IGNITION SYSTEM

IG0DB–01

ON–VEHICLE INSPECTION

NOTICE:

"Cold" and "Hot" in these sentences express 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 SPARK TEST

Check that the spark occurs.

(1) Disconnect the high–tension cord from the spark plug.
(2) Remove the spark plug.
(3) Install the spark plug to the high–tension cord.
(4) Ground the spark plug.
(5) See if spark occurs while engine is being cranked.

NOTICE:

To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 5 – 10 seconds at time.

If the spark does not occur, do the test as follows:

SPARK TEST

NO

CHECK CONNECTION OF IGNITION COIL WITH IGNITER CONNECTORS → BAD → Connect securely.

OK

CHECK RESISTANCE OF HIGH–TENSION CORDS (See step 2)
Maximum resistance: 25 kΩ per cord → BAD → Replace cord(s).

OK

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

→ BAD → Check wiring between ignition switch to ignition coils with igniters.

OK

CHECK RESISTANCE OF IGNITION COILS (See step 4)

Resistance:	Cold	Hot
Secondary	9.7 – 16.7 kΩ	12.4 – 19.6 kΩ

→ BAD → Replace ignition coil(s) with igniter(s).

OK

CHECK RESISTANCE OF SENSORS (See steps 5 and 6)

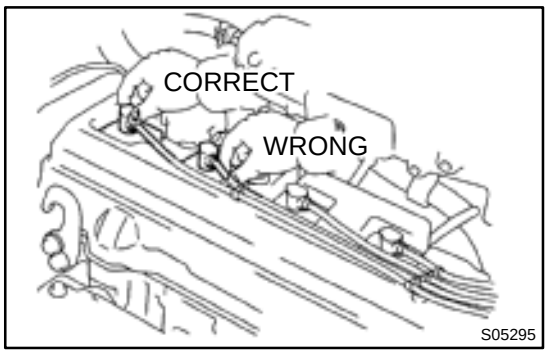
Resistance:	Cold	Hot
Camshaft position sensor	835 – 1,400 Ω	1,060 – 1,645 Ω
Crankshaft position sensor	985 – 1,600 Ω	1,265 – 1,890 Ω

→ BAD → Replace sensor(s).

OK

CHECK IGT SIGNAL FROM ECM (See page DI–22) → BAD → Check wiring between ECM and igniters, and then try another ECM.

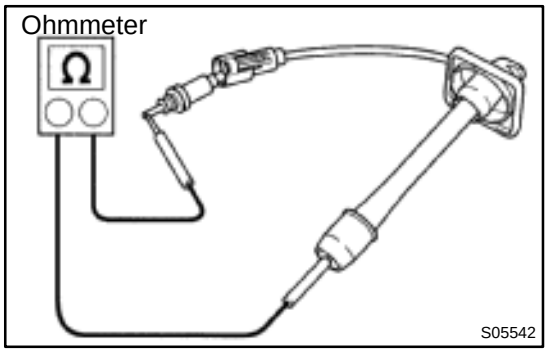
TRY ANOTHER IGNITER



2. INSPECT HIGH–TENSION CORDS

(a) Remove the high–tension cords.
Disconnect the high–tension cords at the rubber boot. Do not pull on the high–tension cords.

NOTICE:
Pulling on or bending the cords may damage the conductor inside.



(b) Using an ohmmeter, measure the high–tension cord resistance.
Maximum resistance: 25 kΩ per cord

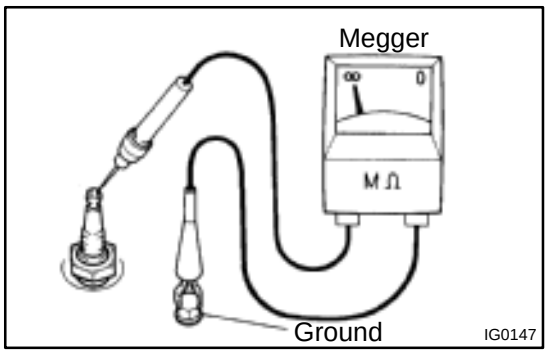
If the resistance is greater than maximum, check the terminals. If necessary, replace the high–tension cord.

(c) Reinstall the high–tension cords.

3. INSPECT SPARK PLUGS

NOTICE:
- **Never use a wire brush for cleaning.**
- **Never attempt to adjust the electrode gap on a used spark plug.**
- **Spark plugs should be replaced every 100,000 km (60,000 miles).**

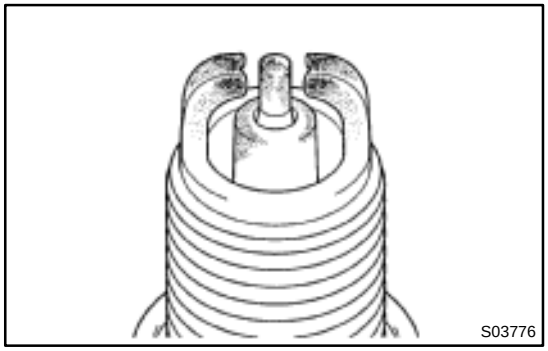
(a) Disconnect the high–tension cords from the spark plugs.



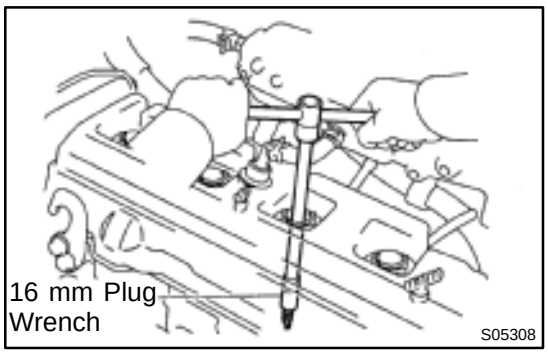
(b) Inspect the electrode.
Using a megger (insulation resistance meter), measure the insulation resistance.
Standard correct insulation resistance:
10 MΩ or more

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

HINT:
If a megger is not available, the following simple method of inspection provides fairly accurate results.



Simple Method:
- Quickly race the engine to 4,000 rpm 5 times.
- Remove the spark plug. (See step (c))
- Visually check the spark plug.
  If the electrode is dry ... OK
  If the electrode is wet ... Proceed to step (d)
- Reinstall the spark plug. (See step (g))

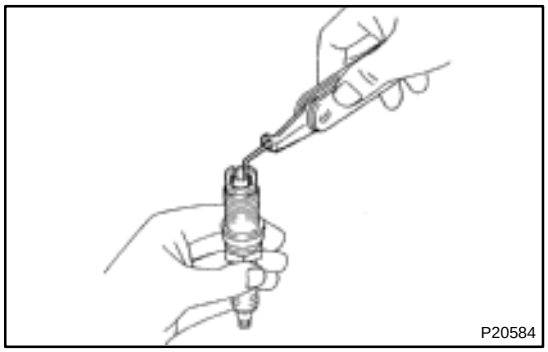


(c) Using a 16 mm plug wrench, remove the 4 spark plugs.
(d) Visually check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

DENSO made	PK20TR11
NGK made	BKR6EKPB11



(e) Inspect the electrode gaps.

