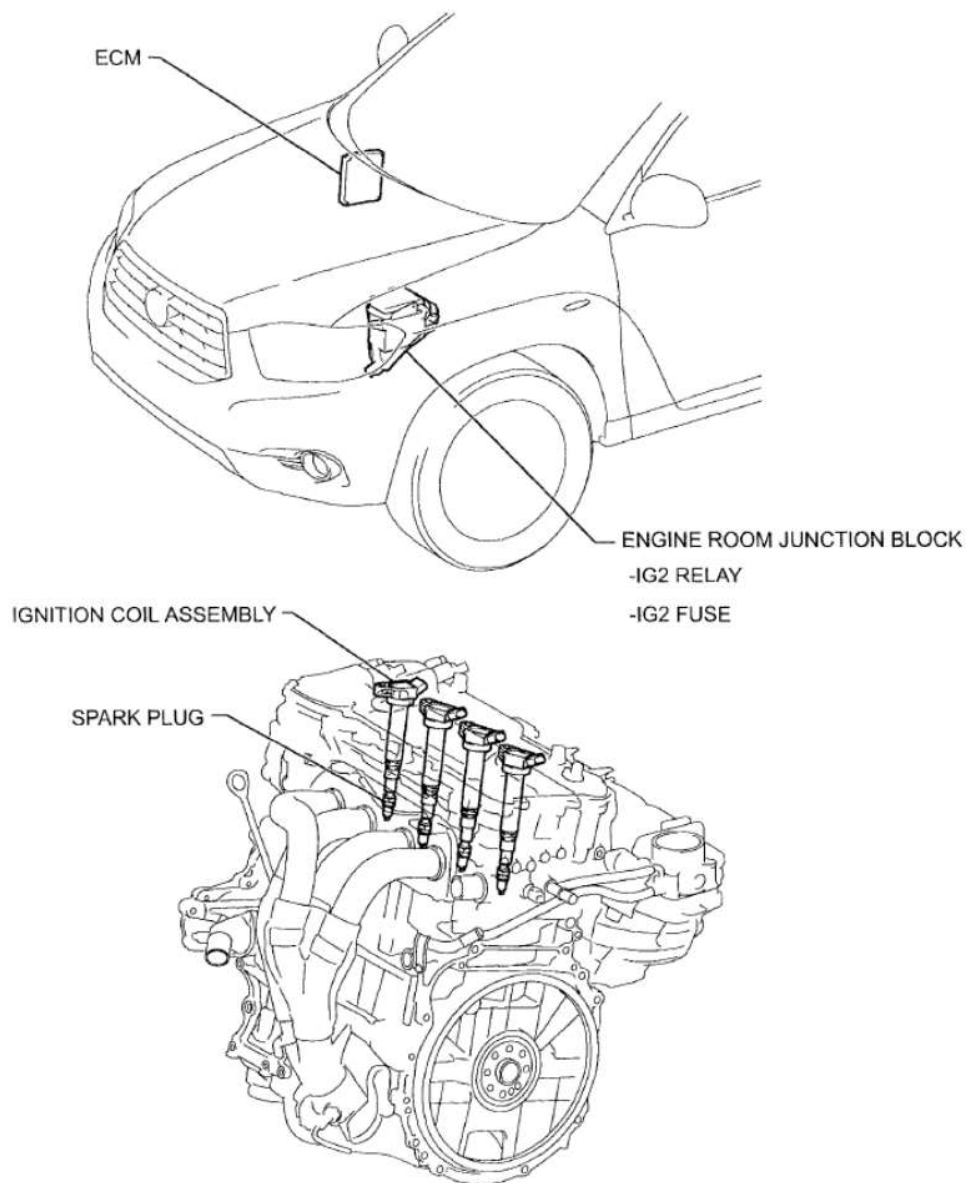


2009 Toyota Highlander Limited

2009 ENGINE Ignition (1AR-FE) - Highlander

2009 ENGINE**Ignition (1AR-FE) - Highlander****IGNITION SYSTEM****PARTS LOCATION**

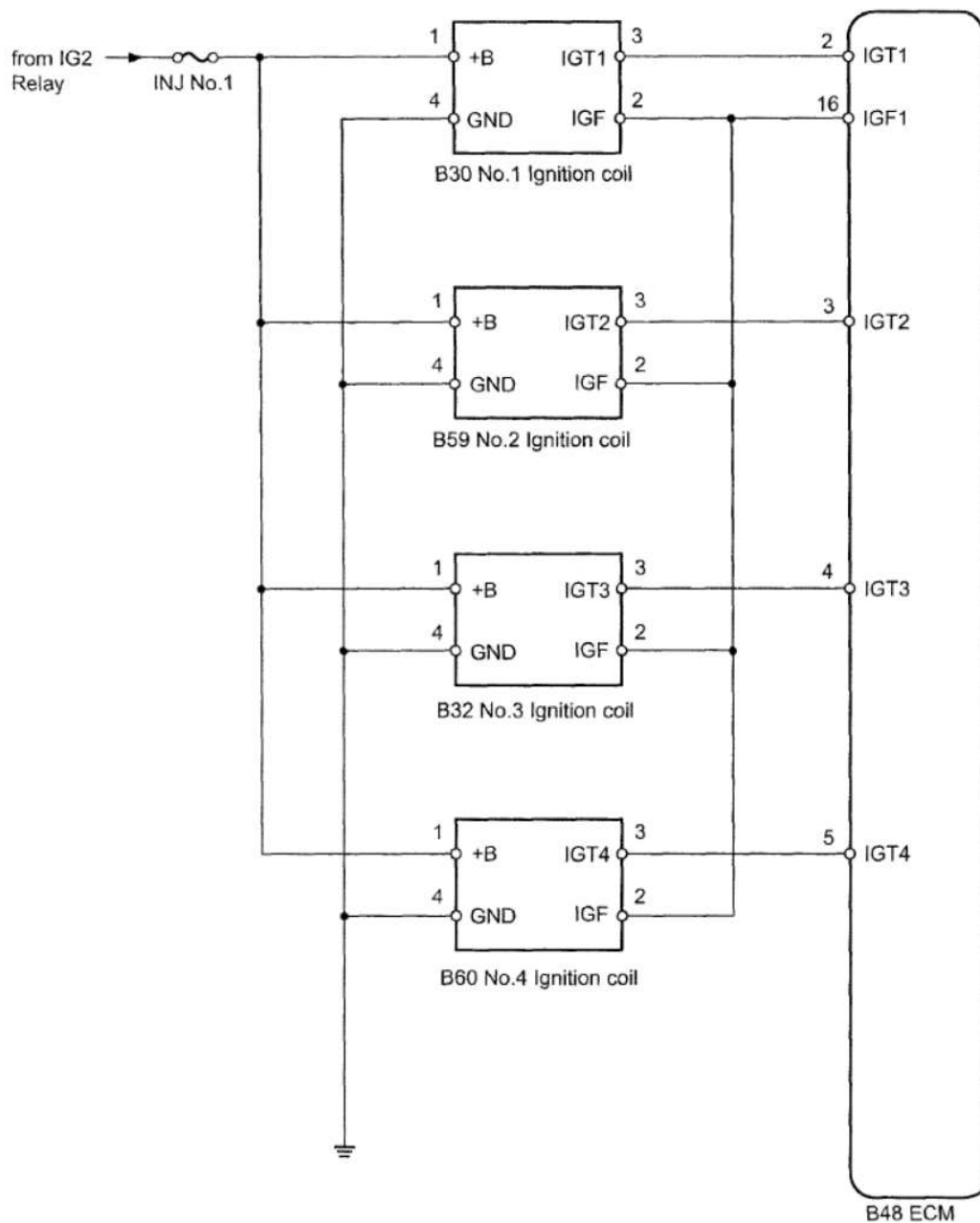
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Fig. 1: Identifying Ignition System Parts Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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SYSTEM DIAGRAM



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Fig. 2: Ignition System Diagram

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

ON-VEHICLE INSPECTION

1. CHECK IGNITION COIL ASSEMBLY AND PERFORM SPARK TEST

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- a. Check for DTCs (See **DTC CHECK/CLEAR**).

NOTE: If any DTC is output, perform troubleshooting procedures for that DTC.

- b. Check that spark occurs.

1. Remove the ignition coils and spark plugs (See **REMOVAL**).
2. Disconnect the 4 injector connectors.
3. Install the spark plug into the ignition coil, and then connect the ignition coil connector.

