IGNITION SYSTEM

LOCATION

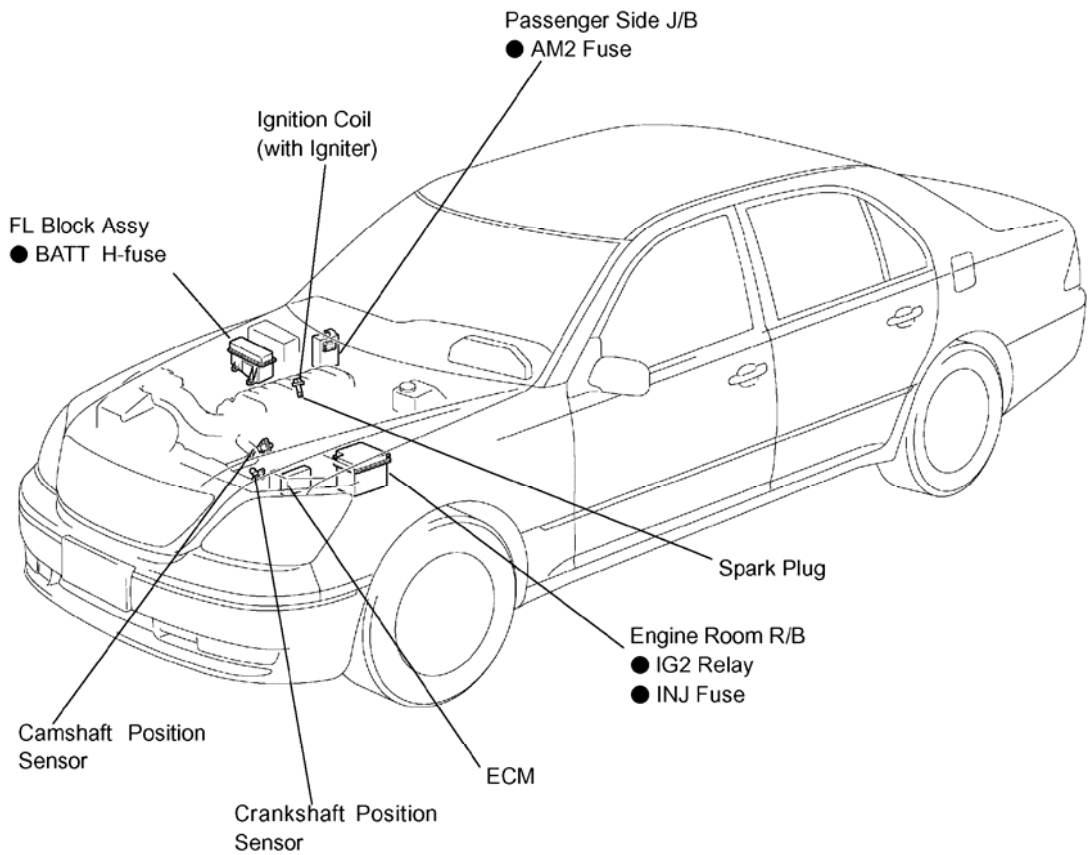

Fig. 1: Identifying Ignition System Components And Replacement Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SYSTEM DIAGRAM

The ECM determines ignition timing based on signals from various sensors.

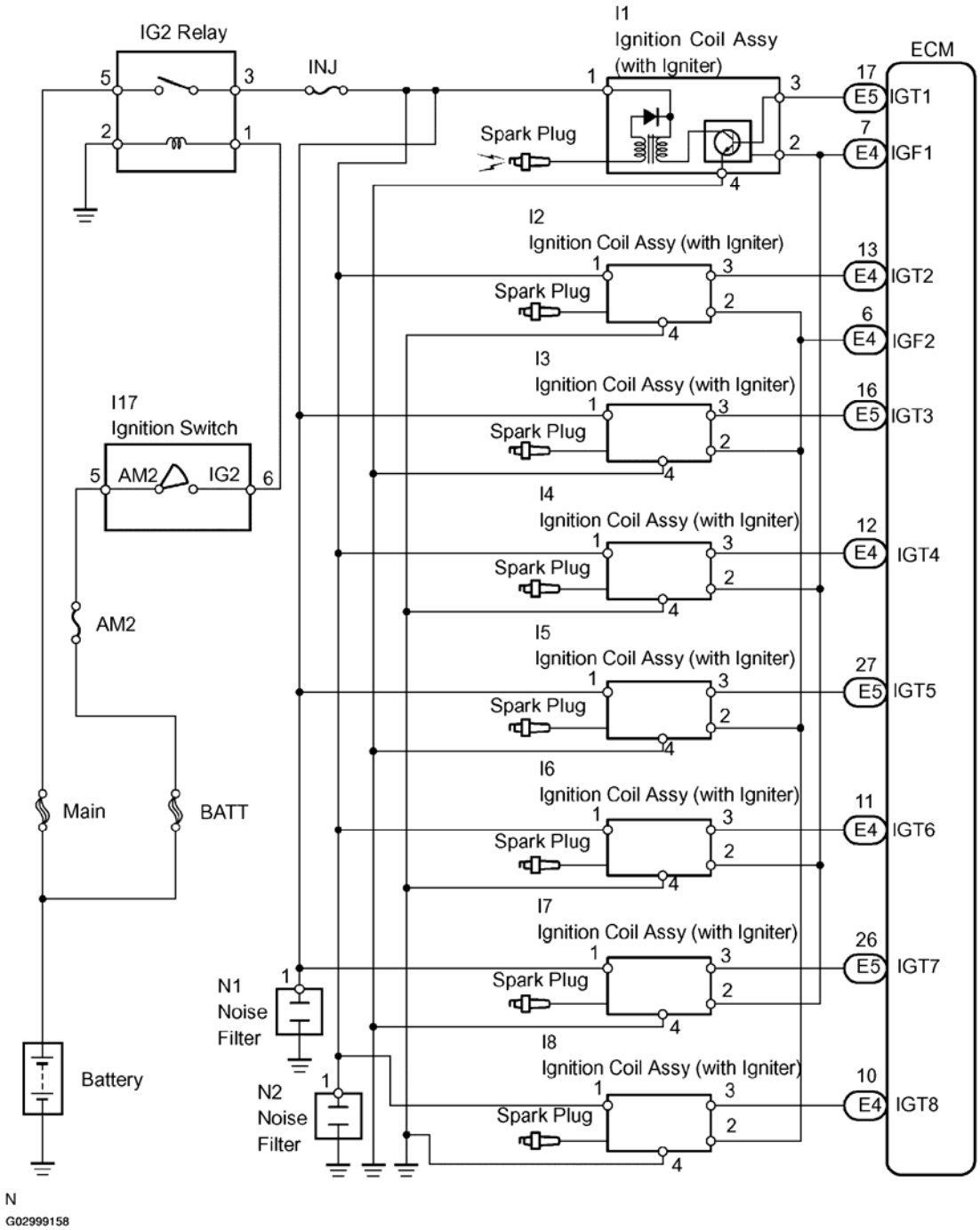

Fig. 2: Ignition System Diagram (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

