

2009 Toyota Highlander Limited

2009 ENGINE Fuel (1AR-FE) - Highlander

2009 ENGINE**Fuel (1AR-FE) - Highlander****FUEL SYSTEM****PRECAUTION****1. DISCHARGE FUEL SYSTEM PRESSURE****CAUTION:**

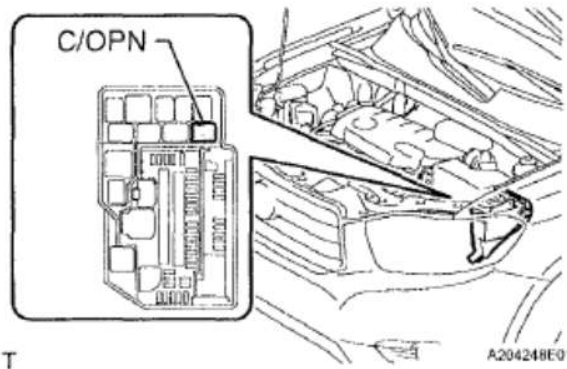
- Perform the following procedures to prevent fuel from spilling out before removing any fuel system parts.
- Pressure will still remain in the fuel lines even after performing the following procedures. When disconnecting a fuel line, cover it with a shop rag or a piece of cloth to prevent fuel from spraying or coming out.

a. For work associated with removal of the C/OPN relay:

1. Separate the brake master cylinder reservoir assembly (See **INTEGRATION RELAY**).
2. Remove the reservoir bracket (See **INTEGRATION RELAY**).
3. Remove the No. 1 relay block cover (See **REMOVAL**).
4. Remove the C/OPN relay.
5. Start the engine.
6. After the engine stops, turn the ignition switch off.

HINT:

DTC P0171/25 (fuel problem) may be detected.

**Fig. 1: Identifying C/OPN Relay**

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

7. Crank the engine again. Check that the engine does not start.

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8. Remove the fuel tank cap to discharge pressure from the fuel tank.
9. Disconnect the cable from the negative (-) battery terminal.

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

10. Install the C/OPN relay.
 11. Install the No. 1 relay block cover (See INSTALLATION).
 12. Install the reservoir bracket (See INSTALLATION).
 13. Install the brake master cylinder reservoir assembly (See INSTALLATION).
- b. Perform the following to disconnect the fuel pump connector:
1. Remove the rear No. 1 seat assembly (for LH side) (See REMOVAL).
 2. Remove the rear No. 1 seat assembly (for RH side) (See REMOVAL).
 3. Using a clip remover, remove the 3 clips and lift up the front floor carpet, (w/rear No. 2 seat)

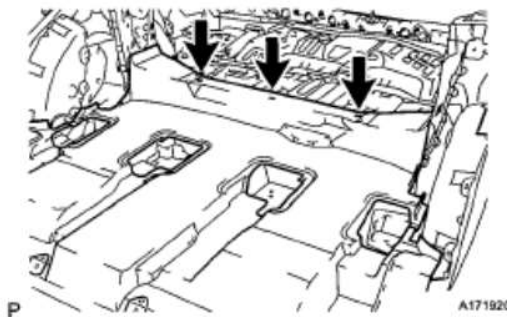


Fig. 2: Locating Front Floor Carpet Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Disengage the 3 claws and lift up the front floor carpet, (w/o rear No. 2 seat)

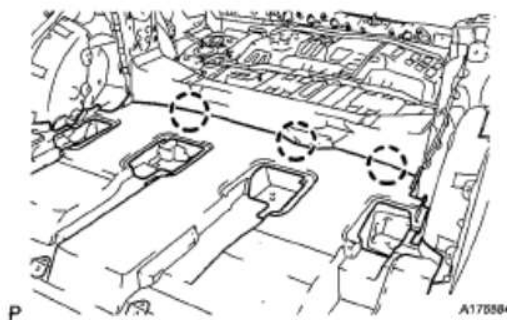


Fig. 3: Identifying Front Floor Carpet Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. Remove the rear floor service hole cover.

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6. Disconnect the fuel pump connector.
7. Start the engine.
8. After the engine stops, turn the ignition switch off.

HINT:

DTC P0171/25 (fuel problem) may be detected.

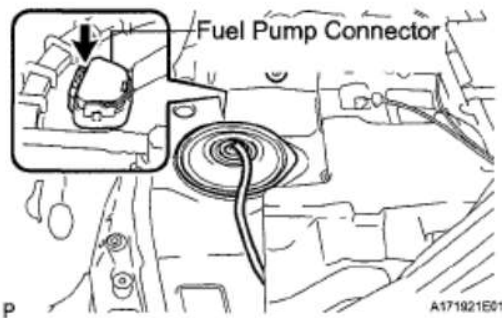


Fig. 4: Locating Fuel Pump Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. Crank the engine again. Check that the engine does not start.
10. (10) Remove the fuel tank cap to discharge pressure from the fuel tank.
11. Disconnect the cable from the negative (-) battery terminal.

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

12. Reconnect the fuel pump connector.
13. Install the rear floor service hole cover.

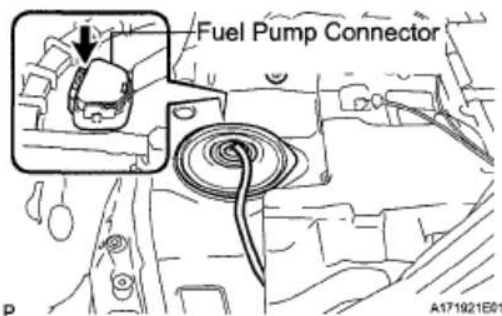


Fig. 5: Locating Fuel Pump Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. Install the front floor carpet and the 3 clips, (w/rear No. 2 seat)

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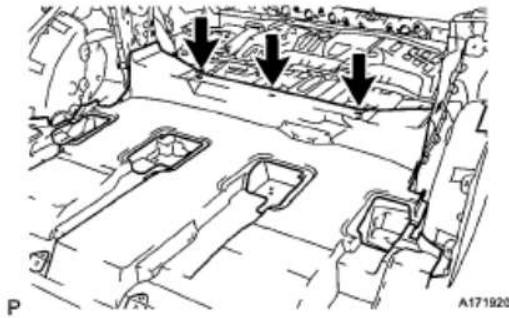


Fig. 6: Locating Front Floor Carpet Clips

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

15. Engage the 3 claws to install the front floor carpet, (w/o rear No. 2 seat)
16. Install the rear No. 1 seat assembly (for LH side) (See **INSTALLATION**).
17. Install the rear No. 1 seat assembly (for RH side) (See **INSTALLATION**).

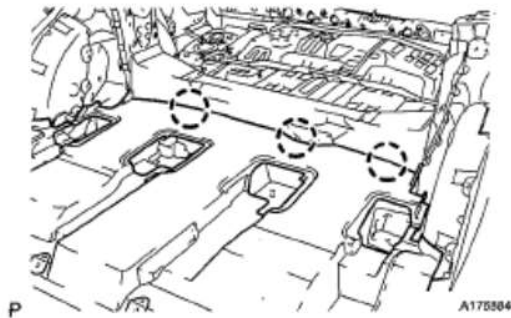


Fig. 7: Identifying Front Floor Carpet Claws

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

2. PRECAUTIONS

- a. Before inspecting and repairing the fuel system, disconnect the cable from the negative (-) battery terminal.
- b. Do not smoke or work near fire when handling the fuel system.
- c. Keep gasoline away from rubber or leather parts.

3. FUEL LINE

- a. When disconnecting a high pressure fuel line, a large amount of gasoline will spill out, so perform the following procedures:
 1. Discharge fuel system pressure.
 2. Disconnect the fuel pump tube (See **REMOVAL**).
 3. Drain the fuel that remains in the fuel pump tube.
 4. Cover the disconnected fuel pump tube with a plastic bag to prevent damage and contamination.
 5. Put a container under the connectors.

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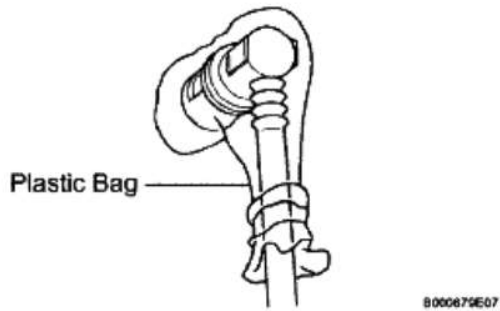


Fig. 8: Covering Fuel Pump Main Tube From Plastic Bag
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Perform the following procedure when disconnecting the fuel tube.

NOTE: Do not forcibly bend, kink or twist the fuel tube.

1. Remove the fuel tube from the fuel hose clamp.
2. Remove the No. 2 fuel pipe clamp.
3. Wipe off any dirt on the fuel tube connector.
4. Hold the fuel tube connector, and then install SST.

SST 09268-21010

5. Turn SST to align the retainer inside the fuel tube connector with the chamfered part of SST.
6. Insert SST into the fuel tube and hold it. Then push the fuel tube connector toward SST.
7. Mount the retainer of the fuel tube connector onto the chamfered part of SST.

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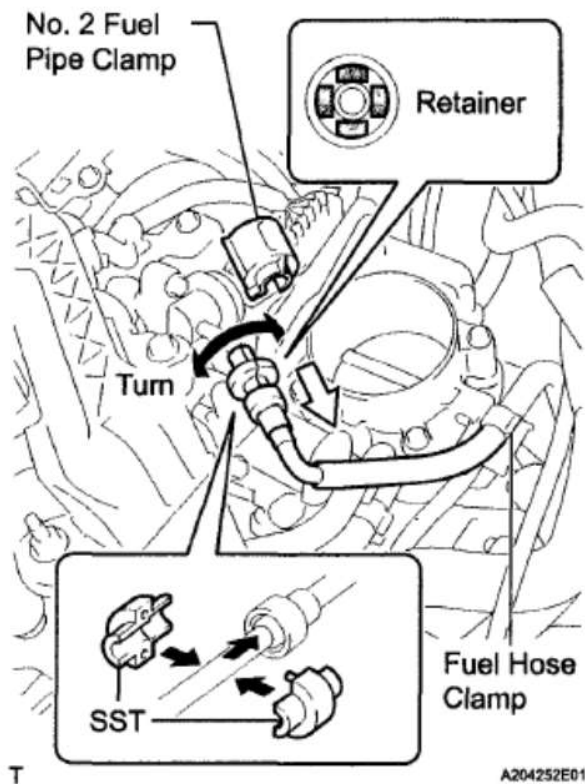


Fig. 9: Disconnecting Fuel Tube

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

8. Slide SST and the fuel tube connector together toward the fuel tube until they make a "click" sound, and then disconnect the fuel tube.
9. Drain the fuel remaining inside the fuel tube.
10. Cover the fuel tube and fuel pipe with a plastic bag to protect the disconnected part.

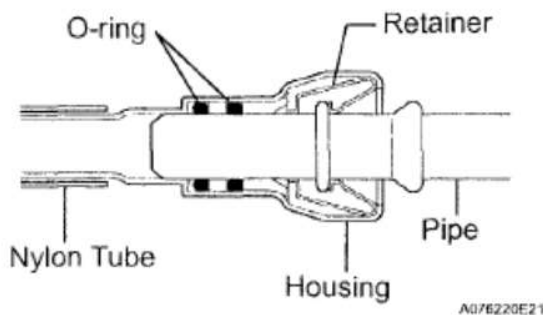


Fig. 10: Identifying O-Ring, Retainer, Nylon Tube, Pipe And Housing

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

- c. Perform the following procedure when connecting the fuel tube connector.
 1. Check if there is any damage or foreign objects on the connecting part of the pipe.

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2. Match the axis of the connector with the axis of the pipe, and push into the connector until the connector makes a "click" sound. If the connection is tight, apply a small amount of clean engine oil to the tip of the pipe.

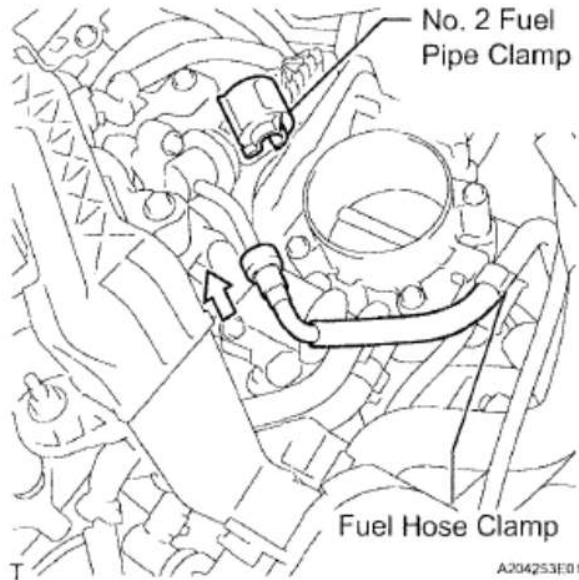


Fig. 11: Identifying No. 2 Fuel Pipe Clamp And Fuel Hose Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. After finishing the connection, check if the pipe and the connector are securely connected by pulling on them.
4. Inspect for fuel leaks.
5. Install a new No. 2 fuel pipe clamp.
6. Install the fuel tube to the fuel hose clamp.

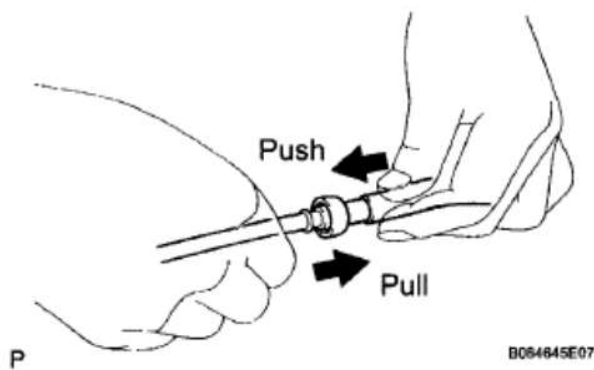


Fig. 12: Connecting Quick Connector To Pipe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Perform these procedure when disconnecting the fuel tube connector (Quick Type A):

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1. Remove the No. 1 fuel pipe clamp.
2. Check whether there is any dirt in the pipe around the connector before disconnecting it and remove the dirt as necessary.

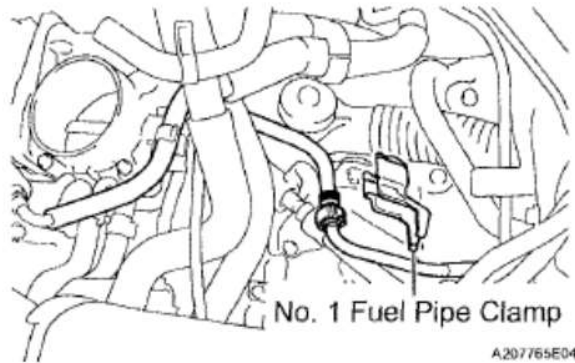


Fig. 13: Identifying No. 1 Fuel Pipe Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Disconnect the connector from the pipe by hand.

NOTE: Be sure to disconnect the connector by hand.

4. If the connector and the pipe are stuck, push in and pull on the connector to release it. Pull the connector out of the pipe carefully.

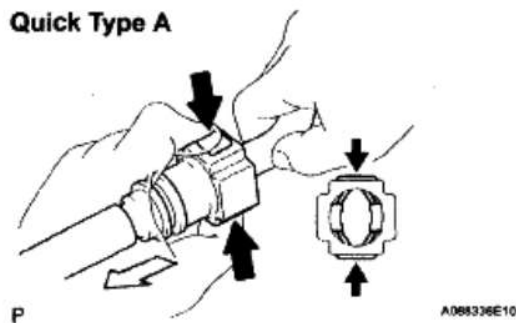


Fig. 14: Disconnecting Connector From Pipe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be sure to disconnect the connector by hand.

5. Check that there is no dirt or other foreign objects on the sealing surface of the disconnected pipe. Clean the surfaces if necessary.
6. Cover the disconnected pipe and connector with a plastic bag to prevent damage and contamination.

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Quick Type A

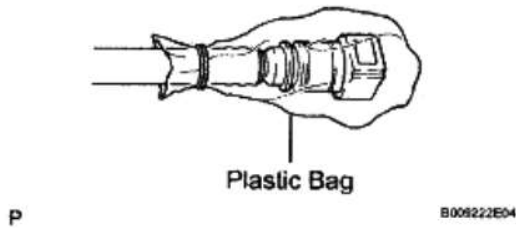


Fig. 15: Covering Pipe And Connector With Plastic Bag
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Perform the following procedure when connecting a fuel tube connector (Quick Type A):
1. Check if there is any damage or foreign objects on the connecting parts of the pipes.
 2. Line up the 2 parts of the pipes to be connected, and push them together until the connector makes a "click" sound. If the pipe is difficult to push into the connector, apply a small amount of clean engine oil to the tip of the pipe and reinsert it.
 3. After connecting the pipes, check that the pipe and connector are securely connected by pulling on them.
 4. Inspect for fuel leaks.
 5. Install the No. 1 fuel pipe clamp.

Quick Type A

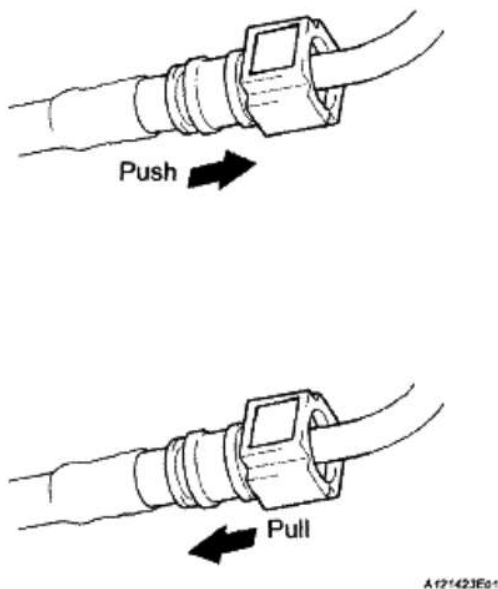


Fig. 16: Connecting Fuel Tube Connector (Quick Type A)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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- f. Perform the following procedure when disconnecting the fuel tube connector (Quick type B):
1. Before disconnecting the connector, clean off any dirt that may be present.
 2. Pinch the tabs of the fuel tube retainer to disengage the 2 claws. Push the retainer down as shown in the illustration.

