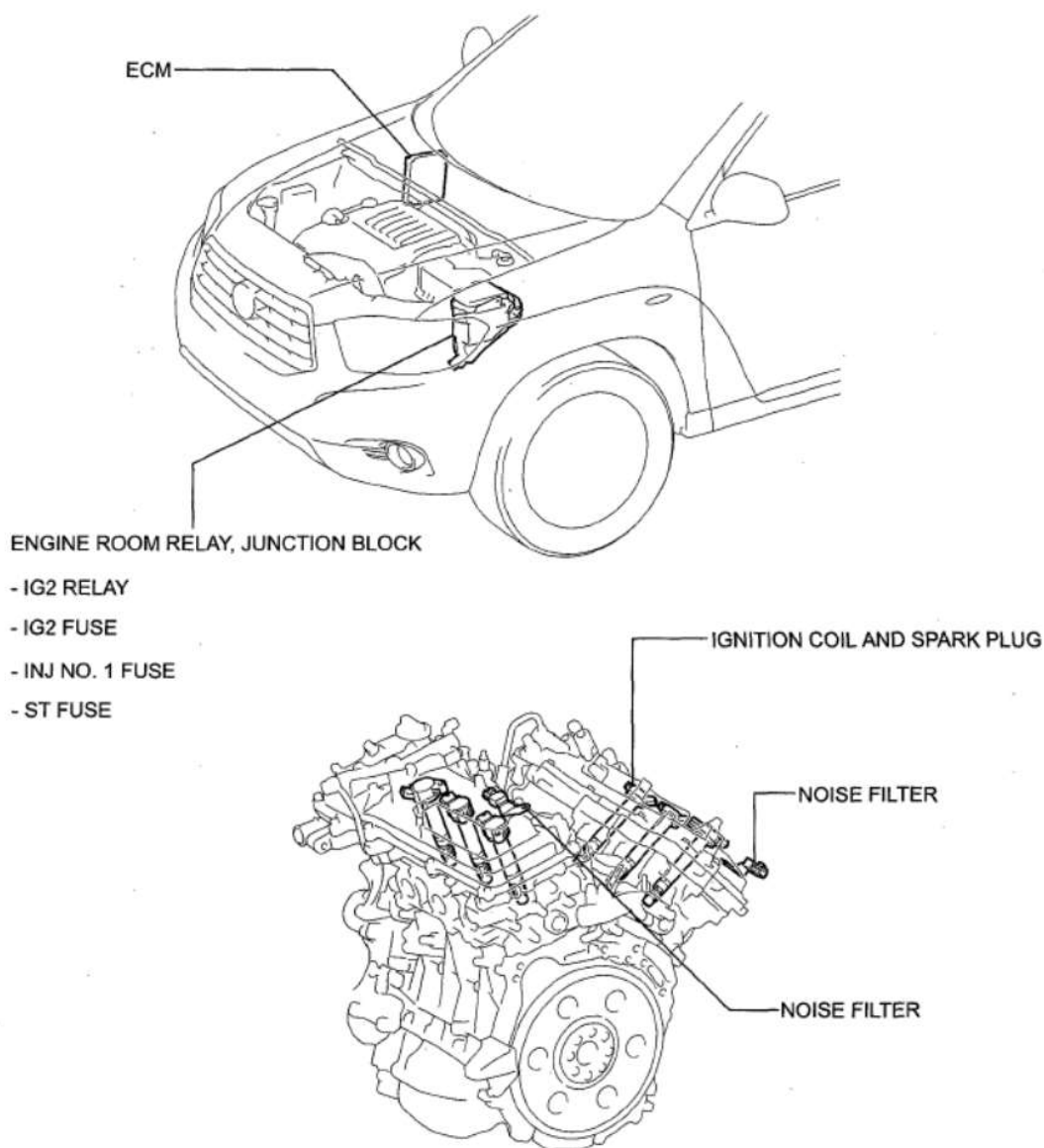


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2009 ENGINE Ignition (2GR-FE) - Highlander