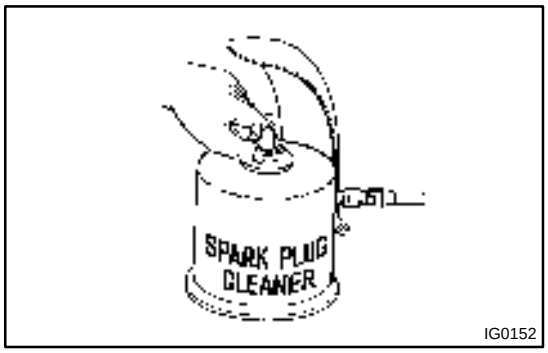
Maximum electrode gap for used spark plug:
1.3 mm (0.051 in.)

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

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

NOTICE:

If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on the used plug.



(f) Clean the spark plugs.

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

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

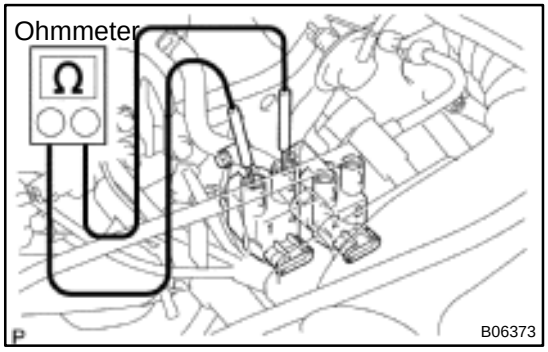
HINT:

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

(g) Using a 16 mm plug wrench, install the 4 spark plugs.

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

(h) Reconnect the high–tension cords from the spark plugs.



4. INSPECT IGNITION COILS WITH IGNITERS

(a) Disconnect the high–tension cords from the ignition coils.
(b) Inspect the secondary coil resistance.

Using an ohmmeter, measure the resistance between the high–tension terminals.

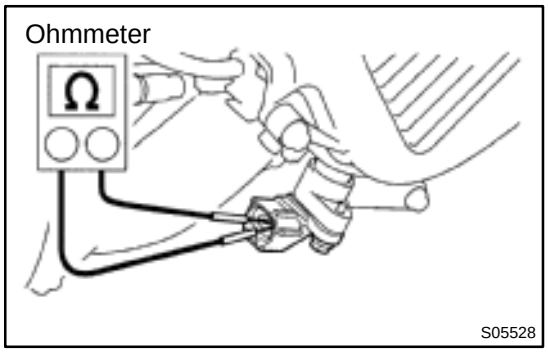
Secondary coil resistance:

Cold	9.7 – 16.7 kΩ
Hot	12.4 – 19.6 kΩ

If the resistance is not as specified, replace the ignition coil. (See page IG–6)

(c) Reconnect the high–tension cords to the ignition coils.

(d) Inspect the igniters. (See procedure spark test)



5. INSPECT CAMSHAFT POSITION SENSOR

(a) Disconnect the camshaft position sensor connector.

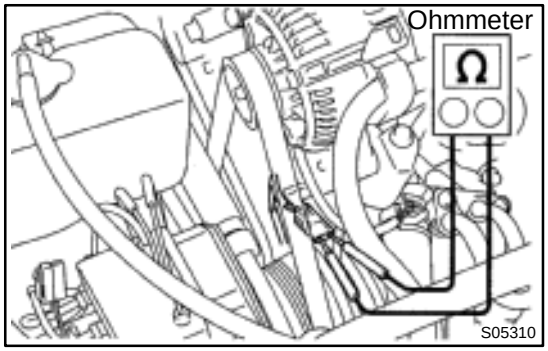
(b) Using an ohmmeter, measure the resistance between terminals.

Resistance:

Cold	835 – 1,400 Ω
Hot	1,060 – 1,645 Ω

If the resistance is not as specified, replace the sensor. (See page IG–9)

(c) Reconnect the camshaft position sensor connector.



6. INSPECT CRANKSHAFT POSITION SENSOR

(a) Disconnect the crankshaft position sensor connector.

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

Resistance:

Cold	985 – 1,600 Ω
Hot	1,265 – 1,890 Ω

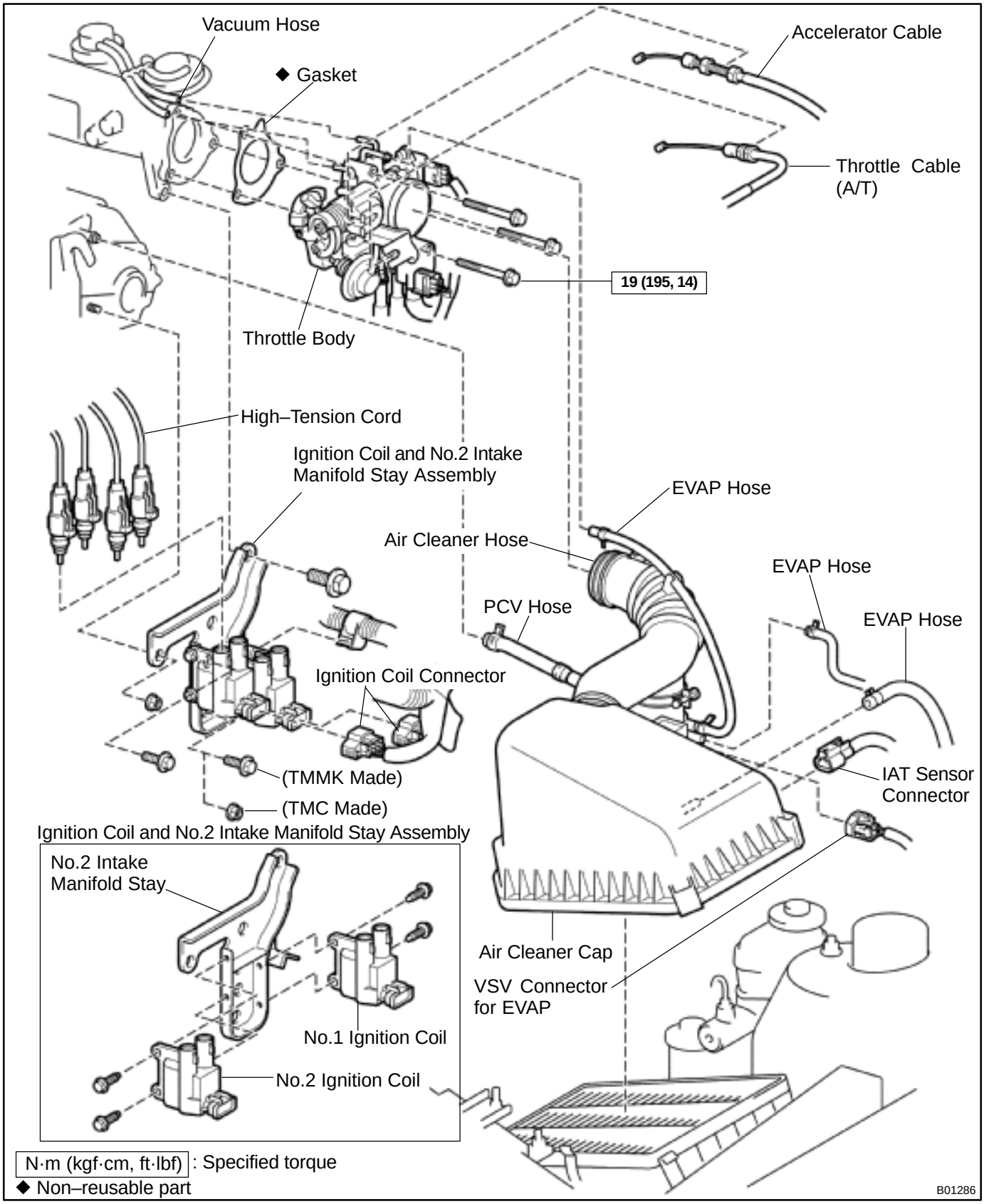
If the resistance is not as specified, replace the sensor. (See page IG–12)