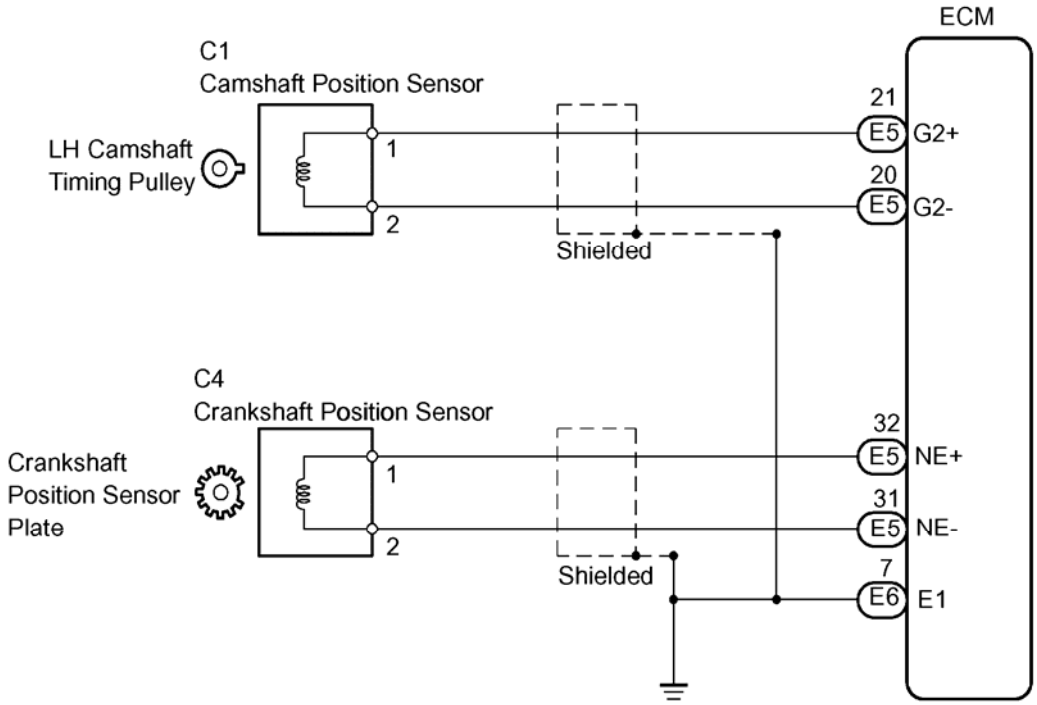

Fig. 3: Ignition System Diagram (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ON-VEHICLE INSPECTION

NOTE: In this article, the terms "cold" and "hot" refer to the temperature of the coils. "Cold" means approximately -10°C (14°F) to 50°C (122°F). "Hot" means approximately 50°C (122°F) to 100°C (212°F).

1. **INSPECT IGNITION COIL ASSY (WITH IGNITER) AND PERFORM SPARK TEST**
   a. Check for DTCs.

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

   b. Check if sparks occur.
      1. Remove the ignition coil (see **REPLACEMENT**).
      2. Remove the spark plug.
      3. Install the spark plug to the ignition coil, and connect the ignition coil connector.
      4. Disconnect the 8 injector connectors.
      5. Ground the spark plug.

6. Visually check if spark occurs while the engine is being cranked.

NOTE:

- **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 a spark does not occur, perform the test as follows:

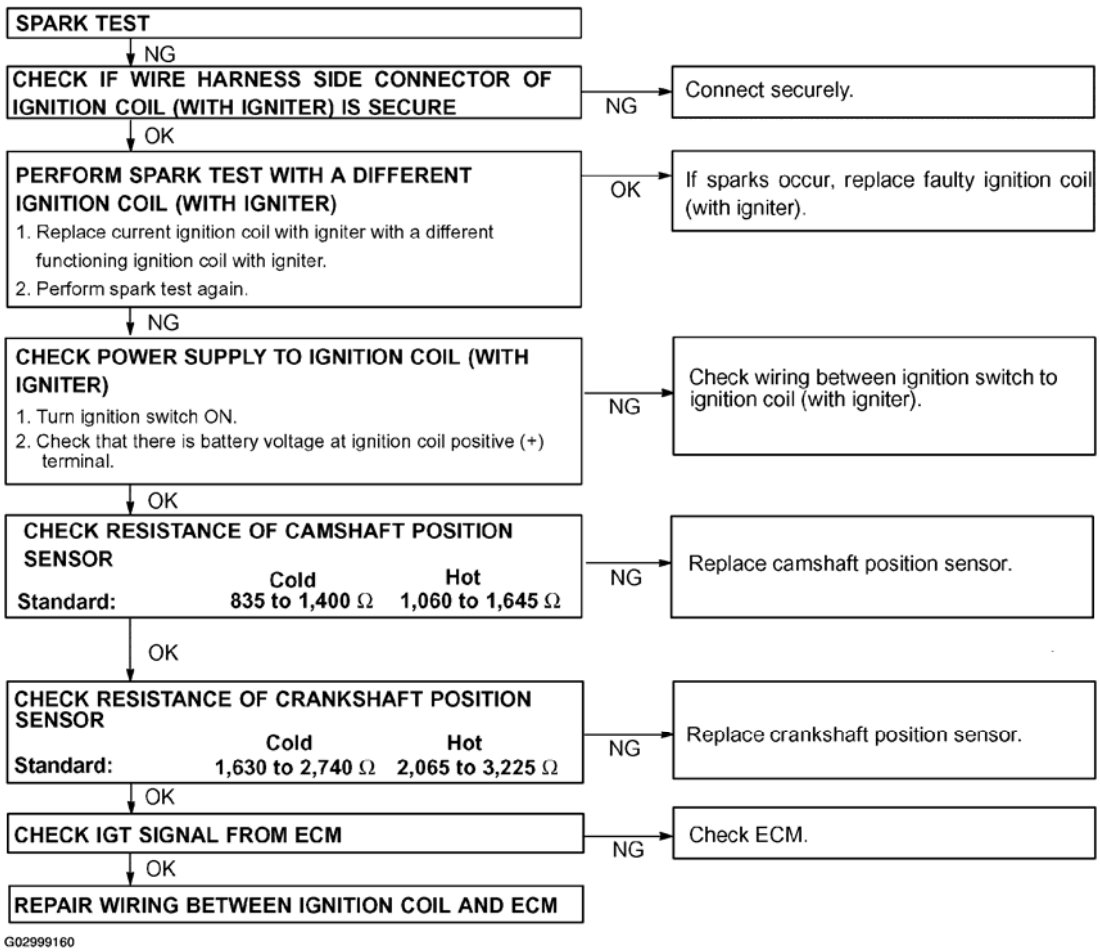

Fig. 4: Spark Test Flow Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. Using a 16 mm (0.63 in.) plug wrench, install the spark plugs.

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

8. Install the ignition coils (see **REPLACEMENT**).

INSPECTION

NOTE: **In this article, the terms "cold" and "hot" refer to the temperature of the coils. "Cold" means approximately -10°C (14°F) to 50°C (122°F). "Hot" means approximately 50°C (122°F) to 100°C (212°F).**

1. **INSPECT SPARK PLUG**

NOTE:

- **Do not use a wire brush for cleaning.**
- **Do not attempt to adjust the electrode gap of a used spark plug.**

a. Check the electrode.