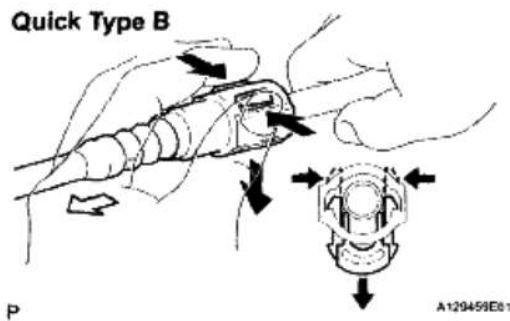


Fig. 17: Detaching Claws Of Connector Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be sure to disconnect the connector by hand.

3. If the connector and pipe are stuck, push and pull on the connector while holding the pipe by hand. Pull the 2 pipes apart to separate the connector.

NOTE: Be sure to disconnect the connector by hand.

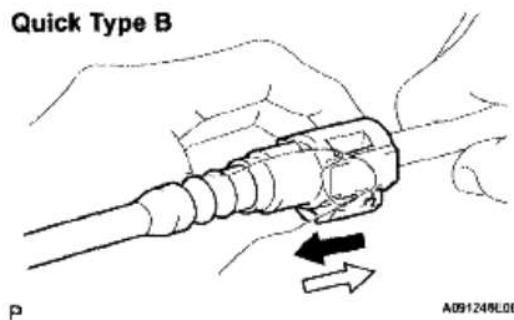


Fig. 18: Disconnecting Quick Type B Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Check if there is any dirt or other foreign objects on the sealing surfaces of the disconnected pipes. Clean the sealing surfaces if necessary.
5. Cover the disconnected pipe and connector with a plastic bag to prevent damage and contamination.

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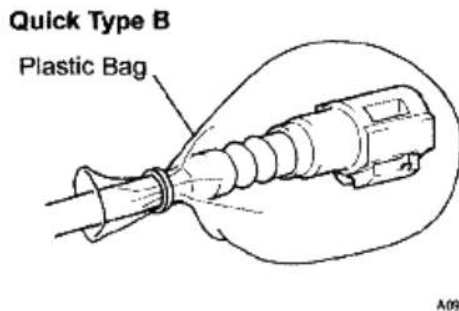


Fig. 19: Covering Connector And Pipe With Plastic Bag (Quick Type B)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Perform the following procedure when connecting a fuel tube connector (Quick Type B):
1. Line up the 2 parts of the pipes to be connected, and fully push the fuel tube connector and pipe together until they are fully seated. Next, push the retainer into the connector until its claws lock. If the pipe is difficult to push into the connector, apply a small amount of clean engine oil to the tip of the pipe and reinsert it.

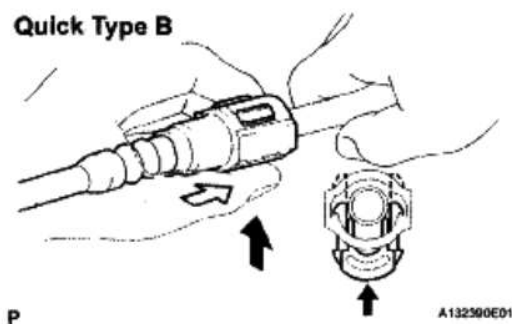


Fig. 20: Connecting Fuel Tube Connector (Quick Type B)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. After connecting the pipes, check that the pipe and connector are securely connected by pulling on them.
 3. Inspect for fuel leaks.
- h. Observe the following precautions when handling a nylon tube:

CAUTION:

- Do not twist the connector part of the nylon tube or the quick connector when connecting them.
- Do not bend or twist the nylon tube.
- Do not remove the EPDM protector on the outside of the nylon tube.
- Do not pinch or kink the nylon tubes to prevent fuel leakage.

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4. INJECTOR

- a. Install the injector to the delivery pipe and the lower intake manifold as shown in the illustration.

NOTE: Before installing the injector, be sure to apply a light coat of gasoline or spindle oil where the delivery pipe contacts the injector O-ring.

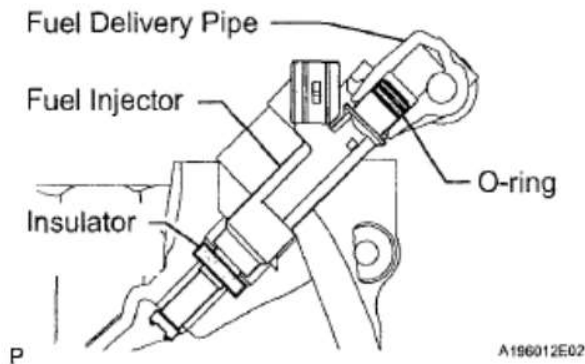


Fig. 21: Identifying Fuel Delivery Pipe, Fuel Injector, O-Ring And Insulator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Observe the following precautions when removing and installing the fuel injectors:
1. Never reuse an O-ring.
 2. When placing a new O-ring on the injector, do not damage the O-ring.
 3. Coat a new O-ring with spindle oil or gasoline before installing it.

NOTE: Do not use engine oil, gear oil or brake fluid.

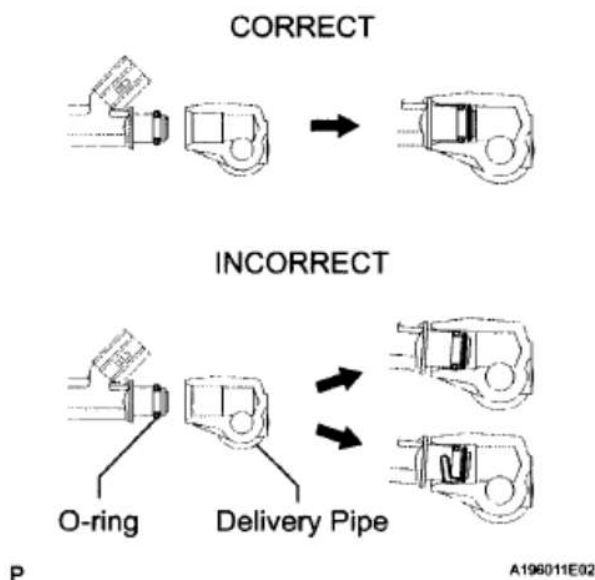


Fig. 22: Precautions For Removing And Installing Of Fuel Injectors

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

5. FUEL SUCTION TUBE ASSEMBLY WITH PUMP AND GAUGE

- a. Do not disconnect the tube shown in the illustration when disassembling the fuel suction tube assembly with pump and gauge. Doing so will cause reassembly of the fuel suction tube assembly with pump and gauge to be impossible as the tube is welded to the plate.

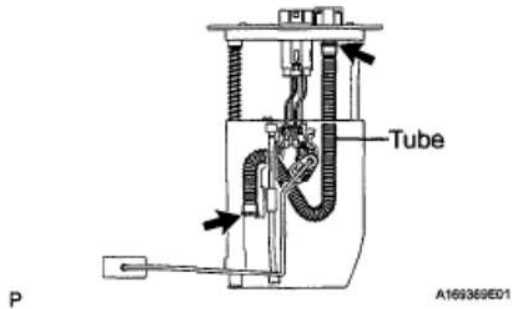


Fig. 23: Identifying Fuel Suction Tube Assembly With Pump And Gauge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

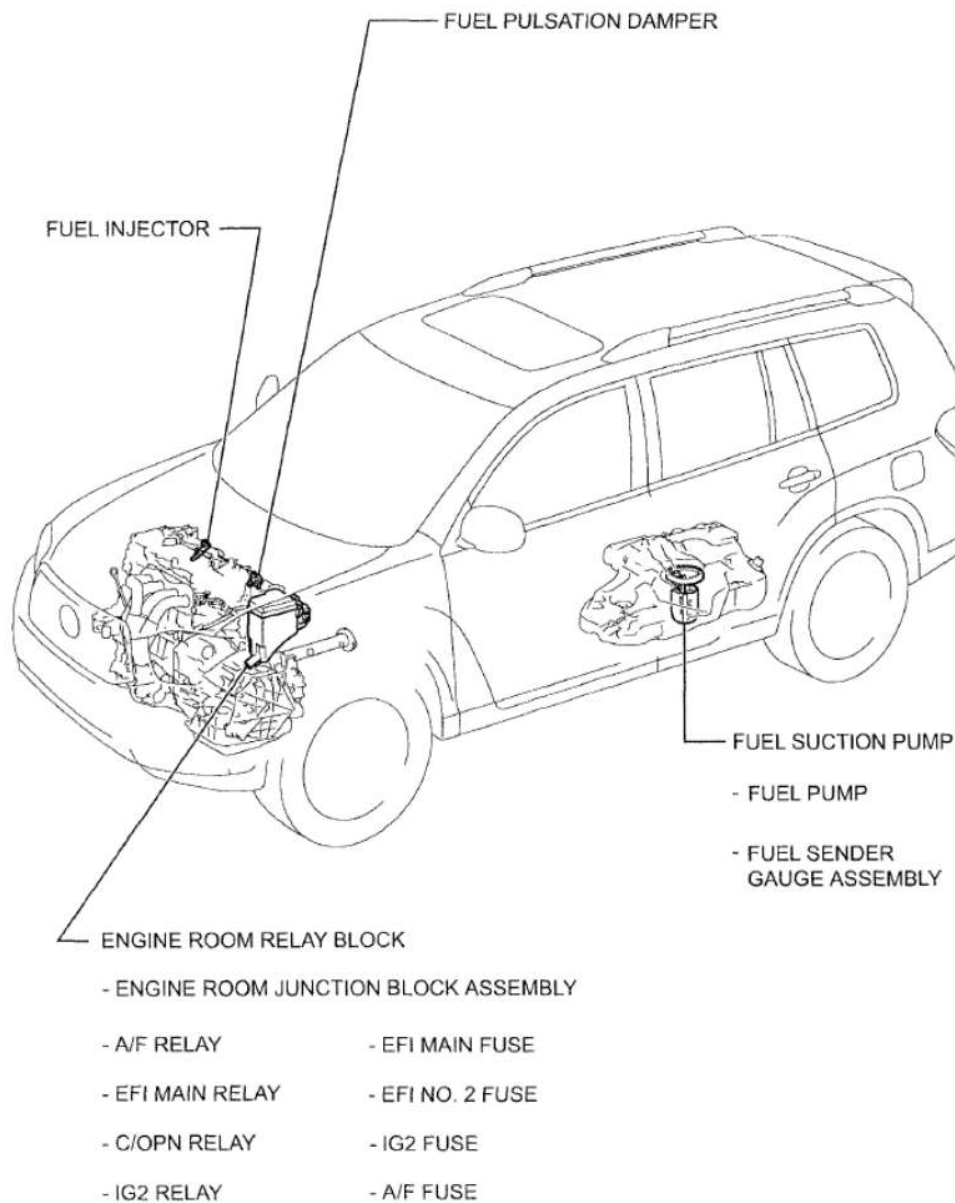
6. INSPECT FOR FUEL LEAK

- a. Check that there are no fuel leaks from the fuel system after doing any maintenance or repairs (See **ON-VEHICLE INSPECTION**).

PARTS LOCATION

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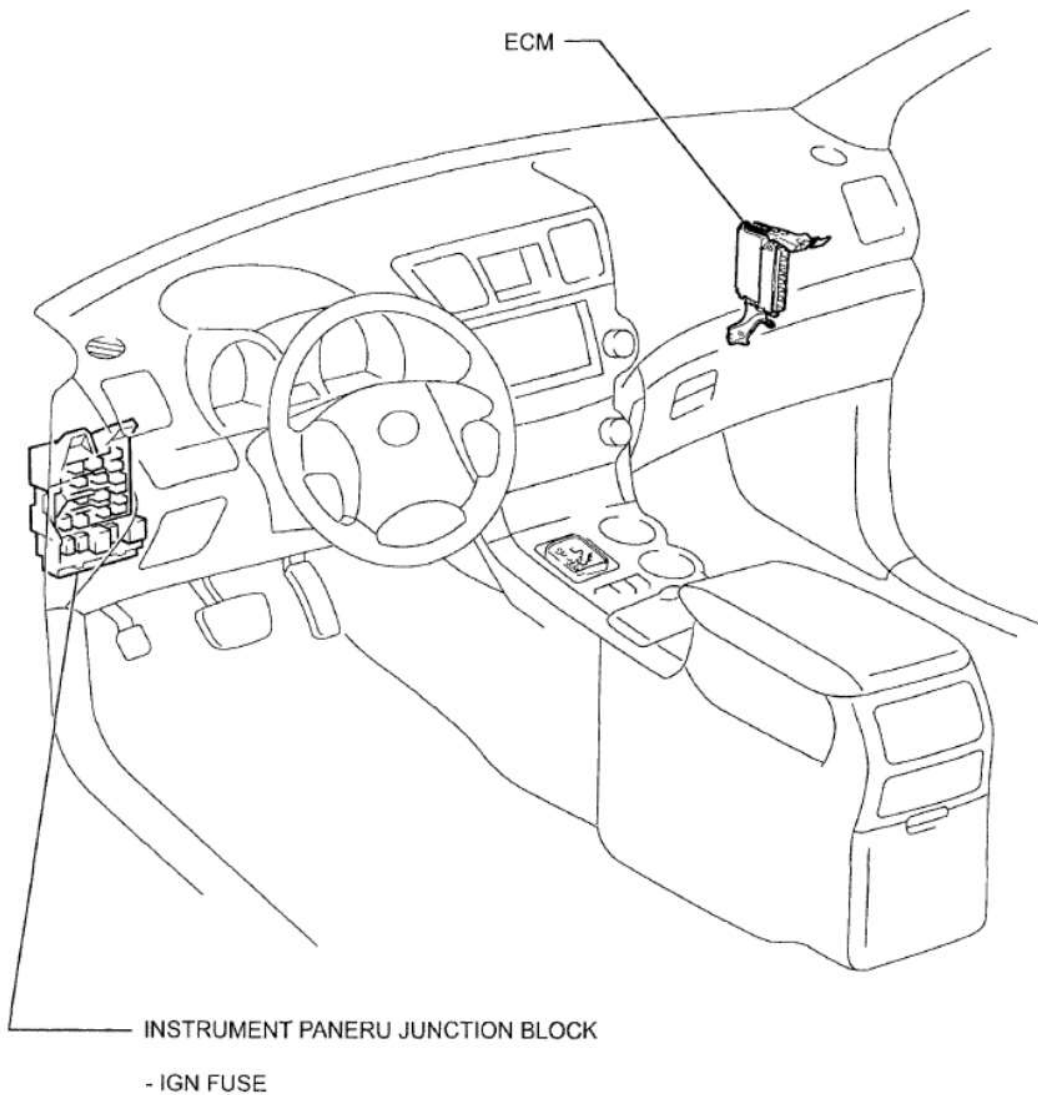
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Fig. 24: Identifying Fuel System Parts Location (1 Of 2)
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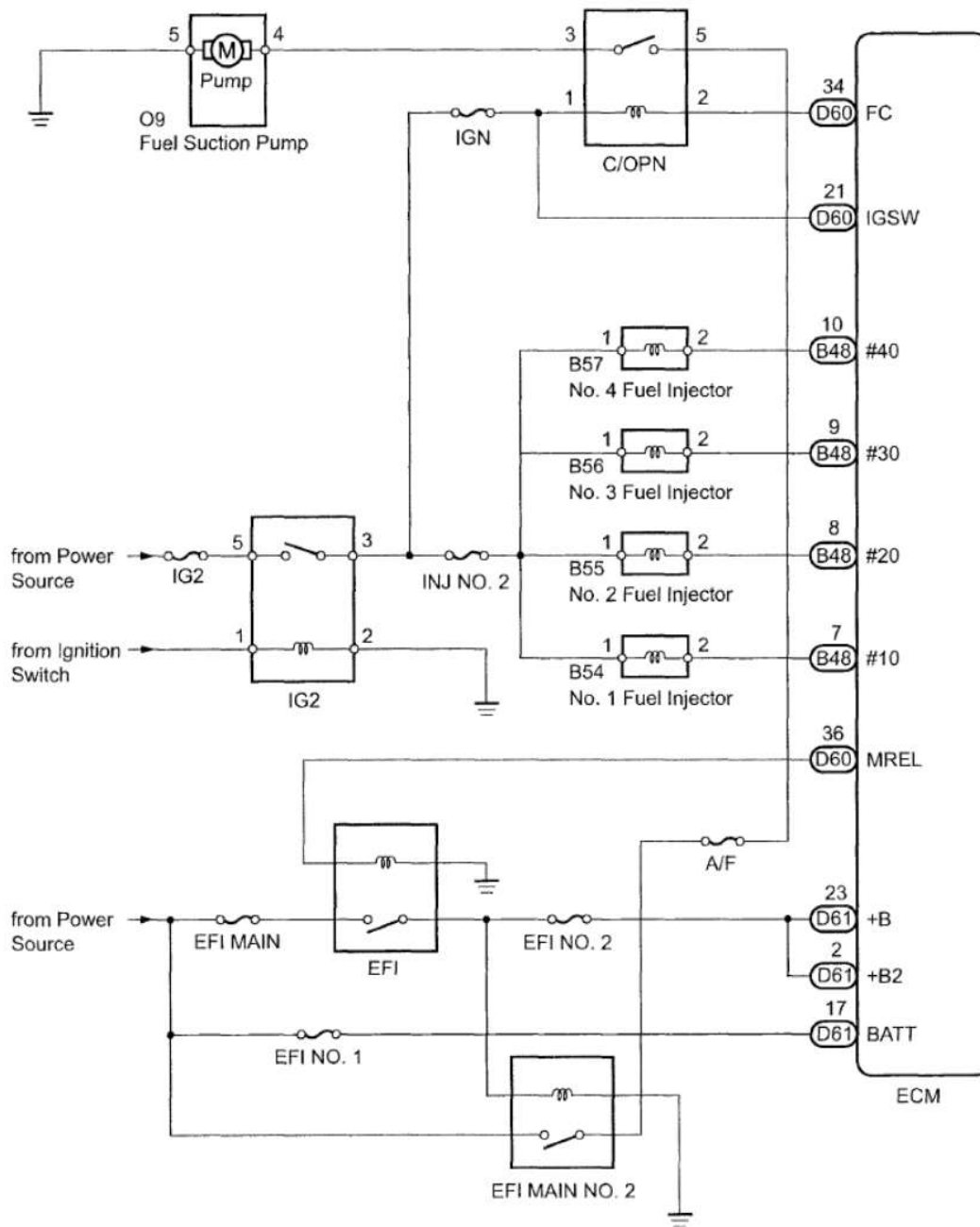
Fig. 25: Identifying Fuel System Parts Location (2 Of 2)

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

SYSTEM DIAGRAM**1. FUEL SYSTEM WIRING DIAGRAM**

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Fig. 26: Fuel System Wiring Diagram

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

ON-VEHICLE INSPECTION**1. CHECK FOR FUEL PUMP OPERATION AND INSPECT FOR FUEL LEAKS**

a. Check fuel pump operation.