(c) Reconnect the crankshaft position sensor connector.

IGNITION COIL

COMPONENTS

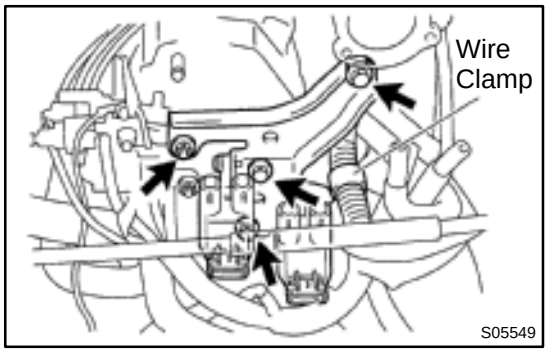
IG041–03



IG0DC–01

REPLACEMENT

1. DISCONNECT THROTTLE BODY FROM INTAKE MANIFOLD (See page SF–32)

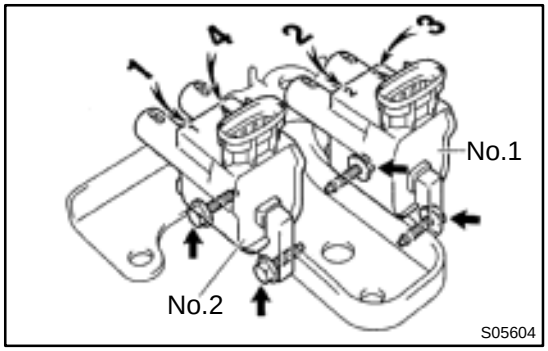


2. REMOVE IGNITION COILS AND NO.2 INTAKE MANIFOLD STAY ASSEMBLY

(a) Disconnect the 2 ignition coil connectors.
(b) Disconnect the wire clamp from the manifold stay.
(c) TMC Made:
Remove the 2 nuts, 2 bolts, 2 ignition coils and manifold stay assembly.
(d) TMMK Made:
Remove the nut, 3 bolts, 2 ignition coils and manifold stay assembly.

3. REMOVE IGNITION COILS FROM NO.2 INTAKE MANIFOLD STAY

Remove the 2 bolts and ignition coil. Remove the 2 ignition coils.



4. REINSTALL IGNITION COILS TO NO.2 INTAKE MANIFOLD STAY

Install the ignition coil with the 2 bolts. Install the 2 ignition coils.
Torque: 9.8 N·m (100 kgf·cm, 87 in.·lbf)

NOTICE:
The installation positions of the ignition coils are different for No.1 and No.2.

5. REINSTALL IGNITION COILS AND NO.2 INTAKE MANIFOLD STAY ASSEMBLY

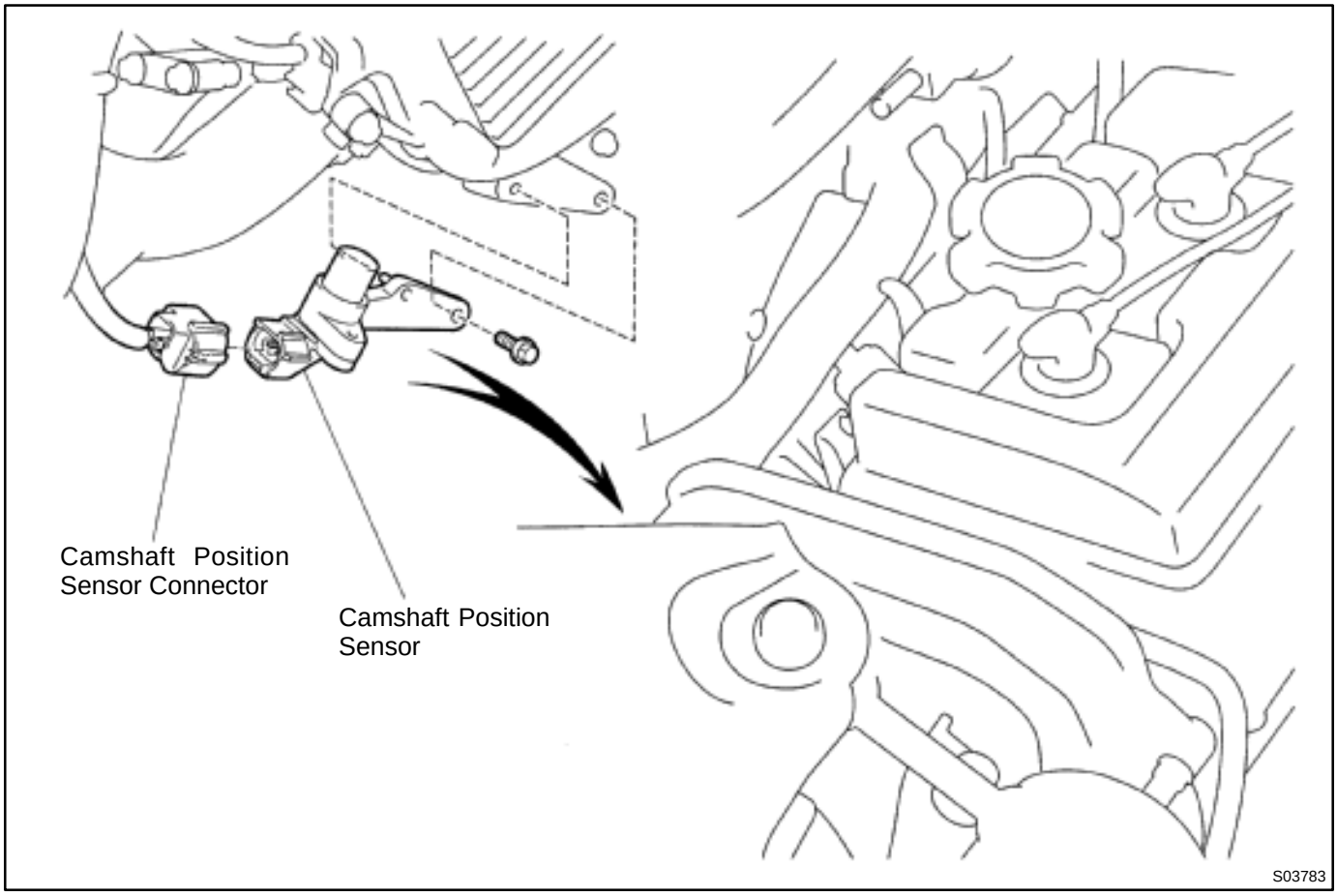
(a) TMC Made:
Install the 2 ignition coils and manifold stay assembly with the 2 nuts and 2 bolts.
(b) TMMK Made:
Install the 2 ignition coils and manifold stay assembly with the nut and 3 bolts.
Torque:
21 N·m (214 kgf·cm, 15 ft·lbf) for 12 mm head
42 N·m (428 kgf·cm, 31 ft·lbf) for 14 mm head
(c) Install the wire clamp to the manifold stay.
(d) Connect the 2 ignition coil connectors.