1. Using an megaohmmeter, measure the insulation resistance.

Correct insulation resistance: 10 Mohms or higher

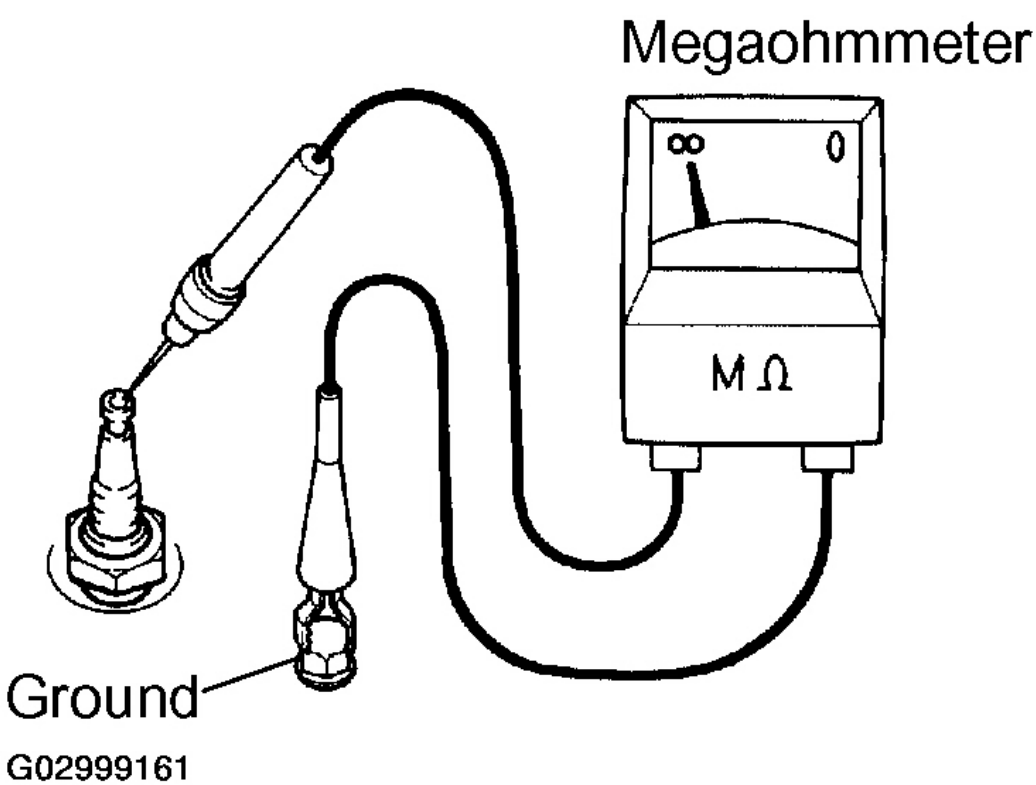

Fig. 5: Checking Electrode
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

If the megaohmmeter is not available, perform the following simple inspection instead.

b. Alternative inspection method:
    1. Quickly accelerate the engine to 4,000 rpm 5 times.
    2. Remove the spark plug.
    3. Visually check the spark plug.
    - If the electrode is dry, the spark plug is functioning. Reinstall the spark plug. Proceed to step 3.
    - If the electrode is damp, proceed to steps (c), (d) and (e).

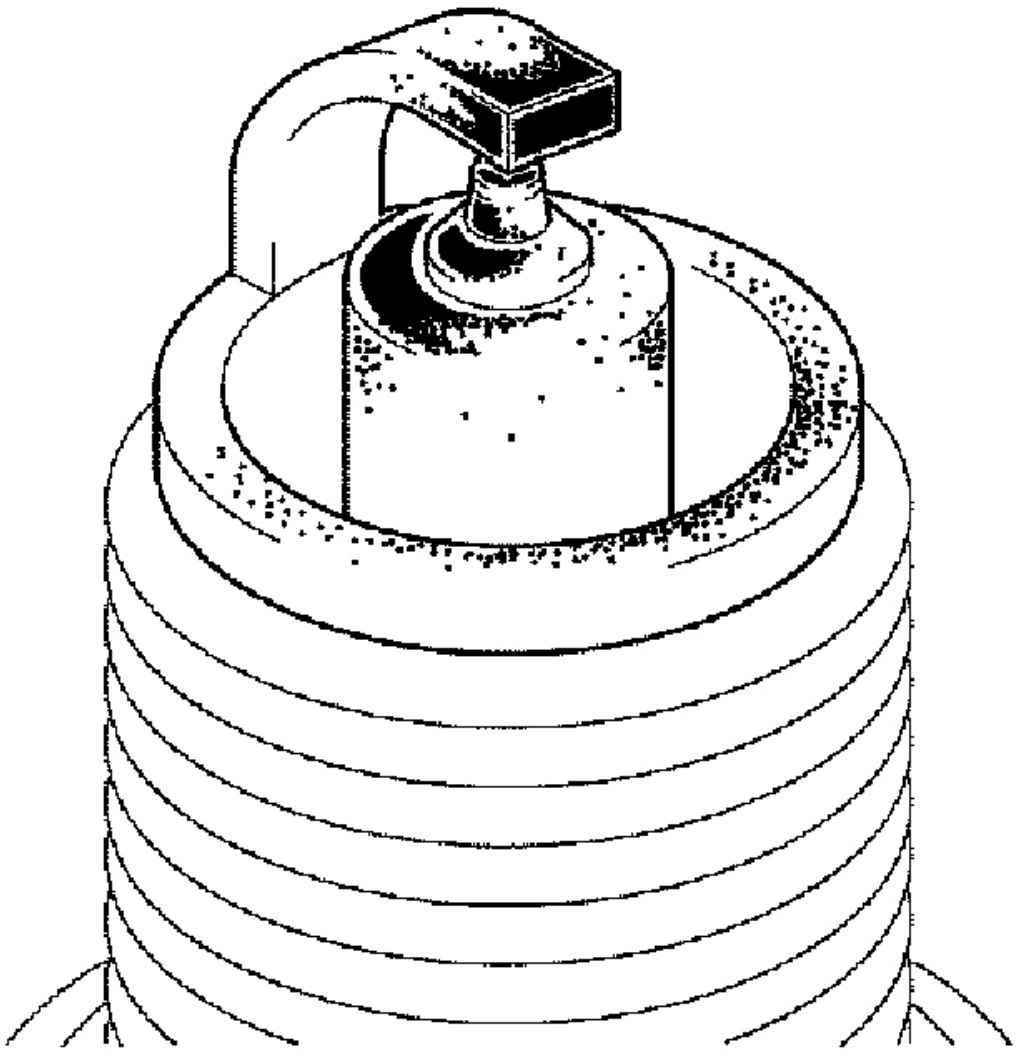

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Fig. 6: Alternative Inspection Method
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

If there is any damage, replace the spark plug. If not, reinstall the spark plug.

RECOMMENDED SPARK PLUG TABLE

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 the maximum, replace the spark plug.

