial directions with a soft cloth.

NOTICE:

Do not use a conventional record cleaner or anti–static preservative.

8. COMMUNICATION SYSTEM

(a) Components in the audio system communicate each other though AVC–LAN. (Radio receiver function)

(b) The master component of AVC–LAN is the radio receiver assy with a resistance (60 – 80 Ω), which is necessary for communication.

(c) When short circuit or open circuit occurs in the AVC–LAN circuit, the audio system does not operate normally due to the communication cutoff.

9. DIAGNOSIS FUNCTION

(a) The audio system has diagnosis function (The diagnosis result is displayed on the LCD of the radio receiver assy). (Radio receiver function)

(b) The component code (physical address), or three–digit number (in hexadecimal) is set for each component comprising AVC–LAN.

(c) The logical address, or two–digit number (in hexadecimal) is set for each function and component unit in each component.

0549J–12

DIAGNOSTIC TROUBLE CODE CHART

Terms	Meaning
Physical address	Three–digit code (shown in hexadecimal) which is given to each component comprising the AVC–LAN. Corresponding to the function, individual symbols are specified.
Logical address	Two–digit code (shown in hexadecimal) which is given to each function comprising the inner system of the AVC–LAN.

1. RADIO RECEIVER ASSY (Physical address: 190)

HINT:

- *1: Even if no failure is detected, trouble code may be stored depending on the battery condition or voltage for starting the engine.
- *2: It is stored when 180 seconds have passed after the power supply connector is pulled out after the engine starts.
- *3: It may be stored when the engine key is turned 1 minuite after the engine starts.
- *4: It may be stored when the engine key is turned again after the engine starts.
- *5: When 210 seconds have passed after pulling out the power supply connector of the master component with the ignition switch in ACC or ON, this code is stored.

(a) Logical address: 01 (Communication control)

DTC	Diagnosis item	Description	Action to be taken
22	RAM Error	Abnormal condition of RAM is detected.	Replace radio receiver assy.
D6 *1	Absence of Master	Component in which this code is recorded was disconnected from system or master component with ignition in ACC or ON.	• Check harness for power supply system of radio receiver assy. • Check harness for communication system of radio receiver assy.
D7 *5	Connection check Error	Component in which this code is recorded was disconnected from system or master component ignition with in ACC or ON.	• Check harness for power supply of radio receiver assy. • Check harness for communication system of radio receiver assy.
D8 *2	No Response to Connection Check	Component shown by sub code is or was disconnected from system after engine start.	• Check harness for power supply system of component shown by sub code. • Check harness for communication system of component shown by sub code.
D9 *1	Last Mode Error	Audio or visual component operated before engine stop is or was disconnected with ignition switch in ACC or ON.	• Check harness for power supply system of component shown by sub code. • Check harness for communication system of component shown by sub code.
DA	No Response to ON/OFF Instruction	No response is identified when changing mode (audio and visual mode change). Sound and picture does not change by button operation.	• Check harness for power supply system of component shown by sub code. • Check harness for communication system of component shown by sub code. • If error occurs again, replace component shown by sub code.
DB *1	Mode Status Error	Dual alarm is detected.	• Check harness for power supply of component shown by sub code. • Check harness for communication system of component shown by sub code.
DC *3	Transmission Error	Transmission to component shown by auxiliary code failed. (Detecting this DTC does not necessarily mean actual failure.)	If same sub code is recorded in other component, check harness for power supply and communication system of all components shown by code. (If not, delete DTC and recheck.)

DD *4	Master Reset (Momentary Interruption)	After the engine was started, master component was disconnected from system.	• Check harness for power supply system of multi–display. • Check harness for communication system of radio receiver assy. • If this error occurs frequently, replace radio receiver assy.
DE *4	Slave Reset (Momentary Interruption)	After the engine was started, component shown by sub code had been disconnected from system.	• Check harness for power supply of component shown by sub code. • Check harness for communication system of component shown by sub code.
E0 *1	Registration Completion Instruction Error	”Registration Completion Instruction” command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E2	ON/OFF Instruction Parameter Error	Error occures in ON/OFF controlling command from master component.	Replace radio receiver assy
E3 *1	Registration Request Transmission	Registration Request command is output from component shown by sub code. Receiving Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

(b) Logical address: 61 (Cassette switch)

DTC	Diagnosis item	Description	Action to be taken
40	Mechanical Error of Media	Malfunction due to mechanical failure is identified. Or cassette tape is cut or entangled.	• Inspect cassette tape. • Replace radio receiver assy.
41	EJECT Error	Malfunction due to mechanical failure.	Replace radio receiver assy.
42	Tape caught in the radio receiver assy	Hub lock etc.	Inspect cassette tape.

(c) Logical address: 62 (CD player)

DTC	Diagnosis item	Description	Action to be taken
42	No Disc Readout	Disc cannot be read.	• Inspect CD. • Replace radio receiver assy.
44	CD player Error	Error is detected in CD player.	Replace radio receiver assy.
45	EJECT Error	Magazine cannot be ejected.	Replace radio receiver assy.
46	Scratched/Reversed Disc	Scratches or dirt is found on CD surface or CD is set upside down.	Inspect CD.
47	CD High Temp.	High temperature is detected in CD player.	Replace radio receiver assy.
48	CD Excess Current	Excess current is applied CD player.	Replace radio receiver assy.

0549G–09

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (SEE PAGE 05–1398)

3	CHECK AND CLEAR THE DTCS (SEE PAGE 05–1399)

4	PROBLEM SYMPTOM CONFIRMATION

→ SYMPTOM OCCURS (GO TO STEP 6)

SYMPTOM DOES NOT OCCUR (GO TO STEP 5)

5	SYMPTOM SIMULATION (SEE PAGE 05–1398)

6	DTC CHECK (SEE PAGE 05–1399)

→ MALFUNCTION CODE (GO TO STEP 7)

→ NORMAL CODE (GO TO STEP 8)

7	DTC CHART (SEE PAGE 05–1405)

→ GO TO STEP 9

8	PROBLEM SYMPTOMS TABLE (SEE PAGE 05–1412)

9	CIRCUIT INSPECTION (SEE PAGE 05–1413 – 05–1432)

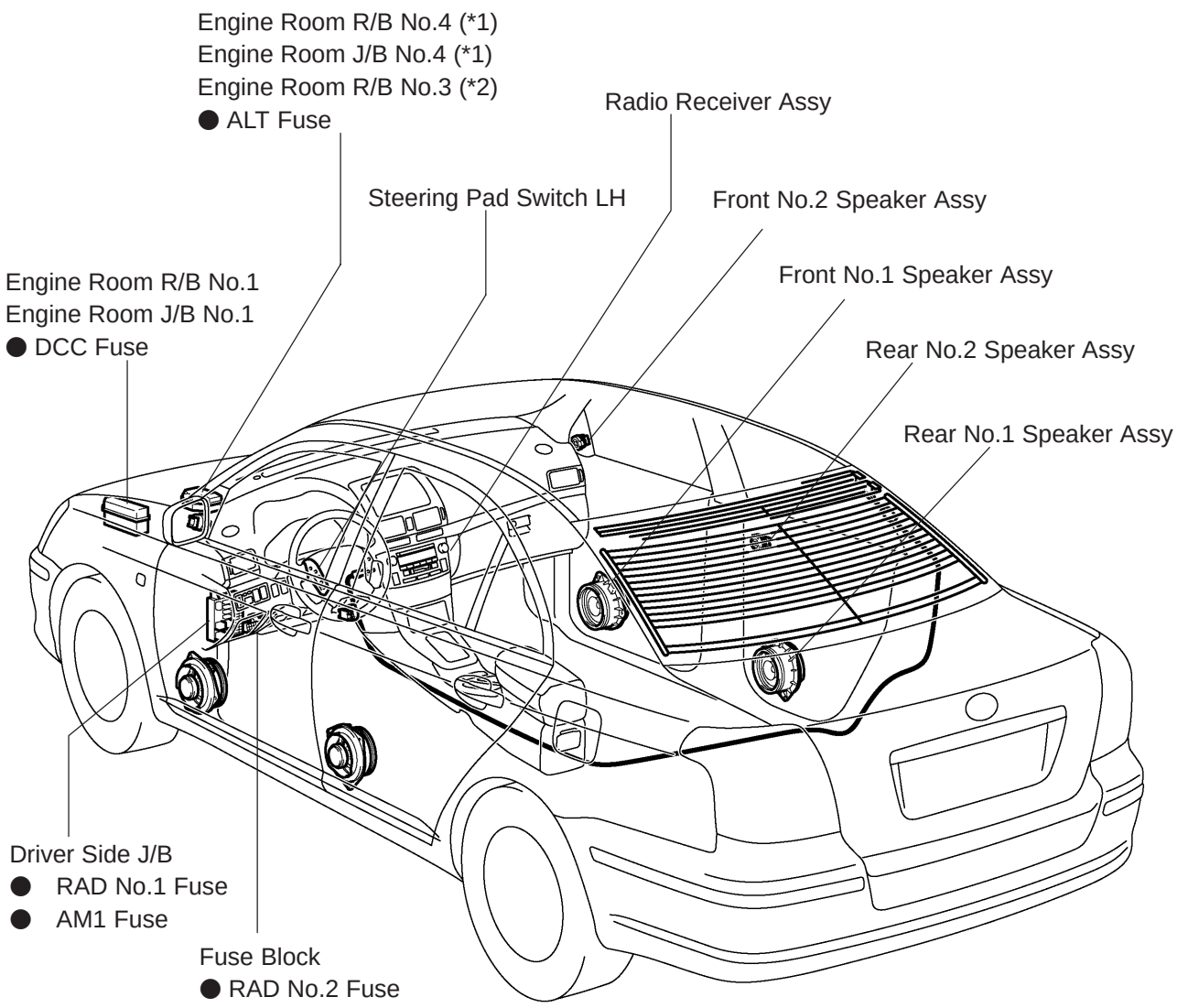
10	CONFIRMATION TEST

END

05C4X–01

LOCATION

Sedan:

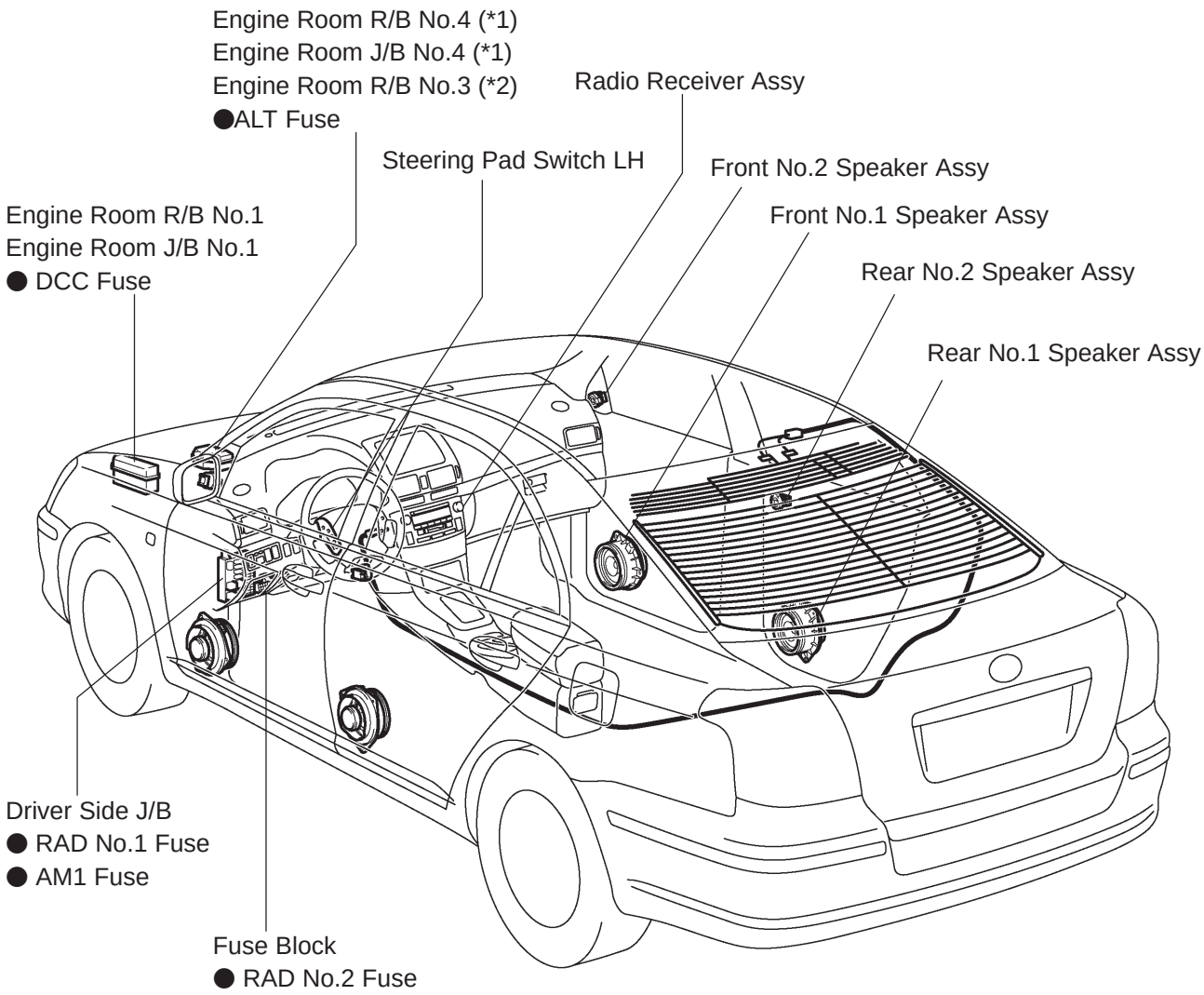


*1: Gasoline
*2: 1CD–FTV

H

I35612

Lift Back:

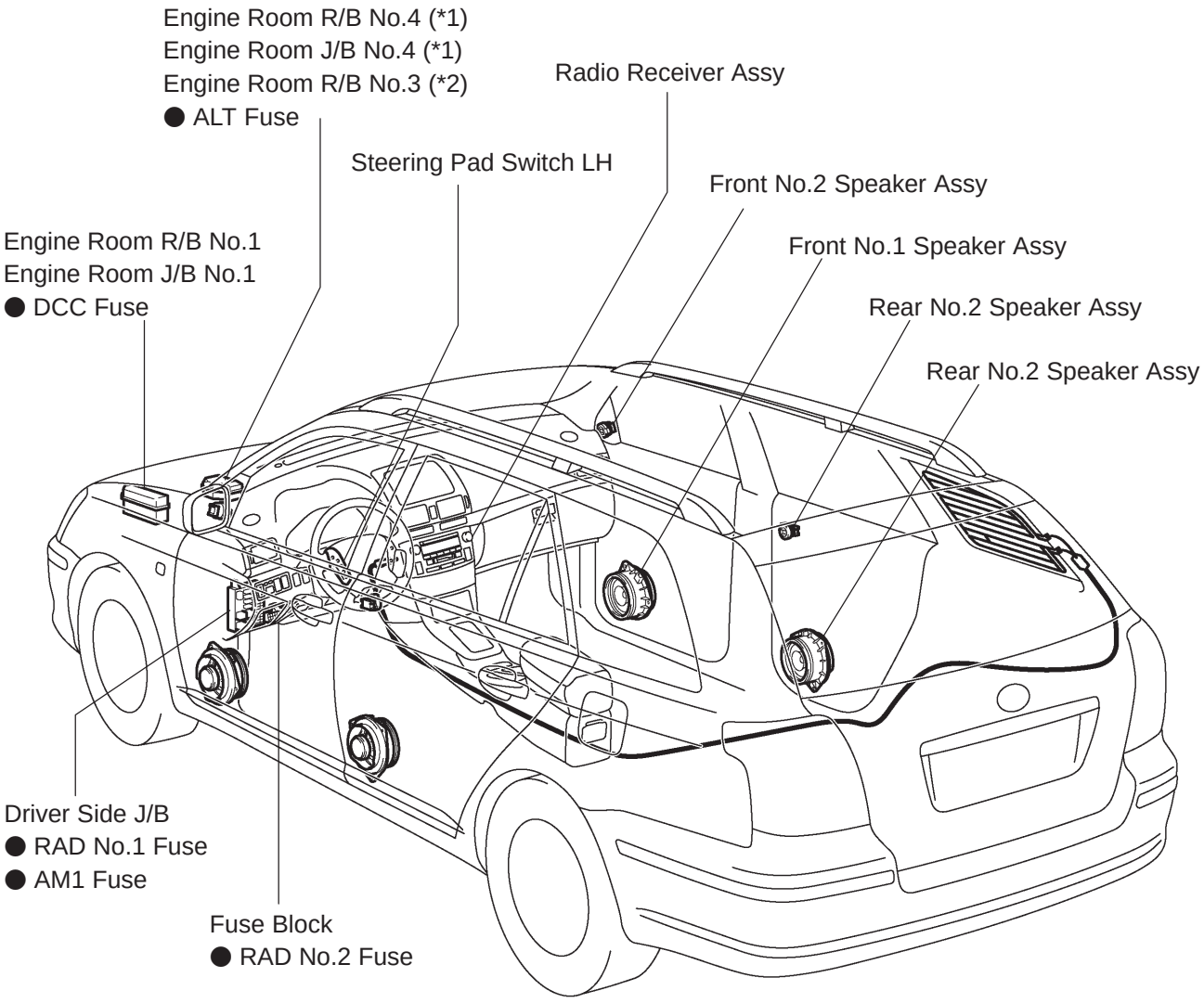


*1: Gasoline
*2: 1CD–FTV

H

I35613

Wagon:



*1: Gasoline
*2: 1CD–FTV

H

I35614

NOISE OCCURS

INSPECTION PROCEDURE

1	CHECK OF SPEAKER INSTALLATION

(a) Check the speaker installation condition.
  (1) Check that each speaker is securely installed.
  Standard: Malfunction disappears.

HINT:

The radio is equipped with the noise prevention system that works against only the excessively large noise, thereby excessively large noise do not occur in the radio. If large noise occurs, check whether or not the earth on the antenna installation part and the proper noise–prevention equipment are all installed, and whether or not the improper wiring is held.

Condition in which noise occurs	Noise type
Depressing the acceleration pedal increases noise, and stopping the engine erases the noise immediately.	Alternator noise
Noise occurs during the A/C or the heater operation.	Blower motor noise
Rapid acceleration during the drive on the unpaved road or after the IG switch is turned ON makes noise.	Fuel pump noise
Pressing and then releasing the horn switch, and keeping pressing the horn switch makes noise.	Horn noise
Stopping the engine erases the small noise that has been heard.	Ignition noise
Noise occurs in turn with the blink of the turn signal flash.	Flasher noise
Noise occurs during the window washer operation.	Washer noise
Noise occurs during the engine running, and it continues to occur after the engine is stopped.	Water temperature sensor noise
Noise occurs during the wiper operation.	Wiper noise
Noise occurs when the brake pedal is depressed.	Stop light switch noise
Others.	Static electricity on the vehicle

HINT:

- Identify the condition under which the noise occurs, and check the noise filter on the related part.
- Make sure first that there is no noise from outside. Failing to do so makes the noise occurrence source detection impossible and leads to misunderstanding.
- The noise should be removed in descending order of loudness.

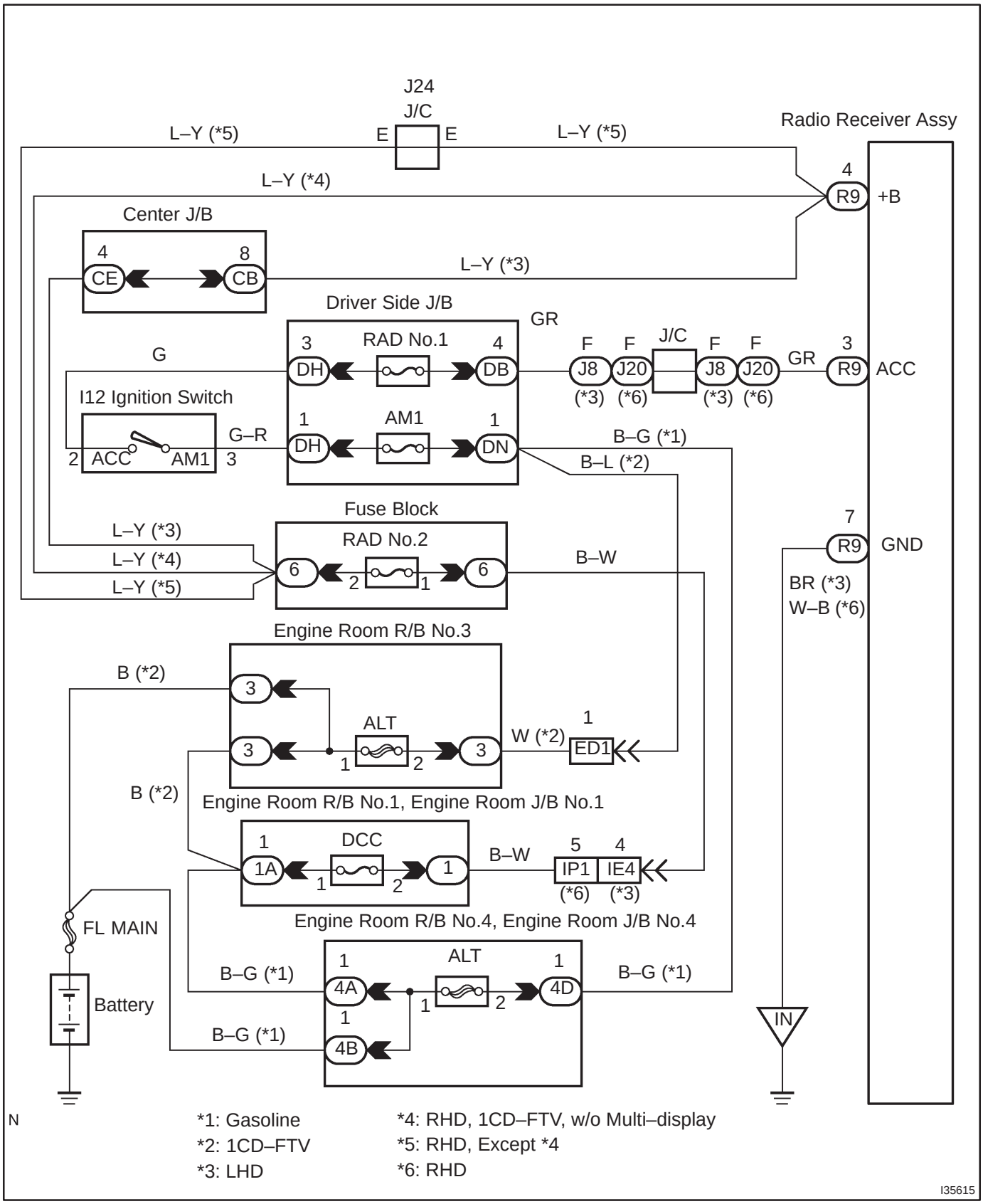
NG → **INSTALL IT PROPERLY**

OK

IDENTIFICATION OF NOISE SOURCE

POWER SOURCE CIRCUIT (RADIO RECEIVER ASSY)

WIRING DIAGRAM



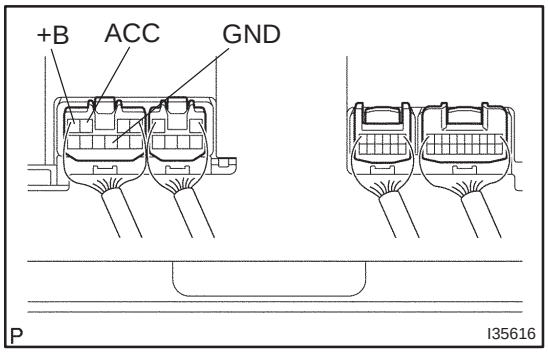
N

*1: Gasoline
*2: 1CD–FTV
*3: LHD
*4: RHD, 1CD–FTV, w/o Multi–display
*5: RHD, Except *4
*6: RHD

I35615

INSPECTION PROCEDURE

1 INSPECT RADIO RECEIVER ASSY(BU, ACC, GND)



(a) Remove the radio receiver assy.

(b) Check continuity between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND – Body ground	Always	Continuity

(c) Check the voltage between terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
+B – GND	Always	10 to 14 V
ACC – GND	Ignition SW ACC	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (See page 01–32)**

OK

2 CHECK FOR PROBLEM SYMPTOMS TABLE

(a) Check problem symptoms table (See page 05–1412).

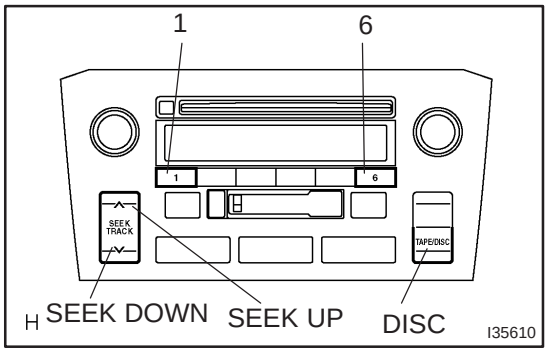
Suspected areas are cleared	A
Suspected areas still exist	B

B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1412)**

A

REPLACE RADIO RECEIVER ASSY

0549I–12



PRE–CHECK

1. DIAGNOSIS CHECK

(a) Starting Diagnosis Mode (All elements are lighting in the SW check mode).

(1) Turn off the audio system and turn the IG switch to ACC. While pressing the preset switches ”1” and ”6” at the same time, press ”DISC” 3 times.

(2) Reference:

- When the system enters the Diagnosis Mode, a ”beep” tone is emitted 3 times and all the elements are lighting in the SW check mode.
- It takes about 40 seconds to complete the check.
- Turn all the elements in the LCD on.
- When pressing the switch, comfirm a beep tone is emitted.
- Press ”SEEK TRACK UP” button switches to enter the ”Service Check Screen”.

(b) Service Check Screen.

(1) Reference

- In the service check mode, the system check and the diagnosis memory check are performed, and the check results are displayed in ascending order of the device codes (physical address.)

Terms	Meaning
Component code (Physical address)	Three–digit code (In hexadecimal) given to each device comprising AVC–LAN. Corresponding to its function, individual symbol is provided.
Logical address	Two–digit code (In hexadecimal) given to each function and device unit in each device comprising AVC–LAN.

Code No. (physical address) List

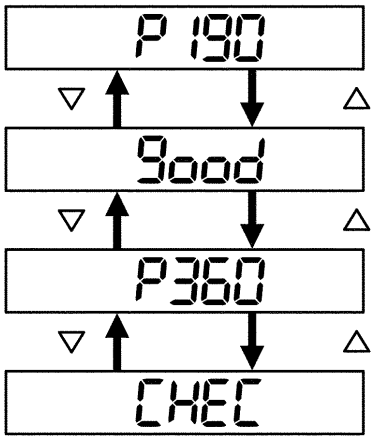
Code No. (physical address)	Equipment name
190	Radio receiver assy (Audio head unit)

(c) Finishing Diagnosis Mode.

(1) Press ”DISC” for 2 seconds or more, or turn the IG switch OFF.

(d) Service Check Mode Result Display (for checking the current and the past system conditions).

(1) Press the ”SEEK TRACK” switch to see the check result of each device.



P——indicates physical address
190——physical address

good——”The component is normal”.

P——indicates physical address
360——physical address

CHEC——”Check needed”.

△ : SEEK TRACK UP

▽ : SEEK TRACK DOWN

The illustration shows the case that the system has 2 devices with codes 190 and 360, and the device (code 360) requires a check.
The check result is displayed in ascending order of device code. The device code is displayed first, and then the check result.

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(2) Check Result Display.

Display	Original Language	Meaning	Action to be taken
good	Good (normal)	No DTCs are detected in both ”System Check Mode” and ”Diagnosis Memory Mode”.	–
NCON	No connection	The system recognized the component when it was registered, but the component gives no response to the ”Diagnosis Mode ON Request”.	Check the power source circuit and the communication circuit of the device indicated by the device code (physical address).
ECHN	Exchange	One or more DTC for ”Exchange” is detected in either ”System Check Mode” or ”Diagnosis Memory Mode”.	Go to the detail information mode to check the trouble area referring to the DTC list.
CHEC	Check	When no DTCs are detected for ”Exchange”, one or more DTC for ”Check is detected in either ”System Check Mode” or ”Diagnosis Memory Mode”.	Go to the detail information mode to check the trouble area referring to the DTC list.

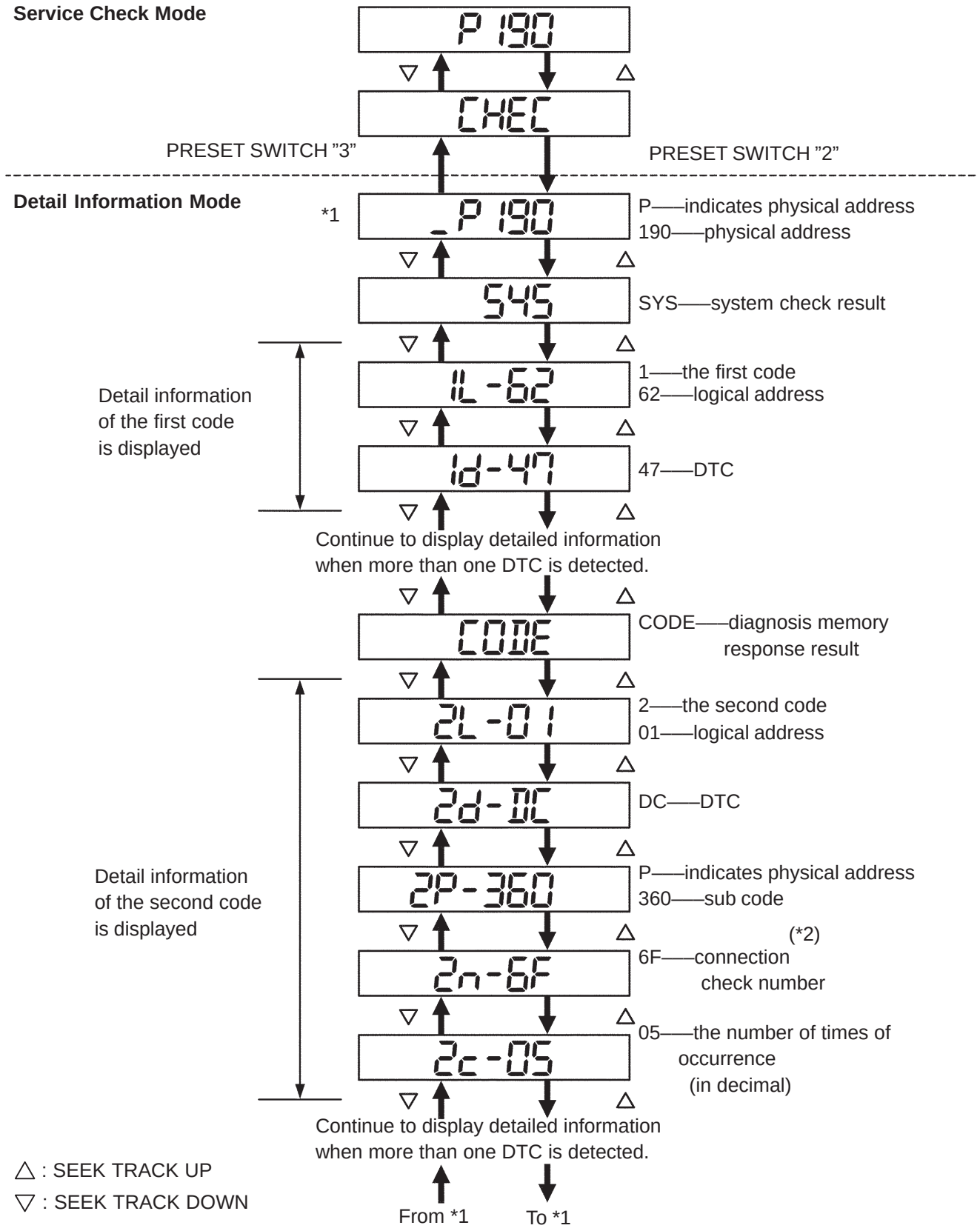
Display	Original Language	Meaning	Action to be taken
OLD	Old version	Old DTC application is identified and DTC is detected in either ”System Check Mode” or ”Diagnosis Memory Mode”.	–
NRES	No response	The device gives no response to any one of ”System Check Mode ON Request”, ”System Check Result Request” and ”Diagnosis Memory Request”.	Check the power source circuit and the communication circuit of the device indicated by the device code (physical code).

(3) To perform the Service Check again, press the preset switch ”1”.

(e) Detailed information Mode (when displaying the troubled device’s DTC)

(1) With ”CHEC” or ”ECHN” being displayed, press the preset switch ”2” to go to the detailed information mode.

(2) Press the ”SEEK TRACK” switch to display ”System Check Result (SYS)” and ”Diagnosis Memory Response (CODE)”.



The illustration shows the case that the component with code 190 has DTC "47" and "dC" as a result of the system check and the diagnosis memory response.
The detailed information mode shows the system check result first, then the diagnosis memory response result.
(*2): As for the DTCs that do not have any sub code, sub code is not displayed.

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(3) Displayed Items in Detailed Information Mode

Division Code for DTC display	Meaning	The order of detailed information displayed when the "SEEK TRACK UP" switch is pressed. (The order is reversed when the "SEEK TRACK DOWN" switch is pressed.)
SYS	System check result is displayed.	Logical address → DTC
CODE	Diagnosis memory check result is displayed.	Logical address→ DTC→ Sub code→ Connection confirmation number→ The number of times of occurrence

(4) Check the trouble area referring to the DTC list.

(5) To return to the service check mode, press the preset switch "3".

(f) Clearing Individual DTC Memory (when clearing the memory of the DTC detected in the past individually)

(1) Press the preset switch "5" for 2 seconds or more while the "ECHN" is displayed in the service check mode or during the detail information mode.

HINT:

- Beep sound is emitted once when the DTC memory is completely cleared.
- When the DTC memory is cleared, only the component code (physical address) is displayed for the target component.
- To check the DTC, press the preset switch "1" and perform the service check again.

(g) Clearance of all the DTC memory (when clearing all the memory of the DTC detected in the past)

(1) Start the diagnosis mode after repairing the trouble area.

(2) Press the preset switch "5" for 2 seconds or more. ("CLR" is displayed at this time.)

HINT:

- Beep sound is given once when the DTC memory is completely cleared.
- When the DTCs memory for all the device is cleared, only the component codes (physical address) are displayed.

(3) Press the preset switch "1" to perform the service check again, and check that no DTCs are displayed for all the component codes (physical address).

2. IDENTIFICATION OF NOISE SOURCE

(a) Identify the condition under which the noise occurs, and check the noise filter on the related part.

Condition in which noise occurs	Noise Source
Depressing the acceleration pedal increases noise, and stopping the engine erases the noise immediately.	Generator
Noise occurs during the A/C or the heater operation.	Blower motor
Rapid acceleration while driving on the unpaved road or after the IG switch is turned ON makes noise.	Fuel pump
Pressing and then releasing the horn switch, and keeping pressing the horn switch makes unusual noise.	Horn
Stopping the engine erases small noise that has been heard.	Ignition
Noise occurs synchronously with the turn signal flash.	Flasher
Noise occurs during the window washer operation.	Washer
Noise occurs during the engine running, and it continues after the engine stops.	Engine coolant temperature sensor
Noise occurs during the wiper operation.	Wiper
Noise occurs when the brake pedal is depressed.	Stop light switch
Others.	Static electricity stored on the vehicle

(b) Reference:

- Make sure first that there is no noise from outside. Failing to do so makes the noise source detection difficult and leads to misunderstanding.
- The noise should be removed in descending order of loudness.
- Setting the radio untuned makes noise noticeable, making the recognition of the phenomenon easier.

0549M–11

PROBLEM SYMPTOMS TABLE

RADIO RECEIVER ASSY

Symptom	Suspect Area	See page
Pressing power switch does not start system.	5. Power source circuit (radio receiver assy)	05–1413
Sound quality is bad in all modes. (volume is too low)	1. Power source circuit (radio receiver assy) 2. Sound quality is bad in all modes (volume is too low)	05–1413 05–1415
Noise occurs.	–	05–1419
Radio broadcast cannot be received. (bad reception)	–	05–1420
CD cannot be inserted or is ejected right after insertion.	1. Power source circuit (radio receiver assy) 2. CD cannot be inserted or is ejected right after insertion	05–1413 05–1422
CD cannot be ejected.	1. Power source circuit (radio receiver assy) 2. CD cannot be ejected	05–1413 05–1424
Sound quality is bad only when CD is played.(volume is too low)	–	05–1425
CD sound skips.	–	05–1426
Cassette tape cannot be inserted or played.	1. Power source circuit (radio receiver assy) 2. Cassette tape cannot be inserted or played	05–1413 05–1428
Cassette tape cannot be ejected.	1. Power source circuit (radio receiver assy) 2. Cassette tape cannot be ejected	05–1413 05–1429
Sound quality is bad only when playing tape.	–	05–1430
Tape is tangled due to incorrect tape speed or auto–reverse malfunction.	–	05–1431

STEERING PAD SWITCH

Symptom	Suspect Area	See page
A audio system cannot be operated with steering pad switch	–	05–1432

RADIO BROADCAST CANNOT BE RECEIVED (BAD RECEPTION)

INSPECTION PROCEDURE

1	CHECK IF RADIO AUTO–SEARCH FUNCTIONS PROPERLY

(a) Check if the radio auto–search functions properly.
  (1) Perform the auto–search of the radio and check that it functions normally.
  Standard: The radio auto–search functions properly.

OK → **REPLACE RADIO RECEIVER ASSY**

NG

2	CHECK OPTIONAL COMPONENT

(a) Check optional component (Sun shade film, telephone antenna etc.).
  (1) Check whether or not any optional component is installed, such as the sunshade film and the telephone antenna.
  Standard: Optional component is installed.

OK → **EFFECT FROM OPTIONAL COMPONENT**

NG

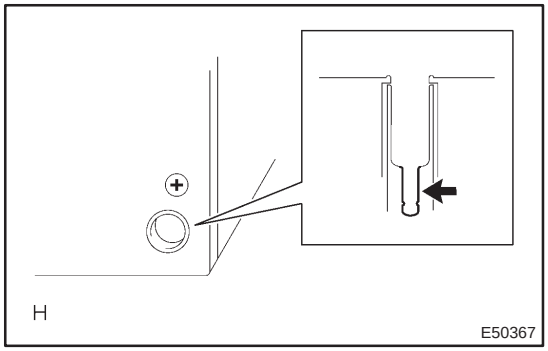
3	CHECK ANTENNA FOR NOISE PRODUCTION

(a) Noise Check with Antenna.
  (1) With the ignition switch in ACC, turn on the radio and choose the AM mode.
  (2) Place a tip of a screwdriver or the antenna of the antenna assembly w/ holder and check that the noise heard from the speaker.
  Standard: Noise occurs.

OK → **REPLACE RADIO RECEIVER ASSY**

NG

4	INSPECT RADIO RECEIVER ASSY(ANTENNA)



(a) Preparation for Check
  (1) Remove the antenna plug of the radio receiver assy.

(b) Noise Check
  (1) With the radio receiver assy connector connected, turn the ignition switch to ACC.
  (2) Turn on the radio and choose the AM mode.
  (3) Place a flat–head screwdriver or a metal such as a thin wire on the antenna jack of the radio receiver assy and check that the noise heard from the speaker.

Standard: Noise occurs.

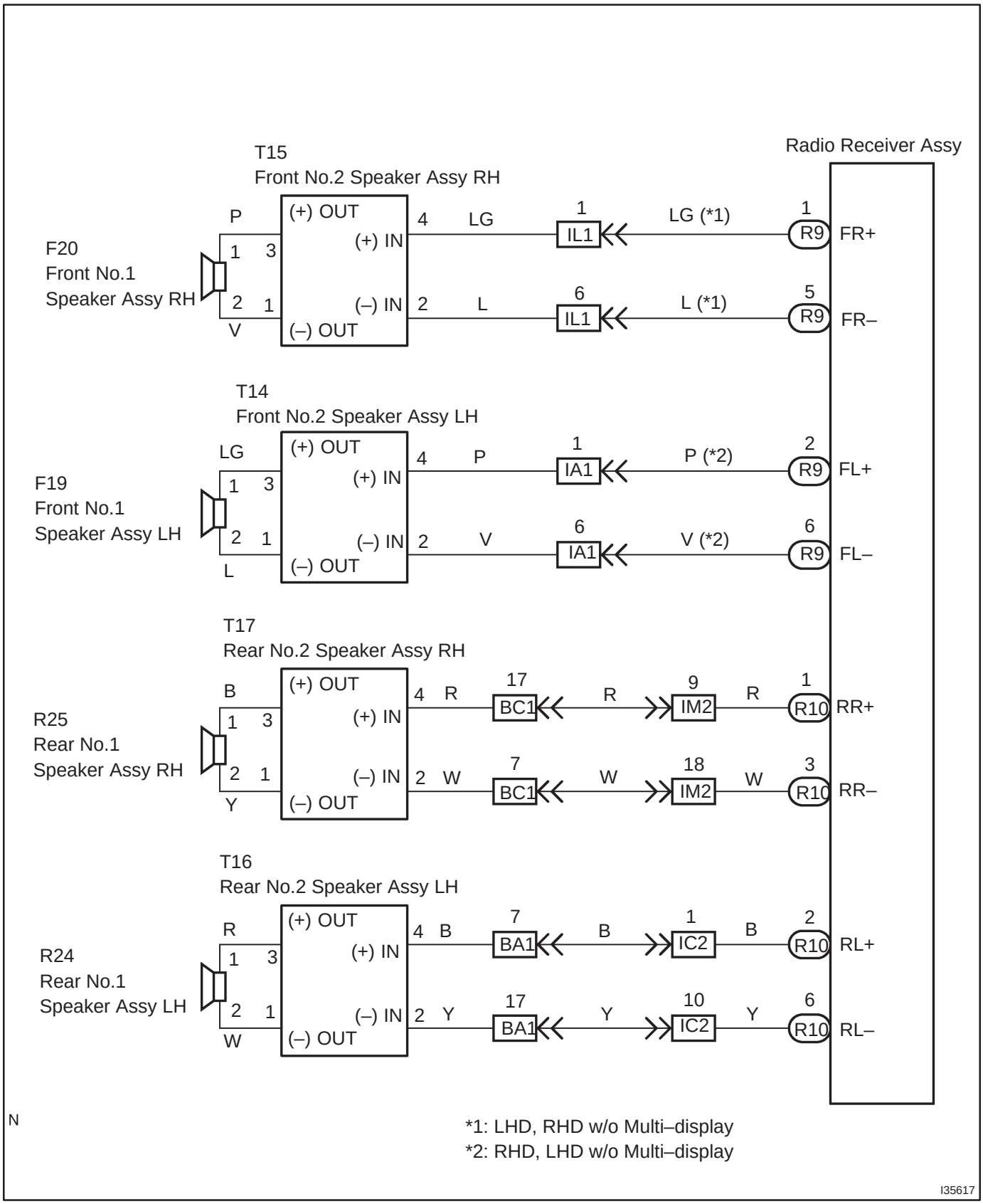
OK → **REPLACE RADIO RECEIVER ASSY**

NG

REPLACE ANTENNA CORD SUB–ASSY

SOUND QUALITY IS BAD IN ALL MODES (VOLUME IS TOO LOW)

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	ADJUST SOUND QUALITY

(a) Adjust the sound quality.
(1) Operate the radio receiver assy to adjust the sound quality.
Standard: Malfunction disappears.

OK	BAD SOUND QUALITY

NG

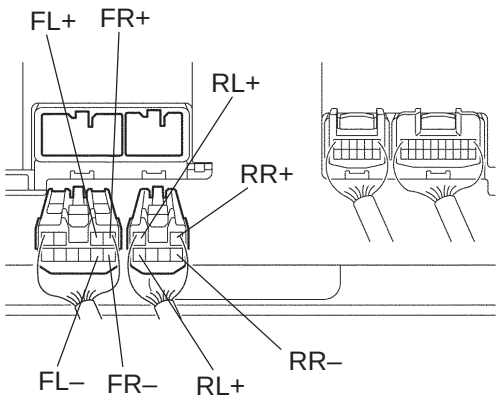
2	COMPARE IT WITH ANOTHER CAR OF SAME MODEL

(a) Compare it with another vehicle of the same models.
(1) Compare with the vehicle of the same type which does not have a trouble to see if there is any difference in the condition of trouble occurrence.
Standard: No difference found.

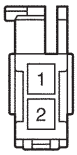
OK	SETTING

NG

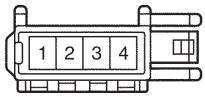
3	CHECK HARNESS AND CONNECTOR(RADIO RECEIVER ASSY – SPEAKER ASSY)



Front No.1 Speaker Assy
Rear No.1 Speaker Assy



Front No.2 Speaker Assy
Rear No.2 Speaker Assy



P I35618

(a) Disconnect the connectors from the radio receiver assy and speakers.

(1) Check continuity between terminals at each condition, as shown in the chart.

Tester connection	Specified condition
FL+ – 1 (Front No.1 speaker assy LH)	Continuity
FL– – 2 (Front No.1 speaker assy LH)	Continuity
FR+ – 1 (Front No.1 speaker assy RH)	Continuity
FR– – 2 (Front No.1 speaker assy RH)	Continuity
FL+ – 4 (Front No.2 speaker assy LH)	Continuity
FL– – 2 (Front No.2 speaker assy LH)	Continuity
FR+ – 4 (Front No.2 speaker assy RH)	Continuity
FR– – 2 (Front No.2 speaker assy RH)	Continuity
RL+ – 1 (Rear No.1 speaker assy LH)	Continuity
RL– – 2 (Rear No.1 speaker assy LH)	Continuity
RR+ – 1 (Rear No.1 speaker assy RH)	Continuity
RR– – 2 (Rear No.1 speaker assy RH)	Continuity
RL+ – 4 (Rear No.2 speaker assy LH)	Continuity
RL– – 2 (Rear No.2 speaker assy LH)	Continuity
RR+ – 4 (Rear No.2 speaker assy RH)	Continuity
RR– – 2 (Rear No.2 speaker assy RH)	Continuity

(2) Check for a short between terminals at each condition, as shown in the chart.

Tester connection	Specified condition
FL+ – Body ground	No Continuity
FL– – Body ground	No Continuity
FR+ – Body ground	No Continuity
FR– – Body ground	No Continuity
RL+ – Body ground	No Continuity
RL– – Body ground	No Continuity
RR+ – Body ground	No Continuity
RR– – Body ground	No Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR(See page 01–32)**

OK

4	INSPECT FRONT NO.1 SPEAKER ASSY

(a) Resistance check.
(1) Check the resistance between the terminals of the speaker.

NOTICE:
The speaker should not be removed for checking.

Standard value: 4 Ω

NG → **REPLACE FRONT NO.1 SPEAKER ASSY**

OK

5	INSPECT FRONT NO.2 SPEAKER ASSY

(a) Check that malfunction disappears when a known good speaker is installed.
Standard: Malfunction disappears.

HINT:
Connect the all connectors of speakers.

NG → **REPLACE FRONT NO.2 SPEAKER ASSY**

OK

6	INSPECT REAR NO.1 SPEAKER ASSY

(a) Resistance check.
(1) Check the resistance between the terminals of the speaker.

NOTICE:
The speaker should not be removed for checking.

Standard value: 4 Ω

NG → **REPLACE REAR NO.1 SPEAKER ASSY**

OK

7	INSPECT REAR NO.2 SPEAKER ASSY

(a) Check that malfunction disappears when a known good speaker is installed.
Standard: Malfunction disappears.

HINT:
Connect the all connectors of speakers.

NG → **REPLACE REAR NO.2 SPEAKER ASSY**

OK

REPLACE RADIO RECEIVER ASSY

SOUND QUALITY IS BAD ONLY WHEN CD IS PLAYED (VOLUME IS TOO LOW)

INSPECTION PROCEDURE

1	REPLACE CD WITH ANOTHER AND RECHECK

(a) Replace the CD with another and recheck.
  (1) Check the installation condition of the radio receiver assembly.
  Standard: Malfunction disappears.

OK → **CD FAULTY**

NG

REPLACE RADIO RECEIVER ASSY

SOUND QUALITY IS BAD ONLY WHEN PLAYING TAPE

INSPECTION PROCEDURE

1	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK

(a) Replace the cassette tape with another and recheck.
(1) Replace the cassette tape with another normal one to see if the same trouble occurs again.
Standard: Malfunction disappear.

OK → **CASSETTE TAPE FAULTY**

NG

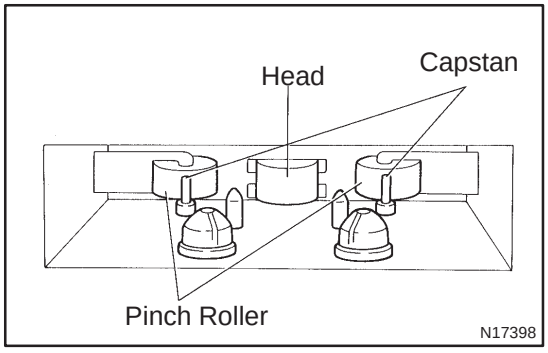
2	CHECK FOR ANY FOREIGN OBJECT

(a) Check for foreign objects.
(1) Check that no foreign material and troubles are detected in the radio receiver assembly cassette tape player.
Standard: No foreign objects or defects detected.

NG → **REMOVE FOREIGN OBJECT**

OK

3	CLEAN HEAD AND CHECK OPERATION



(a) Head cleaning
(1) Raise the cassette door with your finger. Next, using a pencil or similar object, push in the guide.
(2) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.
(3) Check that the same trouble occurs again.
Standard: Malfunction disappears.

OK → **HEAD DIRTY**

NG

REPLACE RADIO RECEIVER ASSY

TAPE IS TANGLED DUE TO INCORRECT TAPE SPEED OR AUTO–REVERSE MALFUNCTION

INSPECTION PROCEDURE

1	CHECK FOR ANY FOREIGN OBJECT

(a) Check for any foreign objects.
  (1) Check that no foreign objects or defects are detected in the cassette tape player of radio receiver assy.

Standard: No foreign objects or defects detected.

NG → **REMOVE FOREIGN OBJECT**

OK

2	REPLACE CASSETTE TAPE WITH ANOTHER AND RECHECK(BELOW 90 MIN.)

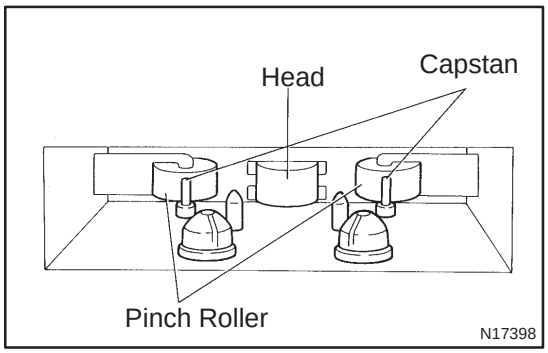
(a) Replace the cassette tape with another and recheck.
  (1) Replace the cassette tape with another normal one (90min or less) to see if the same trouble occurs again.

Standard: Malfunction disappears.

OK → **CASSETTE TAPE FAULTY**

NG

3	CLEAN HEAD AND CHECK OPERATION



(a) Head cleaning
  (1) Raise the cassette door with your finger. Next, using a pencil or similar object, push in the guide.
  (2) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.
  (3) Check that the same trouble occurs again.

Standard: Malfunction disappears.

OK → **HEAD DIRTY**

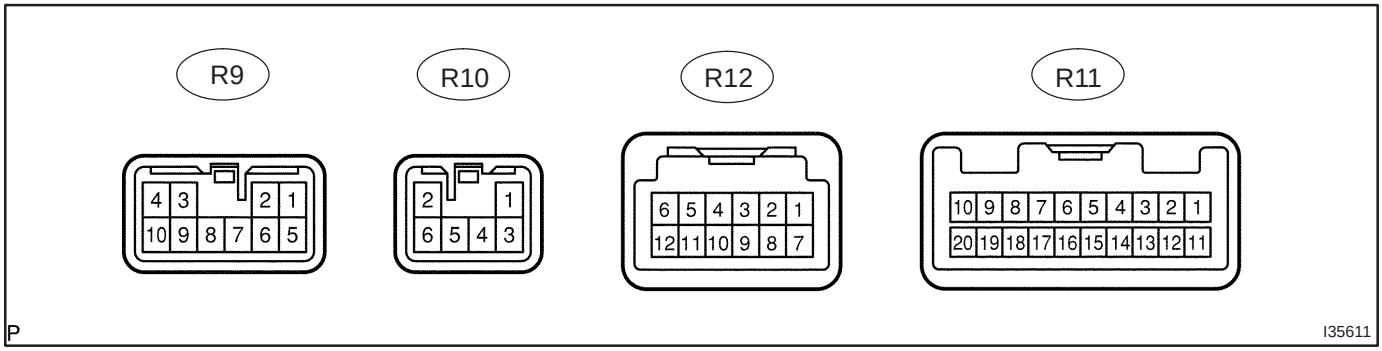
NG

REPLACE RADIO RECEIVER ASSY

05C4Y–01

TERMINALS OF ECU

1. RADIO RECEIVER ASSY



Terminal No. (Symbols)	Wiring Color	Condition	STD Voltage (V)
R9–1(FR+) – R9–7(GND)	LG – BR*1 LG – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R9–2(FL+) – R9–7(GND)	P – BR*1 P – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R9–3(ACC) – R9–7(GND)	GR – BR*1 GR – W–B*2	Ignition switch to ACC	10 to 14
R9–4(+B) – R9–7(GND)	L–Y – BR*1 L–Y – W–B*2	Always	10 to 14
R9–5(FR–) – R9–7(GND)	L – BR*1 L – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R9–6(FL–) – R9–7(GND)	V – BR*1 V – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R9–7(GND) – Body ground	BR*1 – Body ground W–B*2 – Body ground	Always	Continuity
R9–8(ANT) – R9–7(GND)	B – BR*1 B – W–B*2	Radio switch ON and AM or FM	10 to 14
R9–10(ILL+) – R9–7(GND)	G – BR*1 G – W–B*2	Light control switch TAIL	10 to 14
R10–1(RR+) – R9–7(GND)	B – BR*1 R – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R10–2(RL+) – R9–7(GND)	B – BR*1 B – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R10–3(RR–) – R9–7(GND)	W – BR*1 W – W–B*1	Audio system is playing	A waveform synchronized with sounds is output
R10–6(RL–) – R9–7(GND)	Y – BR*1 Y – W–B*2	Audio system is playing	A waveform synchronized with sounds is output
R11–6(GND) – R9–7(GND)	W–R – BR*1 W–R – W–B*2	Always	Below 1.0
R11–7(SW1) – R9–7(GND)	LG – BR*1 LG – W–B*2	Steering pad switch not operating. →SEEK+ switch push →SEEK– switch push →VOL+ switch push →VOL– switch push	4 or more →Approx. 0.5 →Approx. 0.9 →Approx. 2.0 →Approx. 3.4

R11–8(SW2) – R9–7(GND)	P – BR*1 P – W–B*2	Steering pad switch is not operating →MODE switch push	4 or more → Below 2.5
R12–9 (TX+)	P	See "Service Check Mode"	–
R12–10 (TX–)	LG	See "Service Check Mode"	–

*1: LHD

*2: RHD

05C4F–01

CUSTOMER PROBLEM ANALYSIS CHECK

COMBINATION METER SYSTEM Check Sheet

Inspector's name:

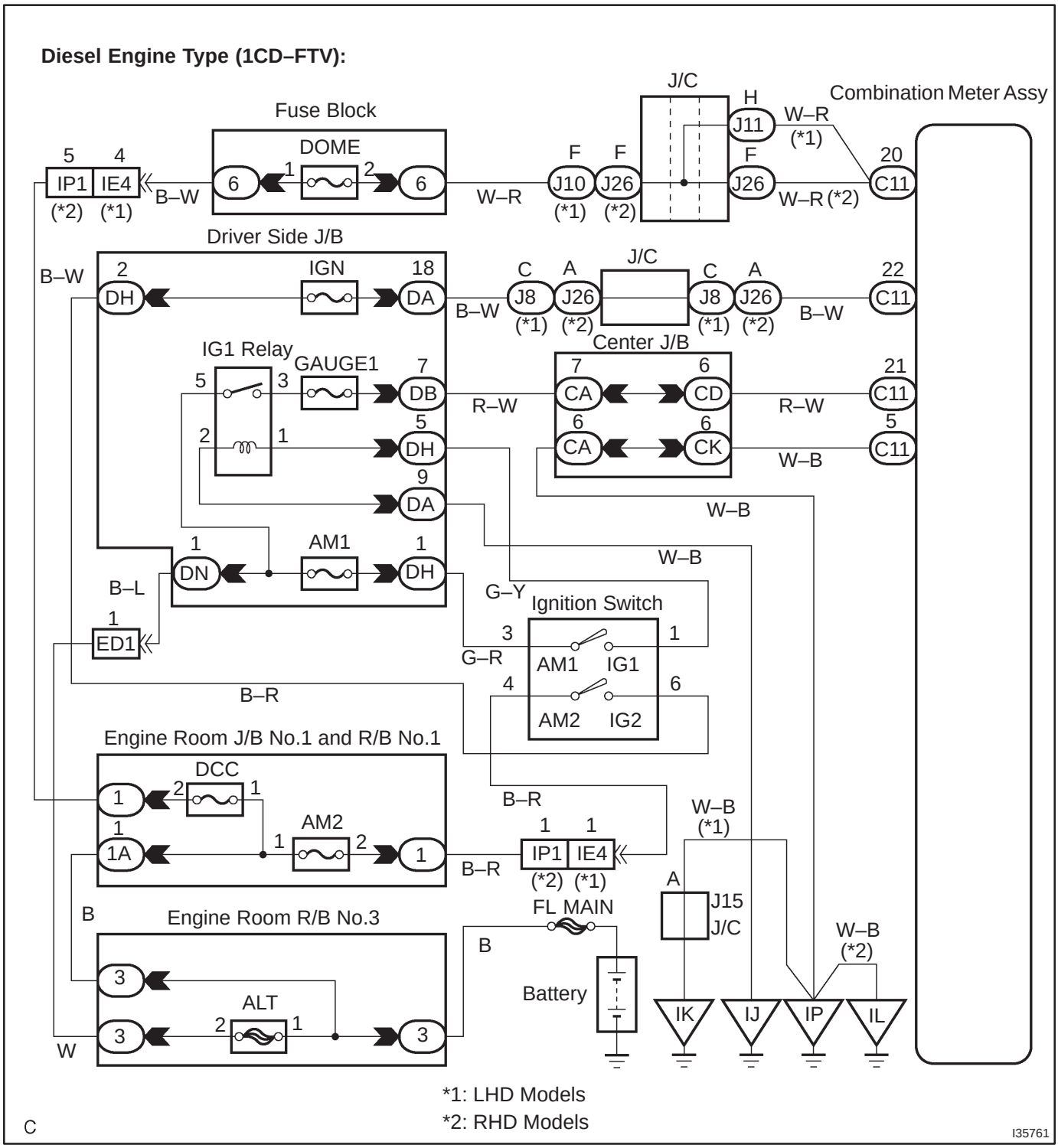
Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date of Vehicle Brought In	/ /	**Odometer Reading**	**km** **Mile**

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constantly ☐ Sometimes (Times per day, month) ☐ Once only
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outside temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F (°C))

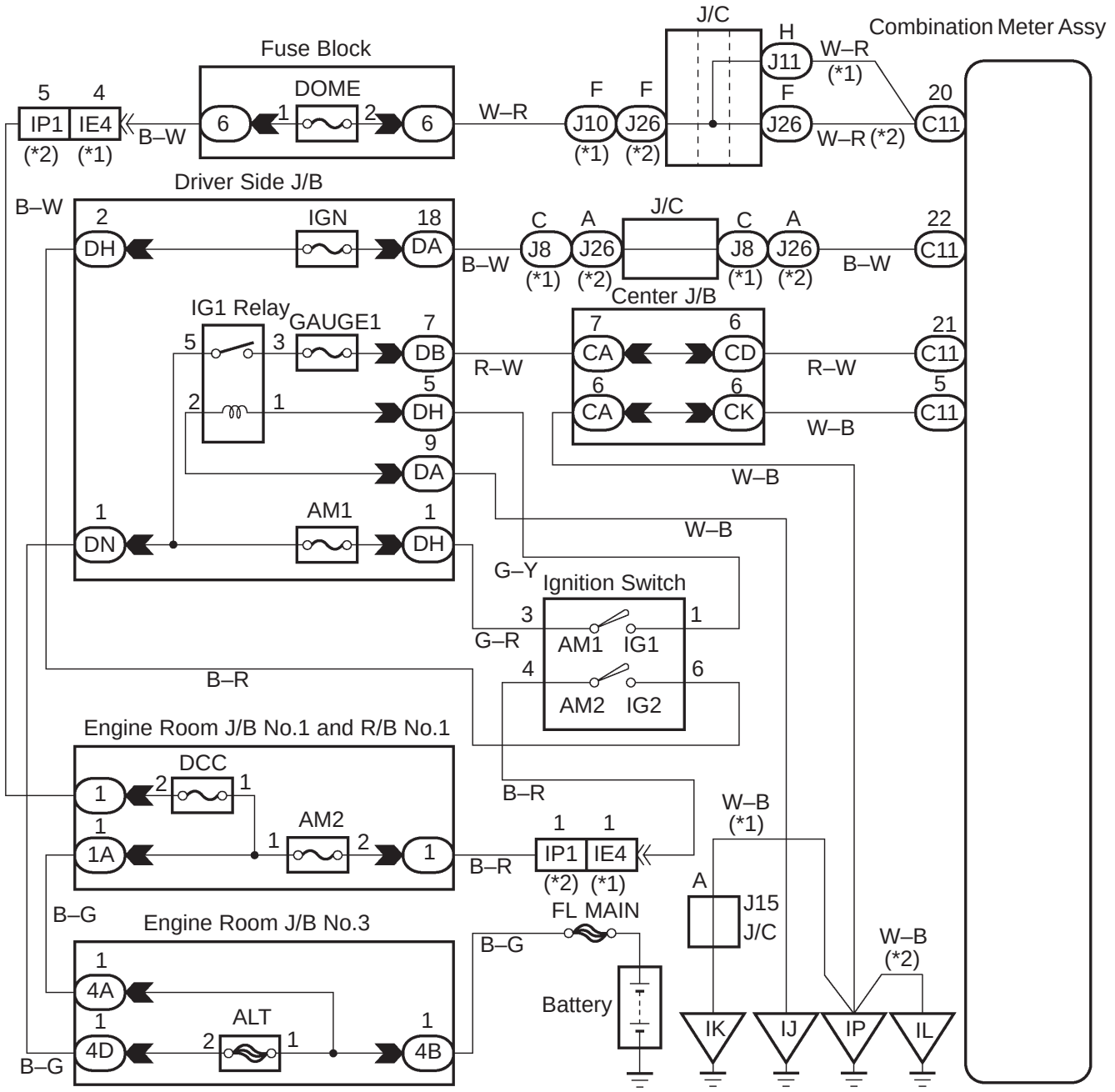
Problem Symptom	**Gauge**	☐ Malfunction in speedometer
		☐ Malfunction in tachometer
		☐ Malfunction in water temperature receiver gauge
		☐ Malfunction in fuel receiver gauge
	Others	☐ Entire combination meter does not operate
		☐ Buzzer does not sound
		☐ Seat belt warning lamp for driver's seat does not come on
		☐ Seat belt warning lamp for front passenger's seat does not come on
		☐ The ambient temperature is not displayed

ENTIRE COMBINATION METER DOES NOT OPERATE

WIRING DIAGRAM



Gasoline Engine Type:



INSPECTION PROCEDURE

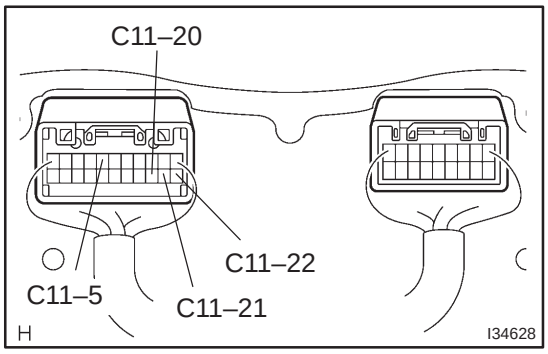
1	INSPECT FUSE(GAUGE2, ECU–B)

(a) Check continuity in the GAUGE, DOME fuse.

NG → **REPLACE FUSE**

OK

2	CHECK COMBINATION METER ASSY(POWER SOURCE AND GROUND CIRCUIT)



(a) Remove the combination meter assy.
(b) Check continuity.
  (1) Check continuity between the terminal C11–5 of the combination meter connector and the body ground.

  Standard: Continuity.
(c) Check the voltage.
  (1) Measure the voltage between the terminal C11–20 of the combination meter connector and the body ground.

  Standard voltage: 10 – 14 V
  (2) Turn the ignition switch to ON.
  (3) Measure the voltage between the terminal C11–21, 22 of the combination meter connector and the body ground.

  Standard voltage: 10 – 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE COMBINATION METER ASSY

COMBINATION METER

HOW TO PROCEED WITH TROUBLESHOOTING

056Q7–04

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–1498)

3	Check multiplex communication system (See page 05–1654)

(a) Check the DTC output.

- DTC outputs (Proceed to "BODY MULTIPLEX COMMUNICATION SYSTEM)
- DTC does not output (Go to step 4)

4	Problem Symptom Confirmation (See page 05–1509)

5	Circuit Inspection (See page 05–1510 – 05–1522)

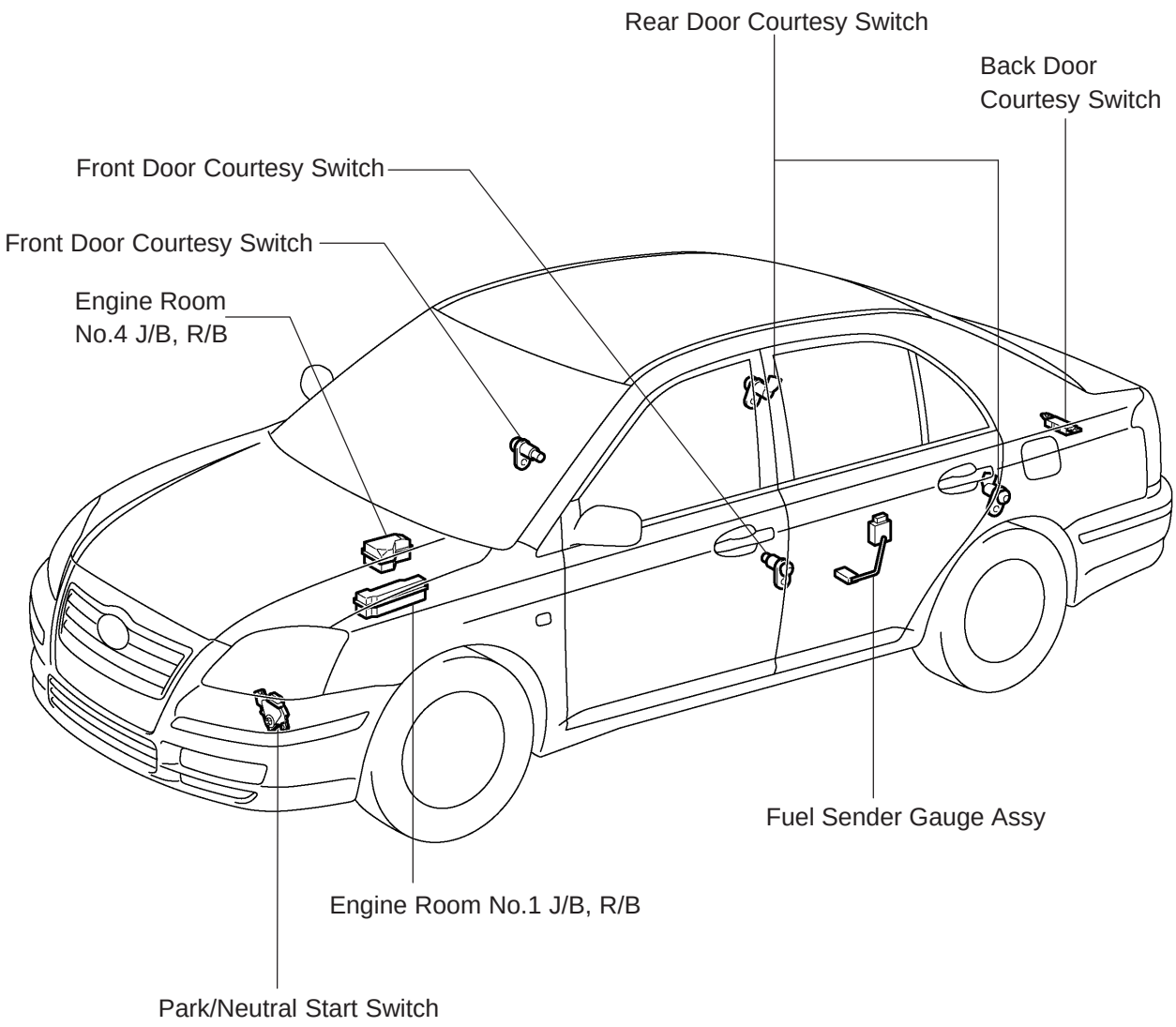
6	Repair or Replace

7	Confirmation Test

8	End

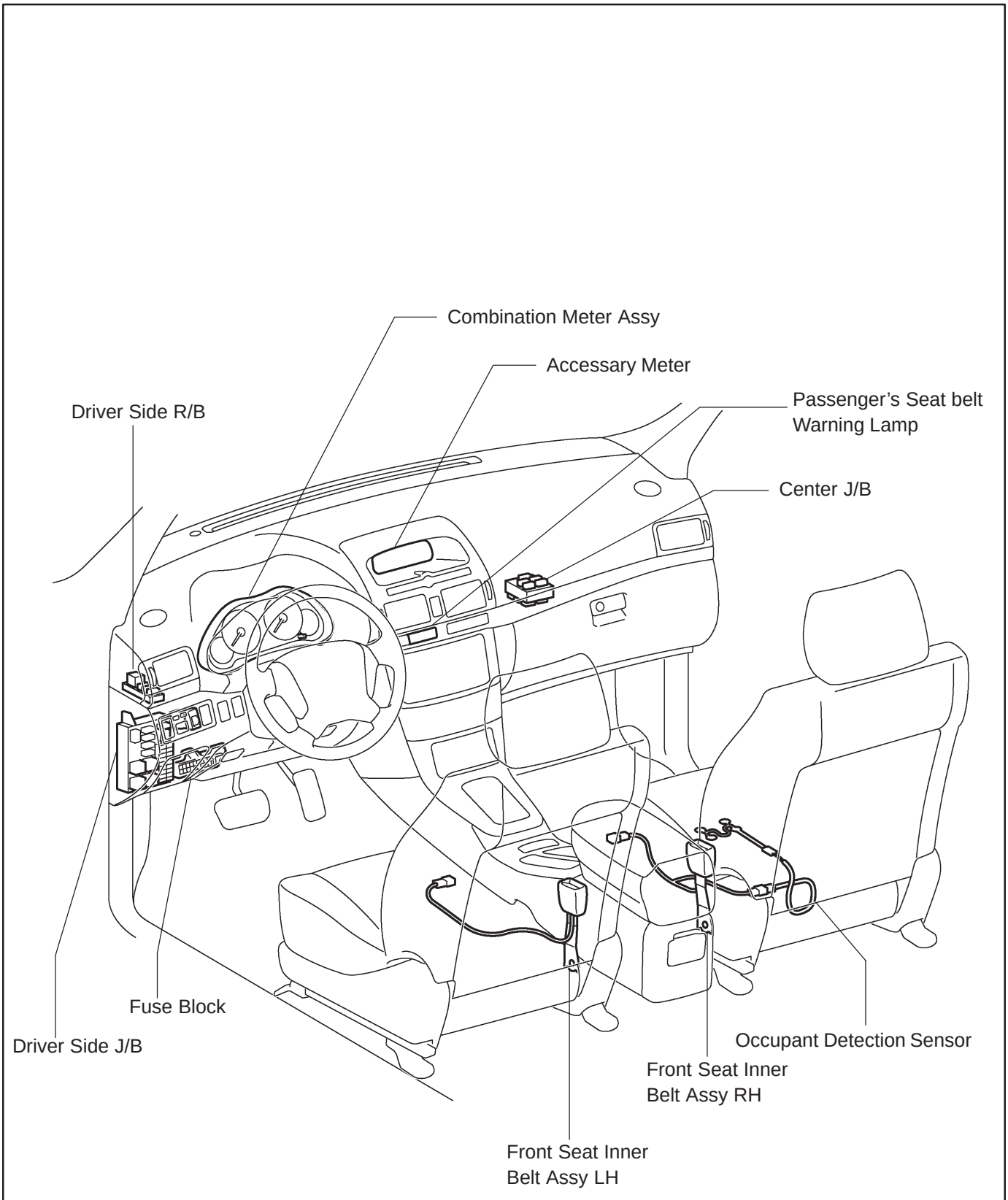
056QA–03

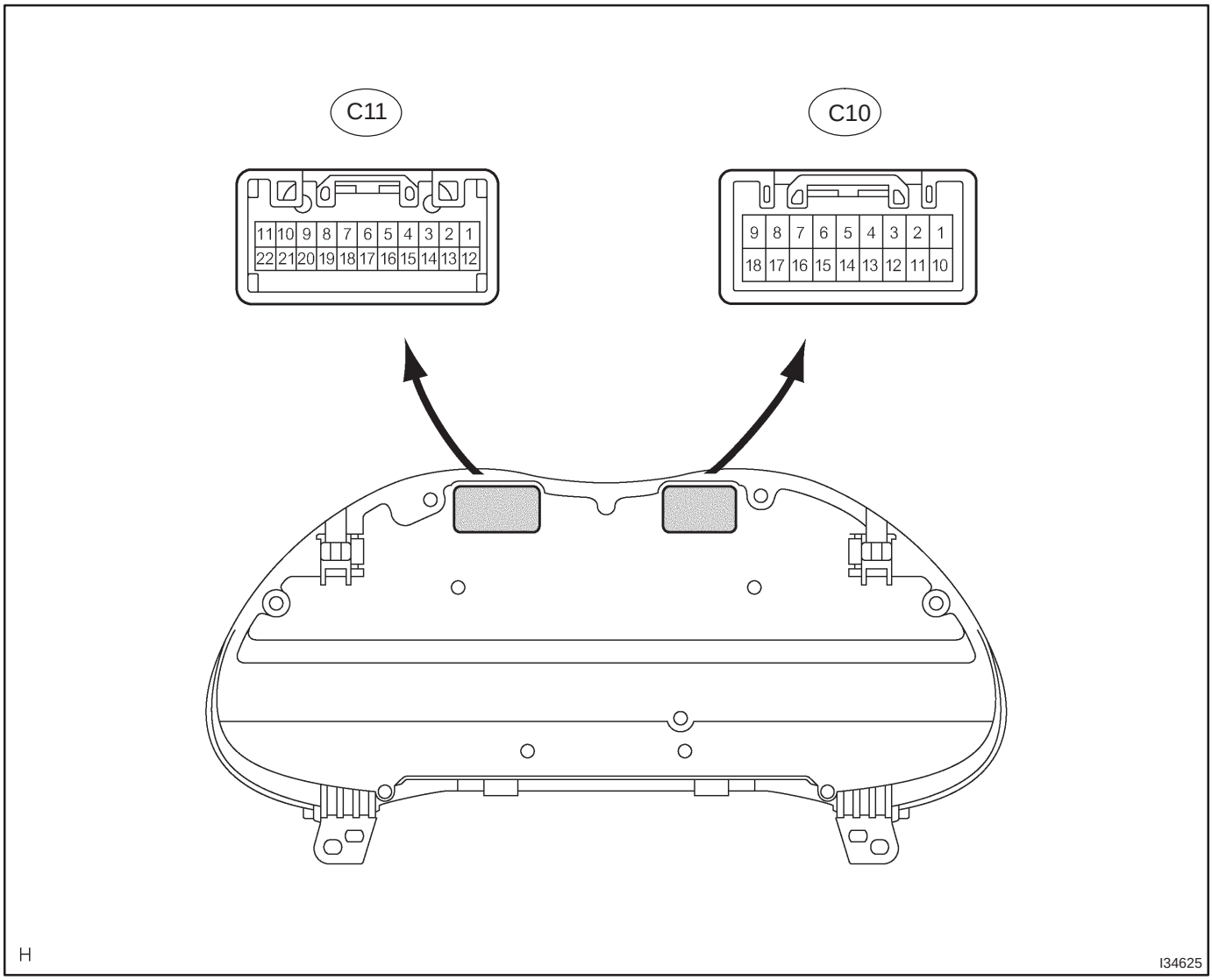
LOCATION

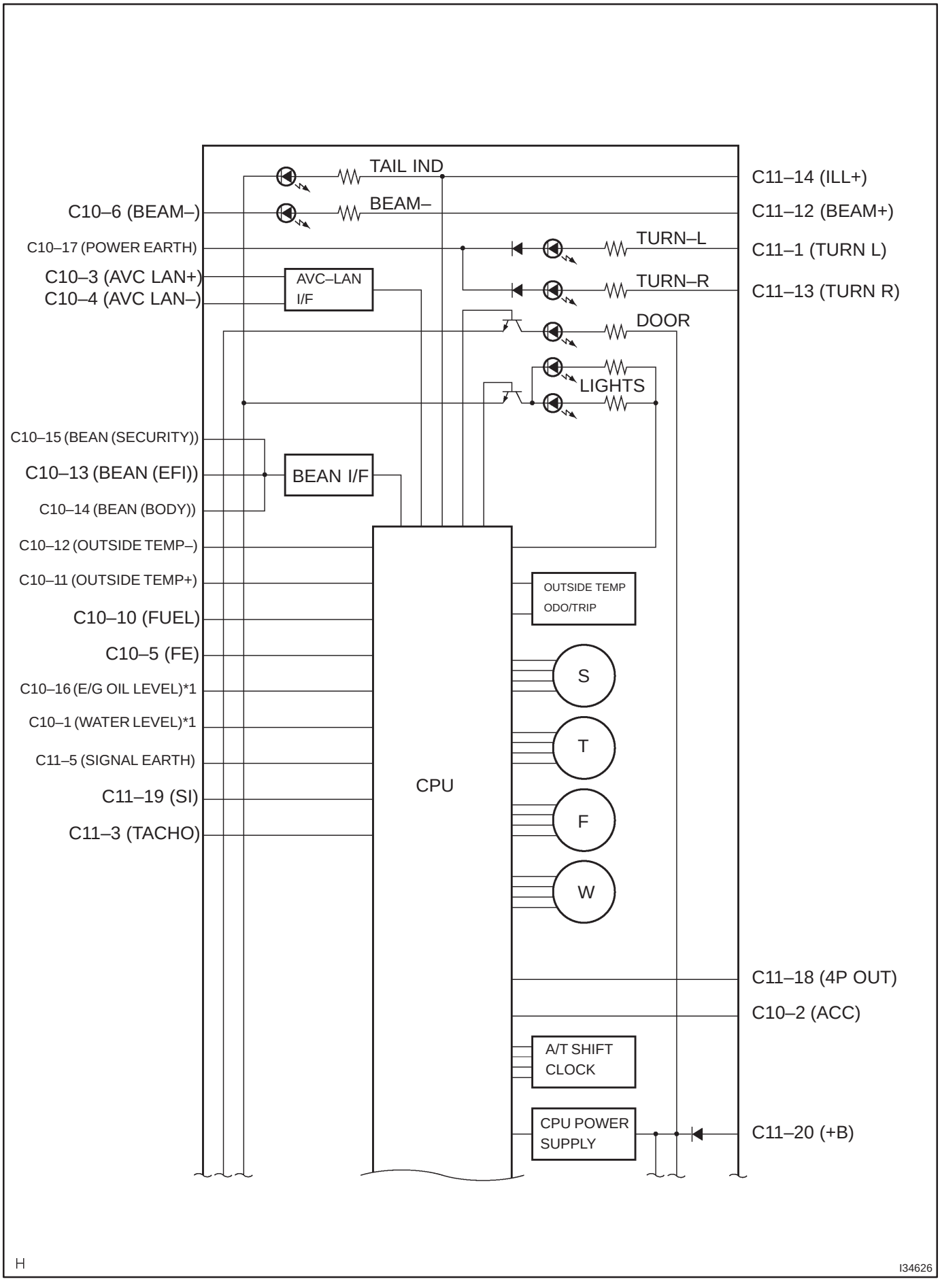


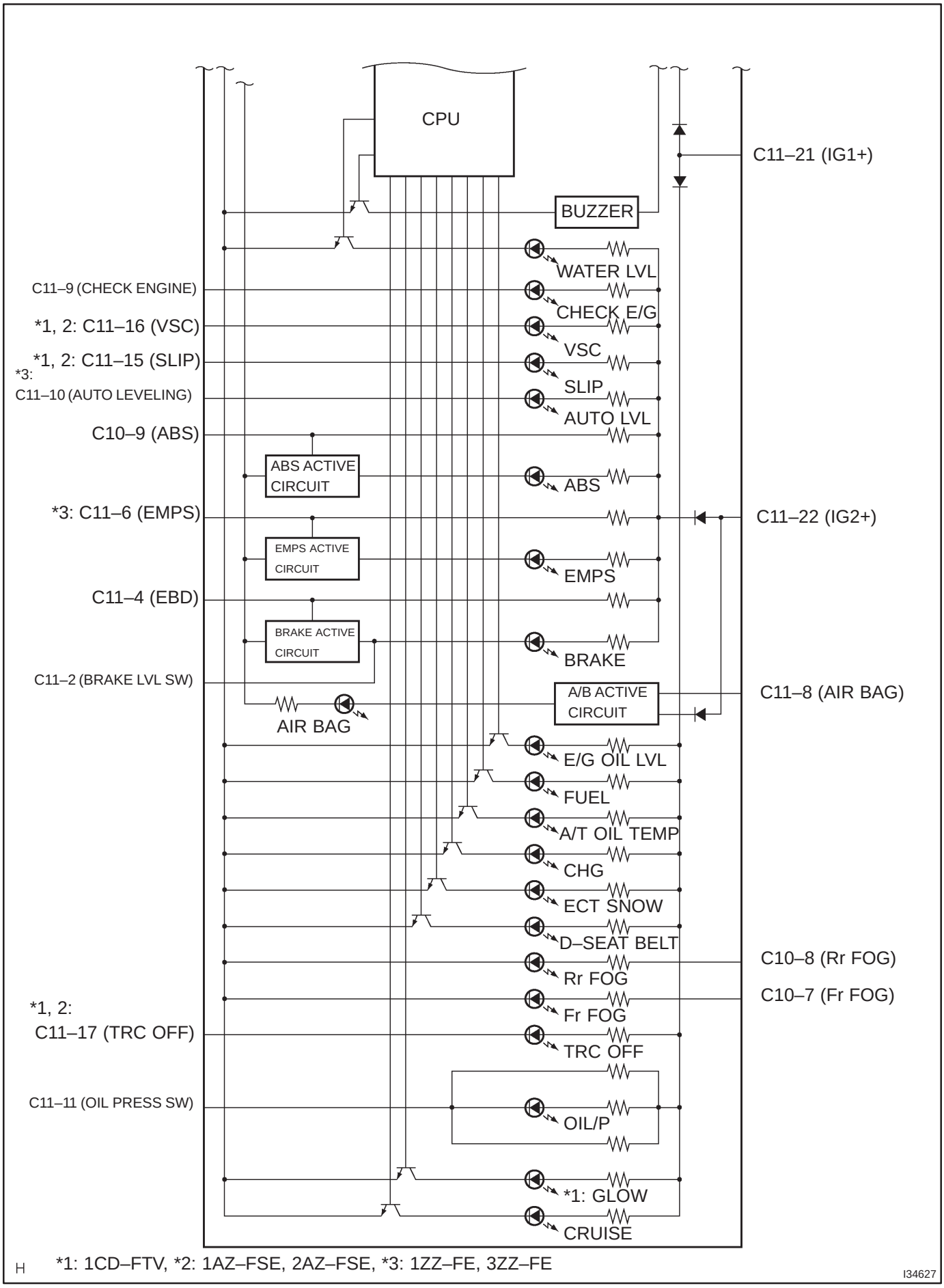
H

I34623


Combination Meter Assy
Accessary Meter
Passenger's Seat belt Warning Lamp
Driver Side R/B
Center J/B
Fuse Block
Driver Side J/B
Occupant Detection Sensor
Front Seat Inner Belt Assy RH
Front Seat Inner Belt Assy LH
H
I34624


C11
C10
11 10 9 8 7 6 5 4 3 2 1
22 21 20 19 18 17 16 15 14 13 12
9 8 7 6 5 4 3 2 1
18 17 16 15 14 13 12 11 10
H
I34625


TAIL IND
BEAM–
TURN–L
TURN–R
DOOR
LIGHTS
C10–6 (BEAM–)
C10–17 (POWER EARTH)
C10–3 (AVC LAN+)
C10–4 (AVC LAN–)
AVC–LAN I/F
C10–15 (BEAN (SECURITY))
C10–13 (BEAN (EFI))
C10–14 (BEAN (BODY))
BEAN I/F
C10–12 (OUTSIDE TEMP–)
C10–11 (OUTSIDE TEMP+)
C10–10 (FUEL)
C10–5 (FE)
C10–16 (E/G OIL LEVEL)*1
C10–1 (WATER LEVEL)*1
C11–5 (SIGNAL EARTH)
C11–19 (SI)
C11–3 (TACHO)
CPU
OUTSIDE TEMP
ODO/TRIP
S
T
F
W
A/T SHIFT
CLOCK
CPU POWER
SUPPLY
C11–14 (ILL+)
C11–12 (BEAM+)
C11–1 (TURN L)
C11–13 (TURN R)
C11–18 (4P OUT)
C10–2 (ACC)
C11–20 (+B)
H
I34626

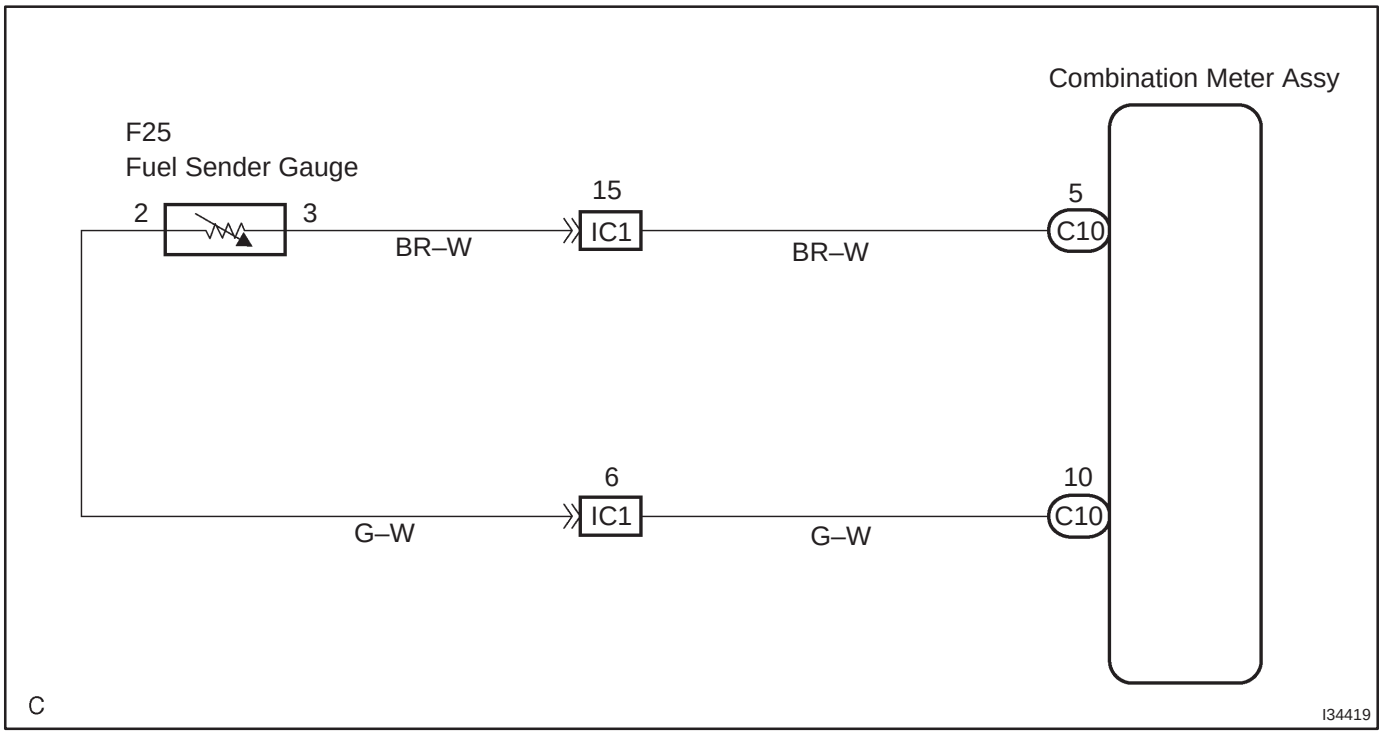

CPU
C11–21 (IG1+)
BUZZER
WATER LVL
C11–9 (CHECK ENGINE)
CHECK E/G
*1, 2: C11–16 (VSC)
VSC
*1, 2: C11–15 (SLIP)
SLIP
*3:
C11–10 (AUTO LEVELING)
AUTO LVL
C10–9 (ABS)
ABS ACTIVE CIRCUIT
ABS
*3: C11–6 (EMPS)
C11–22 (IG2+)
EMPS ACTIVE CIRCUIT
EMPS
C11–4 (EBD)
BRAKE ACTIVE CIRCUIT
BRAKE
C11–2 (BRAKE LVL SW)
A/B ACTIVE CIRCUIT
C11–8 (AIR BAG)
AIR BAG
E/G OIL LVL
FUEL
A/T OIL TEMP
CHG
ECT SNOW
D–SEAT BELT
C10–8 (Rr FOG)
Rr FOG
C10–7 (Fr FOG)
Fr FOG
*1, 2:
C11–17 (TRC OFF)
TRC OFF
C11–11 (OIL PRESS SW)
OIL/P
*1: GLOW
CRUISE
H
*1: 1CD–FTV, *2: 1AZ–FSE, 2AZ–FSE, *3: 1ZZ–FE, 3ZZ–FE
I34627

Terminal No.		Wire harness side
C10	1	Fuse Filter Warning Switch (*1)
	2	RAD No.1 Fuse
	3	Multi Display
	4	Multi Display
	5	Fuel Sender Gauge
	6	GND
	7	Front Fog Light Relay
	8	Rear Fog Light Relay
	9	Skid Control ECU with Actuator
	10	Fuel Sensor Gauge
	11	Ambient Temp. Sensor
	12	Ambient Temp. Sensor
	13	Engine ECU
	14	Integration Relay
	15	Security ECU
	16	Engine Oil Level Sensor
	17	GND
	18	–
C11	1	Turn Signal Flasher Relay
	2	Brake Fluid Level Warning Switch
	3	Engine ECU
	4	Skid Control ECU with Actuator
	5	GND
	6	EMPS ECU
	7	–
	8	Airbag Sensor Assembly
	9	Engine ECU
	10	Headlight Beam Level Control ECU
	11	Oil Pressure Switch
	12	H–HI RH Fuse/H–LP RH Fuse
	13	Turn Signal Flasher Relay
	14	TAIL Fuse
	15	Skid Control ECU with Actuator
	16	Skid Control ECU with Actuator
	17	Skid Control ECU with Actuator
	18	4P OUT (Other Parts)
	19	Skid Control ECU with Actuator
	20	DOME Fuse
	21	GAUGE1 Fuse
	22	IGN Fuse

*1: 1CD–FTV

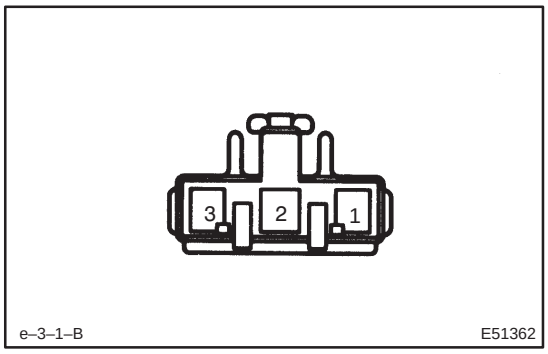
MALFUNCTION IN FUEL RECEIVER GAUGE

WIRING DIAGRAM



INSPECTION PROCEDURE

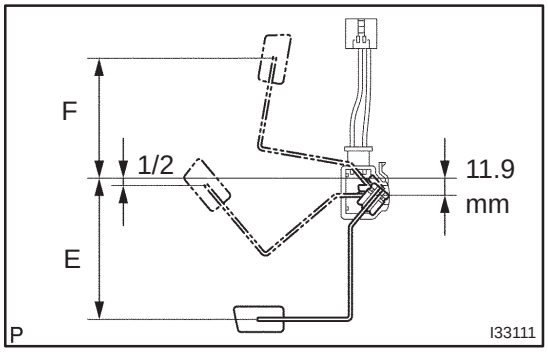
1	INSPECT FUEL SENDER GAUGE ASSY



(a) Remove the fuel sender gauge assy.
(b) Check that the float position is between E and F and measure resistance between the terminal 2 and 3 of the connector.
(c) Check that the resistance value changes continuously.

Standard:

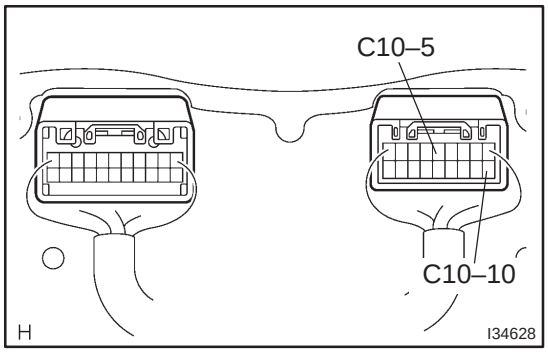
Float level	Float position mm (in.)	Resistance (Ω)
F	88.6 (3.49) ± 3 (0.12)	4.0 ± 1.5
1/2	6.4 (0.25) ± 3 (0.12)	50.5 ± 2.6
E	102.9 (4.05) ± 3 (0.12)	110.0 ± 3.0



NG → **REPLACE FUEL SENDER GAUGE ASSY**

OK

2	CHECK HARNESS AND CONNECTOR(BETWEEN FUEL SENDER GAUGE ASSY AND COMBINATION METER)



(a) Remove the combination assy and fuel sender gauge.
(b) Check the continuity between the terminal 3 of the fuel sender gauge and the terminal C10–5 of the combination meter assy.
Standard: Continuity.
(c) Check continuity between the terminal 2 of the fuel sender gauge and the terminal C10–10 of the combination meter assy.
Standard: Continuity.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

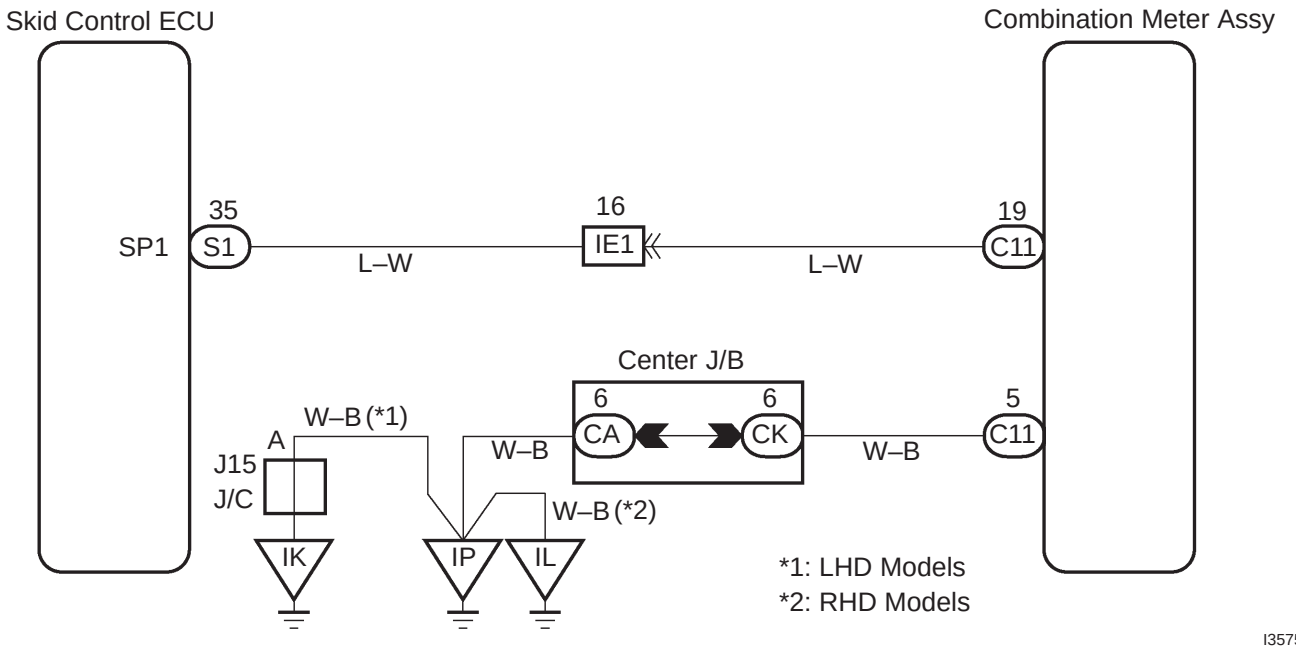
OK

CHECK AND REPLACE COMBINATION METER ASSY

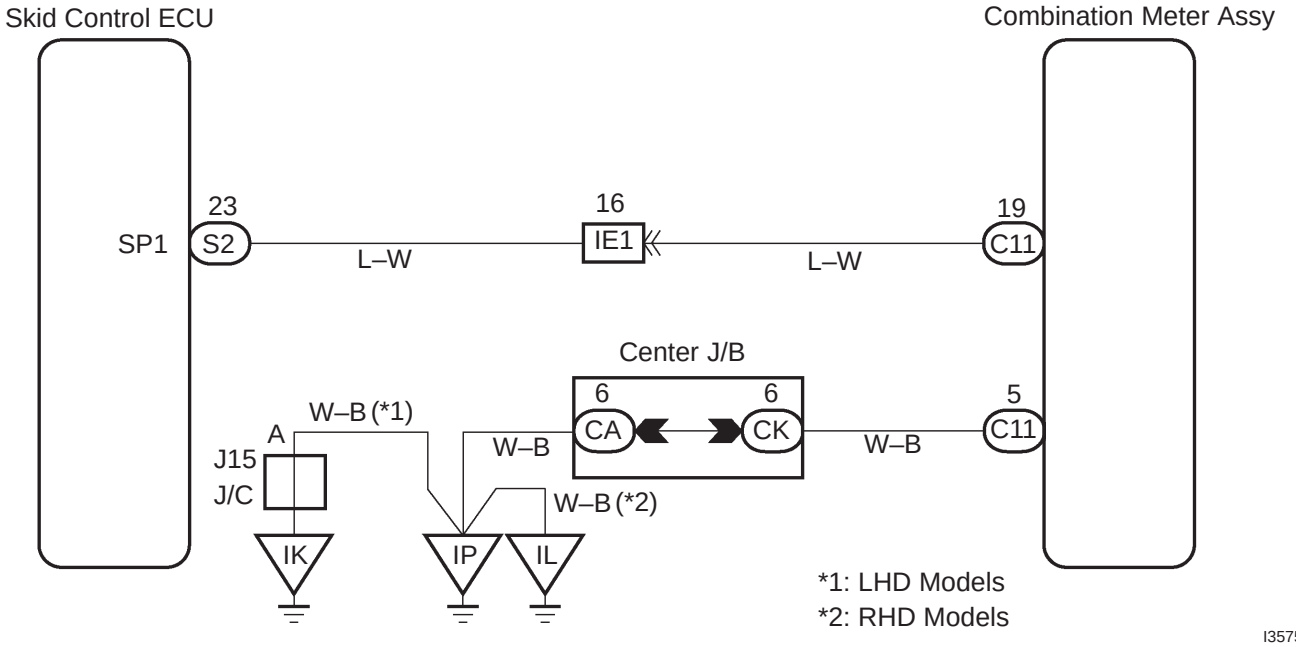
MALFUNCTION IN SPEEDOMETER

WIRING DIAGRAM

w/ VSC:



w/o VSC:



INSPECTION PROCEDURE

1	READ VALUE OF HAND–HELD TESTER(SKID CONTROL ECU)

(a) Operate the hand–held tester according to the steps on the display and select ”DATA LIST”.

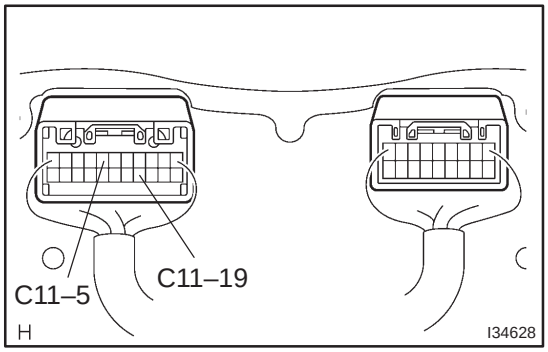
ALL(ECM):

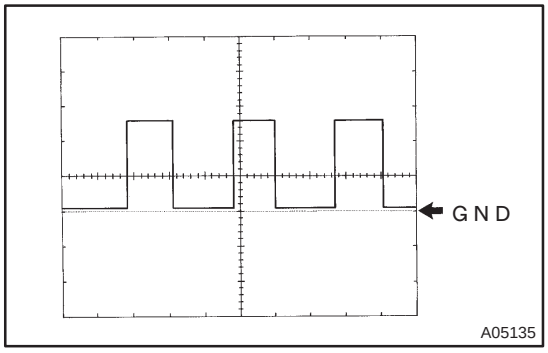
Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
VEHICLE SPEED	Vehicle speed / Min.: 0 km/h, Max.: 255 km/h	Almost same at the meter speed (When driving)	–

NG → **GO TO BRAKE SYSTEM**

OK

2	INSPECT COMBINATION METER ASSY





(REFERENCE) INSPECTION USING OSCILLOSCOPE

(a) Check the input signal waveform.
  (1) Remove the combination meter assy.
  (2) Connect the oscilloscope to the terminal C11–19 and C11–5 of the combination meter assy.
  (3) Start the engine.
  (4) Check the signal waveform.

Item	Contents
Tool setting	5 V/ DIV, 20 ms/ DIV
Vehicle condition	Driving at approx. 20Km/h

HINT:

As the vehicle speed becomes higher, the cycle of the signal waveform becomes shorter.

OK → **CHECK AND REPLACE COMBINATION METER ASSY**

NG

3	CHECK HARNESS AND CONNECTOR(BETWEEN SKID CONTROL ECU AND COMBINATION METER ASSY)

(a) Disconnect the connector from the combination meter assy.
(b) Disconnect the connector from the skid control ECU.
(c) Check continuity between the terminal S1–35 (SP1)/S2–23 (SP1) of the skid control ECU and the terminal C11–19 of the combination meter connector (See Page 05–770).
Standard: Continuity.

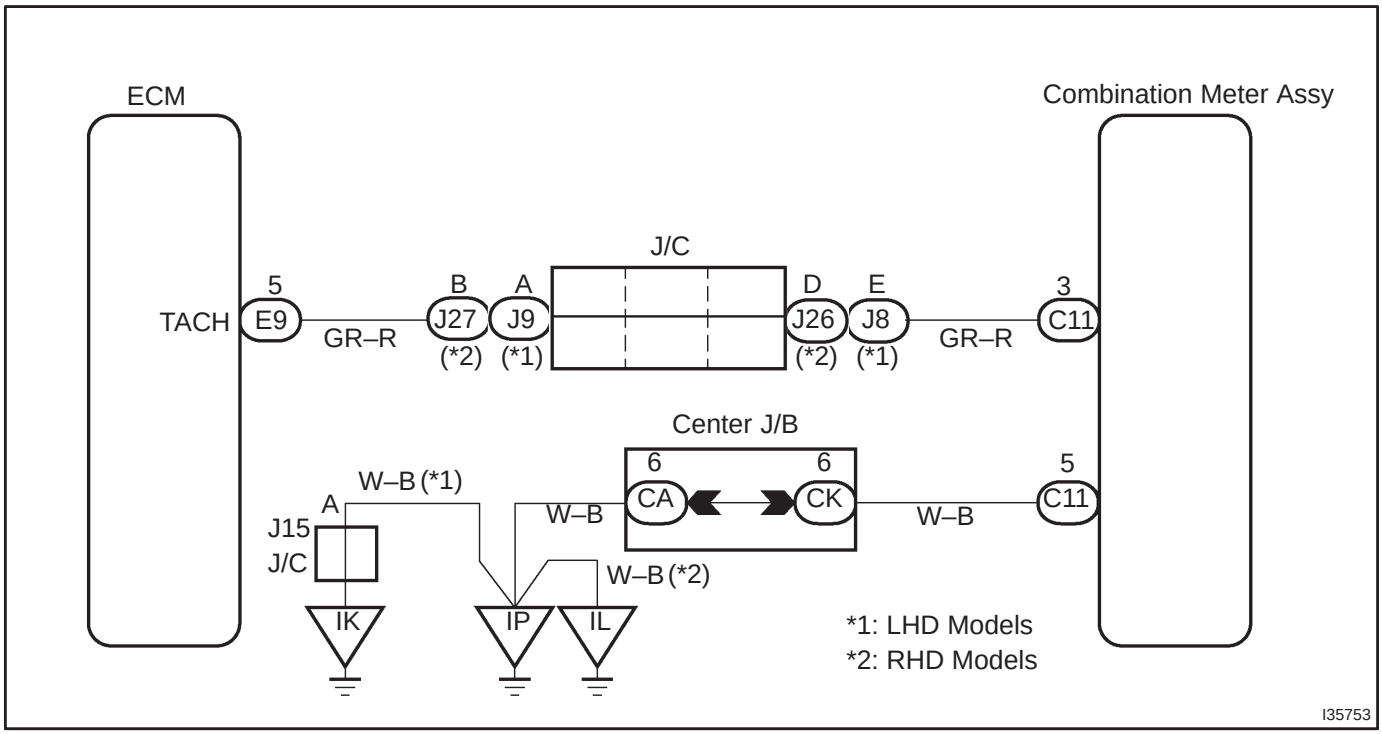
OK → **CHECK AND REPLACE SKID CONTROL ECU**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

MALFUNCTION IN TACHOMETER

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE OF HAND–HELD TESTER(ECM)

(a) Operate the hand–held tester according to the steps on the display and select ”DATE LIST”.

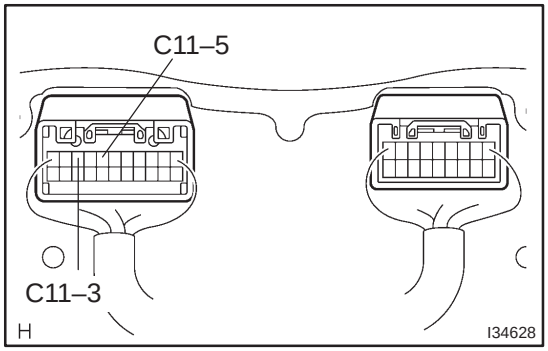
ALL(ECM):

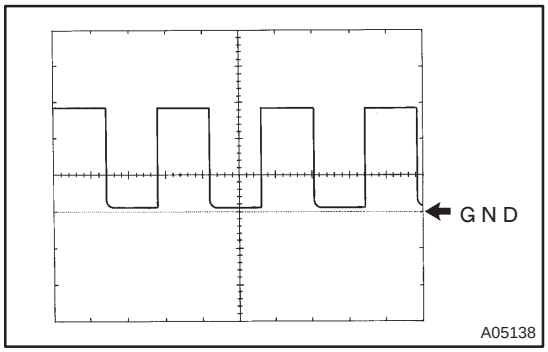
Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
ENGINE SPEED	Engine speed / Min.: 0 rpm, Max.: 16,383 rpm	Almost same at the meter rpm (When engine is running)	–

NG → **GO TO ENGINE CONTROL SYSTEM**

OK

2	INSPECT COMBINATION METER ASSY





(REFERENCE) INSPECTION USING OSCILLOSCOPE

(a) Check the input signal waveform.

(1) Remove the combination meter assy.

(2) Connect the oscilloscope to the terminals C11–3 and C11–5 of the combination meter connector.

(3) Start the engine.

(4) Check the signal waveform.

Item	Contents
Tool setting	5 V/ DIV, 10 ms/ DIV
Vehicle condition	Engine idle speed

OK → **CHECK AND REPLACE COMBINATION METER ASSY**

NG

3	CHECK HARNESS AND CONNECTOR(BETWEEN ECM AND COMBINATION METER ASSY)

(a) Disconnect the connector from the combination meter assy.

(b) Disconnect the connector from the ECM.

(c) Check continuity between the terminal E9–5 (TACH) of ECM and the terminal C11–3 of the combination meter connector (See Page 05–1506).

Standard: Continuity.

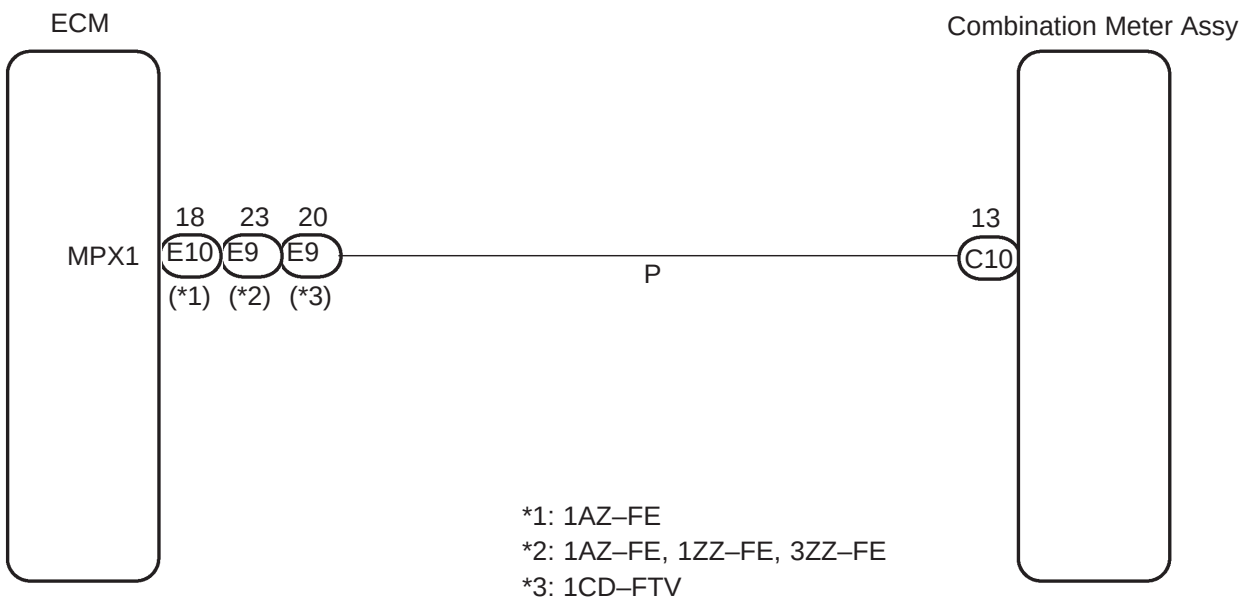
OK → **CHECK AND REPLACE ECM**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

MALFUNCTION IN WATER TEMPERATURE RECEIVER GAUGE

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The ECM sends information on the water temperature sensor to the meter through the Bean. If there is on open or short circuit in the water temperature sensor circuit, the ECM outputs DTCs. Perform troubleshooting with the ”Engine system”.

1	READ VALUE OF HAND–HELD TESTER

(a) Operate the hand–held tester according to the steps on the display and select ”DATA LIST”.

ALL(ECM):

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
COOLANT TEMP	Coolant Temperature / Min.: –40°C, Max.: 140°C	After warming up: 80 – 95˚C (176 – 203˚F)	If the value is ”–40 °C” or ”140 °C”, sensor circuit is open or shorted.

NG → **GO TO ENGINE CONTROL SYSTEM**

OK

2	CHECK THAT MALFUNCTION DISAPPEARS A KNOWN GOOD COMBINATION METER IS INSTALLED

NG → **CHECK AND REPLACE ECM**

OK

CHECK AND REPLACE COMBINATION METER ASSY

056Q9–02

PRE–CHECK

1. DATA LIST

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten work time.

(a) Warm up the engine.
(b) Turn the ignition switch to OFF.
(c) Connect the hand–held tester to DLC3.
(d) Turn the ignition switch to ON.
(e) Operate the hand–held tester according to the steps on the display and select ”DATA LIST”.

ALL(ECM):

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
VEHICLE SPEED	Vehicle speed / Min.: 0 km/h, Max.: 255 km/h	Almost same at the meter speed (When driving)	–
ENGINE SPEED	Engine speed / Min.: 0 rpm, Max.: 16,383 rpm	Almost same at the meter rpm (When engine is running)	–
COOLANT TEMP	Coolant Temperature / Min.: –40°C, Max.: 140°C	After warming up: 80 – 95°C (176 – 203°F)	If the value is ”–40 °C” or ”140 °C”, sensor circuit is open or shorted.

2. SET BUZZER OFF MODE (SEAT BELT)

(a) Within 6 seconds after turning ignition switch to the ON position, depress the ODO/TRIP switch for 10 seconds or more, and fasten the driver’s seat belt to enter the buzzer ON/OFF mode.

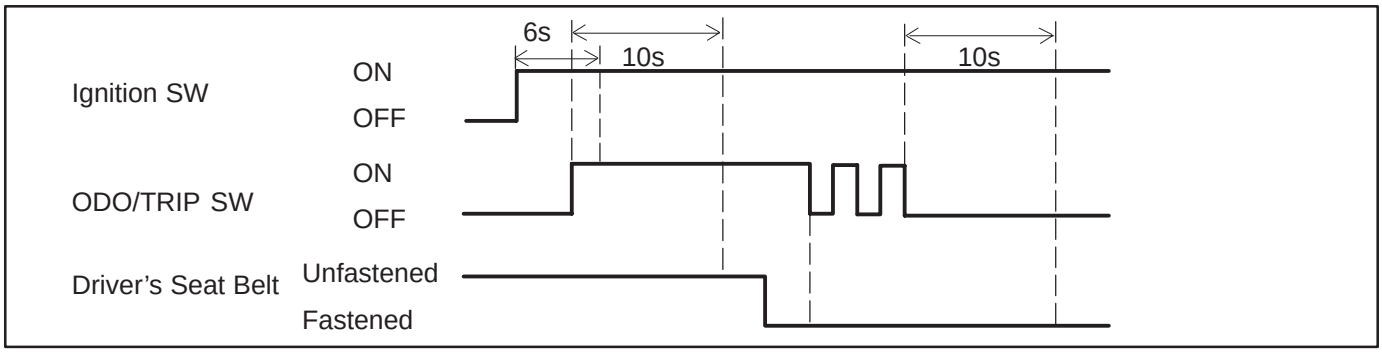
HINT:

This procedure can be performed when the display shows the ”ODO” mode.

(b) When entering the buzzer ON/OFF mode, current buzzer condition is shown on the display. According to the display, select the buzzer OFF mode by operating the ODO/TRIP switch.

HINT:

- After entering the buzzer ON/OFF mode, when the ODO/TRIP switch is not operated for 10 seconds or more, the display returns to the normal mode.
- When the negative (–) terminal cable is disconnected from the battery, the buzzer setting returns to buzzer ON mode.



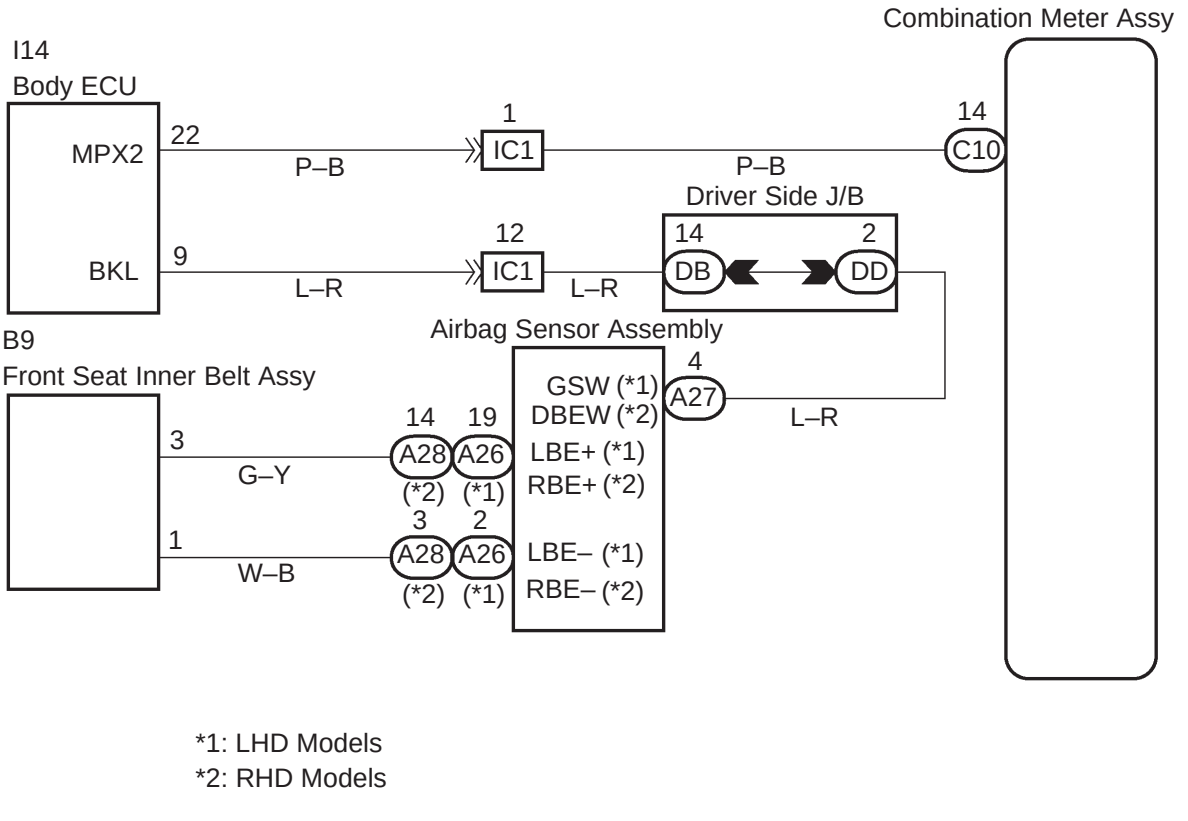
056QC–04

PROBLEM SYMPTOMS TABLE

Chart No.	Symptom	See page
1	Malfunction in speedometer	05–1510
2	Malfunction in tachometer	05–1513
3	Malfunction in water temperature receiver gauge	05–1515
4	Malfunction in fuel receiver gauge	05–1517
5	Entire combination meter does not operate	05–1519
6	Seat belt warning lamp for driver's seat does not operate	05–1522
7	Seat belt warning lamp for front passenger's seat does not flash	05–1524
8	The ambient temperature does not display	05–1527
9	Warning buzzer does not sound	05–1530

SEAT BELT WARNING LAMP FOR DRIVER'S SEAT DOES NOT OPERATE

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE OF HAND–HELD TESTER

(a) Operate the hand–held tester according to the steps on the display and select "DATA LIST".

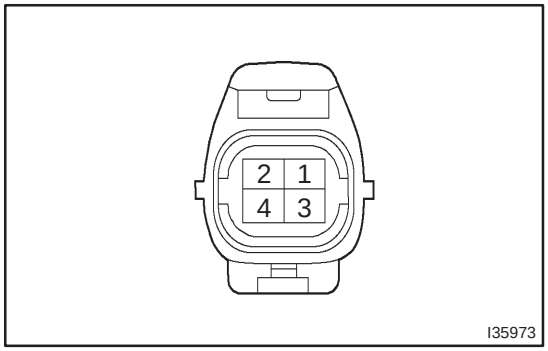
BGW(Body):

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
D SEAT BUCKL SW	Driver seat belt buckle switch ON / OFF	ON: Fasten the driver seat belt OFF: Unfasten the driver seat belt	–

OK → **CHECK AND REPLACE COMBINATION METER ASSY**

NG

2	CHECK FRONT SEAT INNER BELT ASSY



(a) Check resistance.
  (1) Disconnect the connector from front seat inner belt assy.
  (2) Check resistance between the terminal 3 and 1 of the front seat inner belt assy.

Standard:

Condition	Specified Condition
Seat belt is fastened	No continuity
Seat belt is unfastened	Continuity

NG → **REPLACE FRONT SEAT INNER BELT ASSY**

OK

3	CHECK HARNESS OR CONNECTOR(BODY ECU–FRONT SEAT INNER BELT ASSY)

(a) Check continuity between the terminal I14–9 of body ECU and the terminal A27–4 of airbag sensor assembly.
(b) Check continuity between the terminal A28–14 (A26–19) / A28–3 (A26–2)of airbag sensor assembly and the terminal B9–3 / B9–1 of front seat inner belt assy.
  ( ): LHD Models
  Standard: Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK THAT MALFUNCTION DISAPPEARS A KNOWN GOOD COMBINATION METER IS INSTALLED

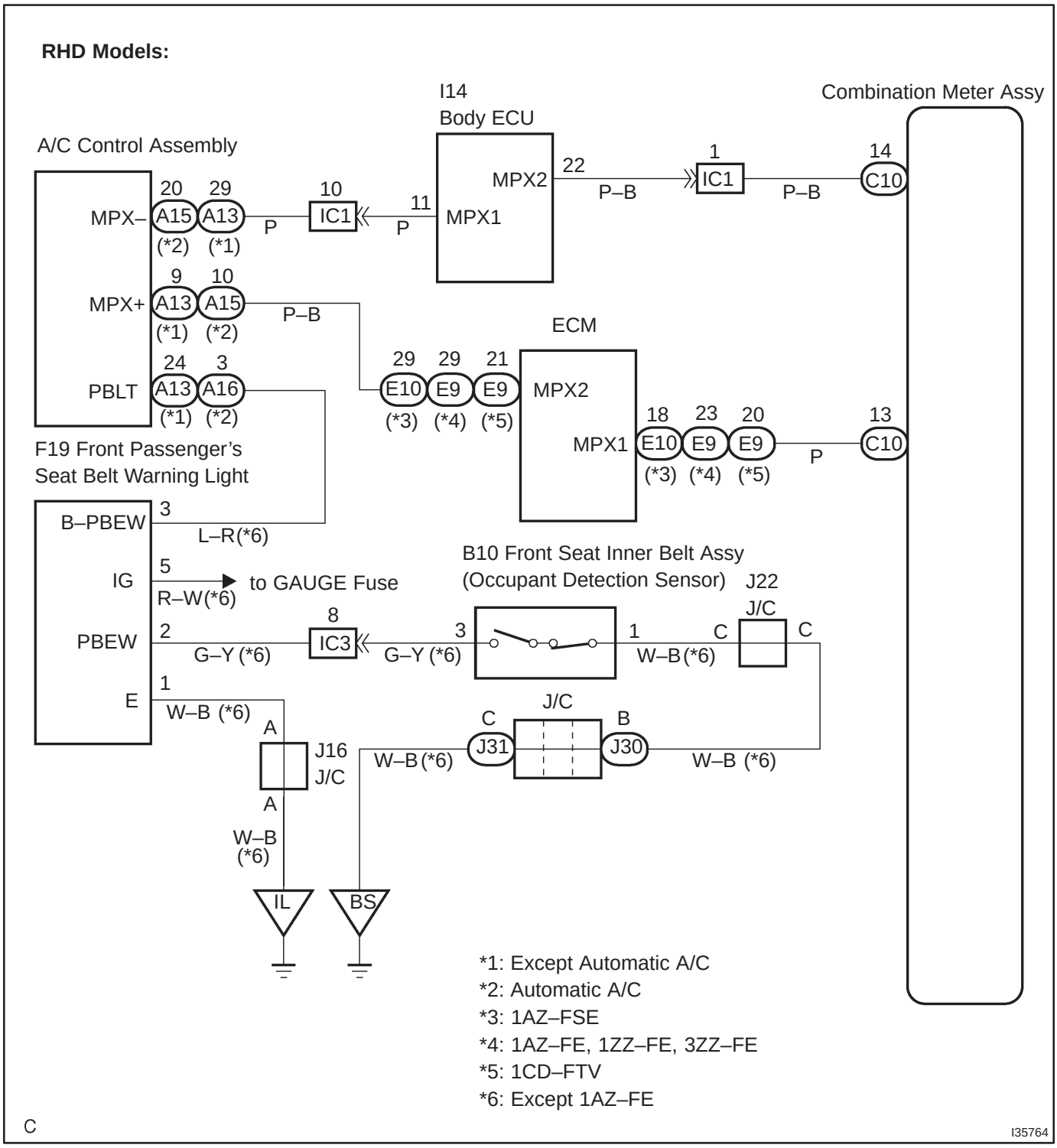
NG → **CHECK AND REPLACE BODY ECU**

OK

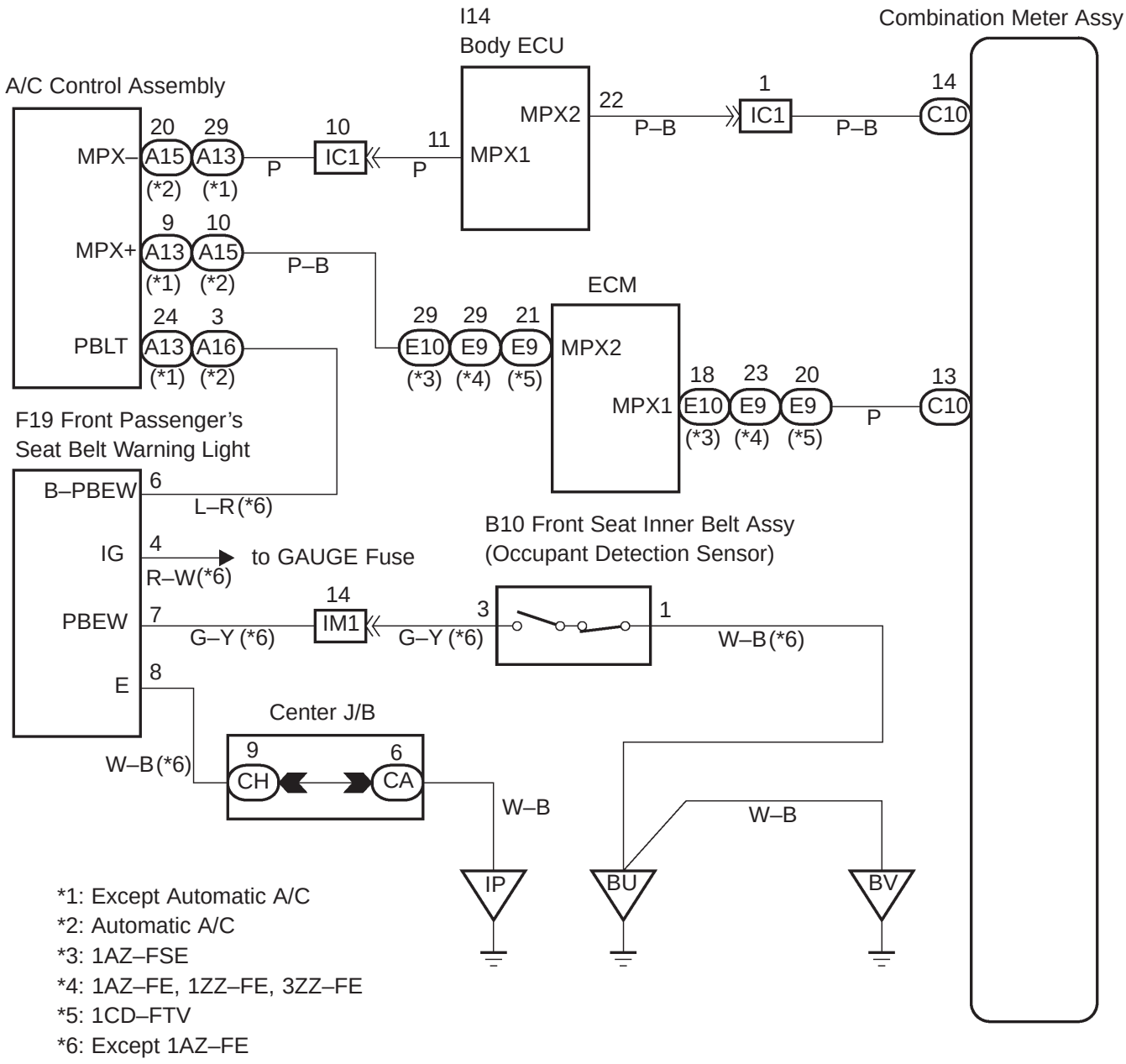
CHECK AND REPLACE COMBINATION METER ASSY

SEAT BELT WARNING LAMP FOR FRONT PASSENGER'S SEAT DOES NOT FLASH

WIRING DIAGRAM

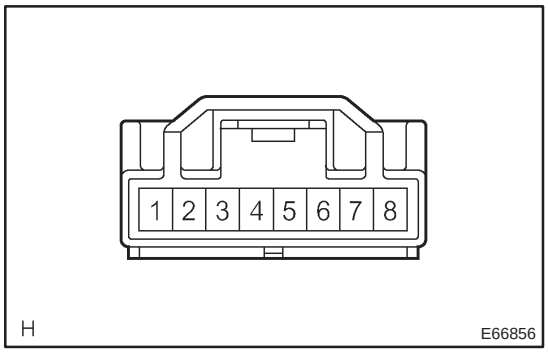


LHD Models:


I14
Body ECU
Combination Meter Assy
A/C Control Assembly
MPX2
MPX1
22
1
14
IC1
C10
P–B
P–B
MPX–
20
29
10
11
A15
A13
IC1
P
P
(*2)
(*1)
MPX+
9
10
A13
A15
P–B
(*1)
(*2)
ECM
PBLT
24
3
29
29
21
A13
A16
E10
E9
E9
MPX2
(*1)
(*2)
(*3)
(*4)
(*5)
MPX1
18
23
20
13
E10
E9
E9
C10
P
(*3)
(*4)
(*5)
F19 Front Passenger's
Seat Belt Warning Light
B10 Front Seat Inner Belt Assy
(Occupant Detection Sensor)
B–PBEW
6
L–R (*6)
IG
4
R–W (*6)
to GAUGE Fuse
PBEW
7
14
3
1
G–Y (*6)
IM1
G–Y (*6)
W–B (*6)
E
8
Center J/B
W–B (*6)
9
6
CH
CA
W–B
W–B
IP
BU
BV
*1: Except Automatic A/C
*2: Automatic A/C
*3: 1AZ–FSE
*4: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*5: 1CD–FTV
*6: Except 1AZ–FE
C
I35765

INSPECTION PROCEDURE

1	CHECK FRONT SEAT INNER BELT ASSY



(a) Check resistance.
  (1) Disconnect the connector from front seat inner belt assy.
  (2) Check resistance between the terminal 3 and 1 of the front seat inner belt assy.

Standard:

Condition	Specified Condition
Seat belt is fastened	No continuity
Seat belt is unfastened	Continuity

NG → **REPLACE FRONT SEAT INNER BELT ASSY**

OK

2	CHECK HARNESS OR CONNECTOR(A/C CONTROL ASSEMBLY–FRONT SEAT INNER BELT ASSY)

(a) Check continuity between the terminal A13–24 / A16–3 of A/C control assembly and the terminal F19–3 (6) of front passenger's seat belt warning light.
  ( ): LHD models

(b) Check continuity between the terminal F19–2 (F19–7)of front passenger's seat belt warning light and the terminal B10–3 of front seat inner belt assy.
  ( ): LHD models
  Standard: Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK THAT MALFUNCTION DISAPPEARS A KNOWN GOOD COMBINATION METER IS INSTALLED

NG → **CHECK AND REPLACE AIR CONDITIONER CONTROL ASSEMBLY**

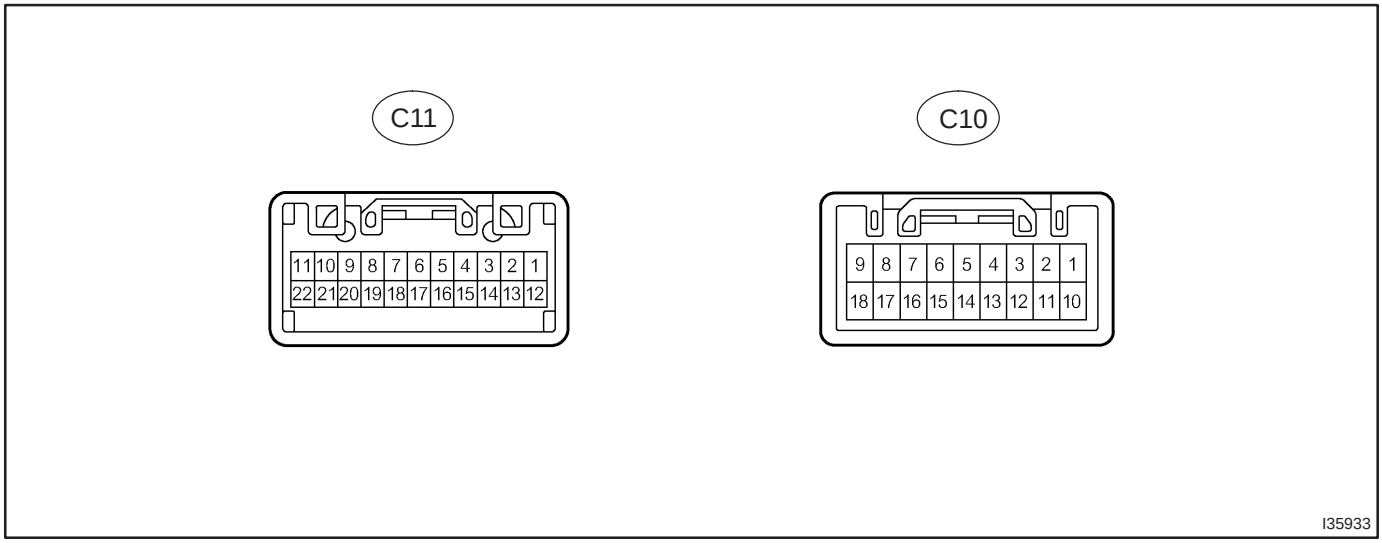
OK

CHECK AND REPLACE COMBINATION METER ASSY

05C4G–01

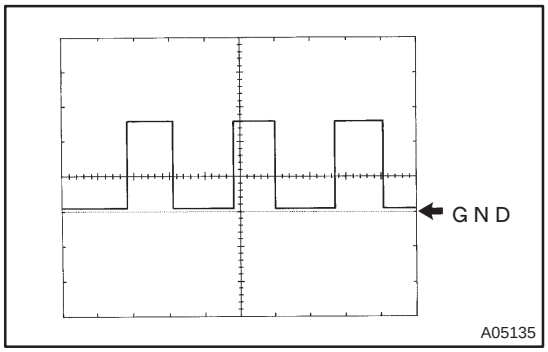
TERMINALS OF ECU

COMBINATION METER ASSY



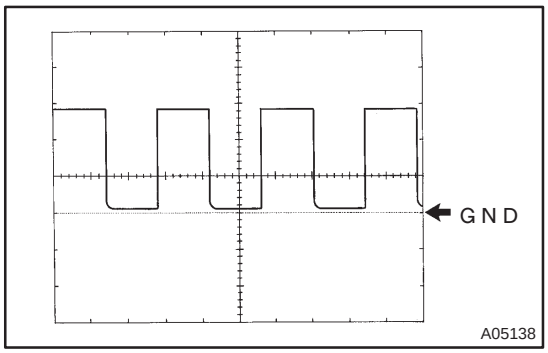
Terminal No.	Wiring color	Condition	Specified condition
C11–1 – Body ground (TURN L – Body ground)	G–W – Body ground	Turn signal LH indicator light OFF → ON	Below 1 V → 10 to 14 V
C11–2 – Body ground (BRAKE LVL SW – Body ground)	R–W – Body ground	Brake fluid level warning switch ON	Below 1 V
C11–3 – Body ground (TACHO – Body ground)	GR–R – Body ground	Ignition switch OFF → ON, Engine idle speed	Puls generation (*2)
C11–5 – Body ground (SIGNAL EARTH – Body ground)	W–B – Body ground	Constant	Continuity
C11–6 – Body ground (EMPS – Body ground)	B–W – Body ground	Ignition switch ON and EMPS Indicator OFF → ON	10 to 14 V → Below 1 V
C11–8 – Body ground (AIRBAG – Body ground)	B–Y – Body ground	Ignition switch ON and AIRBAG Indicator OFF → ON	10 to 14 V → Below 1 V
C11–9 – Body ground (CHECK ENGINE – Body ground)	W – Body ground	Engine running and CHECK ENGINE indicator OFF	9 to 14 V
C11–10 – Body ground (AUTO LEVELING – Body ground)	LG – Body ground	Ignition switch ON and AUTO LEVERING Indicator OFF → ON	10 to 14 V → Below 1 V
C11–11 – Body ground (OIL PRESS SW – Body ground)	Y–B – Body ground	Engine running → Stopped	No continuity → Continuity
C11–12 – Body ground (BEAM+ – Body ground)	R–W (w/HID), R (w/o HID) – Body ground	Headlight OFF → ON	Below 1 V → 10 to 14 V
C11–13 – Body ground (TURN R – Body ground)	G–Y – Body ground	Turn signal RH indicator light OFF → ON	Below 1 V → 10 to 14 V
C11–14 – Body ground (ILL+ – Body ground)	G – Body ground	Combination switch OFF → ON	Below 1 V → 10 to 14 V
C11–15 – Body ground (SLIP – Body ground)	LG – Body ground	Ignition switch ON and SLIP Indicator OFF → ON	10 to 14 V → Below 1 V
C11–16 – Body ground (VSC – Body ground)	W–R – Body ground	Ignition switch ON and VSC Indicator OFF → ON	10 to 14 V → Below 1 V

C11–17 – Body ground (TRC OFF – Body ground)	LG–B – Body ground	Ignition switch ON and TRC OFF Indicator OFF → ON	10 to 14 V → Below 1 V
C1–19 – Body ground (SI – Body ground)	L–W – Body ground	Ignition switch ON and turn the wheel slowly	Puls generation (*1)
C11–20 – Body ground (+B – Body ground)	W–R – Body ground	Any Contents	10 to 14 V
C11–21 – Body ground (IG1+ – Body ground)	R–W – Body ground	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
C11–22 – Body ground (IG2+ – Body ground)	B–W – Body ground	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
C10–1 – Body ground (WATER LEVEL – Body ground)	Y–R – Body ground	Fuel filter warning switch ON	Below 1 V
C10–2 – Body ground (ACC – Body ground)	GR – Body ground	Ignition switch OFF → ACC	Below 1 V → 10 to 14 V
C10–3 – Body ground (AVC LAN+ – Body ground)	G–Y – Body ground	Communication circuit	–
C10–4 – Body ground (AVC LAN– – Body ground)	G – Body ground	Communication circuit	–
C10–5 – Body ground (FE – Body ground)	BR–W – Body ground	Constant	Continuity
C10–6 – Body ground (BEAM– – Body ground)	W–B (DRL) R–W (w/ HID) R– (w/o HID) – Body ground	Headlight ON, Hi–beam indicator OFF → ON	No continuity → Continuity
C10–7 – Body ground (Fr FOG – Body ground)	G – Body ground	Ignition switch ON, Fr fog light indicator ON → OFF	10 to 14 V → Below 1 V
C10–8 – Body ground (Rr FOG – Body ground)	R–W – Body ground	Ignition switch ON, Rr fog light indicator ON → OFF	10 to 14 V → Below 1 V
C10–9 – Body ground (ABS – Body ground)	R–Y – Body ground	Ignition switch ON and ABS Indicator OFF → ON	10 to 14 V → Below 1 V
C10–10 – Body ground (FUEL – Body ground)	G–W – Body ground	Fuel sender gauge is F position → E position	4.0 Ω → 110.0 Ω
C10–11 – Body ground (OUTSIDE TEMP+ – Body ground)	W–R – Body ground	Ignition switch ON	3.31 V (–9°C) 0.8 V (43°C)
C10–12 – Body ground (OUTSIDE TEMP– – Body ground)	W – Body ground	Constant	Continuity
C10–13 – Body ground (BEAN (EFI) – Body ground)	P – Body ground	Communication circuit	–
C10–14 – Body ground (BEAN (BODY) – Body ground)	P–B – Body ground	Communication circuit	–
C10–15 – Body ground (BEAN (SECURITY) – Body ground)	P–L – Body ground	Communication circuit	–
C10–16 – Body ground (E/G OIL LEVEL – Body ground)	Y–G – Body ground	OIL LEVEL switch ON	No continuity
C10–17 – Body ground (POWER EARTH – Body ground)	W–B – Body ground	Constant	Continuity



*1: Reference: Using oscilloscope:

Item	Contents
Tool setting	5 V/ DIV, 20 ms/ DIV
Vehicle condition	Driving at approx. 20Km/h

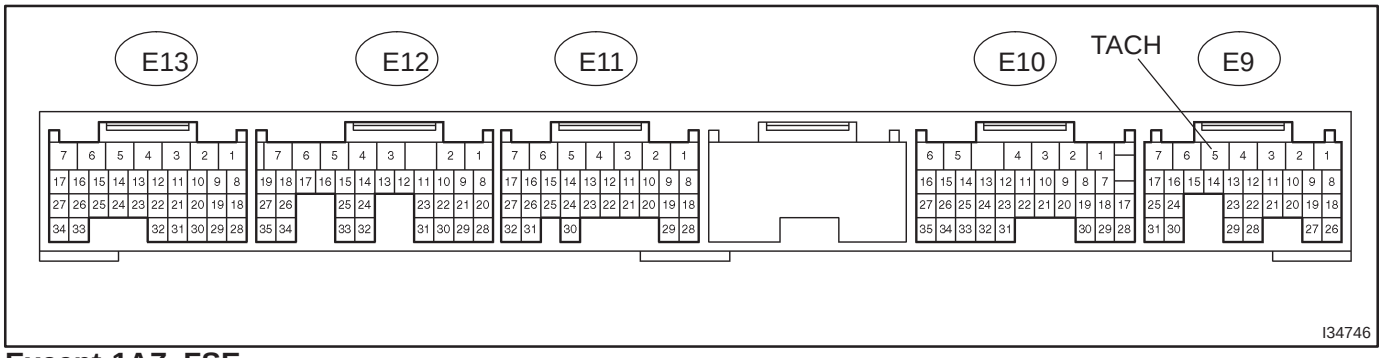


*2: Reference: Using oscilloscope:

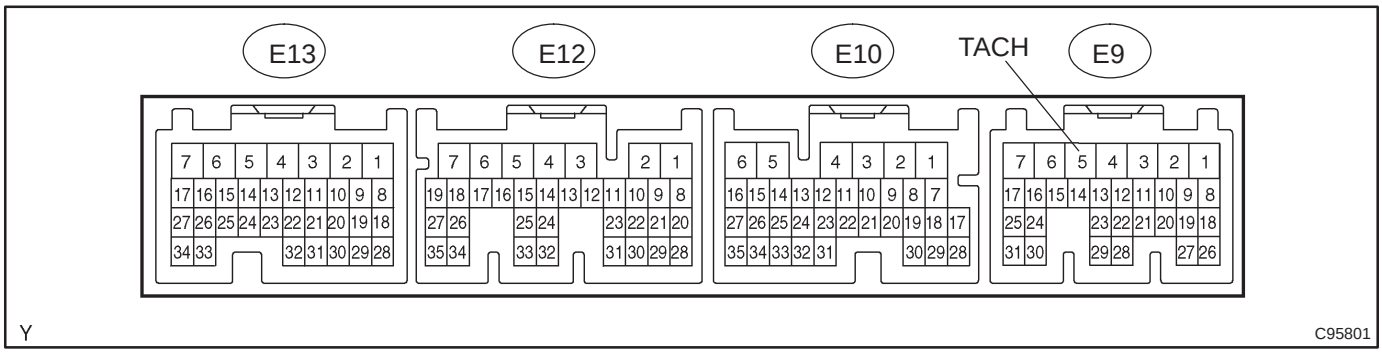
Item	Contents
Tool setting	5 V/ DIV, 10 ms/ DIV
Vehicle condition	Engine idle speed

ENGINE ECU

1AZ–FSE:

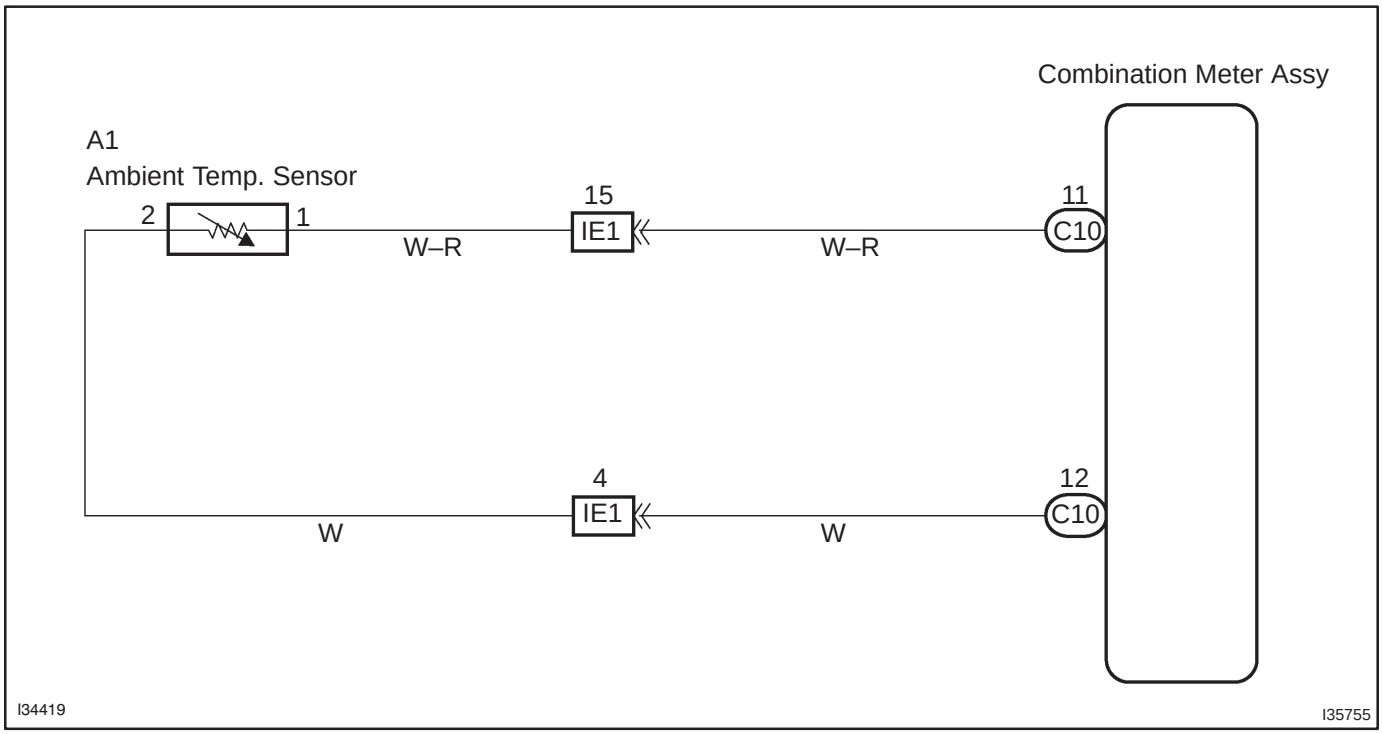


Except 1AZ–FSE:



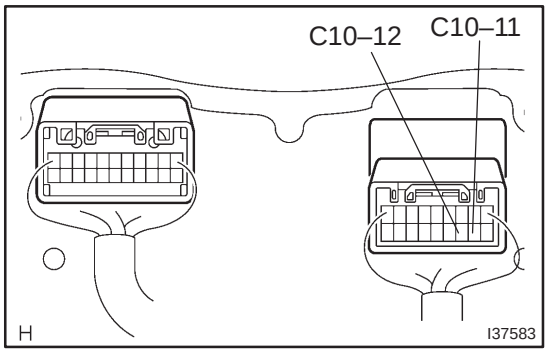
THE AMBIENT TEMPERATURE DOES NOT DISPLAY

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK COMBINATION METER ASSY



(a) Disconnect the connector from the combination meter assy.

(b) Measure resistance between the terminal C10–11 and C10–12 of the ambient temp. sensor connector at each temperature.

Resistance:

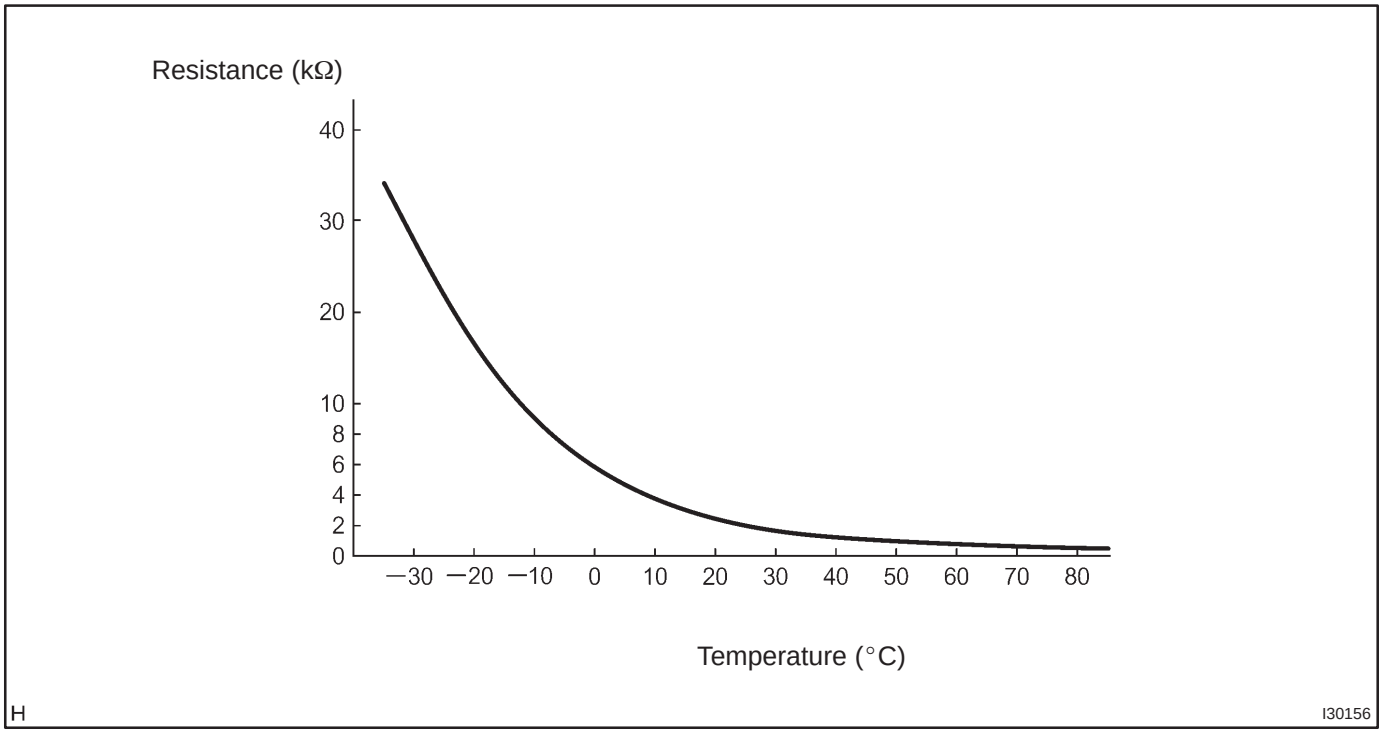
9.0 to 9.8 kΩ: at 0°C (0°F)

2.7 to 2.9 kΩ: at 25°C (77°F)

HINT:

As the temperature increases, resistance decreases.

Resistance:



OK → **REPLACE COMBINATION METER ASSY**

NG

2	CHECK HARNESS OR CONNECTOR

(a) Disconnect the connector from ambient temp. sensor.
(b) Check continuity between the terminal C10–11 (12) of combination meter assy and the terminal A1–1 (2) of ambient temp. sensor connector.
Standard: Continuity.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

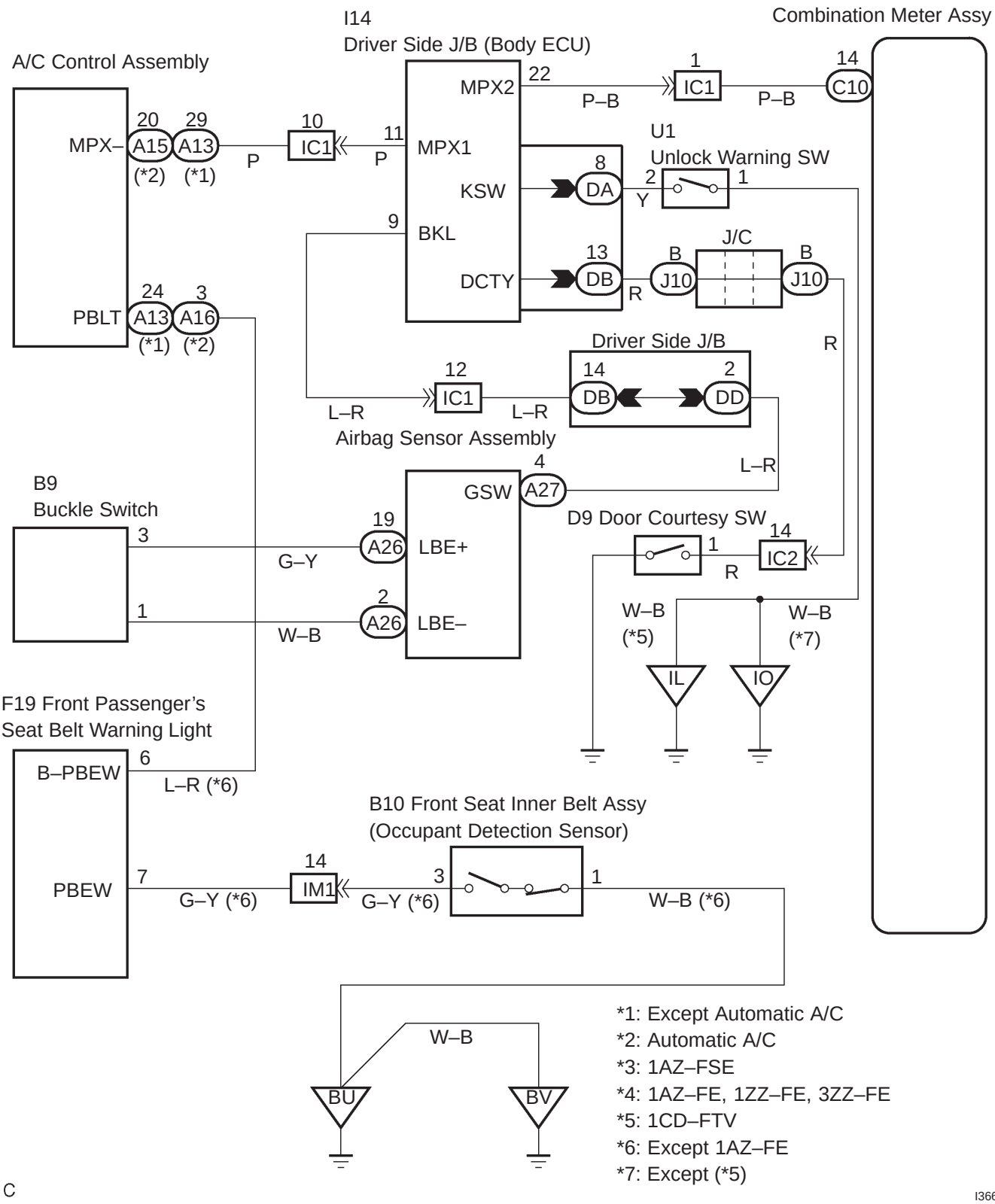
OK

REPLACE OUTER AMBIENT TEMPERATURE SENSOR

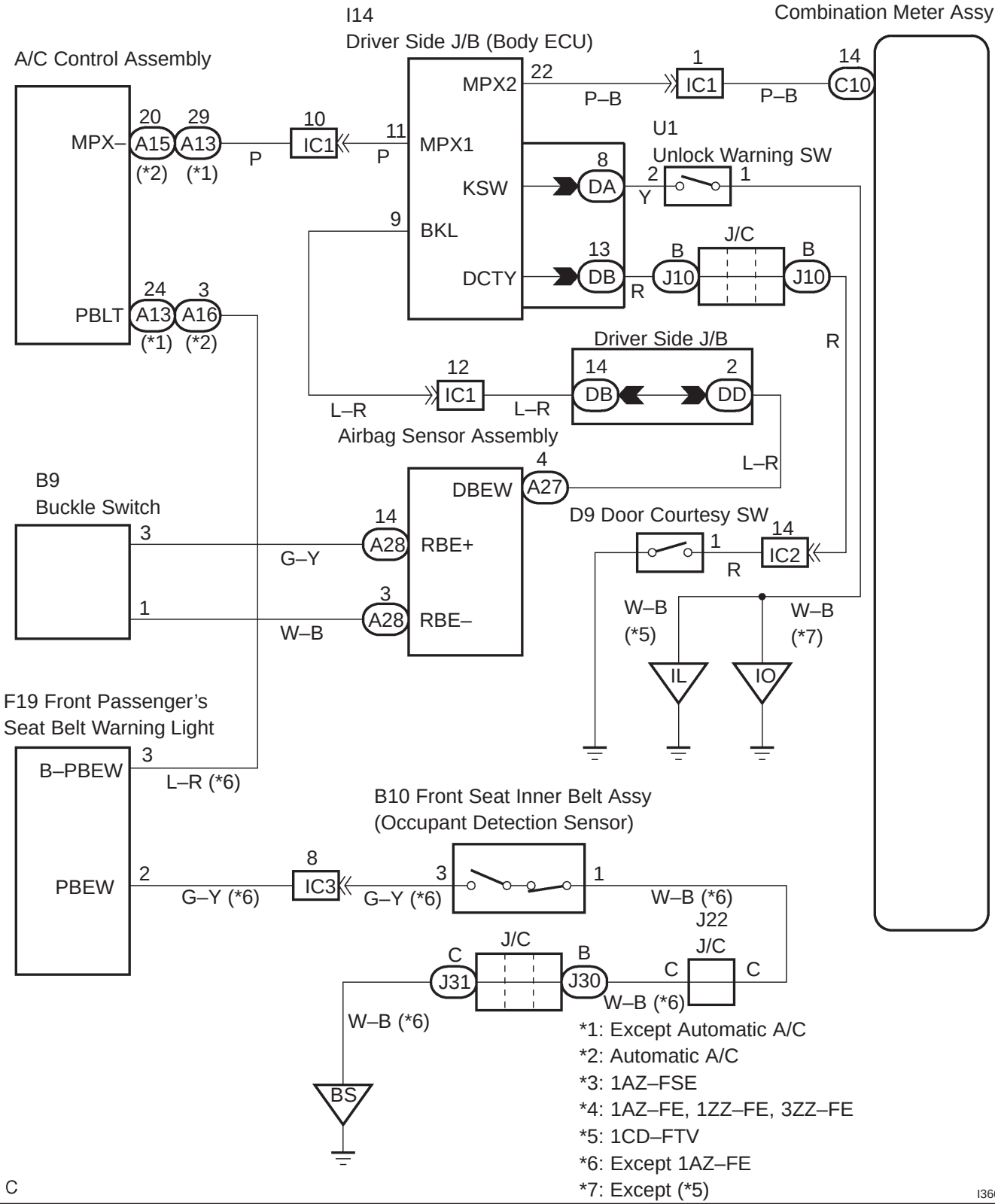
WARNING BUZZER DOES NOT SOUND

WIRING DIAGRAM

LHD Models:



RHD Models:


I14
Driver Side J/B (Body ECU)
Combination Meter Assy
A/C Control Assembly
MPX2
22
P–B
1
IC1
P–B
14
C10
MPX–
20
A15
29
A13
(*2)
(*1)
P
10
IC1
11
P
MPX1
U1
Unlock Warning SW
KSW
8
DA
2
Y
1
9
BKL
J/C
DCTY
13
DB
B
J10
R
B
J10
PBLT
24
A13
3
A16
(*1)
(*2)
Driver Side J/B
R
12
IC1
L–R
L–R
14
DB
2
DD
Airbag Sensor Assembly
L–R
4
A27
DBEW
B9
Buckle Switch
D9 Door Courtesy SW
3
G–Y
14
A28
RBE+
1
IC2
R
1
W–B
3
A28
RBE–
W–B
(*5)
W–B
(*7)
IL
IO
F19 Front Passenger's
Seat Belt Warning Light
B–PBEW
3
L–R (*6)
B10 Front Seat Inner Belt Assy
(Occupant Detection Sensor)
PBEW
2
G–Y (*6)
8
IC3
3
G–Y (*6)
1
W–B (*6)
J22
J/C
J/C
C
J31
B
J30
C
C
W–B (*6)
W–B (*6)
BS
*1: Except Automatic A/C
*2: Automatic A/C
*3: 1AZ–FSE
*4: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*5: 1CD–FTV
*6: Except 1AZ–FE
*7: Except (*5)
C
I36642

INSPECTION PROCEDURE

1	CHECK BUZZER

Buzzer does not sound.	A
Only seat belt buzzer does not sound.	B

HINT:

Perform the buzzer OFF mode check, when only the seat belt buzzer does not sound. If the seat belt buzzer still does not sound even after the check, proceed to step 2.

B → SYSTEM CHECK MODE(SEE PAGE 05–1499)

A

2	READ VALUE OF HAND–HELD TESTER

(a) Operate the hand–held tester according to the display and select the ”DATA LIST”.

Key reminder buzzer:

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
KEY UNLOCK WRN SW	Key unlock warning switch OFF / ON	Key unlock warning switch ON	–
D DOOR CTY SW	D door courtesy switch OFF / ON	D door courtesy switch ON	–
IG SW	Ignition switch OFF / ON	Ignition switch OFF	–

Light reminder buzzer:

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
KEY UNLOCK WRN SW	Key unlock warning switch OFF / ON	Key unlock warning switch ON	–
D DOOR CTY SW	D door courtesy switch OFF / ON	D door courtesy switch ON	–
IG SW	Ignition switch OFF / ON	Ignition switch OFF	–

Seat belt buzzer:

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
D SEAT BUCKL SW	Driver seat buckle switch is OFF / ON	Driver seat buckle switch is OFF position	–
P SEAT BUCKL SW	Passenger seat buckle switch is OFF / ON	Passenger seat buckle switch is OFF position	–
IG SW	Ignition switch OFF / ON	Ignition switch OFF	–
VEHICLE SPD	Vehicle speed / Min.: 0 km/h, Max.: 255 km/h	Vehicle speed ≧15 km/h	Almost same at the meter speed (When driving)

HINT:

When the vehicle speed is not displayed on the hand–held tester, refer to ”Malfunction in speedometer” (See Page 05–1510).

Result:

NG (Seat belt buzzer does not operate)	A
NG (Key reminder / Light reminder buzzer does not operate)	B
OK	C

B	Go to step 5
C	CHECK AND REPLACE COMBINATION METER ASSY

A

3	INSPECT FRONT SEAT INNER BELT ASSY(D–SEAT)(SEE PAGE 05–1594)

NG	CHECK AND REPLACE FRONT SEAT INNER BELT ASSY

OK

4	INSPECT FRONT SEAT INNER BELT ASSY(P–SEAT)(SEE PAGE 05–1594)

NG	CHECK AND REPLACE FRONT SEAT INNER BELT ASSY

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

5	INSPECT IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH(SEE PAGE 05–1594)

NG	CHECK AND REPLACE IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH

OK

6	INSPECT DOOR COURTESY LAMP SWITCH ASSY(SEE PAGE 05–1594)

NG	CHECK AND REPLACE DOOR COURTESY LAMP SWITCH ASSY

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

05C7U–01

CUSTOMER PROBLEM ANALYSIS CHECK

AIR CONDITIONING SYSTEM Check Sheet

Inspector's name:

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date vehicle Brought In	/ /	**Odometer Reading**	**km Miles**

Date of Problem Occurrence	/ /
How Often does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)
Weather	☐ Fine ☐ Cloudy ☐ Snowy ☐ Various / Other
Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F °C)

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

I35990

05C7W–01

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the appropriate page.

DTC No.	Description of fault	Comment / Remedy
000	No malfunction	–
010 011	Overvoltage shutoff Undervoltage shutoff	Voltage between 1 and 5 at connector A > 16 V Voltage between 1 and 5 at connector A < 10.2 V (Voltage values must be present > 20 seconds) Check battery, regulator and electrical leads.
012	Overheating	Check temperature at temperature or overheating sensor > 125 °C Check water circuit.
014	Possible overheating detected (Hardware threshold value)	Difference of measured values at temperature sensor > 15 °C (min. 70 °C water temperature and metering pump in operation); Check temperature sensor and overheating sensor, replace if necessary.
017	Overheating detected (Hardware threshold value)	Temperature at temperature or overheating sensor > 130 °C, emergency OFF if DTC No. 012 or 014 not is applicable; Check water circuit, temperature sensor and overheating sensor, replace if necessary.
020	Glow plug break	Check glow plug, replace if necessary.
021	Glow plug output overload	Check glow plug, replace if necessary.
030	Combustion air blower motor EMF outside perm. range.	Blower impeller or burner motor fammed (frozen solid, dirty, etc.) Remedy jam, replace burner motor if necessary.
031	Combustion air blower motor break	Check the lead to combustion air motor (burner motor) for continuity, replace if necessary.
032	Combustion air blower motor short–circuit	Check combustion air blower motor (burner motor), replace if necessary. Check supply lead (chafed, etc.).
047	Metering pump short–circuit	Check the supply lead to metering pump for short–circuit, check metering pump, replace if necessary.
048	Metering pump break	Check the supply lead to metering pump for continuity, remedy break, replace metering pump if necessary.
051	Cold blow time exceeded	At start, if flame sensor above 70 °C, > 240 sec.; Check exhaust gas combustion air supply, check flame sensor, replace if necessary.
052	Safety time exceeded	When all perm. start attempts used up; Check the fuel delivery and fuel supply. Check exhaust gas and combustion air ducts.
054	Flame cutout, High setting	Check the fuel delivery and fuel supply. Check exhaust gas combustion air ducts. If combustion OK → Check the flame sensor, replace if necessary.
056	Flame cutout, LOW setting	
060	Temperature conrol sensor break	Check connecting leads. Resistance value between 2 and 10 connector B > 2 MΩ (if break)
061	Temperature control sensor short–circuit	Check connecting leads. Resistance value between 2 and 10 at connector B < 2 MΩ (If short– circuit)
064	Flame sensor break	Check connecting leads. Resistance value between 7 and 14 at connector B > 3,040 Ω (If break)
065	Flame sensor short–circuit	Check connecting leads. Resistance value between 7 and 14 at connector B > 780 Ω (If short–circuit)

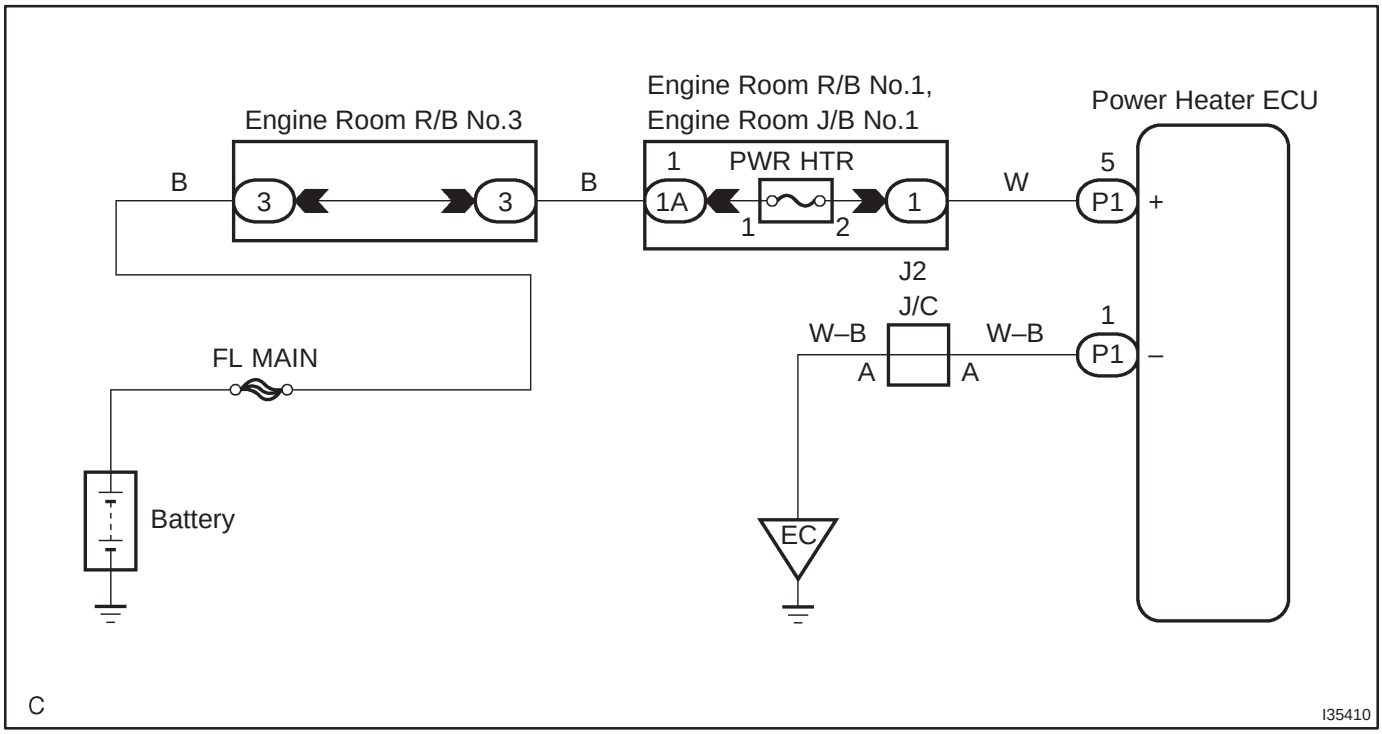
DTC No.	Description of fault	Comment / Remedy
071	Surface sensor break	Check connecting leads. Resistance value between 4 and 11 at connector B > 2 MΩ (If break)
072	Surface sensor short–circuit	Check connecting leads. Resistance value between 4 and 11 at connector B > 50 Ω (If short–circuit)
090 092 093	Control unit detective (Internal fault / Reset) Control unit detective (ROM error) Control unit detective (RAM error)	Control unit malfunction due to interference voltage from vehicle electrical system; possible causes low batteries, chargers, other sources of interference; eliminate interference voltages. Internal faults detected in microprocessor / memory detected. Replace control unit.
097	Internal control unit faults	Other faults which cannot lead to DTC No. 90, 92 and 93, replace control unit.

ECU POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This is power source for the power heater ECU and power heater fuel pump.

WIRING DIAGRAM



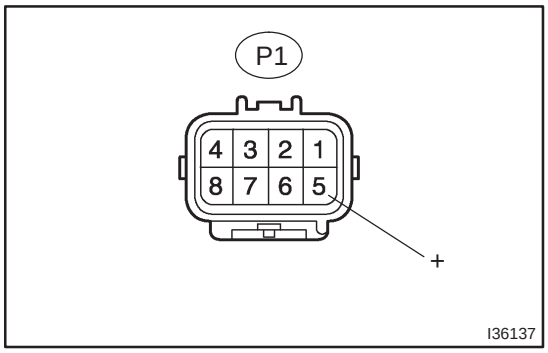
1	CHECK FUSE(PWR HTR)

(a) Remove the PWR HTR from the engine room J/B or R/B No.1.
(b) Check that the continuity exists of PWR HTR fuse.

NG → REPAIR OR REPLACE FUSE

OK

2	INSPECT POWER HEATER ECU(+)

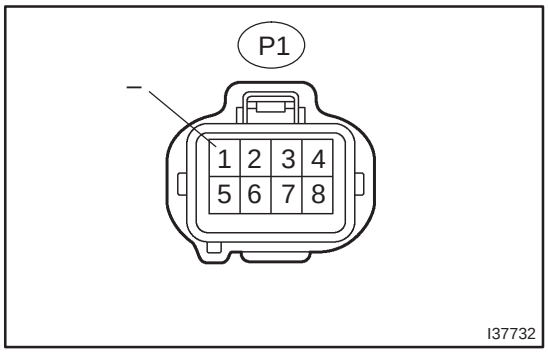


(a) Remove the power heater ECU with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between terminal "+" of the power heater ECU and body ground.
Standard: 10 to 14 V

NG → REPAIR OR REPLACE WIRE HARNESS

OK

3	CHECK HARNESS AND CONNECTOR(POWER HEATER ECU – BODY GROUND)



(a) Check for an open or short circuit in harness and connector between the power heater ECU and body ground (See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

COMBUSTION TYPE POWER HEATER SYSTEM

05C7T–01

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORK SHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1163)

3	CHECK AND CLEAR DTC (See page 05–1164)

4	PROBLEM SYMPTOM CONFIRMATION

SYMPTOM OCCUR (GO TO STEP 6)

SYMPTOM DOES NOT OCCUR (GO TO STEP 5)

5	SYMPTOM SIMULATION (See page 01–22)

6	DTC CHECK (See page 05–1164)

7	DTC CHART (See page 05–1166)

8	PROBLEM SYMPTOMS TABLE (See page 05–1170)

9	CIRCUIT INSPECTION (See page 05–1171 to 05–1179)

10	IDENTIFICATION OF PROBLEM

11	PARTS INSPECTION

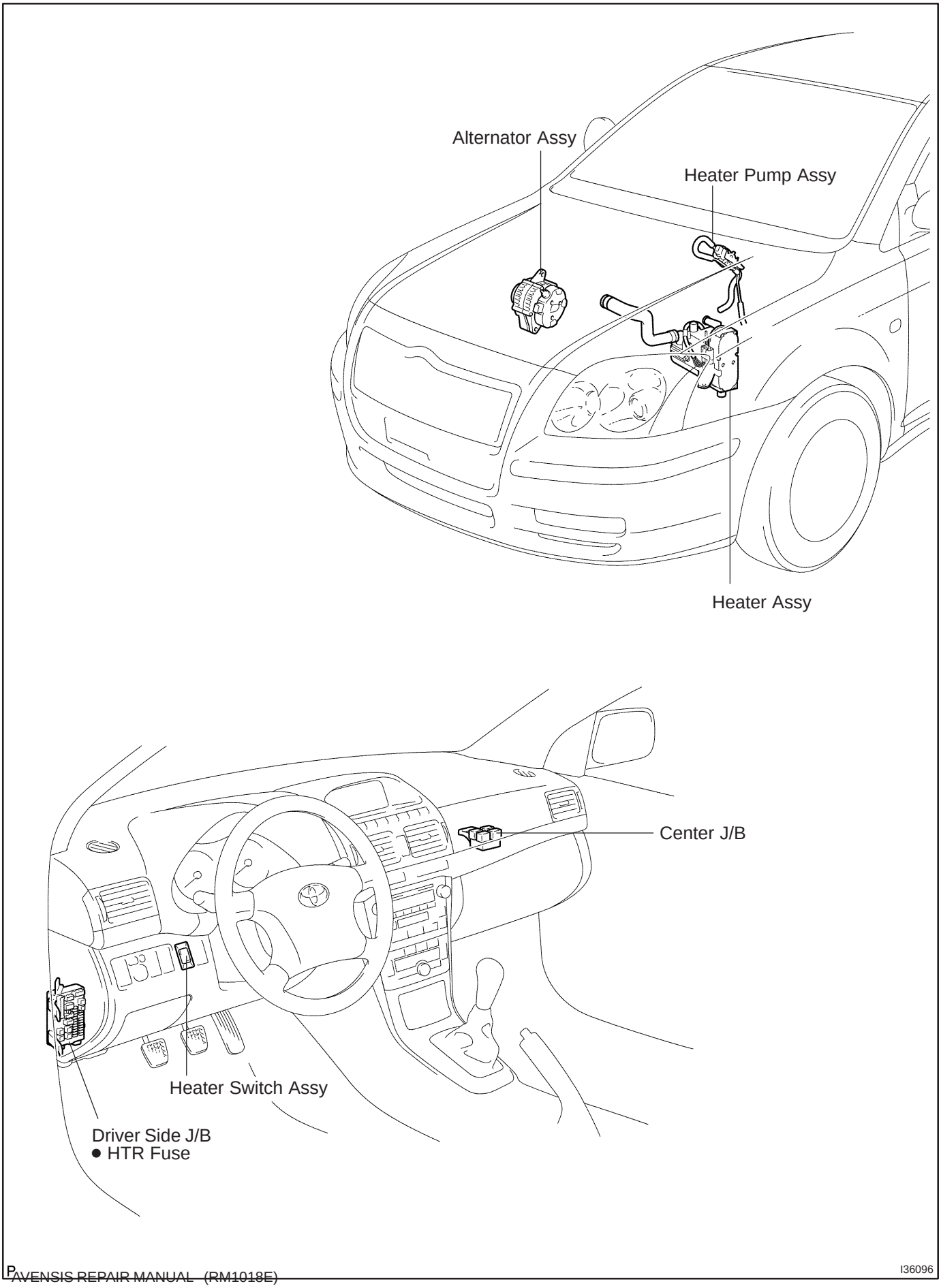
12	REPAIR

13	CONFIRMATION TEST

14	END

05C7X–01

LOCATION



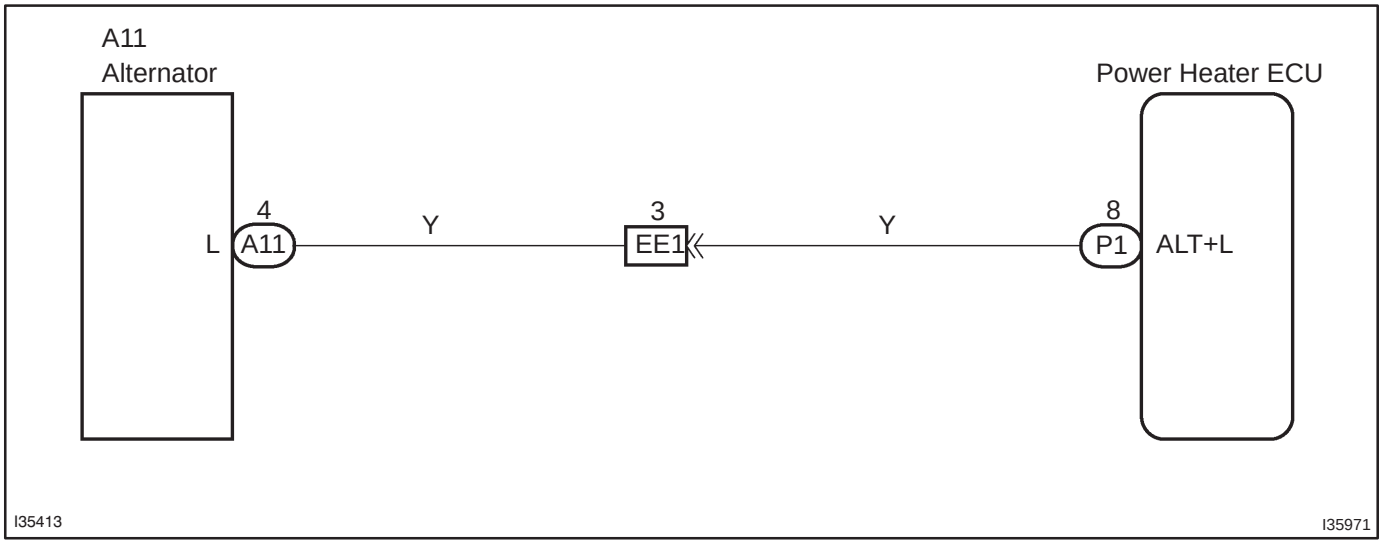
I36096

POWER HEATER ALTERNATOR CIRCUIT

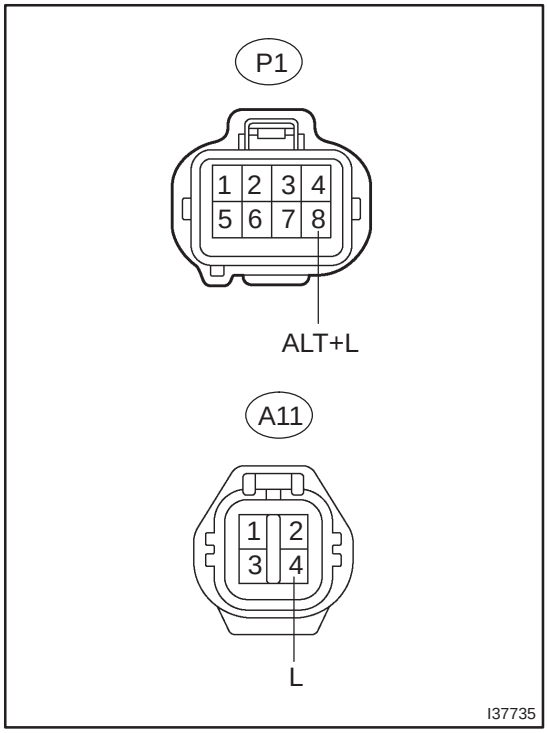
CIRCUIT DESCRIPTION

Turning on the alternator allows current to flow from the alternator to the power heater. As a result, the power heater ECU control the expanded power of the combustion type power heater.

WIRING DIAGRAM



1	CHECK WIRE HARNESS(POWER HEATER ECU – ALTERNATOR)



(a) Check for an open or short circuit in harness and connector between terminal ALT+L of power heater ECU and terminal L of alternator (See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

2	CHECK AND REPLACE GENERATOR W/CLUTCH PULLEY

NG → REPAIR OR REPLACE GENERATOR W/CLUTCH PULLEY

OK

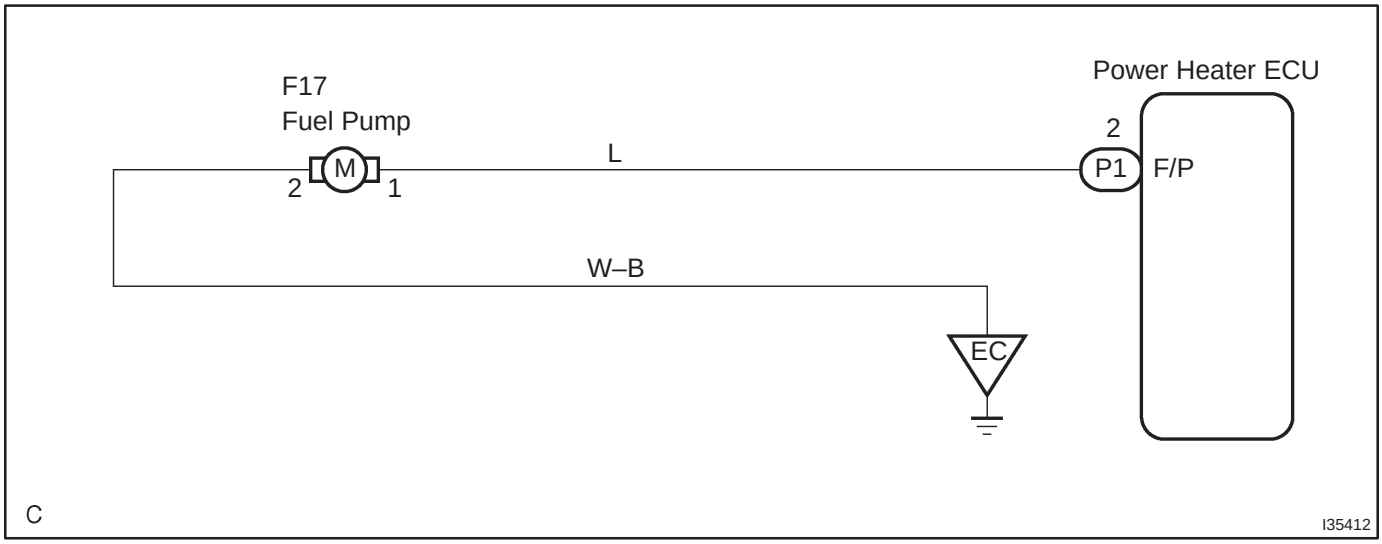
REPAIR OR REPLACE POWER HEATER ECU

POWER HEATER FUEL PUMP CIRCUIT

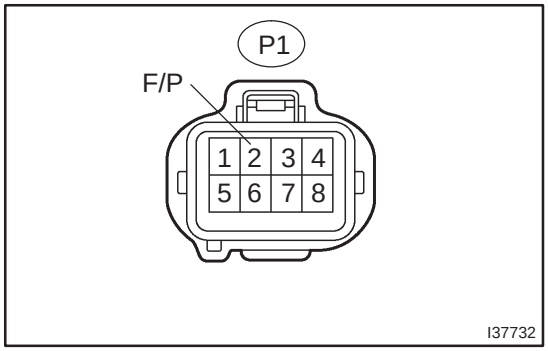
CIRCUIT DESCRIPTION

When the power heater switch is turned on, the fuel pump receives the drive voltage from the power heater ECU, causing the combustion type power heater to operate.

WIRING DIAGRAM



1	CHECK WIRE HARNESS(POWER HEATER ECU – BODY GROUND)

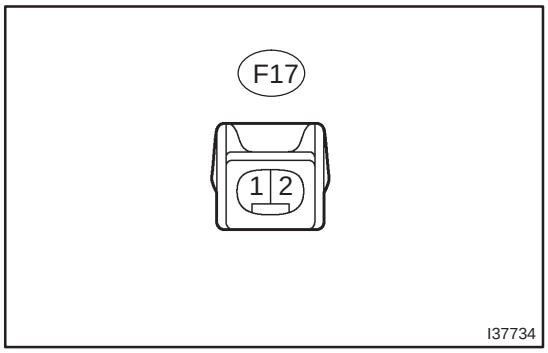


(a) Check for short circuit in harness and connector between terminal F/P of power heater ECU and body ground (See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

2	CHECK WIRE HARNESS(POWER HEATER ECU – POWER HEATER FUEL PUMP)

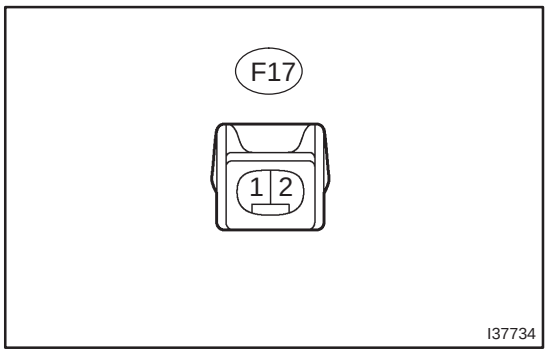


(a) Check for an open or short circuit in harness and connector betwen terminal 1 of power heater ECU and power heater fuel pump (See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

3	CHECK WIRE HARNESS(POWER HEATER FUEL PUMP – BODY GROUND)

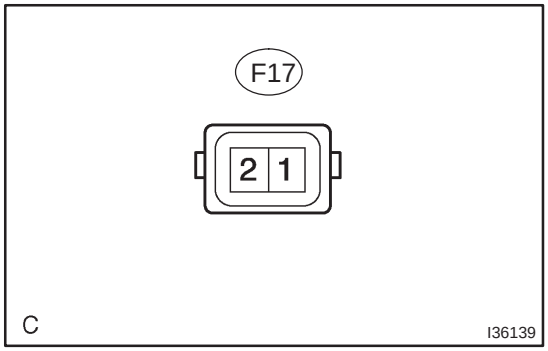


(a) Check for an open circuit in harness and connector between terminal 2 of power heater fuel pump and body ground (See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

4	INSPECT POWER HEATER FUEL PUMP



(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) to terminal 2 with the power heater turned on and check the pressure of the hose by hand.
Standard: The pressure is applied to the hose.

NG → **REPAIR OR REPLACE POWER HEATER FUEL PUMP**

OK

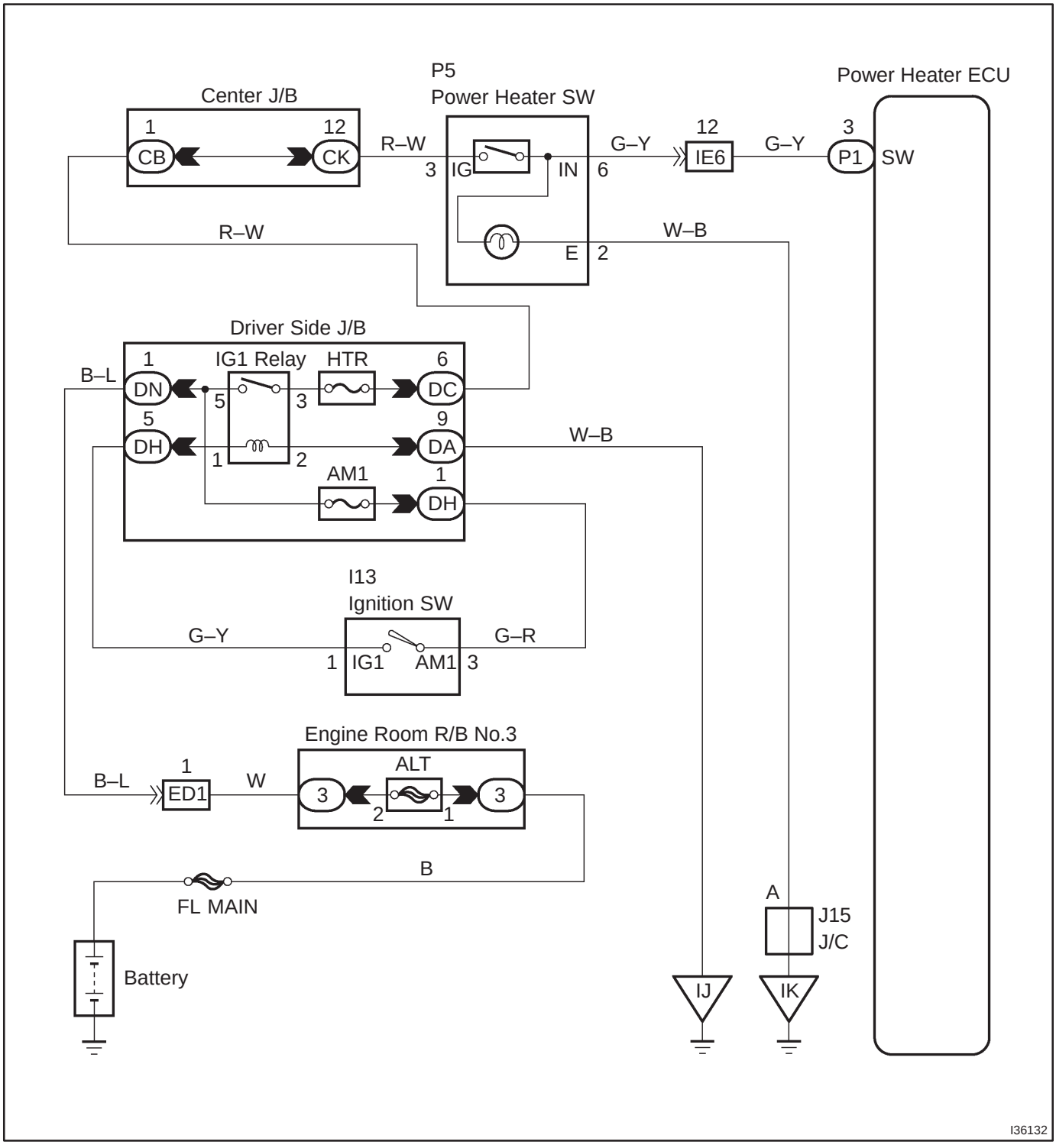
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

POWER HEATER SWITCH CIRCUIT

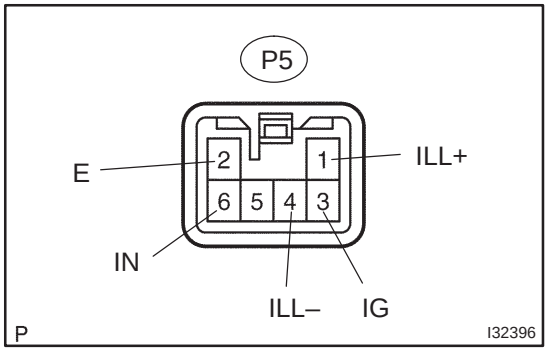
CIRCUIT DESCRIPTION

When the power heter switch is turned on, the power heater ECU sends the drive signal to the fuel pump, causing the combustion type power heater to operate.

WIRING DIAGRAM



1 INSPECT HETER SWITCH ASSY



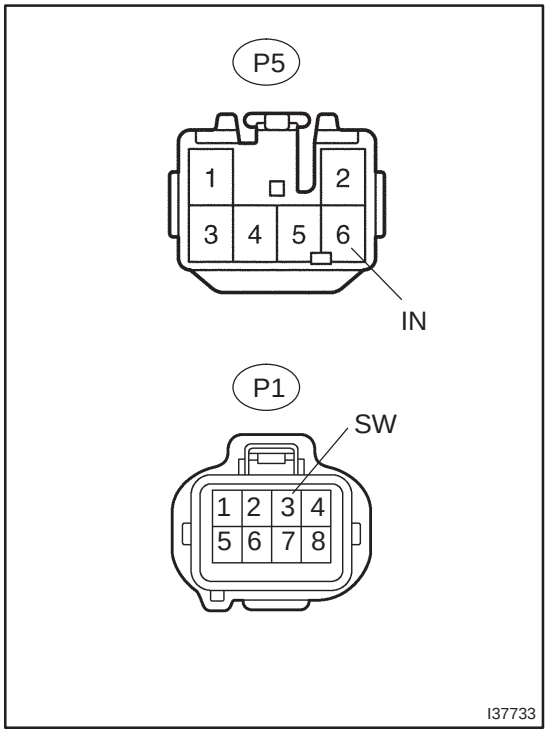
(a) Check that the continuity when connecting the positive tester lead (+) and the negative tester lead (–) to the following terminals.

Heater switch condition	Connectiong terminals	Standard Value
ON	IG – IN	Continuity
OFF	IG – IN	No Continuity
ON	IG – E	Continuity
OFF	IG – E	No Continuity
ON	ILL+ – ILL–	Continuity
OFF	ILL+ – ILL–	Continuity

NG → **REPLACE HETER SWITCH ASSY**

OK

2 CHECK WIRE HARNESS(HETER SWITCH ASSY – POWER HEATER ECU)



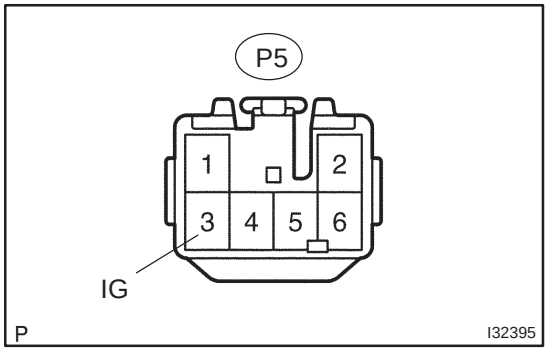
(a) Remove the A/C amplifier with connectors being connected.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between terminal IN of the heater switch and SW of the power heater ECU.

Heater switch condition	Standard value
ON	10 to 14 V
OFF	0 V

NG → **REPAIR OR REPLACE WIRE HARNESS**

OK

3	CHECK WIRE HARNESS(HETER SWITCH ASSY – BATTERY)

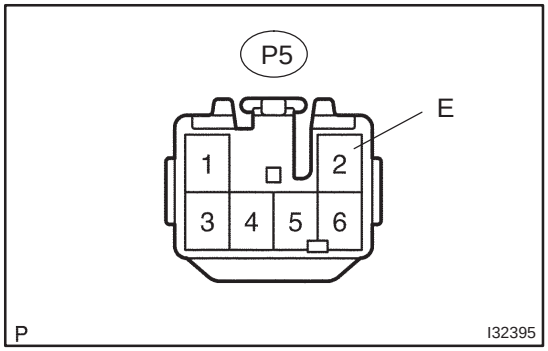


(a) Check for an open and short circuit in harness and connector between heater switch and battery
(See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

4	CHECK WIRE HARNESS(HETER SWITCH ASSY – BODY GROUND)



(a) Check for an open circuit in henees and connector between heater swith and body ground
(See page 01–32).

NG → REPAIR OR REPLACE WIRE HARNESS

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

05C7V–01

PRE–CHECK

NOTICE:

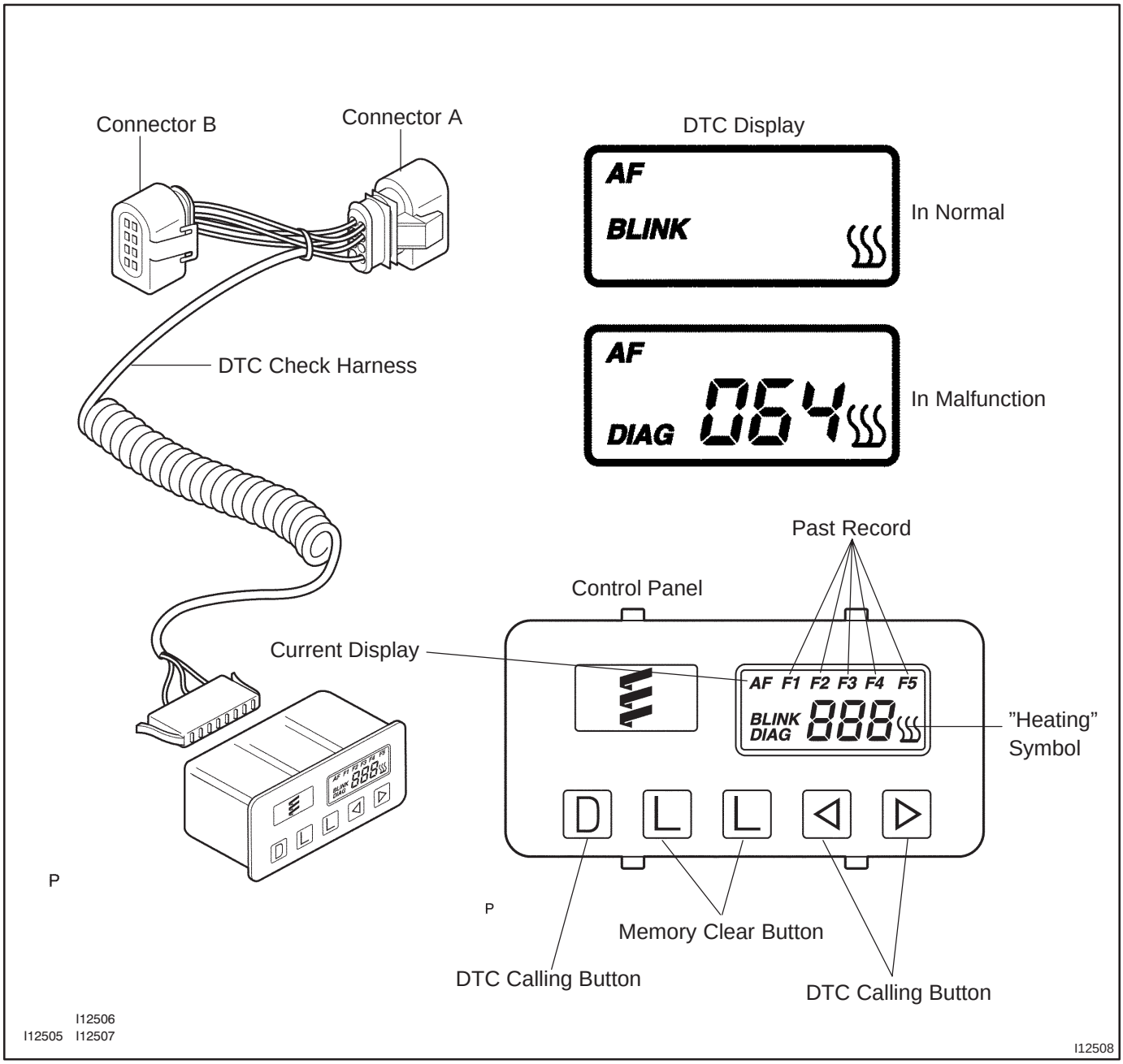
- **If the glow plug breaks, the ECU detects the breakage and stops the automatic operation, so the burner heater does not activate. (For other failures, similarly activated.)**
- **The cause of failures (such as voltage malfunction, overheating malfunction, short–circuit or breakage of functional components, etc.) and repair methods are shown by connecting the DTC tester and reading the DTC.**

1. DIAGNOSTICS FUNCTION

(a) Connect the DTC tester between the connector A (Vehicle harness) of DTC check harness and connector B (Power heater harness).

(b) Start the engine.

(c) Pressing the DTC calling button displays a 3–digit number DTC.



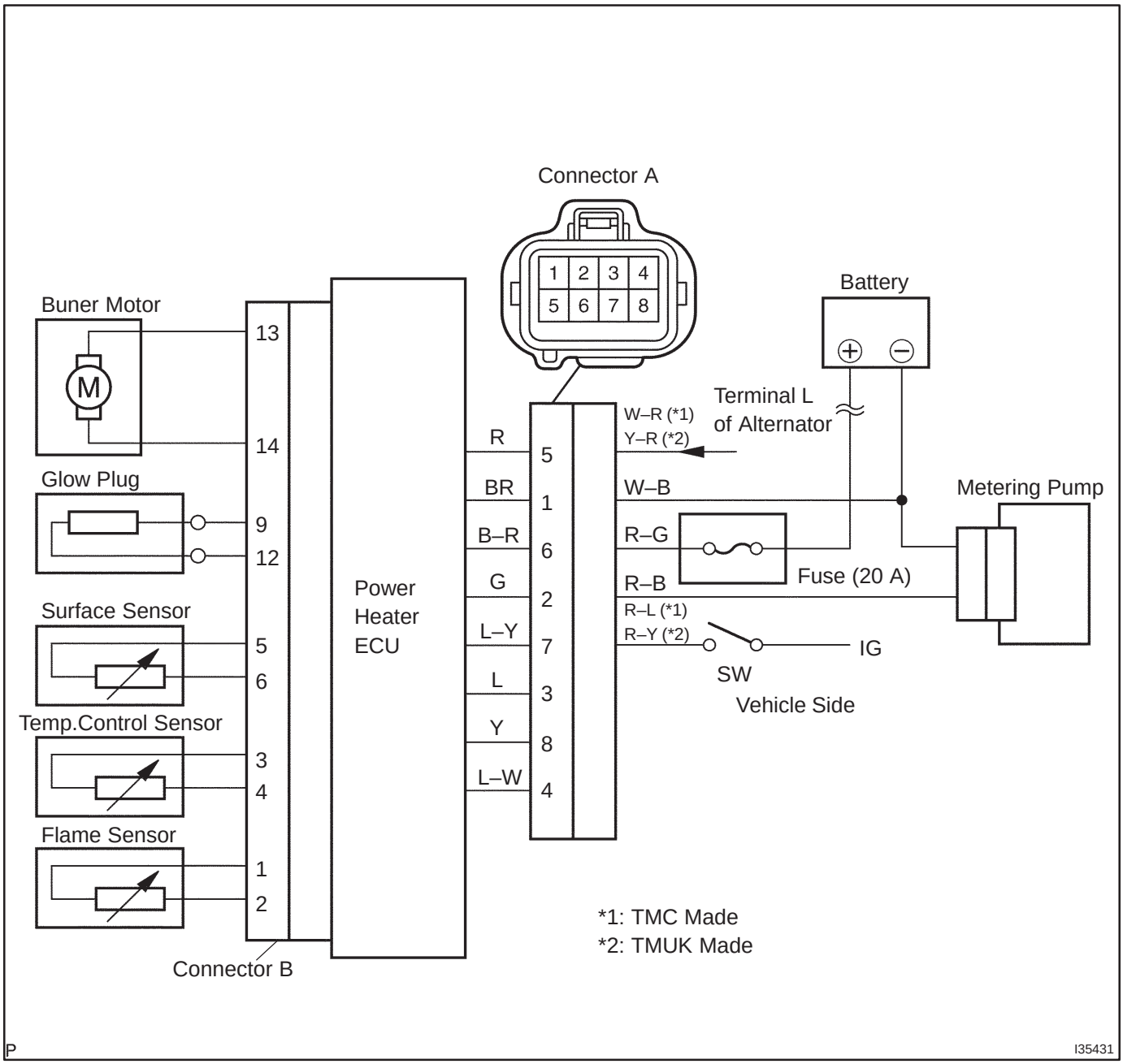
2. DESCRIPTION OF DISPLAY AND BUTTONS

(a) AF: Current Value Malfunction (Blinking at current failure)
Diag: DTC (Example: 064 Flame sensor break)
Memory Clear button: Deletion of faulty memory (Press both buttons together for longer than 2 sec.)
> Button: Scroll up of faulty memory (The past 5 codes can be stored.)
< Button: Scroll down of faulty memory (The past 5 codes can be stored.)

3. FAULTY MEMORY

(a) The ECU is able to store upto 5 pieces of faulty memory. If it is full, the new data is written over F5.

4. WIRING DIAGRAM



05C7Z–01

PROBLEM SYMPTOMS TABLE

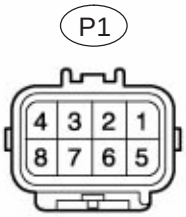
If the normal code is displayed during DTC check although the problem still occurs, check the circuits for each problem symptom in the order given in the table below, and proceed to the relevant troubleshooting.

Symptom	Suspect Area	See page
The combustion type power heater does not operate	1. ECU power source circuit	05–1171
	2. Power heater switch circuit	05–1173
	3. Power heater fuel pump circuit	05–1176
	4. Power heater alternator circuit	05–1179

05C7Y–01

TERMINALS OF ECU

1. POWER HEATER ECU



I36138

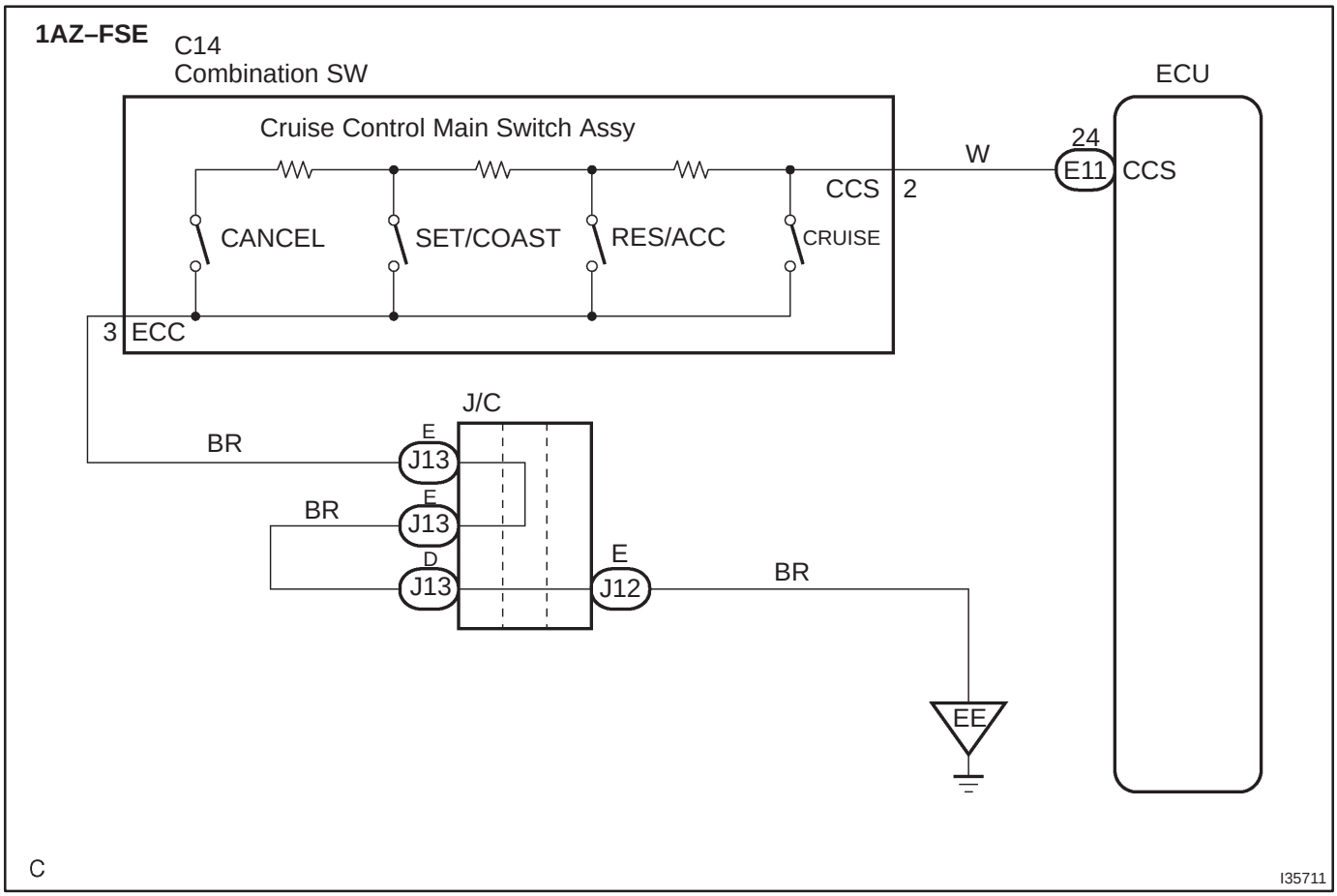
Terminal No. (Symbols)	Wiring Color	Condition	Specification
P1–1 (–) – Body ground	W–B – Body ground	Always	Continuity
P1–2 (F/P) – Body ground	L – Body ground	Always	Continuity
P1–3 (SW) – Body ground	G–Y – Body ground	IG SW: ON Power heater SW: ON	10 to 14
P1–5 (+) – Body ground	W – Body ground	Always	Continuity
P1–8 (ALT +L) – Body ground	Y – Body ground	Alternator: Operate	Pulse generation

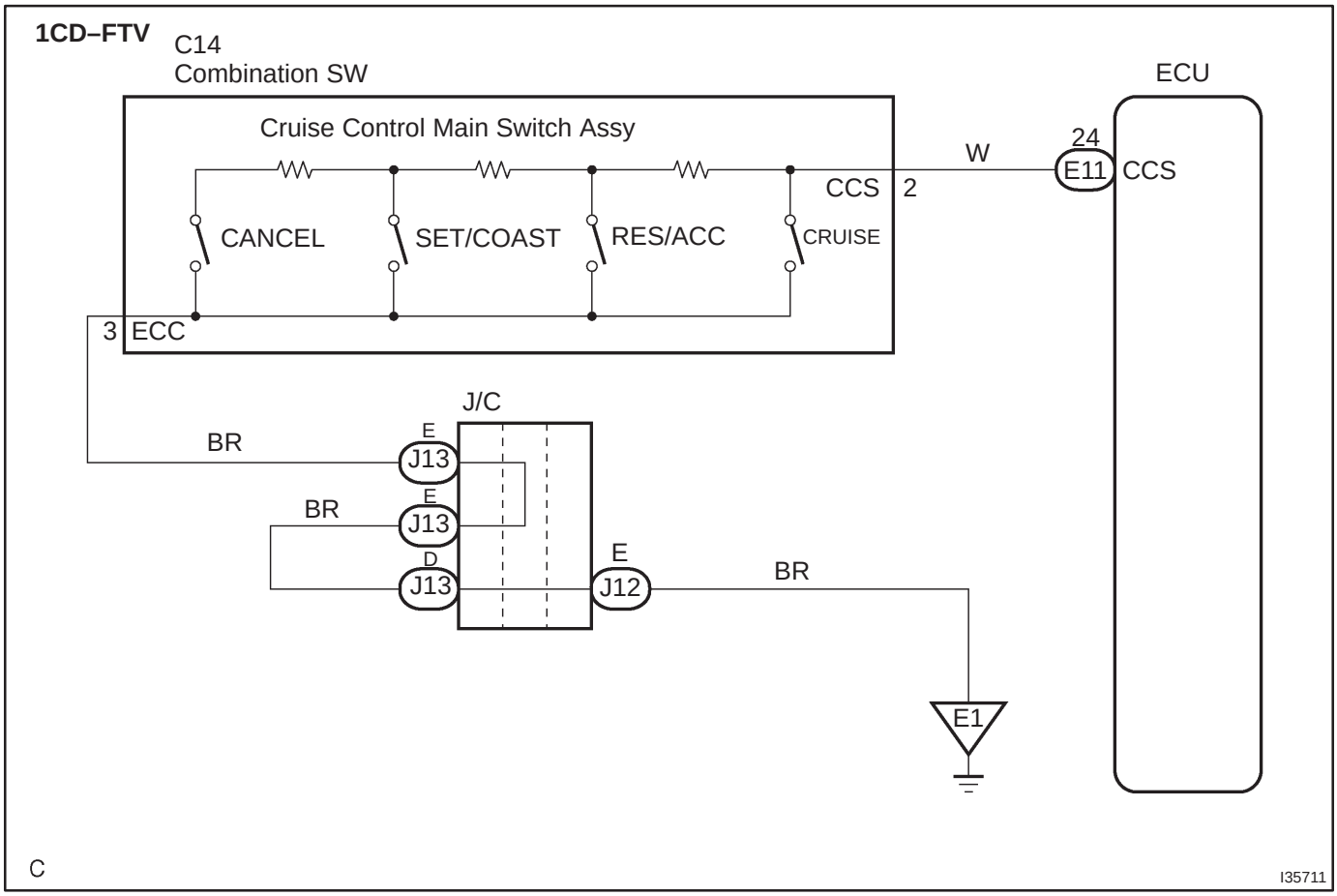
CRUISE CONTROL SWITCH CIRCUIT

CIRCUIT DESCRIPTION

This circuit carries the SET/COAST, RES/ACC and CANCEL signals (each voltage) to the ECM.

WIRING DIAGRAM




1CD–FTV
C14
Combination SW
Cruise Control Main Switch Assy
CANCEL
SET/COAST
RES/ACC
CRUISE
CCS
2
3
ECC
W
ECU
24
E11
CCS
J/C
E
J13
BR
E
J13
BR
D
J13
E
J12
BR
E1
C
I35711

INSPECTION PROCEDURE

HINT:
In case of using the hand–held tester, start the inspection from step 1, and in case of not using the hand–held tester, start from step 2.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position, and turn the hand–held tester main switch ON.
(c) Select the item ”CCS READY” in the DATA LIST and read its prompts displayed on the hand–held tester.

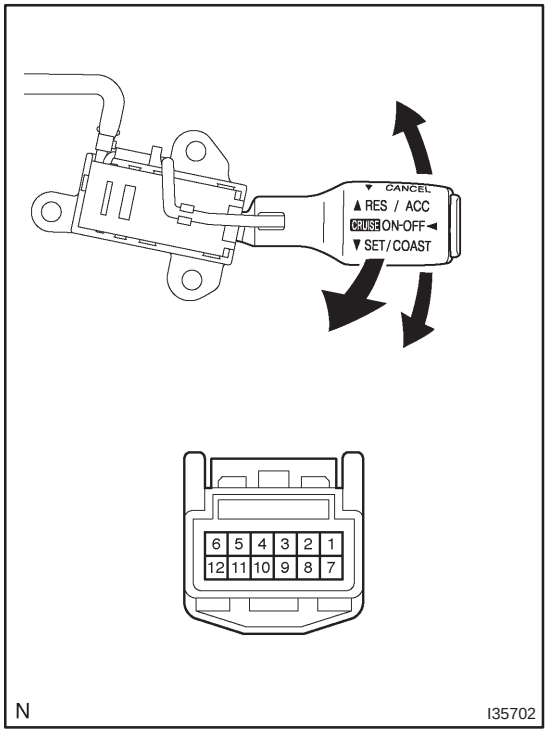
Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
CCS READY M	Cruise control system standby condition (Main CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”
CCS READY S	Cruise control system standby condition (Sub CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”

NG → **Go to step 2**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

2 INSPECT CRUISE CONTROL MAIN SWITCH ASSY



(a) Remove the horn button assy.
(b) Disconnect the cruise control main switch connector.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

Switch condition	Tester connection	Resistance(Ω)
Neutral	2 – 3	∞ (No continuity)
RES/ACC	2 – 3	210 to 270
SET/COAST	2 – 3	560 to 700
CANCEL	2 – 3	1,380 to 1,700

(d) Measure the resistance according to the value(s) in the table below.

Standard:

Switch condition	Tester connection	Specification
OFF	2 – 3	10 kΩ or higher
ON	2 – 3	1 Ω or less

HINT:
When malfunction is found with the cruise control main switch assy, replace the steering wheel assy.

NG → **REPLACE STEERING WHEEL ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(CRUISE CONTROL MAIN SWITCH, BODY GROUND – ECM)

(a) Disconnect the cruise control switch connector and ECM connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specification
CCS (S14 – 2) – CCS (E11 – 24)	Always	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specification
CCS (E11 – 24) – Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

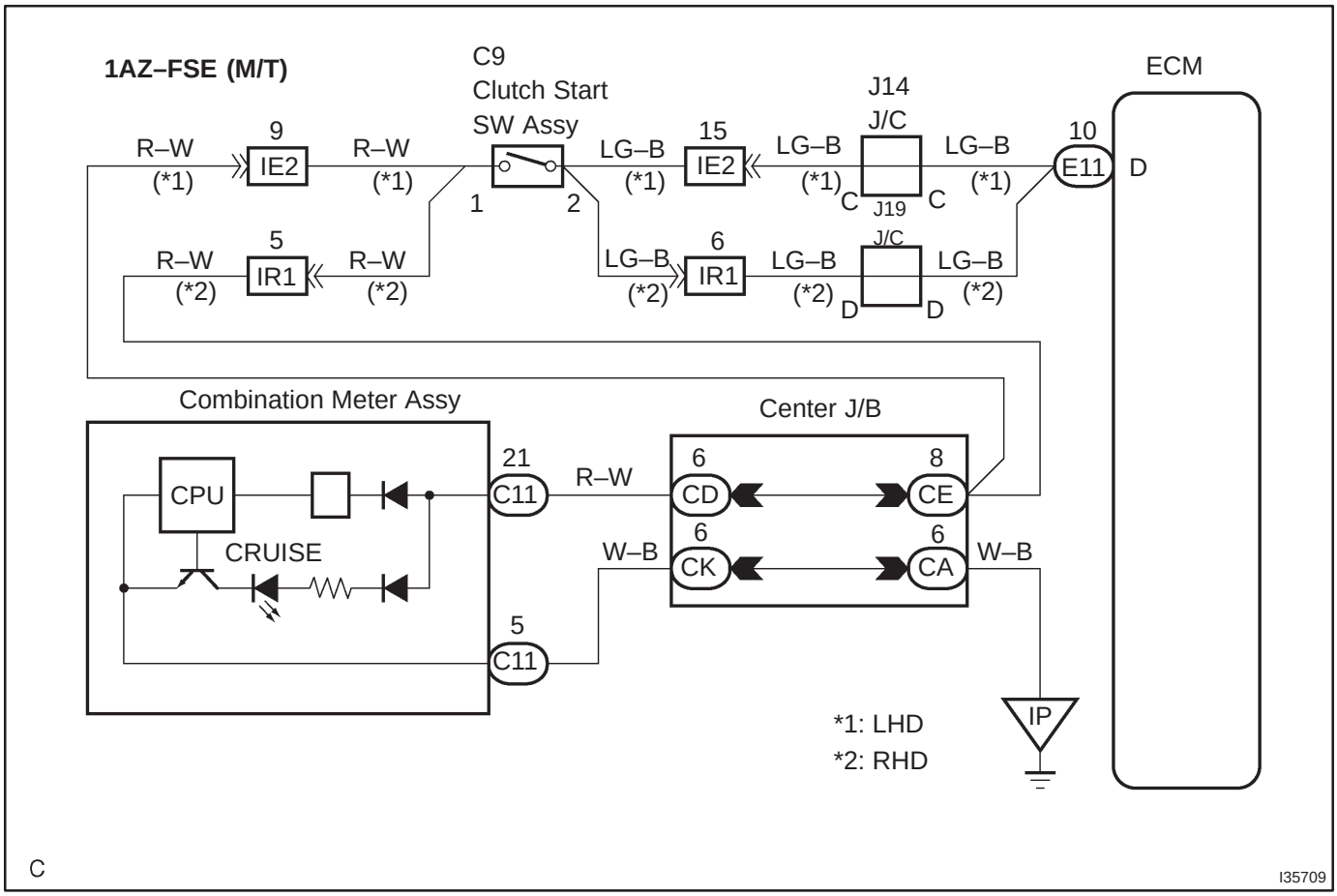
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1709)

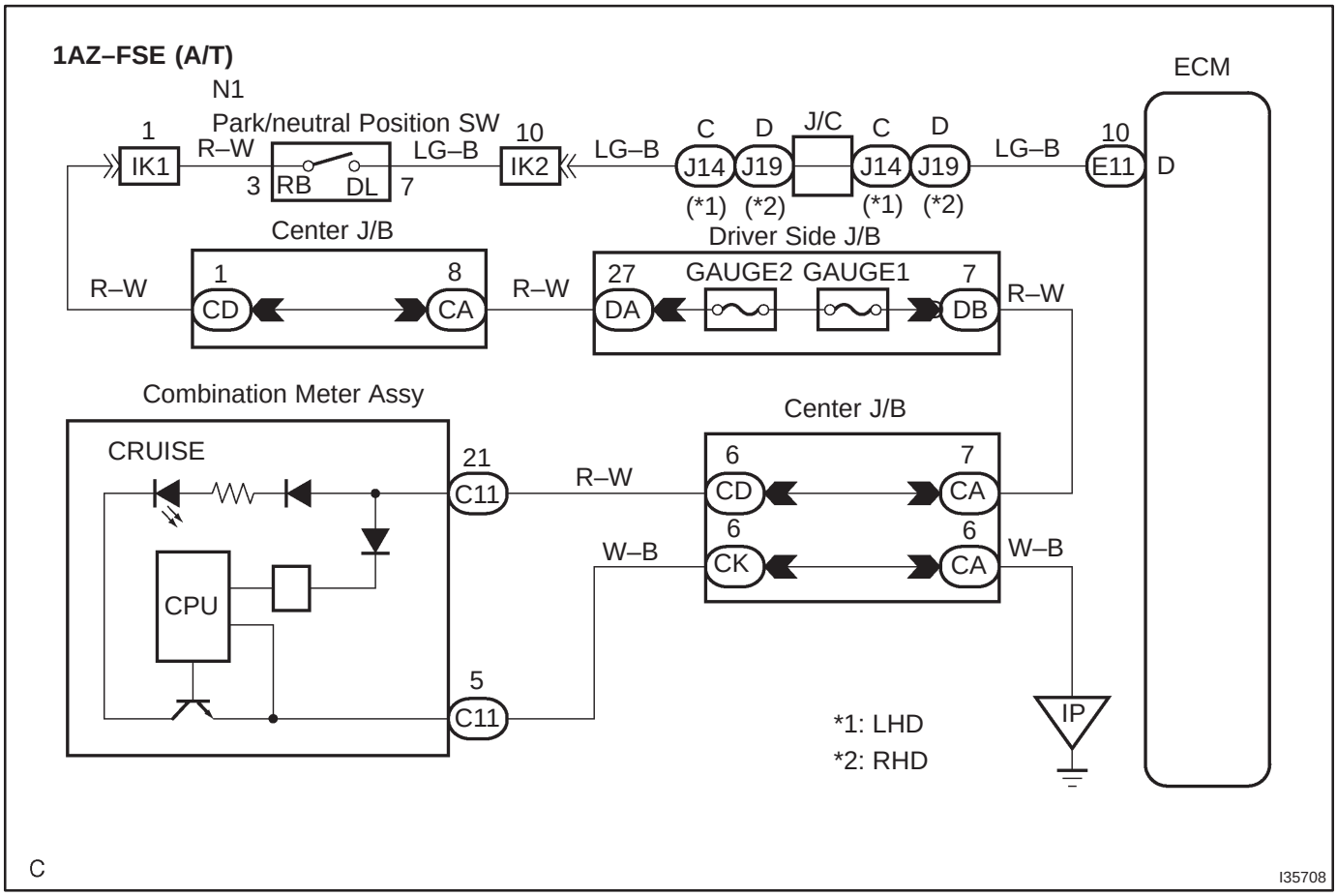
CRUISE MAIN INDICATOR LIGHT CIRCUIT

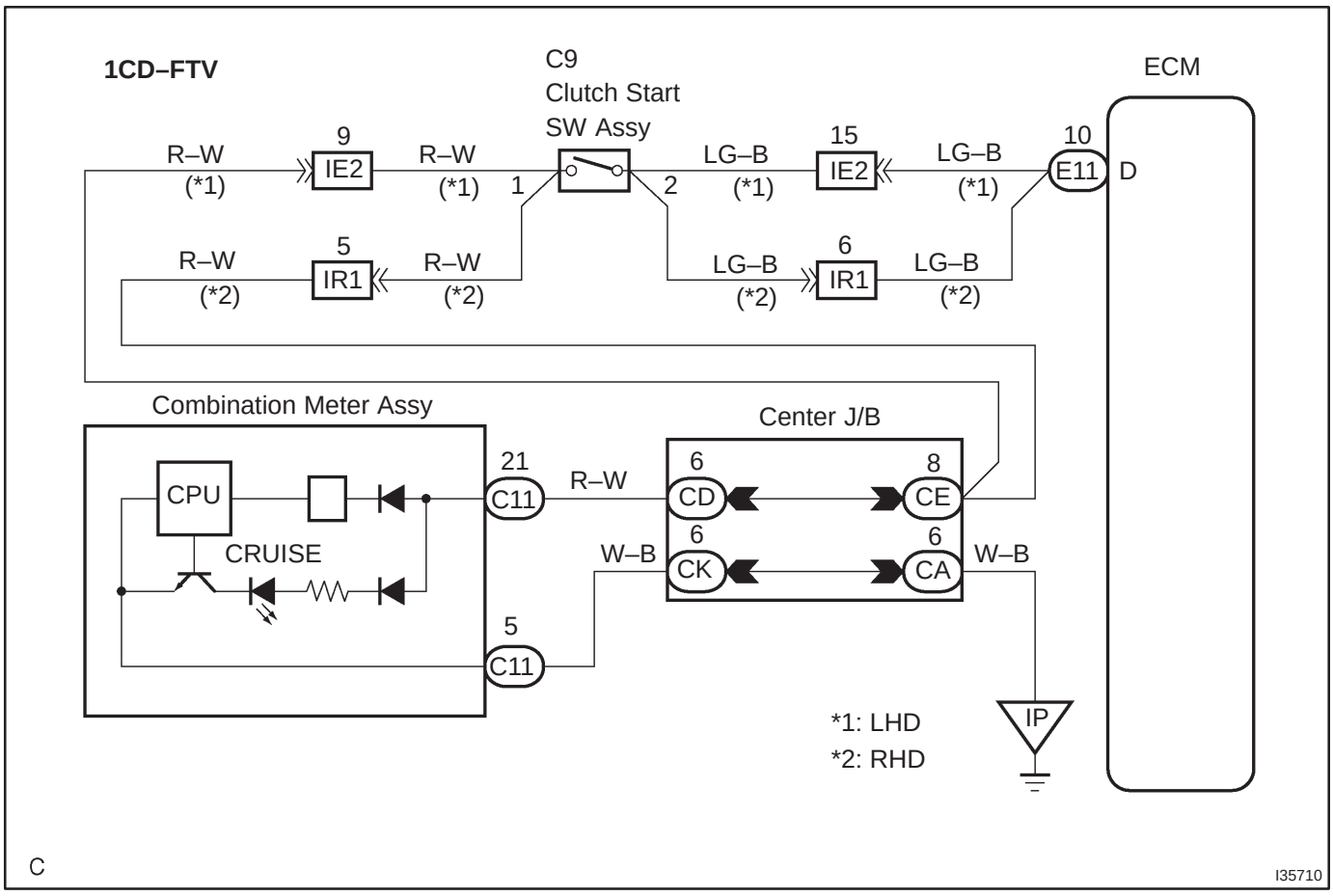
CIRCUIT DESCRIPTION

When the cruise control main switch is turned off, the cruise control does not operate.

WIRING DIAGRAM




1AZ–FSE (A/T)
N1
Park/neutral Position SW
ECM
1
IK1
R–W
3
RB
DL
7
10
IK2
LG–B
LG–B
C
D
J/C
C
D
J14
J19
J14
J19
(*1)
(*2)
(*1)
(*2)
LG–B
10
E11
D
Center J/B
Driver Side J/B
R–W
1
CD
8
CA
R–W
27
DA
GAUGE2
GAUGE1
7
DB
R–W
Combination Meter Assy
Center J/B
CRUISE
21
C11
R–W
6
CD
7
CA
6
CK
6
CA
W–B
W–B
CPU
5
C11
*1: LHD
*2: RHD
IP
C
I35708


1CD–FTV
C9
Clutch Start
SW Assy
ECM
R–W
(*1)
9
IE2
R–W
(*1)
1
2
LG–B
(*1)
15
IE2
LG–B
(*1)
10
E11
D
R–W
(*2)
5
IR1
R–W
(*2)
LG–B
(*2)
6
IR1
LG–B
(*2)
Combination Meter Assy
Center J/B
CPU
CRUISE
21
C11
R–W
6
CD
8
CE
6
CK
6
CA
W–B
W–B
5
C11
*1: LHD
*2: RHD
IP
C
I35710

INSPECTION PROCEDURE

HINT:

In case of using the hand–held tester, start the inspection from step 1, and in case of not using the hand–held tester, start from step 2.

1	READ VALUE OF HAND–HELD TESTER

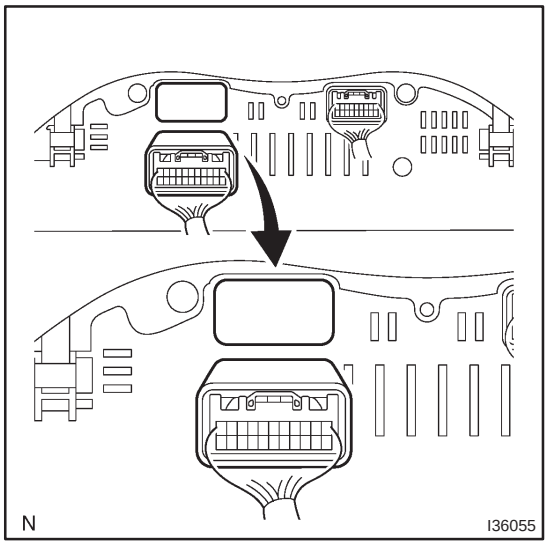
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position, and turn the hand–held tester main switch ON.
(c) Select the item ”CCS READY” in the DATA LIST and read its prompts displayed on the hand–held tester.

Item	Measurement Item / Display (Range)	Normal Condition
CCS READY M	Cruise control system standby condition (Main CPU) / ON or OFF	ON ⇔ OFF: Change ON/OFF each time Main SW is pushed in.
CCS READY S	Cruise control system standby condition (Sub CPU) / ON or OFF	ON ⇔ OFF: Change ON/OFF each time Main SW is pushed in.

NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1709)**

OK

2	INSPECT COMBINATION METER ASSY



(a) Disconnect the C11connector from combination meter assy.
(b) Measure voltage according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
Terminal 21 (C11) – Body ground	10 to 14 V

Result:

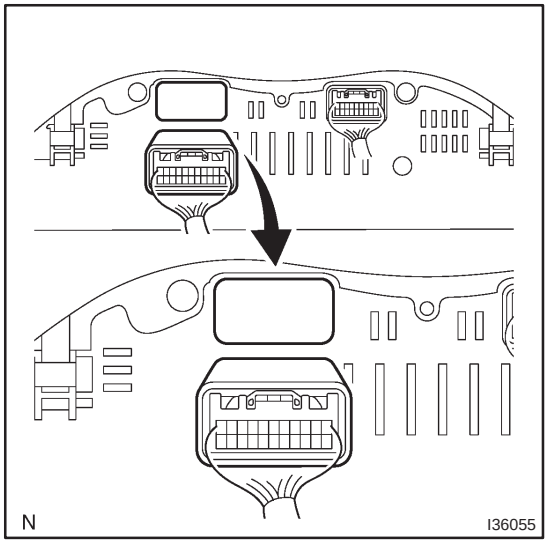
OK	A
NG (M/T)	B
NG (A/T)	C

B → **Go to step 4**

C → **Go to step 7**

A

3 INSPECT COMBINATION METER ASSY



(a) Disconnect the C11 connector from the combination meter.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

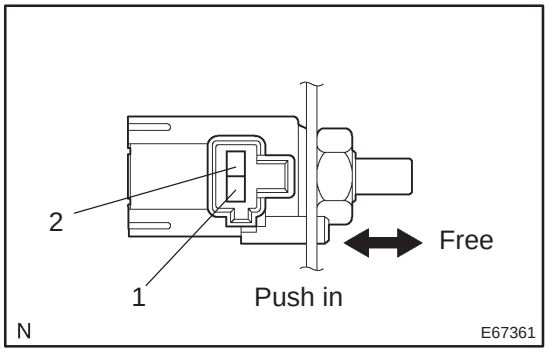
Tester Connection	Specified Condition
Terminal 5 (C11) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPAIR OR REPLACE COMBINATION METER ASSY

4 INSPECT CLUTCH START SWITCH ASSY



(a) Disconnect the clutch start switch assy connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Switch condition	Tester connection	Specification
Switch pin free	1 – 2	10 kΩ or higher
Switch pin pushed in	1 – 2	1 Ω or less

NG → **INSPECT CLUTCH START SWITCH ASSY**

OK

5	CHECK HARNESS AND CONNECTOR(COMBINAITION METER ASSY – CLUTCH START SWITCH ASSY)

(a) Disconnect the combination meter connector and clutch start switch connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Combination meter (C11–21) – Clutch start switch (C9–1)	Always	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Clutch start switch (C9–1) – Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6	CHECK HARNESS AND CONNECTOR(CLUTCH START SWITCH ASSY – ECM)

(a) Disconnect the clutch start switch connector and ECM connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Clutch start switch (C9–2) – D (E11–10)	Always	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.
Standard:

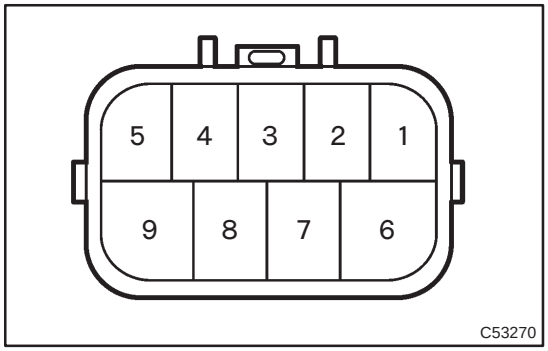
Tester connection	Condition	Specification
D (E11–10) – Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1709)

7	INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.
(b) Shift the shift lever to the D range.
(c) Check continuity between terminal 3 and terminal 7.
Standard:
There is continuity.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY**

OK

8	CHECK HARNESS AND CONNECTOR(COMBINAITION METER ASSY – PARK/NEUTRAL POSITION SWITCH ASSY)

(a) Disconnect the combination meter connector and park/neutral position switch connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Park/neutral start switch (N1–3) – Combination meter (C11–21)	Always	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Combination meter (C11–21) – Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

9	CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH ASSY – ECM)

(a) Disconnect the ECM connector and park/neutral position switch connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
Park/neutral start switch (N1–7) – D (E11–10)	Always	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.
Standard:

Tester connection	Condition	Specification
D (E11–10) – Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE
(See page 05–1709)

05ADJ–04

CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date of Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

Condition of Problem Occurrence	**Date of Problem Occurrence**	/ /
	Frequency Problem Occurs?	☐ Continuous ☐ Intermittent (Times a day)
	Vehicle Speed when Problem Occurred	**km Mile**

Symptoms	☐ Auto cancel occurs	● Driving condition ☐ City driving ☐ Freeway ☐ Up hill ☐ Down hill ● After cancel occurred, did the driver activate cruise control again? ☐ Yes ☐ No
	☐ Cancel does not occur	☐ With brake ON ☐ Clutch pedal depressed (M/T) ☐ Except D range shift (A/T) ☐ When control SW turns to CANCEL position
	☐ Cruise control malfunction	☐ Slip to acceleration side ☐ Slip to deceleration side ☐ Hunting occurs ☐ O/D cut off does not occur (A/T) ☐ O/D does not return (A/T)
	☐ Switch malfunction	☐ SET ☐ 'ACCEL' ☐ 'COAST' ☐ RESUME ☐ CANCEL
	☐ CRUISE MAIN indicator light	☐ Remains ON ☐ Does not light up ☐ Blinks

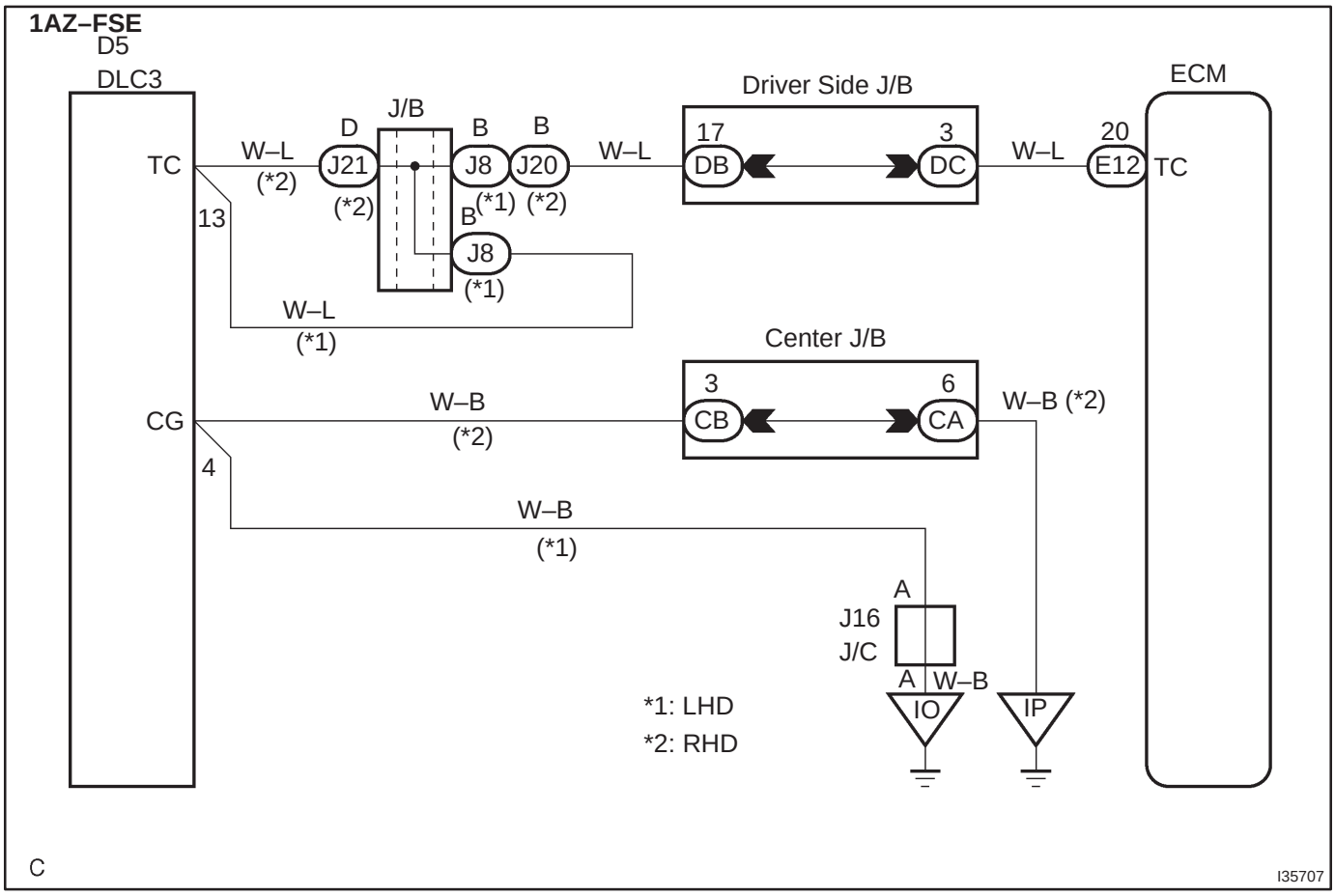
DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

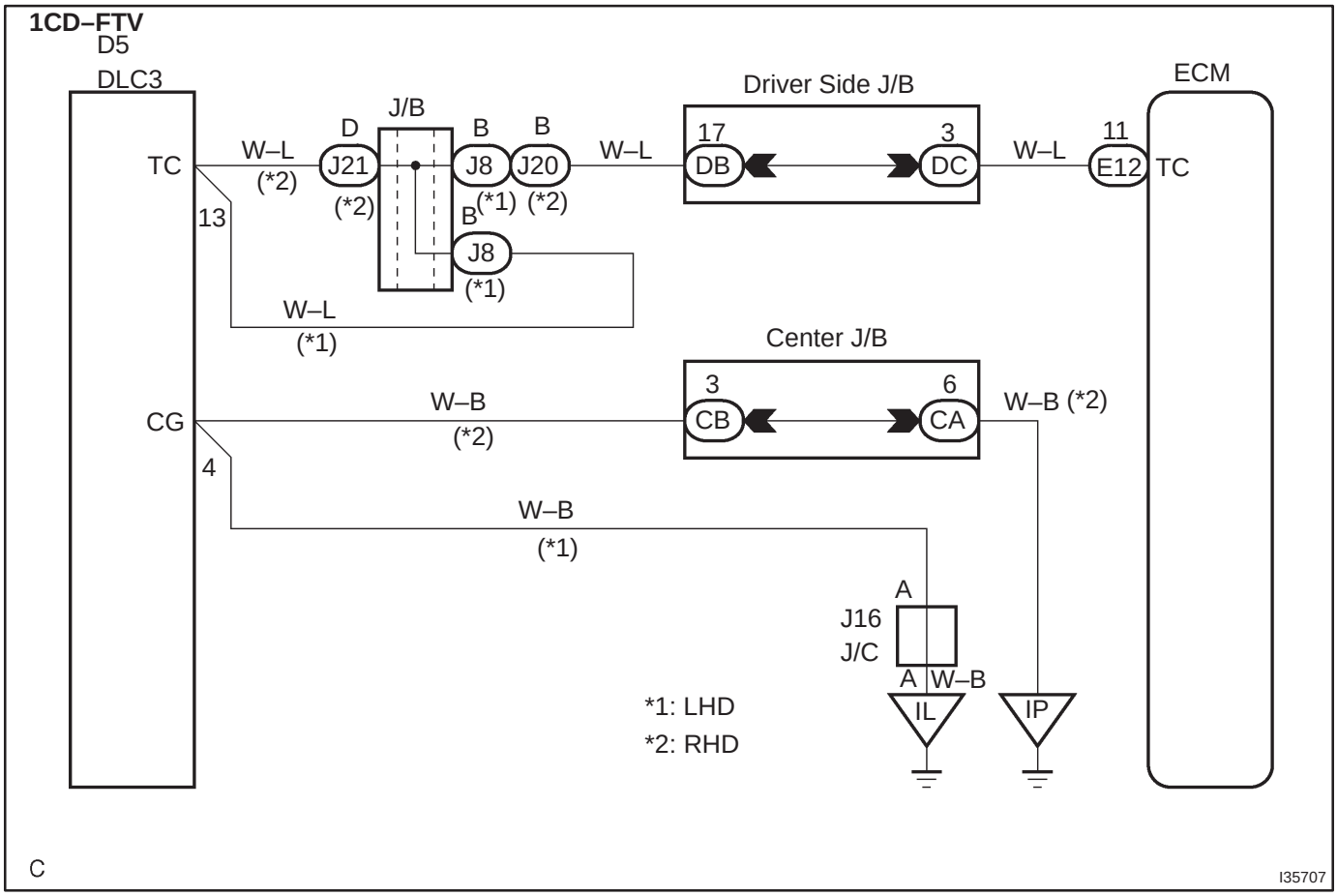
DIAGNOSIS CIRCUIT

CIRCUIT DESCRIPTION

Making short circuit between terminal TC and CG of DLC3 will output DTC from the DLC3.

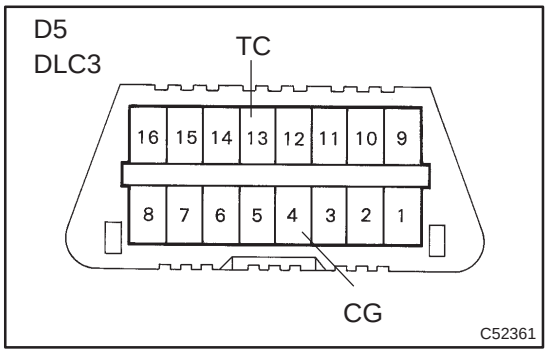
WIRING DIAGRAM





INSPECTION PROCEDURE

1	INSPECT DLC3(TC TERMINAL VOLTAGE)



(a) Turn the ignition switch to the ON position.

(b) Measure the voltage according to the value(s) in the table below.

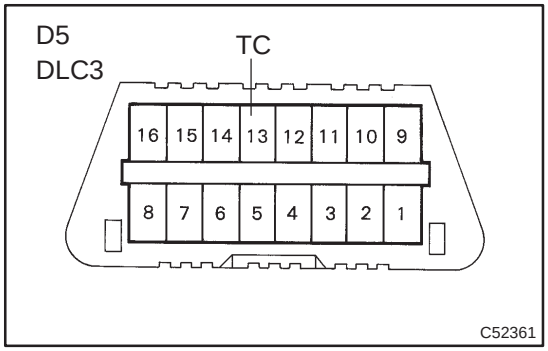
Standard:

Tester Connection	Specified Condition
TC (D5 – 13) – CG (D5 – 4)	10 to 14 V

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR(DLC3 – ECM)



(a) Disconnect the ECM connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

1AZ–FSE

Tester Connection	Specified Condition
TC (D5 – 13) – TC (E12 – 20)	1 Ω or less

1CD–FTV

Tester Connection	Specified Condition
TC (D5 – 13) – TC (E12 – 11)	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.
Standard:

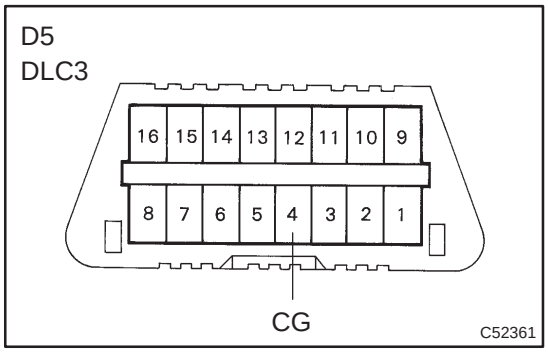
Tester Connection	Specified Condition
TC (E12 – 20) – Body ground	10 kΩ or higher
TC (E12 – 11) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 01–32)

3 CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)



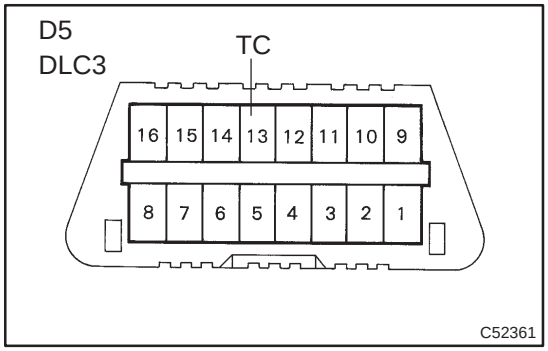
(a) Disconnect the ECM connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
CG (D5 – 4) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK HARNESS AND CONNECTOR(DLC3 – ECM)



(a) Disconnect the ECM connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

1AZ–FSE

Tester Connection	Specified Condition
TC (D5 – 13) – TC (E12 – 20)	1 Ω or less

1CD–FTV

Tester Connection	Specified Condition
TC (D5 – 13) – TC (E12 – 11)	1 Ω or less

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
TC (E12 – 20) – Body ground	10 kΩ or higher
TC (E12 – 11) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

REPLACE ECM (See page 01–32)

056HG–05

PRE–CHECK

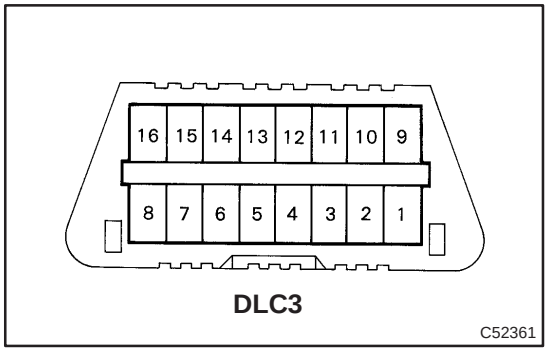
1. DIAGNOSIS SYSTEM

(a) Description

ECM controls of the cruise control the function on a vehicle.

Data stored in the cruise control memory and on the DTC can be read from the DLC3 on the vehicle. If CRUISE MAIN indicator light does not come on after the DTC check, there is a malfunction of the cruise control.

Use the hand–held tester or SST to check and solve the problem.



DLC3

(b) Check the DLC3.

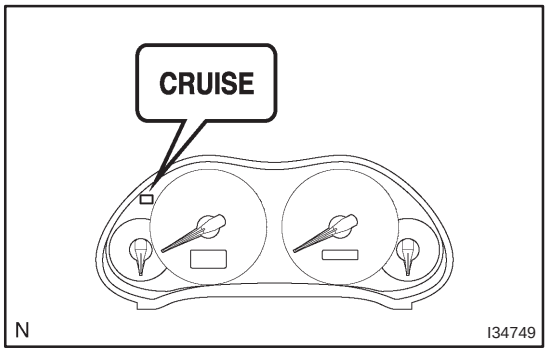
The vehicle's ECM uses ISO 9141–2(Euro–OBD)/ISO 14230 (M–OBD) for communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–3 and matches the ISO 9141–2 / ISO 14230 format.

Terminal No.	Connection/SpecifiedCondition	Condition
4	Chassis Ground ↔ Body Ground / 1 Ω or less	Always
7	Bus ⊕ Line / Pulse Generation	DuringCommunication
16	Battery Positive – Body Ground / 9 to 14 V	Always

HINT:

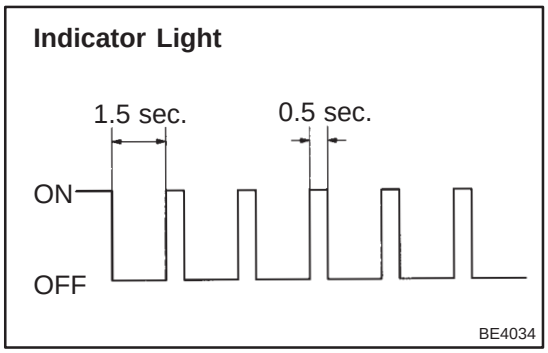
If the display shows "UNABLE TO CONNECT TO VEHICLE" after connecting the hand–held tester to the DLC3 and turning the ignition ON, there is a problem either with the vehicle or with the tool.

- If communication is normal when connecting the tool to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when connecting the tool to another vehicle, the problem is probably in the tool itself. Consult the Service Department listed in the tool's instruction manual.



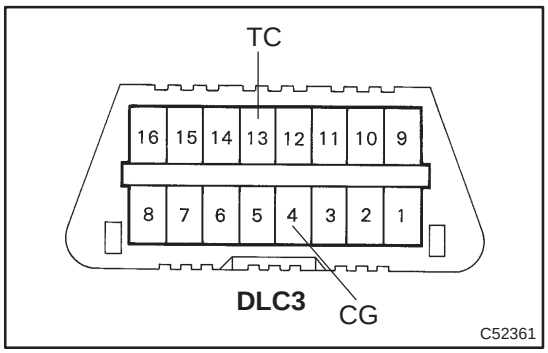
(c) Check the indicator.
(1) Turn the ignition switch to the ON position.
(2) Check that the CRUISE MAIN indicator light comes on when the main switch is ON, and that the indicator light goes off when the main switch is OFF.

HINT:
If there is a problem with the indicator, inspect the cruise main indicator light circuit (See page 05–1722).

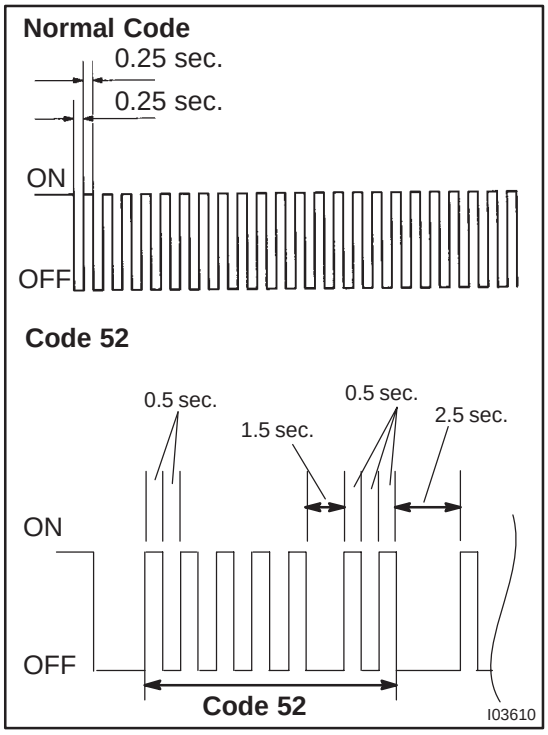


(d) Check the DTC.

HINT:
If a malfunction occurs in the vehicle speed sensors or stop lamp switch assy, etc. during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and then the CRUISE MAIN indicator light will start to blink, informing the driver of a malfunction. At the same time, data of the malfunction is stored as a diagnostic trouble code, or DTC.



(e) Output of the DTC using diagnosis check wire.
(1) Using SST, connect terminals TC and CG of DLC3.
SST 09843–18040
(2) Turn the ignition switch to the ON position.
(3) Read the DTC on the CRUISE MAIN indicator light.



HINT:
If the DTC is not output, inspect the cruise main indicator light circuit (See page 05–1722) and diagnosis circuit (See page 05–1729).
For example, the normal blinking pattern and the blinking pattern for code 52 are shown in the illustration.

2. USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:
Hand–held tester has a ”Snapshot” function which records the monitored data.
Refer to the hand–held tester operator’s manual for further details.

3. DATA LIST

HINT:
From the DATA LIST displayed by the the hand–held tester, you can read the value of the switch, the sensor and so on without removing parts. Reading the DATA LIST as the first step to troubleshooting is one way to shorten labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position.
(c) According to the display on the tester, read the ”DATA LIST”.

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
VEHICLE SPD	Vehicle speed / min.: 0 km/h (0 mph), max.: 255 km/h (158 mph)	Actual vehicle speed	–
MEMORY SPD	Stored vehicle speed / min.: 36 km/h (22 mph), max.: 200 km/h (124 mph)	Actual stored vehicle speed	–
THROTTLE	Required throttle opening angle / min.: 0°, max.: 125°	Actual required throttle opening	–
CRUISE CONTROL	Cruise control system active condition / ON or OFF	ON : Cruise control activated OFF : Cruise control inactivated	–
MAIN SW (MAIN)	Main SW signal (Main CPU) / ON or OFF	ON : Main SW ON (Pushed in) OFF: Main SW OFF (Pushed out)	”3”
MAIN SW (SUB)	Main SW signal (Sub CPU) / ON or OFF	ON : Main SW ON (Pushed in) OFF: Main SW OFF (Pushed out)	”3”
CCS READY M	Cruise control system standby condition (Main CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”
CCS READY S	Cruise control system standby condition (Sub CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”
CCS INDICATOR M	Cruise indicator signal (Main CPU) / ON or OFF	ON : ”CCS READY” ON OFF : ”CCS READY” OFF	”2”
CCS INDICATOR S	Cruise indicator signal (Sub CPU) / ON or OFF	ON : ”CCS READY” ON OFF : ”CCS READY” OFF	”2”
CANCEL SW	CANCEL SW signal / ON or OFF	ON : CANCEL SW ON OFF : CANCEL SW OFF	–
SET/COAST SW	COAST/SET SW signal / ON or OFF	ON : COAST/SET SW ON OFF : COAST/SET SW OFF	–
RES/ACC SW	ACCEL/RES SW signal / ON or OFF	ON : ACCEL/RES SW ON OFF : ACCEL/RES SW OFF	–
STP LIGHT SW2 M	Stop lamp SW signal (Main CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
STP LIGHT SW2 S	Stop lamp SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–

STP LIGHT SW1 S	Stop light SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
SHIFT D POS	PNP SW signal (D position) / ON or OFF	ON : Shift D position OFF : Except shift D position	–

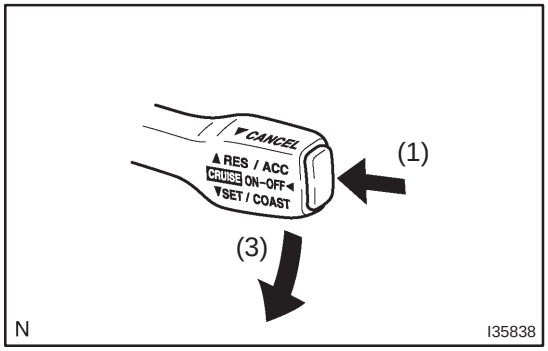
HINT:
”3” is OK but ”1” is NG → ECM failure
”1” is OK but ”2” is NG → DTC output or ECM failure
”3” is OK but cruise indicator does not turn on → CRUISE MAIN indicator or wire harness or ECM failure

4. DTC CLEAR

(a) The following methods will erase the DTCs and freeze frame data.
  (1) The hand–held tester can be used to erase the codes.
  (2) Disconnecting the battery terminals or EFI No.1 fuse can also erase the codes (1AZ–FSE). Disconnecting the battery terminals or EFI the fuse (1CD–FTV).

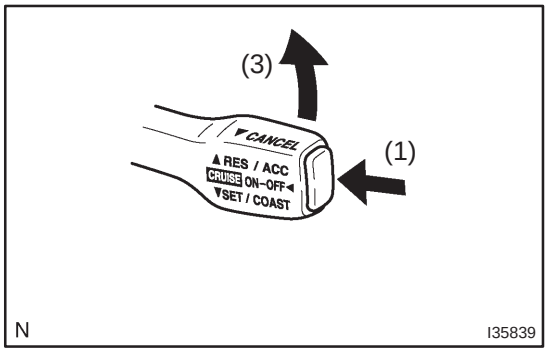
(b) After completing repairs, the DTC retained in the memory can be cleared by removing the EFI No.1 fuse for 1 minute or more with the ignition switch to the OFF position.

(c) Check that the normal code is displayed after connecting the fuse.

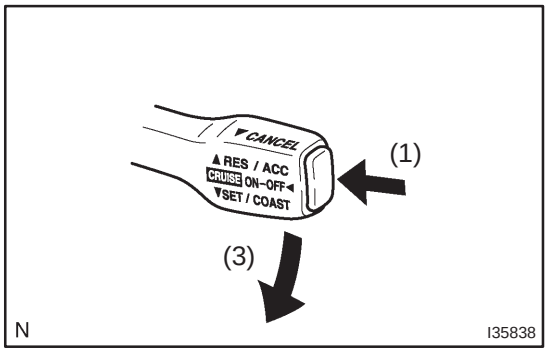


5. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)

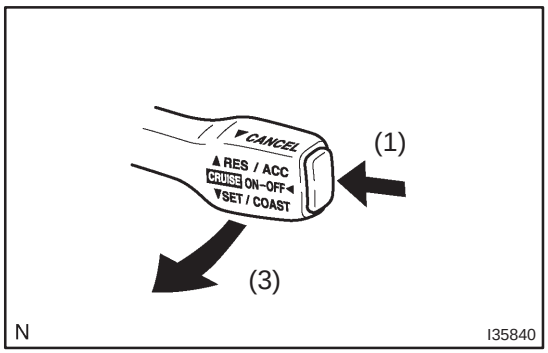
(a) Inspect the SET switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Push down the control switch to the SET/COAST position.
  (4) After releasing the switch, check that the vehicle cruises at the desired speed.



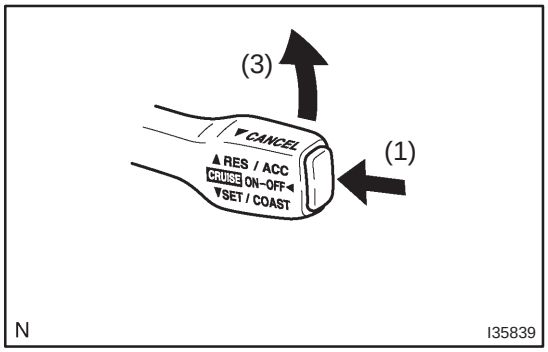
(b) Inspect the ’ACC’ switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Check that the vehicle speed increases when the control switch is pushed up to RES/ACC, and that the vehicle cruises at the set speed when the switch is released.
  (4) Push the control switch to RES/ACC, and then immediately release it. Check that the vehicle speed increases by about 1.6 km/h (Tap–up function).



(c) Inspect the 'COAST' switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) Check that the vehicle speed decreases while the control switch is pushed down to SET/COAST, and the vehicle cruises at the set speed when the switch is released.
(4) Push the control switch to SET/COAST, and then immediately release it. Check that the vehicle speed decreases by about 1.6 km/h (Tap–down function).



(d) Inspect the CANCEL switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) After doing one of the following, check that the cruise control system is cancelled and that the normal driving mode is resumed.
- Depressing the brake pedal.
- Depressing the clutch pedal (M/T).
- Shifting to any gear besides D (A/T).
- Pushing the main switch button to OFF.
- Pulling the control switch to CANCEL.



(e) Inspect the RESUME switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) After doing one of the following, check that the cruise control system is cancelled and that the normal driving mode is resumed.
- Depressing the brake pedal.
- Depressing the clutch pedal (M/T).
- Shift to any gear besides D (A/T).
- Pulling the control switch to CANCEL.

(4) After the control switch is press towards RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle resumes the same speed maintained before the cancellation.

CRUISE CONTROL SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

05ADI–04

1	VEHICLE BROUGHT TO WORK SHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–1699)

3	CHECK AND CLEAR DTCS (See page 05–1700)

4	PROBLEM SYMPTOM CONFIRMATION

- SYMPTOM DOES NOT OCCUR (GO TO STEP 5)
- SYMPTOM OCCURS (GO TO STEP 6)

5	SYMPTOM SIMULATION (See page 01–22)

6	DTC CHECK (See page 05–1700)

- MALFUNCTION CODE (GO TO STEP 7)
- NORMAL CODE (GO TO STEP 8)

7	DTC CHART (See page 05–1705)

GO TO STEP 9

8	PROBLEM SYMPTOMS TABLE (See page 05–1709)

9	CIRCUIT INSPECTION (See page 05–453)

10	TERMINAL OF ECM (See page 05–1707)

11	INDEMNIFICATION OF PROBLEM

12	REPAIR OR REPLACE

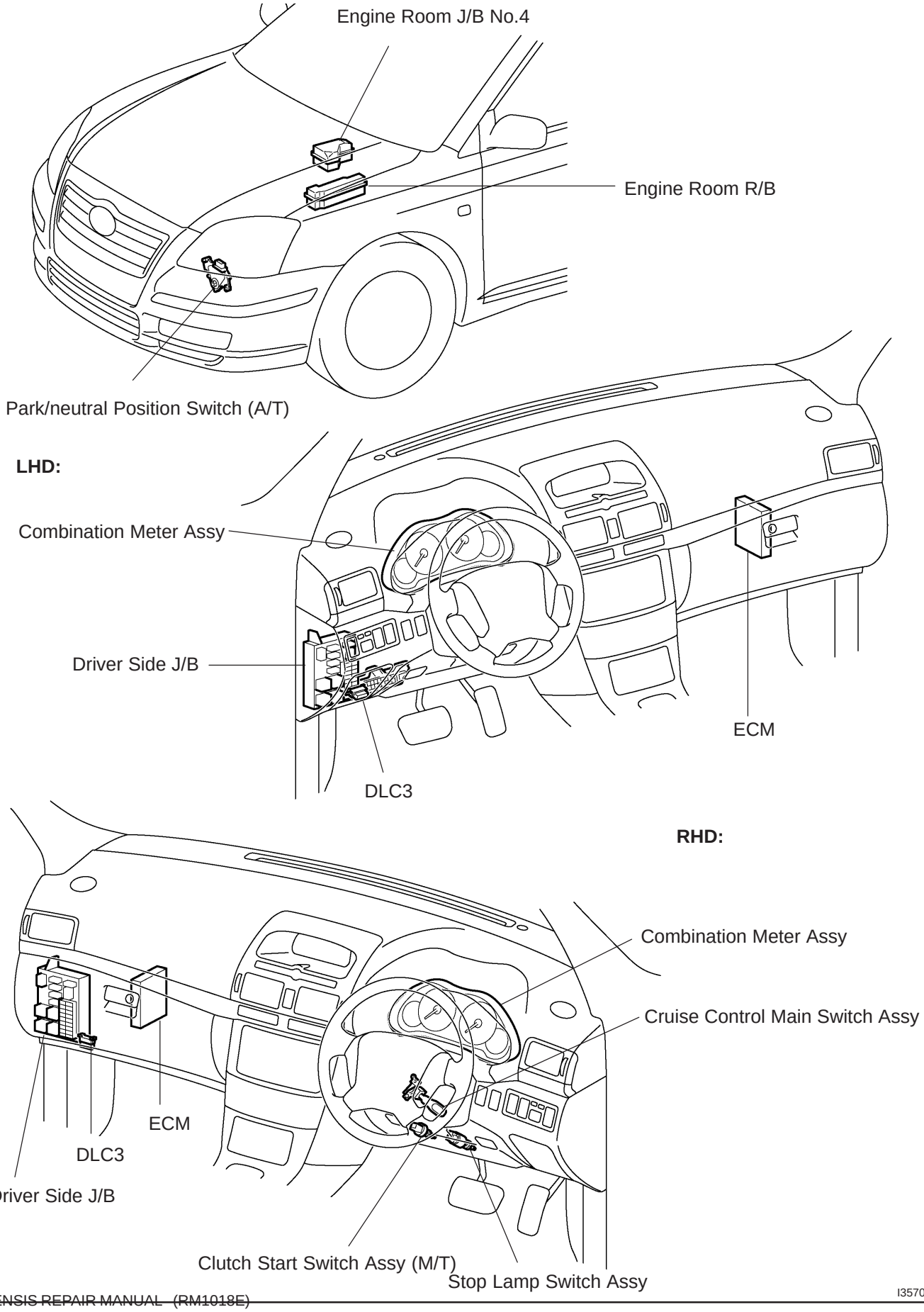
13	CONFIRMATION TEST

END

HINT:
Step 3, 6, 9, 13:
Diagnostic steps permit the use of the hand–held tester.

05ADK–04

LOCATION



I35700

DTC	P0500/21	VEHICLE SPEED SENSOR ”A”

DTC	P0503/23	VEHICLE SPEED SENSOR ”A” INTERMITTENT/ERRATIC/HIGH

CIRCUIT DESCRIPTION

See page 05–453. (1AZ–FSE) See page 05–640. (1CD–FTV)

DTC No.	DTC Detection Condition	Trouble Area
P0500/21	The malfunction code is output when the vehicle speed signal from the vehicle speed sensor is cut for 0.14 sec. or more while cruise control is in operation.	• Combination meter • Vehicle speed sensor • Vehicle speed sensor • ECM
P0503/23	Momentary interruption and noise malfunction codes are output when a rapid change of vehicle speed occurs while cruise control is in operation.	

WIRING DIAGRAM

See page 05–453. (1AZ–FSE) See page 05–640. (1CD–FTV)

INSPECTION PROCEDURE

See page 05–453. (1AZ–FSE) See page 05–640. (1CD–FTV)

DTC P0571/52 BRAKE SWITCH ”A” CIRCUIT

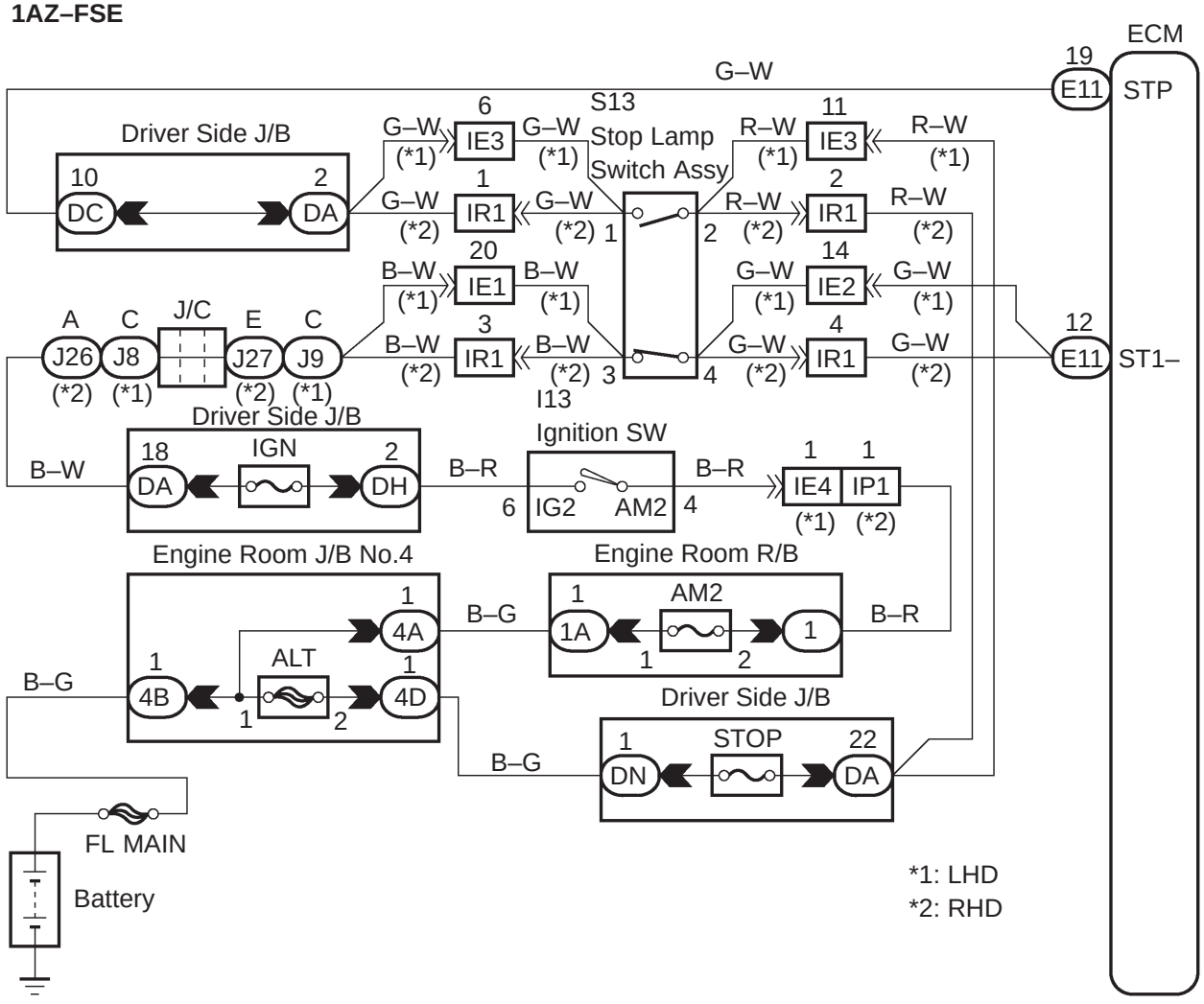
CIRCUIT DESCRIPTION

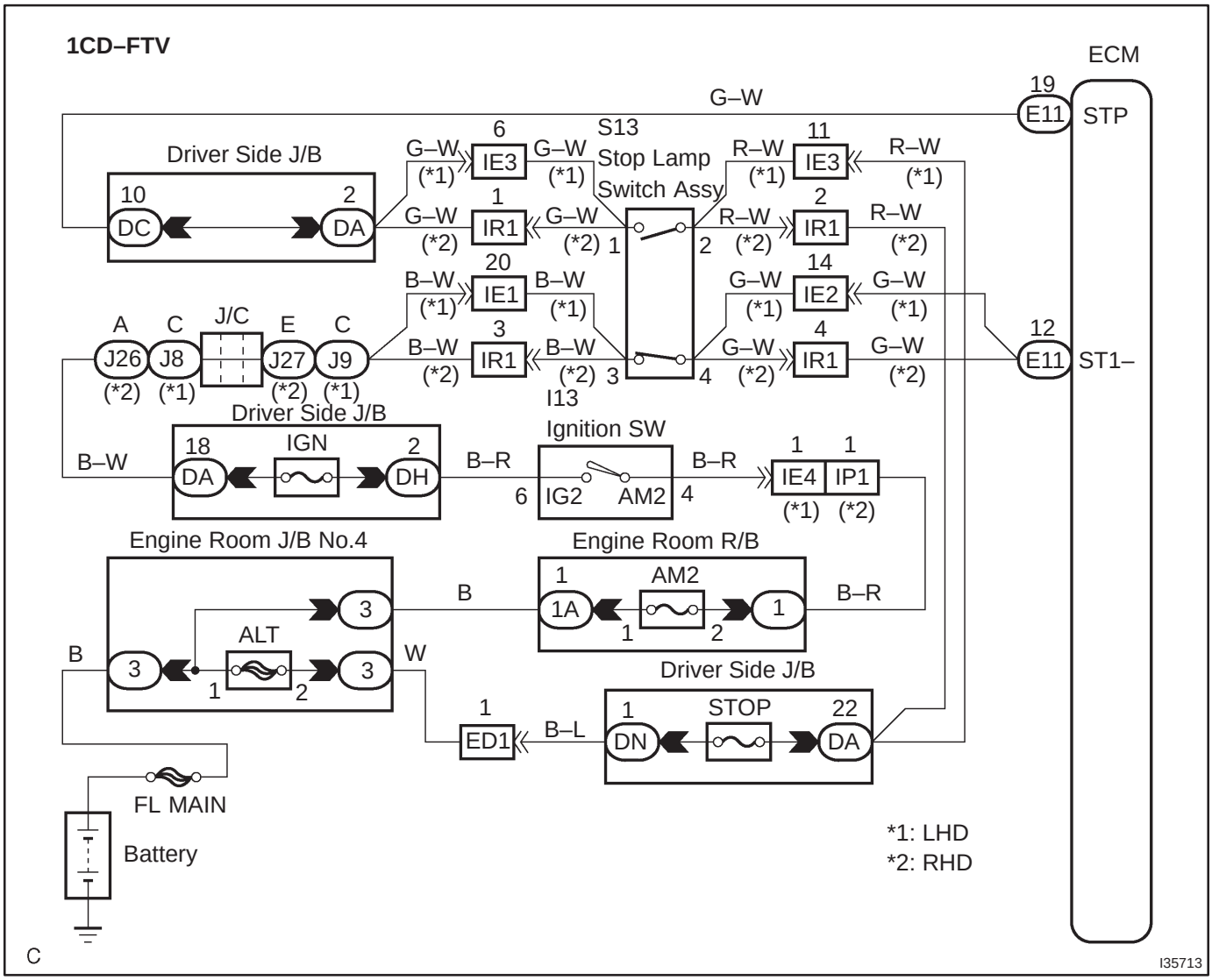
When the brake pedal is depressed, the stop lamp switch assy sends a signal to the ECM. When the ECM receives this signal, it cancels the cruise control.
A fail–safe function is provided so that it functions normally, even if there is a malfunction in the stop lamp signal circuit.
The cancel condition occurs when battery positive voltage is supplied to terminal STP.
When the brake is on, battery positive voltage is normally applied through the STOP fuse and the stop lamp switch assy to terminal STP of the ECM, and the ECM turns the cruise control OFF.
If the harness connected to terminal STP has an open circuit, terminal STP will have battery positive voltage and the cruise control will be turned OFF.

DTC No.	DTC Detection Condition	Trouble Area
P0571/52	The malfunction code is output when the voltage of the STP terminal and that of the ST1 terminal on the ECM are less than 1 V for 0.5 sec. or more. When the following conditions are realized, a malfunction is detected. • The STP terminal voltage is less than 1 V. • The ST1 terminal voltage is less than 1 V. • For more than 0.5 sec. or more.	• Stop lamp switch assy • Stop lamp switch assy circuit • ECM

WIRING DIAGRAM

1AZ–FSE




1CD–FTV
ECM
19
E11
STP
G–W
Driver Side J/B
10
DC
2
DA
G–W
(*1)
6
IE3
G–W
(*1)
S13
Stop Lamp
Switch Assy
R–W
(*1)
11
IE3
R–W
(*1)
G–W
(*2)
1
IR1
G–W
(*2)
1
2
R–W
(*2)
2
IR1
R–W
(*2)
B–W
(*1)
20
IE1
B–W
(*1)
G–W
(*1)
14
IE2
G–W
(*1)
A
J26
(*2)
C
J8
(*1)
J/C
E
J27
(*2)
C
J9
(*1)
B–W
(*2)
3
IR1
B–W
(*2)
3
4
G–W
(*2)
4
IR1
G–W
(*2)
12
E11
ST1–
I13
Driver Side J/B
Ignition SW
B–W
18
DA
IGN
2
DH
B–R
6
IG2
AM2
4
B–R
1
IE4
(*1)
1
IP1
(*2)
Engine Room J/B No.4
Engine Room R/B
3
B
1
1A
AM2
1
2
B–R
B
3
ALT
1
2
3
W
Driver Side J/B
1
ED1
B–L
1
DN
STOP
22
DA
FL MAIN
Battery
*1: LHD
*2: RHD
C
I35713

INSPECTION PROCEDURE

HINT:

In case of using the hand–held tester, start the inspection from step1, and in case of not using the hand–held tester, start from step 2.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position and turn the hand–held tester main switch ON.
(c) Select the item ”STOP LIGHT SW” in the DATA LIST and read the displayed value.

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
STP LIGHT SW2 M	Stop lamp SW signal (Main CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
STP LIGHT SW2 S	Stop lamp SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–

Standard:
Brake pedal depressed: OK
Brake pedal released: OFF

NG → **Go to step 2**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

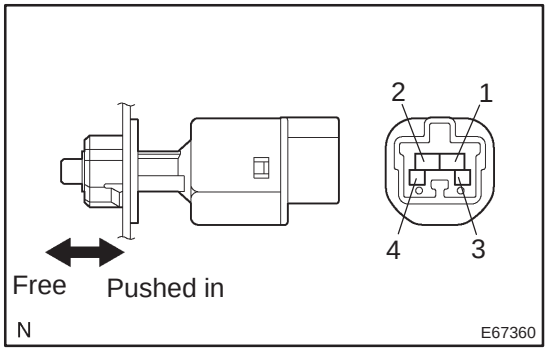
2	INSPECT STOP LAMP SWITCH OPERATION

(a) Check that the stop lamp lights up when brake pedal is depressed, and goes off when the brake pedal is released.

NG → **INSPECT STOP LAMP SWITCH CIRCUIT**

OK

3 INSPECT STOP LAMP SWITCH ASSY



(a) Disconnect the stop lamp switch assy connector.
(b) Measure the resistance according to the value(s) in the table below.

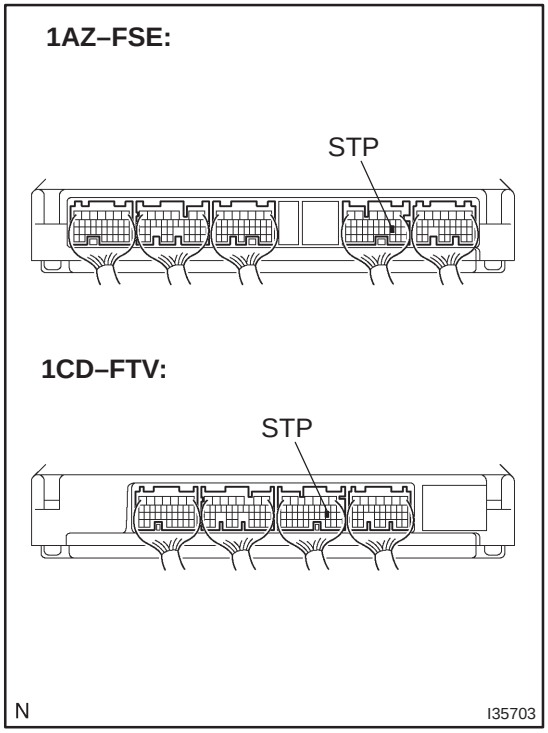
Standard:

Switch condition	Tester connection	Specification
Switch pin free	1 – 2	1 Ω or less
Switch pin free	3 – 4	10 kΩ or higher
Switch pin pushed in	1 – 2	10 kΩ or higher
Switch pin pushed in	3 – 4	1 Ω or less

NG → **REPLACE STOP LAMP SWITCH ASSY**

OK

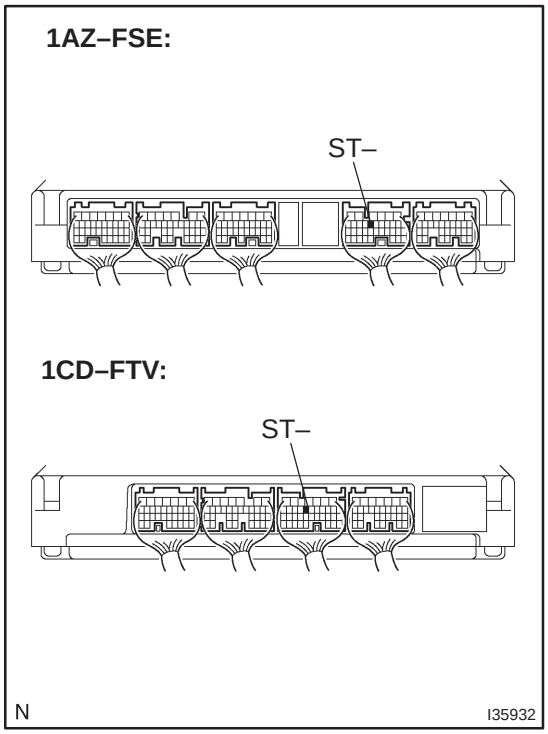
4 INSPECT ECM



(a) Remove the ECM with connectors.
(b) Turn the ignition switch to the ON position.
(c) Measure the voltage between terminal STP of ECM connector and body ground when the brake pedal is depressed and released.

Standard:

Pedal condition	Tester connection	Specification
Depressed	STP (E11–19) – Body ground	10 to 14 V
Released	STP (E11–19) – Body ground	1 V or less



(d) Measure the voltage between terminal ST1– of ECM connector and body ground when the brake pedal is depressed and released.

Standard:

Pedal condition	Tester connection	Specification
Depressed	ST– (E11–12) – Body ground	1 V or less
Released	ST– (E11–12) – Body ground	10 to 14 V

NG → **REPLACE ECM (See page 01–32)**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC	P0607/54	CONTROL MODULE PERFORMANCE

CIRCUIT DESCRIPTION

This DTC indicates the internal abnormalities of ECM.

DTC No.	Detection Item	Trouble Area
P0607/54	The ECM has a supervisory CPU and control ECU inside. When each input STP signal is different for 0.15 sec. or more, the malfunction code is output. The malfunction code is output after 0.4 sec. have passed from the time the cruise cancel input signal (STP input) is input into the ECM. HINT: • When a malfunction code is detected, the fail safe must be kept on until the ignition switch is turned off.	• ECM

INSPECTION PROCEDURE

1	**REPLACE ECM (See page 01–32)**

056HG–05

PRE–CHECK

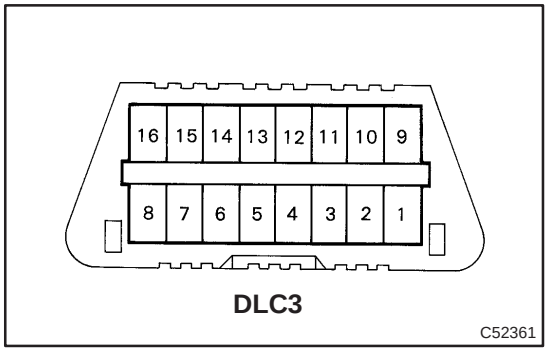
1. DIAGNOSIS SYSTEM

(a) Description

ECM controls of the cruise control the function on a vehicle.

Data stored in the cruise control memory and on the DTC can be read from the DLC3 on the vehicle. If CRUISE MAIN indicator light does not come on after the DTC check, there is a malfunction of the cruise control.

Use the hand–held tester or SST to check and solve the problem.



DLC3

(b) Check the DLC3.

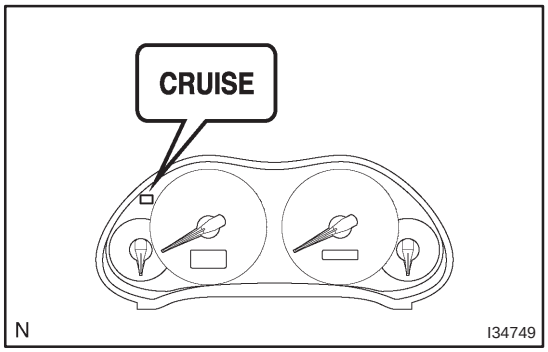
The vehicle's ECM uses ISO 9141–2(Euro–OBD)/ISO 14230 (M–OBD) for communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–3 and matches the ISO 9141–2 / ISO 14230 format.

Terminal No.	Connection/SpecifiedCondition	Condition
4	Chassis Ground ↔ Body Ground / 1 Ω or less	Always
7	Bus ⊕ Line / Pulse Generation	DuringCommunication
16	Battery Positive – Body Ground / 9 to 14 V	Always

HINT:

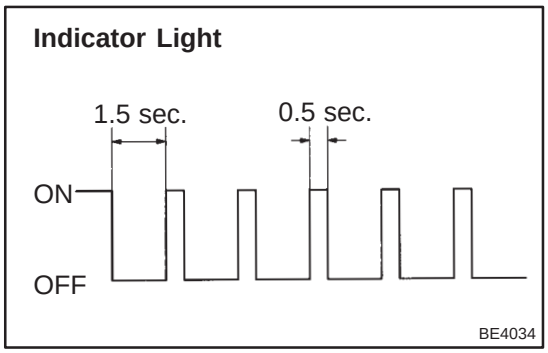
If the display shows "UNABLE TO CONNECT TO VEHICLE" after connecting the hand–held tester to the DLC3 and turning the ignition ON, there is a problem either with the vehicle or with the tool.

- If communication is normal when connecting the tool to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when connecting the tool to another vehicle, the problem is probably in the tool itself. Consult the Service Department listed in the tool's instruction manual.



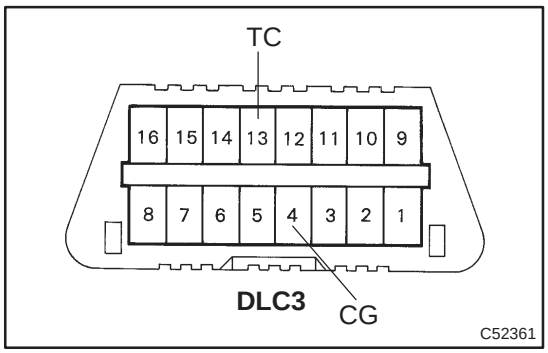
(c) Check the indicator.
(1) Turn the ignition switch to the ON position.
(2) Check that the CRUISE MAIN indicator light comes on when the main switch is ON, and that the indicator light goes off when the main switch is OFF.

HINT:
If there is a problem with the indicator, inspect the cruise main indicator light circuit (See page 05–1722).

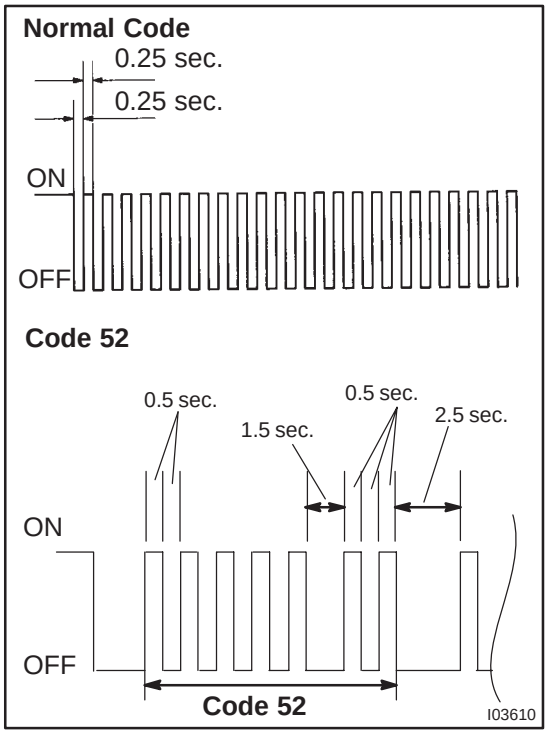


(d) Check the DTC.

HINT:
If a malfunction occurs in the vehicle speed sensors or stop lamp switch assy, etc. during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and then the CRUISE MAIN indicator light will start to blink, informing the driver of a malfunction. At the same time, data of the malfunction is stored as a diagnostic trouble code, or DTC.



(e) Output of the DTC using diagnosis check wire.
(1) Using SST, connect terminals TC and CG of DLC3.
SST 09843–18040
(2) Turn the ignition switch to the ON position.
(3) Read the DTC on the CRUISE MAIN indicator light.



HINT:
If the DTC is not output, inspect the cruise main indicator light circuit (See page 05–1722) and diagnosis circuit (See page 05–1729).
For example, the normal blinking pattern and the blinking pattern for code 52 are shown in the illustration.

2. USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:
Hand–held tester has a ”Snapshot” function which records the monitored data.
Refer to the hand–held tester operator’s manual for further details.

3. DATA LIST

HINT:
From the DATA LIST displayed by the the hand–held tester, you can read the value of the switch, the sensor and so on without removing parts. Reading the DATA LIST as the first step to troubleshooting is one way to shorten labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to the ON position.
(c) According to the display on the tester, read the ”DATA LIST”.

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
VEHICLE SPD	Vehicle speed / min.: 0 km/h (0 mph), max.: 255 km/h (158 mph)	Actual vehicle speed	–
MEMORY SPD	Stored vehicle speed / min.: 36 km/h (22 mph), max.: 200 km/h (124 mph)	Actual stored vehicle speed	–
THROTTLE	Required throttle opening angle / min.: 0°, max.: 125°	Actual required throttle opening	–
CRUISE CONTROL	Cruise control system active condition / ON or OFF	ON : Cruise control activated OFF : Cruise control inactivated	–
MAIN SW (MAIN)	Main SW signal (Main CPU) / ON or OFF	ON : Main SW ON (Pushed in) OFF: Main SW OFF (Pushed out)	”3”
MAIN SW (SUB)	Main SW signal (Sub CPU) / ON or OFF	ON : Main SW ON (Pushed in) OFF: Main SW OFF (Pushed out)	”3”
CCS READY M	Cruise control system standby condition (Main CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”
CCS READY S	Cruise control system standby condition (Sub CPU) / ON or OFF	ON – OFF : Change ON/OFF each time Main SW is pushed in.	”1”
CCS INDICATOR M	Cruise indicator signal (Main CPU) / ON or OFF	ON : ”CCS READY” ON OFF : ”CCS READY” OFF	”2”
CCS INDICATOR S	Cruise indicator signal (Sub CPU) / ON or OFF	ON : ”CCS READY” ON OFF : ”CCS READY” OFF	”2”
CANCEL SW	CANCEL SW signal / ON or OFF	ON : CANCEL SW ON OFF : CANCEL SW OFF	–
SET/COAST SW	COAST/SET SW signal / ON or OFF	ON : COAST/SET SW ON OFF : COAST/SET SW OFF	–
RES/ACC SW	ACCEL/RES SW signal / ON or OFF	ON : ACCEL/RES SW ON OFF : ACCEL/RES SW OFF	–
STP LIGHT SW2 M	Stop lamp SW signal (Main CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
STP LIGHT SW2 S	Stop lamp SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–

STP LIGHT SW1 S	Stop light SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
SHIFT D POS	PNP SW signal (D position) / ON or OFF	ON : Shift D position OFF : Except shift D position	–

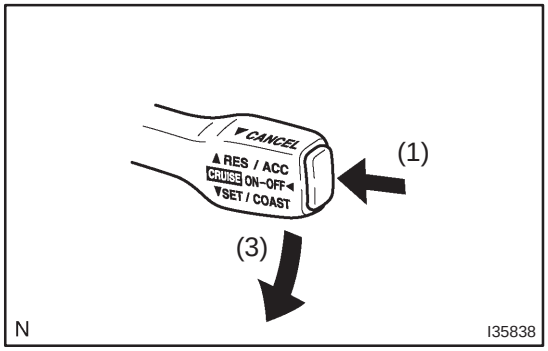
HINT:
”3” is OK but ”1” is NG → ECM failure
”1” is OK but ”2” is NG → DTC output or ECM failure
”3” is OK but cruise indicator does not turn on → CRUISE MAIN indicator or wire harness or ECM failure

4. DTC CLEAR

(a) The following methods will erase the DTCs and freeze frame data.
  (1) The hand–held tester can be used to erase the codes.
  (2) Disconnecting the battery terminals or EFI No.1 fuse can also erase the codes (1AZ–FSE). Disconnecting the battery terminals or EFI the fuse (1CD–FTV).

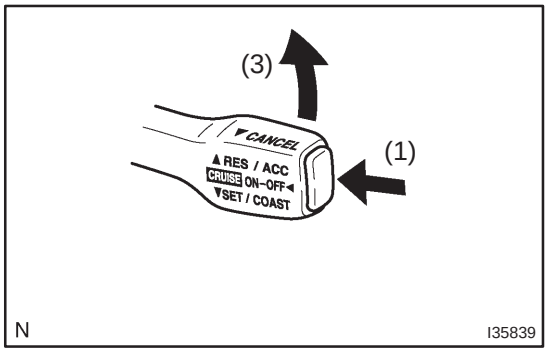
(b) After completing repairs, the DTC retained in the memory can be cleared by removing the EFI No.1 fuse for 1 minute or more with the ignition switch to the OFF position.

(c) Check that the normal code is displayed after connecting the fuse.

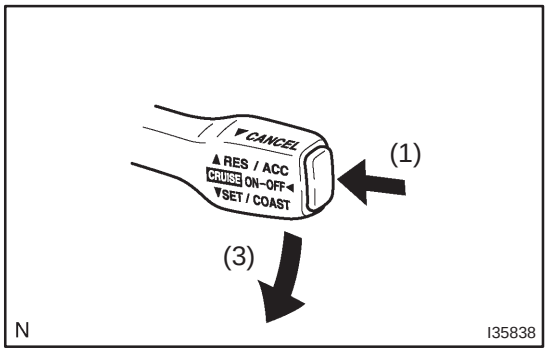


5. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)

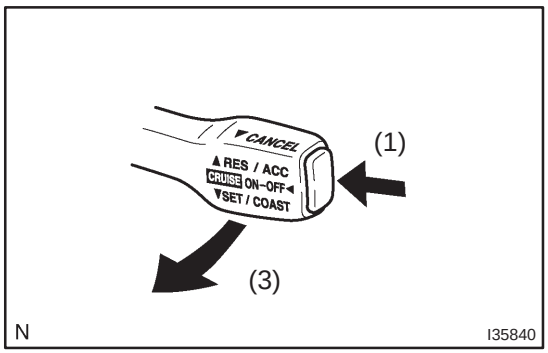
(a) Inspect the SET switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Push down the control switch to the SET/COAST position.
  (4) After releasing the switch, check that the vehicle cruises at the desired speed.



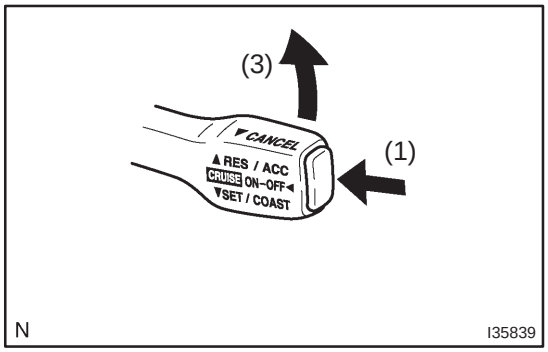
(b) Inspect the ’ACC’ switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed (40 km/h (25 mph) or higher).
  (3) Check that the vehicle speed increases when the control switch is pushed up to RES/ACC, and that the vehicle cruises at the set speed when the switch is released.
  (4) Push the control switch to RES/ACC, and then immediately release it. Check that the vehicle speed increases by about 1.6 km/h (Tap–up function).



(c) Inspect the 'COAST' switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) Check that the vehicle speed decreases while the control switch is pushed down to SET/COAST, and the vehicle cruises at the set speed when the switch is released.
(4) Push the control switch to SET/COAST, and then immediately release it. Check that the vehicle speed decreases by about 1.6 km/h (Tap–down function).



(d) Inspect the CANCEL switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) After doing one of the following, check that the cruise control system is cancelled and that the normal driving mode is resumed.
- Depressing the brake pedal.
- Depressing the clutch pedal (M/T).
- Shifting to any gear besides D (A/T).
- Pushing the main switch button to OFF.
- Pulling the control switch to CANCEL.



(e) Inspect the RESUME switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) After doing one of the following, check that the cruise control system is cancelled and that the normal driving mode is resumed.
- Depressing the brake pedal.
- Depressing the clutch pedal (M/T).
- Shift to any gear besides D (A/T).
- Pulling the control switch to CANCEL.

(4) After the control switch is press towards RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle resumes the same speed maintained before the cancellation.

056HK–05

PROBLEM SYMPTOMS TABLE

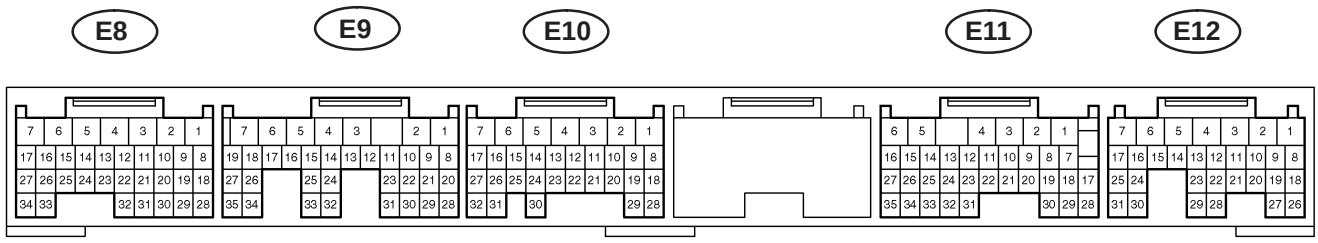
If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the related troubleshooting page.

Symptom	Suspect Area	See page
Main switch cannot be turned ON. (Cruise indicator light in combination meter is not lit.)	1. Cruise control switch circuit 2. CRUISE MAIN indicator light circuit 3. ECM	05–1718 05–1722 01–32
Setting of vehicle speed cannot be done. (Although indicator light in combination meter is lit when the main switch is turned ON, they go off when vehicle speed is set.)	1. Cruise control switch circuit 2. ECM	05–1718 01–32
Setting cannot be done. (Indicator light in combination meter is lit when the main switch is turned ON and they remain ON while setting.)	1. Cruise control switch circuit 2. Stop lamp switch circuit 3. Combination meter system 4. ECM	05–1718 05–1711 71–1 01–32
While the vehicle is driving with cruise control, the set control is canceled. (Indicator light and CRUISE remain ON.)	1. Cruise control switch circuit 2. Vehicle speed sensor circuit 3. Stop lamp switch circuit 4. CRUISE MAIN indicator light circuit 5. ECM	05–1718 05–1710 05–1711 05–1722 01–32
Hunting (Speed is not constant.)	1. Vehicle speed sensor circuit 2. ECM	05–1710 01–32
Setting cannot be cancelled. (When Coast, Acceleration, Resume, Set speed change and Control switch are operated.)	1. Cruise control switch circuit 2. CRUISE MAIN indicator light circuit 3. ECM	05–1718 05–1722 01–32
DTC is not output, or is output when should not be.	1. Diagnosis circuit 2. CRUISE MAIN indicator light circuit 3. ECM	05–1729 05–1722 01–32
CRUISE MAIN indicator light does not light up.	1. Cruise control switch circuit 2. CRUISE MAIN indicator light circuit 3. ECM 4. Combination meter	05–1718 05–1722 01–32 71–1

05ADL–02

TERMINALS OF ECM

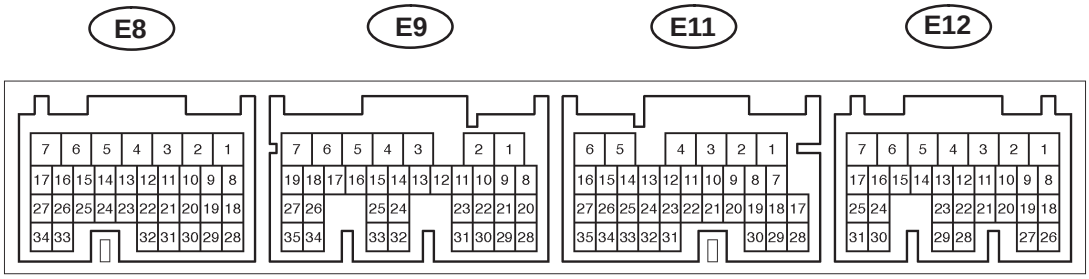
1AZ–FSE:



I34746

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
TC – E1 (E12–20 – E10–1)	W–L – BR	Ignition switch ON	10 to 14 V
		Ignition switch ON Connect terminals TC and CG of DLC3	Below 2 V
STP – E1 (E11–19 – E10–1)	G–W – BR	Ignition switch ON Depress brake pedal	10 to 14 V
		Ignition switch ON Release brake pedal	Below 1 V
IGSW – E1 (E12–9 – E10–1)	B–W – BR	Ignition switch ON Cruise control main switch ON	0 to 3 V
		Ignition switch ON Cruise control main switch OFF	9 to 14 V
ST1– – E1 (E11–12 – E10–1)	G–W – BR	Ignition switch ON Depress brake pedal	Below 1 V
		Ignition switch ON Release brake pedal	10 to 14 V
CCS – E1 (E11–24 – E10–1)	W – BR	Ignition switch ON	9 to 14 V
		Ignition switch ON CANCEL switch hold ON	6 to 10.1 V
		Ignition switch ON SET/COAST switch hold ON	4 to 7.1 V
		Ignition switch ON RES/ACC switch hold ON	2.1 to 4 V
		Ignition switch ON MAIN switch hold ON	Below 1 V

1CD–FTV:



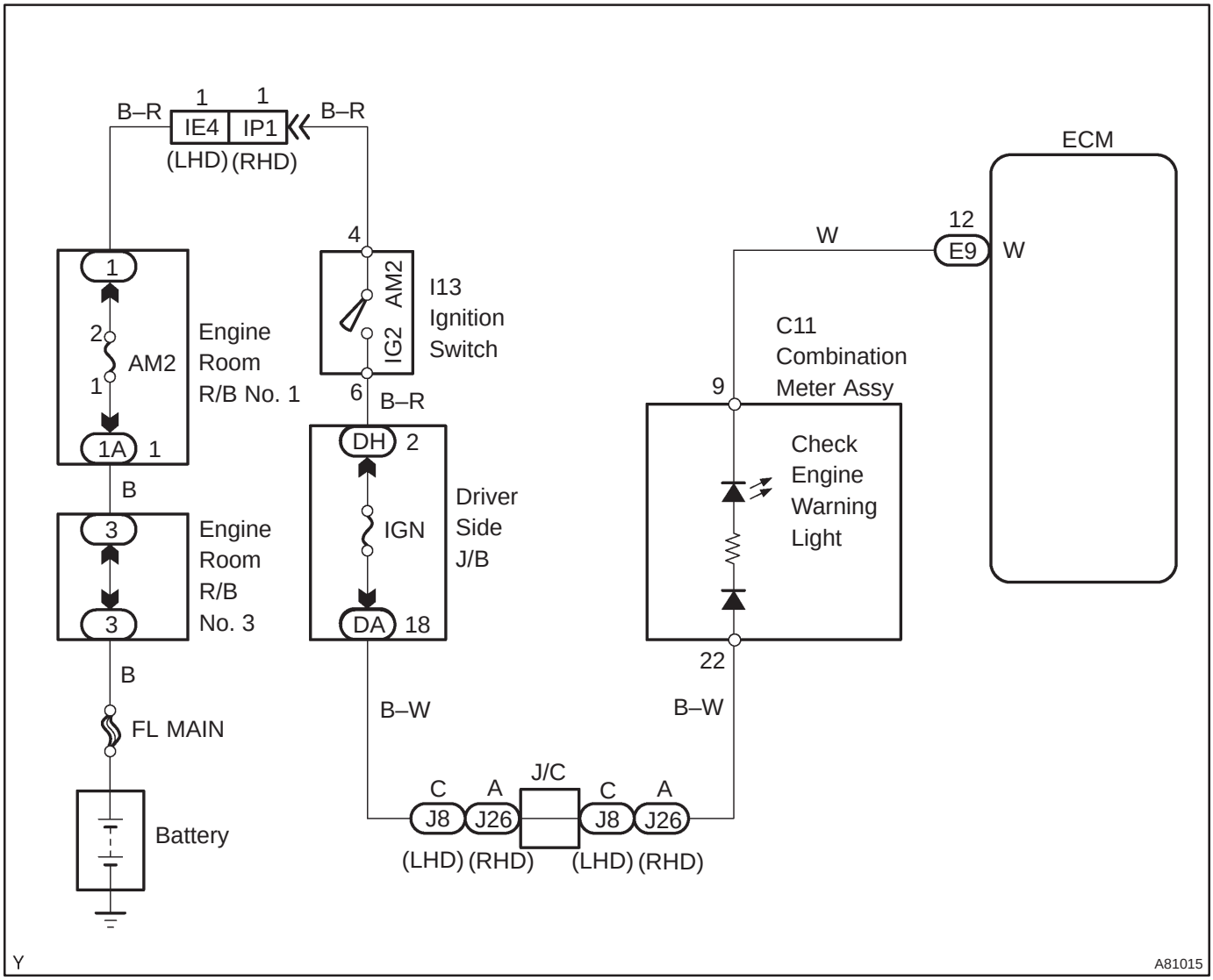
Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
STP – E1 (E11–19 – E9–7)	G–W – BR	Ignition switch ON Depress brake pedal	10 to 14 V
		Ignition switch ON Release brake pedal	Below 1 V
ST1– – E1 (E11–12 – E9–7)	G–W – BR	Ignition switch ON Depress brake pedal	Below 1 V
		Ignition switch ON Release brake pedal	10 to 14 V
CCS – E1 (E11–24 – E9–7)	W – BR	Ignition switch ON	9 to 14 V
		Ignition switch ON CANCEL switch hold ON	6 to 10.1 V
		Ignition switch ON SET/COAST switch hold ON	4 to 7.1 V
		Ignition switch ON RES/ACC switch hold ON	2.1 to 4 V
		Ignition switch ON MAIN switch hold ON	Below 1 V
M/T: D – E1 (E11–10 – E9–7)	LG–B – BR	Ignition switch ON Depress clutch pedal	Below 1 V
		Ignition switch ON Release clutch pedal	10 to 14 V
TC – E1 (E12–11 – E9–7)	W–L – BR	Ignition switch ON	10 to 14 V
		Ignition switch ON Connect terminals TC and CG of DLC3	Below 2 V

CHECK ENGINE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

If the ECM detects a trouble, the CHK ENG is illuminated. At this time, the ECM records the DTC in its memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below .

CHK ENG remains on	Start inspection from step 1
CHK ENG is not illuminated	Start inspection from step 3

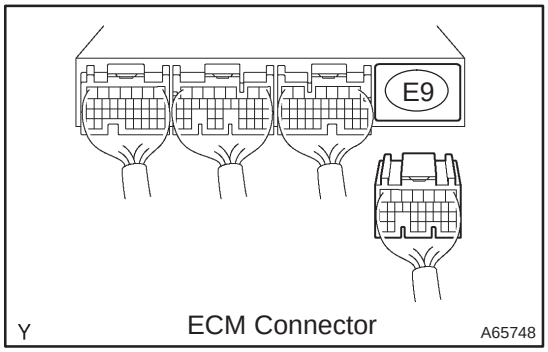
1	CLEAR DTC

(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Read the DTC (See page 05–528).
(d) Clear the DTC (See page 05–528).
(e) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated

OK → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE (See page 05–544)**

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E9 ECM connector.
(b) Turn the ignition switch ON.
(c) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated

OK → **REPLACE ECM (See page 10–65)**

NG

CHECK AND REPAIR HARNESS AND CONNECTOR

3	CHECK ENGINE WARNING LIGHT CONDITION

(a) Check that the CHK ENG is illuminated when the ignition switch is turned ON.
Standard: CHK ENG is illuminated

OK → **SYSTEM OK**

NG

4	INSPECT COMBINATION METER ASSY(CHECK ENGINE WARNING LIGHT CIRCUIT)

(a) See the combination meter troubleshooting on page 05–1509.

NG → **REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER – ECM)

054JC–04

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

Customer's Name		VIN	
Driver's Name		Production Date	
Date Vehicle Brought in		Licence No.	
License No.		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx.____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of check engine warning light (CHK ENG)		☐ Remains on	☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre–check)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

ECD SYSTEM (1CD–FTV)

05CP9–01

DESCRIPTION

1. COMMON RAIL SYSTEM

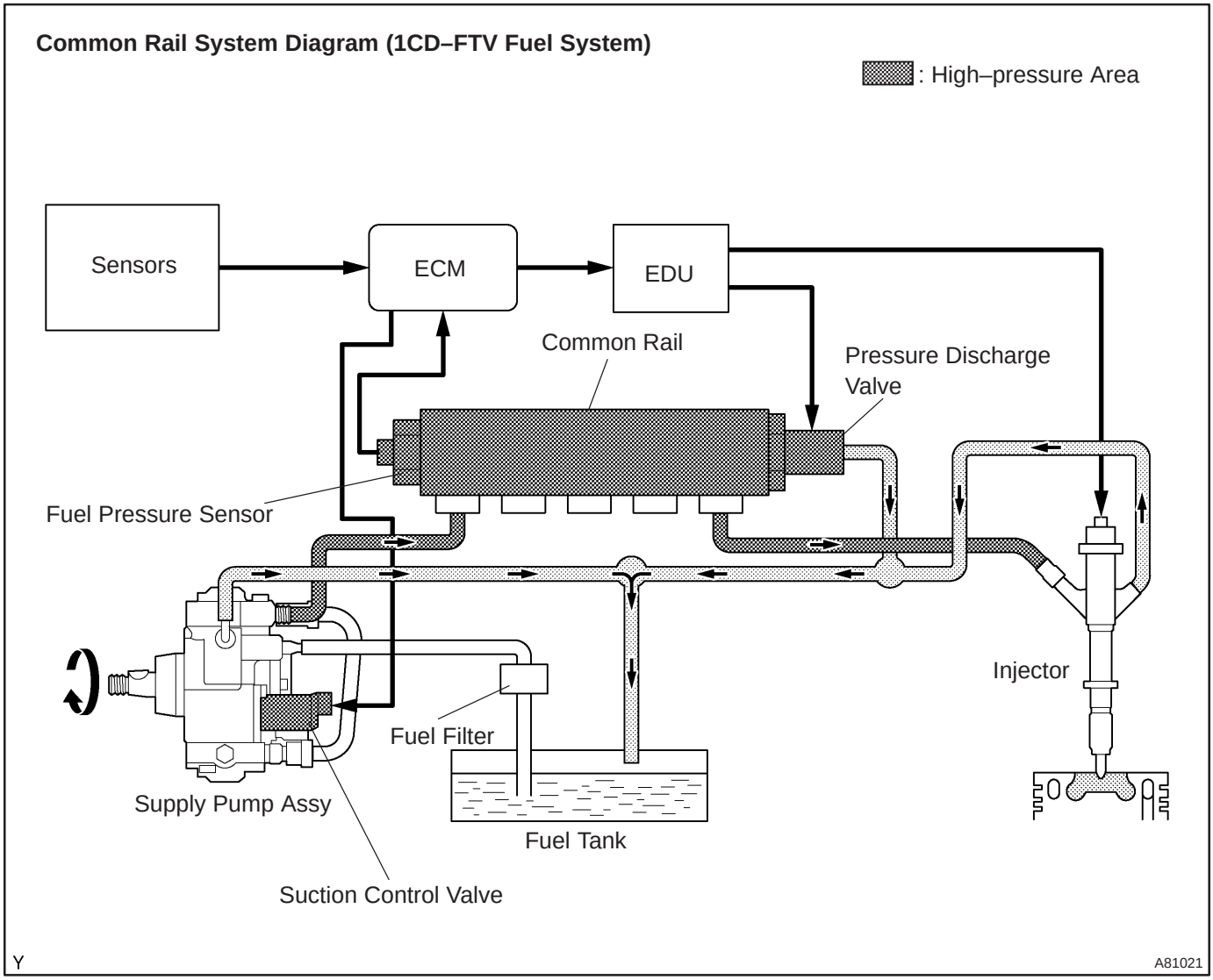
The common rail system stores high–pressure fuel supplied from the supply pump in the common rail and injects it using the injector. Fuel injection timing and fuel injection volume are regulated by the ECM; it provides an electric current to the solenoid valve of the injector with the EDU to regulate them.

By storing high–pressure fuel produced in the supply pump in the common rail, this system can always offer stable fuel injection pressure regardless of the engine speed and engine load, even if a driving speed is low. In addition, this system uses the injector that opens and closes its fuel passage with the Two–Way–Valve (TWV) therefore both the fuel injection time and volume are precisely regulated by the ECM.

The ECM monitors internal fuel pressure of the common rail with the fuel pressure sensor and commands the supply pump to supply fuel to obtain a target internal pressure (approximately 30 to 180 MPa (306 to 1,835 kgf/cm^2, 4,351 to 26,106 psi)). The ECM opens and closed the pressure discharge valve to improve controllability for the common rail internal fuel pressure.

This system has two divisional fuel injections. It performs ”pilot–injection” as subsidiary fuel injection prior to the main fuel injection to make combustion soft, and this helps to reduce engine vibration and noise.

Common Rail System Diagram (1CD–FTV Fuel System)

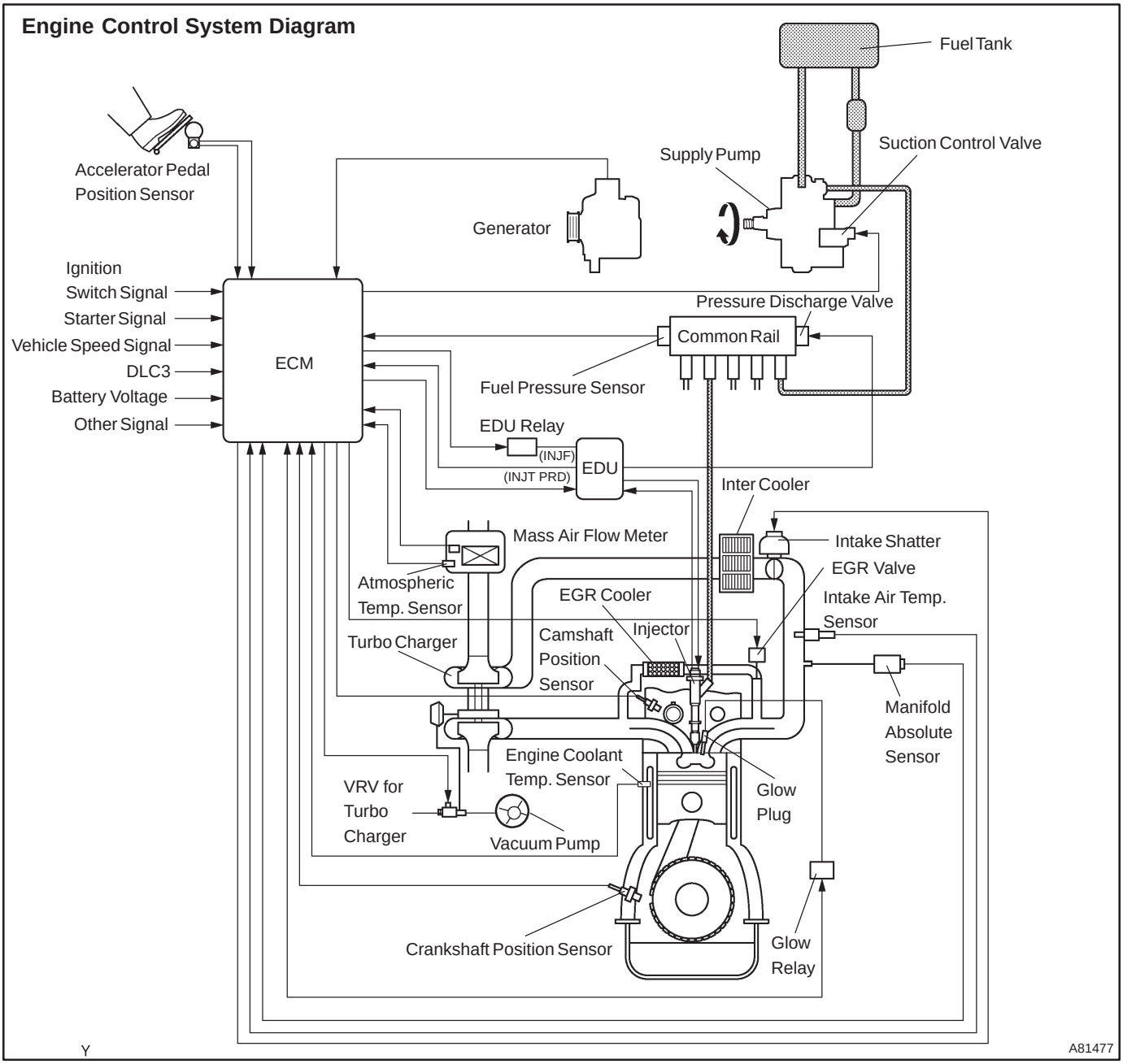


COMMON RAIL SYSTEM COMPONENTS:

Component	Description
Common rail	Store high–pressure fuel produced by the supply pump
Supply pump	Operated by the crankshaft, and supply high–pressure fuel to the common rail
Injector	Inject fuel to the combustion room based on signals from the ECM
Fuel pressure sensor	Monitor internal fuel pressure of the common rail and send signals to the ECM
Pressure discharge valve	Based on signals from the ECM, open the valve when sudden deceleration is occurred, or when the ignition switch is OFF to prevent the fuel pressure from being too high
Suction control valve	Based on signals from the ECM, adjust fuel volume supplied to the common rail and regulate the internal fuel pressure

2. ENGINE CONTROL SYSTEM

Engine Control System Diagram

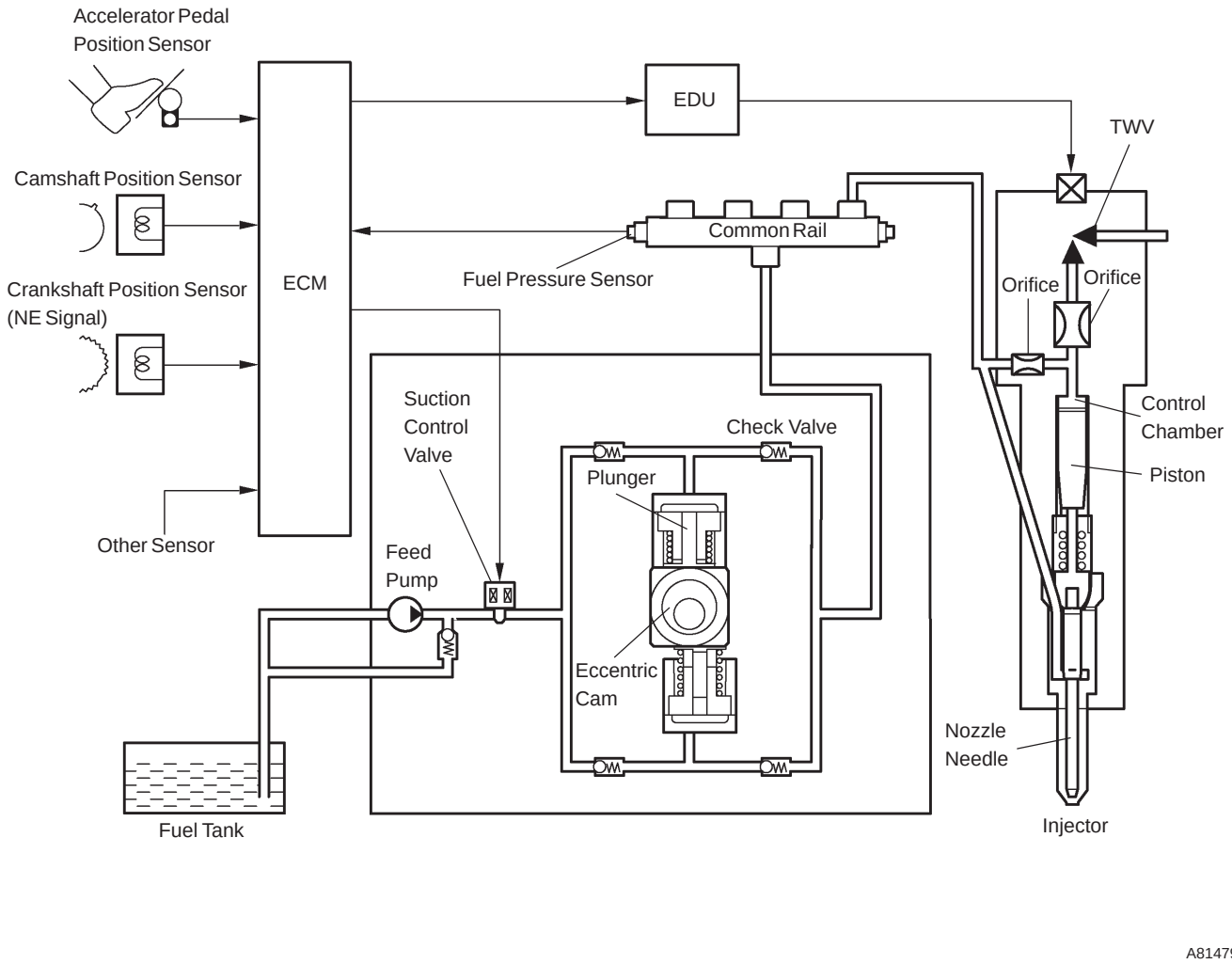


3. INJECTION CONTROL SYSTEM

The ECM controls the fuel injection system using the injector and the supply pump. The ECM determines the fuel injection volume and injection timing by controlling duration and timing of the energizing to the solenoid valve of the injector, and determines injection pressure by controlling the Suction Control Valve located on the supply pump.

The feed pump is used to pump fuel from the fuel tank into the supply pump.

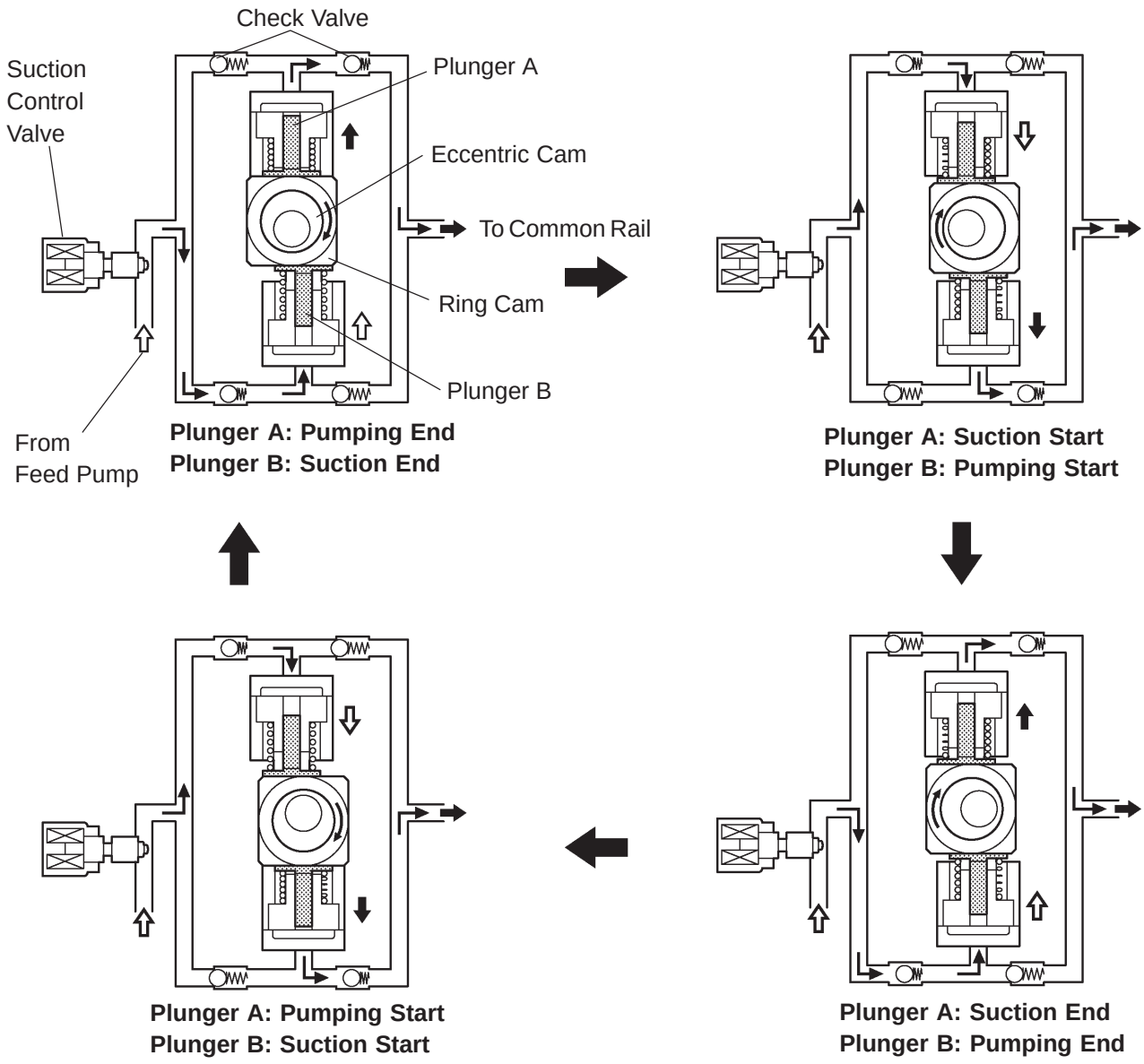
Injection Control Diagram



4. SUPPLY PUMP OPERATION SYSTEM

The rotation of the eccentric cam causes the ring cam pushes plunger A upward as illustrated below. The spring force pulls plunger B (which is located on opposite of plunger A) upward. As a result, plunger B draws fuel in, and plunger A pumps fuel at the same time.

Supply Pump Operation Diagram



5. SUCTION CONTROL VALVE OPERATION SYSTEM

HINT:

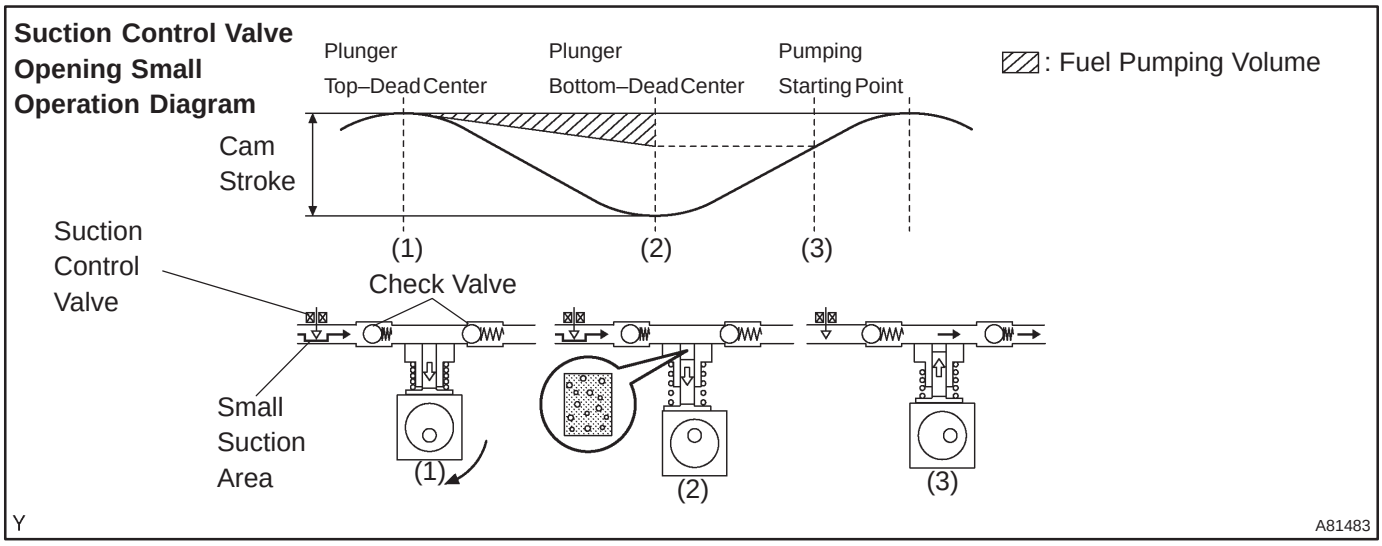
The ECM controls the suction control valve operation to regulate the fuel volume that is pumped by the supply pump to the common rail. Consequently, the fuel pressure in the common rail is controlled to the target injection pressure.

(a) Suction control valve opening small:

(1) When the opening of the suction control valve is small, the fuel suction area is kept small, therefore the transferble fuel volume is decreased.

(2) The suction volume becomes small due to the small suction area, despite the plunger stroke is full. Therefore, the difference of the volume between the geometry volume and the suction volume is in vacuum condition.

(3) Pumping will start at the time when the fuel pressure has become higher than the common rail pressure.

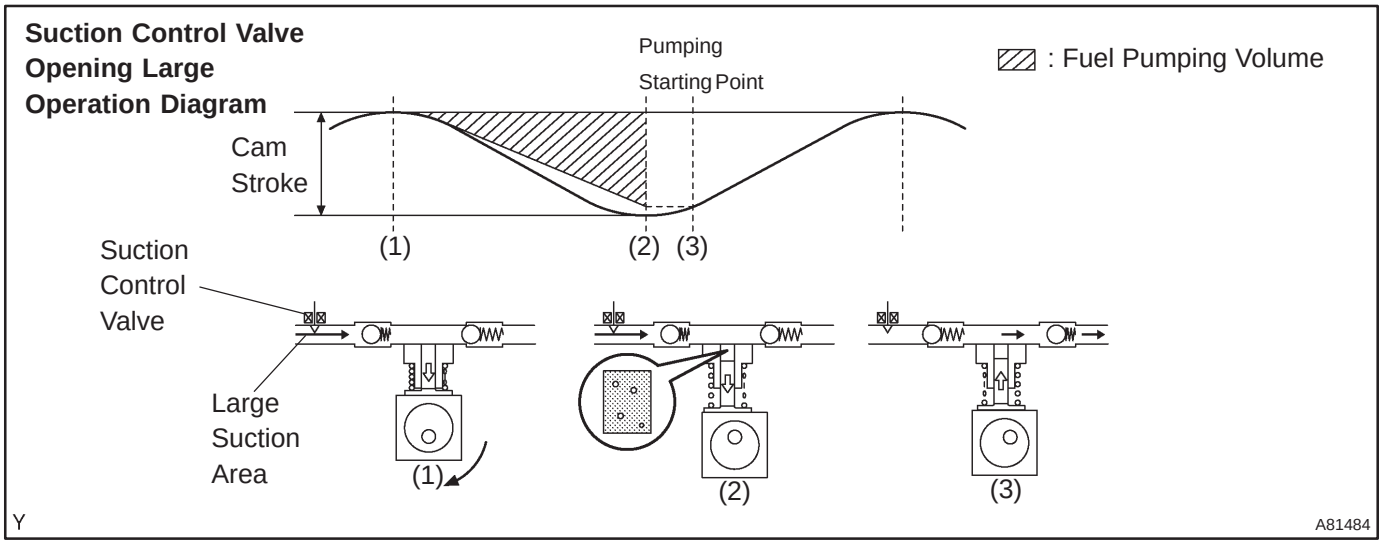


(b) Suction control valve opening large:

(1) When the opening of the suction control valve is large, the fuel suction area is kept large, therefore the transferble fuel volume is increased.

(2) If the plunger strokes fully, the suction volume will increase because the suction area is large.

(3) Pumping will start at the time when the fuel pressure has become higher than the common rail pressure.



6. DIAGNOSTICS TROUBLE CODE MATRIX FOR FUEL SYSTEM

HINT:

This matrix indicates typical DTC codes combinations for each malfunction occurrence.

( ): Potential DTC codes

DTC No.	A	B	C	D	E	F	G	H	I	J	K	L
P0087 (See page 05–557)				●								
P0088 (See page 05–563)					(●)		(●)	(●)	(●)			
P0093 (See page 05–570)	(●)	●			(●)	●					(●)	●
P0190 (See page 05–557)				●								
P0191 (See page 05–603)				●								
P0192 (See page 05–557)				●								
P0193 (See page 05–557)				●								
P0200 (See page 05–604)	●										(●)	
P0627 (See page 05–655)								●				
P1229 (See page 05–563)					(●)			●	●			
P1238 (See page 05–658)	●	●	●								(●)	
P1271 (See page 05–663)					●						(●)	
P1272 (See page 05–663)					●		●				(●)	

Trouble area	Malfunction	Refer to
Injector	Open or short in injector circuit	A
	Stuck open	B
	Stuck close	C
Fuel pressure sensor	Open or short in fuel pressure sensor circuit or pressure sensor output fixed	D
Pressure discharge valve	Open or short in pressure discharge valve circuit	E
	Stuck open	F
	Stuck close	G
Suction control valve	Open or short in suction control valve circuit	H
	Stuck open	I
	Stuck close	J
EDU	Faulty EDU	K
Common rail system (Fuel system)	Fuel leaks in high–pressure area	L

7. DIAGNOSTICS TROUBLE CODE DESCRIPTION

DTC No.	Description
P0087	Fuel pressure sensor output status at fixed value
P0088	Internal fuel pressure too high (200 MPa (2,039 kgf/cm^2, 29,007 psi) or more)
P0093	Fuel leaks in high–pressure area
P0190	Open or short in fuel pressure sensor circuit (Low or high output)
P0191	Fuel pressure sensor out of range (Low output)
P0192	Open or short in fuel pressure sensor circuit (High output)
P0193	Open or short in fuel pressure sensor circuit (Sensor 1 and/or 2 relation)
P0200	Open or short in EDU or injector circuit
P0627	Open or short in suction control valve circuit
P1229	Fuel over fed
P1238	Injection malfunction, exclude open or short in injector circuit
P1271	Open or short in pressure discharge valve circuit
P1272	Closed malfunction of the pressure discharge valve

054JD–04

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your readings due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in the check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the ''See page '' under the respective ''DTC No.'' in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0045 (05–554)	Turbo/Super Charger Boost Control Solenoid Circuit / Open	• VRV • Open or short in VRV circuit • ECM	○	○
P0087 (05–557)	Fuel Rail/System Pressure – Too Low	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM	○	○
P0088 (05–563)	Fuel Rail/System Pressure – Too High	• Supply pump • Pressure discharge valve • Short in Supply pump (suction control valve)circuit • Open pressure discharge valve circuit • ECM	○	○
P0093 (05–570)	Fuel System Leak Detected – Large Leak	• Fuel line between supply pump and common rail • Fuel line between common rail and injector • Supply pump • Common rail • Injector (P1238 is set simultaneously) • Pressure discharge valve • Open or short in EDU circuit (P0200 is set simultaneously) • Open or short in injector circuit (P0200 and P1238 are set simultaneously) • EDU (P0200 is set simultaneously) • ECM	○	○
P0095 (05–573)	Intake Air Temperature Sensor 2 Circuit	• Open or short in diesel turbo inlet air temp. sensor circuit • Diesel turbo inlet air temperature sensor • ECM	○	○
P0097 (05–573)	Intake Air Temperature Sensor 2 Circuit Low		○	○
P0098 (05–573)	Intake Air Temperature Sensor 2 Circuit High		○	○
P0100 (05–577)	Mass or Volume Air Flow Circuit	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (05–583)	Mass or Volume Air Flow Circuit Range/PerformanceProblem	• Mass air flow meter	○	○
P0102 (05–577)	Mass or Volume Air Flow Meter Circuit Low Input	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0103 (05–577)	Mass or Volume Air Flow Meter Circuit High Input		○	○
P0105 (05–584)	Manifold Absolute Pressure/ Barometric Pressure Circuit	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • Turbocharger assy • EGR valve assy • ECM	○	○
P0106 (05–588)	Manifold Absolute Pressure/ Barometric Pressure Circuit Range/PerformanceProblem	• Manifold absolute pressure sensor	○	○

P0107 (05–584)	Manifold Absolute Pressure/ Barometric Pressure Circuit Low Input	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • Turbocharger assy • EGR valve assy • ECM	○	○
P0108 (05–584)	Manifold Absolute Pressure/ Barometric Pressure Circuit High Input		○	○
P0110 (05–589)	Intake Air Temperature Circuit	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0112 (05–589)	Intake Air Temperature Circuit Low Input		○	○
P0113 (05–589)	Intake Air Temperature Circuit High Input		○	○
P0115 (05–593)	Engine Coolant Temperature Circuit	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0116 (05–597)	Engine Coolant Temperature Circuit Range/Performance Problem	• Cooling system • Engine coolant temperature sensor • Thermostat	○	○
P0117 (05–593)	Engine Coolant Temp. Circuit Low Input	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0118 (05–593)	Engine Coolant Temp. Circuit High Input		○	○
P0168 (05–598)	Fuel Temperature Too High	• Fuel temperature sensor	○	○
P0180 (05–599)	Fuel Temperature Sensor "A" Circuit	• Open or short in fuel temp. sensor circuit • Fuel temperature sensor • ECM	○	○
P0182 (05–599)	Fuel Temperature Sensor "A" Circuit Low Input		○	○
P0183 (05–599)	Fuel Temperature Sensor "A" Circuit High Input		○	○
P0190 (05–557)	Fuel Rail Pressure Sensor Circuit	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM	○	○
P0191 (05–603)	Fuel Rail Pressure Sensor CircuitRange/Performance	• Fuel pressure sensor	○	○
P0192 (05–557)	Fuel Rail Pressure Sensor Circuit Low Input	• Open or short in fuel pressure sensor • Fuel pressure sensor • ECM	○	○
P0193 (05–557)	Fuel Rail Pressure Sensor Circuit High Input		○	○
P0200 (05–604)	Injector Circuit / Open	• Open or short in EDU circuit • Injector • EDU • ECM	○	○
P0234 (05–612)	Turbo/Super Charger Overboost Condition	• VRV • Open or short in VRV circuit • Turbocharger • EGR valve • Vacuum hose • ECM	○	○
P0299 (05–612)	Turbo/Super Charger Underboost		○	○
P0335 (05–616)	Crankshaft Position Sensor "A" Circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft timing pulley) • ECM	○	○
P0339 (05–616)	Crankshaft Position Sensor "A" CircuitIntermittent		—	○
P0340 (05–620)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • ECM	○	○

P0380 (05–622)	Glow Plug/Heater Circuit "A"	• Open or short in glow plug circuit • Glow fuse • Glow relay • Glow plug • ECM	○	○
P0400 (05–629)	Exhaust Gas Recirculation Flow	• EGR valve assy • EGR passage • Open or short in EGR circuit • ECM	○	○
P0403 (05–629)	Exhaust Gas Recirculation Control Circuit		○	○
P0488 (05–633)	Exhaust Gas Recirculation Throttle Position Control Range/ Performance	• Open or short in intake shutter circuit • Open or short in fully opened switch circuit • Intake shutter • ECM	○	○
P0500 (05–640)	Vehicle Speed Sensor "A"	• Open or short in speed sensor circuit • Speed sensor • Combinationmeter • ECM • Skid control ECU	○	○
P0504 (05–643)	Brake Switch "A"/"B" Correlation	• Short in stop lamp switch signal circuit • Stop lamp switch • ECM	—	○
P0560 (05–647)	System Voltage	• Open in back–up power source circuit • ECM	○	○
P0606 (05–650)	ECM/PCM Processor	• ECM	—	—
P0607 (05–650)	Control Module Performance		○	○
P0622 (05–651)	Generator Field "F" Terminal Circuit	• Open in generator circuit • Generator • Drive belt • ECM	○	○
P0627 (05–655)	Fuel Pump Control Circuit / Open	• Open or shot in suction control valve circuit • Suction control valve • ECM	○	○
P1229 (05–563)	Fuel Pump System	• Short in supply pump (suction control valve) circuit • Suction control valve • ECM	○	○
P1238 (05–658)	Injector Malfunction	• Injector • EDU (P0200 is set simultaneously) • Open or short in engine wire (P0200 is set simultaneously) • Connector connection (P0200 is set simultaneously) • Compression pressure • Valve clearance • Valve timing • ECM	○	○
P1251 (05–612)	Turbo/Super Charger Overboost Condition (Too High)	• VRV • Open or short in VRV circuit • Turbocharger • EGR valve • Vacuum hose • ECM	○	○
P1271 (05–663)	Fuel Regulator Circuit Malfunction (EDU Drive)	• Open or short in pressure discharge valve circuit • Open or short in pressure discharge valve it self • EDU • ECM	○	○
P1272 (05–663)	Fuel Pressure Regulator Malfunction	• Open or short in pressure discharge valve circuit (P1271 is set simultaneously) • Pressure discharge valve • Supply pump • ECM	○	○

P1601 (05–673)	Injector Correction Circuit Malfunction (EEPROM)	• Injector compensation code • ECM	○	○
P1611 (05–650)	IC Circuit Malfunction	• ECM	○	○
P2120 (05–674)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P2121 (05–681)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	• Accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P2122 (05–674)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P2123 (05–674)	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input		○	○
P2125 (05–674)	Throttle/Pedal Position Sensor/ Switch "E" Circuit		○	○
P2127 (05–674)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input		○	○
P2128 (05–674)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input		○	○
P2138 (05–674)	Throttle/Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation		○	○
P2226 (05–684)	Barometric Pressure Circuit	• ECM	○	○
P2227 (05–685)	Barometric Pressure Circuit Range/Performance		○	○
P2228 (05–685)	Barometric Pressure Circuit Low Input		○	○
P2229 (05–685)	Barometric Pressure Circuit High Input		○	○
B2799 (05–1625)	Engine Immobiliser System Malfunction	• Immobiliser system	—	○

*1: Check engine warning light (CHK ENG) is illuminated

ECM POWER SOURCE CIRCUIT

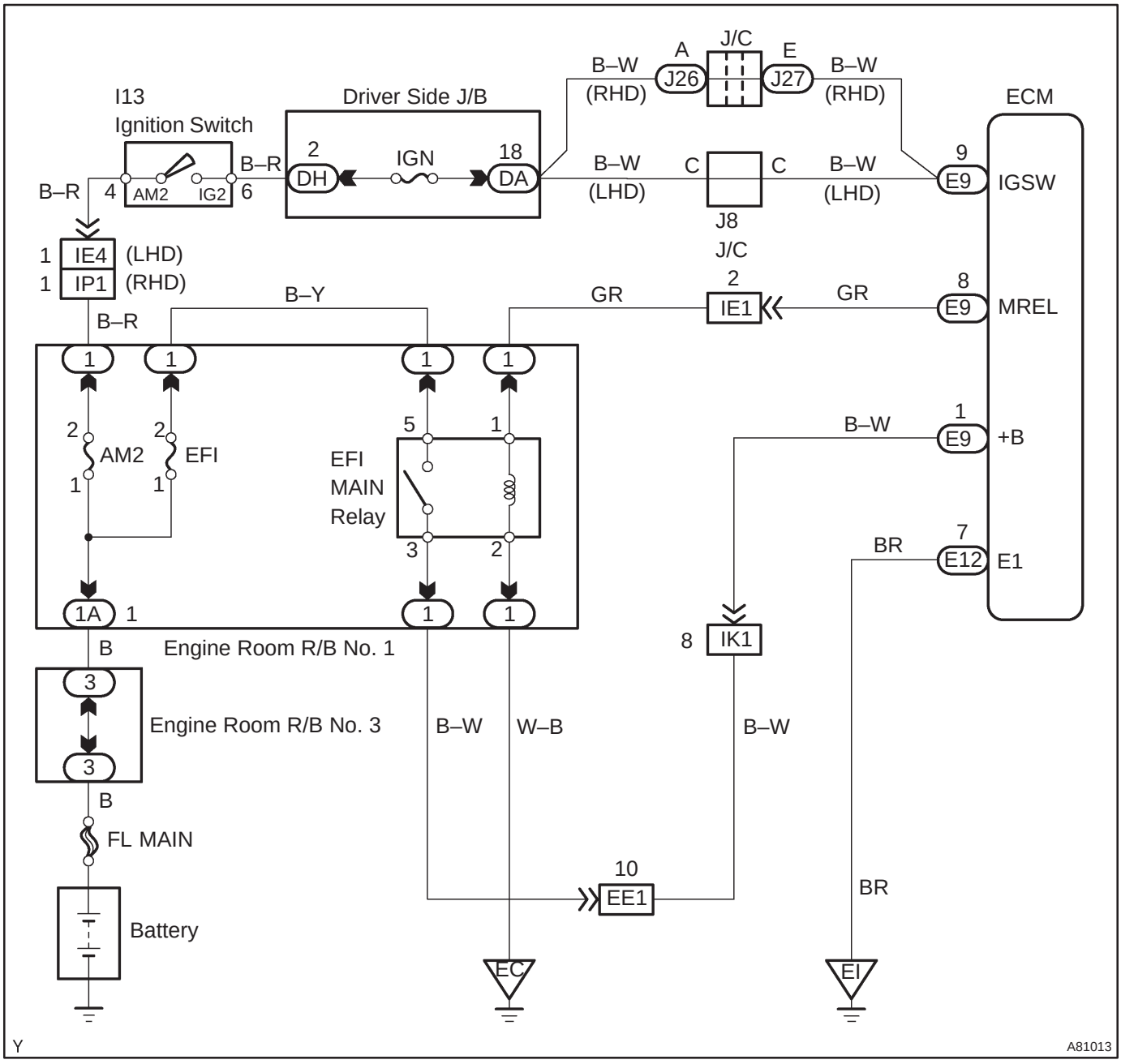
CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to terminal IGSW of the ECM and the EFI MAIN relay (Marked: EFI MAIN) control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EFI MAIN relay.

This signal causes current to flow to the coil, closing the contacts of the EFI MAIN relay and supplying power to terminal +B of the ECM.

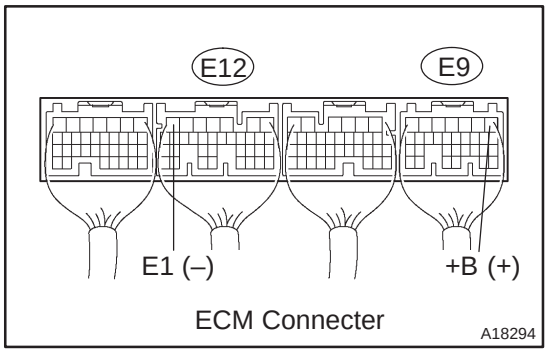
If the ignition switch is turned off, the ECM continues to switch on the EFI MAIN relay for a maximum of 2 seconds for the initial setting of the throttle valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM(+B VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 and E12 ECM connectors.

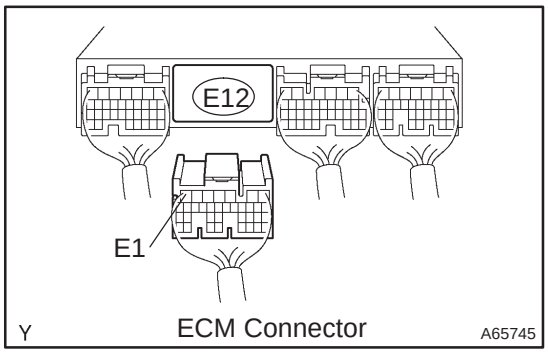
Standard:

Symbols (Terminal No.)	Specified condition
+B (E9–1) – E1 (E12–7)	9 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–551)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM – BODY GROUND)



(a) Disconnect the E12 ECM connector.
(b) Check for continuity between the wire harness side connectors.

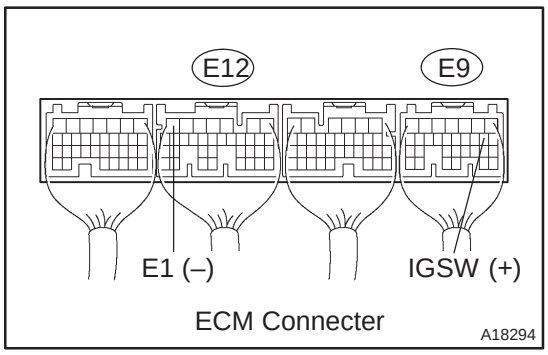
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
E1 (E12–7) – Body ground	Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM(IGSW VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 and E12 ECM connectors.

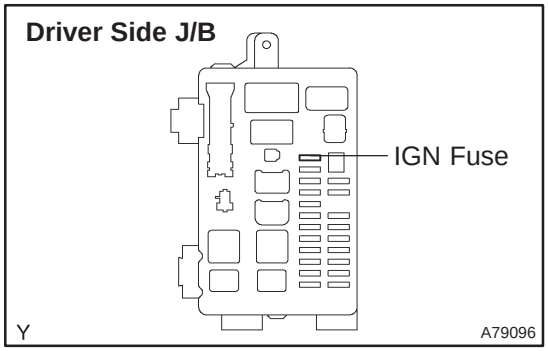
Standard:

Symbols (Terminal No.)	Specified condition
IGSW (E9–9) – E1 (E12–7)	9 to 14 V

OK → **Go to step 6**

NG

4 CHECK FUSE(IGN FUSE)

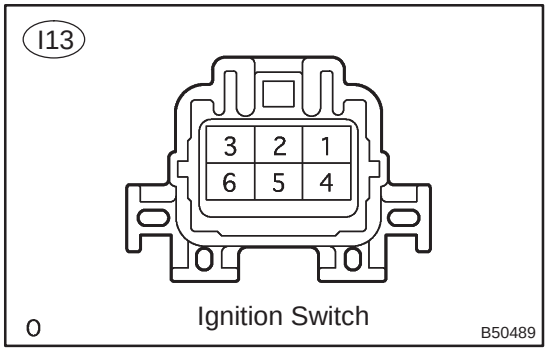


(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

5 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Measure the for continuity between the connector terminals shown in the chart below.

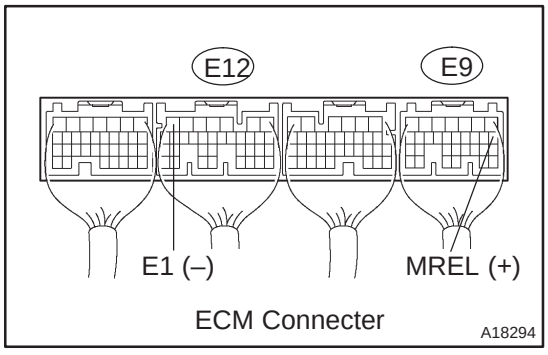
Switch	Terminal No.	Resisitance
LOCK	All Terminals	No continuity
ACC	1–3	Continuity
ON	1–2, 1–3, 2–3, 5–6	Continuity
START	4–5, 4–6, 5–6, 1–2	Continuity

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (BATTERY – IGNITION SWITCH, IGNITION SWITCH – ECM)

6 INSPECT ECM(MREL VOLTAGE)



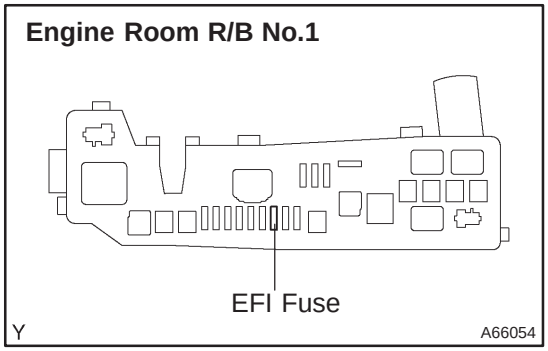
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 and E12 ECM connectors.
Standard:

Symbols (Terminal No.)	Specified condition
MREL (E9–8) – E1 (E12–7)	9 to 14 V

NG → **REPLACE ECM (See page 10–65)**

OK

7 CHECK FUSE(EFI FUSE)

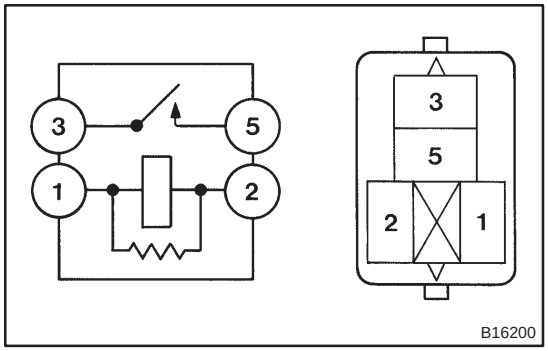


(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

8 INSPECT EFI MAIN RELAY



(a) Remove the EFI MAIN relay from the engine room R/B No.1.
(b) Inspect the EFI MAIN relay.
Standard:

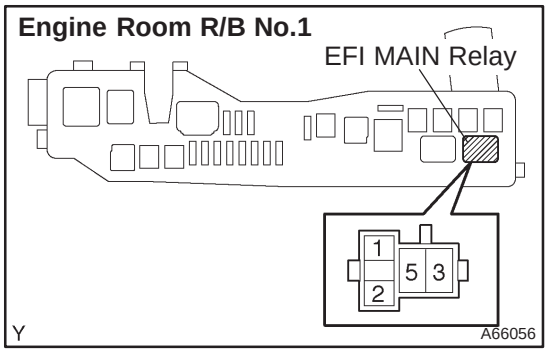
Terminal No.	Condition	Specified condition
1 – 2	Constant	Continuity
3 – 5	Usually	No Continuity
	Apply B+ between Terminals 1 and 2	Continuity

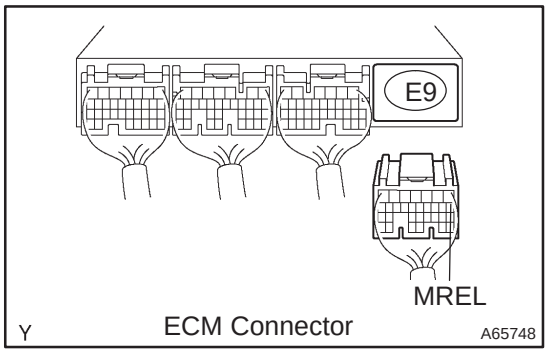
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI MAIN RELAY**

OK

9	CHECK HARNESS AND CONNECTOR(EFI MAIN RELAY – ECM, EFI MAIN RELAY – BODY GROUND)





(a) Check the harness and connector between the EFI MAIN relay and ECM connector.
  (1) Remove the EFI MAIN relay from the engine room R/B No.1.
  (2) Disconnect the E9 ECM connector.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI MAIN relay (1) – MREL (E9–8)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI MAIN relay (1) or MREL (E9–8) – Body ground	No continuity

(b) Check the harness and connector between the EFI MAIN relay and body ground.
  (1) Remove the EFI MAIN relay from the engine room R/B No.1.
  (2) Check for continuity between the wire harness side connector and body ground.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI MAIN relay (2) – Body ground	Continuity

OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

CHECK AND REPAIR HARNESS AND CONNECTOR (TERMINAL +B OF ECM – BATTERY POSITIVE TERMINAL)

054JB–04

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–527)

3	CONNECT THE HAND–HELD TESTER TO DLC3

HINT:
If the display indicates a communication fault in the tool, inspect DLC3.

4	CHECK DTC AND FREEZE FRAME DATA (See page 05–528)

HINT:
Record or print DTC and freeze frame data, if needed.

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05–528)

6	VISUAL INSPECTION

7	SETTING THE CHECK (TEST) MODE DIAGNOSIS (See page 05–528)

8	PROBLEM SYMPTOM CONFIRMATION

HINT:
If the engine does not start, perform steps 10 and 12 first.

