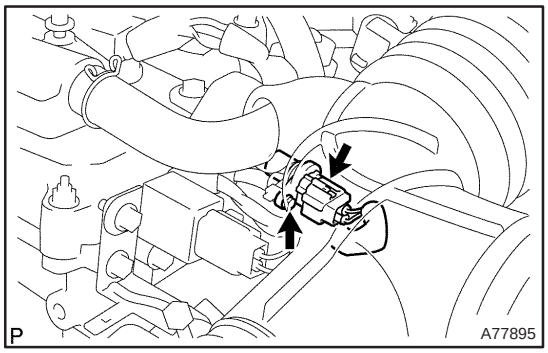
CAMSHAFT POSITION SENSOR (1AZ–FE/1AZ–FSE)

1807K–01

REPLACEMENT

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



2. REMOVE CAMSHAFT POSITION SENSOR

(a) Disconnect the camshaft position sensor connector.

(b) Remove the bolt, and then remove the camshaft position sensor.

3. INSTALL CAMSHAFT POSITION SENSOR

(a) Apply a light coat of engine oil to the O–ring on the camshaft position sensor.

(b) Install the camshaft position sensor with the bolt.

Torque: 9.0 N·m (92 kgf·cm, 79 in.·lbf)

(c) Connect the camshaft position sensor connector.

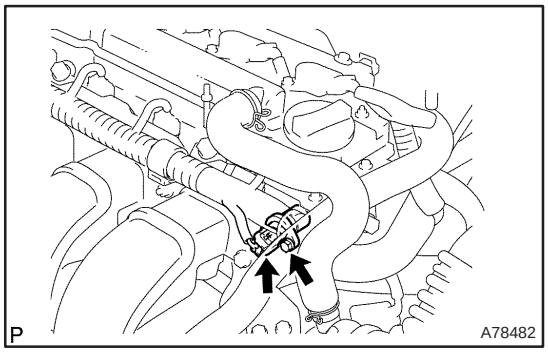
4. INSTALL RADIATOR SUPPORT OPENING COVER

CAMSHAFT POSITION SENSOR (1ZZ–FE/3ZZ–FE)

1807I–01

REPLACEMENT

1. **REMOVE RADIATOR SUPPORT OPENING COVER (See page 10–9)**
2. **REMOVE CYLINDER HEAD COVER NO.2 (See page 10–9)**



3. **REMOVE CAMSHAFT POSITION SENSOR**

(a) Disconnect the camshaft position sensor connector.

(b) Remove the bolt, and then remove the camshaft position sensor.

4. **INSTALL CAMSHAFT POSITION SENSOR**

(a) Apply a light coat of engine oil to the O–ring on the camshaft position sensor.

(b) Install the camshaft position sensor with the bolt.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(c) Connect the camshaft position sensor connector.

5. **INSTALL CYLINDER HEAD COVER NO.2 (See page 10–9)**
6. **INSTALL RADIATOR SUPPORT OPENING COVER**

CRANKSHAFT POSITION SENSOR (1AZ–FE/1AZ–FSE)

1807L–01

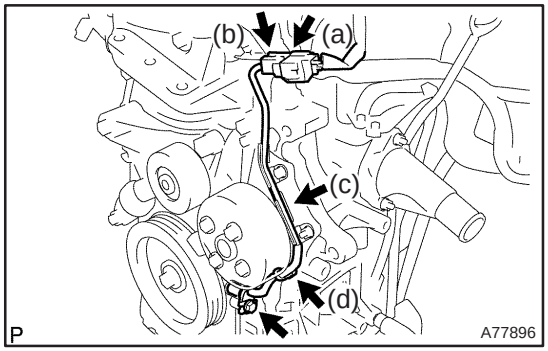
REPLACEMENT

1. **REMOVE ENGINE UNDER COVER LH (See page 19–20)**
2. **REMOVE ENGINE UNDER COVER RH (See page 19–20)**
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**
6. **REMOVE GENERATOR ASSY (See page 19–20)**

   SST 09249–63010

HINT:

- 1AZ–FE: 14–105
- 1AZ–FSE: 14–185



7. **REMOVE CRANKSHAFT POSITION SENSOR**

(a) Disconnect the crankshaft position sensor connector.
(b) Remove the wire harness of the crankshaft position sensor from the wire harness clamp bracket.
(c) Remove the connector clamp.
(d) Remove the wire harness clamp.
(e) Remove the bolt, and then remove the crankshaft position sensor.