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

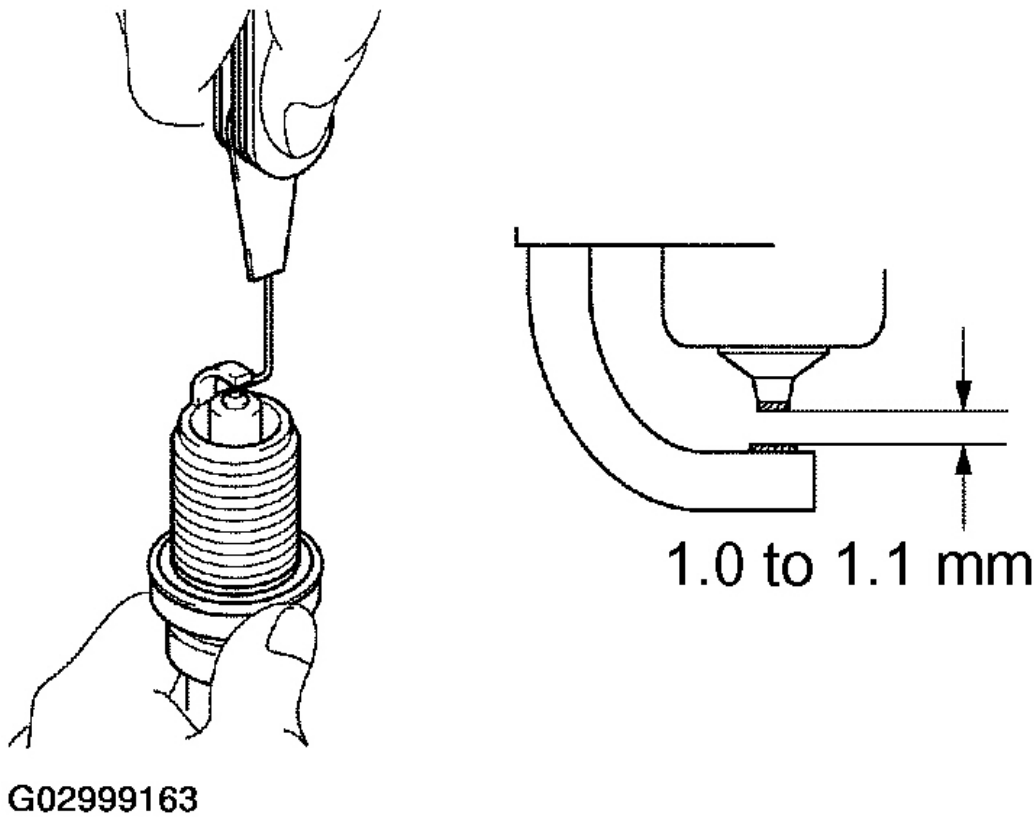

Fig. 7: Checking Spark Plug Electrode Gap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: **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 a used plug.**

e. Clean the spark plugs.

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

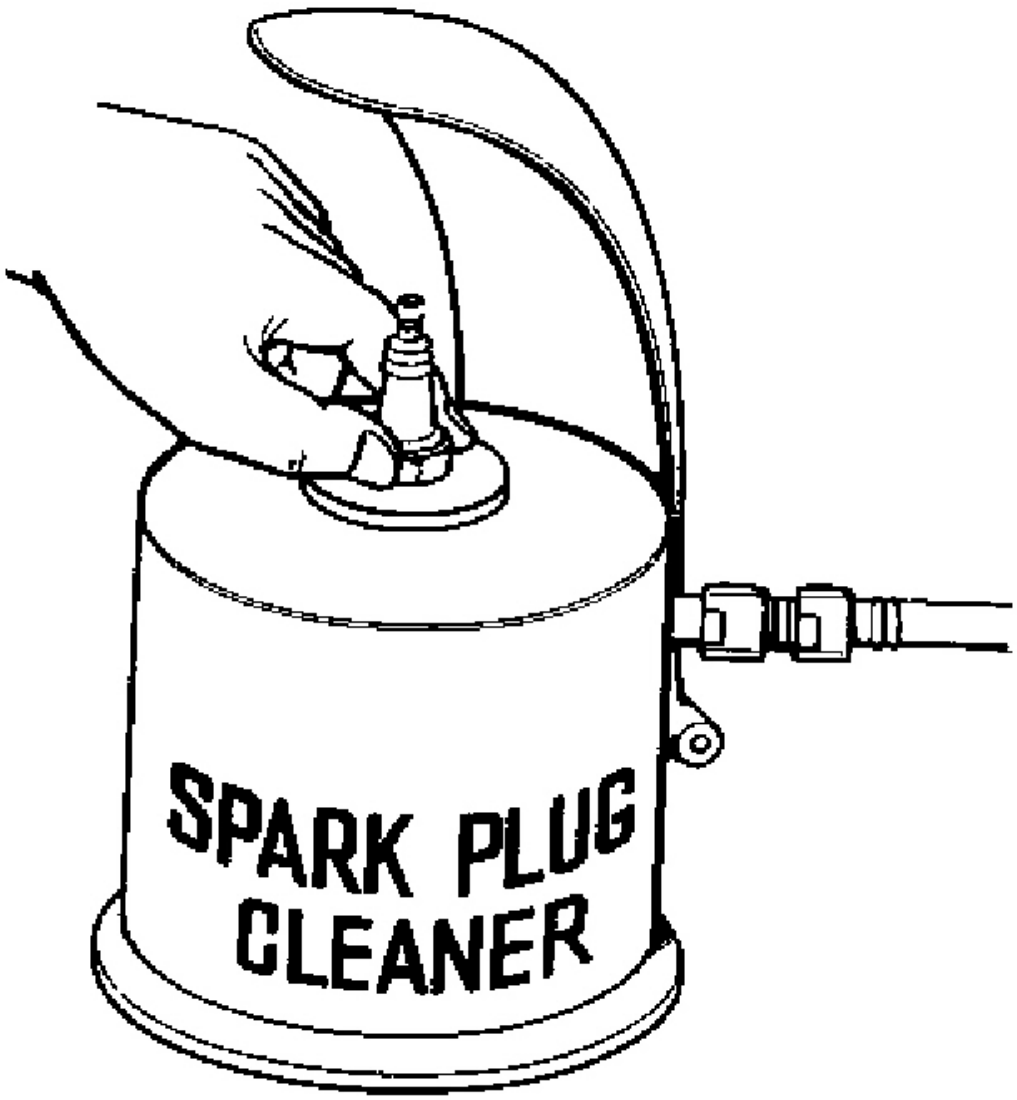

Fig. 8: Cleaning Spark Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

Only use the spark plug cleaner when the electrode is free of oil. If the electrode has traces of oil, use gasoline to clean off the oil before using the spark plug cleaner.

2. **INSPECT CAMSHAFT POSITION SENSOR**
   a. Using an ohmmeter, measure the resistance between the terminals.