A	Malfunction does not occur
B	Malfunction occurs

B	GO TO STEP 10

A

9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05–528)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	DTC CHART (See page 05–544)

GO TO STEP 14

12	BASIC INSPECTION (See page 05–528)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	PROBLEM SYMPTOMS TABLE (See page 05–551)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05–686)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)

GO TO STEP 18

17	PARTS INSPECTION

18	IDENTIFICATION OF PROBLEM

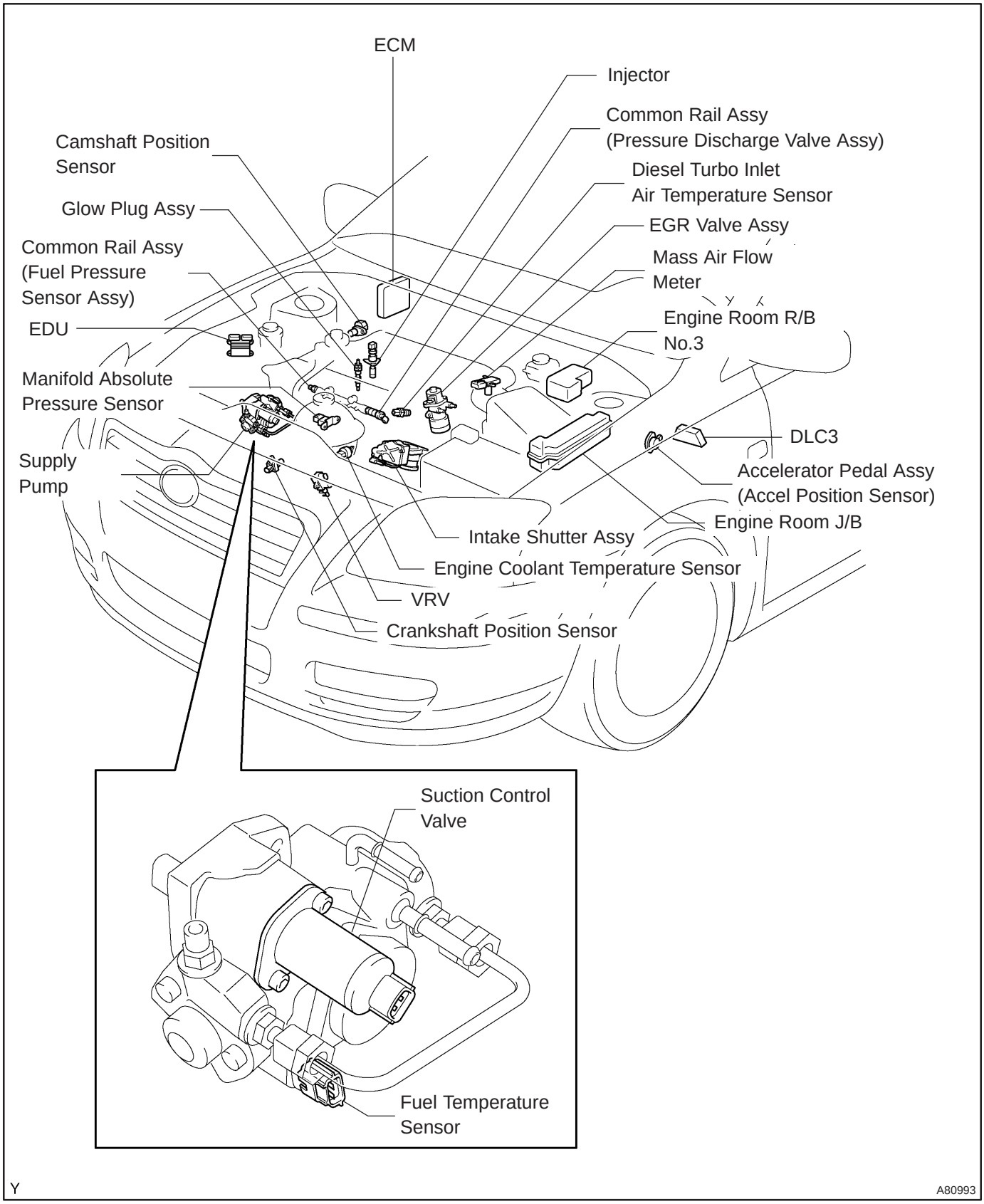
19	ADJUSTMENT, REPAIR

20	CONFIRMATION TEST

END

054JE–04

LOCATION



Y

A80993

DTC	P0045	TURBO/SUPER CHARGER BOOST CONTROL SOLENOID CIRCUIT / OPEN

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0045	Open or short in VRV circuit for 0.5 sec. or more (1 trip detection logic)	• VRV • Open or short in VRV circuit • ECM

WIRING DIAGRAM

Refer to DTC P0234 on page 05–612.

INSPECTION PROCEDURE

HINT:

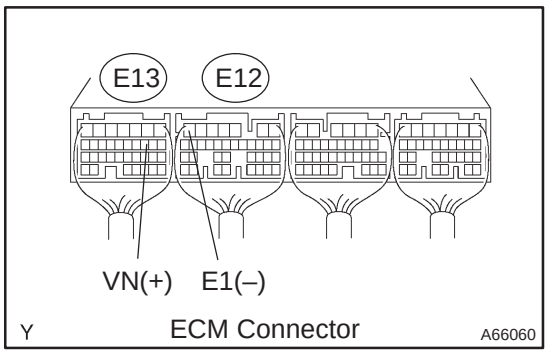
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	INSPECT VACUUM REGULATING VALVE ASSY (See page 12–16)

NG → REPLACE VACUUM REGULATING VALVE ASSY

OK

2	INSPECT ECM(VN VOLTAGE)

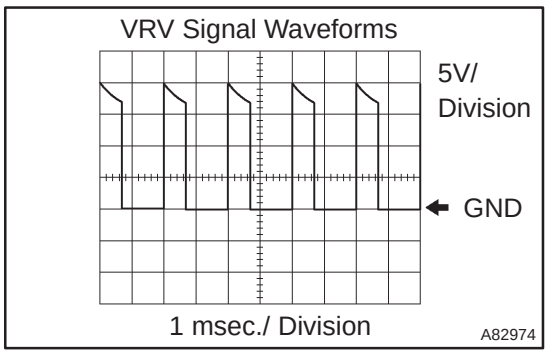


(a) Inspect using the oscilloscope.

(b) During idling, check the waveform between terminals E12 and E13 of the ECM connectors.

Standard:

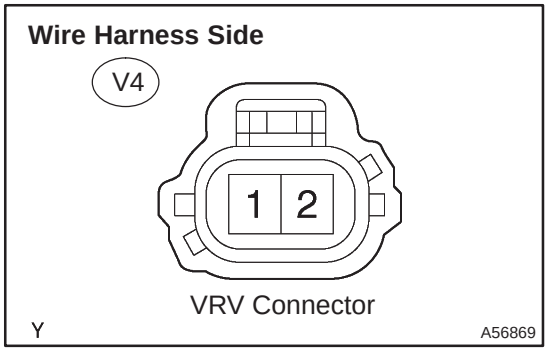
Symbols (Terminal No.)	Specified condition
VN (E13–10) – E1 (E12–7)	Correct waveform is as shown

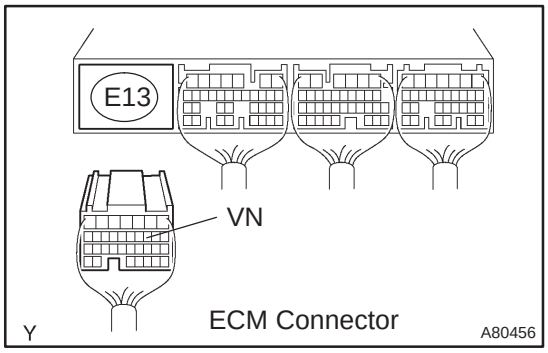


NG → REPLACE ECM (See page 10–65)

OK

3 CHECK HARNESS AND CONNECTOR(VRV – ECM)





(a) Disconnect the V4 VRV connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VN (E13–10) – (V4–2)	Continuity

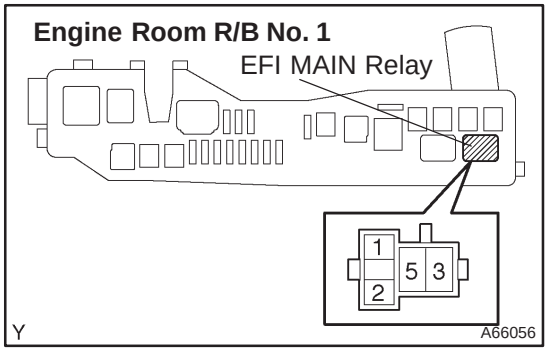
Standard (Check for short):

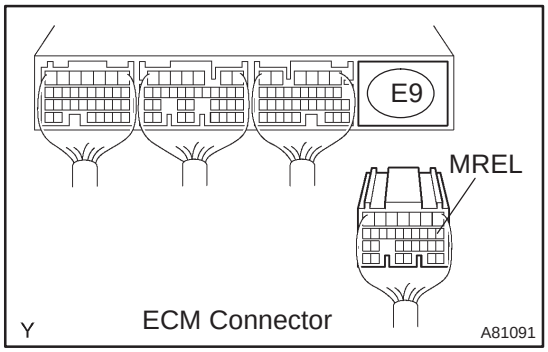
Symbols (Terminal No.)	Specified condition
VN (E13–10) or (V4–2) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 CHECK HARNESS AND CONNECTOR(VRV – EFI MAIN RELAY)





(a) Check the harness and connector between the EFI main relay and ECM connector.

(1) Remove the EFI MAIN relay from the engine room R/B No. 1.

(2) Disconnect the E9 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI main relay (1) – MREL (E9–8)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI main relay (1) or MREL (E9–8) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–65)

DTC	P0087	FUEL RAIL/SYSTEM PRESSURE – TOO LOW

DTC	P0190	FUEL RAIL PRESSURE SENSOR CIRCUIT

DTC	P0192	FUEL RAIL PRESSURE SENSOR CIRCUIT LOW INPUT

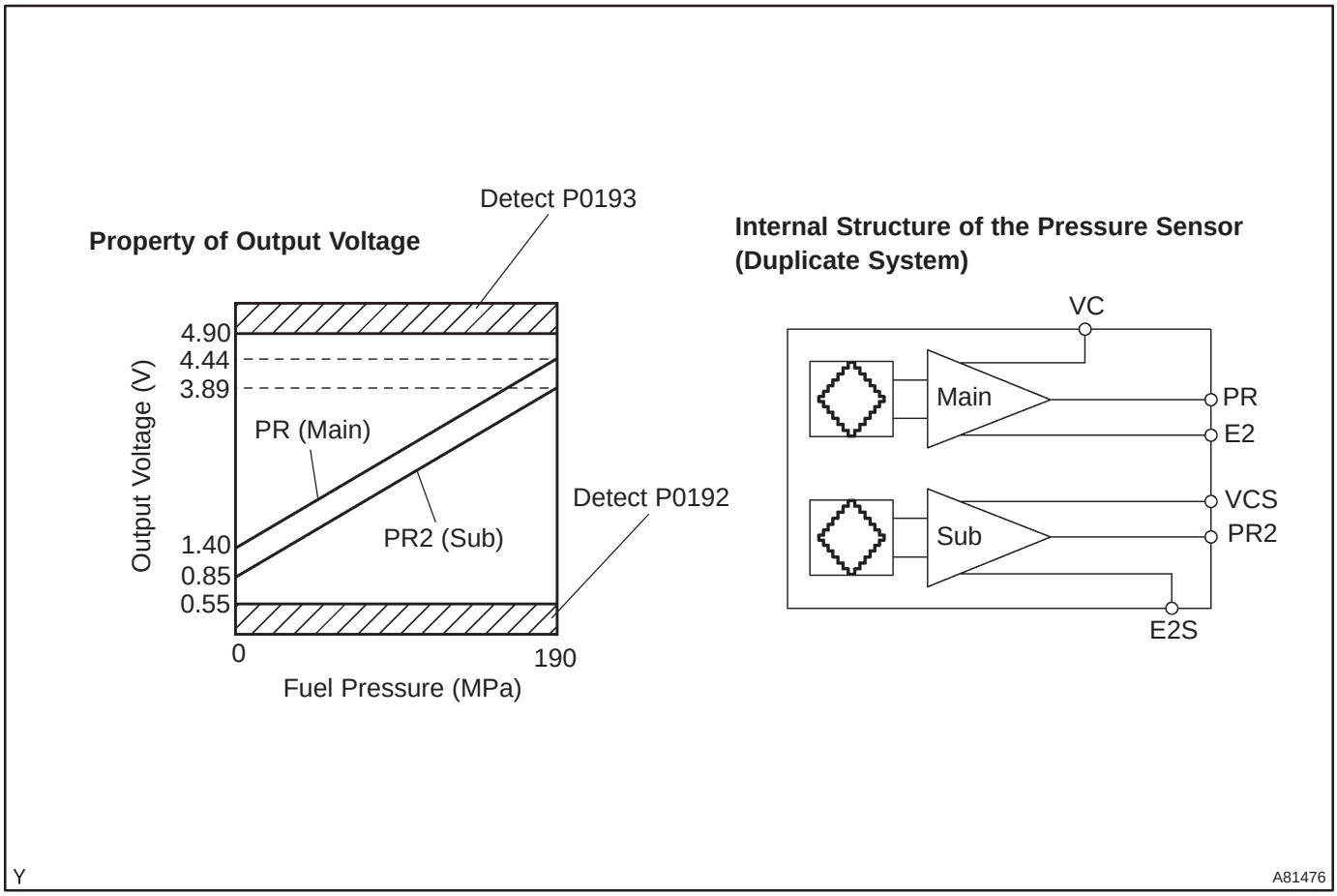
DTC	P0193	FUEL RAIL PRESSURE SENSOR CIRCUIT HIGH INPUT

HINT:

- For more information on the fuel pressure sensor and the common rail system, see page 05–517.
- If P0087, P0190, P0192 and/or P0193 are present, use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

The ECM monitors internal fuel pressure of common rail using the fuel pressure sensor and controls the suction control valve to regulate the internal pressure to the target pressure(approx. 30 to 180 MPa (306 to 1,835 kgf/cm^2, 4.351 to 26,106 psi)).
The pressure sensor is a semiconductor pressure sensor that varies electric resistance when applying pressure to its silicon. This sensor outputs voltage in proportion to the internal fuel pressure. The sensor has been designed as a duplicate circuit, and its main (PR) circuit is used under normal condition. Even if either sensor is failed, another normal sensor will be used to monitor the internal fuel pressure.



DTC No.	DTC Detection Condition	Trouble Area
P0087	Fuel pressure sensor output stays at fixed value.	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM
P0190	Condition (a) continues for 0.5 sec.: (c) Fuel pressure sensor output voltage is "0.55 V or less" or "4.9 V or more".	
P0192	Condition (a) continues for 0.5 sec.: (a) Fuel pressure sensor output voltage is 0.55 V or less.	
P0193	Condition (a) continues for 0.5 sec.: (a) Fuel pressure sensor output voltage is 4.9 V or more.	

HINT:
After confirming DTC "P0087, P0190, P0192 and P0193", use the hand–held tester to confirm internal the fuel pressure of the common rail from the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS".

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

MONITOR DESCRIPTION

P0087 (Fuel pressure sensor output stays at fixed value):

Under normal condition, internal fuel pressure of the common rail usually fluctuates 1 to 2 MPa (10 to 20 kgf/cm^2, 145 to 290 psi) even if the driving condition is constant. The internal fuel pressure is approximately 30 to 40 MPa (306 to 408 kgf/cm^2, 4,351 to 5,801 psi) at idling, and it increases to approx. 50 to 100 MPa (510 to 1,020 kgf/cm^2, 7,251 to 14,503 psi) when running the engine at 2,500 rpm. This DTC code is set if there is no fluctuation at the internal fuel pressure.

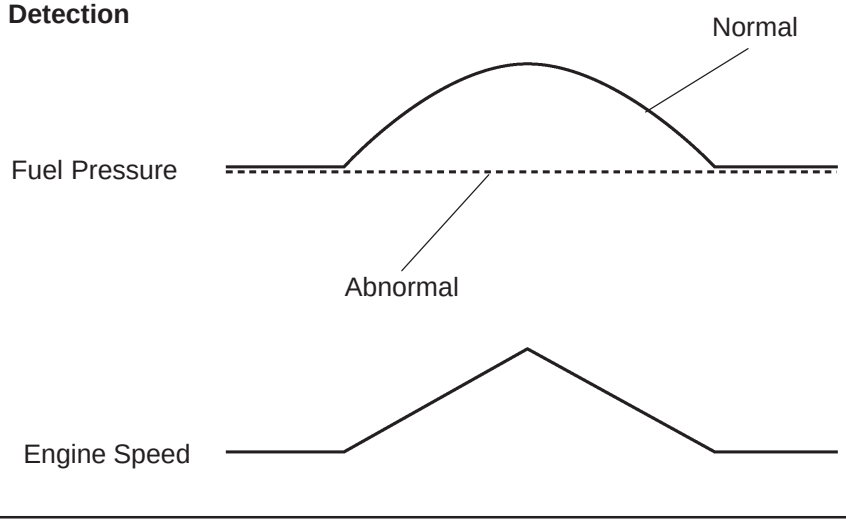
If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

P0190, P0192 and P0193 (Open or short in fuel pressure sensor circuit):

These DTCs are set if the fuel pressure sensor output voltage is out of the standard range. The DTCs stand for open or short malfunction of the sensor circuit.

If these DTCs are present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

P0087 Malfunction Detection



MONITOR STRATEGY

P0087:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 sec.
CHK ENG operation	1 driving cycle

P0190:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	0.5 sec.
CHK ENG operation	1 driving cycle

P0192:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	0.5 sec.
CHK ENG operation	1 driving cycle

P0193:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	0.5 sec.
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

P0087:

Item	Specification	
	Minimum	Maximum
Engine speed	500 rpm	–
Battery voltage	8 V	–
Fuel quantify	5 mm^3/st	–
The monitor will not run if the fuel pressure sensor circuit (P0190, P0192 and P0193) is malfunction		

TYPICAL MALFUNCTION THRESHOLDS

P0087:

Detection Criteria	Threshold
Changing value of fuel pressure	Virtually no fluctuation

P0190:

Detection Criteria	Threshold
Fuel pressure sensor output voltage	Less than 0.55 V or more than 4.9 V

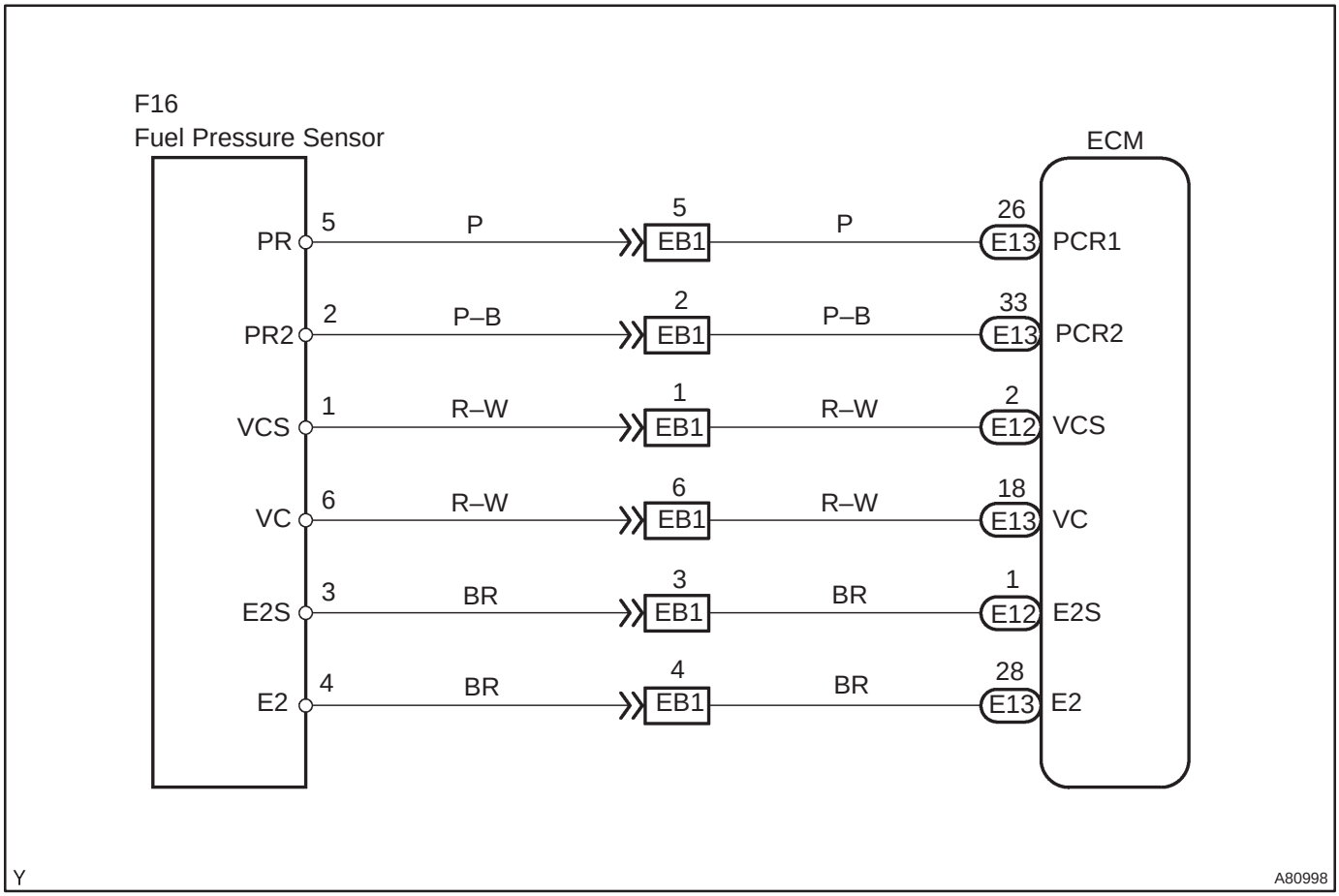
P0192:

Detection Criteria	Threshold
Fuel pressure sensor output voltage	Less than 0.55 V

P0193:

Detection Criteria	Threshold
Fuel pressure sensor output voltage	More than 4.9 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- After completing repair, confirm P0087 is not set again.
- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(FUEL PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.
(e) Check that internal fuel pressure of the common rail is within specification below.
Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

NG → **Go to step 3**

OK

2 READ OUTPUT DTC(FUEL PRESSURE SENSOR DTCS ARE OUTPUT AGAIN)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES”.
(d) Clear the DTCs.
(e) Let the engine idle for 60 seconds and perform quick acceleration to 2,500 rpm for 30 seconds.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(g) Read the DTCs.

Result:

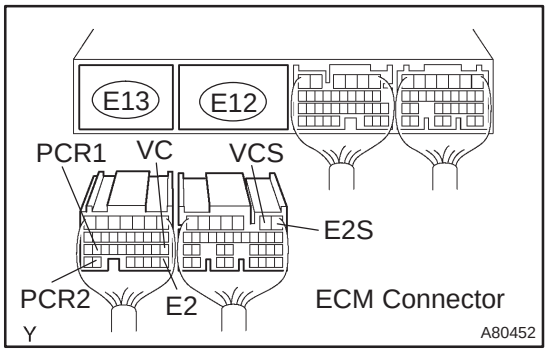
Display (DTC output)	Proceed to
DTC ”P0087, P0190, P0192 and/or P0193” are output.	A
DTC ”P0087, P0190, P0192 and/or P0193” are not output.	B

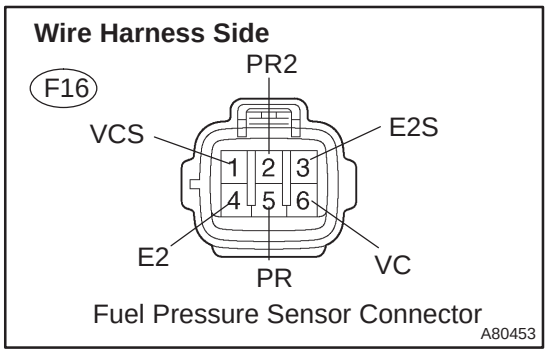
B → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

A

REPLACE ECM (See page 10–65)

3 CHECK HARNESS AND CONNECTOR(FUEL PRESSURE SENSOR – ECM)





(a) Disconnect the F16 fuel pressure sensor connector.
(b) Disconnect the E12 and E13 ECM connectors.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PCR1 (E13–26) – PR (F16–5)	Continuity
PCR2 (E13–33) – PR2 (F16–2)	
VCS (E12–2) – VCS (F16–1)	
VC (E13–18) – VC (F16–6)	
E2 (E13–28) – E2 (F16–4)	
E2S (E12–1) – E2S (F16–3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PCR1 (E13–26) or PR (F16–5) – Body ground	No continuity
PCR2 (E13–33) or PR2 (F16–2) – Body ground	
VCS (E12–2) or VCS (F16–1) – Body ground	
VC (E13–18) or VC (F16–6) – Body ground	
E2 (E13–28) or E2 (F16–4) – Body ground	
E2S (E12–1) or E2S (F16–3) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR) (See page 11–78)

DTC	P0088	FUEL RAIL/SYSTEM PRESSURE – TOO HIGH

DTC	P1229	FUEL PUMP SYSTEM

HINT:

- For more information on the supply pump (suction control valve) and the common rail system, see page 05–517.
- If P0088 and/or P1229 are present, use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

Refer to description on page 05–517.

DTC No.	DTC Detection Condition	Trouble Area
P0088	Internal fuel pressure of the common rail is too high. The fuel pressure exceeds 200 MPa (2,039 kgf/cm^2, 29,007 psi).	• Supply pump (Suction control valve) • Pressure discharge valve • Short in supply pump (Suction control valve) circuit • Open in pressure discharge valve circuit • ECM
P1229	Fuel over fed. Internal fuel pressure is beyond the target fuel pressure despite the ECM closing the suction control valve.	• Short in supply pump (Suction control valve) circuit • Supply pump (Suction control valve) • ECM

HINT:

After confirming DTC ”P0088 and P1229”, use the hand–held tester to confirm the fuel rail pressure from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

MONITOR DESCRIPTION

P0088 (Internal fuel pressure too high):

The ECM will set this DTC if the fuel pressure inside the common rail is beyond 200 MPa (2,039 kgf/cm^2, 29,007 psi). This DTC indicates that the suction control valve may be stuck open, or there may be short in its circuit, and the pressure discharge valve may be stuck close, or there may be open in its circuit.

If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

P1229 (Fuel over fed):

The ECM will set this DTC if the actual fuel pressure inside the common rail stays higher than the target fuel pressure, despite the ECM closing the suction control valve. This DTC code represents that the suction control valve may be stuck open, or there may be short in its circuit. Under this condition, the pressure discharge valve will operate quite often.

If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

MONITOR STRATEGY

P0088:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 sec.
CHK ENG operation	1 driving cycle

P1229:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 min.
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

P0088:

Specification
The monitor will not run if the fuel pressure sensor, or suction control valve circuit, or pressure discharge valve is malfunctioning

P1229:

Item	Specification
Target fuel pressure variation is small	–
The monitor will not run if the fuel pressure sensor, or suction control valve circuit, or pressure discharge valve is malfunctioning	

TYPICAL MALFUNCTION THRESHOLDS

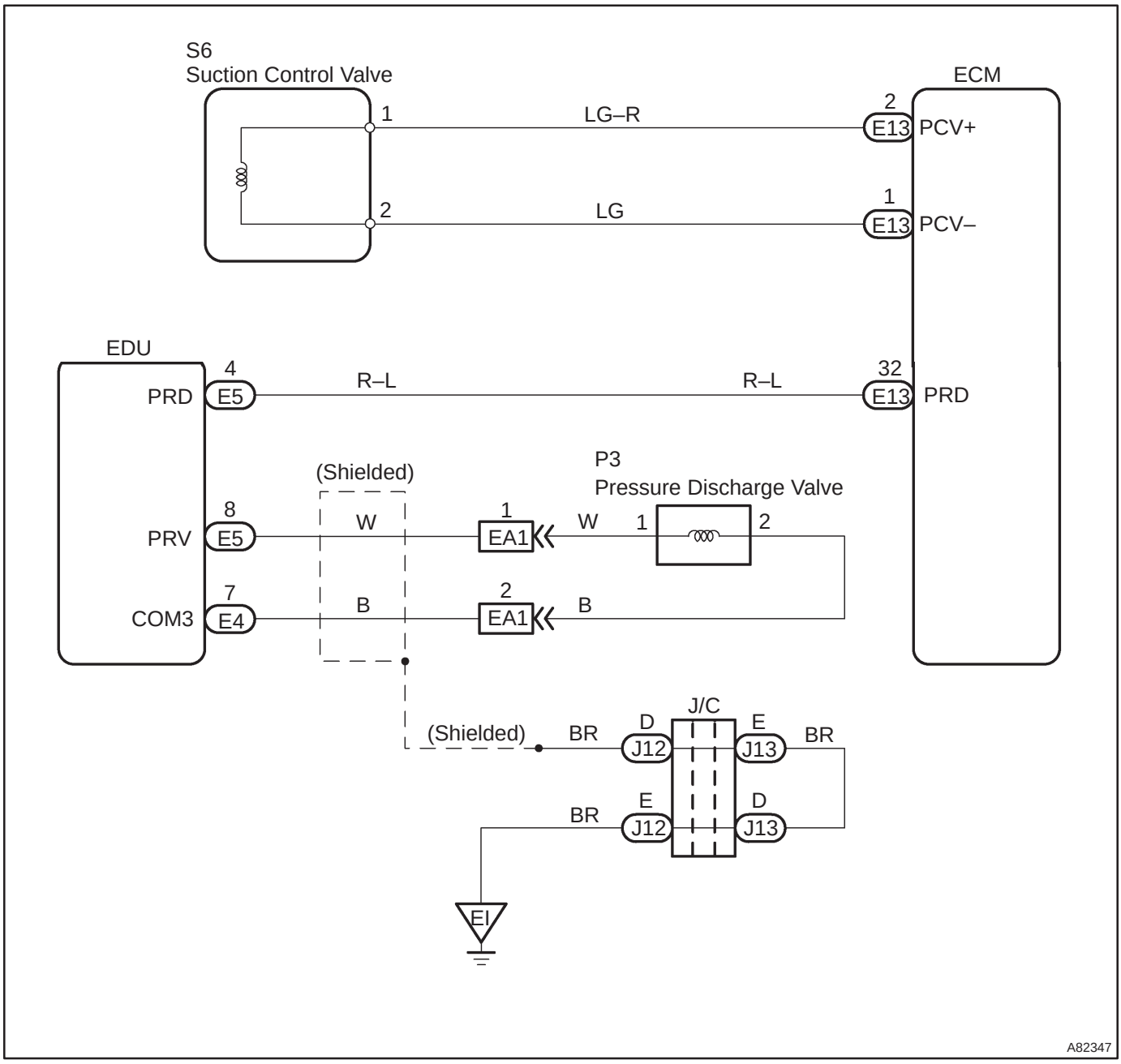
P0088:

Detection Criteria	Threshold
Fuel pressure sensor	200 MPa (2,039 kgf/cm^2, 29,007 psi) or more

P1229:

Threshold
Internal fuel pressure of the common rail stays higher than the target fuel pressure, despite the ECM closing the suction control valve, and also the pressure discharge valve is frequently operating

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDS DTC P0088 AND/OR P1229)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
”Only DTC P0088” or ”DTC P0088 and P1229” are output	A
Only DTC P1229 is output	B
DTC ”P0190, P0191, P0192, P0193 and/or P1271” are output	C
Only DTC P1272 is output	D

B → **Go to step 4**

C → **GO TO RELEVANT DTC CHART** (See page 05–544)

D → **Go to step 3**

A

2	READ OUTPUT DTC(DTC P1272 OUTPUT)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES”.
(d) Clear the DTCs.
(e) Start the engine and turn the ignition switch OFF. Wait for 10 seconds and then restart the engine and turn the ignition switch OFF again.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(g) Read the DTCs.

Result:

Display (DTC output)	Proceed to
DTC P1272 is output	A
DTC P1272 is not output	B

B → **Go to step 4**

A

3	READ VALUE OF HAND–HELD TESTER(FUEL PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" and read its value displayed on the hand–held tester.
(e) Check that the internal fuel pressure of the common rail drops below approximately 5 MPa within approximately 1 second as the ignition switch is turned OFF at the engine in an idle.

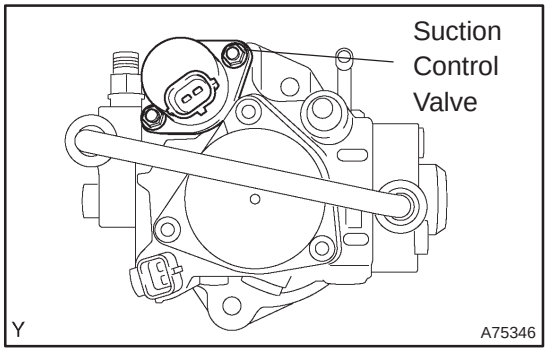
Result:

Pressure Displayed (MPa)	Proceed to
Approx. 5 or less	A
Approx. 5 or more	B

B → **REPLACE COMMON RAIL ASSY (PRESSURE DISCHARGE VALVE) (See page 14–286)**
PROCEED TO STEP 4 AFTER REPLACEMENT

A

4	CHECK INJECTION OR SUPPLY PUMP ASSY(SUCTION CONTROL VALVE)



(a) Check the suction control valve for resistance.
(1) Measure the resistance between the terminals.
Resistance: 1.9 to 2.3 Ω at 20°C (68°F)

NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11–69)**

OK

5 READ OUTPUT DTC(DTC P1229 OUTPUT)

(a) Disconnect the suction control valve connector and then start the engine. Wait for 1 minute.
HINT:
If the engine does not start, the suction control valve is normal. Therefore proceed to step 6.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES".
(e) Clear the DTCs.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(g) Read the DTCs.

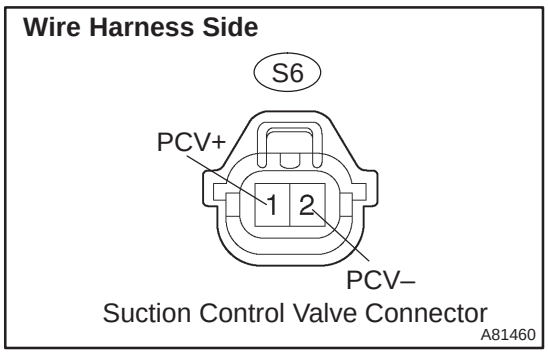
Result:

Display (DTC output)	Proceed to
DTC P1229 is not output	A
DTC P1229 is output	B

B → **REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11–69)**

A

6 CHECK HARNESS AND CONNECTOR(SUCTION CONTROL VALVE – ECM)



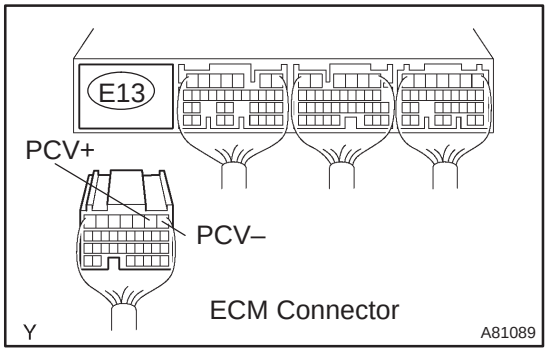
(a) Disconnect the S6 suction control valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PCV+ (S6–1) – PCV+ (E13–2)	Continuity
PCV– (S6–2) – PCV– (E13–1)	

Standard (Check for short):

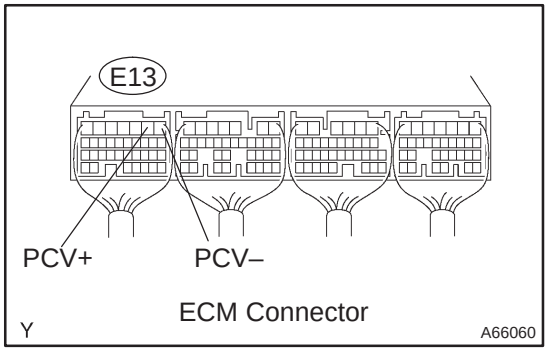
Symbols (Terminal No.)	Specified condition
PCV+ (S6–1) or PCV+ (E13–2) – Body ground	No continuity
PCV– (S6–2) or PCV– (E13–1) – Body ground	



NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

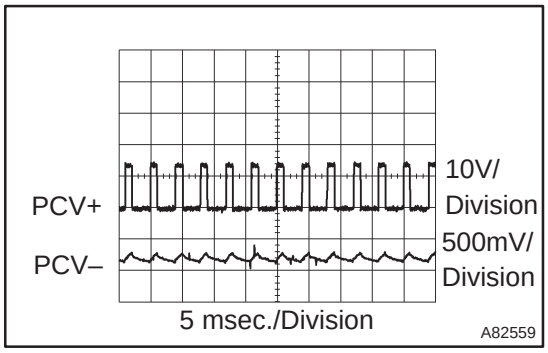
7 INSPECT ECM(PCV VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During cranking or idling, check the waveform between the specified terminals of the E13 ECM connector.

Standard :

Symbols (Terminal No.)	Specified condition
PCV+ (E13–2) – PCV– (E13–1)	Correct waveform is as shown



NG → **REPLACE ECM (See page 10–65)**

OK

CHECK DTC OUTPUT RECUR (DTC P0088 AND/OR P1229 OUTPUT AGAIN)

HINT:
After clearing the DTC, drive the vehicle at 50 km/h (31 mph) for 5 minutes, and then confirm P0088 and/or P1229 is not set again.

DTC	P0093	FUEL SYSTEM LEAK DETECTED – LARGE LEAK

HINT:
- For more information on the common rail system, see page 05–517.
- If P0093 is present, use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

Refer to description on page 05–517.

DTC No.	DTC Detection Condition	Trouble Area
P0093	Fuel leaks in high–pressure area.	• Fuel line between supply pump and common rail • Fuel line between common rail and injector • Supply pump • Common rail • Injector (P1238 is set simultaneously) • Pressure discharge valve • Open or short in EDU circuit (P0200 is set simultaneously) • Open or short in injector circuit (P0200 and P1238 are set simultaneously) • EDU (P0200 is set simultaneously) • ECM

HINT:
After confirming DTC P0093, use the hand–held tester to confirm the fuel rail pressure from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

MONITOR DESCRIPTION

P0093 (Fuel leaks in high–pressure area):

This DTC stands for fuel leaks is existing in high–pressure area in the common rail system. The ECM constantly monitors the internal fuel pressure of the common rail after the engine is started, and the ECM then will set this DTC if the decreasing rate of the internal fuel pressure is large when injecting the fuel.
In the common rail system, high–pressure fuel (approx. 30 to 180 MPa (306 to 1,835 kgf/cm^2, 4.351 to 26,106 psi)) is always applied to the high–pressure area including the supply pump, common rail, injector and piping. The ECM adjusts the suction control valve opening angle to obtain the target internal fuel pressure.
If this DTC is present, the ECM enters fail–safe mode and permits driving the vehicle for extra 1 minute before stopping both the fuel injection and supply pump operation, then stops the engine. The fail–safe mode will continue until the ignition switch is turned OFF.

MONITOR STRATEGY

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 sec.
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine speed	600 rpm	–
The monitor will not run if the fuel pressure sensor, or suction control valve circuit, or pressure discharge valve is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

Threshold
Drop rate in the internal fuel pressure is large when injecting fuel

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0093)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.

Result:

Display (DTC output besides DTC P0093)	Proceed to
Only DTC P0093 is output	A
DTC P1238 is output	B
DTC ”P0200 and/or P1271” are output	C

HINT:

If any other codes besides ”P0093” are output, perform the troubleshooting for those DTCs first.

B → **Go to step 3**

C → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

2	CHECK FUEL LEAKAGE(INSPECT HIGH–PRESSURE FUEL PARTS AND AREA FOR FUEL LEAKS)

(a) Visually check the supply pump, injector and fuel line located between the supply pump and the common rail for fuel leaks or fuel pressure leaks. Also, perform the same on the fuel line between the common rail and the injector (See page 11–69, 11–60).

HINT:

Fuel leaks inside the components (Supply pump, etc) may result.

NG → **REPAIR OR REPLACE**

OK

3	READ VALUE OF HAND–HELD TESTER(COMPENSATION OF INJECTION QUANTIFY BETWEEN CYLINDERS)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB” and read its value displayed on the hand–held tester.
Result:
STD – 3 to 3 mm^3/st
Maximum – 4.9 to 4.9 mm^3/st

NG → **REPLACE INJECTOR ASSY (See page 11–60)**

OK

4	PERFORM ACTIVE TEST USING HAND–HELD TESTER(FUEL LEAK TEST)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / FUEL LEAK TEST”.
(e) Check for fuel leaks in high–pressure area.

GO

CHECK DTC OUTPUT RECUR (DTC P0093 OUTPUT AGAIN)

HINT:
- After clearing the DTC, let the engine idle for 1 minute and then run it at 2,500 rpm for 30 seconds.
- At the same time, use the hand–held tester to confirm the fuel pressure inside the common rail from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.
  Internal fuel pressure of the common rail must be stable under each driving condition.

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

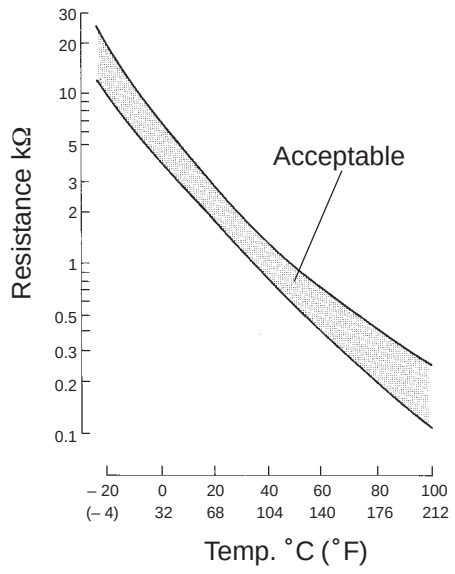
DTC	P0095	INTAKE AIR TEMPERATURE SENSOR 2 CIRCUIT

DTC	P0097	INTAKE AIR TEMPERATURE SENSOR 2 CIRCUIT LOW

DTC	P0098	INTAKE AIR TEMPERATURE SENSOR 2 CIRCUIT HIGH

CIRCUIT DESCRIPTION

(Fig. 1)



The inlet air temperature sensor is built into the intake air connector and senses the inlet air temperature. A thermistor built in the sensor changes the resistance value according to the inlet air temperature. The lower the inlet air temperature, the greater the thermistor resistance value, and the higher the inlet air temperature, the lower the thermistor resistance value (See Fig. 1).

The inlet air temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the inlet air temperature sensor from terminal THIA via a resistor R. That is the resistor R and the inlet air temperature sensor are connected in series. When the resistance value of the inlet air temperature sensor changes in accordance with changes in the inlet air temperature, the potential at the terminal THIA also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability with a cold engine.

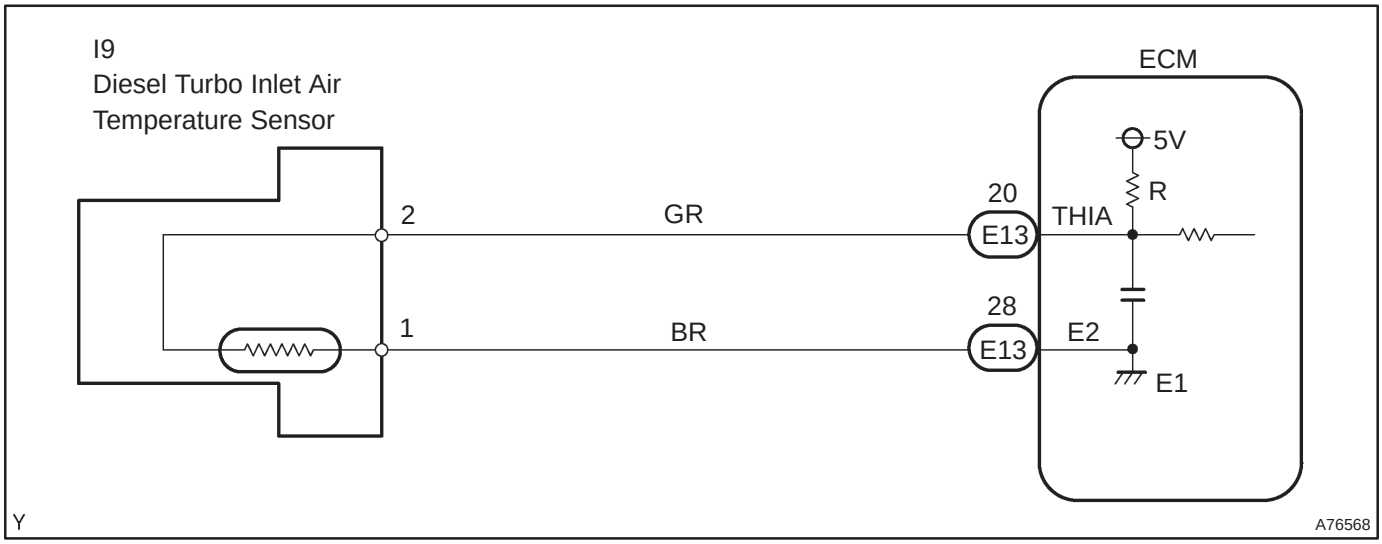
DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0095	Step 1	Open or short in diesel turbo inlet air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	• Open or short in diesel turbo inlet air temp. sensor circuit • Diesel turbo inlet air temperature sensor • ECM
P0097	Step 4	Short in diesel turbo inlet air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	
P0098	Step 2	Open in diesel turbo inlet air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	

HINT:

After confirming DTC ”P0095, P0097 or P0098”, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(INLET AIR TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual diesel turbo inlet air temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

HINT:

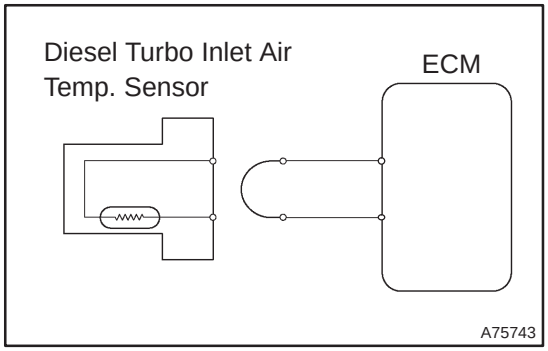
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B → **Go to step 4**

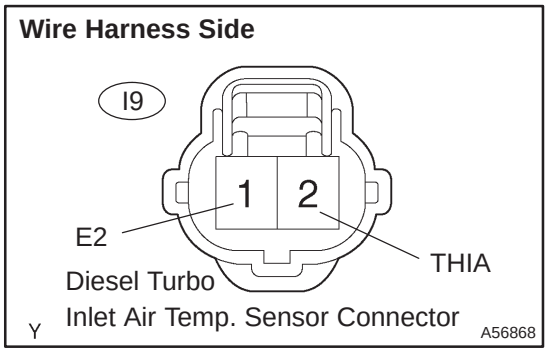
C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



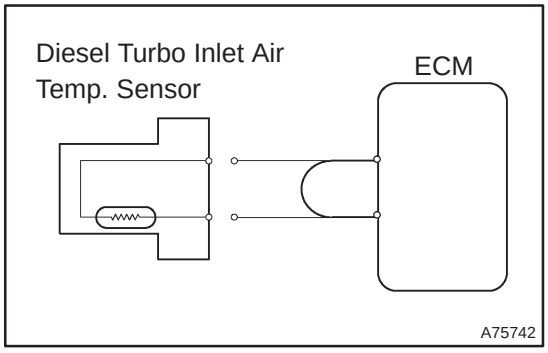
(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Connect terminals THIA and E2 of the diesel turbo inlet air temperature sensor wire harness side connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE DIESEL TURBO INLET AIR TEMPERATURE SENSOR**

NG

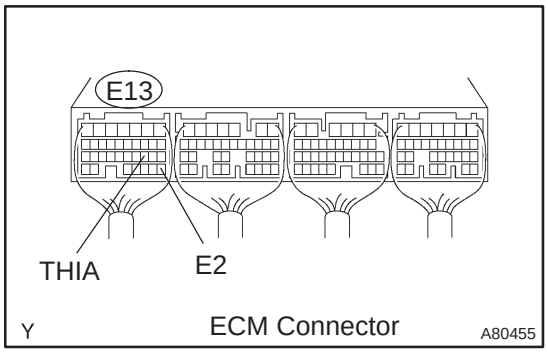
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Connect terminals THIA and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more

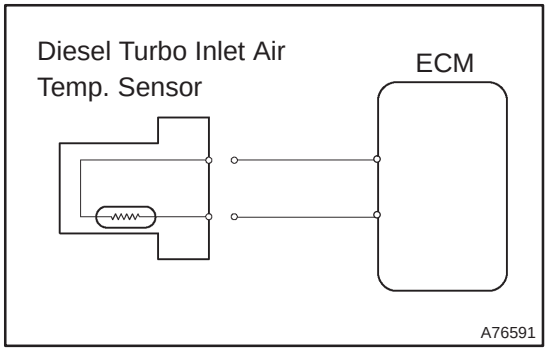


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10–65)

4 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

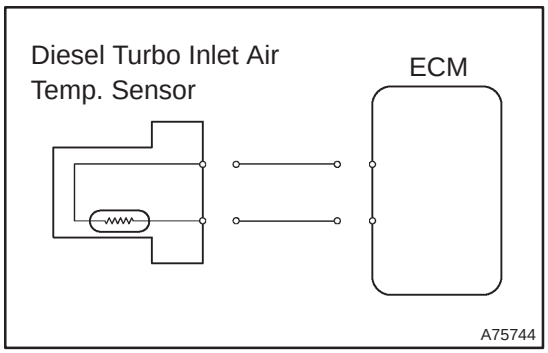


(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

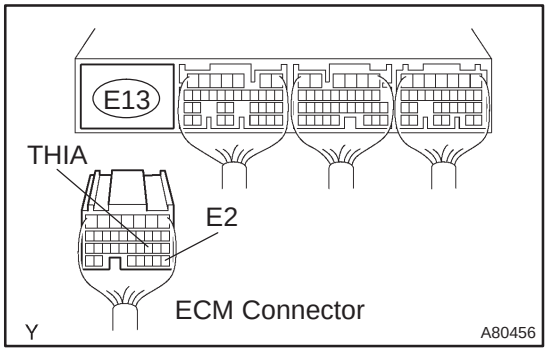
OK	**REPLACE DIESEL TURBO INLET AIR TENPERATURE SENSOR**

NG

5 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)



OK	**REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

REPLACE ECM (See page 10–65)

DTC	P0100	MASS OR VOLUME AIR FLOW CIRCUIT

DTC	P0102	MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

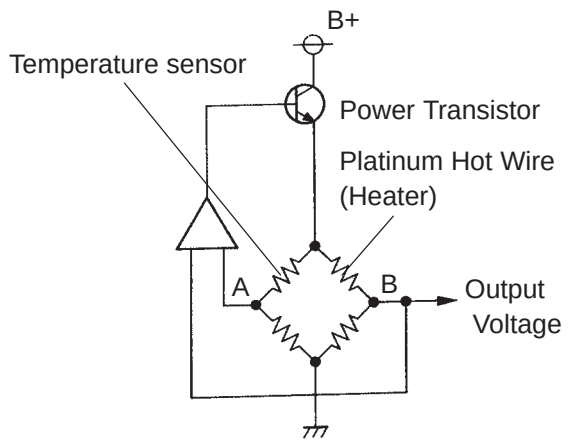
DTC	P0103	MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire. The hot wire mass air flow meter consists of a platinum hot wire, a temperature sensor and a control circuit installed in a plastic housing. The hot wire mass air flow meter works on the principle that the hot wire and temperature sensor located in the intake air bypass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the mass air flow meter.

The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



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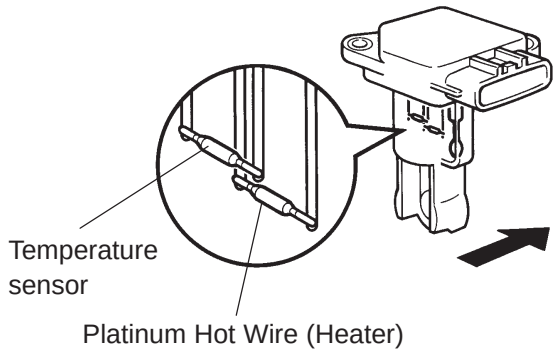


A53295

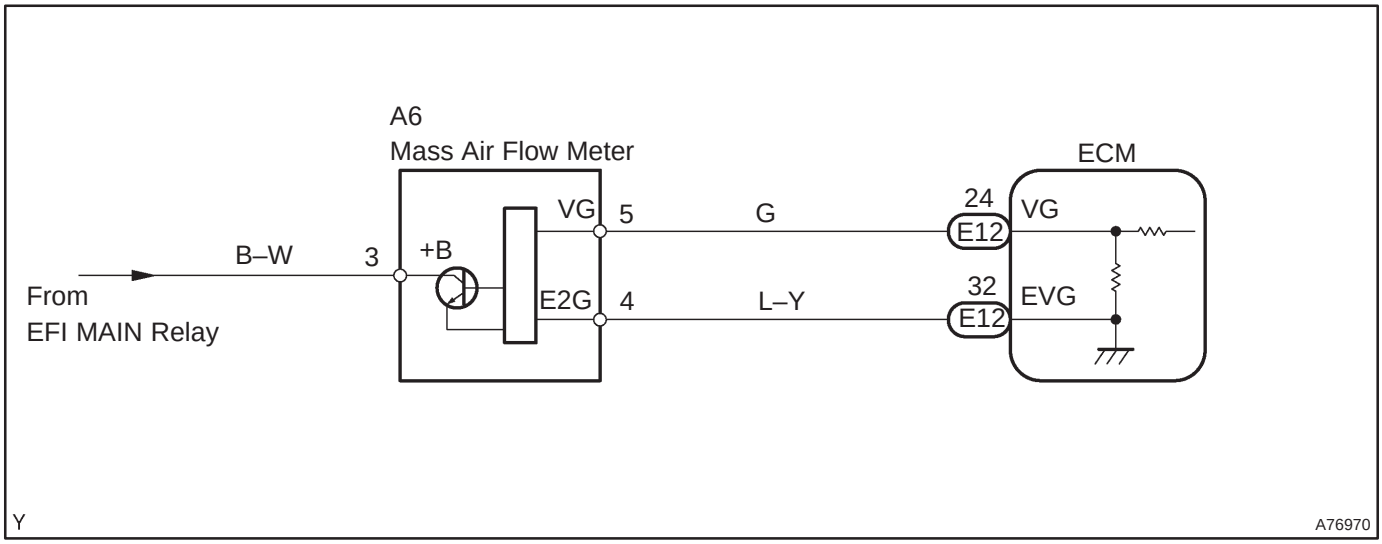
DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit for more than 3 sec. with engine speed 4,000 rpm or less (1 trip detection logic)	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P0102	Open in mass air flow meter circuit for more than 3 sec. with engine speed 4,000 rpm or less (1 trip detection logic)	
P0103	Short in mass air flow meter circuit for more than 3 sec. with engine speed 4,000 rpm or less (1 trip detection logic)	

HINT:

After confirming DTC ”P0100, P0102 or P0103”, use the hand–held tester to confirm the mass air flow ratio from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF”.

Air Flow Value (gm/s)	Malfunction
Approx. 0.0	• Mass air flow meter power source circuit open • VG circuit open or short
174.0 or more	• EVG circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

Result:

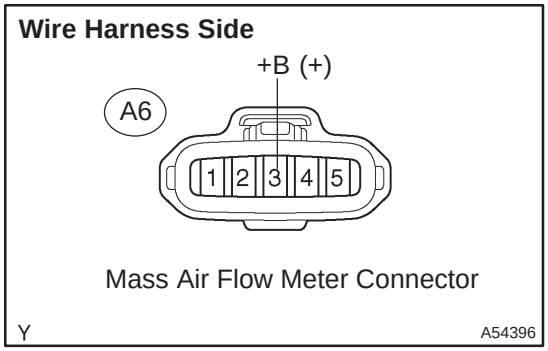
Air flow rate (gm/s)	Proceed to
0.0	A
174.0 or more	B
1 ≦ Mass Air Flow Rate ≦ 173.0 or more (*1)	C

*1: The value must be changed when the throttle valve is opened or closed.

B	**Go to step 6**
C	**CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

A

2 INSPECT MASS AIR FLOW METER(POWER SOURCE)



(a) Turn the ignition switch ON.
(b) Disconnect the A6 mass air flow meter connector.
(c) Measure the voltage between the terminal of the wire harness side connector and the body ground.

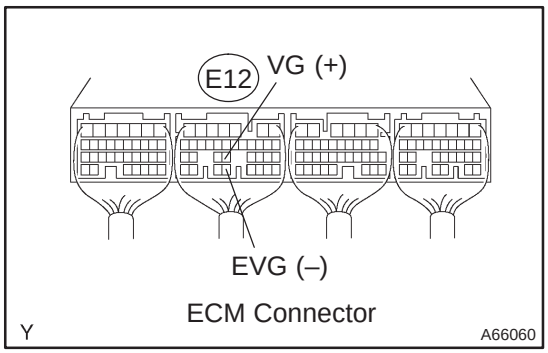
Standard:

Symbols (Terminal No.)	Specified condition
+B (A6–3) – Body ground	9 to 14 V

NG → **Go to step 5**

OK

3 INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E12 ECM connector.

HINT:
The A/C switch should be turned OFF.

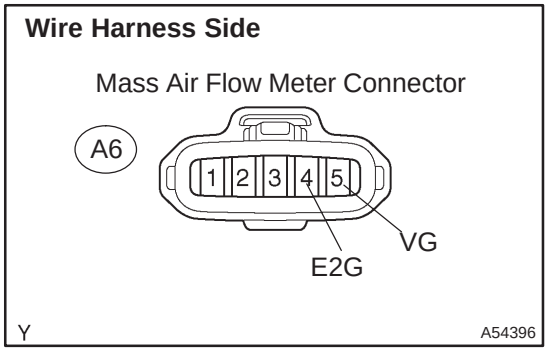
Standard:

Symbols (Terminal No.)	Condition	Specified condition
VG (E12–24) – EVG (E12–32)	Engine is idling	0.5 to 3.4 V

OK → **REPLACE ECM (See page 10–65)**

NG

4 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)



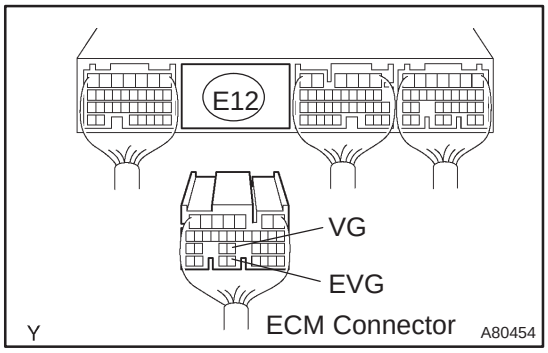
(a) Disconnect the A6 mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–5) – VG (E12–24)	Continuity
E2G (A6–4) – EVG (E12–32)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–5) or VG (E12–24) – Body ground	No continuity

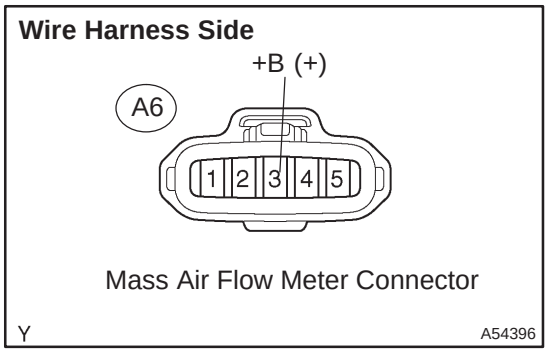


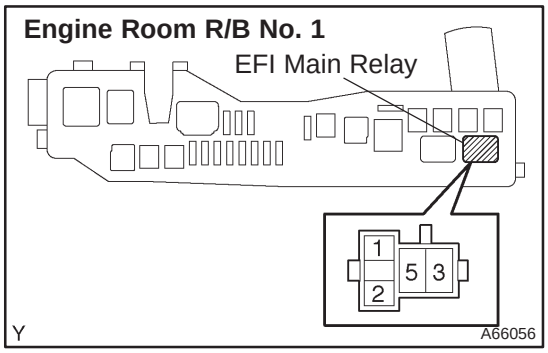
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

5 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – EFI MAIN RELAY)





(a) Disconnect the A6 mass air flow meter connector.
(b) Remove the EFI main relay from the engine room R/B No. 1.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (A6–3) – EFI main relay (3)	Continuity

Standard (Check for short):

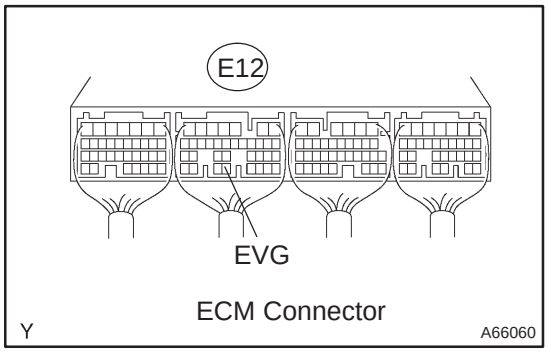
Symbols (Terminal No.)	Specified condition
+B (A6–3) or EFI main relay (3) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–686)

6 INSPECT ECM(SENSOR GROUND)



(a) Check for continuity between the terminal of the E12 ECM connector and body ground.

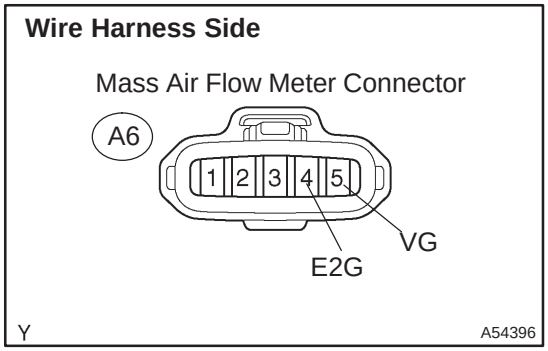
Standard:

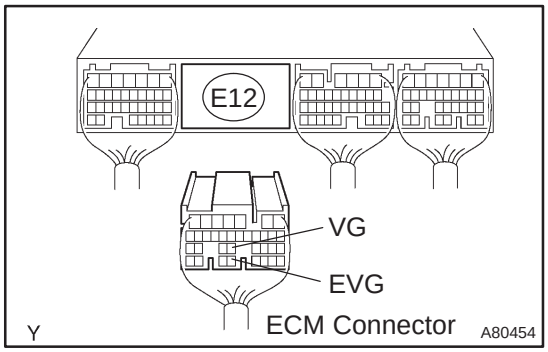
Symbols (Terminal No.)	Specified condition
EVG (E12–32) – Body ground	Continuity

NG → **REPLACE ECM (See page 10–65)**

OK

7 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)





(a) Disconnect the A6 mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–5) – VG (E12–24)	Continuity
E2G (A6–4) – EVG (E12–32)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–5) or VG (E12–24) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

DTC	P0101	MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page 05–577.

DTC No.	DTC Detection Condition	Trouble Area
P0101	After engine is warmed up, condition (a) continues for more than 10 sec. at idling: (2 trip detection logic) (a) Mass air flow meter output greater than 2.2 V	• Mass air flow meter
	Conditions (a) and (b) continue for more than 6 sec. with engine speed 2000 rpm or more: (2 trip detection logic) (a) VTA greater than 0.1 V (b) Mass air flow meter output less than 0.25 V	

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0101)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
P0101 and other DTCs are output	A
Only P0101 is output	B

HINT:

If any other codes besides P0101 are output, perform the troubleshoot for those DTCs first.

B → REPLACE MASS AIR FLOW METER

A

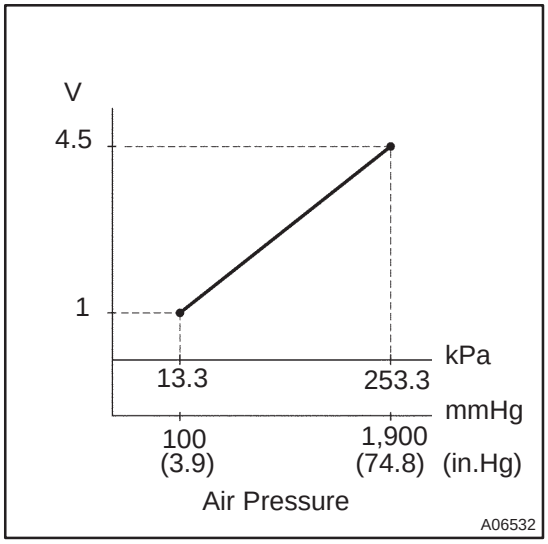
GO TO RELEVANT DTC CHART (See page 05–544)

DTC	P0105	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT

DTC	P0107	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC	P0108	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION



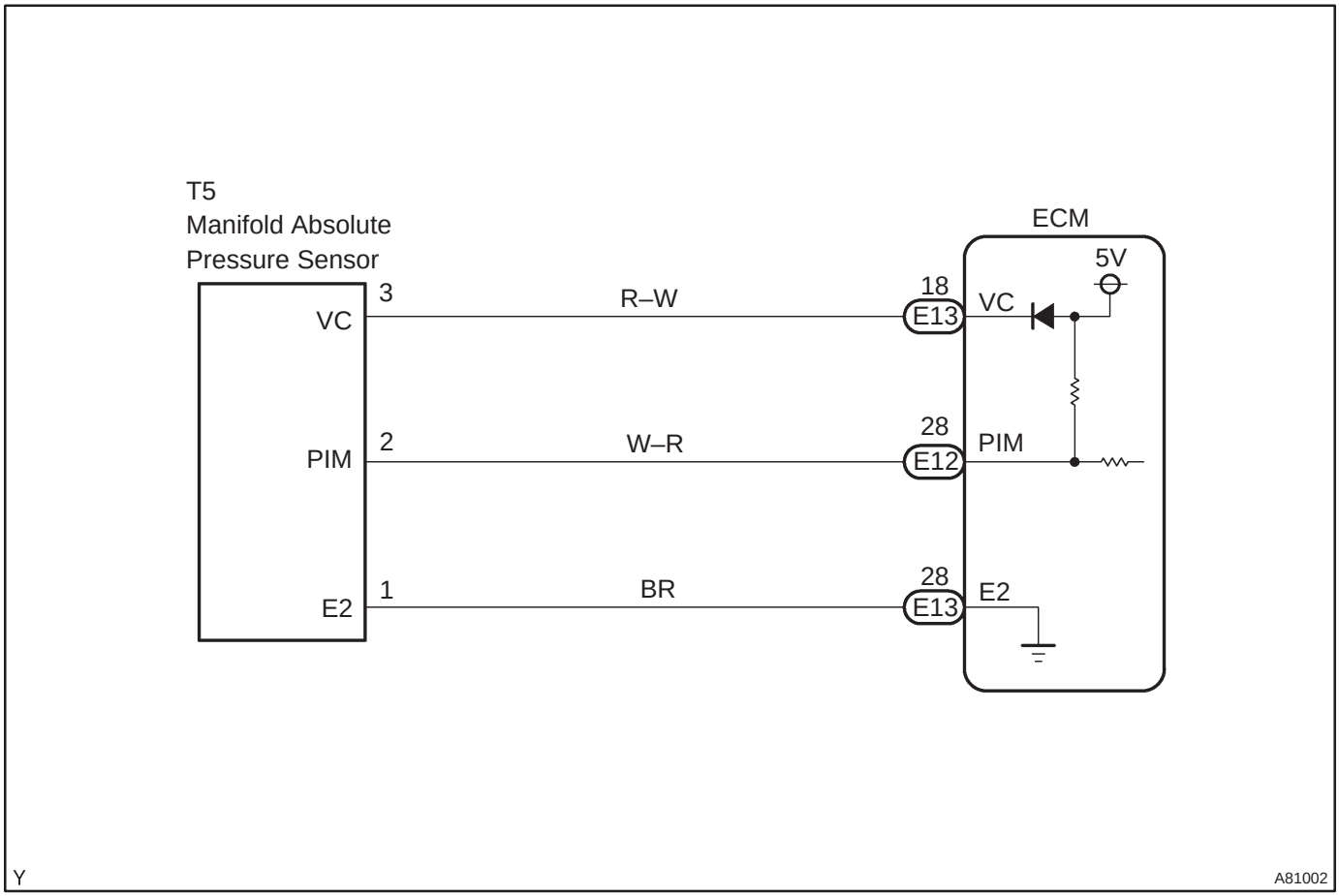
By a built–in sensor unit, the manifold absolute pressure sensor detects the intake manifold pressure as a voltage. The ECM then determines the basic injection duration and basic ignition advance angle based on this voltage.
Since the manifold absolute pressure sensor does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake manifold (the pressure in proportion to the preset absolute vacuum 0), it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. This permits it to control the air fuel ratio at the proper level under all conditions.

DTC No.	DTC Detection Condition	Trouble Area
P0105 P0107 P0108	Open or short in manifold absolute pressure sensor circuit for 0.5 sec. or more (1 trip detection logic)	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • Turbocharger assy • EGR valve assy • ECM

HINT:
After confirming DTC ”P0105, P0107 or P0108”, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / PIM”.

Intake Manifold Pressure (kPa)	Malfunction
Approx. 0	• PIM circuit short
250 or more	• VC circuit open or short • PIM circuit open • E2 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

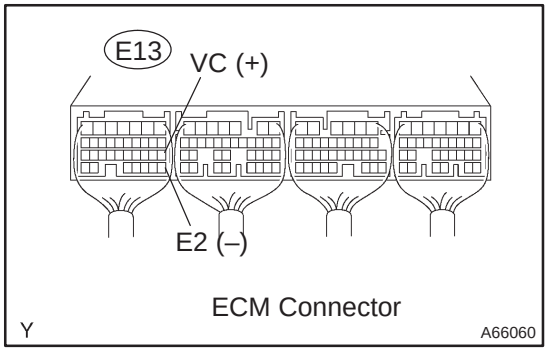
1	READ VALUE OF HAND–HELD TESTER(MANIFOLD ABSOLUTE PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / PIM” and read its value displayed on the hand–held tester.
Pressure: Same value as the actual atmospheric pressure.

NG → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

OK

2 INSPECT ECM(VC VOLTAGE)



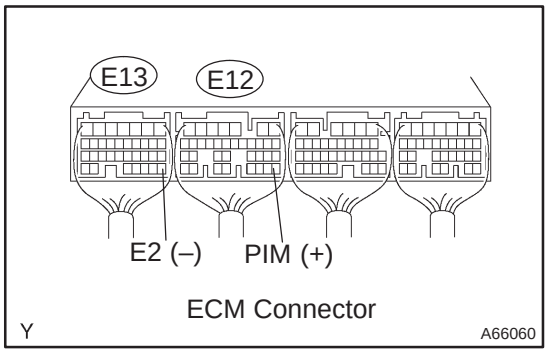
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.
Voltage:

Symbols (Terminal No.)	Specified condition
VC (E13–18) – E2 (E13–28)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10–65)**

OK

3 INSPECT ECM(PIM VOLTAGE)



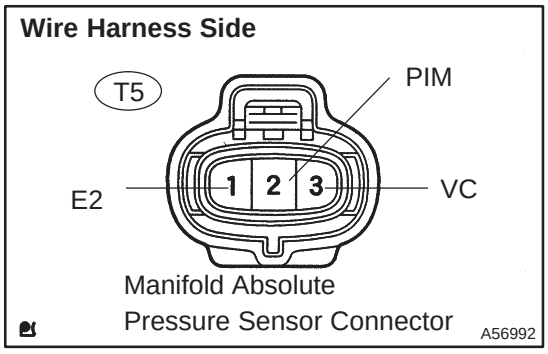
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E12 and E13 ECM connectors.
Voltage:

Symbols (Terminal No.)	Condition	Specified condition
PIM (E12–28) – E2 (E13–28)	Applied negative pressure of 40kPa (300 mmHg, 11.8 in.Hg)	0.2 to 0.8 V
PIM (E12 – 28) – E2 (E13–28)	Same as atmosphere	1.3 to 1.9 V
PIM (E12 – 28) – E2 (E13–28)	Applied positive pressure of 69kPa (0.7 kg/cm^{3}, 10.0 psi	3.2 to 3.8 V

NG → **REPLACE ECM (See page 10–65)**

OK

4	CHECK HARNESS AND CONNECTOR(MANIFOLD ABSOLUTE PRESSURE SENSOR – ECM)



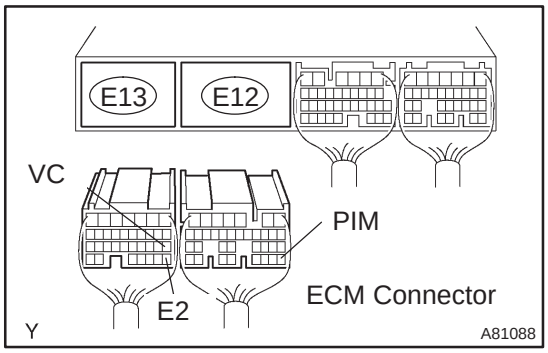
(a) Disconnect the T5 manifold absolute pressure sensor connector.
(b) Disconnect the E12 and E13 ECM connectors.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PIM (T5–2) – PIM (E12–28)	Continuity
VC (T5–3) – VC (E13–18)	
E2 (T5–1) – E2 (E13–28)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PIM (T5–2) or PIM (E12–28) – Body ground	No continuity
VC (T5–3) or VC (E13–18) – Body ground	
E2 (T5–1) or E2 (E13–28) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	CHECK TURBOCHARGER SUB–ASSY (See page 13–7)

NG → **REPLACE TURBOCHARGER SUB–ASSY (See page 13–11)**

OK

6	CHECK EGR VALVE ASSY (See page 12–18)

NG → **REPLACE EGR VALVE ASSY (See page 14–286)**

OK

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

DTC	P0106	MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT RANGE/ PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0105 on page 05–584.

DTC No.	DTC Detection Condition	Trouble Area
P0106	Voltage output of the manifold absolute pressure sensor is out of the standard range. (2 trip detection logic)	• Manifold absolute pressure sensor

INSPECTION PROCEDURE

HINT:

- If DTCs ”P0105, P0107, and P0108” are output simultaneously, manifold absolute pressure sensor circuit may be open or short. Perform the troubleshooting of DTC ”P0105, P0107 or P0108” first.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0106)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only P0106 are output	A
P0106 and other DTCs are output	B

HINT:

If any other codes besides ”P0106” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

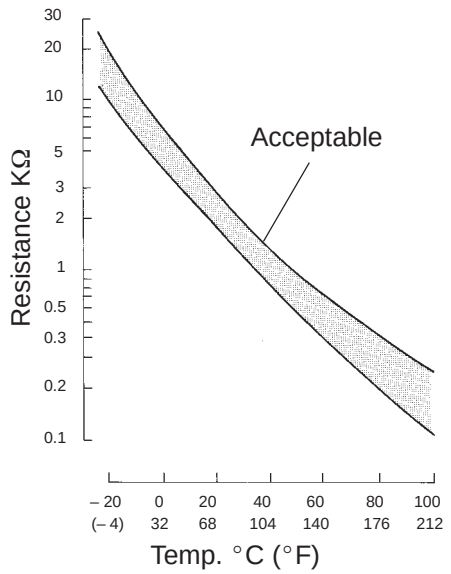
DTC	P0110	INTAKE AIR TEMPERATURE CIRCUIT

DTC	P0112	INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC	P0113	INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Fig.1)



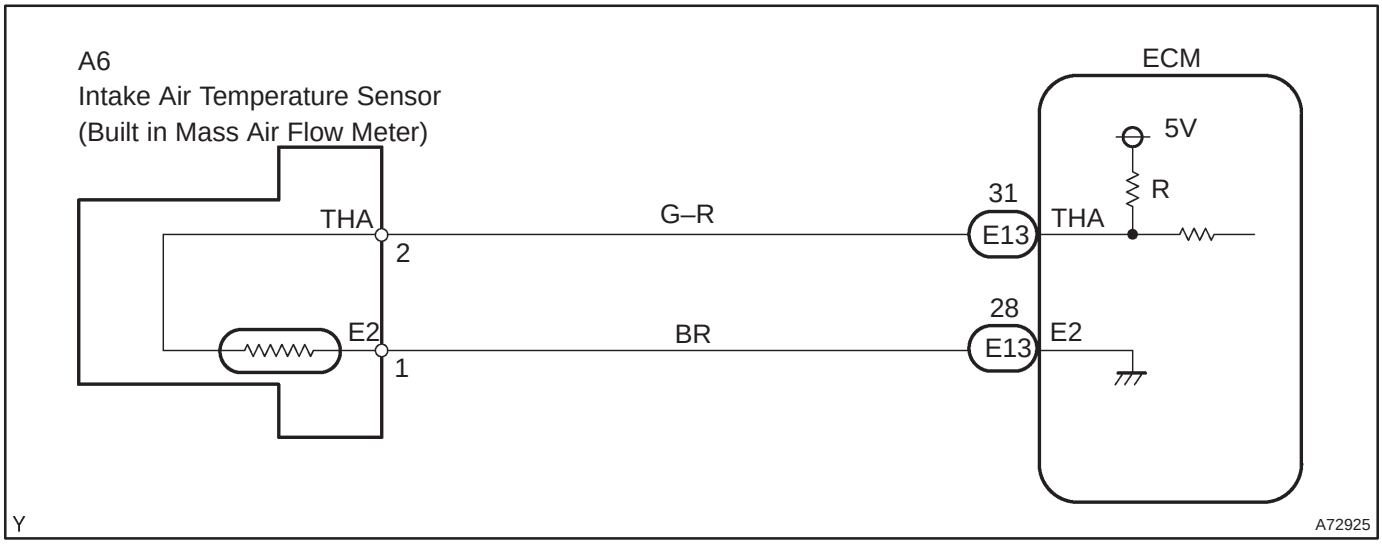
The intake air temperature sensor is built in the mass air flow meter and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature is, the greater the thermistor resistance value becomes, and the higher the intake air temperature is, the lower the thermistor resistance value becomes (See Fig. 1).
The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.
The resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability with a cold engine.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0112	Step 4	Short in intake air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	
P0113	Step 2	Open in intake air temp. sensor circuit for 0.5 sec. (1 trip detection logic)	

HINT:
After confirming DTC ”P0110, P0112 or P0113, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

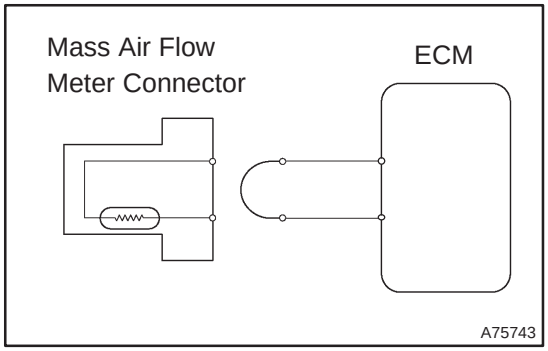
HINT:

- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

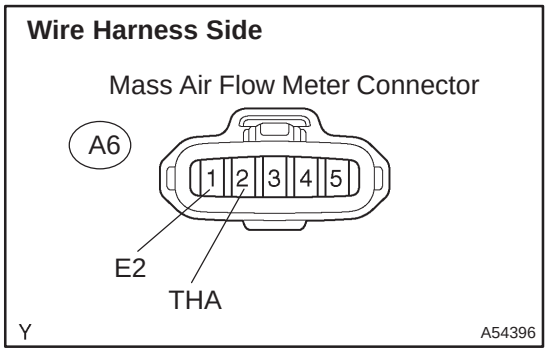
B	**Go to step 4**
C	**CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



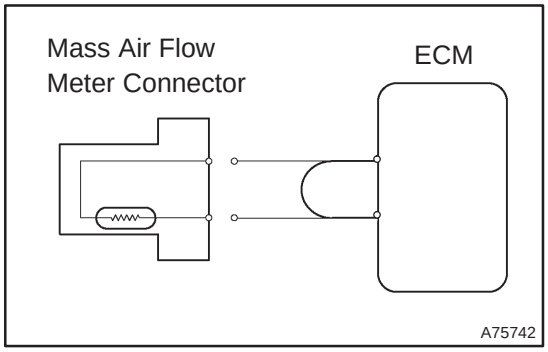
(a) Disconnect the A6 mass air flow meter connector.
(b) Connect terminals THA and E2 of the mass air flow meter wire harness side connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE MASS AIR FLOW METER**

NG

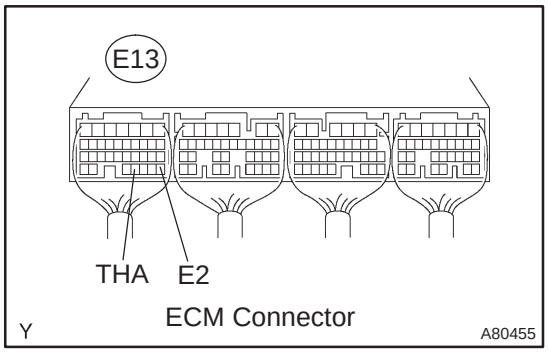
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the A6 mass air flow meter connector.
(b) Connect terminals THA and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more

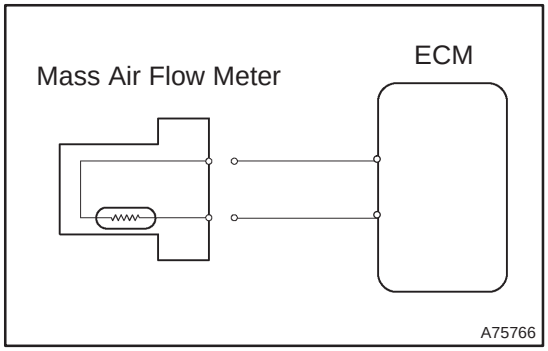


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10–65)

4	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

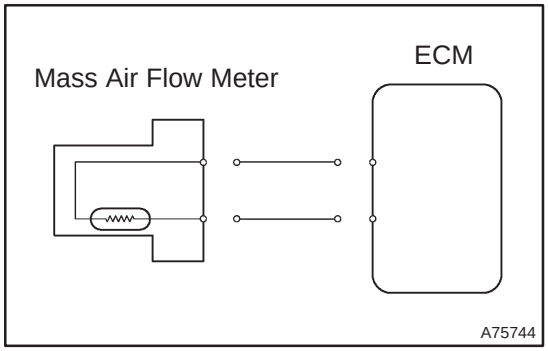


(a) Disconnect the A6 mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

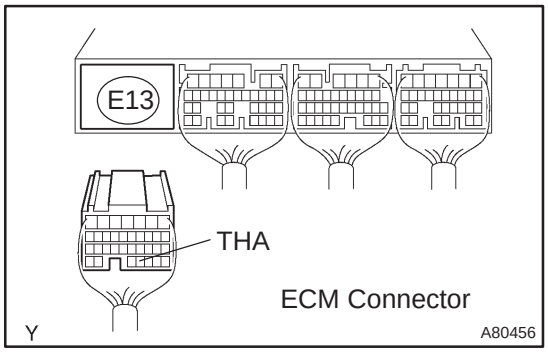
OK	REPLACE MASS AIR FLOW METER

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)



OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

REPLACE ECM (See page 10–65)

DTC	P0115	ENGINE COOLANT TEMPERATURE CIRCUIT

DTC	P0117	ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC	P0118	ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

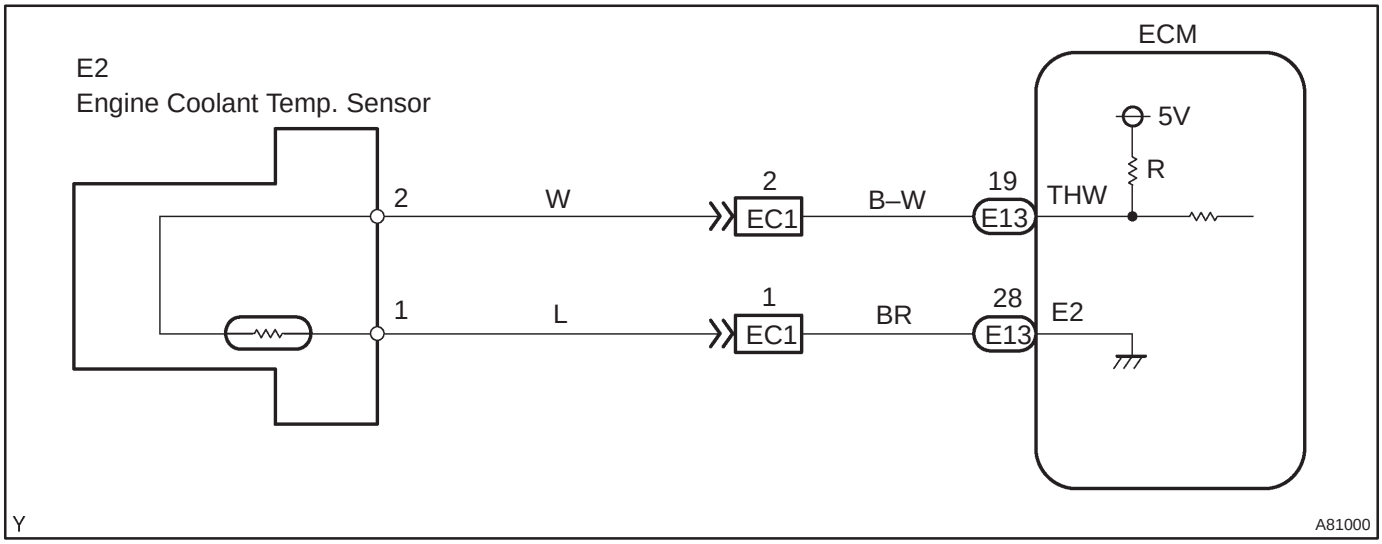
A thermistor is built in the engine coolant temperature sensor and changes the resistance value according to the engine coolant temperature.
The structure of the sensor and connection to the ECM is the same as those of the intake air temperature sensor.
HINT:
If the ECM detects DTC ”P0115, P0117 or P0118” it enters the fail–safe mode in which the engine coolant temperature is assumed to be 80 °C (176 °F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115	Step 1	Open or short in engine coolant temp. sensor circuit for 0.5 sec. (1 trip detection logic)	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM
P0117	Step 4	Short in engine coolant temp. sensor circuit for 0.5 sec. (1 trip detection logic)	
P0118	Step 2	Open in engine coolant temp. sensor circuit for 0.5 sec. (1 trip detection logic)	

HINT:
After confirming DTC ”P0115, P0117 or P0118”, use the hand–held tester to confirm the engine coolant temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(ENGINE COOLANT TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

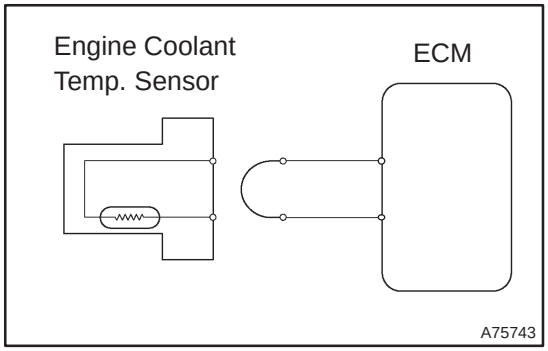
HINT:

- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

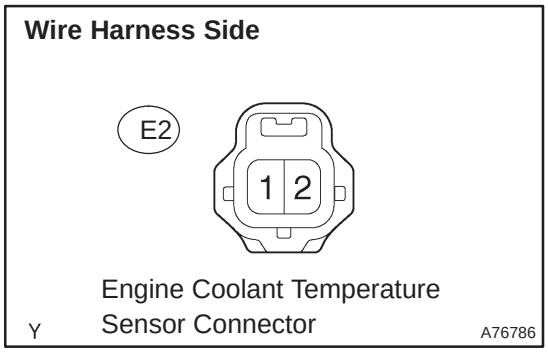
B	**Go to step 4**
C	**CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



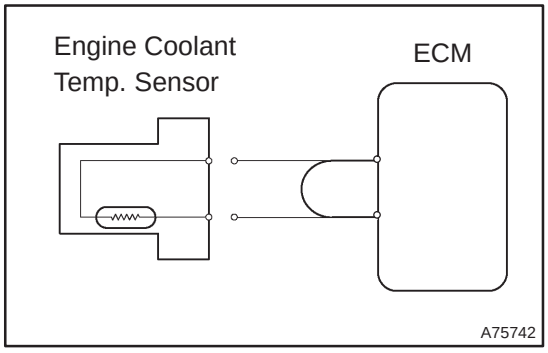
(a) Disconnect the E2 engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor wire harness side connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE ENGINE COOLANT TEMP. SENSOR**

NG

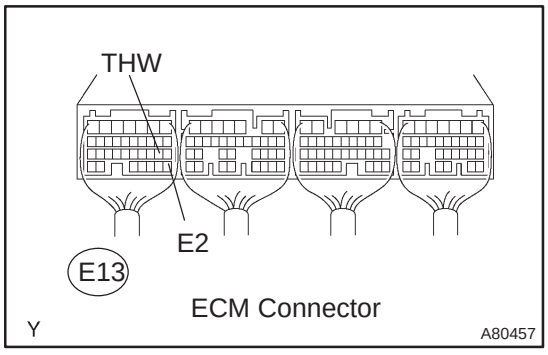
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the E2 engine coolant temperature sensor connector.
(b) Connect terminals THW and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more

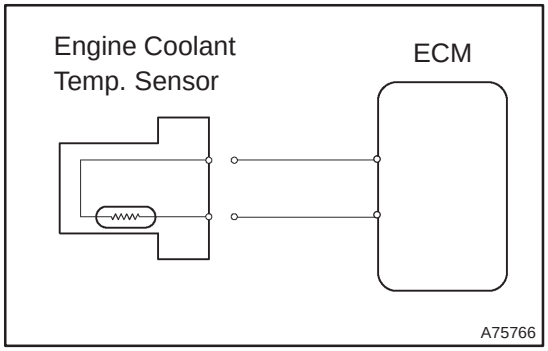


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10–65)

4	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

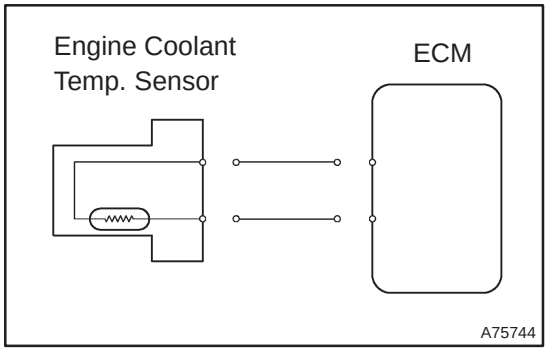


(a) Disconnect the E2 engine coolant temperature sensor connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

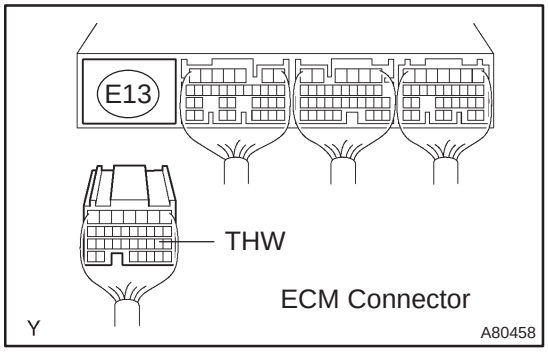
OK → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

REPLACE ECM (See page 10–65)

DTC	P0116	ENGINE COOLANT TEMPERATURE CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05–593.

DTC No.	DTC Detection Condition	Trouble Area
P0116	When THW greater than –40°C (–40°F) and less than 60°C (140°F), and THA greater than –6.7°C (20°F), and when starting engine, conditions (a) and (b) continue (2 trip detection logic): (a) Vehicle speed is changing (Not stable) (b) THW change is lower than 3°C (5.4°F) after engine was started.	• Cooling system • Engine coolant temperature sensor • Thermostat
	In case that reading value of engine coolant temp. sensor will not change more than 1°C (1.8°F) even after repeating 6 trips (detection logic) of adjusting speed pattern with THW more than 90°C (194°F) after engine was started.	

INSPECTION PROCEDURE

HINT:

- If DTCs ”P0115, P0116, P0117 and P0118” are output simultaneously, engine coolant temperature sensor circuit may be open or short. Perform the troubleshooting of DTC ”P0115, P0117 or P0118” first.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(BESIDES DTC P0116)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
Only P0116 are output	A
P0116 and other DTCs are output	B

HINT:

If any other codes besides ”P0116” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

2 INSPECT THERMOSTAT (See page 16–39)

NG → **REPLACE THERMOSTAT (See page 16–50)**

OK

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

DTC P0168 FUEL TEMPERATURE TOO HIGH

CIRCUIT DESCRIPTION

Refer to DTC P0180 on page 05–599.

DTC No.	DTC Detection Condition	Trouble Area
P0168	When THF greater than 35˚C (95˚F) and less than 60˚C (140˚F), and THF ≧ –6.7˚C (20˚F), and when starting engine, conditions (a) and (b) continue (1 trip detection logic): (a) Vehicle speed is changing (Not stable) (b) THF change is lower than 3˚C (5.4˚F) after the engine was started.	• Fuel temperature sensor
	In case that reading value of fuel temp. sensor will not change more than 1˚C (1.8˚F) even after repeating 6 trips (detection logic) of adjusting speed pattern with THF more than 60˚C (140˚F) after the engine was started.	

INSPECTION PROCEDURE

HINT:

- If DTCs ”P0180, P0182 and P0183” are output simultaneously, fuel temperature sensor circuit may be open or short. Perform the troubleshooting of DTC ”P0180, P0182 or P0183” first.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(BESIDES DTC P0168)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only P0168 are output	A
P0168 and other DTCs are output	B

HINT:

If any other codes besides ”P0168” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

REPLACE FUEL TEMPERATURE SENSOR

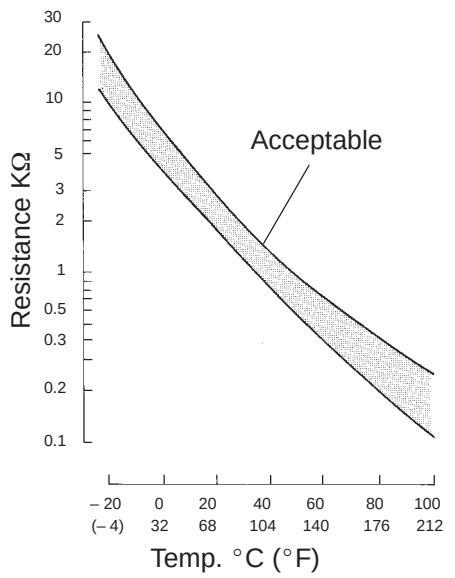
DTC	P0180	FUEL TEMPERATURE SENSOR ”A” CIRCUIT

DTC	P0182	FUEL TEMPERATURE SENSOR ”A” CIRCUIT LOW INPUT

DTC	P0183	FUEL TEMPERATURE SENSOR ”A” CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Fig.1)



The fuel temperature sensor senses the fuel temperature. A thermistor built into the sensor changes the resistance value according to the fuel temperature. The lower the fuel temperature is, the greater the thermistor resistance becames, and the higher the fuel temperature is, the lower the thermistor resistance becomes (See Fig. 1).

The fuel temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the fuel temperature sensor from terminal THF via a resistor R. The resistor R and the fuel temperature sensor are connected in series. When the resistance value of the fuel temperature sensor changes in accordance with changes in the fuel temperature, the potential at terminal THF also changes. Based on this signal, the ECM performs the pressure control compensation of the supply pump and error detection compensation of the highly pressurized fuel system.

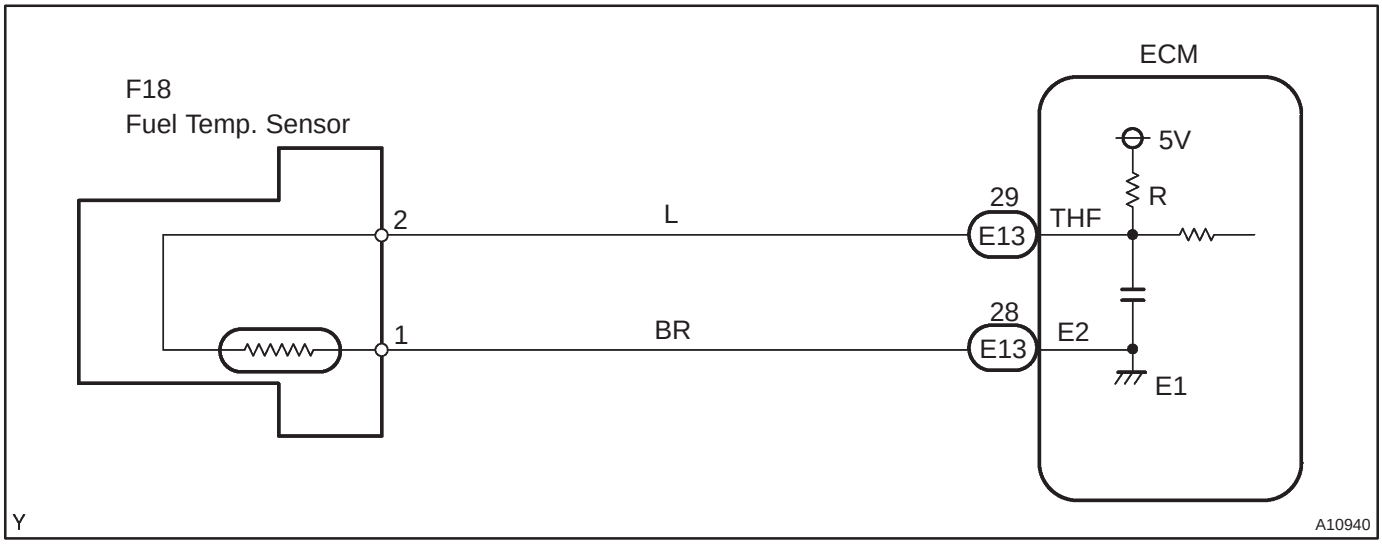
DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0180	Step 1	Open or short in fuel temp. sensor circuit for 0.5 sec. (1 trip detection logic)	• Open or short in fuel temp. sensor circuit • Fuel temperature sensor • ECM
P0182	Step 4	Short in fuel temp. sensor circuit for 0.5 sec. (1 trip detection logic)	
P0183	Step 2	Open in fuel temp. sensor circuit for 0.5 sec. (1 trip detection logic)	

HINT:

After confirming DTC ”P0180, P0182 or P0183”, use the hand–held tester to confirm the fuel temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(FUEL TEMPARATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual fuel temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

HINT:

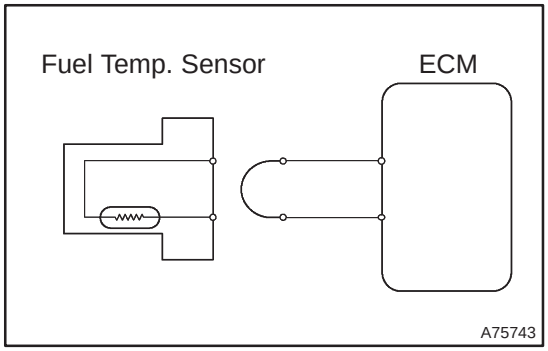
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B	Go to step 4

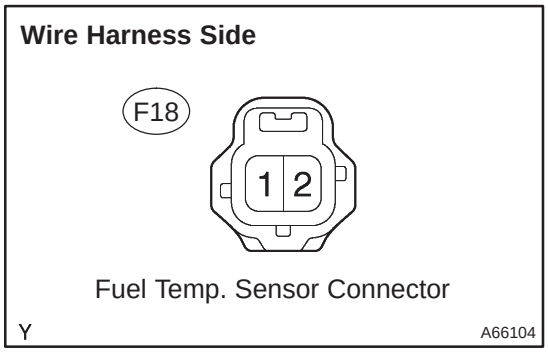
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



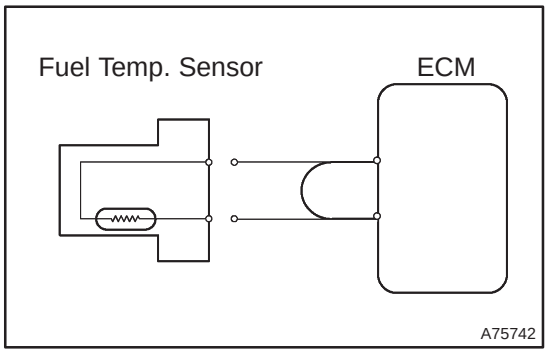
(a) Disconnect the F18 fuel temperature sensor connector.
(b) Connect terminals 1 and 2 of the fuel temperature sensor wire harness side connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE FUEL TEMPERATURE SENSOR**

NG

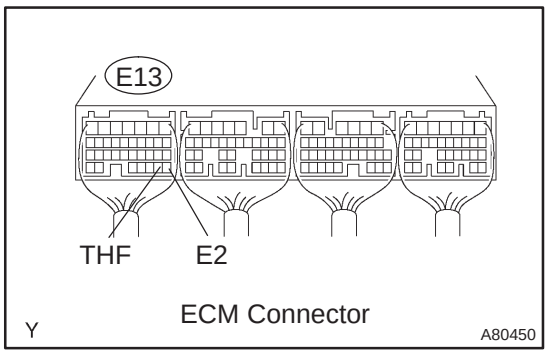
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the F18 fuel temperature sensor connector.
(b) Connect terminals THF and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP” and read its value displayed on the hand–held tester.
Temperature: 140°C (284°F) or more

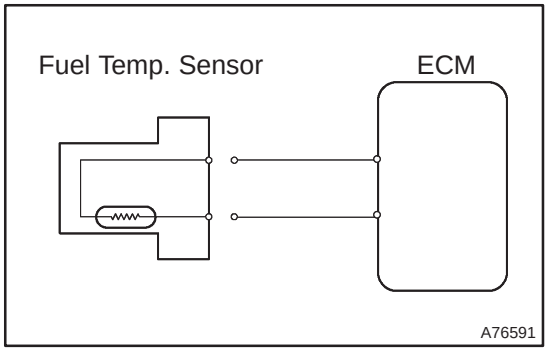


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM
(See page 10–65)

4 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

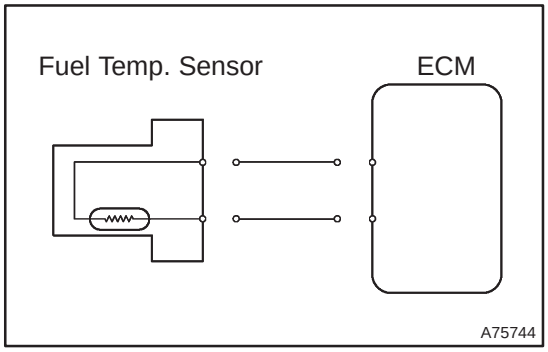


(a) Disconnect the F18 fuel temperature sensor connector.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

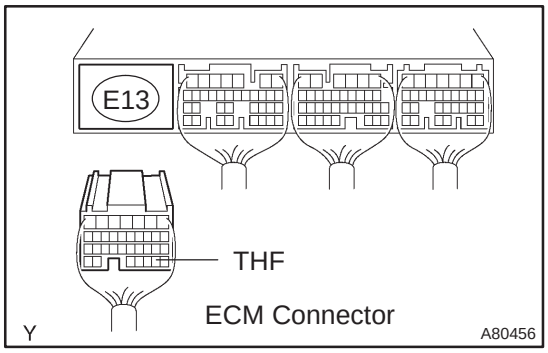
OK → **REPLACE FUEL TEMPERATURE SENSOR**

NG

5 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

REPLACE ECM (See page 10–65)

DTC	P0191	FUEL RAIL PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTCs P0087 on page 05–557.

INSPECTION PROCEDURE

HINT:

- If DTCs ”P0087, P0190, P0192, and P0193” are output simultaneously, manifold absolute pressure sensor circuit may be open or short. Perform the troubleshooting of DTC ”P0087, P0190, P0192, and P0193” first.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

DTC No.	DTC Detection Condition	Trouble Area
P0191	Voltage output of the fuel pressure sensor for the common rail is out of the standard range. (1 trip detection logic)	• Fuel pressure sensor

1	CHECK OTHER DTC OUTPUT(BESIDS DTC P0191)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only P0191 is output	A
P0191 and other DTCs are output	B

HINT:
If any other codes besides P0191 are output, perform the troubleshoot for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR) (See page 11–78)

DTC	P0200	INJECTOR CIRCUIT / OPEN

HINT:

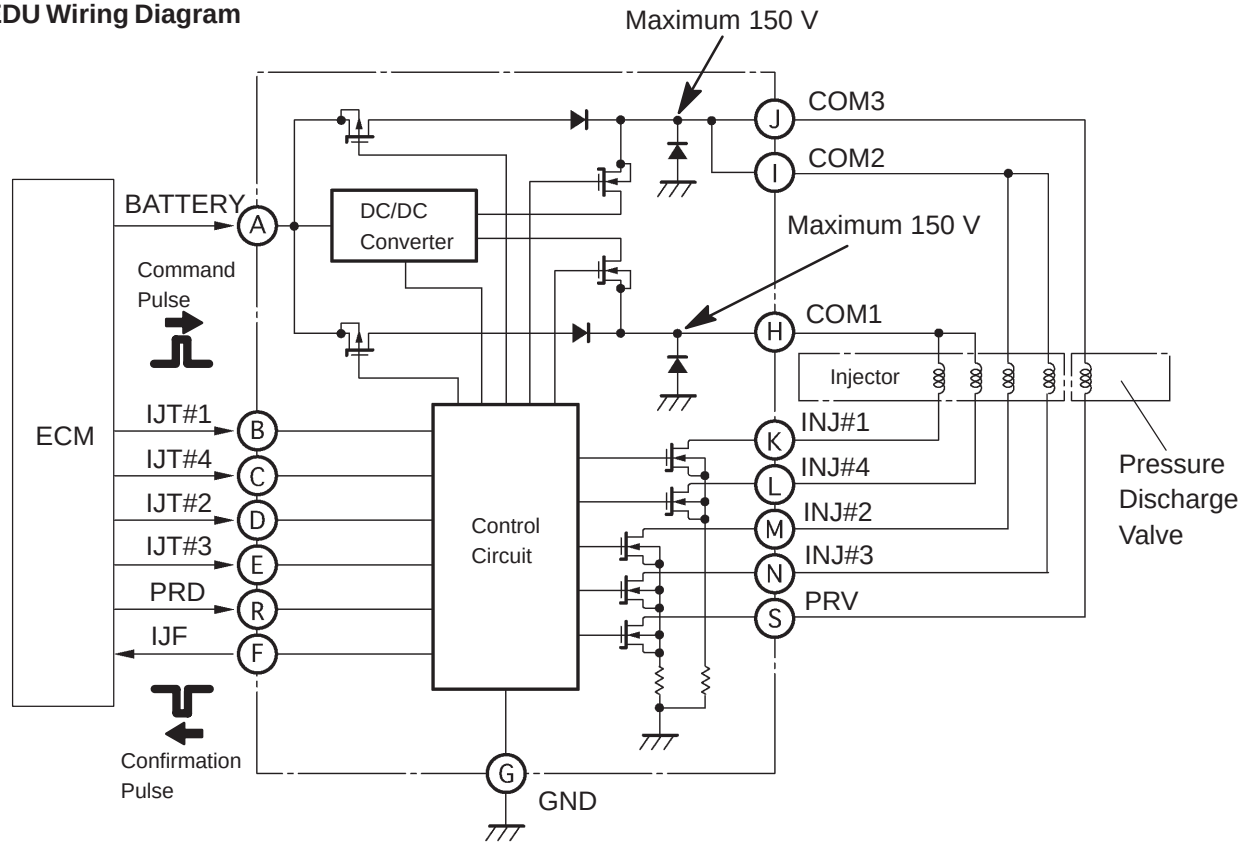
- For more information on the EDU, see page 05–517.
- If P0200 are present, Use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

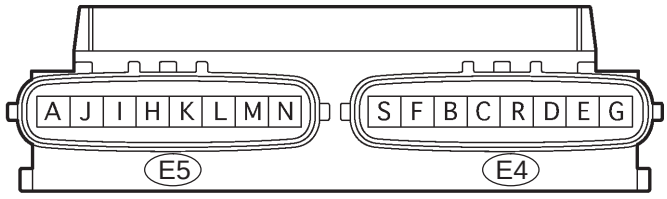
The EDU has been adopted to drive the injector at high speeds. The EDU has realized high–speed driving under high fuel pressure conditions using the DC/DC converter that provides a high–voltage, quick–charging system.

Soon after the EDU receives an injection command signal (IJT) from the ECM, the EDU responds to the command with injector injection confirmation signal (IJF) when the current is applied to the injector.

EDU Wiring Diagram



EDU Connector



Warning: Terminal J, I, H, K, L, M, N and S are high voltage

Y A81481

DTC No.	DTC Detection Condition	Trouble Area
P0200	Open or short in EDU or injector circuit. After engine is started, there is no injection confirmation signal (IJF) from EDU to ECM, despite the ECM sending injection command signal (IJT) to the EDU.	• Open or short in EDU circuit • Injector • EDU • ECM

MONITOR DESCRIPTION

P0200 (Open or short in EDU or injector circuit):

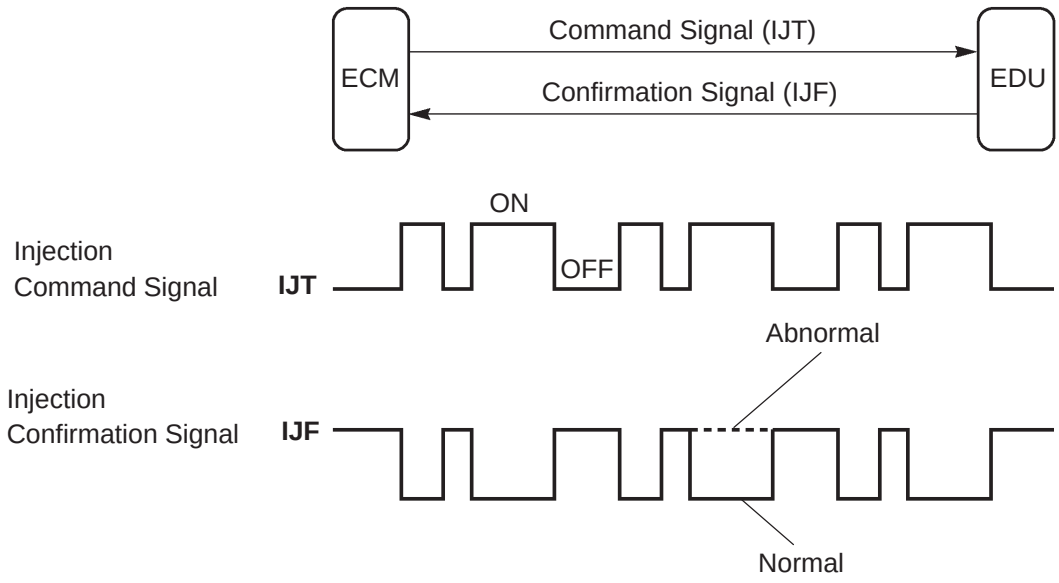
The ECM always monitors both the injection command signal (IJT) and injection confirmation signal (IJF). This DTC will be set if the ECM judged that the number of IJT signals and IJF signals are inconsistent.

The EDU monitors a drive current supplied to the injector and interprets the IJF signal as low if the current exceeds the specified level, and then it indicates that there is the current in the injector.

P0200 refers to malfunction of injector drive circuit or injector circuit.

If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

Malfunction Detection



MONITOR STRATEGY

Required sensors	IJF signal from EDU
Frequency of operation	Continuous
Duration	10 sec.
CHK ENG operation	1 driving cycle

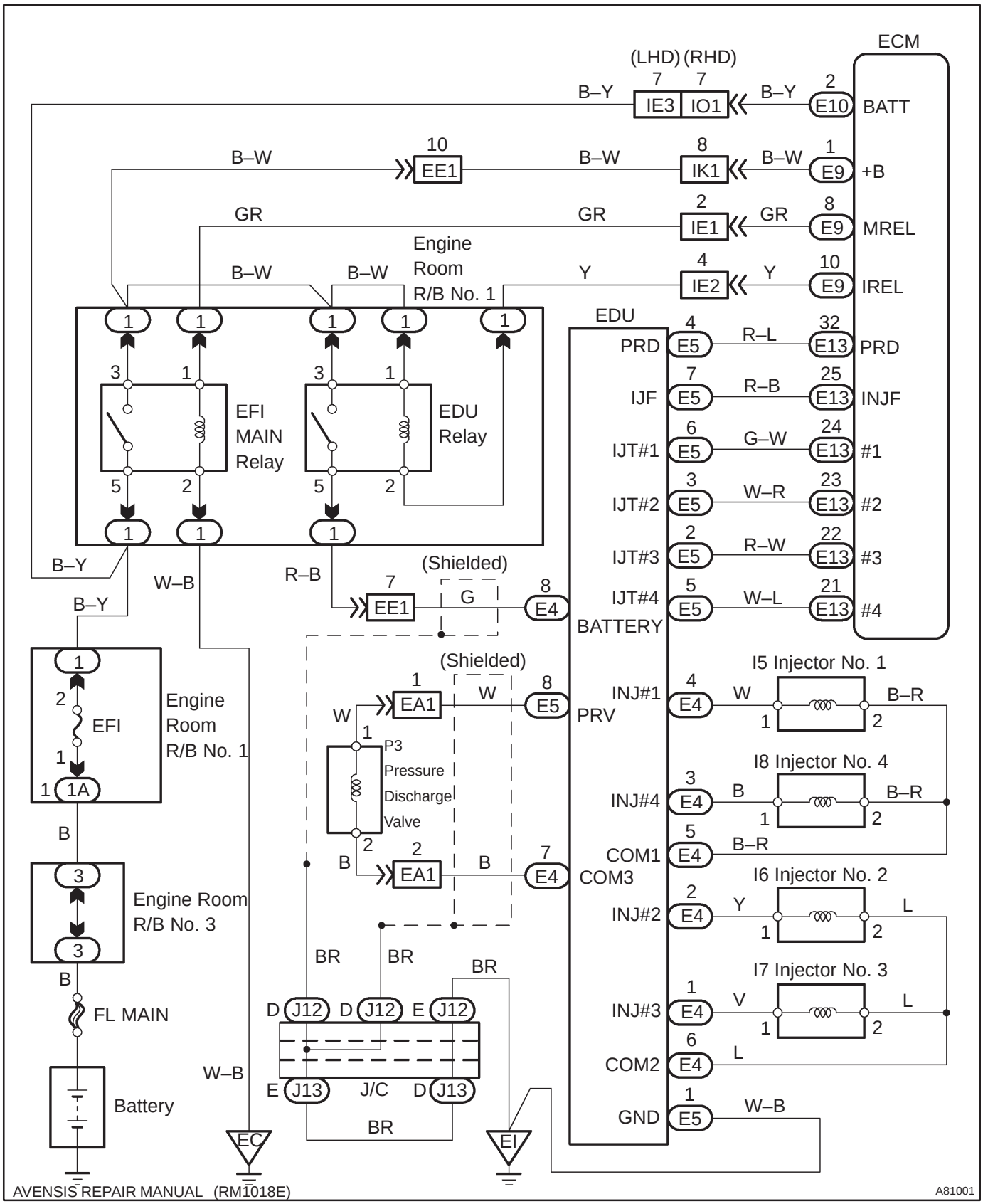
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine speed	500 rpm	–
Battery voltage	11 V	–
Ignition switch	ON	

TYPICAL MALFUNCTION THRESHOLDS

Threshold
If injection missing counter* is accumulated a specified number of times successively, or if injection missing counter for either one of the cylinders is accumulated a specified number of times successively (Approximately 1 second or more). *: Injection missing counter increments when no IJF signal from the EDU despite the ECM sending the IJT signal.

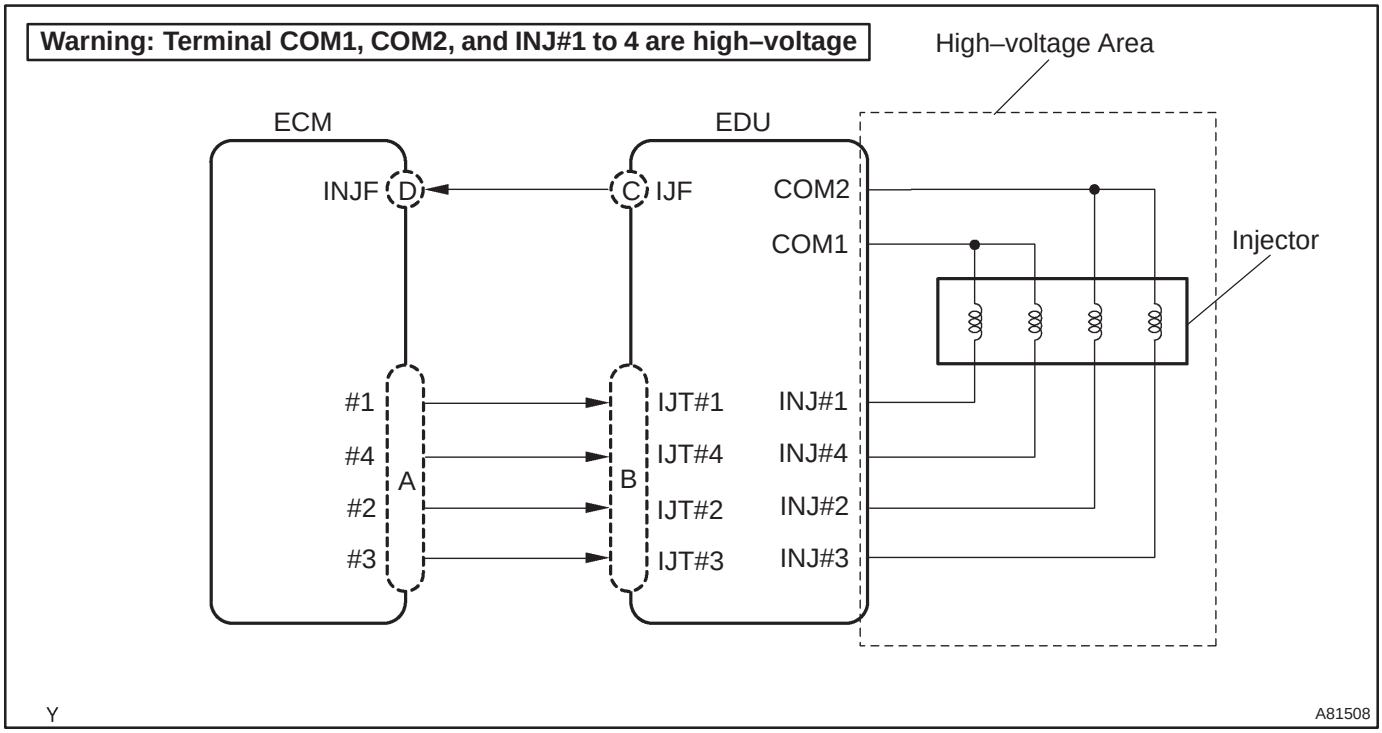
WIRING DIAGRAM



PULSE GENERATION INSPECTION

HINT:

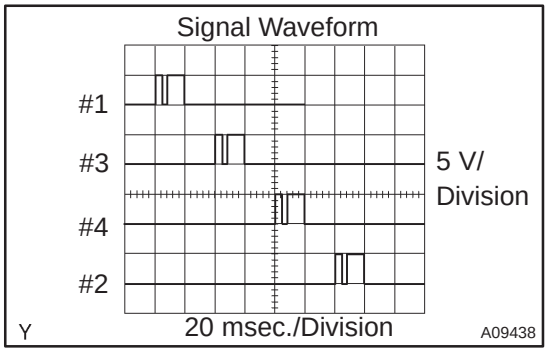
Problem area can be identified by inspecting waveform at the following inspection points.



HINT:

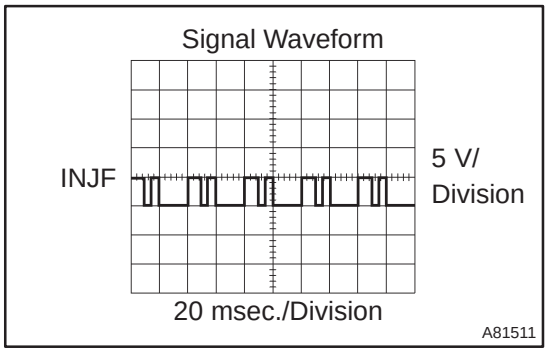
Inspect the following inspection points ”A and D” or ” B and C” at the same time.

Malfunction point	Trouble area
A	• ECM
B (if A is normal)	• Open or short in ”#1 to #4 (ECM)” – ”IJT#1 to #4 (EDU)” harness or connector.
C (if A and B are normal)	• Open or short in ”INJ#1 to #4 (EDU)” – ”COM1 and/or COM2” (EDU) circuit. • Injector • EDU
D (if A, B and C are normal)	• Open or short in ”IJF (EDU)” – ”INJF (ECM)” circuit. (P1271 is set simultaneously)



(a) Reference: Inspect using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Inspection Points	Specified Condition
A and B	Correct waveform is as shown



(b) Reference: Inspect using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Inspection Points	Specified Condition
C and D	Correct waveform is as shown

INSPECTION PROCEDURE

HINT:

- If P0200 and P1271 are present simultaneously, there is open in the INJF wire harness between the EDU and ECM, or there is open in the wire harness for both of the injector the pressure discharge valve.
- Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0200)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.
Result:

Display (DTC output)	Proceed to
DTC P0200 and P1238 are output	A
Only DTC P0200 is output	B

B → **Go to step 3**

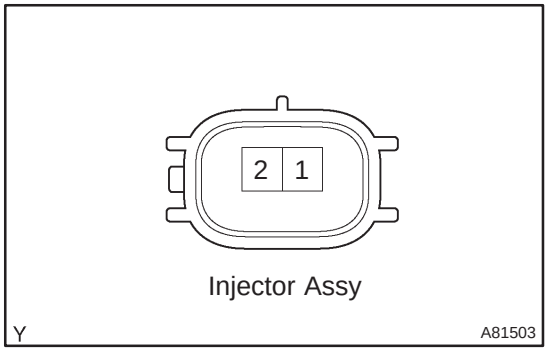
A

2	READ VALUE OF HAND–HELD TESTER(COMPENSATION OF INJECTION QUANTIFY BETWEEN CYLINDERS)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB” and read its value displayed on the hand–held tester.
Result:
STD – 3 to 3 mm^3/st
Maximum – 4.9 to 4.9 mm^3/st
(e) The cylinder that has a misspecification compensation value is a faulty cylinder, use the following flow-chart to inspect and repair the cylinder.

GO

3 INSPECT INJECTOR ASSY

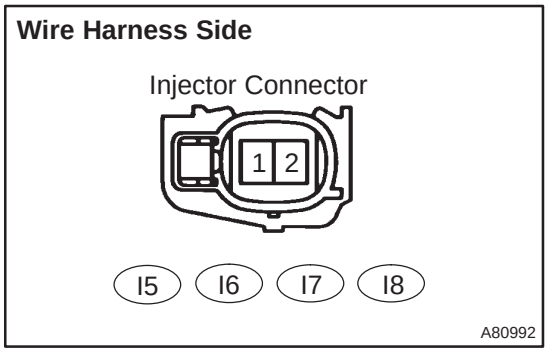


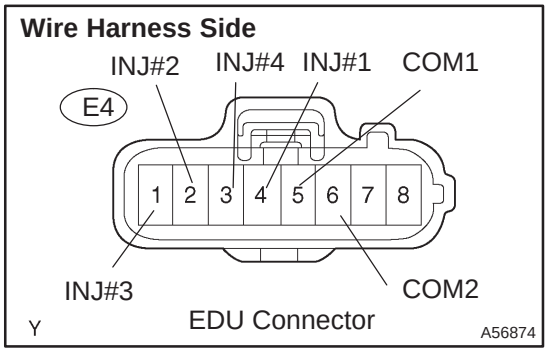
(a) Check the injector for resistance.
(1) Measure the resistance between the terminals.
Resistance: 0.85 to 1.05 Ω at 20°C (68°F)

NG → **REPLACE INJECTOR ASSY (See page 11–60)**

OK

4 CHECK HARNESS AND CONNECTOR(EDU – INJECTOR ASSY)





(a) Check the harness and connector between the injector and EDU (INJ# terminal).
(1) Disconnect the I5, I6, I7, or I8 injector connector.
(2) Disconnect the E4 EDU connector.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Injector (I5–1) – INJ#1 (E4–4)	Continuity
Injector (I6–1) – INJ#2 (E4–2)	
Injector (I7–1) – INJ#3 (E4–1)	
Injector (I8–1) – INJ#4 (E4–3)	
Injector (I5–2) – COM1 (E4–5)	
Injector (I6–2) – COM2 (E4–6)	
Injector (I7–2) – COM2 (E4–6)	
Injector (I8–2) – COM1 (E4–5)	

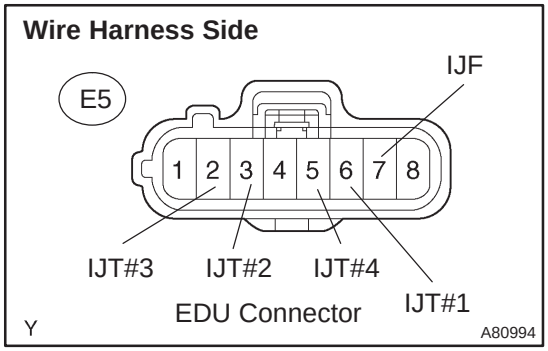
Standard (Check for short):

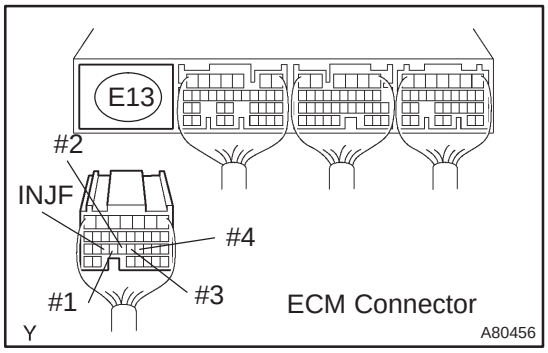
Symbols (Terminal No.)	Specified condition
Injector (I5–1) or INJ#1 (E4–4) – Body ground	No continuity
Injector (I6–1) or INJ#2 (E4–2) – Body ground	
Injector (I7–1) or INJ#3 (E4–1) – Body ground	
Injector (I8–1) or INJ#4 (E4–3) – Body ground	
Injector (I5–2) or COM1 (E4–5) – Body ground	
Injector (I6–2) or COM2 (E4–6) – Body ground	
Injector (I7–2) or COM2 (E4–6) – Body ground	
Injector (I8–2) or COM1 (E4–5) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 CHECK HARNESS AND CONNECTOR(EDU – ECM)





(a) Disconnect the E5 EDU connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the terminals of the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IJT#1 (E5–6) – #1 (E13–24)	Continuity
IJT#2 (E5–3) – #2 (E13–23)	
IJT#3 (E5–2) – #3 (E13–22)	
IJT#4 (E5–5) – #4 (E13–21)	
IJF (E5–7) – INJF (E13–25)	

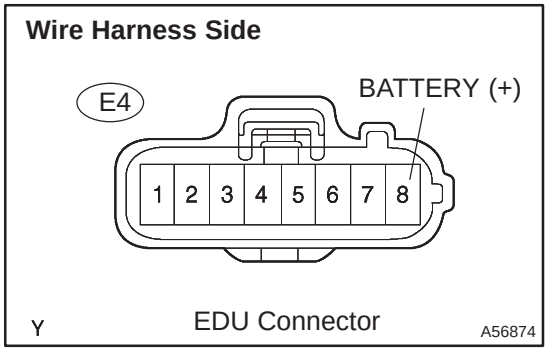
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
#1 (E13–24) or IJT#1 (E5–6) – Body ground	No continuity
#2 (E13–23) or IJT#2 (E5–3) – Body ground	
#3 (E13–22) or IJT#3 (E5–2) – Body ground	
#4 (E13–21) or IJT#4 (E5–5) – Body ground	
INJF (E13–25) or IJF (E5–7) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

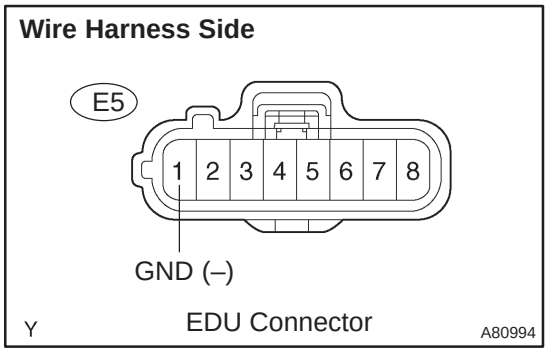
6 INSPECT INJECTOR DRIVER(BATTERY VOLTAGE)



(a) Disconnect the E4 and E5 EDU connectors.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the specified terminals of the EDU connector.

Voltage:

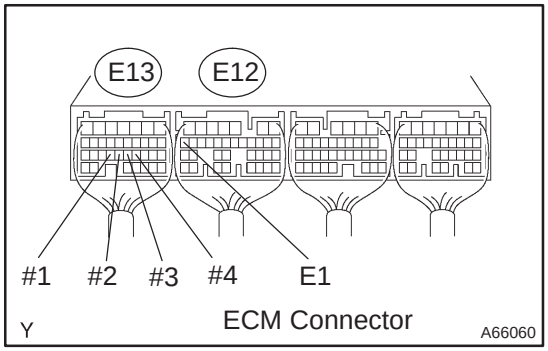
Symbols (Terminal No.)	Specified condition
BATTERY (E4–8) – GND (E5–1)	9 to 14 V



NG → **CHECK INJECTOR DRIVER POWER SOURCE CIRCUIT (BATTERY – EDU)**

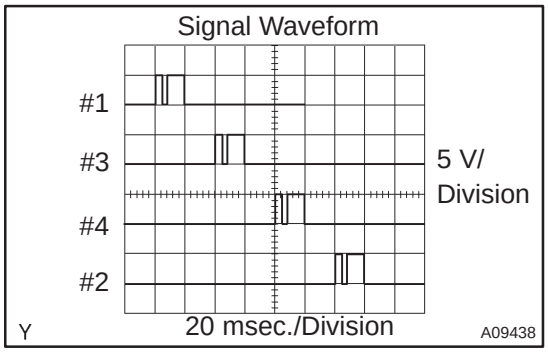
OK

7 INSPECT ECM(INJECTOR VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E12 and E13 ECM connectors.
Standard:

Symbols (Terminal No.)	Specified condition
#1 (E13–24) – E1 (E12–7)	Correct waveform is as shown
#2 (E13–23) – E1 (E12–7)	
#3 (E13–22) – E1 (E12–7)	
#4 (E13–21) – E1 (E12–7)	



NG → **REPLACE ECM(See page 10–65)**

OK

8 REPLACE INJECTOR DRIVER

GO

CHECK DTC OUTPUT RECUR (DTC P0200 OUTPUT AGAIN)

HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds, and then confirm P0200 is not set again.

DTC	P0234	TURBO/SUPER CHARGER OVERBOOST CONDITION

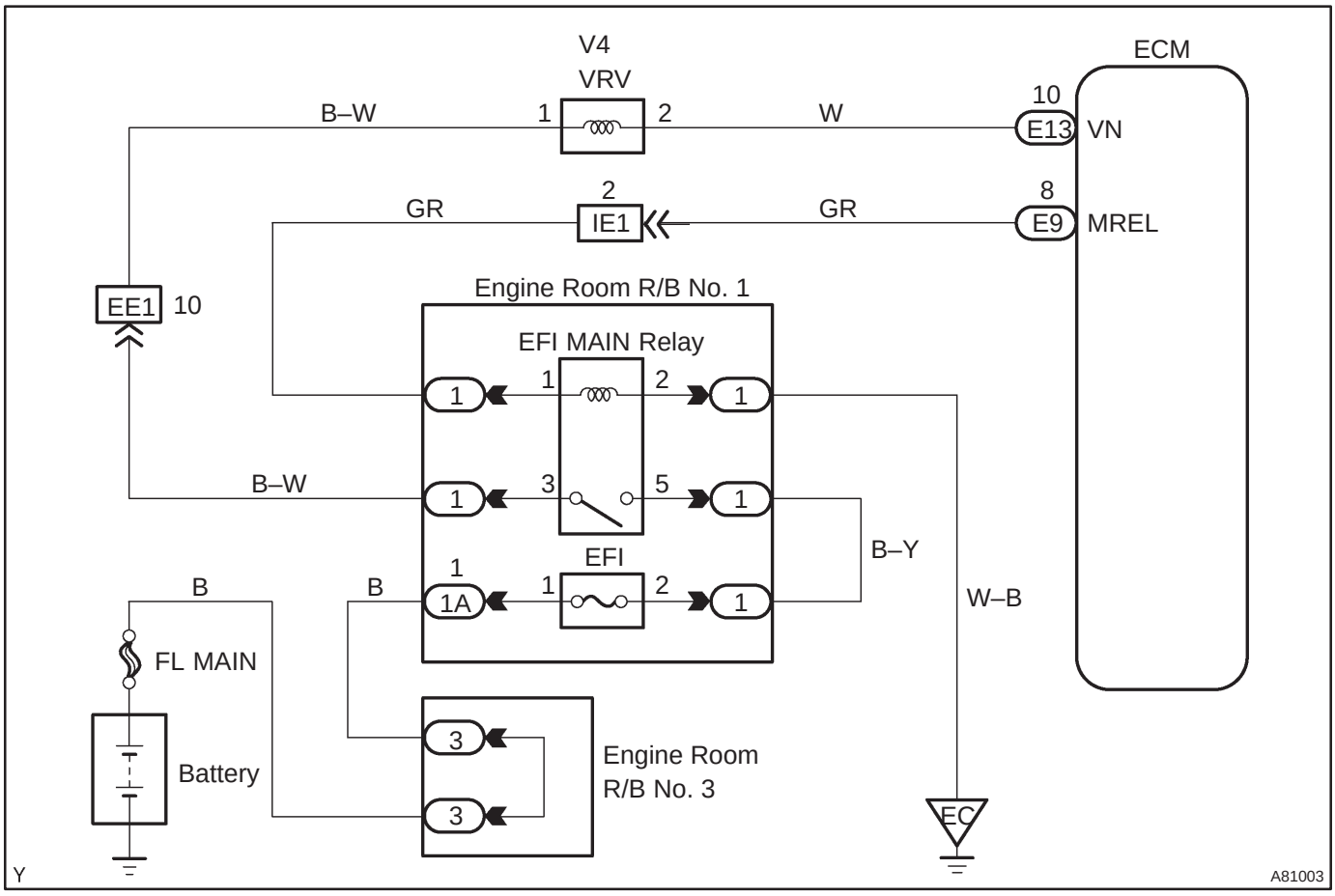
DTC	P0299	TURBO/SUPER CHARGER UNDERBOOST

DTC	P1251	TURBO/SUPER CHARGER OVERBOOST CONDITION (TOO HIGH)

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0234 P0299 P1251	When the condition that the turbocharger pressure exceeds the standard value for 0.5 sec. or more. (1 trip detection logic)	• VRV • Open or short in VRV circuit • Turbocharger • Vacuum hose • EGR valve • ECM
	Actual turbocharger pressure is deviated 20 kPa (0.2 kgf/cm^2, 2.9 psi) or more from the simulated target pressure based on the engine speed and fue injection volume for 60 seconds.	

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0234, P0299 AND/OR P1251)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
”P0234, P0299 and/or P1251” are output	A
”P0234, P0299 and/or P1251 and other DTCs are output	B

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

2	CHECK CONNECTION OF VACUUM HOSE

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

3	CHECK VACUUM HOSE(CHECK VACUUM BETWEEN TURBOCHARGER – VRV FOR INTAKE PRESURE CHANGE AT 900 RPM)

(a) Using a 3–way connector, connect a vacuum gauge to the hose between the E–VRV and turbocharger.

(b) Warm up the engine to above 80˚C (176˚F).

(c) Check the vacuum at 900 rpm.

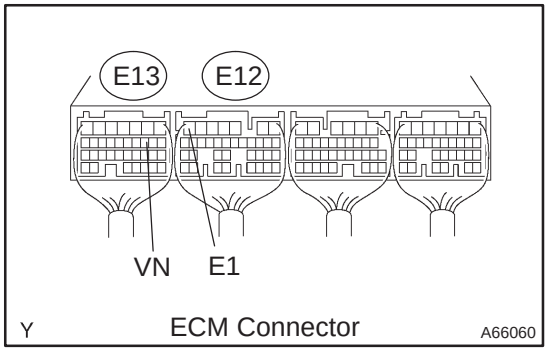
Result:

Proceed to	Vacuum
A	0 kPa (0 mmHg, 0 in.Hg) to 50 kPa (375 mmHg, 14.8 in.Hg)
B	Above 50 kPa (375 mmHg, 14.8 in.Hg)

B → **Go to step 8**

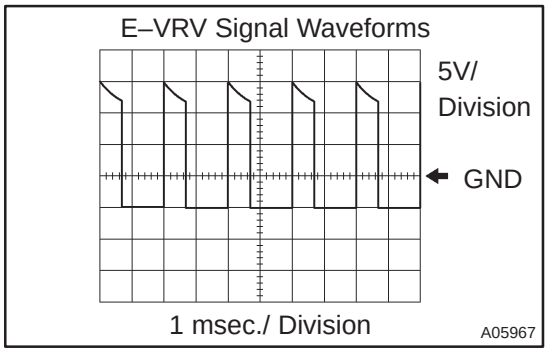
A

4 INSPECT ECM(VN VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E12 and E13 ECM connectors.
Standard:

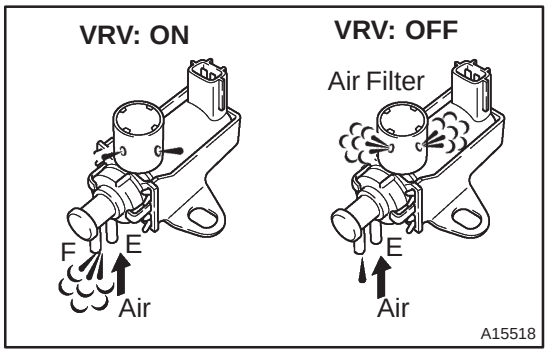
Symbols (Terminal No.)	Specified condition
VN (E13–10) – E1 (E12–7)	Correct waveform is as shown



NG → **REPLACE ECM (See page 10–65)**

OK

5 INSPECT VACUUM REGULATING VALVE ASSY(OPERATION)



(a) Disconnect the vacuum hoses from the VRV.
(b) Turn the ignition switch ON.
(c) Check for operation of the E–VRV when it is operated by the hand–held tester.
VRV ON:
Air from port E flows out through port F.
VRV OFF:
Air from port E flows out through air filter.

NG → **REPLACE VACUUM REGULATING VALVE ASSY**

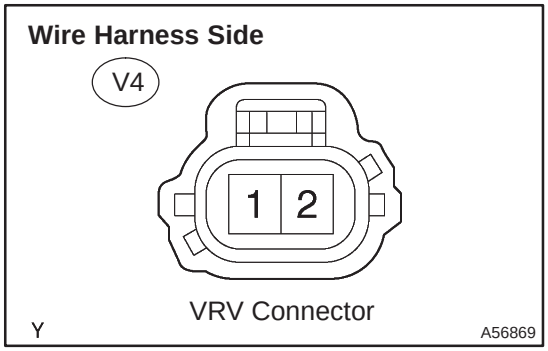
OK

6 INSPECT VACUUM REGULATING VALVE ASSY(RESISTANCE) (See page 12–16)

NG → **REPLACE VACUUM REGULATING VALVE ASSY**

OK

7	CHECK HARNESS AND CONNECTOR(VRV – ECM)



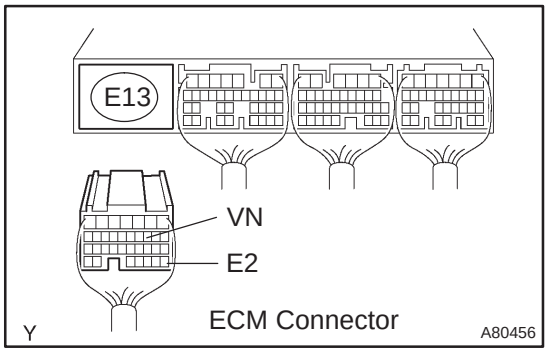
(a) Disconnect the V4 VRV connector.
(b) Disconnect the E13 ECM connector.
(c) Check the continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VN (E13–10) – (V4–2)	Continuity
E2 (E13–28) – (V4–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VN (E13–10) or (V4–2) – Body ground	No continuity
E2 (E13–28) or (V4–1) – Body ground	



NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

8	INSPECT TURBOCHARGER SUB–ASSY (See page 13–7)

NG → **REPLACE TURBOCHARGER SUB–ASSY (See page 13–11)**

OK

9	INSPECT EGR VALVE ASSY (See page 12–18)

NG → **REPLACE EGR VALVE ASSY (See page 14–286)**

OK

REPLACE ECM (See page 10–65)

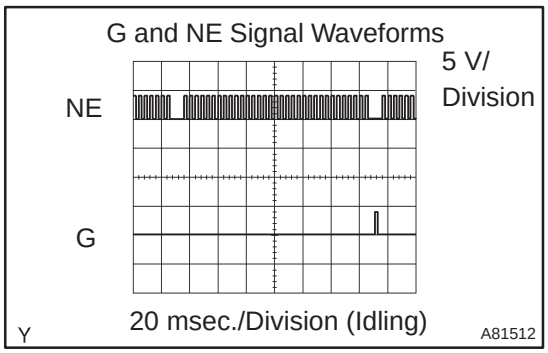
DTC	P0335	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT

DTC	P0339	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT INTERMITTENT

CIRCUIT DESCRIPTION

Crankshaft position sensor (NE signal) consists of a magnet, iron core and pickup coil.
The NE signal plate has 34 teeth and is installed the crankshaft timing pulley. The NE signal sensor generates 34 signals of every engine revolution. The ECM detects the standard crankshaft angle based on the G signal, and the actual crankshaft angle and the engine speed by the NE signal.

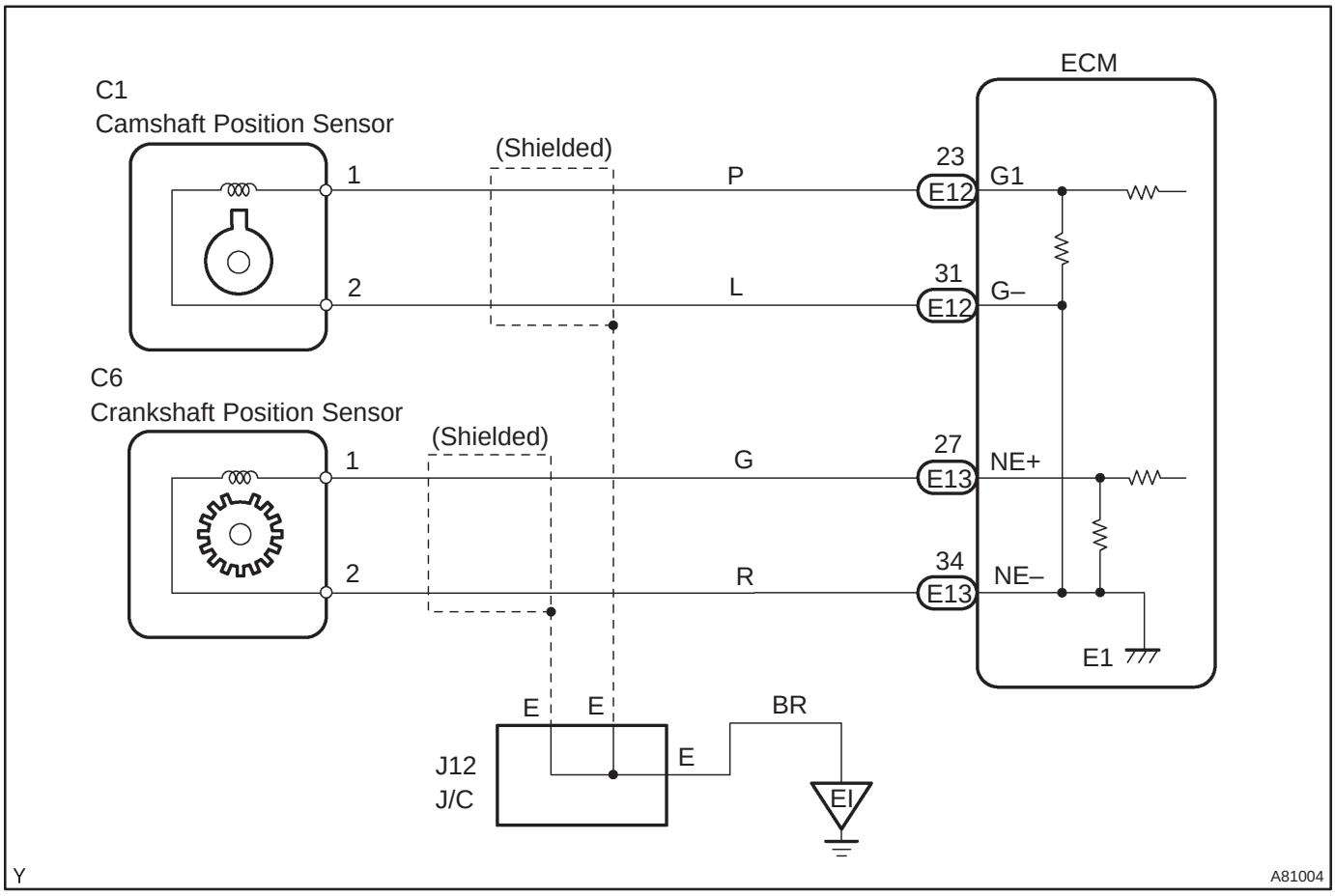
DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft timing pulley) • ECM
	No crankshaft position sensor signal to ECM with engine speed 650 rpm or more (2 trip detection logic)	
P0339	In conditions (a), (b) and (c), when no crankshaft position sensor (NE) signal is input for 0.05 sec. or more. (1 trip detection logic) (a) Engine revolution 1,000 rpm or more (b) STA signal is OFF (c) 3 sec. or more has lapsed after STA signal is switched from ON to OFF.	



Reference: Inspection using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Symbols (Terminal No.)	Specified condition
NE+ (E13–27) – NE– (E13–34)	Correct waveform is as shown

WIRING DIAGRAM

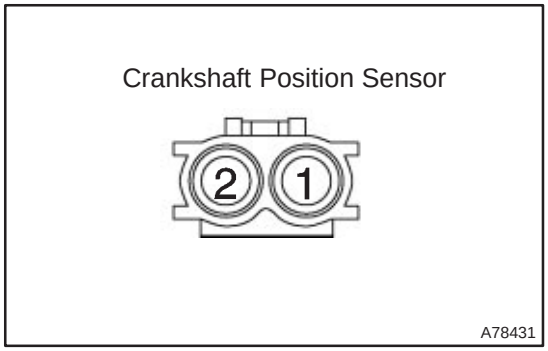


INSPECTION PROCEDURE

HINT:

- Perform troubleshooting of DTC P0335 first. If no trouble is found, troubleshoot the engine mechanical systems.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 INSPECT CRANKSHAFT POSITION SENSOR(RESISTANCE)



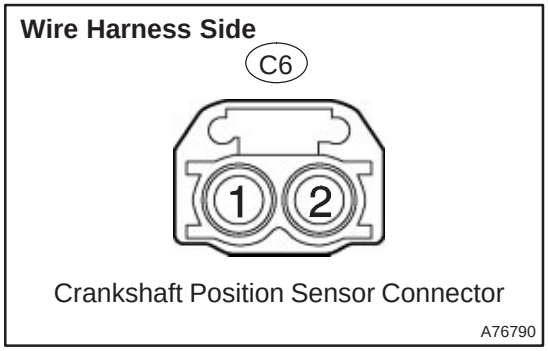
(a) Measure the resistance between terminals 1 and 2.
Resistance:
1,630 to 2,740 Ω at cold
2,065 to 3,225 Ω at hot

NOTICE:
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50 °C (122 °F) and "Hot" is from 50 °C (122 °F) to 100 °C (212 °F).

NG → **REPLACE CRANKSHAFT POSITION SENSOR (See page 10–64)**

OK

2 CHECK HARNESS AND CONNECTOR(CRANKSHAFT POSITION SENSOR – ECM)



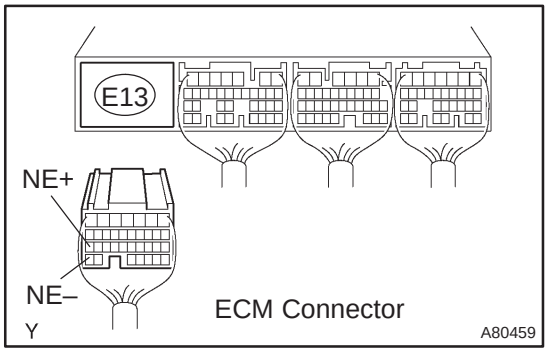
(a) Disconnect the C6 crankshaft position sensor connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Crankshaft position sensor (C6–1) – NE+ (E13–27)	Continuity
Crankshaft position sensor (C6–2) – NE– (E13–34)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Crankshaft position sensor (C6–1) or NE+ (E13–27) – Body ground	No continuity
Crankshaft position sensor (C6–2) or NE– (E13–34) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)

NG → **TIGHTEN SENSOR**

OK

4	CHECK CRANKSHAFT POSITION SENSOR PLATE(TEETH OF SENSOR PLATE(CRANKSHAFT TIMING PULLEY))

(a) Check the teeth of the sensor plate.

NG → REPLACE CRANKSHAFT POSITION SENSOR PLATE (CAMSHAFT TIMING PULLEY)

OK

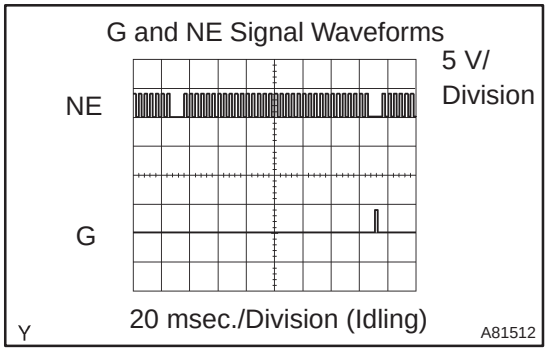
REPLACE ECM (See page 10–65)

DTC	P0340	CAMSHAFT POSITION SENSOR ”A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

Camshaft position sensor (G signal) consists of a magnet, iron core and pickup coil.
The G signal plate has one tooth on its outer circumference and is installed on the camshaft timing pulley. When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft timing pulley. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the standard crankshaft angle based on the G signal and the actual crankshaft angle and the engine speed by the NE signal.

DTC No.	DTC Detection Condition	Trouble Area
P0340	• No camshaft position sensor signal to ECM during cranking (2 trip detection logic) • No camshaft position sensor signal to ECM with engine speed 650 rpm or more (1 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • ECM



Reference: Inspection using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Symbols (Terminal No.)	Specified condition
G1 (E12–23) – G– (E12–31)	Correct waveform is as shown

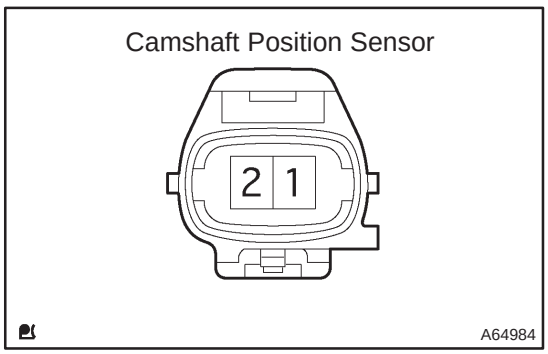
WIRING DIAGRAM

Refer to DTC P0335 on page 05–616.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	INSPECT CAMSHAFT POSITION SENSOR



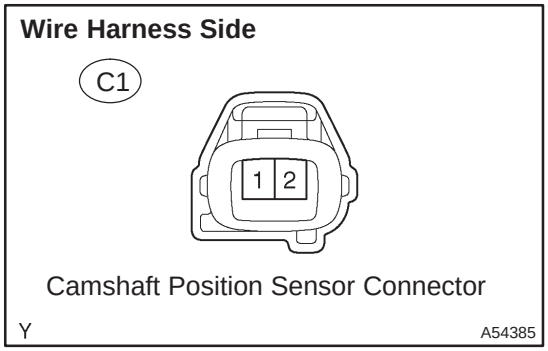
(a) Measure the resistance between terminals 1 and 2.
Resistance:
1,630 to 2,740 Ω at cold
2,065 to 3,225 Ω at hot

NOTICE:
”Cold” and ”Hot” shown above mean the temperature of the coils themselves. ”Cold” is from –10°C (14°F) to 50 °C (122 °F) and ”Hot” is from 50 °C (122 °F) to 100 °C (212 °F).

NG → **REPLACE CAMSHAFT POSITION SENSOR (See page 10–63)**

OK

2 CHECK HARNESS AND CONNECTOR(CAMSHAFT POSITION SENSOR – ECM)



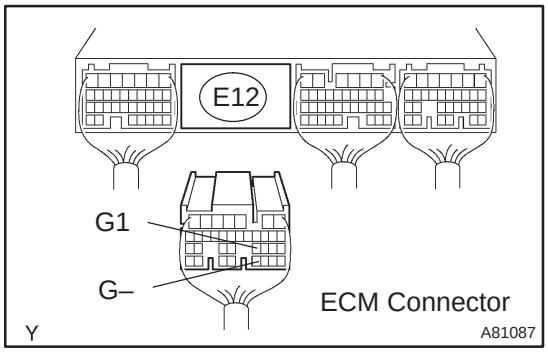
(a) Disconnect the C1 camshaft position sensor connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Camshaft position sensor (C1–1) – G1 (E12–23)	Continuity
Camshaft position sensor (C1–2) – G– (E12–31)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Camshaft position sensor (C1–1) or G1 (E12–23) – Body ground	No continuity
Camshaft position sensor (C1–2) or G– (E12–31) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CAMSHAFT POSITION SENSOR)

NG → **TIGHTEN SENSOR**

OK

4 CHECK CAMSHAFT TIMING PULLEY(TEETH OF PLATE)

(a) Check the teeth of the signal plate.

NG → **REPLACE CAMSHAFT TIMING PULLEY**

OK

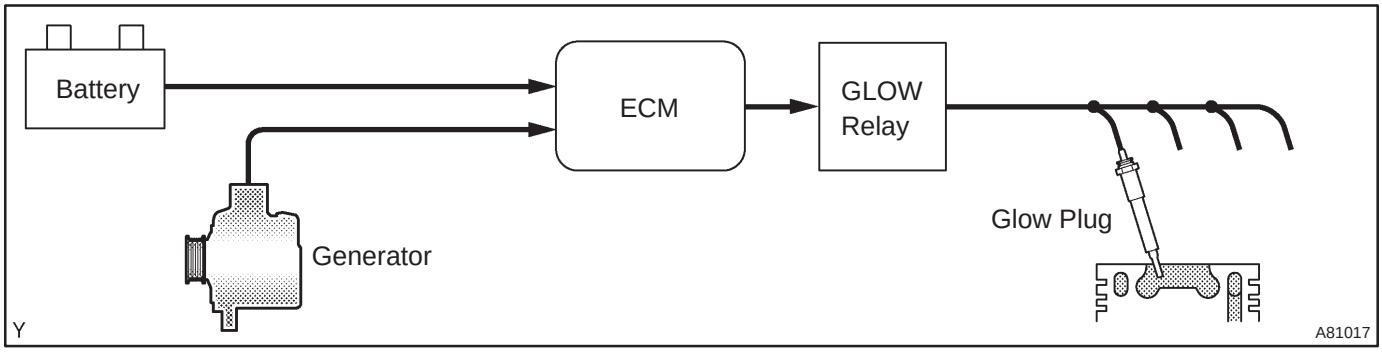
REPLACE ECM (See page 10–65)

DTC	P0380	GLOW PLUG/HEATER CIRCUIT ”A”

CIRCUIT DESCRIPTION

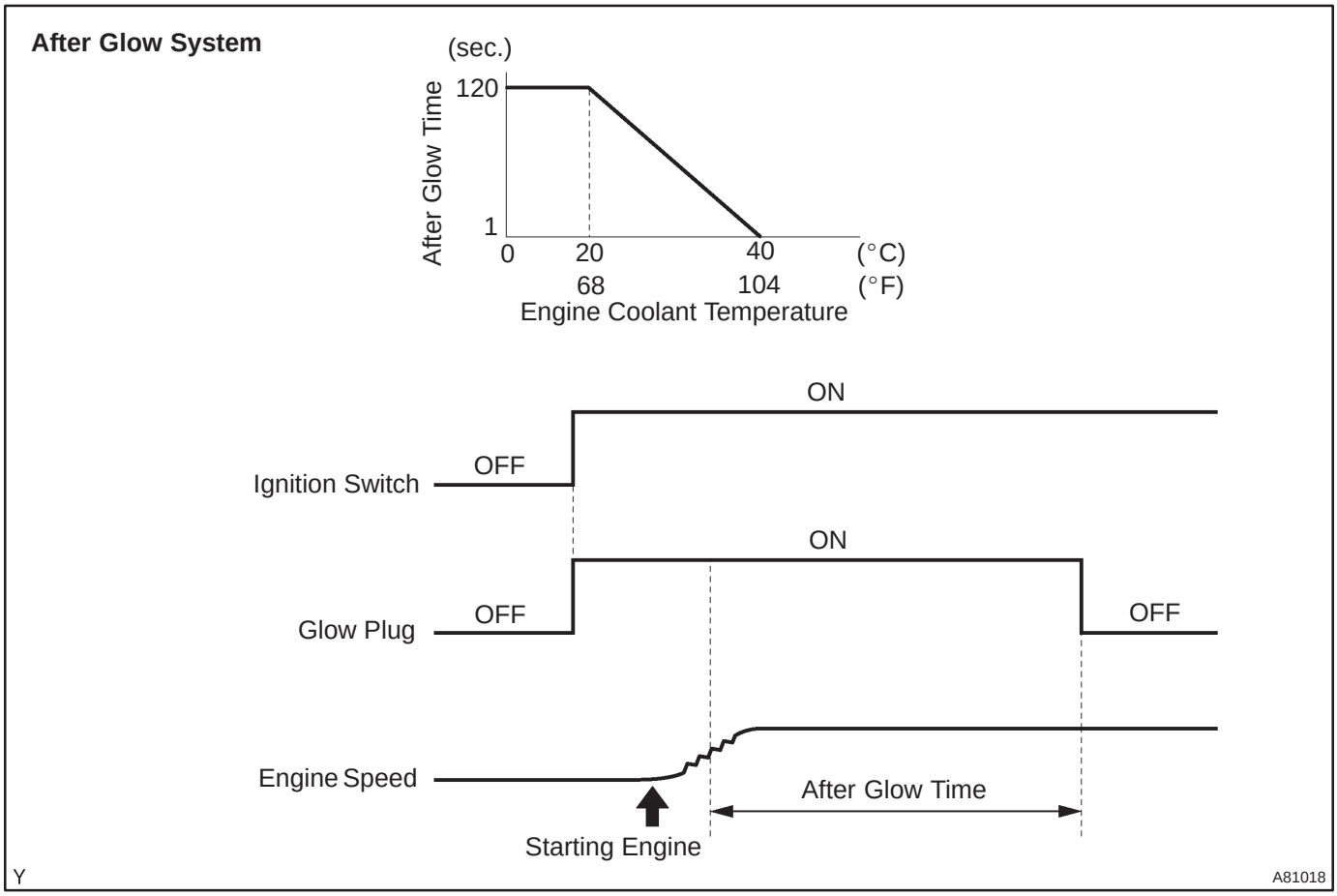
The glow plug is mounted inside the engine combustion room. To ensure efficient engine starting with a cold engine, the ECM calculates time the current needs to flow into the glow plug depending on the engine coolant temperature after the ignition switch is turned ON. The ECM then turns on the glow relay and permits the current to flow into the glow plug. The glow plug is then heated and enhances fuel combustion with the cold engine.

This DTC will be set if there is open in glow plug itself or its circuit.



The ECM performs the after glow for a certain period of time depending on the engine coolant temperature after the engine has been started. After glow reduces a diesel engine knocking, a white smoke, and etc with a cold engine.

After Glow System



DTC No.	DTC Detection Condition	Trouble Area
P0380	When the glow plug is turned from ON to OFF, or vice–versa, conditions (a) and (b) are satisfied: (a) Battery voltage dos not change (b) Duty signal from terminal M of the generator does not change	• Open or short in glow plug circuit • Glow fuse • Glow relay • Glow plug • ECM

MONITOR DESCRIPTION

When starting a cold engine, the ECM supplies the current to the glow plug for a certain period of time. As the supplying current to the glow plug is terminated, the large current is suddenly cut off, therefore the battery voltage then varies and also terminal M output (duty ratio) of the generator varies. If these variations are not occurred when the glow plug is turned from ON to OFF, or vice–versa, the ECM realizes that the current has not been supplied to the glow plug, and interprets this as open malfunction of the glow plug or glow plug circuit.

MONITOR STRATEGY

Required sensors	Glow plug circuit
Frequency of operation	Twice per driving cycle
Duration	3 min.
CHK ENG operation	2 driving cycles

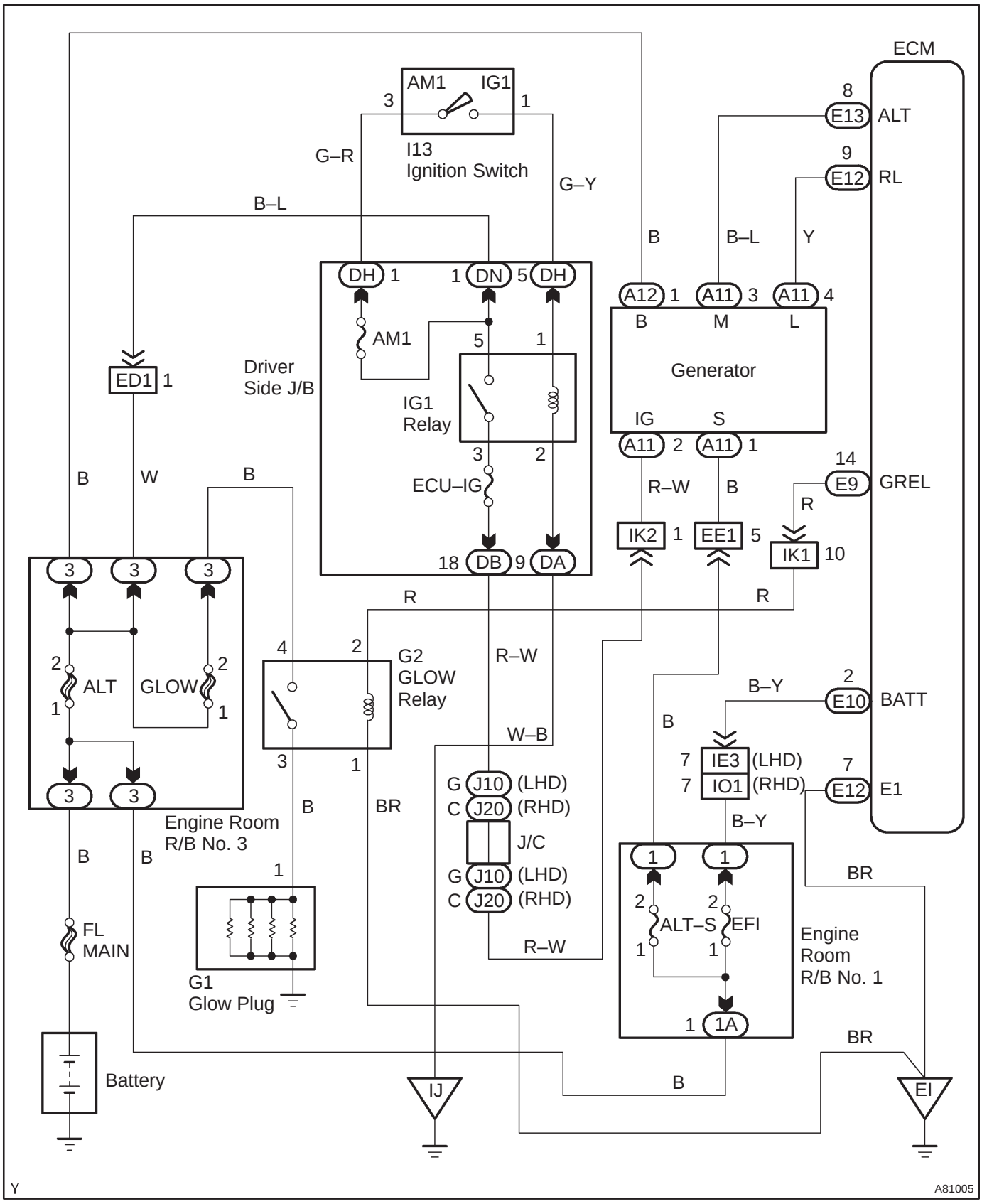
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Battery voltage	11 V	–
Engine speed	700 rpm	2,000 rpm
Engine coolant temperature	–	40°C (104°F)
Engine speed is stable	–	
Time after engine start	8 sec.	–
Any switches that vary electrical load have not been being operated	–	
The monitor will not run if the generator circuit is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

Threshold
When the battery voltage, or terminal M output (duty ratio) of the generator does not change, despite turning the glow plug from ON to OFF, or vice–versa

WIRING DIAGRAM

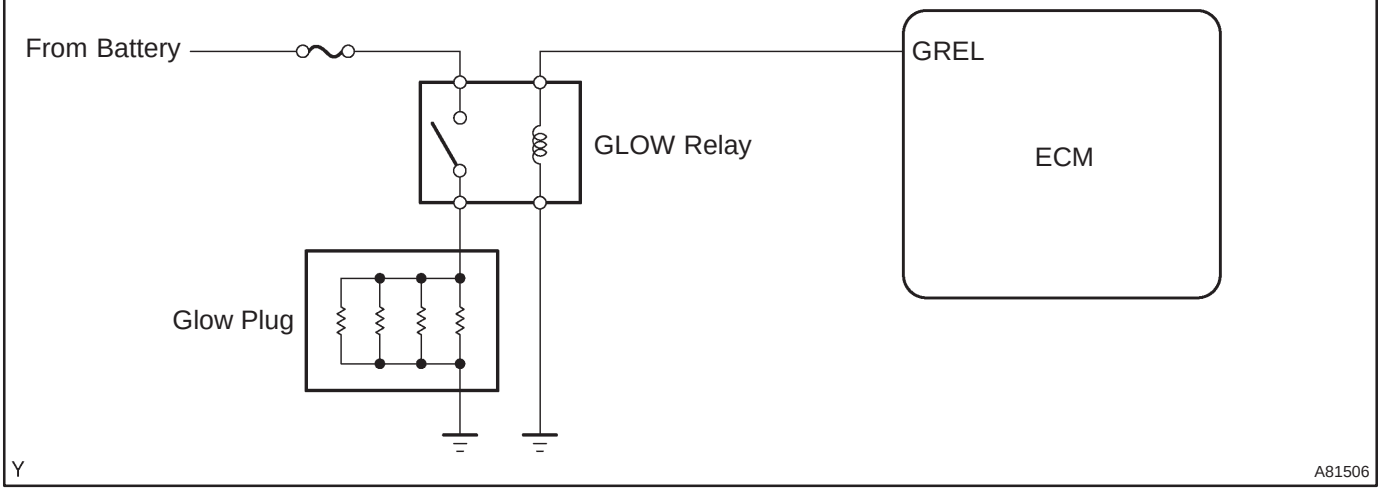


INSPECTION PROCEDURE

HINT:

- After completing repair, confirm P0380 is not set again.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

Glow System Wiring Diagram



1	CHECK OTHER DTC OUTPUT(BESIDS DTC P0380)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.

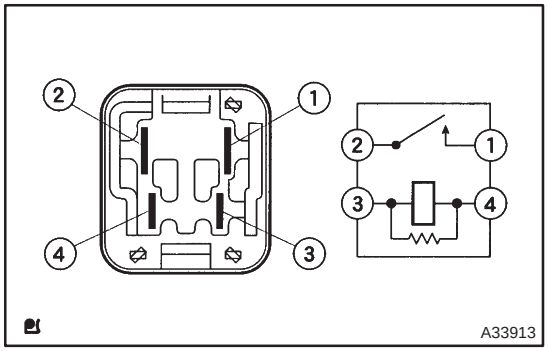
Result:

Display (DTC output)	Proceed to
Only P0380 are output	A
P0380 and P0622 are output	B

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

2 CHECK GLOW PLUG RELAY ASSY



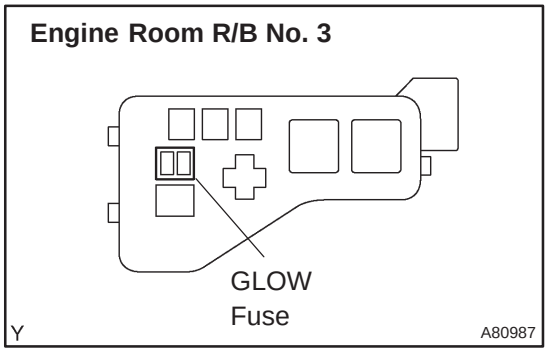
(a) Check the glow plug relay for continuity.
(1) Check that there is continuity between and terminal.
Specified condition:

Between terminal	Specified condition
1 – 2	No continuity
	Continuity (Apply battery voltage terminals 3 and 4)
3 – 4	Continuity

NG → **REPLACE GLOW PLUG RELAY ASSY**

OK

3 CHECK FUSE(GLOW FUSE)

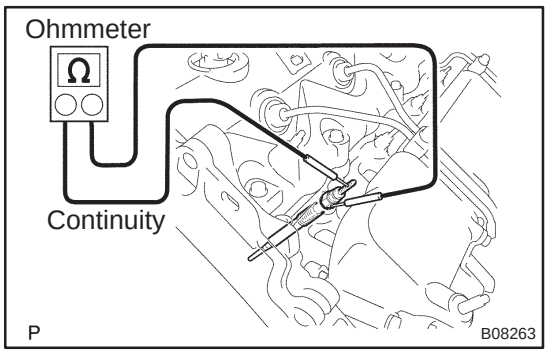


(a) Remove the GLOW fuse from the engine room R/B No. 3.
(b) Check for continuity in the GLOW fuse.
Result: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

4 INSPECT GLOW PLUG ASSY



(a) Check the glow plug for resistance.
(1) Check that there is resistance between the glow plug terminal and ground.
Standard resistance: Approx. 1.1 Ω at 20°C (68°F)

NOTICE:

- **Be careful not to damage the glow plug pipes as it could cause an open circuit or shorten life of the glow plugs.**
- **Avoid getting oil and fuel on the glow plug when cleaning.**
- **During inspection, be sure to wipe off any oil of the terminal and bakelite washer with a dry cloth.**
- **Do not apply more than 11 V to the glow plug as it could cause an open circuit.**

NG → **REPLACE GLOW PLUG ASSY** **(See page 19–33)**

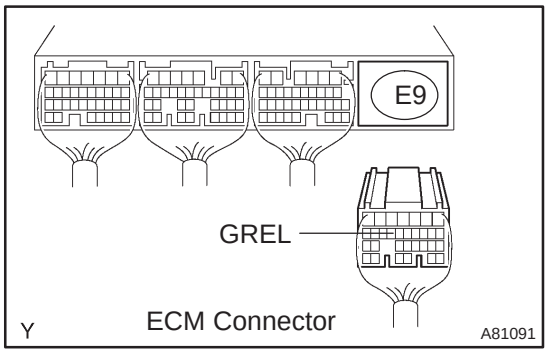
OK

5	INSPECT GLOW PLUG ASSY(INSTALLATION)

NG → TIGHTEN GLOW PLUG

OK

6	CHECK HARNESS AND CONNECTOR(GLOW PLUG RELAY – ECM, AND GLOW PLUG RELAY – BODY GROUND)



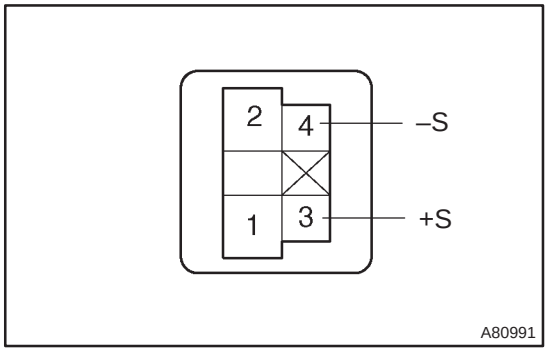
(a) Disconnect the E9 ECM connector.
(b) Remove the glow plug relay.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+S (Glow plug relay terminal 3) – GREL (E9–14)	Continuity
–S (Glow plug relay terminal 4) – Body ground	

Standard (Check for short):

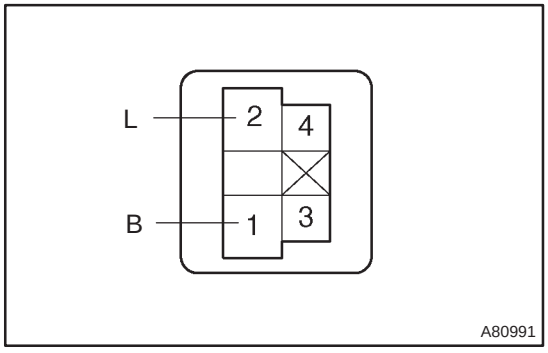
Symbols (Terminal No.)	Specified condition
GREL (E9–14) – Body ground	No Continuity



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	CHECK HARNESS AND CONNECTOR(GLOW PLUG RELAY – GLOW PLUG, AND GLOW PLUG RELAY – BATTERY)



(a) Remove the glow plug relay.
(b) Disconnect the glow plug wire.
(c) Check for continuity between the wire harness.

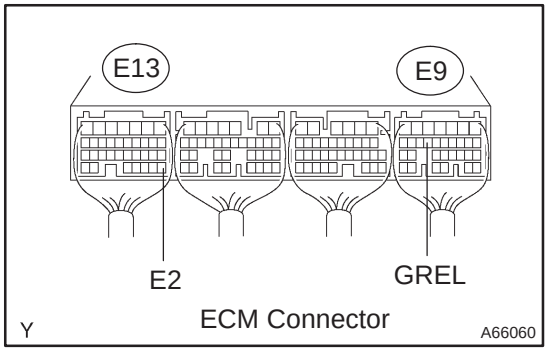
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
L (Glow plug relay terminal 2) – Glow plug wire	Continuity
B (Glow plug relay terminal 1) – Positive terminal of the battery	

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8 INSPECT ECM(GREL VOLTAGE)



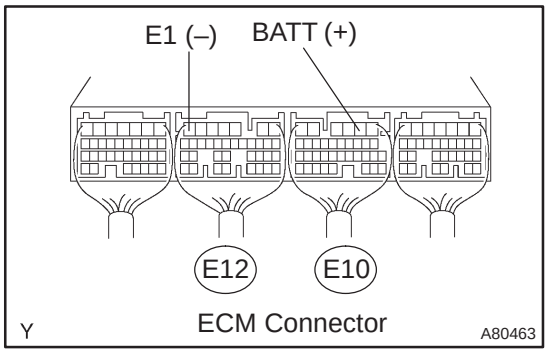
(a) Turn the ignition switch START.
(b) Measure the voltage between the specified terminals of the E9 and E13 ECM connectors.
Voltage:

Symbols (Terminal No.)	Condition	Specified Condition
GREL (E9–14) – E2 (E13–28)	Engine coolant temp. is 40°C (104°F) or less	9 to 14 V

NG → **REPLACE ECM (See page 10–65)**

OK

9 INSPECT ECM(BATT VOLTAGE)



(a) Measure the voltage between the specified terminals of the E10 and E12 ECM connectors.
Standard:

Symbols (Terminal No.)	Specified Condition
BATT (E10–2) – E1 (E12–7)	9 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (BATTERY – ECM)**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)

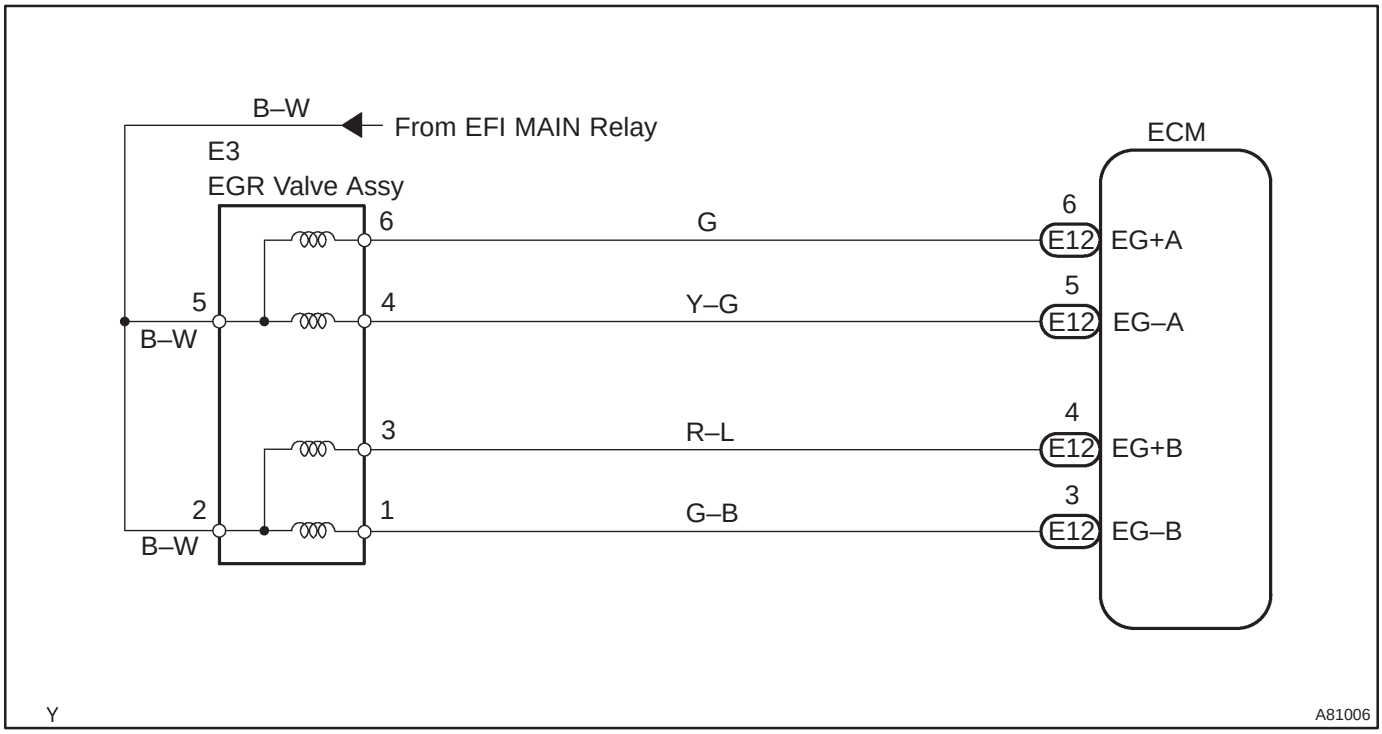
DTC	P0400	EXHAUST GAS RECIRCULATION FLOW

DTC	P0403	EXHAUST GAS RECIRCULATION CONTROL CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0400	Mass air flow rate is not changed when turning on EGR valve	• EGR valve assy • Open or short in EGR circuit • EGR passage • ECM
P0403	EGR valve assy motor malfunction	

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES P0400 AND/OR P0403)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed
P0400 and/or P0403 are output	A
P0400 and/or P0403 and other DTCs are output	B

HINT:

If any other codes besides P0400 and/or P0403 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

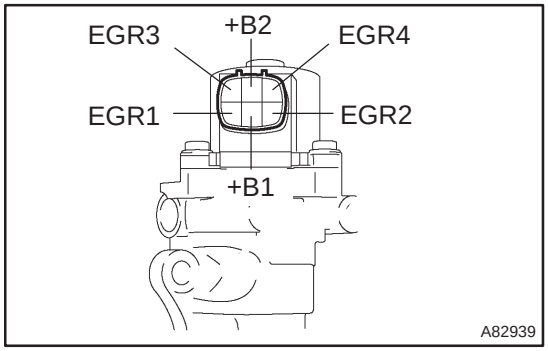
2	READ VALUE OF HAND–HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Warm up the engine, the engine coolant temperature should be above 75°C (167°F) and bellow 90°C (194°F).
(e) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF”.
(f) Check that the MAF reading during idling.
Result: MAF greater than 4 g/s but less than 16 g/s
(g) Force the EGR valve to operate with a hand–held tester, make the valve opening 0, and check that the AFM reading during idling.
Result: MAF greater than 10 g/s but less than 16 g/s

NG → **REPLACE EGR VALVE ASSY (See page 14–286)**

OK

3	INSPECT EGR VALVE ASSY



(a) Check the EGR valve for resistance.
(1) Measure the resistance between the specified terminals.

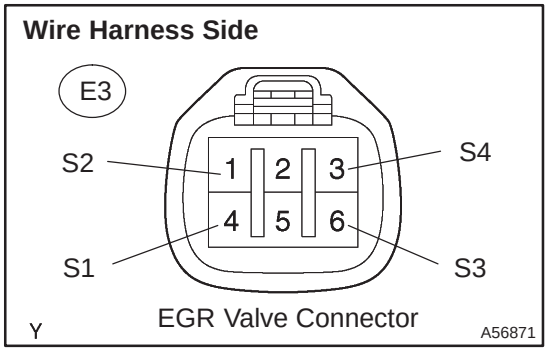
Resistance:

Terminal No.	Specified condition
+B1 – EGR1	19.6 ± 1.4 Ω
+B1 – EGR2	19.6 ± 1.4 Ω
+B2 – EGR3	19.6 ± 1.4 Ω
+B2 – EGR4	19.6 ± 1.4 Ω

NG → **REPLACE EGR VALVE ASSY (See page 14–286)**

OK

4 CHECK HARNESS AND CONNECTOR(EGR VALVE ASSY – ECM)



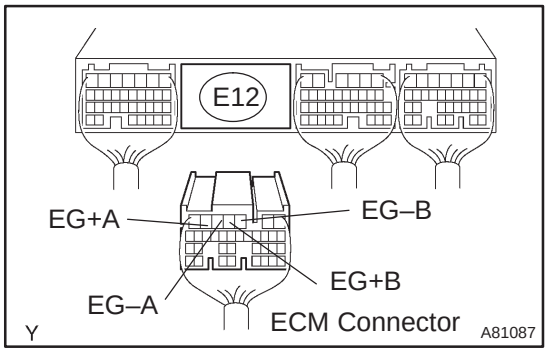
(a) Disconnect the E2 EGR valve connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EG+A (E12–6) – S3 (E3–6)	Continuity
EG–A (E12–5) – S1 (E3–4)	
EG+B (E12–4) – S4 (E3–3)	
EG–B (E12–3) – S2 (E3–1)	

Standard (Check for short):

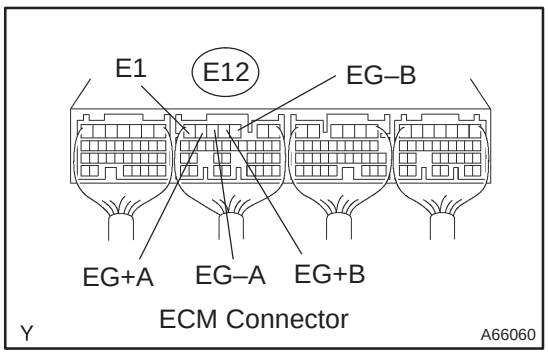
Symbols (Terminal No.)	Specified condition
EG+A (E12–6) or S3 (E3–6) – Body ground	No continuity
EG–A (E12–5) or S1 (E3–4) – Body ground	
EG+B (E12–4) or S4 (E3–3) – Body ground	
EG–B (E12–3) or S2 (E3–1) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

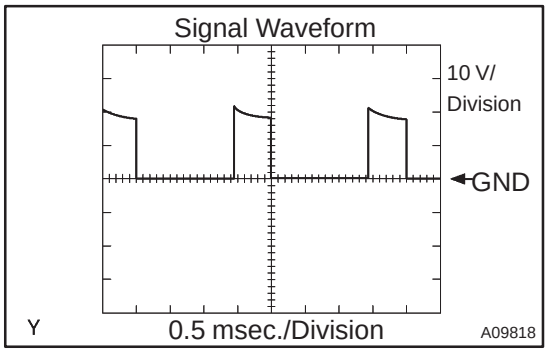
5 INSPECT ECM(EGR VALVE ASSY VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E12 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
EG+A (E12–6) – E1 (E12–7)	Correct waveform is as shown
EG–A (E12–5) – E1 (E12–7)	
EG+B (E12–4) – E1 (E12–7)	
EG–B (E12–3) – E1 (E12–7)	



NG → **REPLACE ECM (See page 10–65)**

OK

6	CHECK DEPOSIT(EGR VALVE ASSY)

NG → REMOVE FOREIGN OBJECT AND CLEAN EGR VALVE

OK

7	CHECK DEPOSIT(EGR PASSAGE)

NG → REPAIR OR REPLACE

OK

8	CHECK FOR EXHAUST GAS LEAKS

NG → REPAIR EXHAUST GAS LEAKAGE POINT

OK

REPLACE ECM (See page 10–65)

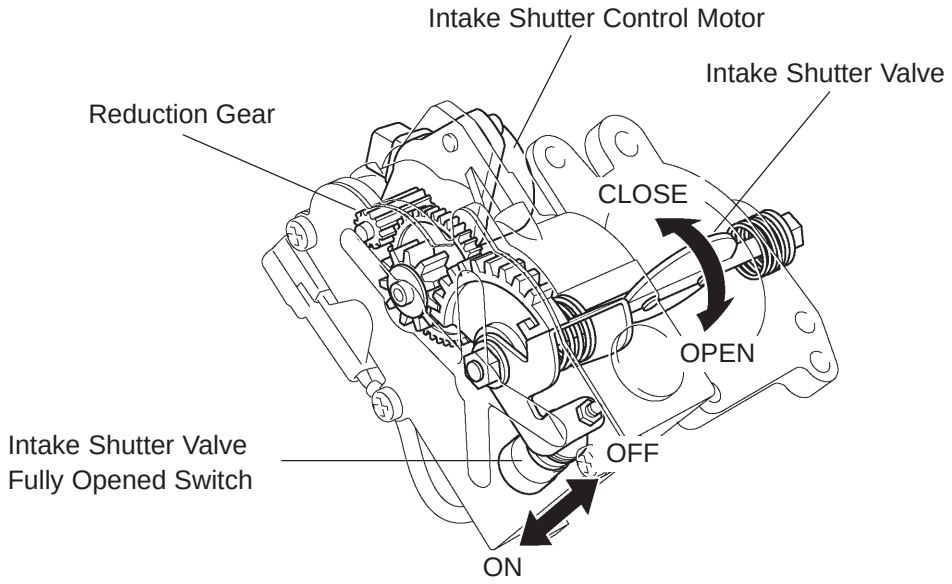
DTC	P0488	EXHAUST GAS RECIRCULATION THROTTLE POSITION CONTROL RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The ECM opens and closes the intake shutter valve using the step motor. Upon opening and closing the valve, the exhaust gas recirculation volume is properly controlled. Also, the engine vibration and noise will be reduced by closing the valve when the engine is stopped.

The ECM detects fully opened of the intake shutter valve with the intake shutter valve fully opened switch

Intake Shutter Internal Structure



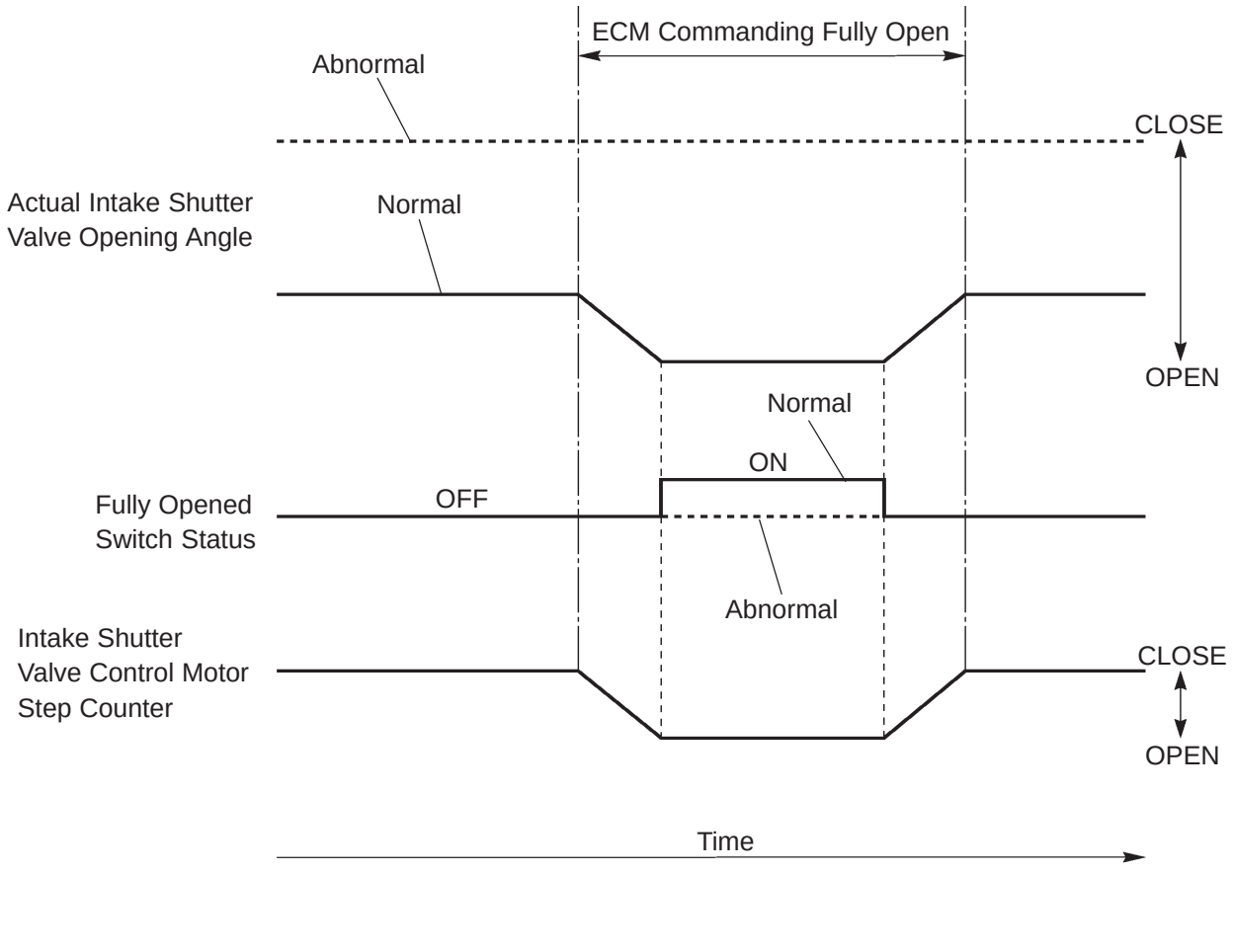
A81482

DTC No.	DTC Detection Condition	Trouble Area
P0488	Intake shutter valve fully opened switch is not turned on, despite forcing the intake shutter valve to fully open.	• Open or short in intake shutter circuit • Open or short in fully opened switch circuit • Intake shutter • ECM

MONITOR DESCRIPTION

This DTC will be set if the actual opening angle of the intake shutter valve varies from the target opening angle. The ECM forces the valve to fully open within 2 to 3 seconds as the ignition switch is turned ON, and then checks if the intake shutter valve fully opened switch is turned on. In addition, the ECM also forces the valve to fully open when accelerating the engine (high engine load) and checks if the switch is turned ON. When starting and/or accelerating the engine, the ECM sets this DTC if the switch is not turned on.
If the DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

Malfunction Detection



MONITOR STRATEGY

Required sensors	Intake shutter valve fully opened switch
Frequency of operation	Continuous
Duration	3 sec.
CHK ENG operation	1 driving cycle

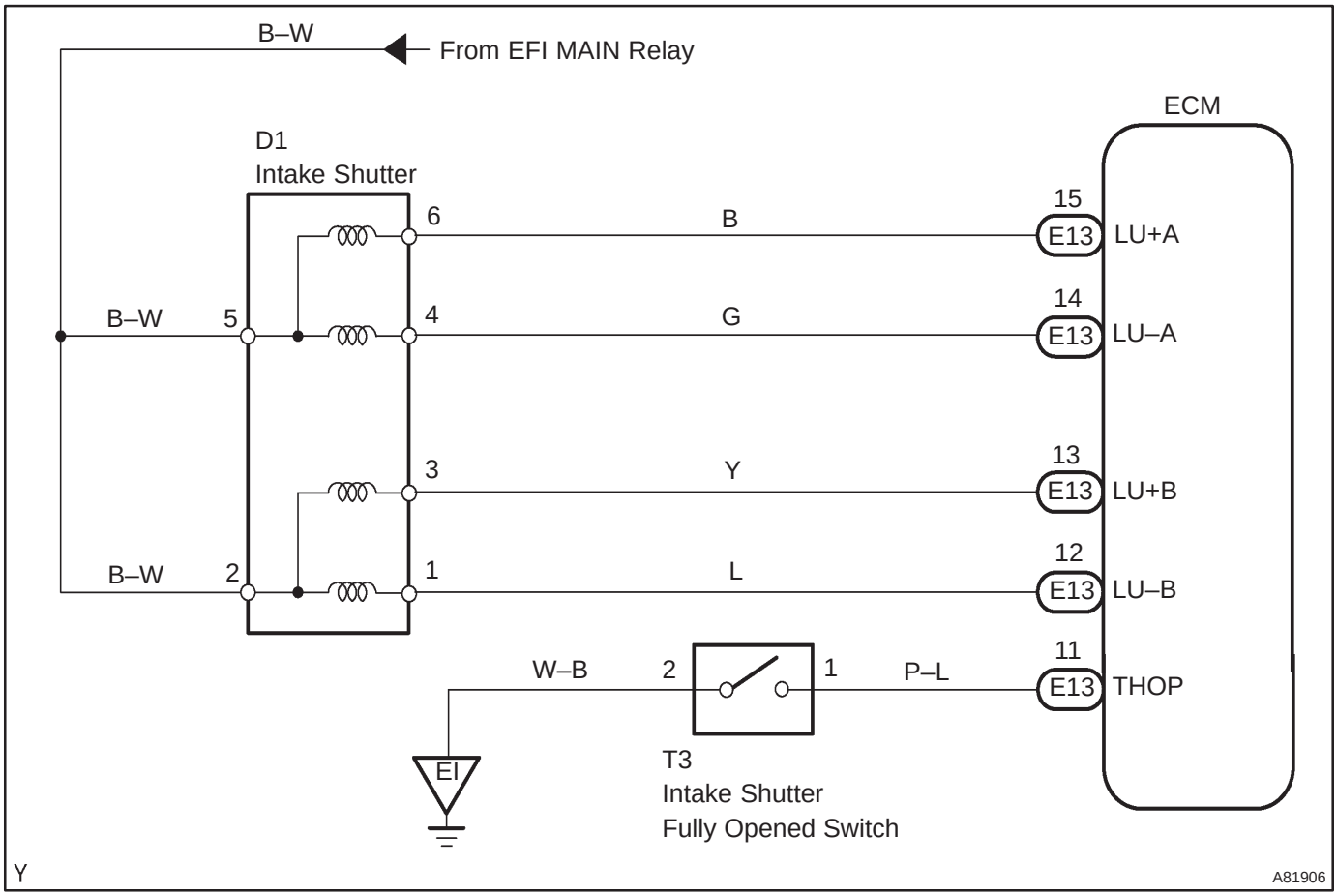
TYPICAL ENABLING CONDITIONS

Specification
Start the engine and let it idle for 30 seconds and accelerate the vehicle speed to 60 km/h (37 mph) with the accelerator pedal opened more than the half angle

TYPICAL MALFUNCTION THRESHOLDS

Threshold
Intake shutter valve fully opened switch is not turned ON, despite the ECM commanding the intake shutter valve to open fully

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK INTAKE SHUTTER ASSY

(a) Visually check that the intake shutter valve moves within approximately 2 to 3 seconds after the ignition switch is turned ON.

Intake shutter	Proceed to
Does not move	A
Smoothly move to full–open position	B

B → **Go to step 6**

A

2 CHECK INTAKE SHUTTER ASSY

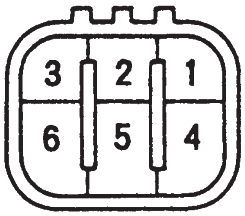
(a) Check if the intake shutter valve moves as the lever is rotated by hand.

Intake shutter	Proceed to
Smoothly moved	A
Difficult to move smoothly	B

B → **REPLACE INTAKE SHUTTER ASSY (See page 10–61)**

A

3 INSPECT INTAKE SHUTTER ASSY



Intake Shutter Assy
A31135

(a) Check the intake shutter for resistance.
(1) Measure the resistance between the terminals.

RHD Resistance:

Terminals	Temperature	Resistance
1 – 2	at 20°C (68°F)	18 to 22 Ω
1 – 3		
4 – 5		
4 – 6		

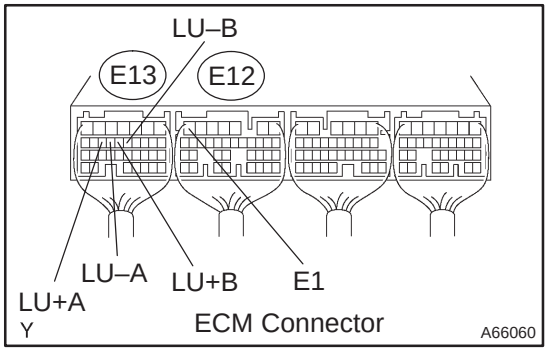
LHD Resistance:

Terminals	Temperature	Resistance
1 – 3	at 20°C (68°F)	18 to 22 Ω
2 – 3		
4 – 6		
5 – 6		

NG → **REPLACE INTAKE SHUTTER ASSY (See page 10–61)**

OK

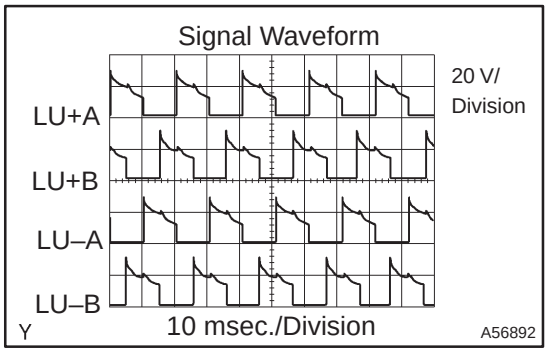
4 INSPECT ECM(LU VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E12 and E13 ECM connectors.

Standard:

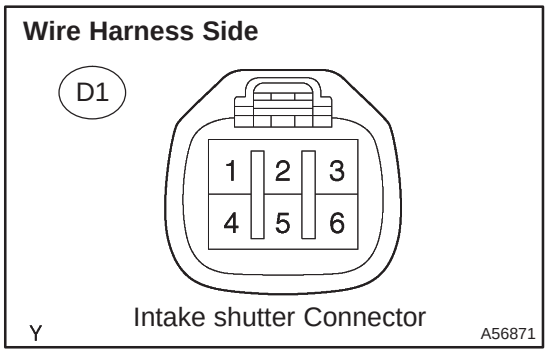
Symbols (Terminal No.)	Specified condition
LU+A (E13–15) – E1 (E12–7)	Correct waveform is as shown
LU–A (E13–14) – E1 (E12–7)	
LU+B (E13–13) – E1 (E12–7)	
LU–B (E13–12) – E1 (E12–7)	



NG → **REPLACE ECM (See page 10–65)**

OK

5 CHECK HARNESS AND CONNECTOR(INTAKE SHUTTER ASSY – ECM)



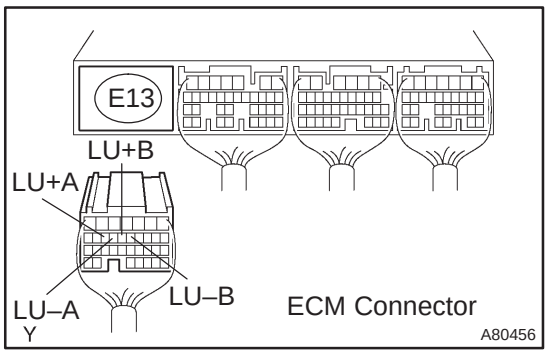
(a) Disconnect the D1 intake shutter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
LU+A (E13–15) – Intake shutter (D1–6)	Continuity
LU–A (E13–14) – Intake shutter (D1–4)	
LU+B (E13–13) – Intake shutter (D1–3)	
LU–B (E13–12) – Intake shutter (D1–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
LU+A (E13–15) or Intake shutter (D1–6) – Body ground	No continuity
LU–A (E13–14) or Intake shutter (D1–4) – Body ground	
LU+B (E13–13) or Intake shutter (D1–3) – Body ground	
LU–B (E13–12) or Intake shutter (D1–1) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Fully open the intake shutter valve by hand.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / ACCEL OPEN SW” and read its value displayed on the hand–held tester.

Result:

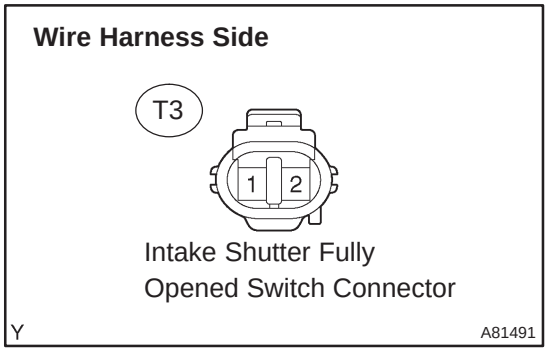
Switch Condition Displayed	Proceed to
OFF	A
ON	B

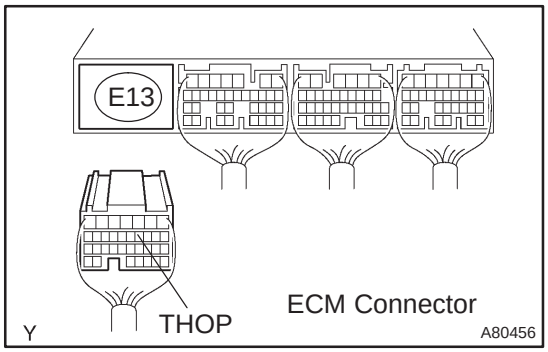
B → **CHECK DTC OUTPUT RECUR (DTC P0488 OUTPUT AGAIN)**

HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds and accelerate the vehicle speed to 60 km/h (37 mph) with the accelerator pedal opened more than the half angle, then confirm P0488 is not set again.

A

7 CHECK HARNESS AND CONNECTOR(FULLY OPENED SWITCH – ECM)





(a) Disconnect T3 the intake shutter fully opened switch connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
THOP (E13–11) – Intake shutter (T3–1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
THOP (E13–11) or Intake shutter (T3–1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK DTC OUTPUT RECUR (DTC P0488 OUTPUT AGAIN)

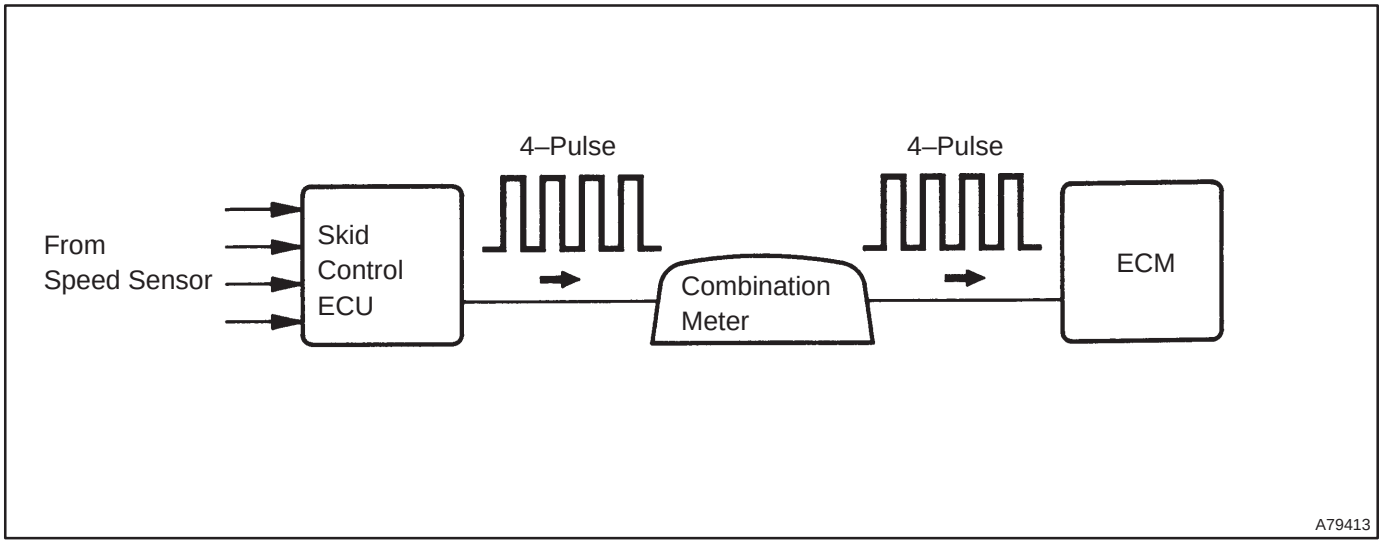
HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds and accelerate the vehicle speed to 60 km/h (37 mph) with the accelerator pedal opened more than the half angle, then confirm P0488 is not set again.

DTC	P0500	VEHICLE SPEED SENSOR ”A”

CIRCUIT DESCRIPTION

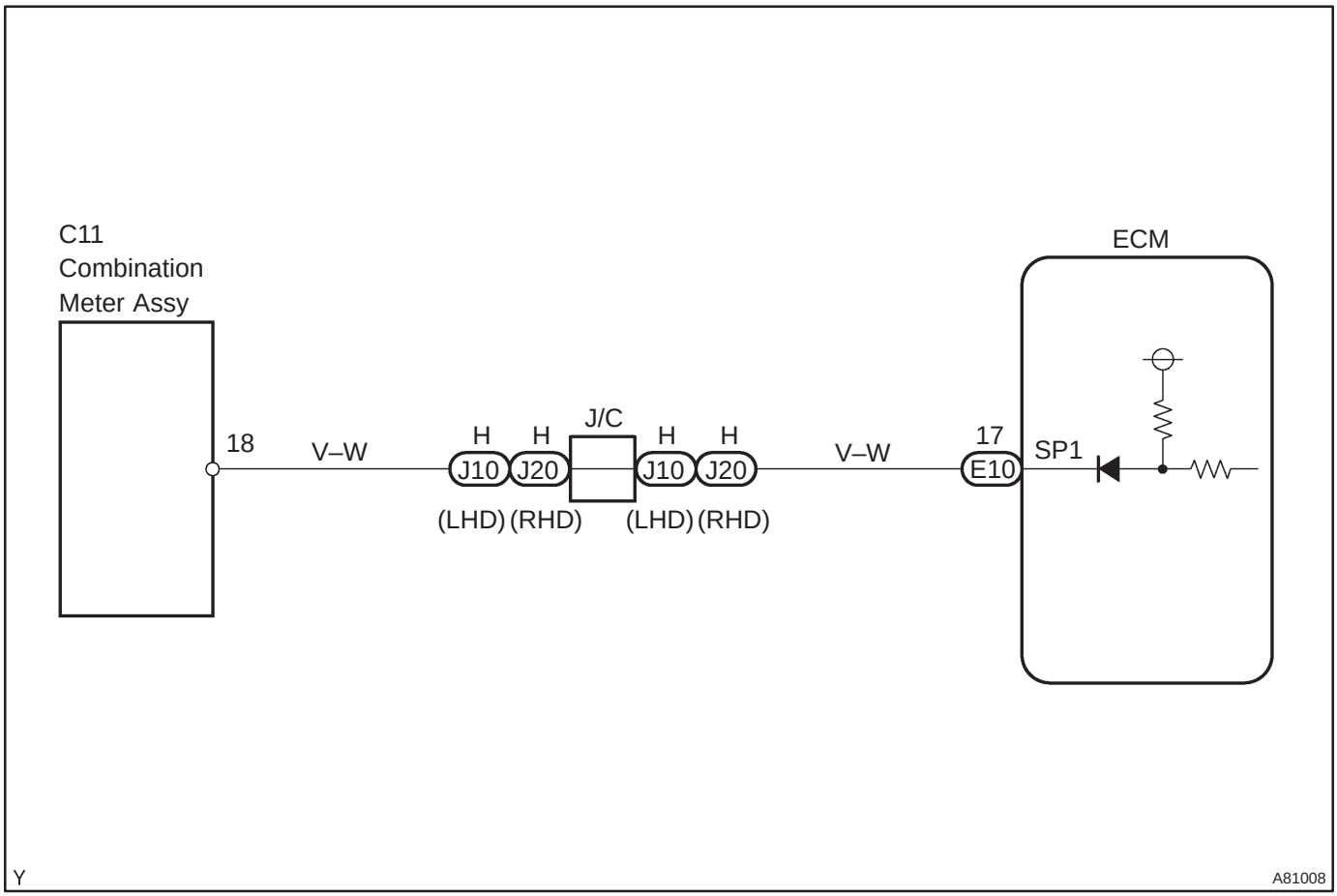
The speed sensor for skid control ECU detects the wheel speed and sends the appropriate signals to the skid control ECU.

The skid control ECU converts these signals into a 4–pulse signal and outputs it to the combination meter. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500	Conditions (a) and (b) continue for 7 sec. or more (2 trip detection logic): (a) THW less than 70°C (158°F) (b) Engine speed is greater than 2,000 rpm but less than 3,500 rpm	• Open or short in speed sensor circuit • Speed sensor • Combination meter • ECM • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OPERATION OF SPEEDOMETER

(a) Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

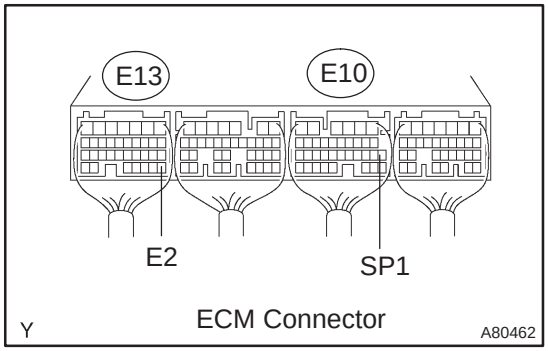
HINT:

The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **CHECK SPEEDOMETER CIRCUIT** (See page 05–1510)

OK

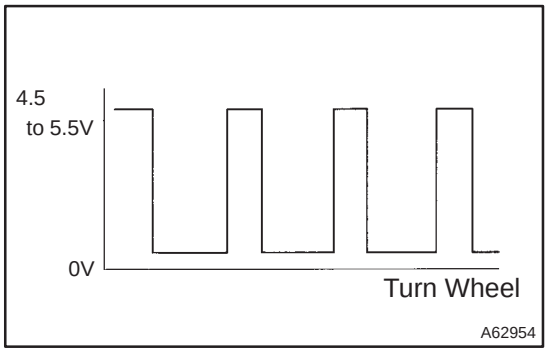
2 INSPECT ECM(SP1 VOLTAGE)



(a) Shift the transmission to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch ON.
(d) Measure the voltage between the specified terminals of the E10 and E13 ECM connectors as the wheel is turned slowly.

Standard:

Symbols (Terminal No.)	Specified condition
SP1 (E10–17) – E2 (E13–28)	Generated intermittently



HINT:
The output voltage should fluctuate ups and downs similarly to the diagram on the left when the wheel is turned slowly.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–65)

DTC P0504 BRAKE SWITCH ”A”/”B” CORRELATION

CIRCUIT DESCRIPTION

In this system, the signal of the stop lamp switch is used to judge whether the acceleration system is abnormal or not.

The stop lamp switch has a duplex system (signals STP and ST1–) to memorize the abnormality when the signals of depressing and releasing the brake pedal are detected simultaneously.

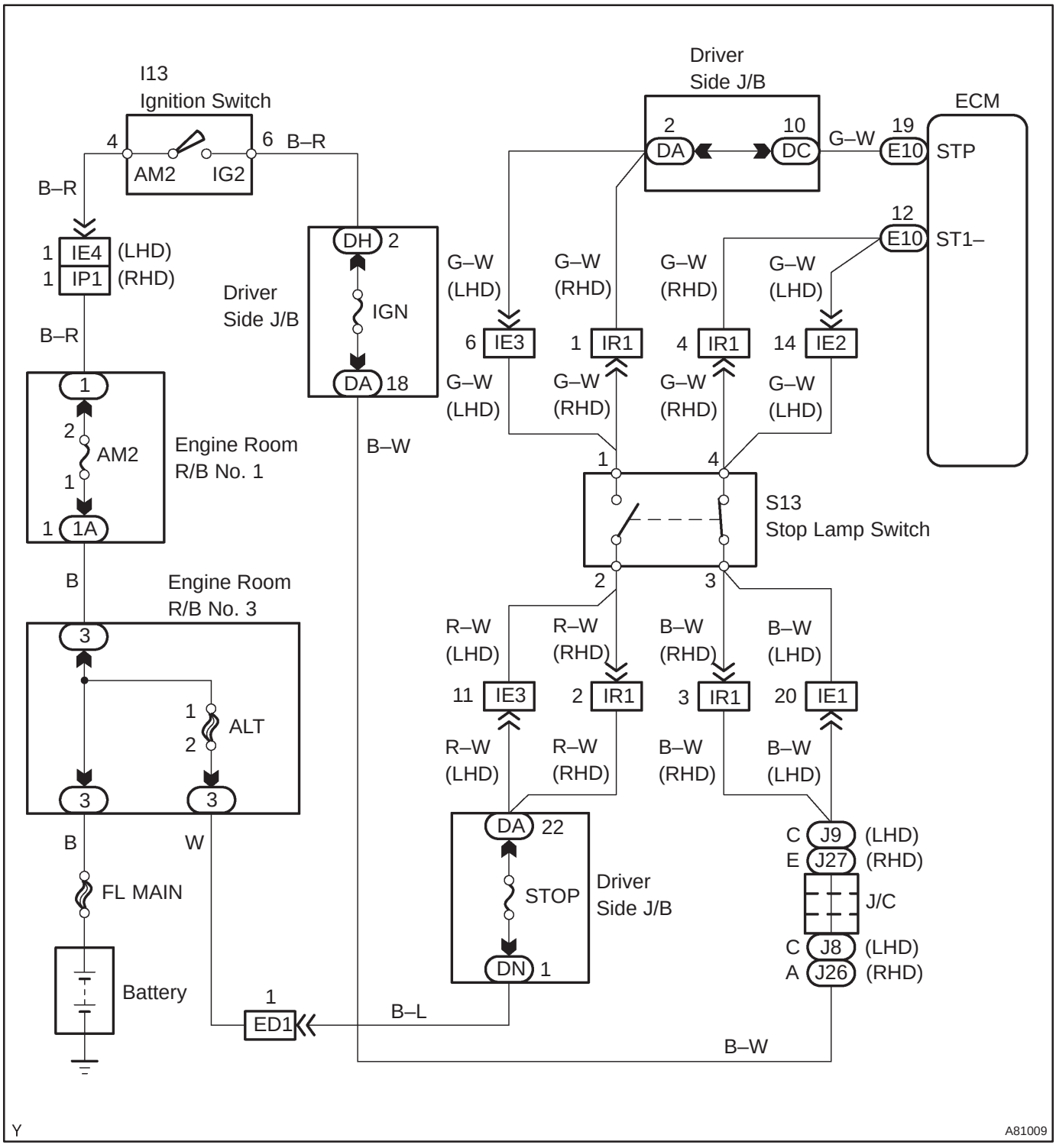
HINT:

Normal condition is as shown in the table.

Signal	Brake pedal released	In transition	Brake pedal depressed
STP	OFF	ON	ON
ST1–	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P0504	Conditions (a), (b) and (c) continue for 0.5 sec. or more (1 trip detection logic): (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the ST1– signal is OFF	• Short in stop lamp switch signal circuit • Stop lamp switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

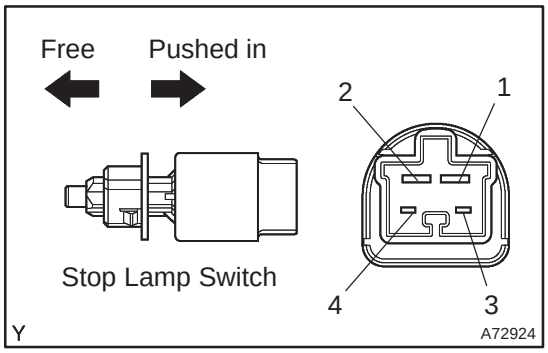
1 CHECK OPERATION OF STOP LIGHT

(a) Check if the stop lights go on and off normally when the brake pedal is depressed and released.

NG → **REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT**

OK

2 INSPECT STOP LAMP SWITCH ASSY



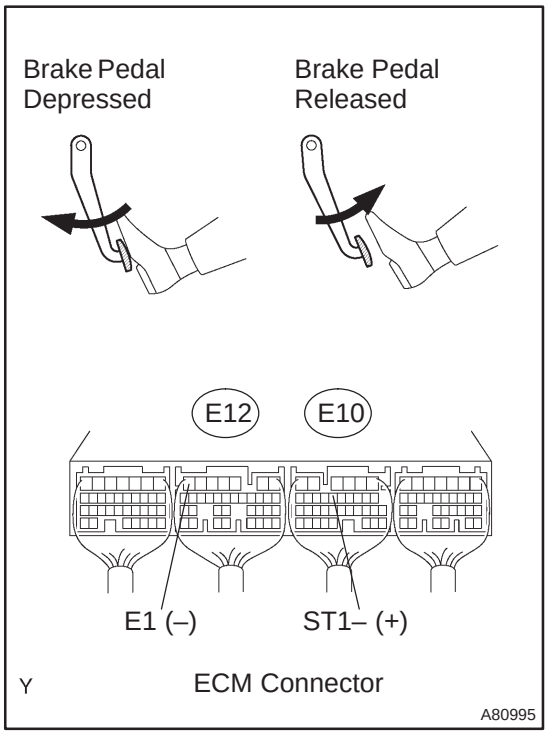
(a) Check for continuity between each pair of the terminals.
Standard:

Switch position	Terminals No.	Specified condition
Switch pin free	1 – 2	Continuity
	3 – 4	No continuity
Switch pin pushed in	1 – 2	No continuity
	3 – 4	Continuity

NG → **REPLACE STOP LAMP SWITCH ASSY**

OK

3 READ VALUE OF HAND–HELD TESTER(STP SIGNAL AND ST1– VOLTAGE)



(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW” and read its value displayed on the hand–held tester.
Standard:

Brake Pedal	Specified condition
Depressed	STP Signal ON
Released	STP Signal OFF

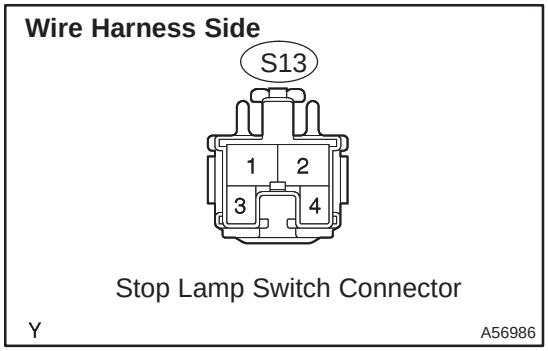
(c) Measure the voltage between the specified terminals of the E10 and E12 ECM connectors.
Standard:

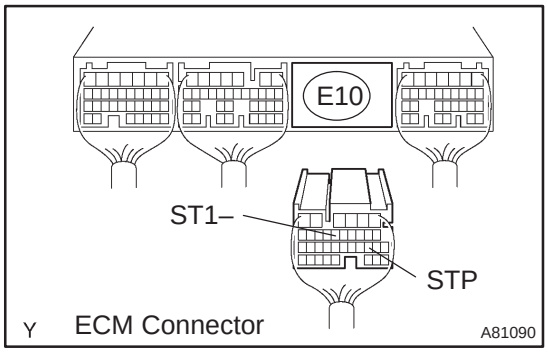
Symbols (Terminal No.)	Brake pedal	Specified condition
ST1– (E10–12) – E1 (E12–7)	Depressed	Below 1.5 V
	Released	7.5 to 14 V

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)**

NG

4 CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH – ECM)





(a) Disconnect the S13 stop lamp switch connector.
(b) Disconnect the E10 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Stop lamp switch (S13–1) – STP (E10–19)	Continuity
Stop lamp switch (S13–4) – ST1– (E10–12)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Stop lamp switch (S13–1) or STP (E10–19) – Body ground	No continuity
Stop lamp switch (S13–4) or ST1– (E10–12) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM(See page 10–65)

DTC	P0560	SYSTEM VOLTAGE

CIRCUIT DESCRIPTION

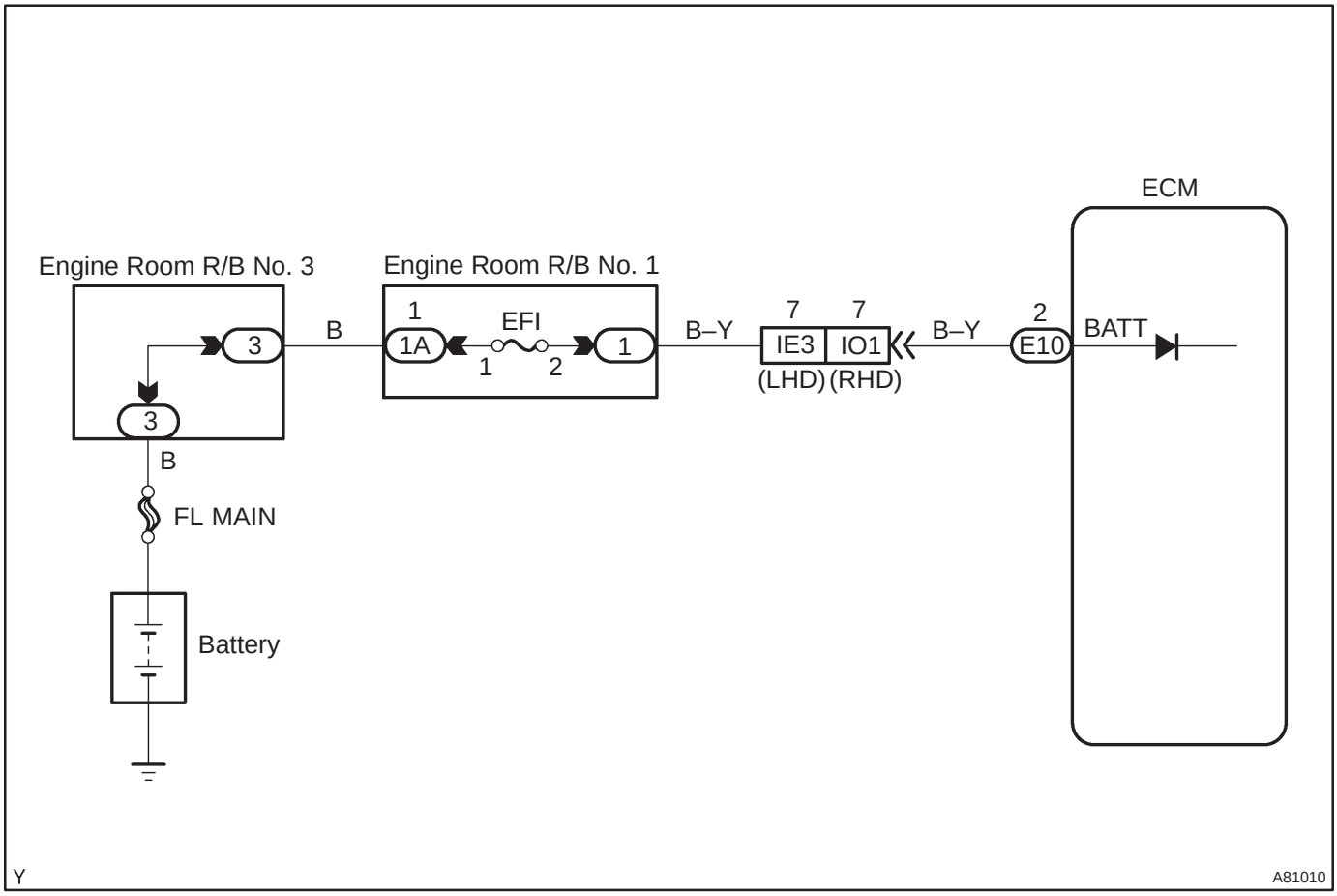
While the ignition switch is OFF, the battery positive voltage is supplied to terminal BATT of the ECM for the DTCs memory and air–fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in back–up power source circuit (1 trip detection logic).	• Open in back–up power source circuit • ECM

HINT:

If DTC P0560 appears, the ECM does not store other DTC.

WIRING DIAGRAM

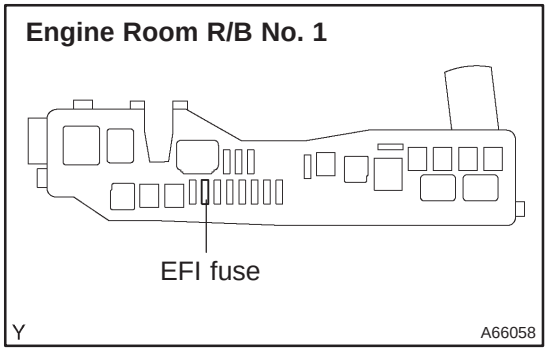


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 CHECK FUSE(EFI FUSE)

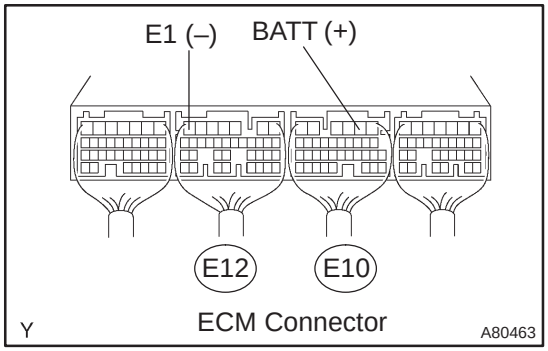


(a) Remove the EFI fuse from the engine room R/B No. 1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

2 INSPECT ECM(BATT VOLTAGE)



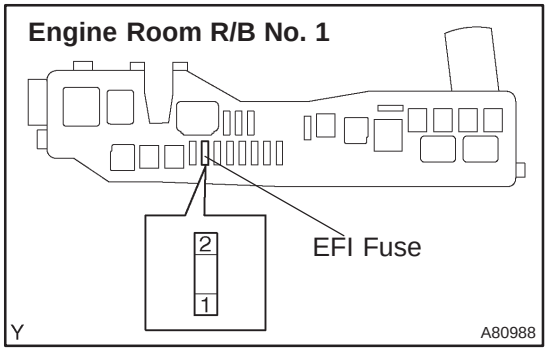
(a) Measure the voltage between the specified terminals of the E10 and E12 ECM connectors.
Standard:

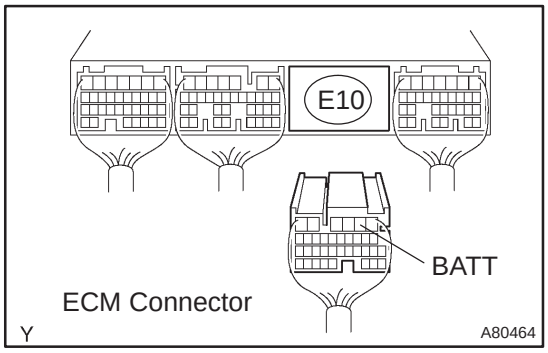
Symbols (Terminal No.)	Specified condition
BATT (E10–2) – E1 (E12–7)	9 to 14 V

OK → **REPLACE ECM (See page 10–65)**

NG

3 CHECK HARNESS AND CONNECTOR(EFI FUSE – ECM, EFI FUSE – BATTERY)





(a) Check the harness and connector between the EFI fuse and ECM.

(1) Remove the EFI fuse from the engine room R/B No. 1.

(2) Disconnect the E10 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) – BATT (E10–2)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) or BATT (E10–2) – Body ground	No continuity

(b) Check the harness and connector between the EFI fuse and battery.

(1) Remove the EFI fuse from the engine room R/B No. 1.

(2) Disconnect the battery positive terminal.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Battery positive terminal – EFI fuse (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Battery positive terminal or EFI fuse (1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE JUNCTION BLOCK

DTC	P0606	ECM/PCM PROCESSOR

DTC	P0607	CONTROL MODULE PERFORMANCE

DTC	P1611	IC CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0606 P0607 P1611	ECM inside error (1 trip detection logic)	• ECM

INSPECTION PROCEDURE

HINT:

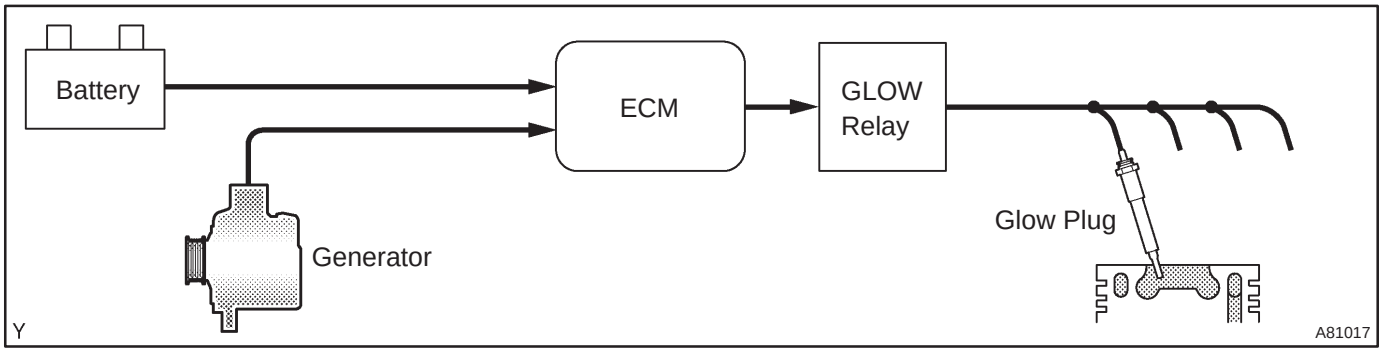
Read freeze frame data using the hand–held tester,. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

REPLACE ECM (See page 10–65)

DTC P0622 GENERATOR FIELD "F" TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

While the generator is generating the current, the duty signal is sent from terminal M of the generator to the ECM terminal ALT. The duty signal is used for detecting the open malfunction of the generator circuit and DTC P0380.



DTC No.	DTC Detection Condition	Trouble Area
P0622	Generator terminal M duty signal is not output while engine is running.	• Open in generator circuit • Generator • Driver belt • ECM

MONITOR DESCRIPTION

The ECM will detect a generator failure or an open malfunction of the circuit, if the duty signal is not output from terminal M of the generator despite the engine running.

MONITOR STRATEGY

Required sensors	Generator circuit
Frequency of operation	Continuous
Duration	10 sec.
CHK ENG operation	1 driving cycle

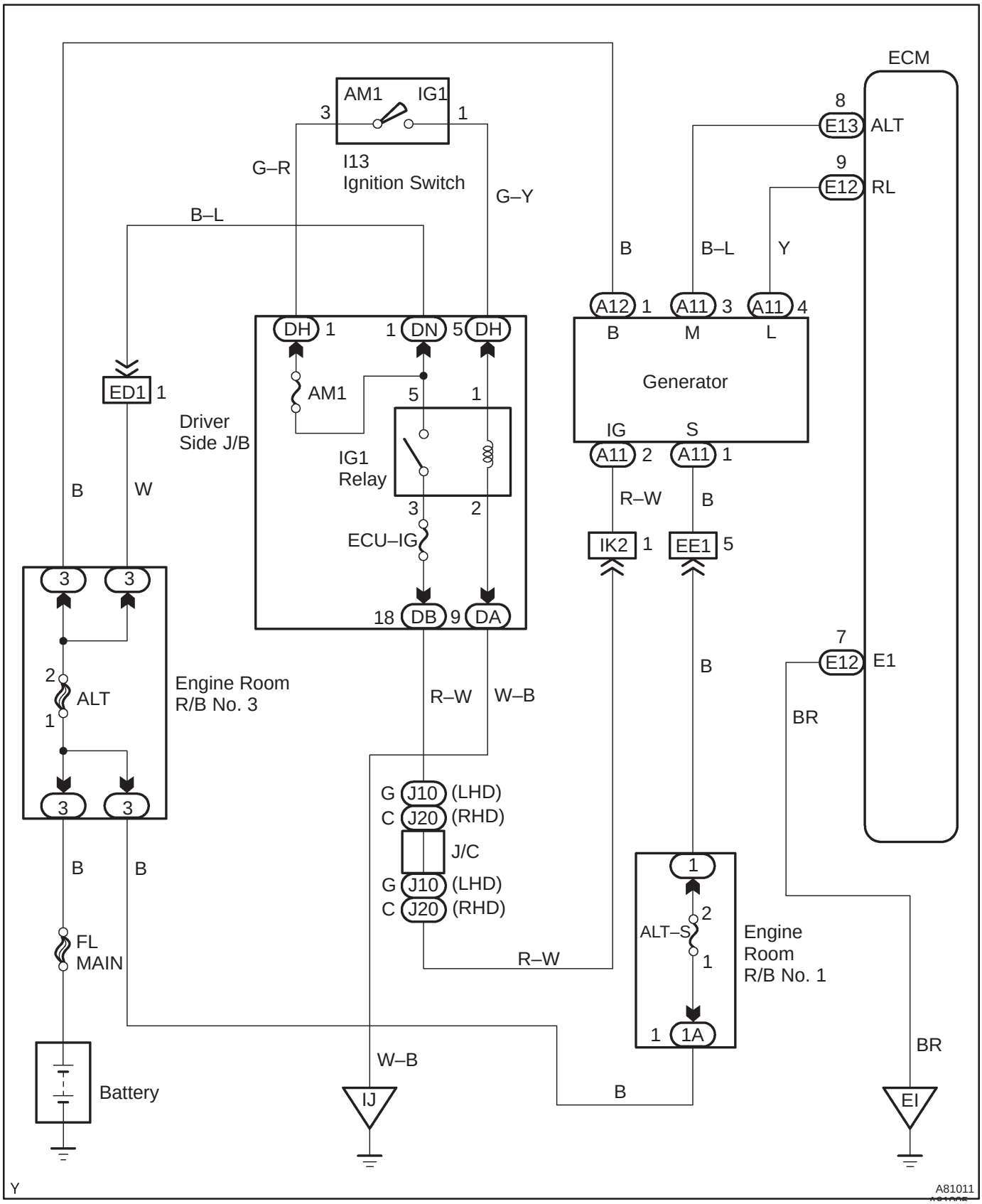
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Battery voltage	11 V	–
Engine speed	700 rpm	2,000 rpm

TYPICAL MALFUNCTION THRESHOLDS

Threshold
There is no signal output from terminal M of the generator

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK IF CHARGE LAMP IS ILLUMINATED

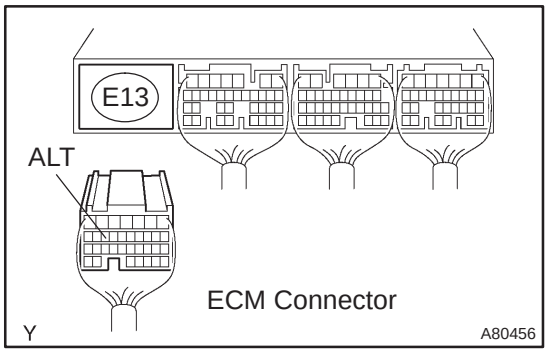
HINT:

Run the engine at 2,000 rpm, and check if the charge lamp located in the combination meter is OFF.

YES → **Go to step 3**

NO

2	CHECK HARNESS AND CONNECTOR(GENERATOR – ECM)



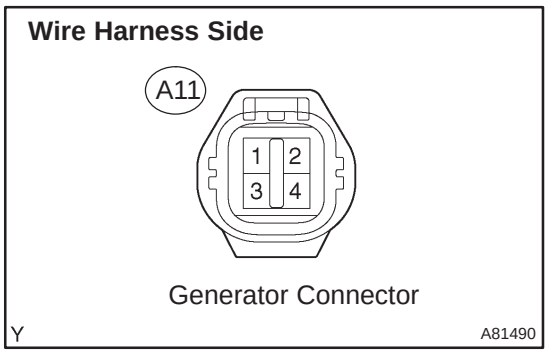
(a) Disconnect the E13 ECM connector.
(b) Disconnect the A11 generator connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
ALT (E13–8) – M (A11–3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
ALT (E13–8) or M (A11–3) – Body ground	No continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT DRIVE BELT (See page 14–266)

NG → **REPAIR OR REPLACE DRIVE BELT (See page 14–269)**

OK

4	**INSPECT CHARGING SYSTEM (See page 19–26)**

GO

CHECK DTC OUTPUT RECUR (DTC P0622 OUTPUT AGAIN)

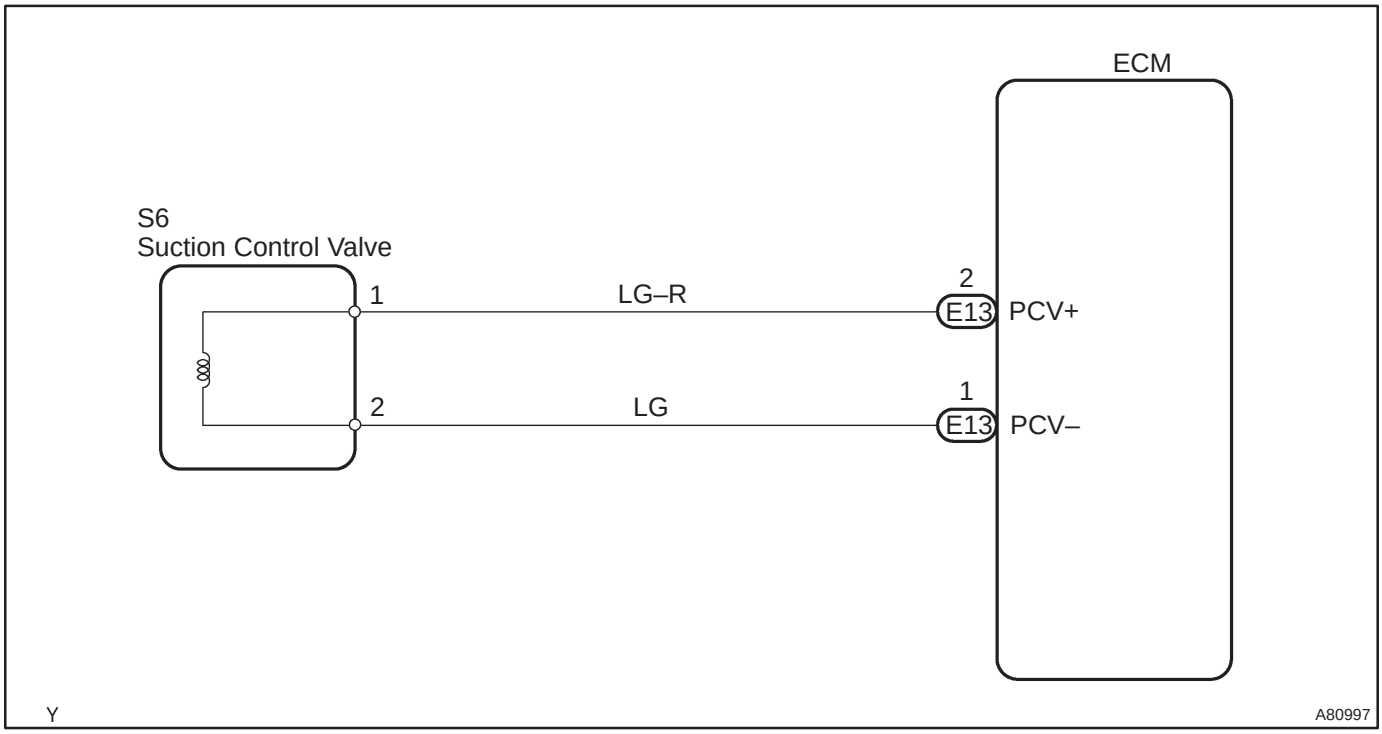
HINT:
After clearing the DTC, start the engine and let it idle for 10 seconds, and then confirm P0622 is not set again.

DTC	P0627	FUEL PUMP CONTROL CIRCUIT / OPEN

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0627	Open or short in suction control valve circuit for more than 0.5 sec. (1 trip detection logic).	• Open or short in suction control valve circuit • Suction control valve • ECM

WIRING DIAGRAM

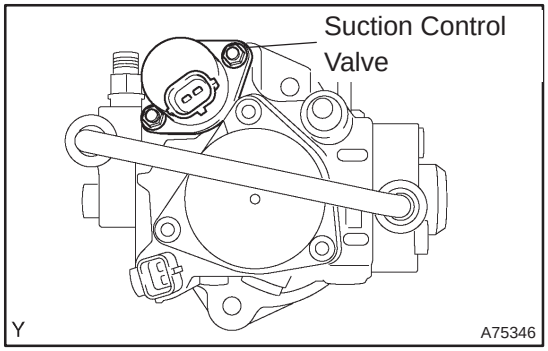


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 CHECK INJECTION OR SUPPLY PUMP ASSY

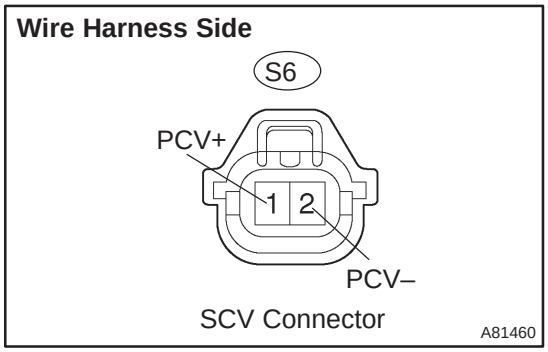


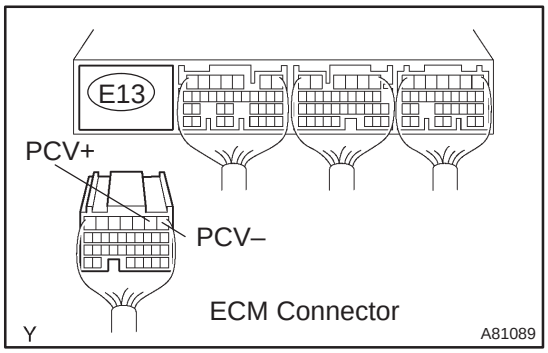
(a) Check the suction control valve for resistance.
(1) Measure the resistance between the terminals.
Resistance: 1.9 to 2.3 Ω at 20°C (68°F)

NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11–69)**

OK

2 CHECK HARNESS AND CONNECTOR(SUCTION CONTROL VALVE – ECM)





(a) Disconnect the S6 suction control valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PCV+ (S6–1) – PCV+ (E13–2)	Continuity
PCV– (S6–2) – PCV– (E13–1)	

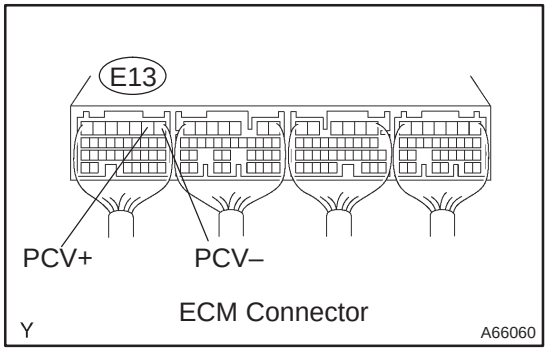
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PCV+ (S6–1) or PCV+ (E13–2) – Body ground	No continuity
PCV– (S6–2) or PCV– (E13–1) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

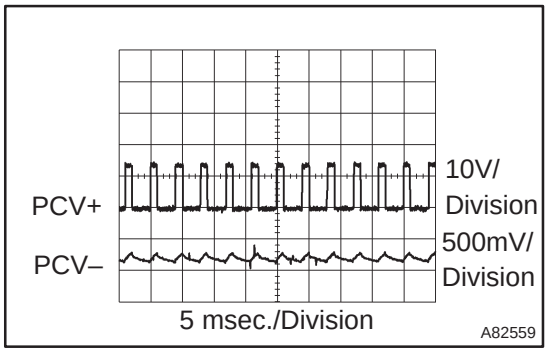
3 INSPECT ECM(PCV VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During cranking or idling, check the waveform between the specified terminals of the E13 ECM connector.

Standard :

Symbols (Terminal No.)	Specified condition
PCV+ (E13–2) – PCV– (E13–1)	Correct waveform is as shown



NG → **REPLACE ECM (See page 10–65)**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)

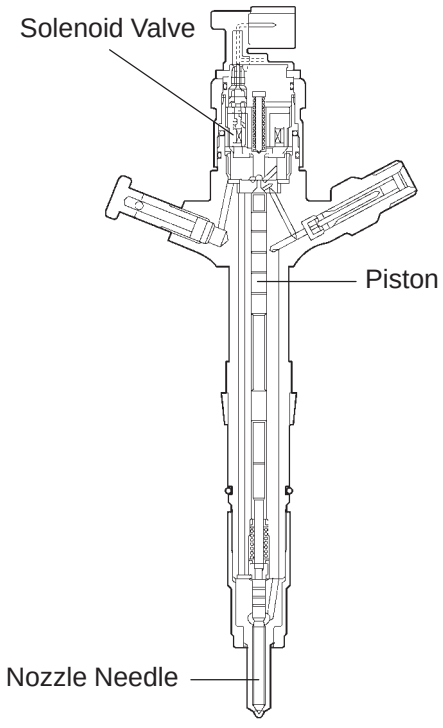
DTC	P1238	INJECTOR MALFUNCTION

HINT:
- For more information on the injector and the common rail system, see page 05–517.
- If P1238 is present, use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

The ECM detects combustion deterioration for specific cylinder.
HINT:
- The cylinder that has compensation learned value for INJ VOL varies from other cylinders may be malfunctioning.
- If DTC P0093 (Fuel leaks in high–pressure area) is present simultaneously, leakage malfunction of the cylinder probably be occurred.
- If DTC P0200 (Open or short in EDU or injector circuit) is present simultaneously, there probably be faulty circuit located between the ECM and the injector including the EDU.
- If only DTC P1238 (Injector malfunction) is present, probably the injector is mechanical malfunction or insufficient compression (valve clearance, etc) has occurred, not an open or short malfunction of the ECM, EDU and injector circuit.
- Solenoid valve of the injector is the same type of the pressure discharge valve.

Injector Cross Section Diagram



DTC No.	DTC Detection Condition	Main Trouble Area	Related Trouble Area
P1238	Engine speed variation is large when idling.	• Injector • EDU (P0200 is set simultaneously) • Open or short in engine wire (P0200 is set simultaneously) • Connector connection (P0200 is set simultaneously) • Compression pressure • Valve clearance	• Valve timing • ECM

HINT:
After confirming DTC P1238, use the hand–held tester to confirm the fuel pressure inside the common rail in the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

MONITOR DESCRIPTION

P1238 (Injection malfunction, exclude open or short in injector circuit):
This DTC will be set if the engine speed variations between each cylinder is large. The ECM monitors changes in the crankshaft rotation speed using the crankshaft position sensor for detecting poor combustion. Also, it identifies faulty cylinder using the camshaft position sensor. The fluctuation counter increments when irregular crankshaft rotation speed variation exceeds the threshold at idling. Therefore, either one of the cylinders has very poor combustion (Rough idle), the ECM sets this DTC.

MONITOR STRATEGY

Required sensors	Crankshaft position sensor
Frequency of operation	Continuous
Duration	10 min.
CHK ENG operation	2 driving cycles

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine	At idling	
Engine speed	500 rpm	–
Engine coolant temperature	20°C (68°F)	

TYPICAL MALFUNCTION THRESHOLDS

Threshold
The number of irregular changes in the crankshaft rotation speed

HINT:
The number of irregular changes in the crankshaft rotation speed indicates the insufficient combustion cylinder.

WIRING DIAGRAM

Refer to DTC P0200 on page 05–604.

INSPECTION PROCEDURE

HINT:

- If DTCs other than P1238 are present simultaneously, first perform the troubleshooting for them.
- Read freeze frame data using the hand−held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P1238)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
Only P1238 is output	A
P1238 and other DTCs are output	B

HINT:
If any other codes besides P1238 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–544)**

A

2	CHECK WIRE HARNESS AND CONNECTOR IN ENGINE ROOM

HINT:
Check the wire harness and connector connections.

NG → **REPAIR OR REPLACE**

OK

3	READ VALUE OF HAND–HELD TESTER(COMPENSATION OF INJECTION QUANTIFY BETWEEN CYLINDERS FOR MALFUNCTION CYLINDER)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB" and read its value displayed on the hand–held tester.
Result:
STD – 3 to 3 mm^3/st
Maximum – 4.9 to 4.9 mm^3/st
(d) Cylinders that have a compensation value which is outside of the specification range are considered to be faulty cylinders. Use the following flowchart to inspect and repair the cylinder.
Result:

Result	Proceed to
Faulty cylinder can not identified	A
Faulty cylinder can be identified	B

B → **Go to step 5**

A

4	PERFORM ACTIVE TEST USING HAND–HELD TESTER(INJECTION CUT FOR MALFUNCTION CYLINDER)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / INJECTOR CUT #1, #2, #3 and #4".
(e) Check for the 4 cylinders in the sequence and then performs the power balance inspection to identify faulty cylinder (If there is no changes in the engine speed even though the fuel injection is cut off during idling, the cylinder is malfunctioning).

GO

5	CHECK CYLINDER COMPRESSION PRESSURE OF MALFUNCTION CYLINDER (See page 14–266)

NG → **REPAIR OR REPLACE**

OK

6	CHECK VALVE CLEARANCE OF MALFUNCTION CYLINDER (See page 14–266)

NG → **ADJUST VALVE CLEARANCE (See page 14–270)**

OK

7	READ OUTPUT DTC (DTC P1238 OUTPUT AGAIN)

HINT:
After clearing the DTC, let the engine idle for 10 minutes after it was warmed up, and confirm P1238 is not set again.

OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05–528)

NG

8	REPLACE INJECTOR ASSY (See page 11–60)

GO

CHECK DTC OUTPUT RECUR (DTC P1238 OUTPUT AGAIN)

HINT:
After clearing the DTC, let the engine idle for 10 minutes after it was warmed up, and confirm P1238 is not set again.

DTC	P1271	FUEL REGULATOR CIRCUIT MALFUNCTION (EDU DRIVE)

DTC	P1272	FUEL PRESSURE REGULATOR MALFUNCTION

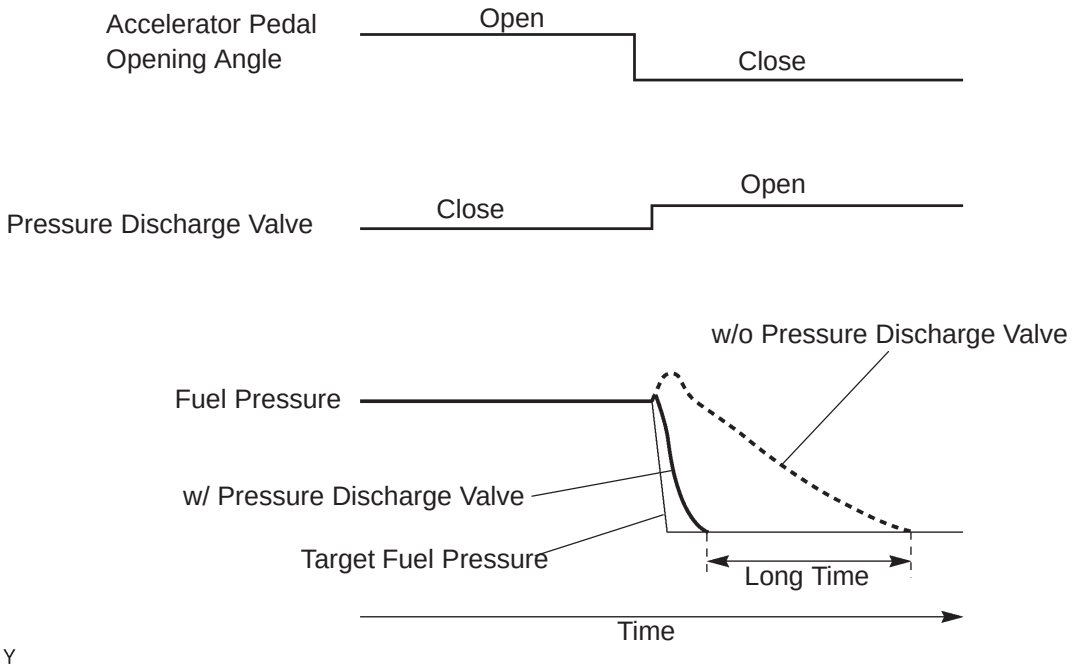
HINT:

- For more information on the pressure discharge valve and the common rail system, see page 05–517.
- For more information on the EDU, see page 05–604.
- If P1271 and/or P1272 are present, use the diagnostic trouble code matrix for fuel system, see page 05–517.

CIRCUIT DESCRIPTION

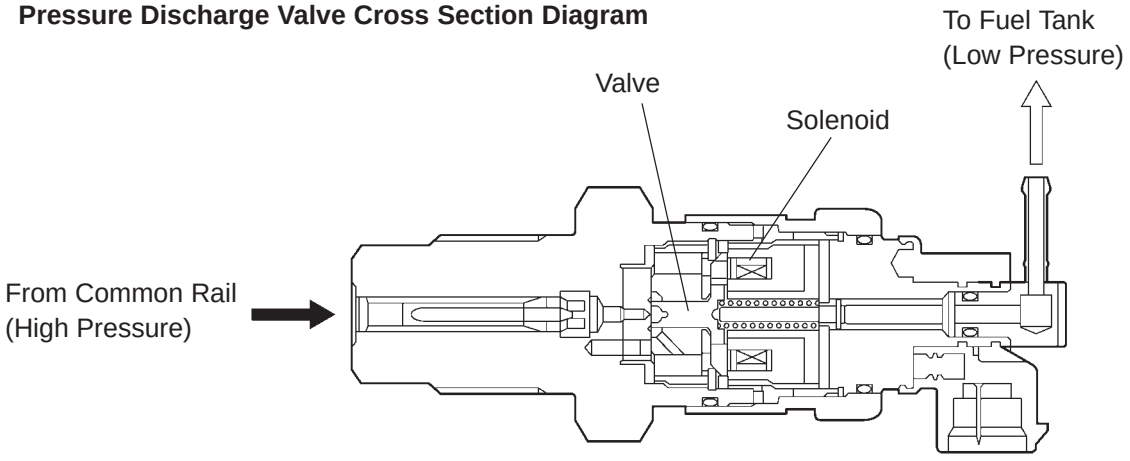
The ECM controls the internal fuel pressure of the common rail by opening and closing the pressure discharge valve. When sudden deceleration is occurred, the internal fuel pressure will temporarily become higher than usual and combustion noise may result, therefore the ECM will open the valve temporarily to discharge the pressure inside the common rail. Also, the pressure discharge valve opens when the ignition switch is turned OFF, and the internal pressure is then promptly discharged.

Pressure Discharge Valve Operation Under Sudden Deceleration



HINT:
The solenoid valve of the pressure discharge valve is the same type of the injector solenoid valve.

Pressure Discharge Valve Cross Section Diagram



DTC No.	DTC Detection condition	Trouble Area
P1271	Open or short in pressure discharge valve circuit. There is no valve opening confirmation signal (IJF) from EDU to ECM, despite the ECM sending valve opening command signal (PRD) after the engine has been started (1 trip detection).	• Open or short in pressure discharge valve circuit • Open or short in pressure discharge valve itself • EDU • ECM
P1272	Pressure discharge valve closed malfunction. Actual pressure decreasing rate deviates from the simulated pressure drop rate by the ECM after the ignition switch is turned OFF (2 trip detection).	• Open or short in pressure discharge valve circuit (P1271 is set simultaneously) • Pressure discharge valve • Supply pump • ECM

HINT:
After confirming DTC ”P1271 and/or P1272”, use the hand–held tester to confirm the fuel pressure inside common rail in the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS”.

Engine Speed	Fuel Pressure (MPa)
Idling	Approx. 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approx. 50 to 100

MONITOR DESCRIPTION

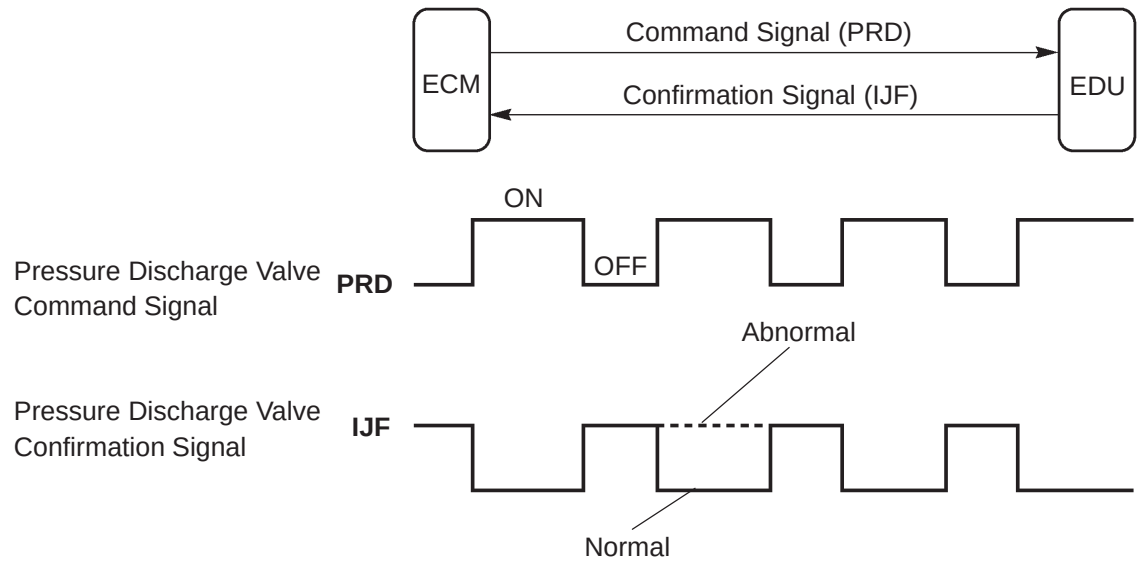
P1271 (Open or short in pressure discharge valve circuit):

This DTC will be set if there is no valve opening confirmation signal (IJF) from the EDU to the ECM, despite the ECM commanding the pressure discharge valve to open with the EDU. This DTC refers to open or short malfunction of the pressure discharge valve circuit, therefore the malfunction that the valve is stuck open or closed can be excluded.

The EDU monitors the current supplied to the pressure discharge valve, and the EDU interprets the IJF signal is low if the current exceeds the specified level, and the EDU indicates that there is the current in the pressure discharge valve.

If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

P1271 Malfunction Detection



P1272 (Closed malfunction of the pressure discharge valve):

The pressure discharge valve will open and discharge the internal fuel pressure of the common rail to the fuel tank when the ignition switch is turned OFF. In this event, the ECM compares the actual dropping rate of the internal fuel pressure and the simulated dropping rate. If the ECM judges the actual dropping rate is smaller than the simulation, the ECM then interprets this as the valve has stuck closed and set this DTC. This DTC detection will be activated if the internal fuel pressure does not drop below the specified level after the ignition switch has been turned OFF.

If this DTC is present, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode will continue until the ignition switch is turned OFF.

MONITOR STRATEGY

P1271:

Required sensors	EDU
Frequency of operation	Continuous
Duration	3 sec.
CHK ENG operation	1 driving cycles

P1272:

Required sensors	Fuel pressure sensor
Frequency of operation	Once per driving cycle
Duration	1 sec.
CHK ENG operation	2 driving cycles

TYPICAL ENABLING CONDITIONS

P1271:

Specification
Drive the vehicle at 50 km/h with the 3 rd transmission gear and then decelerate it by completly releasing the accelerator pedal

P1272:

Item	Specification	
	Minimum	Maximum
Fuel pressure	30 MPa (306 kgf/cm^2, 4,351 psi)	–
Fuel temperature	0°C	–
Battery voltage	11 V	–
The monitor will not run if the fuel pressure sensor, or pressure discharge valve circuit, or fuel temp. sensor is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

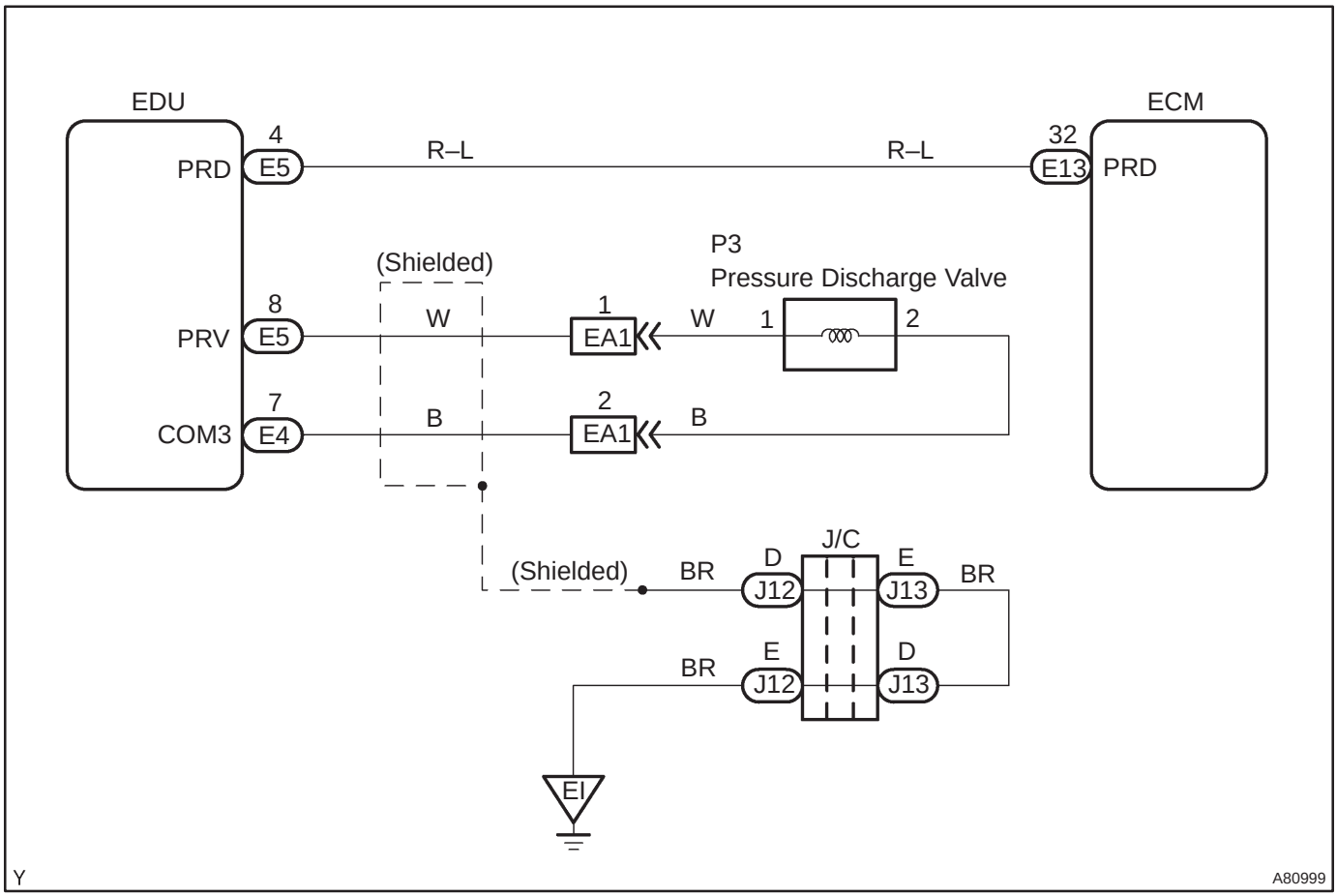
P1271:

Threshold
If the confirmation signals from the EDU is not present, despite the ECM sending the command signals regularly during decelerating

P1272:

Threshold
If the internal pressure stays beyond the specified level after the ignition switch was turned OFF

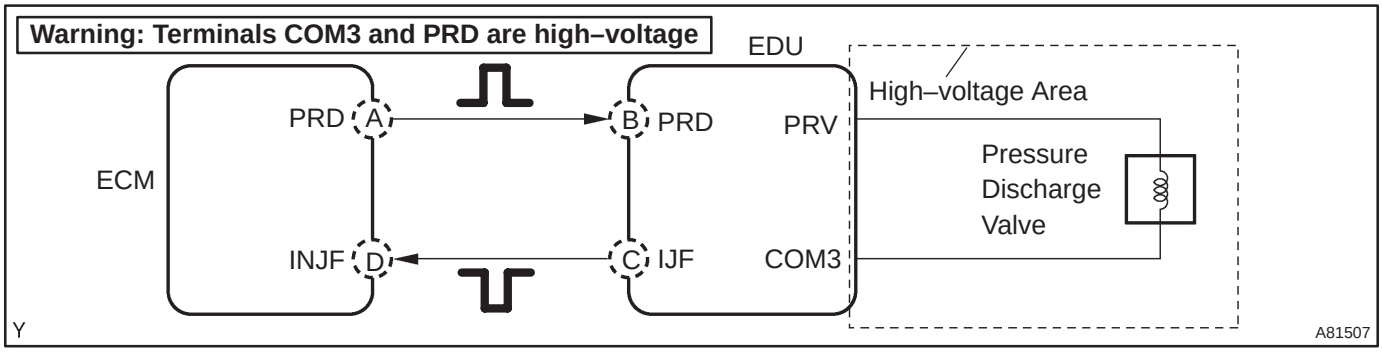
WIRING DIAGRAM



PULSE GENERATION INSPECTION

HINT:

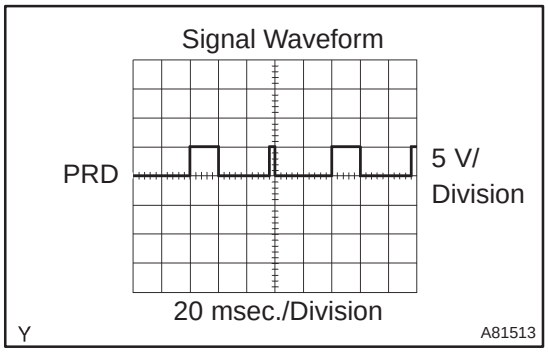
Problem area can be identified by inspecting waveform at the following inspection points.



HINT:

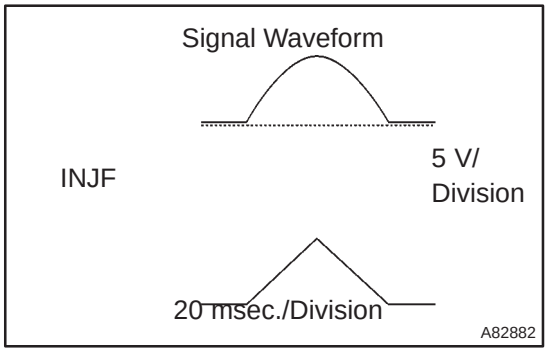
Inspect the following inspection points ”A and D” or ”B and C” at the same time.

Malfunction point	Trouble area
A	• ECM
B (If A is normal)	• Open or short in ”PRD (ECM)” – ”PRD (EDU)” circuit.
C (If A and B are normal)	• Open or short in ”PRV (EDU)” – ”COM3 (EDU)” circuit. • Pressure discharge valve • EDU
D (If A, B and C are normal)	• Open or short in ”IJF (EDU)” – ”INJF (ECM)” circuit. (P0200 is set simultaneously)



(a) Reference: Inspect using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Inspection point	Specified condition
A and B	Correct waveform is as shown



(b) Reference: Inspect using the oscilloscope.
The correct waveform is as shown in the diagram on the left.

Inspection point	Specified condition
C and D	Correct waveform is as shown

INSPECTION PROCEDURE

HINT:

- After completing repair, confirm P1271 and/or P1272 is not set again.
- If P0200 and P1271 are present simultaneously, there is open in the INJF wire harness between the EDU and ECM, or there is open in the wire harness for both of the injector the pressure discharge valve.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ OUTPUT DTC(DTC P1271 AND/OR P1272)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES”.
(d) Read the DTCs.

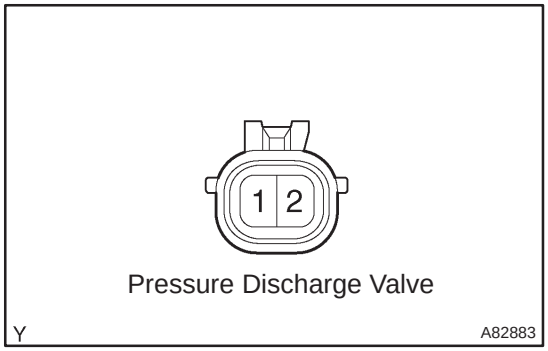
Result:

Display (DTC output)	Proceed to
”Only DTC P1271” or ”P1271 and P1272” are output	A
Only DTC P1272 is output	B

B → **Go to step 8**

A

2 INSPECT COMMON RAIL ASSY (PRESSURE DISCHARGE VALVE)

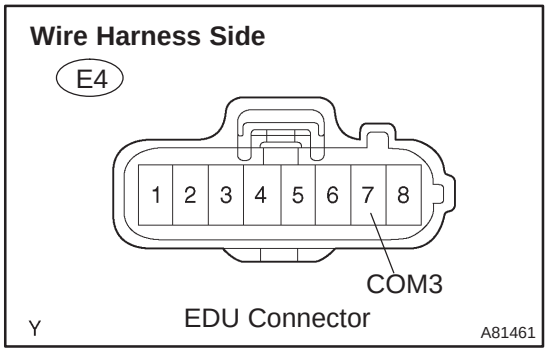


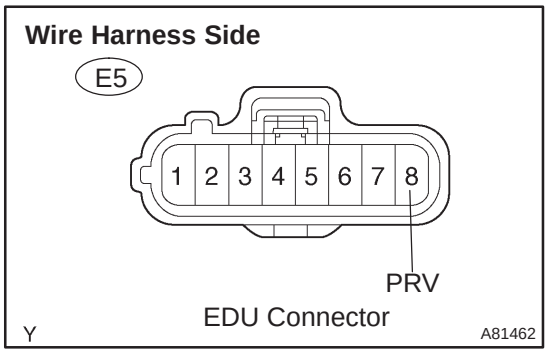
(a) Check the pressure discharge valve for resistance.
(1) Measure the resistance between the terminals.
Resistance: 0.85 to 1.05 Ω at 20°C (68°F)

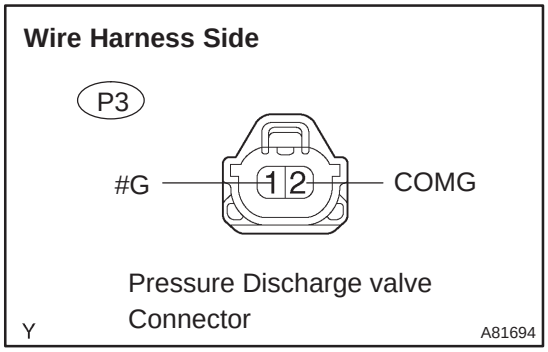
NG → **REPLACE COMMON RAIL ASSY (PRESSURE DISCHARGE VALVE) (See page 14–286)**

OK

3 CHECK HARNESS AND CONNECTOR(PRESSURE DISCHARGE VALVE – EDU)







(a) Disconnect the E4 and E5 EDU connectors.
(b) Disconnect the P3 pressure discharge valve connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
COM3 (E4–7) – COMG (P3–2)	Continuity
PRV (E5–8) – #G (P3–1)	

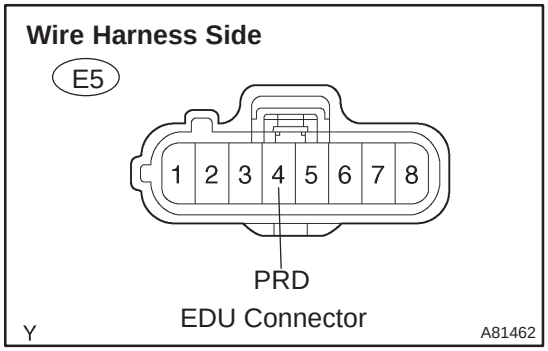
Standard (Check for short):

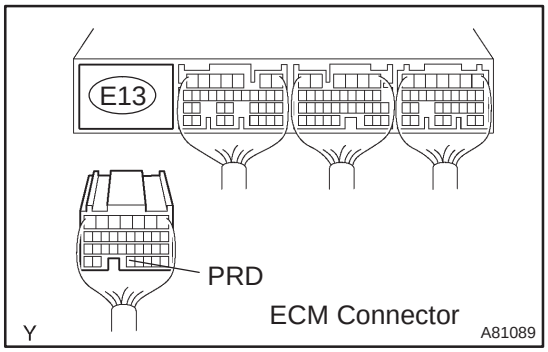
Symbols (Terminal No.)	Specified condition
COM3 (E4–7) or COMG (P3–2) – Body ground	No continuity
PRV (E5–8) or #G (P3–1) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 CHECK HARNESS AND CONNECTOR(EDU – ECM)





(a) Disconnect the E5 EDU connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PRD (E5–4) – PRD–(E13–32)	Continuity

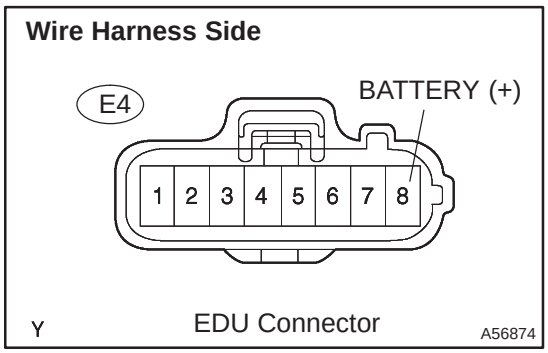
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PRD (E5–4) or PRD (E13–32) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

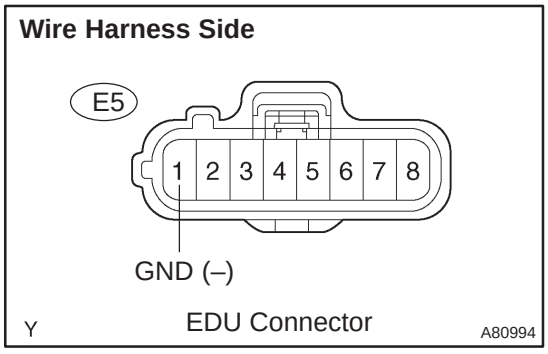
5 INSPECT INJECTOR DRIVER(BATTERY VOLTAGE)



(a) Disconnect the E4 and E5 EDU connectors.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the specified terminals of the EDU connector.

Voltage:

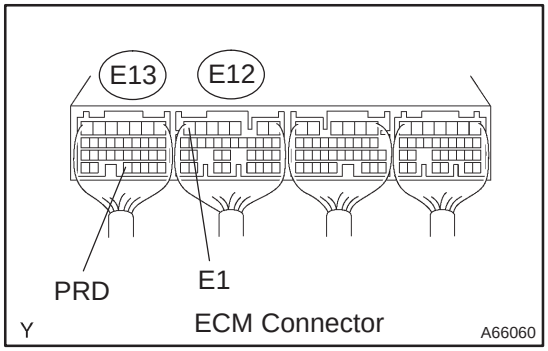
Symbols (Terminal No.)	Specified condition
BATTERY (E4–8) – GND (E5–1)	9 to 14 V

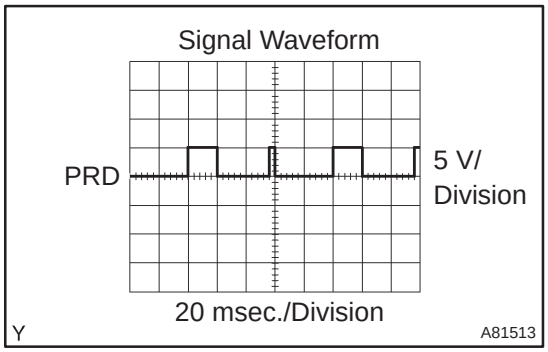


NG → **CHECK INJECTOR DRIVER POWER SOURCE CIRCUIT (EDU – BATTERY)**

OK

6 INSPECT ECM(PRD VOLTAGE)





(a) Inspect using the oscilloscope.
(b) Drive the vehicle at 50 km/h (31 mph) with the 3rd transmission gear and then decelerate by releasing the accelerator pedal, and check the waveform between the specified terminals of the E12 and E13 ECM connectors.

Standard:

Symbols (Terminal No.)	Specified condition
PRD (E13–4) – E1 (E12–7)	Correct waveform is as shown

HINT:
It may be that the following method is the alternative inspection: Run the engine at 2,500 rpm for 10 seconds and then decrease to idle speed with accelerator pedal completely released.

NG → **REPLACE ECM (See page 10–65)**

OK

7 REPLACE INJECTOR DRIVER

GO

CHECK DTC OUTPUT RECUR (DTC P1271 AND/OR P1272)

HINT:
P1271:
After clearing the DTC, drive the vehicle at 50 km/h (31 mph) with the 3rd transmission gear and then decelerate by releasing the accelerator pedal, then confirm P1271 is not set again.
P1272:
After clearing the DTC, turn the ignition switch OFF after the engine was started, and restart the engine and then turn the ignition switch OFF, and then confirm P1272 is not set again.

8	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" and read its value displayed on the hand–held tester.
(e) Check if the internal fuel pressure of the common rail drops below approximately 5 MPa within approximately 1 second after the ignition switch is turned OFF at idling.

Result:

Pressure Displayed	Proceed to
5 MPa or more	A
5 MPa or less	B

B → **CHECK DTC OUTPUT RECUR (DTC P1271 AND/OR P1272)**

HINT:
P1271:
After clearing the DTC, drive the vehicle at 50 km/h (31 mph) with the 3rd transmission gear and then decelerate by releasing the accelerator pedal, then confirm P1271 is not set again.
P1272:
After clearing the DTC, turn the ignition switch OFF after the engine was started, and restart the engine and then turn the ignition switch OFF, and then confirm P1272 is not set again.

A

9	REPLACE COMMON RAIL ASSY(PRESSURE DISCHARGE VALVE) (See page 11–78)

GO

CHECK DTC OUTPUT RECUR (DTC P1271 AND/OR P1272)

HINT:
P1271:
After clearing the DTC, drive the vehicle at 50 km/h (31 mph) with the 3rd transmission gear and then decelerate by releasing the accelerator pedal, then confirm P1271 is not set again.
P1272:
After clearing the DTC, turn the ignition switch OFF after the engine was started, and restart the engine and then turn the ignition switch OFF, and then confirm P1272 is not set again.

DTC	P1601	INJECTOR CORRECTION CIRCUIT MALFUNCTION (EEPROM)

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P1601	• Injector compensation value is not registered (1 trip detection logic) • Wrong injector compensation value is registered (1 trip detection logic)	• Injector compensation code • ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK INJECTOR COMPENSATION CODE (See page 05–528)

NG → SET INJECTOR COMPENSATION CODE (See page 05–528)

OK

REPLACE ECM (See page 10–65)

DTC	**P2120**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT**

DTC	**P2122**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT LOW INPUT**

DTC	**P2123**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT HIGH INPUT**

DTC	**P2125**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT**

DTC	**P2127**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT LOW INPUT**

DTC	**P2128**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT HIGH INPUT**

DTC	**P2138**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D”/”E” VOLTAGE CORRELATION**

HINT:
This is procedure of accelerator pedal position sensor.

CIRCUIT DESCRIPTION

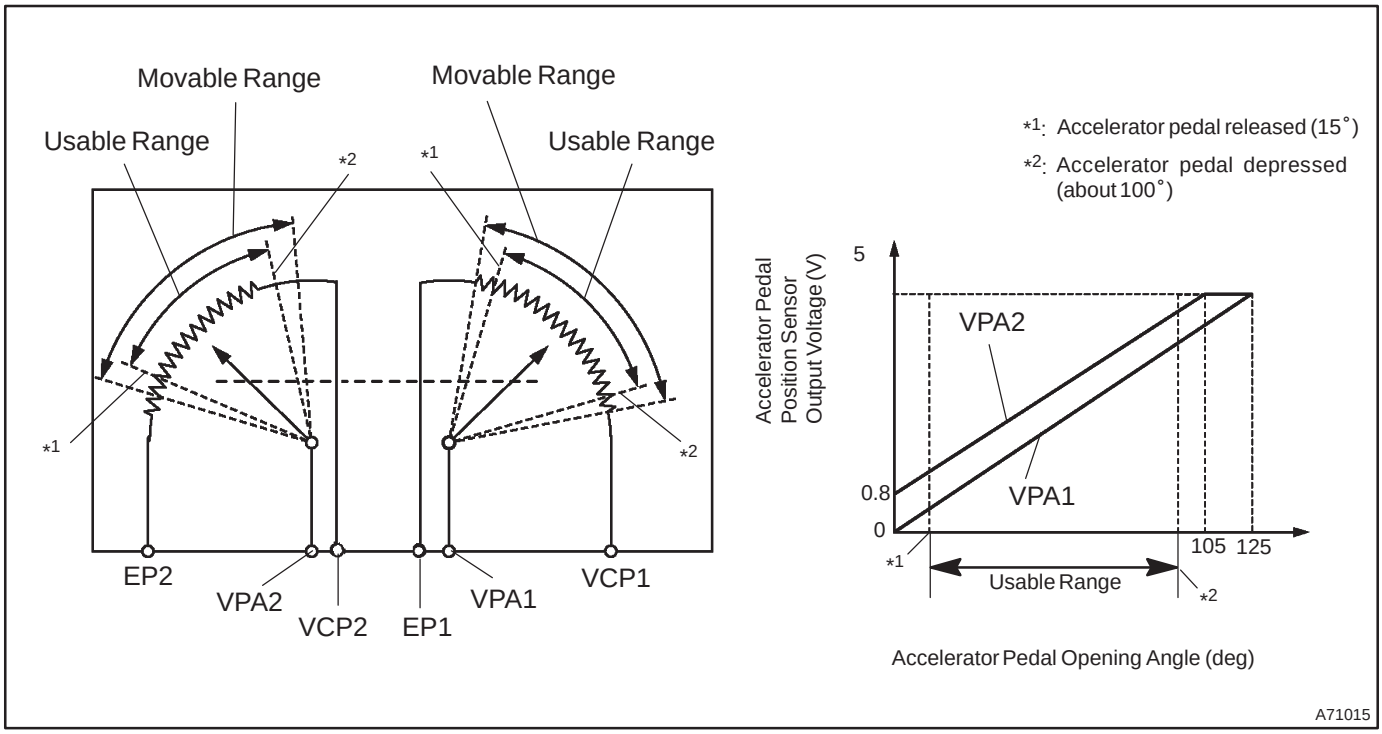
HINT:

This electrical throttle system does not use a throttle cable.

The accelerator pedal position sensor is mounted on the accelerator pedal bracket and it has the 2 sensors to detect the accelerator position and a malfunction of the accelerator position sensor.

In the accelerator pedal position sensor, the voltage applied to pedal terminals VPA1 and VPA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the accelerator pedal. The VPA1 is a signal to indicate the actual accelerator pedal opening angle which is used for the engine control, and the VPA2 is a signal to indicate the information about the opening angle which is used for detecting a malfunction.

The ECM judges the current accelerator pedal opening angle with the signals from terminals VPA1 and VPA2, and the ECM controls the throttle motor based on these signals.



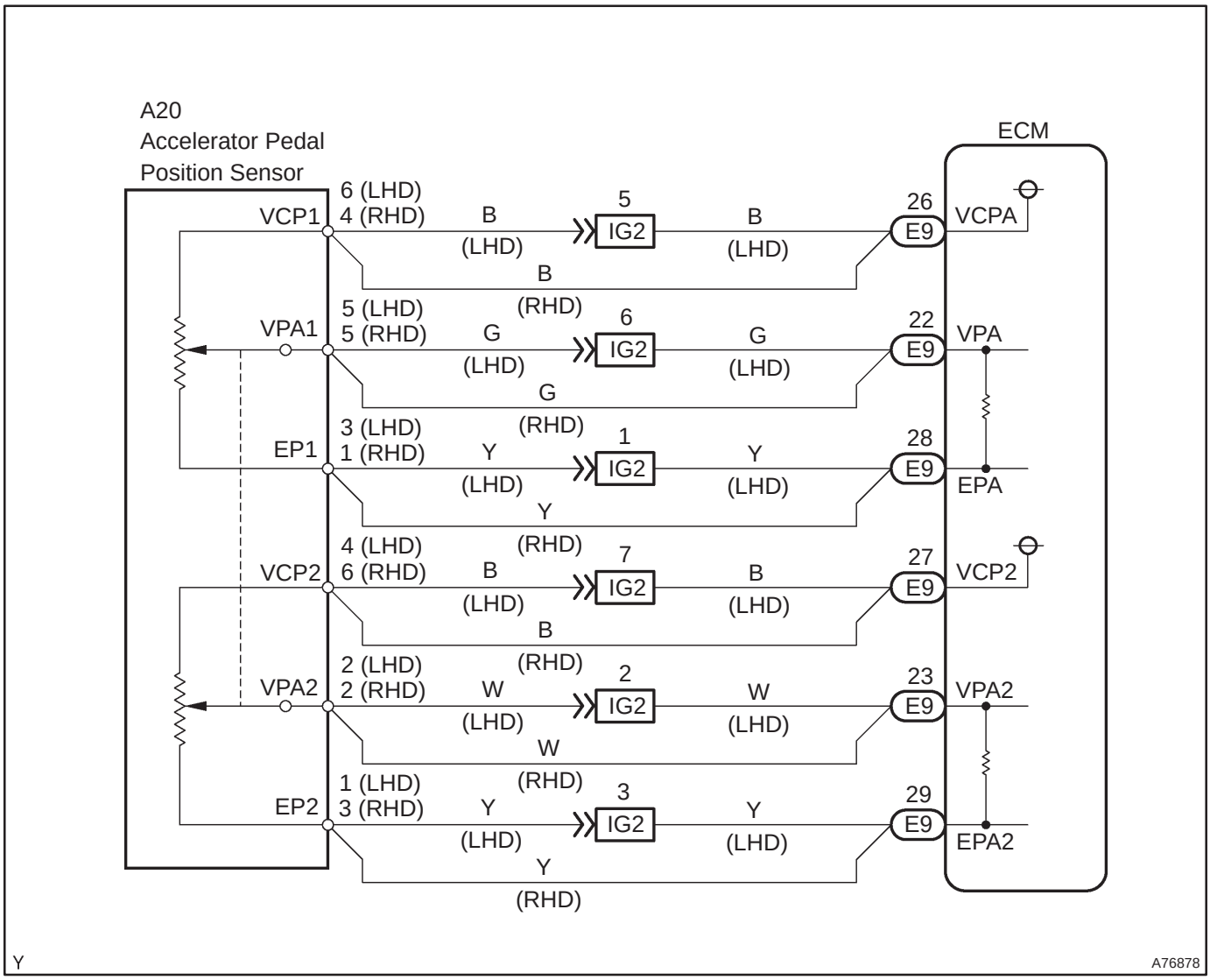
DTC No.	DTC Detecting Condition	Trouble Area
P2120	Condition (a) continues for 0.5 sec. or more: (a) VPA less than 0.2 V and VPA2 greater than 0.97 deg, or VPA greater than 4.8 V	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM
P2122	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA less than 0.2 V (b) VPA2 greater than 0.97 deg	
P2123	Condition (a) continues for 2.0 sec. or more: (a) VPA greater than 4.8 V	
P2125	Condition (a) continues for 0.5 sec. or more: (a) VPA2 less than 0.5 V and VPA greater than 0.97 deg, or VPA2 greater than 4.8 V and VPA greater than 0.2 V but les than 3.45 V	
P2127	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA2 less than 0.5 V (b) VPA greater than 0.97 deg	
P2128	Conditions (a) and (b) continue for 2.0 sec. or more: (a) VPA2 greater than 4.8 V (b) VPA greater than 0.2 V but less than 3.45 V	
P2138	Condition (a) or (b) continues for 2.0 sec. or more: (a) Difference between VPA and VPA2 less than 0.02 V (b) VPA less than 0.2 V and VPA2 less than 0.5 V	

HINT:

After confirming ”DTC P2120, P2122, P2123, P2125, P2127, P2128 and P2138”, use the hand–held tester to confirm the accelerator pedal position sensor output voltage.

Trouble area	Accelerator pedal position expressed as voltage output			
	Accelerator pedal released		Accelerator pedal depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VC circuit open	0 V	0 V	0 V	0 V
VPA circuit open or ground short	0 V	1.5 to 2.9 V	0 V	3.5 to 5.5 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 V	2.5 to 4.6 V	0 V
EP circuit open	5 V	5 V	5 V	5 V

WIRING DIAGRAM

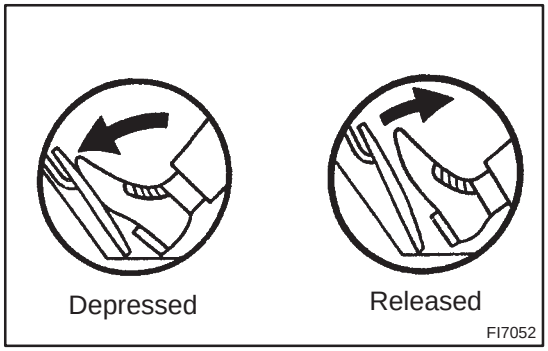


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 READ VALUE OF HAND–HELD TESTER(ACCEL POS #1 AND ACCEL POS #2)



(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2" and read its value displayed on the hand–held tester.

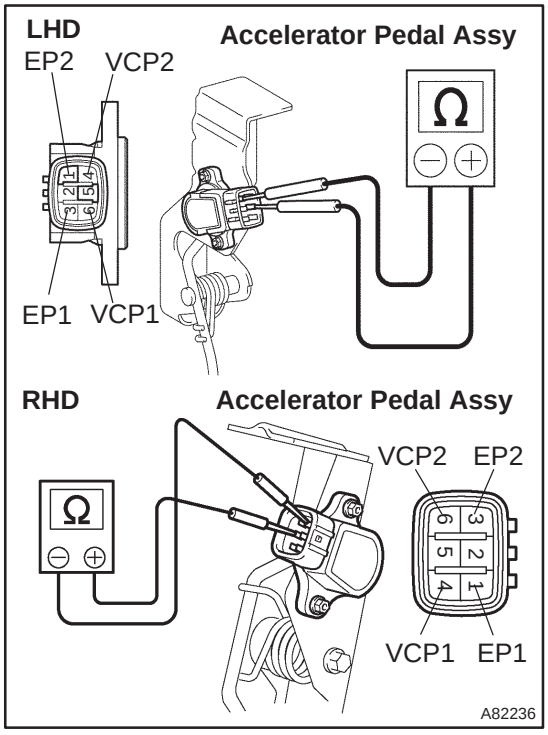
Standard:

Accelerator pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

OK → **REPLACE ECM (See page 10–65)**

NG

2 INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the accelerator pedal position sensor connector.
(b) Measure the resistance between each terminal.

Standard (LHD):

Symbols (Terminal No.)	Resistance
EP1 (3) – VCP1 (6)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (1) – VCP2 (4)	

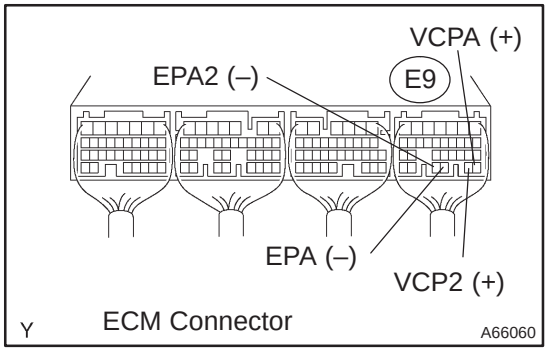
Standard (RHD):

Symbols (Terminal No.)	Resistance
EP1 (1) – VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) – VCP2 (6)	

NG → **REPLACE ACCELERATOR PEDAL ASSY (See page 10–66)**

OK

3 INSPECT ECM(VCPA AND VCP2 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

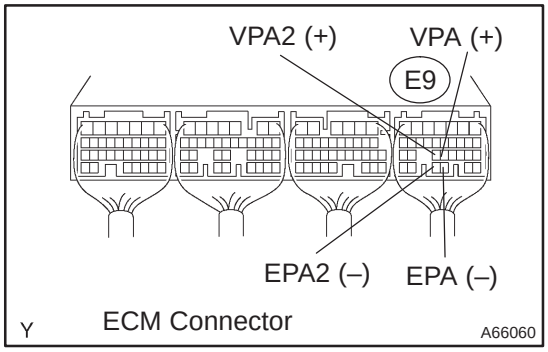
Standard:

Symbols (Terminal No.)	Specified condition
VCPA (E9–26) – EPA (E9–28)	4.5 to 5.5 V
VCP2 (E9–27) – EPA2 (E9–29)	

NG → **REPLACE ECM (See page 10–65)**

OK

4 INSPECT ECM(VPA AND VPA2 VOLTAGE)



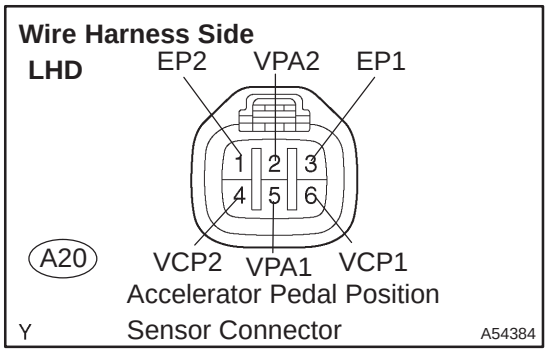
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

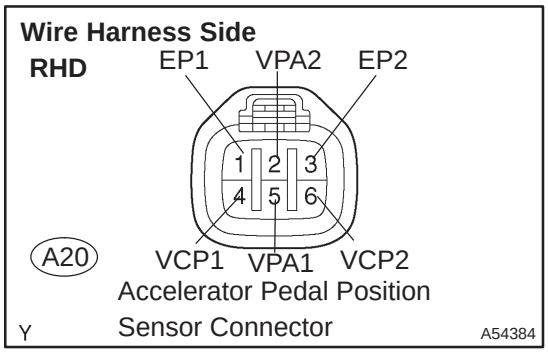
Accelerator pedal position	Symbols (Terminal No.) VPA (E9–22) – EPA (E9–28)	Symbols (Terminal No.) VPA2 (E9–23) – EPA2 (E9–29)
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

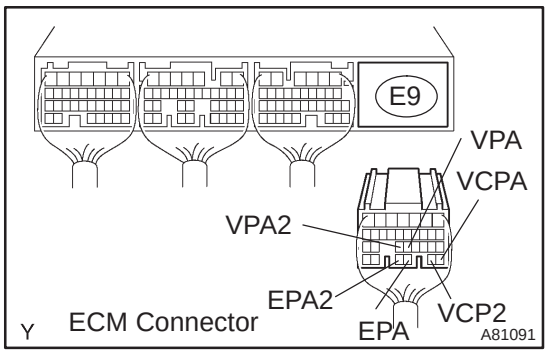
OK → **REPLACE ECM (See page 10–65)**

NG

5	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)







(a) Disconnect the A20 accelerator pedal position sensor connector.

(b) Disconnect E9 the ECM connector.

(c) Check for continuity between the wire harness side connectors.

Standard (LHD):

(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–3) – EPA (E9–28)	
VCP1 (A20–6) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–1) – EPA2 (E9–29)	
VCP2 (A20–4) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–3) or EPA (E9–28) – Body ground	
VCP1 (A20–6) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–1) or EPA2 (E9–29) – Body ground	
VCP2 (A20–4) or VCP2 (E9–27) – Body ground	

Standard (RHD):

(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–1) – EPA (E9–28)	
VCP1 (A20–4) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–3) – EPA2 (E9–29)	
VCP2 (A20–6) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–1) or EPA (E9–28) – Body ground	
VCP1 (A20–4) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–3) or EPA2 (E9–29) – Body ground	
VCP2 (A20–6) or VCP2 (E9–27) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–65)

DTC	P2121	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page 05–492.

DTC No.	DTC Detection Condition	Trouble Area
P2121	Conditions (a) and (B) continue for 0.5 sec.: (a) Difference between VPA and VPA2 exceeds the threshold (b) IDL is OFF	• Accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM

WIRING DIAGRAM

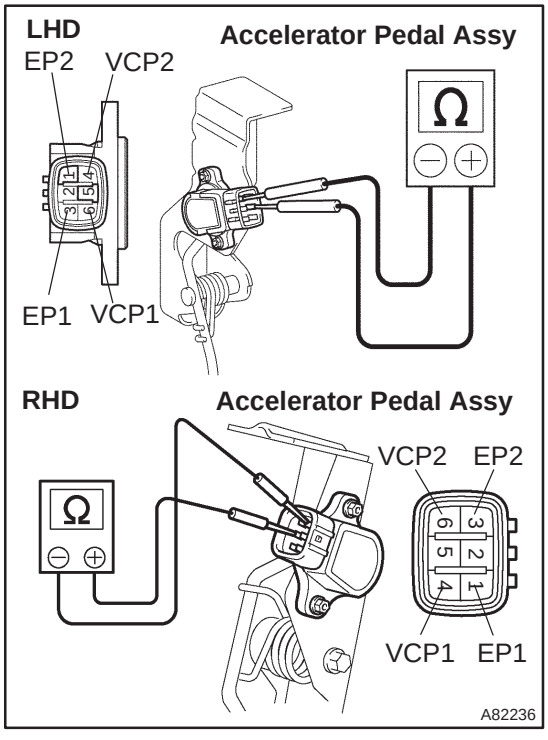
Refer to DTC P2120 on page 05–492.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A20 accelerator pedal position sensor connector.

(b) Measure the resistance between each terminal.

Standard (LHD):

Symbols (Terminal No.)	Resistance
EP1 (3) – VCP1 (6)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (1) – VCP2 (4)	

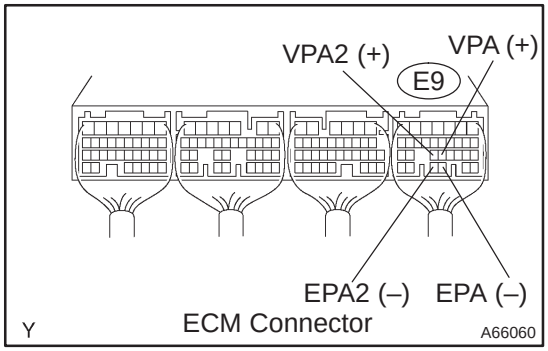
Standard (RHD):

Symbols (Terminal No.)	Resistance
EP1 (1) – VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) – VCP2 (6)	

NG → **REPLACE ACCELERATOR PEDAL ASSY (See page 10–66)**

OK

2 INSPECT ECM(VPA AND VPA2 VOLTAGE)



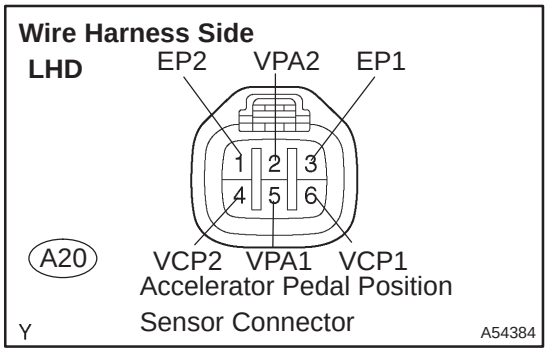
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

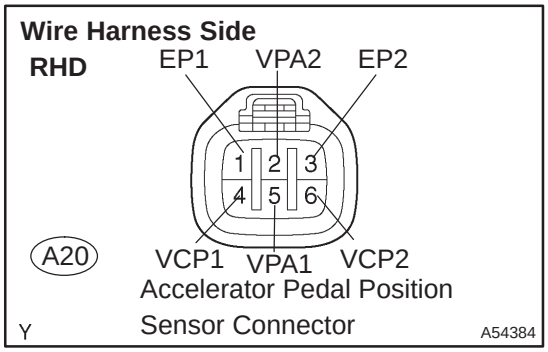
Accelerator pedal position	Symbols (Terminal No.)	Symbols (Terminal No.)
	VPA (E9–22) – EPA (E9–28)	VPA2 (E9–23) – EPA2 (E9–29)
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

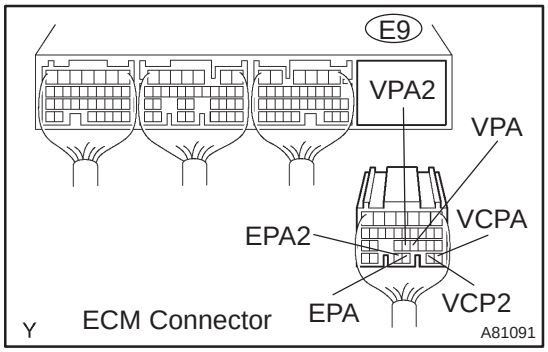
OK → **REPLACE ECM (See page 10–65)**

NG

3 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)







(a) Disconnect the A20 accelerator pedal position sensor connector.
(b) Disconnect the E9 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (LHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–3) – EPA (E9–28)	
VCP1 (A20–6) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–1) – EPA2 (E9–29)	
VCP2 (A20–4) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–3) or EPA (E9–28) – Body ground	
VCP1 (A20–6) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–1) or EPA2 (E9–29) – Body ground	
VCP2 (A20–4) or VCP2 (E9–27) – Body ground	

Standard (RHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–1) – EPA (E9–28)	
VCP1 (A20–4) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–3) – EPA2 (E9–29)	
VCP2 (A20–6) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–1) or EPA (E9–28) – Body ground	
VCP1 (A20–4) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–3) or EPA2 (E9–29) – Body ground	
VCP2 (A20–6) or VCP2 (E9–27) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ACCELERATOR PEDAL ASSY (See page 10–66)

DTC	P2226	BAROMETRIC PRESSURE CIRCUIT

DTC	P2228	BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC	P2229	BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

Detect the atmospheric pressure using the atmospheric pressure sensor. Followed by the atmospheric pressure, correct the injection timing, the injection volume and the amount of common rail internal fuel pressure and then they create optimum combustion.

DTC No.	DTC Detection Condition	Trouble Area
P2226 P2228 P2229	ECM malfunction (1 trip detection logic)	• ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

REPLACE ECM (See page 10–65)

DTC	P2227	BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Detect the atmospheric pressure using the atmospheric pressure sensor. Followed by the atmospheric pressure, correct the injection timing, the injection volume and the amount of common rail internal fuel pressure and then they create optimum combustion.

DTC No.	DTC Detection Condition	Trouble Area
P2227	Atmospheric pressure sensor malfunction (2 trip detection logic)	• ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P2227)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
P2227 and other DTCs are output	A
Only P2227 is output	B

HINT:

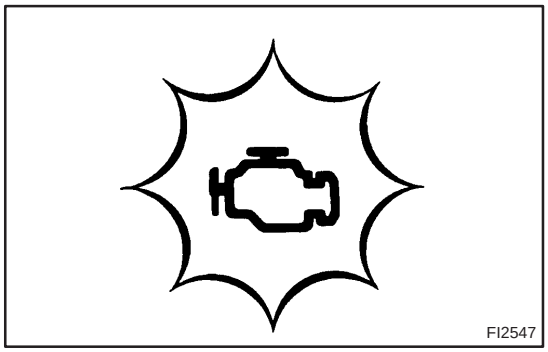
If any other codes besides P2227 are output, perform the troubleshooting for those DTCs first.

B → **REPLACE ECM (See page 10–65)**

A

GO TO RELEVANT DTC CHART (See page 05–544)

05CPB–01

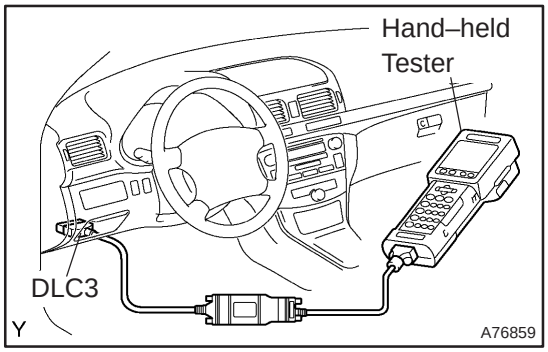

FI2547

PRE–CHECK

1. DIAGNOSIS SYSTEM

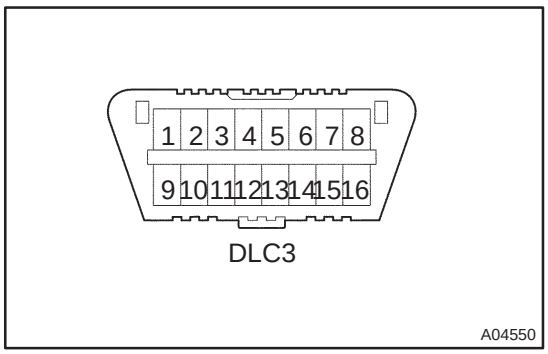
(a) Description for Euro–OBD

- When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect an OBD scan tool complying with ISO 15031–4 or a hand–held tester to the vehicle, and read the various data output from the vehicle's ECM.
- Euro–OBD regulations require that the vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the emission control system / components or in the power train control components which affect vehicle emissions, or a malfunction in the computer. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO 15031–4 are recorded in the ECM memory (See page 05–544). If the malfunction does not reoccur in 3 consecutive trips, the CHK ENG goes off automatically but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect the OBD scan tool or hand–held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check the freeze frame data and various forms of engine data. (For operating instructions, see the OBD scan tool's instruction book.)
- DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–544).
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).

- * 2 trip detection logic
  When a logic malfunction is first detected, the pending fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  The freeze frame data records the engine conditions (fuel system, calculator load, engine coolant temperature, engine speed, vehicle speed, etc.) when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.
- Priorities for troubleshooting:
  If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.



(b) Check the DLC3.
The vehicle's ECM uses the ISO 9141–2(Euro–OBD) communication protocol. The terminal arrangement of the DLC3 complies with ISO 15031–03 and matches the ISO 9141–2 format.

Terminal No.	Connection / Voltage or Residence	Condition
7	Bus + Line / Pulse generation+	During transmission
4	Chassis Ground – Body Ground / 1 Ω or less	Always
16	Battery Positive – Body Ground / 9 to 14 V	Always

HINT:
If the display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Deparment listed in the tool's instruction manual.

(c) Inspect the battery voltage.
Battery voltage: 11 to 14 V

If voltage is below 11V, recharge the battery before proceeding.

(d) Check the CHK ENG.
(1) The CHK ENG lamp comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the CHK ENG is not illuminate, troubleshoot the combination meter.

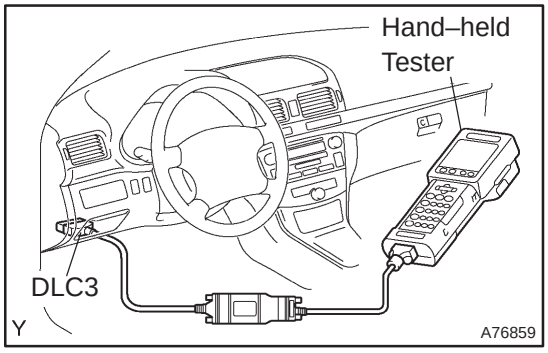
(2) When the engine is started, the CHK ENG should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

2. DTC CHECK (Normal Mode):

NOTICE:

Hand–held tester only:

When the diagnosis system is switched from the normal mode to the check mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and then write them down.



(a) Checking DTCs using the hand–held tester.
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch ON and switch the hand–held tester main switch ON.
(3) Use the hand–held tester to check the DTCs and freeze frame data and then write them down. If you need help with the hand–held tester, refer to the hand–held tester's instruction book).
(4) See page 05–544 to confirm the details of the DTCs.

(b) Clearing the DTCs using the hand–held tester:
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) When operating the hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester:
(1) Disconnect the battery terminal or remove the EFI and ETCS fuses from the engine room R/B for more than 60 seconds.

3. DTC CHECK (Check Mode):

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has more sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

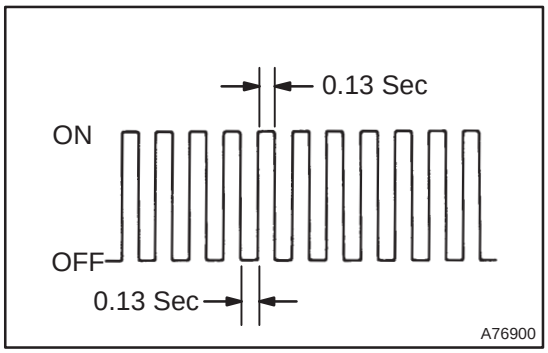
(a) Procedure for Check Mode using the hand–held tester.

(1) Check the initial conditions.
- Battery positive voltage 11V or more.
- Throttle valve fully closed.
- Transmission in the ”N” position.
- A/C switched OFF.

(2) Turn the ignition switch OFF.

(3) Connect the hand–held tester to the DLC3.

(4) Turn the ignition switch ON and switch the hand–held tester main switch ON.



(5) Switch the hand–held tester from the normal mode to the check mode. The CHK ENG blinks in 0.13 sec intervals as shown in the illustration.

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(6) Start the engine. (The CHK ENG goes off after the engine start.)

(7) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTC, etc.

(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the normal mode and will result in all of the DTCs and freeze frame data being erased.

(9) After checking the DTC, inspect the applicable circuit.

(b) Clearing the DTCs using the hand–held tester:

(1) Connect the hand–held tester to the DLC3.

(2) Turn the ignition switch ON.

(3) When operating the hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester’s instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester:
(1) Disconnect the battery terminal or remove the EFI and ETCS fuses from the engine room R/B for more than 60 seconds.

4. FAIL–SAFE CHART

If any of the following codes are recorded, the ECM enters the fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0087	VTA is fixed at 10 %	Ignition switch OFF
P0088	VTA is fixed at 10 %	Ignition switch OFF
P0093	After fail safe driving control is performed for 1 minute, engine stalls	Ignition switch OFF
P0095 P0097 P0098	Intake air temp. is fixed at 145°C (293°F)	Return to normal condition
P0105 P0107 P0108	Turbo pressure is set at fixed value	Return to normal condition
P0115 P0117 P0118	When fuel temp. sensor operates normal and intake air temp. is less than 15°C (59°F), value of fuel temp. sensor is substituted When fuel temp. sensor operates normal and intake air temp. is more than 20°C (68°F), value is fixed at 120°C (248°F) When the fuel temp. sensor is abnormal, value is fixed at 40°C (104°F)	Return to normal condition
P0168	Output limit	Return to normal condition
P0180 P0182 P0183	Fuel temp. is fixed at 40°C (104°F)	Return to normal condition
P0190 P0191 P0192 P0193	VTA is fixed at 10 %	Ignition switch OFF
P0200	VTA is fixed at 25 %	Ignition switch OFF
P0335	Output limit	Return to normal condition
P0488	VTA is fixed at 25 %	Ignition switch OFF
P0500	Vehicle speed is fixed at 0 km/h (0 mph)	Vehicle speed less than 10 km/h (6 mph)
P1229	VTA is fixed at 10 %	Ignition switch OFF
P1271	VTA is fixed at 25 %	Ignition switch OFF
P1272	VTA is fixed at 25 %	Ignition switch OFF
P2120 P2122 P2123 P2125 P2127 P2128 P2138	Output limit	Ignition switch OFF

5. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:

By putting the vehicle's ECM in the check mode, the 1 trip detection logic is possible instead of the 2 trip detection logic, and the sensitivity to detect faults is increased. This makes it easier to detect intermittent problems.

(a) Clear the DTCs (See step 2).
(b) Set the check mode (See step 3).

(c) Perform a simulation test (See page 01–22).
(d) Check the connector and terminal (See page 01–32).
(e) Wiggle the harness and connector (See page 01–32).

6. DATA LIST

HINT:
Using the DATA LIST displayed by the hand–held tester, you can read the value of the switches, sensors, actuators and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one method to shorten diagnostic time.

NOTICE:
The values given below for "Normal Condition" are representative values. A vehicle may still be normal even if its value differs from those listed here. Do not solely depend on the "Normal Condition" here when deciding whether a part is faulty or not.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand–held tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST".
(g) According to the display on tester, read the "DATA LIST".

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *	Diagnostic Note
INJ VOLUME	Injection volume/ Min.: 0 mm^3, Max.: 1279.98 mm^3	Idling: 3 to 10 mm^3	—
INJ TIMING	Injection timing/ Min.: 0°CA, Max.: 51°CA	Idling: –1 to 5°CA	—
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16383.75 rpm	Idling: 750 to 850 rpm	—
MAF	Air flow rate from MAF sensor status/ Min.: 0 gm/s, Max.: 655.35 gm/s	• Idling: 3.2 to 4.7 gm/s • Running without load (2,500 rpm): 13.1 to 18.9 gm/s	If the value is Approximately 0.0 gm/s: • Mass air flow meter power source circuit open • VG circuit open or short If the valve is 160 gm/s or more: • E2G circuit open
PIM	Absolute pressure inside intake manifold/ Min.: 0 kPa, Max.: 255 kPa	Idling: 85 to 110 kPa	—
COOLANT TEMP	Coolant temperature/ Min.: –40 °C, Max.: 215 °C	After warming up: 80 to 95°C (176 to 203°F)	If the value is "–40 °C" or "140 °C", sensor circuit is open or shorted.
INTAKE AIR	Intake air temperature/ Min.: –40 °C, Max.: 215 °C	Equivalent to Ambient Temp.	
FUEL TEMP	Fuel temperature status/ Min.: –40 °C, Max.: 215 °C	Actual fuel temp.	
ACCEL POSITION	Accel position status/ Min.: 0 %, Max.: 100 %	• Accelerator pedal released: 10 to 22 % • Accelerator pedal depressed: 52 to 90 %	Read the value with ignition switch ON (Do not start engine).
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Actual vehicle speed	Speed indicated on speedometer
THROTTLE POS	Throttle step position status/ Min.: 1 step, Max.: 255 step	• Throttle fully closed: 1 step • Throttle fully open: 255 step	Read the value with ignition switch ON (Do not start engine).
COMN RAIL PRESS	Common rail pressure status/ Min.: 0 MPa, Max.: 255 MPa	Idling: 30 to 40 MPa	—

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *	Diagnostic Note
AMBI TEMP SENS	Ambient temperature sensor status/ Min.: –40 °C, Max.: 215 °C	Actual atmosphere	If the value is ”–40 °C” or ”140 °C”, sensor circuit is open or shorted.
INJ VOL FB #1	Revised injection volume of the cylinder 1/ Min.: –10 mm^3, Max.: 40 mm^3	Idling: –3.0 to 3.0 mm^3	—
INJ VOL FB #2	Revised injection volume of the cylinder 2/ Min.: –10 mm^3, Max.: 40 mm^3	Idling: –3.0 to 3.0 mm^3	—
INJ VOL FB #3	Revised injection volume of the cylinder 3/ Min.: –10 mm^3, Max.: 40 mm^3	Idling: –3.0 to 3.0 mm^3	—
INJ VOL FB #4	Revised injection volume of the cylinder 4/ Min.: –10 mm^3, Max.: 40 mm^3	Idling: –3.0 to 3.0 mm^3	—
PUMP VCM ANGLE	Pump vacuum angle status/ Min.: 0 °CA, Max.: 255 °CA	Idling: 70 to 90˚CA	—
M–INJ/PILOT ON	M–INJ/PILOT ON/ Min.: 0 us, Max.: 65,535 us	Idling: 600 to 1,200 us	—
M–INJ/PILOT OFF	M–INJ/PILOT OFF/ Min.: 0 us, Max.: 65,535 us	Idling: 0 us	—
PILOT–INJ	Pilot–Injection/ Min.: 0 us, Max.: 65,535 us	Idling: 400 to 700 us	—
INJ FB VALUE	Injection volume feedback learning value/ Min.: –10 mm^3, Max.: 9,092 mm^3	Idling: –4.0 to 4.0 mm^3	—
STOP LIGHT SW	Stop light switch/ ON or OFF	• Brake pedal depressed: ON • Brake pedal released: OFF	—
STARTER SIG	Starter signal/ ON or OFF	Cranking: ON	—
A/C CUT SIG	A/C cut signal/ ON or OFF	A/C ON: OFF	—
EGR SYSTEM	EGR system status/ ON or OFF	Idling: ON	—
ACCEL OPEN SW	Accel open switch/ ON or OFF	Accelerator pedal fully opened: ON	—
CHECK MODE	Check mode/ ON or OFF	Check mode ON: ON	—
EGR STEP POS	EGR step position status/ Min: 0 step, Max: 125 step	Idling: 0 to 125 step	—

*: If no conditions are specifically stated for ”ldling”, it means the A/C switch is OFF and all accessory switches are OFF.

7. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the methods to shorten diagnostic time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST”

(g) According to the display on tester, perform the ”ACTIVE TEST”.

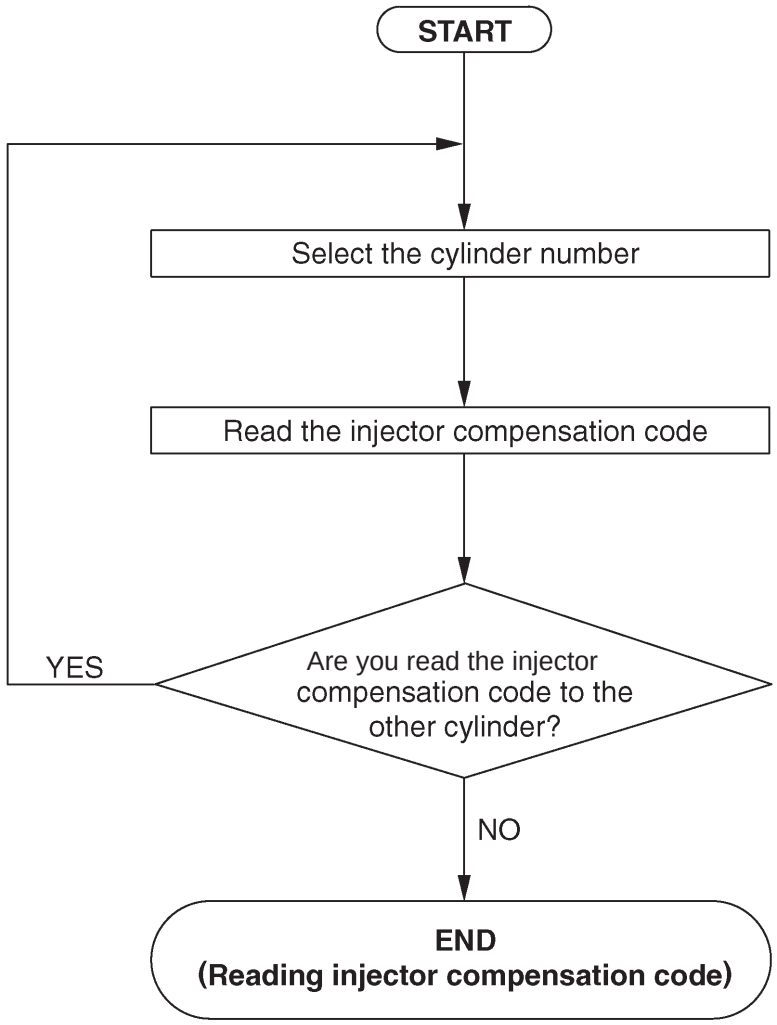
Hand–held Tester Display	Test Details	Diagnostic Note
EGR STEP POS	[Test Details] Change step of EGR motor Min: 0 step, Max: 125 step	—
TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	—
FUEL LEAK TEST	[Test Details] Fuel leak test ON or OFF	—
INJECTOR CUT #1	[Test Details] Injector cut #1 ON or OFF	—
INJECTOR CUT #2	[Test Details] Injector cut #2 ON or OFF	—
INJECTOR CUT #3	[Test Details] Injector cut #3 ON or OFF	—
INJECTOR CUT #4	[Test Details] Injector cut #4 ON or OFF	—

8. READ INJECTOR COMPENSATION CODE

HINT:

This operation is useful when confirming the compensation code of each injector or when DTC P1601 is present.

Reading flowchart:



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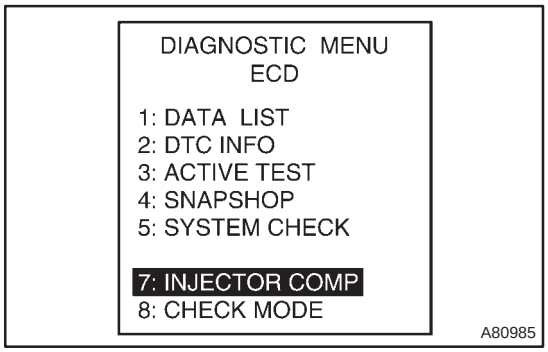
(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON.
(c) Turn the main switch of the hand–held tester ON.

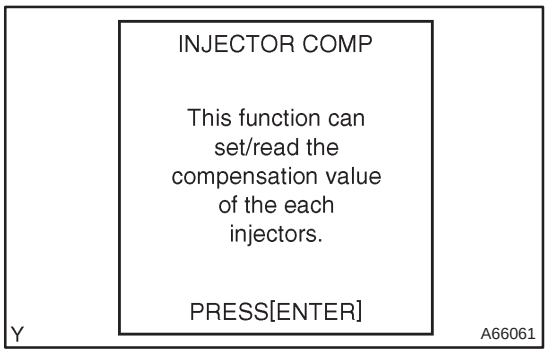
NOTICE:

Do not start the engine in this operation.

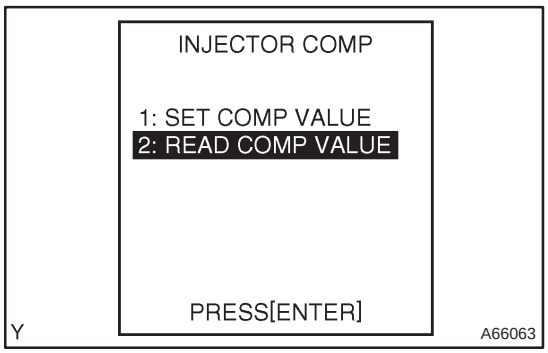


(d) Enter ”DIAGNOSIS / OBD/MOBD / DIAGNOSTIC MENU ECD” and select the item ”INJECTOR COMP.”

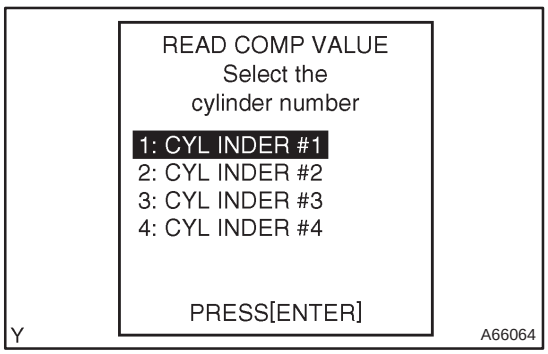
(e) Press the ”ENTER” button on the hand–held tester.



(f) Press the ”ENTER” button again.

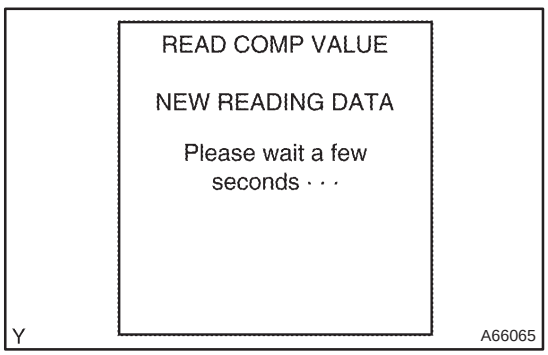


(g) Select ”READ COMP VALUE” and press the ”ENTER” button.

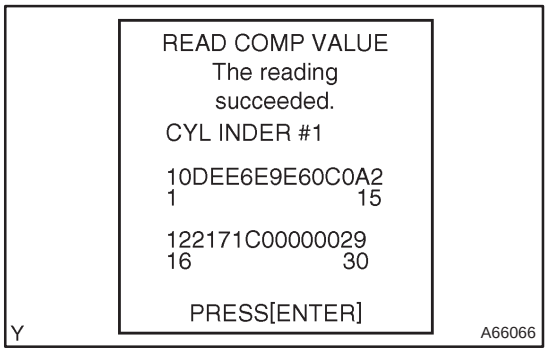


(h) Select a cylinder number which you want to read the compensation code.

(i) Press the ”ENTER” button.



(j) Wait until the next screen comes up.

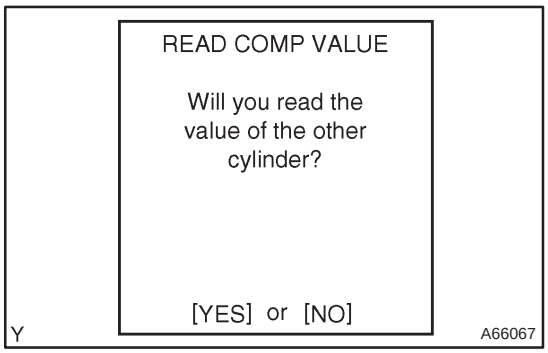


(k) Confirm the 30–digit–alphanumeric code which is displayed on the hand–held tester. This is the injection compensation code for the cylinder.

HINT:

The code shown in the illustration is an example.

(l) Press the ”ENTER” button to exit this screen.



(m) Press the ”NO” button to complete the confirmation.

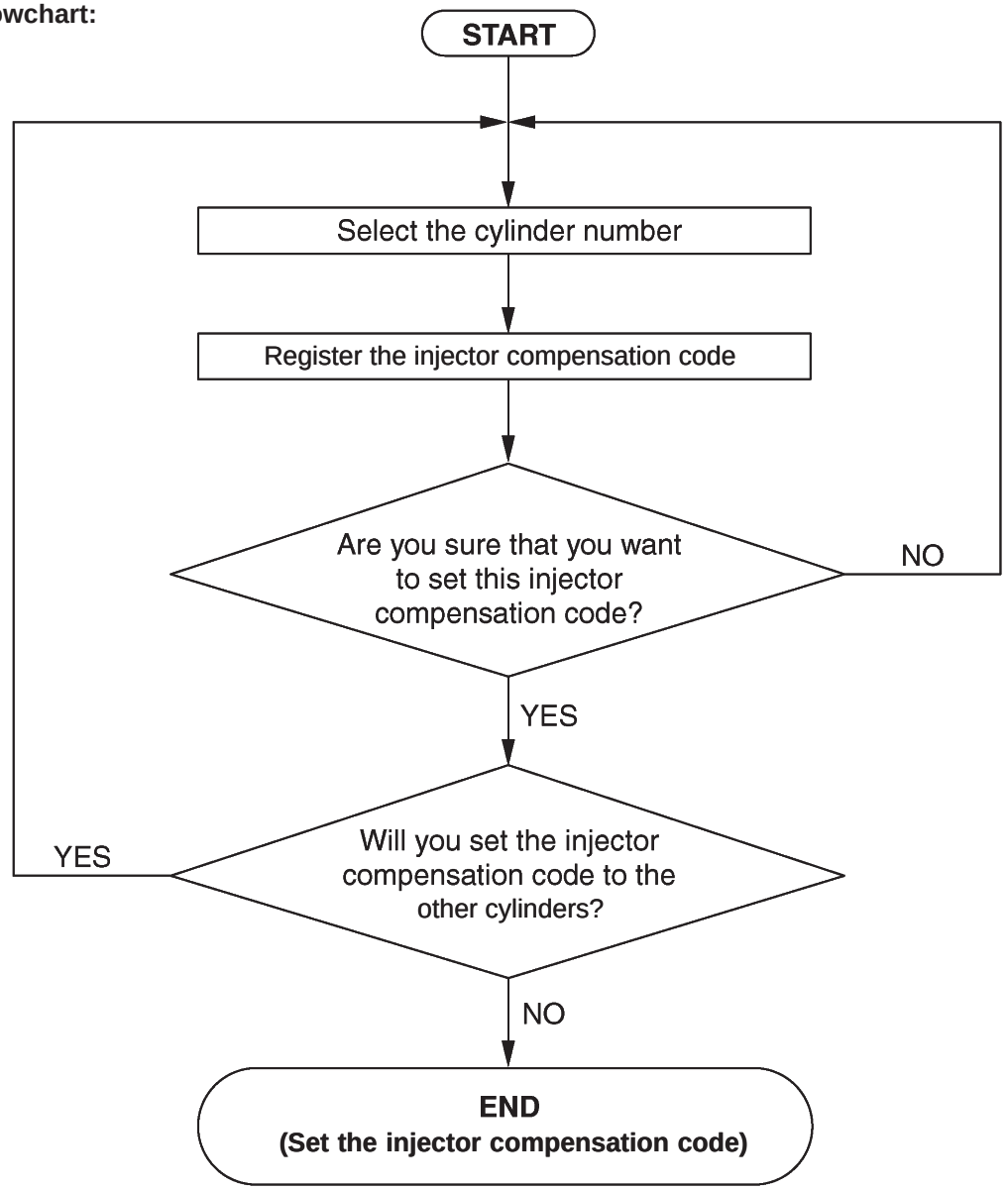
HINT:

- If you want to read other compensation codes for other cylinders, press the ”YES” button instead of ”NO.”
- By pressing the ”NO” button, the hand–held tester returns to the ”DIAGNOSTIC MENU ECD” screen.

9. SET INJECTOR COMPENSATION CODE

HINT:
This operation must be done when replacing the ECM or the injectors.

Setting flowchart:



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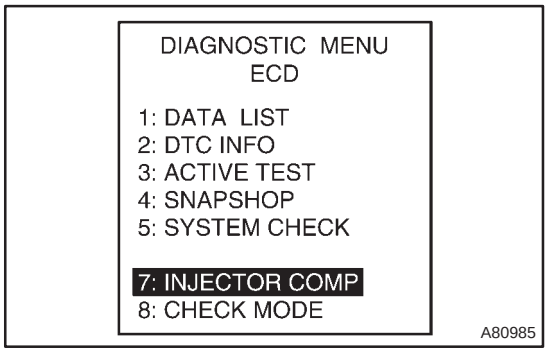
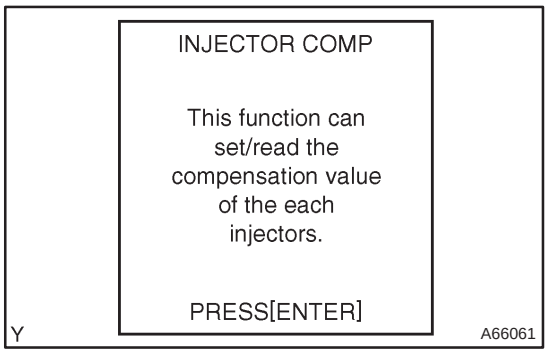
(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON.
(c) Turn the main switch of the hand–held tester ON.

NOTICE:
Do not start the engine in this operation.

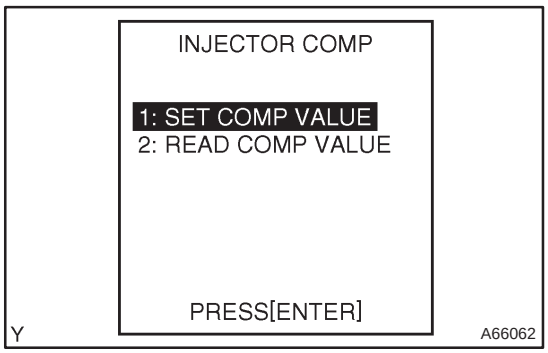


(d) Enter ”DIAGNOSIS / OBD/MOBD / DIAGNOSTIC MENU ECD” and select the item ”INJECTOR COMP.”

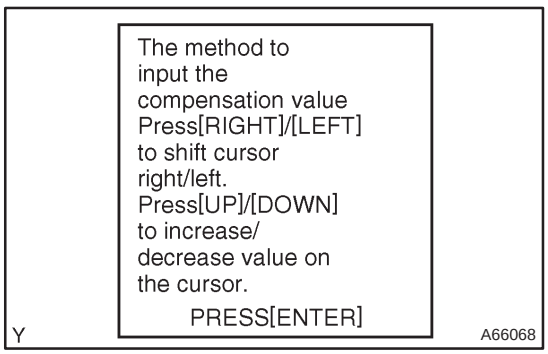
(e) Press the ”ENTER” button on the hand–held tester.



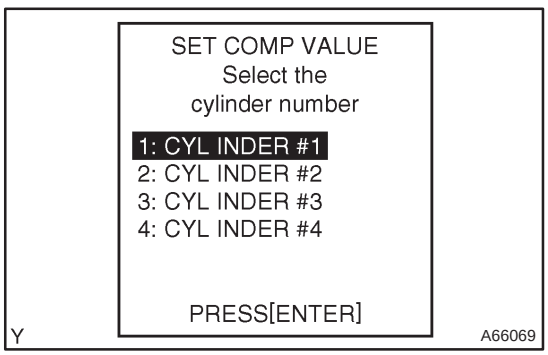
(f) Press the ”Enter” button again.



(g) Select ”SET COMP VALUE” and press the ”ENTER” button.

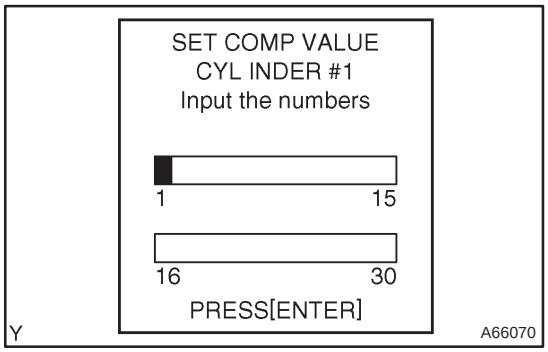


(h) Press the ”ENTER” button.



(i) Select a cylinder number which you want to register the compensation code.

(j) Press the ”ENTER” button.



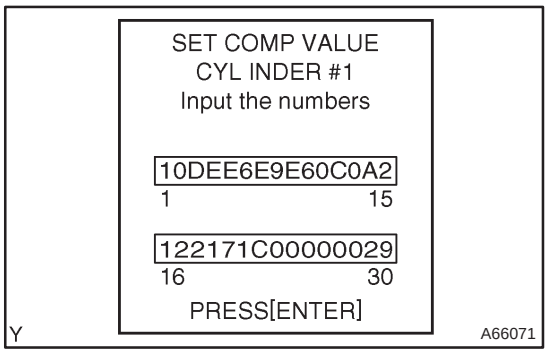
(k) Input the 30–digit–alphanumeric code with the hand–held tester to register the compensation code to the ECM.

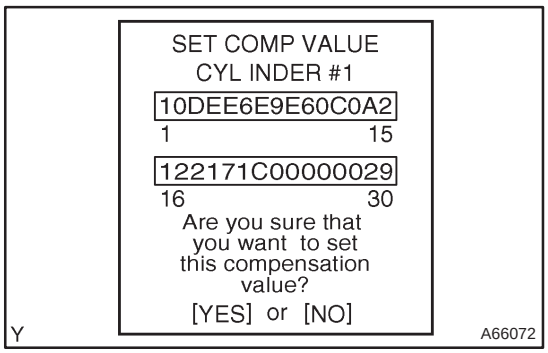
NOTICE:

Be careful not to register a wrong compensation code to the ECM. The compensation code which stored in the ECM must be consistent with the compensation code of the injector assembly. If a wrong code was set to the ECM, rough idling or engine rattling may result. In addition, it may be a cause of the engine failure or short–life.

(l) After inputting, press the ”ENTER” button.

(m) Press the ”ENTER” button again.





(n) Confirm the injection compensation code which is displayed on the hand–held tester.

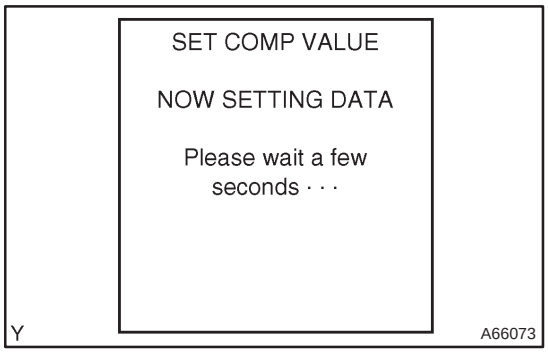
HINT:

The code shown in the illustration is an example.

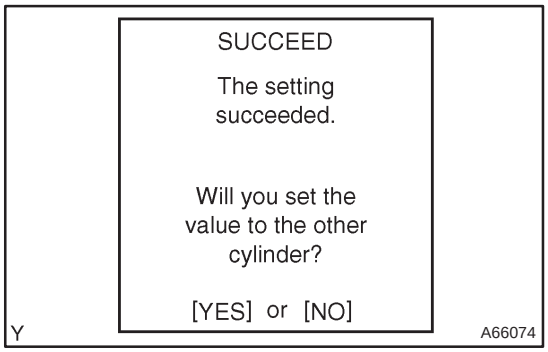
NOTICE:

- **Make sure the correct compensation code is entered on the hand–held tester before pressing YES button.**
- **If a wrong compensation code was entered on the hand–held tester, select the ”NO” button to correct the error (Back to step (g)).**

(o) Press the ”YES” button to set the code to the ECM.



(p) Wait until the next screen comes up.



(q) Press the ”NO” button to complete the registration.

HINT:

- If you want to register other compensation code for other cylinders, press the ”YES” button instead of ”NO.”
- By pressing the ”NO” button, the hand–held tester returns to the ”DIAGNOSTIC MENU ECD” screen.

BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	CHECK BATTERY VOLTAGE

NOTICE:

Carry out this check with the engine stopped and ignition switch OFF.

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → **CHARGE OR REPLACE BATTERY**

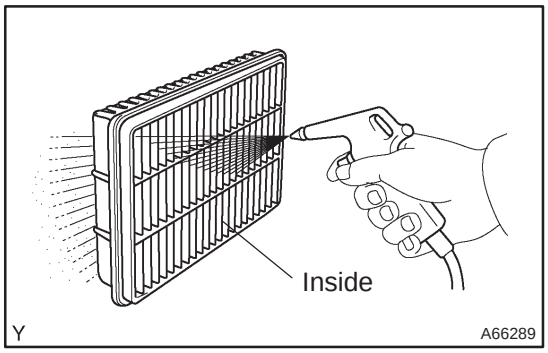
OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–551**

OK

3	CHECK AIR FILTER



(a) Visually check that the air filter is not excessively dirty or oily.

NOTICE:

If necessary, clean the filter with compressed air. First blow from the inside thoroughly, then blow from the outside of the filter.

NG → **CLEAN OR REPLACE**

OK

4	CHECK FUEL QUALITY

(a) Check that only diesel fuel is used
(b) Check that the fuel does not contain any impurity.

NG → REPLACE FUEL

OK

5	CHECK ENGINE OIL (See page 17–20)

NG → ADD OR REPLACE

OK

6	CHECK ENGINE COOLANT (See page 16–37)

NG → REPLACE ENGINE COOLANT (See page 16–44)

OK

7	CHECK IDLE SPEED AND MAXIMUM SPEED (See page 14–266)

NG → REPAIR OR REPLACE INJECTION PUMP (See page 11–69)

OK

8	CHECK DIAGNOSTIC CIRCUIT

NG → REPAIR OR REPLACE

OK

9	CHECK VACUUM PUMP

NG → REPAIR OR REPLACE VACUUM PUMP

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE (See page 05–551)

05CPA–01

PRECAUTION

1. **Since each injector has a characteristic fuel injecting behavior, the ECM compensates such behavior by adjusting an injection time for each injector to optimize the fuel injection volume. Compensating data for the optimum injection volume, which has converted into a 30–digit–alphanumeric value, has been imprinted on a head potion of the injector as the injection compensation code.**
2. **The injection compensation code will be required to register to the ECM when replacing the injectors or the ECM.**
3. **If an incorrect injection compensation value was registered to the ECM, the engine assembly may rattle or the engine idling may be rough. In addition, it may be a cause of the engine failure or short–life.**

054JF–04

PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed the DTC check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform troubleshooting according to the numbered order given in the table below.

Symptom	Suspect Area	See page
Does not crank (Difficult to start)	2. Starter 3. Starter relay 4. Engine coolant temperature sensor	19–22 19–22 10–56
Difficult to start with a cold engine	1. STA signal circuit 2. Injector 3. Fuel filter 4. Compression 5. ECM 6. Supply pump 7. Fuel pressure sensor 8. Diesel throttle 9. Glow plug system	05–691 11–56 11–82 14–266 10–56 10–56 10–56 10–56 10–56
Difficult to start with a warm engine	1. STA signal circuit 2. Injector 3. Fuel filter 4. Compression 5. ECM 6. Supply pump 7. Fuel pressure sensor 8. Diesel throttle	05–691 11–56 11–82 14–266 10–56 10–56 10–56 10–56
Engine stalls soon after starting	1. Fuel filter 2. Injector 3. ECM power source circuit 4. ECM 5. Supply pump 6. Fuel pressure sensor 7. Diesel throttle	11–82 11–56 05–686 10–56 10–56 10–56 10–56
Engine stalls (Other than conditions listed abobe)	1. ECM power source circuit 2. Injector 3. ECM 4. Supply pump 5. Fuel pressure sensor 6. Diesel throttle	05–686 11–56 10–56 10–56 10–56 10–56
Incorrect first idle (Poor idling)	1. Fuel filter 2. Injector 3. ECM 4. Supply pump 5. Fuel pressure sensor	11–82 11–56 10–56 10–56 10–56
High engine idle speed (Poor idling)	1. A/C signal circuit 2. Injector 3. STA signal circuit 4. ECM 5. Supply pump 6. Fuel pressure sensor	55–3 11–56 05–691 10–56 10–56 10–56

Lower engine idle speed (Poor idling)	1. A/C signal circuit 2. Injector 3. EGR system 4. Compression 5. Valve clearance 6. Fuel line (Air bleed) 7. ECM 8. Supply pump 9. Fuel pressure sensor 10. Diesel throttle	55–3 11–56 12–16 14–266 14–270 – 10–56 10–56 10–56 10–56
Rough idling (Poor idling)	1. Injector 2. Fuel line (Air bleed) 3. EGR system 4. Compression 5. Valve clearance 6. ECM 7. Supply pump 8. Fuel pressure sensor 9. Diesel throttle	11–56 – 12–16 14–266 14–270 10–56 10–56 10–56 10–56
Hunting at hot engine (Poor idling)	1. Injector 2. ECM power source circuit 3. Compression 4. Fuel line (Air bleed) 5. Valve clearance 6. ECM 7. Supply pump 8. Fuel pressure sensor 9. Diesel throttle	11–56 05–686 14–266 – 14–270 10–56 10–56 10–56 10–56
Hunting at cold engine (Poor idling)	1. Injector 2. ECM power source circuit 3. Compression 4. Fuel line (Air bleed) 5. Valve clearance 6. ECM 7. Supply pump 8. Fuel pressure sensor 9. Diesel throttle	11–56 05–686 14–266 – 14–270 10–56 10–56 10–56 10–56
Hesitation/ Poor acceleration (Poor driveability)	1. Injector 2. Fuel filter 3. EGR system 4. Compression 5. ECM 6. Supply pump 7. Fuel pressure sensor 8. Diesel throttle	11–56 11–82 12–16 14–266 10–56 10–56 10–56 10–56
Knocking (Poor driveability)	1. Injector 2. EGR system 3. ECM 4. Supply pump 5. Fuel pressure sensor	11–56 12–16 10–56 10–56 10–56
Black smoke (Poor driveability)	1. Injector 2. EGR system 3. ECM 4. Supply pump 5. Fuel pressure sensor 6. Diesel throttle	11–56 12–16 10–56 10–56 10–56 10–56

White smoke (Poor driveability)	1. EGR system 2. Injector 3. Fuel filter 4. ECM 5. Supply pump 6. Fuel pressure sensor 7. Diesel throttle	12–16 11–56 11–82 10–56 10–56 10–56 10–56
Surging/ Hunting (Poor driveability)	1. Injector 2. ECM 3. Supply pump 4. Fuel pressure sensor	11–56 10–56 10–56 10–56

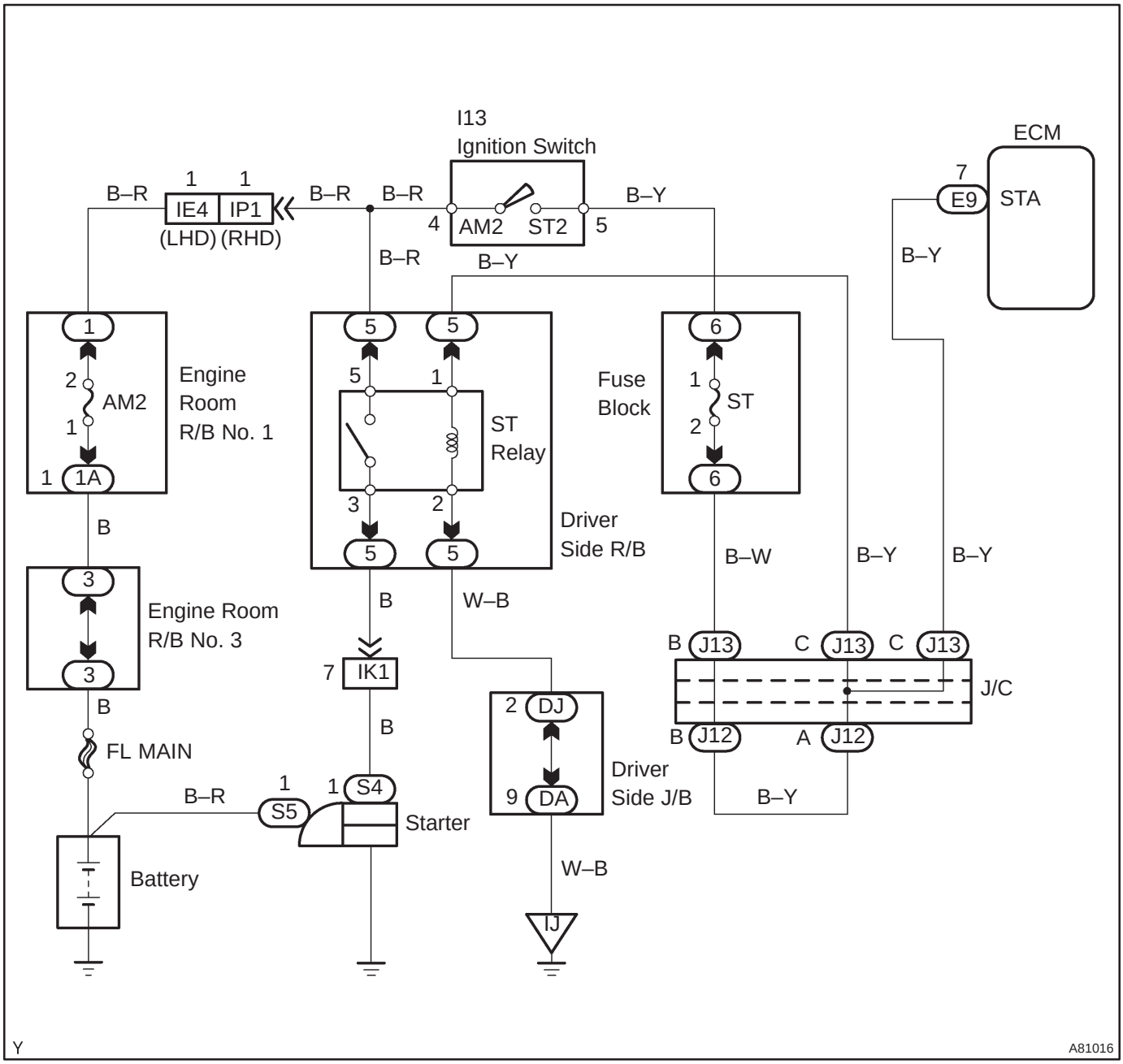
STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

HINT:

While the engine is being cranked, current flows from terminal ST2 of the ignition switch to the ST relay coil and also current flows to terminal STA of the ECM (STA signal).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

This chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05–551.

1	READ VALUE OF HAND–HELD TESTER(STA SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG” and read its value displayed on the hand–held tester.

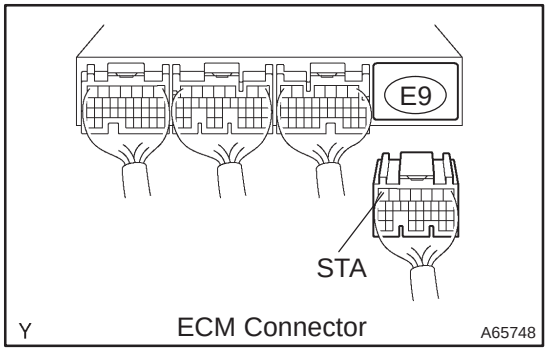
Standard:

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–551)**

NG

2 INSPECT HARNESS AND CONNECTOR(ECM – ST RELAY)



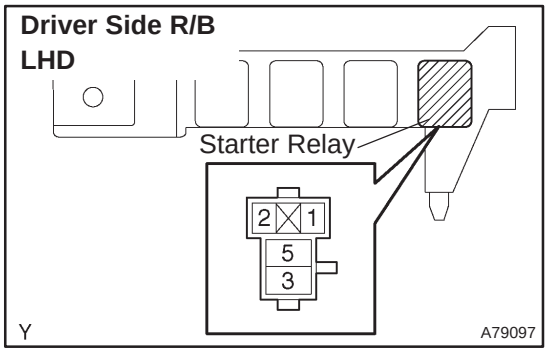
(a) Disconnect the E9 ECM connector.
(b) Remove the ST relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

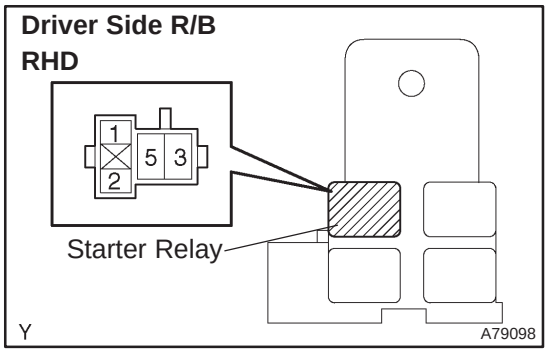
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
ST relay (1) – STA (E9–7)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
ST relay (1) or STA (E9–7) – Body ground	No continuity





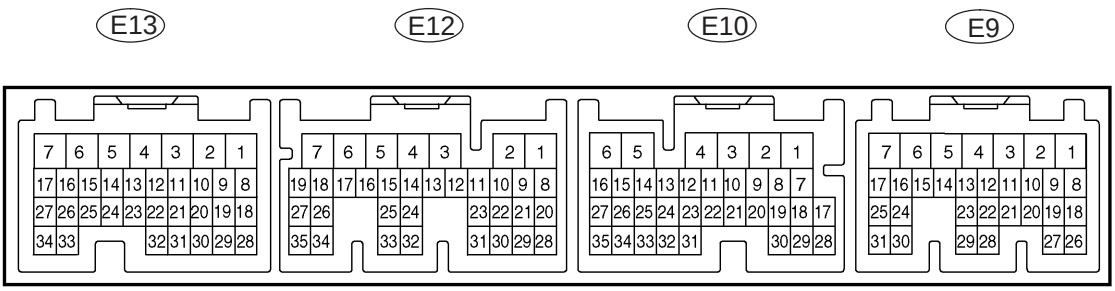
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

REPLACE ECM (See page 10–65)

054KK–04

TERMINALS OF ECM



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A66714

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E10–2) – E1 (E12–7)	B–Y – BR	Always	9 to 14
IGSW (E9–9) – E1 (E12–7)	B–W – BR	IG switch ON	9 to 14
+B (E9–1) – E1 (E12–7)	B–W – BR	IG switch ON	9 to 14
MREL (E9–8) – E1 (E12–7)	GR – BR	IG switch ON	9 to 14
		IG switch OFF	0 to 1.5
VC (E13–18) – E1 (E12–7)	R–W – BR	IG switch ON	4.5 to 5.5
VPA (E9–22) – EPA (E9–28)	G – Y	IG switch ON, accelerator pedal fully released	0.5 to 1.1
		IG switch ON, accelerator pedal fully depressed	3.0 to 4.6
VPA2 (E9–23) – EPA2 (E9–29)	W – Y	IG switch ON, accelerator pedal fully released	0.9 to 2.3
		IG switch ON, accelerator pedal fully depressed	3.4 to 5.0
VCPA (E9–26) – EPA (E9–28)	B – Y	IG switch ON	4.5 to 5.5
VCP2 (E9–27) – EPA2 (E9–29)	B – Y	IG switch ON	4.5 to 5.5
VG (E12–24) – EVG (E12–32)	G – L–Y	Idling	0.5 to 3.4
THA (E13–31) – E2 (E13–28)	G–R – BR	Idling, intake air temp. at 20 °C (68 °F)	0.5 to 3.4
THW (E13–19) – E2 (E13–28)	B–W – BR	Idling, engine coolant temp. at 80°C (176°F)	0.2 to 1.0
STA (E9–7) – E1 (E12–7)	B–Y – BR	Cranking	6.0 or more
#1 (E13–24) – E1 (E12–7) #2 (E13–23) – E1 (E12–7) #3 (E13–22) – E1 (E12–7) #4 (E13–21) – E1 (E12–7)	G–W – BR W–R – BR R–W – BR W–L – BR	Idling	Pulse generation (See page 05–604)
G1 (E12–23) – G– (E12–31)	P – L	Idling	Pulse generation (See page 05–616)
NE+ (E13–27) – NE– (E13–34)	G – R	Idling	Pulse generation (See page 05–616)
STP (E10–19) – E1 (E12–7)	G–W – BR	IG switch on, brake pedal is depressed	7.5 to 14
		IG switch on, brake pedal is released	0 to 1.5
ST1– (E10–12) – E1 (E12–7)	G–W – BR	Brake pedal is depressed	0 to 1.5
		Brake pedal is released	7.5 to 14
TC (E9–11) – E1 (E12–7)	W–L – BR	IG switch ON	9 to 14
W (E9–12) – E1 (E12–7)	W – BR	Idling	9 to 14
		IG switch ON	0 to 3
SP1 (E10–17) – E1 (E12–7)	V–W – BR	IG switch ON, rotate driving wheel slowly	Pulse generation (See page 05–640)
SIL (E9–18) – E1 (E12–7)	W–G – BR	Connect the hand–held tester to the DLC3	Pulse generation

PIM (E12–28) – E2 (E13–28)	W–R – BR	Applied negative pressure of 40 kPa (300 mmHg, 11.8 in. hg)	0.2 to 0.8
		Same as atmosphere	1.3 to 1.9
		Applied positive pressure of 69kPa (0.7 kg/cm^{3}, 10.0 psi)	3.2 to 3.8
IREL (E9–10) – E1 (E12–7)	Y – BR	IG switch OFF	9 to 14
		Idling	0 to 1.5
TACH (E9–5) – E1 (E12–7)	GR–R – BR	Idling	Pulse generation
VCS (E12–2) – E1 (E12–7)	R–W – BR	IG switch ON	4.5 to 5.5
GREL (E9–14) – E1 (E12–7)	R – BR	Cranking	9 to 14
		Idling	0 to 1.5
FAN (E9–3) – E1 (E12–7)	W – BR	Fan OFF	9 to 14
		Fan ON	0 to 1.5
THIA (E13–20) – E2 (E13–28)	GR – BR	Idling, intake air temp. at 80 °C (176 °F)	0.5 to 3.4
THF (E13–29) – E2 (E13–28)	L – BR	IG switch ON	0.5 to 3.4
PCR1 (E13–26) – E2 (E13–28)	P – BR	Idling	1.8 to 2.1
PCR2 (E13–33) – E2 (E13–28)	P–B – BR	Idling	1.2 to 1.5
ALT (E13–8) – E1 (E12–7)	B–L – BR	Idling	Pulse generation
RL (E12–9) – E1 (E12–7)	Y – BR	Idling	9 to 14
		IG switch ON	0 to 3
PCV+ (E13–2) – PCV– (E13–1)	LG–R – LG	Idling	Pulse generation (See page 05–563)
PRD (E13–32) – E1 (E12–7)	R–L – BR	IG switch OFF	4 to 6.5
INJF (E13–25) – E1 (E12–7)	R–B – BR	Idling	Pulse generation (See page 05–604)
EG+A (E12–6) – E1 (E12–7) EG–A (E12–5) – E1 (E12–7) EG+B (E12–4) – E1 (E12–7) EG–B (E12–3) – E1 (E12–7)	G – BR Y–G – BR R–L – BR G–B – BR	Idling	Pulse generation (See page 05–629)
LU+A (E13–15) – E1 (E12–7) LU–A (E13–14) – E1 (E12–7) LU+B (E13–13) – E1 (E12–7) LU–B (E13–12) – E1 (E12–7)	B – BR G – BR Y – BR L – BR	Racing	Pulse generation (See page 05–633)
THOP (E13–11) – E1 (E12–7)	P–L – BR	Idling	9 to 14
		IG switch ON	0 to 3
VN (E13–10) – E1 (E12–7)	W – BR	IG switch ON	Pulse generation (See page 05–554)

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CUSTOMER PROBLEM ANALYSIS CHECK

Transmission Control System Check Sheet	Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move (☐ Any range ☐ Particular range)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)
	☐ No down–shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ No up–shift (S range)
	☐ No down–shift (S range)
	☐ Lock–up malfunction
	☐ Shift point too high or too low
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive range)
	☐ Slip or shudder
	☐ No kick–down
	☐ Others ( )

Check Item	MIL	☐ Normal ☐ Remains ON

DTC Check	1st Time	☐ Normal code ☐ Malfunction code (DTC)
	2nd Time	☐ Normal code ☐ Malfunction code (DTC)

0567Q–08

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.