2009 ENGINE**Ignition (2GR-FE) - Highlander****IGNITION SYSTEM****PARTS LOCATION**

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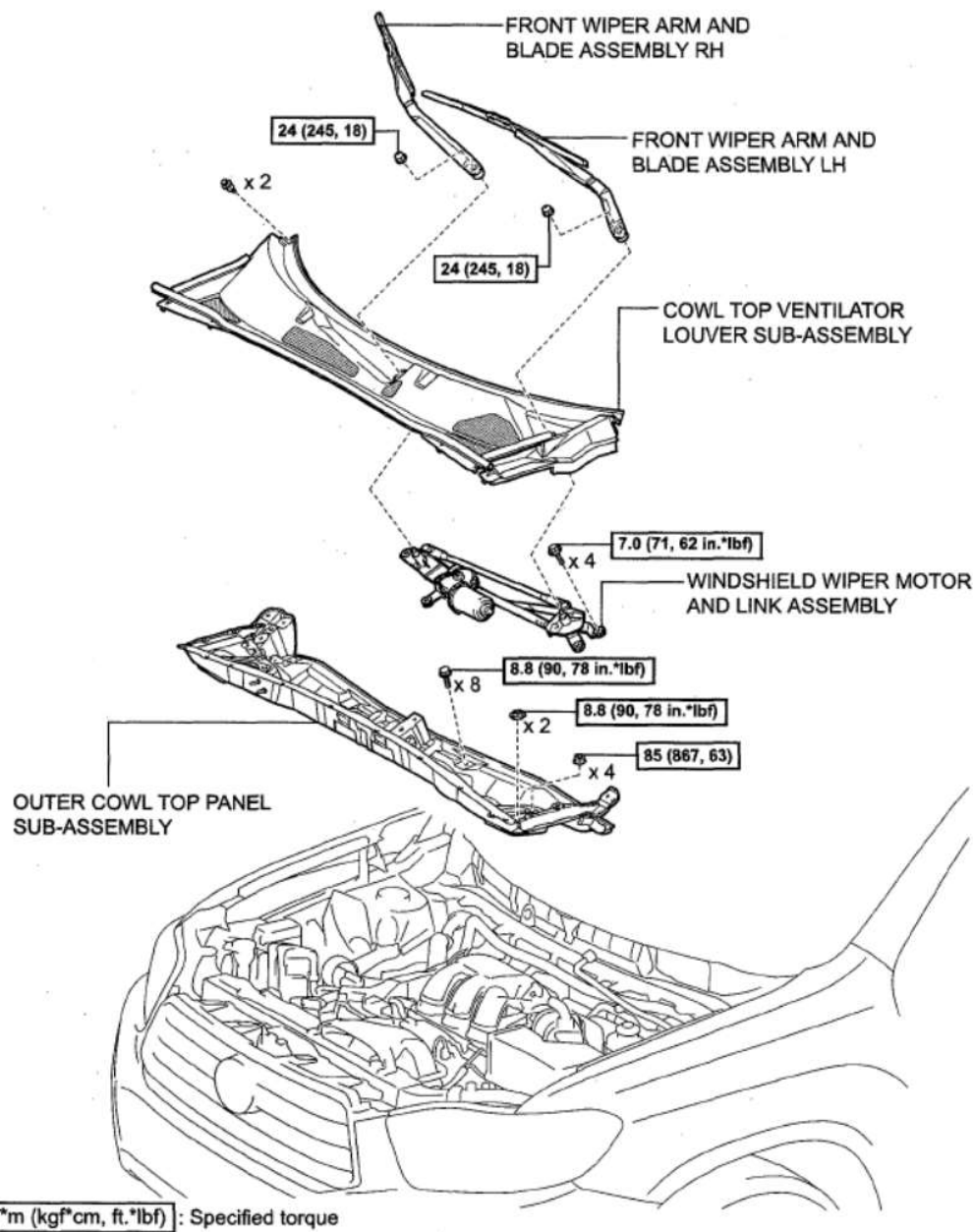
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Fig. 1: Identifying Ignition System