8. **INSTALL CRANKSHAFT POSITION SENSOR**

(a) Apply a light coat of engine oil to the O–ring on the crankshaft position sensor.
(b) Install the crankshaft position sensor with the bolt.
Torque: 9.0 N·m (92 kgf·cm, 79 in.·lbf)
(c) Install the wire harness clamp.
(d) Install the connector clamp.
(e) Install the wire harness of the crankshaft position sensor to the the wire harness clamp bracket.
(f) Connect the crankshaft position sensor connector.

9. **INSTALL GENERATOR ASSY (See page 19–20)**
10. **INSTALL FAN AND GENERATOR V BELT**

    SST 09249–63010

HINT:

- 1AZ–FE: 14–105
- 1AZ–FSE: 14–185

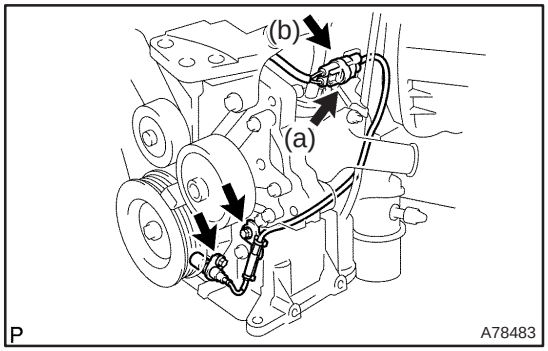
11. **INSTALL ENGINE ROOM COVER SIDE**
12. **INSTALL RADIATOR SUPPORT OPENING COVER**
13. **INSTALL ENGINE UNDER COVER RH**
14. **INSTALL ENGINE UNDER COVER LH**

CRANKSHAFT POSITION SENSOR (1ZZ–FE/3ZZ–FE)

1807J–01

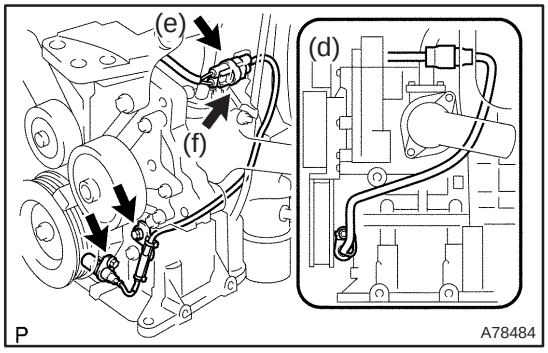
REPLACEMENT

1. REMOVE ENGINE UNDER COVER LH (See page 19–20)
2. REMOVE ENGINE UNDER COVER SUB–ASSY NO.1 (See page 10–17)
3. REMOVE ENGINE UNDER COVER RH (See page 19–20)
4. REMOVE RADIATOR SUPPORT OPENING COVER (See page 10–9)
5. REMOVE ENGINE ROOM COVER SIDE (See page 10–9)
6. REMOVE FAN AND GENERATOR V BELT (See page 14–5)
7. REMOVE GENERATOR ASSY (See page 19–7)



8. REMOVE CRANKSHAFT POSITION SENSOR

(a) Disconnect the crankshaft position sensor connector.
(b) Remove the connector clamp.
(c) Remove the 2 bolts, and then remove the crankshaft position sensor.
(d) Remove the cord clamp from the crankshaft position sensor.



9. INSTALL CRANKSHAFT POSITION SENSOR

(a) Install the cord clamp to the crankshaft position sensor.
(b) Apply a light coat of engine oil on the O–ring of the crankshaft position sensor.
(c) Install the crankshaft position sensor with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)
(d) Install the wire harness as shown in the illustration.
(e) Install the connector clamp.
(f) Connect the crankshaft position sensor connector.

10. INSTALL GENERATOR ASSY (See page 19–7)
11. INSTALL FAN AND GENERATOR V BELT (See page 14–5)
12. INSTALL ENGINE ROOM COVER SIDE
13. INSTALL RADIATOR SUPPORT OPENING COVER
14. INSTALL ENGINE UNDER COVER RH
15. INSTALL ENGINE UNDER COVER SUB–ASSY NO.1
16. INSTALL ENGINE UNDER COVER LH

IGNITION SYSTEM (1AZ–FE)

1807M–01

ON–VEHICLE INSPECTION

NOTICE:

"Cold" and "Hot" in this section 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).

1. INSPECT IGNITION COIL (WITH IGNITER) AND SPARK TEST

(a) Check for DTCs.

NOTICE:

If DTC is present, perform a troubleshooting in accordance with a procedure for that DTC.

(b) Check that spark occurs.

(1) Remove the cylinder head cover No. 1. (See page 14–106)

(2) Remove the ignition coils (with igniter).