*1 : – ... MIL does not light /● ... MIL light up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *	Memory
P0500/42 (05–240)	Vehicle Speed Sensor ”A”	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	●	○
P0710/38 (05–882)	Transmission Fluid Temperature Sensor ”A” Circuit	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM	●	○
P0712/38 (05–882)	Transmission Fluid Temperature Sensor ”A” Circuit Low Input		●	○
P0713/38 (05–882)	Transmission Fluid Temperature Sensor ”A” Circuit High Input		●	○
P0717/37 (05–884)	Turbine Speed Sensor Circuit No Signal	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transaxle assembly	●	○
P0748/62 (05–886)	Pressure Control Solenoid ”A” Electrical (Shift Solenoid Valve SL1)	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM	●	○
P0778/63 (05–886)	Pressure Control Solenoid ”B” Electrical (Shift Solenoid Valve SL2)	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM	●	○
P0793/67 (05–892)	Intermediate Shaft Speed Sensor ”A”	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM	●	○
P0982/65 (05–886)	Shift Solenoid ”D” Control Circuit Low (Shift Solenoid Valve S4)	• Open or short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM	●	○
P0983/65 (05–886)	Shift Solenoid ”D” Control Circuit High (Shift Solenoid Valve S4)		●	○
P2716/77 (05–894)	Pressure Contorl Solenoid ”D” Electrical (Shift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	–	○
P2769/64 (05–897)	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL)	• Open or short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM	–	○
P2770/64 (05–897)	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL)		–	○

ELECTRONIC CONTROLLED AUTOMATIC TRANSAXLE [ECT] (U241E(1AZ–FE))

0567N–11

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

The ECM of this system is connected to the multiplex communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the multiplex communication system.

When using hand–held tester, troubleshoot in accordance with the procedure on the following pages.

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–862)

3	Connect the hand–held tester to DLC3

4	Check and Clear DTC and Freeze Frame Data (See page 05–863)

5	Visual Inspection

6	Setting the Check Mode Diagnosis (See page 05–863)

7	Problem Symptom Confirmation

- Symptom does not occur: Go to step 8
- Symptom occur: Go to step 9

8	Symptom Simulation (See page 01–22)

9	DTC Check (See page 05–863)

DTC is not output: Go to step 10

DTC is output: Go to step 17

10	Basic Inspection (See page 40–2, 40–8 and 40–69)

NG: Go to step 19

OK

11	Mechanical System Test (See page 05–863)

NG: Go to step 16

OK

12	Manual Shifting Test (See page 05–863)

NG: Go to step 14

OK

13	Problem Symptoms Table Chapter 1 (See page 05–879)

NG: Go to step 18

OK

14	Problem Symptoms Table Chapter 2 (See page 05–879)

NG: Go to step 16

OK

15	Problem Symptoms Table Chapter 3 (See page 05–879)

NG

16	Part Inspection

Go to step 19

17	DTC Chart (See page 05–876)

18	Circuit Inspection (See page 05–882)

19	Identification of Problem

20	Repair

21	Confirmation Test

End

When not using hand–held tester, troubleshoot in accordance with the procedure on the following pages.

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–862)

3	Check and Clear DTCs (See page 05–863)

4	Problem Symptom Confirmation

Symptom does not occur: Go to step 5

Symptom occur: Go to step 6

5	Symptom Simulation (See page 01–22)

6	DTC Check (See page 05–863)

DTC is not output: Go to step 7

DTC is output: Go to step 14

7	Basic Inspection (See page 40–2, 40–8 and 40–69)

NG → Go to step 16

OK

8	Mechanical System Test (See page 05–863)

NG → Go to step 13

OK

9	Manual Shifting Test (See page 05–863)

NG → Go to step 11

OK

10	Problem Symptoms Table Chapter 1 (See page 05–879)

NG → Go to step 15

OK

11	Problem Symptoms Table Chapter 2 (See page 05–879)

NG → Go to step 13

OK

12	Problem Symptoms Table Chapter 3 (See page 05–879)

NG

13	Part Inspection

Go to step 16

14	DTC Chart (See page 05–876)

15	Circuit Inspection (See page 05–882)

16	Identification of Problem

17	Repair

18	Confirmation Test

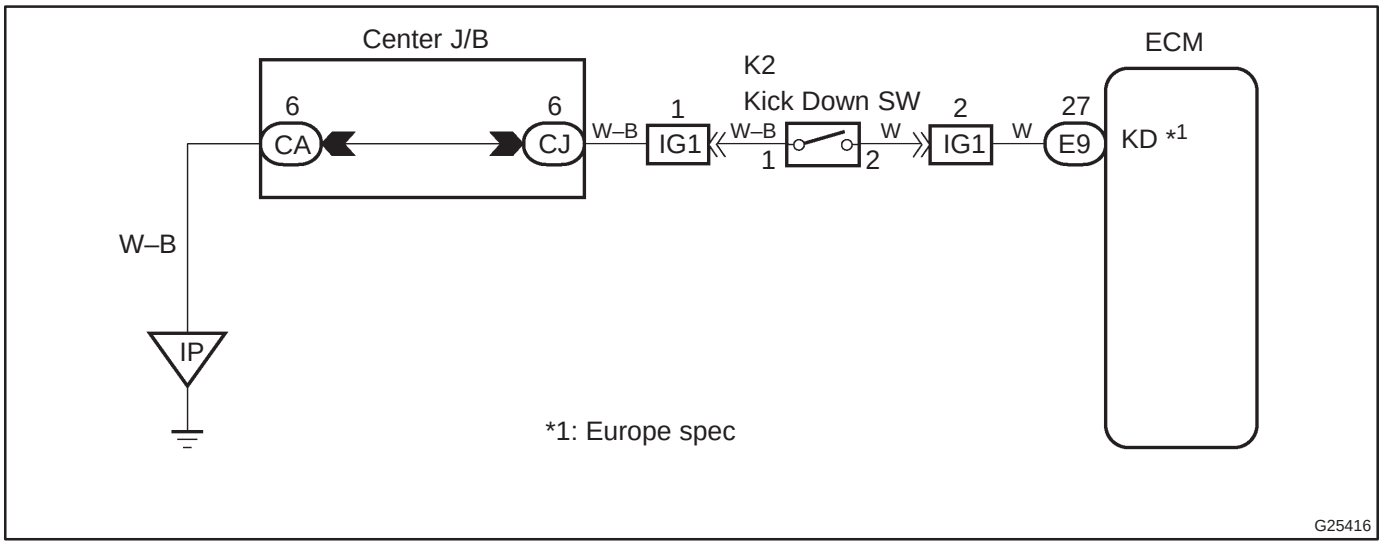
End

KICK DOWN SWITCH CIRCUIT

CIRCUIT DESCRIPTION

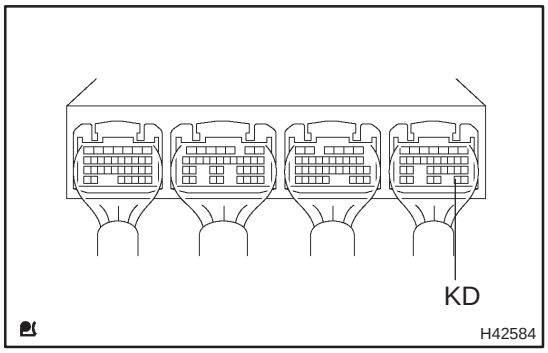
The kick–down switch is turned ON when the accelerator pedal is depressed to the full throttle and sends signals to ECM.
When the kick–down switch is turned ON, the ECM controls gear shifting according to the programmed shift diagrams.
If a short circuit develops in the kick–down switch, the ECM disregards the kick–down signals and controls shifting at the normal shift points.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TERMINAL VOLTAGE



(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminal KD of ECM and body ground when accelerator pedal is fully depressed or not.

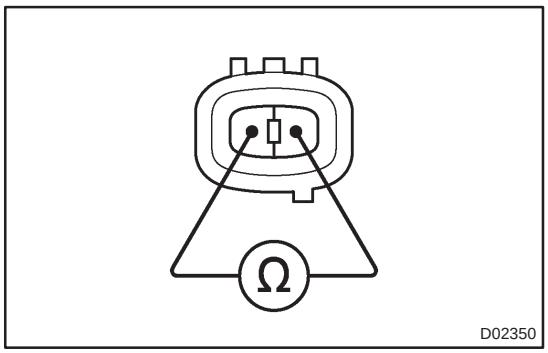
OK:

Accelerator pedal	Voltage
Fully depressed (Kick–down switch is ON)	Below 1 V
Released (Kick–down switch is OFF)	10 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2 INSPECT KICK DOWN SWITCH



(a) Disconnect the kick–down switch connector.
(b) Measure the continuity between terminals of the kick–down switch connector when kick–down switch is ON and OFF.

OK:

Kick–down switch	Continuity
ON	Continuity
OFF	No continuity

NG → **REPLACE KICK DOWN SWITCH**

OK

3 CHECK HARNESS AND CONNECTOR

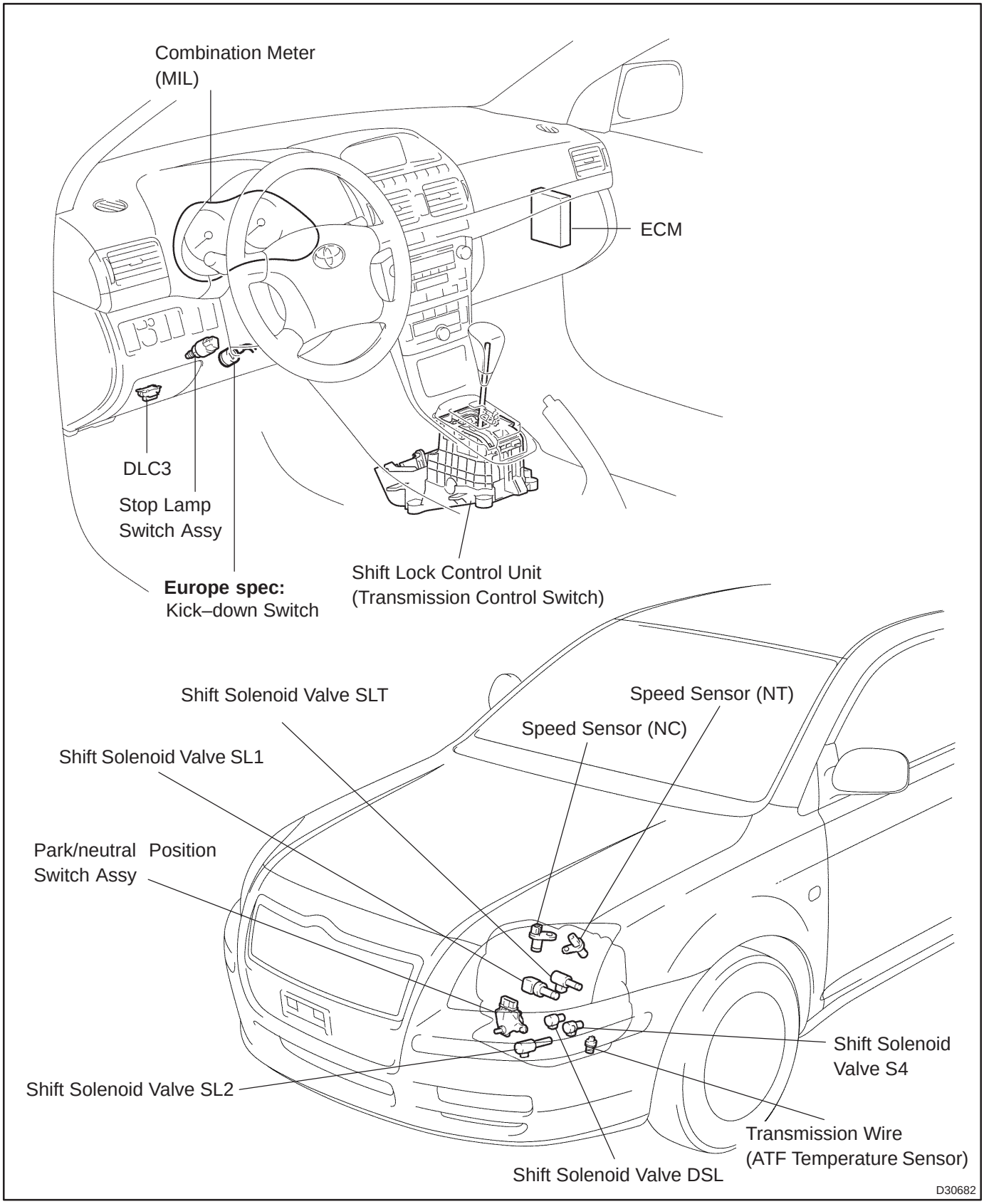
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

0567R–11

LOCATION



DTC	P0710/38	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT

DTC	P0712/38	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT LOW INPUT

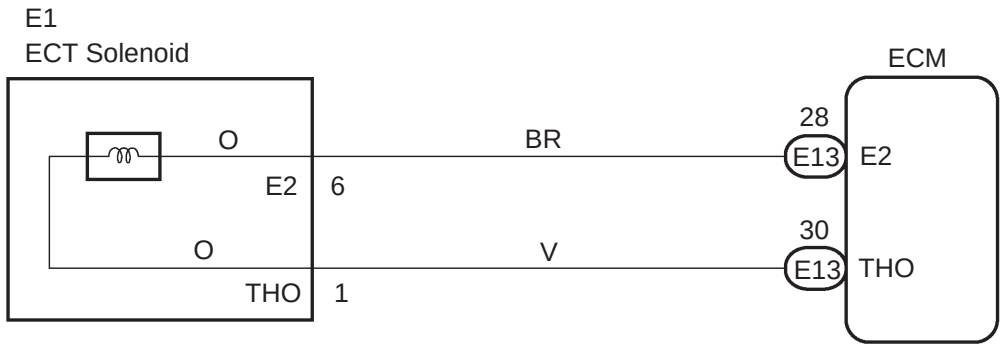
DTC	P0713/38	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0710/38	(a) and (b) is detected momentary within 0.5 sec. when neither P0712 or P0713 is not detected (1–trip detection logic) (a) ATF temperature sensor resistance is less than 79 Ω. (b) ATF temperature sensor resistance is more than 156 kΩ. HINT: Wthin 0.5 sec. the malfunction switches from (a) to (b) or from (b) to (a)	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM
P0712/38	ATF temperature sensor resistance is less than 79 Ω. for 0.5 sec. or more (1–trip detection logic)	
P0713/38	DTC is detected for 0.5 sec. or more (1–trip detection logic) ATF temperature sensor resistance is more than 156 kΩ. after started engine for 15 minutes or more	

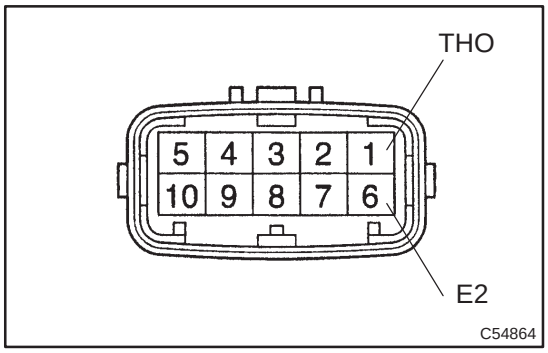
WIRING DIAGRAM



D26545

INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



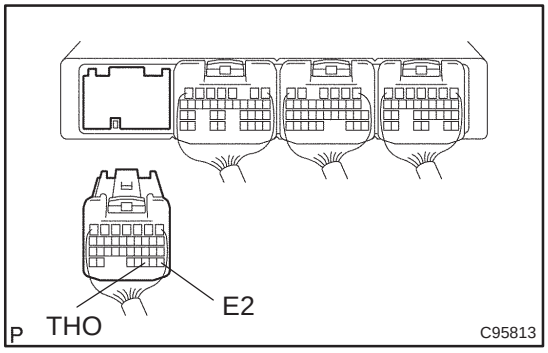
(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminals THO and E2.
OK:
Resistance: 79 Ω to 156 kΩ
(c) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals THO and E2.
OK:
Resistance: 79 Ω to 156 kΩ
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

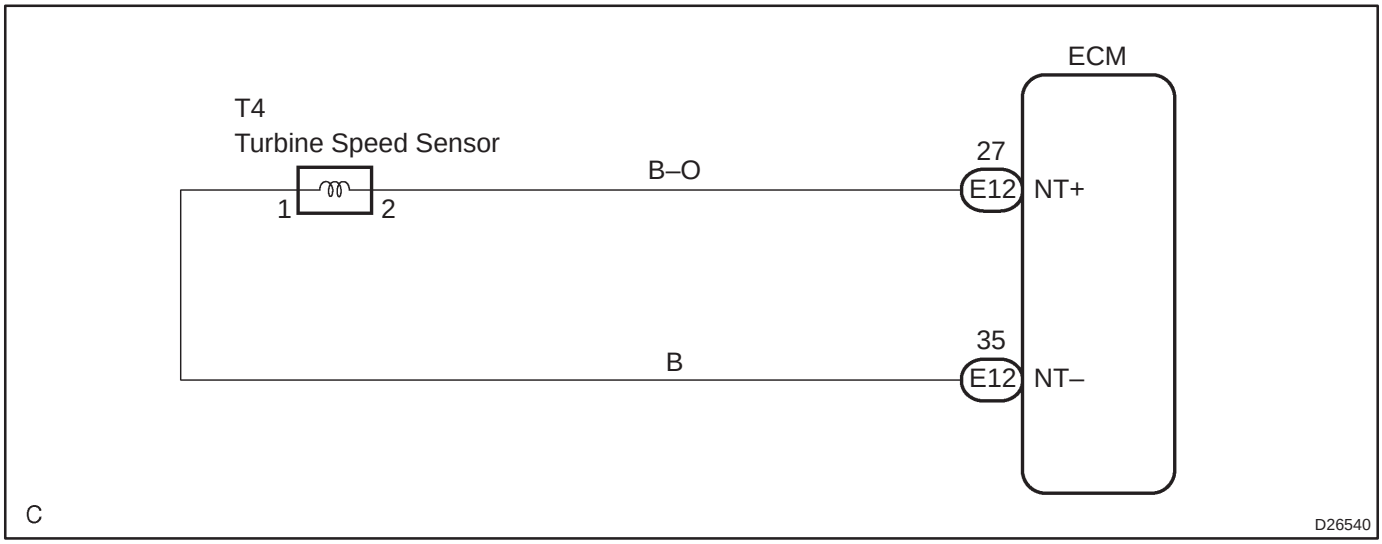
DTC	P0717/37	TURBINE SPEED SENSOR CIRCUIT NO SIGNAL

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the input turbine. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (NC), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

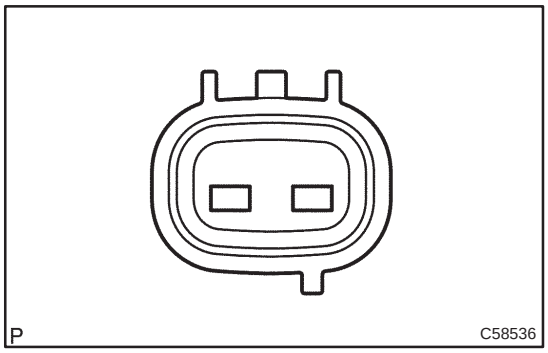
DTC No.	DTC Detection Condition	Trouble Area
P0717/37	ECM detects conditions (a), (b), (c) and (d) continuity for 5 sec. or more: (2 trip detection logic) (a) Vehicle speed: 50 km/h (20 mph) or more (b) 2nd, 3rd or O/D gear (c) Solenoid valves and park/neutral position switch are normal (d) NT < 300 rpm	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(NT)

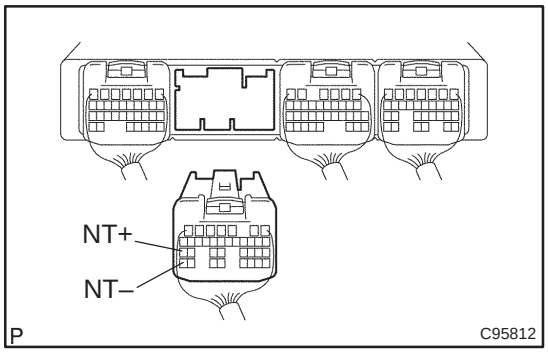


(a) Disconnect the speed sensor connector from the transaxle.
(b) Measure the resistance between terminals of speed sensor.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)

NG → **REPLACE SPEED SENSOR(NT)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



(a) Connect the speed sensor connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NT+ and NT–.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)
(d) Measure the resistance between body ground and that NT+ as well as NT– of the ECM connector.
OK:
Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0748/62	PRESSURE CONTROL SOLENOID ”A” ELECTRICAL (SHIFT SOLENOID VALVE SL1)

DTC	P0778/63	PRESSURE CONTROL SOLENOID ”B” ELECTRICAL (SHIFT SOLENOID VALVE SL2)

DTC	P0982/65	SHIFT SOLENOID ”D” CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE S4)

DTC	P0983/65	SHIFT SOLENOID ”D” CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE S4)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF operation of the shift solenoid valves SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

DTC No.	DTC Detection Condition	Trouble Area
P0748/62	ECM checks for an open or short circuit in shift solenoid valves SL1 (1–trip detection logic) (a) When solenoid is energized, duty ratio exceeds 75% (b) When solenoid is not energized, duty ratio is less than 3%	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM
P0778/63	ECM checks for an open or short circuit in shift solenoid valves SL2 (1–trip detection logic) (a) When solenoid is energized, duty ratio exceeds 75% (b) When solenoid is not energized, duty ratio is less than 3%	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM
P0982/65	ECM detects short in solenoid valve S4 circuit 4 times when solenoid valve S4 is operated (1–trip detection logic)	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983/65	ECM detects open in solenoid valve S4 circuit 4 times when solenoid valve S4 is not operated (1–trip detection logic)	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

HINT:

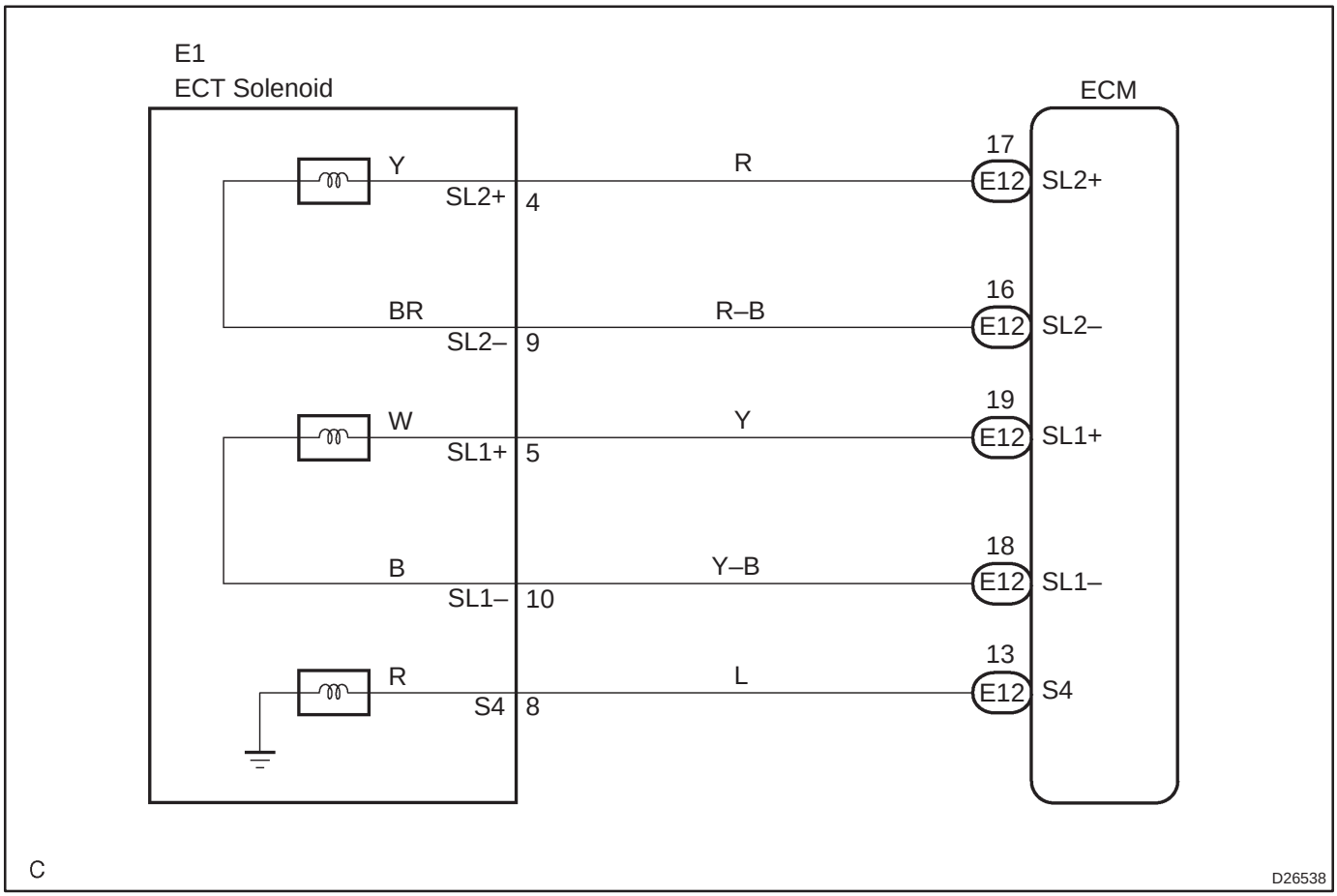
Check the shift solenoid valve SL1 when DTC P0748/62 is output, check the shift solenoid valve SL2 when DTC P0778/63 is output and check the shift solenoid valve S4 when DTC P0982/65 and P0983/65 is output.

Fail safe function:
If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid ON and OFF in order to shift into the gear positions shown in the table below. The ECM also turns the shift solenoid valve SL OFF at the same time. If both solenoids malfunction, hydraulic control cannot be performed electronically, and so it must be done manually.
Manual shifting as shown in the following table must be done (In case of a short circuit, the ECM stops sending the current to the short circuit solenoid).

NORMAL				SHIFT SOLENOID SL1 MALFUNCTIONING				SHIFT SOLENOID SL2 MALFUNCTIONING				SHIFT SOLENOID S4 MALFUNCTIONING			
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
ON	ON	OFF	1st	X	ON	OFF	2nd	ON ↓ OFF	X	OFF	3rd	ON	ON	X	1st
OFF	ON	OFF	2nd	X	ON	OFF	2nd	OFF	X	OFF	3rd	OFF	ON	X	2nd
OFF	OFF	OFF	3rd	X	OFF ↓ ON	OFF ↓ ON	3rd	OFF	X	OFF	3rd	OFF	OFF	X	3rd
OFF	OFF	ON	O/D	X	OFF ↓ ON	ON	3rd	OFF	X	ON	O/D	OFF	OFF	X	3rd

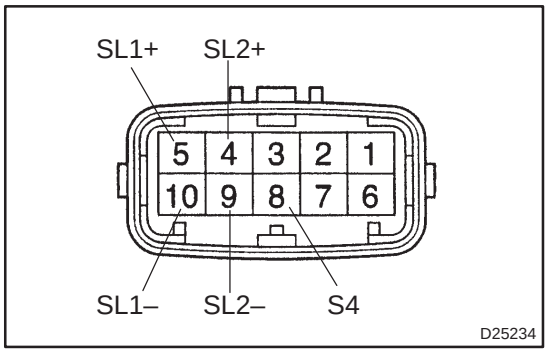
SHIFT SOLENOID SL1 AND SL2 MALFUNCTIONING				SHIFT SOLENOID SL1 AND S4 MALFUNCTIONING				SHIFT SOLENOID SL2 AND S4 MALFUNCTIONING				SHIFT SOLENOID SL1, SL2 AND S4 MALFUNCTIONING			
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
X	X	OFF	3rd	X	ON	X	2nd	ON ↓ OFF	X	X	3rd	X	X	X	3rd
X	X	OFF	3rd	X	ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd
X	X	OFF	3rd	X	OFF ↓ ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd
X	X	ON	O/D	X	OFF ↓ ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SL1/SL2/S4)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals SLT1+ and SL1– of the transmission wire connector.

OK:

Resistance: 5.0 to 5.6 Ω at 20°C (68°F)

(c) Measure the resistance between body ground and that SL1+ as well as SL1– of the transmission wire connector.

OK:

Resistance: 1MΩ or higher

NG	Go to step 3

(d) Measure the resistance between terminals SL2+ and SL2–.

OK:

Resistance: 5.1 to 5.5 Ω at 20°C (68°F)

(e) Measure the resistance between body ground and that SL2+ as well as SL2– of the transmission wire connector.

OK:

Resistance: 1MΩ or higher

NG	Go to step 4

(f) Measure the resistance between terminal S4 of the transmission wire connector and body ground.

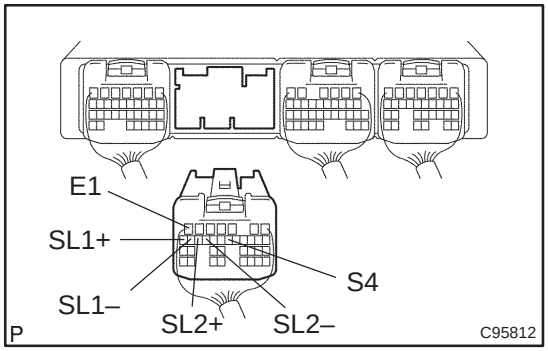
OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

NG	Go to step 5

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



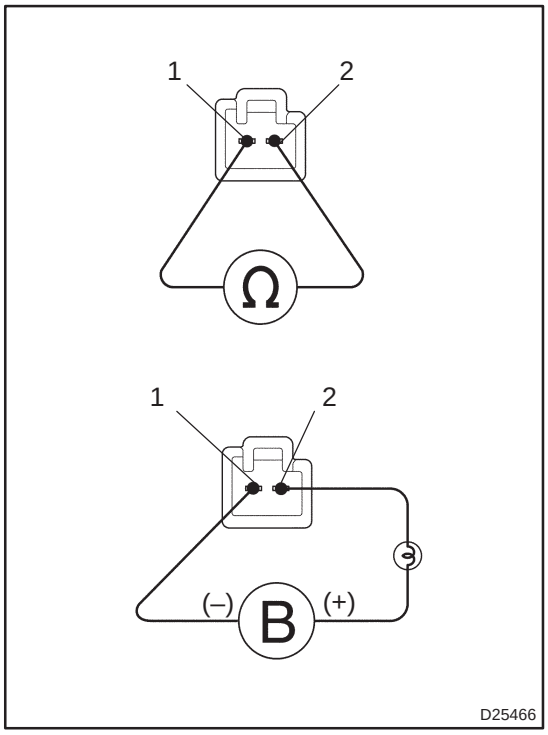
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the connector from the ECM.
(c) Measure the resistance between terminals.
OK:
Resistance:
SL1+ – SL1–: 5.0 to 5.6 Ω at 20°C (68°F)
SL2+ – SL2–: 5.1 to 5.5 Ω at 20°C (68°F)
S4 – E1: 11 to 15 Ω at 20°C (68°F)
(d) Measure the resistance between terminals SL1+, SL1–, SL2+ and SL2– of the ECM connector and body ground.
OK:
Resistance: 1MΩ or higher

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(SL1)



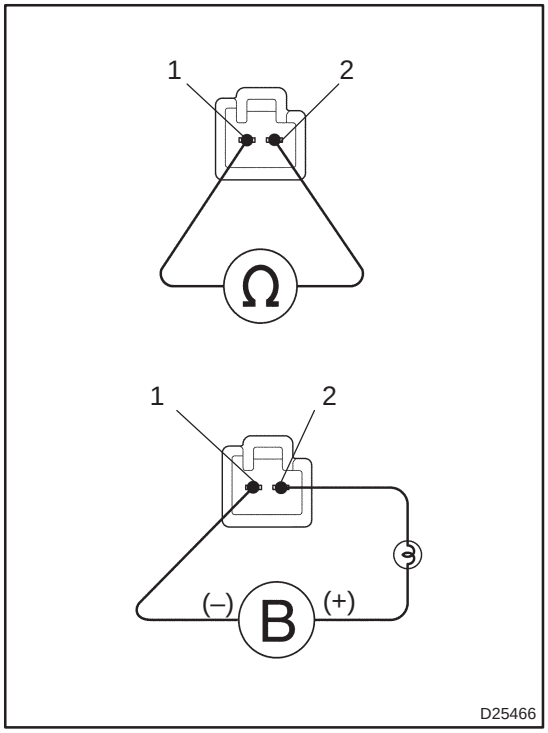
(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance between terminals of the shift solenoid valve SL1.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG	REPLACE SHIFT SOLENOID VALVE(SL1)

OK

REPAIR OR REPLACE TRANSMISSION WIRE

4 INSPECT SHIFT SOLENOID VALVE(SL2)



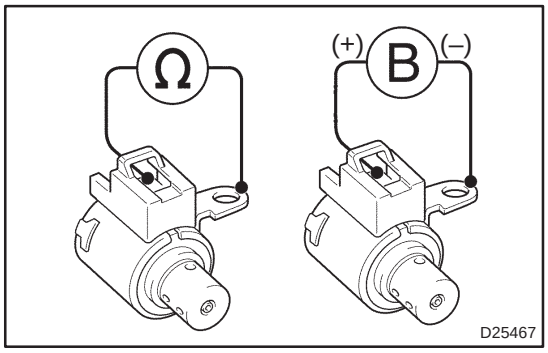
(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance between terminals of the shift solenoid valve SL2.
OK:
Resistance: 5.1 to 5.5 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL2)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

5 INSPECT SHIFT SOLENOID VALVE(S4)



(a) Remove the shift solenoid valve S4.
(b) Measure the resistance between the solenoid connector and the solenoid body.
OK:
Resistance: 11 to 15 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid body.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(S4)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

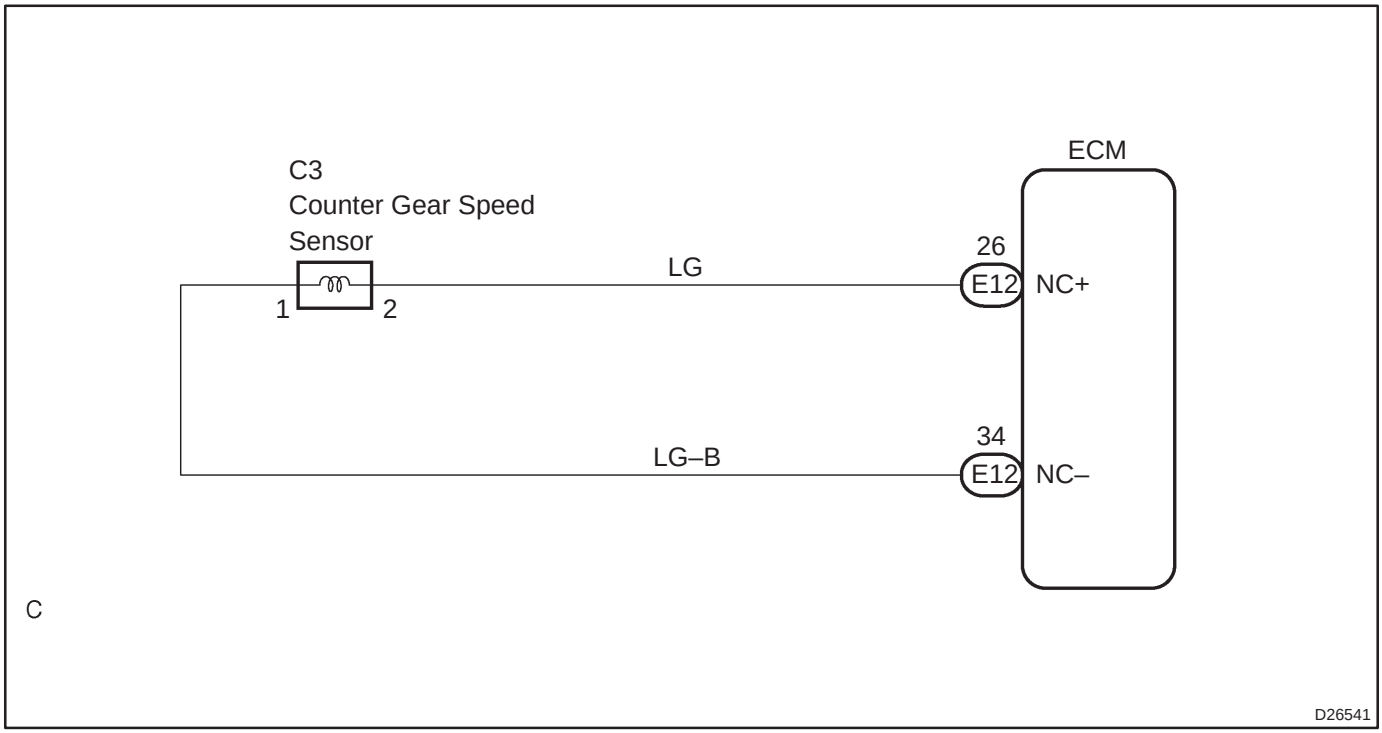
DTC	P0793/67	INTERMEDIATE SHAFT SPEED SENSOR ”A”

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the counter gear. By comparing the counter gear speed signal (NC) with the direct clutch speed sensor signal (NT), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

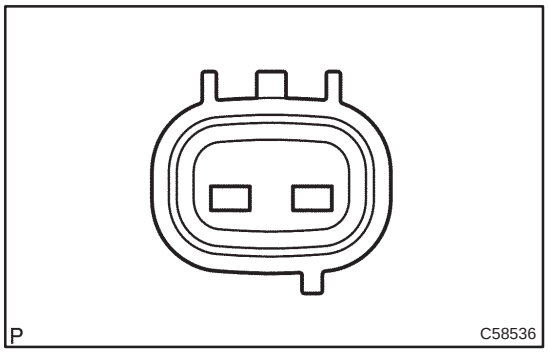
DTC No.	DTC Detection Condition	Trouble Area
P0793/67	ECM detects conditions (a), (b), (c) and (d) continuity for 5 sec. or more: (2 trip detection logic) (a) Vehicle speed: 50 km/h (20 mph) or more (b) 2nd, 3rd or O/D gear (c) Solenoid valves and park/neutral position switch are normal (d) NC < 300 rpm	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(NC)

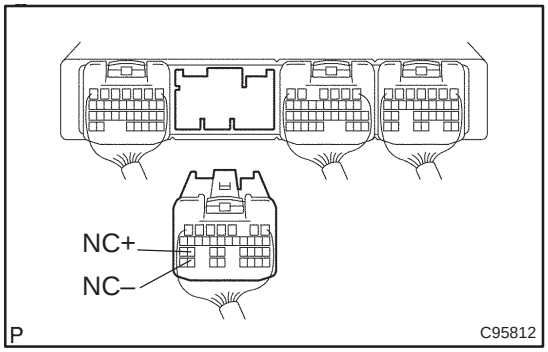


(a) Disconnect the speed sensor (NC) connector from the transaxle.
(b) Measure the resistance between terminals of speed sensor.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)

NG → **REPLACE SPEED SENSOR(NC)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



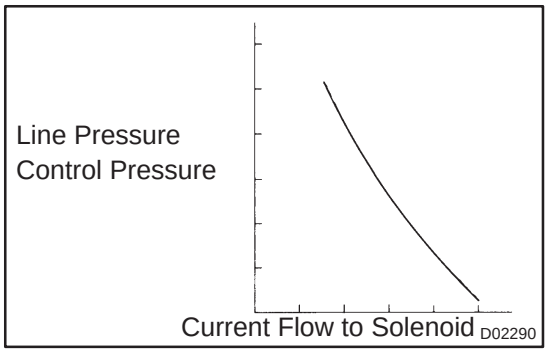
(a) Connect the speed sensor (NC) connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NC+ and NC– of the ECM connector.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)
(d) Measure the resistance between body ground and that NC+ as well as NC– of the ECM connector.
OK:
Resistance: 1MΩ or higher

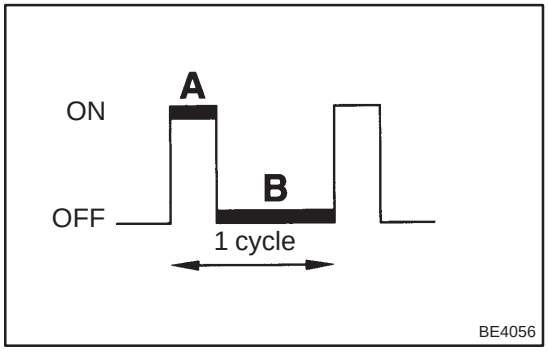
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P2716/77	PRESSURE CONTROL SOLENOID ”D” ELECTRICAL (SHIFT SOLENOID SLT)





CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates the line pressure) causes the solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate the line pressure according to the extent of the accelerator pedal depressed or the output of engine power.

This controls the line pressure and provides smooth shifting.

Upon receiving a signal of the throttle valve opening angle, the ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure and generating throttle pressure.

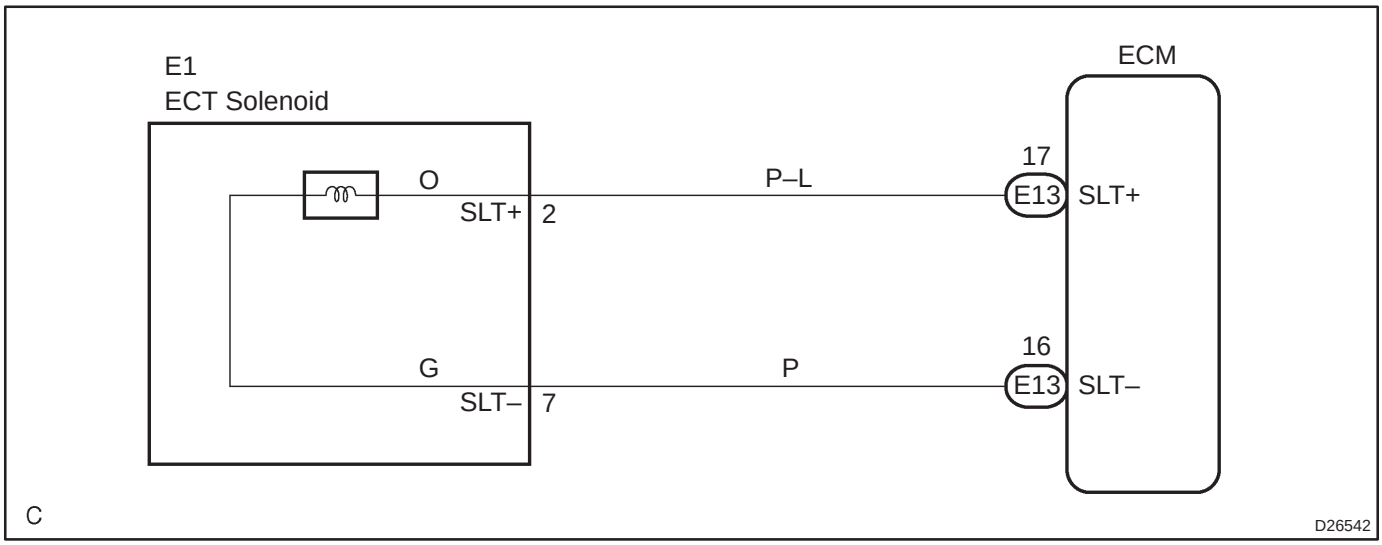
(*): Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

Duty Ratio=A/(A+B) x 100 (%)

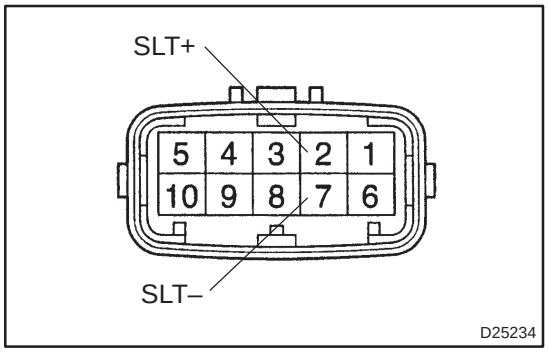
DTC No.	DTC Detection Condition	Trouble Area
P2716/77	Condition (a) or (b) below is detected 1 sec. or more: (1 trip detection logic) (a) SLT– terminal: 0V (b) SLT– terminal: 12V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SLT)



(a) Disconnect the transmission wire connector from the transaxle.

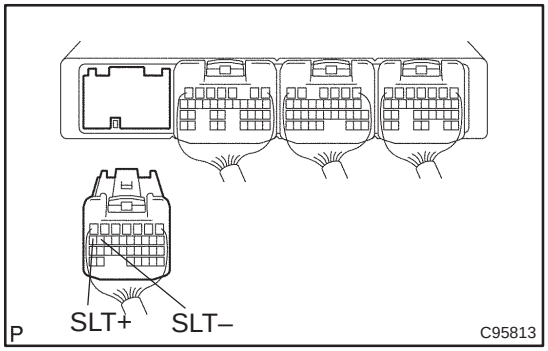
(b) Measure the resistance between terminals SLT+ and SLT– of the transmission wire connector.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

(c) Measure the resistance between body ground and that SLT+ as well as SLT– of the transmission wire connector.
OK:
Resistance: 1MΩ or higher

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



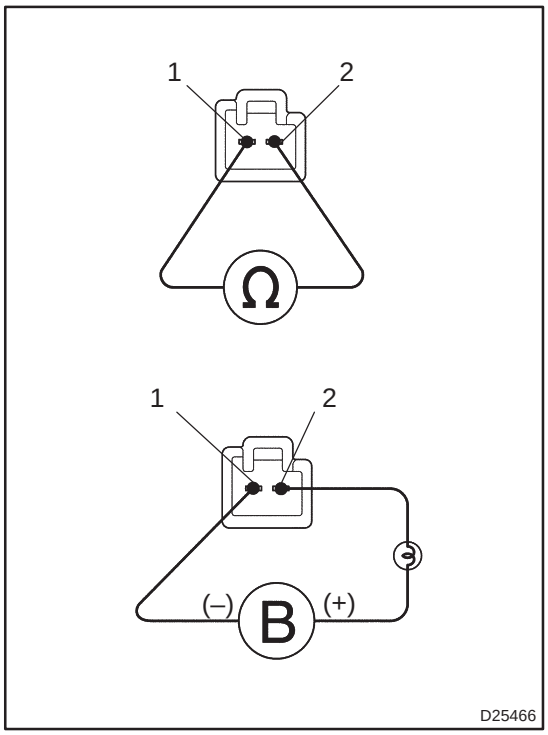
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals SLT+ and SLT– of the ECM connector.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(d) Measure the resistance between body ground and that SLT+ as well as SLT– of the ECM connector.
OK:
Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(SLT)



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance between terminals of the shift solenoid valve SLT.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SLT)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P2769/64	TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT LOW (SHIFT SOLENOID VALVE DSL)

DTC	P2770/64	TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT HIGH (SHIFT SOLENOID VALVE DSL)

CIRCUIT DESCRIPTION

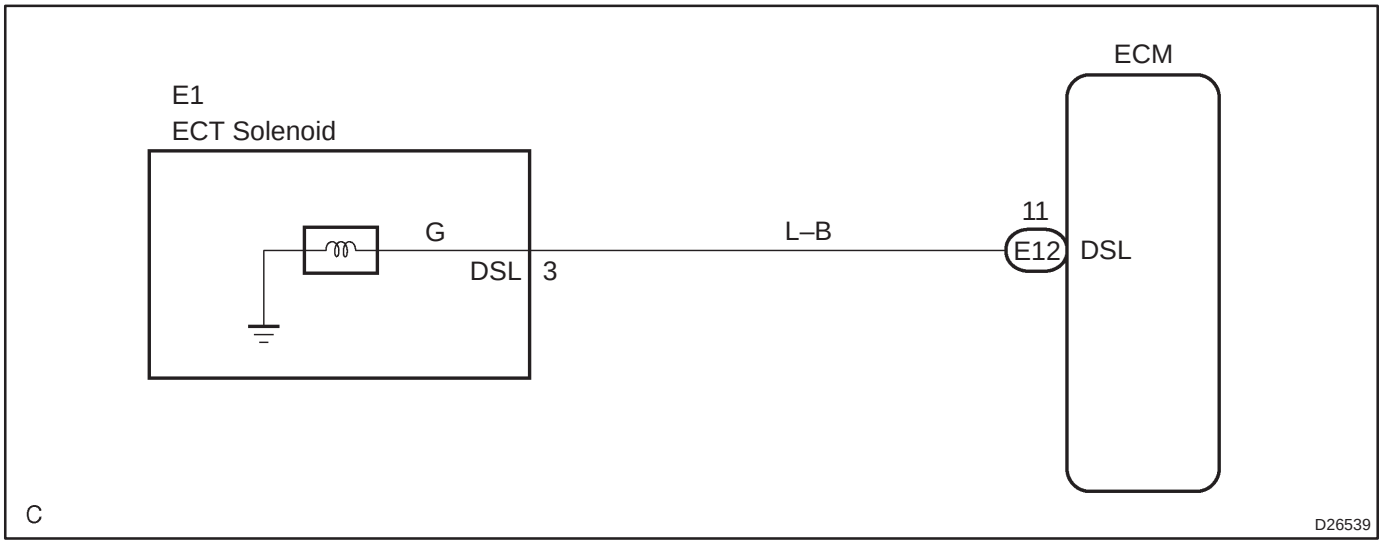
The shift solenoid valve DSL is turned ON and OFF by signals from the ECM in order to control the hydraulic pressure operation the lock–up relay valve, which then the controls operation of the lock–up clutch.

DTC No.	DTC Detection Condition	Trouble Area
P2769/64	ECM detects short in solenoid valve DSL circuit 4 times when solenoid valve DSL is operated (2 trip detection logic)	• Short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM
P2770/64	ECM detects open in solenoid valve DSL circuit 4 times when solenoid valve DSL is not operated (2 trip detection logic)	• Open in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM

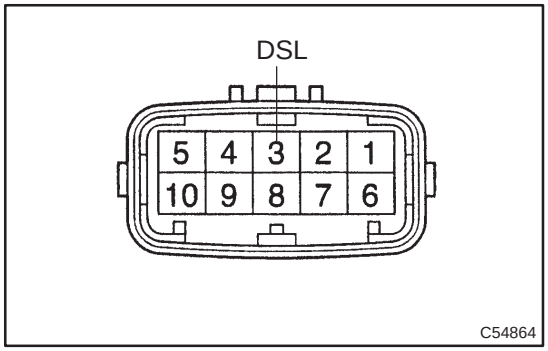
Fail safe function:

If the ECM detects a malfunction, it turns the shift solenoid valve DSL OFF.

WIRING DIAGRAM



1	INSPECT TRANSMISSION WIRE(DSL)

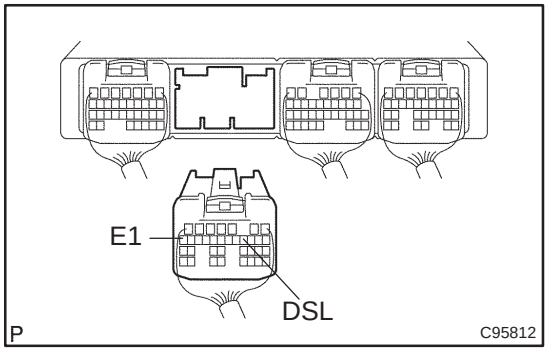


(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminal DSL of the transmission wire connector and body ground.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



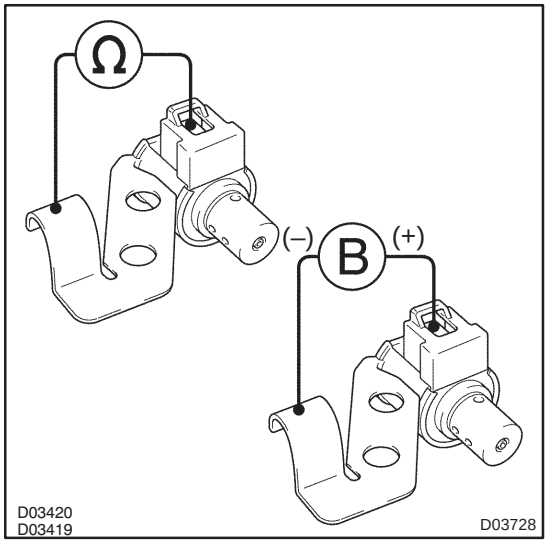
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals DSL and E1 of the ECM connector.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(DSL)



(a) Remove the shift solenoid valve DSL.

(b) Measure the resistance between terminal DSL of shift solenoid valve DSL and the solenoid body.

OK:

Resistance: 11 to 13 Ω at 20°C (68°F)

(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid body.

OK:

The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(DSL)**

OK

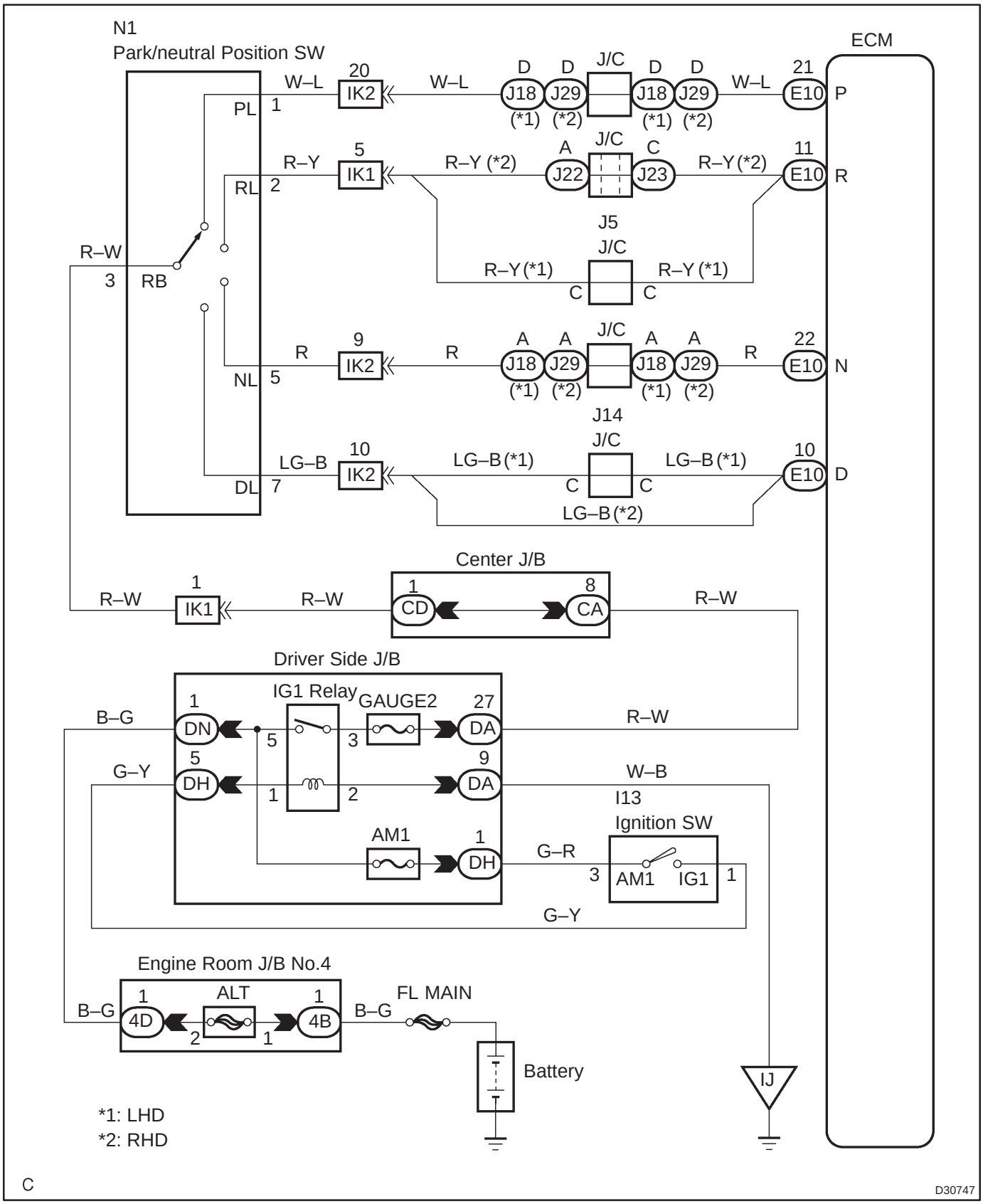
REPAIR OR REPLACE TRANSMISSION WIRE

PARK/NEUTRAL POSITION SWITCH CIRCUIT

CIRCUIT DESCRIPTION

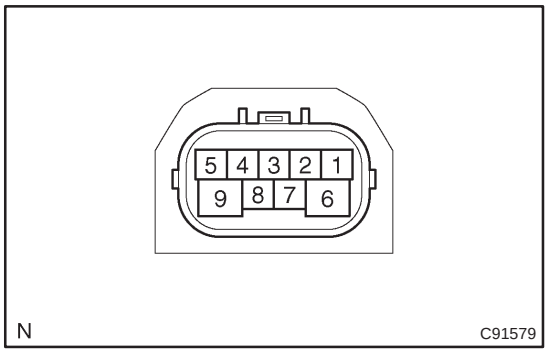
The park/neutral position switch detects the shift lever position and sends signals to the ECM.
The ECM receives signals (REVERSE and DRIVE) from the park/neutral position switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.
(b) Check the continuity between each terminal shown below when the shift lever is moved to each position.

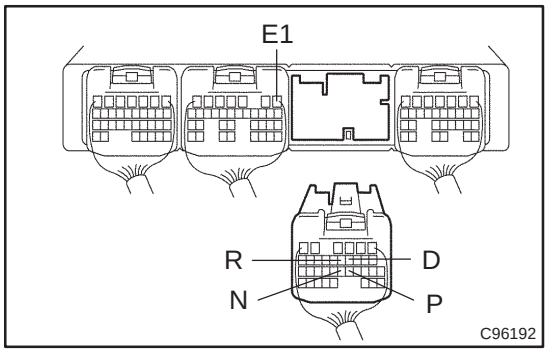
Shift Position	Terminal No. to continuity	
P	1 – 3	6 – 9
R	2 – 3	–
N	3 – 5	6 – 9
D	3 – 7	–

OK:
There is continuity.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY**

OK

2 CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – ECM)



(a) Connect the park/neutral position switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminals E1 and that P, R, N as well as D of the ECM connector when the shift lever is shifted to the following position.

OK:

Shift range	Terminal	Voltage (V)
P	P – E1	7.5 to 14
R	R – E1	7.5 to 14
N	N – E1	7.5 to 14
D	D – E1	7.5 to 14

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

05C8R–02

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description for Euro–OBD

(1) When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to the OBD scan tool complying with ISO 15031–4 or hand–held tester, and read off various data output from the vehicle's ECM.

(2) Euro–OBD regulations require that the vehicle's on–board computer illuminates the Check Engine Warning Light (Malfunction Indicator Lamp)/CHK ENG (MIL) on the instrument panel when the computer detects a malfunction in the emission control system/components or in the driving system components which affect vehicle emissions, or a malfunction in the computer. In addition to CHK ENG (MIL) illuminating when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO15031–6 are recorded in the ECM memory.

If the malfunction does not occur in 3–trip, the CHK ENG (MIL) goes off but the DTCs remain recorded in the ECM memory.

(3) To check the DTCs, connect the OBD scan tool or hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data (For operating instructions, see the OBD scan tool's instruction book.).

(4) DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–876).

(5) The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic (*) to prevent erroneous detection, and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, technicians can cause the CHK ENG (MIL) to light up for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 2).

(6) *2 trip detection logic:
When a malfunction is first detected, the malfunction code is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG (MIL) to illumenate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and the 2nd trip.).

(b) Description M–OBD

(1) When troubleshooting Multiplex (M–OBD) vehicles, the only difference from the usual troubleshooting procedure is that you connect the hand–held tester to the vehicle, and read off various data output from the vehicle's ECM.

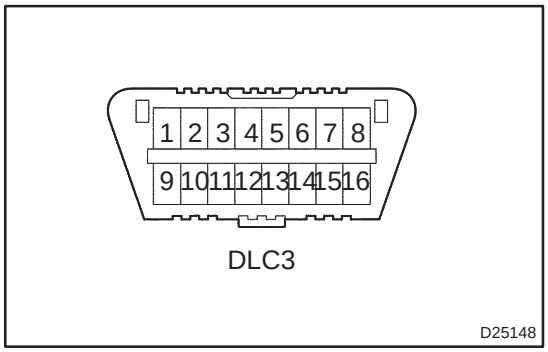
(2) The vehicle's on–board computer illuminates the MIL on the instrument panel when the computer detects a malfunction in the computer itself or in driving system components. In addition to the MIL illuminating when a malfunction is detected, the applicable DTCs are recorded in the ECM memory.

If the malfunction does not occur in 3–trip, the CHK ENG (MIL) goes off but the DTCs remain recorded in the ECM memory.

(3) To check the DTCs, connect the hand–held tester to DLC3 on the vehicle or read the number of blinks of the MIL when TC and CG terminals on the DLC3 are connected. The hand–held tester also enables you to erase the DTCs and activate the several actuators and check freeze frame data and various forms of engine data (For instruction book).

(4) The diagnosis system operates in normal mode during normal vehicle use, and also has a check (test) mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2–trip detection logic (*) to prevent erroneous detection and ensure thorough malfunction detection. By switching the ECM to check (test) mode using the hand–held tester when troubleshooting, the technician can cause the MIL to illuminate for a malfunction that is only detected once or momentarily.

*2–trip detection logic:
When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the 2nd test drive, this 2nd detection causes the MIL to illuminate.



(c) Inspect the DLC3.

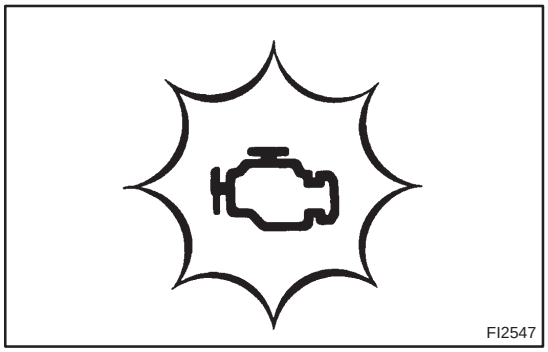
(1) The vehicle's ECM uses the ISO 9141–2 (Euro–OBD)/ISO 14230 (M–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–3 and matches the ISO 9141–2/ISO 14230 format.

Terminal No.	Connection	Voltage or Resistance	Condition
7	Bus ⊕ Line	Pulse generation	During communication
4	Chassis Ground	↔ Body Ground / 1 Ω or less	Always
16	Battery Positive	↔ Body Ground / 9 – 14 V	Always

HINT:

If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of hand–held tester to DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. INSPECT DIAGNOSIS (NORMAL MODE)

(a) Check the MIL.

(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:

If the MIL does not come on, troubleshoot the combination meter.

(2) When the engine is started, the MIL should go off. If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC, using the hand–held tester.

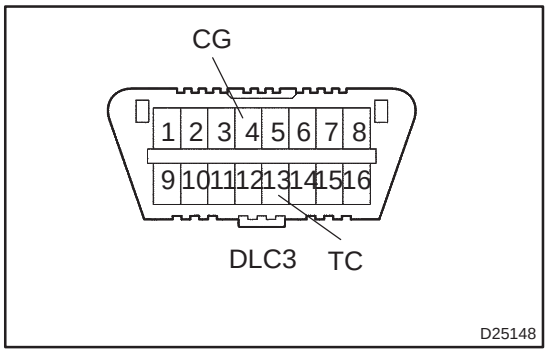
NOTICE:

Hand–held tester only:

When the diagnostic system is switched from normal mode to check (test) mode, it erases all DTCs and freeze frame data recorded in normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.

(1) Use the hand–held tester to check the DTCs and instructions, see the hand–held tester instruction book.

(2) See page 05–876 to confirm the details of the DTCs.



(c) Check the DTC (Not using the hand–held tester).

(1) Turn the ignition switch ON, but do not start the engine.

(2) Using SST, connect terminals 13 (TC) and 4 (CG) of DLC3.

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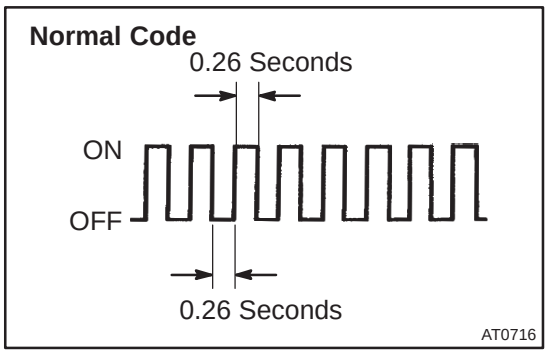
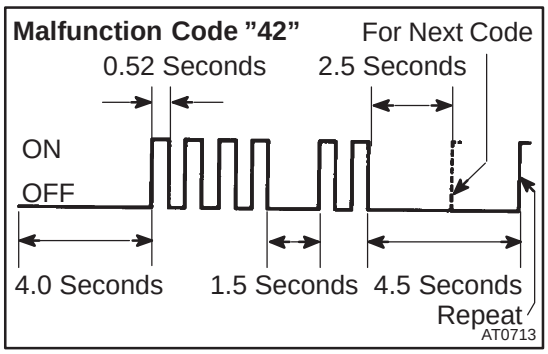


(3) Read the DTC indicated by the number of times of the MIL blinks.

HINT:
If the system is operating normally, the light will blink 2 times per second.



(4) The malfunction code is indicated, as shown in the chart on the left (DTC ”42” is shown as an example).

HINT:
When 2 or more malfunction codes are stored in memory, the lower–numbered code is displayed first.

3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has high sensing ability to detect malfunctions.

Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

(a) Check the DTC.

(1) Check the initial conditions.

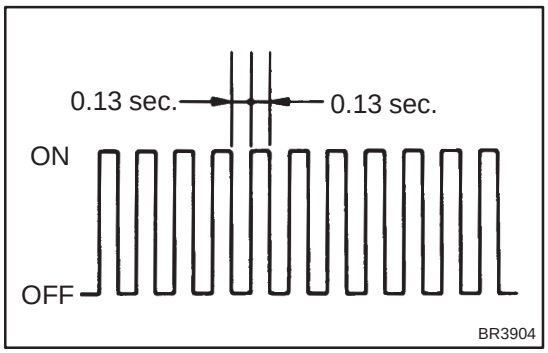
- Battery voltage 11 V or more
- Throttle valve fully closed
- Shift lever in P range
- Air conditioning switched OFF

(2) Turn the ignition switch OFF.

(3) Prepare the hand–held tester.

(4) Connect the hand–held tester to DLC3.

(5) Turn the ignition switch ON and switch the hand–held tester ON.



(6) Switch the hand–held tester from Normal mode to Check mode (Check that the MIL flashes).

(7) Start the engine (MIL goes out after the engine starts).

(8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Take care not to turn the ignition switch OFF, as turning it off switches the diagnosis system from Check mode to Normal mode, which all DTCs etc. are erased.

(10) After checking the DTC, inspect the applicable circuit.

(b) Clear the DTC.

(1) When using hand–held tester:

The following operation will erase the DTC and freeze frame data. Operate a hand–held tester to erase the codes.

(2) When not using the hand–held tester:

Remove the EFI fuse from engine room J/B for 10 seconds or more.

4. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one of the methods to shorten the work time.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) According to the display on tester, read the ”DATA LIST”.

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	←
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th (O/D)	Shift lever Range is; • D: 1st, 2nd, 3rd or 4th (O/D)	←
SPD (NC)	Counter Gear Speed display: 50 r/min	D Range is warmed up,4th (O/D); Same as input shaft speed	←
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	←
KICKDOWN SW	Kick down SW Status/ ON or OFF	• Accelerator Pedal is depressed: ON • Accelerator Pedal is released: OFF	←
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever range is; P or N: ON Except P or N: OFF	The shift lever range and these values are different, there are failures of the PNP switch or shift cable adjustment.
REVERSE	PNP SW Status/ ON or OFF	Shift lever range is; R: ON Except R: OFF	
DRIVE	PNP SW Status/ ON or OFF	Shift lever range is; D and 3: ON Except D and 3: OFF	
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: –40°C (–40°F) max.: 215°C (419°F)	80°C (176°F) (After Stall Test)	If the value is ”–40°C (–40°F)” or ”215°C (419°F)”, ATF temp. sensor circuit is opened or shorted.

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one of the method to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) According to the display on tester, perform the ”ACTIVE TEST”.

Item	Test Details	Diagnostic Note
LINE PRESS UP	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [Others] ON: Line pressure up. OFF: No action (normal operation)	–
LOCK UP	[Test Details] Control the shift solenoid DSL to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 60 km/h (37 mph) or more	Possible to check the DSL operation.
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift range by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid values.

6. PROBLEM SYMPTOM CONFIRMATION

(a) Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

7. ROAD TEST

NOTICE:

Conduct the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).

(a) D range test

Shift into the D range and fully depress the accelerator pedal and check the following points:

(1) Check up–shift operation.

Check to see that 1 → 2, 2 → 3 and 3 → O/D up–shift take place, and that the shift points conform to the automatic shift schedule (See page 03–45).

HINT:

- O/D Gear Up–shift Prohibition Control (1. Water temp. is 60˚C (140˚F) or less. 2. If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.)
- O/D Gear Lock–up Prohibition Control (1. Brake pedal is depressed. 2. Water temp. is 60˚C (140˚F) or lower)

(2) Check for shift shock and slip.
Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shift.

(3) Check for abnormal noise and vibration.
Run in D range lock–up or O/D gear and check for abnormal noise and vibration.

HINT:
The check for the cause of abnormal noise and vibration must be done very thoroughly as it could also be sure to loss of balance in the differential, torque converter, etc.

(4) Check kick–down operation.
While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated in the automatic shift schedule (See page 03–45).

(5) Check for abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.
- Drive in D range O/D gear, at a steady speed (lock–up ON) of about 60 km/h (37 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(b) S range test
Shift to the S range, depress the accelerator pedal and check the following points:
Shift operations.
- Shifting the shift lever to ”+” or ”–” changes the shift range on the combination meter.

HINT:
Manual shift prohibition control is performed when:
- Down–shifting causes engine overrun.
- Down–shifting is required continuously, down–shifting to 1st gear may not be performed.

(c) R range test
Shift into the R range and fully depress the accelerator pedal and check for slipping.

CAUTION:
Before conducting this test, ensure that the test area is free from people and obstruction.

(d) P range test
Stop the vehicle on a grade (more than 5°) and after shifting into the P range, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

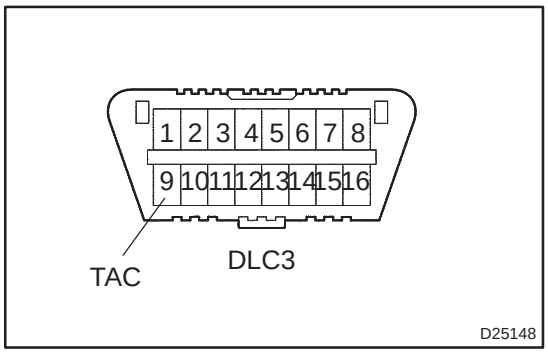
8. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R ranges.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Do not continuously run this test for longer than 5 seconds.**
- **To ensure safety, do this test in a wide, clear level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**



(1) Chock the 4 wheels.

(2) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

SST 09843–18030

(3) Fully apply the parking brake.

(4) Keep your left foot pressing firmly on the brake pedal.

(5) Start the engine.

(6) Shift into the D range. Press all the way down on the accelerator pedal with your right foot.

(7) Quickly read the stall speed at this time.

Stall speed: 2,550 ± 150 rpm

(8) Do the same test in the R range.

Stall speed: 2,550 ± 150 rpm

Evaluation:

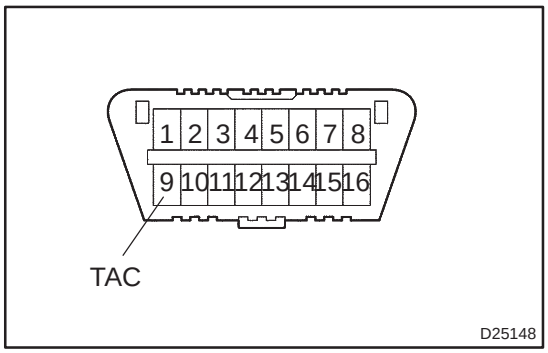
Problem	Possible cause
(a) Stall speed low in D and R ranges	• Engine output may be insufficient • Stator one–way clutch not operating properly HINT: If more than 600 rpm below the specified value, the torque converter could be faulty.
(b) Stall speed high in D range	• Line pressure too low • Forward clutch slipping • No. 2 one–way clutch not operating properly • U/D clutch slipping
(c) Stall speed high in R range	• Line pressure too low • Direct clutch slipping • 1st & reverse brake slipping • U/D clutch slipping
(d) Stall speed high in D and R ranges	• Line pressure too low • Improper fluid level • U/D one–way clutch not operating properly

(b) Measure the time lag.

(1) When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the direct clutch, forward clutch, and 1st and reverse brake.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**



(2) Chock the 4 wheels.

(3) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

SST 09843–18030

(4) Start engine and check idle speed.

Idle speed: 650 ± 50 rpm (In N range and A/C OFF)

(5) Shift the lever from N to D range. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag: N → D less than 1.2 seconds

(6) In the same way, measure the time lag for N → R.

Time lag: N → R less than 1.5 seconds

Evaluation (If N → D or N → R time lag is longer than the specified):

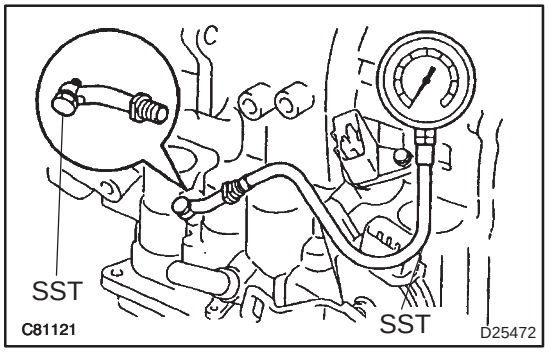
Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • U/D one–way clutch not operating properly
N → R time lag is longer	• Line pressure too low • Direct clutch worn • 1st and reverse brake worn • U/D one–way clutch not operating properly

9. HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **Do the test at normal operation ATF temperature 50 to 80˚C (122 to 176˚F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stopper outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**



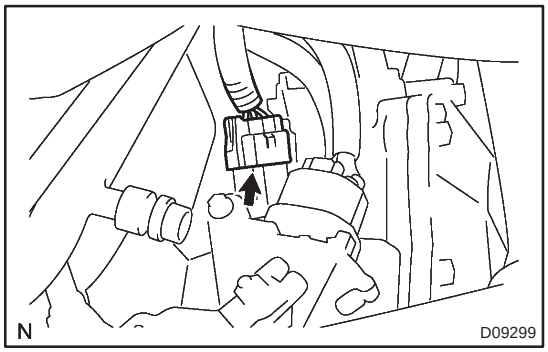
(1) Warm up the ATF.
(2) Remove the test plug on the rear side of the transaxle case and connect SST.
SST 09992–00095 (09992– 00231, 09992–00271)
(3) Fully apply the parking brake and chock the 4 wheels.
(4) Connect the hand–held tester to DLC3.
(5) Start the engine and check idling speed.
(6) Keep your left foot pressing firmly on the brake pedal and shift into D range.
(7) Measure the line pressure when the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(9) In the same way, do the test in R range.

Specified line pressure:

Condition	D range kPa (kgf / cm^2, psi)	R range kPa (kgf / cm^2, psi)
Idling	372 to 412 (3.8 to 4.2, 54 to 60)	672 to 742 (6.9 to 7.6, 98 to 108)
Stall	931 to 1,031 (9.5 to 10.5, 135 to 150)	1,768 to 1,968 (18.0 to 20.1, 256 to 285)

Evaluation:

Problem	Possible cause
If the measured values at all ranges are higher	• Line pressure control solenoid (SLT) defective • Regulator valve detective
If the measured values at all ranges are lower	• Line pressure control solenoid (SLT) defective • Regulator valve detective • Oil pump defective
If pressure is low in the D range only	• D range circuit fluid leak • Forward clutch defective
If pressure is low in the R range only	• R range circuit fluid leak • Direct clutch defective • 1st & reverse brake defective



10. MANUAL SHIFTING TEST

HINT:

By this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transaxle.

(a) Disconnect the solenoid wire.

(b) Inspect the manual driving operation.

Check that the shift and gear ranges correspond to the table below.

While driving, shift through the D range.

Check that the gear change corresponds to the shift range.

Shift range	Gear position
D	3rd
R	Reverse
P	Pawl Lock

HINT:

If the gear positions of the D are difficult to distinguish, do the above road test.

If any abnormality is found in the above test, the problem is in the transaxle itself.

(c) Connect the solenoid wire.

(d) Cancel out the DTC.

11. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

NOTICE:

Hand–held tester only

(a) Turn the ignition switch to OFF.

(b) Connect the hand–held tester to the DLC3.

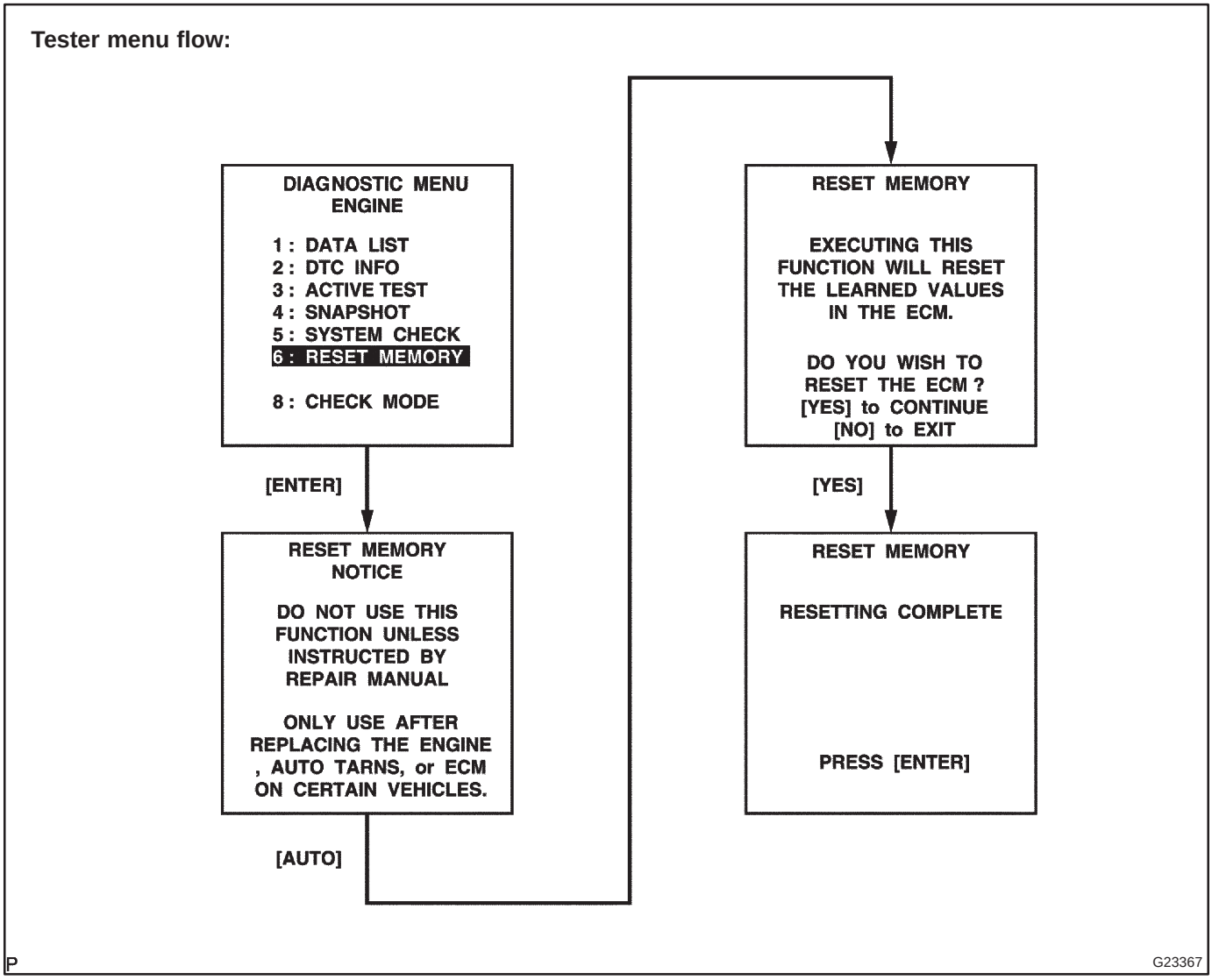
(c) Turn the ignition switch to ON.

(d) Perform the reset memory procedure from the ENGINE menu.

CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

Tester menu flow:



05CBX–01

PRECAUTION

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

HINT:

Initialization can not be completed by only removing the battery.

0567W–11

PROBLEM SYMPTOMS TABLE

HINT:

If a normal code is displayed during the DTC check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for trouble-shooting.

The Matrix Chart is divided into 3 chapters.

- If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.
- If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM.

CHAPTER 1: ELECTRONIC CIRCUIT MATRIX CHART

Symptom	Suspect Area	See page
No up–shift (A particular gear, from 1st to O/D gear, is not up–shifted)	ECM	01–32
No down–shift (A particular gear, from O/D to 1st gear, is not down–shifted)	ECM	01–32
No lock–up or No lock–up off	4. Stop light switch circuit 5. Engine coolant temp. sensor circuit 6. Throttle position sensor circuit 7. ECM	05–905 05–161 05–161 01–32
Shift point too high or too low	ECM	01–32
No gear change by shifting into ”+” or ”–” while the shift lever is in the Sposition	1. Transmission control switch circuit 2. ECM	05–910 01–32
Up–shift to O/D from 3rd while engine is cold	1. Engine coolant temp. sensor circuit 2. ATF temp. sensor circuit 3. ECM	05–161 05–882 01–32
Harsh engagement (N → D)	ECM	01–32
Harsh engagement (Lock–up)	ECM	01–32
Harsh engagement (Any driving range)	ECM	01–32
Poor acceleration	ECM	01–32
Engine stalls when starting off or stopping	ECM	01–32
No kick–down	1. Kick–down switch circuit 2. ECM	05–908 01–32

Chapter 2: On–vehicle Repair
(★: U241E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM840U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward range or reverse range	1. Manual valve 2. Primary regulator valve 3. Off–vehicle repair matrix chart	★ ★ –
Vehicle does not move in R range	Off–vehicle repair matrix chart	–
No up–shift (1st → 2nd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (2nd → 3rd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (3rd → O/D)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No down–shift (O/D → 3rd)	Valve body assy	★
No down–shift (3rd → 2nd)	Valve body assy	★
No down–shift (2nd → 1st)	Valve body assy	★
No lock–up or No lock–up off	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Off–vehicle repair matrix chart 3. Valve body assy	★ – ★
Harsh engagement (N → R)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (Lock–up)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (2nd → 3rd)	Valve body assy	★
Harsh engagement (3rd → O/D)	Valve body assy	★
Harsh engagement (O/D → 3rd)	Valve body assy	★
Slip or shudder (Forward and reverse)	1. Oil strainer 2. Off–vehicle repair matrix chart	40–47 –
No kick–down	Valve body assy	★

Chapter 3: Off–vehicle Repair
(★: U241E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM840U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward range or reverse range	1. Front and rear planetary gear 2. U/D planetary gear 3. U/D one–way clutch (F_2) 4. Forward clutch (C_1) 5. U/D brake (B_3)	★ ★ ★ ★ ★
Vehicle does not move in R range	1. Front and rear planetary gear unit 2. U/D planetary gear 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. 1st & reverse brake (B_2)	★ ★ ★ ★ ★
No up–shift (1st → 2nd)	1. No.1 one–way clutch (F_1) 2. 2nd brake (B_1)	★ ★
No up–shift (2nd → 3rd)	Direct clutch (C_2)	★
No up–shift (3rd → O/D)	U/D clutch (C_3)	★
No lock–up or No lock–up off	Torque converter clutch	40–37
Harsh engagement (N → D)	1. Forward clutch (C_1) 2. U/D one–way clutch (F_2) 3. No.1 one–way clutch (F_1)	★ ★ ★
Harsh engagement (N → R)	1. Direct clutch (C_2) 2. 1st & reverse brake (B_2)	★ ★
Harsh engagement (Lock–up)	Torque converter clutch	40–37
Slip or shudder (Forward position: After warm–up)	1. Torque converter clutch 2. Forward clutch (C_1) 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. No.1 one–way clutch (F_1) 6. U/D one–way clutch (F_2)	40–37 ★ ★ ★ ★ ★
Slip or shudder (R range)	1. Direct clutch (C_2) 2. 1st & reverse brake (B_2)	★ ★
Slip or shudder (1st)	No.1 one–way clutch (F_1)	★
Slip or shudder (2nd)	1. U/D one–way clutch (F_2) 2. 2nd brake (B_1)	★ ★
Slip or shudder (3rd)	Direct clutch (C_2)	★
Slip or shudder (O/D)	U/D clutch (C_3)	★
No engine braking (1st – 3rd: D range)	U/D brake (B_3)	★
Poor acceleration (All range)	1. Torque converter clutch 2. U/D planetary gear	40–37 ★
Poor acceleration (O/D)	1. U/D clutch (C_3) 2. U/D planetary gear	★ ★
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	40–37

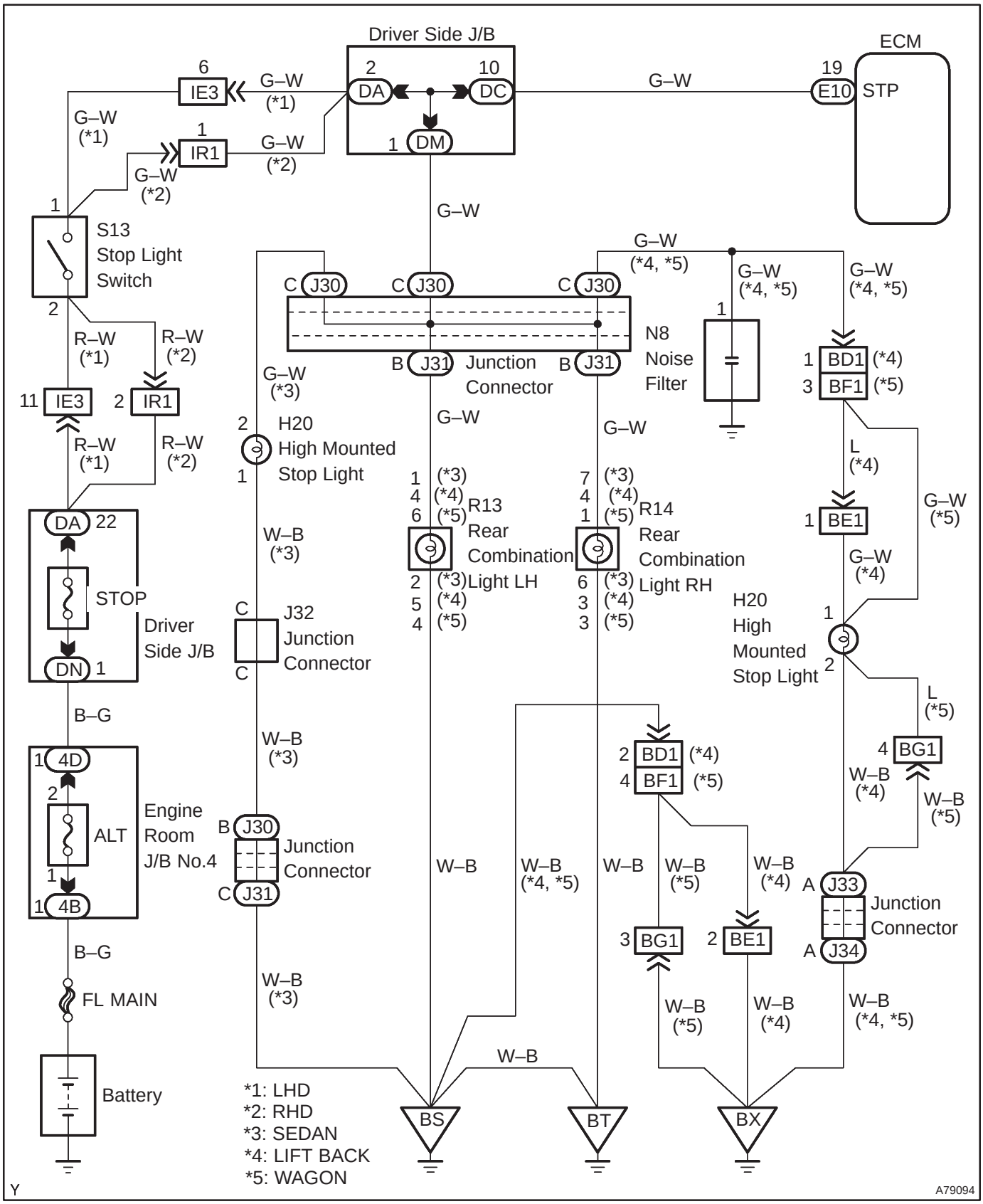
STOP LIGHT SWITCH SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in lock–up condition, when brakes are suddenly applied.

When the brake pedal is depressed, this switch sends a signals to the ECM. Then the ECM cancels the operation of the lock–up clutch while braking is in progress.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT STOP LAMP SWITCH ASSY

NG → REPLACE STOP LAMP SWITCH ASSY

OK

2	CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH ASSY – ECM)

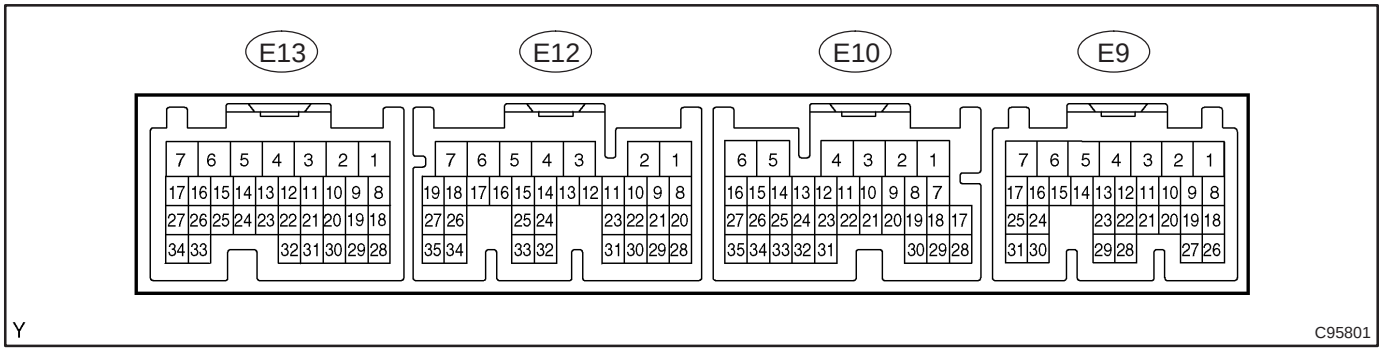
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPAIR OR REPLACE ECM

05C8S–01

TERMINALS OF ECM



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
SLT+ (E13–17) – SLT– (E13–16)	P–L – P	IG switch ON	10 to 14
THO (E13–30) – E2 (E13–28)	V – BR	IG switch ON and ATF temperature 110°C (230°F)	Below 1
DSL (E12–11) – E1 (E12–7)	L–B – BR	IG switch ON	Below 1
		Vehicle driving under lock–up range	10 to 14
S4 (E12–13) – E1 (E12–7)	L – BR	IG switch ON	Below 1
		O/D gear	10 to 14
		Except O/D gear	Below 1
SL2+ (E12–17) – SL2– (E12–16)	R – R–B	IG switch ON	Below 1
		1st or 2nd gear	10 to 14
		3rd or O/D gear	Below 1
SL1+ (E12–19) – SL1– (E12–18)	Y – Y–B	IG switch ON	10 to 14
		1st gear	10 to 14
		Except 1st gear	Below 1
NC+ (E12–26) – NC– (E12–34)	LG – LG–B	Engine is running	Below 1 and 4 to 5
NT+ (E12–27) – NT– (E12–35)	B–O – B	Engine is running	Below 1 and 4 to 5
D (E10–10) – E1 (E12–7)	LG–B – BR	IG switch ON Shift lever D range	10 to 14
		IG switch ON Shift lever other than D range	Below 1
R (E10–11) – E1 (E12–7)	R–Y – BR	IG switch ON Shift lever R range	10 to 14
		IG switch ON Shift lever other than R range	Below 1
SPD (E10–17) – E1 (E12–7)	V–W – BR	IG switch ON	4.5 to 5.5
SPT1 (E10–20) – E1 (E12–7)	L – BR	IG switch ON and shift lever S position	7.5 to 14
		IG switch ON and shift lever except for S position	Below 1
SFTD (E9–21) – E1 (E12–7)	B – BR	IG switch ON and shift lever S position	7.5 to 14
		IG switch ON and shift lever "–" position (Down shift)	Below 1.5
SFTU (E9–22) – E1 (E12–7)	R – BR	IG switch ON and shift lever S position	7.5 to 14
		IG switch ON and shift lever "+" position (Up shift)	Below 1.5
KD*1 (E9–27) – E1 (E12–7)	W – BR	IG switch ON and kick–down switch ON	Below 1
		IG switch ON and kick–down switch OFF	10 to 14

*1: Europe

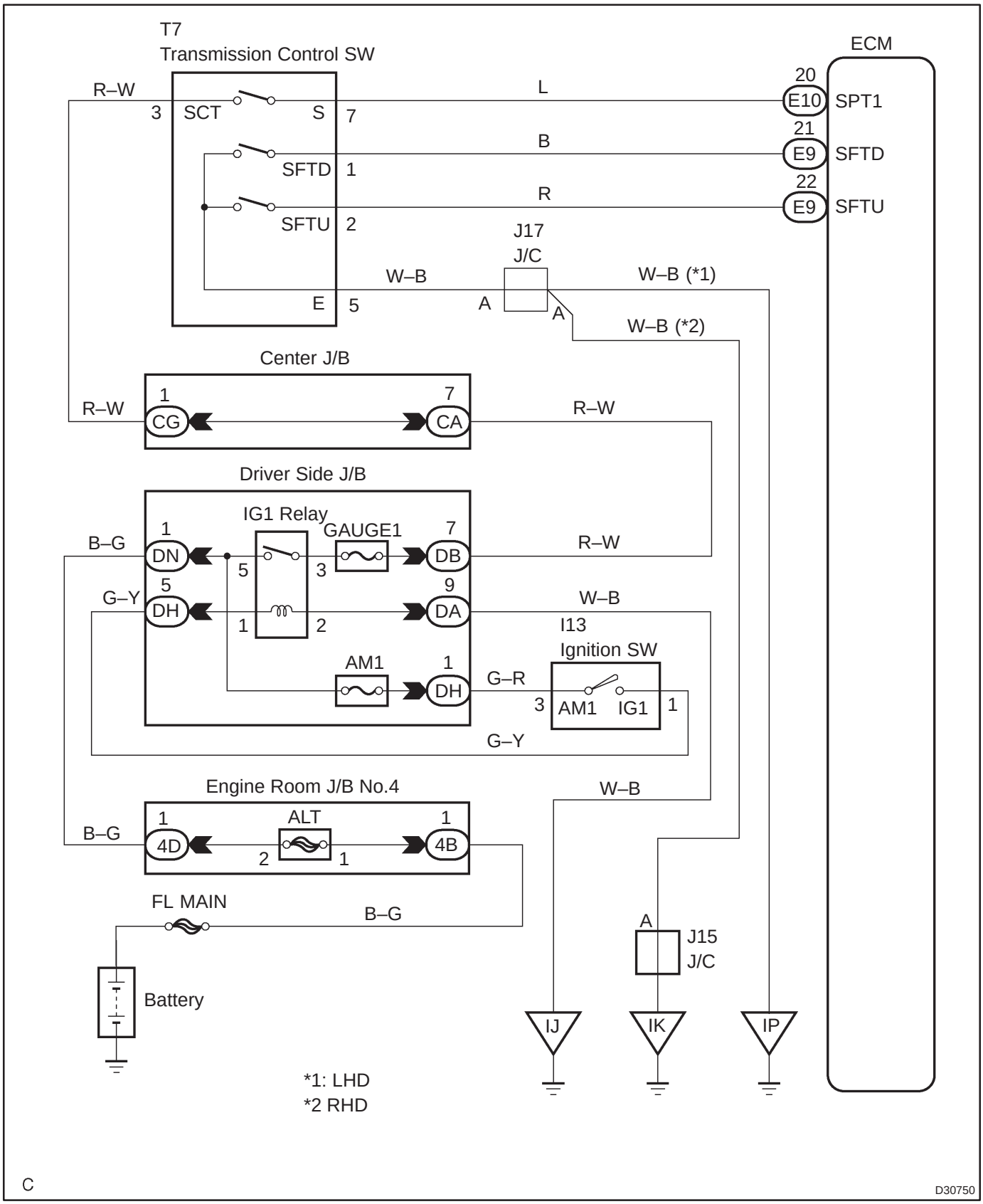
TRANSMISSION CONTROL SWITCH CIRCUIT

CIRCUIT DESCRIPTION

When shifting the shift lever into S range using the transmission control switch, it is possible to shift in 1 to 4 positions.

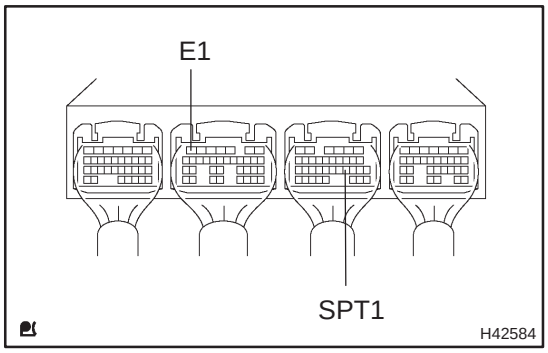
Shifting ”+” once changes up 1 shift range position, ”–” once changes down 1 shift range position respectively.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK ECM



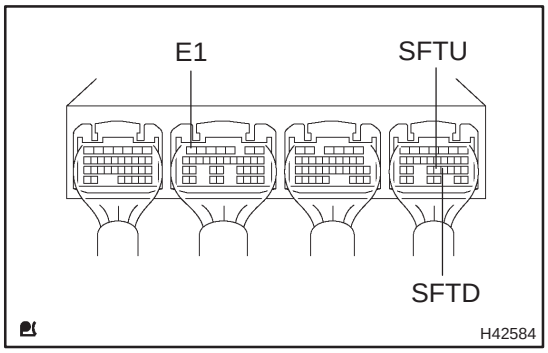
(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminals SPT1 and E1 of the ECM.
OK:

Shift position	Specified condition
Except S position	Below 1 V
S position	7.5 to 14 V

NG → **Go to step 6**

OK

2 CHECK ECM



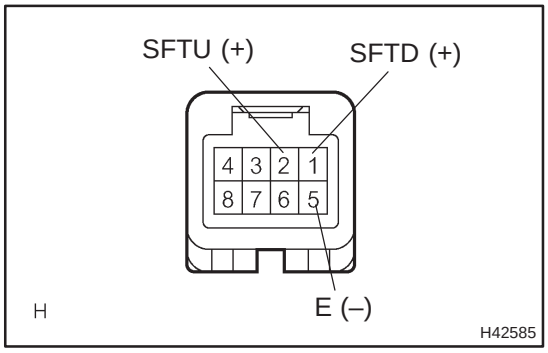
(a) Measure the voltage between terminals E1 and that SFTU as well as SFTD of the ECM.
OK:

Shift position	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E1	Below 1.5 V
S position	SFTU – E1	7.5 to 14 V
Shift to "–" (Down shift)	SFTD – E1	Below 1.5 V
S position	SFTD – E1	7.5 to 14 V

OK → **NORMAL**

NG

3 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



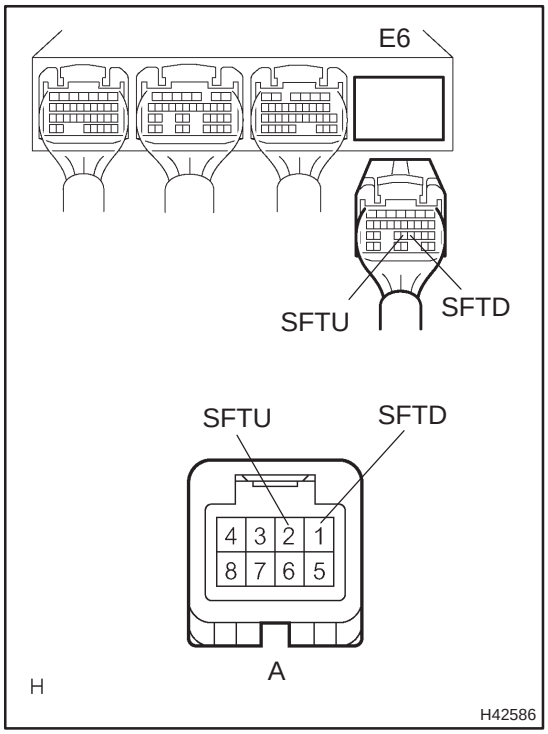
(a) Turn the ignition switch to LOCK.
(b) Disconnect the transmission control switch connector.
(c) Check the continuity between terminals E and that SFTU as well as SFTD of the transmission control switch connector.
OK:

Shift position	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E	Continuity
S position	SFTU – E	No continuity
Shift to "–" (Down shift)	SFTD – E	Continuity
S position	SFTD – E	No continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

4	CHECK HARNESS AND CONNECTOR(ECM – TRANSMISSION CONTROL SWITCH)



(a) Disconnect the ECM connector.
(b) Check the continuity between ECM and transmission control switch.
OK:

Tester connection	Specified condition
SFTU (E6–22) – SFTU (A–2)	Continuity
SFTD (E6–28) – SFTD (A–1)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR(TRANSMISSION COTROL SWITCH – BODY GROUND)

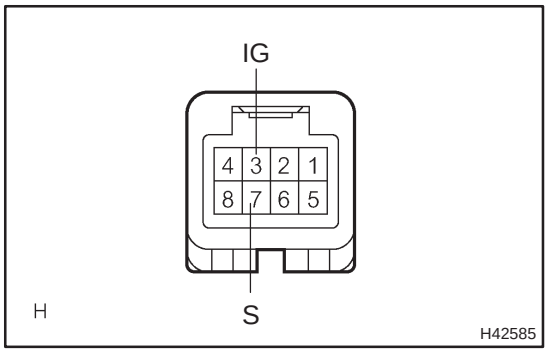
(a) Check the continuity between body ground and E of the transmission control switch connector (wire harness side).
OK:
Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

6 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



(a) Turn the ignition switch to LOCK.
(b) Disconnect the transmission control switch connector.
(c) Check the continuity between terminal IG and S of the transmission control switch.

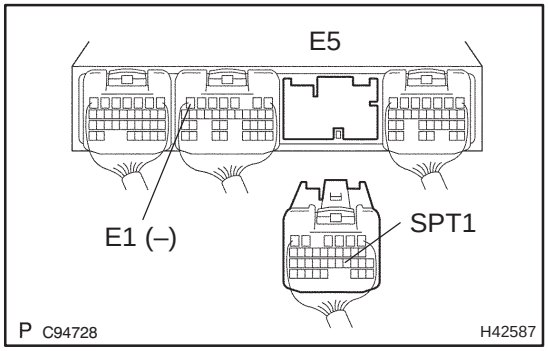
OK:

Shift position	Tester connection	Specified condition
Except S position	IG – S	No continuity
S position	IG – S	Continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

7 CHECK HARNESS AND CONNECTOR



(a) Connect the transmission control switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminal SPT1 and E1 of the ECM connector.

OK:

Shift position	Tester connection	Specified condition
Except S position	SPT1 – E1	Below 1 V
S position	SPT1 – E1	7.5 to 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

TRANSMISSION FLUID TEMPERATURE SENSOR NO.2 CIRCUIT

CIRCUIT DESCRIPTION

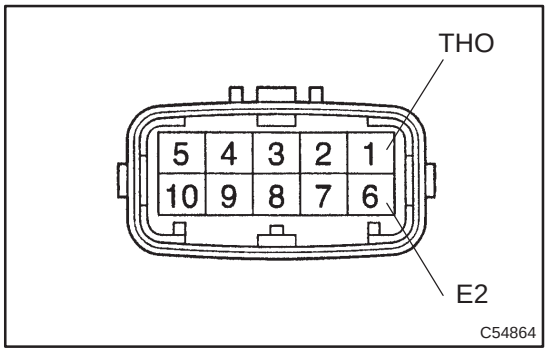
The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

WIRING DIAGRAM

See page 05–882.

INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals THO and E2.

OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(c) Check the continuity between the wire harness side connectors.

OK:

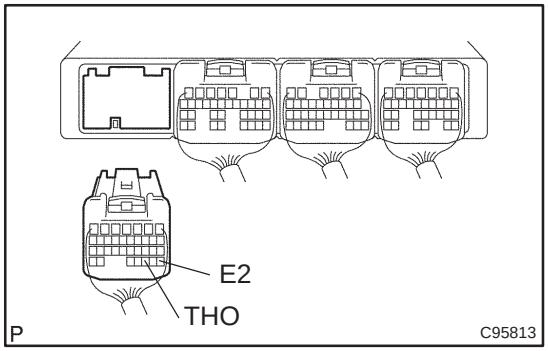
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals THO and E2.
OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

0567O–11

CUSTOMER PROBLEM ANALYSIS CHECK

Transmission Control System Check Sheet	Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move (☐ Any range ☐ Particular range)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)
	☐ No down–shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ No up–shift (S range)
	☐ No down–shift (S range)
	☐ Lock–up malfunction
	☐ Shift point too high or too low
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive range)
	☐ Slip or shudder
	☐ No kick–down
	☐ Others ( )

Check Item	MIL	☐ Normal ☐ Remains ON

DTC Check	1st Time	☐ Normal code ☐ Malfunction code (DTC)
	2nd Time	☐ Normal code ☐ Malfunction code (DTC)

0567Q–09

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.

*1 : – ... MIL does not light /● ... MIL light up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *	Memory
P0500 (05–453)	Vehicle Speed Sensor "A"	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	●	○
P0705 (05–938)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	●	○
P0710 (05–941)	Transmission Fluid Temperature Sensor "A" Circuit	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM	●	○
P0711 (05–943)	Transmission Fluid Temperature Sensor "A" Performance		●	○
P0712 (05–941)	Transmission Fluid Temperature Sensor "A" Circuit Low Input		●	○
P0713 (05–941)	Transmission Fluid Temperature Sensor "A" Circuit High Input		●	○
P0717 (05–945)	Turbine Speed Sensor Circuit No Signal	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transaxle assembly	●	○
P0724 (05–947)	Brake Switch "B" Circuit High	• Short in stop light switch circuit • Stop light switch • ECM	●	○
P0741 (05–948)	Torque Converter Clutch Solenoid Perfomance (Shift Solenoid Valve DSL)	• Shift solenoid valve DSL is stuck open or closed • Valve body is blocked up or stuck • Shift solenoid valve DSL • ECM	●	○
P0743 (05–951)	Torque Converter Clutch Circuit Electrical (Shift Solenoid Valve DSL)	• Open or short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM	●	○
P0746 (05–954)	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)	• Shift solenoid valve SL1 is stuck open or closed • Valve body is blocked up or stuck • Shift solenoid valve SL1 • ECM	●	○
P0748 (05–956)	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM	●	○
P0766 (05–962)	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	• Shift solenoid valve S4 is stuck open or closed • Valve body is blocked up or stuck • Shift solenoid valve S4 • ECM	●	○
P0776 (05–963)	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	• Shift solenoid valve SL2 is stuck open or closed • Valve body is blocked up or stuck • Shift solenoid valve SL2 • ECM	●	○

P0778 (05–956)	Pressure Control Solenoid ”B” Electrical (Shift Solenoid Valve SL2)	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM	●	○
P0793 (05–965)	Intermediate Shaft Speed Sensor ”A”	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM	●	○
P0982 (05–956)	Shift Solenoid ”B” Control Circuit Low (Shift Solenoid Valve S4)	• Open or short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM	●	○
P0983 (05–956)	Shift Solenoid ”B” Control Circuit High (Shift Solenoid Valve S4)		●	○
P2716 (05–967)	Pressure Contorl Solenoid ”D” Electrical (Shift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	●	○

ELECTRONIC CONTROLLED AUTOMATIC TRANSAXLE [ECT] (U241E(1AZ–FSE))

0567N–12

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

The ECM of this system is connected to the multiplex communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the multiplex communication system.

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–919)

3	Connect the hand–held tester to DLC3

4	Check and Clear DTC and Freeze Frame Data (See page 05–920)

5	Visual Inspection

6	Setting the Check Mode Diagnosis (See page 05–920)

7	Problem Symptom Confirmation

- Symptom does not occur: Go to step 8
- Symptom occur: Go to step 9

8	Symptom Simulation (See page 01–22)

9	DTC Check (See page 05–920)

- DTC is not output: Go to step 10
- DTC is output: Go to step 17

10	Basic Inspection (See page 40–2, 40–8 and 40–69)

NG → Go to step 19

OK

11	Mechanical System Test (See page 05–920)

NG → Go to step 16

OK

12	Manual Shifting Test (See page 05–920)

NG → Go to step 14

OK

13	Problem Symptoms Table Chapter 1 (See page 05–935)

NG → Go to step 18

OK

14	Problem Symptoms Table Chapter 2 (See page 05–935)

NG → Go to step 16

OK

15	Problem Symptoms Table Chapter 3 (See page 05–935)

NG

16	Part Inspection

→ Go to step 19

17	DTC Chart (See page 05–931)

18	Circuit Inspection (See page 05–938)

19	Identification of Problem

20	Repair

21	Confirmation Test

End

KICK DOWN SWITCH CIRCUIT

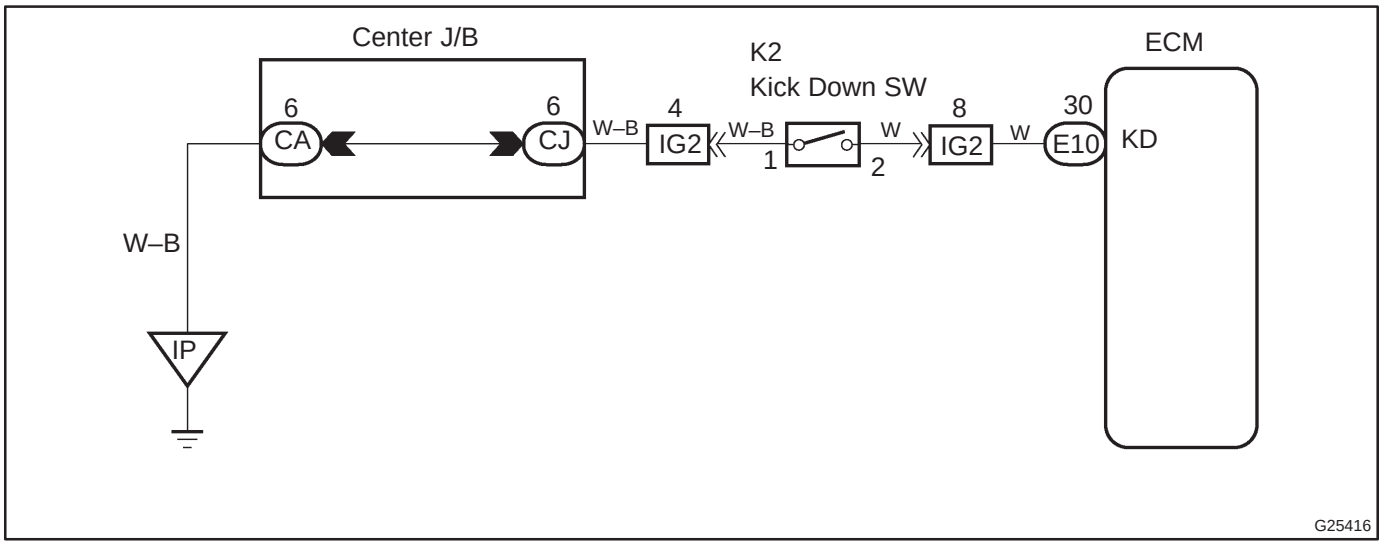
CIRCUIT DESCRIPTION

The kick–down switch is turned ON when the accelerator pedal is depressed to the full throttle and sends signals to ECM.

When the kick–down switch is turned ON, the ECM controls gear shifting according to the programmed shift diagrams.

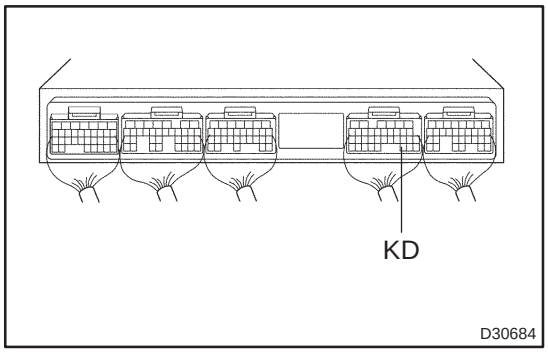
If a short circuit develops in the kick–down switch, the ECM disregards the kick–down signals and controls shifting at the normal shift points.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TERMINAL VOLTAGE



(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminal KD of ECM and body ground when accelerator pedal is fully depressed or not.

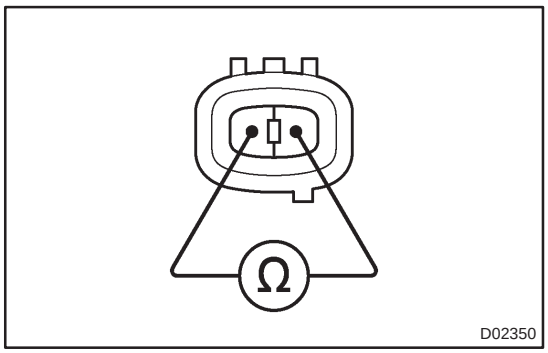
OK:

Accelerator pedal	Voltage
Fully depressed (Kick–down switch is ON)	Below 1 V
Released (Kick–down switch is OFF)	10 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2 INSPECT KICK DOWN SWITCH



(a) Disconnect the kick–down switch connector.
(b) Check the continuity between terminals 1 and 2 of the kick–down switch when kick–down switch is ON and OFF.

OK:

Kick–down switch	Continuity
ON	Continuity
OFF	No continuity

NG → **REPLACE KICK DOWN SWITCH**

OK

3 CHECK HARNESS AND CONNECTOR

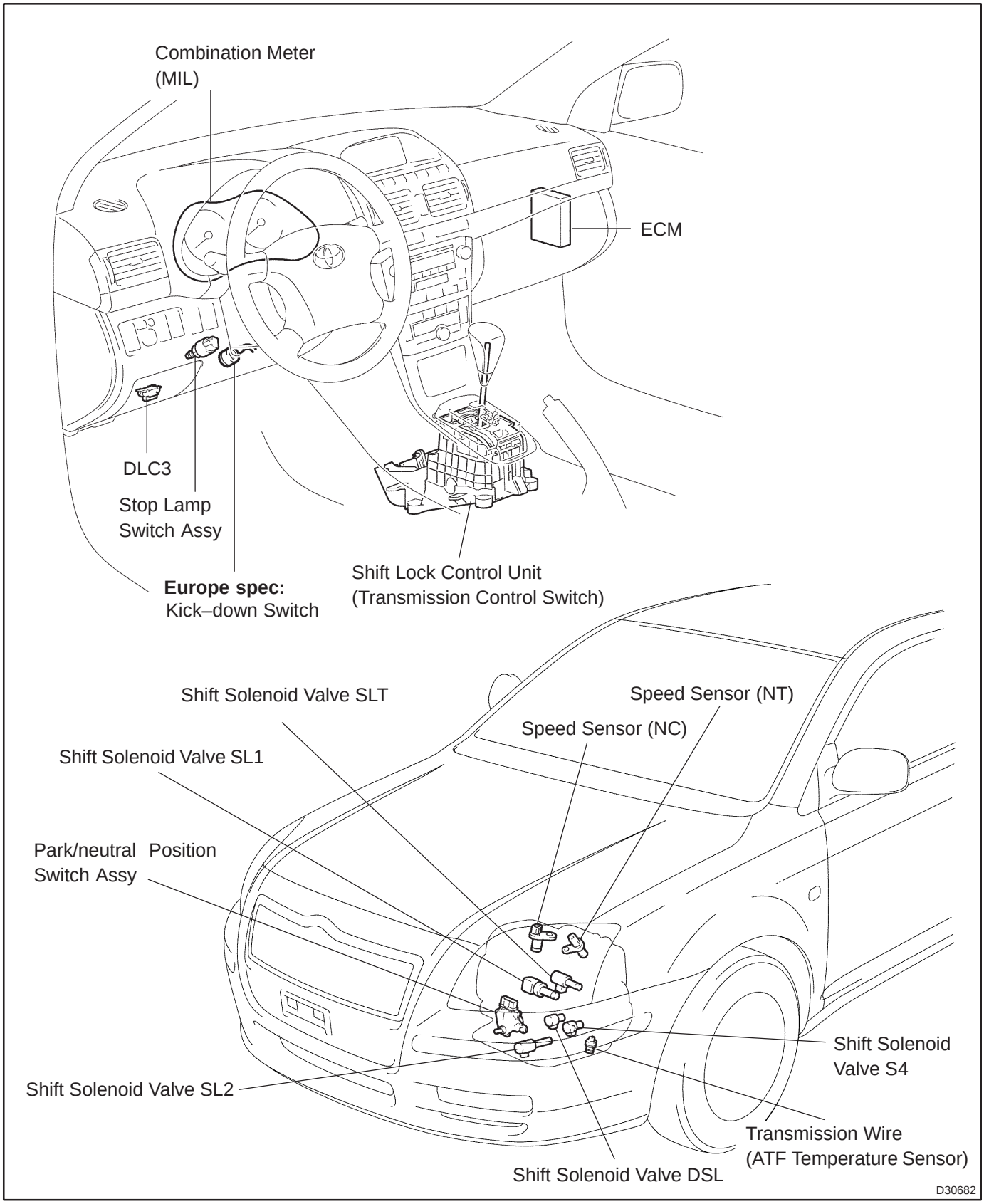
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

0567R–12

LOCATION



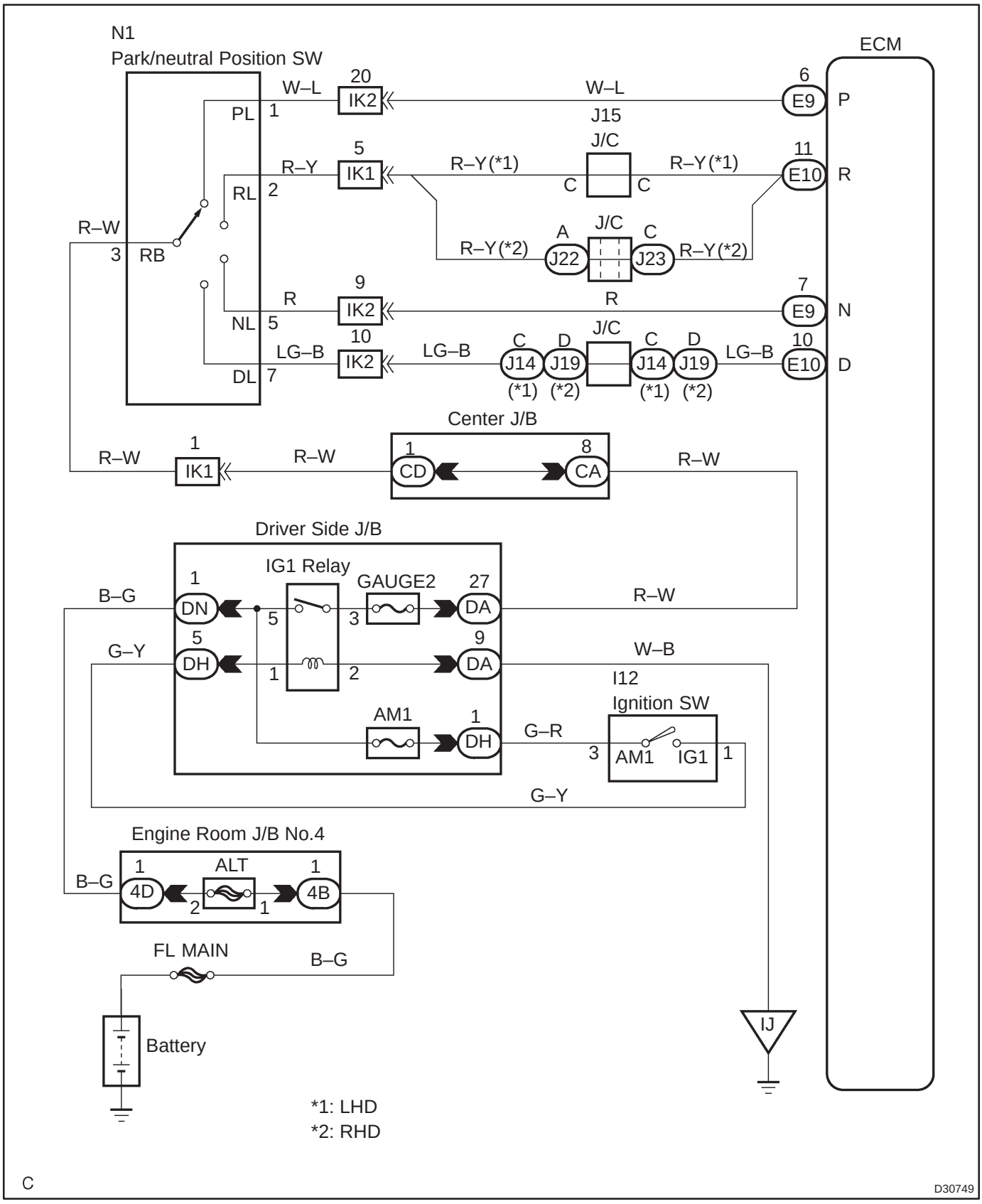
DTC	P0705	TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.

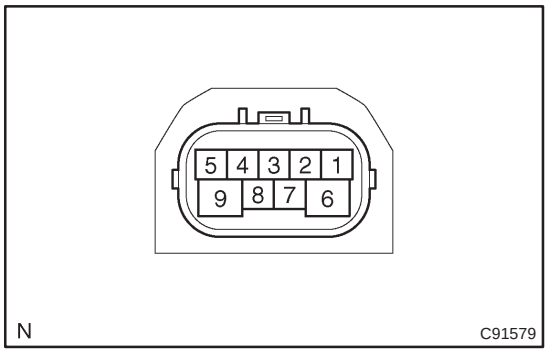
DTC No.	DTC Detecting Condition	Trouble Area
P0705	DTC is detected for 500 msec. or more (2–trip detection logic). • 2 or more switches are ON simultaneously for P, R, N and D position.	• Short in park/neutral position switch circuit • Park/neutral position switch assy • ECM
	When any of following conditions for 500 msec. or more in the S position (2–trip detection logic). (a) P position input signal is ON. (b) N position input signal is ON. (c) R position input signal is ON.	

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.
(b) Check the continuity between each terminal shown below when the shift lever is moved to each position.

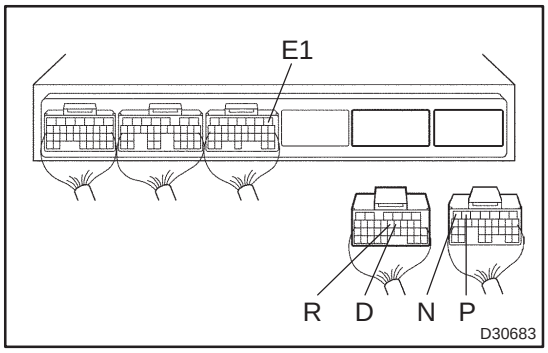
Shift Position	Terminal No. to continuity	
P	1 – 3	6 – 9
R	2 – 3	–
N	3 – 5	6 – 9
D	3 – 7	–

OK:
There is continuity.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY**

OK

2 CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – ECM)



(a) Connect the park/neutral position switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminals E1 and that P, R, N as well as D of the ECM connector when the shift lever is shifted to the following range.

OK:

Shift range	Terminal	Voltage (V)
P	P – E1	7.5 to 14
R	R – E1	7.5 to 14
N	N – E1	7.5 to 14
D	D – E1	7.5 to 14

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0710	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT

DTC	P0712	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT LOW INPUT

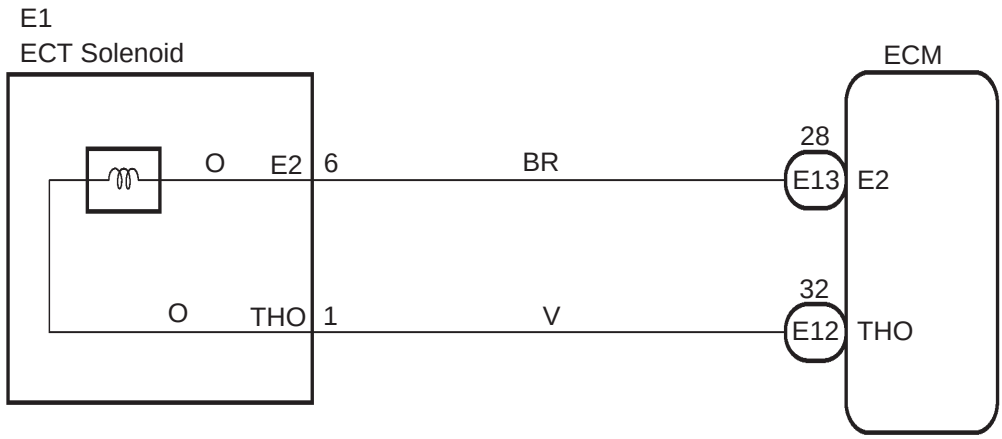
DTC	P0713	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

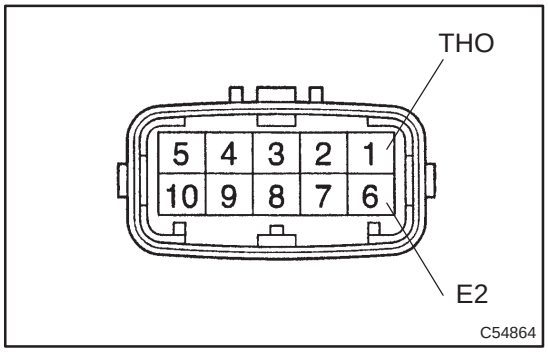
DTC No.	DTC Detection Condition	Trouble Area
P0710	(a) and (b) is detected momentary within 0.5 sec. when neither P0712 or P0713 is not detected (1–trip detection logic) (a) ATF temperature sensor resistance is less than 79 Ω. (b) ATF temperature sensor resistance is more than 156 kΩ. HINT: Wthin 0.5 sec. the malfunction switches from (a) to (b) or from (b) to (a)	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM
P0712	ATF temperature sensor resistance is less than 79 Ω. for 0.5 sec. or more (1–trip detection logic)	
P0713	DTC is detected for 0.5 sec. or more (1–trip detection logic) ATF temperature sensor resistance is more than 156 kΩ. after started engine for 15 minutes or more	

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals THO and E2.

OK:

Resistance: 79 Ω to 156 kΩ

(c) Check the continuity between the wire harness side connectors.

OK:

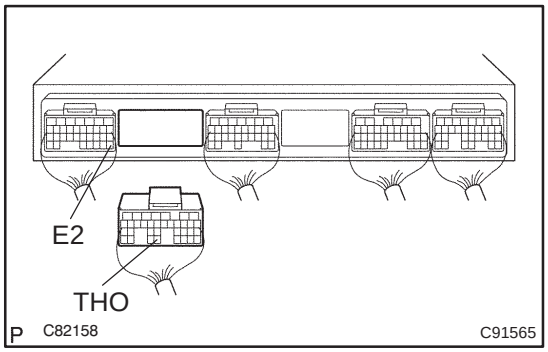
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector from the transaxle.

(b) Disconnect the ECM connector.

(c) Measure the resistance between terminals THO and E2.

OK:

Resistance: 79 Ω to 156 kΩ

(d) Check the continuity between the wire harness side connectors.

OK:

Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0711	TRANSMISSION FLUID TEMPERATURE SENSOR ”A” PERFORMANCE

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

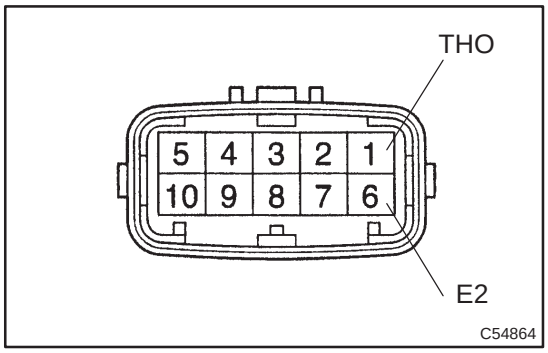
DTC No.	DTC Detection Condition	Trouble Area
P0711	Both (a) and (b) are detected: (2–trip detection logic) (a) After 12 sec. of engine start, temp. of atmosphere and that of engine coolant is more than –10˚C (b) After normal driving for over 20 min. and 10 km, ATF temp. is less than 10˚C	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM

WIRING DIAGRAM

See page 05–941.

INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals THO and E2.

OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(c) Measure the resistance between body ground and that THO as well as E2 of the transmission wire connector.

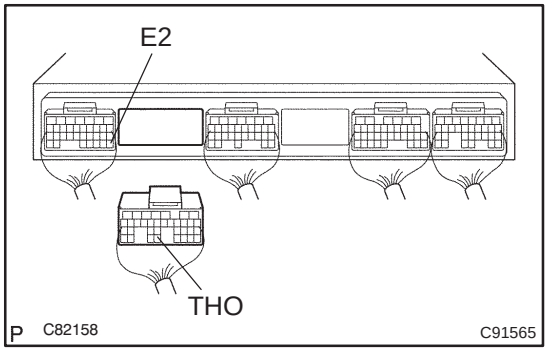
OK:

Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals THO and E2.
OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(d) Measure the resistance between body ground and that THO as well as E2 of the ECM connector.
OK:
Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

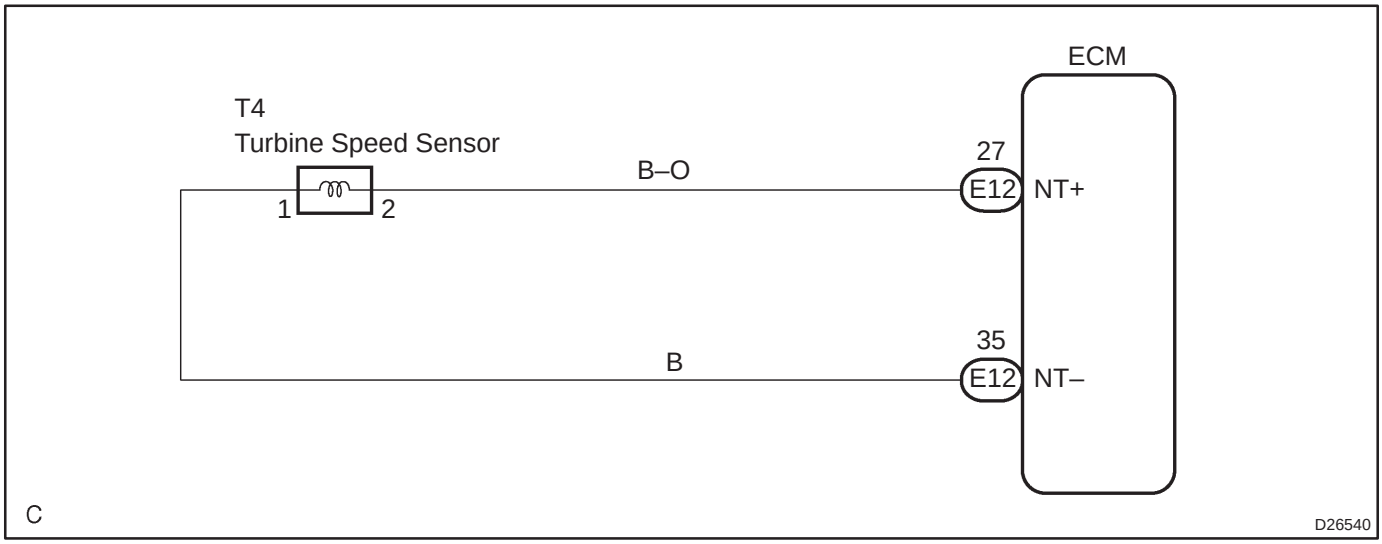
DTC	P0717	TURBINE SPEED SENSOR CIRCUIT NO SIGNAL

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the input turbine. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (NC), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

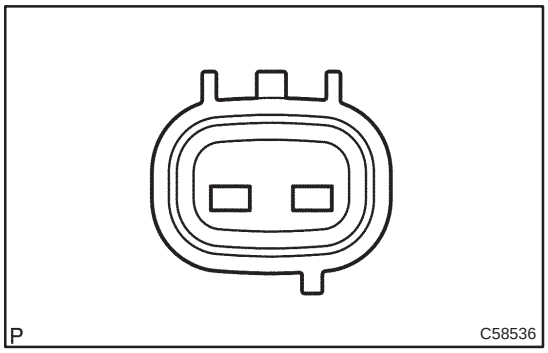
DTC No.	DTC Detection Condition	Trouble Area
P0717	ECM detects conditions (a), (b), (c) and (d) continuity for 5 sec. or more: (1 trip detection logic) (a) Vehicle speed: 50 km/h (20 mph) or more (b) 2nd, 3rd or O/D gear (c) Solenoid valves and park/neutral position switch are normal (d) NT < 300 rpm	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(NT)

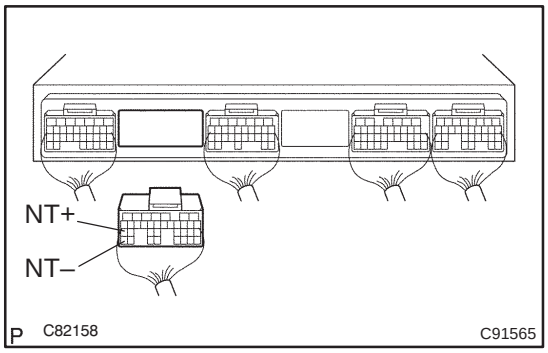


(a) Disconnect the speed sensor connector from the transaxle.
(b) Measure the resistance between terminals of speed sensor.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)

NG → **REPLACE SPEED SENSOR(NT)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



(a) Connect the speed sensor connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NT+ and NT–.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)
(d) Measure the resistance between body ground and that NT+ as well as NT– of the ECM connector.
OK:
Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0724	BRAKE SWITCH ”B” CIRCUIT HIGH

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in lock–up condition, when brakes are suddenly applied.
When the brake pedal is depressed, this switch sends signals to the ECM. Then the ECM cancels the operation of the lock–up clutch while braking is in progress.

DTC No.	DTC Detecting Condition	Trouble Area
P0724	The stop light switch does not turn off even once the vehicle is driven (2–trip detection logic).	• Short in stop light switch signal circuit • Stop light switch • ECM

WIRING DIAGRAM

See page 05–475.

INSPECTION PROCEDURE

1	INSPECT STOP LAMP SWITCH ASSY

NG → REPLACE STOP LAMP SWITCH ASSY

OK

2	CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH ASSY – ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPAIR OR REPLACE ECM

DTC	P0741	TORQUE CONVERTER CLUTCH SOLENOID PERFORMANCE (SHIFT SOLENOID VALVE SL)

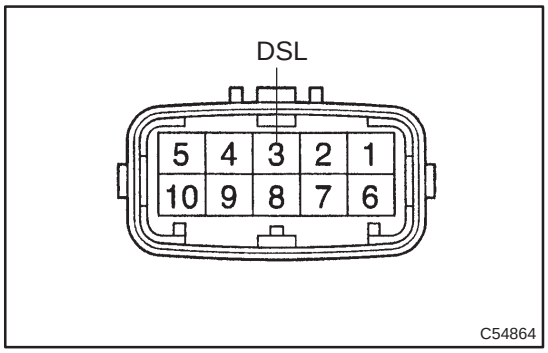
SYSTEM DESCRIPTION

The ECM uses the signals from the throttle position sensor, Air–flow meter and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.
Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect a mechanical trouble of the shift solenoid valve DSL, valve body and torque converter clutch.

DTC No.	DTC Detection Condition	Trouble Area
P0741	Lock–up does not occur when driving in lock–up range (normal driving at 80 km/h [50 mph]), or lock–up remains ON in lock–up OFF range (2 trip detection logic)	• Shift solenoid valve DSL is stuck open or closed • Valve body blocked or stuck • Shift solenoid valve DSL • Lock–up clutch

INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE(DSL)

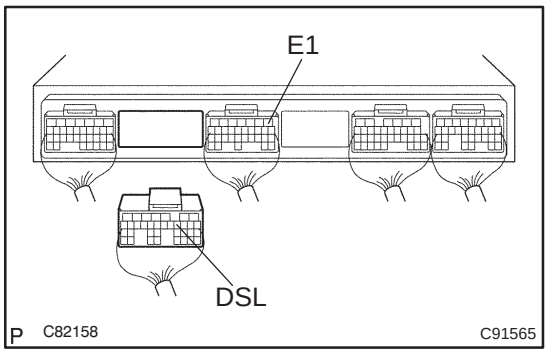


(a) Disconnect the transmission wire connector connector from the transaxle.
(b) Measure the resistance between the terminal 3 and the body ground.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSIONWIRE – ECM)



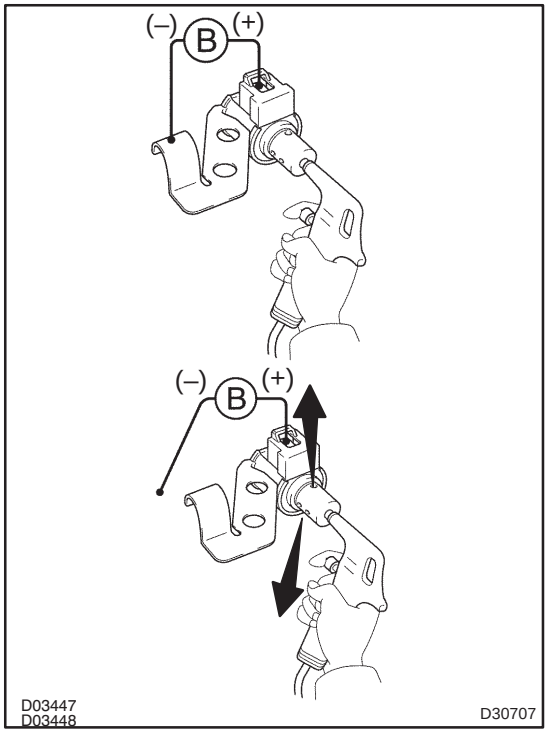
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals DSL and E1.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

OK → **Go to step 3**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

3 INSPECT SHIFT SOLENOID VALVE(DSL)



(a) Remove the shift solenoid valve DSL.

(b) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does not leak the air.

OK:

Solenoid valve does not leak air.

(c) When battery voltage is supplied to the shift solenoid valve, check that the valve opens.

OK:

Solenoid valve opens.

(d) Measure the resistance between the terminal DSL of shift solenoid valve DSL and the solenoid body.

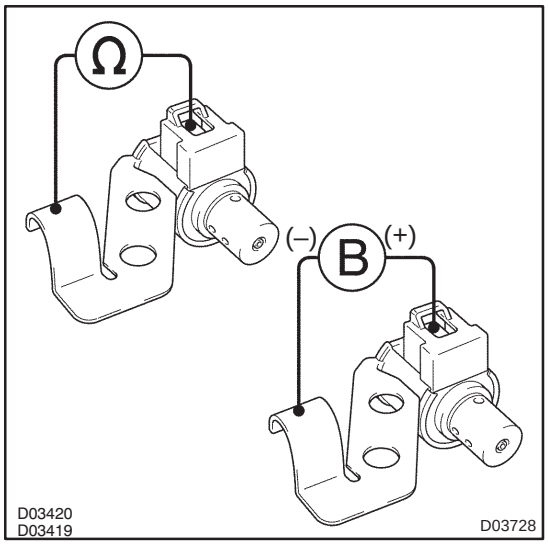
OK:

Resistance: 11 to 13 Ω at 20°C (68°F)

(e) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid body.

OK:

The solenoid valve makes operation noise.



NG → **REPLACE SHIFT SOLENOID VALVE(DSL)**

OK

4 CHECK TRANSMISSION WIRE

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

5	INSPECT TRANSMISSION VALVE BODY ASSY

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY

OK

6	INSPECT TORQUE CONVERTER CLUTCH ASSY

NG → REPLACE TORQUE CONVERTER CLUTCH ASSY

OK

REPAIR AUTOMATIC TRANSAXLE ASSY

DTC	P0743	TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL (SHIFT SOLENOID VALVE DSL)

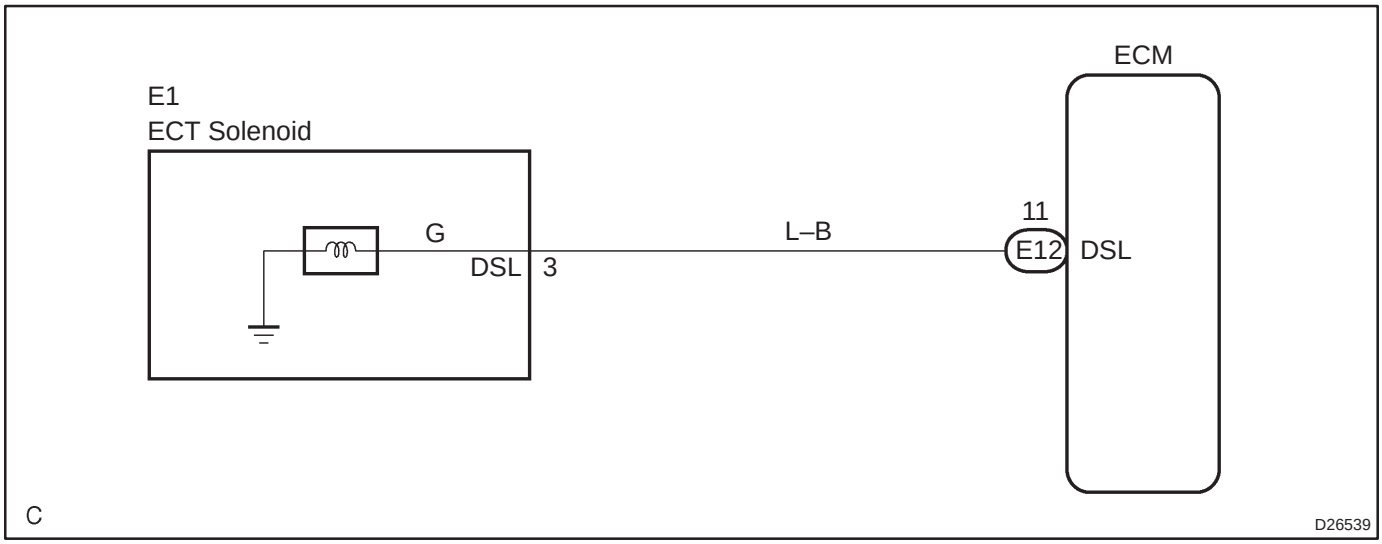
CIRCUIT DESCRIPTION

The shift solenoid valve DSL is turned ON and OFF by signals from the ECM in order to control the hydraulic pressure operation the lock–up relay valve, which then the controls operation of the lock–up clutch.

DTC No.	DTC Detection Condition	Trouble Area
P0743	Either (a) or (b) is detected at 1 time: (2 trip detection logic) (a) Solenoid resistance is 8 Ω or less short circuit when solenoid is energized (b) Solenoid resistance is 100 kΩ or more open circuit when solenoid is not energized	• Open or short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM

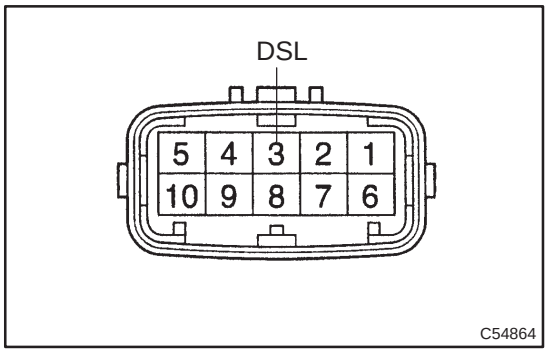
Fail safe function:
If the ECM detects a malfunction, it turns the shift solenoid valve DSL OFF.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(DSL)

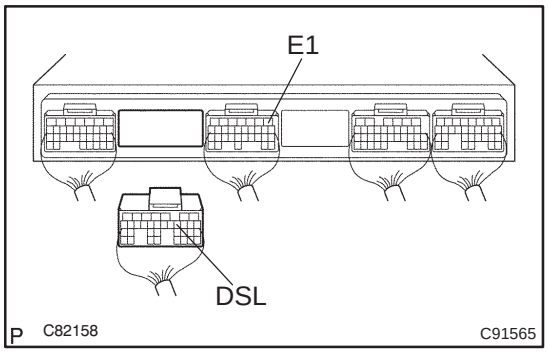


(a) Disconnect the solenoid connector from the transaxle.
(b) Measure the resistance between the terminal 3 and the body ground.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



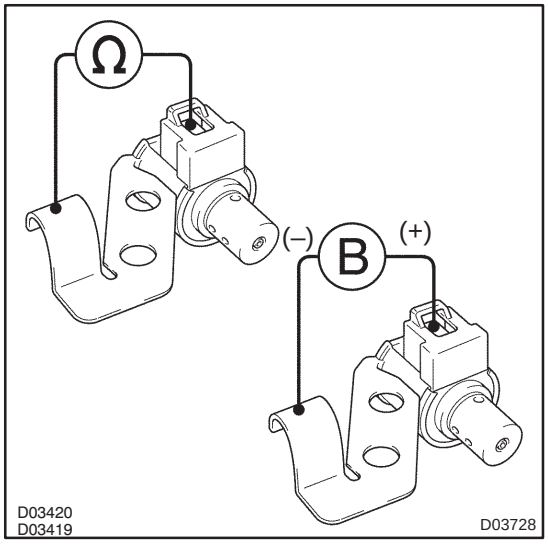
(a) Connect the transmission wire connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminal DSL and E1.
OK:
Resistance: 11 to 13 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(DSL)



(a) Remove the shift solenoid valve DSL.

(b) Measure the resistance between the terminals DSL of shift solenoid valve and the solenoid valve body.

OK:

Resistance: 11 to 13 Ω at 20°C (68°F)

(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid valve body.

OK:

The solenoid valve makes operation noise.

NG → **REPLACE SHIFT SOLENOID VALVE(DSL)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0746	PRESSURE CONTROL SOLENOID ”A” PERFORMANCE (SHIFT SOLENOID VALVE SL1)

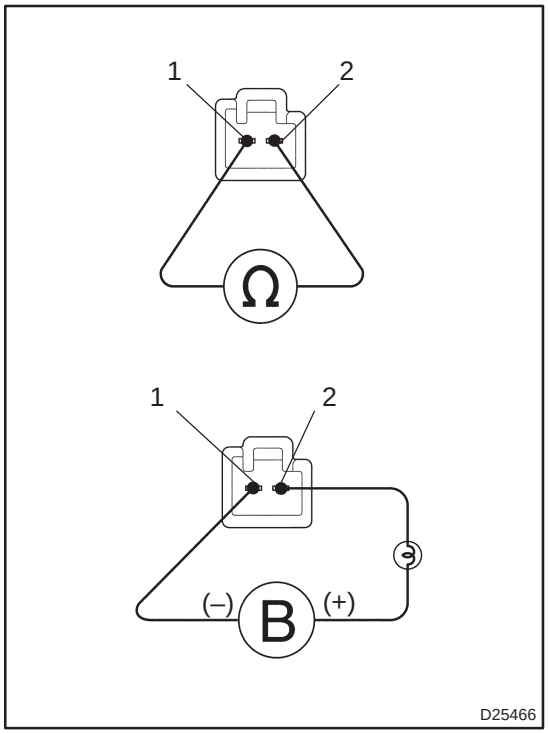
SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical troubles of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0746	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	• Shift solenoid valve SL1 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(SL1)



(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance between terminals of the shift solenoid valve SL1.
OK:
Resistance: 5.0 to 5.6 Ω at 20°C (68°F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL1)**

OK

2	INSPECT TRANSMISSION VALVE BODY ASSY

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY**

OK

3	INSPECT TORQUE CONVERTER CLUTCH ASSY

NG → REPLACE TORQUE CONVERTER CLUTCH ASSY

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSY

DTC	P0748	PRESSURE CONTROL SOLENOID ”A” ELECTRICAL (SHIFT SOLENOID VALVE SL1)

DTC	P0778	PRESSURE CONTROL SOLENOID ”B” ELECTRICAL (SHIFT SOLENOID VALVE SL2)

DTC	P0982	SHIFT SOLENOID ”D” CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE S4)

DTC	P0983	SHIFT SOLENOID ”D” CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE S4)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF operation of the shift solenoid valves SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

DTC No.	DTC Detection Condition	Trouble Area
P0748	ECM checks for an open or short circuit in shift solenoid valves SL1 (1–trip detection logic) (a) When solenoid is energized, duty ratio exceeds 75% (b) When solenoid is not energized, duty ratio is less than 3%	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM
P0778	ECM checks for an open or short circuit in shift solenoid valves SL2 (1–trip detection logic) (a) When solenoid is energized, duty ratio exceeds 75% (b) When solenoid is not energized, duty ratio is less than 3%	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM
P0982	ECM detects short in solenoid valve No. 4 circuit 4 times when solenoid valve No. 4 is operated (1–trip detection logic)	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	ECM detects open in solenoid valve No. 4 circuit 4 times when solenoid valve No. 4 is not operated (1–trip detection logic)	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

HINT:

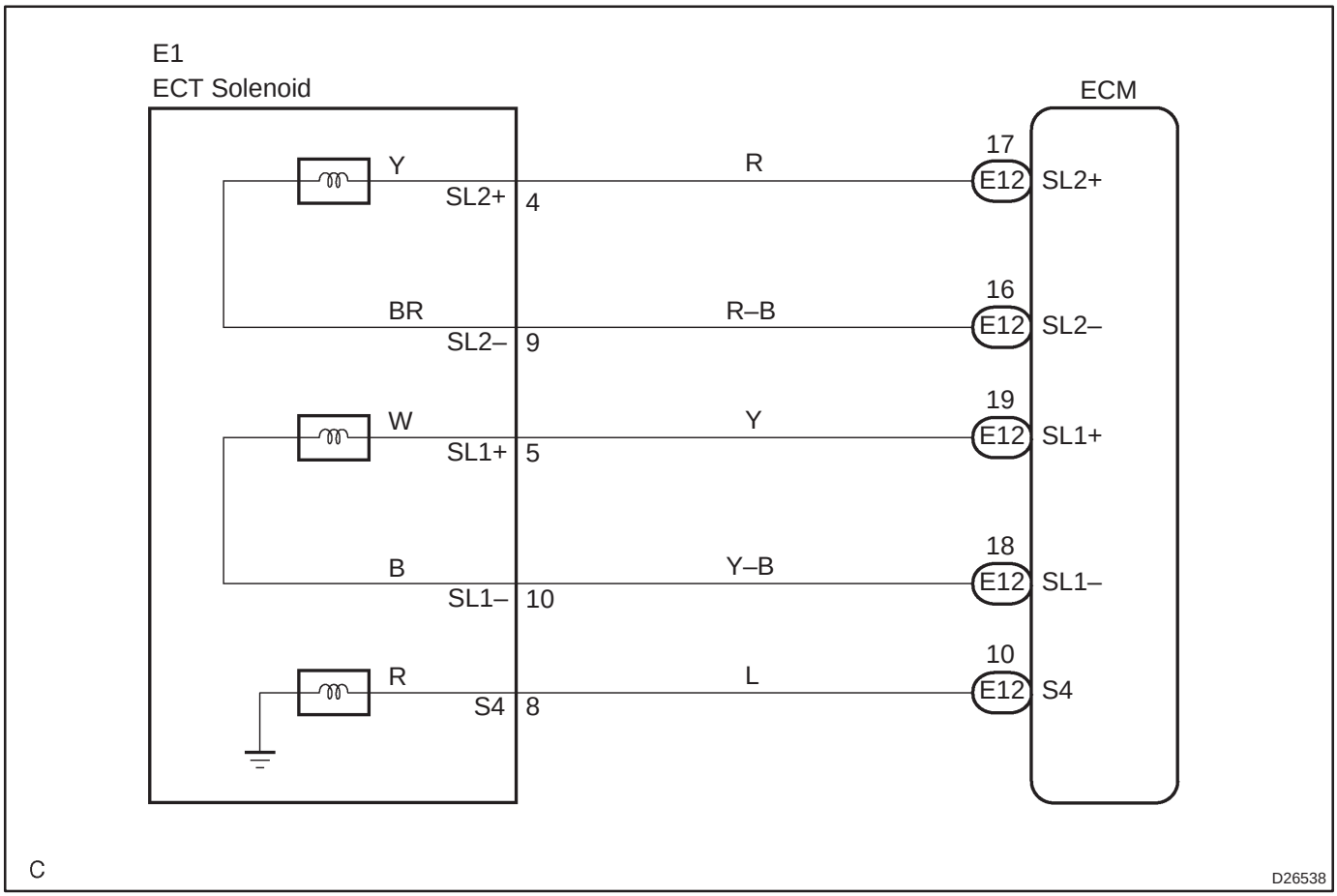
Check the shift solenoid valve SL1 when DTC P0748 is output, check the shift solenoid valve SL2 when DTC P0778 is output and check the shift solenoid valve S4 when DTC P0982 and P0983 is output.

Fail safe function:
If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid ON and OFF in order to shift into the gear positions shown in the table below. The ECM also turns the shift solenoid valve SL OFF at the same time. If both solenoids malfunction, hydraulic control cannot be performed electronically, and so it must be done manually.
Manual shifting as shown in the following table must be done (In case of a short circuit, the ECM stops sending the current to the short circuit solenoid).

NORMAL				SHIFT SOLENOID SL1 MALFUNCTIONING				SHIFT SOLENOID SL2 MALFUNCTIONING				SHIFT SOLENOID S4 MALFUNCTIONING			
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
ON	ON	OFF	1st	X	ON	OFF	2nd	ON ↓ OFF	X	OFF	3rd	ON	ON	X	1st
OFF	ON	OFF	2nd	X	ON	OFF	2nd	OFF	X	OFF	3rd	OFF	ON	X	2nd
OFF	OFF	OFF	3rd	X	OFF ↓ ON	OFF ↓ ON	3rd	OFF	X	OFF	3rd	OFF	OFF	X	3rd
OFF	OFF	ON	O/D	X	OFF ↓ ON	ON	3rd	OFF	X	ON	O/D	OFF	OFF	X	3rd

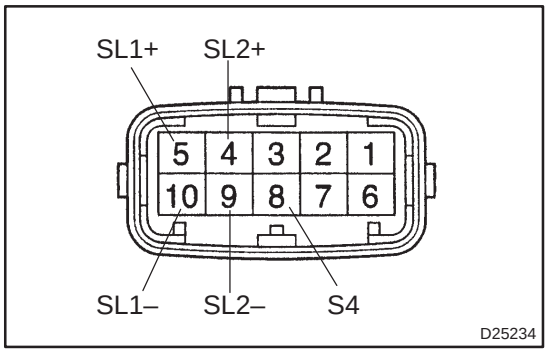
SHIFT SOLENOID SL1 AND SL2 MALFUNCTIONING				SHIFT SOLENOID SL1 AND S4 MALFUNCTIONING				SHIFT SOLENOID SL2 AND S4 MALFUNCTIONING				SHIFT SOLENOID SL1, SL2 AND S4 MALFUNCTIONING			
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
X	X	OFF	3rd	X	ON	X	2nd	ON ↓ OFF	X	X	3rd	X	X	X	3rd
X	X	OFF	3rd	X	ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd
X	X	OFF	3rd	X	OFF ↓ ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd
X	X	ON	O/D	X	OFF ↓ ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SL1/SL2/S4)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals 5 and 10.
OK:
Resistance: 5.0 to 5.6 Ω at 20°C (68°F)

(c) Measure the resistance between terminals 5 and 10 of the transmission wire connector and body ground.
OK:
Resistance: 1MΩ or higher

NG → **Go to step 3**

(d) Measure the resistance between terminals 4 and 9.
OK:
Resistance: 5.1 to 5.5 Ω at 20°C (68°F)

(e) Measure the resistance between terminals 4 and 9 of the transmission wire connector and body ground.
OK:
Resistance: 1MΩ or higher

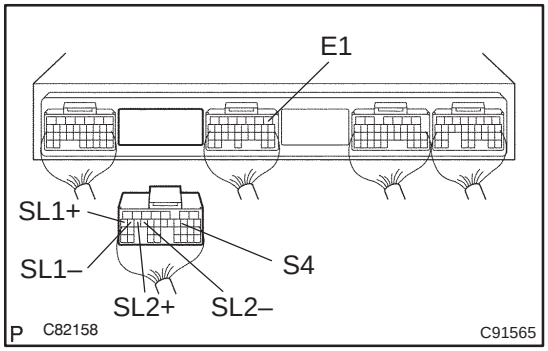
NG → **Go to step 4**

(f) Measure the resistance between terminal 8 and body ground.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 5**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



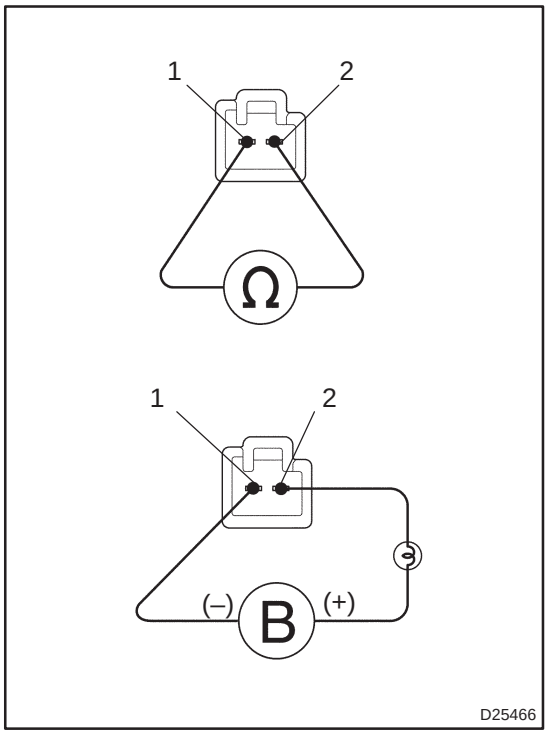
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the connector from the ECM.
(c) Measure the resistance between terminals of the ECM connector.
OK:
Resistance:
SL1+ – SL1–: 5.0 to 5.6 Ω at 20°C (68°F)
SL2+ – SL2–: 5.1 to 5.5 Ω at 20°C (68°F)
S4 – E1: 11 to 15 Ω at 20°C (68°F)
(d) Measure the resistance between terminals SL1+, SL1–, SL2+ and SL2– of the ECM connector and body ground.
OK:
Resistance: 1MΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(SL1)



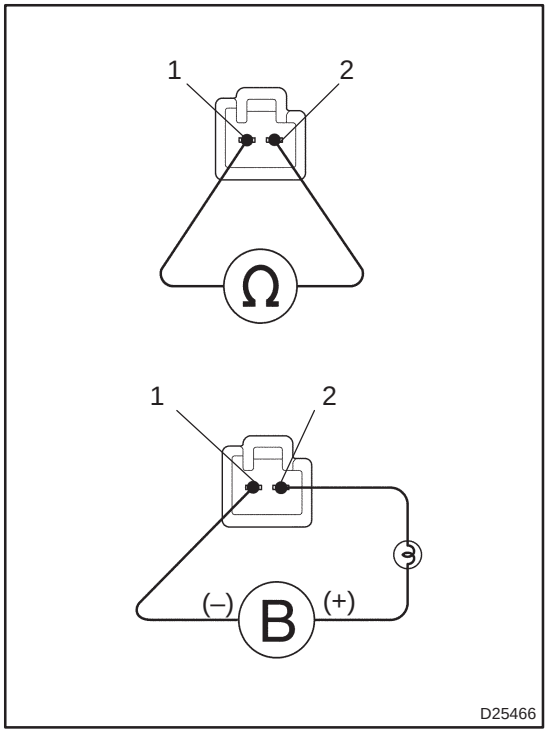
(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance between terminals of the shift solenoid valve SL1.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL1)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

4 INSPECT SHIFT SOLENOID VALVE(SL2)



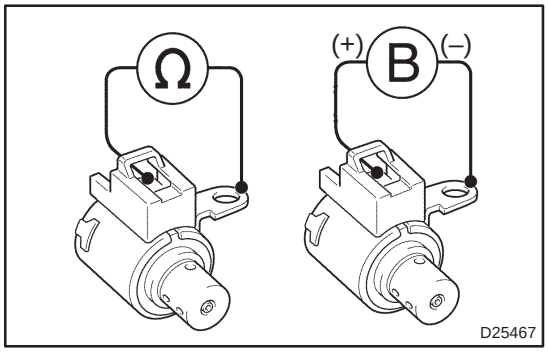
(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance between terminals of the shift solenoid valve SL2.
OK:
Resistance: 5.1 to 5.5 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL2)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

5 INSPECT SHIFT SOLENOID VALVE(S4)



(a) Remove the shift solenoid valve S4.
(b) Measure the resistance between the solenoid connector and the solenoid valve body.
OK:
Resistance: 11 to 15 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid valve body.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(S4)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0766	SHIFT SOLENOID ”D” PERFORMANCE (SHIFT SOLENOID VALVE S4)

SYSTEM DESCRIPTION

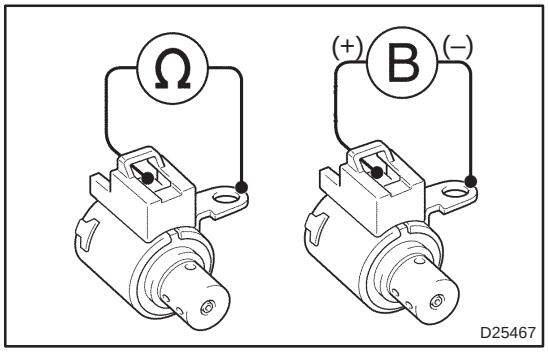
The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical troubles of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0766	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	• Shift solenoid valve S4 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)

INSPECTION PROCEDURE

1 INSPECT SHIFT SOLENOID VALVE(S4)



(a) Remove the shift solenoid valve S4.

(b) Measure the resistance between the solenoid connector and the solenoid body.

OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid body.

OK:

The solenoid makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(S4)**

OK

2 INSPECT TRANSMISSION VALVE BODY ASSY

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY**

OK

3 INSPECT TORQUE CONVERTER CLUTCH ASSY

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSY

DTC	P0776	PRESSURE CONTROL SOLENOID ”B” PERFORMANCE (SHIFT SOLENOID VALVE SL2)

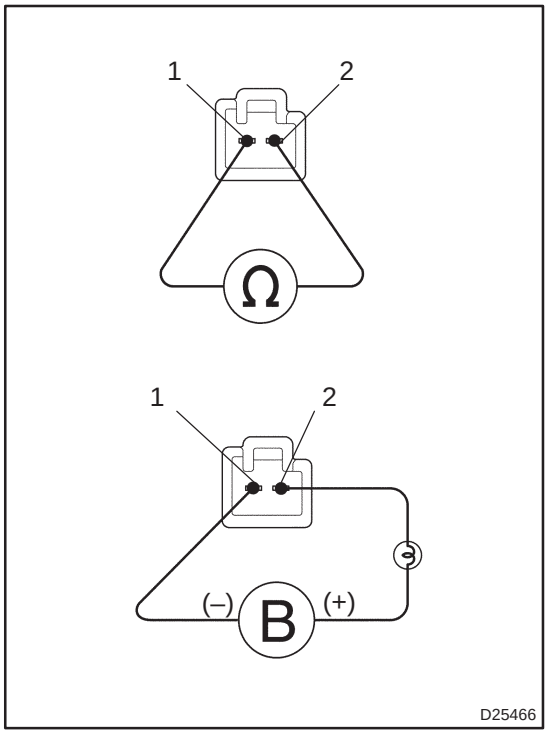
SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical troubles of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0776	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	• Shift solenoid valve SL2 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(SL2)



(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance between terminals.
OK:
Resistance: 5.1 to 5.5 Ω at 20°C (68°F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL2)**

OK

2	INSPECT TRANSMISSION VALVE BODY ASSY

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY**

OK

3	INSPECT TORQUE CONVERTER CLUTCH ASSY

NG → REPLACE TORQUE CONVERTER CLUTCH ASSY

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSY

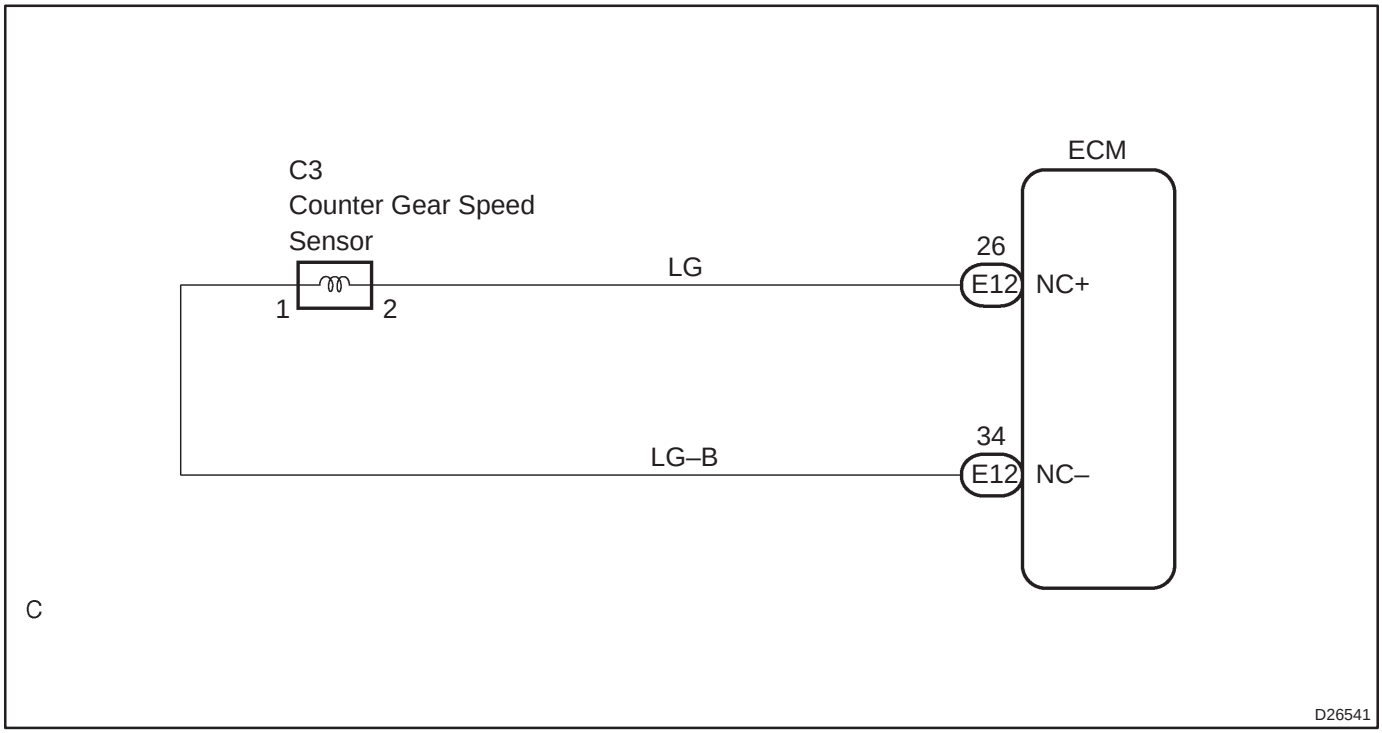
DTC	P0793	INTERMEDIATE SHAFT SPEED SENSOR ”A”

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the counter gear. By comparing the counter gear speed signal (NC) with the direct clutch speed sensor signal (NT), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

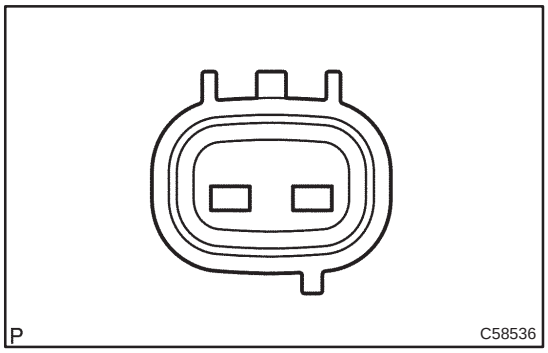
DTC No.	DTC Detection Condition	Trouble Area
P0793	ECM detects conditions (a), (b), (c) and (d) continuity for 5 sec. or more: (1 trip detection logic) (a) Vehicle speed: 50 km/h (20 mph) or more (b) 2nd, 3rd or O/D gear (c) Solenoid valves and park/neutral position switch are normal (d) NC < 300 rpm	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(NC)

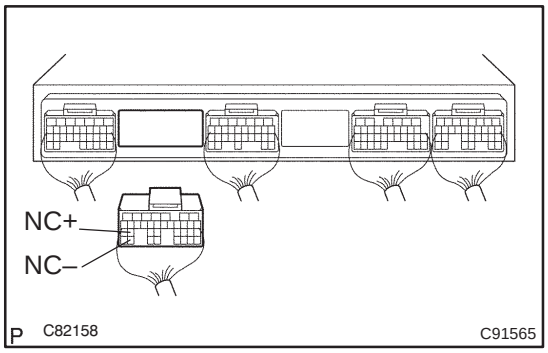


(a) Disconnect the speed sensor (NC) connector from the transaxle.
(b) Measure the resistance between terminals of the speed sensor.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)

NG → **REPLACE SPEED SENSOR(NC)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR – ECM)



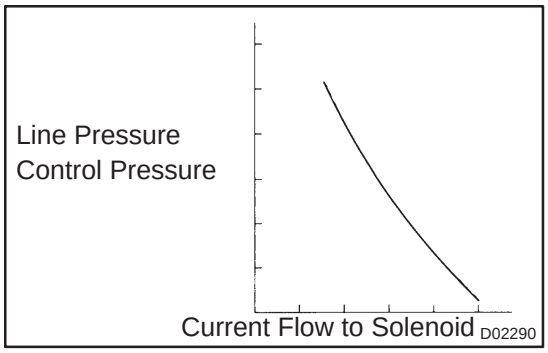
(a) Connect the speed sensor (NC) connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NC+ and NC–.
OK:
Resistance:
TOYOTA made: 500 to 620 Ω at 20°C (68°F)
AISIN made: 560 to 680 Ω at 20°C (68°F)
(d) Measure the resistance between terminals NC+ and NC– of the ECM connector and body ground.
OK:
Resistance: 1MΩ or higher

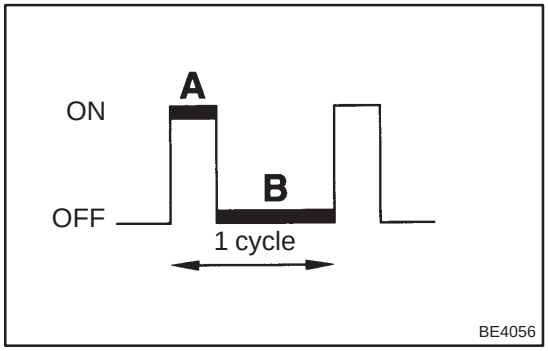
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P2716	PRESSURE CONTROL SOLENOID ”D” ELECTRICAL (SHIFT SOLENOID SLT)





CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates the line pressure) causes the solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate the line pressure according to the extent of the accelerator pedal depressed or the output of engine power.

This controls the line pressure and provides smooth shifting.

Upon receiving a signal of the throttle valve opening angle, the ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure and generating throttle pressure.

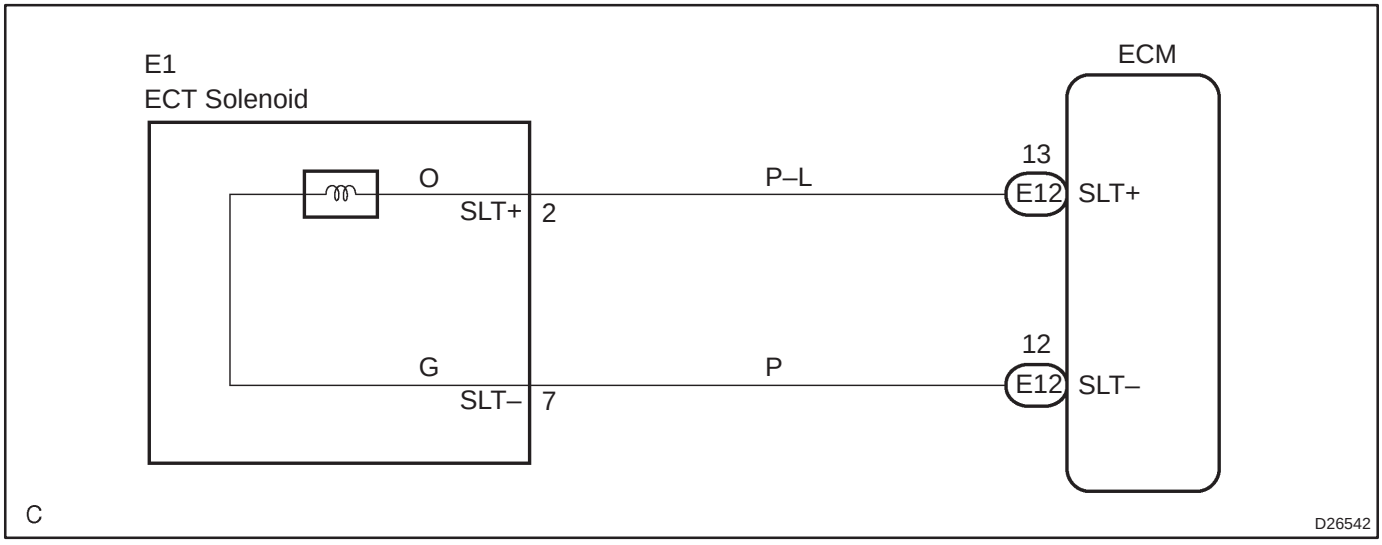
(*): Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

Duty Ratio=A/(A+B) x 100 (%)

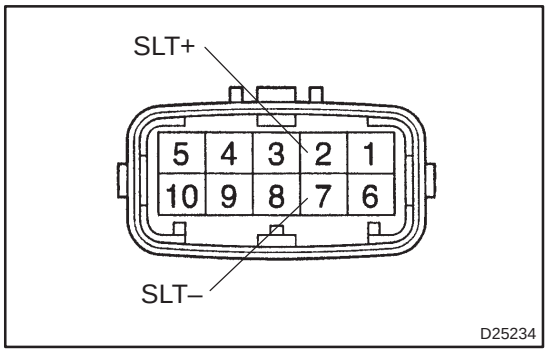
DTC No.	DTC Detection Condition	Trouble Area
P2716	Condition (a) or (b) below is detected 1 sec. or more: (1–trip detection logic) (a) SLT– terminal: 0V (b) SLT– terminal: 12V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SLT)

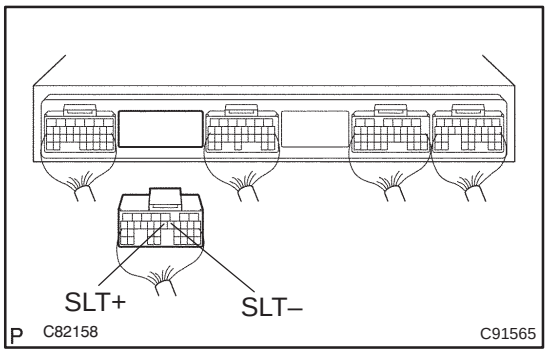


(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminals SLT+ and SLT–.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Measure the resistance between terminals SLT+ and SLT– of the transmission wire connector and body ground.
OK:
Resistance: 1MΩ or higher

NG	Go to step 3

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



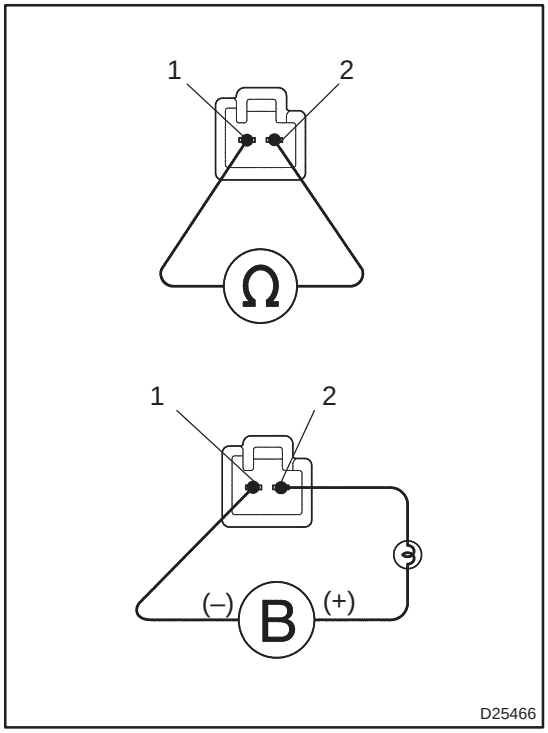
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals SLT+ and SLT– of ECM connector.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(d) Measure the resistance between terminals SLT+ and SLT– of the ECM connector and body ground.
OK:
Resistance: 1MΩ or higher

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(SLT)



(a) Remove the shift solenoid valve SLT.

(b) Measure the resistance between terminals of the shift solenoid valve SLT.

OK:

Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.

OK:

The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SLT)**

OK

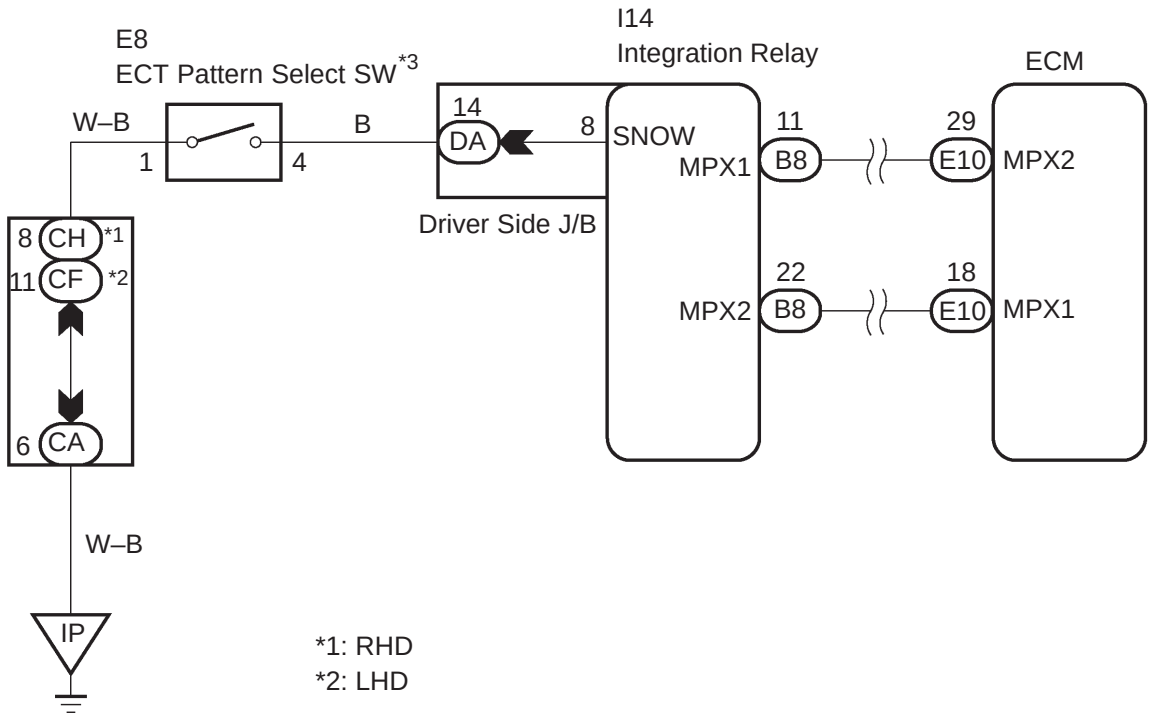
REPAIR OR REPLACE TRANSMISSION WIRE

PATTERN SELECT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

ECT SNOW is the system that operates the throttle motor to control engine output to reduce skidding of the driving wheels, guarantee takeoff acceleration, driving straightness and turning stability.

WIRING DIAGRAM



(*3) Pattern Select Switch (ECT SNOW Switch)
When the ECT SNOW switch is pushed, the switch contact is made and the ECT SNOW mode is selected. To cancel the ECT SNOW mode, push the ECT SNOW switch once again. The ECT SNOW mode is automatically cancelledout when the ignition switch is turned ”OFF”.

C

D30688

INSPECTION PROCEDURE

1	DRIVING TEST

(a) Start the engine.
(b) Turn the ECT SNOW switch ”OFF”.
(c) Confirm vehicle response by driving from a parked position to fully depressing the accelerator pedal.
(d) Turn the ECT SNOW switch on and perform the same check as (c).
Confirm that there is a difference between ECT SNOW switch ”ON” and ”OFF”.

HINT:
- Driving test should be done on a paved road (a nonskid road).
- Make sure not to use the TRAC system when testing a vehicle equipped with one.

Standard:
There is a difference in acceleration between ”ON” and ”OFF”.

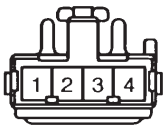
NG → **Go to step 2**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page xx–xxx)

2	CHECK HARNESS AND CONNECTOR(PATTERN SELECT SWITCH ASSY – BODY GROUND)

Wire Harness Side:



B59192

(a) Disconnect the connector of pattern select switch (ECT SNOW switch).
(b) Measure the resistance between 4 of the wire harness connector and body ground.
Standard:

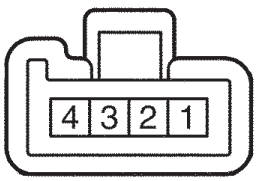
Tester connection	Specified condition
4 – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3	INSPECT PATTERN SELECT SWITCH ASSY

Switch Side:



D30685

(a) Measure the resistance between terminals 1 and 4 of pattern select switch (ECT SNOW switch).
Standard:

Switch condition	Tester connection	Specified condition
Press continuously Pattern select switch	1 – 4	Continuity
Release Pattern select switch	1 – 4	No continuity

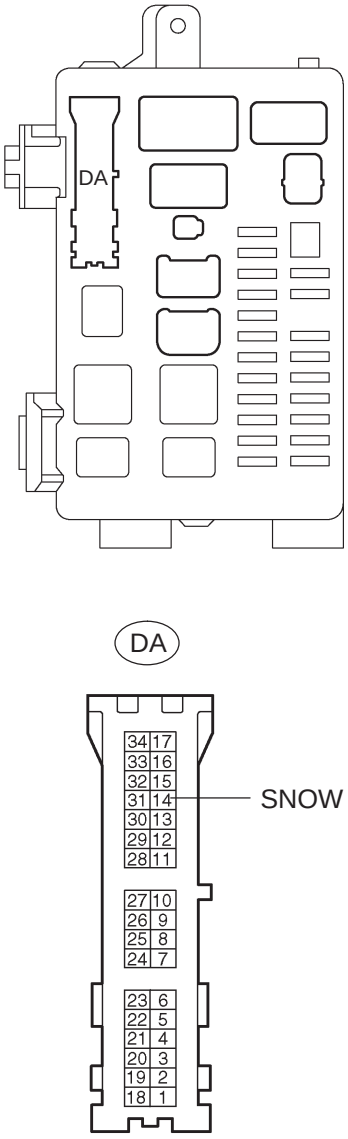
NG → **REPLACE PATTERN SELECT SWITCH ASSY**

OK

4	CHECK HARNESS AND CONNECTOR(PATTERN SELECT SWITCH ASSY – INTEGRATION RELAY)

Instrument Panel J/B Assy

Vehicle Front Side:



(a) Connect the connector of pattern select switch (ECT SNOW switch).

(b) Disconnect the instrument panel J/B assy (integration relay) connector.

(c) Measure the resistance between terminal SNOW of instrument panel J/B assy (integration relay) and body ground.

Standard:

Switch condition	Tester connection	Specified condition
Press continuously Pattern select switch	DA–14 (SNOW) – Body ground	Below 1 Ω
Release Pattern select switch	DA–14 (SNOW) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page xx–xxx)

05C94–02

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

(1) When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to the OBD scan tool complying with ISO 15031–4 or hand–held tester, and read off various data output from the vehicle's ECM.

(2) Euro–OBD regulations require that the vehicle's on–board computer illuminates the Check Engine Warning Light (Malfunction Indicator Lamp)/CHK ENG (MIL) on the instrument panel when the computer detects a malfunction in the emission control system/components or in the driving system components which affect vehicle emissions, or a malfunction in the computer. In addition to CHK ENG (MIL) illuminating when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO15031–6 are recorded in the ECM memory.

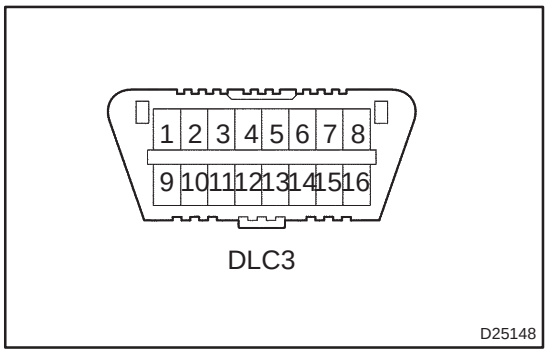
If the malfunction does not occur in 3–trip, the CHK ENG (MIL) goes off but the DTCs remain recorded in the ECM memory.

(3) To check the DTCs, connect the OBD scan tool or hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data (For operating instructions, see the OBD scan tool's instruction book.).

(4) DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–931).

(5) The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic (*) to prevent erroneous detection, and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, technicians can cause the CHK ENG (MIL) to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 2).

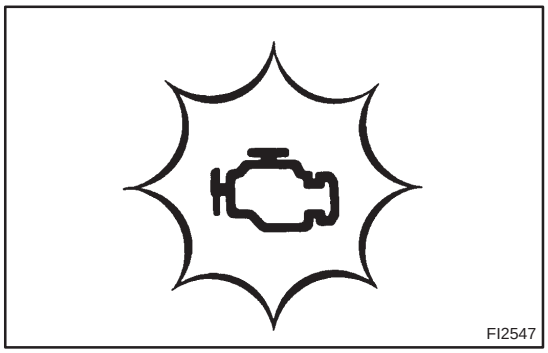
(6) *2 trip detection logic:
When a malfunction is first detected, the malfunction code is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG (MIL) to illumenate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and the 2nd trip.).



(b) Inspect the DLC3.
(1) The vehicle's ECM uses ISO 9141–2 (Euro–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–3 and matches the ISO 9141–2 format.

Terminal No.	Connection	Voltage or Resistance	Condition
7	Bus ⊕ Line	Pulse generation	During communication
4	Chassis Ground	↔ Body Ground / 1 Ω or less	Always
16	Battery Positive	↔ Body Ground / 9 to 14 V	Always

HINT:
If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of hand–held tester to DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.
- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. INSPECT DIAGNOSIS (NORMAL MODE)

(a) Check the MIL.
(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the MIL does not come on, troubleshoot the combination meter.

(2) When the engine is started, the MIL should go off. If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC, using the hand–held tester.

NOTICE:

Hand–held tester only:

When the diagnostic system is switched from normal mode to check (test) mode, it erases all DTCs and freeze frame data recorded in normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.

(1) Use the hand–held tester to check the DTCs and instructions, see the hand–held tester instruction book.

(2) See page 05–931 to confirm the details of the DTCs.

(c) Clear the DTC.

(1) When using the hand–held tester:
The following operation will erase the DTC and freeze frame data. Operate the hand–held tester to erase the codes.

(2) When not using the hand–held tester:
Remove the EFI fuse from engine room J/B for 60 seconds or more.

3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has high sensing ability to detect malfunctions.

Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

(a) Check the DTC.

(1) Check the initial conditions.

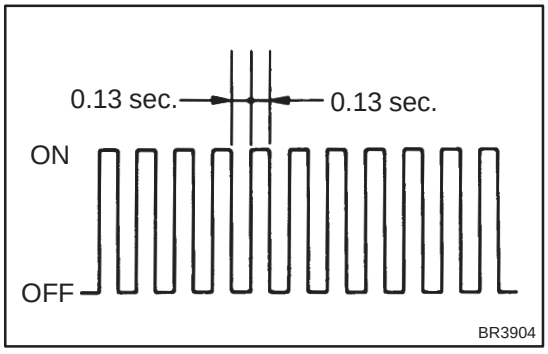
- Battery voltage 11 V or more
- Throttle valve fully closed
- Shift lever in P range
- Air conditioning switched OFF

(2) Turn the ignition switch OFF.

(3) Prepare the hand–held tester.

(4) Connect the hand–held tester to DLC3.

(5) Turn the ignition switch ON and switch the hand–held tester ON.



(6) Switch the hand–held tester from Normal mode to Check mode (Check that the MIL flashes).

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(7) Start the engine (MIL goes out after the engine starts).

(8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Take care not to turn the ignition switch OFF, as turning it off switches the diagnosis system from Check mode to Normal mode, which all DTCs etc. are erased.

(10) After checking the DTC, inspect the applicable circuit.

(b) Clear the DTC.

When using the hand–held tester:

The following operation will erase the DTC and freeze frame data. Operate the hand–held tester to erase the codes.

(c) Clear the DTC.

When not using the hand–held tester:

Remove the EFI fuse from engine room J/B for 10 seconds or more.

4. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one of the methods to shorten the work time.

(a) Warm up the engine.

(b) Turn the ignition switch OFF.

(c) Connect the hand–held tester to the DLC3.

(d) Turn the ignition switch ON.

(e) According to the display on tester, read the ”DATA LIST”.

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	←
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th (O/D)	Shift lever Range is; • D: 1st, 2nd, 3rd or 4th (O/D)	←
SPD (NC)	Counter Gear Speed display: 50 r/min	D Range is warmed up,4th (O/D); Same as input shaft speed	←
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	←
KICKDOWN SW	Kick down SW Status/ ON or OFF	• Accelerator Pedal is depressed: ON • Accelerator Pedal is released: OFF	←

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever range is; P or N: ON Except P or N: OFF	The shift lever range and these values are different, there are failures of the PNP switch or shift cable adjustment.
REVERSE	PNP SW Status/ ON or OFF	Shift lever range is; R: ON Except R: OFF	
DRIVE	PNP SW Status/ ON or OFF	Shift lever range is; D and 3: ON Except D and 3: OFF	
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: –40°C (–40°F) max.: 215°C (419°F)	80°C (176°F) (After Stall Test)	If the value is "–40°C (–40°F)" or "215°C (419°F)", ATF temp. sensor circuit is opened or shorted.

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one of the methods to shorten the work time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) According to the display on tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
LINE PRESS UP	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [Others] ON: Line pressure up. OFF: No action (normal operation)	–
LOCK UP	[Test Details] Control the shift solenoid DSL to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 60 km/h (37 mph) or more	Possible to check the DSL operation.
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift range by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid values.

6. PROBLEM SYMPTOM CONFIRMATION

(a) Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

7. ROAD TEST

NOTICE:

Conduct the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).

(a) D range test

Shift into the D range and fully depress the accelerator pedal and check the following points:

(1) Check up–shift operation.

Check to see that 1 → 2, 2 → 3 and 3 → O/D up–shift take place, and that the shift points conform to the automatic shift schedule (See page 03–45).

HINT:

- O/D Gear Up–shift Prohibition Control (1. Water temp. is 60˚C (140˚F) or less. 2. If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.)
- O/D Gear Lock–up Prohibition Control (1. Brake pedal is depressed. 2. Water temp. is 60˚C (140˚F) or lower)

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shift.

(3) Check for abnormal noise and vibration.

Run in D range lock–up or O/D gear and check for abnormal noise and vibration.

HINT:

The check for the cause of abnormal noise and vibration must be done very thoroughly as it could also be sure to loss of balance in the differential, torque converter, etc.

(4) Check kick–down operation.

While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated in the automatic shift schedule (See page 03–45).

(5) Check for abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.

- Drive in D range O/D gear, at a steady speed (lock–up ON) of about 60 km/h (37 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(b) S range test

Shift to the S range, depress the accelerator pedal and check the following points:

Shift operations.

- Shifting the shift lever to ”+” or ”–” changes the shift range on the combination meter.

HINT:

Manual shift prohibition control is performed when:

- The ATF temperature is low.
- Down–shifting causes engine overrun.
- Down–shifting is required continuously. (Down–shifting to 1st gear may not be performed.)

(c) R range test

Shift into the R range and fully depress the accelerator pedal and check for slipping.

CAUTION:

Before conducting this test, ensure that the test area is free from people and obstruction.

(d) P range test

Stop the vehicle on a grade (more than 5˚) and after shifting into the P range, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

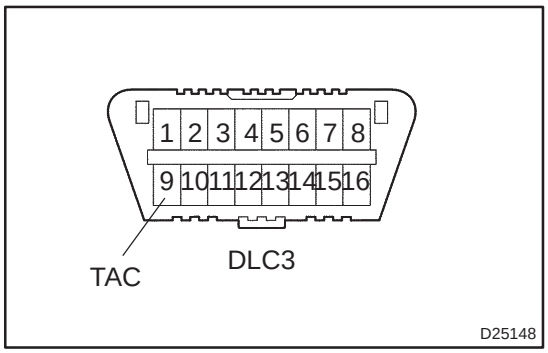
8. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R ranges.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Do not continuously run this test for longer than 5 seconds.**
- **To ensure safety, do this test in a wide, clear level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**



(1) Chock the 4 wheels.

(2) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

SST 09843–18030

(3) Fully apply the parking brake.

(4) Keep your left foot pressing firmly on the brake pedal.

(5) Start the engine.

(6) Shift into the D range. Press all the way down on the accelerator pedal with your right foot.

(7) Quickly read the stall speed at this time.

Stall speed: 2,550 ± 150 rpm

(8) Do the same test in the R range.

Stall speed: 2,550 ± 150 rpm

Evaluation:

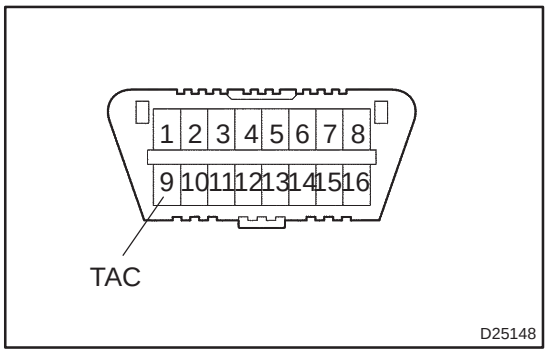
Problem	Possible cause
(a) Stall speed low in D and R ranges	• Engine output may be insufficient • Stator one–way clutch not operating properly HINT: If more than 600 rpm below the specified value, the torque converter could be faulty.
(b) Stall speed high in D range	• Line pressure too low • Forward clutch slipping • No. 2 one–way clutch not operating properly • U/D clutch slipping
(c) Stall speed high in R range	• Line pressure too low • Direct clutch slipping • 1st and reverse brake slipping • U/D clutch slipping
(d) Stall speed high in D and R ranges	• Line pressure too low • Improper fluid level • U/D one–way clutch not operating properly

(b) Measure the time lag.

(1) When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the direct clutch, forward clutch, and 1st and reverse brake.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**



(2) Chock the 4 wheels.

(3) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

SST 09843–18030

(4) Start engine and check idle speed.

Idle speed: 650 ± 50 rpm (In N range and A/C OFF)

(5) Shift the lever from N to D range. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag: N → D less than 1.2 seconds

(6) In the same way, measure the time lag for N → R.

Time lag: N → R less than 1.5 seconds

Evaluation (If N → D or N → R time lag is longer than the specified):

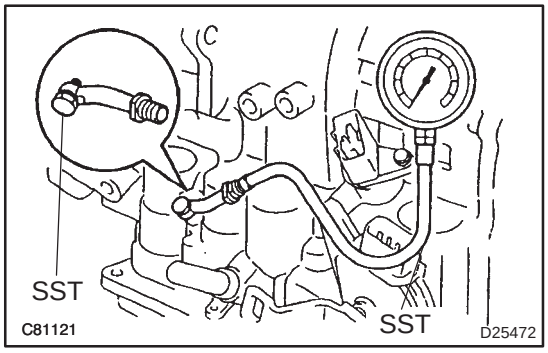
Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • U/D one–way clutch not operating properly
N → R time lag is longer	• Line pressure too low • Direct clutch worn • 1st and reverse brake worn • U/D one–way clutch not operating properly

9. HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **Do the test at normal operation ATF temperature 50 to 80˚C (122 to 176˚F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stopper outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**



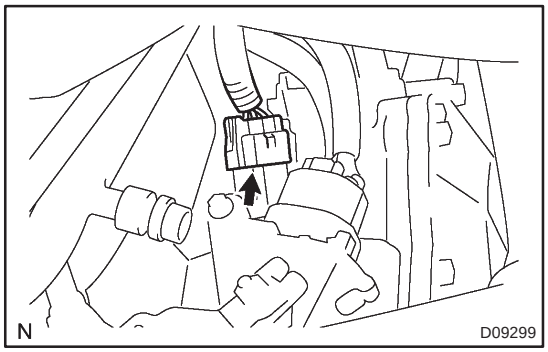
(1) Warm up the ATF.
(2) Remove the test plug on the rear side of the transaxle case and connect SST.
SST 09992–00095 (09992– 00231, 09992–00271)
(3) Fully apply the parking brake and chock the 4 wheels.
(4) Connect the hand–held tester to DLC3.
(5) Start the engine and check idling speed.
(6) Keep your left foot pressing firmly on the brake pedal and shift into D range.
(7) Measure the line pressure when the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(9) In the same way, do the test in R range.

Specified line pressure:

Condition	D range kPa (kgf / cm^2, psi)	R range kPa (kgf / cm^2, psi)
Idling	372 to 412 (3.8 to 4.2, 54 to 60)	672 to 742 (6.9 to 7.6, 98 to 108)
Stall	931 to 1,031 (9.5 to 10.5, 135 to 150)	1,768 to 1,968 (18.0 to 20.1, 256 to 285)

Evaluation:

Problem	Possible cause
If the measured values at all ranges are higher	• Shift solenoid valve SLT defective • Regulator valve detective
If the measured values at all ranges are lower	• Shift solenoid valve SLT defective • Regulator valve detective • Oil pump defective
If pressure is low in the D range only	• D range circuit fluid leak • Forward clutch defective
If pressure is low in the R range only	• R range circuit fluid leak • Direct clutch defective • 1st and reverse brake defective



10. MANUAL SHIFTING TEST

HINT:

By this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transaxle.

(a) Disconnect the transmission wire.

(b) Inspect the manual driving operation.

Check that the shift and gear ranges correspond to the table below.

While driving, shift through the D range.

Check that the gear change corresponds to the shift range.

Shift range	Gear position
D	3rd
R	Reverse
P	Pawl Lock

HINT:

If the gear positions of the D are difficult to distinguish, do the above road test.

If any abnormality is found in the above test, the problem is in the transaxle itself.

(c) Connect the transmission wire.

(d) Cancel out the DTC.

11. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

NOTICE:

Hand–held tester only

(a) Turn the ignition switch to OFF.

(b) Connect the hand–held tester to the DLC3.

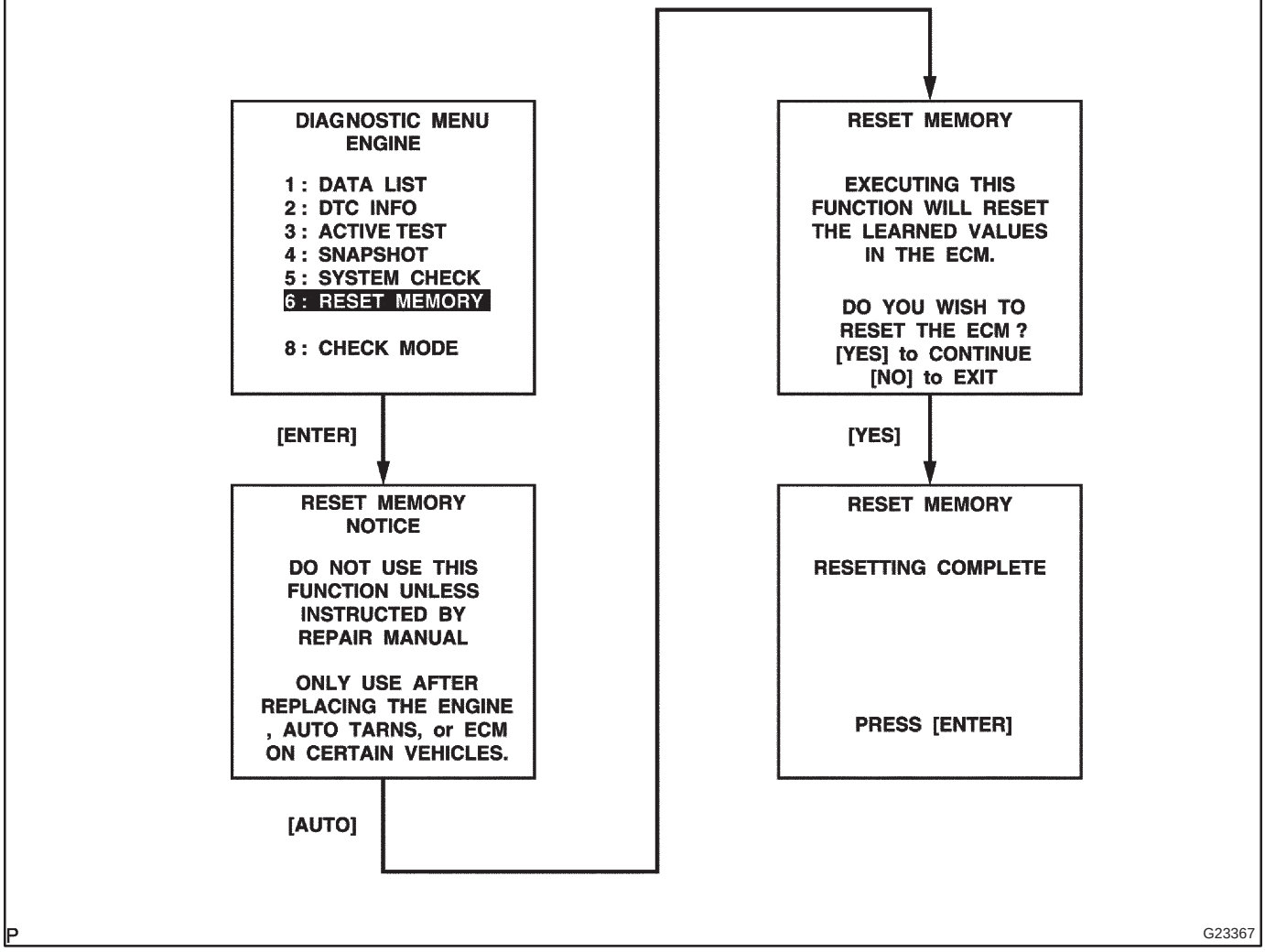
(c) Turn the ignition switch to ON.

(d) Perform the reset memory procedure from the ENGINE menu.

CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

Tester menu flow:



05CBY–01

PRECAUTION

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

HINT:

Initialization can not be completed by only removing the battery.

0567W–12

PROBLEM SYMPTOMS TABLE

HINT:

If a normal code is displayed during the DTC check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for trouble-shooting.

The Matrix Chart is divided into 3 chapters.

- If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.
- If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM.

CHAPTER 1: ELECTRONIC CIRCUIT MATRIX CHART

Symptom	Suspect Area	See page
No up–shift (A particular gear, from 1st to O/D gear, is not up–shifted)	ECM	01–32
No down–shift (A particular gear, from O/D to 1st gear, is not down–shifted)	ECM	01–32
No lock–up or No lock–up off	1. Stop light switch circuit 2. Engine coolant temp. sensor circuit 3. Throttle position sensor circuit 4. ECM	05–947 05–309 05–309 01–32
Shift point too high or too low	ECM	01–32
No gear change by shifting into ”+” or ”–” while the shift lever is in the Sposition	1. Transmission control switch circuit 2. ECM	05–972 01–32
Up–shift to O/D from 3rd while engine is cold	1. Engine coolant temp. sensor circuit 2. ATF temp. sensor circuit 3. ECM	05–309 05–941 05–943 01–32
Harsh engagement (N → D)	ECM	01–32
Harsh engagement (Lock–up)	ECM	01–32
Harsh engagement (Any driving range)	ECM	01–32
Poor acceleration	ECM	01–32
Engine stalls when starting off or stopping	ECM	01–32
No kick–down	1. Kick–down switch circuit 2. ECM	05–970 01–32

Chapter 2: On–vehicle Repair
(★: U241E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM840U)

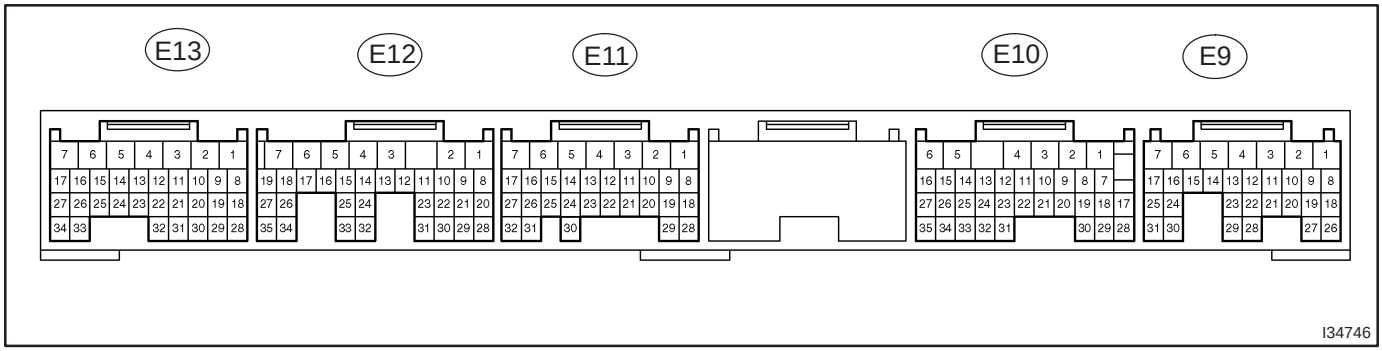
Symptom	Suspect Area	See page
Vehicle does not move in any forward range or reverse range	1. Manual valve 2. Primary regulator valve 3. Off–vehicle repair matrix chart	★ ★ –
Vehicle does not move in R range	Off–vehicle repair matrix chart	–
No up–shift (1st → 2nd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (2nd → 3rd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (3rd → O/D)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No down–shift (O/D → 3rd)	Valve body assy	★
No down–shift (3rd → 2nd)	Valve body assy	★
No down–shift (2nd → 1st)	Valve body assy	★
No lock–up or No lock–up off	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Off–vehicle repair matrix chart 3. Valve body assy	★ – ★
Harsh engagement (N → R)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (Lock–up)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (2nd → 3rd)	Valve body assy	★
Harsh engagement (3rd → O/D)	Valve body assy	★
Harsh engagement (O/D → 3rd)	Valve body assy	★
Slip or shudder (Forward and reverse)	1. Oil strainer 2. Off–vehicle repair matrix chart	40–47 –
No kick–down	Valve body assy	★

Chapter 3: Off–vehicle Repair
(★: U241E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM840U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward range or reverse range	1. Front and rear planetary gear 2. U/D planetary gear 3. U/D one–way clutch (F_2) 4. Forward clutch (C_1) 5. U/D brake (B_3)	★ ★ ★ ★ ★
Vehicle does not move in R range	1. Front and rear planetary gear unit 2. U/D planetary gear 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. 1st and reverse brake (B_2)	★ ★ ★ ★ ★
No up–shift (1st → 2nd)	1. No.1 one–way clutch (F_1) 2. 2nd brake (B_1)	★ ★
No up–shift (2nd → 3rd)	Direct clutch (C_2)	★
No up–shift (3rd → O/D)	U/D clutch (C_3)	★
No lock–up or No lock–up off	Torque converter clutch	40–37
Harsh engagement (N → D)	1. Forward clutch (C_1) 2. U/D one–way clutch (F_2) 3. No.1 one–way clutch (F_1)	★ ★ ★
Harsh engagement (N → R)	1. Direct clutch (C_2) 2. 1st and reverse brake (B_2)	★ ★
Harsh engagement (Lock–up)	Torque converter clutch	40–37
Slip or shudder (Forward position: After warm–up)	1. Torque converter clutch 2. Forward clutch (C_1) 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. No.1 one–way clutch (F_1) 6. U/D one–way clutch (F_2)	40–37 ★ ★ ★ ★ ★
Slip or shudder (R range)	1. Direct clutch (C_2) 2. 1st and reverse brake (B_2)	★ ★
Slip or shudder (1st)	No.1 one–way clutch (F_1)	★
Slip or shudder (2nd)	1. U/D one–way clutch (F_2) 2. 2nd brake (B_1)	★ ★
Slip or shudder (3rd)	Direct clutch (C_2)	★
Slip or shudder (O/D)	U/D clutch (C_3)	★
No engine braking (1st – 3rd: D range)	U/D brake (B_3)	★
No engine braking (1st: L range)	1st and reverse brake (B_2)	★
No engine braking (2nd: 2 range)	2nd brake (B_1)	★
Poor acceleration (All range)	1. Torque converter clutch 2. U/D planetary gear	40–37 ★
Poor acceleration (O/D)	1. U/D clutch (C_3) 2. U/D planetary gear	★ ★
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	40–37

05C95–01

TERMINALS OF ECM



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
S4 (E12–10) – E1 (E11–1)	L – BR	IG switch ON	Below 1
		O/D gear	10 – 14
		Except O/D gear	Below 1
DSL (E12–11) – E1 (E11–1)	L–B – BR	IG switch ON	Below 1
		Vehicle driving under lock–up range	10 – 14
SLT+ (E12–13) – SLT– (E12–12)	P–L – P	IG switch ON	10 – 14
SL2+ (E12–17) – SL2– (E12–16)	R – R–B	IG switch ON	Below 1
		1st or 2nd gear	10 – 14
		3rd or O/D gear	Below 1
SL1+ (E12–19) – SL1– (E12–18)	Y – Y–B	IG switch ON	10 – 14
		1st gear	10 – 14
		Except 1st gear	Below 1
NC+ (E12–26) – NC– (E12–34)	LG – LG–B	Engine is running	Below 1 and 4 – 5
NT+ (E12–27) – NT– (E12–35)	B–O – B	Engine is running	Below 1 and 4 – 5
THO (E12–32) – E2 (E13–28)	V – BR	ATF temperature: 115 °C (239 °F) or more	Below 1.5
D (E10–10) – E1 (E11–1)	LG–B – BR	IG switch ON and Shift lever D range	10 – 14
		IG switch ON and Shift lever other than D range	Below 1
R (E10–11) – E1 (E11–1)	R–Y – BR	IG switch ON and Shift lever R range	10 – 14
		IG switch ON and Shift lever other than R range	Below 1
SPD (E10–17) – E1 (E11–1)	V–W – BR	IG switch ON	4.5 – 5.5
SPT1 (E10–20) – E1 (E11–1)	L – BR	IG switch ON and Shift lever S position	7.5 – 14
		IG switch ON and Shift lever except for S position	Below 1
SFTD (E10–21) – E1 (E11–1)	B – BR	IG switch ON and Shift lever S position	7.5 – 14
		IG switch ON and Shift lever "–" position (Down shift)	Below 1.5
SFTU (E10–22) – E1 (E11–1)	R – BR	IG switch ON and Shift lever S position	7.5 – 14
		IG switch ON and Shift lever "+" position (Up shift)	Below 1.5
KD*1 (E10–30) – E1 (E11–1)	W*1 ⇔ BR	IG switch ON and kick–down switch ON	Below 1
		IG switch ON and kick–down switch OFF	10 – 14

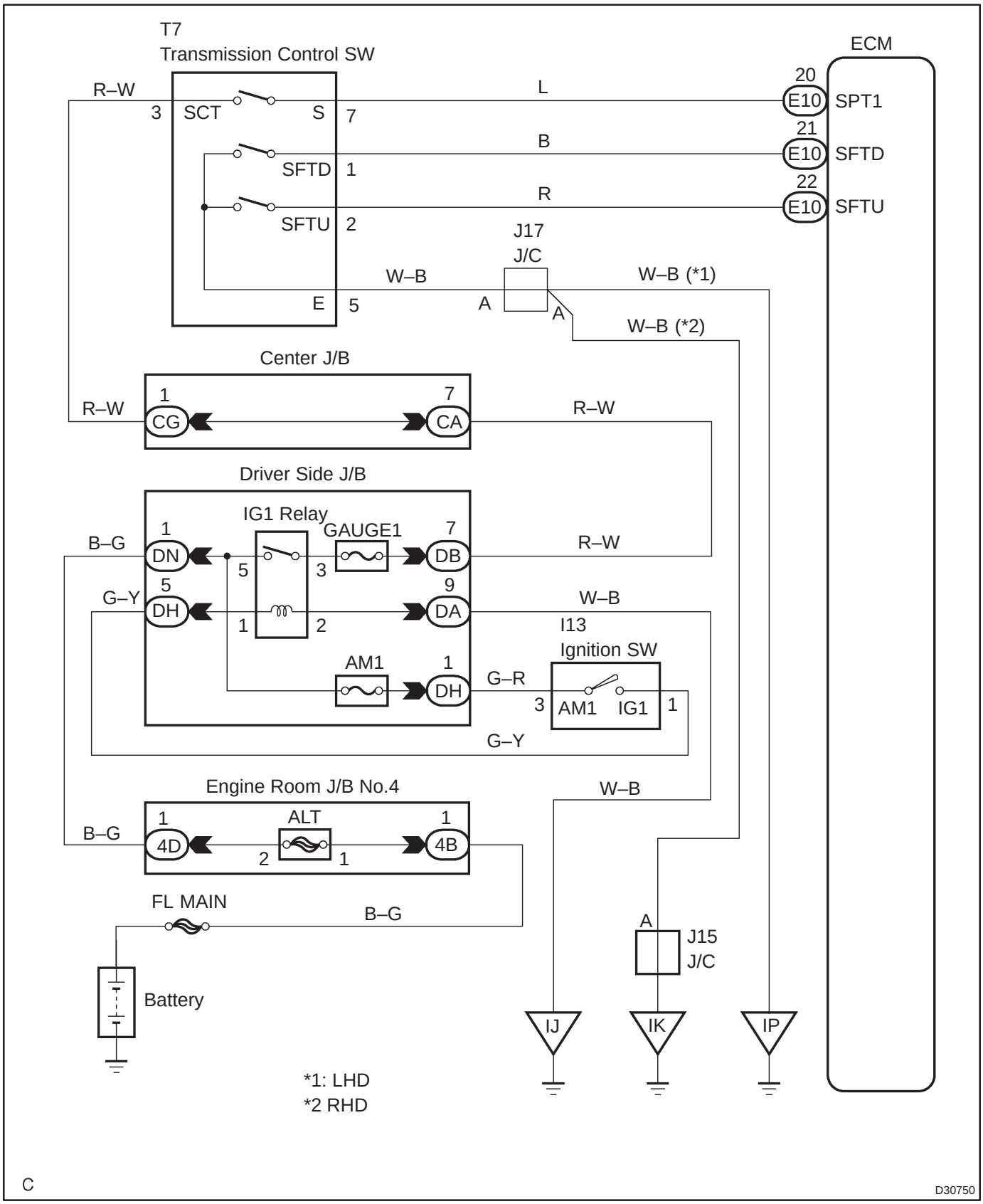
*1: LHD

TRANSMISSION CONTROL SWITCH CIRCUIT

CIRCUIT DESCRIPTION

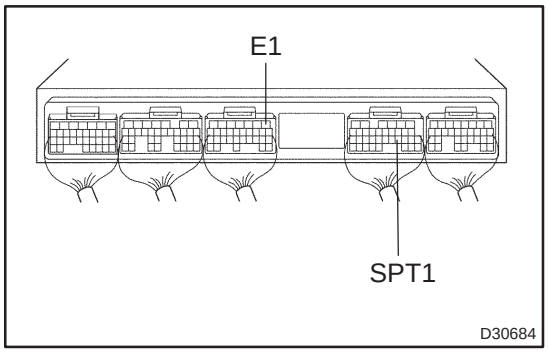
When shifting the shift lever into S position using the transmission control switch, it is possible to shift in 1 to 4 positions.
Shifting ”+” once changes up 1 shift range position, ”–” once changes down 1 shift range position respectively.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK ECM



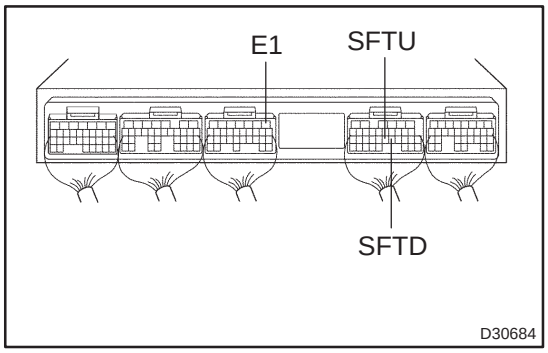
(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminals SPT1 and E1 of the ECM.
OK:

Shift range	Specified condition
Except S position	Below 1 V
S position	7.5 to 14 V

NG → **Go to step 6**

OK

2 CHECK ECM



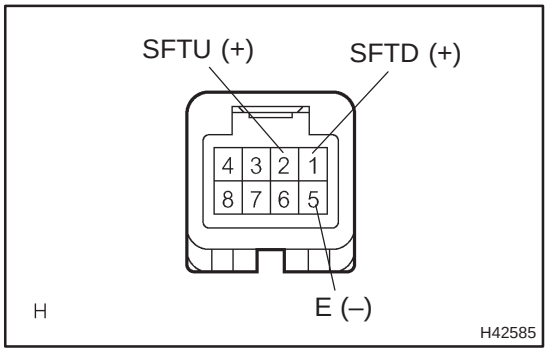
(a) Measure the voltage between terminals E1 and that SFTU as well as SFTD of the ECM.
OK:

Shift range	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E1	Below 1.5 V
S position	SFTU – E1	7.5 to 14 V
Shift to "–" (Down shift)	SFTD – E1	Below 1.5 V
S position	SFTD – E1	7.5 to 14 V

OK → **NORMAL**

NG

3 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



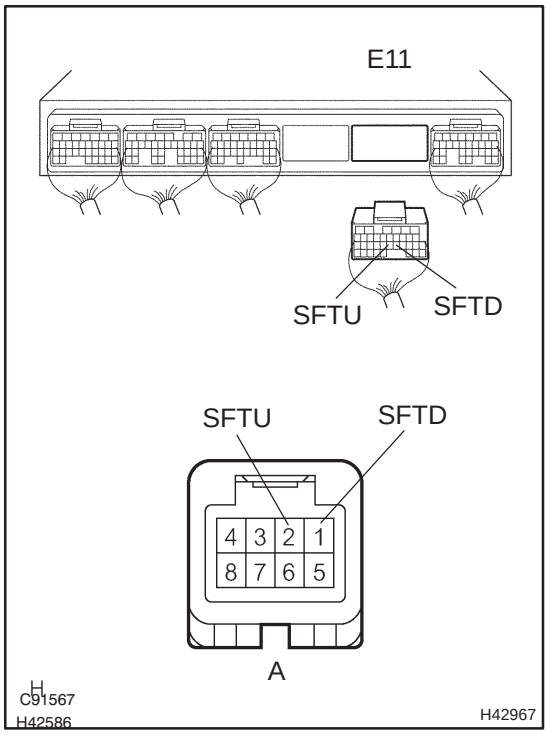
(a) Turn the ignition switch to OFF.
(b) Disconnect the transmission control switch connector.
(c) Measure the resistance between terminals E and SFTU as well as SFTD of the transmission control switch connector.
OK:

Shift range	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E	Continuity
S position	SFTU – E	No continuity
Shift to "–" (Down shift)	SFTD – E	Continuity
S position	SFTD – E	No continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

4	CHECK HARNESS AND CONNECTOR(ECM – TRANSMISSION CONTROL SWITCH)



(a) Disconnect the ECM connector.

(b) Check the continuity between ECM and transmission control switch.

OK:

Tester connection	Specified condition
SFTU (E11–22) – SFTU (A–2)	Continuity
SFTD (E11–21) – SFTD (A–1)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR(TRANSMISSION COTROL SWITCH – BODY GROUND)

(a) Check the continuity between body ground and E of the transmission control switch connector (wire harness side).

OK:

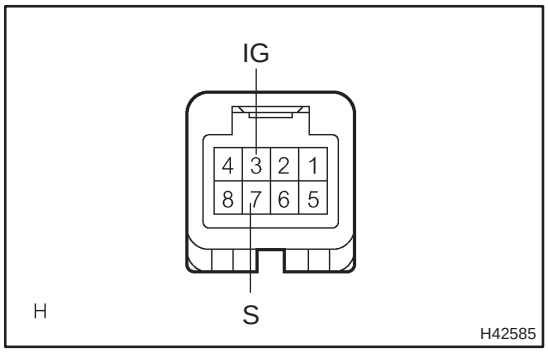
Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

6 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



(a) Turn the ignition switch to OFF.
(b) Disconnect the transmission control switch connector.
(c) Check the continuity between terminal IG and S of the transmission control switch.

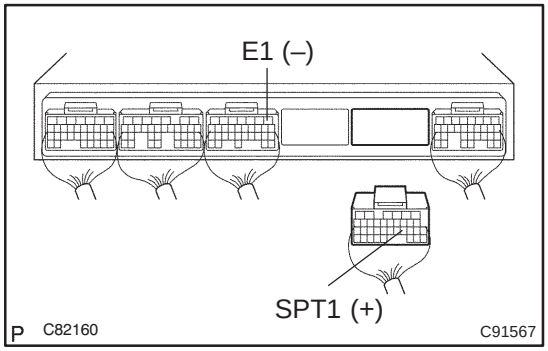
OK:

Shift range	Tester connection	Specified condition
Except S position	IG – S	No continuity
S position	IG – S	Continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

7 CHECK HARNESS AND CONNECTOR



(a) Connect the transmission control switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminal SPT1 and E1 of the ECM connector.

OK:

Shift range	Tester connection	Specified condition
Except S position	SPT1 – E1	Below 1 V
S position	SPT1 – E1	7.5 to 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

0567O–09

CUSTOMER PROBLEM ANALYSIS CHECK

Transmission Control System Check Sheet	Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move (☐ Any range ☐ Particular range)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)
	☐ No down–shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ No up–shift (S range)
	☐ No down–shift (S range)
	☐ Lock–up malfunction
	☐ Shift point too high or too low
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive range)
	☐ Slip or shudder
	☐ No kick–down
	☐ Others ( )

Check Item	MIL	☐ Normal ☐ Remains ON

DTC Check	1st Time	☐ Normal code ☐ Malfunction code (DTC)
	2nd Time	☐ Normal code ☐ Malfunction code (DTC)

0567Q–07

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.

*1 : ● ... MIL light up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *1	Memory
P0500 (05–98)	Vehicle Speed Sensor Malfunction	• Combination meter • Open or short in speed sensor circuit • Speed sensor • ECM	●	○
P0710 (05–1003)	Transmission Fluid Temperature Sensor Circuit Malfunction (ATF Temperature Sensor)	• Open or short in ATF temp. sensor circuit • Transmission wire (ATF temperature sensor) • ECM	●	○
P0711 (05–1005)	Transmission Fluid Temperature Sensor Circuit Range/Performance (ATF Temperature Sensor)		●	○
P0750 (05–1007)	Shift Solenoid "A" Malfunction (Shift Solenoid Valve S1)	• Shift solenoid valve S1 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)	●	○
P0753 (05–1010)	Shift Solenoid "A" Electrical (Shift Solenoid Valve S1)	• Open or short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM	●	○
P0755 (05–1007)	Shift Solenoid "B" Malfunction (Shift Solenoid Valve S2)	• Shift solenoid valve S2 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)	●	○
P0758 (05–1010)	Shift Solenoid "B" Electrical (Shift Solenoid Valve S2)	• Open or short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM	●	○
P0770 (05–1013)	Shift Solenoid "E" Malfunction (Shift Solenoid Valve SL)	• Shift solenoid valve SL is stuck open or closed • Valve body blocked or stuck • Shift solenoid valve SL • Torque converter clutch • Automatic transaxle (clutch, brake or gear etc.)	●	○
P0773 (05–1015)	Shift Solenoid "E" Electrical (Shift Solenoid Valve SL)	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM	●	○
P1520 (05–1018)	Stop Light Switch Circuit	• Open or short in stop light switch circuit • Stop lamp switch assy • ECM	●	○
P1725 (05–1019)	NT Revolution Sensor Circuit Malfunction (Input Turbine Speed Sensor)	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM	●	○
P1760 (05–1021)	Linear Solenoid for Line Pressure Control Circuit Malfunction (Shift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	●	○
P1780 (05–1024)	Park/Neutral Position Switch Malfunction	• Short in park/neutral position switch circuit • Park/Neutral position switch assy • ECM	●	○
P1790 (05–1027)	ST Solenoid Circuit Malfunction (Shift Solenoid Valve ST)	• Open or short in shift solenoid valve ST circuit • Shift solenoid valve ST • ECM	●	○
P1798 (05–1030)	SB Solenoid Circuit Malfunction (Shift Solenoid Valve SB)	• Open or short in shift solenoid valve SB circuit • Shift solenoid valve SB • ECM	●	○

HINT:
This DTC may be output when the clutch, brake and gear components, etc. inside the automatic transmission are damaged.

ELECTRONIC CONTROLLED AUTOMATIC TRANSAXLE [ECT] (U341E)

0567N–10

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

The ECM of this system is connected to the multiplex communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the multiplex communication system.

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–984)

3	Connect the hand–held tester to DLC3

4	Check and Clear DTC and Freeze Frame Data (See page 05–985)

5	Visual Inspection

6	Setting the Check Mode Diagnosis (See page 05–985)

7	Problem Symptom Confirmation

- Symptom does not occur: Go to step 8
- Symptom occur: Go to step 9

8	Symptom Simulation (See page 01–22)

9	DTC Check (See page 05–996)

- DTC is not output: Go to step 10
- DTC is output: Go to step 17

10	Basic Inspection (See page 40–2, 40–8 and 40–69)

NG → Go to step 19

OK

11	Mechanical System Test (See page 05–985)

NG → Go to step 16

OK

12	Manual Shifting Test (See page 05–985)

NG → Go to step 14

OK

13	Problem Symptoms Table Chapter 1 (See page 05–1000)

NG → Go to step 18

OK

14	Problem Symptoms Table Chapter 2 (See page 05–1000)

NG → Go to step 16

OK

15	Problem Symptoms Table Chapter 3 (See page 05–1000)

NG

16	Part Inspection

→ Go to step 19

17	DTC Chart (See page 05–996)

18	Circuit Inspection (See page 05–1003)

19	Identification of Problem

20	Repair

21	Confirmation Test

End

KICK DOWN SWITCH CIRCUIT

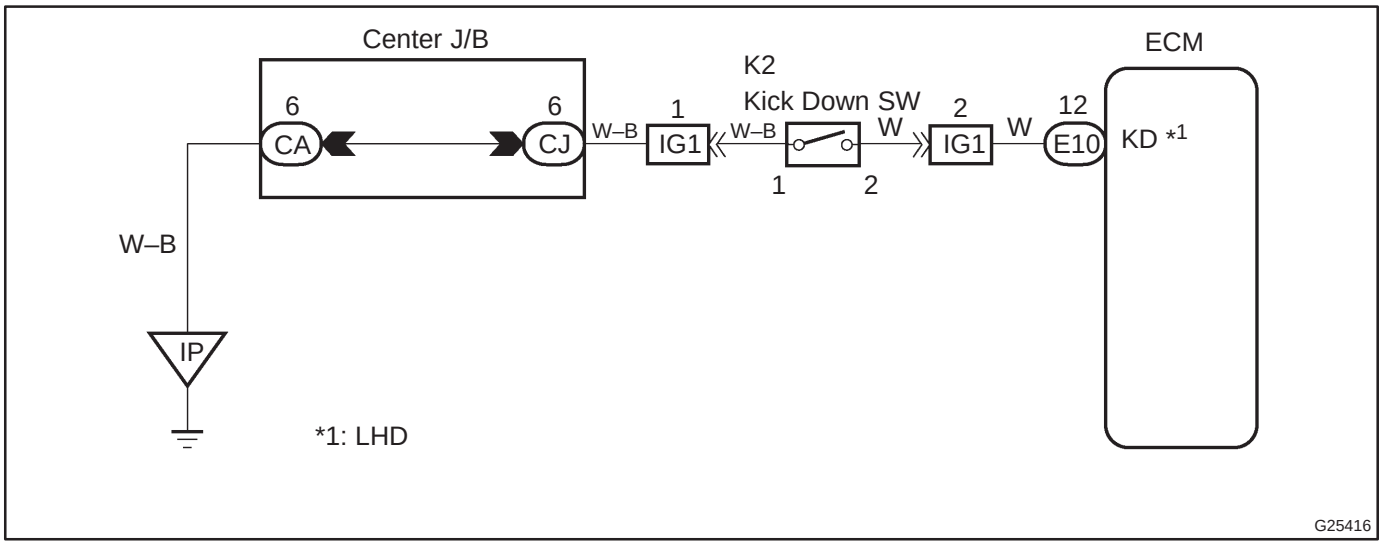
CIRCUIT DESCRIPTION

The kick–down switch is turned ON when the accelerator pedal is depressed to the full throttle and sends signals to ECM.

When the kick–down switch is turned ON, the ECM controls gear shifting according to the programmed shift diagrams.

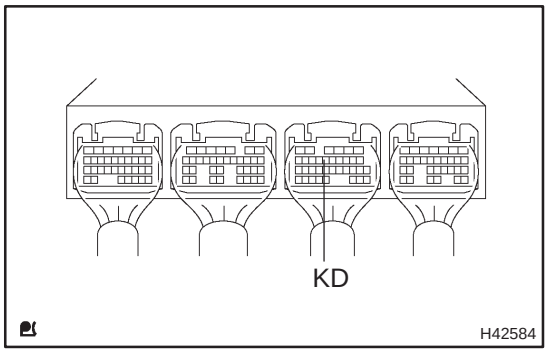
If a short circuit develops in the kick–down switch, the ECM disregards the kick–down signals and controls shifting at the normal shift points.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TERMINAL VOLTAGE



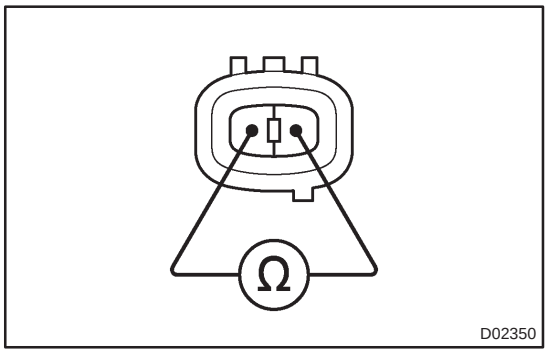
(a) Turn the ignition switch ON.
(b) Measure voltage between terminal KD of ECM and body ground when accelerator pedal is fully depressed or not.
OK:

Accelerator pedal	Voltage
Fully depressed (Kick–down switch is ON)	Below 1 V
Released (Kick–down switch is OFF)	10 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	INSPECT KICK DOWN SWITCH



(a) Disconnect the kick–down switch connector.
(b) Check continuity between terminals of the kick–down switch connector when kick–down switch is ON and OFF.
OK:

Kick–down switch	Continuity
ON	Continuity
OFF	No continuity

NG → **REPLACE KICK DOWN SWITCH**

OK

3	CHECK HARNESS AND CONNECTOR

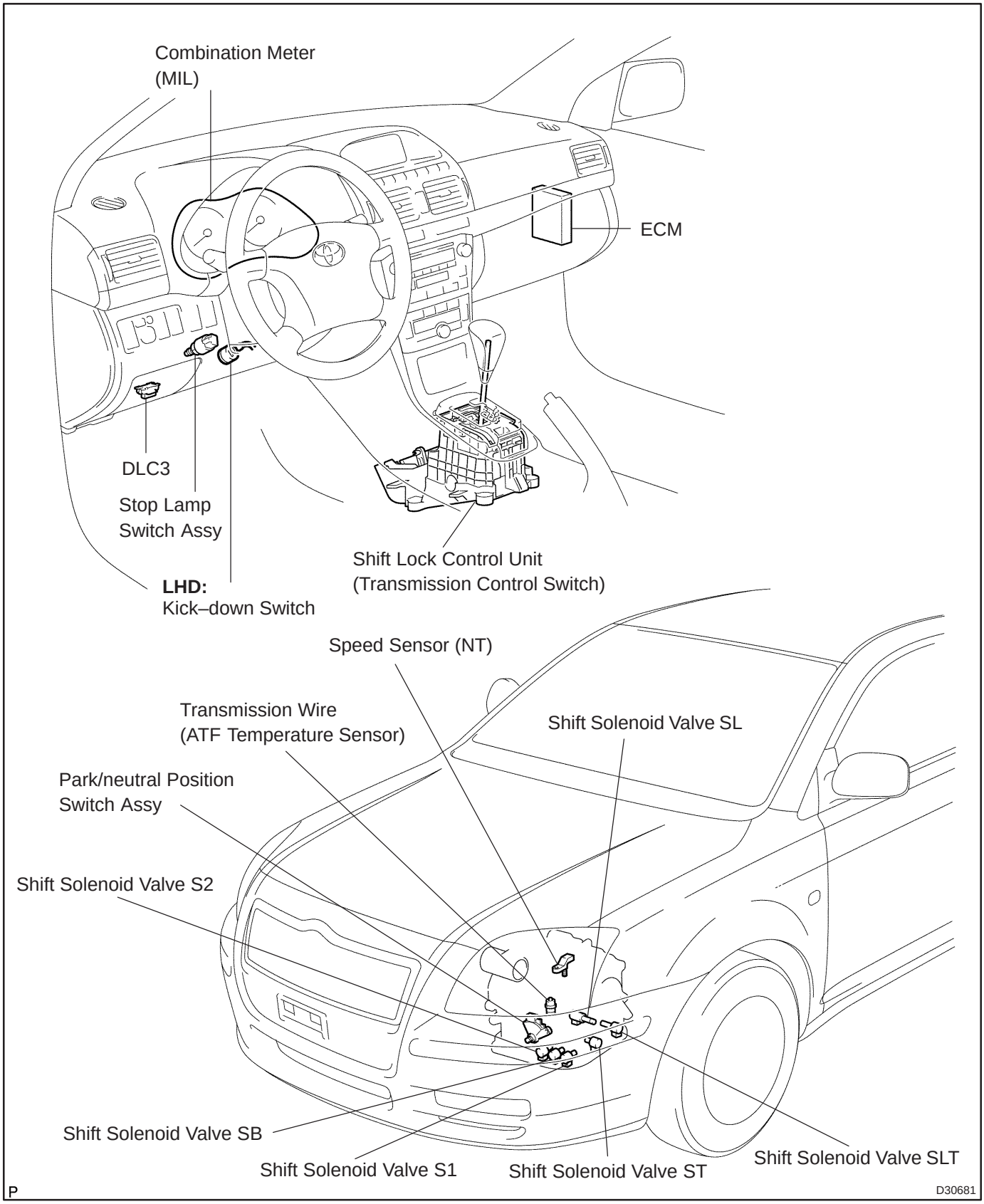
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

0567R–10

LOCATION



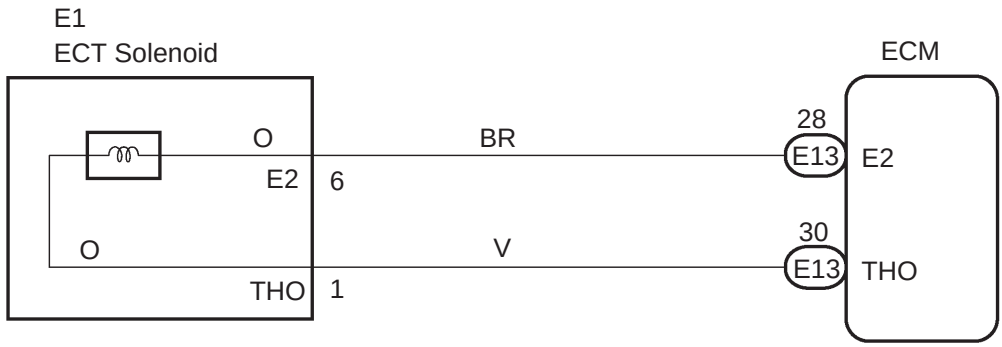
DTC	P0710	TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

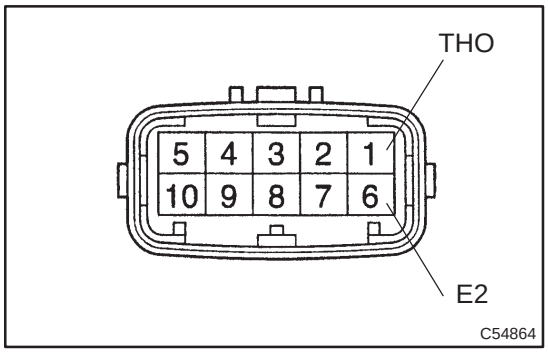
DTC No.	DTC Detection Condition	Trouble Area
P0710	Either (a) or (b) is detected for 0.5 sec. or more: (1 trip detection logic) (c) Temp. sensor resistance is less than 79 Ω (d) After engine has been operating for 15 min. or more, resistance at temp. sensor is more than 156 kΩ	• Open or short in ATF temp. sensor circuit • Transmission wire (ATF temperature sensor) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



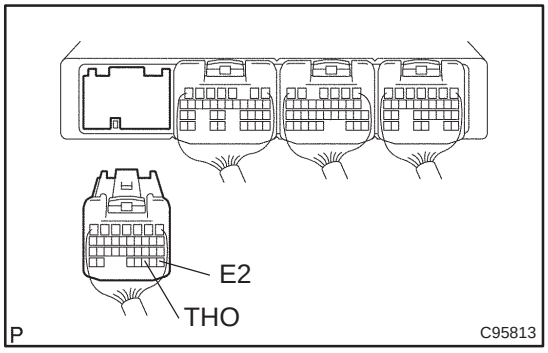
(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminals THO and E2.
OK:
Resistance: 79 Ω to 156 kΩ
(c) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals THO and E2.
OK:
Resistance: 79 Ω to 156 kΩ
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0711	TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

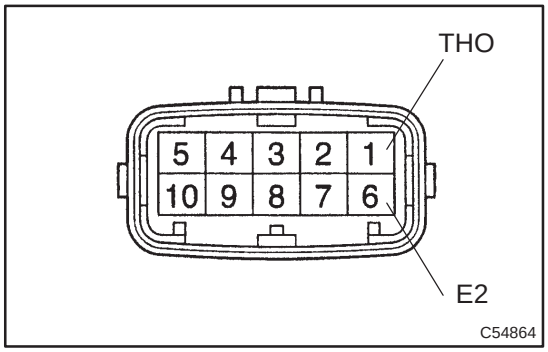
DTC No.	DTC Detection Condition	Trouble Area
P0711	Both (a) and (b) are detected: (2–trip detection logic) (a) After 12 sec. of engine start, temp. of atmosphere and that of engine coolant is more than –10°C (b) After normal driving for over 20 min. and 10 km, ATF temp. is less than 10°C	• Open or short in ATF temp. sensor circuit • Transmission wire (ATF temperature sensor) • ECM

WIRING DIAGRAM

See page 05–1003.

INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminals THO and E2.

OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(c) Check the continuity between the wire harness side connectors.

OK:

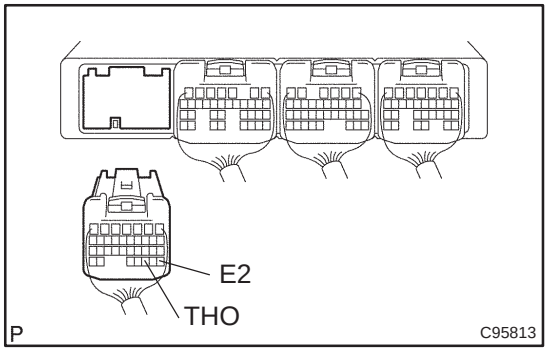
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals THO and E2.
OK:

Temperature: °C (°F)	Resistance: kΩ
10 (50)	6.4
110 (230)	0.2

(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for a short):

Symbols	Specified condition
THO – Body ground	No continuity
E2 – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P0750	SHIFT SOLENOID ”A” MALFUNCTION (SHIFT SOLENOID VALVE S1)

DTC	P0755	SHIFT SOLENOID ”B” MALFUNCTION (SHIFT SOLENOID VALVE S2)

SYSTEM DESCRIPTION

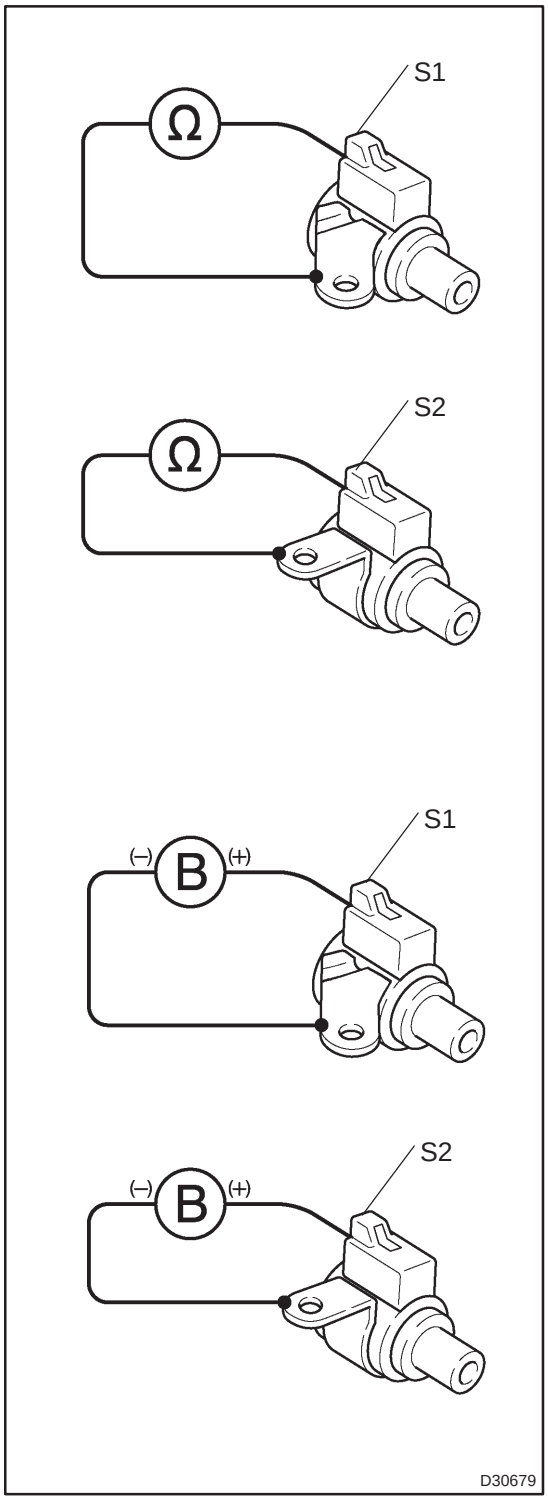
The ECM uses signals from the vehicle speed sensor and speed sensor NT to detect the actual gear position (1st, 2nd, 3rd or O/D gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect the mechanical trouble of the shift solenoid valves, the valve body or automatic transaxle (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0750	The gear required by the ECM does not match the actual gear when driving (2–trip detection logic)	• Shift solenoid valve S1 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)
P0755		• Shift solenoid valve S2 is stuck open or closed • Valve body is blocked up or stuck • Automatic transaxle (clutch, brake or gear etc.)

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(S1/S2)



(a) Remove the shift solenoid valve S1/S2.

(b) Measure the resistance between the solenoid connector and the solenoid valve body.

OK:

Resistance: 11 to 15 Ω at 20˚C (68˚F)

(c) Connect the positive (+) lead to the terminal of solenoid valve connector and the negative (–) lead to the solenoid valve body.

OK:

The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(S1/S2)**

OK

2	**INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table)**

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSY

DTC	P0753	SHIFT SOLENOID ”A” ELECTRICAL (SHIFT SOLENOID VALVE S1)

DTC	P0758	SHIFT SOLENOID ”B” ELECTRICAL (SHIFT SOLENOID VALVE S2)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF operation of the shift solenoid valves S1 and S2 controlled by ECM. If an open or short circuit occurs in either of the solenoid valves, the ECM controls the remaining normal solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

Fail safe function:

If either of the solenoid valve circuits develops an open or short, the ECM turns the other solenoid valve ON and OFF to shift to the gear positions shown in the table below. The ECM also turns the shift solenoid valve ST OFF at the same time. If both solenoids malfunction, hydraulic control cannot be performed electronically and must be done manually.

Manual shifting as shown in the above table must be done (In the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

Range	NORMAL			SHIFT SOLENOID VALVE S1 MALFUNCTIONING			SHIFT SOLENOID VALVE S2 MALFUNCTIONING			BOTH SHIFT SOLENOID VALVES MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	S1	S2		S1	S2		S1	S2		
D	ON	ON	1st	X	OFF	3rd	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd
	OFF	OFF	3rd	X	OFF	3rd	OFF	X	3rd	3rd
	OFF	ON	O/D	X	ON	O/D	OFF	X	3rd	3rd
2 (S range)	ON	ON	1st	X	OFF	3rd	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd
	OFF	OFF	3rd	X	OFF	3rd	OFF	X	3rd	3rd
1 (S range)	ON	ON	1st	X	OFF	O/D	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd

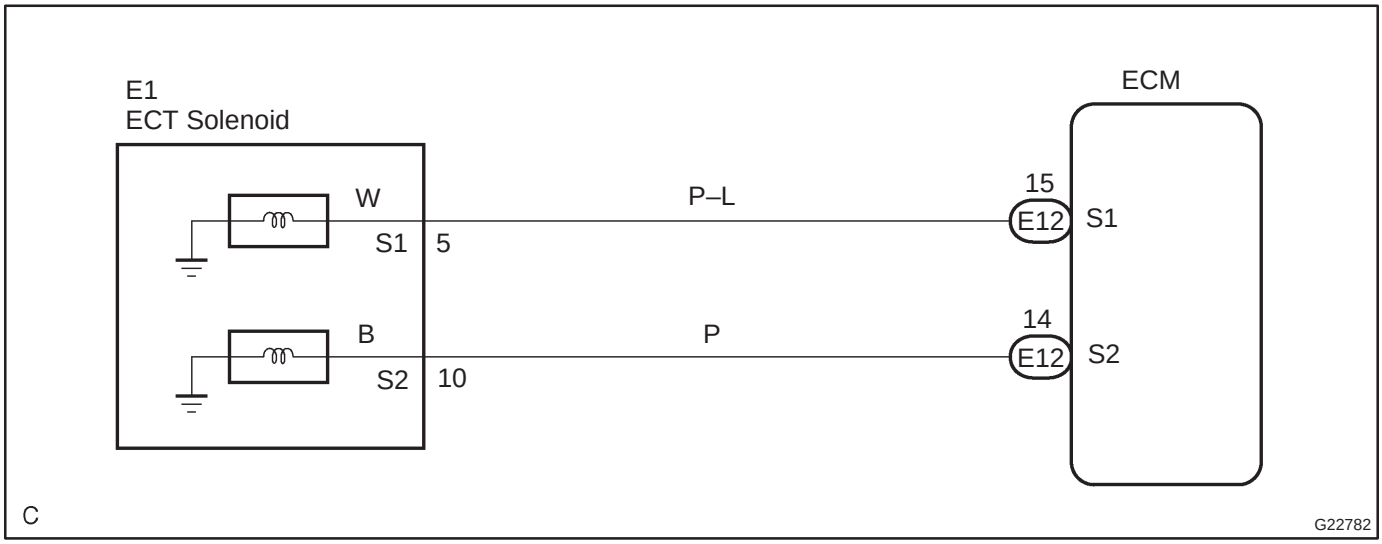
X: Malfunctions

DTC No.	DTC Detection Condition	Trouble Area
P0753 P0758	ECM checks for an open or short circuit in shift solenoid valve S1 or S2 circuit when it changes ECM records DTC P0753 or P0758 if condition (a) or (b) is detected: (a) When solenoid is energized, solenoid resistance is 8 Ω or less and it is counted (b) When solenoid is not energized, solenoid resistance is 100 kΩ or more and it is counted	• Open or short in shift solenoid valve S1/S2 circuit • Shift solenoid valve S1/S2 • ECM

HINT:

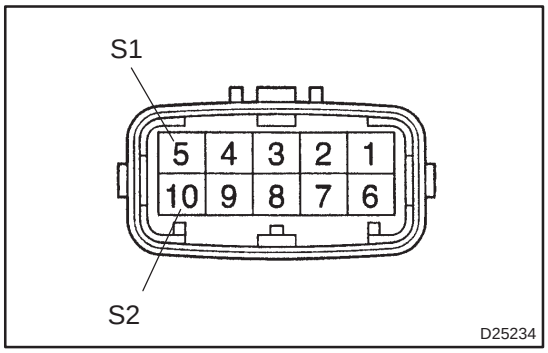
Check the shift solenoid valve S1 when DTC P0753 is output and check the shift solenoid valve S2 when DTC P0758 is output.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(S1/S2)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure the resistance between terminal S1/S2 of transmission wire connector and body ground.

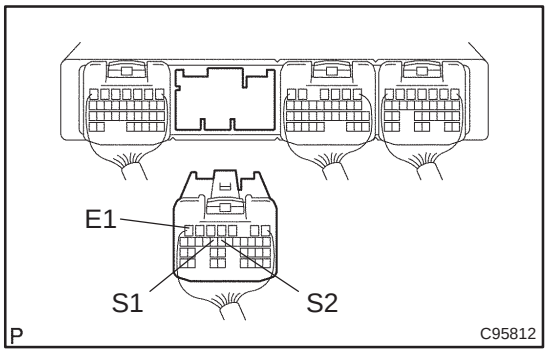
OK:

Resistance: 11 to 15 Ω at 20˚C (68˚F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



(a) Connect the transmission wire connector to the transaxle.

(b) Disconnect the ECM connector.

(c) Measure the resistance between terminals.

OK:

Resistance:

S1 – E1: 11 to 15 Ω at 20˚C (68˚F)

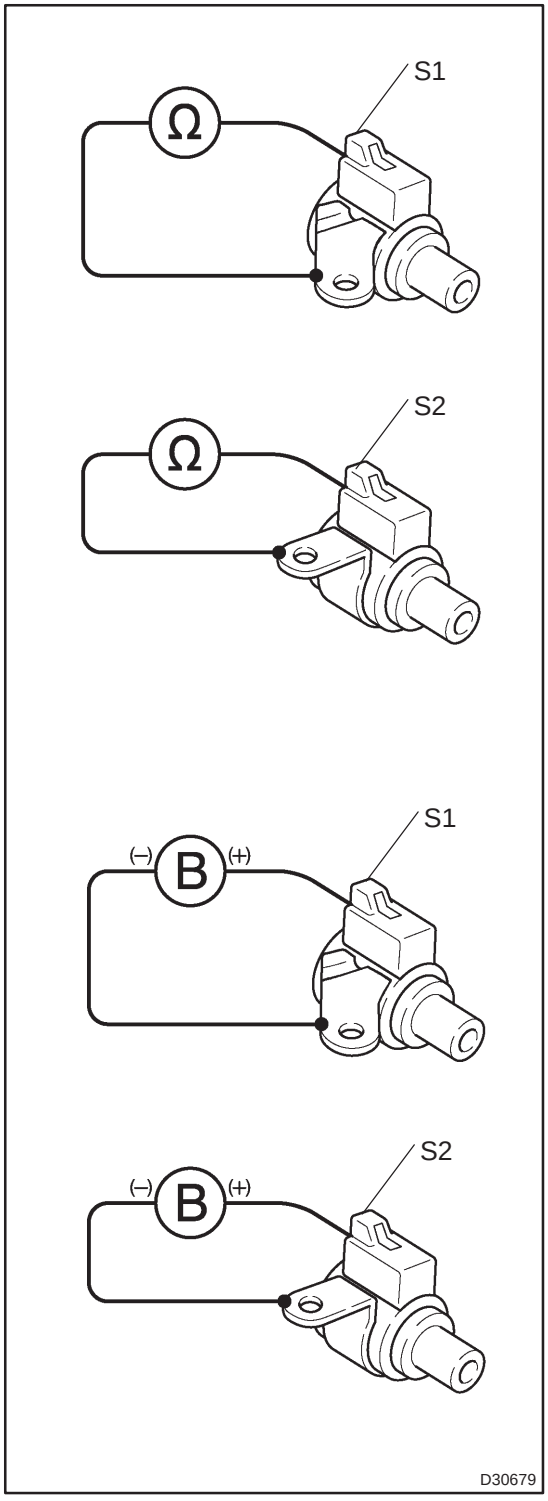
S2 – E1: 11 to 15 Ω at 20˚C (68˚F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(S1/S2)



(a) Remove the shift solenoid valve S1/S2.

(b) Measure the resistance between the solenoid valve connector and the solenoid valve body.

OK:

Resistance: 11 to 15 Ω at 20˚C (68˚F)

(c) Connect the positive (+) lead to the terminal of solenoid valve connector and the negative (–) lead to the solenoid valve body.

OK:

The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(S1/S2)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0770	SHIFT SOLENOID ”E” MALFUNCTION (SHIFT SOLENOID VALVE SL)

SYSTEM DESCRIPTION

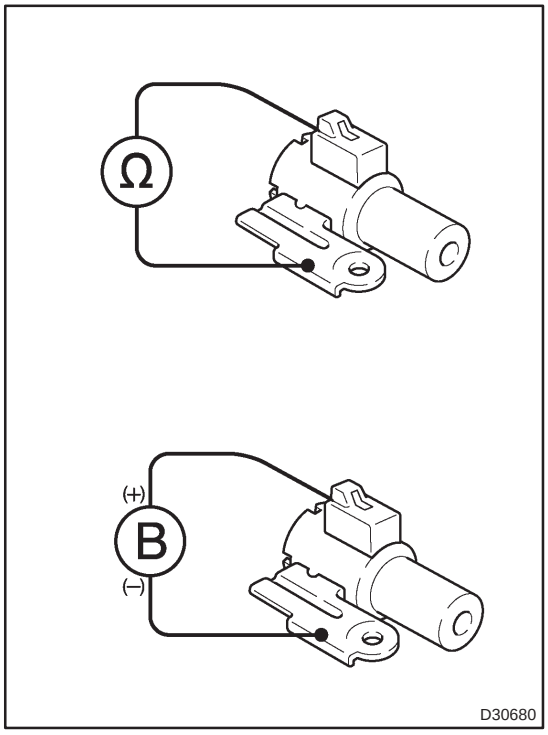
The ECM uses the signals from the throttle position sensor, air–flow meter and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.

Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SL, valve body and torque converter clutch or automatic transaxle (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0770	• Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h [50 mph]), or lock–up remains ON in the lock–up OFF range. (2–trip detection logic) • When lock–up is ON, clutch or brake slips or gear is broken. (2–trip detection logic)	• Shift solenoid valve SL is stuck open or closed • Valve body blocked or stuck • Shift solenoid valve SL • Torque converter clutch • Automatic transaxle (clutch, brake or gear etc.)

INSPECTION PROCEDURE

1	INSPECT SHIFT SOLENOID VALVE(SL)



(a) Remove the shift solenoid valve SL.

(b) Measure the resistance between terminal SL of shift solenoid valve and the solenoid valve body.

OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

(c) Connect the positive (+) lead to the terminal of solenoid valve connector and the negative (–) lead to the solenoid valve body.

OK:

The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SL)**

OK

2	INSPECT TRANSMISSION VALVE BODY ASSY(See chapter 2 in the problem symptoms table)

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSY**

OK

3	INSPECT TORQUE CONVERTER CLUTCH ASSY

NG → REPLACE TORQUE CONVERTER CLUTCH ASSY

OK

REPAIR AUTOMATIC TRANSAXLE ASSY

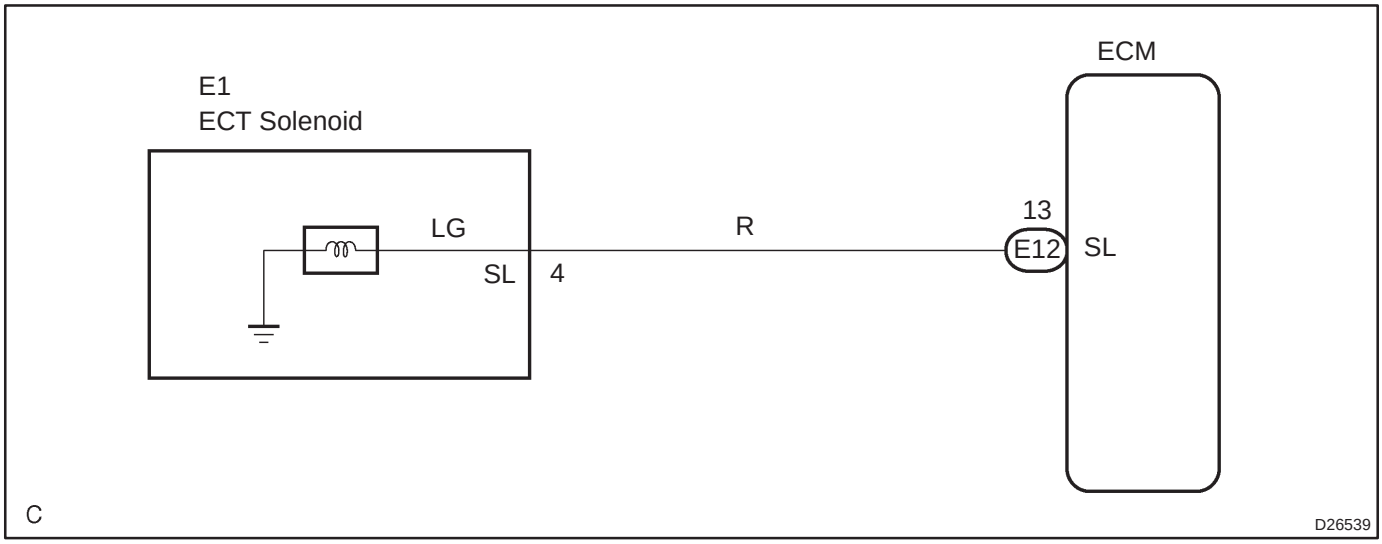
DTC	P0773	SHIFT SOLENOID ”E” ELECTRICAL (SHIFT SOLENOID VALVE SL)

CIRCUIT DESCRIPTION

The shift solenoid valve SL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock–up relay valve, which then controls operation of the lock–up clutch.
Fail safe function:
If the ECM detects a malfunction, it turns the shift solenoid valve SL OFF.

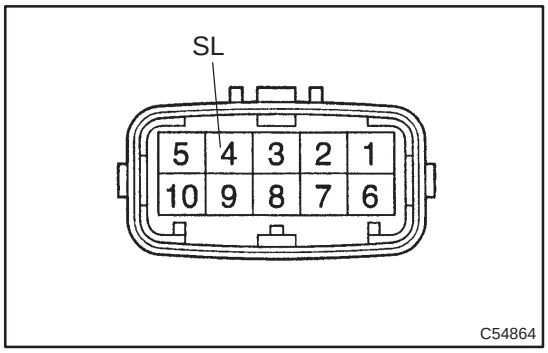
DTC No.	DTC Detecting Condition	Trouble Area
P0773	Either (a) or (b) is detected for 1 time. (2–trip detection logic) (a) Solenoid resistance is 8 Ω or less when solenoid is energized. (b) Solenoid resistance is 100 kΩ or more when solenoid is not energized.	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SL)

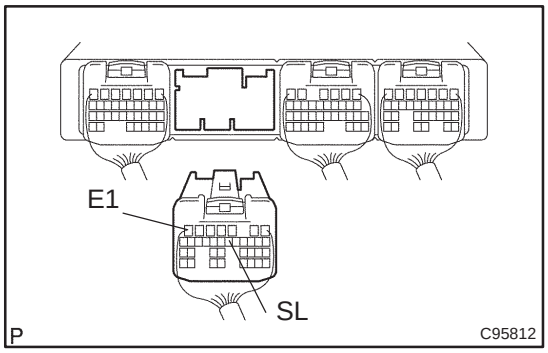


(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminal SL and the body ground.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE–ECM)



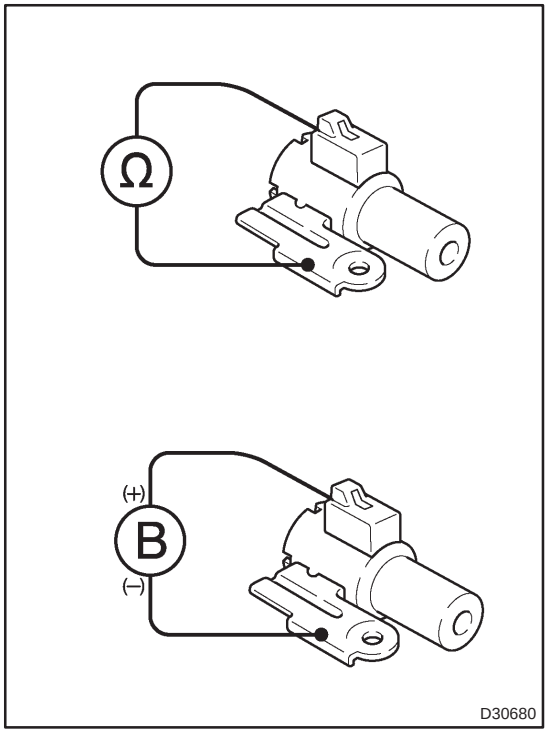
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals SL and E1.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE(SL)



(a) Remove the shift solenoid valve SL.

(b) Measure the resistance between terminal SL of shift solenoid valve and the solenoid valve body.

OK:

Resistance: 11 to 15 Ω at 20°C (68°F)

(c) Connect the positive (+) lead to the terminal of solenoid valve connector and the negative (–) lead to the solenoid valve body.

OK:

The solenoid valve makes an operating noise.

OK → **REPAIR OR REPLACE TRANSMISSION WIRE**

NG

REPLACE SHIFT SOLENOID VALVE(SL)

DTC	P1520	STOP LIGHT SWITCH CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in lock–up condition, when brakes are suddenly applied.
When the brake pedal is depressed, this switch sends signals to the ECM. Then the ECM cancels the operation of the lock–up clutch while braking is in progress.

DTC No.	DTC Detection Condition	Trouble Area
P1520	Stop light switch remains ON while vehicle running (1–trip detection logic)	• Short in stop lamp switch signal circuit • Stop lamp switch • ECM

WIRING DIAGRAM

See page 05–115.

INSPECTION PROCEDURE

1	INSPECT STOP LAMP SWITCH ASSY

NG → REPLACE STOP LAMP SWITCH ASSY

OK

2	CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH ASSY – ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM

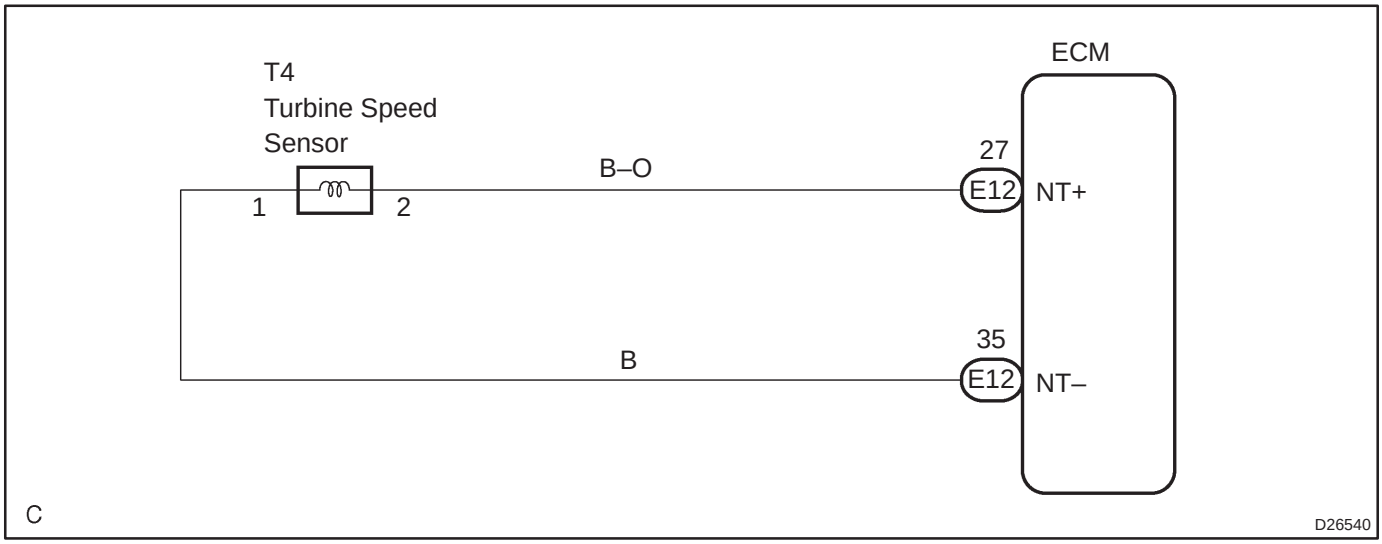
DTC	P1725	NT REVOLUTION SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the input turbine. By comparing the input turbine speed signal (NT) with the vehicle speed sensor signal, the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

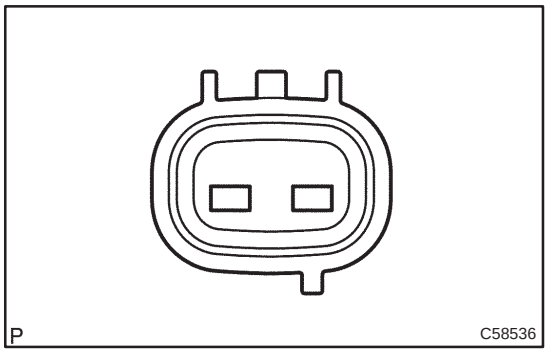
DTC No.	DTC Detection Condition	Trouble Area
P1725	ECM detects conditions (a), (b), (c) and (d) continuity for 5 sec. or more: (1 – trip detection logic) (a) Vehicle speed: 50 km/h (20 mph) or more (b) 2nd, 3rd or O/D gear (c) Solenoid valves and Park/neutral position switch are normal (d) NT < 300 rpm	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR(NT)

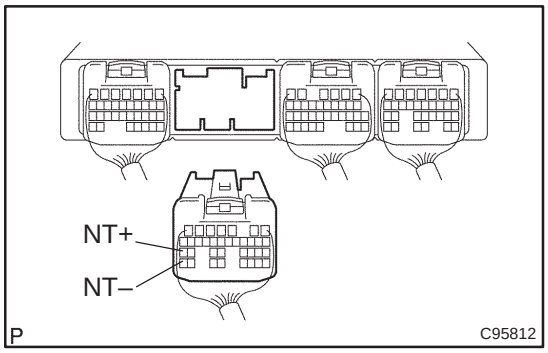


(a) Disconnect the sensor connector from the transaxle.
(b) Measure the resistance between terminals of speed sensor (NT).
OK:
Resistance: 560 to 680 Ω at 20°C (68°F)

NG → **REPLACE SPEED SENSOR(NT)**

OK

2	CHECK HARNESS AND CONNECTOR(SPEED SENSOR–ECM)



(a) Connect the speed sensor (NT) connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals NT+ and NT–.
OK:
Resistance: 560 to 680 Ω at 20°C (68°F)
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for short):

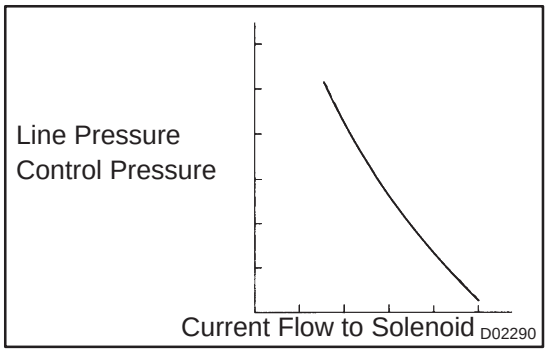
Symbols	Specified condition
NT+ – Body ground	No continuity
NT– – Body ground	

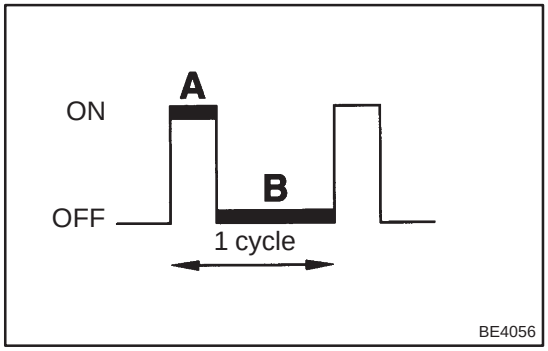
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	P1760	LINEAR SOLENOID FOR LINE PRESSURE CONTROL CIRCUIT MALFUNCTION





CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates the line pressure) causes the solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate the line pressure according the extent of the accelerator pedal depressed or the output of engine power.

This reduces the function of the line pressure and provides smooth shifting.

Upon receiving a signal of the throttle valve opening angle, the ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure and generating throttle pressure.

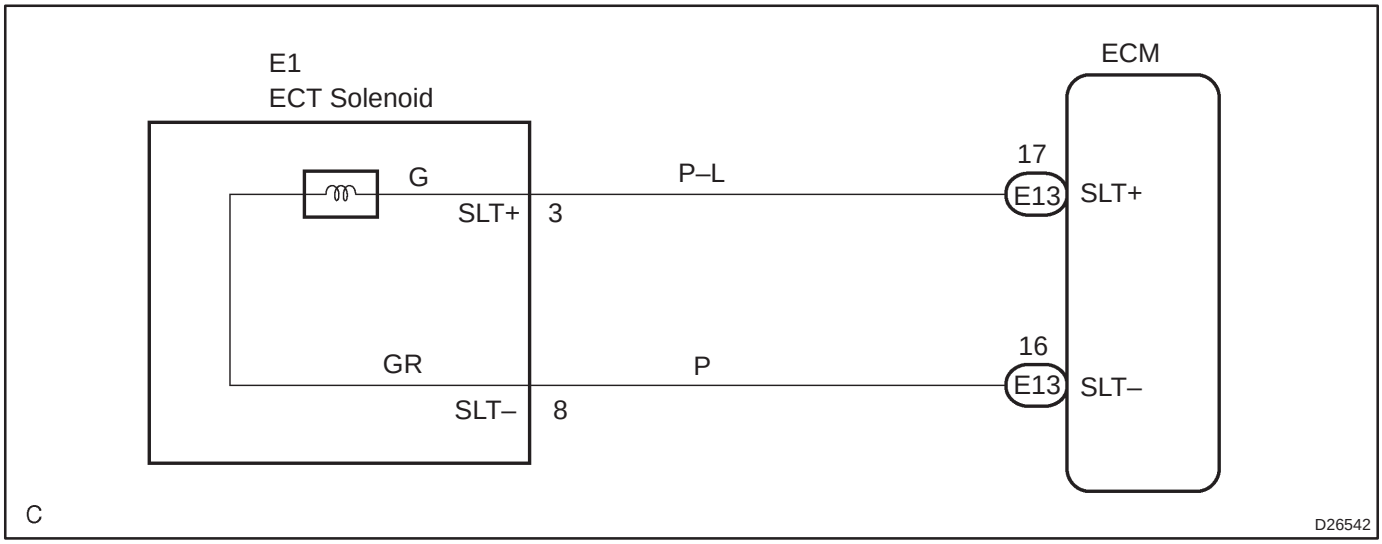
(*): Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

Duty Ratio=A/(A+B) x 100 (%)

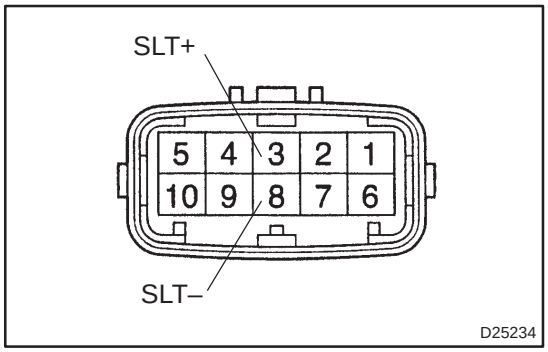
DTC No.	DTC Detection Condition	Trouble Area
P1760	Condition (a) or (b) below is detected 1 sec. or more: (a) SLT– terminal: 0 V (b) SLT– terminal: 12 V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SLT)



(a) Disconnect the transmission wire connector from the transaxle.

(b) Measure resistance between terminals SLT+ and SLT–.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)

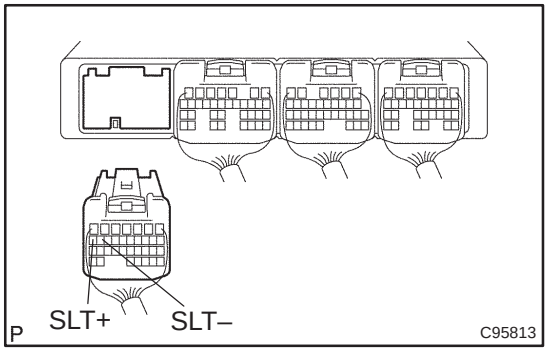
(c) Check continuity between the wire harness side connectors.
OK:
Standard (Check for short):

Symbols	Specified condition
SLT+ – Body ground	No continuity
SLT– – Body ground	

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE–ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals SLT+ and SLT– of ECM connector.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(d) Check the continuity between the wire harness side connectors.
OK:
Standard (Check for short):

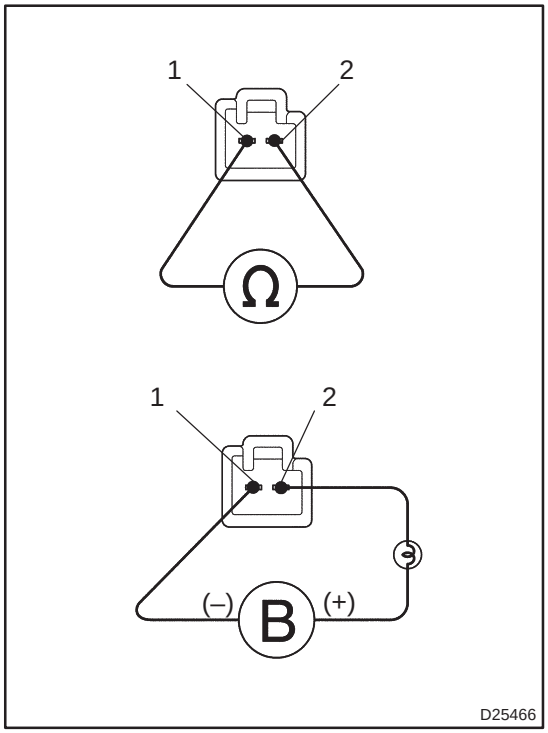
Symbols	Specified condition
SLT+ – Body ground	No continuity
SLT– – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE(SLT)



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance between terminals.
OK:
Resistance: 5.0 to 5.6 Ω at 20˚C (68˚F)
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (–) lead to terminal 1 of the solenoid valve connector, then check the movement of the solenoid valve.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SLT)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

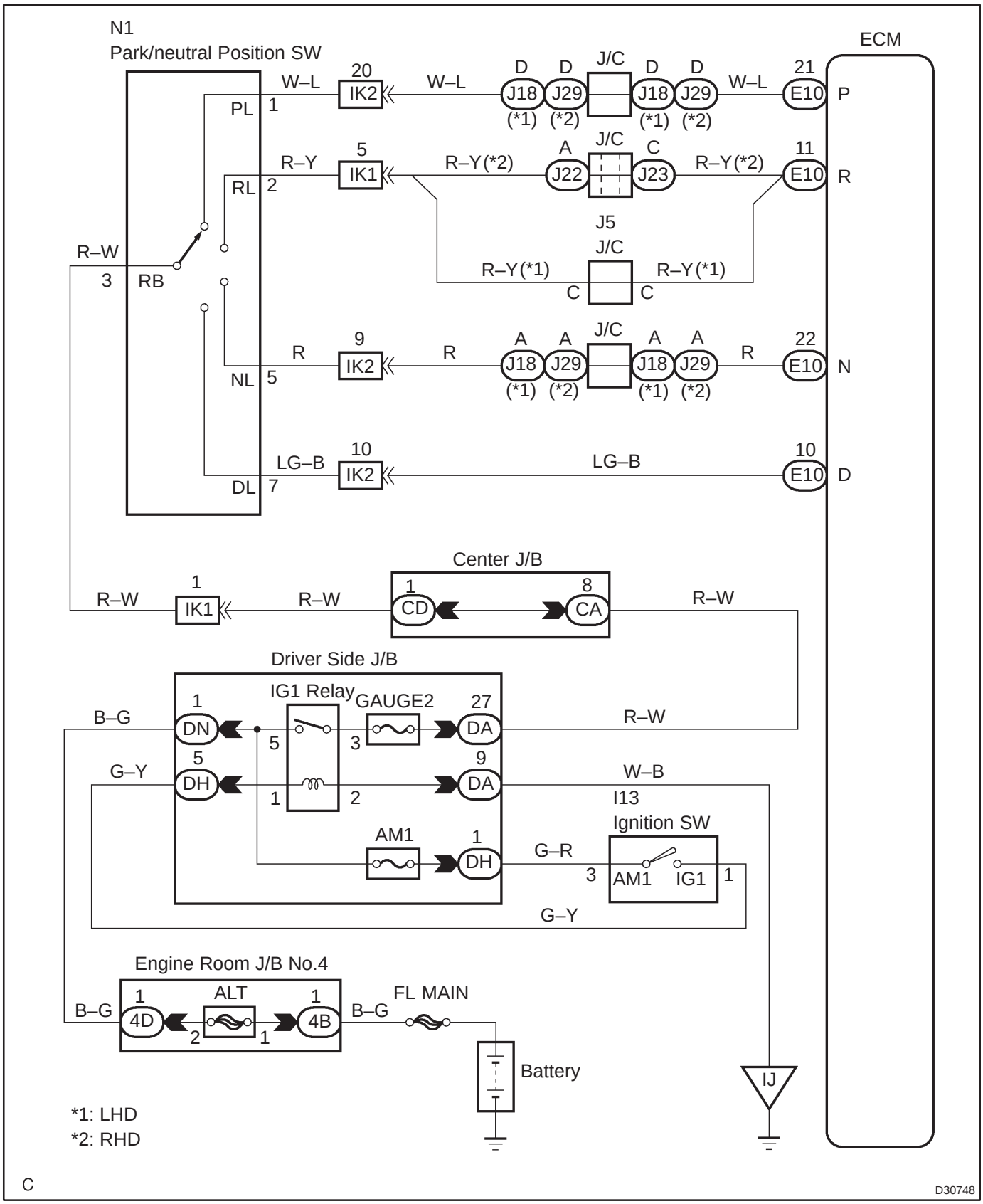
DTC	P1780	PARK/NEUTRAL POSITION SWITCH MALFUNCTION

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends the signals to the ECM.

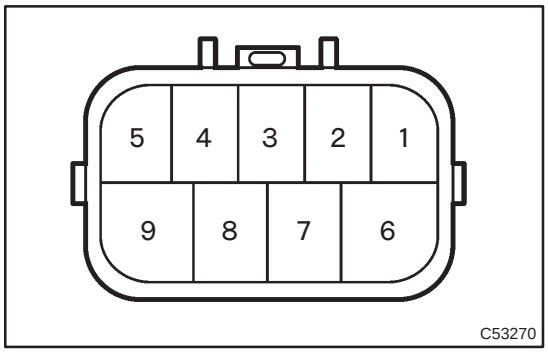
DTC No.	DTC Detecting Condition	Trouble Area
P1780	DTC is detected for 500 msec. or more (2–trip detection logic). • 2 or more switches are ON simultaneously for P, R, N and D position.	• Short in park/neutral position switch circuit • Park/neutral position switch assy • ECM
	When any of following conditions for 500 msec. or more in the S position (2–trip detection logic). (a) P position input signal is ON. (b) N position input signal is ON. (c) R position input signal is ON.	

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT PARK/NEUTRAL POSITION SWITCH ASSY



(a) Disconnect the park/neutral position switch connector.
(b) Check the continuity between each terminals shown below when the shift lever is moved to each range.

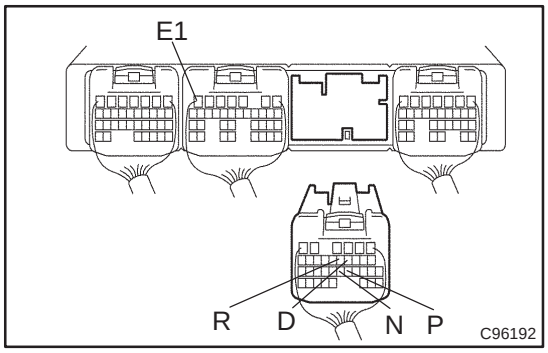
Shift Range	Terminal No. to continuity	
P	1 – 3	6 – 9
R	2 – 3	–
N	3 – 5	6 – 9
D	3 – 7	–

OK:
There is continuity.

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY**

OK

2 CHECK HARNESS AND CONNECTOR(PARK/NEUTRAL POSITION SWITCH – ECM)



(a) Connect the park/neutral position switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminals E1 and that R as well as D, P and N of the ECM when the shift lever is shifted to the following range.

OK:

Shift Range	Terminal	Voltage (V)
P	P – E1	10 to 14
R	R – E1	10 to 14
N	N – E1	10 to 14
D	D – E1	10 to 14

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

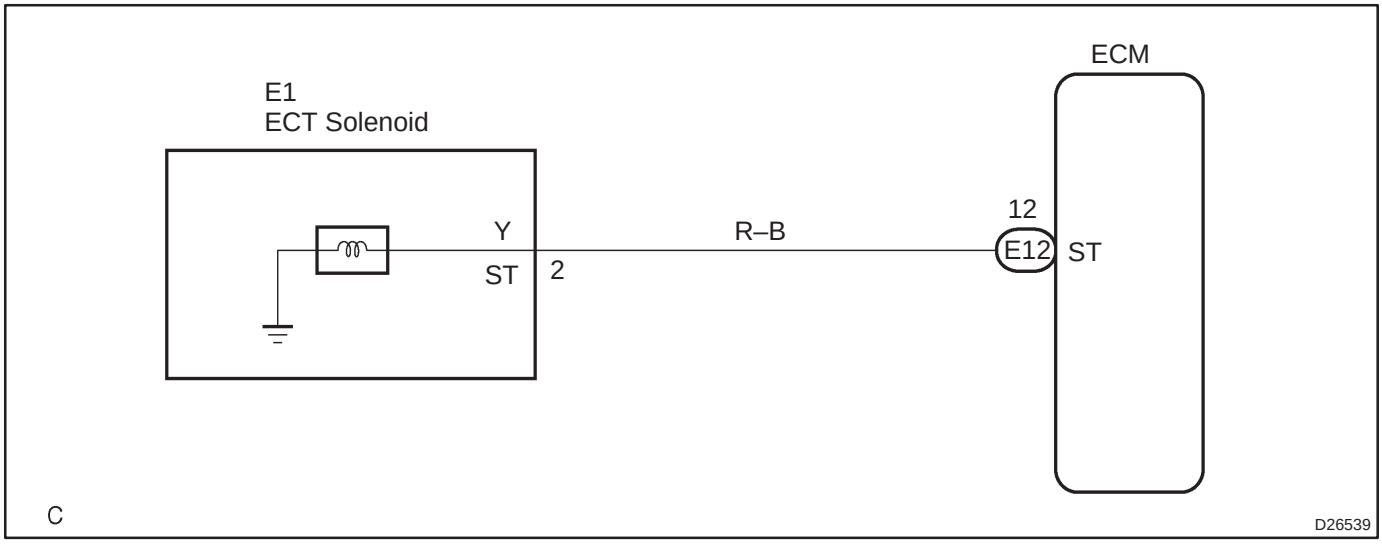
DTC P1790 ST SOLENOID CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

Shift solenoid valve ST is switched ON–OFF by a signal from ECM so that let in or out timing of O/D and 2nd brake is adjusted by operating orifice control valve. Therefore, shift solenoid valve ST operates when letting in or out reverse clutch.
If it is broken, the shift shock becomes big.

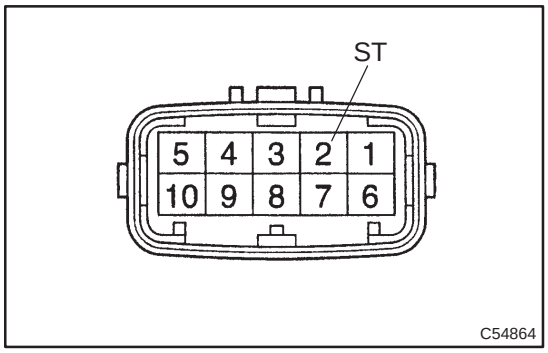
DTC No.	DTC Detection Condition	Trouble Area
P1790	ECM memorizes DTC P1790 if (a) or (b) condition below is detected once or more. (a) Solenoid resistance is 30 Ω or lower (short circuit) when solenoid is energized. (b) Solenoid resistance is 100 kΩ or higher (open circuit) when solenoid is not energized.	• Open or short in shift solenoid valve ST circuit • Shift solenoid valve ST • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(ST)

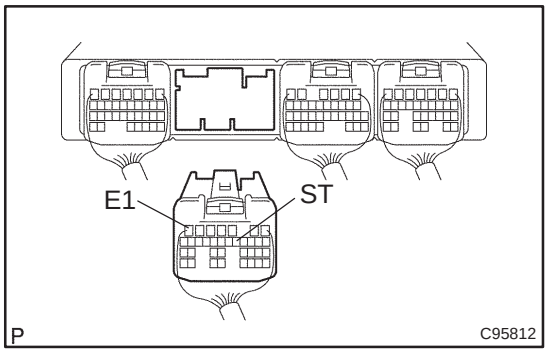


(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure the resistance between terminal ST and body ground.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



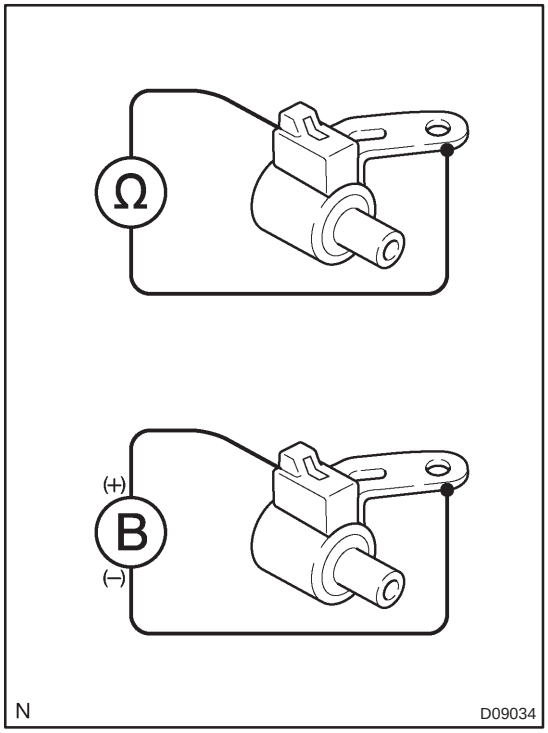
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance between terminals ST and E1.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE(ST)



(a) Remove the shift solenoid valve ST.
(b) Measure the resistance between the solenoid connector and the solenoid valve body.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)
(c) Connect the positive (+) lead to the terminal of solenoid connector and the negative (–) lead to the solenoid valve body.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(ST)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P1798	SB SOLENOID CIRCUIT MALFUNCTION (SHIFT SOLENOID VALVE SB)

CIRCUIT DESCRIPTION

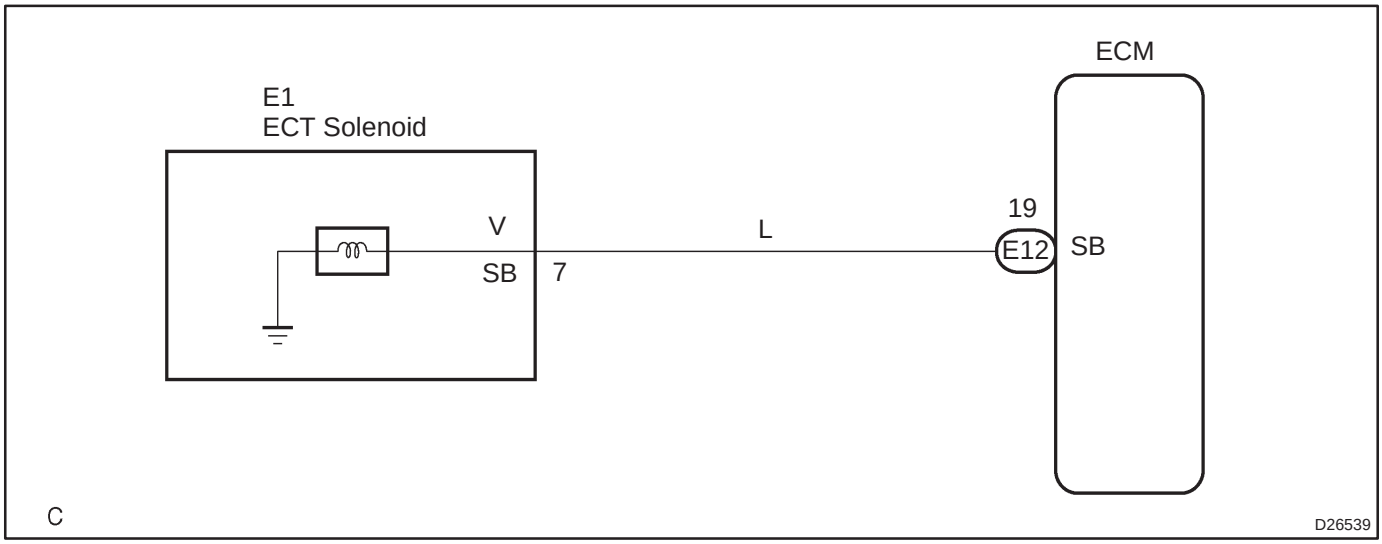
Shift solenoid valve SB controls the 2nd brake (B1) and 1st and reverse brake pressures and performs the 1st and 2nd engine brake control.

Fail safe function:

- S shift control prohibition.
- On activating the fail–safe function during S shift, the driving mode turns to the ordinal D range.

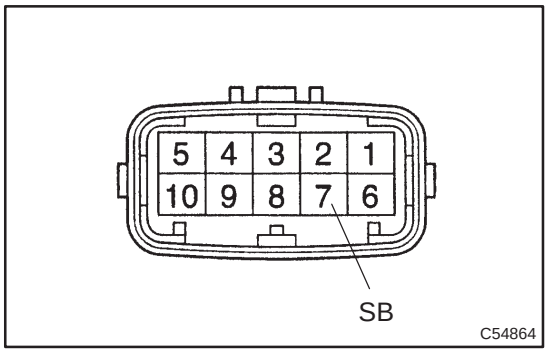
DTC No.	DTC Detection Condition	Trouble Area
P1798	ECM memorizes DTC P1798 if (a) or (b) condition below is detected once or more. (a) Solenoid resistance is 30 Ω or lower (short circuit) when solenoid is energized. (b) Solenoid resistance is 100 kΩ or higher (open circuit) when solenoid is not energized.	• Open or short in shift solenoid valve SB circuit • Shift solenoid valve SB • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE(SB)

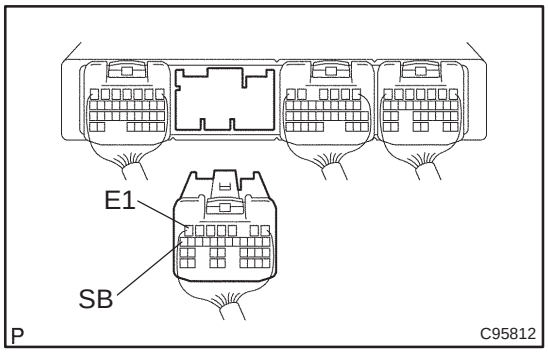


(a) Disconnect the transmission wire connector from the transaxle.
(b) Measure resistance between terminal 7 and body ground.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(TRANSMISSION WIRE – ECM)



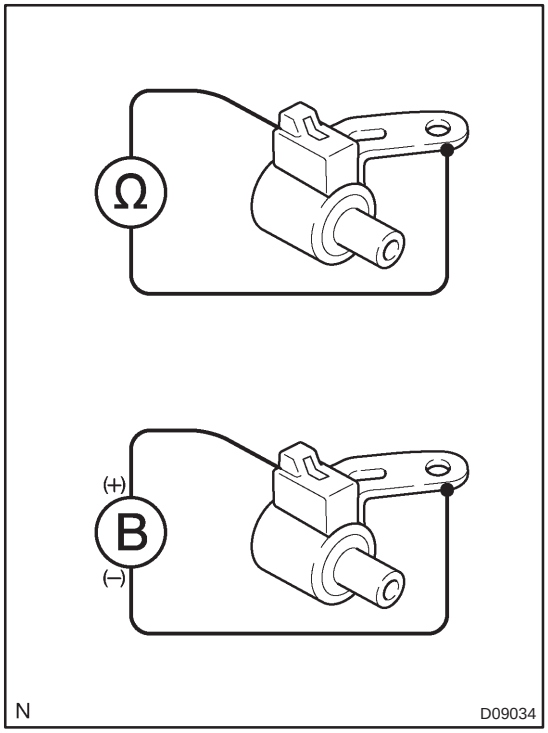
(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure resistance between terminals SB and E1.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE(SB)



(a) Remove the shift solenoid valve SB.
(b) Measure resistance between the solenoid connector and the solenoid body.
OK:
Resistance: 11 to 15 Ω at 20°C (68°F)
(c) Connect the positive (+) lead to the terminal of solenoid valve connector and the negative (–) lead to the solenoid valve body.
OK:
The solenoid valve makes an operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE(SB)**

OK

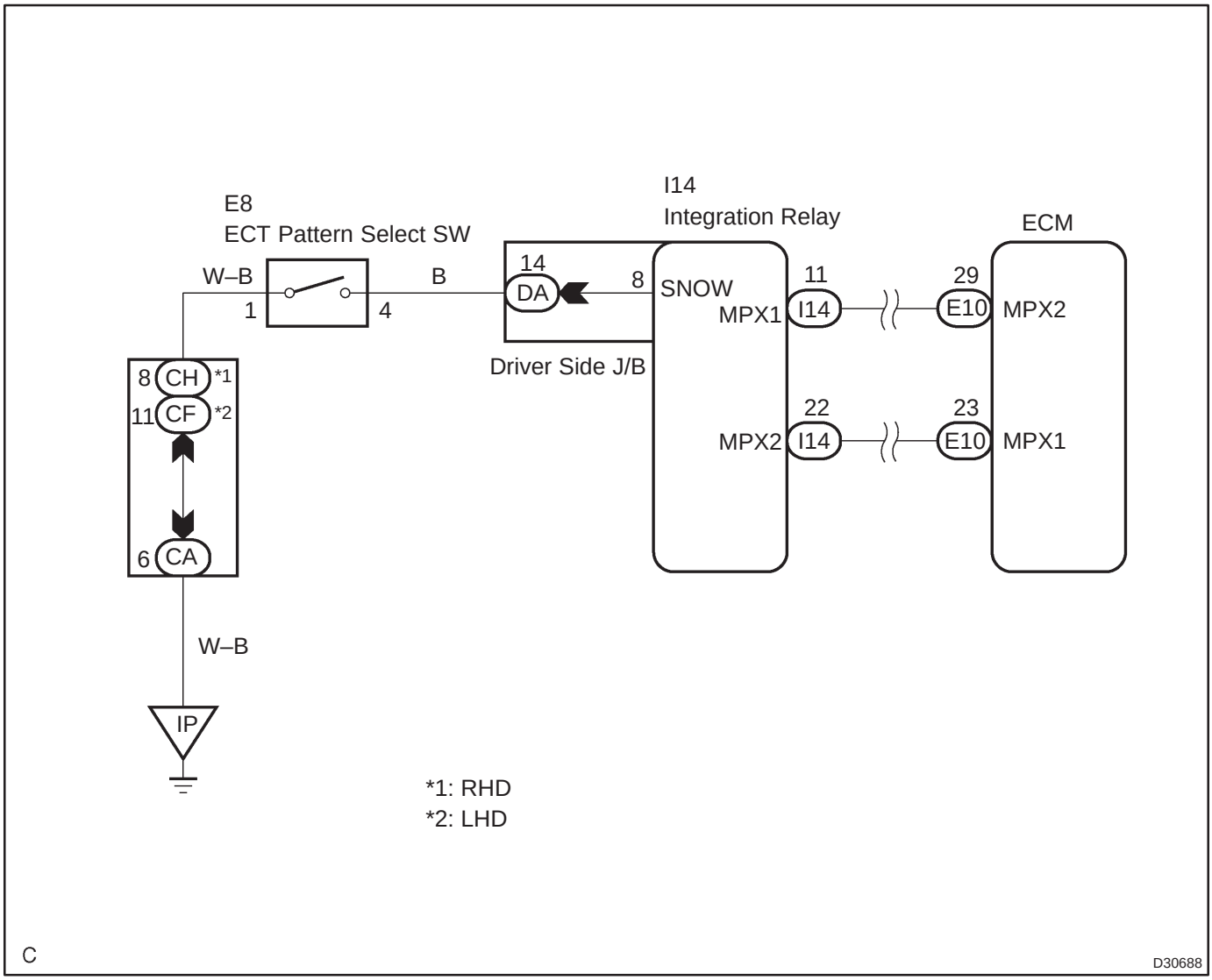
REPAIR OR REPLACE TRANSMISSION WIRE

PATTERN SELECT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

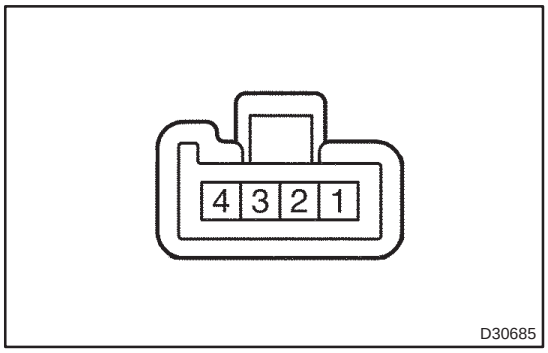
When SNOW mode is selected with the pattern select switch, the ECM controls the solenoid valves and the transmission starts from 2nd gear.
In D range, the transmission automatically shifts up through 3rd to O/D as usual.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT PATTERN SELECT SWITCH ASSY



(a) Disconnect the connector of pattern select switch.
(b) Check the continuity between terminals 1 and 4 of the pattern select switch.

OK:

Pattern select switch	Specified condition
Press continuously Pattern select switch	Continuity
Release Pattern select switch	No continuity

NG → **REPLACE PATTERN SELECT SWITCH ASSY**

OK

2	CHECK HARNESS AND CONNECTOR(PATTERN SELECT SWITCH – INTEGRATION RELAY, PATTERN SELECT SWITCH – BODY GROUND)

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

05C8E–01

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

(1) When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to the OBD scan tool complying with ISO 15031–4 or hand–held tester, and read off various data output from the vehicle's ECM.

(2) Euro–OBD regulations require that the vehicle's on–board computer illuminates the Check Engine Warning Light (Malfunction Indicator Lamp)/CHK ENG (MIL) on the instrument panel when the computer detects a malfunction in the emission control system/components or in the driving system components which affect vehicle emissions, or a malfunction in the computer. In addition to CHK ENG (MIL) illuminating when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO15031–6 are recorded in the ECM memory.

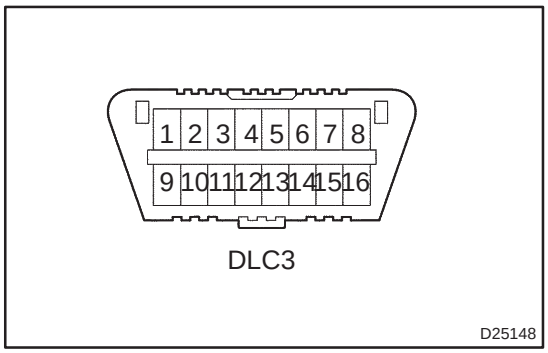
If the malfunction does not occur in 3–trip, the CHK ENG (MIL) goes off but the DTCs remain recorded in the ECM memory.

(3) To check the DTCs, connect the OBD scan tool or hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data (For operating instructions, see the OBD scan tool's instruction book.).

(4) DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–996).

(5) The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic (*) to prevent erroneous detection, and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, technicians can cause the CHK ENG (MIL) to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 2).

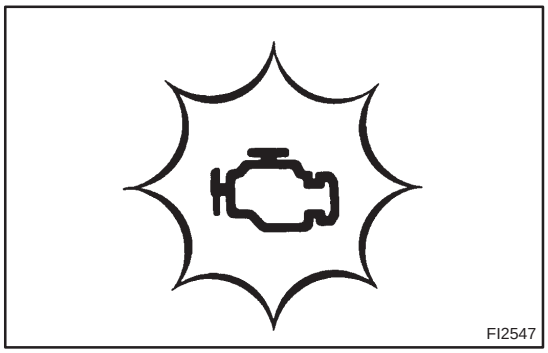
(6) *2 trip detection logic:
When a malfunction is first detected, the malfunction code is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG (MIL) to illumenate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and the 2nd trip.).



(b) Inspect the DLC3.
(1) The vehicle's ECM uses ISO 9141–2 (Euro–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–3 and matches the ISO 9141–2 format.

Terminal No.	Connection	Voltage or Resistance	Condition
7	Bus ⊕ Line	Pulse generation	During communication
4	Chassis Ground	↔ Body Ground / 1 Ω or less	Always
16	Battery Positive	↔ Body Ground / 9 to 14 V	Always

HINT:
If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of hand–held tester to DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.
- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. INSPECT DIAGNOSIS (NORMAL MODE)

(a) Check the MIL.
(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the MIL does not come on, troubleshoot the combination meter.

(2) When the engine is started, the MIL should go off. If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC, Using the hand–held tester.

NOTICE:

Hand–held tester only:

When the diagnostic system is switched from normal mode to check (test) mode, it erases all DTCs and freeze frame data recorded in normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.

(1) Use the hand–held tester to check the DTCs and instructions, see the hand–held tester instruction book.

(2) See page 05–996 to confirm the details of the DTCs.

(c) Clear the DTC.

(1) When using the hand–held tester:
The following operation will erase the DTC and freeze frame data. Operate the hand–held tester to erase the codes.

(2) When not using the hand–held tester:
Remove the EFI fuse from engine room J/B for 60 seconds or more.

3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has high sensing ability to detect malfunctions.

Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

(a) Check the DTC.

(1) Check the initial conditions.

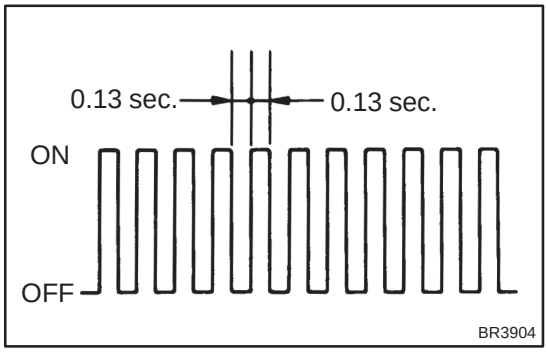
- Battery voltage 11 V or more
- Throttle valve fully closed
- Shift lever in P or N range
- Air conditioning switched OFF

(2) Turn the ignition switch OFF.

(3) Prepare the hand–held tester.

(4) Connect the hand–held tester to DLC3.

(5) Turn the ignition switch ON and switch the hand–held tester ON.



(6) Switch the hand–held tester from Normal mode to Check mode (Check that the MIL flashes).

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(7) Start the engine (MIL goes off after the engine starts).

(8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Take care not to turn the ignition switch OFF, as turning it off switches the diagnosis system from Check mode to Normal mode, which all DTCs etc. are erased.

(10) After checking the DTC, inspect the applicable circuit.

(b) Clear the DTC.

(1) When using the hand–held tester:
The following operation will erase the DTC and freeze frame data. Operate the hand–held tester to erase the codes.

(2) When not using the hand–held tester:
Remove the EFI fuse from engine room J/B for 60 seconds or more.

4. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one of the methods to shorten the work time.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) According to the display on tester, read the ”DATA LIST”.

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	←
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th (O/D)	Shift lever Range is; • D: 1st, 2nd, 3rd or 4th (O/D)	←
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	←
KICKDOWN SW	Kick down SW Status/ ON or OFF	• Accelerator Pedal is depressed all the way down: ON • Accelerator Pedal is released: OFF	←
SNOW SW	Pattern SW (2nd) Status/ ON or OFF	• IG SW ON: OFF ↓ • Pattern SW (2nd) Push: ON ↓ • Pattern SW (2nd) Push: OFF	←

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever range is; P or N: ON Except P or N: OFF	The shift lever range and these values are different, there are failures of the PNP switch or shift cable adjustment.
REVERSE	PNP SW Status/ ON or OFF	Shift lever range is; R: ON Except R: OFF	
DRIVE	PNP SW Status/ ON or OFF	Shift lever range is; D and S: ON Except D and S: OFF	
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: –40°C (–40°F) max.: 215°C (419°F)	80°C (176°F) (After Stall Test)	If the value is "–40°C (–40°F)" or "215°C (419°F)", ATF temp. sensor circuit is opened or shorted.

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one of the method to shorten the work time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) According to the display on tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
LINE PRESS UP	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [Others] ON: Line pressure up. OFF: No action (normal operation)	–
LOCK UP	[Test Details] Control the shift solenoid SL to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 60 km/h (37 mph) or more	Possible to check the SL operation.
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift range by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid values.

6. PROBLEM SYMPTOM CONFIRMATION

(a) Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

7. ROAD TEST

NOTICE:

Conduct the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).

(a) D range test

Shift into the D range and fully depress the accelerator pedal and check the following points:

(1) Check up–shift operation.

Check that 1 → 2, 2 → 3 and 3 → O/D up–shift take place, and that the shift points conform to the automatic shift schedule (See page 03–45).

HINT:

O/D Gear Up–shift Prohibition Control

- Coolant temp. is 60˚C (140˚F) or less and vehicle speed is 70 km/h (43 mph) or less.
- ATF temp. is 10˚C (50˚F) or less.

O/D and 3rd Gear Lock–up Prohibition Control

- Brake pedal is depressed.
- Accelerator pedal is released.
- ATF temp. is 10˚C (50˚F) or less.
- Coolant temp. is 60˚C (140˚F) or less.

When the 2nd start switch is on, there is no 1 → 2 up–shift and 2 → 1 down–shift.

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shift.

(3) Check for abnormal noises and vibration.

Run in D range lock–up or O/D gear and check for abnormal noise and vibration.

HINT:

The check for the cause of abnormal noise and vibration must be done very thoroughly as it could also be sure to loss of balance in the differential, torque converter, etc.

(4) Check kick–down operation.

While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated in the automatic shift schedule (See page 03–45).

(5) Check for abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.

- Drive in D range O/D gear, at a steady speed (lock–up ON) of about 70 km/h (43 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(b) S range test

Shift to the S range, depress the accelerator pedal and check the following points:

Shift operations.

- Shifting the shift lever to ”+” or ”–” changes the shift range on the combination meter.

HINT:

Manual shift prohibition control is performed when:

- Down–shifting causes engine overrun.
- Down–shifting is required continuously. (Down–shifting to 1st gear may not be performed.)

(c) R range test

Shift into the R range and fully depress the accelerator pedal and check for slipping.

CAUTION:

Before conducting this test, ensure that the test area is free from people and obstruction.

(d) P range test

Stop the vehicle on a grade (more than 5˚) and after shifting into the P range, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

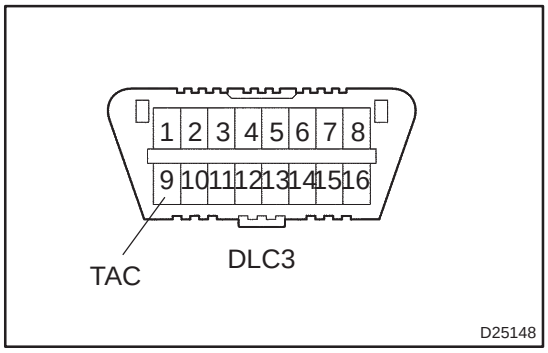
8. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R ranges.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Do not continuously run this test for longer than 5 seconds.**
- **To ensure safety, do this test in a wide, clear level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**



(1) Chock the 4 wheels.
(2) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

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(3) Fully apply the parking brake.
(4) Keep your left foot pressing firmly on the brake pedal.
(5) Start the engine.
(6) Shift into the D range. Press all the way down on the accelerator pedal with your right foot.
(7) Quickly read the stall speed at this time.

Stall speed: 2,400 ± 150 rpm

(8) Do the same test in the R range.

Stall speed: 2,400 ± 150 rpm

Evaluation:

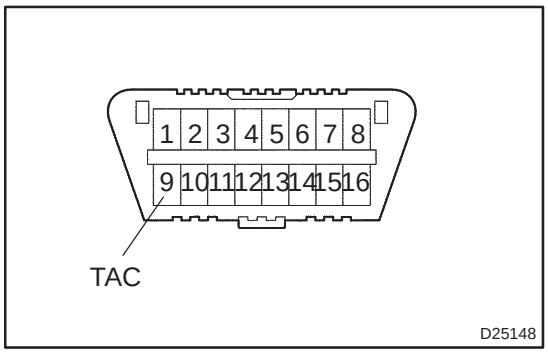
Problem	Possible cause
(a) Stall speed low in D and R ranges	• Engine output may be insufficient • Stator one–way clutch not operating properly HINT: If the value is larger or smaller than the specified value by 600 rpm or more, the torque converter could be faulty.
(b) Stall speed high in D range	• Line pressure too low • Forward clutch slipping • One–way clutch No.2 not operating properly
(c) Stall speed high in R range	• Line pressure too low • Reverse clutch slipping • 1st and reverse brake slipping
(d) Stall speed high in D and R ranges	• Line pressure too low • Improper fluid level

(b) Measure the time lag.

(1) When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the reverse clutch, forward clutch, and 1st and reverse brake.

NOTICE:

- **Do the test at normal operating ATF temperature 50 to 80˚C (122 to 176˚F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**



(2) Chock the 4 wheels.

(3) Connect the hand–held tester to DLC3 or tachometer to terminal TAC of DLC3 with SST.

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(4) Start engine and check idle speed.

Idle speed: 650 ± 50 rpm (In N range and A/C OFF)

(5) Shift the lever from N to D range. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag: N → D less than 1.2 seconds

(6) In the same way, measure the time lag for N → R.

Time lag: N → R less than 1.5 seconds

Evaluation (If N → D or N → R time lag is longer than the specified):

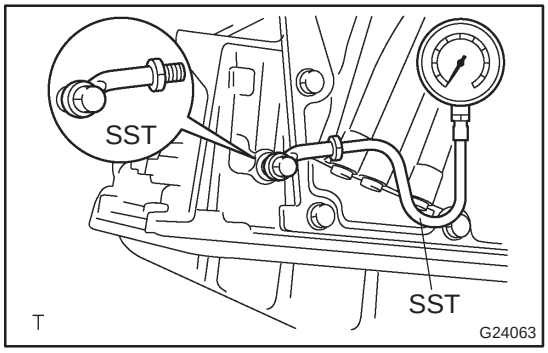
Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • One–way clutch No.2 not operating properly
N → R time lag is longer	• Line pressure too low • Reverse clutch worn • 1st and reverse brake worn

9. HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **Do the test at normal operation ATF temperature 50 to 80˚C (122 to 176˚F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stopper outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**



(1) Warm up the ATF.
(2) Remove the test plug on the left side of the transaxle case and connect SST.

SST 09992–00095 (09992– 00231, 09992–00271)

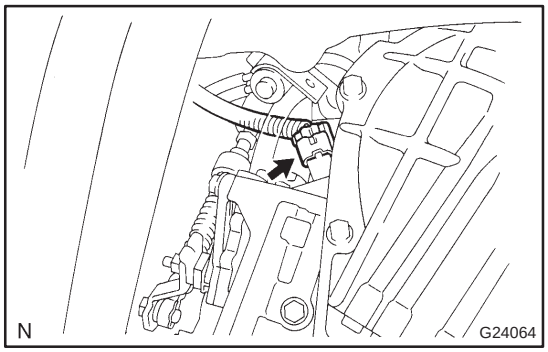
(3) Fully apply the parking brake and chock the 4 wheels.
(4) Connect the hand–held tester to DLC3.
(5) Start the engine and check idling speed.
(6) Keep your left foot pressing firmly on the brake pedal and shift into D range.
(7) Measure the line pressure when the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(9) In the same way, do the test in R range.

Specified line pressure:

Condition	D range kPa (kgf / cm^2, psi)	R range kPa (kgf / cm^2, psi)
Idling	370 to 410 (3.8 to 4.2, 54 to 60)	540 to 640 (5.5 to 6.5, 78 to 92)
Stall	1,110 to 1,230 (11.3 to 12.5, 161 to 178)	1,700 to 1,810 (17.3 to 18.5, 246 to 263)

Evaluation:

Problem	Possible cause
If the measured values at all ranges are higher	• Shift solenoid valve SLT defective • Regulator valve detective
If the measured values at all ranges are lower	• Shift solenoid valve SLT defective • Regulator valve detective • Oil pump defective
If pressure is low in the D range only	• D range circuit fluid leak • Forward clutch defective
If pressure is low in the R range only	• R range circuit fluid leak • Reverse clutch defective • 1st and reverse brake defective



10. MANUAL SHIFTING TEST

HINT:

By this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transaxle.

(a) Disconnect the transmission wire connector.

(b) Inspect the manual driving operation.

Check that the shift and gear ranges correspond to the table below.

While driving, shift through the D range.

Check that the gear change corresponds to the shift range.

Shift range	Gear position
D	3rd
R	Reverse
P	Pawl Lock

HINT:

If the gear positions of the D are difficult to distinguish, do the above road test.

If any abnormality is found in the above test, the problem is in the transaxle itself.

(c) Connect the transmission wire connector.

(d) Clear the DTC.

11. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

NOTICE:

Hand–held tester only

(a) Turn the ignition switch to OFF.

(b) Connect the hand–held tester to the DLC3.

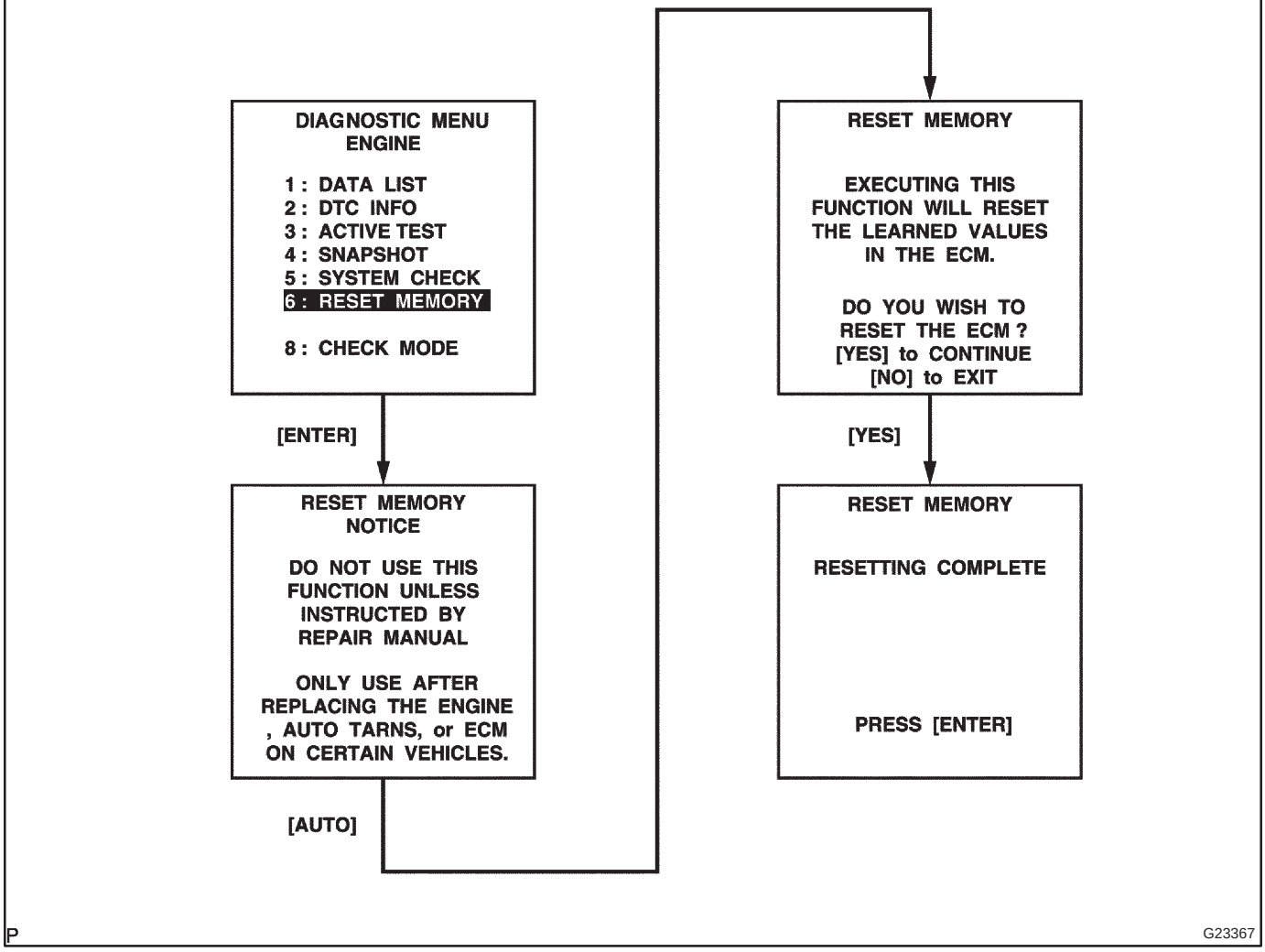
(c) Turn the ignition switch to ON.

(d) Perform the reset memory procedure from the ENGINE menu.

CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

Tester menu flow:



05CBZ–01

PRECAUTION

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or ECM.

HINT:

Initialization can not be completed by only removing the battery.

0567W–10

PROBLEM SYMPTOMS TABLE

HINT:

If a normal code is displayed during the DTC check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for trouble-shooting.

The Matrix Chart is divided into 3 chapters.

- If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.
- If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM.

CHAPTER 1: ELECTRONIC CIRCUIT MATRIX CHART

Symptom	Suspect Area	See page
No up–shift (A particular gear, from 1st to O/D gear, is not up–shifted)	ECM	01–32
No down–shift (A particular gear, from O/D to 1st gear, is not down–shifted)	ECM	01–32
No lock–up or No lock–up off	3. Stop light switch circuit 4. Engine coolant temp. sensor circuit 5. Throttle position sensor circuit 6. ECM	05–1018 05–16 05–16 01–32
Shift point too high or too low	1. Engine coolant temp. sensor circuit 2. Throttle position sensor circuit 3. ECM	05–16 05–16 01–32
No gear change by shifting into ”+” or ”–” while the shift lever is in the Sposition	1. Transmission control switch circuit 2. ECM	05–1035 01–32
Up–shift to O/D from 3rd while engine is cold	1. Engine coolant temp. sensor circuit 2. ATF temp. sensor circuit 3. ECM	05–16 05–1003 05–1005 01–32
Harsh engagement (N → D)	ECM	01–32
Harsh engagement (Lock–up)	ECM	01–32
Harsh engagement (Any driving range)	ECM	01–32
Poor acceleration	1. Pattern select switch circuit (ECT SNOW switch) 2. Instrument panel J/B assy (Integration relay) 3. ECM	05–1040 01–32
Engine stalls when starting off or stopping	ECM	01–32
No kick–down	1. Kick–down switch circuit 2. ECM	05–1033 01–32
No 2nd start	1. Pattern select switch circuit (ECT SNOW switch) 2. Transmission control switch circuit 3. Park/neutral position switch circuit 4. Instrument panel J/B assy (Integration relay) 5. ECM	05–1040 05–1035 05–1024 05–1040 01–32

Chapter 2: On–vehicle Repair
(★: U340E, U341E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM824E)

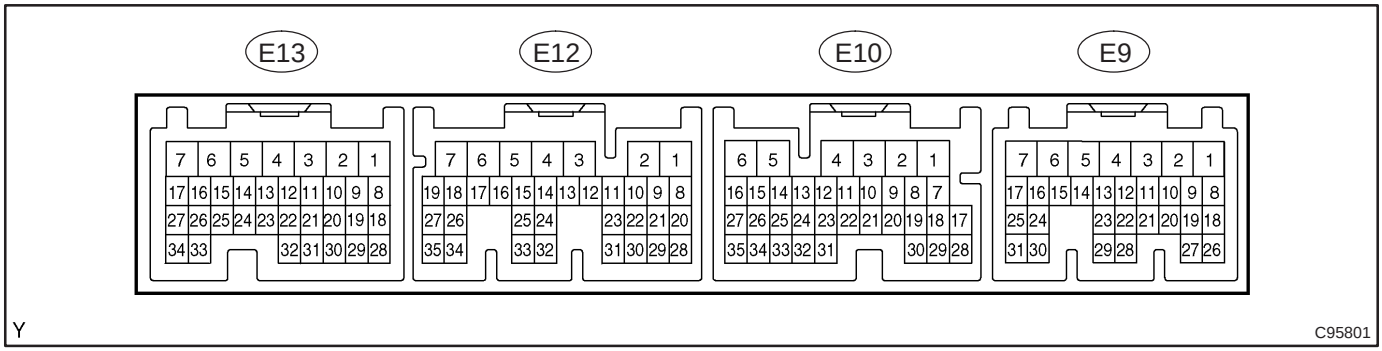
Symptom	Suspect Area	See page
Vehicle does not move in any forward range and reverse range	1. Manual valve 2. Primary regulator valve 3. Secondary regulator valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Vehicle does not move in R range	1. Manual valve 2. Off–vehicle repair matrix chart	★ –
No up–shift (1st → 2nd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (2nd → 3rd)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No up–shift (3rd → O/D)	1. Valve body assy 2. Off–vehicle repair matrix chart	★ –
No down–shift (O/D → 3rd)	Valve body assy	★
No down–shift (3rd → 2nd)	Valve body assy	★
No down–shift (2nd → 1st)	Valve body assy	★
No lock–up or No lock–up off	1. Lock–up relay valve 2. Solenoid relay valve 3. Solenoid modulator valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Accumulator control valve 3. Off–vehicle repair matrix chart	★ ★ –
Harsh engagement (N → R)	1. C_3 accumulator 2. Accumulator control valve 3. Reverse control valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Harsh engagement (Lock–up)	1. Lock–up relay valve 2. Accumulator control valve 3. Off–vehicle repair matrix chart	★ ★ –
Harsh engagement (1st → 2nd)	1. B_2 accumulator 2. Accumulator control valve	★ ★
Harsh engagement (2nd → 3rd)	1. C_2 accumulator 2. Accumulator control valve	★ ★
Harsh engagement (3rd → O/D)	1. B_1 accumulator 2. Accumulator control valve 3. 3–4 shift timing valve	★ ★ ★
Harsh engagement (O/D → 3rd)	Valve body assy	★
Harsh engagement (D, 2, L)	Coat relay valve	★
Slip or shudder (Forward and reverse)	1. Oil strainer 2. Off–vehicle repair matrix chart	40–42 –
No kick–down	Valve body assy	★
Poor acceleration	SLT damper	★

Chapter 3: Off–vehicle Repair
(★: U340E, U341E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM824E)

Symptom	Suspect Area	See page
Vehicle does not move in any forward range and reverse range	1. Planetary gear unit 2. Forward clutch 3. One–way clutch No.2 4. Reverse Clutch 5. 1st and reverse brake	★ ★ ★ ★ ★
Vehicle does not move in R range	1. Planetary gear unit 2. Reverse Clutch 3. 1st and reverse brake	★ ★ ★
No up–shift (1st → 2nd)	1. 2nd brake 2. One–way clutch No.1	★ ★
No up–shift (2nd → 3rd)	Direct clutch	★
No up–shift (3rd → O/D)	O/D and 2nd brake	★
No lock–up or No lock–up off	Torque converter clutch	40–37
Harsh engagement (N → D)	1. Forward clutch 2. One–way clutch No.2	★ ★
Harsh engagement (N → R)	1. Reverse clutch 2. 1st and reverse brake	★ ★
Harsh engagement (Lock–up)	Torque converter clutch	40–37
Harsh engagement (1st → 2nd)	1. 2nd brake 2. One–way clutch No.1	★ ★
Harsh engagement (2nd → 3rd)	Direct clutch	★
Harsh engagement (3rd → O/D)	O/D and 2nd brake	★
Slip or shudder (Forward range)	1. Torque converter clutch 2. Forward clutch 3. Direct clutch 4. O/D and 2nd brake 5. 2nd brake 6. One–way clutch No.1 7. One–way clutch No.2	40–37 ★ ★ ★ ★ ★ ★
Slip or shudder (Reverse range)	1. Reverse clutch 2. 1st and reverse brake	★ ★
Slip or shudder (1st)	One–way clutch No.2	★
Slip or shudder (2nd)	1. 2nd brake 2. One–way clutch No.1	★ ★
Slip or shudder (3rd)	Direct clutch	★
Slip or shudder (O/D)	O/D and 2nd brake	★
No engine braking (1st)	1st and reverse brake	★
No engine braking (2nd)	O/D and 2nd brake	★
Poor acceleration (All range)	Torque converter clutch	40–37
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	40–37

05C8F–01

TERMINALS OF ECM



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
SLT^{+} (E13–17) – SLT^{-} (E13–16)	P–L – P	IG switch ON	10 to 14
THO (E13–30) – E2 (E13–28)	V – BR	IG switch ON and ATF temperature 110 ˚C (230 ˚F)	Below 1
ST (E12–12) – E1 (E12–7)	R–B – BR	IG switch ON	Below 1
		IG switch ON and R gear	10 to 14
SL (E12–13) – E1 (E12 – 7)	R – BR	IG switch ON	Below 1
		Vehicle driving under lock–up position	10 to 14
S2 (E12–14) – E1 (E12–7)	P – BR	IG switch ON	Below 1
		1st or O/D gear	10 to 14
		2nd or 3rd gear	Below 1
S1 (E12–15) – E1 (E12–7)	P–L – BR	IG switch ON	10 to 14
		1st or 2nd gear	10 to 14
		3rd or O/D gear	Below 1
SB (E12–19) – E1 (E12–7)	L – BR	IG switch ON	Below 1
NT^{+} (E12–27) – NT^{-} (E12–35)	B–O – B	Engine is running	Pulse signal is output Below 1 ↔ 4 to 5
SPT (E10–8) – E1 (E12–7)	L – BR	IG switch ON and Shift lever S position	7.5 to 14
		IG switch ON and Shift lever except for S position	Below 1
D (E10–10) – E1 (E12–7)	LG–B – BR	IG switch ON and Shift lever D position	10 to 14
		IG switch ON and Shift lever other than D position	Below 1
R (E10–11) – E1 (E12–7)	R–Y – BR	IG switch ON and Shift lever R position	10 to 14
		IG switch ON and Shift lever other than R position	Below 1
KD*1 (E10–12) – E1 (E12–7)	W*1 – BR	IG switch ON and Kick–down switch ON	Below 1
		IG switch ON and Kick–down switch OFF	10 to 14
SPD (E10–17) – E1 (E12–7)	V–W – BR	IG switch ON and rotate driving wheel slowly	Pulse signal is output
SFTU (E10–23) – E1 (E12–7)	R – BR	IG switch ON and Shift lever S position	7.5 to 14
		IG switch ON and Shift lever "+" position (Up shift)	Below 1.5
SFTD (E10–30) – E1 (E12–7)	B – BR	IG switch ON and Shift lever S position	7.5 to 14
		IG switch ON and Shift lever "–" position (Down shift)	Below 1.5

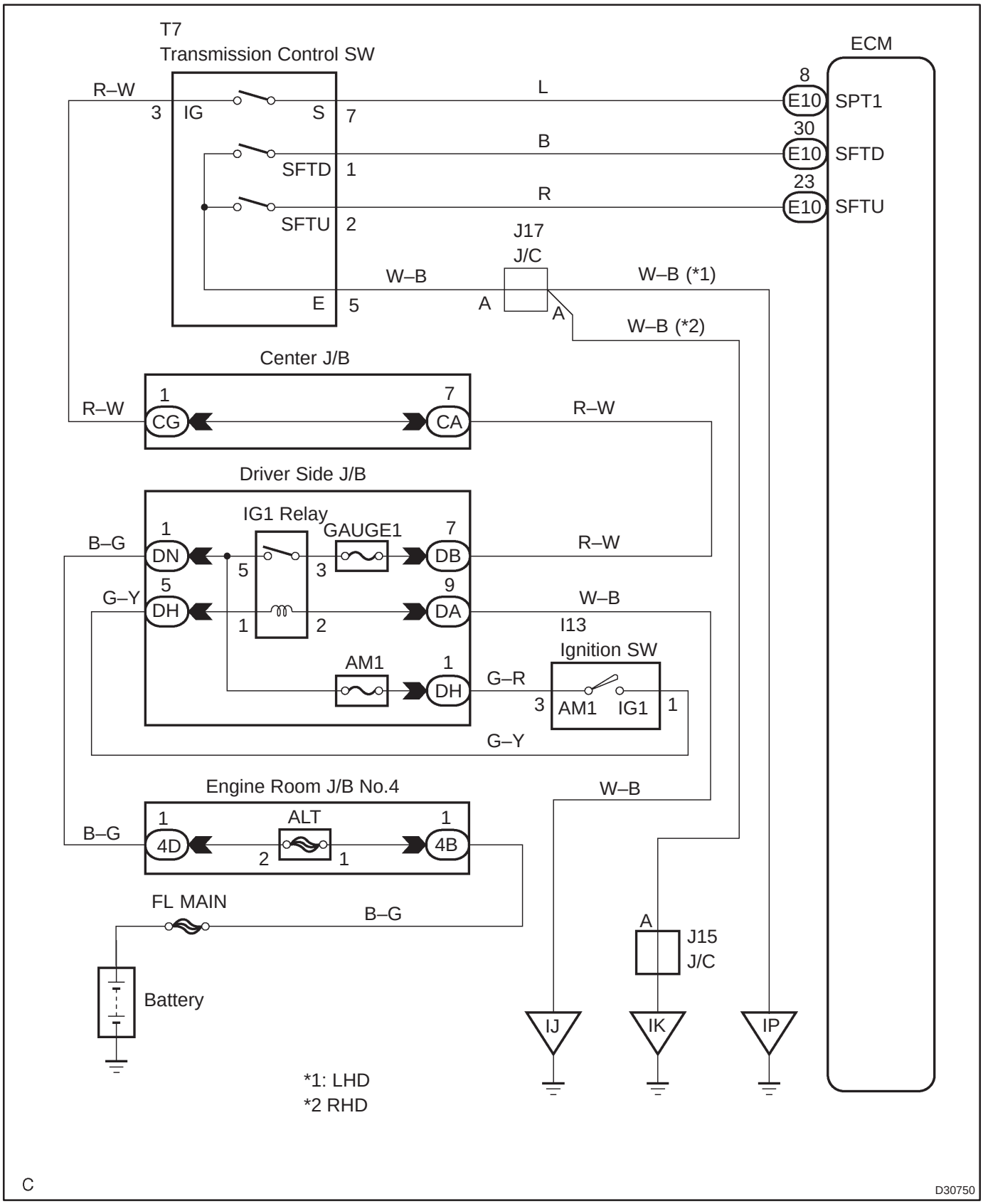
*1: LHD

TRANSMISSION CONTROL SWITCH CIRCUIT

CIRCUIT DESCRIPTION

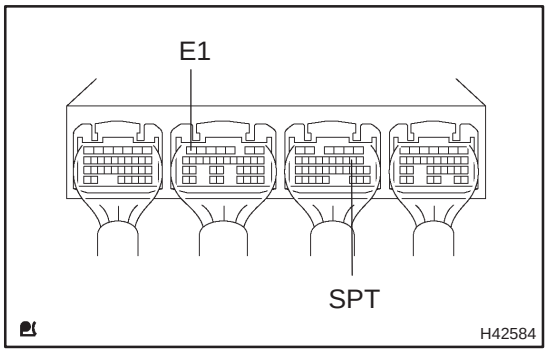
When shifting the shift lever into S range using the transmission control switch, it is possible to shift in 1 to 4 positions.
Shifting ”+” once changes up 1 shift range position, ”–” once changes down 1 shift range position respectively.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK ECM



(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminals SPT and E1 of the ECM.

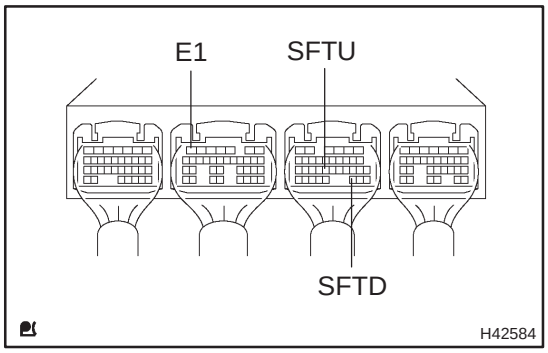
OK:

Shift position	Specified condition
Except S position	Below 1 V
S position	7.5 to 14 V

NG → **Go to step 6**

OK

2 CHECK ECM



(a) Measure the voltage between terminals E1 and that SFTU as well as SFTD of the ECM.

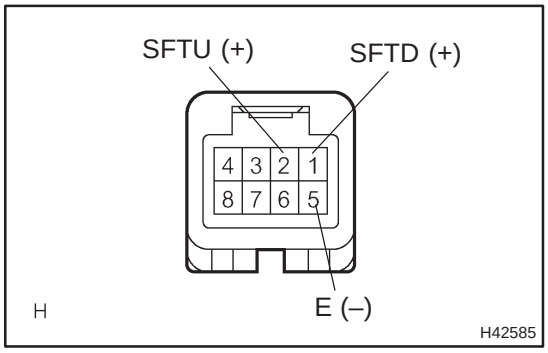
OK:

Shift position	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E1	Below 1.5 V
S position	SFTU – E1	7.5 to 14 V
Shift to "–" (Down shift)	SFTD – E1	Below 1.5 V
S position	SFTD – E1	7.5 to 14 V

OK → **NORMAL**

NG

3 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



(a) Turn the ignition switch to OFF.
(b) Disconnect the transmission control switch connector.
(c) Measure the resistance between terminals E and that SFTU as well as SFTD of the transmission control switch connector.

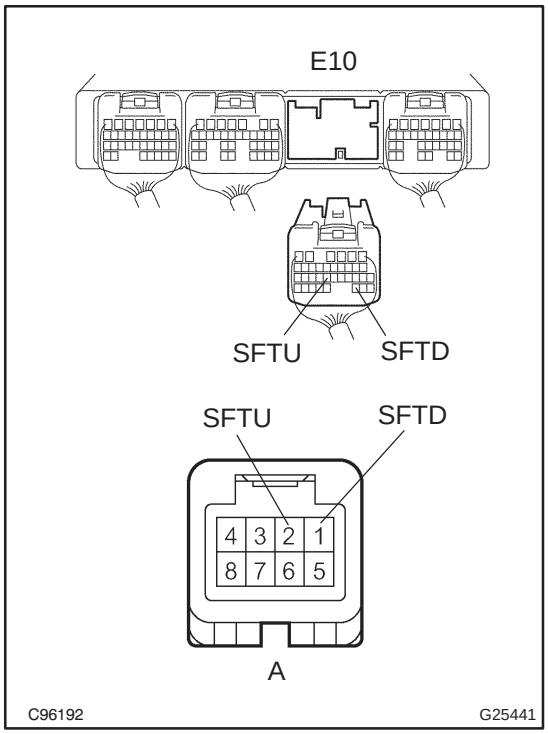
OK:

Shift position	Tester connection	Specified condition
Shift to "+" (Up shift)	SFTU – E	Continuity
S position	SFTU – E	No continuity
Shift to "–" (Down shift)	SFTD – E	Continuity
S position	SFTD – E	No continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

4	CHECK HARNESS AND CONNECTOR(ECM – TRANSMISSION CONTROL SWITCH)



(a) Disconnect the ECM connector.
(b) Check the continuity between ECM and transmission control switch.
OK:

Tester connection	Specified condition
SFTU (E10–23) – SFTU (A–2)	Continuity
SFTD (E10–30) – SFTD (A–1)	Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR(TRANSMISSION COTROL SWITCH – BODY GROUND)

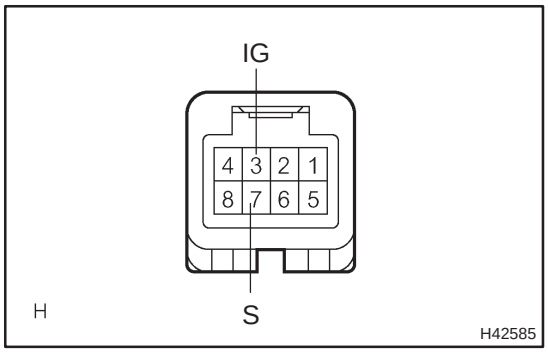
(a) Check the continuity between body ground and E of the transmission control switch connector (wire harness side).
OK:
Continuity

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

6 INSPECT SHIFT LOCK CONTROL UNIT ASSY(TRANSMISSION CONTROL SWITCH)



(a) Turn the ignition switch to OFF.
(b) Disconnect the transmission control switch connector.
(c) Check the continuity between terminals IG and S of the transmission control switch.

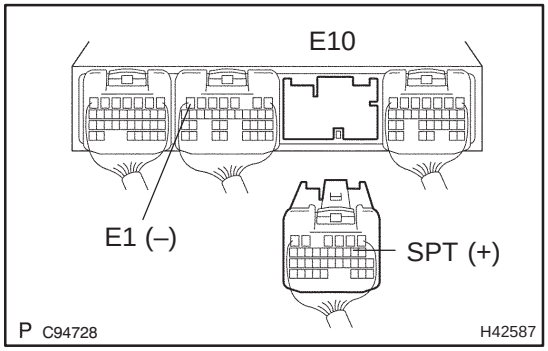
OK:

Shift position	Tester connection	Specified condition
Except S position	IG – S	No continuity
S position	IG – S	Continuity

NG → **REPLACE SHIFT LOCK CONTROL UNIT ASSY**

OK

7 CHECK HARNESS AND CONNECTOR



(a) Connect the transmission control switch connector.
(b) Disconnect the ECM connector.
(c) Turn the ignition switch to ON.
(d) Measure the voltage between terminals SPT and E1 of the ECM connector.

OK:

Shift position	Tester connection	Specified condition
Except S position	SPT – E1	Below 1 V
S position	SPT – E1	7.5 to 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM

DTC	C1511/11	Torque Sensor Circuit Malfunction

DTC	C1512/12	Torque Sensor Circuit Malfunction

DTC	C1513/13	Torque Sensor Circuit Malfunction

DTC	C1514/14	Torque Sensor Power Source Circuit Malfunction

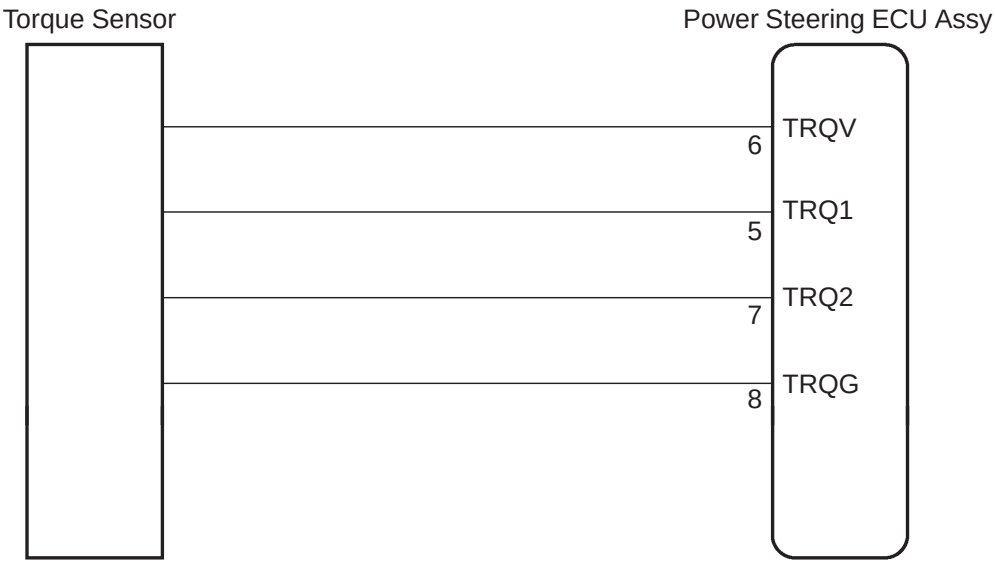
DTC	C1517/17	Torque Sensor Hold Malfunction

CIRCUIT DESCRIPTION

The torque sensor converts the power input in the steering wheel into electric signals, and sends them to the ECU.

DTC No.	DTC Detecting Condition	Trouble Area
C1511/11	Torque sensor circuit malfunction	• Steering column assy • Power steering ECU assy
C1512/12		
C1513/13		
C1514/14	Torque sensor power source circuit malfunction	
C1517/17	Torque sensor hold malfunction	

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

HINT:

Start the inspection from the step 1 with using hand–held tester. Start from step 2 without using hand–held tester.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch to ON and push the hand–held tester main switch ON.

(c) Select the item ”TRQ1” and ”TRQ2” in the DATA LIST and read its value displayed on the hand–held tester.

(d) Check the values on the ”TRQ1” and ”TRQ2” of the data monitor with the steering wheel being in the center value position (no load).

Standard:

2.3 to 2.7 V

(e) Check the difference of the values between ”TRQ1” and ”TRQ2” with the steering wheel being in the center value position (no load).

Standard:

Voltage: 0.3 V or less

(f) Check the values of the torque sensor on the data monitor when turning steering wheel.

(1) Turn the steering wheel to the right end from the center value position, and check the values on the ”TRQ1” and ”TRQ2” of the data monitor.

Standard:

2.5 to 4.7 V

(2) Turn the steering wheel to the left end from the center value position, and check the values on the ”TRQ1” and ”TRQ2” of the data monitor.

Standard:

0.3 to 2.5 V

(3) Check the difference of the values between ”TRQ1” and ”TRQ2”.

Standard:

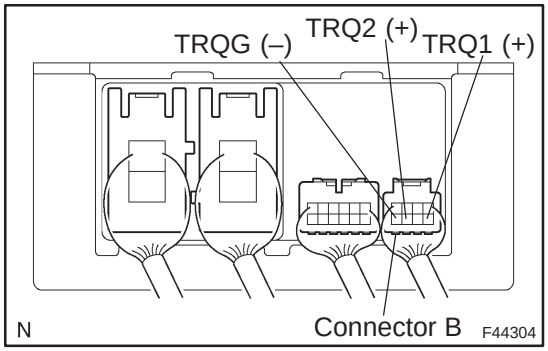
Voltage: 0.3 V or less

NG → **Go to step 3**

OK

REPLACE POWER STEERING ECU ASSY (See page 50–20)

2 INSPECT STEERING COLUMN ASSY(TORQUE SENSOR)



(a) Measure the voltage between terminals TRQ1 and TRQG, TRQ2 and TRQG of power steering ECU assy connector.

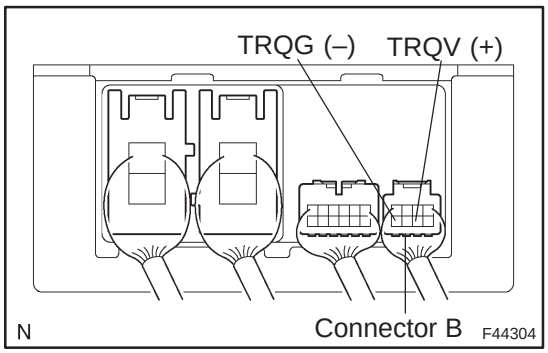
Standard:

Steering position	TRQ1	TRQ2
Center position	2.3 to 2.7 V	2.3 to 2.7 V
Right turned	2.5 to 4.7 V	2.5 to 4.7 V
Left turned	0.3 to 2.5 V	0.3 to 2.5 V

OK → **REPLACE POWER STEERING ECU ASSY (See page 50–20)**

NG

3 INSPECT POWER STEERING ECU ASSY



(a) Measure the voltage between terminals TRQV and TRQG of power steering ECU assy connector.

Standard:

7.5 to 8.5 V

OK → **REPLACE STEERING COLUMN ASSY (See page 50–9)**

NG

REPLACE POWER STEERING ECU ASSY (See page 50–20)

DTC	C1515/15	Torque Sensor Zero Point Calbration Not Performed

CIRCUIT DESCRIPTION

This DTC does not indicate trouble. Perform calibration of torque sensor zero point to delete DTC.

DTC No.	DTC Detecting Condition	Trouble Area
C1515/15	When torque sensor zero point calibration is not performed, this DTC is detected.	Sensor zero point calibration is not performed.

INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check the DTCs (See page 05–1045).
(b) Is DTC excepted for C1515/15 outputed?

YES → REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

2	PERFORM CALIBRATION OF TORQUE SENSOR ZERO POINT(See page 05–1045)

3	RECONFIRM DTC

(a) Check the DTC (See page 05–1045).
(b) Is DTC C1516/16 outputed?

NO → END

YES

REPAIR CIRCUIT INDICATED BY DTC C1516/16(See page 05–1063)

DTC	C1516/16	Calibration of Sensor Zero Point Not Completed

CIRCUIT DESCRIPTION

This DTC does not indicate trouble. This is detected when the torque sensor zero point calibration is not completed normally.

DTC No.	DTC Detecting Condition	Trouble Area
C1516/16	The torque sensor zero point calibration is not completed normally.	Sensor zero point calibration failure.

INSPECTION PROCEDURE

1	CLEAR DTC(See page 05–1045)

2	PERFORM CALIBRATION OF TORQUE SENSOR ZERO POINT(See page 05–1045)

3	RECONFIRM DTC

(a) Check the DTCs (See page 05–1045).

(A): DTC C1516/16 output after attempted 3 time or more.

(B): Normal code output.

HINT:

If the DTC code is output in spite of conducting the steering zero point calibration, replace the steering column assy.

(A) → **REPLACE STEERING COLUMN ASSY**

(B)

END

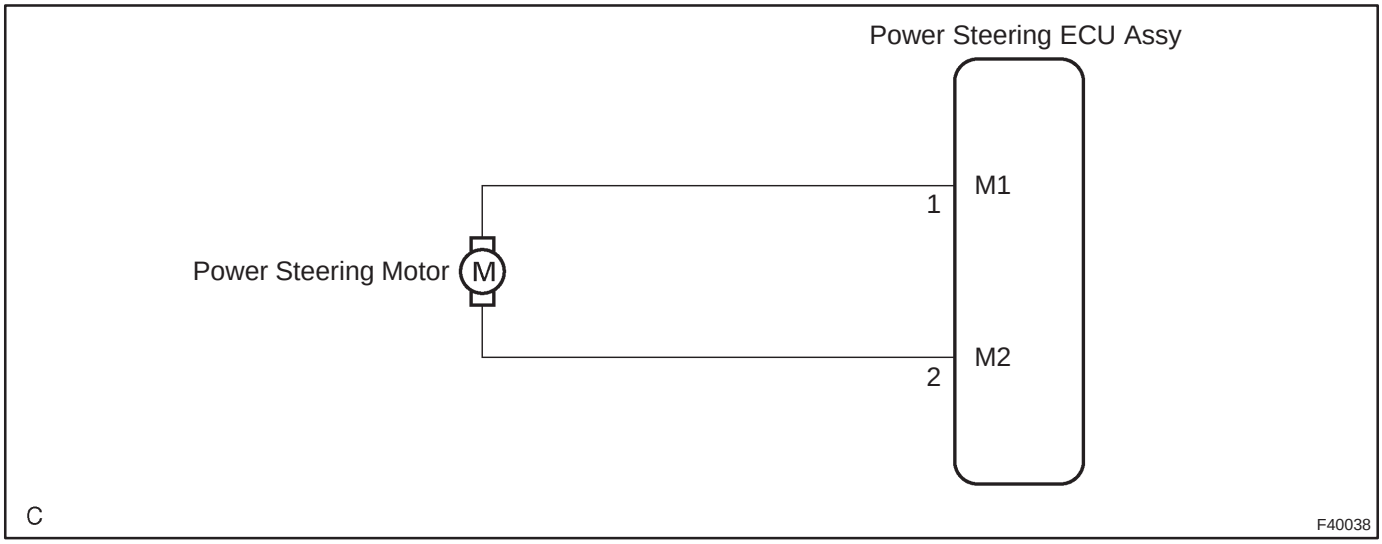
DTC	C1523/23	Motor Circuit Malfunction

DTC	C1524/24	Motor Circuit Malfunction

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1523/23	Short circuit of motor terminal or abnormal voltage or current in motor circuit.	• Steering column assy • Power steering ECU assy
C1524/24		

WIRING DIAGRAM

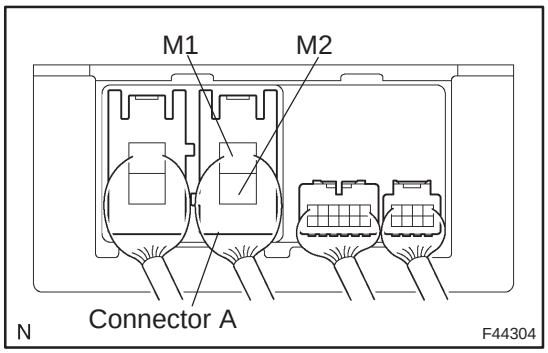


INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

1	INSPECT POWER STEERING ECU ASSY



(a) Turn the ignition switch ON.

(b) Turn the steering wheel to the left and right and measure the voltage between terminals M1 and M2 of power steering ECU assy connector.

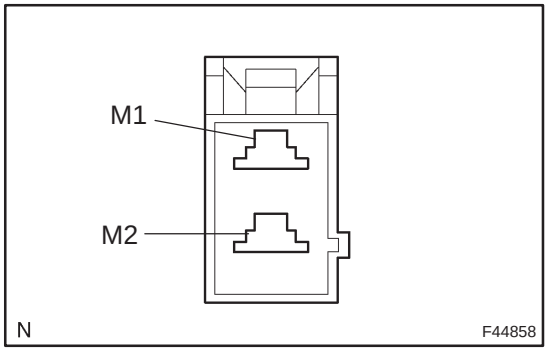
Standard:

Voltage changes when steering wheel is turned.

NG → **REPLACE POWER STEERING ECU ASSY(See page 50–20)**

OK

2	INSPECT STEERING COLUMN ASSY(POWER STEERING MOTOR)



(a) Disconnect the connector from the power steering motor.

(b) Measure the resistance between terminals M1 and M2 of power steering motor connector.

Standard:

Resistance: 0.07 to 1 Ω

NG → **REPLACE STEERING COLUMN ASSY (See page 50–9)**

OK

REPLACE POWER STEERING ECU ASSY(See page 50–20)

DTC	C1531/31	EMPS ECU Circuit Malfunction

DTC	C1532/32	EMPS ECU Circuit Malfunction

DTC	C1533/33	EMPS ECU Circuit Malfunction

DTC	C1534/34	EMPS ECU Circuit Malfunction

DTC	C1581/81	Assist Map Un–written

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1531/31	Power steering ECU assy malfunction	Power steering ECU assy
C1532/32		
C1533/33		
C1534/34		
C1581/81	Assist map un–written	

INSPECTION PROCEDURE

1	RECONFIRM DTC

(a) Check the DTCs (See page 05–1045).

(b) Is DTC except for C1531/31, C1532/32, C1533/33, C1534/34 and/or C1581/81 output?

YES → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

NO

REPLACE POWER STEERING ECU ASSY (See page 50–20)

DTC	C1541/41	Speed Sensor Malfunction

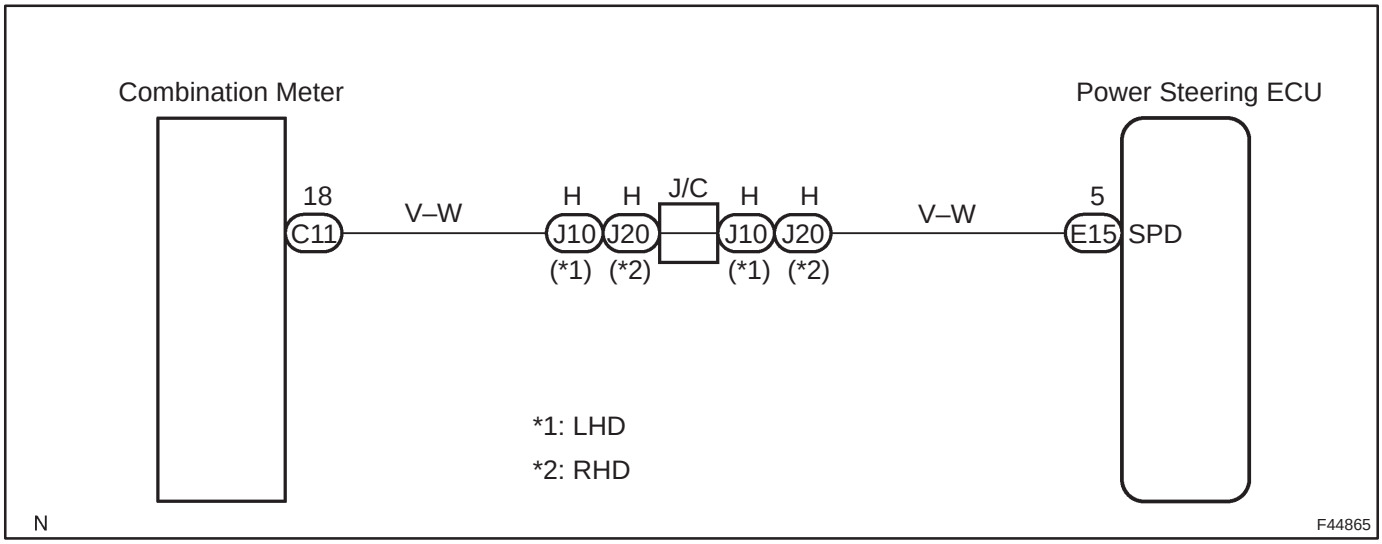
DTC	C1542/42	Speed Sensor Malfunction

DTC	C1571/71	Speed Sensor Malfunction (Test mode)

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1541/41	Speed sensor malfunction	• Speed sensor • Speed sensor circuit • Skid control ECU assy • Combination meter assy • Power steering ECU assy
C1542/42		
C1571/71	Speed sensor malfunction (Test mode)	

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

HINT:

Start the inspection from the step 1 with using hand–held tester. Start from step 2 without using hand–held tester.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON, and turn the hand–held tester main switch to ON.
(c) Select the item ”SPD” in the DATA LIST and read its value displayed on the hand–held tester.
(d) Check that there is no difference between the speed value output from the speedometer displayed by the hand–held tester and the speed value displayed by the speedometer when driving the vehicle.
OK:
There is almost no difference in the displayed speed values.