1. Connect the Techstream to the DLC3.

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2. Turn the ignition switch to ON and turn the Techstream on.

NOTE: **Do not start the engine.**

3. Enter the following menus: Powertrain/Engine/Active Test/Control the Fuel Pump/Speed.
 4. Check for pressure in the fuel inlet tube from the fuel line. Check that sounds of fuel flowing from the fuel tank can be heard. If no sounds can be heard, check the integration relay, fuel pump, ECM and wiring connectors.
- b. Inspect for fuel leaks.
 1. Check that there are no fuel leaks from the fuel system after doing any maintenance or repairs. If there is a fuel leak, repair or replace parts as necessary.
 - c. Turn the ignition switch off.
 - d. Disconnect the Techstream from the DLC3.

2. CHECK FUEL PRESSURE

- a. Discharge the fuel system pressure (See **FUEL SYSTEM**).
- b. Using a voltmeter, measure the battery voltage.

Standard voltage:

11 to 14 V

- c. Disconnect the cable from the negative (-) battery terminal.

NOTE: **When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).**

- d. Disconnect the fuel hose from the fuel main tube (See **FUEL SYSTEM**).
- e. Install SST (pressure gauge) using SST and a fuel tube connector as shown in the illustration.

SST 09268-31011 (09268-41500, 90467-13001, 95336-08070), 09268-45014 (09268-41200, 09268-41220, 09268-41250)

- f. Wipe up any spilled gasoline.
- g. Connect the cable to the negative (-) battery terminal.

NOTE: **When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).**

- h. Connect the Techstream to the DLC3.
- i. Enter the following menus: Powertrain/Engine/Active Test/Control the Fuel Pump/Speed.
- j. Measure the fuel pressure.

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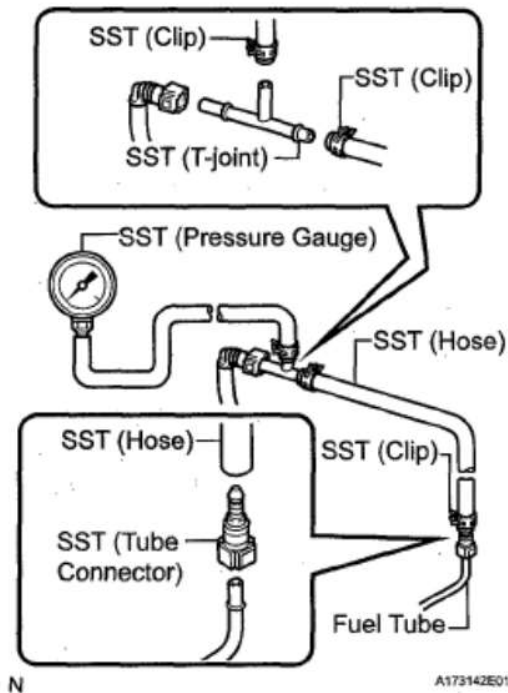


Fig. 27: Measuring Fuel Pressure

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

Standard fuel pressure:

304 to 343 kPa (3.1 to 3.5 kgf*cm² , 44 to 50 psi)

- If the fuel pressure is greater than the standard value, replace the fuel pressure regulator.
- If the fuel pressure is less than the standard value, check the fuel hoses and connections, fuel pump, fuel filter and fuel pressure regulator.

- Disconnect the Techstream from the DLC3.
- Start the engine,
- Measure the fuel pressure at idle.

Standard fuel pressure:

304 to 343 kPa (3.1 to 3.5 kgf*cm² , 44 to 50 psi)

- Stop the engine.
- Check that the fuel pressure remains as specified for 5 minutes after the engine stops.

Standard fuel pressure:

147 kPa (1.5 kgf*cm² , 21 psi) or more

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If the fuel pressure is not as specified, check the fuel pump, pressure regulator and/or fuel injectors.

- p. After checking the fuel pressure, disconnect the cable from the negative (-) battery terminal and carefully remove SST to prevent gasoline from splashing.

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

- q. Reconnect the fuel tube to the main fuel tube (fuel tube connector).
r. Install the No. 1 fuel pipe clamp to the fuel tube connector.
s. Inspect for fuel leaks.
1. Check that there are no fuel leaks from the fuel system after doing any maintenance or repairs. If there is a fuel leak, repair or replace parts as necessary.

FUEL INJECTOR

COMPONENTS

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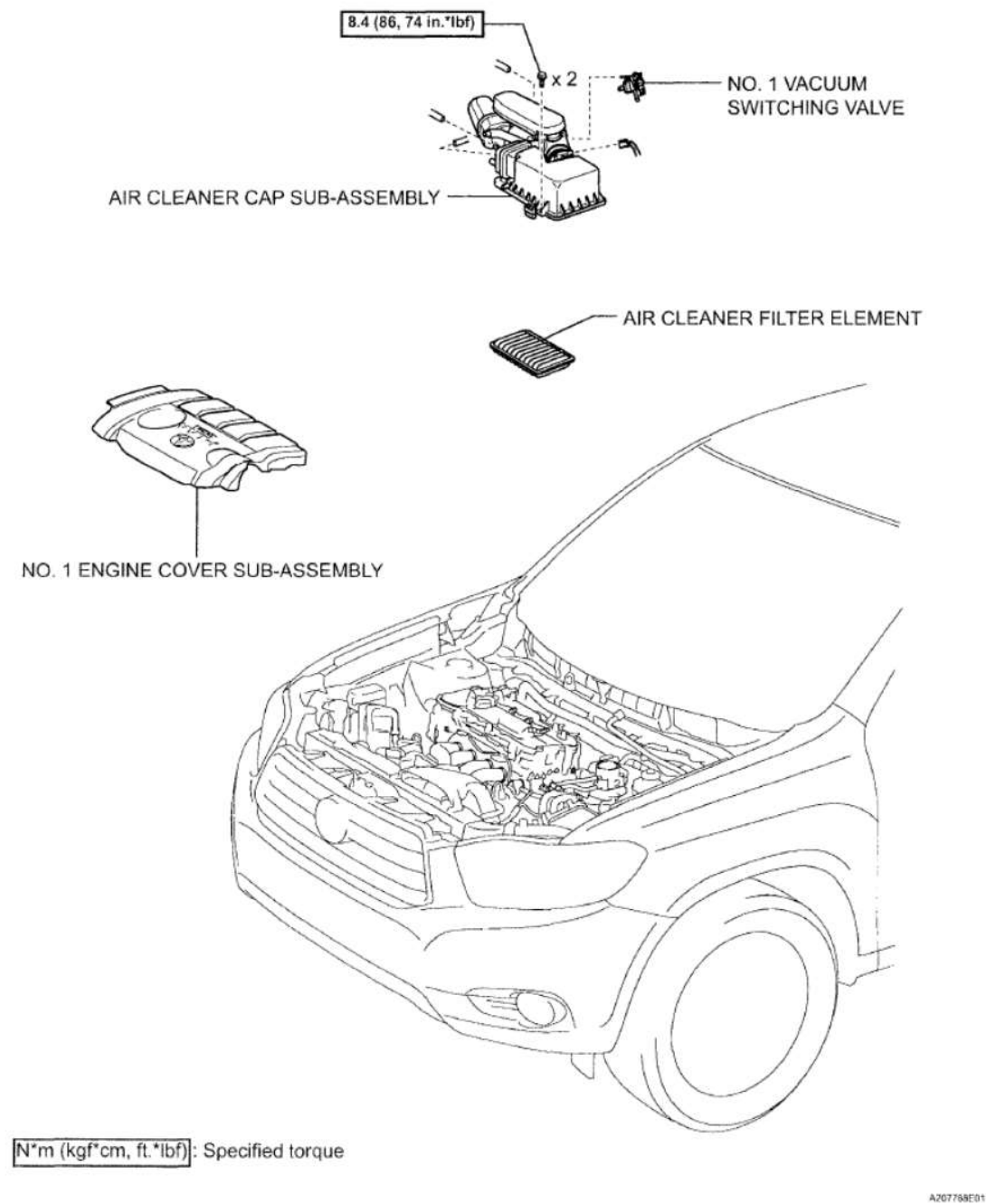


Fig. 28: Identifying Fuel Injector Components With Torque Specification (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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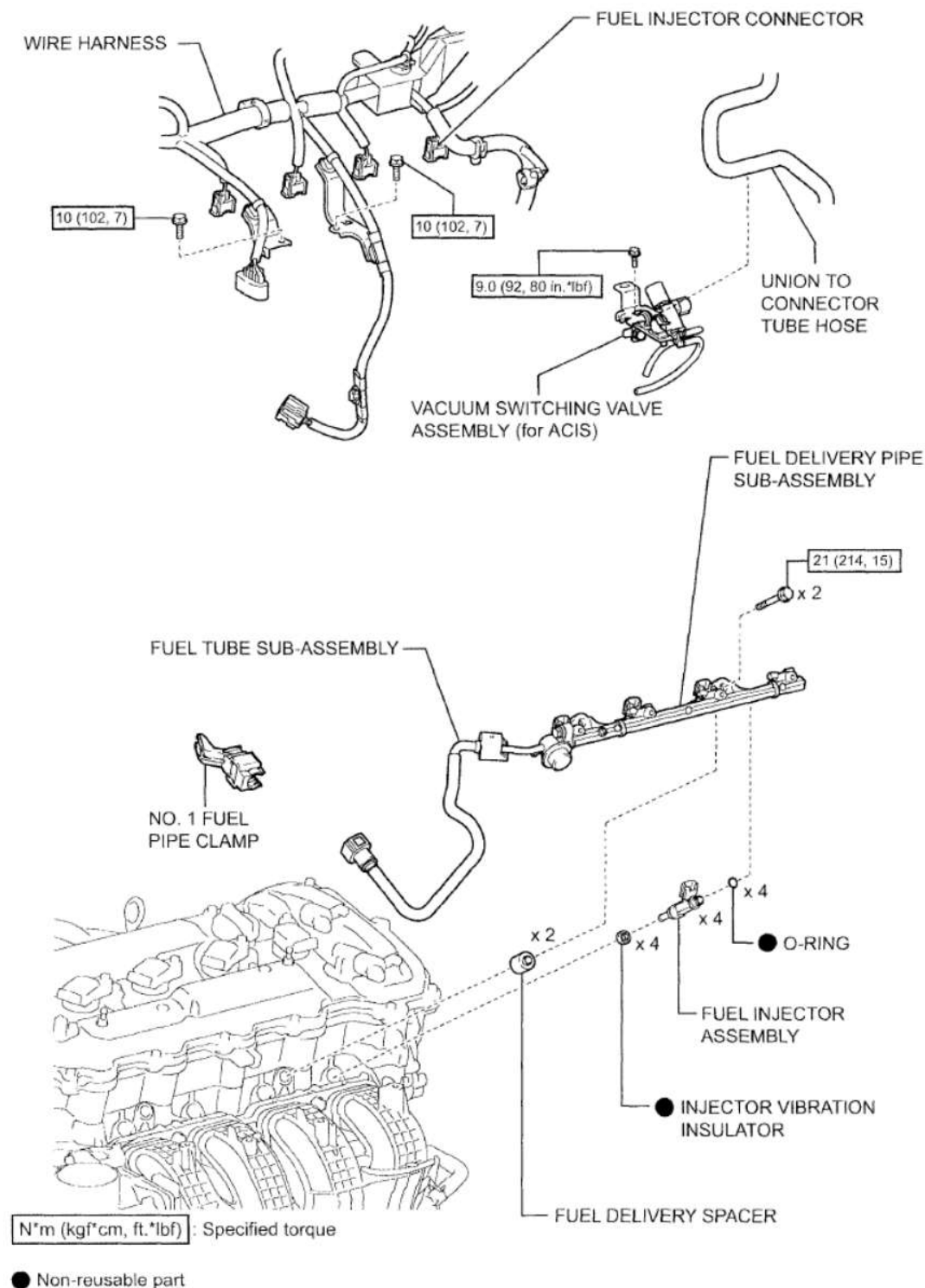


Fig. 29: Identifying Fuel Injector Components With Torque Specification (2 Of 2)
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REMOVAL

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1. DISCHARGE FUEL SYSTEM PRESSURE

- a. Discharge fuel system pressure (See **FUEL SYSTEM**).

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

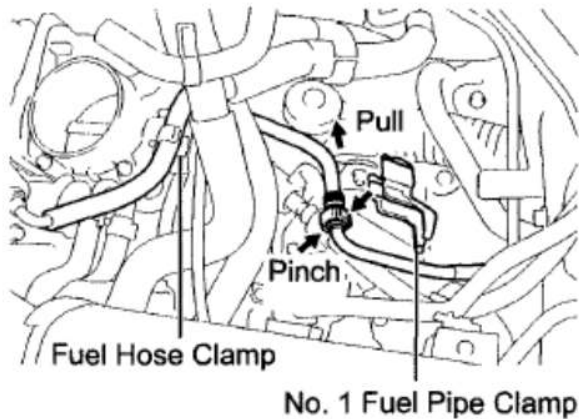
NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See **INITIALIZATION**).

3. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY (See **REMOVAL)****4. REMOVE AIR CLEANER CAP SUB-ASSEMBLY (See **REMOVAL**)****5. DISCONNECT FUEL TUBE SUB-ASSEMBLY**

- a. Remove the No. 1 fuel pipe clamp.
- b. Pinch the tube connector, and then pull the tube connector off of the pipe.
 - Check for foreign matter in the fuel tube around the fuel tube connector. Clean it if necessary. Foreign matter can affect the ability of the O-ring to seal the connector and fuel pipe.
 - Do not use any tools to separate the connector and pipe.
 - Do not forcefully bend, kink or twist the hose.
 - Keep the connector and pipe free from foreign matter.
 - If the connector and pipe are stuck together, pinch the connector and turn it carefully to disconnect it.
 - Put the connector in a plastic bag to prevent damage and contamination.
- c. Remove the fuel tube sub-assembly from the fuel hose clamp.

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Fig. 30: Pinching Tube Connector And Pulling Tube Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. DISCONNECT WIRE HARNESS

- Disconnect the 4 fuel injector connectors.
- Disconnect the 3 connectors.
- Remove the 2 bolts and 2 wire harness brackets.
- Detach the 2 clamps to disconnect the wire harness.

7. REMOVE VACUUM SWITCHING VALVE ASSEMBLY (for ACIS) (See INSPECTION)

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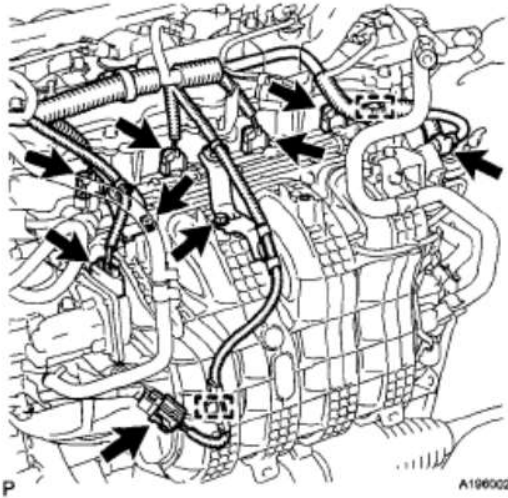


Fig. 31: Locating Fuel Injector Connectors And Wire Harness Brackets Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY

- a. Remove the 2 bolts, and then remove the fuel delivery pipe together with the 4 fuel injectors.

NOTE: Be careful not to drop the fuel injectors when removing the fuel delivery pipe.

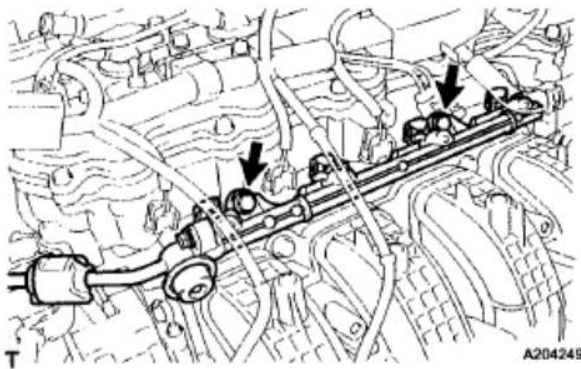


Fig. 32: Locating Fuel Delivery Pipe Sub-Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 2 fuel delivery spacers from the cylinder head.
- c. Remove the 4 injector vibration insulators from the cylinder head.