Parts Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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Fig. 3: Identifying Ignition Coil And Spark Plug Replacement Components (1 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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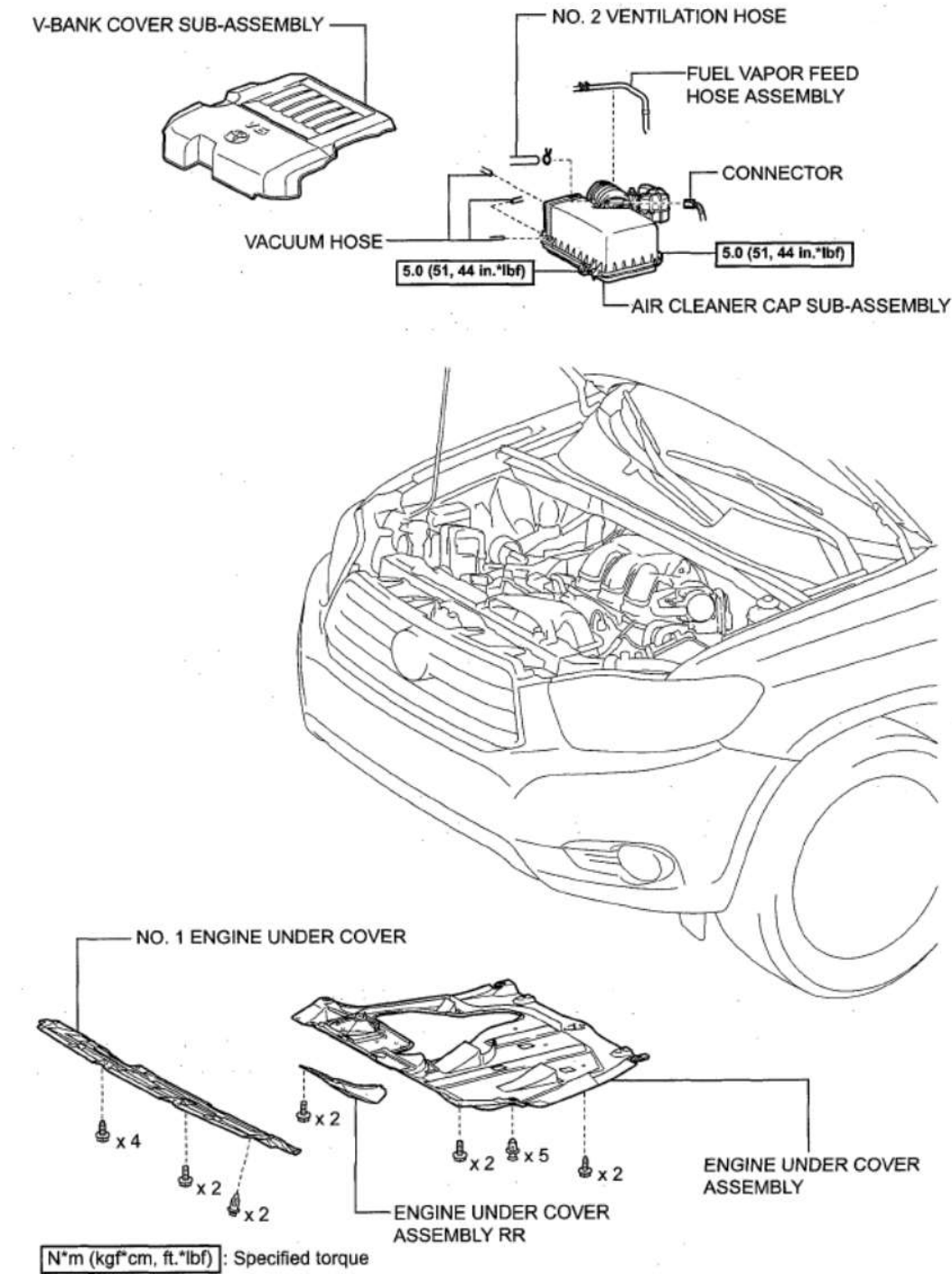