(3) Using a 16mm (0.63 in) plug wrench, remove the spark plugs.

(4) Install the spark plugs to each ignition coil (with igniter) and connect the ignition coil connectors.

(5) Disconnect the 4 injector connectors.

(6) Ground the spark plugs.

(7) Check if spark occurs at each spark plug while engine is being cranked.

NOTICE:

- **Be sure to ground the spark plug when checking.**
- **Replace the ignition coil if it is given physical impact.**
- **Do not crank the engine for more than 2 seconds.**

If the sparks do not occur, do the following test:

SPARK TEST

↓ NG

CHECK CONNECTION OF IGNITION COIL WITH IGNITER CONNECTOR → NG → Connect securely.

↓ OK

CHANGE IT TO NORMAL IGNITION COIL WITH IGNITER AND PERFORM SPARK TEST AGAIN → OK → Replace ignition coil with igniter.

↓ NG

CHECK POWER SUPPLY TO IGNITION COIL WITH IGNITER
1. Turn ignition switch ON.
2. Check that there is battery voltage at ignition coil positive (+) terminal.

→ NG → Check wiring between ignition switch to ignition coil with igniter.

↓ OK

CHECK RESISTANCE OF CAMSHAFT POSITION SENSOR (See page 18–9)

	Cold	Hot
Resistance:	**835 to 1,400 Ω**	**1,060 to 1,645 Ω**

→ NG → Replace camshaft position sensor.

↓ OK

CHECK RESISTANCE OF CRANKSHAFT POSITION SENSOR (See page 18–9)

	Cold	Hot
Resistance:	**985 to 1,600 Ω**	**1,265 to 1,890 Ω**

→ NG → Replace crankshaft position sensor.

↓ OK

CHECK IGT SIGNAL FROM ECM (See page 05–232) → NG → Check ECM (See page 01–32)

↓ OK

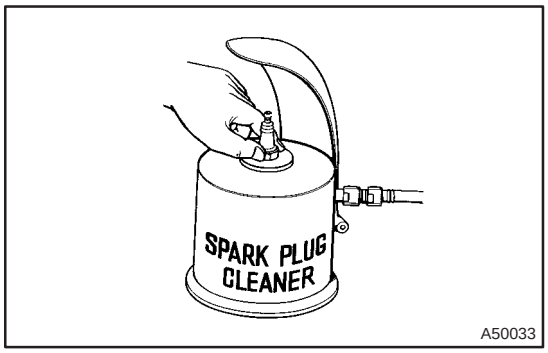
REPAIR WIRING BETWEEN IGNITION COIL AND ECM

(c) Using a 16 mm (0.63 in.) plug wrench, install the spark plugs.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

(d) Install the ignition coil with igniter.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(e) Install the cylinder head cover No. 1. (See page 14–106)

INSPECTION

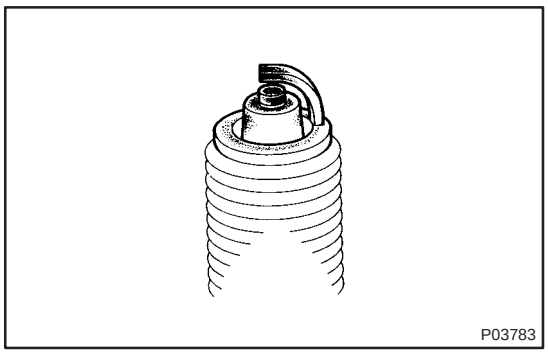


1. INSPECT SPARK PLUG (EXCEPT EUROPE)

(a) Clean the spark plugs.

If the electrode has traces of wet carbon, clean the electrode with a spark plug cleaner then dry it.

Air pressure: Below 588 kPa (6kg/cm^2, 85 psi)
Duration: 20 seconds or less

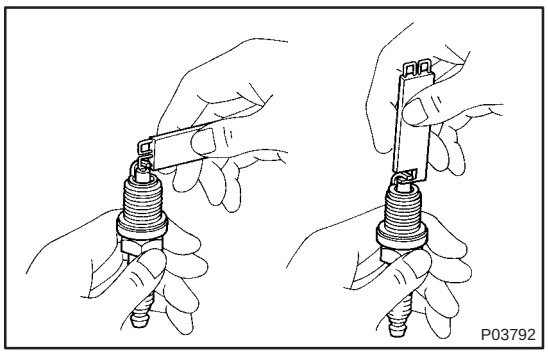


(b) Check the spark plug for any damage on its thread and insulator damage.

If there is damage, replace the spark plug.