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2009 ENGINE Fuel (1AR-FE) - Highlander

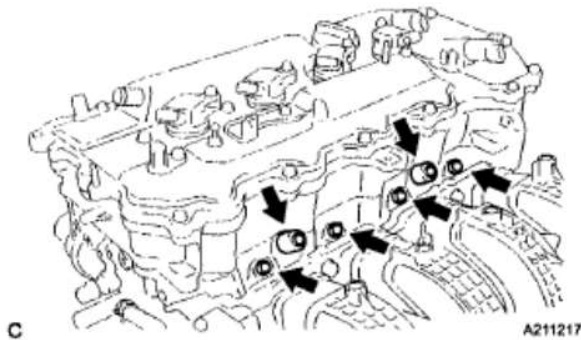


Fig. 33: Locating Fuel Delivery Spacers And Injector Vibration Insulators
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. REMOVE FUEL INJECTOR ASSEMBLY
- a. Pull the 4 fuel injectors out of the fuel delivery pipe.

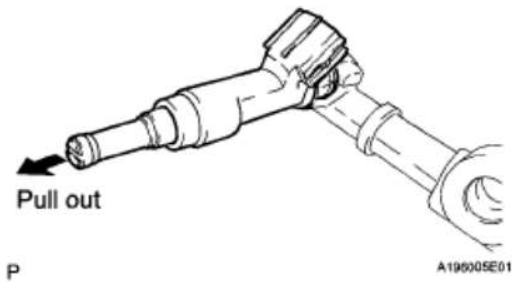


Fig. 34: Pulling Fuel Injectors Out Of Fuel Delivery Pipe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT FUEL INJECTOR ASSEMBLY
- a. Measure the resistance according to the value(s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
1 -2	20°C (68°F)	11.6 to 12.4 ohms

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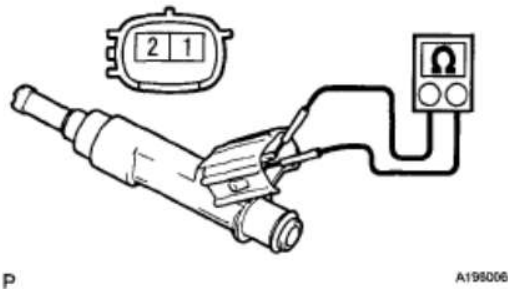


Fig. 35: Measuring Resistance Between Fuel Injector Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the result is not as specified, replace the fuel injector assembly.

- b. Inspect the injector injection.

CAUTION: Keep the injector away from sparks during the test.

1. Connect SST (fuel tube connector) to SST (hose) with SST (clip), and then connect them to the fuel pipe (vehicle side).

SST 09268-31012 (09268-41500, 90467-13001, 95336-08070)

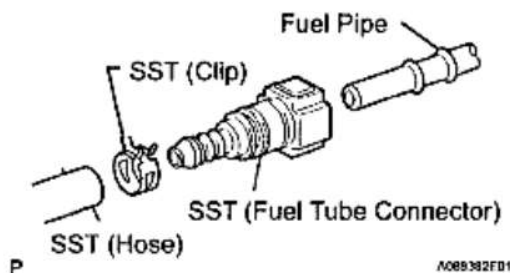


Fig. 36: Connecting SST (Fuel Tube Connector) To SST (Hose)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Install a new O-ring to the fuel injector.

SST 09268-31012 (09268-41110, 09268-41300, 90467-13001, 95336-08070), 09842-30080

3. Connect SST (adapter and hose) to the injector, and hold the injector and union with SST (clamp).

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2009 ENGINE Fuel (1AR-FE) - Highlander

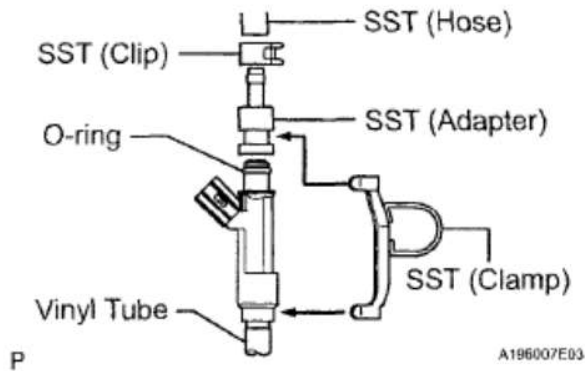


Fig. 37: Connecting SST (Adapter And Hose) To Injector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Install a vinyl tube onto the injector.

CAUTION: Install a suitable vinyl tube onto the injector to contain any gasoline spray.

5. Put the injector into the graduated cylinder.
6. Operate the fuel pump.
7. Connect SST (wire) to the injector and the battery for 15 seconds, and measure the injection volume with the graduated cylinder. Test each injector 2 or 3 times.

SST 09842-30080

Standard injection volume:

88 to 106 cm³ (5.4 to 6.5 cu in.) per 15 seconds

Standard difference between each injector:

18 cm³ (1.1 cu in.) or less

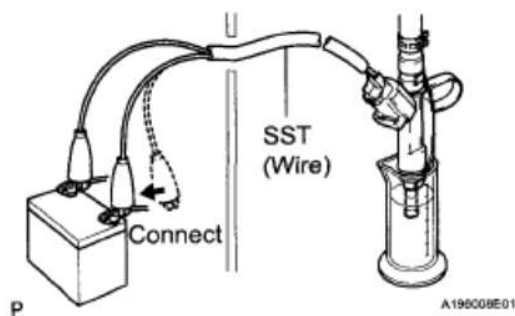


Fig. 38: Measuring Injection Volume Of Injector

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

If the result is not as specified, replace the fuel injector assembly.

c. Check for fuel drop.

1. In the condition above, disconnect the tester probes of SST (wire) from the battery and check for fuel drop from the injector.

Standard fuel drop:

1 drop or less per 20 minutes

If fuel drop is not as specified, replace the fuel injector assembly.

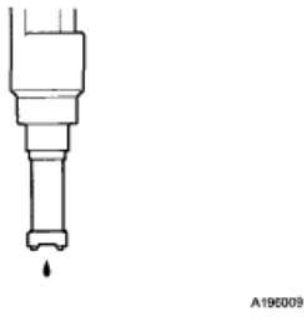


Fig. 39: Checking For Fuel Drop

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

INSTALLATION

1. INSTALL FUEL INJECTOR ASSEMBLY

- a. Apply a light coat of gasoline or spindle oil to new O-rings, and then install one onto each fuel injector.

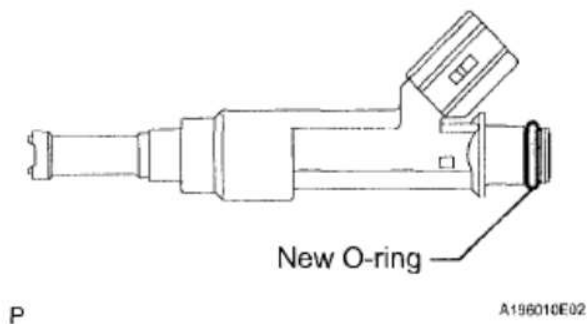


Fig. 40: Identifying Fuel Injector O-Rings

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

- b. Apply a light coat of gasoline or spindle oil to the part of the fuel delivery pipe which comes into

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contact with the O-ring of the fuel injector.

- c. Apply a light coat of gasoline or spindle oil to the O-ring again, and then install the fuel injectors onto the fuel delivery pipe.

NOTE: Make sure that the O-ring is not cracked or jammed when installing the injector.

- d. Check that the fuel injector rotates smoothly. If the fuel injector does not rotate, replace the O-ring.

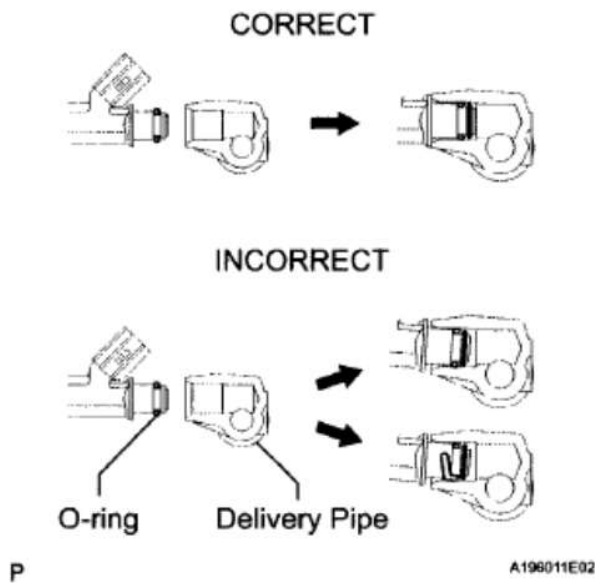


Fig. 41: Identifying Fuel Delivery Pipe And O-Ring Correct And Incorrect Installation Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY

- a. Install 4 new injector vibration insulators to the cylinder head.

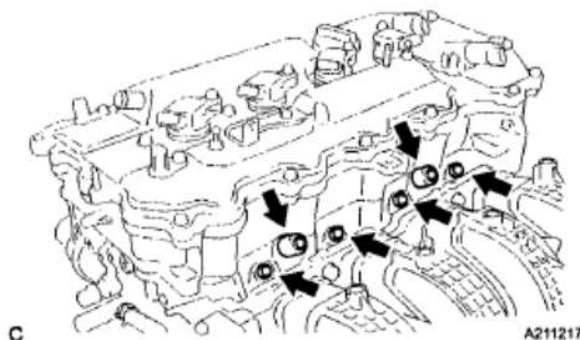


Fig. 42: Locating Fuel Delivery Spacers And Injector Vibration Insulators
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

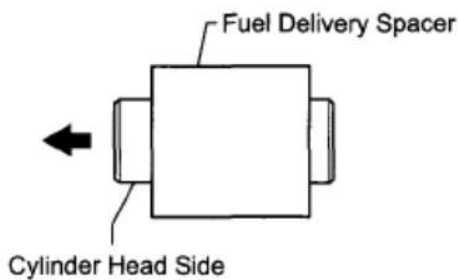
2009 Toyota Highlander Limited

2009 ENGINE Fuel (1AR-FE) - Highlander

- b. Install the 2 fuel delivery spacers onto the cylinder head.

HINT:

Install the fuel delivery spacer so that the longer protrusion is on the cylinder head side.



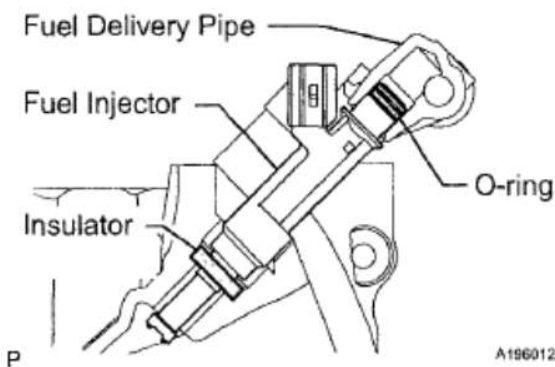
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Fig. 43: Installing Fuel Delivery Spacers Onto Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the fuel delivery pipe together with the 4 fuel injectors to the cylinder head, and then temporarily install the 2 bolts.

NOTE: Be careful not to drop the fuel injectors when installing the fuel delivery pipe.

- d. Check that the fuel injector rotates smoothly. If the fuel injector does not rotate, replace the O-ring.



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Fig. 44: Identifying Fuel Delivery Pipe, Fuel Injector, O-Ring And Insulator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Tighten the 2 bolts to the specified torque.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

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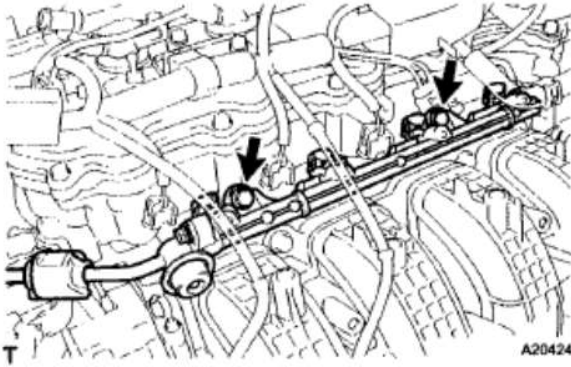


Fig. 45: Locating Fuel Delivery Pipe Sub-Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. CONNECT WIRE HARNESS

- a. Install the 2 wire harness brackets with the 2 bolts.

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

- b. Connect the 3 connectors.
- c. Connect the 4 fuel injector connectors.
- d. Attach the 2 clamps to connect the wire harness.

4. INSTALL VACUUM SWITCHING VALVE ASSEMBLY (for ACIS) (See INSTALLATION)

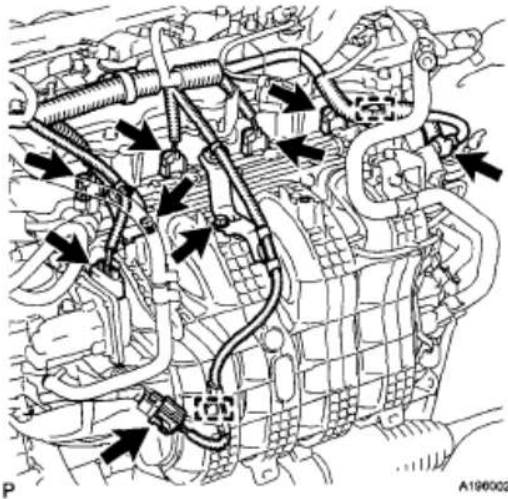


Fig. 46: Locating Fuel Injector Connectors And Wire Harness Brackets Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. CONNECT FUEL TUBE SUB-ASSEMBLY

- a. Push the tube connector to the pipe until the tube connector makes a "click" sound.

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NOTE:

- Before connecting the connector and fuel pipe, check that there is no damage or foreign matter on the connecting part of the fuel pipe.
- After connecting the fuel tube connector and pipe, check that they are securely connected by trying to pull them apart.

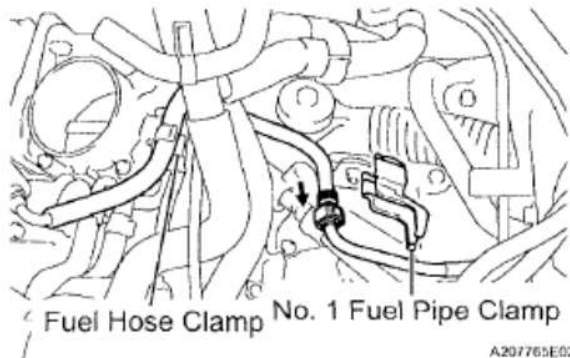


Fig. 47: Identifying No. 1 Fuel Pipe Clamp And Fuel Hose Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Install the No. 1 fuel pipe clamp.
 - Install the fuel tube sub-assembly to the fuel hose clamp.
- INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See INTAKE MANIFOLD)
 - INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** (See INSTALLATION)
 - CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

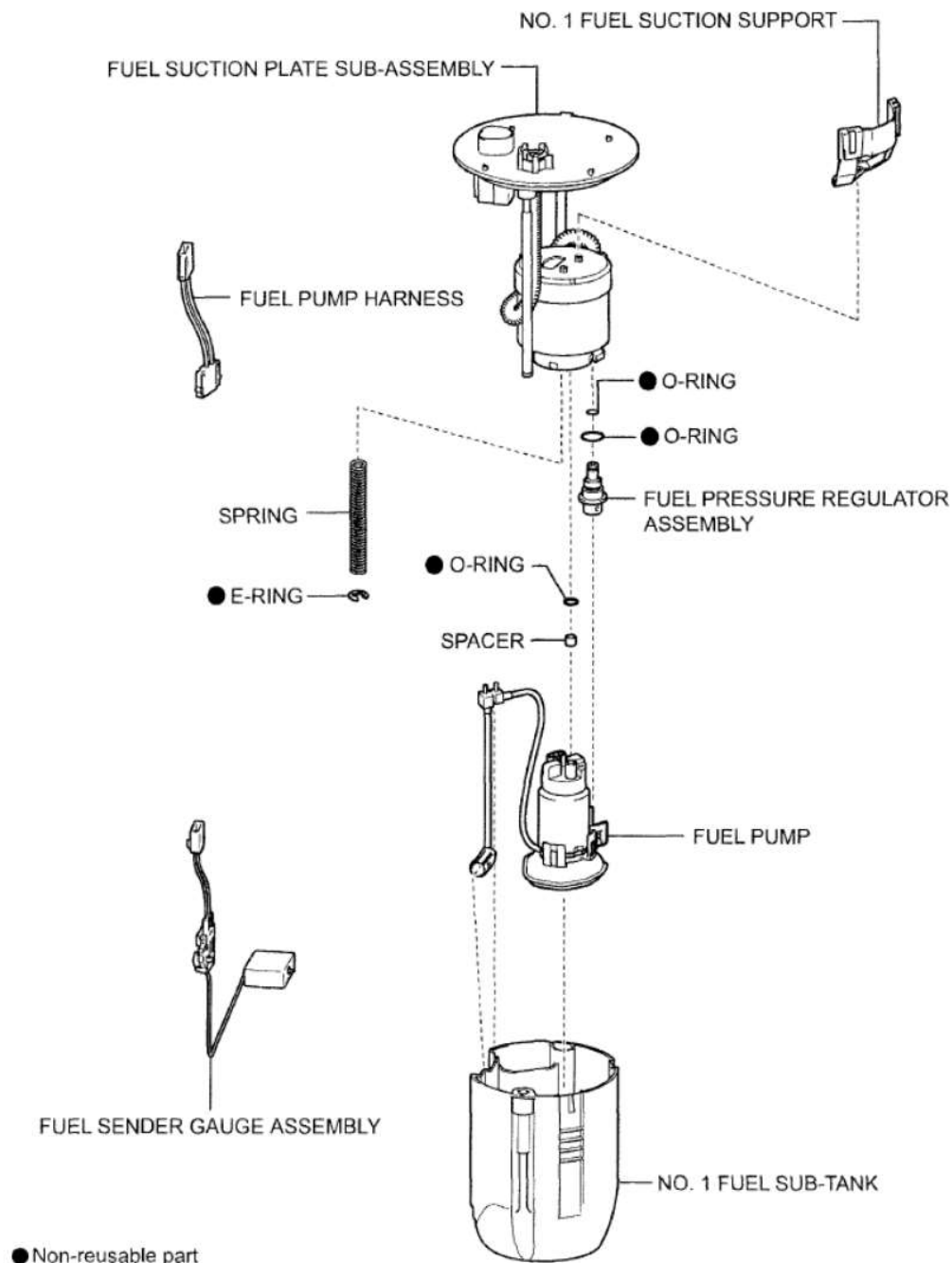
- INSPECT FOR FUEL LEAK** (See ON-VEHICLE INSPECTION)

FUEL PRESSURE REGULATOR

COMPONENTS

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Fig. 48: Identifying Fuel Pressure Regulator Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

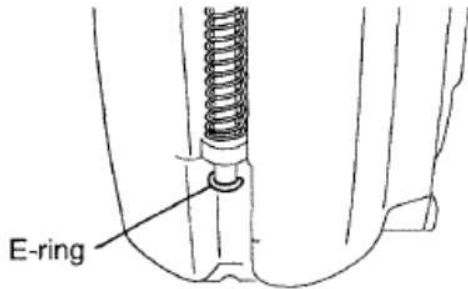
REMOVAL

1. **REMOVE FUEL SUCTION TUBE ASSEMBLY WITH PUMP AND GAUGE**
 - a. Remove fuel suction tube assembly with pump and gauge (See **REMOVAL**).