CAMSHAFT POSITION SENSOR - REFERENCE TABLE

Condition	Specified Condition
Cold	835 to 1,400 ohms
Hot	1,060 to 1,645 ohms

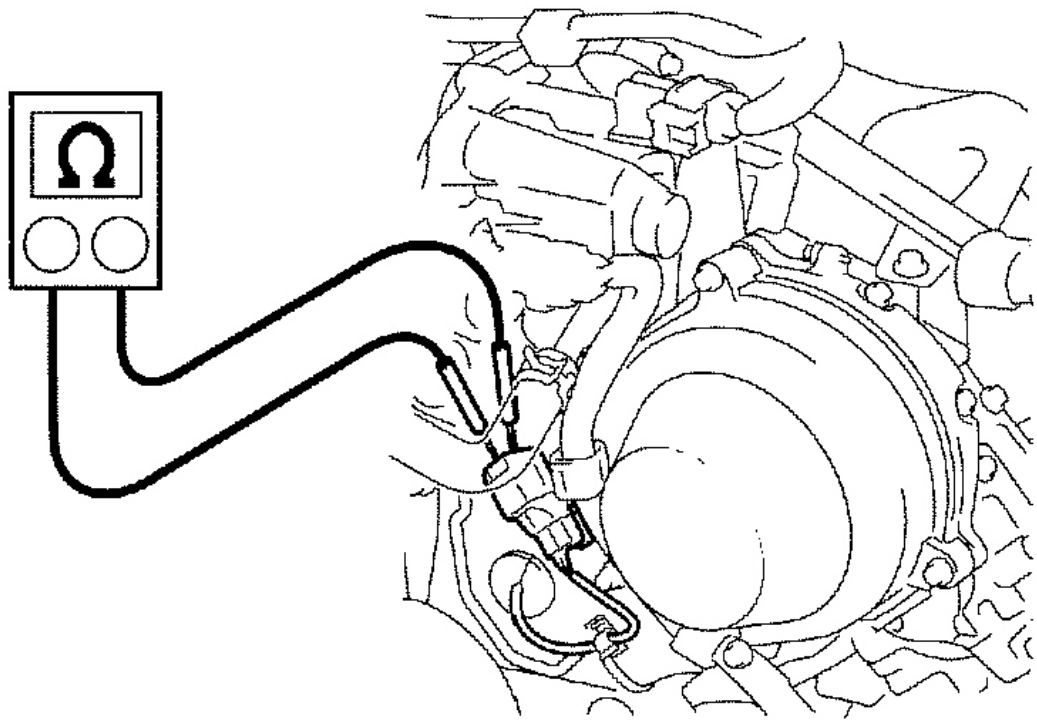

Fig. 9: Inspecting Camshaft Position Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

3. **INSPECT CRANKSHAFT POSITION SENSOR**

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

CRANKSHAFT POSITION SENSOR - REFERENCE TABLE

Condition	Specified Condition
Cold	1,630 to 2,740 ohms
Hot	2,065 to 3,225 ohms

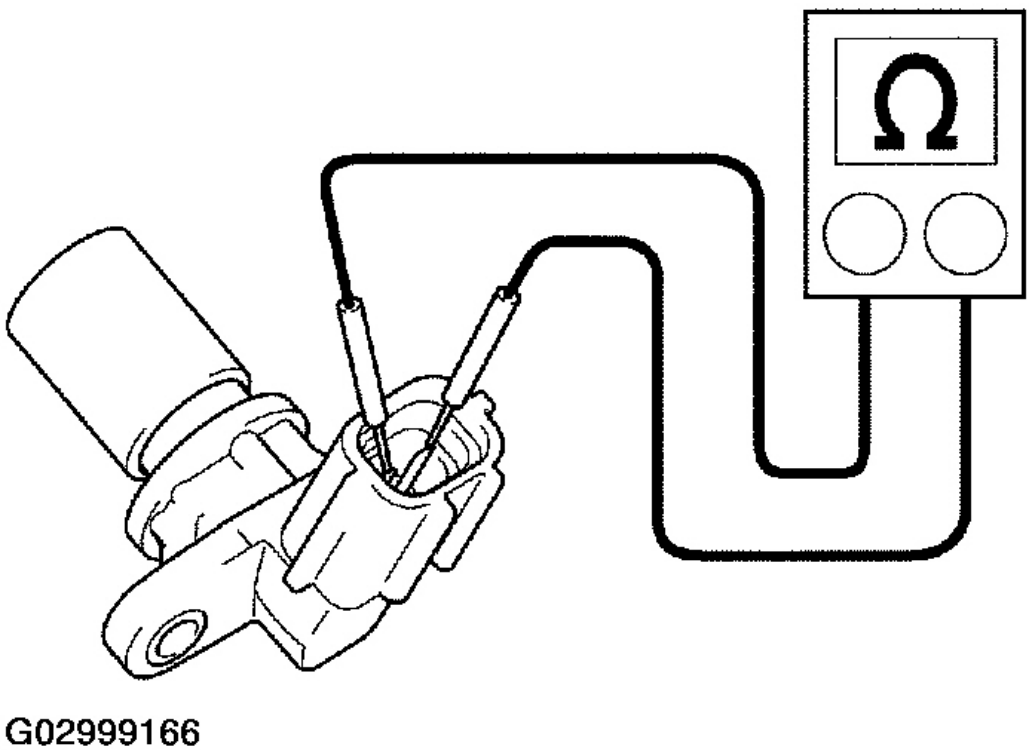

Fig. 10: Inspecting Crankshaft Position Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

