CHARGING SYSTEM (1AZ–FE)

190NV–01

PRECAUTION

1. **Check that the battery cables are connected to the correct terminals.**
2. **Disconnect the battery cables when the battery is given a quick charge.**
3. **Do not perform tests with a high voltage insulation resistance tester.**
4. **Never disconnect the battery while the engine is running.**
5. **Check that the charging cable is tightened on terminal B of the generator and the fuse box.**

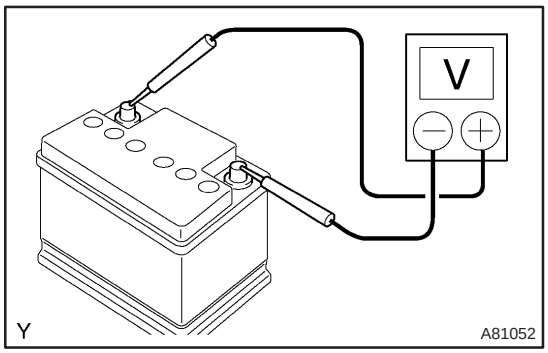
190NW–01

ON–VEHICLE INSPECTION

1. CHECK BATTERY ELECTROLYTE LEVEL

(a) Check the electrolyte quantity of each cell.

(1) If the electrolyte is under the low level, replace the battery (or add distilled water if possible) and check the charging system.



2. CHECK BATTERY VOLTAGE

(a) If it has not been 20 minutes since you drove the vehicle or since the engine was stopped, turn the ignition switch and the electrical system (headlight, blower motor, rear defogger etc.) to the on position for 60 seconds. This will remove the surface charge on the battery.

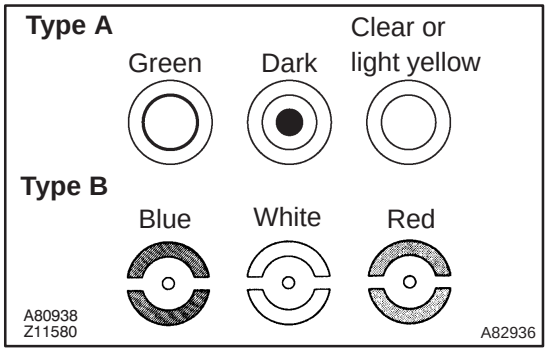
(b) Turn off the ignition switch and the electrical systems.

(c) Measure the battery voltage between the negative (–) and positive (+) terminals of the battery.

Standard voltage: 12.5 to 12.9 V at 20°C (68°F)

HINT:

If the voltage is less than specification, charge the battery.



(d) Check the indicator as shown in the illustration.

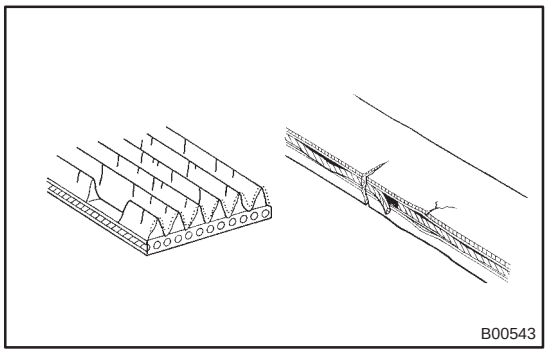
HINT:

Indicator color		Condition
Type A	Type B	
Green	Blue	OK
Dark	White	Charging necessary
Clear or light yellow	Red	Replace

3. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loosened or corroded.

(b) Check the fusible links, high–current fuses and regular fuses.

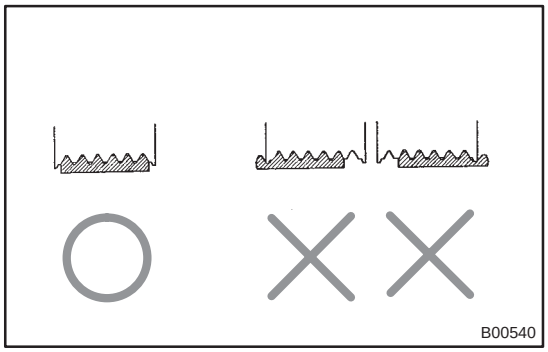


4. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

HINT:

- If any defect found, replace the drive belt.
- Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Check that it fits properly in the ribbed grooves.

HINT:

Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.

5. VISUALLY CHECK GENERATOR WIRING

(a) Check that the wiring is in good condition.

6. LISTEN FOR ABNORMAL NOISES FROM GENERATOR

(a) Check that there is no abnormal noise from the generator while the engine is running.

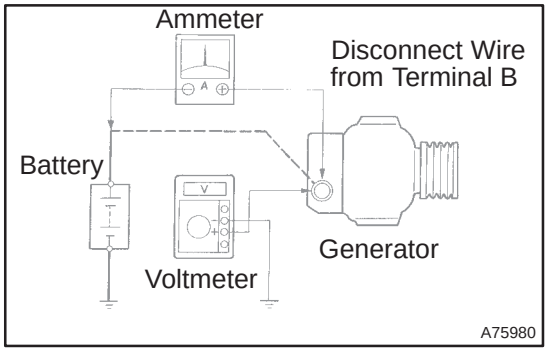
7. INSPECT CHARGE WARNING LIGHT CIRCUIT

(a) Turn the ignition switch ON. Check that the charge warning light comes on.

(b) Start the engine and check that the light goes off.

HINT:

If the light does not operate as specified, troubleshoot the charge warning light circuit.



8. INSPECT CHARGING CIRCUIT WITHOUT LOAD

(a) According to the following procedure, connect an ammeter and voltmeter as shown in the illustration.

(1) Disconnect the wire from terminal B of the generator and connect it to the negative (–) lead of the ammeter.

(2) Connect the positive (+) lead of the ammeter to terminal B of the generator

(3) Connect the positive (+) lead of the voltmeter to terminal B of the generator.

(4) Ground the negative (–) lead of the voltmeter.

(b) Check the charging circuit.

(1) Keep the engine speed at 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 12.9 to 14.9 V

HINT:

- If the voltmeter reading is more than standard voltage, replace the voltage regulator.
- If the voltmeter reading is less than the standard voltage, check the voltage regulator and generator as follows:

9. INSPECT CHARGING CIRCUIT WITH LOAD

(a) Keep the engine speed at 2,000 rpm, turn on the high beam headlights and turn the heater blower switch to the ”HI” position.

(b) Check the reading on the ammeter.

Standard amperage: 30 A or more

HINT:

- If the ammeter reading is less than standard amperage, repair the generator.
- If the battery is fully charged, the indication will sometimes be less than standard amperage.

CHARGING SYSTEM (1AZ–FSE)

190NS–01

PRECAUTION

1. **Check that the battery cables are connected to the correct terminals.**
2. **Disconnect the battery cables when the battery is given a quick charge.**
3. **Do not perform tests with a high voltage insulation resistance tester.**
4. **Never disconnect the battery while the engine is running.**
5. **Check that the charging cable is tightened on terminal B of the generator and the fuse box.**

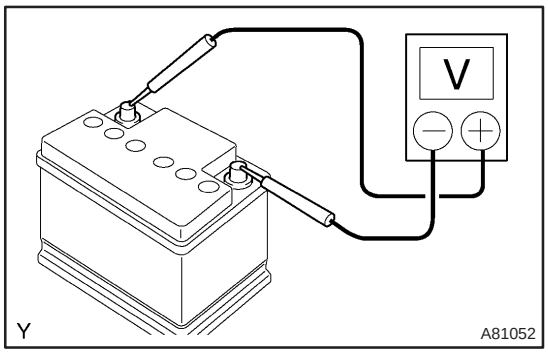
190NT–01

ON–VEHICLE INSPECTION

1. CHECK BATTERY ELECTROLYTE LEVEL

(a) Check the electrolyte quantity of each cell.

(1) If the electrolyte is under the low level, replace the battery (or add distilled water if possible) and check the charging system.



2. CHECK BATTERY VOLTAGE

(a) If it has not been 20 minutes since you drove the vehicle or since the engine was stopped, turn the ignition switch and the electrical system (headlight, blower motor, rear defogger etc.) to the on position for 60 seconds. This will remove the surface charge on the battery.

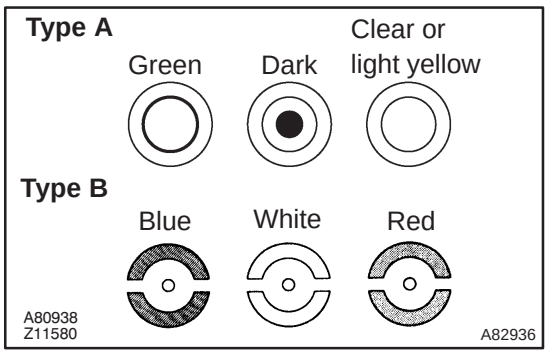
(b) Turn off the ignition switch and the electrical systems.

(c) Measure the battery voltage between the negative (–) and positive (+) terminals of the battery.

Standard voltage: 12.5 to 12.9 V at 20°C (68°F)

HINT:

If the voltage is less than specification, charge the battery.



(d) Check the indicator as shown in the illustration.