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2. **REMOVE FUEL SENDER GAUGE ASSEMBLY** (See **REMOVAL**)
3. **REMOVE FUEL SUCTION PLATE SUB-ASSEMBLY**
 - a. Using needle nozzle pliers, remove the E-ring.

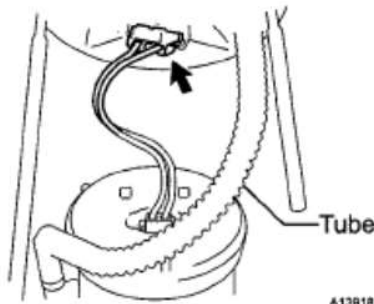


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Fig. 49: Identifying E-Ring

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

- b. Disconnect the fuel pump harness connector.



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Fig. 50: Locating Fuel Pump Harness Connector

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

NOTE: Do not disconnect the tube shown in the illustration when disassembling the fuel suction tube assembly with pump and gauge. Doing so will cause reassembly of the fuel suction tube assembly with pump and gauge to be impossible as the tube is welded to the plate.

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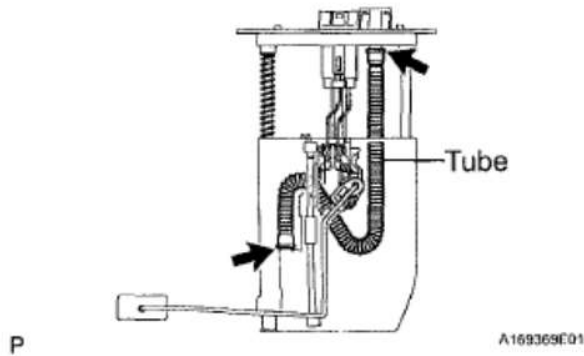


Fig. 51: Identifying Fuel Suction Tube Assembly With Pump And Gauge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Disengage the 2 claws of the No. 1 fuel suction support and remove the fuel suction plate with the fuel filter from the No. 1 fuel sub-tank.
- d. Remove the spring from the fuel suction plate.

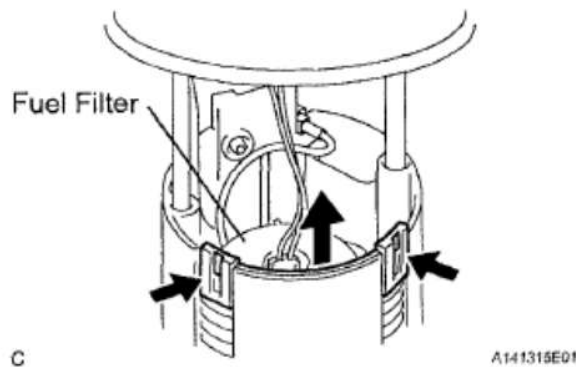


Fig. 52: Removing Fuel Suction Plate With Fuel Filter From No. 1 Fuel Sub-Tank
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Disengage the claw of the jet pump nozzle.
- f. Separate the fuel pump filter hose.

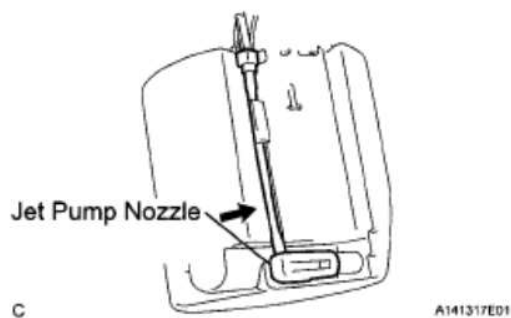


Fig. 53: Identifying Jet Pump Nozzle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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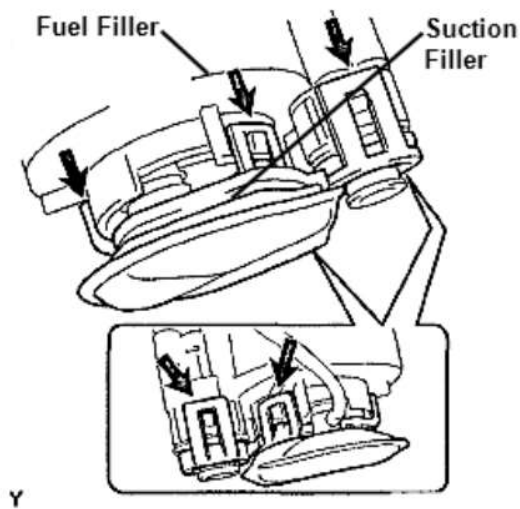
2009 ENGINE Fuel (1AR-FE) - Highlander

4. REMOVE FUEL PUMP

- a. Using a screwdriver with its tip wrapped in protective tape, disengage the 5 claws on the filter and remove the fuel pump from the fuel filter.

NOTE:

- Do not damage the fuel filter.
- Do not remove the suction filter.
- Do not use either the fuel pump or the suction filter if the suction filter is removed from the fuel pump.

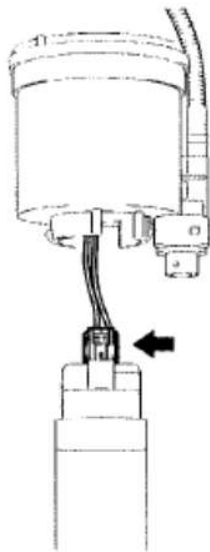
**Fig. 54: Locating Claws On Filter**

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

- b. Disconnect the fuel pump connector from the fuel pump and then remove the fuel pump harness.

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Fig. 55: Locating Fuel Pump Connector

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

- c. Remove the O-ring and spacer from the fuel pump.

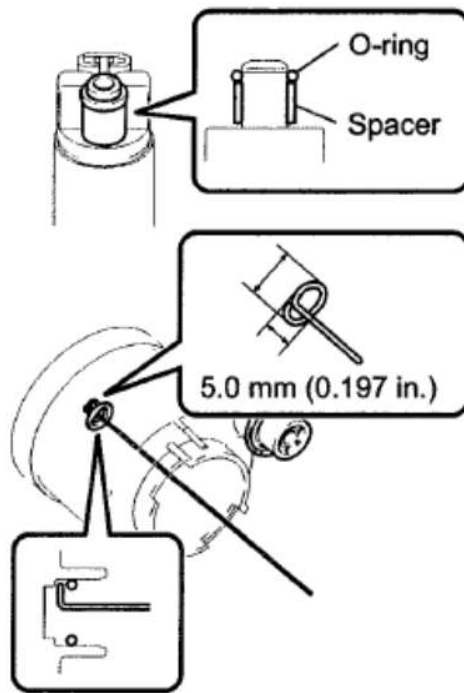
NOTE: Be careful not to damage the sealing surface.

HINT:

If the O-ring still remains in the fuel filter, remove it using a wire tip (1 mm) that is formed as shown in the illustration.

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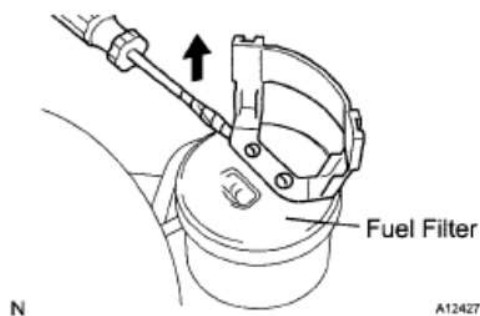
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Fig. 56: Removing O-Ring And Spacer From Fuel Pump
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE NO. 1 FUEL SUCTION SUPPORT

- Using a screwdriver with the tip taped, disengage the claw and remove the No. 1 fuel suction support.



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Fig. 57: Removing No. 1 Fuel Suction Support
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE FUEL PRESSURE REGULATOR ASSEMBLY

- Remove the fuel pressure regulator from the fuel filter.

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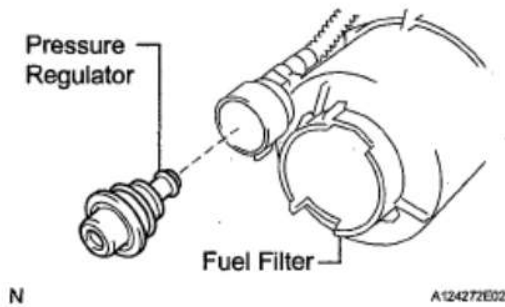


Fig. 58: Identifying Fuel Pressure Regulator And Fuel Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 2 O-rings from the fuel pressure regulator.

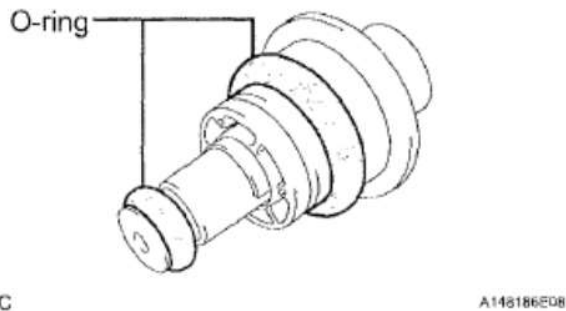


Fig. 59: Identifying Fuel Pressure Regulator O-Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL FUEL PRESSURE REGULATOR ASSEMBLY

- a. Apply a light coat of gasoline to 2 new O-rings, and install them onto the fuel pressure regulator.

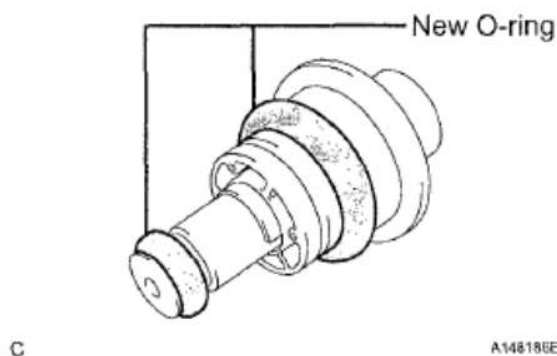


Fig. 60: Identifying Fuel Pressure Regulator O-Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the fuel pressure regulator to the fuel filter.

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2. **INSTALL NO. 1 FUEL SUCTION SUPPORT** (See INSPECTION)
3. **INSTALL FUEL PUMP** (See INSTALLATION)
4. **INSTALL FUEL PUMP HARNESS** (See INSTALLATION)

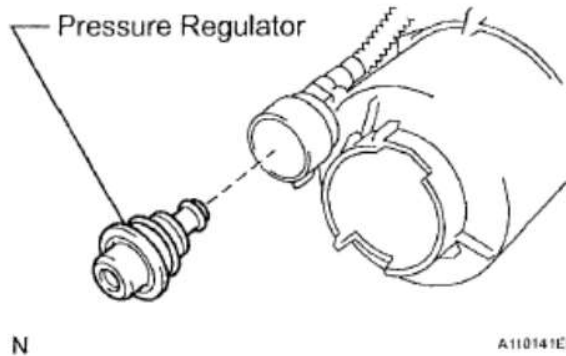


Fig. 61: Identifying Fuel Pressure Regulator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL FUEL SUCTION PLATE SUB-ASSEMBLY** (See INSTALLATION)
6. **INSTALL FUEL SENDER GAUGE ASSEMBLY** (See REMOVAL)
7. **INSTALL FUEL SUCTION TUBE ASSEMBLY WITH PUMP AND GAUGE**
 - a. Install fuel suction tube assembly with pump and gauge (See INSTALLATION).

FUEL PRESSURE PULSATION DAMPER**COMPONENTS**

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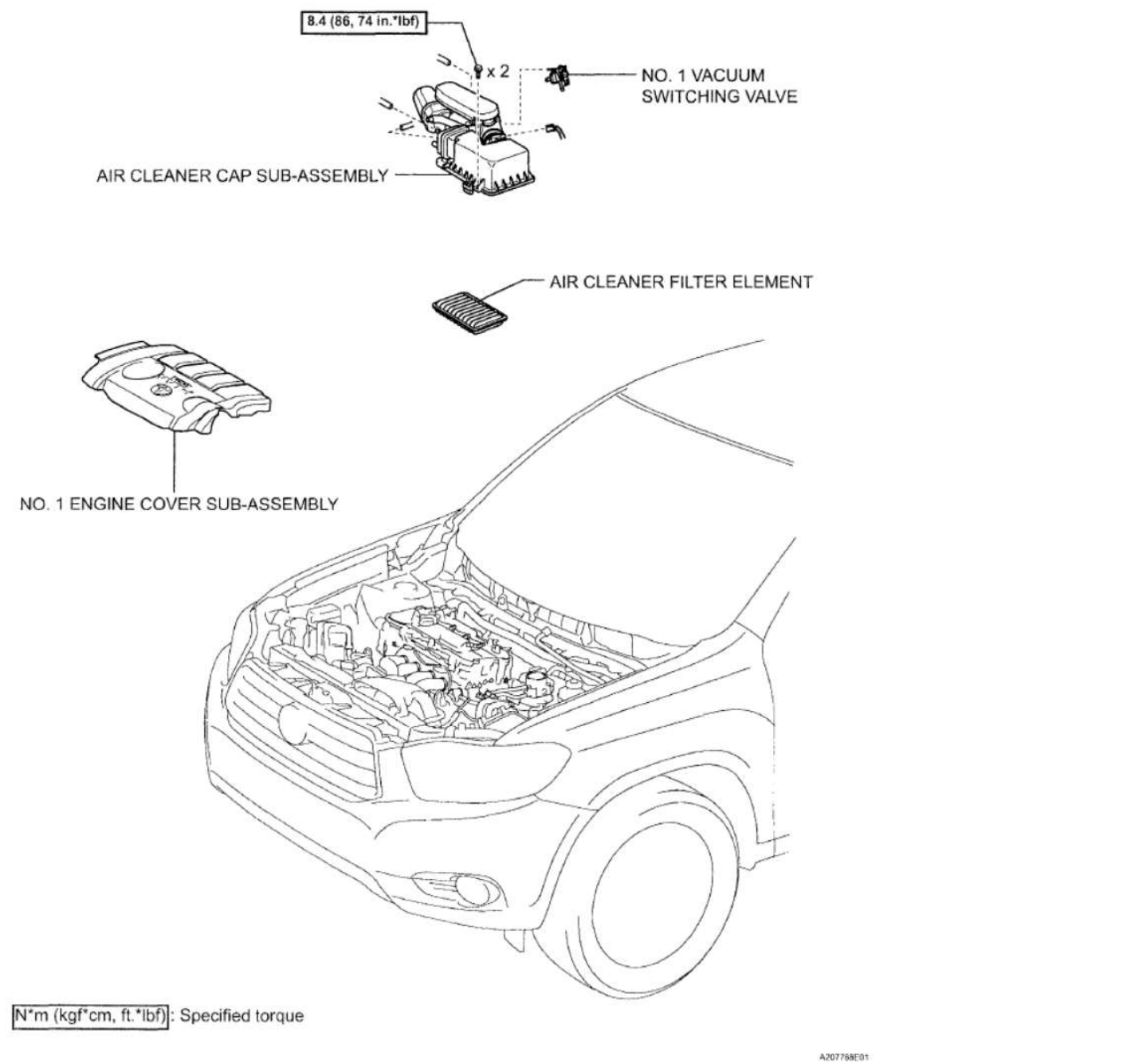