6. REINSTALL THROTTLE BODY (See page SF–34)

CAMSHAFT POSITION SENSOR

IG044–03

COMPONENTS



IG0DD–01

REPLACEMENT

1. REMOVE CAMSHAFT POSITION SENSOR

(a) Disconnect the sensor connector.

(b) Remove the bolt and sensor.

2. REINSTALL CAMSHAFT POSITION SENSOR

(a) Install the sensor with the bolt.

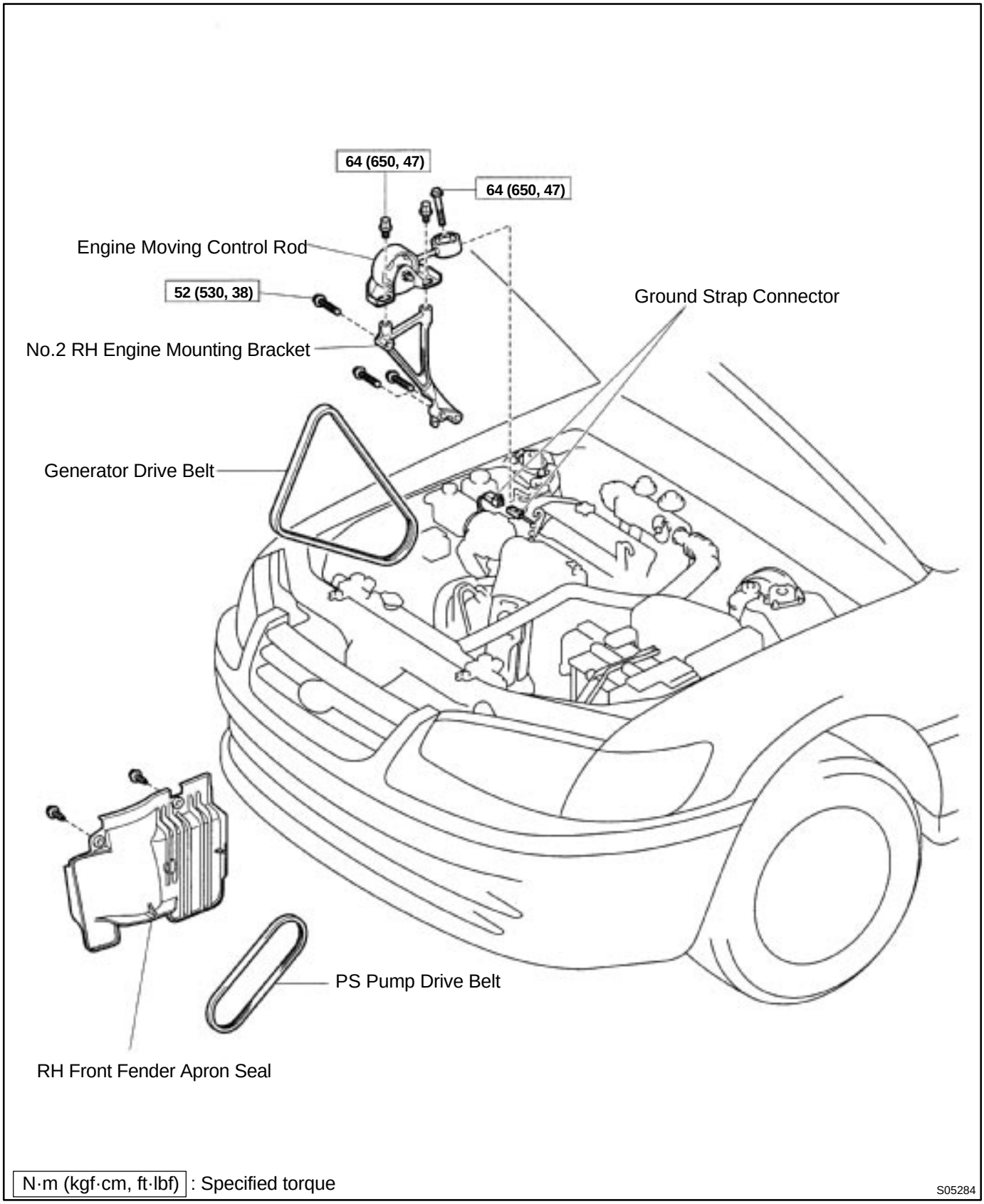
Torque: 9.5 N·m (97 kgf·cm, 84 in.·lbf)