Fig. 4: Identifying Ignition Coil And Spark Plug Replacement Components (2 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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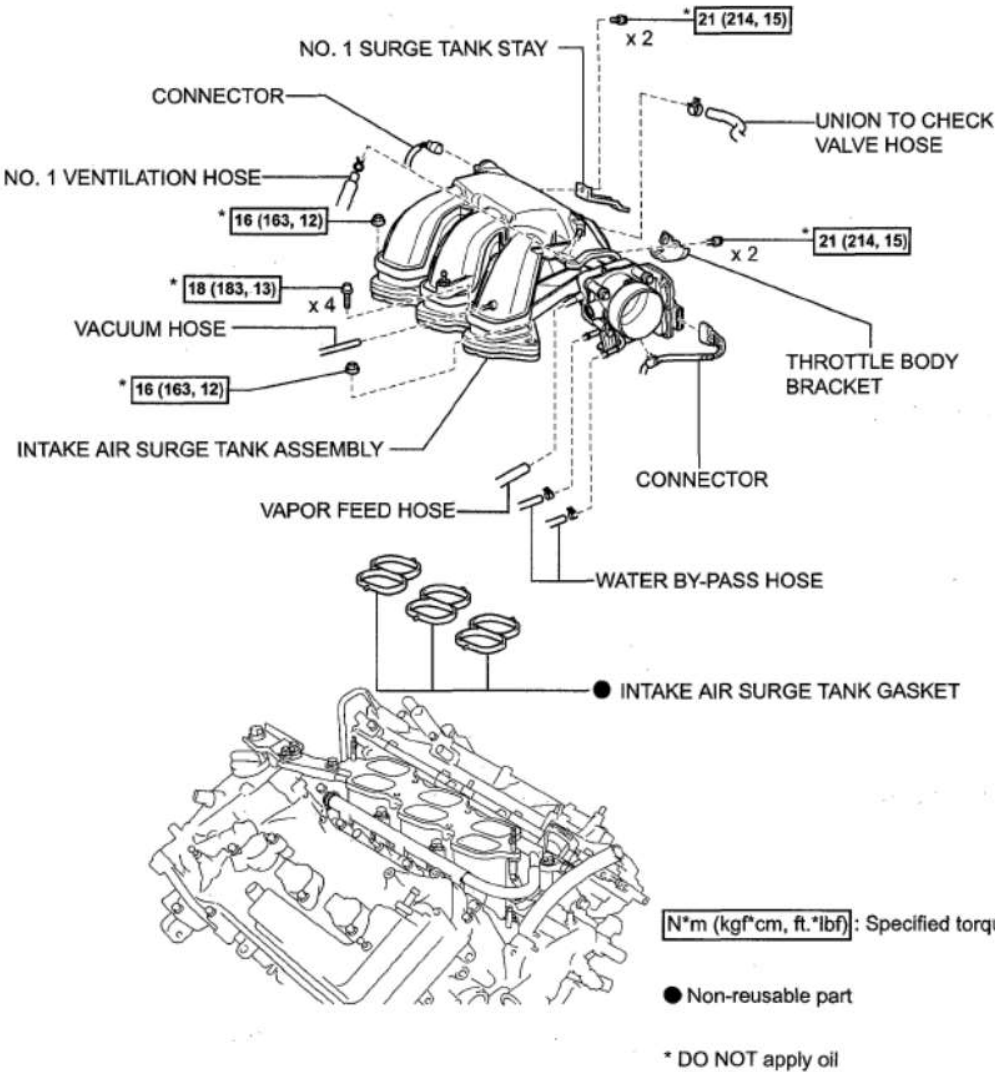
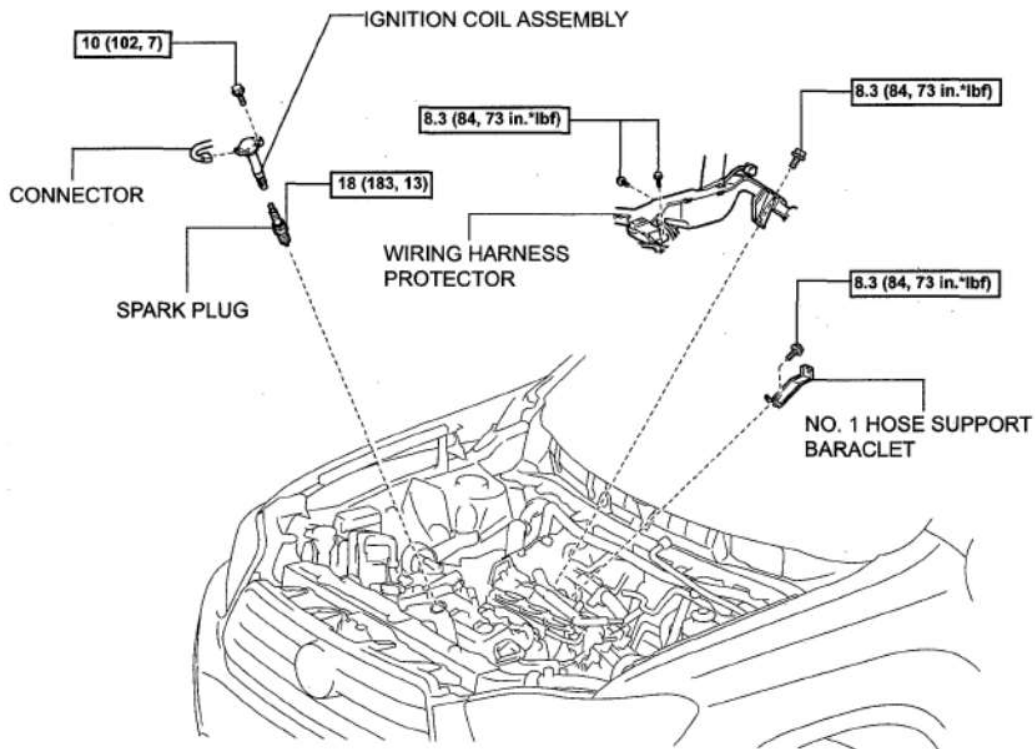