HINT:

There is tolerance of ±10 % in the speedometer indication.

OK → **REPLACE POWER STEERING ECU ASSY(See page 50–20)**

NG

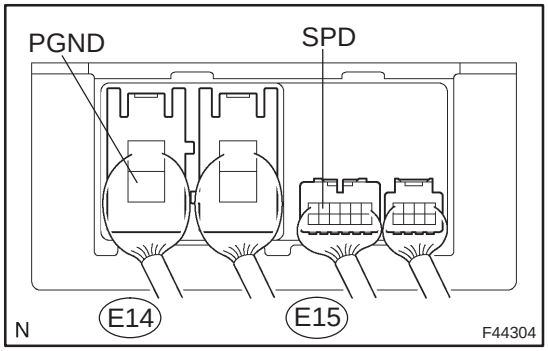
2	CHECK DIAGNOSTIC CODE OUTPUT

(a) Check that DTC for brake system output the normal code.

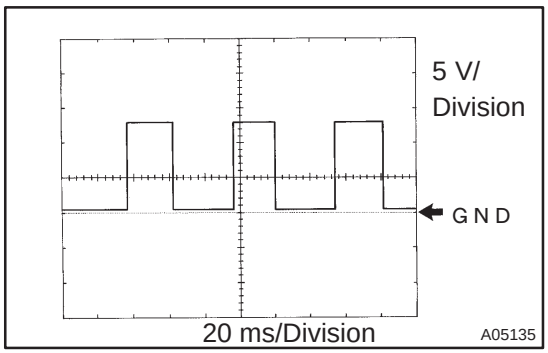
NG → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

OK

3	INSPECT POWER STEERING ECU ASSY(METER SPEED SIGNAL)



(a) Turn the ignition switch ON.
(b) Connect an oscilloscope to terminals SPD and PGND of the power steering ECU assy connector.



(c) Driving at about 20 km/h (12 mph), check the signal waveform.
Standard:
Signal waveform as shown in the illustration.

HINT:
As the vehicle speed becomes high, the waveform cycle narrows.

OK	REPLACE POWER STEERING ECU ASSY(See page 50–20)

NG

4	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – COMBINATION METER ASSY)

(a) Check for an open or short circuit in harness and connector between power steering ECU assy and combination meter assy (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

GO TO COMBINATION METER SYSTEM(See page 05–1510)

DTC	C1544/44	Engine Revolution Signal Malfunction

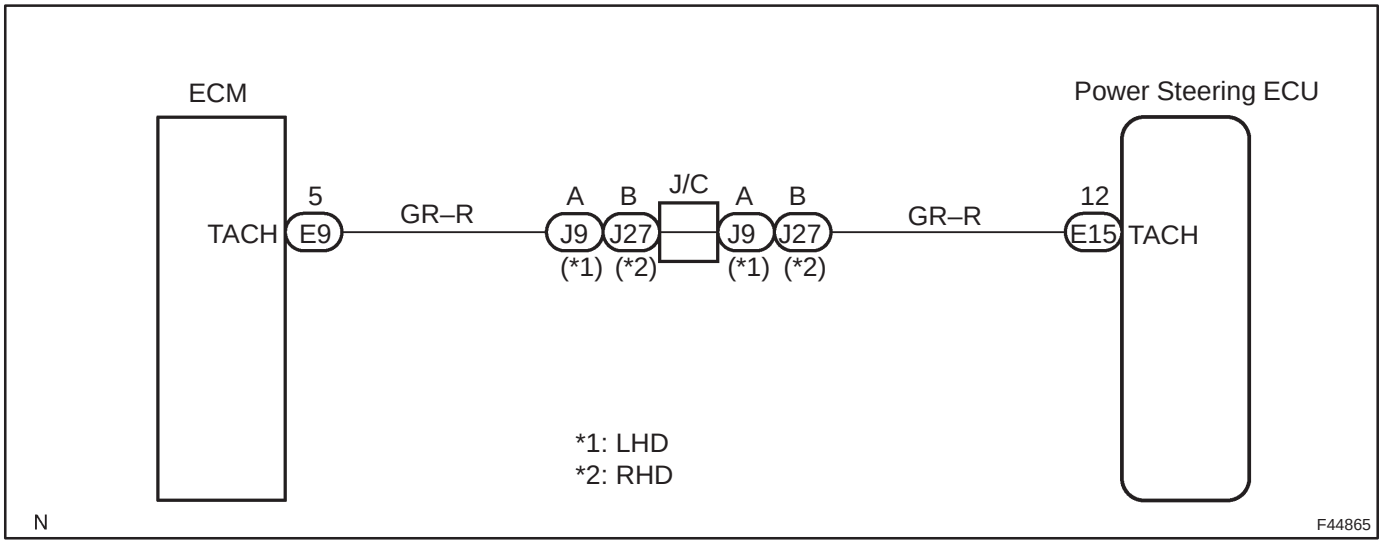
DTC	C1545/45	Engine Revolution Signal Malfunction

DTC	C1573/73	Engine Revolution Signal Malfunction (Test Mode)

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1544/44	Engine revolution signal malfunction	• Engine revolution signal circuit • ECM • Power steering ECU assy
C1545/45		
C1573/73	Engine revolution signal malfunction (Test mode)	

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

HINT:

Start the inspection from the step 1 with using hand–held tester. Start from step 2 without using hand–held tester.

1	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON, and turn the hand–held tester main switch to ON.
(c) Select the item ”ENGINE REV” in the DATA LIST and read its value displayed on the hand–held tester.
(d) Check that there is no difference between the engine revolution value output from the tachometer displayed by the hand–held tester and the engine revolution value displayed by the tachometer when engine is idle.

OK:

There is almost no difference in the displayed engine revolution values.

HINT:

There is tolerance of ±10 % in the tachometer indication.

OK	REPLACE POWER STEERING ECU ASSY(See page 50–20)

NG

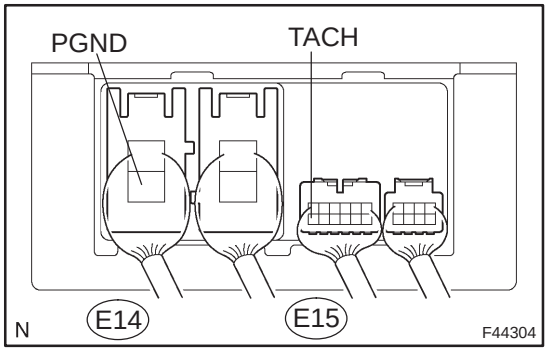
2	CHECK DIAGNOSTIC CODE OUTPUT

(a) Check that the DTC for engine output the normal code.

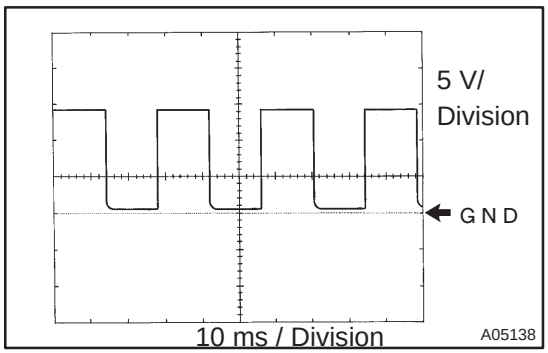
NG	REPAIR CIRCUIT INDICATED BY OUTPUT CODE

OK

3	INSPECT POWER STEERING ECU ASSY(ENGINE REVOLUTION SIGNAL)



(a) Turn the ignition switch ON.
(b) Connect an oscilloscope to terminals TACH and PGND of the power steering ECU assy connector.



(c) With the engine idling, check the signal waveform.
Standard:
Signal waveform as shown in the illustration.

HINT:
As the engine revolution becomes high, the waveform cycle narrows.

OK → **REPLACE POWER STEERING ECU ASSY(See page 50–20)**

NG

4	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – ECM)

(a) Check for an open or short circuit in harness and connector between power steering ECU assy and ECM (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

GO TO ENGINE CONTROL SYSTEM

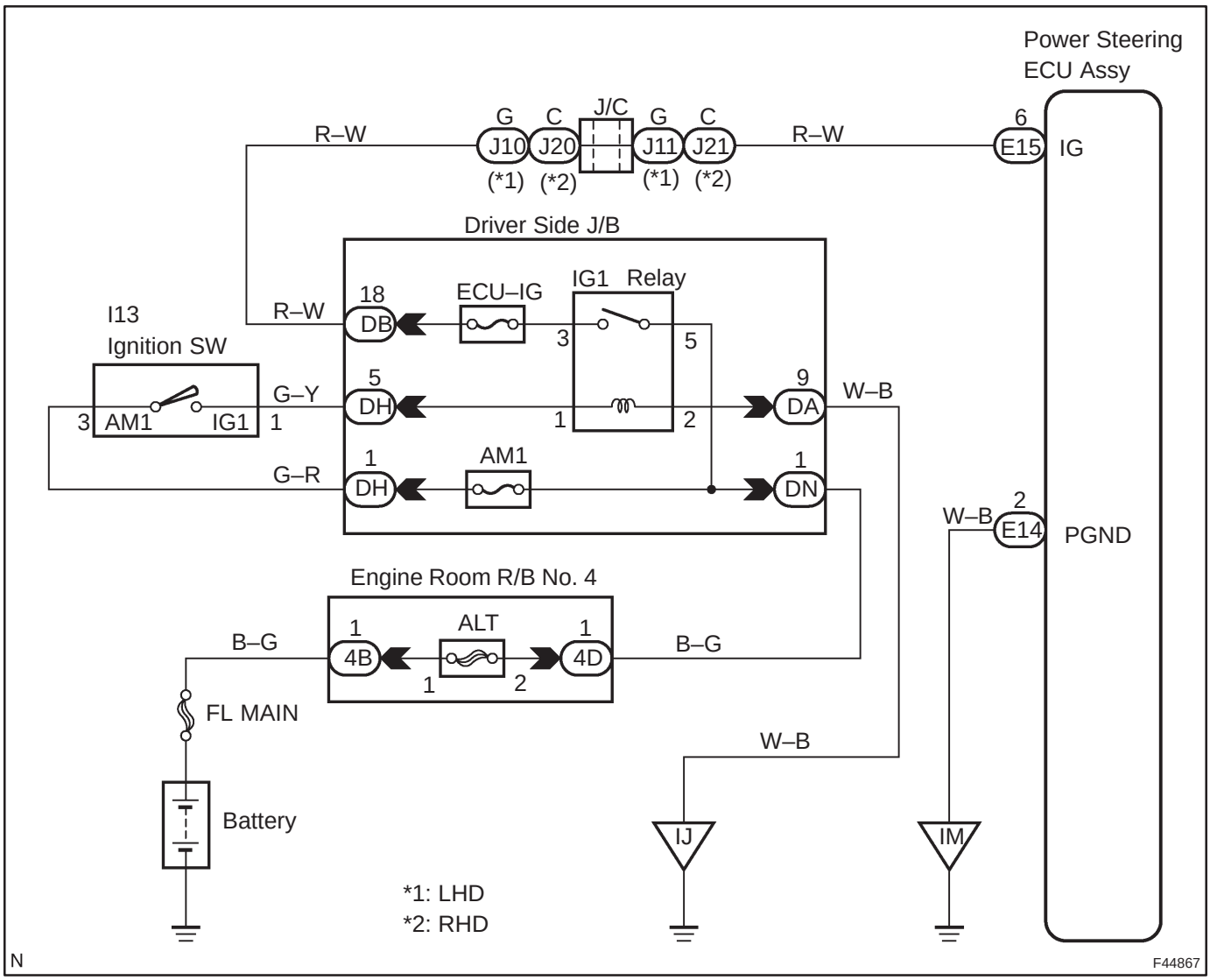
DTC C1551/51 IG Power Source Circuit Malfunction

CIRCUIT DESCRIPTION

The power steering ECU assy identifies ON or OFF status of the ignition switch by this circuit.

DTC No.	DTC Detecting Condition	Trouble Area
C1551/51	Unusual IG voltage value which exceeds the specification is inputed to power steering ECU assy.	• ECU–IG fuse • IG power source circuit • Charging system • Power steering ECU assy

WIRING DIAGRAM

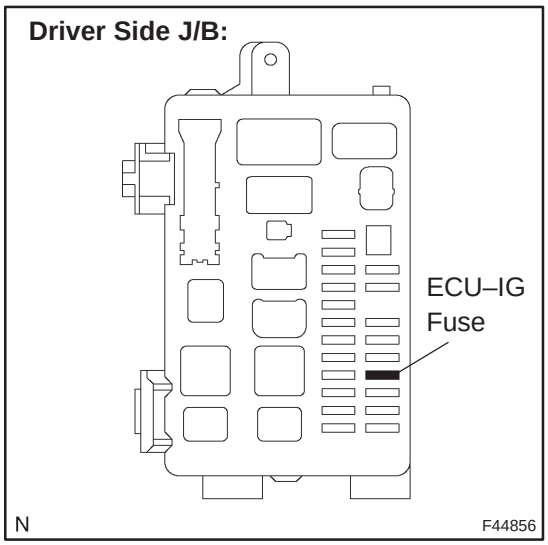


INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

1	INSPECT FUSE(ECU–IG)



(a) Remove the ECU–IG fuse from the driver side J/B.

(b) Check the continuity of the ECU–IG fuse.

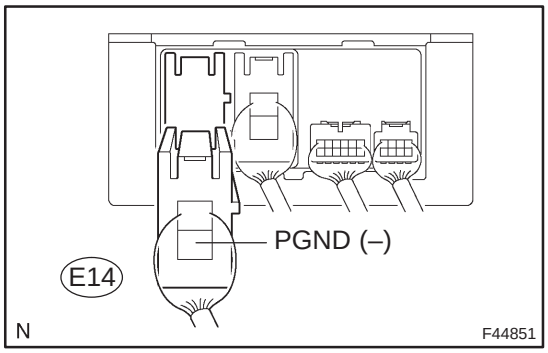
Standard:

Continuity

NG → **INSPECT FOR SHORT CIRCUIT IN ALL HARNESS AND COMPONENTS CONNECTED TO ECU–IG FUSE**

OK

2	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – BODY GROUND)



(a) Disconnect the E14 connector from the power steering ECU assy.

(b) Measure the resistance between terminal PGND of E14 connector and body ground.

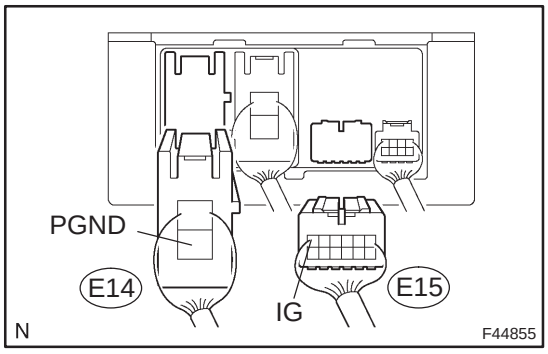
Standard:

Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – DRIVER SIDE J/B)



(a) Disconnect the E14 and E15 connectors from the power steering ECU assy.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals IG and PGND of the E14 and E15 connectors.
Standard:
Voltage: 10 to 16 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE POWER STEERING ECU ASSY (See page 50–20)

DTC	C1552/52	PIG Power Source Circuit

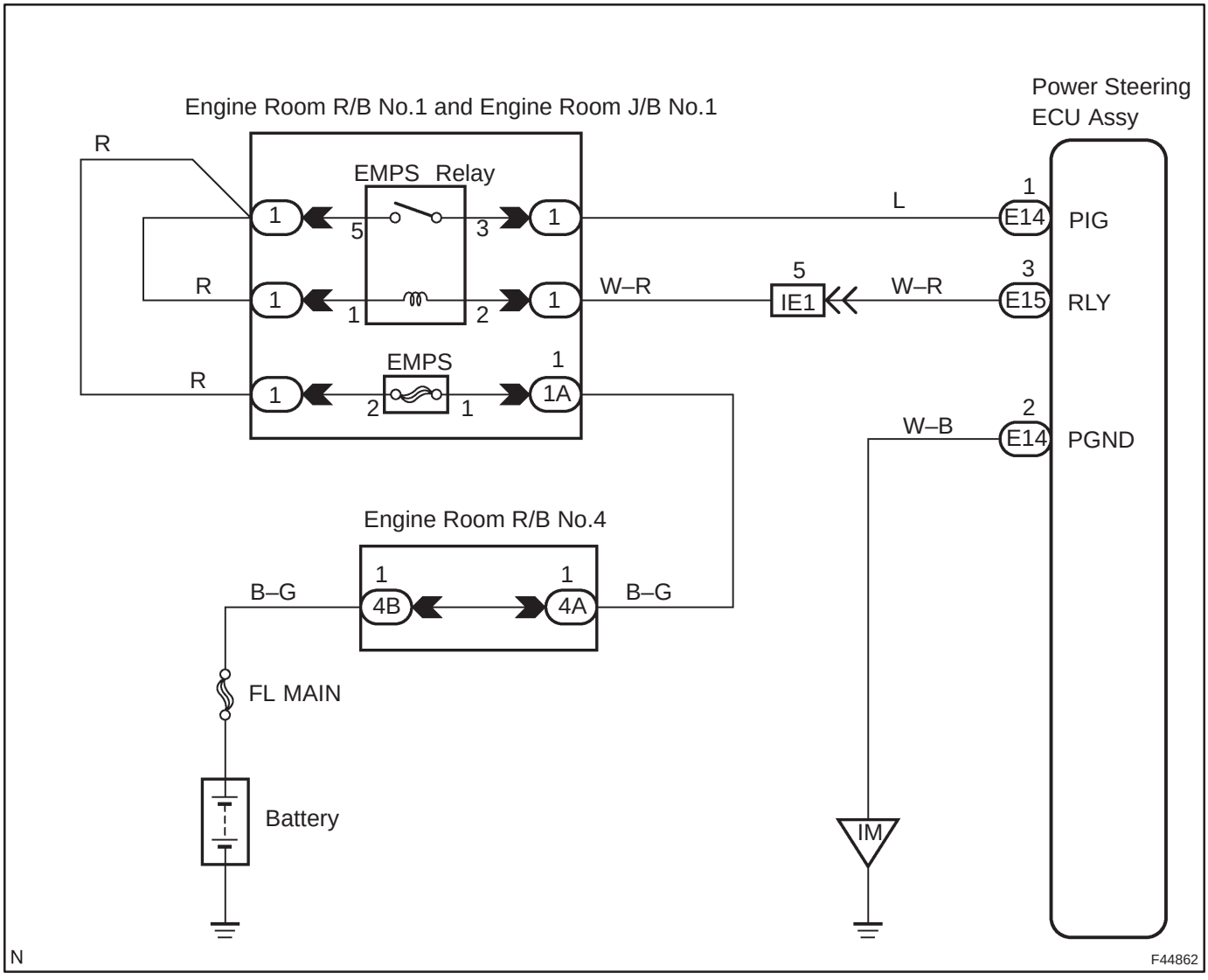
DTC	C1554/54	EMPS Relay Circuit

CIRCUIT DESCRIPTION

When turning the ignition switch to ON, battery voltage is supplied to terminal PIG of the power steering ECU assy by EMPS relay operations. If a malfunction occurs in the system, the system prohibits the steering assist by interrupting the circuits of the EMPS relay and the motor relay (built in the power steering ECU assy).

DTC No.	DTC Detecting Condition	Trouble Area
C1552/52	Unusual motor power source voltage value which is not within the specification is input to power steering ECU assy.	• EMPS fuse • EMPS relay • PIG power source circuit • Power steering ECU assy
C1554/54	Open or short circuit of EMPS relay circuit is detected.	

WIRING DIAGRAM



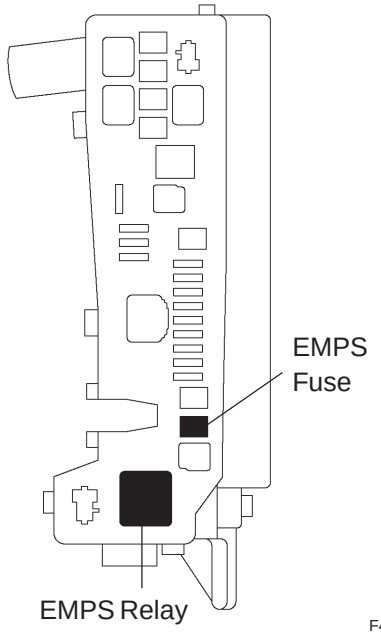
INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

1	INSPECT FUSE(EMPS)

Engine Room R/B No.1 and Engine Room J/B No.1:



(a) Remove the EMPS fuse from the engine room R/B No.1 and J/B No.1.

(b) Check the continuity of the EMPS fuse.

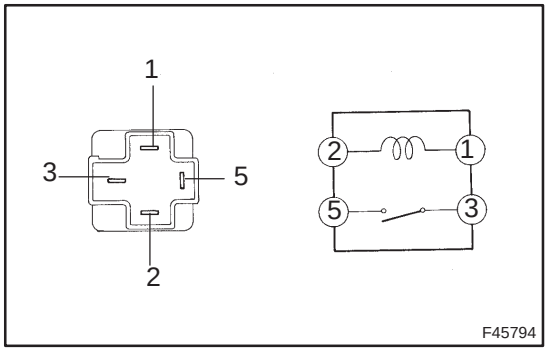
Standard:

Continuity

NG → **INSPECT FOR SHORT CIRCUIT IN HARNESS AND ALL COMPONENTS CONNECTED TO EMPS FUSE**

OK

2	INSPECT EMPS RELAY



(a) Remove the EMPS relay from the engine room R/B No. 1 and J/B No. 1.

(b) Check operation of the EMPS relay.

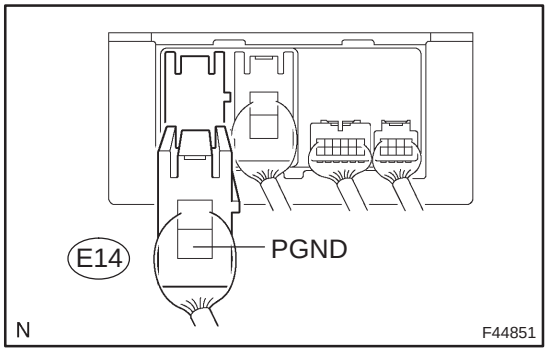
Standard:

Terminal No.	Specified condition
3 – 5	10 kΩ or higher
3 – 5	Below 1 Ω (When battery voltage is applied to terminals 1 and 2)

NG → **REPLACE EMPS RELAY**

OK

3	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – BODY GROUND)



(a) Disconnect the E14 connector from the power steering ECU assy.

(b) Measure the resistance between the terminal PGND of the E14 connector and body ground.

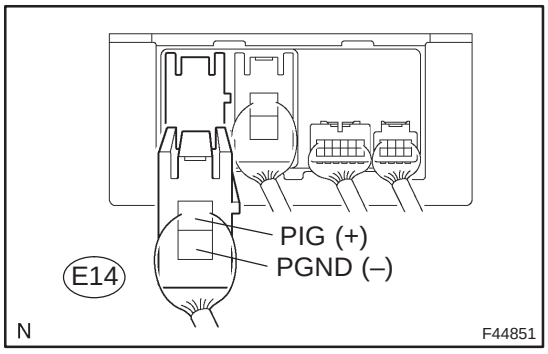
Standard:

Resistance: 1 Ω or less

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – ENGINE ROOM R/B AND J/B)



(a) Disconnect the E14 connector from the power steering ECU assy.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals PIG and PGND of the E14 connector.
Standard:
Voltage: 10 to 16 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE POWER STEERING ECU ASSY(See page 50–20)

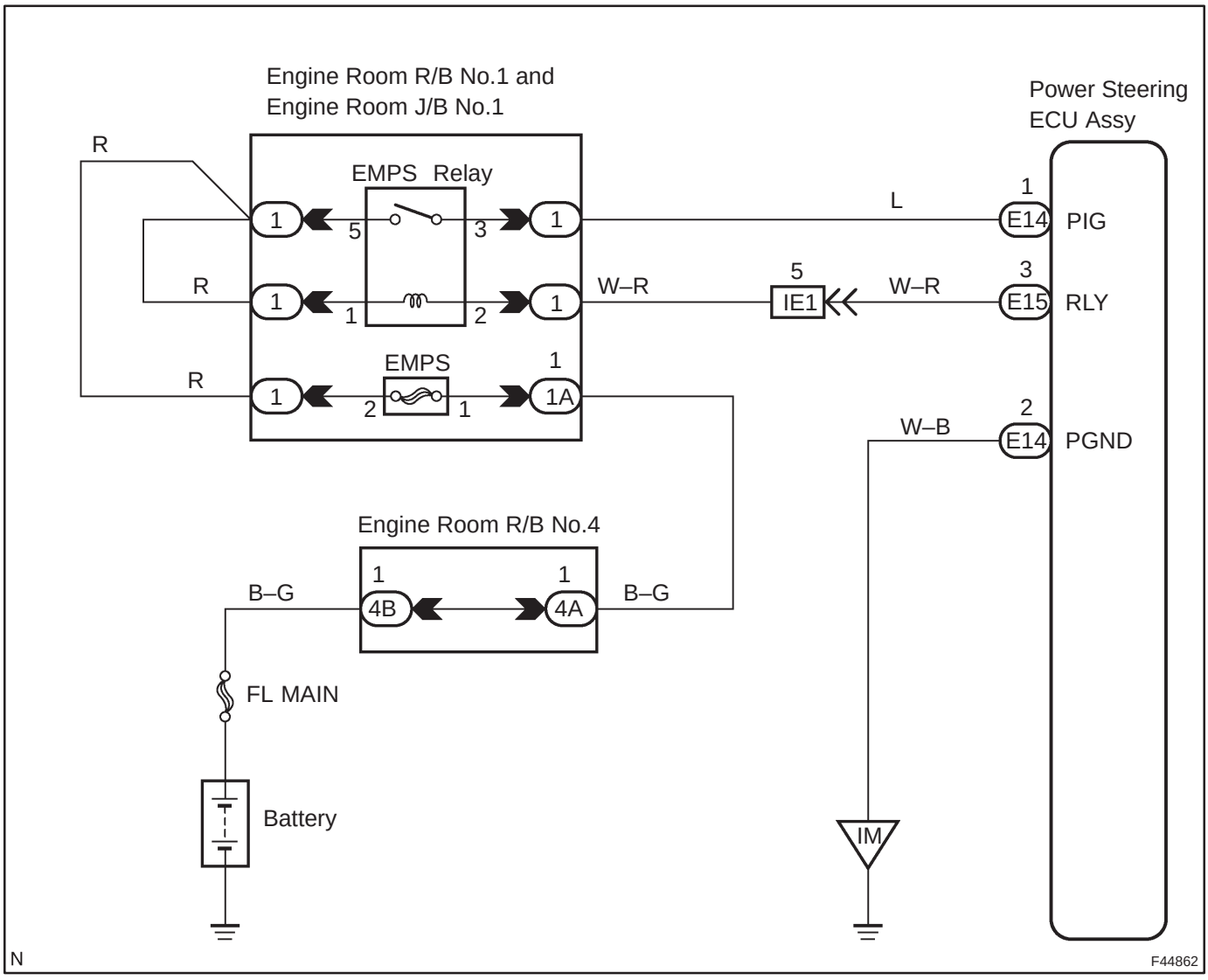
DTC C1555/55 EMPS Motor Relay Circuit

CIRCUIT DESCRIPTION

If a malfunction occurs in the system, the system prohibits the steering assist by interrupting the circuits of the EMPS relay and the motor relay (built in the power steering ECU assy).

DTC No.	DTC Detecting Condition	Trouble Area
C1555/55	Open or short circuit of EMPS motor relay in the ECU circuit is detected.	Power steering ECU assy

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

HINT:

Start the inspection from the step 1 with using hand–held tester. Start from step 2 without using hand–held tester.

1 READ VALUE OF HAND–HELD TESTER

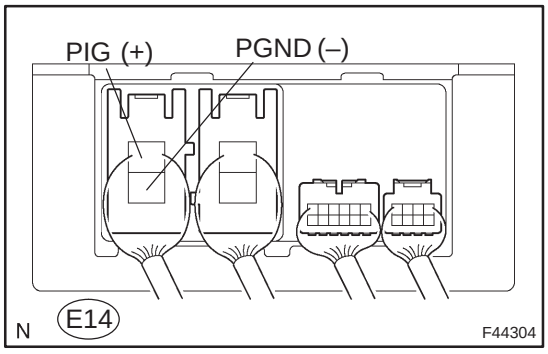
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the hand–held tester main switch to ON.
(c) Select the item ”PIG SUPPLY” in the FREEZE FRAME DATA and read its value displayed on the hand–held tester.
(d) Check that the power supply voltage value of the drive motor displayed by the hand–held tester.
Standard:
Voltage: 10 to 16 V

OK → **Go to step 3**

NG

GO TO RELEVANT DTC CHART

2 INSPECT POWER STEERING ECU ASSY(PIG TERMINAL VOLTGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals PIG and PGND of power steering ECU assy connector.
Standard:
Voltage: 10 to 16 V

NG → **GO TO RELEVANT DTC CHART (See page 05–1076)**

OK

3 RECONFIRM DTC

(a) Check the DTCs (See page 05–1045).
(b) Is DTC except for C1552/52 output?

YES → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE**

NO

REPLACE POWER STEERING ECU ASSY(See page 50–20)

050Y7–04

CUSTOMER PROBLEM ANALYSIS CHECK

EMPS Check Sheet

Inspector's :
Name

Customer's Name		**VIN**	
		Production Date	/ /
Vehicle Model		**Licence No.**	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ / (Engine ☐ Cooled ☐ Warmed up)
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Steering operation is heavy.	
	☐ Steering force to the right and left differs, or steering force is uneven.	
	☐ While running, the steering force does not alter corresponding the vehicle speed.	
	☐ The steering returns unwell.	
	☐ Vibration or strange sound comes from the steering column assy.	
	☐ When a trouble happens (☐ During turning ☐ During vehicle stop ☐ Always)	
	☐ Others	
	PS Warning Light Abnormal	☐ Remains ON ☐ Does not come on

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data
A malfunction code is outputed at the first time, record the freeze frame data as well (as the DTCs).

050WM–04

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- Using SST 09843–18040, connect terminals Tc and CG of the DLC3.
- If a malfunction code is displayed during the DTC check, check the circuit listed for the code. For details of each code, proceed the page referred to under the ”See page” for respective ”DTC No.” in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area
C1511/11 (05–1059)	Torque sensor circuit malfunction	• Steering column assy • Power steering ECU assy
C1512/12 (05–1059)		
C1513/13 (05–1059)		
C1514/14 (05–1059)	Torque sensor power source circuit malfunction	
C1515/15 (05–1062)	Calibration of torque sensor zero point is not performed	Sensor zero point calibration is not preformed.
C1516/16 (05–1063)	Calibration of torque sensor zero point is not completed	Sensor zero point calibration failure.
C1517/17 (05–1059)	Torque sensor hold malfunction	• Steering column assy • Power steering ECU assy
C1523/23 (05–1064)	Motor circuit malfunction	• Steering column assy • Power steering ECU assy
C1524/24 (05–1064)		
C1531/31 (05–1066)	Power steering ECU assy malfunction	Power steering ECU assy
C1532/32 (05–1066)		
C1533/33 (05–1066)		
C1534/34 (05–1066)		
C1541/41 (05–1067)	Speed sensor malfunction	• Speed sensor • Speed sensor circuit • Skid control ECU • Combination meter assy • Power steering ECU assy
C1542/42 (05–1067)		
C1544/44 (05–1070)	Engine revolution signal malfunction	• Engine revolution signal circuit • ECM • Power steering ECU assy
C1545/45 (05–1070)		
C1551/51 (05–1073)	IG power source circuit malfunction	• ECU–IG fuse • Power steering relay • IG power source circuit • Charging system • Power steering ECU assy
C1552/52 (05–1076)	PIG power source circuit malfunction	• EMPS fuse • EMPS relay • PIG power source circuit • Power steering ECU assy
C1554/54 (05–1076)	EMPS relay circuit malfunction	

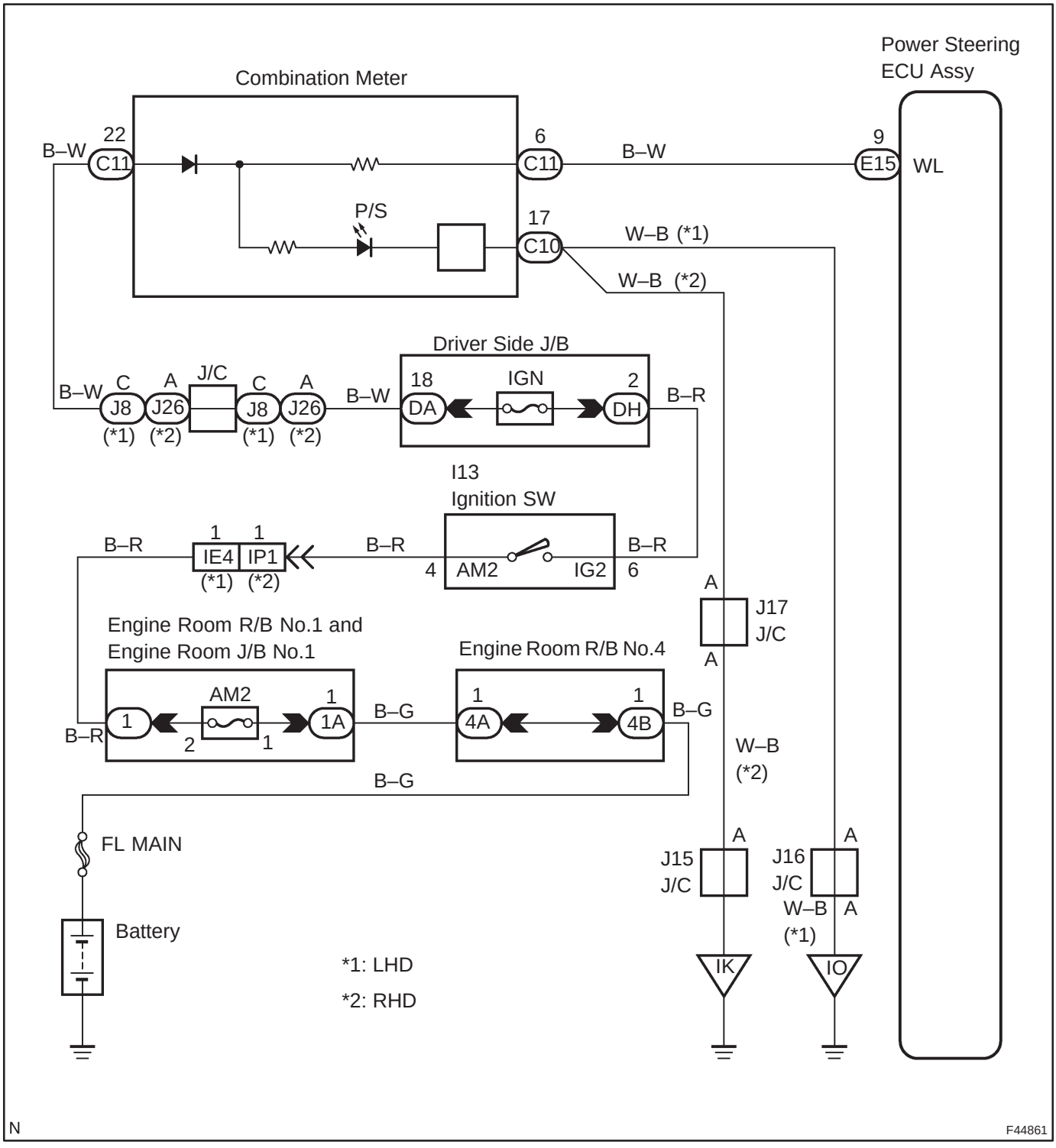
C1555/55 (05–1080)	EMPS motor relay circuit malfunction	Power steering ECU assy
C1581/81 (05–1066)	Assist map un–written	Power steering ECU assy

EMPS Warning Light Circuit

CIRCUIT DESCRIPTION

If the power steering ECU assy detects a trouble, the PS warning lights up. At this time, the power steering ECU assy records a DTC in memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

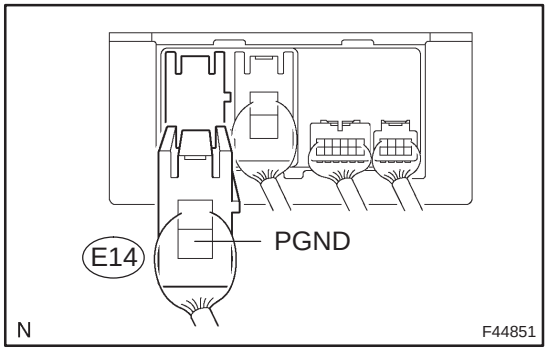
1	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – COMBINATION METER ASSY)

(a) Check for an open or short circuit in harness and connector between power steering ECU assy and combination meter assy (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – BODY GROUND)



(a) Disconnect the E14 connector from the power steering ECU assy.

(b) Check the continuity between the terminal PGND of the E14 connector and body ground.

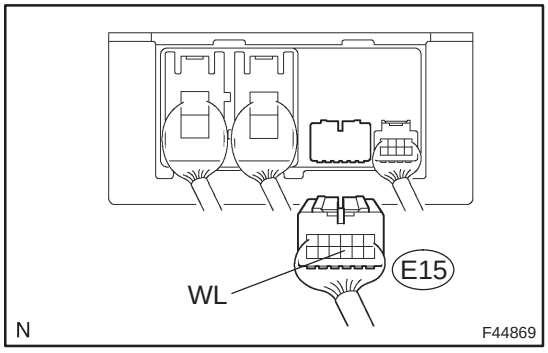
Standard:

Continuity

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	INSPECT POWER STEERING ECU ASSY



(a) Turn the ignition switch ON.

(b) Disconnect the E15 connector from the power steering ECU assy, and check the P/S warning light comes on.

(c) Using a service wire, ground the terminal WL of the E15 connector, and check the P/S warning light goes off.

Standard:

P/S warning light comes on and then goes off

NG	REPLACE POWER STEERING ECU ASSY (See page 50–20)

OK

CHECK GO TO COMBINATION METER SYSTEM

ELECTRONIC MOTOR POWER STEERING SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

050Y2–04

Perform troubleshooting in accordance with the procedure on the following pages.

HINT:

- See the indicated pages for detailed explanation.
- The hand–held tester can be used at step 3, 6, 9, 12.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS(See page 05–1044)

3	CHECK AND CLEAR DTCS AND FREEZE FRAME DATA

(a) After the completion of the DTC and freeze frame data check, clear the DTCs (See page 05–1045).

4	PROBLEM SYMPTOM CONFIRMATION

- SYMPTOM DOES NOT OCCUR(Go to step 5)
- SYMPTOM OCCURS(Go to step 6)

5	SYMPTOM SIMULATION(See page 01–22)

6	DTC CHECK(See page 05–1045)

- NORMAL CODE(Go to step 7)
- MALFUNCTION CODE(Go to step 8)

7	PROBLEM SYMPTOMS TABLE(See page 05–1058)

8	DTC CHART(See page 05–1054)

9	CIRCUIT INSPECTION(See page 05–1059 to 05–1086)

10	IDENTIFYING PROBLEMS

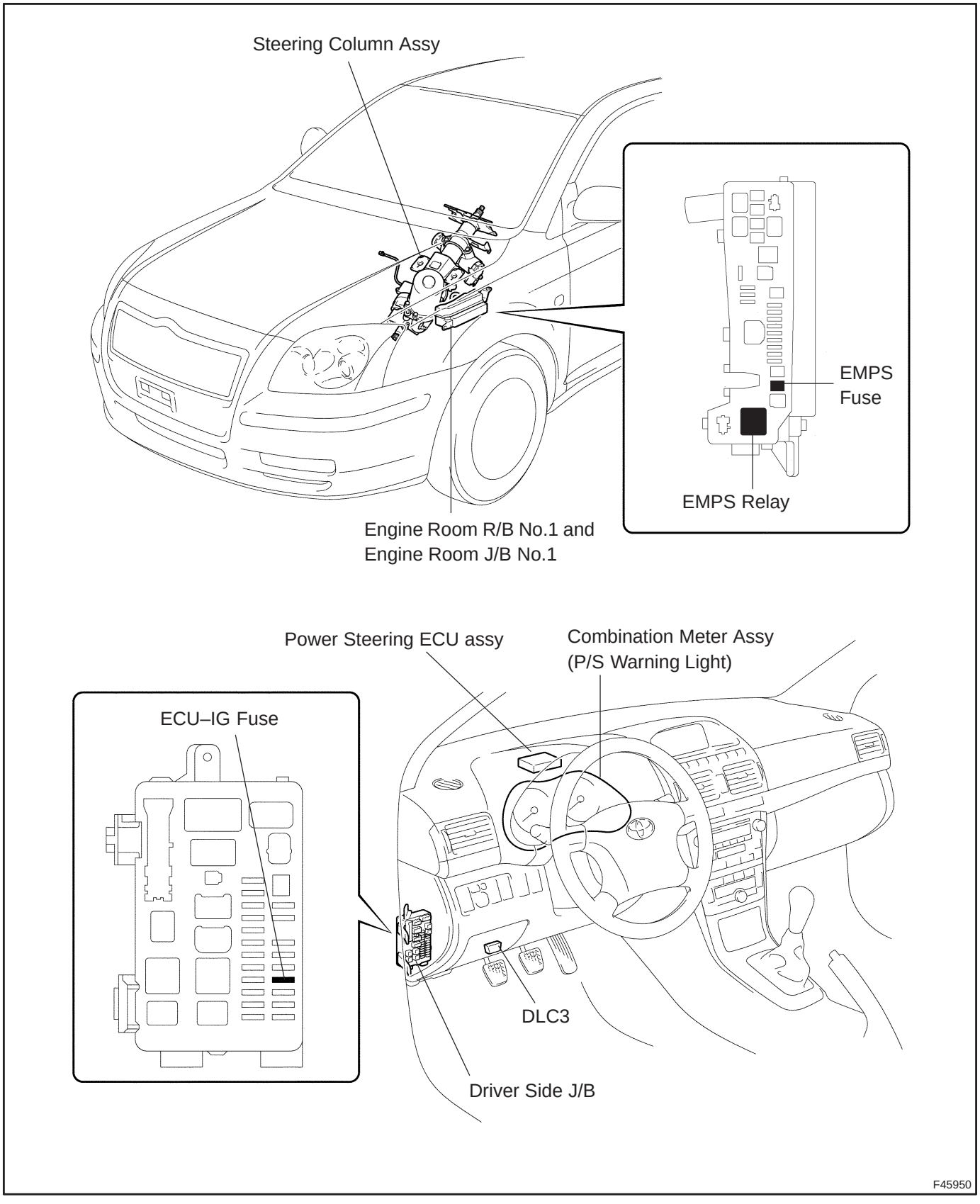
11	REPAIR

12	CONFIRMATION TEST

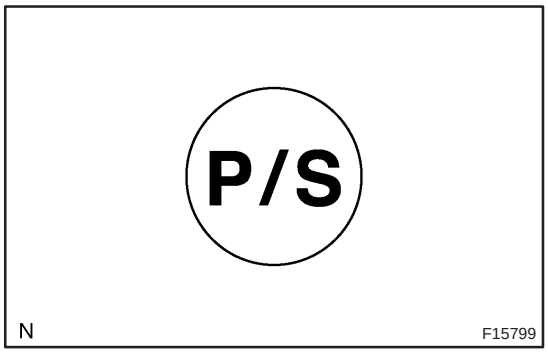
END

050WN–04

LOCATION



PRE–CHECK



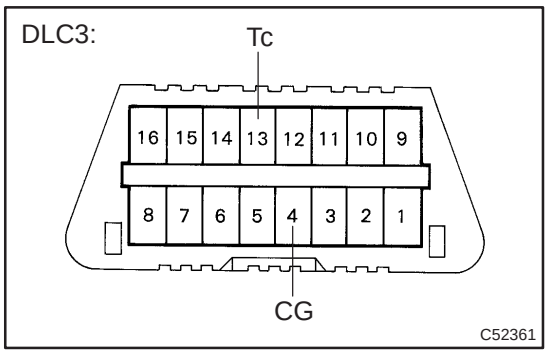
1. DIAGNOSIS SYSTEM

(a) Check the PS warning light.

(1) When the ignition switch is turned ON, check that the PS warning light goes on for 2 seconds.

HINT:

If the indicator check result is not normal, proceed to trouble-shooting for the PS warning light circuit (See page 05–1082).



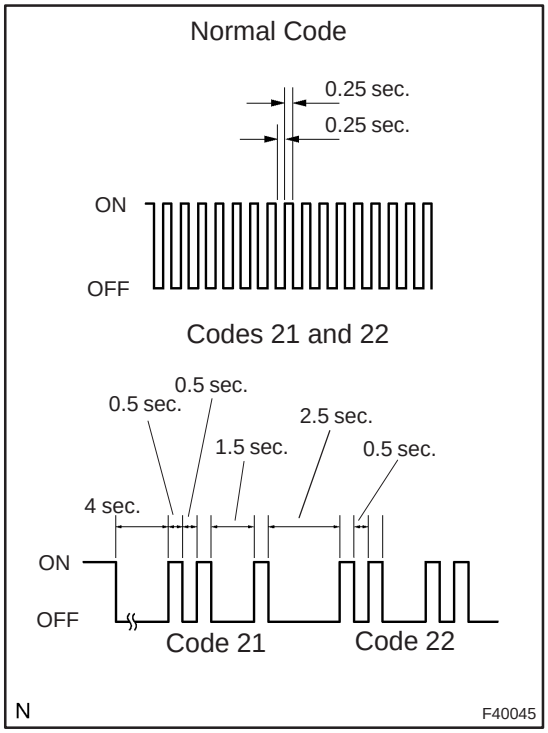
2. DTC CHECK (USING SST CHECK WIRE)

(a) Checking DTCs using a SST check wire.

SST 09843–18040

(1) Using SST, connect terminals Tc and CG of the DLC3.

(2) Turn the ignition switch to ON.



(3) Read and record any DTCs from the P/S warning light on the combination meter. Refer to the chart on the left for examples of a normal code and codes 21 and 22.

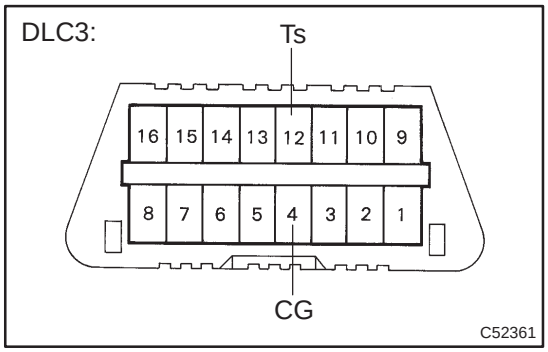
HINT:

- If the P/S warning light does not blink any DTC codes or the normal code, inspect the circuit shown in the charts below.

Trouble Area	
Tc Terminal Circuit	05–1084
P/S Warning Light Circuit	05–1082

- If 2 or more malfunctions are detected at the same time, DTC will be displayed in the ascending order.

(4) Refer to the Diagnostic Trouble Code Chart (See page 05–1054) for DTC information.



(b) Clearing the DTCs using the SST check wire.
SST 09843–18040
(1) Using SST, connect terminals Ts and CG of the DLC3.
(2) Turn the ignition switch to ON.
(3) Disconnect and connect the SST check wire from the CG terminal 4 times or more in 8 seconds ending with it connected.
(4) Check that the P/S warning light blinks a normal code.
(5) Turn the ignition switch to OFF.
(6) Remove the SST from the DLC3.
SST 09843–18040

3. DTC CHECK (USING HAND–HELD TESTER)

(a) Checking DTCs using the hand–held tester.
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch to ON.
(3) Read the DTCs by following the prompts on the tester screen.

HINT:
Refer to the hand–held tester operator's manual for further details.

(b) Clearing the DTCs using the hand–held tester.
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch to ON.
(3) Clear the DTCs by following the prompts on the tester screen.

HINT:
Refer to the hand–held tester operator's manual for further details.

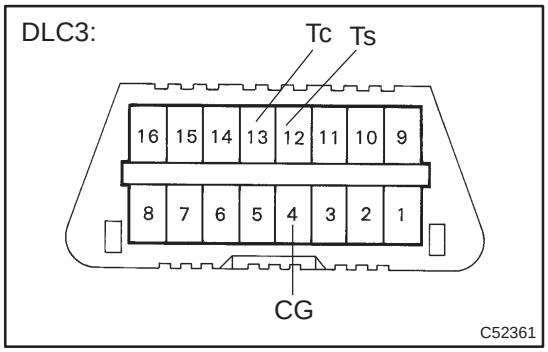
4. DATA LIST AND FREEZE FRAME DATA

HINT:
Ignition switch must be turned ON, and the vehicle should be placed on a leveled ground to observe data by using a hand–held tester.

Data List (*: with freeze frame data):

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
TRQ1 (*)	Show the output states in the torque sensor / Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V Steering wheel right turned: 2.5 to 4.7 V Steering wheel left turned: 0.3 to 2.5 V	–
TRQ2 (*)	Show the output states in the torque sensor / Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V Steering wheel right turned: 2.5 to 4.7 V Steering wheel left turned: 0.3 to 2.5 V	–

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
TRQ3 (*)	Show the output states in the torque sensor / Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V Steering wheel right turned: 2.5 to 4.7 V Steering wheel left turned: 0.3 to 2.5 V	–
SPD (*)	Show the vehicle speed on the speedometer / Min.: 0 km/h (0 mph), Max.: 255 km/h (158 mph)	Actual vehicle speed	Vehicle speed indicated on speedometer
ENGINE REV (*)	Show the engine revolution / Min.: 0 rpm Max.: 8,192 rpm	Actual engine speed	–
MOTOR ACTUAL (*)	Show the current flowing motor / Min.: –128 A, Max.: 128 A	0 to 65 A	–
COMMAND VALUE (*)	Show the specified current value / Min.: –128 A, Max.: 128 A	0 to 65 A	–
THERMISTOR TEMP (*)	Show the temperature of the thermistor / Min.: –50 °C, Max.: 205 °C	–	–
PIG SUPPLY (*)	Show the power supply voltage for driving motor / Min.: 0 V, Max.: 25 V	10 to 16 V	While power steering operated
IG SUPPLY (*)	Show the power supply condition / Min.: 0 V, Max.: 25 V	10 to 16 V	–
TRQ1 ZERO VAL (*)	Show the torque sensor/ Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V	–
TRQ2 ZERO VAL (*)	Show the torque sensor/ Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V	–
TRQ3 ZERO VAL (*)	Show the torque sensor/ Min.: 0 V, Max.: 5 V	Steering wheel center position: 2.3 to 2.7 V	–
MTR OVERHEAT	Record of continuous overheat preventive control / record or un–record	Un–record	–
MTR LOW POWER	Record of low motor power supply voltage / record or un–record	Un–record	–
MTR HIGH POWER	Record of high motor power supply voltage / record or un–record	Un–record	
#CODES	Number of DTC recorded / Min.: 0, Max.: 255	Min.: 0, Max.: XX	–
ASSIST MAP	Show the selected condition of the assist map / 01, 02, 03, 11 or 12	–	–
ECU ID	Show the identified information of ECU / 01, 02, 03, 04 or 05	–	–
TEST MODE STAT	Test mode status / NORMAL or TEST	NORMAL: Normal mode TEST: During test mode	–



5. INPUT SIGNAL CHECK (TEST MODE) (USING SST CHECK WIRE)

(a) Check the input signal using a SST check wire.

(1) Using SST, connect terminals Ts and CG of DLC3.
SST 09843–18040

(2) Turn the ignition switch to ON.

(3) Check that the PS warning light shows the normal code.

(4) Check that the PS warning light goes off while driving the vehicle more than 10 km/h (6 mph) and the engine speed more than 300 rpm.

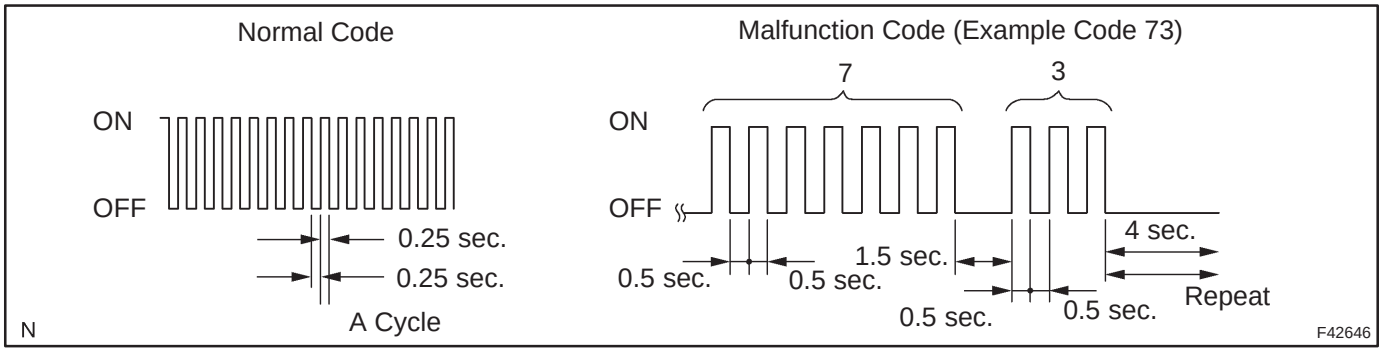
HINT:
If the PS warning light goes off during driving, the sensor is judged to be normal.

(5) Stop the vehicle.

(6) Using SST, connect terminals Tc and CG of DLC3.
SST 09843–18040

(7) Read the number of blinks of the PS warning light.

HINT:
- See the list of DTC shown in the table below.
- Even if a sensor is normal, it output codes 71 and 73 during test mode.



DTC of input signal check function:

Code No. (See page)	Diagnosis	Trouble Area
C1571/71 (05–1067)	Speed sensor signal check 1 (Test mode)	• Speed sensor • Speed sensor circuit • Skid control ECU assy • Combination meter assy • Power steering ECU assy
C1573/73 (05–1070)	Engine revolution signal check (Test mode)	• Engine revolution signal circuit • ECM • Power steering ECU assy

(8) After checking, disconnect the SST from the terminal Ts and CG, Tc and CG of DLC3, and turn the ignition switch to OFF.
SST 09843–18040

6. INPUT SIGNAL CHECK (TEST MODE) (USING HAND–HELD TESTER)

(a) Check the input signal using the hand–held tester.
  (1) Connect the hand–held tester to the DLC3.
  (2) Check that the warning light goes off with driving the vehicle more than 10 km/h (6 mph) and engine speed more than 300 rpm.
  (3) Read the DTC by following the prompts on the tester screen.

HINT:
- Refer to the hand–held tester operator's manual for further details.
- See the list of DTC shown in the table below.
- Even if a sensor is normal, it outputs codes C1571/71 and C1573/73 during test mode.

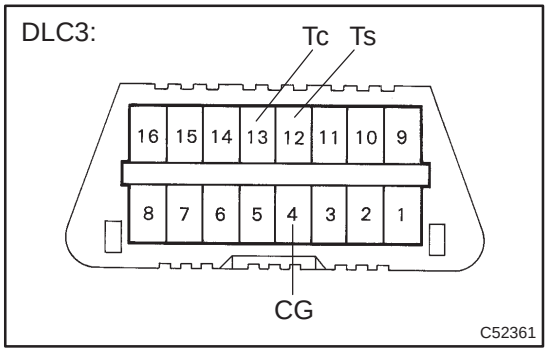
DTC of input signal check function:

Code No. (See page)	Diagnosis	Trouble Area
C1571/71 (05–1067)	Speed sensor signal check 1 (Test mode)	• Speed sensor • Speed sensor circuit • Skid control ECU assy • Combination meter assy • Power steering ECU assy
C1573/73 (05–1070)	Engine revolution signal check (Test mode)	• Engine revolution signal circuit • ECM • Power steering ECU assy

7. CALIBRATION OF TORQUE SENSOR ZERO POINT (USING SST CHECK WIRE)

HINT:
Perform this operation in the following cases.
- When removing and installing "steering wheel assembly", "tilt steering column assembly" and "steering gear assembly".
- When replacing power steering ECU assy.

(a) Place front wheels and steering wheel facing straight ahead.



(b) Perform the torque sensor zero point initialization.

HINT:
If the power steering ECU assy is replaced, initialization is not necessary.
  (1) Stop the vehicle and turn the ignition switch OFF.
  (2) Using SST, connect terminals Ts and CG of DLC3.
  SST 09843–18040
  (3) Using SST, connect terminals Tc and CG of DLC3.
  SST 09843–18040
  (4) Turn the ignition switch ON.

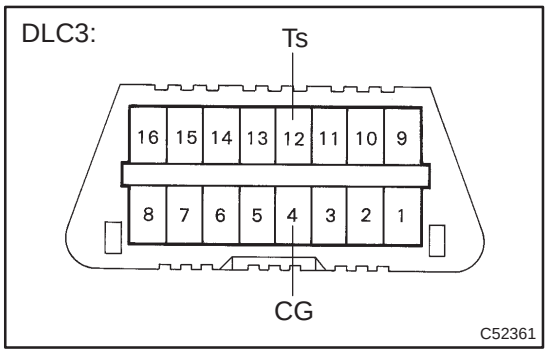
(5) Disconnect and connect the terminal Tc of DLC3 20 times within 20 seconds.
(6) Check the DTC C1515/15 output.

(c) Perform the torque sensor zero point calibration.

HINT:

- Do not touch the steering wheel.
- Check that the DTC for except C1515/15 is not output.

(1) Stop the vehicle and turn the ignition switch to OFF.



(2) Using SST, connect terminals Ts and CG of DLC3 and turn the ignition switch to ON.

SST 09843–18040

(3) Disconnect the SST.

SST 09843–18040

(4) Check the DTC is not output.

8. CALIBRATION OF TORQUE SENSOR ZERO POINT (USING HAND–HELD TESTER)

HINT:

Perform this operation in the following cases.

- When removing and installing ”steering wheel assembly”, ”tilt steering column assembly” and ”steering gear assembly”.
- When replacing power steering ECU assy.

(a) Place front wheels and steering wheel facing straight ahead.

(b) Perform the torque sensor zero point initialization.

HINT:

If the power steering ECU assy is replaced, initialization is not necessary.

(1) Stop the vehicle.
(2) Connect the hand–held tester to the DLC3.
(3) Select the ”TRQ SENS ADJUST” mode on the hand–held tester.
(4) Select the ”ZERO POINT INITIALIZE”.
(5) Following the screen instructions, perform the torque sensor zero point initialization.

(c) Perform the torque sensor zero point calibration.

HINT:

Do not touch the steering wheel.

(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Select the ”TRQ SENS ADJUST” mode on the hand–held tester.
(4) Select the ”ZERO POINT ADJUST”.
(5) Following the screen instructions, perform the torque sensor zero point calibration.

9. REPLACE POWER STEERING ECU ASSY

NOTICE:

Thoroughly check the procedures for removing and installing the power steering ECU assy when replacing it. Do the same operation or procedure for the removing and installing the steering column assy.

(a) Remove the power steering ECU assy (See page 50–20).

(1) Mark the clamp position on the torque sensor wire harness in order to reinstall the wire harness as shown in the illustration.

(2) Disconnect the torque sensor wire harness from the clamp.

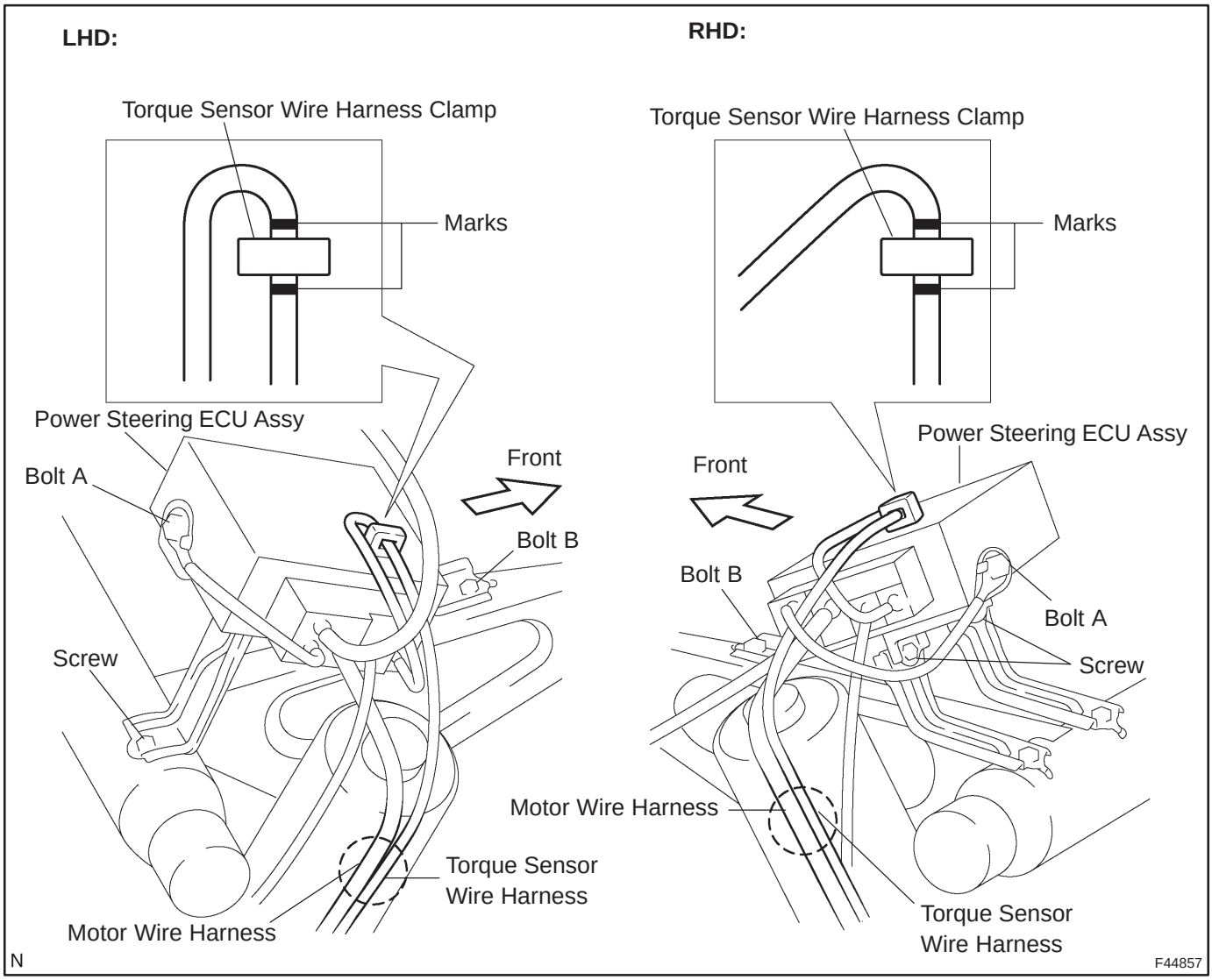
NOTICE:

In case the clamp will be reused, pay attention so as not to damage it.

(3) Disconnect the connectors.

(4) LHD:
Remove the 2 bolts, screw and power steering ECU assy.

(5) RHD:
Remove the 2 bolts, 2 screws and power steering ECU assy.



(b) Install the power steering ECU assy (See page 50–20).

(1) LHD:

Install the power steering ECU assy with the 2 bolts and screw.

Torque:
Bolt A: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
Bolt B: 15.5 N·m (158 kgf·cm, 11 ft·lbf)

(2) RHD:

Install the power steering ECU assy with the 2 bolts and 2 screws.

Torque:
Bolt A: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
Bolt B: 15.5 N·m (158 kgf·cm, 11 ft·lbf)

(3) Connect the connectors.

(4) Align the marks on the torque sensor wire harness with the clamp, as shown in the illustration.

NOTICE:

- **When reusing the clamp, check that there is no damage on it.**
- **When reinstalling the wire harness, make sure there is no twist in the harness or with other wire harness.**

10. FAIL SAFE FUNCTION

(a) If the power steering ECU assy detects a trouble, the ECU assy halt, fix or lower the steering power assist in order to protect the system.

HINT:

Repeating the steering operation when stopping or driving at low speed, or leaving the steering wheel turn fully for long hours will lower the amount of power assist in order to prevent power steering ECU assy from heating up. In this case, not operating the steering for about 10 minutes with engine idle will lead the fail safe function to return the normal state.

050WP–04

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

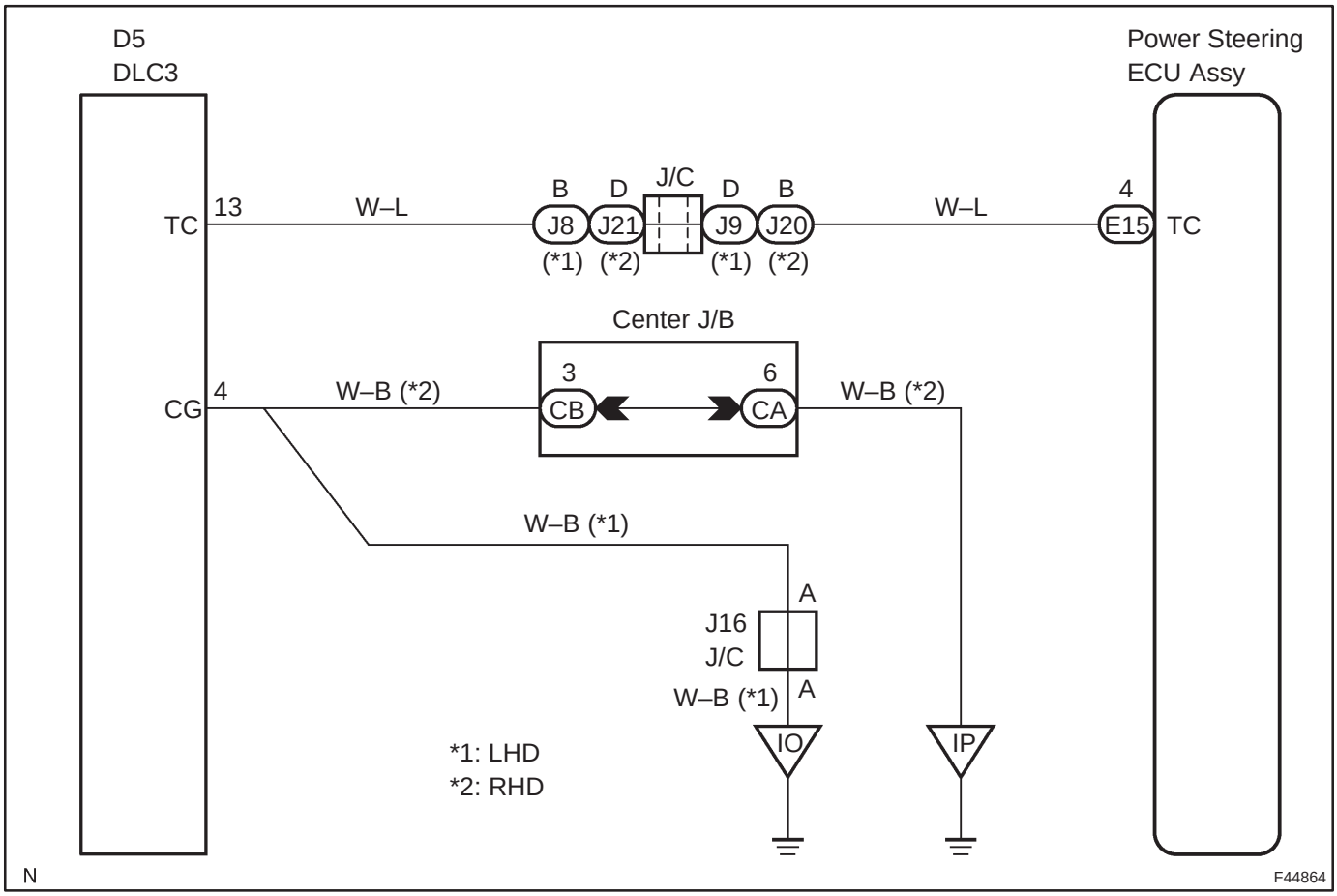
Symptom	Suspected Area	See page
At the time of idling, steering control force is great.	1. Check the DTC reconfirming that the normal code is output. 2. IG Power source circuit 3. Front tire (Worn or improperly inflated) 4. Front wheel alignment (Incorrect) 5. Steering column assy 6. Power steering ECU assy	05–1045 05–1073 28–1 26–6 50–9 01–32
Even if the vehicle speed is increased, appropriate steering resistance cannot be felt.	1. Check the DTC reconfirming that the normal code is output. 2. Combination meter assy 3. Steering column assy 4. Power steering ECU assy	05–1045 71–21 50–9 01–32
P/S warning light faulty.	1. P/S warning light circuit 2. Power steering ECU assy	05–1082 01–32
DTC check cannot be done.	1. P/S warning light circuit 2. Tc terminal circuit 3. Power steering ECU assy	05–1082 05–1084 01–32
Input signal check cannot be done.	1. Ts terminal circuit 2. Power steering ECU assy 3. Combination meter assy	05–1086 01–32 71–21
Unusual noise.	1. Steering column assy 2. Power steering ECU assy 3. Steering gear assy	50–9 01–32 51–28

TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

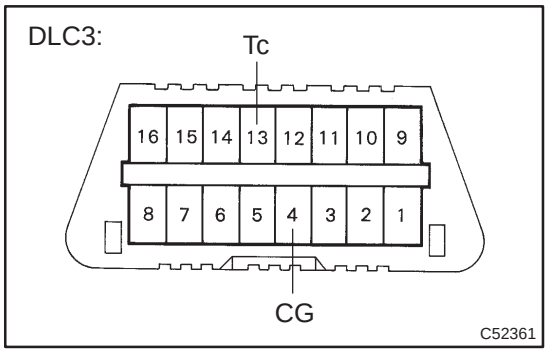
When the terminals Tc and CG of DLC3 are connected, the power steering ECU assy displays the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Tc TERMINAL)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Tc and CG of DLC3.
OK:
Voltage: 5 to 16 V

OK → **Go to step 3**

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminals CG of DLC3 and body ground (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK HARNESS AND CONNECTOR(DLC3 – POWER STEERING ECU ASSY)

(a) Check for an open or short circuit in harness and connector between terminals Tc of DLC3 and power steering ECU assy (See page 01–32).

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

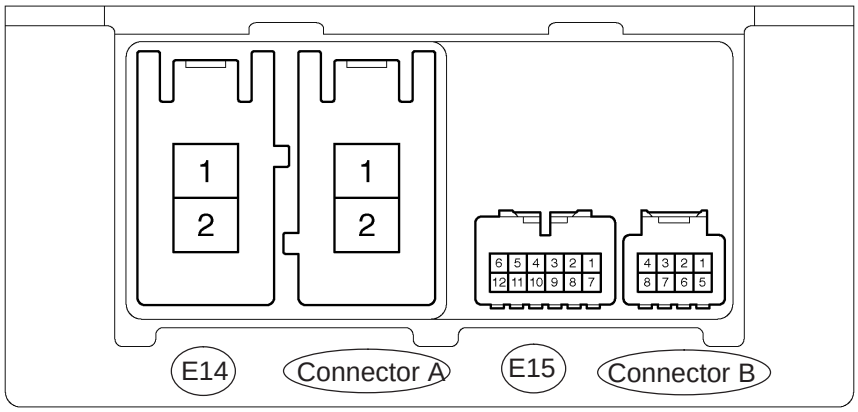
OK

REPLACE POWER STEERING ECU ASSY(See page 50–20)

050WO–04

TERMINALS OF ECU

POWER STEERING ECU ASSY



N

F44303

NOTICE:

When performing the inspection of power steering ECU, ECU must be installed to the vehicle or fully fixed.

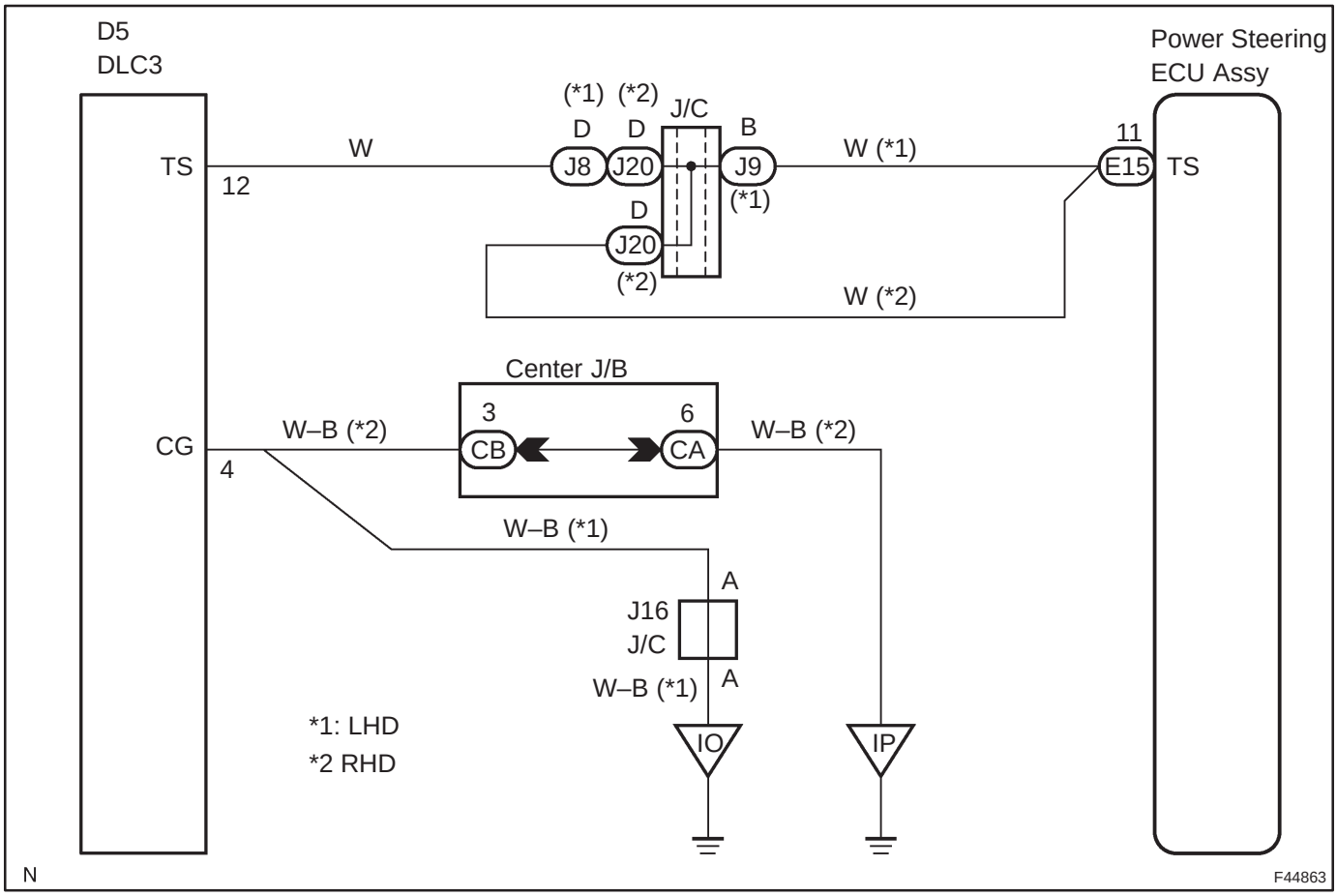
Symbols (Terminal No.)	Wiring Color	Condition	Specified condition
PIG (E14–1) – PGND (E14–2)	L – W–B	IG switch ON	10 to 16 V
PGND (E14–2) – Body Ground	W–B – Body Ground	Always	Below 1.0 V
M1 (A–1) – PGND (E14–2)	– – W–B	IG switch ON, turn the steering wheel to left	Below 1.0 V
		IG switch ON, turn the steering wheel to right	10 to 16 V
M2 (A–2) – PGND (E14–2)	– – W–B	IG switch ON, turn the steering wheel to left	10 to 16 V
		IG switch ON, turn the steering wheel to right	Below 1.0 V
SIL (E15–2) – PGND (E14–2)	W–G – W–B	IG switch ON	10 to 16 V
RLY (E15–3) PGND (E14–2)	W–R – W–B	IG switch ON, after 1 sec. or more	Below 2.0 V
Tc (E15–4) – PGND (E14–2)	W–L – W–B	IG switch ON	5 to 16 V
		IG switch ON, short circuit Tc and CG terminals of DLC3	Below 1.0 V
SPD (E15–5) – PGND (E14–2)	V–W – W–B	IG switch ON	Pulse generation
IG (E15–6) – PGND (E14–2)	R–W – W–B	IG switch ON	10 to 16 V
IDUP (E15–8) – PGND (E14–2)	GR – W–B	IG switch ON	5 to 16 V
WL (E15–9) – PGND (E14–2)	B–W – W–B	IG switch ON, P/S warning light goes off	10 to 16 V
		IG switch ON, P/S warning light comes on	Below 1.0 V
Ts (E15–11) – PGND (E14–2)	W – W–B	IG switch ON	5 to 16 V
		IG switch ON, short circuit Ts and CG terminals of DLC3	Below 1.0 V
TACH (E15–12) – PGND (E14–2)	GR–R – W–B	IG switch ON	Pulse generation
TRQ1 (B–5) – PGND (E14–2)	– – W–B	IG switch ON, turn the steering wheel to left and right	0.3 to 4.7 V
TRQV (B–6) – PGND (E14–2)	– – W–B	IG switch ON	7.5 to 8.5 V
TRQ2 (B–7) – PGND (E14–2)	– – W–B	IG switch ON, turn the steering wheel to left and right	0.3 to 4.7 V
TRQG (B–8) – PGND (E14–2)	– – W–B	IG switch ON	Below 1.0 V

TS TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

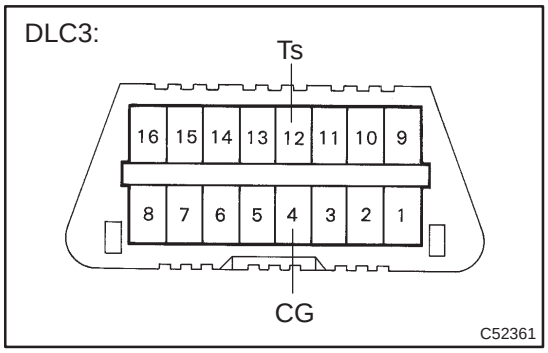
After making short circuit between terminal Ts and CG of DLC3 with turning the ignition switch OFF, the mode will change from the normal mode to test mode when the ignition switch is turned ON. After the ignition switch is turned ON, there will be DTC output from Tc terminal of DLC3.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT DLC3 TERMINAL VOLTAGE(Ts TERMINAL) (Ts – CG)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals Ts and CG of DLC3.
OK:
Voltage: 5 to 16 V

OK	Go to step 3

NG

2	CHECK HARNESS AND CONNECTOR(DLC3 – BODY GROUND)

(a) Check for an open or short circuit in harness and connector between terminal CG of DLC3 and body ground (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK HARNESS AND CONNECTOR(POWER STEERING ECU ASSY – DLC3)

(a) Check for an open or short circuit in harness and connector between terminal Ts of DLC3 and power steering ECU assy (See page 01–32).

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE POWER STEERING ECU ASSY(See page 50–20)

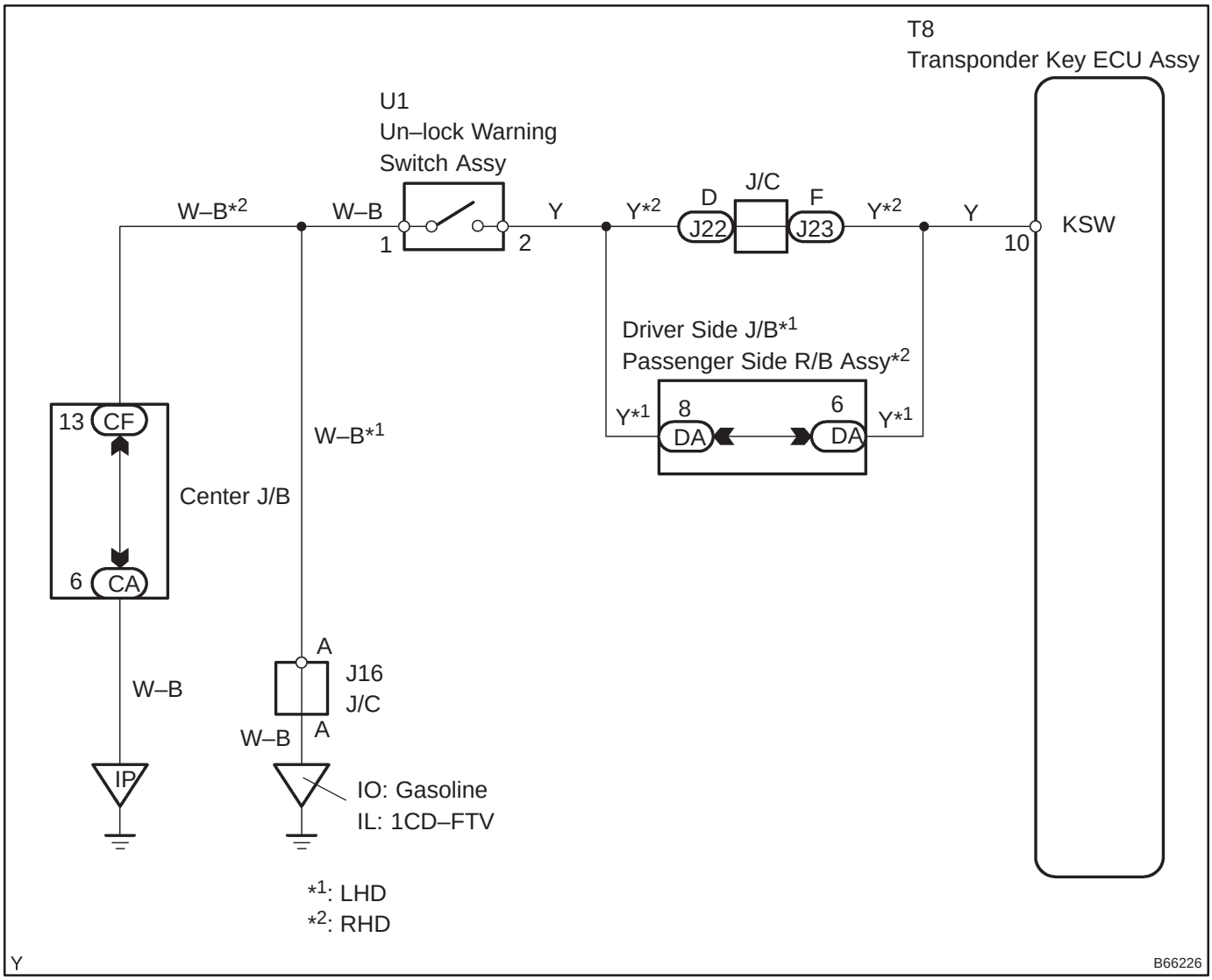
DTC	B2780	PUSH SWITCH/KEY UNLOCK WARNING SWITCH MALFUNCTION

CIRCUIT DESCRIPTION

This DTC will be output if the transponder key ECU does not detect that the unlock warning switch is ON even when the ignition switch is ON (Under normal conditions, the unlock warning switch is ON when the ignition switch is ON).

DTC No.	DTC Detection Condition	Trouble Area
B2780	Unlock warning switch ON is not detected when ignition switch is ON	• Unlock warning switch assy • Wire harness • Transponder key ECU assy

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 when using the hand–held tester and start from step 2 when not using the hand–held tester.

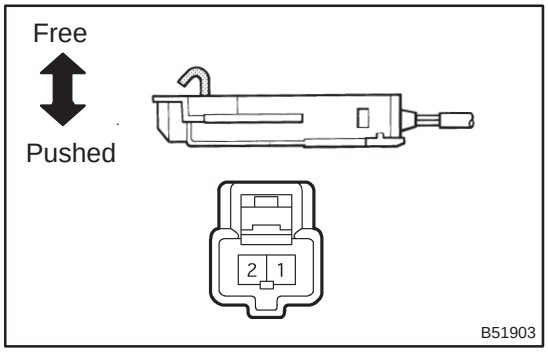
1	READ VALUE OF HAND–HELD TESTER (TRANSPONDER KEY ECU (SWITCH CONDITION))

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key that will not start the engine.
(c) Select the item KEY SW on the hand–held tester.
OK:
OFF → Key is in ignition key cylinder
ON → No key is in ignition key cylinder

OK → **REPLACE TRANSPONDER KEY ECU ASSY**

NG

2	INSPECT UNLOCK WARNING SWITCH ASSY



(a) Remove the unlock warning switch.
(b) Inspect the unlock warning switch resistance.
Standard:

Tester Connection	Switch Position	Specified Condition
1 – 2	Switch pushed (Key set)	Below 1 Ω
	Switch free (Key removed)	10 kΩ or higher

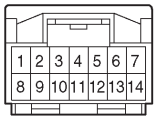
NG → **REPLACE UNLOCK WARNING SWITCH ASSY**

OK

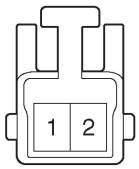
3	**CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY – UNLOCK WARNING SWITCH ASSY) (UNLOCK WARNING SWITCH ASSY – BODY GROUND)**

Wire Harness Side

T8
Transponder Key ECU Assy



U1
Unlock Warning Switch Assy



B63404
B65748
B65751

(a) Disconnect the T8 ECU and U1 switch connectors.
(b) Check the resistance between the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
T8–10 (KSW) – U1–2	Below 1 Ω
U1–1 – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE TRANSPONDER KEY ECU ASSY

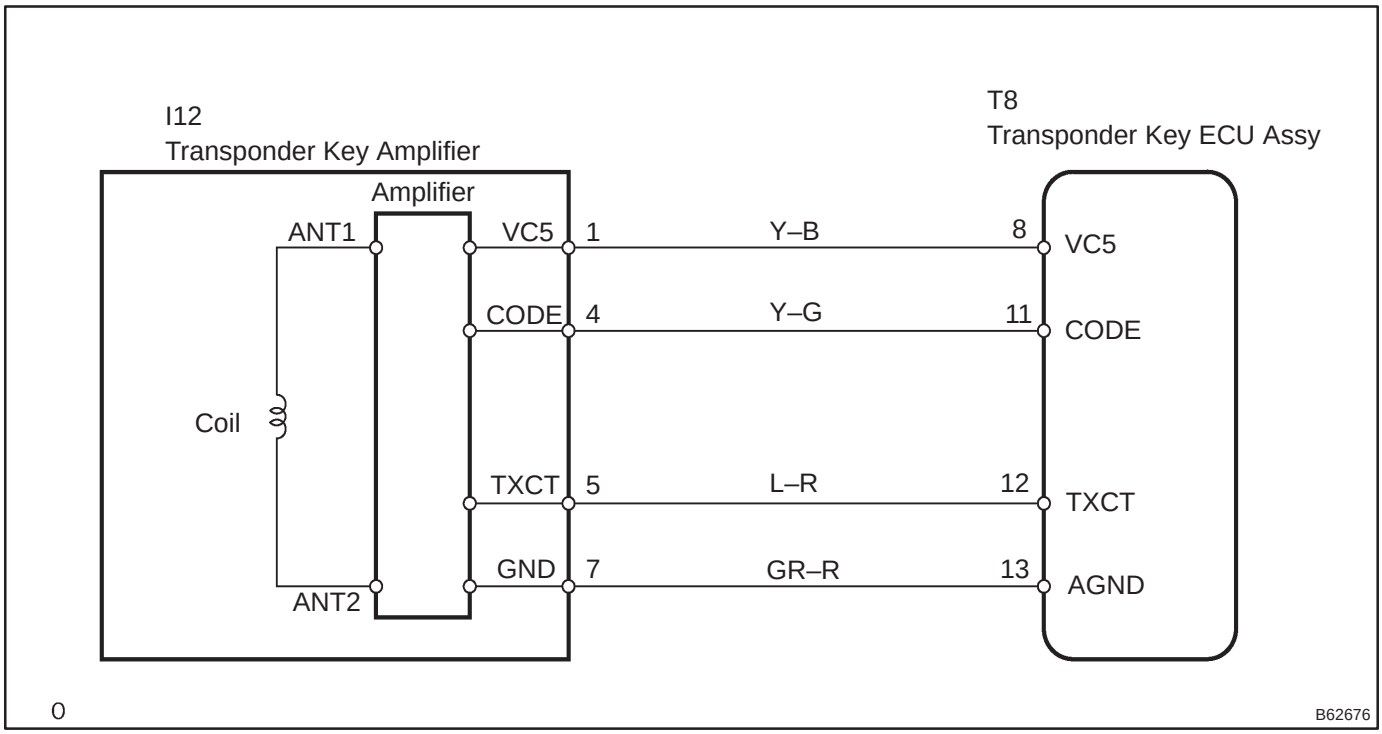
DTC B2784 ANTENNA COIL OPEN/SHORT

CIRCUIT DESCRIPTION

The transponder key coil is built into the transponder key amplifier and receives a key code signal from the transponder chip in the key. This signal is amplified by the amplifier and then output to the transponder key ECU.

DTC No.	DTC Detection Condition	Trouble Area
B2784	Antenna coil is open/short	• Wire harness • Transponder key amplifier • Transponder key ECU assy

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 when using the hand–held tester and start from step 2 when not using the hand–held tester.

1	**READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))**

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key that will not start the engine.
(c) Select the item ANTENNA COIL on the hand–held tester.
OK: NORMAL
NG: FAIL

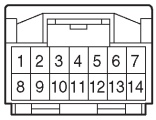
OK → **CHECK AND REPLACE TRANSPONDER KEY ECU ASSY**

NG

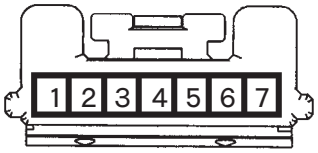
2	**CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY – TRANSPONDER KEY AMPLIFIER) (TRANSPONDER KEY ECU ASSY OR TRANSPONDER KEY AMPLIFIER – BODY GROUND)**

Wire Harness Side

T8
Transponder Key ECU Assy



I12
Transponder Key Amplifier



B63404
B55013
B64974

(a) Disconnect the T8 ECU and I12 amplifier connectors.
(b) Check the resistance of the wire harness side connectors.
Standard:

Tester Connection	Specified Condition
T8–8 (VC5) – I12–1 (VC5)	Below 1 Ω
T8–11 (CODE) – I12–4 (CODE)	
T8–12 (TXCT) – I12–5 (TXCT)	
T8–13 (AGND) – I12–7 (GND)	
T8–8 (VC5) or I12–1 (VC5) – Body ground	10 kΩ or higher
T8–11 (CODE) or I12–4 (CODE) – Body ground	
T8–12 (TXCT) or I12–5 (TXCT) – Body ground	
T8–13 (AGND) or I12–7 (GND) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE TRANSPONDER KEY AMPLIFIER

DTC B2793 TRANSPONDER CHIP MALFUNCTION

CIRCUIT DESCRIPTION

This DTC is output when a malfunction is found in a key during the key code registration or the key code is not registered normally. Replace the key when the key code registration is not performed normally and this DTC is detected.

DTC No.	DTC Detection Condition	Trouble Area
B2793	Transponder chip malfunction	• Key

INSPECTION PROCEDURE

1 CHECK DTC

(a) Delete the DTC (See page 05–1602).
(b) Insert the key into the ignition key cylinder.
(c) Check that no code is output.

OK → **NO PROBLEM**

NG

2 RE–REGISTER KEY

(a) Delete the DTC (See page 05–1602).
(b) Re–register the key and check that the engine starts with the key.

OK → **NORMAL**

NG

REPLACE KEY

DTC	B2794	UNMATCHED ENCRYPTION CODE

CIRCUIT DESCRIPTION

This DTC is output when a key with an incomplete key code is inserted into the ignition key cylinder.

DTC No.	DTC Detection Condition	Trouble Area
B2794	Key with incomplete key code is inserted	• Key

INSPECTION PROCEDURE

1	**REPLACE KEY**

DTC	B2795	UNMATCHED KEY CODE

CIRCUIT DESCRIPTION

This DTC is output when a key with a key code that has not been registered in the ECU is inserted into the ignition key cylinder.

DTC No.	DTC Detection Condition	Trouble Area
B2795	Key with unregistered key code is inserted	• Key

INSPECTION PROCEDURE

1	DELETE DTC AND INSERT ALL PRESENTLY AVAILABLE KEYS TO CHECK WHETHER ENGINE STARTS OR NOT

OK → NO PROBLEM (BECAUSE OF KEY RE–REGISTRATION)

NG

REPLACE KEY THAT WILL NOT START ENGINE

DTC	B2796	NO COMMUNICATION IN IMMOBILISER SYSTEM

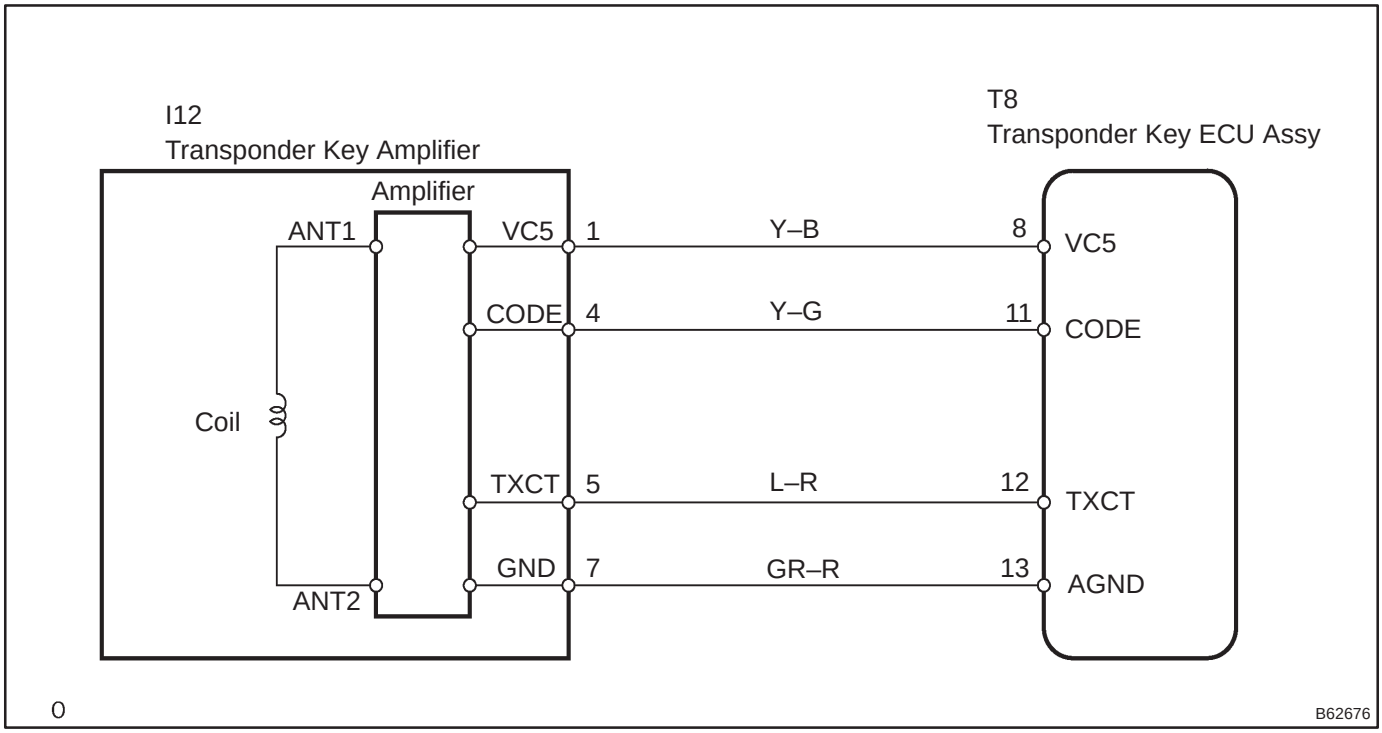
DTC	B2798	COMMUNICATION MALFUNCTION NO.2

CIRCUIT DESCRIPTION

This code is stored in the memory when a key that does not have a transponder chip is inserted or if communication between the key and transponder key ECU is impossible.

DTC No.	DTC Detection Condition	Trouble Area
B2796	No communication	• Key • Wire harness • Transponder key amplifier (Transponder key coil) • Transponder key ECU assy
B2798	Communication error	• Key

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 when using the hand–held tester and start from step 2 when not using the hand–held tester.

1	**READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))**

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key that will not start the engine.
(c) Select IMMOBILISER on the hand–held tester.
OK:
SET → Ignition switch ON
UNSET → Without key

OK → **NORMAL**

NG

2	**CHECK WHETHER ENGINE STARTS WITH OTHER KEYS**

(a) Check whether the engine starts with the other keys for the vehicle.

OK → **RE–REGISTER OR REPLACE KEY THAT WILL NOT START ENGINE**

NG

HINT:
Start the inspection from step 3 when using the hand–held tester and start from step 4 when not using the hand–held tester.

3	**READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))**

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON with the key that will does not start the engine.
(c) Select the item ANTENNA COIL on the hand–held tester.
OK: NORMAL
NG: FAIL

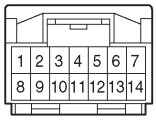
NG → **CHECK AND REPLACE TRANSPONDER KEY ECU ASSY**

OK

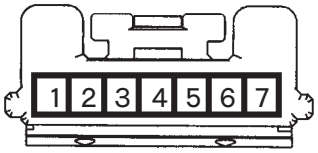
4	CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY – TRANSPONDER KEY AMPLIFIER) (TRANSPONDER KEY ECU ASSY OR TRANSPONDER KEY AMPLIFIER – BODY GROUND)

Wire Harness Side

T8
Transponder Key ECU Assy



I12
Transponder Key Amplifier



B63404
B55013
B64974

(a) Disconnect the T8 ECU and I12 amplifier connectors.
(b) Check the resistance of the wire harness side connectors.
Standard:

Tester Connection	Specified Condition
T8–8 (VC5) – I12–1 (VC5)	Below 1 Ω
T8–11 (CODE) – I12–4 (CODE)	
T8–12 (TXCT) – I12–5 (TXCT)	
T8–13 (AGND) – I12–7 (GND)	
T8–8 (VC5) or I12–1 (VC5) – Body ground	10 kΩ or higher
T8–11 (CODE) or I12–4 (CODE) – Body ground	
T8–12 (TXCT) or I12–5 (TXCT) – Body ground	
T8–13 (AGND) or I12–7 (GND) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5	CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After replacing the transponder key amplifier, check that the engine starts.

NG → **NORMAL (TRANSPONDER KEY AMPLIFIER DEFECTIVE)**

OK

REPLACE TRANSPONDER KEY ECU ASSY

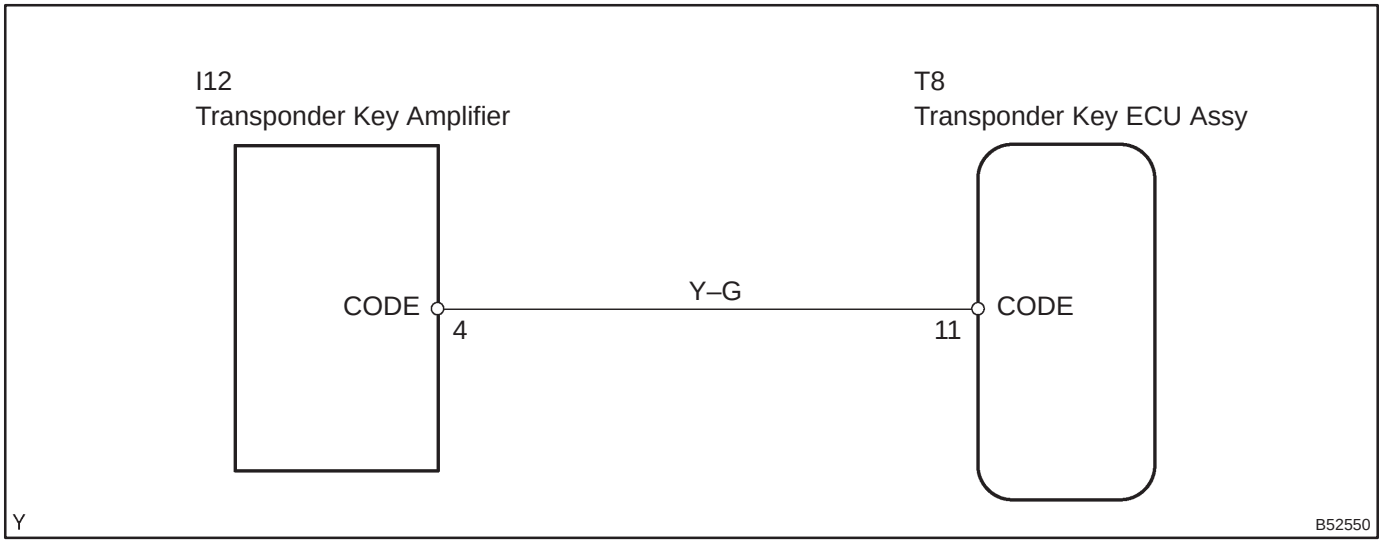
DTC B2797 COMMUNICATION MALFUNCTION NO.1

CIRCUIT DESCRIPTION

This DTC is output when an error occurs in normal communication.
HINT:
Some noise is found in the communication line.

DTC No.	DTC Detection Condition	Trouble Area
B2797	Keys are positioned too close to each other or noise occurred in communication line	• Key • Wire harness • Transponder key amplifier • Transponder key ECU assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After replacing the transponder key amplifier, check that the engine starts.

OK → **NORMAL (TRANSPONDER KEY AMPLIFIER DEFECTIVE)**

NG

REPLACE TRANSPONDER KEY ECU ASSY

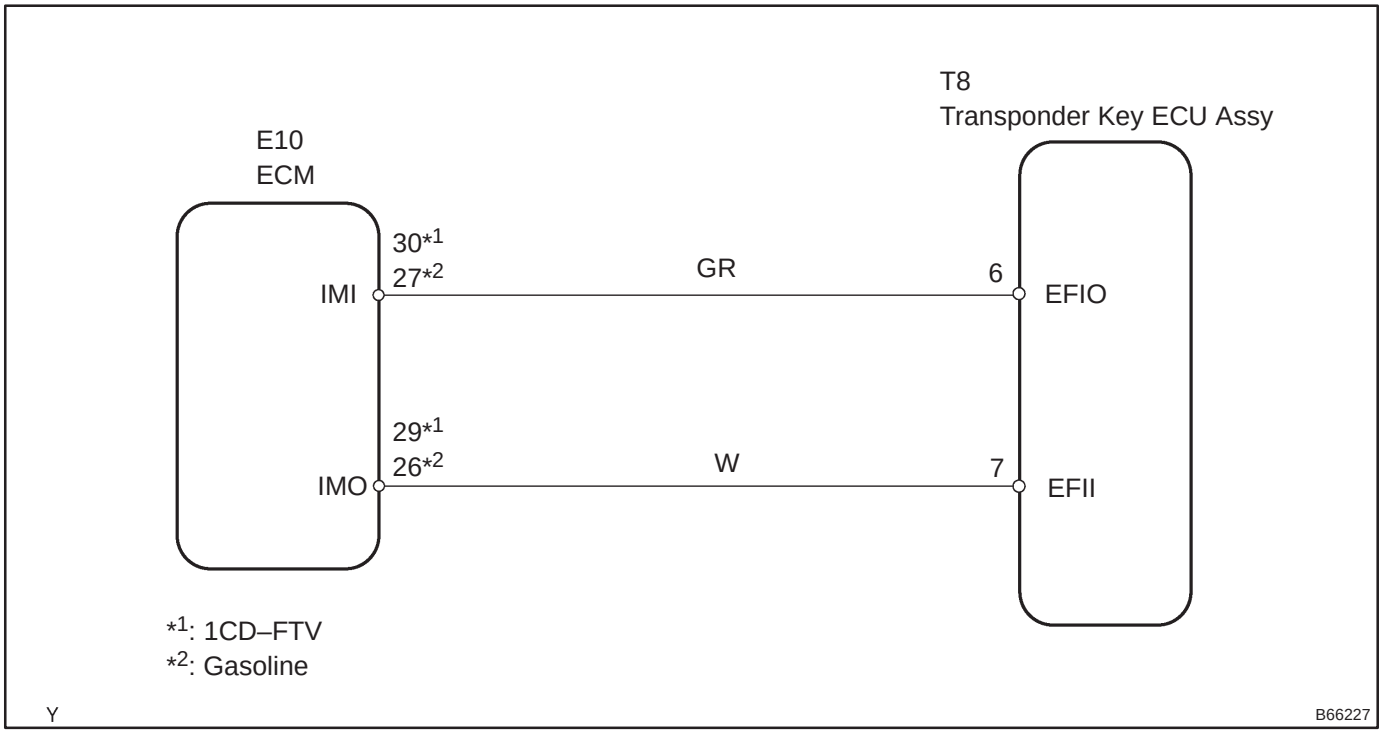
DTC	B2799	ENGINE IMMOBILISER SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

This DTC is output when the ECM detects errors in communication between the transponder key ECU assy and the ECM or in the communication lines.
This DTC is also output when an engine start is attempted while the ECU communication ID between the transponder key ECU and the ECM are different.
Before troubleshooting for this DTC, make sure that there is no DTC detected in the transponder key ECU. If there is a key code–related DTC detected in the transponder key ECU, repair it first.

DTC No.	DTC Detection Condition	Trouble Area
B2799	• Error in communication between ECM and transponder key ECU, and in communication line • Communication ID is different during communication with transponder key ECU	• Wire harness • Transponder key ECU assy • Transponder key amplifier • ECM

WIRING DIAGRAM

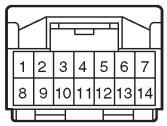


INSPECTION PROCEDURE

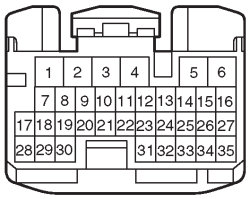
1	CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY – ECM) (TRANSPONDER KEY ECU ASSY OR ECM – BODY GROUND)

Wire Harness Side

T8
Transponder Key ECU Assy



E10
ECM



Y B66220 B66229

(a) Disconnect the T8 ECU and E10 ECM connectors.
(b) Check the resistance of the wire harness side connectors.

Standard:

1CD–FTV

Terminal No.	Specified Condition
T8–6 (EFIO) – E10–30 (IMI)	Below 1 Ω
T8–7 (EFII) – E10–29 (IMO)	
T8–6 (EFIO) or E10–30 (IMI) – Body ground	10 kΩ or higher
T8–7 (EFII) or E10–29 (IMO) – Body ground	

Gasoline

Terminal No.	Specified Condition
T8–6 (EFIO) – E10–27 (IMI)	Below 1 Ω
T8–7 (EFII) – E10–26 (IMO)	
EFIO (T8–6) or IMI (E10–27) – Body ground	10 kΩ or higher
EFII (T8–7) or IMO (E10–26) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2	CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After replacing the transponder key amplifier, check that the engine starts.

NG → **NORMAL (TRANSPONDER KEY AMPLIFIER DEFECTIVE)**

OK

REPLACE TRANSPONDER KEY ECU ASSY

054CG–07

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE IMMOBILISER SYSTEM Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Intermittent (times a day) ☐ Only once
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °C (°F)

Symptoms	☐ Immobiliser is not set (Engine starts with key codes other than registered key code)
	☐ Engine does not start

DTC Check	**1st Time**	☐ Normal code ☐ Malfunction code (Code)
	2nd Time	☐ Normal code ☐ Malfunction code (Code)

054CI–07

DIAGNOSTIC TROUBLE CODE CHART

1. TRANSPONDER KEY ECU DTC CHART

DTC No. (See Page)	Detection Item	Trouble Area
*B2780 (05–1613)	Push Switch/Key Unlock Warning Switch Malfunction	• Unlock warning switch • Wire harness • Transponder key ECU assy
B2784 (05–1616)	Antenna Coil Open/Short	• Wire harness • Transponder key amplifier • Transponder key ECU assy
B2793 (05–1618)	Transponder Chip Malfunction	• Key
B2794 (05–1619)	Unmatched Encryption Code	• Key
B2795 (05–1620)	Unmatched Key Code	• Key
B2796 (05–1621)	No Communication in Immobiliser System	• Key • Transponder key amplifier • Wire harness • Transponder key ECU assy
B2797 (05–1624)	Communication Malfunction No. 1	• Key • Wire harness • Transponder key amplifier • Transponder key ECU assy
B2798 (05–1621)	Communication Malfunction No. 2	• Key

HINT:

*: Except for 1AZ–FE engine

2. ECM DTC CHART

NOTICE:

The DTC for the immobiliser system is specified. If the other codes are output, check the DTC chart of the engine control system.

DTC No. (See Page)	Detection Item	Trouble Area
B2799 (05–1625)	Engine Immobiliser System Malfunction	• Wire harness • Key • Transponder key ECU assy • Transponder key amplifier • ECM

ENGINE IMMOBILISER SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

054CF–07

HINT:

- Use this procedure to troubleshoot the engine immobiliser system.
- The hand–held tester should be used in step 4, 5 and 7.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM CHECK (See page 05–1601)

3	CRANK ENGINE FOR MORE THAN 10 SECONDS

4	CHECK FOR DTC

(a) Check for DTCs and note any codes that are output.
(b) Delete the DTC.
(c) Recheck for DTCs. Try to prompt the DTC (SFI system and engine immobiliser system) by simulating the original activity that the DTC suggested.
  (1) If the DTC does not reoccur, proceed to A.
  (2) If the DTC (SFI system) reoccurs, proceed to B.
  (3) If the DTC (engine immobiliser system) reoccurs, proceed to C.

B	Go to SFI or ECD SYSTEM (See page 05–290 or 05–517)

C	Go to step 8

A

5	READ VALUE OF HAND–HELD TESTER (IMMOBILISER ECU (TRANSPONDER KEY ECU ASSY) (SWITCH CONDITION))

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item KEY SW in the DATA LIST and read its value displayed on the hand–held tester.
Transponder key ECU:

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
KEY SW	Un–lock warning switch signal /ON or OFF	ON: Key is in ignition key cylinder OFF: No key is in ignition key cylinder	–

NG	Go to DTC B2780 (See page 05–1613)

OK

6	PROBLEM SYMPTOMS TABLE (See page 05–1612)

(a) When problem is not listed on problem symptoms table, proceed to A.
(b) When problem is listed on problem symptoms table, proceed to B.

B → Go to step 8

A

7	PERFORM TROUBLESHOOTING ACCORDING TO MALFUNCTION SYMPTOM

(a) Pre–check (See page 05–1602)
  (1) Inspect with the hand–held tester (ECU data monitor).
  (2) Inspect with the hand–held tester (ACTIVE TEST).
(b) Terminals of ECU (See page 05–1607)

8	ADJUST, REPAIR OR REPLACE

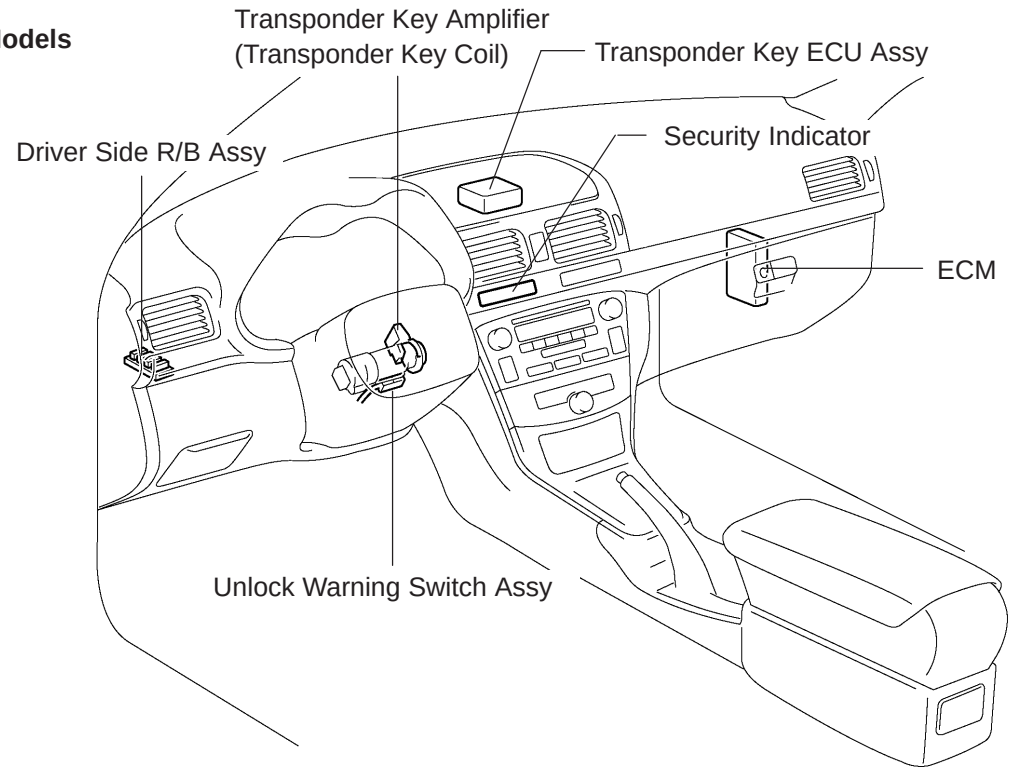
9	CONFIRMATION TEST

END

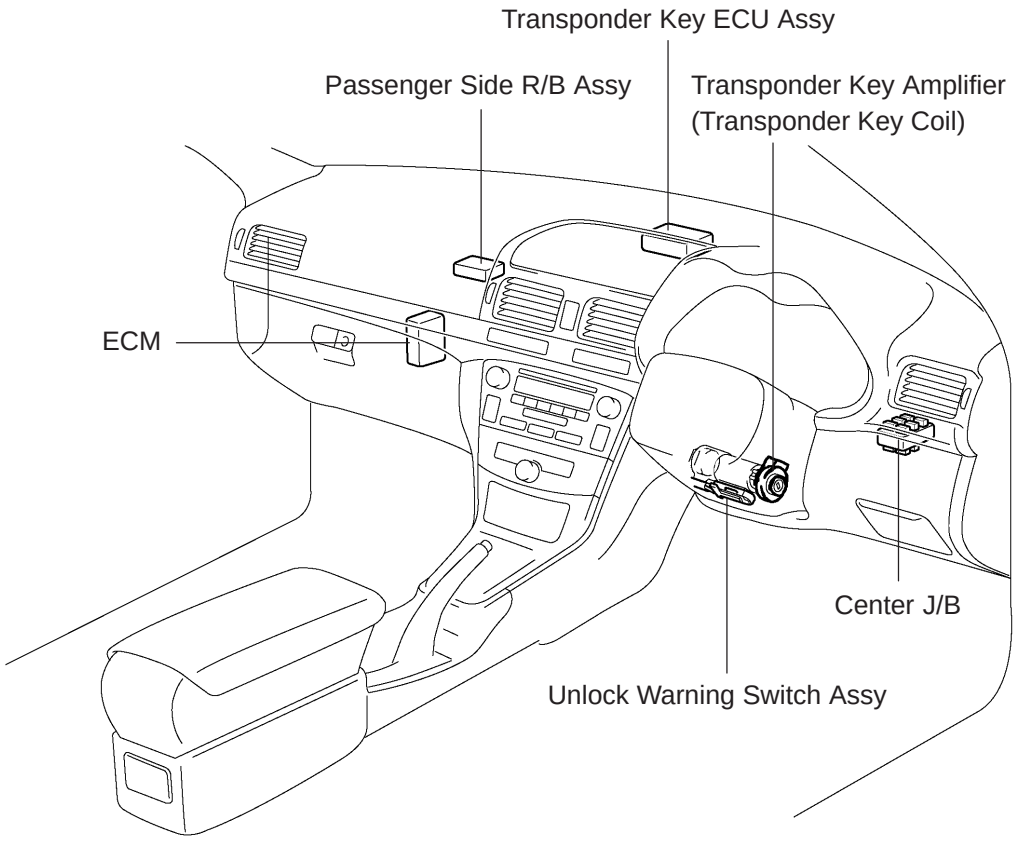
054CM–07

LOCATION

LHD Models



RHD Models



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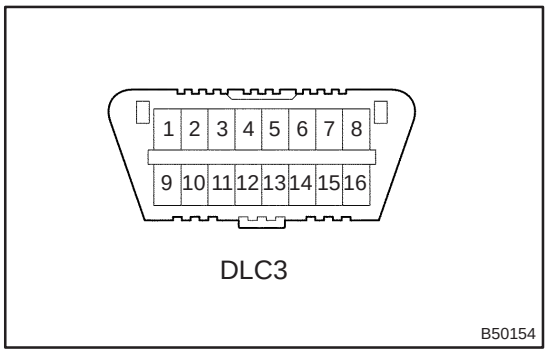
B65753

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

(1) The ECM controls the function of the immobiliser system on the vehicle.
Data of the immobiliser system and the Diagnostic Trouble Code (DTC) can be read in the Data Link Connector 3 (DLC3) of the vehicle. When trouble occurs in the immobiliser system, even though the security indicator lamp does not come on, DTCs can be checked.
Therefore, the immobiliser system seems to be malfunctioning, use the hand–held tester to check for a malfunction and repair it.



(b) Inspect the DLC3.
The vehicle's ECM uses the ISO 9141–2 (Euro–OBD)/ISO 14230 (M–OBD) communication protocol.
The terminal arrangement of the DLC3 complies with the ISO 15031–3 and matches the ISO 9141–2/ISO 14230 format.

Standard:

Tester Connection	Condition	Specified Condition
7 (Bus + line) – 5 (Signal ground)	During communication	Pulse generation
4 (Chassis ground) – Body ground	Always	Below 1 Ω
5 (Signal ground) – Body ground	Always	Below 1 Ω
16 (B+) – Body ground	Always	10 to 14 V

HINT:
If the screen displays UNABLE TO CONNECT TO VEHICLE after you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and used the hand–held tester, the problem may be on the vehicle side or the tester side.

- If communication is normal when the tester is connected to other vehicle, inspect the DLC3 of the original vehicle.
- If communication is still impossible when the tester is connected to another vehicle, the problem may be in the tester itself, so consult the Service Department listed in the tester's instruction manual.

2. Using hand–held tester:

CHECK DTC

(a) Checking DTCs.

(1) Connect the hand–held tester to DLC3.
(2) Turn the ignition switch ON.
(3) Read DTCs by following the prompts on the tester screen.

HINT:
Refer to the hand–held tester operator's manual for further details.

(b) Clear the DTCs from memory.

(1) Connect the hand–held tester to DLC3.
(2) Turn the ignition switch ON.
(3) Erase DTCs by following the prompts on the tester screen.

HINT:
Refer to the hand–held tester operator's manual for further details.

3. CHECK DIAGNOSIS

(a) Using the hand–held tester, check for DTCs.

NOTICE:

Hand–held tester only:

When the diagnosis system is switched from normal mode to check mode, all the DTCs and freeze frame data recorded in normal mode are erased. So before switching modes, always check the DTCs and freeze frame data, and make a note of them.

(1) Prepare the hand–held tester.
(2) Connect the hand–held tester to the DLC3 under the instrument panel lower pad.
(3) Turn the ignition switch ON and push the hand–held tester switch ON.
(4) Use the hand–held tester to check for DTCs and freeze frame data, and make a note of them (For operating instructions, see the hand–held tester instruction book).
(5) Confirm the details of the DTCs.

(b) Either of the following procedures will erase the DTCs and freeze frame data.
(1) Operating the hand–held tester to erase the codes (See the hand–held tester instruction book for operating instructions).
(2) Disconnecting the battery terminals or ECU–B fuse.

4. DATA LIST

HINT:

Using the DATA LIST displayed on the hand–held tester, you can read the value of the switch, sensor, actuator, etc. without parts removal. Reading the DATA LIST as the first step of troubleshooting is one way to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Read the DATA LIST, according to the display on the tester.

Transponder key ECU:

Item	Measurement Item/ Display (Range)	Normal Condition
KEY SW	Un–lock warning switch signal/ ON or OFF	OFF: Key is in Ignition key cylinder ON: No key is in Ignition key cylinder
IG SW	Ignition switch signal/ ON or OFF	OFF: Ignition switch is ON or START position ON: Ignition switch is OFF or ON position
IMMOBILISER	Immobiliser system status/ SET or UNSET	UNSET: Without key SET: Ignition switch ON
RESPONSE	Transponder chip data/ NG or OK	NG: Data error OK: Data OK
FRAME	Transponder chip data/ NG or OK	NG: Data error OK: Data OK
SERIAL NUMBER	Transponder chip data/ NG or OK	NG: Data error OK: Data OK
ENCRYPT CODE	Transponder chip data/ NG or OK	NG: Data error OK: Data OK
STATUS	Transponder chip data/ NG or OK	NG: Data error OK: Data OK
BCC	Transponder chip signal/ NG or OK	NG: Incorrect data sending OK: Correct data sending
SUB KEY	Sub key code signal/ NOMATCH or MATCH	NOMATCH: Nomatch sub–key code is sent MATCH: Sub key code is sent
MASTER KEY	Master key code signal/ NOMATCH or MATCH	NOMATCH: Nomatch Master key code is sent MATCH: Master key code is sent
REGIST SUB CODE	Number of registered sub–key/ min. 0, max. 15	Number of registered sub–key
REGIST MAS CODE	Number of registered master key/ min. 0, max. 15	Number of registered master key

Item	Measurement Item/ Display (Range)	Normal Condition
REG CODE SPACE	Memory space for key codes registration/ NOT FUL or FULL	NOT FUL: Possible to resister more key code FULL: Impossible to register key code any more
ANTENNA COIL	Antenna coil condition/ NORMAL or FAIL	Normal: Antenna coil is normal FAIL: Antenna coil is abnormal

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows you to operate the relay, VSV, actuator, etc. without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one way to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) Perform the ACTIVE TEST, according to the display on the tester.

Transponder key ECU:

Item	Test Details
SECURITY INDIC	Turn security indicator ON/OFF

054CK–07

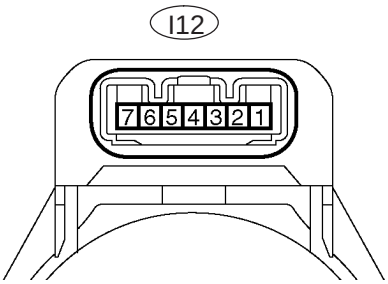
PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
Engine does not start	1. Key	05–1618 05–1619 05–1620 05–1621 05–1624 05–1625
	2. Transponder key amplifier	05–1616 05–1621 05–1624 05–1625
	3. Transponder key ECU assy	05–1613 05–1616 05–1621 05–1624 05–1625

05B0B–02

TERMINALS OF ECU

1. CHECK TRANSPONDER KEY AMPLIFIER (COIL)



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(a) Disconnect the I12 amplifier connector and check the resistance between the terminal of the wire harness side connector and body ground.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
GND (I12–7) – Body ground	GR–R – Body ground	Constant	Below 1 Ω

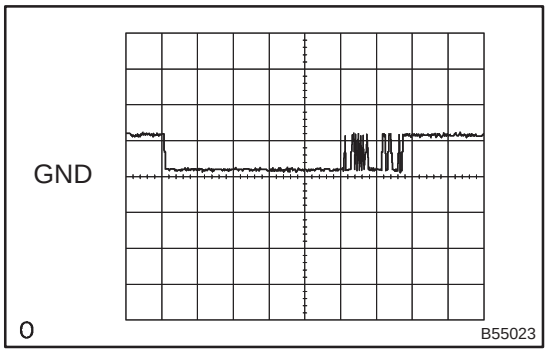
If the result is not as specified, there may be a malfunction on the wire harness side.

(b) Reconnect the I12 amplifier connector and check the resistance or voltage of each terminal of the connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
VC5 (I12–1) – GND (I12–7)	Y–B – GR–R	No key in ignition key cylinder → With key	0 V → 10 to 14 V
CODE(I12–4) – GND (I12–7)	Y–G – GR–R	No key in ignition key cylinder → With key	Waveform 1
TXCT (I12–5) – GND (I12–7)	L–R – GR–R	No key in ignition key cylinder → With key	Waveform 2
GND (I12–7) – Body ground	GR–R – Body ground	Constant	Below 1 Ω

If the result is not as specified, the amplifier may have a malfunction.

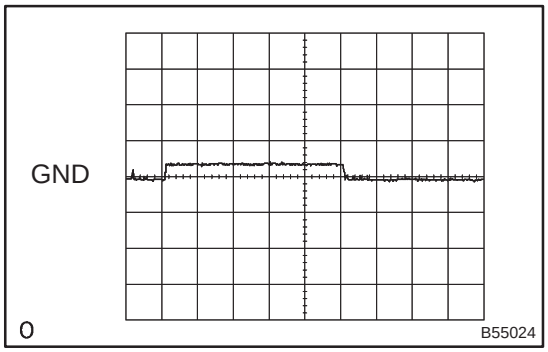


B55023

(c) Inspect using an oscilloscope.

Waveform 1 (Reference):

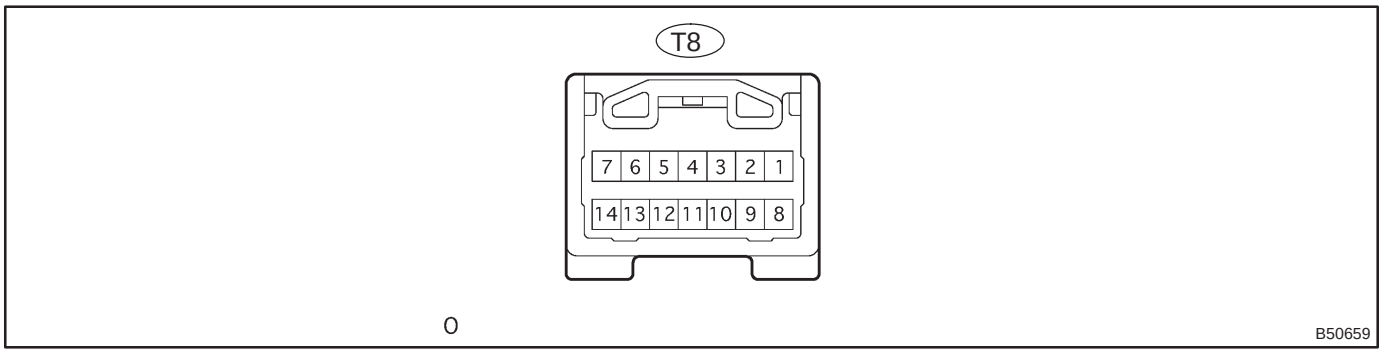
Terminal	CODE – GND
Tool Setting	10 V/DIV., 10 ms/DIV.
Condition	Ignition switch ON



Waveform 2 (Reference):

Terminal	TXCT – GND
Tool Setting	10 V/DIV., 10 ms/DIV.
Condition	Ignition switch ON

2. CHECK TRANSPONDER KEY ECU ASSY



(a) Disconnect the T8 ECU connector and check the voltage and resistance between each terminal of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
AGND (T8–13) – Body ground	GR–R – Body ground	Constant	Below 1 Ω
+B (T8–1) – GND (T8–14)	W–R – W–B	Constant	10 to 14 V
IG (T8–2) – AGND (T8–13)	B–W – GR–R	Ignition switch OFF → ON	0 V → 10 to 14 V
KSW (T8–10) – AGND (T8–13)	Y – GR–R	No key in ignition key cylinder → With key	10 kΩ or higher → Below 1 Ω

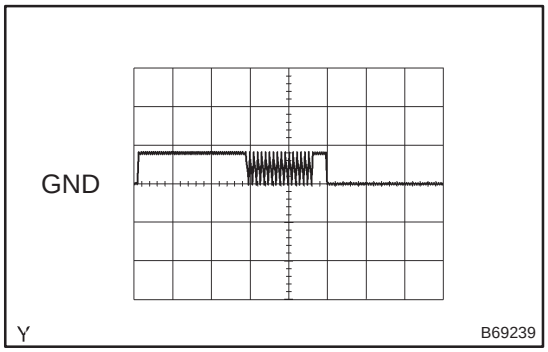
If the result is not as specified, there may be a malfunction on the wire harness side.

(b) Reconnect the T8 ECU connector and check the voltage between each terminal of the connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
KSW (T8–10) – AGND (T8–13)	Y – GR–R	No key in ignition key cylinder → With key	10 to 14 V → 0 V
VC5 (T8–8) – AGND (T8–13)	Y–B – GR–R	Ignition switch OFF → ON	0 V → 4.6 to 5.4 V
TXCT (T8–12) – AGND (T8–13)	L–R – GR–R	Ignition switch OFF → ON	Waveform 1
CODE (T8–11) – AGND (T8–13)	Y–G – GR–R	Ignition switch OFF → ON	Waveform 2
EFIO (T8–6) – AGND (T8–13)	GR – GR–R	Ignition switch OFF → ON	Waveform 3
EFII (T8–7) – AGND (T8–13)	W – GR–R	Ignition switch OFF → ON	Waveform 4

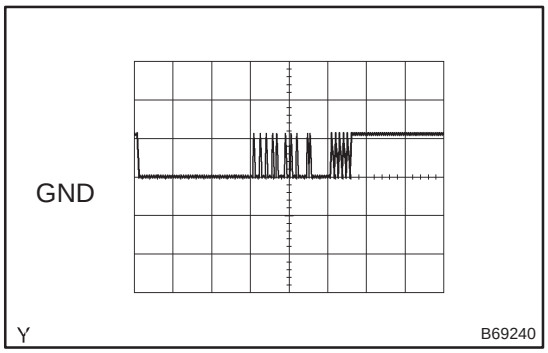
If the result is not as specified, the ECU may have a malfunction.



(c) Inspect using an oscilloscope.

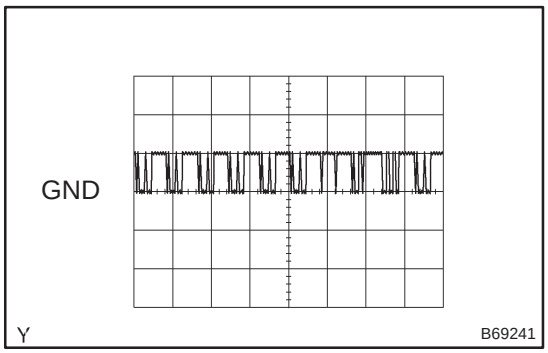
Waveform 1 (Reference):

Terminal	TXCT – GND
Tool Setting	5 V/DIV., 20 ms/DIV.
Condition	Ignition switch ON



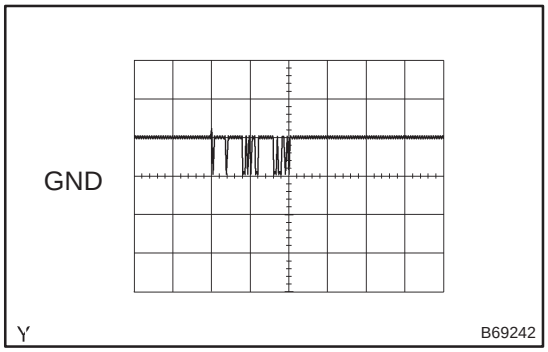
Waveform 2 (Reference):

Terminal	CODE – GND
Tool Setting	10 V/DIV., 20 ms/DIV.
Condition	Ignition switch ON



Waveform 3 (Reference):

Terminal	EFIO – GND
Tool Setting	5 V/DIV., 50 ms/DIV.
Condition	Ignition switch ON

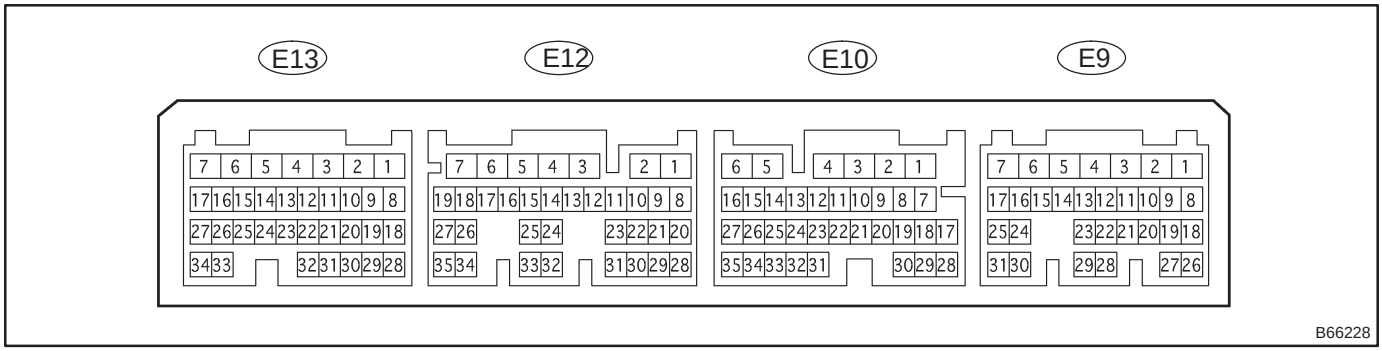


Waveform 4 (Reference):

Terminal	EFII – GND
Tool Setting	5 V/DIV., 50 ms/DIV.
Condition	Constant

3. CHECK ECM

3ZZ–FE, 1ZZ–FE , 1AZ–FE engine:

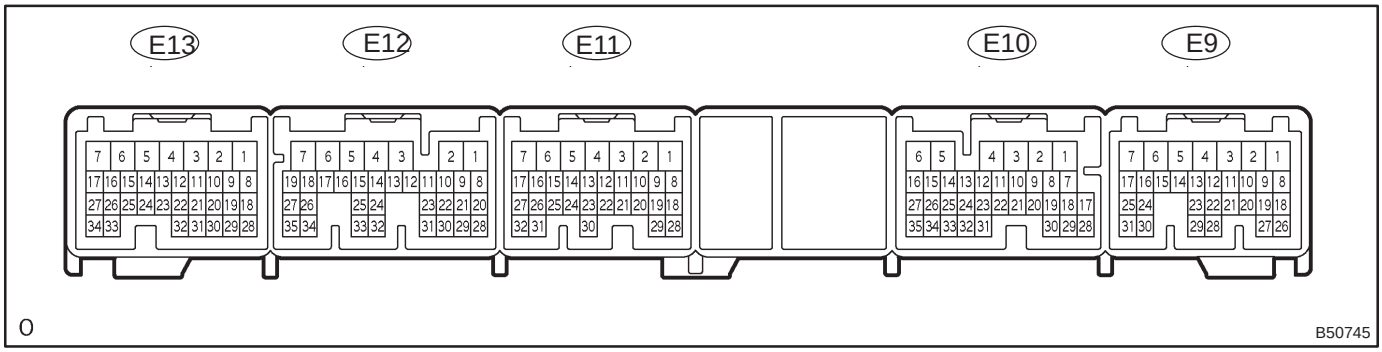


(a) Disconnect the E10 and E12 ECM connectors and check the voltage or resistance between each terminal of the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
IMI (E10–27) – E1 (E12–7)	GR–R – BR	No key in ignition key cylinder → With key	Waveform 1
IMO (E10–26) – E1 (E12–7)	W – BR	No key in ignition key cylinder → With key	Waveform 2
E1 (E12–1) – Body ground	BR – Body ground	Constant	Below 1 Ω

1CD–FTV, 1AZ–FSE engine:

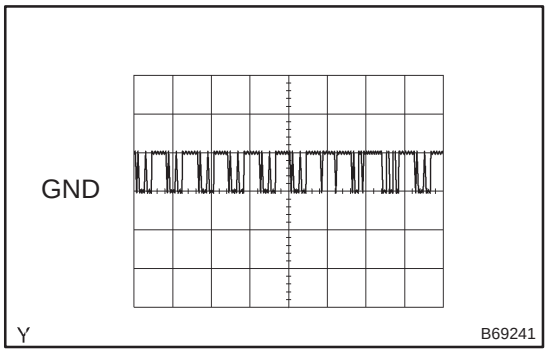


(b) Disconnect the E10 and E11 or E12 ECM connectors and check the voltage or continuity between each terminal of the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
*1 IMI (E10–30) – E1 (E12–7)	GR – BR	No key in ignition key cylinder → With key	Waveform 1
*2 IMI (E10–27) – E1 (E11–1)	GR – BR	No key in ignition key cylinder → With key	Waveform 1
*1 IMO (E10–29) – E1 (E12–7)	W – BR	No key in ignition key cylinder → With key	Waveform 2
*2 IMO (E10–26) – E1 (E11–1)	W– BR	No key in ignition key cylinder → With key	Waveform 2
*1 E1 (E12–7) – Body ground	BR – Body ground	Constant	Below 1 Ω
*2 E1 (E11–1)) – Body ground	BR – Body ground	Constant	Below 1 Ω

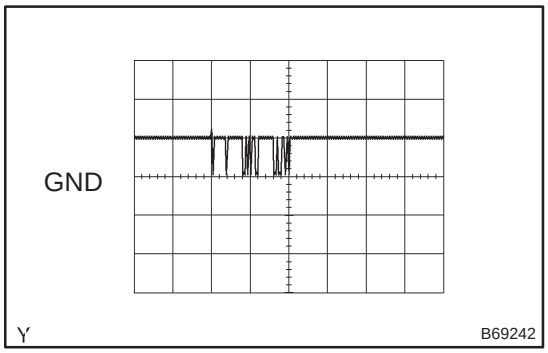
HINT:
*1: 1CD–FTV engine
*2: 1AZ–FSE engine
If the result is not as specified, there may be a malfunction on the wire harness side.



(c) Inspect using an oscilloscope.

Waveform 1 (Reference):

Terminal	IMI – GND
Tool Setting	5 V/DIV., 50 ms/DIV.
Condition	Ignition switch ON



Waveform 2 (Reference):

Terminal	IMO – GND
Tool Setting	5 V/DIV., 50 ms/DIV.
Condition	Constant

05AEZ–02

CUSTOMER PROBLEM ANALYSIS CHECK

KEY REMINDER WARNING SYSTEM Check Sheet

Inspector's name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	km miles

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Intermittent (times a day) ☐ Only once
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °C (°F))

Problem Symptoms	☐ Key reminder buzzer does not sound

KEY REMINDER WARNING SYSTEM

05AEY–02

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:
Use this procedure to troubleshoot the key reminder warning system.
The hand–held tester should be used in step 3 and 4.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND PROBLEM SYMPTOM

3	DTC CHECK (MULTIPLEX COMMUNICATION SYSTEM) (See page 05–1656)

(a) Check for DTCs and note any codes that are output.
(b) Delete the DTC.
(c) Recheck for DTCs. Try to prompt the DTC by simulating the original activity that the DTC suggests.
  (1) If the DTC does not reoccur, proceed to A.
  (2) If the DTC reoccurs, proceed to B.

B	GO TO MULTIPLEX COMMUNICATION SYSTEM (See page 05–1656)

A

4	PROBLEM SYMPTOMS TABLE (See page 05–1593)

(a) If the fault is not listed on the symptoms table, proceed to A.
(b) If the fault is listed on the symptoms table, proceed to B.

B	Go to step 5

A

5	PERFORM TROUBLESHOOTING ACCORDING TO MALFUNCTION SYMPTOM

(a) Pre–check (See page 05–1655).
  (1) Inspection with the hand–held tester (ECU DATA MONITOR).
(b) Terminals of ECU (See page 05–1659).
(c) On–vehicle inspection (See page 73–26).

6	ADJUST, REPAIR OR REPLACE

7	CONFIRMATION TEST

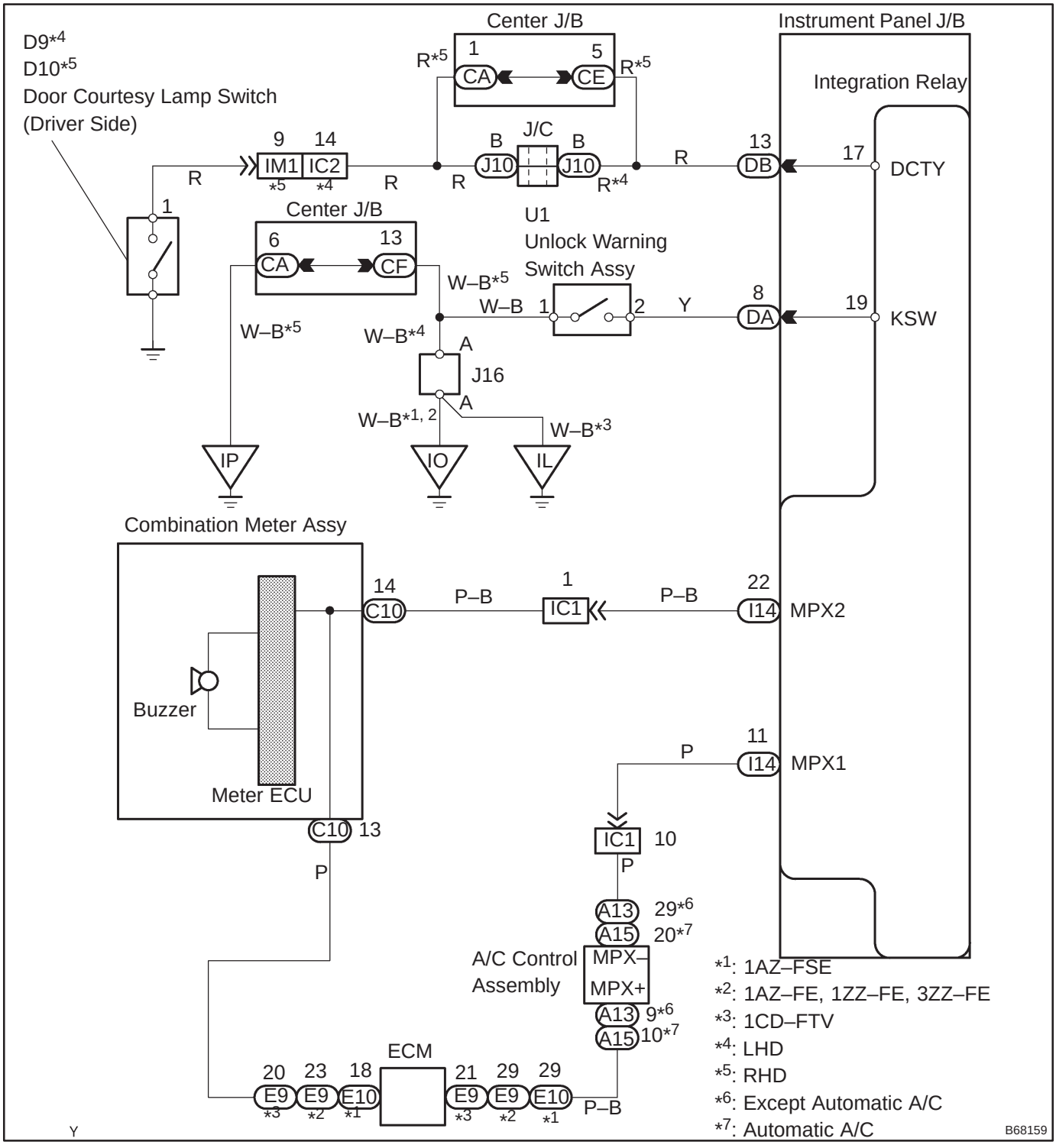
END

KEY REMINDER BUZZER DOES NOT SOUND

CIRCUIT DESCRIPTION

When the ignition switch is OFF, the key is in the ignition key cylinder and the driver side door is open the integration relay activates the combination meter to cause the buzzer to sound.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT FRONT DOOR COURTESY LAMP SWITCH ASSY (DRIVER SIDE)

(a) When using hand–held tester, proceed to A.
(b) When not using hand–held tester, proceed to B.

B → **Go to step 3**

A

2	READ VALUE OF HAND–HELD TESTER (COURTESY LAMP SWITCH)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item D DOR CTY SW in the DATA LIST and read its value displayed on the hand–held tester.
Standard:
ON: Driver side door is open
OFF: Driver side door is closed

OK → **Go to step 6**

NG → **Go to step 4**

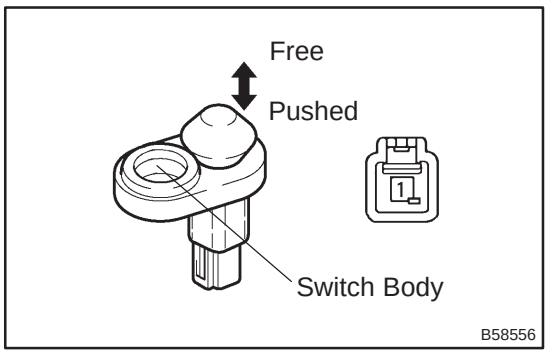
3	CHECK FRONT DOOR COURTESY LAMP SWITCH ASSY

(a) Put the dome lamp No. 2 switch in the door position and open the driver side door. Then check that the courtesy lamp comes on.

OK → **Go to step 7**

NG

4	INSPECT FRONT DOOR COURTESY LAMP SWITCH ASSY (DRIVER SIDE)



(a) Remove the courtesy lamp switch.
(b) Check the switch resistance.
Standard:

Twster Connection	Swicth	Specified Condition
1 – Swicth Body	Switch Free	10 kΩ or higher
	Switch Pushed	Below 1 Ω

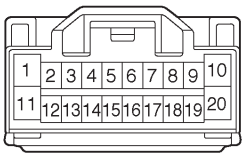
NG → **REPLACE FRONT DOOR COURTESY LAMP SWITCH ASSY**

OK

5	CHECK WIRE HARNESS (INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY) – FRONT DOOR COURTESY LAMP SWITCH ASSY)

Wire Harness Side

DB
Instrument Panel J/B Assy



D9*1
D10*2
Y Front Door Courtesy Lamp Switch Assy

Y B68145

(a) Disconnect the DB J/B connector.
(b) Disconnect the D9 or D10 switch connector.
(c) Check the resistance of the wire harness side connectors.

Standard

Tester Connection	Specified Condition
*1 DB–13 (DCTY) – D9–1 *2 DB–13 (DCTY) – D10–1	Below 1 Ω
DB–13 (DCTY) – Body ground	10 kΩ or higher

HINT:
*1: RHD
*2: LHD

OK → **REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY**

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

6	READ VALUE OF HAND–HELD TESTER (UNLOCK WARNING SWITCH ASSY)

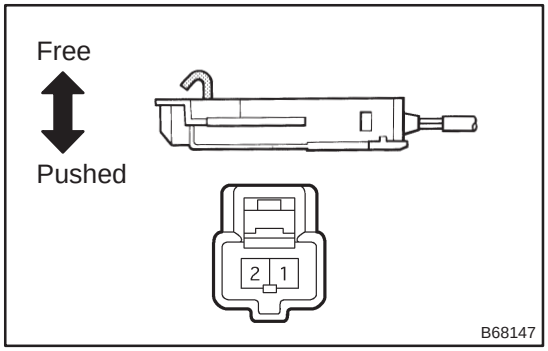
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item KEY UNLK WRN SW in the DATA LIST and read its value displayed on the hand–held tester.

Standard:
ON: The key is in the ignition key cylinder
OFF: No key is in the ignition key cylinder

OK → **Go to step 9**

NG

7 INSPECT UNLOCK WARNING SWITCH ASSY



(a) Remove the unlock warning switch.
(b) Check the switch resistance.

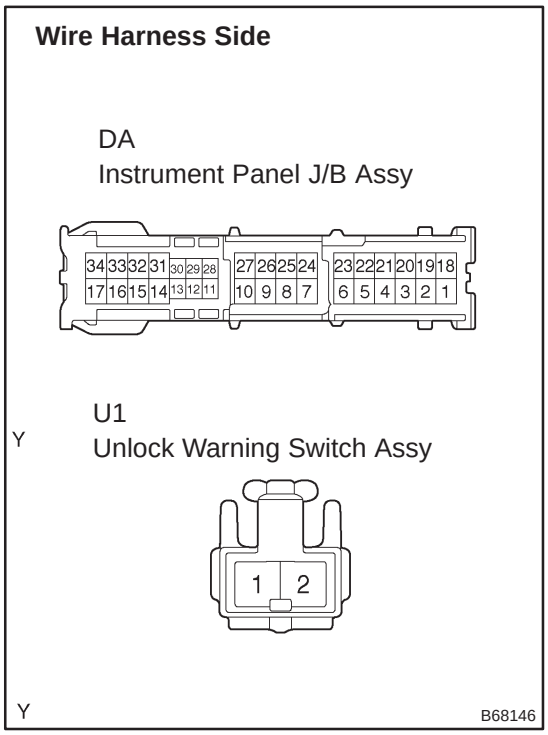
Standard:

Tester Connection	Switch Position	Specified Condition
1 – 2	Free	10 kΩ or higher
	Pushed	Below 1 Ω

NG → **REPLACE UNLOCK WARNING SWITCH ASSY**

OK

8 CHECK WIRE HARNESS (INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY) – UNLOCK WARNING SWITCH ASSY) (UNLOCK WARNING SWITCH ASSY – BODY GROUND)



(a) Disconnect the DA J/B connector.
(b) Disconnect the U1 switch connector.
(c) Check the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
DA–8 (KSW) – U1–2	Below 1 Ω
U1–1 – Body ground	
DA–8 (KSW) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

9	CHECK BUZZER (COMBINATION METER)

(a) Check if the seat belt warning buzzer sounds when the vehicle speed is 15 km/h (9 mph) or more (See page 05–1509).

HINT:

When the seat belt warning buzzer sounds, the instrument panel J/B is abnormal.

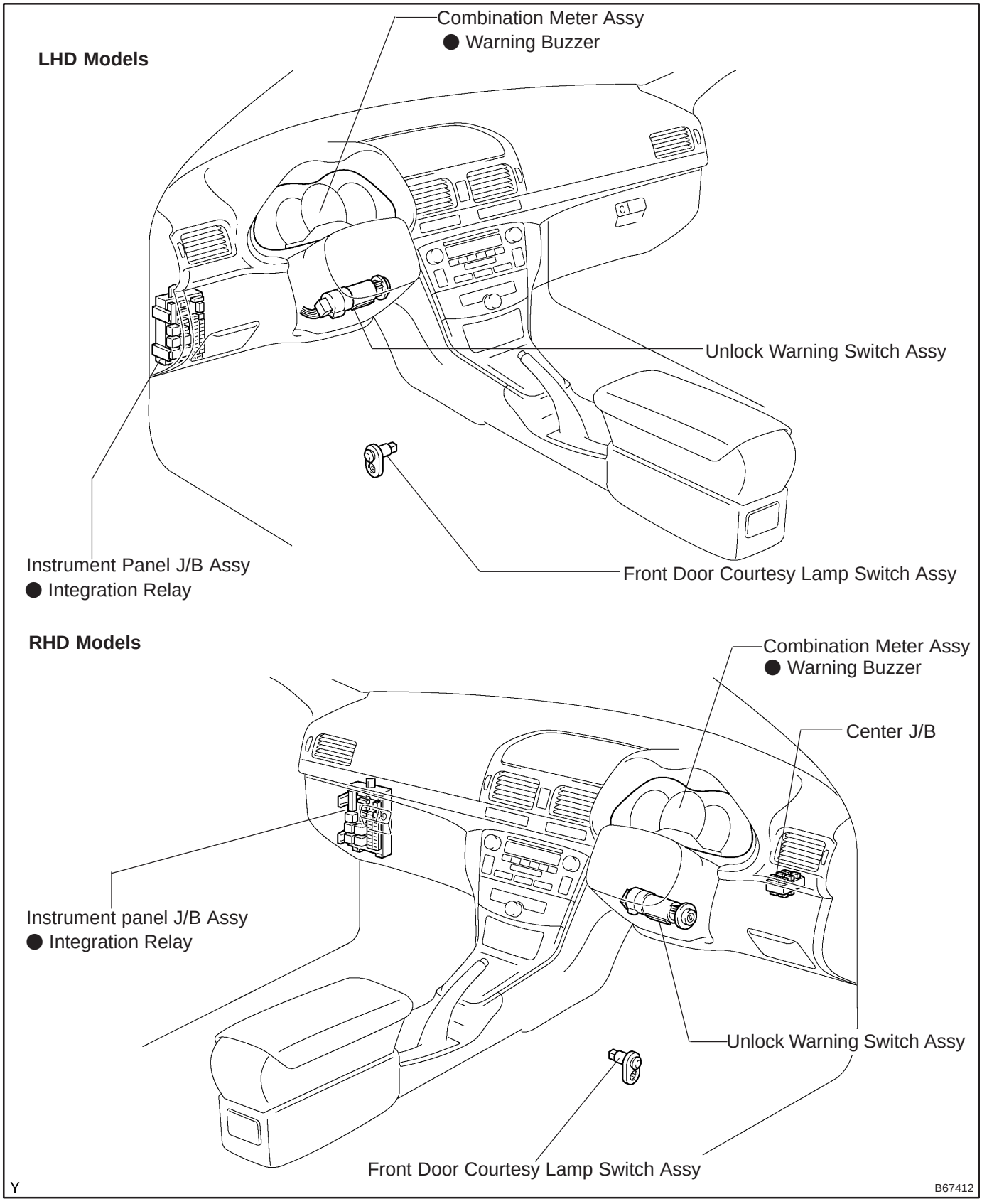
NG → REPLACE COMBINATION METER ASSY

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

05AF5–02

LOCATION



05AF0–02

PRE–CHECK

1. USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.

(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:

The hand–held tester has a ”Snapshot” function which records the monitored data.

Refer to the hand–held tester operator’s manual for further details.

2. DATA LIST

HINT:

Using the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator etc. without parts removal. Reading the DATA LIST as the first step of troubleshooting is one way to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) Read the DATA LIST according to the display on tester.

Standard (Integuration relay):

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
KEY UNLK WRN SW	Unlock warning switch signal/ ON or OFF	ON: Key is in ignition key cylinder OFF: No key is in ignition key cylinder	–
D DOOR CTY SW	Driver side door courtesy switch signal/ ON or OFF	ON: Driver side door is open OFF: Driver side door is closed	–

05AF2–02

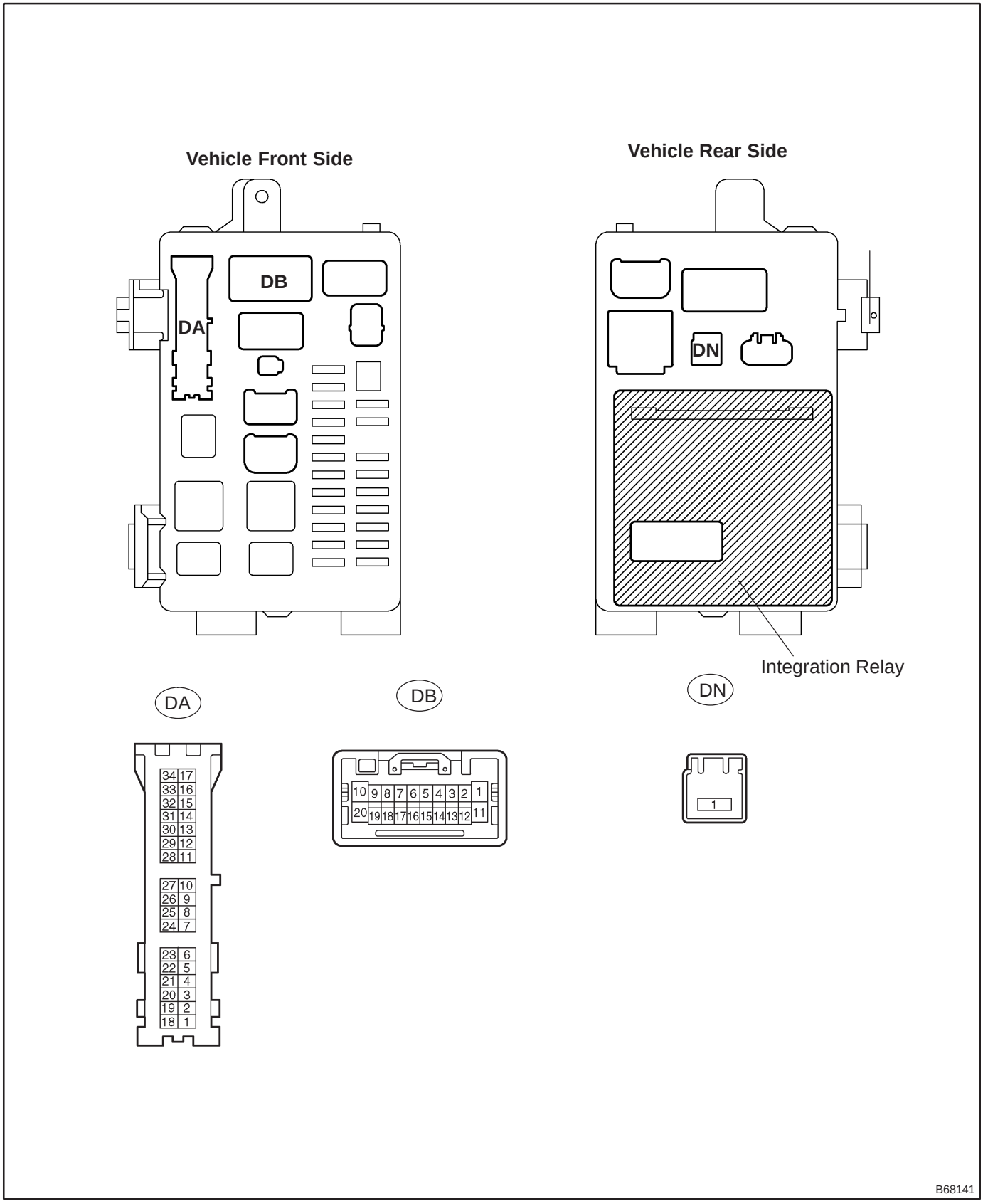
PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
Key reminder buzzer does not sound	1. Unlock warning switch assy	05–1594
	2. Front door courtesy lamp switch (Driver side)	05–1594
	3. Instrument panel junction block assy (Integration relay)	05–1591
	4. Combination meter	–
	5. Wire harness	–

05AF1–02

TERMINALS OF ECU

1. INSPECT INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY)



(a) Disconnect the DA, DB and DN J/B connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connectors.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
B (DB–16) – Body ground	W–R – Body ground	Constant	10 to 14 V
B (DN–1) – Body ground	*1 B–G – Body ground		
	*2 B–L – Body ground		10 to 14 V
E (DA–9) – Body ground	W–B – Body ground	Constant	Below 1Ω
KSW (DA–8) – Body ground	Y – Body ground	No key is inserted in ignition key cylinder → Key inserted	10 kΩ or higher → Below 1Ω

HINT:
*1: Except 1CD–FTV
*2: 1CD–FTV
If the result is not as specified, there may be a malfunction on the wire harness side.
(c) Reconnect the DA, DB and DN J/B connectors.
(d) Check the voltage of each terminal of the connectors.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
DCTY (DB–13) – Body ground	R – Body ground	Drive side door CLOSED → OPEN	10 to 14 V → Below 1 V

If the result is not as specified, the J/B may have a malfunction.

DTC	B1214	DOOR SYSTEM COMMUNICATION BUS MALFUNCTION (+B SHORT)

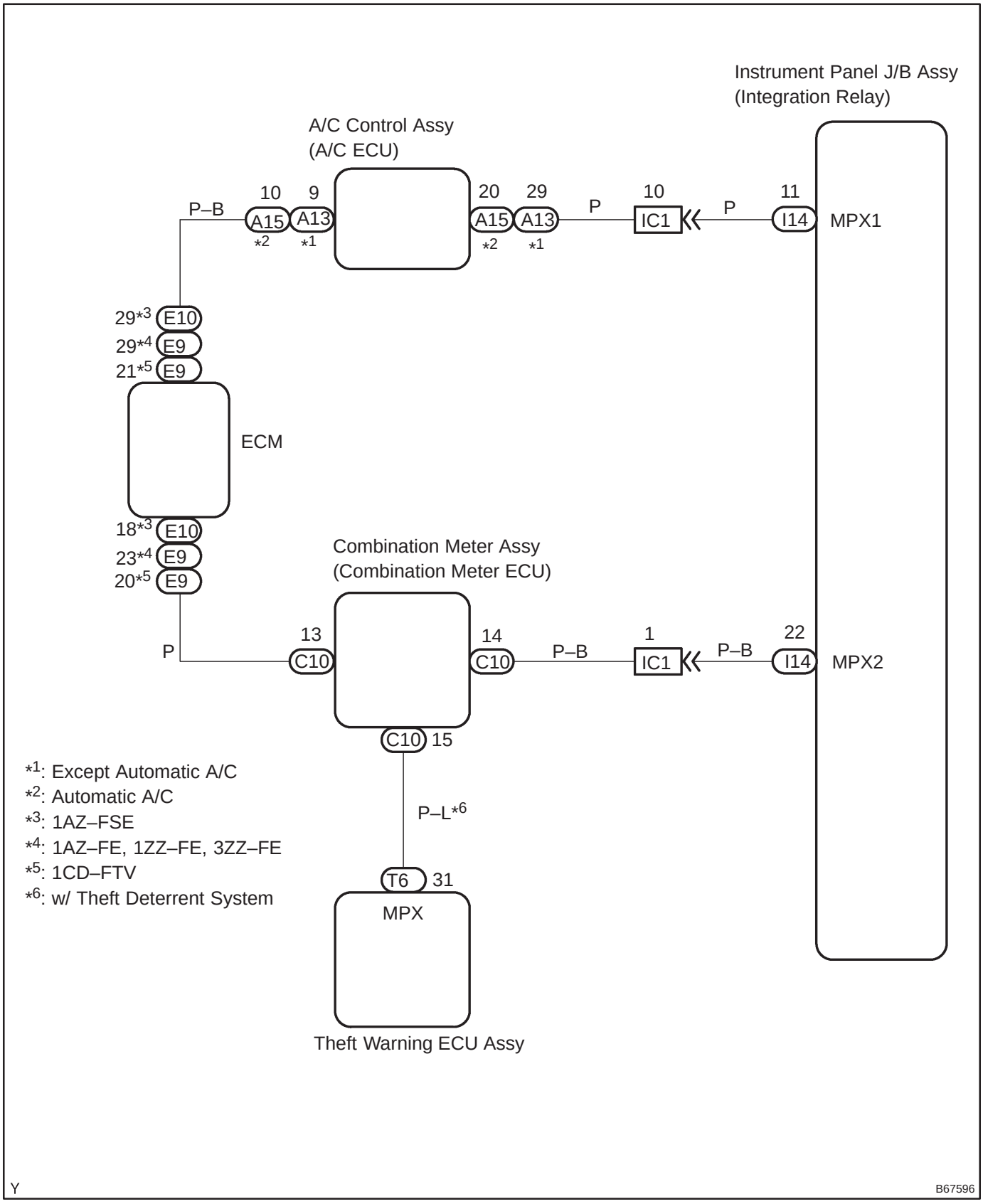
DTC	B1215	DOOR SYSTEM COMMUNICATION BUS MALFUNCTION (GND SHORT)

CIRCUIT DESCRIPTION

DTCs B1214 and B1215 are output when +B and the body ground is short–circuited on the communication bus. Detecting this condition disables all the BEAN communication and outputs some DTCs.

DTC No.	DTC Detection Condition	Trouble Area
B1214	Communication circuit and +B battery system short	• ECM • A/C control assy (A/C ECU) • Combination meter assy • Theft warning ECU assy • Wire harness • Instrument panel J/B assy (Integration relay)
B1215	Communication circuit and body ground short	• ECM • A/C control assy (A/C ECU) • Combination meter • Theft warning ECU assy • Wire harness • Instrument panel J/B assy (Integration relay)

WIRING DIAGRAM



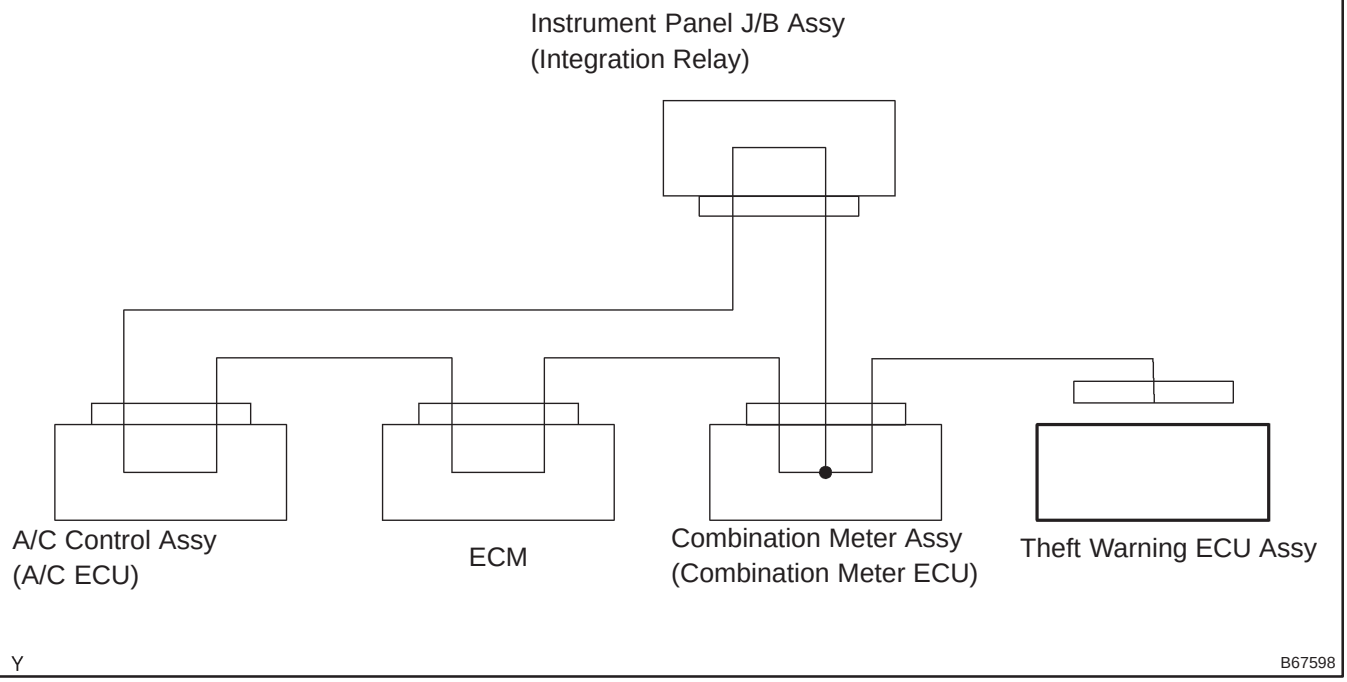
INSPECTION PROCEDURE

NOTICE:

Disconnect connectors in operational sequence and start the next operation after the connector is connected.

1	CHECK DTC (THEFT WARNING ECU ASSY)

(a) Check whether the outputs of the DTC stops when the theft warning ECU connector is disconnected.



HINT:

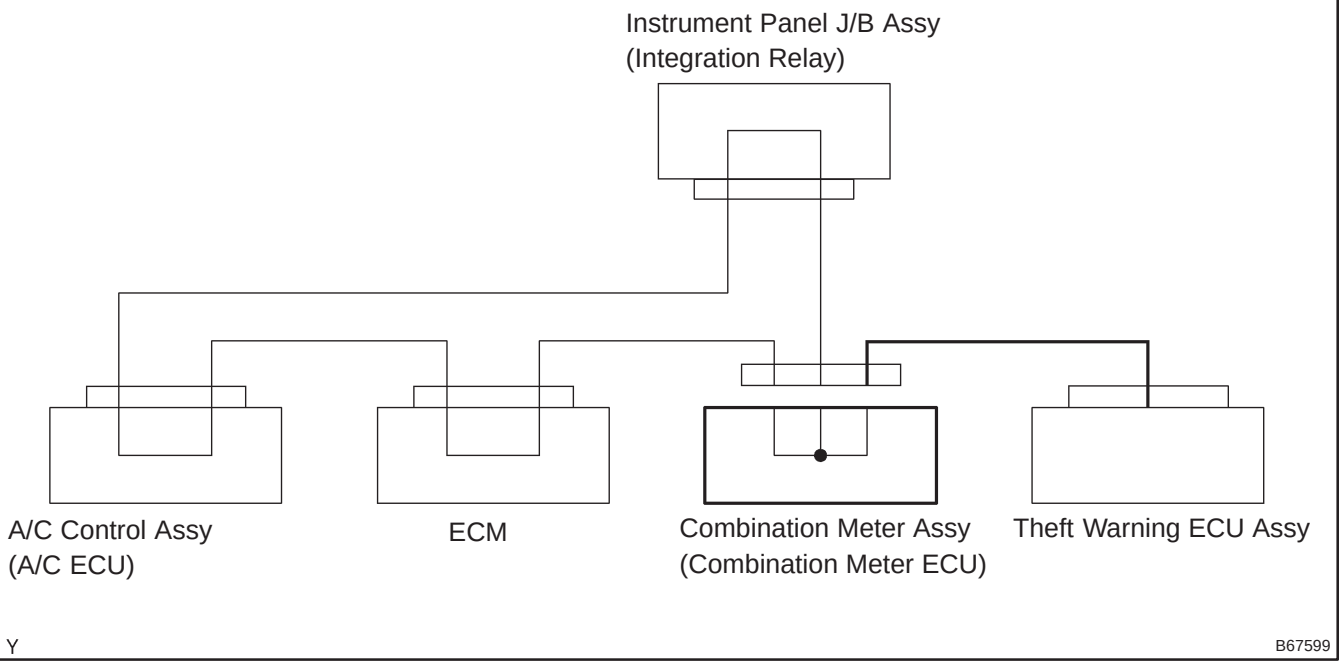
When the output of the DTC stops, the theft warning ECU is malfunctioning.

YES → **REPLACE THEFT WARNING ECU ASSY**

NO

2	CHECK DTC (COMBINATION METER ECU AND WIRE HARNESS)

(a) Check whether the outputs of the DTC stops when the combination meter ECU connector is disconnected.



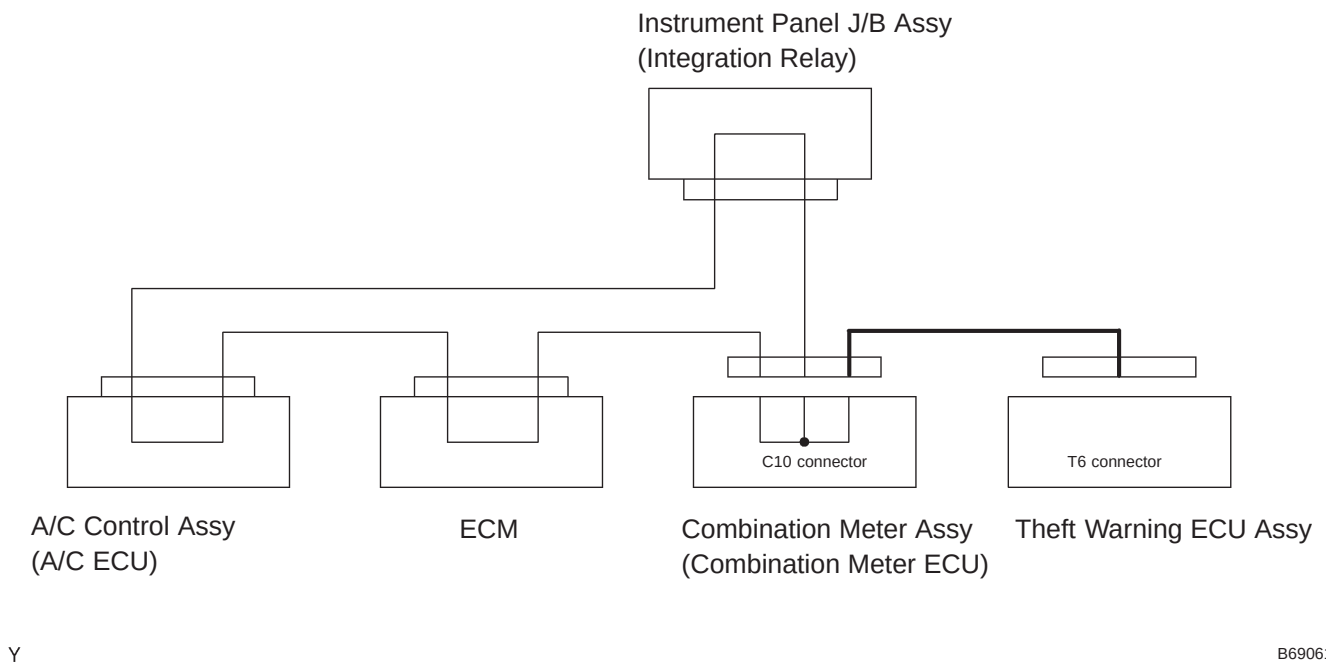
HINT:
When the output of the DTC stops, the combination meter ECU itself or the wire harness between the combination meter ECU and the theft warning ECU is malfunctioning.

NO → **Go to step 4**

YES

3	CHECK WIRE HARNESS (COMBINATION METER ECU – THEFT WARNING ECU ASSY)

(a) Disconnect the combination meter ECU and theft warning ECU connectors.
(b) Check the wire harness (MPX line) between the combination ECU and theft warning ECU.



(1) Turn the ignition switch ON.
(2) Check the voltage between the wire harness (MPX line) and the body ground.

Standard:

Tester Condition	Specified Condition
BEAN (SECURITY) (C10–15) or MPX (T6–31) – Body ground	0 V

If the output voltage is not 0 V, the wire harness (MPX line) may be short–circuited with +B.

(3) Check the resistance between the wire harness (MPX line) and the body ground.

Standard:

Tester Condition	Specified Condition
BEAN (SECURITY) (C10–15) or MPX (T6–31) – Body ground	10 kΩ or higher

When the resistance is 10 kΩ or higher, the wire harness (MPX line) and body ground may be short–circuited with the body ground.

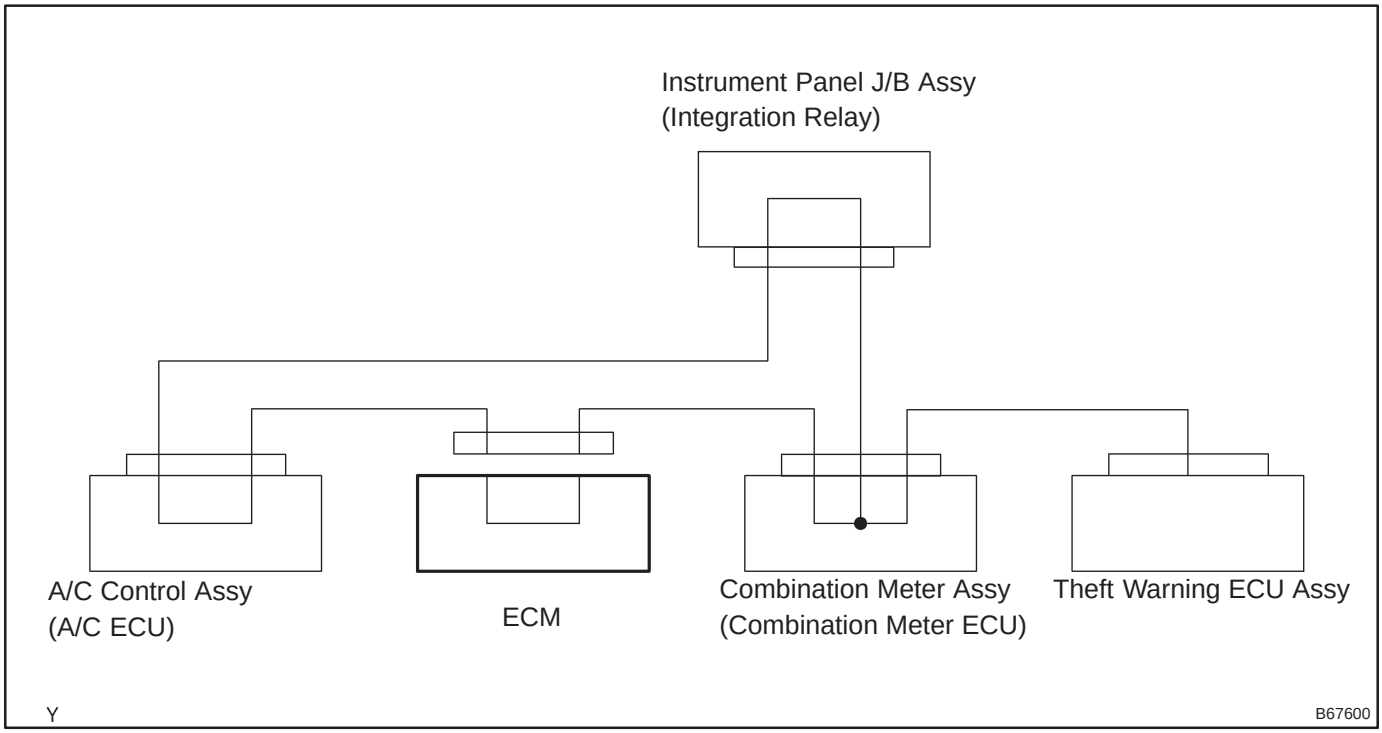
NO → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

YES

REPLACE COMBINATION METER ASSY (COMBINATION METER ECU)

4	CHECK DTC (ECM)

(a) Check whether the output of the DTC stops when the ECM connector is disconnected.



HINT:

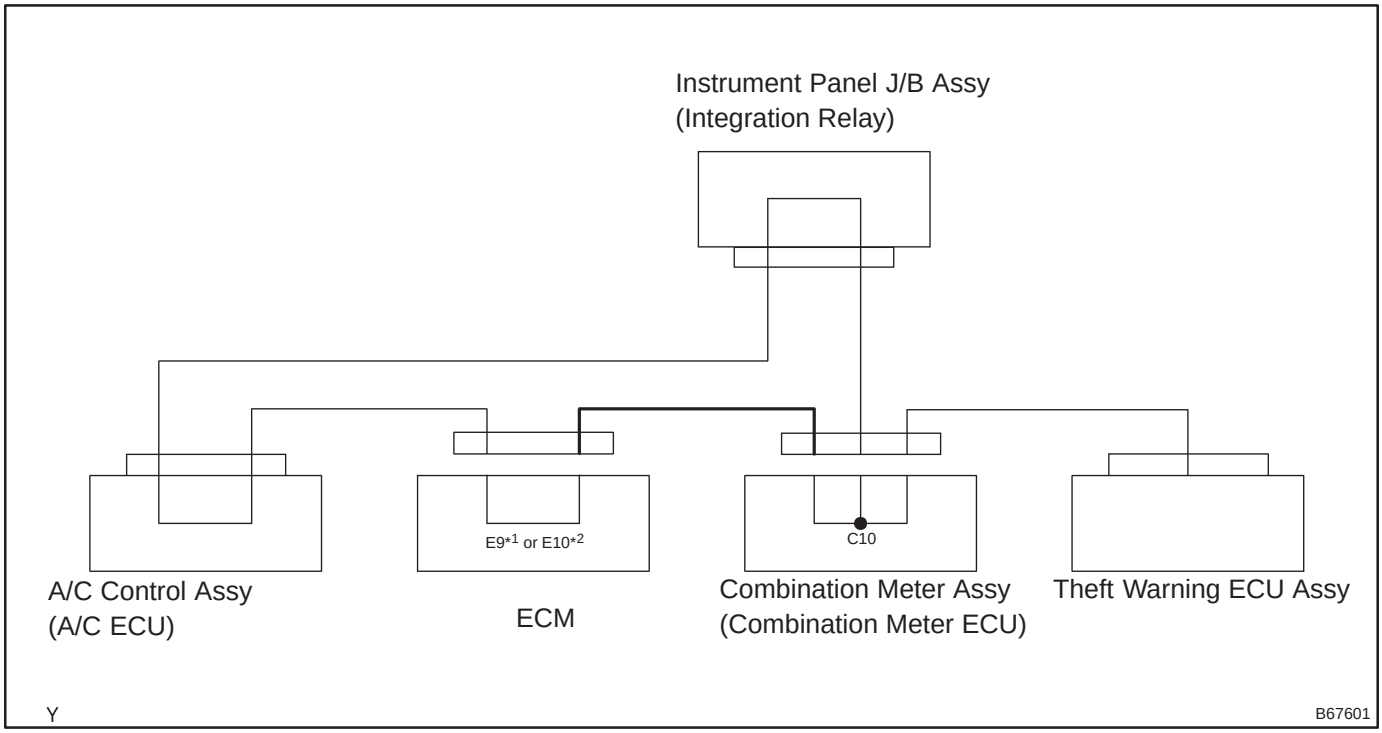
When the output of the DTC stops, the ECM is malfunctioning.

YES → **REPLACE ECM**

NO

5	CHECK WIRE HARNESS (COMBINATION METER ECU – ECM)

(a) Check whether the output of the DTC stops when the E10*1 or E9*2 connector of the ECM and the C10 connector of the combination meter ECU are disconnected.



HINT:

When the output of the DTC stops, the wire harness between the E10*1 or E9*2 connector of the ECM and the C10 connector of the combination meter ECU is malfunctioning.

*1: 1AZ–FSE

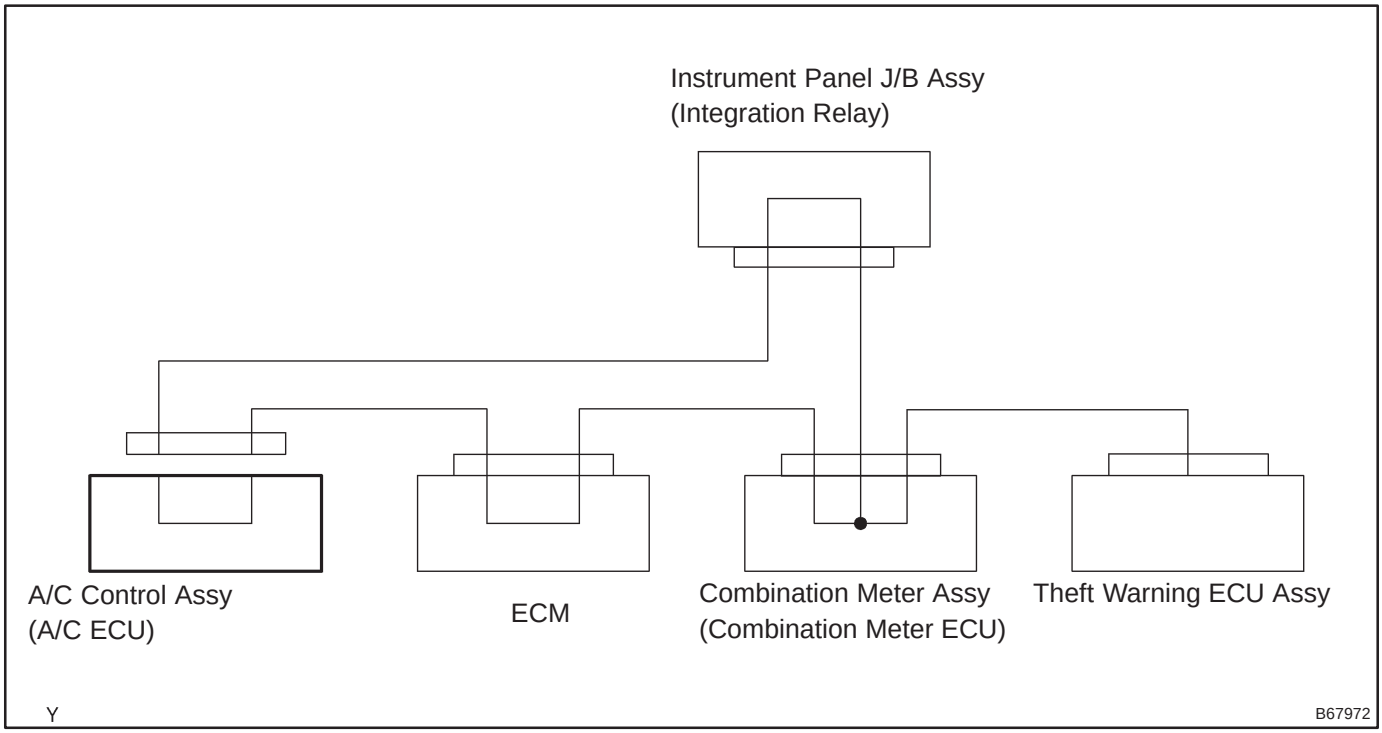
*2: Except 1AZ–FSE

YES → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

NO

6	CHECK DTC (A/C ECU)

(a) Check whether the output of the DTC stops when the A/C ECU connector is disconnected.



HINT:

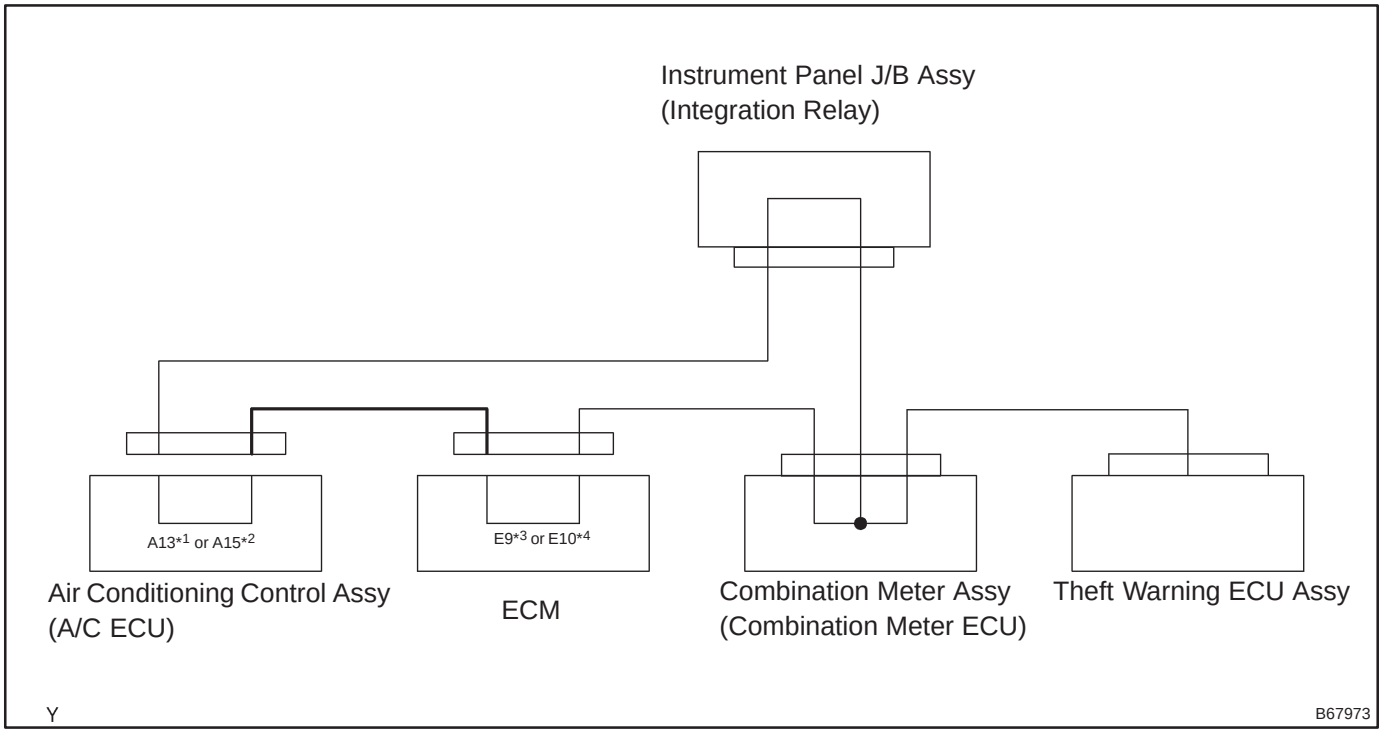
When the output of the DTC stops, the A/C ECU is malfunctioning.

YES → **REPLACE AIR CONDITIONING CONTROL ASSY (A/C ECU)**

NO

7	CHECK WIRE HARNESS (A/C ECU – ECM)

(a) Check whether the output of the DTC stops when the A13*1 or A15*2 connector of the A/C ECU and the E10*3 or E9*4 connector of the ECM are disconnected.



HINT:

When the output of the DTC stops, the wire harness between the A13*1 or A15*2 connector of the A/C ECU and the E10*3 or E9*4 connector of the ECM is malfunctioning.

*1: Except Automatic A/C

*2: Automatic A/C

*3: 1AZ–FSE

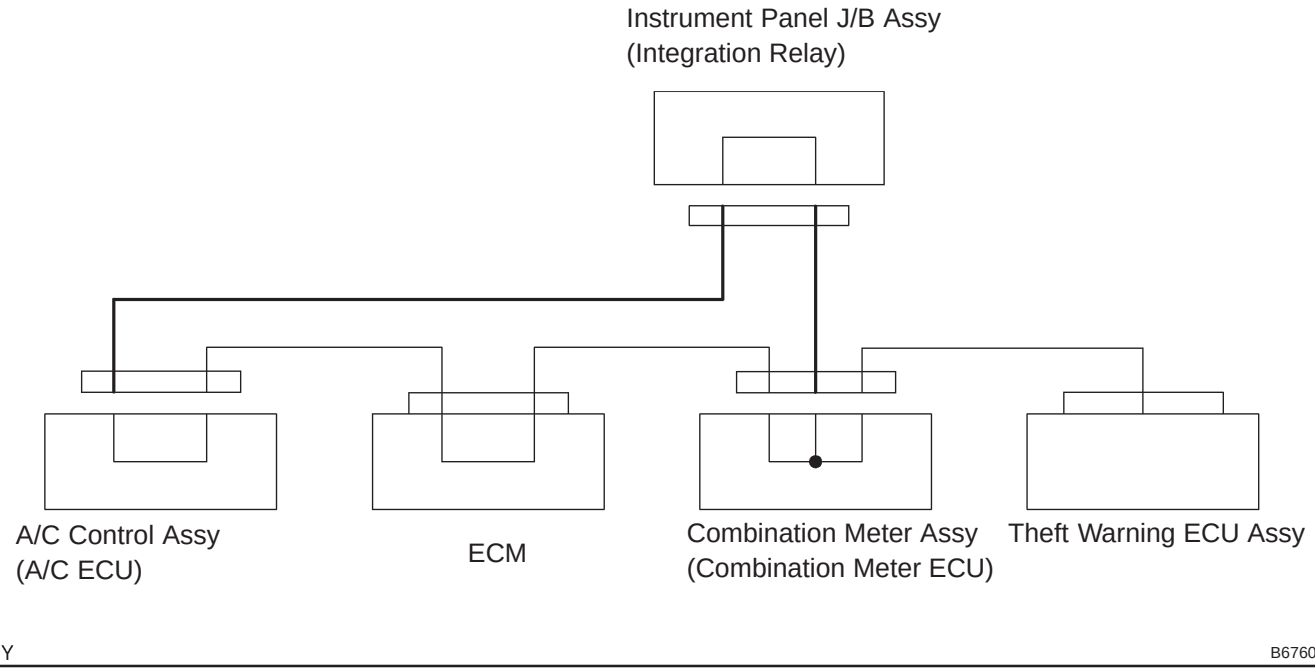
*4: Except 1AZ–FSE

YES → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

NO

8	CHECK WIRE HARNESS (INTEGRATION RELAY – A/C ECU) (INTEGRATION RELAY – COMBINATION METER ECU)

(a) Disconnect the A/C ECU, combination meter ECU and integration relay connectors.
(b) Check the wire harness (MPX lines) between the integration relay and A/C ECU as well as in between the integration relay and combination ECU.



(1) Turn the ignition switch ON.
(2) Check the voltage between the wire harness (MPX lines) and the body ground.

Standard:

Tester Condition	Specified Condition
Integration relay or A/C ECU – Body ground	0 V
Integration relay or combination meter ECU – Body ground	

If the output voltage is not 0 V, the wire harness (MPX line) may be short–circuited with +B.

(3) Check the resistance between the wire harness (MPX lines) and the body ground.

Standard:

Tester Condition	Specified Condition
Integration relay or A/C ECU – Body ground	10 kΩ or higher
Integration relay or combination meter ECU – Body ground	

When the resistance is 10 kΩ or higher, the wire harness (MPX line) and body ground may be short–circuited with the body ground.

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY (INTEGRATION RELAY)

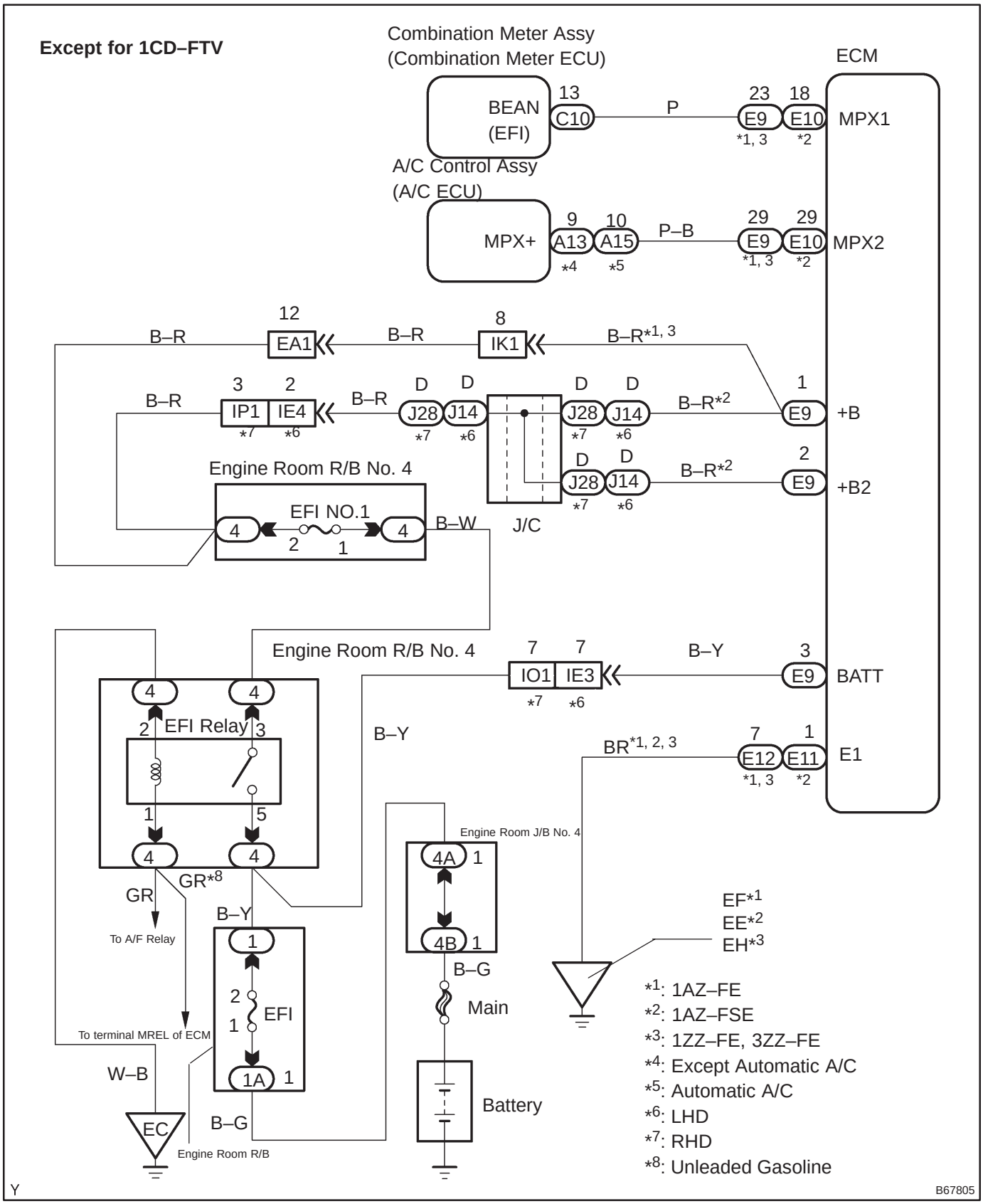
DTC	B1261	ECM (ENGINE ECU) COMMUNICATION STOP

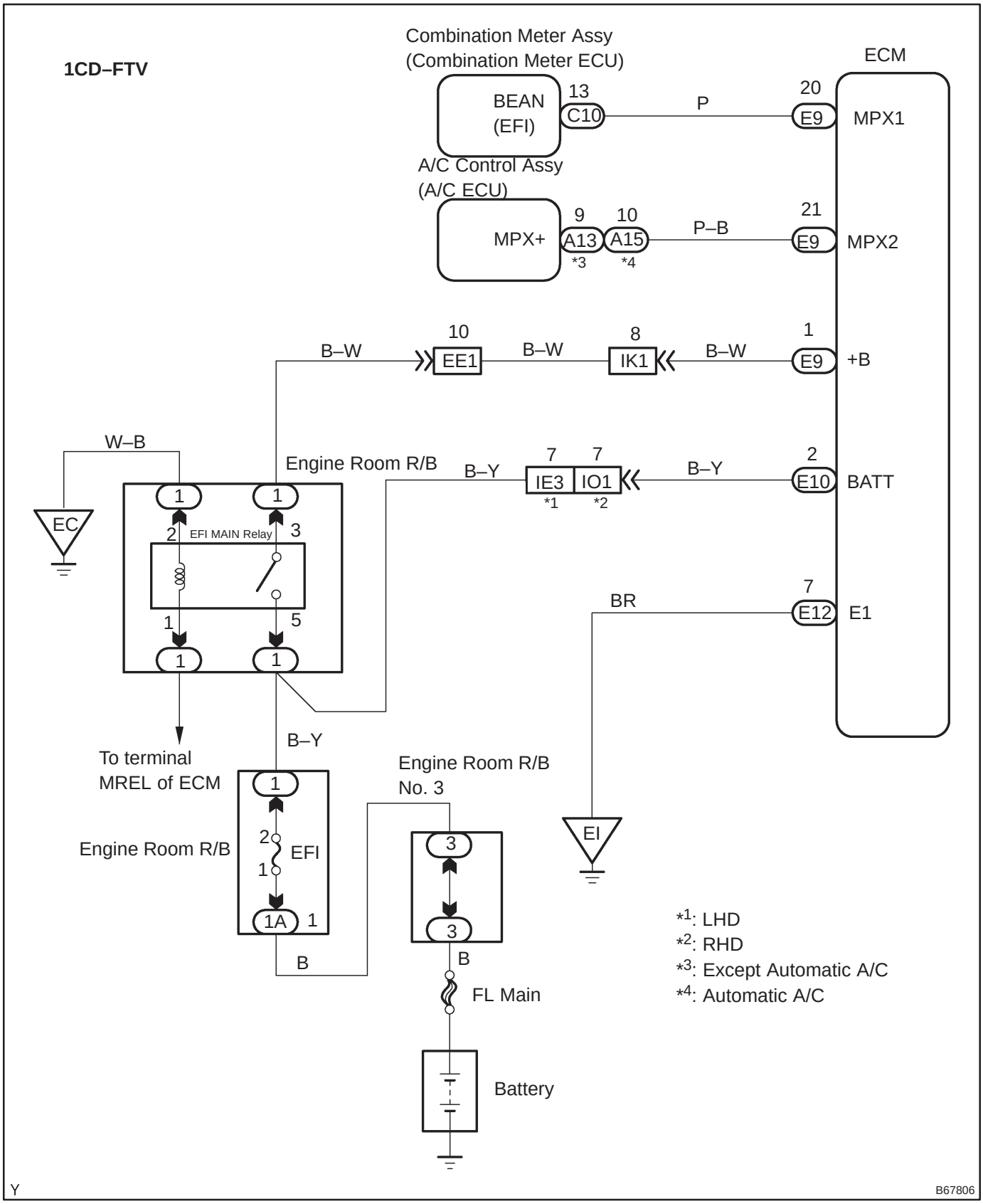
CIRCUIT DESCRIPTION

DTC B1261 is output when communication between the ECM and integration relay stops for more than 10 seconds.

DTC No.	DTC Detection Condition	Trouble Area
B1261	No communication from ECM for more than 10 seconds	• ECM • Wire harness

WIRING DIAGRAM

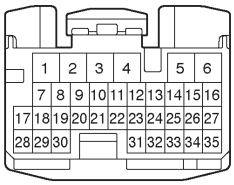



1CD–FTV
Combination Meter Assy
(Combination Meter ECU)
BEAN
(EFI)
13
C10
P
20
E9
ECM
MPX1
A/C Control Assy
(A/C ECU)
MPX+
9
A13
*3
10
A15
*4
P–B
21
E9
MPX2
10
EE1
B–W
B–W
8
IK1
B–W
1
E9
+B
W–B
Engine Room R/B
B–Y
7
IE3
*1
7
IO1
*2
B–Y
2
E10
BATT
EC
EFI MAIN Relay
2
3
1
5
1
1
1
1
BR
7
E12
E1
To terminal
MREL of ECM
B–Y
Engine Room R/B
No. 3
Engine Room R/B
2
EFI
1
1A
1
B
3
3
B
FL Main
Battery
EI
*1: LHD
*2: RHD
*3: Except Automatic A/C
*4: Automatic A/C
Y
B67806

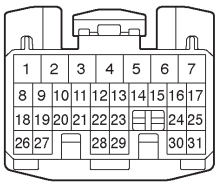
1 CHECK RESISTANCE OF COMMUNICATION LINE

Wire Harness Side

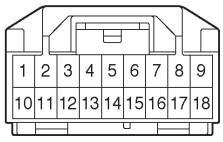
E10*2
ECM



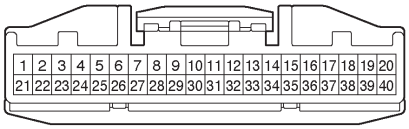
Y E9*1, 3, 4
ECM



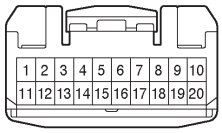
Y C10
Combination Meter Assy
(Combination Meter ECU)



Y A13*5
A/C Control Assy
(A/C ECU)



Y A15*6
A/C Control Assy
(A/C ECU)



B68027

(a) Disconnect the E9 or E10 ECM, C10 and A13 or A15 ECU connectors.

(b) Check the resistance between wire harness side connectors.

Standard:

1AZ–FSE

Tester Connection	Specified Condition
E10–18 (MPX1) – C10–13 (BEAN)	Below 1 Ω
*5 E10–29 (MPX2) – A13–9 (MPX+)	
*6 E10–29 (MPX2) – A15–10 (MPX+)	

1AZ–FE, 1ZZ–FE, 3ZZ–FE

Tester Connection	Specified Condition
E9–23 (MPX1) – C10–13 (BEAN)	Below 1 Ω
*5 E9–29 (MPX2) – A13–9 (MPX+)	
*6 E9–29 (MPX2) – A15–10 (MPX+)	

1CD–FTV

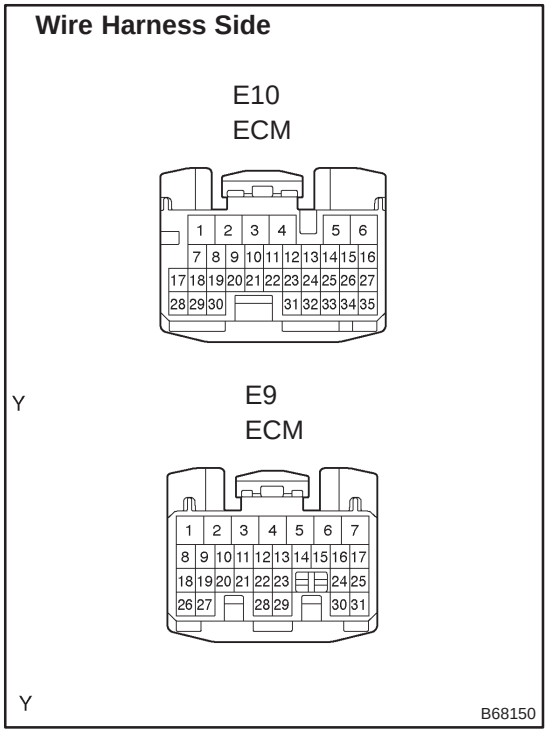
Tester Connection	Specified Condition
E9–20 (MPX1) – C10–13 (BEAN)	Below 1 Ω
*5 E9–21 (MPX2) – A13–9 (MPX+)	
*6 E9–21 (MPX2) – A15–10 (MPX+)	

HINT:
*1: 1AZ–FE
*2: 1AZ–FSE
*3: 1ZZ–FE, 3ZZ–FE
*4: 1CD–FTV
*5: Except Automatic A/C
*6: Automatic A/C

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 CHECK ECM (POWER SOURCE)



(a) Disconnect the E10 or E9 ECM connector.
(b) Check the voltage between the wire harness side connectors and the body ground.

Standard:

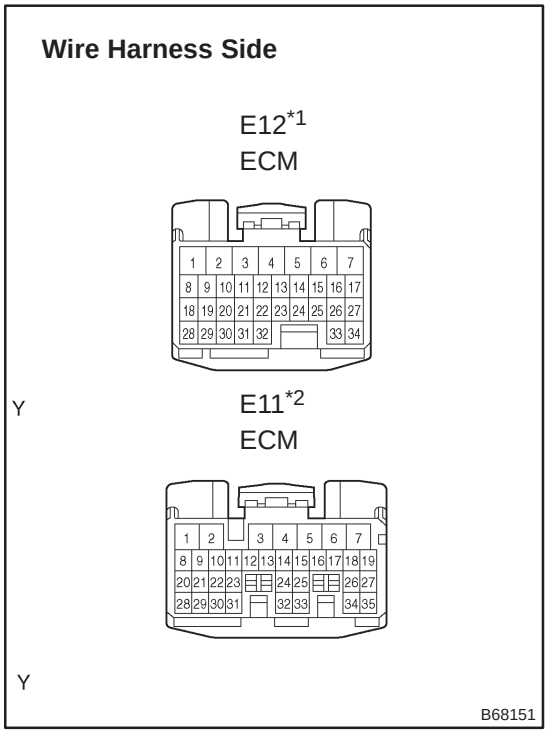
Tester Connection	Specified Condition
+B (E9–1) – Body ground	10 to 14 V
*1 +B2 (E9–2) – Body ground	
*1 BATT (E9–3) – Body ground	
*2 BATT (E10–2) – Body ground	

HINT:
*1: Except 1CD–FTV
*2: 1CD–FTV

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK ECM (GROUND)



(a) Disconnect the E12 or E11 ECM connector.
(b) Check the resistance between the wire harness side connectors and the body ground.

Standard:

Tester Connection	Specified Condition
*1 E12–7 (E1) – Body ground	Below 1 Ω
*2 E11–1 (E1) – Body ground	

HINT:
*1: Except 1AZ–FSE
*2:1AZ–FSE

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

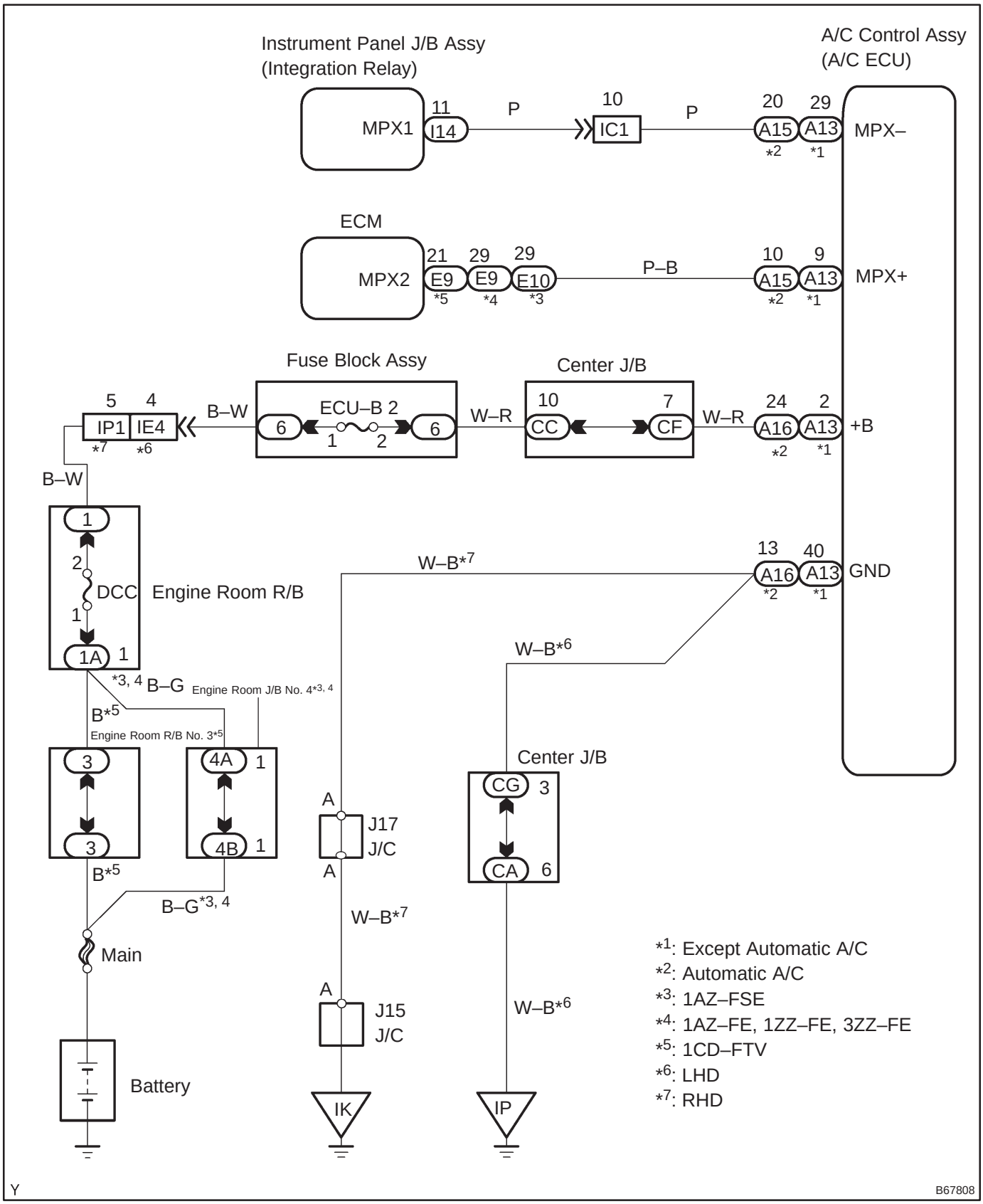
DTC B1262 A/C ECU COMMUNICATION STOP

CIRCUIT DESCRIPTION

DTC B1262 will be output when the communication between the A/C ECU and the integration relay stops for more than 10 seconds.

DTC No.	DTC Detection Condition	Trouble Area
B1262	No communication from A/C ECU for more than 10 seconds	• A/C control assy (A/C ECU) • Wire harness

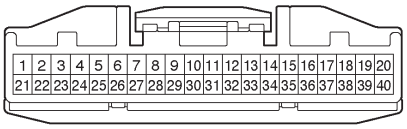
WIRING DIAGRAM



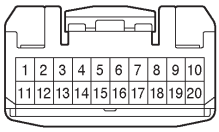
1 CHECK RESISTANCE OF COMMUNICATION LINE

Wire Harness Side

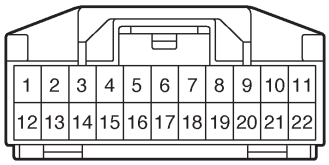
A13*1
Air Conditioning Control Assy



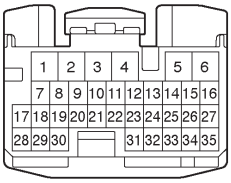
A15*2
Y Air Conditioning Control Assy



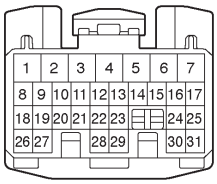
I14
Y Instrument Panel J/B Assy
(Integration Relay)



E10*3
ECM



E9*4, 5
Y ECM



Y

B68152

(a) Disconnect the A13 or A15, E10 or E9 and I14 connectors.

(b) Check the resistance between wire harness side connectors.

Standard:

1AZ–FSE

Tester Connection	Specified Condition
*1 A13–29 (MPX–) – I14–11 (MPX1)	Below 1 Ω
*2 A15–20 (MPX–) – I14–11 (MPX1)	
*1 A13–9 (MPX+) – E10–29 (MPX2)	
*2 A15–10 (MPX+) – E10–29 (MPX2)	

1AZ–FE, 1ZZ–FE, 3ZZ–FE

Tester Connection	Specified Condition
*1 MPX– (A13–29) – MPX1 (I14–11)	Below 1 Ω
*2 MPX– (A15–20) – MPX1 (I14–11)	
*1 MPX+ (A13–9) – MPX2 (E9–29)	
*2 MPX+ (A15–10) – MPX2 (E9–29)	

1CD–FTV

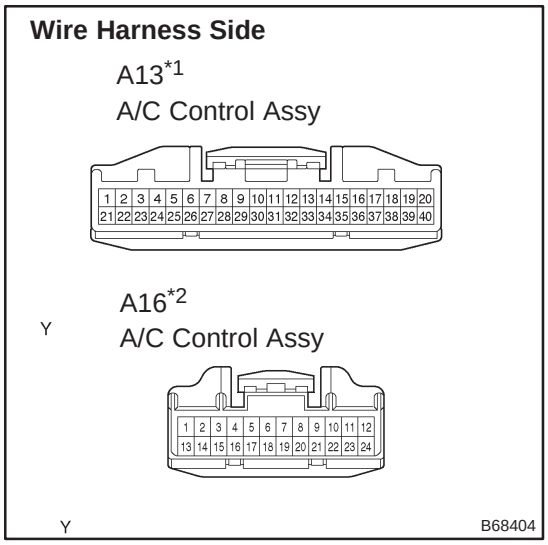
Tester Connection	Specified Condition
*1 MPX– (A13–29) – MPX1 (I14–11)	Below 1 Ω
*2 MPX– (A15–20) – MPX1 (I14–11)	
*1 MPX+ (A13–9) – MPX2 (E9–21)	
*2 MPX+ (A15–10) – MPX2 (E9–21)	

HINT:
*1: Except automatic A/C
*2: Automatic A/C
*3: 1AZ–FSE
*4: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*5: 1CD–FTV

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 CHECK AIR CONDITIONING CONTROL ASSY (A/C ECU) (POWER SOURCE)



(a) Disconnect the A13 or A16 ECU connector.
(b) Check the voltage between the wire harness side connectors and the body ground.

Standard:

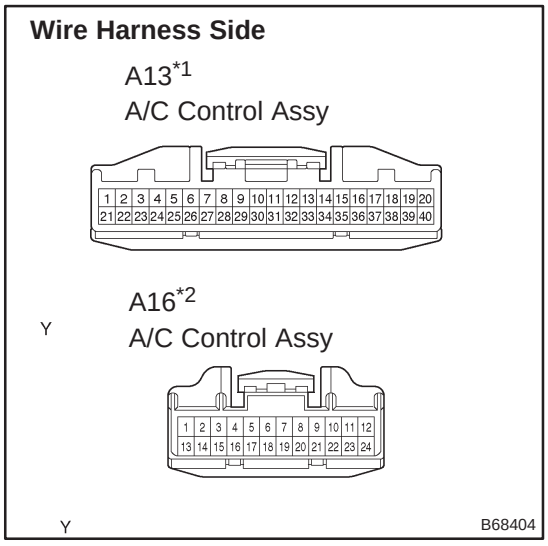
Tester Connection	Specified Condition
*1 A13–2 (+B) – Body ground	10 to 14 V
*2 A16–24 (+B) – Body ground	

*1: Except Automatic A/C
*2: Automatic A/C

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK AIR CONDITIONING CONTROL ASSY (A/C ECU) (GROUND)



(a) Disconnect the A13 or A16 ECU connector.
(b) Check the voltage between the wire harness side connectors and the body ground.

Standard:

Tester Connection	Specified Condition
*1 A13–40 (GND) – Body ground	10 to 14 V
*2 A16–3 (GND) – Body ground	

*1: Except Automatic A/C
*2: Automatic A/C

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE AIR CONDITIONING CONTROL ASSY

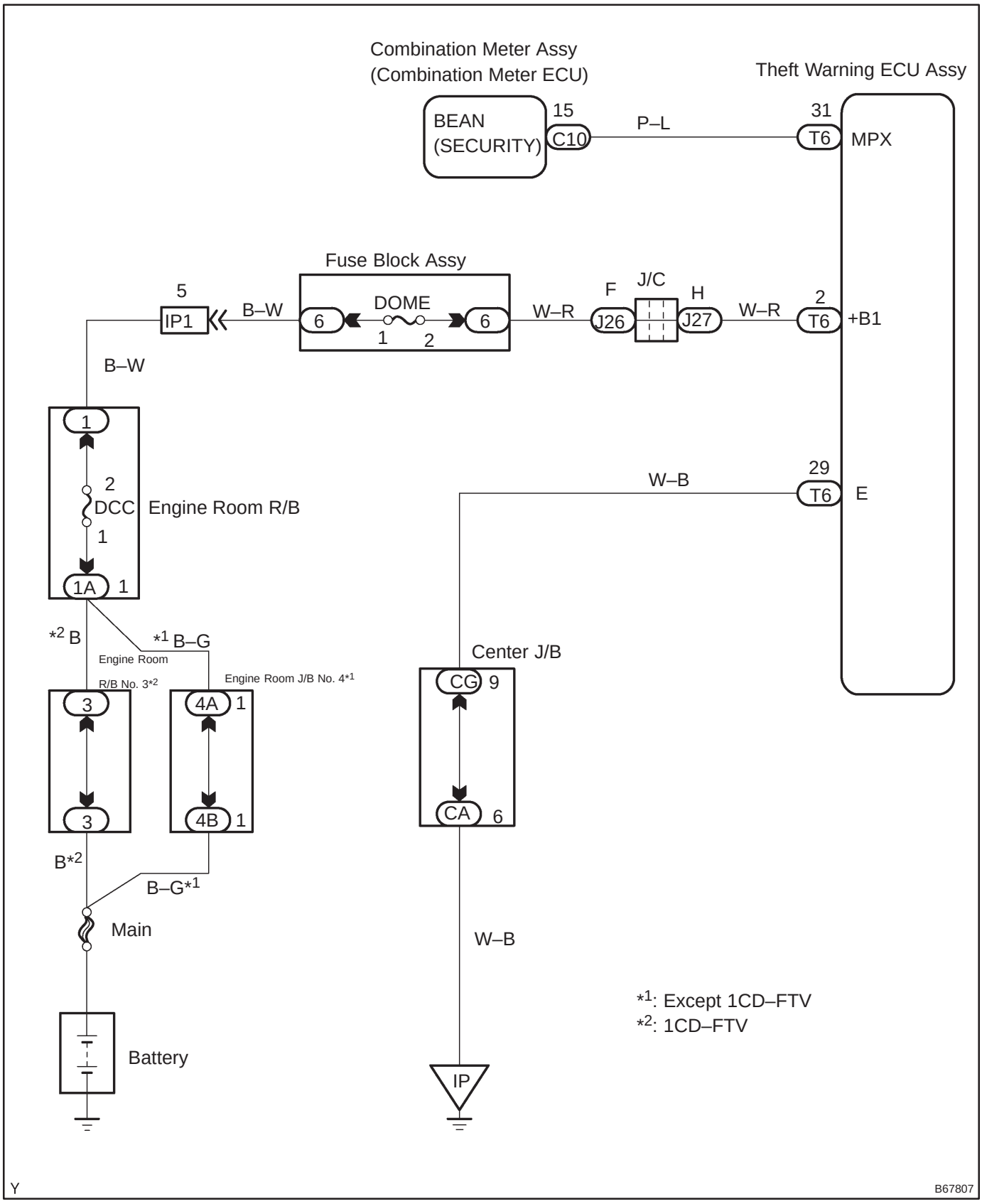
DTC	B1269	THEFT DETERRENT ECU COMMUNICATION STOP

CIRCUIT DESCRIPTION

DTC B1269 is output when communication between the theft warning ECU and the combination meter stops for more than 10 seconds.

DTC No.	DTC Detection Condition	Trouble Area
B1269	No communication from theft deterrent ECU for more than 10 seconds	• Theft warning ECU assy • Wire harness

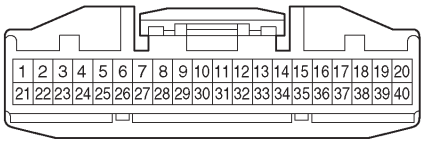
WIRING DIAGRAM



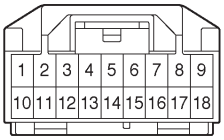
1 CHECK RESISTANCE OF COMMUNICATION LINE

Wire Harness Side

T6
Theft Warning ECU Assy



C10
Combination Meter Assy
(Combination Meter ECU)



Y

B68155

(a) Disconnect the T6 and C10 ECU connectors.
(b) Check the resistance between wire harness side connectors.

Standard:

Tester Connection	Specified Condition
T6–31 (MPX) – C10–15 (BEAN) (Security)	Below 1 Ω

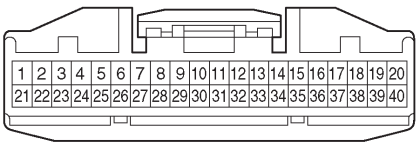
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 CHECK THEFT WARNING ECU ASSY (POWER SOURCE)

Wire Harness Side

T6
Theft Warning ECU Assy



B65849

(a) Disconnect the T6 ECU connector.
(b) Check the voltage between the wire harness side connector and the body ground.

Standard:

Tester Connection	Specified Condition
T6–2 (+B1) – Body ground	10 to 14 V

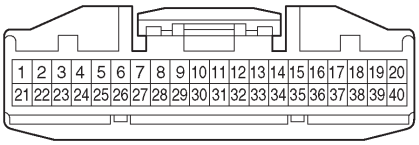
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK THEFT WARNING ECU ASSY (GROUND)

Wire Harness Side

T6
Theft Warning ECU Assy



B65849

(a) Disconnect the T6 ECU connector.
(b) Check the resistance between the wire harness side connector and the body ground.

Standard:

Tester Connection	Specified Condition
T6–29 (E) – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE THEFT WARNING ECU ASSY

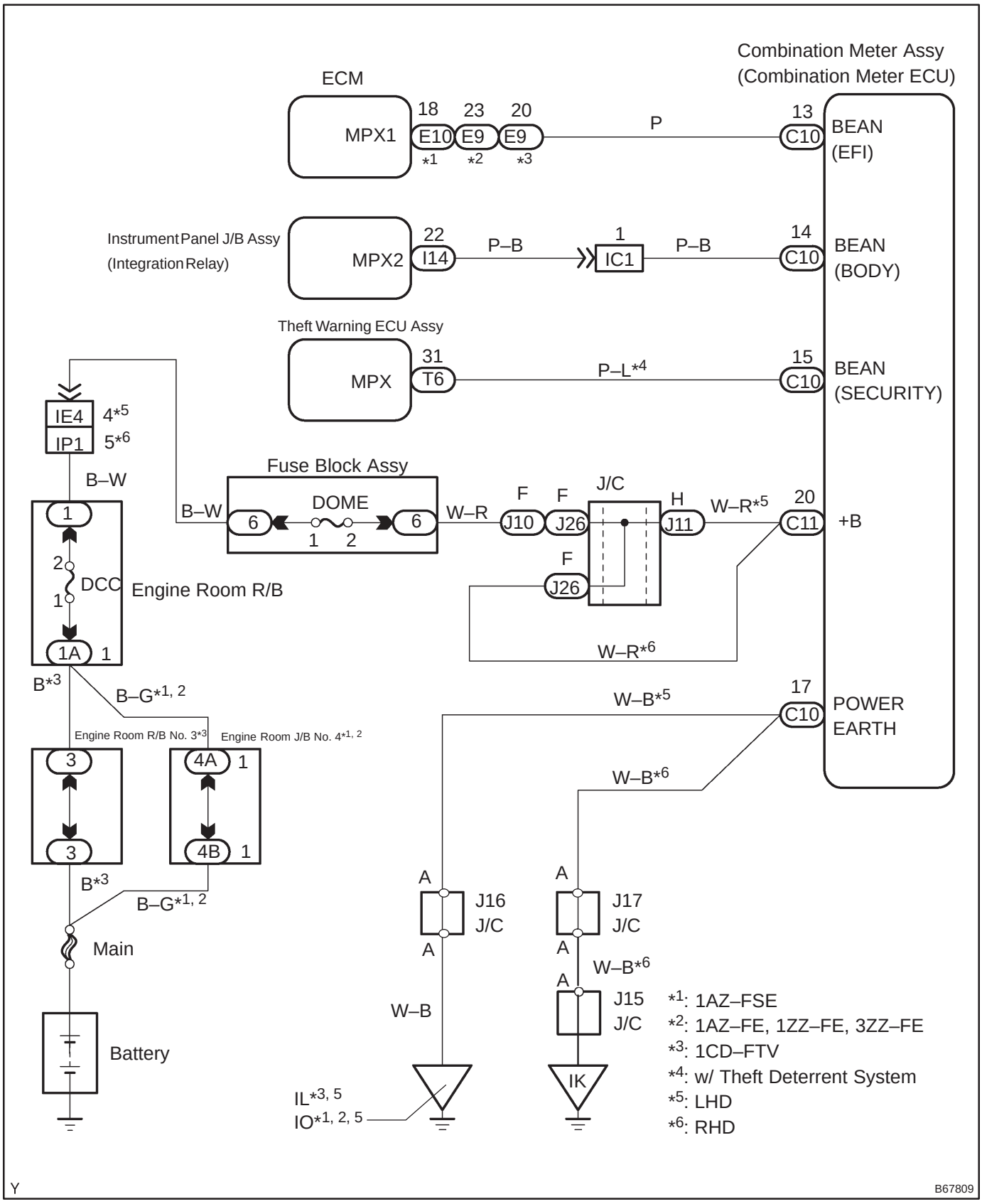
DTC	B1271	COMBINATION METER ECU COMMUNICATION STOP

CIRCUIT DESCRIPTION

DTC B1271 is output when communication between the combination meter and integration relay stops for more than 10 seconds.

DTC No.	DTC Detection Condition	Trouble Area
B1271	No communication from Combination meter ECU for more than 10 seconds	• Combination meter assy (Combination meter ECU) • Wire harness

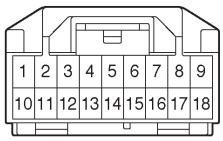
WIRING DIAGRAM



1 CHECK RESISTANCE OF COMMUNICATION LINE

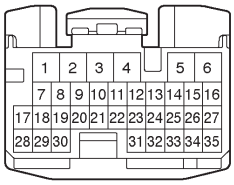
Wire Harness Side

C10
Combination Meter Assy
(Combination Meter ECU)



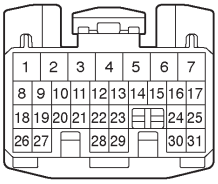
Y

E10*1
ECM



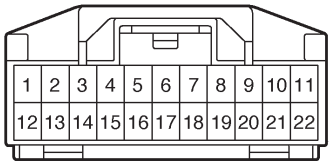
Y

E9*2, 3
ECM

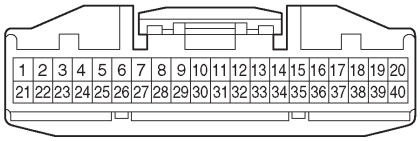


Y

I14
Instrument Panel J/B Assy
(Integration Relay)



T6
Theft Warning ECU Assy



B68156

(a) Disconnect the C10, E10 or E9, T6 and I14 connectors.
(b) Check the resistance between wire harness side connectors.

Standard:

Tester Connection	Specified Condition
*1 C10–13 (BEAN) (EFI) – E10–18 (MPX1)	Below 1 Ω
*2 C10–13 (BEAN) (EFI) – E9–23 (MPX1)	
*3 C10–13 (BEAN) (EFI) – E9–20 (MPX1)	
C10–14 (BEAN) (BODY) – I14–22 (MPX2)	
C10–15 (BEAN) (SECURITY) – T6–31 (MPX)	

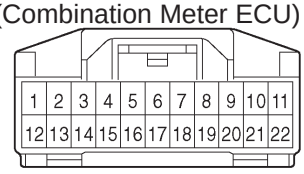
HINT:
*1: 1AZ–FSE
*2: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*3: 1CD–FTV

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2 CHECK COMBINATION METER ASSY (COMBINATION METER ECU) (POWER SOURCE)

Wire Harness Side
C11
Combination Meter Assy
(Combination Meter ECU)



Y B67965

(a) Disconnect the C11 ECU connector.
(b) Check the voltage between the wire harness side connector and the body ground.

Standard:

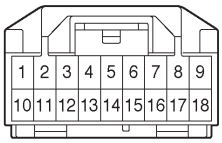
Tester Connection	Specified Condition
C11–20 (+B) – Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK COMBINATION METER ASSY (COMBINATION METER ECU) (GROUND)

Wire Harness Side
C10
Combination Meter Assy
(Combination Meter ECU)



B68158

(a) Disconnect the C10 ECU connector.
(b) Check the resistance between the wire harness side connector and the body ground.

Standard:

Tester Connection	Specified Condition
C10–17 (POWER EARTH) – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE COMBINATION METER ASSY (COMBINATION METER ECU) (See page 05–1509)

05AEQ–02

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the chart below (Proceed to the page given for that circuit).

DTC No. (See Page)	Detection Item	Trouble Area
B1214 (05–1670)	Door System Communication Bus Malfunction (+B Short)	• Wire harness • ECM • A/C control assy (A/C ECU) • Theft warning ECU assy • Combination meter assy (Combination meter ECU) • Instrument panel J/B assy (Integration relay)
B1215 (05–1670)	Door System Communication Bus Malfunction (GND Short)	• Wire harness • ECM • A/C control assy (A/C ECU) • Theft warning ECU assy • Combination meter assy (Combination meter ECU) • Instrument panel J/B assy (Integration relay)
B1261 (05–1680)	ECM Communication Stop	• Wire harness • ECM
B1262 (05–1685)	A/C ECU Communication Stop	• Wire harness • A/C assy (A/C ECU)
B1269 (05–1689)	Theft Deterrent ECU Communication Stop	• Wire harness • Theft warning ECU assy
B1271 (05–1693)	Combination Meter ECU Communication Stop	• Wire harness • Combination meter assy (Combination meter ECU)

MULTIPLEX COMMUNICATION SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

05AEO–02

HINT:

- Use this procedure to troubleshoot the key reminder warning system.
  The hand–held tester should be used at step 3 and 4.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM

3	DTC CHECK (See page 05–1656)

(a) Check for DTCs and note any codes that are output.
(b) Delete the DTC.
(c) Recheck for DTCs. Try to prompt the DTC by simulating the original activity that the DTC suggests.
  (1) If the DTC does not reoccur, proceed to A.
  (2) If the DTC reoccurs, proceed to B.

B	Go to step 5

A

4	PERFORM TROUBLESHOOTING ACCORDING TO MALFUNCTION SYMPTOM

(a) Pre–check (See page 05–1655).
(b) Terminals of ECU (See page 05–1659).

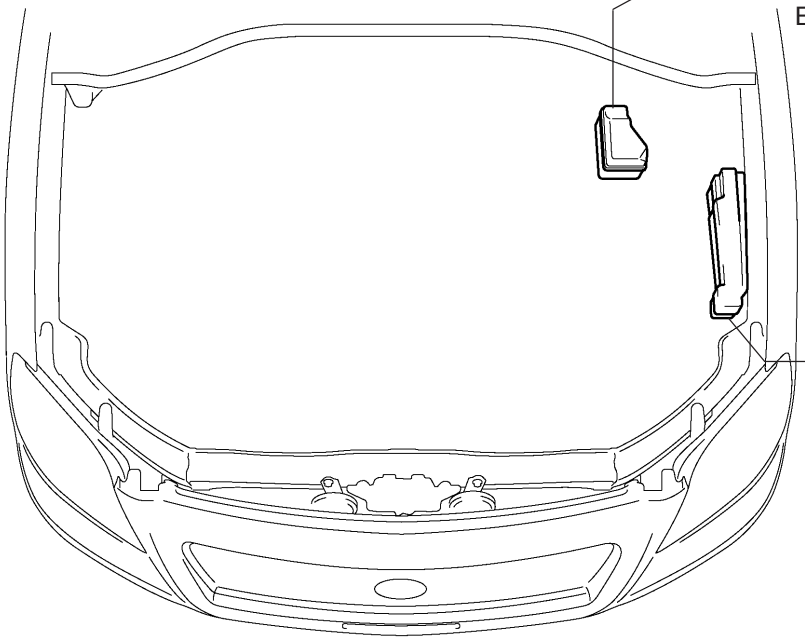
5	ADJUST, REPAIR OR REPLACE

END

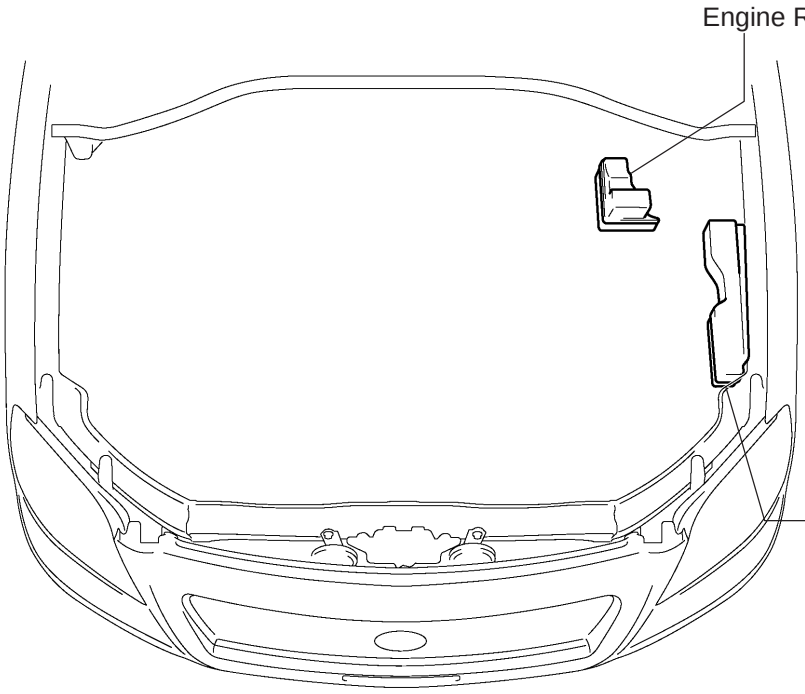
05C5K–01

LOCATION

Gasoline

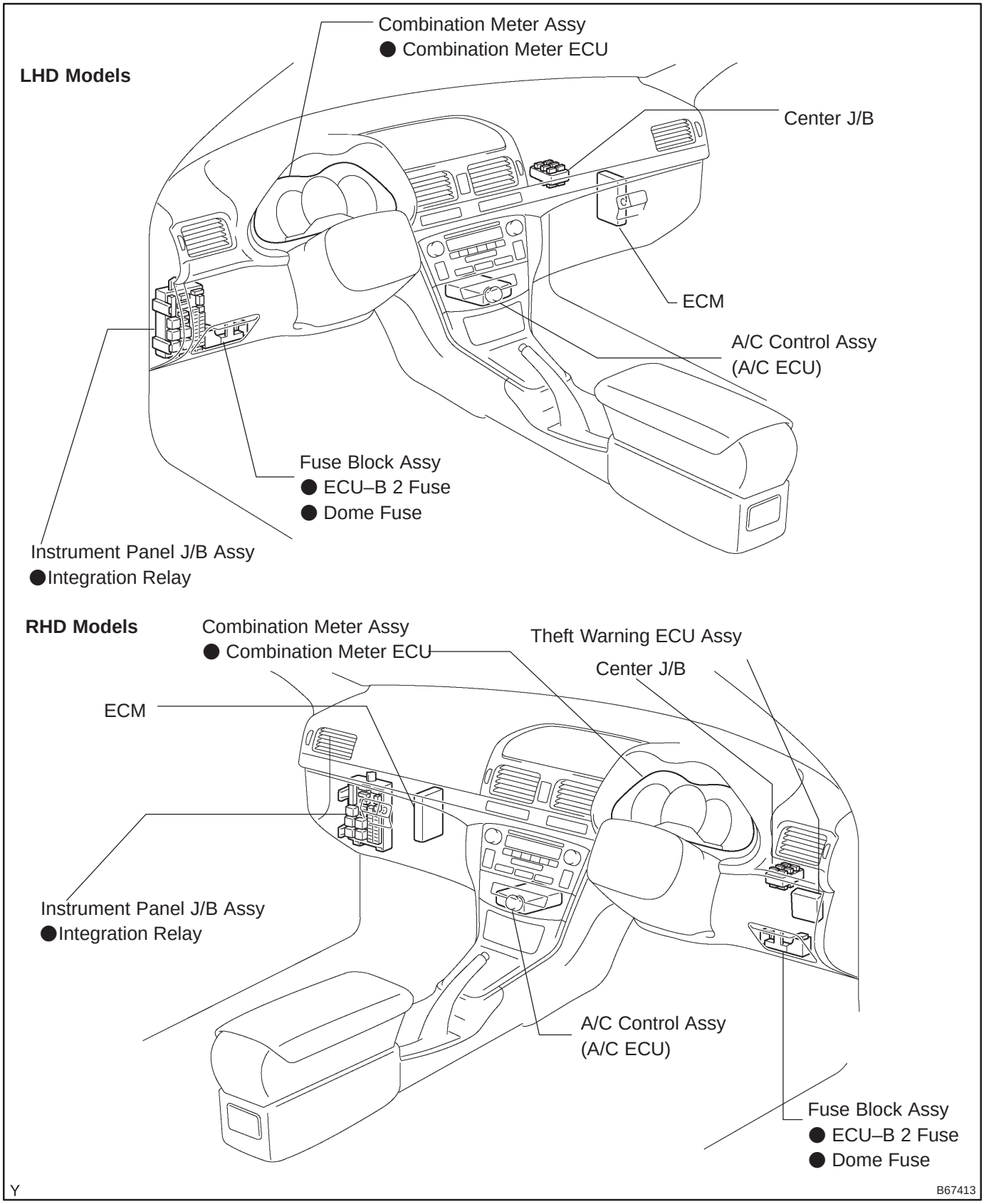


1CD–FTV



Y

B70602


LHD Models
Combination Meter Assy
● Combination Meter ECU
Center J/B
ECM
A/C Control Assy
(A/C ECU)
Fuse Block Assy
● ECU–B 2 Fuse
● Dome Fuse
Instrument Panel J/B Assy
●Integration Relay
RHD Models
Combination Meter Assy
● Combination Meter ECU
Theft Warning ECU Assy
Center J/B
ECM
Instrument Panel J/B Assy
●Integration Relay
A/C Control Assy
(A/C ECU)
Fuse Block Assy
● ECU–B 2 Fuse
● Dome Fuse
Y
B67413

05AEP–02

PRE–CHECK

1. MULTIPLEX COMMUNICATION SYSTEM (BEAN)

(a) The BEAN communication line is used to control the ECM, the A/C control assy (A/C ECU), the combination meter assy (combination meter ECU) and the theft warning ECU, which are connected to the instrument panel J/B assy (integration relay). If there is a short–circuit (bus–down) in the line, the communication to the system that has a short–circuit (bus–down)will be disabled and the DTC concerning the system will be output from the instrument panel J/B assy (integration relay).

2. CHECK COMMUNICATION FUNCTION

(a) Check the battery voltage.

Standard: 10 to 14 V

(b) Inspect the DTC output.

(1) Check a DTC for the instrument panel J/B assy (integration relay) by connecting the hand–held tester to the DLC3 and turning the ignition switch ON.

HINT:

- When DTC check is impossible, check the following items.
- The display shows communication error (refer to new diagnostic system and the operations when an error occurrs.)

(2) When the display shows DTCs of the ECU unconnected and the communication bus defective, perform the inspection depending on the type of troubleshooting.

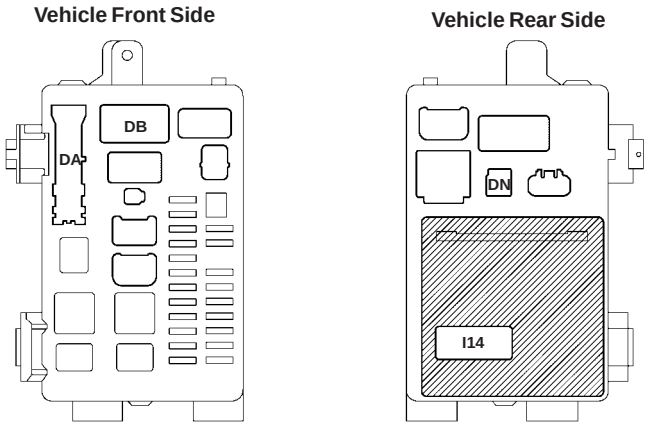
HINT:

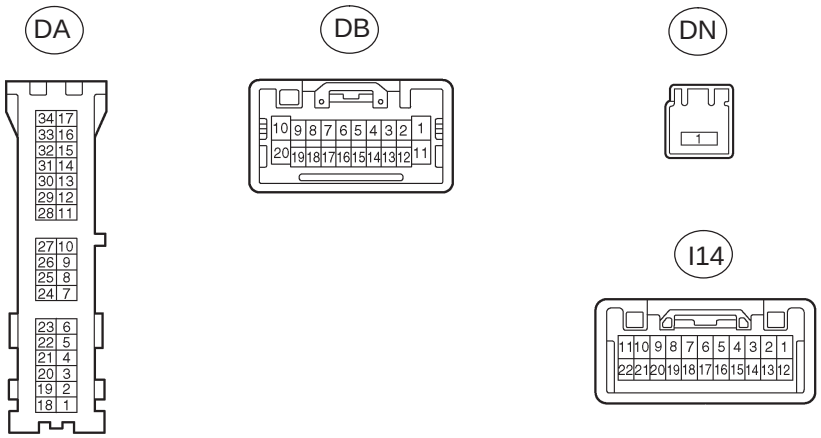
If another DTC is output, refer to the DTC chart and check the applicable section.

TERMINALS OF ECU

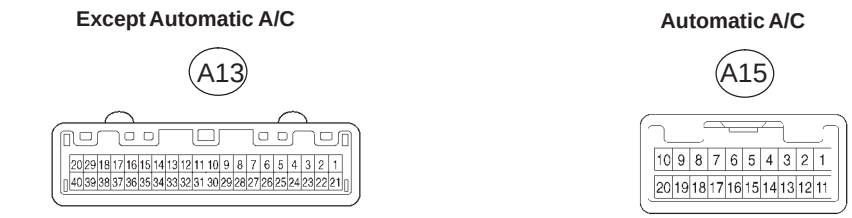
1. CHECK INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY)

Instrument Panel J/B Assy
(Integuration Relay)

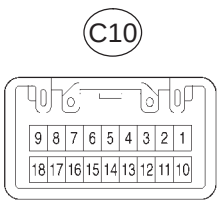




A/C Control Assy
(A/C ECU)



Combination Meter Assy
(Combination Meter ECU)



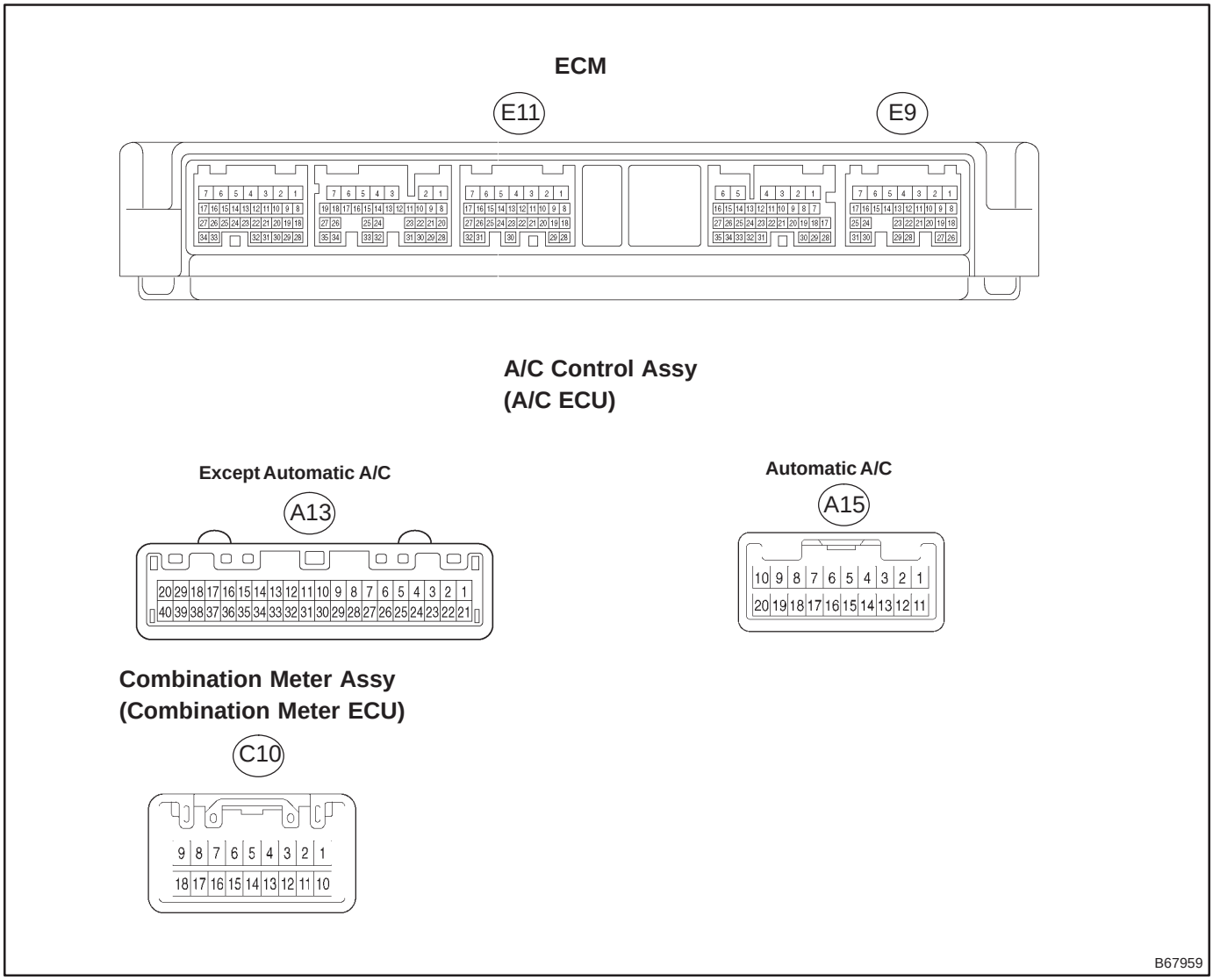
B67982

(a) Disconnect the DA, DB, DN, I14 J/B, A13 or A15 and C10 ECU connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connectors.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
B (DN–1) – Body ground	*1 B–G – Body ground	Constant	10 to 14 V
	*2 B–L – Body ground	Constant	10 to 14 V
B (DB–16) – Body ground	W–R – Body ground	Constant	10 to 14 V
E (DA–9) – Body ground	W–B – Body ground	Constant	Below 1 Ω
*3 MPX1 (I14–11) – MPX– (A13–29)	P – P		
*4 MPX1 (I14–11) – MPX– (A15–20)			
MPX2 (I14–22) – BEAN (BODY) (C10–14)	P–B – P–B		

HINT:
*1: Gasoline
*2: 1CD–FTV
*3: Except automatic A/C
*4: Automatic A/C
If the result is not as specified, there may be a malfunction on the wire harness side.

2. CHECK ECM FOR 1AZ–FSE



(a) Disconnect the A13 or A15, C10 ECU, E9, E10 and E11 ECM connectors.

(b) Check the voltage and resistance of each terminal of the wire harness side connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
E1 (E11–1) – Body ground	BR – Body ground	Constant	Below 1 Ω
+B (E9–1) – E1 (E11–1)	B–R – BR	Constant	10 to 14 V
+B2 (E9–2) – E1 (E11–1)	B–R – BR		
BATT (E9–3) – E1 (E11–1)	B–Y – BR		
MPX1 (E10–18) – BEAN (C10–13)	P – P	Constant	Below 1 Ω
*1 MPX2 (E10–29) – MPX+ (A13–9)	P–B – P–B		
*2 MPX2 (E10–29) – MPX+ (A15–10)			

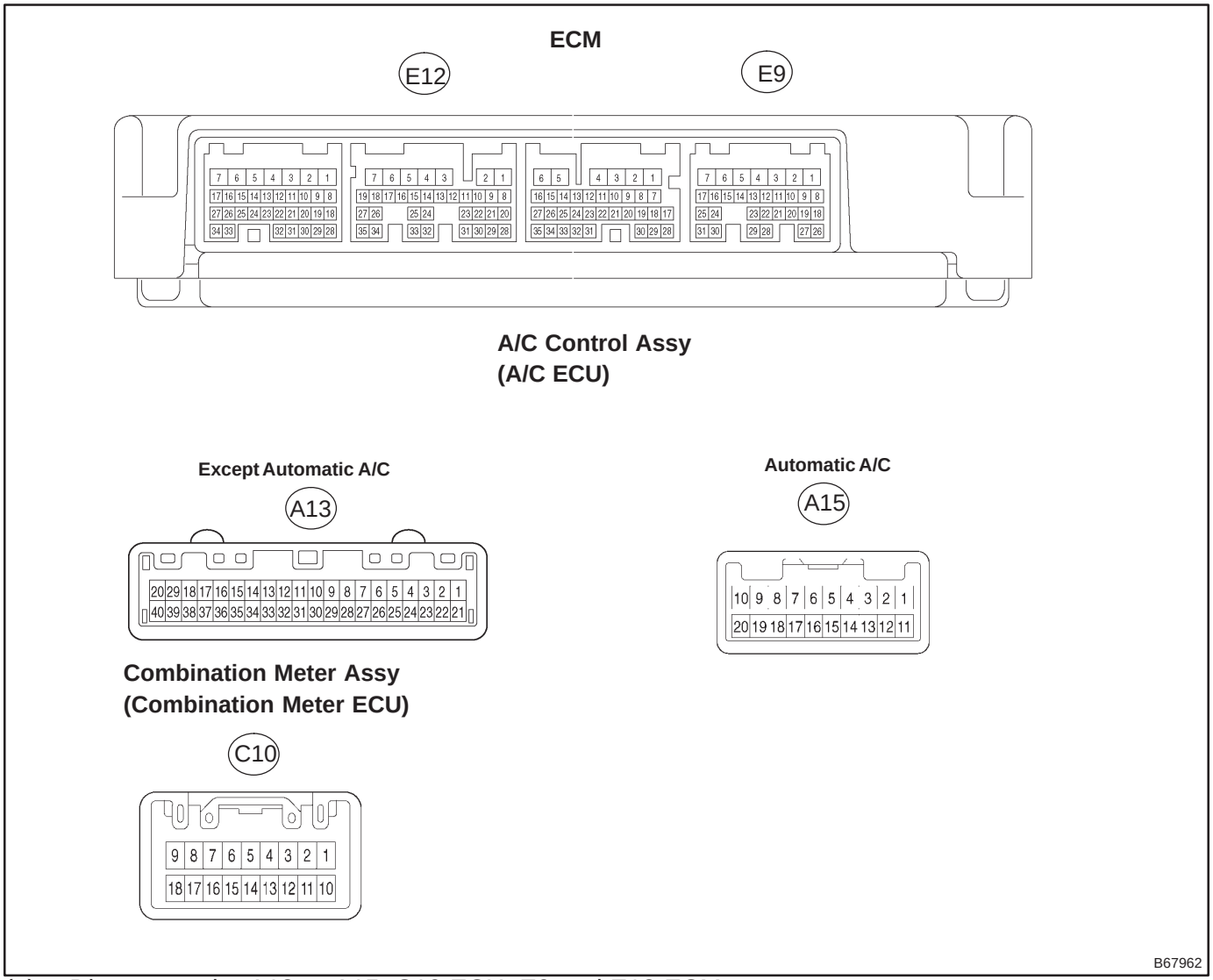
HINT:

*1: Except Automatic A/C

*2: Automatic A/C

If the result is not as specified, there may be a malfunction on the wire harness side.

3. CHECK ECM FOR 1AZ–FE, 1ZZ–FE, 3ZZ–FE



(a) Disconnect the A13 or A15, C10 ECU, E9 and E12 ECM connectors.

(b) Check the voltage or resistance of each terminal of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
E1 (E12–7) – Body ground	BR – Body ground	Constant	Below 1 Ω
+B (E9–1) – E1 (E12–7)	B–R – BR	Constant	10 to 14 V
BATT (E9–3) – E1 (E12–7)	B–Y – BR		
MPX1 (E9–23) – BEAN (C10–13)	P – P	Constant	Below 1 Ω
*1 MPX2 (E9–29) – MPX+ (A13–9)	P–B – P–B		
*2 MPX2 (E9–29) – MPX+ (A15–10)			

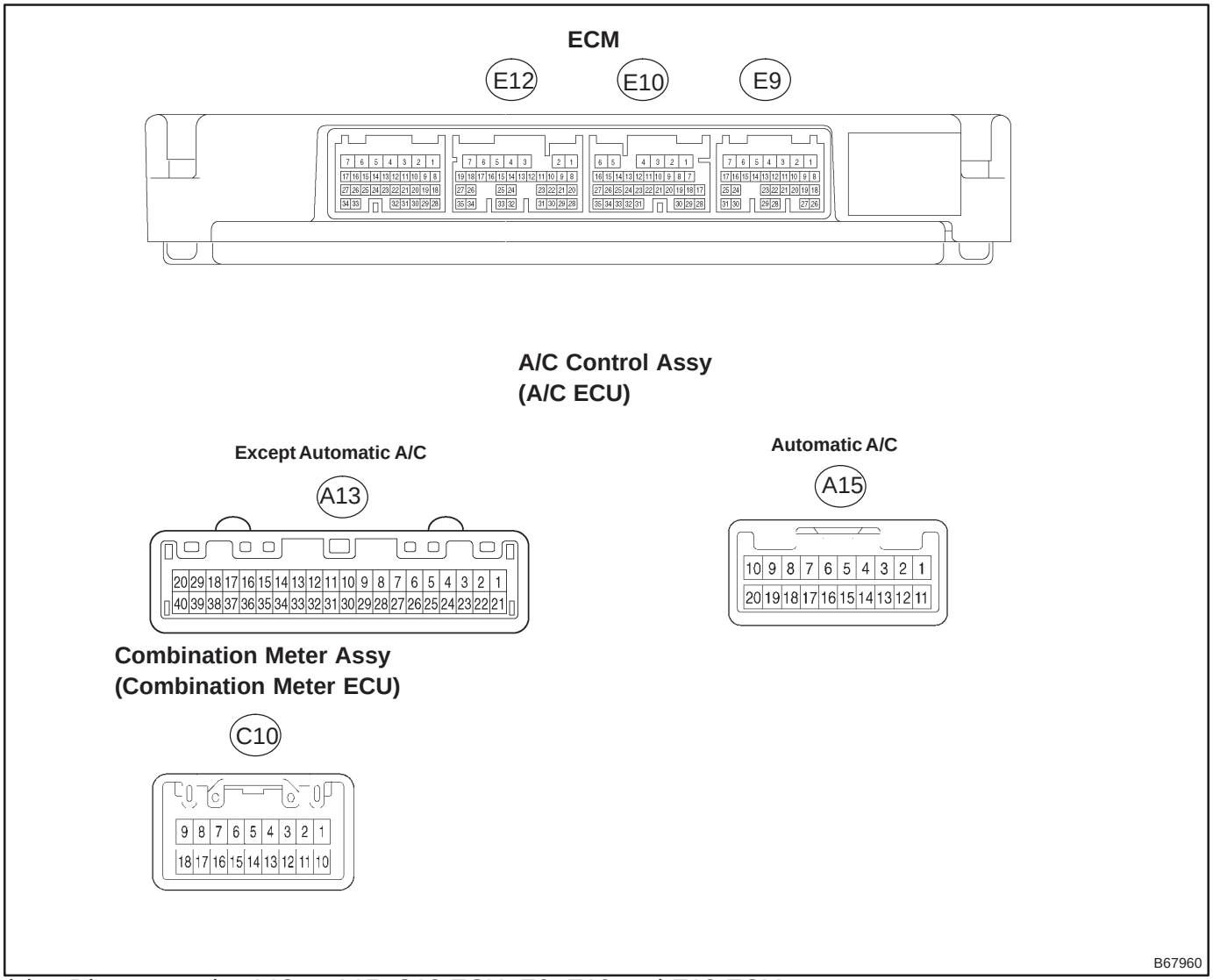
HINT:

*1: Except Automatic A/C

*2: Automatic A/C

If the result is not as specified, there may be a malfunction on the wire harness side.

4. CHECK ECM FOR 1CD–FTV



(a) Disconnect the A13 or A15, C10 ECU, E9, E10 and E12 ECM connectors.

(b) Check the voltage or resistance of each terminal of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
E1 (E12–7) – Body ground	BR – Body ground	Constant	Below 1 Ω
+B 〈E9–1) – E1 (E12–7)	B–W – BR	Constant	10 to 14 V
BATT (E10–2) – E1 (E12–7)	B–Y – BR		
MPX1 (E9–20) – BEAN (C10–13)	P – P	Constant	Below 1 Ω
*1 MPX2 (E9–21) – MPX+ (A13–9)	P–B – P–B		
*2 MPX2 (E9–21) – MPX+ (A15–10)			

HINT:

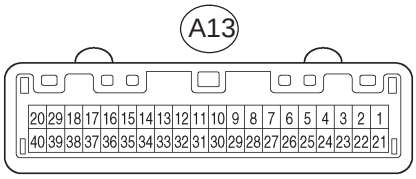
*1: Except Automatic A/C

*2: Automatic A/C

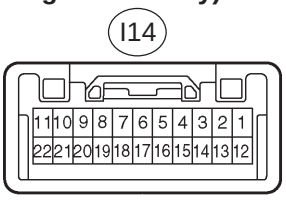
If the result is not as specified, there may be a malfunction on the wire harness side.

5. CHECK A/C CONTROL ASSY EXCEPT AUTO (A/C ECU)

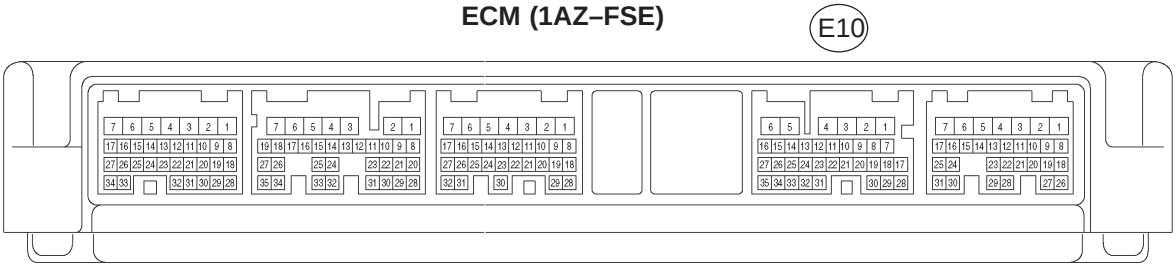
A/C Control Assy
(A/C ECU)



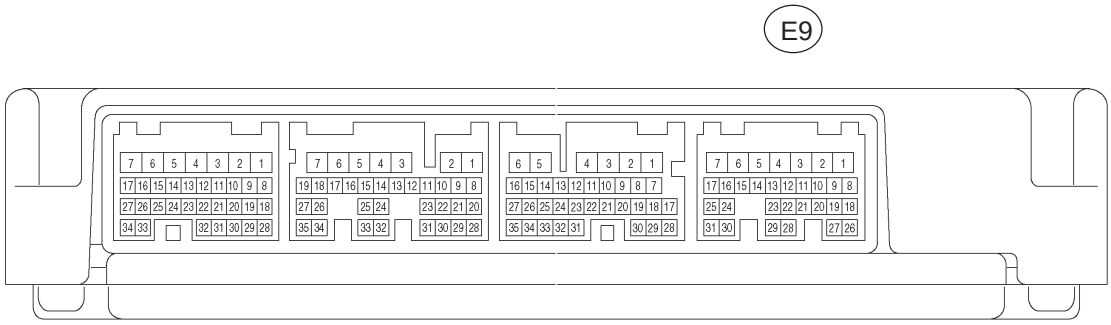
Instrument Panel J/B Assy
(Integration Relay)



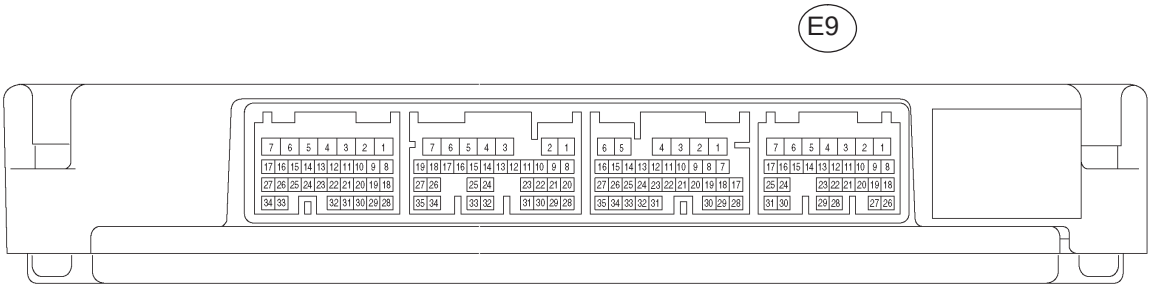
ECM (1AZ–FSE)



ECM (1AZ–FE, 1ZZ–FE, 3ZZ–FE)



ECM (1CD–FTV)



B67983

(a) Disconnect the A13 ECU, E9 or E10 ECM and I14 J/B connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connector.
Standard:

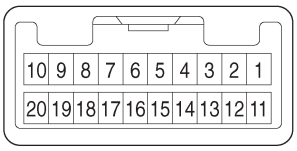
Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
GND (A13–40) – Body ground	W–B – body ground	Constant	Below 1 Ω
+B ⟨A13–2) – GND (A13–40)	W–R – W–B	Constant	10 to 14 V
MPX– (A13–29) – MPX1 (I14–11)	P – P	Constant	Below 1 Ω
*1 MPX+ (A13–9) – MPX2 (E10–29)	P–B – P–B		
*2 MPX+ (A13–9) – MPX2 (E9–29)	P–B – P–B		
*3 MPX+ (A13–9) – MPX2 (E9–21)	P–B – P–B		

HINT:
*1: 1AZ–FSE
*2: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*3: 1CD–FTV
If the result is not as specified, there may be a malfunction on the wire harness side.

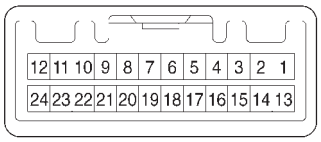
6. CHECK A/C CONTROL ASSY FOR AUTO (A/C ECU)

A/C Control Assy (A/C ECU)

A15

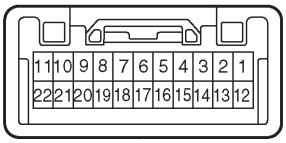


A16



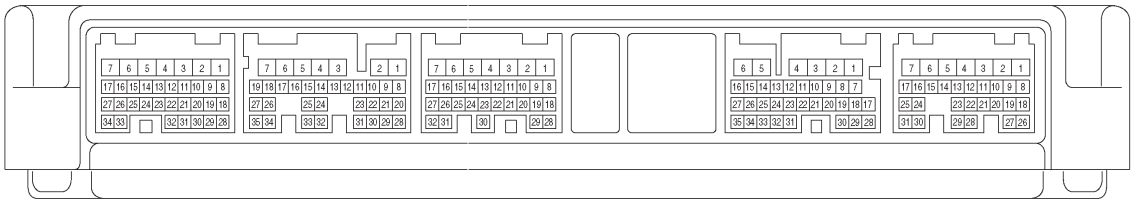
Instrument Panel J/B Assy (Integration Relay)

I14



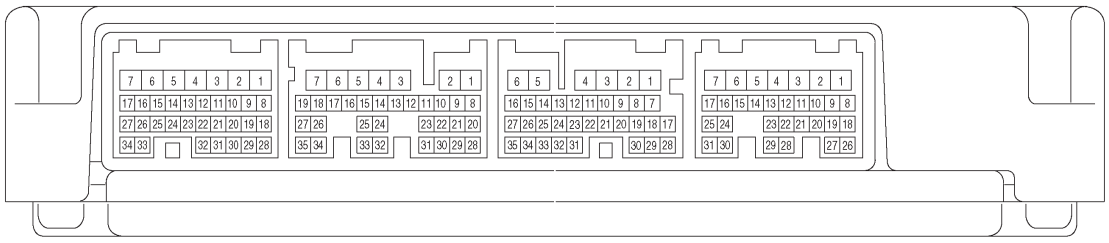
ECM (1AZ–FSE)

E10



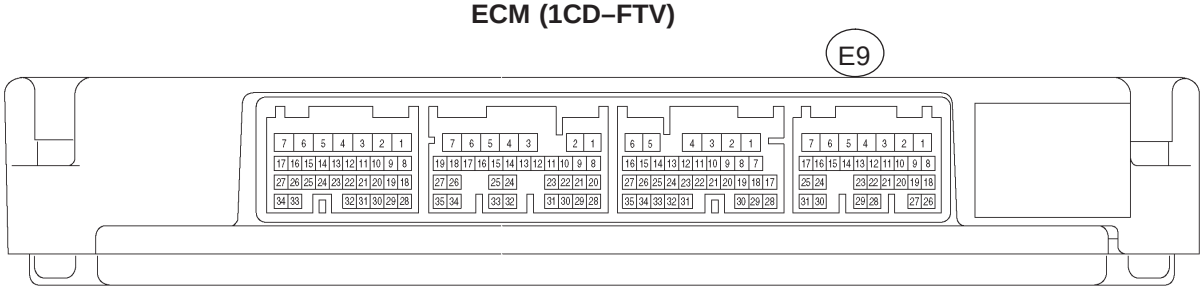
ECM (1AZ–FE, 1ZZ–FE, 3ZZ–FE)

E9



ECM (1CD–FTV)

E9



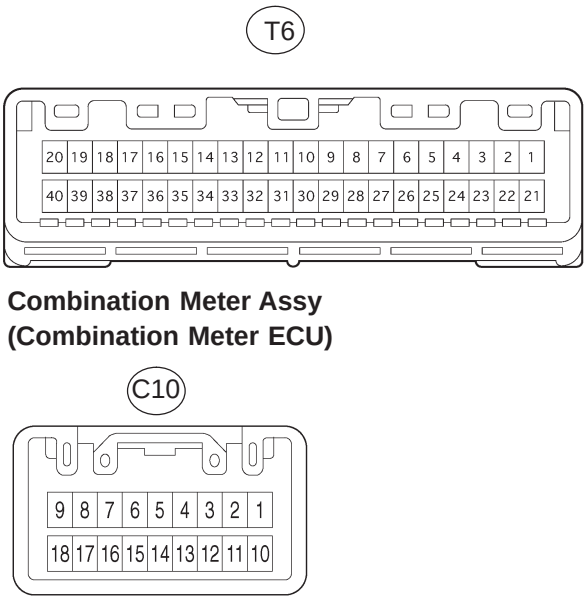
B67984

(a) Disconnect the A15, A16 ECU, E9 or E10 ECM and I14 J/B connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connector.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
GND (A16–13) – Body ground	W–B – Body ground	Constant	Below 1 Ω
+B (A16–24) – GND (A16–13)	W–R – W–B	Constant	10 to 14 V
MPX– (A15–20) – MPX1 (I14–11)	P – P	Constant	Below 1 Ω
*1 MPX+ (A15–10) – MPX2 (E10–29)	P–B – P–B		
*2 MPX+ (A15–10) – MPX2 (E9–29)	P–B – P–B		
*3 MPX+ (A15–10) – MPX2 (E9–21)	P–B – P–B		

HINT:
*1: 1AZ–FSE
*2: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*3: 1CD–FTV
If the result is not as specified, there may be a malfunction on the wire harness side.

7. CHECK THEFT WARNING ECU ASSY



(a) Disconnect the T6 and C10 ECU connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connector.
Standard:

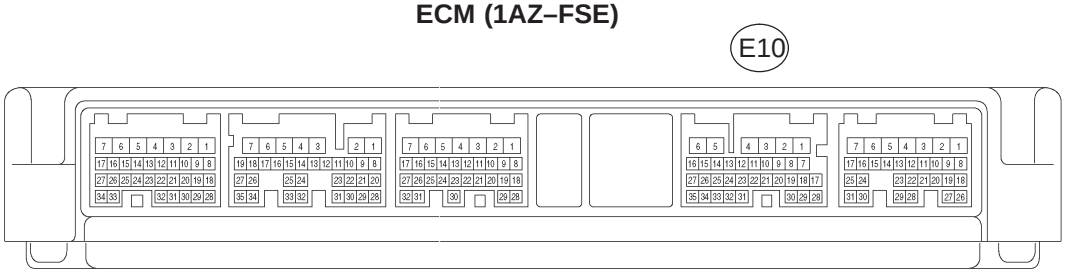
Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
E (T6–29) – Body ground	W–B – Body ground	Constant	Below 1 Ω
+B1 (T6–2) – E (T6–29)	W–R – W–B	Constant	10 – 14 V
MPX (T6–31) – BEAN (Security)(C10–15)	P–L – P–L	Constant	Below 1 Ω

If the result is not as specified, there may be a malfunction on the wire harness side.

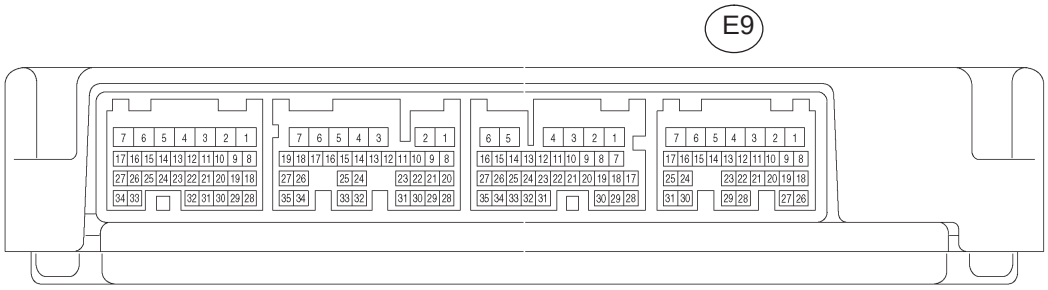
8. CHECK COMBINATION METER ASSY (COMBINATION METER ECU)

Combination Meter Assy (Conbination Meter ECU)

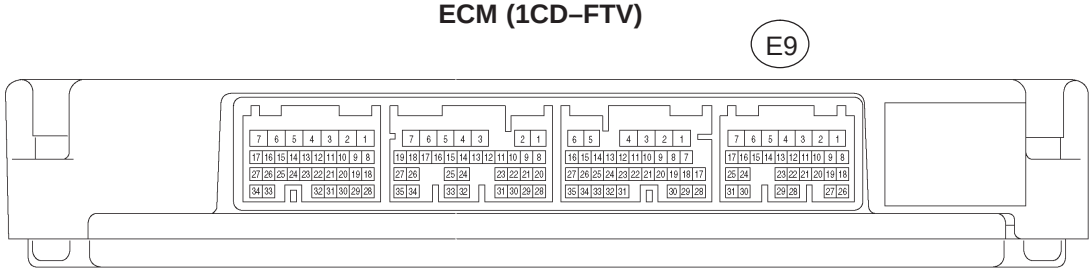
ECM (1AZ–FSE)



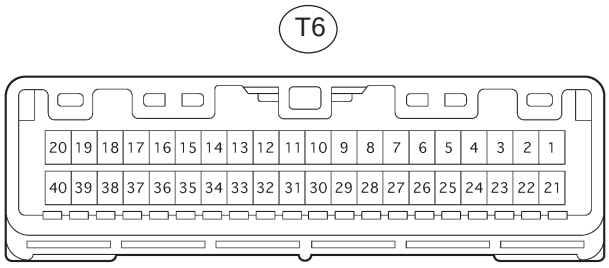
ECM (1AZ–FE, 1ZZ–FE, 3ZZ–FE)



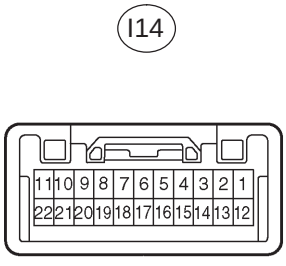
ECM (1CD–FTV)



Theft Warning ECU Assy



Instrument Panel J/B Assy (Integration Relay)



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(a) Disconnect the C10, C11, T6, ECU, E10 or E9 ECM and I14 connectors.
(b) Check the voltage or resistance of each terminal of the wire harness side connector.
Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
POWER EARTH (C10–17) – Body ground	W–B – Body ground	Constant	Below 1 Ω
+B 〈C11–20) – POWER EARTH (C10–17)	W–R – W–B	Constant	10 to 14 V
*1 BEAN (EFI) (C10–13) – MPX1 (E10–18)	P – P	Constant	Below 1 Ω
*2 BEAN (EFI) (C10–13) – MPX1 (E9–23)	P – P		
*3 BEAN (EFI) (C10–13) – MPX1 (E9–20)	P – P		
BEAN (BODY) (C10–14) – MPX2 (I14–22)	P–B – P–B		
*4 BEAN (SECURITY) (C10–15) – MPX (T6–31)	P–L – P–L		

HINT:
*1: 1AZ–FSE
*2: 1AZ–FE, 1ZZ–FE, 3ZZ–FE
*3: 1CD–FTV
*4: w/ Theft deterrent system
If the result is not as specified, there may be a malfunction on the wire harness side.

A NAVIGATION CONTROLLER ASSY DOES NOT OPERATE

INSPECTION PROCEDURE

1	CHECK MALFUNCTION SYMPTOMS

(a) Check obstruction.
(1) Check that there are no obstructions between the navigation controller assy and the infrared ray light emission portion of the multi–display (CRT display) display.
Standard: Normally returns

OK → **SYSTEM OK**

NG

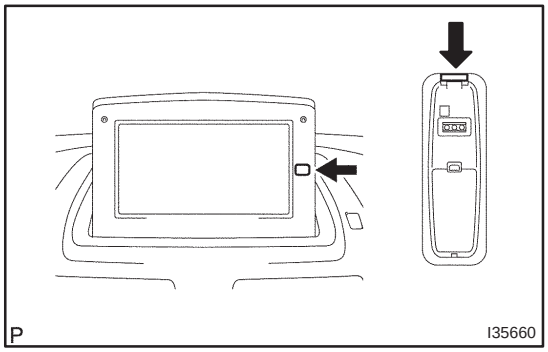
2	CHECK BATTERY(NAVIGATION CONTROLLER ASSY)

(a) Check battery.
(1) Check that the dry–cell battery used for the navigation controller assy is not dead.
Standard: It is not dead

NG → **BATTERY IS DEAD**

OK

3	CLEAN THE INFRARED RAY EMITTED PORTION



(a) Clean the infrared ray emitted portion.
(1) Clean the infrared ray emitted portion on the multi–display (CRT display) display and navigation controller assy.
(2) Check whether the same malfunction occurs.
Standard: The function returns to normal.

OK → **DIRT AT THE INFRARED RAY EMITTED PORTION**

NG

4	REPLACE NAVIGATION CONTROLLER ASSY

Standard: Normally returns

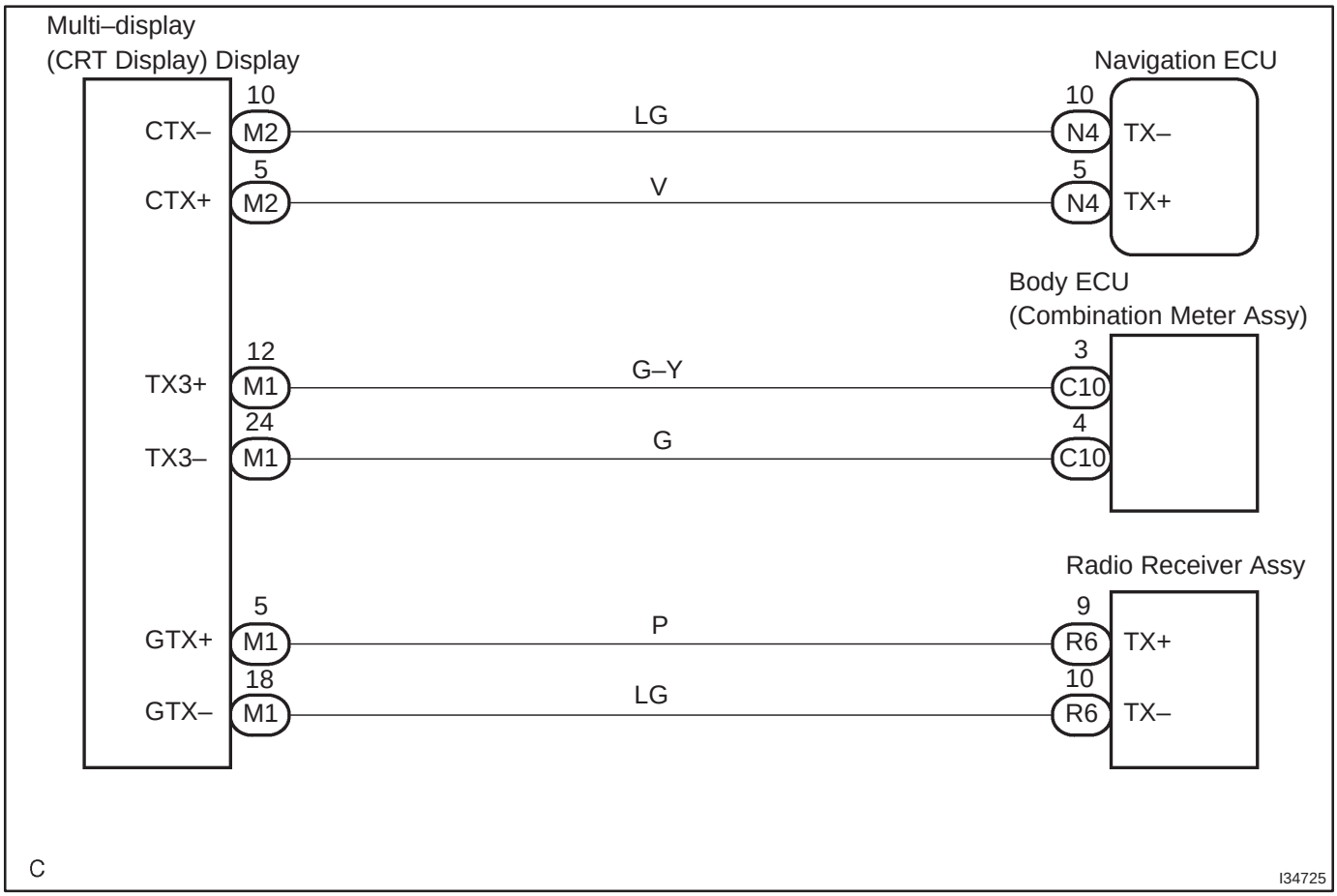
OK → **SYSTEM OK**

NG

REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)

AVC–LAN CIRCUIT

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT APPARATUS

(a) Choose the apparatus to be inspected.

Apparatus	Go to step
Radio receiver assy	A
Navigation ECU	B
Body ECU (Combination Meter Assy)	C

B → **Go to step 4**

C → **Go to step 6**

A

2	SERVICE CHECK MODE(RADIO RECEIVER ASSY)

(a) Perform the service check.
(1) Start the diagnosis system and read the check result for the radio receiver assy.
Standard:

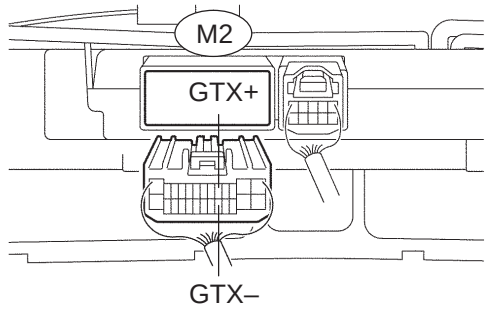
A	”NCON” is displayed or nothing is displayed (AUDIO H/U)
B	”GOOD” is displayed

B → **REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)**

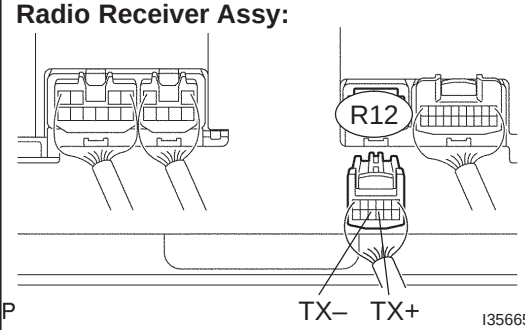
A

3	CHECK HARNESS AND CONNECTOR(MULTI–DISPLAY (CRT DISPLAY) DISPLAY – RADIO RECEIVER ASSY)

Multi–display (CRT Display) Display:



Radio Receiver Assy:



(a) Disconnect the connectors from the multi–display (CRT display) display and radio receiver assy.
(1) Check continuity between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
GTX+ – TX+	Continuity
GTX– – TX–	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
GTX+ – Body ground	No continuity
GTX– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE RADIO RECEIVER ASSY (See page 67–5)

4	SERVICE CHECK MODE(NAVIGATION ECU)

(a) Perform the service check.
(1) Start the diagnosis system and read the check result for the navigation ECU.
Standard:

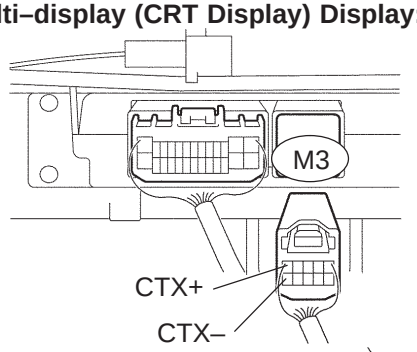
A	”NCON” is displayed or nothing display (NAVI)
B	”GOOD” is display

B → **REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)**

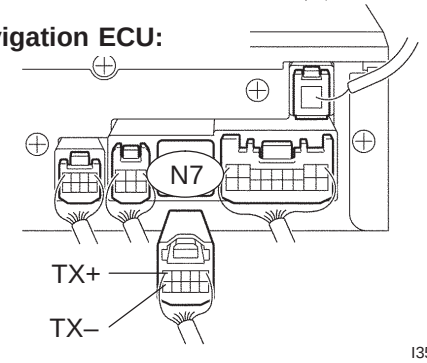
A

5	CHECK HARNESS AND CONNECTOR(MULTI–DISPLAY (CRT DISPLAY) DISPLAY – NAVIGATION ECU)

Multi–display (CRT Display) Display:



Navigation ECU:



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(a) Disconnect the connectors from the multi–display (CRT display) display and navigation ECU.
(1) Check continuity between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
CTX+ – TX+	Continuity
CTX– – TX–	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
CTX+ – Body ground	No continuity
CTX– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE NAVIGATION ECU (See page 67–27)

6	SERVICE CHECK MODE(BODY ECU)

(a) Perform the service check.
(1) Start the diagnosis system and read check result for body ECU.
Standard:

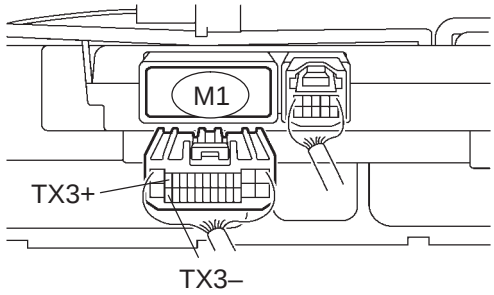
A	”NCON” is displayed or nothing display (BODY)
B	”GOOD” is display

B → **REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)**

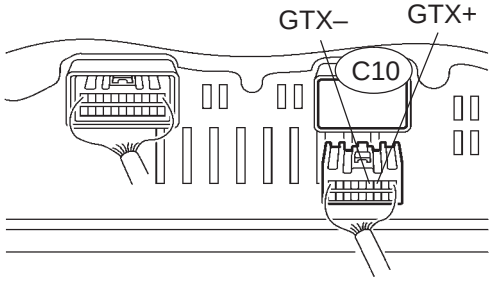
A

7	CHECK HARNESS AND CONNECTOR(MULTI–DISPLAY (CRT DISPLAY) DISPLAY – BODY ECU)

Multi–display (CRT Display) Display:



Body ECU (Combination Meter Assy):



C

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(a) Disconnect the connectors from the multi–display (CRT display) display and body ECU (Combination meter assy).
(1) Check continuity between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
TX3+ – GTX+	Continuity
TX3– – GTX–	Continuity

(2) Check short between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
TX3+ – Body ground	No continuity
TX3– – Body ground	No continuity

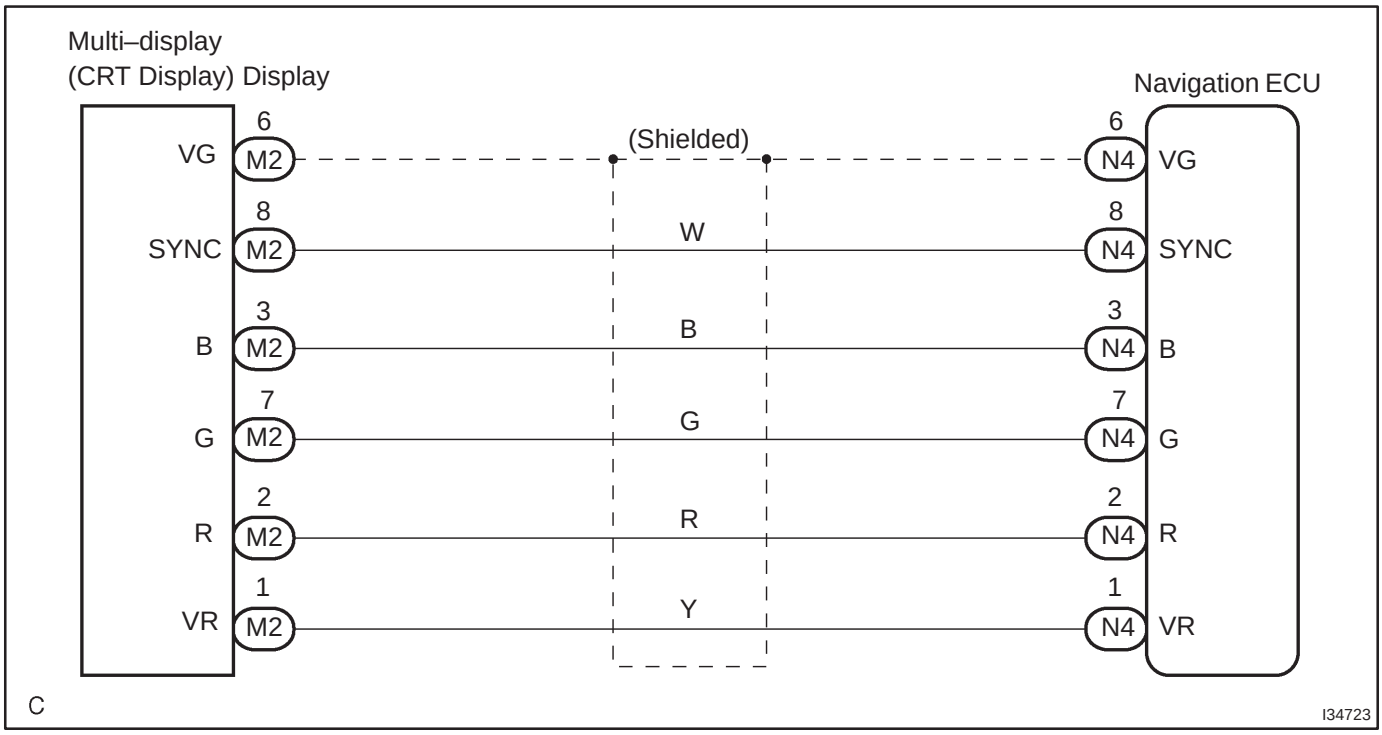
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE COMBINATION METER ASSY (See page 71–21)

COLOR ON NAVIGATION SCREEN IS UNUSUAL (RGB SIGNAL ERROR)

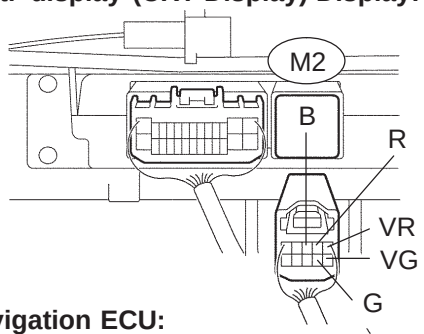
WIRING DIAGRAM



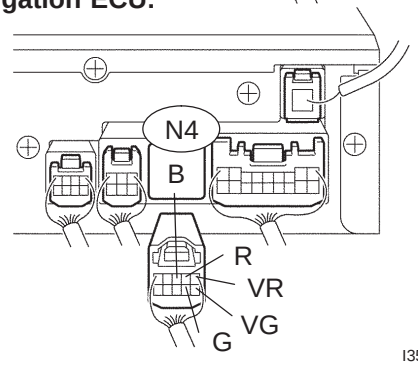
INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(MULTI–DISPLAY (CRT DISPLAY)DISPLAY – NAVIGATION ECU)

Multi–display (CRT Display) Display:



Navigation ECU:



(a) Disconnect the connectors from the multi–display (CRT display)display and navigation ECU.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
VG – VG	Continuity
VR – VR	Continuity
R – R	Continuity
G – G	Continuity
B – B	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
VG – Body ground	Continuity
VR – Body ground	Continuity
R – Body ground	No continuity
G – Body ground	No continuity
B – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2	REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)

Standard: Normally returns.

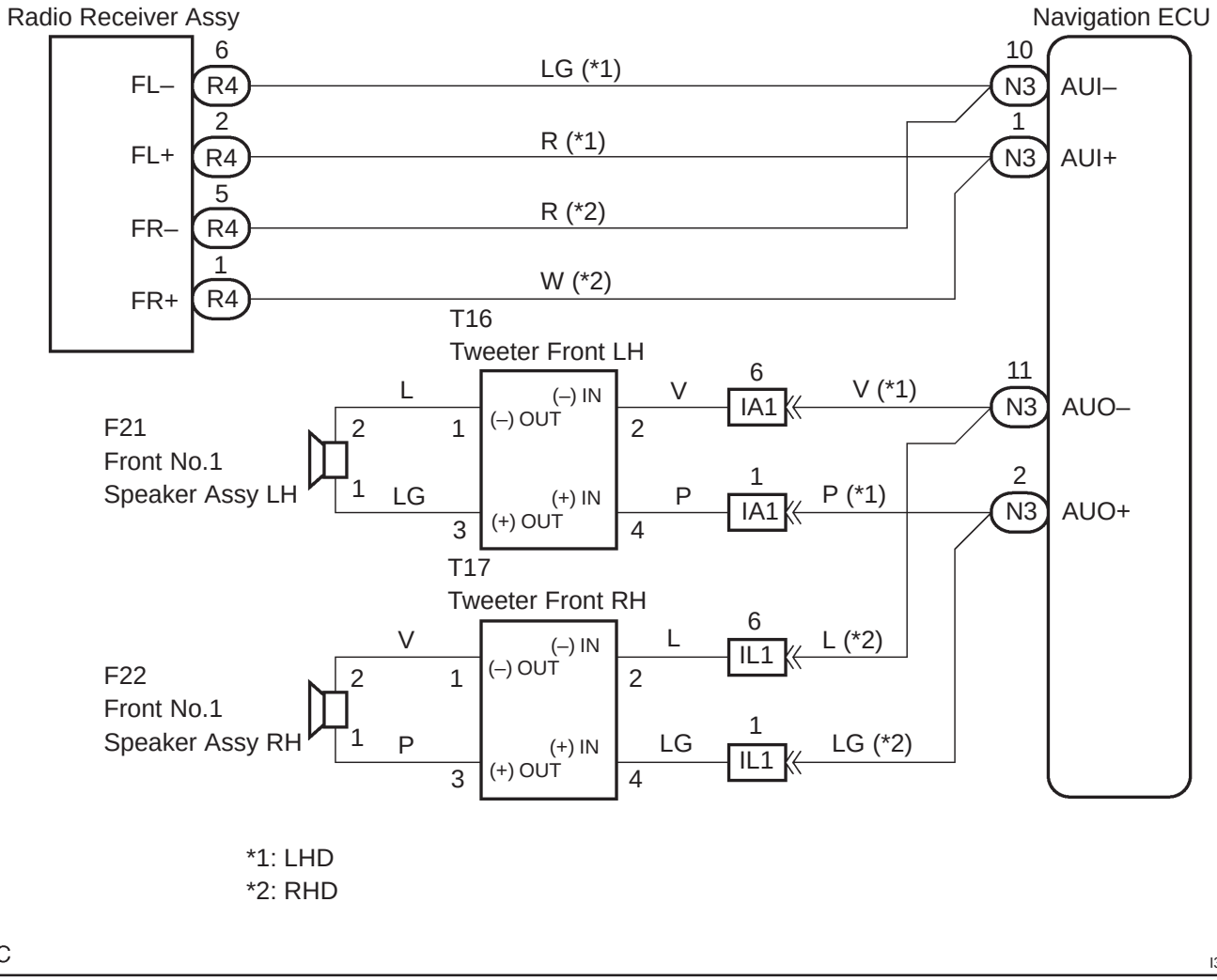
NG → **REPLACE NAVIGATION ECU (See page 67–27)**

OK

SYSTEM OK

FRONT SPEAKER (DRIVER SIDE) ONLY IS NOT HEARD

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK SETTING(THE VOLUME OF THE NAVIGATION VOICE SOUND)

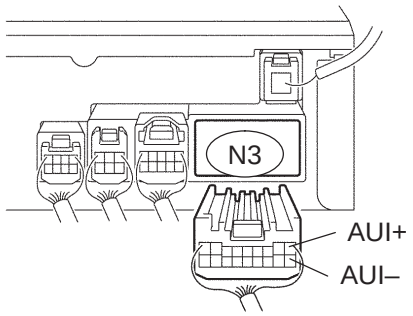
(a) Check the settings.
(1) Set the volume MAX at the voice sound settings on the menu.
Standard: "This system will guide you in this volume" is produced.

OK → **Go to step 4**

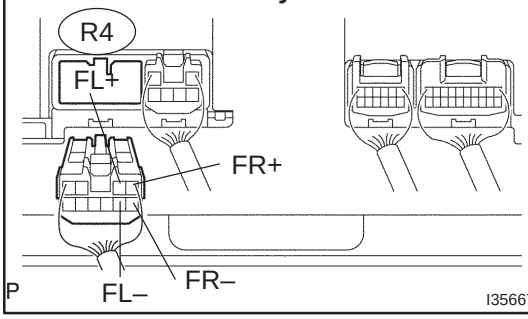
NG

2	CHECK HARNESS AND CONNECTOR(NAVIGATION ECU – RADIO RECEIVER ASSY)

Navigation ECU:



Radio Receiver Assy:



(a) Disconnect the connector between the navigation ECU and radio receiver assy.
(1) Check continuity between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
FL+*1, FR+*2 – AUI+	Continuity
FL–*1, FR–*2 – AUI–	Continuity

*1: LHD Models
*2: RHD Models

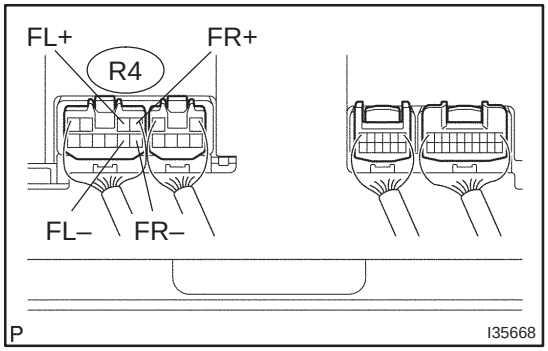
(2) Check for a short between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
AUI+ – Body ground	No continuity
AUI– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT RADIO RECEIVER ASSY(FL+(*1), FL–(*1), FR+(*2), FR–(*2), GND)



(a) Remove the radio receiver assy.
(b) Using an oscilloscope, check the signal waveform between the terminals FL+*1, FL–*1, FR+*2, FR–*2 and GND of stereo component amplifier assy.
*1: LHD Models
*2: RHD Models

Standard:

Tester connection	Condition	Specified condition
FL+*1, FR+*2 – GND	While voice sound is being produced	A waveform synchronized with sound is output
FL–*1, FL–*2 – GND	While voice sound is being produced	A waveform synchronized with sound is output

NG → **REPLACE RADIO RECEIVER ASSY (See page 67–5)**

OK

4 INSPECT FRONT NO.1 SPEAKER ASSY

(a) Resistance check
(1) Check resistance between the terminals of the front No.1 speaker assy.
Standard: 4 Ω

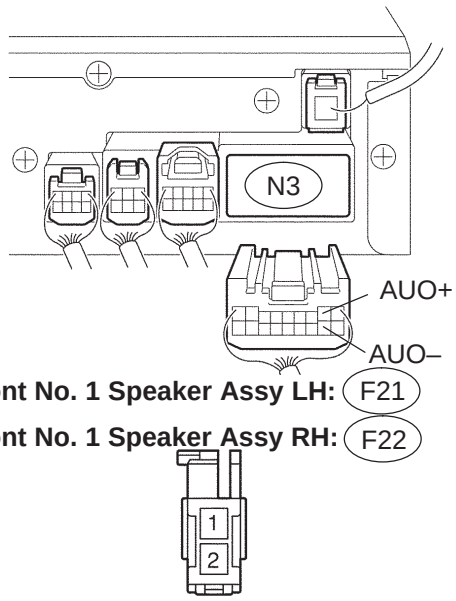
NOTICE:
The speaker should not be removed for checking

NG → **REPLACE FRONT NO.1 SPEAKER ASSY (See page 67–10)**

OK

5	CHECK HARNESS AND CONNECTOR(NAVIGATION ECU – FRONT NO. 1 SPEAKER ASSY)

Navigation ECU:



(a) Disconnect the connectors from the navigation ECU and front No.1 speaker assy.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
AUO+ – 1	Continuity
AUO– – 2	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
AUO+ – Body ground	No continuity
AUO– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE NAVIGATION ECU (See page 67–27)

05C3E–01

DIAGNOSTIC TROUBLE CODE CHART

Terms	Meaning
Physical address	Three–digit code (shown in hexadecimal) which is given to each component comprising the AVC–LAN. Corresponding to the function, individual symbols are specified.
Logical address	Two–digit code (shown in hexadecimal) which is given to each function comprising the inner system of the AVC–LAN.

1. RADIO RECEIVER ASSY (Physical address: 190)

HINT:

- *1: Even if no failure is detected, this code may be stored depending on the battery condition or voltage for starting an engine.
- *2: This code is stored in 180 sec. after the power supply connector is pulled out after engine start.
- *3: This code may be stored when the ignition switch is turned again after engine start.
- *4: This code may be stored when the ignition switch is turned again in 1 min. after engine start.

(a) Logical address: 01 (Communication control)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
D5 *1	Registered component disconnected	Component shown by sub–code is or was disconnected from system with ignition switch ACC or ON. Communication with component shown by sub–code is not ensured when engine is started.	• Check harness for power supply of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition switch ACC or ON. Or, when this code was recorded, multi–display (CRT display) display was disconnected.	• Check harness for power supply system of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display.
D8 *2	No response to connection check	Component shown by sub–code is or was disconnected from system after engine is started.	• Check harness for power supply of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
D9 *1	Last Mode Error	Component operated (sound and/or image was provided) before engine stop is or was disconnected with ignition switch ACC or ON.	• Check harness for power supply of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
DA	No Response to ON/OFF Instruction	No response is identified when changing mode (audio and visual mode change). Detected when sound and picture does not change by button operation	• Check harness for power supply system of component shown by sub–code. • Check harness for communication system of component shown by sub–code. • If error occurs again, replace component shown by auxiliary code
DB *1	Mode Status Error	Dual alarm is detected.	• Check harness for power supply system of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
DC *4	Transmission Error	Transmission to component shown by sub–code has been failed. (This code does not necessarily mean actual failure.)	If same sub–code is recorded in other component(s), check harness for power supply and communication system of all components shown by code.
DD *4	Master Reset (Momentary Interruption)	After engine is started, multi–display (CRT display) display was disconnected from system.	• Check harness for power supply system of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • If this error occurs frequently, replace multi–display (CRT display) display.

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
DE *3	Slave Reset (Momentary Interruption)	After engine start, slave component has been disconnected.	• Check harness for power supply system of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
DF *5	Master Error	Due to defective condition of component with a display, master function is switched to audio equipment. Error occurs in communication between sub–master (audio) and master component.	• Check harness for power supply of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display.
E0 *1	Registration Completion Instruction Error	”Registration Completion Instruction” command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E1 *1	Audio processor ON error	While source equipment is operating, AMP output is stopped.	• Check harness for power supply of radio receiver assy. • Check harness for communication system of radio receiver assy.
E2	ON/OFF Instruction Parameter Error	Error occurs in ON/OFF controlling command from multi–display (CRT display) display.	Replace multi–display (CRT display) display.
E3 *1	Registration Request Transmission	Registration Request command is output from slave component. Receiving Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E4 *1	Multiple Frame Abort	Multiple frame transmission is aborted.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

(b) Logical address: 21 (Switch)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
10	Panel Switch Error	Error in panel switch input part is detected. (Error in switch control part, or internal communication error with switch control part is detected.)	• Inspect all switches on panel switch test screen in display check mode. If any of them does not function, replace radio receiver assy. • If all switches function without problem, observe them for a while.
11	Touch Switch Error	Error in touch switch sensor is detected. (Light level of LED is detected to be less than a fixed value.)	• Inspect all touch switches on touch switch test screen in display check mode. If any of lines do not react, replace radio receiver assy. • If all of vertical and horizontal lines react normally, observe them for a while.

(c) Logical address: 61 (Cassette tape player’s switch)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
40	Mechanical Error of Media	Malfunction due to mechanical failure is identified. Or cassette tape is cut or entangled.	• Inspect cassette tape. • Replace radio receiver assy.

(d) Logical address: 62 (CD player)

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
42	No Disc Readout	Disc cannot be read.	• Inspect CD. • Replace radio receiver assy.
44	CD player Error	Error is detected in CD player.	Replace radio receiver assy.
45	EJECT Error	Magazine cannot be ejected.	Replace radio receiver assy.
46	Scratched/Reversed Disc	Scratches or dirt is found on CD surface or CD is set upside down.	Inspect CD.

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
47	CD Player Temp. Too High	Readout cannot be done because temperature around player's pick–up (reading part) is too high.	With IG switch OFF, leave vehicle in cool shaded place for a while and recheck. After deleting the DTC memory, if same code is detected, replace radio receiver assy.
48	CD Player Excess Current	Excess current is applied radio receiver assy.	Replace radio receiver assy.

2. NAVIGATION ECU (Physical address: 178)

HINT:

- *1: Even if no failure is detected, this code may be stored depending on the battery condition or voltage for starting the engine.
- *2: This code is stored in 210 seconds after the master component is turned off with the ignition switch ACC or ON.
- *3: This code may be stored when the ignition switch is turned in 1 min. again after engine start.
- *4: This code may be stored when the ignition switch is turned again after engine start.

(a) Logical address: 01 (Communication control)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition switch ACC or ON. Or, when this code was recorded, multi–display (CRT display) display was disconnected.	• Check harness for power supply system of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • Check harness for power supply system of navigation ECU. • Check harness for communication system of navigation ECU.
D7 *2	Connection Check Error	Component in which this code is recorded has been disconnected from system with ignition switch ACC or ON. Or, when this code was recorded, multi–display (CRT display) display was disconnected.	• Check harness for power supply system of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • Check harness for power supply system of navigation ECU. • Check harness for communication system of navigation ECU.
DC *3	Transmission Error	Transmission to component shown by sub–code has been failed. (This code does not necessarily mean actual failure.)	If same sub–code is recorded in other component(s), check harness for power supply and communication system of all components shown by code.
DD *4	Master Reset (Momentary Interruption)	Component that is to be master has been disconnected after engine start.	• Check harness for power supply system of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • If error occurs frequently, replace multi–display (CRT display) display.
E0 *1	Registration Completion Instruction Error	"Registration Completion Instruction" command from master cannot be received.	Since this DTC is provided for engineering, it may be detected when no actual failure exists.
E2	ON/OFF Instruction Parameter Error	Error is detected in ON/OFF control command from multi–display (CRT display) display .	Replace multi–display (CRT display) display.
E3 *1	Registration Request Transmission	• Registration Request command is output from slave component. • Registration Request command is output from sub–master component.	Since this DTC is provided for engineering, it may be detected when no actual failure exists.

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
DF *4	Master Error	Due to defective condition of component with a display, master function is switched to audioequipment. Error occurs in communication between sub–master (audio) and master component.	• Check harness for power supply of radio receiver assy. • Check harness for communication system of radio receiver assy.
E4 *1	Multiple Frame Abort	Multiple frame transmission is aborted.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

(b) Logical address: 58 (Navigation ECU)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
10	Gyro Error	Error in gyro sensor is detected. (Abnormal value in voltage output from sensor is detected for more than specified time.)	Replace navigation ECU.
42	Map Disc Error	Data cannot be read for a certain time due to scratches or dirt on disc surface or insertion of wrong disc.	Inspect disc and replace as necessary. (Visually check disc surface and wipe it with a soft cloth.)
43	Vehicle Signal Error	Input error of vehicle signal is detected. (When no vehicle signal has been input for a certain time.)	• Inspect wire harness. • If wire harness is normal, replace navigation ECU.

(c) Logical address: 58 (GPS receiver)

DTC	Diagnosis item	Condition	Countermeasure and inspected parts
11	GPS Receiver Error	Operation error of GPS receiver is detected.	At an outdoor site with a clear view, operate the system to display GPS data. If GPS mark is not properly displayed after 15 min. or more, replace navigation ECU.
40	GPS Antenna Error	Open condition of GPS antenna is detected. (Open circuit, connection failure of connectors, etc.)	Inspect antenna and replace as necessary.
41	Power Supply Error of GPS Antenna	Abnormal voltage of GPS antenna cable or short circuit is detected.	• Inspect GPS antenna and replace as necessary. (When no continuity is identified between connector's core and sealed part, GPS antenna is normal.) • If GPS antenna is normal, replace navigation ECU.

3. MULTI–DISPLAY (CRT DISPLAY) DISPLAY (Physical address: 110)

HINT:

- *1: Even if no failure is detected, it may be stored depending on the battery condition or voltage for starting an engine.
- *2: It is stored in 180 sec. after the power supply connector is pulled out after engine start.
- *3: It may be stored when the ignition switch is turned again after engine start.
- *4: It may be stored when the ignition switch is turned in 1 min. again after engine start.

(a) Logical address: 01 (Communication control)

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
21	ROM Error	Abnormal condition of ROM is detected.	Replace multi–display (CRT display) display.
22	RAM Error	Abnormal condition of RAM is detected.	Replace multi–display (CRT display) display.
D5 *1	Registered component disconnected	Component shown by auxiliary code is or was disconnected from system with ignition switch ACC or ON. Communication with component shown by auxiliary code is not ensured when engine is started.	• Check harness for power supply of component shown by auxiliary code. • Check harness for communication system of component shown by auxiliary code.
D8 *2	No response to connection check	Component shown by auxiliary code is or was disconnected from system after engine start.	• Check harness for power supply of component shown by sub– code. • Check harness for communication system of component shown by auxiliary code.

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
D9 *1	Last Mode Error	Component operated (sound and/or image was provided) before engine stop is or was disconnected with ignition switch ACC or ON.	• Check harness for power supply of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
DB *1	Mode Status Error	Dual alarm is detected.	• Check harness for power supply system of component shown by sub–auxiliary code. • Check harness for communication system of component shown by sub–code.
DC *4	Transmission Error	Transmission to component shown by auxiliary code has been failed. (This code does not necessarily mean actual failure.)	If same auxiliary code is recorded in order component(s), check harness for power supply and communication system of all components shown by code.
DE *3	Slave Reset (Momentary Interruption)	After engine start, slave component has been disconnected. DB	• Check harness for power supply system of component shown by sub–code. • Check harness for communication system of component shown by sub–code.
E2	ON/OFF Instruction Parameter Error	Error is detected in ON/OFF control command from radio receiver assy.	Replace radio receiver assy.
E3 *1	Registration Request Transmission	• Registration Request command is output from slave component. • By reception of connection check instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering, it may be detected when no actual failure exists.

(b) Logical address: 21 (Switch)

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
10	Panel Switch Error	Error in panel switch input part is detected. (Error in switch control part, or internal communication error with switch control part is detected.)	• Inspect all switches on panel switch test screen in display check mode. If any of them do not function, replace multi–display (CRT display) display. • If all switches function without problem, observe them for a while.
11	Touch Switch Error	Error in touch switch sensor is detected. (Light level of LED is detected to be less than a fixed value.)	• Inspect all touch switches on touch switch test screen in display check mode. If any of lines does not react, replace multi–display (CRT display) display. • If all of vertical and horizontal lines react normally, observe them for a while.

(c) Logical address: 34 (Front passenger monitor)

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
10	Error in Picture Circuit	Error in power supply system for picture circuit (abnormal voltage) is detected.	Replace multi–display (CRT display) display.
11	Back–light Error (No current)	Decline in power output from inverter circuit for back–light.	Replace multi–display (CRT display) display.
12	Back–light Error (Excess current)	Excess power output from inverter circuit for back–light.	Replace multi–display (CRT display) display.

4. BODY ECU (COMBINATION METER) (Physical address: 1EC)

HINT:

- *1: Even if no failure is detected, it may be stored depending on the battery condition or voltage for starting an engine.
- *2: It may be stored when the ignition switch is turned in 1 min. again after the engine starts.
- *3: It may be stored when the ignition switch is turned again after the engine starts.
- *4: This code is stored in 210 sec. after the master components is turned off with the ignition switch ACC or ON.

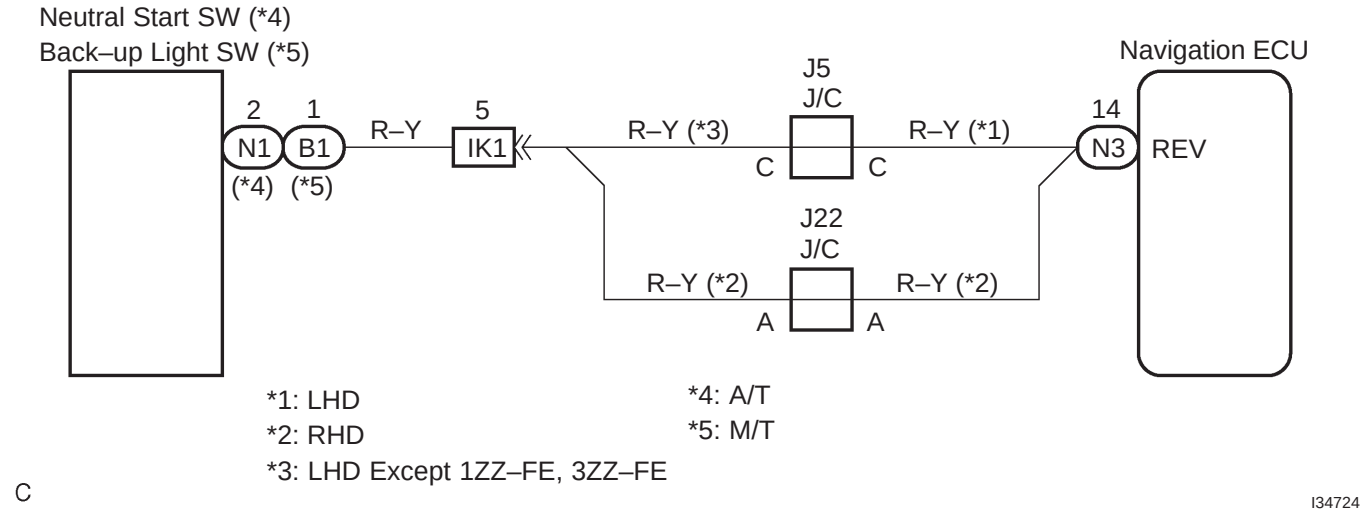
Logical address: 01 (Communication control)

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
D6 *1	Absence of Master	Component in which this code is recorded has been disconnected from system with ignition ACC or ON. Or, when this code was recorded, multi–display (CRT display) display was disconnected.	• Check harness for power supply of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • Check harness for power supply of body ECU. • Check harness for communication system of body ECU.
D7	Communication Check Error	Component in which this code is recorded is or was disconnected from system after engine start. Or, when recording this code, multi–display (CRT display) display was disconnected.	• Check harness for power supply of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • Check harness for power supply of body ECU. • Check harness for communication system of body ECU.
DC *2	Transmission Error	Transmission to component shown by auxiliary code has been failed. (Detecting this DTC does not necessarily mean actual failure.)	If same auxiliary code is recorded in other components, check harness for power supply and communication system of all components shown by code.
DD *3	Master Reset (Momentary Interruption)	After engine was started, multi–display (CRT display) display was disconnected from system	• Check harness for power supply of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display. • If this error occurs frequently, replace multi–display (CRT display) display.
DF *4	Master Error	Due to defective condition of component with a display, master function is switched to audioequipment. Error occurs in communication between sub–master (audio) and master component.	• Check harness for power supply of radio receiver assy. • Check harness for communication system of multi–display (CRT display) display. • Check harness for communication system between radio receiver assy and multi–display (CRT display) display.
E0 *1	Registration Completion Instruction Error	”Registration Completion Instruction” command from master cannot be received.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.
E1 *1	Audio processor ON error	While source equipment is operating, AMP output is stopped.	• Check harness for power supply of multi–display (CRT display) display. • Check harness for communication system of multi–display (CRT display) display.

DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts
E2	ON/OFF Instruction Parameter Error	Error occurs in ON/OFF controlling command from stereo component amplifier assy.	Replace radio receiver assy.
E3 *1	Registration Request Transmission	• Registration Request command is output from slave component. • Registration Connection Check Instruction, Registration Request command is output from sub–master component.	Since this DTC is provided for engineering purpose, it may be detected when no actual failure exists.

DRIVING DIRECTIONS ARE OPPOSITE TO MOVING DIRECTION OF VEHICLE POSITION MARK

WIRING DIAGRAM



INSPECTION PROCEDURE

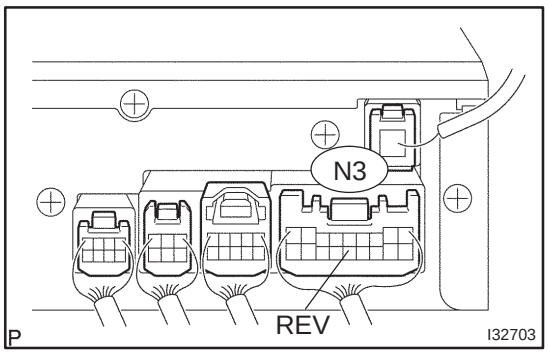
1	NAVIGATION CHECK MODE(VEHICLE SENSORS)

(a) Check the vehicle input signals.
(1) Start up the diagnosis system and read the REV signal in vehicle sensors mode.
Standard: Input signal is normal (REV)

OK → **REPLACE NAVIGATION ECU (See page 67–27)**

NG

2	INSPECT NAVIGATION ECU(REV)



(a) Remove the navigation ECU.
(b) Check the voltage.
(1) Measure the voltage between the terminal REV of navigation ECU and body ground.
Voltage:

Terminal	Condition	Voltage (V)
REV – Body ground	Turn ignition switch ON and put gear shift in R range	10 to 14

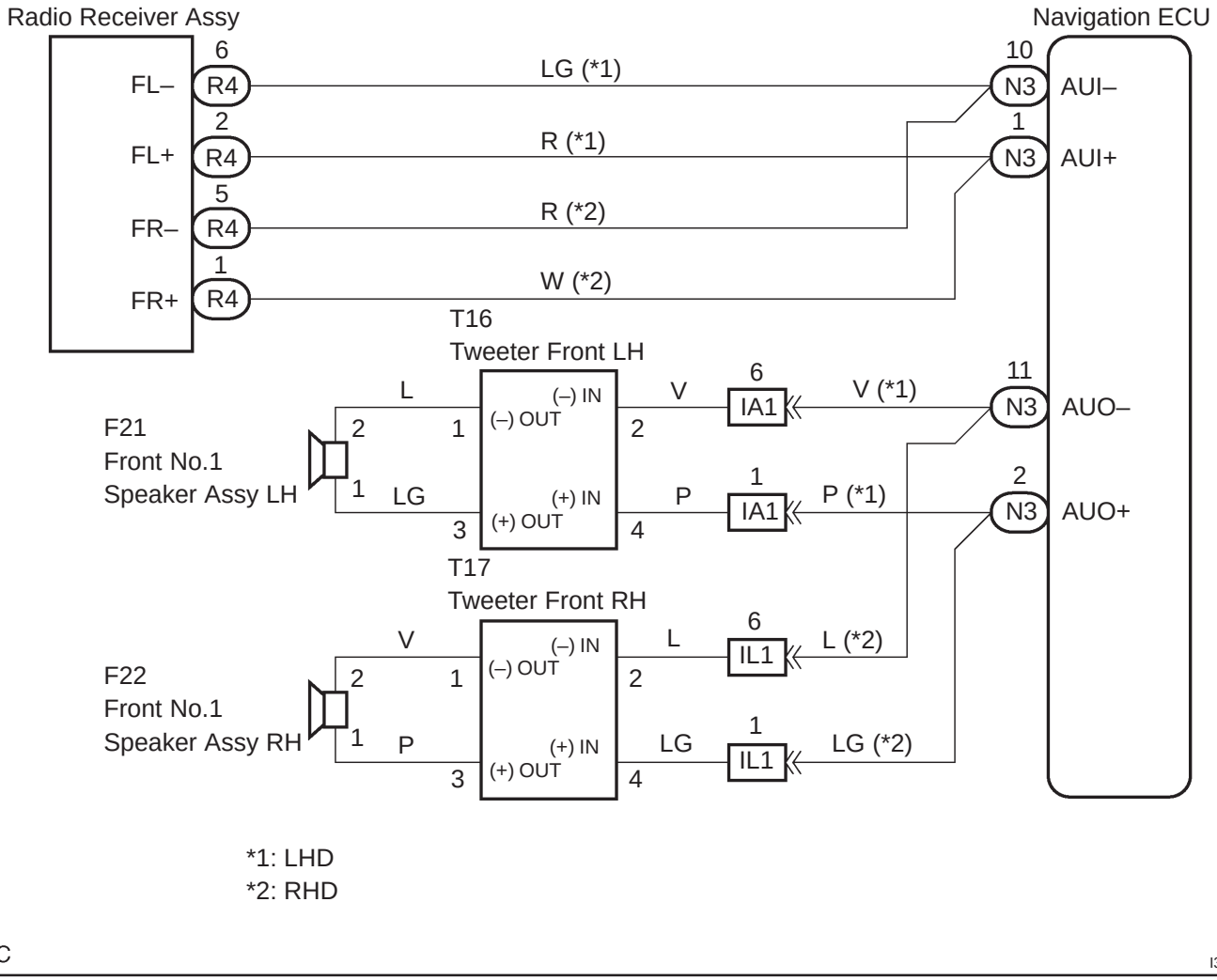
OK → **REPLACE NAVIGATION ECU (See page 67–27)**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

FRONT SPEAKER (DRIVER SIDE) ONLY IS NOT HEARD

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK SETTING(THE VOLUME OF THE NAVIGATION VOICE SOUND)

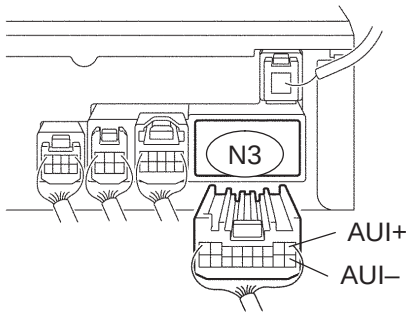
(a) Check the settings.
(1) Set the volume MAX at the voice sound settings on the menu.
Standard: "This system will guide you in this volume" is produced.

OK → **Go to step 4**

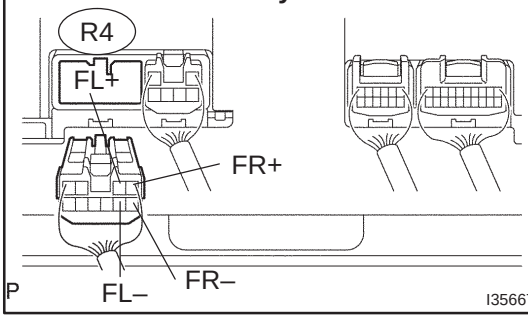
NG

2	CHECK HARNESS AND CONNECTOR(NAVIGATION ECU – RADIO RECEIVER ASSY)

Navigation ECU:



Radio Receiver Assy:



(a) Disconnect the connector between the navigation ECU and radio receiver assy.
(1) Check continuity between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
FL+*1, FR+*2 – AUI+	Continuity
FL–*1, FR–*2 – AUI–	Continuity

*1: LHD Models
*2: RHD Models

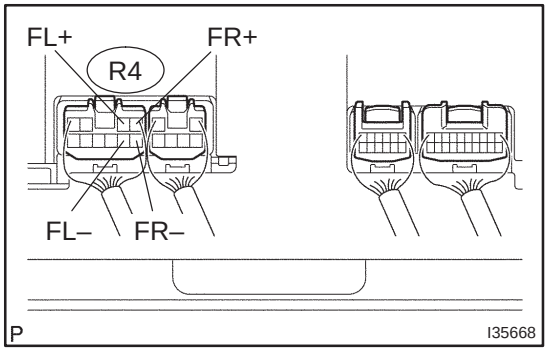
(2) Check for a short between the terminals at each condition, as shown in the chart.
Standard:

Tester connection	Specified condition
AUI+ – Body ground	No continuity
AUI– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT RADIO RECEIVER ASSY(FL+(*1), FL–(*1), FR+(*2), FR–(*2), GND)



(a) Remove the radio receiver assy.
(b) Using an oscilloscope, check the signal waveform between the terminals FL+*1, FL–*1, FR+*2, FR–*2 and GND of stereo component amplifier assy.
*1: LHD Models
*2: RHD Models

Standard:

Tester connection	Condition	Specified condition
FL+*1, FR+*2 – GND	While voice sound is being produced	A waveform synchronized with sound is output
FL–*1, FL–*2 – GND	While voice sound is being produced	A waveform synchronized with sound is output

NG → **REPLACE RADIO RECEIVER ASSY (See page 67–5)**

OK

4 INSPECT FRONT NO.1 SPEAKER ASSY

(a) Resistance check
(1) Check resistance between the terminals of the front No.1 speaker assy.
Standard: 4 Ω

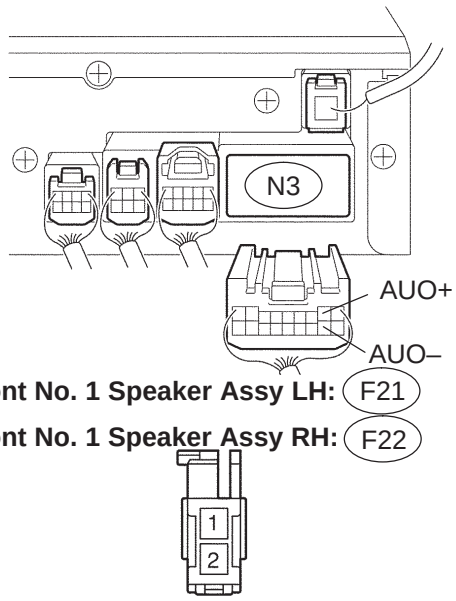
NOTICE:
The speaker should not be removed for checking

NG → **REPLACE FRONT NO.1 SPEAKER ASSY (See page 67–10)**

OK

5	CHECK HARNESS AND CONNECTOR(NAVIGATION ECU – FRONT NO. 1 SPEAKER ASSY)

Navigation ECU:



(a) Disconnect the connectors from the navigation ECU and front No.1 speaker assy.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
AUO+ – 1	Continuity
AUO– – 2	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
AUO+ – Body ground	No continuity
AUO– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE NAVIGATION ECU (See page 67–27)

GPS MARK DOES NOT APPEAR

INSPECTION PROCEDURE

1	CHECK MARK DISPLAY

(a) Check that the malfunction disappears when placing the vehicle outdoors with a good view.
Standard: GPS mark is displayed.

HINT:
At the place surrounded by the architecture, the vehicle cannot receive the GPS radio wave.

OK → **SYSTEM OK**

NG

2	CHECK OPTIONAL COMPONENT

(a) Check for optional component.
(1) Check if there are any optional components on the vehicle.
Standard: There are no optional components on the vehicle.
(2) Check if there is anything such as film stuck to the window or any metal objects on the instrument panel.
Standard: There is nothing such as film stuck to the window or any metal objects on the instrument panel.

NG → **EFFECT FROM OPTIONAL COMPONENT**

OK

3	REPLACE NAVIGATION ANTENNA ASSY (See page 67–28)

Standard: Normally returns.

NG → **REPLACE NAVIGATION ECU (See page 67–27)**

OK

SYSTEM OK

NAVIGATION SYSTEM

05C3B–01

HOW TO PROCEED WITH TROUBLESHOOTING

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (See page 05–1437)

3	Problem Symptom Confirmation

- Symptom does not occur (Go to step 4)
- Symptom occurs (Go to step 5)

4	Symptom Simulation (See page 01–32)

5	DTC Check (See page 05–1438)

- Normal code (Go to step 7)
- Malfunction code (Go to step 6)

6	DTC Chart (See page 05–1453)

- Go to step 8

7	Problem Symptoms Table (See page 05–1464)

8	Circuit Inspection and Part Inspection

9	Indemnification of Problem

10	**Repair or Replace**

11	**Confirmation Test**

End

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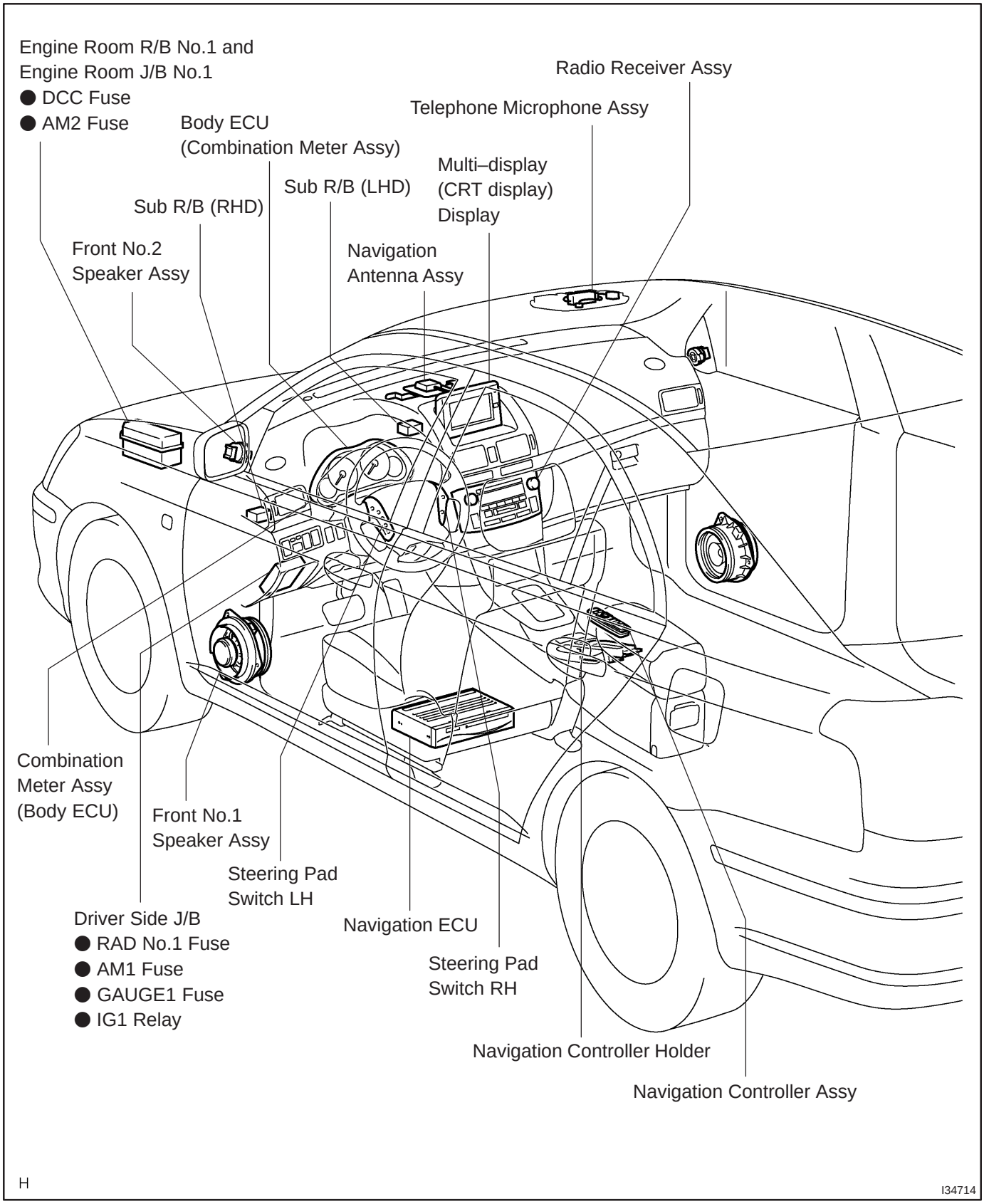
LOCATION



MAP IS DISPLAYED IN WHITE OR BLUE SCREEN (SWITCHED AND VEHICLE POSITION MARK ARE DISPLAYED)

INSPECTION PROCEDURE

1	CHECK SETTING

(a) Check the settings.
(1) Check that the map display is normal when the map scale is set to the widest area.
Standard: Map display is normal

OK → **SYSTEM OK**

NG

2	CHECK AND OPERATE AGAIN

(a) Clean the map disc.
(1) After wiping the map disc in the circumference direction with a soft cloth, insert it again.

OK → **SYSTEM OK**

NG

3	REPLACE DISC PLAYER DISC

Standard: Normally returns

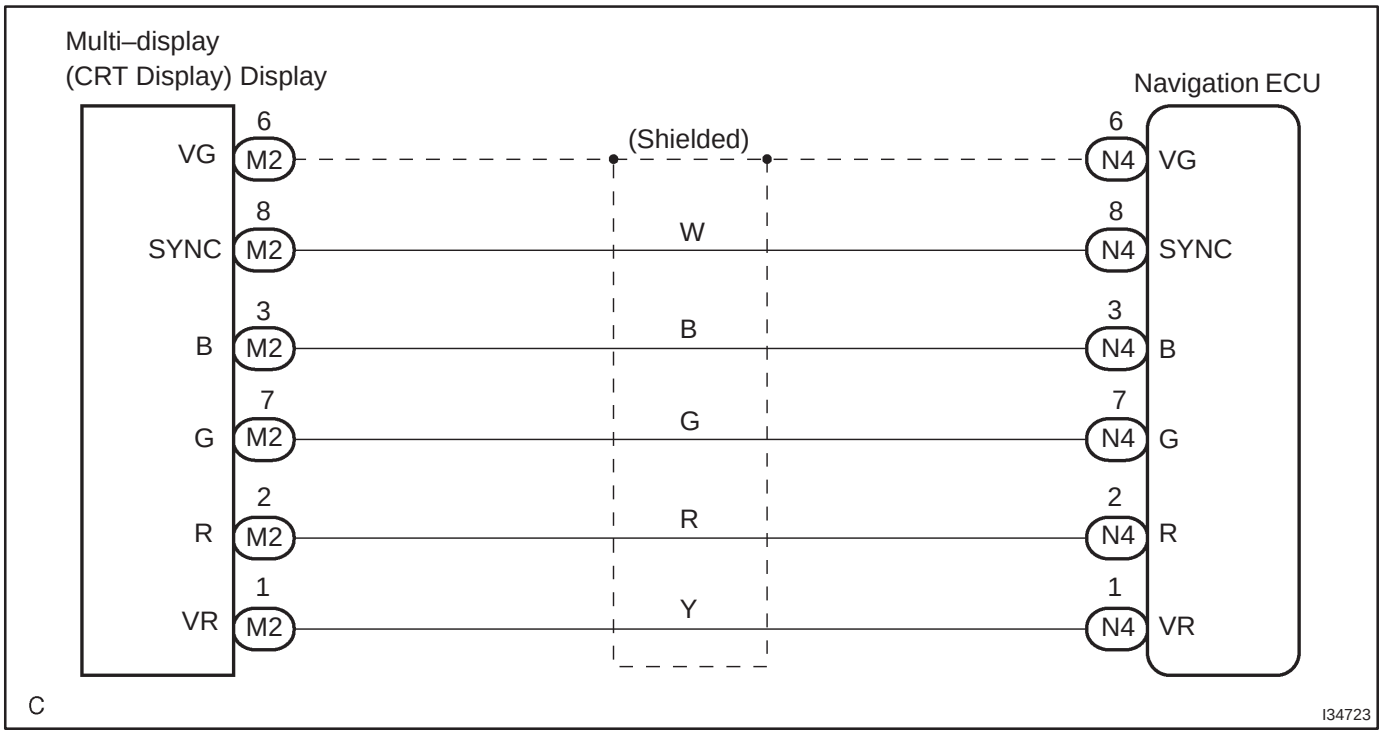
OK → **SYSTEM OK**

NG

REPLACE NAVIGATION ECU (See page 67–27)

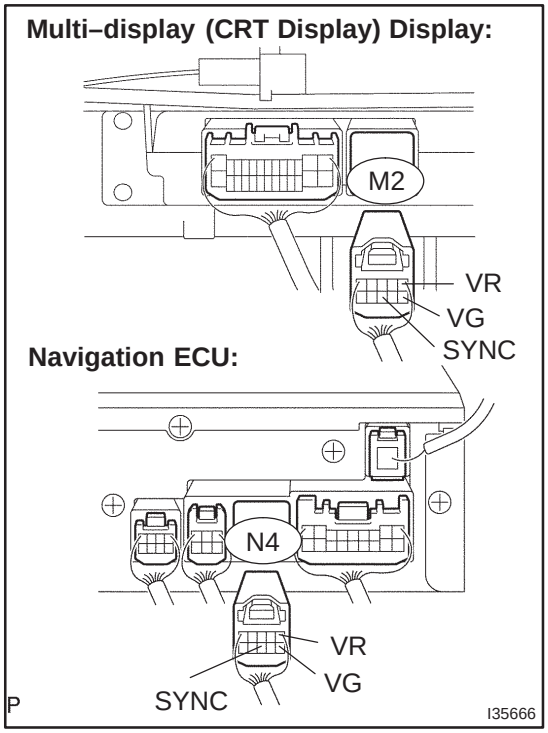
NAVIGATION SCREEN IS NOT STABILIZED (SYNCRONOUS ERROR)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(MULTI–DISPLAY (CRT DISPLAY)DISPLAY – NAVIGATION ECU)



(a) Disconnect the connectors from the multi–display (CRT display)display and navigation ECU.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
VG – VG	Continuity
VR – VR	Continuity
SYNC – SYNC	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
VG – Body ground	Continuity
VR – Body ground	Continuity
SYNC – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2	REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)

Standard: Normally returns.

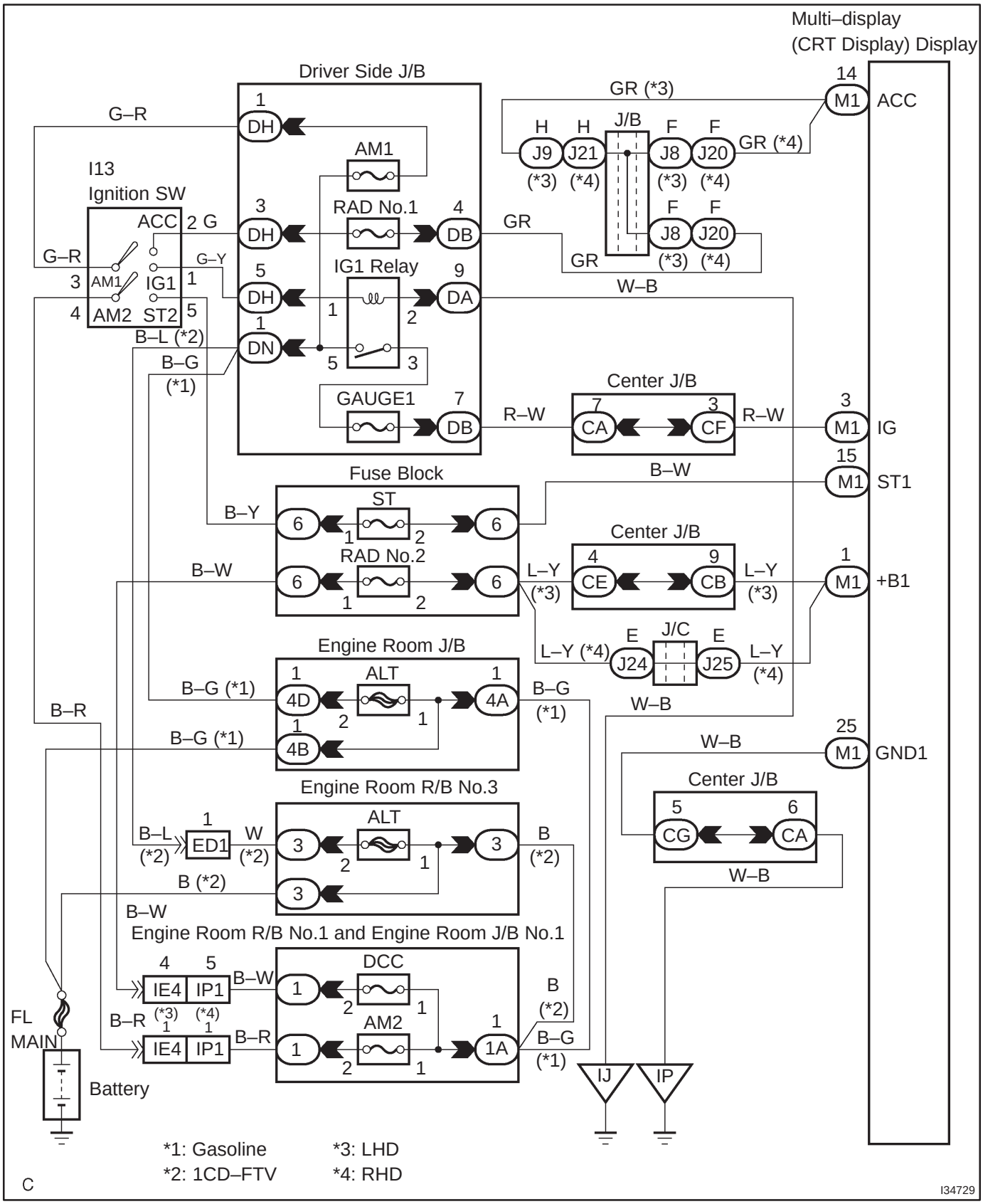
NG → **REPLACE NAVIGATION ECU (See page 67–27)**

OK

SYSTEM OK

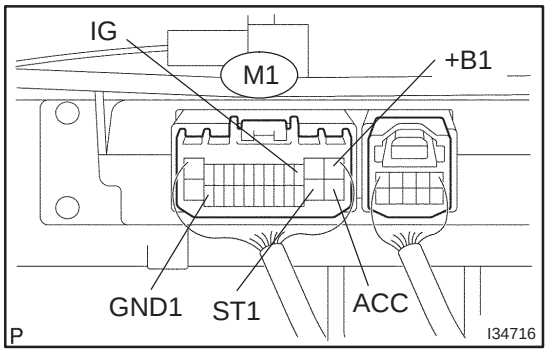
POWER SOURCE CIRCUIT (MULTI–DISPLAY (CRT DISPLAY) DISPLAY)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT MULTI–DISPLAY (CRT DISPLAY) DISPLAY(ACC, IG, ST1, +B1, GND1)



(a) Remove the multi–display (CRT display) display.

(b) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND1 – Body ground	Always	Continuity

(c) Check the voltage between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
+B1 – GND1	Always	10 to 14 V
IG – GND1	Ignition SW ON	10 to 14 V
ACC – GND1	Ignition SW ACC	10 to 14 V
ST1 – GND1	Ignition SW ON	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2	CHECK FOR PROBLEM SYMPTOMS TABLE

(a) Check the problem symptoms table (See page 05–1464).

A	Suspected areas are cleared
B	Suspected areas still exist

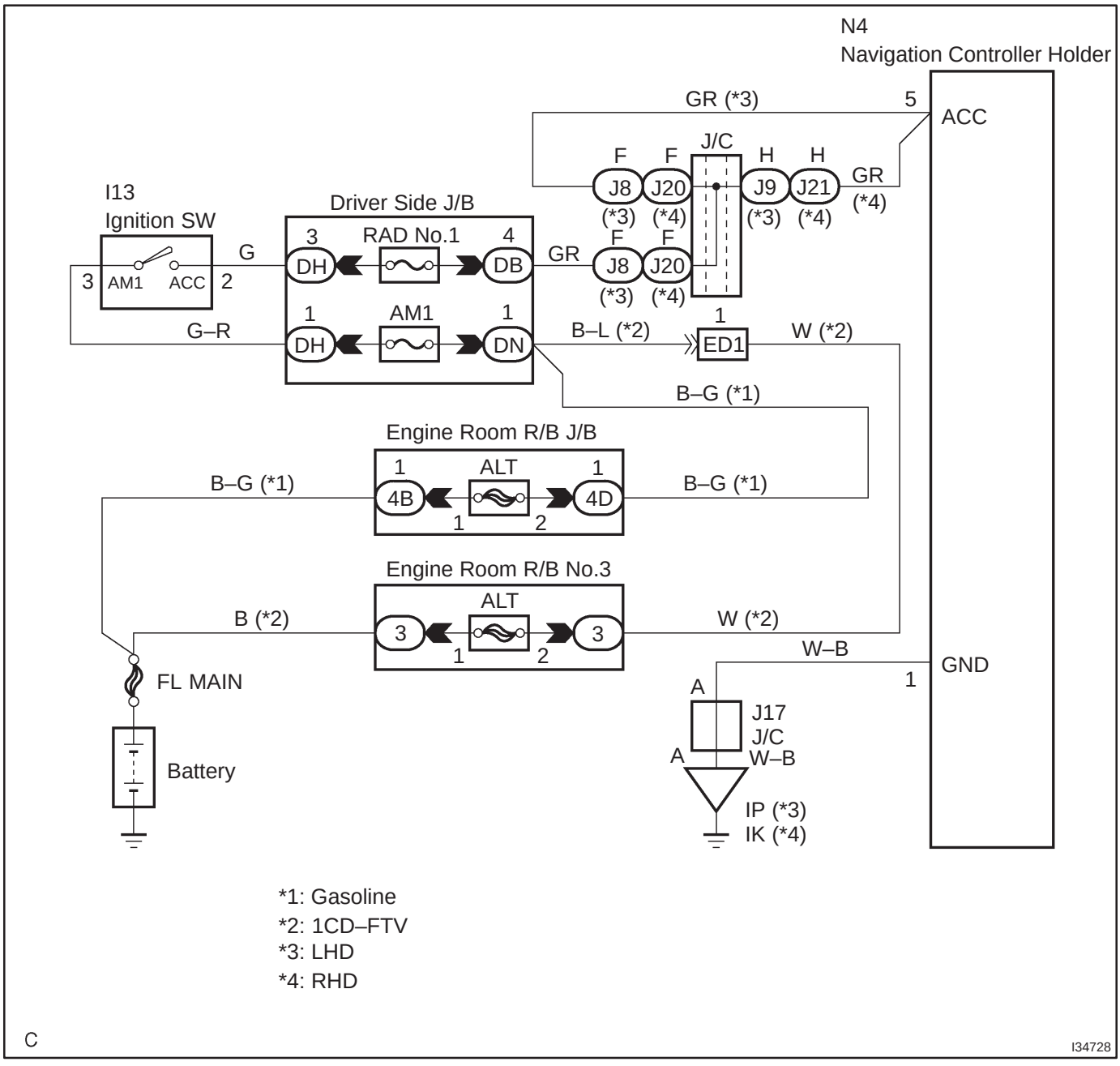
B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1464)**

A

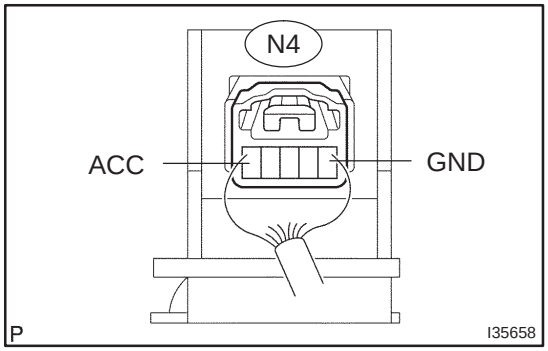
REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)

POWER SOURCE CIRCUIT (NAVIGATION CONTROLLER HOLDER)

WIRING DIAGRAM



1 INSPECT NAVIGATION CONTROLLER HOLDER(ACC, GND)



(a) Remove the navigation controller holder.

(b) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND – Body ground	Constant	Continuity

(c) Check the voltage between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
ACC – GND	Ignition SW ACC	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 CHECK FOR PROBLEM SYMPTOMS TABLE

(a) Check the problem symptoms table (See page 05–1464).

A	Suspected areas are cleared
B	Suspected areas still exist

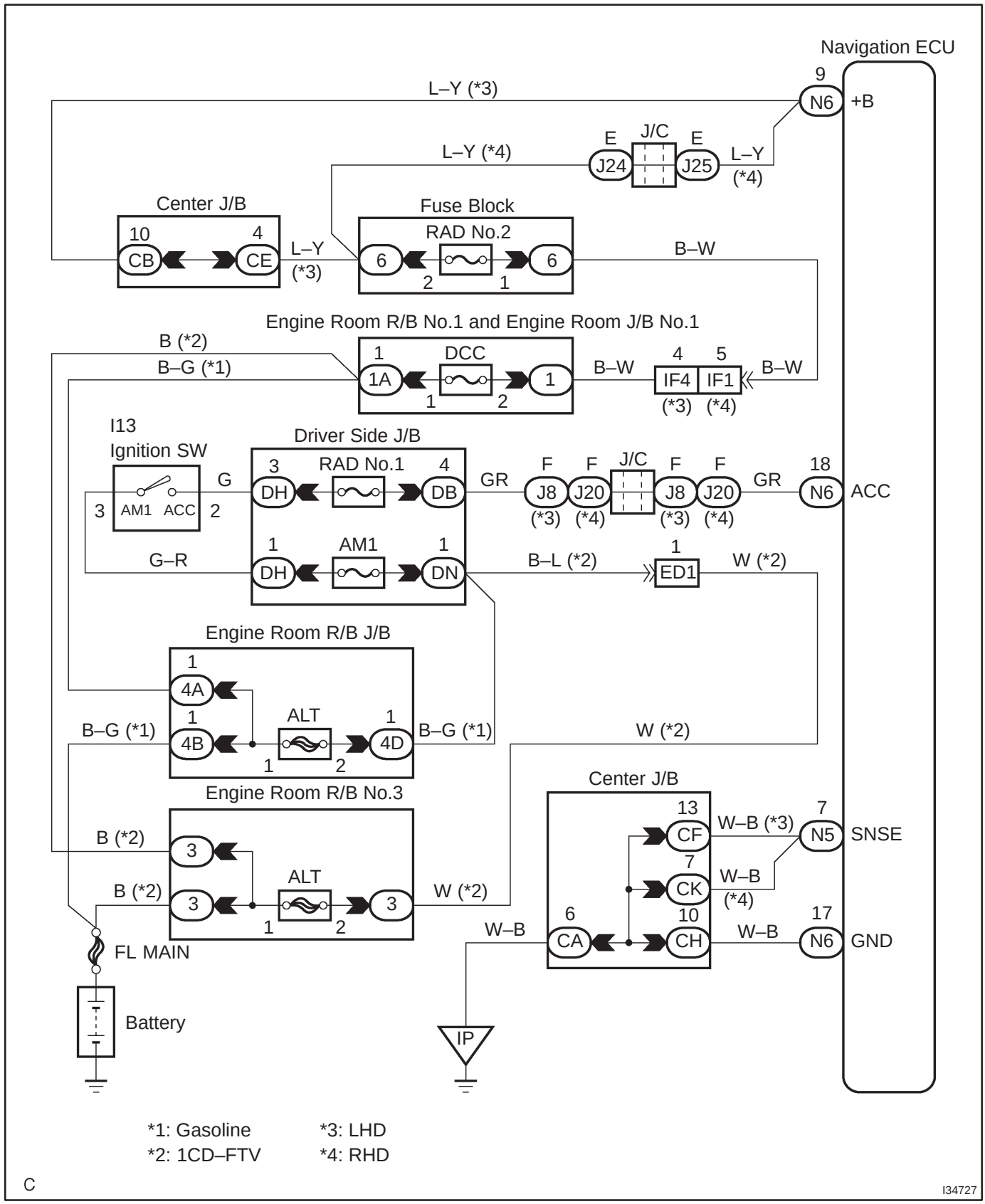
B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1464)**

A

REPLACE NAVIGATION CONTROLLER HOLDER

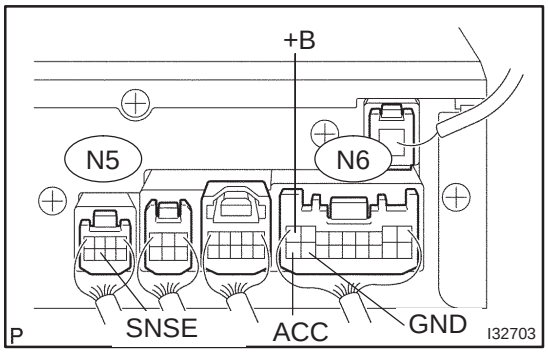
POWER SOURCE CIRCUIT (NAVIGATION ECU)

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT NAVIGATION ECU(+B, ACC, SNSE, GND)



(a) Remove the navigation ECU.

(b) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
GND – Body ground	Always	Continuity
SNSE – Body ground	Always	Continuity

(c) Check the voltage between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Condition	Specified condition
+B – GND	Always	10 to 14 V
ACC – GND	Ignition SW ACC, ON	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 CHECK FOR PROBLEM SYMPTOMS TABLE

(a) Check the problem symptoms table (See page 05–1464).