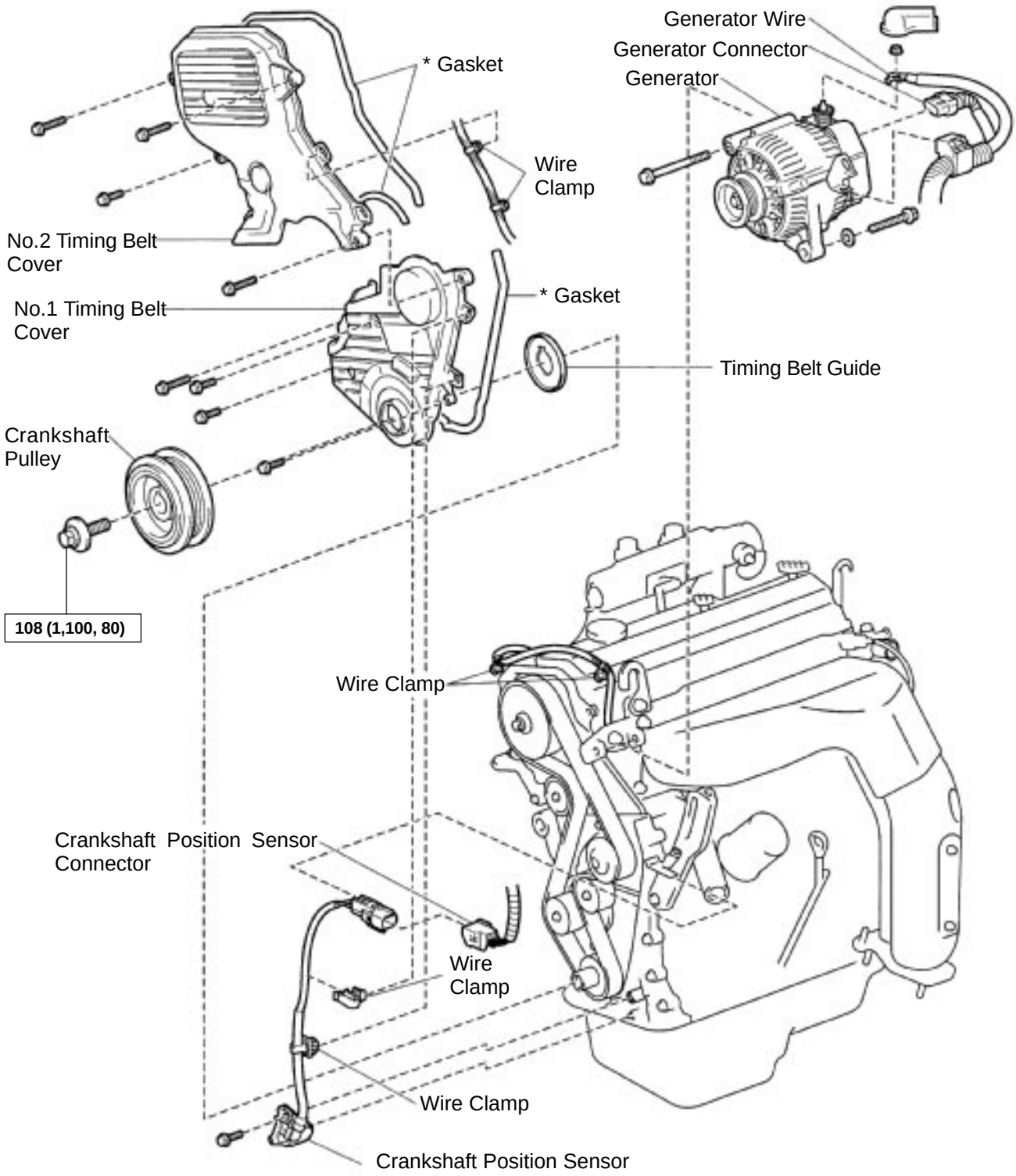
(b) Connect the sensor connector.

CRANKSHAFT POSITION SENSOR

IG047–03

COMPONENTS





N·m (kgf·cm, ft·lbf) :Specified torque
* Replace only if damaged

S05938

IGNITION SYSTEM

IG0DF–01

ON–VEHICLE INSPECTION

NOTICE:

"Cold" and "Hot" in these sentences express 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 IGNITER AND SPARK TEST

Check that the spark occurs.

(1) Remove the ignition coil.
(2) Remove the spark plug.
(3) Install the spark plug to the ignition coil, and connect the ignition coil connector.
(4) Ground the spark plug.
(5) Check if spark occurs while engine is being cranked.

NOTICE:

To prevent excess fuel being injected from the injectors during this test, do not crank the engine for more 5 – 10 seconds at a time.

If the spark does not occur, do the test as follows:

SPARK TEST

↓ NO

CHECK CONNECTION OF IGNITION COIL AND IGNITER CONNECTORS → BAD → Connect securely.

↓ OK

CHECK RESISTANCE OF HIGH–TENSION CORD
Maximum resistance: 25 kΩ per cord → BAD → Replace the cord(s).

↓ OK

CHECK POWER SUPPLY OF HIGH–TENSION COIL AND IGNITER
1. Turn ignition switch to ON.
2. Check that there is battery voltage at ignition coil positive (+) terminal.

→ BAD → Check wiring between ignition switch to ignition coil and igniter.

↓ OK

CHECK RESISTANCE OF IGNITION COIL

Resistance:	Cold	Hot
AISAN made:		
Primary	0.70 – 0.94 Ω	0.85 – 1.10 Ω
Secondary	10.8 – 14.9 kΩ	13.1 – 17.5 kΩ
Diamond made:		
Primary	0.70 – 0.94 Ω	0.85 – 1.10 Ω
Secondary	6.8 – 11.7 kΩ	8.6 – 13.7 kΩ

→ BAD → Replace the ignition coil (s).

↓ OK

Continue to the next page

Continued from the previous page

OK

CHECK RESISTANCE OF CAMSHAFT POSITION SENSOR

Resistance:	Cold	Hot
DENSO made:	835 – 1,400 Ω	1,060 – 1,645 Ω
Wabash made:	1,690 – 2,560 Ω	2,145 – 3,010 Ω

BAD → Replace the camshaft position sensor.

OK

CHECK RESISTANCE OF CRANKSHAFT POSITION SENSOR

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

BAD → Replace the crankshaft position sensor.

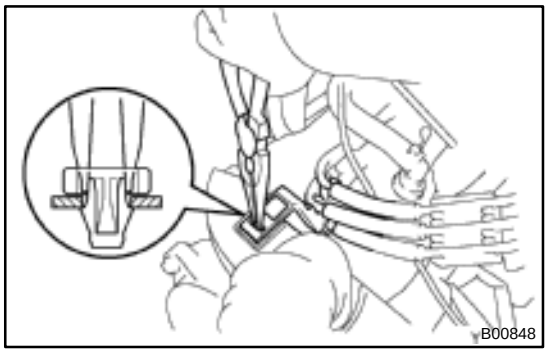
OK

CHECK IGT SIGNAL FROM ECM

BAD → Check wiring between ECM and igniter, and then try another ECM.

OK

TRY ANOTHER IGNITER

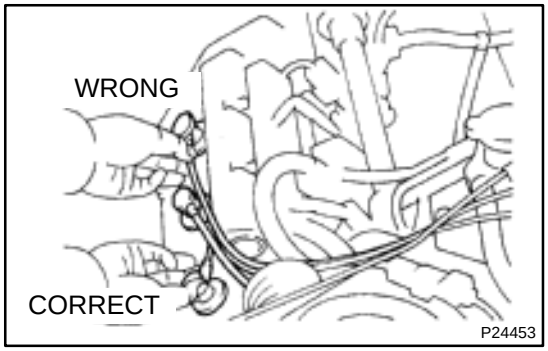


2. INSPECT HIGH–TENSION CORDS

(a) Remove the V–bank cover.

(b) Disconnect the high–tension cords from the spark plugs.

(1) Using needle–nose pliers, disconnect the cord clamp from the engine wire protector.

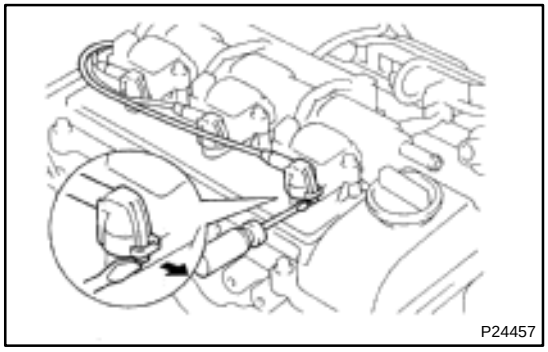


(2) Disconnect the high–tension cords from the spark plugs.