Fig. 5: Identifying Ignition Coil And Spark Plug Replacement Components (3 Of 4)
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N*m (kg*cm, ft.*lbf) : Specified torque

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Fig. 6: Identifying Ignition Coil And Spark Plug Replacement Components (4 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

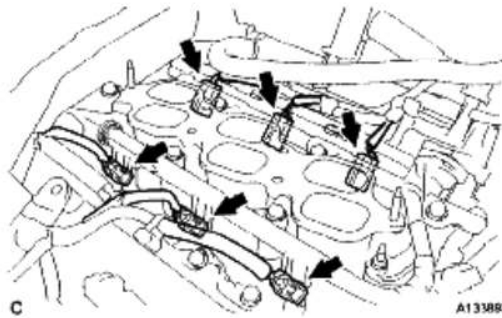
ON-VEHICLE INSPECTION

1. INSPECT IGNITION COIL ASSEMBLY

- Check for DTCs.

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

- Remove the ignition coil assembly and spark plug (See **REMOVAL**).
- Check that sparks occur.
 - Disconnect the 6 fuel injector connectors.

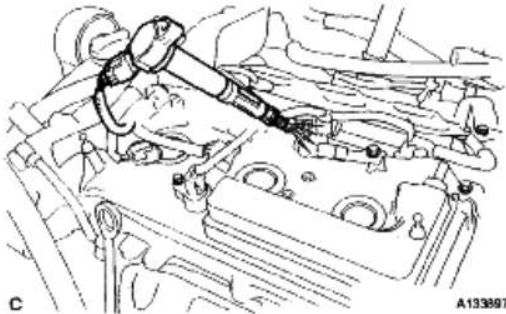
2009 Toyota Highlander Limited**2009 ENGINE Ignition (2GR-FE) - Highlander****Fig. 7: Locating Fuel Injector Connectors**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Install the spark plug to ignition coil, and connect the ignition coil connector.
3. Ground the spark plug.
4. Check if spark occurs at each spark plug while the engine is being cranked.

NOTE:

- Be sure to ground the spark plugs during the inspection.
- Replace the ignition coil if it receives an impact.
- Do not crank the engine for more than 2 seconds.

**Fig. 8: Checking Spark Occurs At Each Spark Plug While Engine Is Being Cranked**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Perform the spark test according to the flowchart below:
 1. Check that the ignition coil connector is securely connected.

Result**RESULT REFERENCE CHART**

Result	Action
NG	Connect securely
OK	Go to next step

2. Perform a spark test on each ignition coil.

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1. Replace the ignition coil with a known good one.
2. Perform the spark test again.