A	Suspected areas are cleared
B	Suspected areas still exist

B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1464)**

A

REPLACE NAVIGATION ECU (See page 67–27)

05C3G–01

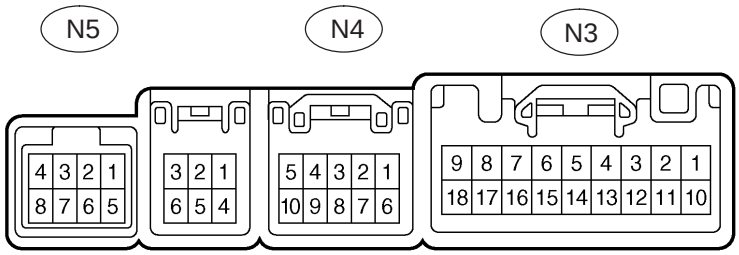
PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Black screen	1. RAD No.2 fuse 2. Power source circuit (multi–display (CRT display)display) 3. AVC–LAN circuit	01–5 05–1465 05–1471
Navigation screen display nothing	1. RAD No.2 fuse 2. Power source circuit (navigation ECU) 3. AVC–LAN circuit	01–5 05–1467 05–1471
Navigation screen is not stabilized (Synchronous error)	1. RAD No.2 fuse 2. Power source circuit (navigation ECU) 3. Navigation screen is not stabilized (Synchronous error)	01–5 05–1467 05–1475
Color on navigation screen is unusual (RGB signal error)	1. RAD No.2 fuse 2. Power source circuit (navigation ECU) 3. Color on navigation screen is unusual (RGB signal error)	01–5 05–1467 05–1477
Front speaker (driver side) only is not heard	–	05–1479
Map disc cannot be inserted	1. RAD No.2 fuse 2. Power source circuit (navigation ECU)	01–5 05–1467
Current position cannot be displayed on screen (disc caution screen does not change)	–	05–1483
Map is displayed in white or blue screen (switched and vehicle position mark are displayed)	–	05–1484
Vehicle position is deviated from correct point badly	1. Vehicle position is deviated from correct point badly. 2. GPS mark does not appear.	05–1485 05–1487
GPS mark does not appear	–	05–1487
Vehicle position mark rotates without control (map rotates without control)	–	05–1488
Driving directions are opposite to moving direction of vehicle position mark	–	05–1490
A navigation controller assy does not operate	1. A navigation controller assy does not operate 2. The system cannot be operated by the voice sound	05–1491 05–1494
When mount the navigation controller to the navigation controller system, it cannot be operated	1. RAD No.2 fuse 2. Power source circuit (navigation controller holder) 3. When mount the navigation controller holder to the navigation controller system, it cannot be operated 4. The system cannot be operated by the voice sound	01–5 05–1469 05–1492 05–1494
The system cannot be operated by the voice sound	1. The system cannot be operated by the voice sound 2. AVC–LAN circuit	05–1494 05–1471

05C3X–01

TERMINALS OF ECU

1. NAVIGATION ECU



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I35876

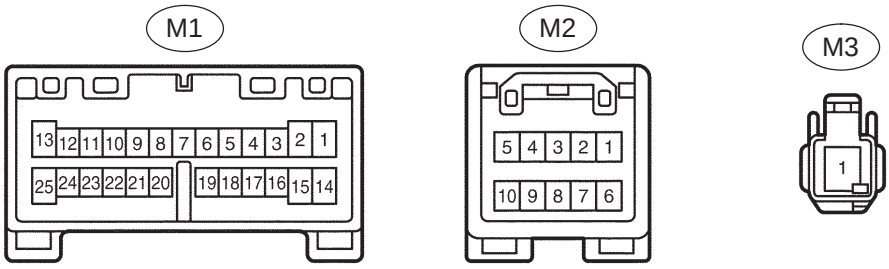
Symbols (Terminals No.)	Wiring Color	Condition	Specification
N5–3 (MIC+) – N5–6 (SGND)	B – BR	Audio system is playing	A waveform synchronized with sounds is output
N5–4 (MACC) – N5–6 (SGND)	R – BR	Ignition switch ACC	4 to 6 V
N5–5 (MIC–) – N5–6 (SGND)	BR – BR	Always	Continuity
N5–6 (SGND) – Body ground	BR – Body ground	Always	Continuity
N5–7 (SNSE) – Body ground	W–B – Body ground	Always	Continuity
N3–1 (AUI+) – N3–17 (GND)	R*1, W*2 – W–B	Audio system is sounding	A waveform synchronized with sounds is output
N3–2 (AUO+) – N3–17 (GND)	P*1, LG*2 – W–B	Sound quality test	–
N3–5 (SPD) – N3–17 (GND)	V–W – W–B	See ”Vehicle Signal Check Mode”	–
N3–9 (+B) – N3–17 (GND)	L–Y – W–B	Always	Below 1 V
N3–10 (AUI–) – N3–17 (GND)	LG*1, R*2 – W–B	Audio system is playing	A waveform synchronized with sounds is output
N3–11 (AUO–) – N3–17 (GND)	V*1, L*2 – W–B	Sound quality test	–
N3–14 (REV) – N3–17 (GND)	R–Y – W–B	See ”Vehicle Signal Check Mode”	–
N3–17 (GND) – Body ground	W–B – Body ground	Always	Continuity
N3–18 (ACC) – N3–17 (GND)	GR – W–B	Ignition switch ACC	10 to 14 V
N4–1 (VR) – N4–6 (VG)	Y – Shielded	Ignition switch OFF	Below 1 V
N4–2 (R) – N4–6 (VG)	R – Shielded	Navigation display is displayed	Pulse generation *2
N4–3 (B) – N4–6 (VG)	B – Shielded	Navigation display is displayed	Pulse generation *2
N4–5 (TX+)	V	See ”Service Check Mode”	–
N4–6 (VG) – Body ground	Shielded – Body ground	Always	Continuity
N4–7 (G) – N4–6 (VG)	G – Shielded	Navigation display is displayed	Pulse generation *2

Symbols (Terminals No.)	Wiring Color	Condition	Specification
N4–8 (SYNC) – N4–6 (VG)	W – Shielded	Navigation display is displayed	Pulse generation *1
N4–10 (TX–)	LG	See "Service Check Mode"	–

*1: LHD

*2: RHD

2. MULTI–DISPLAY (CRT DISPLAY) DISPLAY

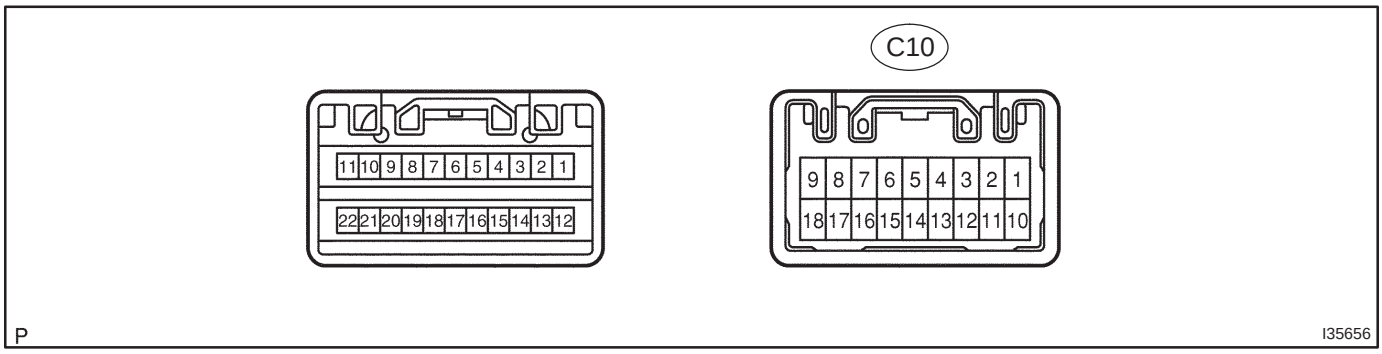


P I34717

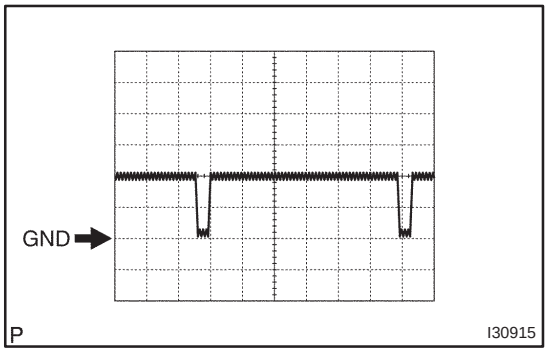
Symbols (Terminals No.)	Wiring Color	Condition	Specification
M1–1 (+B1) – M2–1 (GND2)	L–Y – W–B	Always	10 to 14 V
M1–3 (IG) – M2–1 (GND2)	R–W – W–B	Ignition switch ON	10 to 14 V
M1–4 (SPD) – M2–1 (GND2)	V–W – W–B	See "Vehicle Signal Check"	–
M1–5 (GTX+)	P	See "Service Check Mode"	–
M1–10 (RE1) – M1–22 (SGD1)	R – Shielded	Ignition switch ACC	Approx. 3.3 V
M1–12 (TX3+)	G–Y	See "Service Check Mode"	–
M1–14 (ACC) – M2–1 (GND2)	GR – W–B	Ignition switch ACC	10 to 14 V
M1–15 (ST1) – M2–1 (GND2)	B–W – W–B	Ignition switch START	10 to 14 V
M1–16 (TC) – M2–1 (GND2)	W–L – W–B	Ignition switch OFF and connect terminals TC and GND1 of check connector	Continuity
M1–17 (PKB) – M2–1 (GND2)	B–W – W–B	See "Vehicle Signal Check Mode"	–
M1–18 (GTX–)	LG	See "Service Check Mode"	–
M1–22 (SGD1) – Body ground	Shielded – Body ground	Always	Continuity
M1–24 (TX3–)	G	See "Service Check Mode"	–
M1–25 (GND1) – Body ground	W–B – Body ground	Always	Continuity
M2–1 (GND1) – M1–6 (VG)	Y – Shielded	Ignition switch OFF	Below 1 V
M2–2 (R) – M1–6 (VG)	R – Shielded	Navigation display is displayed	Pulse generation *2
M–2 (B) – M1–6 (B – VG)	B – Shielded	Navigation display is displayed	Pulse generation *2
M2–5 (CTX+)	V	See "Service Check Mode"	–
M2–6 (VG) – Body ground	Shielded – Body ground	Always	Continuity
M2–7 (G) – M1–6 (VG)	G – Shielded	Navigation display is displayed	Pulse generation *2

Symbols (Terminals No.)	Wiring Color	Condition	Specification
M2–8 (SYNC) – M1–6 (VG)	W – Shielded	Navigation display is displayed	Pulse generation *1
M2–10 (CTX–)	LG	See "Service Check Mode"	–
M3–1 (GND2) – Body ground	W–B – Body ground	Always	Continuity

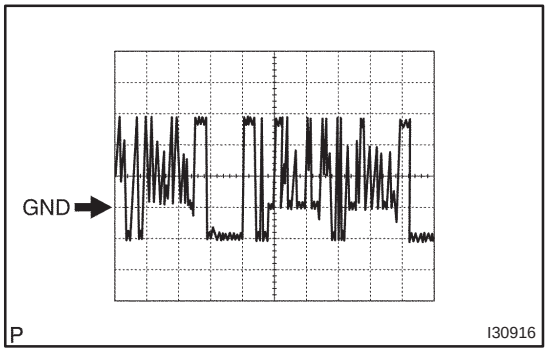
3. BODY ECU (COMBINATION METER ASSY)



Symbols (Terminals No.)	Wiring Color	Condition	Specification
C10–3 (GTX+)	G–Y	See "Service Check Mode"	–
C10–4 (GTX–)	G	See "Service Check Mode"	–



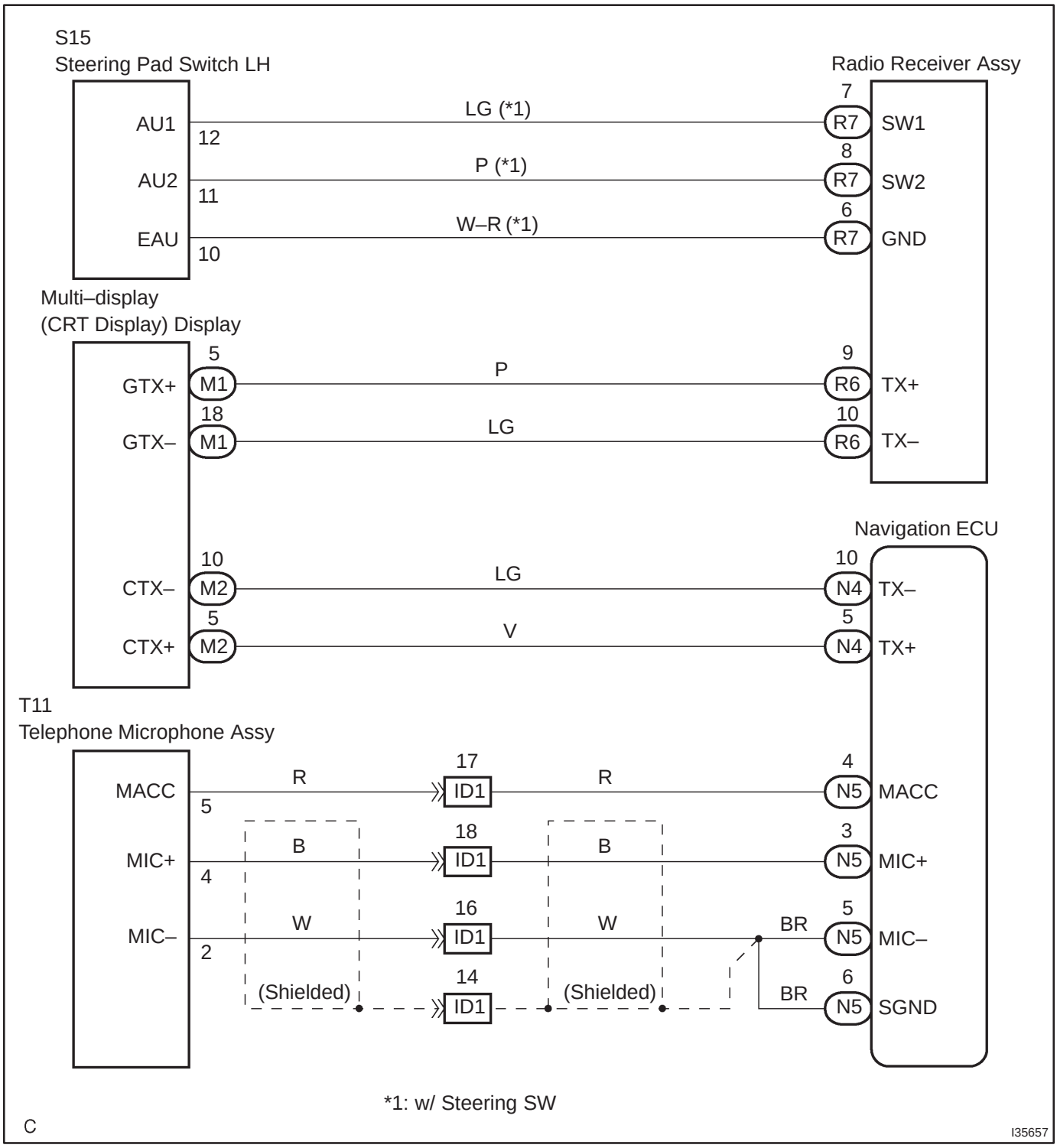
(a) *1: Oscilloscope wave
Terminal to be measured: SYNC – GND
Setting for measurement: 500 mV/DIV10– μs/DIV
Condition: Navigation display is displayed.



(b) *2: Oscilloscope wave
Terminal to be measured: R, G, B – GND
Setting for measurement: 200 mV/DIV10– μs/DIV
Condition: Navigation map is switched.

THE SYSTEM CANNOT BE OPERATED BY THE VOICE SOUND

WIRING DIAGRAM



INSPECTION PROCEDURE

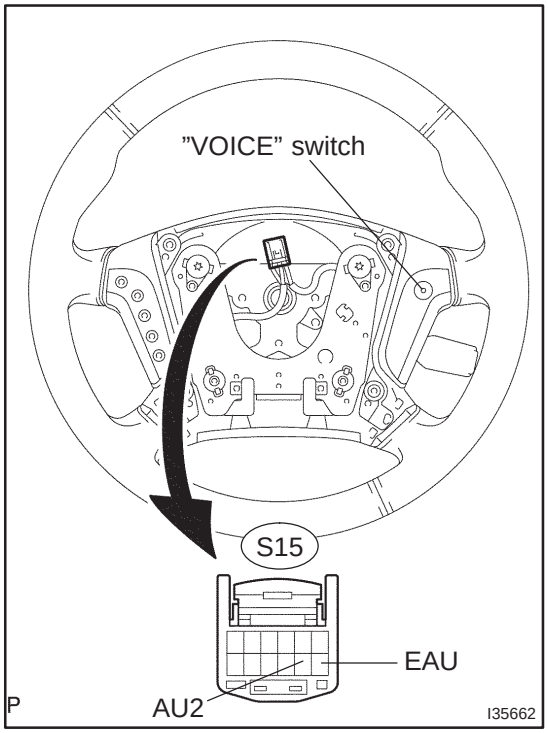
1	INSPECT STEERING WHEEL ASSY(BEEP SOUND)

(a) Check the switch (Beep sound).
(1) Press steering pad switch LH to check that the beep sound is produced.

OK → **Go to step 3**

NG

2	INSPECT STEERING WHEEL ASSY(AU2, EAU)



(a) Remove the horn button assy(See page 50–9).
(b) Check continuity between the terminals at each condition, as shown in the chart.

Tester connection	Condition	Specified condition
AU2 – EAU	Do not switch position	Approx. 100 kΩ
AU2 – EAU	VOICE switch: push	Approx. 3.1 k

NG → **REPLACE STEERING WHEEL ASSY (See page 50–9)**

OK

3	CHECK TALK BACK

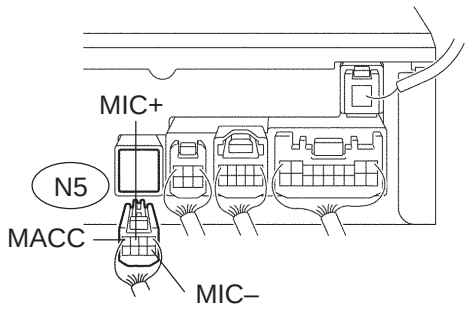
(a) Check whether the system performs talk back or not.
Standard: The system performs talk back.

OK → **SYSTEM OK**

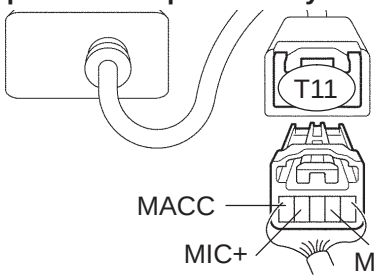
NG

4	CHECK HARNESS AND CONNECTOR(NAVIGATION ECU – TELEPHONE MICROPHONE ASSY)

Navigation ECU:



Telephone Microphone Assy:



P I35670

(a) Disconnect the connectors from the navigation ECU and telephone microphone assy.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
MACC – MACC	Continuity
MIC+ – MIC+	Continuity
MIC– – MIC–	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart.

Standard:

Tester connection	Specified condition
MACC – Body ground	No continuity
MIC+ – Body ground	No continuity
MIC– – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	REPLACE TELEPHONE MICROPHONE ASSY

Standard: Normally returns

NG → **REPLACE NAVIGATION ECU (See page 67–27)**

OK

SYSTEM OK

VEHICLE POSITION IS DEVIATED FROM CORRECT POINT BADLY

INSPECTION PROCEDURE

1	CHECK DISPLAY(GPS MARK DISPLAY)

(a) Preparation for the pre–check.
  (1) Place the vehicle outdoors with a good view of the GPS mark.
(b) Check the screen display.
  (1) Turn the ignition switch ON.
  (2) Turn the power switch of the radio receiver assy ON to display the map.
  Standard: ”GPS” mark appears

NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–1464)**

OK

2	CHECK WHEN THIS HAPPENS

(a) Check the abnormal condition.
  (1) Check the point in which the trouble occurs.
  Standard:

A	The trouble occurs outside the specific area
B	The trouble occurs in the specific area

HINT:
At the place difficult to specify the vehicle position (a by–pass road, a overhand road, a loop road, or several–storied car park, etc.), the vehicle position may be out of the point due to the wrong matching.

B → **SYSTEM OK**

A

3	CHECK DISPLAY(AUTOMATIC CALIBRATION)

(a) Check the screen display.
  (1) Check the color of ”Automatic calibration” switch at the distance correction screen.
  Standard: Green (”Automatic calibration” switch)

OK → **SYSTEM OK**

NG

4	NAVIGATION CHECK MODE(VEHICLE SENSORS)

(a) Check the vehicle input signals.
(1) Start up the diagnosis system and read the SPEED signal in vehicle signal check mode.
Standard: Input signal is normal (SPEED)

NG → **Go to step 6**

OK

5	CHECK AND OPERATE AGAIN

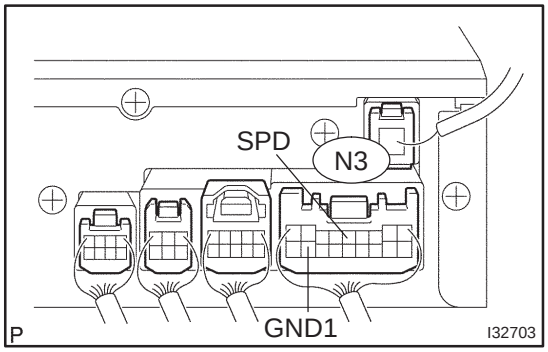
Standard: Normally returns

OK → **SYSTEM OK**

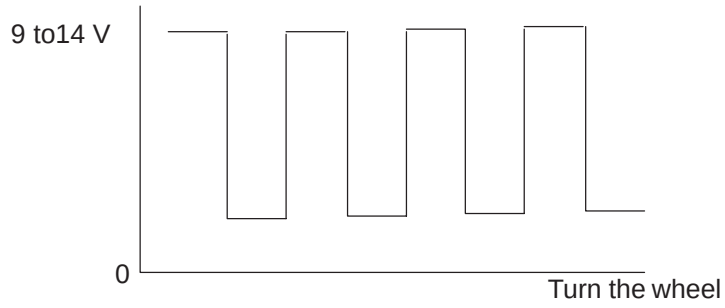
NG

REPLACE NAVIGATION ECU (See page 67–27)

6	INSPECT NAVIGATION ECU(SPD, GND1)



(a) Remove the navigation ECU.
(b) Check the voltage.
(1) Shift the shift lever to neutral.
(2) Jack up either one of the front wheels.
(3) Turn ignition switch ON.
(4) Measure the voltage between the terminal SPD and GND1 of navigation ECU when the front wheels are turned slowly.
Standard: Voltage is pulsed.



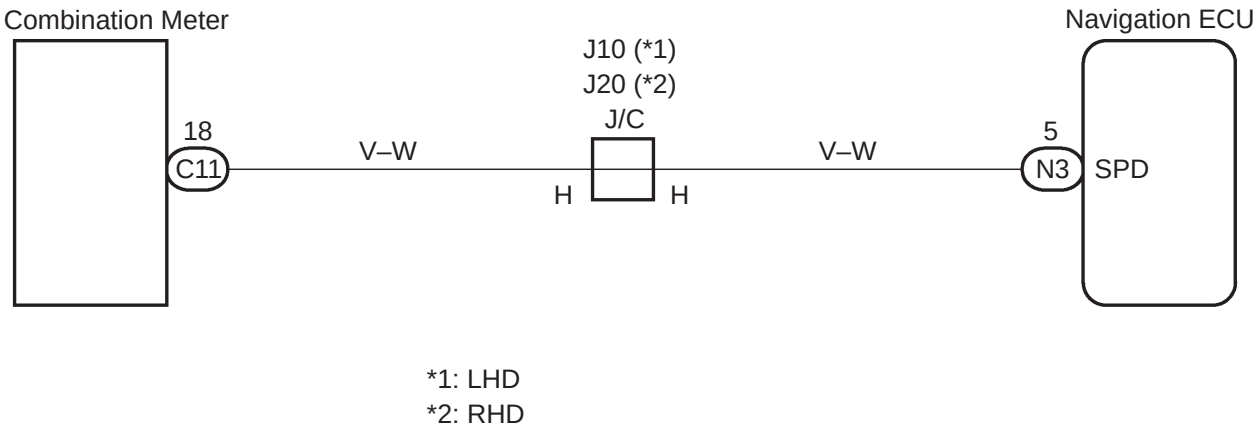
OK → **REPLACE NAVIGATION ECU (See page 67–27)**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

VEHICLE POSITION MARK ROTATES ARBITRARILY (MAP ROTATES ARBITRARILY)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK AND OPERATE AGAIN

(a) Turn the ignition switch from OFF to ON, check that the malfunction disappears.
Standard: Malfunction disappears

HINT:
Even if the system works correctly, the following conditions may be seen: vehicle position mark turns, or the map turns unwillingly. (It is because by turning the IG switch to ACC or ON during turning, navigation system stores based on the angular speed). In that case, turn the IG switch from OFF to ACC or ON to return the correct function.

OK	SYSTEM OK

NG

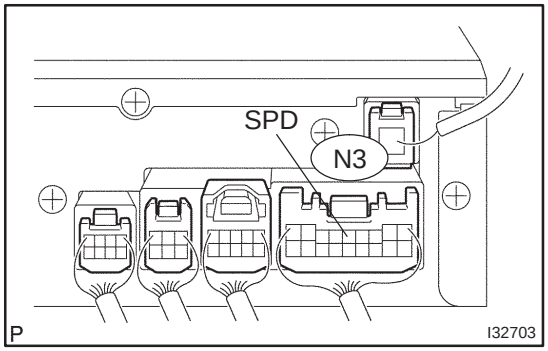
2	NAVIGATION CHECK MODE(VEHICLE SENSORS)

(a) Check the vehicle input signals.
(1) Start up the diagnosis system and read the ”SPD” signal in vehicle sensors mode.
Standard: Input signal is normal

OK	REPLACE NAVIGATION ECU (See page 67–27)

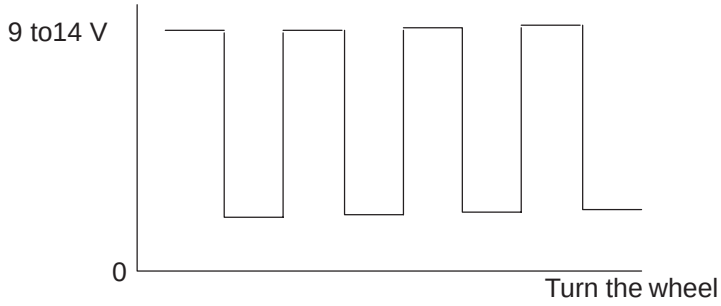
NG

3	INSPECT NAVIGATION ECU(SPD)



(a) Remove the navigation ECU.
(b) Check the voltage.
  (1) Shift the shift lever to neutral.
  (2) Jack up either one of the front wheels.
  (3) Turn ignition switch ON.
  (4) Measure the voltage between the terminal SPD of navigation ECU and body ground when the front wheel are turned slowly.

Standard: Voltage is pulsed.



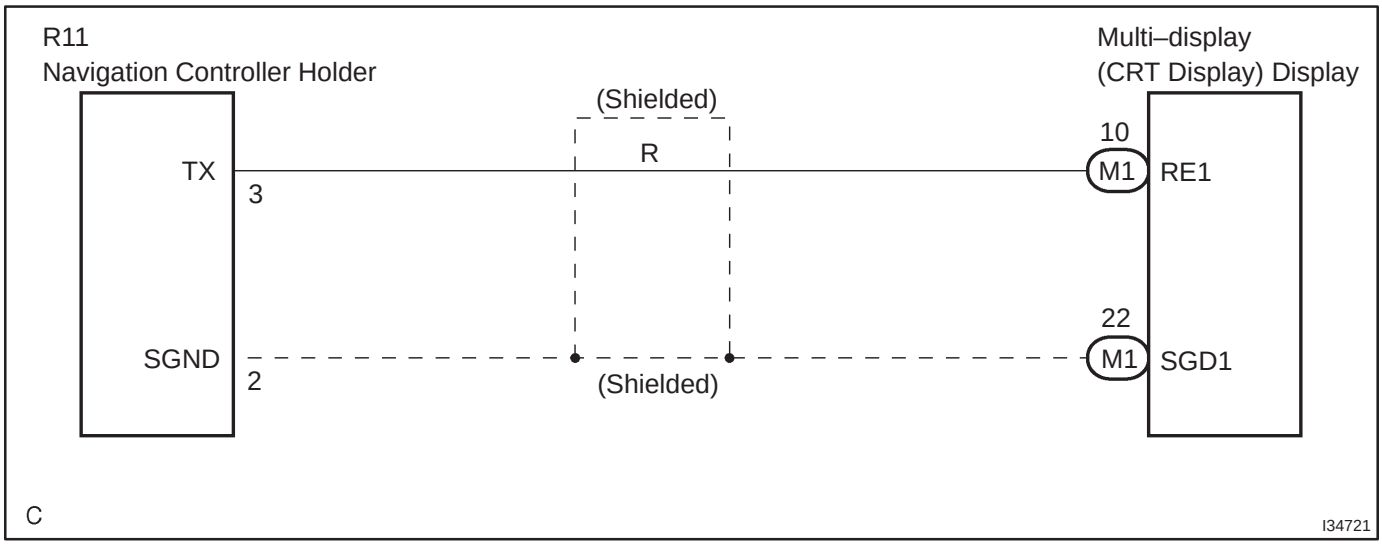
OK → **REPLACE NAVIGATION ECU**
(See page 67–27)

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

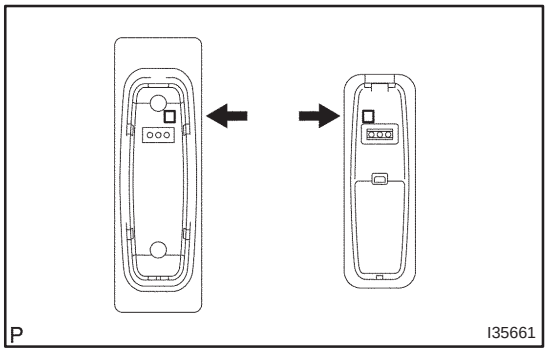
WHEN MOUNT THE NAVIGATION CONTROLLER ASSY TO THE NAVIGATION CONTROLLER HOLDER, IT CANNOT BE OPERATED

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CLEAN THE INFRARED RAY EMITTED PORTION



(a) Clean the infrared ray emitted portion.
  (1) Clean the infrared ray emitted portion on the navigation controller holder and navigation controller assy.
  (2) Check whether the same malfunction occurs.

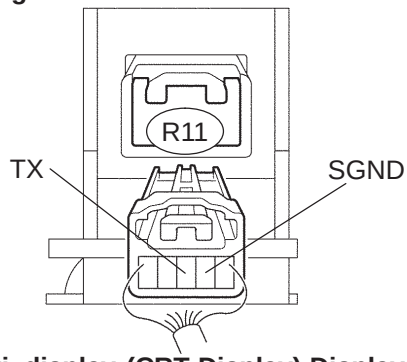
Standard: The function returns to normal.

OK	**DIRT AT THE INFRARED RAY EMITTED PORTION**

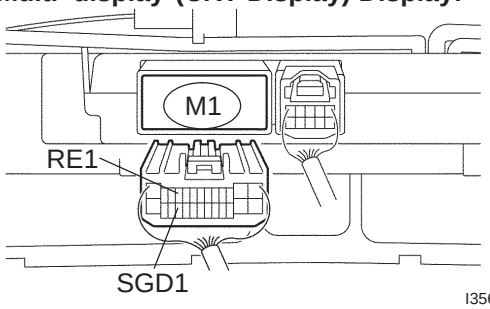
NG

2	CHECK HARNESS OR CONNECTOR(NAVIGATION CONTROLLER HOLDER – MULTI–DISPLAY (CRT DISPLAY) DISPLAY)

Navigation Controller Holder:



Multi–display (CRT Display) Display:



(a) Disconnect the connectors from the navigation controller assy and multi–display (CRT display) display.

(1) Check continuity between the terminals at each condition, as shown in the chart.

Standard:

Tester connecter	Specified condition
TX – RE1	Continuity
SGND – SGD1	Continuity

(2) Check for a short between the terminals at each condition, as shown in the chart

Standard:

Tester connecter	Specified condition
TX – Body ground	No continuity
SGND – Body ground	Continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	REPLACE NAVIGATION CONTROLLER HOLDER

Standard: Normally returns.

OK → **SYSTEM OK**

NG

4	REPLACE NAVIGATION CONTROLLER ASSY

Standard: Normally returns.

OK → **SYSTEM OK**

NG

REPLACE MULTI–DISPLAY (CRT DISPLAY) DISPLAY (See page 67–6)

05C8A–01

PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
All doors cannot be locked/unlocked at once	3. DOOR fuse 4. ECU–B 2 fuse 5. Power window regulator master switch assy 6. Front door lock assy LH, RH (Driver side) 7. Instrument panel J/B assy (Integration relay) 8. Wire harness	05–1546
Key lock–in prevention function does not work properly (Manual operation and operation interlocked with key are active)	1. Unlock warning switch assy 2. Courtesy lamp switch assy LH, RH (Driver side) 3. Instrument panel J/B assy (Integration relay) 4. Wire harness	05–1555
w/ Double lock: Double lock function does not operate properly	1. Wireless system 2. DOOR fuse 3. ECU–B 2 fuse 4. Front door lock assy LH, RH 5. Rear door lock assy LH, RH 6. Instrument panel J/B assy (Integration relay) 7. Wire harness	05–1560

05C85–01

CUSTOMER PROBLEM ANALYSIS CHECK

POWER DOOR LOCK CONTROL SYSTEM Check Sheet

Inspector's name:_____

Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	km miles

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Sometimes (Times per day, month) ☐ Once only
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others
	Outdoor temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °C (°F))

Problem Symptoms	☐ Malfunction in Door Lock/Unlock Operation Using Door Lock Control Switch	☐ Driver side door lock control switch	☐ Driver side door ☐ Passenger side door ☐ Rear left door ☐ Rear right door ☐ Luggage door ☐ Back door
	☐ Malfunction in Door Lock/Unlock Operation Using Key	☐ Driver side door key lock and unlock control switch	☐ Driver side door ☐ Passenger side door ☐ Rear left door ☐ Rear right door ☐ Luggage door ☐ Back door
	☐ Malfunction in Key Lock–in Prevention Function		
	☐ w/ Double Lock: Malfunction in Double Locking Function System		
	☐ Others		

05C87–01

CUSTOMIZE PARAMETERS

HINT:

The following items can be customized.

NOTICE:

- **After confirming whether the items requested by the customer are applicable or not for customization, perform the customize operation.**
- **Be sure to record the current settings before customizing.**
- **When troubleshooting, make sure that the item in question is not set to ”OFF” as a result of customization.**

Standard (Integration relay):

DISPLAY (ITEM)	DEFAULT	CONTENTS	SETTING
AUTO LOCK DELAY	30s	Function that selects AUTO LOCK time 30 sec. or 60 sec.	30s/60s
ALL UNLK/OPN–CL (All unlock w/ D door open–close)	OFF	Function that unlocks all other doors when opening driver side door within 10 seconds after turning the ignition switch to OFF from ON	ON/OFF

DOUBLE LOCK FUNCTION DOES NOT OPERATE PROPERLY

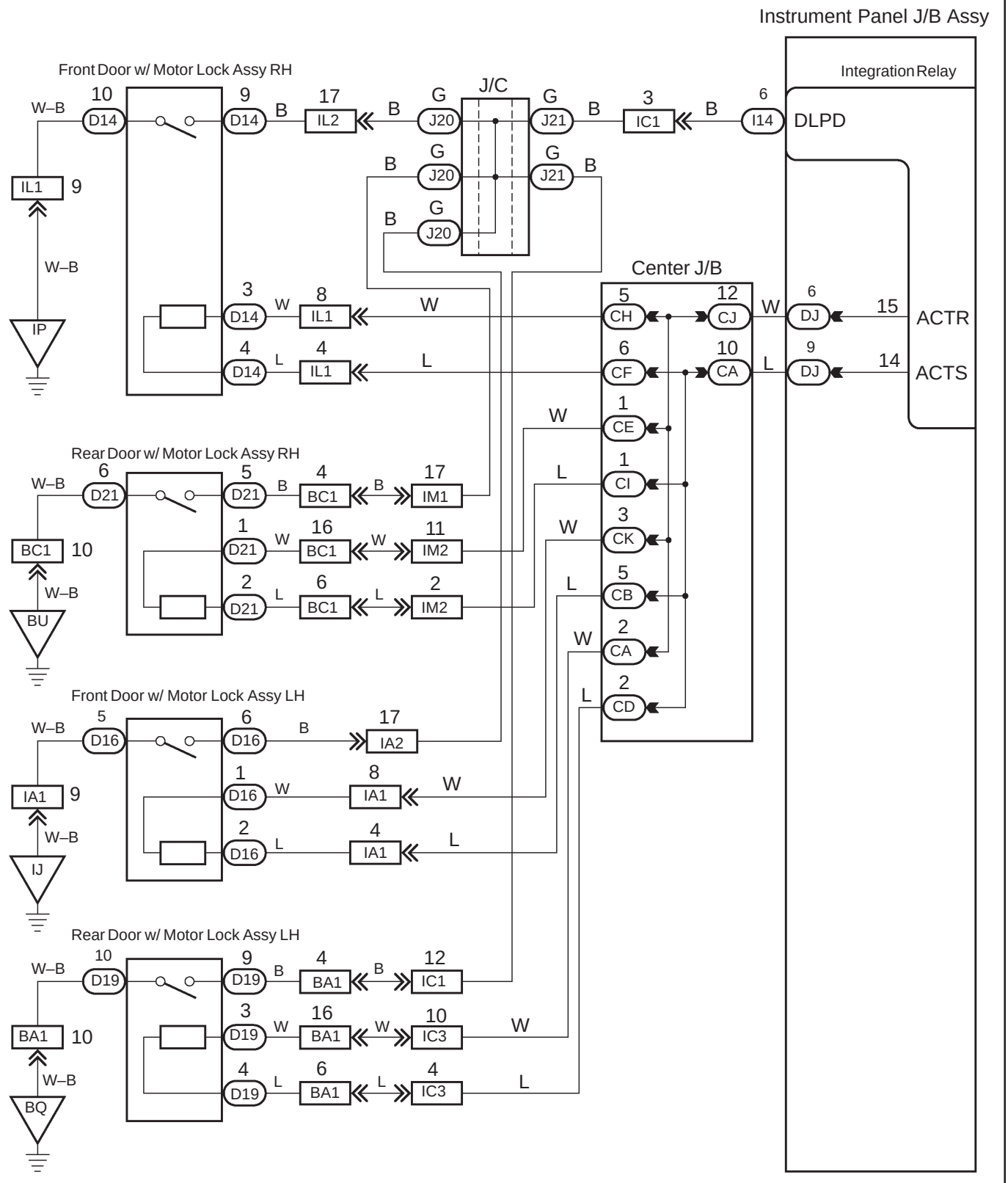
CIRCUIT DESCRIPTION

RHD Models w/ Double Lock Only:

All the doors except the back door have the double locking system. This system is set and unset by the integration relay. When the integration relay receives a request signal from the wireless transmitter (See page 73–1) to set or unset the double locking system, it drives the double lock motor built into each door lock according to the condition of all the double lock position switches, thus causing the double locking system to be set and unset.

WIRING DIAGRAM

RHD Models w/ Double Lock Only



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INSPECTION PROCEDURE

1	INSPECT WIRELESS DOOR LOCK OPERATION

(a) Check that the doors can be normally locked and unlocked by the wireless operation.

NG → **GO TO WIRELESS DOOR CONTROL SYSTEM (See page 05–1568)**

OK

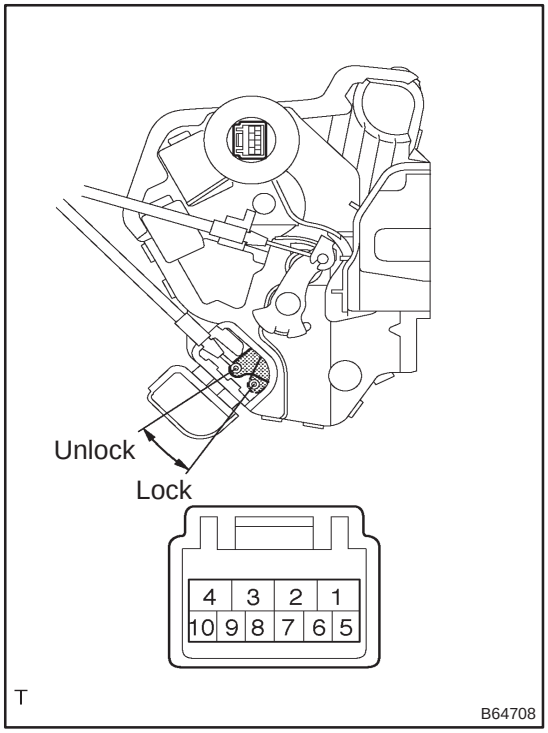
2	INSPECT FUSE (ECU–B 2, DOOR)

(a) Inspect the ECU–B 2 and DOOR fuses (See page 68–1).

NG → **REPLACE FUSE**

OK

3 INSPECT FRONT DOOR W/MOTOR LOCK ASSY RH



(a) Front Door w/ Motor Lock Assy RH:
Inspect operation of the double lock motor.

(1) Apply battery voltage and set the door lock motor to set.

(2) Apply battery voltage to the double lock motor and inspect operation.

Standard:

Measurement Condition	Specified Condition
Battery positive (+) → Terminal 4 Battery negative (–) → Terminal 3	Double locking system is Set
Battery positive (+) → Terminal 3 Battery negative (–) → Terminal 4	Double locking system is Unset

(3) Check that the doors cannot be unlocked by operating the control cable while the double locking system is set.

(4) Inspect the resistance of the double lock position switch.

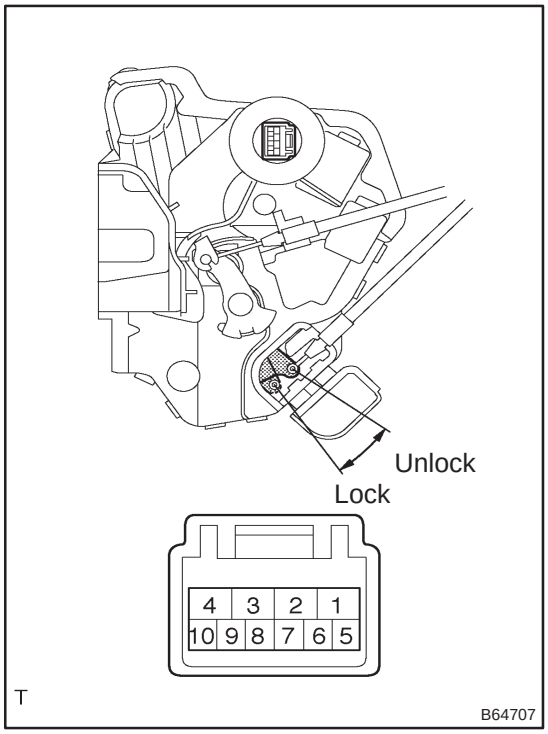
Standard:

Tester Connection	Double Lock Position	Specified Condition
9 – 10	SET	Below 1 Ω
	UNSET	10 kΩ or higher

NG → **REPLACE FRONT DOOR W/MOTOR LOCK ASSY RH**

OK

4 INSPECT FRONT DOOR W/MOTOR LOCK ASSY LH



(a) Front Door w/ Motor Lock Assy LH:
Inspect operation of the double lock motor.
(1) Apply battery voltage and set the door lock motor to set.
(2) Apply battery voltage to the double lock motor and inspect operation.

Standard:

MeasurementCondition	SpecifiedCondition
Battery positive (+) → Terminal 2 Battery negative (–) → Terminal 1	Double locking system is Set
Battery positive (+) → Terminal 1 Battery negative (–) → Terminal 2	Double locking system is Unset

(3) Check that the doors cannot be unlocked by operating the control cable while the double locking system is set.
(4) Inspect the resistance of the double lock position switch.

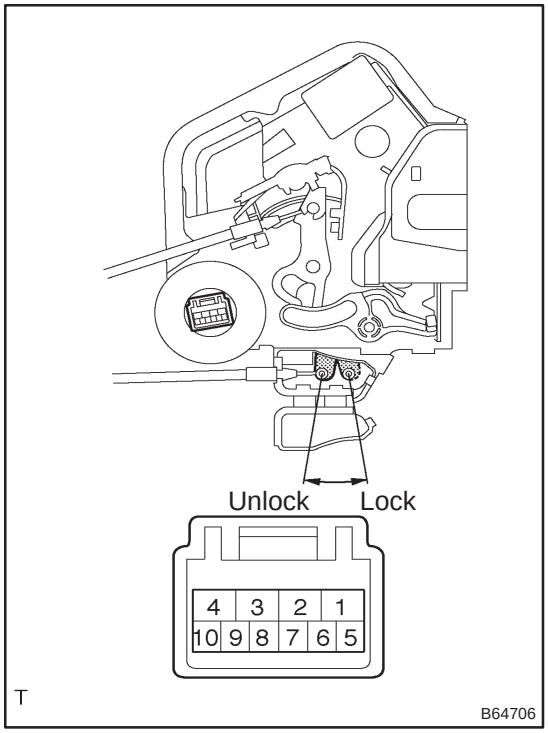
Standard:

Tester Connection	Double Lock Position	SpecifiedCondition
5 – 6	SET	Below 1 Ω
	UNSET	10 kΩ or higher

NG → **REPLACE FRONT DOOR W/MOTOR LOCK ASSY LH**

OK

5 INSPECT REAR DOOR W/MOTOR LOCK ASSY RH



(a) Rear Door w/ Motor Lock Assy RH:
Inspect operation of the double lock motor.

(1) Apply battery voltage and set the door lock motor to set.

(2) Apply battery voltage to the double lock motor and inspect operation.

Standard:

Measurement Condition	Specified Condition
Battery positive (+) → Terminal 2 Battery negative (–) → Terminal 1	Double locking system is Set
Battery positive (+) → Terminal 1 Battery negative (–) → Terminal 2	Double locking system is Unset

(3) Check that the doors cannot be unlocked by operating the control cable while the double locking system is set.

(4) Inspect the resistance of the double lock position switch.

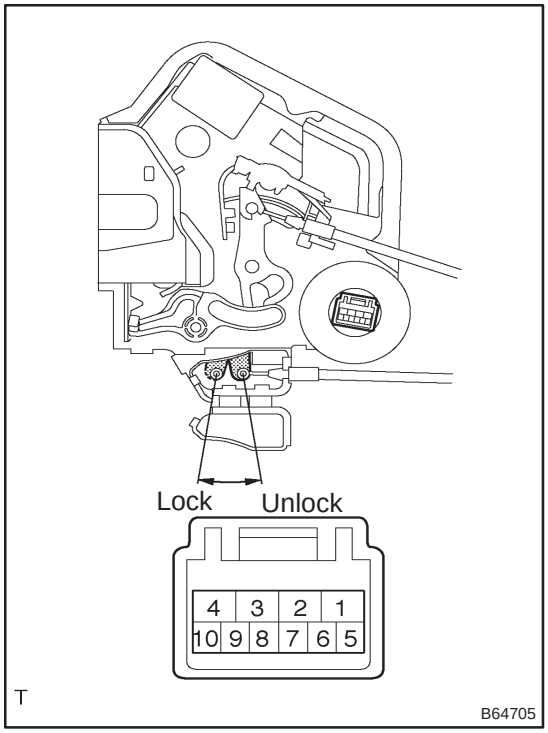
Standard:

Tester Connection	Double Lock Position	Specified Condition
5 – 6	SET	Below 1 Ω
	UNSET	10 kΩ or higher

NG → **REPLACE REAR DOOR W/MOTOR LOCK ASSY RH**

OK

6 INSPECT REAR DOOR W/MOTOR LOCK ASSY LH



(a) Rear Door w/ Motor Lock Assy LH:
Inspect operation of the double lock motor.

(1) Apply battery voltage and set the door lock motor to set.

(2) Apply battery voltage to the double lock motor and inspect operation.

Standard:

Measurement Condition	Specified Condition
Battery positive (+) → Terminal 4 Battery negative (–) → Terminal 3	Double locking system is Set
Battery positive (+) → Terminal 3 Battery negative (–) → Terminal 4	Double locking system is Unset

(3) Check that the doors cannot be unlocked by operating the control cable while the double locking system is set.

(4) Inspect the resistance of the double lock position switch.

Standard:

Tester Connection	Double Lock Position	Specified Condition
9 – 10	SET	Below 1 Ω
	UNSET	10 kΩ or higher

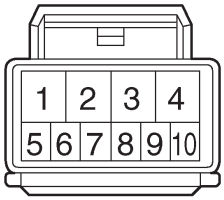
NG → **REPLACE REAR DOOR W/MOTOR LOCK ASSY LH**

OK

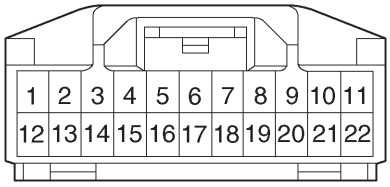
7	CHECK WIRE HARNESS (DOOR LOCK – INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY))

Wire Harness Side

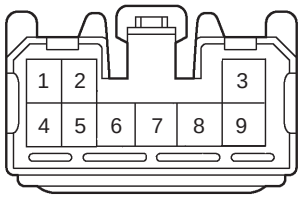
D14*1, D21*2, D16*3, D19*4
Door Lock



I14
Instrument Panel J/B Assy
(Integration Relay)



DJ
Instrument Panel J/B Assy



T *1 Driver side *2 Passenger side
*3 Rear right side *4 Rear left side

B70501

(a) Disconnect the D14, D21, D16 or D19 door lock and the I14 and DJ J/B connectors.

(b) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
D14–9 – I14–6 (DLPD)	Below 1 Ω
D21–5 – I14–6 (DLPD)	
D16–6 – I14–6 (DLPD)	
D19–9 – I14–6 (DLPD)	
D14–4 – DJ–8 (ACTS)	
D21–2 – DJ–8 (ACTS)	
D16–2 – DJ–8 (ACTS)	
D19–4 – DJ–8 (ACTS)	
D14–3 – DJ–9 (ACTR)	
D21–1 – DJ–9 (ACTR)	
D16–1 – DJ–9 (ACTR)	
D19–3 – DJ–9 (ACTR)	

(c) Check the resistance between the D14, D21, D16 or D19 door lock connector and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
D14–10 – Body ground	Below 1 Ω
D21–6 – Body ground	
D16–5 – Body ground	
D19–10 – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

POWER DOOR LOCK CONTROL SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

05C84–01

HINT:

Troubleshoot in accordance with the procedures on the following pages.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS CHECK AND PROBLEM SYMPTOM

3	PROBLEM SYMPTOMS TABLE (See page 05–1545)

(a) When problem is not listed on problem symptoms table, proceed to A.

(b) When problem is listed on problem symptoms table, proceed to B.

B → Go to step 6

A

4	PERFORM TROUBLESHOOTING ACCORDING TO MALFUNCTION SYMPTOM

(a) Pre–check (See page 05–1536).
  (1) Inspection with the hand–held tester (ECU DATA LIST).
  (2) Inspection with the hand–held tester (ACTIVE TEST).

(b) On–vehicle inspection (See page 73–1).

(c) Inspection (See page 73–3).

(d) Terminals of ECU (See page 05–1542).

5	ADJUST, REPAIR OR REPLACE

END

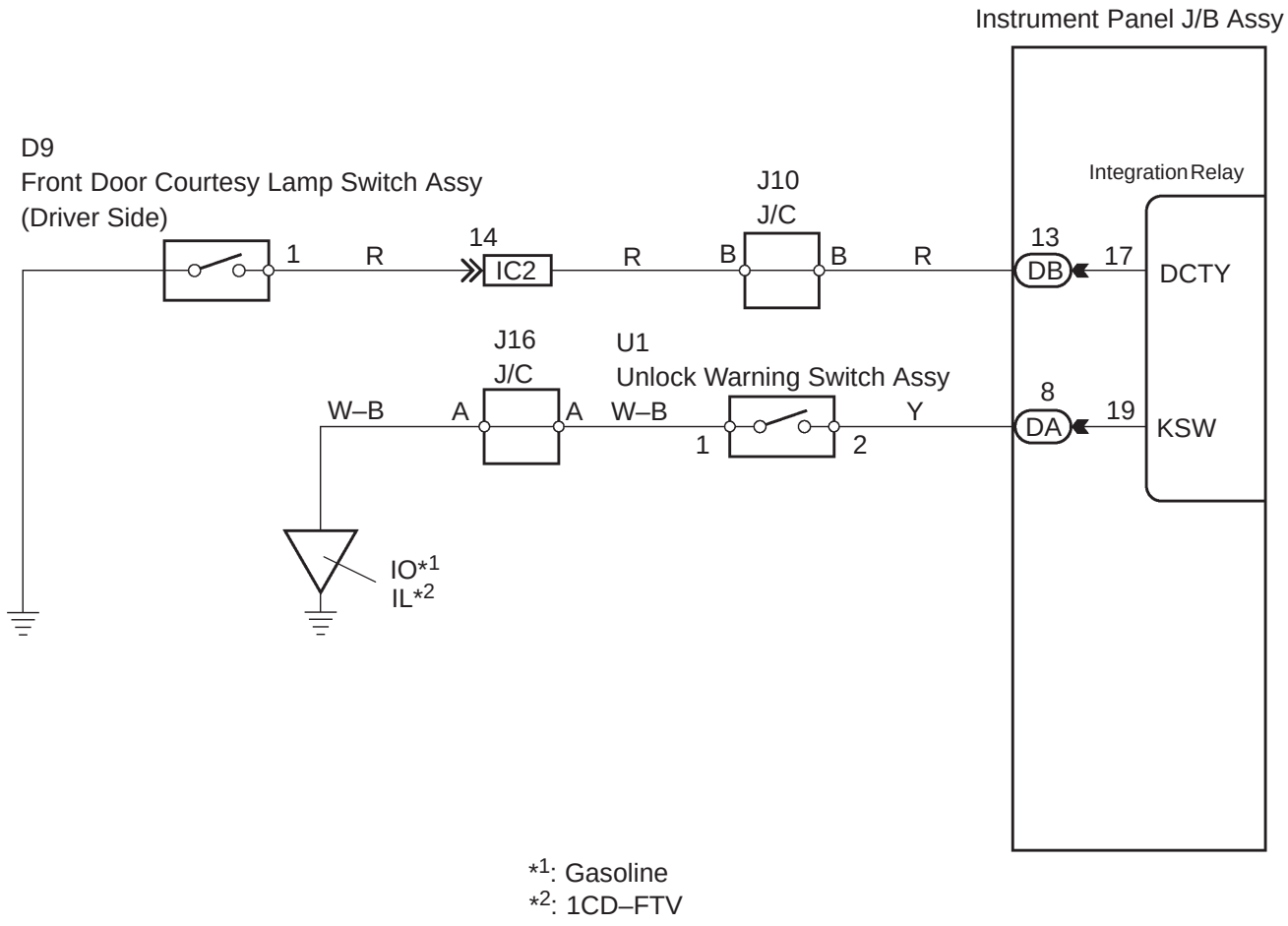
KEY LOCK–IN PREVENTION FUNCTION DOES NOT WORK PROPERLY (MANUAL OPERATION AND OPERATION INTERLOCKED WITH KEY ARE ACTIVE)

CIRCUIT DESCRIPTION

The unlock warning switch turns ON when the key is inserted into the ignition key cylinder. The courtesy lamp switch turns ON when the driver side door is opened. These 2 switches are monitored by the integration relay. In order to prevent the key from being locked in, the integration relay controls door locking operation according to the conditions of these switches so that the doors are not locked with the key locked in.

WIRING DIAGRAM

LHD models

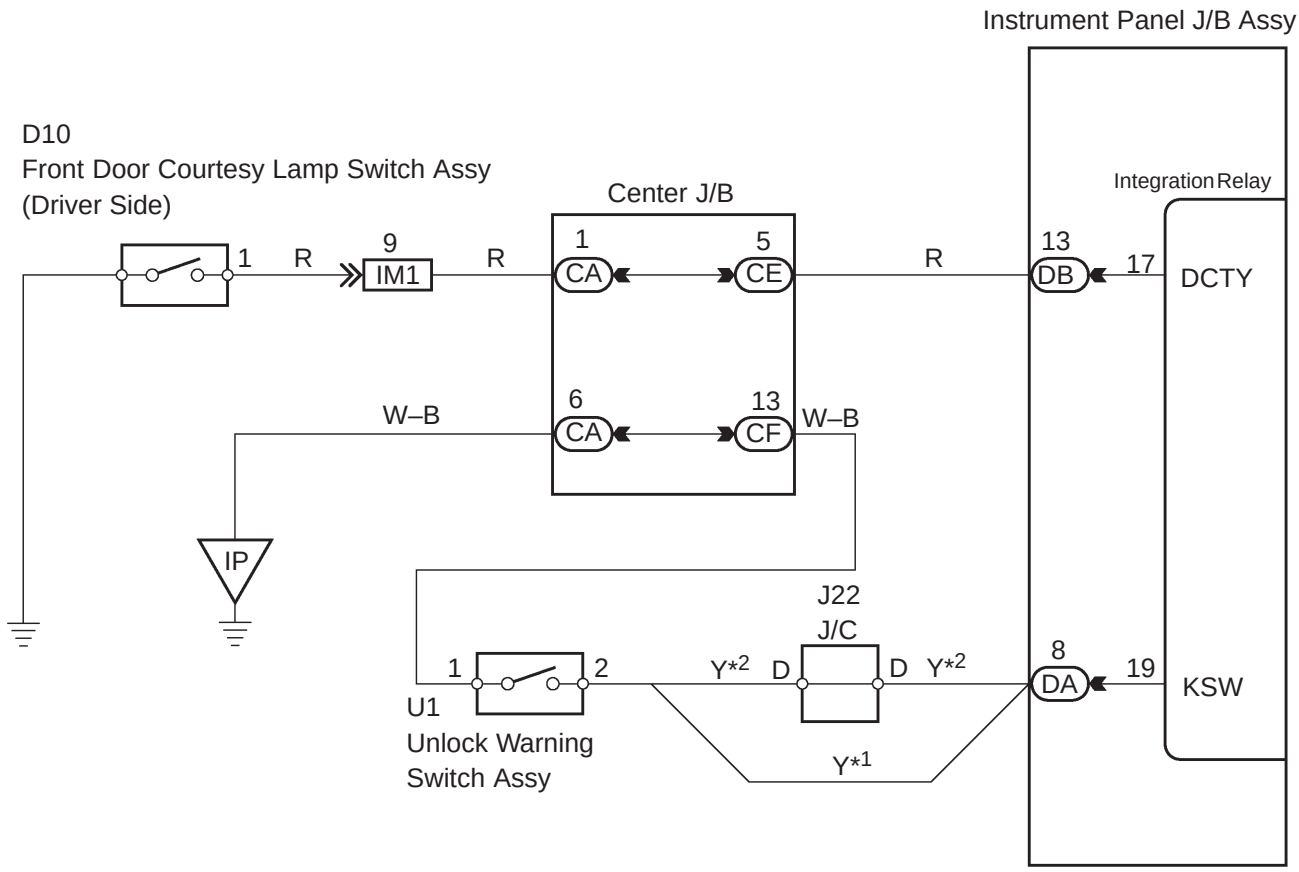


*1: Gasoline
*2: 1CD–FTV

T

B66819

RHD models



*1: 1AZ–FE
*2: Except 1AZ–FE

T

B66820

INSPECTION PROCEDURE

1 READ VALUE OF HAND–HELD TESTER

(a) Using the hand–held tester, check that the unlock warning switch signal is output when the switch is operated.

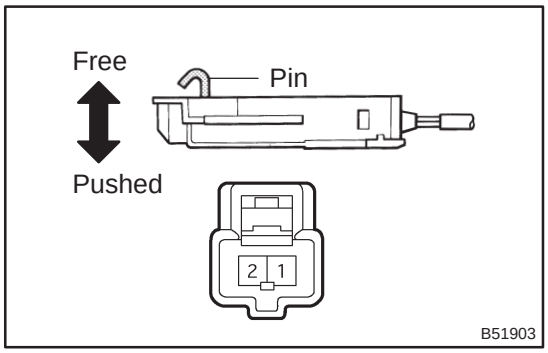
Standard (Integration relay):

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
KEY UNLK WRN SW	Unlock warning switch signal /ON or OFF	ON: Key is in ignition key cylinder OFF: No key is in ignition key cylinder	–

OK → **Go to step 4**

NG

2 INSPECT UNLOCK WARNING SWITCH ASSY



(a) Remove the unlock warning switch.

(b) Inspect the resistance of the switch.

Standard:

Tester Connection	Switch Position	Specified Condition
1 – 2	Free (Key removed)	10 kΩ or higher
	Pushed (Key set)	Below 1 Ω

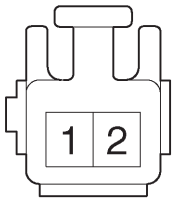
NG → **REPLACE UNLOCK WARNING SWITCH ASSY**

OK

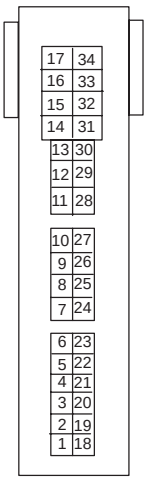
3 CHECK WIRE HARNESS (UNLOCK WARNING SWITCH ASSY – INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY))

Wire Harness Side

U1
Unlock Warning Switch Assy



DA
Instrument Panel J/B Assy



B70499

(a) Disconnect the U1 switch and DA J/B connectors.
(b) Check the continuity between the wire harness connectors.

Standard (Check for open):

Tester Connection	Specified Condition
U1–2 – DA–8 (KSW)	Below 1 Ω

(c) Check the resistance between the U1 switch connector and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
U1–1 – Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

4 READ VALUE OF HAND–HELD TESTER

(a) Using the hand–held tester, check that the driver side door courtesy lamp switch signal is output when the switch is operated.

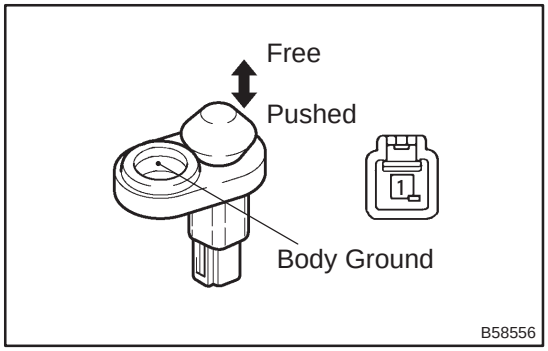
Standard (Integration relay):

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
D DOR CTY SW	Driver side door courtesy switch signal /ON or OFF	ON: Driver side door is open OFF: Driver side door is closed	–

OK → **REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY**

NG

5 INSPECT FRONT DOOR COURTESY LAMP SWITCH ASSY (DRIVER SIDE)



(a) Remove the courtesy lamp switch.
(b) Inspect the resistance of the switch.

Standard:

Tester Connection	Switch Position	Specified Condition
1 – Body ground	Free	Below 1 Ω
	Pushed	10 kΩ or higher

NG → **REPLACE FRONT DOOR COURTESY LAMP SWITCH ASSY (DRIVER SIDE)**

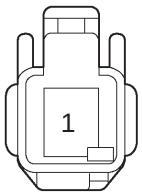
OK

6 CHECK WIRE HARNESS (COURTESY LAMP SWITCH (DRIVER SIDE) – INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY), BODY GROUND)

Wire Harness Side

D9*1, D10*2

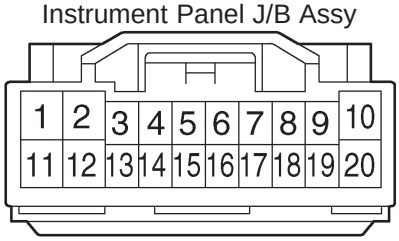
Courtesy Lamp Switch (Driver Side)



*1LHD models
*2RHD models

DB

Instrument Panel J/B Assy



B70500

(a) Disconnect the D9, D10 switch and the DB J/B connectors.
(b) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
D9, D10–1 – DB–13 (DCTY)	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

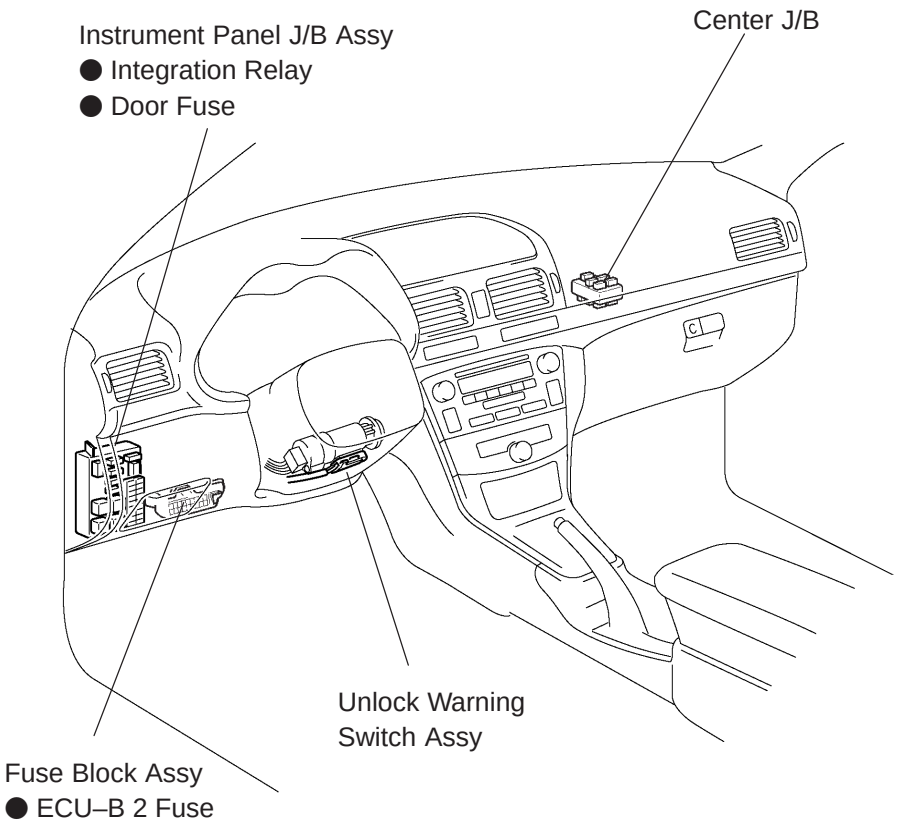
OK

REPLACE INSTRUMENT PANEL JUNCTION BLOCK ASSY

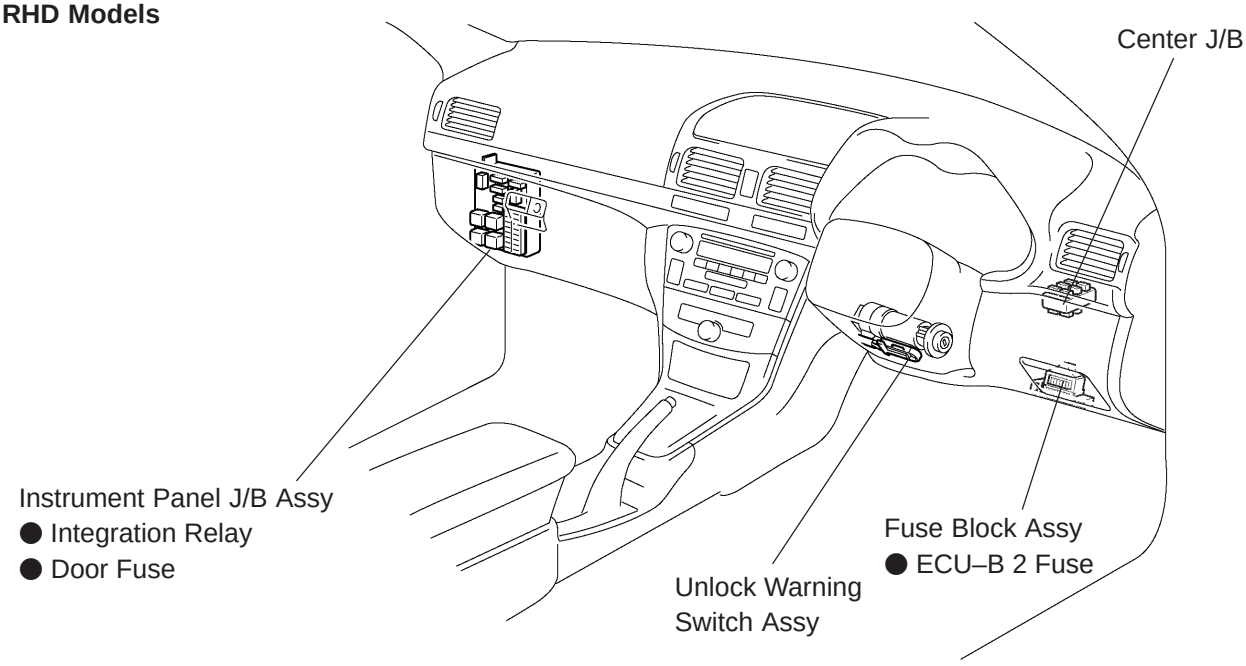
05C88–01

LOCATION

LHD Models



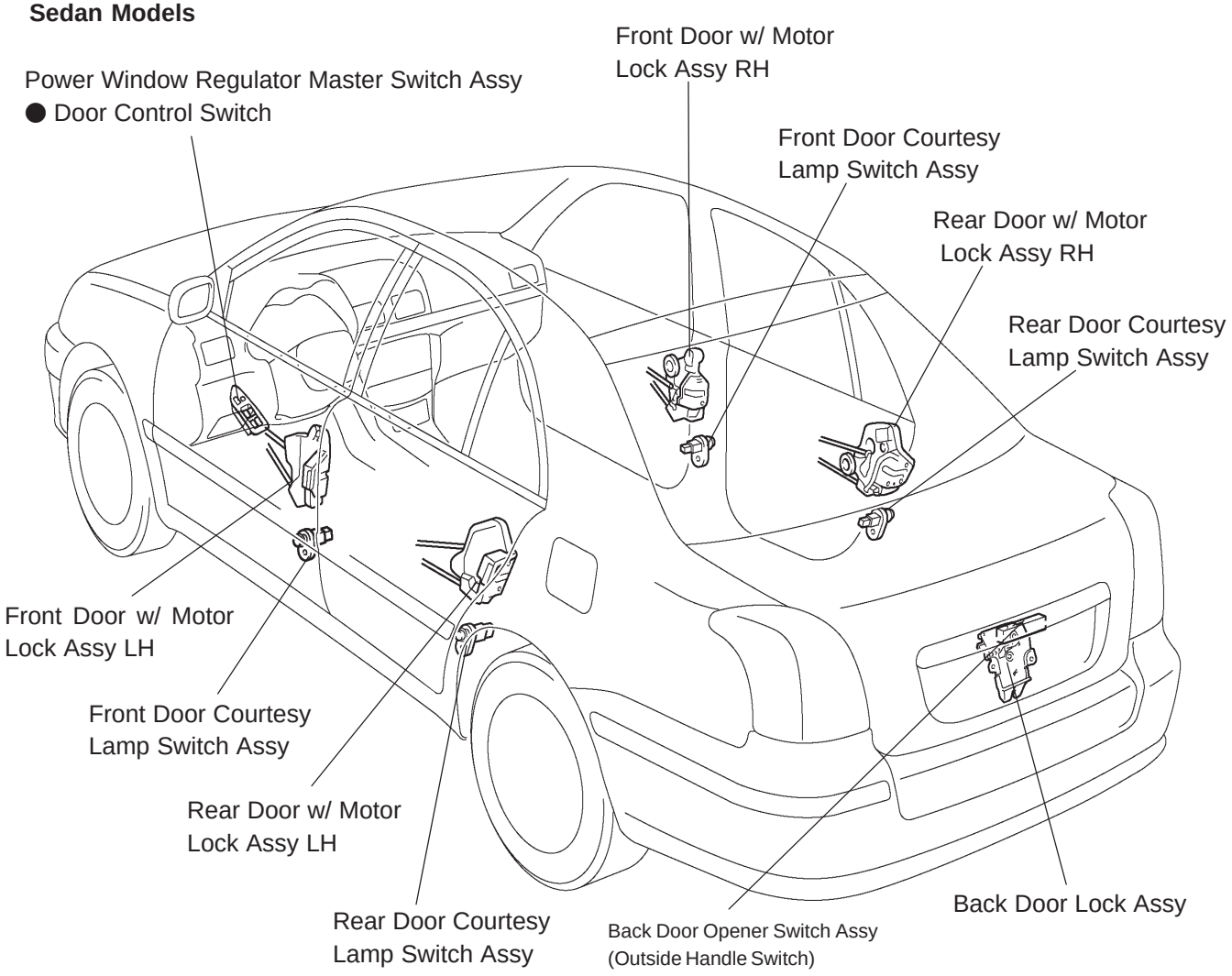
RHD Models



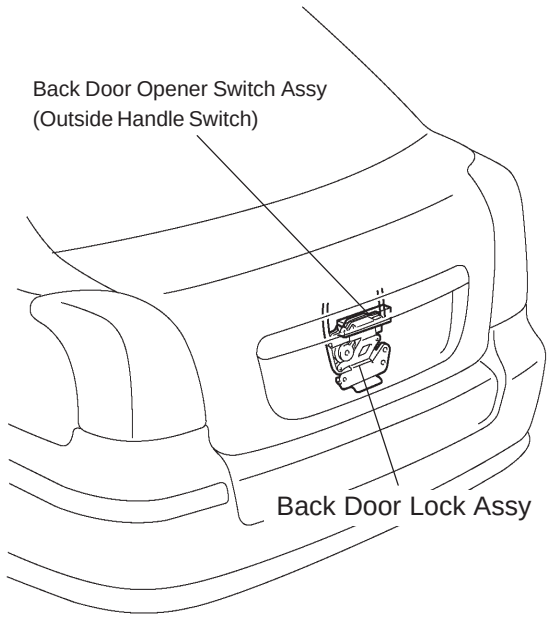
B68459
B70503
B70504
Y

B70813

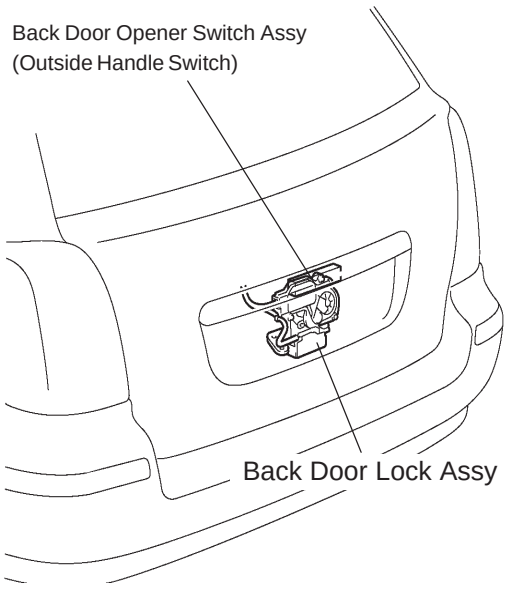
Sedan Models



Liftback Models

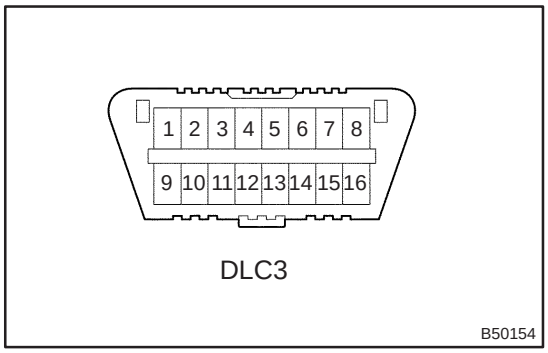


Wagon Models



B70496

PRE–CHECK



1. DIAGNOSIS SYSTEM

(a) Inspect the DLC3.

HINT:

The vehicle's ECM uses the ISO 14230 (M–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–03 and matches the ISO 14230 format.

Tester Connection	Condition	Specified Condition
7 (Bus + line) – 5 (Signal ground)	During communication	Pulse generation
4 (Chassis ground) – Body ground	Constant	Below 1 Ω
5 (Signal ground) – Body ground	Constant	Below 1 Ω
16 (B+) – Body ground	Constant	9 to 14 V

HINT:

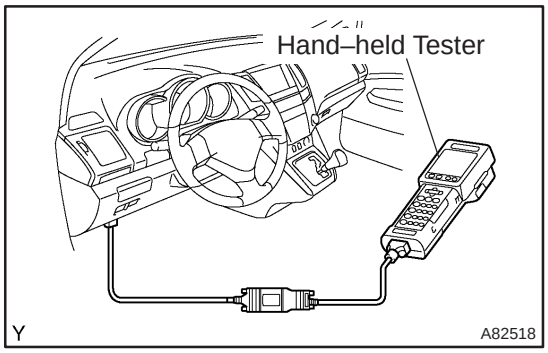
If the display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and used the hand–held tester, there is a problem on the vehicle side or tester side.

- If communication is normal when the tester is connected to another vehicle, inspect the DLC3 of the original vehicle.
- If communication is still impossible when the tester is connected to another vehicle, the problem is probably in the tester itself, so consult the Service Department listed in the tester's manual.

(b) Check the battery voltage.

Battery voltage: 11 to 14 V

If voltage is below 11V, recharge the battery before proceeding.



2. USING HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.

(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:

The hand–held tester has a "Snapshot" function which records the monitored data.

Refer to the hand–held tester operator's manual for further details.

3. DATA LIST

HINT:

According to the DATA LIST displayed by the hand–held tester, you can read the value of the switch, sensor, actuator, etc. without parts removal. Reading the DATA LIST as the first step of troubleshooting is one way to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) Read the DATA LIST according to the display on the tester.

Standard (Integration relay):

Item	MeasurementItem/Display (Range)	NormalCondition	Diagnostic Note
KEY UNLK WRN SW	Unlock warning switch signal /ON or OFF	ON: Key is in ignition key cylinder OFF: No key is in ignition key cylinder	–
D DOR CTY SW	Driver side door courtesy switch signal /ON or OFF	ON: Driver side door is open OFF: Driver side door is closed	–
P DOR CYT SW	Passenger side door courtesy switch signal /ON or OFF	ON: Passenger side door is open OFF: Passenger side door is closed	–
Rr DOR CTY SW	Rear door courtesy switch signal /ON or OFF	ON: Either right or left rear door is open OFF: Both right and left rear doors are closed	–
P LOCK POS SW	Passenger side door lock position switch signal /ON or OFF	ON: Passenger side door lock is in unlock position OFF: Passenger side door lock is in lock position	–
Rr LOCK POS SW	Rear door lock position switch signal /ON or OFF	ON: Rear door lock is in unlock position OFF: Rear door lock is in lock position	–
IG SW	IG switch signal /ON or OFF	ON: Key is in ON or START position OFF: Key is in OFF or ACC position	–
D LOCK POS SW	Driver side door lock position switch signal /ON or OFF	ON: Driver side door lock is in unlock position OFF: Driver side door lock is in lock position	–
D/L SW–LOCK	Manual door lock switch LOCK signal /ON or OFF	ON: Manual door lock switch is in lock position OFF: Manual door lock switch is in original position (Common to driver side and passenger side model)	–
D/L SW–UNLOCK	Manual door lock switch UNLOCK signal /ON or OFF	ON: Manual door lock switch is in unlock position OFF: Manual door lock switch is in original position (Common to driver side and passenger side model)	–
DOR KEY SW–LOCK	Key operation door lock switch signal /ON or OFF	ON: Key operation door lock switch is in lock position OFF: Key operation door lock switch is in original position (Common to driver side and passenger side model)	–
P DOR KEY SW–UL	Key operation passenger door unlock switch signal /ON or OFF	ON: Passenger key operation door lock switch is in unlock position OFF: Passenger key operation door lock switch is in neutral position	–
D DOR KEY SW–UL	Key operation driver door unlock switch signal /ON or OFF	ON: Driver key operation door lock switch is in unlock position OFF: Driver key operation door lock switch is in original position	–
ALL UNLK/OPN–CL	Driver side door courtesy switch signal /ON or OFF	ON: All doors unlock when driver side door is opened OFF: Other doors do not unlock when driver side door is opened	–
OPEN DOOR WARN	Door courtesy switch signal /ON or OFF	ON: Either door is open OFF: All doors are closed	–
AUTO LOCK DELAY	Door courtesy switch signal /60s or 30s	60s: Door auto locking time is 60 sec. 30s: Door auto locking time is 30 sec.	–

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
DOOR HANDLE SW	Back door opener switch signal (Outside handle switch) /ON or OFF	ON: Back door opener switch is pushed OFF: Back door opener switch is not pushed	–
LOCK STATUS	Back door position switch signal /UNLOCK or LOCK	UNLOCK: Back door is unlock LOCK: Back door is lock	–

4. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows you to operate the relay, VSV, actuator, etc. without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one way to shorten the labor time. It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) According to the display on the tester, perform the ACTIVE TEST.

Standard (Integration relay):

Item	Test Details	Diagnostic Note
DOOR LOCK	Operate door lock motor for all doors LOCK/OFF	–
DOOR LOCK	Operate door lock motor for all doors UNLOCK/OFF	–

05C8A–01

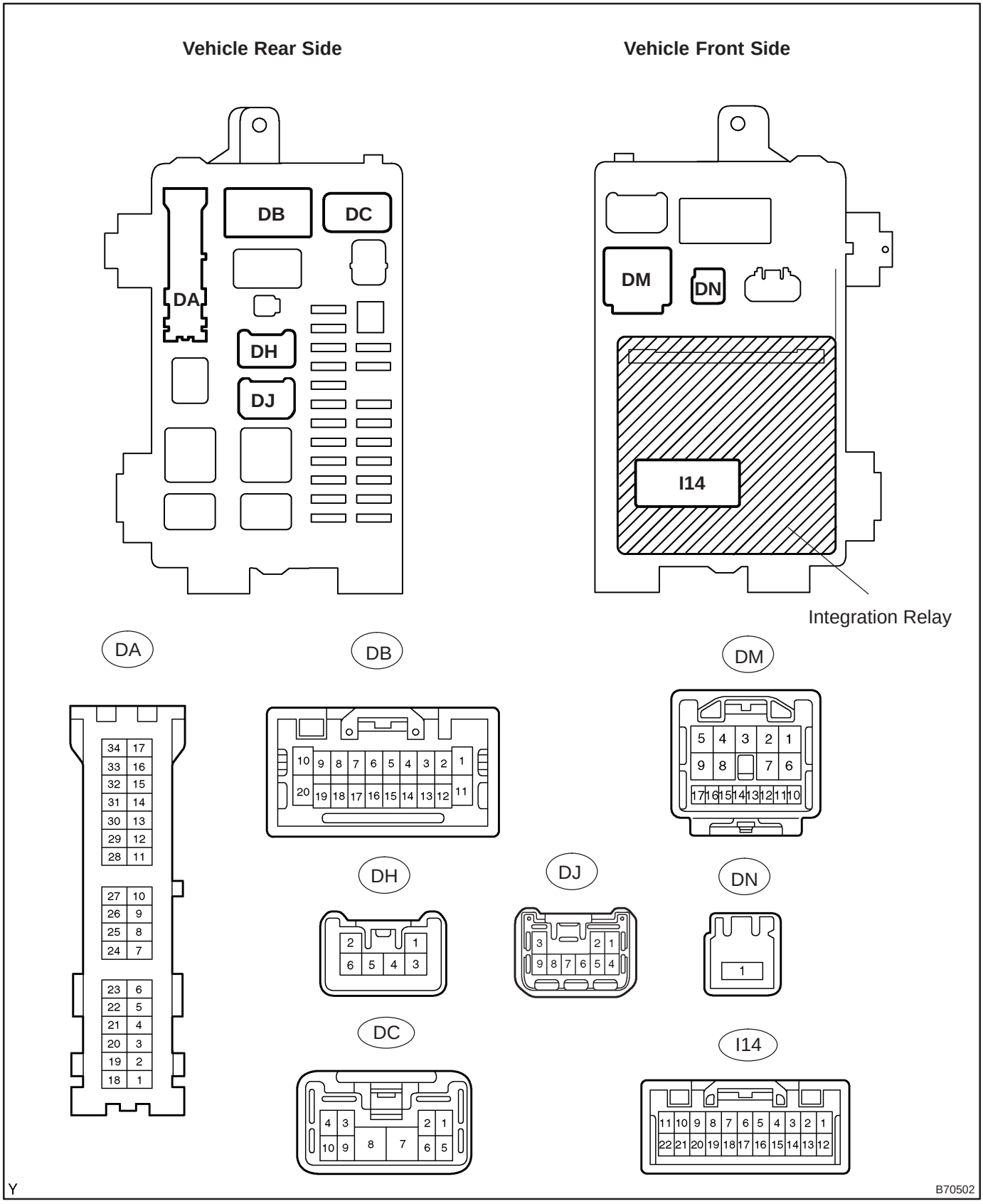
PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
All doors cannot be locked/unlocked at once	3. DOOR fuse 4. ECU–B 2 fuse 5. Power window regulator master switch assy 6. Front door lock assy LH, RH (Driver side) 7. Instrument panel J/B assy (Integration relay) 8. Wire harness	05–1546
Key lock–in prevention function does not work properly (Manual operation and operation interlocked with key are active)	1. Unlock warning switch assy 2. Courtesy lamp switch assy LH, RH (Driver side) 3. Instrument panel J/B assy (Integration relay) 4. Wire harness	05–1555
w/ Double lock: Double lock function does not operate properly	1. Wireless system 2. DOOR fuse 3. ECU–B 2 fuse 4. Front door lock assy LH, RH 5. Rear door lock assy LH, RH 6. Instrument panel J/B assy (Integration relay) 7. Wire harness	05–1560

05C89–01

TERMINALS OF ECU

1. CHECK INSTRUMENT PANEL J/B ASSY (INTEGRATION RELAY)



(a) Disconnect the DA, DB, DC, DM, DN and I14 J/B connectors.
(b) Check the voltage or continuity between each terminal of the wire harness side connectors and the body ground.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
KSW (DA–8) – Body ground	Y – Body ground	No key in ignition key cylinder → Key inserted	No continuity → Continuity
E (DA–9) – Body ground	W–B – Body ground	Constant	Continuity
B (DB–16) – Body ground	W–R – Body ground	Constant	10 to 14 V
B (DN–1) – Body ground	*1 B–G – Body ground	Constant	10 to 14 V
	*2 B–L – Body ground		
L1 (DA–29) – Body Ground	BR–W – Body ground	Door control switch (Master switch) OFF → LOCK	No continuity → Continuity
UL1 (DA–13) – Body Ground	G–W – Body ground	Door control switch (Master switch) OFF → UNLOCK	
L2 (I14–4) – Body Ground	*3 L–Y – Body ground	Driver door key cylinder OFF → LOCK	
	*4 L–R – Body ground		
UL2 (I14–5) – Body Ground	L – Body ground	Driver door key cylinder OFF → UNLOCK	
*3 BDSU (I14–10) – Body Ground	L–B – Body ground	*3 Luggage component door opener switch FREE → PUSHED *4 Back door opener switch FREE → PUSHED	
DCTY (DB–13) – Body Ground	R – Body ground	Driver door CLOSED → OPEN	10 kΩ or higher → Below 1 Ω
PCTY (DC–9) – Body Ground	R – Body ground	Passenger door CLOSED → OPEN	
RCTY (DM–12) – Body Ground	W–G – Body ground	Rear left door CLOSED → OPEN	
RCTY (DM–13) – Body Ground	W–G – Body ground	Rear right door CLOSED → OPEN	
*3 LGCY (I14–1) – Body Ground	R–Y – Body ground	Luggage door CLOSED → OPEN	
*4 BDCY (I14–12) – Body Ground	R–Y – Body ground	Back door CLOSED → OPEN	

HINT:
*1: Gasoline *2: 1CD–FTV engine *3: Sedan *4: Liftback and Wagon
If the result is not as specified, there may be a malfunction on the wire harness side.

(c) Reconnect the J/B connectors.

(d) Check the voltage between each terminal of the connectors and the body ground.

Standard:

Symbols (Terminal No.)	Wiring Color	Condition	Specified Condition
ACC (DH–3) – Body ground	G – Body ground	Ignition switch ACC	10 to 14 V
ACT+ (DJ–1) – Body Ground	L–R – Body ground	Door control switch (master switch) or door key cylinder OFF → LOCK	Below 1 V → 10 to 14 V → Below 1 V
ACT+ (DM–7) – Body Ground	L–R – Body ground		
ACT+ (DB–20) – Body Ground	L–R – Body ground		
ACT– (DJ–4) – Body Ground	L–B – Body ground	Door control switch (master switch) or door key cylinder OFF → UNLOCK	
ACT– (DM–6) – Body Ground	L–B – Body ground		
ACT– (DB–10) – Body Ground	L–B – Body ground		
LACT (DM–3) – Body Ground	L – Body ground	Back door opener switch (outside handle switch) OFF → ON	
LSWD (I14–3) – Body Ground	LG – Body ground	Driver door UNLOCK → LOCK	Below 1 V → 10 to 14 V
* LSWP (DB–8) – Body Ground	LG–B – Body ground	Passenger door UNLOCK → LOCK	
* LSWP (DA–20) – Body Ground	LG–B – Body ground	Rear right door UNLOCK → LOCK	
* LSWP (DM–10) – Body Ground	LG–B – Body ground	Rear left door UNLOCK → LOCK	
DLPD (I14–6) – Body Ground	B – Body ground	Double lock UNSET → SET	More than 5 V → Less than 1 V
* ACTS (DJ–8) – Body Ground	L – Body ground	Double lock UNSET → SET	Below 1 V → 10 to 14 V
* ACTR (DJ–9) – Body Ground	W – Body ground	Double lock SET → UNSET	

HINT:

*: Double Lock

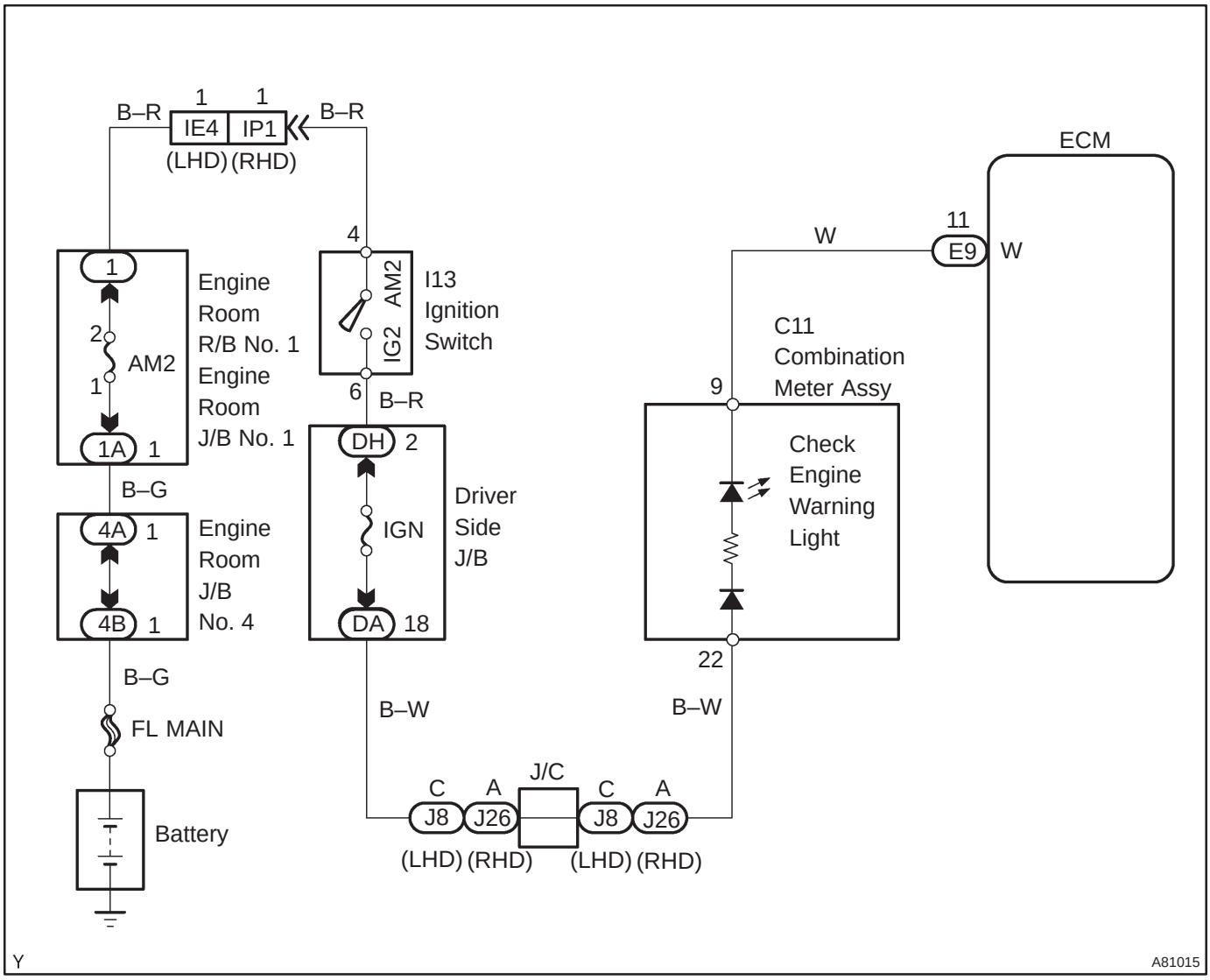
If the result is not as specified, the J/B assy (integration relay) may have a malfunction.

CHECK ENGINE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

If the ECM detects a trouble, the CHK ENG is illuminated. At this time, the ECM records a DTC in the memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below .

CHK ENG remains on	Start inspection from step 1
CHK ENG is not illuminate	Start inspection from step 3

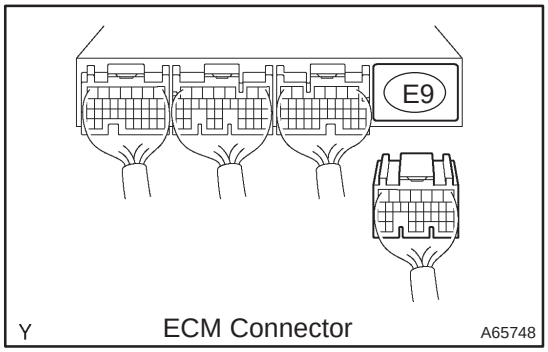
1	CLEAR DTC

(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Read the DTC (See page 05–149).
(d) Clear the DTC (See page 05–149).
(e) Check that the CHK ENG is OFF.
Standard: CHK ENG is OFF

OK → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE (See page 05–161)**

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E9 ECM connector.
(b) Turn the ignition switch ON.
(c) Check that the CHK ENG is OFF.
Standard: CHK ENG is OFF

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

CHECK AND REPAIR HARNESS AND CONNECTOR

3	CHECK CHK ENG CONDITION

(a) Check that the CHK ENG is illuminated when turning the ignition switch ON.
Standard: CHK ENG is illuminated

OK → **CHECK AND REPAIR HARNESS AND CONNECTOR**

NG

4	INSPECT COMBINATION METER ASSY(CHK ENG CIRCUIT)

(a) See the combination meter troubleshooting on page 05–1509.

NG → **REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLYSYSTEM OK**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR

05C6L–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

Customer's Name		VIN	
Driver's Name		Production Date	
Date Vehicle Brought in		Licence No.	
License No.		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx.____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of check engine warning light (CHK ENG)		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre–check)	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

05C6N–01

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your readings due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in the check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the ”See page ” under the respective ”DTC No.” in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0010/39 *4 (05–169)	Camshaft Position ”A” Actuator Circuit (Bank 1)	• Open or short in oil control valve (OCV) circuit • Oil control valve • ECM	○	○
P0011/59 *4 (05–174)	Camshaft Position ”A” –Timing Over–Advanced or System Performance (Bank 1)	• Valve timing • Oil control valve (OCV) • Camshaft timing gear assy • ECM	—	○
P0012/59 *4 (05–174)	Camshaft Position ”A” –Timing Over– Retarded (Bank 1)		—	○
P0016/18 *4 (05–181)	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM	—	○
P0031/21 *2, *4 (05–182)	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 1 Sensor 1)	• Open or short in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM	—	○
P0032/21 *2, *4 (05–182)	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 1 Sensor 1)		—	○
P0051/28 *2, *4 (05–182)	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 2 Sensor 1)		—	○
P0052/28 *2, *4 (05–182)	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 2 Sensor 1)		—	○
P0100/31 (05–186)	Mass Air Flow Circuit	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0102/31 (05–186)	Mass or volume Air Flow Circuit Low Input		○	○
P0103/31 (05–186)	Mass or volume Air Flow Circuit High Input		○	○
P0110/24 (05–194)	Intake Air Temperature Circuit	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built in mass air flow meter) • ECM	—	○
P0112/24 (05–194)	Intake Air Temperature Circuit Low Input		—	○
P0113/24 (05–194)	Intake Air Temperature Circuit High Input		—	○
P0115/22 (05–199)	Engine Coolant Temperature Circuit	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0117/22 (05–199)	Engine Coolant Temperature Circuit Low Input		○	○
P0118/22 (05–199)	Engine Coolant Temperature Circuit High Input		○	○
P0120/41 (05–204)	Throttle/Pedal Position Sensor/ Switch ”A” Circuit	• Throttle position sensor (built in throttle body) • ECM	—	○
P0122/41 (05–204)	Throttle/Pedal Position Sensor/ Switch ”A” Circuit Low Input	• Throttle position sensor (built in throttle body) • Short in VTA1 circuit • Open in VC circuit • ECM	—	○

P0123/41 (05–204)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	• Throttle position sensor (built in throttle body) • Open in VTA1 circuit • open in E2 circuit • VC and VTA1 circuit are short–circuited • ECM	—	○
P0136/27*4 (05–211)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay	—	○
P0141/27*4 (05–218)	Oxygen Sensor Heater Circuit malfunction (Bank 1 Sensor 2)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	—	○
P0156/29*4 (05–211)	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay	—	○
P0161/29*4 (05–218)	Oxygen Sensor Heater Circuit (Bank 2 Sensor 2)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	—	○
P0325/52 (05–222)	Knock Sensor 1 Circuit (Bank 1 or Single Sensor)	• Knock sensor 1 • Knock sensor 1 (under–torqued or loose) • ECM	○	○
P0327/52 (05–222)	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	• Short in knock sensor 1 circuit • Knock sensor 1 • ECM	○	○
P0328/52 (05–222)	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	• Open in knock sensor 1 circuit • Knock sensor 1 • ECM	○	○
P0335/12, 13 (05–226)	Crankshaft Position Sensor "A" Circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft) • ECM	○	○
P0339/13 (05–226)	Crankshaft Position Sensor "A" Circuit Intermittent		—	○
P0340/12 (05–229)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has jumped a tooth • ECM	○	○
P0341/12 (05–229)	Camshaft Position Sensor "A" CircuitRange/Performance (Bank 1 or Single Sensor)		○	○
P0351/14*3 (05–232)	Ignition Coil "A" Primary/Secondary Circuit	• Ignition system • Open or short in IGF or IGT1 to 4 circuit from ignition coil with igniter to ECM • No. 1 to No. 4 ignition coil with igniter • IG2 relay • ECM	○	○
P0352/15*3 (05–232)	Ignition Coil "B" Primary/Secondary Circuit		○	○
P0353/14*3 (05–232)	Ignition Coil "C" Primary/Secondary Circuit		○	○
P0354/15*3 (05–232)	Ignition Coil "D" Primary/Secondary Circuit		○	○
P0500/42 (05–240)	Vehicle Speed Sensor "A"	• Open or short in speed sensor circuit • Speed sensor • Combinationmeter • ECM • Skid control ECU	○	○
P0511/33 (05–243)	Idle Air Control Circuit	• Open or short in idle speed control (ISC) valve circuit • Idle speed control (ISC) valve is stuck or closed • A/C switch circuit • Air induction system • ECM	○	○
P0606/89 (05–247)	ECM/PCM Processor	• ECM	○	○

P0710/38 (05–882)	Transmission Fluid Temperature Sensor "A" Circuit	• Electronic controlled automatic transmission (ECT)	○	○
P0712/38 (05–882)	Transmission Fluid Temperature Sensor "A" Circuit Low Input		○	○
P0713/38 (05–882)	Transmission Fluid Temperature Sensor "A" Circuit High Input		○	○
P0717/37 (05–884)	Input/Turbine Speed Sensor "A" Circuit No Signal		○	○
P0748/62 (05–886)	Pressure Control Solenoid "A" Electrocal (Shift Solenoid Valve SL1)		○	○
P0778/63 (05–886)	Pressure Control Solenoid "B" Electrocal (Shift Solenoid Valve SL2)		○	○
P0793/67 (05–892)	Intermediate Shaft Speed Sensor "A"		○	○
P0982/65 (05–886)	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)		○	○
P0983/65 (05–886)	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)		○	○
P2237/21 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit/ Open (for A/F sensor) (Bank 1 Sensor 1)	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • A/F sensor heater relay • A/F sensor heater and relay circuit • ECM	—	○
P2238/21 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit Low (for A/F sensor) (Bank 1 Sensor 1)		—	○
P2239/21 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit High (for A/F sensor) (Bank 1 Sensor 1)		—	○
P2240/28 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit/ Open (for A/F sensor) (Bank 2 Sensor 1)		—	○
P2241/28 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit Low (for A/F sensor) (Bank 2 Sensor 1)		—	○
P2242/28 *2, *4 (05–248)	Oxygen Sensor Pumping Current Circuit High (for A/F sensor) (Bank 2 Sensor 1)		—	○
P2251/21 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit/ Open (for A/F senor) (Bank 1 Sensor 1)		—	○
P2252/21 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit Low (for A/F senor) (Bank 1 Sensor 1)		—	○
P2253/21 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit High (for A/F senor) (Bank 1 Sensor 1)		—	○
P2254/28 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit/ Open (for A/F senor) (Bank 2 Sensor 1)		—	○
P2255/28 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit Low (for A/F senor) (Bank 2 Sensor 1)		—	○
P2256/28 *2, *4 (05–248)	Oxygen Sensor Reference Ground Circuit High (for A/F senor) (Bank 2 Sensor 1)		—	○

P2716/77 (05–894)	Pressure Control Solenoid "D" Electrical	• Electronic controlled automatic transmission (ECT)	—	○
P2769/64 (05–897)	DSL Solenoid Circuit Low (Shift Solenoid Valve DSL)		—	○
P2770/64 (05–897)	DSL Solenoid Circuit High (Shift Solenoid Valve DSL)		—	○
B2799/99 (05–1625)	Engine Immobilizer System Malfunction	• Immobilizer system	—	○

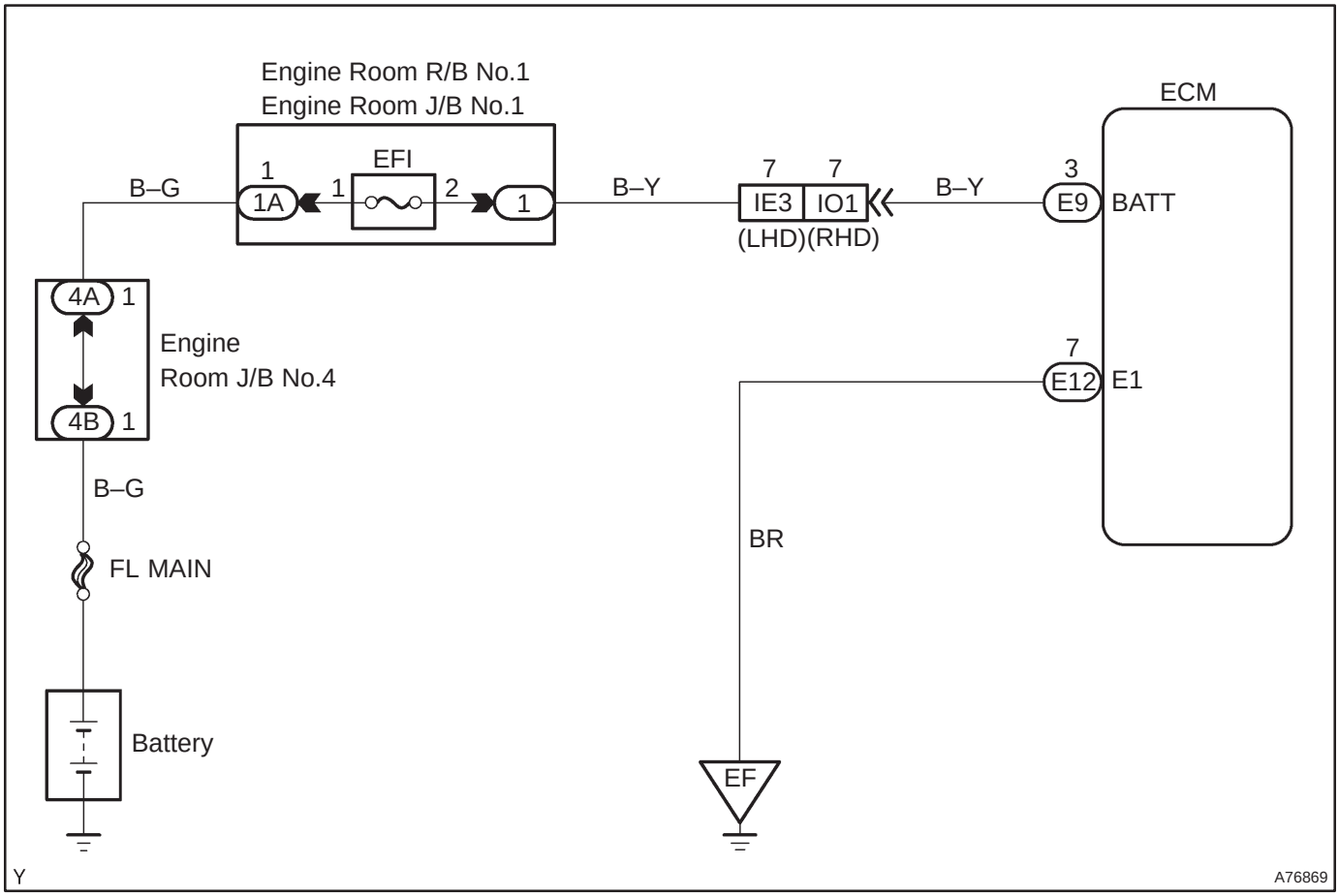
*1: ○ ... CHK ENG is illuminated. — ... CHK ENG is not illuminated.
*2: This DTC is related to A/F sensor, although the caption is heated oxygen sensor.
*3: This DTC indicate a malfunction related to primary circuit.
*4: For European spec. only

ECM BACK–UP POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

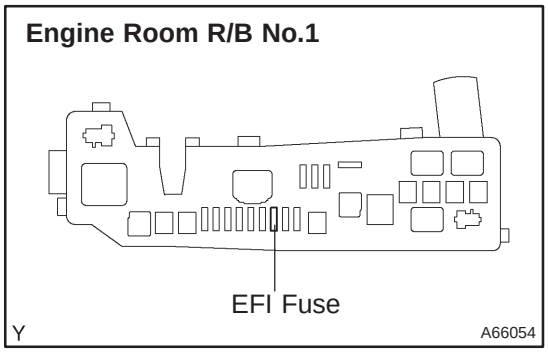
While the ignition switch is OFF, the battery positive voltage is supplied to terminal BATT of the ECM for the DTCs memory and air–fuel ratio adaptive control value memory, etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FUSE(EFI FUSE)

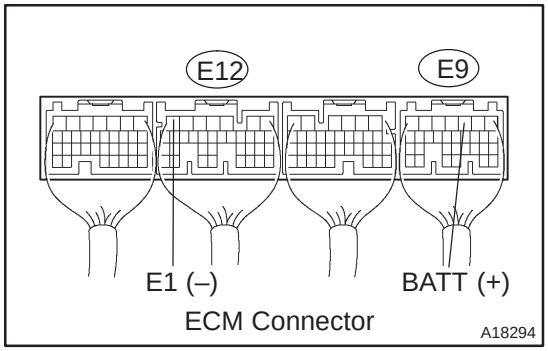


(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

2 INSPECT ECM(BATT VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.

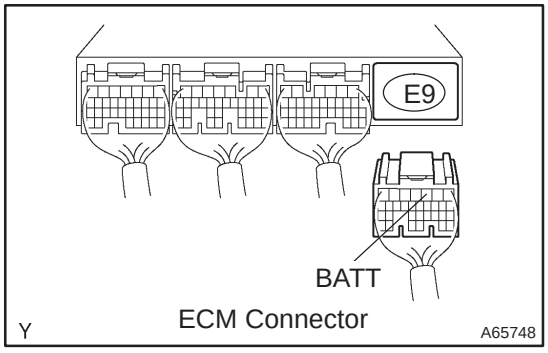
Standard:

Symbols (Terminal No.)	Specified condition
BATT (E9–3) – E1 (E12–7)	8 to 14 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

3 CHECK HARNESS AND CONNECTOR(ECM – EFI FUSE, EFI FUSE – BATTERY)



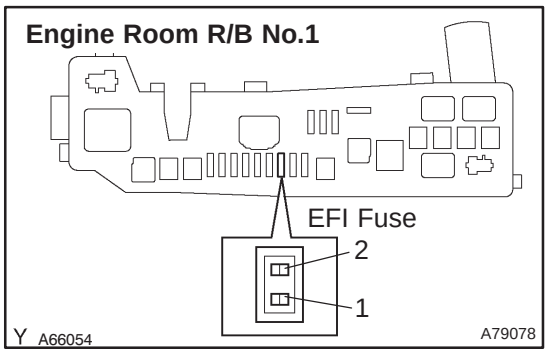
(a) Check the harness and connector between the EFI fuse and ECM.
(1) Remove the EFI fuse from the engine room R/B.
(2) Disconnect the E9 ECM connector.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) – BATT (E9–3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) or BATT (E9–3) – Body ground	No continuity



(b) Check the harness and connector between the EFI fuse and battery.
(1) Remove the EFI fuse from the engine room R/B.
(2) Disconnect the battery positive terminal.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Battery positive terminal – EFI fuse (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Battery positive terminal or EFI fuse (1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ENGINE ROOM RELAY BLOCK

ECM POWER SOURCE CIRCUIT

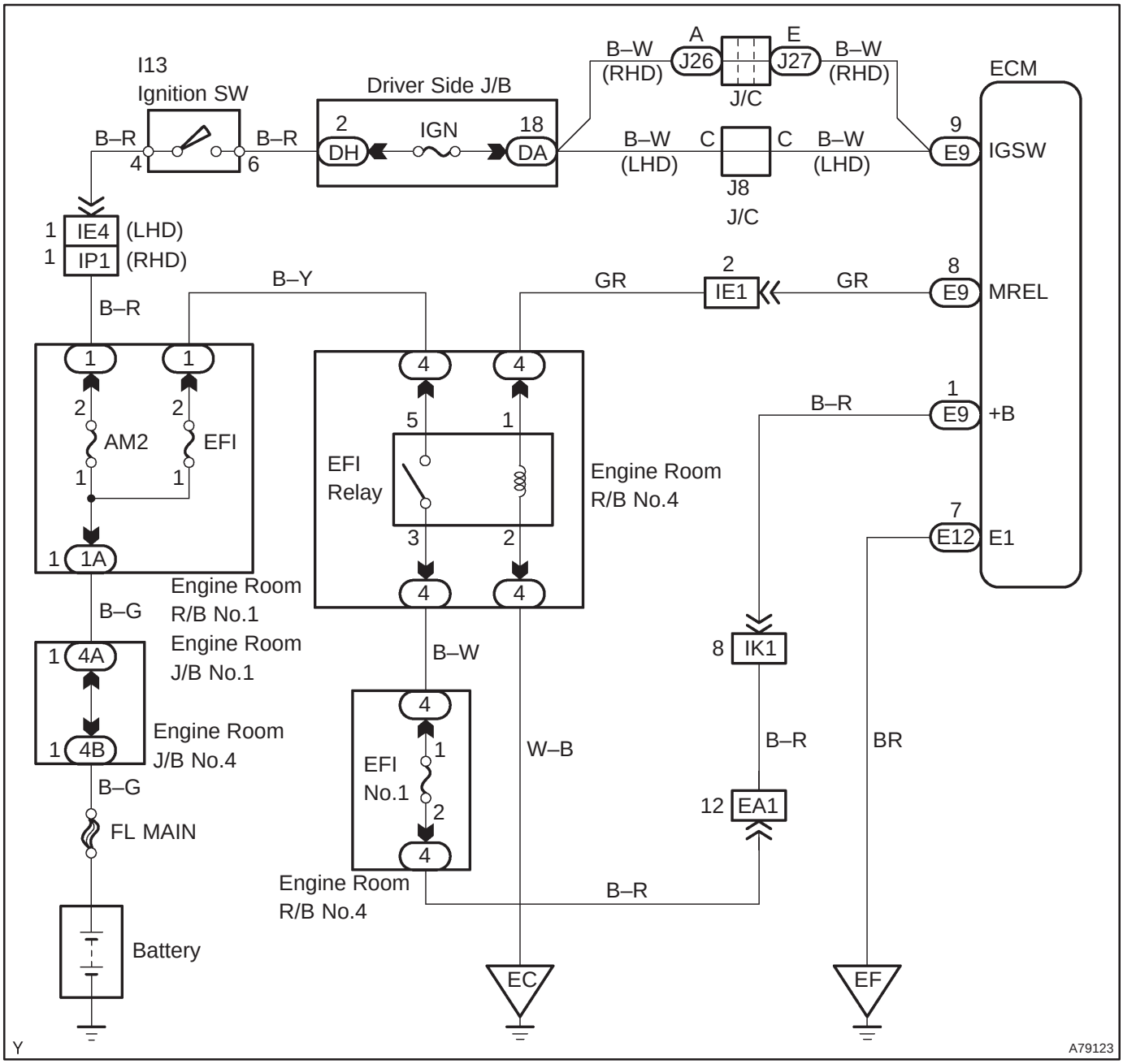
CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to terminal IGSW of the ECM and the EFI relay (Marking: EFI) control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EFI relay.

This signal causes current to flow to the coil, closing the contacts of the EFI relay and supplying power to terminal +B of the ECM.

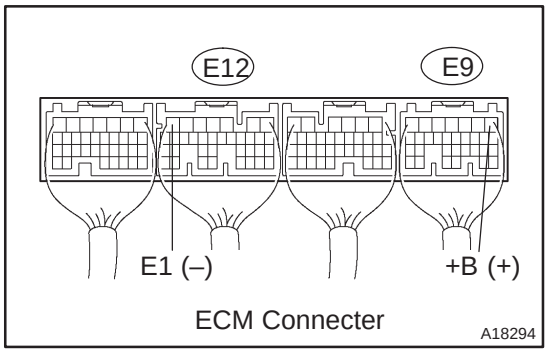
If the ignition switch is turned off, the ECM continues to switch on the EFI relay for a maximum of 2 seconds for the initial setting of the throttle valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM(+B VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.

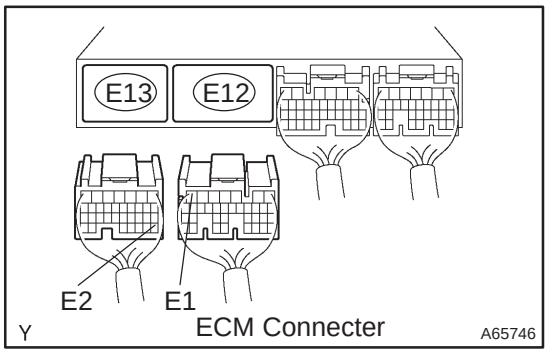
Standard:

Symbols (Terminal No.)	Specified condition
+B (E9–1) – E1 (E12–7)	9 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–168)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM – BODY GROUND)



(a) Disconnect the negative (–) battery terminal.
(b) Disconnect the E12 and E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

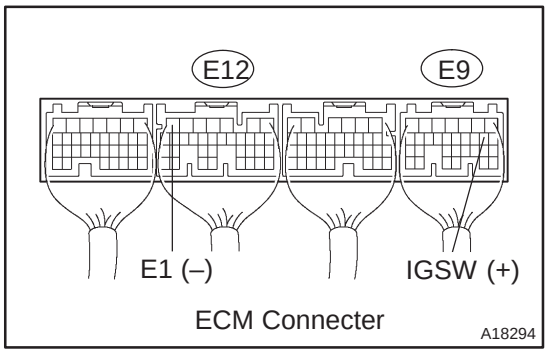
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
E1 (E12–7) – Body ground	Continuity
E2 (E13–28) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM(IGSW VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.

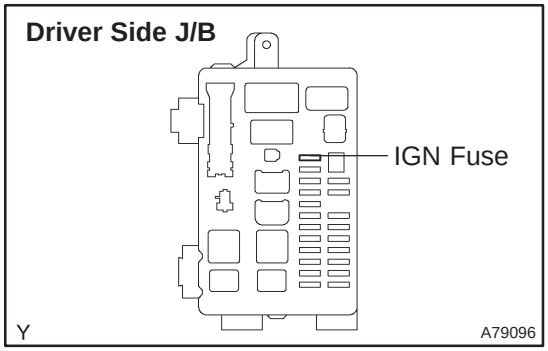
Standard:

Symbols (Terminal No.)	Specified condition
IGSW (E9–9) – E1 (E12–7)	9 to 14 V

OK → **Go to step 6**

NG

4 CHECK FUSE(IGN FUSE)

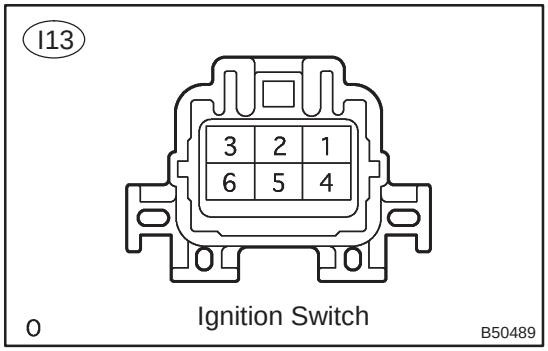


(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

5 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Measure the resistance between the connector terminals shown in the chart below.

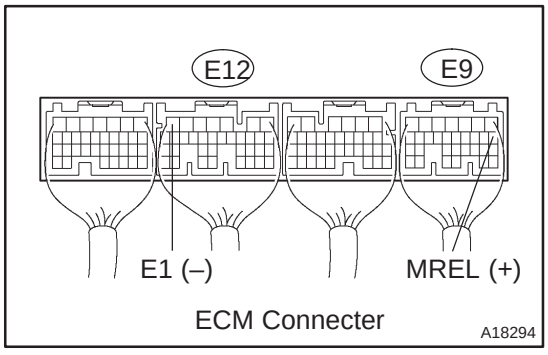
Switch	Terminal No.	Resisitance
LOCK	All Terminals	1MΩ or more
ACC	1–3	1Ω or less
ON	1–2, 1–3, 2–3, 5–6	1Ω or less
START	4–5, 4–6, 5–6, 1–2	1Ω or less

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (BATTERY – IGNITION SWITCH, IGNITION SWITCH – ECM)

6 INSPECT ECM(MREL VOLTAGE)



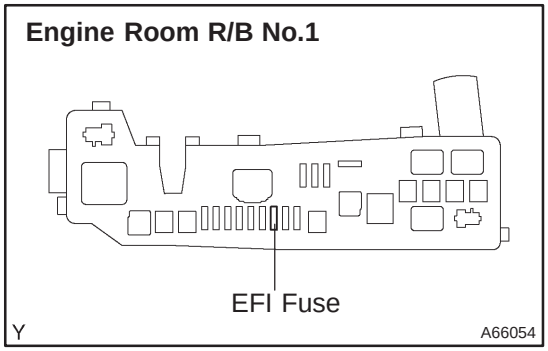
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
MREL (E9–8) – E1 (E12–7)	9 to 14 V

NG → **CHECK AND REPLACE ECM**

OK

7 CHECK FUSE(EFI FUSE)

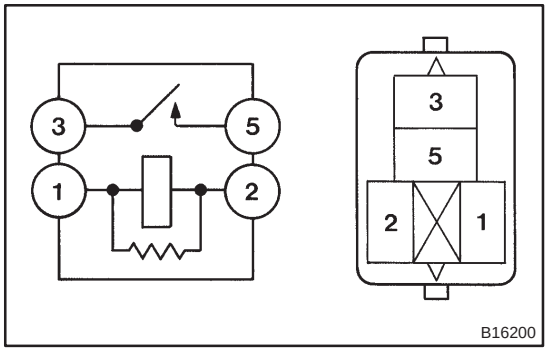


(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

8 INSPECT EFI RELAY



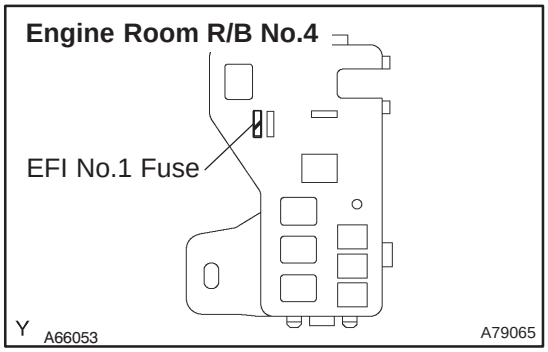
(a) Remove the EFI relay from the engine room R/B No.4.
(b) Inspect the EFI relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

9 CHECK FUSE(EFI No,1 FUSE)

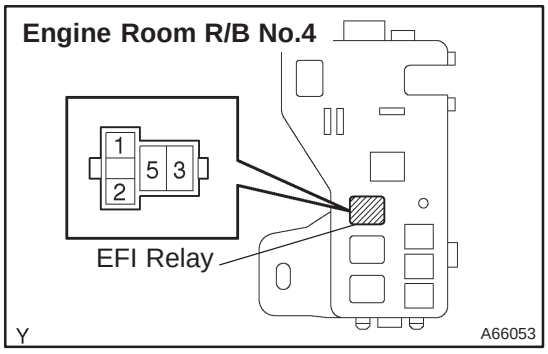


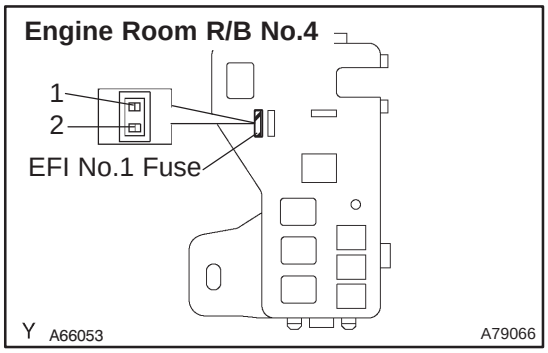
(a) Remove the EFI No.4 fuse from the engine room R/B No.4.
(b) Check for continuity in the EFI No.4 fuse.
Standard: Continuity

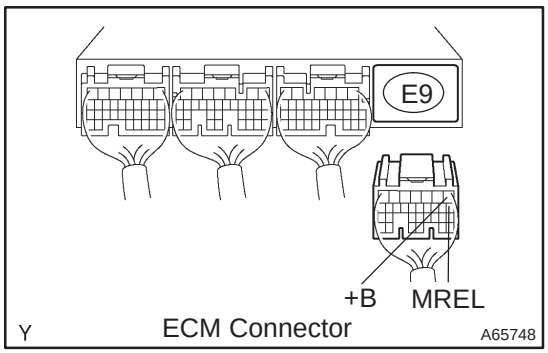
NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

10	CHECK HARNESS AND CONNECTOR(EFI RELAY – ECM, EFI RELAY – BODY GROUND)







(a) Check the harness and connector between the EFI relay and ECM connector.

(1) Remove the EFI relay from the engine room R/B No.4.

(2) Remove the EFI No.1 fuse from the engine room R/B No.4.

(3) Disconnect the E9 ECM connector.

(4) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (1) – MREL (E9–8)	Continuity
EFI relay (3) – EFI No.1 fuse (1)	
EFI No.1 fuse (2) – +B (E9–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (1) or MREL (E9–8) – Body ground	No continuity
EFI relay (3) or EFI No.1 fuse (1) – Body ground	
EFI No.1 fuse (2) or +B (E9–1) – Body ground	

(b) Check the harness and connector between the EFI relay and body ground.

(1) Remove the EFI relay from the engine room J/B No.4.

(2) Check for continuity between the wire harness side connector and the body ground.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (2) – Body ground	Continuity

OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

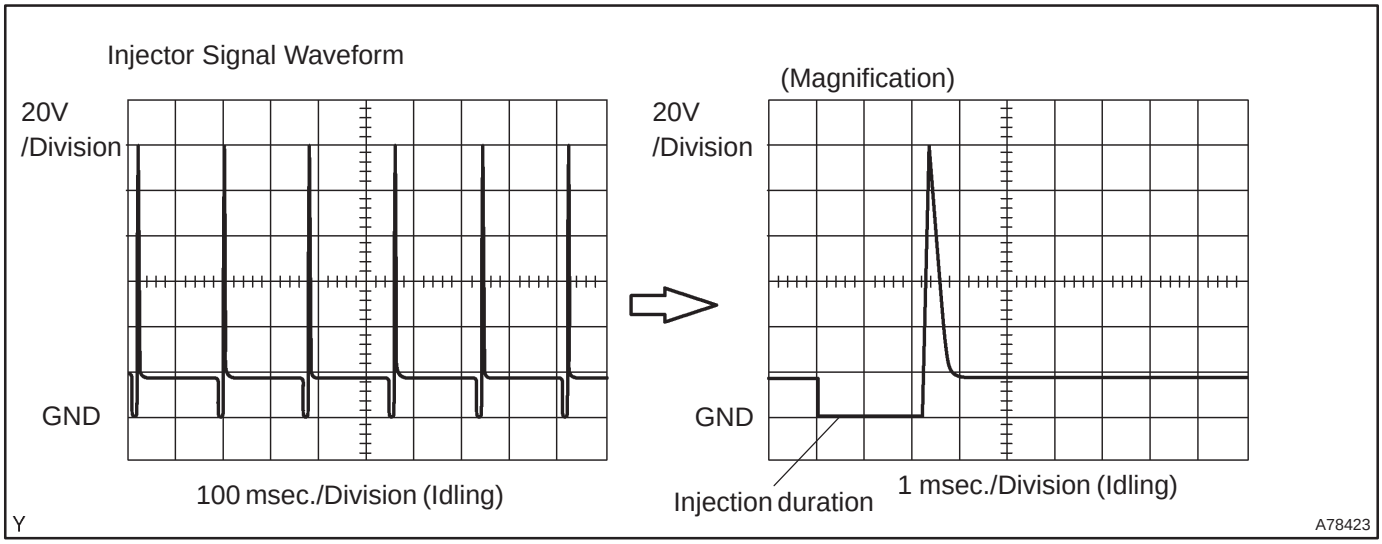
CHECK AND REPAIR HARNESS AND CONNECTOR (TERMINAL +B OF ECM – BATTERY POSITIVE TERMINAL)

FUEL INJECTOR CIRCUIT

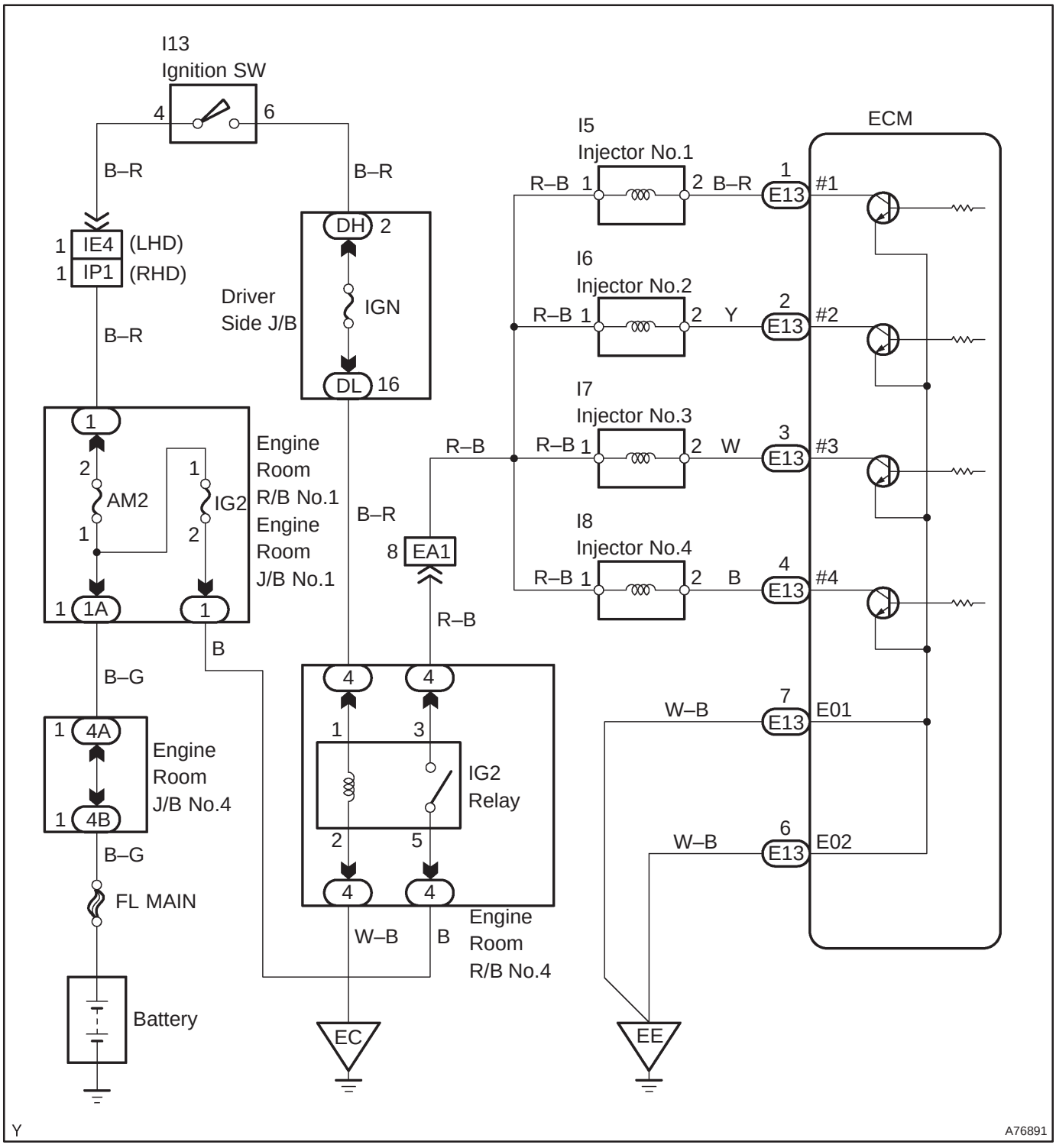
CIRCUIT DESCRIPTION

The fuel injectors are located on the intake manifold.
They inject fuel into the cylinders based on the signals from the ECM.
Reference: Inspection using oscilloscope
With the engine idling, check the waveform between terminals #1 to #4 and E01 of the ECM connectors.
HINT:

The correct waveform is as shown in the diagram below.

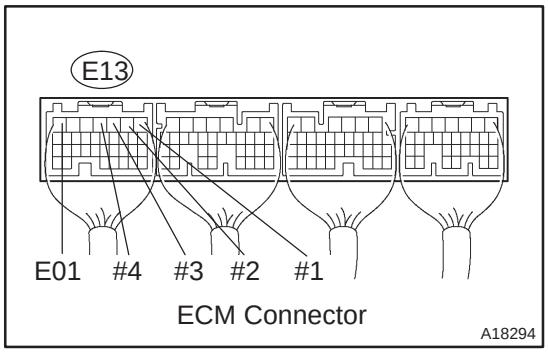


WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM(#1, #2, #3 OR #4 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E13 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
#1 (E13–1) – E01 (E13–7)	9 to 14 V
#2 (E13–2) – E01 (E13–7)	
#3 (E13–3) – E01 (E13–7)	
#4 (E13–4) – E01 (E13–7)	

OK → **Go to step 7**

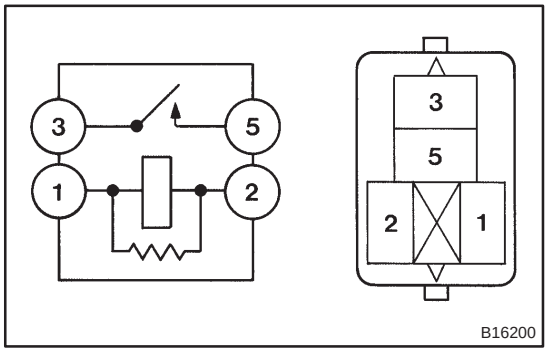
NG

2 INSPECT FUEL INJECTOR ASSY(CHECK RESISTANCE) (See page 11–22)

NG → **REPLACE FUEL INJECTOR ASSY**

OK

3 INSPECT IG2 RELAY



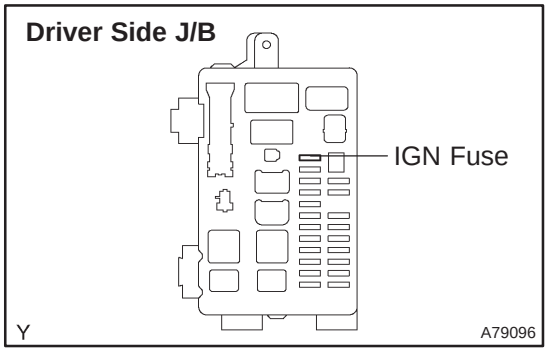
(a) Remove the IG2 relay from the engine room R/B No.4.
(b) Inspect the IG2 relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE IG2 RELAY**

OK

4 CHECK FUSE(IGN FUSE)

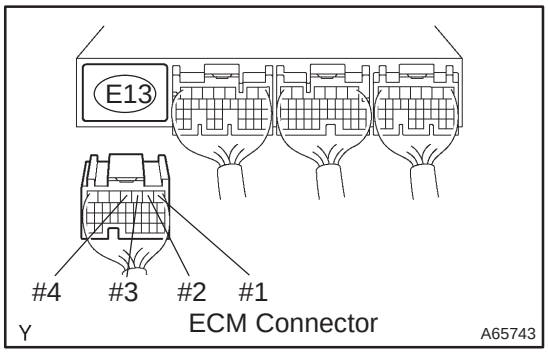


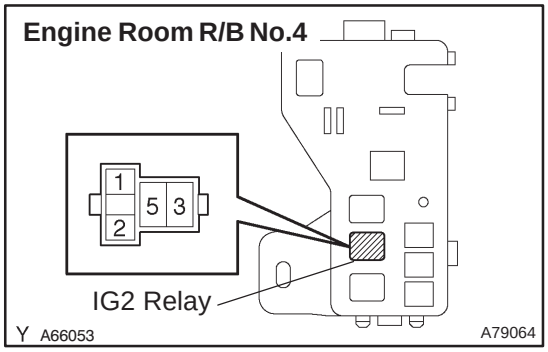
(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity

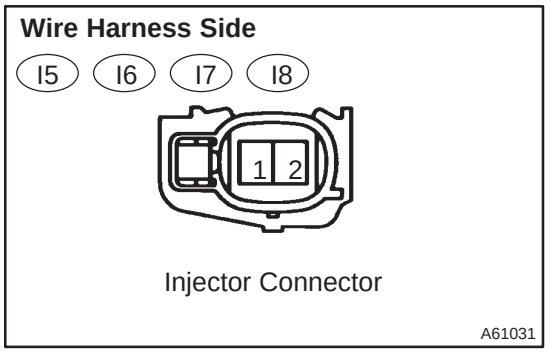
NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

5	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(INJECTOR – ECM, INJECTOR – IG2 RELAY)







(a) Check the harness and connector between the injector connector and ECM connector.
(1) Disconnect the I5, I6, I7 or I8 injector connector.
(2) Disconnect the E13 ECM connector.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Injector (I5–1) – #1 (E13–1)	Continuity
Injector (I6–1) – #2 (E13–2)	
Injector (I7–1) – #3 (E13–3)	
Injector (I8–1) – #4 (E13–4)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Injector (I5–1) or #1 (E13–1) – Body ground	No continuity
Injector (I6–1) or #2 (E13–2) – Body ground	
Injector (I7–1) or #3 (E13–3) – Body ground	
Injector (I8–1) or #4 (E13–4) – Body ground	

(b) Check the harness and connector between the injector connector and ignition switch connector.
(1) Disconnect the I5, I6, I7 or I8 injector connector.
(2) Remove theIG2 relay from the engine room R/B No.4.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Injector (I5–2) – IG2 Relay (3)	Continuity
Injector (I6–2) – IG2 Relay (3)	
Injector (I7–2) – IG2 Relay (3)	
Injector (I8–2) – IG2 Relay (3)	

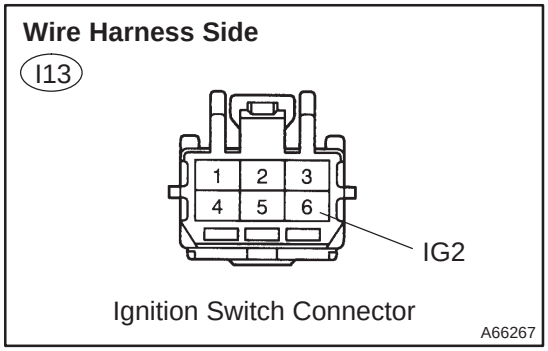
Standard (Check for short):

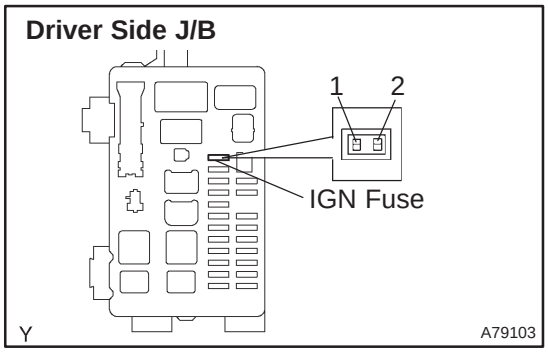
Symbols (Terminal No.)	Specified condition
Injector (I5–2) or IG2 Relay (3) – Body ground	No continuity
Injector (I6–2) or IG2 Relay (3) – Body ground	
Injector (I7–2) or IG2 Relay (3) – Body ground	
Injector (I8–2) or IG2 Relay (3) – Body ground	

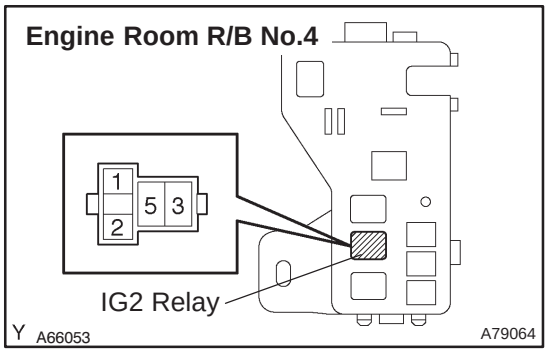
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 CHECK HARNESS AND CONNECTOR(IGNITION SWITCH – IG2 RELAY)







(a) Disconnect the battery negative (–) terminal.
(b) Disconnect the ignition switch connector.
(c) Remove the IGN fuse from the driver side J/B.
(d) Remove the IG2 relay from the engine room R/B No.4.
(e) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) – IGN fuse (1)	Continuity
IGN fuse (2) – IG2 relay (1)	

Standard (Check for short):

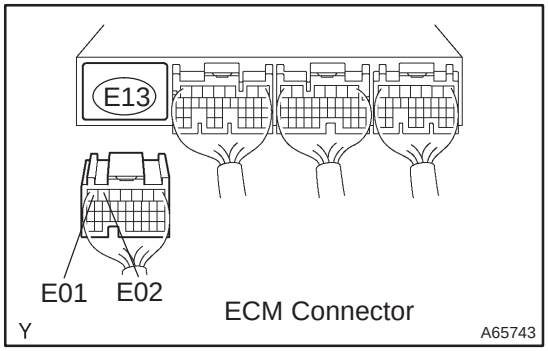
Symbols (Terminal No.)	Specified condition
IG2 (I13–6) or IGN fuse (1) – Body ground	No continuity
IGN fuse (2) or IG2 relay (1) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR ECM POWER SOURCE CIRCUIT

7	INSPECT ECM



(a) Disconnect the ECM E13 connector.
(b) Check for continuity between the ECM connector and body ground.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
E01 (E13–7) – Body ground	Continuity
E02 (E13–6) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8	INSPECT FUEL INJECTOR ASSY(CHECK INJECTOR VOLUME) (See page 11–22)

NG → **REPLACE FUEL INJECTOR ASSY**

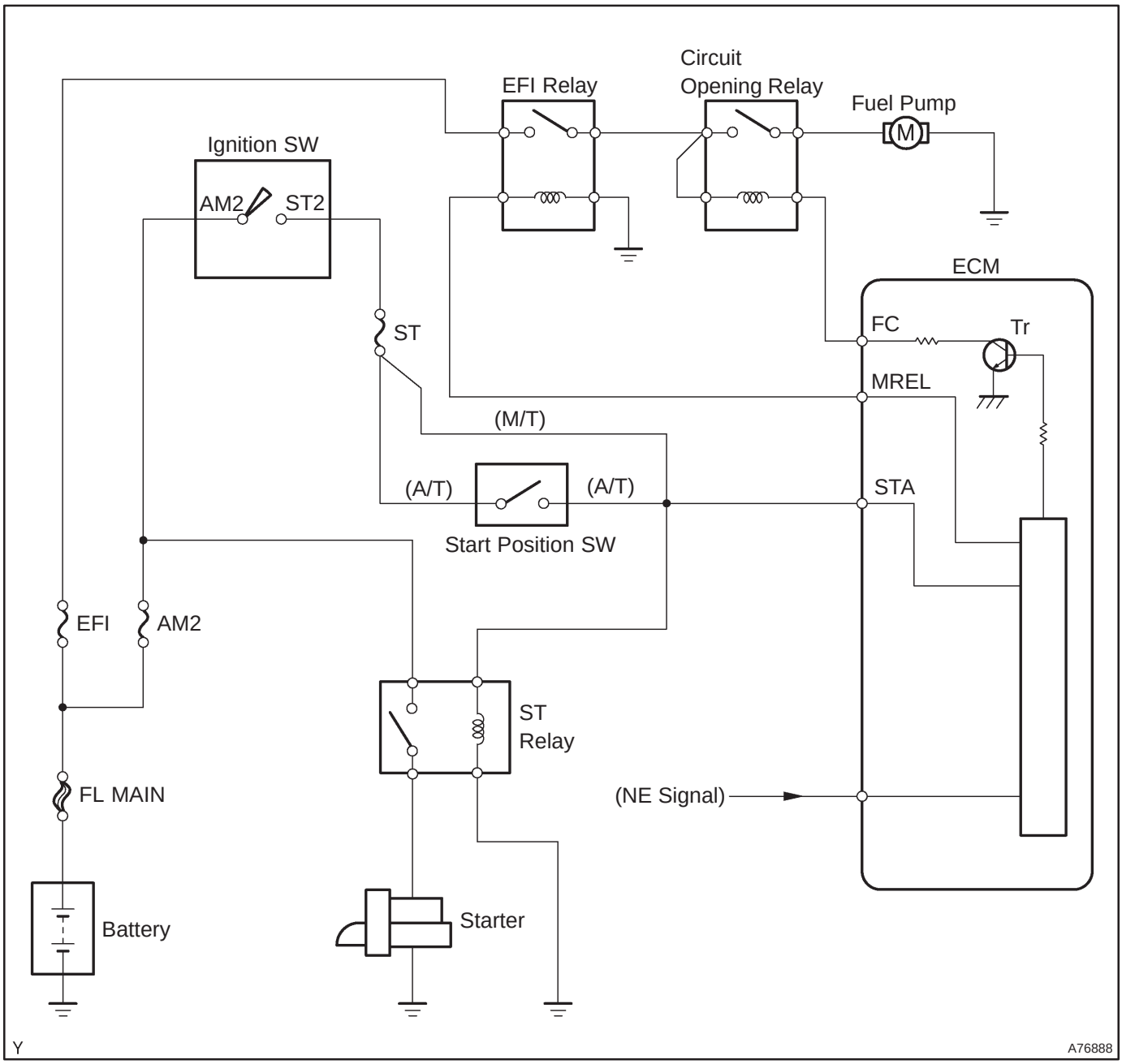
OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–168)

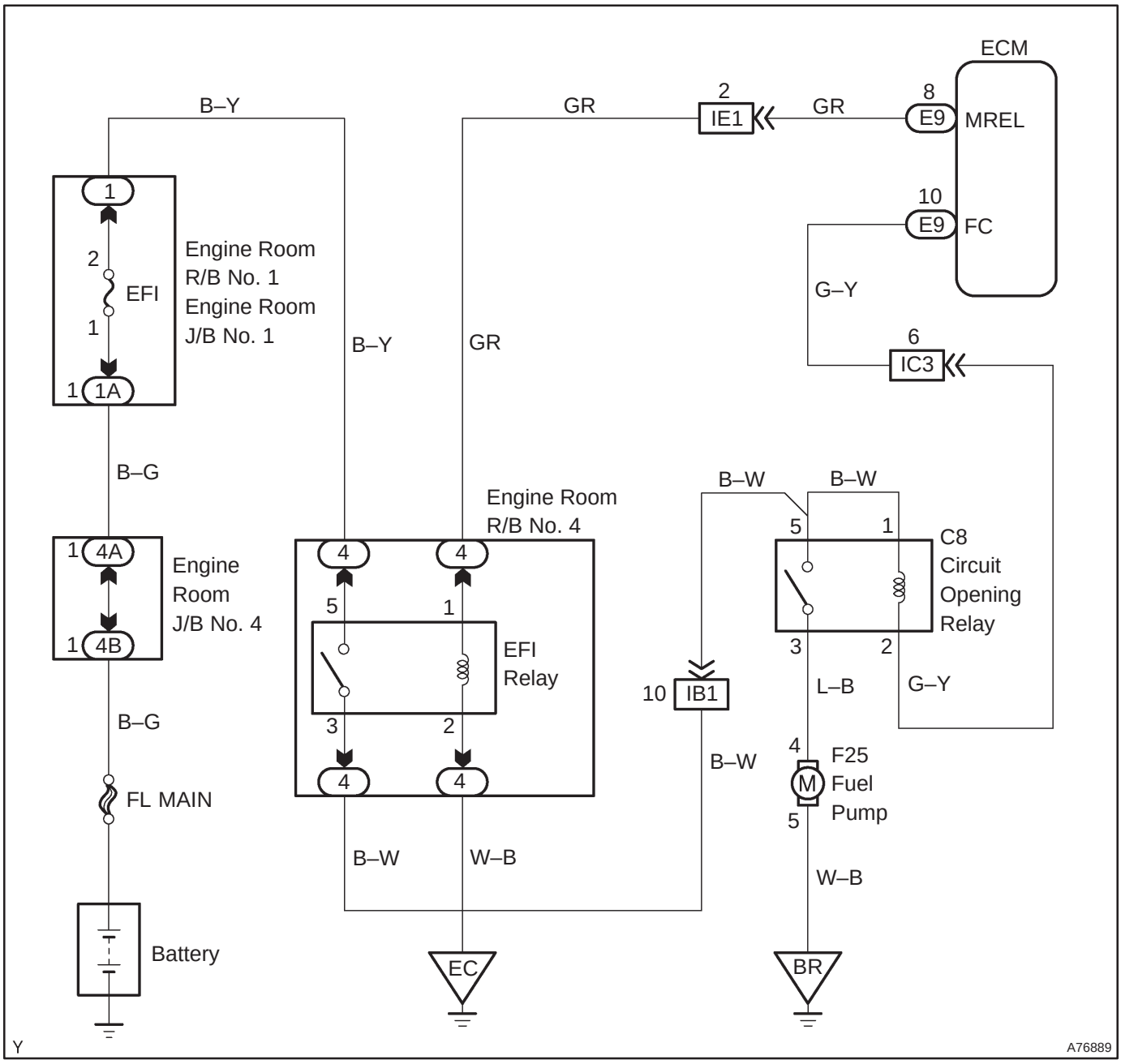
FUEL PUMP CONTROL CIRCUIT

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST2 of the ignition switch to the starter relay coil and also current flows to terminal STA of the ECM (STA signal).
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to the coil of the E.F.I. circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates.
While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



WIRING DIAGRAM



INSPECTION PROCEDURE

When using hand–held tester:

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATION OF CIRCUIT OPENING RELAY)

(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / FUEL PUMP / SPD”.
(c) Perform the active test with the engine stopped.
Result: The circuit opening relay operates.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

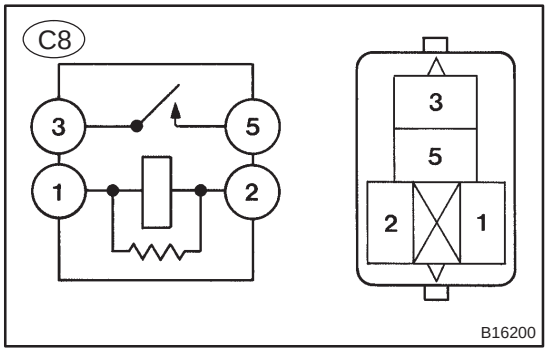
NG

2	CHECK ECM POWER SOURCE CIRCUIT (See page 05–257)

NG → **REPAIR OR REPLACE POWER SOURCE CIRCUIT**

OK

3	INSPECT CIRCUIT OPENING RELAY



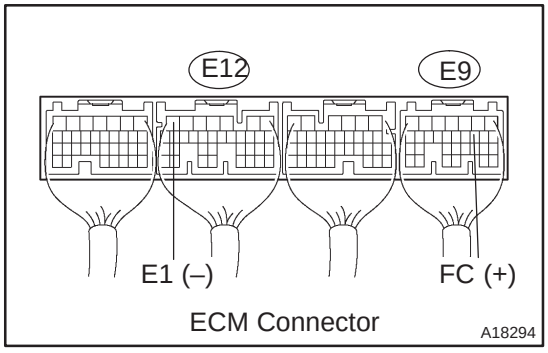
(a) Remove the circuit opening relay.
(b) Inspect the circuit opening relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE CIRCUIT OPENING RELAY**

OK

4	INSPECT ECM(CHECK VOLTAGE)



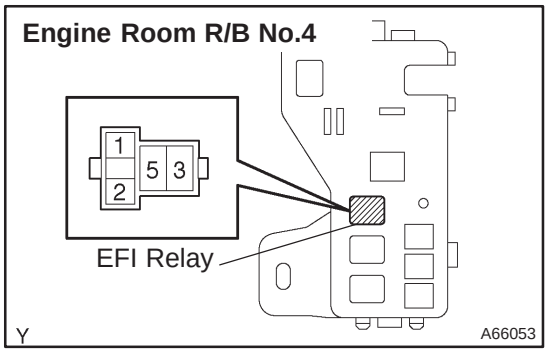
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
FC (E9–10) – E1 (E12–7)	8 to 14 V

OK → **Go to step 6**

NG

5	CHECK HARNESS AND CONNECTOR(EFI RELAY – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – ECM)



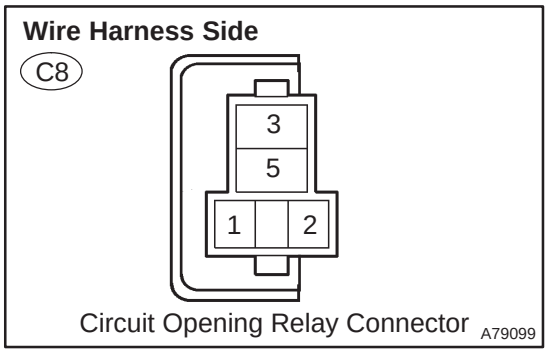
(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the circuit opening relay.
(c) Disconnect the E9 ECM connector.
(d) Check for continuity between the wire harness side connectors.

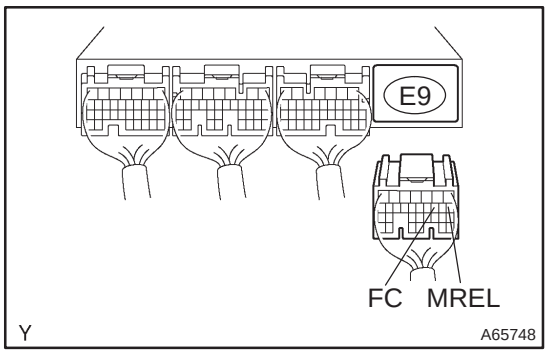
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – Circuit opening relay (C8–1)	Continuity
Circuit opening relay (C8–2) – FC (E9–10)	
EFI relay (1) – MREL (E9–8)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or Circuit opening relay (C8–1) – Body ground	No continuity
Circuit opening relay (C8–2) or FC (E9–10) – Body ground	
EFI relay (1) or MREL (E9–8) – Body ground	





NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

6	INSPECT FUEL PUMP ASSY (See page 11–22)

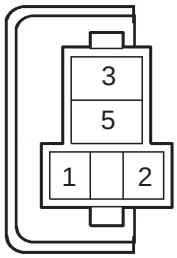
NG → **REPAIR OR REPLACE FUEL PUMP ASSY**

OK

7	CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP, FUEL PUMP – BODY GROUND)

Wire Harness Side

C8



Circuit Opening Relay Connector

A79099

(a) Remove the circuit opening relay.
(b) Disconnect the fuel pump connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) – Fuel pump (F25–4)	Continuity
Fuel pump (F25–5) – Body ground	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) or Fuel pump (F25–4) – Body ground	No continuity

Wire Harness Side

F25

Fuel Pump Connector

A66276

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1	CHECK OPERATION OF FUEL PUMP (See page 11–19)

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

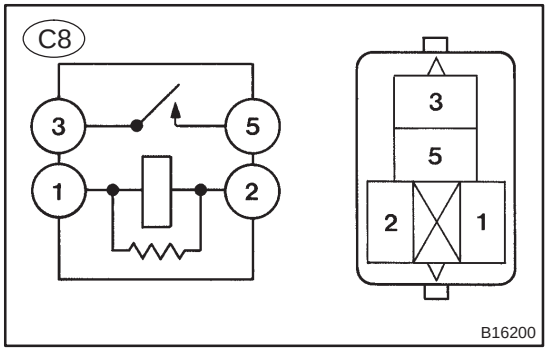
NG

2	CHECK ECM POWER SOURCE CIRCUIT (See page 05–257)

NG → **CHECK FOR ECM POWER SOURCE CIRCUIT**

OK

3 INSPECT CIRCUIT OPENING RELAY



(a) Remove the circuit opening relay.
(b) Inspect the circuit opening relay.

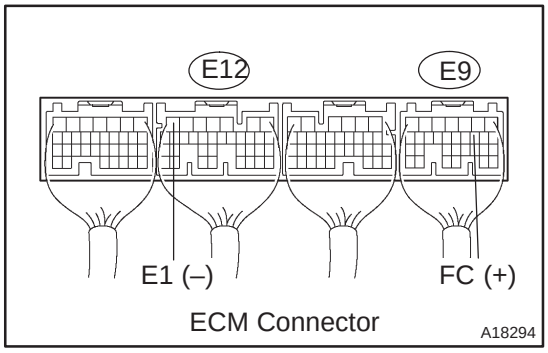
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE CIRCUIT OPENING RELAY**

OK

4 INSPECT ECM(CHECK VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.

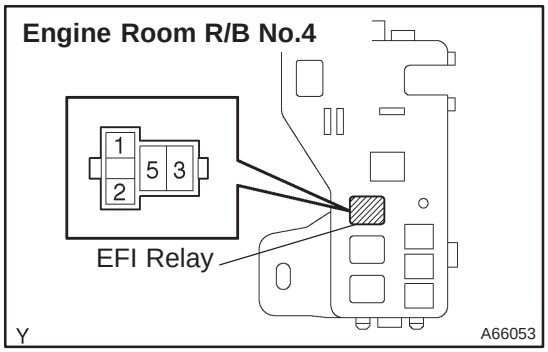
Standard:

Symbols (Terminal No.)	Specified condition
FC (E9–10) – E1 (E12–7)	8 to 14 V

OK → **Go to step 6**

NG

5	CHECK HARNESS AND CONNECTOR(EFI RELAY – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – ECM)



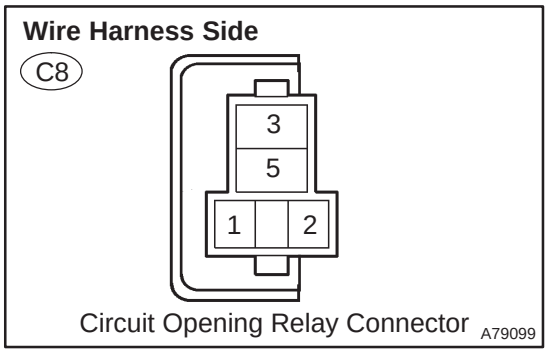
(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the circuit opening relay.
(c) Disconnect the E9 ECM connector.
(d) Check for continuity between the wire harness side connectors.

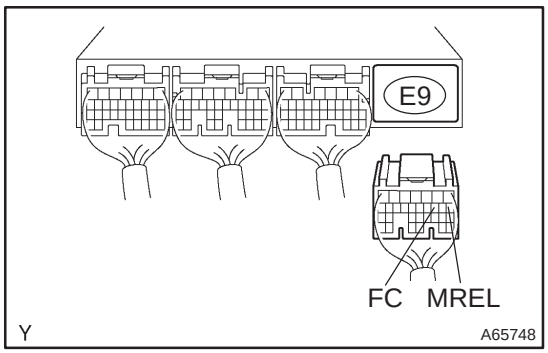
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – Circuit opening relay (C8–1)	Continuity
Circuit opening relay (C8–2) – FC (E9–10)	
EFI relay (1) – MREL (E9–8)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or Circuit opening relay (C8–1) – Body ground	No continuity
Circuit opening relay (C8–2) or FC (E9–10) – Body ground	
EFI relay (1) or MREL (E9–8) – Body ground	





NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

6	INSPECT FUEL PUMP ASSY (See page 11–22)

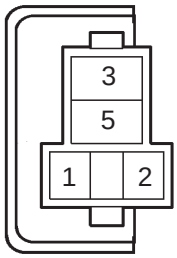
NG → **REPAIR OR REPLACE FUEL PUMP ASSY**

OK

7	CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP, FUEL PUMP – BODY GROUND)

Wire Harness Side

C8



Circuit Opening Relay Connector

A79099

(a) Remove the circuit opening relay.
(b) Disconnect the fuel pump connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) – Fuel pump (F25–4)	Continuity
Fuel pump (F25–5) – Body ground	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) or Fuel pump (F25–4) – Body ground	No continuity

Wire Harness Side

F25

Fuel Pump Connector

A66276

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE ECM (See page 01–32)

SFI SYSTEM (1AZ–FE)

HOW TO PROCEED WITH TROUBLESHOOTING

05C7H–01

When using hand–held tester, troubleshoot in accordance with the procedure shown below.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–148)

3	CONNECT THE HAND–HELD TESTER TO DLC3

HINT:
If the display indicates a communication fault in the tool, inspect DLC3.

4	CHECK DTC AND FREEZE FRAME DATA (See page 05–149)

HINT:
Record or print DTC and freeze frame data, if needed.

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05–149)

6	VISUAL INSPECTION

7	SETTING THE CHECK (TEST) MODE DIAGNOSIS (See page 05–149)

8	PROBLEM SYMPTOM CONFIRMATION

HINT:
If the engine does not start, perform steps 10 and 12 first.

A	Malfunction does not occur
B	Malfunction occurs

B → GO TO STEP 10

A

9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05–149)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	DTC CHART (See page 05–161)

GO TO STEP 14

12	BASIC INSPECTION (See page 05–149)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	PROBLEM SYMPTOMS TABLE (See page 05–168)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05–257)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)

GO TO STEP 18

17	PARTS INSPECTION

18	IDENTIFICATION OF PROBLEM

19	ADJUSTMENT, REPAIR

20	CONFIRMATION TEST

END

When not using hand–held tester, troubleshoot in accordance with the procedure shown below.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–148)

3	CHECK AND CLEAR DTC (See page 05–149)

4	PROBLEM SYMPTOM CONFIRMATION

A	Malfunction occurs
B	Malfunction does not occur

B → SYMPTOM SIMULATION (See page 01–22)

A

5	DTC CHECK (See page 05–149)

A	Malfunction code
B	No code

B → GO TO STEP 7

A

6	DTC CHART (See page 05–161)

GO TO STEP 9

7	BASIC INSPECTION (See page 05–149)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 12

A

8	PROBLEM SYMPTOMS TABLE (See page 05–168)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 12

A

9	CHECK ECM POWER SOURCE CIRCUIT (See page 05–257)

10	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 13

A

11	CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)

GO TO STEP 13

12	PARTS INSPECTION

13	IDENTIFICATION OF PROBLEM

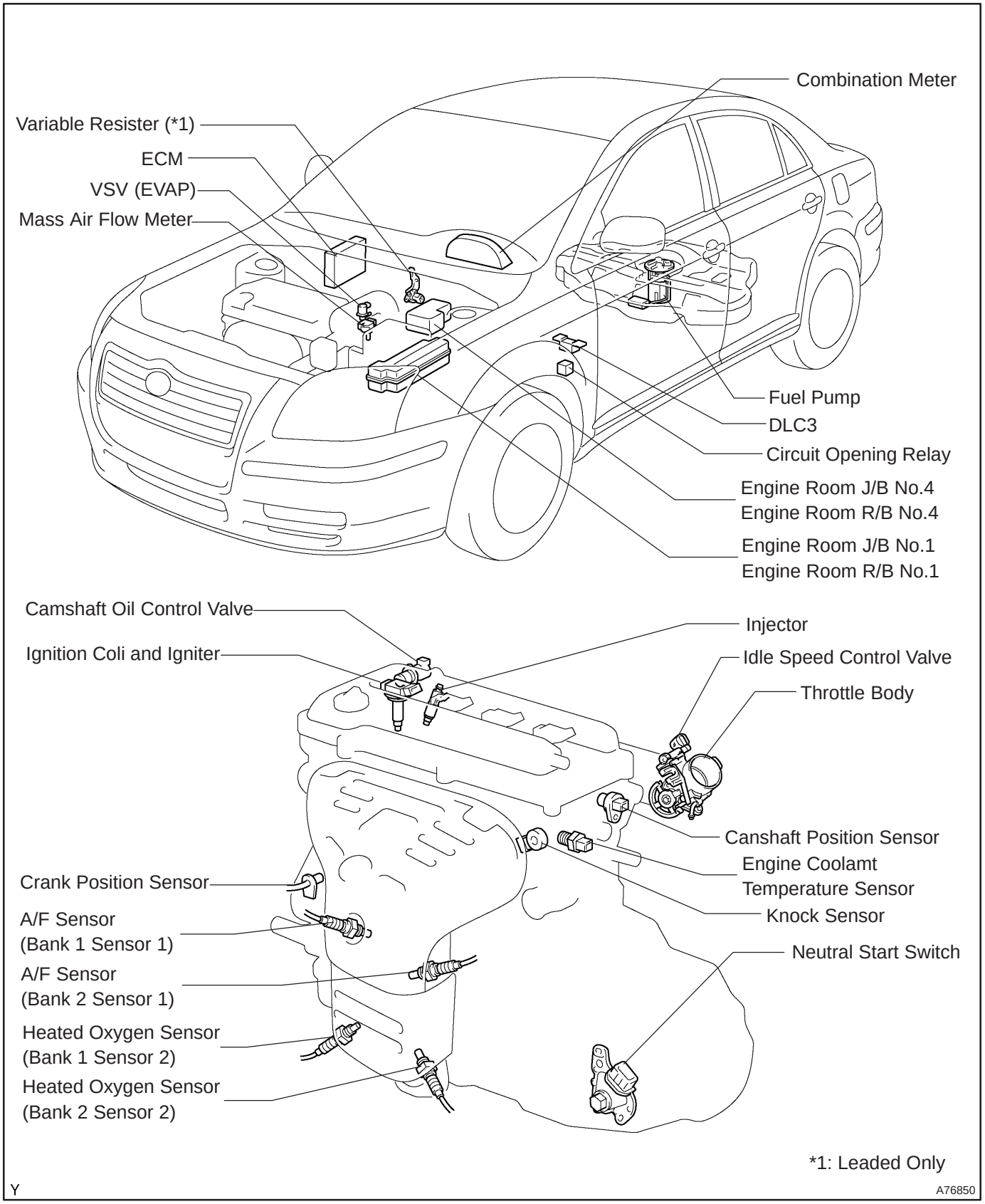
14	ADJUSTMENT, REPAIR

15	CONFIRMATION TEST

END

05C6O–01

LOCATION

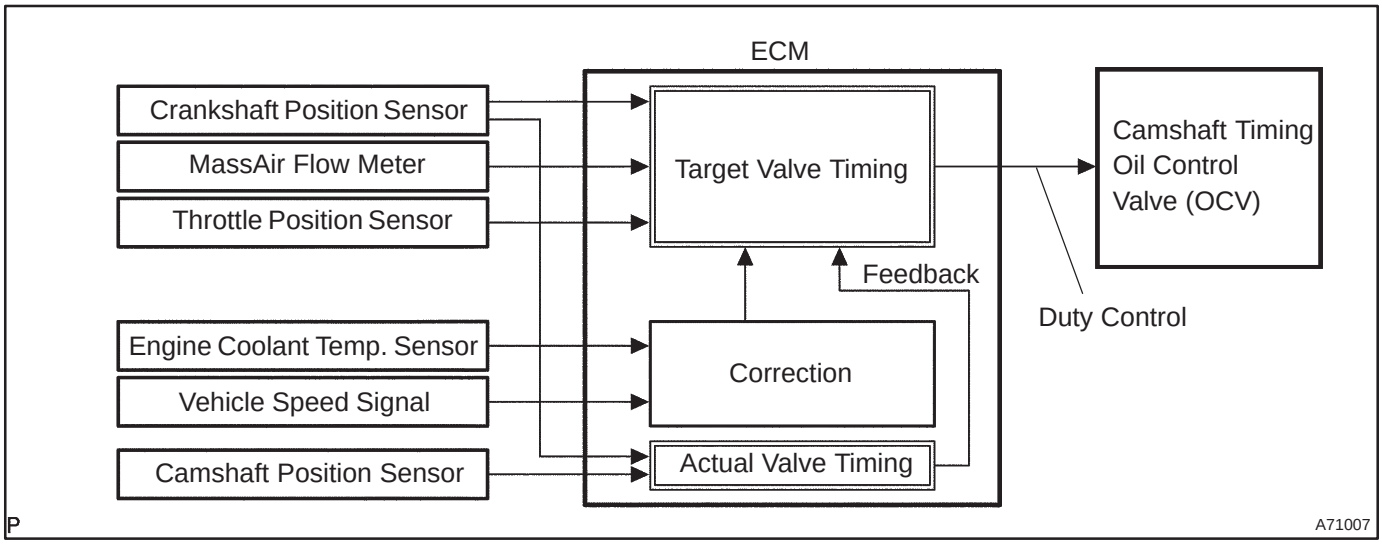


DTC	P0010/39	CAMSHAFT POSITION ”A” ACTUATOR CIRCUIT (BANK 1)

CIRCUIT DESCRIPTION

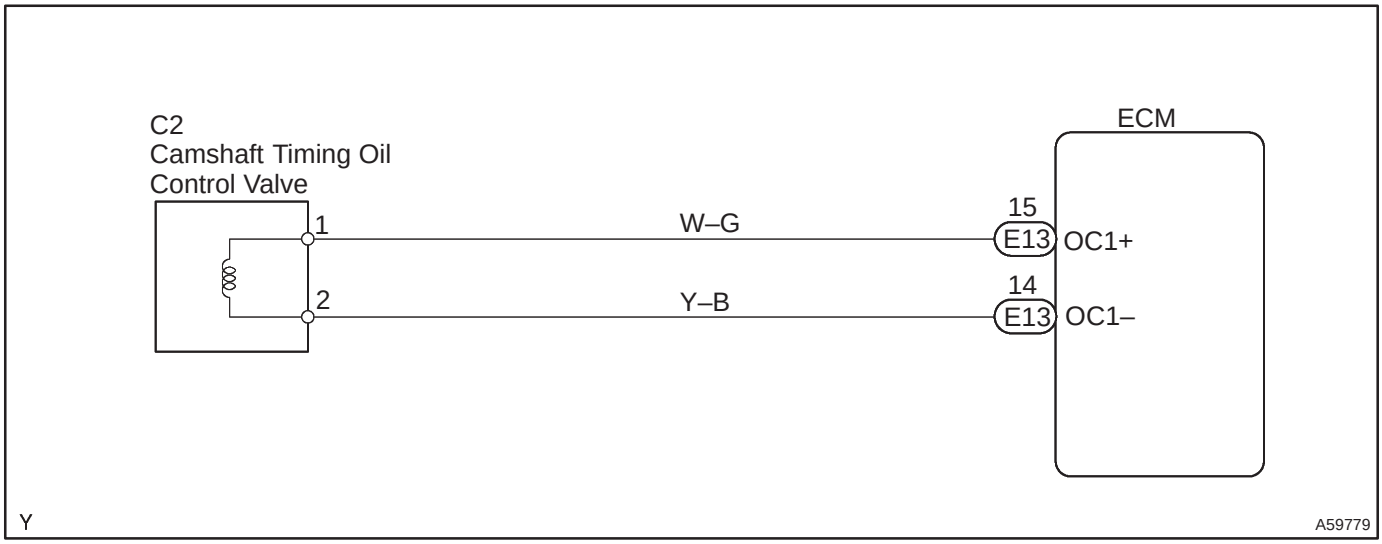
The VVT system controls the intake camshaft to provide the optimal valve timing for every driving condition. This control is performed based on the signals, such conditions as intake air volume, throttle position and engine coolant temperature.

The ECM controls the oil control valve (OCV), based on the signals output from the sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the oil control valve (OCV). As result, the relative position between the camshaft and the crankshaft becomes optimal, and the engine torque improves, fuel economy improves, exhaust emissions decrease under overall driving conditions. Also, the ECM detects the actual valve timing using the signals from the camshaft position sensor and the crankshaft position sensor, and performs feedback control. This is how target valve timing is achieved by the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0010/39	Open or short in oil control valve (OCV) circuit	• Open or short in oil control valve circuit • Oil control valve • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OCV OPERATION)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD/ ACTIVE TEST / VVT CTRL B1 or VVT CTRL B2”.
(e) Check the engine speed when operating the OCV by the hand–held tester.

Standard:

Tester operation	Specified condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

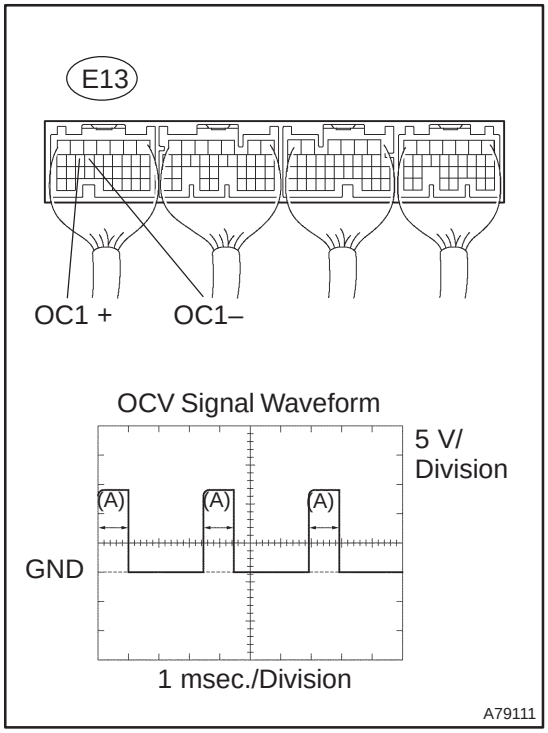
NG

2	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY (See page 10–20)

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

OK

3 INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E13 ECM connector.

Standard:

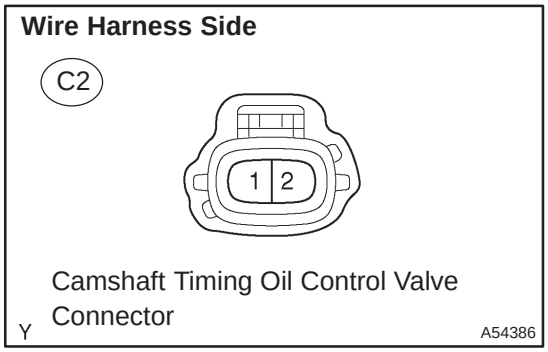
Symbols (Terminal No.)	Specified condition
OC1+ (E13–15) – OC1– (E13–14)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

4 CHECK HARNESS AND CONNECTOR(ECM – OCV)



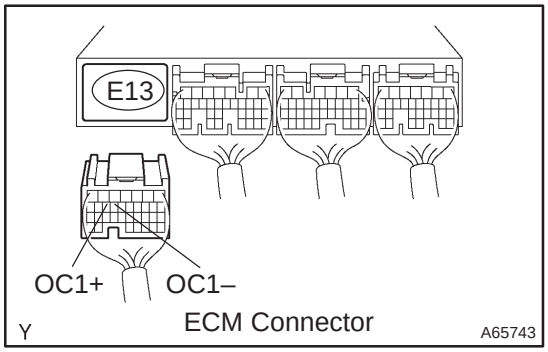
(a) Disconnect the camshaft timing oil control valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) – OC1+ (E13–15)	Continuity
Oil control valve (C2–2) – OC1– (E13–14)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) or OC1+ (E13–15) – Body ground	No continuity
Oil control valve (C2–2) or OC1– (E13–14) – Body ground	



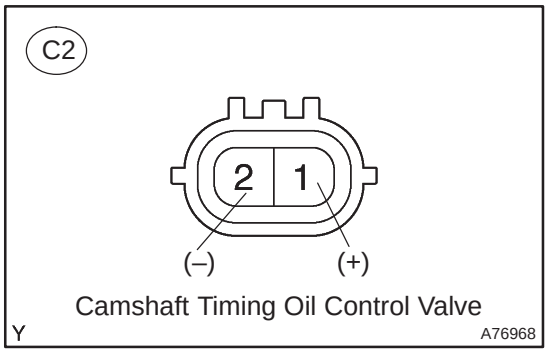
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR INTERMITTENT PROBLEMS

When not using hand–held tester:

1	CHECK OPERATION OF OCV

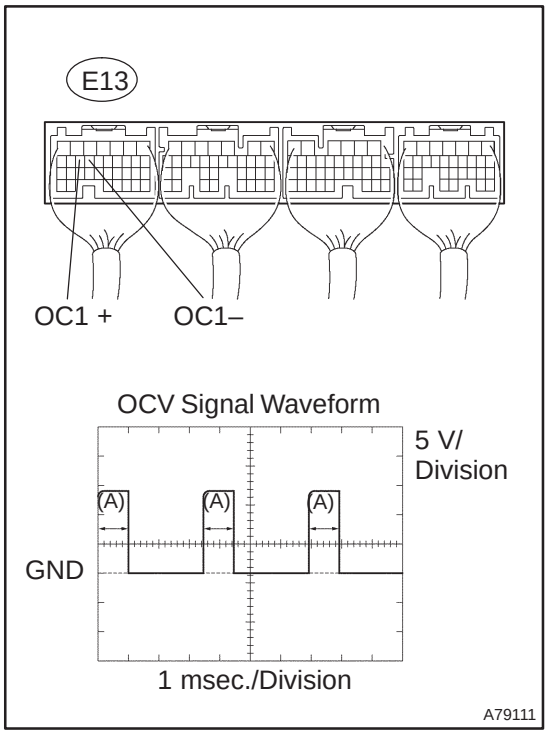


(a) Disconnect the camshaft timing oil control valve connector.
(b) Apply battery positive voltage between the terminals of the camshaft timing oil control valve.
(c) Check the engine speed.
Standard:
Engine speed is rough idle or engine is stalled.

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

OK

2	INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E13 ECM connector.
Standard:

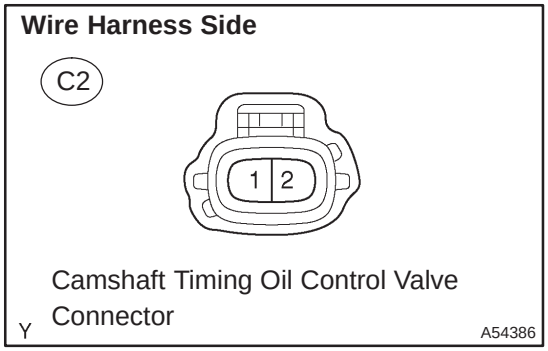
Symbols (Terminal No.)	Specified condition
OC1+ (E13–15) – OC1– (E13–14)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page)**

OK

3 CHECK HARNESS AND CONNECTOR(ECM – OCV)



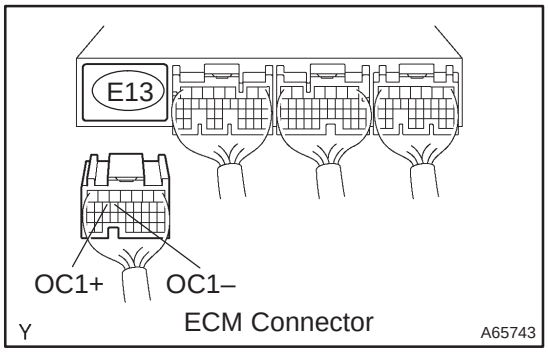
(a) Disconnect the camshaft timing oil control valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) – OC1+ (E13–15)	Continuity
Oil control valve (C2–2) – OC1– (E13–14)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) or OC1+ (E13–15) – Body ground	No continuity
Oil control valve (C2–2) or OC1– (E13–14) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)

DTC	P0011/59	CAMSHAFT POSITION ”A” –TIMING OVER–ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC	P0012/59	CAMSHAFT POSITION ”A” –TIMING OVER–RETARDED (BANK 1)

CIRCUIT DESCRIPTION

Refer to DTC P0010/39 on page 05–169.

DTC No.	DTC Detection Condition	Trouble Area
P0011/59	Condition (a) or (b) continues after engine is warmed up and engine speed at 400 to 4,000 rpm (Problem of the advanced oil control valve.): (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	• Valve timing • Oil control valve • Camshaft timing gear assy • ECM
P0012/59	Condition (a) or (b) continues after engine is warmed up and engine speed at 400 to 4,000 rpm (Problem of the retarded oil control valve.): (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	

WIRING DIAGRAM

Refer to DTC P0010/39 on page 05–169.

INSPECTION PROCEDURE

HINT:

Advanced timing over (Valve timing is out of specified range)	P0011/59
Retarded timing over (Valve timing is out of specified range)	P0012/59

- If DTC ”P0011/59 or P0012/59” is displayed, check VVT system circuit.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	CHECK VALVE TIMING (See page 14–139)

NG → ADJUST VALVE TIMING (See page 14–139)

OK

2	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATION OF OCV)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / VVT CTRL B1”.
(e) Check the engine speed when operating the OCV by the hand–held tester.
Standard:

Tester operation	Specified condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK → **Go to step 4**

NG

3	READ OUTPUT DTC(CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
  (1) Operating the hand–held tester to erase the codes, or disconnecting the battery terminal or the EFI and ECTS fuses for more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.

Standard: No DTC output.

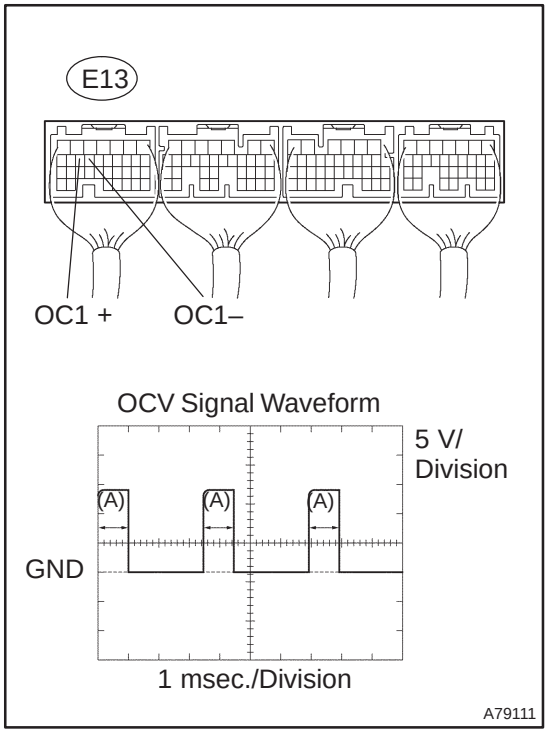
HINT:

*: DTCs P0011/59 or P0012/59 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → **VVT SYSTEM OK***

NG

4	CHECK ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
OC1+ (E13–15) – OC1– (E13–14)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

5	CHECK OIL CONTROL VALVE FILTER

NG → **REPLACE OIL CONTROL VALVE FILTER**

OK

6	CHECK CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–20)

OK → **Go to step 8**

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	CHECK CAMSHAFT TIMING GEAR ASSY (See page 14–171)

OK → **Go to step 10**

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK FOR BLOCKAGE(OCV, OIL CHECK VALVE AND OIL HOLE)

NG → REPAIR OR REPLACE

OK

11	READ OUTPUT DTC(CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
  (1) Operating the hand–held tester to erase the codes, or disconnecting the battery terminal or the EFI and ECTS fuses for more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.

Standard: No DTC output.

HINT:

*: DTCs P0011/59 or P0012/59 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → VVT SYSTEM OK*

NG

CHECK AND REPLACE ECM (See page 01–32)

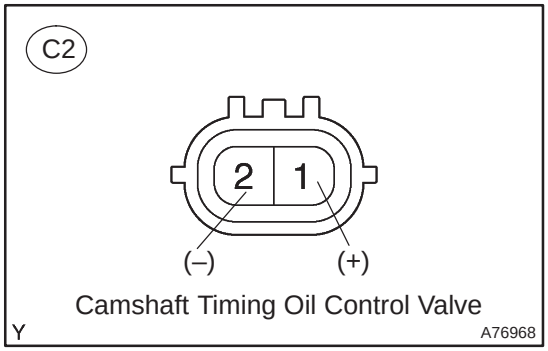
When not using hand–held tester:

1	CHECK VALVE TIMING (See page 14–139)

NG → ADJUST VALVE TIMING (See page 14–139)

OK

2 CHECK OPERATION OF OCV



(a) Start the engine.
(b) Check the engine speed with conditions (1) and then (2).
  (1) Disconnect the camshaft timing oil control valve connector.
  (2) Apply battery positive voltage between the terminals of the camshaft timing oil control valve.

Result:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Conditions other than A	

B → **Go to step 4**

A

3 READ OUTPUT DTC(CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
  (1) Disconnecting the battery terminal or removing the EFI and ECTS fuses for more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC.

Standard: No DTC output.

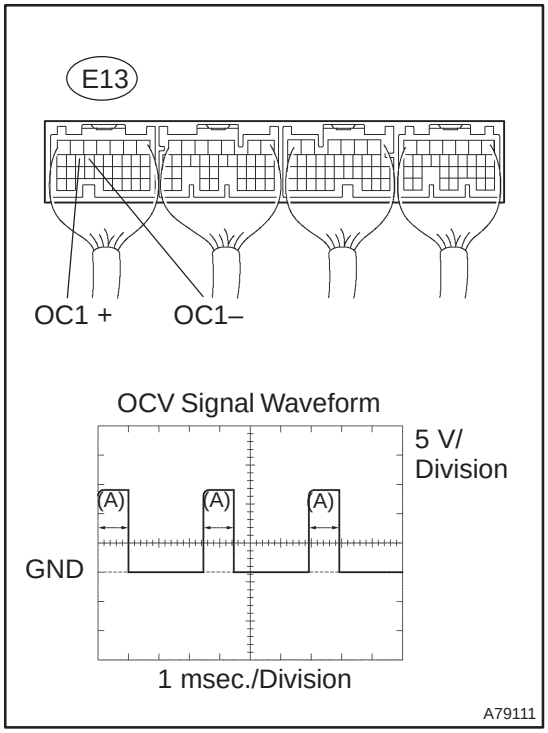
HINT:

*: DTCs P0011/59 or P0012/59 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → **VVT SYSTEM OK***

NG

4	CHECK ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
OC1+ (E13–15) – OC1– (E13–14)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

5	CHECK OIL CONTROL VALVE FILTER

NG → **REPLACE OIL CONTROL VALVE FILTER**

OK

6	CHECK CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–20)

OK → **Go to step 8**

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	CHECK CAMSHAFT TIMING GEAR ASSY (See page 14–171)

OK → **Go to step 10**

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK FOR BLOCKAGE(OCV, OIL CHECK VALVE AND OIL HOLE)

NG → REPAIR OR REPLACE

OK

11	READ OUTPUT DTC(CHECK IF DTC OUTPUT RECURS)

(a) Clear the DTC.
  (1) Disconnecting the battery terminal or removing the EFI and ECTS fuses for more than 60 sec.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC.

Standard: No DTC output.

HINT:

*: DTCs P0011/59 or P0012/59 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → VVT SYSTEM OK*

NG

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0016/18	CRANKSHAFT POSITION –CAMSHAFT POSITION CORRELATION (BANK 1 SENSOR A)

CIRCUIT DESCRIPTION

Refer to DTC P0335/12, 13 and P0339/13 on page 05–226.

DTC No.	DTC Detection Condition	Trouble Area
P0016/18	Deviation in crankshaft position sensor signal and VVT sensor 1 signal (2 trip detection logic)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM

WIRING DIAGRAM

Refer to DTC P0335/12, 13 and P0339/13 on page 05–226.

INSPECTION PROCEDURE

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK VALVE TIMING (See page 14–139)

NG → ADJUST VALVE TIMING (See page 14–139)

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0031/21	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC	P0032/21	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC	P0051/28	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

DTC	P0052/28	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

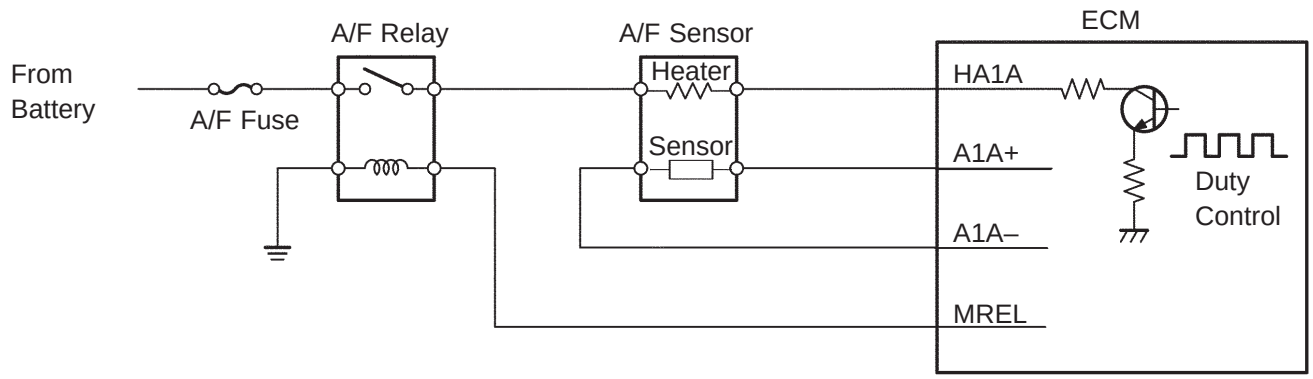
CIRCUIT DESCRIPTION

Refer to DTC P2237/21 on page 05–248.

HINT:

- These DTCs are related to the air fuel raito (A/F) sensor, although the caption is the heated oxygen sensor.
- The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 1 System Drawing)



DTC No.	DTC Detection Condition	Trouble Area
P0031/21 P0051/28	Heated current is 0.8 A or less when heater operates (1 trip detection logic)	• Open or short in heater circuit of A/F sensor • A/F sensor heater • A/F relay • ECM
P0032/21 P0052/28	When the heater operates, heated current exceeds 19.7 A (1 trip detection logic)	

HINT:

- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that does not include cylinder No.1.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

WIRING DIAGRAM

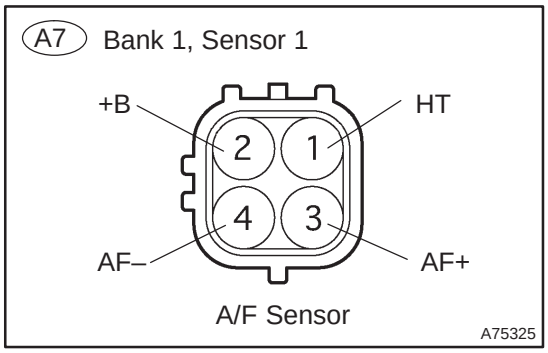
Refer to DTC P2237/21 on page 05–248.

INSPECTION PROCEDURE

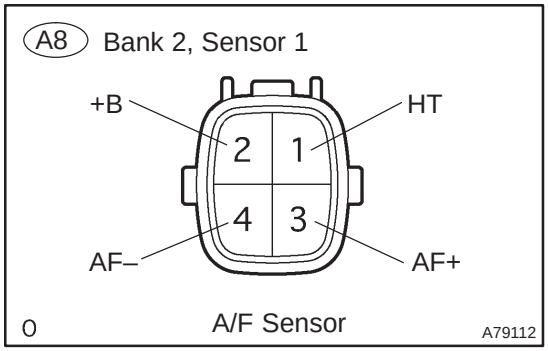
HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



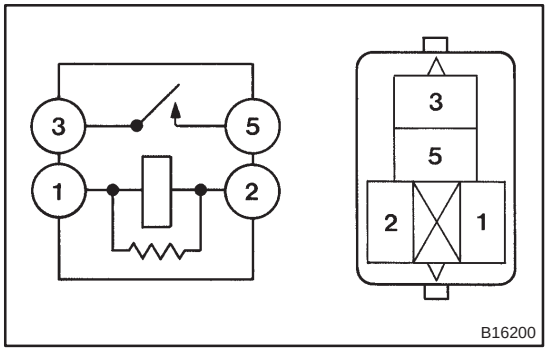
(a) Disconnect the A/F sensor connector.
(b) Measure resistance between terminals HT and +B of the A/F sensor.
Resistance: 1.8 to 3.4 Ω (20 °C)



NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

2	INSPECT A/F RELAY



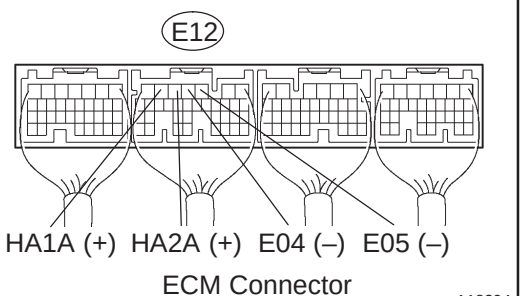
(a) Remove the A/F relay from the engine room R/B No.4.
(b) Inspect the A/F relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE A/F RELAY**

OK

3 INSPECT ECM(VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the applicable terminals of the E12 ECM connectors.

Standard:

Symbols (Terminal No.)	Specified condition
HA1A (E12–6) – E04 (E12–4)	9 to 14 V
HA2A (E12–5) – E05 (E12–3)	

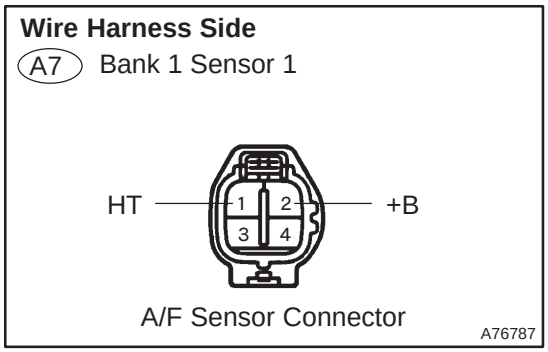
HINT:

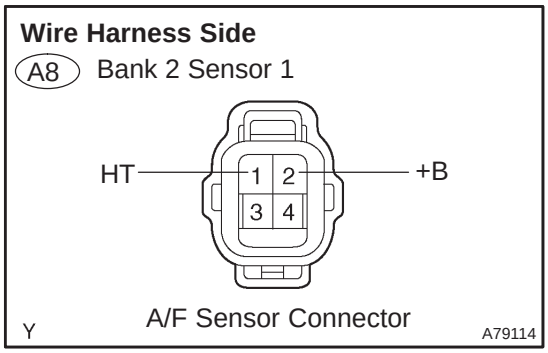
- The HA1A means the heated oxygen sensor bank 1 sensor 1.
- The HA2A means the heated oxygen sensor bank 2 sensor 1.

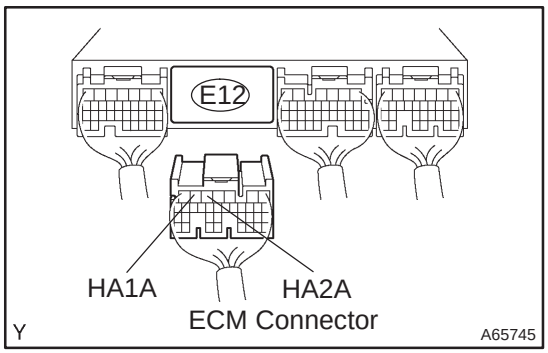
OK → **CHECK AND REPLACE ECM (See page 01–32)**

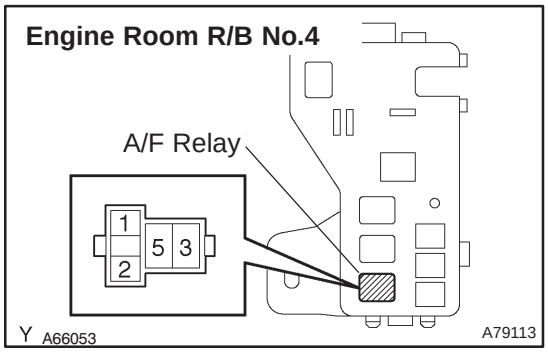
NG

4 CHECK HARNESS AND CONNECTOR(A/F SENSOR – ECM, A/F SENSOR – A/F RELAY)









(a) Check the harness and connector between the ECM and A/F sensor connectors.

(1) Disconnect the A7 or A8 A/F sensor connector.

(2) Disconnect the E12 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
HT (A7–1) – HA1A (E12–6)	Continuity
HT (A8–1) – HA2A (E12–5)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
HT (A7–1) or HA1A (E12–6) – Body ground	No continuity
HT (A8–1) or HA2A (E12–5) – Body ground	

(b) Check the harness and connector between the A/F sensor connector and A/F relay.

(1) Disconnect the A7 or A8 A/F sensor connector.

(2) Remove the A/F relay from the engine room R/B No.4.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (A7–2) – A/F relay (3)	Continuity
+B (A8–2) – A/F relay (3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (A7–2) or A/F relay (3) – Body ground	No continuity
+B (A8–2) or A/F relay (3) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0100/31	MASS OR VOLUME AIR FLOW CIRCUIT

DTC	P0102/31	MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

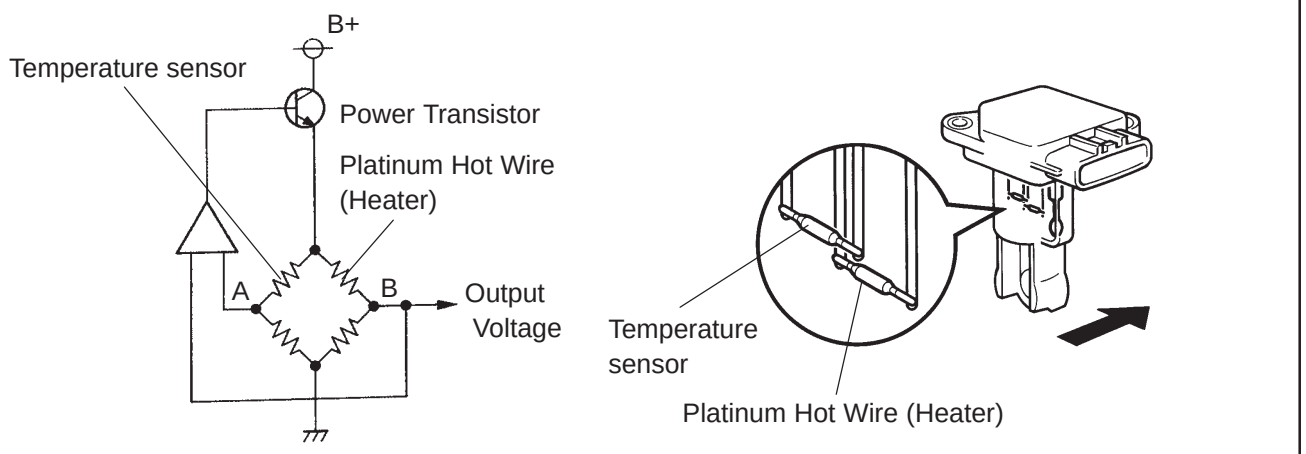
DTC	P0103/31	MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire. The hot wire mass air flow meter consists of a platinum hot wire, a temperature sensor and a control circuit installed in a plastic housing. The hot wire mass air flow meter works on the principle that the hot wire and temperature sensor located in the intake air bypass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the mass air flow meter.

The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



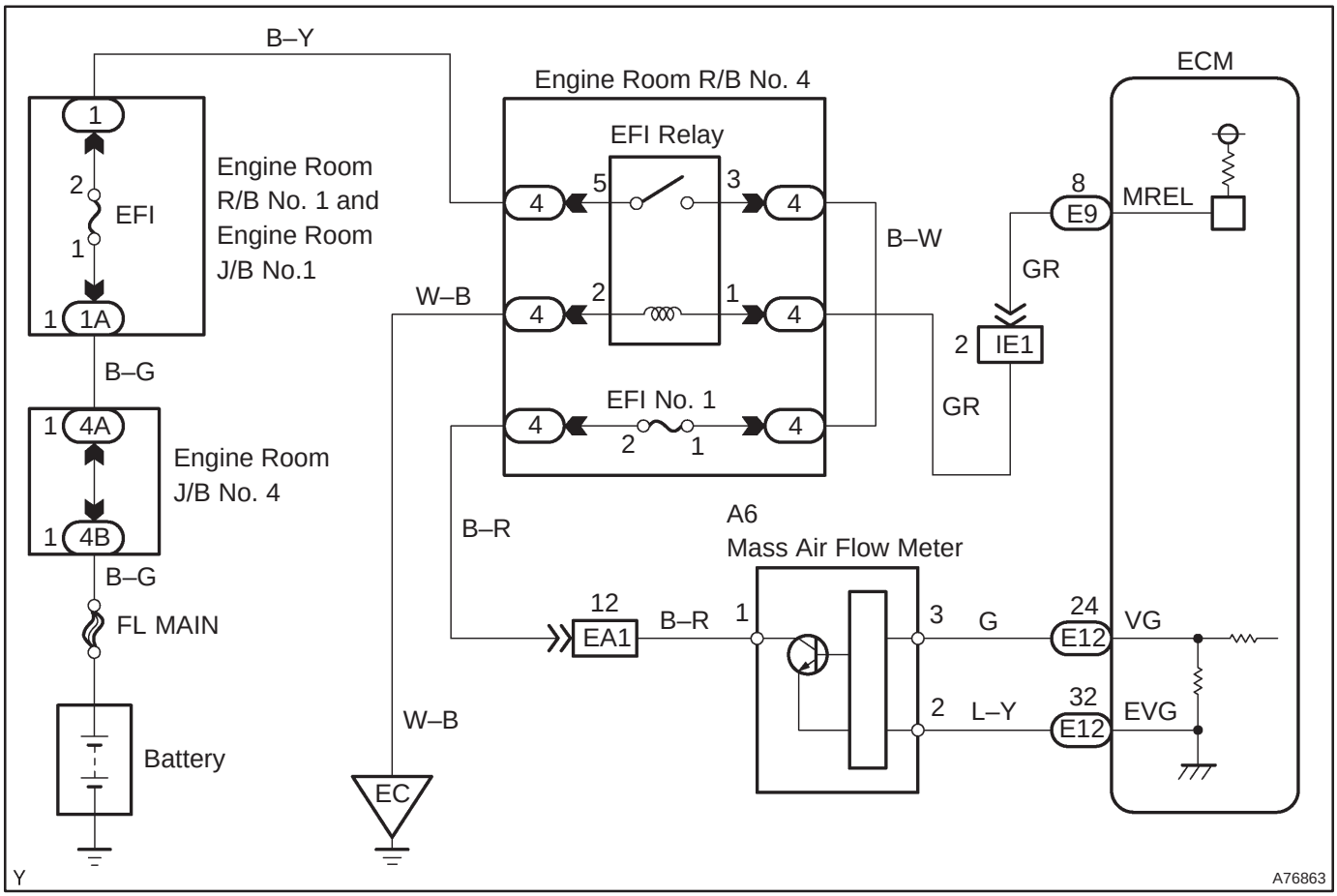
DTC No.	DTC Detection Condition	Trouble Area
P0100/31	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 sec.	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P0102/31	Open in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 sec.	
P0103/31	Short in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 sec. (+B circuit)	

HINT:

After confirming DTC ”P0100/31, P0102/31 or P0103/31”, use the hand–held tester to confirm the mass air flow ratio in the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Air Flow Value (gm/s)	Malfunction
Approx. 0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• E2G circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

Result:

Air flow rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
1 ≦ Mass Air Flow Rate ≦ 270.0 or more (*1)	C

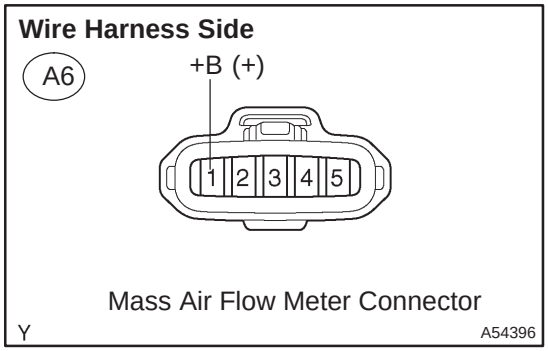
*1: The value must be changed when the throttle valve is opened or closed.

B → **Go to step 6**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

A

2	INSPECT MASS AIR FLOW METER(POWER SOURCE)



(a) Turn the ignition switch ON.
(b) Disconnect the mass air flow meter connector.
(c) Measure the voltage between the terminal of the wire harness side connector and the body ground.

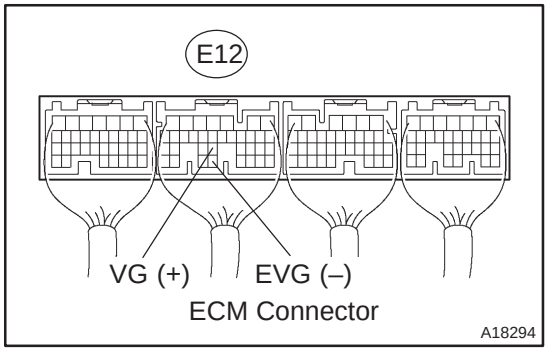
Standard:

Symbols (Terminal No.)	Specified condition
+B (A6–1) – Body ground	9 to 14 V

NG → **Go to step 5**

OK

3 INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the terminals of the E12 ECM connector.

HINT:
The shift position should be P or N and the A/C switch should be turned OFF.

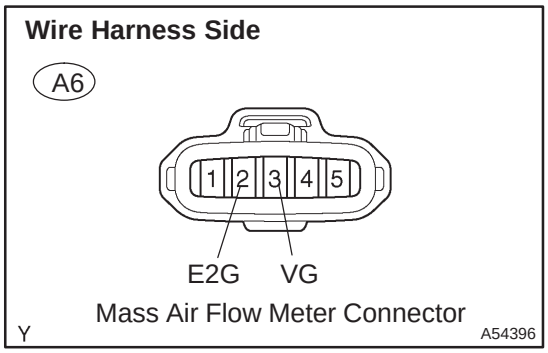
Standard:

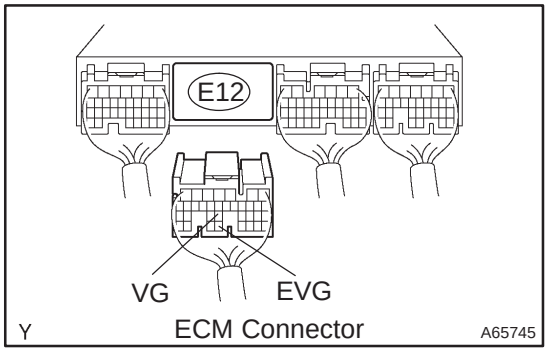
Symbols (Terminal No.)	Condition	Specified condition
VG (E12–24) – EVG (E12–32)	Engine is idling	0.5 to 3.0 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

4 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E12–24)	Continuity
E2G (A6–2) – EVG (E12–32)	

Standard (Check for short):

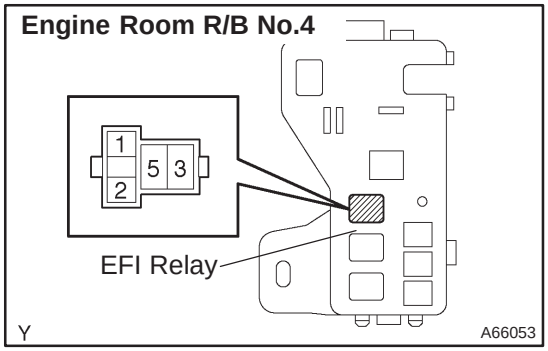
Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E12–24) – Body ground	No continuity

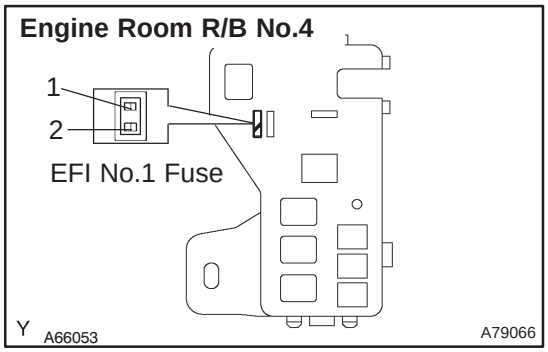
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

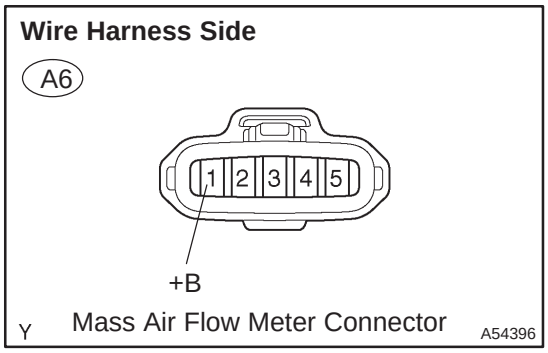
OK

REPLACE MASS AIR FLOW METER

5 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – EFI RELAY)







(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the EFI No.1 fuse from the engine room R/B No.4.
(c) Disconnect the mass air flow meter connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – EFI No.1 fuse (1)	Continuity
EFI No.1 fuse (2) – +B (A6–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or EFI No.1 fuse (1) – Body ground	No continuity
EFI No.1 fuse (2) or +B (A6–1) – Body ground	

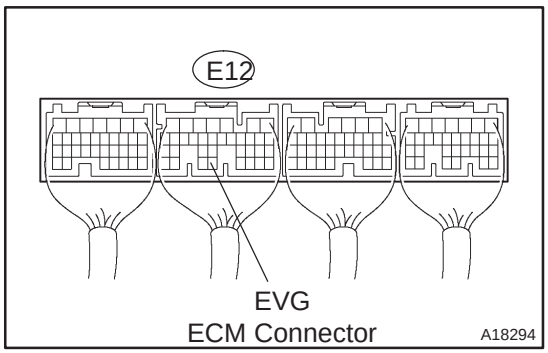
NOTICE:
Do not insert the tester leads hard in the procedure (c), the holder may be damaged.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–257)

6 INSPECT ECM(SENSOR GROUND)



(a) Check for continuity between the terminal of the E12 ECM connector and the body ground.

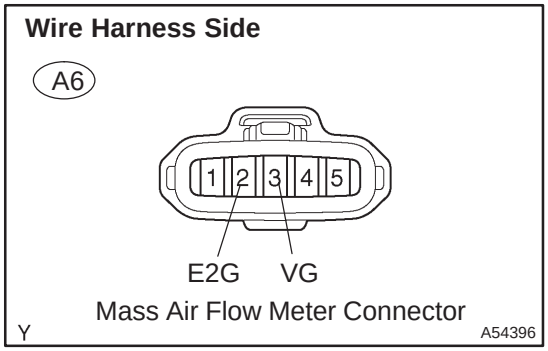
Standard:

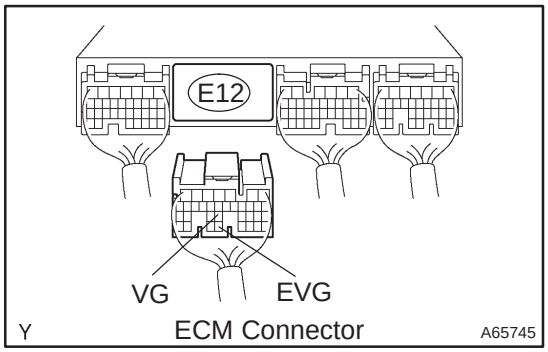
Symbols (Terminal No.)	Specified condition
EVG (E12–32) – Body ground	Continuity

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

7	CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E12–24)	Continuity
E2G (A6–2) – EVG (E12–32)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E12–24) – Body ground	No continuity

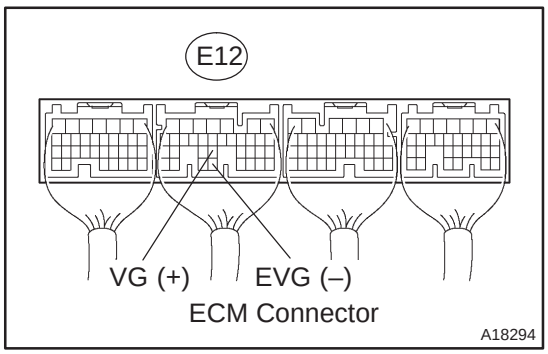
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

When not using hand–held tester:

1	INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the terminals of the E12 ECM connector.

HINT:
The shift position should be P or N and the A/C switch should be turned OFF.

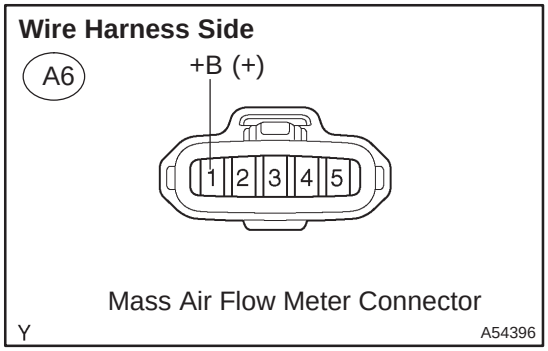
Standard:

Symbols (Terminal No.)	Condition	Specified condition
VG (E12–24) – EVG (E12–32)	Engine is idling	0.5 to 3.0 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

2 INSPECT MASS AIR FLOW METER(POWER SOURCE)



(a) Turn the ignition switch ON.
(b) Disconnect the mass air flow meter connector.
(c) Measure the voltage between the terminal of the wire harness side connector and the body ground.

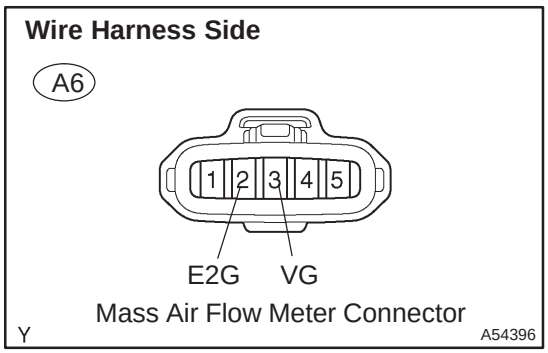
Standard:

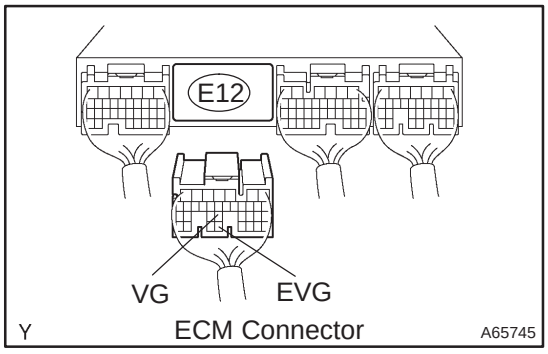
Symbols (Terminal No.)	Specified condition
+B (A6–1) – Body ground	9 to 14 V

NG → **Go to step 4**

OK

3 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – ECM)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E12–24)	Continuity
E2G (A6–2) – EVG (E12–32)	

Standard (Check for short):

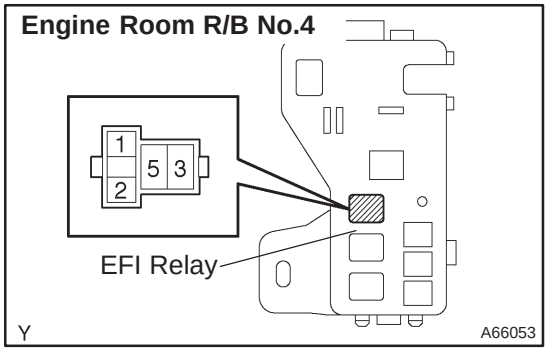
Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E12–24) – Body ground	No continuity

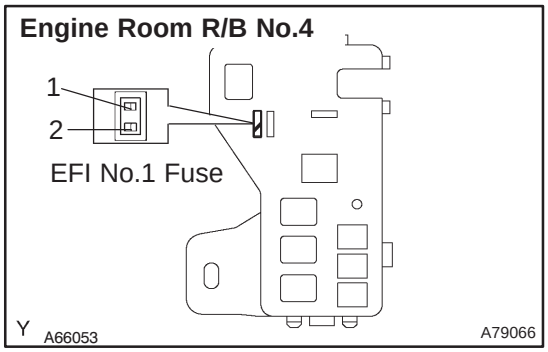
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

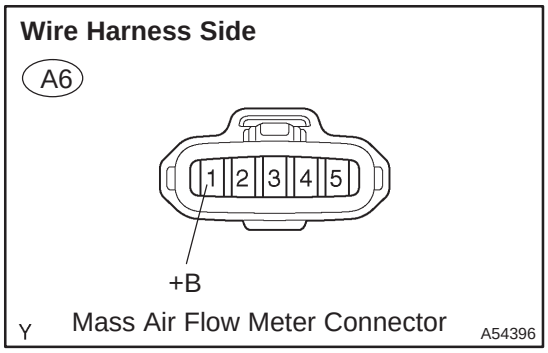
OK

REPLACE MASS AIR FLOW METER

4 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER – EFI RELAY)







(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the EFI No.1 fuse from the engine room R/B No.4.
(c) Disconnect the mass air flow meter connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – EFI No.1 fuse (1)	Continuity
EFI No.1 fuse (2) – +B (A6–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or EFI No.1 fuse (1) – Body ground	No continuity
EFI No.1 fuse (2) or +B (A6–1) – Body ground	

NOTICE:
Do not insert the tester leads hard in the procedure (c), the holder may be damaged.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–257)

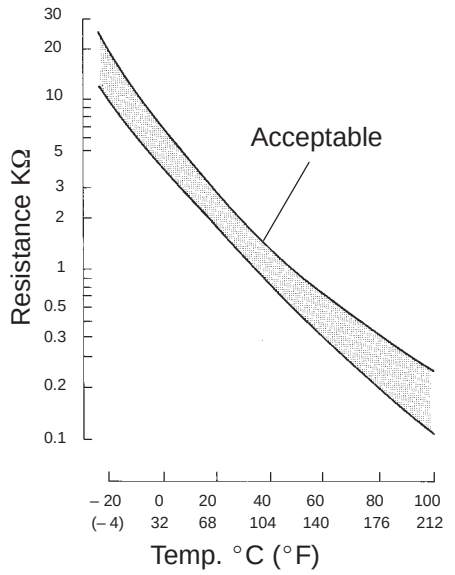
DTC	P0110/24	INTAKE AIR TEMPERATURE CIRCUIT MALFUNCTION

DTC	P0112/24	INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC	P0113/24	INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Fig.1)



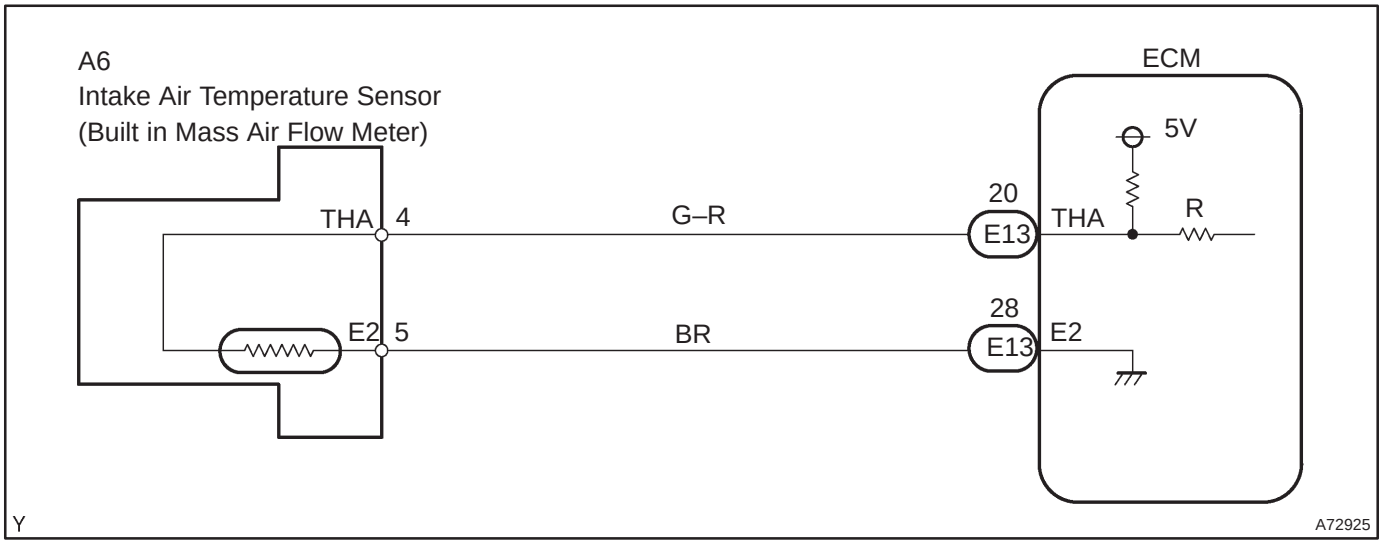
The intake air temperature sensor is built in the mass air flow meter and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature is the greater the thermistor resistance value becomes and the higher the intake air temperature is the lower the thermistor resistance value becomes (See Fig. 1).
The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.
That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110/24	Step 1	Open or short in intake air temp. sensor circuit for 0.5 sec.	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0112/24	Step 4	Short in intake air temp. sensor circuit for 0.5 sec.	
P0113/24	Step 2	Open in intake air temp. sensor circuit for 0.5 sec.	

After confirming DTC ”P0110/24, P0112/24 or P0113/24”, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

HINT:

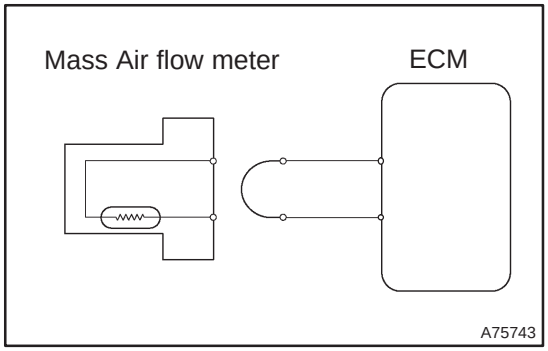
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B → **Go to step 4**

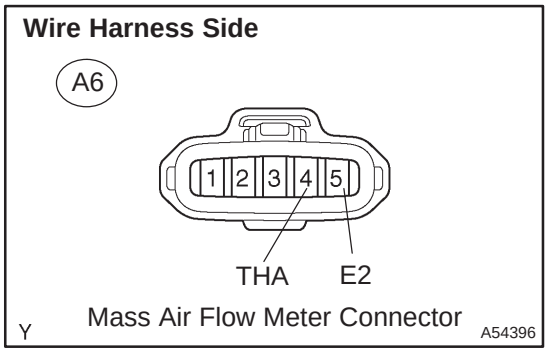
C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



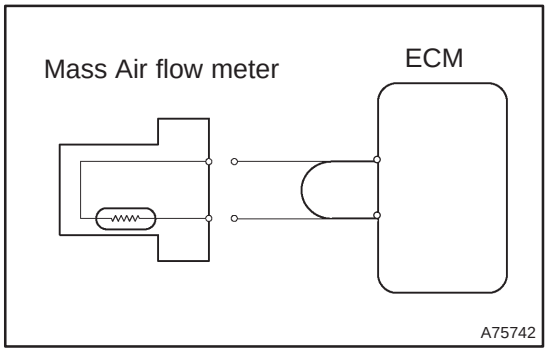
(a) Disconnect the mass air flow meter connector.
(b) Connect terminals THA and E2 of the mass air flow meter connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE MASS AIR FLOW METER**

NG

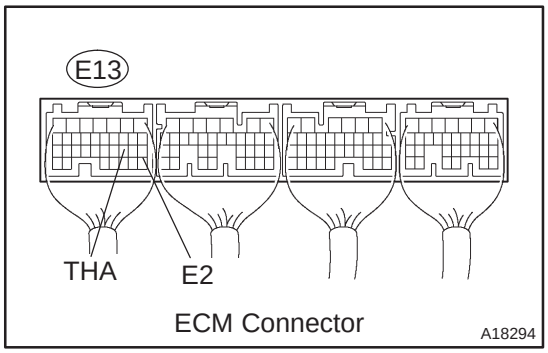
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the mass air flow meter connector.
(b) Connect terminals THA and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more

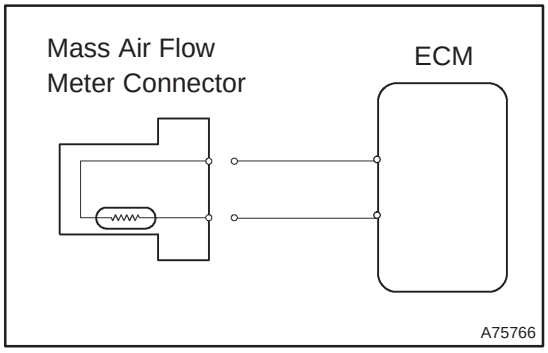


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM (See page 01–32)

4	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

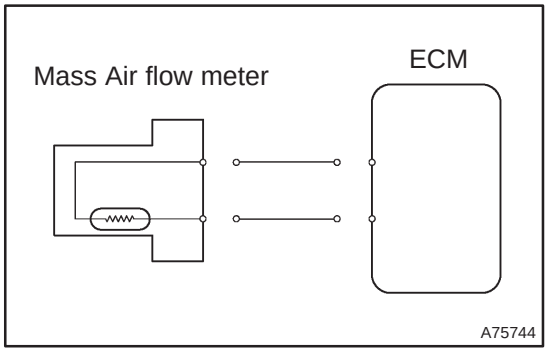


(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)

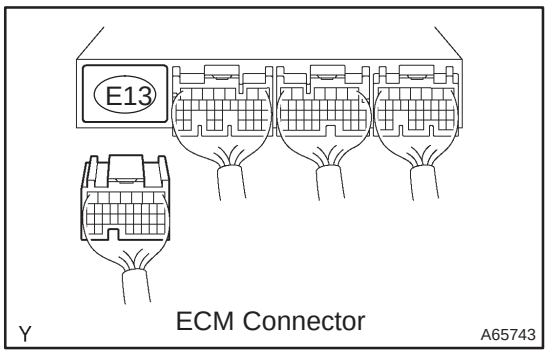
OK → **REPLACE MASS AIR FLOW METER**

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)



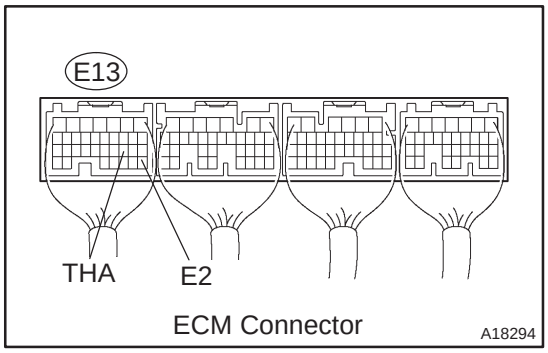
OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1	INSPECT ECM(THA VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals THA and E2 of the E13 ECM connector.

Voltage:

Intake air temp.	Voltage
20 °C (68 °F)	0.5 to 3.4 V
60 °C (140 °F)	0.2 to 1.0 V

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

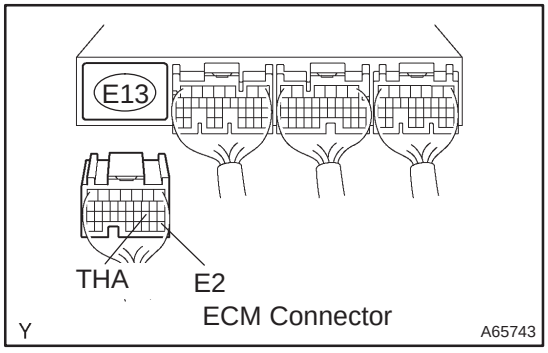
NG

2	INSPECT MASS AIR FLOW METER (See page 10–20)

NG → **REPLACE MASS AIR FLOW METER**

OK

3	CHECK HARNESS AND CONNECTOR(ECM – MASS AIR FLOW METER)



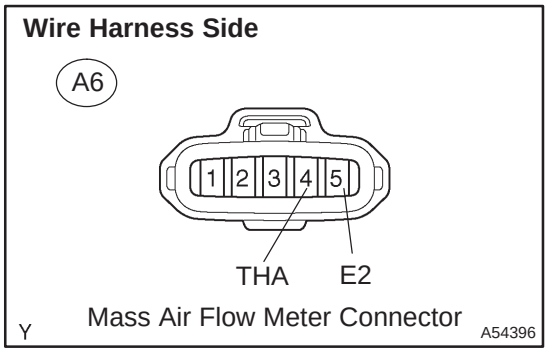
(a) Disconnect the E13 ECM connector.
(b) Disconnect the mass air flow meter connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
THA (E13–20) – THA (A6–4)	Continuity
E2 (E13–28) – E2 (A6–5)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
THA (E13–20) or THA (A6–4) – Body ground	Continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0115/22	ENGINE COOLANT TEMPERATURE CIRCUIT

DTC	P0117/22	ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC	P0118/22	ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

A thermistor is built in the engine coolant temperature sensor and changes the resistance value according to the engine coolant temperature.

The structure of the sensor and connection to the ECM is the same as those of the intake air temperature sensor.

HINT:

If the ECM detects the DTC ”P0115/22, P0117/22 or P0118/22” it enters the fail–safe mode in which the engine coolant temperature is assumed to be 80 °C (176 °F).

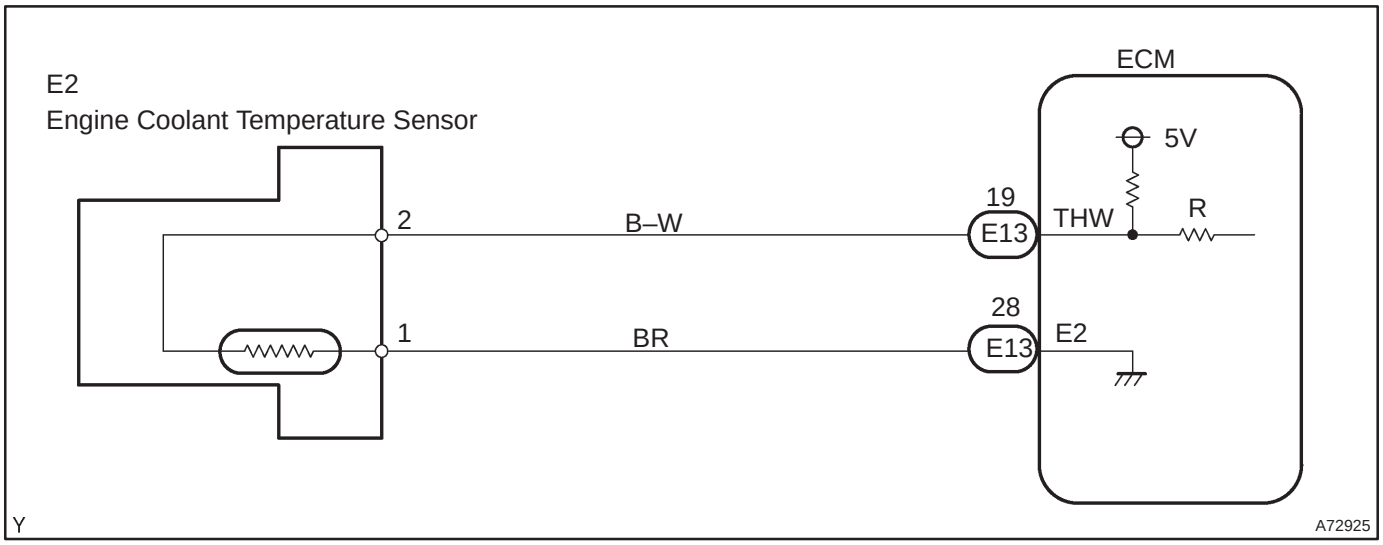
DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115/22	Step 1	Open or short in engine coolant temp. sensor circuit for 0.5 sec.	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM
P0117/22	Step 4	Short in engine coolant temp. sensor circuit for 0.5 sec.	
P0118/22	Step 2	Open in engine coolant temp. sensor circuit for 0.5 sec.	

HINT:

After confirming DTC ”P0115/22, P0117/22 or P0118/22”, use the hand–held tester to confirm the engine coolant temperature in the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(ENGINE COOLANT TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

HINT:

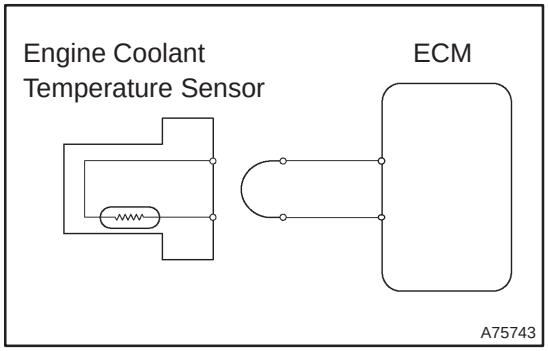
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B → **Go to step 4**

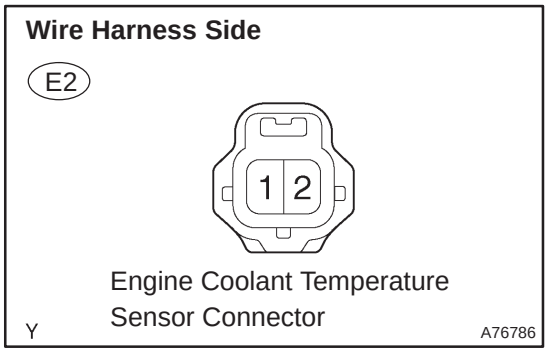
C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



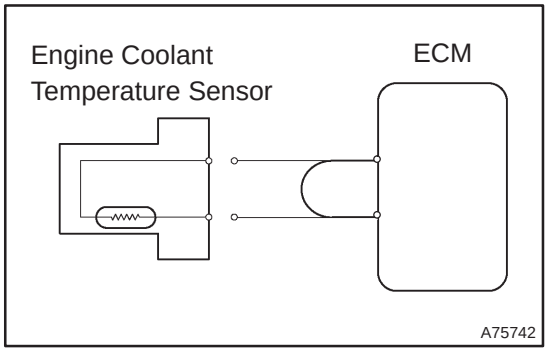
(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor connector.
(c) Turn the ignition switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE WATER TEMP. SENSOR**

NG

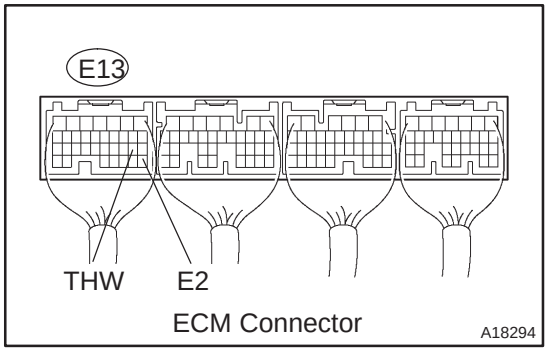
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect terminals THW and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more

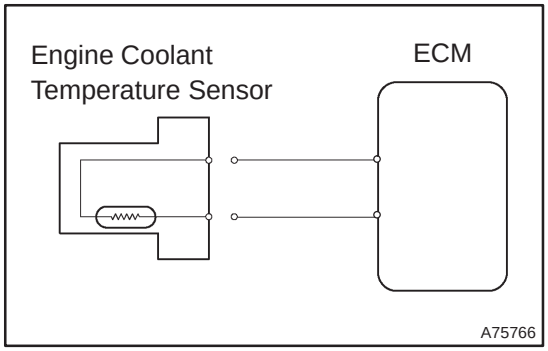


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM (See page 01–32)

4	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

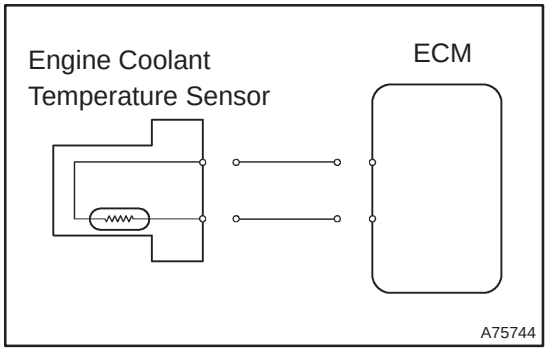


(a) Disconnect the engine coolant temperature sensor connector.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)

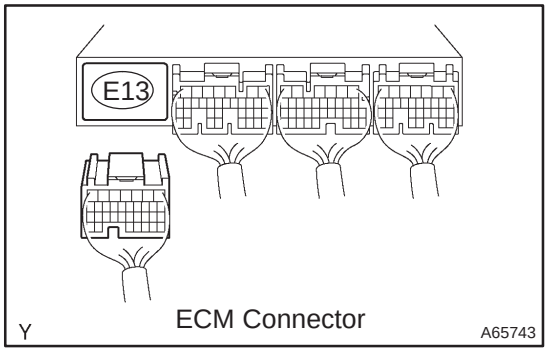
OK → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Disconnect the engine coolant temperature sensor connector.
(c) Turn the ignition switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)



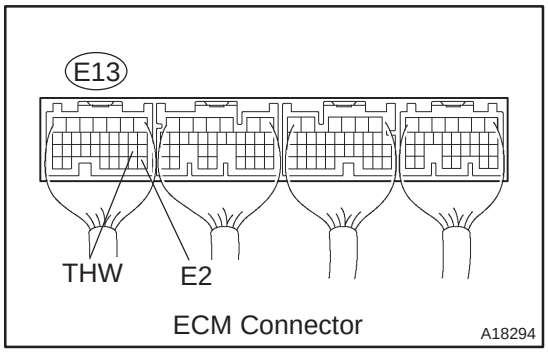
OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1 INSPECT ECM(THW VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between terminals THW and E2 of the ECM connector.

Voltage:

Intake air temp.	Voltage
20 °C (68 °F)	0.5 to 3.4 V
60 °C (140 °F)	0.2 to 1.0 V

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

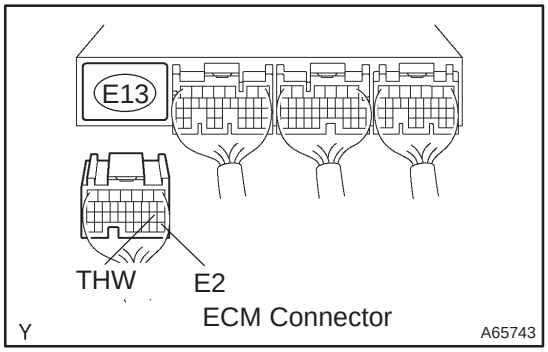
NG

2 INSPECT ENGINE COOLANT TEMPERATURE SENSOR (See page 10–20)

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

3 CHECK HARNESS AND CONNECTOR(ECM – EFI WATER TEMP. SENSOR)



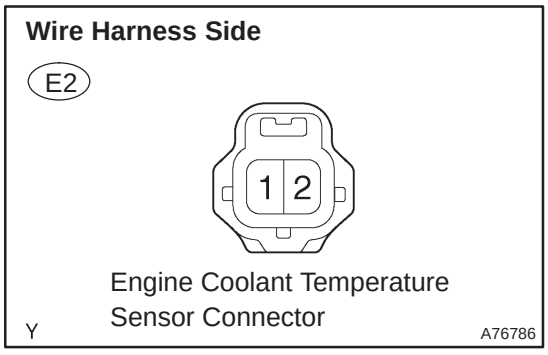
(a) Disconnect the E13 ECM connector.
(b) Disconnect the engine coolant temperature sensor connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
THW (E13–19) – Engine coolant temperature sensor (E2–2)	Continuity
E2 (E13–28) – Engine coolant temperature sensor (E2–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
THW (E13–19) or Engine coolant temperature sensor (E2–2) – Body ground	Continuity



MG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

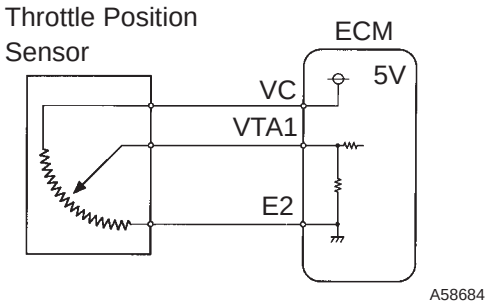
CHECK AND REPLACE ECM (See page 01–32)

DTC	P0120/41	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT

DTC	P0122/41	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT LOW INPUT

DTC	P0123/41	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION



The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle.
When the throttle valve is fully closed, a voltage of approximately 0.7 V is applied to terminal VTA1 of the ECM. The voltage applied to terminal VTA1 of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.5 to 5.0 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from terminal VTA1, uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc.

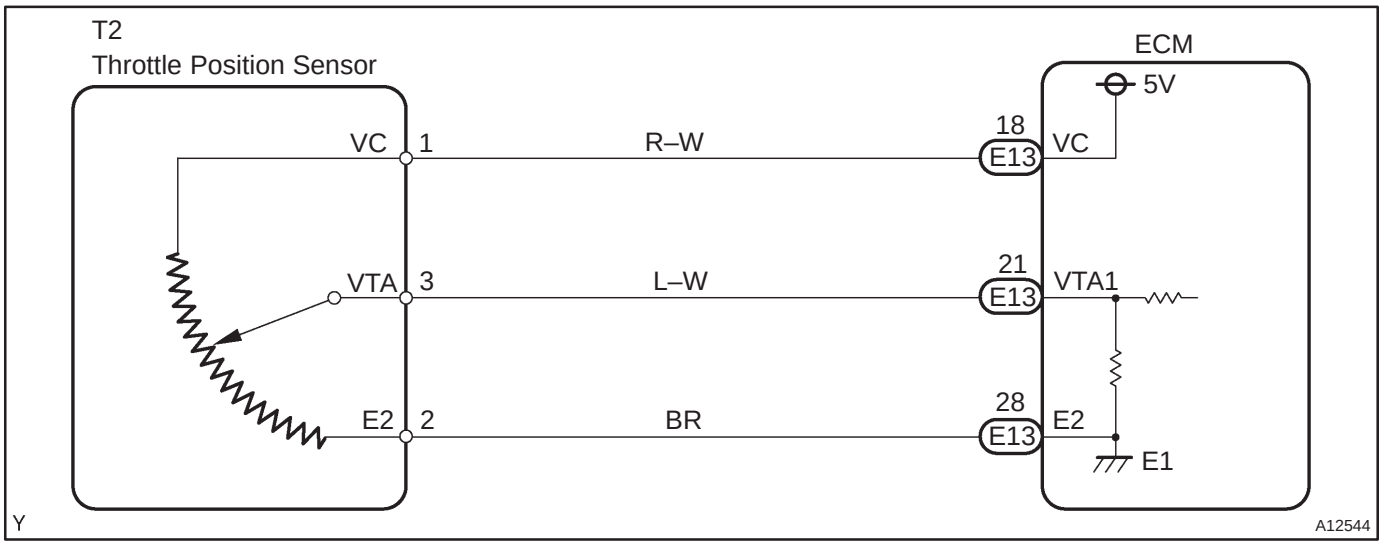
DTC No.	DTC Detection Condition	Trouble Area
Condition (a) of DTC P0120/41, P0122/41 or P0123/41 continues for 2 sec. (Open or short in throttle position sensor circuit)		
P0120/41	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied (a) VTA1 less than 0.1 V, or VTA1 greater than 4.9 V	• Throttle position sensor (built in throttle body) • ECM
P0122/41	(a) VTA1 less than 0.1 V	• Throttle position sensor (built in throttle body) • Short in VTA1 circuit • Open in VC circuit • ECM
P0123/41	(a) VTA1 greater than 4.9 V	• Throttle position sensor (built in throttle body) • Open in VTA1 circuit • Open in E2 circuit • VC and VTA1 circuit are short–circuited • ECM

NOTICE:
When a malfunction is detected, the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.
HINT:

- After confirming DTCs, use the hand–held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve fully closed	Throttle valve fully open	
0 %	0 %	VC circuit open VTA circuit open or short
Approx. 100 %	Approx. 100 %	E2 circuit open

WIRING DIAGRAM



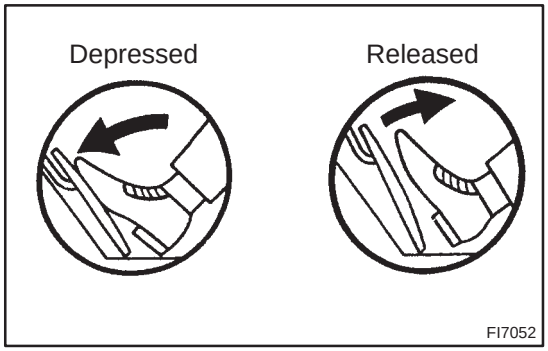
INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand−held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

When using hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(THROTTLE VALVE OPENING PERCENTAGE)



(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / THROTTLE POS” and read its value displayed on the hand–held tester.

Result:

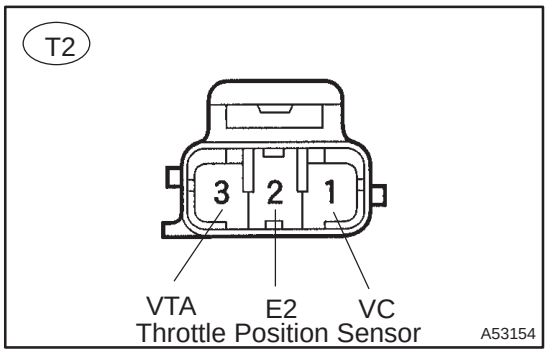
Accelerator pedal operation	Throttle valve opening position expressed as percentage	Proceed to
Released→Depressed	0 %	A
	Approx. 10 %→ Approx. 75 %	B
	Approx. 100 %	C

B → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

C → **Go to step 4**

A

2	INSPECT THROTTLE POSITION SENSOR



(a) Disconnect the throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

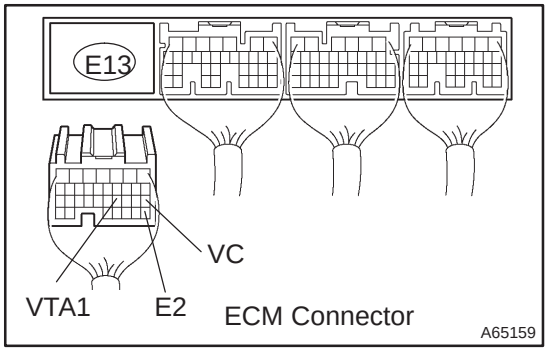
Standard:

Symbols (Terminal No.)	Throttle Valve	Resistance
VC (T2–1) – E2 (T2–2)	—	2.5 to 5.9 kΩ
VTA (T2–3) – E2 (T2–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG → **REPLACE THROTTLE POSITION SENSOR**

OK

3 INSPECT ECM



(a) Reconnect the throttle position sensor connector.
(b) Disconnect the E13 ECM connector.
(c) Measure the resistance between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Throttle valve	Resistance
VC (E13–18) – EC (E13–28)	—	2.5 to 5.9 kΩ
VTA1 (E13–21) – E2 (E13–28)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

(d) Check for continuity between the terminals of the E13 ECM connector.

Standard (Check for short):

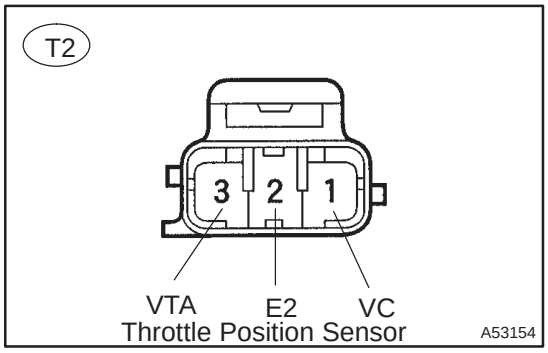
Symbols (Terminal No.)	Specified condition
VC (E13–18) – Body ground	No Continuity
VTA1 (E13–21) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

4 INSPECT THROTTLE POSITION SENSOR



(a) Disconnect the throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

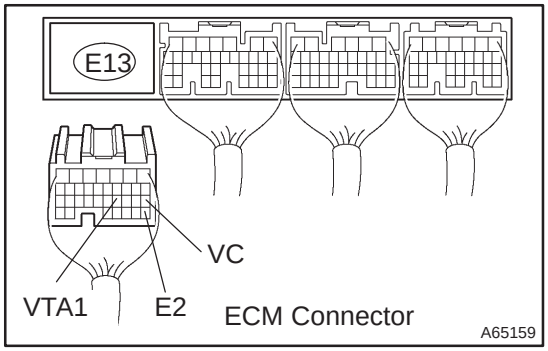
Standard:

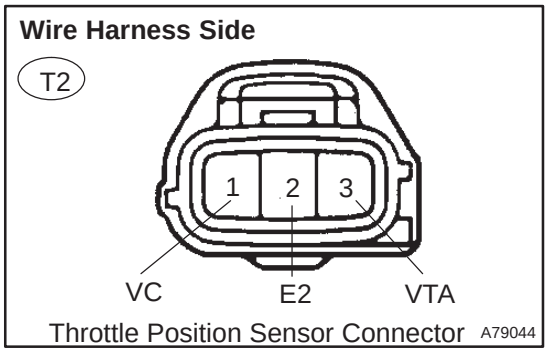
Symbols (Terminal No.)	Throttle Valve	Resistance
VC (T2–1) – E2 (T2–2)	—	2.5 to 5.9 kΩ
VTA (T2–3) – E2 (T2–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG → **REPLACE THROTTLE POSITION SENSOR**

OK

5 CHECK HARNESS AND CONNECTOR(ECM – THROTTLE POSITION SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the throttle position sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (T2–1) – VC (E13–18)	Continuity
VTA (T2–3) – VTA1 (E13–21)	
E2 (T2–2) – E2 (E13–28)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (T2–1) or VC (E13–18) – Body ground	No continuity
VTA (T2–3) or VTA1 (E13–21) – Body ground	

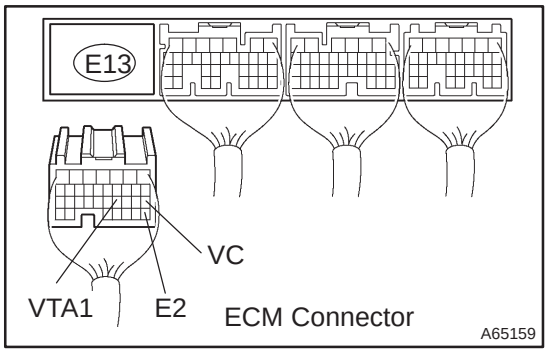
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1 CHECK HARNESS AND CONNECTOR(THROTTLE POSITION SENSOR – ECM)



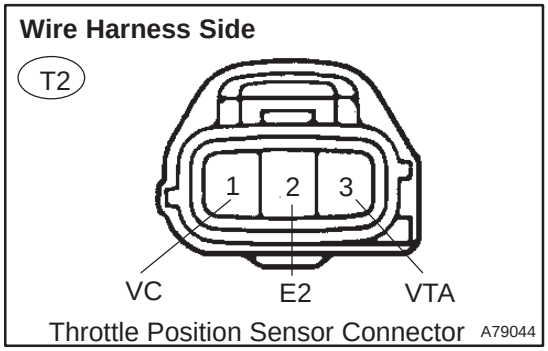
(a) Disconnect the E13 ECM connector.
(b) Disconnect the throttle position sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (T2–1) – VC (E13–18)	Continuity
VTA (T2–3) – VTA1 (E13–21)	
E2 (T2–2) – E2 (E13–28)	

Standard (Check for short):

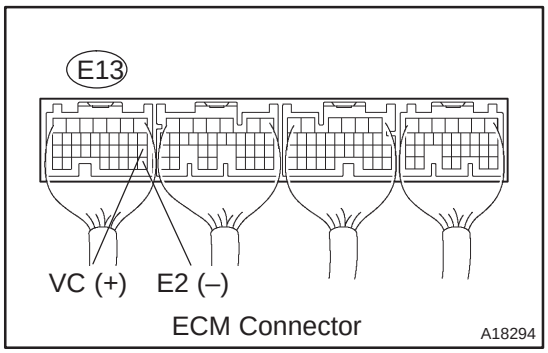
Symbols (Terminal No.)	Specified condition
VC (T2–1) or VC (E13–18) – Body ground	No continuity
VTA (T2–3) or VTA1 (E13–21) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 INSPECT ECM(VC VOLTAGE)



(a) Disconnect the throttle position sensor connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
VC (E13–18) – E2 (E13–28)	4.5 to 5.5 V

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

3 REPLACE THROTTLE BODY ASSY

GO

4	READ OUTPUT DTC(THROTTLE POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (See page 05–149).
(b) Start the engine.
(c) Run the engine at idle for more than 15 seconds.
(d) Read the DTC (See page 05–149).

Result:

Display (DTC output)	Proceed to
”P0120/41, P0122/41 or P0123/41” is output again	A
”P0120/41, P0122/41 or P0123/41” is not output again	B

B → **SYSTEM OK**

A

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0136/27	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

DTC	P0156/29	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 2 SENSOR 2)

CIRCUIT DESCRIPTION

The heated oxygen sensor is the lamination type. Compared to the conventional type, the sensor and heater portions of the lamination type are narrower overall. Because the heat of the heater acts directly on the alumina and zirconia (of the sensor portion) it accelerates the activation of the sensor.

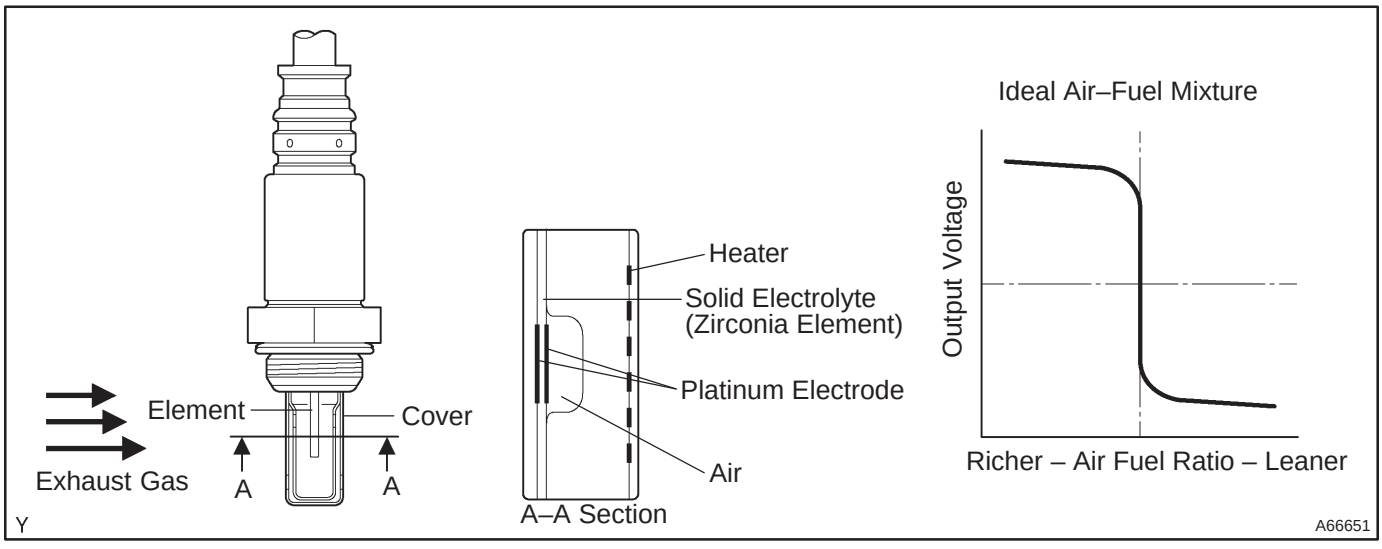
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used. But for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.

The heated oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and provide the ECM with feedback control the air–fuel ratio.

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust gas increases. And the heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i.e. less than 0.45 V).

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio, the oxygen concentration in the exhaust gas is reduced. And the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i.e. more than 0.45 V). The ECM judges by the voltage output from the heated oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if the malfunction of the heated oxygen sensor causes an output of abnormal voltage, the ECM becomes unable to perform accurate air–fuel ratio control.

The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), current flows to the heater in order to heat the sensor for the accurate oxygen concentration detection.

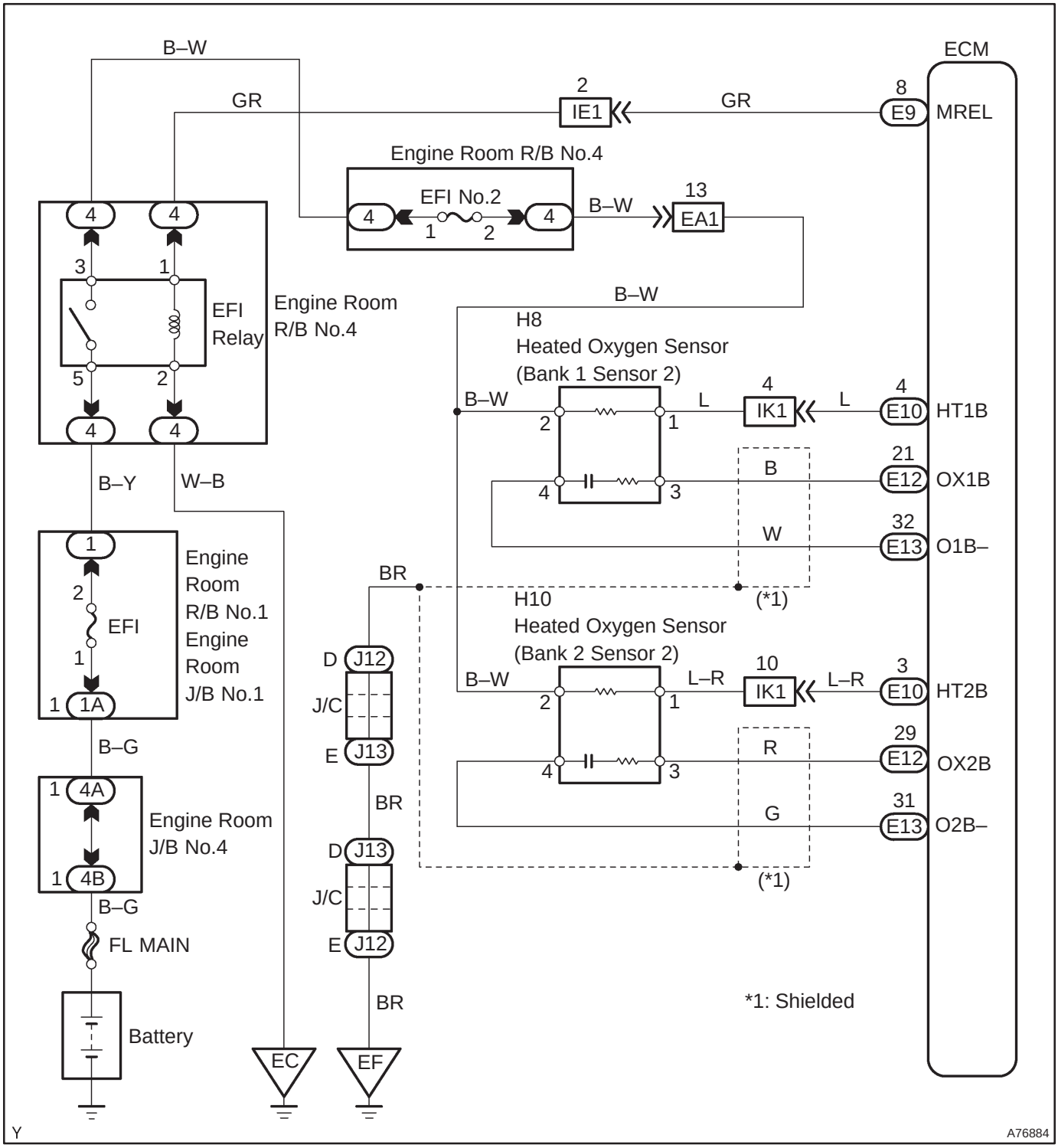


DTC No	DTC Detection Condition	Trouble Area
P0136/27 P0156/29	The following condition continues for 480 sec. or more: • During driving with the engine warmed up, voltage output of the heated oxygen sensor remains at 0.45 V or more, or 0.60 V or less.	• Open or short in heated oxygen sensor (bank 1, 2 sensor 2) circuit • Heated oxygen sensor (bank 1, 2 sensor 2) • Heated oxygen sensor heater (bank 1, 2 sensor 2) • EFI relay

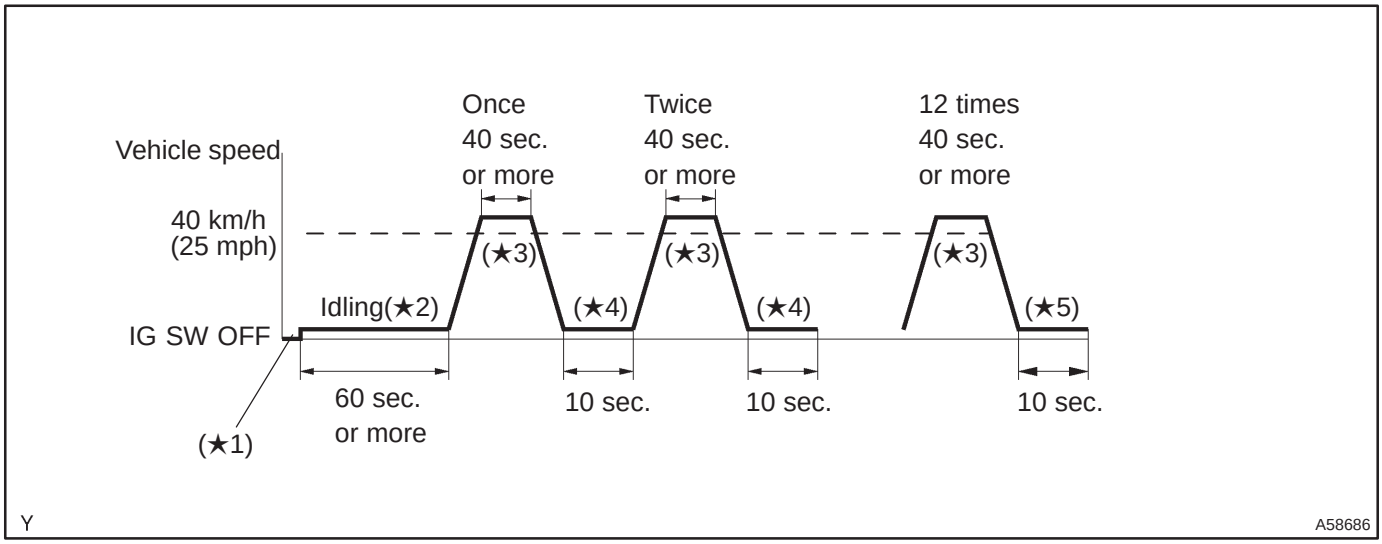
HINT:

- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that does not include cylinder No.1.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



1. **Connect the hand–held tester to the DLC3. (★1)**
2. **Switch the hand–held tester from the normal mode to the check mode (See page 05–149). (★1)**
3. **Start the engine and let the engine idle for 60 seconds or more. (★2)**
4. **Drive the vehicle at 40 km/h (25 mph) or more for 40 seconds or more. (★3)**
5. **Let the engine idle for 10 seconds or more. (★4)**
6. **Perform steps 4 to 5 12 times. (★5)**

HINT:

If a malfunction exists, the CHK ENG will be illuminated on the multi–information display during step 6.

NOTICE:

If the conditions in this test are not strictly followed, detection of the malfunction will be impossible. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from 3 to 6, then perform steps from 3 to 6 again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (A/F sensor, heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

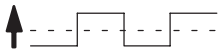
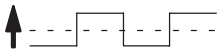
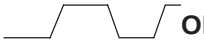
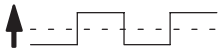
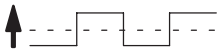
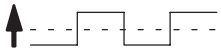
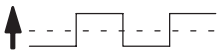
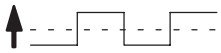
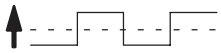
”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately. 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: Less than 3.0 V
–12.5 % → lean output: More than 3.35 V
Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:
There is a few second delay in the A/F sensor output, and there is about 20 seconds delay in the heated oxygen sensor output.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 3.35 V Less than 3.0 V **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	A/F sensor (A/F sensor, heater, A/F sensor circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 3.35 V Less than 3.0V **OK**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following procedure of A/F CONTROL enables the technician to check and graph the voltage outputs of both the A/F sensor and heated oxygen sensor.
For displaying the graph indication, enter ”ACTIVE TEST/ A/F CONTROL/USER DATA”, then select ”AFS B1S1 and O2S B1S2” or ”AFS B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand−held tester Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ OUTPUT DTC(BESIDES DTC P0136/27)

(a) Read the DTC.
Result:

Display (DTC output)	Proceed to
Only ”P0136/27” is output	A
”P0136/27” and other DTCs are output	B

HINT:
If any other codes besides ”P0136/27” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–161)**

A

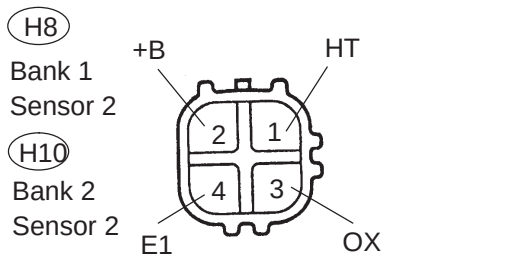
2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.
(b) Read the output voltage of the heated oxygen sensor when the engine rpm is suddenly increased.
HINT:
Quickly accelerate the engine to 4,000 rpm 3 times by using the accelerator pedal.
Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0.5 V or more.

OK → **Go to step 6**

NG

3	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



Heated Oxygen Sensor Connector
A79117

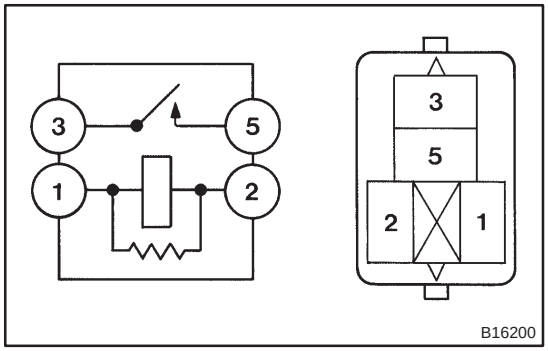
(a) Disconnect the heated oxygen sensor connector.
(b) Inspect the heated oxygen sensor.
Standard:

Symbols (Terminal No.)	Condition	Specified condition
HT (H8–1) – +B (H8–2)	20°C (68°F)	11 to 16 Ω
HT (H8–1) – E1 (H8–4)	—	No Continuity
HT (H10–1) – +B (H10–2)	20°C (68°F)	11 to 16 Ω
HT (H10–1) – E1 (H10–4)	—	No Continuity

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No.4.
(b) Inspect the EFI relay.

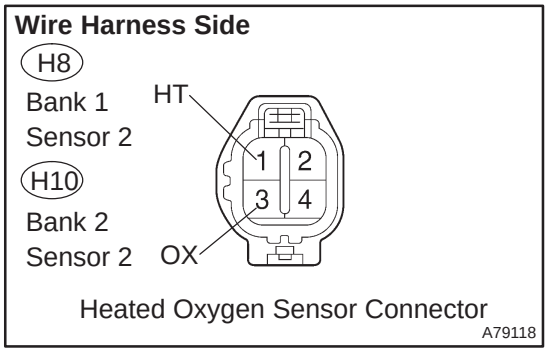
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

5 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)



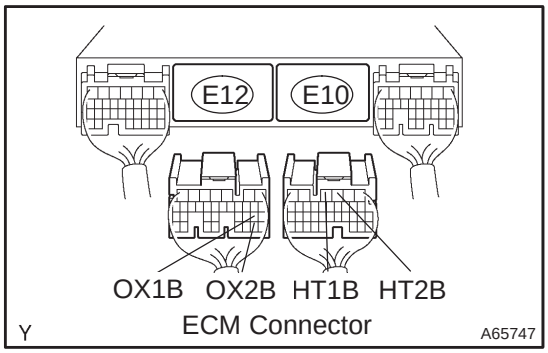
(a) Disconnect the H8 or H10 heated oxygen sensor connector.
(b) Disconnect the E10 and E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

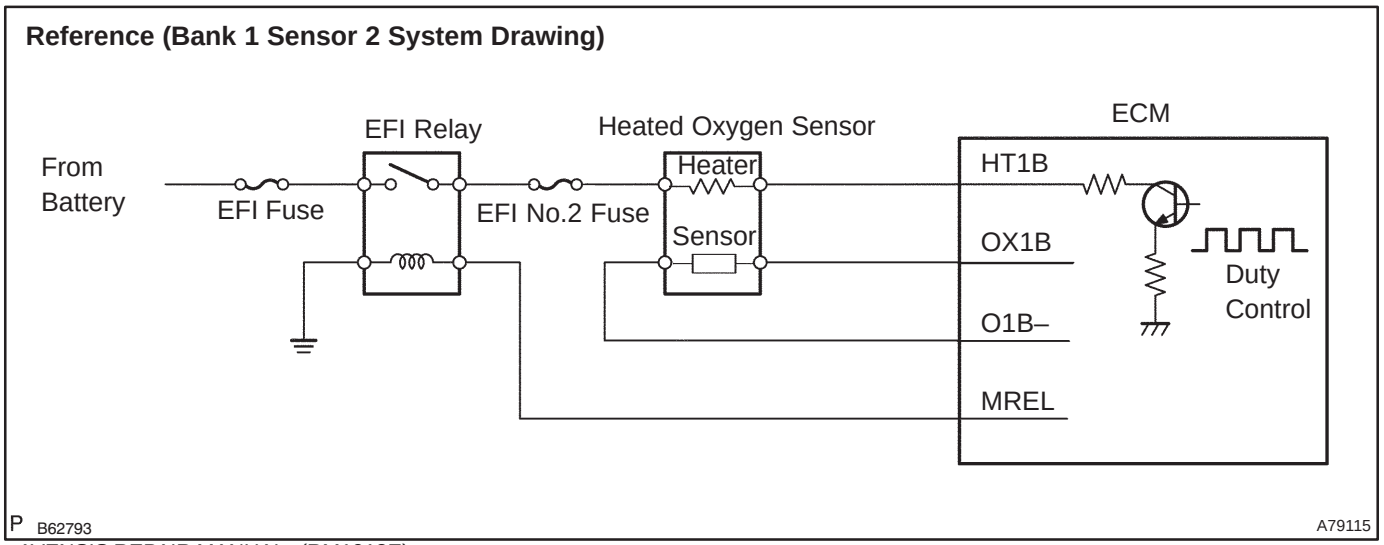
Symbols (Terminal No.)	Specified condition
OX (H8–3) – OX1B (E12–21)	Continuity
HT (H8–1) – HT1B (E10–4)	
OX (H10–3) – OX2B (E12–29)	
HT (H10–1) – HT2B (E10–3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H8–3) or OX1B (E12–21) – Body ground	No continuity
HT (H8–1) or HT1B (E10–4) – Body ground	
OX (H10–3) or OX2B (E12–29) – Body ground	
HT (H10–1) or HT2B (E10–3) – Body ground	



Reference (Bank 1 Sensor 2 System Drawing)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE HEATED OXYGEN SENSOR

6	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to perform the confirmation driving pattern.

GO

7	READ OUTPUT DTC(DTC P0136/27 IS OUTTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0136/27” is not output again	A
”P0136/27” is output again	B

B → REPLACE HEATED OXYGEN SENSOR

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)

DTC	P0141/27	OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

DTC	P0161/29	OXYGEN SENSOR HEATER CIRCUIT (BANK 2 SENSOR 2)

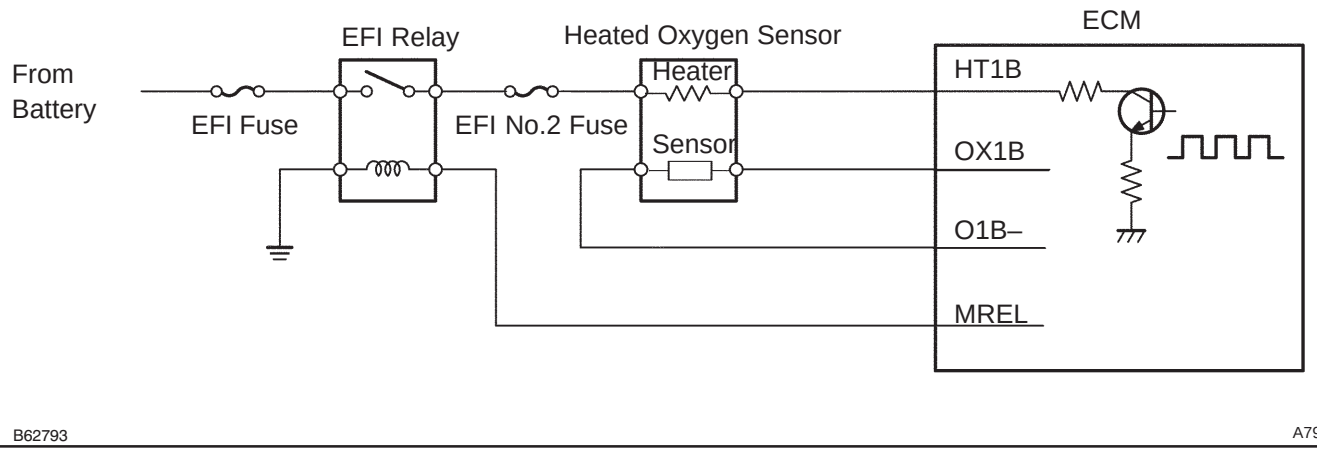
CIRCUIT DESCRIPTION

Refer to DTC P0136/27 on page 05–211.

HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 2 System Drawing)



DTC No.	DTC Detection Condition	Trouble Area
P0141/27 P0161/29	Heated current is 0.2 A or less when heater operates (1 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM
	When heater operates, heated current exceeds 2 A (1 trip detection logic)	

HINT:

- Bank 1 refers to the bank that includes cylinder No.1.
- Bank 2 refers to the bank that does not include cylinder No.1.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

WIRING DIAGRAM

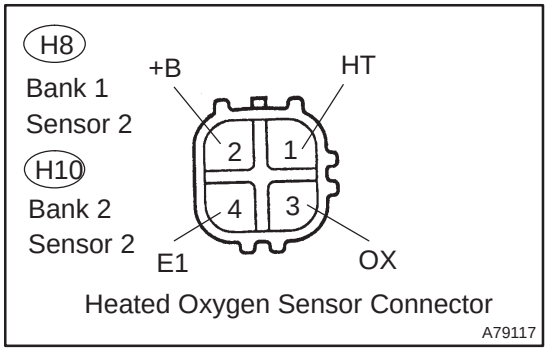
Refer to DTC P0136/27 on page 05–211.

INSPECTION PROCEDURE

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the heated oxygen sensor connector.
(b) Inspect the heated oxygen sensor.

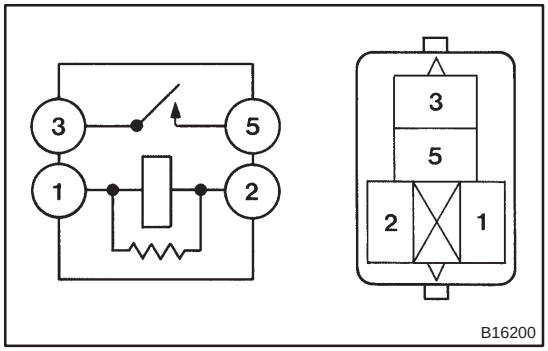
Standard:

Symbols (Terminal No.)	Condition	Specified condition
HT (H8–1) – +B (H8–2)	20°C (68°F)	11 to 16 Ω
HT (H8–1) – E1 (H8–4)	—	No Continuity
HT (H10–1) – +B (H10–2)	20°C (68°F)	11 to 16 Ω
HT (H10–1) – E1 (H10–4)	—	No Continuity

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

2 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B.
(b) Inspect the EFI relay.

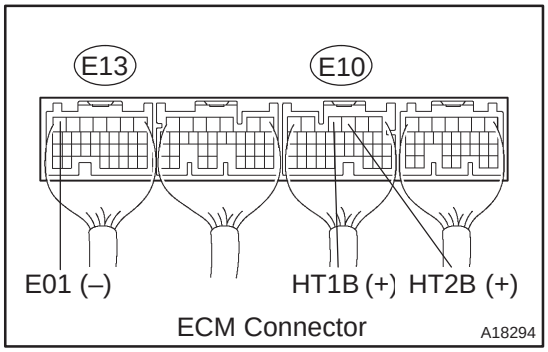
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

3 INSPECT ECM(HT1B OR HT2B VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the applicable terminals of the E10 and E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
HT1B (E10–4) – E01 (E13–7)	9 to 14 V
HT2B (E10–3) – E01 (E13–7)	

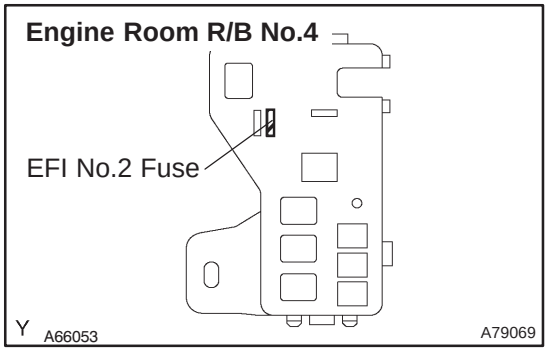
HINT:

- The HT1B means the heated oxygen sensor bank 1 sensor 2.
- The HT2B means the heated oxygen sensor bank 2 sensor 2.

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

4	CHECK FUSE(EFI No.2)



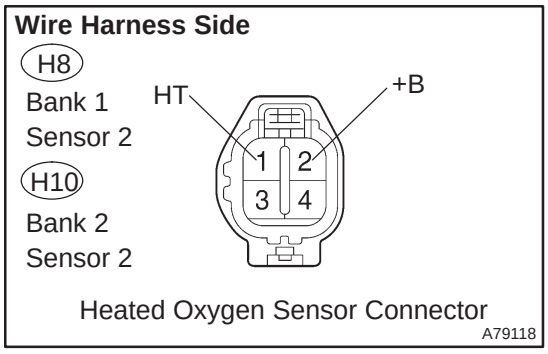
(a) Remove the EFI No.2 fuse from the engine room R/B No.4.

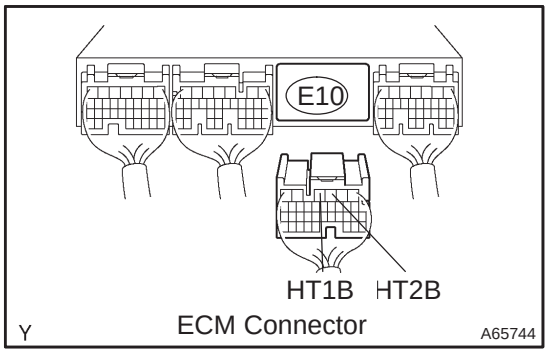
(b) Check for continuity in the EFI No.4 fuse.
Standard: Continuity

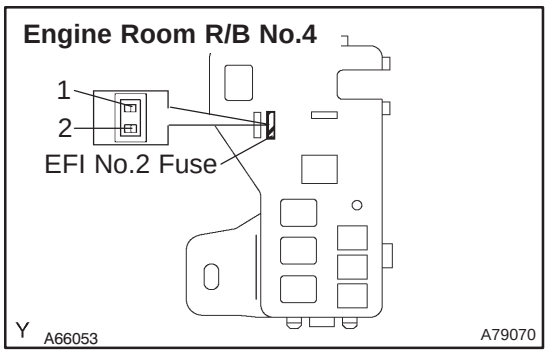
NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

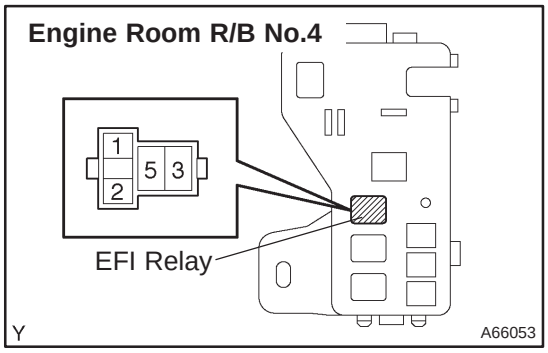
OK

5 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM, HEATED OXYGEN SENSOR – EFI RELAY)









(a) Check the harness and connector between the ECM and heated oxygen sensor connectors.

(1) Disconnect the H8 or H10 heated oxygen sensor connector.

(2) Disconnect the E10 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
HT (H8–1) – HT1B (E10–4)	Continuity
HT (H10–1) – HT2B (E10–3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
HT (H8–1) or HT1B (E10–4) – Body ground	No continuity
HT (H10–1) or HT2B (E10–3) – Body ground	

(b) Check the harness and connector between the heated oxygen sensor connector and EFI relay.

(1) Disconnect the H8 or H10 heated oxygen sensor connector.

(2) Remove the EFI No.2 fuse from the engine room R/B No.4.

(3) Remove the EFI relay from the engine room R/B No.4.

(4) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (H8–2) – EFI No.2 fuse (2)	Continuity
+B (H10–2) – EFI No.2 fuse (2)	
EFI No.2 fuse (1) – EFI relay (3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (H8–2) or EFI No.2 fuse (2) – Body ground	No continuity
+B (H10–2) or EFI No.2 fuse (2) – Body ground	
EFI No.2 fuse (1) or EFI relay (3) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0325/52	KNOCK SENSOR 1 CIRCUIT (BANK 1 OR SINGLE SENSOR)

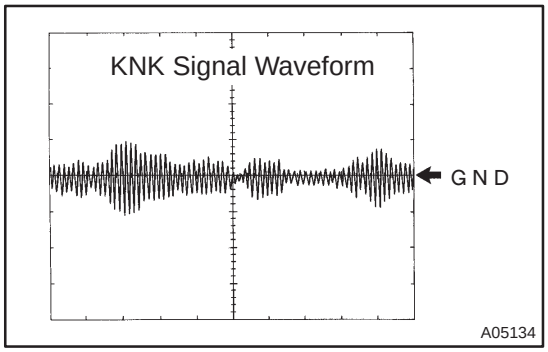
DTC	P0327/52	KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

DTC	P0328/52	KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

A flat type knock sensor (non–resonant type) has the structure that can detect the vibration in a wider band of frequency from about 6 kHz to 15 kHz and has the following features.
Knock sensors are fitted on the cylinder block to detect the engine knocking.
Sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is retarded to suppress it.

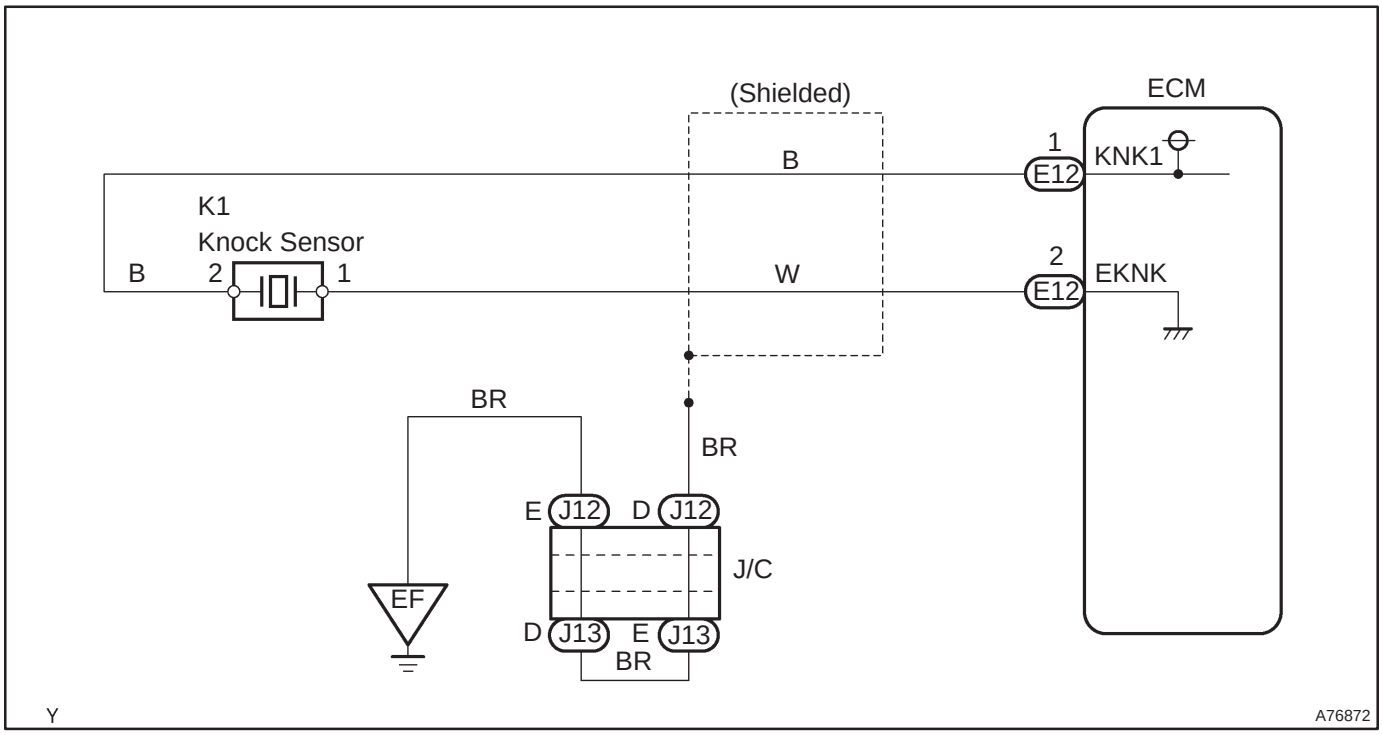
DTC No.	DTC Detection Condition	Trouble Area
P0325/52	Output voltage of the knock sensor 1 decreases beyond a threshold. (Threshold varies according to an engine speed.)	• Knock sensor 1 • Knock sensor 1 (under–torqued or loose) • ECM
P0327/52	Output voltage the knock sensor 1 is 0.5 V or less.	• Short in knock sensor 1 circuit • Knock sensor 1 • ECM
P0328/52	Output voltage the knock sensor 1 is 4.5 V or more.	• Open in knock sensor 1 circuit • Knock sensor 1 • ECM



Reference:
The correct waveform is as shown.

Item	Contents
Terminal	KNK1 – EKNK
Equipment Set	0.01 to 10 V/ DIV, 0.01 to 10 msec./ DIV
Condition	After warming up the engine, keep the engine speed 4,000 rpm.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ OUTPUT DTC

(a) Clear the DTC (See page 05–149).
(b) Warm up the engine.
(c) Accelerate the engine to 3,000 rpm for 10 seconds or more.
(d) Read the DTC (See page 05–149).

Result :

Display (DTC output)	Proceed to
Only "P0325/52" is output again	A
"P0325/52, P0327/52 and/or P0328/52" are output again	B

B → **Go to step 3**

A

2 CHECK KNOCK SENSOR

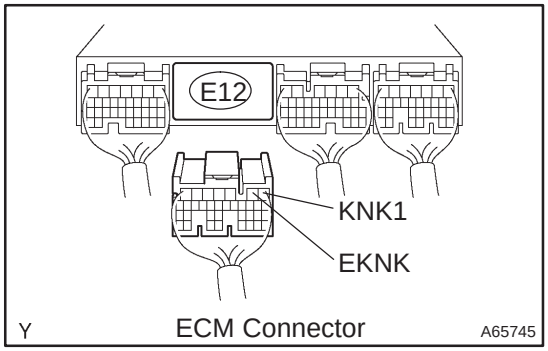
(a) Check the knock sensor installation.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

NG → **TIGHTEN SENSOR**

OK

REPLACE KNOCK SENSOR

3 CHECK HARNESS AND CONNECTOR(ECM – KNOCK SENSOR)



(a) Disconnect the E12 ECM connector.
(b) Disconnect the knock sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
KNK1 (E12–1) – Knock sensor (K1–2)	Continuity
EKNK (E12–2) – Knock sensor (K1–1)	

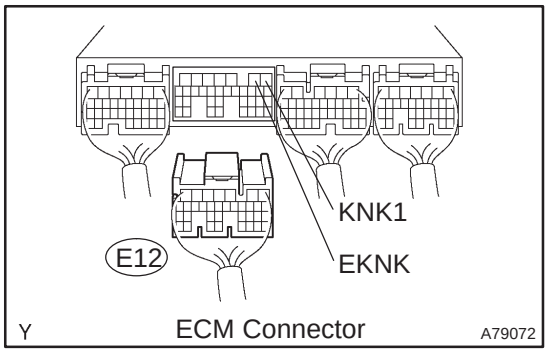
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
KNK1 (E12–1) or Knock sensor (K1–2) – Body ground	No continuity
EKNK (E12–2) or Knock sensor (K1–1) – Body ground	

NG → **Go to step 5**

OK

4 INSPECT ECM(KNK1 VOLTAGE)



(a) Disconnect the E12 ECM connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E12 ECM side terminals.

Standard:

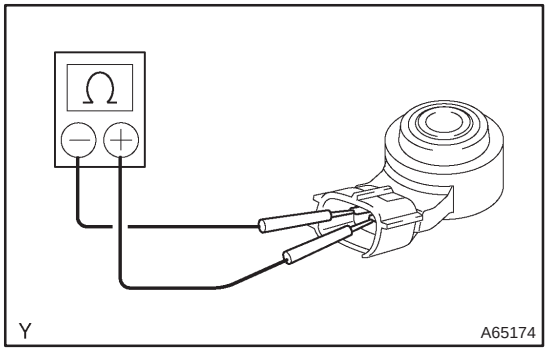
Symbols (Terminal No.)	Specified condition
KNK1 (E12–1) – EKNK (E12–2)	4.5 to 5.5 V

NG → **REPLACE ECM**

OK

CHECK AND REPLACE ECM (See page 01–32)

5 INSPECT KNOCK SENSOR



(a) Remove knock sensor.
(b) Measure the resistance between the terminals.
Standard:

Symbols (Terminal No.)	Condition	Specified condition
FKN+ (1) – FKN– (2)	20 °C (68 °F)	120 to 280 Ω

NG → **REPLACE KNOCK SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC	P0335/12	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT

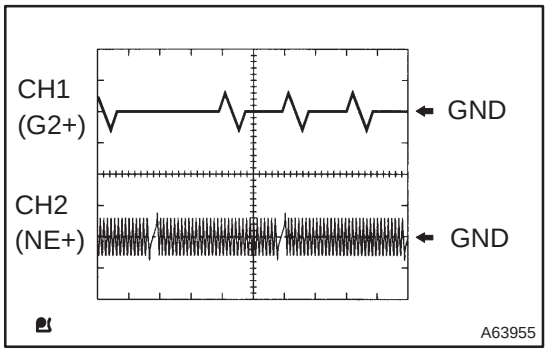
DTC	P0335/13	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT

DTC	P0339/13	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT INTERMITTENT

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a magnet, iron core and pickup coil.
The NE signal plate (crankshaft position sensor plate) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signal, and the cylinder and the angle of the VVT based on the combination of the G and NE signal.

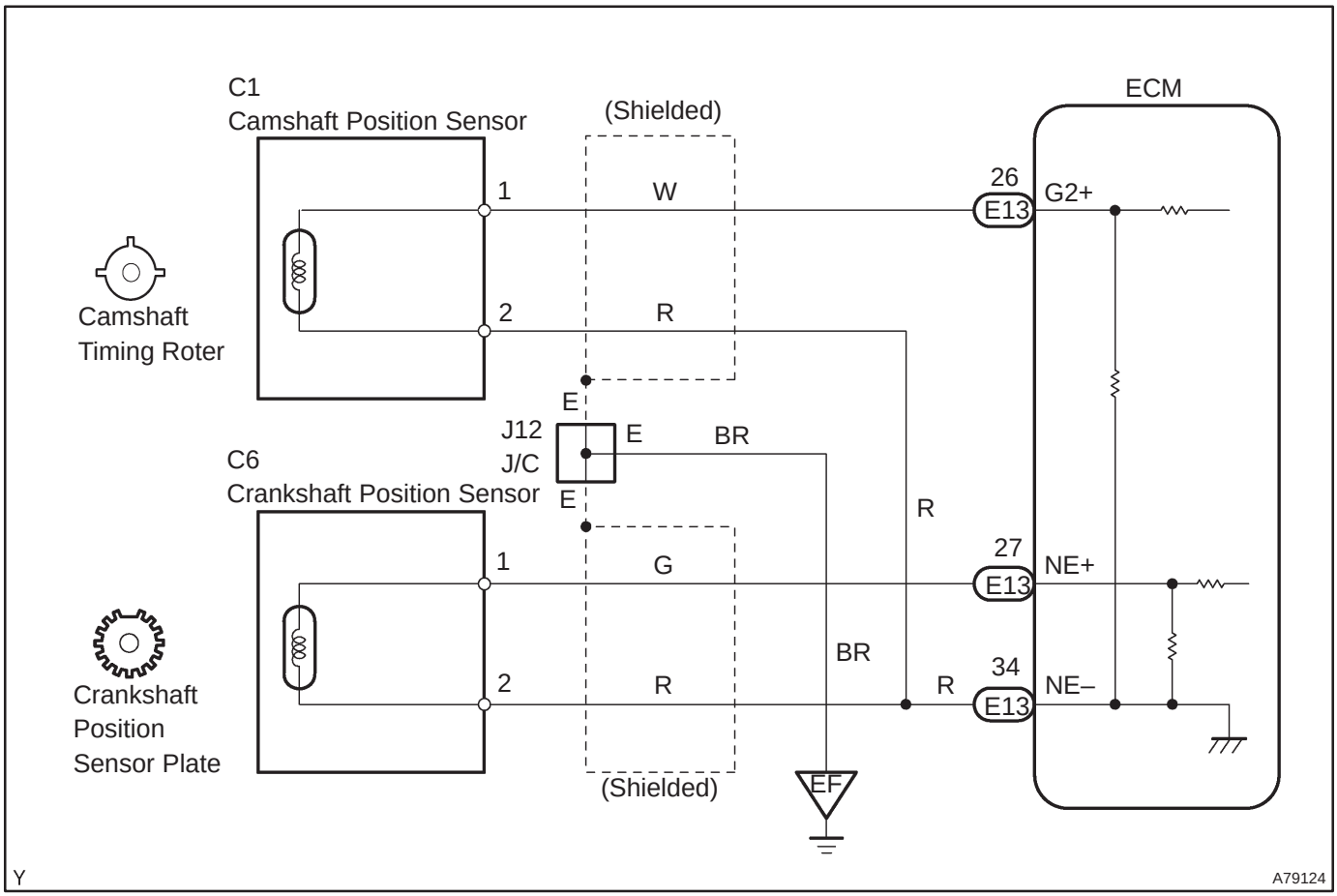
DTC No.	DTC Detection Condition	Trouble Area
P0335/12	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft) • ECM
P0335/13	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (1 trip detection logic)	
P0339/13	In condition (a), (b) and (c), when no crankshaft position sensor (NE) signal is input for 0.05 sec. or more. (a) Engine revolution 1,000 rpm or more (b) STA signal is OFF (c) 3 sec. or more has lapsed after STA signal is switched from ON to OFF.	



Reference: Inspection using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G2+ – NE– CH2: NE+ – NE–
Equipment Set	5V/DIV, 20ms/DIV
Condition	During cranking or idling

WIRING DIAGRAM

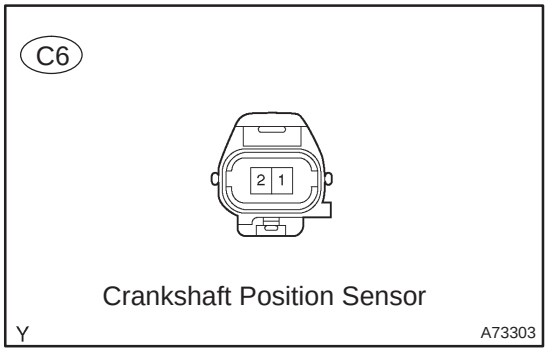


INSPECTION PROCEDURE

HINT:

- Perform troubleshooting of DTC P0335/12, 13 first. If no trouble is found, troubleshoot the engine mechanical systems.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT CRANKSHAFT POSITION SENSOR(RESISTANCE)



(a) Measure the resistance between the terminals of the crankshaft posision sensor connector.

Resistance:

985 to 1,600 Ω at cold

1,265 to 1,890 Ω at hot

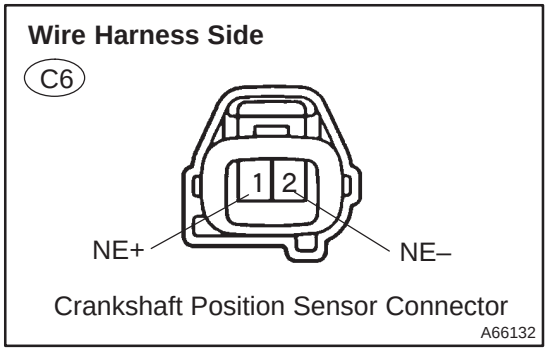
NOTICE:

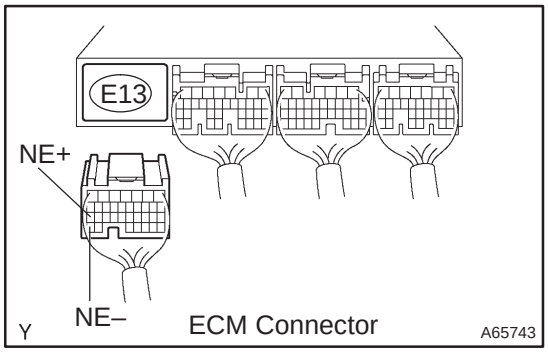
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50 °C (122 °F) and "Hot" is from 50 °C (122 °F) to 100 °C (212 °F).

NG → **REPLACE CRANKSHAFT POSITION SENSOR**

OK

2	CHECK HARNESS AND CONNECTOR(CRANKSHAFT POSITION SENSOR – ECM)





(a) Disconnect the crankshaft position sensor connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
NE+ (C6–1) – NE+ (E13–27)	Continuity
NE– (C6–2) – NE– (E13–34)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
NE+ (C6–1) or NE+ (E13–27) – Body ground	No continuity
NE– (C6–2) or NE– (E13–34) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)

(a) Check the crankshaft position sensor installation .

NG → **TIGHTEN SENSOR**

OK

4	CHECK CRANKSHAFT POSITION SENSOR PLATE(TEETH OF SENSOR PLATE(CRANKSHAFT))

(a) Check the teeth of the sensor plate.

NG → **REPLACE CRANKSHAFT POSITION SENSOR PLATE (CRANKSHAFT)**

OK

CHECK AND REPLACE ECM (See page 01–32)

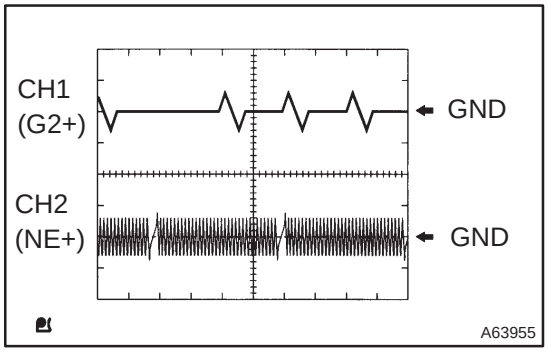
DTC	P0340/12	CAMSHAFT POSITION SENSOR ”A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0341/12	CAMSHAFT POSITION SENSOR ”A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

The camshaft position sensor (G signal) consists of a magnet, iron core and pickup coil.
The G signal rotor has 3 teeth on its outer circumference and is installed on the intake camshaft.
When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil changes, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate (crankshaft position sensor plate) has 34 teeth and is installed to the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signals, and the cylinder and the angle of the VVT based on the combination of the G and NE signals.

DTC No.	DTC Detection Condition	Trouble Area
P0340/12	• No camshaft position sensor signal to ECM during cranking (1 trip detection logic) • No camshaft position sensor signal to ECM with engine speed 600 rpm or more (1 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has jumped a tooth • ECM
P0341/12	While crankshaft rotates twice, camshaft position sensor signal is input to ECM 12 times or more (1 trip detection logic)	



Reference: Inspection using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G2+ – NE– CH2: NE+ – NE–
Equipment Set	5V/DIV, 20ms/DIV
Condition	During cranking or idling

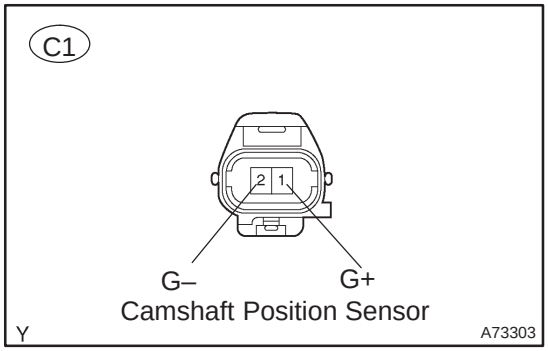
WIRING DIAGRAM

Refer to DTC P0335/12, 13 and P0339/13 on page 05–226.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT CAMSHAFT POSITION SENSOR



(a) Measure the resistance between the terminals of camshaft posision sensor connector.

Resistance:

835 to 1,400 Ω (Cold)

1,060 to 1,645 Ω (Hot)

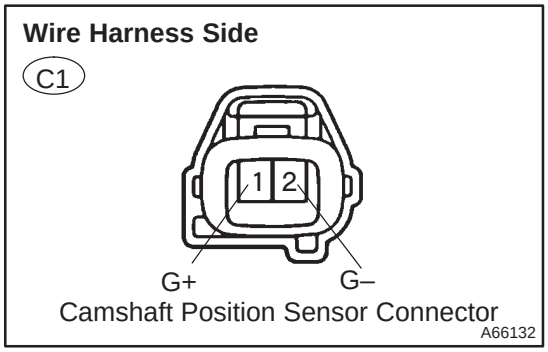
NOTICE:

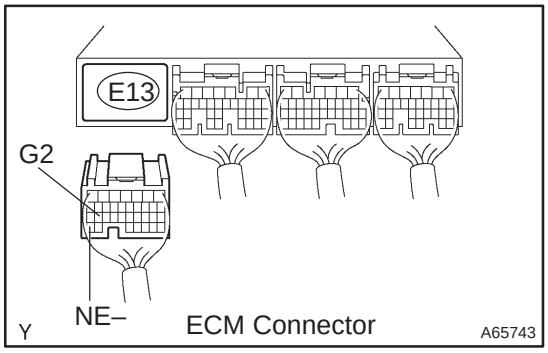
"Cold" and "Hot" mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **REPLACE CAMSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(ECM – CAMSHAFT POSITION SENSOR)





(a) Disconnect the camshaft position sensor connector.

(b) Disconnect the E13 ECM connector.

(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
G+ (C1–1) – G2 (E13–26)	Continuity
G– (C1–2) – NE– (E13–34)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
G+ (C1–1) or G2+ (E13–26) – Body ground	No continuity
G– (C1–2) or NE– (E13–34) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CAMSHAFT POSITION SENSOR)

(a) Check the camshaft position sensor installation.

NG → **TIGHTEN SENSOR**

OK

4	INSPECT CAMSHAFT

(a) Check the teeth of the signal plate.

NG → REPLACE CAMSHAFT

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0351/14	IGNITION COIL ”A” PRIMARY/SECONDARY CIRCUIT

DTC	P0352/15	IGNITION COIL ”B” PRIMARY/SECONDARY CIRCUIT

DTC	P0353/14	IGNITION COIL ”C” PRIMARY/SECONDARY CIRCUIT

DTC	P0354/15	IGNITION COIL ”D” PRIMARY/SECONDARY CIRCUIT

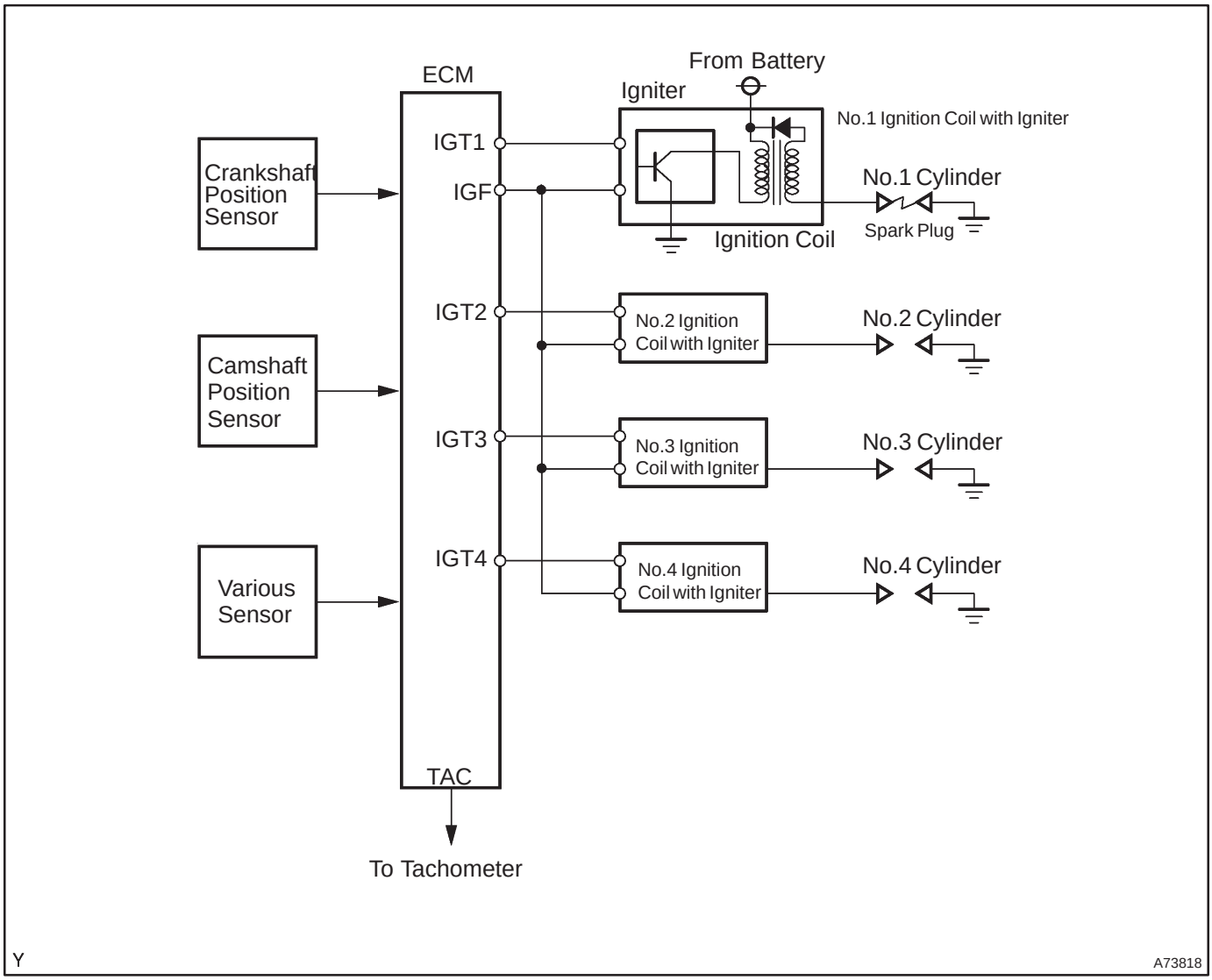
CIRCUIT DESCRIPTION

HINT:

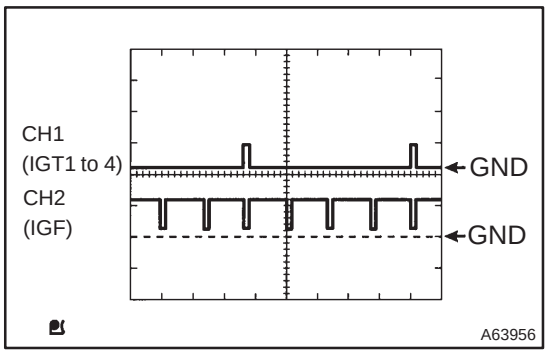
- These DTCs indicate a malfunction related to primary circuit.
- If DTC P0351/14 is displayed, check No.1 ignition coil with igniter circuit.
- If DTC P0352/15 is displayed, check No.2 ignition coil with igniter circuit.
- If DTC P0353/14 is displayed, check No.3 ignition coil with igniter circuit.
- If DTC P0354/15 is displayed, check No.4 ignition coil with igniter circuit.

A Direct Ignition System (DIS) has been adopted. The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.

The ECM determines the ignition timing and outputs the ignition (IGT) signals for each cylinder. Based on the IGT signals, the power transistors in the igniter cut off the current to the primary coil in the ignition coil is supplied to the spark plug that is connected to the end of the secondary coil. At the same time, the igniter also sends an ignition confirmation (IGF) signal as a fail–safe measure to the ECM.

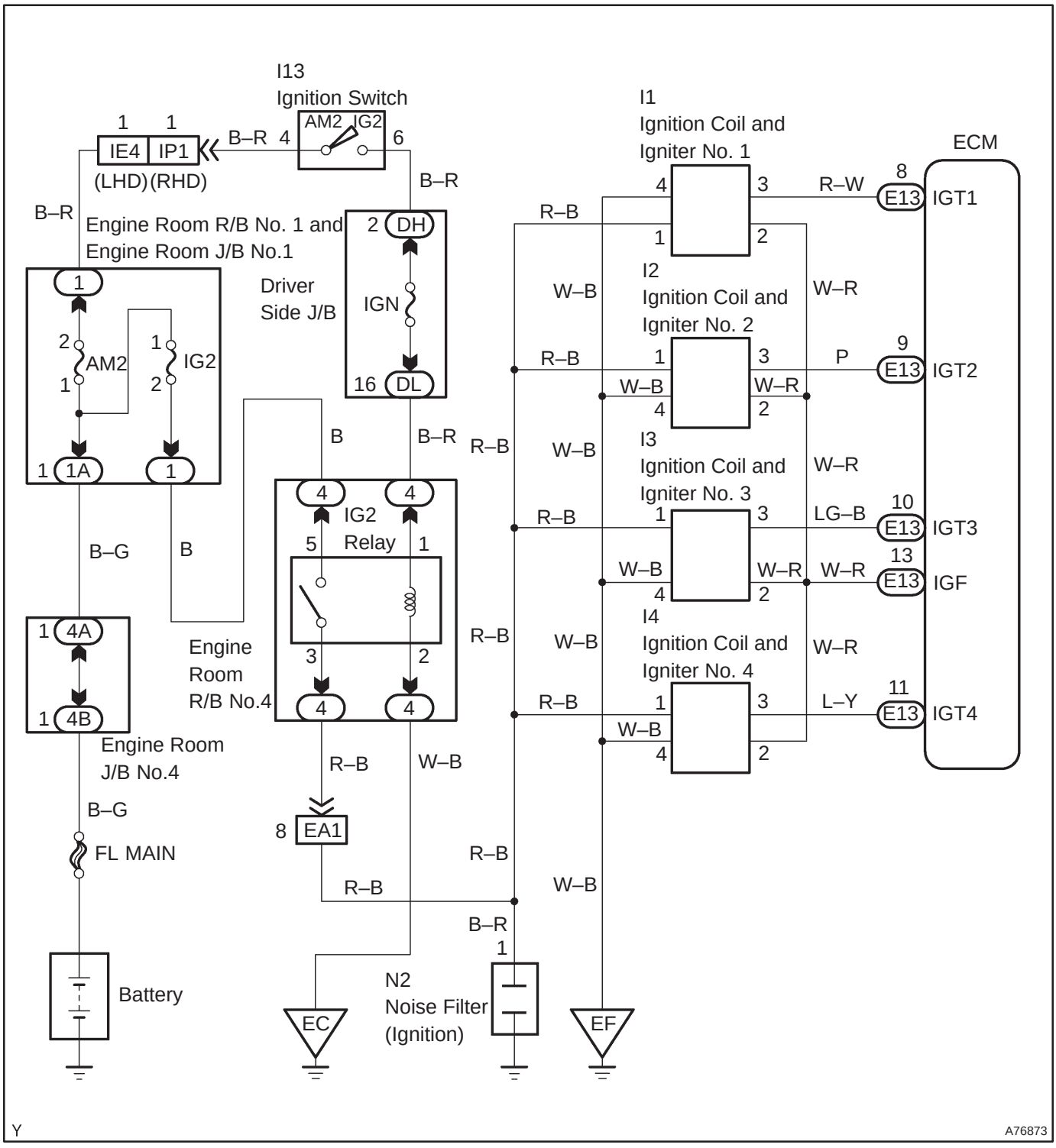


DTC No.	DTC Detection Condition	Trouble Area
P0351/14 P0352/15 P0353/14 P0354/15	No IGF signal to ECM while engine is running	• Ignition system • Open or short in IGF and IGT1 to 4 circuit from ignition coil with igniter to ECM • No. 1 to 4 ignition coil with igniter • IG2 relay • ECM



Reference: Inspection using the oscilloscope.
During cranking or idling, check the waveform between terminals IGT1 to IGT4 and E1, and IGF and E1 of the E4 and ECM connectors.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

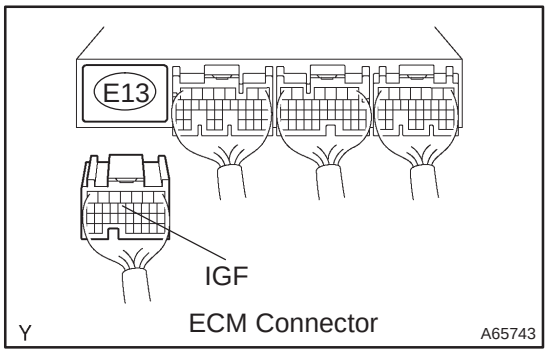
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

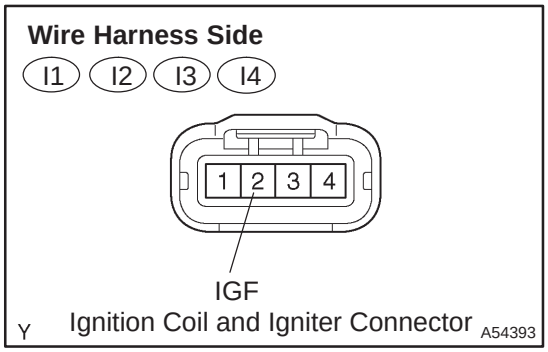
1	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER

NG → Go to step 4

OK

2	CHECK HARNESS AND CONNECTOR(ECM – IGNITION COIL)





(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IGF (I1–2) – IGF (E13–13)	Continuity
IGF (I2–2) – IGF (E13–13)	
IGF (I3–2) – IGF (E13–13)	
IGF (I4–2) – IGF (E13–13)	

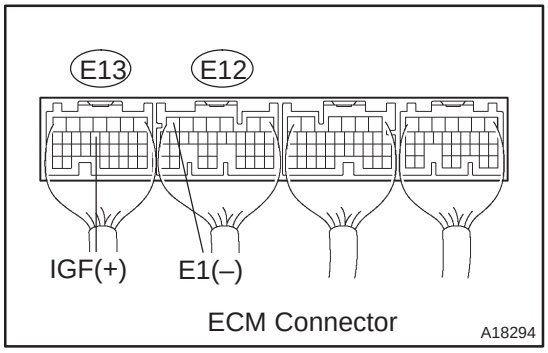
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IGF (I1–2) or IGF (E13–13) – Body ground	No continuity
IGF (I2–2) or IGF (E13–13) – Body ground	
IGF (I3–2) or IGF (E13–13) – Body ground	
IGF (I4–2) or IGF (E13–13) – Body ground	

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	INSPECT ECM



(a) Disconnect the ignition coil and igniter connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E12 and E13 ECM connector.

Standard:

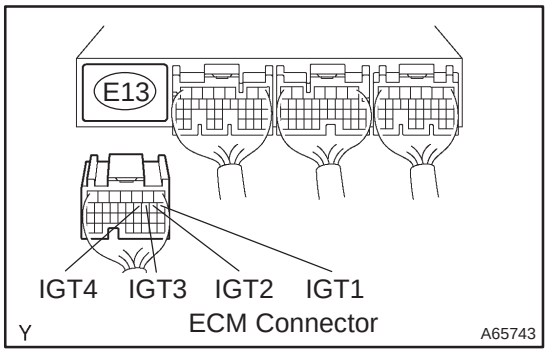
Symbols (Terminal No.)	Specified condition
IGF (E13–13) – E1 (E12–7)	4.5 to 5.5 V

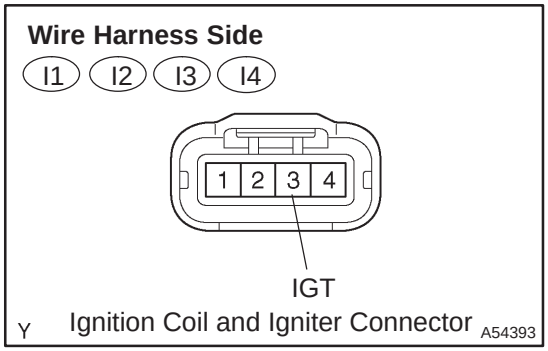
NG → CHECK AND REPLACE ECM (See page 01–32)

OK

REPLACE IGNITION COIL ASSY

4 CHECK HARNESS AND CONNECTOR(ECM (IGT TERMINAL) – IGNITION COIL)





(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IGT (I1–3) – IGT1 (E13–8)	Continuity
IGT (I2–3) – IGT2 (E13–9)	
IGT (I3–3) – IGT3 (E13–10)	
IGT (I4–3) – IGT4 (E13–11)	

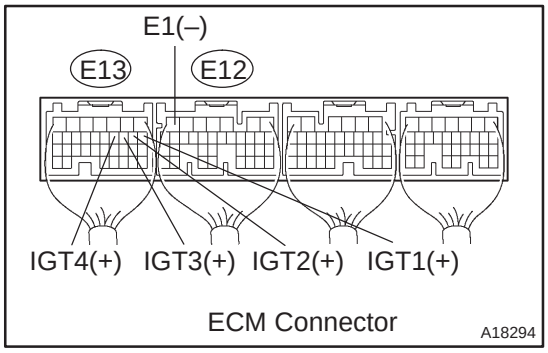
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IGT (I1–3) or IGT1 (E13–8) – Body ground	No continuity
IGT (I2–3) or IGT2 (E13–9) – Body ground	
IGT (I3–3) or IGT3 (E13–10) – Body ground	
IGT (I4–3) or IGT4 (E13–11) – Body ground	

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

5 INSPECT ECM(IGT1, IGT2, IGT3 AND IGT4 VOLTAGE)



(a) Measure the voltage between the terminals of the E12 and E13 ECM connectors when the engine is cranked.

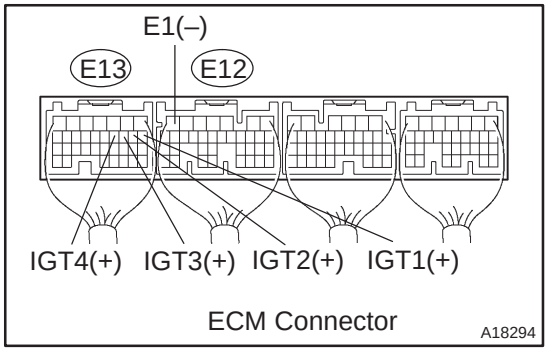
Standard:

Symbols (Terminal No.)	Specified condition
IGT1 (E13–8) – E1 (E12–7)	Between 0.1 V and 4.5 V
IGT2 (E13–9) – E1 (E12–7)	
IGT3 (E13–10) – E1 (E12–7)	
IGT4 (E13–11) – E1 (E12–7)	

NG → CHECK AND REPLACE ECM (See page 01–32)

OK

6 INSPECT ECM(IGT1, IGT2, IGT3 AND IGT4 VOLTAGE)



(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.

(b) Measure the voltage between the terminals of the E12 and E13 ECM connectors when the engine is cranked.

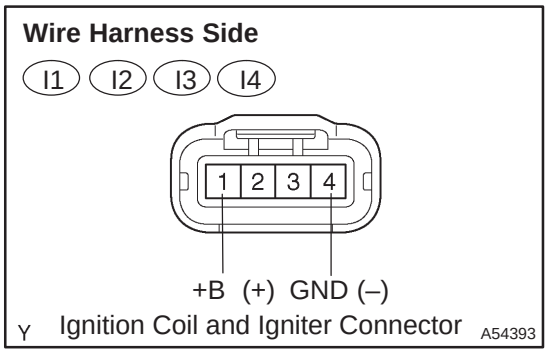
Standard:

Symbols (Terminal No.)	Specified condition
IGT1 (E13–8) – E1 (E12–7)	4.5 V or more
IGT2 (E13–9) – E1 (E12–7)	
IGT3 (E13–10) – E1 (E12–7)	
IGT4 (E13–11) – E1 (E12–7)	

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

7 INSPECT IGNITION COIL ASSY(POWER SOUSE CIRCUIT)



(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.

(b) Turn the ignition switch ON position.

(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

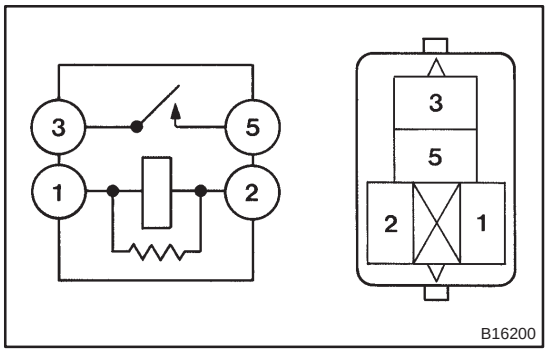
Standard:

Symbols (Terminal No.)	Specified condition
+B (I1–1) – GND (I1–4)	9 to 14 V
+B (I2–1) – GND (I2–4)	
+B (I3–1) – GND (I3–4)	
+B (I4–1) – GND (I4–4)	

OK → **REPLACE IGNITION COIL ASSY**

NG

8 INSPECT IG2 RELAY



(a) Remove the IG2 relay from the engine room R/B No.4.

(b) Inspect the IG2 relay.

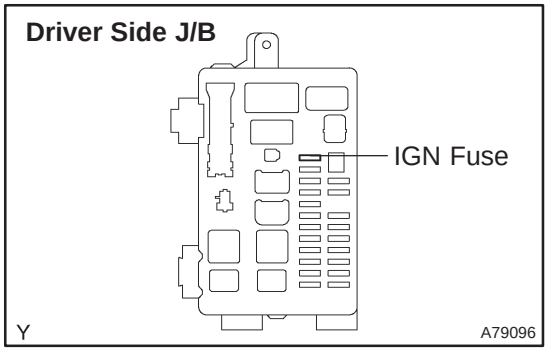
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE IG2 RELAY**

OK

9 CHECK FUSE(IGN)

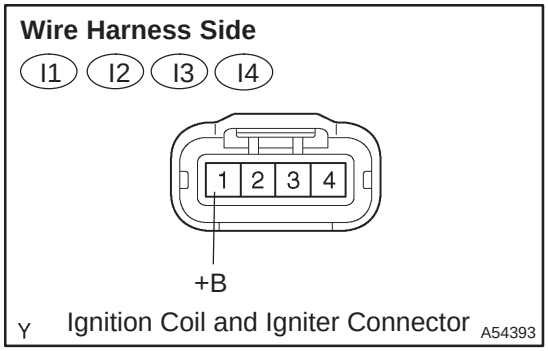


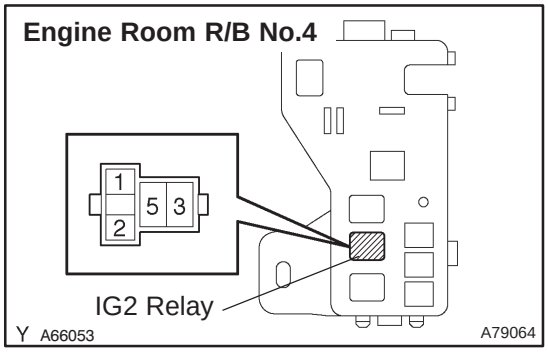
(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

10 CHECK HARNESS AND CONNECTOR(IG2 RELAY – IGNITION COIL AND IGNITER)





(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.
(b) Remove the IG2 relay from the engine room R/B No.4.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (I1–1) – IG2 relay (3)	Continuity
+B (I2–1) – IG2 relay (3)	
+B (I3–1) – IG2 relay (3)	
+B (I4–1) – IG2 relay (3)	

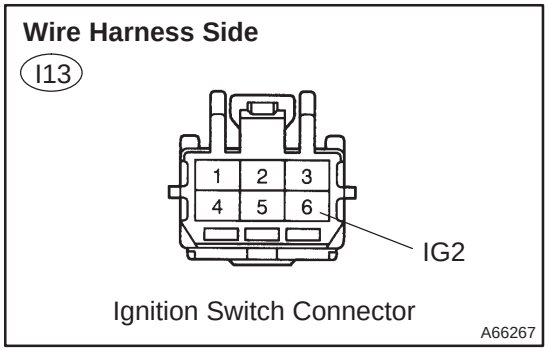
Standard (Check for short):

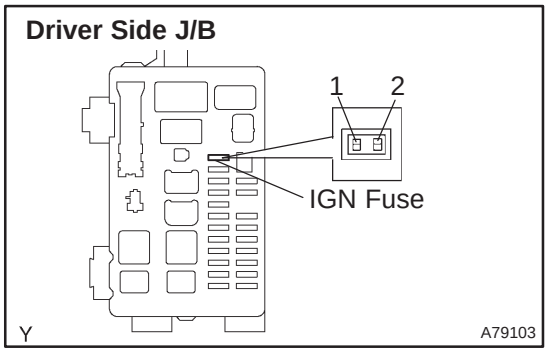
Symbols (Terminal No.)	Specified condition
+B (I1–1) or IG2 relay (3) – Body ground	No continuity
+B (I2–1) or IG2 relay (3) – Body ground	
+B (I3–1) or IG2 relay (3) – Body ground	
+B (I4–1) or IG2 relay (3) – Body ground	

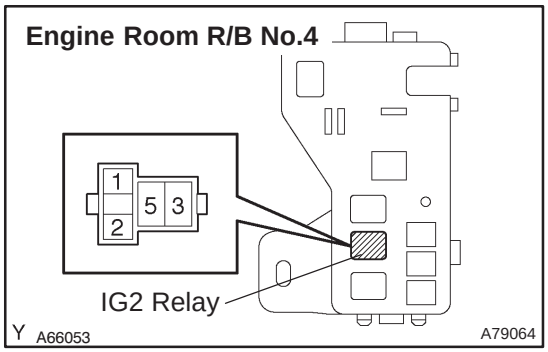
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

11 CHECK HARNESS AND CONNECTOR(IGNITION SWITCH – IG2 RELAY)







(a) Disconnect the battery negative (–) terminal.
(b) Disconnect the ignition switch connector.
(c) Remove the IGN fuse from the driver side J/B.
(d) Remove the IG2 relay from the engine room R/B No.4.
(e) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) – IGN fuse (1)	Continuity
IGN fuse (2) – IG2 relay (1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) or IGN fuse (1) – Body ground	No continuity
IGN fuse (2) or IG2 relay (1) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

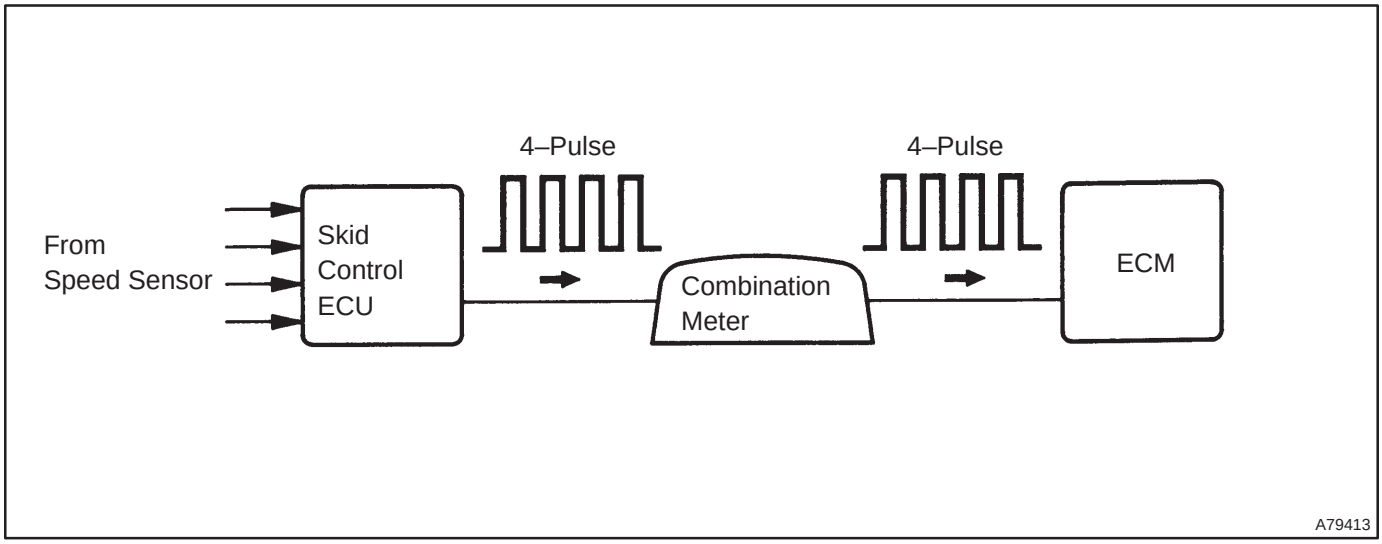
CHECK AND REPLACE POWER SOURCE CIRCUIT

DTC	P0500/42	VEHICLE SPEED SENSOR ”A”

CIRCUIT DESCRIPTION

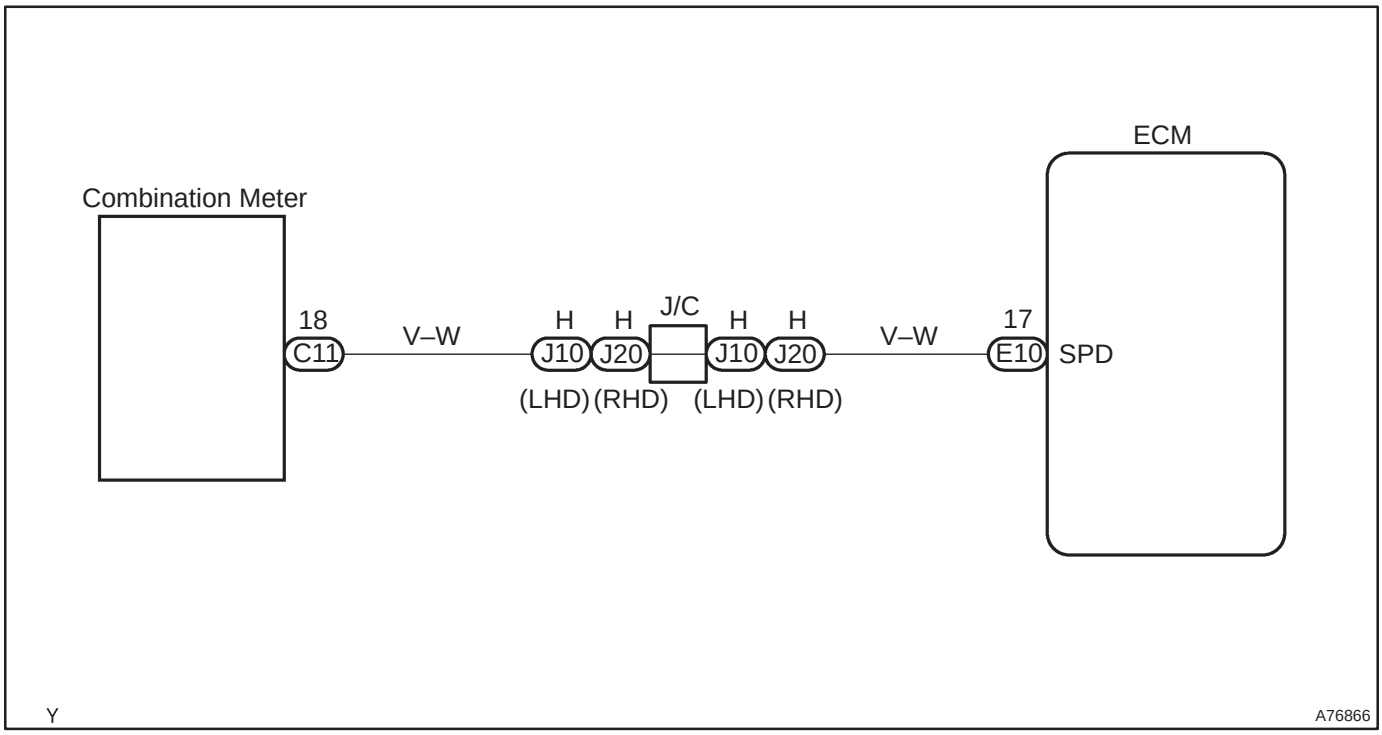
The speed sensor for skid control ECU detects the wheel speed and sends the appropriate signals to the skid control ECU.

The skid control ECU converts these signals into a 4–pulse signal and outputs it to the combination meter. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500/42	During the vehicle is being driven, no vehicle speed sensor signal to the ECM (2 trip detection logic)	• Open or short in speed sensor circuit • Speed sensor • Combination meter • ECM • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OPERATION OF SPEEDOMETER

(a) Drive the vehicle and check that the operation of the speedometer in the combination meter is normal.

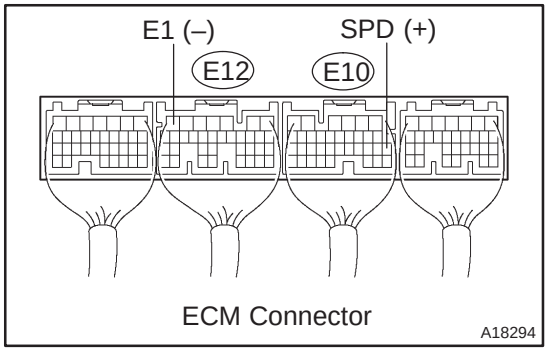
HINT:

The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **CHECK SPEEDOMETER CIRCUIT (See page 05–1500)**

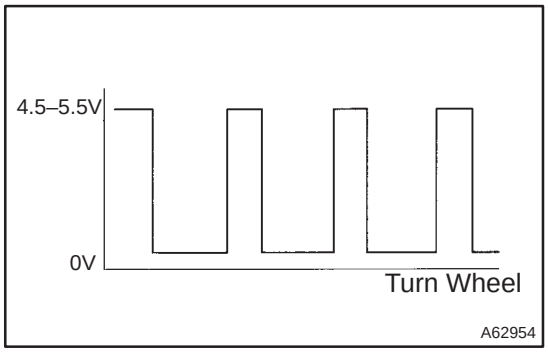
OK

2 INSPECT ECM



(a) Shift the lever to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch ON.
(d) Measure the voltage between the terminals of the E10 and E12 ECM connectors as the wheel is turned slowly.
Standard:

Symbols (Terminal No.)	Specified condition
SPD (E10–17) – E1 (E12–7)	Generated intermittently



HINT:
The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.

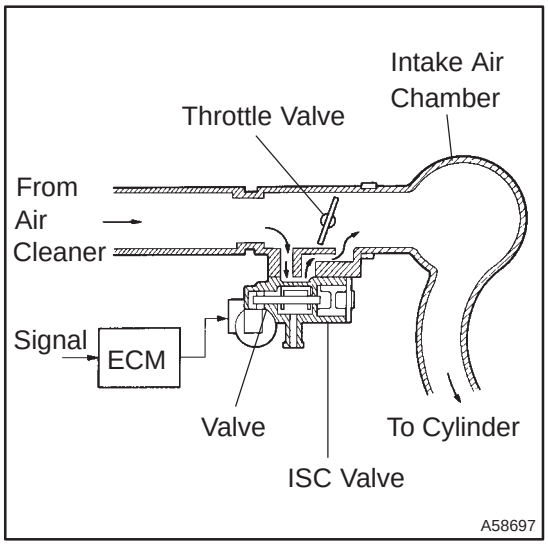
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC P0511/33 IDLE AIR CONTROL CIRCUIT

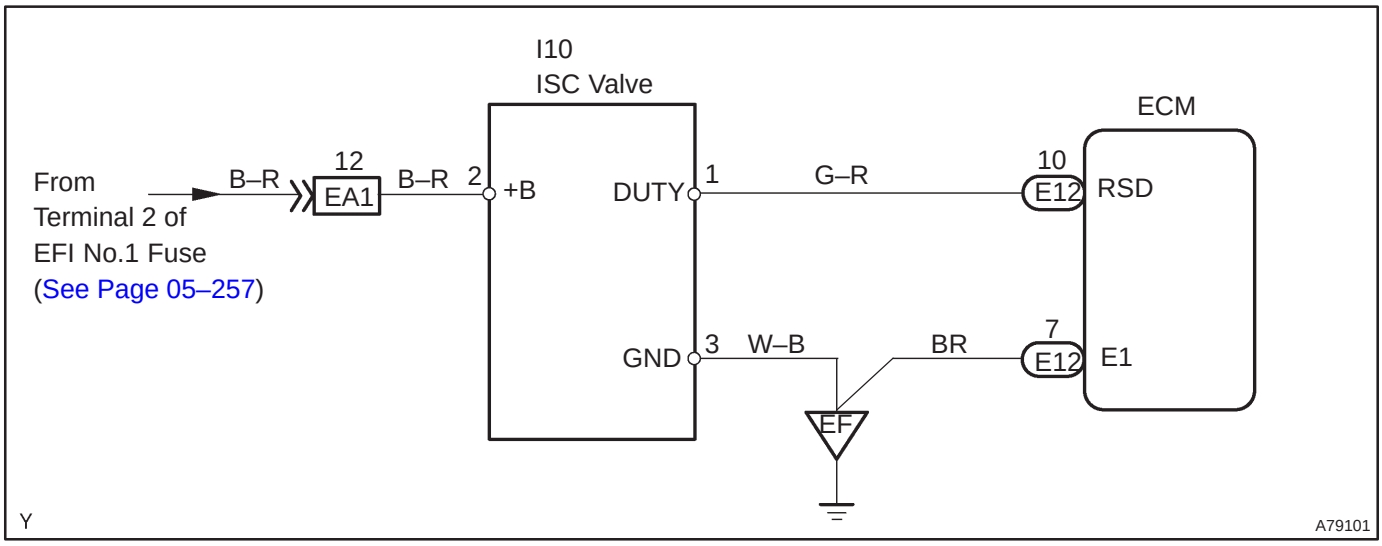
CIRCUIT DESCRIPTION



The rotary solenoid type idle speed control (ISC) valve is located under the throttle body and intake air bypassing the throttle valve is directed to the idle speed control (ISC) valve through the passage.
In this way the intake air volume bypassing the throttle valve is regulated, controls the engine speed.
The ECM operates the idle speed control (ISC) valve only to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detecting Condition	Trouble Area
P0511/33	Idle speed continues to vary greatly from target speed (1 trip detection logic)	• Open or short in idle speed control (ISC) valve circuit • Idle speed control (ISC) valve is stuck or closed • A/C switch circuit • Air induction system • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

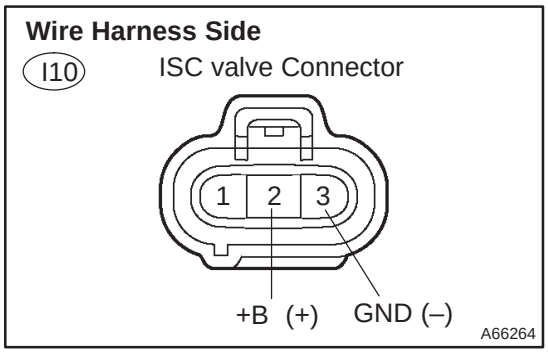
1	PERFORM ACTIVE TEST USING HAND–HELD TESTER(CHECK ISC VALVE OPERATION)

(a) Warm up the engine to the normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the A/C.
(d) Shift the lever to the neutral position.
(e) Connect the hand–held tester to the DLC3 on the vehicle.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / ISC DUTY RATIO”.
(g) Check that the engine RPM varies when changing the ISC duty ratio.
Engine RPM:
Engine RPM fluctuates ups and downs in respose to the ISC duty ratio variation.

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–149)**

NG

2	CHECK HARNESS AND CONNECTOR



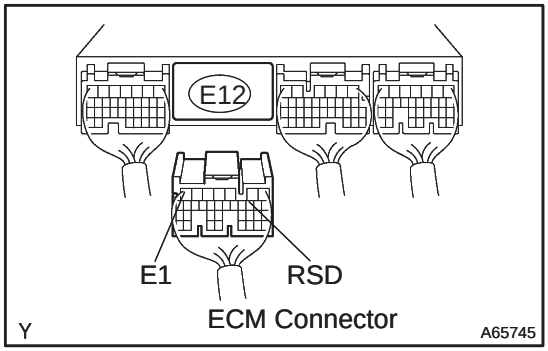
(a) Disconnect the ISC valve connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the ISC valve wire harness side connector.
Standard:

Symbols (Terminal No.)	Specified condition
+B (I10–2) – GND (I10–3)	9 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK HARNESS AND CONNECTOR(RSD CIRCUIT)



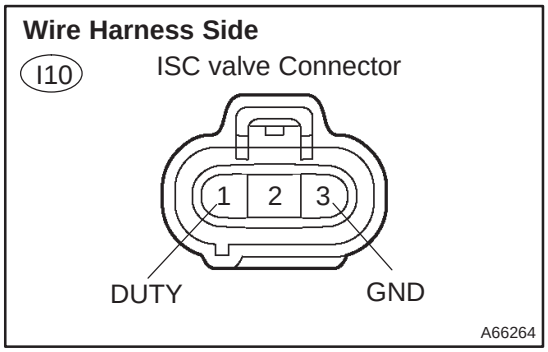
(a) Disconnect the ISC valve connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
DUTY (I10–1) – RSD (E12–10)	Continuity
GND (I10–3) – E1 (E12–7)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
DUTY (I10–1) or RSD (E12–10) – Body groundr	No continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY (See page 10–18)

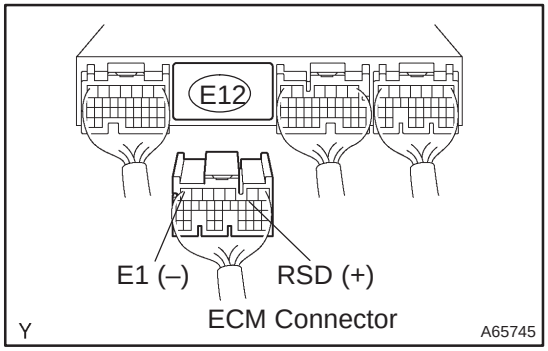
NG → **REPLACE THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY**

OK

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1	INSPECT ECM



(a) Disconnect the E12 ECM connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E4 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
RSD (E12–10) – E1 (E12–7)	9 to 14 V

OK → **Go to step 3**

NG

2	INSPECT THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY (See page 10–18)

NG → REPAIR OR REPLACE THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

3	INSPECT THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY (See page 10–18)

NG → REPAIR OR REPLACE THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY

OK

4	CHECK BLOCKAGE OF ISC VALVE AND PASSAGE TO BYPASS THROTTLE VALVE

NG → REPAIR OR REPLACE THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0606/89	ECM/PCM PROCESSOR

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0606/89	ECM inside error	• ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

CHECK AND REPLACE ECM (See page 01–32)

DTC	P2237/21	OXYGEN SENSOR PUMPING CURRENT CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2238/21	OXYGEN SENSOR PUMPING CURRENT CIRCUIT LOW (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2239/21	OXYGEN SENSOR PUMPING CURRENT CIRCUIT HIGH (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2240/28	OXYGEN SENSOR PUMPING CURRENT CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2241/28	OXYGEN SENSOR PUMPING CURRENT CIRCUIT LOW (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2242/28	OXYGEN SENSOR PUMPING CURRENT CIRCUIT HIGH (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2251/21	OXYGEN SENSOR REFERENCE GROUND CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2252/21	OXYGEN SENSOR REFERENCE GROUND CIRCUIT LOW (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2253/21	OXYGEN SENSOR REFERENCE GROUND CIRCUIT HIGH (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2254/28	OXYGEN SENSOR REFERENCE GROUND CIRCUIT/OPEN (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2255/28	OXYGEN SENSOR REFERENCE GROUND CIRCUIT LOW (FOR A/F SENSOR)(BANK 2 SENSOR 1)

DTC	P2256/28	OXYGEN SENSOR REFERENCE GROUND CIRCUIT HIGH (FOR A/F SENSOR)(BANK 2 SENSOR 1)

CIRCUIT DESCRIPTION

HINT:

This DTC is recorded when A/F sensor has a malfunction, although the caption is healed oxygen sensor. The air–fuel ratio sensor are the lamination type. Compared to the conventional type, the sensor and heater portions of the lamination type are narrower overall. Because the heat of the heater acts directly on the alumina and zirconia (of the sensor portion) it accelerates the activation of the sensor.

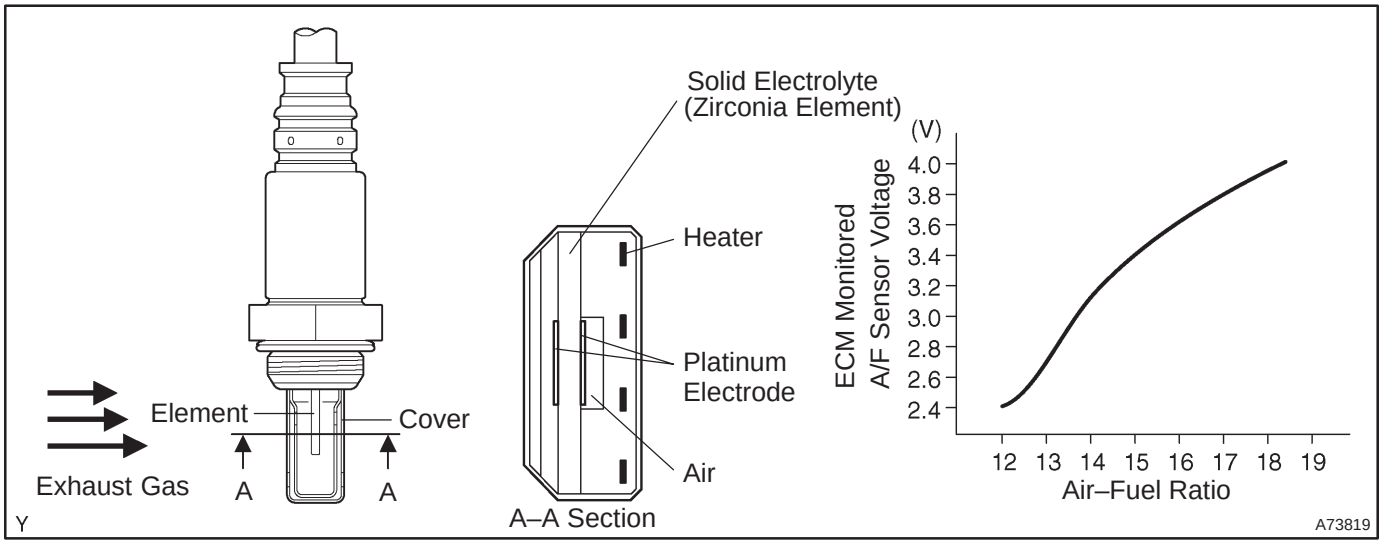
To obtain a high purification rate of the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used. For the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.

The A/F sensor has the characteristic that it provides output voltage* being approximately proportional to the existing air–fuel ratio. The A/F sensor output voltage* is used to provide feedback for the ECM to control the air–fuel ratio.

By the A/F sensor output, the ECM can determine the deviation amount from the stoichiometric air–fuel ratio and control the proper injection time immediately. If the A/F sensor is out of order, ECM is unable to perform the accurate air–fuel ratio control.

The A/F sensor is equipped with a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), the current flows to the heater to heat the sensor for the accurate oxygen concentration detection.

*: The voltage value changes at the inside of the ECM only.

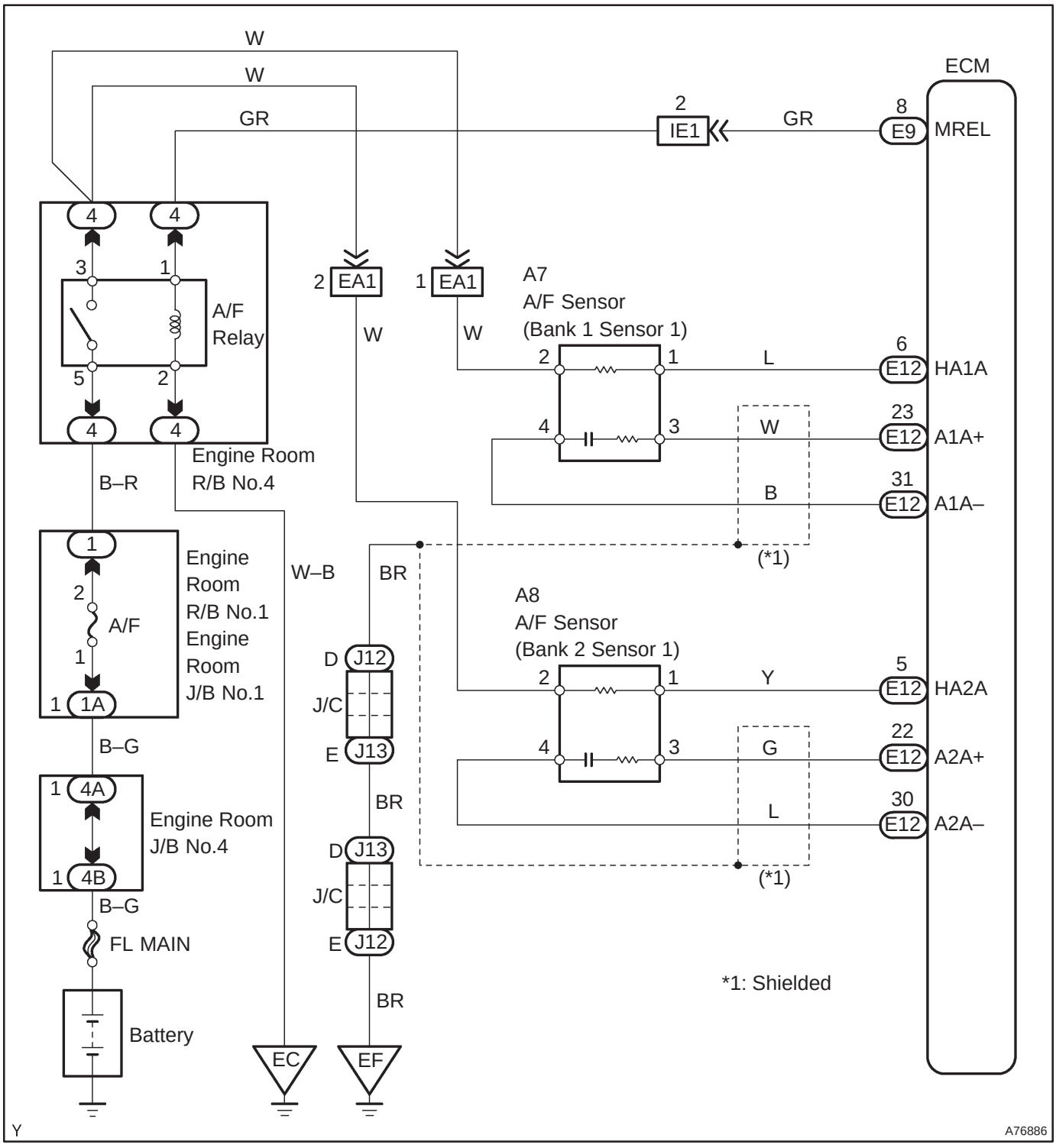


DTC No.	DTC Detecting Condition	Trouble Area
P2237/21 P2240/28	A/F sensor circuit (bank 1 sensor 1)	HINT : Main trouble area • Open or short in A/F sensor circuit
	Conditions (a) and (b) continue for 5.0 sec. or more : (a) AF+ less than 0.5 V (b) AF+ greater than 4.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • A/F sensor heater relay • A/F sensor heater and relay circuit • ECM
	Conditions (a) and (b) continue for 5.0 sec. or more : (a) (AF+) – (AF–) less than 0.1 V (b) (AF+) – (AF–) greater than 0.8 V	
P2238/21 P2241/28	A/F sensor circuit low (bank 1 sensor 1)	HINT : Main trouble area • Open in A/F sensor circuit
	Condition (a) continues for 5.0 sec. or more : (a) AF+ less than 0.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • A/F sensor heater relay • A/F sensor heater and relay circuit • ECM
	Condition (a) continues for 5.0 sec. or more : (a) (AF+) – (AF–) less than 0.1 V	
P2239/21 P2242/28	A/F sensor circuit high (bank 1 sensor 1)	HINT : Main trouble area • Short in A/F sensor circuit
	Condition (a) continue for 5.0 sec. or more : (a) AF+ greater than 4.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • A/F sensor heater relay • A/F sensor heater and relay circuit • ECM
	Condition (a) continue for 5.0 sec. or more : (a) (AF+) – (AF–) greater than 0.8 V	
P2251/21 P2254/28	Conditions (a) and (b) continue for 5.0 sec. or more : (a) AF– less than 0.5 V (b) AF– greater than 4.5 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • A/F sensor heater relay • A/F sensor heater and relay circuit • ECM
P2252/21 P2255/28	Condition (a) continue for 5.0 sec. or more : (a) AF– less than 0.5 V	
P2253/21 P2256/28	Condition (a) continue for 5.0 sec. or more : (b) AF– greater than 4.5 V	

HINT:

- DTC P2237/28, P2238/28, P2239/28, P2251/28, P2252/28 and P2253/28 means malfunction related to bank 1 A/F sensor circuit.
- DTC P2240/21, P2241/21, P2242/21, P2254/21, P2255/21 and P2256/21 means malfunction related to bank 2 A/F sensor circuit.
- Bank 1 refers to the bank that includes cylinder No. 1.
- Bank 2 refers to the bank that includes cylinder No. 2.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (A/F sensor, heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:

+25 % → rich output: Less than 3.0 V

–12.5 % → lean output: More than 3.35 V

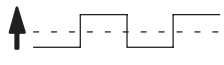
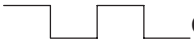
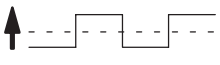
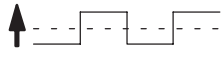
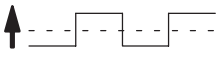
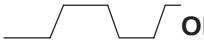
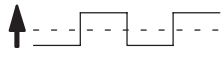
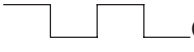
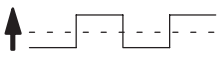
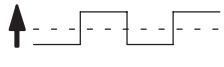
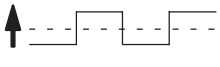
Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:

+25 % → rich output: More than 0.55 V

–12.5 % → lean output: Less than 0.4 V

NOTICE:

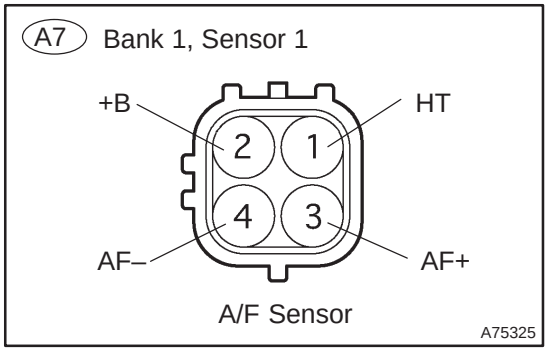
There is a few second delay in the A/F sensor output, and there is about 20 seconds delay in the heated oxygen sensor output.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 3.35 V Less than 3.0 V  **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	A/F sensor (A/F sensor, heater, A/F sensor circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 3.35 V Less than 3.0V  **OK**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Heated oxygen sensor (heated oxygen sensor, heater, heated oxygen sensor circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

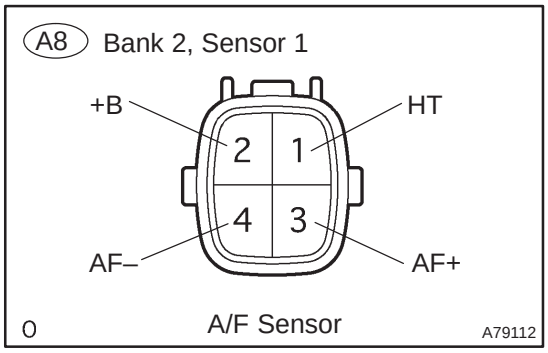
The following procedure of A/F CONTROL enables the technician to check and graph voltage output of both the A/F sensor and heated oxygen sensor.
For displaying the graph indication, enter ”ACTIVE TEST/ A/F CONTROL/USER DATA”, then select ”AFS B1S1 and O2S B1S2” or ”AFS B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If DTC P2237/21, P2238/21, P2239/21, P2251/21, P2252/21 or P2253/21 is displayed, check bank 1 sensor 1 circuit.
- If DTC P2240/28, P2241/28, P2242/28, P2254/28, P2255/28 or P2256/28 is displayed, check bank 2 sensor 1 circuit.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



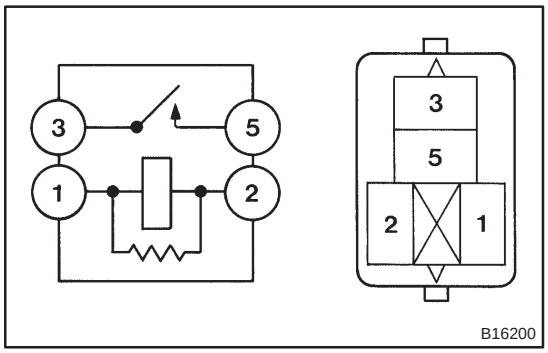
(a) Disconnect the A/F sensor connector.
(b) Measure resistance between terminals HT and +B of the A/F sensor.
Resistance: 1.8 to 3.4 Ω (20°C)



NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

2 INSPECT A/F RELAY



(a) Remove the A/F sensor heater relay from the engine room R/B.
(b) Inspect the A/F senor heater relay.
Standard:

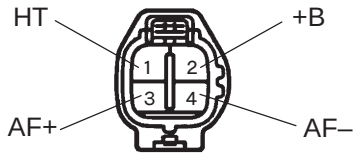
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE A/F RELAY**

OK

3 CHECK HARNESS AND CONNECTOR(ECM – A/F SENSOR)

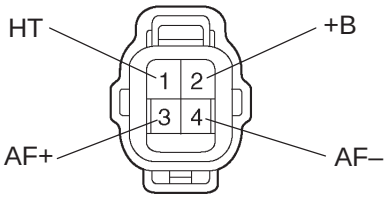
Wire Harness Side
A7 Bank 1 Sensor 1



A/F Connector

A76787

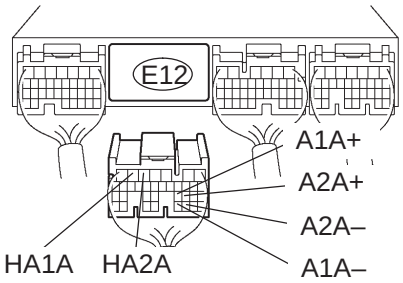
Wire Harness Side
A8 Bank 2 Sensor 1



A/F Connector

Y

A79114



Y

A65745

(a) Disconnect the A7 or A8 A/F sensor connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

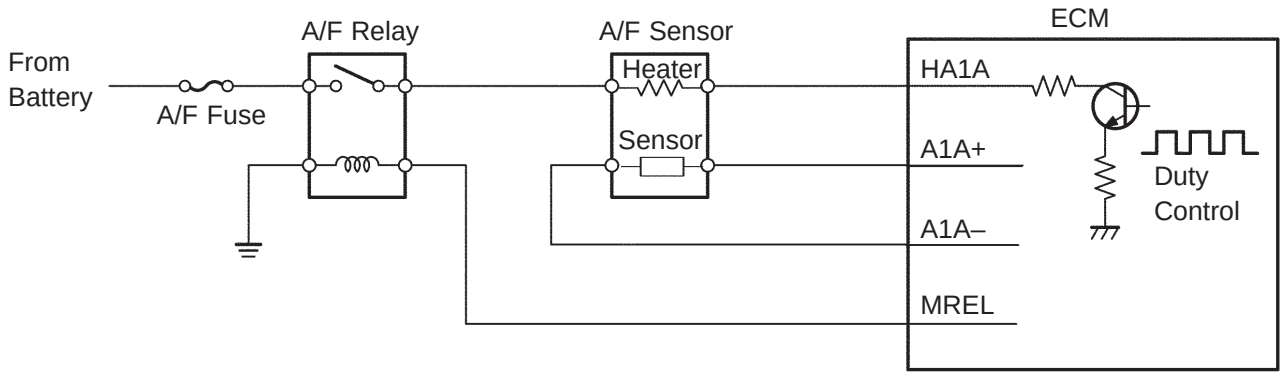
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
AF+ (A7–3) – A1A+ (E12–23)	Continuity
AF– (A7–4) – A1A– (E12–31)	
HT (A7–1) – HA1A (E12–6)	
AF+ (A8–3) – A2A+ (E12–22)	
AF– (A8–4) – A2A– (E12–30)	
HT (A8–1) – HA2A (E12–5)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
AF+ (A7–3) or A1A+ (E12–23) – Body ground	No continuity
AF– (A7–4) or A1A– (E12–31) – Body ground	
HT (A7–1) or HA1A (E12–6) – Body ground	
AF+ (A8–3) or A2A+ (E12–22) – Body ground	
AF– (A8–4) or A2A– (E12–30) – Body ground	
HT (A8–1) or HA2A (E12–5) – Body ground	

Reference (Bank 1 Sensor 1 System Drawing)



P

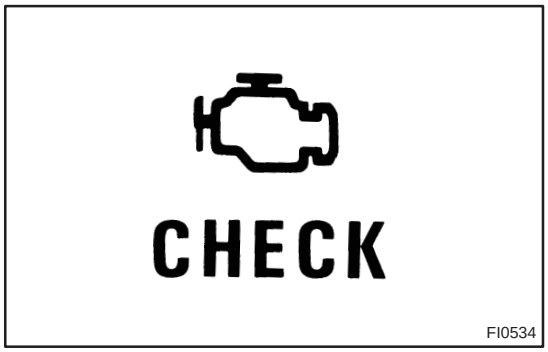
B62793

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM (See page 01–32)

05C6M–01

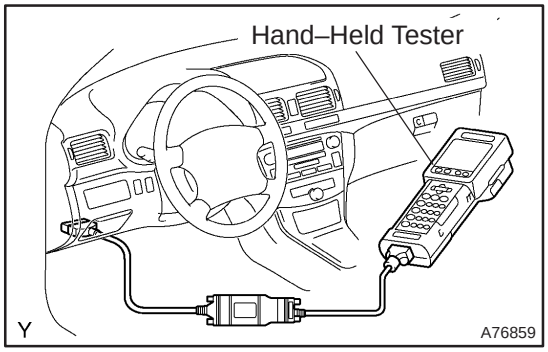


PRE–CHECK

1. DIAGNOSIS SYSTEM

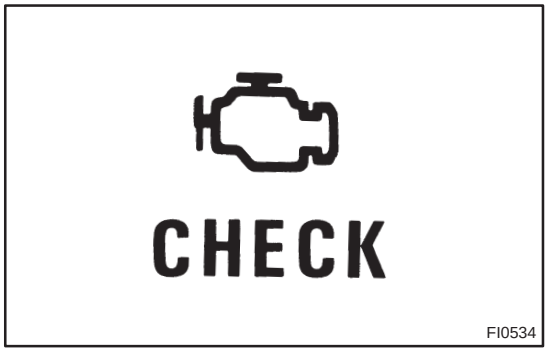
(a) Description for Euro–OBD (European spec.)

- When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to the OBD scan tool complying with ISO 15031–4 or hand–held tester, and read the various data output from the vehicle's ECM.
- Euro–OBD regulations require that the vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the emission control system / components or in the power train control components which affect vehicle emissions, or a malfunction in the computer. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTC) prescribed by ISO 15031–4 are recorded in the engine ECU memory (See page 05–161). If the malfunction does not reoccur in 3 consecutive trips, the CHK ENG goes off automatically but the DTCs remain recorded in the ECM memory.



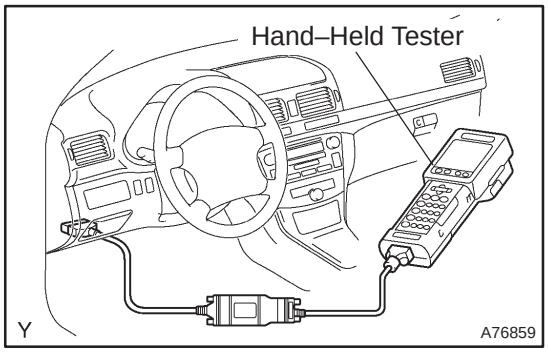
- To check the DTCs, connect the OBD scan tool or hand–held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data. (For operating instructions, see the OBD scan tool's instruction book.)
  DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–161).
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).