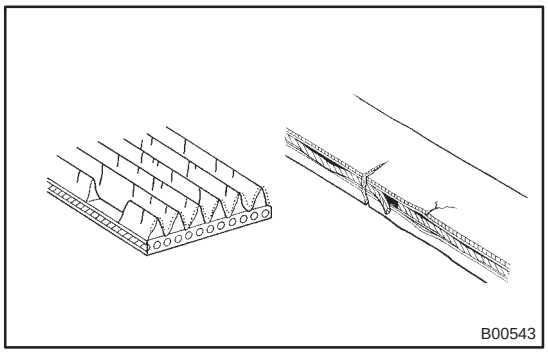
HINT:

Indicator color		Condition
Type A	Type B	
Green	Blue	OK
Dark	White	Charging necessary
Clear or light yellow	Red	Replace

3. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loosened or corroded.

(b) Check the fusible links, high–current fuses and regular fuses.

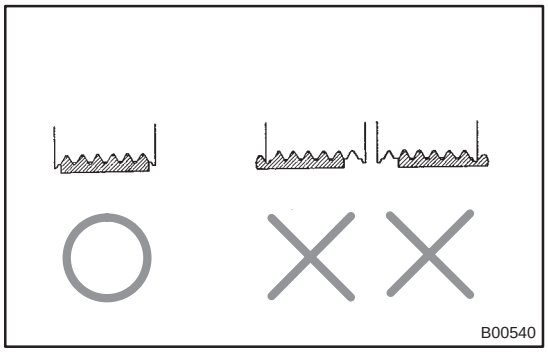


4. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

HINT:

- If any defect found, replace the drive belt.
- Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Check that it fits properly in the ribbed grooves.

HINT:

Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.

5. VISUALLY CHECK GENERATOR WIRING

(a) Check that the wiring is in good condition.

6. LISTEN FOR ABNORMAL NOISES FROM GENERATOR

(a) Check that there is no abnormal noise from the generator while the engine is running.

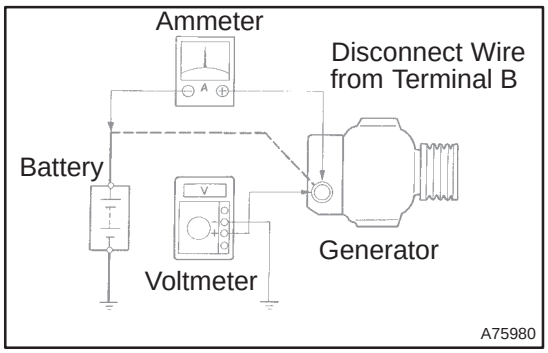
7. INSPECT CHARGE WARNING LIGHT CIRCUIT

(a) Turn the ignition switch ON. Check that the charge warning light comes on.

(b) Start the engine and check that the light goes off.

HINT:

If the light does not operate as specified, troubleshoot the charge warning light circuit.



8. INSPECT CHARGING CIRCUIT WITHOUT LOAD

(a) According to the following procedure, connect an ammeter and voltmeter as shown in the illustration.

(1) Disconnect the wire from terminal B of the generator and connect it to the negative (–) lead of the ammeter.

(2) Connect the positive (+) lead of the ammeter to terminal B of the generator

(3) Connect the positive (+) lead of the voltmeter to terminal B of the generator.

(4) Ground the negative (–) lead of the voltmeter.

(b) Check the charging circuit.

(1) Keep the engine speed at 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 12.9 to 14.9 V

HINT:

- If the voltmeter reading is more than standard voltage, replace the voltage regulator.
- If the voltmeter reading is less than the standard voltage, check the voltage regulator and generator as follows:

9. INSPECT CHARGING CIRCUIT WITH LOAD

(a) Keep the engine speed at 2,000 rpm, turn on the high beam headlights and turn the heater blower switch to the ”HI” position.

(b) Check the reading on the ammeter.

Standard amperage: 30 A or more

HINT:

- If the ammeter reading is less than standard amperage, repair the generator.
- If the battery is fully charged, the indication will sometimes be less than standard amperage.

CHARGING SYSTEM (1CD–FTV)

190NM–01

PRECAUTION

1. **Check that the battery cables are connected to the correct terminals.**
2. **Disconnect the battery cables when the battery is given a quick charge.**
3. **Do not perform tests with a high voltage insulation resistance tester.**
4. **Never disconnect the battery while the engine is running.**
5. **Check that the charging cable is tightened on terminal B of the generator and the fuse box.**

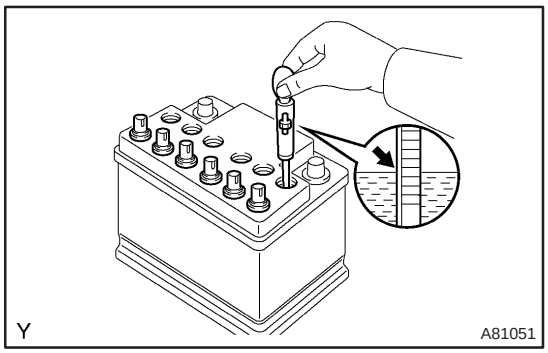
190NN–01

ON–VEHICLE INSPECTION

1. CHECK BATTERY ELECTROLYTE LEVEL

(a) Check the electrolyte quantity of each cell.

(1) If the electrolyte is under the low level, replace the battery (or add distilled water if possible) and check the charging system.



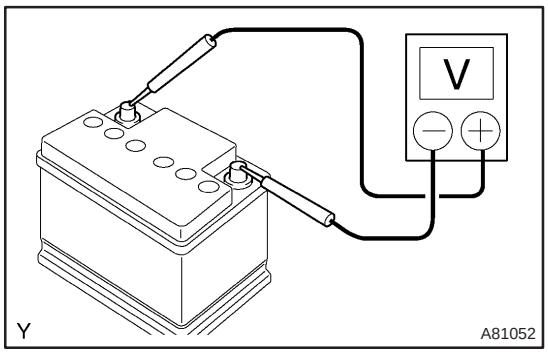
2. CHECK BATTERY SPECIFIC GRAVITY (MAINTENANCE TYPE BATTERY)

(a) Check the specific gravity of each cell.

Standard specific gravity: 1.25 to 1.29 at 20°C (68°F)

HINT:

If the specific gravity is less than specification, charge the battery.



3. CHECK BATTERY VOLTAGE

(a) If it has not been 20 minutes since you drove the vehicle or since the engine was stopped, turn the ignition switch and the electrical system (headlight, blower motor, rear defogger etc.) to the on position for 60 seconds. This will remove the surface charge on the battery.

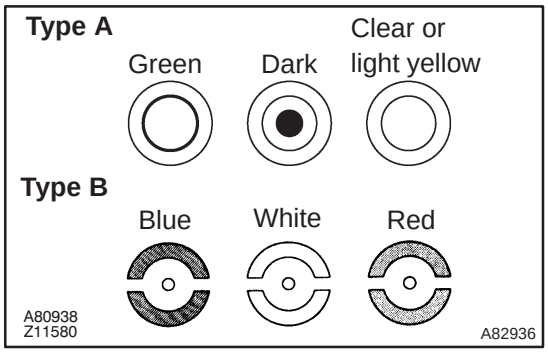
(b) Turn off the ignition switch and the electrical systems.

(c) Measure the battery voltage between the negative (–) and positive (+) terminals of the battery.

Standard voltage: 12.5 to 12.9 V at 20°C (68°F)

HINT:

If the voltage is less than specification, charge the battery.



(d) Check the indicator as shown in the illustration. (Non maintenance type battery)

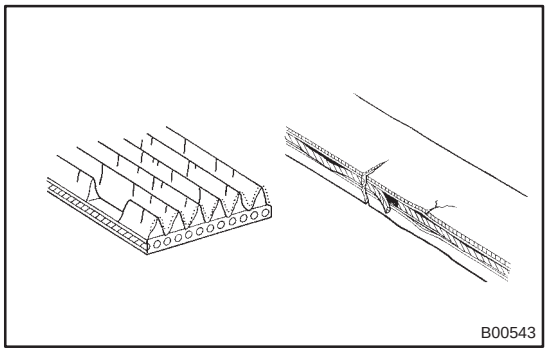
HINT:

Indicator color		Condition
Type A	Type B	
Green	Blue	Good
Dark	White	Charging necessary
Clear or light yellow	Red	Replace

4. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loosened or corroded.

(b) Check the fusible links, high–current fuses and regular fuses.

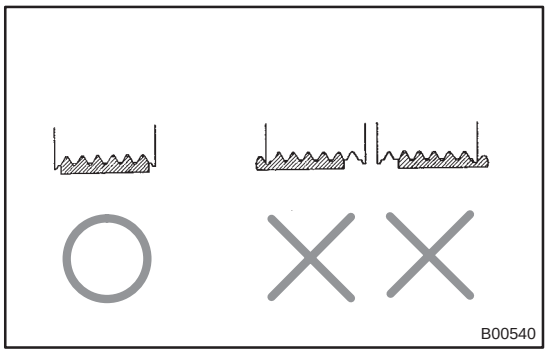


5. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

HINT:

- If any defect found, replace the drive belt.
- Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Check that it fits properly in the ribbed grooves.

HINT:

Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.

6. VISUALLY CHECK GENERATOR WIRING

(a) Check that the wiring is in good condition.