NOTICE:

Pulling on or bending the cords may damage the conductor inside.

(3) Disconnect the high–tension cords from the clamp.



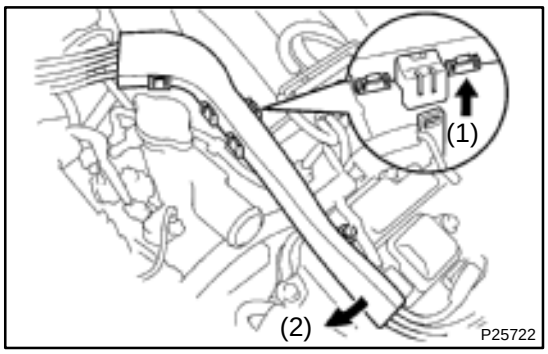
(c) Disconnect the high–tension cords from the ignition coils.

(1) Using a screwdriver, lift up the lock claw and disconnect the holder from the ignition coils.

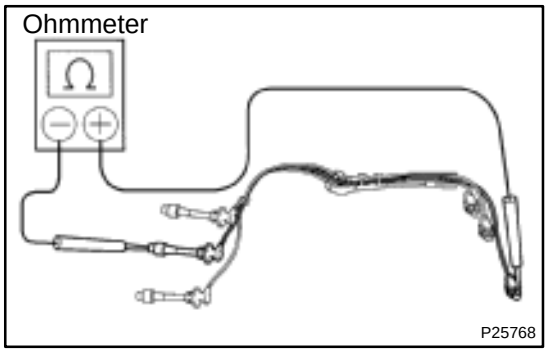
(2) Disconnect the high–tension cord at the grommet.

NOTICE:

- **Pulling on or bending the cords may damage the conductor inside.**
- **Do not wipe any of the oil from the grommet after the high–tension cord is disconnected.**



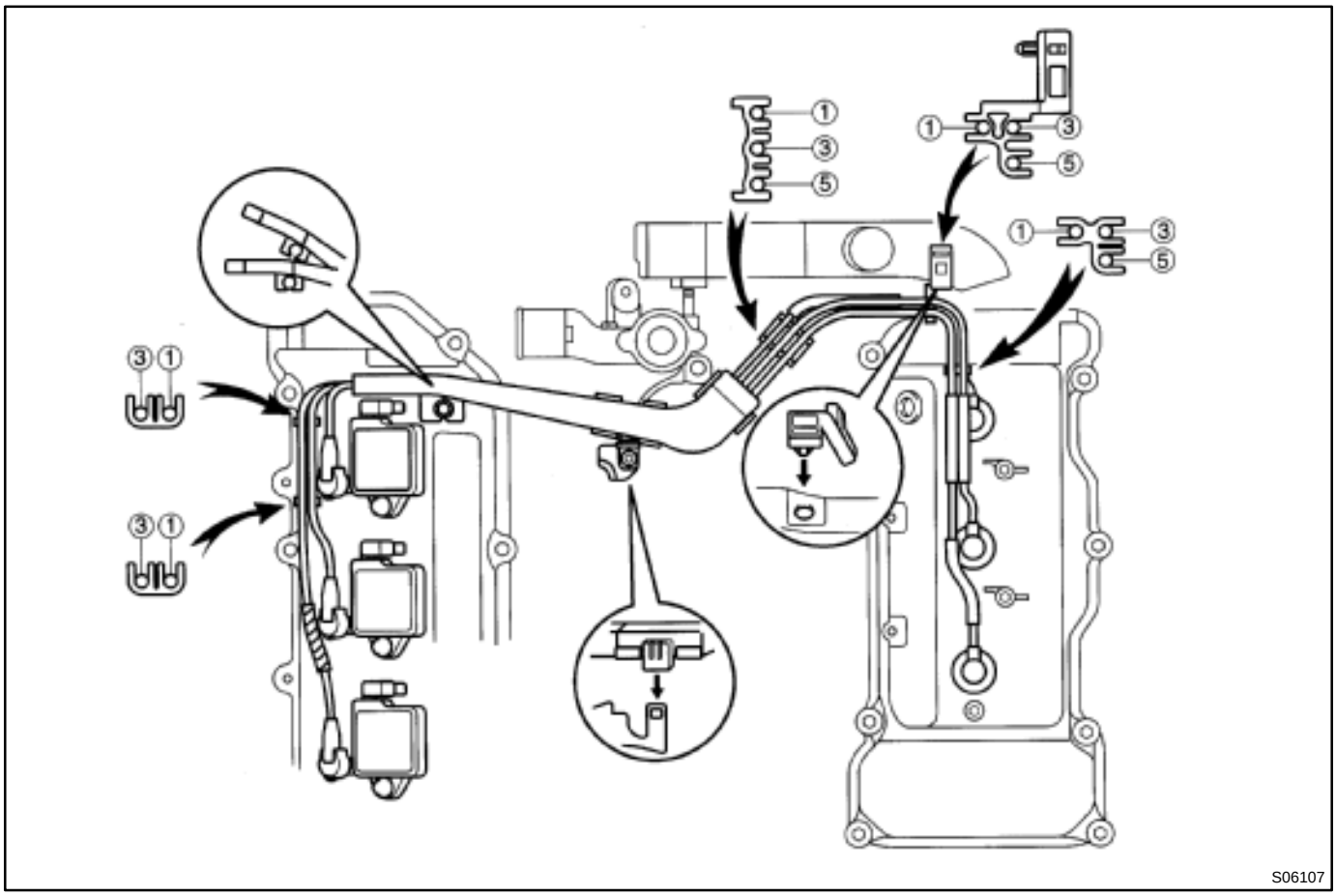
(d) Remove the high–tension cords set.
(1) Disconnect the clamp from the emission control valve set.
(2) Remove the high–tension cords set in indicated direction.

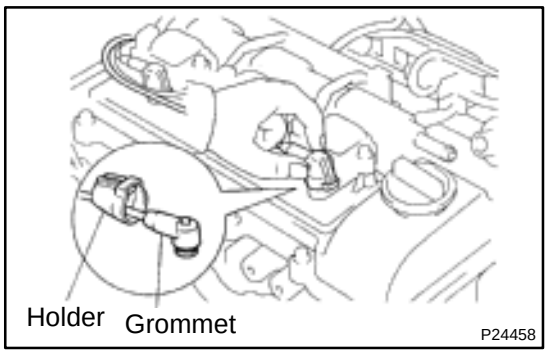


(e) Using an ohmmeter, measure the resistance.
Maximum resistance: 25 kΩ per cord

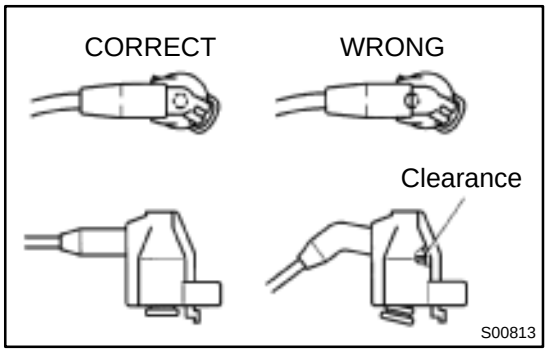
If the resistance is greater than maximum, check the terminals. If necessary, replace the high–tension cord.