Recommended spark plug:

DENSO made	K20R–U11
NGK made	BKR6EYA11



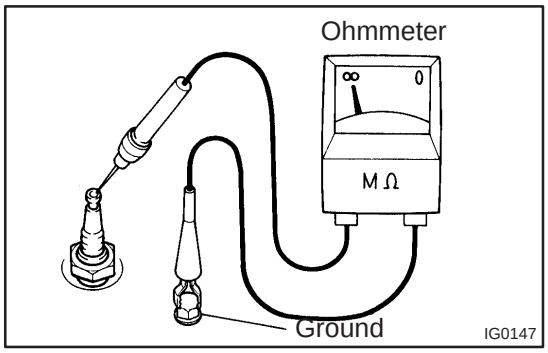
(c) Adjust electrode gap.

Electrode gap: 1.0 to 1.1 mm (0.039 to 0.043 in.)

2. INSPECT SPARK PLUG (FOR EUROPE)

NOTICE:

- **Do not use a wire brush for cleaning.**
- **Do not attempt to adjust the electrode gap of a used spark plug.**
- **Spark plug should be replaced every 100,000 km (60,000 miles).**



(a) Check the electrode.

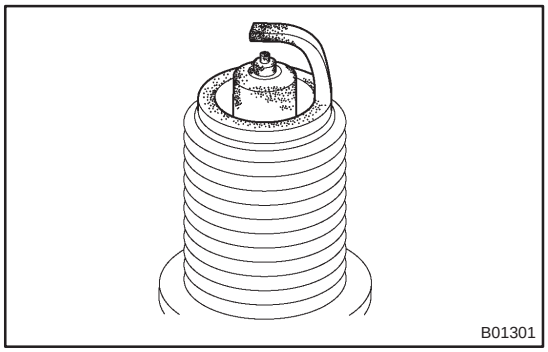
(1) Using an ohmmeter, measure the insulation resistance.

Correct insulation resistance: 10 MΩ or more

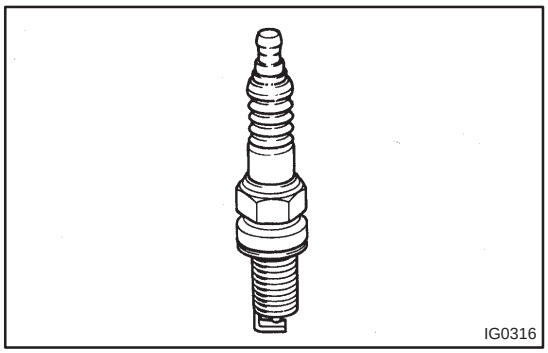
If the resistance is less then the specified valve, proceed to step (d).

HINT:

If the ohmmeter is not available, perform the following alternative inspection. This provides also fairly accurate results.



(b) Alternative inspection:
(1) Quickly accelerate the engine to 4,000 rpm 5 times.
(2) Remove the spark plug.
(3) Visually check the spark plug.
(4) If the electrode is dry...OK.
(5) If the electrode is wet...Proceed to step (C).
(6) Reinstall the spark plug.

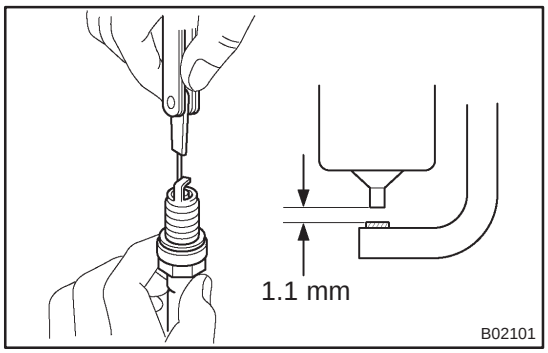


(c) Check the spark plug for any damage on its thread and insulator.

If there is damage, replace the spark plug.

Recommended spark plug:

DENSO made	SK20R11
NGK made	IFR6A11

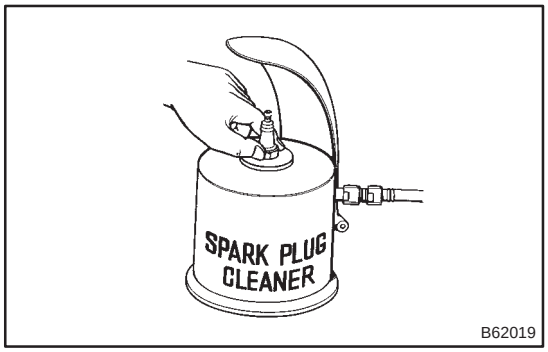


(d) Check the spark plug electrode gap.