7. LISTEN FOR ABNORMAL NOISES FROM GENERATOR

(a) Check that there is no abnormal noise from the generator while the engine is running.

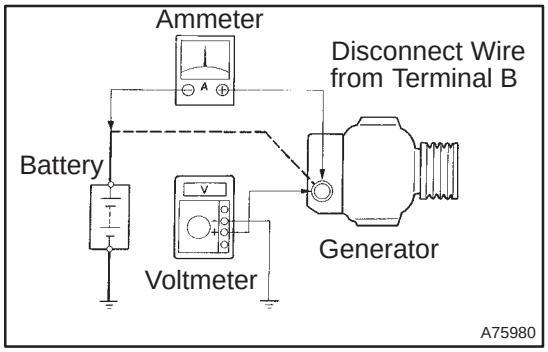
8. INSPECT CHARGE WARNING LIGHT CIRCUIT

(a) Turn the ignition switch ON. Check that the charge warning light comes on.

(b) Start the engine and check that the light goes off.

HINT:

If the light does not operate as specified, troubleshoot the charge warning light circuit.



9. INSPECT CHARGING CIRCUIT WITHOUT LOAD

(a) According to the following procedure, connect an ammeter and voltmeter as shown in the illustration.

(1) Disconnect to the wire from terminal B of the generator and connect it to the negative (–) lead of the ammeter.

(2) Connect the positive (+) lead of the ammeter to terminal B of the generator

(3) Connect the positive (+) lead of the voltmeter to terminal B of the generator.

(4) Ground the negative (–) lead of the voltmeter.

(b) Check the charging circuit.

(1) Keep the engine speed at 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 13.2 to 14.8 V

HINT:

- If the voltmeter reading is more than standard voltage, replace the voltage regulator.
- If the voltmeter reading is less than the standard voltage, check the voltage regulator and generator as follows:

10. INSPECT CHARGING CIRCUIT WITH LOAD

(a) Keep the engine speed at 2,000 rpm, turn on the high beam headlights and turn the heater blower switch to the ”HI” position.

(b) Check the reading on the ammeter.

Standard amperage: 30 A or more

HINT:

- If the ammeter reading is less than standard amperage, repair the generator.
- If the battery is fully charged, the indication will sometimes be less than standard amperage.

CHARGING SYSTEM (1ZZ–FE/3ZZ–FE)

190NP–01

PRECAUTION

1. **Check that the battery cables are connected to the correct terminals.**
2. **Disconnect the battery cables when the battery is given a quick charge.**
3. **Do not perform tests with a high voltage insulation resistance tester.**
4. **Never disconnect the battery while the engine is running.**
5. **Check that the charging cable is tightened on terminal B of the generator and the fuse box.**

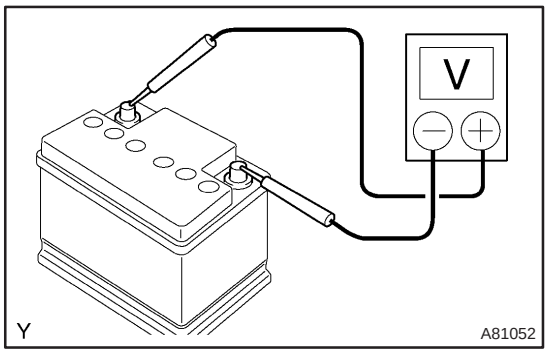
190NQ–01

ON–VEHICLE INSPECTION

1. CHECK BATTERY ELECTROLYTE LEVEL

(a) Check the electrolyte quantity of each cell.

(1) If the electrolyte is under the low level, replace the battery (or add distilled water if possible) and check the charging system.



2. CHECK BATTERY VOLTAGE

(a) If it has not been 20 minutes since you drove the vehicle or since the engine was stopped, turn the ignition switch and the electrical system (headlight, blower motor, rear defogger etc.) to the on position for 60 seconds. This will remove the surface charge on the battery.

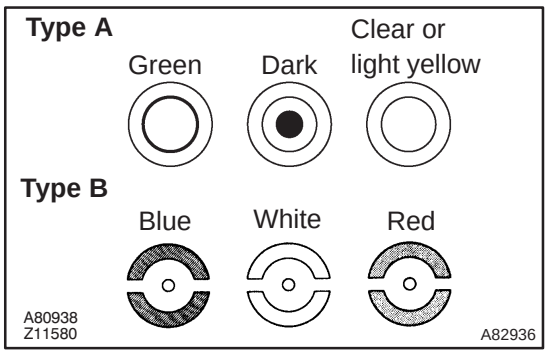
(b) Turn off the ignition switch and the electrical systems.

(c) Measure the battery voltage between the negative (–) and positive (+) terminals of the battery.

Standard voltage: 12.5 to 12.9 V at 20°C (68°F)

HINT:

If the voltage is less than specification, charge the battery.



(d) Check the indicator as shown in the illustration.

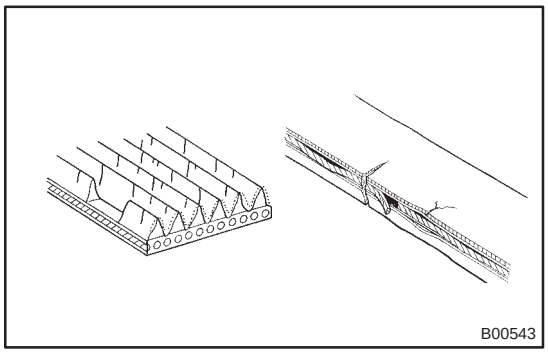
HINT:

Indicator color		Condition
Type A	Type B	
Green	Blue	OK
Dark	White	Charging necessary
Clear or light yellow	Red	Replace

3. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loosened or corroded.

(b) Check the fusible links, high–current fuses and regular fuses.

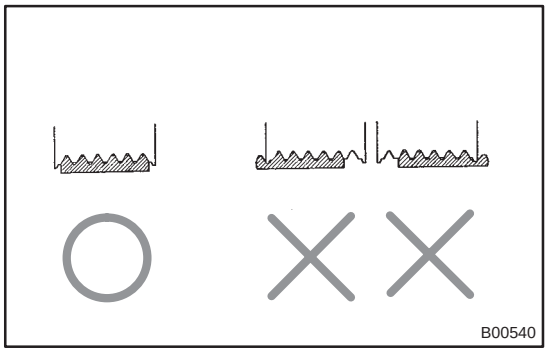


4. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

HINT:

- If any defect found, replace the drive belt.
- Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Check that it fits properly in the ribbed grooves.

HINT:

Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.

5. VISUALLY CHECK GENERATOR WIRING

(a) Check that the wiring is in good condition.

6. LISTEN FOR ABNORMAL NOISES FROM GENERATOR

(a) Check that there is no abnormal noise from the generator while the engine is running.

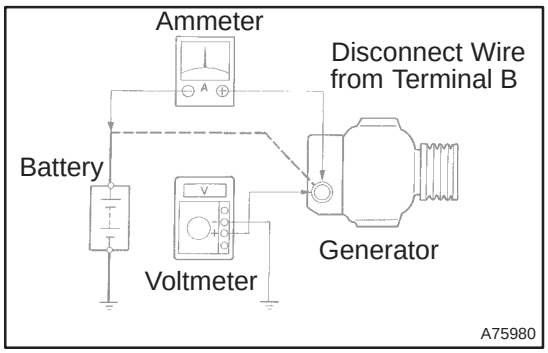
7. INSPECT CHARGE WARNING LIGHT CIRCUIT

(a) Turn the ignition switch ON. Check that the charge warning light comes on.

(b) Start the engine and check that the light goes off.

HINT:

If the light does not operate as specified, troubleshoot the charge warning light circuit.



8. INSPECT CHARGING CIRCUIT WITHOUT LOAD

(a) According to the following procedure, connect an ammeter and voltmeter as shown in the illustration.

(1) Disconnect the wire from terminal B of the generator and connect it to the negative (–) lead of the ammeter.

(2) Connect the positive (+) lead of the ammeter to terminal B of the generator

(3) Connect the positive (+) lead of the voltmeter to terminal B of the generator.

(4) Ground the negative (–) lead of the voltmeter.

(b) Check the charging circuit.

(1) Keep the engine speed at 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 12.9 to 14.9 V

HINT:

- If the voltmeter reading is more than standard voltage, replace the voltage regulator.
- If the voltmeter reading is less than the standard voltage, check the voltage regulator and generator as follows:

9. INSPECT CHARGING CIRCUIT WITH LOAD

(a) Keep the engine speed at 2,000 rpm, turn on the high beam headlights and turn the heater blower switch to the ”HI” position.

(b) Check the reading on the ammeter.

Standard amperage: 30 A or more

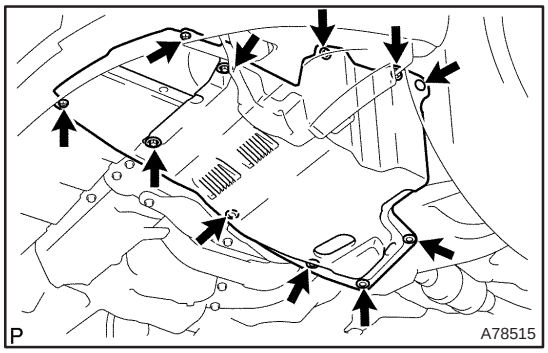
HINT:

- If the ammeter reading is less than standard amperage, repair the generator.
- If the battery is fully charged, the indication will sometimes be less than standard amperage.