- * 2 trip detection logic
  When a logic malfunction is first detected, the pending fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTCs P0300 – P0304) or fuel trim malfunction (DTCs P0171) or other malfunction (first malfunction only), is detected.
  Because freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- Priorities for troubleshooting:
  If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.

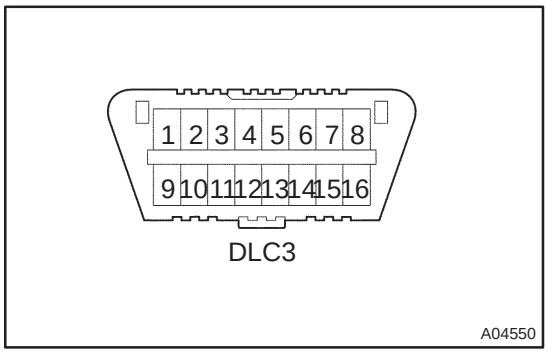


(b) Description for M–OBD (Except European spec.)

- When troubleshoot Multiplex OBD (M–OBD) vehicles, the only difference from the usual troubleshooting procedure is that you connect the hand–held tester to the vehicle, and read the various data output from the vehicle's ECM.
- The vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) are recorded in the ECM memory (See page 05–161). When the malfunction does not reoccur, the CHK ENG is indicated until the ignition switch is turned off, and then the CHK ENG is not indicated when the ignition switch is turned on but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect the hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle or read the DTC which is indicated on the multi information display when TC and CG terminals on the DLC3 are connected. The hand–held tester also enables you to erase the DTCs and check the freeze frame data and various forms of engine data. (for operating instructions, see the instruction book.)
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).
- * 2 trip detection logic
  When a logic malfunction is first detected, the pending fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  Freeze frame data records the engine conditions (fuel system, calculator load, water temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.



(c) Check the DLC3.
The vehicle's ECM uses the ISO 14230(M–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–03 and matches the ISO 14230 format.

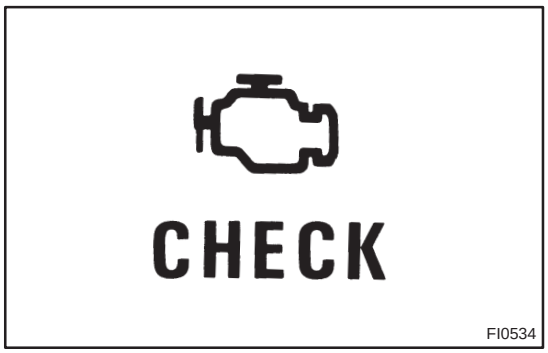
Terminal No.	Connection / Voltage or Residence	Condition
7	Bus + Line / Pulse generation+	During transmission
4	Chassis Ground – Body Ground / 1 Ω or less	Always
16	Battery Positive – Body Ground / 9 to 14 V	Always

HINT:
If the display shows ”UNABLE TO CONNECT TO VEHICLE” when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Deparment listed in the tool’s instruction manual.

(d) Inspect the battery voltage.
Battery voltage: 11 to 14 V

If voltage is below 11V, recharge the battery before proceeding.



(e) Check the CHK ENG.
(1) The CHK ENG lamp comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the CHK ENG lamp is not illuminated, troubleshoot the combination meter.

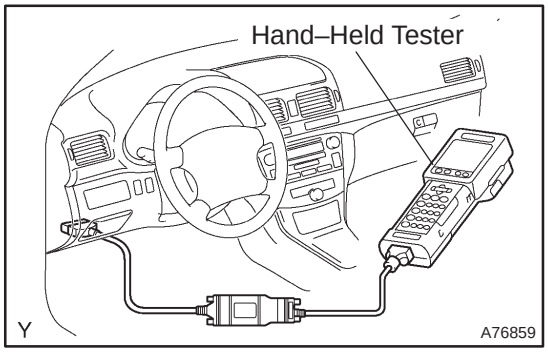
(2) When the engine is started, the CHK ENG should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

2. DTC CHECK (Nomal Mode) :

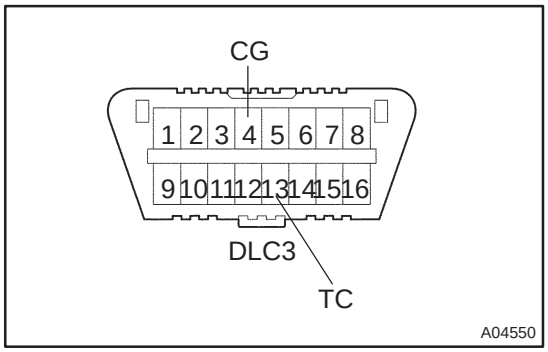
NOTICE:

Hand–held tester only:

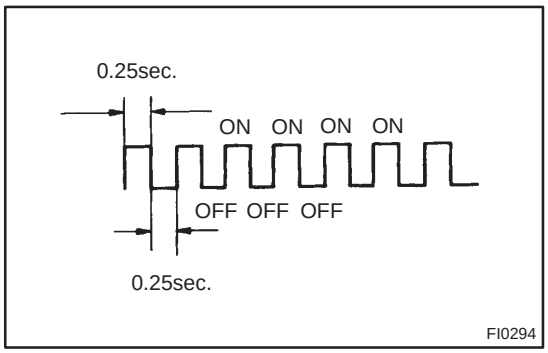
When the diagnosis system is switched from the normal mode to the check (test) mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and then write them down.



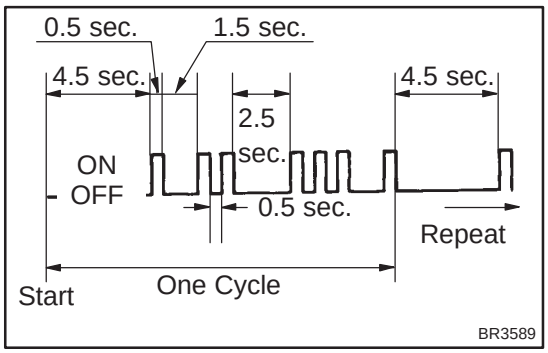
(a) Checking DTCs using the hand–held tester.
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch ON and switch the hand–held tester main switch ON.
(3) Use the hand–held tester to check the DTCs and freeze frame data and then write them down. The hand–held tester’s instruction book.
(4) See page 05–161 to confirm the details of the DTCs.



(b) If you have no hand–held tester, perform the following steps (1) to (6).
(1) Turn the ignition switch ON.
(2) Using SST, connect between terminals 13 (TC) and 4 (CG) of the DLC3.
SST 09843–18040



(3) Read DTC by observing the CHK ENG lamp. If any DTC is not detected, the CHK ENG lamp blinks as shown in the illustration.



(4) Example
If DTC 12 and DTC 31 are detected, the CHK ENG flashes 1 time (for 0.5 sec) and flashes 2 times after the 1.5 sec interval, then flashes 3 times after a 2.5 sec interval from the previous DTC and flashes 1 time.
If the interval between the previous DTC and the next DTC is 4.5 sec, it means the previous DTC is the last one of the multiple string DTCs. The CHK ENG lamp repeats the indication of DTCs from the initial cycle. (Refer to the illustration on the left)
(5) Check the details of the malfunction using the DTC chart on page 05–16.
(6) After completing the check, disconnect terminals 13 (TC) and 4 (CG) and turn off the display.

HINT:
In the event that 2 or more DTCs are detected, the CHK ENG lamp will indicate the smaller number DTC first.

(c) Clearing the DTCs using the hand–held tester:
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) When operating hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(d) Clearing the DTCs not using the hand–held tester:
(1) Disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.

3. DTC CHECK (Check Mode):

HINT:

Hand–held tester only:

Compared to the normal mode, the check mode has more sensing ability to detect malfunctions.

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check (test) mode.

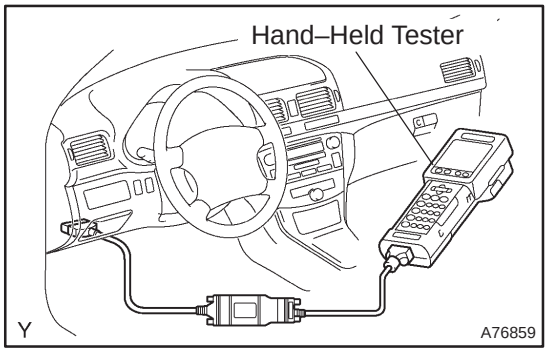
(a) Proceduce for check mode using hand–held tester.

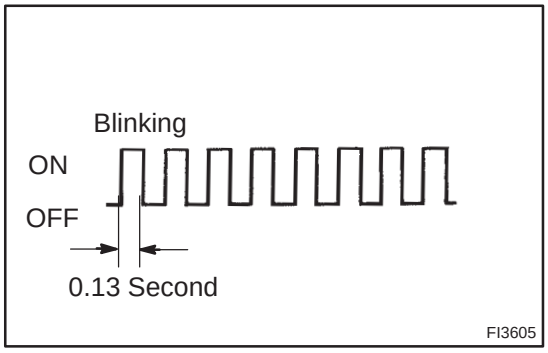
(1) Check the initial conditions
- Battery positive voltage 11V or more.
- Throttle valve fully closed.
- Transmission in the ”P” or ”N” position.
- Air conditioning switched OFF.

(2) Turn the ignition switch OFF.

(3) Connect the hand–held tester to the DLC3.

(4) Turn the ignition switch and the hand–held tester main switch ON.





(5) Switch the hand–held tester from the normal mode to the check (test) mode. The CHK ENG blinks in 0.13 sec interval as shown in the illustration.

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(6) Start the engine. (The CHK ENG lamp goes out after the engine start.)

(7) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTC, etc.

(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the nomal mode and will result in all of the DTCs and freeze frame data being erased.

(9) After checking the DTCs, inspect the applicable circuit.

(b) Clearing the DTCs using the hand–held tester
(1) Connect the hand–held tester to DLC3.
(2) Turn the ignition switch ON.
(3) When operating hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester:
(1) Disconnecting the battery terminal or remove the EFI fuse for more than 60 seconds.

4. FAIL–SAFE CHART

If any of the following codes are recorded, the engine ECM enters the fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0031/21 P0032/21 P0051/28 P0052/28	The heater circuit in which the abnormality is detected is turned off	Ignition switch OFF
P0100/31 P0102/31 P0103/31	Ignition timing is calculated from engine speed and a throttle angle	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0110/24 P0112/24 P0113/24	Intake air temp. is fixed at 20°C (68°F)	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0115/22 P0117/22 P0118/22	Engine coolant temp. is fixed at 80°C (176°F)	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0120/41 P0122/41 P0123/41	Fuel cut intermittently while idling	Returned to normal condition and ignition switch OFF
P0325/52 P0327/52 P0328/52	Max. timing retardation	Ignition switch OFF
P0351/14 P0352/15 P0353/14 P0354/15	Fuel cut	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".

5. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:

By putting the vehicle's engine ECM in check (test) mode, 1 trip detection logic is possible instead of 2 trip detection logic, and sensitivity to detect faults is increased. This makes it easier to detect intermittent problems.

(a) Clear the DTC. (See step 3.)
(b) Set the check (test) mode. (See step 3.)
(c) Perform a simulation test. (See page 01–22)
(d) Check the connector and terminal. (See page 01–32)
(e) Wiggle the harness and the connector. (See page 01–32)

6. DATA LIST

HINT:

Using the DATA LIST displayed by the hand–held tester, you can read the value of the switches, sensors, actuators and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten diagnostic time.

NOTICE:

The values given below for ”Normal Condition” are representative values. A vehicle may still be normal even if the measured values are a little different from those listed here. Do not decide whether a part is faulty or not solely according to the ”Normal Condition” here.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the Hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.
(g) According to the display on tester, read the ”DATA LIST”.

Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition	Diagnostic Note
INJECTOR	Injection period/ Min.: 0 ms, Max.: 32.64 ms	Idling: 1.92 to 3.37 ms	—
IGN ADVANCE	Ignition timing advance/ Min.: –64 deg., Max.: 63.5 deg.	Idling: BTDC 5 to 15 deg.	—
CALC LOAD	Calculated load by engine ECM/ Min.: 0 %, Max.: 100 %	• Idling: 3.3 to 26.7 % • Running without load (2,500 rpm): 12.0 to 14.7 %	—
MAF	Air flow rate from MAF sensor/ Min.: 0 gm/s, Max.: 655 gm/s	• Idling: M/T 0.54 to 4.33 gm/sec. A/T 0.58 to 4.67 gm/sec. • Runnning without load (2,500 rpm): 3.33 to 9.17 gm/sec.	—
ENGINE SPD	Engine Speed/ Min.: 0 rpm, Max.: 16,383 rpm	Idling: M/T 650 to 750 rpm A/T 550 to 750 rpm	—
COOLANT TEMP	Coolant temperature/ Min.: –40 °C, Max.: 140 °C	After warming up: 80 to 95°C (176 to 203°F)	If the value is ”–40 °C” or ”140 °C”, sensor circuit is open or shorted.
INTAKE AIR	Intake air temperature/ Min.: –40 °C, Max.: 140 °C	Equivalent to ambient temp.	
THROTTLE POS	Absolute throttle position sensor/ Min.: 0 %, Max.: 100 %	• Throttle fully closed: 6 to 16 % • Throttle fully open: 64 to 98 %	Read the value with ignition switch ON (Do not start engine)
CTP SW	Closed throttle position switch/ ON or OFF	• Throttle fully closed: ON • Throttle open: OFF	—
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Vehicle stopped: 0 km/h (0 mph)	—
O2S B1 S2	Oxygen sensor output voltage of the bank 1 sensor 2/ Min.: 0 V, Max.: 1.275 V	Idling: 0.1 to 0.9 V	—
AFS B1 S1	A/F sensor output voltage of the bank 1 sensor 1/ Min.: 0 V, Max.: 7.999 V	Idling: 2.8 to 3.8 V	—

SHORT FT #1	Short term fuel trim of bank 1/ Min.: –100 %, Max.: 100%	0 ± 20 %	—
LONG FT #1	Long term fuel trim of bank 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	—
TOTAL FT #1	Total fuel trim of bank 1/ Min.: 0.5, Max.: 1.496	Idling: 0.5 to 1.4	—
TOTAL FT #2	Total fuel trim of bank 2/ Min.: 0.5, Max.: 1.496	Idling: 0.5 to 1.4	—
AF FT B1 S1	Short term fuel trim associated with the bank 1, sensor 1/ Min.: 0, Max.: 1.999	• Lean: 0 < 1 • Stoichiometric Air–Fuel Ratio = 1 • Rich: 1 < 1.999	—
FUEL SYS #1	Fuel system status (Bank1) / OL or CL or OLDRIVE or OLFAULT or CLFAULT	Idling after warming up: CL	• OL: Open Loop–has not yet satisfied conditions to go closed loop. • CL: Closed Loop–using oxygen sensor(s) as feed back for fuel control. • OL DRIVE: Open loop due to driving conditions. (power enrichment, deceleration enleanment) • OL FAULT: Open loop due to detected system fault. • CL FAULT: Closed loop, but fault with at least one oxygen sensor may be using single oxygen sensor for fuel control.
FC IDL	Idle fuel cut / ON or OFF	Fuel cut operation: ON	—
CHK ENG	CHK ENG status / ON or OFF	CHK ENG ON: ON	—
STARTER SIG	Starter signal / ON or OFF	Cranking: ON	—
A/C SIG	A/C signal / ON or OFF	A/C ON: ON	—
PNP SW [NSW]	Neutral position switch signal / ON or OFF	P or N position: ON	—
ELECT LOAD SIG	Electrical load signal / ON or OFF	Defogger switch ON: ON	—
STOP LIGHT SW	Stop light switch / ON or OFF	• Brake pedal depressed: ON • Brake pedal released: OFF	—
PS OIL PRESS SW	Power steering signal / ON or OFF	Steering position is; center: OFF Except center:ON	—
PS SIGNAL	Power steering signal/ ON or OFF	• After engine start: OFF • After steer the steering: ON	—
FUEL PUMP / SPD	Fuel pump / speed status / ON/H or OFF/M,L	Idling: ON	—
EVAP VSV	VSV status for EVAP control / ON or OFF	VSV operating: ON	—
VVT CTRL B1	VVT control status / ON or OFF	VVT system operation: ON	—
IGNITION	Ignition counter/ Min.: 0, Max.: 400	0 to 400	—
CYL #1, #2, #3, #4	Misfire ratio of the cylinder 1/ Min.: 0 %, Max.: 50 %	0 %	—

THROTTLE POS	Throttle position sensor output voltage/ Min.: 0 V, Max.: 5 V	• Throttle fully closed: 0.3 to 0.8 V • Throttle fully open: 3.2 to 4.9 V	Read the value with ignition switch ON (Do not start engine)
THROTTLE TARGT	Target position of throttle valve/ Min.: 0 V, Max.: 5 V	Idling: 0.4 to 1.0 V	Read the value with ignition switch ON (Do not start engine)

If no conditions are specifically stated for ”Idling”, it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

7. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten diagnostic time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST”.
(g) According to the display on tester, perform the ”ACTIVE TEST”.

Hand–held Tester Display	Test Details	Diagnostic Note
INJ VOL	[Test Details] Control the injection volume Min.: –12.5 %, Max.: 25 % [Vehicle Condition] Engine speed: 3000 rpm or less.	• All injectors are tested at once. • Injection volume is gradually changed between –12.5 and 25%.
A/F CONTROL	[Test Details] Control the injection volume –12.5 % ⇔ 25 % (Change the injection volume –12.5 % or 25 %.) [Vehicle Condition] Engine speed: 3000 rpm or less.	The following procedure of A/F CONTROL enables the technician to check and graph the voltage outputs of both the A/F sensor and heated oxygen sensor. To display the graph indication, select O2S B1 S1 or A/F B1S1 and press button ”4” after selecting ”ACTIVE TEST/A/F CONTROL/ USER DATA”.
EVAP VSV (ALONE)	[Test Details] Activate the VSV for EVAP control. ON or OFF	—
FUEL PUMP / SPD	[Test Details] Control the fuel pump. ON or OFF	—
VVT CTRL B1	[Test Details] Activate the VVT system. ON or OFF	• ON: Rough idle or engine stall. • OFF: Normal engine speed.
TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	—
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit ON or OFF	—

BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	CHECK BATTERY VOLTAGE

NOTICE:
Carry out this check with the engine stopped and ignition switch off.

Reference:

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → **CHARGE OR REPLACE BATTERY**

OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–168**

OK

3	CHECK IF ENGINE STARTS

NG → **GO TO STEP 6**

OK

4	CHECK AIR FILTER

(a) Visually check that the air filter is not excessively dirty or oily.

HINT:
If necessary, clean the filter with compressed air. First blow from the inside thoroughly, then blow from the outside of filter.

NG → **REPAIR OR REPLACE**

OK

5	CHECK IDLE SPEED (See page 14–101)

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–168**

OK

6	CHECK FUEL PRESSURE (See page 11–19)

NG → PROCEED TO PAGE 11–15 AND CONTINUE TO TROUBLESHOOT

OK

7	CHECK FOR SPARK (See page 18–7)

NG → PROCEED TO PAGE 18–7 AND CONTINUE TO TROUBLESHOOT

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE

05C6Q–01

PROBLEM SYMPTOMS TABLE

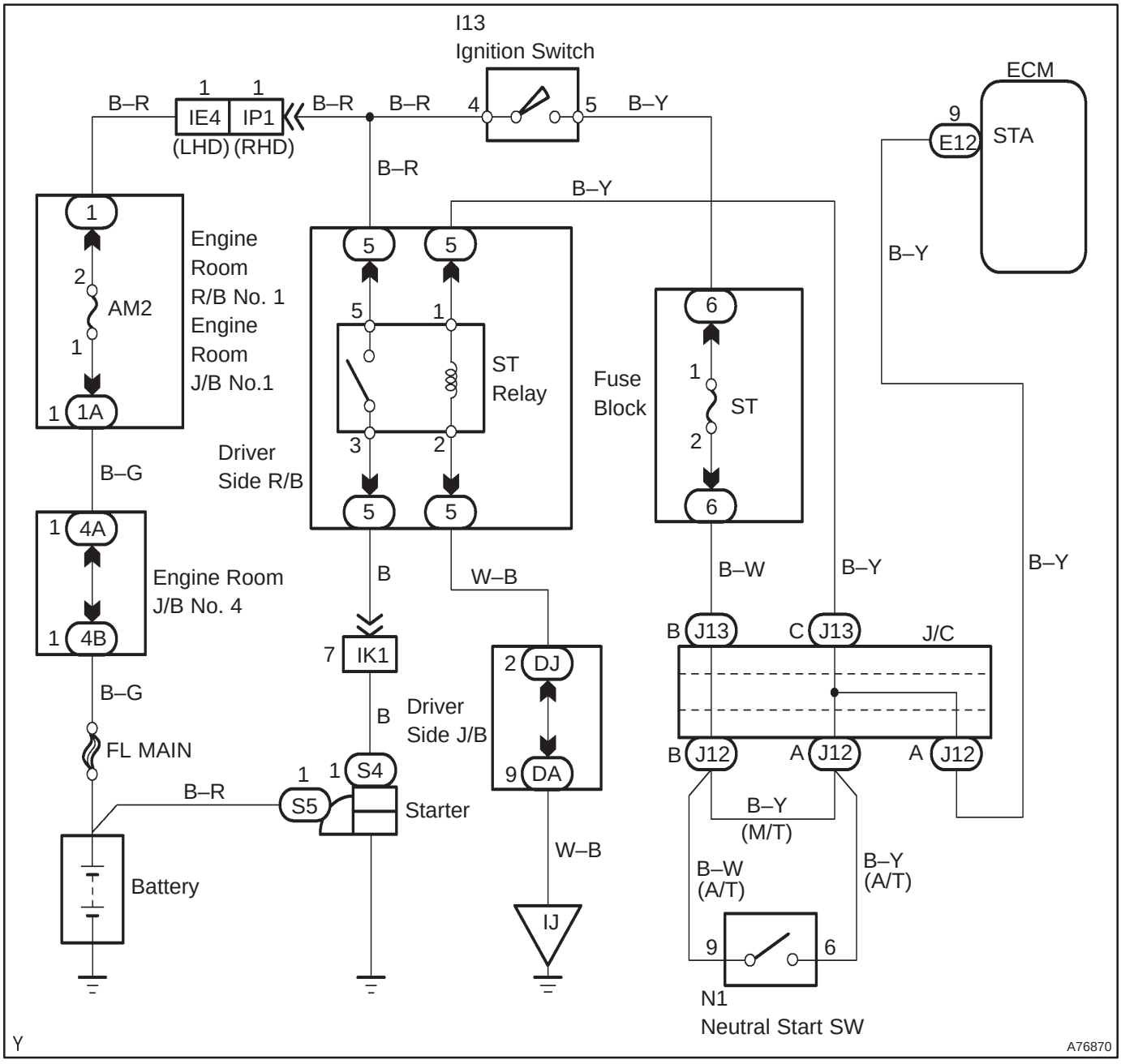
Symptom	Suspected Area	See page
Engine does not crank (Does not start)	1. Starter 2. Starter relay	19–8 19–8
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. ECM	05–257 05–264 01–32
No complete combustion (Does not start)	1. Fuel pump control circuit	05–264
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	05–278 05–264 14–101
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	05–278 05–264
Hot engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	05–278 05–264
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	– 05–257
Low engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Fuel pump control circuit	– 05–264
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	14–101 05–264
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	05–257 05–264
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	05–264 05–879
Surging (Poor driveability)	1. Fuel pump control circuit	05–264
Engine stalls soon after starting	1. Fuel pump control circuit	05–264
Engine stalls during A/C operation	1. A/C signal circuit (Compressor circuit) 2. ECM	– 01–32
Unable to refuel/Difficult to refuel	1. ORVR system	–

STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow becomes slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

This chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05–168.

When using hand–held tester:

1	READ VALUE OF HAND–HELD TESTER(STA SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG” and read its value displayed on the hand–held tester.

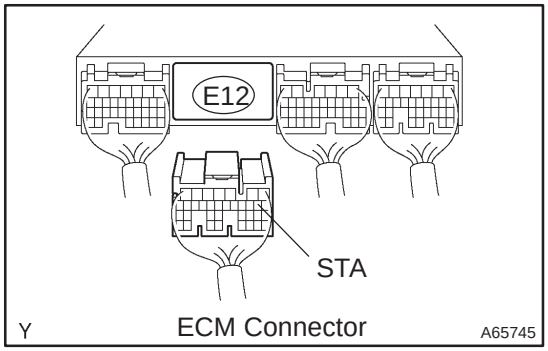
Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–149)**

NG

2	CHECK HARNESS AND CONNECTOR



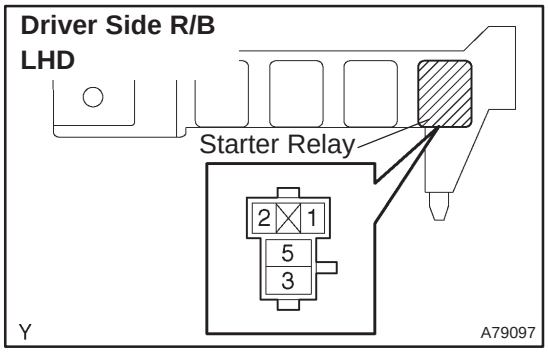
(a) Disconnect the E12 ECM connector.
(b) Remove the starter relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

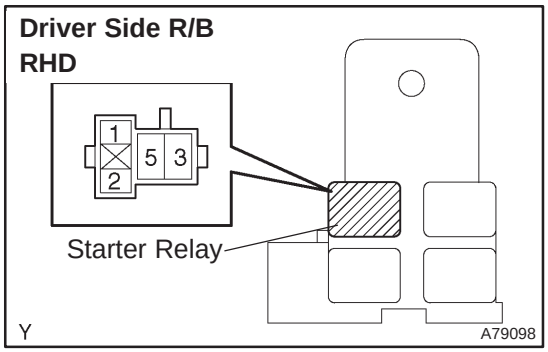
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Starter relay (1) – STA (E12–9)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Starter relay (1) or STA (12–9) – Body ground	No continuity





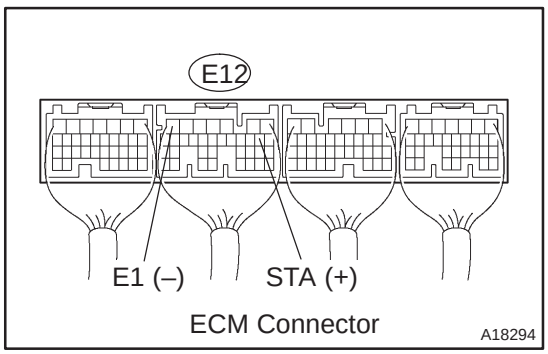
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE ECM (See page 01–32)

When not using hand–held tester:

1	INSPECT ECM(STA VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E12 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
STA (E12–9) – E1 (E12–7)	0 V

(c) Measure the voltage between the terminals of the E12 ECM connector when the engine is cranked.

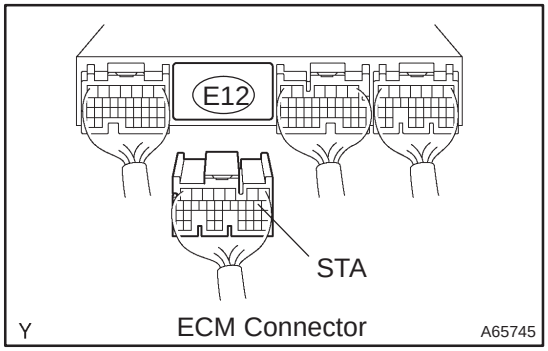
Standard:

Symbols (Terminal No.)	Specified condition
STA (E12–9) – E1 (E12–7)	6 V or more

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–149)**

NG

2 CHECK HARNESS AND CONNECTOR



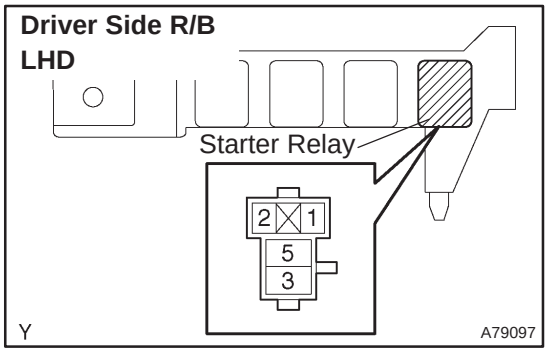
(a) Disconnect the E12 ECM connector.
(b) Remove the starter relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

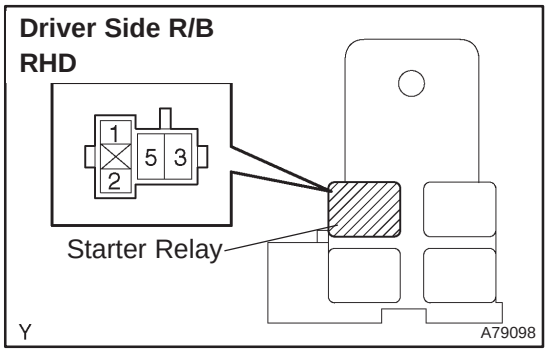
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Starter relay (1) – STA (E12–9)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Starter relay (1) or STA (12–9) – Body ground	No continuity





NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

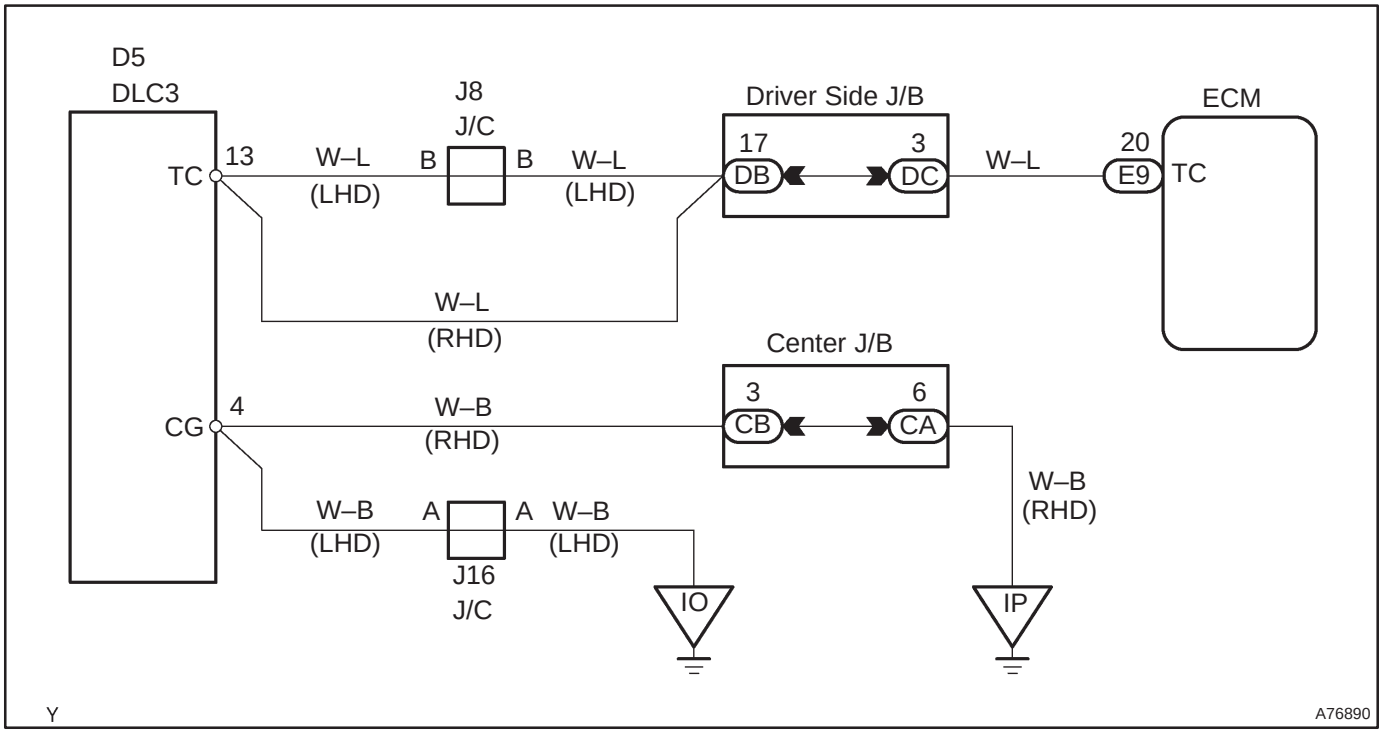
CHECK AND REPLACE ECM (See page 01–32)

TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

Terminals TC and CG are located in the DLC3. When connecting these terminals, DTCs in normal mode or check mode can be read through the CHK ENG flashing in the combination meter.

WIRING DIAGRAM

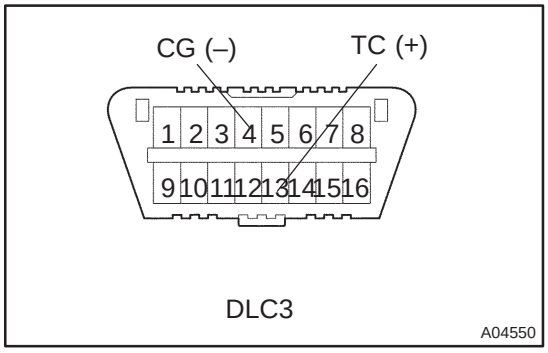


INSPECTION PROCEDURE

HINT:

- Even though terminal TC is not connected to terminal CG, the CHK ENG blinks.
- For the above phenomenon, an open or short in the wire harness, or malfunction inside the ECM is the likely cause.

1	CHECK DLC3(TC VOLTAGE)



(a) Turn the ignition switch ON.

(b) Measure the voltage between the terminals of the DLC3.

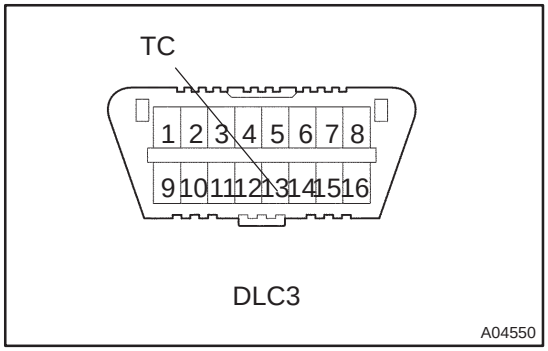
Standard:

Symbols (Terminal No.)	Specified condition
TC (13) – CG (4)	9 to 14 V

OK → **Go to step 3**

NG

2 CHECK HARNESS AND CONNECTOR(DLC3 – ECM)



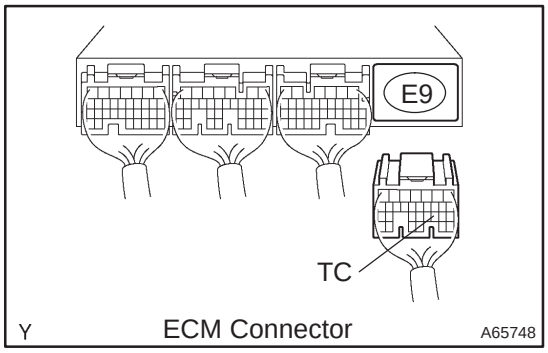
(a) Disconnect the E9 ECM connector.
(b) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
TC (13) – TC (E9–20)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
TC (13) or TC (E9–20) – Body ground	No continuity



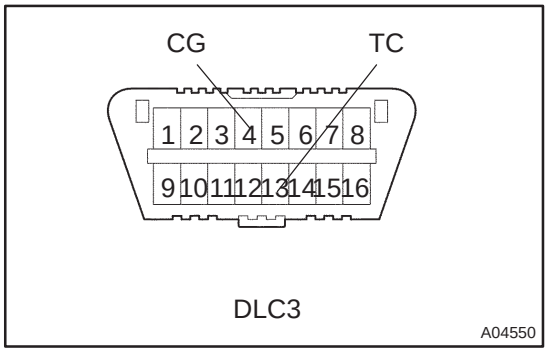
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR

3 CHECK CHK ENG CONDITION

SST 09843–18040



(a) Turn the ignition switch ON.
(b) Connect between terminals TC and CG of the DLC3 connector.
(c) Check that the CHK ENG blinks.

Standard: CHK ENG blinks

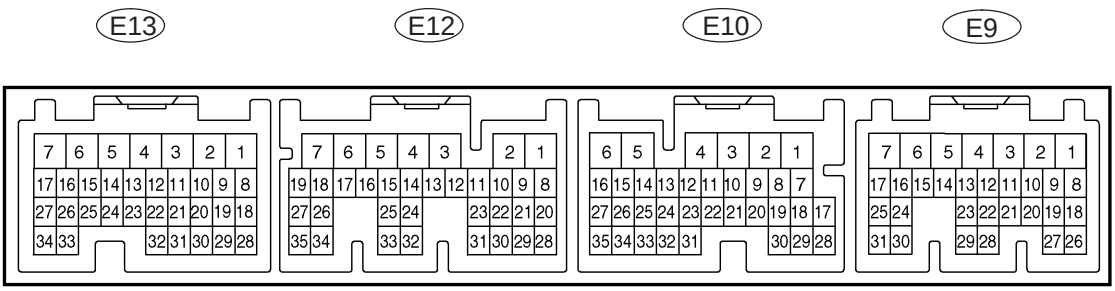
NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

NO PROBLEM

05C6P–01

TERMINALS OF ECM



Y

A66714

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E9 – 3) – E1 (E12 – 7)	B–Y – BR	Always	8 to 14
FC (E9 – 10) – E1 (E12 – 7)	G–Y – BR	IG switch ON	8 to 14
		Idling	Below 1.5
W (E9 – 11) – E1 (E12 – 7)	W – BR	Idling	8 to 14
		IG switch ON	Below 3.5
+B (E9 – 1) – E1 (E12 – 7)	B–R – BR	IG switch ON	8 to 14
STP (E10 – 19) – E1 (E12 – 7)	G–W – BR	IG switch ON, brake pedal depressed	8 to 14
		IG switch ON, brake pedal released	Below 1.5
F/PS (E9 – 14) – E1 (E12 – 7)	LG–B – BR	IG switch ON	Pulse generation
STA (E12 – 9) – E1 (E12 – 7)	B–Y – BR	Cranking	5.5 or more
HA1A (E12 – 6) – E04 (E12 – 4) *1	L – W–B	Idling	Below 3.0
		IG switch ON	9 to 14
A1A+ (E12 – 23) – E1 (E12 – 7) *1	W – BR	IG switch ON	3.0 to 3.6
A1A– (E12 – 31) – E1 (E12 – 7) *1	B – BR	IG switch ON	2.7 to 3.3
HA2A (E12 – 5) – E05 (E12 – 3) *1	Y – W–B	Idling	Below 3.0
		IG switch ON	9 to 14
A2A+ (E12 – 22) – E1 (E12 – 7) *1	G – BR	IG switch ON	3.0 to 3.6
A2A– (E12 – 30) – E1 (E12 – 7) *1	L – BR	IG switch ON	2.7 to 3.3
HT1B (E10 – 4) – E01 (E13 – 7) *1	L – W–B	Idling	Below 3.0
		IG switch ON	9 to 14
OX1B (E12 – 21) – 01B (E13 – 32) *1	B – BR	IG switch ON	0 to 1.0
O1B– (E13 – 32) – E1 (E12 – 7) *1	W – BR	IG switch ON	0.4 to 1.1
HT2B (E10 – 3) – E01 (E13 – 7) *1	L–R – W–B	Idling	Below 3.0
		IG switch ON	9 to 14
OX2B (E12 – 29) – 01B (E13 – 32) *1	R – BR	IG switch ON	0 to 1.0
O2B– (E13 – 31) – E1 (E12 – 7) *1	G – BR	IG switch ON	0.4 to 1.1

SPD (E10 – 17) – E1 (E12 – 7)	V–W – BR	IG switch ON, rotate driving wheel slowly	Pulse generation (See page 05–240)
TACH (E9 – 5) – E1 (E12 – 7)	GR–R – BR	Idling	Pulse generation
VC (E13 – 18) – E2 (E13 – 28)	R–W – BR	IG switch ON	4.5 to 5.5
PRG (E13 – 12) – E01 (E13 – 7)	W–G – W–B	IG switch ON	8 to 14
VG (E12 – 24) – EVG (E12 – 32)	G – L–Y	Idling, A/C switch OFF	1.1 to 1.5
THW (E13 – 19) – E2 (E13 – 28)	B–W – BR	Idling, Engine coolant temp. at 80°C (176°F)	0.2 to 1.0
G2+ (E13 – 26) – NE– (E13 – 34)	W – R	Idling	Pulse generation (See page 05–229)
NE+ (E13 – 27) – NE– (E13 – 34)	G – R	Idling	Pulse generation (See page 05–226)
THA (E13 – 20) – E2 (E13 – 28)	G–R – BR	Idling, intake air temp. at 20 °C (68 °F)	0.5 to 3.4
VTA1 (E13 – 21) – E2 (E13 – 28)	L–W – BR	IG switch ON, throttle valve fully closed	0.3 to 1.0
		IG switch ON, throttle valve fully open	3.2 to 4.9
#1 (E13 – 1) – E01 (E13 – 7) #2 (E13 – 2) – E01 (E13 – 7) #3 (E13 – 3) – E01 (E13 – 7) #4 (E13 – 4) – E01 (E13 – 7)	B–R – W–B Y – W–B W – W–B B – W–B	IG switch ON	8 to 14
IGT1 (E13 – 8) – E1 (E12 – 7) IGT2 (E13 – 9) – E1 (E12 – 7) IGT3 (E13 – 10) – E1 (E12 – 7) IGT4 (E13 – 11) – E1 (E12 – 7)	R–W – BR P – BR LG–B – BR L–Y – BR	Idling	Pulse generation (See page 05–232)
IGF (E13 – 13) – E1 (E12 – 7)	W–R – BR	IG switch ON	4.5 to 5.5
		Idling	Pulse generation (See page 05–232)
RSD (E12 – 10) – E1 (E12 – 7)	G–R – W–B	IG switch ON	9 to 14
OC1+ (E13 – 15) – OC1– (E13 – 14) *1	W–G – Y–B	IG switch ON	Pulse generation (See page 05–169)
KNK1 (E12 – 1) – EKNK (E12 – 2)	B – W	Idling	Pulse generation (See page 05–222)
ELS2 (E9 – 13) – E1 (E12 – 7)	G – BR	Defoger switch ON	9 to 14
		IG switch ON	Below 3.0
MREL (E9 – 8) – E1 (E12 – 7)	GR – BR	IG switch ON	9 to 14
IGSW (E9 – 9) – E1 (E12 – 7)	B–W – BR	IG switch ON	9 to 14
TC (E9 – 20) – E1 (E12 – 7)	W–L – BR	IG switch ON	9 to 14
SIL (E9 – 18) – E1 (E12 – 7)	W–G – BR	Connect hand–held tester to DLC3	Pulse generation
ELS (E9 – 12) – E1 (E12 – 7)	G – BR	Taillight ON	9 to 14
		IG switch ON	Below 3.0
VAF (E13 – 32) – E2 (E13 – 28) *2	P – BR	IG switch ON	2.0 to 3.5

*1: For European spec. only

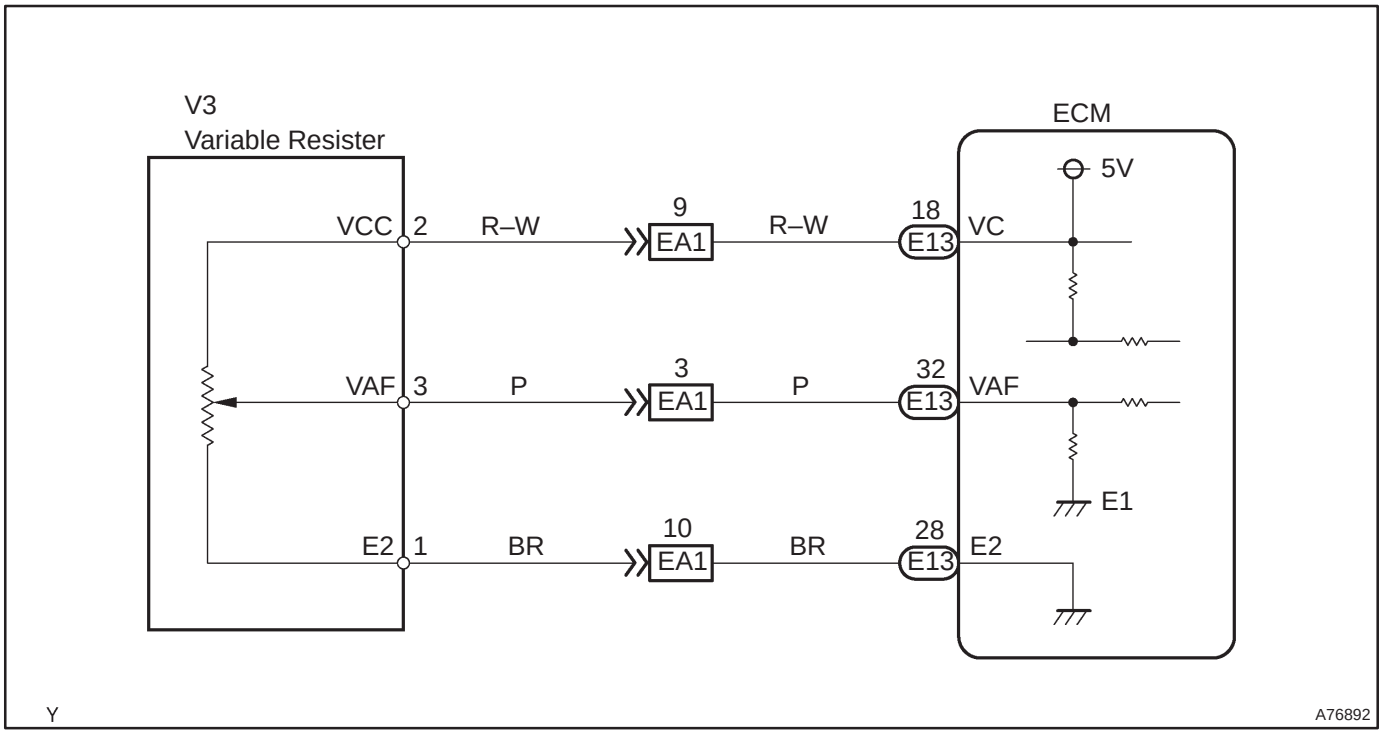
*2: Leaded only

VARIABLE RESISTOR CIRCUIT

CIRCUIT DESCRIPTION

The variable resister has been adopted to leaded–type vehicle only.
This resistor is used change the air–fuel ratio of the air–fuel mixture.
The idle mixture is adjusted using this resistor.
Turning the idle mixture adjusting screw clockwise moves the contacts inside the resistor, raising the terminal VAF voltage. Conversely, turning the screw counterclockwise lowers the terminal VAF voltage.
When the terminal VAF voltage rises, the ECM increases the injection volume slightly, marking the air–fuel mixture a little richer.

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

Always use a CO meter when adjusting the idle mixture. If a CO meter is not available, DO NOT ATTEMPT TO ADJUST IDLE MIXTURE.

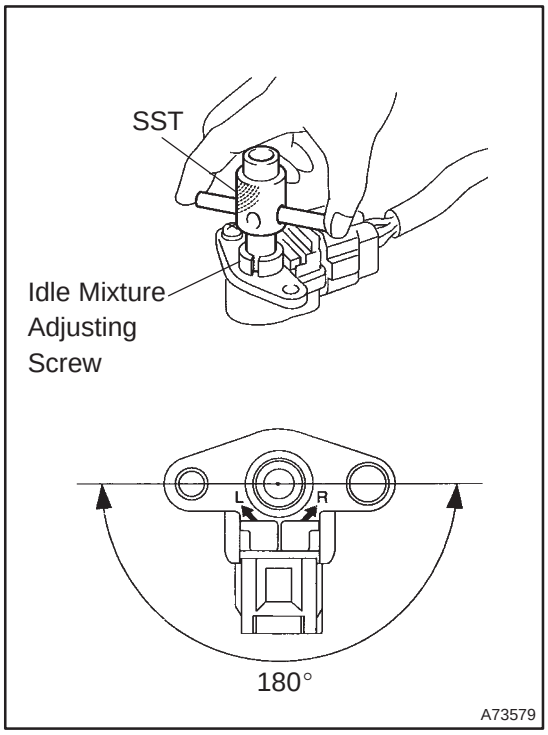
1	CHECK CO/HC (See page 14–101)

OK → CHECK FOR PROBLEM SYMPTOMS TABLE (See page 05–168)

NG

2	ADJUST CO CONCENTRATION

SST 09243–00020



(a) Same condition as step 1 this chart.

(b) Using SST, adjusting the idle mixture by turning the idle mixture adjusting screw in the variable resistor.

Result:

Result	Proceed
Connection: 1.5 ± 0.5 %	B
Change in CO connection	C
No change in CO connection	A

HINT:

- Always check idle speed after turning the idle mixture adjusting screw. If it is incorrect, readjust idle speed.
- Adjustable range of the idle mixture adjust to turn this screw is 180 degrees. Do not turn this screw more than it.

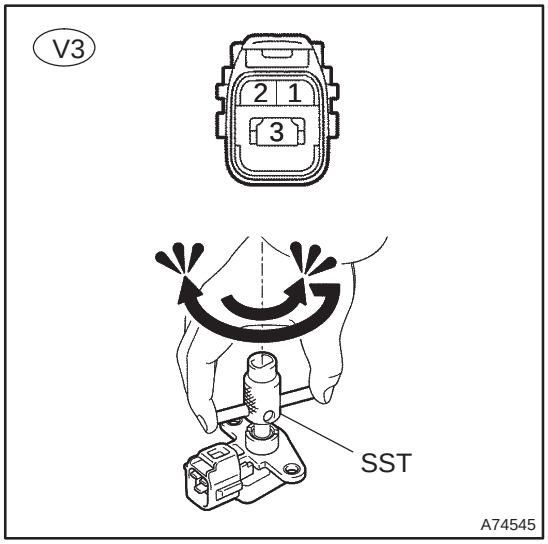
B → ADJUSTMENT COMPLETE

C → CHECK CO/HC (See page 14–101)

A

3 INSPECT VARIABLE RESISTOR

SST 09243–00020



(a) Measure the resistance between the terminals.
Resistance:

Symbols (Terminal No.)	Specified condition
1 – 2	3.5 – 6.5 Ω

(b) Measure the resistance between terminals 2 and 3 when turning the idle mixture adjusting screw fully clockwise and counterclockwise using SST
Resistance:

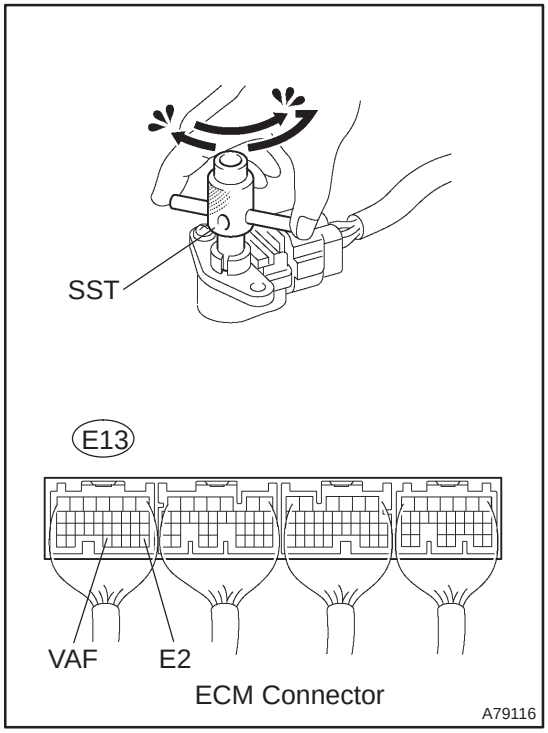
Symbols (Terminal No.)	Specified condition
2 – 3	Change from about 5 kΩ to 0 kΩ accordingly

NG → **REPLACE VARIABLE RESISTOR**

OK

4 CHECK ECM

SST 09243–00020



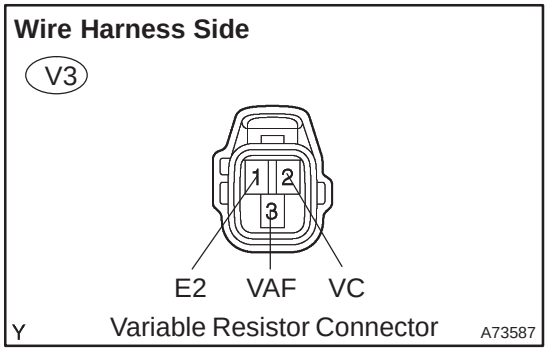
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E13 ECM connector while slowly turning the idle mixture adjusting screw first fully counterclockwise and then fully clockwise, using SST.
Voltage:

Symbols (Terminal No.)	Specified condition
VAF (E13–32) – E2 (E13–28)	Voltage changes smoothly from 0 V to about 5 V, i.e. does not suddenly jump up to 5 V down to 0 V

OK → **CHECK AND REPLACE ECM** **(See page 01–32)**

NG

5 CHECK HARNESS AND CONNECTOR(ECM – VARIABLE RESISTOR)



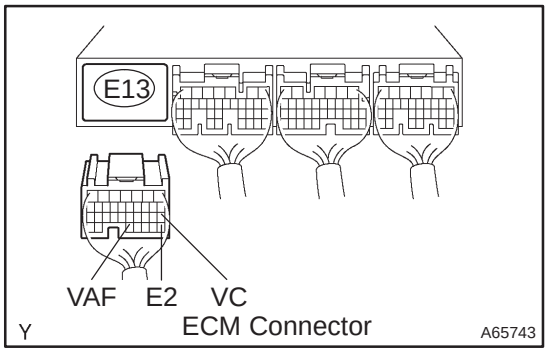
(a) Disconnect the V3 variable resistor connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (V3–2) – VC (E13–18)	Continuity
VAF (V3–3) – VAF (E13–32)	
E2 (V3–1) – E2 (E13–28)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (V3–2) or VC (E13–18) – Body ground	No continuity
VAF (V3–3) or VAF (E13–32) – Body ground	



OK

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

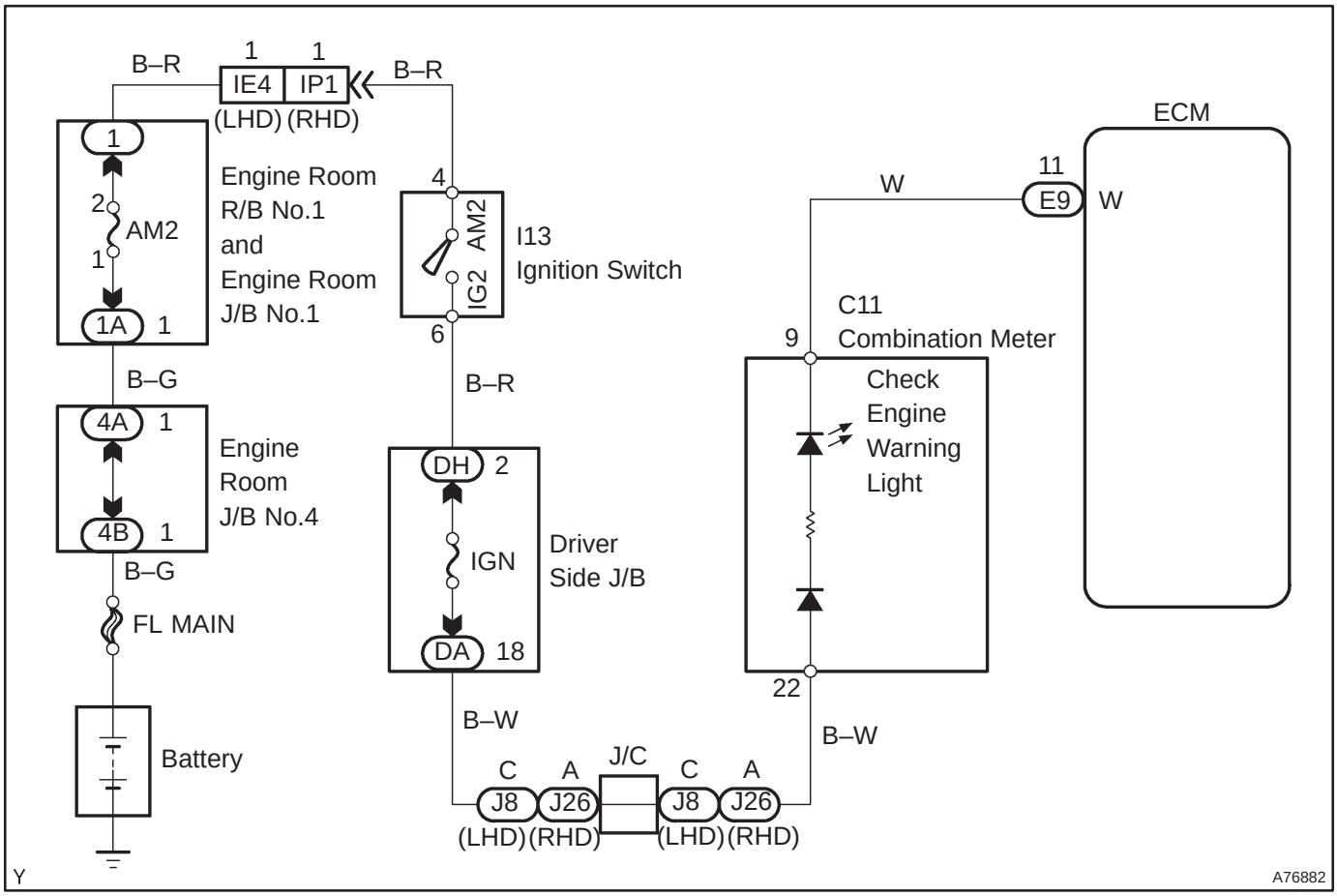
CHECK AND REPLACE ECM (See page 01–32)

CHECK ENGINE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

If the ECM detects a trouble, it illuminates CHK ENG. At this time, the ECM sets a DTC in the memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below .

CHK ENG remains on	Start inspection from step 1
CHK ENG is not illuminated	Start inspection from step 3

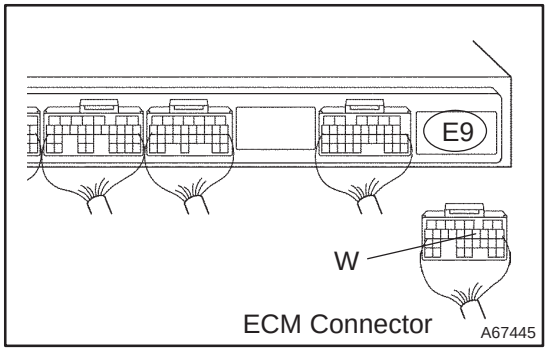
1 CLEAR DTC

(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Read the DTC (See page 05–294).
(d) Clear the DTC (See page 05–294).
(e) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated

OK → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE (See page 05–309)**

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E9 ECM connector.
(b) Turn the ignition switch ON.
(c) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated

NG → **CHECK AND REPAIR HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

3	CHECK CHK ENG CONDITION

(a) Check that the CHK ENG is illuminated when turning the ignition switch ON.
Standard: CHK ENG is illuminated

OK → **SYSTEM OK**

NG

4	INSPECT COMBINATION METER ASSY(CHK ENG CIRCUIT)

(a) See the combination meter troubleshooting on page 05–1509.

NG → **REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER – ECM)

05CDT–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name _____

Customer's Name		VIN	
Driver's Name		Production Date	
Date Vehicle Brought in		Licence No.	
License No.		Odometer Reading	km / miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx.____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of check engine warning light (CHK ENG)		☐ Remains on	☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre–check)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

05CID–01

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your readings due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in the check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the ”See page ” under the respective ”DTC No.” in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0010 (05–322)	Camshaft Position ”A” Actuator Circuit (Bank 1)	• Open or short in OCV circuit • OCV • ECM	○	○
P0011 (05–325)	Camshaft Position ”A” –Timing Over– Advanced or System Performance (Bank 1)	• Valve timing • OCV • VVT controller assembly • ECM	○	○
P0012 (05–325)	Camshaft Position ”A” –Timing Over– Retarded (Bank 1)		○	○
P0016 (05–329)	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM	○	○
P0031 (05–330)	Oxygen Sensor Heater Circuit Low (Bank 1 Sensor 1)	• Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • EFI fuse • EFI No. 2 fuse • ECM	○	○
P0032 (05–330)	Oxygen Sensor Heater Circuit High (Bank 1 Sensor 1)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0037 (05–330)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)	• Same as DTC No. P0031	○	○
P0038 (05–330)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)	• Same as DTC No. P0032	○	○
P0051 (05–330)	Oxygen Sensor Heater Circuit Low (Bank 2 Sensor 1)	• Same as DTC No. P0031	○	○
P0052 (05–330)	Oxygen Sensor Heater Circuit High (Bank 2 Sensor 1)	• Same as DTC No. P0032	○	○
P0057 (05–330)	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 2)	• Same as DTC No. P0031	○	○
P0058 (05–330)	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 2)	• Same as DTC No. P0032	○	○
P0100 (05–336)	Mass or volume Air Flow Circuit	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0102 (05–336)	Mass or volume Air Flow Circuit Low Input		○	○
P0103 (05–336)	Mass or volume Air Flow Circuit High Input		○	○
P0105 (05–342)	Manifold Absolute Pressure/ Barometric Pressure Circuit	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM	○	○
P0107 (05–342)	Manifold Absolute Pressure/ Barometric Pressure Circuit Low Input		○	○
P0108 (05–342)	Manifold Absolute Pressure/ Barometric Pressure Circuit High Input		○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0110 (05–347)	Intake Air Temperature Circuit	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0112 (05–347)	Intake Air Temperature Circuit Low Input	• Short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0113 (05–347)	Intake Air Temperature Circuit High Input	• Open in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0115 (05–351)	Engine Coolant Temperature Circuit	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0116 (05–355)	Engine Coolant Temperature Circuit Range/Performance Problem	• Cooling system • Engine coolant temperature sensor • Thermostat	○	○
P0117 (05–351)	Engine Coolant Temperature Circuit Low Input	• Short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0118 (05–351)	Engine Coolant Temperature Circuit High Input	• Open in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0120 (05–356)	Throttle/Pedal Position Sensor/ Switch "A" Circuit	• Throttle position sensor (built in throttle body) • ECM	○	○
P0121 (05–362)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Range/Performance Problem	• Throttle position sensor (built in throttle body)	○	○
P0122 (05–356)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low Input	• Throttle position sensor (built in throttle body) • VTA1 circuit short • VC circuit open • ECM	○	○
P0123 (05–356)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	• Throttle position sensor (built in throttle body) • VTA1 circuit open • E2 circuit open • VC and VTA1 circuit are short–circuited • ECM	○	○
P0130 *3 (05–363)	Oxygen Sensor Circuit (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay • Air induction system • Fuel pressure • Injector • ECM	○	○
P0133 *3 (05–374)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay • Air induction system • Fuel pressure • Injector • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0134 (05–381)	Oxygen Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay • Air induction system • Fuel pressure • Injector • Gas leakage in exhaust system • PCV valve and hose • PCV hose connection • ECM	○	○
P0136 *3 (05–388)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay	○	○
P0150 *3 (05–363)	Oxygen Sensor Circuit (Bank 2 Sensor 1)	• Same as DTC No. P0130	○	○
P0153 *3 (05–374)	Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 1)	• Same as DTC No. P0133	○	○
P0154 (05–381)	Oxygen Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	• Same as DTC No. P0134	○	○
P0156 *3 (05–388)	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)	• Same as DTC No. P0136	○	○
P0171 *3 (05–394)	System too Lean (Bank 1)	• Air induction system • Injector blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • PCV valve and hose • PCV hose connection • ECM	○	○
P0172 *3 (05–394)	System too Rich (Bank 1)	• Injector leak, blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0174 *3 (05–394)	System too Lean (Bank2)	• Air induction system • Injector blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 2 sensor 1) circuit • Heated oxygen sensor (bank 2 sensor 1) • Heated oxygen sensor heater (bank 2 sensor 1) • EFI relay • PCV valve and hose • PCV hose connection • ECM	○	○
P0175 *3 (05–394)	System too Rich (Bank2)	• Injector leak, blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 2 sensor 1) circuit • Heated oxygen sensor (bank 2 sensor 1) • ECM	○	○
P0190 (05–406)	Fuel Rail Pressure Sensor Circuit	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM	○	○
P0191 (05–410)	Fuel Rail Pressure Sensor Circuit Range/Performance	• Open or short in high–pressure fuel pump (spill valve) circuit • High–pressure fuel pump • Low–pressure fuel pump • Fuel pipe • Fuel relief valve • Fuel pressure regulator • ECM	○	○
P0200 (05–415)	Injector Circuit/Open	• Open or short in EDU circuit • EDU (Injector driver) • Fuel injector assy • ECM	○	○
P0201 (05–415)	Injector Circuit/Open – (Cylinder 1)		○	○
P0202 (05–415)	Injector Circuit/Open – (Cylinder 2)		○	○
P0203 (05–415)	Injector Circuit/Open – (Cylinder 3)		○	○
P0204 (05–415)	Injector Circuit/Open – (Cylinder 4)		○	○
P0220 (05–356)	Throttle/Pedal Position Sensor/ Switch "B" Circuit	• Throttle position sensor (built in throttle body) • ECM	○	○
P0222 (05–356)	Throttle/Pedal Position Sensor/ Switch "B" Circuit Low Input	• Throttle position sensor (built in throttle body) • VTA2 circuit short • VC circuit open • ECM	○	○
P0223 (05–356)	Throttle/Pedal Position Sensor/ Switch "B" Circuit High Input	• Throttle position sensor (built in throttle body) • VTA2 circuit open • E2 circuit open • VC and VTA2 circuit are short–circuited • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0300 *3 (05–420)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • PCV hose • ECM	○*2	○
P0301 *3 (05–420)	Cylinder 1 Misfire Detected		○*2	○
P0302 *3 (05–420)	Cylinder 2 Misfire Detected		○*2	○
P0303 *3 (05–420)	Cylinder 3 Misfire Detected		○*2	○
P0304 *3 (05–420)	Cylinder 4 Misfire Detected		○*2	○
P0325 (05–429)	Knock Sensor 1 Circuit (Bank 1 or Single Sensor)	• Knock sensor • Knock sensor (under–torqued or loose) • ECM	○	○
P0327 (05–429)	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	• Short in knock sensor circuit • Knock sensor • ECM	○	○
P0328 (05–429)	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	• Open in knock sensor circuit • Knock sensor • ECM	○	○
P0335 (05–433)	Crankshaft Position Sensor "A" Circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft position sensor plate No. 1) • ECM	○	○
P0339 (05–433)	Crankshaft Position Sensor "A" Circuit Intermittent		—	○
P0340 (05–436)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing gear • Timing chain has jumped a tooth • ECM	○	○
P0341 (05–436)	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)		○	○
P0351 (05–439)	Ignition Coil "A" Primary/Secondary Circuit	• Ignition system • Open or short in IGF and IGT circuit from ignition coil with igniter to ECM (ignition coil circuit 1 through 4) • Ignition coil with igniter (ignition coil 1 through 4) • IG2 relay • ECM	○	○
P0352 (05–439)	Ignition Coil "B" Primary/Secondary Circuit		○	○
P0353 (05–439)	Ignition Coil "C" Primary/Secondary Circuit		○	○
P0354 (05–439)	Ignition Coil "D" Primary/Secondary Circuit		○	○
P0420 *3 (05–446)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage in exhaust system • Heated oxygen sensor • Three–way catalytic converter (inside exhaust manifold)	○	○
P0430 *3 (05–446)	Catalyst System Efficiency Below Threshold (Bank 2)		○	○
P0443 (05–449)	Evaporative Emission Control System Purge Control Valve Circuit	• Open of short in VSV circuit for EVAP • VSV for EVAP • ECM	○	○
P0500 (05–453)	Vehicle Speed Sensor "A"	• Combination meter • Open or short in speed sensor circuit • Vehicle speed sensor • ECM • Skid control ECU • Clutch or brake slips or gear is broken	○	○
P0504 (05–455)	Brake Switch Correlation	• Short in stop light switch signal circuit • Stop light switch • ECM	—	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0555 (05–459)	Brake Booster Pressure Sensor Circuit	• Open or short in brake booster pressure sensor circuit • Brake booster pressure sensor • Vacuum hose • ECM	○	○
P0556 (05–462)	Brake Booster Pressure Sensor CircuitRange/Performance	• Vacuum hose (between the brake booster and intake manifold, the brake booster and brake booster pressure sensor, and the intake manifold and manifold absolute pressure sensor) • Open or short in brake booster pressure sensor circuit • Brake booster pressure sensor • Manifold absolute pressure sensor • Brake booster • Open or short in stop light switch circuit • Stop light switch • ECM	○	○
P0557 (05–459)	Brake Booster Pressure Sensor Circuit Low Input	• Same as DTC No. P0555	○	○
P0558 (05–459)	Brake Booster Pressure Sensor Circuit High Input	• Same as DTC No. P0555	○	○
P0560 (05–467)	System Voltage	• Open in back–up power source circuit • ECM	○	○
P0571 (05–1711)	Brake Switch "A" Circuit	• Cruise control system	—	○
P0604 (05–470)	Internal Control Module Random Access Memory (RAM) Error	• ECM	○	○
P0606 (05–470)	ECM/PCM Processor		○	○
P0607 (05–470)	Control Module Performance		○	○
P0617 (05–471)	Starter Relay Circuit High	• Short in park/neutral position switch (A/T) • Park/neutral position switch (A/T) • Ignition switch • ECM	○	○
P0657 (05–470)	Actuator Supply Voltage Circuit / Open	• ECM	○	○
P0705 *4 (05–474)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	○	○
P0710 *4 (05–941)	Transmission Fluid Temperature Sensor "A" circuit	• Electronic controlled automatic transmission (ECT)	○	○
P0711 *3,4 (05–943)	Transmission Fluid Temperature Sensor "A" Performance	• Electronic controlled automatic transmission (ECT)	○	○
P0712 *4 (05–941)	Transmission Fluid Temperature Sensor "A" Circuit Low Input	• Electronic controlled automatic transmission (ECT)	○	○
P0713 *4 (05–941)	Transmission Fluid Temperature Sensor "A" Circuit High Input	• Electronic controlled automatic transmission (ECT)	○	○
P0717 *4 (05–945)	Input/Turbine Speed Sensor "A" Circuit No Signal	• Electronic controlled automatic transmission (ECT)	○	○
P0724 *4 (05–947)	Brake Switch "B" Circuit High	• Short in stop light switch signal circuit • Stop light switch • ECM	○	○
P0741 *3,4 (05–948)	Torque Converter Clutch Circuit Performance or Stuck Off	• Electronic controlled automatic transmission (ECT)	○	○
P0743 *4 (05–951)	Torque Converter Clutch Circuit Electrical	• Electronic controlled automatic transmission (ECT)	○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0746 *3,4 (05–954)	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)	• Electronic controlled automatic transmission (ECT)	○	○
P0748 *4 (05–956)	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	• Electronic controlled automatic transmission (ECT)	○	○
P0766 *3,4 (05–962)	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	• Electronic controlled automatic transmission (ECT)	○	○
P0776 *3,4 (05–963)	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	• Electronic controlled automatic transmission (ECT)	○	○
P0778 *4 (05–956)	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	• Electronic controlled automatic transmission (ECT)	○	○
P0793 *4 (05–965)	Intermediate Shaft Speed Sensor "A" Circuit No Signal	• Electronic controlled automatic transmission (ECT)	○	○
P0982 *4 (05–956)	Shift Solenoid "D" Control Low	• Electronic controlled automatic transmission (ECT)	○	○
P0983 *4 (05–956)	Shift Solenoid "D" Control High	• Electronic controlled automatic transmission (ECT)	○	○
P1235 (05–477)	High Pressure Fuel Pump Circuit	• Open or short in fuel pump (high pressure) • Fuel pump (high pressure) • ECM	○	○
P2008 (05–480)	Intake Manifold Runner Control Circuit/Open (Bank 1)	• Open of short in VSV for IACV circuit • VSV for IACV • ECM	○	○
P2102 (05–483)	Throttle Actuator Control Motor Circuit Low	• Open in throttle control motor circuit • Throttle control motor • ECM	○	○
P2103 (05–483)	Throttle Actuator Control Motor Circuit High	• Short in throttle control motor circuit • Throttle control motor • ECM	○	○
P2111 (05–485)	Throttle Actuator Control System – Stuck Open	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve	○	○
P2112 (05–485)	Throttle Actuator Control System – Stuck Closed		○	○
P2118 (05–487)	Actuator Control Motor Current Range/Performance	• Open in ETCS power source circuit • ECM	○	○
P2119 (05–490)	Throttle Actuator Control Throttle Body Range/Performance	• Electric throttle control system • ECM	○	○
P2120 (05–492)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P2121 (05–499)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P2122 (05–492)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	• Same as DTC No. P2120	○	○
P2123 (05–492)	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input		○	○
P2125 (05–492)	Throttle/Pedal Position Sensor/ Switch "E" Circuit		○	○
P2127 (05–492)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input		○	○
P2128 (05–492)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input		○	○
P2135 (05–356)	Throttle Pedal Position Sensor/ Switch "A"/"B" Voltage Correlation	• VTA1 and VTA2 circuit are short–circuited • Throttle position sensor (built in throttle body) • ECM	○	○
P2138 (05–492)	Throttle Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	• Same as DTC No. P2120	○	○
P2195 *3 (05–363)	Oxygen Sensor Signal Stuck Lean (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM	○	○
P2196 *3 (05–363)	Oxygen Sensor Signal Stuck Rich (Bank 1 Sensor 1)		○	○
P2197 *3 (05–363)	Oxygen Sensor Signal Stuck Lean (Bank 2 Sensor 1)		○	○
P2198 *3 (05–363)	Oxygen Sensor Signal Stuck Rich (Bank 2 Sensor 1)		○	○
P2716 *4 (05–967)	Pressure Control Solenoid "D" Electrical	• Electronic controlled automatic transmission (ECT)	○	○
B2799 (05–1625)	Engine Immobiliser System Malfunction	• Immobiliser system	—	○

*1: CHK ENG (Check engine warning light) is illuminated
*2: CHK ENG (Check engine warning light) is illuminated or blinks
*3: For Euro–OBD vehicles only.
*4: For A/T only.

DTC	P2121	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page 05–492.

DTC No.	DTC Detection Condition	Trouble Area
P2121	Conditions (a) and (b) continue for 0.5 seconds: (a) Difference between VPA and VPA2 exceeds the threshold (b) IDL is OFF	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM

WIRING DIAGRAM

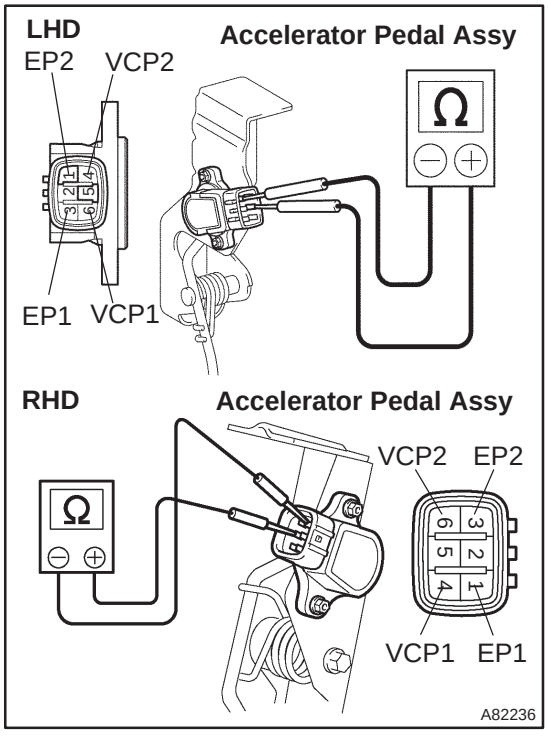
Refer to DTC P2120 on page 05–492.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A20 accelerator pedal position sensor connector.

(b) Measure the resistance between each terminal.

Standard (LHD):

Symbols (Terminal No.)	Resistance
EP1 (3) – VCP1 (6)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (1) – VCP2 (4)	

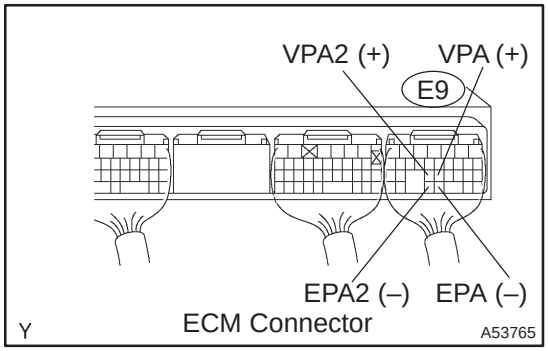
Standard (RHD):

Symbols (Terminal No.)	Resistance
EP1 (1) – VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) – VCP2 (6)	

NG → **REPLACE ACCELERATOR PEDAL ASSY**

OK

2 INSPECT ECM(VPA AND VPA2 VOLTAGE)



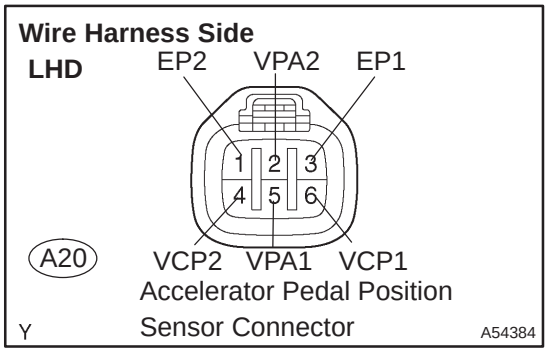
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

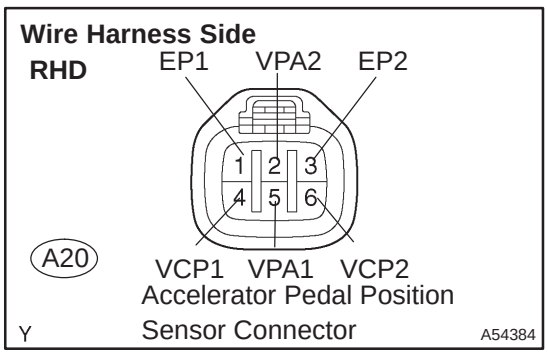
Accelerator pedal position	Symbols (Terminal No.)	Symbols (Terminal No.)
	VPA (E9–22) – EPA (E9–28)	VPA2 (E9–23) – EPA2 (E9–29)
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

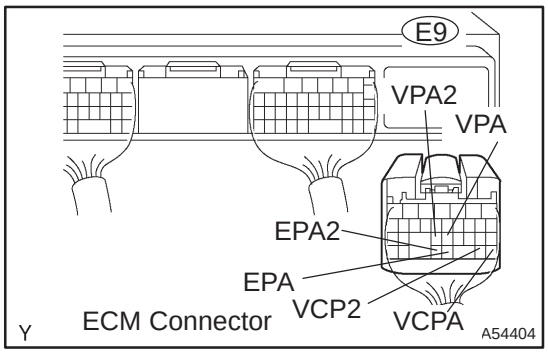
OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

3 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)







(a) Disconnect the accelerator pedal position sensor connector.
(b) Disconnect the E9 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (LHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–3) – EPA (E9–28)	
VCP1 (A20–6) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–1) – EPA2 (E9–29)	
VCP2 (A20–4) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–3) or EPA (E9–28) – Body ground	
VCP1 (A20–6) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–1) or EPA2 (E9–29) – Body ground	
VCP2 (A20–4) or VCP2 (E9–27) – Body ground	

Standard (RHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–1) – EPA (E9–28)	
VCP1 (A20–4) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–3) – EPA2 (E9–29)	
VCP2 (A20–6) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–1) or EPA (E9–28) – Body ground	
VCP1 (A20–4) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–3) or EPA2 (E9–29) – Body ground	
VCP2 (A20–6) or VCP2 (E9–27) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

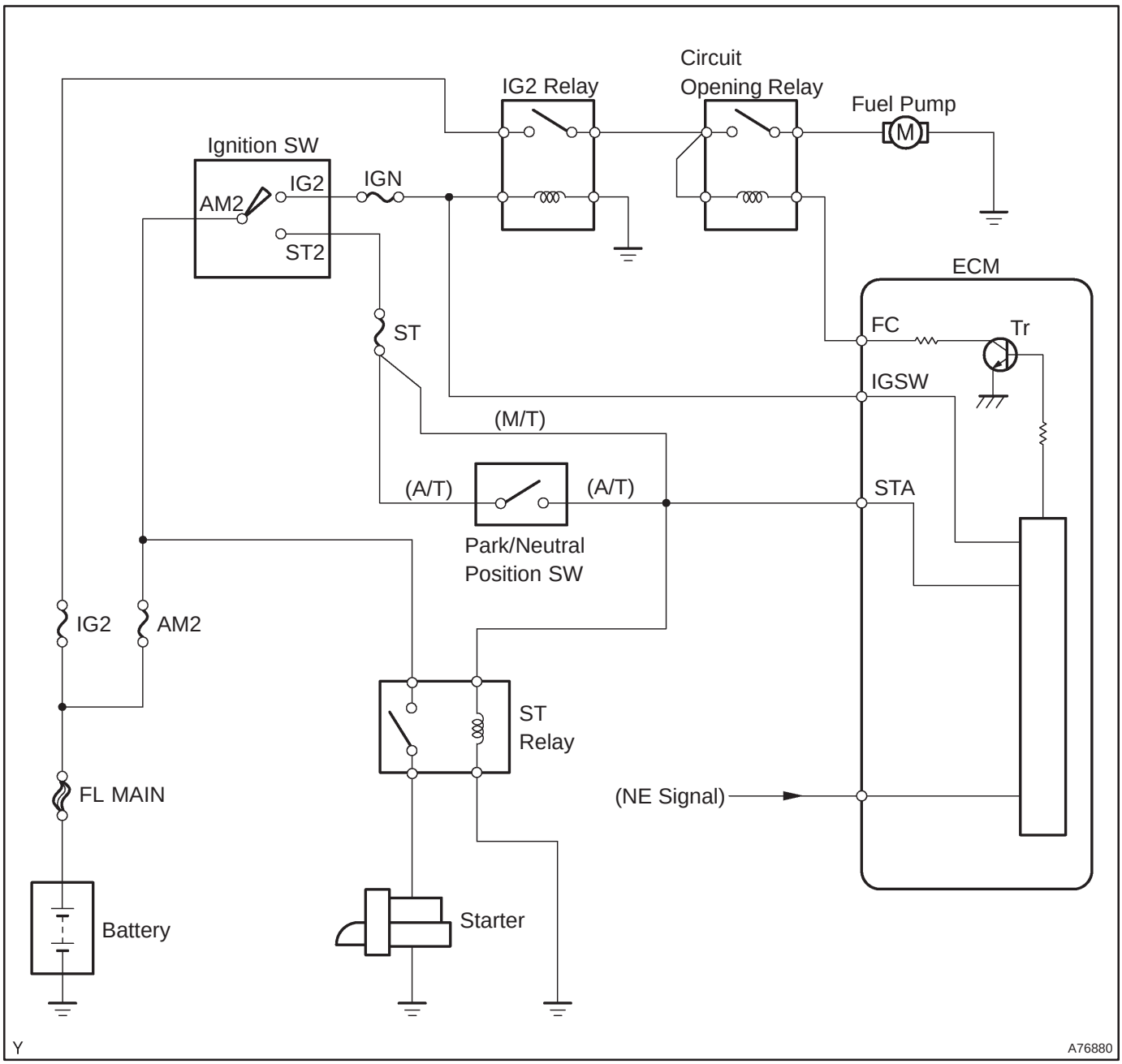
OK

REPLACE ACCELERATOR PEDAL ASSY (See page 10–66)

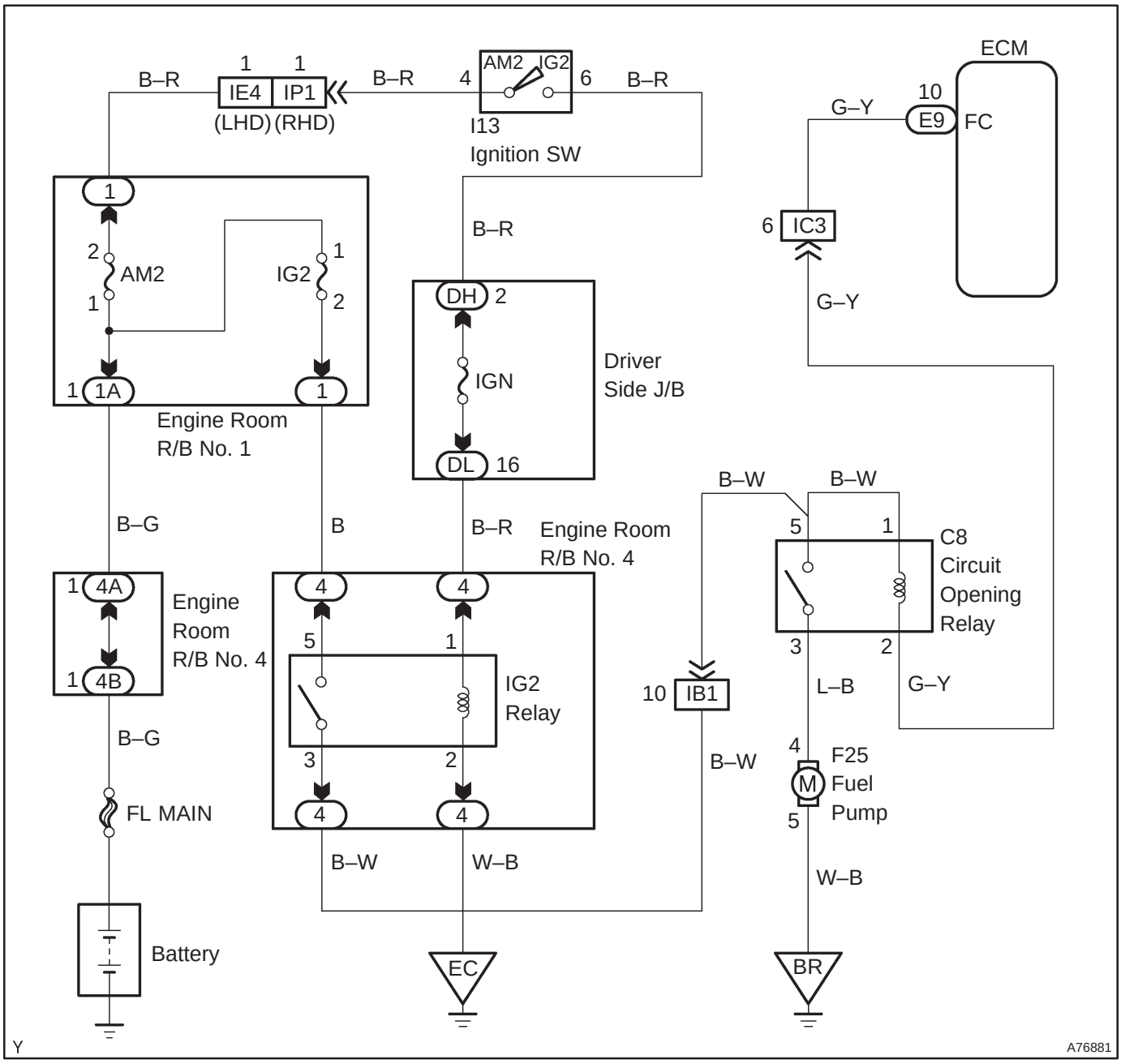
FUEL PUMP CONTROL CIRCUIT

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST2 of the ignition switch to the starter relay coil and also current flows to terminal STA of ECM (STA signal).
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to the coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates. While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



WIRING DIAGRAM



INSPECTION PROCEDURE

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATION OF CIRCUIT OPENING RELAY)

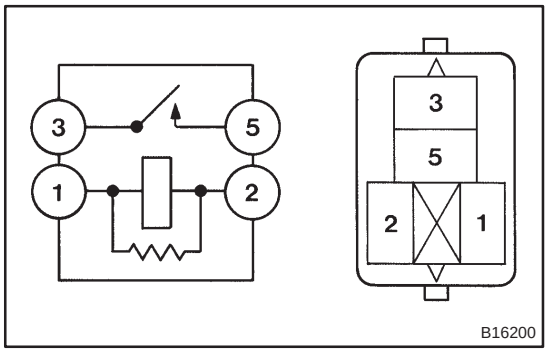
(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / FUEL PUMP/SPD”.
(c) Perform the ACTIVE TEST with the engine stopped.
Result: The circuit opening relay operates.

NG → **Go to step 2**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–320)

2	INSPECT CIRCUIT OPENING RELAY



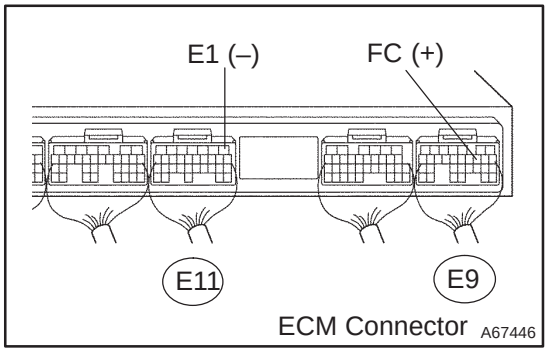
(a) Remove the circuit opening relay.
(b) Inspect the circuit opening relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE CIRCUIT OPENING RELAY**

OK

3	INSPECT ECM(FC VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 and E11 ECM connectors.
Standard:

Symbols (Terminal No.)	Specified condition
FC (E9–10) – E1 (E11–1)	9 to 14 V

NG → **Go to step 6**

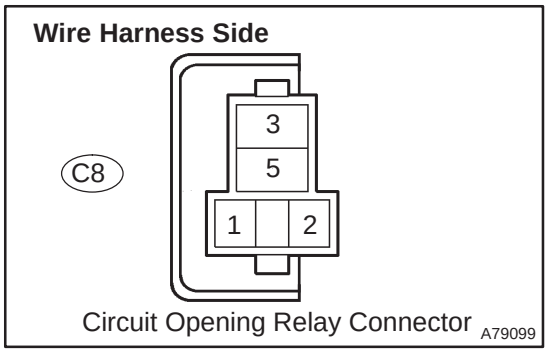
OK

4	INSPECT FUEL PUMP ASSY (See page 11–36)

NG → **REPLACE FUEL PUMP ASSY**

OK

5	CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP, FUEL PUMP – BODY GROUND)



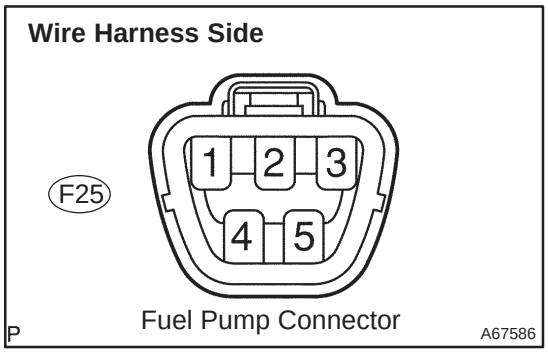
(a) Remove the circuit opening relay.
(b) Disconnect the F25 fuel pump connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) – Fuel pump (F25–4)	Continuity
Fuel pump (F25–5) – Body ground	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) or Fuel pump (F25–4) – Body ground	No continuity

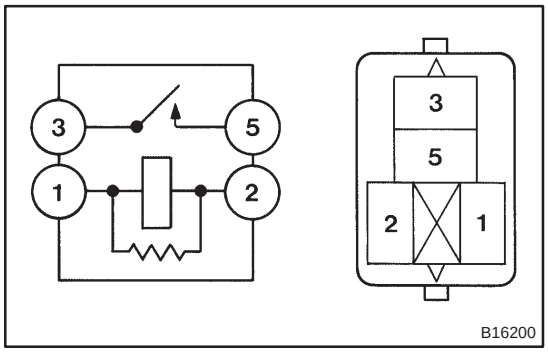


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

6	INSPECT IG2 RELAY



(a) Remove the IG2 relay from the engine room R/B No. 4.
(b) Inspect the IG2 relay.

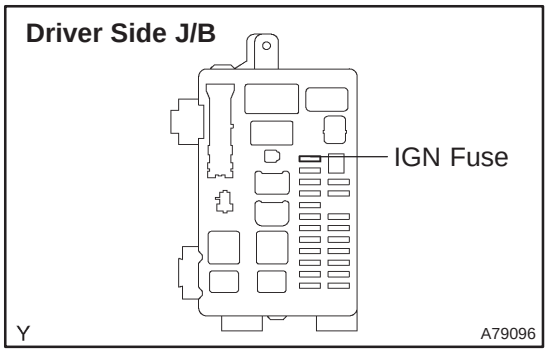
Standard:

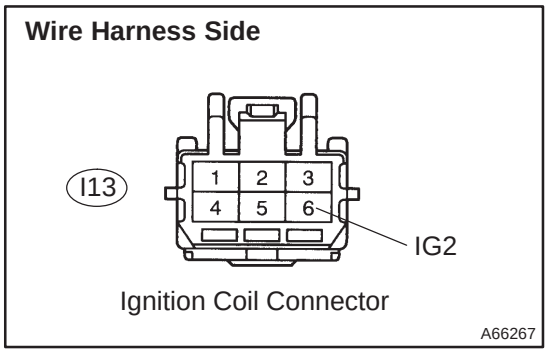
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

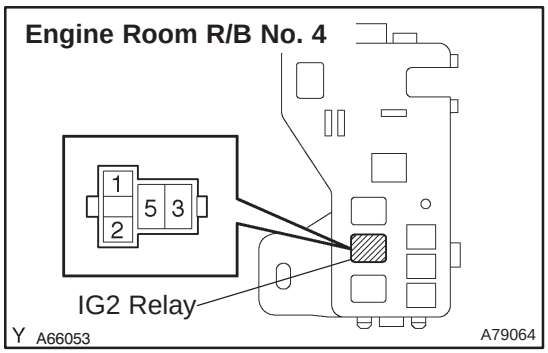
NG → **REPLACE IG2 RELAY**

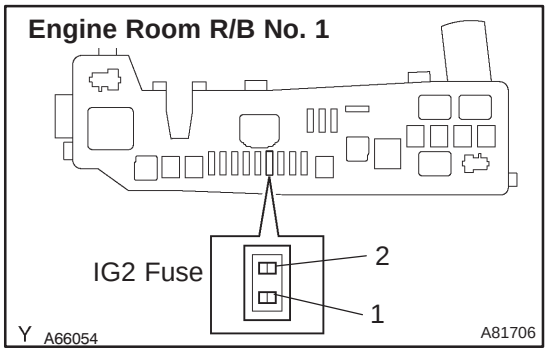
OK

7 CHECK HARNESS AND CONNECTOR(IGNITION SWITCH – IG2 RELAY, IG2 FUSE – IG2 RELAY)









(a) Check harness and connector between the IG2 relay and ignition switch.

(1) Inspect the IGN fuse.

- Remove the IGN fuse from the driver side J/B.
- Check for continuity in the IGN fuse.

Standard: Continuity

- Reinstall the IGN fuse.

(2) Disconnect the I13 ignition switch connector.

(3) Remove the IG2 relay.

(4) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) – IG2 relay (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) or IG2 relay (1) – Body ground	No continuity

(b) Check harness and connector between the IG2 relay and the IG2 fuse.

(1) Inspect the IG2 fuse.

- Remove the IG2 fuse from the engine room R/B No. 1.
- Check for continuity in the IG2 fuse.

Standard: Continuity

(2) Remove the IG2 relay from the engine room R/B No. 4.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 fuse (2) – IG2 relay (5)	Continuity

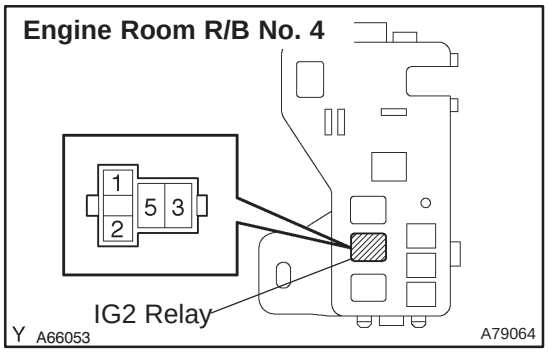
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 fuse (2) or IG2 relay (5) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8	CHECK HARNESS AND CONNECTOR(IG2 RELAY – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – ECM)



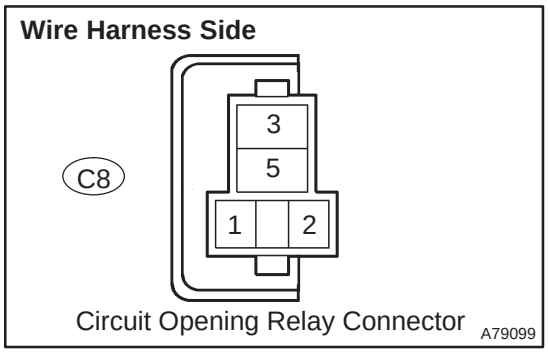
(a) Remove the IG2 relay from the engine room R/B No. 4.
(b) Remove the circuit opening relay.
(c) Disconnect the E9 ECM connector.
(d) Check for continuity between the wire harness side connectors.

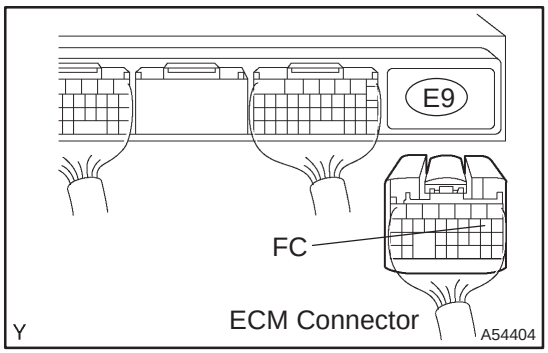
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 relay (3) – Circuit opening relay (C8–1)	Continuity
Circuit opening relay (C8–2) – FC (E9–10)	
IG2 relay (2) – Body ground	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 relay (3) or Circuit opening relay (C8–1) – Body ground	No continuity
Circuit opening relay (C8–2) or FC (E9–10) – Body ground	





NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE ECM (See page 01–32)

SFI SYSTEM (1AZ–FSE)

05CDS–01

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–293)

3	CONNECT THE HAND–HELD TESTER TO DLC3

HINT:
If the display indicates a communication fault in the tool, inspect the DLC3.

4	CHECK DTC AND FREEZE FRAME DATA (See page 05–294)

HINT:
Record or print DTC and freeze frame data, if needed.

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05–294)

6	VISUAL INSPECTION

7	SETTING THE CHECK (TEST) MODE DIAGNOSIS (See page 05–294)

8	PROBLEM SYMPTOM CONFIRMATION

HINT:
If the engine does not start, perform steps 10 and 12 first.

A	Malfunction does not occur
B	Malfunction occurs

B → GO TO STEP 10

A

9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05–294)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	DTC CHART (See page 05–309)

GO TO STEP 14

12	BASIC INSPECTION (See page 05–294)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	PROBLEM SYMPTOMS TABLE (See page 05–320)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05–502)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05–294)

GO TO STEP 18

17	PARTS INSPECTION

18	IDENTIFICATION OF PROBLEM

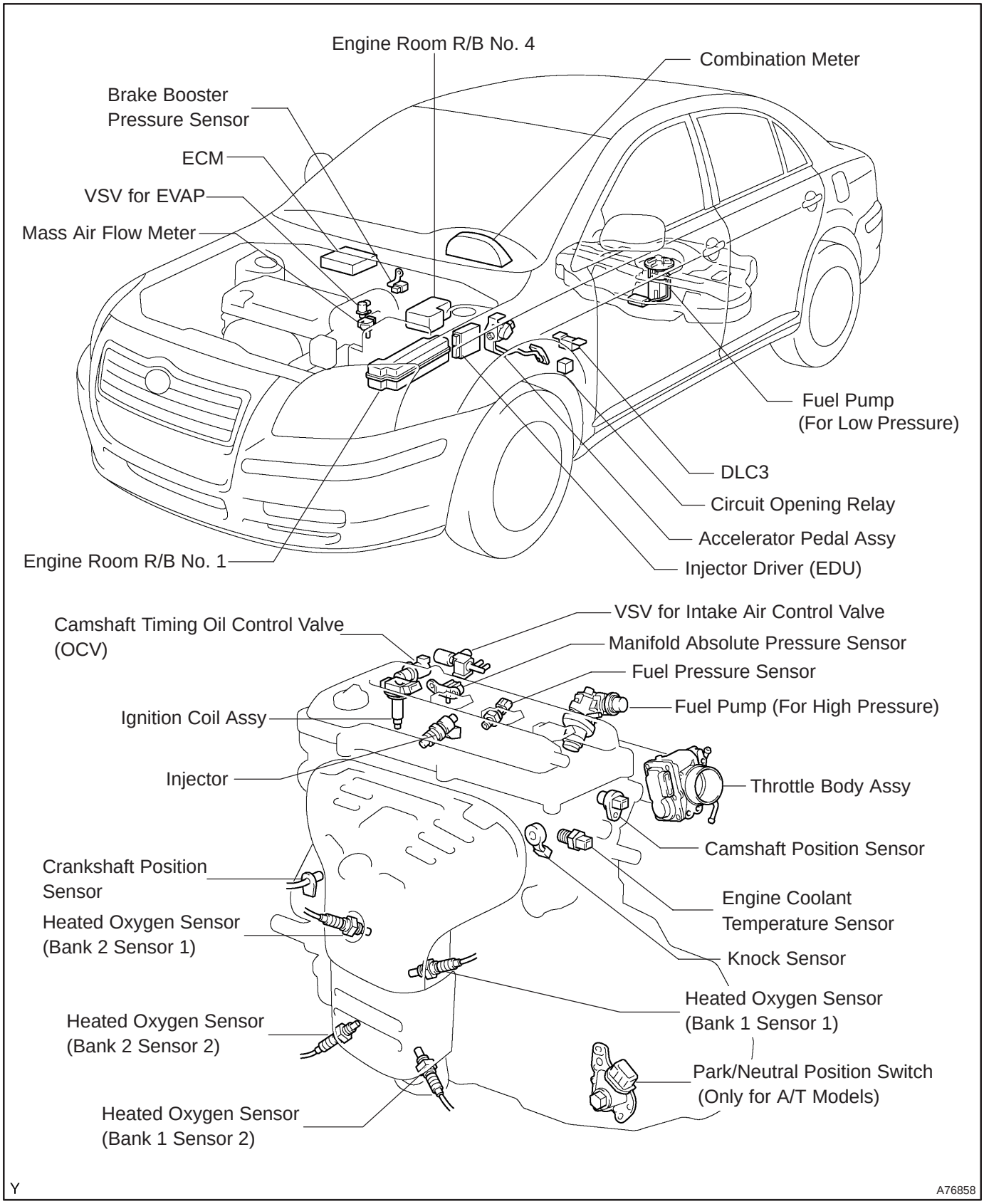
19	ADJUSTMENT, REPAIR

20	CONFIRMATION TEST

END

05CDV–01

LOCATION

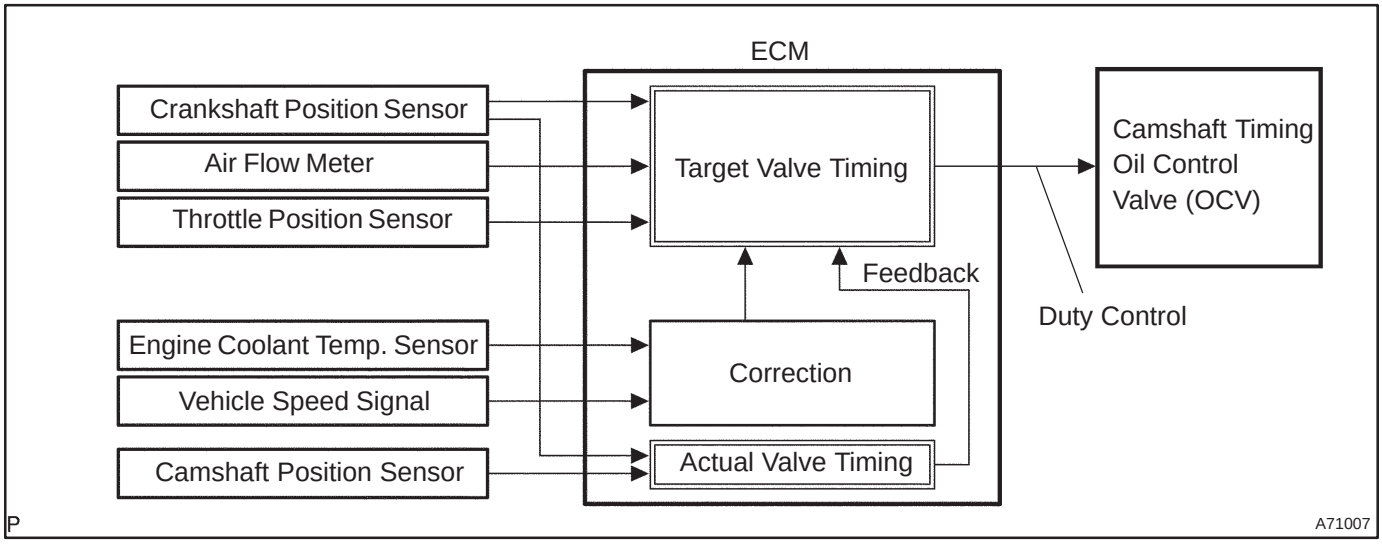


DTC	P0010	CAMSHAFT POSITION ”A” ACTUATOR CIRCUIT (BANK 1)

HINT:
This is the procedure of oil control valve (OCV).

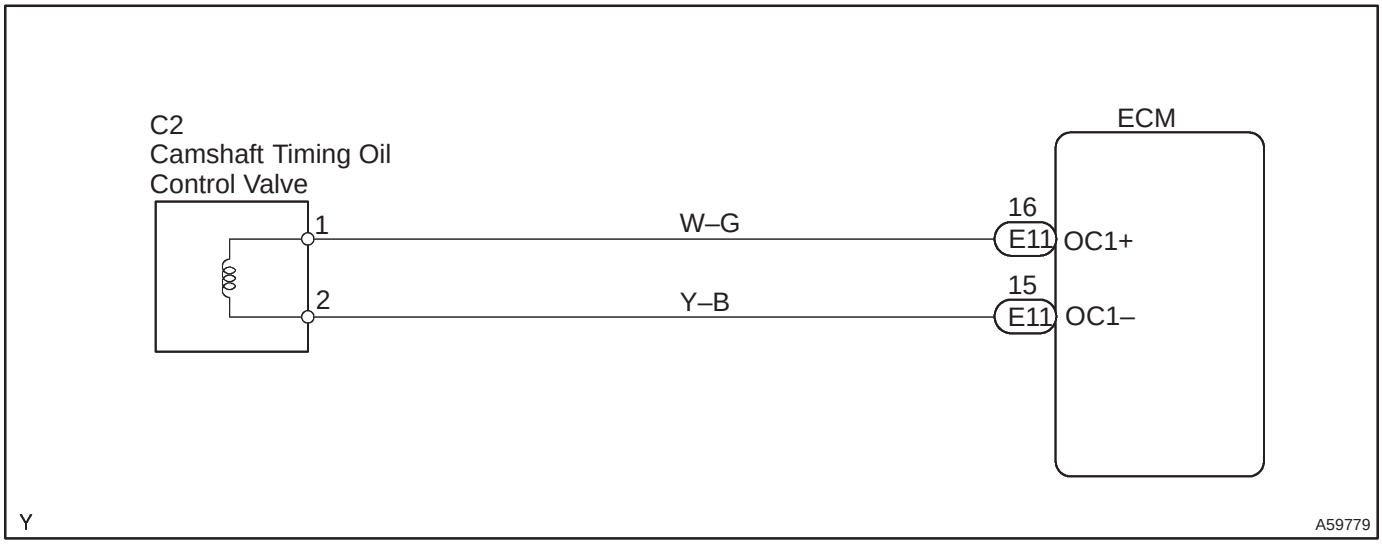
CIRCUIT DESCRIPTION

The VVT system controls the intake camshaft to provide the optimal valve timing for every driving condition. This control is performed based on the signals, such conditions as intake air volume, throttle position and engine coolant temperature.
The ECM controls the oil control valve (OCV), based on the signals output from the sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As result, the relative position between the camshaft and the crankshaft becomes optimal, and the engine torque improves, fuel economy improves, exhaust emissions decrease under overall driving conditions. Also, the ECM detects the actual valve timing using the signals from the camshaft position sensor and the crankshaft position sensor, and performs feedback control. This is how target valve timing is achieved by the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0010	Open or short in OCV circuit	• Open or short in OCV circuit • OCV • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE OCV)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / VVT CTRL B1”.
(e) Check the engine speed when operating the OCV by the hand–held tester.
Standard:

Tester operation	Specified condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK → CHECK FOR INTERMITTENT PROBLEMS

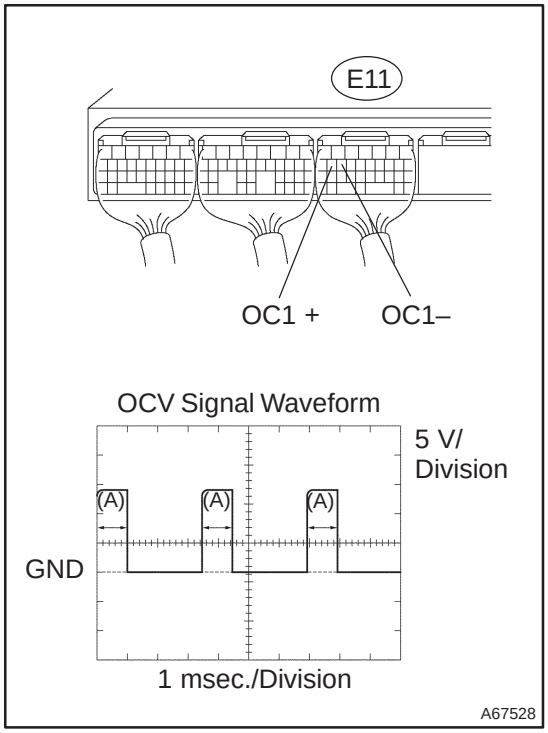
NG

2	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–39)

NG → REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY

OK

3 INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E11 ECM connector.

Standard:

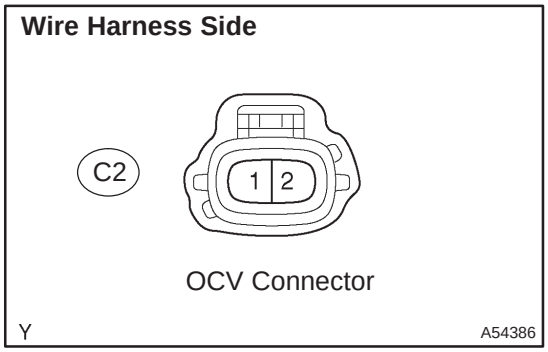
Symbols (Terminal No.)	Specified condition
OC1+ (E11–16) – OC1– (E11–15)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

4 CHECK HARNESS AND CONNECTOR(ECM – OCV)



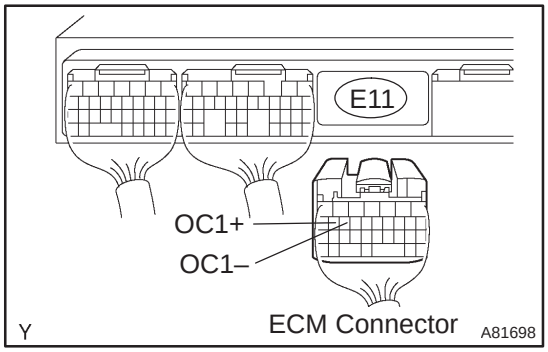
(a) Disconnect the C2 OCV connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OCV (C2–1) – OC1+ (E11–16)	Continuity
OCV (C2–2) – OC1– (E11–15)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OCV (C2–1) or OC1+ (E11–16) – Body ground	No continuity
OCV (C2–2) or OC1– (E11–15) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR INTERMITTENT PROBLEMS

DTC	P0011	CAMSHAFT POSITION ”A” –TIMING OVER–ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC	P0012	CAMSHAFT POSITION ”A” –TIMING OVER–RETARDED (BANK 1)

CIRCUIT DESCRIPTION

Refer to DTC P0010 on page 05–322.

DTC No.	DTC Detection Condition	Trouble Area
P0011	Condition (a) or (b) continues after engine is warmed up and engine speed at 400 to 4,000 rpm (Problem of the advanced OCV.): (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	• Valve timing • OCV • Camshaft timing gear assy • ECM
P0012	Condition (a) or (b) continues after engine is warmed up and engine speed at 400 to 4,000 rpm (Problem of the retarded OCV.): (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	

WIRING DIAGRAM

Refer to DTC P0010 on page 05–322.

INSPECTION PROCEDURE

HINT:

Advanced timing over (Valve timing is out of specified range)	P0011
Retarded timing over (Valve timing is out of specified range)	P0012

- If DTC ”P0011 or P0012” is displayed, check VVT system circuit.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK VALVE TIMING (See page 14–186)

NG → ADJUST VALVE TIMING (See page 14–186)

OK

2	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE OCV)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / VVT CTRL B1”.
(e) Check the engine speed when operating the OCV by the hand–held tester.
Standard:

Tester operation	Specified condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

NG → **Go to step 4**

OK

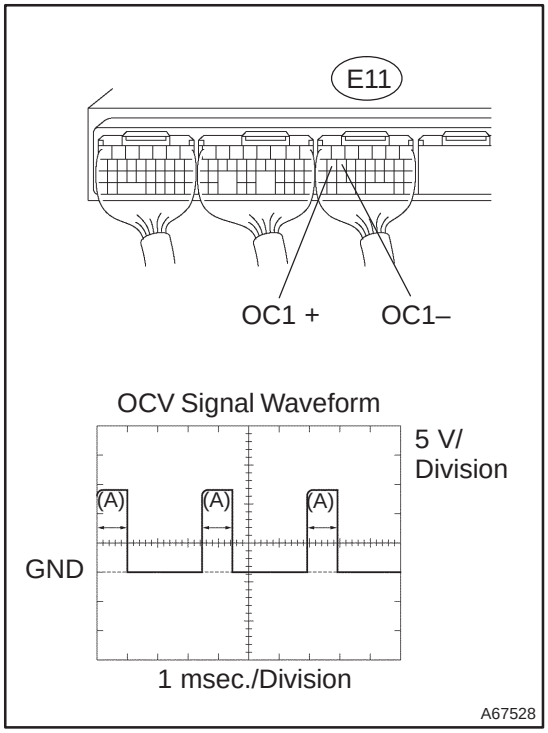
3	CHECK IF DTC OUTPUTS REOCCUR

(a) Clear the DTC.
(1) Operating the hand–held tester to erase the codes, or disconnecting the battery terminal or the EFI and ETCS fuses for 60 seconds or more.
(b) Start the engine and warm it up.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.
Standard: No DTC output.
HINT:
*: DTCs P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → **VVT SYSTEM OK ***

NG

4	INSPECT ECM(OCV SIGNAL)



(a) Inspection using the oscilloscope.
(b) During idling, check the waveform between the terminals of the E11 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
OC1+ (E11–16) – OC1– (E11–15)	Correct waveform is as shown

HINT:
The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

5	INSPECT OIL CONTROL VALVE FILTER

NG → **REPLACE OIL CONTROL VALVE FILTER**

OK

6	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10–39)

OK → **Go to step 8**

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	INSPECT CAMSHAFT TIMING GEAR ASSY (See page 14–240)

OK → **Go to step 10**

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY (See page 14–240)

GO

10	CHECK BLOCKAGE(OCV, OIL CHECK VALVE AND OIL HOLE)

NG → REPAIR OR REPLACE

OK

11	CHECK IF DTC OUTPUTS REOCCUR

(a) Clear the DTC.
  (1) Operating the hand–held tester to erase the codes, or disconnecting the battery terminal or the EFI and ETCS fuses for 60 seconds or more.
(b) Start the engine and warm it up.
(c) Drive the vehicle around for 10 minutes or more.
(d) Read output DTC using the hand–held tester.

Standard: No DTC output.

HINT:

*: DTCs P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. These foreign objects are then captured by the oil filter, thus eliminating the source of the problem.

OK → VVT SYSTEM OK

NG

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0016	CRANKSHAFT POSITION –CAMSHAFT POSITION CORRELATION (BANK 1 SENSOR A)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page 05–433.

DTC No.	DTC Detection Condition	Trouble Area
P0016	Deviation in crankshaft position sensor signal and camshaft position sensor (bank 1) signal (2 trip detection logic)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM

WIRING DIAGRAM

Refer to DTC P0335 on page 05–433.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK VALVE TIMING (See page 14–186)

(a) Check for loose and jumping teeth of timing chain.

NG → ADJUST VALVE TIMING (See page 14–186) (REPAIR OR REPLACE TIMING CHAIN)

OK ↓

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0031	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC	P0032	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC	P0037	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

DTC	P0038	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC	P0051	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

DTC	P0052	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

DTC	P0057	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2)

DTC	P0058	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2)

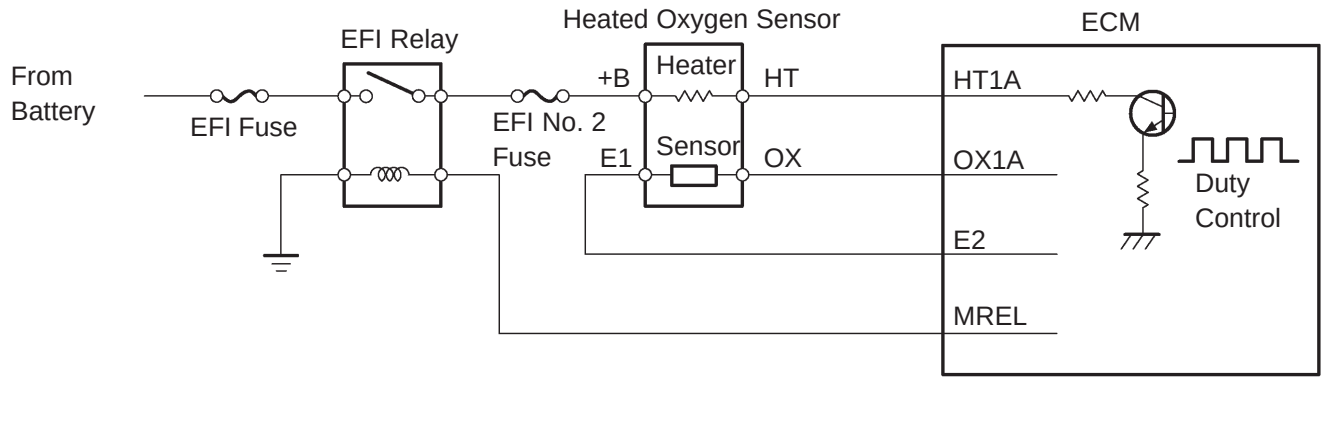
CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–363.

HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 1 System Drawing)



DTC No.	DTC Detection Condition	Trouble Area
P0031 P0037 P0051 P0057	Heated current is 0.2 A or less when heater operates with +B > 10.5 V and < 11.5 V (1 trip detection logic)	• Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • EFI fuse • EFI No. 2 fuse • ECM
	Heated current is 0.25 A or less when heater operates with +B ≧ 11.5 V (1 trip detection logic)	
P0032 P0038 P0052 P0058	Heated current exceeds 2 A when heater operates. (1 trip detection logic)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM

HINT:

- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

WIRING DIAGRAM

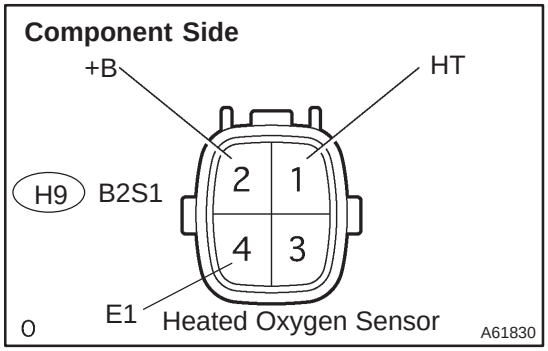
Refer to DTC P0130 on page 05–363.

INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H7, H8, H9 or H10 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

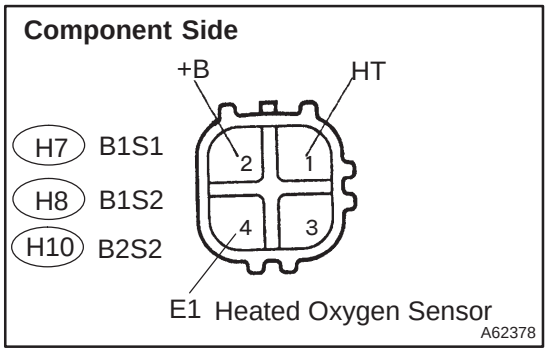
Standard (Bank 2 sensor 1):

Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity

(c) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Except Bank 2 sensor 1):

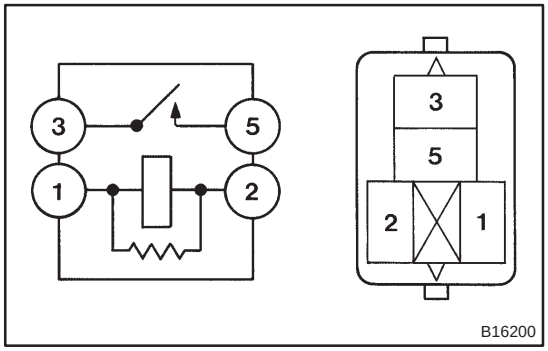
Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity



NG → **REPLACE HEATED OXYGEN SENSOR**

OK

2 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No. 4.

(b) Inspect the EFI relay.

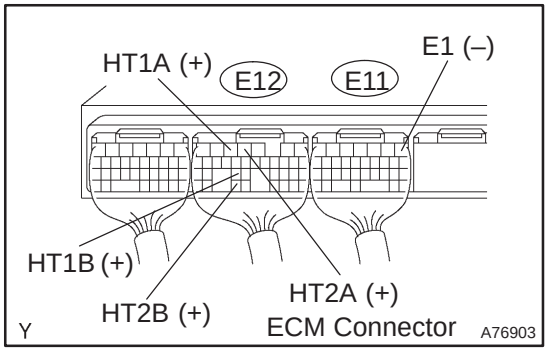
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

3 INSPECT ECM(HT1A, HT1B, HT2A OR HT2B VOLTAGE)



(a) Turn the ignition switch ON.

(b) Measure the voltage between the applicable terminals of the E11 and E12 ECM connectors.

Standard:

Symbols (Terminal No.)	Specified condition
HT1A (E12–5) – E1 (E11–1)	9 to 14 V
HT1B (E12–25) – E1 (E11–1)	
HT2A (E12–4) – E1 (E11–1)	
HT2B (E12–33) – E1 (E11–1)	

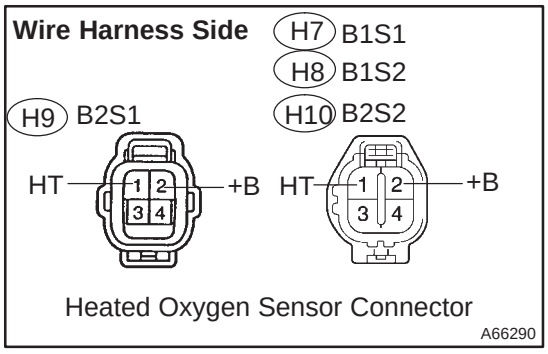
HINT:

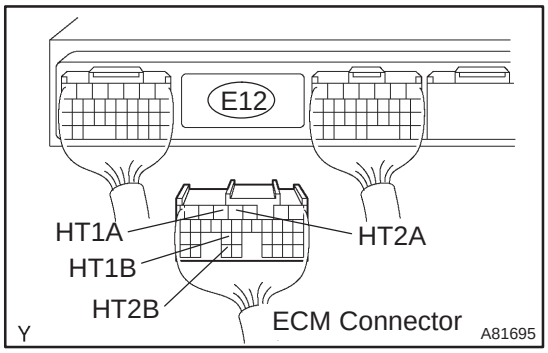
- The HT1A means the heated oxygen sensor bank 1 sensor 1.
- The HT1B means the heated oxygen sensor bank 1 sensor 2.
- The HT2A means the heated oxygen sensor bank 2 sensor 1.
- The HT2B means the heated oxygen sensor bank 2 sensor 2.

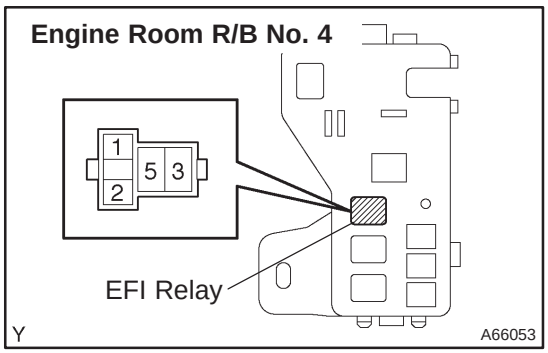
OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

4 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM, HEATED OXYGEN SENSOR – EFI RELAY)







(a) Check the harness and connector between the ECM and heated oxygen sensor connectors.

(1) Disconnect the H7, H8, H9 or H10 heated oxygen sensor connector.

(2) Disconnect the E12 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
HT (H7–1) – HT1A (E12–5)	Continuity
HT (H8–1) – HT1B (E12–25)	
HT (H9–1) – HT2A (E12–4)	
HT (H10–1) – HT2B (E12–33)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
HT (H7–1) or HT1A (E12–5) – Body ground	No continuity
HT (H8–1) or HT1B (E12–25) – Body ground	
HT (H9–1) or HT2A (E12–4) – Body ground	
HT (H10–1) or HT2B (E12–33) – Body ground	

(b) Check the harness and connector between the heated oxygen sensor connector and EFI relay.

(1) Inspect the EFI No.2 fuse.

- Remove the EFI No.2 fuse from the engine room R/B No. 4.
- Check for continuity in the EFI No.2 fuse.

Standard: Continuity

(2) Disconnect the H7, H8, H9 or H10 heated oxygen sensor connector.

(3) Remove the EFI relay from the engine room R/B No. 4.

(4) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (H7–2) – EFI relay (3)	Continuity
+B (H8–2) – EFI relay (3)	
+B (H9–2) – EFI relay (3)	
+B (H10–2) – EFI relay (3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (H7–2) or EFI relay (3) – Body ground	No continuity
+B (H8–2) or EFI relay (3) – Body ground	
+B (H9–2) or EFI relay (3) – Body ground	
+B (H10–2) or EFI relay (3) – Body ground	

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0100	MASS OR VOLUME AIR FLOW CIRCUIT

DTC	P0102	MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

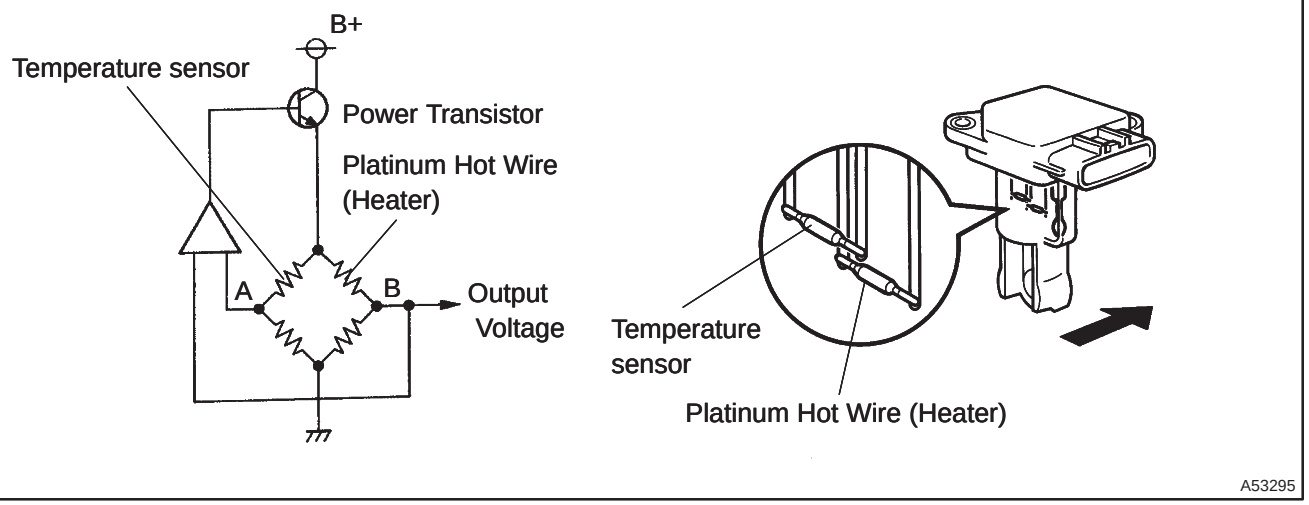
DTC	P0103	MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire. The hot wire mass air flow meter consists of a platinum hot wire, a temperature sensor and a control circuit installed in a plastic housing. The hot wire mass air flow meter works on the principle that the hot wire and temperature sensor located in the intake air bypass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the mass air flow meter.

The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



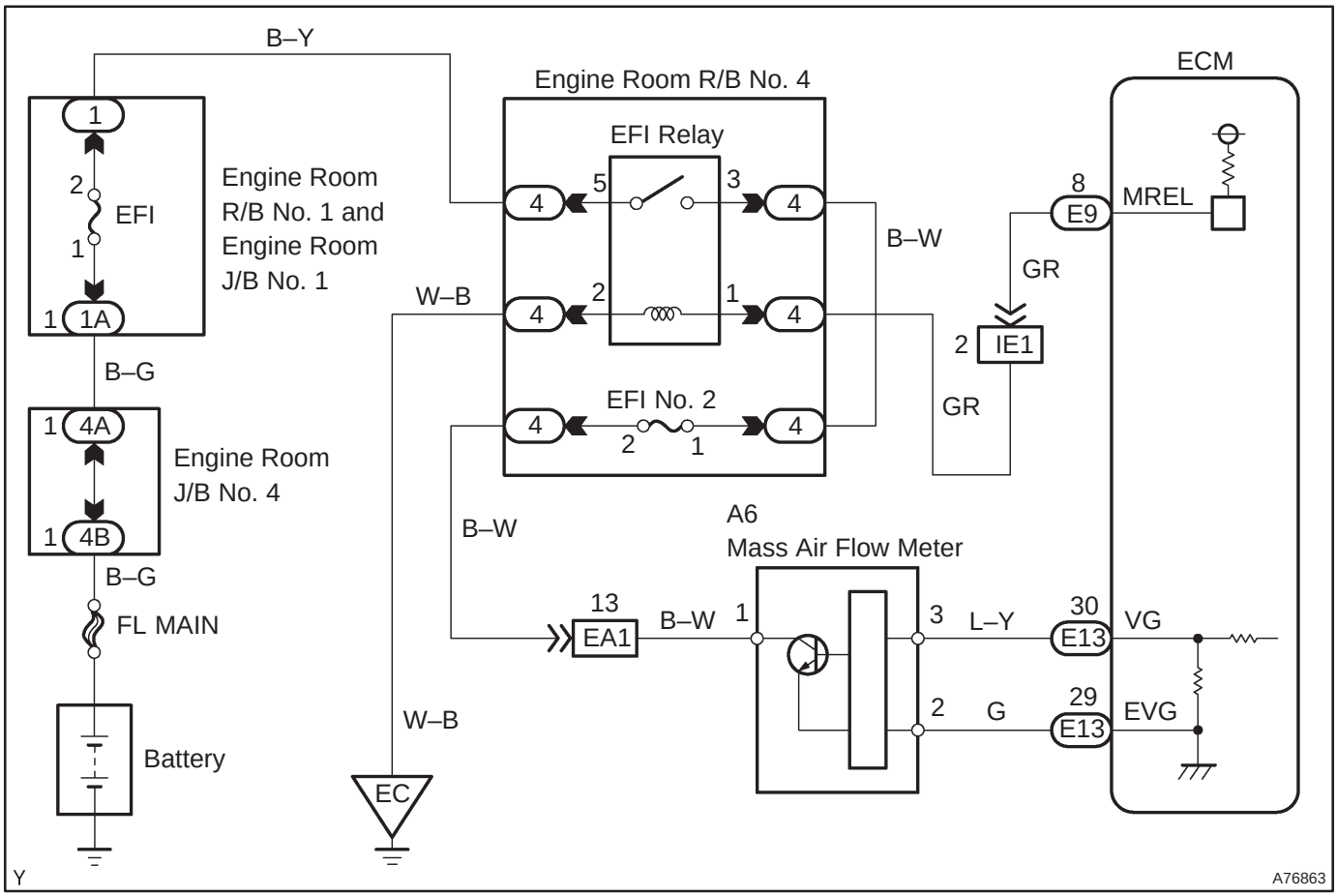
DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 seconds.	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P0102	Open in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 seconds.	
P0103	Short in mass air flow meter circuit with engine speed 4,000 rpm or less for more than 3 seconds.	

HINT:

After confirming DTC ”P0100, P0102 or P0103”, use the hand–held tester to confirm the air flow rate from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Air flow rate (gm/s)	Malfunction
Approximately 0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• EVG circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

Result:

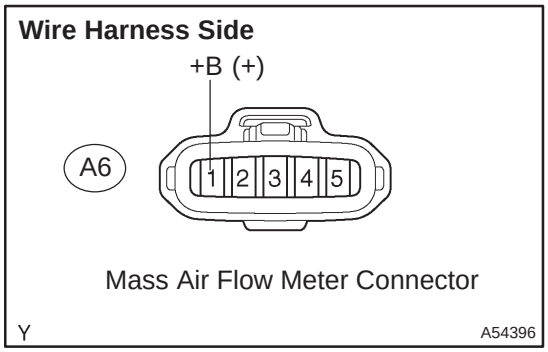
Air flow rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
1 ≦ Mass Air Flow Rate ≦ 270.0 (*1)	C

*1: The value must be changed when the throttle valve is opened or closed.

B	Go to step 5
C	CHECK FOR INTERMITTENT PROBLEMS

A

2 INSPECT MASS AIR FLOW METER(POWER SOURCE)



(a) Disconnect the A6 mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

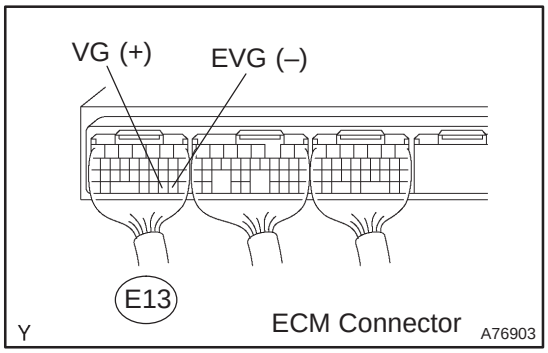
Standard:

Symbols (Terminal No.)	Specified condition
+B (A6–1) – Body ground	9 to 14 V

NG	Go to step 7

OK

3 INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

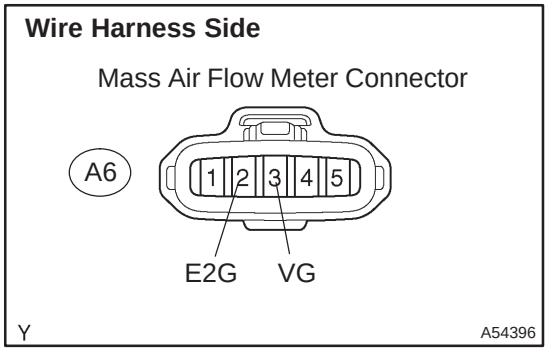
Symbols (Terminal No.)	Condition	Specified condition
VG (E13–30) – EVG (E13–29)	Engine is idling	0.5 to 3.0 V

HINT:
The shift position should be P or N and the A/C switch should be turned OFF.

OK	CHECK AND REPLACE ECM (See page 01–32)

NG

4 CHECK HARNESS AND CONNECTOR(ECM – MASS AIR FLOW METER)



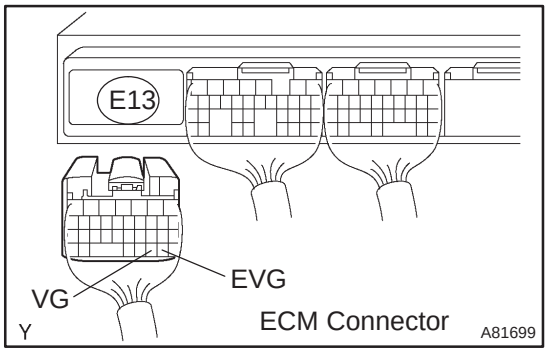
(a) Disconnect the A6 mass air flow meter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E13–30)	Continuity
E2G (A6–2) – EVG (E13–29)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E13–30) – Body ground	No continuity

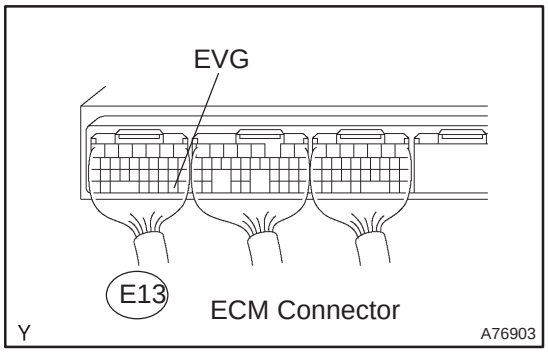


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

5 INSPECT ECM(SENSOR GROUND)



(a) Check for continuity between the terminal of the E13 ECM connector and body ground.

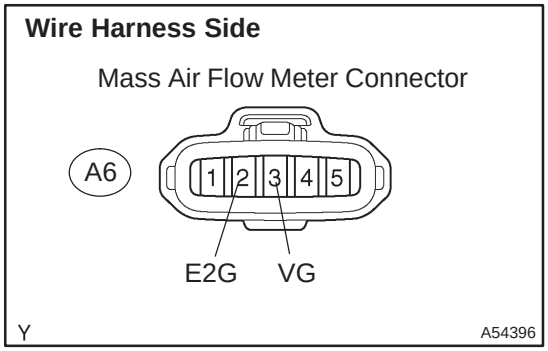
Standard:

Symbols (Terminal No.)	Specified condition
EVG (E13–29) – Body ground	Continuity

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

6 CHECK HARNESS AND CONNECTOR(ECM – MASS AIR FLOW METER)



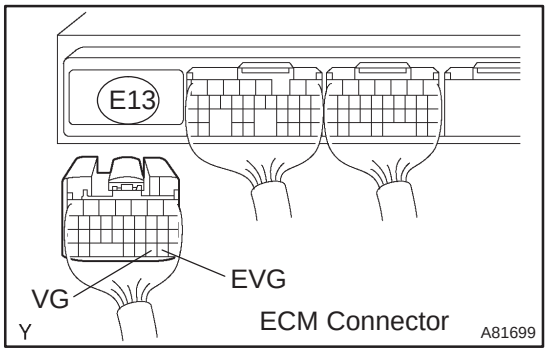
(a) Disconnect the A6 mass air flow meter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E13–30)	Continuity
E2G (A6–2) – EVG (E13–29)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E13–30) – Body ground	No continuity

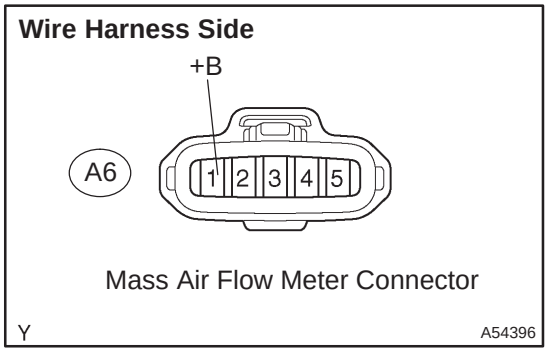


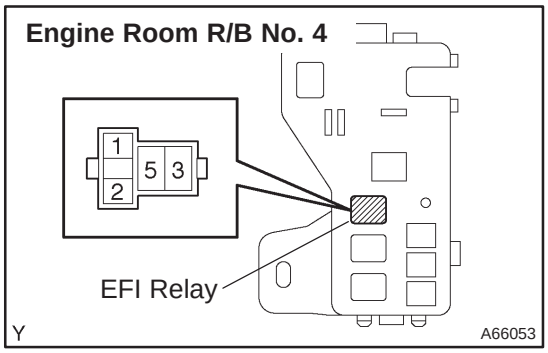
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

7	CHECK HARNESS AND CONNECTOR(EFI RELAY – MASS AIR FLOW METER)





(a) Inspect the EFI No. 2 fuse.
  (1) Remove the EFI No. 2 fuse from the engine room R/B No. 4.
  (2) Check for continuity in the EFI No. 2 fuse.

Standard: Continuity

(b) Disconnect the A6 mass air flow meter connector.

(c) Remove the EFI relay from the engine room R/B No. 4.

(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (A6–1) – EFI relay (3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (A6–1) or EFI relay (3) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

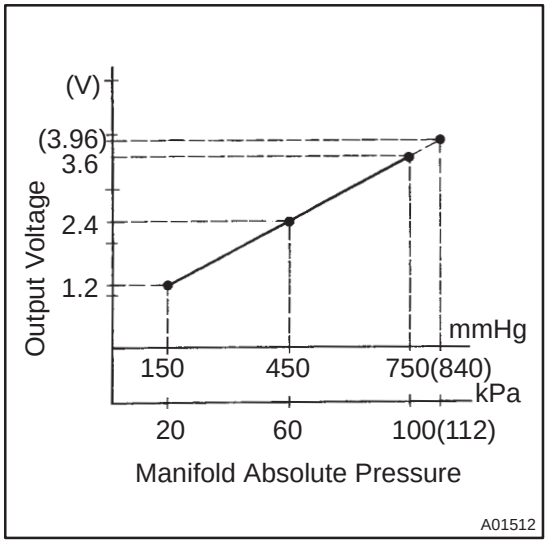
CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–502)

DTC	P0105	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT

DTC	P0107	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC	P0108	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION



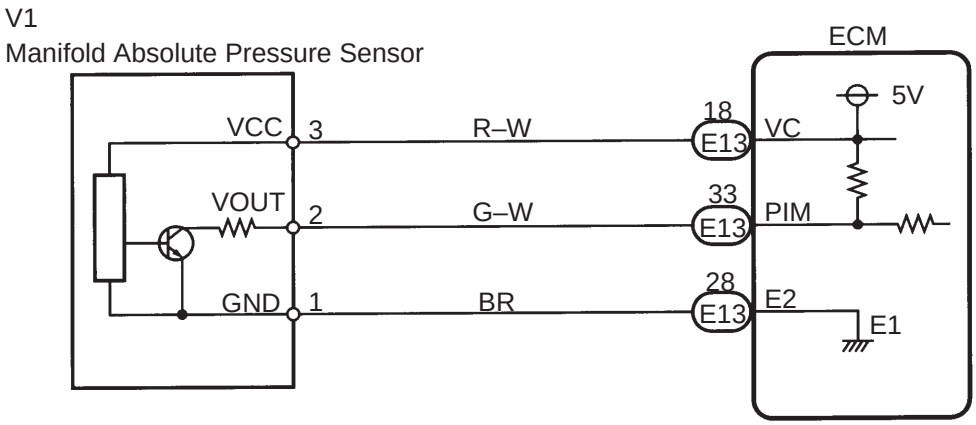
By a built–in sensor unit, the manifold absolute pressure sensor detects the intake manifold pressure as a voltage. The ECM then determines the basic injection duration and basic ignition advance angle based on this voltage.
Since the manifold absolute pressure sensor does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake manifold (the pressure in proportion to the preset absolute vacuum 0), it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. This permits it to control the air fuel ratio at the proper level under all conditions.
If the ECM detects the DTC ”P0105, P0107 or P0108”, it operates the fail–safe function, keeping the ignition timing and fuel injection volume constant and making it possible to drive the vehicle.

DTC No.	DTC Detection Condition	Trouble Area
P0105	Open or short in manifold absolute pressure sensor circuit for 0.5 sec. or more	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM
P0107	Open in manifold absolute pressure sensor circuit for 0.5 sec. or more	
P0108	Short in manifold absolute pressure sensor circuit for 0.5 sec. or more	

HINT:
After confirming DTC ”P0105, P0107 or P0108”, use the hand–held tester to confirm the manifold absolute pressure from ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Manifold Absolute Pressure (kPa)	Malfunction
Approximately 0	• PIM circuit short
142 or more	• VC circuit open or short • PIM circuit open • E2 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**READ VALUE OF HAND–HELD TESTER(INTAKE MANIFOLD ABSOLUTE PRESSURE)**

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAP” and read its value displayed on the hand–held tester.
Pressure: Same as the atmospheric pressure
Result:

Manifold Absolute Pressure (kPa)	Proceed to
142 or more	A
0.0	B
OK (Same as present pressure) (*1)	C

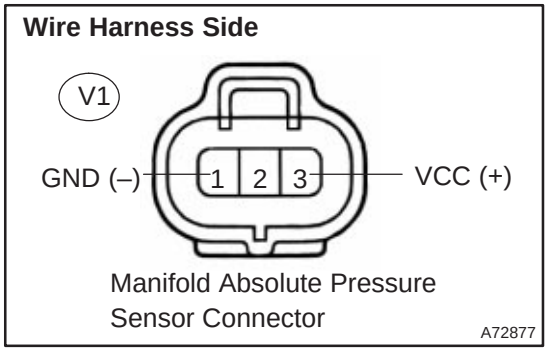
*1: The value must be changed when the engine is run or stopped.

B → **Go to step 3**

C → **CHECK FOR INTERMITTENT PROBLEMS**

A

2 INSPECT MANIFOLD ABSOLUTE PRESSURE SENSOR(VCC VOLTAGE)



(a) Disconnect the V1 manifold absolute pressure sensor connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the specified terminals of the V1 manifold absolute pressure sensor connector.

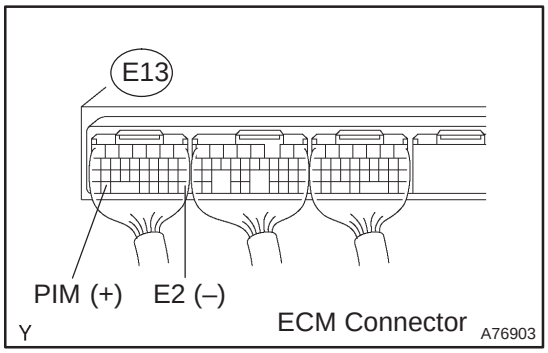
Standard:

Symbols (Terminal No.)	Specified condition
VCC (V1–3) – GND (V1–1)	4.5 to 5.5 V

NG → **Go to step 4**

OK

3 INSPECT ECM(PIM VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

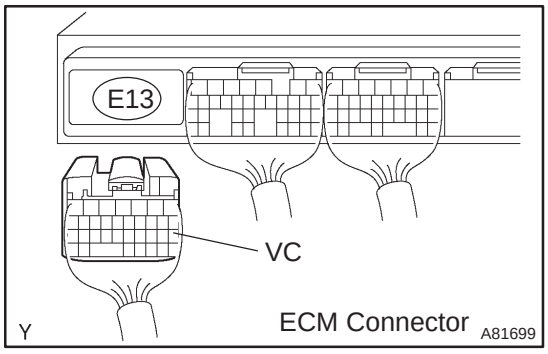
Symbols (Terminal No.)	Specified condition
PIM (E13–33) – E2 (E13–28)	3.4 to 3.8 V

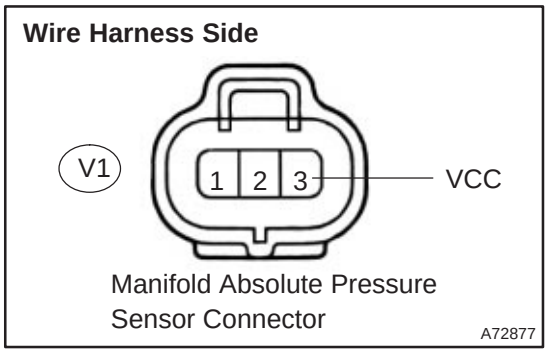
NG → **Go to step 5**

OK

CHECK AND REPLACE ECM (See page 01–32)

4 CHECK HARNESS AND CONNECTOR(ECM – MANIFOLD ABSOLUTE PRESSURE SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the V1 manifold absolute pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (E13–18) – VCC (V1–3)	Continuity

Standard (Check for short):

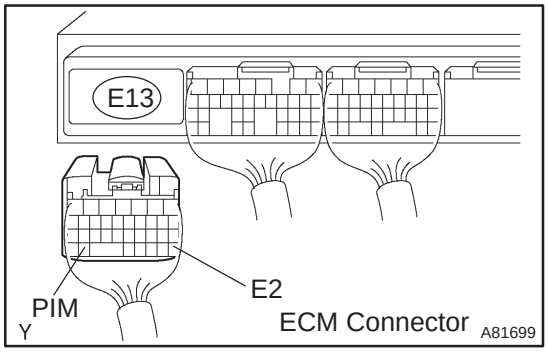
Symbols (Terminal No.)	Specified condition
VC (E13–18) or VCC (V1–3) – Body ground	No continuity

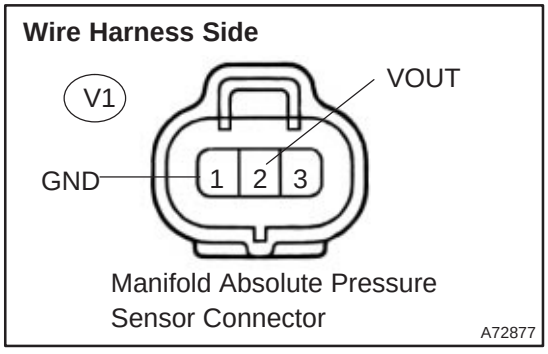
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

5 CHECK HARNESS AND CONNECTOR(ECM – MANIFOLD ABSOLUTE PRESSURE SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the V1 manifold absolute pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PIM (E13–33) – VOUT (V1–2)	Continuity
E2 (E13–28) – GND (V1–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PIM (E13–33) or VOUT (V1–2) – Body ground	No continuity

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

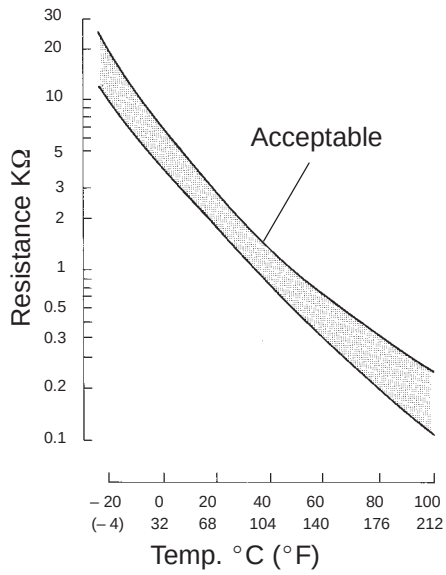
DTC	P0110	INTAKE AIR TEMPERATURE CIRCUIT

DTC	P0112	INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC	P0113	INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Fig.1)



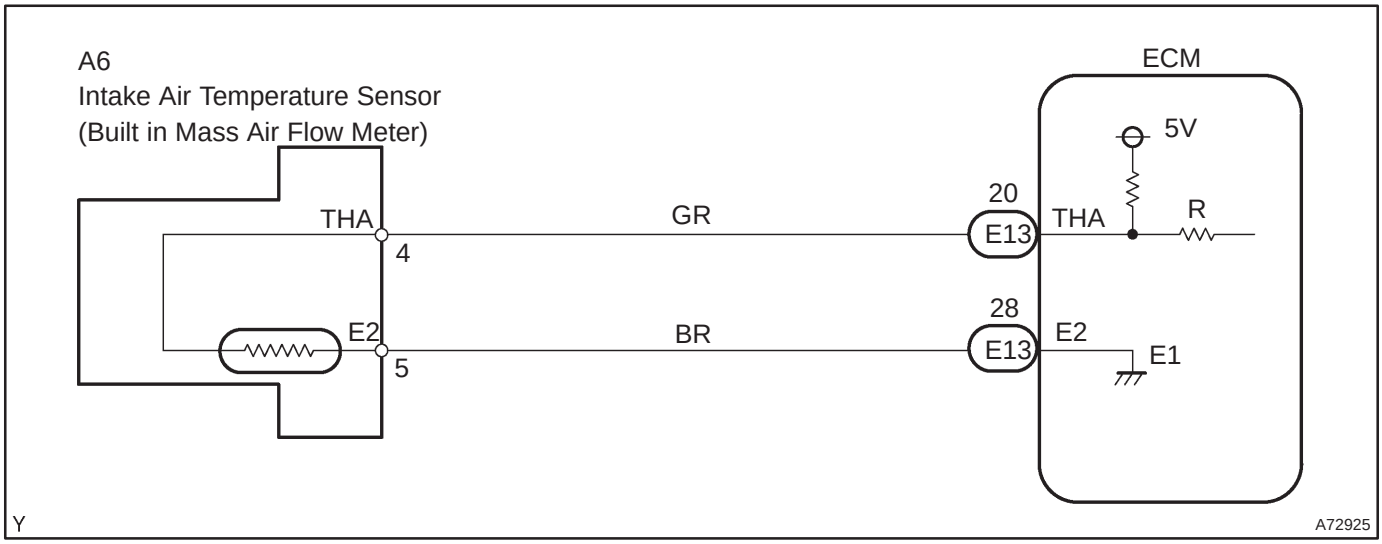
The intake air temperature sensor is built in the mass air flow meter and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature is the greater the thermistor resistance value becomes and the higher the intake air temperature is the lower the thermistor resistance value becomes (See Fig. 1).
The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA via resistor R.
That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.
If the ECM detects the DTC ”P0110, P0112 or P0113”, it operates the fail–safe functions in which the intake air temperature is assumed to be 20°C (68°F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temp. sensor circuit for 0.5 sec.	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0112	Step 4	Short in intake air temp. sensor circuit for 0.5 sec.	• Short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0113	Step 2	Open in intake air temp. sensor circuit for 0.5 sec.	• Open in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM

HINT:
After confirming DTC ”P0110, P0112 or P0113”, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: Same value as the actual intake air temperature
Result:

Display	Proceed to
–40˚C (–40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

HINT:

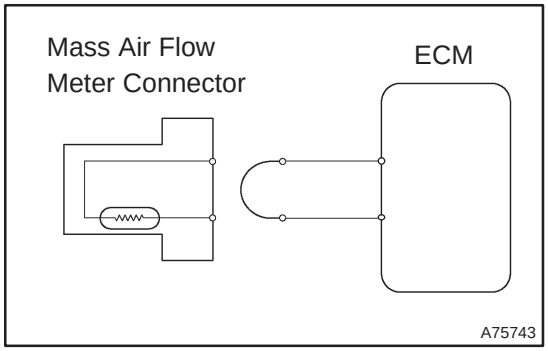
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

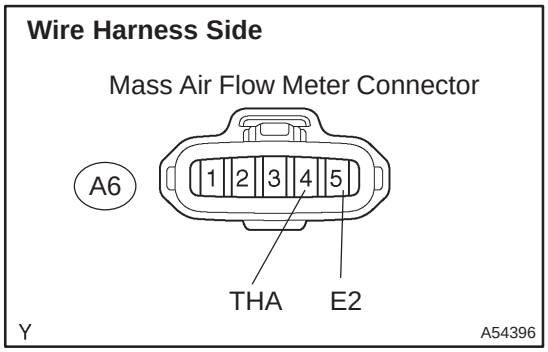
B → **Go to step 4**

C → **CHECK FOR INTERMITTENT PROBLEMS**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN HARNESS)



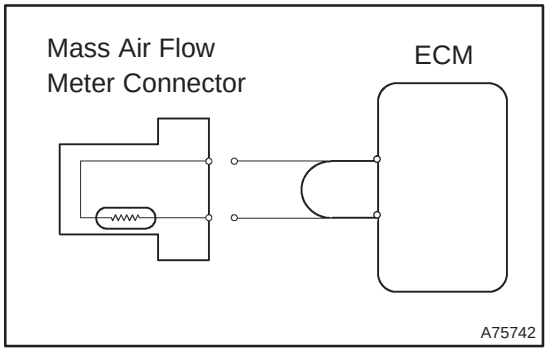


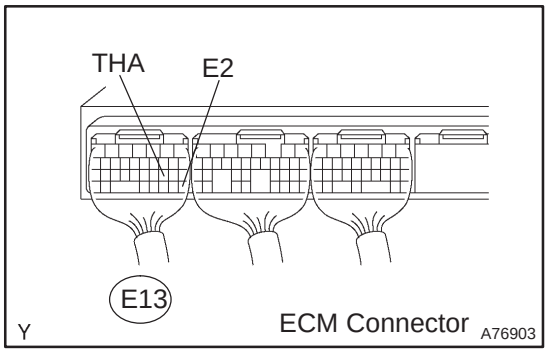
(a) Disconnect the A6 mass air flow meter connector.
(b) Connect the terminals THA and E2 of the mass air flow meter wire harness side connector.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the hand–held tester main switch ON.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more

OK	**CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE MASS AIR FLOW METER**

NG

3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)





(a) Disconnect the A6 mass air flow meter connector.
(b) Connect terminals THA and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

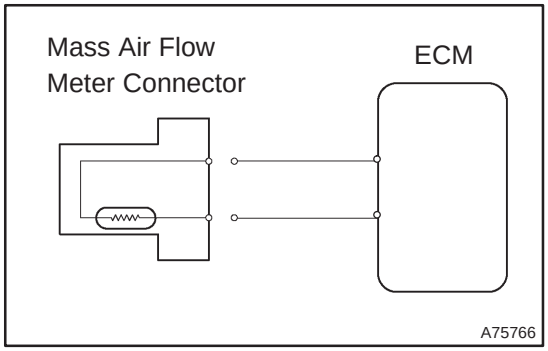
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the hand–held tester main switch ON.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more

OK	**REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM (See page 01–32)

4	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN HARNESS)

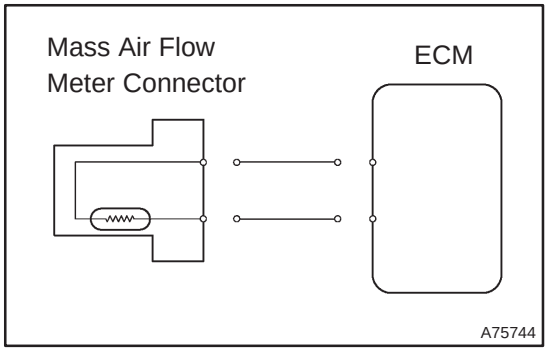


(a) Disconnect the A6 mass air flow meter connector.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON.
(d) Push the hand–held tester main switch ON.
(e) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)

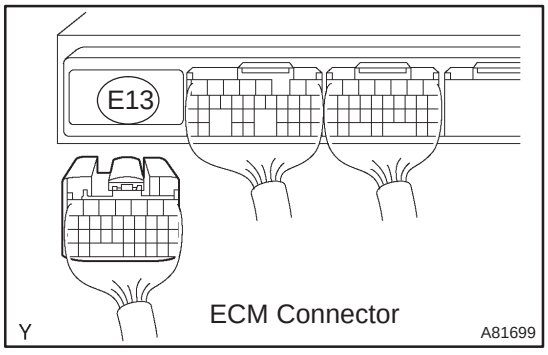
OK → **REPLACE MASS AIR FLOW METER**

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON.
(d) Push the hand–held tester main switch ON.
(e) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0116	ENGINE COOLANT TEMP. CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05–351.

DTC No.	DTC Detection Condition	Trouble Area
P0116	When THW is greater than –40°C (–40°F) but less than 60°C (140°F), and THA is greater than –6.7°C (20°F), and when starting engine, conditions (a) and (b) continue (2 trip detection logic): (a) Vehicle speed is changing (Not stable) (b) THW change is lower than 3°C (5.4°F) from THW since when starting engine	• Cooling system • Engine coolant temperature sensor • Thermostat

INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ OUTPUT DTC(IN ADDITION TO P0116)

(a) Read the DTC using the hand–held tester.

Result:

Display	Proceed to
Only ”P0116” is output.	A
”P0116” and other DTCs are output.	B

HINT:

If any other codes besides ”P0116” are output, perform the troubleshooting for those DTCs first.

B → GO TO RELEVANT DTC CHART (See page 05–309)

A

2	INSPECT THERMOSTAT (See page 16–27)

NG → REPLACE THERMOSTAT (See page 16–35)

OK

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

DTC	P0120	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT

DTC	P0122	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT LOW INPUT

DTC	P0123	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT HIGH INPUT

DTC	P0220	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT

DTC	P0222	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT LOW INPUT

DTC	P0223	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT HIGH INPUT

DTC	P2135	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A”/”B” VOLTAGE CORRELATION

HINT:
This is repair procedure of ”throttle position sensor”.

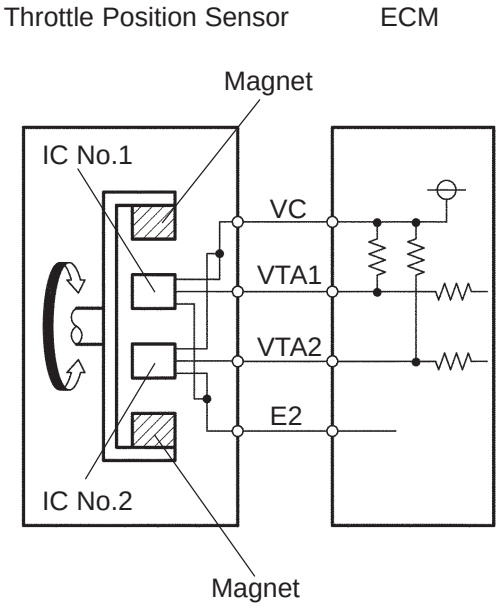
CIRCUIT DESCRIPTION

HINT:

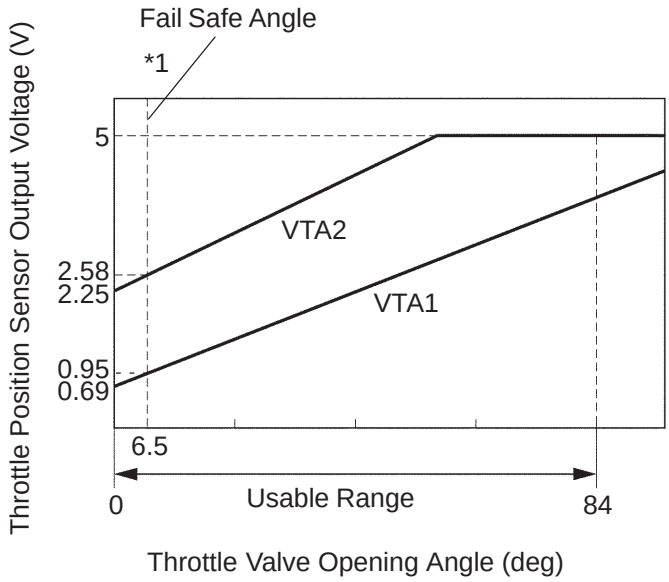
- This electrical throttle system is no used throttle cable.
- This throttle position sensor is non–contact type.

The throttle position sensor is mounted on the throttle body to detect the opening angle of the throttle valve. Since this sensor is electronically controlled with hall elements, accurate control and reliability can be obtained. It has 2 sensors to detect the throttle opening angle and a malfunction of the throttle position sensor. The voltage is applied to the terminals VTA1 and VTA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the throttle valve. The VTA1 is a signal to indicate the actual throttle valve opening angle which is used for the engine control, and the VTA2 is a signal to indicate the information about the opening angle which is used for detecting a malfunction.

The ECM judges the current opening angle of the throttle valve from these signals input from terminals VTA1 and VTA2, and the ECM controls the throttle motor to make the throttle valve angle properly in response to the driving condition.



A19755



A19802

Throttle Valve Fully Closed
(Throttle Position Opening Position Expressed as Percentage
(VTA1) 10 to 24 %)

Throttle Valve Fully Opened
(Throttle Position Opening Position Expressed as Percentage
(VTA1) 64 to 96 %)

*1: Fail Safe Angle 6.5°
(Throttle Position Opening Position Expressed as Percentage
(VTA1) about 16 %)

DTC No.	DTC Detection Condition	Trouble Area
Condition (a) of DTC P0120, P0122, P0123, P0220, P0222 or P0223 continues for 2 sec. (Open or short in throttle position sensor circuit)		
P0120	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied (a) VTA1 ≦ 0.2 V or VTA1 ≧ 4.8 V	• Throttle position sensor (built in throttle body) • ECM
P0122	(a) VTA1 ≦ 0.2 V	• Throttle position sensor (built in throttle body) • VTA1 circuit short • VC circuit open • ECM
P0123	(a) VTA1 ≧ 4.8 V	• Throttle position sensor (built in throttle body) • VTA1 circuit open • E2 circuit open • VC and VTA1 circuit are short–circuited • ECM
P0220	Detection conditions for DTCs P0222 and P0223 are not satisfied but condition (a) is satisfied (a) VTA2 ≦ 0.5 V or VTA2 ≧ 4.97 V and 0.2 V ≦ VTA1 ≦ 1.8 V	• Throttle position sensor (built in throttle body) • ECM
P0222	(a) VTA2 ≦ 0.5 V	• Throttle position sensor (built in throttle body) • VTA2 circuit short • VC circuit open • ECM
P0223	(a) VTA2 ≧ 4.97 V and 0.2 V ≦ VTA1 ≦ 1.8 V	• Throttle position sensor (built in throttle body) • VTA2 circuit open • E2 circuit open • VC and VTA2 circuit are short–circuited • ECM
P2135	Condition (a) continues for 0.5 sec. or more, or condition (b) continues for 0.4 sec. or more: (a) |VTA1 – VTA2| ≦ 0.02 V (b) VTA1 ≦ 0.2 V and VTA2 ≦ 0.5 V	• VTA1 and VTA2 circuit are short–circuited • Throttle position sensor (built in throttle body) • ECM

NOTICE:

When a malfunction is detected, the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.

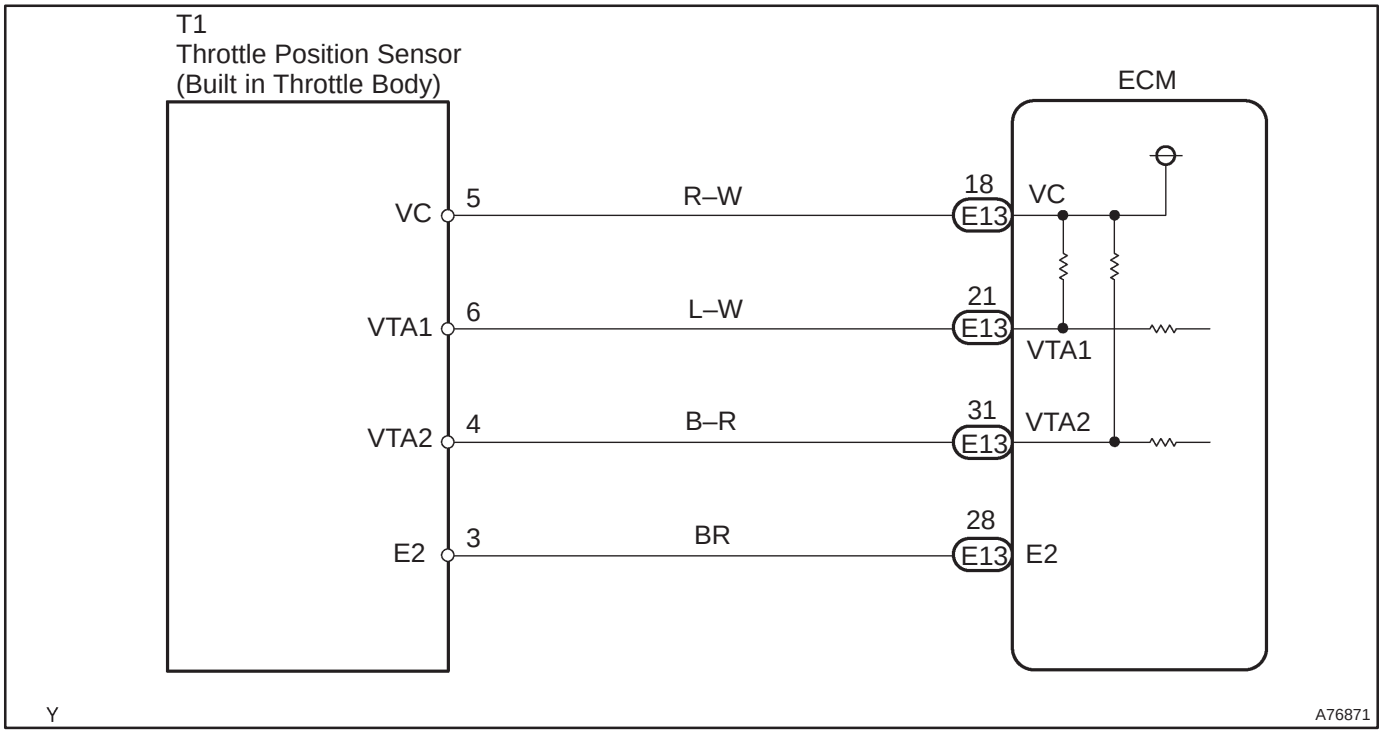
HINT:

- After confirming DTCs, use the hand–held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.
- The THROTTLE POS means VTA1 signal as well as the THROTTLE POS #2 for the VTA2 signal.

Reference (Normal condition):

Tester display	Accelerator pedal fully released	Accelerator pedal fully depressed
THROTTLE POS	10 to 24 %	64 to 96 %
THROTTLE POS #2	2.1 to 3.1 V	4.5 to 5.5 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**READ VALUE OF HAND–HELD TESTER(THROTTLE POS AND THROTTLE POS #2)**

(a) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ETCS / THROTTLE POS and THROTTLE POS #2” and read its value displayed on the hand–held tester.

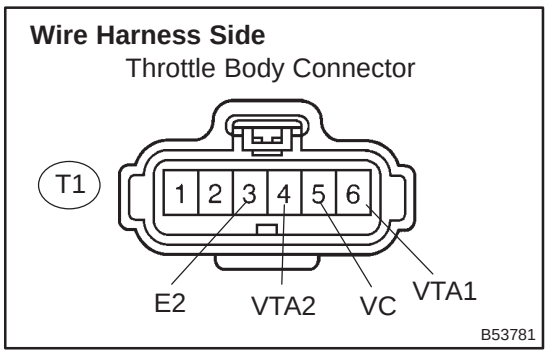
Result:

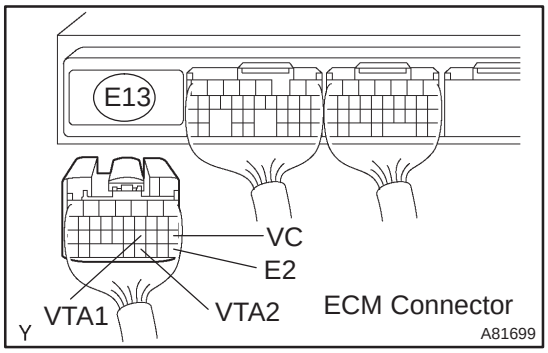
Throttle position expressed as percentage and voltage				Trouble area	Proceed to
Accelerator pedal released		Accelerator pedal depressed			
THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)	THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)		
0 %	0 to 0.2 V	0 %	0 to 0.2 V	VC circuit open	A
100 %	4.5 to 5.5 V	100 %	4.5 to 5.5 V	E2 circuit open	
0 % or 100 %	2.1 to 3.1 V (Fail safe)	0 % or 100 %	2.1 to 3.1 V (Fail safe)	VTA1 circuit open or ground short	
About 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	About 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	VTA2 circuit open or ground short	
10 to 24 %	2.1 to 3.1 V	64 to 96 % (Does not fail safe)	4.5 to 5.5 V (Does not fail safe)	Throttle position sensor circuit is normal	B

B	Go to step 5

A

2 CHECK HARNESS AND CONNECTOR(THROTTLE POSITION SENSOR – ECM)





(a) Disconnect the T1 throttle body connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (T1–5) – VC (E13–18)	Continuity
VTA1 (T1–6) – VTA1 (E13–21)	
VTA2 (T1–4) – VTA2 (E13–31)	
E2 (T1–3) – E2 (E13–28)	

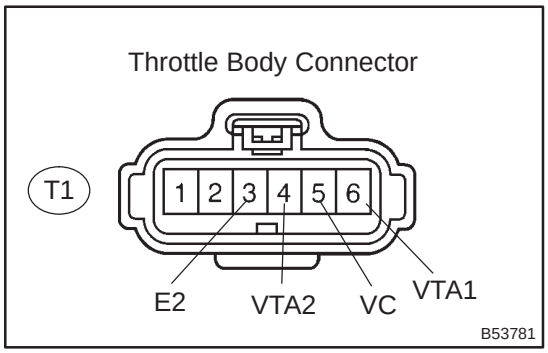
Standard (Check for short):

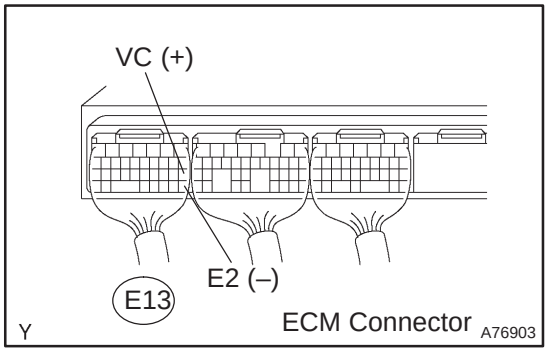
Symbols (Terminal No.)	Specified condition
VC (T1–5) or VC (E13–18) – Body ground	No continuity
VTA1 (T1–6) or VTA1 (E13–21) – Body ground	
VTA2 (T1–4) or VTA2 (E13–31) – Body ground	

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3 INSPECT ECM(VC VOLTAGE)





(a) Disconnect the T1 throttle body connector.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
VC (E13–18) – E2 (E13–28)	4.5 to 5.5 V

NG → CHECK AND REPLACE ECM (See page 01–32)

OK

4	REPLACE THROTTLE BODY ASSY

GO

5	READ OUTPUT DTC(THROTTLE POSTION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (See page 05–294).
(b) Start the engine.
(c) Run the engine at idle for 15 sec. or more.
(d) Read the DTC (See page 05–294).

Result:

Display (DTC output)	Proceed to
”P0120, P0122, P0123, P0220, P0222, P0223 and/or P2135” are output again	A
No DTC output	B

B → SYSTEM OK

A

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0121	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT RANGE/PERFORMANCE PROBLEM

HINT:
This is the procedure of the ”throttle position sensor”.

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page 05–356.

DTC No.	DTC Detection Condition	Trouble Area
P0121	Condition (a) continues for 2.0 seconds: (a) Difference between VTA1 and VTA2 is out of threshold	Throttle position sensor (built in throttle body)

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

REPLACE THROTTLE BODY ASSY

DTC	P0130	OXYGEN SENSOR CIRCUIT (BANK 1 SENSOR 1)

DTC	P0150	OXYGEN SENSOR CIRCUIT (BANK 2 SENSOR 1)

DTC	P2195	OXYGEN SENSOR SIGNAL STUCK LEAN (BANK 1 SENSOR 1)

DTC	P2196	OXYGEN SENSOR SIGNAL STUCK RICH (BANK 1 SENSOR 1)

DTC	P2197	OXYGEN SENSOR SIGNAL STUCK LEAN (BANK 2 SENSOR 1)

DTC	P2198	OXYGEN SENSOR SIGNAL STUCK RICH (BANK 2 SENSOR 1)

CIRCUIT DESCRIPTION

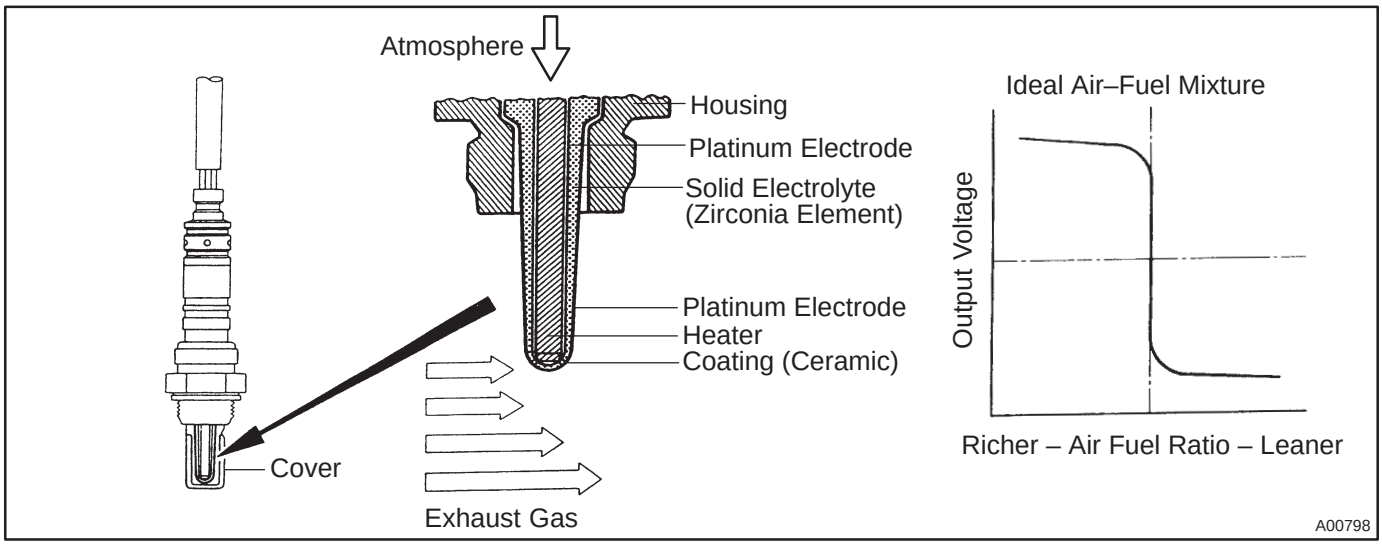
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used. For the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.

The heated oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and provide the ECM with feedback control the air–fuel ratio.

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust gas increases. And the heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i.e. less than 0.45 V).

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio, the oxygen will be vanished from the exhaust gas. And the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i.e. more than 0.45 V). The ECM judges by the voltage output from the heated oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. If the malfunction of the heated oxygen sensor causes an output of abnormal voltage, the ECM becomes unable to perform accurate air–fuel ratio control.

The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), current flows to the heater in order to heat the sensor for the accurate oxygen concentration detection.

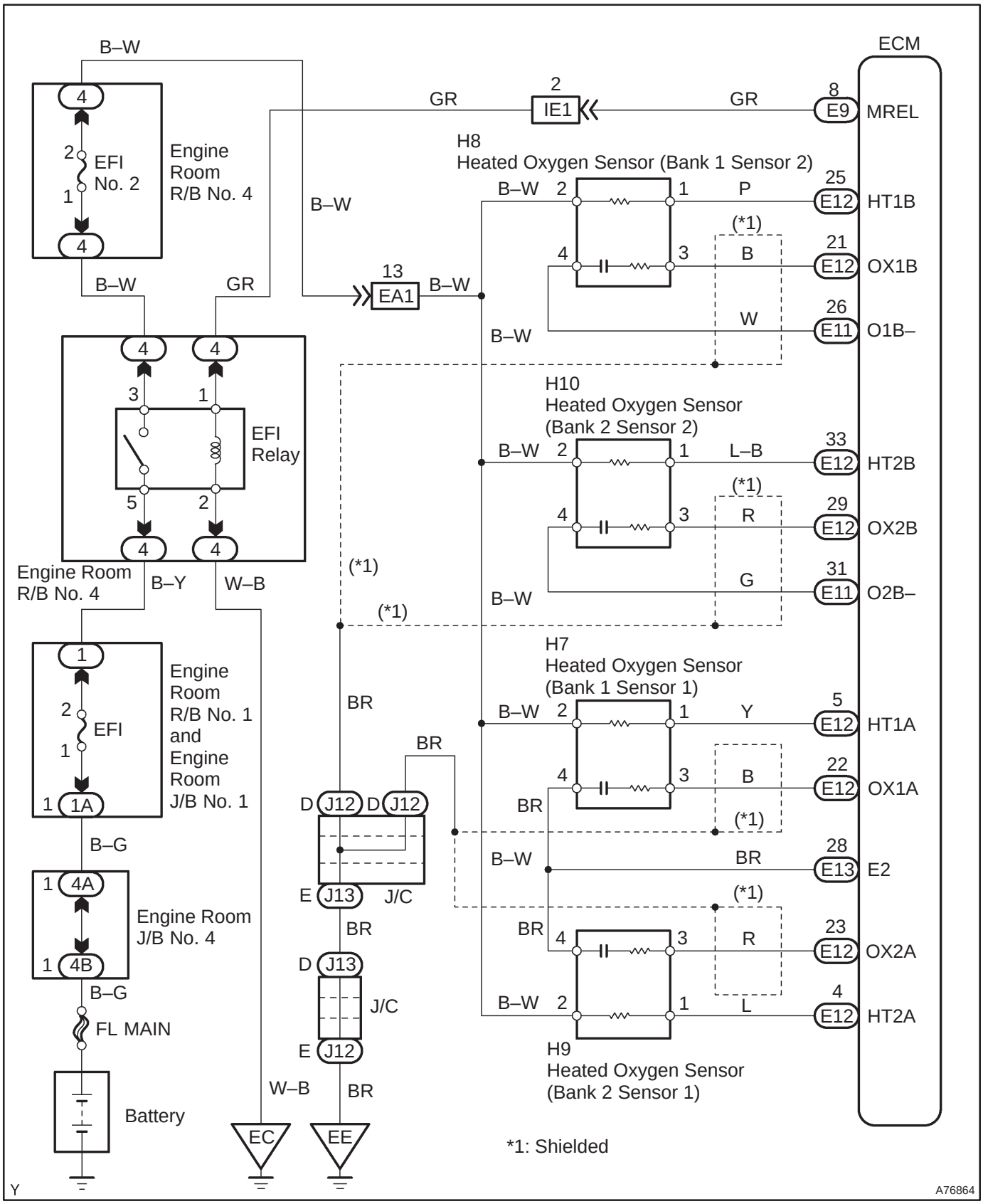


DTC No.	DTC Detection Condition	Trouble Area
P0130 P0150	Output voltage of heated oxygen sensor (sensor 1) remains at 0.4 V or more, or 0.55 V or less, during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM
P2195 P2197	Output voltage of heated oxygen sensor (sensor 1) remains at 0.55 V or less, during idling after engine is warmed up (2 trip detection logic)	
P2196 P2198	Output voltage of heated oxygen sensor (sensor 1) remains at 0.4 V or more, during idling after engine is warmed up (2 trip detection logic)	

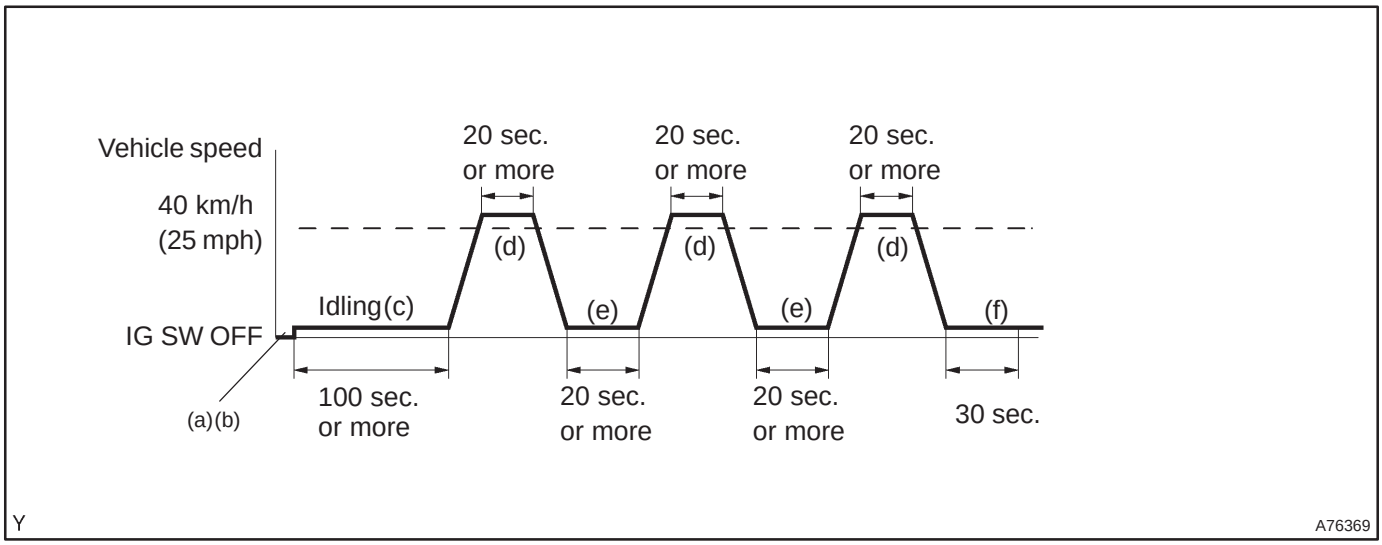
HINT:

- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 1 refers to the sensor closest to the engine assembly.
- The output voltage of the heated oxygen sensor and the short–term fuel trim value can be read using the hand–held tester.

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the ”normal mode” to the ”check mode” (See page 05–294).
(c) Start the engine and let the engine idle for 100 seconds or more.
(d) Drive the vehicle at 40 km/h (25 mph) or more for 20 seconds or more.
(e) Let the engine idle for 20 seconds or more. Perform steps from (d) to (e) 3 times.
(f) Let the engine idle for 30 seconds.

HINT:
If a malfunction exists, the CHK ENG will be illuminated on the multi information display during step (f).

NOTICE:
If the conditions in this test are not strictly followed, detection of a malfunction will not occur.
If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing the ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few seconds delay in the sensor 1 (front sensor) output. And there is about 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs will be recorded, and the CHK ENG then comes on.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	**CHECK OTHER DTC OUTPUT(IN ADDITION TO HEATED OXYGEN SENSOR DTCS)**

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0130, P0150, P2195, P2196, P2197 and/or P2198” are output	A
”P0130, P0150, P2195, P2196, P2197 or P2198” and other DTCs are output	B

HINT:

- If any other codes besides ”P0130, P0150, P2195, P2196, P2197 and/or P2198” are output, perform the troubleshooting for those DTCs first.
- If a misfiring DTC(s) is present, record the DTC(s) that indicates misfiring cylinder(s), then proceed to A.

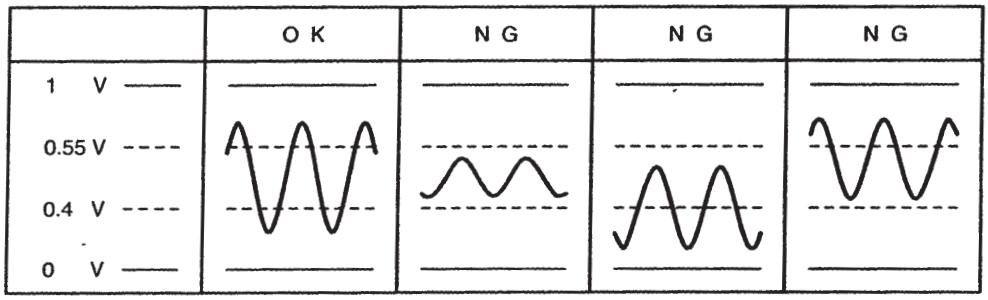
B → **GO TO RELEVANT DTC CHART**
(See page 05–309)

A

2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Warm up the heated oxygen sensor (sensor 1) with the engine speed at 2,500 rpm for approximately 90 seconds.

(b) Read the output voltage of the heated oxygen sensor during idling.
Heated oxygen sensor (sensor 1) output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



P18349

NG → **Go to step 5**

OK

3	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

4	READ OUTPUT DTC(HEATED OXYGEN SENSOR DTCS ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

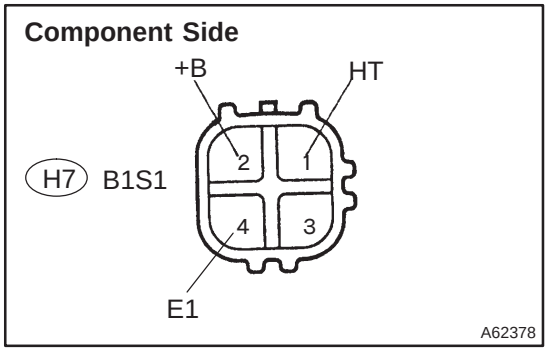
Display (DTC output)	Proceed to
”P0130, P0150, P2195, P2196, P2197 and/or P2198” are output again	A
”P0130, P0150, P2195, P2196, P2197 and/or P2198” are not output again	B

B → **CHECK FOR INTERMITTENT PROBLEMS**

A

REPLACE HEATED OXYGEN SENSOR

5 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)

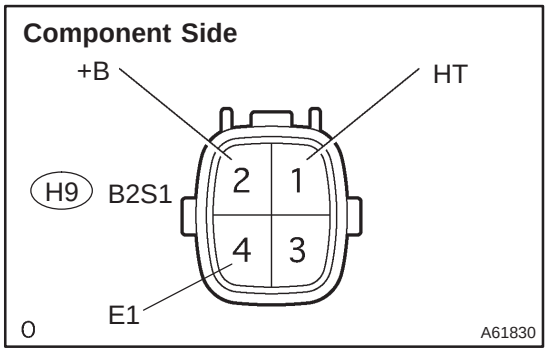


(a) Disconnect the H7 or H9 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 Sensor 1):

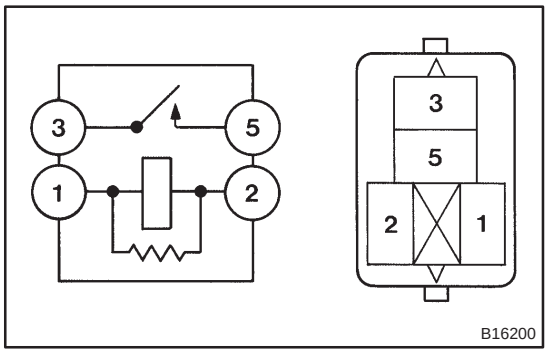
Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity



NG → **REPLACE HEATED OXYGEN SENSOR**

OK

6 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No. 4.

(b) Inspect the EFI relay.

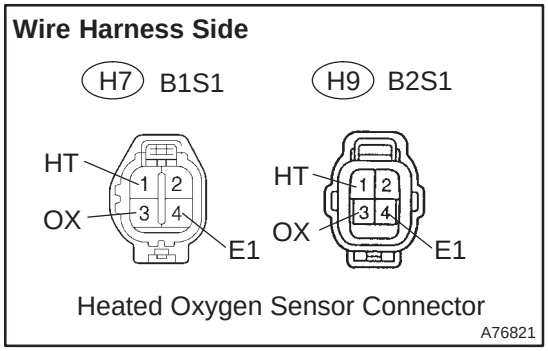
Standard:

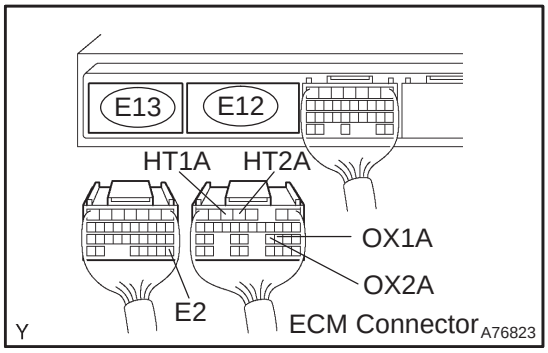
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

7 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H7 or H9 heated oxygen sensor connector.

(b) Disconnect the E12 and E13 ECM connectors.

(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OX (H7–3) – OX1A (E12–22)	Continuity
HT (H7–1) – HT1A (E12–5)	
E1 (H7–4) – E2 (E13–28)	
OX (H8–3) – OX2A (E12–23)	
HT (H8–1) – HT2A (E12–4)	
E1 (H8–4) – E2 (E13–28)	

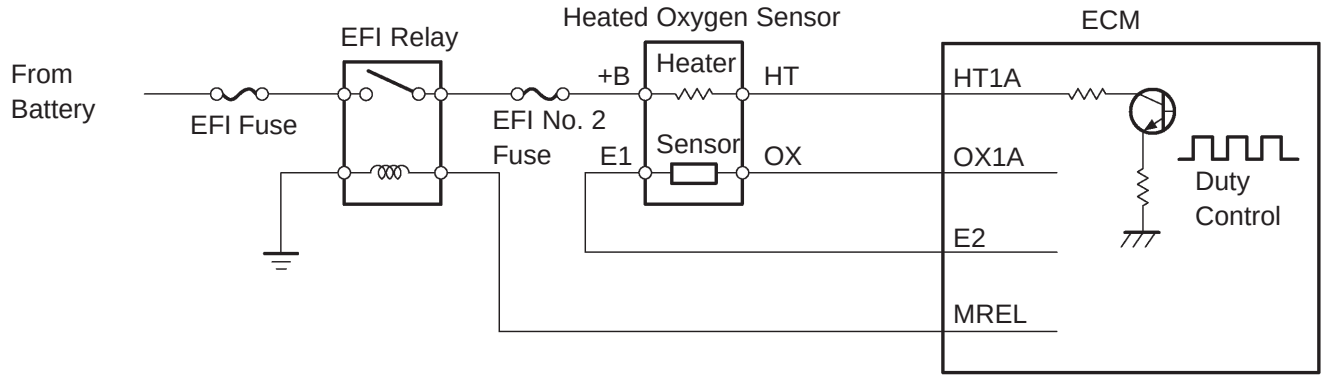
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H7–3) or OX1A (E12–22) – Body ground	No continuity
HT (H7–1) or HT1A (E12–5) – Body ground	
OX (H8–3) or OX2A (E12–23) – Body ground	
HT (H8–1) or HT2A (E12–4) – Body ground	

HINT:

- The OX1A and HT1A means the heated oxygen sensor bank 1 sensor 1.
- The OX2A and HT2A means the heated oxygen sensor bank 2 sensor 1.

Reference (Bank 1 Sensor 1 System Drawing)



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

9	CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

10	CHECK FUEL PRESSURE(HIGH PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, FUEL PRESSURE SENSOR, WIRING AND FUEL LEAKAGE

OK

11	CONFIRM IF ANY MISFIRING DTCS WERE PRESENT AT STEP 1

(a) Misfiring DTC ”P0301, P0302, P0303 and/or P0304” was present at step 1.

NO → REPLACE HEATED OXYGEN SENSOR

YES

12	REPLACE FUEL INJECTOR ASSY (See page 11–42)

HINT:
If one or more the misfiring DTCs ”P0301, P0302, P0303 and/or P0304” were present at step 1, replace the injector(s) mounted on the misfiring cylinder(s) that is referred by the DTC(s) with normal injector(s).

GO

13	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

14	READ OUTPUT DTC(HEATED OXYGEN SENSOR DTCS ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0130, P0150, P2195, P2196, P2197 and/or P2198” are output again	A
”P0130, P0150, P2195, P2196, P2197 and/or P2198” are not output again	B

B → **REPLACE FUEL INJECTOR ASSY**

A

REPLACE HEATED OXYGEN SENSOR

DTC	P0133	OXYGEN SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC	P0153	OXYGEN SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–363.

DTC No.	DTC Detection Condition	Trouble Area
P0133 P0153	Response time for output voltage of heated oxygen sensor (sensor 1) to change from rich to lean, or from lean to rich, is 1.0 sec. or more during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM

HINT:

- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 1 refers to the sensor closest to the engine assembly.

WIRING DIAGRAM

Refer to DTC P0130 on page 05–363.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing the ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

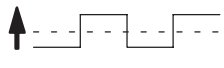
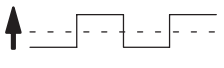
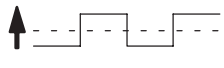
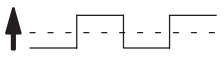
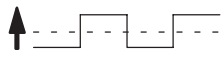
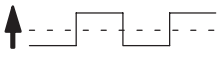
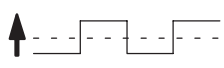
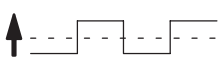
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few seconds delay in the sensor 1 (front sensor) output. And there is about 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and DTCs P0133 and/or P0153 will be recorded, and the CHK ENG then comes on.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0133 AND/OR P0153)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0133 and/or P0153” are output	A
”P0133 or P0153” and other DTCs are output	B

HINT:

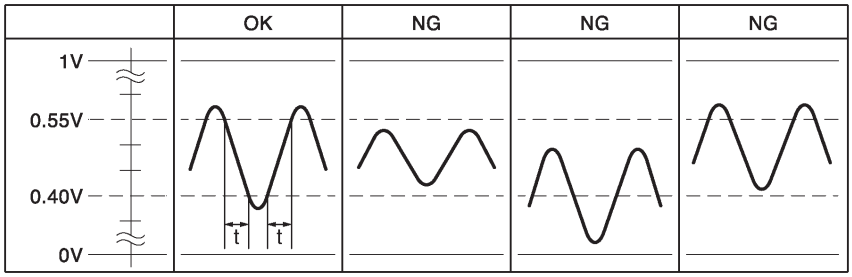
- If any other codes besides ”P0133 and/or P0153” are output, perform the troubleshooting for those DTCs first.
- If a misfiring DTC(s) is present, record the DTC(s) that indicates misfiring cylinder(s), then proceed to A.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	READ VALUE OF HAND–HELD TESTER(HEATED OXYGEN SENSOR DURING IDLING)

(a) Warm up the heated oxygen sensor (sensor 1) with the engine speed at 2,500 rpm for approximately 90 seconds.
(b) Read the output voltage of the heated oxygen sensor (sensor 1) during idling.
Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V, and period of ”t” must exist less than 1.0 sec. (See the following table).



N A73686

NG → **Go to step 5**

OK

3	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

4 READ OUTPUT DTC(DTC P0133 AND/OR P0153 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

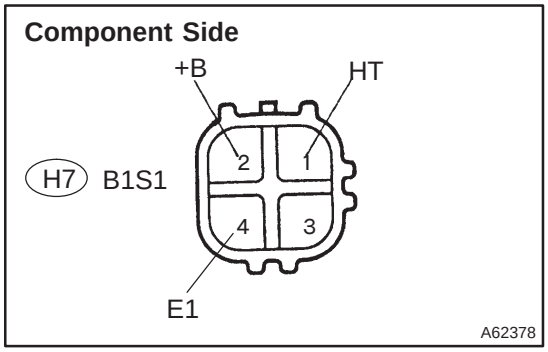
Display (DTC output)	Proceed to
”P0133 and/or P0153” are output again	A
”P0133 and/or P0153” are not output again	B

B → **CHECK FOR INTERMITTENT PROBLEMS**

A

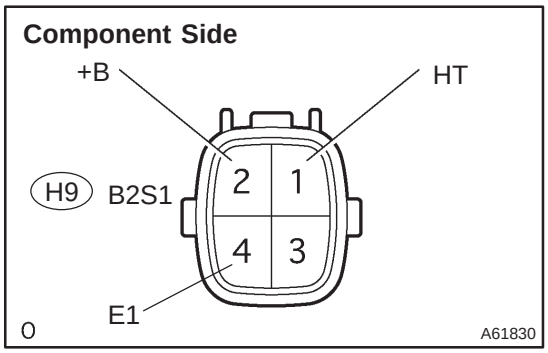
REPLACE HEATED OXYGEN SENSOR

5 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H7 or H9 heated oxygen sensor connector.
(b) Measure the resistance between the terminals of the heated oxygen sensor connector.
Standard (Bank 1, 2 Sensor 1):

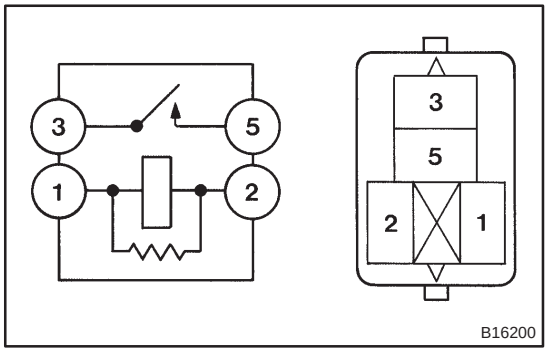
Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity



NG → **REPLACE HEATED OXYGEN SENSOR**

OK

6 INSPECT EFI RELAY



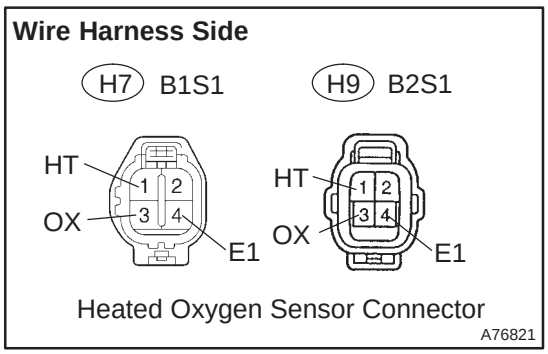
(a) Remove the EFI relay from the engine room R/B No. 4.
(b) Inspect the EFI relay.
Standard:

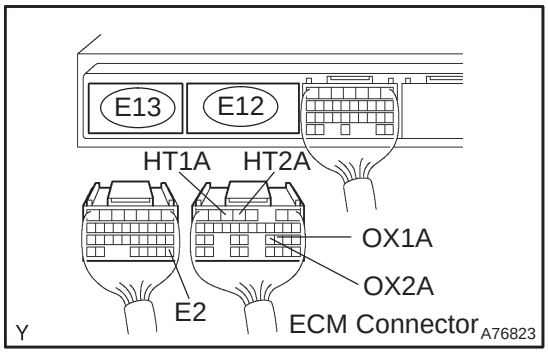
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → REPLACE EFI RELAY

OK

7 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H7 or H9 heated oxygen sensor connector.
(b) Disconnect the E12 and E13 ECM connectors.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OX (H7–3) – OX1A (E12–22)	Continuity
HT (H7–1) – HT1A (E12–5)	
E1 (H7–4) – E2 (E13–28)	
OX (H8–3) – OX2A (E12–23)	
HT (H8–1) – HT2A (E12–4)	
E1 (H8–4) – E2 (E13–28)	

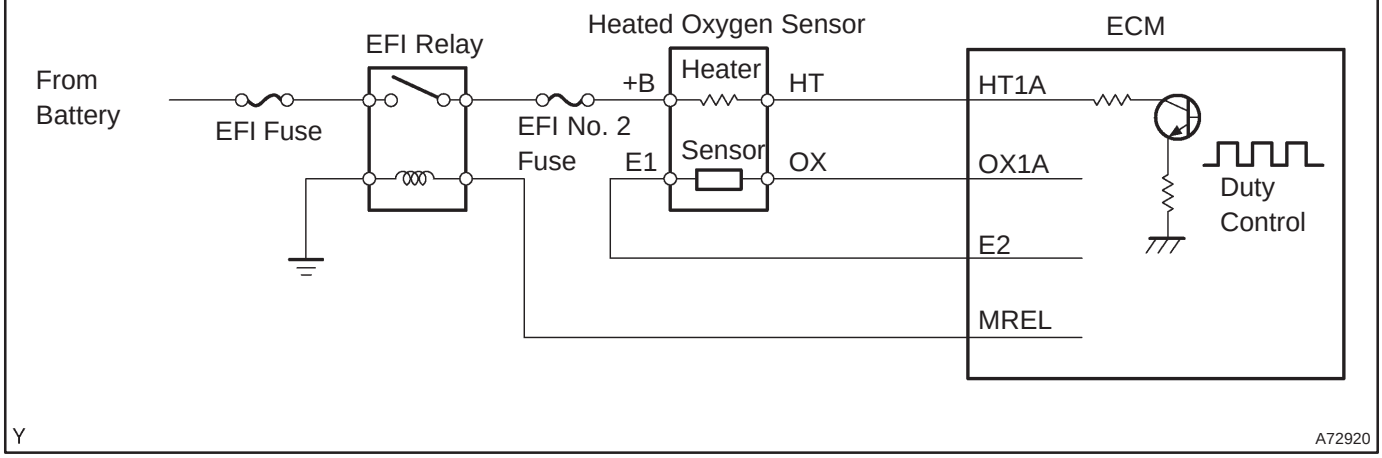
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H7–3) or OX1A (E12–22) – Body ground	No continuity
HT (H7–1) or HT1A (E12–5) – Body ground	
OX (H8–3) or OX2A (E12–23) – Body ground	
HT (H8–1) or HT2A (E12–4) – Body ground	

HINT:

- The OX1A and HT1A means the heated oxygen sensor bank 1 sensor 1.
- The OX2A and HT2A means the heated oxygen sensor bank 2 sensor 1.

Reference (Bank 1 Sensor 1 System Drawing)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

9	CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

10	CHECK FUEL PRESSURE(HIGH PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

11	CONFIRM IF ANY MISFIRING DTCS WERE PRESENT AT STEP 1

(a) Misfiring DTC ”P0301, P0302, P0303 and/or P0304” was present at step 1.

NO → REPLACE HEATED OXYGEN SENSOR

YES

12	REPLACE FUEL INJECTOR ASSY (See page 11–42)

HINT:
If one or more the misfiring DTCs ”P0301, P0302, P0303 and/or P0304” were present at step 1, replace the injector(s) mounted on the misfiring cylinder(s) that is referred by the DTC(s) with normal injector(s).

GO

13	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

14	READ OUTPUT DTC(DTC P0133 AND/OR P0153 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0133 and/or P0153” are output again	A
”P0133 and/or P0153” are not output again	B

B → **REPLACE FUEL INJECTOR ASSY**

A

REPLACE HEATED OXYGEN SENSOR

DTC	P0134	OXYGEN SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

DTC	P0154	OXYGEN SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–363.

DTC No.	DTC Detection Condition	Trouble Area
P0134 P0154	After engine is warmed up, heated oxygen sensor (sensor 1) output does not indicate RICH (≧ 0.45 V) even once when conditions (a), (b), (c) and (d) continue for at least 65 sec.: (a) Engine speed: 1,400 rpm or more (b) Vehicle speed: 130 km/h (81 mph) (c) Throttle valve is not fully closed (d) 180 sec. or more after starting engine	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • Air induction system • Fuel pressure • PCV hose connection • PCV valve and hose • Injector • Gas leakage in exhaust system • ECM

HINT:

- After confirming DTCs ”P0134 and P0154”, use the hand–held tester to confirm the output voltage of the heated oxygen sensor (bank 1, 2 sensor 1) from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”. If the output voltage of the heated oxygen sensor is less than 0.1 V, the heated oxygen sensor circuit may be open or short.
- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 1 refers to the sensor closest to the engine assembly.

WIRING DIAGRAM

Refer to DTC P0130 on page 05–363.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing the ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:
There is a few seconds delay in the sensor 1 (front sensor) output. And there is about 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0134 AND/OR P0154)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0134 and/or P0154” are output	A
”P0134 or P0154” and other DTCs are output	B

HINT:
- If any other codes besides ”P0134 and/or P0154” are output, perform the troubleshooting for those DTCs first.
- If a misfiring DTC(s) is present, record the DTC(s) that indicates misfiring cylinder(s), then proceed to A.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Warm up the engine to the normal operating temperature above 75°C (169°F).
(b) Read the output voltage of the heated oxygen sensor (sensor 1) when the engine rpm is suddenly increased.

HINT:
Quickly accelerate the engine to 4,000 rpm 3 times using the accelerator pedal.
Standard:
Heated oxygen sensor (sensor 1) outputs a RICH signal (0.45 V or more) at least once.

NG → **Go to step 6**

OK

3	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

4	READ OUTPUT DTC(DTC P0134 AND/OR P0154 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0134 and/or P0154” are not output again	A
”P0134 and/or P0154” are output again	B

B → **CHECK AND REPLACE ECM (See page 01–32)**

A

5	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS

YES

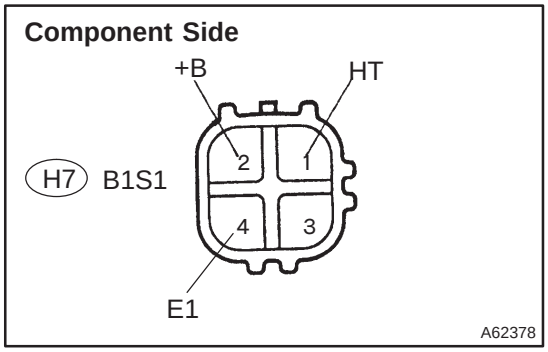
DTC IS CAUSED BY RUNNING OUT OF FUEL (DTC P0134 AND/OR P0154)

6	CHECK CONNECTION OF PCV HOSE

NG → REPAIR OR REPLACE PCV HOSE

OK

7	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)

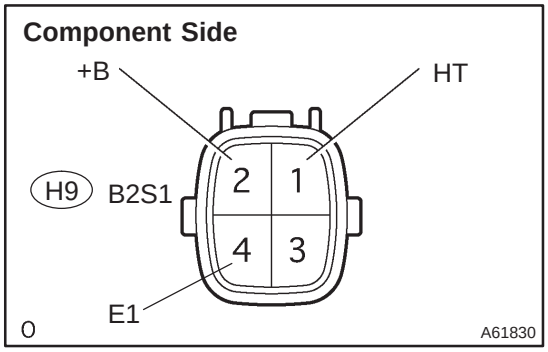


(a) Disconnect the H7 or H9 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 Sensor 1):

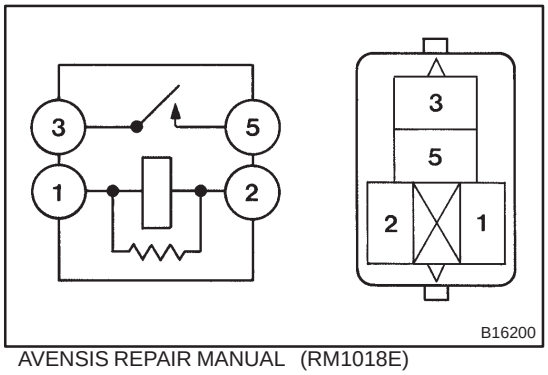
Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity



NG → REPLACE HEATED OXYGEN SENSOR

OK

8	INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No. 4.

(b) Inspect the EFI relay.

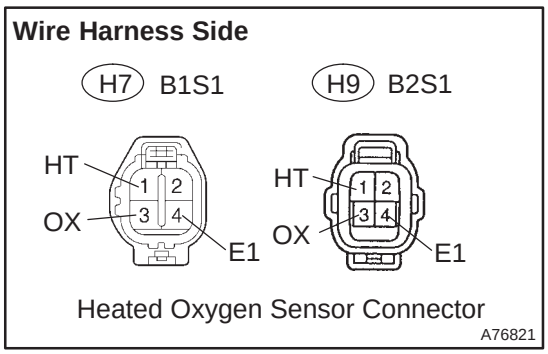
Standard:

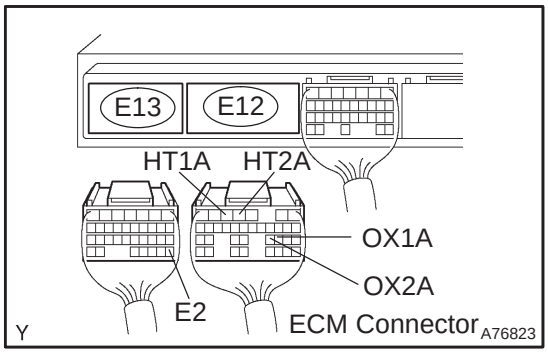
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → REPLACE EFI RELAY

OK

9 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H7 or H9 heated oxygen sensor connector.
(b) Disconnect the E12 and E13 ECM connectors.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OX (H7–3) – OX1A (E12–22)	Continuity
HT (H7–1) – HT1A (E12–5)	
E1 (H7–4) – E2 (E13–28)	
OX (H8–3) – OX2A (E12–23)	
HT (H8–1) – HT2A (E12–4)	
E1 (H8–4) – E2 (E13–28)	

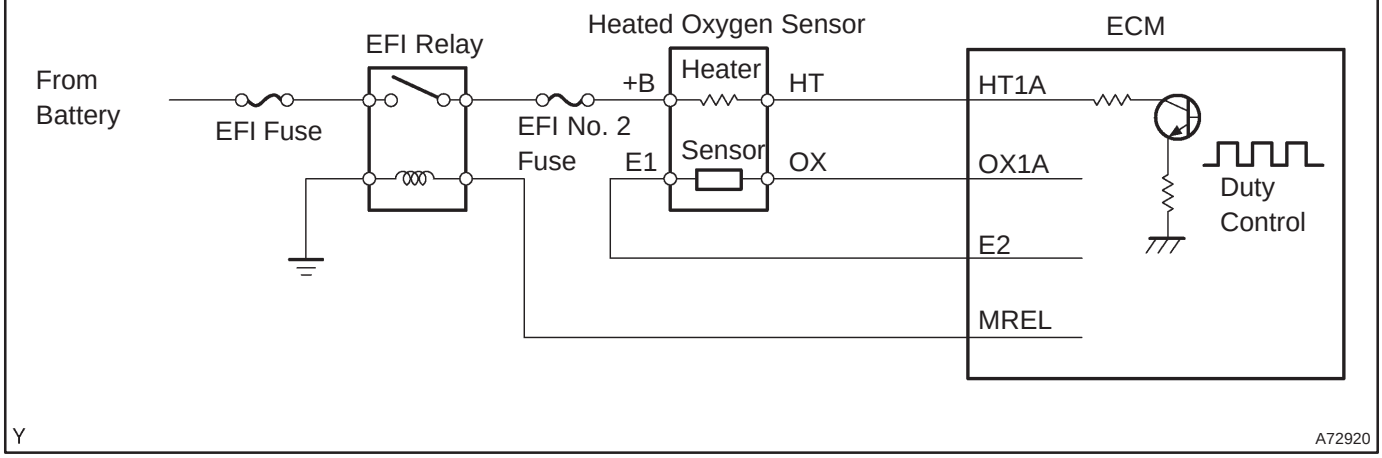
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H7–3) or OX1A (E12–22) – Body ground	No continuity
HT (H7–1) or HT1A (E12–5) – Body ground	
OX (H8–3) or OX2A (E12–23) – Body ground	
HT (H8–1) or HT2A (E12–4) – Body ground	

HINT:

- The OX1A and HT1A means the heated oxygen sensor bank 1 sensor 1.
- The OX2A and HT2A means the heated oxygen sensor bank 2 sensor 1.

Reference (Bank 1 Sensor 1 System Drawing)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

10	CHECK WHETHER MISFIRE IS OCCURRED OR NOT BY MONITORING DTC AND DATA LIST

NG → PERFORM TROUBLESHOOTING FOR MISFIRE (See page 05–294)

OK

11	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

12	CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

13	CHECK FUEL PRESSURE(HIGH PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, FUEL PRESSURE SENSOR, WIRING AND FUEL LEAKAGE

OK

14	CHECK FOR EXHAUST GAS LEAK

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK

15	CONFIRM IF ANY MISFIRING DTCS WERE PRESENT AT STEP 1

(a) Misfiring DTC ”P0301, P0302, P0303 and/or P0304” was present at step 1.

NO → REPLACE HEATED OXYGEN SENSOR

YES

16	REPLACE FUEL INJECTOR ASSY (See page 11–42)

HINT:
If one or more the misfiring DTCs ”P0301, P0302, P0303 and/or P0304” were present at step 1, replace the injector(s) mounted on the misfiring cylinder(s) that is referred by the DTC(s) with normal injector(s).

GO

17	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

18	READ OUTPUT DTC(DTC P0134 AND/OR P0154 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0134 and/or P0154” are not output again	A
”P0134 and/or P0154” are output again	B

B → REPLACE FUEL INJECTOR ASSY

A

REPLACE HEATED OXYGEN SENSOR

DTC	P0136	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

DTC	P0156	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 2 SENSOR 2)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page 05–363.

DTC No	DTC Detection Condition	Trouble Area
P0136 P0156	If the following two conditions are satisfied at a time (2 trip detection logic): (a) The ECM records cycles which the vehicle driving and stops 8 times or more. (b) There was no change in the rich and lean outputs from heated oxygen sensor (sensor 2) for the 360 seconds under air fuel ratio feedback control. (Throttle was not closed)	• Open or short in heated oxygen sensor (bank 1, 2 sensor 2) circuit • Heated oxygen sensor (bank 1, 2 sensor 2) • Heated oxygen sensor heater (bank 1, 2 sensor 2) • EFI relay

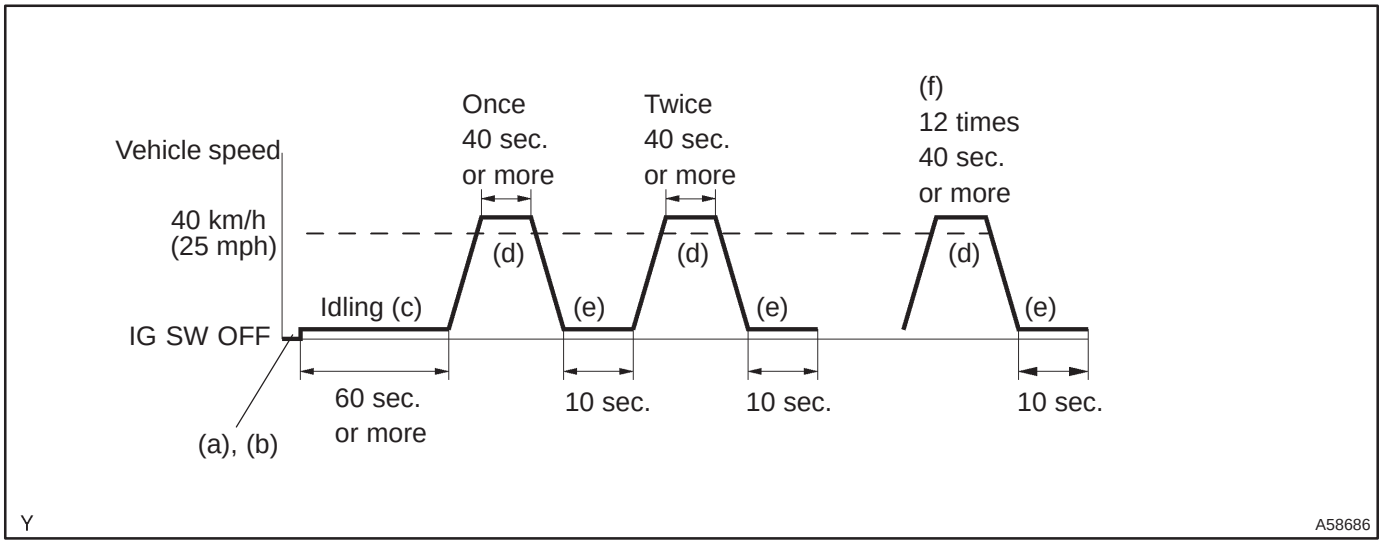
HINT:

- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

WIRING DIAGRAM

Refer to DTC P0130 on page 05–363.

CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the normal mode to the check (test) mode (See page 05–294).
(c) Start the engine and let the engine idle for 60 seconds or more.
(d) Drive the vehicle at 40 km/h (25 mph) or more for 40 seconds or more.
(e) Let the engine idle for 10 seconds or more.
(f) Perform steps (d) and (e) 12 times.

HINT:

If a malfunction exists, the CHK ENG will be illuminated on the multi information display during step (f).

NOTICE:

If the conditions in this test are not strictly followed, detection of a malfunction will not occur. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing the ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:
There is a few seconds delay in the sensor 1 (front sensor) output. And there is about 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0136 AND/OR P0156)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0136 and/or P0156” are output	A
”P0136 or P0156” and other DTCs are output	B

HINT:
If any other codes besides ”P0136 and/or P0156” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.
(b) Read the output voltage of the heated oxygen sensor (sensor 2) when the engine rpm is suddenly increased.

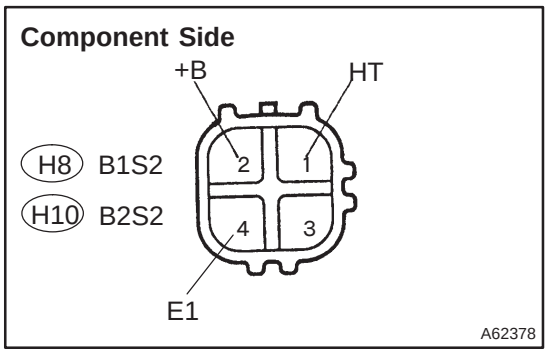
HINT:
Quickly accelerate the engine to 4,000 rpm 3 times by using the accelerator pedal.

The output voltage of heated oxygen sensor (sensor 2): Alternates from 0.4 V or less to 0.5 V or more.

OK → **Go to step 6**

NG

3	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



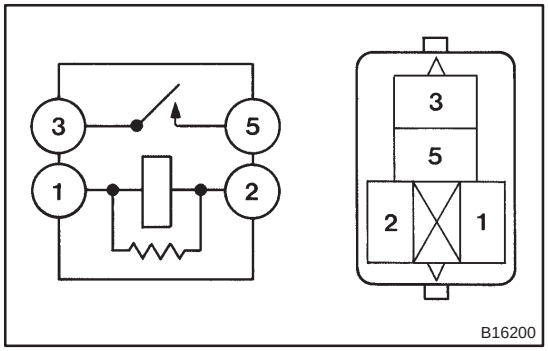
(a) Disconnect the H8 or H10 heated oxygen sensor connector.
(b) Measure the resistance between the terminals of the heated oxygen sensor connector.
Standard (Bank 1, 2 Sensor 2):

Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No. 4.
(b) Inspect the EFI relay.

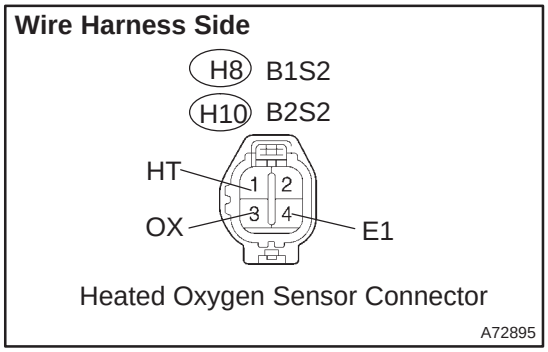
Standard:

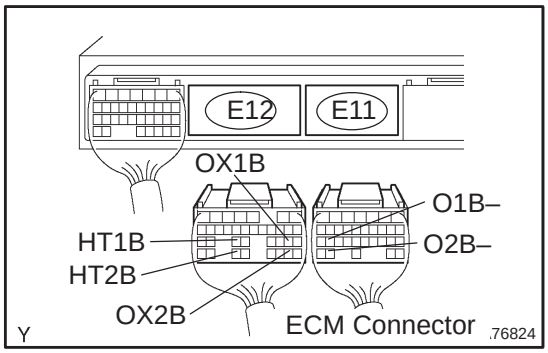
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

5 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H8 or H10 heated oxygen sensor connector.
(b) Disconnect the E11 and E12 ECM connectors.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OX (H8–3) – OX1B (E12–21)	Continuity
HT (H8–1) – HT1B (E12–25)	
E1 (H8–4) – O1B– (E11–26)	
OX (H10–3) – OX2B (E12–29)	
HT (H10–1) – HT2B (E12–33)	
E1 (H10–4) – O2B– (E11–31)	

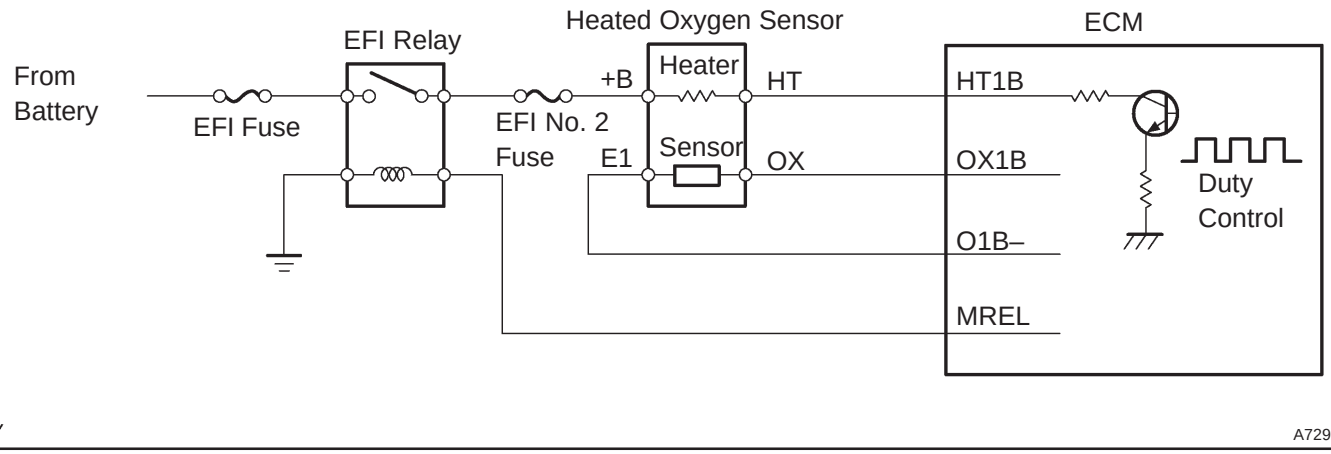
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H8–3) or OX1B (E12–21) – Body ground	No continuity
HT (H8–1) or HT1B (E12–25) – Body ground	
OX (H10–3) or OX2B (E12–29) – Body ground	
HT (H10–1) or HT2B (E12–33) – Body ground	

HINT:

- The OX1B and HT1B means the heated oxygen sensor bank 1 sensor 2.
- The OX2B and HT2B means the heated oxygen sensor bank 2 sensor 2.

Reference (Bank 1 Sensor 2 System Drawing)



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE HEATED OXYGEN SENSOR

6	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

7	READ OUTPUT DTC(DTC P0136 AND/OR P0156 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0136 and/or P0156” are not output again	A
”P0136 and/or P0156” are output again	B

B → **REPLACE HEATED OXYGEN SENSOR**

A

CHECK FOR INTERMITTENT PROBLEMS

DTC	P0171	SYSTEM TOO LEAN (BANK 1)

DTC	P0172	SYSTEM TOO RICH (BANK 1)

DTC	P0174	SYSTEM TOO LEAN (BANK 2)

DTC	P0175	SYSTEM TOO RICH (BANK 2)

CIRCUIT DESCRIPTION

The fuel trim is related to the feedback compensation value, not to the basic injection time. The fuel trim includes the short–term fuel trim and the long–term fuel trim.

The short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the stoichiometric air–fuel ratio. This variance triggers a reduction in the fuel volume if the air–fuel ratio is RICH, and an increase in the fuel volume if it is LEAN.

The long–term fuel trim is the overall fuel compensation carried out in long–term to compensate for a continual deviation of the short–term fuel trim from the central value, due to individual engine differences, wear overtime and changes in the operating environment.

If both the short–term fuel trim and the long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the CHK ENG is illuminated.

DTC No.	DTC Detection Condition	Trouble Area
P0171 P0174	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on LEAN side (2 trip detection logic)	• Air induction system • Injector blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Heated oxygen sensor heater (bank 1, 2 sensor 1) • EFI relay • PCV valve and hose • PCV hose connection • ECM
P0172 P0175	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Injector leakage blockage • Mass air flow meter • Manifold absolute pressure sensor • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • ECM

HINT:

- When DTC ”P0171 or P0174” is recorded, the actual air–fuel ratio is on the LEAN side. When DTC ”P0172 or P0175” is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC ”P0171 or P0174” is recorded. The CHK ENG then comes on.

- If the total of the short–term fuel trim value and long–term fuel trim value is within ± 25 % (Engine coolant temperature is greater than 75°C), the system is functioning normally.
- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.

WIRING DIAGRAM

Refer to DTC P0130 on page 05–363.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing the ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

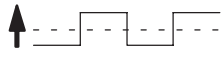
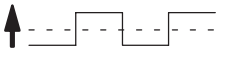
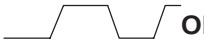
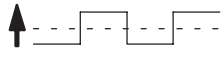
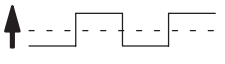
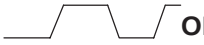
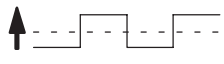
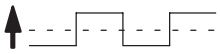
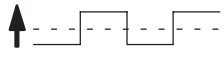
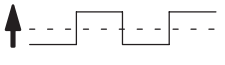
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few seconds delay in the sensor 1 (front sensor) output. And there is about 20 seconds delay in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” or ”O2S B2S1 and O2S B2S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0171, P0172, P0174 AND/OR P0175)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0171, P0172, P0174 and/or P0175” are output	A
”P0171, P0172, P0174 or P0175” and other DTCs are output	B

HINT:

- If any other codes besides ”P0171, P0172, P0174 and/or P0175” are output, perform the troubleshooting for those DTCs first.
- If a misfiring DTC(s) is present, record the DTC(s) that indicates misfiring cylinder(s), then proceed to A.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in air the induction system.

NG → **REPAIR OR REPLACE AIR INDUCTION SYSTEM**

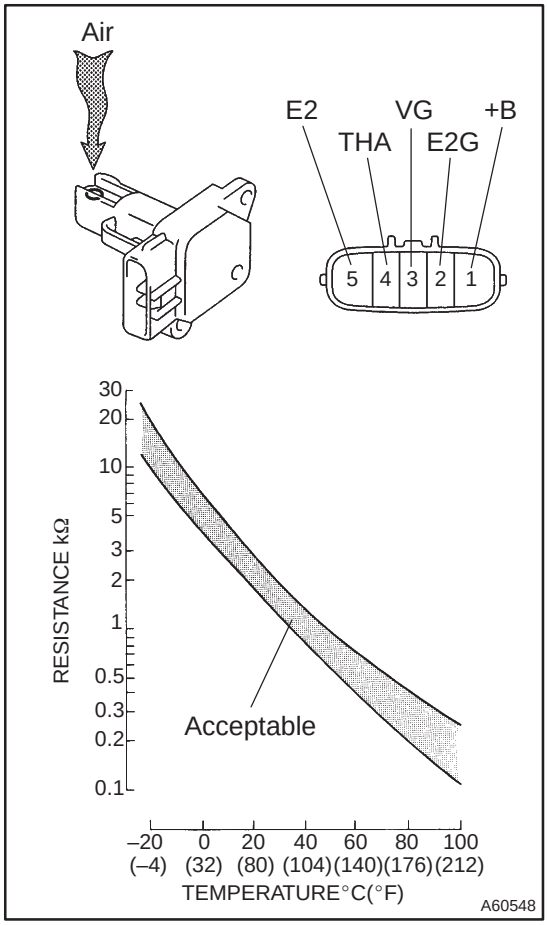
OK

3	CHECK CONNECTION OF PCV HOSE

NG → **REPAIR OR REPLACE PCV HOSE**

OK

4 INSPECT MASS AIR FLOW METER



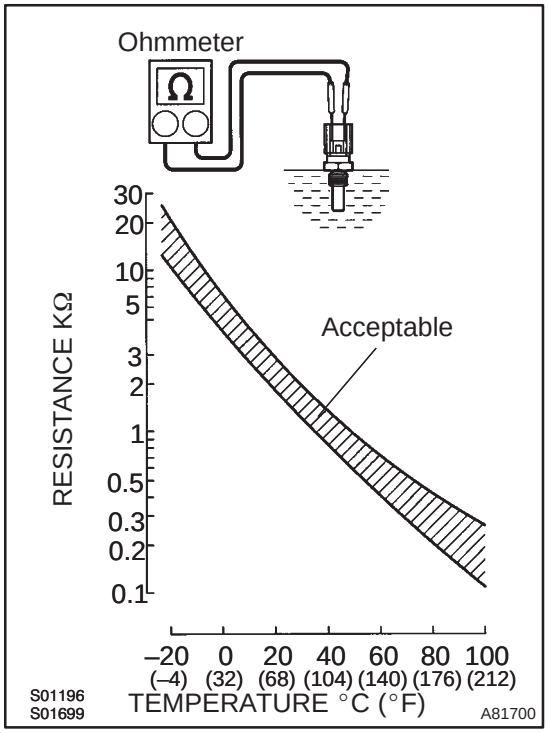
(a) Remove the mass air flow meter.
(b) Output voltage inspection.
  (1) Apply battery voltage across terminals +B and E2G.
  (2) Connect the positive (+) tester prove to terminal VG, and negative (–) tester prove to terminal E2G.
  (3) Blow air into the mass air flow meter, and check that the voltage fluctuates.
(c) Resistance inspection.
  (1) Measure the resistance between terminals THA and E2.

Resistance:
13.6 to 18.4 kΩ at –20°C (–4°F)
2.21 to 2.69 kΩ at 20°C (68°F)
0.49 to 0.67 kΩ at 60°C (140°F)

NG → **REPLACE MASS AIR FLOW METER**

OK

5	INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE)



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals.
Resistance:
2.32 to 2.59 kΩ at 20°C (68°F)
0.310 to 0.326 kΩ at 80°C (176°F)

NOTICE:
In case of checking the engine coolant temperature sensor in the water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:
Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK ↓

6	CHECK FOR SPARK AND IGNITION (See page 18–12)

NG → **REPAIR OR REPLACE**

OK ↓

7	CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → **CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER**

OK ↓

8	CHECK FUEL PRESSURE(HIGH PRESSURE) (See page 11–33)

NG → **CHECK AND REPLACE FUEL PUMP, FUEL PRESSURE SENSOR, WIRING AND FUEL LEAKAGE**

OK ↓

9	CHECK FOR EXHAUST GAS LEAKAGE

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT (See page 15–6)

OK

10	CONFIRM IF ANY MISFIRING DTCS WERE PRESENT AT STEP 1

(a) Misfiring DTC ”P0301, P0302, P0303 and/or P0304” was present at step 1.

NO → Go to step 14

YES

11	REPLACE FUEL INJECTOR ASSY (See page 11–42)

HINT:
If one or more the misfiring DTCs ”P0301, P0302, P0303 and/or P0304” were present at step 1, replace the injector(s) mounted on the misfiring cylinder(s) that is referred by the DTC(s) with normal injector(s).

GO

12	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

13	READ OUTPUT DTC(DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC ”P0171, P0172, P0174 and/or P0175” are output again	A
DTC ”P0171, P0172, P0174 and/or P0175” are not output again	B

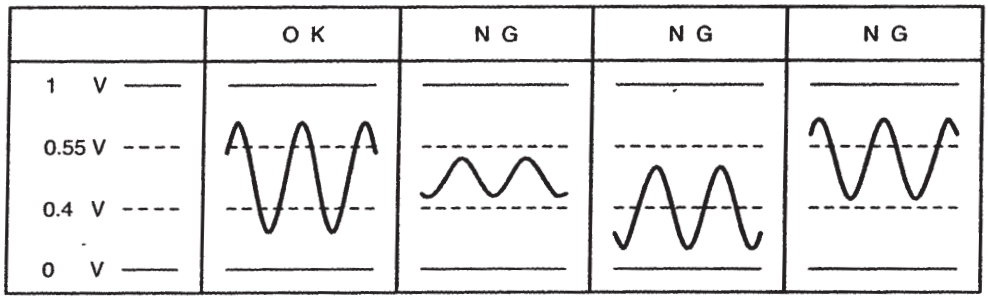
B → REPLACE FUEL INJECTOR ASSY

A

14	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR (BANK 1, 2 SENSOR 1))

(a) Warm up the heated oxygen sensor (sensor 1) with the engine speed at 2,500 rpm for approximately 90 seconds.

(b) Read the output voltage of the heated oxygen sensor (sensor 1) during idling.
The output voltage of heated oxygen sensor (sensor 1):
Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



P18349

NG → **Go to step 21**

OK

15	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

16	READ OUTPUT DTC(DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC "P0171, P0172, P0174 and/or P0175" are output again	A
DTC "P0171, P0172, P0174 and/or P0175" are not output again	B

B → **Go to step 20**

A

17	REPLACE HEATED OXYGEN SENSOR

GO

18	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

19	READ OUTPUT DTC(DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC "P0171, P0172, P0174 and/or P0175" are not output again	A
DTC "P0171, P0172, P0174 and/or P0175" are output again	B

B → CHECK AND REPLACE ECM (See page 01–32) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

A

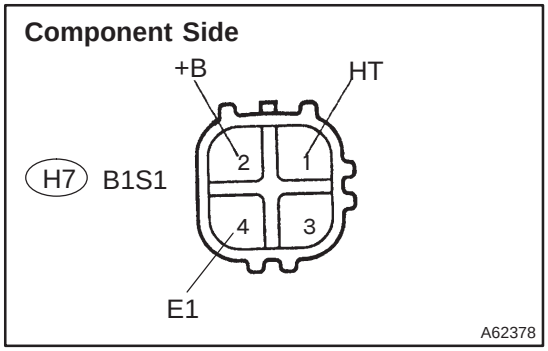
20	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL (DTCS P0171, P0172, P0174 AND/OR P0175)

21 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)

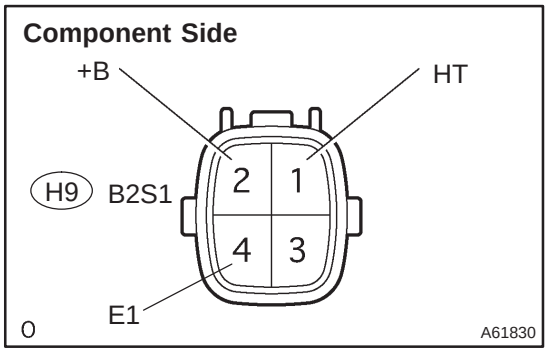


(a) Disconnect the H7 or H9 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1, 2 Sensor 1):

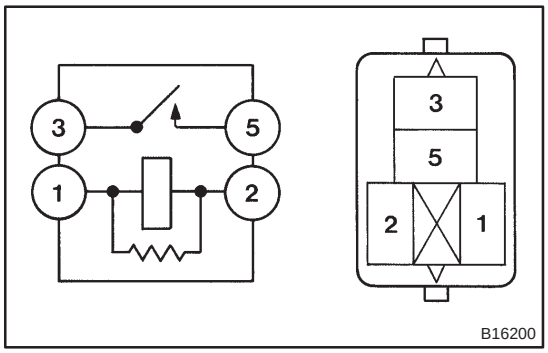
Terminal No.	Resistance
1 (HT) – 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT) – 4 (E1)	No Continuity



NG → **REPLACE HEATED OXYGEN SENSOR**

OK

22 INSPECT EFI RELAY



(a) Remove the EFI relay from the engine room R/B No. 4.

(b) Inspect the EFI relay.

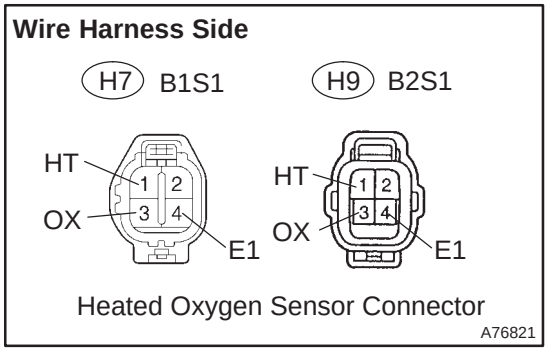
Standard:

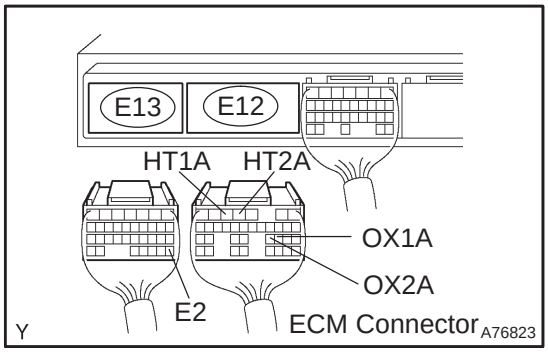
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

23 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)





(a) Disconnect the H7 or H9 heated oxygen sensor connector.

(b) Disconnect the E12 and E13 ECM connectors.

(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
OX (H7–3) – OX1A (E12–22)	Continuity
HT (H7–1) – HT1A (E12–5)	
E1 (H7–4) – E2 (E13–28)	
OX (H8–3) – OX2A (E12–23)	
HT (H8–1) – HT2A (E12–4)	
E1 (H8–4) – E2 (E13–28)	

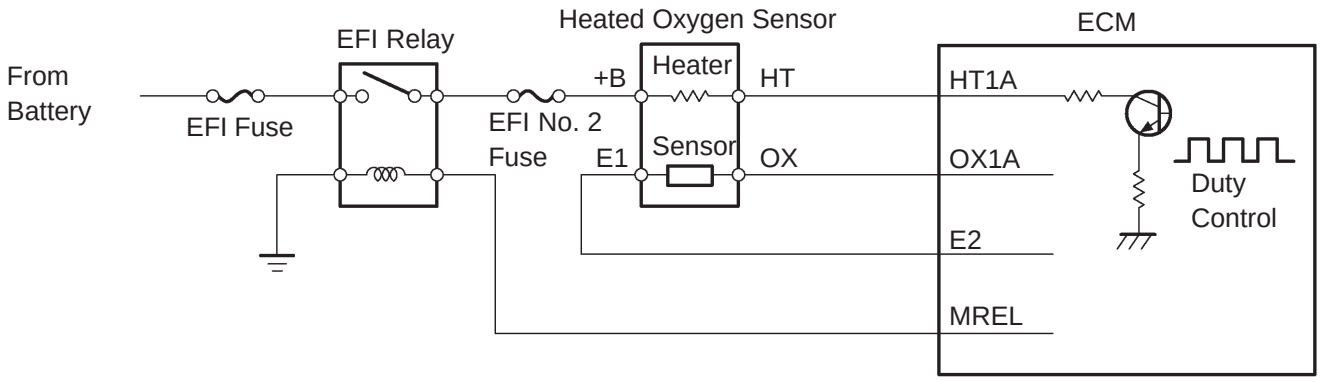
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
OX (H7–3) or OX1A (E12–22) – Body ground	No continuity
HT (H7–1) or HT1A (E12–5) – Body ground	
OX (H8–3) or OX2A (E12–23) – Body ground	
HT (H8–1) or HT2A (E12–4) – Body ground	

HINT:

- The OX1A and HT1A means the heated oxygen sensor bank 1 sensor 1.
- The OX2A and HT2A means the heated oxygen sensor bank 2 sensor 1.

Reference (Bank 1 Sensor 1 System Drawing)



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

24 REPLACE HEATED OXYGEN SENSOR

GO

25	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

26	READ OUTPUT DTC(DTC P0171, P0172, P0174 AND/OR P0175 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC "P0171, P0172, P0174 and/or P0175" are not output again	A
DTC "P0171, P0172, P0174 and/or P0175" are output again	B

B → CHECK AND REPLACE ECM (See page 01–32) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05–363)

A

27	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

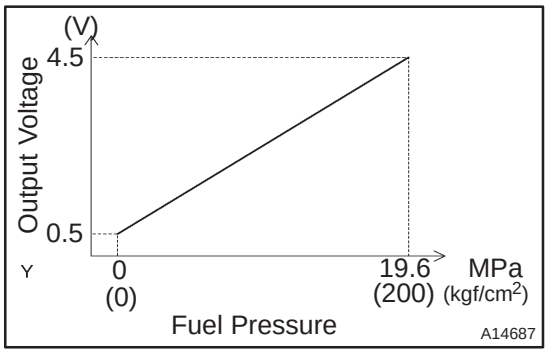
NO → CHECK FOR INTERMITTENT PROBLEMS

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL (DTCS P0171, P0172, P0174 AND/OR P0175)

DTC P0190 FUEL RAIL PRESSURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION



The fuel pressure sensor is installed on a fuel delivery pipe and detects the fuel pressure. It controls of feedback the pump discharge in order to keep the fuel at target pressure 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi) by the ECM.

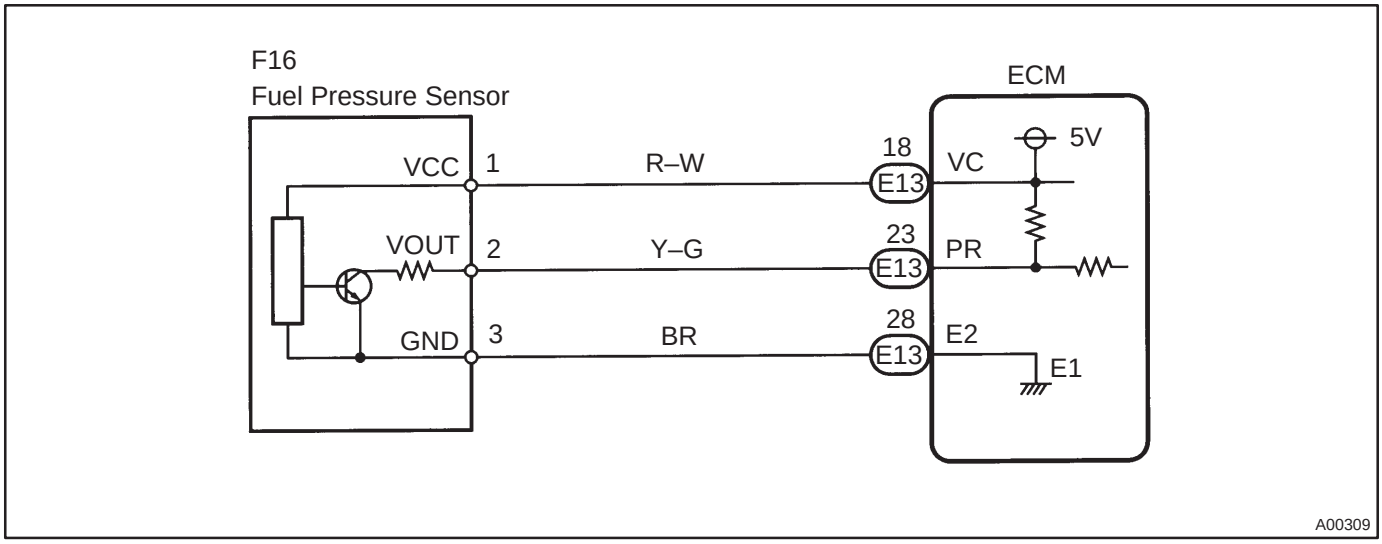
DTC No.	DTC Detection Condition	Trouble Area
P0190	Open or short in fuel pressure sensor circuit	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM

HINT:

After confirming DTC ”P0190”, use the hand–held tester to confirm the delivery pipe pressure from ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Fuel Pressure (MPa)	Malfunction
Approximately 0	• PR circuit short
19.6 or more	• VC circuit open or short • PR circuit open • E2 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 READ VALUE OF HAND–HELD TESTER(FUEL PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL PRESS” and read its value displayed on the hand–held tester.
Pressure: 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi)
Result:

Fuel Pressure (MPa)	Proceed to
19.6 or more	A
0.0	B
OK (8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi)) (*1)	C

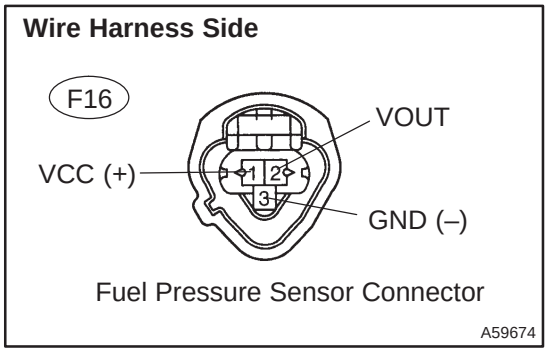
*1: The value must be changed when the engine is run or stopped.

B → **Go to step 3**

C → **CHECK FOR INTERMITTENT PROBLEMS**

A

2 INSPECT FUEL PRESSURE SENSOR(VCC VOLTAGE)



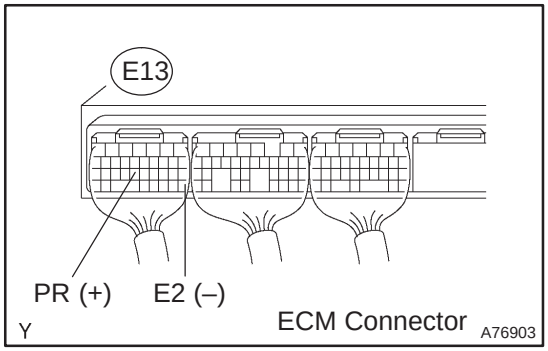
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the F16 fuel pressure sensor connector.
Standard:

Symbols (Terminal No.)	Specified condition
VCC (F16–1) – GND (F16–3)	4.5 to 5.5 V

NG → **Go to step 4**

OK

3 INSPECT ECM(PR VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
PR (E13–23) – E2 (E13–28)	2.1 to 3.2 V at 25°C (77°F)

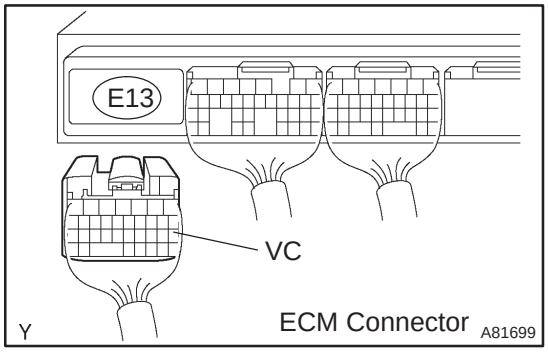
HINT:
The fuel pressure in the delivery pipe is 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi)

NG → **Go to step 5**

OK

CHECK AND REPLACE ECM (See page 01–32)

4 CHECK HARNESS AND CONNECTOR(ECM – FUEL PRESSURE SENSOR)



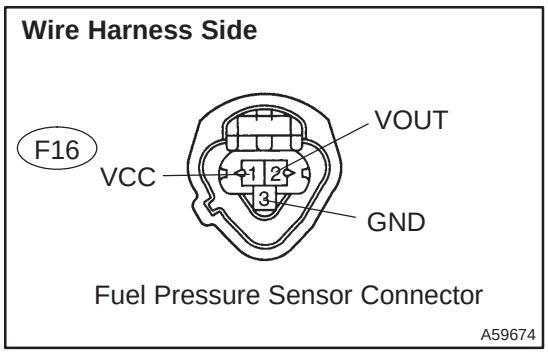
(a) Disconnect the E13 ECM connector.
(b) Disconnect the F16 fuel pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (E13–18) – VCC (F16–1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (E13–18) or VCC (F16–1) – Body ground	No continuity

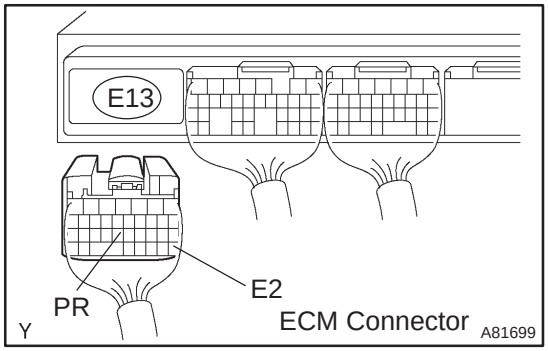


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

5 CHECK HARNESS AND CONNECTOR(ECM – FUEL PRESSURE SENSOR)



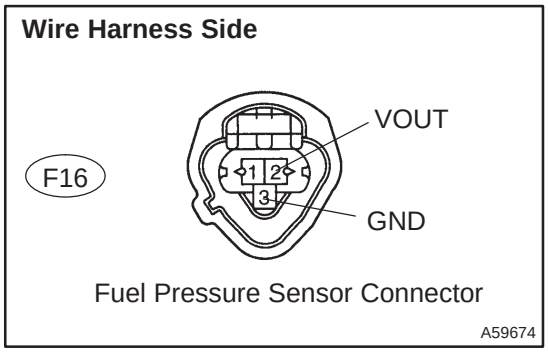
(a) Disconnect the E13 ECM connector.
(b) Disconnect the F16 fuel pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
PR (E13–23) – VOUT (F16–2)	Continuity
E2 (E13–28) – GND (F16–3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
PR (E13–23) or VOUT (F16–2) – Body ground	No continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

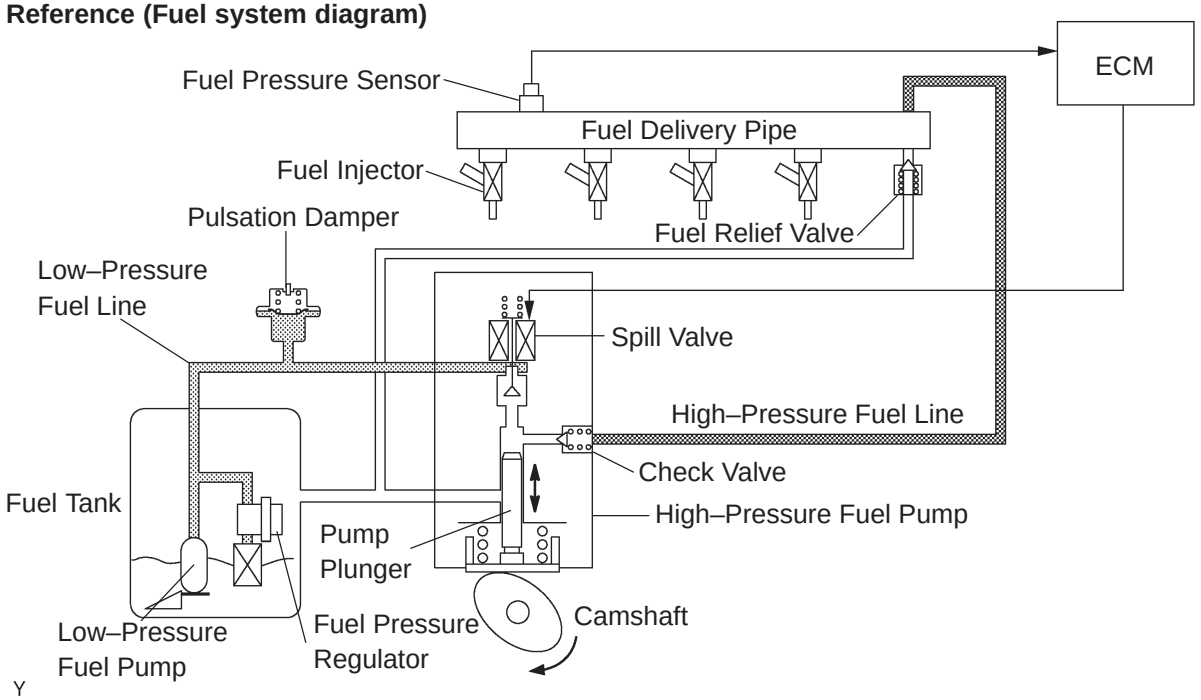
REPLACE FUEL PRESSURE SENSOR

DTC	P0191	FUEL RAIL PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The high–pressure fuel system consists of the spill valve, pump plunger, check valve, fuel relief valve and fuel pressure sensor. The spill valve opens and closes the low–pressure fuel line (from the fuel tank), the pump plunger operated by the camshaft pressurizes fuel, the check valve mechanically opens and closes the high–pressure fuel line (to the fuel delivery pipe), the fuel relief valve prevents fuel pressure from becoming extremely high, and the fuel pressure sensor located on the fuel delivery pipe monitors fuel pressure.
The high–pressure fuel pump is mounted on the cylinder head cover, and its plunger is operated by the cam located between #3 and #4 on the intake camshaft. Let the plunger moves up and down by the camshaft rotations, it produces vacuum to suck fuel and pressurizes the fuel. This fuel then pushes the check valve open and flows into the fuel delivery pipe. The ECM opens and closes the spill valve to regulate the fuel pressure to the target fuel pressure 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi). In order to obtain and maintain the target pressure, the ECM monitors the fuel pressure using the fuel pressure sensor and performs the feedback control.
If the internal fuel pressure of the fuel delivery pipe exceeds beyond the standard pressure 14 MPa (142.8 kgf/cm^2, 2,030 psi), the fuel relief valve installed on gateway of the fuel delivery pipe discharges the fuel pressure and then returns the fuel back to the fuel tank.

Reference (Fuel system diagram)



DTC No.	DTC Detection Condition	Trouble Area
P0191	After the fuel pressure is stable for 3 seconds or more, the following condition (a) or (b) continues for more than 10 seconds: (a) ECM did not command the high–pressure fuel pump to open the spill valve, but fuel pressure increases 3 MPa (30.6 kgf/cm^2, 435 psi). (b) Despite ECM commanded the high–pressure fuel pump to open the spill valve, fuel pressure decreases 5 MPa (51.0 kgf/cm^2, 725 psi).	• Open or short in high–pressure fuel pump (spill valve) circuit • High–pressure fuel pump • Low–pressure fuel pump • Fuel pipe • Fuel relief valve • Fuel pressure regulator • ECM

WIRING DIAGRAM

Refer to DTC P1235 on page 05–477.

INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0191)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0191” is output	A
”P0191” and other DTCs are output	B

HINT:
If any other codes besides ”P0191” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2 READ VALUE OF HAND–HELD TESTER(FUEL PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL PRESS” and read its value displayed on the hand–held tester.
Pressure: 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi)

NG → **Go to step 10**

OK

3 CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → **Go to step 12**

OK

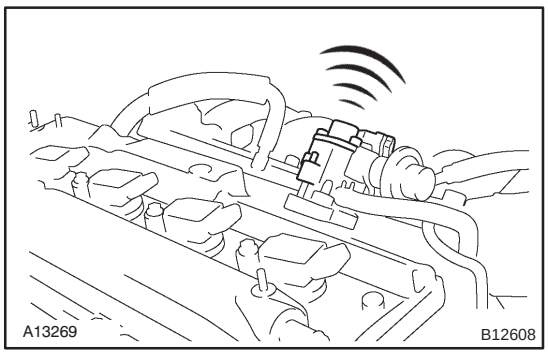
4 CHECK FOR FUEL LEAKS(HIGH PRESSURE)

(a) Check if there is leakage in the fuel pipe located between the high–pressure fuel pump and the injectors.

NG → REPAIR OR REPLACE A PLACE FUEL LEAKS

OK

5 CHECK FUEL PUMP(HIGH PRESSURE)



(a) With the engine running or cranking, use a sound scope to check that there is the normal operating sounds of the fuel pump (high–pressure) when it is operated.

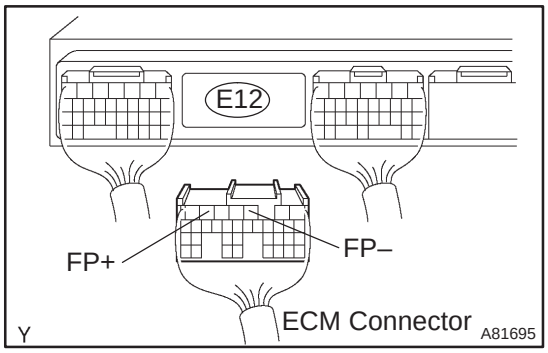
Standard:

There is the operating sounds of the fuel pump (high–pressure).

NG → REPAIR OR REPLACE FUEL PUMP ASSY

OK

6 CHECK HARNESS AND CONNECTOR(ECM – HIGH PRESSURE FUEL PUMP (SPILL VALVE))



(a) Disconnect the E12 ECM connector.

(b) Disconnect the S3 high–pressure fuel pump (spill valve) connector.

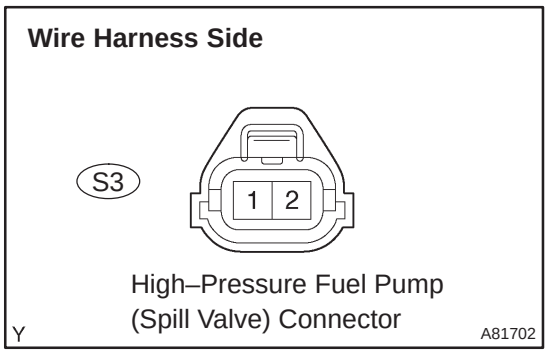
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
FP+ (E12–6) – Fuel pump (S3–1)	Continuity
FP– (E12–3) – Fuel pump (S3–2)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
FP+ (E12–6) or Fuel pump (S3–1) – Body ground	No continuity
FP– (E12–3) or Fuel pump (S3–2) – Body ground	



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	CHECK IF DTC OUTPUTS REOCCUR(DTC P0191 IS OUTPUT AGAIN)

(a) Clear the DTC (See page 05–294).
(b) Warm up the engine.
(c) Let the engine idle for 30 seconds or more.
(d) Read the DTC (See page 05–294).

Result:

Display (DTC output)	Proceed to
”P0191” is output again	A
No DTC output	B

B → CHECK FOR INTERMITTENT PROBLEMS

A

8	REPLACE FUEL RELIEF VALVE ASSY

GO

9	CHECK IF DTC OUTPUTS REOCCUR(DTC P0191 IS OUTPUT AGAIN)

(a) Clear the DTC (See page 05–294).
(b) Warm up the engine.
(c) Let the engine idle for 30 seconds or more.
(d) Read the DTC (See page 05–294).

Result:

Display (DTC output)	Proceed to
”P0191” is output again	A
No DTC output	B

B → SYSTEM OK

A

REPLACE FUEL PUMP ASSY (HIGH PRESSURE)

10	CHECK OPERATION OF FUEL PUMP(LOW PRESSURE) (See page 11–33)

OK → Go to step 3

NG

11	CHECK VOLTAGE FUEL PUMP(LOW PRESSURE) (See page 05–507)

OK → Go to step 3

NG

CHECK FOR FUEL PUMP CONTROL CIRCUIT (See page 05–507)

12	CHECK FOR FUEL LEAKS(LOW PRESSURE)

(a) Check if there is leakage in the fuel pipe located between the fuel tank and the high–pressure fuel pump.

NG → REPAIR OR REPLACE A PLACE FUEL LEAKS

OK

REPLACE FUEL PRESSURE REGULATOR ASSY

DTC	P0200	INJECTOR CIRCUIT / OPEN

DTC	P0201	INJECTOR CIRCUIT / OPEN – (CYLINDER 1)

DTC	P0202	INJECTOR CIRCUIT / OPEN – (CYLINDER 2)

DTC	P0203	INJECTOR CIRCUIT / OPEN – (CYLINDER 3)

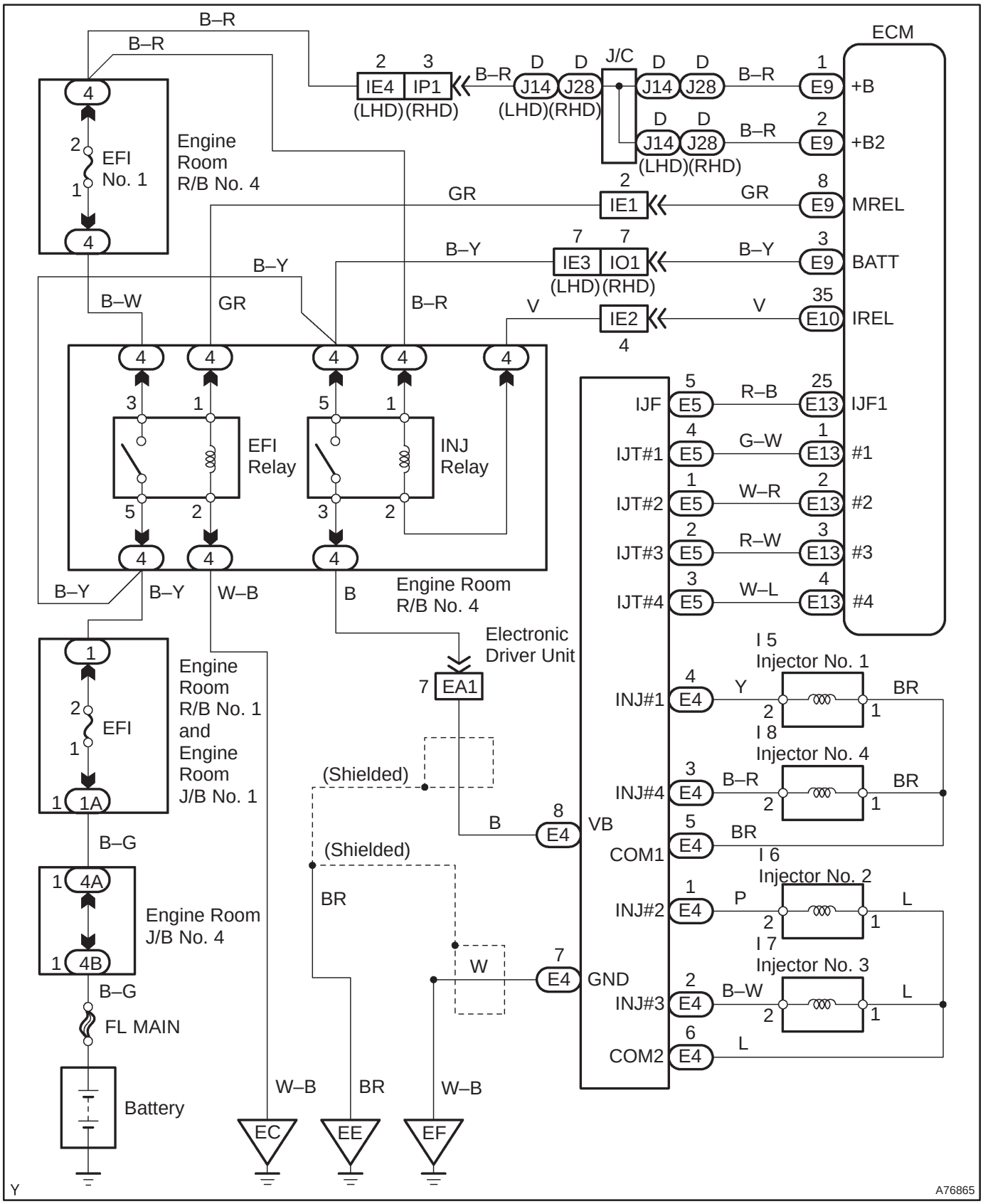
DTC	P0204	INJECTOR CIRCUIT / OPEN – (CYLINDER 4)

CIRCUIT DESCRIPTION

The Electronic Driver Unit (EDU) has been adopted to operate the injector at high speed. The EDU enables the injector to drive in high–speed rate under high–pressure fuel condition using its internal DC/DC converter that provides high voltage and quick–charging system.
The ECM constantly monitors the EDU. If the ECM detects abnormal condition, it will stop the engine.

DTC No.	DTC Detection Condition	Trouble Area
P0200	No IJF signals to ECM despite crankshaft rotating 10 times (1 trip detection logic).	• Open or short in EDU circuit • EDU (Injector driver) • Fuel injector assy • ECM
	No IJF signals to ECM despite crankshaft rotating 20 times during cranking (2 trip detection logic).	
P0201 P0202 P0203 P0204	No IJF signals of each cylinder to ECM 20 times successively (1 trip detection logic).	

WIRING DIAGRAM

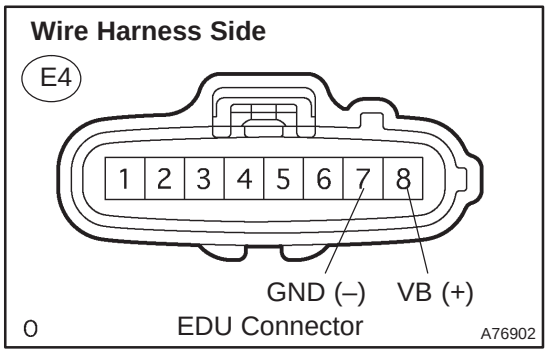


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK INJECTOR DRIVER(POWER SOURCE OF EDU)



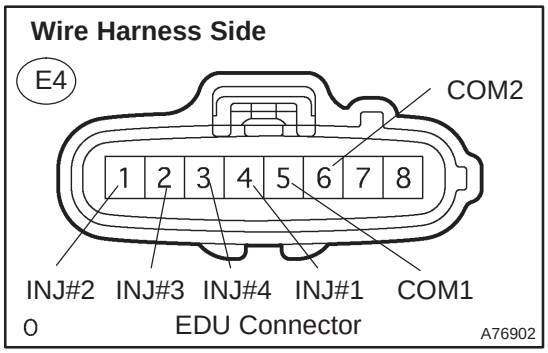
(a) Disconnect the E4 EDU connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the specified terminals of the EDU connector.

Symbols (Terminal No.)	Specified condition
VB (E4–8) – GND (E4–7)	9 to 14 V

NG → CHECK EDU POWER SOURCE CIRCUIT

OK

2 CHECK HARNESS AND CONNECTOR(EDU – FUEL INJECTOR)



(a) Disconnect the E4 EDU connector.
(b) Measure the resistance between the specified terminals of the EDU connector.

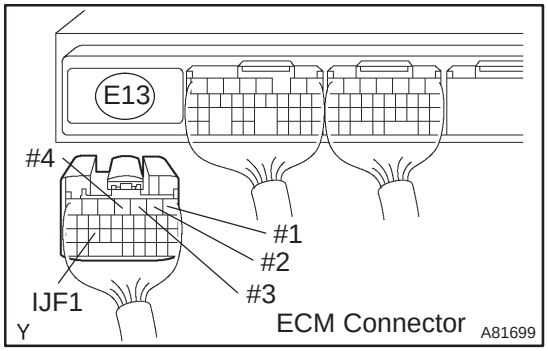
Standard:

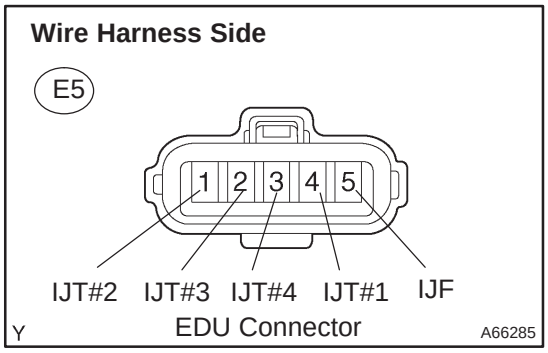
Symbols (Terminal No.)	Specified condition
INJ#1 (E4–4) – COM1 (E4–5)	2.55 to 2.85 Ω at 20 °C (68 °F)
INJ#2 (E4–1) – COM2 (E4–6)	
INJ#3 (E4–2) – COM2 (E4–6)	
INJ#4 (E4–3) – COM1 (E4–5)	

NG → Go to step 6

OK

3 CHECK HARNESS AND CONNECTOR(ECM – EDU)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the E5 EDU connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IJF1 (E13–25) – IJF (E5–5)	Continuity
#1 (E13–1) – IJT#1 (E5–4)	
#2 (E13–2) – IJT#2 (E5–1)	
#3 (E13–3) – IJT#3 (E5–2)	
#4 (E13–4) – IJT#4 (E5–3)	

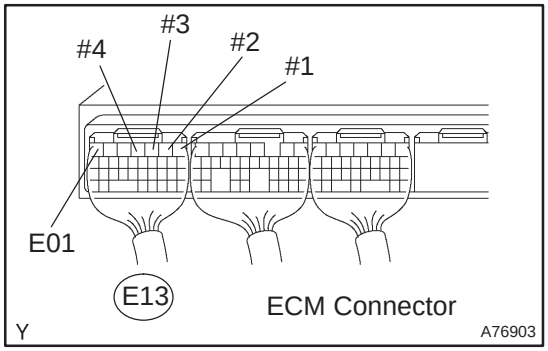
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IJF1 (E13–25) or IJF (E5–5) – Body ground	No continuity
#1 (E13–1) or IJT#1 (E5–4) – Body ground	
#2 (E13–2) or IJT#2 (E5–1) – Body ground	
#3 (E13–3) or IJT#3 (E5–2) – Body ground	
#4 (E13–4) or IJT#4 (E5–3) – Body ground	

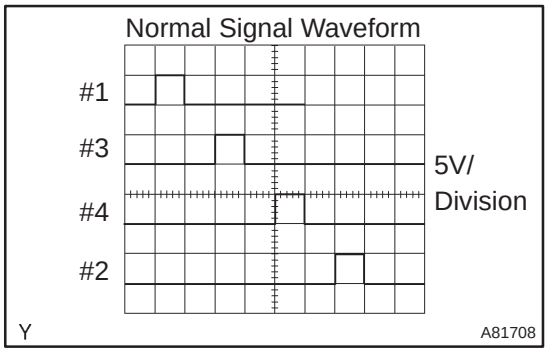
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 CHECK ECM(#1, #2, #3 AND #4 VOLTAGE)



(a) Connect an oscilloscope to terminals #1 – #4 and E01 of the E13 ECM harness side connector.



(b) With the engine cranking or idling, check the signal waveform.

Standard:

Signal waveform appears as shown in the illustration.

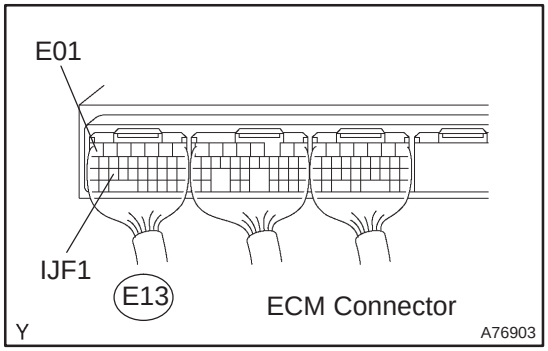
HINT:

Check the waveform before the ECM detects the DTC(s) and enters the fail–safe mode, because the ECM will no more indicate the voltage output once it enters the fail–safe mode.

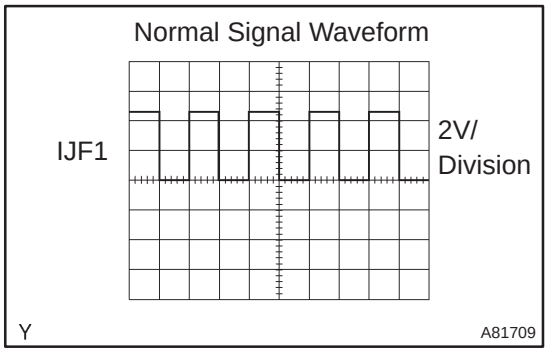
NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

5	CHECK ECM(IJF1 VOLTAGE)



(a) Connect an oscilloscope to terminals IJF1 and E01 of the E13 ECM harness side connector.



(b) With the engine cranking or idling, check the signal waveform.

Standard:

Signal waveform appears as shown in the illustration.

HINT:

Check the waveform before the ECM detects the DTC(s) and enters the fail–safe mode, because the EDU will no more indicate the voltage output once the ECM enters the fail–safe mode.

NG → **REPLACE INJECTOR DRIVER**

OK

CHECK FOR INTERMITTENT PROBLEMS

6	INSPECT FUEL INJECTOR ASSY (See page 11–36)

NG → **REPLACE FUEL INJECTOR ASSY**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC	P0300	RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED

DTC	P0301	CYLINDER 1 MISFIRE DETECTED

DTC	P0302	CYLINDER 2 MISFIRE DETECTED

DTC	P0303	CYLINDER 3 MISFIRE DETECTED

DTC	P0304	CYLINDER 4 MISFIRE DETECTED

CIRCUIT DESCRIPTION

Misfire: The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation for each cylinder.

The ECM counts the number of times the engine speed change rate indicates that misfire has occurred. And when the misfire rate equals to or exceeds the count of indicating that the engine condition has deteriorated, the CHK ENG is illuminated.

If the misfire rate is high enough and the driving conditions will cause the catalyst to overheat, the CHK ENG blinks when misfiring occurs.

HINT:

- For any particular 200 revolutions of the engine, misfiring which would result in overheating of catalyst is detected. This cause CHK ENG to blink (1 trip detection logic).
- For any particular 1,000 revolutions of engine, misfiring which would result in a deterioration of emissions. This illuminates CHK ENG (2 trip detection logic).

DTC No.	DTC Detection Condition	Trouble Area
P0300	Misfiring of random cylinders is detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • PCV hose • ECM
P0301 P0302 P0303 P0304	Misfiring of each cylinder is detected	

HINT:

When codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires have been detected and recorded at different times.

WIRING DIAGRAM

Refer to DTC P0200 on page 05–415 for the wiring diagram of the injector system.
Refer to DTC P0351 on page 05–439 for the wiring diagram of the ignition system.

CONFIRMATION DRIVING PATTERN

(a) Connect the hand–held tester to the DLC3.
(b) Record the DTC and freeze frame data.
(c) Use the hand–held tester to set to the check (test) mode (See page 05–294).
(d) Read the value on the misfire counter for each cylinder when idling. If the value is displayed on the misfire counter, skip the following procedure of confirmation driving.
(e) Drive the vehicle several times with the engine speed, load and its surrounding range shown with ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the DATA LIST.

If you have no hand–held tester, turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again.
HINT:
In order to memorize the DTC of misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD for the following period of time in the DATA LIST. Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check (test) mode to normal mode. So all DTCs, etc., will be erased.

Engine Speed	Time
Idling	3 minutes and 30 seconds or more
1,000 rpm	3 minutes or more
2,000 rpm	1 minutes and 30 seconds or more
3,000 rpm	1 minute or more

(f) Check whether there is misfire or not by monitoring the DTC and the freeze frame data, and then, record them.
(g) Turn the ignition switch OFF and wait at least for 5 seconds.

INSPECTION PROCEDURE

HINT:

- If DTCs besides misfire are memorized simultaneously, first perform the troubleshooting for them.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If the misfire does not occur when the vehicle is brought to the workshop, misfire can be confirmed by reproducing the condition of the freeze frame data. Also, after finishing the repair, confirm that there is no misfire (See confirmation driving pattern).
- When either of SHORT FT #1, LONG FT #1, SHORT FT #2 or LONG FT #2 in the freeze frame data is over the range of ±20 %, there is a possibility that the air–fuel ratio is inclining either to ”RICH” (–20 % or less) or ”LEAN” (+20 % or more).
- When COOLANT TEMP in the freeze frame data is less than 80˚C (176˚F), there is a possibility of misfire only during warming up the engine.
- If the misfire cannot be reproduced, the reason may be because of the driving the vehicle with lack of fuel, the use of improper fuel, a stain on the ignition plug, etc.
- Be sure to check the value on the misfire counter after the repair.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO MISFIRE DTCS)

(a) Read the DTC using the hand–held tester.
Result :

Display	Proceed to
DTC "P0300, P0301, P0302, P0303 and/or P0304" are output.	A
DTC "P0300, P0301, P0302, P0303 or P0304" and other codes are output.	B

HINT:
If any other codes besides "P0300, P0301, P0302, P0303 and/or P0304" are output, perform the trouble-shooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	CHECK WIRE HARNESS, CONNECTOR AND VACUUM HOSE IN ENGINE ROOM

(a) Check the connection conditions of the wire harness and connector.
(b) Check the disconnection, piping and break of the vacuum hose.

NG → **REPAIR OR REPLACE, THEN CONFIRM THAT THERE IS NO MISFIRE**

OK

3	CHECK CONNECTION OF PCV HOSE

NG → **REPAIR OR REPLACE PCV HOSE**

OK

4	READ VALUE OF HAND–HELD TESTER(NUMBER OF MISFIRE)

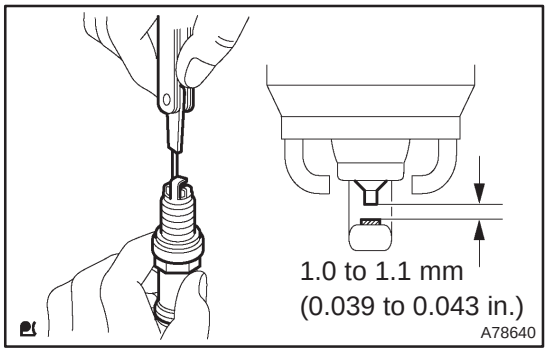
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / CYL#1 – CYL#4".
(e) Read the number of misfire on the hand–held tester.
HINT:
When a misfire is not reproduced, be sure to branch below based on the stored DTC.
Result:

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → **Go to step 12**

A

5	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER



(a) Remove the ignition coil with igniter assy.
(b) Remove the spark plug.
(c) Check the spark plug type.
Recommended spark plug:

DENSO made	SK20BR11

(d) Check the spark plug electrode gap.
Electrode gap: 1.0 to 1.1 mm (0.039 to 0.043 in.)
Maximum electrode gap: 1.3 mm (0.051 in.)

NOTICE:
If adjusting the gap of a new spark plug, bend only the base the ground electrode. Do not touch the tip. Never attempt to adjust the gap on a used plug.

(e) Check the electrode for carbon deposits.
(f) Perform a spark test.

CAUTION:
Each injector connector must be disconnected.
NOTICE:
Do not crank the engine for more than 2 seconds.

(1) Install the spark plug to the ignition coil with igniter, and connect the ignition coil with igniter connector.
(2) Disconnect the injector connectors.
(3) Ground the spark plug.
(4) Check if spark occurs while the engine is being cranked.

Standard: Spark jumps across electrode gap.

NG → **Go to step 19**

OK

6	CHECK CYLINDER COMPRESSION PRESSURE OF MISFIRING CYLINDER (See page 14–181)

NG → **REPAIR OR REPLACE**

OK

7	CHECK VALVE CLEARANCE OF MISFIRING CYLINDER (See page 14–186)

NG → **ADJUST VALVE CLEARANCE (See page 14–186)**

OK

8	REPLACE FUEL INJECTOR OF MISFIRING CYLINDER

(a) Read the DTC and check which of the cylinders causes the misfiring DTC (See page 05–294).
(b) Remove the injector of the misfiring cylinder and other normal injector (See page 11–42).
(c) Swap the injector of misfiring cylinder for the normal injector.

GO

9	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

10	READ OUTPUT DTC(MISFIRE DTCS ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
The same DTC is output again	A
The other DTC is output	B

B → REPLACE FUEL INJECTOR ASSY

A

11	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)

- If the result of step 4 is ”1 or 2 cylinders”, proceed to A.
- If the result of step 4 is ”more than 3 cylinders”, proceed to B.

B → CHECK FOR INTERMITTENT PROBLEMS

A

12	CHECK VALVE TIMING(CHECK FOR LOOSE AND JUMPING TEETH)

NG → ADJUST VALVE TIMING

OK

13	CHECK FUEL PRESSURE(LOW PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

14	CHECK FUEL PRESSURE(HIGH PRESSURE) (See page 11–33)

NG → CHECK AND REPLACE FUEL PUMP, FUEL PRESSURE SENSOR, WIRING AND FUEL LEAKAGE

OK

15	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE AND MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Check the intake air temperature.
  (1) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.

  Temperature: Equivalent to ambient temperature
(d) Check the air flow rate.
  (1) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

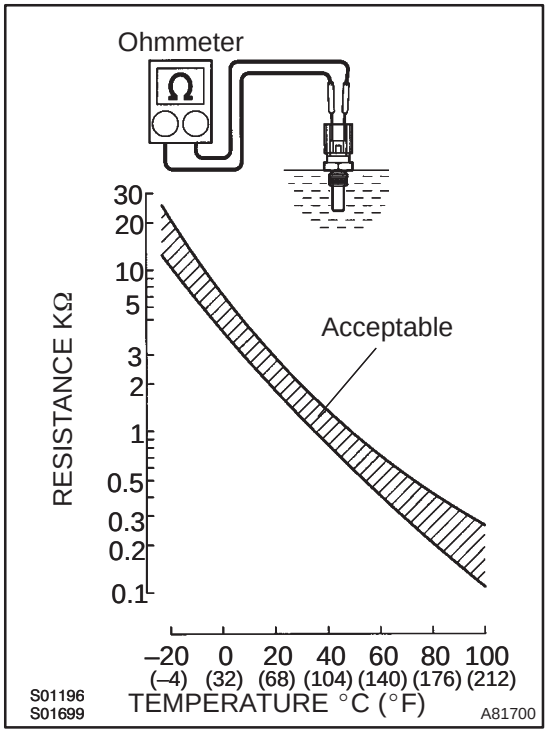
  Standard:

Condition	Air flow rate (gm/s)
Ignition switch ON (do not start engine)	0
Idling	4 to 6
Running without load (2,500 rpm)	13 to 20
Idling – Running	Air flow rate fluctuates

NG → REPLACE MASS AIR FLOW METER

OK

16	INSPECT ENGINE COOLANT TEMPERATURE SENSOR



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals.
Resistance:
2.32 to 2.59 kΩ at 20°C (68°F)
0.310 to 0.326 kΩ at 80°C (176°F)

NOTICE:
In case of checking the engine coolant temperature sensor in the water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:
Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

17	INSPECT MANIFOLD ABSOLUTE PRESSURE SENSOR (See page 05–342)

NG → **REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR**

OK

18	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)

- If the result of step 4 is ”1 or 2 cylinders”, proceed to A.
- If the result of step 4 is ”more than 3 cylinders”, proceed to B.

B → **AGAIN GO TO STEP 5**

A

CHECK FOR INTERMITTENT PROBLEMS

19	INSPECT CHANGE NORMAL SPARK PLUG AND CHECK SPARK OF MISFIRING CYLINDER

(a) Change to the normal spark plug.
(b) Perform a spark test.

CAUTION:
Each injector connector must be disconnected.
NOTICE:
Do not crank the engine for more than 2 seconds.

(1) Install the spark plug to the ignition coil, and connect the ignition coil connector.
(2) Disconnect the injector connectors.
(3) Ground the spark plug.
(4) Check if spark occurs while the engine is being cranked.

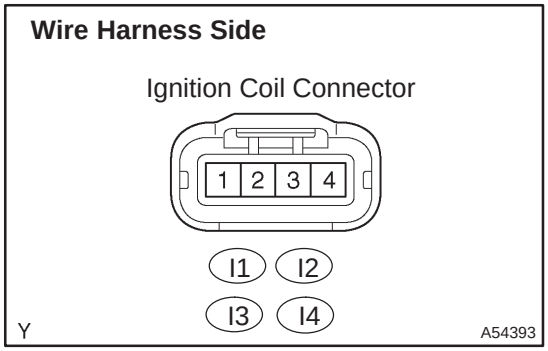
Standard: Spark jumps across electrode gap.

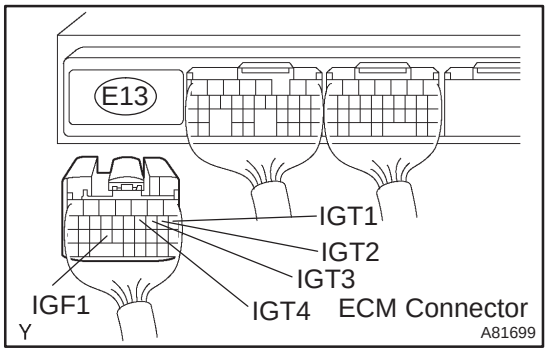
NG → **Go to step 20**

OK

REPLACE SPARK PLUG

20	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(IGNITION COIL ASSY – ECM)





(a) Check the harness and connector between the ignition coil and ECM (IGF terminal) connectors
(1) Disconnect the I1, I2, I3 or I4 ignition coil connector.
(2) Disconnect the E13 ECM connector.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–2) – IGF1 (E13–24)	Continuity
Ignition coil (I2–2) – IGF1 (E13–24)	
Ignition coil (I3–2) – IGF1 (E13–24)	
Ignition coil (I4–2) – IGF1 (E13–24)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–2) or IGF1 (E13–24) – Body ground	No continuity
Ignition coil (I2–2) or IGF1 (E13–24) – Body ground	
Ignition coil (I3–2) or IGF1 (E13–24) – Body ground	
Ignition coil (I4–2) or IGF1 (E13–24) – Body ground	

(b) Check the harness and connector between the ignition coil and ECM (IGT terminal) connectors
(1) Disconnect the I1, I2, I3 or I4 ignition coil connector.
(2) Disconnect the E13 ECM connector.
(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–3) – IGT1 (E13–8)	Continuity
Ignition coil (I2–3) – IGT2 (E13–9)	
Ignition coil (I3–3) – IGT3 (E13–10)	
Ignition coil (I4–3) – IGT4 (E13–11)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–3) or IGT1 (E13–8) – Body ground	No continuity
Ignition coil (I2–3) or IGT2 (E13–9) – Body ground	
Ignition coil (I3–3) or IGT3 (E13–10) – Body ground	
Ignition coil (I4–3) or IGT4 (E13–11) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE IGNITION COIL ASSY (THEN CONFIRM THAT THERE IS NO MISFIRE)

DTC	P0325	KNOCK SENSOR 1 CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0327	KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

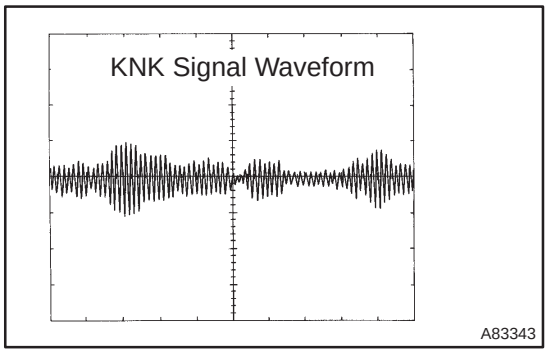
DTC	P0328	KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

A flat type knock sensor (non–resonant type) has a structure that can detect vibrations in a wide frequency range, from about 6 kHz to 15 kHz, and has the following features.
Knock sensor is fitted on the cylinder block to detect the engine knocking.
The knock sensor contains a piezoelectric element which generates a voltage when it becomes deformed. This occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is retarded to suppress it.

DTC No.	DTC Detection Condition	Trouble Area
P0325	Output voltage of the knock sensor decreases beyond a threshold. (Threshold varies according to an engine speed.)	• Knock sensor • Knock sensor (under–torqued or loose) • ECM
P0327	Output voltage of the knock sensor is 0.5 V or less.	• Short in knock sensor circuit • Knock sensor • ECM
P0328	Output voltage of the knock sensor is 4.5 V or more.	• Open in knock sensor circuit • Knock sensor • ECM

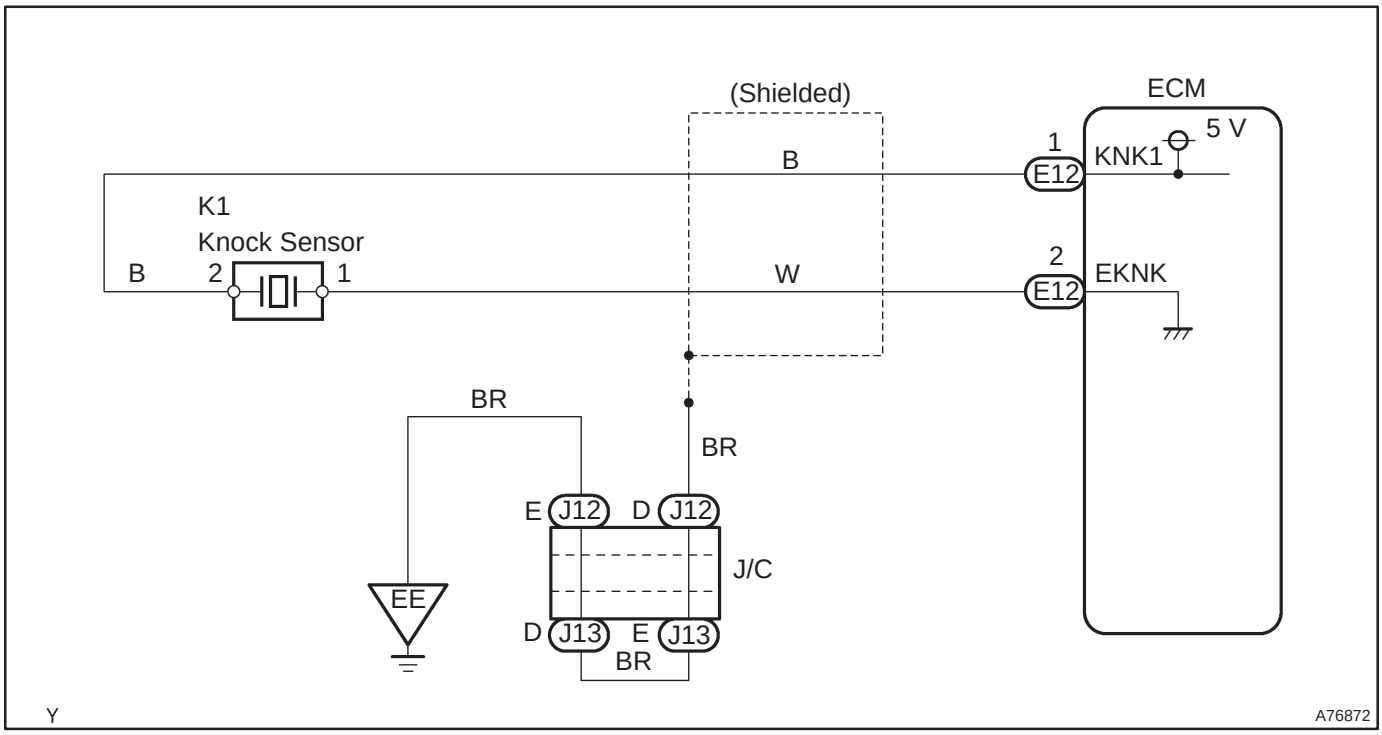
HINT:
If the ECM detects above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.



Reference:
The correct waveform is shown in the diagram on the left.

Item	Details
Terminal	KNK1 – EKNK
Equipment Settings	0.01 to 10 V/ Division, 0.01 to 10 msec./ Division
Condition	After warming up the engine, keep the engine speed at 4,000 rpm.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ OUTPUT DTC

(a) Clear the DTC (See page 05–294).
(b) Warm up the engine.
(c) Run the engine at 3,000 rpm for 10 seconds or more.
(d) Read the DTC (See page 05–294).

Result :

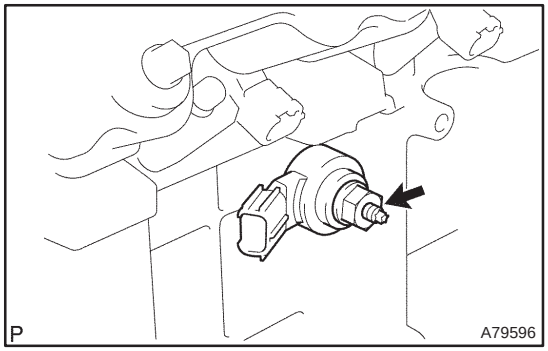
Display (DTC output)	Proceed to
Only ”P0325” is output again	A
”P0325, P0327 and/or P0328” are output again	B
”P0325, P0327 and/or P0328” are not output again	C

B	Go to step 3

C	CHECK FOR INTERMITTENT PROBLEMS

A

2 CHECK KNOCK SENSOR



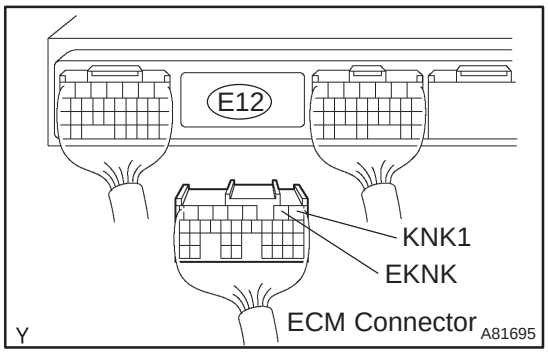
(a) Check the knock sensor installation.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

NG → **TIGHTEN SENSOR**

OK

REPLACE KNOCK SENSOR

3 CHECK HARNESS AND CONNECTOR(ECM – KNOCK SENSOR)

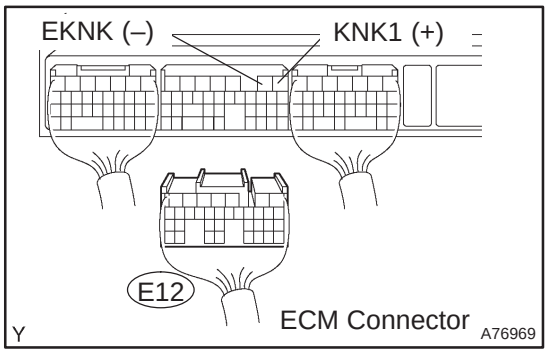


(a) Disconnect the E12 ECM connector.
(b) Measure the resistance between terminals KNK1 (E12–1) and EKNK (E12–2) of the ECM connector.
Resistance: 120 to 280 kΩ at 20°C (68°F)

NG → **Go to step 5**

OK

4 INSPECT ECM(KNK1 VOLTAGE)



(a) Disconnect the E12 ECM connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between terminals KNK1 (E12–1) and EKNK (E12–2) of the ECM terminals.
Voltage: 4.5 to 5.5 V

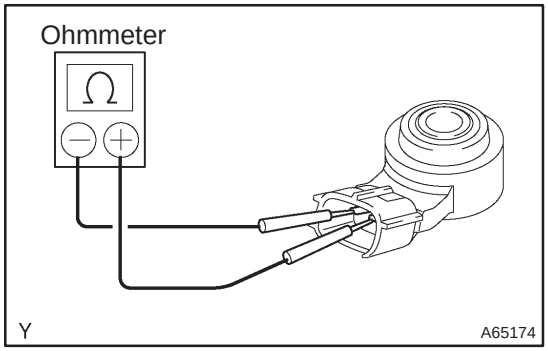
NG → **REPLACE ECM (See page 10–65)**

OK

CHECK FOR INTERMITTENT PROBLEMS

NOTICE:
Fault may be intermittent. Check harness and connectors carefully and result.

5	INSPECT KNOCK SENSOR



(a) Remove the knock sensor.
(b) Measure the resistance between the terminals.
Resistance: 120 to 280 kΩ at 20°C (68°F)

NG → **REPLACE KNOCK SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

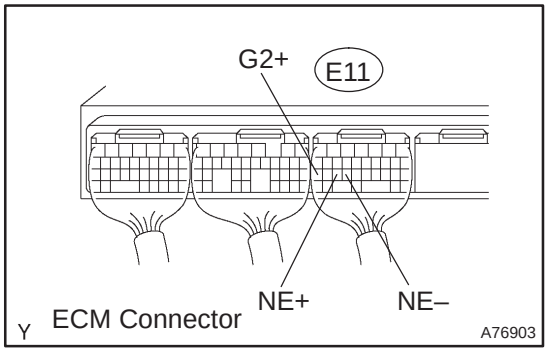
DTC	P0335	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT

DTC	P0339	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT INTERMITTENT

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a magnet, iron core and pick up coil.
The NE signal plate (crankshaft position sensor plate No. 1) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signal, and the cylinder and the angle of the VVT based on the combination of the G2 and NE signal.

DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor (NE) signal to ECM during cranking for 3 sec. or more (2 trip detection logic).	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft position sensor plate No. 1) • ECM
	No crankshaft position sensor (NE) signal to ECM with engine speed 600 rpm or more (2 trip detection logic).	
P0339	In condition (a), (b) and (c), when no crankshaft position sensor (NE) signal is input for 0.05 sec. or more (1 trip detection logic): (a) Engine revolution 1,000 rpm or more (b) STA signal is OFF (c) 3 sec. or more has been lapsed after STA signal is switched from ON to OFF.	

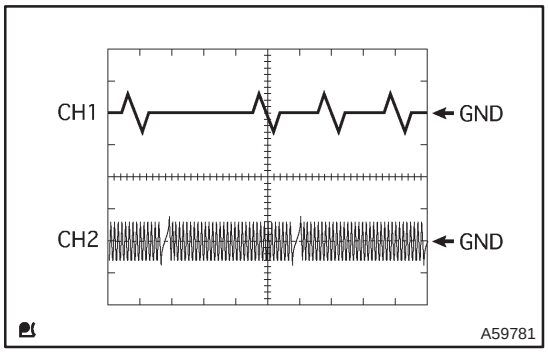


Reference: Inspection using the oscilloscope.

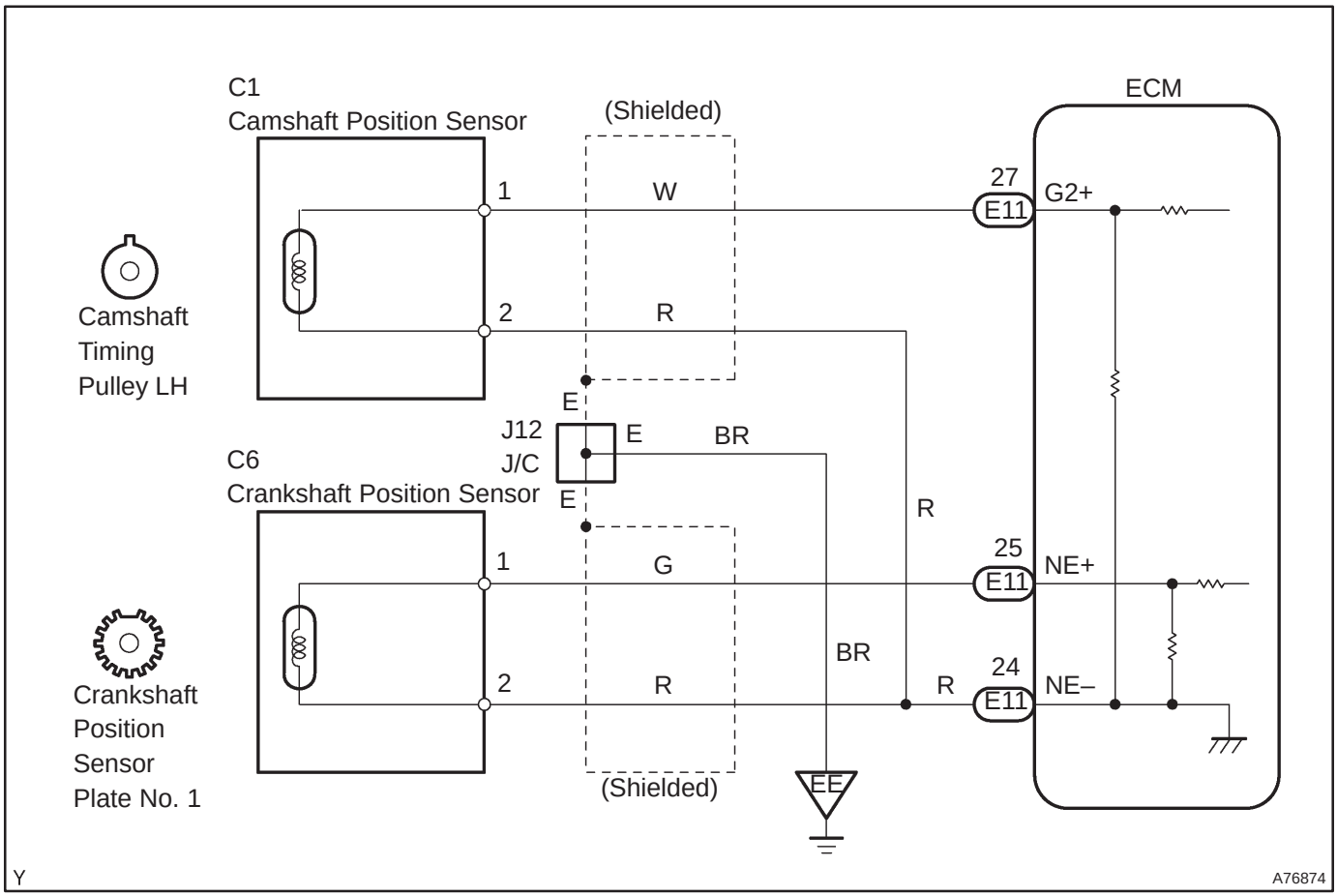
(1) During cranking or idling, check the waveform between the terminals of the ECM connector.

Item	Details
Terminal	CH1: G2+ – NE– CH2: NE+ – NE–
Equipment Setting	5 V/Division, 20 ms/Division
Condition	During Cranking or idling

HINT:
The correct waveforms are as shown in the left.



WIRING DIAGRAM



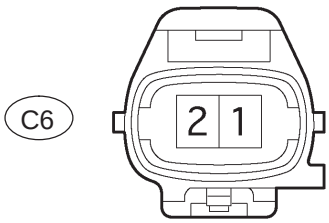
INSPECTION PROCEDURE

HINT:

- Perform troubleshooting of DTC P0335 first. If no trouble is found, troubleshoot the engine mechanical system.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT CRANKSHAFT POSITION SENSOR(RESISTANCE)

Component Side



Crankshaft Position Sensor

A64984

(a) Disconnect the C6 crankshaft position sensor connector.
(b) Measure the resistance between the terminals of the crankshaft position sensor.

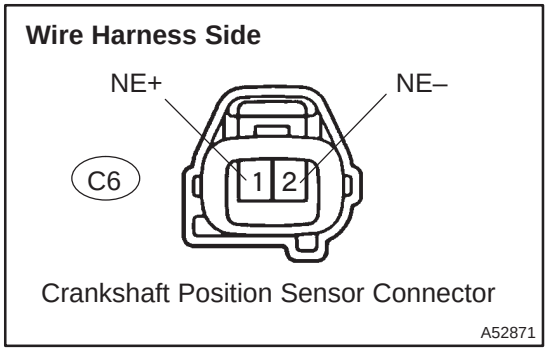
Resistance:
985 to 1,600 Ω at cold
1,265 to 1,890 Ω at hot

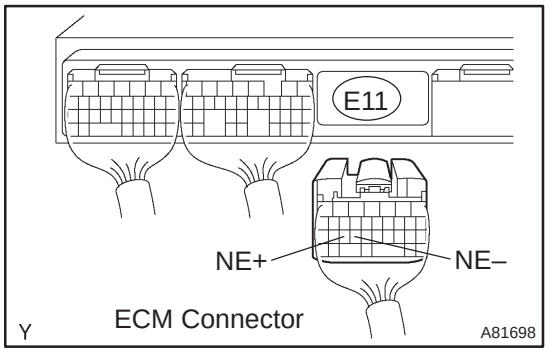
NOTICE:
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **REPLACE CRANKSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(ECM – CRANKSHAFT POSITION SENSOR)





(a) Disconnect the C6 crankshaft position sensor connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Crankshaft position sensor (C6–1) – NE+ (E11–25)	Continuity
Crankshaft position sensor (C6–2) – NE– (E11–24)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Crankshaft position sensor (C6–1) or NE+ (E11–25) – Body ground	No continuity
Crankshaft position sensor (C6–2) or NE– (E11–24) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)

(a) Check the crankshaft position sensor installation.

NG → **TIGHTEN SENSOR**

OK

4 INSPECT CRANKSHAFT POSITION SENSOR PLATE NO.1(TEETH OF SIGNAL PLATE)

(a) Remove the crankshaft position sensor plate No. 1 (See page 14–222).
(b) Check the teeth of the signal plate.

NG → **REPLACE CRANKSHAFT POSITION SENSOR PLATE NO.1**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0340	CAMSHAFT POSITION SENSOR ”A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0341	CAMSHAFT POSITION SENSOR ”A” CIRCUIT RANGE/PERFORMANCE (BANK 1 SINGLE SENSOR)

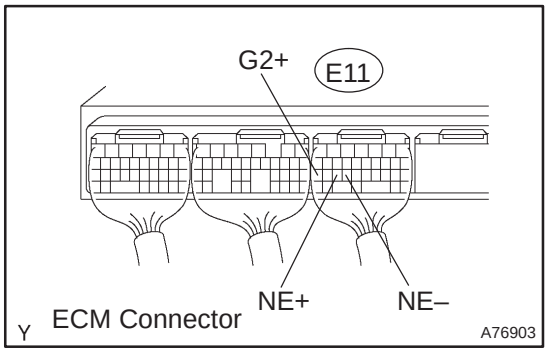
CIRCUIT DESCRIPTION

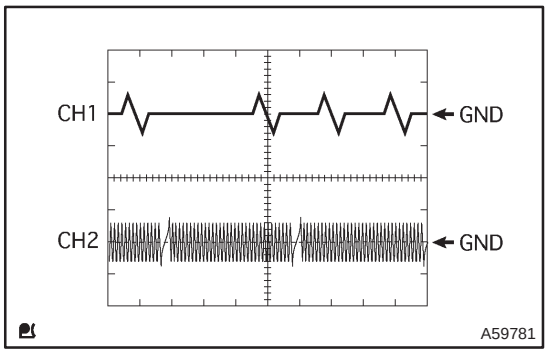
The camshaft position sensor (G2 signal) consists of a magnet, iron core and pickup coil.
The G2 signal rotor has 3 teeth on the outside and is mounted on the intake camshaft.
When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil changes, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate (crankshaft position sensor plate No. 1) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signal, and the cylinder and the angle of the VVT based on the combination of the G2 and NE signal.

DTC No.	DTC Detection Condition	Trouble Area
P0340	No camshaft position sensor (G2) signal to ECM during cranking for 4 sec. or more (2 trip detection logic).	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing gear • Timing chain has jumped a tooth • ECM
	No camshaft position sensor (G2) signal to ECM with engine speed 600 rpm or more for 5 sec. or more (1 trip detection logic).	
P0341	While crankshaft rotates twice, camshaft position sensor (G2) signal will be input to ECM 12 times or more (1 trip detection logic).	

HINT:

- DTC P0340 indicate a malfunction related to the camshaft position sensor (+) circuit. (Wire harness (ECM – camshaft position sensor) and camshaft position sensor)
- DTC P0341 indicate a malfunction related to the camshaft position sensor (–) circuit. (Wire harness (ECM – camshaft position sensor) and camshaft position sensor)





Reference: Inspection using the oscilloscope.

(1) During cranking or idling, check the waveform between the terminals of the ECM connector.

Item	Details
Terminal	CH1: G2+ – NE– CH2: NE+ – NE–
Equipment Setting	5 V/Division, 20 ms/Division
Condition	During Cranking or idling

HINT:

The correct waveforms are as shown in the left.

WIRING DIAGRAM

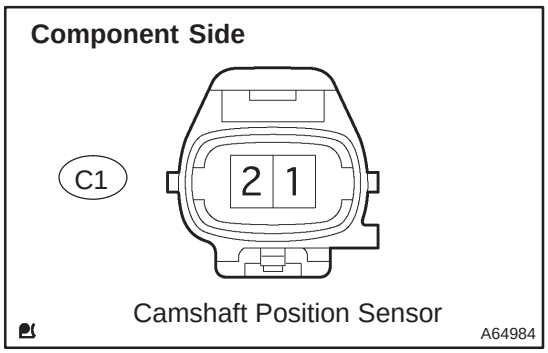
Refer to DTC P0335 on page 05–433.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT CAMSHAFT POSITION SENSOR(RESISTANCE)



(a) Disconnect the C1 camshaft position sensor connector.

(b) Measure the resistance between the terminals of the camshaft position sensor.

Resistance:

835 to 1,400 Ω at cold

1,060 to 1,645 Ω at hot

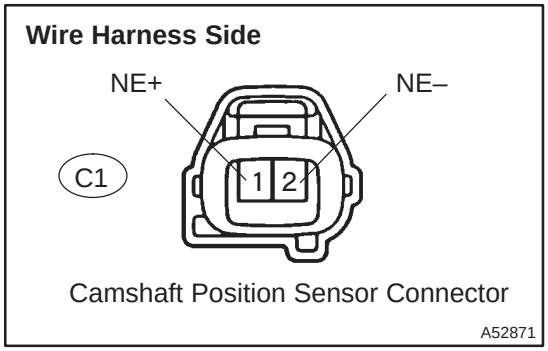
NOTICE:

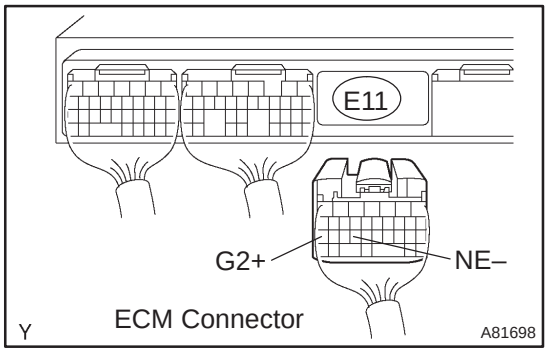
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **REPLACE CAMSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(ECM – CAMSHAFT POSITION SENSOR)





(a) Disconnect the C1 camshaft position sensor connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Camshaft position sensor (C1–1) – G2+ (E11–27)	Continuity
Camshaft position sensor (C1–2) – NE– (E11–24)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Camshaft position sensor (C1–1) or G2+ (E11–27) – Body ground	No continuity
Camshaft position sensor (C1–2) or NE– (E11–24) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CAMSHAFT POSITION SENSOR)

(a) Inspect the camshaft position sensor installation.

NG → **TIGHTEN SENSOR**

OK

4 INSPECT CAMSHAFT

(a) Remove the camshafts (See page 14–240).
(b) Check the camshaft lobes.

NG → **REPLACE CAMSHAFT**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0351	IGNITION COIL ”A” PRIMARY/SECONDARY CIRCUIT

DTC	P0352	IGNITION COIL ”B” PRIMARY/SECONDARY CIRCUIT

DTC	P0353	IGNITION COIL ”C” PRIMARY/SECONDARY CIRCUIT

DTC	P0354	IGNITION COIL ”D” PRIMARY/SECONDARY CIRCUIT

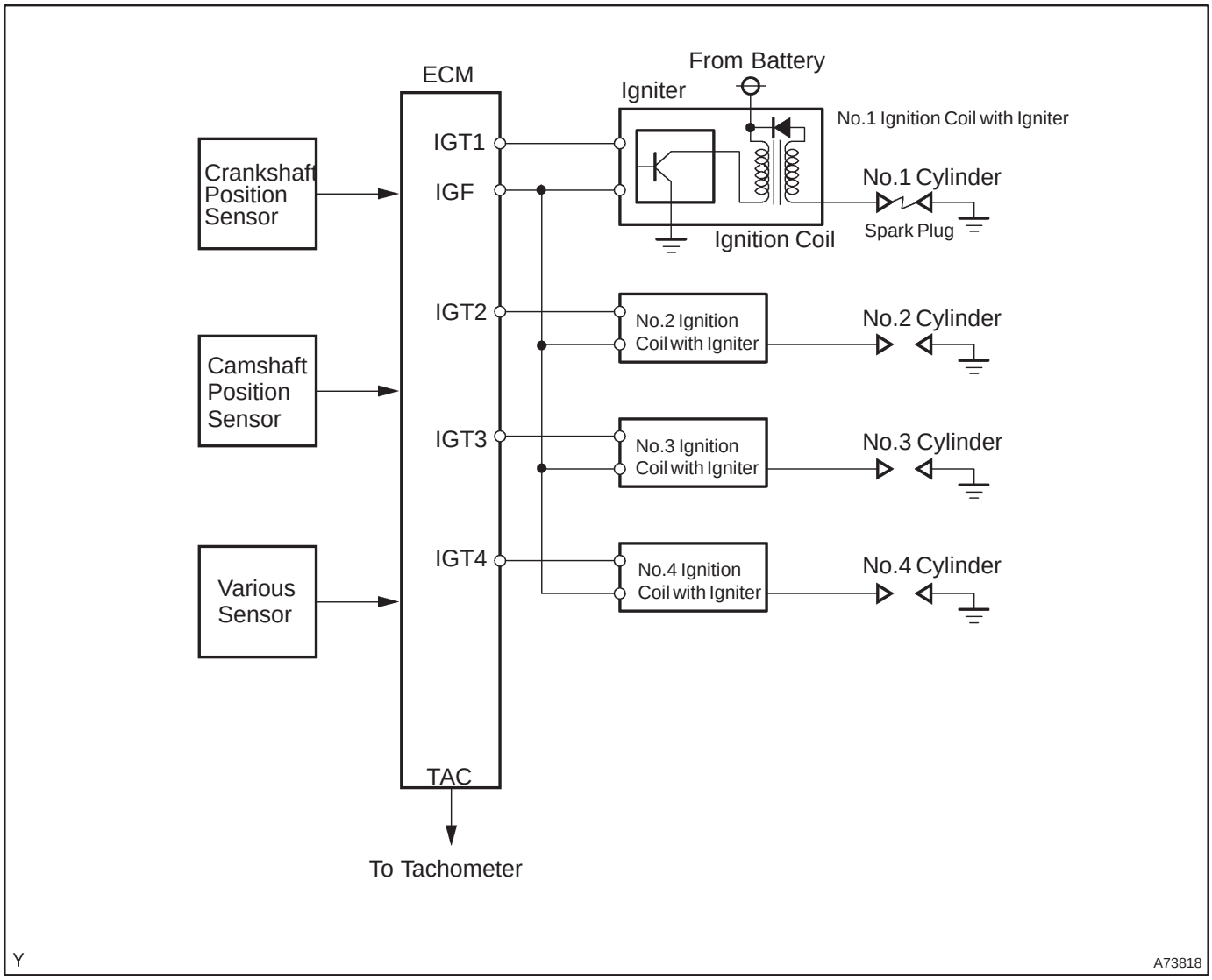
HINT:

- These DTCs indicate a malfunction related to primary circuit.
- If DTC P0351 is displayed, check No. 1 ignition coil with igniter circuit.
- If DTC P0352 is displayed, check No. 2 ignition coil with igniter circuit.
- If DTC P0353 is displayed, check No. 3 ignition coil with igniter circuit.
- If DTC P0354 is displayed, check No. 4 ignition coil with igniter circuit.

CIRCUIT DESCRIPTION

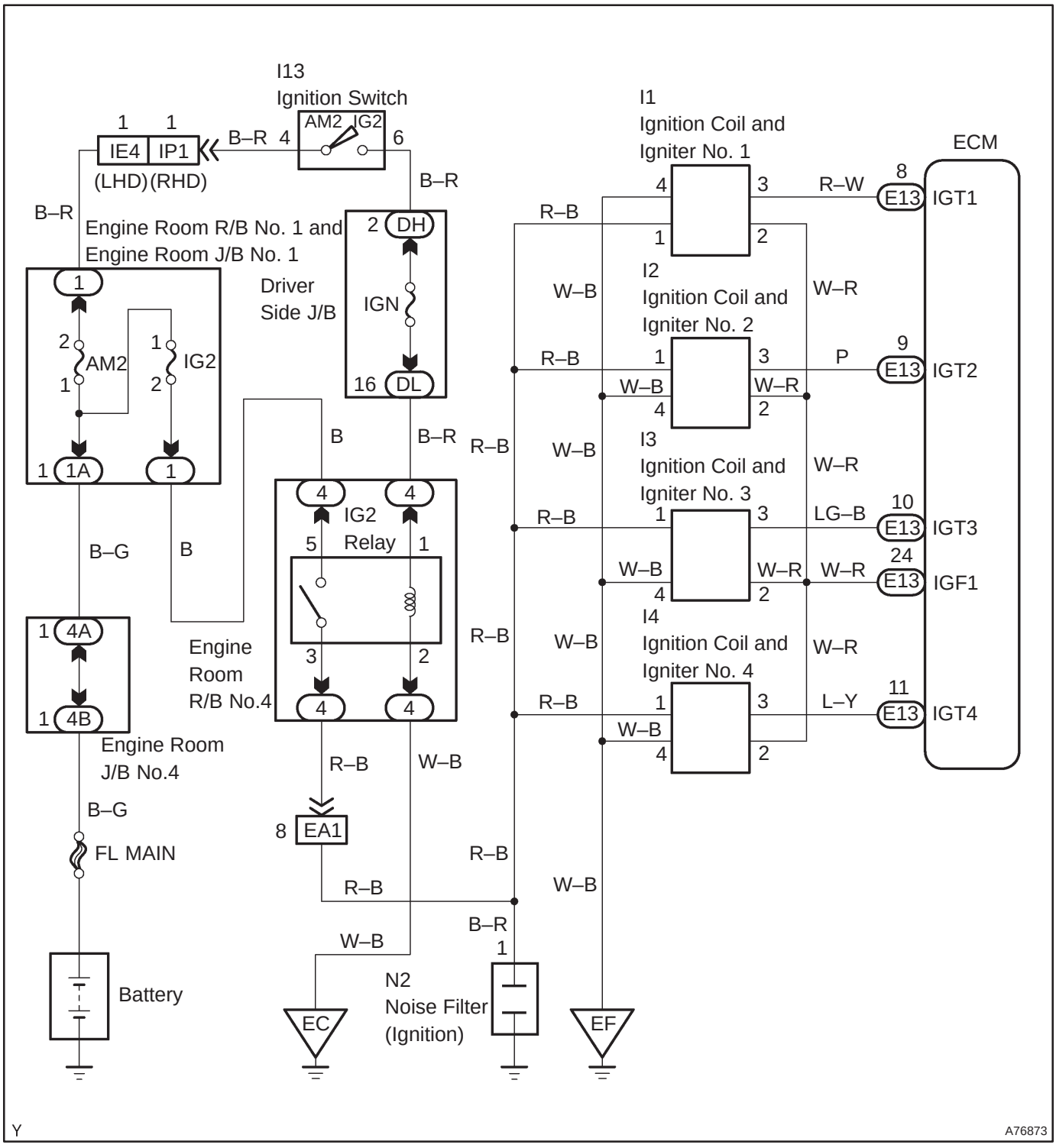
A Direct Ignition System (DIS) has been adopted. The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.

The ECM determines the ignition timing and outputs the ignition signals (IGT) for each cylinder. Based on the IGT signals, the power transistors in the igniter cut off the current to the primary coil in the ignition coil is supplied to the spark plug that is connected to the end of the secondary coil. At the same time, the igniter also sends an ignition confirmation signal (IGF) as a fail–safe measure to the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0351 P0352 P0353 P0354	No IGF signal to ECM while engine is running	• Ignition system • Open or short in IGF and IGT circuit from ignition coil with igniter to ECM (ignition coil circuit 1 through 4) • Ignition coil with igniter (ignition coil 1 through 4) • IG2 relay • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	PERFORM SIMULATION TEST(CHECK DTC)

(a) Read the DTC and check which of the cylinders causes the DTC (See page 05–294).
(b) Clear the DTC (See page 05–294).
(c) Swap the ignition coil with igniter of the cylinder that is referred by the DTC for the others.

NOTICE:

Do not swap the ignition coil with igniter connector for the others.

(d) Start the engine.
(e) Read the DTC (See page 05–294).

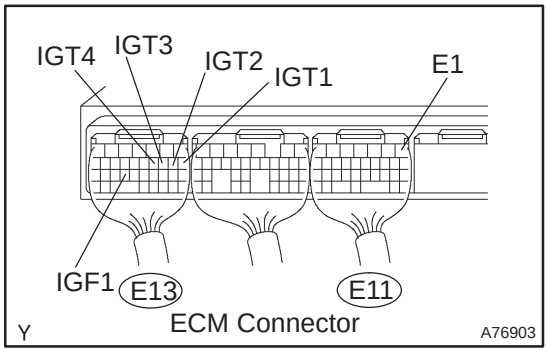
Result:

Display (DTC output)	Proceed to
The same DTC is output again	A
The other DTC is output	B

B → REPLACE IGNITION COIL ASSY

A

2	INSPECT ECM(IGT1, IGT2, IGT3 OR IGT4 VOLTAGE)

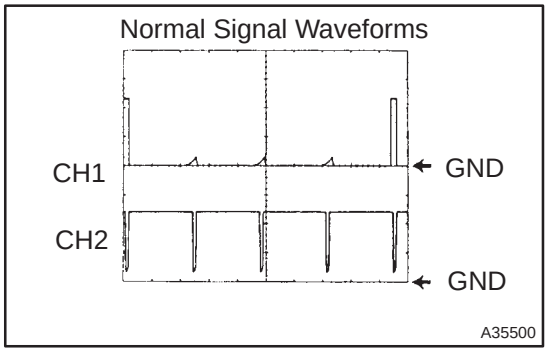


(a) During cranking or idling, check the waveform between terminals IGT1 to IGT4 and E1, and IGF1 and E1 of the ECM connector.

Item	Details
Terminal	CH1: IGT1, IGT2, IGT3, IGT4 – E1 CH2: IGF1 – E1
Equipment Settings	2 V/Division, 20 ms/Division
Condition	While the engine is cranking or idling

HINT:

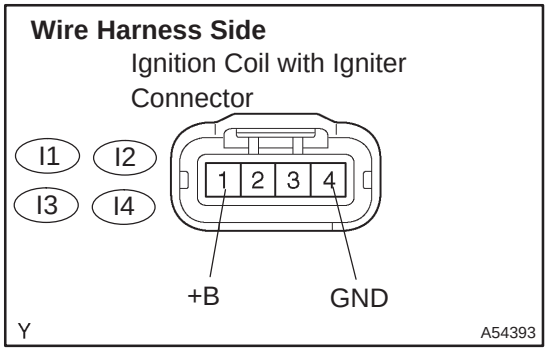
Correct waveform appears as shown, with rectangle waves.



OK → CHECK AND REPLACE ECM (See page 01–32)

NG

3 CHECK IGNITION COIL ASSY(POWER SOURSE)



(a) Disconnect the I1, I2, I3 or I4 ignition coil with igniter connector.

(b) Check for open between terminal GND of the ignition coil with igniter connector and body ground.

Resistance: 1 Ω or less

(c) Turn the ignition switch ON.

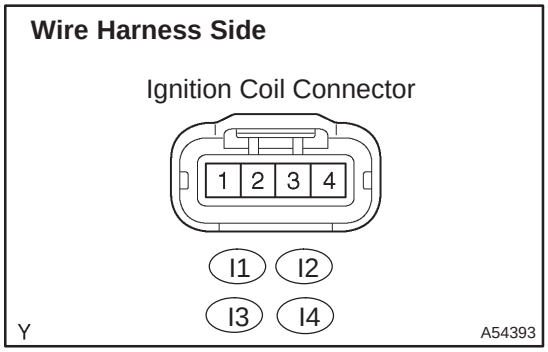
(d) Measure the voltage between terminals +B and GND of the ignition coil with igniter connector.

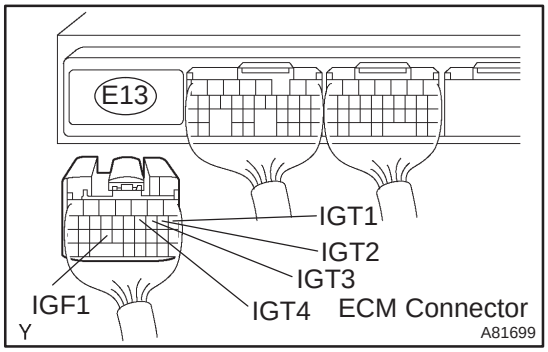
Voltage: 9 to 14 V

NG → **Go to step 5**

OK

4 CHECK HARNESS AND CONNECTOR(ECM – IGNITION COIL)





(a) Check the harness and connector between the ignition coil and ECM (IGF terminal) connectors

(1) Disconnect the I1, I2, I3 or I4 ignition coil connector.

(2) Disconnect the E13 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–2) – IGF1 (E13–24)	Continuity
Ignition coil (I2–2) – IGF1 (E13–24)	
Ignition coil (I3–2) – IGF1 (E13–24)	
Ignition coil (I4–2) – IGF1 (E13–24)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–2) or IGF1 (E13–24) – Body ground	No continuity
Ignition coil (I2–2) or IGF1 (E13–24) – Body ground	
Ignition coil (I3–2) or IGF1 (E13–24) – Body ground	
Ignition coil (I4–2) or IGF1 (E13–24) – Body ground	

(b) Check the harness and connector between the ignition coil and ECM (IGT terminal) connectors

(1) Disconnect the I1, I2, I3 or I4 ignition coil connector.

(2) Disconnect the E13 ECM connector.

(3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–3) – IGT1 (E13–8)	Continuity
Ignition coil (I2–3) – IGT2 (E13–9)	
Ignition coil (I3–3) – IGT3 (E13–10)	
Ignition coil (I4–3) – IGT4 (E13–11)	

Standard (Check for short):

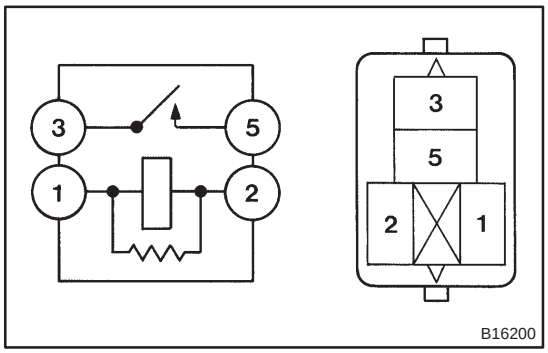
Symbols (Terminal No.)	Specified condition
Ignition coil (I1–3) or IGT1 (E13–8) – Body ground	No continuity
Ignition coil (I2–3) or IGT2 (E13–9) – Body ground	
Ignition coil (I3–3) or IGT3 (E13–10) – Body ground	
Ignition coil (I4–3) or IGT4 (E13–11) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE IGNITION COIL ASSY

5 INSPECT IG2 RELAY



(a) Remove the IG2 relay from the engine room R/B No. 4.
(b) Inspect the IG2 relay.

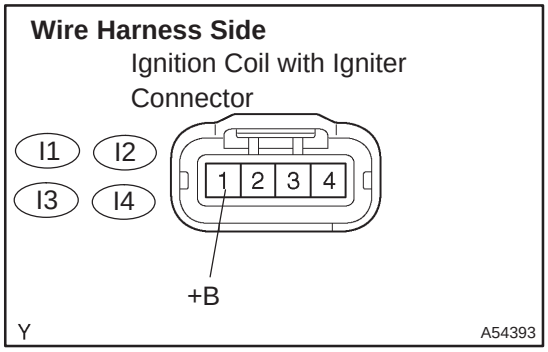
Standard:

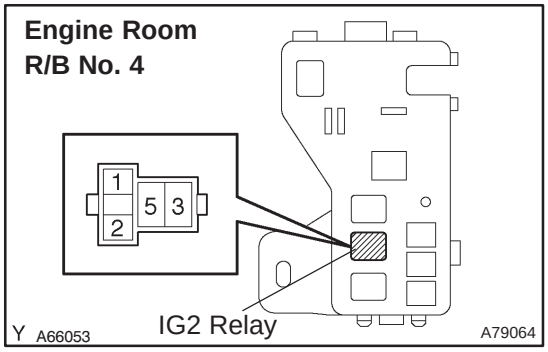
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage terminals 1 and 2)

NG → **REPLACE IG2 RELAY**

OK

6 CHECK HARNESS AND CONNECTOR(IG2 RELAY – IGNITION COIL)





(a) Disconnect the I1, I2, I3 or I4 ignition coil with igniter connector.
(b) Remove the IG2 relay from the engine room R/B No. 4.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–1) – IG2 relay (3)	Continuity
Ignition coil (I2–1) – IG2 relay (3)	
Ignition coil (I3–1) – IG2 relay (3)	
Ignition coil (I4–1) – IG2 relay (3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Ignition coil (I1–1) or IG2 relay (3) – Body ground	No continuity
Ignition coil (I2–1) or IG2 relay (3) – Body ground	
Ignition coil (I3–1) or IG2 relay (3) – Body ground	
Ignition coil (I4–1) or IG2 relay (3) – Body ground	

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK FOR FUEL PUMP CONTROL CIRCUIT (See page 05–507)

DTC	P0420	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC	P0430	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 2)

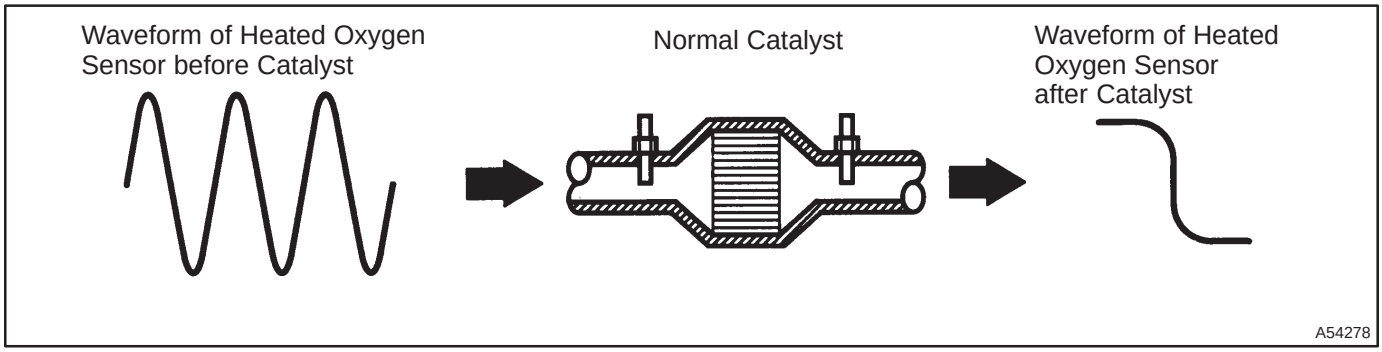
CIRCUIT DESCRIPTION

The ECM compares the waveform of the heated oxygen sensor located before the catalyst with the waveform of the heated oxygen sensor located after the catalyst to determine whether or not the catalyst performance has deteriorated.

The air–fuel ratio feedback compensation keeps the waveform of the heated oxygen sensor before the catalyst repeatedly changing back and forth from rich to lean.

If the catalyst is functioning normally, the waveform of the heated oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the heated oxygen sensor before the catalyst.

But when both waveforms change at a similar rate, it indicates that the catalyst performance has deteriorated.

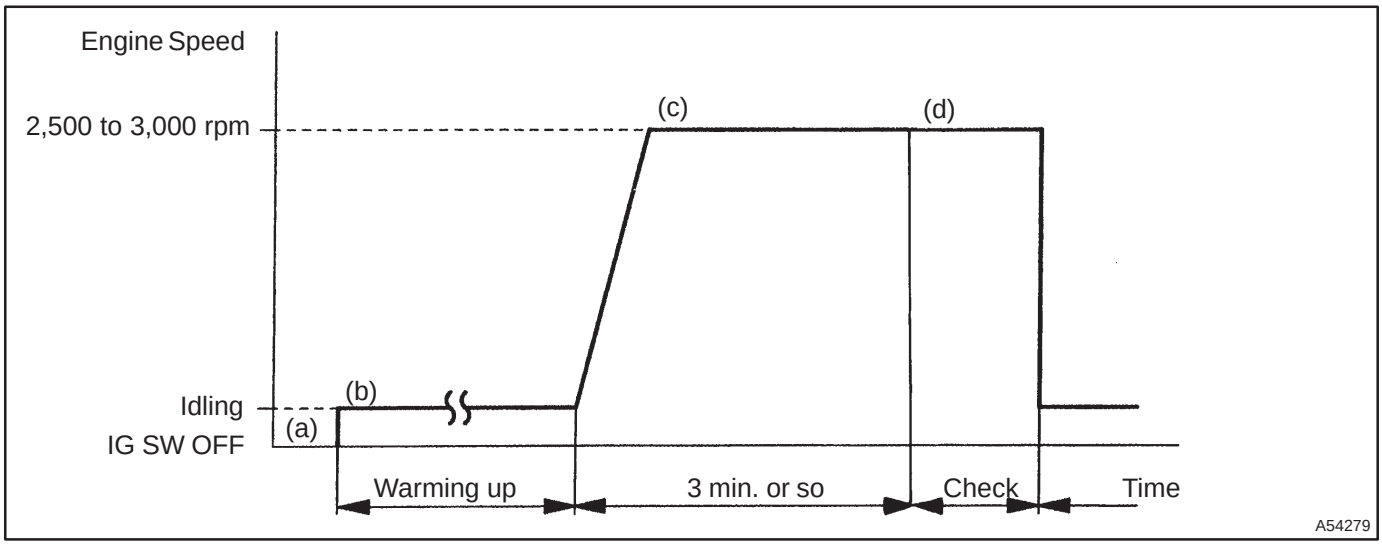


DTC No.	DTC Detection Condition	Trouble Area
P0420 P0430	After engine and catalyst are warmed up, and while vehicle is driven within set value and engine speed range, waveforms of heated oxygen sensors have the same amplitude (2 trip detection logic)	• Gas leakage in exhaust system • Heated oxygen sensor • Three–way catalytic converter (inside exhaust manifold)

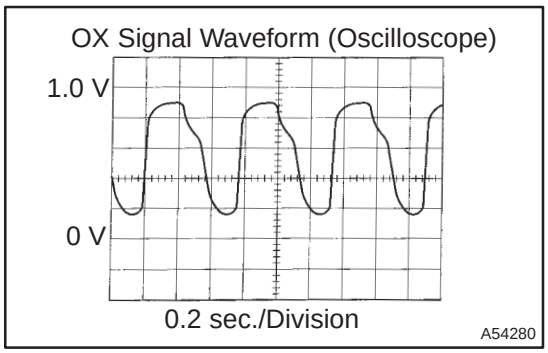
HINT:

- Bank 1 refers to the No. 1 and No. 4 cylinders.
- Bank 2 refers to the No. 2 and No. 3 cylinders.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

CONFIRMATION ENGINE RACING PATTERN



(a) Connect the hand–held tester to the DLC3, or connect the probe of the oscilloscope between terminals OX1A, OX2A, OX1B or OX2B and E2 of the ECM connectors.
(b) Start the engine and warm it up with all the accessories switched OFF until the engine coolant temperature is stable.
(c) Run the engine at 2,500 to 3,000 rpm for about 3 minutes.
(d) After confirming that the waveforms of the heated oxygen sensor (bank 1, 2 sensor 1 (OX1A, OX2A)) which oscillates around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor (bank 1, 2 sensor 2 (OX1B, OX2B)).



HINT:
If there is a malfunction in the system, the waveform of the heated oxygen sensor (bank 1, 2 sensor 2 (OX1B, OX2B)) is almost the same as that of the heated oxygen sensor (bank 1, 2 sensor 1 (OX1A, OX2A)) on the left.
There are some cases where, even though a malfunction exists, the CHK ENG may either light up or not light up.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO P0420 AND/OR P0430)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0420 and/or P0430” are output	A
”P0420 or P0430” and other DTCs are output	B

HINT:
If any other codes besides ”P0420 and/or P0430” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	CHECK FOR EXHAUST GAS LEAKS

NG → **REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT**

OK

3	CHECK HEATED OXYGEN SENSOR(BANK 1, 2 SENSOR 1) (See page 05–363)

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4	CHECK HEATED OXYGEN SENSOR(BANK 1, 2 SENSOR 2) (See page 05–388)

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

REPLACE THREE–WAY CATALYTIC CONVERTER (EXHAUST MANIFOLD)

DTC	P0443	EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT

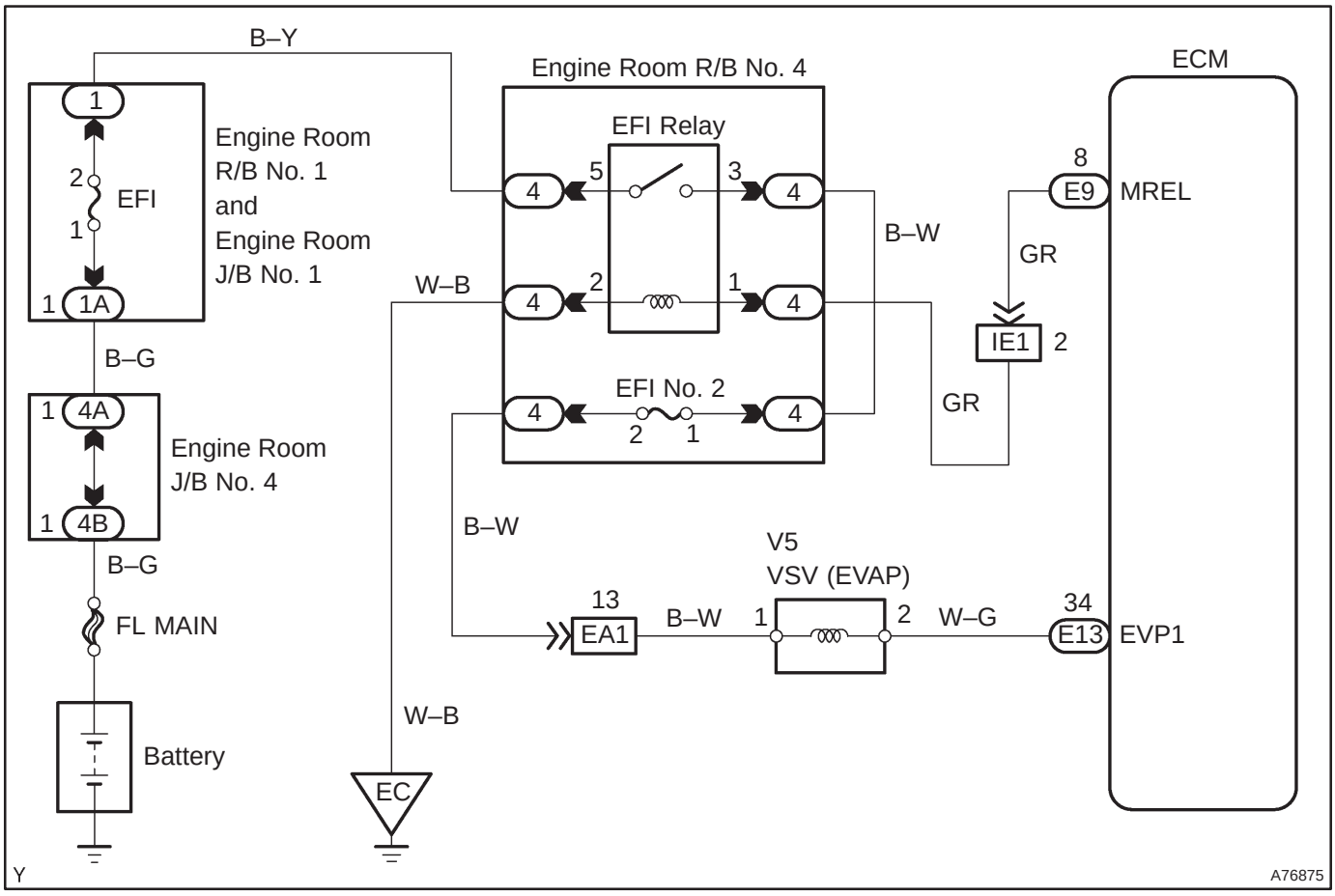
CIRCUIT DESCRIPTION

To reduce HC emissions, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

The ECM changes the duty signal to the VSV for the EVAP so that the intake quantity of HC emissions is appropriate for the driving conditions (engine load, engine speed, vehicle speed, etc.) after the engine is warmed up.

DTC No.	DTC Detection Condition	Trouble Area
P0443	Proper response to ECM command does not occur	• Open of short in VSV circuit for EVAP • VSV for EVAP • ECM

WIRING DIAGRAM

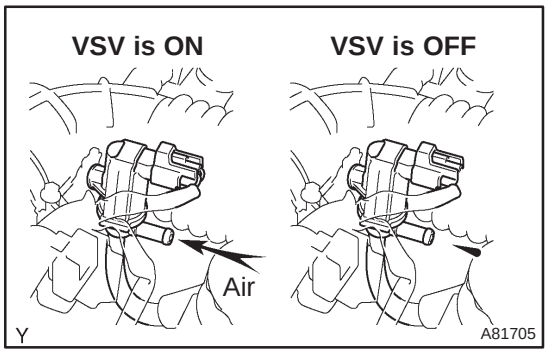


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR EVAP)



(a) Disconnect the vacuum hose from the VSV for EVAP.
(b) Start the engine.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / EVAP VSV” (press the right or left button).
(d) When the VSV for EVAP is operated by the hand–held tester, check whether the disconnected hose applies suction to your finger.

Standard:

Tester operation	Specified condition
VSV is ON	Disconnected hose applies suction to your finger
VSV is OFF	Disconnected hose applies no suction to your finger

OK → **CHECK FOR INTERMITTENT PROBLEMS**

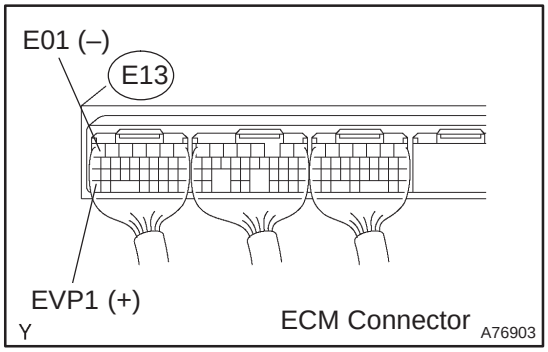
NG

2	INSPECT VACUUM SWITCHING VALVE ASSY NO.1(VSV FOR EVAP) (See page 12–13)

NG → **REPLACE VACUUM SWITCHING VALVE ASSY NO.1 (VSV FOR EVAP)**

OK

3	INSPECT ECM(EVP1 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

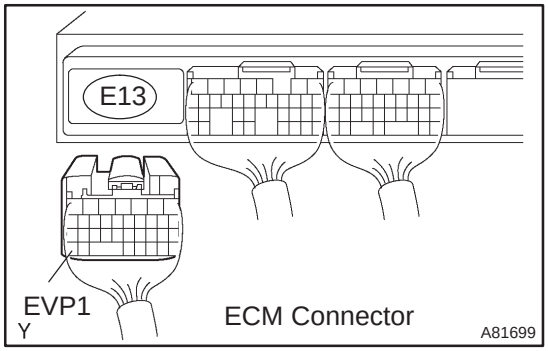
Standard:

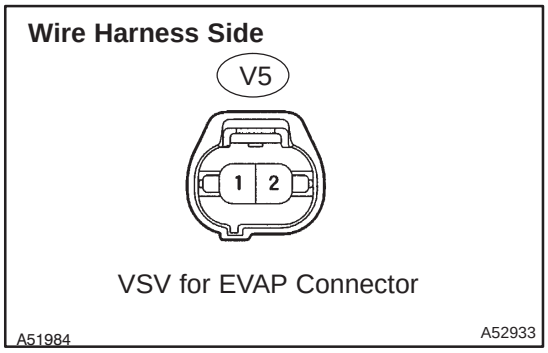
Symbols (Terminal No.)	Specified condition
EVP1 (E13–34) – E01 (E13–7)	9 to 14 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

4 CHECK HARNESS AND CONNECTOR(ECM – VSV FOR EVAP)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the V5 VSV for EVAP connector.
(c) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV for EVAP (V5–2) – EVP1 (E13–34)	Continuity

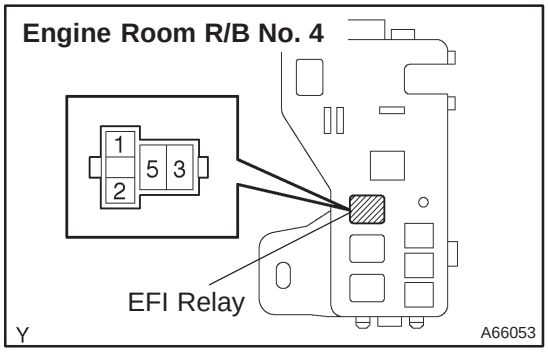
Standard (Check for short):

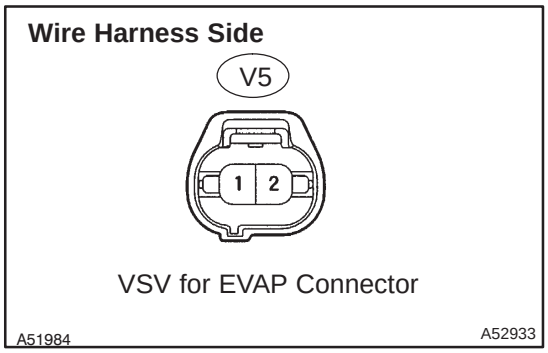
Symbols (Terminal No.)	Specified condition
VSV for EVAP (V5–2) or EVP1 (E13–34) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR(EFI RELAY – VSV FOR EVAP)





(a) Inspect the EFI No. 2 fuse.
  (1) Remove the EFI No. 2 fuse from the engine room R/B No. 4.
  (2) Check for continuity in the EFI No. 2 fuse.

Standard: Continuity

(b) Remove the EFI relay from the engine room R/B No. 4.

(c) Disconnect the V5 VSV for EVAP connector.

(d) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – VSV for EVAP (V5–1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or VSV for EVAP (V5–1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

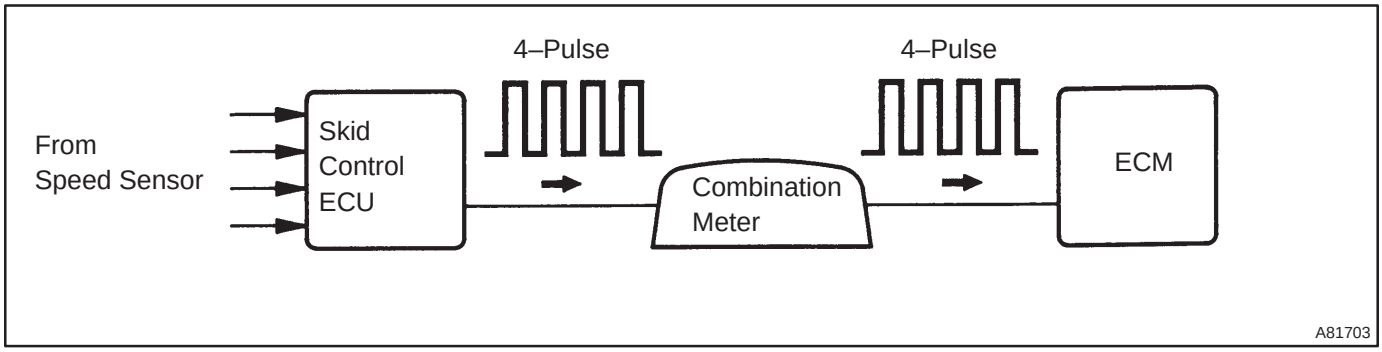
CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–502)

DTC	P0500	VEHICLE SPEED SENSOR ”A”

CIRCUIT DESCRIPTION

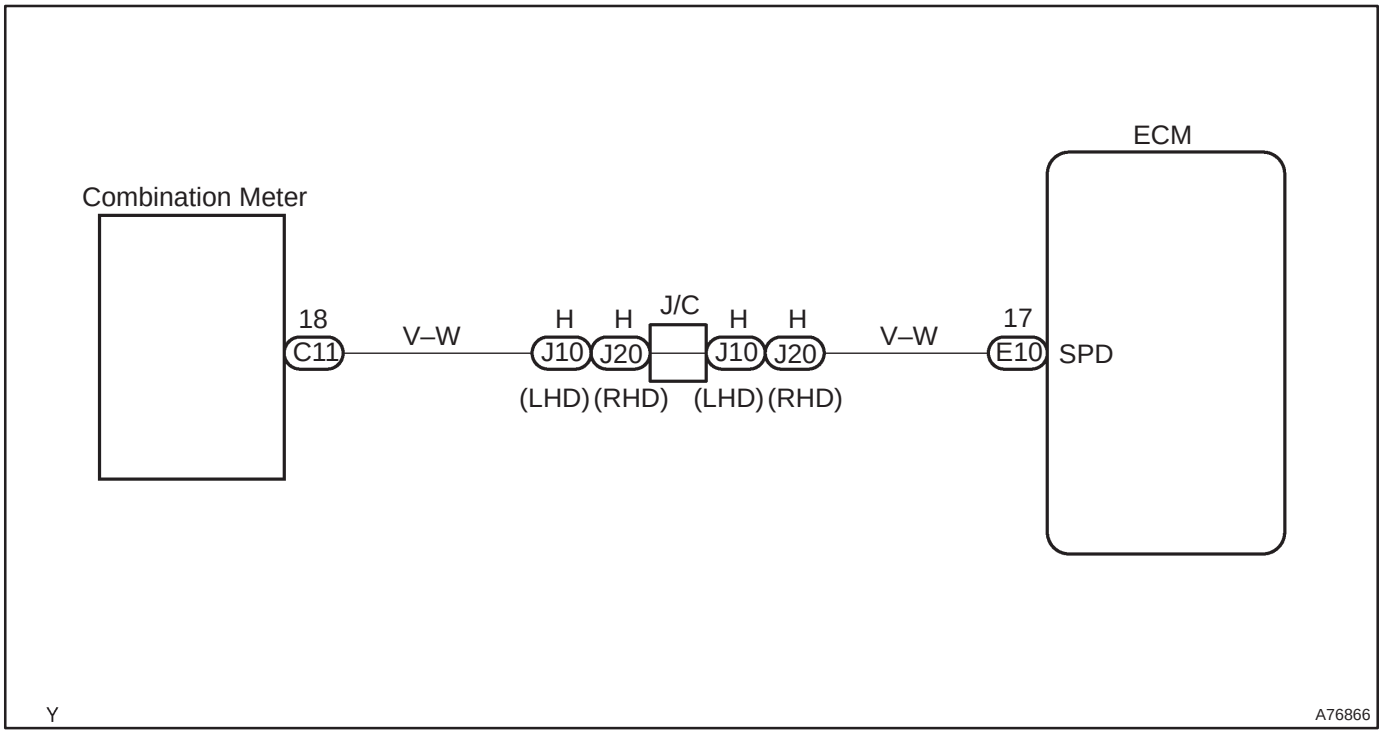
The speed sensor for skid control ECU detects the wheel speed and sends the appropriate signals to the skid control ECU.

The skid control ECU converts these signals into a 4–pulse signal and outputs it to the combination meter. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter,it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM under the following condition (1 trip (A/T) or 2 trip (M/T) detection logic): (a) Vehicle is being driven	• Combination meter • Open or short in speed sensor circuit • Vehicle speed sensor • ECM • Skid control ECU • Clutch or brake slips or gear is broken

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

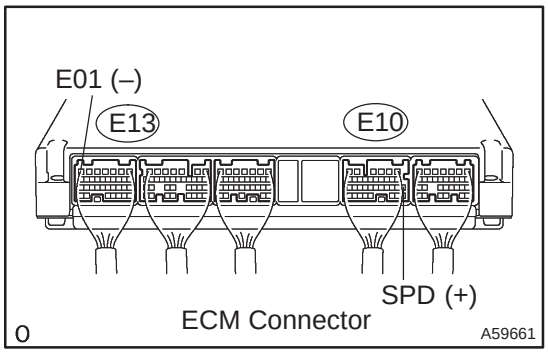
1	CHECK OPERATION OF SPEEDOMETER

(a) Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.
HINT:
The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **CHECK SPEEDOMETER CIRCUIT (See page 05–1510)**

OK

2	INSPECT ECM(SPD VOLTAGE)

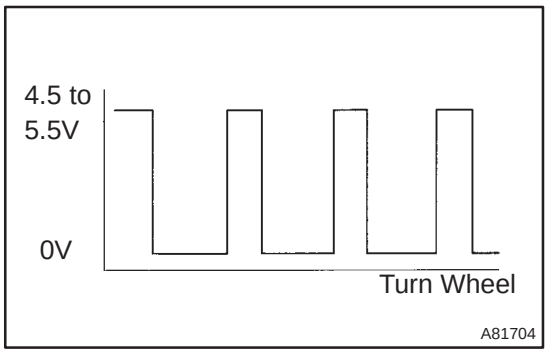


(a) Shift the lever to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch ON.
(d) Measure the voltage between the specified terminals of the E10 and E13 ECM connectors as the wheel is turned slowly.

Standard:

Symbols (Terminal No.)	Specified condition
SPD (E10–17) – E01 (E13–7)	Generated intermittently

HINT:
The output voltage should fluctuate ups and downs similarly to the diagram on the left as the wheel is turned slowly.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC P0504 BRAKE SWITCH "A"/"B" CORRELATION

CIRCUIT DESCRIPTION

In this system, the signal of the stop light switch is used to judge whether the acceleration system is abnormal or not.

The stop light switch has a duplex system (signals STP and ST1–) to memorize the abnormality when the signals of depressing and releasing the brake pedal are detected simultaneously.