Maximum electrode gap for used spark plug:
1.3 mm (0.051 in.)

If the gap is greater than maximum, replace the spark plug.

Correct electrode gap for new spark plug:
1.0 to 1.1 mm (0.039 to 0.043 in.)



(e) Clean the spark plugs.

If the electrode has traces of wet carbon, clean the electrode with a spark plug cleaner then dry it.

Air pressure: Blow 588 kPa (6 kgf/cm^2, 85 psi)
Duration: 20 seconds or less

HINT:

If there are traces of oil, remove it with gasoline before using the spark plug cleaner.

3. INSPECT CAMSHAFT POSITION SENSOR

(a) Using an ohmmeter, measure the resistance between the terminals.

RESISTANCE:
835 to 1,400 Ω at cold
1,060 to 1,645 Ω at 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).

4. INSPECT CRANKSHAFT POSITION SENSOR

(a) Using an ohmmeter, measure the resistance between the terminals.

RESISTANCE:

985 to 1,600 Ω at cold

1,265 to 1,890 Ω at 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).

IGNITION SYSTEM (1AZ–FSE)

1807Q–01

ON–VEHICLE INSPECTION

NOTICE:

"Cold" and "Hot" in this section 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).

1. INSPECT IGNITION COIL (WITH IGNITER) AND SPARK TEST

(a) Check for DTCs.

NOTICE:

If DTC is present, perform a troubleshooting in accordance with a procedure for that DTC.

(b) Check that spark occurs.

(1) Remove the cylinder head cover No. 1. (See page 14–186)

(2) Remove the ignition coils (with igniter).

(3) Using a 16mm (0.63 in) plug wrench, remove the spark plugs.

(4) Install the spark plugs to each ignition coil (with igniter) and connect the ignition coil connectors.

(5) Disconnect the 4 injector connectors.

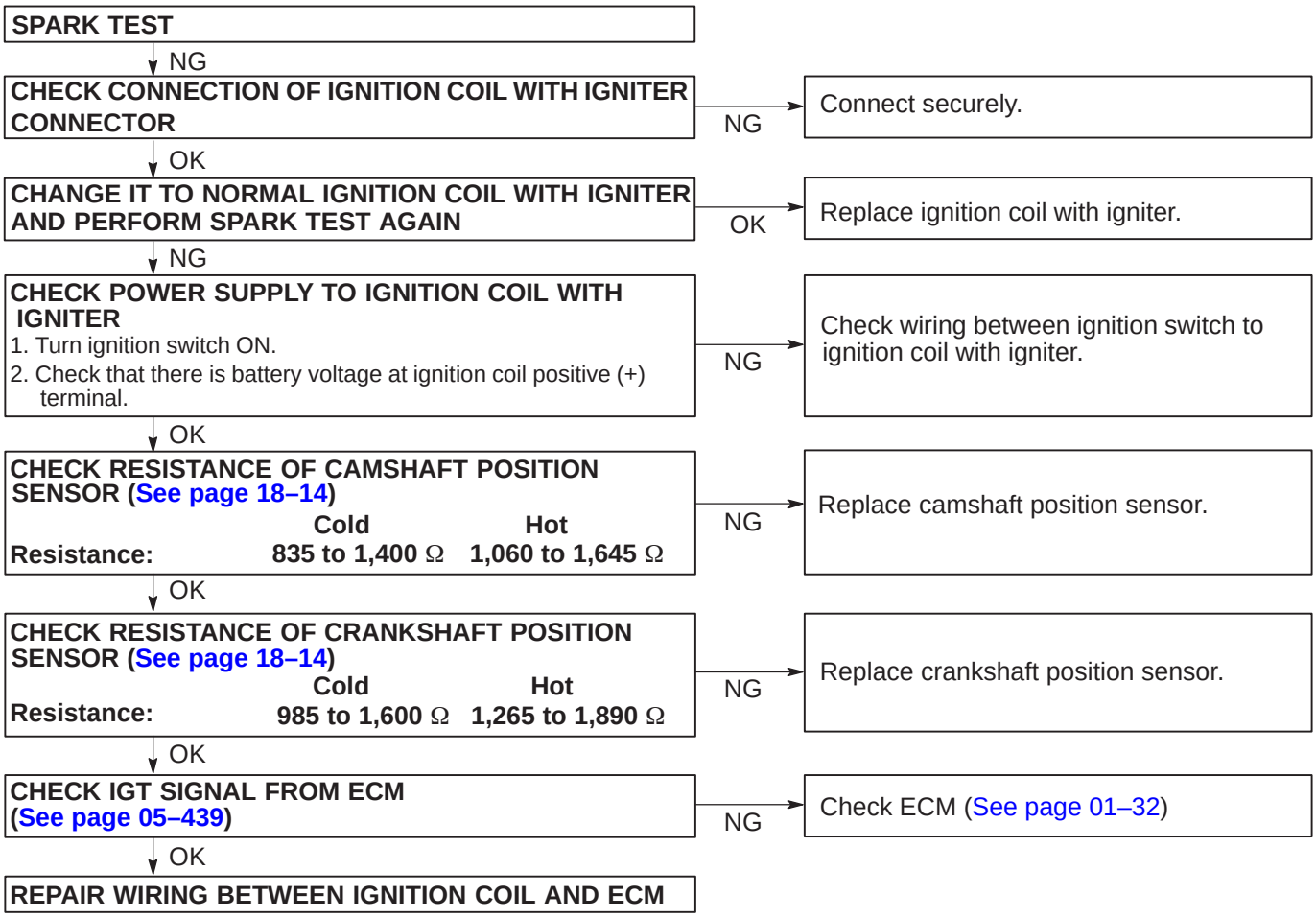
(6) Ground the spark plugs.