GENERATOR ASSY (1AZ–FE/1AZ–FSE)

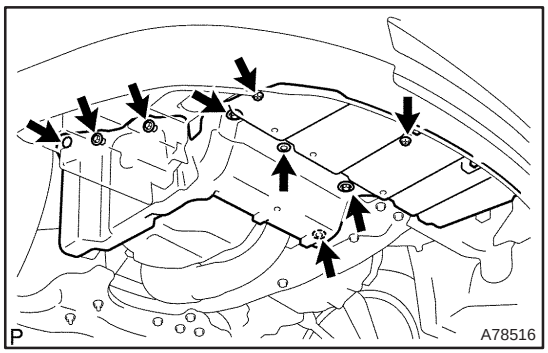
190NK–01

REPLACEMENT



1. REMOVE ENGINE UNDER COVER LH

(a) Remove the 6 screws and 5 clips, and then remove the engine under cover.



2. REMOVE ENGINE UNDER COVER RH

(a) Remove the 6 screws and the 3 clips, and then remove the engine under cover.

3. REMOVE RADIATOR SUPPORT OPENING COVER (See page 10–26)

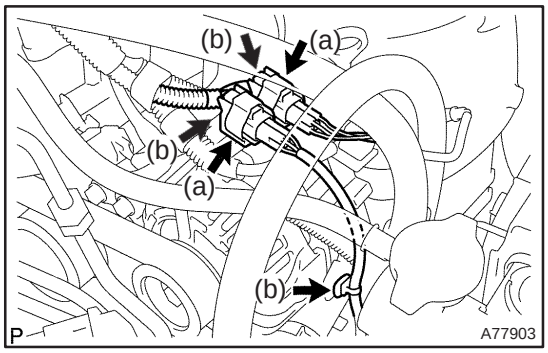
4. REMOVE ENGINE ROOM COVER SIDE (See page 10–26)

5. REMOVE FAN AND GENERATOR V BELT

SST 09249–63010

HINT:

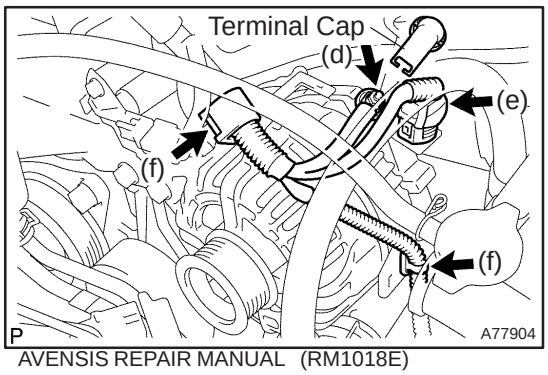
- 1AZ–FE: 14–105
- 1AZ–FSE: 14–185



6. REMOVE GENERATOR ASSY

(a) Disconnect the 2 heated oxygen sensor connectors. (1AZ–FE (Unleaded Gasoline) or 1AZ–FSE)

(b) Remove the 2 connector clamps of the heated oxygen sensor and the wire harness clamp. (1AZ–FE (Unleaded Gasoline) or 1AZ–FSE)

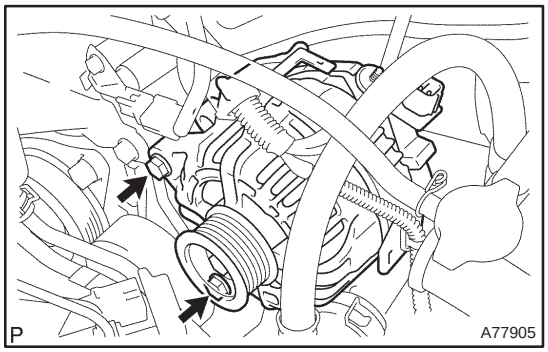


(c) Remove the terminal cap.

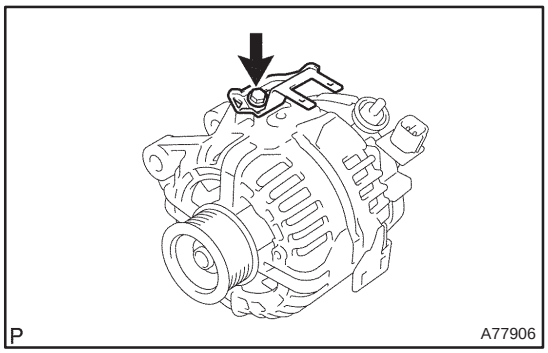
(d) Remove the nut and disconnect the generator wire.

(e) Disconnect the generator connector.

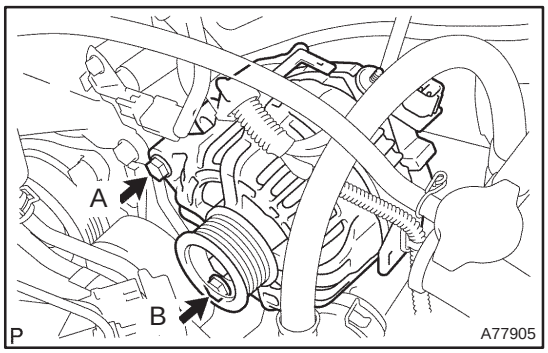
(f) Remove the 2 wire harness clamps.



(g) Remove the 2 bolts, and then remove the generator.



(h) Remove the bolt, and then remove the wire harness clamp bracket.



7. INSTALL GENERATOR ASSY

(a) Install the wire harness clamp bracket wire the bolt.
Torque: 8.4 N·m (86 kgf·cm, 74 in.·lbf)

(b) Install the generator the 2 bolts.
Torque:
52 N·m (530 kgf·cm, 38 ft·lbf) for bolt A
21 N·m (214 kgf·cm, 16 ft·lbf) for bolt B

(c) Install the 2 wire harness clamps.

(d) Connect the generator connector.

(e) Install the generator wire with the nut.
Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)

(f) Install the terminal cap.

(g) Install the 2 connector clamps of the heated oxygen sensor and the wire harness clamp.
(1AZ–FE (Unleaded Gasoline) or 1AZ–FSE)

(h) Connect the 2 heated oxygen sensor connectors.
(1AZ–FE (Unleaded Gasoline) or 1AZ–FSE)

8. INSTALL FAN AND GENERATOR V BELT
SST 09249–63010

HINT:
- 1AZ–FE: 14–105
- 1AZ–FSE: 14–185

9. INSTALL ENGINE ROOM COVER SIDE

10. INSTALL RADIATOR SUPPORT OPENING COVER

11. INSTALL ENGINE UNDER COVER RH

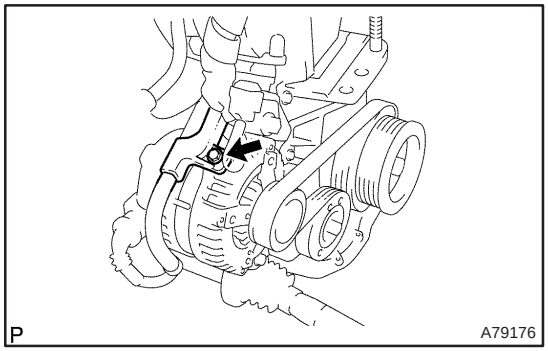
12. INSTALL ENGINE UNDER COVER LH

GENERATOR ASSY (1CD–FTV)

190O1–01

REPLACEMENT

1. REMOVE FRONT WHEEL RH
2. REMOVE RADIATOR SUPPORT OPENING COVER
3. REMOVE ENGINE ROOM COVER SIDE
4. REMOVE ENGINE UNDER COVER SUB–ASSY NO.1
5. REMOVE ENGINE UNDER COVER RH
6. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14–269)
7. REMOVE GENERATOR V BELT (See page 14–269)
8. REMOVE FLOOR PANEL BRACE FRONT (See page 15–10)
9. REMOVE EXHAUST PIPE ASSY FRONT (See page 15–10)
10. REMOVE EXHAUST PIPE ASSY (W/ COLD AREA) (See page 13–11)



11. REMOVE GENERATOR ASSY
    (a) Remove the bolt and disconnect the wire harness.
    (b) Remove the cap and nut, disconnect the generator wire.
    (c) Disconnect the generator connector.
    (d) Remove the 2 bolts and the generator.