Fig. 62: Identifying Fuel Pressure Pulsation Damper Components With Torque Specification (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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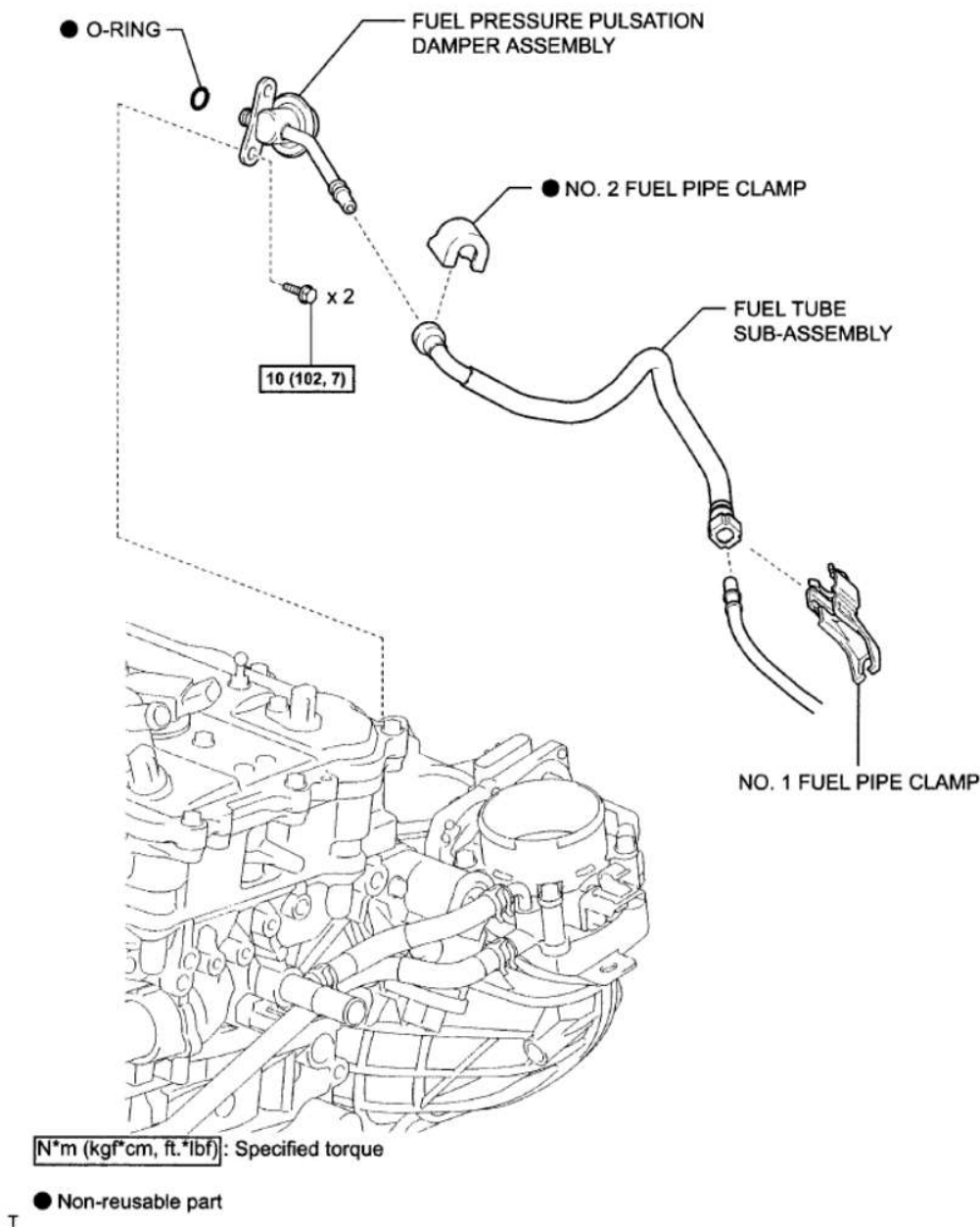


Fig. 63: Identifying Fuel Pressure Pulsation Damper Components With Torque Specification (2 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. DISCHARGE FUEL SYSTEM PRESSURE

HINT:

FUEL SYSTEM

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2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

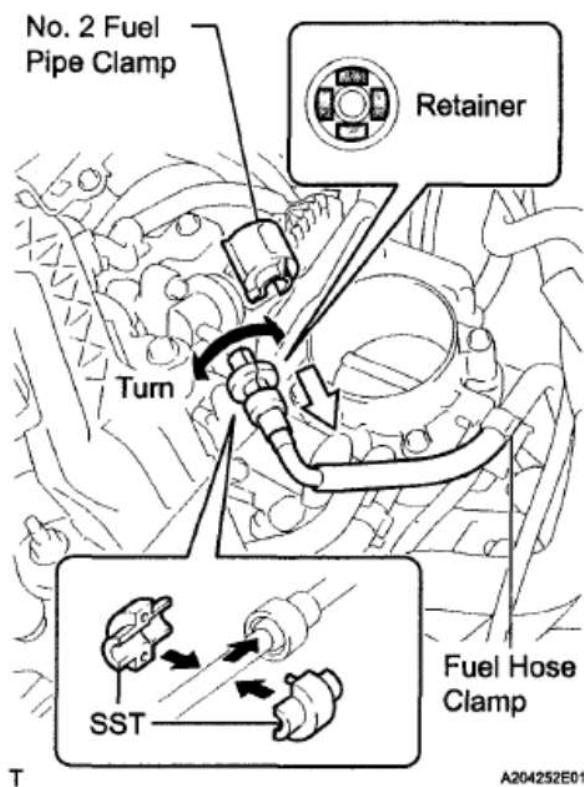
3. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY** (See REMOVAL)
4. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY** (See REMOVAL)
5. **REMOVE FUEL TUBE SUB-ASSEMBLY**

NOTE: Do not forcibly bend, kink or twist the fuel tube.

- a. Remove the fuel tube from the fuel hose clamp.
- b. Remove the No. 2 fuel pipe clamp.
- c. Wipe off any dirt on the fuel tube connector.
- d. Hold the fuel tube connector, and then install SST.

SST 09268-21010

- e. Turn SST to align the retainer inside the fuel tube connector with the chamfered part of SST.
- f. Insert SST into the fuel tube and hold it. Then push the fuel tube connector toward SST.
- g. Mount the retainer of the fuel tube connector onto the chamfered part of SST.



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Fig. 64: Disconnecting Fuel Tube

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

- h. Slide SST and the fuel tube connector together toward the fuel tube until they make a "click" sound, and then disconnect the fuel tube.

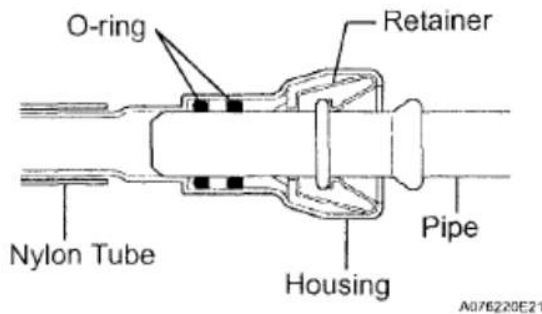


Fig. 65: Identifying O-Ring, Retainer, Nylon Tube, Pipe And Housing

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

NOTE:

- Check for foreign matter in the fuel tube around the fuel tube connector. Clean it if necessary. Foreign matter can affect the ability of the O-rings to seal the connector and fuel pipe.
- Do not use any tools to separate the connector and pipe.
- Do not forcefully bend, kink or twist the hose.
- Keep the connector and pipe free from foreign matter.
- If the connector and pipe are stuck together, pinch the connector and turn it carefully to disconnect it.
- Put the connector in a plastic bag to prevent damage and contamination.

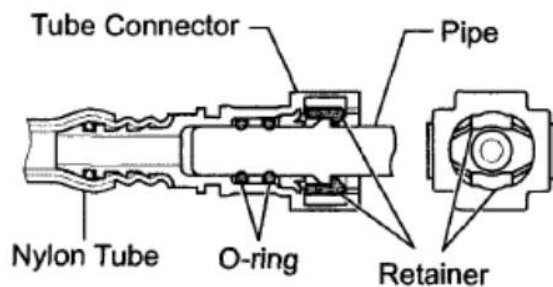
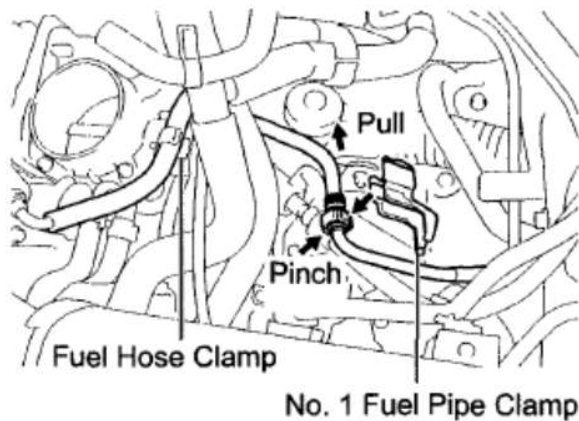
- i. Remove the No. 1 fuel pipe clamp.
- j. Pinch the tube connector, and then pull the tube connector off of the pipe.

NOTE:

- Check for foreign matter in the fuel tube around the fuel tube connector. Clean it if necessary. Foreign matter can affect the ability of the O-rings to seal the connector and fuel pipe.
- Do not use any tools to separate the connector and pipe.
- Do not forcefully bend, kink or twist the hose.
- Keep the connector and pipe free from foreign matter.
- If the connector and pipe are stuck together, pinch the connector and turn it carefully to disconnect it.
- Put the connector in a plastic bag to prevent damage and contamination.

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Fig. 66: Pinching Tube Connector And Pulling Tube Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE FUEL PRESSURE PULSATION DAMPER ASSEMBLY

- Remove the 2 bolts and fuel pressure pulsation damper.
- Remove the O-ring from the fuel pressure pulsation damper.



Fig. 67: Locating Fuel Pressure Pulsation Damper Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL FUEL PRESSURE PULSATION DAMPER ASSEMBLY

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- a. Apply a light coat of gasoline or spindle oil to a new O-ring.
- b. Install the O-ring to the fuel pressure pulsation damper.

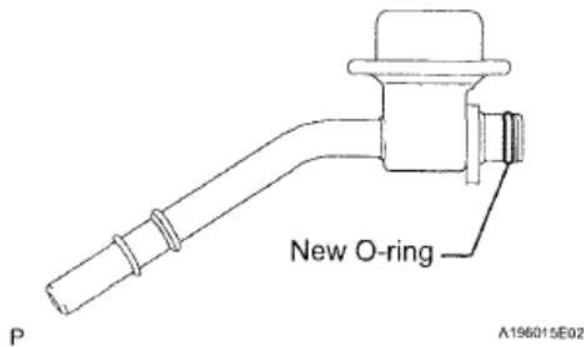


Fig. 68: Identifying Fuel Pressure Pulsation Damper O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the fuel pressure pulsation damper with the 2 bolts.

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

NOTE: Make sure that the O-ring is not cracked or jammed when installing the damper.



Fig. 69: Locating Fuel Pressure Pulsation Damper Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL FUEL TUBE SUB-ASSEMBLY

- a. Connect the fuel tube.
- b. Push the fuel tube connector until it makes a "click" sound.
- c. Install the new No. 2 fuel pipe clamp.
- d. Install the fuel tube to the fuel hose clamp.

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2009 ENGINE Fuel (1AR-FE) - Highlander

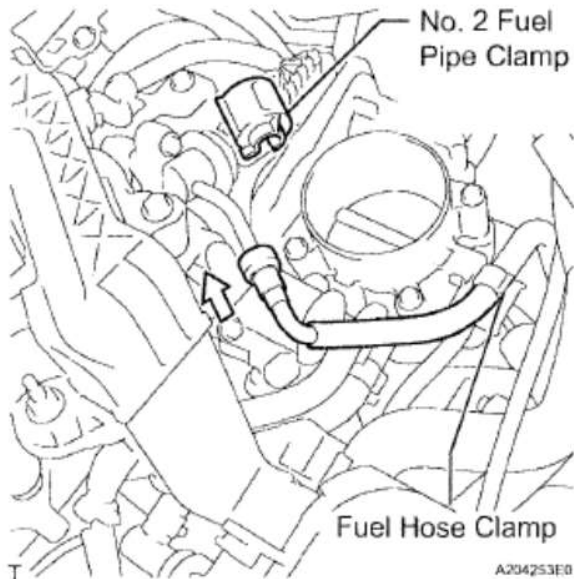


Fig. 70: Identifying No. 2 Fuel Pipe Clamp And Fuel Hose Clamp
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Push the tube connector to the pipe until the tube connector makes a "click" sound.

NOTE:

- Before connecting the connector and fuel pipe, check that there is no damage or foreign matter on the connecting part of the fuel pipe.
- After connecting the fuel tube connector and pipe, check that they are securely connected by trying to pull them apart.

- f. Install the No. 1 fuel pipe clamp.

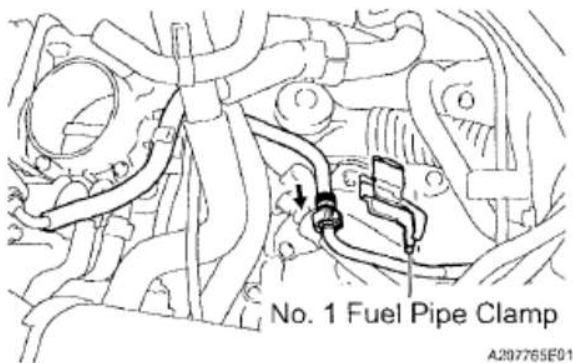


Fig. 71: Identifying No. 1 Fuel Pipe Clamp
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL AIR CLEANER CAP SUB-ASSEMBLY (See INSTALLATION)

2009 Toyota Highlander Limited

2009 ENGINE Fuel (1AR-FE) - Highlander

4. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** (See INSTALLATION)
5. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

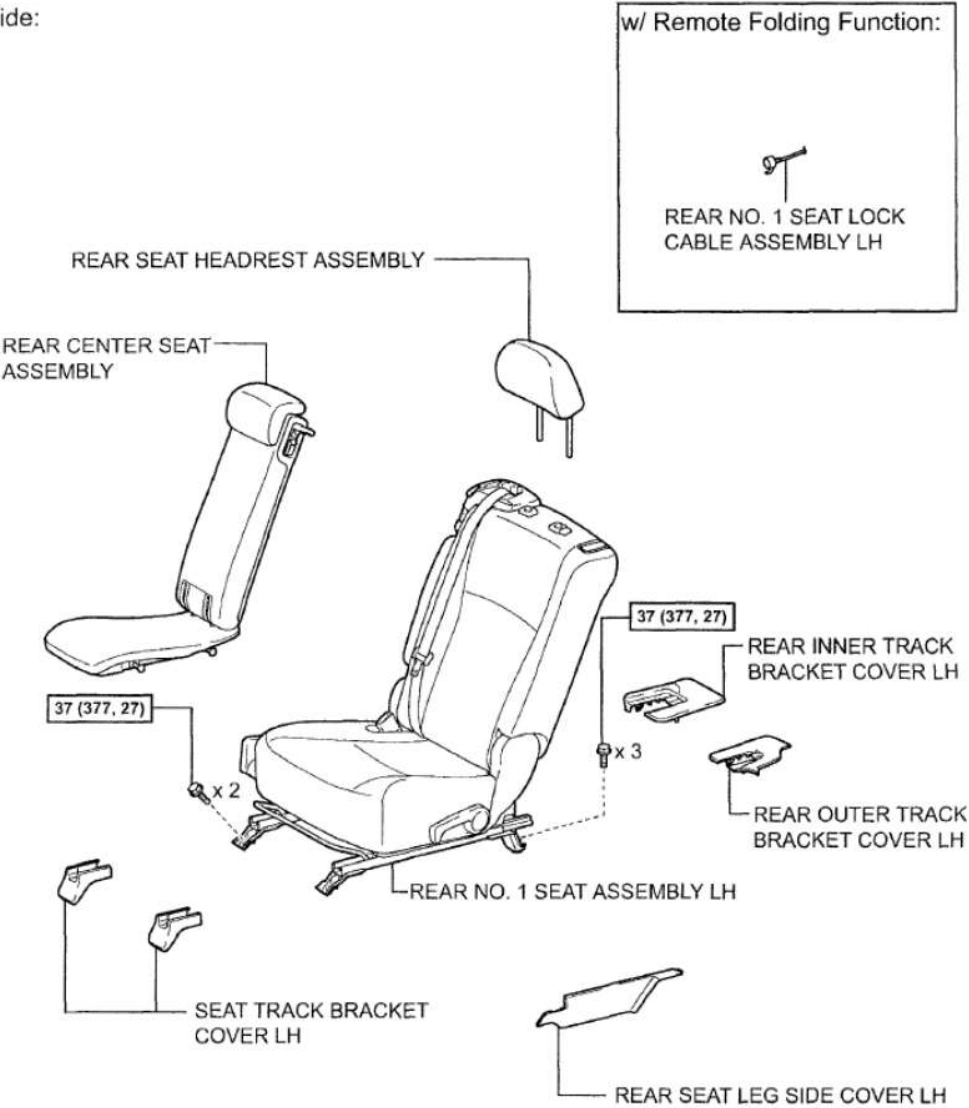
6. **INSPECT FOR FUEL LEAK** (See ON-VEHICLE INSPECTION)

FUEL PUMP**COMPONENTS**

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for LH Side:



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

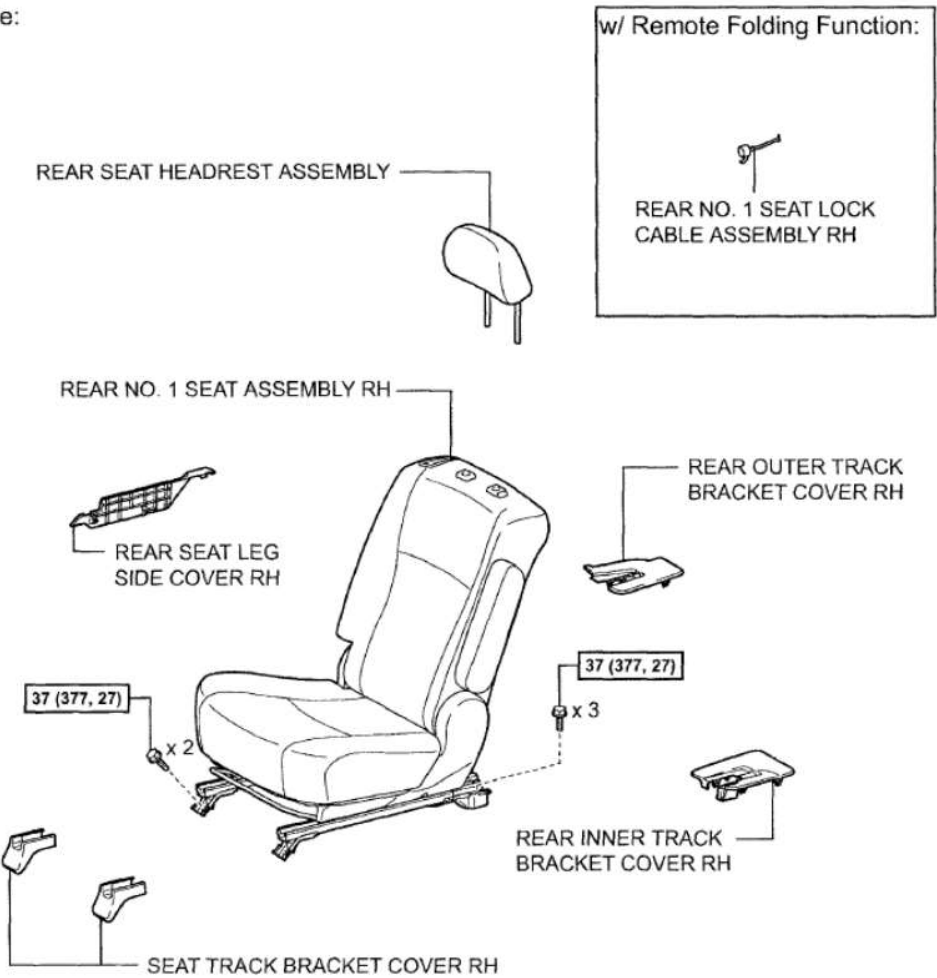
P B1726RRE16

Fig. 72: Identifying Fuel Pump Components With Torque Specification (1 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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for RH Side:

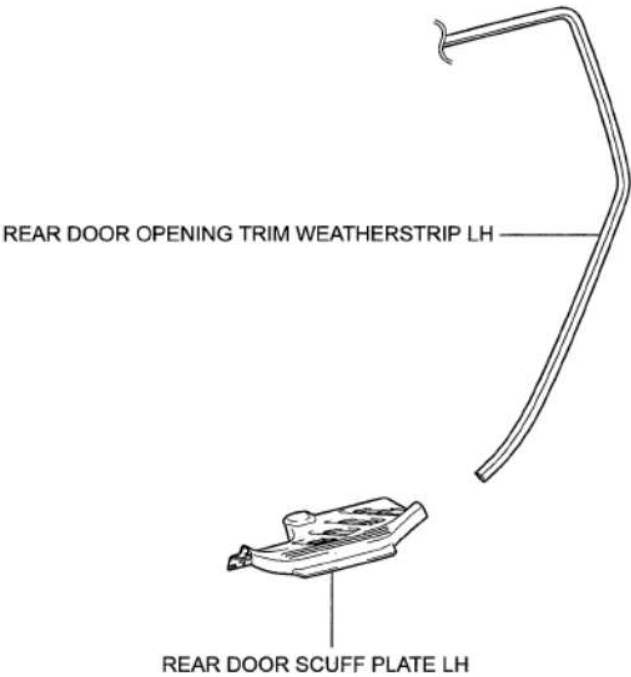


N*m (kgf*cm, ft.*lbf): Specified torque

P G172885E13

Fig. 73: Identifying Fuel Pump Components With Torque Specification (2 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2009 Toyota Highlander Limited
2009 ENGINE Fuel (1AR-FE) - Highlander



P

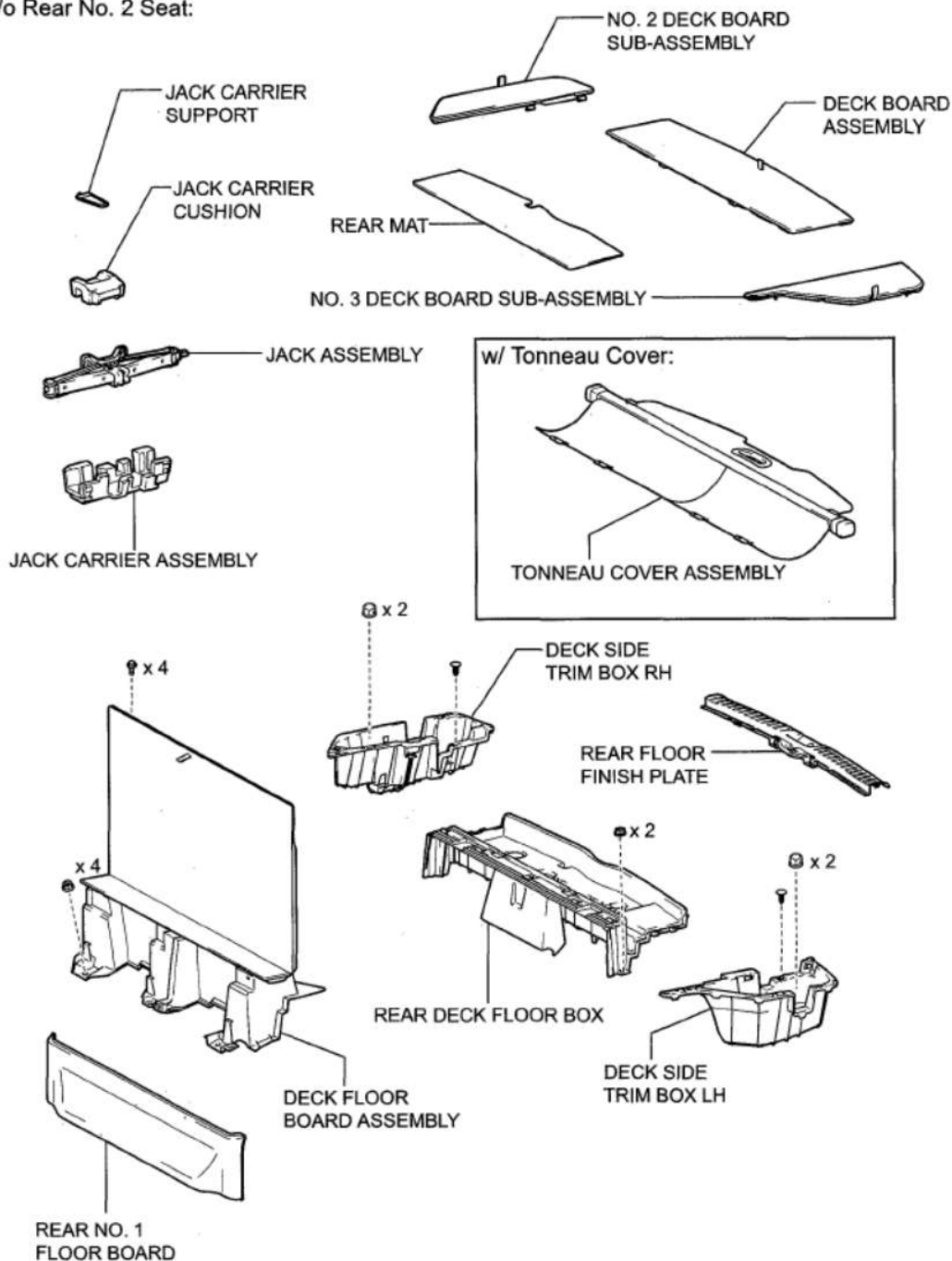
B179877E01

Fig. 74: Identifying Fuel Pump Components With Torque Specification (3 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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2009 ENGINE Fuel (1AR-FE) - Highlander

w/o Rear No. 2 Seat:



P

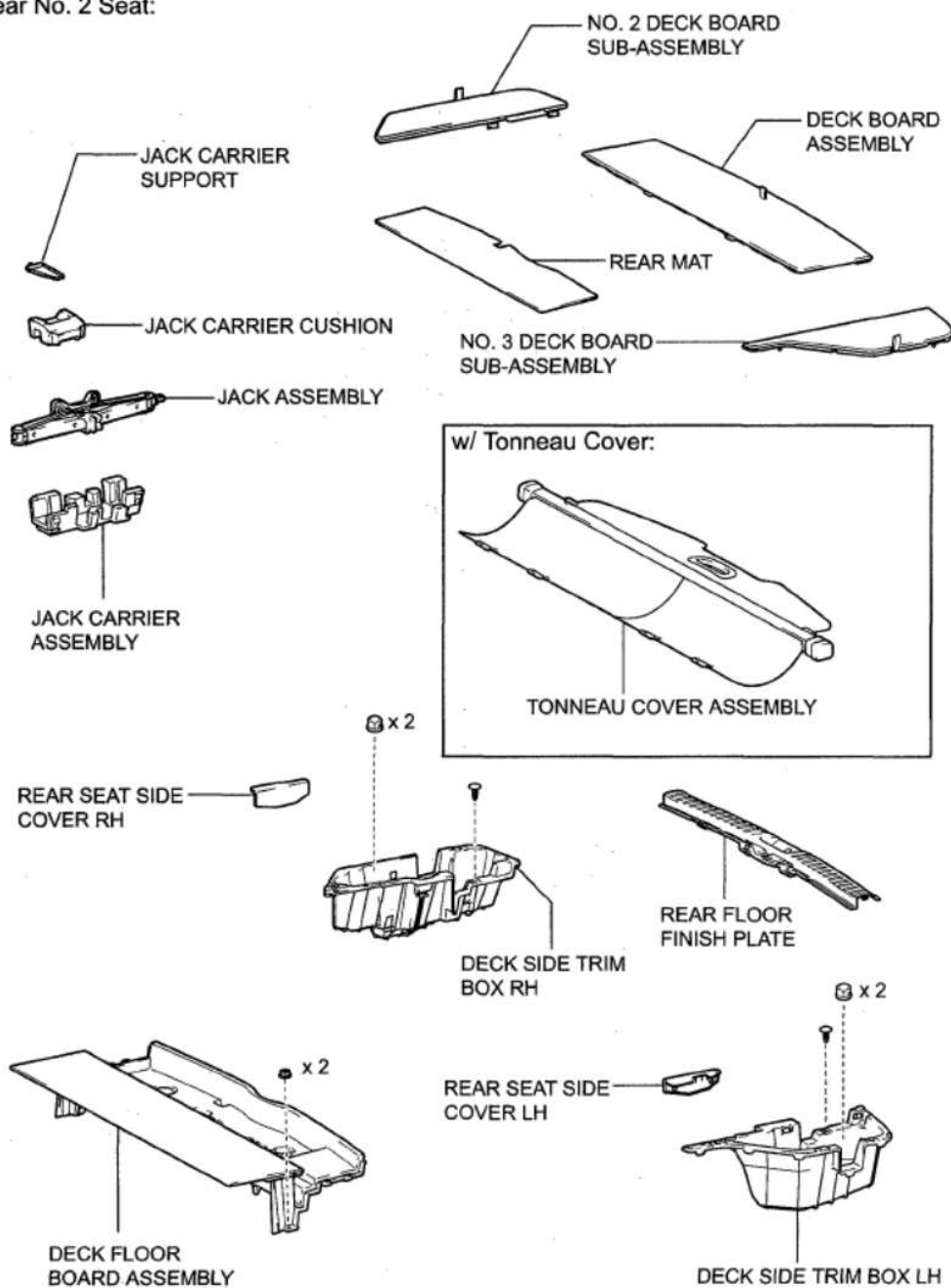
8178663E01

Fig. 75: Identifying Fuel Pump Components With Torque Specification (4 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2009 Toyota Highlander Limited

2009 ENGINE Fuel (1AR-FE) - Highlander

w/ Rear No. 2 Seat:



P

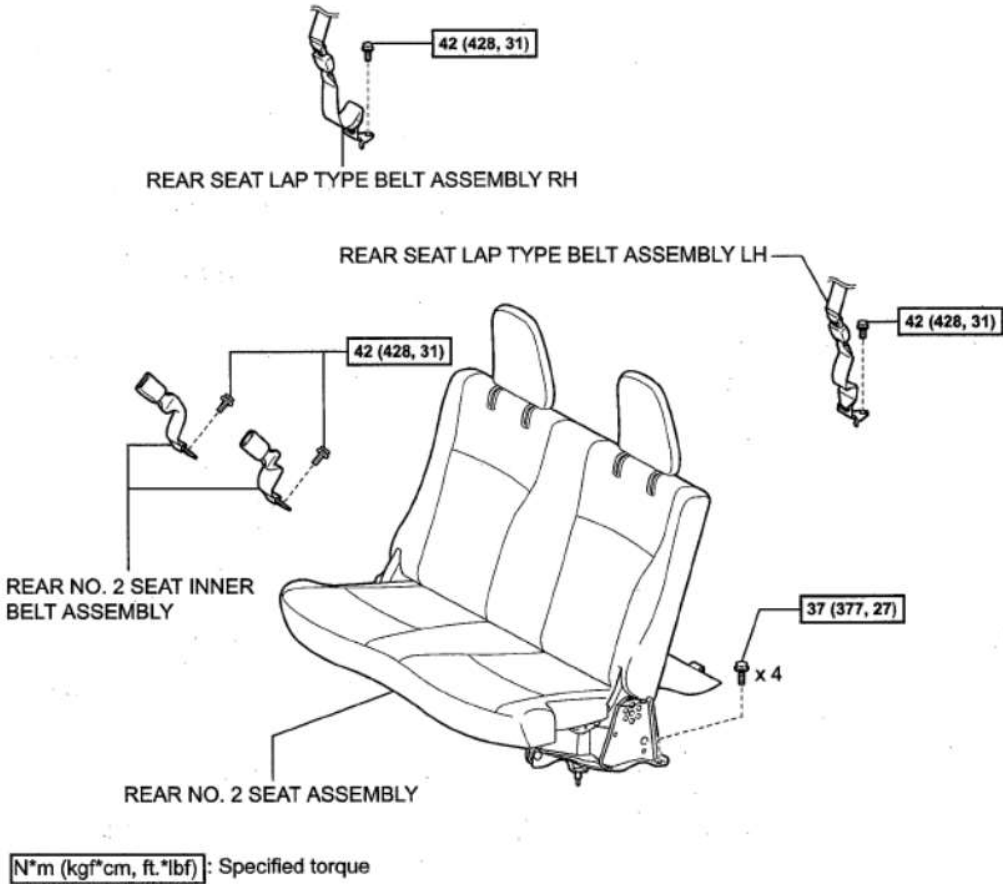
B178060E01

Fig. 76: Identifying Fuel Pump Components With Torque Specification (5 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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2009 ENGINE Fuel (1AR-FE) - Highlander

w/ Rear No. 2 Seat:



P B170871E01

Fig. 77: Identifying Fuel Pump Components With Torque Specification (6 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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2009 ENGINE Fuel (1AR-FE) - Highlander

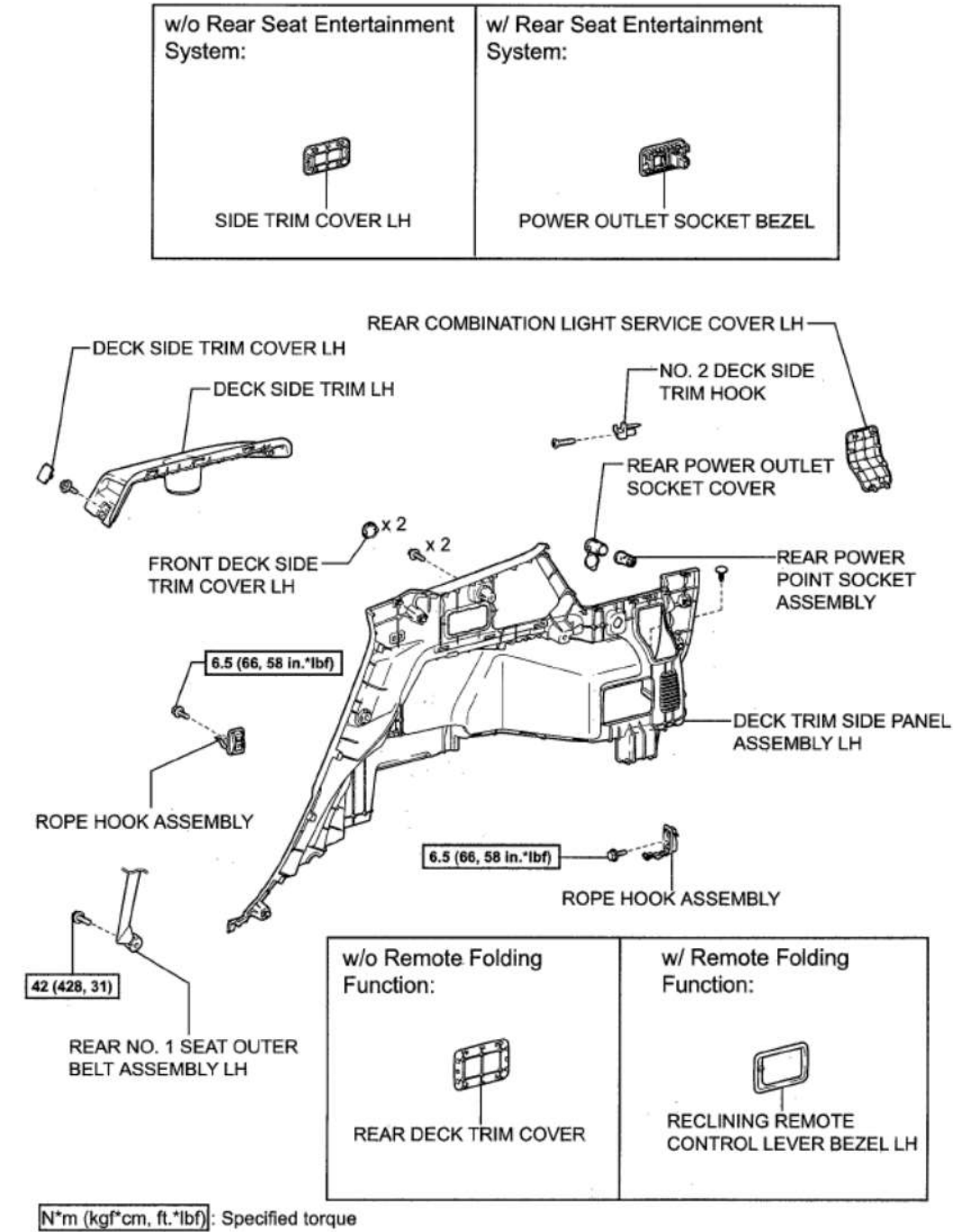


Fig. 78: Identifying Fuel Pump Components With Torque Specification (7 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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2009 ENGINE Fuel (1AR-FE) - Highlander