(7) Check if spark occurs at each spark plug while engine is being cranked.

NOTICE:

- **Be sure to ground the spark plug when checking.**
- **Replace the ignition coil it is given physical impact.**
- **Do not crank the engine for more than 2 seconds.**

If the sparks do not occur, do the following test:



(c) Using a 16 mm (0.63 in.) plug wrench, install the spark plugs.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

(d) Install the ignition coil with igniter.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

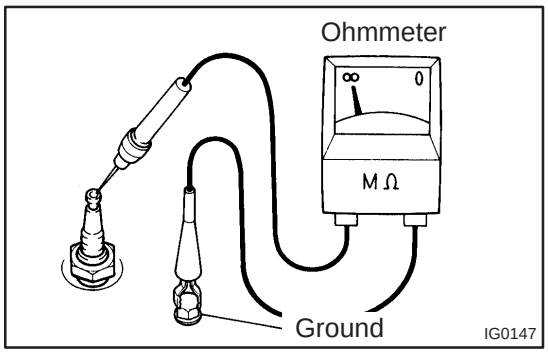
(e) Install the cylinder head cover No. 1. (See page 14–186)

INSPECTION

1. INSPECT SPARK PLUG

NOTICE:

- **Do not use a wire brush for cleaning.**
- **Do not attempt to adjust the electrode gap of a used spark plug.**
- **Spark plug should be replaced every 100,000 km (60,000 miles).**



(a) Check the electrode.

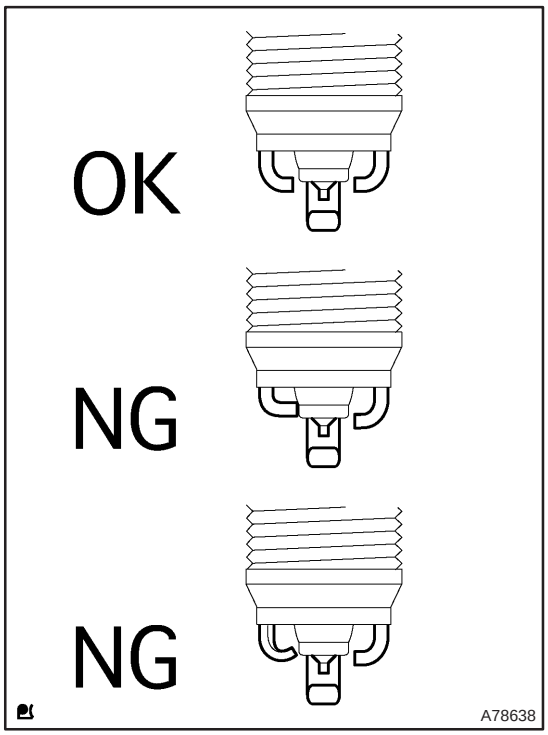
(1) Using an ohmmeter, measure the insulation resistance.

Correct insulation resistance: 10 MΩ or more

If the resistance is less then the specified value, proceed to step (d).

HINT:

If the ohmmeter is not available, do the following inspection instead.



(b) Alternative inspection:

(1) Quickly accelerate the engine to 4,000 rpm 5 times.

(2) Remove the spark plug.