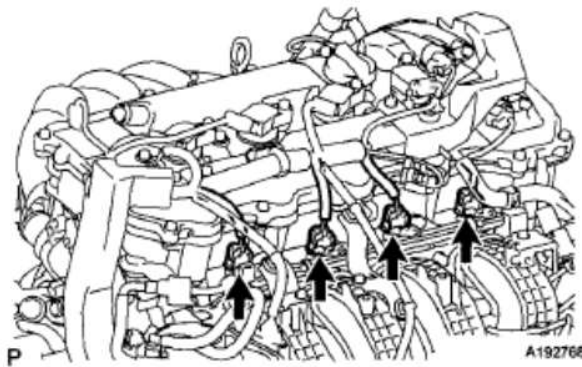


Fig. 3: Locating Injector Connectors

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

4. Ground the spark plug.
5. Check that spark occurs at each spark plug while the engine is being cranked.

NOTE:

- Be sure to ground the spark plugs when checking them.
- If an ignition coil has been struck or dropped, replace it.
- Do not crank the engine for more than 2 seconds.

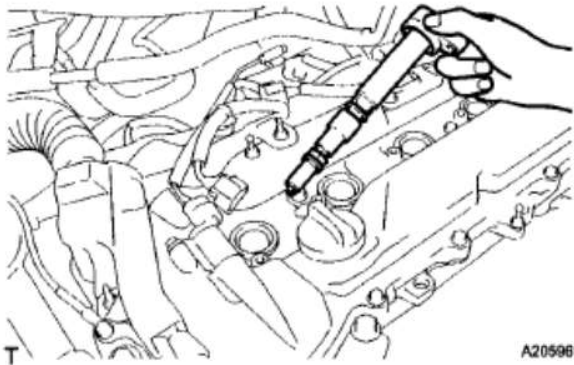


Fig. 4: Checking Spark Occurs At Each Spark Plug While Engine Is Being Cranked

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2009 Toyota Highlander Limited**2009 ENGINE Ignition (1AR-FE) - Highlander****HINT:**

If spark does not occur, perform the following procedure (go to step (c)).

6. Connect the 4 fuel injector connectors.
7. Install the spark plugs and ignition coils (See **REMOVAL**).
8. Clear the DTCs (See **DTC CHECK/CLEAR**).
- c. Perform the following spark test procedure.
 1. Check that the wire harness side connector of the ignition coil with igniter 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.
 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. Perform a spark test on each spark plug.
 1. Replace the spark plug with a known good one.
 2. Perform the spark test again.

Result**RESULT REFERENCE CHART**

Result	Action
NG	Go to next step
OK	Replace spark plug

4. Check that power is supplied to the ignition coil.
 1. Turn the ignition switch to ON.
 2. Measure the voltage according to the value(s) in the table below.

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Standard Voltage

STANDARD VOLTAGE

Tester Connection	Condition	Specified Condition
1 (+B) - 4 (GND)	Ignition switch ON	11 to 14 V

Result

RESULT REFERENCE CHART

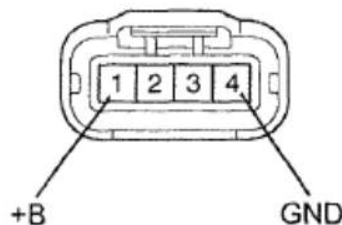
Result	Action
NG	Check wiring between ignition switch and ignition coil with igniter and check ground circuit
OK	Replace the ECM

2. CHECK SPARK PLUG

NOTE:

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

Front view of wire harness connector:
(to Ignition Coil)



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Fig. 5: Identifying Ignition Coil Connector Terminals
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- a. Check the electrode using a megohmmeter:
 1. Using a megohmmeter, measure the insulation resistance.

Standard Insulation Resistance

STANDARD INSULATION RESISTANCE

Tester Connection	Condition	Specified Condition
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Spark plug (terminal part) - Body ground	Always	10 Mohms or higher
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HINT:

- If the result is not as specified, clean the spark plug with a spark plug cleaner and measure the resistance again.
- If a megohmmeter is not available, perform the following simple inspection instead.

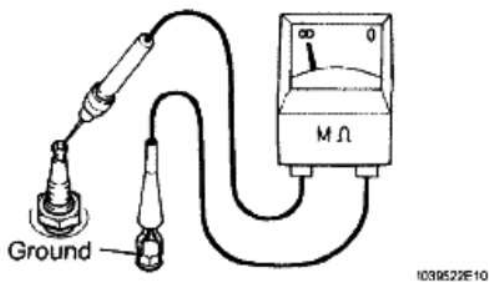


Fig. 6: Measuring Insulation Resistance
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- b. Alternative inspection method:
1. Quickly accelerate the engine to 4000 rpm 5 times.
 2. Remove the spark plug.
 3. Visually check the spark plug.

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 thread and insulator.