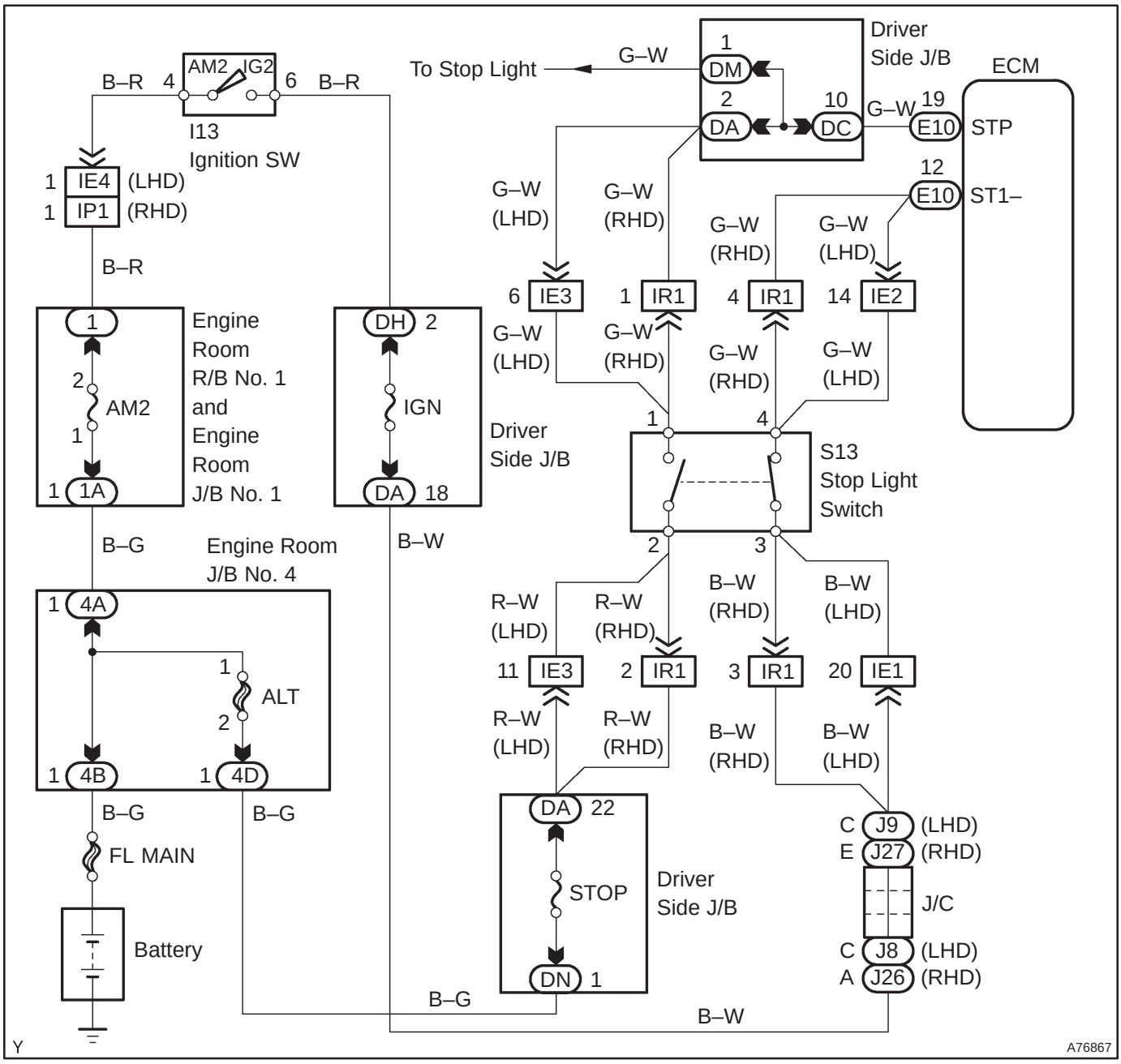
HINT:

Normal condition is as shown in the table.

Signal	Brake pedal released	In transition	Brake pedal depressed
STP	OFF	ON	ON
ST1–	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P0504	Condition (a), (b) and (c) continue for 0.5 sec. or more: (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the ST1– signal is OFF	• Short in stop light switch signal circuit • Stop light switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

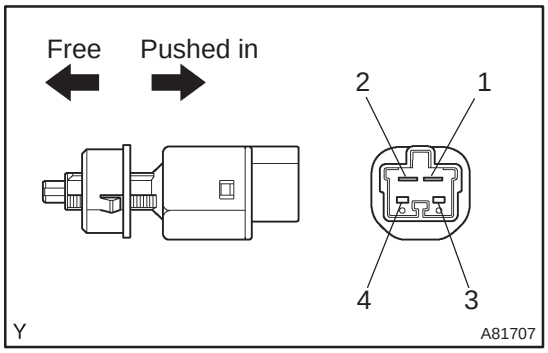
1	CHECK OPERATION OF STOP LIGHT

(a) Check if the stop lights go on and off normally when the brake pedal is depressed and released.

NG → **REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT**

OK

2	INSPECT STOP LIGHT SWITCH ASSY



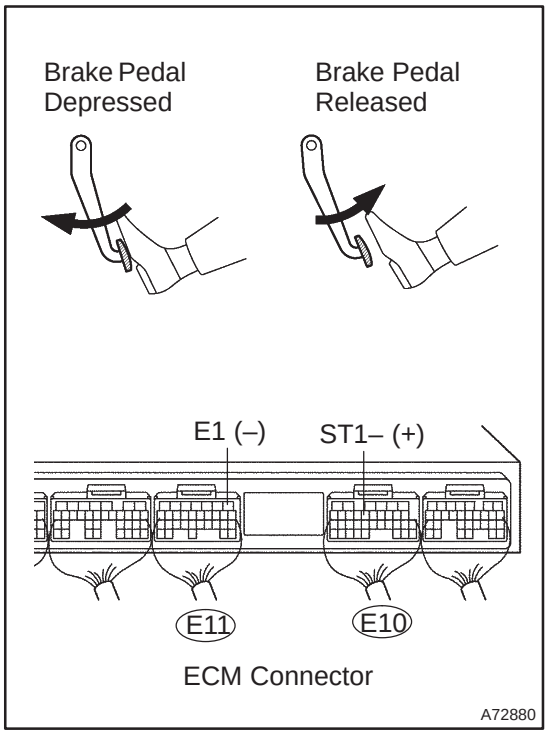
(a) Check for continuity between each pair of the terminals.
Standard:

Switch position	Terminal No.	Specified condition
Switch pin free	1 – 2	Continuity
	3 – 4	No continuity
Switch pin pushed in	1 – 2	No continuity
	3 – 4	Continuity

NG → **REPLACE STOP LIGHT SWITCH ASSY**

OK

3	READ VALUE OF HAND–HELD TESTER(STP SIGNAL AND ST1– VOLTAGE)



(a) Turn the ignition switch ON.
(b) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW" and read its value displayed on the hand–held tester.
Standard:

Brake Pedal	Specified condition
Depressed	STP Signal ON
Released	STP Signal OFF

(c) Measure the voltage between the specified terminals of the E10 and E11 ECM connectors.
Standard:

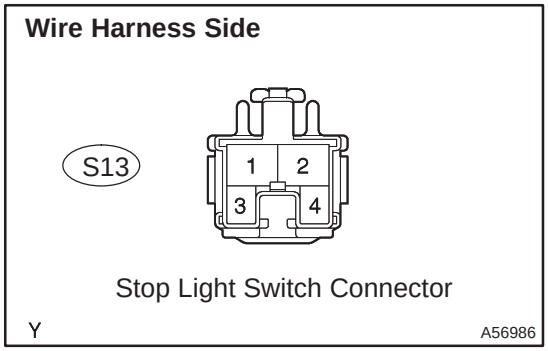
Symbols (Terminal No.)	Brake pedal	Specified condition
ST1– (E10–12) – E1 (E11–1)	Depressed	Below 1.5 V
	Released	7.5 to 14 V

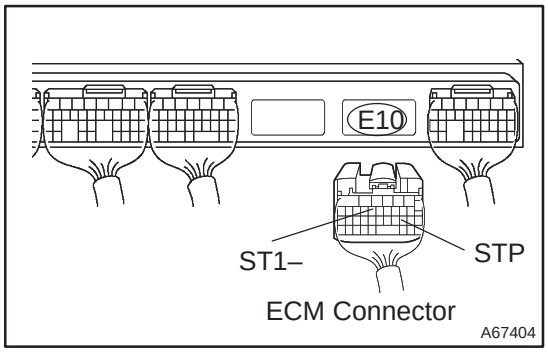
NG → **Go to step 4**

OK

CHECK FOR INTERMITTENT PROBLEMS

4 CHECK HARNESS AND CONNECTOR(ECM – STOP LIGHT SWITCH)





(a) Disconnect the S13 stop light switch connector.
(b) Disconnect the E10 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) – STP (E10–19)	Continuity
Stop light switch (S13–4) – ST1– (E10–12)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) or STP (E10–19) – Body ground	No continuity
Stop light switch (S13–4) or ST1– (E10–12) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0555	BRAKE BOOSTER PRESSURE SENSOR CIRCUIT

DTC	P0557	BRAKE BOOSTER PRESSURE SENSOR CIRCUIT LOW INPUT

DTC	P0558	BRAKE BOOSTER PRESSURE SENSOR CIRCUIT HIGH INPUT

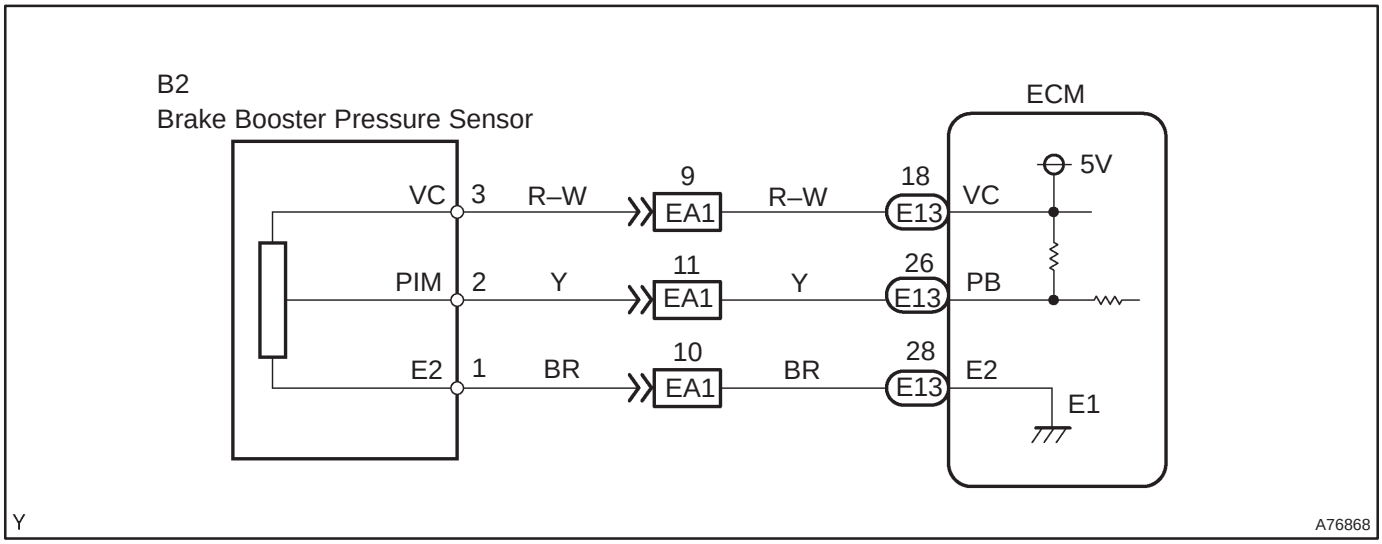
CIRCUIT DESCRIPTION

The brake booster pressure sensor detects internal pressure of the brake booster as voltage. A structure of the sensor and its connection to the ECM are the same as ones for the intake air pressure sensor. (Refer to DTC P0105 on page 05–342).

In order to purify emission gas when starting a cold engine, drastically retard the ignition timing to quickly activate tha catalyst. Upon this, the throttle valve is opened larger than the throttle opening angle with a warm engine, therefore the intake manifold pressure will be closer to atmospheric pressure. If the negative pressure (vacuum) applied inside the brake booster drops, the ECM cancels the drastic retarding timing and introduces the negative pressure (vacuum) into the intake manifold, and the ECM then resumes the drastic retarding timing after the brake booster negative pressure (vacuum) is ensured at required level.

DTC No.	DTC Detection Condition	Trouble Area
P0555	Open or short in brake booster pressure sensor circuit for 5 sec. or more	• Open or short in brake booster pressure sensor circuit • Brake booster pressure sensor • Vacuum hose • ECM
P0557	Open in brake booster pressure sensor circuit for 5 sec. or more	
P0558	Short in brake booster pressure sensor circuit for 5 sec. or more	

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

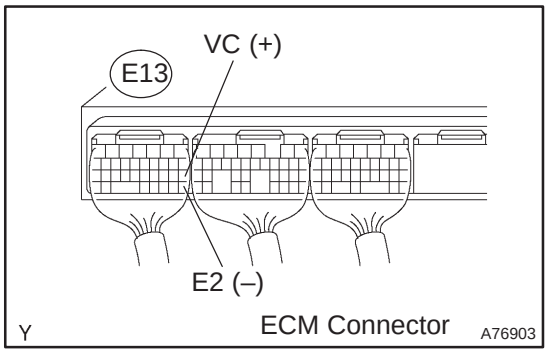
1	CHECK VACUUM HOSE(BRAKE BOOSTER PRESSURE SENSOR – BRAKE BOOSTER, INTAKE MANIFOLD – BRAKE BOOSTER)

(a) Check that the vacuum hoses are connected correctly.
(b) Check that the vacuum hoses are not loose or disconnected.
(c) Check the vacuum hoses and tubes for clogs, cracks, holes, damage, or blockage.

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

2	INSPECT ECM(VC VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E13 ECM connector.

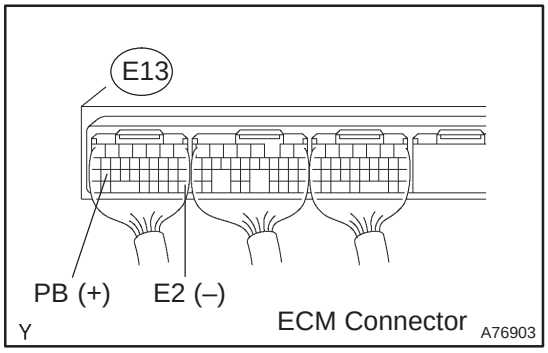
Standard:

Symbols (Terminal No.)	Specified condition
VC (E13–18) – E2 (E13–28)	4.5 to 5.5 V

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

3	INSPECT ECM(PB VOLTAGE)



(a) Measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

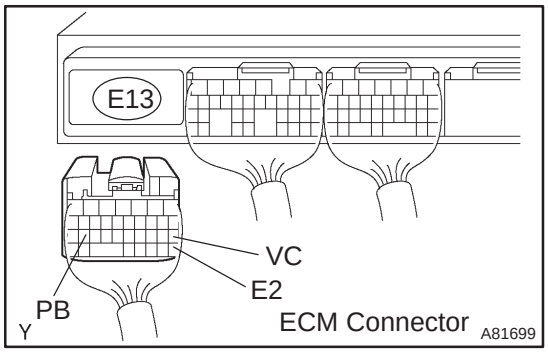
Symbols (Terminal No.)	Condition	Specified condition
PB (E13–26) – E2 (E13–28)	Ignition switch ON (do not start engine)	0.5 to 4.5 V
	Idling	

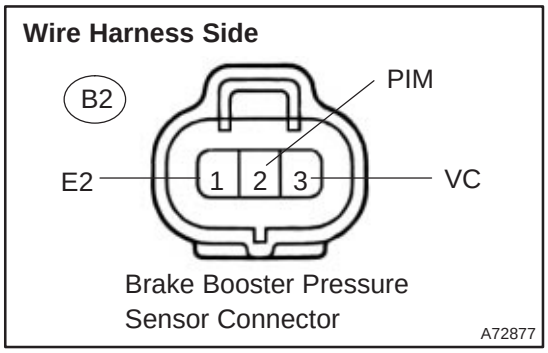
NG → **Go to step 4**

OK

CHECK FOR INTERMITTENT PROBLEMS

4	CHECK HARNESS AND CONNECTOR(ECM – BRAKE BOOSTER PRESSURE SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the B2 brake booster pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (E13–18) – VC (B2–3)	Continuity
PB (E13–26) – PIM (B2–2)	
E2 (E13–28) – E2 (B2–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (E13–18) or VC (B2–3) – Body ground	No continuity
PB (E13–26) or PIM (B2–2) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

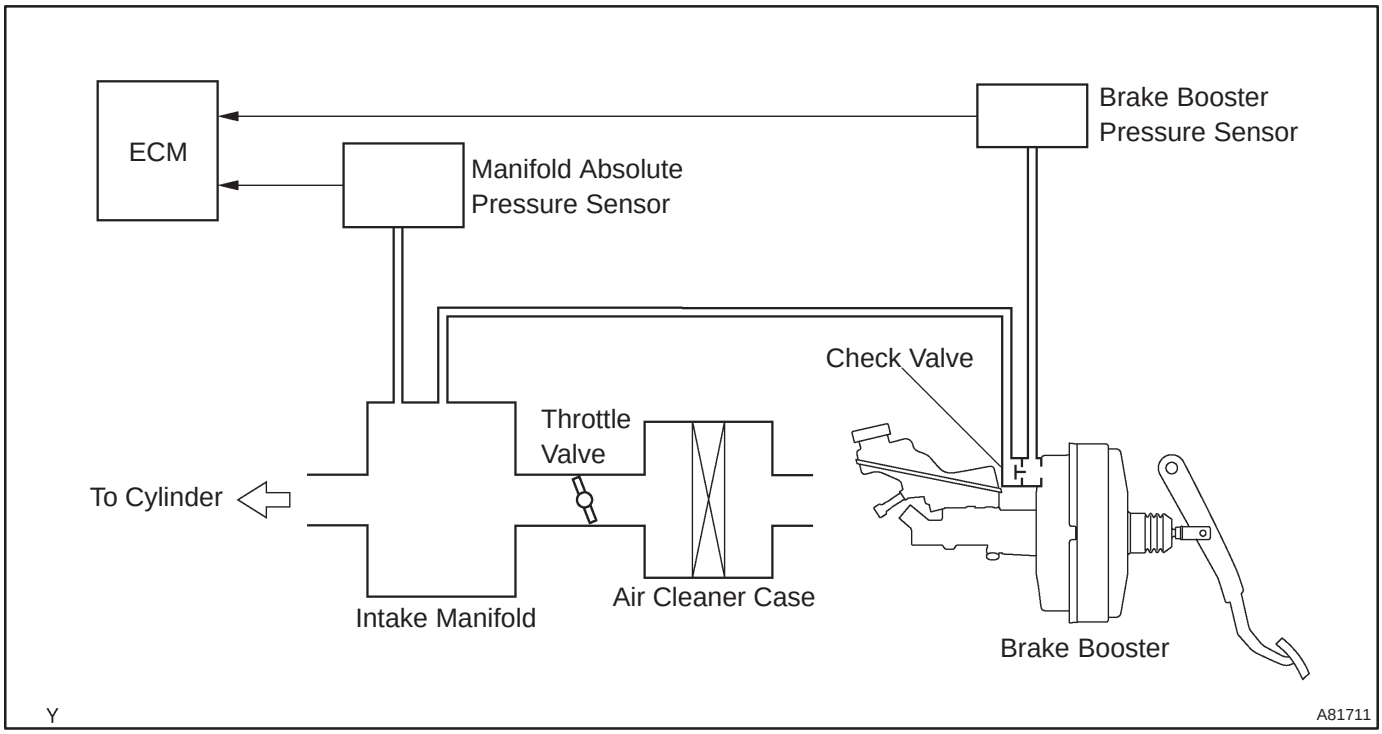
OK

REPLACE BRAKE BOOSTER PRESSURE SENSOR

DTC	P0556	BRAKE BOOSTER PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P0555 on page 05–459.



DTC No.	DTC Detection Condition	Trouble Area
P0556	When either one of the following conditions (a), (b), (c) or (d) is satisfied (1 trip detection logic): (a) If pressure inside the intake manifold is low, the brake booster internal pressure is 38 kPa (285 mmHg, 11.2 in.Hg) or more higher than the intake manifold internal pressure and this condition remains for more than 10 sec. (Pressure leaks caused by hose disconnection, etc). (b) Pressure inside the brake booster stays low or at fixed level, despite the vehicle has driven and stopped 10 times (Vacuum stuck caused by hose clogged, etc). (c) While the brake pedal is released, the pressure inside the brake booster is 32 kPa (240 mmHg, 9.4 in.Hg) or more higher than the intake manifold internal pressure and this condition remains for more than 1 sec. (Pressure leaks). (d) After running the engine for more than 100 sec. with the brake pedal released and the negative pressure (vacuum) has accumulated in the brake booster, the following two conditions are satisfied despite depressing the brake pedal for more than 1 sec. (Vacuum stuck): • Internal pressure of the brake booster does not increase • Internal pressure of the brake booster is 32 kPa (240 mmHg, 9.4 in.Hg) or more lower than the internal pressure of the intake manifold	• Vacuum hose (between the brake booster and intake manifold, the brake booster and brake booster pressure sensor, and the intake manifold and manifold absolute pressure sensor) • Open or short in brake booster pressure sensor circuit • Brake booster pressure sensor • Manifold absolute pressure sensor • Brake booster • Open or short in stop light switch circuit • Stop light switch • ECM

WIRING DIAGRAM

Refer to DTC P0555 on page 05–459.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO P0556)

(a) Read the DTC using the hand–held tester.

Result :

Display	Proceed to
Only ”P0556” is output.	A
”P0556” and other DTCs are output.	B

HINT:

If any other codes besides ”P0556” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2	READ VALUE OF HAND–HELD TESTER(INTAKE MANIFOLD ABSOLUTE PRESSURE)

(a) Connect the hand–held tester to the DLC3.
(b) Warm up the engine.
(c) Push the hand–held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAP” and read its value displayed on the hand–held tester with the shift lever is the ”N” position.

Standard :

Condition	Intake Manifold Absolute Pressure
Ignition switch ON (do not start engine)	70 to 110 kPa (525 to 825 mmHg, 20.7 to 32.5 in.Hg)
Running without load (2,500 rpm)	20 to 35 kPa (150 to 263 mmHg, 5.9 to 10.4 in.Hg)

NG → **Go to step 7**

OK

3	READ VALUE OF HAND–HELD TESTER(STOP LIGHT SWITCH)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW” and read its value displayed on the hand–held tester.

Result :

Brake Pedal	STP Signal
Depressed	ON
Released	OFF

NG → CHECK AND REPAIR STOP LIGHT SWITCH CIRCUIT

OK

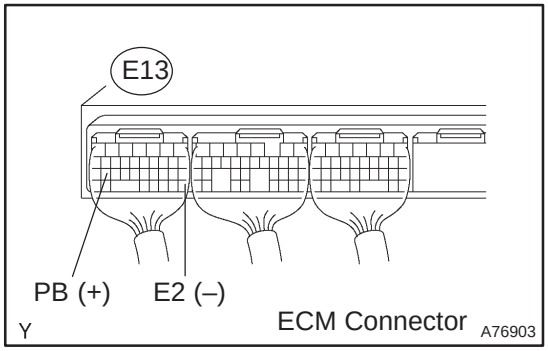
4	CHECK VACUUM HOSE(BRAKE BOOSTER PRESSURE SENSOR – BRAKE BOOSTER, INTAKE MANIFOLD – BRAKE BOOSTER)

(a) Check that the vacuum hoses are connected correctly.
(b) Check that the vacuum hoses are not loose or disconnected.
(c) Check the vacuum hoses and tubes for clogs, cracks, holes, damage, or blockage.

NG → REPAIR OR REPLACE VACUUM HOSE

OK

5	INSPECT ECM(PB VOLTAGE)



(a) Disconnect the vacuum hose from the brake booster pressure sensor.
(b) Turn the ignition switch ON.
(c) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum to the brake booster pressure sensor, measure the voltage between the specified terminals of the E13 ECM connector.

Standard:

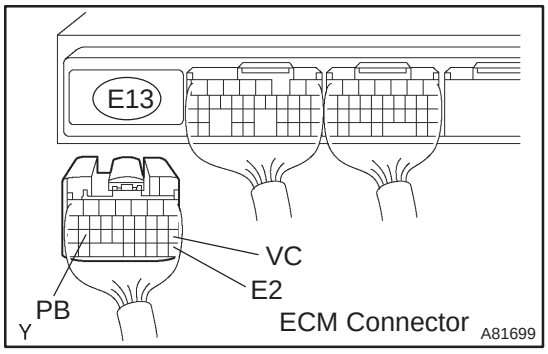
Symbols (Terminal No.)	Vacuum pump operation	Specified condition
PB (E13–26) – E2 (E13–28)	0 kPa (0 mmHg, 0 in.Hg)	3.3 to 3.9 V
	40 kPa (300 mmHg, 11.8 in.Hg)	2.1 to 2.7 V
	80 kPa (600 mmHg, 23.6 in.Hg)	0.9 to 1.5 V

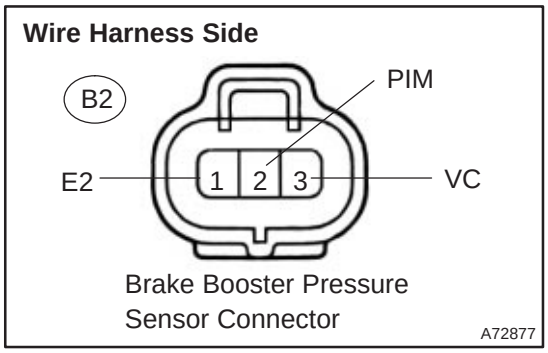
NG → Go to step 6

OK

CHECK FUNCTION OF BRAKE BOOSTER (See page 32–17, 32–21)

6	CHECK HARNESS AND CONNECTOR(ECM – BRAKE BOOSTER PRESSURE SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the B2 brake booster pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (E13–18) – VC (B2–3)	Continuity
PB (E13–26) – PIM (B2–2)	
E2 (E13–28) – E2 (B2–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (E13–18) or VC (B2–3) – Body ground	No continuity
PB (E13–26) or PIM (B2–2) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE BRAKE BOOSTER PRESSURE SENSOR

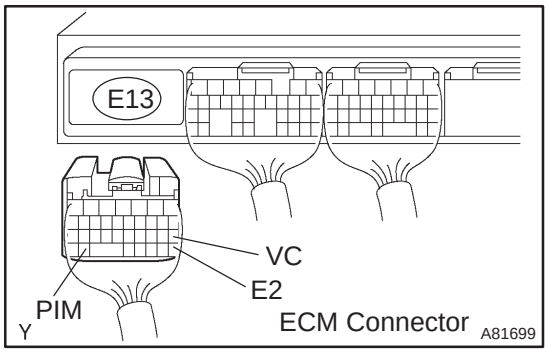
7	CHECK VACUUM HOSE(MANIFOLD ABSOLUTE PRESSURE SENSOR – INTAKE MANIFOLD)

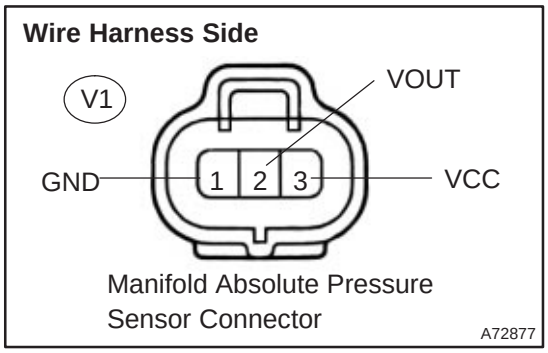
(a) Check that the vacuum hose is connected correctly.
(b) Check that the vacuum hose is not loose or disconnected.
(c) Check the vacuum hose for clogs, cracks, holes, damage, or blockage.

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

8	CHECK HARNESS AND CONNECTOR(ECM – MANIFOLD ABSOLUTE PRESSURE SENSOR)





(a) Disconnect the E13 ECM connector.
(b) Disconnect the V1 manifold absolute pressure sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (E13–18) – VCC (V1–3)	Continuity
PIM (E13–33) – VOUT (V1–2)	
E2 (E13–28) – GND (V1–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (E13–18) or VCC (V1–3) – Body ground	No continuity
PIM (E13–33) or VOUT (V1–2) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

DTC	P0560	SYSTEM VOLTAGE

CIRCUIT DESCRIPTION

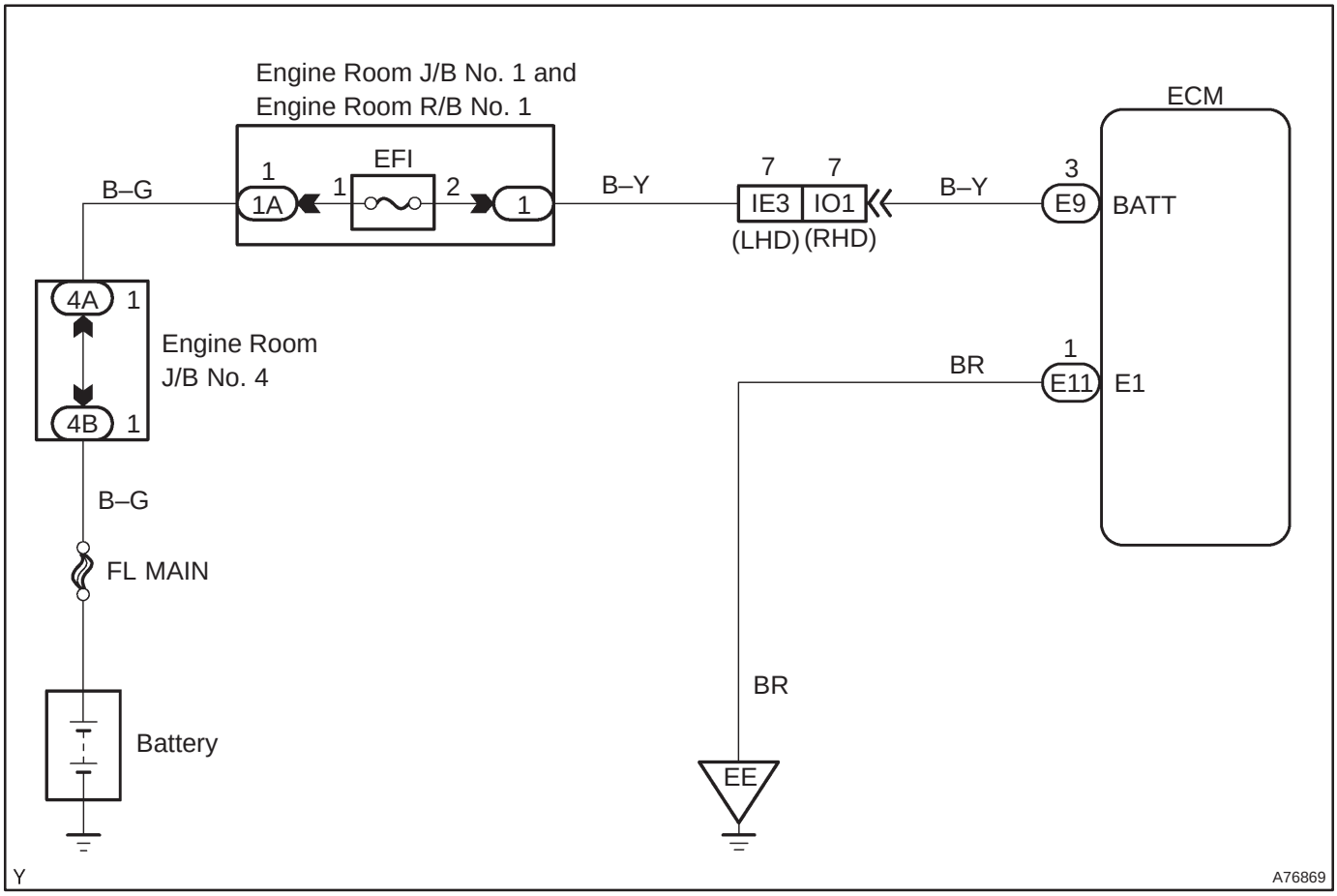
While the ignition switch is OFF, the battery positive voltage is supplied to terminal BATT of the ECM for the DTCs memory and air–fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in back–up power source circuit	• Open in back–up power source circuit • ECM

HINT:

If DTC P0560 is present, the ECM is unable to store other DTCs.

WIRING DIAGRAM

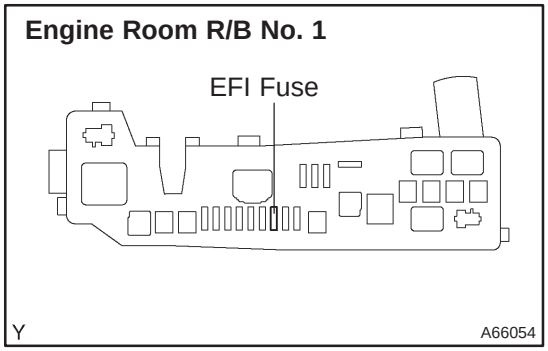


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK FUSE(EFI FUSE)

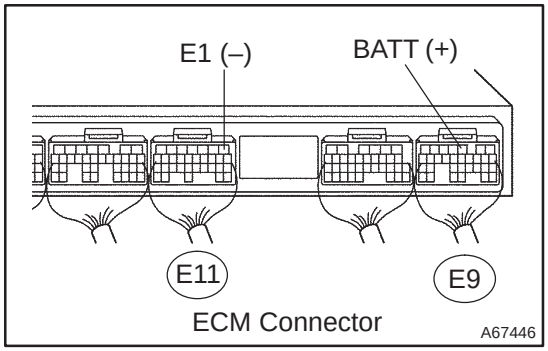


(a) Remove the EFI fuse from the engine room R/B No. 1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED EFI FUSE**

OK

2 INSPECT ECM(BATT VOLTAGE)



(a) Measure the voltage between the specified terminals of the E9 and E11 ECM connectors.
Standard:

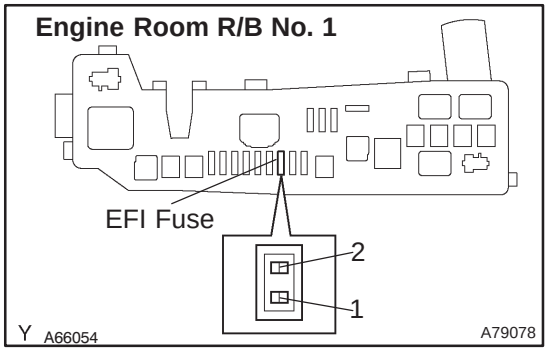
Symbols (Terminal No.)	Specified condition
BATT (E9–3) – E1 (E11–1)	9 to 14 V

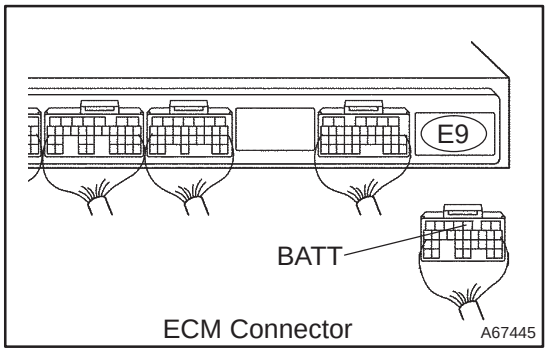
NG → **Go to step 3**

OK

CHECK AND REPLACE ECM (See page 01–32)

3 CHECK HARNESS AND CONNECTOR(ECM – EFI FUSE, EFI FUSE – BATTERY)





(a) Check the harness and connector between the EFI fuse and ECM.
  (1) Remove the EFI fuse from the engine room R/B No.1.
  (2) Disconnect the E9 ECM connector.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) – BATT (E9–3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) or BATT (E9–3) – Body ground	No continuity

(b) Check the harness and connector between the EFI fuse and battery.
  (1) Remove the EFI fuse from the engine room R/B No.1.
  (2) Disconnect the battery positive terminal.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Battery positive terminal – EFI fuse (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Battery positive terminal or EFI fuse (1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ENGINE ROOM RELAY BLOCK

DTC	P0604	INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC	P0606	ECM/PCM PROCESSOR

DTC	P0607	CONTROL MODULE PERFORMANCE

DTC	P0657	ACTUATOR SUPPLY VOLTAGE CIRCUIT/OPEN

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0604 P0606 P0607 P0657	ECM inside error	• ECM

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

REPAIR OR REPLACE ECM (See page 01–32)

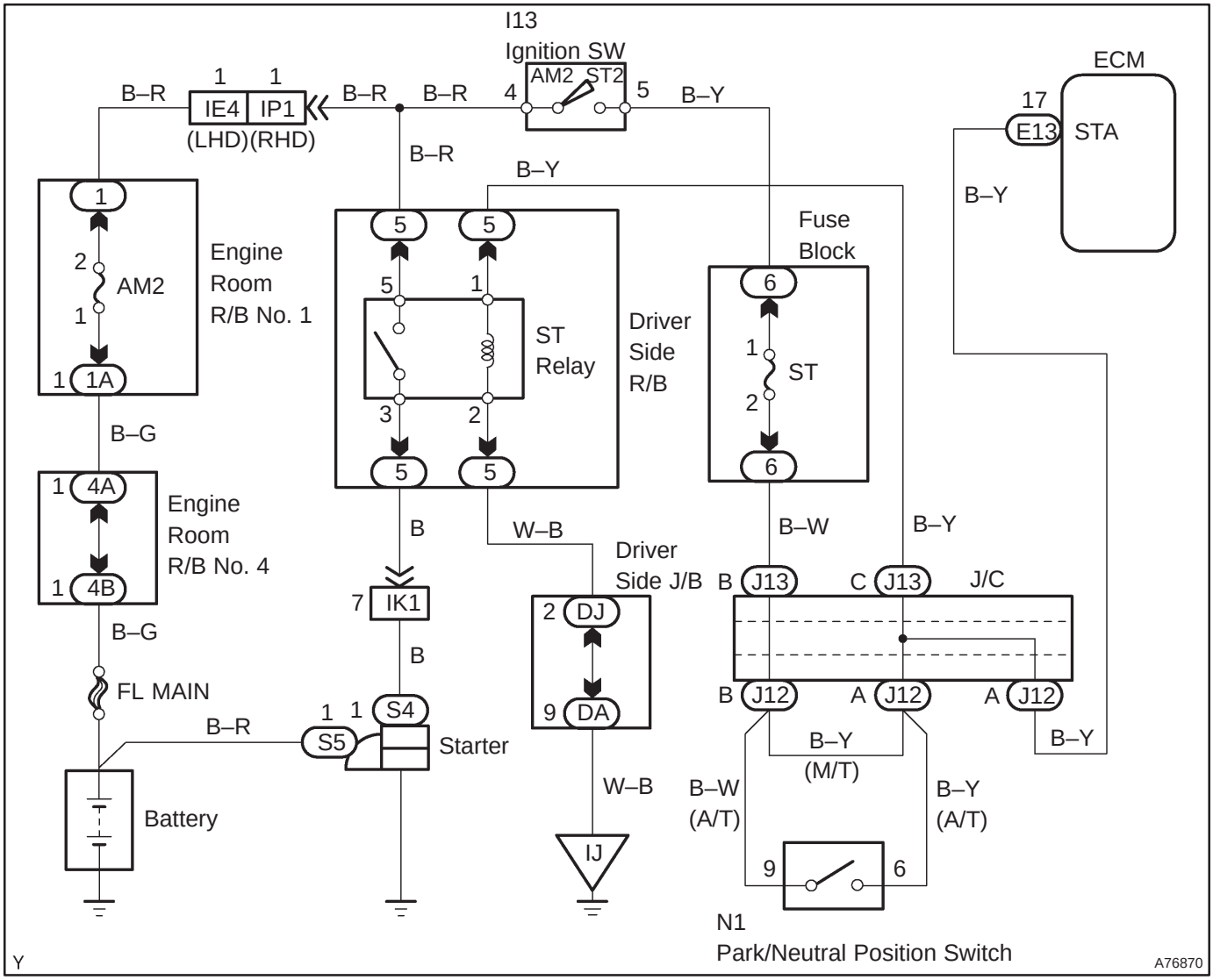
DTC	P0617	STARTER RELAY CIRCUIT HIGH

CIRCUIT DESCRIPTION

While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0617	When all conditions (a), (b) and (c) are satisfied with battery (+B) voltage 10.5 V or more for 20 sec. (a) Vehicle speed greater than 20 km/h (b) Engine revolution greater than 1,000 rpm (c) STA signal ON	• Short in park/neutral position switch (A/T) • Park/neutral position switch (A/T) • Ignition switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG" and read its value displayed on the hand–held tester.

Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

2	INSPECT PARK/NEUTRAL POSITION SWITCH ASSY

(a) Inspect the park/neutral position switch (A/T) (See page 05–938).

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSY (See page 40–8) (GO TO NEXT STEP 3 AFTER THE REPLACEMENT)**

OK

3	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG" and read its value displayed on the hand–held tester.

Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **SYSTEM OK**

NG

4	INSPECT IGNITION OR STARTER SWITCH ASSY (See page 80–2)

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY (GO TO NEXT STEP 5 AFTER THE REPLACEMENT)**

OK

5	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG" and read its value displayed on the hand–held tester.

Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **SYSTEM OK**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC	P0705	TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)

CIRCUIT DESCRIPTION

The park/neutral position switch goes on when the shift lever is in the N or P shift position. If the shift lever is moved from the N position to the D position, this signal is used for air–fuel ratio correction and for idle speed control (estimated control), etc.

DTC No.	DTC Detection Condition	Trouble Area
P0705	2 or more switches are ON simultaneously for N, P, D and R positions (2 trip detection logic)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM

HINT:

After confirming DTC P0705, use the hand–held tester to confirm the park/neutral position switch signal from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

WIRING DIAGRAM

Refer to DTC P0705 on page 05–938.

INSPECTION PROCEDURE

Refer to DTC P0705 on page 05–938.

DTC	P0724	BRAKE SWITCH ”B” CIRCUIT HIGH

CIRCUIT DESCRIPTION

This STP signal is used to detect that the brakes have been applied. The STP signal voltage is the same as the one supplied to the stop lights.
The STP signal is used mainly to control the fuel cut–off engine speed (The fuel cut–off engine speed is reduced slightly when the vehicle is braking).

DTC No.	DTC Detection Condition	Trouble Area
P0724	The stop light switch does not turn off even the vehicle is driven. (2 trip detection logic)	• Short in stop light switch signal circuit • Stop light switch • ECM

WIRING DIAGRAM

Refer to DTC P0504 on page 05–455.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OPERATION OF STOP LIGHT

(a) Check if the stop lights go on and off normally when the brake pedal is operated and released.

NG → **REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT**

OK

2	READ VALUE OF HAND–HELD TESTER(STOP LIGHT SWITCH)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW” and read its value displayed on the hand–held tester.

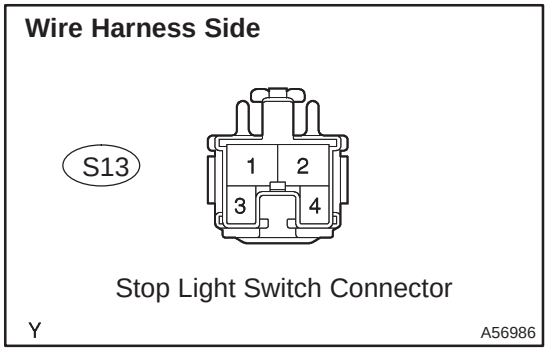
Result:

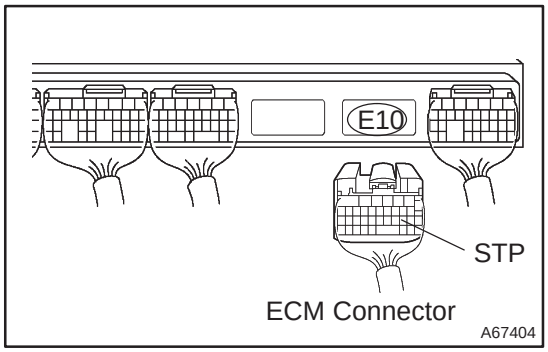
Brake Pedal	STP Signal
Depressed	ON
Released	OFF

OK → **CHECK FOR INTERMITTENT PROBLEMS**

NG

3 CHECK HARNESS AND CONNECTOR(ECM – STOP LIGHT SWITCH)





(a) Disconnect the S13 stop light switch connector.
(b) Disconnect the E10 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) – STP (E10–19)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) or STP (E10–19) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

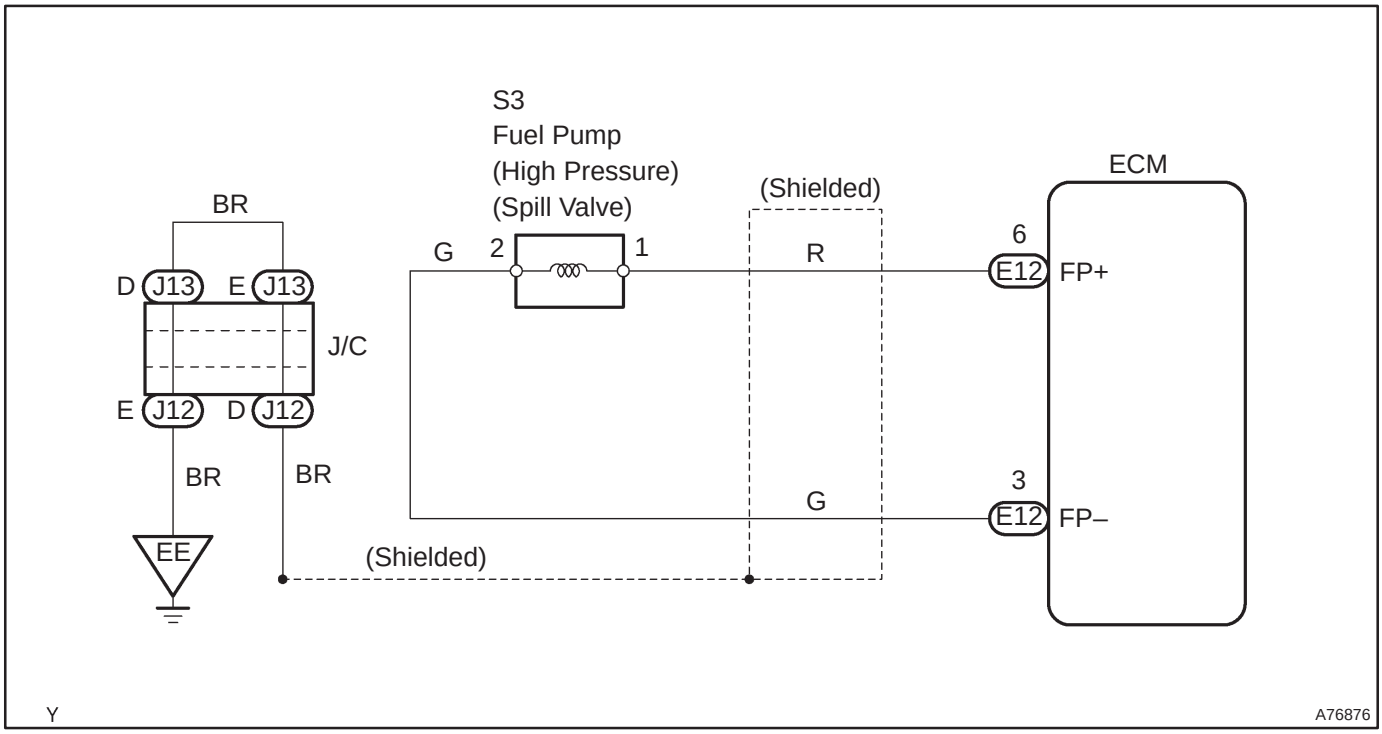
DTC	P1235	HIGH PRESSURE FUEL PUMP CIRCUIT

CIRCUIT DESCRIPTION

The fuel pump (high pressure) is an electronically controlled plunger type fuel pump (high pressure) which is driven by the cam provided on the intake cam shaft rear end on the cylinder head.
The fuel pump (high pressure) increases the pressure of the fuel fed from the fuel pump (low pressure) in the fuel tank at 8 to 13 MPa (81.6 to 132.6 kgf/cm^2, 1,160 to 1,885 psi) according to the operating condition, and it feeds the fuel to the fuel delivery pipe.

DTC No.	DTC Detection condition	Trouble Area
P1235	Open or short in fuel pump (high pressure) circuit for 1sec. or more	• Open or short in fuel pump (high pressure) • Fuel pump (high pressure) • ECM

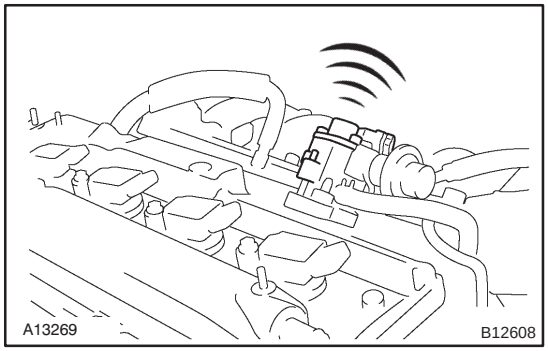
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester. Freeze frame data records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OPERATION OF FUEL PUMP(HIGH PRESSURE)



(a) With the engine running or cranking, use a sound scope to check that there is the normal operating sounds of the fuel pump (high–pressure) when it is operated.

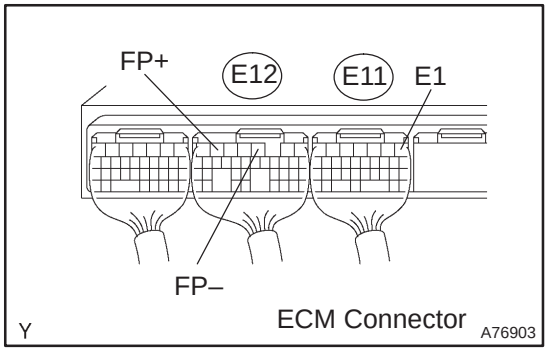
Standard:

There is the operating sounds of the fuel pump (high–pressure).

NG → **REPLACE FUEL PUMP (HIGH PRESSURE)**

OK

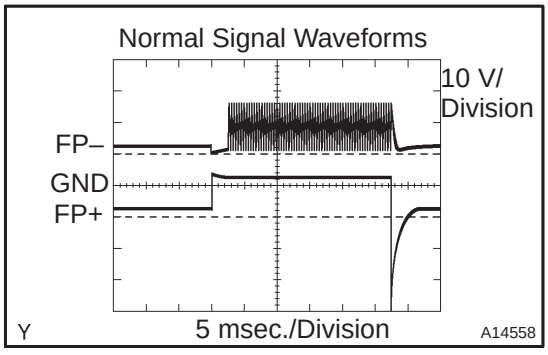
2 INSPECT ECM(FP+ AND FP– VOLTAGE)



(a) Turn the ignition switch ON, and check the waveforms between terminals FP+ and E1, and FP– and E1 of the E11 and E12 ECM connectors.

HINT:

The correct waveform is as shown in the illustration.



NG → **CHECK AND REPLACE ECM (See page 01–32)**

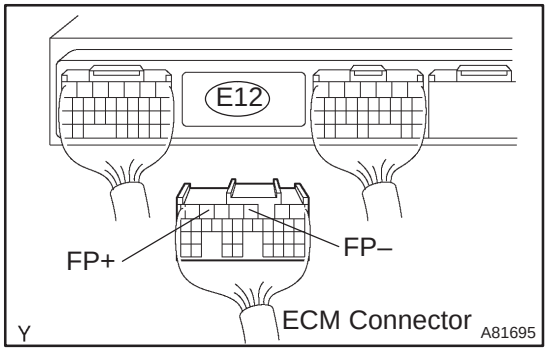
OK

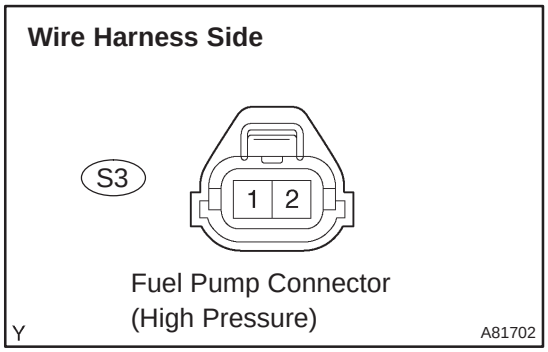
3 CHECK FUEL PUMP(HIGH PRESSURE) (See page 11–33)

NG → **REPLACE FUEL PUMP(HIGH PRESSURE)**

OK

4 CHECK HARNESS AND CONNECTOR(FUEL PUMP (HIGH PRESSURE) – ECM)





(a) Disconnect the E12 ECM connector.
(b) Disconnect the S3 fuel pump (high pressure) connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
FP+ (E12–6) – Fuel pump (S3–1)	Continuity
FP– (E12–3) – Fuel pump (S3–2)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
FP+ (E12–6) or Fuel pump (S3–1) – Body ground	No continuity
FP– (E12–3) or Fuel pump (S3–2) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK FOR INTERMITTENT PROBLEMS

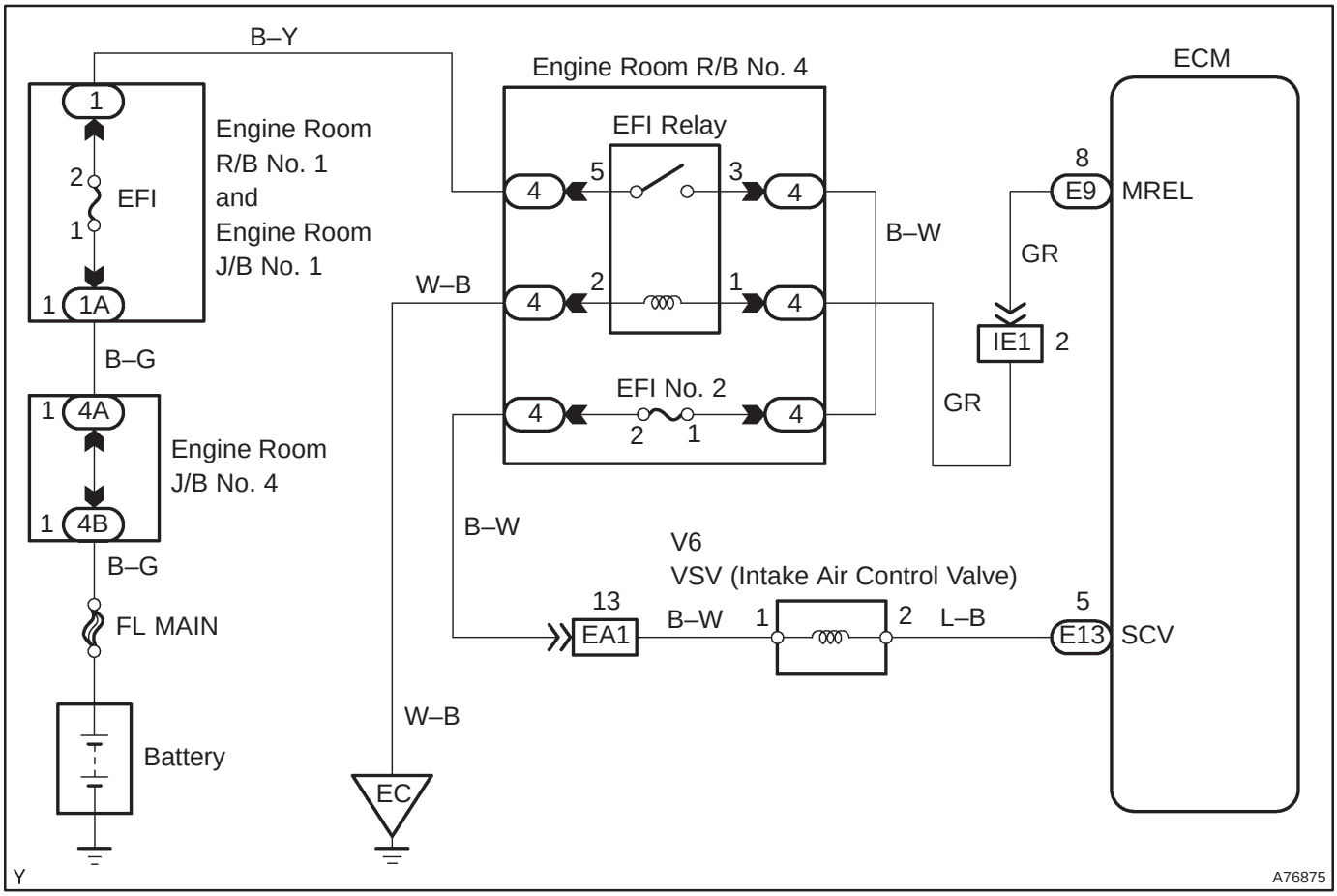
DTC	P2008	INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

CIRCUIT DESCRIPTION

The Intake Air Control valve (IACV) is opened and shut by the actuator with intake manifold vacuum. It stabilizes the engine combustion. The IACV operation generates swirl air flow in the cylinder.

DTC No.	DTC Detection Condition	Trouble Area
P2008	Open or short in VSV for IACV circuit 0.5 sec. or more (2 trip detection logic)	• Open of short in VSV for IACV circuit • VSV for IACV • ECM

WIRING DIAGRAM

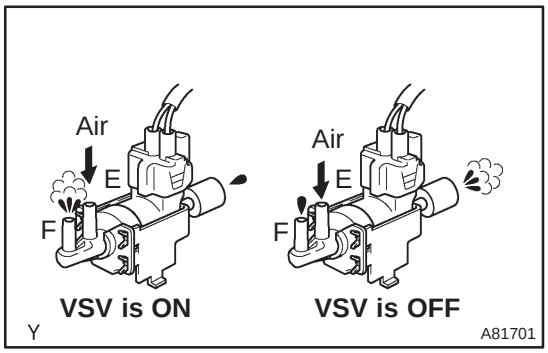


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR IACV)



(a) Disconnect the vacuum hose from the VSV for IACV.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / SCV VSV" (press the right or left button).
(d) Check the VSV for IACV operation when it is operated by the hand–held tester.

Standard:

Tester operation	Specified condition
VSV is ON	Air from port E flows out through port F.
VSV is OFF	Air does not flow from port E to port F.

NG → **Go to step 2**

OK

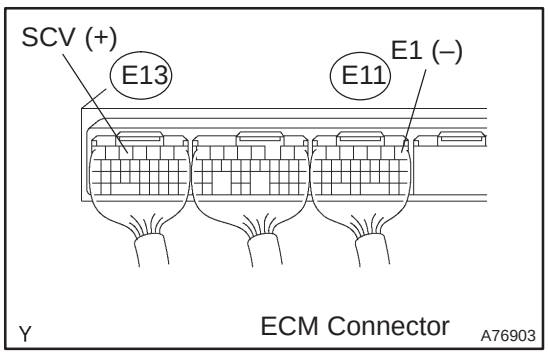
CHECK FOR INTERMITTENT PROBLEMS

2	INSPECT VACUUM SWITCHING VALVE ASSY NO.1(VSV FOR IACV) (See page 13–2)

NG → **REPLACE VACUUM SWITCHING VALVE ASSY NO.1 (VSV FOR IACV)**

OK

3	INSPECT ECM(SCV VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E11 and E13 ECM connectors.

Standard:

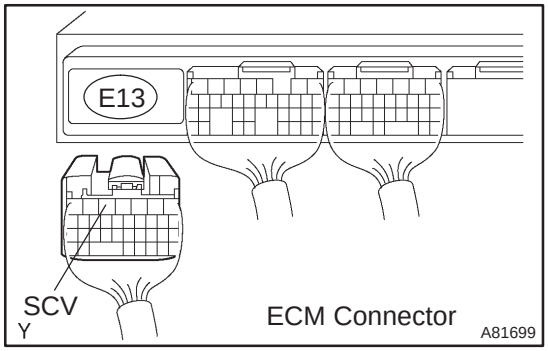
Symbols (Terminal No.)	Specified condition
SCV (E13–5) – E1 (E11–1)	9 to 14 V

NG → **Go to step 4**

OK

CHECK AND REPLACE ECM (See page 01–32)

4 CHECK HARNESS AND CONNECTOR(ECM – VSV FOR IACV)



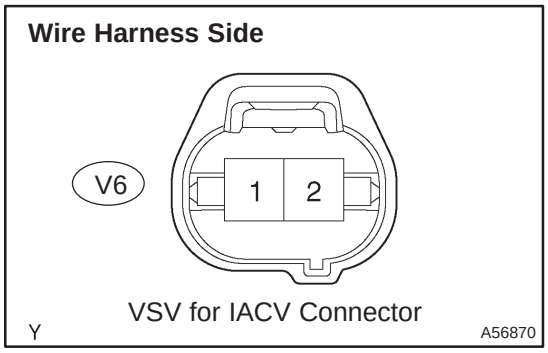
(a) Disconnect the V6 VSV for IACV connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV for IACV (V6–2) – SCV (E13–5)	Continuity

Standard (Check for short):

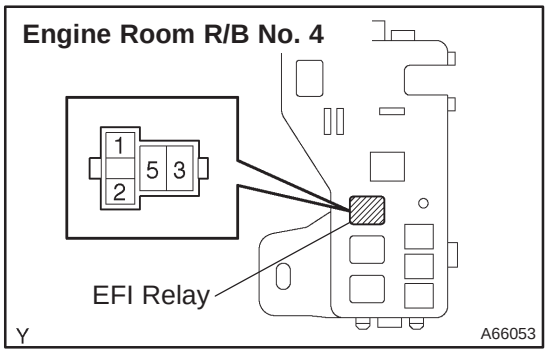
Symbols (Terminal No.)	Specified condition
VSV for IACV (V6–2) or SCV (E13–5) – Body ground	No continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 CHECK HARNESS AND CONNECTOR(EFI RELAY – VSV FOR IACV)



(a) Inspect the EFI No. 2 fuse.
  (1) Remove the EFI No. 2 fuse from the engine room R/B No. 4.
  (2) Check the continuity of the EFI No. 2 fuse.

Standard: Continuity

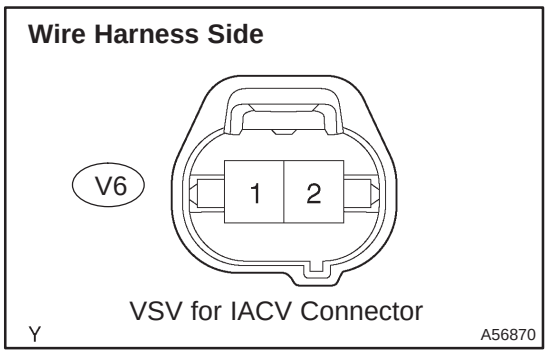
(b) Remove the EFI relay from the engine room R/B No. 4.
(c) Disconnect the V6 VSV for IACV connector.
(d) Check for continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV for IACV (V6–1) – EFI relay (3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VSV for IACV (V6–1) or EFI relay (3) – Body ground	No continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–502)

DTC	P2102	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

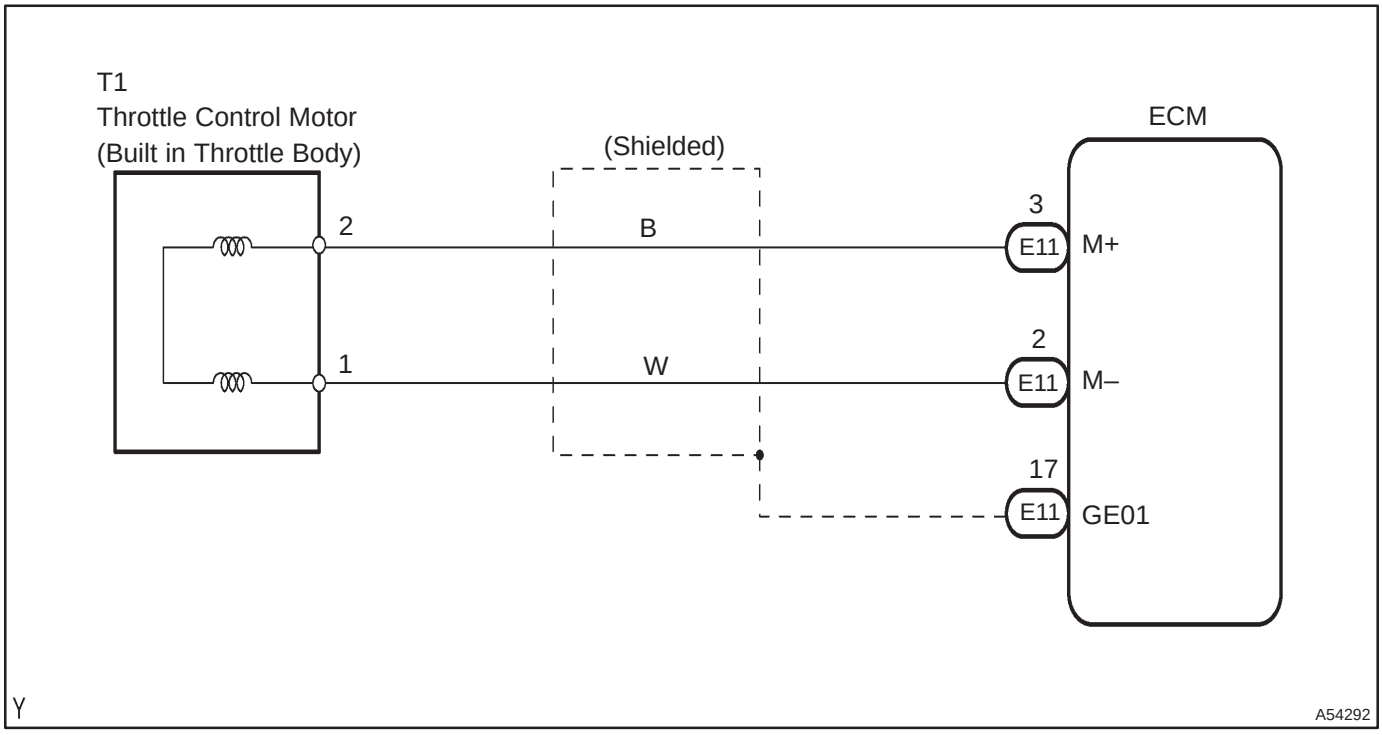
DTC	P2103	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM and it opens and closes the throttle valve.
The opening angle of the throttle valve is detected by the throttle position sensor which is mounted on the throttle body. It provides feedback to the ECM to control the throttle motor in order to regulate the throttle valve opening angle properly in response to the driving condition.
If this malfunction is detected, the ECM shuts down the power for the throttle motor, and the throttle valve is closed by the return spring. And the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.
HINT:
This electrical throttle system does not use the throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2102	Conditions (a) and (b) continue for 2.0 seconds: (a) Throttle control motor output duty greater than 80 % (b) Throttle control motor current less than 0.5 A	• Open in throttle control motor circuit • Throttle control motor • ECM
P2103	Throttle control motor current greater than 10 A	• Short in throttle control motor circuit • Throttle control motor • ECM
	Condition (a) continues for 0.6 seconds: (a) Throttle control motor current greater than 7 A	

WIRING DIAGRAM

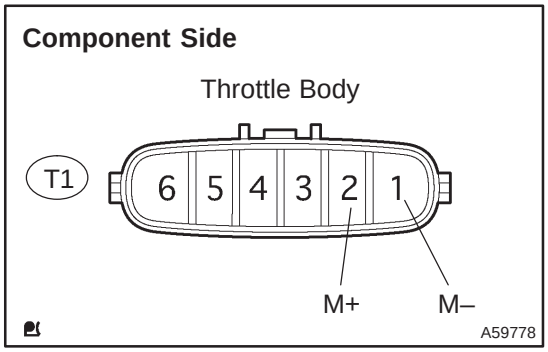


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT THROTTLE BODY ASSY(RESISTANCE OF THROTTLE CONTROL MOTOR)

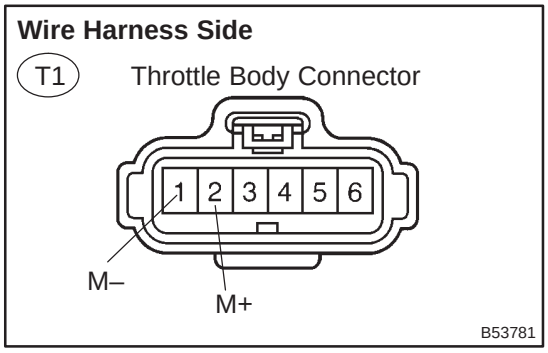


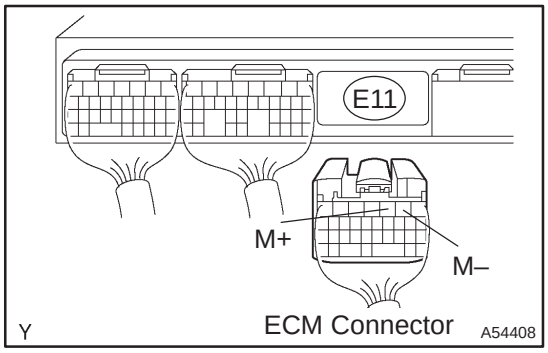
(a) Disconnect the T1 throttle body connector.
(b) Measure the motor resistance between terminals M+ and M–.
Motor resistance: 0.3 to 100 Ω at 20°C (68°F)

NG → **REPLACE THROTTLE BODY ASSY (See page 10–44)**

OK

2	CHECK HARNESS AND CONNECTOR(THROTTLE CONTROL MOTOR – ECM)





(a) Disconnect the T1 throttle body connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
M+ (T1–2) – M+ (E11–3)	Continuity
M– (T1–1) – M– (E11–2)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
M+ (T1–2) or M+ (E11–3) – Body ground	No continuity
M– (T1–1) or M– (E11–2) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P2111	THROTTLE ACTUATOR CONTROL SYSTEM – STUCK OPEN

DTC	P2112	THROTTLE ACTUATOR CONTROL SYSTEM – STUCK CLOSED

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM and it opens and closes the throttle valve using gears. The opening angle of the throttle valve is detected by the throttle position sensor which is mounted on the throttle body. And, it provides feedback to the ECM to control the throttle motor in order to make the throttle valve opening angle properly in response to the driving condition. If this malfunction is detected, the ECM shuts down the power for the throttle motor, and the throttle valve is closed by the return spring. And the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.

HINT:

This electrical throttle system is no used throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2111	The throttle motor locked during control by the ECM (Stuck open)	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve
P2112	The throttle motor locked during control by the ECM (Stuck closed)	

WIRING DIAGRAM

Refer to DTC P2102 on page 05–483.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

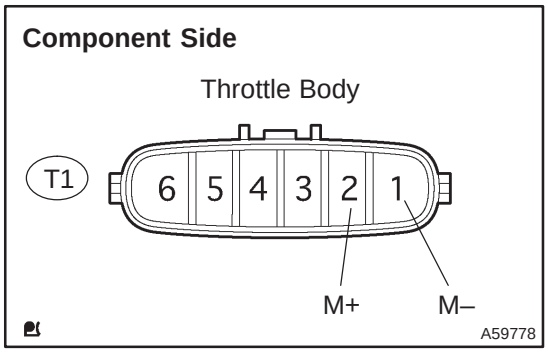
1	INSPECT THROTTLE BODY ASSY(VISUALLY CHECK THROTTLE VALVE)

(a) Check it a foreign object has been caught between the throttle valve and the housing.

NG → REMOVE FOREIGN OBJECT AND CLEAN THROTTLE BODY

OK

2 INSPECT THROTTLE BODY ASSY(RESISTANCE OF THROTTLE CONTROL MOTOR)

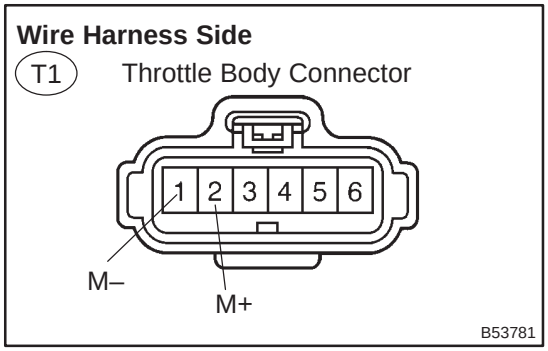


(a) Disconnect the T1 throttle body connector.
(b) Measure the motor resistance between terminals M+ and M–.
Motor resistance: 0.3 to 100 Ω at 20°C (68°F)

NG → **REPLACE THROTTLE BODY ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(THROTTLE CONTROL MOTOR – ECM)



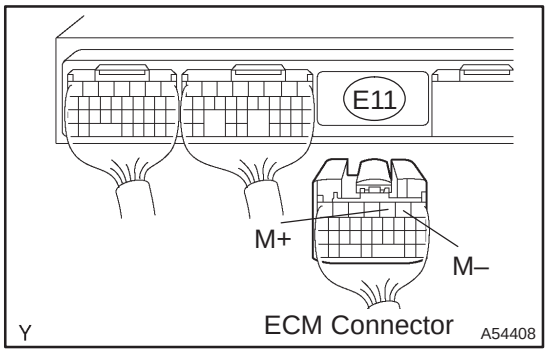
(a) Disconnect the T1 throttle body connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
M+ (T1–2) – M+ (E11–3)	Continuity
M– (T1–1) – M– (E11–2)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
M+ (T1–2) or M+ (E11–3) – Body ground	No continuity
M– (T1–1) or M– (E11–2) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR INTERMITTENT PROBLEMS

DTC	P2118	THROTTLE ACTUATOR CONTROL MOTOR CURRENT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

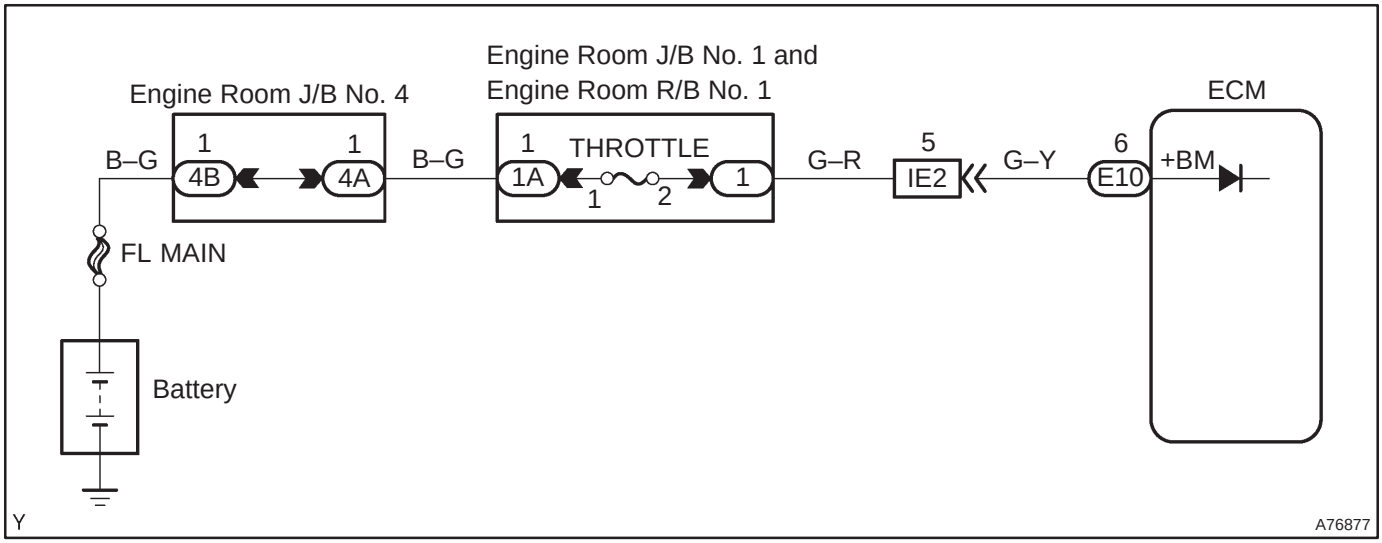
If this DTC is detected, the ECM shuts down the power for the throttle motor, and the throttle valve is closed by the return spring. And the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.

HINT:

This electrical throttle control system (ETCS) does not use the throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2118	Open in ETCS power source circuit	• Open in ETCS power source circuit • ECM

WIRING DIAGRAM

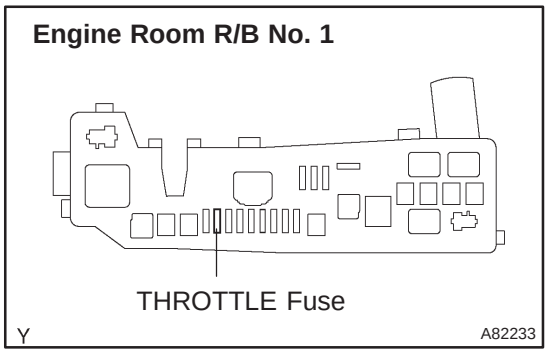


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK FUSE(THROTTLE FUSE)



(a) Remove the THROTTLE fuse from the engine room R/B No. 1.

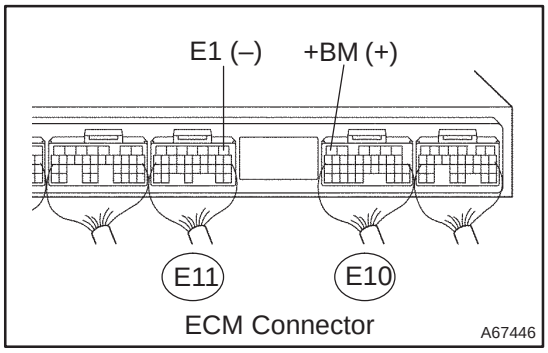
(b) Check for continuity in the THROTTLE fuse.

Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

2 INSPECT ECM(+BM VOLTAGE)



(a) Check the voltage between the specified terminals of the E10 and E11 ECM connectors.

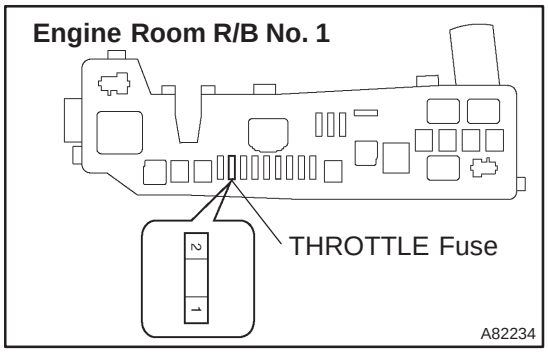
Standard:

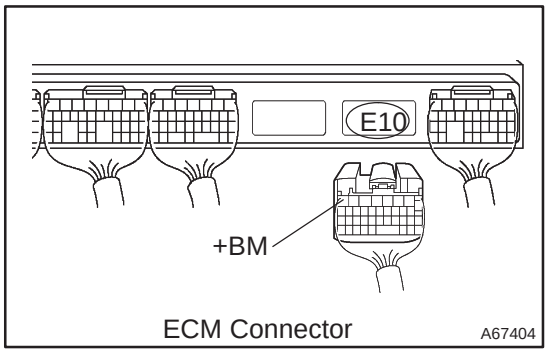
Symbols (Terminal No.)	Specified condition
+BM (E10–6) – E1 (E11–1)	9 to 14 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

3	CHECK HARNESS AND CONNECTOR(ECM – THROTTLE FUSE, THROTTLE FUSE – BATTERY)





(a) Check the harness and the connector between the THROTTLE fuse and the ECM.
  (1) Remove the THROTTLE fuse from the engine room R/B No. 1.
  (2) Disconnect the E10 ECM connector.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
THROTTLE fuse (2) – +BM (E10–6)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
THROTTLE fuse (2) or +BM (E10–6) – Body ground	No continuity

(b) Check the harness and the connector between the THROTTLE fuse and the battery.
  (1) Remove the THROTTLE fuse from the engine room R/B No. 1.
  (2) Disconnect the battery positive terminal.
  (3) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Battery positive terminal – THROTTLE fuse (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Battery positive terminal or THROTTLE fuse (1) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ENGINE ROOM RELAY BLOCK

DTC	P2119	THROTTLE ACTUATOR CONTROL THROTTLE BODY RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The Electric Throttle Control System (ETCS) is composed of the throttle motor that operates the throttle valve, the throttle position sensor that detects the opening angle of the throttle valve, the accelerator pedal position sensor that detects the accelerator pedal position, the ECM that controls the ETCS, and the one valve type throttle body.
The ECM controls the throttle motor to provide the proper throttle valve opening angle in response to the driving condition.
The throttle position sensor which is mounted on the throttle body detects the opening angle of the throttle valve, and it provides feedback to the ECM to control the throttle motor.
If the ETCS has a malfunction, the ECM shuts down the power for the throttle motor, and the throttle valve is closed by the return spring. And the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.

DTC No.	DTC Detection Condition	Trouble Area
P2119	Throttle opening angle continues to vary greatly from target throttle opening angle	• Electric throttle control system • ECM

WIRING DIAGRAM

Refer to DTC P2102 on page 05–483.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P2119)

(a) Read the DTC using hand–held tester.
Result:

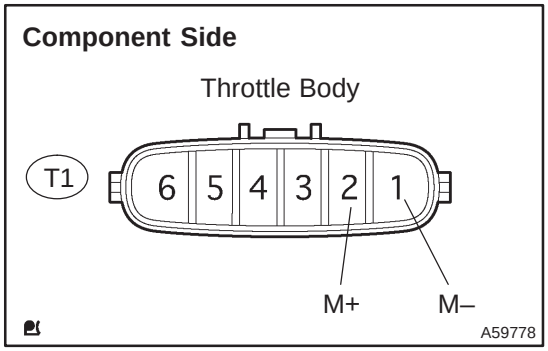
Display (DTC output)	Proceed to
Only P2119 is output	A
P2119 and other DTCs are output	B

HINT:
If any other codes besides P2119 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–309)**

A

2 INSPECT THROTTLE BODY ASSY



(a) Disconnect the T1 throttle body connector.
(b) Measure the motor resistance between terminals M+ and M–.
Motor resistance: 0.3 to 100 Ω at 20°C (68°F)

NG → **REPLACE THROTTLE BODY ASSY**

OK

3 REPLACE ECM AND CLEAR DTC(CHECK IF DTC OUTPUTS REOCCUR)

(a) Replace the ECM.
(b) Clear the DTC (See page 05–294).
(c) Start and warm up the engine.
(d) Run the engine at idle for 15 sec. or more.
(e) Read the DTC (See page 05–294).
Standard: No DTC output.

OK → **NORMAL**

NG

REPLACE THROTTLE BODY ASSY

DTC	P2120	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT

DTC	P2122	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT LOW INPUT

DTC	P2123	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT HIGH INPUT

DTC	P2125	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT

DTC	P2127	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT LOW INPUT

DTC	P2128	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”E” CIRCUIT HIGH INPUT

DTC	P2138	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D”/”E” VOLTAGE CORRELATION

HINT:
This is procedure of accelerator pedal position sensor.

CIRCUIT DESCRIPTION

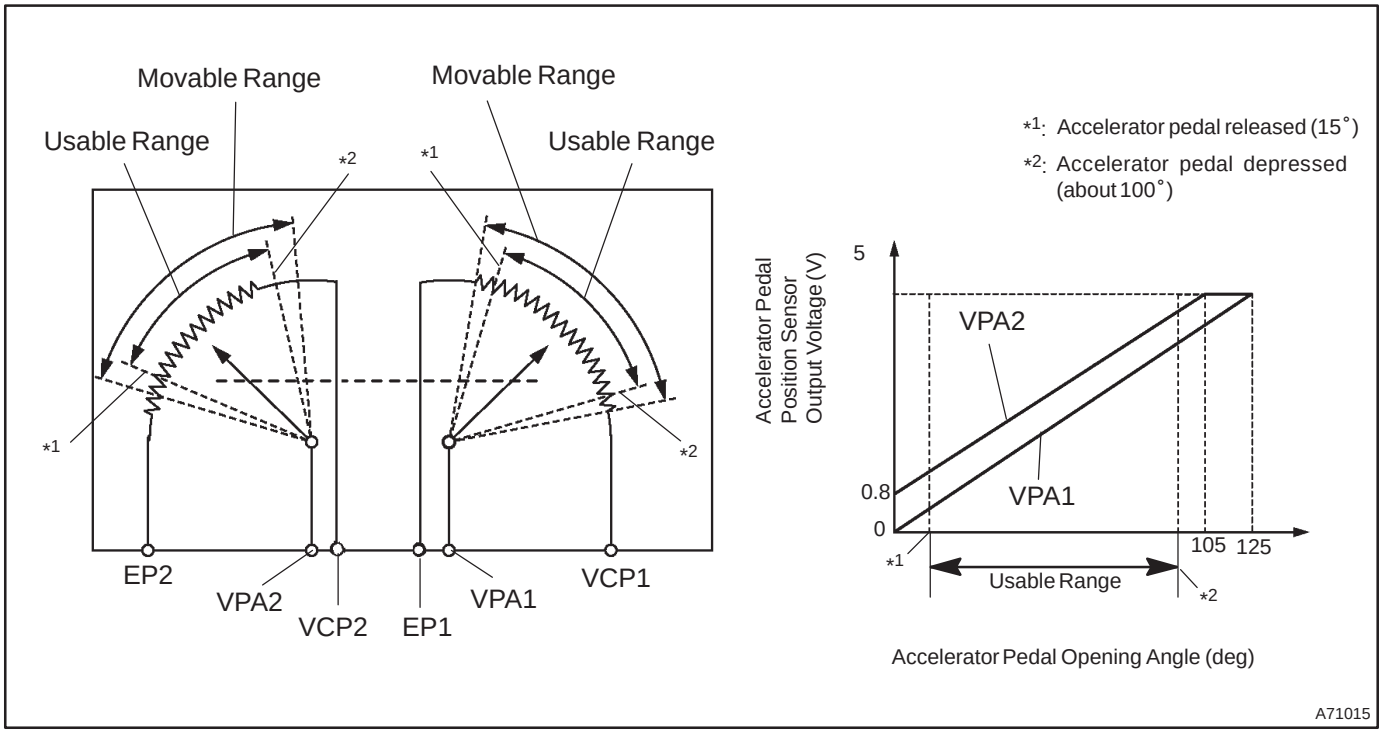
HINT:

This electrical throttle system is no used throttle cable.

The accelerator pedal position sensor is mounted on the accelerator pedal bracket and it have the 2 sensors to detect the accelerator position and a malfunction of the accelerator position sensor.

In the accelerator pedal position sensor, the voltage applied to VPA1 and VPA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the accelerator pedal. The VPA1 is a signal to indicate the actual accelerator pedal opening angle which is used for the engine control, and the VPA2 is a signal to indicate the information about VPA1 which is used for detecting a malfunction in VPA1.

The ECM monitors the current opening angle of the accelerator pedal from these signals input from VPA1 and VPA2, and controls the throttle motor based on these signals.



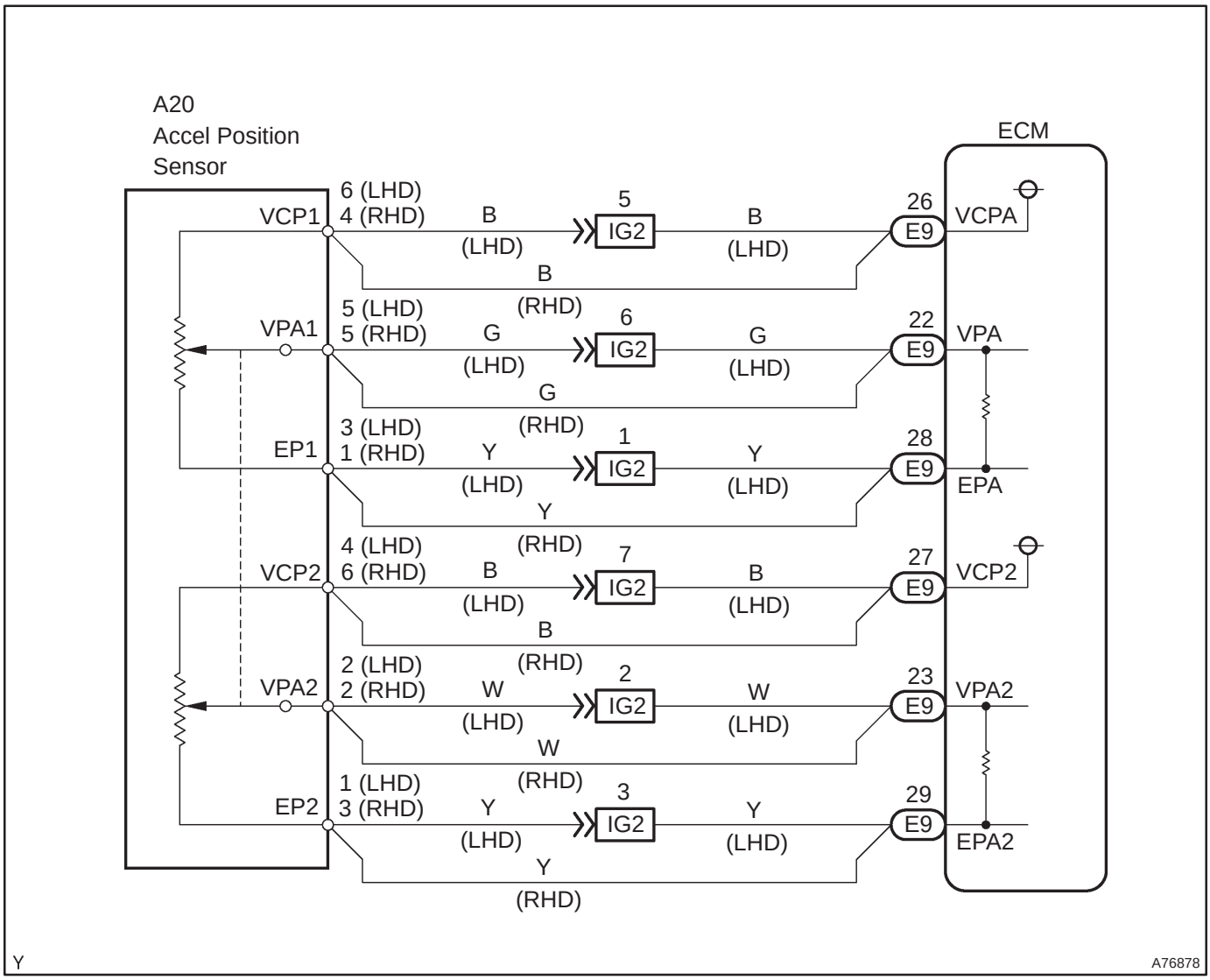
DTC No.	DTC Detection Condition	Trouble Area
P2120	Condition (a) continues for 0.5 sec. or more: (a) VPA less than 0.2 V and VPA2 greater than 0.97 deg, or VPA greater than 4.8 V	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM
P2122	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA less than 0.2 V (b) VPA2 greater than 0.97 deg	
P2123	Condition (a) continues for 2.0 sec. or more: (a) VPA greater than 4.8 V	
P2125	Condition (a) continues for 0.5 sec. or more: (a) VPA2 less than 0.5 V and VPA greater than 0.97 deg, or VPA2 greater than 4.8 V and VPA greater than 0.2 V but less than 3.45 V	
P2127	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA2 less than 0.5 V (b) VPA greater than 0.97 deg	
P2128	Conditions (a) and (b) continue for 2.0 sec. or more: (a) VPA2 greater than 4.8 V (b) VPA greater than 0.2 V but less than 3.45 V	
P2138	Condition (a) or (b) continues for 2.0 sec. or more: (a) Difference between VPA and VPA2 less than 0.02 V (b) VPA less than 0.2 V and VPA2 less than 0.5 V	

HINT:

After confirming ”DTC P2120, P2122, P2123, P2125, P2127, P2128 and P2138”, use the hand–held tester to confirm the accelerator pedal position sensor output voltage.

Trouble area	Accelerator pedal position expressed as voltage output			
	Accelerator pedal released		Accelerator pedal depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VCP circuit open	0 V	0 V	0 V	0 V
VPA circuit open or ground short	0 V	1.5 to 2.9 V	0 V	3.5 to 5.5 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 V	2.5 to 4.6 V	0 V
EP circuit open	5 V	5 V	5 V	5 V

WIRING DIAGRAM

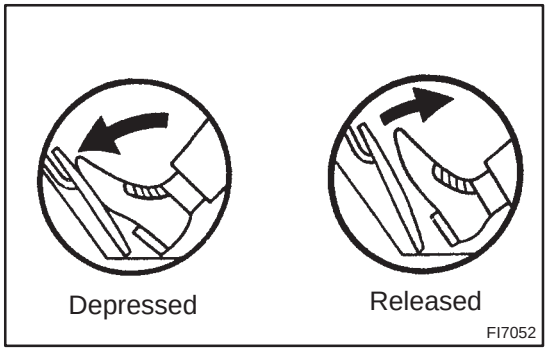


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 READ VALUE OF HAND–HELD TESTER(ACCEL POS #1 AND ACCEL POS #2)



(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2” and read its value displayed on the hand–held tester.

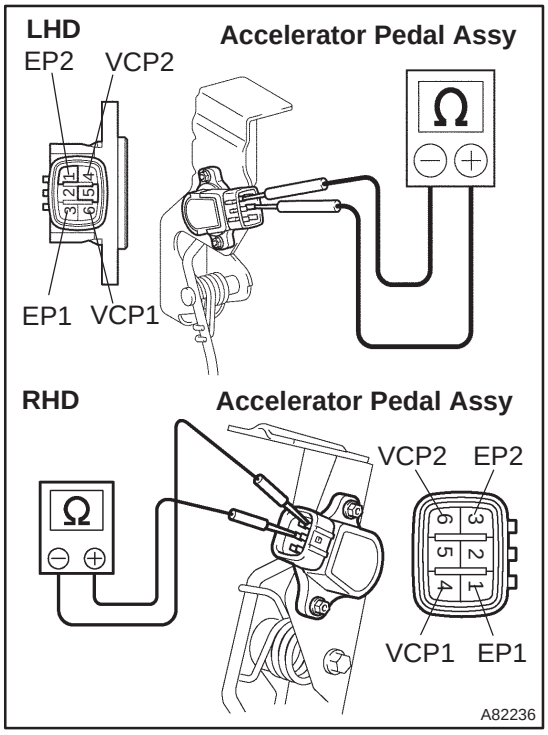
Standard:

Accelerator pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

2 INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A20 accelerator pedal position sensor connector.
(b) Measure the resistance between each terminal.

Standard (LHD):

Symbols (Terminal No.)	Resistance
EP1 (3) – VCP1 (6)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (1) – VCP2 (4)	

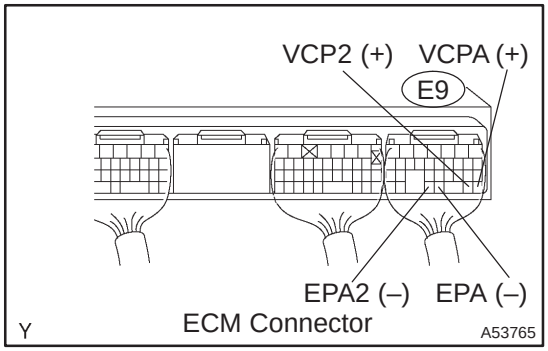
Standard (RHD):

Symbols (Terminal No.)	Resistance
EP1 (1) – VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) – VCP2 (6)	

NG → **REPLACE ACCELERATOR PEDAL ASSY**

OK

3 INSPECT ECM(VCPA AND VCP2 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

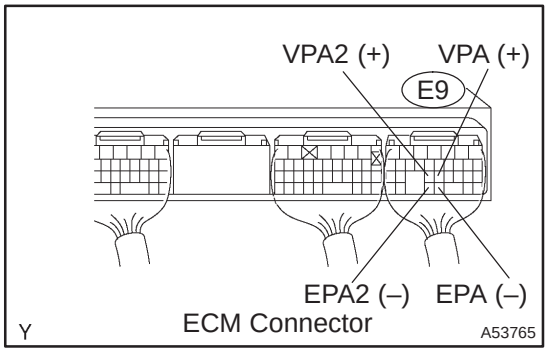
Standard:

Symbols (Terminal No.)	Specified condition
VCPA (E9–26) – EPA (E9–28)	4.5 to 5.5 V
VCP2 (E9–27) – EPA2 (E9–29)	

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

4 INSPECT ECM(VPA AND VPA2 VOLTAGE)



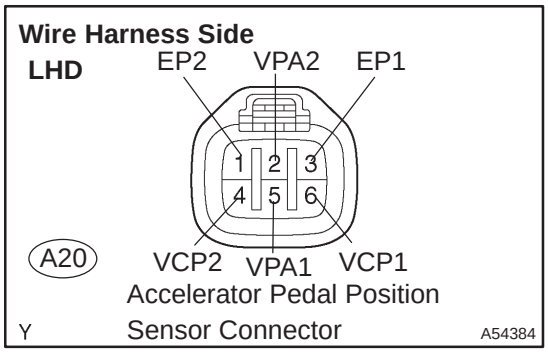
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

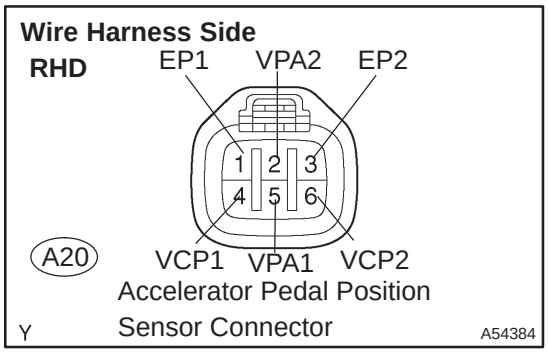
Accelerator pedal position	Symbols (Terminal No.) VPA (E9–22) – EPA (E9–28)	Symbols (Terminal No.) VPA2 (E9–23) – EPA2 (E9–29)
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

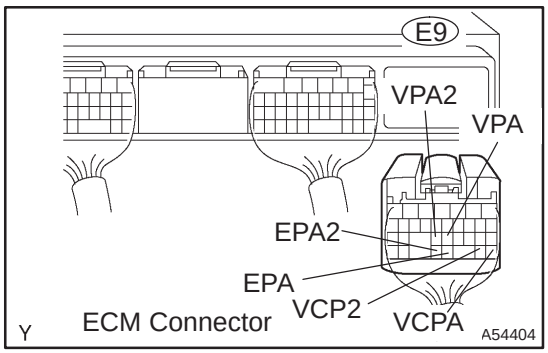
OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

5 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)







(a) Disconnect the A20 accelerator pedal position sensor connector.

(b) Disconnect the E9 ECM connector.

(c) Check for continuity between the wire harness side connectors.

Standard (LHD):

(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–3) – EPA (E9–28)	
VCP1 (A20–6) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–1) – EPA2 (E9–29)	
VCP2 (A20–4) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–3) or EPA (E9–28) – Body ground	
VCP1 (A20–6) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–1) or EPA2 (E9–29) – Body ground	
VCP2 (A20–4) or VCP2 (E9–27) – Body ground	

Standard (RHD):

(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–1) – EPA (E9–28)	
VCP1 (A20–4) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–3) – EPA2 (E9–29)	
VCP2 (A20–6) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–1) or EPA (E9–28) – Body ground	
VCP1 (A20–4) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–3) or EPA2 (E9–29) – Body ground	
VCP2 (A20–6) or VCP2 (E9–27) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P2121	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page 05–492.

DTC No.	DTC Detection Condition	Trouble Area
P2121	Conditions (a) and (b) continue for 0.5 seconds: (a) Difference between VPA and VPA2 exceeds the threshold (b) IDL is OFF	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM

WIRING DIAGRAM

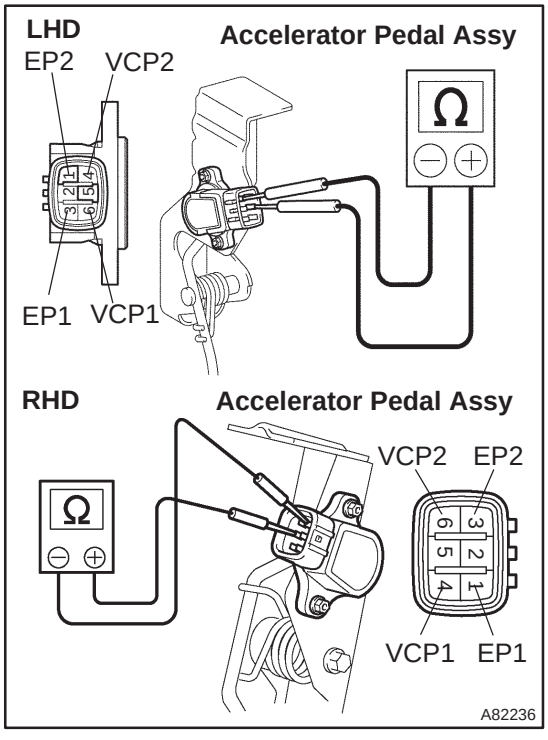
Refer to DTC P2120 on page 05–492.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A20 accelerator pedal position sensor connector.

(b) Measure the resistance between each terminal.

Standard (LHD):

Symbols (Terminal No.)	Resistance
EP1 (3) – VCP1 (6)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (1) – VCP2 (4)	

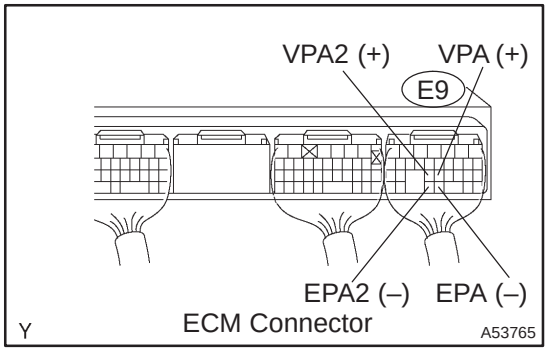
Standard (RHD):

Symbols (Terminal No.)	Resistance
EP1 (1) – VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) – VCP2 (6)	

NG → **REPLACE ACCELERATOR PEDAL ASSY**

OK

2 INSPECT ECM(VPA AND VPA2 VOLTAGE)



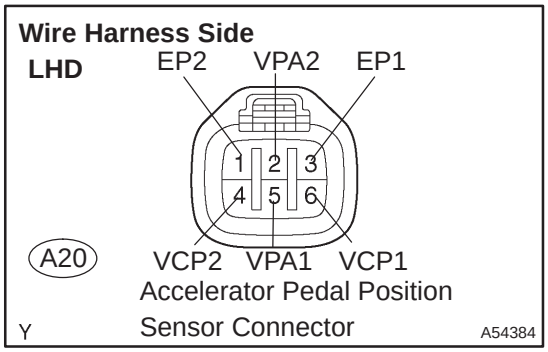
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E9 ECM connector.

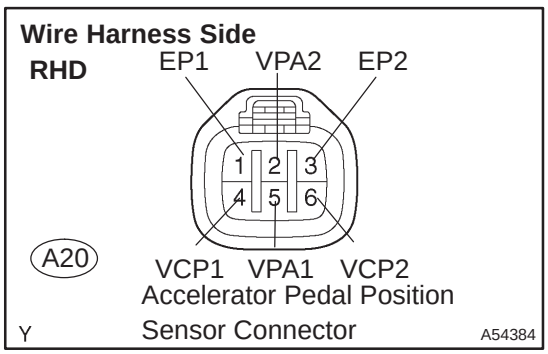
Accelerator pedal position	Symbols (Terminal No.)	Symbols (Terminal No.)
	VPA (E9–22) – EPA (E9–28)	VPA2 (E9–23) – EPA2 (E9–29)
Released	0.5 to 1.1 V	1.5 to 2.9 V
Depressed	2.5 to 4.6 V	3.5 to 5.5 V

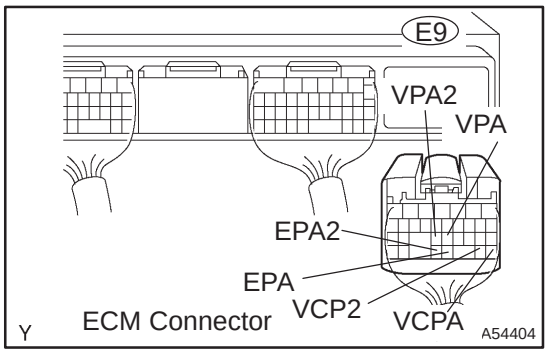
OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

3 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)







(a) Disconnect the accelerator pedal position sensor connector.
(b) Disconnect the E9 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (LHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–3) – EPA (E9–28)	
VCP1 (A20–6) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–1) – EPA2 (E9–29)	
VCP2 (A20–4) – VCP2 (E9–27)	

(Check for Short)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–3) or EPA (E9–28) – Body ground	
VCP1 (A20–6) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–1) or EPA2 (E9–29) – Body ground	
VCP2 (A20–4) or VCP2 (E9–27) – Body ground	

Standard (RHD):
(Check for open)

Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) – VPA (E9–22)	Continuity
EP1 (A20–1) – EPA (E9–28)	
VCP1 (A20–4) – VCPA (E9–26)	
VPA2 (A20–2) – VPA2 (E9–23)	
EP2 (A20–3) – EPA2 (E9–29)	
VCP2 (A20–6) – VCP2 (E9–27)	

(Check for Short)

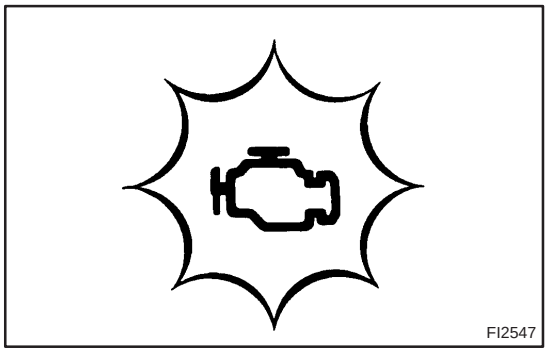
Symbols (Terminal No.)	Specified condition
VPA1 (A20–5) or VPA (E9–22) – Body ground	No continuity
EP1 (A20–1) or EPA (E9–28) – Body ground	
VCP1 (A20–4) or VCPA (E9–26) – Body ground	
VPA2 (A20–2) or VPA2 (E9–23) – Body ground	
EP2 (A20–3) or EPA2 (E9–29) – Body ground	
VCP2 (A20–6) or VCP2 (E9–27) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ACCELERATOR PEDAL ASSY (See page 10–66)

05CDU–01

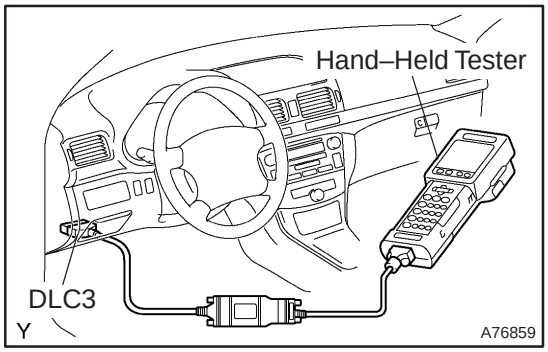

FI2547

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description for Euro–OBD (European spec.)

- When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect an OBD scan tool complying with ISO 15031–4 or a hand–held tester to the vehicle, and read off various data output from the vehicle's ECM.
- Euro–OBD regulations require that the vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the emission control system / components or in the power train control components which affect vehicle emissions, or a malfunction in the computer. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO 15031–4 are recorded in the ECM memory (See page 05–309). If the malfunction does not reoccur in 3 consecutive trips, the CHK ENG goes off automatically but the DTCs remain recorded in the ECM memory.

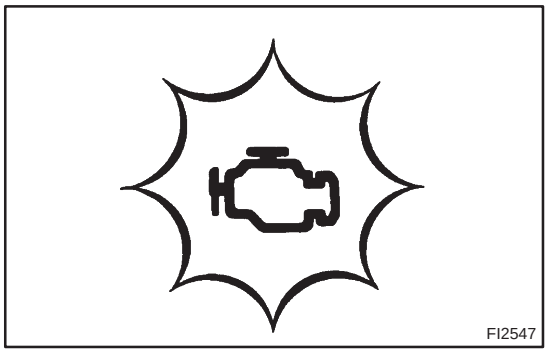


- To check the DTCs, connect the OBD scan tool or hand–held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data. (For operating instructions, see the OBD scan tool's instruction book.)
  DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–309).
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).

- * 2 trip detection logic
  When a logic malfunction is first detected, the malfunction is temporally stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTCs P0300 – P0304) or fuel trim malfunction (DTCs P0171, P0172, P0174 and P0175) or other malfunction (first malfunction only) is detected.
  Because freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- Priorities for troubleshooting:
  If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.

If no instructions are given, troubleshoot according to the following priorities.

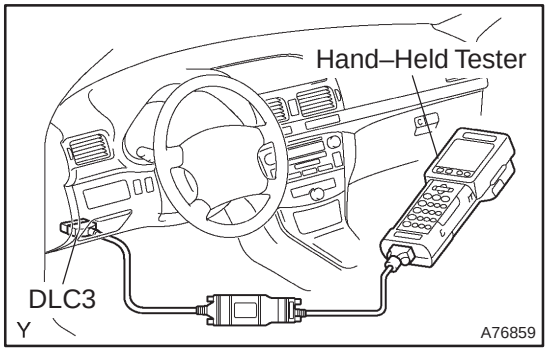
(1) DTCs other than fuel trim malfunction (DTCs P0171, P0172, P0174 and P0175) and misfire (DTCs P0300 – P0304).
(2) Fuel trim malfunction (DTCs P0171, P0172, P0174 and P0175).
(3) Misfire (DTCs P0300 – P0304).


FI2547

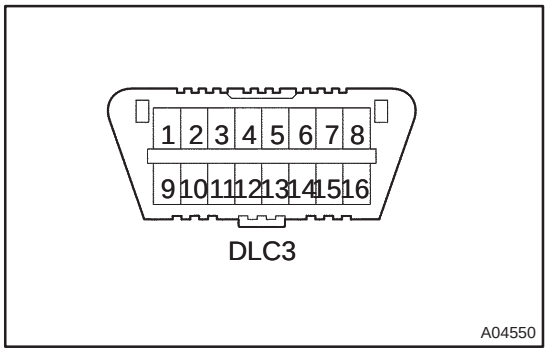
(b) Description for M–OBD (Except European spec.)

- When troubleshoot Multiplex OBD (M–OBD) vehicles, the only difference from the usual troubleshooting procedure is that you connect the hand–held tester to the vehicle, and read off various data output from the vehicle's ECM.

- The vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) are recorded in the ECM memory (See page 05–309). If the malfunction does not recur, the CHK ENG lamp will be disappeared by turning off the ignition switch but the recorded DTC will be remaining in the ECM memory.



- To check the DTCs, connect the hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The hand–held tester also enables you to erase the DTCs and check the freeze frame data and various forms of engine data. (for operating instructions, see the instruction book.)
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).
- * 2 trip detection logic
  When a logic malfunction is first detected, the malfunction is temporally stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  Freeze frame data records the engine conditions (fuel system, calculator load, water temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.



(c) Check the DLC3.
The vehicle's ECM uses the ISO 9141–2 (Euro–OBD)/ ISO 14230(M–OBD) communication protocol. The terminal arrangement of the DLC3 complies with ISO 15031–03 and matches the ISO 9141–2/ ISO 14230 format.

Symbol	Terminal No.	Connection/Voltage or Resistance	Condition
SIL	7	Bus + Line/Pulse generation	During transmission
CG	4	Chassis Ground – Body Ground/1 Ω or less	Always
SG	5	Signal Ground – Body Ground/1 Ω or less	Always
BAT	16	Battery Positive – Body Ground/9 to 14 V	Always

HINT:
If the display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

(d) Inspect the battery voltage.
Battery voltage: 11 to 14 V

If voltage is below 11 V, recharge the battery before proceeding.

(e) Check the CHK ENG.
(1) The CHK ENG lamp comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the CHK ENG is not illuminated, troubleshoot the combination meter.

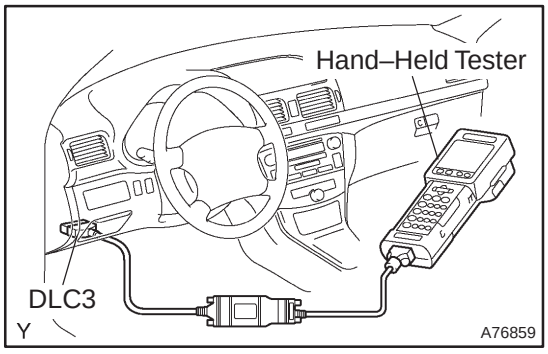
(2) When the engine is started, the CHK ENG should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

2. DTC CHECK (Normal Mode)

NOTICE:

Hand–held tester only:

When the diagnosis system is switched from the normal mode to the check (test) mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.



(a) Checking the DTCs using the hand–held tester.
  (1) Connect the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON and switch the hand–held tester main switch ON.
  (3) Use the hand–held tester to check the DTCs and freeze frame data and note them down (for operating instructions, see the hand–held tester's instruction book).
  (4) See page 05–309 to confirm the details of the DTCs.

HINT:
In the event that 2 or more DTCs are detected, the CHK ENG lamp will indicate the smaller number DTC first.

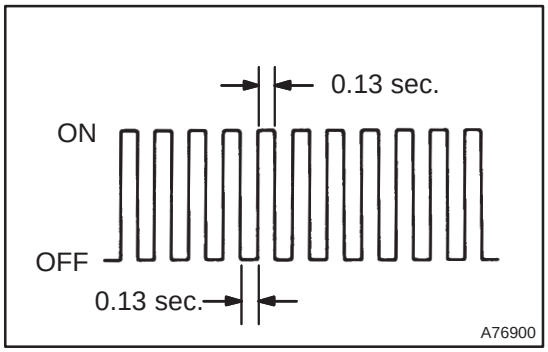
(b) Clearing the DTCs using the hand–held tester.
  (1) Connect the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON.
  (3) When operating the hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester.
  (1) Disconnect the battery terminal or remove the EFI and THROTTLE fuses from the engine room R/B No. 1 for more than 60 seconds.

3. DTC CHECK (Check Mode)

HINT:
Hand–held tester only:
Compared to the normal mode, the check mode has more sensing ability to detect malfunctions.
Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check (test) mode.

(a) Procedure for check mode using the hand–held tester.
  (1) Check the initial conditions
    - Battery positive voltage 11 V or more.
    - Throttle valve fully closed.
    - Transmission in the "P" or "N" position.
    - Air conditioning switched OFF.
  (2) Turn the ignition switch OFF.
  (3) Connect the hand–held tester to the DLC3.
  (4) Turn the ignition switch ON and switch the hand–held tester main switch ON.



(5) Switch the hand–held tester from the normal mode to the check (test) mode. The CHK ENG blinks in 0.13 sec. intervals as shown in the illustration.

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(6) Start the engine. (The CHK ENG goes off after the engine start.)

(7) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTC, etc.

(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the normal mode and will result in all of the DTCs and freeze frame data being erased.

(9) After checking the DTC, inspect the applicable circuit.

(b) Clearing the DTCs using the hand–held tester.

(1) Connect the hand–held tester to the DLC3.

(2) Turn the ignition switch ON.

(3) When operating the hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester.

(1) Disconnect the battery terminal or remove the EFI and THROTTLE fuses from the engine room R/B No. 1 for more than 60 seconds.

4. FAIL–SAFE CHART

If any of the following codes is recorded, the ECM enters into the fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0031 P0032 P0037 P0038 P0051 P0052 P0057 P0058	Faulty heater circuit is turned off.	Ignition switch is OFF.
P0100 P0102 P0103	Ignition timing is calculated based on an engine speed and a throttle opening angle.	”Pass” detection has occurred. Upon this occurrence, the ECM will return to normal mode.
P0105 P0107 P0108	• Intake air pressure is controlled with a calculated value in proportion to the throttle opening angle and the engine speed. • Limit the engine speed to 3,000 rpm or less.	”Pass” detection has occurred. Upon this occurrence, the ECM will return to normal mode.
P0110 P0112 P0113	Intake air temperature is fixed at 20°C (68°F)	”Pass” detection has occurred. Upon this occurrence, the ECM will return to normal mode.
P0115 P0117 P0118	Engine coolant temperature is fixed at 80°C (176°F)	”Pass” detection has occurred. Upon this occurrence, the ECM will return to normal mode.
P0120 P0121 P0122 P0123 P0220 P0222 P0223 P2135	Turn off the power for the throttle motor, return the throttle valve in position using the return spring, and fuel cut intermittent.	Repeat the following conditions at least 2 seconds or more with the throttle position switch closed: • VTA is more than 0.1 V but less than 0.95 V • Engine speed is 0 km/h
P0190 P0191	• Stop the high–pressure pump operation. • Limit the engine speed to 2,000 rpm or less.	After it is returned to normal condition, turn the ignition switch ON.
P0200	Turn off the INJ relay and cut the power for the EDU.	After it is returned to normal condition, turn the ignition switch ON.
P0201 P0202 P0203 P0204	• Stop fuel injection for an abnormal cylinder and related other cylinders. • Limit the engine speed to 3,000 rpm or less.	
P0325 P0327 P0328	Maximum timing retardation	Ignition switch is OFF.
P0351 P0352 P0353 P0354	Stop fuel injection for all the cylinders.	”Pass” detection has occurred. Upon this occurrence, the ECM will return to normal mode.
P0604 P0606 P0607 P0657	Turn off the power for the throttle motor, return the throttle valve in position using the return spring, and fuel cut intermittent.	After it is returned to normal condition, turn the ignition switch ON.
P1235	• Stop the high–pressure pump operation. • Limit the engine speed to 2,000 rpm or less.	After it is returned to normal condition, turn the ignition switch ON.
P2008	Force IACV to close.	After it is returned to normal condition, turn the ignition switch ON.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P2102 P2103 P2111 P2112 P2118 P2119	Turn off the power for the throttle motor, return the throttle valve in position using the return spring, and fuel cut intermittent.	After it is returned to normal condition, turn the ignition switch ON.
P2120 P2121 P2122 P2123 P2125 P2127 P2128 P2138	• If both VPA1 and VPA2 are malfunctioning: Fixed at idle • If either of VPA1 or VPA2 is malfunctioning: Fuel cut intermittently	After it is returned to normal condition, turn the ignition switch ON.

5. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:

By putting the vehicle's ECM in the check mode, the 1 trip detection logic is possible instead of the 2 trip detection logic, and the sensitivity to detect faults is increased. This makes it easier to detect intermittent problems.

(a) Clear the DTCs (See step 2).
(b) Set the check mode (See step 3).
(c) Perform a simulation test (See page 01–22).
(d) Check the connector and terminal (See page 01–32).
(e) Wiggle the harness and the connector (See page 01–32).

6. DATA LIST

HINT:

Using the DATA LIST displayed by the hand–held tester, you can read the value of the switches, sensors, actuators and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one method to shorten diagnostic time.

NOTICE:

The values given below for "Normal Condition" are representative values. A vehicle may still be normal even if its value differs from those listed here. So, do not solely depend on the "Normal Condition" here when deciding whether a part is faulty or not.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand–held tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST".
(g) According to the display on tester, read the "DATA LIST".

Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *1	Diagnostic Note
INJECTOR	Injection period of the No. 1 cylinder/ Min.: 0 ms, Max.: 32.64 ms	Idling: 0.40 to 0.78 ms	—
IGN ADVANCE	Ignition timing advance for No. 1 cylinder/ Min.: –64 deg., Max.: 63.5 deg.	Idling: BTDC 5 to 23°	—
CALC LOAD	Calculated load by ECM/ Min.: 0 %, Max.: 100 %	• Idling: 21.6 to 31.4 % • Running without load (2,500 rpm): 19.6 to 29.4 %	—

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *1	Diagnostic Note
MAF	Air flow rate from MAF sensor/ Min.: 0 gm/s, Max.: 655 gm/s	• Idling: 3.2 to 4.7 gm/s • Running without load (2,500 rpm): 13.1 to 18.9 gm/s	If the value is Approximately 0.0 gm/s: • Mass air flow meter power source circuit open • VG circuit open or short If the value is 160.0 gm/s or more: • E2G circuit open
MAP	Absolute pressure inside intake manifold/ Min.: 0 kPa, Max.: 224 kPa	• Idling: 22 to 32 kPa • Running without load (2,500 rpm): 20 to 30 kPa	If the value is Approximately 0.0 kPa: • PIM circuit short If the value is 142.0 kPa or more: • VC circuit open or short • PIM circuit open • E2 circuit open
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16383 rpm	Idling: 625 to 725 rpm	—
COOLANT TEMP	Coolant temperature/ Min.: –40°C, Max.: 140°C	After warming up: 80 to 95°C (176 to 203°F)	If the value is –40°C (–40°F): • Sensor circuit is open. If the value is 140°C (284°F): • Sensor circuit is shorted.
INTAKE AIR	Intake air temperature/ Min.: –40°C, Max.: 140°C	Equivalent to Ambient Temp.	
THROTTLE POS	Absolute throttle position sensor/ Min.: 0 %, Max.: 100 %	• Throttle fully closed: 10 to 24 % • Throttle fully open: 64 to 96 %	Read the value with ignition switch ON (Do not start engine).
CTP SW	Closed throttle position switch/ ON or OFF	• Throttle fully closed: ON • Throttle open: OFF	—
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Actual vehicle speed	Speed indicated on speedometer
ACCEL POS #1	Accelerator pedal position sensor No.1 output voltage/ Min.: 0 V, Max.: 5 V	• Accelerator pedal released: 0.5 to 1.1 V • Accelerator pedal depressed: 2.5 to 4.6 V	Read the value with ignition switch ON (Do not start engine).
ACCEL POS #2	Accelerator pedal position sensor No.2 output voltage/ Min.: 0 V, Max.: 5 V	• Accelerator pedal released: 1.5 to 2.9 V • Accelerator pedal depressed: 3.5 to 5.5 V	Read the value with ignition switch ON (Do not start engine).
THROTTLE POS #2	Throttle position sensor No.2 output voltage/ Min.: 0 V, Max.: 5 V	• Throttle fully closed: 2.1 to 3.1 V • Throttle fully open: 4.5 to 5.5 V	Read the value with ignition switch ON (Do not start engine).
THROTTLE TARGT	Target position of throttle valve/ Min.: 0 V, Max.: 5 V	Idling: 0.4 to 1.1 V	—
THROTTLE OPN DUTY	Throttle motor opening duty ratio/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 0 %	• When accelerator pedal is depressed, duty ratio is increased. • Read the value with ignition switch ON (Do not start engine)
THROTTLE CLS DUTY	Throttle motor closed duty ratio/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 0 %	• When accelerator pedal is released quickly, duty ratio is increased. • Read the value with ignition switch ON (Do not start engine)
THROTTLE MOT	Whether or not throttle motor control is permitted/ ON or OFF	Idling: ON	—
+BM	Whether or not electric throttle control system power is inputted/ ON or OFF	Idling: ON	—

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *1	Diagnostic Note
ACCEL IDL POS	Whether or not accelerator pedal position sensor is detecting idle/ ON or OFF	Idling: ON	—
THROTTLE IDL POS	Whether or not throttle position sensor is detecting idle/ ON or OFF	Idling: ON	—
FAIL #1	Whether or not fail safe function is executed/ ON or OFF	ETCS has failed: ON	—
FAIL #2	Whether or not fail safe function is executed/ ON or OFF	ETCS has failed: ON	—
THROTTLE INITIAL	Throttle fully closed learned value Min.: 0 V, Max.: 5 V	0.5 to 0.9 V	—
ACCEL LEARN VAL	Accelerator fully closed learned value Min.: 0 V, Max.: 5 V	0.4 to 1.4 V	—
THROTTLE MOT	Throttle motor current Min.: 0 A, Max.: 20 A	Idling: 0 to 3.0 A	—
O2S B1 S1	Heated oxygen sensor output voltage for bank 1 sensor 1/ Min.: 0 V, Max.: 1.0 V	Driving (50 km/h, 31 mph): 0.1 to 0.9 V	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the user to check the voltage output of each sensor.
O2S B1 S2	Heated oxygen sensor output voltage for bank 1 sensor 2/ Min.: 0 V, Max.: 1.0 V		
O2S B2 S1	Heated oxygen sensor output voltage for bank 2 sensor 1/ Min.: 0 V, Max.: 1.0 V		
O2S B2 S2	Heated oxygen sensor output voltage for bank 2 sensor 2/ Min.: 0 V, Max.: 1.0 V		
SHORT FT #1	Short term fuel trim of bank 1/ Min.: –100 %, Max.: 100%	0 ± 20 %	This item is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio
LONG FT #1	Long term fuel trim of bank 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is the overall fuel compensation carried out in long–term to compensate for a continual deviation of the short–term fuel trim from the central value.
TOTAL FT #1	Total fuel trim bank 1: Average value for fuel trim system of bank 1/ Min.: 0.5, Max.: 1.496	Idling: 0.5 to 1.4	—
SHORT FT #2	Short term fuel trim of bank 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio
LONG FT #2	Long term fuel trim of bank 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	This item is the overall fuel compensation carried out in long–term to compensate for a continual deviation of the short–term fuel trim from the central value.
TOTAL FT #2	Total fuel trim bank 2: Average value for fuel trim system of bank 2/ Min.: 0.5, Max.: 1.496	Idling: 0.5 to 1.4	—

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *1	Diagnostic Note
O2FT B1 S1	Short term fuel trim associated with the bank 1 sensor 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #1
O2FT B1 S2	Short term fuel trim associated with the bank 1 sensor 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #1
O2FT B2 S1	Short term fuel trim associated with the bank 2 sensor 1/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #2
O2FT B2 S2	Short term fuel trim associated with the bank 2 sensor 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #2
FUEL SYS #1	Fuel system status (Bank1) / OL or CL or OL DRIVE or OL FAULT or CL FAULT	Idling after warming up: CL	• OL: Open Loop–has not yet satisfied conditions to go closed loop. • CL: Closed Loop–using heated oxygen sensor(s) as feed back for fuel control. • OL DRIVE: Open loop due to driving conditions. (fuel enrichment) • OL FAULT: Open loop due to detected system fault. • CL FAULT: Closed loop but one of heated oxygen sensors, which is used for fuel control, is functioningimproperly.
FUEL SYS #2	Fuel system status (Bank2) / OL or CL or OL DRIVE or OL FAULT or CL FAULT		
FC IDL	Fuel cut idle/ ON or OFF	Fuel cut operation: ON	FC IDL= ”ON” when throttle valve fully closed and engine speed is over 1,500 rpm.
MIL	MIL status/ ON or OFF	MIL ON: ON	—
O2 LR B1 S1	Oxygen sensor lean rich bank 1 sensor 1: Response time for oxygen sensor output to switch from lean to rich/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 msec.	—
O2 LR B2 S1	Oxygen sensor lean rich bank 2 sensor 1: Response time for oxygen sensor output to switch from lean to rich/ Min.: 0 ms, Max.: 16,711 ms		
O2 RL B1 S1	Oxygen sensor rich lean bank 1 sensor 1: Response time for oxygen sensor output to switch from rich to lean/ Min.: 0 ms, Max.: 16,711 ms		
O2 RL B2 S1	Oxygen sensor rich lean bank 2 sensor 1: Response time for oxygen sensor output to switch from rich to lean/ Min.: 0 ms, Max.: 16,711 ms		
STARTER SIG	Starter signal/ ON or OFF	Cranking: ON	—
A/C SIG	A/C signal/ ON or OFF	A/C ON: ON	—
PNP SW [NSW] *2	Park/neutral position switch signal/ ON or OFF	P or N position: ON	—

Hand–held Tester Display	MeasurementItem/Range (Display)	Normal Condition *1	Diagnostic Note
ELECT LOAD SIG	Electrical load signal/ ON or OFF	• Tail light switch ON: ON • Defogger switch ON: ON	—
STOP LIGHT SW	Stop light switch/ ON or OFF	• Brake pedal depressed: ON • Brake pedal released: OFF	—
PS OIL PRESS SW	Power steering signal/ ON or OFF	• While turning the steering wheel: ON • While not turning the steering wheel: OFF	The idle–up control is performed when PS is ON.
PS SIGNAL	Power steering signal/ ON or OFF	When the steering wheel is turned: ON	This signal is usually ON status until the IG switch is turned OFF.
SCV VSV	VSV status for intake air control valve/ ON or OFF	VSV operation: ON	—
FUEL PUMP / SPD	Fuel pump/speed status/ ON/H or OFF/M,L	Idling: ON	—
EVAP VSV	VSV status for EVAP control/ ON or OFF	VSV operating: ON	VSV for EVAP is controlled by the ECM (ground side duty control)
VVT CTRL B1	VVT control status (bank 1)/ ON or OFF	VVT system operation: ON	—
IGNITION	Ignition counter/ Min.: 0, Max.: 400	0 to 400	—
CYL #1, #2, #3, #4	Misfire ratio of the cylinder 1 to 4/ Min.: 0 %, Max.: 50 %	0 %	This item is displayed in only idling
MISFIRE RPM	Engine RPM for first misfire range/ Min.: 0 rpm, Max.: 6,375 rpm	Misfire 0: 0 rpm	—
FC TAU	Fuel Cut TAU: Fuel cut during very light load/ ON or OFF	Fuel cut operating: ON	The fuel cut is being performed under very light load to prevent the engine combustion from becoming incomplete.
CHECK MODE	Check mode/ ON or OFF	Check mode ON: ON	See step 3
O2 RL B1 S2	Oxygen sensor rich lean bank 1 sensor 2: Response time for oxygen sensor output to switch from rich to lean/ Min.: 0 ms, Max.: 16,702.5 ms	Idling after warming up: 0 to 1,000 msec.	—
O2 RL B2 S2	Oxygen sensor rich lean bank 2 sensor 2: Response time for oxygen sensor output to switch from rich to lean/ Min.: 0 ms, Max.: 16,702.5 ms		
MIL ON RUN DIST	Distance since activation of check engine warning light/ Min.: 0 km, Max.: 65,535 km	When there is no DTC: 0 km	—
FUEL PRESS	Fuel high pressure inside fuel delivery pipe/ Min.: 0 MPa, Max.: 819 MPa	• Idling: 8 to 13 MPa • Running without load (3,000 rpm): 9.5 to 10.5 MPa	—

*1: If no conditions are specifically stated for ”Idling”, it means the shift lever is at the N or P position, the A/C switch is OFF and all accessory switches are OFF.
*2: For A/T only

7. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one method to shorten diagnostic time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST”
(g) According to the display on tester, perform the ”ACTIVE TEST”.

Hand–held Tester Display	Test Details	Diagnostic Note
INJ VOL	[Test Details] Control the injection volume Min.: –12.5 %, Max.: 25 % [Vehicle Condition] Engine speed: 3,000 rpm or less	• All injectors are tested at once. • Injection volume is gradually changed between –12.5 and 25 %.
A/F CONTROL	[Test Details] Control the injection volume –12.5 or 25 % (Change the injection volume –12.5 % or 25 %.) [Vehicle Condition] Engine speed: 3,000 rpm or less	The following procedure of A/F CONTROL enables the user to check its output (show its graph indication) of sensor 1 and sensor 2: For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1 S1 and O2S B1 S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
SCV VSV	[Test Details] Activate the VSV for intake air control valve. ON or OFF	—
EVAP VSV (ALONE)	[Test Details] Activate the VSV for EVAP control ON or OFF	—
FUEL PUMP / SPD	[Test Details] Control the fuel pump ON or OFF	—
VVT CTRL B1	[Test Details] Active the VVT system (Bank 1). ON or OFF	• ON: Rough idle or engine stall. • OFF: Normal engine speed.
TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	—
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit ON or OFF	—

BASIC INSPECTION

When the malfunction code is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problems. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	CHECK BATTERY VOLTAGE

NOTICE:
Carry out this check with the engine stopped and ignition switch OFF.

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → **CHARGE OR REPLACE BATTERY**

OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–320**

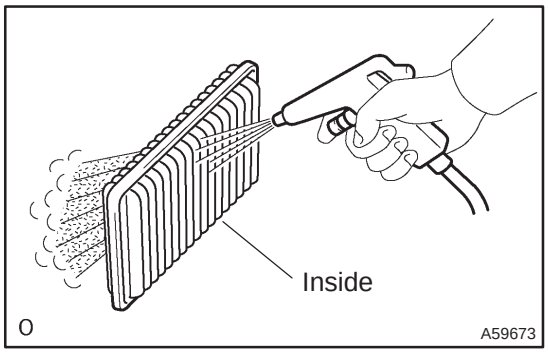
OK

3	CHECK IF ENGINE STARTS

NG → **GO TO STEP 7**

OK

4	CHECK AIR FILTER



(a) Visually check that the air filter is not excessively dirty or oily.

NOTICE:
If necessary, clean the filter with compressed air. First blow from the inside thoroughly, then blow from the outside of the filter.

NG → **CLEAN OR REPLACE**

OK

5	CHECK IDLE SPEED (See page 14–181)

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–320**

OK

6	CHECK IGNITION TIMING (See page 14–181)

NG → PROCEED TO PAGE AND CONTINUE TO TROUBLESHOOT

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–320

7	CHECK FUEL PRESSURE (See page 11–33)

NG → PROCEED TO PAGE 11–33 AND CONTINUE TO TROUBLESHOOT

OK

8	CHECK FOR SPARK (See page 18–12)

NG → PROCEED TO PAGE 18–12 AND CONTINUE TO TROUBLESHOOT

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–320

05CDX–01

PROBLEM SYMPTOMS TABLE

When the malfunction is not confirmed in the DTC check and the problem still can not be confirmed in the basic inspection either, proceed to this problem symptoms table and troubleshoot according to the number given below.

Symptom	Suspected Area	See page
Engine does not crank (Does not start)	2. Starter	19–10
	3. Starter relay	19–10
	4. Park/neutral position switch	40–8
No initial combustion (Does not start)	1. ECM power source circuit	05–502
	2. Ignition coil assy	05–439
	3. Fuel pump control circuit	05–507
	4. Injector circuit	05–415
No complete combustion (Does not start)	1. Ignition coil assy	05–439
	2. Fuel pump control circuit	05–507
	3. Injector circuit	05–415
Engine cranks normally (Difficult to start)	1. Starter signal circuit	05–513
	2. Ignition coil assy	05–439
	3. Spark plug	18–14
	4. Compression	14–181
	5. Injector circuit	05–415
	6. Fuel pump control circuit	05–507
Cold engine (Difficult to start)	1. Starter signal circuit	05–513
	2. Injector circuit	05–415
	3. Ignition coil assy	05–439
	4. Spark plug	18–14
	5. Fuel pump control circuit	05–507
Hot engine (Difficult to start)	1. Starter signal circuit	05–513
	2. Injector circuit	05–415
	3. Ignition coil assy	05–439
	4. Spark plug	18–14
	5. Fuel pump control circuit	05–507
High engine idle speed (Poor idling)	1. ECM power source circuit	05–502
	2. Park/neutral position switch	40–8
	3. Back up power source circuit	05–467
Low engine idle speed (Poor idling)	1. Park/neutral position switch	40–8
	2. Injector circuit	05–415
	3. Back up power source circuit	05–467
	4. Fuel pump control circuit	05–507
Rough idling (Poor idling)	1. Mass air flow meter circuit	05–336
	2. Vacuum sensor circuit	05–342
	3. Injector circuit	05–415
	4. Fuel pump control circuit	05–507
	5. Ignition coil assy	05–439
	6. Compression	14–181
	7. Back up power source circuit	05–467
Hunting (Poor idling)	1. Mass air flow meter circuit	05–336
	2. Vacuum sensor circuit	05–342
	3. ECM power source circuit	05–502
Hesitation/Poor acceleration (Poor driveability)	1. Mass air flow meter circuit	05–336
	2. Vacuum sensor circuit	05–342
	3. Injector circuit	05–415
	4. Ignition coil assy	05–439
	5. Fuel pump control circuit	05–507
Muffler explosion after fire (Poor driveability)	1. Ignition coil assy	05–439
	2. Spark plug	18–14
	3. Injector circuit	05–415

Symptom	Suspected Area	See page
Surging (Poor driveability)	1. Spark plug 2. Injector circuit	18–14 05–415
Engine stall (Soon after starting)	1. Mass air flow meter circuit 2. Vacuum sensor circuit	05–336 05–342
Engine stall (After accelerator pedal depressed)	1. Mass air flow meter circuit 2. Vacuum sensor circuit	05–336 05–342
Engine stall (After accelerator pedal released)	1. Mass air flow meter circuit 2. Vacuum sensor circuit 3. ECM	05–336 05–342 01–32
Engine stall (During A/C operation)	1. A/C signal circuit (Compressor circuit) 2. ECM	05–1100 01–32
Engine stall (When shifting N to D)	1. Park/neutral position switch	40–8

STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM

Refer to DTC P0617 on page 05–471.

INSPECTION PROCEDURE

HINT:

This diagnostic troubleshooting procedure is on the premise that the engine is being cranked under normal conditions. If the engine does not crank, proceed to the problem symptoms table on page 05–320.

1	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG” and read its value displayed on the hand–held tester.

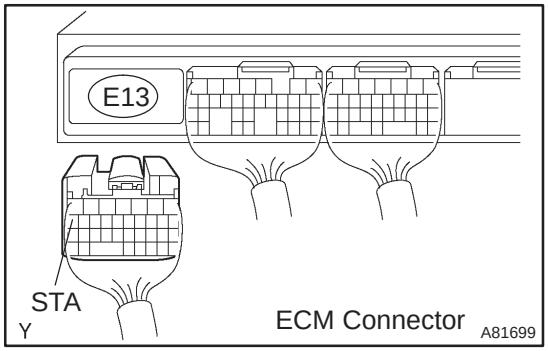
Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–320)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM – STARTER RELAY)



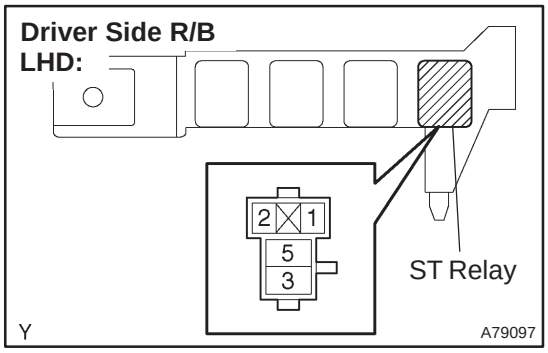
(a) Disconnect the E13 ECM connector.
(b) Remove the ST relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

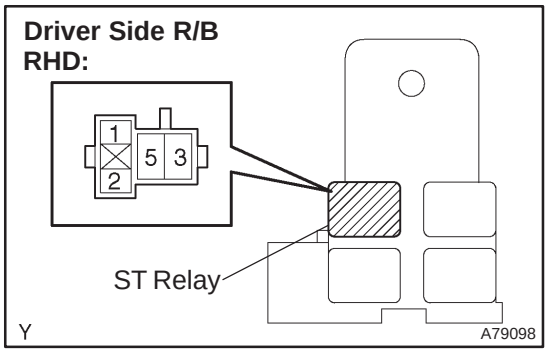
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
STA (E13–17) – ST relay (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
STA (E13–17) or ST relay (1) – Body ground	No continuity





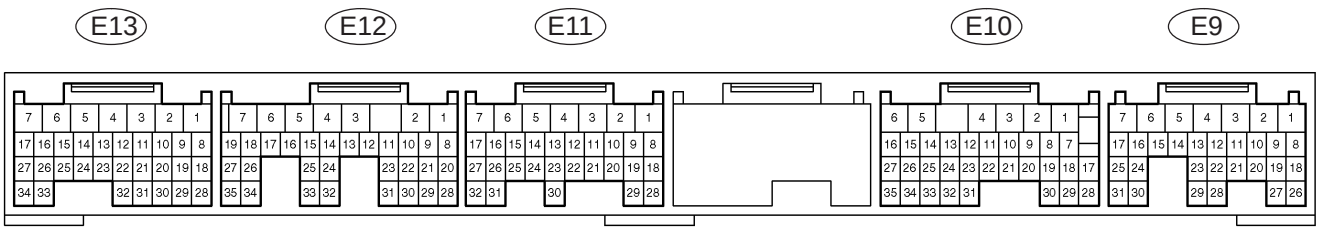
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

05CDW–01

TERMINALS OF ECM



Y

A53766

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E9–3) – E1 (E11–1)	B–Y – BR	Always	9 to 14
+BM (E10–6) – E1 (E11–1)	G–Y – BR	Always	9 to 14
IGSW (E9–9) – E1 (E11–1)	B–W – BR	IG switch ON	9 to 14
+B (E9–1) – E1 (E11–1)	B–R – BR	IG switch ON	9 to 14
+B2 (E9–2) – E1 (E11–1)	B–R – BR	IG switch ON	9 to 14
MREL (E9–8) – E1 (E11–1)	GR – BR	IG switch ON	9 to 14
IREL (E10–35) – E1 (E11–1)	V – BR	IG switch ON	9 to 14
VC (E13–18) – E2 (E13–28)	R–W – BR	IG switch ON	4.5 to 5.5
VTA1 (E13–21) – E2 (E13–28)	L–W – BR	IG switch ON, Accelerator pedal fully released	0.4 to 1.0
		IG switch ON, Accelerator pedal fully depressed	3.2 to 4.8
VTA2 (E13–31) – E2 (E13–28)	B–R – BR	IG switch ON, Accelerator pedal fully released	2.1 to 3.1
		IG switch ON, Accelerator pedal fully depressed	4.5 to 5.5
VPA (E9–22) – EPA (E9–28)	G – Y	IG switch ON, Accelerator pedal fully released	0.5 to 1.1
		IG switch ON, Accelerator pedal fully depressed	2.5 to 4.6
VPA2 (E9–23) – EPA2 (E9–29)	W – Y	IG switch ON, Accelerator pedal fully released	1.5 to 2.9
		IG switch ON, Accelerator pedal fully depressed	3.5 to 5.5
VCPA (E9–26) – EPA (E9–28)	B – Y	IG switch ON	4.5 to 5.5
VCP2 (E9–27) – EPA2 (E9–29)	B – Y	IG switch ON	4.5 to 5.5
VG (E13–30) – EVG (E13–29)	L–Y – G	Idling, P or N position, A/C switch OFF	0.5 to 3.0
THA (E13–20) – E2 (E13–28)	GR – BR	Idling, Intake air temperature 20°C (68°F)	0.5 to 3.4
THW (E13–19) – E2 (E13–28)	B–W – BR	Idling, Coolant temperature 80°C (176°F)	0.2 to 1.0
#1 (E13–1) – E01 (E13–7) #2 (E13–2) – E01 (E13–7) #3 (E13–3) – E01 (E13–7) #4 (E13–4) – E01 (E13–7)	G–W – W–B W–R – W–B R–W – W–B W–L – W–B	IG switch ON	9 to 14
		Idling	Pulse generation (See page 05–415)
IJF1 (E13–25) – E01 (E13–7)	R–B – W–B	Idling	Pulse generation (See page 05–415)
IGT1 (E13–8) – E1 (E11–1) IGT2 (E13–9) – E1 (E11–1) IGT3 (E13–10) – E1 (E11–1) IGT4 (E13–11) – E1 (E11–1)	R–W – BR P – BR LG–B – BR L–Y – BR	Idling	Pulse generation (See page 05–439)
IGF1 (E13–24) – E1 (E11–1)	W–R – BR	IG switch ON	4.5 to 5.5
		Idling	Pulse generation (See page 05–439)
G2+ (E11–27) – NE– (E11–24)	W – R	Idling	Pulse generation (See page 05–436)
NE+ (E11–25) – NE– (E11–24)	G – R	Idling	Pulse generation (See page 05–433)
FC (E9–10) – E1 (E11–1)	G–Y – BR	IG switch ON	9 to 14
M+ (E11–3) – E01 (E13–7) M– (E11–2) – E01 (E13–7)	B – W–B W – W–B	Idling	Pulse generation

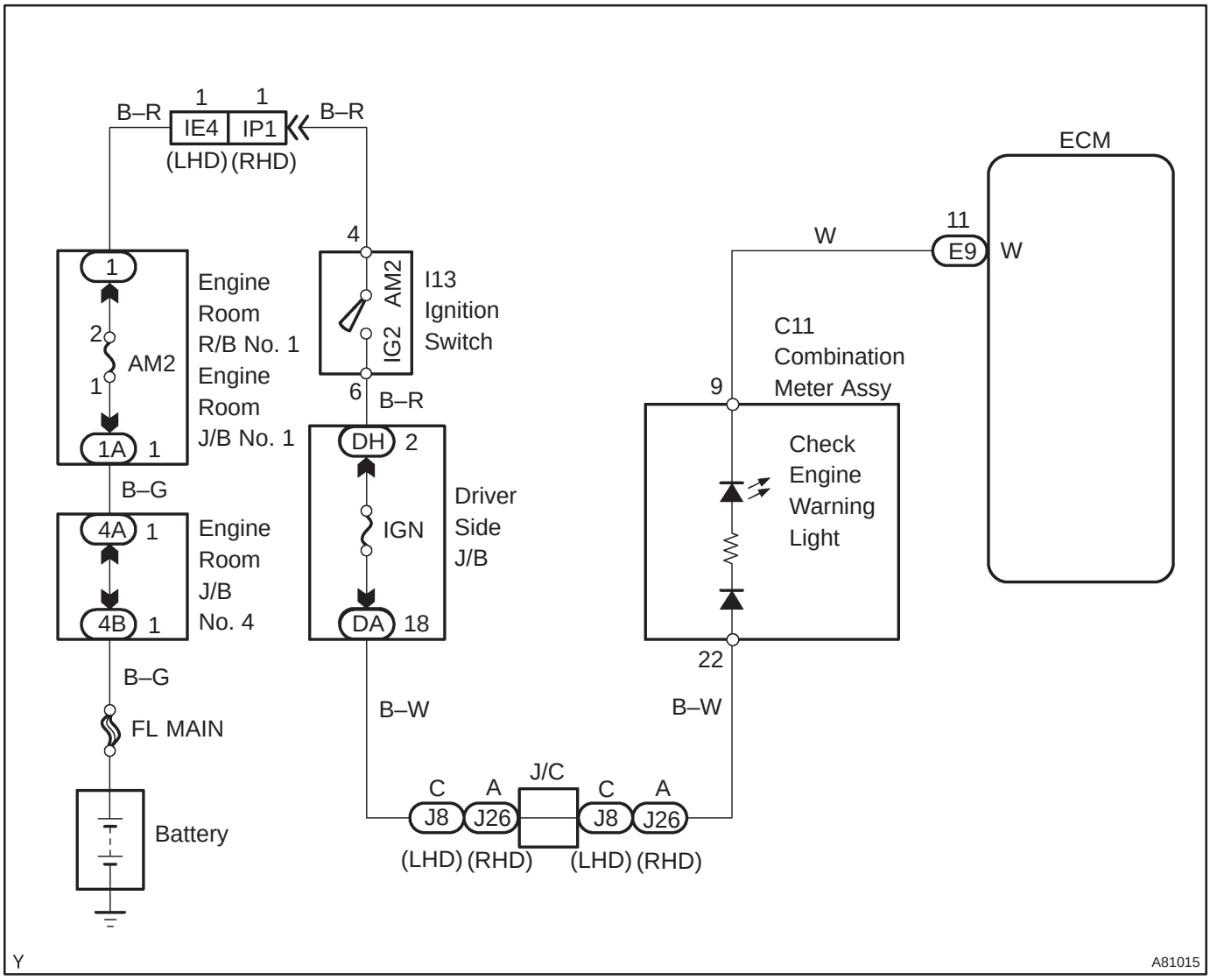
Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
OX1A (E12–22) – E2 (E13–28)	B – BR	Maintain engine speed at 2,500 rpm for 2 minutes after warming up	Pulse generation (See page 05–363)
OX1B (E12–21) – O1B– (E11–26)	B – W		
OX2A (E12–23) – E2 (E13–28)	R – BR		
OX2B (E12–29) – O2B– (E11–31)	R – G		
HT1A (E12–5) – E03 (E11–7) HT1B (E12–25) – E03 (E11–7) HT2A (E12–4) – E03 (E11–7) HT2B (E12–33) – E03 (E11–7)	Y – W–B P – W–B L – W–B L–B – W–B	Idling	Below 3.0
		IG switch ON	9 to 14
KNK1 (E12–1) – EKNK (E12–2)	B – W	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See page 05–429)
OC1+ (E11–16) – OC1– (E11–15)	W–G – Y–B	IG switch ON	Pulse generation (See page 05–322)
EVP1 (E13–34) – E01 (E13–7)	W–G – W–B	IG switch ON	9 to 14
SCV (E13–5) – E1 (E11–1)	L–B – BR	IG switch ON	9 to 14
PIM (E13–33) – E2 (E13–28)	G–W – BR	IG switch ON	3.3 to 3.9
		Apply vacuum 26.7 kPa (200 mmHg, 7.9 in.Hg)	2.6 to 3.0
PB (E13–26) – E2 (E13–28)	Y – BR	IG switch ON	3.3 to 3.9
		Apply vacuum 26.7 kPa (200 mmHg, 7.9 in.Hg)	2.6 to 3.0
PR (E13–23) – E2 (E13–28)	Y–G – BR	Idling	2.1 to 3.2
FP+ (E12–6) – E1 (E11–1) FP– (E12–3) – E1 (E11–1)	R – BR G – BR	Idling	Pulse generation (See page 05–477)
STA (E13–17) – E1 (E11–1)	B–Y – BR	Shift position in neutral, IG switch START	6.0 or more
STP (E10–19) – E1 (E11–1)	G–W – BR	Brake pedal is depressed	9 to 14
		Brake pedal is released	Below 1.5
ST1– (E10–12) – E1 (E11–1)	G–W – BR	IG switch ON, Brake pedal is depressed	Below 1.5
		IG switch ON, Brake pedal is released	7.5 to 14
W (E9–11) – E01 (E13–7)	W – W–B	Idling	9 to 14
		IG switch ON	Below 3.0
ELS (E9–12) – E1 (E11–1)	G – BR	Taillight switch ON, Defogger switch ON	7.5 to 14
		Taillight switch OFF, Defogger switch OFF	0 to 1.5
TACH (E9–5) – E1 (E11–1)	GR–R – BR	Idling	Pulse generation
SPD (E10–17) – E01 (E13–7)	V–W – W–B	IG switch ON	4.5 to 5.5
TC (E9–20) – E1 (E11–1)	W–L – BR	IG switch ON	9 to 14
SIL (E9–18) – E1 (E11–1)	W–G – BR	During charge of gears	Pulse generation
PSW (E11–10) – E1 (E11–1)	G – BR	While turning the steering wheel	Below 1.5
F/PS (E9–14) – E1 (E11–1)	LG–B – BR	IG switch ON	Below 1.5

CHECK ENGINE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

If the ECM detects a trouble, the CHK ENG is illuminated. At this time, the ECM records a DTC in the memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below .

CHK ENG remains on	Start inspection from step 1
CHK ENG is not illuminated	Start inspection from step 3

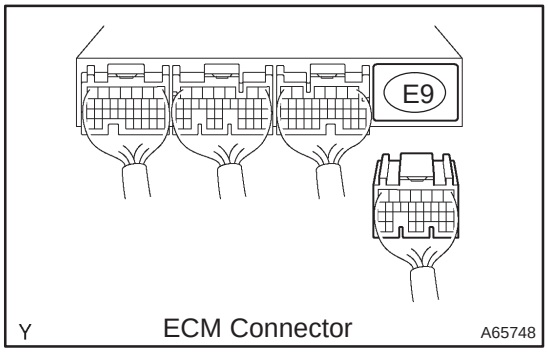
1	CLEAR DTC

(a) Connect the hand–held tester to the DLC 3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Read the DTC (See page 05–5).
(d) Clear the DTC (See page 05–5).
(e) Check that the CHK ENG is OFF.
Standard: CHK ENG is OFF

OK	REPAIR CIRCUIT INDICATED BY OUTPUT CODE (See page 05–16)

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E9 ECM connector.
(b) Turn the ignition switch ON.
(c) Check that the CHK ENG is OFF.
Standard: CHK ENG is OFF

OK	CHECK AND REPLACE ECM (See page 01–32)

NG

CHECK AND REPAIR HARNESS AND CONNECTOR

3	CHECK CHK ENG CONDITION

(a) Check that the CHK ENG is illuminated when turning the ignition switch ON.
Standard: CHK ENG is illuminated

OK	SYSTEM OK

NG

4	INSPECT COMBINATION METER ASSY(CHK ENG CIRCUIT)

(a) See the combination meter troubleshooting on page 05–1509.

NG	REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER – ECM)

0505N–04

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

Customer's Name		VIN	
Driver's Name		Production Date	
Date Vehicle Brought in		Licence No.	
License No.		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx.____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of check engine warning light (CHK ENG)		☐ Remains on	☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre–check)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

0505J–04

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in the check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the ”See page ” under the respective ”DTC No.” in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0100 (05–24)	Mass Air Flow Circuit Malfunction	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0110 (05–30)	Intake Air Temperature Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built into mass air flow meter) • ECM	○	○
P0115 (05–34)	Engine Coolant Temperature Circuit Malfunction	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0116 (05–38)	Engine Coolant Temperature Circuit Range/Performance Problem	• Engine coolant temperature sensor • Thermostat	○	○
P0120 (05–39)	Throttle Pedal Position Sensor/ Switch ”A” Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0121 (05–44)	Throttle Pedal Position Sensor/ Switch ”A” Circuit Range/Performance Problem	• Throttle position sensor	○	○
P0125 (05–45)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • Gas leakage on exhaust system • ECM	○	○
P0130*3 (05–54)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector	○	○
P0133*3 (05–60)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM	○	○
P0135 (05–65)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0136 (05–54)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor	○	○
P0141 (05–65)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○

P0171*3 (05–67)	System too Lean (Fuel Trim) (Bank1)	• Air induction system • Injector blockage • PCV hose • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Open or short in heated oxygen sensor circuit • Heated oxygen sensor • ECM	○	○
P0172*3 (05–67)	System too Rich (Fuel Trim) (Bank1)	• Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Open or short in heated oxygen sensor circuit • Gas leakage in exhaust system • Heated oxygen sensor • ECM	○	○
P0300*3 (05–73)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • PCV hose • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • ECM	○	○
P0301*3 (05–73)	Cylinder 1 Misfire Detected			
P0302*3 (05–73)	Cylinder 2 Misfire Detected			
P0303*3 (05–73)	Cylinder 3 Misfire Detected			
P0304*3 (05–73)	Cylinder 4 Misfire Detected			
P0325 (05–81)	Knock Sensor 1 Circuit Malfunction (Bank 1)	• Open or short in knock sensor circuit • Knock sensor (under–torqued or loose) • ECM	○	○
P0335 (05–84)	Crankshaft Position Sensor ”A” Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM	○	○
P0340 (05–88)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Intake camshaft • Timing chain has jumped a tooth • ECM	○	○
P0420*3 (05–91)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage in exhaust system • Heated oxygen sensor • Three–way catalytic converter • ECM	○	○
P0443 (05–94)	Evaporative Emission Control System Purge Control Vent Circuit Malfunction	• Open or short in VSV for EVAP circuit • VSV for EVAP • ECM	○	○
P0500 (05–98)	Vehicle Speed Sensor Malfunction	• Open or short in speed sensor circuit • Speed sensor • Combination meter • ECM • Skid control ECU	○	○

P0505*3 (05–100)	Idle Control System Malfunction	• Open or short in ISC valve circuit • ISC valve is stuck or closed • PCV hose • A/C switch circuit • Air induction system • ECM	○	○
P1300 (05–103)	Igniter Circuit Malfunction (No. 1)	• Ignition system • Open or short in IGF or IGT1 circuit from No. 1 ignition coil with igniter to ECM • No. 1 ignition coil with igniter • ECM	○	○
P1305 (05–103)	Igniter Circuit Malfunction (No. 2)	• Ignition system • Open or short in IGF or IGT2 circuit from No. 2 ignition coil with igniter to ECM • No. 2 ignition coil with igniter • ECM	○	○
P1310 (05–103)	Igniter Circuit Malfunction (No. 3)	• Ignition system • Open or short in IGF or IGT3 circuit from No. 3 ignition coil with igniter to ECM • No. 3 ignition coil with igniter • ECM	○	○
P1315 (05–103)	Igniter Circuit Malfunction (No. 4)	• Ignition system • Open or short in IGF or IGT4 circuit from No. 4 ignition coil with igniter to ECM • No. 4 ignition coil with igniter • ECM	○	○
P1335 (05–84)	Crankshaft Position Sensor Circuit Malfunction (During engine running)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM	—	○
P1346 (05–111)	VVT Sensor/Camshaft Position Sensor Circuit Range/Performance Problem (Bank 1)	• Mechanical system (Timing chain has janped a tooth, chain stretched) • ECM	○	○
P1349 (05–112)	VVT System Malfunction (Bank 1)	• Valve timing • OCV • VVT controller assembly • ECM	○	○
P1520*2 (05–115)	Stop Light Switch Circuit Malfunction	• Open or short in stop light switch signal circuit • Stop light switch • ECM	○	○
P1600 (05–119)	ECM BATT Malfunction	• Open in back up power source circuit • ECM	○	○
P1656 (05–122)	OCV Circuit Malfunction (Bank 1)	• Open or short in OCV circuit • OCV • ECM	○	○

*1: ○ ... CHK ENG is illuminated. — ... CHK ENG is not illuminated.
*2: Only for A/T models.
*3: For European spec. only

ECM POWER SOURCE CIRCUIT

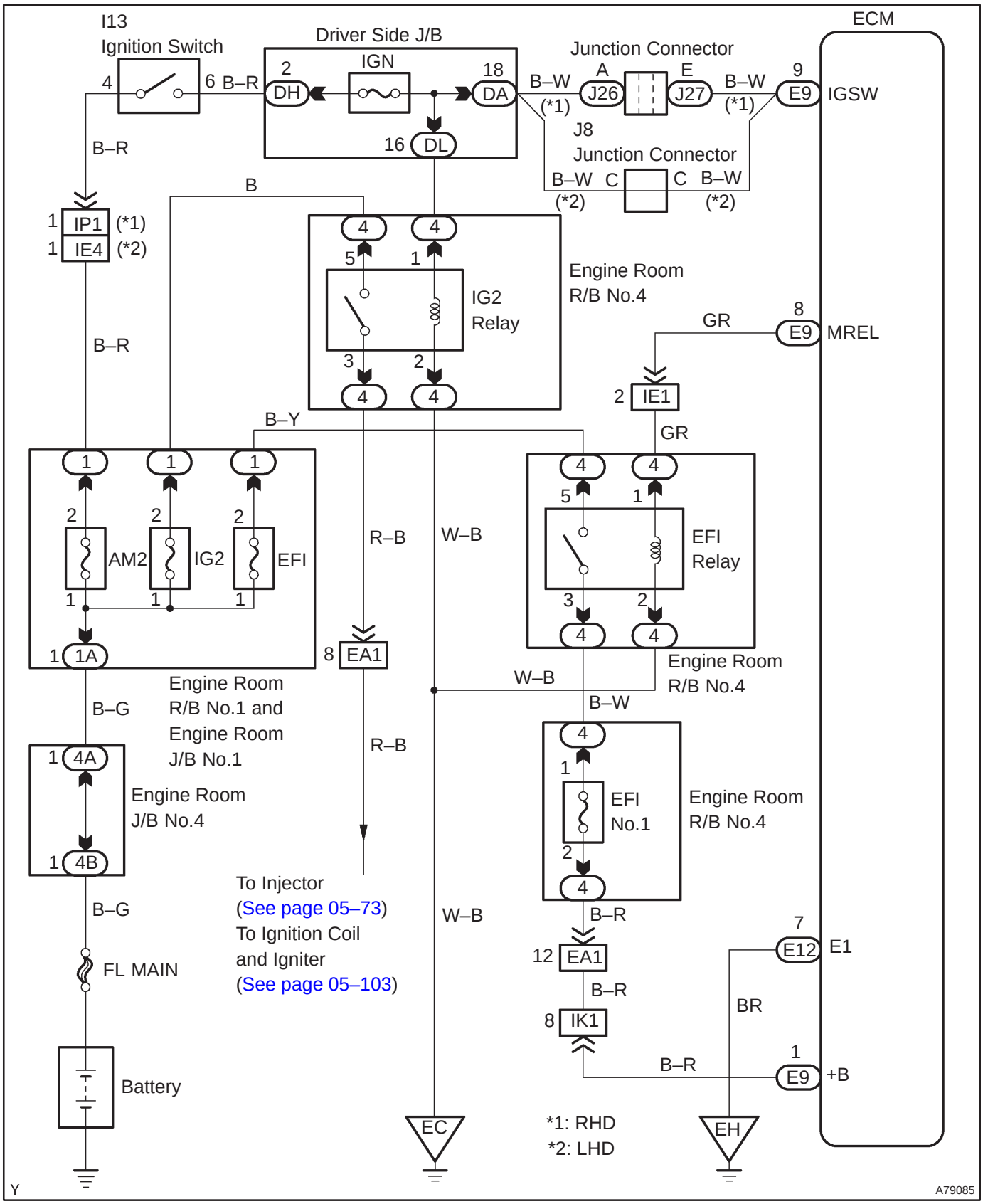
CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to terminal IGSW of the ECM and the EFI relay (Marking: EFI) control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EFI relay.

This signal causes current to flow to the coil, closing the contacts of the EFI relay and supplying power to terminal +B of the ECM.

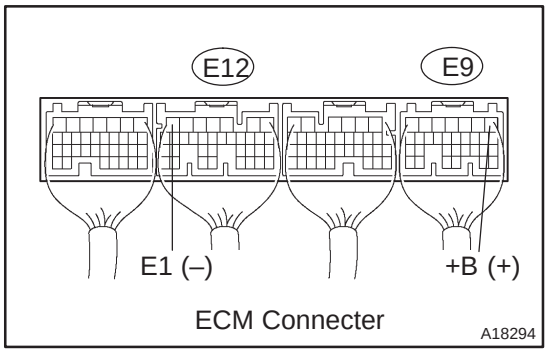
If the ignition switch is turned off, the ECM continues to switch on the EFI relay for a maximum of 2 seconds for the initial setting of the throttle valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM(+B VOLTAGE)



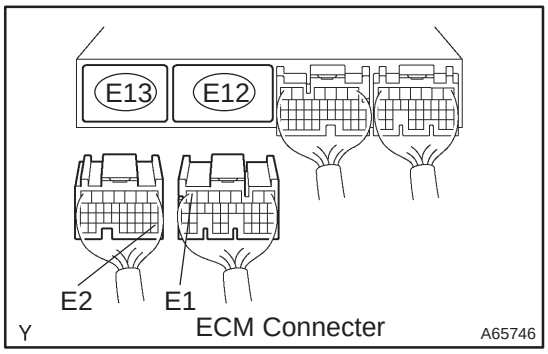
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
+B (E9–1) – E1 (E12–7)	9 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–5)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM – BODY GROUND)



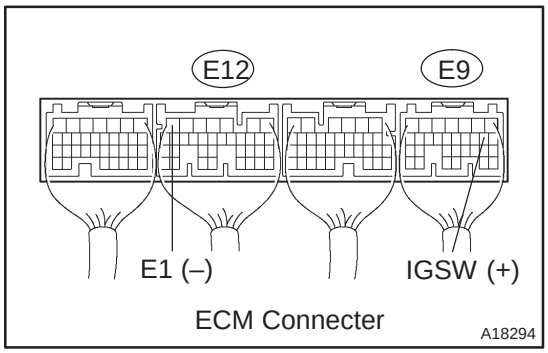
(a) Disconnect the negative (–) battery terminal.
(b) Disconnect the E12 and E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
E1 (E12–7) – Body ground	Continuity
E2 (E13–28) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM(IGSW VOLTAGE)



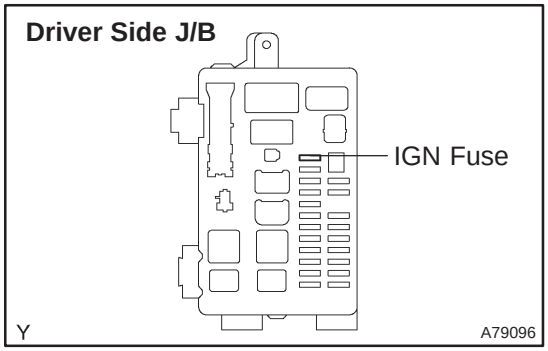
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
IGSW (E9–9) – E1 (E12–7)	9 to 14 V

OK → **Go to step 8**

NG

4 CHECK FUSE(IGN FUSE)

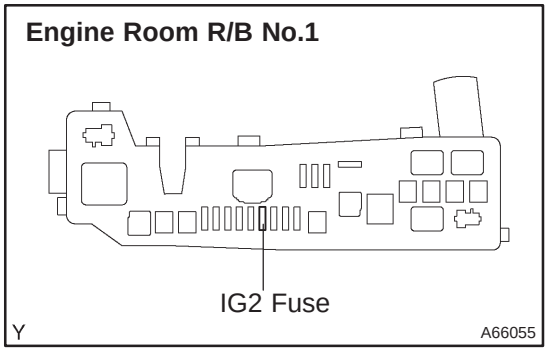


(a) Remove the IGN fuse from the driver side J/B.
(b) Check for continuity in the IGN fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

5 CHECK FUSE(IG2 FUSE)

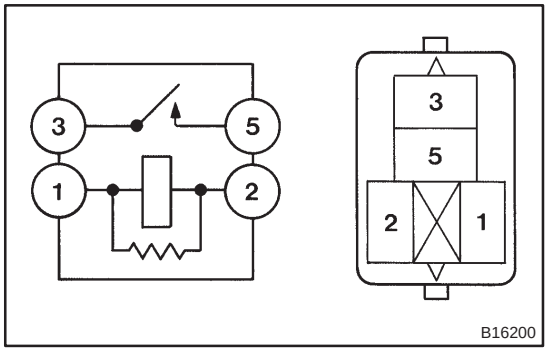


(a) Remove the IG2 fuse from the engine room R/B No.1.
(b) Check for continuity in the IG2 fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

6 INSPECT IG2 RELAY



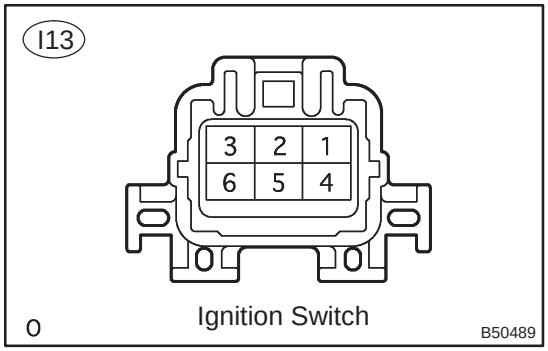
(a) Remove the IG2 relay from the engine room R/B No.4.
(b) Inspect the IG2 relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE IG2 RELAY**

OK

7 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Measure the resistance between the connector terminals shown in the chart below.

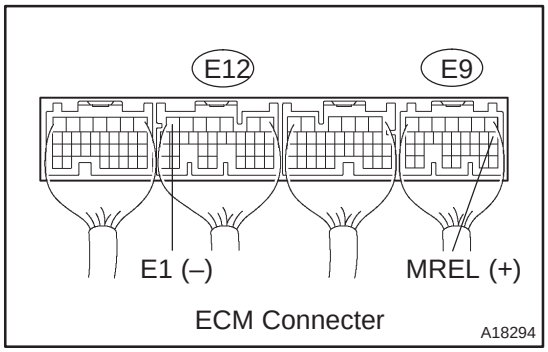
Switch	Terminal No.	Resisitance
LOCK	All Terminals	1MΩ or more
ACC	1–3	1Ω or less
ON	1–2, 1–3, 2–3, 5–6	1Ω or less
START	4–5, 4–6, 5–6, 1–2	1Ω or less

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (BATTERY – IGNITION SWITCH, IGNITION SWITCH – ECM)

8 INSPECT ECM(MREL VOLTAGE)



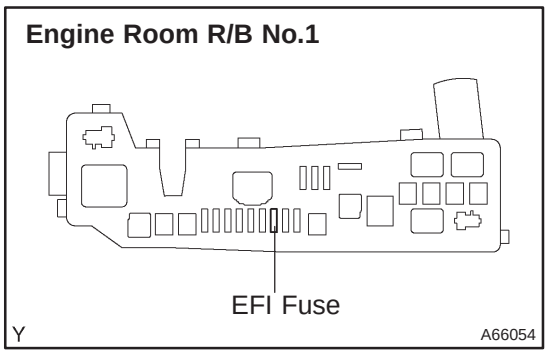
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
MREL (E9–8) – E1 (E12–7)	9 to 14 V

NG → **CHECK AND REPLACE ECM**

OK

9 CHECK FUSE(EFI FUSE)

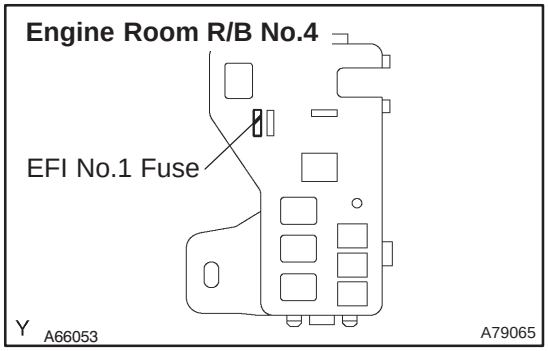


(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

10 CHECK FUSE(EFI No.1 FUSE)

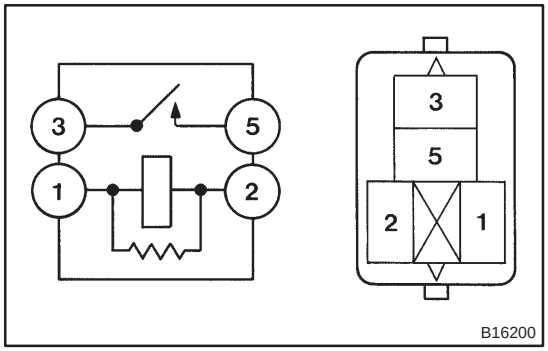


(a) Remove the EFI No.1 fuse from the engine room R/B No.4.
(b) Check for continuity in the EFI No.1 fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

11 INSPECT EFI RELAY



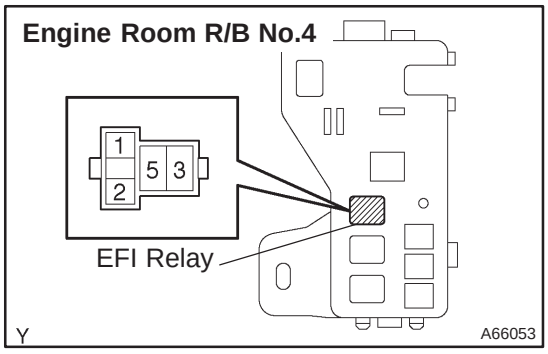
(a) Remove the EFI relay from the engine room R/B No.4.
(b) Inspect the EFI relay.
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE EFI RELAY**

OK

12	CHECK HARNESS AND CONNECTOR(EFI RELAY – ECM, EFI RELAY – BODY GROUND)



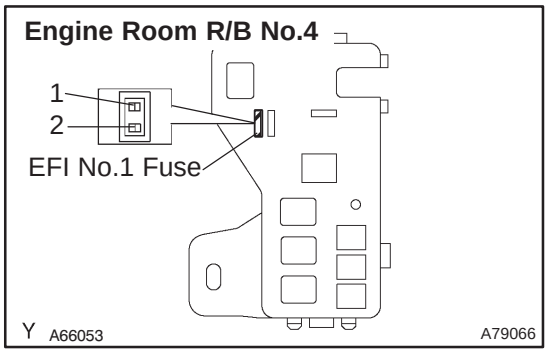
(a) Check the harness and connector between the EFI relay and ECM connector.
(1) Remove the EFI relay from the engine room R/B No.4.
(2) Remove the EFI No.1 fuse from the engine room R/B No.4.
(3) Disconnect the E9 ECM connector.
(4) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (1) – MREL (E9–8)	Continuity
EFI relay (3) – EFI No.1 fuse (1)	
EFI No.1 fuse (2) – +B (E9–1)	

Standard (Check for short):

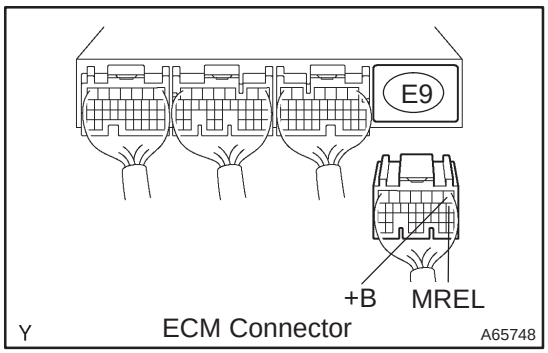
Symbols (Terminal No.)	Specified condition
EFI relay (1) or MREL (E9–8) – Body ground	No continuity
EFI relay (3) or EFI No.1 fuse (1) – Body ground	
EFI No.1 fuse (2) or +B (E9–1) – Body ground	



(b) Check the harness and connector between the EFI relay and body ground.
(1) Remove the EFI relay from the engine room J/B No.4.
(2) Check for continuity between the wire harness side connector and the body ground.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (2) – Body ground	Continuity



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

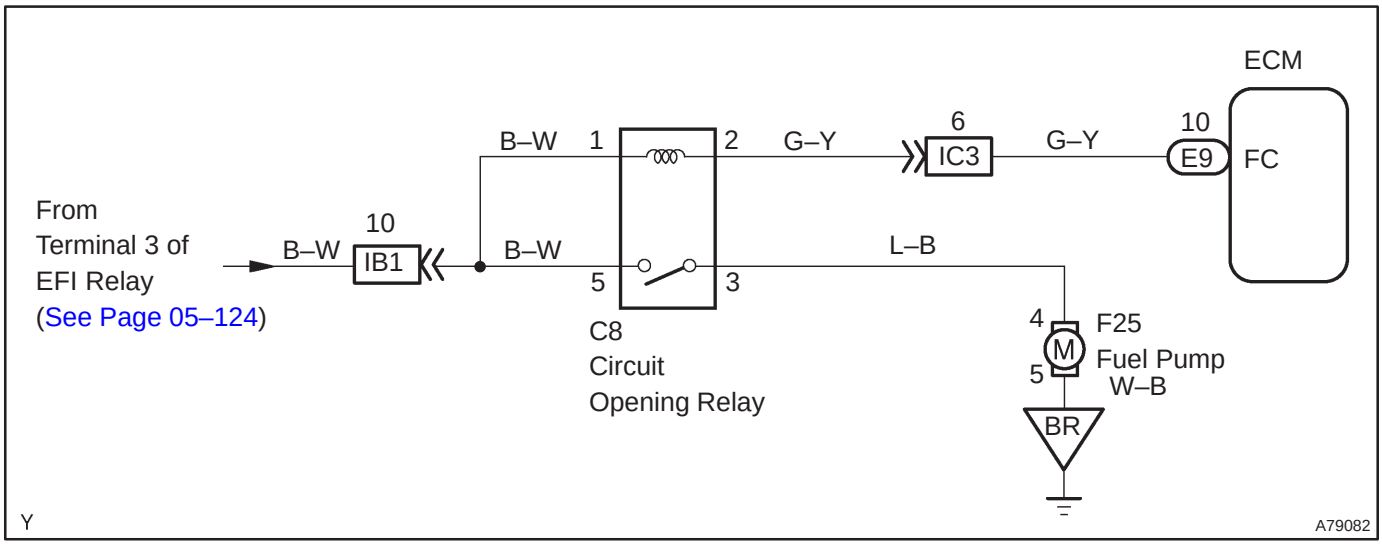
CHECK AND REPAIR HARNESS AND CONNECTOR (TERMINAL +B OF ECM – BATTERY POSITIVE TERMINAL)

FUEL PUMP CONTROL CIRCUIT

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil and also current flows to terminal STA of the ECM (STA signal).
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to the coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates. While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**PERFORM ACTIVE TEST USING HAND–HELD TESTER(OPERATION OF CIRCUIT OPENING RELAY)**

(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / FUEL PUMP / SPD”.
(c) Perform the active test with the engine stopped.
Result: The circuit opening relay operates.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

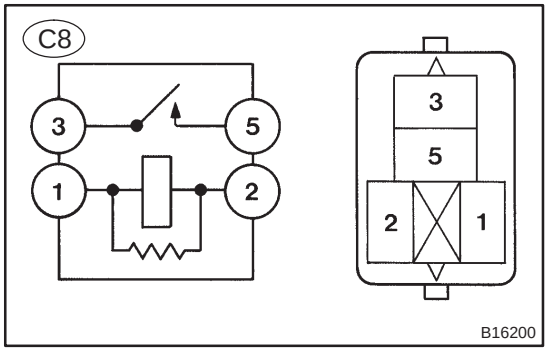
NG

2	**CHECK FOR ECM POWER SOURCE CIRCUIT(See page 05–124)**

NG → **REPAIR OR REPLACE POWER SOURCE CIRCUIT**

OK

3 INSPECT CIRCUIT OPENING RELAY



(a) Remove the circuit opening relay.
(b) Inspect the circuit opening relay.

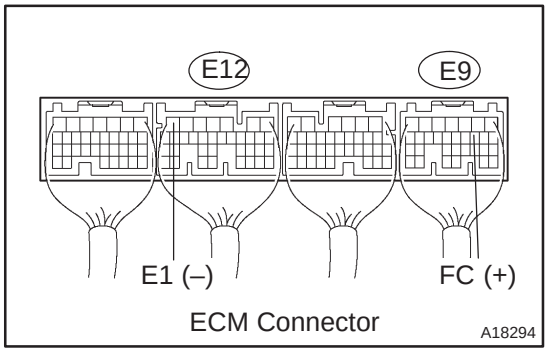
Standard:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE CIRCUIT OPENING RELAY**

OK

4 INSPECT ECM



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.

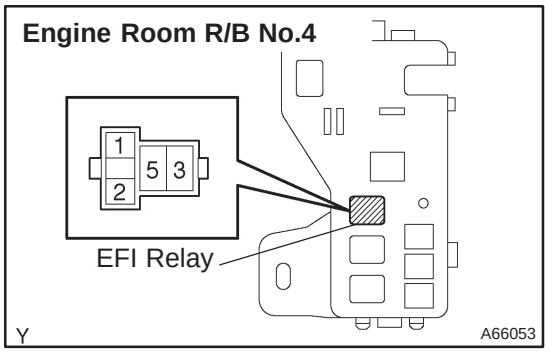
Standard:

Symbols (Terminal No.)	Specified condition
FC (E9–10) – E1 (E12–7)	8 to 14 V

OK → **Go to step 6**

NG

5	CHECK HARNESS AND CONNECTOR(EFI RELAY – CIRCUIT OPENING RELAY, CIRCUIT OPENING RELAY – ECM)



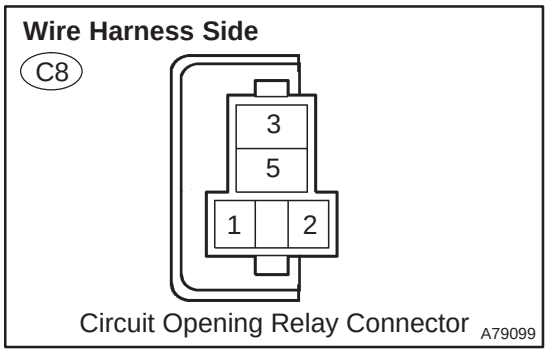
(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the circuit opening relay.
(c) Disconnect the E9 ECM connector.
(d) Check for continuity between the wire harness side connectors.

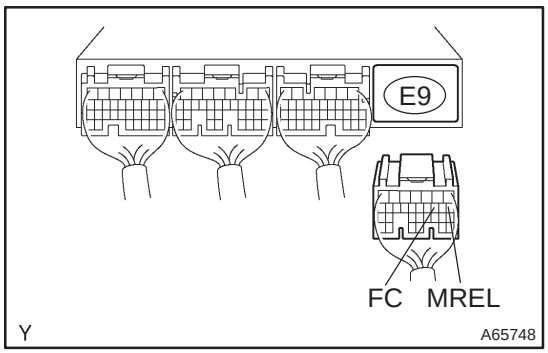
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – Circuit opening relay (C8–1)	Continuity
Circuit opening relay (C8–2) – FC (E9–10)	
EFI relay (1) – MREL (E9–8)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or Circuit opening relay (C8–1) – Body ground	No continuity
Circuit opening relay (C8–2) or FC (E9–10) – Body ground	
EFI relay (1) or MREL (E9–8) – Body ground	





NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

6	INSPECT FUEL PUMP ASSY (See page 11–8)

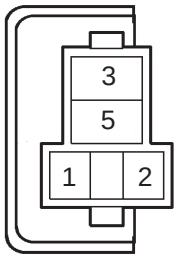
NG → **REPAIR OR REPLACE FUEL PUMP ASSY**

OK

7	CHECK HARNESS AND CONNECTOR(CIRCUIT OPENING RELAY – FUEL PUMP, FUEL PUMP – BODY GROUND)

Wire Harness Side

C8



Circuit Opening Relay Connector

A79099

(a) Remove the circuit opening relay.
(b) Disconnect the fuel pump connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) – Fuel pump (F24–4)	Continuity
Fuel pump (F25–5) – Body ground	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Circuit opening relay (C8–3) or Fuel pump (F24–4) – Body ground	No continuity

Wire Harness Side

F25

Fuel Pump Connector

A66276

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE ECM (See page 01–32)

SFI SYSTEM (1ZZ–FE/3ZZ–FE)

0505G–04

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05–4)

3	CONNECT THE HAND–HELD TESTER TO DLC3

HINT:
If the display indicates a communication fault in the tool, inspect DLC3.

4	CHECK DTC AND FREEZE FRAME DATA (See page 05–5)

HINT:
Record or print DTC and freeze frame data, if needed.

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05–5)

6	VISUAL INSPECTION

7	SETTING THE CHECK (TEST) MODE DIAGNOSIS (See page 05–5)

8	PROBLEM SYMPTOM CONFIRMATION

HINT:
If the engine does not start, perform steps 10 and 12 first.

A	Malfunction does not occur
B	Malfunction occurs

B → GO TO STEP 10

A

9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05–5)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	DTC CHART (See page 05–16)

GO TO STEP 14

12	BASIC INSPECTION (See page 05–5)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	PROBLEM SYMPTOMS TABLE (See page 05–22)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05–124)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)

GO TO STEP 18

17	PARTS INSPECTION

18	IDENTIFICATION OF PROBLEM

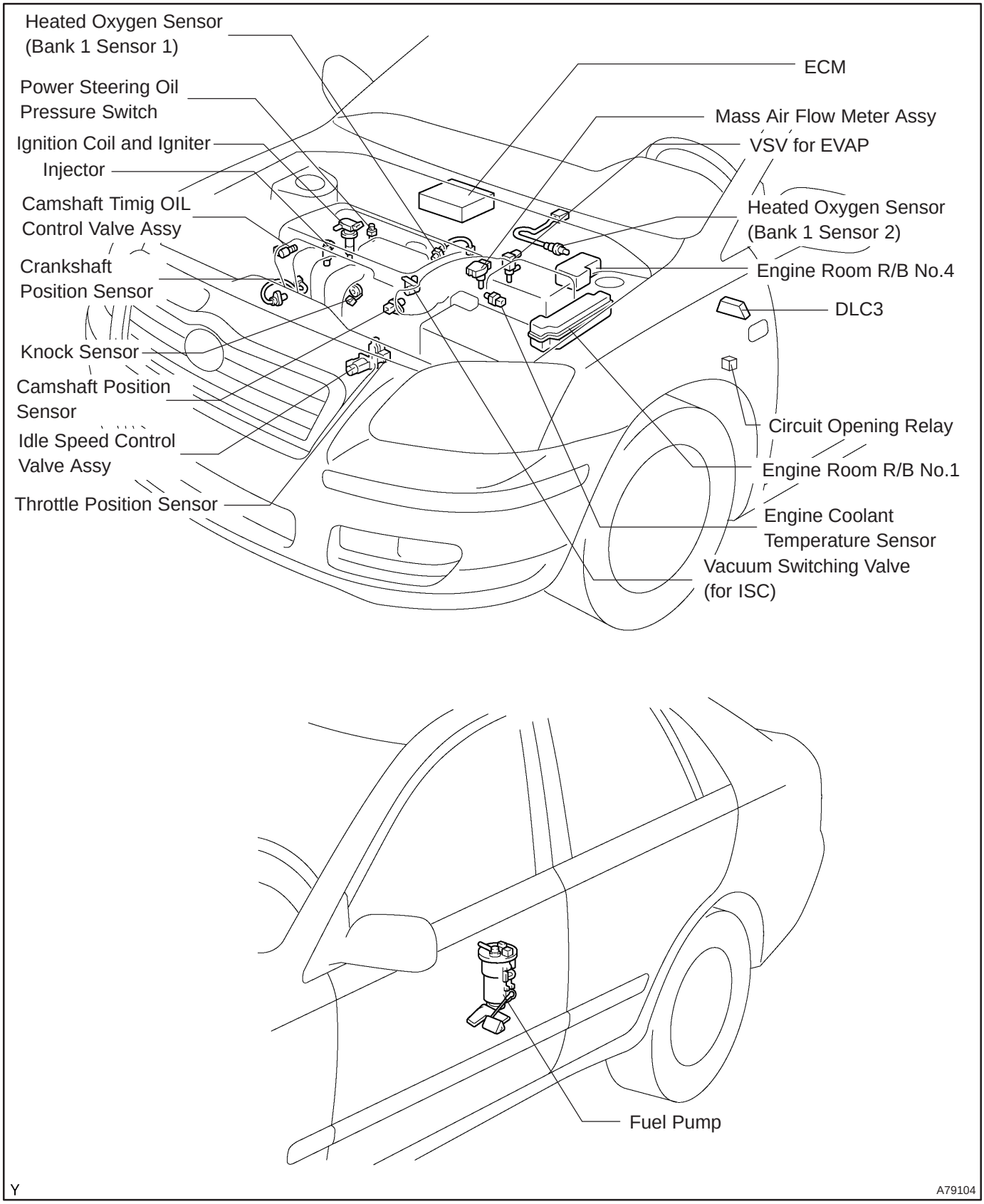
19	ADJUSTMENT, REPAIR

20	CONFIRMATION TEST

END

05B3M–03

LOCATION

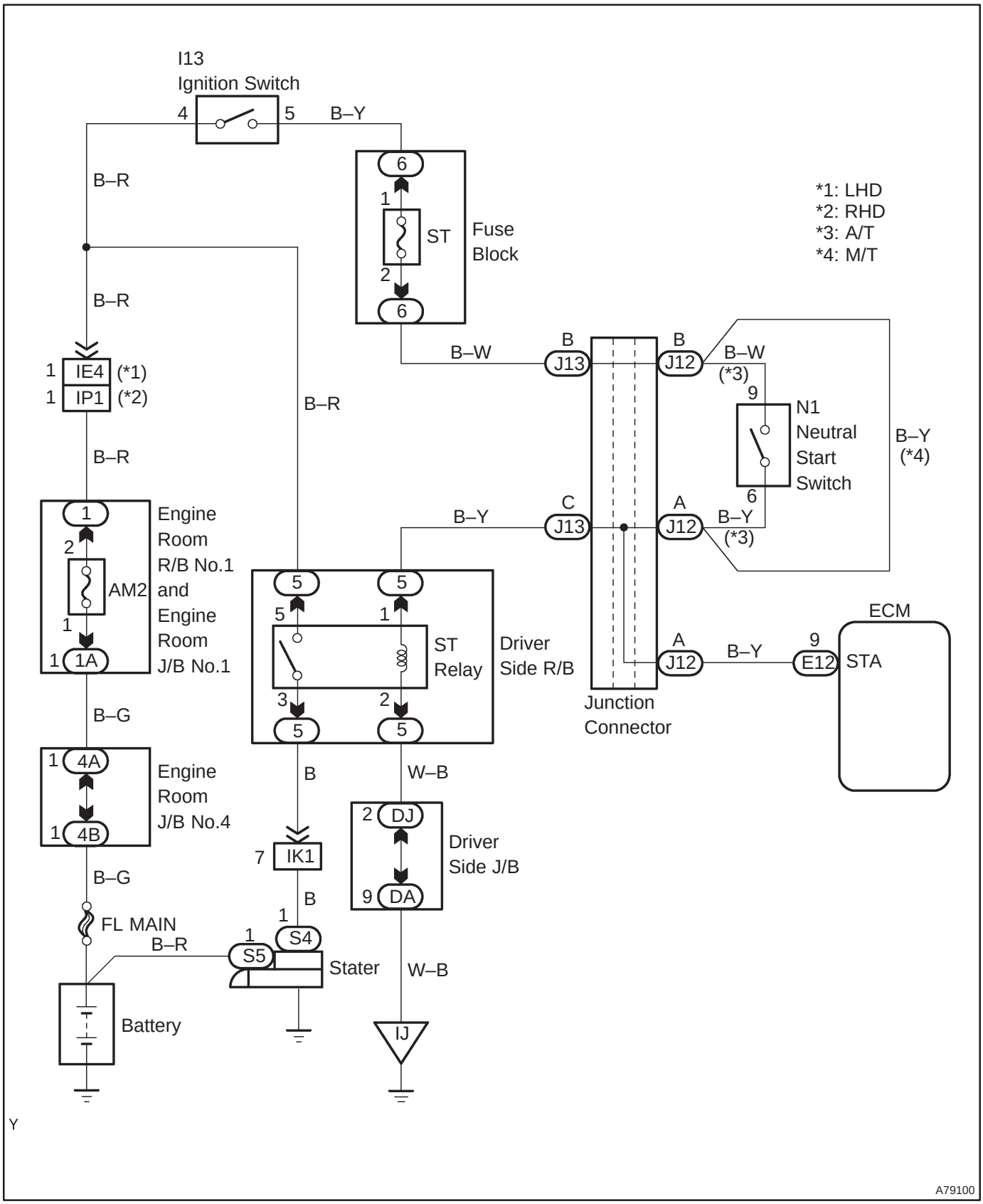


STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow becomes slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM



NSPECTION PROCEDURE

HINT:

This diagnostic chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05–22.

1	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG” and read its value displayed on the hand–held tester.

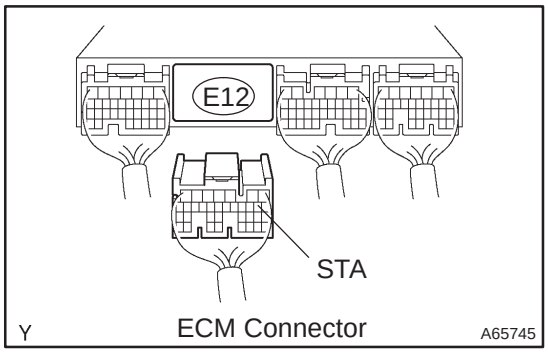
Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	CHECK HARNESS AND CONNECTOR(ECM – STARTER RELAY)



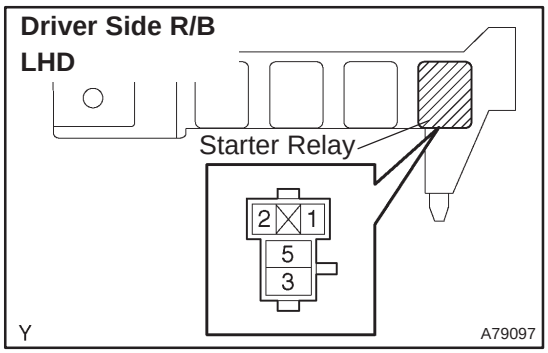
(a) Disconnect the ECM E12 connector.
(b) Remove the starter relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

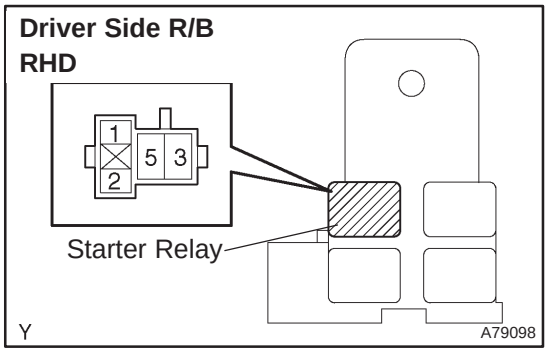
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Starter relay (1) – STA (E12–9)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Starter relay (1) or STA (12–9) – Body ground	No continuity





NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ECM (See page 01–32)

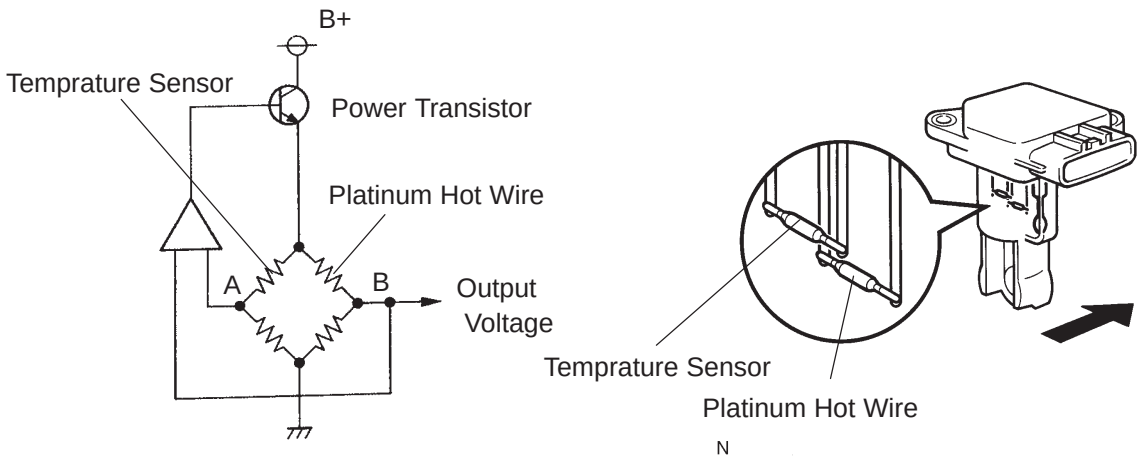
DTC	P0100	MASS AIR FLOW CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire. The hot wire air flow meter consists of a platinum hot wire, temprature sensor and a control circuit installed in a plastic housing. The hot wire air flow meter works on the principle that the hot wire and temprature sensor located in the intake air bypass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the mass air flow meter.

The circuit is constructed so that the platinum hot wire and temprature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



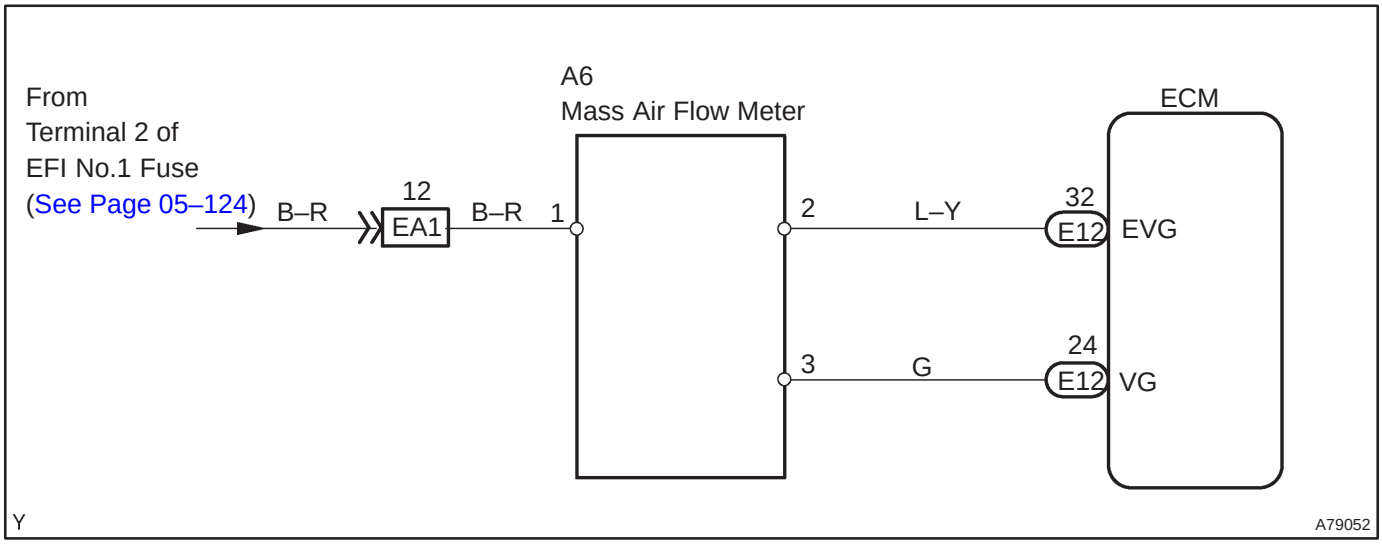
DTC No	DTC Detecting Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with engine speed less than 4,000 rpm for more than 3 sec.	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM

HINT:

After confirming DTC ”P0100”, use the hand–held tester to confirm the air flow ratio in the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Air Flow Value (gm/sec)	Malfunction
Approx. 0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• EVG circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ VALUE OF HAND–HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine.
(c) Read air flow rate on the hand–held tester.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

Result:

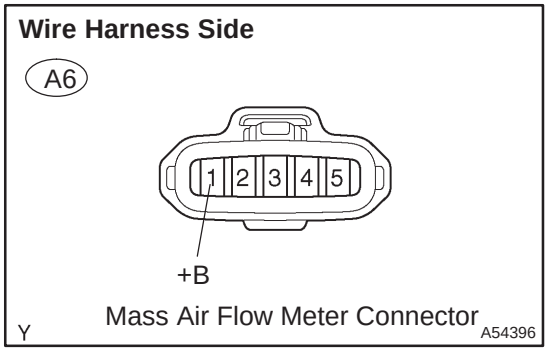
Air flow rate (gm/sec)	Proceed to
0.0	A
271.0 or more	B
1 less than Mass Air Flow Rate less than 270.0 or more (*1)	C

*1: The value must be changed when the throttle valve is opend or closed.

B	**Go to step 6**
C	**CHECK FOR INTERMITTENT PROBLEMS (See Page 05–5)**

A

2 INSPECT MASS AIR FLOW METER(POWER SORUCE VOLTAGE)



(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminal of the wire harness side connector and the body ground.

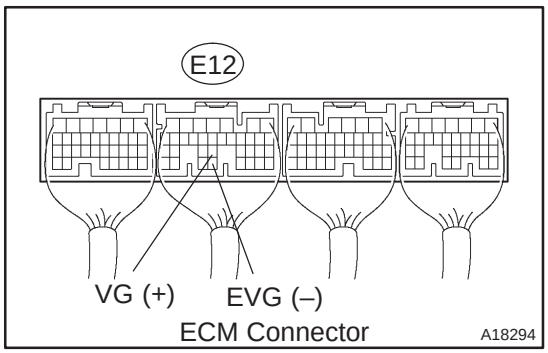
Standard:

Symbols (Terminal No.)	Specified condition
+B (A6–1) – Body ground	9 to 14 V

NG → **Go to step 5**

OK

3 INSPECT ECM



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E12 ECM connector.

HINT:
The shift position should be P or N and the A/C switch should be turned OFF.

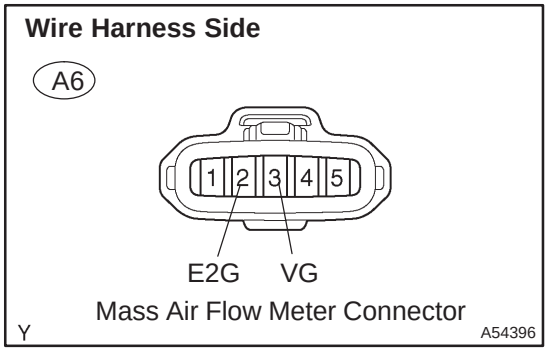
Standard:

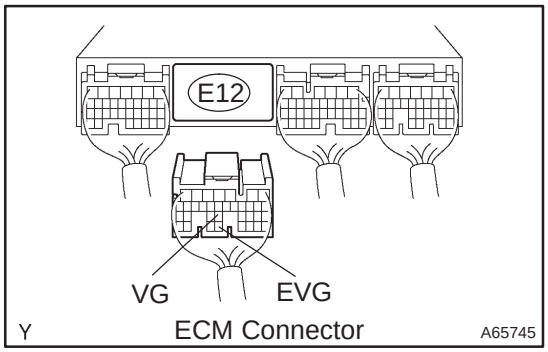
Symbols (Terminal No.)	Condition	Specified condition
VG (E12–24) – EVG (E12–32)	Engine is idling	0.5 to 3.0 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

4 CHECK HARNESS AND CONNECTOR(ECM – MASS AIR FLOW METER)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E12–24)	Continuity
E2G (A6–2) – EVG (E12–32)	

Standard (Check for short):

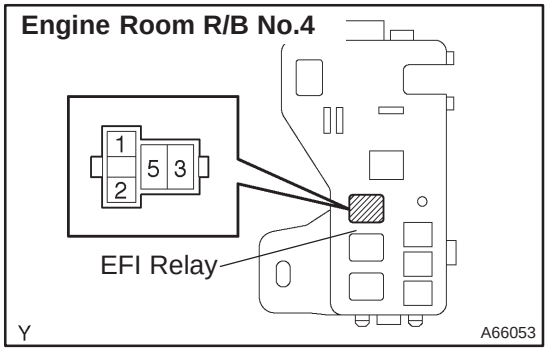
Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E12–24) – Body ground	No continuity

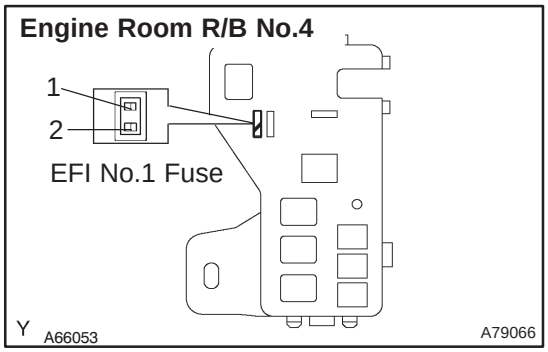
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

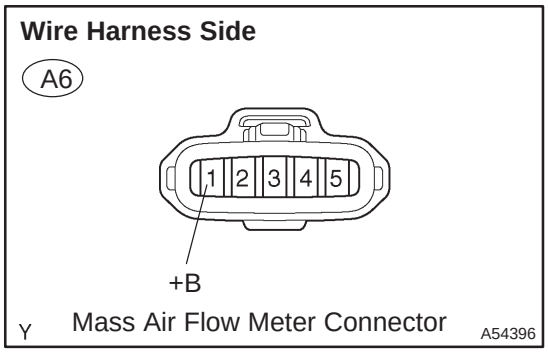
OK

REPLACE MASS AIR FLOW METER

5 CHECK HARNESS AND CONNECTOR(EFI RELAY – MASS AIR FLOW METER)







(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the EFI No.1 fuse from the engine room R/B No.4.
(c) Disconnect the mass air flow meter connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – EFI No.1 fuse (1)	Continuity
EFI No.1 fuse (2) – +B (A6–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or EFI No.1 fuse (1) – Body ground	No continuity
EFI No.1 fuse (2) or +B (A6–1) – Body ground	

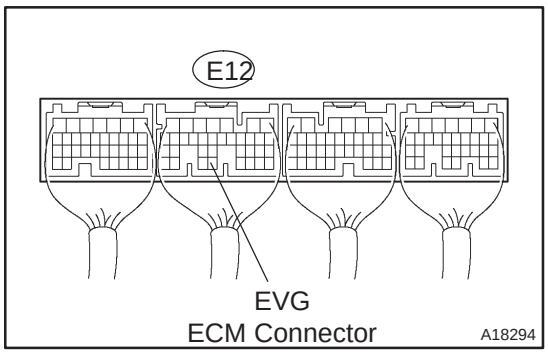
NOTICE:
Do not insert the tester leads hard in the procedure (c), the holder may be damaged.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK ECM POWER SOURCE CIRCUIT (See page 05–124)

6 INSPECT ECM



(a) Check for continuity between the terminal of the E12 ECM connector and the body ground.

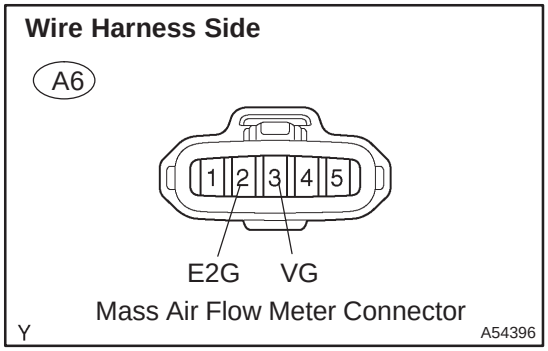
Standard:

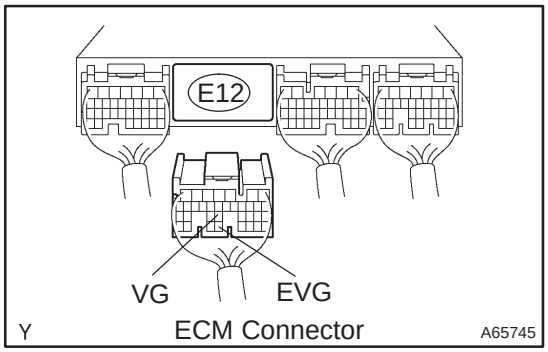
Symbols (Terminal No.)	Specified condition
EVG (E12–32) – Body ground	Continuity

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

7 CHECK HARNESS AND CONNECTOR(ECM – MASS AIR FLOW METER)





(a) Disconnect the mass air flow meter connector.
(b) Disconnect the E12 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VG (A6–3) – VG (E12–24)	Continuity
E2G (A6–2) – EVG (E12–32)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VG (A6–3) or VG (E12–24) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

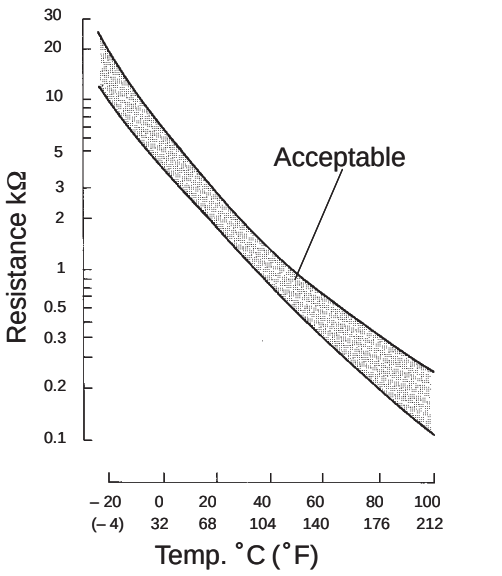
OK

CHECK AND REPLACE ECM (See page 01–32)

DTC P0110 INTAKE AIR TEMPERATURE CIRCUIT

CIRCUIT DESCRIPTION

(fig. 1)



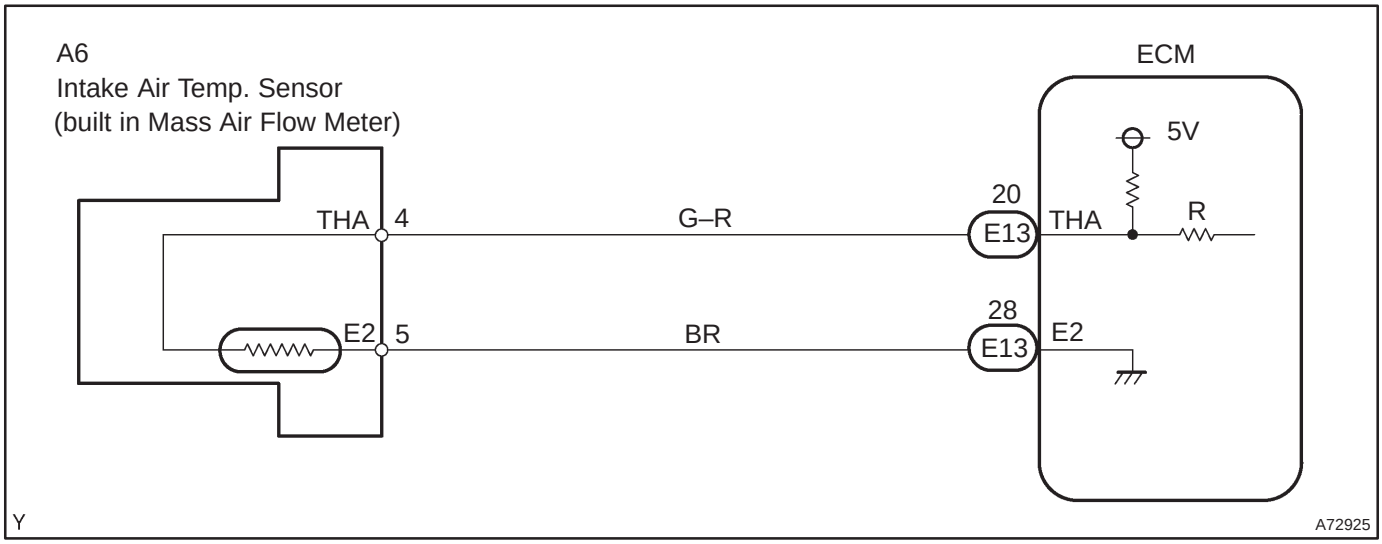
The intake air temperature sensor is built into the mass air flow meter and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature, the lower the thermistor resistance value (See fig. 1).
The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from the terminal THA via resistor R.
That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation.

DTC No.	DTC Detecting Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built into mass air flow meter) • ECM

If the ECM detects the DTC ”P0110”, it enters the fail–safe mode in which the intake air temperature is assumed to be 20 °C (68 °F).
HINT:
After confirming DTC ”P0110”, use the hand–held tester to confirm the intake air temperature from the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40 °C (–40 °F)	Open circuit
140 °C (284 °F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

1	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: The same as actual intake air temperature
Result:

Temperature Displayed	Proceed to
–40 °C (–40 °F)	A
140 °C (284 °F) or more	B
OK (Same as present temperature)	C

HINT:

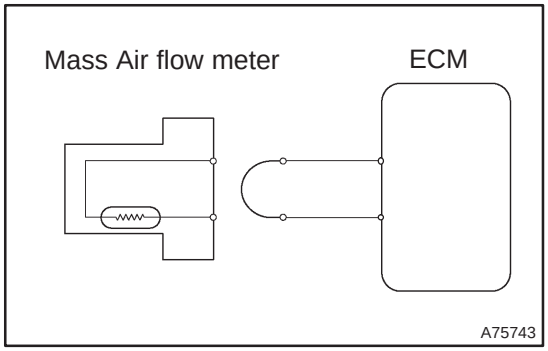
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B → **Go to step 4**

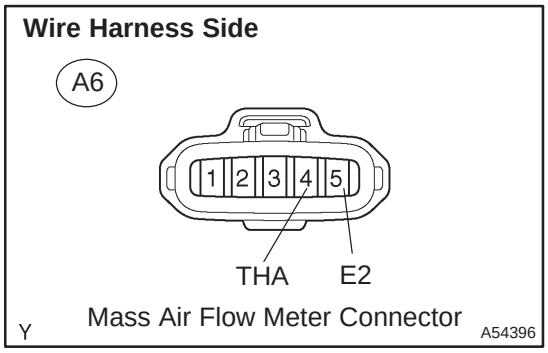
C → **CHECK FOR INTERMITTENT PROBLEMS (See Page 05–5)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN HARNESS)



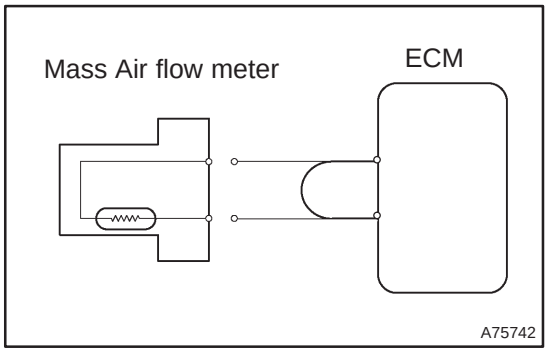
(a) Disconnect the mass air flow meter connector.
(b) Connect terminals THA and E2 of the mass air flow meter connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more



OK → **REPLACE MASS AIR FLOW METER**

NG

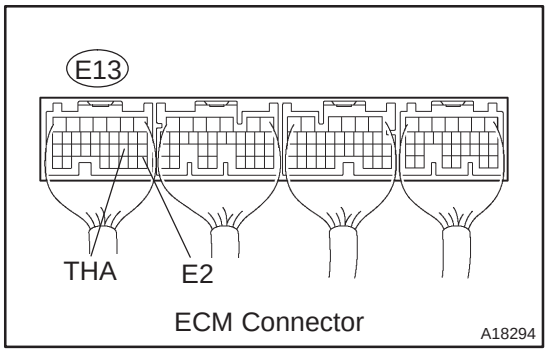
3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the mass air flow meter connector.
(b) Connect terminals THA and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: 140°C (284°F) or more

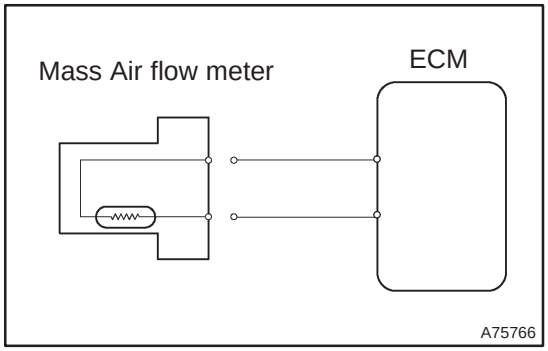


NG → **CHECK AND REPLACE ECM** (See page 01–32)

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

4 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN HARNESS)

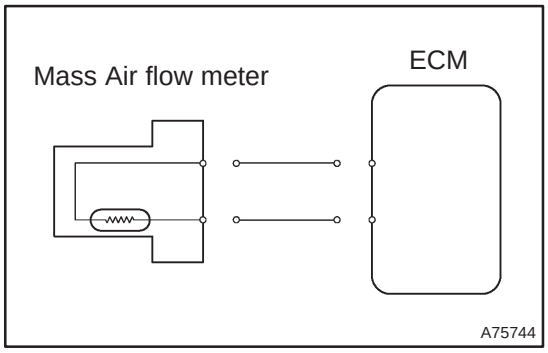


(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

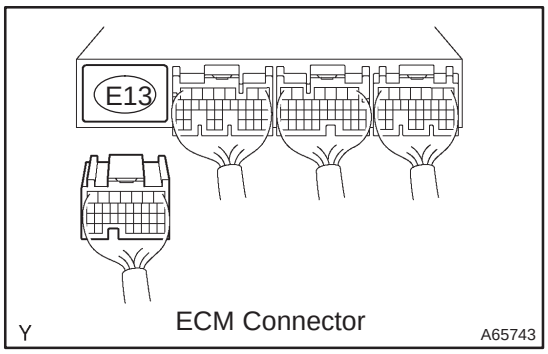
OK → **REPLACE MASS AIR FLOW METER**

NG

5 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.
Temperature value: –40°C (–40°F)



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM (See page 01–32)

DTC P0115 ENGINE COOLANT TEMPERATURE CIRCUIT

CIRCUIT DESCRIPTION

A thermistor is built into the engine coolant temperature sensor and changes the resistance value according to the engine coolant temperature.

The structure of the sensor and connection to the ECM is the same as the ones of the intake air temperature sensor.

DTC No.	DTC Detecting Condition	Trouble Area
P0115	Open or short in water temp. sensor circuit	• Open or short in Engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM

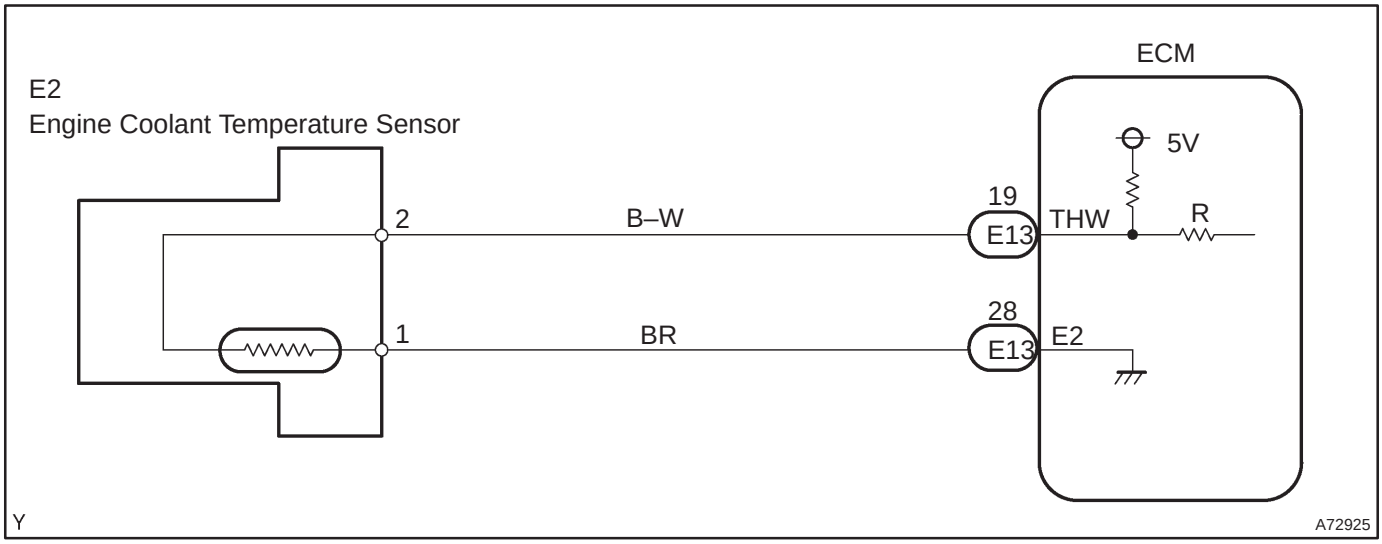
If the ECM detects the DTC ”P0115”, it enters the fail–safe mode in which the engine coolant temperature is assumed to be 80 °C (176 °F).

HINT:

After confirming DTC P0115, use the hand–held tester to confirm the engine coolant temperature in ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

Temperature Displayed	Malfunction
–40 °C (–40 °F)	Open circuit
140 °C (284 °F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

1 READ VALUE OF HAND–HELD TESTER(WATER TEMPERATURE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: Same as actual engine coolant temperature
Result:

Temperature Displayed	Proceed to
–40 °C (–40 °F)	A
140 °C (284 °F) or more	B
OK (Same as present temperature)	C

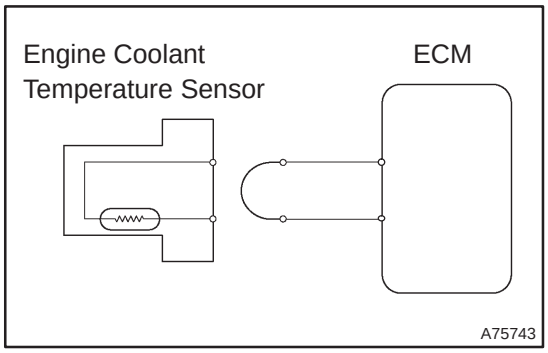
HINT:
- If there is an open circuit, the hand–held tester indicates –40˚C (–40˚F).
- If there is a short circuit, the hand–held tester indicates 140˚C (284˚F) or more.

B → **Go to step 4**

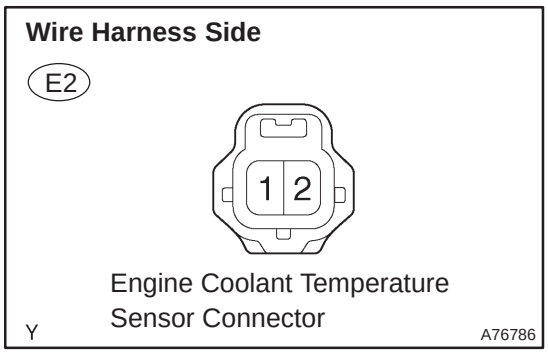
C → **CHECK FOR INTERMITTENT PROBLEMS (See Page 05–5)**

A

2 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN HARNESS)



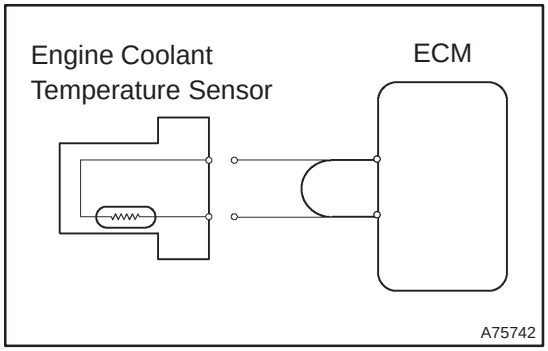
(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: 140 °C (284 °F) or more

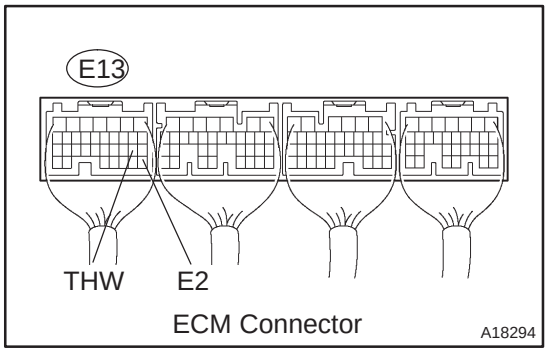


OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE ENGINE COOLANT TEMP. SENSOR**

NG

3 READ VALUE OF HAND–HELD TESTER(CHECK FOR OPEN IN ECM)





(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect terminals THW and E2 of the E13 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

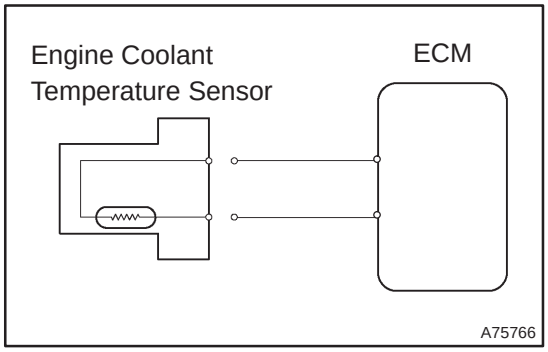
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: 140 °C (284 °F) or more

OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM (See page 01–32)

4 READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN HARNESS)

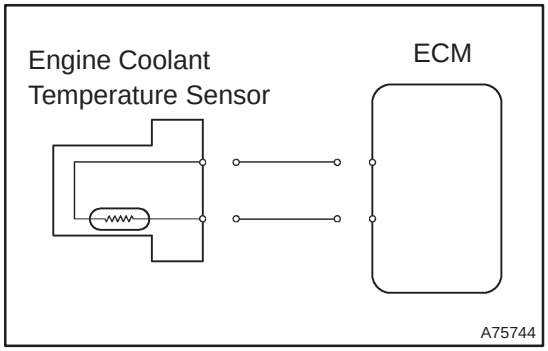


(a) Disconnect the engine coolant temperature sensor connector.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: –40°C (–40°F)

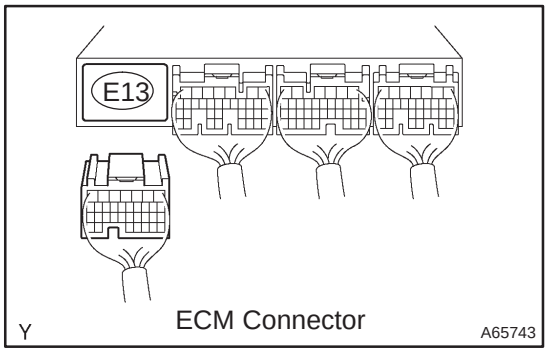
OK → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

5	READ VALUE OF HAND–HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the E13 ECM connector.
(b) Disconnect the engine coolant temperature sensor connector.
(c) Turn the ignition switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP” and read its value displayed on the hand–held tester.
Temperature: –40 °C (–40 °F)



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0116	ENGINE COOLANT TEMPERATURE CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Rfer to DTC P0115 on page 05–34

DTC No.	DTC Detecting Condition	Trouble Area
P0116	When the temperature of engine coolant is –7 °C (20 °F) with a cold engine, and if the engine coolant temperature sensor value is 20 °C (68 °F) or less even if it has been 20 min or more since the engine was warmed up. (2 trip detection logic)	• Engine coolant temperature sensor • Thermostat

INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different systems are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

1	READ OUTPUT DTC(BESIDES P0116)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0116” is output	A
”P0116” and other DTCs are output	B

HINT:
If any other codes besides ”P0116” are output, perform the troubleshooting for those DTCs first.

B → GO TO RELEVANT DTC CHART

A

2	INSPECT THERMOSTAT (See Page 16–3)

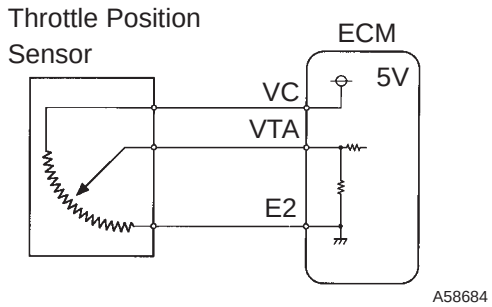
NG → REPLACE THERMOSTAT

OK

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

DTC	P0120	THROTTLE PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION



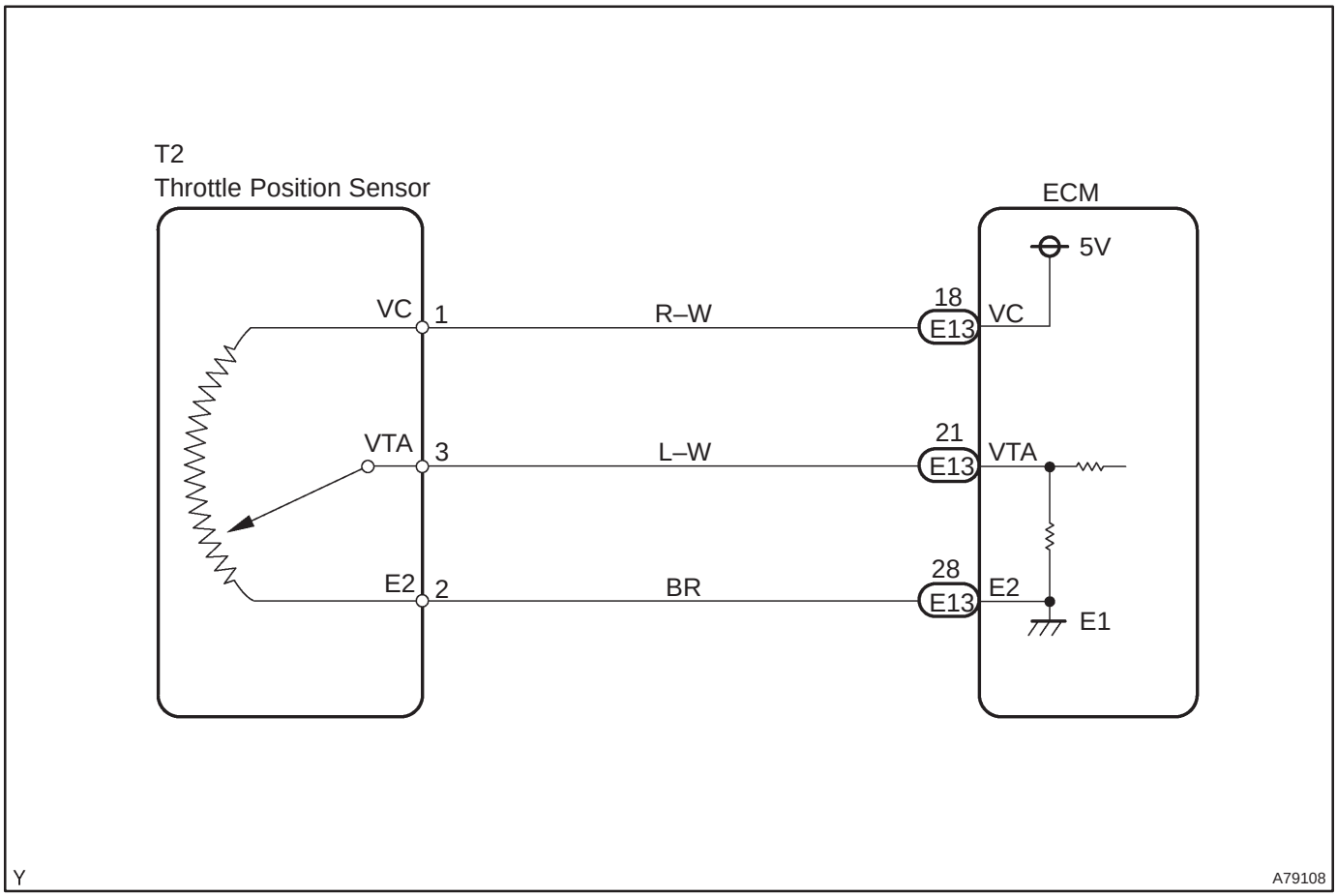
The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle.
When the throttle valve is fully closed, a voltage of approximately 0.7 V is applied to terminal VTA of the ECM. The voltage applied to terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.5 to 5.0 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from terminal VTA, uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc.

DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues for more than 5 sec. (a) VTA is less than 0.1 V (b) VTA is greater than 4.9 V	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

HINT:
After confirming DTC ”P0120”, use the hand–held tester to confirm the throttle valve opening percentage.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve fully closed	Throttle valve fully open	
0 %	0 %	VC circuit open VTA circuit open or short
Approx. 100 %	Approx. 100 %	E2 circuit open

WIRING DIAGRAM

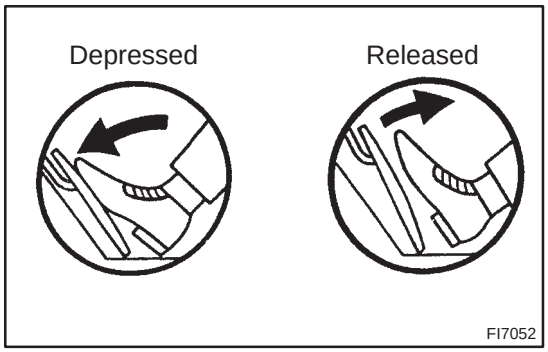


INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

1	READ VALUE OF HAND–HELD TESTER(THROTTLE VALVE OPENING PERCENTAGE)



(a) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / THROTTLE POS” and read its value displayed on the hand–held tester.

Result:

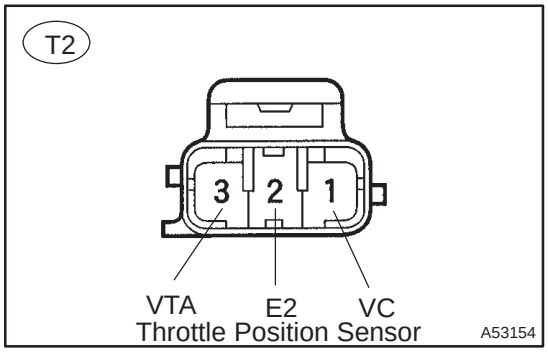
Accelerator pedal operatuin	Throttle valve opening position expressed as percentage	Proceed to
Released→Depressed	0 %	A
	Approx. 10 %→ Approx. 75 %	B
	Approx. 100 %	C

B → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)**

C → **Go to step 4**

A

2	INSPECT THROTTLE POSITION SENSOR



(a) Disconnect the throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

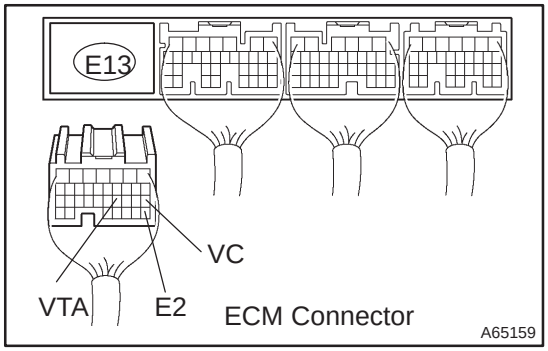
Standard:

Symbols (Terminal No.)	Throttle Valve	Resistance
VC (T2–1) – E2 (T2–2)	—	2.5 to 5.9 kΩ
VTA (T2–3) – E2 (T2–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG → **REPLACE THROTTLE POSITION SENSOR**

OK

3 CHECK HARNESS AND CONNECTOR(ECM – THROTTLE POSITION SENSOR)



(a) Disconnect the E13 ECM connector.
(b) Measure the resistance between the terminals of the E13 ECM connector.
Standard:

Symbols (Terminal No.)	Throttle valve	Resistance
VC (E13–18) – E2 (E13–28)	—	2.5 to 5.9 kΩ
VTA(E13–21) – E2 (E13–28)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

(c) Check for continuity between the terminals of the E13 ECM connector.
Standard (Check for short):

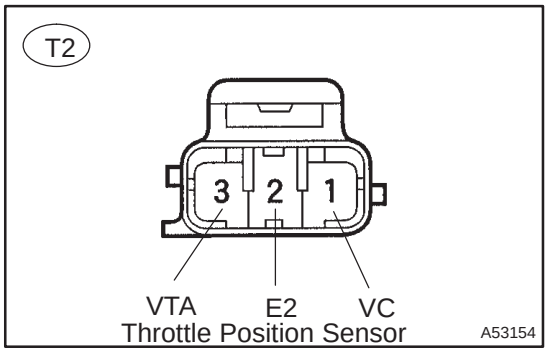
Symbols (Terminal No.)	Specified condition
VC (E13–18) – Body ground	No Continuity
VTA (E13–28) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

4 INSPECT THROTTLE POSITION SENSOR



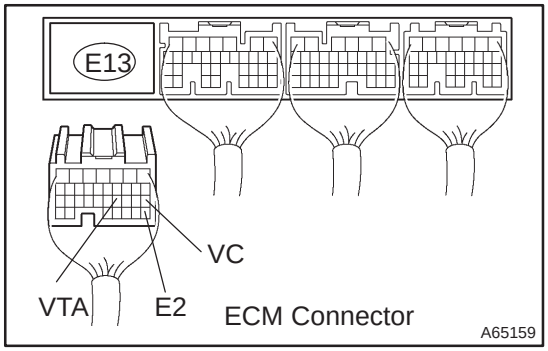
(a) Disconnect the throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.
Standard:

Symbols (Terminal No.)	Throttle Valve	Resistance
VC (T2–1) – E2 (T2–2)	—	2.5 to 5.9 kΩ
VTA (T2–3) – E2 (T2–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG → **REPLACE THROTTLE POSITION SENSOR**

OK

5 CHECK HARNESS AND CONNECTOR(ECM – THROTTLE POSITION SENSOR)



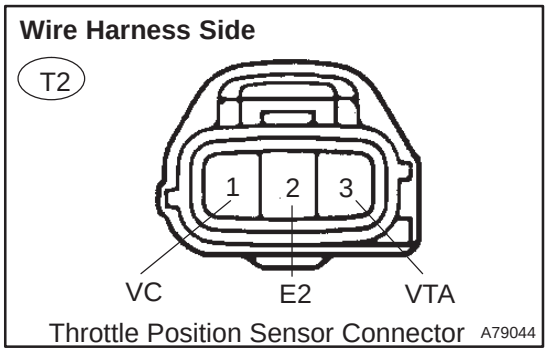
(a) Disconnect the E13 ECM connector.
(b) Disconnect the throttle position sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (T2–1) – VC (E13–18)	Continuity
VTA (T2–3) – VTA (E13–21)	
E2 (T2–2) – E2 (E13–28)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (T2–1) or VC (E13–18) – Body ground	No continuity
VTA (T2–3) or VTA (E13–21) – Body ground	



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0121	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page 05–39

HINT:

This is the troubleshooting procedure of the throttle position sensor.

DTC No.	DTC Detecting Condition	Trouble Area
P0121	After the vehicle speed has exceeded 30 km/h (19 mph) once, and an output value of the throttle position sensor is out of the applicable range, althought the vehicle speed is more than 0 km/h (0 mph). (2 trip detection logic)	• Throttle position sensor

INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.

1	ARE THERE ANY DTC BEING OUTPUT(BESIDES P0121)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
Only ”P0121” is output	A
”P0121” and other DTCs are output	B

HINT:

If any other codes besides ”P0121” are output, perform the troubleshooting for those DTCs first.

B → GO TO RELEVANT DTC CHART

A

REPLACE THROTTLE POSITION SENSOR

DTC	P0125	INSUFFICIENT COOLANT TEMP. FOR CLOSED LOOP FUEL CONTROL

CIRCUIT DESCRIPTION

The heated oxygen sensor is the planar type. Compared to the conventional type, the sensor element and the heater portions have a narrower overall. The heater can directly conduct its heat to the zirconia element via the alumina, it helps to accerate the sensor activation.

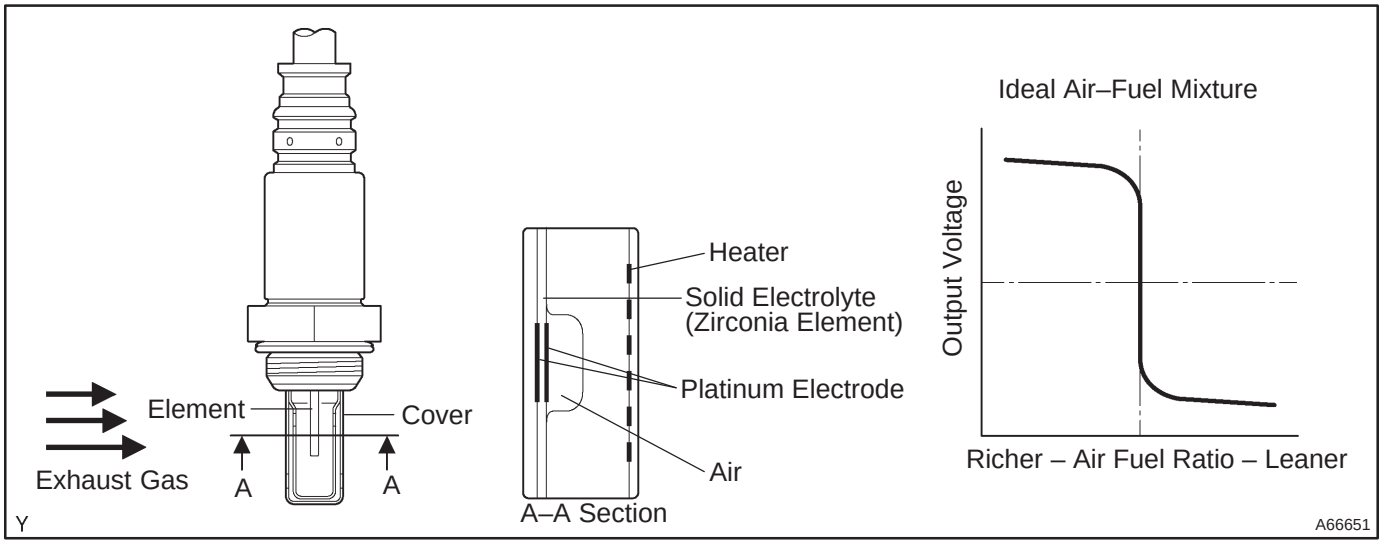
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three – way catalytic converter is used. For the most efficient use of the three – way catalytic converter, the air – fuel ratio must be precisely controlled so that it is always close to the stoichiometric air – fuel ratio.

The heated oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and provide the ECM with feedback control the air–fuel ratio.

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust gas increases. And the heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i. e. less than 0.45 V).

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio, the oxygen concentration in the exhaust gas is reduced. And the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i. e. more than 0.45V). The ECM judges by the voltage output from the heated oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. If the malfunction of the heated oxygen sensor causes an output of abnomal voltage, the ECM becomes unable to perform accurate air–fuel ratio control.

The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), current flows to the heater in order to heat the sensor for the accurate oxygen concentration detection.

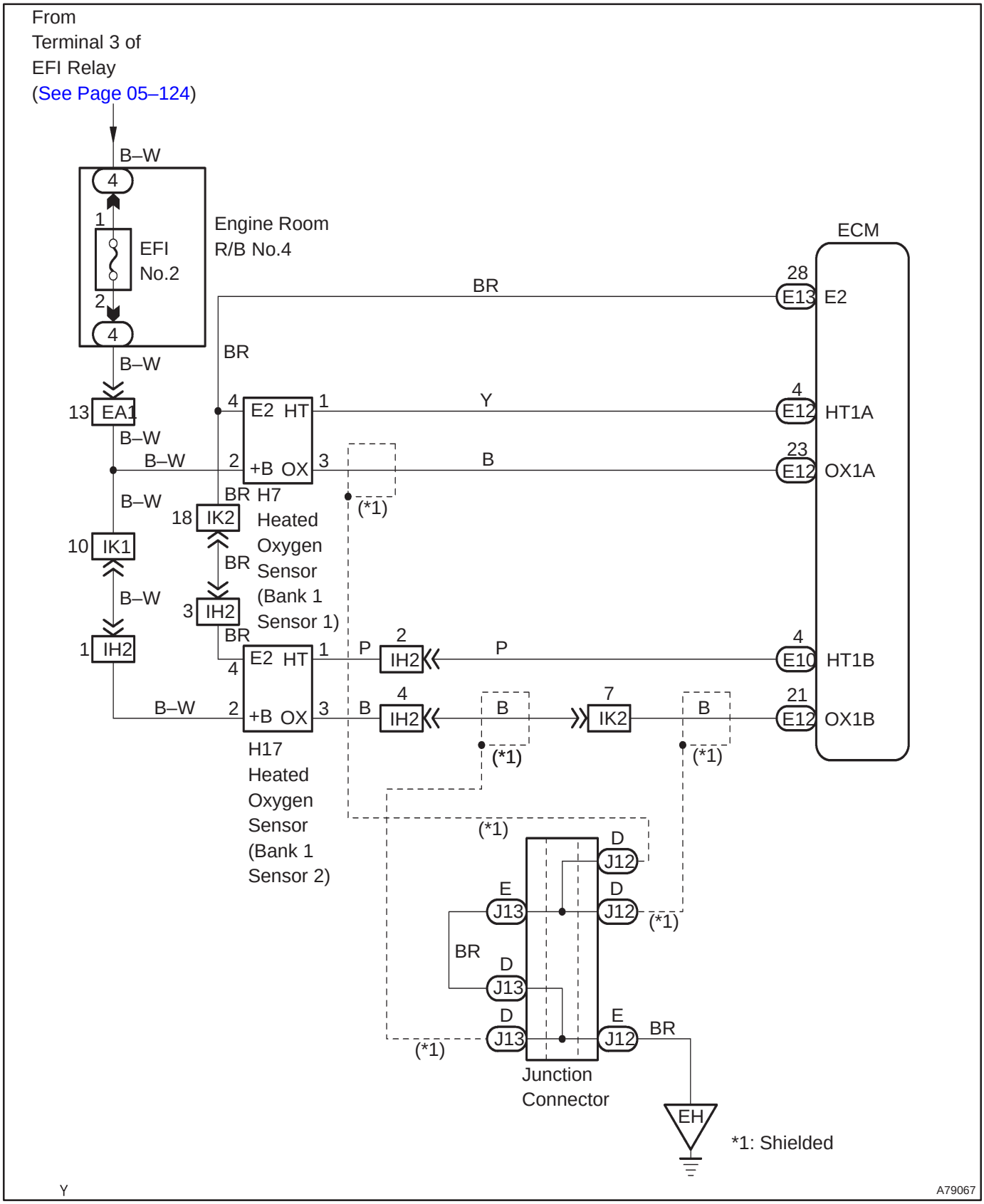


DTC No	DTC Detecting Condition	Trouble Area
P0125	After engine is warmed up, heated oxygen sensor output* does not change when conditions (a), (b), (c) and (d) continue for at least 1.5 min: *: Output value changes at inside of the ECM only (a) Engine speed: 1,400 rpm or more (b) Vehicle speed: 40 to 100 km/h (25 to 62 mph) (c) Throttle valve is not fully closed (d) 180 sec. or more after starting engine	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • Gas leakage in exhaust system • ECM

HINT:

- After confirming DTC ”P0125”, use the hand–held tester to confirm output voltage of the heated oxygen sensor the ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL”.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST by the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

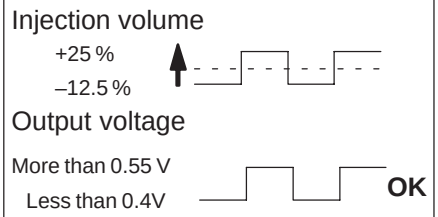
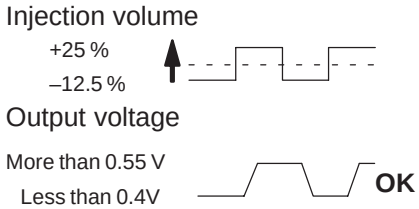
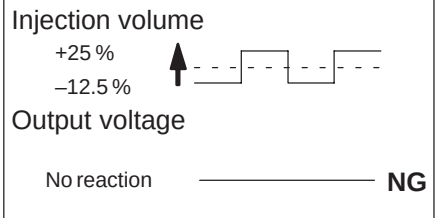
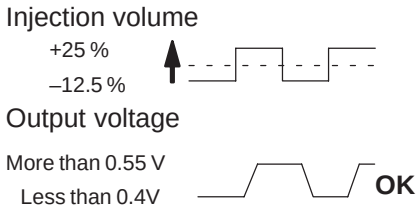
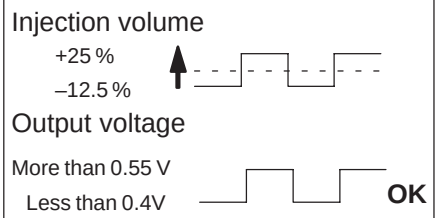
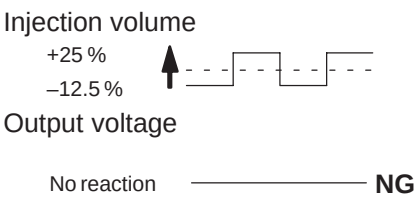
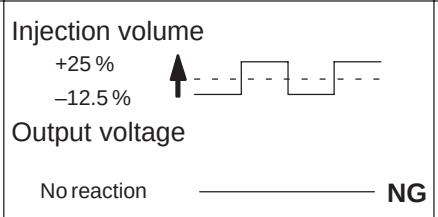
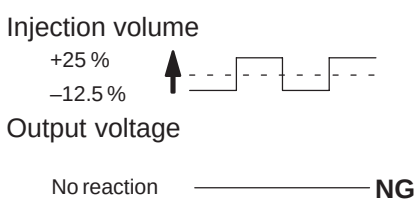
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few second delay in the sensor 1 (front sensor) output, and there is about 20 seconds delay in the sensor 2 (rear sensor)output.

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1			—
Case 2			Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3			Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4			Extremely rich or lean of the actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following procedure of A/F CONTROL enable the technician to check and graph voltage output of the heated oxygen sensor.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0125)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0125” is output	A
”P0125” and other DTCs are output	B

HINT:
If any other codes besides ”P0125” are output, perform the troubleshoot on that DTC before.

B → **GO TO RELEVANT DTC CHART (See page 05–16)**

A

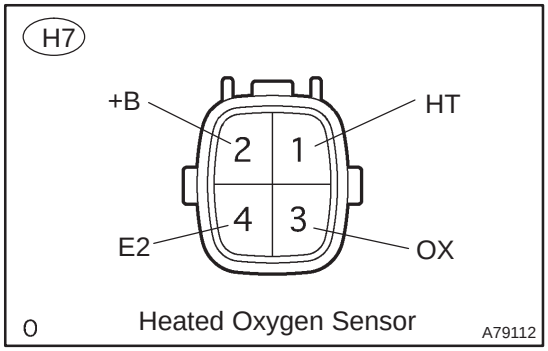
2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Warm up the engine to the normal operating temperature above 75°C (169°F).
(b) Read the output voltage of the heated oxygen sensor when the engine rpm is suddenly increased.
HINT:
Quickly accelerate the engine to 4,000 rpm 3 times using the accelerator pedal.
Standard:
Heated oxygen sensor outputs a RICH signal (0.45 V or more) at least once.

OK → **Go to step 13**

NG

3 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



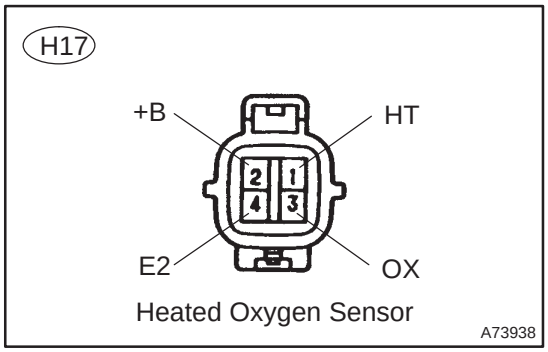
(a) Disconnect the heated oxygen sensor connector.
(b) Inspect the heated oxygen sensor.

Standard: (Bank1 Sensor1)

Symbols (Terminal No.)	Condition	Specified condition
HT (H7–1) – +B (H7–2)	20°C (68°F)	6 to 9 Ω
HT (H7–1) – E2 (H7–4)	—	No Continuity

Standard: (Bank1 Sensor2)

Symbols (Terminal No.)	Condition	Specified condition
HT (H17–1) – +B (H17–2)	20°C (68°F)	11 to 16 Ω
HT (H17–1) – E2 (H17–4)	—	No Continuity



NG → **REPLACE HEATED OXYGEN SENSOR**

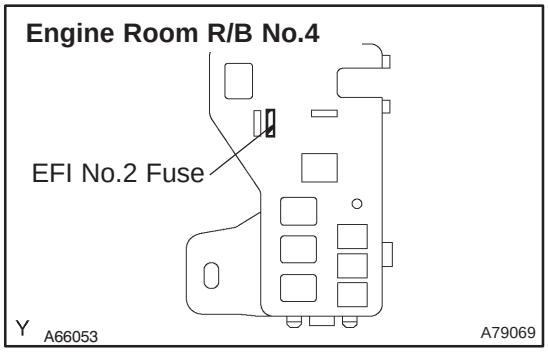
OK

4 INSPECT EFI RELAY (See page 10–3)

NG → **REPLACE EFI RELAY**

OK

5 CHECK FUSE(EFI No.2)



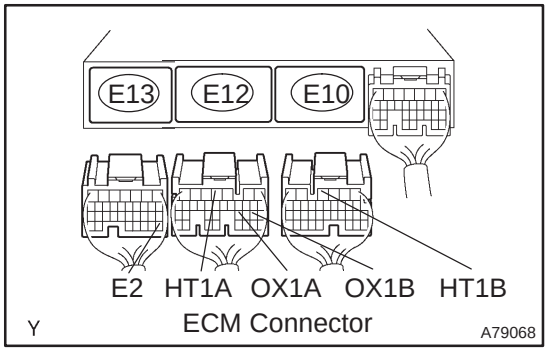
(a) Remove the EFI No.2 fuse from the engine room R/B No.4.
(b) Check for continuity in the EFI fuse.

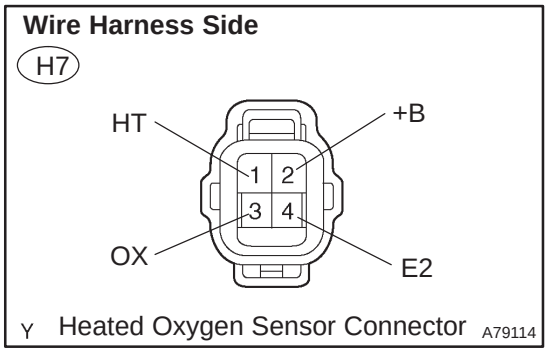
Standard: Continuity

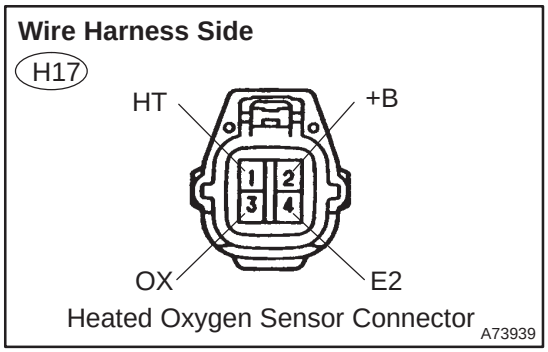
NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

6 CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM)







(a) Disconnect the heated oxygen sensor connector.
(b) Disconnect the E10, E12 and E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open): (Bank1 Sensor1)

Symbols (Terminal No.)	Specified condition
HT (H7–1) – HT1A (E12–4)	Continuity
OX (H7–3) – OX1A (E12–23)	
E2 (H7–4) – E2 (E13–28)	

Standard (Check for short): (Bank1 Sensor1)

Symbols (Terminal No.)	Specified condition
HT (H7–1) or HT1A (E12–4) – Body ground	No continuity
OX (H7–3) or OX1A (E12–23) – Body ground	

Standard (Check for open): (Bank1 Sensor2)

Symbols (Terminal No.)	Specified condition
HT (H17–1) – HT1B (E10–4)	Continuity
OX (H17–3) – OX1B (E12–21)	
E2 (H17–4) – E2 (E13–28)	

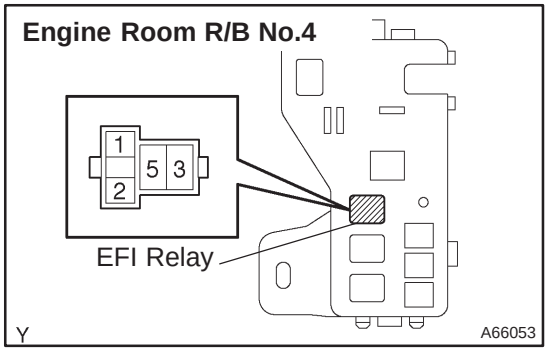
Standard (Check for short): (Bank1 Sensor2)

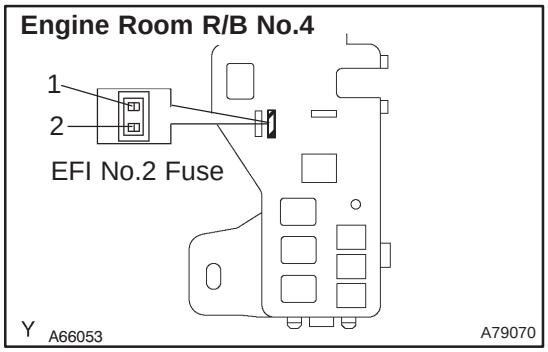
Symbols (Terminal No.)	Specified condition
HT (H17–1) or HT1B (E10–4) – Body ground	No continuity
OX (H17–3) or OX1B (E12–21) – Body ground	

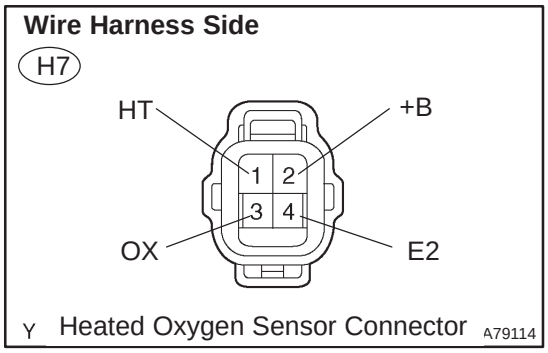
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

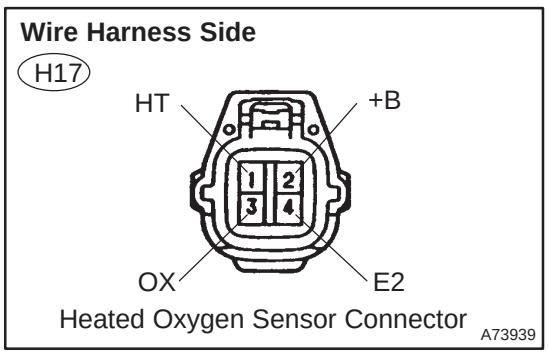
OK

7 CHECK HARNESS AND CONNECTOR(EFI RELAY – HEATED OXYGEN SENSOR)









(a) Remove the EFI relay from the engine room R/BNo.4.
(b) Remove the EFI No.2 fuse from the engine room R/B No.4.
(c) Disconnect the heated oxygen sensor connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – EFI No.2 fuse (1)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or EFI No.2 fuse (1) – Body ground	No continuity

Standard (Check for open): (Bank1 Sensor1)

Symbols (Terminal No.)	Specified condition
EFI No.2 fuse (2) – +B (H7–2)	Continuity

Standard (Check for short): (Bank1 Sensor1)

Symbols (Terminal No.)	Specified condition
EFI No.2 fuse (2) or +B (H7–2) – Body ground	No continuity

Standard (Check for open): (Bank1 Sensor2)

Symbols (Terminal No.)	Specified condition
EFI No.2 fuse (2) – +B (H17–2)	Continuity

Standard (Check for short): (Bank1 Sensor2)

Symbols (Terminal No.)	Specified condition
EFI No.2 fuse (2) or +B (H17–2) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8	CHECK WHETHER MISFIRE IS OCCURRED OR NOT BY MONITORING DTC AND DATA LIST

NG → PERFORM TROUBLESHOOTING FOR MISFIRE (See page 05–5)

OK

9	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

10	CHECK FUEL PRESSURE (See page 11–5)

(a) Check the fuel pressure (high or low pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

11	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–8)

NG → REPLACE FUEL INJECTOR ASSY

OK

12	CHECK FOR EXHAUST GAS LEAK

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK

REPLACE HEATED OXYGEN SENSOR

13	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)

GO

14	READ OUTPUT DTC(DTC P0125 IS OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0125” is not output again	A
”P0125” is output again	B

B → **CHECK AND REPLACE ECM (See page 01–32)**

A

15	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → **CHECK FOR INTERMITTENT PROBLEMS**

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL

DTC	P0130	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 1)

DTC	P0136	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page 05–45.

DTC No	DTC Detecting Condition	Trouble Area
P0130	Voltage output of heated oxygen sensor remains between 0.40 V and 0.55 V during idling after the engine is warmed up	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM
P0136	Voltage output of heated oxygen sensor remains 0.4 V or more or 0.5 V or less when vehicle is driven at 30 km/h (19 mph) or more after the engine is warmed up (2 trip detection loginc)	• Open or short in heated oxygen sensor circuit • Heated Oxygen sensor

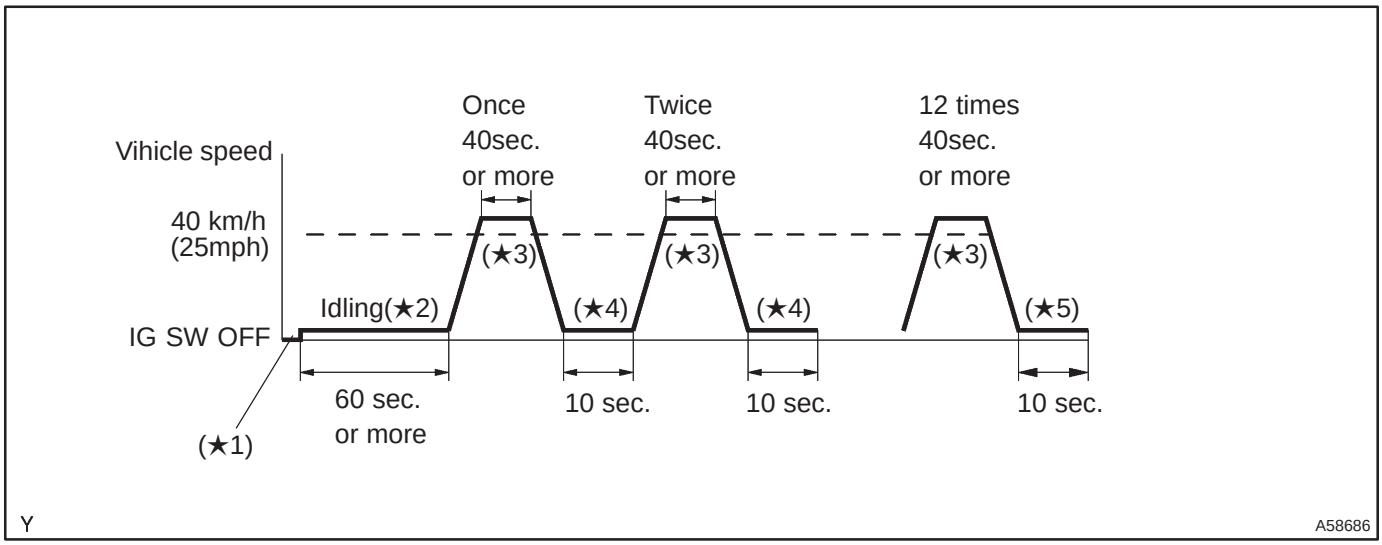
HINT:

- Bank 1 refers to the bank that includes cylinder No. 1.
- Sensor 1 refers to the sensor closer to the engine assembly.
- The heated oxygen sensor output voltage and the short−term fuel trim value can be read using the hand−held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page 05–45.

CONFIRMATION DRIVING PATTERN



1. **Connect the hand–held tester to the DLC3. (★1)**
2. **Switch the hand–held tester from the normal mode to the check mode (See page 05–5). (★1)**
3. **Start the engine and let the engine idle for 60 seconds or more. (★2)**
4. **Drive the vehicle at 40 km/h (25 mph) or more for 40 seconds or more. (★3)**
5. **Let the engine idle for 10 seconds or more. (★4)**
6. **Perform steps 4 to 5 12 times. (★5)**

HINT:

If a malfunction exists, the CHECK ENG will be illuminated on the multi–information display during step 6.

NOTICE:

If the conditions in this test are not strictly followed, detection of the malfunction will not be possible. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from 3 to 6, then perform steps from 3 to 6 again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” whith the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:
There is a few second delay in the sensor 1 (front sensor) output, and there is about 20 seconds delay in the sensor 2 (rear sensor) output.

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Injection volume +25 % –12.5 % Output voltage No reaction **NG**	Extremely rich or lean of the actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following procedure of A/F CONTROL enable the technician to check and graph voltage output of the heated oxygen sensor.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
NOTICE:
If the vehicle has low fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs will be recorded, and the CHK ENG lamp then comes on.
HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(BESIDES HEATED OXYGEN SENSOR DTCS)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0130 and/or P0136” are output	A
”P0130 and/or P0136” and other DTCs are output	B

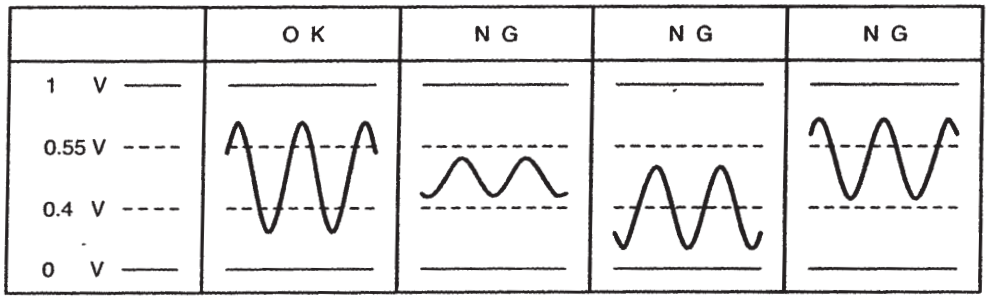
HINT:
If any other codes besides ”P0130 and/or P0136” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–16)**

A

2	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.
(b) Read the output voltage of the heated oxygen sensor during idling.
Heated oxygen sensor output voltage:
Alternates less than 0.4 V and more than 0.55 V (See the following table).



P18349

OK → **Go to step 11**

NG

3	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE) (See page 05–45)

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4	INSPECT EFI RELAY (See page 10–3)

NG → **REPLACE EFI RELAY**

OK

5	CHECK FUSE(EFI No.2) (See page 05–45)

NG → CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE

OK

6	CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	CHECK HARNESS AND CONNECTOR(EFI RELAY – HEATED OXYGEN SENSOR) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

9	CHECK FUEL PRESSURE (See page 11–5)

(a) Check the fuel pressure (high or low pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

10	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–8)

NG → REPLACE FUEL INJECTOR ASSY

OK

REPLACE HEATED OXYGEN SENSOR

11	PERFORM CONFIRMATION DRIVING PATTERN

GO

12	READ OUTPUT DTC(HEATED OXYGEN SENSOR DTCS ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0130 and/or P0136” are not output again	A
”P0130 and/or P136” are output again	B

B → **CHECK FOR INTERMITTENT PROBLEMS**

A

REPLACE HEATED OXYGEN SENSOR

DTC	P0133	OXYGEN SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page 05–45.

DTC No	DTC Detecting Condition	Trouble Area
P0133	Response time for heated oxygen sensor voltage output to change from rich to lean, or from lean to rich, is 1.0 sec. or more during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM

HINT:

- Bank 1 refers to bank that includes cylinder No. 1.
- Sensor 1 refers to the sensor closer to the engine assembly.
- The heated oxygen sensor output voltage and the short−term fuel trim value can be read using the hand−held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page 05–45.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

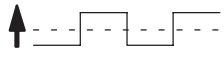
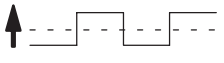
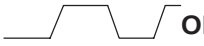
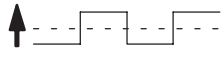
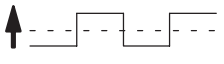
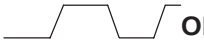
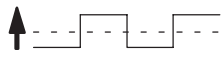
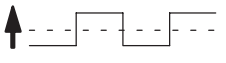
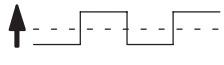
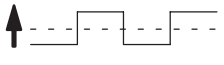
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately. 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few second delay in the sensor 1 (front sensor) output, and there is about 20 seconds delay in the sensor 2 (rear sensor) output.

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V **OK**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Injection volume +25 % –12.5 %  Output voltage No reaction **NG**	Extremely rich or lean of the actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following procedure of A/F CONTROL enable the technician to check and graph volatge output of the heated oxygen sensor.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

NOTICE:

If the vehicle is lack of fuel, the air–fuel ratio becomes LEAN and DTC P0133 will be set, and the CHK ENG then comes on.

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0133)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0133” is output	A
”P0133 or P0133” and other DTCs are output	B

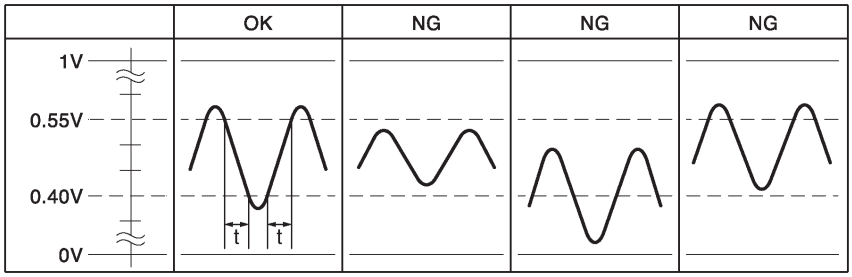
HINT:
If any other codes besides ”P0133” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–16)**

A

2	READ VALUE OF HAND–HELD TESTER(HEATED OXYGEN SENSOR DURING IDLING)

(a) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.
(b) Read the output voltage of the heated oxygen sensor during idling.
Heated oxygen sensor output voltage:
Alternates less than 0.4 V and more than 0.55 V, and duration ”t” must exist more than 0.9 sec. (See the following table).



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OK → **Go to step 11**

NG

3	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE) (See page 05–45)

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4	INSPECT EFI RELAY (See page 10–3)

NG → **REPLACE EFI RELAY**

OK

5	CHECK FUSE(EFI No.2) (See page 05–45)

NG → CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE

OK

6	CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	CHECK HARNESS AND CONNECTOR(EFI RELAY – HEATED OXYGEN SENSOR) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

9	CHECK FUEL PRESSURE (See page 11–5)

(a) Check the fuel pressure (high or low pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

10	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–8)

NG → REPLACE HEATED OXYGEN SENSOR

OK

REPLACE HEATED OXYGEN SENSOR

11	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)

GO

12	READ OUTPUT DTC(DTC P0133 IS OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
”P0133” is not output again	A
”P0133” is output again	B

B → **CHECK FOR INTERMITTENT PROBLEMS (See Page 05–5)**

A →

REPLACE HEATED OXYGEN SENSOR

DTC	P0135	OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION (BANK 1 SENSOR 1)

DTC	P0141	OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page 05–45.

DTC No.	DTC Detecting Condition	Trouble Area
P0135	• When the heater operates, heater current exceeds 3.5 A (1 trip detection logic) • Heater current is 0.2 A or less when the heater operates (1 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM
P0141	• When the heater operates, heater current exceeds 2 A (1 trip detection logic) • Heater current is 0.2 A or less when the heater operates (1 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM

WIRING DIAGRAM

Refer to DTC P0125 on page 05–45.

INSPECTION PROCEDURE

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand−held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE) (See page 05–45)

NG → REPLACE HEATED OXYGEN SENSOR

OK

2	INSPECT EFI RELAY (See page 10–3)

NG → REPLACE EFI RELAY

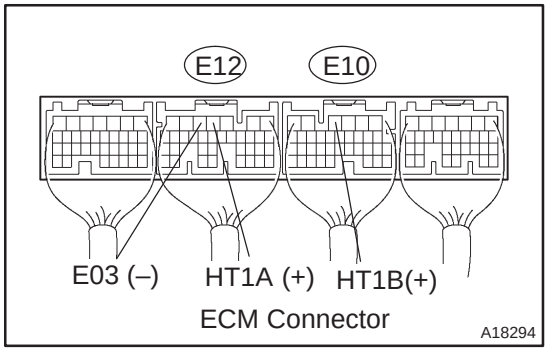
OK

3	CHECK FUSE(EFI No.2) (See page 05–45)

NG → CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE

OK

4	INSPECT ECM(HTL OR HTL2 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E10 and E12 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
HT1A (E12–4) – E03 (E12–5)	9 to 14 V
HT1B (E10–4) – E03 (E12–5)	

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

5	CHECK HARNESS AND CONNECTOR(EFI RELAY – HEATED OXYGEN SENSOR) (See page 05–45)

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0171	SYSTEM TOO LEAN (FUEL TRIM) (BANK 1)

DTC	P0172	SYSTEM TOO RICH (FUEL TRIM) (BANK 1)

CIRCUIT DESCRIPTION

Fuel trim refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short–term fuel trim and long–term fuel trim.

Short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the stoichiometric air–fuel ratio, This variance triggers a reduction in fuel volume if the air–fuel ratio is rich, and an increase in the fuel volume if it is lean.

Long–term fuel trim is overall fuel compensation carried out long–term to compensate for a continual deviation of the short–term fuel trim from the central value, due to individual engine differences, wear over time and changes in the operating environment.

If both the short–term fuel trim and long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the CHK ENG is illuminated.

DTC No.	DTC Detecting Condition	Trouble Area
P0171	When air fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on LEAN side (2 trip detection logic)	• Air induction system • Injector blockage • PCV hose • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Open or short in heated oxygen sensor circuit • Heated oxygen sensor • ECM
P0172	When air fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Open or short in heated oxygen sensor circuit • Gas leakage in exhaust system • Heated oxygen sensor • ECM

HINT:

If the total of the short–term fuel trim value and long–term fuel trim value is within ± 25 %, the system is functioning normally.

WIRING DIAGRAM

Refer to DTC P0125 on page 05–45.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ACTIVE TEST of the following ”A/F CONTROL” (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is an ACTIVE TEST which changes the injection volume –12.5 % or +25 %.

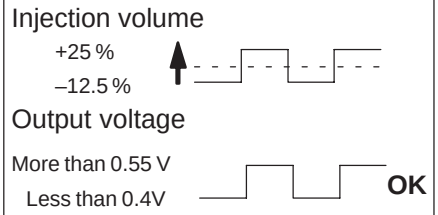
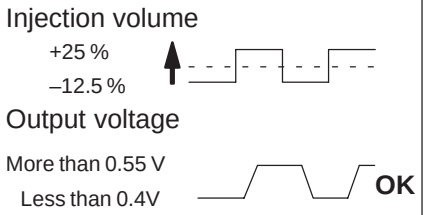
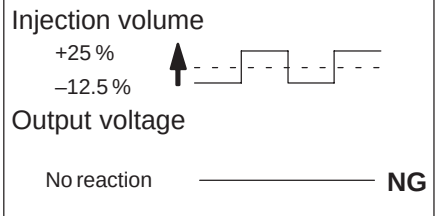
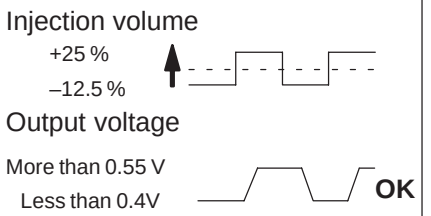
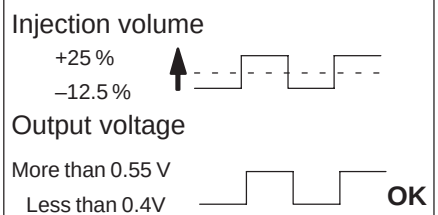
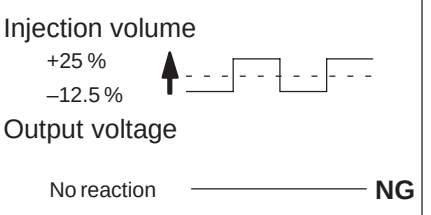
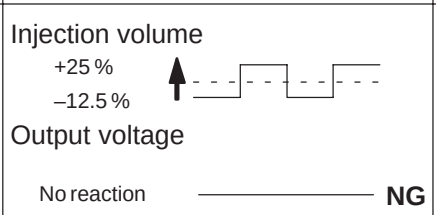
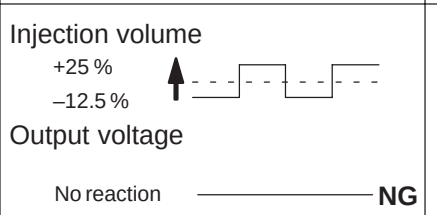
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine with the engine speed at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

Result:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a few second delay in the sensor 1 (front sensor) output, and there is about 20 seconds delay in the sensor 2 (rear sensor) output.

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1			—
Case 2			Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3			Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4			Extremely rich or lean of the actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following procedure of A/F CONTROL enable the technician to check and graph voltage output of the heated oxygen sensor.
For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- A high heated oxygen sensor (sensor 1) voltage (0.55 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

2	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11–8)

NG → REPLACE FUEL INJECTOR ASSY

OK

3	INSPECT MASS AIR FLOW METER (See page 10–3)

NG → REPLACE MASS AIR FLOW METER

OK

4	INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE) (See page 10–3)

NG → REPLACE ENGINE COOLANT TEMPERATURE SENSOR

OK

5	CHECK FOR SPARK AND IGNITION (See page 18–1)

NG → REPAIR OR REPLACE

OK

6	CHECK FUEL PRESSURE (See page 11–5)

(a) Check the fuel pressure (high or low pressure).

NG → CHECK AND REPLACE FUEL SYSTEM

OK

7	CHECK FOR EXHAUST GAS LEAKAGE

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK

8	READ VALUE OF HAND–HELD TESTER(OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR) (See page 05–54)

OK → Go to step 18

NG

9	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE) (See page 05–45)

NG → REPLACE HEATED OXYGEN SENSOR

OK

10	INSPECT EFI RELAY (See page 10–3)

NG → REPLACE EFI RELAY

OK

11	CHECK FUSE(EFI No.2) (See page 05–45)

NG → CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE

OK

12	CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR – ECM) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

13	CHECK HARNESS AND CONNECTOR(EFI RELAY – HEATED OXYGEN SENSOR) (See page 05–45)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

14	REPLACE HEATED OXYGEN SENSOR

GO

15	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)

GO

16	READ OUTPUT DTC(DTC P0171 AND/OR P0172 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.

Result:

Display (DTC output)	Proceed to
DTC ”P0171 and/or P0172” are not output again	A
DTC ”P0171 and/or P0172” are output again	B

B → CHECK AND REPLACE ECM (See page 01–32) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)

A

17	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL (DTCS P0171 AND/OR P0172)

18	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)

GO

19	READ OUTPUT DTC(DTC P0171 AND/OR P0172 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC "P0171 and/or P0172" are not output again	A
DTC "P0171 and/or P0172" are output again	B

B → **Go to step 22**

A

20	REPLACE HEATED OXYGEN SENSOR

GO

21	READ OUTPUT DTC(DTC P0171 AND/OR P0172 ARE OUTPUT AGAIN)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
DTC "P0171 and/or P0172" are not output again	A
DTC "P0171 and/or P0172" are output again	B

B → **CHECK AND REPLACE ECM (See page 01–32) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05–54)**

A

22	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → **CHECK FOR INTERMITTENT PROBLEMS (See Page 05–5)**

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL

DTC	P0300	RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED

DTC	P0301	CYLINDER 1 MISFIRE DETECTED

DTC	P0302	CYLINDER 2 MISFIRE DETECTED

DTC	P0303	CYLINDER 3 MISFIRE DETECTED

DTC	P0304	CYLINDER 4 MISFIRE DETECTED

CIRCUIT DESCRIPTION

Misfire: The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation of each cylinder.

The ECM counts the number of times from the engine speed change rate, indicating that misfire has occurred. When the misfire rate equals to or exceeds the count, indicating that the engine condition has deteriorated, the CHK ENG is illuminated.

If the misfire rate is high enough and the driving conditions causes the catalyst to overheat, the CHK ENG blinks when the misfire occurs.

HINT:

- For any particular 200 revolutions of engine, misfiring which could result in overheating of catalyst is detected. This cause CHK ENG to blink (1 trip detection logic).
- For any particular 1,000 revolutions of engine, misfiring which could result in a deterioration of emissions is detected. This cause CHK ENG to illuminate (2 trip detection logic).

DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • PCV hose • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • ECM
P0301 P0302 P0303 P0304	Misfiring of each cylinder is detected	

HINT:

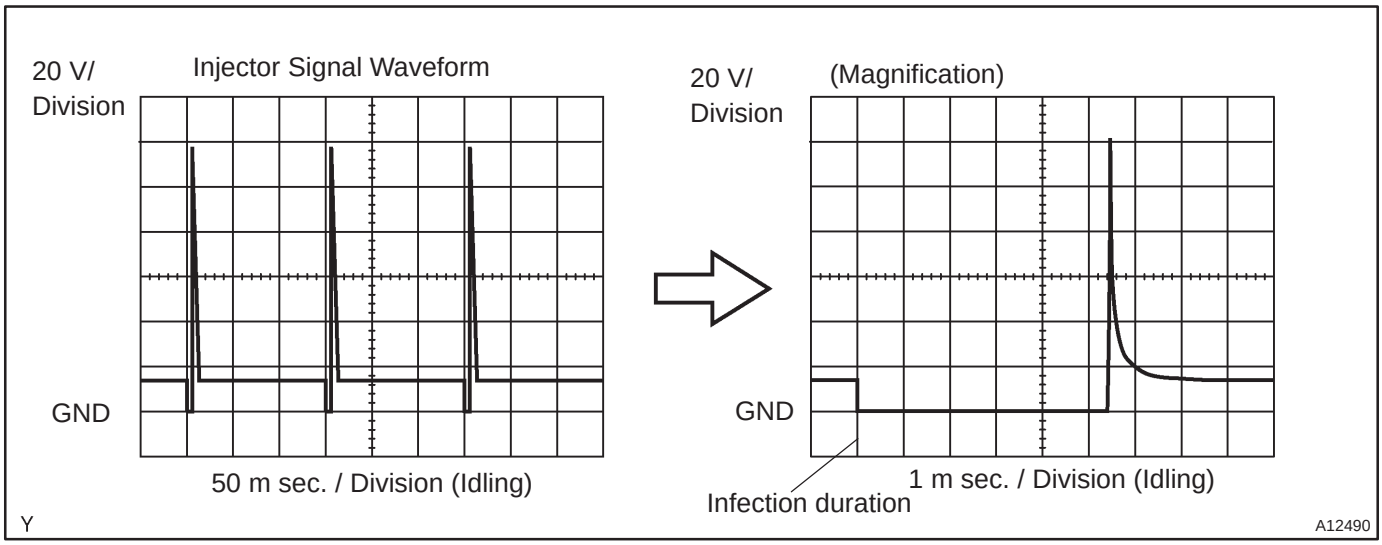
When 2 or more codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it is indicated that the misfires were detected and recorded at different times.

Reference: Inspection using an oscilloscope for injector signal waveform.

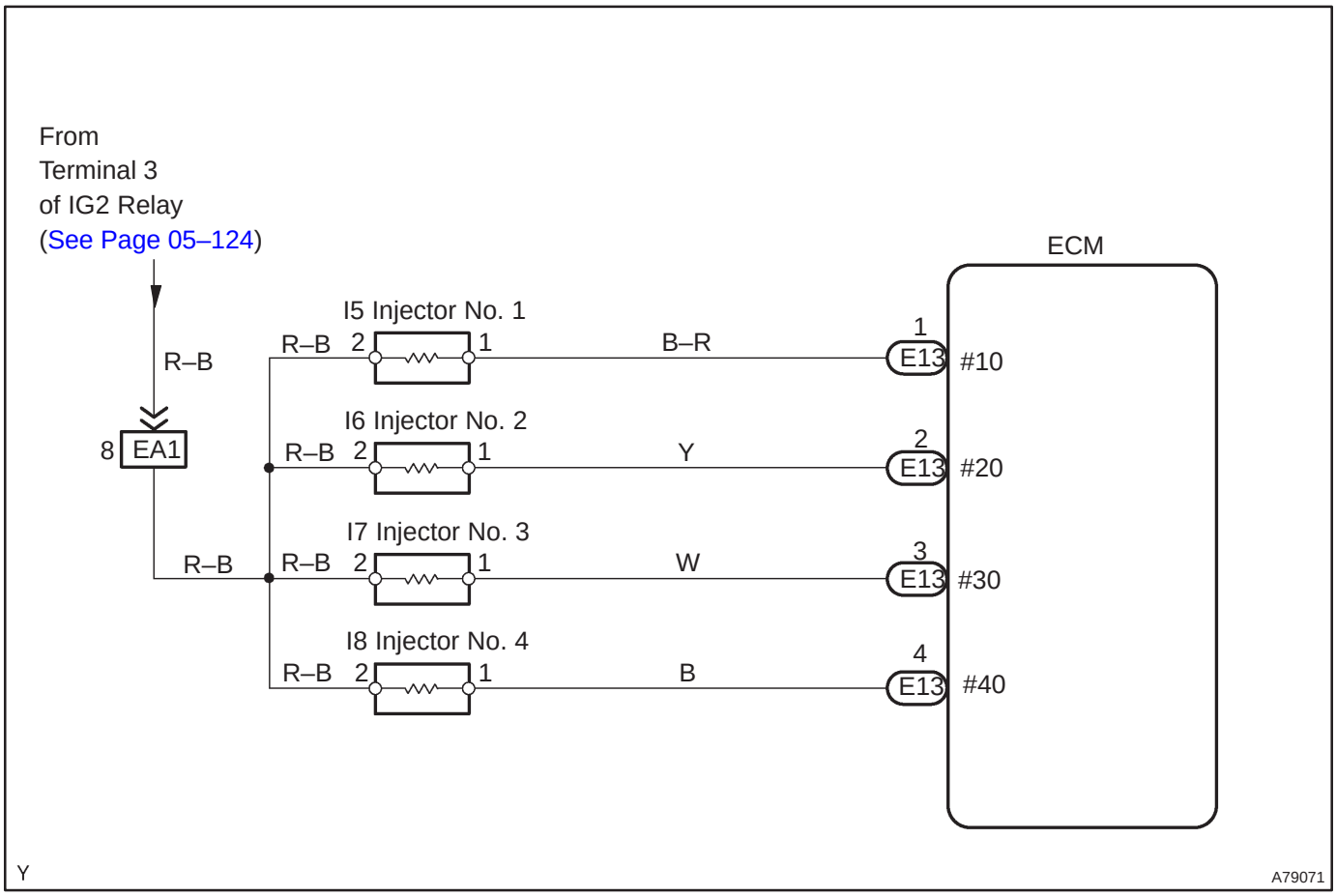
(1) With the engine idling, check the waveforms between terminals #1 – #4 and E1 of the ECM connector.

HINT:

The correct waveforms are shown below.



WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN

(a) Connect the hand–held tester to the DLC3.
(b) Record the DTC and freeze frame data.
(c) Use the hand–held tester to set to the check mode (See page 05–5).
(d) Read the value on the misfire counter for each cylinder when idling. If the value is displayed on the misfire counter, skip the following procedure of confirmation driving.
(e) Drive the vehicle several times with the engine speed, load and its surrounding range shown with ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the data list. If you do not have the hand–held tester, turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again.

HINT:
In order to memorize the DTC of the misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD in the following data list. Be sure not to turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the nomal mode and will result in all of the DTCs and the freeze frame data being erased.

Engine Speed	Time
Idling	5 minutes and 45 seconds or more
1,000 rpm	4 minutes or more
2,000 rpm	2 minutes and 30 seconds or more
3,000 rpm	1 minute and 30 seconds or more

(f) Check if there is misfire by monitoring the DTC and the freeze frame data, and then record them.
(g) Turn the ignition switch OFF and wait for at least 5 seconds.

INSPECTION PROCEDURE

HINT:

- If the other DTCs besides misfire are memorized simultaneously, perform the troubleshooting for them first.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- If the misfire is not occured when the vehicle is brought to the workshop, it can be confirmed by reproducing the condition of the freeze frame data. After finishing the repair, confirm that there is no misfire (See the confirmation driving pattern).
- When either of SHORT FT #1 or LONG FT #1 the freeze frame data is over the range of ±20%, there is a possibility that the air–fuel ratio is inclining either to ”RICH” (–20% or less) or ”LEAN” (+20% or more).
- When COOLANT TEMP in the freeze frame data is less than 80˚C (176˚F), there is a possibility of misfire only during warming up.
- In case that the misfire cannot be reproduced, this may be because of the driving with the shortage of fuel, the use of improper fuel, a stain of ignition plug and etc.

1	CHECK OTHER DTC OUTPUT(BESIDES MISFIRE DTCS)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0300, P0301, P0302, P0303 and/or P0304” are output	A
”P0300, P0301, P0302, P0303 and/or P0304” and other DTCs are output	B

HINT:
If any other codes besides ”P0300, P0301, P0302, P0303 and/or P0304” are output, perform the trouble-shooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–16)**

A

2	CHECK WIRE HARNESS, CONNECTOR AND VACUUM HOSE IN ENGINE ROOM

(a) Check the connection of the wire harness and the connector.
(b) Check the vacuum hose for disconnection, blockage and break.

NG → **REPAIR OR REPLACE, THEN CONFIRM THAT THERE IS NO MISFIRE**

OK

3	READ VALUE OF HAND–HELD TESTER(NUMBER OF MISFIRE)

(a) Connect the hand–held teste to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL/CYL#1 – CYL#4”.
(e) Read the number of misfire on the hand–held tester.
HINT:
When a misfire is not reproduced, be sure to branch below based on the stored DTC.
Result:

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → **Go to step 15**

A

4	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER (See page 18–1)

OK → **Go to step 7**

NG

5	CHANGE NORMAL SPARK PLUG AND CHECK SPARK OF MISFIRING CYLINDER (See page 18–1)

OK → REPLACE SPARK PLUG

NG

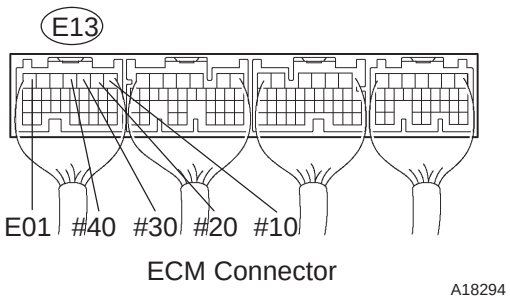
6	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(IGNITION COIL – ECM) (See page 05–103)

OK → REPLACE IGNITION COIL ASSY (THEN CONFIRM THAT THERE IS NO MISFIRE)

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

7	INSPECT ECM TERMINAL OF MISFIRING CYLINDER(#1, #2, #3 OR #4 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
#10 (E13–1) – E01 (E13–7)	8 to 14 V
#20 (E13–2) – E01 (E13–7)	
#30 (E13–3) – E01 (E13–7)	
#40 (E13–4) – E01 (E13–7)	

OK → Go to step 10

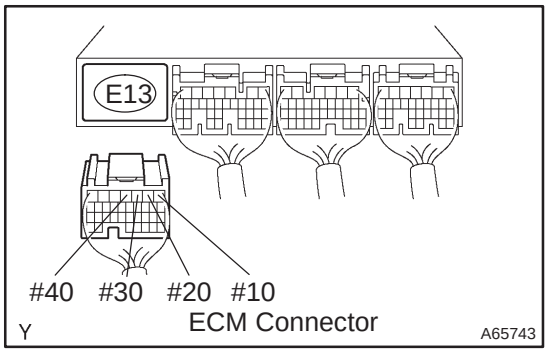
NG

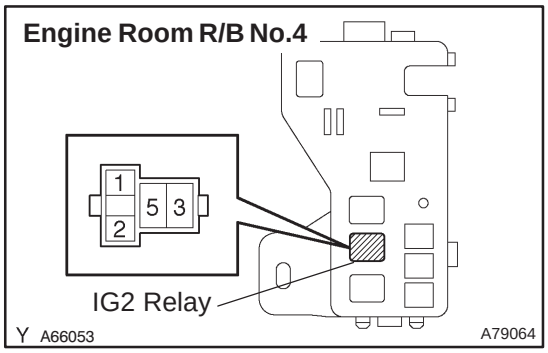
8	INSPECT FUEL INJECTOR RESISTANCE OF MISFIRING CYLINDER (See page 11–8)

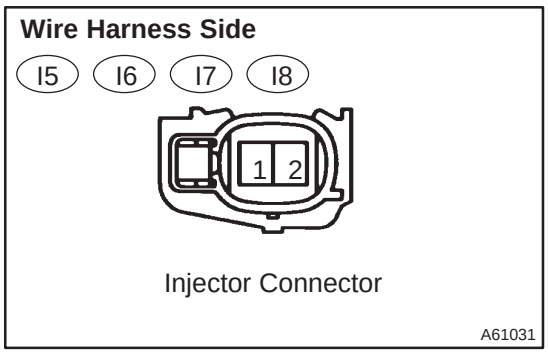
NG → REPLACE FUEL INJECTOR ASSY

OK

9	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(IG2 RELAY – INJECTOR – ECM)







(a) Disconnect the ECM E13 connector.
(b) Remove the IG2 relay from the engine room R/B No.4.
(c) Disconnect the injector connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 Relay (3) – Injector No.1 (I5–2)	Continuity
IG2 Relay (3) – Injector No.2 (I6–2)	
IG2 Relay (3) – Injector No.3 (I7–2)	
IG2 Relay (3) – Injector No.4 (I8–2)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 Relay (3) or Injector No.1 (I5–2) – Body ground	No continuity
IG2 Relay (3) or Injector No.2 (I6–2) – Body ground	
IG2 Relay (3) or Injector No.3 (I7–2) – Body ground	
IG2 Relay (3) or Injector No.4 (I8–2) – Body ground	

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Injector No.1 (I5–1) – #10 (E13–1)	Continuity
Injector No.2 (I6–1) – #20 (E13–2)	
Injector No.3 (I7–1) – #30 (E13–3)	
Injector No.4 (I8–1) – #40 (E13–4)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Injector No.1 (I5–1) or #10 (E13–1) – Body ground	No continuity
Injector No.2 (I6–1) or #20 (E13–2) – Body ground	
Injector No.3 (I7–1) or #30 (E13–3) – Body ground	
Injector No.4 (I8–1) or #40 (E13–4) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

10	INSPECT FUEL INJECTOR INJECTION AND VOLUME OF MISFIRING CYLINDER (See page 11–8)

NG → **REPLACE FUEL INJECTOR ASSY**

OK

11	CHECK CYLINDER COMPRESSION PRESSURE OF MISFIRING CYLINDER (See page 14–1)

NG → **REPAIR OR REPLACE**

OK

12	CHECK VALVE CLEARANCE OF MISFIRING CYLINDER (See page 14–6)

NG → ADJUST VALVE CLEARANCE

OK

13	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → CHECK FOR INTERMITTENT PROBLEMS

A

14	CHECK VALVE TIMING(CHECK FOR LOOSE AND JUMPING TEETH OF TIMING BELT) (See page 14–49)

NG → ADJUST VALVE TIMING

OK

15	CHECK FUEL PRESSURE (See page 11–5)

NG → CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER

OK

16	READ VALUE OF HAND–HELD TESTER(INTAKE AIR TEMPERATURE AND MASS AIR FLOW RATE)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Check the intake air temperature.
  (1) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR” and read its value displayed on the hand–held tester.

  Temperature: Equivalent to ambient temperature

(d) Check the air flow rate.
  (1) Select the item ”DIAGNOSIS / OBS/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand–held tester.

  Standard:

Condition	Air flow rate (gm/s)
Ignition switch On (do not start engine)	0
Idling	4 to 6
Running without load (2,500 rpm)	13 to 20
Idling – Running	Air flow rate fluctuates

NG → REPLACE MASS AIR FLOW METER

OK

17	INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE) (See page 10–3)

NG → REPLACE ENGINE COOLANT TEMPERATURE SENSOR

OK

18	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER RESULT OF STEP 4)

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → AGAIN GO TO STEP5

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)

DTC	P0325	KNOCK SENSOR 1 CIRCUIT MALFUNCTION (BANK 1)

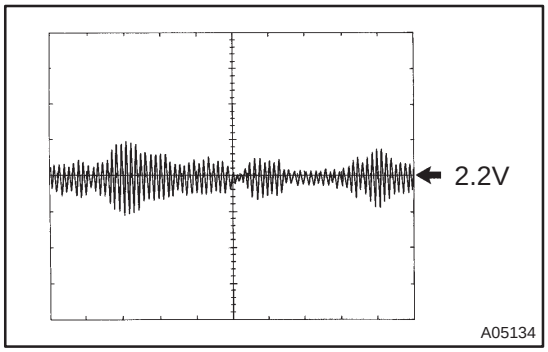
CIRCUIT DESCRIPTION

Knock sensor is fitted on the cylinder block to detect the engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is delayed to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor signal to the ECM with engine speed 3,000 rpm or more	• Open or short in knock sensor circuit • Knock sensor (under–torqued or loose) • ECM

HINT:

If the ECM detects the DTC "P0325", it enters the fail–safe mode in which the corrective retarded angle value is set to the maximum value.



Reference:

Inspection using the oscillascope.

(1) Run the engine at 4,000 rpm, check the waveform between terminal KNKL of the ECM connector and body ground.

HINT:

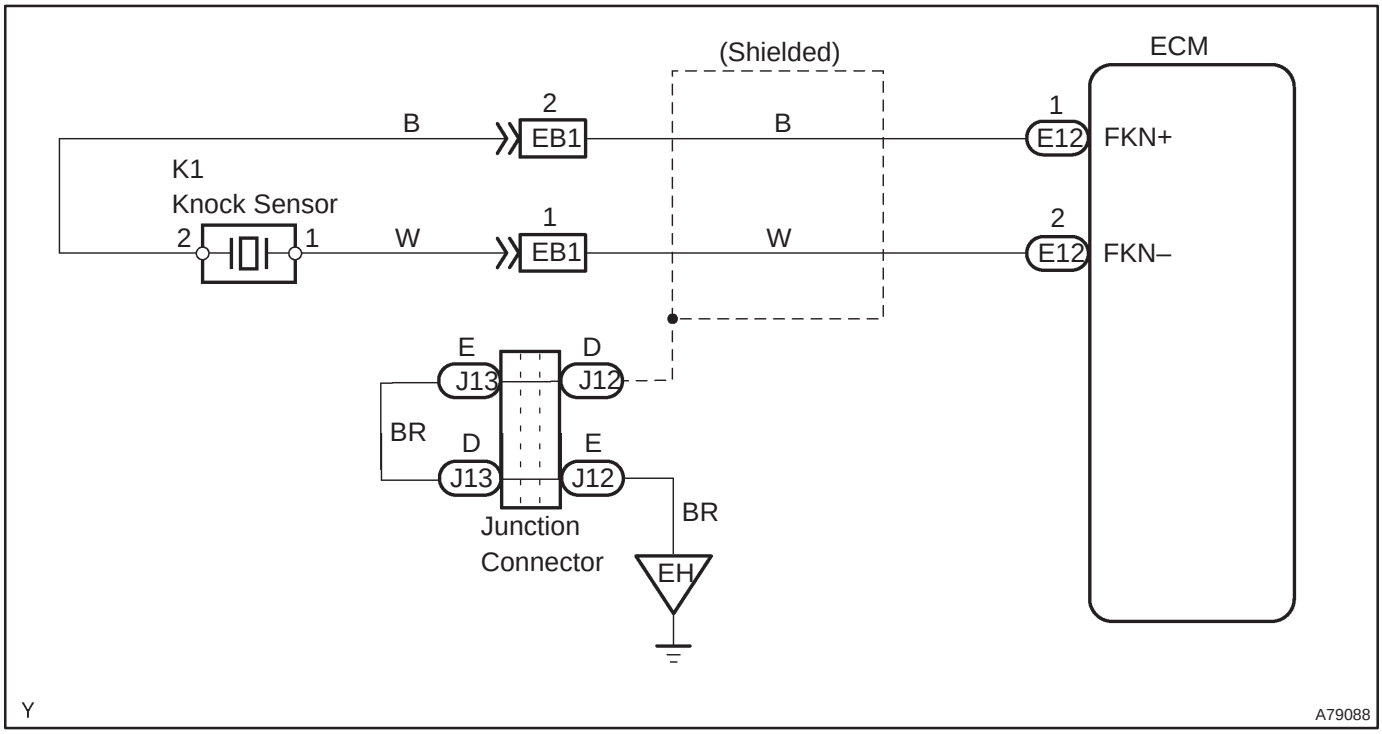
The correct waveform is as shown on the left.

(2) Spread the time on the horizontal axis, and confirm that period of the wave is 80 μ seconds (Normal mode vibration frequency of knock sensor: 11.7 kHz).

HINT:

If the vibration frequency in the normal mode is not 11.7 kHz, the sensor is out of order.

WIRING DIAGRAM

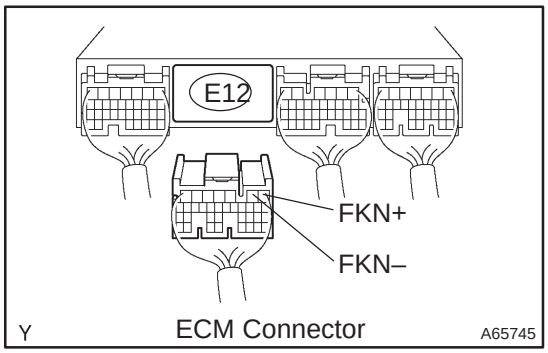


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK HARNESS AND CONNECTOR



(a) Disconnect the E12 ECM connector.
(b) Check for continuity between the wire harness side connectors.

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
FKN+ (E12–1) – FKN– (E12–2)	No continuity

OK → **Go to step 3**

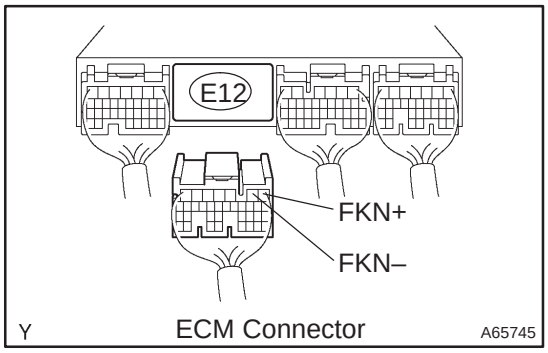
NG

2	INSPECT KNOCK SENSOR (See page 10–3)

NG → **REPLACE KNOCK SENSOR**

OK

3	CHECK HARNESS AND CONNECTOR(ECM – KNOCK SENSOR)



(a) Disconnect the E12 ECM connector.
(b) Disconnect the knock sensor connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
FKN+ (E12–1) – Knock sensor (K1–2)	Continuity
FKN– (E12–2) – Knock sensor (K1–1)	

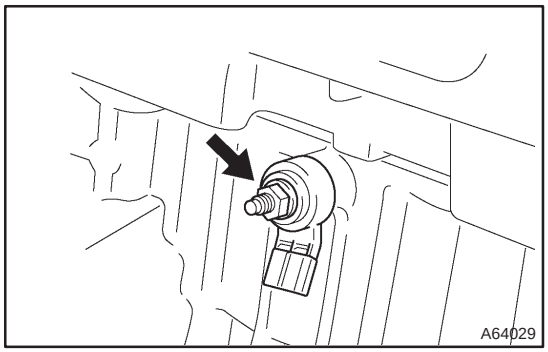
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
FKN+ (E12–1) or Knock sensor (K1–2) – Body ground	No continuity
FKN– (E12–2) or Knock sensor (K1–1) – Body ground	

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CONFIRM THE MALFUNCTION DISAPPEAR WHEN A GOOD KNOCK SENSOR IS INSTALLED



(a) Change the knock sensor to a new one.
  (1) Remove the knock sensor.
  (2) Install a new knock sensor.
  Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
(b) Clear the DTC (See page 05–5).
(c) Perform the driving test.
(d) Read the DTC using the hand–held tester (See page 05–5).

Result:

Display (DTC output)	Proceed to
”P0325” is output	A
”P0325” is not output	B

B → **REPLACE KNOCK SENSOR**

A

CHECK AND REPLACE ECM(See page 01–32)

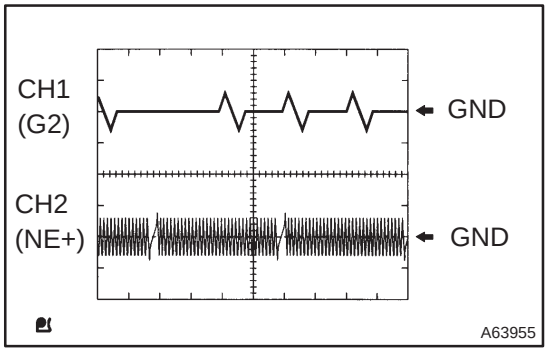
DTC	P0335	CRANKSHAFT POSITION SENSOR ”A” CIRCUIT MALFUNCTION

DTC	P1335	CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION (DURING ENGINE RUNNING)

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a magnet, iron core and pick up coil.
The NE signal plate (crankshaft timing pulley) has 34 teeth and is installed to the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signals, and the cylinder and the angle of the VVT based on the combination of the G2 and NE signals.

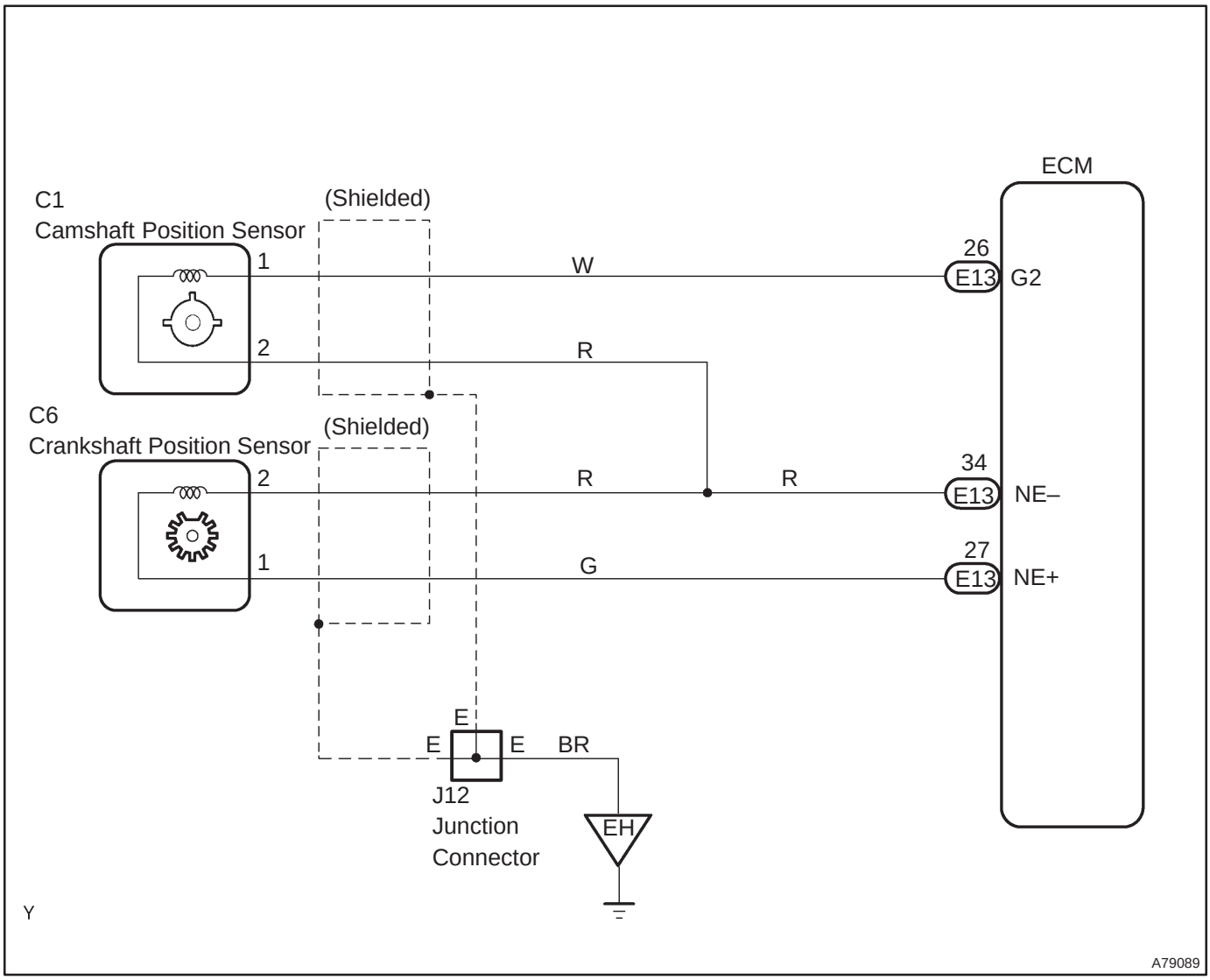
DTC No.	DTC Detecting Condition	Trouble Area
P0335	• No crankshaft position sensor signal to the ECM during cranking • Open in NE– circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM
P1335	If conditions from (a) through (c) are met: (a) NE greater than 1,000 rpm (b) NE signal is not detected for over 0.05 sec. (c) Not during cranking	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM



Reference: Inspection using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G2 – NE– CH2: NE+ – NE–
Equipment Set	5V/DIV, 20ms/DIV
Condition	During cranking or idling

WIRING DIAGRAM

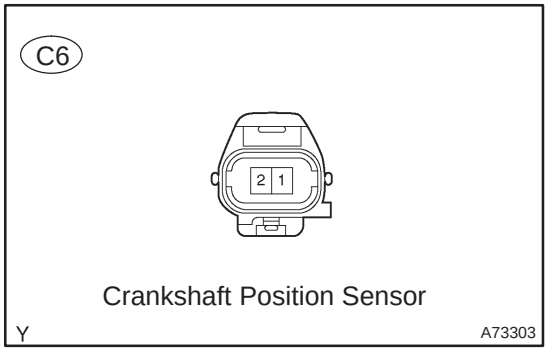


INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- Perform troubleshooting on ”DTC P0335” first. If no trouble is found, troubleshoot the following mechanical system.

1 INSPECT CRANKSHAFT POSITION SENSOR(CHECK RESISTANCE)



(a) Measure the resistance between the terminals of the crankshaft posision sensor connector.

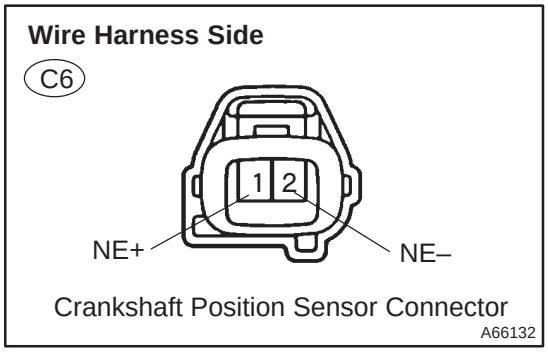
Resistance:
985 to 1,600 Ω (Cold)
1,265 to 1,890 Ω (Hot)

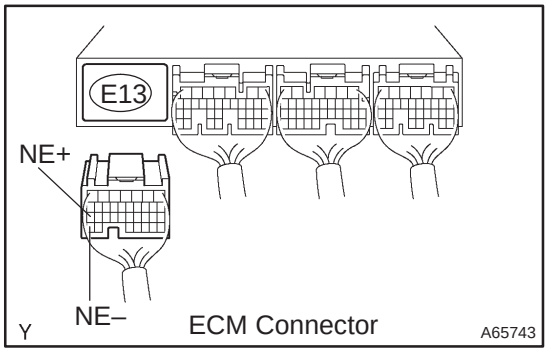
NOTICE:
"Cold" and "Hot" mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **REPLACE CRANKSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(ECM – CRANKSHAFT POSITION SENSOR)





(a) Disconnect the crankshaft position sensor connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
NE+ (C6–1) – NE+ (E13–27)	Continuity
NE– (C6–2) – NE– (E13–34)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
NE+ (C6–1) or NE+ (E13–27) – Body ground	No continuity
NE– (C6–2) or NE– (E13–34) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION

(a) Check the crankshaft position sensor installation .

NG → **TIGHTEN SENSOR**

OK

4	INSPECT CRANKSHAFT(TEETH OF SIGNAL PLATE)

(a) Remove the oil pump assembly. (See page 17–3)
(b) Check the teeth of the signal plate.

NG → REPAIR OR REPLACE CRANKSHAFT

OK

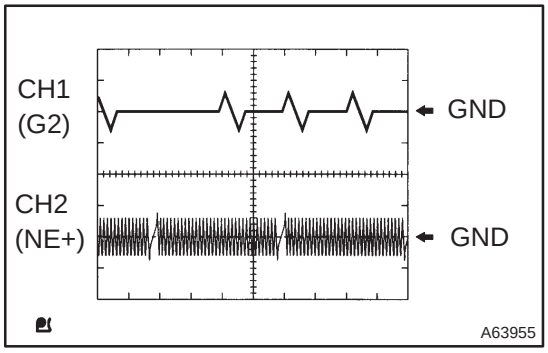
CHECK AND REPLACE ECM (See page 01–32)

DTC	P0340	CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

The camshaft position sensor (G2 signal) consists of a magnet, iron core and pickup coil.
The G2 signal plate has 3 teeth on its outer circumference and is installed on the camshaft timing pulley. When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil changes, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate (crankshaft timing pulley) has 34 teeth and is installed to the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signals, and the cylinder and the angle of the VVT based on the combination of the G2 and NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0340	• No camshaft position sensor signal to the ECM during cranking • Open in NE– circuit	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Intake camshaft • Timing chain has jumped a tooth • ECM



Reference: Inspection using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G2 – NE– CH2: NE+ – NE–
Equipment Set	5V/DIV, 20ms/DIV
Condition	During cranking or idling

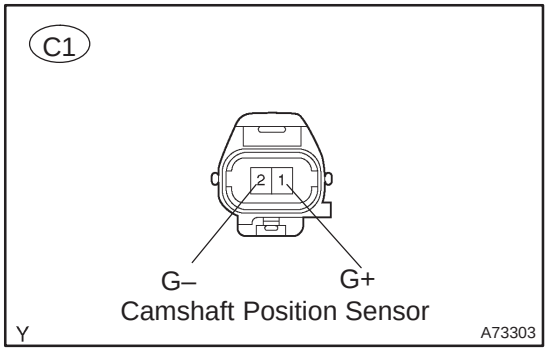
WIRING DIAGRAM

Refer to DTC P0335 on page05–84.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 INSPECT CAMSHAFT POSITION SENSOR(CHECK RESISTANCE)



(a) Measure the resistance between the terminals of the camshaft posision sensor connector.

Resistance:

1,630 to 2,740 Ω (Cold)

2,065 to 3,225 Ω (Hot)

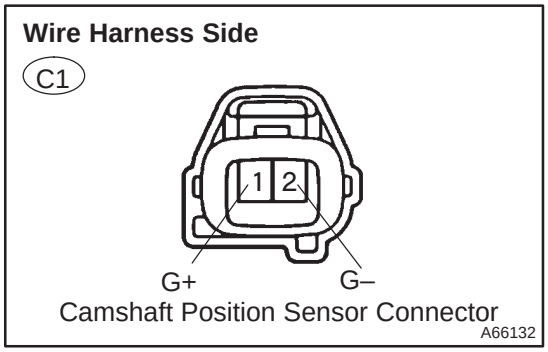
NOTICE:

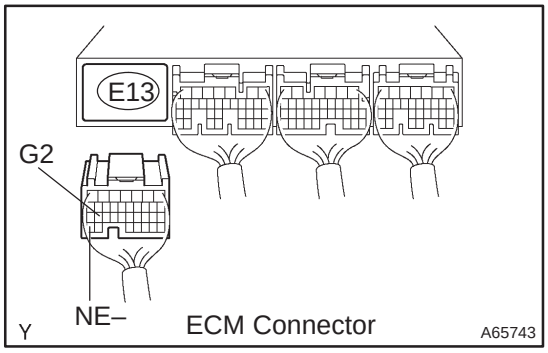
"Cold" and "Hot" mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **REPLACE CAMSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(ECM – CAMSHAFT POSITION SENSOR)





(a) Disconnect the camshaft position sensor connector.

(b) Disconnect the E13 ECM connector.

(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
G+ (C1–1) – G2 (E13–26)	Continuity
G– (C1–2) – NE– (E13–34)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
G+ (C1–1) or G2+ (E13–26) – Body ground	No continuity
G– (C1–2) or NE– (E13–34) – Body ground	

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION

(a) Check the camshaft position sensor installation.

NG → **TIGHTEN SENSOR**

OK

4	INSPECT CAMSHAFT

(a) Check the teeth of the signal plate.

NG → **REPAIR OR REPLACE CAMSHAFT**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P0420	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

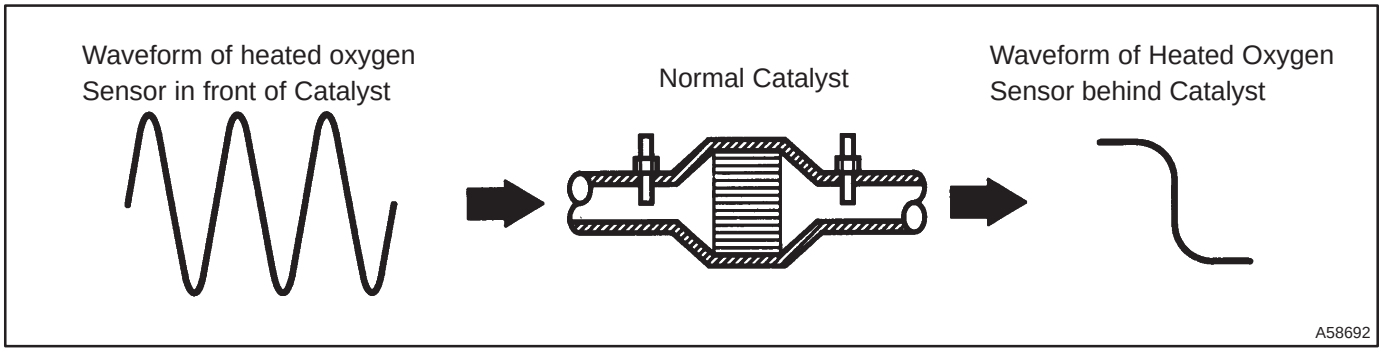
CIRCUIT DESCRIPTION

The ECM compares the 2 waveforms of the heated oxygen sensors located before and after the catalyst to determine whether or not the catalyst performance has deteriorated.

Air–fuel ratio feedback compensation keeps the waveform of the heated oxygen sensor in front of the catalyst alternates between back and forth, from rich to lean.

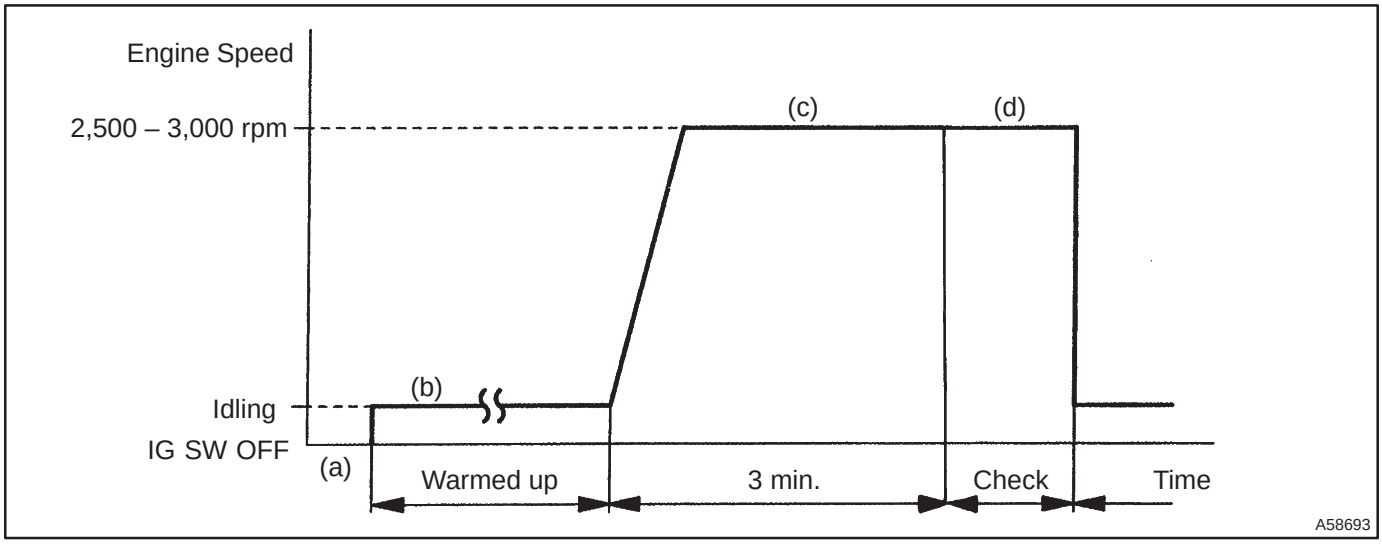
If the catalyst is functioning normally, the waveform of the heated oxygen sensor behind the catalyst switches back and forth between rich and lean much more slowly than the waveform of the heated oxygen sensor in front of the catalyst.

When both waveforms change at a similar rate, it indicates that the catalyst performance has deteriorated.



DTC No.	DTC Detecting Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, waveforms of heated oxygen sensors have same amplitude (2 trip detection logic)	• Gas leakage in exhaust system • Heated oxygen sensor • Three–way catalytic converter • ECM

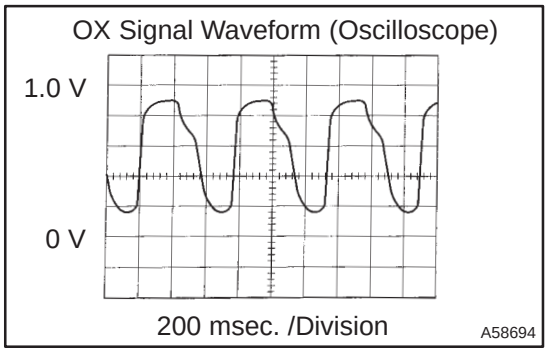
CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3, or connect the probe of the oscilloscope between terminals HT1A, HT1B, OX1A, OX1B and E1 of the ECM connector.
(b) Start the engine and warm it up with all the accessories switched OFF until the engine coolant temperature is stable.
(c) Run the engine at 2,500 to 3,000 rpm for about 3 min.
(d) After confirming that the waveform of the heated oxygen sensor (bank 1 sensor 1 (OX)) which oscillates around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor (bank 1 sensor 2 (OX)).

HINT:

- If there is a malfunction in the system, the waveform of the heated oxygen sensor (bank 1 sensor 2 (OX)) is similar to the wave from of the heated oxygen sensor (bank 1 sensor 1 (OX)) snown in the diagram on the left.
- There are some cases that, even though a malfunction exists, the CHK ENG may not be illuminated.



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ OUTPUT DTC(BESIDES P0420)

(a) Read the DTC using the hand–held tester.
Result:

Display (DTC output)	Proceed to
Only ”P0420” is output	A
”P0420” and other DTCs are output	B

HINT:
If any other codes besides ”P0420” are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–16)**

A

2	CHECK FOR EXHAUST GAS LEAKS

NG → REPAIR OR REPLACE

OK

3	INSPECT HEATED OXYGEN SENSOR(BANK 1 SENSOR 1) (See Page 12–3)

NG → REPAIR OR REPLACE HEATED OXYGEN SENSOR

OK

4	INSPECT HEATED OXYGEN SENSOR(BANK 1 SENSOR 2) (See Page 12–3)

NG → REPAIR OR REPLACE HEATED OXYGEN SENSOR

OK

REPLACE THREE–WAY CATALYTIC CONVERTER

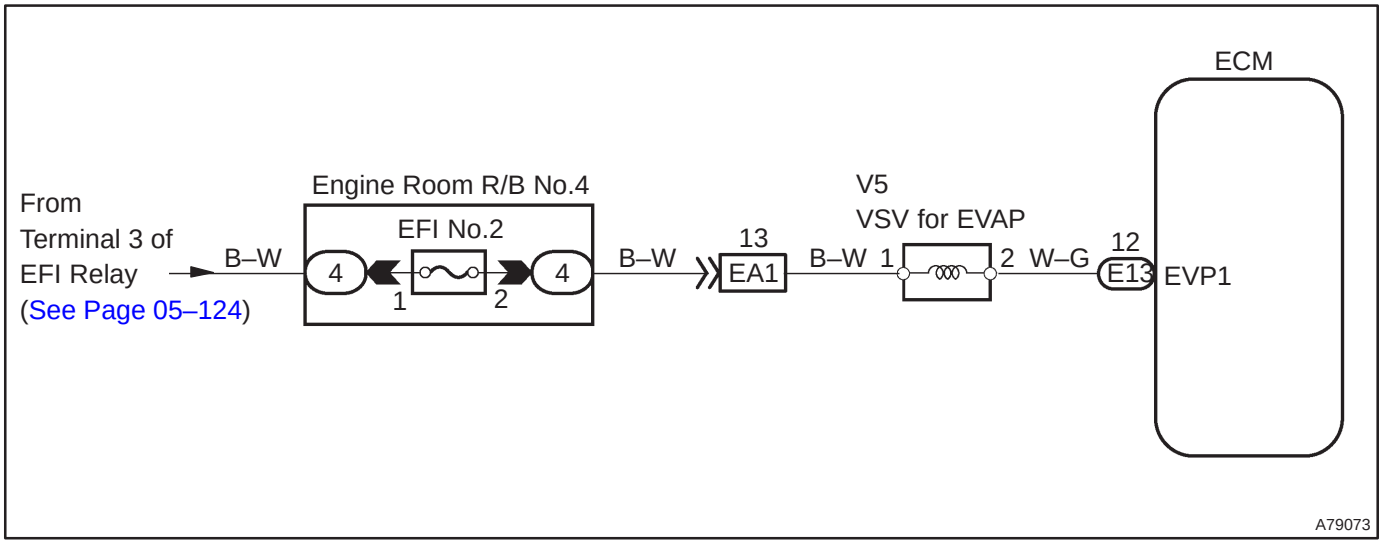
DTC	P0443	EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

To reduce HC emissions, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.
The ECM changes the duty signal to the VSV for EVAP so that the intake quantity of HC emissions becomse properly for the driving conditions (engine load, engine speed, vehicle speed, etc.) after the engine is warmed up.

DTC No.	DTC Detecting Condition	Trouble Area
P0443	Proper response to ECM command does not occur (1 trip detection logic)	• Open or short in VSV for EVAP circuit • VSV for EVAP • ECM

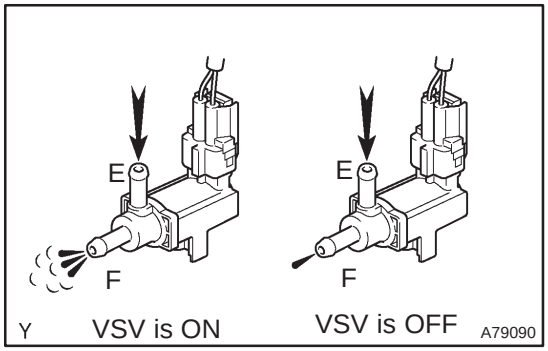
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 PERFORM ACTIVE TEST BY HAND–HELD TESTER(VSV FOR EVAP)



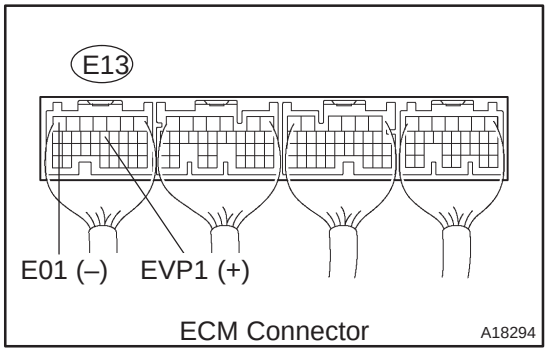
(a) Select the ACTIVE TEST mode on the hand–held tester.
(b) Disconnect the vacuum hose from the VSV for EVAP.
(c) Start the engine.
(d) When the VSV for EVAP is operated by the hand–held tester, apply the disconnected hose to your finger to check the suction.

Result:
VSV is ON: Disconnected port sucks.
VSV is OFF: Disconnected port does not suck.

OK → **CHECK FOR INTERMITTENT PROBLEMS**

NG

2 INSPECT ECM(CHECK VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E13 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
EVP1 (E13–12) – E01 (E13–7)	8 to 14 V

OK → **CHECK AND REPLACE ECM**

NG

3 INSPECT VACUUM SWITCHING VALVE ASSY NO.1

NG → **REPLACE VACUUM SWITCHING VALVE ASSY NO.1**

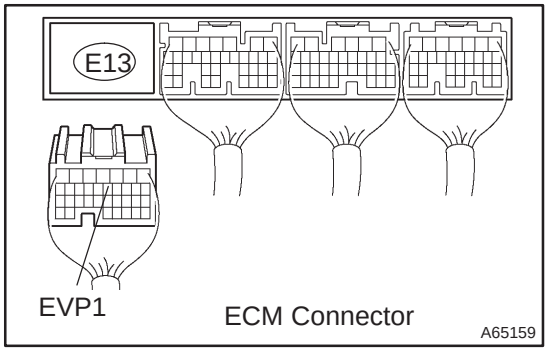
OK

4 CHECK FUSE(EFI No.2) (See page 05–45)

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

5 CHECK HARNESS AND CONNECTOR(ECM – VSV FOR EVAP)



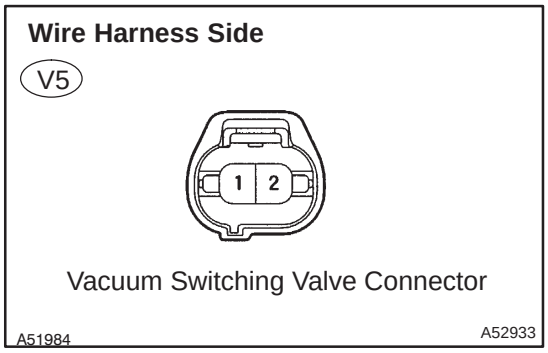
(a) Disconnect the E13 ECM connector.
(b) Disconnect the VSV connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VSV (V5–2) – EVP1 (E13–12)	Continuity

Standard (Check for short):

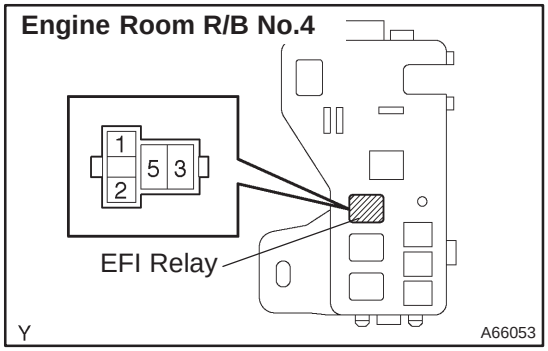
Symbols (Terminal No.)	Specified condition
VSV (V5–2) or EVP1 (E13–12) – Body ground	No continuity

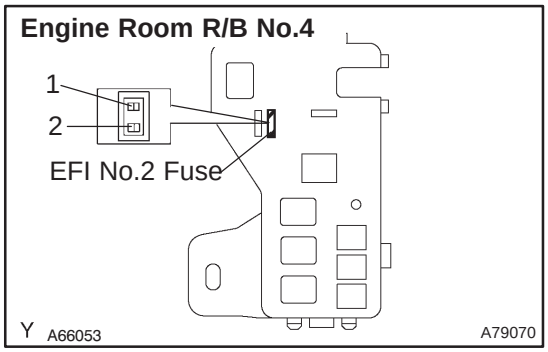


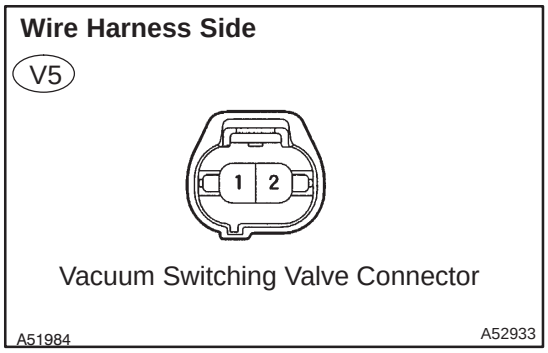
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 CHECK HARNESS AND CONNECTOR(EFI RELAY – VSV FOR EVAP)







(a) Remove the EFI relay from the engine room R/B No.4.
(b) Remove the EFI No.2 fuse from the engine room R/B No.4.
(c) Disconnect the VSV connector.
(d) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI relay (3) – EFI No.2 fuse (1)	Continuity
EFI No.2 fuse (2) – VSV (V5–1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI relay (3) or EFI No.2 fuse (1) – Body ground	No continuity
EFI No.2 fuse (2) or VSV (V5–1) – Body ground	

NOTICE:
Do not insert the tester leads hard in the procedure (c), the holder may be damaged.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

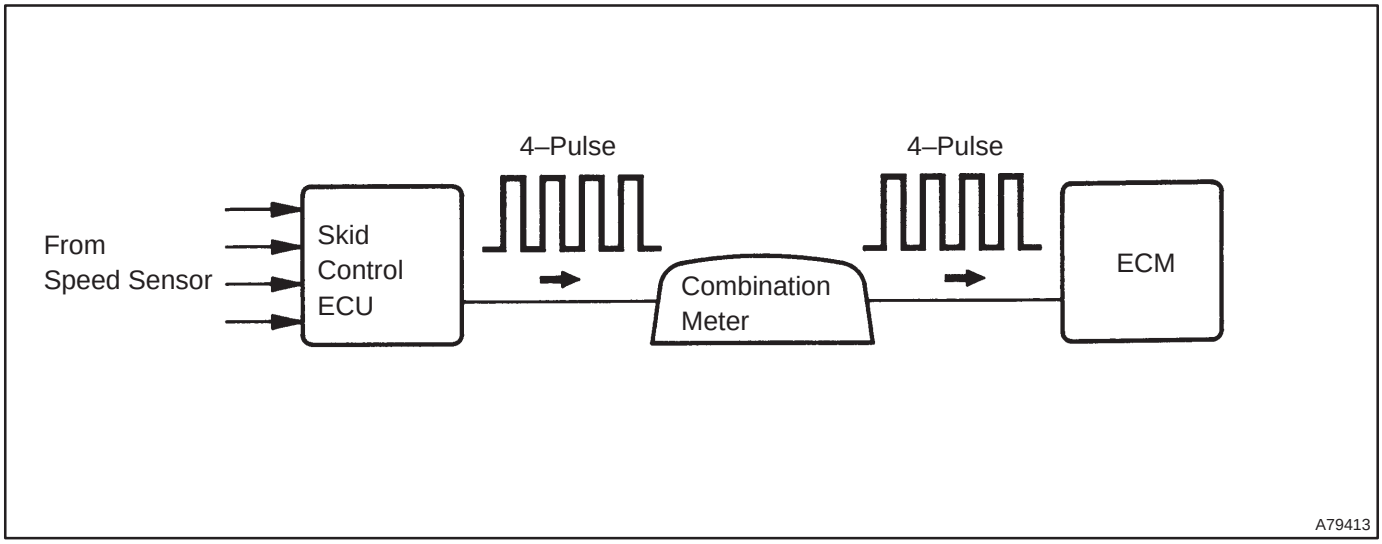
CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05–124)

DTC	P0500	VEHICLE SPEED SENSOR MALFUNCTION

CIRCUIT DESCRIPTION

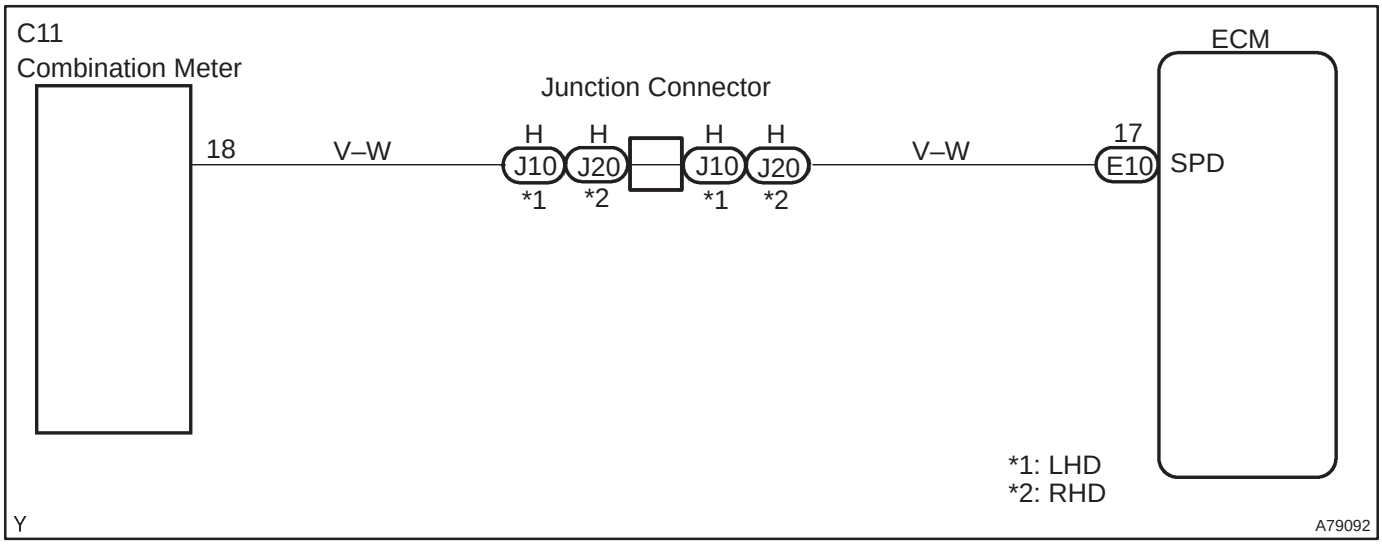
The speed sensor for skid control ECU detects the wheel speed and sends the appropriate signals to the skid control ECU.

The skid control ECU converts these signals into a 4–pulse signal and outputs it to the combination meter. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	During the vehicle is being driven, no vehicle speed sensor signal to the ECM (1 trip detection logic: A/T) (2 trip detection logic: M/T)	• Open or short in speed sensor circuit • Speed sensor • Combination meter • ECM • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OPERATION OF SPEEDOMETER(SPEEDOMETER OPERATION)

(a) Drive the vehicle and check that the operation of the speedometer in the combination meter is normal.

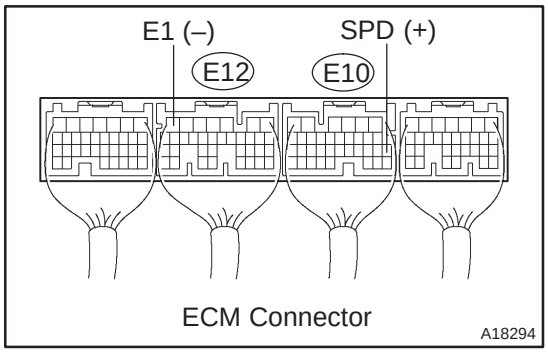
HINT:

The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → CHECK SPEEDOMETER CIRCUIT

OK

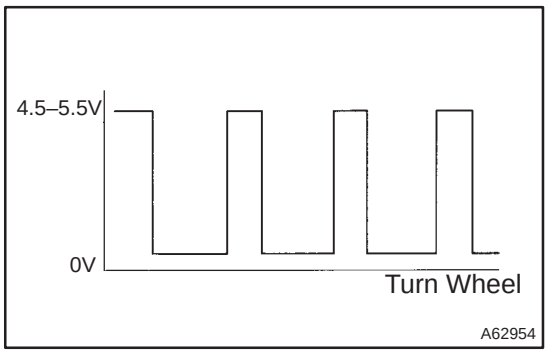
2	INSPECT ECM(CHECK VOLTAGE)



(a) Shift the lever to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch ON.
(d) Measure the voltage between the terminals of the E10 and E12 ECM connectors as the wheel is turned slowly.

Standard:

Symbols (Terminal No.)	Specified condition
SPD (E10–17) – E1 (E12–7)	Generated intermittently



HINT:

The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.

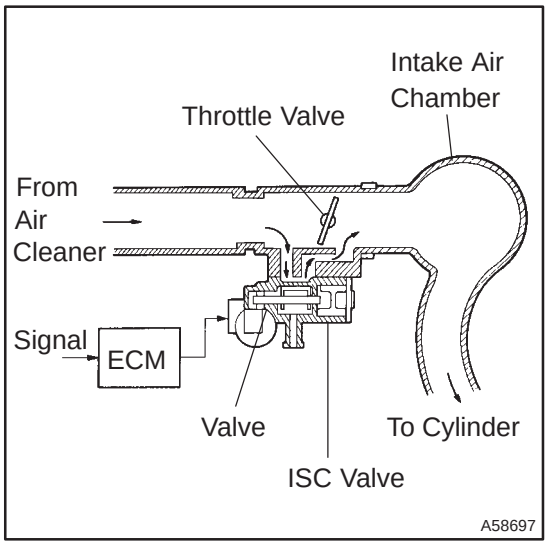
NG → REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC P0505 IDLE CONTROL SYSTEM MALFUNCTION

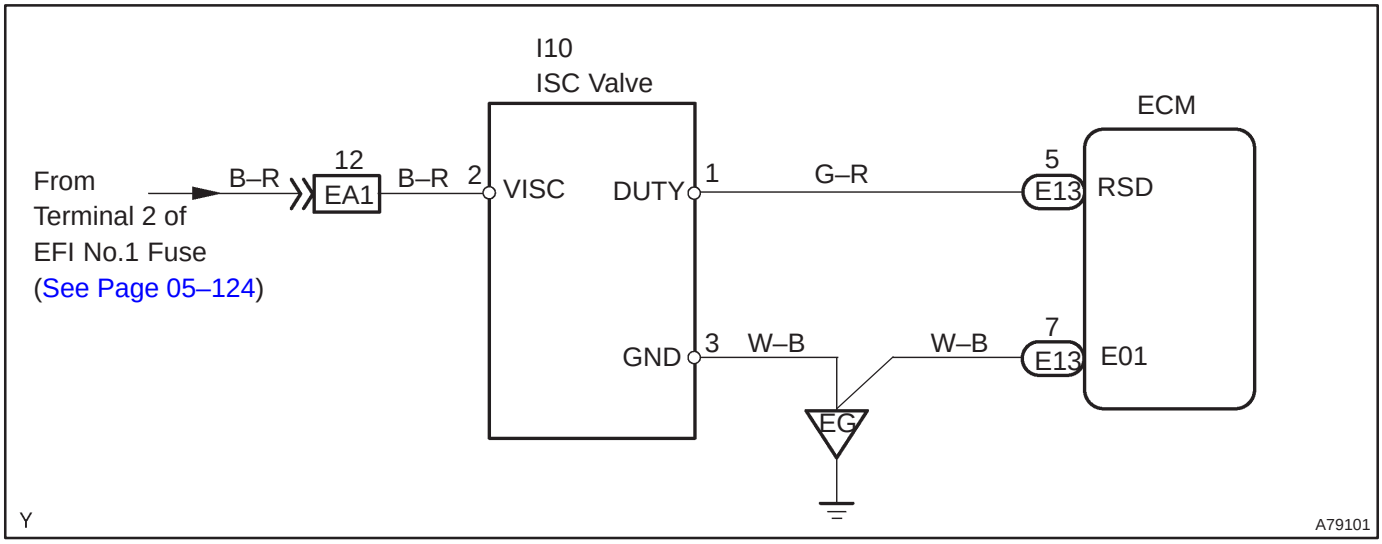
CIRCUIT DESCRIPTION



The rotary solenoid type of the idle speed control (ISC) valve is located under the throttle body and intake air bypassing the throttle valve is directed to the ISC valve through the passage. In this way the intake air volume bypassing the throttle valve is regulated, controls the engine speed.
The ECM operates the ISC valve only to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (1 trip detection logic)	• Open or short in ISC valve circuit • ISC valve is stuck or closed • PCV hose • A/C switch circuit • Air induction system • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

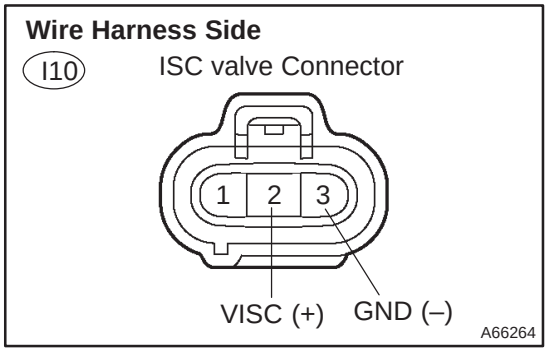
1	PERFORM ACTIVE TEST USING HAND–HELD TESTER(CHECK ISC VALVE OPERATION)

(a) Warm up the engine to the normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the A/C.
(d) Shift the lever to the neutral position.
(e) Connect the hand–held tester to the DLC3 on the vehicle.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST / ISC DUTY RATIO”.
(g) Check that the engine RPM varies when changing the ISC duty ratio.
Engine RPM:
Engine RPM fluctuates ups and downs in respose to the ISC duty ratio variation.

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)**

NG

2	CHECK HARNESS AND CONNECTOR



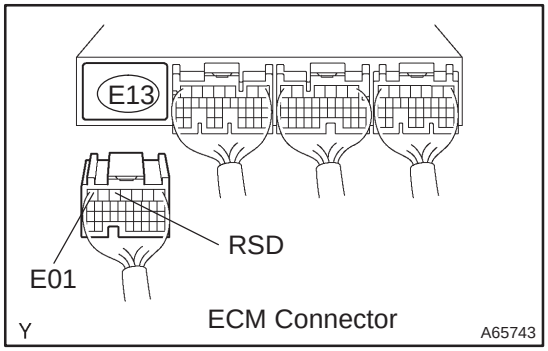
(a) Disconnect the ISC valve connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the ISC valve wire harness side connector.
Standard:

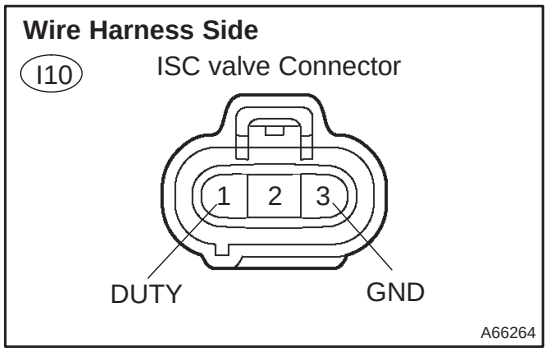
Symbols (Terminal No.)	Specified condition
VISC (I10–2) – GND (I10–3)	9 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK HARNESS AND CONNECTOR(RSD CIRCUIT)





(a) Disconnect the ISC valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
DUTY (I10–1) – RSD (E13–5)	Continuity
GND (I10–3) – E01 (E13–7)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
DUTY (I10–1) or RSD (E13–5) – Body groundr	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY (See page 10–1)

NG → **REPLACE THLOTTLE BODY IDLE SPEED CONTROL VALVE ASSY**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P1300	IGNITER CIRCUIT MALFUNCTION (NO.1)

DTC	P1305	IGNITER CIRCUIT MALFUNCTION (NO.2)

DTC	P1310	IGNITER CIRCUIT MALFUNCTION (NO.3)

DTC	P1315	IGNITER CIRCUIT MALFUNCTION (NO.4)

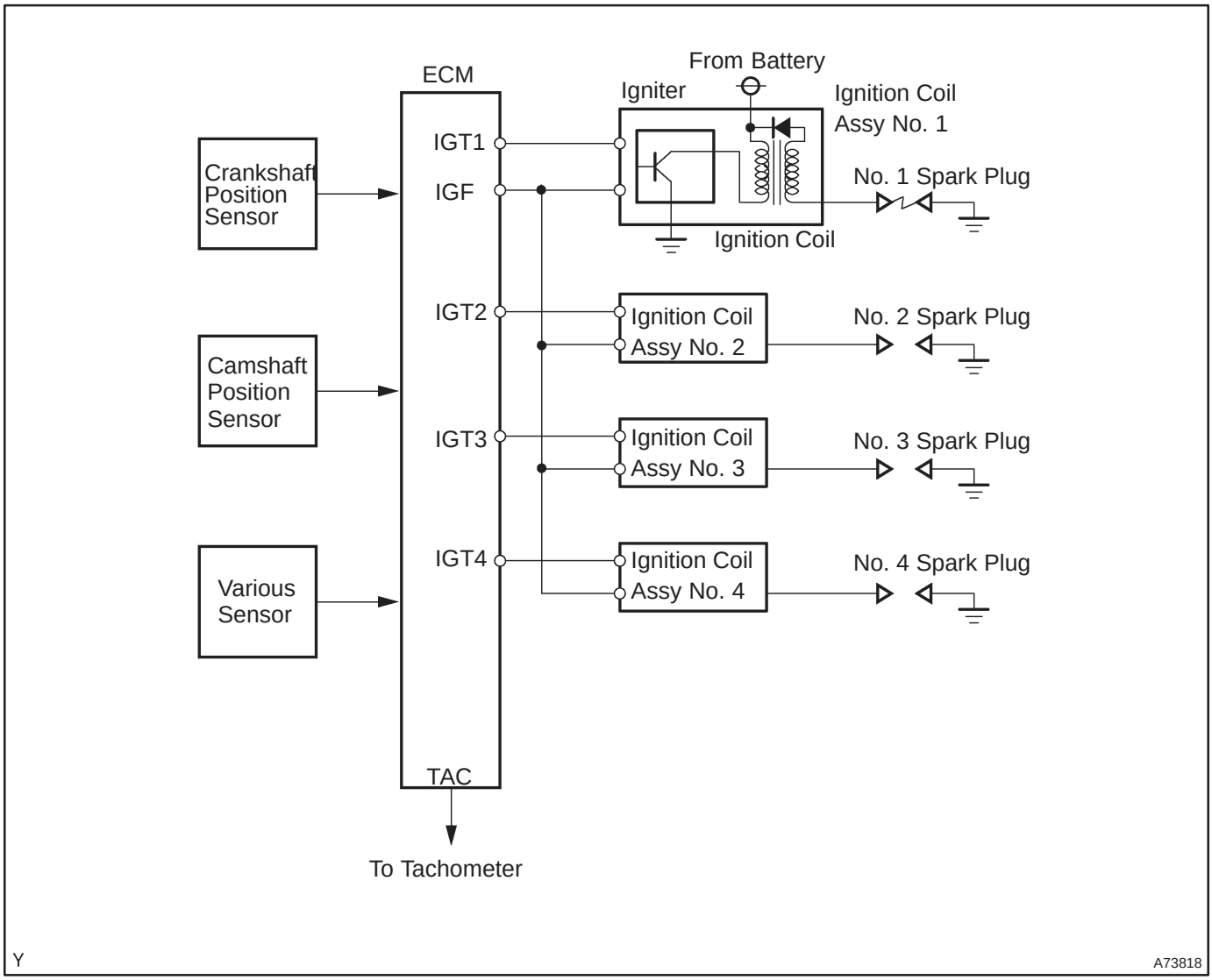
CIRCUIT DESCRIPTION

HINT:

- If DTC P1300 is displayed, check No.1 ignition coil with igniter circuit.
- If DTC P1305 is displayed, check No.2 ignition coil with igniter circuit.
- If DTC P1310 is displayed, check No.3 ignition coil with igniter circuit.
- If DTC P1315 is displayed, check No.4 ignition coil with igniter circuit.

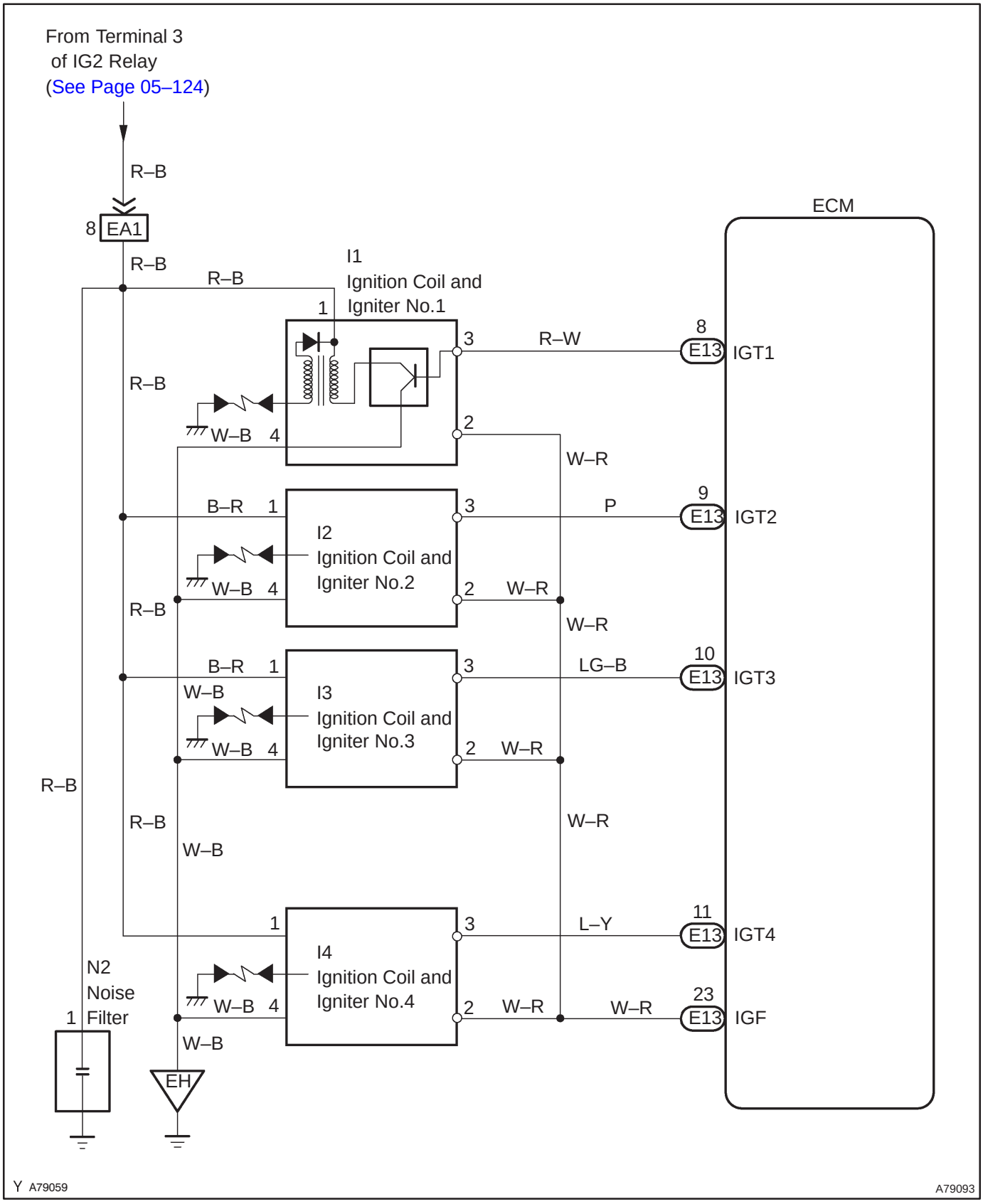
A Direct Ignition System (DIS) has been adopted. The DIS improves the ignition timing accuracy, reduces the high–voltage loss, and enhances overall reliability of the ignition system by eliminating the distributor. The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the spark plug is connected to the end of the secondary coil. High voltage generated in the secondary coil is applied directly to the spark plug. The spark of the spark plug passes through from the center electrode to the ground electrode.

The ECM determines ignition timing and outputs the ignition (IGT) signals of each cylinder. Based on IGT signals, the power transistors cut off the current to the primary coil in the ignition coil. At the same time, the igniter also sends an ignition confirmation (IGF) signal as a fail–safe measurement to the ECM.



DTC No.	DTC Detecting Condition	Trouble Area
P1300 P1305 P1310 P1315	No IGF signal to the ECM while engine is running	• Ignition system • Open or short in IGF or IGT1 circuit from No. 1 ignition coil with igniter to ECM • No.1 – No.4 ignition coil with igniter • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 PERFORM SIMULATION TEST

(a) Clear the DTC (See page 05–5)

(b) Shuffle arrangement of the ighition coil and igniters.

NOTICE:

Do not shuffle the connectors.

(c) Perform the simulation test.

(d) Clear the DTC (See page 05–5)

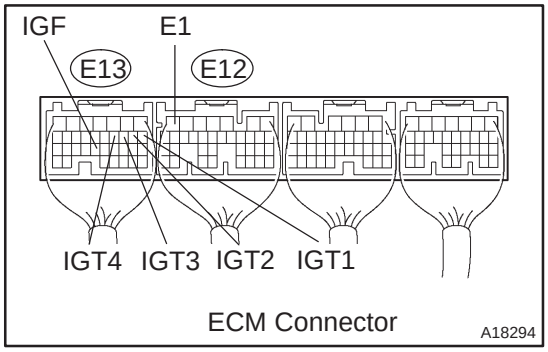
Result:

Display (DTC output)	Proceed to
The same DTC is output again	A
The other DTC is output	B

B → **REPLACE IGNITION COIL**

A

2 INSPECT ECM(IGT1, IGT2, IGT3, IGT4 AND IGF SIGNAL)



(a) Inspection using the oscilloscope.

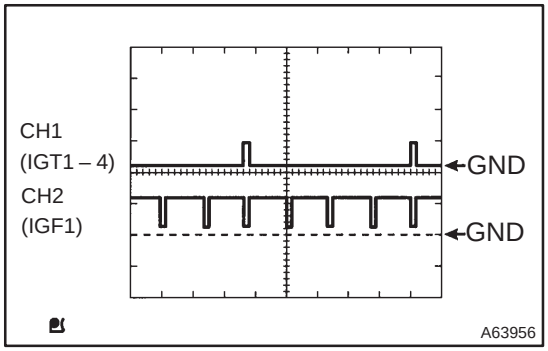
(b) During cranking or idling, check the waveform between terminals IGT1 to IGT4 and E1, and IGF1 and E1 of the ECM connector.

Standard:

Item	Contents
Terminal	CH1: IGT1, IGT2, IGT3, IGT4 – E1 CH2: IGF – E1
Equipment Set	2V/DIV, 20ms/DIV
Condition	While the engine is cranking or idling

HINT:

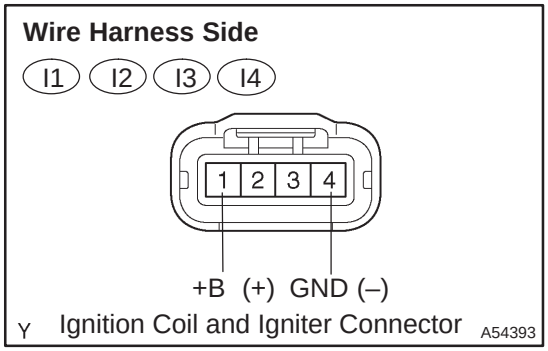
Correct waveform is as shown in the diagram on the left.



NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

3 INSPECT IGNITION COIL(POWER SOURCE)



(a) Disconnect the ignition coil and igniter connector.
(b) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
GND (I1–4) – Body ground	Continuity
GND (I2–4) – Body ground	
GND (I3–4) – Body ground	
GND (I4–4) – Body ground	

(c) Turn the ignition switch ON.
(d) Measure the voltage between the terminals of the ignition coil and igniter connector.

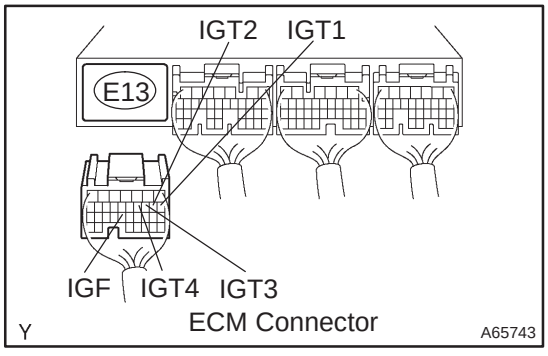
Standard:

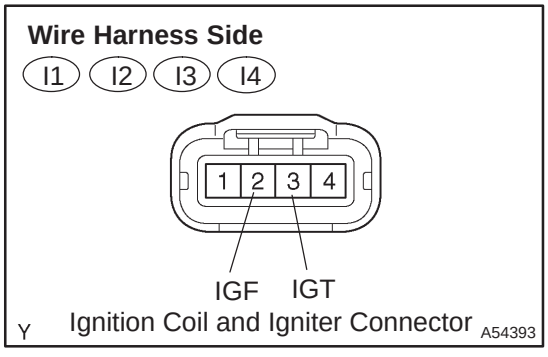
Symbols (Terminal No.)	Specified condition
+B (I1–1) – GND (4)	9 to 14 V
+B (I2–1) – GND (4)	
+B (I3–1) – GND (4)	
+B (I4–1) – GND (4)	

NG → **Go to step 5**

OK

4 CHECK HARNESS AND CONNECTOR(ECM – IGNITION COIL)





HINT:
The procedure below is for No.1 cylinder. If a malfunction is found on other cylinders, check the circuit for the cylinder with referring to this procedure.