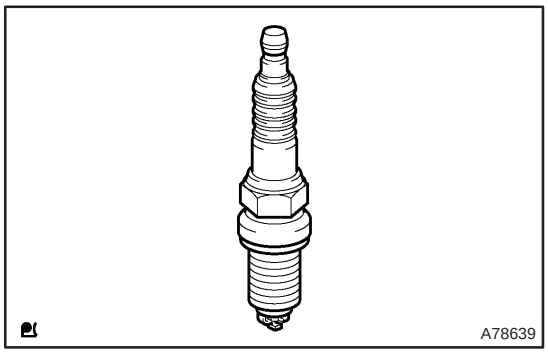
(3) Visually check the spark plug.

If a kink or twist as shown in the illustration on the left is found on the spark plug, replace it with a new one.

(4) If the electrode is dry...OK.

(5) If the electrode is wet...Proceed to step (e).

(6) Reinstall the spark plug.

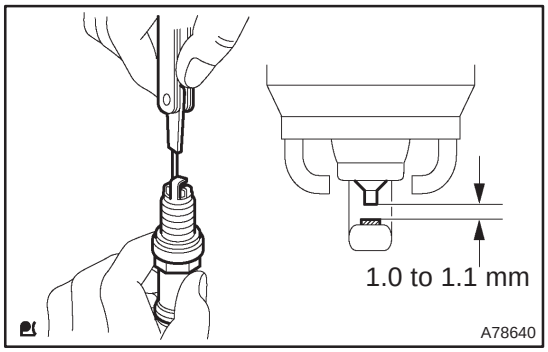


(c) Check the spark plug for any damage on its thread and insulator.

If there is damage, replace the spark plug.

Recommended spark plug:

DENSO made	SK20BR11

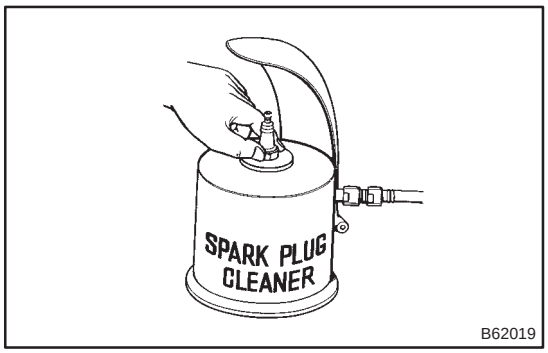


(d) Check the spark plug electrode gap.

Maximum electrode gap for used spark plug:
1.3 mm (0.051 in.)

If the gap is greater than maximum, replace the spark plug.

Correct electrode gap for new spark plug:
1.0 to 1.1 mm (0.039 to 0.043 in.)



(e) Clean the spark plugs.

If the electrode has traces of wet carbon, clean the electrode with a spark plug cleaner then dry it.

Air pressure: Blow 588 kPa (6 kgf/cm^2, 85 psi)
Duration: 20 seconds or less

HINT:

If there are traces of oil, remove them with gasoline before using the spark plug cleaner.

2. INSPECT CAMSHAFT POSITION SENSOR

(a) Using an ohmmeter, measure the resistance between the terminals.

RESISTANCE:
835 to 1,400 Ω at cold
1,060 to 1,645 Ω at 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).

3. INSPECT CRANKSHAFT POSITION SENSOR

(a) Using an ohmmeter, measure the resistance between the terminals.

RESISTANCE:
985 to 1,600 Ω at cold
1,265 to 1,890 Ω at 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).

IGNITION SYSTEM (1ZZ–FE/3ZZ–FE)

1807O–01

ON–VEHICLE INSPECTION

NOTICE:

"Cold" and "Hot" in this section 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).

1. INSPECT IGNITION COIL (WITH IGNITER) AND SPARK TEST

(a) Check for DTCs.

NOTICE:

If DTC is present, perform a troubleshooting in accordance with a procedure for that DTC.

(b) Check that spark occurs.

(1) Remove the cylinder head cover No. 2. (See page 14–6)

(2) Remove the ignition coils (with igniter).

(3) Using a 16mm (0.63 in) plug wrench, remove the spark plugs.

(4) Install the spark plugs to each ignition coil (with igniter) and connect the ignition coil connectors.

(5) Disconnect the 4 injector connectors.

(6) Ground the spark plugs.

(7) Check if spark occurs at each spark plug while engine is being cranked.

NOTICE:

- **Be sure to ground the spark plug when checking.**
- **Replace the ignition coil it is given physical impact.**
- **Do not crank the engine for more than 2 seconds.**

If the sparks do not occur, do the following test:

SPARK TEST

↓ NG

CHECK CONNECTION OF IGNITION COIL WITH IGNITER CONNECTOR → NG → Connect securely.