(f) Install the high–tension cords set.





(g) Connect the high–tension cords to the ignition coils.
(1) Assemble the holder and grommet.
(2) Align the spline of the ignition coil with the spline of the holder, and push in the cord.



NOTICE:
Check that the holder is correctly installed to the grommet and ignition coil as shown in the illustration.

(3) Check that the lock claw of the holder is engaged by lightly pulling the holder.

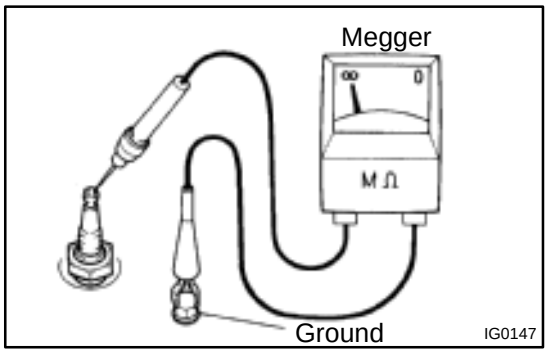
(h) Connect the high–tension cords to the spark plugs.
(i) Install the V–bank cover.

3. INSPECT SPARK PLUGS

NOTICE:

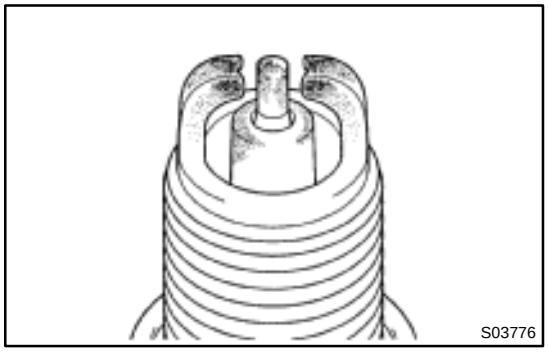
- **Never use a wire brush for cleaning.**
- **Never attempt to adjust the electrode gap on a used spark plug.**
- **Spark plugs should be replaced every 100,000 km (60,000 miles).**

(a) Remove the high–tension cords set. (See step 2)
(b) Remove the ignition coils.



(c) Inspect the electrode.
Using a megger (insulation resistance meter), measure the insulation resistance.
Standard correct insulation resistance:
10 MΩ or more

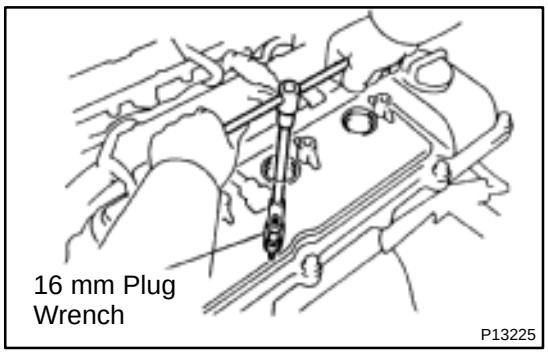
If the resistance is less than specified, proceed to step (e).
HINT:
If a megger is not available, the following simple method of inspection provides fairly accurate results.



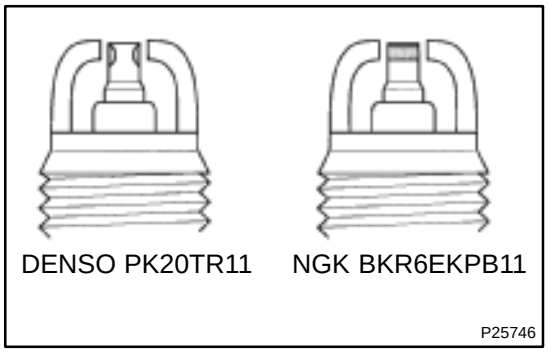
(d) Simple Method:
(1) Quickly race the engine to 4,000 rpm 5 times.
(2) Remove the spark plug. (See step (e))
(3) Visually check the spark plug.

If the electrode is dry ... OK
If the electrode is wet ... Proceed to step (f)

(4) Install the spark plug. (See step (i))



(e) Using a 16 mm plug wrench, remove the 6 spark plugs from the RH and LH cylinder heads.

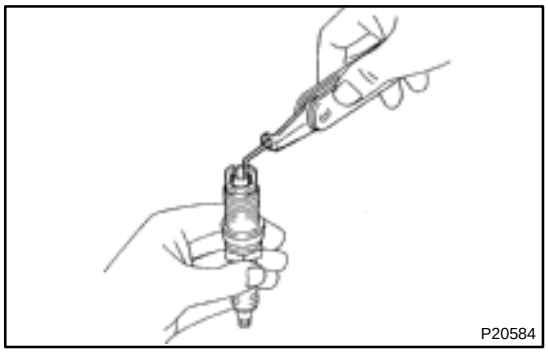


(f) Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

DENSO made	PK20TR11
NGK made	BKR6EKPB11



(g) Inspect the electrode gaps.

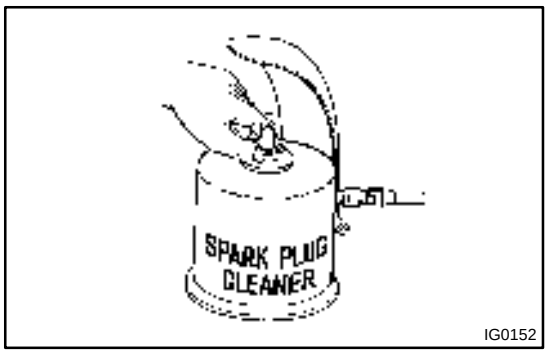
Maximum electrode gap for used spark plug:
1.3 mm (0.051 in.)

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

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

NOTICE:

If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on the used plug.



(h) Clean the spark plugs.

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

Air pressure: Below 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.

(i) Using a 16 mm plug wrench, install the 6 spark plugs to the RH and LH cylinder heads.

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

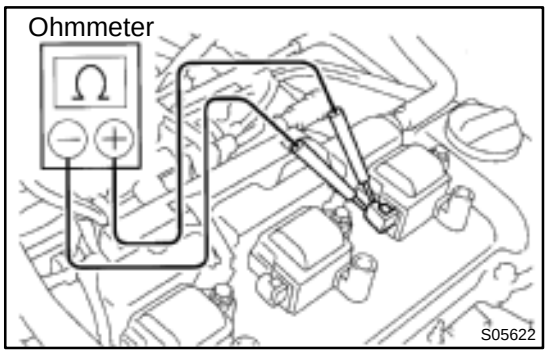
(j) Install the ignition coils.

(k) Install the high–tension cords set. (See step 2)

4. INSPECT IGNITION COILS

(a) Disconnect the high–tension cords from the ignition coils.

(b) Disconnect the ignition coil connectors.