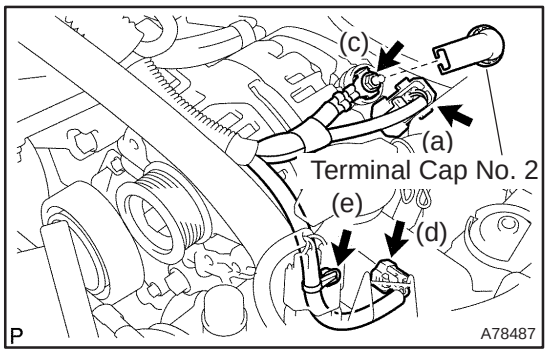
12. INSTALL GENERATOR ASSY
    Torque:
    31 N·m (320 kgf·cm, 23 ft·lbf) for M8
    47 N·m (475 kgf·cm, 34 ft·lbf) for M10
    9.8 N·m (100 kgf·cm, 7 ft·lbf) for Generator wire
    5.0 N·m (51 kgf·cm, 44 ft·lbf) for Wire harness
13. INSTALL EXHAUST PIPE ASSY (W/ COLD AREA) (See page 13–11)
14. INSTALL EXHAUST PIPE ASSY FRONT (See page 15–10)
15. INSTALL FLOOR PANEL BRACE FRONT (See page 15–10)
16. ADJUST V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14–286)
17. INSTALL FRONT WHEEL RH
    Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
18. CHECK FOR EXHAUST GAS LEAKS

GENERATOR ASSY (1ZZ–FE/3ZZ–FE)

190NI–01

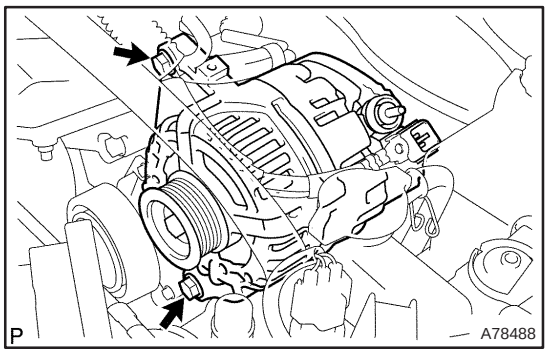
REPLACEMENT

1. **REMOVE ENGINE UNDER COVER SUB–ASSY NO.1 (See page 10–17)**
2. **REMOVE RADIATOR SUPPORT OPENING COVER (See page 10–9)**
3. **REMOVE ENGINE ROOM COVER SIDE (See page 10–9)**
4. **REMOVE FAN AND GENERATOR V BELT (See page 14–5)**

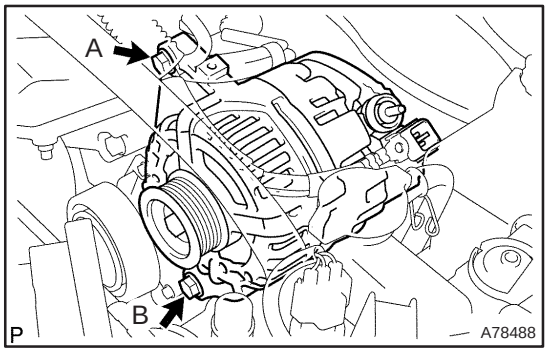


5. **REMOVE GENERATOR ASSY**

(a) Disconnect the generator connector.
(b) Remove the terminal cap No. 2.
(c) Remove the nut and disconnect the generator wire.
(d) Disconnect the A/C connector.
(w/ Air Conditioning)
(e) Remove the wire harness clamp. (w/ Air Conditioning)



(f) Remove the 2 bolts, and then remove the generator.



6. **INSTALL GENERATOR ASSY**

(a) Install the generator with the 2 bolts.
Torque:
25 N·m (255 kgf·cm, 18 ft·lbf) for bolt A
54 N·m (551 kgf·cm, 40 ft·lbf) for bolt B
(b) Install the wire harness clamp. (w/ Air Conditioning)
(c) Connect the A/C connector.
(w/ Air Conditioning)
(d) Install the generator wire with the nut.
Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)
(e) Install the terminal cap No. 2.
(f) Connect the generator connector.

7. **INSTALL FAN AND GENERATOR V BELT (See page 14–5)**
8. **INSTALL ENGINE ROOM COVER SIDE**
9. **INSTALL RADIATOR SUPPORT OPENING COVER**
10. **INSTALL ENGINE UNDER COVER SUB–ASSY NO.1**

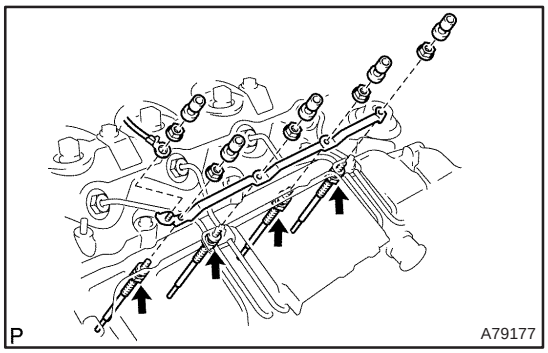
GLOW PLUG ASSY (1CD–FTV)

190O2–01

REPLACEMENT

1. REMOVE ENGINE COVER NO.1

(a) Remove the 5 nuts and the engine cover.



2. REMOVE GLOW PLUG ASSY

(a) Remove the 5 grommets.

(b) Remove the 5 nuts and the glow plug connector.

(c) Remove the 4 glow plugs.

3. INSTALL GLOW PLUG ASSY

Torque:
12.3 N·m (125 kgf·cm, 9 ft·lbf) for glow plug
2.2 N·m (22 kgf·cm, 19 in.·lbf) for nut

4. INSTALL ENGINE COVER NO.1

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

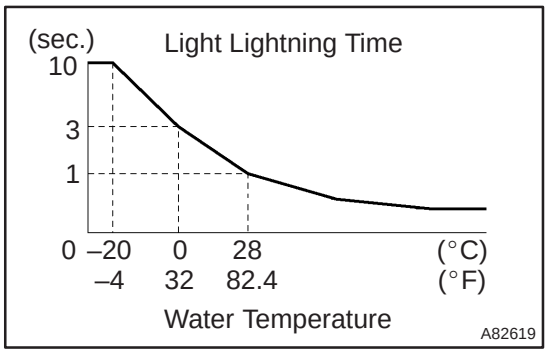
PRE–HEATING SYSTEM (1CD–FTV)

190JE–02

ON–VEHICLE INSPECTION

NOTICE:

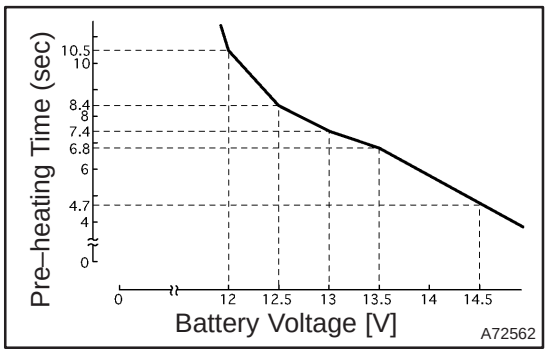
Turn the ignition switch OFF for 60 seconds before performing the following inspections.



1. INSPECT LIGHTING DURATION OF GLOW INDICATOR LIGHT

(a) Turn the ignition switch ON, and measure the lighting duration.

Light lighting duration: Refer to the chart graph



2. INSPECT PRE–HEATING

(a) Turn the ignition switch ON, measure how long it takes to the battery voltage is applied to the glow plugs.

SST 09082–00030, 09083–00150

Pre–Heating time:

Engine coolant temperature	Pre–Heating time
40 °C or more	1 sec
40 °C or less	Refer to the chart graph (15 sec at the longest)

(b) Turn the ignition switch STA, check that the battery voltage applied to the glow plugs.

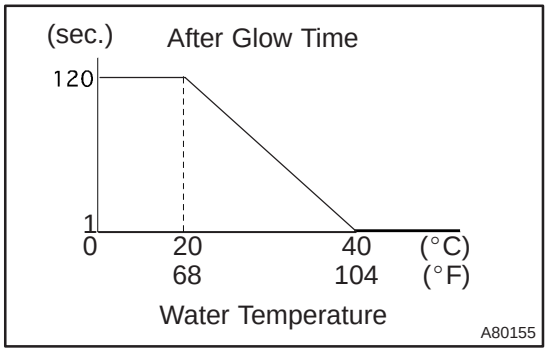
SST 09082–00030, 09083–00150

(c) While cranking the engine, measure how long it takes to the battery voltage is applied to the glow plugs.

SST 09082–00030, 09083–00150

Pre–Heating time:

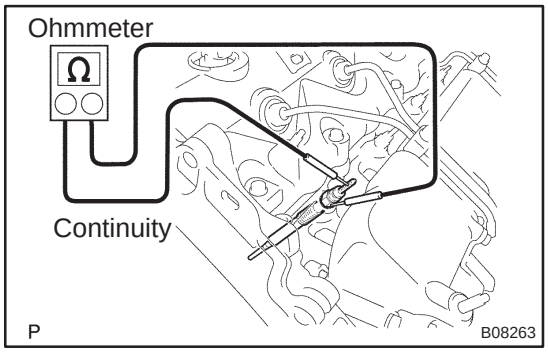
Engine coolant temperature	Pre–Heating time
40 °C or more	1 sec
40 °C or less	Refer to the chart graph (15 sec at the longest)



3. INSPECT AFTER GLOW TIME

(a) After the engine starting, measure how long it takes to the battery voltage is applied to the terminal SREL of the ECM.

After glow time: Refer to the chart graph



4. INSPECT GLOW PLUGS

(a) Using an ohmmeter, check that there is continuity between the glow plug terminal and ground.