↓ OK

CHANGE IT TO NORMAL IGNITION COIL WITH IGNITER AND PERFORM SPARK TEST AGAIN → OK → Replace ignition coil with igniter.

↓ NG

CHECK POWER SUPPLY TO IGNITION COIL WITH IGNITER
1. Turn ignition switch ON.
2. Check that there is battery voltage at ignition coil positive (+) terminal.

→ NG → Check wiring between ignition switch to ignition coil with igniter.

↓ OK

CHECK RESISTANCE OF CAMSHAFT POSITION SENSOR (See page 18–3)

	Cold	Hot
Resistance:	**835 to 1,400 Ω**	**1,060 to 1,645 Ω**

→ NG → Replace camshaft position sensor.

↓ OK

CHECK RESISTANCE OF CRANKSHAFT POSITION SENSOR (See page 18–3)

	Cold	Hot
Resistance:	**1,630 to 2,740 Ω**	**2,065 to 3,225 Ω**

→ NG → Replace crankshaft position sensor.

↓ OK

CHECK IGT SIGNAL FROM ECM (See page 05–103) → NG → Check ECM (See page 01–32)

↓ OK

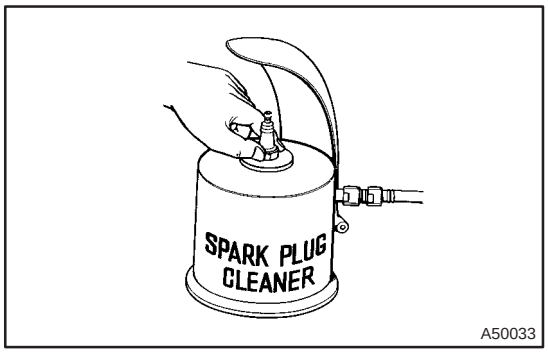
REPAIR WIRING BETWEEN IGNITION COIL AND ECM

(c) Using a 16 mm (0.63 in.) plug wrench, install the spark plugs.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

(d) Install the ignition coil with igniter.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(e) Install the cylinder head cover No. 2. (See page 14–6)

INSPECTION

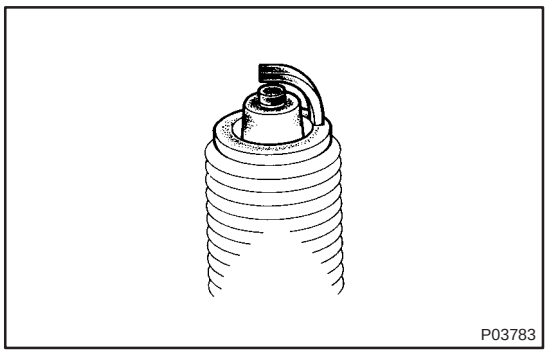


1. INSPECT SPARK PLUG

(a) Clean the spark plugs.

If the electrode has traces of wet carbon, clean the electrode with a spark plug cleaner then dry it.

Air pressure: Below 588 kPa (6kg/cm^2, 85 psi)
Duration: 20 seconds or less

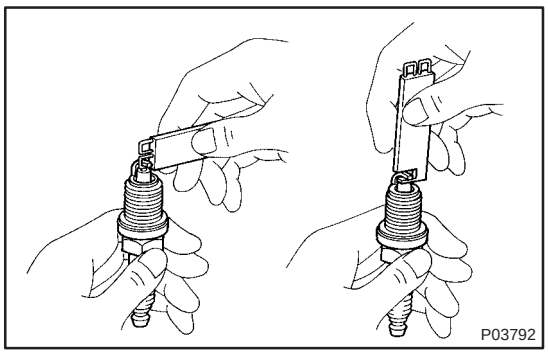


(b) Check the spark plug for any damage on its thread and insulator damage.

If there is damage, replace the spark plug.

Recommended spark plug:

DENSO made	K16R–U11
NGK made	BKR5EYA11



(c) Adjust electrode gap.

Electrode gap: 1.0 to 1.1 mm (0.039 to 0.043 in.)

2. INSPECT CAMSHAFT POSITION SENSOR

(a) Using an ohmmeter, measure the resistance between the terminals.

RESISTANCE:
835 to 1,400 Ω at cold
1,060 to 1,645 Ω at 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).

3. INSPECT CRANKSHAFT POSITION SENSOR

(a) Using an ohmmeter, measure the resistance between the terminals.

RESISTANCE:

1,630 to 2,740 Ω at cold

2,065 to 3,225 Ω at 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).