IGNITION COIL

COMPONENTS

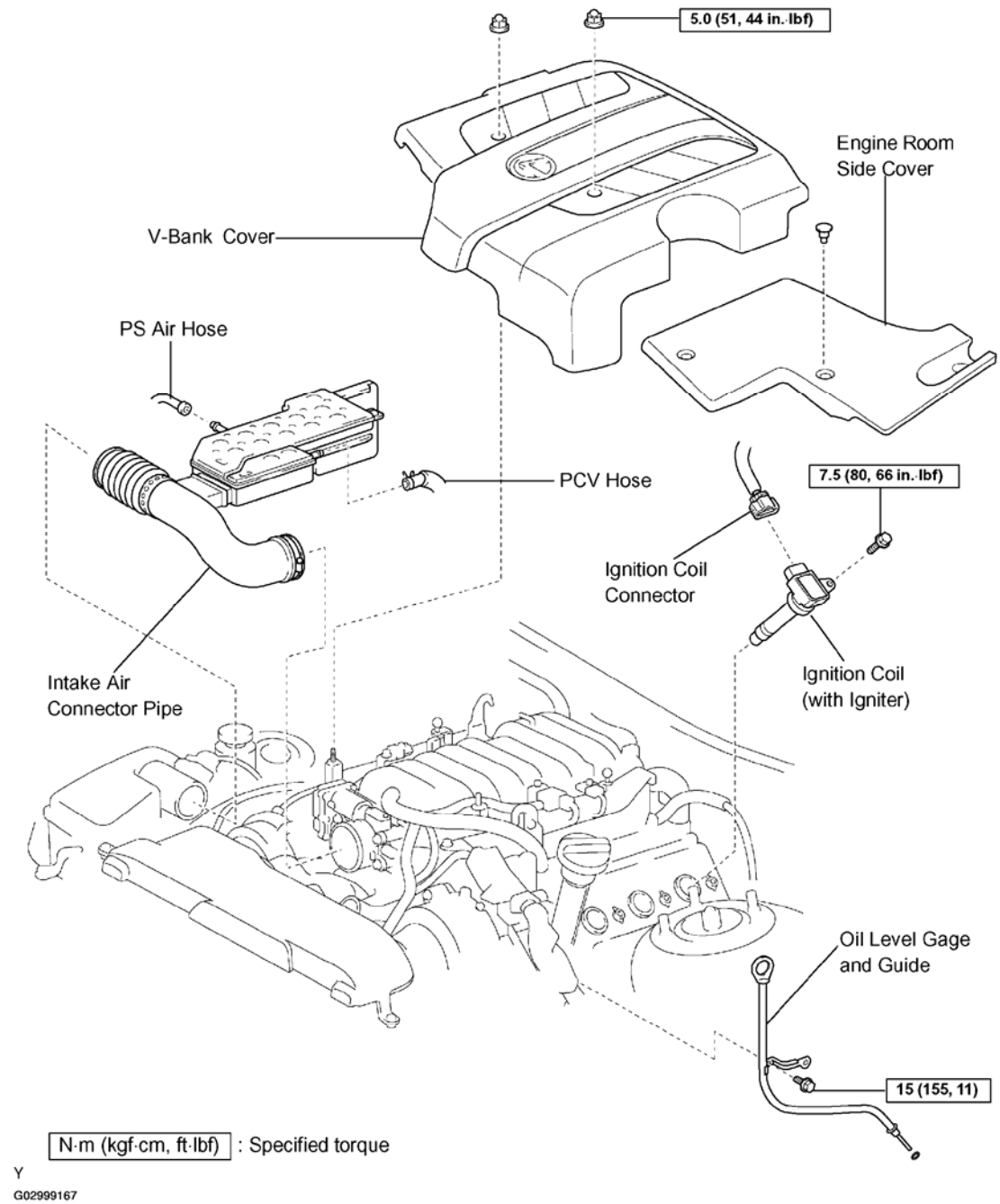

Fig. 11: Identifying Ignition Coil Components And Replacements
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REPLACEMENT

1. **REMOVE V-BANK COVER**
2. **REMOVE ENGINE ROOM SIDE COVER**
3. **REMOVE INTAKE AIR CONNECTOR PIPE**

4. **REMOVE OIL LEVEL GAGE SUB-ASSY (See step 8 in REPLACEMENT)**
5. **REMOVE IGNITION COIL ASSY**
   a. Disconnect the ignition coil connector.
   b. Remove the bolt and pull out the ignition coil.

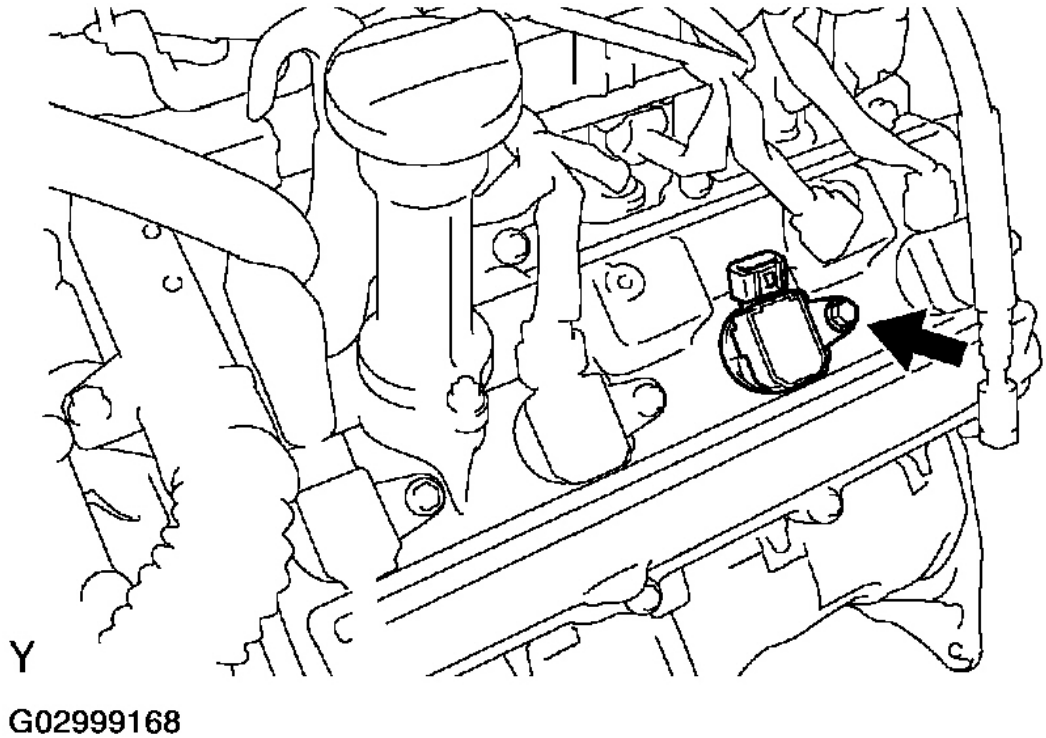

Fig. 12: Removing Ignition Coil Assy
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSTALL IGNITION COIL ASSY**
   a. Connect a new ignition coil to the spark plug, attach the ignition coil to the cylinder head cover, and install the bolt.

      Torque: 7.5 N.m (76 kgf.cm, 66 in.lbf)

   b. Connect the ignition coil connector.
7. **INSTALL OIL LEVEL GAGE SUB-ASSY (See step 27 in REPLACEMENT)**
8. **INSTALL INTAKE AIR CONNECTOR PIPE**
9. **INSTALL V-BANK COVER**
10. **INSTALL ENGINE ROOM SIDE COVER**