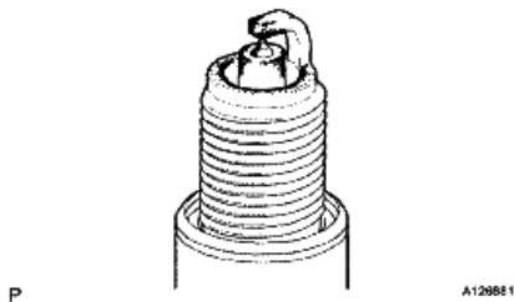


Fig. 7: Inspecting Spark Plug
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If there is any damage, replace the spark plug.

Recommended Spark Plug

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RECOMMENDED SPARK PLUG

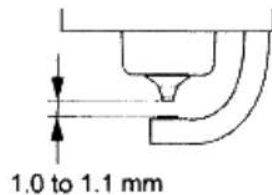
Manufacturer	Spark Plug Type
DENSO	SK16HR11

d. Reference:

1. Check the spark plug electrode gap.

Maximum Electrode Gap for a Used Spark Plug:**1.3 mm (0.0512 in.)**

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

NOTE: Never attempt to adjust the gap of a used plug.**Electrode Gap for a New Spark Plug: 1.0 to 1.1 mm (0.0394 to 0.0433 in.)**

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Fig. 8: Measuring Spark Plug Electrode Gap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Clean the spark plugs.

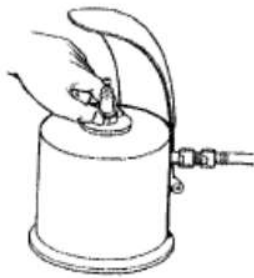
If the electrode has traces of wet carbon, clean the electrode with a spark plug cleaner and then dry it.

Standard air pressure:**588 kPa (6 kgf/cm² , 85 psi)****Standard duration:****20 seconds or less****HINT:**

Only use a 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.

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Fig. 9: Cleaning Spark Plug

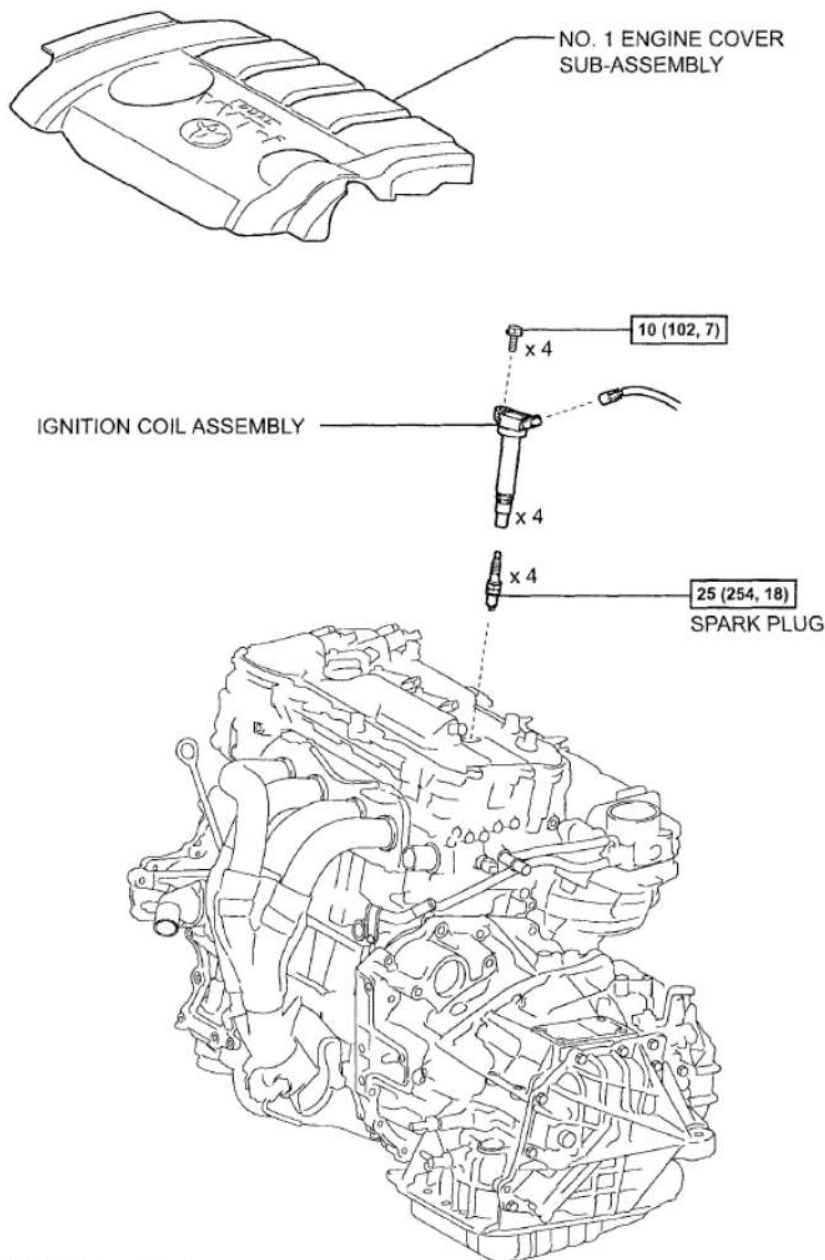
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