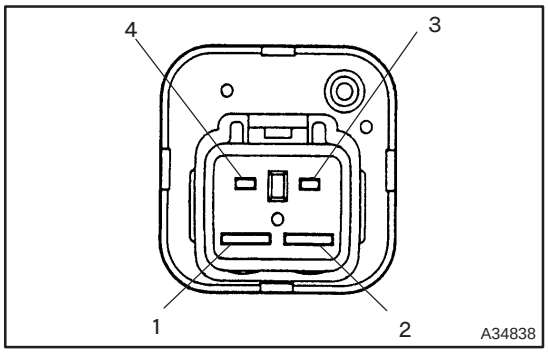
Standard resistance: Approx. 0.72 Ω at 20°C (68°F)

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 gasoline on the glow plug when cleaning.**
- **Wipe up any oil on the terminal and Bakelite washer with a dry cloth if they are stained with oil during inspection.**
- **Be careful not to apply more than 11 V to the glow plug as it could cause an open circuit.**

190JF–02

INSPECTION



1. INSPECT GLOW PLUG RELAY ASSY

(a) Using an ohmmeter, check for continuity between each terminal.

Specified condition:

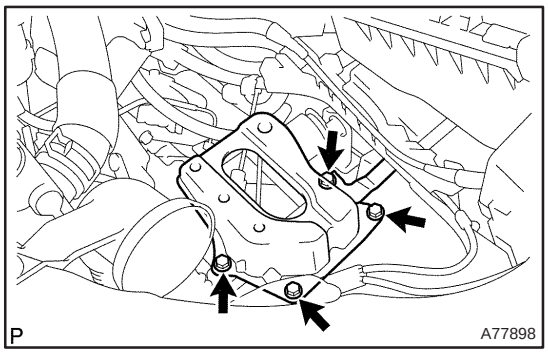
1 – 2	No continuity
	Continuity (Apply battery voltage terminals 3 and 4)

STARTER ASSY (1AZ–FE/1AZ–FSE)

190NJ–01

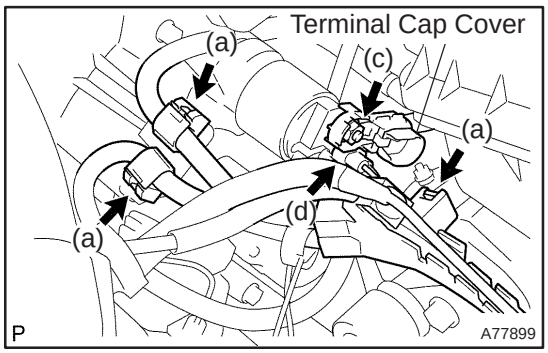
REPLACEMENT

1. REMOVE RADIATOR SUPPORT OPENING COVER (See page 10–26)
2. REMOVE BATTERY CLAMP SUB–ASSY
3. REMOVE BATTERY
4. REMOVE BATTERY TRAY



5. REMOVE BATTERY CARRIER

(a) Remove the 4 bolts, and then remove the battery carrier.



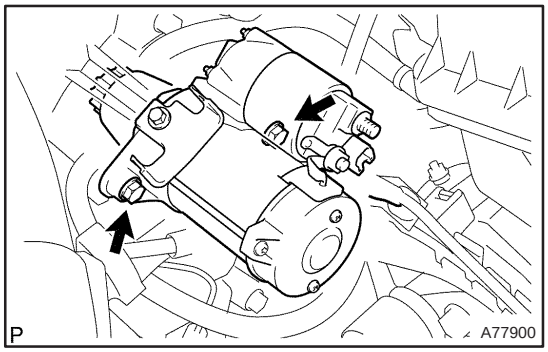
6. REMOVE STARTER ASSY

(a) Remove the 3 wire harness clamps.

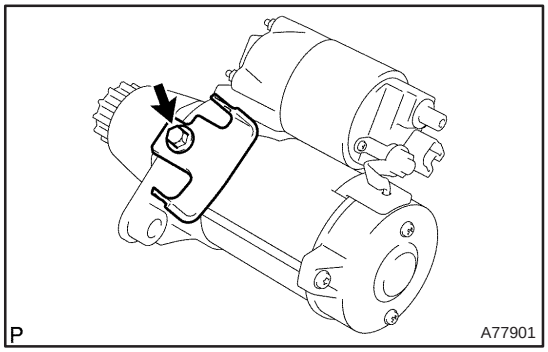
(b) Open the terminal cap cover.

(c) Remove the nut and disconnect the starter wire.

(d) Disconnect the starter connector.



(e) Remove the 2 bolts, and then remove the starter.



(f) Remove the bolt, and then remove the wire harness clamp bracket.

7. INSTALL STARTER ASSY

(a) Install the wire harness clamp bracket with the bolt.
Torque: 8.4 N·m (86 kgf·cm, 74 in.·lbf)

(b) Install the starter with the 2 bolts.
Torque: 37 N·m (380 kgf·cm, 28 ft·lbf)

(c) Connect the starter connector.

(d) Connect the starter wire with the nut.
Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)

(e) Close the terminal cap cover.

(f) Install the 3 wire harness clamps.

8. INSTALL BATTERY CARRIER
Torque: 13 N·m (131 kgf·cm, 9 ft·lbf)

9. INSTALL BATTERY TRAY

10. INSTALL BATTERY

11. INSTALL BATTERY CLAMP SUB–ASSY
Torque:
5.0 N·m (51 kgf·cm, 44 in.·lbf) for bolt
3.6 N·m (36 kgf·cm, 31 in.·lbf) for nut
5.4 N·m (55 kgf·cm, 48 in.·lbf) for terminal

12. INSTALL RADIATOR SUPPORT OPENING COVER

STARTER ASSY (1CD–FTV)

190O0–01

REPLACEMENT

1. **DRAIN ENGINE COOLANT (See page 16–44)**
2. **REMOVE RADIATOR SUPPORT OPENING COVER**
3. **REMOVE RADIATOR RESERVE TANK ASSY (See page 16–50)**
4. **REMOVE AIR CLEANER ASSY (See page 14–286)**
5. **REMOVE BATTERY**
6. **REMOVE STARTER ASSY**

(a) Remove the nut and disconnect terminal 30.
(b) Disconnect the starter connector.
(c) Remove the 2 bolts and the starter.

7. **INSTALL STARTER ASSY**

   Torque:
   37 N·m (377 kgf·cm, 27 ft·lbf) for bolt
   9.8 N·m (100 kgf·cm, 7.2 ft·lbf) for terminal 30

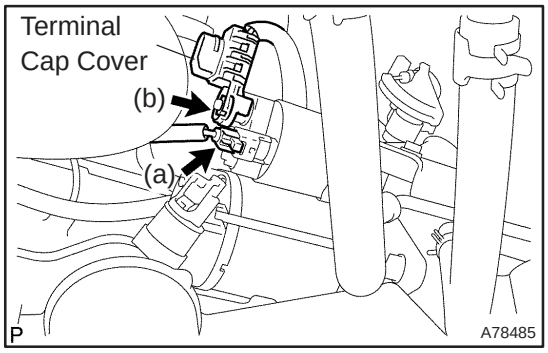
8. **INSTALL AIR CLEANER ASSY (See page 14–286)**
9. **INSTALL RADIATOR RESERVE TANK ASSY (See page 16–50)**
10. **ADD ENGINE COOLANT (See page 16–44)**
11. **CHECK FOR ENGINE COOLANT LEAKS (See page 16–44)**

STARTER ASSY (1ZZ–FE/3ZZ–FE)

190NH–01

REPLACEMENT

1. REMOVE ENGINE UNDER COVER SUB–ASSY NO.1 (See page 10–17)

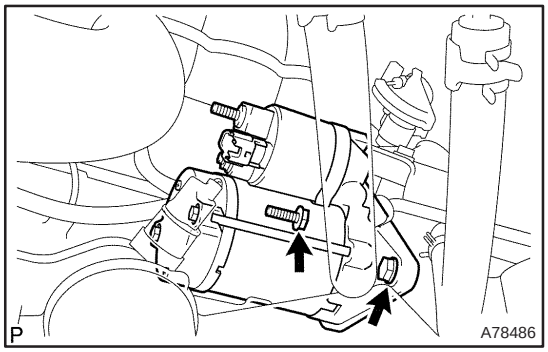


2. REMOVE STARTER ASSY

(a) Disconnect the starter connector.

(b) Open the terminal cap cover.

(c) Remove the nut and disconnect the starter wire.



(d) Remove the 2 bolts, and then remove the starter.