Result

RESULT REFERENCE CHART

Result	Action
NG	Go to next step
OK	Replace ignition coil

3. Check the spark plug (to INSPECT SPARK PLUG).

Result

RESULT REFERENCE CHART

Result	Action
NG	Replace spark plug
OK	Go to next step

4. Check the power supply to the ignition coil.
 1. Turn the ignition switch on (IG).
 2. Check that there is battery voltage at the ignition coil positive (+) terminal.

Result

RESULT REFERENCE CHART

Result	Action
NG	Check wiring between ignition switch and ignition coil
OK	Go to next step

5. Measure the resistance of the crankshaft position sensor (See INSPECTION).

Result

RESULT REFERENCE CHART

Result	Action
NG	Replace crankshaft position sensor
OK	Go to next step

6. Check the IGT signal from the ECM (See TERMINALS OF ECM).

Result

RESULT REFERENCE CHART

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Result	Proceed to Action
NG	Check ECM
OK	Repair wiring between ignition coil and ECM

- e. Using a 16 mm plug wrench, install the spark plugs.

Torque: 18 N*m (183 kgf*cm, 13 ft.*lbf)

- f. Connect the 6 fuel injector connectors.
g. Install the ignition coil assembly (See **INSTALLATION**).

2. INSPECT SPARK PLUG

NOTE:

- Never use a wire brush for cleaning.
- Never attempt to adjust the electrode gap on a used spark plug.

- a. Check the electrode.
1. Using a megohmmeter, measure the insulation resistance.

Standard insulation resistance:

10 Mohms or higher

HINT:

- If the result is below 10 Mohms, clean the plug and measure the resistance again.
- If a megohmmeter is not available, perform the following inspection instead.

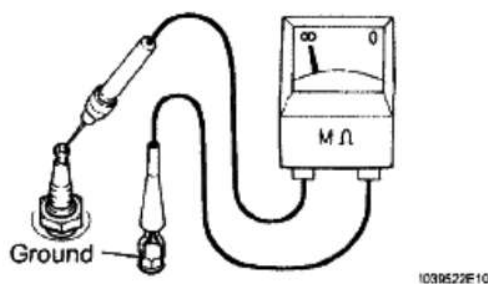


Fig. 9: Measuring Insulation Resistance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Alternative inspection method:
1. Quickly accelerate the engine to 4000 rpm 5 times.
 2. Remove the spark plugs.
 3. Visually check the spark plug.

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If the electrode is dry, the spark plug is functioning properly. If the electrode is damp, proceed to the next step.

- c. Check the spark plug for any damage to its threads and insulator. If there is damage, replace the spark plug.

Recommended spark plug

RECOMMENDED SPARK PLUG

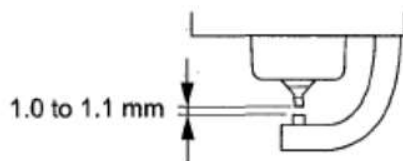
Manufacturer	Spark Plug Type
DENSO	FK20HR11

NOTE: Use only the listed spark plug or equivalent to ensure engine performance and smooth driveability.

- d. Check the spark plug electrode gap.

Maximum electrode gap for a used spark plug: 1.4 mm (0.055 in.)

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



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Fig. 10: Checking Spark Plug Electrode Gap

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Clean the spark plugs.

Electrode gap for a new spark plug (for reference):

1.0 to 1.1 mm (0.039 to 0.043 in.)

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

Standard air pressure:

588 kPa (6 kgf/cm² , 85 psi)

Standard duration:

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20 seconds or less



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Fig. 11: Cleaning Spark Plugs

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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.

- f. Install the ignition coil assembly and spark plug. (See **INSTALLATION**).