IGNITION COIL AND SPARK PLUG**COMPONENTS**

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[N*m (kgf*cm, ft.*lbf)]: Specified torque

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Fig. 10: Identifying Ignition Coil And Spark Plug Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY (See **REMOVAL**)
2. REMOVE IGNITION COIL ASSEMBLY
 - a. Disconnect the 4 ignition coil assembly connectors.

2009 Toyota Highlander Limited**2009 ENGINE Ignition (1AR-FE) - Highlander**

- b. Remove the 4 bolts and 4 ignition coil assemblies.

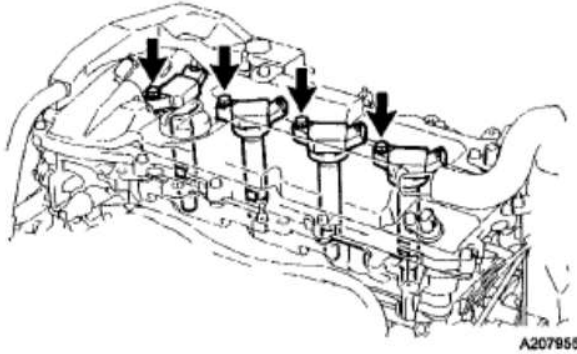


Fig. 11: Locating Ignition Coil Assemblies Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE SPARK PLUG

- a. Using a spark plug wrench, remove the 4 spark plugs.

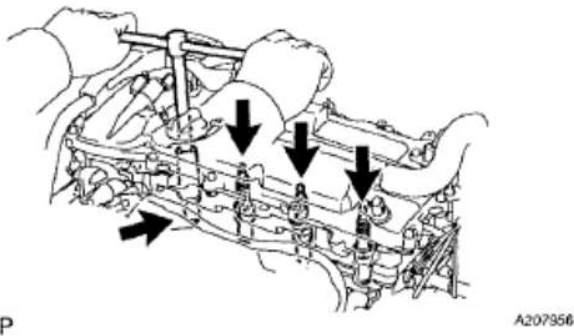


Fig. 12: Removing Spark Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

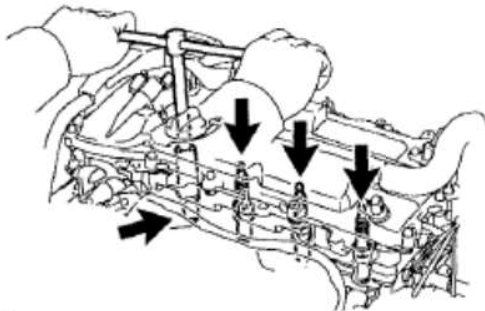
INSTALLATION**1. INSTALL SPARK PLUG**

- a. Using a spark plug wrench, install the 4 spark plugs.

Torque: 25 N*m (254 kgf*cm, 18 ft.*lbf)

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Fig. 13: Installing Spark Plug

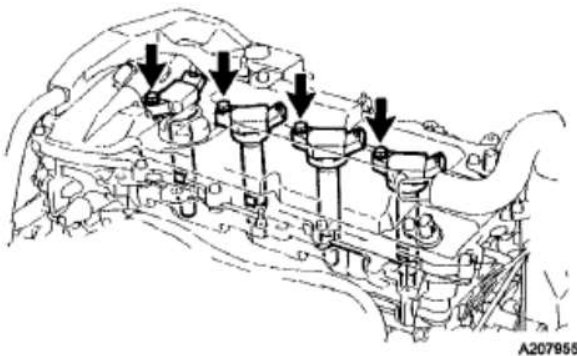
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL IGNITION COIL ASSEMBLY

- a. Install the 4 ignition coil assemblies with the 4 bolts.

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

- b. Connect the 4 ignition coil assembly connectors.

3. INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY (See INSTALLATION)

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Fig. 14: Locating Ignition Coil Assemblies Bolts

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