(a) Disconnect the ignition coil and igniter connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IGT (I1–3) – IGT1 (E13–8)	Continuity
IGT (I2–3) – IGT2 (E13–9)	
IGT (I3–3) – IGT3 (E13–10)	
IGT (I4–3) – IGT4 (E13–11)	
IGF (I1–2) – IGF (E13–23)	
IGF (I2–2) – IGF (E13–23)	
IGF (I3–2) – IGF (E13–23)	
IGF (I4–2) – IGF (E13–23)	

Standard (Check for short):

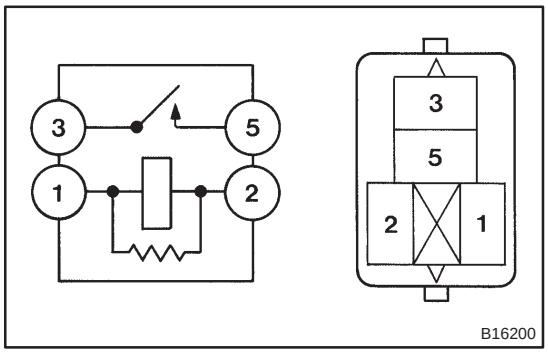
Symbols (Terminal No.)	Specified condition
IGT (I1–3) or IGT1 (E13–8) – Body ground	No continuity
IGT (I2–3) or IGT2 (E13–9) – Body ground	
IGT (I3–3) or IGT3 (E13–10) – Body ground	
IGT (I4–3) or IGT4 (E13–11) – Body ground	
IGF (I1–2) or IGF (E13–23) – Body ground	
IGF (I2–2) or IGF (E13–23) – Body ground	
IGF (I3–2) or IGF (E13–23) – Body ground	
IGF (I4–2) or IGF (E13–23) – Body ground	

NG → **REPLACE HARNESS OR CONNECTOR**

OK

REPLACE IGNITION COIL

5 INSPECT IG2 RELAY



(a) Remove the IG2 relay from the engine room R/B No.4.
(b) Inspect the IG2 relay.

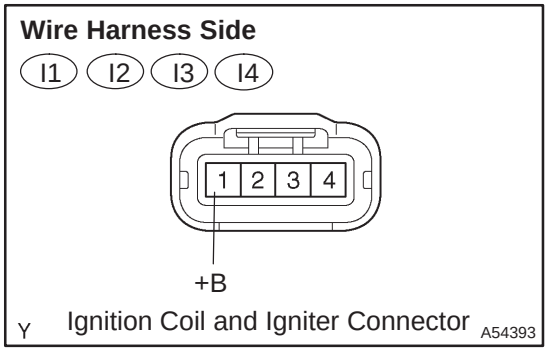
Standard:

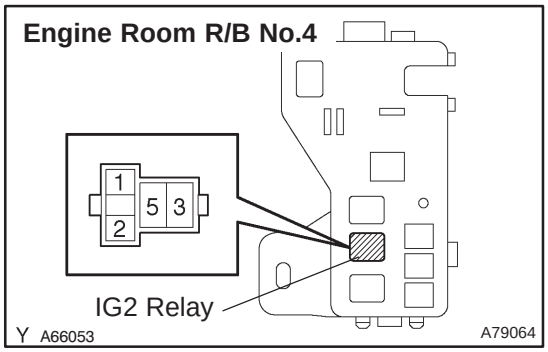
Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No Continuity
	Continuity (Apply battery voltage Terminals 1 and 2)

NG → **REPLACE IG2 RELAY**

OK

6 CHECK HARNESS AND CONNECTOR(IG2 RELAY – IGNITION COIL)





(a) Disconnect the ignition coil and igniter connector.
(b) Remove the IG2 relay from the engine room R/B No.4.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (I1–1) – IG2 relay (3)	Continuity
+B (I2–1) – IG2 relay (3)	
+B (I3–1) – IG2 relay (3)	
+B (I4–1) – IG2 relay (3)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (I1–1) or IG2 relay (3) – Body ground	No continuity
+B (I2–1) or IG2 relay (3) – Body ground	
+B (I3–1) or IG2 relay (3) – Body ground	
+B (I4–1) or IG2 relay (3) – Body ground	

NG → **REPLACE HARNESS OR CONNECTOR**

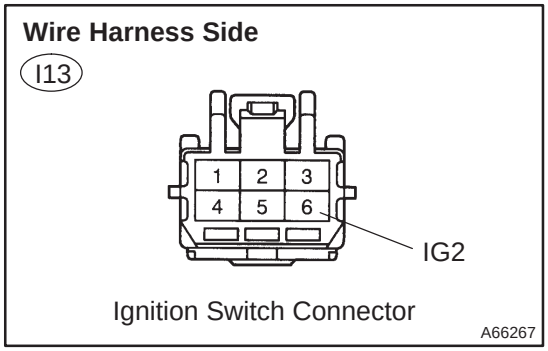
OK

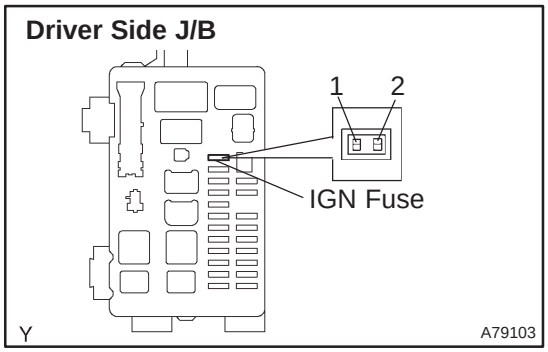
7 CHECK FUSE(IGN FUSE) (See page 05–124)

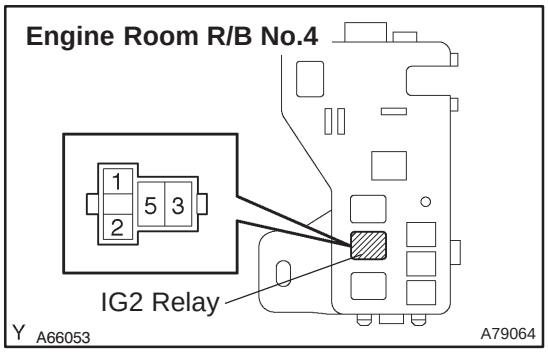
NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

8 CHECK HARNESS AND CONNECTOR(IGNITION SWITCH – IG2 RELAY)







(a) Disconnect the battery negative (–) terminal.
(b) Disconnect the ignition switch connector.
(c) Remove the IGN fuse from the driver side J/B.
(d) Remove the IG2 relay from the engine room R/B No.4.
(e) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) – IGN fuse (1)	Continuity
IGN fuse (2) – IG2 relay (1)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IG2 (I13–6) or IGN fuse (1) – Body ground	No continuity
IGN fuse (2) or IG2 relay (1) – Body ground	

NG → **REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE POWER SOURCE CIRCUIT

DTC	P1346	VVT SENSOR/CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (BANK 1)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page 05–84

DTC No.	Detection Item	Trouble Area
P1346	Deviation in crankshaft position sensor signal and camshaft position sensor signal (2 trip detection logic)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM

WIRING DIAGRAM

Refer to DTC P0335 on page 05–84

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK VALVE TIMING (See page 14–49)

NG → ADJUST VALVE TIMING (See page 14–49)

OK

CHECK AND REPLACE ECM (See page 01–32)

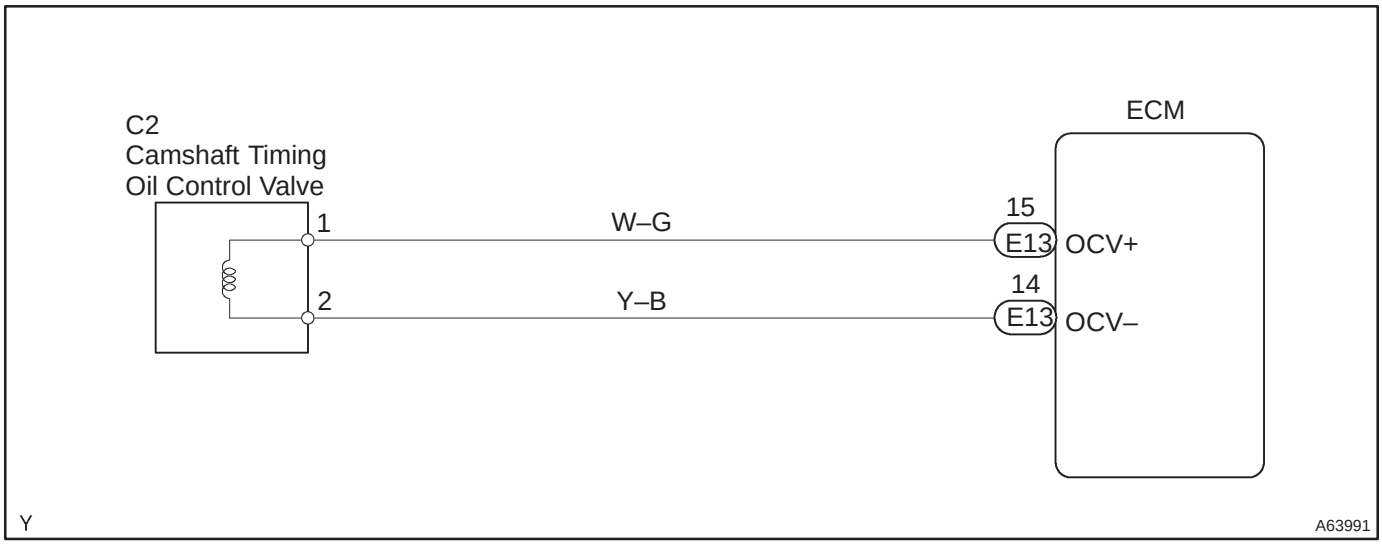
DTC	P1349	VVT SYSTEM MALFUNCTION (BANK 1)

CIRCUIT DESCRIPTION

VVT system controls the intake valve timing to proper timing in response to driving condition.
The ECM controls the oil control valve (OCV) to make the intake valve timing properly, oil pressure regulated by the OCV is supplied to the valiable valve timing (VVT) controller, and then the VVT controller changes relative position between the camshaft and the crankshaft.

DTC No.	DTC Detecting Condition	Trouble Area
P1349	Condition (a) or (b) continues with engine speed at 400 to 4,000 rpm after the engine is warmed up (a) Valve timing does not change from the current valve timing (b) Current valve timing is fixed	• Valve timing • OCV • VVT controller assembly • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK VALVE TIMING (See page 14–49)

NG → ADJUST VALVE TIMING (See page 14–49)

OK

2	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OPERATE OF OCV)

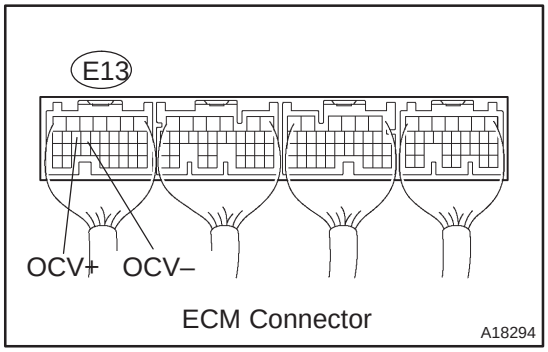
(a) Start the engine and warm it up.
(b) Connect the hand–held tester and select VVT from the ACTIVE TEST menu.
(c) Check the engine speed while operating the OCV by the hand–held tester.
OCV is OFF: Normal engine speed
OCV is ON: Rough idle or engine stall

HINT:
DTC P1349 is also output when a foreign object is detected in some parts of the system in engine oil, and then the system returns to normal in a short time. There is also no problem on the VVT as the oil filter should catch the foreign object in engine oil.

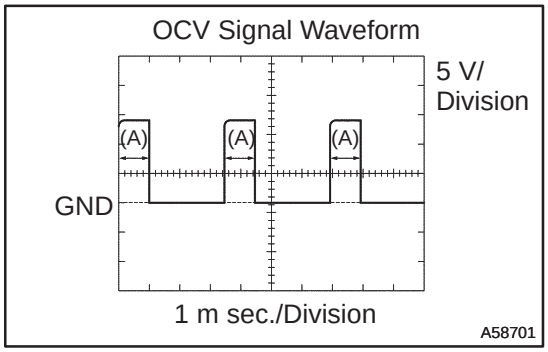
OK	VVT SYSTEM OK

NG

3	INSPECT ECM(CHECK VOLTAGE)



(a) Turn the ignition switch ON.
(b) Check the waveform between terminals OCV+ and OCV– of the E13 ECM connector.



HINT:
- The correct waveform is as shown on the left.
- The waveform frequency (A) becomes longer as the engine speed becomes higher.

NG	CHECK AND REPLACE ECM (See page 01–32)

OK

4	INSPECT CAMSHAFT TIMING GEAR ASSY (See page14–64)

NG	REPLACE VVT CONTROLLER ASSEMBLY, AND THEN GO TO NEXT STEP

OK

5	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY (See page 10–3)

NG → REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY, AND THEN GO TO NEXT STEP

OK

6	CHECK OIL CONTROL VALVE FILTER(CHECK BLOCKAGE)

NG → REPAIR OR REPLACE OIL CONTROL VALVE FILTER

OK

7	PERFORM SIMULATION TEST(DTC CHECK)

(a) Clear the DTC (See page 05–5).
(b) Perform the simulation test.
(c) Check whether or not DTC P1349 is stored (See page 05–5).
Result:

DTC	Proceed to
”P1349” is output.	A
”P1349” is not output.	B

HINT:
DTC P1349 is also output when a foreign object is detected in some parts of the system in engine oil, and then the system returns to normal in a short time. There is also no problem on the VVT as the oil filter should catch the foreign object in the engine oil.

B → VVT SYSTEM OK

A

CHECK AND REPLACE ECM (See page 01–32)

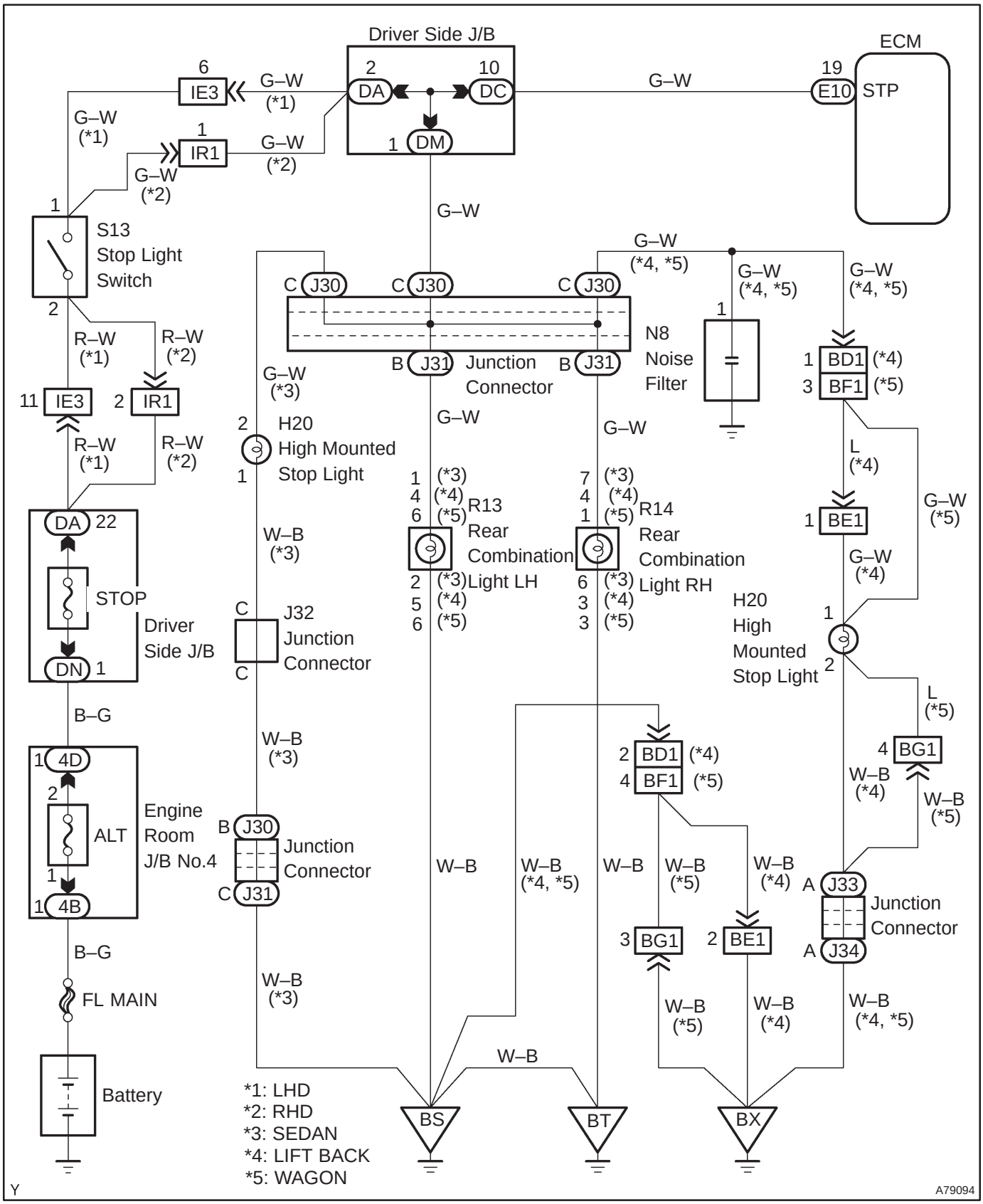
DTC	P1520	STOP LIGHT SWITCH CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

This signal is used to detect that the brakes have been applied. The STP signal voltage is the same as the one supplied to the stop lights.
The STP signal is used mainly to control the fuel cut–off engine speed (The fuel cut–off engine speed is reduced slightly when the vehicle is braking.).

DTC No.	DTC Detecting Condition	Trouble Area
P1520	Condition (a), (b) and (c) continue for 0.5 sec. or more: (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the STP signal is OFF	• Open or short in stop light switch signal circuit • Stop light switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	CHECK OPERATION OF STOP LIGHT

(a) Check if the stop lights go on and off normally when the brake pedal is depressed and released.

NG → **REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT**

OK

2	READ VALUE OF HAND–HELD TESTER

(a) Connect the hand–held tester to the DLC3.
(b) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW” and read its value displayed the hand–held tester.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Read the STP signal on the hand–held tester.

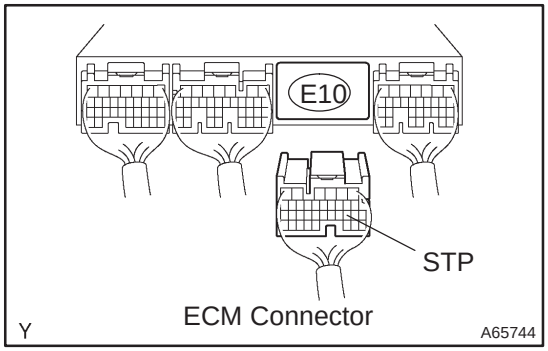
Result:

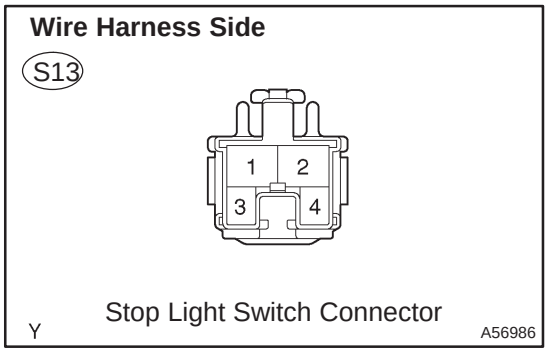
Brake Pedal	STP Signal
Depressed	ON
Released	OFF

OK → **CHECK FOR INTERMITTENT PROBLEMS**

NG

3	CHECK WIRE HARNESS OR CONNECTOR(ECM – STOP LIGHT SWITCH)





(a) Disconnect the stop light switch connector.
(b) Disconnect the the E10 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) – STP (E10–19)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Stop light switch (S13–1) or STP (E10–19) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM (See page 01–32)

DTC	P1600	ECM BATT MALFUNCTION

CIRCUIT DESCRIPTION

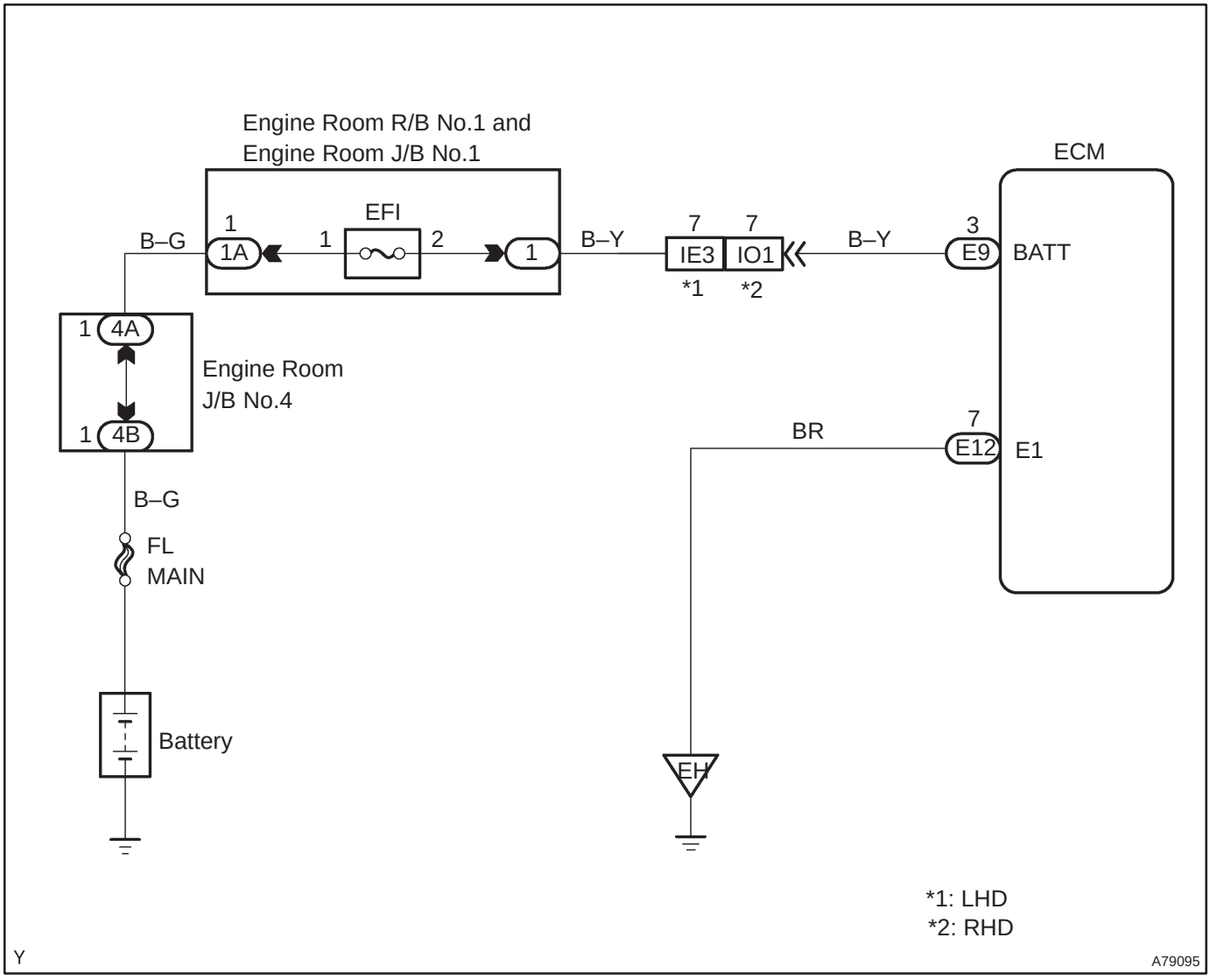
Battery positive voltage is applied to terminal BATT of the ECM even the ignition switch is OFF for the DTC memory and air–fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1600	Open in back up power source circuit	• Open in back up power source circuit • ECM

HINT:

If DTC P1600 is displayed, the ECM does not store other DTCs.

WIRING DIAGRAM

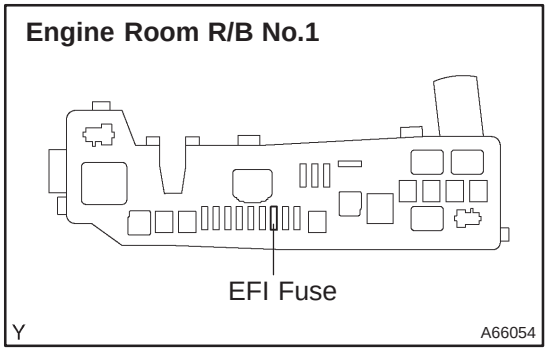


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK FUSE(EFI FUSE)

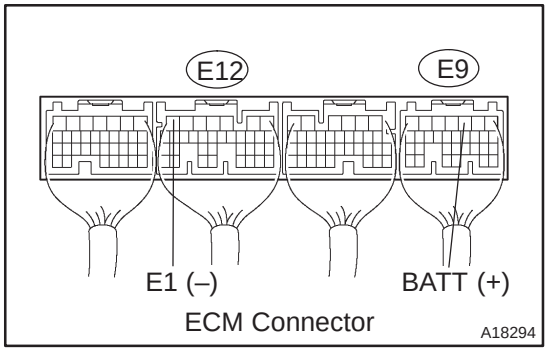


(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Check for continuity in the EFI fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

2 INSPECT ECM(CHECK VOLTAGE)



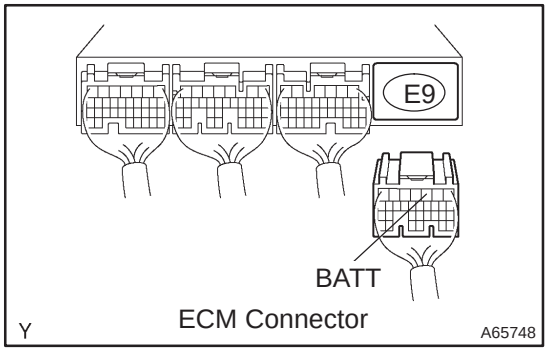
(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E9 and E12 ECM connector.
Standard:

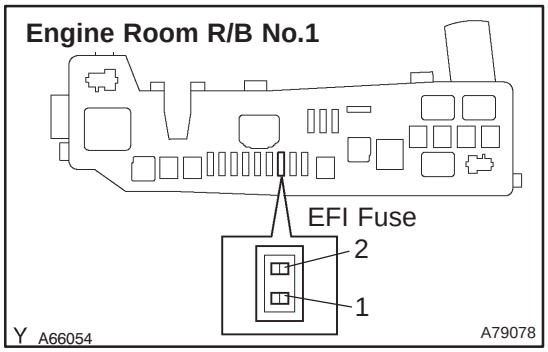
Symbols (Terminal No.)	Specified condition
BATT (E9–3) – E1 (E12–7)	8 to 14 V

OK → **CHECK AND REPLACE ECM (See page 01–32)**

NG

3 CHECK WIRE HARNESS OR CONNECTOR(EFI FUSE – ECM)





(a) Remove the EFI fuse from the engine room R/B No.1.
(b) Disconnect the ECM E9 connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) – BATT (E9–3)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
EFI fuse (2) or BATT (E9–3) – Body ground	No continuity

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

CHECK AND REPLACE HARNESS OR CONNECTOR (BATTERY – EFI FUSE)

DTC	P1656	OCV CIRCUIT MALFUNCTION (BANK 1)

CIRCUIT DESCRIPTION

Refer to DTC P1349 on page 05–112.

DTC No.	DTC Detecting Condition	Trouble Area
P1656	Open or short in oil control valve (OCV) circuit	• Open or short in OCV circuit • OCV • ECM

WIRING DIAGRAM

Refer to DTC P1349 on page 05–112.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand – held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	PERFORM ACTIVE TEST BY HAND–HELD TESTER(OCV OPERATION)

(a) Start the engine and warm it up.
(b) Connect the hand–held tester and select the VVT on the ACTIVE TEST menu.
(c) Check the engine speed while operating the OCV by using the hand–held tester.

Result:

VVT system is OFF (OCV is OFF): Normal engine speed
VVT system is ON (OCV is ON): Rough idle or engine stalled

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)**

NG

2	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY (See page 10–3)

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

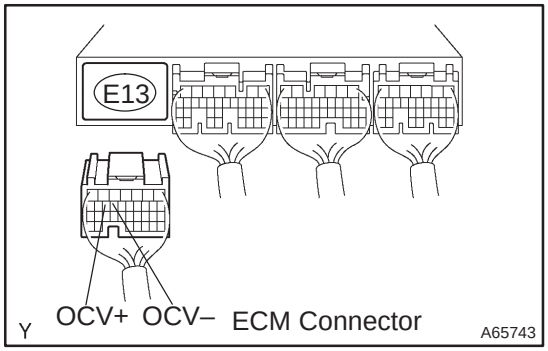
OK

3	INSPECT ECM(CHECK VOLTAGE) (See page 05–20)

NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

4 CHECK HARNESS AND CONNECTOR(ECM – OCV)



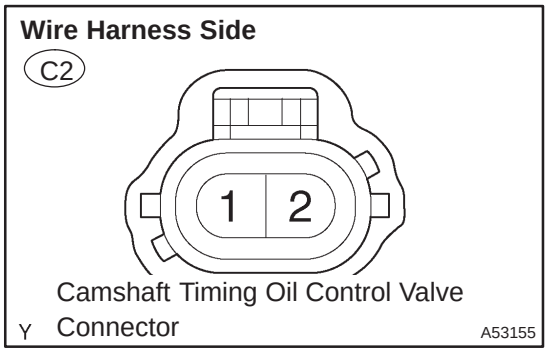
(a) Disconnect the camshaft timing oil control valve connector.
(b) Disconnect the E13 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) – OCV+ (E13–14)	Continuity
Oil control valve (C2–2) – OCV– (E13–15)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Oil control valve (C2–1) or OCV+ (E13–14) – Body ground	No continuity
Oil control valve (C2–2) or OCV– (E13–15) – Body ground	

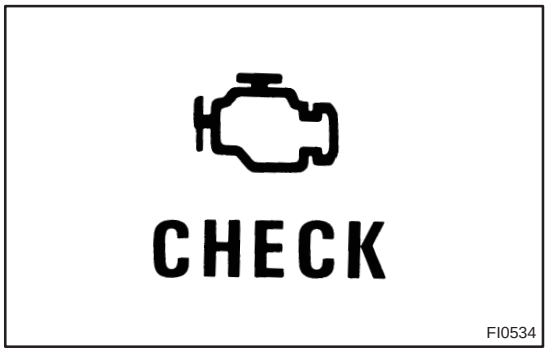


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05–5)

05C66–01

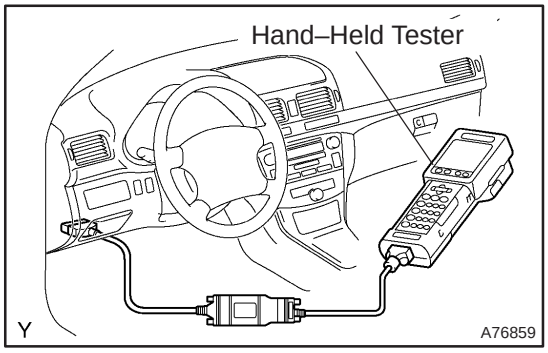


PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description for Euro–OBD (European spec.)

- When troubleshooting Euro–OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to the OBD scan tool complying with ISO 15031–4 or hand–held tester, and read the various data output from the vehicle's ECM.
- Euro–OBD regulations require that the vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the emission control system / components or in the power train control components which affect vehicle emissions, or a malfunction in the computer. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTC) prescribed by ISO 15031–4 are recorded in the engine ECU memory (See page 05–16). If the malfunction does not reoccur in 3 consecutive trips, the CHK ENG goes off automatically but the DTCs remain recorded in the ECM memory.



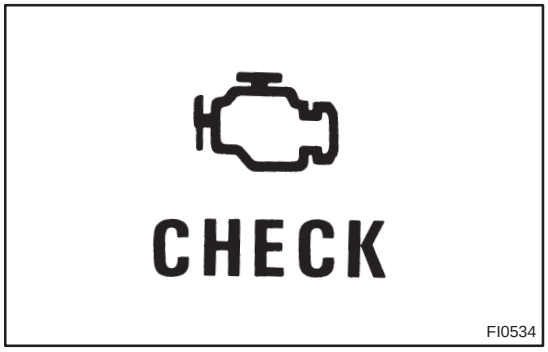
- To check the DTCs, connect the OBD scan tool or hand–held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data. (For operating instructions, see the OBD scan tool's instruction book.)
  DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page 05–16).
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).
- * 2 trip detection logic
  When a logic malfunction is first detected, the pend-

ing fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).

- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTCs P0300 – P0304) or fuel trim malfunction (DTCs P0171) or other malfunction (first malfunction only), is detected.
  Because freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- Priorities for troubleshooting:
  If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.

If no instructions are given, troubleshoot according to the following priorities.

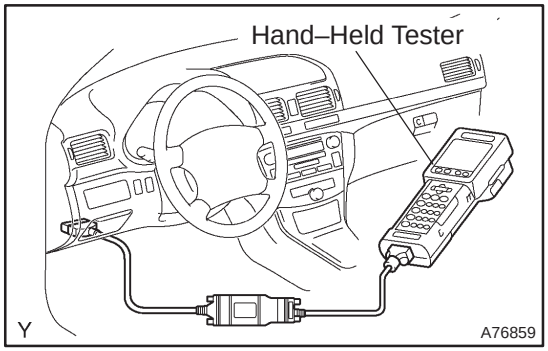
(1) DTCs other than fuel trim malfunction (DTCs P0171) and misfire (DTCs P0300 – P0304).
(2) Fuel trim malfunction (DTCs P0171).
(3) Misfire (DTCs P0300 – P0304).



(b) Description for M–OBD (Except European spec.)

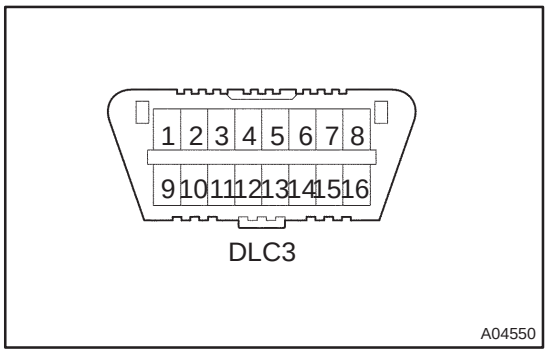
- When troubleshoot Multiplex OBD (M–OBD) vehicles, the only difference from the usual troubleshooting procedure is that you connect the hand–held tester to the vehicle, and read the various data output from the vehicle's ECM.

- The vehicle's on–board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) are recorded in the ECM memory (See page 05–16). When the malfunction does not reoccur, the CHK ENG is indicated until the ignition switch is turned off, and then the CHK ENG is not indicated when the ignition switch is turned on but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect the hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle or read the DTC which is indicated on the multi information display when TC and CG terminals on the DLC3 are connected. The hand–held tester also enables you to erase the DTCs and check the freeze frame data and various forms of engine data. (for operating instructions, see the instruction book.)
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand–held tester only) (See step 3).
- * 2 trip detection logic
  When a logic malfunction is first detected, the pending fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).

- Freeze frame data:
  Freeze frame data records the engine conditions (fuel system, calculator load, water temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.



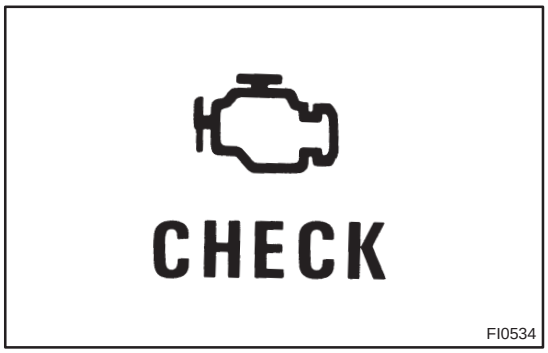
(c) Check the DLC3.
The vehicle's ECM uses the ISO 9141–2 (Euro–OBD)/ ISO 14230(M–OBD) communication protocol. The terminal arrangement of DLC3 complies with ISO 15031–03 and matches the ISO 9141–2/ ISO 14230 format.

Terminal No.	Connection / Voltage or Residence	Condition
7	Bus + Line / Pulse generation+	During transmission
4	Chassis Ground – Body Ground / 1 Ω or less	Always
16	Battery Positive – Body Ground / 9 to 14 V	Always

HINT:
If the display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible is when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Deparment listed in the tool's instruction manual.

(d) Inspect the battery voltage.
Battery voltage: 11 to 14 V
If voltage is below 11V, recharge the battery before proceeding.



(e) Check the CHK ENG.
(1) The CHK ENG lamp comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the CHK ENG lamp is not illuminated, troubleshoot the combination meter.

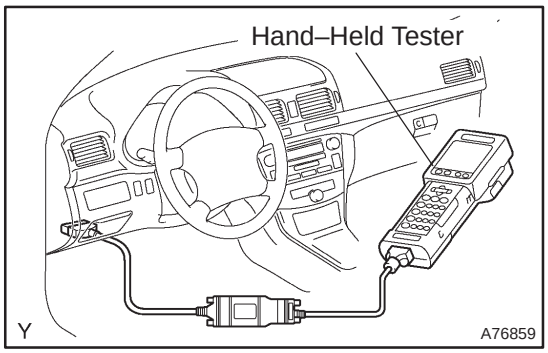
(2) When the engine is started, the CHK ENG should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

2. DTC CHECK (Nomal Mode) :

NOTICE:

Hand–held tester only:

When the diagnosis system is switched from the normal mode to the check (test) mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and then write them down.



(a) Checking DTCs using the hand–held tester.
  (1) Connect the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON and switch the hand–held tester main switch ON.
  (3) Use the hand–held tester to check the DTCs and freeze frame data and then write them down. The hand–held tester's instruction book.
  (4) See page 05–16 to confirm the details of the DTCs.

(b) Clearing the DTCs using the hand–held tester:
  (1) Connect the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON.
  (3) When operating hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester:
  (1) Disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.

3. DTC CHECK (Check Mode):

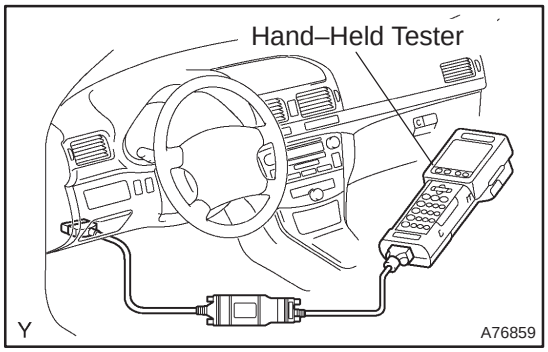
HINT:

Hand–held tester only:

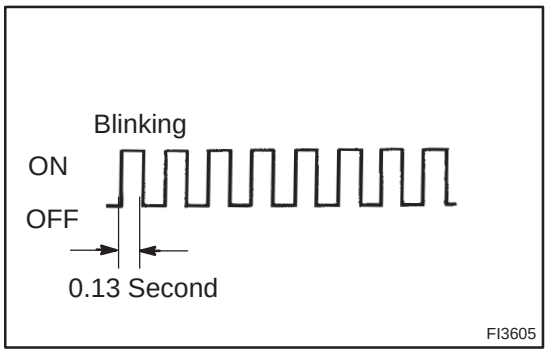
Compared to the normal mode, the check mode has more sensing ability to detect malfunctions.

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check (test) mode.

(a) Proceduce for check mode using hand–held tester.
  (1) Check the initial conditions
    - Battery positive voltage 11V or more.
    - Throttle valve fully closed.
    - Transmission in the "P" or "N" position.
    - Air conditioning switched OFF.
  (2) Turn the ignition switch OFF.



(3) Connect the hand–held tester to the DLC3.
(4) Turn the ignition switch and the hand–held tester main switch ON.



(5) Switch the hand–held tester from the normal mode to the check (test) mode. The CHK ENG blinks in 0.13 sec interval as shown in the illustration.

NOTICE:

If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

(6) Start the engine. (The CHK ENG lamp goes out after the engine start.)
(7) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTC, etc.

(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the nomal mode and will result in all of the DTCs and freeze frame data being erased.

(9) After checking the DTCs, inspect the applicable circuit.

(b) Clearing the DTCs using the hand–held tester
(1) Connect the hand–held tester to DLC3.
(2) Turn the ignition switch ON.
(3) When operating hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the hand–held tester's instruction book for operating instructions.)

(c) Clearing the DTCs not using the hand–held tester:
(1) Disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.

4. FAIL–SAFE CHART

If any of the following codes are recorded, the engine ECM enters the fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0100	Ignition timing is fixed at 5° BTDC	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0110	Intake air temperature is fixed at 20°C (68°F)	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0115	Water temperature is fixed at 80°C (176°F)	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P0120	VTA is fixed at 0°	The following condition must be repeated at least 2 times consecutively when closed throttle position switch is OFF: VTA greater than 0.1 V and less than 0.95 V
P0135 P0141	The heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0325	Max. timing retardation	Ignition switch OFF
P1300 P1305 P1310 P1315	Fuel cut	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".
P1656	It cut electrically the circuit in which an abnormality is detected	If the ECM detects "Pass" condition, the ECM will return to "Nomal mode".

5. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:

By putting the vehicle's engine ECM in check (test) mode, 1 trip detection logic is possible instead of 2 trip detection logic, and sensitivity to detect faults is increased. This makes it easier to detect intermittent problems.

(a) Clear the DTC. (See step 3.)
(b) Set the check (test) mode. (See step 3.)
(c) Perform a simulation test. (See page 01–32)
(d) Check the connector and terminal. (See page 01–32)
(e) Wiggle the harness and the connector. (See page 01–32)

6. DATA LIST

HINT:

Using the DATA LIST displayed by the hand–held tester, you can read the value of the switches, sensors, actuators and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten diagnostic time.

NOTICE:

The values given below for "Normal Condition" are representative values. A vehicle may still be normal even if the measured values are a little different from those listed here. Do not decide whether a part is faulty or not solely according to the "Normal Condition" here.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the Hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand–held tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL".
(g) According to the display on tester, read the "DATA LIST".

Hand–held tester display	MeasurementItem/Range (Display)	Normal Condition*1	Diagnostic Note
FUEL SYS #1	Fuel System Bank 1 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warming up: CLOSED	—
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 3.3 to 26.7 % Runnig without load (2,500rpm): 12.0 to 14.7 %	—
COOLANT TEMP	Coolanttemperature/ Min.: –40 °C, Max.: 140 °C	After warming up: 80 to 95°C (176 to 203°F)	If the value is "–40 °C" or "140 °C", sensor circuit is open or shorted.
INTAKE AIR	Intake air temperature/ Min.: –40 °C, Max.: 140 °C	Equivalent to Ambient Temp.	
SHORT FT #1	Short–term Fuel Trim Bank 1	0 ± 20%	—
LONG FT #1	Long–term Fuel Trim Bank 1	0 ± 20%	—
MAF/AFM	Air flow rate from mass air flow Meter	Idling: M/T 0.54 to 4.33 gm/sec. A/T 0.58 to 4.67 gm/sec. Running without load (2,500 rpm): 3.33 to 9.17 gm/sec.	—
ENGINE SPD	Engine Speed	Idling: 600 to 700 rpm	—
VEHICLE SPD	Vehicle Speed	Actual vehicle speed	Speed indicated on speedmeter.
IGN ADVANCE	Ignition Advance: Ignition Timing of Cylinder No. 1	Idling: BTDC 5 to 15°	—
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage: 0 V → 0%, 5 V → 100%	Throttle Fully Closed: 6 to 16 % Throttle Fully Open: 64 to 98 %	Read the value with ignition switch ON (Do not start engine)
O2S B1, S1	Voltage Output of Heated Oxygen Sensor Bank 1, Sensor 1	Idling: 0.05 to 0.95 V	—
O2FT B1, S1	Heated Oxygen Sensor Fuel Trim Bank 1, Sensor 1 (Same as SHORT FT #1)	0 ± 20 %	—
INJECTOR	Fuel injection time for cylinder No.1	Idling: 1.0 to 3.0 ms	—
ISC DUTY RATIO	Intake Air Control Valve duty ratio Opening ratio rotary solenoid type ISC valve	Idling: 20 to 40 %	—
STARTER SIG	Starter Signal	Cranking: ON	—
CTP SW	Closed Throttle Position Switch Signal	Cranking: ON	—
A/C SIG	A/C Switch Signal	A/C ON: ON	—
STOP LIGHT SW *2	Stop Light Switch Signal	Stop light switch ON: ON	—
FC IDL	Fuel Cut Idle: Fuel cut when throttle valve fully closed, during deceleration	Fuel cut operating: ON	—
PNP SW/NSW *2	Neutral start switch signal	P or N position: ON	—
FC TAU	Fuel Cut TAU: Fuel cut during very light load	Fuel cut operating: ON	—
CYL#1, CYL#2, CYL#3, CYL#4	Abnormal revolution variation for each cylinder	0 %	—
FUEL PUMP	Fuel Pump Signal	Idling: ON	—
EVAP (PURGE) VSV	EVAP VSV Signal	VSV operation: Above 30 %	—

*1: If no conditions are specifically stated for ”Idling”, it means the shift lever is in the N or P position, the A/C switch is OFF and all accessory switches are OFF.
*2: A/T only

7. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester.
(f) Select the item ”DIAGNOSIS / OBD/MOBD / ACTIVE TEST”.
(g) According to the display on tester, perform the ”ACTIVE TEST”.

Hand–held Tester Display	Test Details	Diagnostic Note
INJ VOL	[Test Details] Control the injection volume Min.: –12.5 %, Max.: 25 % [Vehicle Condition] Engine speed: 3,000 rpm or less	• All injectors are tested at once. • Injection volume is gradually changed between –12.5 and 25%.
A/F CONTROL	[Test Details] Control the injection volume –12.5 or 25 % (Change the injection volume –12.5 % or 25 %.) [Vehicle Condition] Engine speed: 3,000 rpm or less	The following procedure of A/F CONTROL enables the technician to check and graph voltage outputs of the heated oxygen sensor. To display the graph indication, select O2S B1 S1 and press button ”F4” after selecting ”ACTIVE TEST/A/F CONTROL/USER DATA”.
ISC DUTY RATIO	[Test Details] Control the ISC duty ratio 0 to 90 % [Vehicle Condition] • Engine speed: 3,000 rpm or less • Vehicle speed: 0 km/h (0 mph) • Battery voltage: 8.5 V or more	—
EVAP VSV (ALONE)	[Test Details] Activate the VSV for EVAP control ON or OFF	—
FUEL PUMP / SPD	[Test Details] Control the fuel pump ON or OFF	—
TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	—
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit ON or OFF	—

BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	CHECK BATTERY VOLTAGE

NOTICE:
Carry out this check with the engine stopped and ignition switch off.

Reference:

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → **CHARGE OR REPLACE BATTERY**

OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–22**

OK

3	CHECK IF ENGINE STARTS

NG → **GO TO STEP 6**

OK

4	CHECK AIR FILTER

(a) Visually check that the air filter is not excessively dirty or oily.

HINT:
If necessary, clean the filter with compressed air. First blow from the inside thoroughly, then blow from the outside of filter.

NG → **REPAIR OR REPLACE**

OK

5	CHECK IDLE SPEED (See page 14–1)

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–22**

OK

6	CHECK FUEL PRESSURE (See page 11–5)

NG → PROCEED TO PAGE 11–1 AND CONTINUE TO TROUBLESHOOT

OK

7	CHECK FOR SPARK (See page 18–1)

NG → PROCEED TO PAGE 18–1 AND CONTINUE TO TROUBLESHOOT

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05–22

0505L–04

PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still can not be confirmed in the basic inspection, proceed to this problem symptoms tables and troubleshoot according to the numbered order given below.

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay 2. Neutral start switch circuit*	19–1 —
No initial combustion (Does not start)	1. ECM power source circuit 2. Ignition coil (w/ Igniter) circuit 3. Fuel pump control circuit 4. Fuel system	05–124 05–103 05–131 11–1
No complete combustion (Does not start)	1. Fuel pump control circuit 2. Ignition coil (w/ Igniter) circuit 3. Fuel system	05–131 05–103 11–1
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. ISC valve circuit 3. Fuel pump control circuit 4. Ignition coil (w/ Igniter) 5. Spark plug 6. Compression 7. Fuel system	05–135 05–100 05–131 05–103 18–3 14–1 11–1
Cold engine (Difficult to start)	1. Starter signal circuit 2. ISC valve circuit 3. Fuel pump control circuit 4. Fuel system 5. Ignition coil (w/ Igniter) 6. Spark plug	05–135 05–100 05–131 11–1 05–103 18–3
Hot engine (Difficult to start)	1. Starter signal circuit 2. ISC valve circuit 3. Fuel pump control circuit 4. Fuel system 5. Ignition coil (w/ Igniter) 6. Spark plug	05–135 05–100 05–131 11–1 05–103 18–3
Incorrect first idle (Poor idling)	1. ISC valve circuit	05–100
High engine idle speed (Poor idling)	1. ISC valve circuit 2. ECM power source circuit 3. Neutral start switch circuit*	05–100 05–124 —
Low engine idle speed (Poor idling)	1. ISC valve circuit 2. Neutral start switch circuit* 3. Fuel pump control circuit 4. Fuel system	05–100 — 05–131 11–1
Rough idling (Poor idling)	1. ISC valve circuit 2. ECM power source circuit 3. Fuel pump control circuit	05–100 05–124 05–131
Hunting (Poor idling)	1. ISC valve circuit 2. ECM power source circuit 3. Fuel pump control circuit	05–100 05–124 05–131
Hesitation/Poor acceleration (Poor drivability)	1. Fuel system 2. Fuel pump control circuit 3. Ignition coil (w/ Igniter) circuit	11–1 05–131 05–103
Muffler explosion, after fire (Poor drivability)	1. Ignition coil (w/ Igniter) circuit 2. Spark plug 3. Fuel system	05–103 18–3 11–1
Surging (Poor drivability)	1. Fuel pump control circuit 2. Spark plug 3. Fuel system	05–131 18–3 11–1

Engine stall (Soon after starting)	1. Fuel pump control circuit 2. ISC valve circuit	05–131 05–100
Engine stall (After accelerator pedal released)	1. Injector circuit 2. ISC valve circuit 3. ECM	11–8 05–100 05–20
Engine stall (When shifting from N to D)	1. Neutral start switch circuit 2. ISC valve circuit	— 05–100

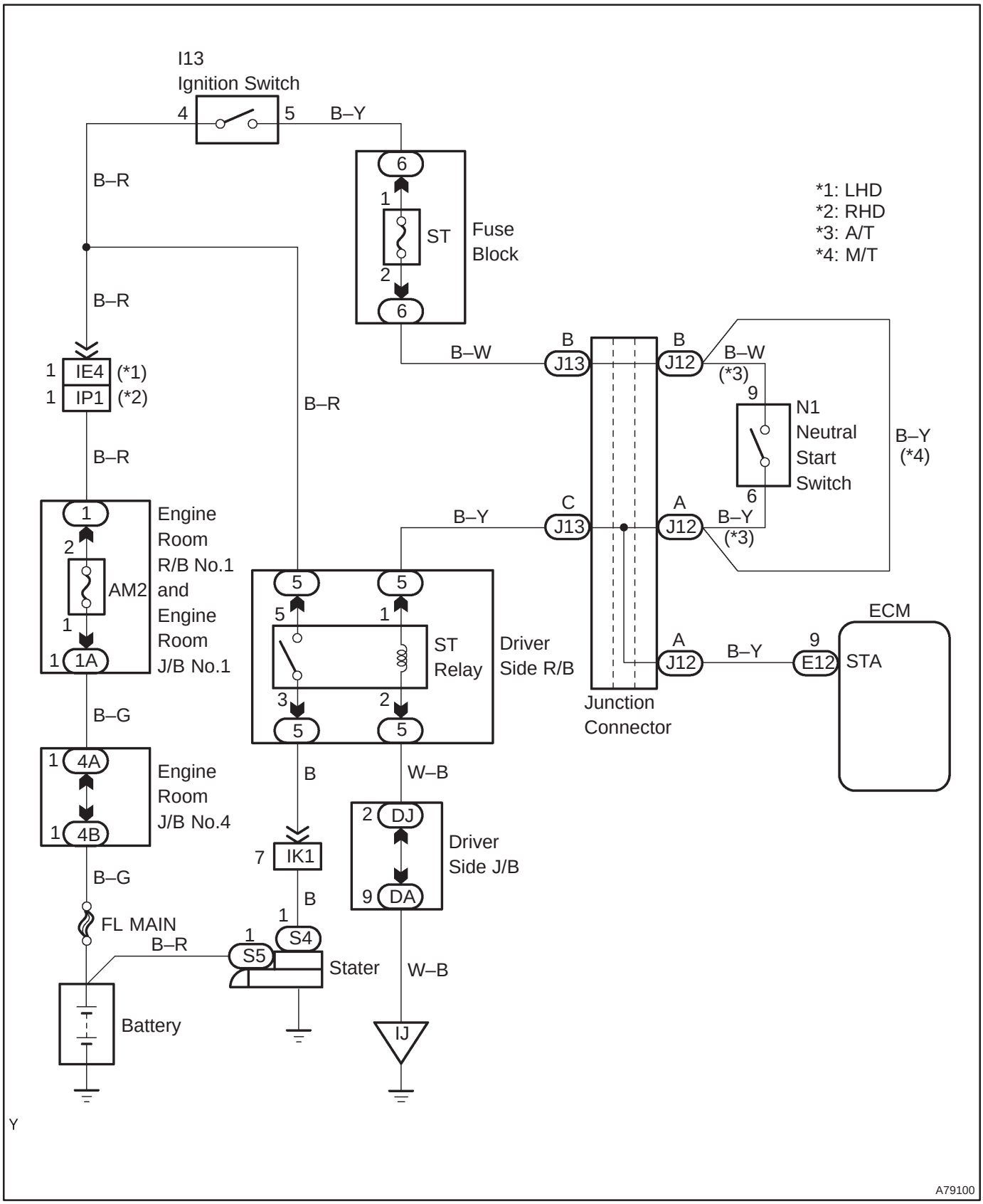
*: A/T only.

STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow becomes slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM



NSPECTION PROCEDURE

HINT:

This diagnostic chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05–22.

1	READ VALUE OF HAND–HELD TESTER(STARTER SIGNAL)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG” and read its value displayed on the hand–held tester.

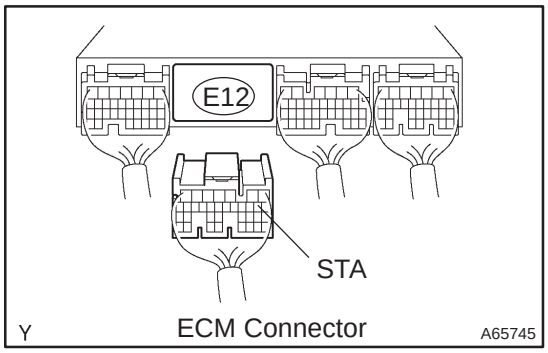
Result:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE**

NG

2	CHECK HARNESS AND CONNECTOR(ECM – STARTER RELAY)



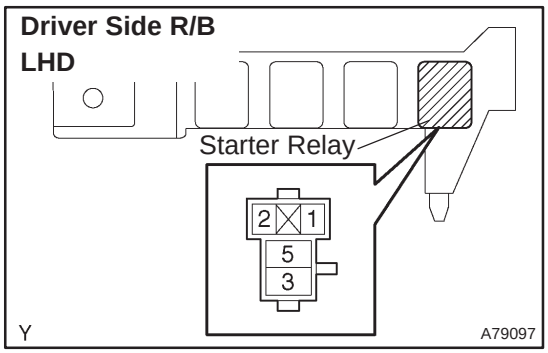
(a) Disconnect the ECM E12 connector.
(b) Remove the starter relay from the driver side R/B.
(c) Check for continuity between the wire harness side connectors.

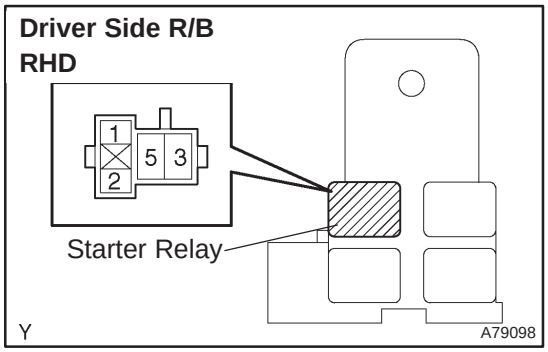
Standard (Check for open):

Symbols (Terminal No.)	Specified condition
Starter relay (1) – STA (E12–9)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
Starter relay (1) or STA (12–9) – Body ground	No continuity





NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

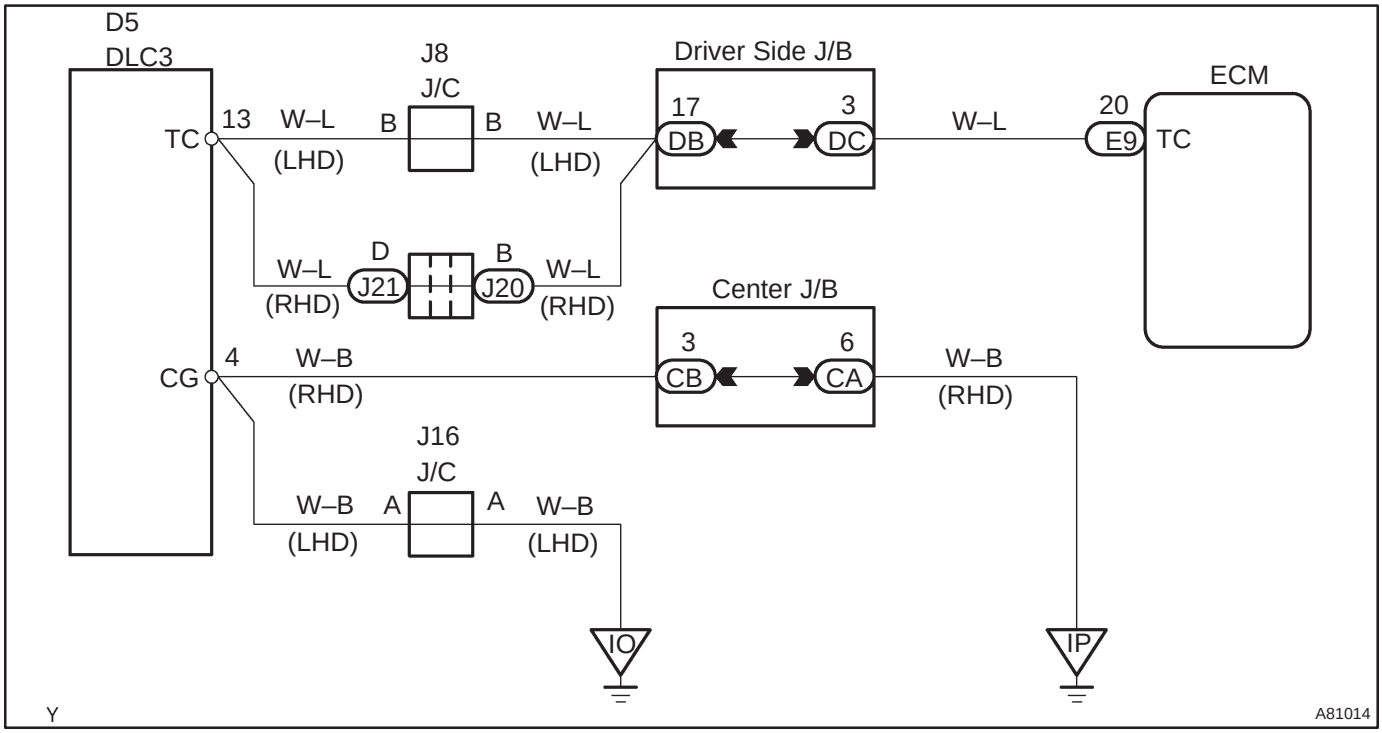
CHECK AND REPLACE ECM (See page 01–32)

TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

Terminals TC and CG are located in the DLC3. When connecting these terminals, DTCs in normal mode or check mode can be read through the CHK ENG flashing in the combination meter.

WIRING DIAGRAM

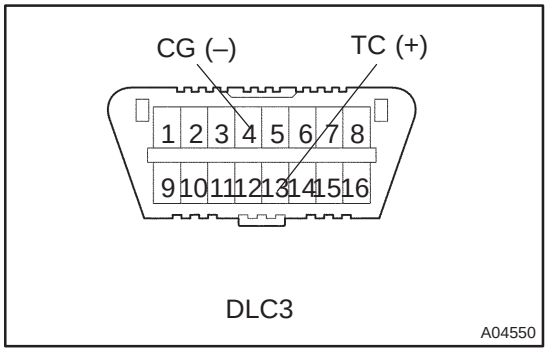


INSPECTION PROCEDURE

HINT:

- Even though terminal TC is not connected to terminal CG, the CHK ENG blinks.
- For the above phenomenon, an open or short in the wire harness, or malfunction inside the ECM is the likely cause.

1	CHECK DLC3(TC VOLTAGE)



(a) Turn the ignition switch ON.

(b) Measure the voltage between the terminals of the DLC3.

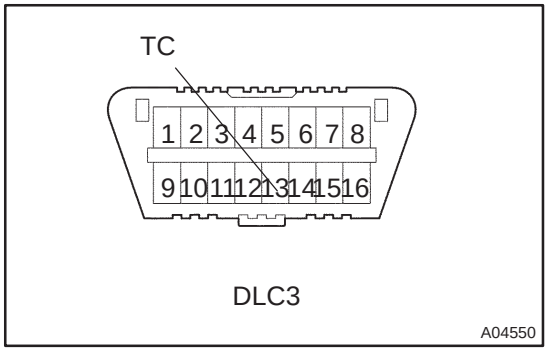
Standard:

Symbols (Terminal No.)	Specified condition
TC (13) – CG (4)	9 to 14 V

OK → **Go to step 3**

NG

2 CHECK HARNESS AND CONNECTOR(DLC3 – ECM)



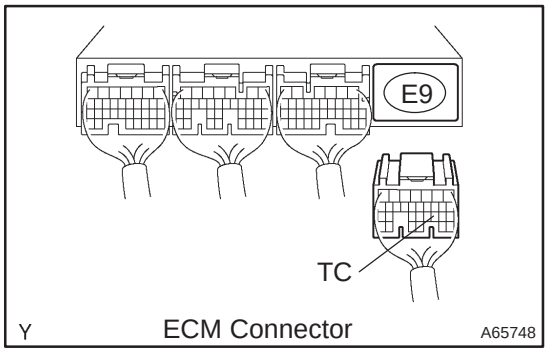
(a) Disconnect the E9 ECM connector.
(b) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
TC (13) – TC (E9–20)	Continuity

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
TC (13) or TC (E9–20) – Body ground	No continuity



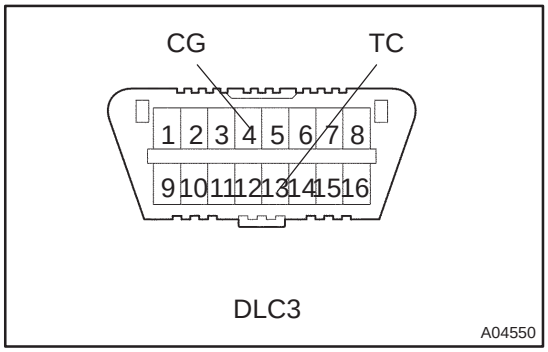
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (DLC3 – BODY GROUND)

3 CHECK CHK ENG CONDITION

SST 09843–18040



(a) Turn the ignition switch ON.
(b) Connect between terminals TC and CG of the DLC3 connector.
(c) Check that the CHK ENG blinks.

Standard: CHK ENG blinks

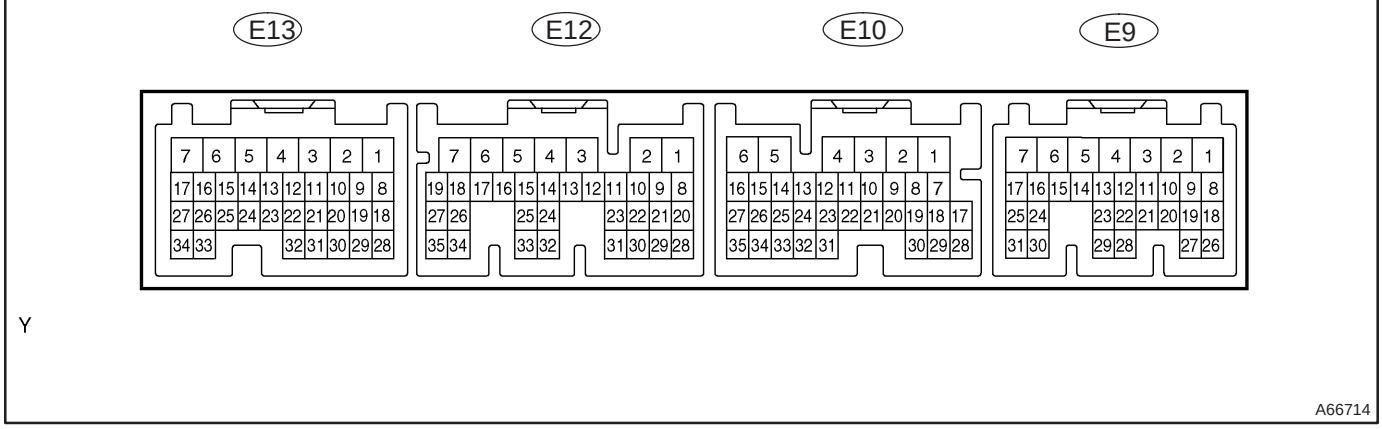
NG → **CHECK AND REPLACE ECM (See page 01–32)**

OK

NO PROBLEM

05C67–01

TERMINALS OF ECM



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E9 – 3) – E1 (E12 – 7)	B–Y – BR	Always	8 to 14
FC (E9 – 10) – E1 (E12 – 7)	G–Y – BR	IG switch ON	8 to 14
FC (E9 – 10) – E1 (E12 – 7)	G–Y – BR	Idling	Below 1.5
W (E9 – 11) – E1 (E12 – 7)	W – BR	Idling	8 to 14
W (E9 – 11) – E1 (E12 – 7)	W – BR	IG switch ON	Below 3.5
+B (E9 – 1) – E1 (E12 – 7)	B–R – BR	IG switch ON	8 to 14
STP (E10 – 19) – E1 (E12 – 7)	G–W – BR	IG switch ON, brake pedal depressed	8 to 14
STP (E10 – 19) – E1 (E12 – 7)	G–W – BR	IG switch ON, brake pedal released	Below 1.5
F/PS (E9 – 14) – E1 (E12 – 7)	LG–B – BR	IG switch ON	Pulse generation
STA (E12 – 9) – E1 (E12 – 7)	B–Y – BR	Cranking	5.5 or more
HT1B (E10 – 4) – E03 (E12 – 5)	P – W–B	Idling	Below 3.0
HT1B (E10 – 4) – E03 (E12 – 5)	P – W–B	IG switch ON	9 to 14
EMPS (E12 – 29) – E1 (E12 – 7)	GR – BR	IG switch ON	8 to 14
SPD (E10 – 17) – E1 (E12 – 7)	V–W – BR	IG switch ON, rotate driving wheel slowly	Pulse generation (See page 05–98)
OX1B (E12 – 21) – E2 (E13 – 28)	B – BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page 05–91)
TACH (E9 – 5) – E1 (E12 – 7)	GR–R – BR	Idling	Pulse generation
VC (E13 – 18) – E2 (E13 – 28)	R–W – BR	IG switch ON	4.5 to 5.5
HT1A (E12 – 4) – E03 (E12 – 5)	Y – W–B	Idling	Below 3.0
HT1A (E12 – 4) – E03 (E12 – 5)	Y – W–B	IG switch ON	9 to 14
EVP1 (E13 – 12) – E01 (E13 – 7)	W–G – W–B	IG switch ON	8 to 14
VG (E12 – 24) – EVG (E12 – 32)	G – L–Y	Idling, A/C switch OFF	1.1 to 1.5
OX1A (E12 – 23) – E2 (E13 – 28)	B – BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page 05–91)
THW (E13 – 19) – E2 (E13 – 28)	B–W – BR	Idling, Engine coolant temp. at 80°C (176°F)	0.2 to 1.0
G2 (E13 – 26) – NE– (E13 – 34)	W – R	Idling	Pulse generation (See page 05–84)
NE+ (E13 – 27) – NE– (E13 – 34)	G – R	Idling	Pulse generation (See page 05–84)
THA (E13 – 20) – E2 (E13 – 28)	G–R – BR	Idling, intake air temp. at 20 °C (68 °F)	0.5 to 3.4

VTA (E13 – 21) – E2 (E13 – 28)	L–W – BR	IG switch ON, throttle valve fully closed	0.3 to 1.0
VTA (E13 – 21) – E2 (E13 – 28)	L–W – BR	IG switch ON, throttle valve fully open	3.2 to 4.9
#10 (E13 – 1) – E01 (E13 – 7)	B–R – W–B	IG switch ON	8 to 14
#20 (E13 – 2) – E01 (E13 – 7)	Y – W–B	IG switch ON	8 to 14
#30 (E13 – 3) – E01 (E13 – 7)	W – W–B	IG switch ON	8 to 14
#40 (E13 – 4) – E01 (E13 – 7)	B – W–B	IG switch ON	8 to 14
IGT1 (E13 – 8) – E1 (E12 – 7)	R–W – BR	Idling	Pulse generation (See page 05–103)
IGT2 (E13 – 9) – E1 (E12 – 7)	P – BR	Idling	Pulse generation (See page 05–103)
IGT3 (E13 – 10) – E1 (E12 – 7)	LG–B – BR	Idling	Pulse generation (See page 05–103)
IGT4 (E13 – 11) – E1 (E12 – 7)	L–Y – BR	Idling	Pulse generation (See page 05–103)
IGF (E13 – 23) – E1 (E12 – 7)	W–R – BR	IG switch ON	4.5 to 5.5
IGF (E13 – 23) – E1 (E12 – 7)	W–R – BR	Idling	Pulse generation (See page 05–103)
RSO (E13 – 5) – E01 (E13 – 7)	G–R – W–B	IG switch ON	9 to 14
OCV+ (E13 – 15) – OCV– (E13 – 14)	W–G – Y–B	IG switch ON	Pulse generation (See page 05–112)
FKN+ (E12 – 1) – FKN– (E12 – 2)	B – W	Idling	Pulse generation (See page 05–81)
ELS2 (E9 – 13) – E1 (E12 – 7)	G – BR	Defoger switch ON	9 to 14
ELS2 (E9 – 13) – E1 (E12 – 7)	G – BR	IG switch ON	Below 3.0
MREL (E9 – 8) – E1 (E12 – 7)	GR – BR	IG switch ON	9 to 14
IGSW (E9 – 9) – E1 (E12 – 7)	B–W – BR	IG switch ON	9 to 14
TC (E9 – 20) – E1 (E12 – 7)	W–L – BR	IG switch ON	9 to 14
SIL (E9 – 18) – E1 (E12 – 7)	W–G – BR	Connect hand–held tester to DLC3	Pulse generation

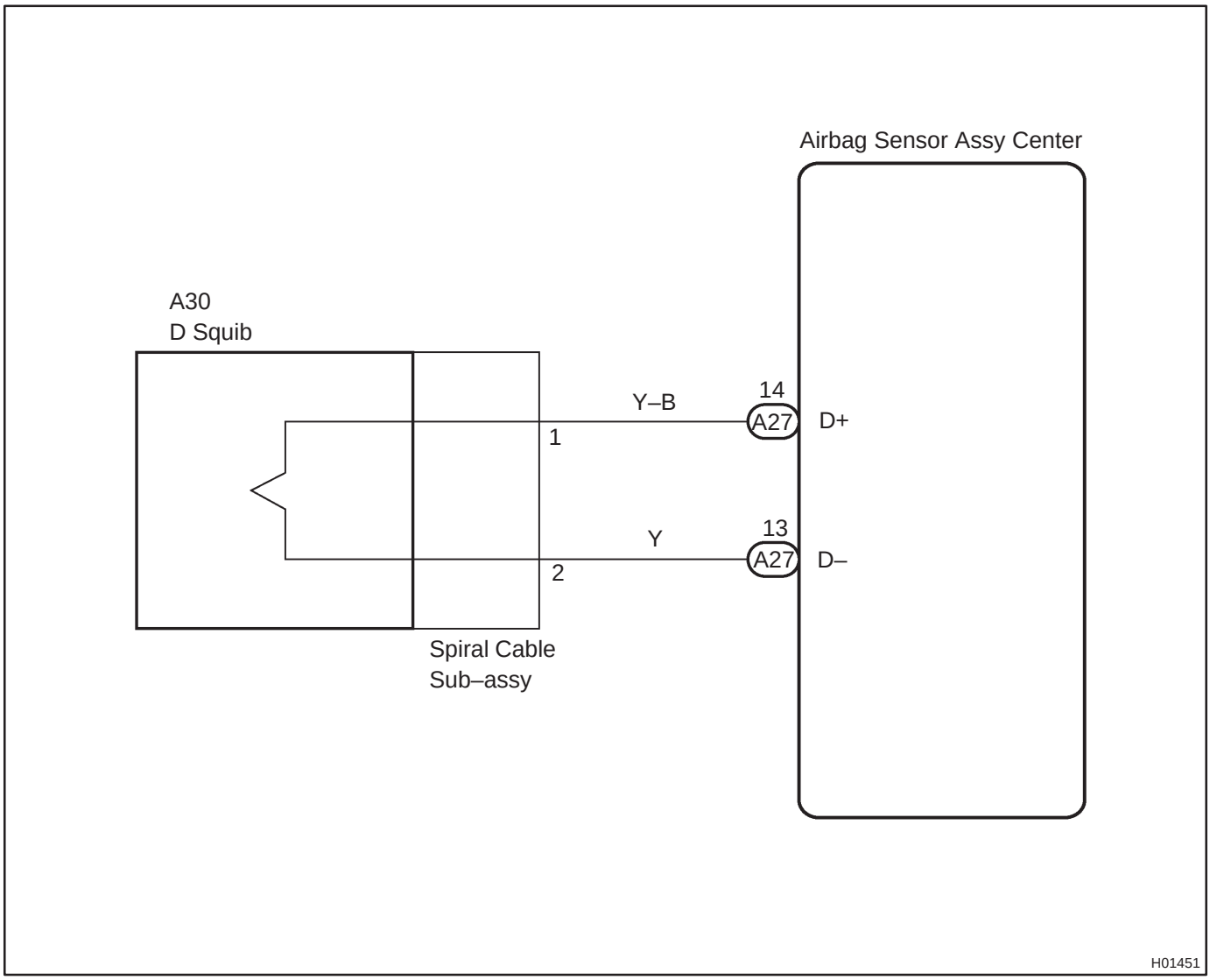
DTC B0100/13 SHORT IN D SQUIB CIRCUIT

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0100/13 is recorded when a short circuit is detected in the D squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0100/13	• Short circuit between D+ wire harness and D– wire harness of D squib • D squib malfunction • Spiral cable sub–assy malfunction • Airbag sensor assy center malfunction	• Horn button assy (D squib) • Spiral cable sub–assy • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM



INSPECTION PROCEDURE

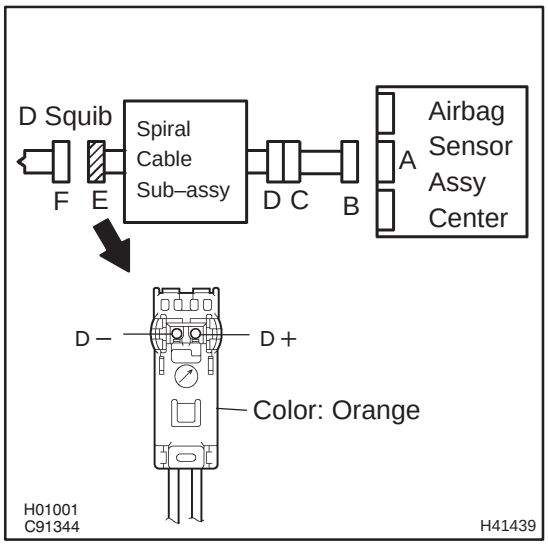
1	CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the horn button assy.
(d) Check that the spiral cable sub–assy connectors (on the horn button assy side) are not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

2	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)

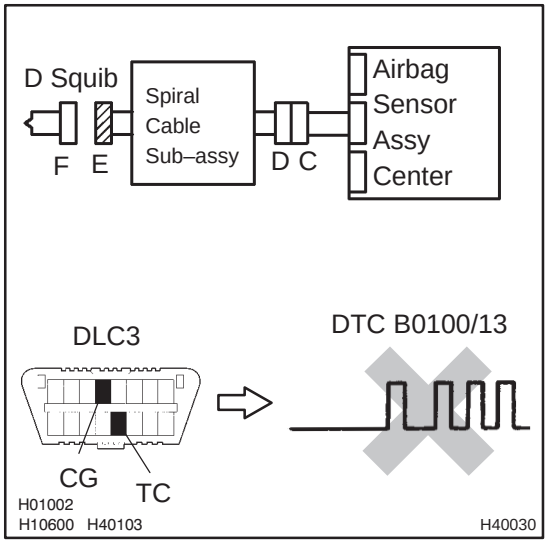


(a) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(b) Measure the resistance between D+ and D– of the connector "E".
OK:
Resistance: 1 MΩ or Higher

NG → **Go to step 5**

OK

3 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).

OK:

DTC B0100/13 is not output.

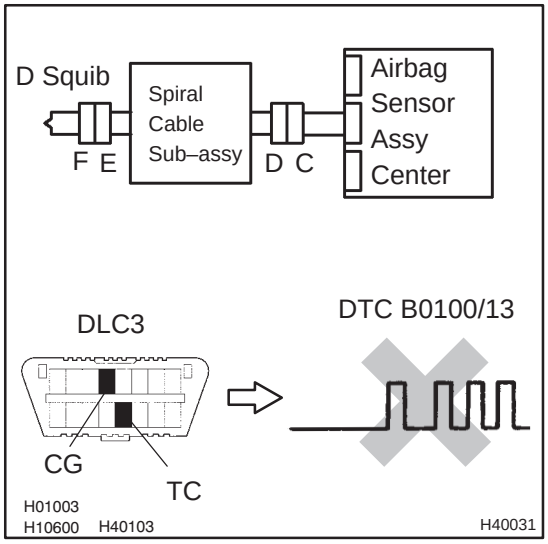
HINT:

Codes other than code B0100/13 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

4 CHECK HORN BUTTON ASSY(D SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the horn button assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).

OK:

DTC B0100/13 is not output.

HINT:

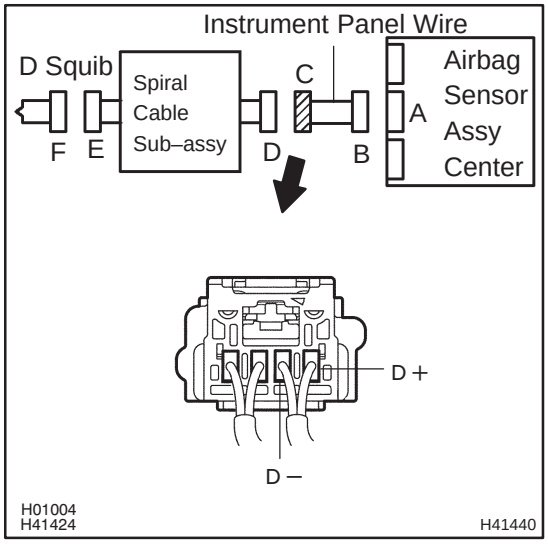
Codes other than code B0100/13 may be output at this time, but they are not related to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

USE SIMULATION METHOD TO CHECK

5 CHECK INSTRUMENT PANEL WIRE



(a) Disconnect the instrument panel wire connector from the spiral cable sub–assy.

(b) Release the activation prevention mechanism built in the connector of the connector "B" (See page 05–1184).

(c) Measure the resistance between D+ and D– of the connector "C".

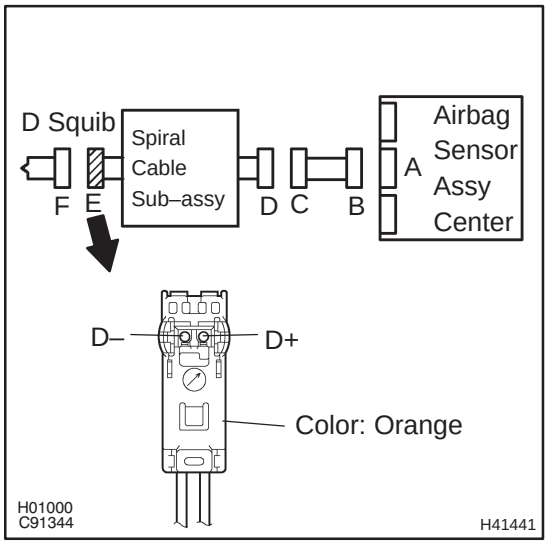
OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

6 CHECK SPIRAL CABLE SUB–ASSY



(a) Release the activation prevention mechanism built in the connector "D" (See page 05–1184).

(b) Measure the resistance between D+ and D– of the connector "E".

OK:

Resistance: 1 MΩ or Higher

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC B0101/14 OPEN IN D SQUIB CIRCUIT

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.

This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.

DTC B0101/14 is recorded when an open circuit is detected in the D squib circuit.

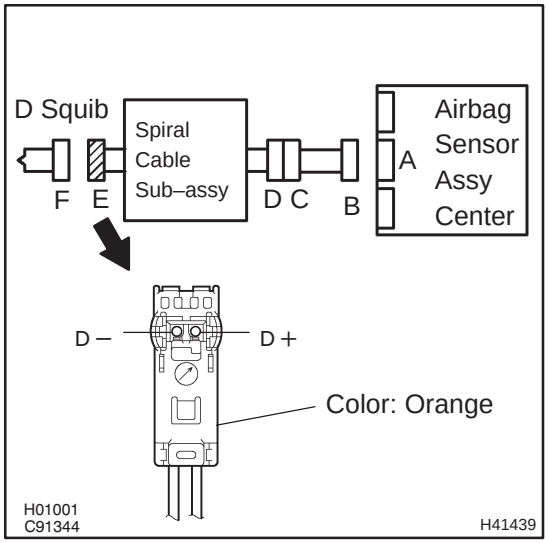
DTC No.	DTC Detecting Condition	Trouble Area
B0101/14	• Open circuit in D+ wire harness or D– wire harness of D squib • D squib malfunction • Spiral cable sub–assy malfunction • Airbag sensor assy center malfunction	• Horn button assy (D squib) • Spiral cable sub–assy • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1198.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)



(a) Turn the ignition switch to the LOCK position.

(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.

(c) Disconnect the connectors from the airbag sensor assy center and the horn button assy.

(d) Measure the resistance between D+ and D– of the connector ”E”.

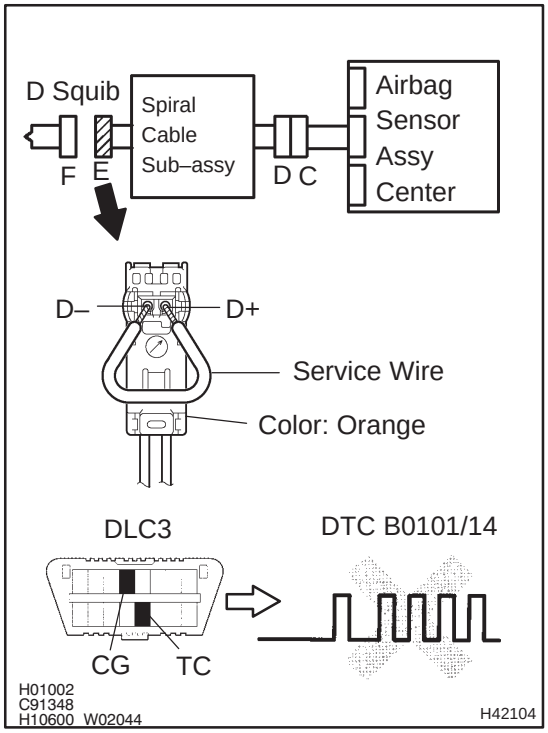
OK:

Resistance: Below 1 Ω

NG → **Go to step 4**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect D+ and D– of the connector "E".

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0101/14 is not output.

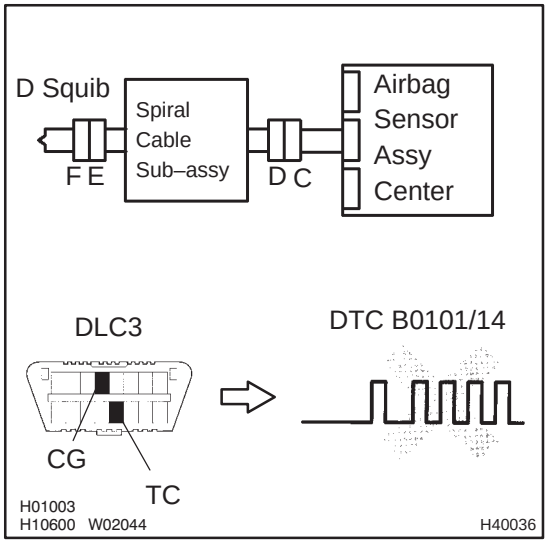
HINT:

Codes other than code B0101/14 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK HORN BUTTON ASSY(D SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the horn button assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0101/14 is not output.

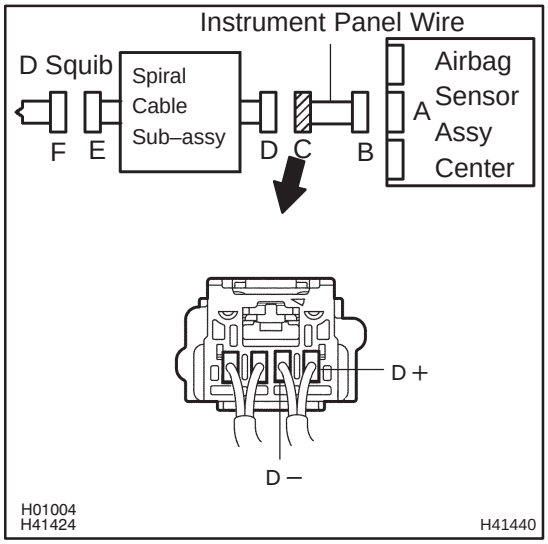
HINT:
Codes other than code B0101/14 may be output at this time, but they are not related to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

USE SIMULATION METHOD TO CHECK

4 CHECK INSTRUMENT PANEL WIRE

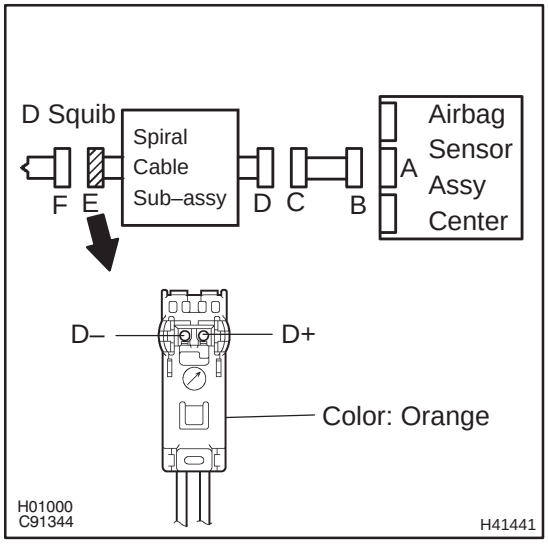


(a) Disconnect the instrument panel wire connector from the spiral cable sub–assy.
(b) Measure the resistance between D+ and D– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

5	CHECK SPIRAL CABLE SUB–ASSY



(a) Measure the resistance between D+ and D– of the connector ”E”.

OK:

Resistance: Below 1 Ω

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC B0102/11 SHORT IN D SQUIB CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0102/11 is recorded when a short to ground is detected in the D squib circuit.

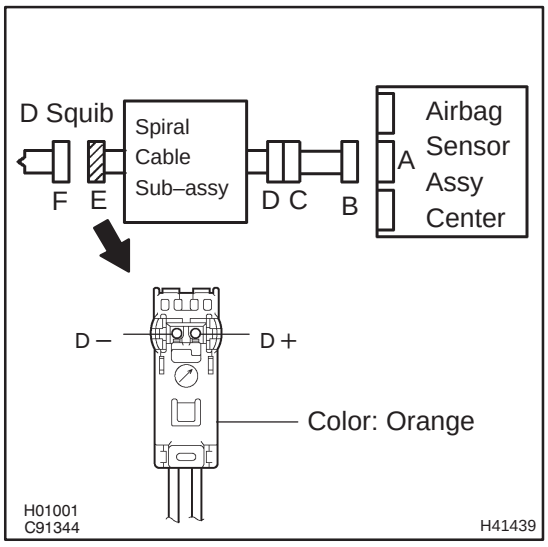
DTC No.	DTC Detecting Condition	Trouble Area
B0102/11	• Short circuit in D squib wire harness (to ground) • D squib malfunction • Spiral cable sub–assy malfunction • Airbag sensor assy center malfunction	• Horn button assy (D squib) • Spiral cable sub–assy • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1198.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)

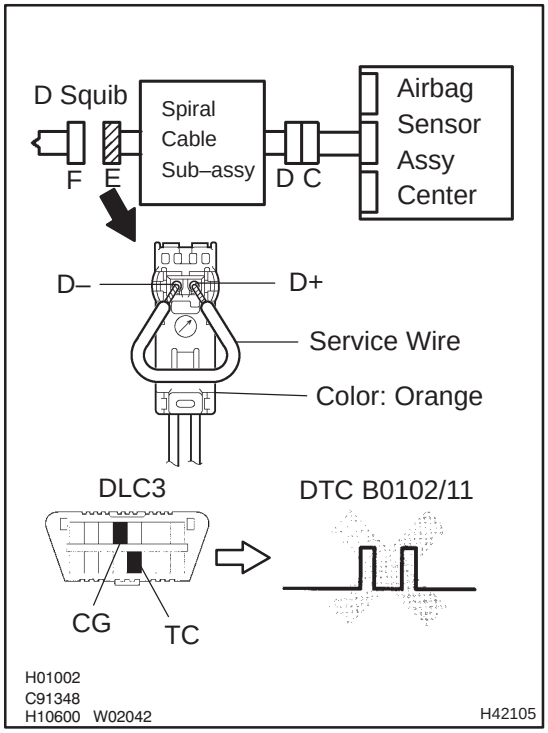


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the horn button assy.
(d) Measure the resistance between the body ground and D+ of the connector "E".
OK:
Resistance: 1 MΩ or Higher

NG → **Go to step 5**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect D+ and D– of the connector "E".

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0102/11 is not output.

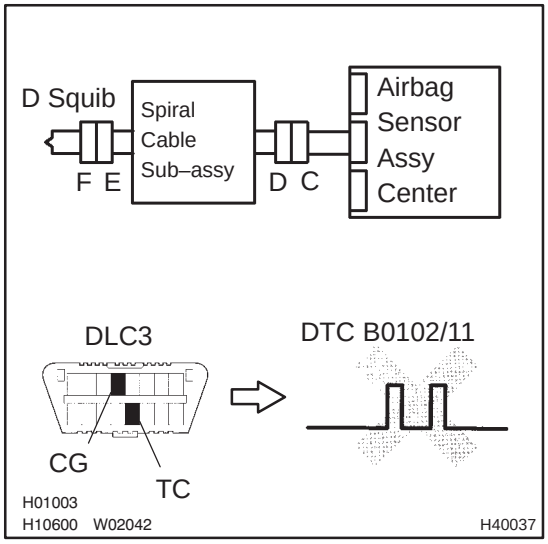
HINT:

Codes other than code B0102/11 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK HORN BUTTON ASSY(D SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the horn button assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).

OK:
DTC B0102/11 is not output.

HINT:
Codes other than code B0102/11 may be output at this time, but they are not related to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

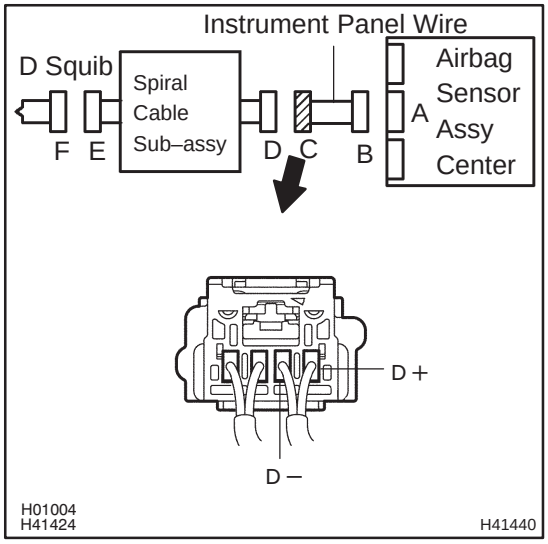
4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

5 CHECK INSTRUMENT PANEL WIRE



(a) Disconnect the instrument panel wire connector from the spiral cable sub–assy.

(b) Measure the resistance between the body ground and D+ of the connector "C".

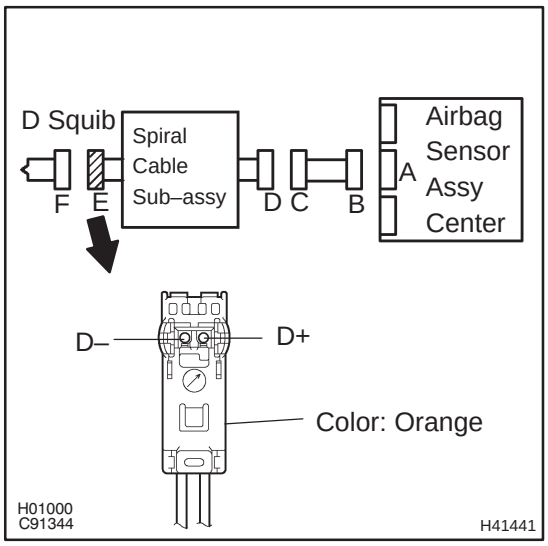
OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

6 CHECK SPIRAL CABLE SUB–ASSY



(a) Measure the resistance between the body ground and D+ of the connector "E".

OK:

Resistance: 1 MΩ or Higher

NG → **REPLACE SPIRAL CABLE SUB–ASSY**

OK

7 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC B0103/12 SHORT IN D SQUIB CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assy center, the spiral cable sub–assy and the horn button assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0103/12 is recorded when a short to B+ is detected in the D squib circuit.

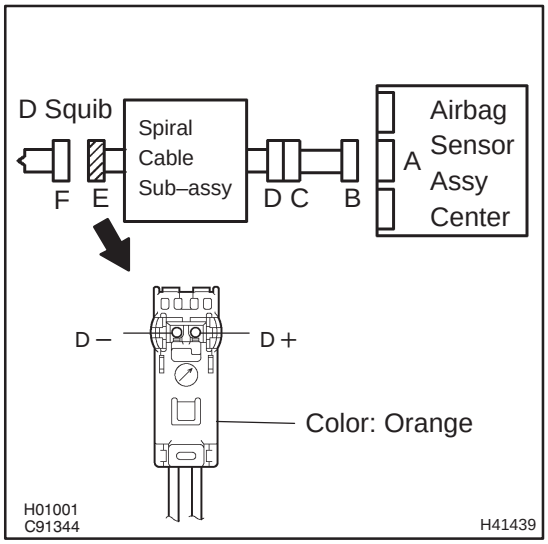
DTC No.	DTC Detecting Condition	Trouble Area
B0103/12	• Short circuit in D squib wire harness (to B+) • D squib malfunction • Spiral cable sub–assy malfunction • Airbag sensor assy center malfunction	• Horn button assy (D squib) • Spiral cable sub–assy • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1198.

INSPECTION PROCEDURE

1	CHECK D SQUIB CIRCUIT(AIRBAG SENSOR ASSY CENTER – HORN BUTTON ASSY)

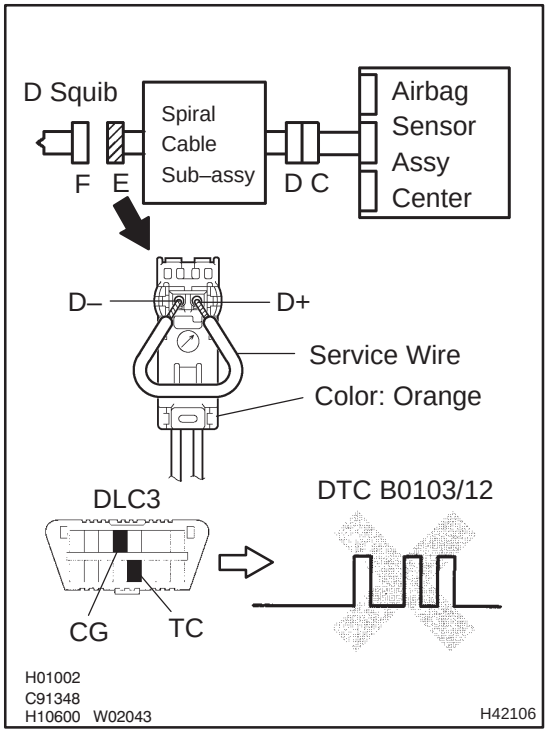


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the horn button assy.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and D+ of the connector "E".
OK:
Voltage: Below 1 V

NG → **Go to step 5**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect D+ and D– of the connector "E".

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

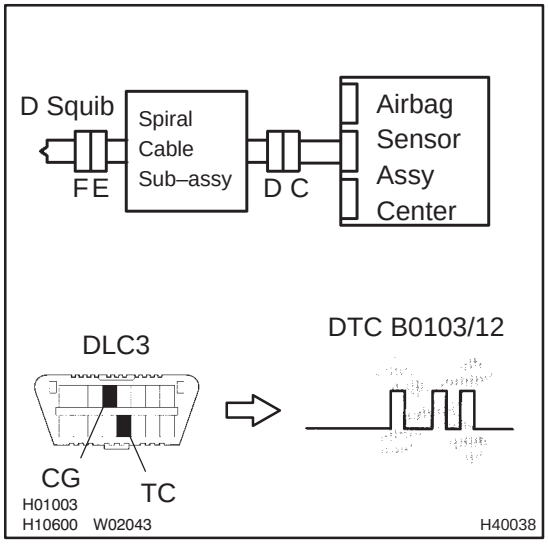
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0103/12 is not output.

HINT:
Codes other than code B0103/12 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK HORN BUTTON ASSY(D SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the horn button assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).

OK:
DTC B0103/12 is not output.

HINT:
Codes other than code B0103/12 may be output at this time, but they are not related to this check.

NG → **REPLACE HORN BUTTON ASSY**

OK

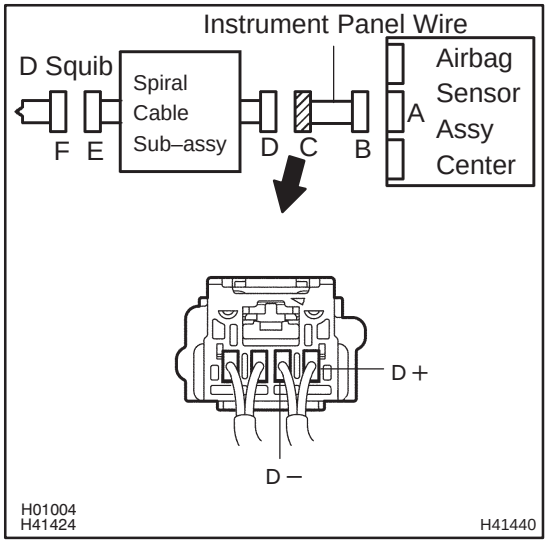
4 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

5 CHECK INSTRUMENT PANEL WIRE

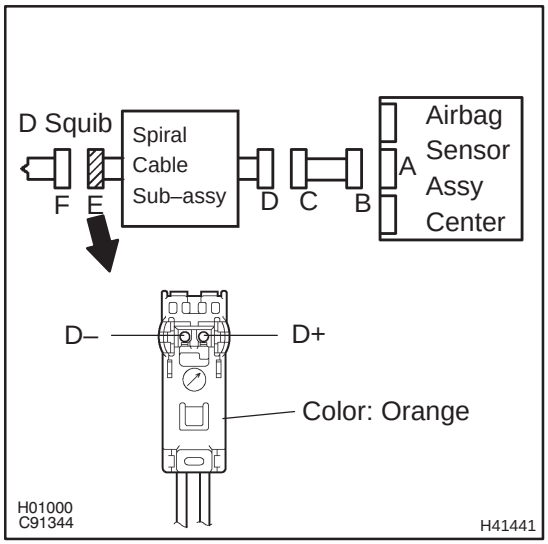


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the instrument panel wire connector from the spiral cable sub–assy.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and D+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG	REPAIR OR REPLACE INSTRUMENT PANEL WIRE

OK

6 CHECK SPIRAL CABLE SUB–ASSY



(a) Turn the ignition switch to the LOCK position.
(b) Turn the ignition switch to the ON position.
(c) Measure the voltage between the body ground and D+ of the connector ”E”.
OK:
Voltage: Below 1 V

NG	REPLACE SPIRAL CABLE SUB–ASSY

OK

7 USE SIMULATION METHOD TO CHECK

NG	Go to step 1

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

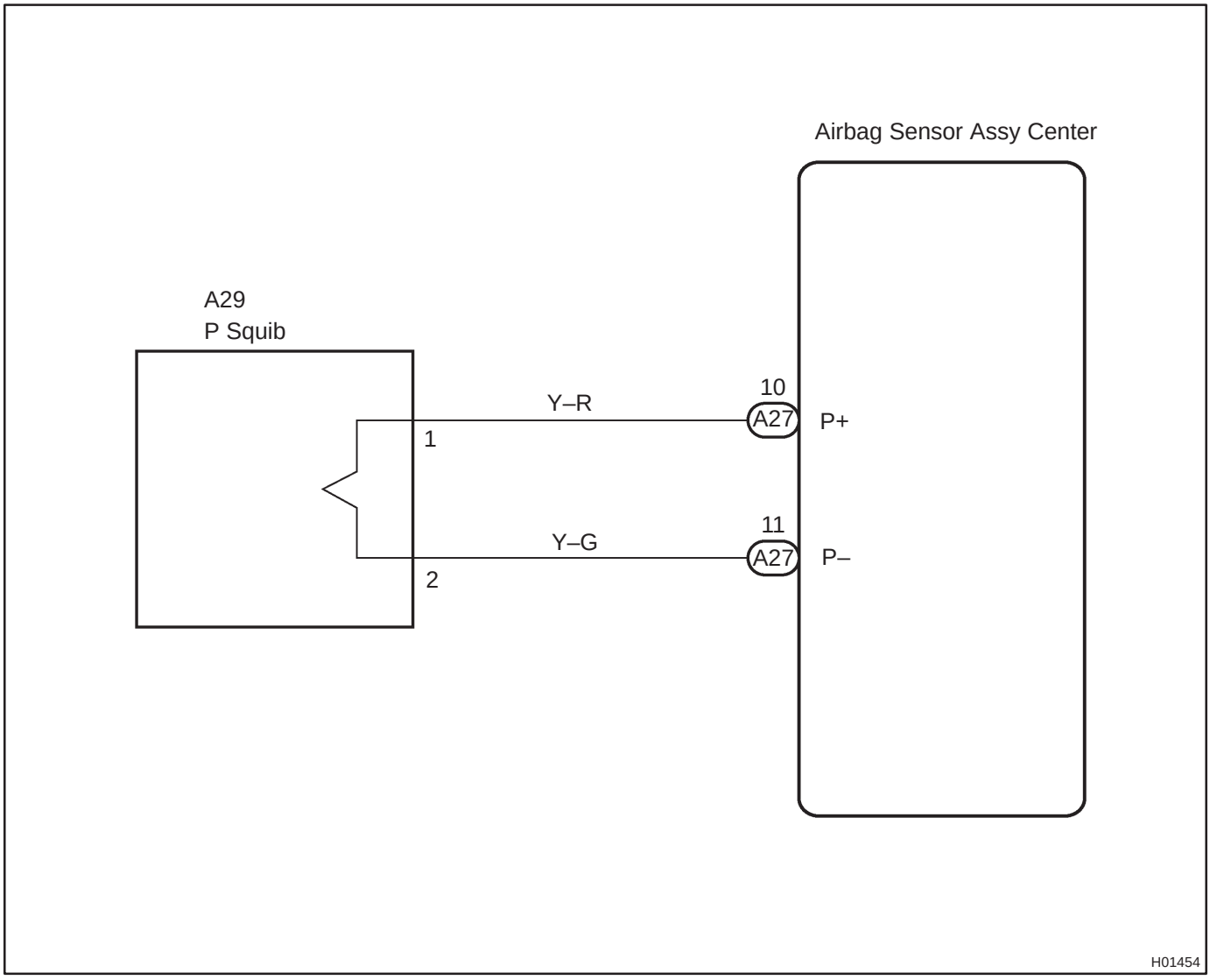
DTC B0105/53 SHORT IN P SQUIB CIRCUIT

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instrument panel passenger airbag assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0105/53 is recorded when a short circuit is detected in the P squib circuit.

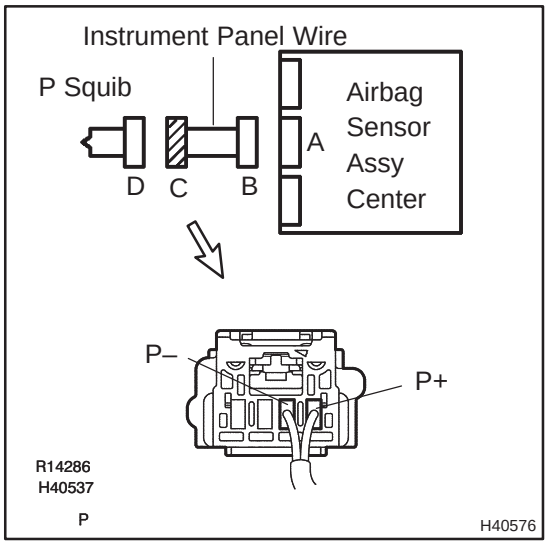
DTC No.	DTC Detecting Condition	Trouble Area
B0105/53	• Short circuit between P+ wire harness and P– wire harness of P squib • P squib malfunction • Airbag sensor assy center malfunction	• Instrument panel passenger airbag assy (P squib) • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)

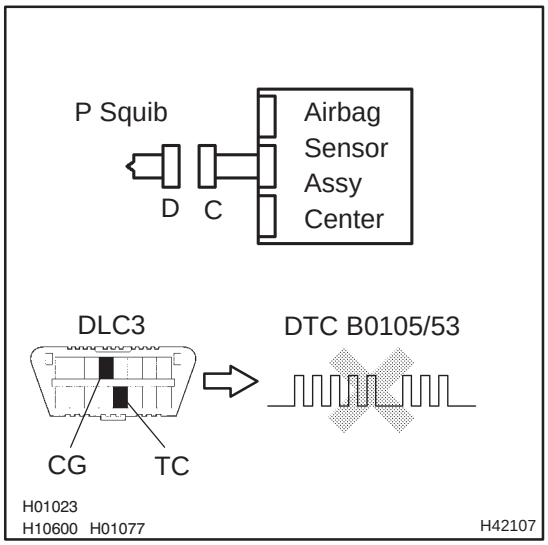


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors between the airbag sensor assy center and the instrument panel passenger airbag assy.
(d) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(e) Measure the resistance between P+ and P– of the connector "E".
OK:
Resistance: 1 MΩ or Higher

NG	REPAIR OR REPLACE INSTRUMENT PANEL WIRE

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



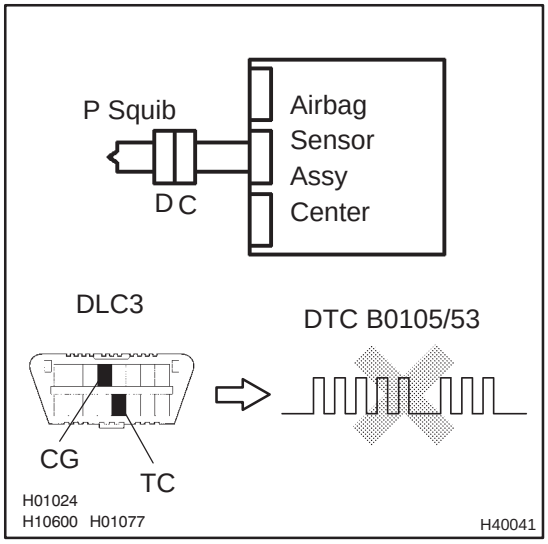
(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B0105/53 is not output.

HINT:
Codes other than code B0105/53 may be output at this time, but they are not related to this check.

NG	REPLACE AIR BAG SENSOR ASSY CENTER

OK

3	CHECK INSTRUMENT PANEL PASSENGER AIR BAG ASSY(P SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the instrument panel passenger airbag assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0105/53 is not output.

HINT:
Codes other than code B0105/53 may be output at this time, but they are not related to this check.

NG → **REPLACE INSTRUMENT PANEL PASSENGER AIR BAG ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC B0106/54 OPEN IN P SQUIB CIRCUIT

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instrument panel passenger airbag assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0106/54 is recorded when an open circuit is detected in the P squib circuit.

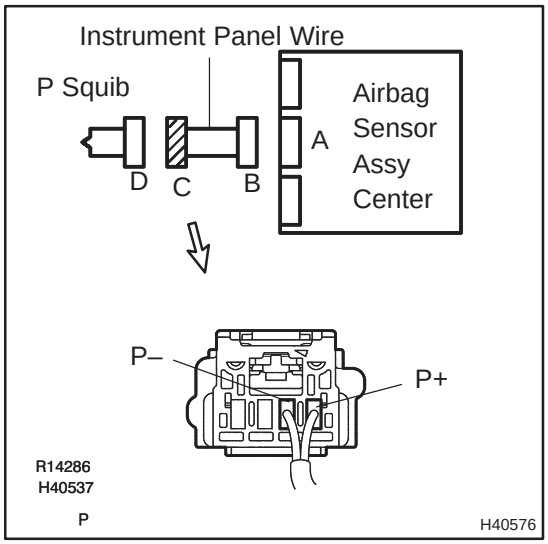
DTC No.	DTC Detecting Condition	Trouble Area
B0106/54	• Open circuit in P+ wire harness or P– wire harness of P squib • P squib malfunction • Airbag sensor assy center malfunction	• Instrument panel passenger airbag assy (P squib) • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1214.

INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)

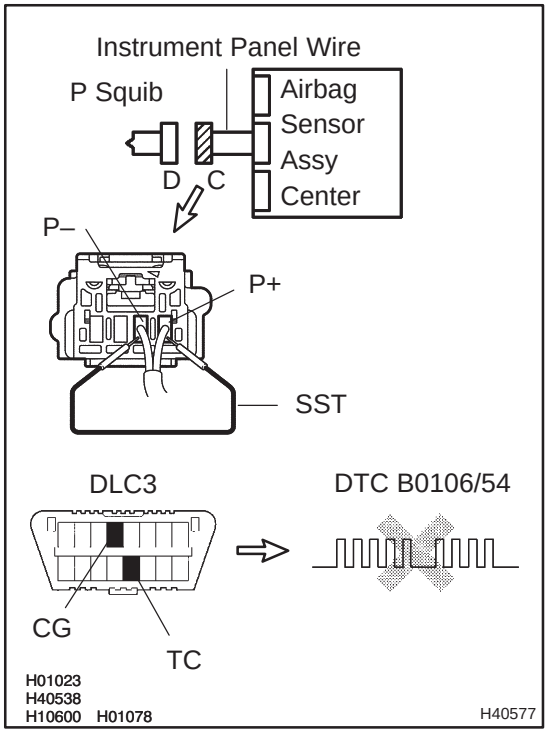


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the instrument panel passenger airbag assy.
(d) Measure the resistance between P+ and P– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



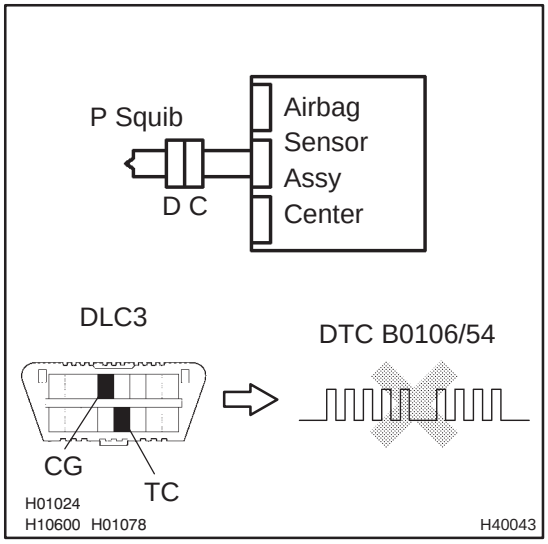
(a) Connect the connector to the airbag sensor assy center.
(b) Using SST, connect P+ and P– of the connector ”C”.
SST 09843–18040
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B0106/54 is not output.

HINT:
Codes other than code B0106/54 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK INSTRUMENT PANEL PASSENGER AIR BAG ASSY(P SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the instrument panel passenger airbag assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0106/54 is not output.

HINT:
Codes other than code B0106/54 may be output at this time, but they are not related to this check.

NG → **REPLACE INSTRUMENT PANEL PASSENGER AIR BAG ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC B0107/51 SHORT IN P SQUIB CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instrument panel passenger airbag assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0107/51 is recorded when a short to ground is detected in the P squib circuit.

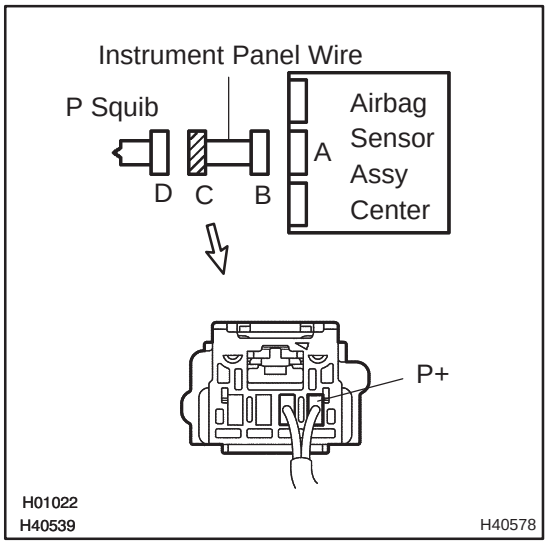
DTC No.	DTC Detecting Condition	Trouble Area
B0107/51	• Short circuit in P squib wire harness (to ground) • P squib malfunction • Airbag sensor assy center malfunction	• Instrument panel passenger airbag assy (P squib) • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1214.

INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)

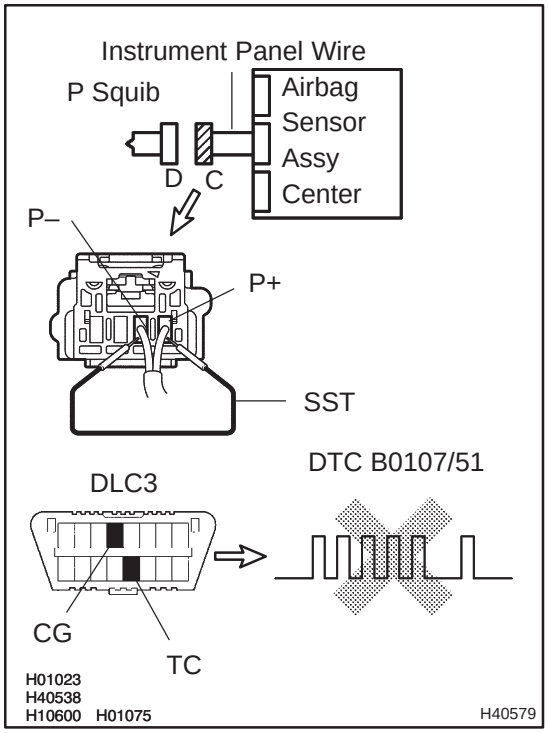


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the instrument panel passenger airbag assy.
(d) Measure the resistance between the body ground and P+ of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



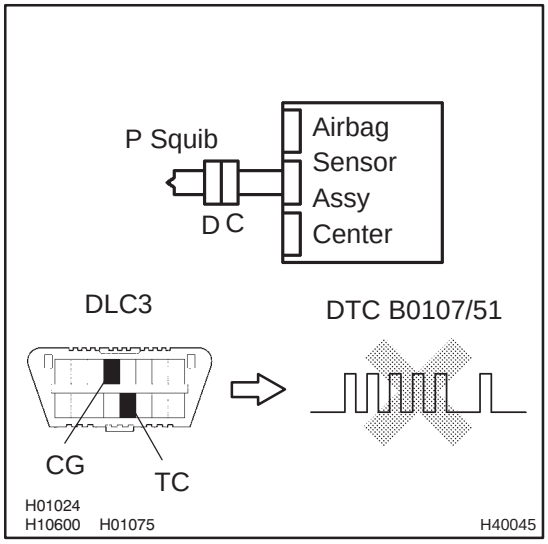
(a) Connect the connector to the airbag sensor assy center.
(b) Using SST, connect P+ and P– of the connector ”C”.
SST 09843–18040
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B0107/51 is not output.

HINT:
Codes other than code B0107/51 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK INSTRUMENT PANEL PASSENGER AIR BAG ASSY(P SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the instrument panel passenger airbag assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0107/51 is not output.

HINT:
Codes other than code B0107/51 may be output at this time, but they are not related to this check.

NG → **REPLACE INSTRUMENT PANEL PASSENGER AIR BAG ASSY**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC B0108/52 SHORT IN P SQUIB CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assy center and the instrument panel passenger airbag assy.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0108/52 is recorded when a short to B+ is detected in the P squib circuit.

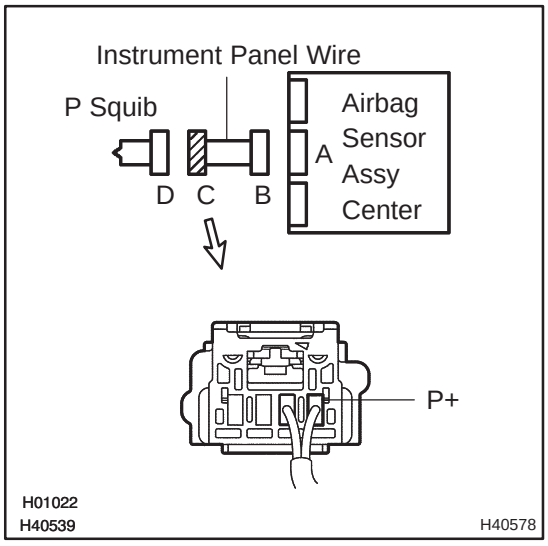
DTC No.	DTC Detecting Condition	Trouble Area
B0108/52	• Short circuit in P squib wire harness (to B+) • P squib malfunction • Airbag sensor assy center malfunction	• Instrument panel passenger airbag assy (P squib) • Airbag sensor assy center • Instrument panel wire

WIRING DIAGRAM

See page 05–1214.

INSPECTION PROCEDURE

1 CHECK INSTRUMENT PANEL WIRE(P SQUIB CIRCUIT)

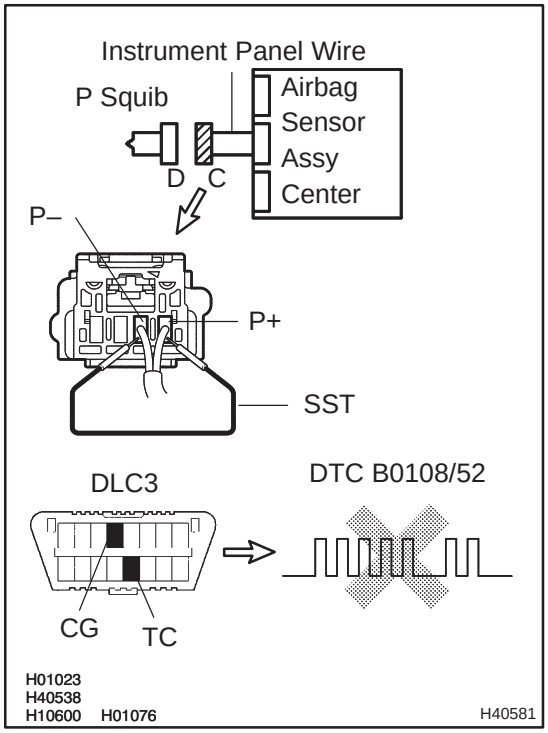


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the instrument panel passenger airbag assy.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and P+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE INSTRUMENT PANEL WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



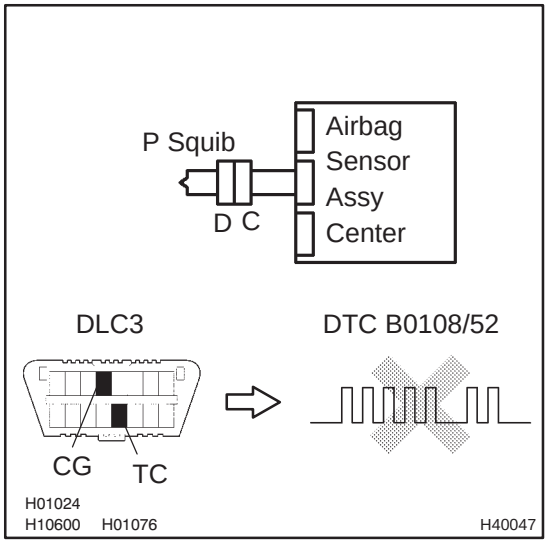
(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using SST, connect P+ and P– of the connector ”C”.
SST 09843–18040
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0108/52 is not output.

HINT:
Codes other than code B0108/52 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK INSTRUMENT PANEL PASSENGER AIR BAG ASSY(P SQUIB)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the instrument panel passenger airbag assy.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0108/52 is not output.

HINT:
Codes other than code B0108/52 may be output at this time, but they are not related to this check.

NG → **REPLACE INSTRUMENT PANEL PASSENGER AIR BAG ASSY**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

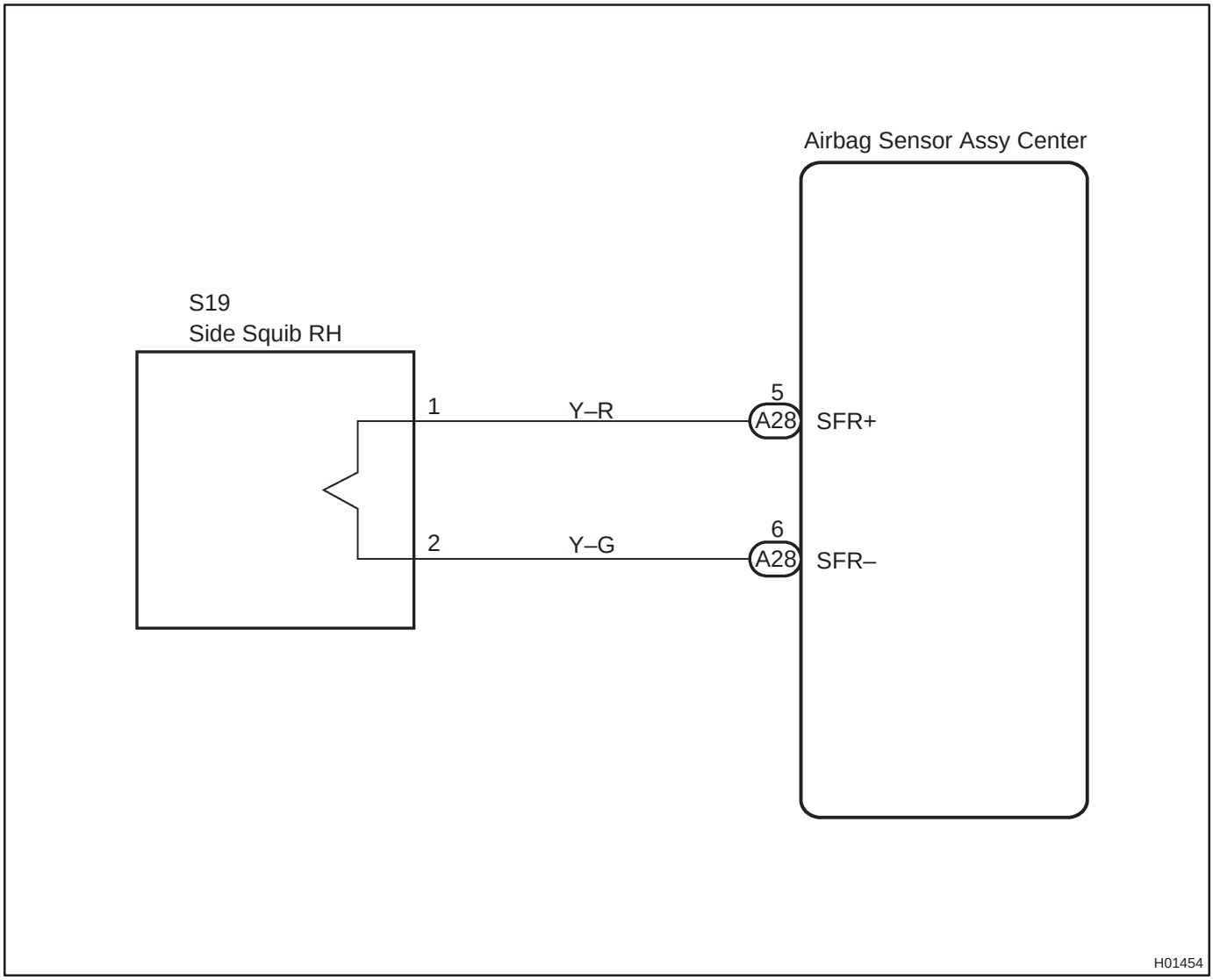
DTC B0110/43 SHORT IN SIDE SQUIB (RH) CIRCUIT

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0110/43 is recorded when a short circuit is detected in the side squib RH circuit.

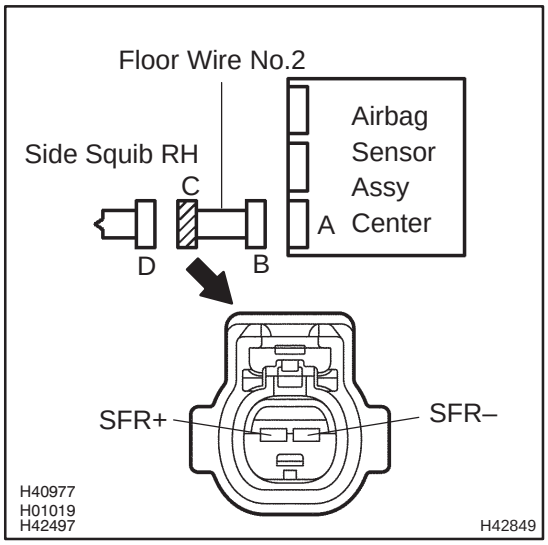
DTC No.	DTC Detecting Condition	Trouble Area
B0110/43	• Short circuit between SFR+ wire harness and SFR– wire harness of side squib RH • Side squib RH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK FLOOR WIRE NO.2(SIDE SQUIB RH CIRCUIT)

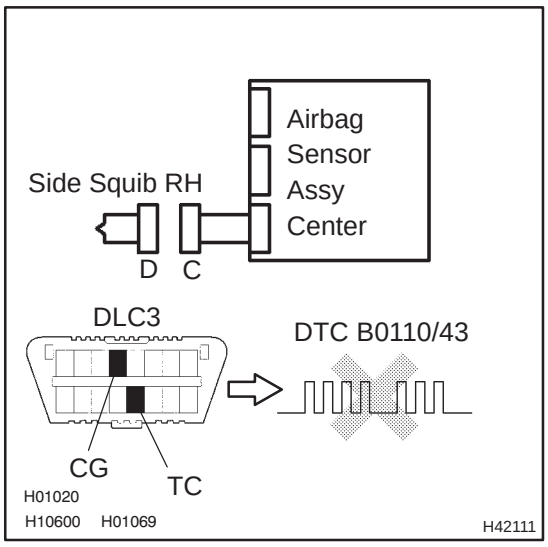


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib RH).
(d) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(e) Measure the resistance between SFR+ and SFR– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



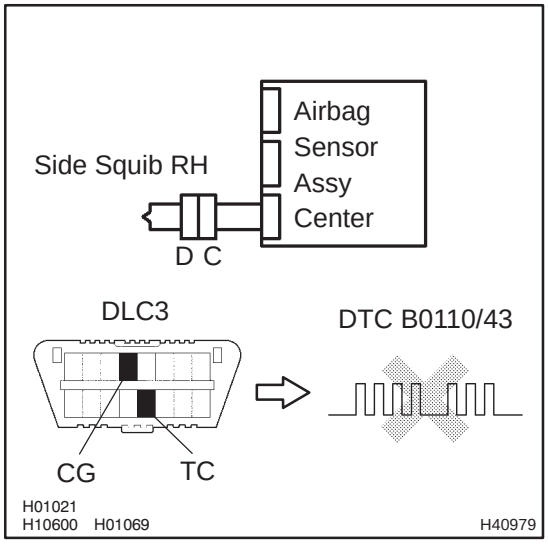
(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B0110/43 is not output.

HINT:
Codes other than code B0110/43 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib RH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0110/43 is not output.

HINT:
Codes other than code B0110/43 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC B0111/44 OPEN IN SIDE SQUIB (RH) CIRCUIT

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0111/44 is recorded when an open circuit is detected in the side squib RH circuit.

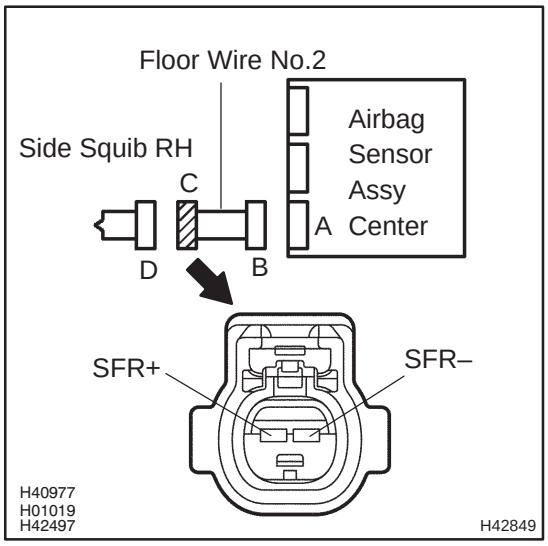
DTC No.	DTC Detecting Condition	Trouble Area
B0111/44	• Open circuit in SFR+ wire harness or SFR– wire harness of side squib RH • Side squib RH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1226.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE NO.2(SIDE SQUIB RH CIRCUIT)

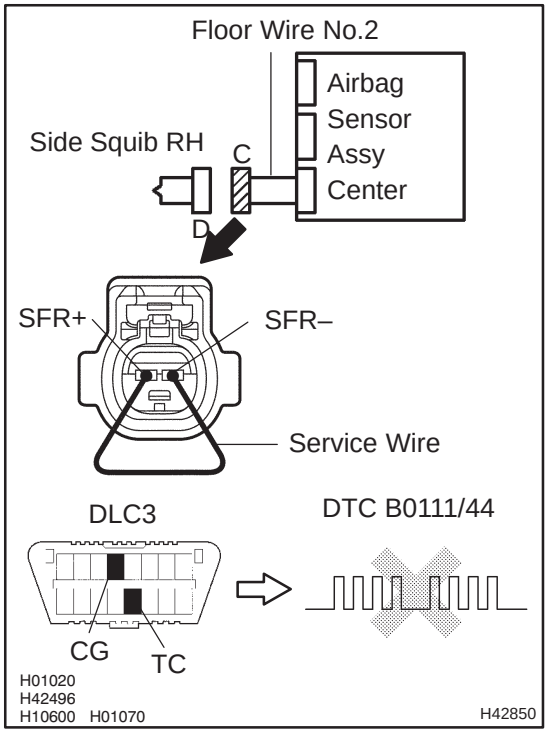


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib RH).
(d) Measure the resistance between SFR+ and SFR– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFR+ and SFR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0111/44 is not output.

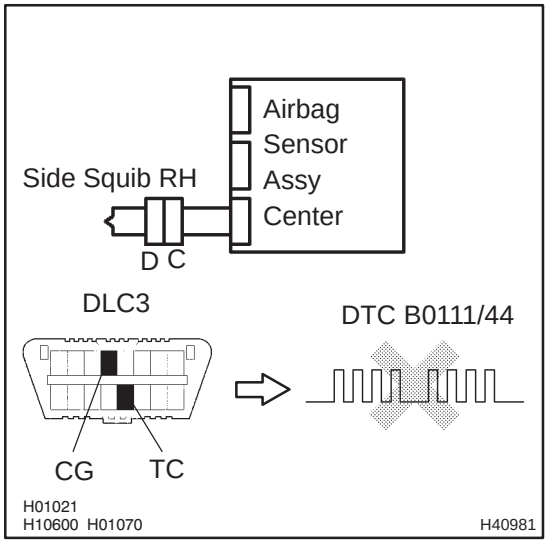
HINT:

Codes other than code B0111/44 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib RH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0111/44 is not output.

HINT:
Codes other than code B0111/44 may be output at this time, but they are not related to this check.

NG	**REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

USE SIMULATION METHOD TO CHECK

DTC	B0112/41	SHORT IN SIDE SQUIB (RH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0112/41 is recorded when a short to ground is detected in the side squib RH circuit.

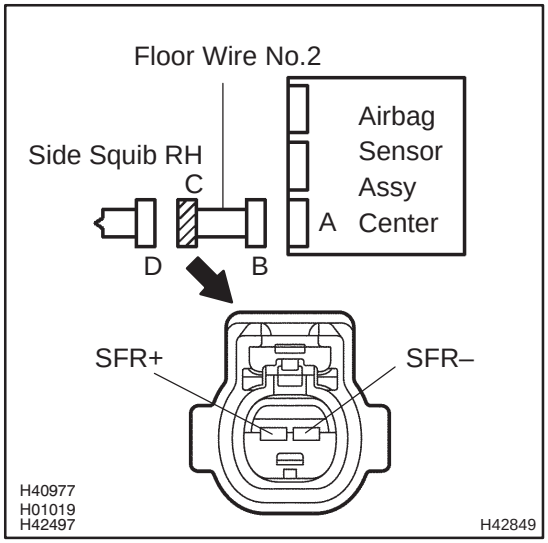
DTC No.	DTC Detecting Condition	Trouble Area
B0112/41	• Short circuit in side squib RH wire harness (to ground) • Side squib RH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1226.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(SIDE SQUIB RH CIRCUIT)

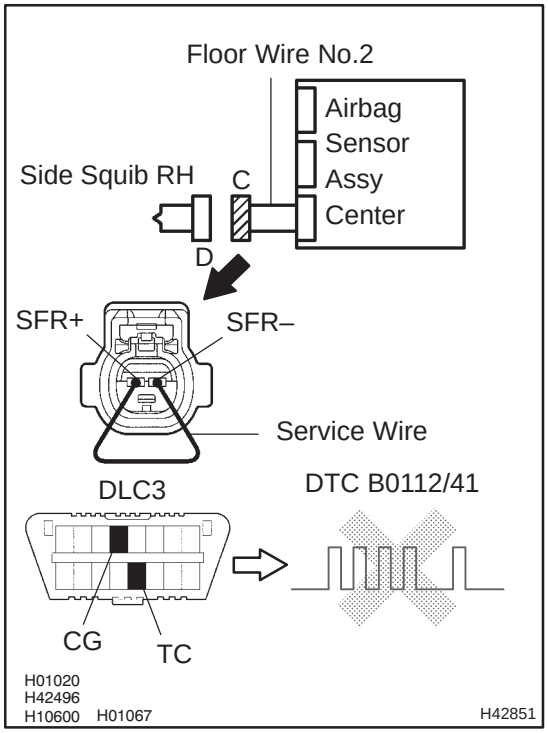


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib RH).
(d) Measure the resistance between the body ground and SFR+ of the connector ”C”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFR+ and SFR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0112/41 is not output.

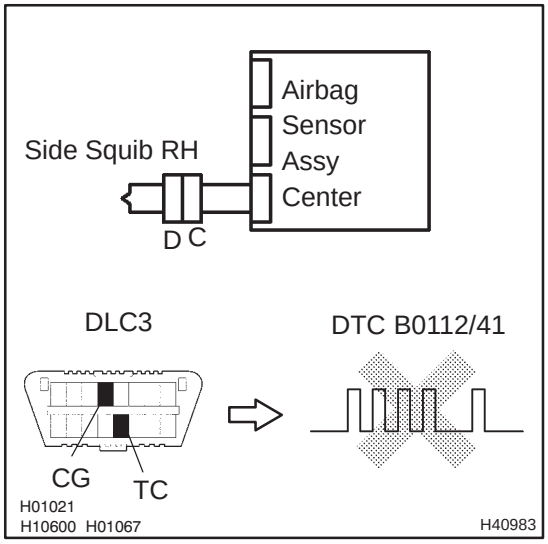
HINT:

Codes other than code B0112/41 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib RH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0112/41 is not output.

HINT:
Codes other than code B0112/41 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

4 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B0113/42	SHORT IN SIDE SQUIB (RH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0113/42 is recorded when a short to B+ is detected in the side squib RH circuit.

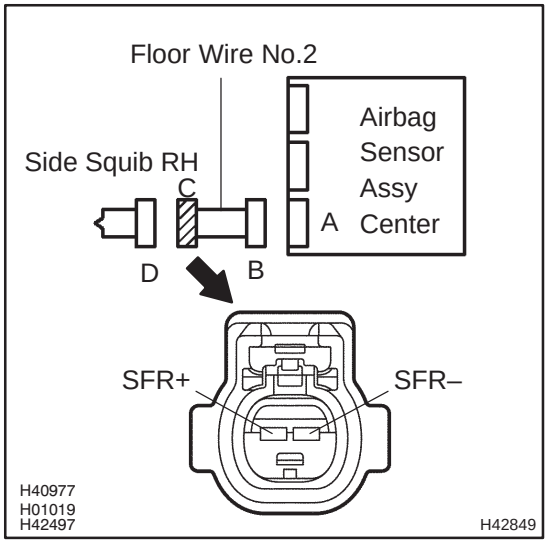
DTC No.	DTC Detecting Condition	Trouble Area
B0113/42	• Short circuit in side squib RH wire harness (to B+) • Side squib RH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1226.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(SIDE SQUIB RH CIRCUIT)

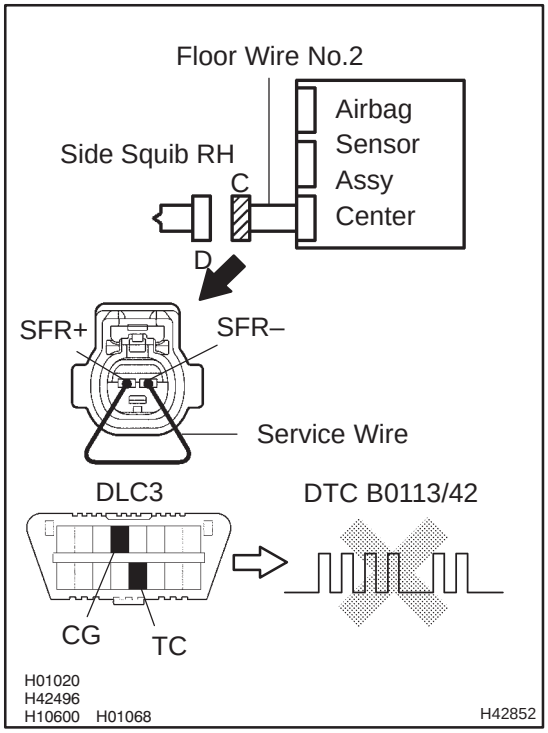


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib RH).
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and SFR+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect SFR+ and SFR– of the connector "C".

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

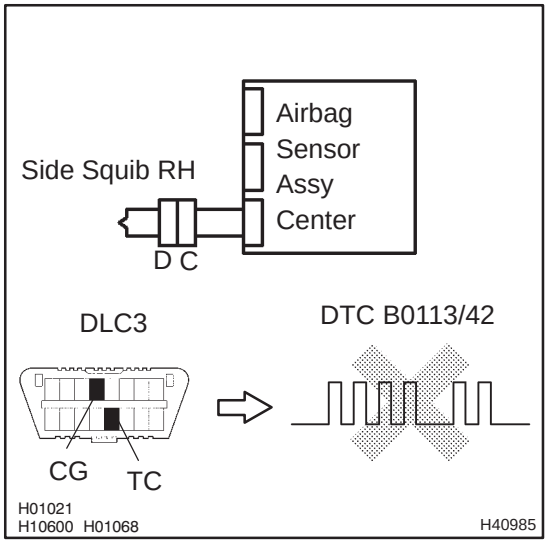
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0113/42 is not output.

HINT:
Codes other than code B0113/42 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib RH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0113/42 is not output.

HINT:
Codes other than code B0113/42 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

4 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

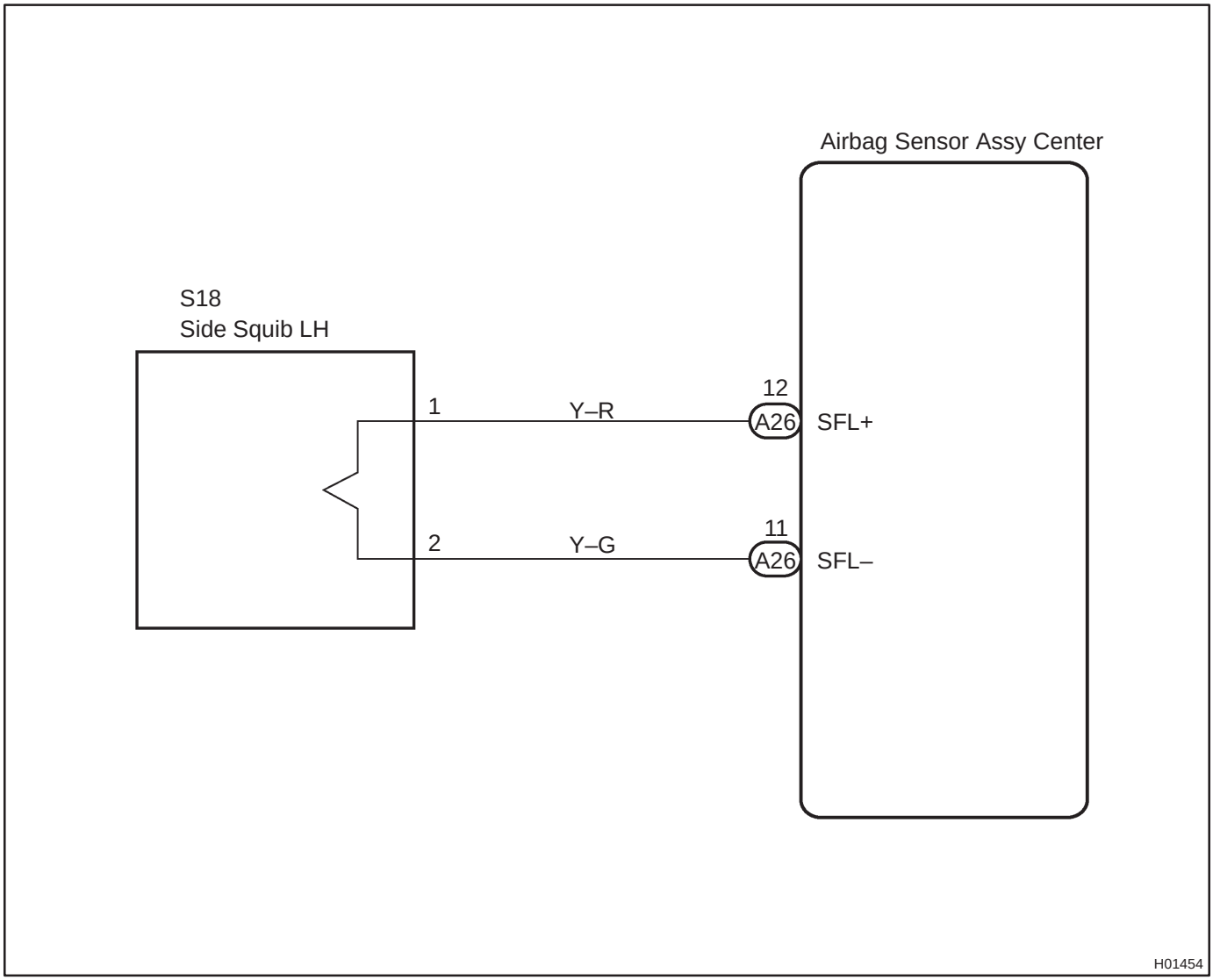
DTC B0115/47 SHORT IN SIDE SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0115/47 is recorded when a short circuit is detected in the side squib LH circuit.

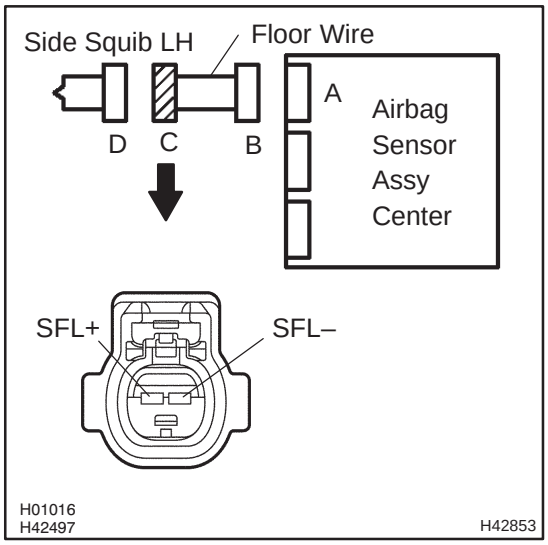
DTC No.	DTC Detecting Condition	Trouble Area
B0115/47	• Short circuit between SFL+ wire harness and SFL– wire harness of side squib LH • Side squib LH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK FLOOR WIRE(SIDE SQUIB LH CIRCUIT)

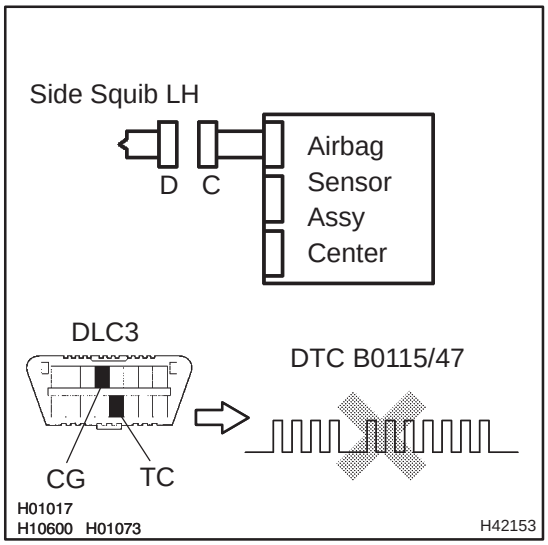


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib LH).
(d) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(e) Measure the resistance between SFL+ and SFL– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



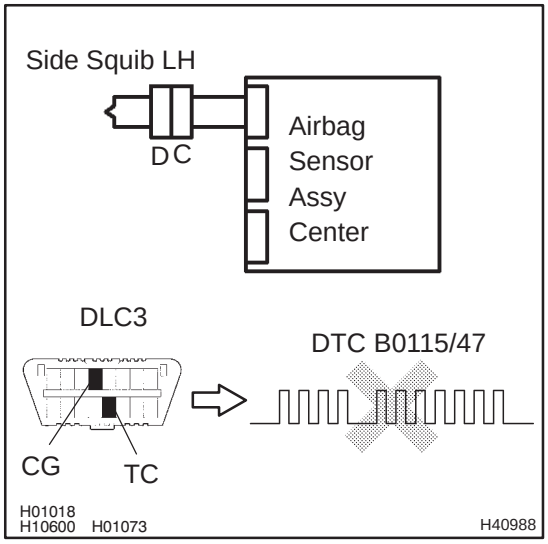
(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B0115/47 is not output.

HINT:
Codes other than code B0115/47 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib LH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0115/47 is not output.

HINT:
Codes other than code B0115/47 may be output at this time, but they are not related to this check.

NG	REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY

OK

USE SIMULATION METHOD TO CHECK

DTC B0116/48 OPEN IN SIDE SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib LH).
This circuit the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0116/48 is recorded when an open circuit is detected in the side squib LH circuit.

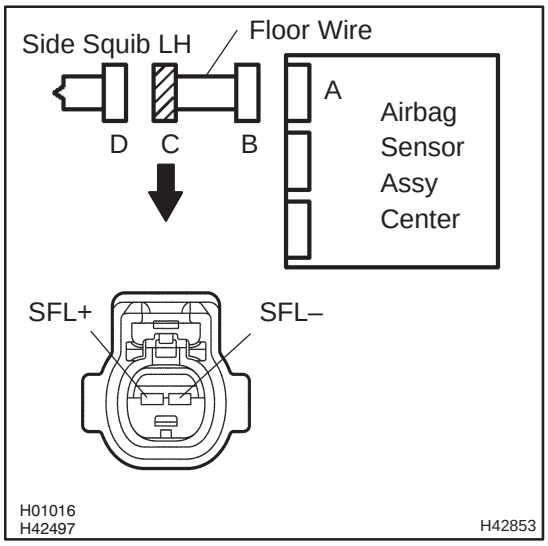
DTC No.	DTC Detecting Condition	Trouble Area
B0116/48	• Open circuit in SFL+ wire harness or SFL– wire harness of side squib LH • Side squib LH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1238.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE(SIDE SQUIB LH CIRCUIT)

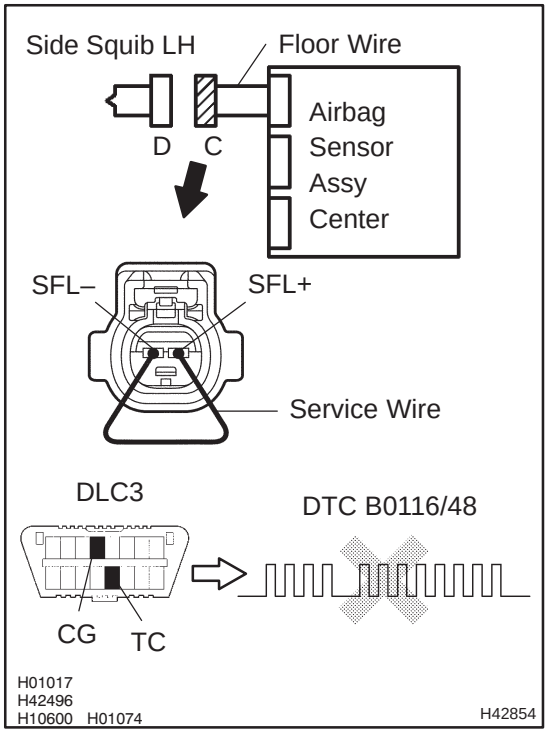


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib LH).
(d) Measure the resistance between SFL+ and SFL– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFL+ and SFL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0116/48 is not output.

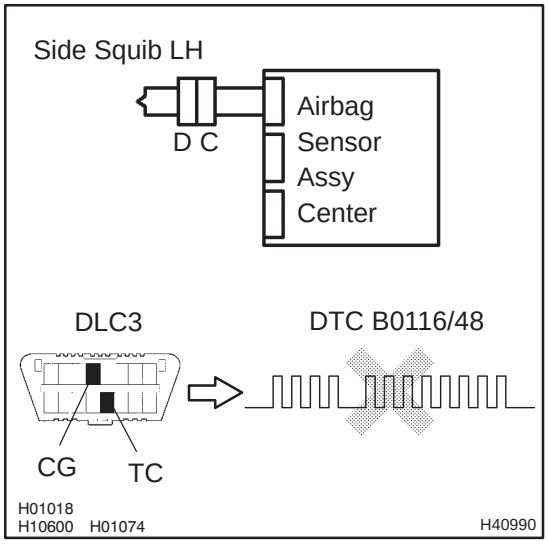
HINT:

Codes other than code B0116/48 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib LH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0116/48 is not output.

HINT:
Codes other than code B0116/48 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK →

USE SIMULATION METHOD TO CHECK

DTC	B0117/45	SHORT IN SIDE SQUIB (LH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0117/45 is recorded when a short to ground is detected in the side squib LH circuit.

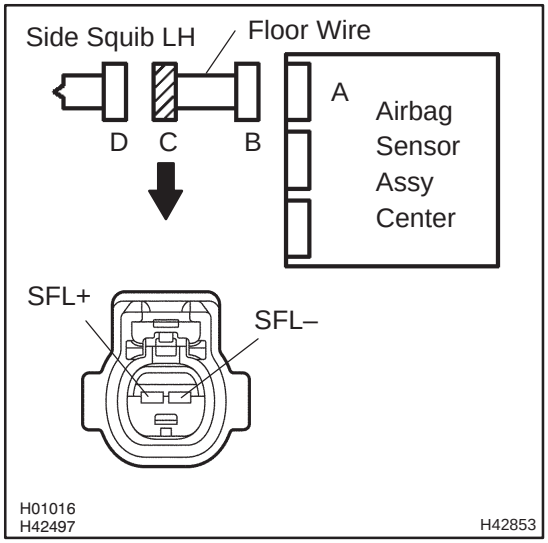
DTC No.	DTC Detecting Condition	Trouble Area
B0117/45	• Short circuit in side squib LH wire harness (to ground) • Side squib LH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1238.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(SIDE SQUIB LH CIRCUIT)

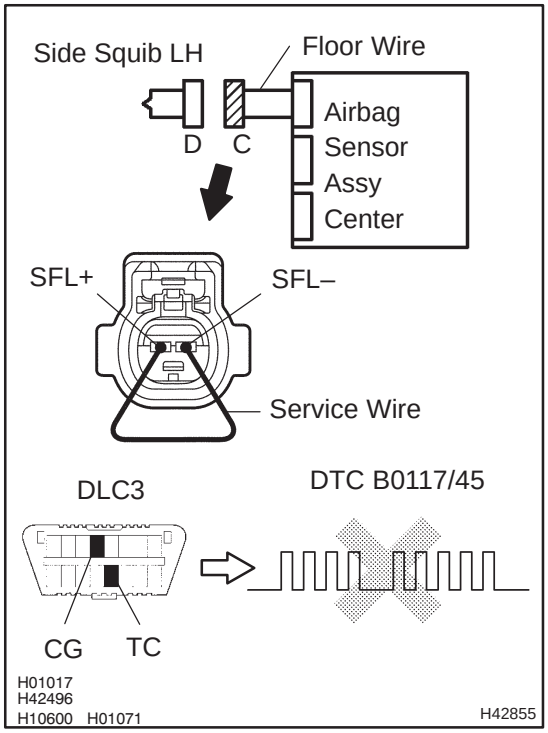


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib LH).
(d) Measure the resistance between the body ground and SFL+ of the connector ”C”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect SFL+ and SFL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0117/45 is not output.

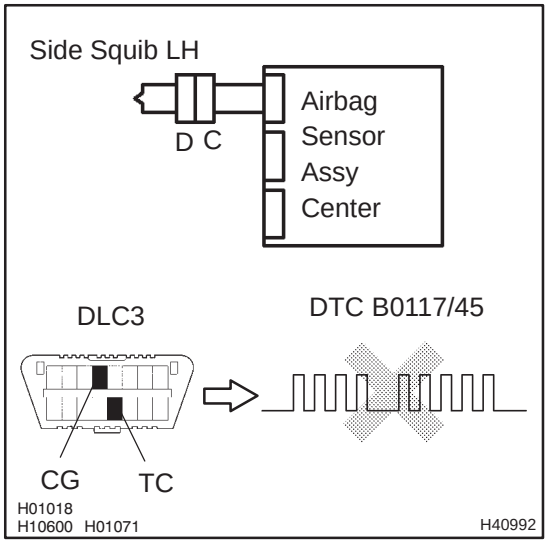
HINT:

Codes other than code B0117/45 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib LH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0117/45 is not output.

HINT:
Codes other than code B0117/45 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

4 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B0118/46	SHORT IN SIDE SQUIB (LH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assy center and the separate type front seat back assy (side squib LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0118/46 is recorded when a short to B+ is detected in the side squib LH circuit.

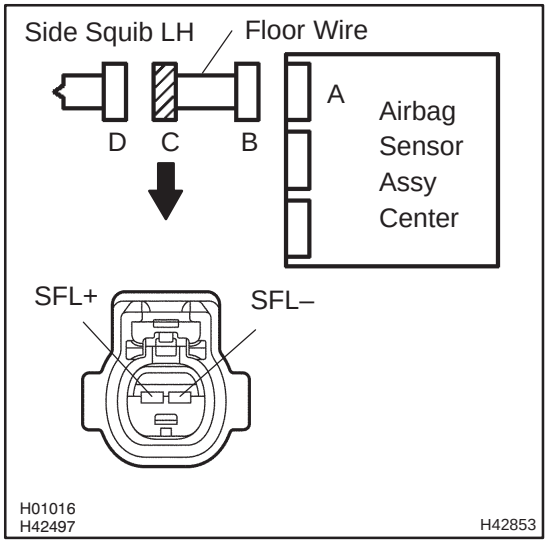
DTC No.	DTC Detecting Condition	Trouble Area
B0118/46	• Short circuit in side squib LH wire harness (to B+) • Side squib LH malfunction • Airbag sensor assy center malfunction	• Separate type front seat back assy (Side squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1238.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(SIDE SQUIB LH CIRCUIT)

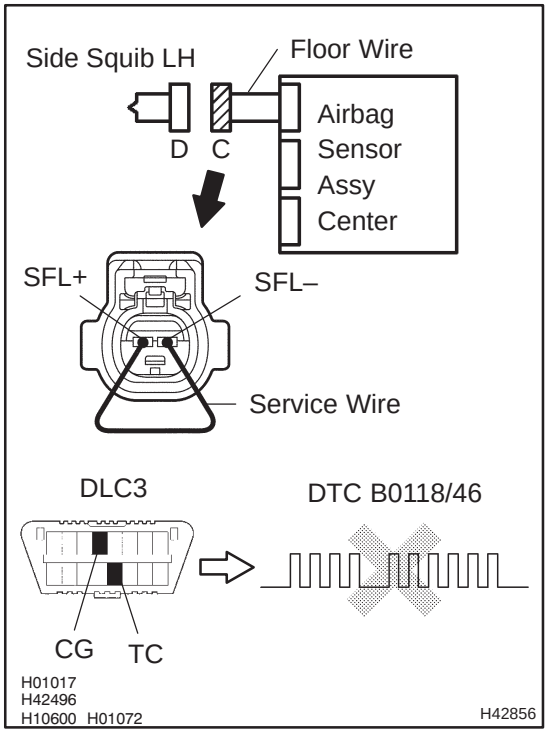


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the separate type front seat back assy (side squib LH).
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and SFL+ of the connector "C".
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect SFL+ and SFL– of the connector ”C”.

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

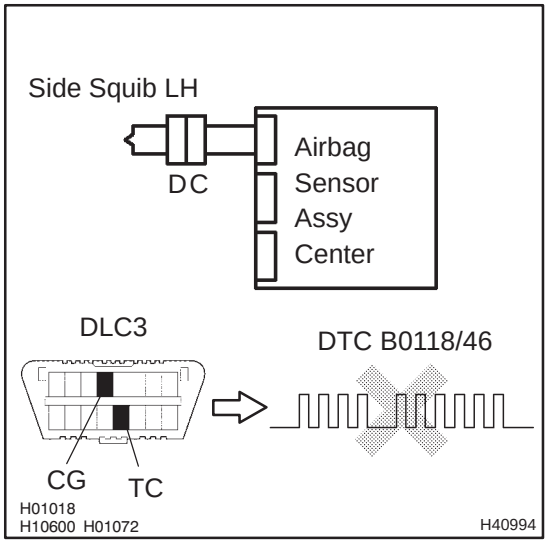
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0118/46 is not output.

HINT:
Codes other than code B0118/46 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK SEPARATE TYPE FRONT SEAT BACK ASSY(SIDE SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the separate type front seat back assy (side squib LH).
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0118/46 is not output.

HINT:
Codes other than code B0118/46 may be output at this time, but they are not related to this check.

NG → **REPLACE SEPARATE TYPE FRONT SEAT BACK ASSY**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B0121/26	SEAT BELT BUCKLE SWITCH (RH) MALFUNCTION

DTC	B0122/26	SEAT BELT BUCKLE SWITCH (RH) MALFUNCTION

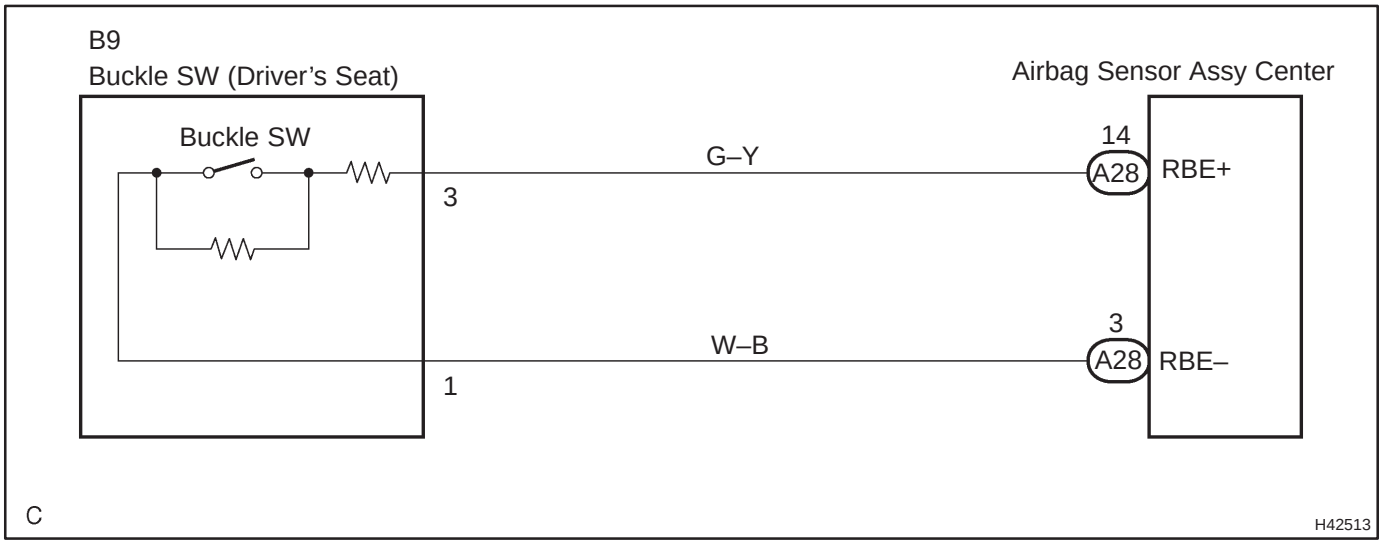
CIRCUIT DESCRIPTION

The seat belt buckle switch RH circuit consists of the airbag sensor assy center and the front seat inner belt assy RH (seat belt buckle switch RH).
DTC B0121/26 or B0122/26 is recorded when a malfunction is detected in the seat belt buckle switch RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0121/B0122/26	• Short circuit in seat belt buckle switch RH wire harness (to ground) • Short circuit in seat belt buckle switch RH wire harness (to B+) • Seat belt buckle switch RH malfunction • Airbag sensor assy center	• Front seat inner belt assy RH (Seat belt buckle switch RH) • Airbag sensor assy center • Floor wire No.2

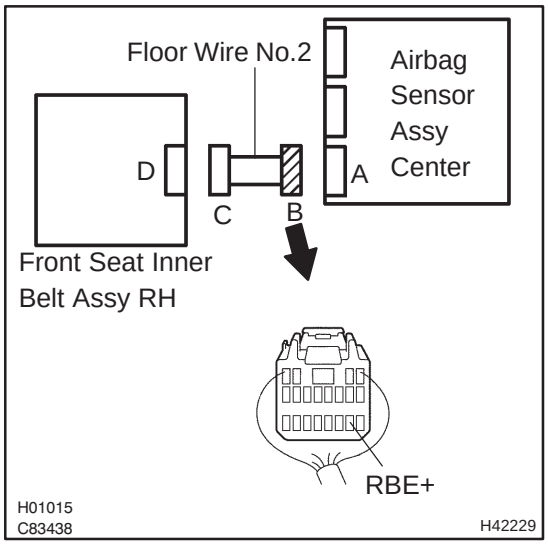
HINT:
DTC B0121/26 or B0122/26 is indicated only for the RHD vehicle.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(TO B+)

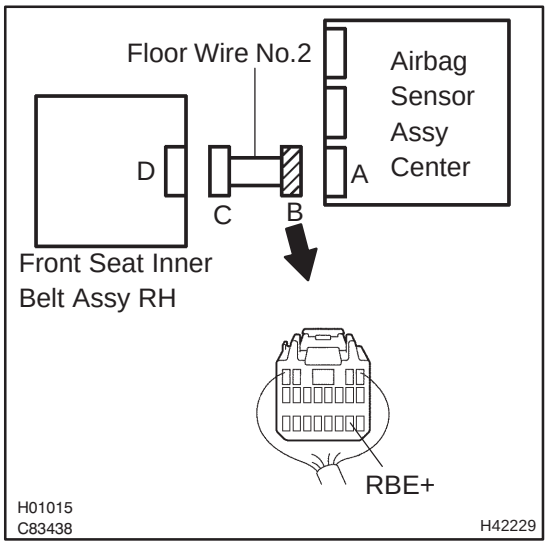


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat inner belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and RBE+ of the connector ”B”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2	CHECK FLOOR WIRE NO.2(TO GROUND)

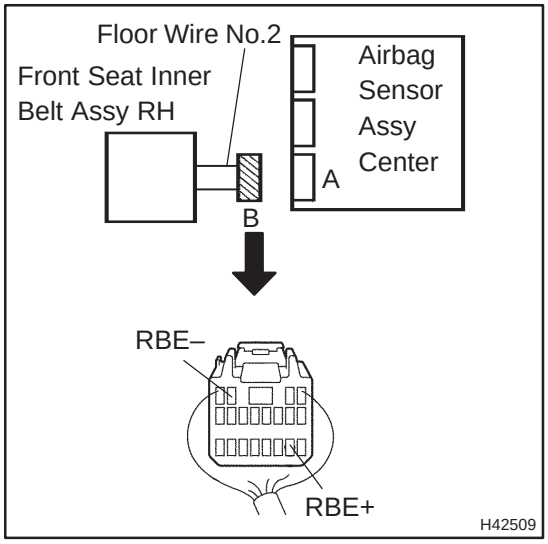


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and RBE+ of the connector ”B”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

3 CHECK FRONT SEAT INNER BELT ASSY RH

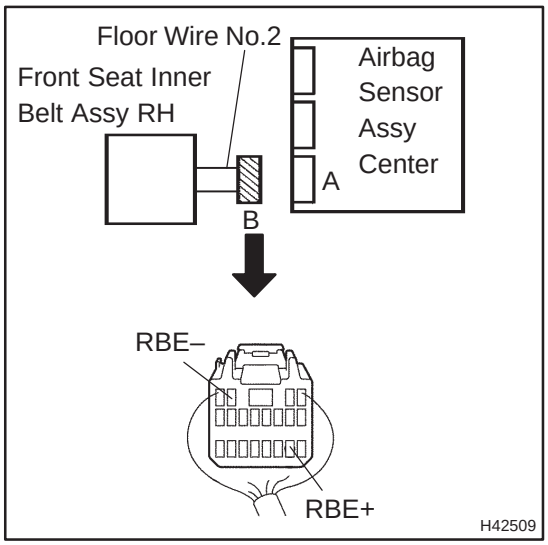


(a) Connect the connector to the front seat inner belt assy RH.
(b) Unlock the seat belt at the front seat RH.
(c) Measure the resistance between RBE+ and RBE– of the connector ”B”.
OK:
Resistance: 1.0 kΩ to 1.6 kΩ

NG → **REPLACE FRONT SEAT INNER BELT ASSY RH**

OK

4 CHECK FRONT SEAT INNER BELT ASSY RH

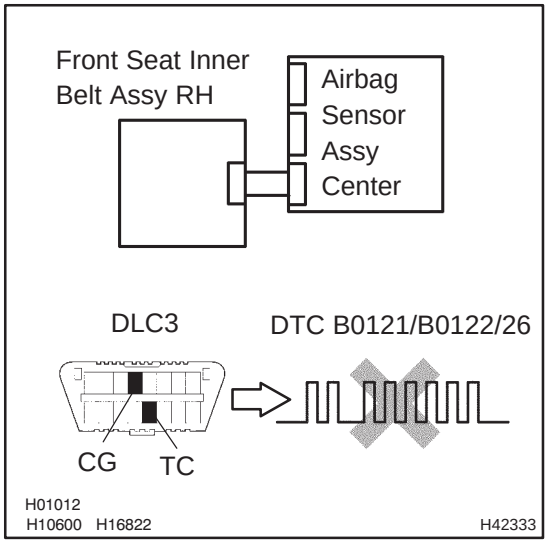


(a) Lock the seat belt at the front seat RH.
(b) Measure the resistance between the RBE+ and RBE– of the connector ”B”.
OK:
Resistance: 100 Ω to 500 Ω

NG → **REPLACE FRONT SEAT INNER BELT ASSY RH**

OK

5	CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B0121/26 or B0122/26 is not output.

HINT:
Codes other than code B0121/26 or B0122/26 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

DTC	B0126/27	SEAT BELT BUCKLE SWITCH (LH) MALFUNCTION

DTC	B0127/27	SEAT BELT BUCKLE SWITCH (LH) MALFUNCTION

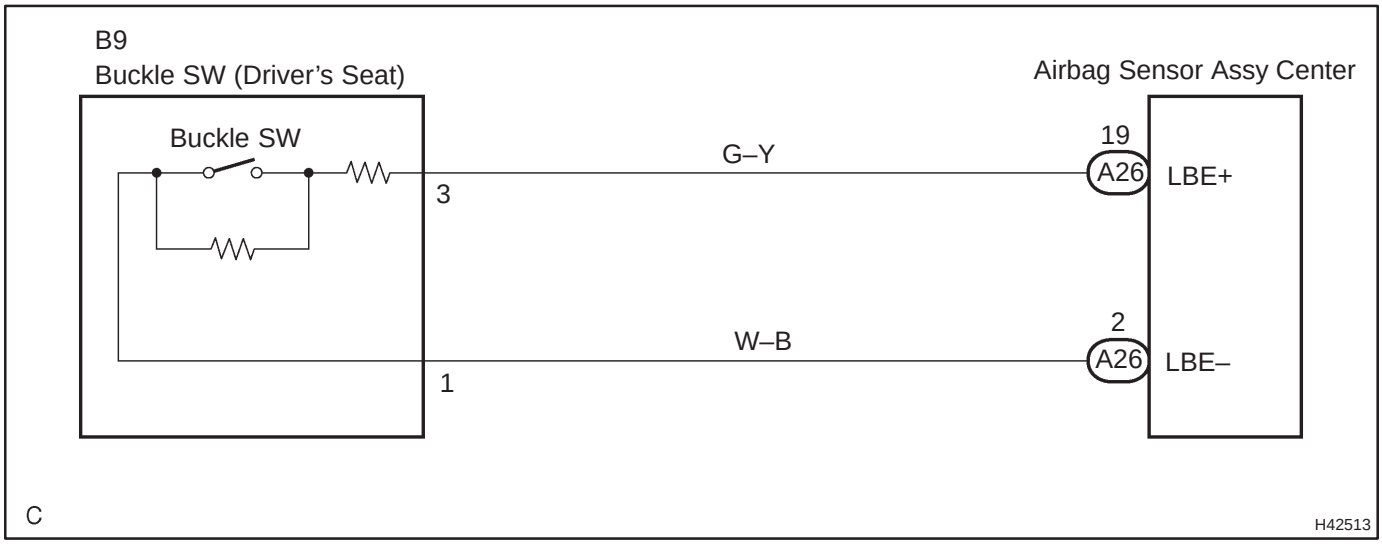
CIRCUIT DESCRIPTION

The seat belt buckle switch LH circuit consists of the airbag sensor assy center and the front seat inner belt assy LH (seat belt buckle switch LH).
DTC B0126/27 or B0127/27 is recorded when a malfunction is detected in the seat belt buckle switch LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0126/B0127/27	• Short circuit in seat belt buckle switch LH wire harness (to ground) • Short circuit in seat belt buckle switch LH wire harness (to B+) • Front seat inner belt assy LH malfunction • Airbag sensor assy center malfunction	• Front seat inner belt assy LH (Seat belt buckle switch LH) • Airbag sensor assy center • Floor wire

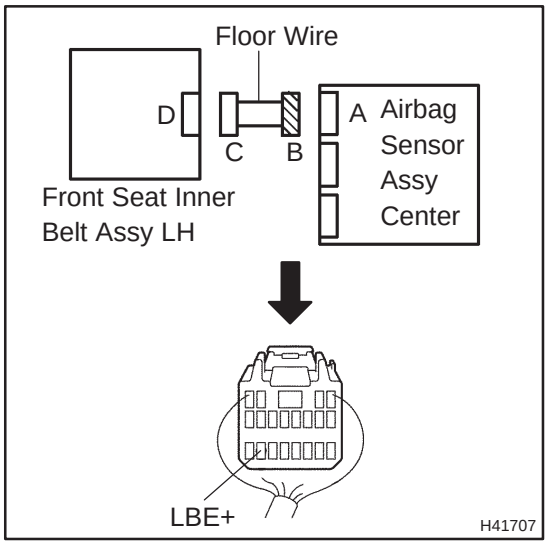
HINT:
DTC B0126/27 or B0127/27 is indicated only for the LHD vehicle.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(TO B+)

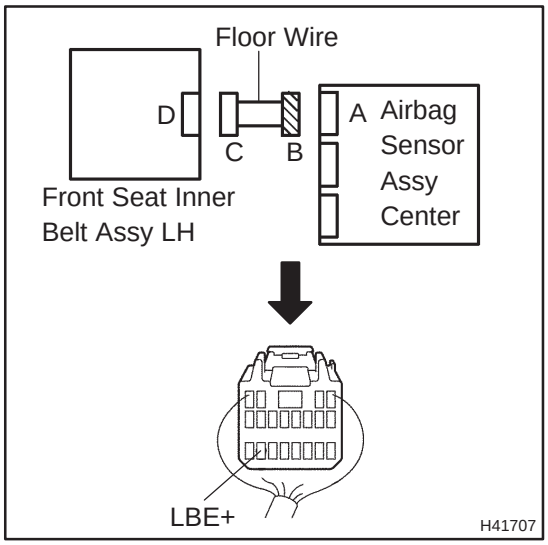


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat inner belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and LBE+ of the connector ”B”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2	CHECK FLOOR WIRE(TO GROUND)

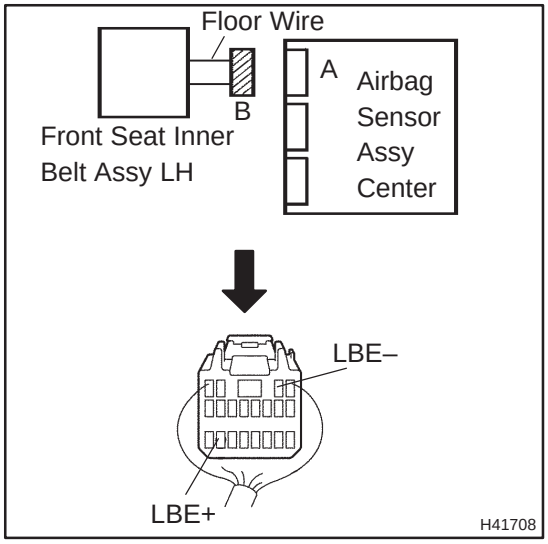


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and LBE+ of the connector ”B”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

3 CHECK FRONT SEAT INNER BELT ASSY LH

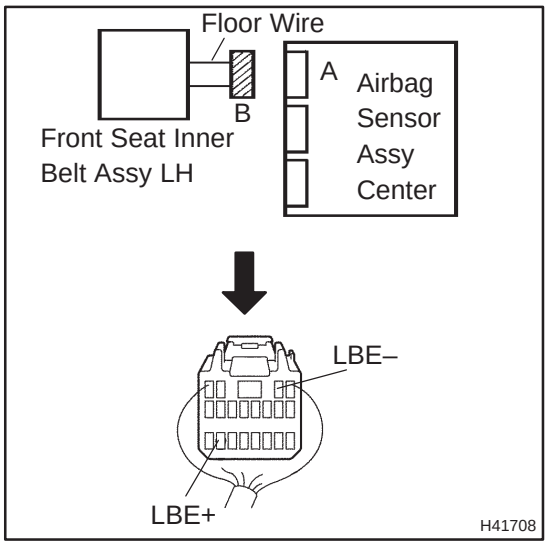


(a) Connect the connector to the front seat inner belt assy LH.
(b) Unlock the seat belt at the front seat LH.
(c) Measure the resistance between LBE+ and LBE– of the connector ”B”.
OK:
Resistance: 1.0 kΩ to 1.6 kΩ

NG → **REPLACE FRONT SEAT INNER BELT ASSY LH**

OK

4 CHECK FRONT SEAT INNER BELT ASSY LH

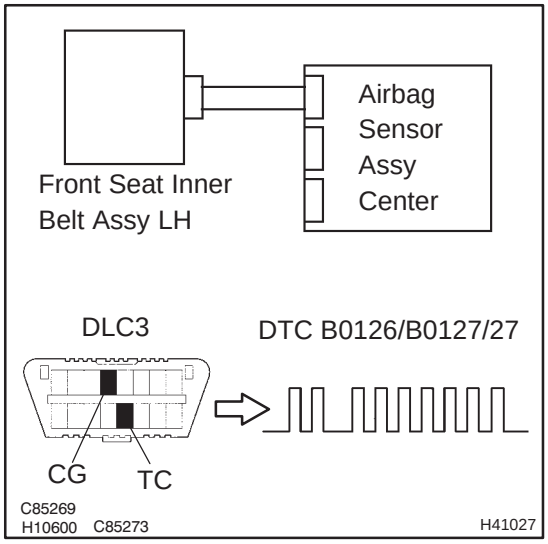


(a) Lock the seat belt at the front seat LH.
(b) Measure the resistance between LBE+ and LBE– of the connector ”B”.
OK:
Resistance: 100 Ω to 500 Ω

NG → **REPLACE FRONT SEAT INNER BELT ASSY LH**

OK

5	CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).

OK:

DTC B0126/27 or B0127/27 is not output.

HINT:

Codes other than code B0126/27 or B0127/27 may be output at this time, but they are not relevant to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

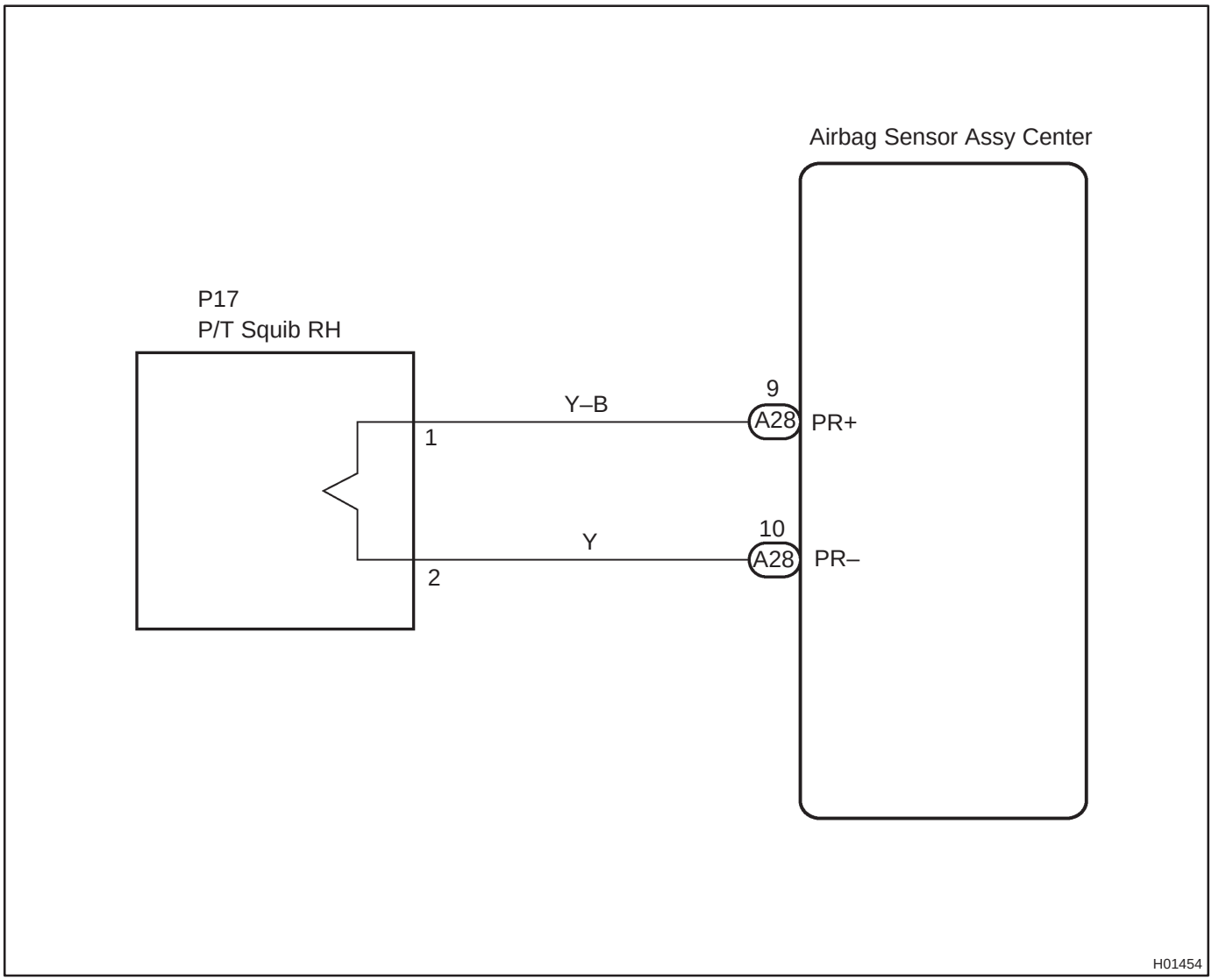
DTC B0130/63 SHORT IN P/T SQUIB (RH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the front seat outer belt assy RH (seat belt pretensioner RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0130/63 is recorded when a short circuit is detected in the P/T squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0130/63	• Short circuit between PR+ wire harness and PR– wire harness of P/T squib RH • P/T squib RH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy RH (P/T squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM



INSPECTION PROCEDURE

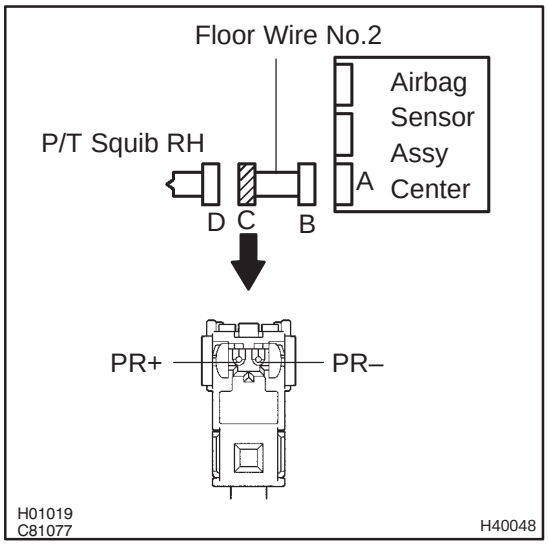
1	CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag assy center and the front seat outer belt assy RH.
(d) Check that the floor wire No.2 connector (on the front seat outer belt assy RH side) is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2	CHECK FLOOR WIRE NO.2(P/T SQUIB RH CIRCUIT)

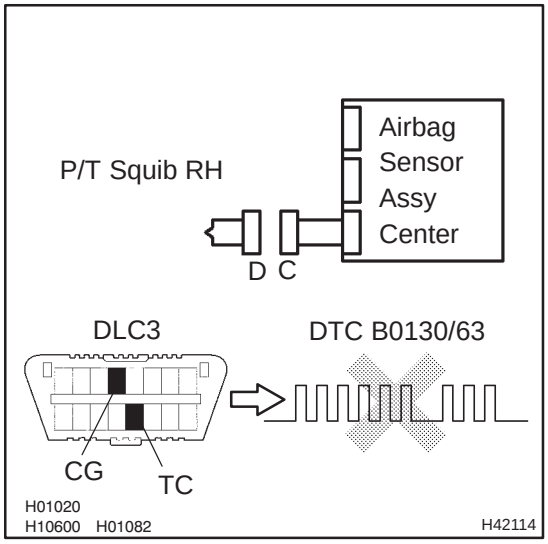


(a) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(b) Measure the resistance between PR+ and PR– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

3 CHECK AIR BAG SENSOR ASSY CENTER



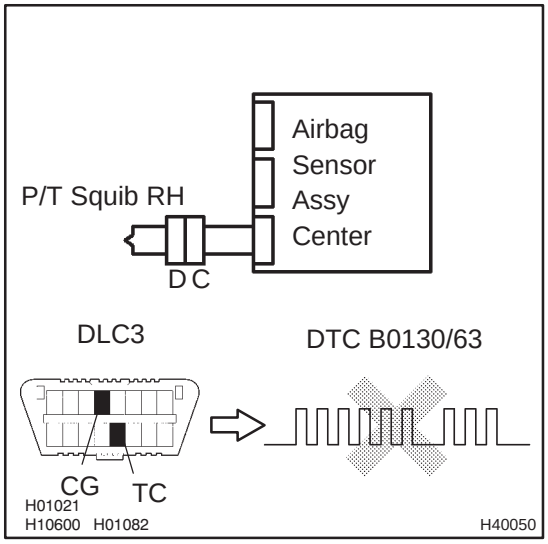
(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B0130/63 is not output.

HINT:
Codes other than code B0130/63 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

4 CHECK FRONT SEAT OUTER BELT ASSY RH(P/T SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0130/63 is not output.

HINT:
Codes other than code B0130/63 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

USE SIMULATION METHOD TO CHECK

DTC B0131/64 OPEN IN P/T (RH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the front seat outer belt assy RH (seat belt pretensioner RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0131/64 is recorded when an open circuit is detected in the P/T squib RH circuit.

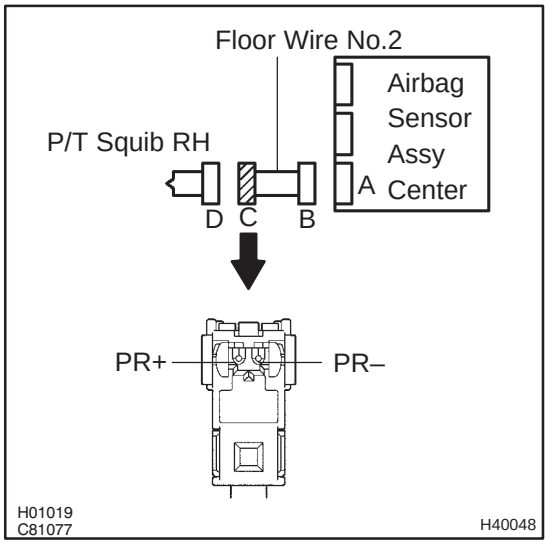
DTC No.	DTC Detecting Condition	Trouble Area
B0131/64	• Open circuit in PR+ wire harness or PR– wire harness of P/T squib RH • P/T squib RH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy RH (P/T squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1258.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE NO.2(P/T SQUIB RH CIRCUIT)

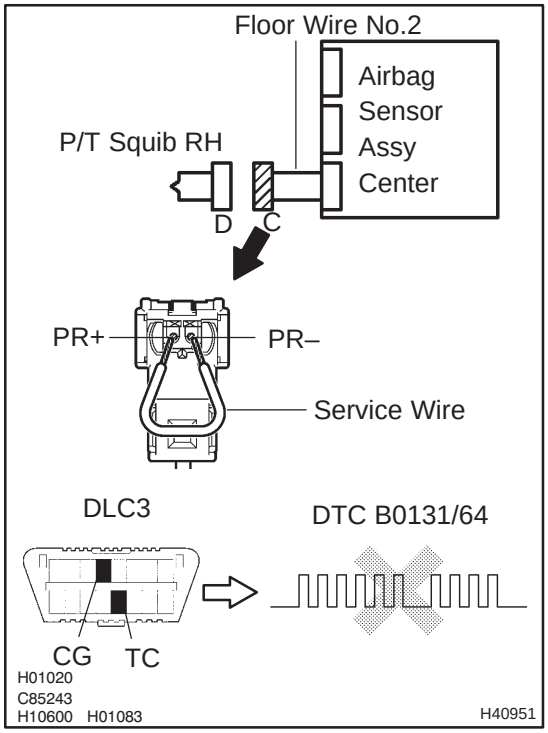


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy RH.
(d) Measure the resistance between PR+ and PR– of the connector "C".
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PR+ and PR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0131/64 is not output.

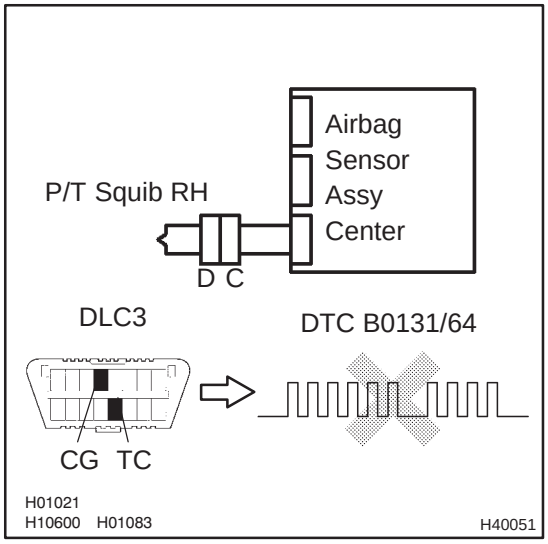
HINT:

Codes other than code B0131/64 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK FRONT SEAT OUTER BELT ASSY RH(P/T SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0131/64 is not output.

HINT:
Codes other than code B0131/64 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B0132/61	SHORT IN P/T SQUIB (RH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the front seat outer belt assy RH (seat belt pretensioner RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0132/61 is recorded when a short to ground is detected in the P/T squib RH circuit.

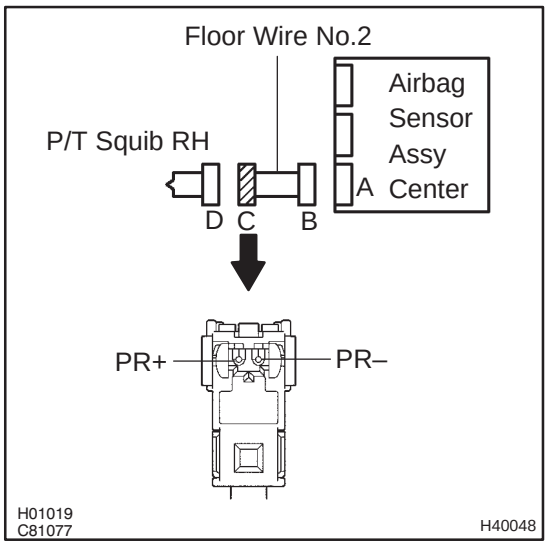
DTC No.	DTC Detecting Condition	Trouble Area
B0132/61	• Short circuit in P/T squib RH wire harness (to ground) • P/T squib RH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy RH (P/T squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1258.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(P/T SQUIB RH CIRCUIT)

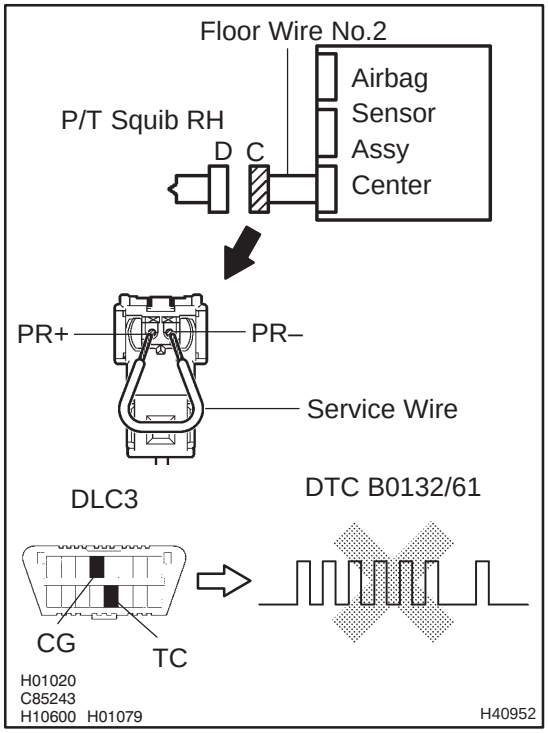


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy RH.
(d) Measure the resistance between the body ground and PR+ of the connector ”C”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PR+ and PR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0132/61 is not output.

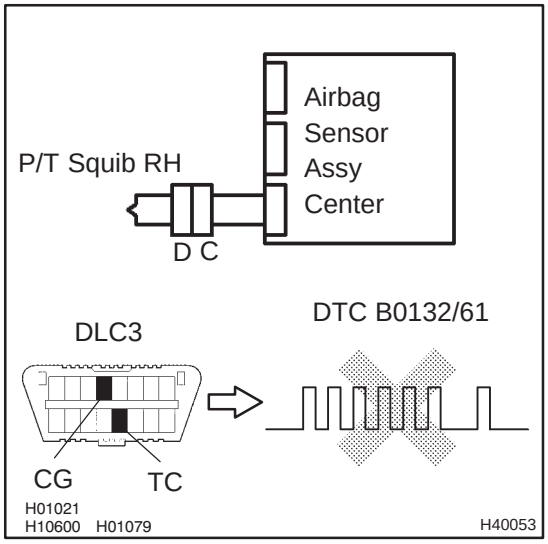
HINT:

Codes other than code B0132/61 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK FRONT SEAT OUTER BELT ASSY RH(P/T SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0132/61 is not output.

HINT:
Codes other than code B0132/61 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC B0133/62 SHORT IN P/T SQUIB (RH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assy center and the front seat outer belt assy RH (seat belt pretensioner RH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0133/62 is recorded when a short to B+ is detected in the P/T squib RH circuit.

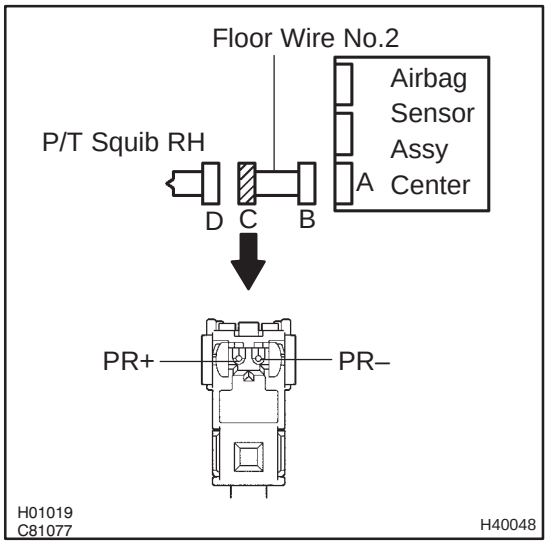
DTC No.	DTC Detecting Condition	Trouble Area
B0133/62	• Short circuit in P/T squib RH wire harness (to B+) • P/T squib RH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy RH (P/T squib RH) • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM

See page 05–1258.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE NO.2(P/T SQUIB RH CIRCUIT)

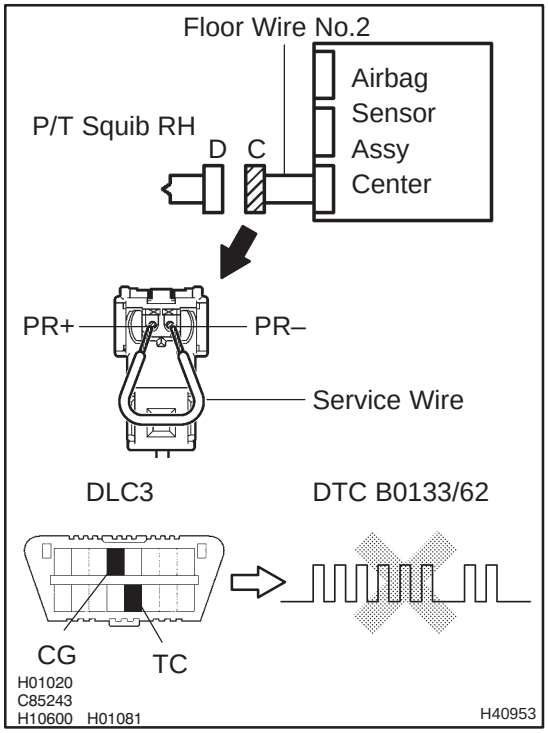


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and PR+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect PR+ and PR– of the connector ”C”.

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

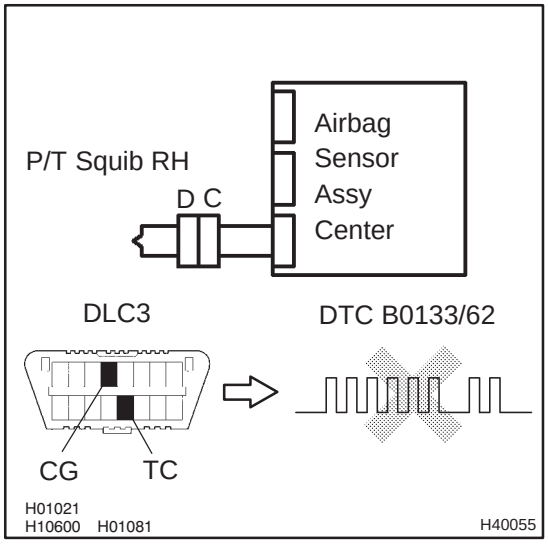
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0133/62 is not output.

HINT:
Codes other than code B0133/62 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK FRONT SEAT OUTER BELT ASSY RH(P/T SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0133/62 is not output.

HINT:
Codes other than code B0133/62 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY RH**

OK

4 USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

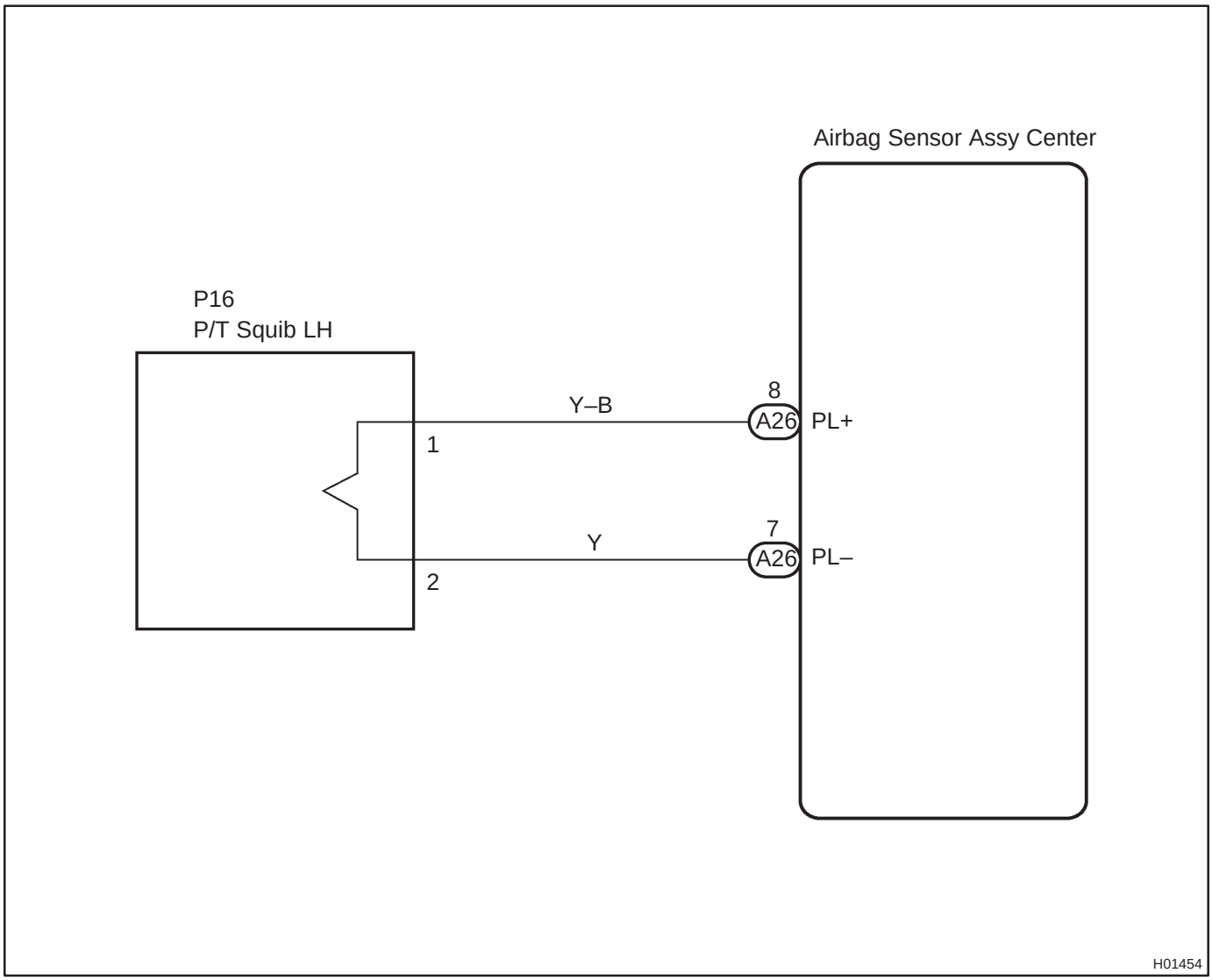
DTC B0135/73 SHORT IN P/T SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the front seat outer belt assy LH (seat belt pretensioner LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0135/73 is recorded when a short circuit is detected in the P/T squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0135/73	• Short circuit between PL+ wire harness and PL– wire harness of P/T squib LH • P/T squib LH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy LH (P/T squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM



INSPECTION PROCEDURE

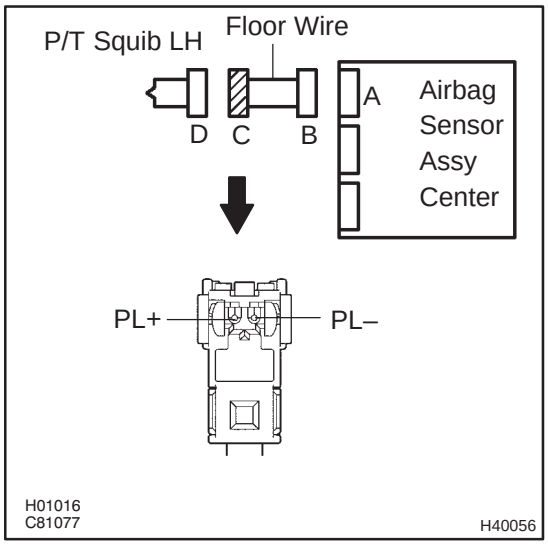
1	CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Disconnect the connector from the airbag sensor assy center and the front seat outer belt assy LH.
(d) Check that the floor wire connector (on the front seat outer belt assy LH side) is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2	CHECK FLOOR WIRE(P/T SQUIB LH CIRCUIT)

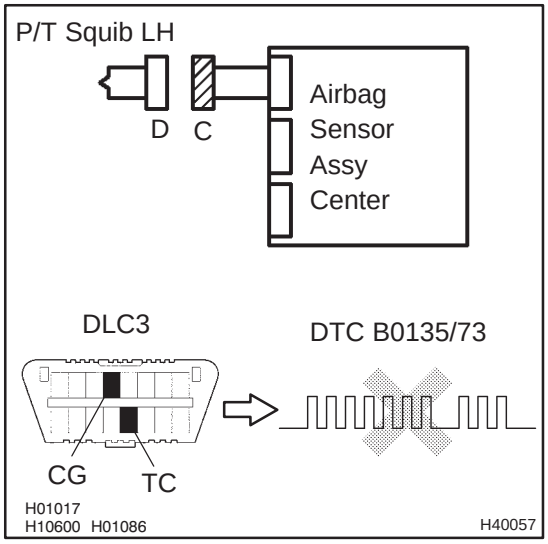


(a) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(b) Measure the resistance between PL+ and PL– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

3 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).

OK:

DTC B0135/73 is not output.

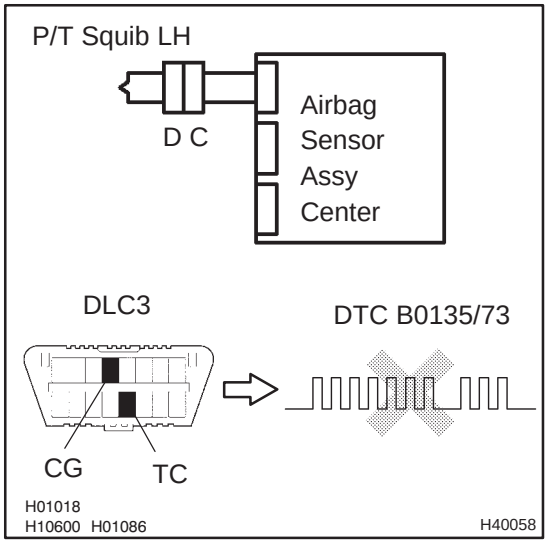
HINT:

Codes other than code B0135/73 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

4 CHECK FRONT SEAT OUTER BELT ASSY LH(P/T SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).

OK:

DTC B0135/73 is not output.

HINT:

Codes other than code B0135/73 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

DTC B0136/74 OPEN IN P/T SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the front seat outer belt assy LH (seat belt pretensioner LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0136/74 is recorded when an open circuit is detected in the P/T squib LH circuit.

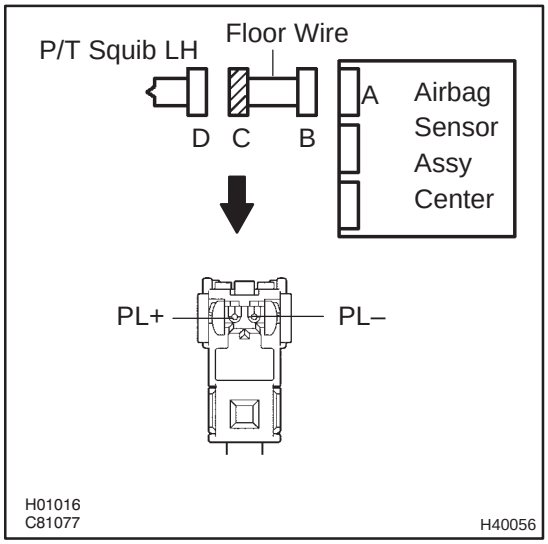
DTC No.	DTC Detecting Condition	Trouble Area
B0136/74	• Open circuit in PL+ wire harness or PL– wire harness of P/T squib LH • P/T squib LH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy LH (P/T squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1270.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE(P/T SQUIB LH CIRCUIT)

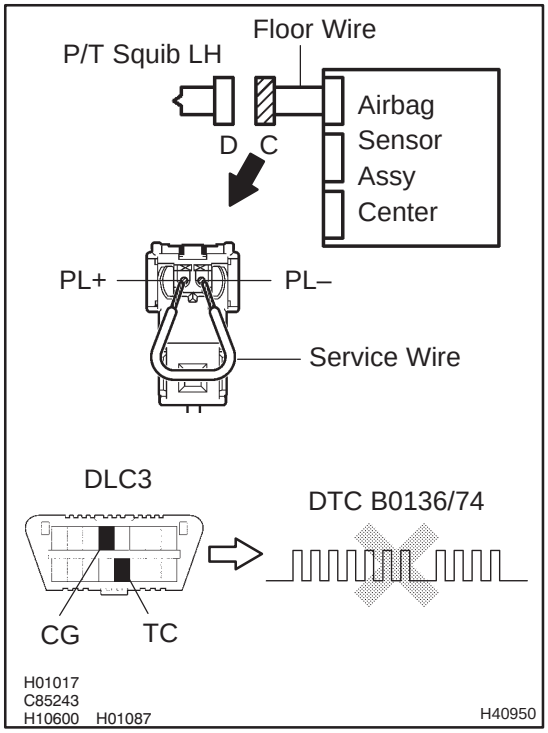


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy LH.
(d) Measure the resistance between PL+ and PL– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PL+ and PL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0136/74 is not output.

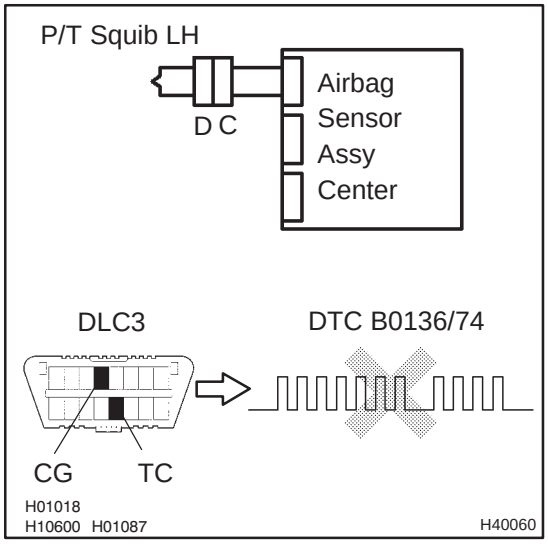
HINT:

Codes other than code B0136/74 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3 CHECK FRONT SEAT OUTER BELT ASSY LH(P/T SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0136/74 is not output.

HINT:
Codes other than code B0136/74 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B0137/71	SHORT IN P/T SQUIB (LH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the front seat outer belt assy LH (seat belt pretensioner LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0137/71 is recorded when a short to ground is detected in the P/T squib LH circuit.

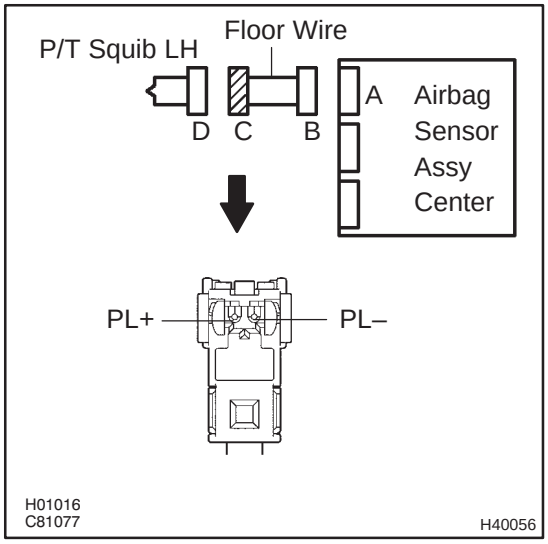
DTC No.	DTC Detecting Condition	Trouble Area
B0137/71	• Short circuit in P/T squib LH wire harness (to ground) • P/T squib LH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy LH (P/T squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1270.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(P/T SQUIB LH CIRCUIT)

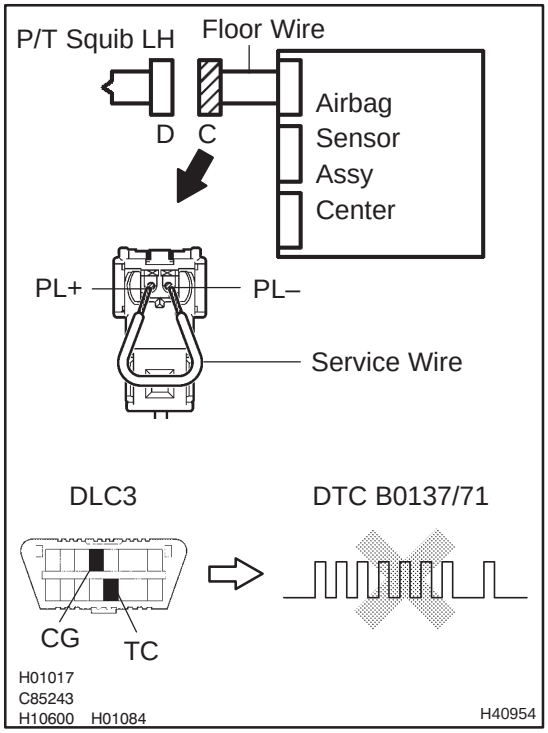


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy LH.
(d) Measure the resistance between the body ground and PL+ of the connector ”C”.
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect PL+ and PL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B0137/71 is not output.

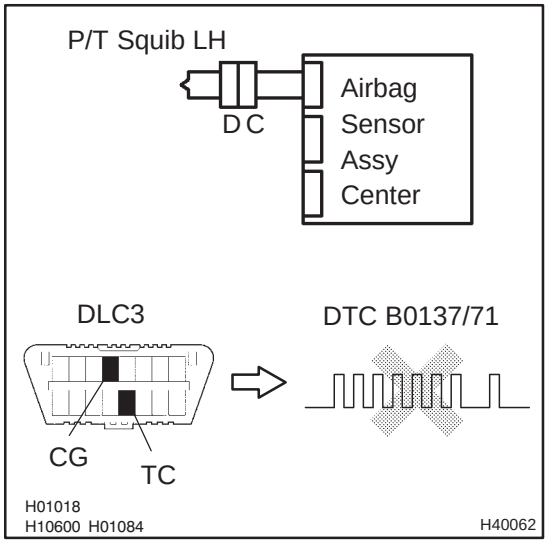
HINT:

Codes other than code B0137/71 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK FRONT SEAT OUTER BELT ASSY LH(P/T SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0137/71 is not output.

HINT:
Codes other than code B0137/71 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC B0138/72 SHORT IN P/T SQUIB (LH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assy center and the front seat outer belt assy LH (seat belt pretensioner LH).
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B0138/72 is recorded when a short to B+ is detected in the P/T squib LH circuit.

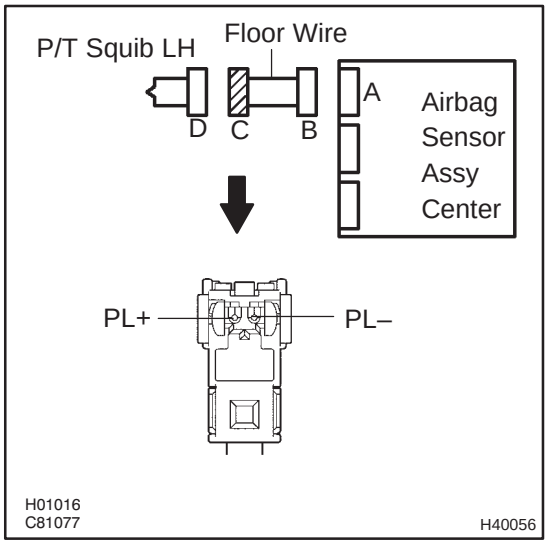
DTC No.	DTC Detecting Condition	Trouble Area
B0138/72	• Short circuit in P/T squib LH wire harness (to B+) • P/T squib LH malfunction • Airbag sensor assy center malfunction	• Front seat outer belt assy LH (P/T squib LH) • Airbag sensor assy center • Floor wire

WIRING DIAGRAM

See page 05–1270.

INSPECTION PROCEDURE

1 CHECK FLOOR WIRE(P/T SQUIB LH CIRCUIT)

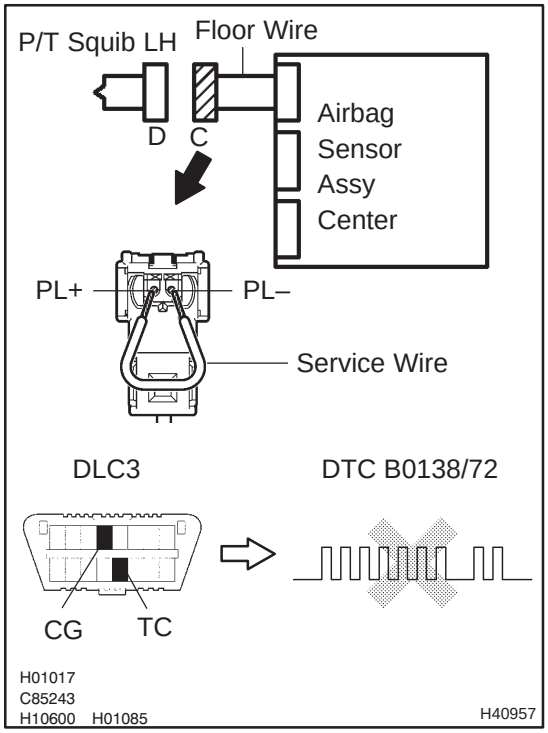


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the front seat outer belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and PL+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect PL+ and PL– of the connector ”C”.

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

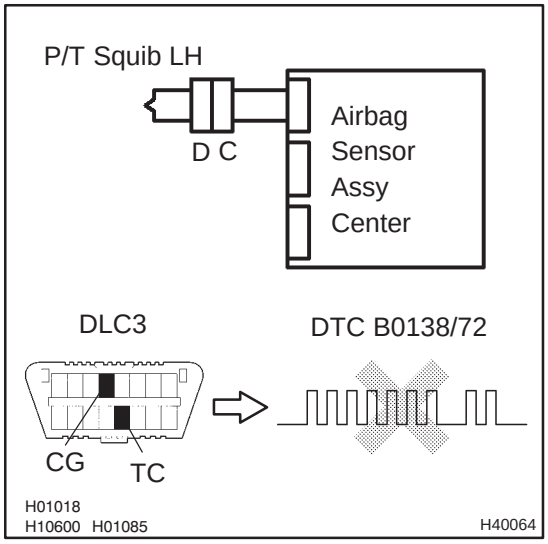
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B0138/72 is not output.

HINT:
Codes other than code B0138/72 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK FRONT SEAT OUTER BELT ASSY LH(P/T SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the front seat outer belt assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B0138/72 is not output.

HINT:
Codes other than code B0138/72 may be output at this time, but they are not related to this check.

NG → **REPLACE FRONT SEAT OUTER BELT ASSY LH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B1100/31	AIRBAG SENSOR ASSY CENTER MALFUNCTION

CIRCUIT DESCRIPTION

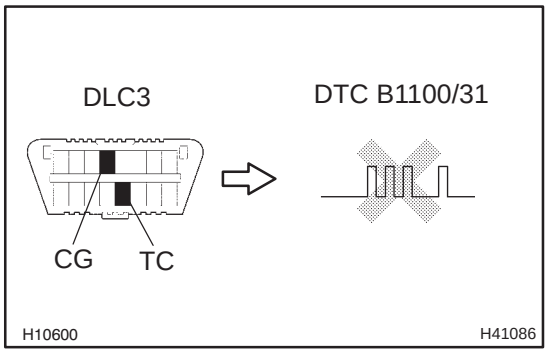
The airbag sensor assy center consists of the airbag sensor, the safing sensor, the drive circuit, the diagnosis circuit and the ignition control, etc.
If the airbag sensor assy center receives signals from the airbag sensor, it judges whether or not the SRS should be activated.
DTC B1100/31 is recorded when a malfunction in the airbag sensor assy center is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1100/31	• Airbag sensor assy center malfunction • Half connection detection malfunction	• Airbag sensor assy center • Airbag sensor assy center connector

HINT:
When a malfunction code other than code B1100/31 is displayed at the same time, first repair the malfunction indicated by the malfunction code other than code B1100/31.

INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1100/31 is not output.

HINT:
Codes other than code B1100/31 may be output at this time, but they are not related to this check.

NG	Go to step 2

OK

USE SIMULATION METHOD TO CHECK

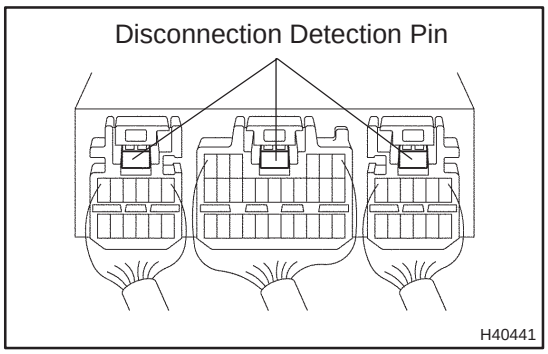
2 CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check the connection of the airbag sensor assy center connectors.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS, THEN GO TO STEP 1**

OK

3 PERFORM A VISUAL CHECK OF THE DISCONNECTION DETECTION PIN

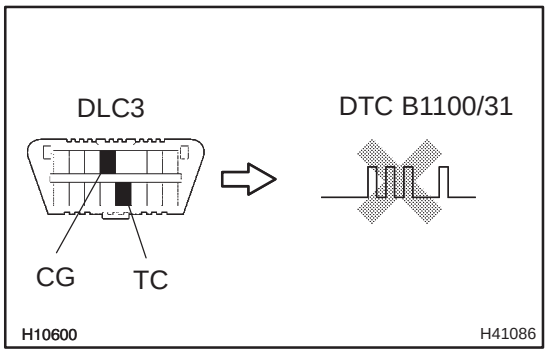


(a) Check that the disconnection detection pin is not deformed.
OK:
The connectors are not deformed.

NG → **REPAIR OR REPLACE AIRBAG SENSOR ASSY CENTER CONNECTOR**

OK

4 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(b) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(c) Clear the stored DTCs in the memory (See page 05–1184).
(d) Turn the ignition switch to the LOCK position.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Check the DTCs (See page 05–1184).
OK:
DTC B1100/31 is not output.

HINT:
Codes other than code B1100/31 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1140/32	SIDE AIRBAG SENSOR ASSY (RH) MALFUNCTION

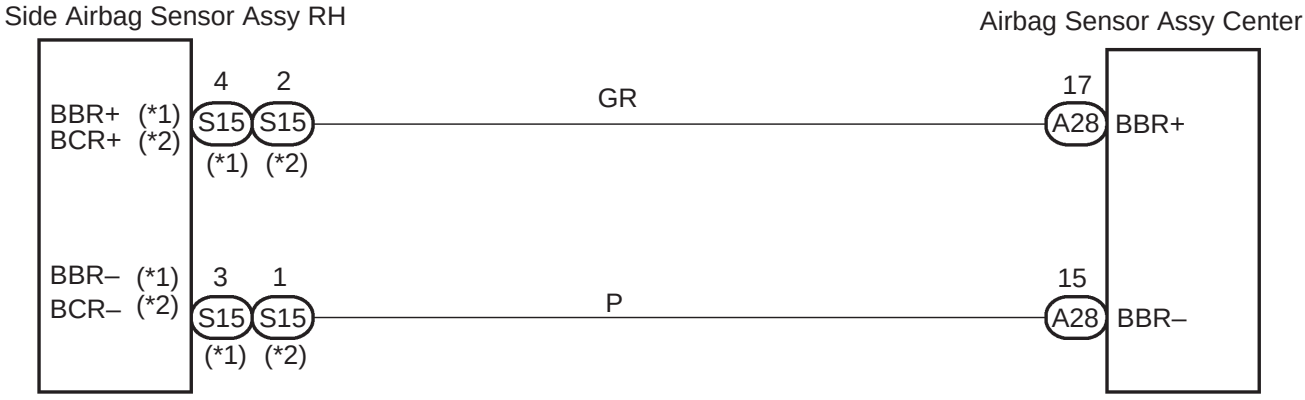
CIRCUIT DESCRIPTION

The side airbag sensor assy RH consists of the diagnosis circuit and the lateral deceleration sensor, etc. If the airbag sensor assy center receives signals from the lateral deceleration sensor, it judges whether or not the SRS should be activated.

DTC B1140/32 is recorded when a malfunction in the side airbag sensor assy RH is detected.

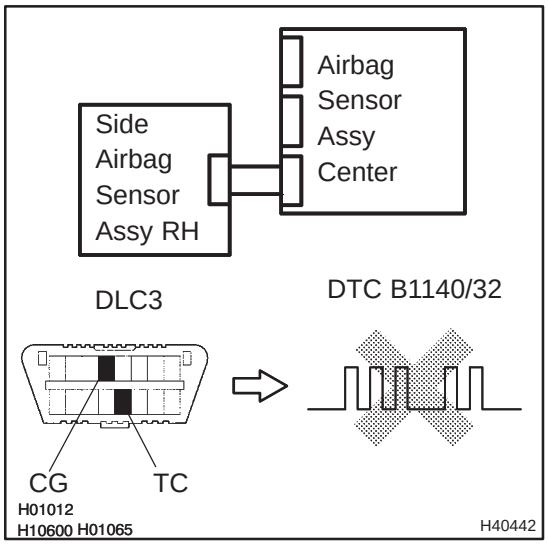
DTC No.	DTC Detecting Condition	Trouble Area
B1140/32	• Short circuit in side airbag sensor assy RH wire harness (to B+) • Short circuit in side airbag sensor assy RH wire harness (to ground) • Open circuit in BBR+ wire harness or BBR– wire harness of side airbag sensor assy RH • Side airbag sensor assy RH malfunction • Airbag sensor assy center malfunction	• Side airbag sensor assy RH • Airbag sensor assy center • Floor wire No.2

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1140/32 is not output.

HINT:
Codes other than code B1140/32 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

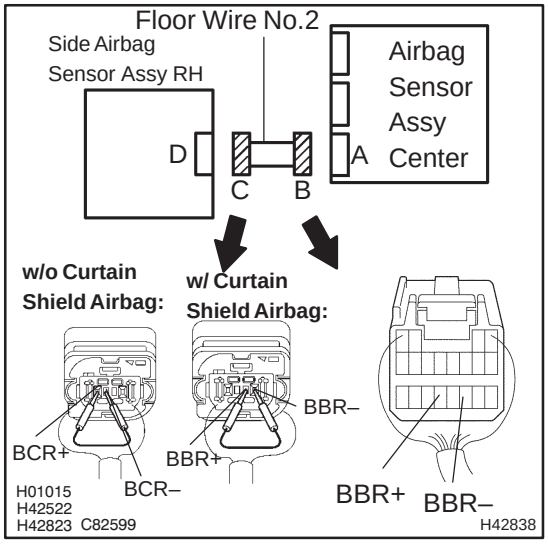
2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the side airbag sensor assy RH.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FLOOR WIRE NO.2(OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the side airbag sensor assy RH.

(b) w/o Curtain shield airbag:
Using a service wire, connect BCR+ and BCR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) w/ Curtain shield airbag:
Using a service wire, connect BBR+ and BBR– of the connector ”C”.

NOTICE:

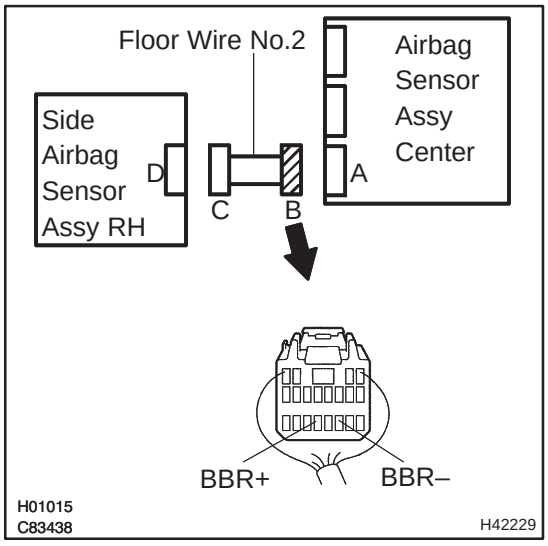
Do not forcibly insert a service wire into the terminal of the connector when connecting.

(d) Measure the resistance between BBR+ and BBR– of the connector ”B”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

4 CHECK FLOOR WIRE NO.2(TO B+)



(a) Disconnect the service wire from the connector ”C”.

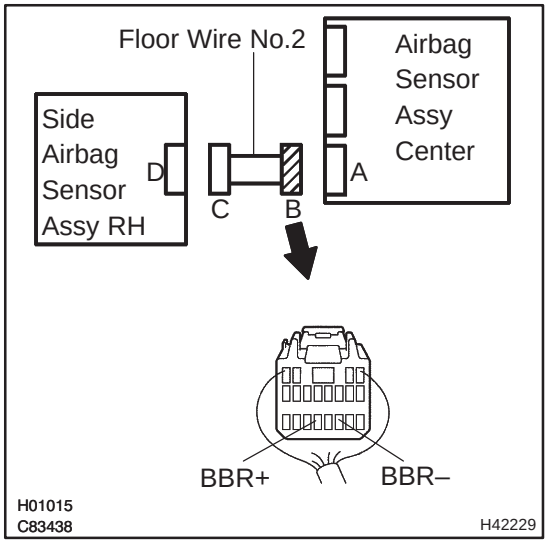
(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of BBR+ and BBR– of the connector ”B”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

5 CHECK FLOOR WIRE NO.2(TO GROUND)

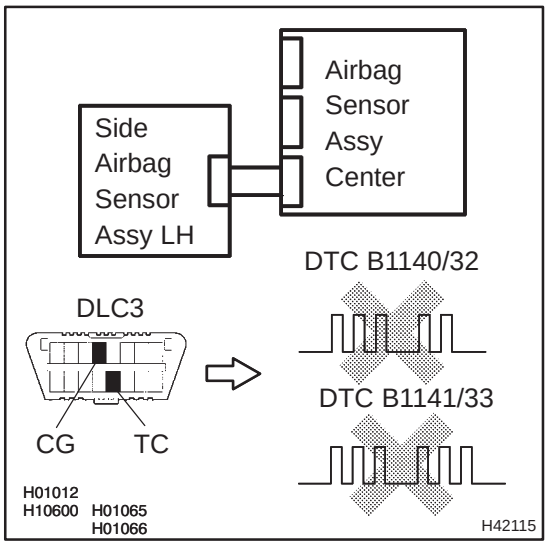


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of BBR+ and BBR– of the connector "C".
OK:
Resistance: 10 kΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

6 CHECK SIDE AIR BAG SENSOR ASSY RH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Interchange the side airbag sensor assy RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
A: DTC B1140/32 is not output.
B: DTC B1141/33 is not output.

NG:A → **REPLACE SIDE AIR BAG SENSOR ASSY RH**

NG:B → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1141/33	SIDE AIRBAG SENSOR ASSY (LH) MALFUNCTION

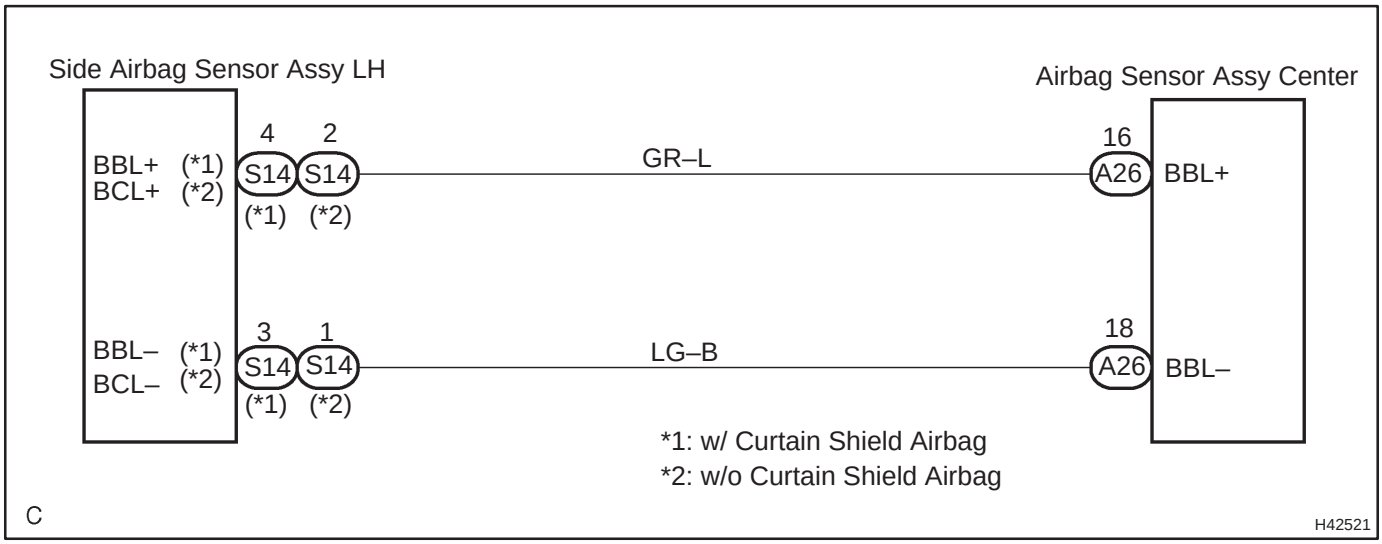
CIRCUIT DESCRIPTION

The side airbag sensor assy LH consists of the diagnosis circuit and the lateral deceleration sensor, etc. If the airbag sensor assy center receives signals from the lateral deceleration sensor, it judges whether or not the SRS should be activated.

DTC B1141/33 is recorded when a malfunction in the side airbag sensor assy LH is detected.

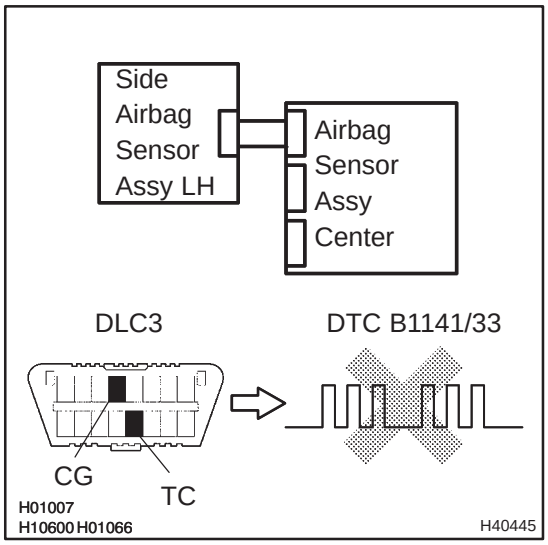
DTC No.	DTC Detecting Condition	Trouble Area
B1141/33	• Short circuit in side airbag sensor assy LH wire harness (to B+) • Short circuit in side airbag sensor assy LH wire harness (to ground) • Open circuit in BBL+ wire harness or BBL– wire harness of side airbag sensor assy LH • Side airbag sensor assy LH malfunction • Airbag sensor assy center malfunction	• Side airbag sensor assy LH • Airbag sensor assy center • Floor wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1141/33 is not output.

HINT:

Codes other than code B1141/33 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the side airbag sensor assy LH.

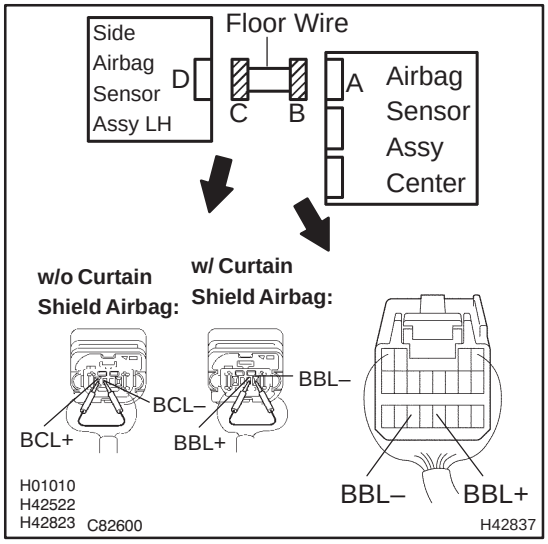
OK:

The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FLOOR WIRE(OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the side airbag sensor assy RH.

(b) w/ Curtain shield airbag:
Using a service wire, connect BCL+ and BCL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) w/o Curtain shield airbag:
Using a service wire, connect BBL+ and BBL– of the connector ”C”.

NOTICE:

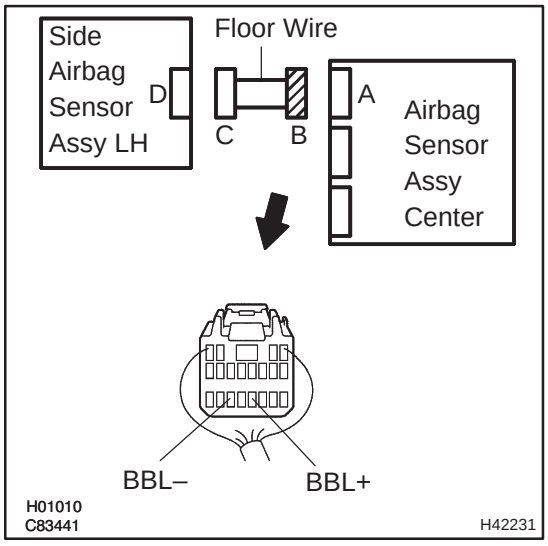
Do not forcibly insert a service wire into the terminal of the connector when connecting.

(d) Measure the resistance between BBL+ and BBL– of the connector ”B”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

4 CHECK FLOOR WIRE(TO B+)



(a) Disconnect the service wire from the connector ”C”.

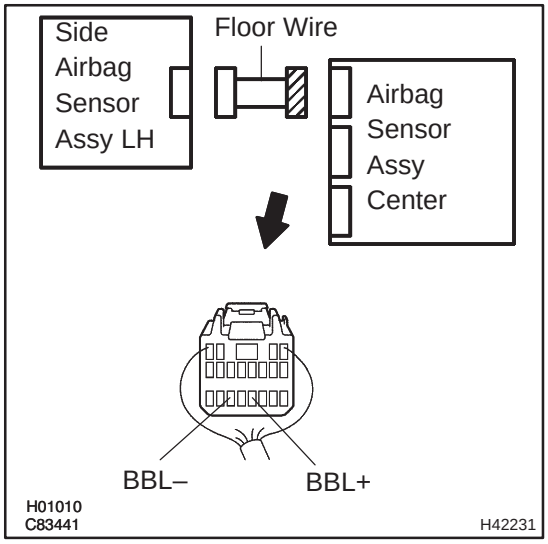
(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of BBL+ and BBL– of the connector ”B”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

5 CHECK FLOOR WIRE(TO GROUND)

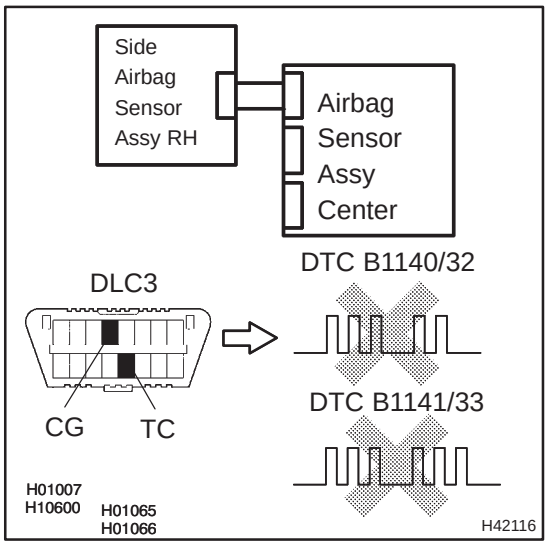


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of BBL+ and BBL– of the connector "B".
OK:
Resistance: 10 kΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

6 CHECK SIDE AIR BAG SENSOR ASSY LH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Interchange the side airbag sensor assy RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
A: DTC B1140/32 is not output.
B: DTC B1141/33 is not output.

NG:A → **REPLACE AIR BAG SENSOR ASSY CENTER**

NG:B → **REPLACE SIDE AIR BAG SENSOR ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

DTC B1148/36 FRONT AIRBAG SENSOR (RH) MALFUNCTION

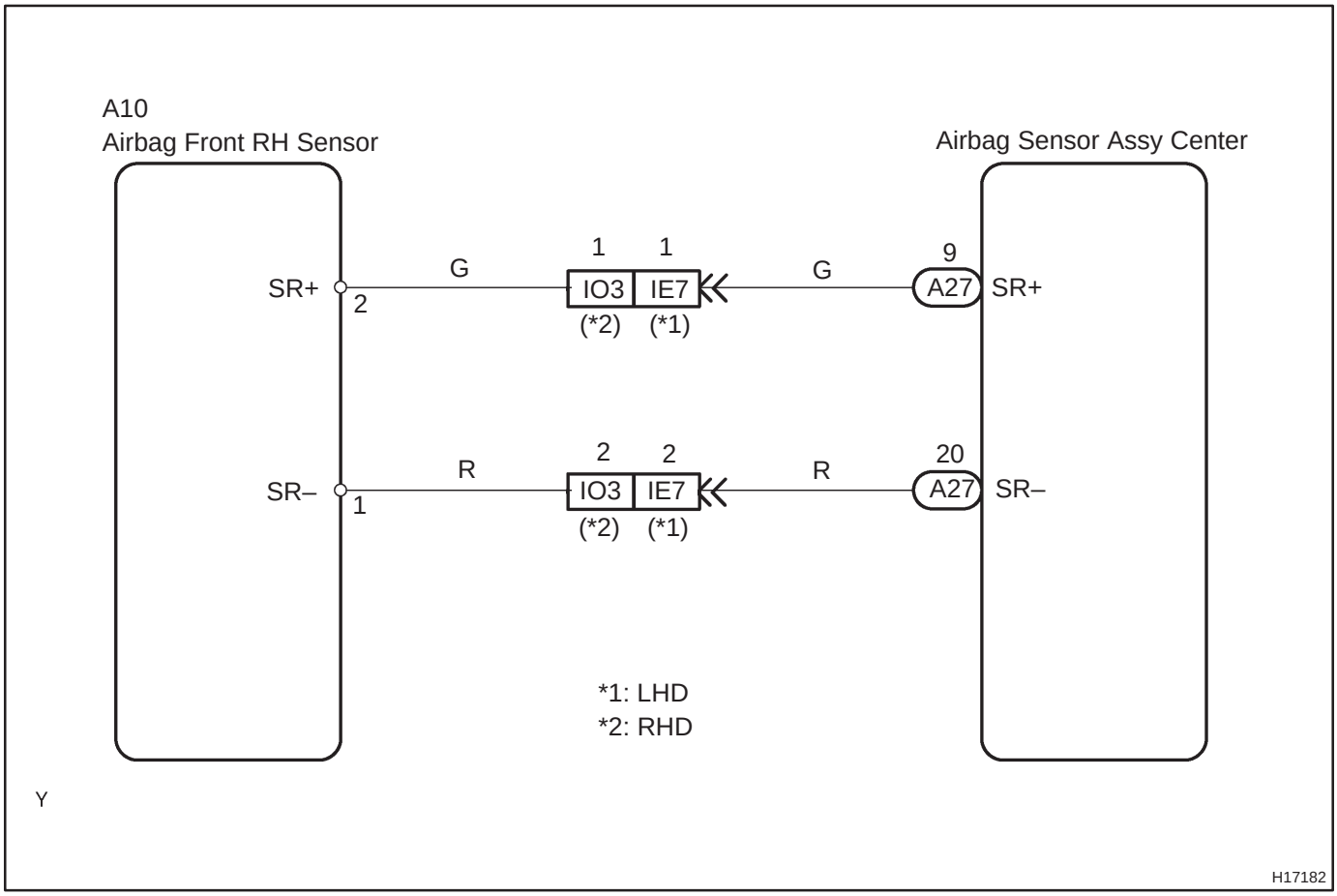
CIRCUIT DESCRIPTION

The airbag front RH sensor circuit consists of the diagnosis circuit and the frontal deceleration sensor, etc. If the airbag sensor assy center receives signals from the frontal deceleration sensor, it judges whether or not the SRS should be activated.

DTC B1148/36 is recorded when a malfunction in the airbag front RH sensor is detected.

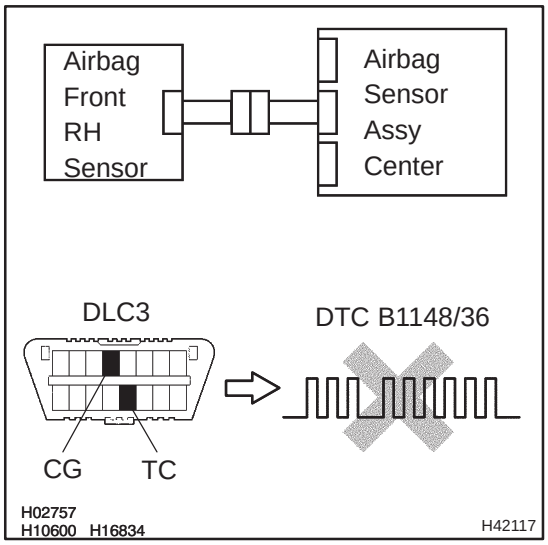
DTC No.	DTC Detecting Condition	Trouble Area
B1148/36	• Open circuit in SR+ wire harness or SR– wire harness of front airbag sensor RH • Short circuit in airbag front RH sensor wire harness (to B+) • Short circuit in airbag front RH sensor wire harness (to ground) • Airbag front RH sensor malfunction • Airbag sensor assy center malfunction	• Airbag front RH sensor • Airbag sensor assy center • Instrument panel wire • Engine room main wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1148/36 is not output.

HINT:
Codes other than code B1148/36 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

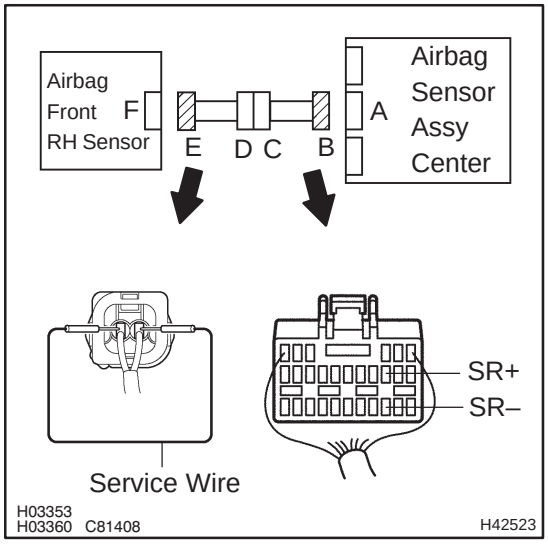
2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the airbag front RH sensor.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the airbag front RH sensor.

(b) Using a service wire, connect SR+ and SR– of the connector ”E”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between SR+ and SR– of the connector ”B”.

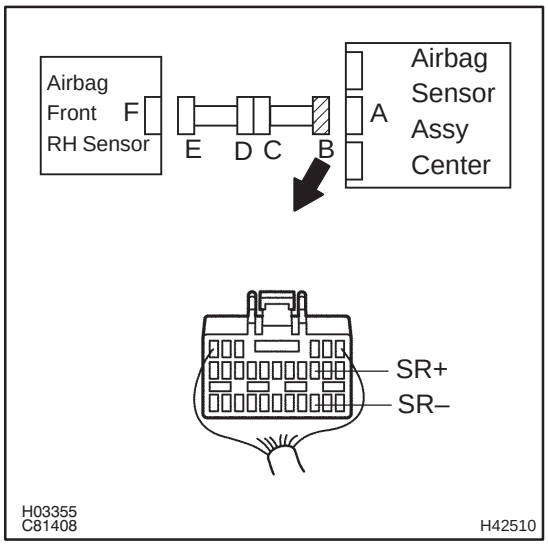
OK:

Resistance: Below 1 Ω

NG	**Go to step 7**

OK

4 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (TO B+)



(a) Disconnect the service wire from the connector ”E”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of SR+ and SR– of the connector ”B”.

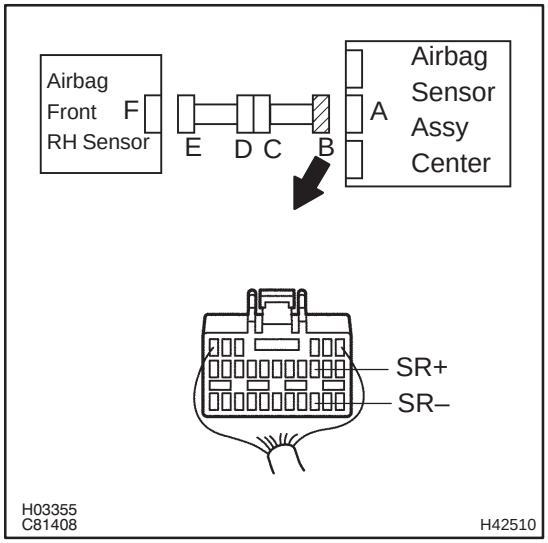
OK:

Voltage: Below 1 V

NG	**Go to step 8**

OK

5 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (TO GROUND)

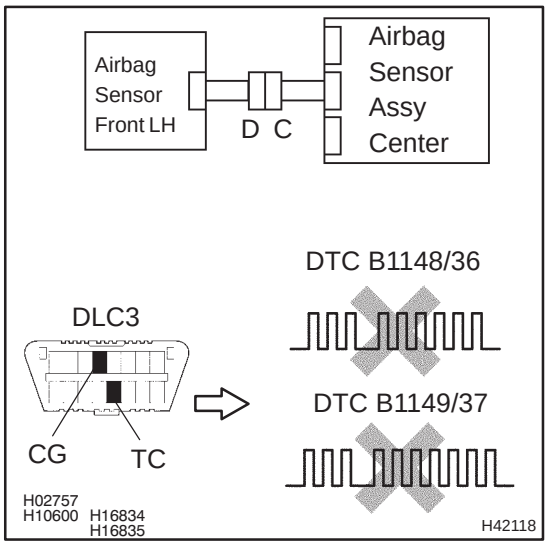


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of SR+ and SR– of the connector "B".
OK:
Resistance: 1 MΩ or Higher

NG → **Go to step 9**

OK

6 CHECK AIR BAG FRONT RH SENSOR



(a) Connect the connector to the airbag sensor assy center.
(b) Interchange the airbag front RH sensor with the airbag sensor front LH and connect the connectors to them.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
A: DTC B1148/36 is not output.
B: DTC B1149/37 is not output.

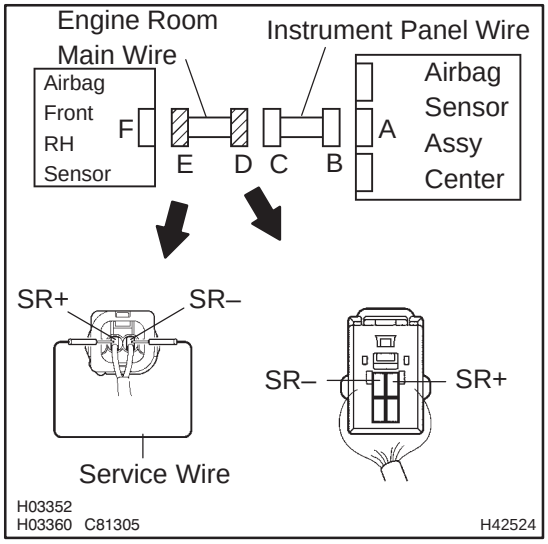
NG:A → **REPLACE AIR BAG FRONT RH SENSOR**

NG:B → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

7 CHECK ENGINE ROOM MAIN WIRE(OPEN)



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Using a service wire, connect SR+ and SR– of the connector ”E”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between SR+ and SR– of the connector ”D”.

OK:

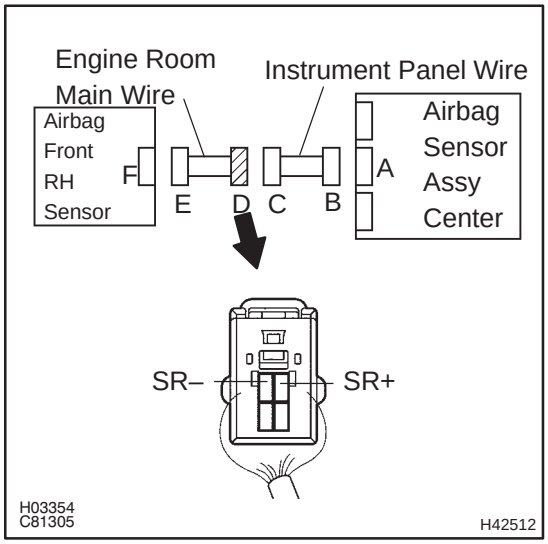
Resistance: Below 1 Ω

NG	**REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

8 CHECK ENGINE ROOM MAIN WIRE(TO B+)



(a) Turn the ignition switch to the LOCK position.

(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.

(c) Disconnect the engine room main wire connector from the instrument panel wire.

(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(e) Measure the voltage between the body ground and each of SR+ and SR– of the connector ”D”.

OK:

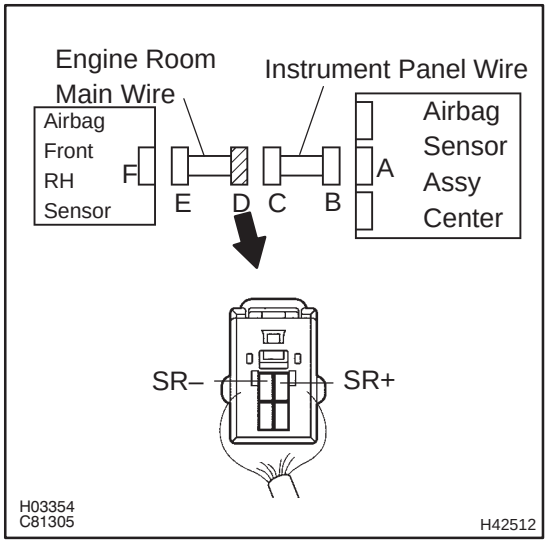
Voltage: Below 1 V

NG	**REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

9	CHECK ENGINE ROOM MAIN WIRE(TO GROUND)



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Measure the resistance between the body ground and each of SR+ and SR– of the connector ”D”.

OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

DTC B1148/36 FRONT AIRBAG SENSOR (RH) MALFUNCTION

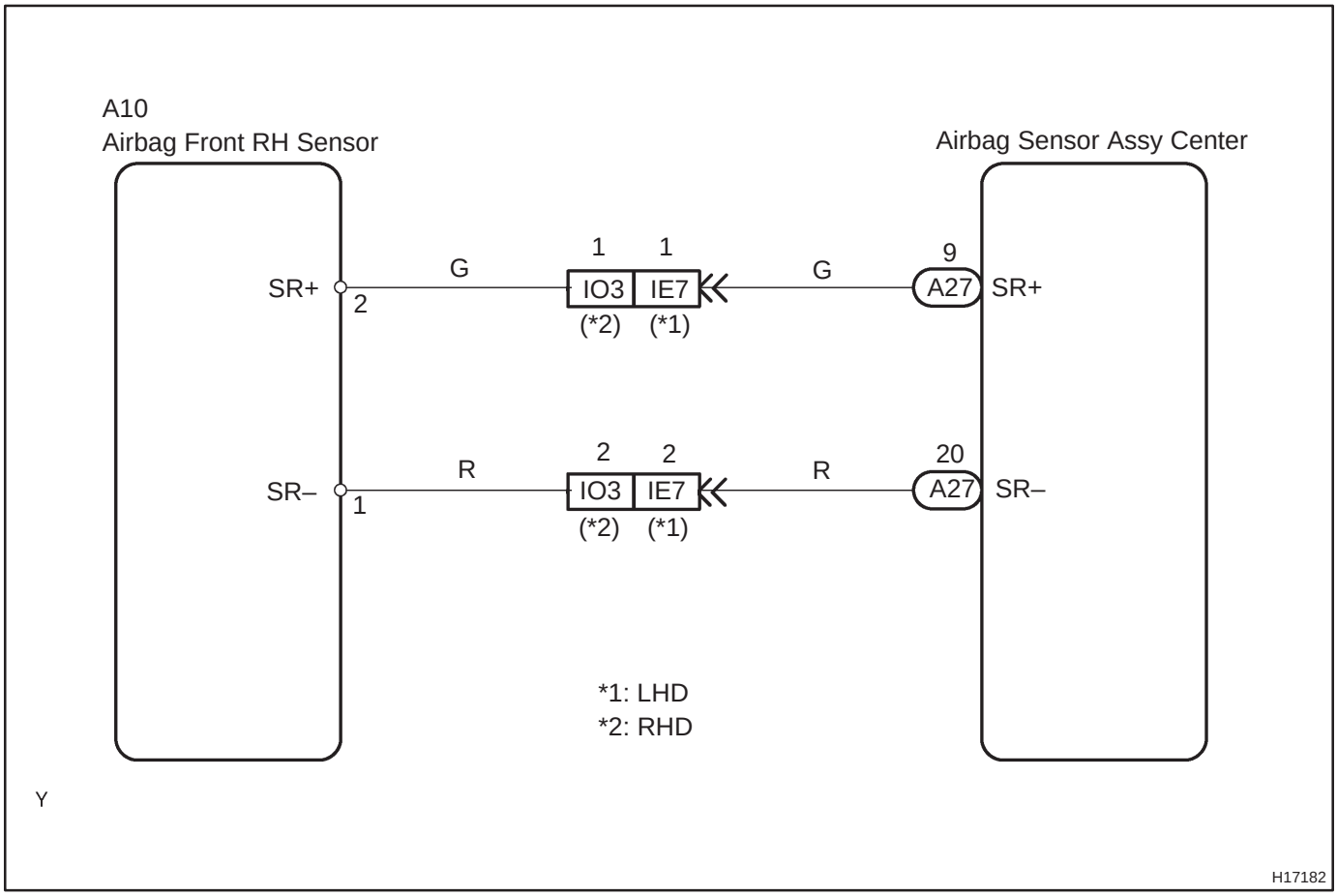
CIRCUIT DESCRIPTION

The airbag front RH sensor circuit consists of the diagnosis circuit and the frontal deceleration sensor, etc. If the airbag sensor assy center receives signals from the frontal deceleration sensor, it judges whether or not the SRS should be activated.

DTC B1148/36 is recorded when a malfunction in the airbag front RH sensor is detected.

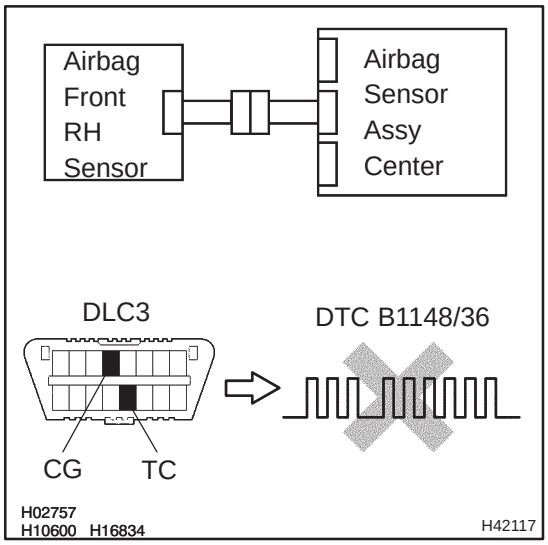
DTC No.	DTC Detecting Condition	Trouble Area
B1148/36	• Open circuit in SR+ wire harness or SR– wire harness of front airbag sensor RH • Short circuit in airbag front RH sensor wire harness (to B+) • Short circuit in airbag front RH sensor wire harness (to ground) • Airbag front RH sensor malfunction • Airbag sensor assy center malfunction	• Airbag front RH sensor • Airbag sensor assy center • Instrument panel wire • Engine room main wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1148/36 is not output.

HINT:
Codes other than code B1148/36 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

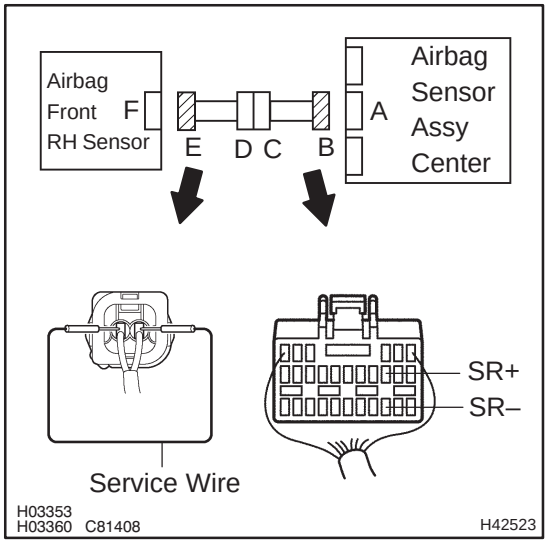
2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the airbag front RH sensor.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the airbag front RH sensor.

(b) Using a service wire, connect SR+ and SR– of the connector ”E”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between SR+ and SR– of the connector ”B”.

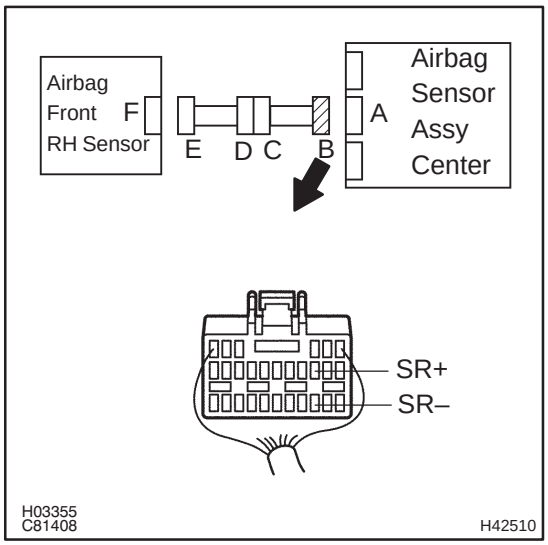
OK:

Resistance: Below 1 Ω

NG	**Go to step 7**

OK

4 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (TO B+)



(a) Disconnect the service wire from the connector ”E”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of SR+ and SR– of the connector ”B”.

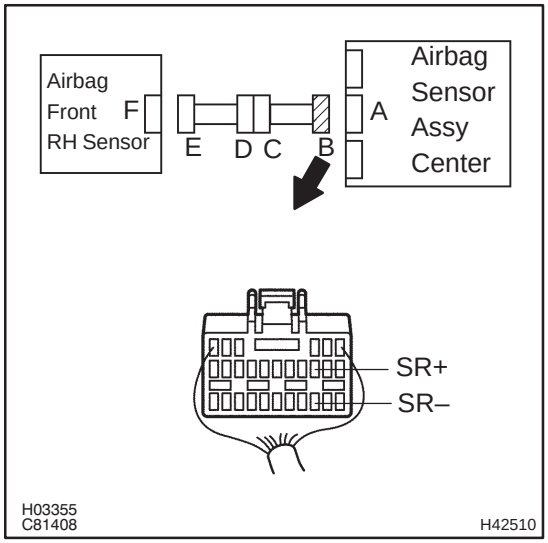
OK:

Voltage: Below 1 V

NG	**Go to step 8**

OK

5 CHECK FRONT AIRBAG SENSOR (RH) CIRCUIT (TO GROUND)

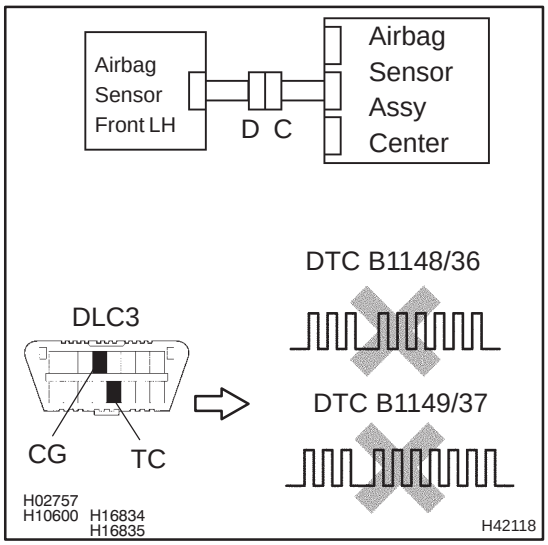


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of SR+ and SR– of the connector "B".
OK:
Resistance: 1 MΩ or Higher

NG → **Go to step 9**

OK

6 CHECK AIR BAG FRONT RH SENSOR



(a) Connect the connector to the airbag sensor assy center.
(b) Interchange the airbag front RH sensor with the airbag sensor front LH and connect the connectors to them.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
A: DTC B1148/36 is not output.
B: DTC B1149/37 is not output.

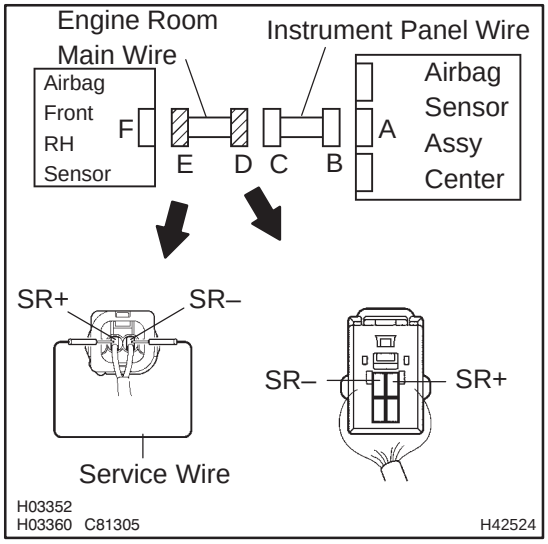
NG:A → **REPLACE AIR BAG FRONT RH SENSOR**

NG:B → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

7 CHECK ENGINE ROOM MAIN WIRE(OPEN)



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Using a service wire, connect SR+ and SR– of the connector ”E”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between SR+ and SR– of the connector ”D”.

OK:

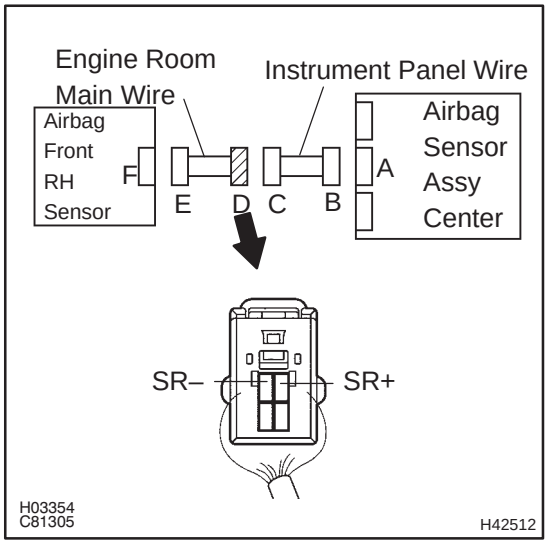
Resistance: Below 1 Ω

NG	**REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

8 CHECK ENGINE ROOM MAIN WIRE(TO B+)



(a) Turn the ignition switch to the LOCK position.

(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.

(c) Disconnect the engine room main wire connector from the instrument panel wire.

(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(e) Measure the voltage between the body ground and each of SR+ and SR– of the connector ”D”.

OK:

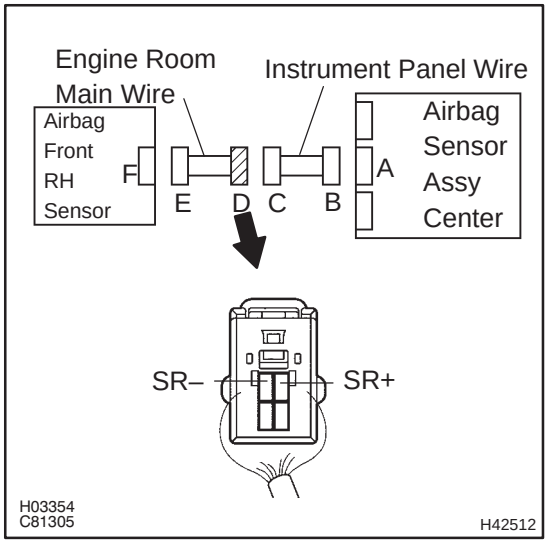
Voltage: Below 1 V

NG	**REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

9	CHECK ENGINE ROOM MAIN WIRE(TO GROUND)



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Measure the resistance between the body ground and each of SR+ and SR– of the connector ”D”.

OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

DTC	B1149/37	FRONT AIRBAG SENSOR (LH) MALFUNCTION

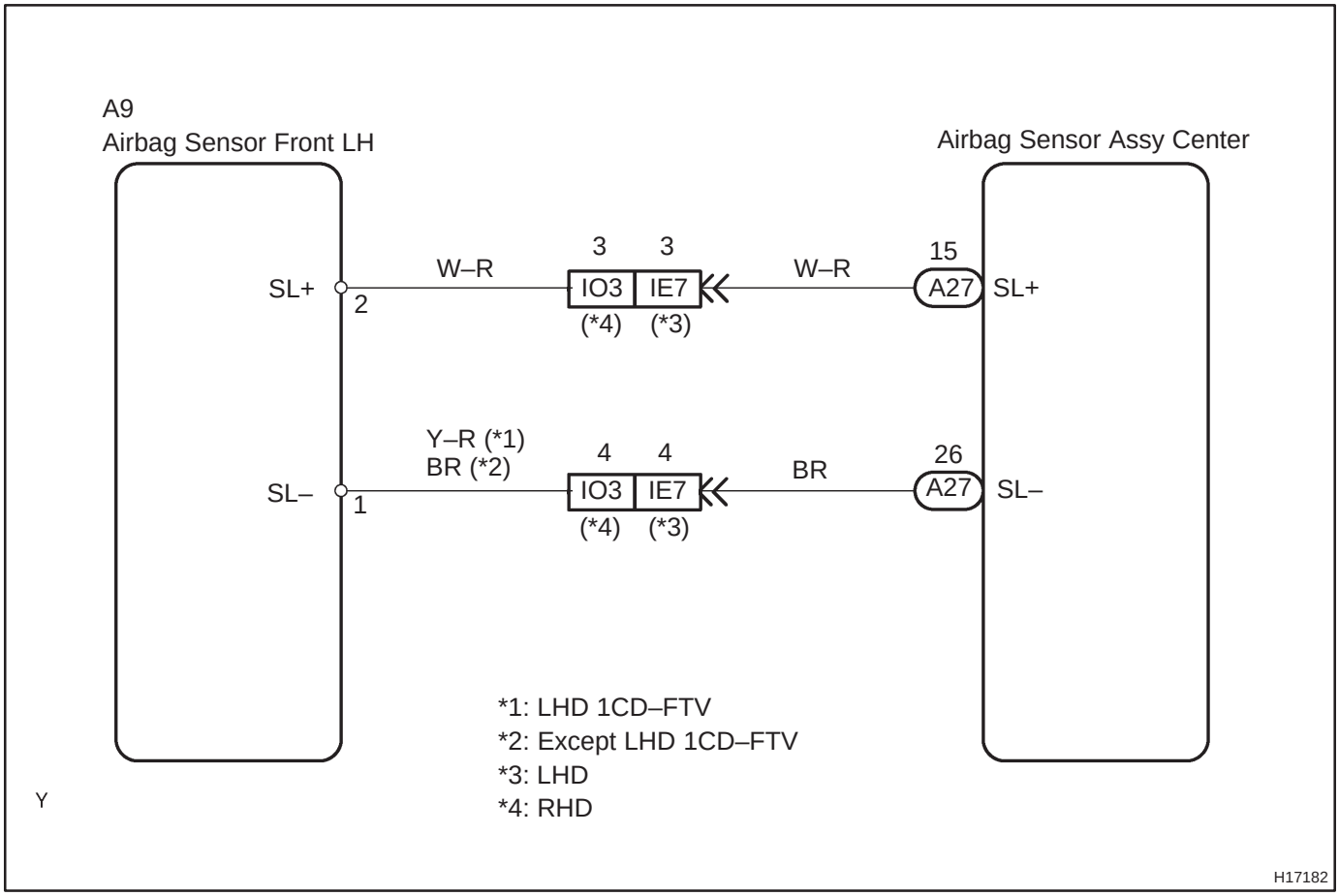
CIRCUIT DESCRIPTION

The airbag sensor front LH circuit consists of the diagnosis circuit and the frontal deceleration sensor, etc.

If the airbag sensor assy center receives signals from the frontal deceleration sensor, it judges whether or not the SRS should be activated.
DTC B1149/37 is recorded when malfunction is detected in the airbag sensor front LH circuit.

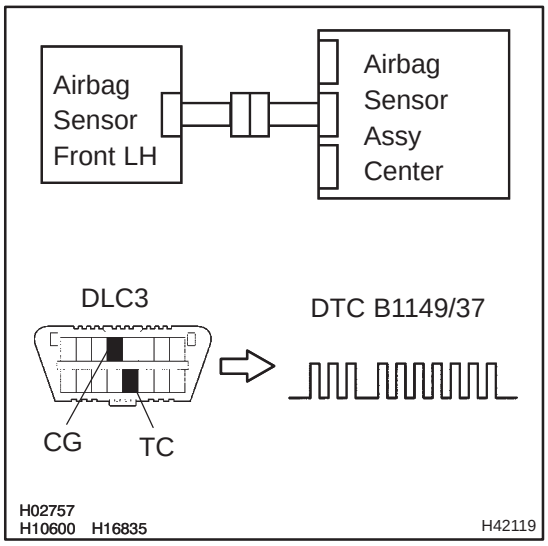
DTC No.	DTC Detecting Condition	Trouble Area
B1149/37	• Open circuit in SL+ wire harness or SL– wire harness of airbag sensor front LH • Short circuit in airbag sensor front LH wire harness (to B+) • Short circuit in airbag sensor front LH wire harness (to ground) • Airbag sensor front LH malfunction • Airbag sensor assy center malfunction	• Airbag sensor front LH • Airbag sensor assy center • Instrument panel wire • Engine room main wire

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1149/37 is not output.

HINT:

Codes other than code B1149/37 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the airbag sensor front LH.

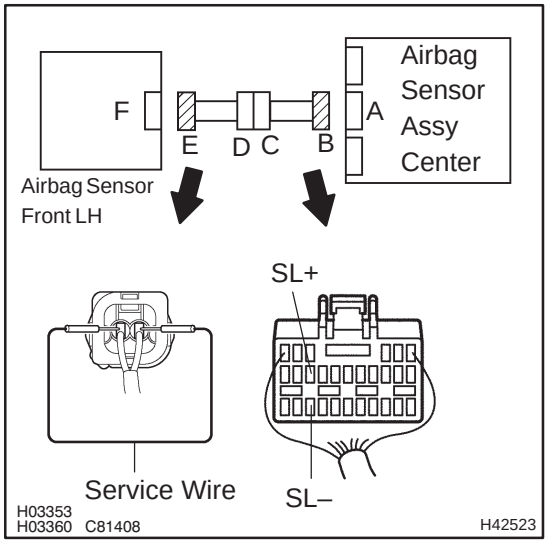
OK:

The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FRONT AIRBAG SENSOR (LH) CIRCUIT (OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the airbag sensor front LH.

(b) Using a service wire, connect SL+ and SL– of the connector ”E”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between SL+ and SL– of the connecter ”B”.

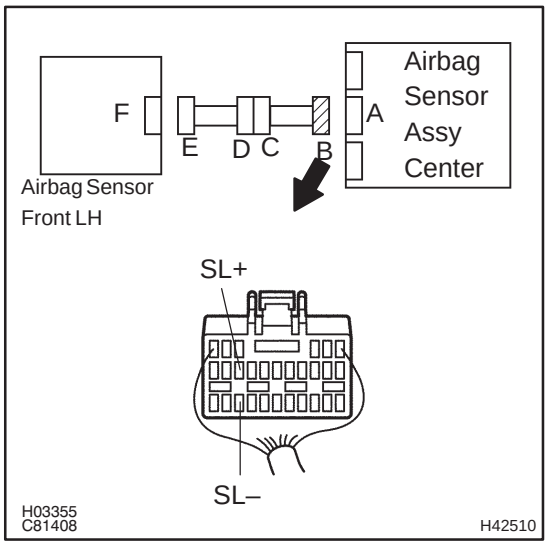
OK:

Resistance: Below 1 Ω

NG	**Go to step 7**

OK

4 CHECK FRONT AIRBAG SENSOR (LH) CIRCUIT (TO B+)



(a) Disconnect the service wire from the connector ”E”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of SL+ and SL– of the connector ”B”.

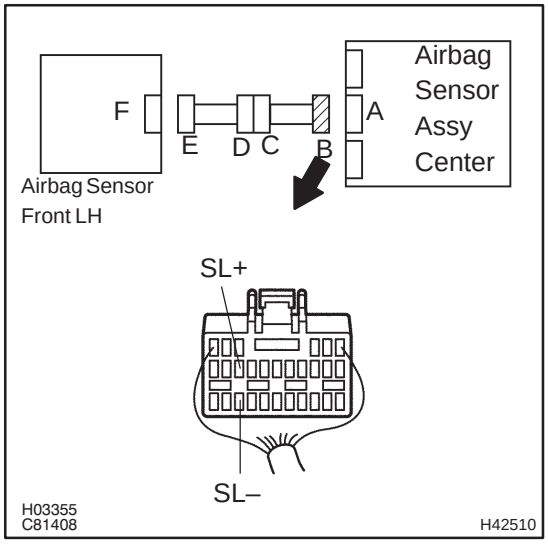
OK:

Voltage: Below 1 V

NG	**Go to step 8**

OK

5 CHECK FRONT AIRBAG SENSOR (LH) CIRCUIT (TO GROUND)

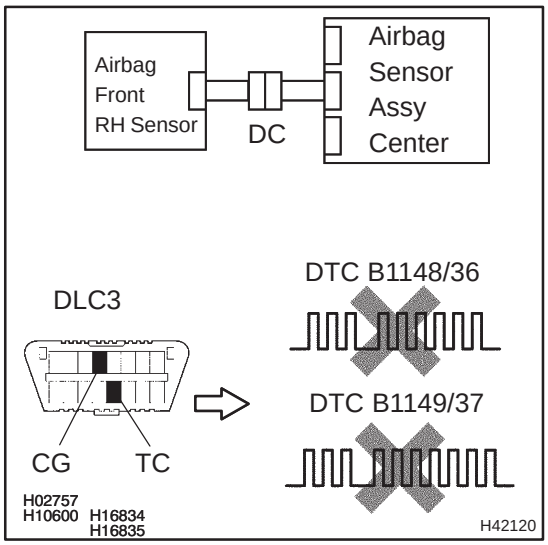


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of SL+ and SL– of the connector "B".
OK:
Resistance: 1 MΩ or Higher

NG → **Go to step 9**

OK

6 CHECK AIR BAG SENSOR FRONT LH



(a) Connect the connector to the airbag sensor assy center.
(b) Interchange the airbag front sensor RH with the airbag sensor front LH and connect the connectors to them.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
A: DTC B1148/36 is not output.
B: DTC B1149/37 is not output.

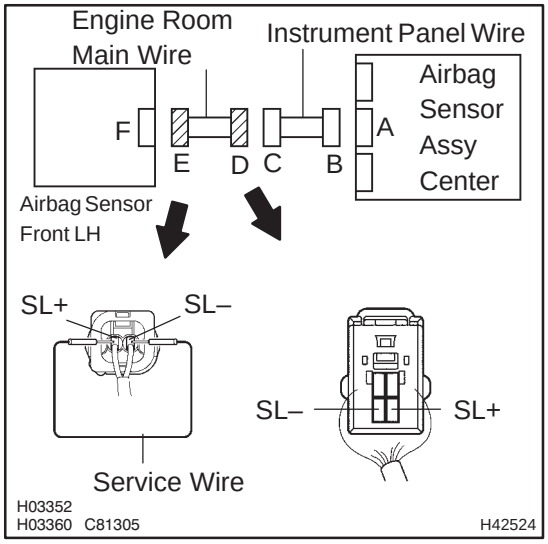
NG:A → **REPLACE AIR BAG SENSOR ASSY CENTER**

NG:B → **REPLACE AIR BAG SENSOR FRONT LH**

OK

USE SIMULATION METHOD TO CHECK

7 CHECK ENGINE ROOM MAIN WIRE(OPEN)



(a) Disconnect the engine room main wire connect from the instrument panel wire.
(b) Using a service wire, connect SL+ and SL– of the connector ”E”.

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

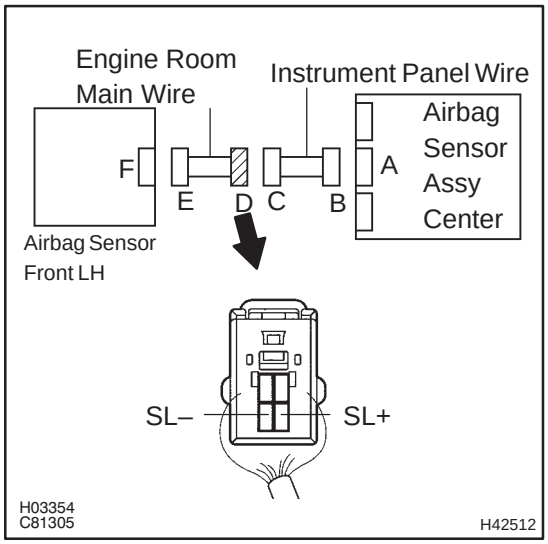
(c) Measure the resistance between SL+ and SL– of the connector ”D”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

8 CHECK ENGINE ROOM MAIN WIRE(TO B+)



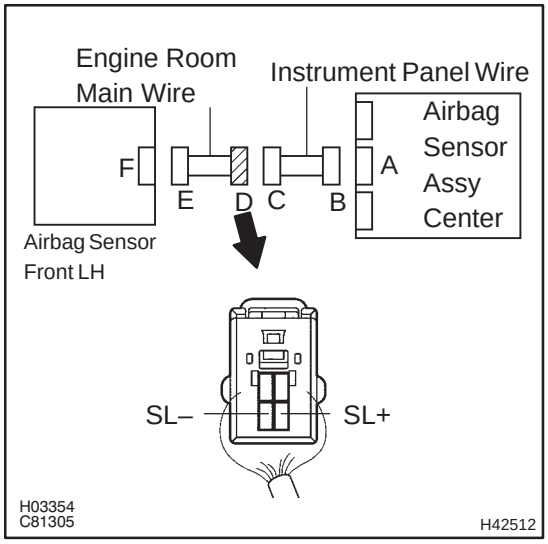
(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the engine room main wire connector from the instrument panel wire.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and each of SL+ and SL– of the connector ”D”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

9	CHECK ENGINE ROOM MAIN WIRE(TO GROUND)



(a) Disconnect the engine room main wire connector from the instrument panel wire.

(b) Measure the resistance between the body ground and each of SL+ and SL– of the connector ”D”.

OK:

Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE ENGINE ROOM MAIN WIRE**

OK

REPAIR OR REPLACE INSTRUMENT PANEL WIRE

DTC	B1153/25	SEAT POSITION AIRBAG SENSOR MALFUNCTION

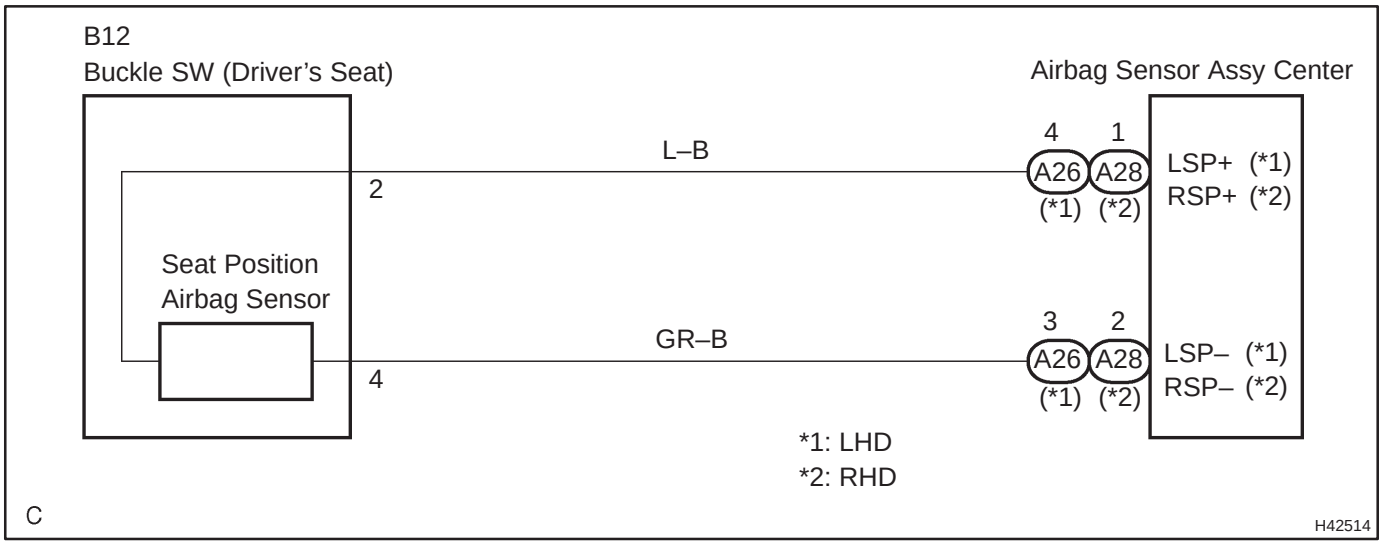
CIRCUIT DESCRIPTION

The seat position airbag sensor circuits consists of the airbag sensor assy center and the seat position airbag sensor.

DTC B1153/25 is recorded when a malfunction is detected in the seat position airbag sensor circuit.

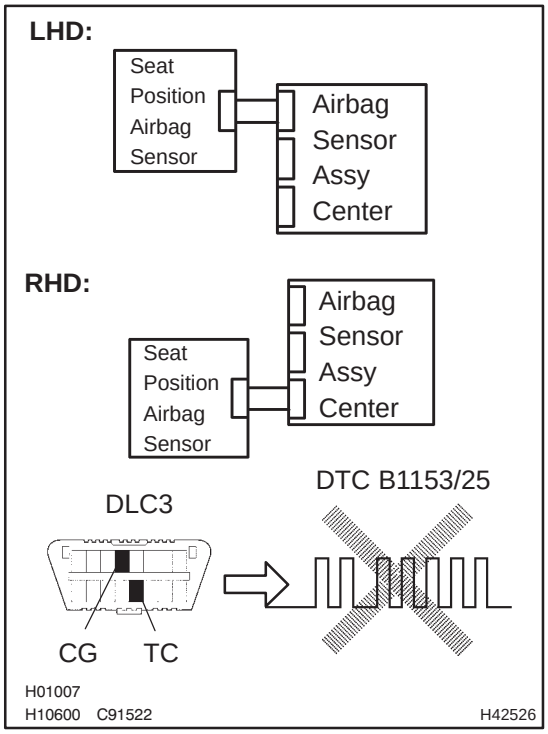
DTC No.	DTC Detecting Condition	Trouble Area
B1153/25	• Open circuit in LSP+ (RSP+) wire harness or LSP– (RSP–) wire harness of seat position airbag sensor • Short circuit in seat position airbag sensor wire harness (to ground) • Short circuit in seat position airbag sensor wire harness (to B+) • Seat position airbag sensor malfunction • Airbag sensor assy center malfunction	• Seat position airbag sensor • Airbag sensor assy center • Floor wire (LHD) • Floor wire No.2 (RHD)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1153/25 is not output.

HINT:
Codes other than code B1153/25 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the airbag sensor assy center and the seat position airbag sensor.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

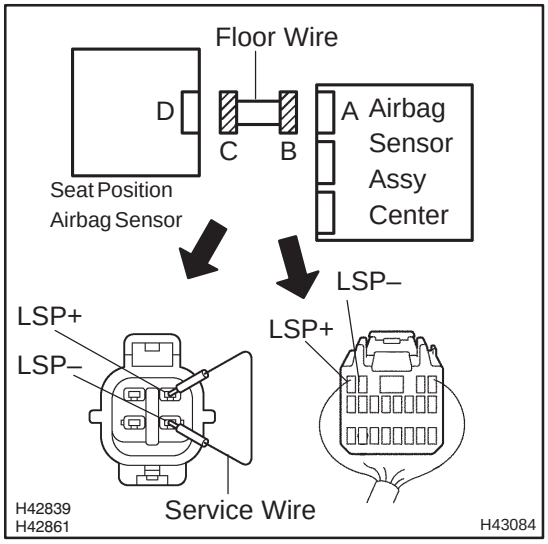
3	CHECK VEHICLE CONDITION

(a) Check the vehicle steering position.

RHD → **Go to step 10**

LHD

4 CHECK FLOOR WIRE(OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the seat position airbag sensor.

(b) Using a service wire, connect between LSP+ and LSP– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between LSP+ and LSP– of the floor wire connector on the airbag sensor assy center side.

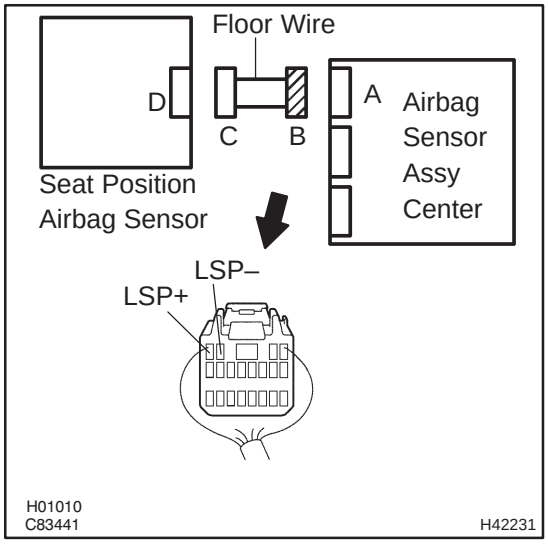
OK:

Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

5 CHECK FLOOR WIRE(TO B+)



(a) Disconnect the service wire from the connector ”C”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of LSP+ and LSP– of the connector ”B”.

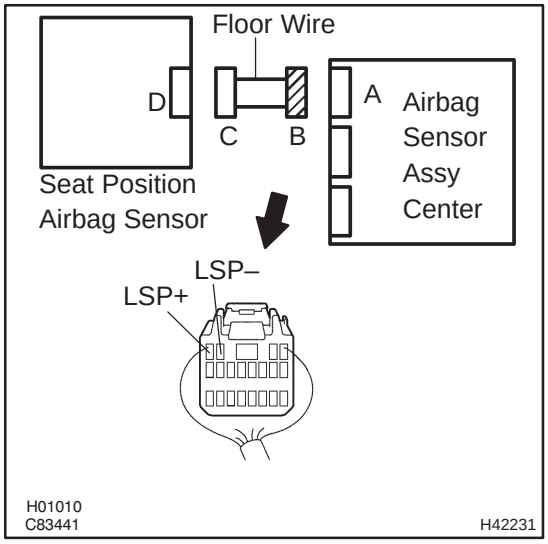
OK:

Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

6 CHECK FLOOR WIRE(TO GROUND)

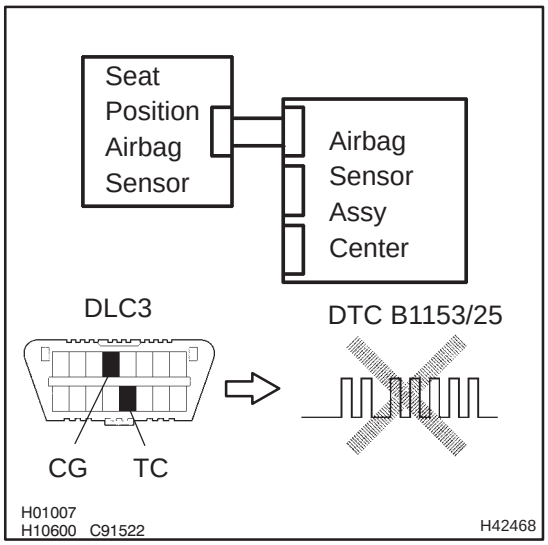


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of LSP+ and LSP– of the connector "B".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

7 CHECK SEAT POSITION AIR BAG SENSOR



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the seat position airbag sensor and the airbag sensor assy center.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1153/25 is not output.

HINT:
Codes other than code B1153/25 may be output at this time, but they are not related to this check.

NG → **Go to step 8**

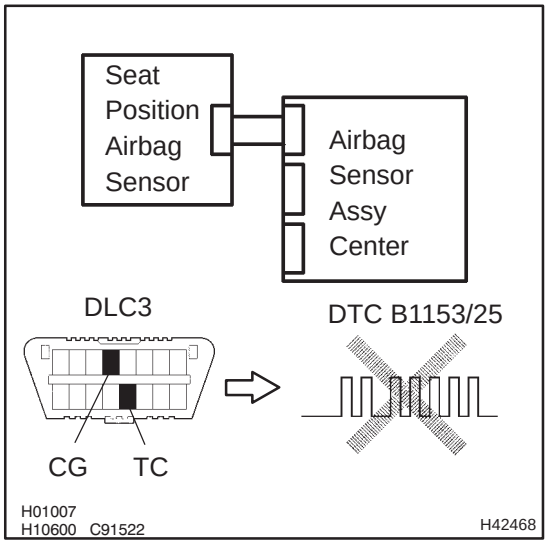
OK

USE SIMULATION METHOD TO CHECK

8	REPLACE SEAT POSITION AIRBAG SENSOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Replace the seat position airbag sensor (See page 60–70).

9	RECHECK DTC



(a) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(b) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(c) Clear the stored DTCs in the memory (See page 05–1184).
(d) Turn the ignition switch to the LOCK position.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Check the DTCs (See page 05–1184).
OK:
DTC B1153/25 is not output.

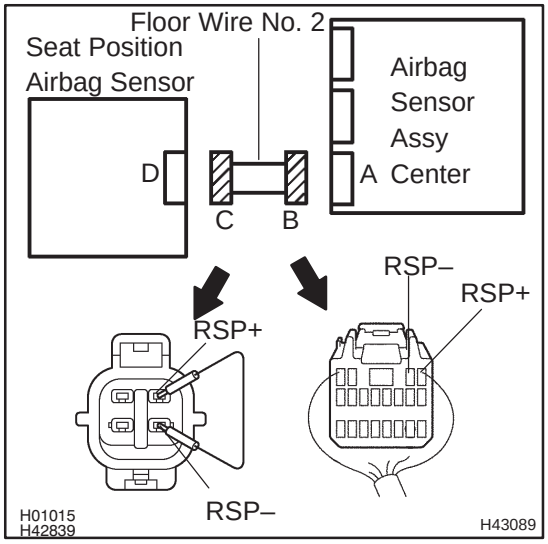
HINT:
Codes other than code B1153/25 may be output at this time, but they are not related to this check.

NG	REPLACE AIR BAG SENSOR ASSY CENTER

OK

USE SIMULATION METHOD TO CHECK

10 CHECK FLOOR WIRE NO.2(OPEN)



(a) Disconnect the connectors from the airbag sensor assy center and the seat position airbag sensor.

(b) Using a service wire, connect between RSP+ and RSP– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between RSP+ and RSP– of the connector ”B”.

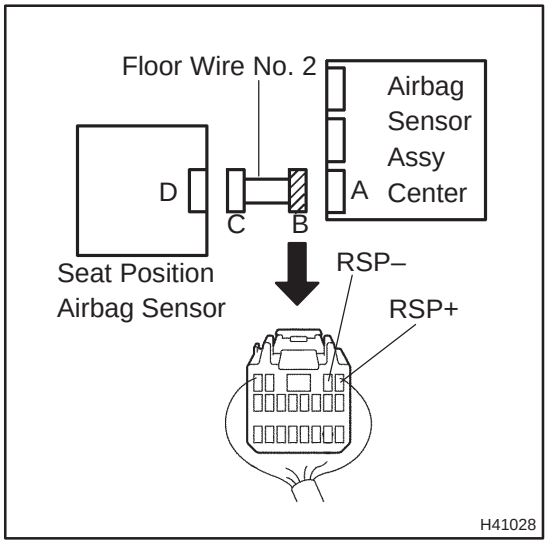
OK:

Resistance: Below 1 Ω

NG	**REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

11 CHECK FLOOR WIRE NO.2(TO B+)



(a) Disconnect the service wire from the connector ”C”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of RSP+ and RSP– of the connector ”B”.

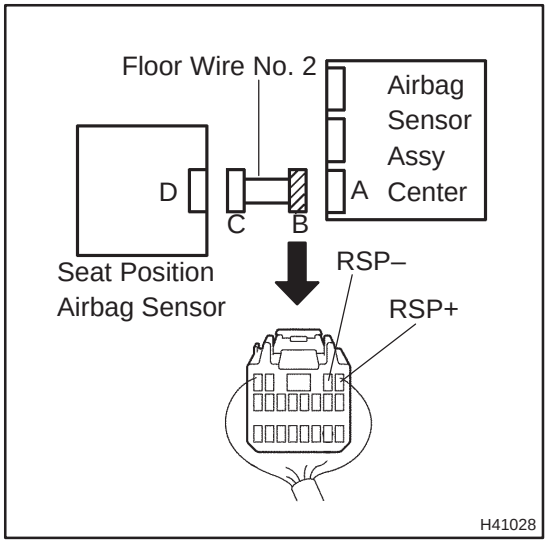
OK:

Voltage: Below 1 V

NG	**REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

12 CHECK FLOOR WIRE NO.2(TO GROUND)

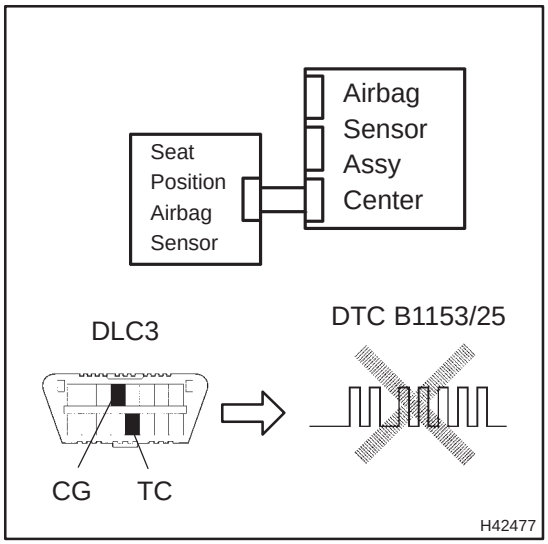


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of RSP+ and RSP– of the connector "B".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

13 CHECK SEAT POSITION AIR BAG SENSOR



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connectors to the seat position airbag sensor and the airbag sensor assy center.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1153/25 is not output.

HINT:
Codes other than code B1153/25 may be output at this time, but they are not related to this check.

NG → **Go to step 14**

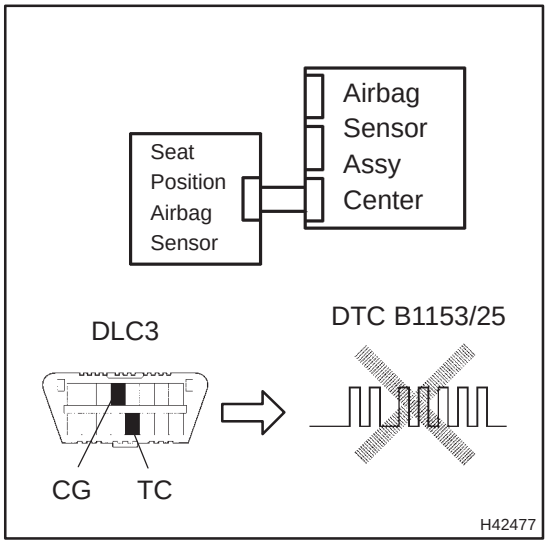
OK

USE SIMULATION METHOD TO CHECK

14	REPLACE SEAT POSITION AIR BAG SENSOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Replace the seat position airbag sensor (See page 60–70).

15	RECHECK DTC



(a) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(b) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(c) Clear the stored DTCs in the memory (See page 05–1184).
(d) Turn the ignition switch to the LOCK position.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Check the DTCs (See page 05–1184).
OK:
DTC B1153/25 is not output.

HINT:
Codes other than code B1153/25 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1154/38	AIRBAG SENSOR REAR (RH) MALFUNCTION

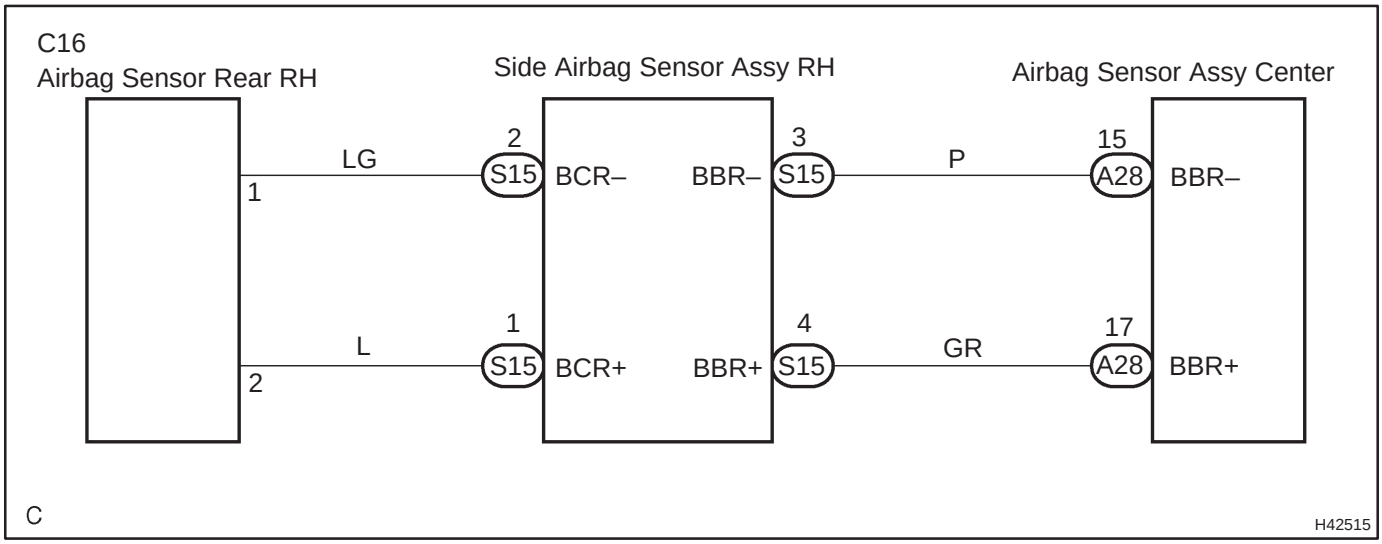
CIRCUIT DESCRIPTION

The airbag sensor rear RH consists of the diagnosis circuit and the lateral deceleration sensor, etc.
If the airbag sensor assy center receives the signal from the lateral deceleration sensor signal in the airbag sensor rear RH, it judges whether or not the SRS should be activated.
DTC B1154/38 is recorded when a malfunction in the airbag sensor rear RH is detected.

DTC No.	DTC Detection Condition	Trouble Area
B1154/38	• Short circuit in airbag sensor rear RH wire harness (to ground) • Short circuit in airbag sensor rear RH wire harness (to B+) • Open circuit in BCR+ wire harness or BCR– wire harness of airbag sensor rear RH • Airbag sensor rear RH malfunction • Side airbag sensor assy RH malfunction • Airbag sensor assy center malfunction	• Airbag sensor rear RH • Side airbag sensor assy RH • Airbag sensor assy center • Floor wire No.2

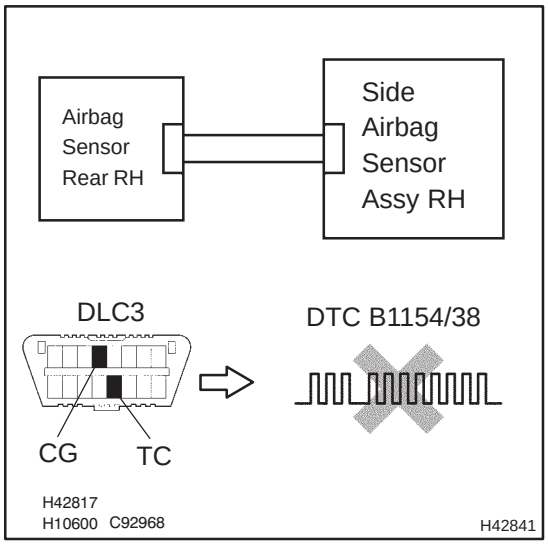
HINT:
DTC B1154/38 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1154/38 is not output.

HINT:

Codes other than code B1154/38 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the side airbag sensor assy RH and the airbag sensor rear RH.

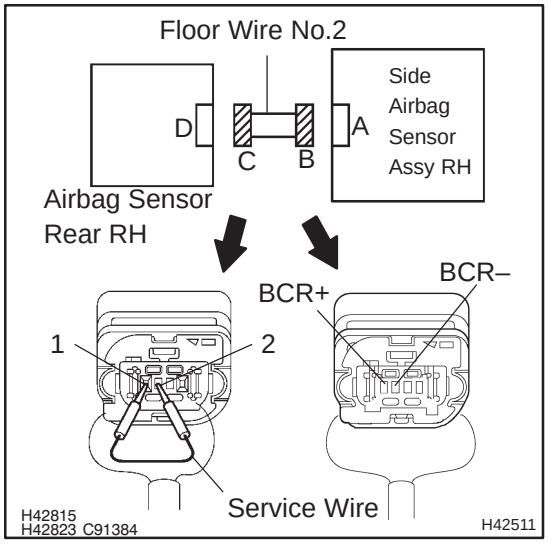
OK:

The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FLOOR WIRE NO.2(OPEN)



(a) Disconnect the connectors from the side airbag sensor assy RH and the airbag sensor rear RH.

(b) Using a service wire, connect 1 and 2 of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between BCR+ and BCR– of the connector ”B”.

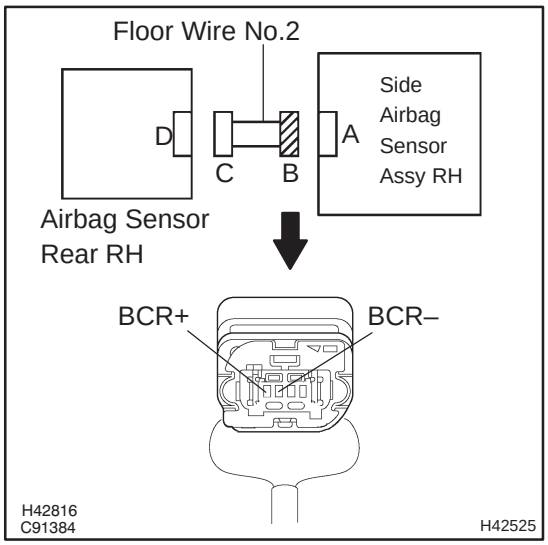
OK:

Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

4 CHECK FLOOR WIRE NO.2(TO B+)



(a) Disconnect the service wire from the connector ”C”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of BCR+ and BCR– of the connector ”B”.

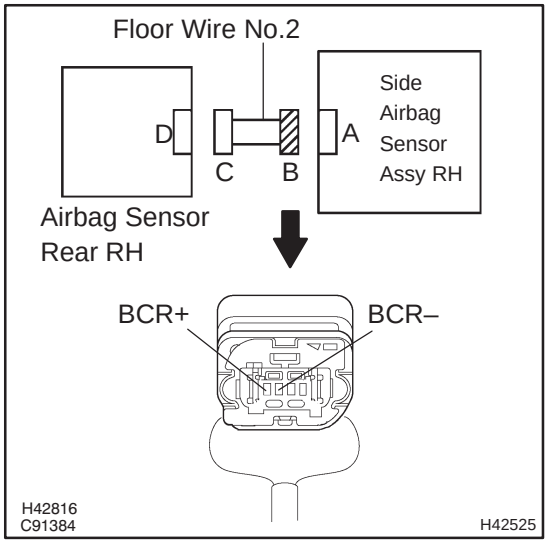
OK:

Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

5 CHECK FLOOR WIRE NO.2(TO GROUND)

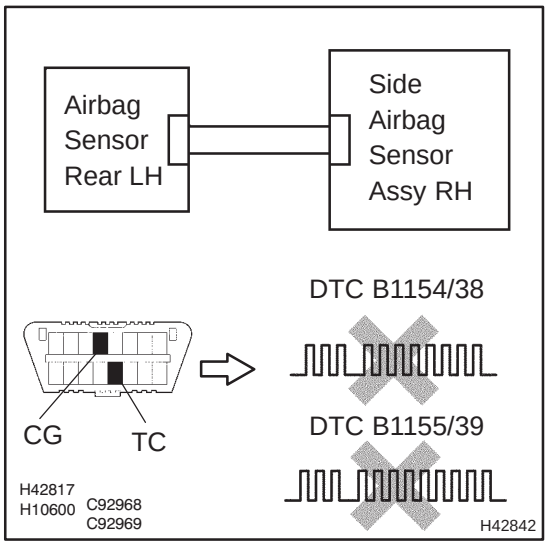


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of BCR+ and BCR– of the connector "B".
OK:
Resistance: 10 kΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

6 CHECK AIR BAG SENSOR REAR RH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the side airbag sensor assy RH.
(d) Interchange the airbag sensor rear RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
A: DTC B1154/38 is not output.
B: DTC B1155/39 is not output.

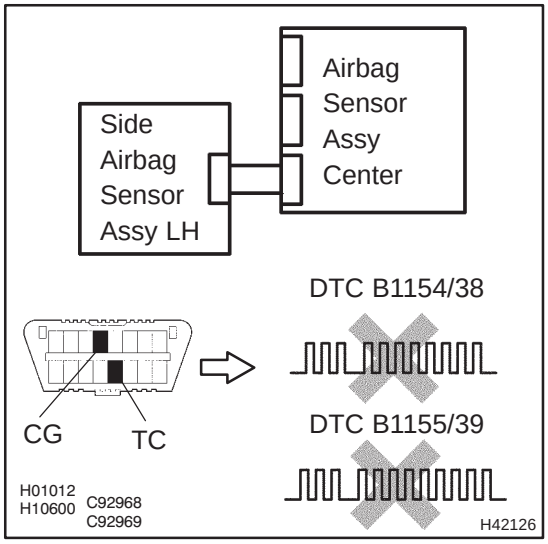
NG:A → **Go to step 7**

NG:B → **REPLACE AIR BAG SENSOR REAR RH**

OK

USE SIMULATION METHOD TO CHECK

7	CHECK SIDE AIR BAG SENSOR ASSY RH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Return the interchanged airbag sensor rear RH and LH to the original condition and connect the connectors to them.
(d) Interchange the side airbag sensor assy RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Tune the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).

OK:
A: DTC B1154/38 is not output.
B: DTC B1155/39 is not output.

NG:A	REPLACE AIR BAG SENSOR ASSY CENTER

NG:B	REPLACE SIDE AIR BAG SENSOR ASSY RH

OK

USE SIMULATION METHOD TO CHECK

DTC	B1155/39	AIRBAG SENSOR REAR (LH) MALFUNCTION

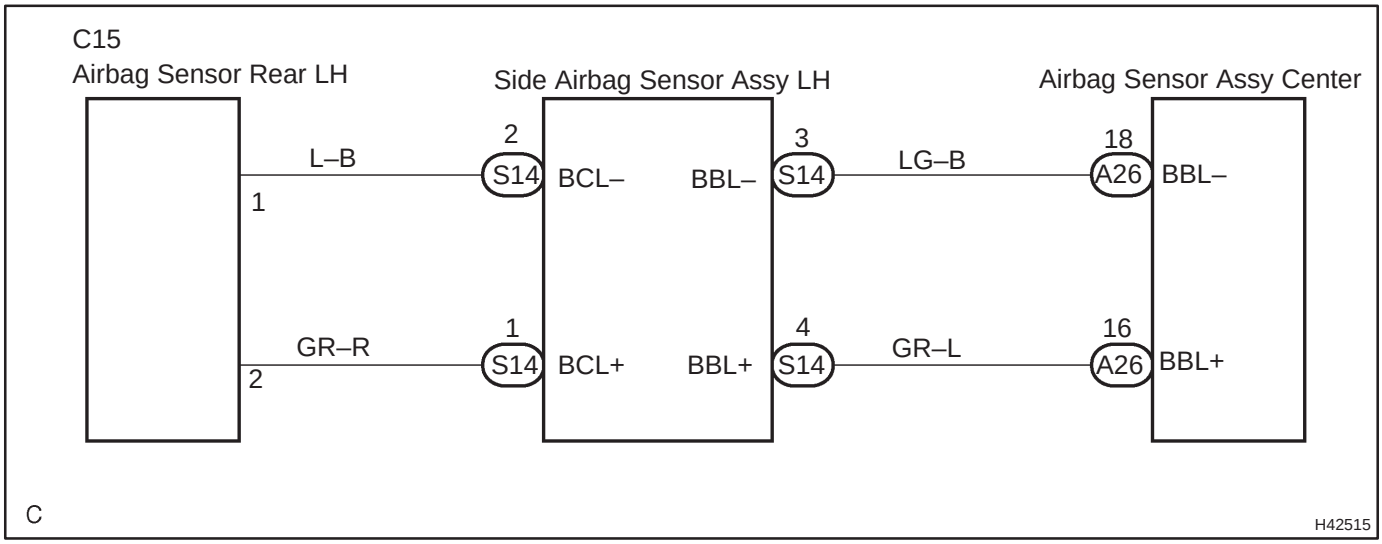
CIRCUIT DESCRIPTION

The airbag sensor rear LH consists of the diagnosis circuit and the lateral deceleration sensor, etc.
If the airbag sensor assy center receives the signal from the lateral deceleration sensor signal in the airbag sensor rear LH, it judges whether or not the SRS should be activated.
DTC B1155/39 is recorded when a malfunction in the airbag sensor rear LH is detected.

DTC No.	DTC Detection Condition	Trouble Area
B1155/39	• Short circuit in airbag sensor rear LH wire harness (to ground) • Short circuit in airbag sensor rear LH wire harness (to B+) • Open circuit in BCL+ wire harness or BCL– wire harness of airbag sensor rear LH • Airbag sensor rear LH malfunction • Side airbag sensor assy LH malfunction • Airbag sensor assy center malfunction	• Airbag sensor rear LH • Side airbag sensor assy LH • Airbag sensor assy center • Floor wire

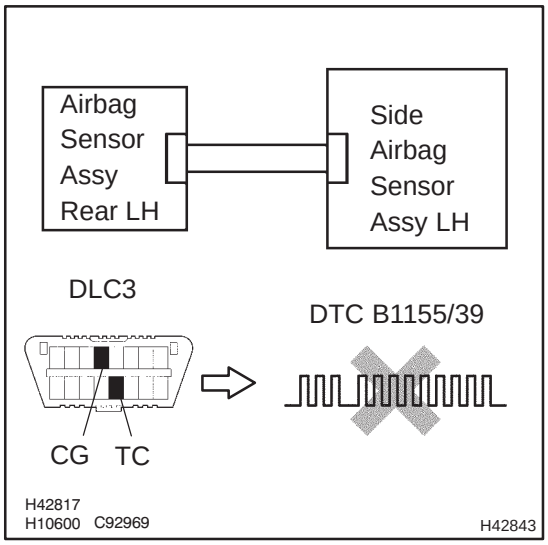
HINT:
DTC B1155/39 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DTC



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).
OK:
DTC B1155/39 is not output.

HINT:
Codes other than code B1155/39 may be output at this time, but they are not related to this check.

NG → **Go to step 2**

OK

USE SIMULATION METHOD TO CHECK

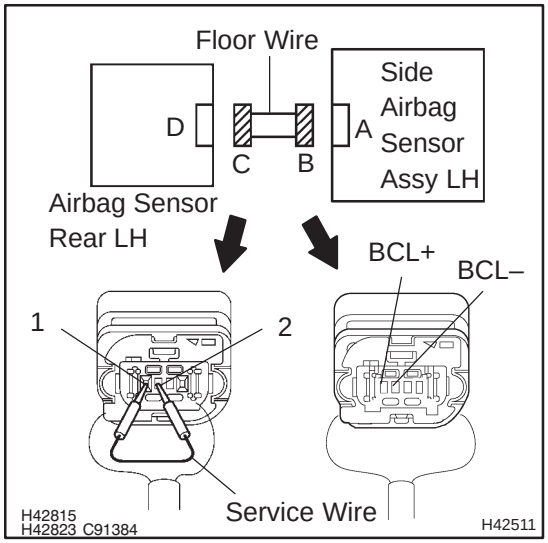
2	CHECK CONNECTION OF CONNECTORS

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–)terminal cable from the battery, and wait for at least 90 seconds.
(c) Check that the connectors are properly connected to the side airbag sensor assy LH and the airbag sensor rear LH.
OK:
The connectors are connected.

NG → **CONNECT CONNECTORS**

OK

3 CHECK FLOOR WIRE(OPEN)



(a) Disconnect the connectors from the side airbag sensor assy LH and the airbag sensor rear LH.

(b) Using a service wire, connect 1 and 2 of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Measure the resistance between BCL+ and BCL– of the connector ”B”.

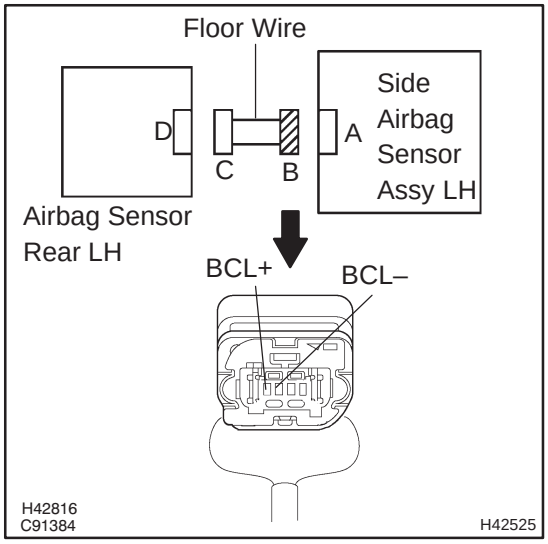
OK:

Resistance: Below 1 Ω

NG	**REPAIR OR REPLACE FLOOR WIRE**

OK

4 CHECK FLOOR WIRE(TO B+)



(a) Disconnect the service wire from the connector ”C”.

(b) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.

(c) Measure the voltage between the body ground and each of BCL+ and BCL– of the connector ”B”.

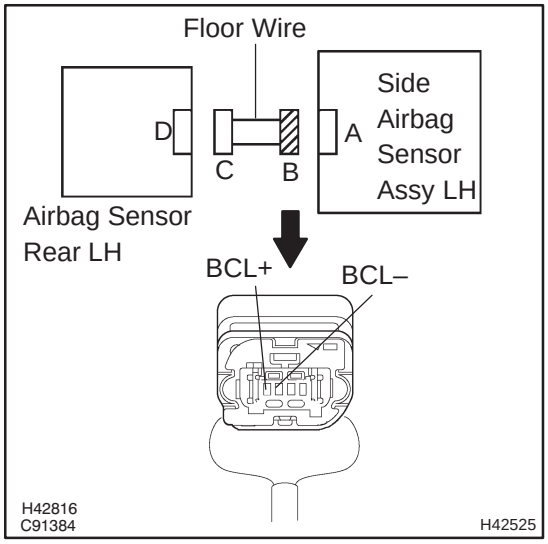
OK:

Voltage: Below 1 V

NG	**REPAIR OR REPLACE FLOOR WIRE**

OK

5 CHECK FLOOR WIRE(TO GROUND)

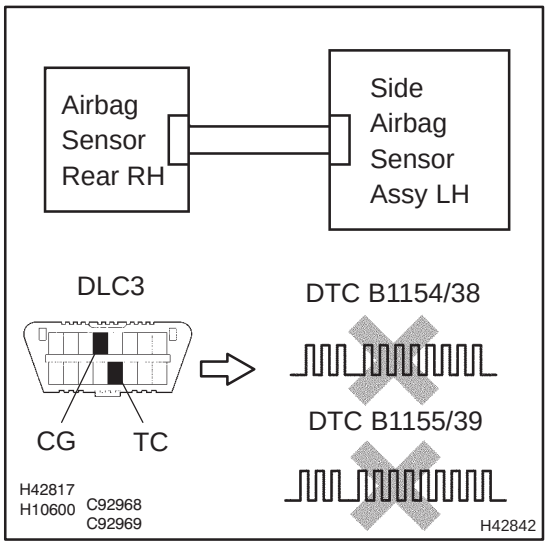


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Measure the resistance between the body ground and each of BCL+ and BCL– of the connector "B".
OK:
Resistance: 10 kΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

6 CHECK AIR BAG SENSOR REAR LH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the side airbag sensor assy LH.
(d) Interchange the airbag sensor rear RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
A: DTC B1154/38 is not output.
B: DTC B1155/39 is not output.

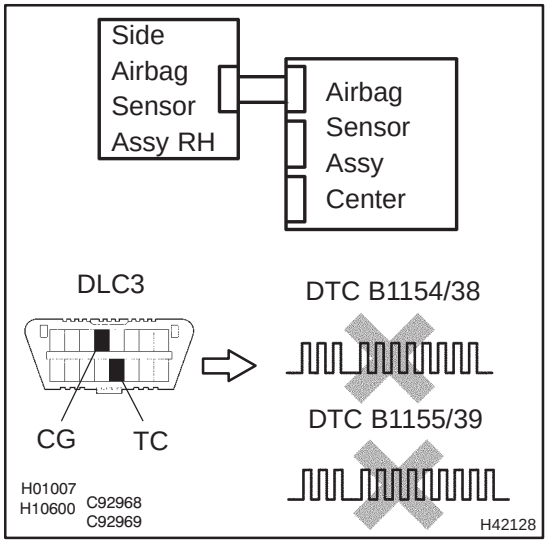
NG:A → **Go to step 7**

NG:B → **REPLACE AIR BAG SENSOR REAR LH**

OK

USE SIMULATION METHOD TO CHECK

7 CHECK SIDE AIR BAG SENSOR ASSY LH



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Return the interchanged airbag sensor rear RH and LH to the original condition and connect the connectors to them.
(d) Interchange the side airbag sensor assy RH with LH and connect the connectors to them.
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Tune the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).

OK:
A: DTC B1154/38 is not output.
B: DTC B1155/39 is not output.

NG:A	**REPLACE AIR BAG SENSOR ASSY CENTER**
NG:B	**REPLACE SIDE AIR BAG SENSOR ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1160/83	SHORT IN CURTAIN SHIELD SQUIB (RH) CIRCUIT

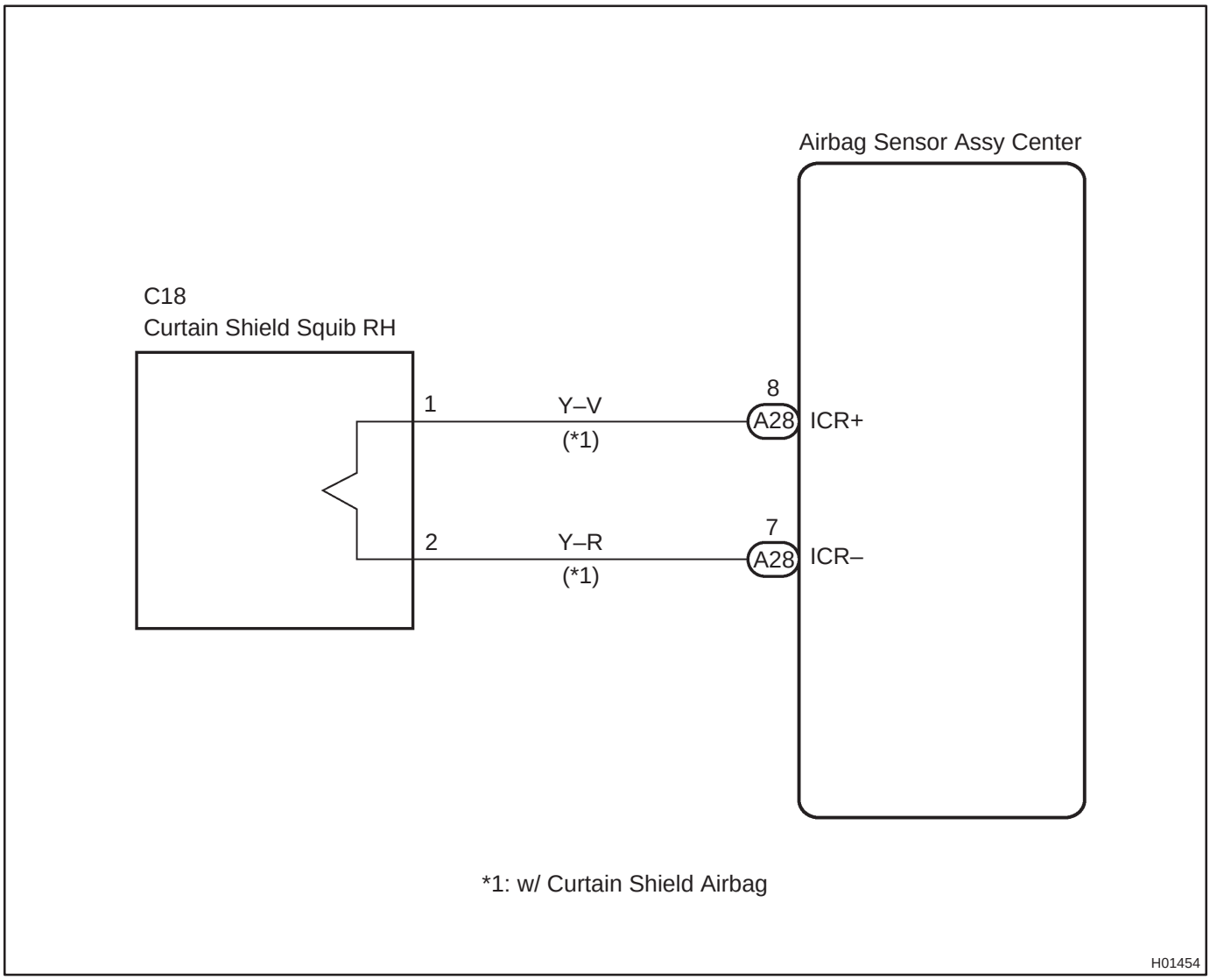
CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1160/83 is recorded when a short circuit is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1160/83	• Short circuit between ICR+ wire harness and ICR– wire harness of curtain shield squib RH • Curtain shield squib RH malfunction • Airbag sensor assy center malfunction	• Curtain shield airbag assy RH (Curtain shield squib RH) • Airbag sensor assy center • Floor wire No.2

HINT:
DTC B1160/83 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM



INSPECTION PROCEDURE

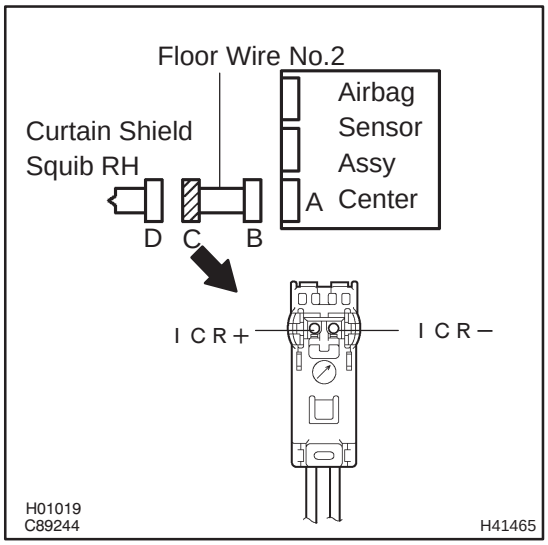
1	CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(d) Check that the floor wire No.2 connector (on the curtain shield airbag assy RH side) is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB RH CIRCUIT)

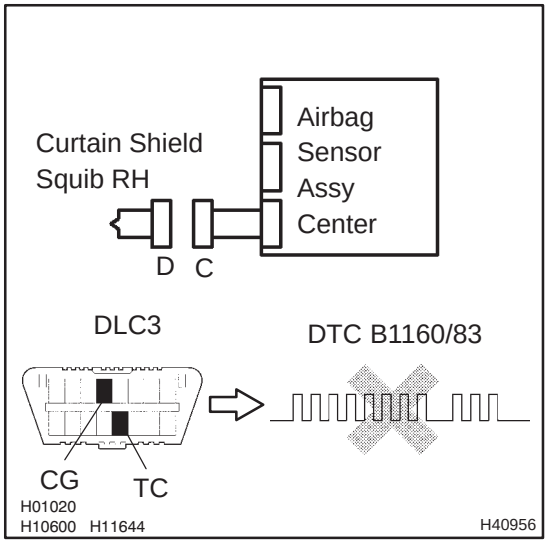


(a) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(b) Measure the resistance between ICR+ and ICR– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

3 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).

OK:

DTC B1160/83 is not output.

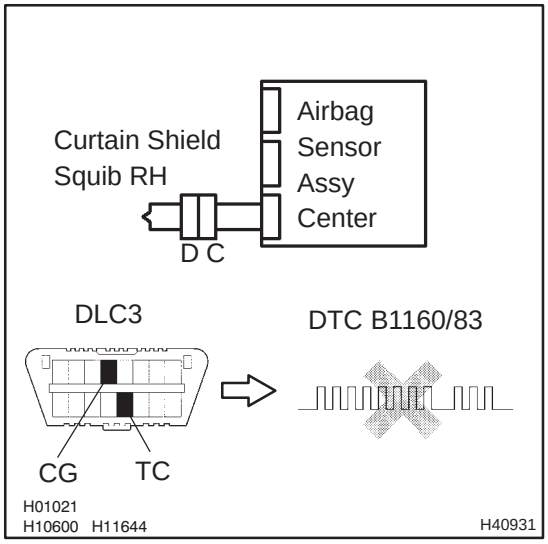
HINT:

Codes other than code B1160/83 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

4 CHECK CURTAIN SHIELD AIR BAG ASSY RH(CURTAIN SHIELD SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).

OK:

DTC B1160/83 is not output.

HINT:

Codes other than code B1160/83 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY RH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1161/84	OPEN IN CURTAIN SHIELD SQUIB (RH) CIRCUIT

CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1161/84 is recorded when an open circuit is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1161/84	• Open circuit in ICR+ wire harness or ICR– wire harness of curtain shield squib RH • Curtain shield squib RH malfunction • Airbag sensor assy center malfunction	• Curtain shield airbag assy RH (Curtain shield squib RH) • Airbag sensor assy center • Floor wire No.2

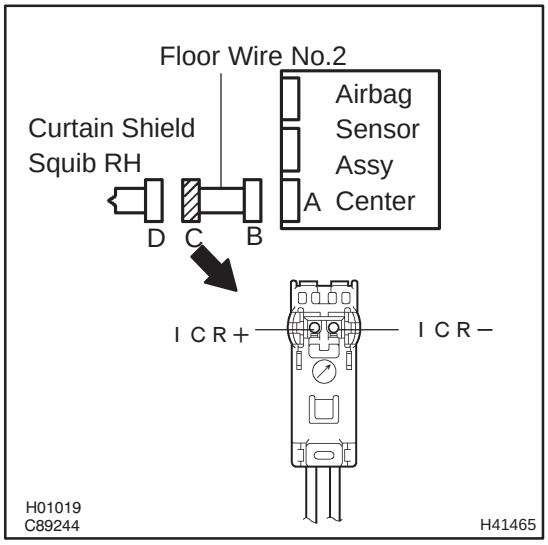
HINT:
DTC B1161/84 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM

See page 05–1322.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB RH CIRCUIT)

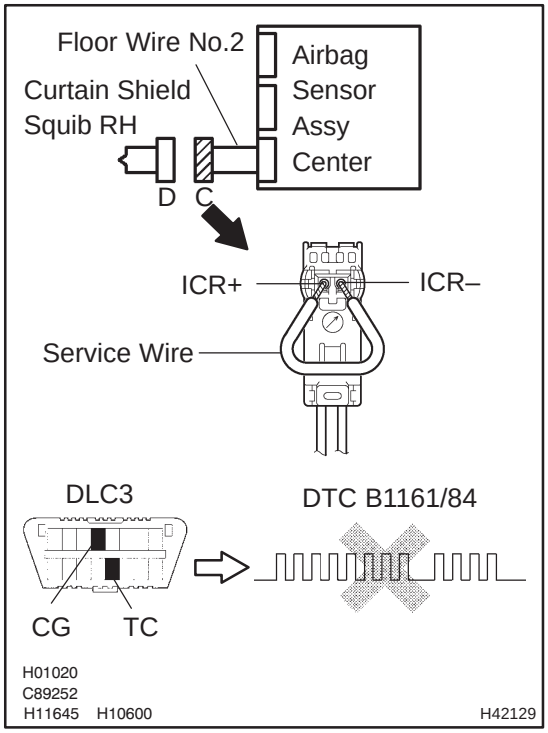


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(d) Measure the resistance between ICR+ and ICR– of the connector "C".
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect ICR+ and ICR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1161/84 is not output.

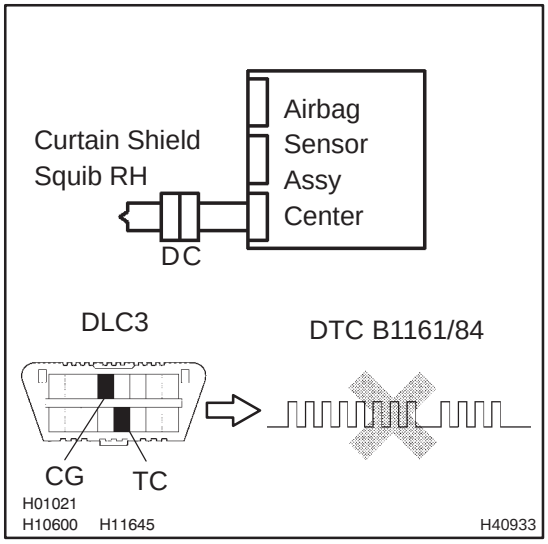
HINT:

Codes other than code B1161/84 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK CURTAIN SHIELD AIR BAG ASSY RH(CURTAIN SHIELD SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1161/84 is not output.

HINT:
Codes other than code B1161/84 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY RH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1162/81	SHORT IN CURTAIN SHIELD SQUIB (RH) CIRCUIT (TO GROUND)

CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1162/81 is recorded when a short to ground is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1162/81	• Short circuit in curtain shield squib RH wire harness (to ground) • Curtain shield squib RH malfunction • Airbag sensor assy malfunction	• Curtain shield airbag assy RH (Curtain shield squib RH) • Airbag sensor assy center • Floor wire No.2

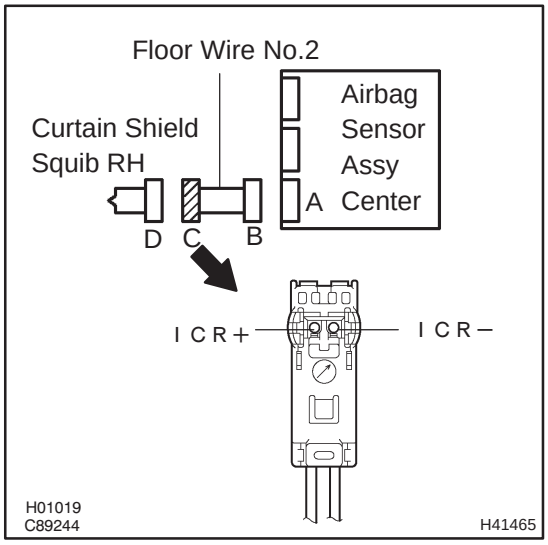
HINT:
DTC B1162/81 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM

See page 05–1322.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB RH CIRCUIT)

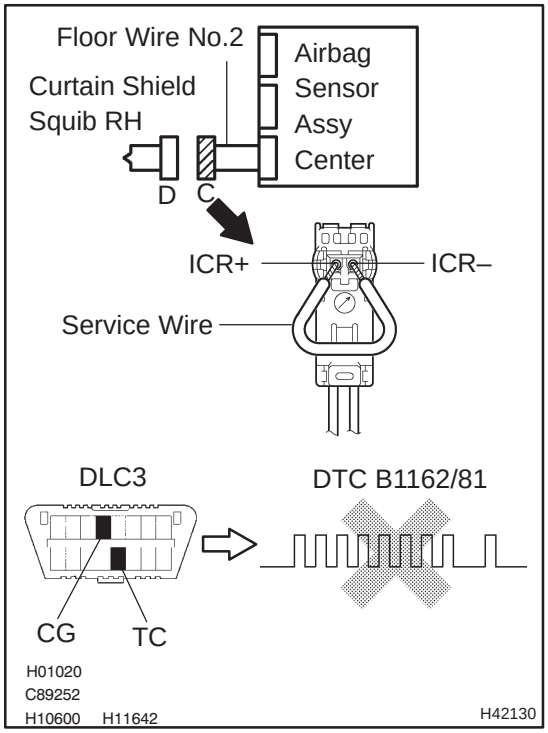


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(d) Measure the resistance between the body ground and ICR+ of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect ICR+ and ICR– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1162/81 is not output.

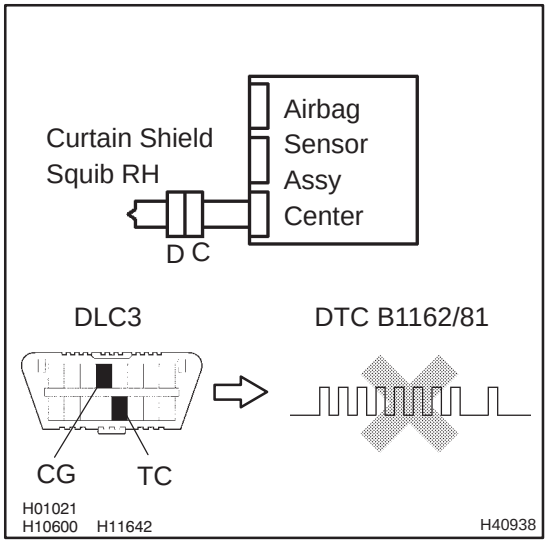
HINT:

Codes other than code B1162/81 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK CURTAIN SHIELD AIR BAG ASSY RH(CURTAIN SHIELD SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1162/81 is not output.

HINT:
Codes other than code B1162/81 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY RH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B1163/82	SHORT IN CURTAIN SHIELD SQUIB (RH) CIRCUIT (TO B+)

CIRCUIT DESCRIPTION

The curtain shield squib RH circuit consists of the airbag sensor assy center and the curtain shield airbag assy RH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1163/82 is recorded when a short to B+ is detected in the curtain shield squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1163/82	• Short circuit in curtain shield squib RH wire harness (to B+) • Curtain shield squib RH malfunction • Airbag sensor assy center malfunction	• Curtain shield airbag assy RH (Curtain shield squib RH) • Airbag sensor assy center • Floor wire No.2

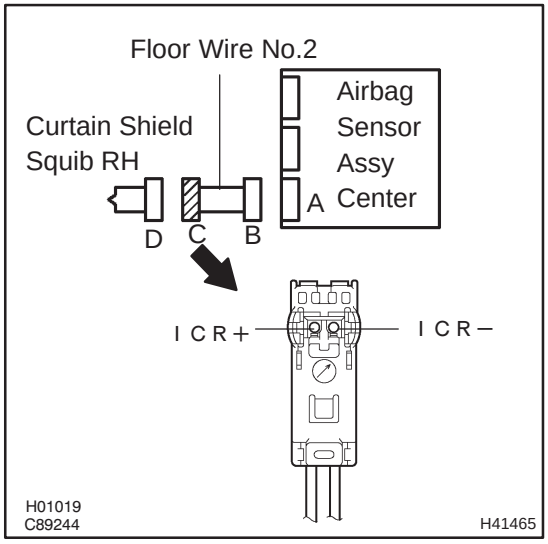
HINT:
DTC B1163/82 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM

See page 05–1322.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE NO.2(CURTAIN SHIELD SQUIB RH CIRCUIT)

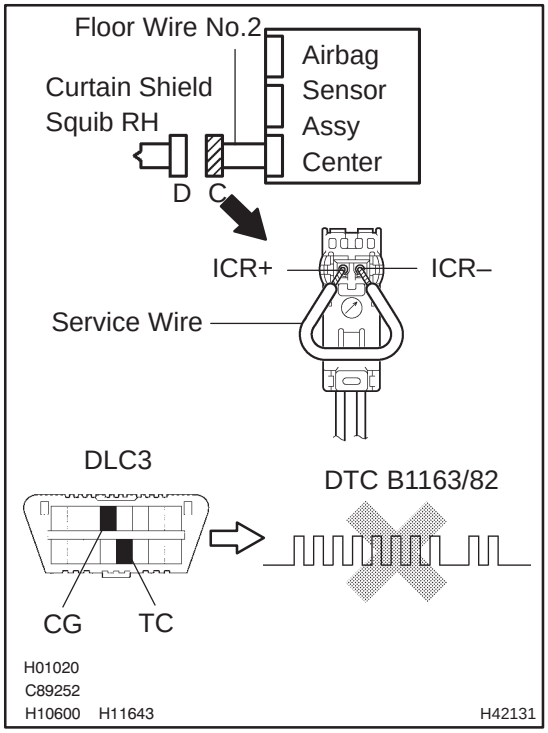


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy RH.
(d) Connect the negative (–) terminal cable to the battery, and turn the ignition switch to the ON position.
(e) Measure the voltage between the body ground and ICR+ of the connector ”C”.
OK:
Voltage: Below 1 V

NG → **REPAIR OR REPLACE FLOOR WIRE NO.2**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the airbag sensor assy center.
(d) Using a service wire, connect ICR+ and ICR– of the connector ”C”.

NOTICE:
Do not forcibly insert a service wire into the terminal of the connector when connecting.

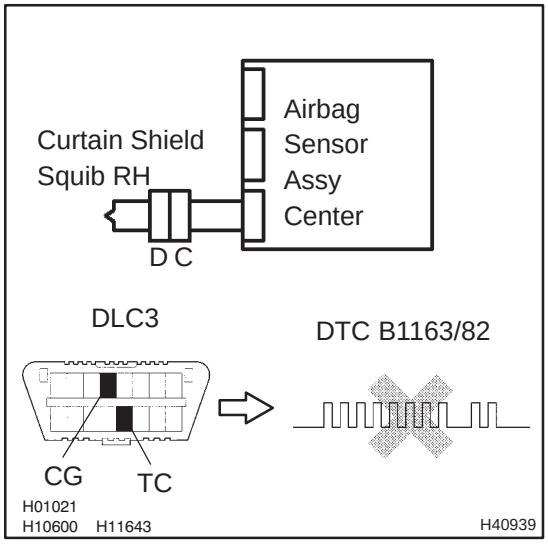
(e) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Clear the stored DTCs in the memory (See page 05–1184).
(h) Turn the ignition switch to the LOCK position.
(i) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(j) Check the DTCs (See page 05–1184).
OK:
DTC B1163/82 is not output.

HINT:
Codes other than code B1163/82 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK CURTAIN SHIELD AIR BAG ASSY RH(CURTAIN SHIELD SQUIB RH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy RH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1163/82 is not output.

HINT:
Codes other than code B1163/82 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY RH**

OK

4	USE SIMULATION METHOD TO CHECK

NG → **Go to step 1**

OK

REPLACE ALL SRS COMPONENTS INCLUDING WIRE HARNESS

DTC	B1165/87	SHORT IN CURTAIN SHIELD SQUIB (LH) CIRCUIT

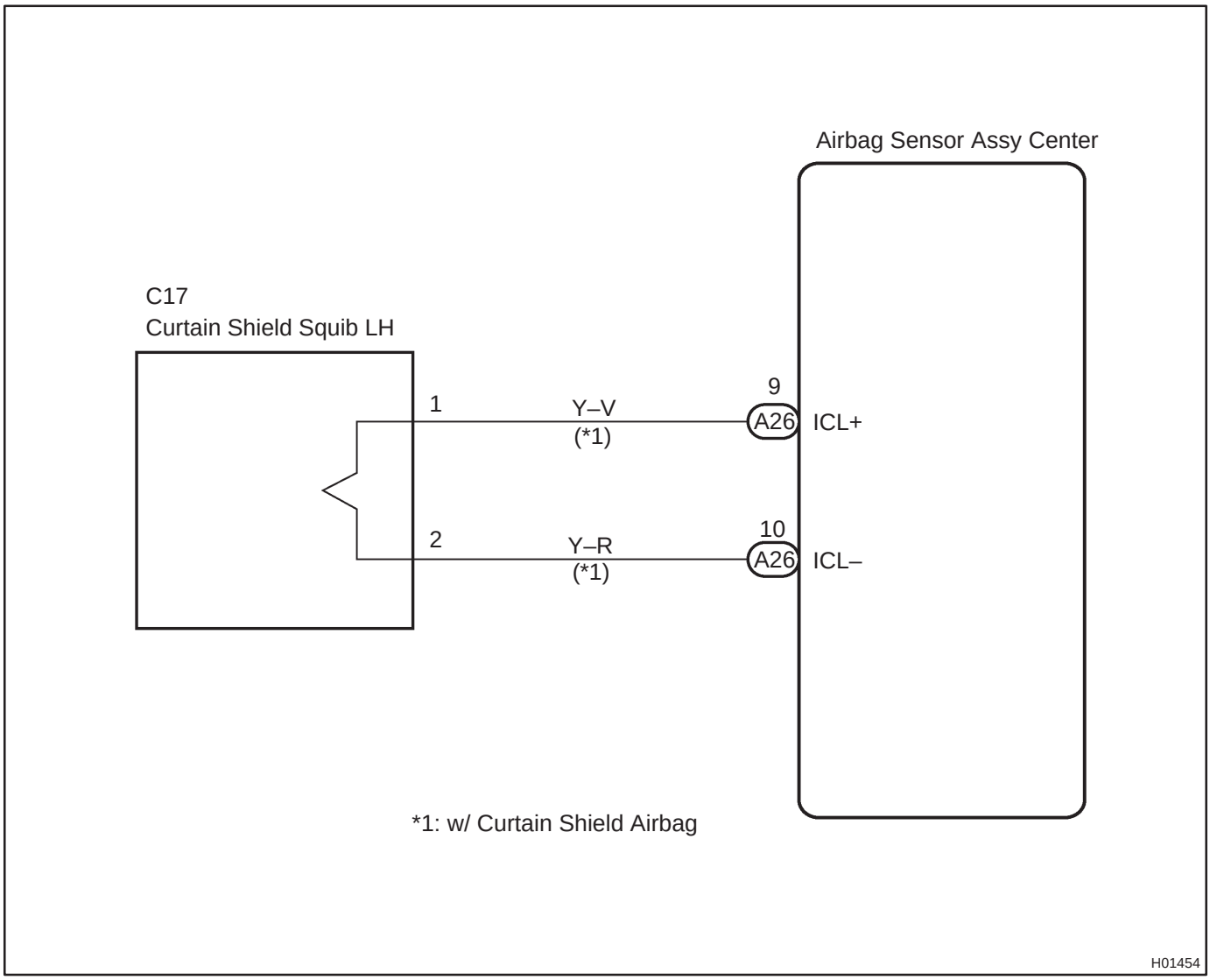
CIRCUIT DESCRIPTION

The curtain shield squib LH circuit consists of the airbag sensor assy center and the curtain shield airbag assy LH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1165/87 is recorded when a short circuit is detected in the curtain shield squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1165/87	• Short circuit between ICL+ wire harness and ICL– wire harness of curtain shield squib LH • Curtain shield squib LH malfunction • Airbag sensor assy center malfunction	• Curtain shield airbag assy LH (Curtain shield squib LH) • Airbag sensor assy center • Floor wire

HINT:
DTC B1165/87 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM



INSPECTION PROCEDURE

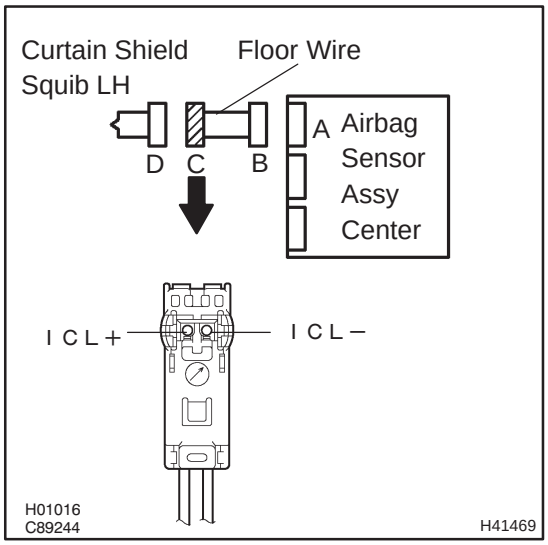
1	CHECK CONNECTOR

(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) DIsconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy LH.
(d) Check that the floor wire connector (on the curtain shield airbag assy LH side) is not damaged.
OK:
The lock button is not disengaged, or the claw of the lock is not deformed or damaged.

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2	CHECK FLOOR WIRE(CURTAIN SHIELD SQUIB LH CIRCUIT)

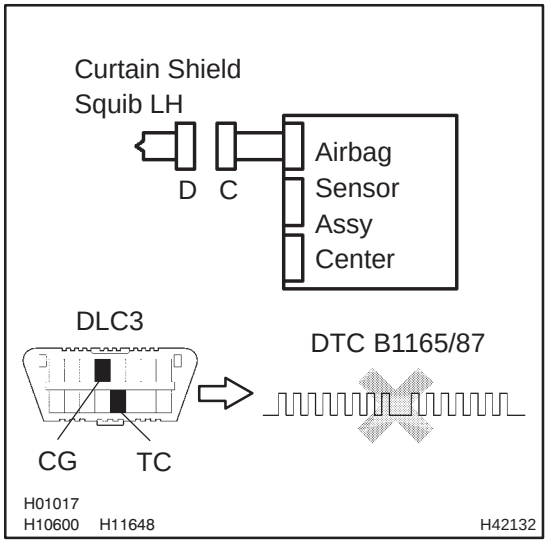


(a) Release the activation prevention mechanism built in the connector "B" (See page 05–1184).
(b) Measure the resistance between ICL+ and ICL– of the connector "C".
OK:
Resistance: 1 MΩ or Higher

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

3 CHECK AIR BAG SENSOR ASSY CENTER



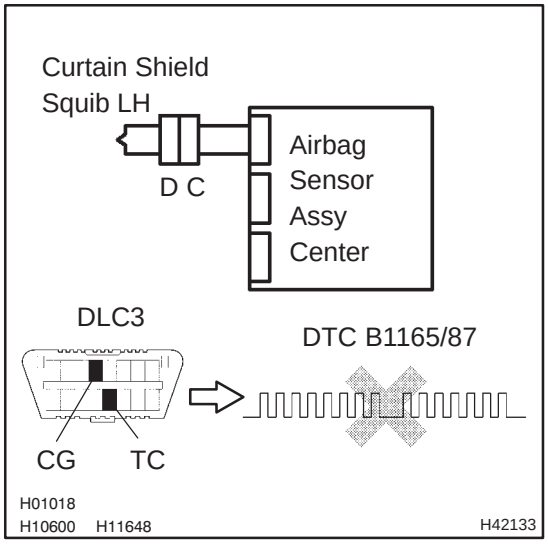
(a) Connect the connector to the airbag sensor assy center.
(b) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(c) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(d) Clear the stored DTCs in the memory (See page 05–1184).
(e) Turn the ignition switch to the LOCK position.
(f) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(g) Check the DTCs (See page 05–1184).
OK:
DTC B1165/87 is not output.

HINT:
Codes other than code B1165/87 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

4 CHECK CURTAIN SHIELD AIR BAG ASSY LH(CURTAIN SHIELD SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1165/87 is not output.

HINT:
Codes other than code B1165/87 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY LH**

OK

USE SIMULATION METHOD TO CHECK

DTC	B1166/88	OPEN IN CURTAIN SHIELD SQUIB (LH) CIRCUIT

CIRCUIT DESCRIPTION

The curtain shield squib LH circuit consists of the airbag sensor assy center and the curtain shield airbag assy LH.
This circuit actuates the SRS to deploy when the SRS deployment conditions are fulfilled.
DTC B1166/88 is recorded when an open circuit is detected in the curtain shield squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1166/88	• Open circuit in ICL+ wire harness or ICL– wire harness of curtain shield squib LH • Curtain shield squib LH malfunction • Airbag sensor assy center malfunction	• Curtain shield airbag assy LH (Curtain shield squib LH) • Airbag sensor assy center • Floor wire

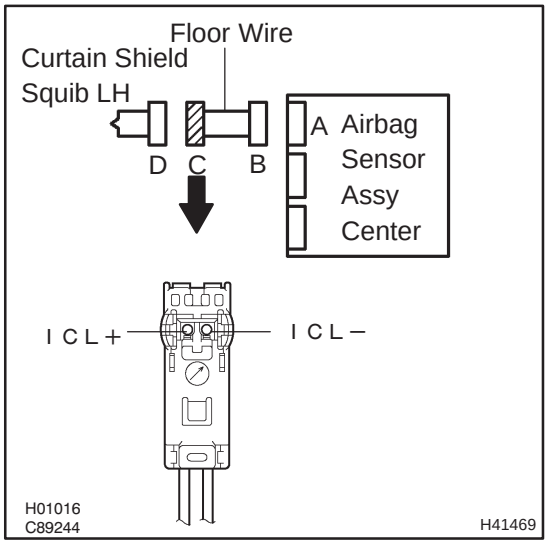
HINT:
DTC B1166/88 is indicated only for the vehicle equipped with the curtain shield airbag.

WIRING DIAGRAM

See page 05–1184.

INSPECTION PROCEDURE

1	CHECK FLOOR WIRE(CURTAIN SHIELD SQUIB LH CIRCUIT)

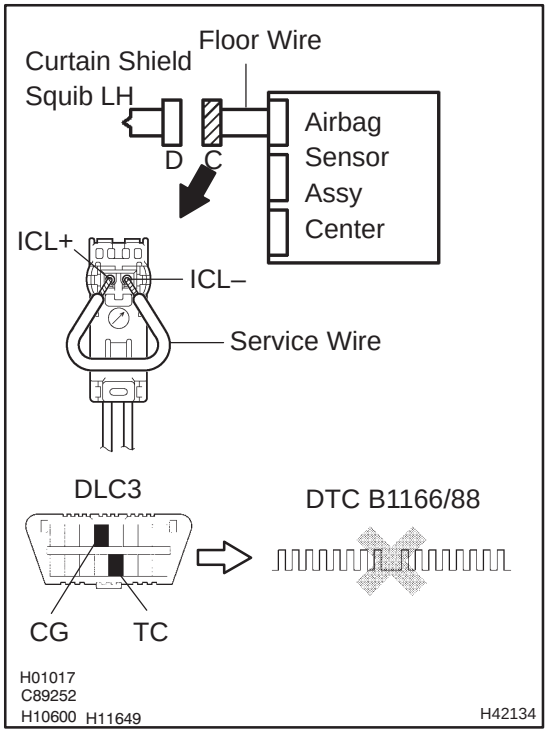


(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Disconnect the connectors from the airbag sensor assy center and the curtain shield airbag assy LH.
(d) Measure the resistance between ICL+ and ICL– of the connector ”C”.
OK:
Resistance: Below 1 Ω

NG → **REPAIR OR REPLACE FLOOR WIRE**

OK

2 CHECK AIR BAG SENSOR ASSY CENTER



(a) Connect the connector to the airbag sensor assy center.
(b) Using a service wire, connect ICL+ and ICL– of the connector ”C”.

NOTICE:

Do not forcibly insert a service wire into the terminal of the connector when connecting.

(c) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(d) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(e) Clear the stored DTCs in the memory (See page 05–1184).
(f) Turn the ignition switch to the LOCK position.
(g) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(h) Check the DTCs (See page 05–1184).

OK:

DTC B1166/88 is not output.

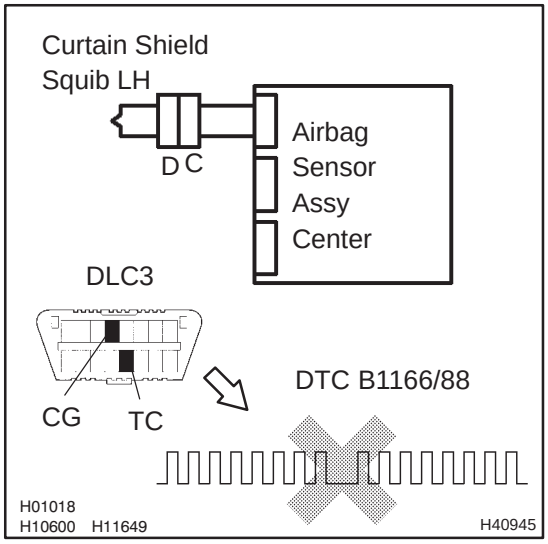
HINT:

Codes other than code B1166/88 may be output at this time, but they are not related to this check.

NG → **REPLACE AIR BAG SENSOR ASSY CENTER**

OK

3	CHECK CURTAIN SHIELD AIR BAG ASSY LH(CURTAIN SHIELD SQUIB LH)



(a) Turn the ignition switch to the LOCK position.
(b) Disconnect the negative (–) terminal cable from the battery, and wait for at least 90 seconds.
(c) Connect the connector to the curtain shield airbag assy LH.
(d) Connect the negative (–) terminal cable to the battery, and wait for at least 2 seconds.
(e) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(f) Clear the stored DTCs in the memory (See page 05–1184).
(g) Turn the ignition switch to the LOCK position.
(h) Turn the ignition switch to the ON position, and wait for at least 10 seconds.
(i) Check the DTCs (See page 05–1184).
OK:
DTC B1166/88 is not output.

HINT:
Codes other than code B1166/88 may be output at this time, but they are not related to this check.

NG → **REPLACE CURTAIN SHIELD AIR BAG ASSY LH**

OK

USE SIMULATION METHOD TO CHECK