REMOVAL

1. REMOVE ENGINE UNDER COVER ASSEMBLY (See **REMOVAL**)
2. REMOVE NO. 1 ENGINE UNDER COVER (See **REMOVAL**)
3. DRAIN ENGINE COOLANT (See **COOLANT**)
4. REMOVE V-BANK COVER SUB-ASSEMBLY (See **REMOVAL**)
5. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH (See **REMOVAL**)
6. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH (See **REMOVAL**)
7. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY (See **REMOVAL**)
8. REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY (See **REMOVAL**)
9. REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY (See **REMOVAL**)
10. DISCONNECT ENGINE ROOM MAIN WIRE (See **REMOVAL**)
11. REMOVE THROTTLE BODY BRACKET (See **REMOVAL**)
12. REMOVE NO. 1 SURGE TANK STAY (See **REMOVAL**)
13. REMOVE AIR CLEANER CAP SUB-ASSEMBLY (See **REMOVAL**)
14. REMOVE INTAKE AIR SURGE TANK ASSEMBLY (See **REMOVAL**)
15. REMOVE IGNITION COIL ASSEMBLY
 - a. Remove the 4 bolts [A].
 - b. Remove the nut [B].
 - c. Disconnect the 2 harness clamps [C].

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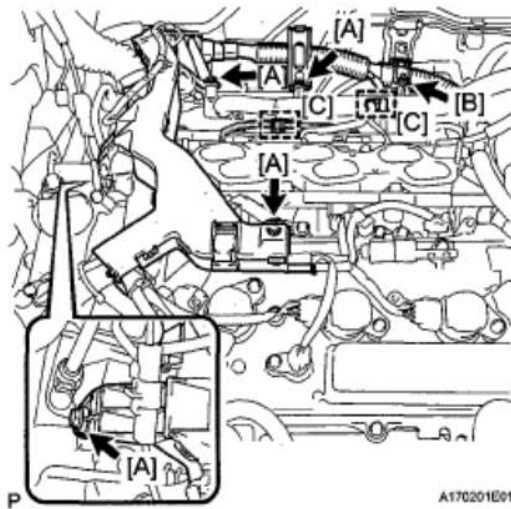
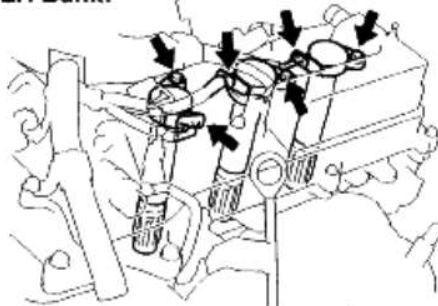


Fig. 12: Locating Bolts, Nut And Harness Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Disconnect the 6 ignition coil connectors.
- e. Remove the 6 bolts and 6 ignition coils.

LH Bank:



RH Bank:

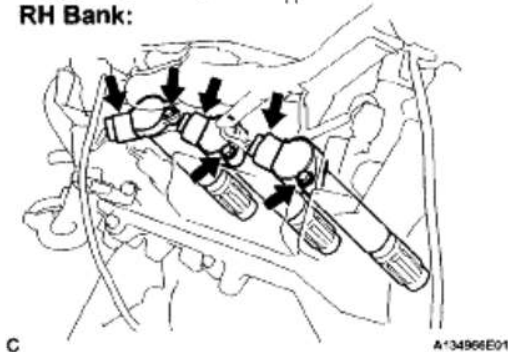


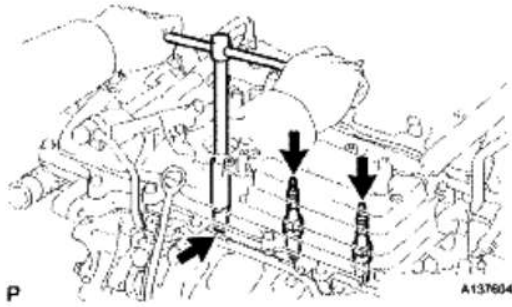
Fig. 13: Locating Ignition Coils And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. REMOVE SPARK PLUG

- a. Remove the 6 spark plugs.

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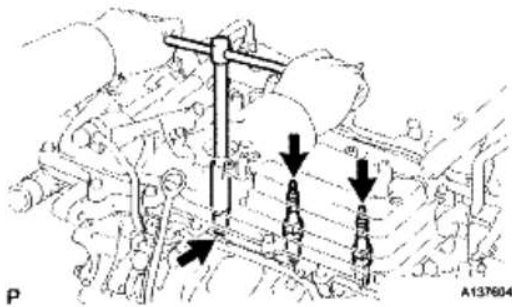
2009 ENGINE Ignition (2GR-FE) - Highlander

**Fig. 14: Removing Spark Plugs**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION**1. INSTALL SPARK PLUG**

- a. Install the 6 spark plugs.