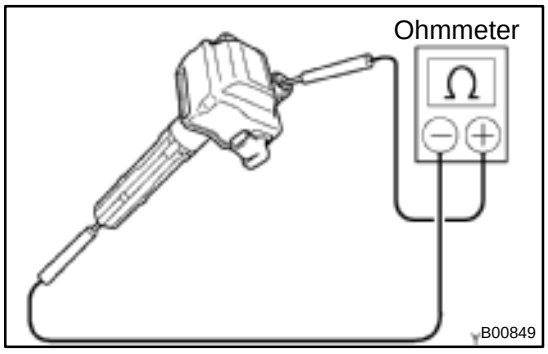


(c) Using an ohmmeter, measure the primary coil resistance between the positive (+) and negative (–) terminals.

Primary coil resistance:

Cold	0.70 – 0.94 Ω
Hot	0.85 – 1.10 Ω

If the resistance is not as specified, replace the ignition coil.



(d) Using an ohmmeter, measure the secondary coil resistance between the positive (+) and high–tension terminal.

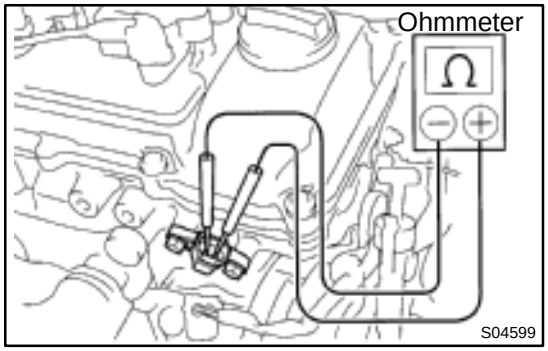
Secondary coil resistance:

AISAN made	Cold	10.8 – 14.9 kΩ
AISAN made	Hot	13.1 – 17.5 kΩ
Diamond made	Cold	6.8 – 11.7 kΩ
Diamond made	Hot	8.6 – 13.7 kΩ

If the resistance is not as specified, replace the ignition coil.

(e) Connect the ignition coil connectors.

(f) Connect the high–tension cords to the ignition coils.



5. INSPECT CAMSHAFT POSITION SENSOR

(a) Disconnect the camshaft position sensor connector.

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

Resistance:

DENSO made	Cold	835 – 1,400 Ω
DENSO made	Hot	1,060 – 1,645 Ω
Wabash made	Cold	1,690 – 2,560 Ω
Wabash made	Hot	2,145 – 3,010 Ω

If the resistance is not as specified, replace the camshaft position sensor.

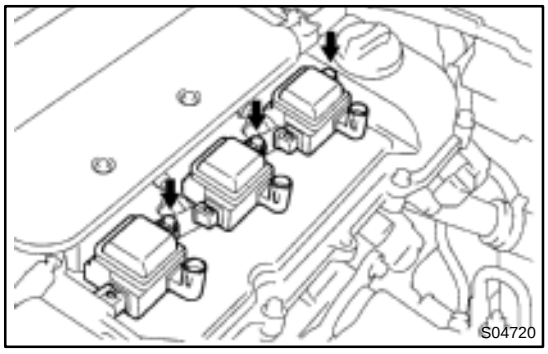
(c) Connect the camshaft position sensor connector.

IGNITION COIL

IG02I–03

REMOVAL

1. DISCONNECT HIGH–TENSION CORDS FROM IGNITION COILS (See page IG–1)



2. REMOVE IGNITION COILS

(a) Disconnect the 3 connectors from the ignition coil.

(b) Remove the 3 bolts and 3 ignition coils from the LH cylinder head.

Torque: 8 N·m (80 kgf·cm, 69 in.·lbf)

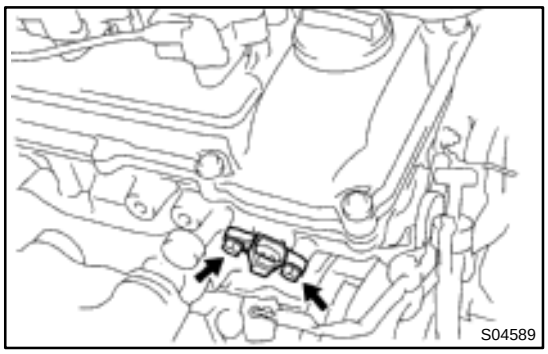
HINT:

Arrange the ignition coils in correct order.

IG02J–01

INSTALLATION

Installation is in the reverse order of removal. (See page IG–7)



CAMSHAFT POSITION SENSOR

IG02K–03

REMOVAL

REMOVE CAMSHAFT POSITION SENSOR

(a) Disconnect the camshaft position sensor connector.
(b) Remove the 2 bolts and camshaft position sensor.
Torque: 8 N·m (80 kgf·cm, 69 in.·lbf)

IG02L–01

INSTALLATION

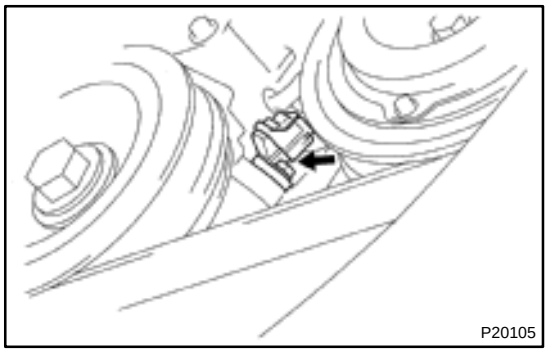
Installation is in the reverse order of removal. (See page IG–9)

CRANKSHAFT POSITION SENSOR

IG02M–03

REMOVAL

1. REMOVE RH FENDER APRON SEAL



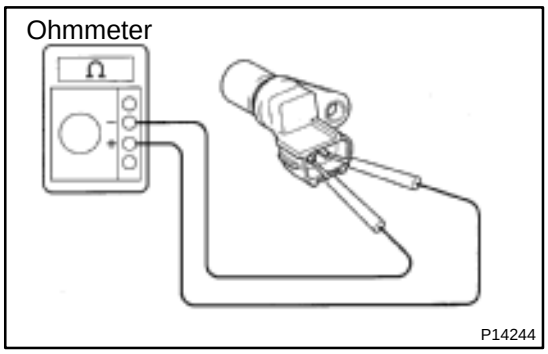
2. REMOVE CRANKSHAFT POSITION SENSOR

(a) Remove the bolt and disconnect the crankshaft position sensor.

Torque: 8 N·m (80 kgf·cm, 69 in.·lbf)

(b) Disconnect the crankshaft position sensor connecter.

IG02N–03



INSPECTION

NOTICE:

"Cold" and "Hot" in these sentences express the temperature of the sensor itself. "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).

INSPECT CRANKSHAFT POSITION SENSOR RESISTANCE

Using an ohmmeter, measure the resistance between terminals.

Resistance:

Cold	1,630 – 2,740 Ω
Hot	2,065 – 3,225 Ω

If the resistance is not as specified, replace the crankshaft position sensor.

IG02O–01

INSTALLATION

Installation is in the reverse order of removal. (See page IG–11)