3. INSTALL STARTER ASSY

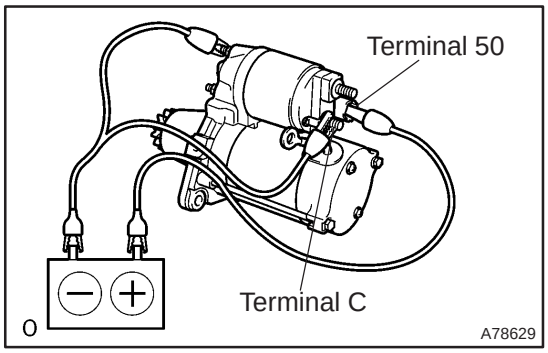
Torque:
37 N·m (378 kgf·cm, 28 ft·lbf) for bolt
9.8 N·m (100 kgf·cm, 7 ft·lbf) for nut

4. INSTALL ENGINE UNDER COVER SUB–ASSY NO.1

STARTING SYSTEM (1AZ–FE)

190NU–01

INSPECTION



1. INSPECT STARTER ASSY

NOTICE:

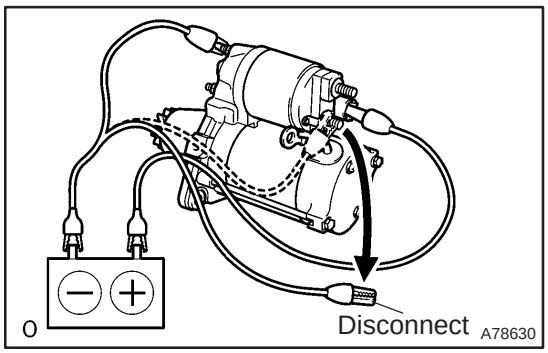
These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

(a) Do pull–in test

(1) Disconnect the field coil lead wire from terminal C.

(2) Connect the battery to the magnetic switch as shown in the illustration on the left. Check that the clutch pinion gear is extended.

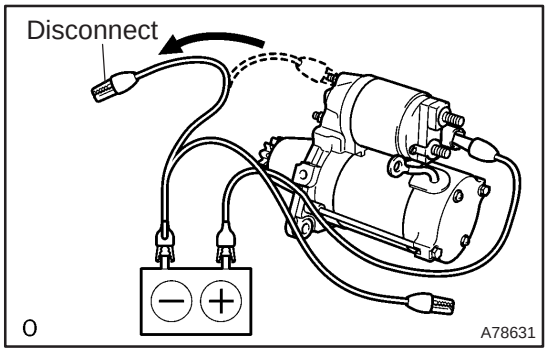
If the clutch pinion gear is not extended, replace the magnetic switch.



(b) Do hold–in test

(1) Disconnect the negative (–) lead from terminal C with the above condition (a) is being maintained. Check that the pinion gear remains extended.

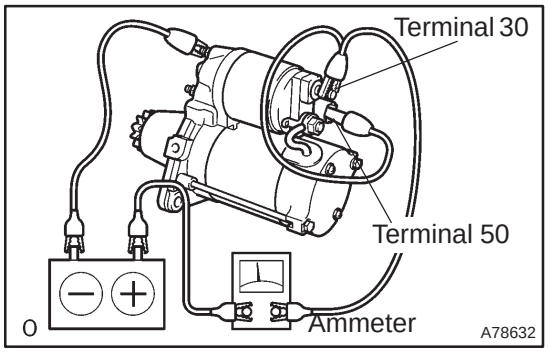
If the clutch pinion gear returns, replace the magnetic switch.



(c) Inspect clutch pinion gear return

(1) Disconnect the negative (–) lead from the switch body. Check that the clutch pinion gear returns.

If the clutch pinion gear does not return, replace the magnetic switch.



(d) Do no–load performance test

(1) Connect the field coil lead wire to terminal C. Make sure that the lead is not grounded.

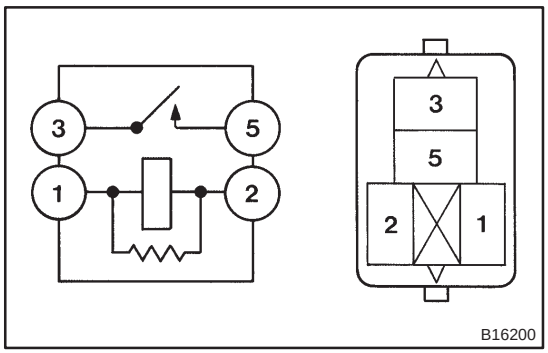
Torque: 5.9 N·m (60 kgf·cm, 52 in·lbf)

(2) Clamp the starter in a vise.

(3) Connect the battery and an ammeter to the starter as shown in the illustration.

(4) Check that the starter rotates smoothly and steadily with the clutch pinion gear extended. Check that the ammeter reads the specified current.

Specified current: 85 A or less at 11.5 V



2. INSPECT STARTER RELAY ASSY

(a) Continuity inspection.

(1) Using an ohmmeter, check for continuity between each terminal.

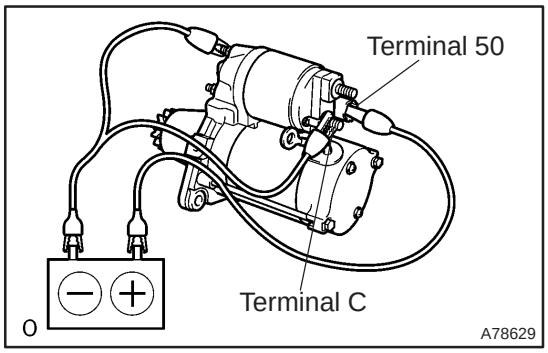
Specified condition:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage terminals 1 and 2)

STARTING SYSTEM (1AZ–FSE)

190NR–01

INSPECTION



1. INSPECT STARTER ASSY

NOTICE:

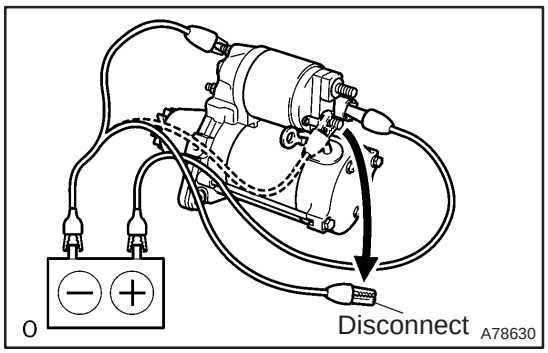
These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

(a) Do pull–in test

(1) Disconnect the field coil lead wire from terminal C.

(2) Connect the battery to the magnetic switch as shown in the illustration on the left. Check that the clutch pinion gear is extended.

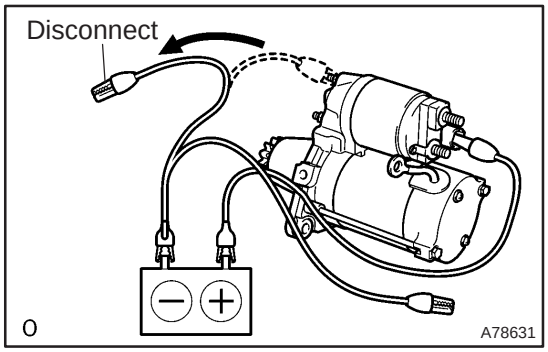
If the clutch pinion gear is not extended, replace the magnetic switch.



(b) Do hold–in test

(1) Disconnect the negative (–) lead from terminal C with the above condition (a) is being maintained. Check that the pinion gear remains extended.

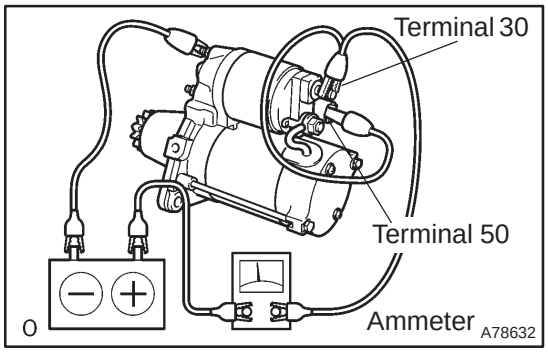
If the clutch pinion gear returns, replace the magnetic switch.



(c) Inspect clutch pinion gear return

(1) Disconnect the negative (–) lead from the switch body. Check that the clutch pinion gear returns.

If the clutch pinion gear does not return, replace the magnetic switch.



(d) Do no–load performance test

(1) Connect the field coil lead wire to terminal C. Make sure that the lead is not grounded.

Torque: 5.9 N·m (60 kgf·cm, 52 in·lbf)

(2) Clamp the starter in a vise.

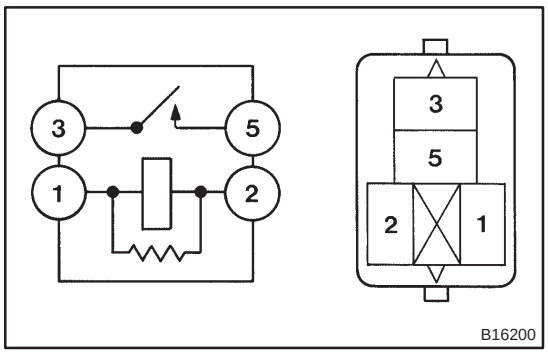
(3) Connect the battery and an ammeter to the starter as shown in the illustration.

(4) Check that the starter rotates smoothly and steadily with the clutch pinion gear extended. Check that the ammeter reads the specified current.

Specified current:

1.3kw 85 A or less at 11.5 V

1.6kw 75 A or less at 11.5 V



2. INSPECT STARTER RELAY ASSY

(a) Continuity inspection.

(1) Using an ohmmeter, check for continuity between each terminal.