Torque: 18 N*m (183 kgf*cm, 13 ft.*lbf)**Fig. 15: Installing Spark Plugs**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL IGNITION COIL ASSEMBLY

- a. Install the 6 ignition coils with the 6 bolts.

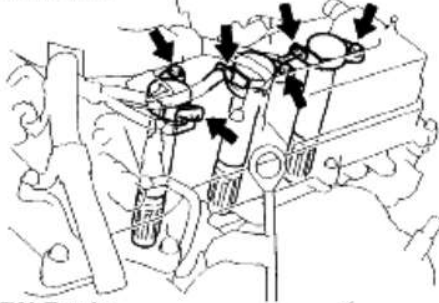
Torque: 10 N*m (102 kgf*cm, 7 ft.*lbf)

- b. Connect the 6 ignition coil connectors.

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LH Bank:



RH Bank:

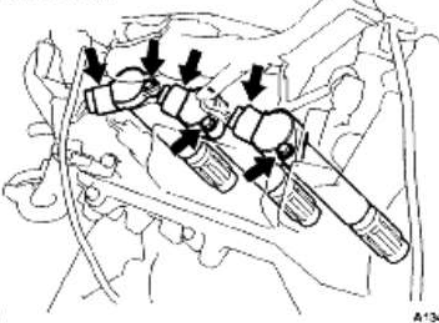


Fig. 16: Locating Ignition Coils And Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the 4 bolts [A].

Torque: 8.3 N*m (84 kgf*cm, 73 in.*lbf)

- d. Install the nut [B].

Torque: 8.3 N*m (84 kgf*cm, 73 in.*lbf)

- e. Install the 2 clamps [C].

3. **INSTALL INTAKE AIR SURGE TANK ASSEMBLY** (See INSTALLATION)
4. **TEMPORARILY INSTALL NO. 1 SURGE TANK STAY** (See INSTALLATION)
5. **TEMPORARILY INSTALL THROTTLE BODY BRACKET** (See INSTALLATION)
6. **FULLY TIGHTEN NO. 1 SURGE TANK STAY** (See INSTALLATION)

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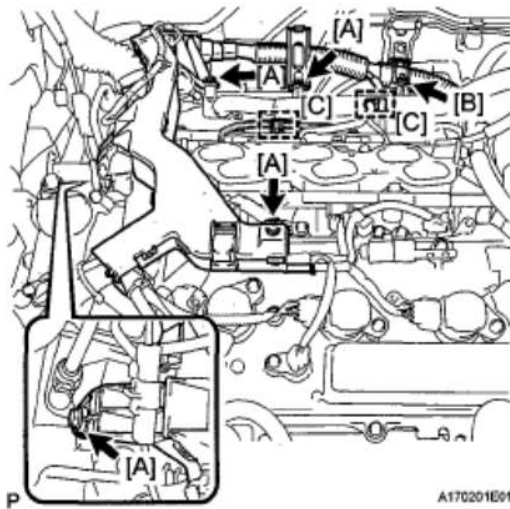


Fig. 17: Locating Bolts, Nut And Harness Clamps
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **FULLY TIGHTEN THROTTLE BODY BRACKET** (See INSTALLATION)
8. **CONNECT ENGINE ROOM MAIN WIRE** (See INSTALLATION)
9. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See INSTALLATION)
10. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** (See INSTALLATION)
11. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See INSTALLATION)
12. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See INSTALLATION)
13. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See INSTALLATION)
14. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See INSTALLATION)
15. **INSTALL V-BANK COVER SUB-ASSEMBLY** (See INSTALLATION)
16. **ADD ENGINE COOLANT** (See REPLACEMENT)
17. **INSPECT FOR ENGINE COOLANT LEAK** (See COOLING SYSTEM)
18. **INSTALL NO. 1 ENGINE UNDER COVER** (See INSTALLATION)
19. **INSTALL ENGINE UNDER COVER ASSEMBLY** (See INSTALLATION)