CAMSHAFT POSITION SENSOR

COMPONENTS

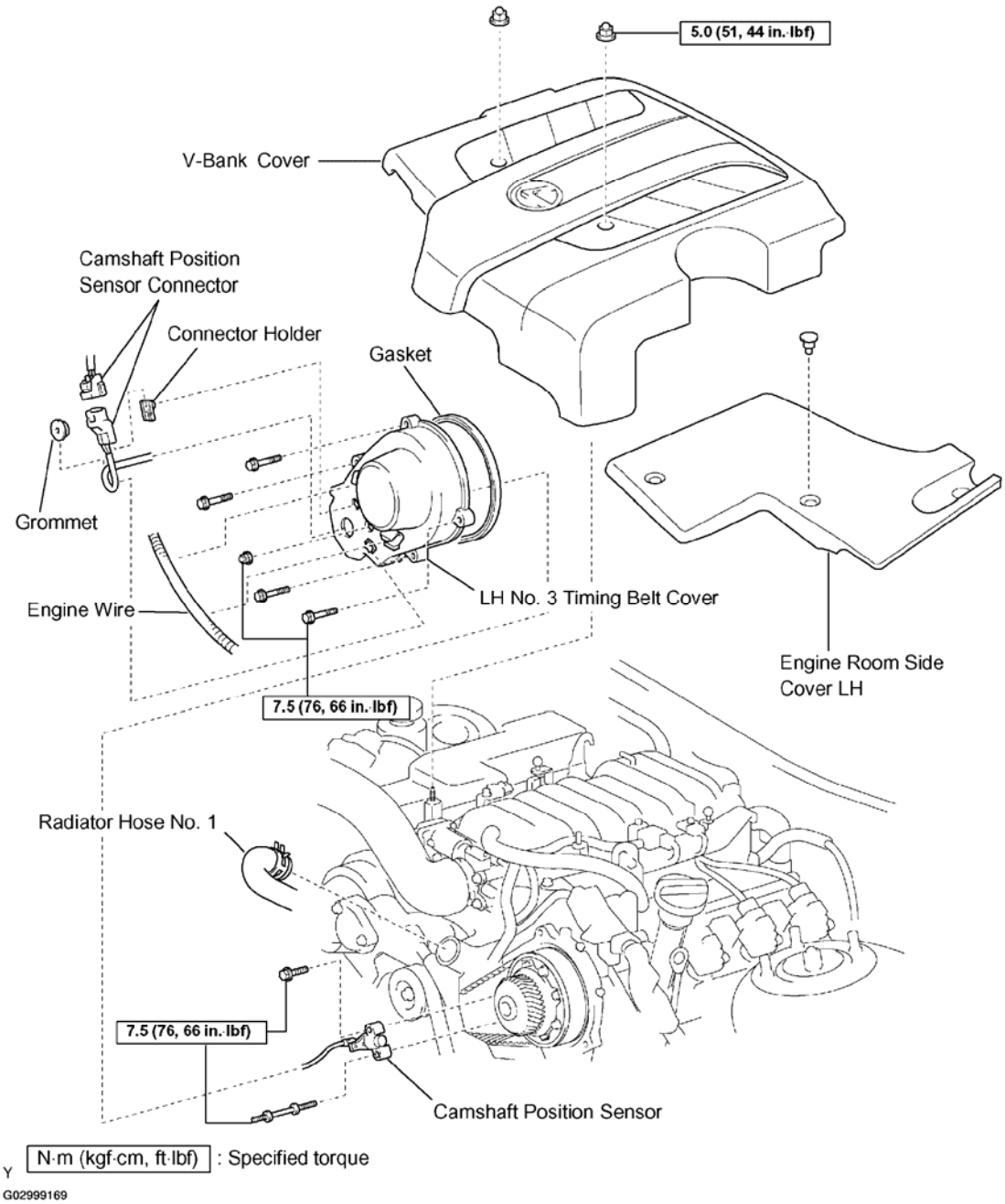

Fig. 13: Identifying Camshaft Position Sensor Components And Replacements
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REPLACEMENT

1. **REMOVE AIR CLEANER INLET NO. 1 (See step 5 in REPLACEMENT)**
2. **DRAIN ENGINE COOLANT (See REPLACEMENT)**

3. **REMOVE V-BANK COVER**
4. **REMOVE ENGINE ROOM SIDE COVER**
5. **DISCONNECT RADIATOR HOSE NO. 1**
6. **REMOVE TIMING BELT COVER SUB-ASSY NO. 3 LH (See step 18 in REPLACEMENT)**
7. **REMOVE CAMSHAFT POSITION SENSOR**
   a. Remove the bolt, stud bolt and sensor.

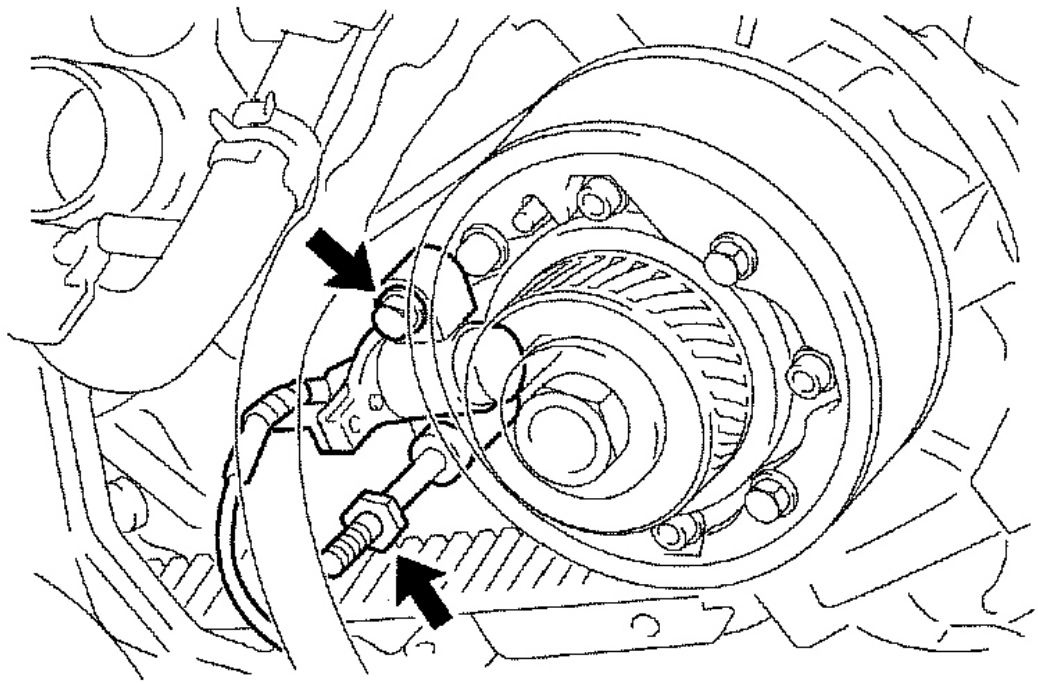

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Fig. 14: Removing Camshaft Position Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **INSTALL CAMSHAFT POSITION SENSOR**
   a. Install a new sensor with the bolt and stud bolt.

      Torque: 7.5 N.m (76 kgf.cm, 66 in.lbf)
9. **INSTALL TIMING BELT COVER SUB-ASSY NO. 3 LH (See step 33 in REPLACEMENT)**
10. **CONNECT RADIATOR HOSE NO. 1**
11. **INSTALL AIR CLEANER INLET NO. 1 (See step 145 in REPLACEMENT)**
12. **INSTALL ENGINE ROOM SIDE COVER**
13. **INSTALL V-BANK COVER**