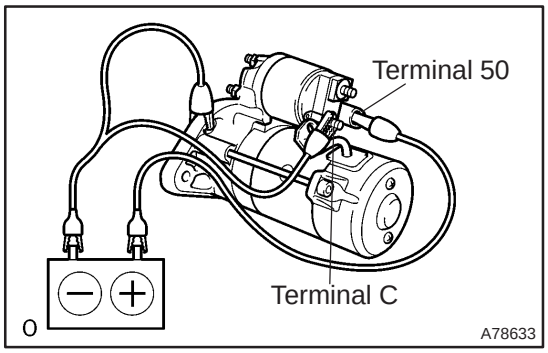
Specified condition:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Applying battery voltage terminals 1 and 2)

STARTING SYSTEM (1CD–FTV)

190NL–01

INSPECTION



1. INSPECT STARTER ASSY

NOTICE:

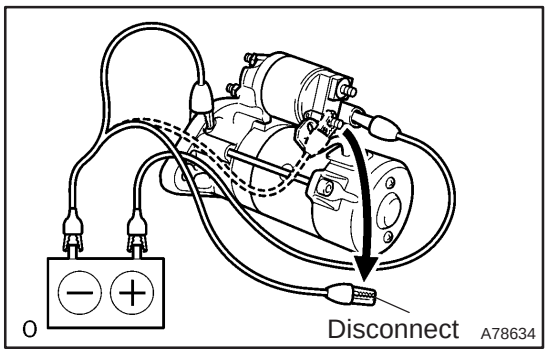
These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

(a) Do pull–in test

(1) Disconnect the field coil lead wire from terminal C.

(2) Connect the battery to the magnetic switch as shown in the illustration on the left. Check that the clutch pinion gear is extended.

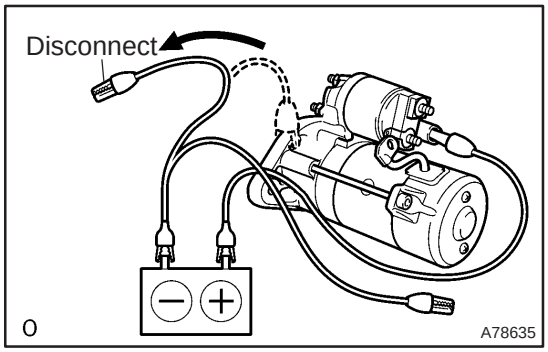
If the clutch pinion gear is not extended, replace the magnetic switch.



(b) Do hold–in test

(1) Disconnect the negative (–) lead from the terminal C with the above condition (a) is being maintained. Check that the pinion gear remains extended.

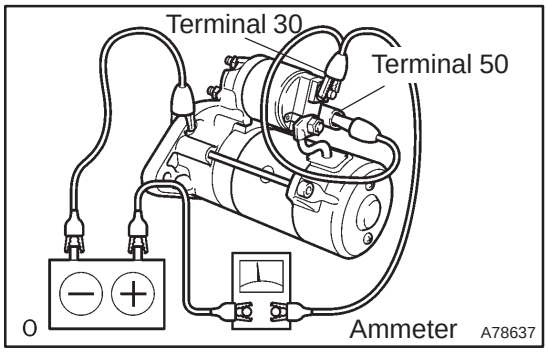
If the clutch pinion gear returns, replace the magnetic switch.



(c) Inspect clutch pinion gear return

(1) Disconnect the negative (–) lead from the switch body. Check that the clutch pinion gear returns.

If the clutch pinion gear does not return, replace the magnetic switch.



(d) Do no–load performance test

(1) Connect the field coil lead wire to terminal C. Make sure that the lead is not grounded.

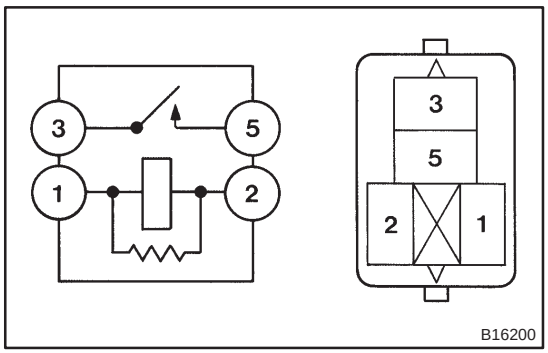
Torque: 5.9 N·m (60 kgf·cm, 52 in·lbf)

(2) Clamp the starter in a vise.

(3) Connect the battery and an ammeter to the starter as shown in the illustration.

(4) Check that the starter rotates smoothly and steadily with the clutch pinion gear extended. Check that the ammeter reads the specified current.

Specified current: 190 A or less at 11.5 V



2. INSPECT STARTER RELAY ASSY

(a) Continuity inspection.

(1) Using an ohmmeter, check for continuity between each terminal.

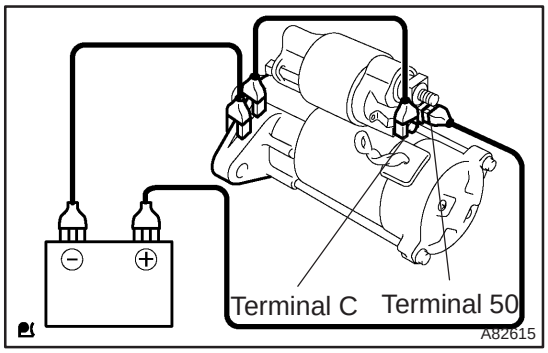
Specified condition:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage terminals 1 and 2)

STARTING SYSTEM (1ZZ–FE/3ZZ–FE)

190NO–01

INSPECTION



1. INSPECT STARTER ASSY

NOTICE:

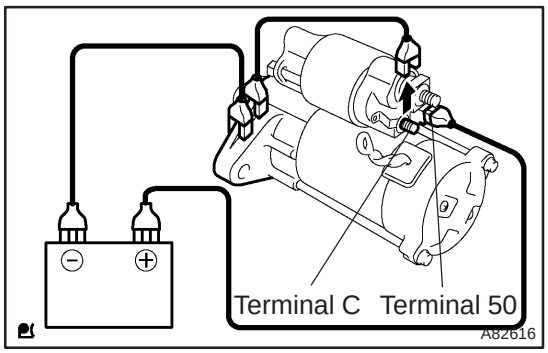
These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

(a) Do pull–in test

(1) Disconnect the field coil lead wire from terminal C.

(2) Connect the battery to the magnetic switch as shown in the illustration on the left. Check that the clutch pinion gear is extended.

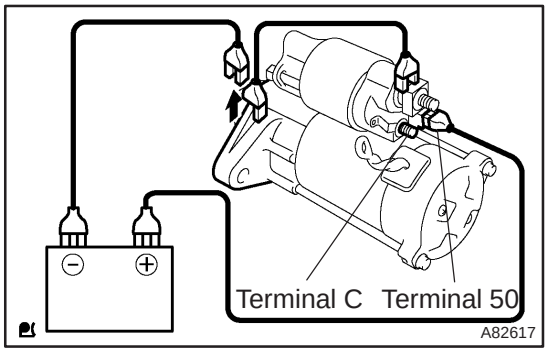
If the clutch pinion gear is not extended, replace the magnetic switch.



(b) Do hold–in test

(1) Disconnect the negative (–) lead from terminal C with the above condition (a) is being maintained. Check that the pinion gear remains extended.

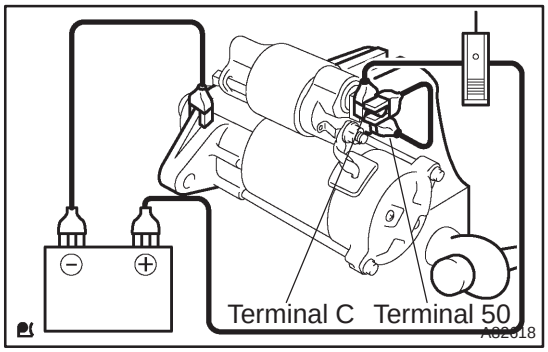
If the clutch pinion gear returns, replace the magnetic switch.



(c) Inspect clutch pinion gear return

(1) Disconnect the negative (–) lead from the switch body. Check that the clutch pinion gear returns.

If the clutch pinion gear does not return, replace the magnetic switch.



(d) Do no–load performance test

(1) Connect the field coil lead wire to terminal C. Make sure that the lead is not grounded.

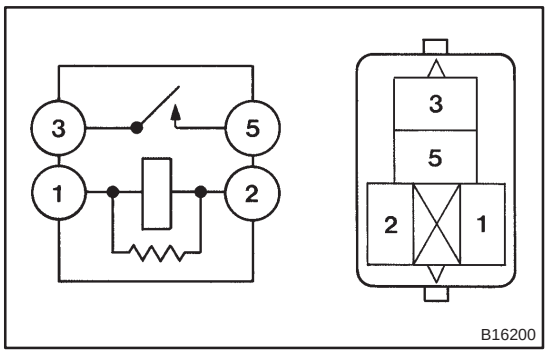
Torque: 5.9 N·m (60 kgf·cm, 52 in·lbf)

(2) Clamp the starter in a vise.

(3) Connect the battery and an ammeter to the starter as shown in the illustration.

(4) Check that the starter rotates smoothly and steadily with the clutch pinion gear extended. Check that the ammeter reads the specified current.

Specified current: 85 A or less at 11.5 V



2. INSPECT STARTER RELAY ASSY

(a) Continuity inspection.

(1) Using an ohmmeter, check for continuity between each terminal.

Specified condition:

Terminal No.	Specified condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage terminals 1 and 2)