14. **REFILL ENGINE COOLANT (See REPLACEMENT)**
15. **WARM UP ENGINE**
16. **CHECK FOR ENGINE COOLANT LEAKS**

CRANKSHAFT POSITION SENSOR

COMPONENTS

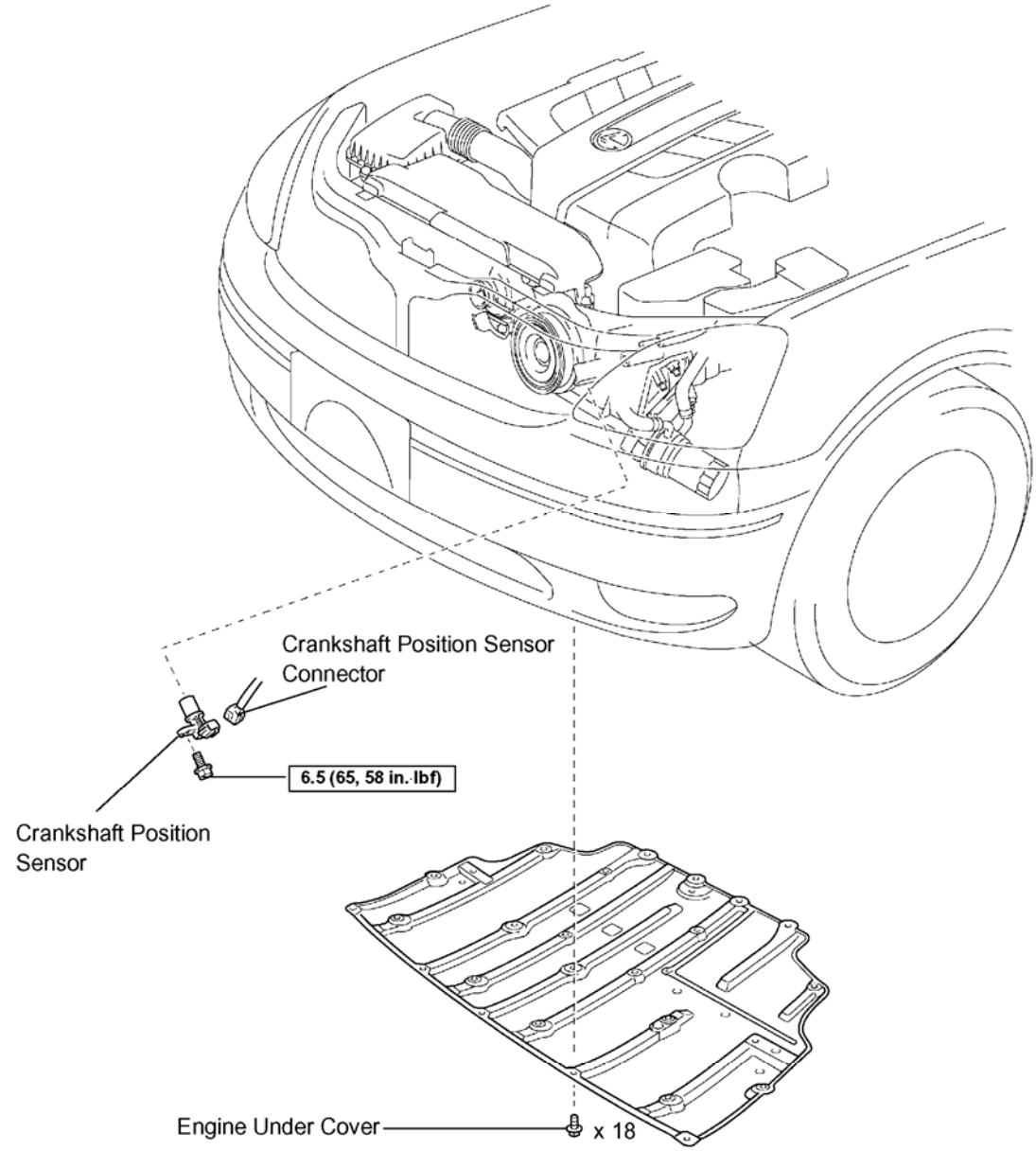

Fig. 15: Identifying Crankshaft Position Sensor Components And Replacements
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REPLACEMENT

1. **REMOVE ENGINE UNDER COVER NO. 1**
2. **REMOVE CRANKSHAFT POSITION SENSOR**

a. Disconnect the sensor connector.
b. Remove the bolt and sensor.

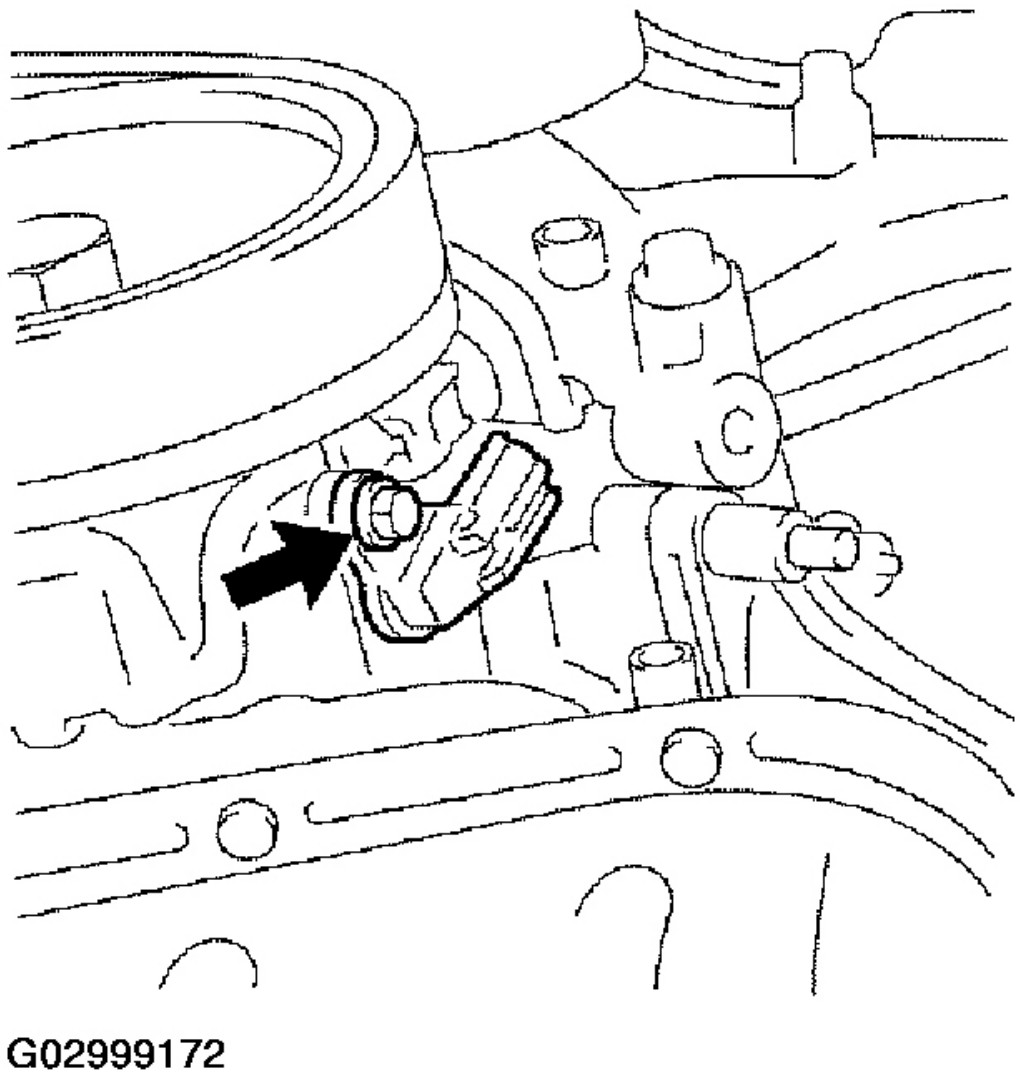

Fig. 16: Removing Crankshaft Position Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL CRANKSHAFT POSITION SENSOR**
   a. Install a new sensor with the bolt.
      Torque: 6.5 N.m (65 kgf.cm, 58 in.lbf)
   b. Connect the sensor connector.

4. **INSTALL ENGINE UNDER COVER NO. 1**