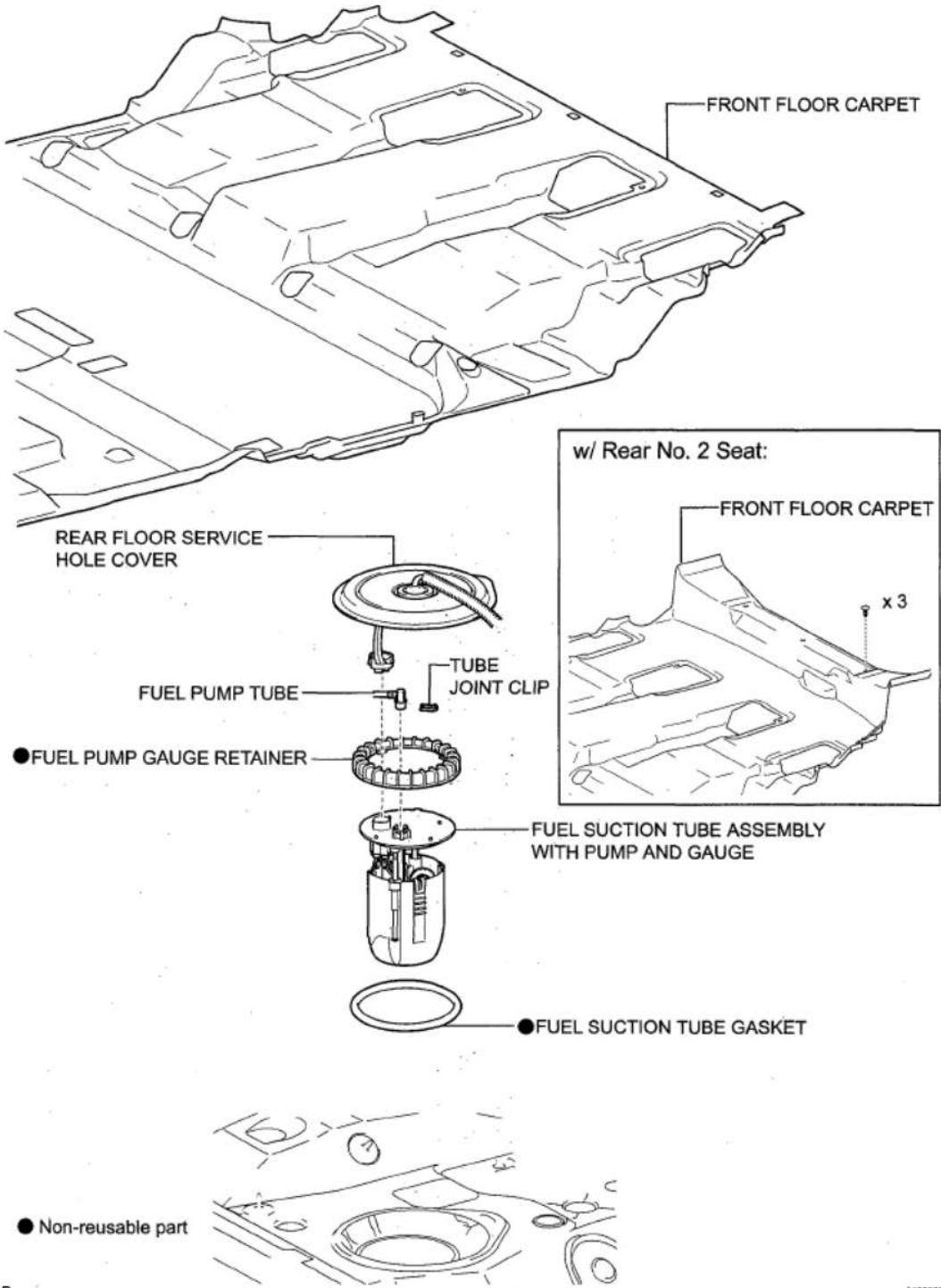
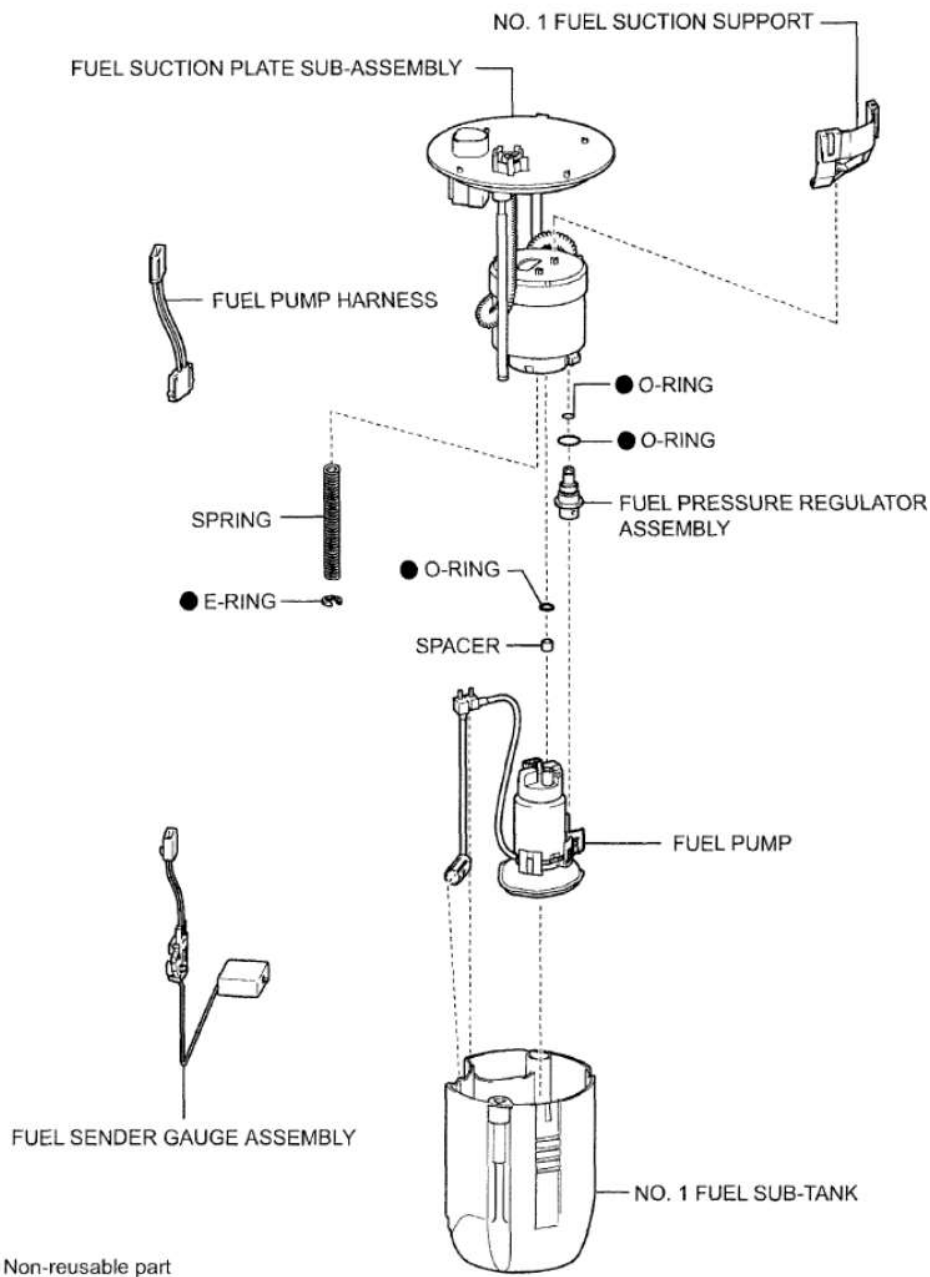


Fig. 79: Identifying Fuel Pump Components With Torque Specification (8 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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Fig. 80: Identifying Fuel Pump Components With Torque Specification (9 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. DISCHARGE FUEL SYSTEM PRESSURE

HINT:

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FUEL SYSTEM**2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See **INITIALIZATION**).

3. **REMOVE REAR CENTER SEAT ASSEMBLY**
4. **REMOVE REAR NO. 1 SEAT ASSEMBLY LH**
 - a. Remove the rear No. 1 seat assembly LH (See **REMOVAL**).
5. **REMOVE REAR NO. 1 SEAT ASSEMBLY RH**
 - a. Remove the rear No. 1 seat assembly RH (See **REMOVAL**).
6. **REMOVE REAR DOOR SCUFF PLATE LH** (See **REMOVAL**)
7. **REMOVE REAR DOOR OPENING TRIM WEATHERSTRIP LH** (See **REMOVAL**)
8. **REMOVE DECK BOARD ASSEMBLY** (See **REMOVAL**)
9. **REMOVE NO. 3 DECK BOARD SUB-ASSEMBLY** (See **REMOVAL**)
10. **REMOVE NO. 2 DECK BOARD SUB-ASSEMBLY** (See **REMOVAL**)
11. **REMOVE TONNEAU COVER ASSEMBLY (w/Tonneau Cover)** (See **REMOVAL**)
12. **REMOVE REAR NO. 1 FLOOR BOARD (w/o Rear No. 2 Seat)** (See **REMOVAL**)
13. **REMOVE REAR SEAT SIDE COVER LH (w/Rear No. 2 Seat)** (See **REMOVAL**)
14. **REMOVE DECK SIDE TRIM BOX LH** (See **REMOVAL**)
15. **REMOVE REAR SEAT SIDE COVER RH (w/Rear No. 2 Seat)** (See **REMOVAL**)
16. **REMOVE JACK CARRIER SUPPORT**
17. **REMOVE JACK CARRIER CUSHION** (See **REMOVAL**)
18. **REMOVE JACK ASSEMBLY** (See **REMOVAL**)
19. **REMOVE JACK CARRIER ASSEMBLY** (See **REMOVAL**)
20. **REMOVE DECK SIDE TRIM BOX RH** (See **REMOVAL**)
21. **REMOVE DECK FLOOR BOARD ASSEMBLY (w/o Rear No. 2 Seat)** (See **REMOVAL**)
22. **REMOVE REAR MAT** (See **REMOVAL**)
23. **REMOVE DECK FLOOR BOARD ASSEMBLY (w/Rear No. 2 Seat)** (See **REMOVAL**)
24. **REMOVE REAR DECK FLOOR BOX (w/o Rear No. 2 Seat)** (See **REMOVAL**)
25. **REMOVE REAR NO. 2 SEAT INNER BELT ASSEMBLY (w/Rear No. 2 Seat)** (See **INSTALLATION**)
26. **DISCONNECT REAR SEAT LAP TYPE BELT ASSEMBLY LH (w/Rear No. 2 Seat)** (See **REMOVAL**)
27. **DISCONNECT REAR SEAT LAP TYPE BELT ASSEMBLY RH (w/Rear No. 2 Seat)** (See **REMOVAL**)
28. **REMOVE REAR NO. 2 SEAT ASSEMBLY (w/Rear No. 2 Seat)** (See **DISASSEMBLY**)
29. **REMOVE REAR FLOOR FINISH PLATE** (See **REMOVAL**)
30. **REMOVE DECK SIDE TRIM COVER LH** (See **REMOVAL**)

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31. **REMOVE DECK SIDE TRIM LH** (See REMOVAL)
32. **REMOVE SIDE TRIM COVER LH** (w/o Rear Seat Entertainment System) (See REMOVAL)
33. **REMOVE POWER OUTLET SOCKET BEZEL** (w/Rear Seat Entertainment System) (See REMOVAL)
34. **REMOVE REAR COMBINATION LIGHT SERVICE COVER LH** (See REMOVAL)
35. **REMOVE REAR POWER POINT SOCKET ASSEMBLY** (See REAR POWER OUTLET SOCKET)
36. **REMOVE REAR POWER OUTLET SOCKET COVER** (See INSTALLATION)
37. **REMOVE REAR DECK TRIM COVER** (w/o Remote Folding Function) (See REMOVAL)
38. **REMOVE RECLINING REMOTE CONTROL LEVER BEZEL LH** (w/Remote Folding Function) (See REMOVAL)
39. **REMOVE ROPE HOOK ASSEMBLY** (for LH Side) (See REMOVAL)
40. **REMOVE NO. 2 DECK SIDE TRIM HOOK** (See REMOVAL)
41. **REMOVE FRONT DECK SIDE TRIM COVER LH** (See REMOVAL)
42. **DISCONNECT REAR NO. 1 SEAT OUTER BELT ASSEMBLY LH** (See REMOVAL)
43. **REMOVE DECK TRIM SIDE PANEL ASSEMBLY LH** (See REMOVAL)
44. **REMOVE REAR FLOOR SERVICE HOLE COVER**
 - a. Lift up the front floor carpet.
 1. Using a clip remover, remove the 3 clips and lift up the front floor carpet, (w/rear No. 2 seat)

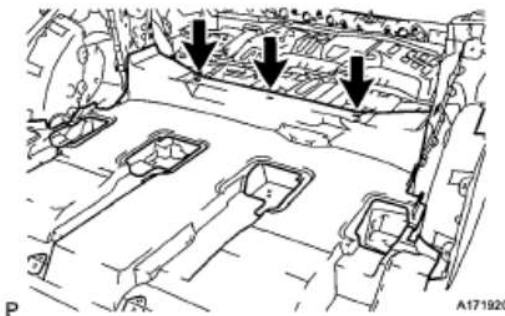


Fig. 81: Locating Front Floor Carpet Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Disengage the 3 claws and lift up the front floor carpet, (w/o rear No. 2 seat)

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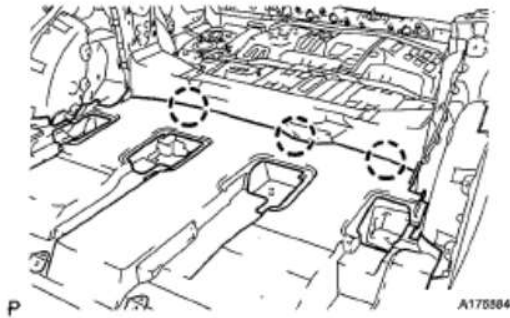


Fig. 82: Identifying Front Floor Carpet Claws

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

- b. Remove the rear floor service hole cover.
- c. Disconnect the fuel pump connector.

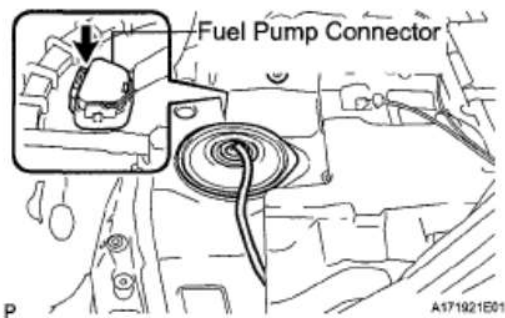


Fig. 83: Locating Fuel Pump Connector

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

45. REMOVE FUEL SUCTION TUBE ASSEMBLY WITH PUMP AND GAUGE

- a. Remove the tube joint clip, and pull out the fuel pump tube.

NOTE:

- Check that there is no dirt or other foreign objects around the connector before disconnecting it. Clean the connector if necessary.
- It is necessary to prevent mud or dirt from entering the quick connector. If mud or dirt gets in the connector, the O-rings may not seal properly.
- Disconnect the quick connector by hand. Do not use any tools.
- Do not bend, kink or twist the nylon tubes. Protect the connector by covering it with a plastic bag.
- If the pipe and connector are stuck, carefully try wiggling or pushing and pulling on the connector to release it. Pull the connector off carefully.

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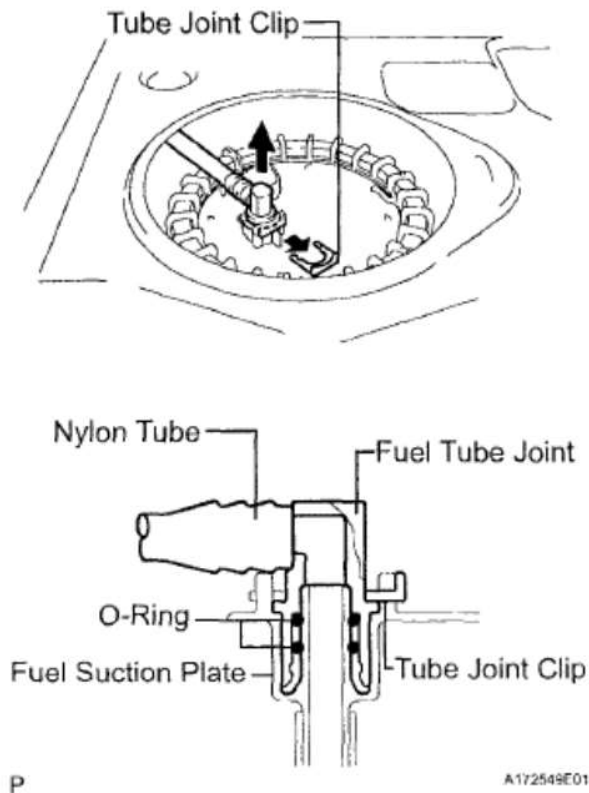


Fig. 84: Removing Tube Joint Clip And Pulling Out Fuel Pump Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a 6 mm socket hexagon wrench, install SST to the fuel pump gauge retainer.

SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

HINT:

- Engage the SST claws securely with the fuel pump gauge retainer ribs to secure SST.
- Install SST while pressing the SST claws toward the fuel pump gauge retainer (toward the center of SST).

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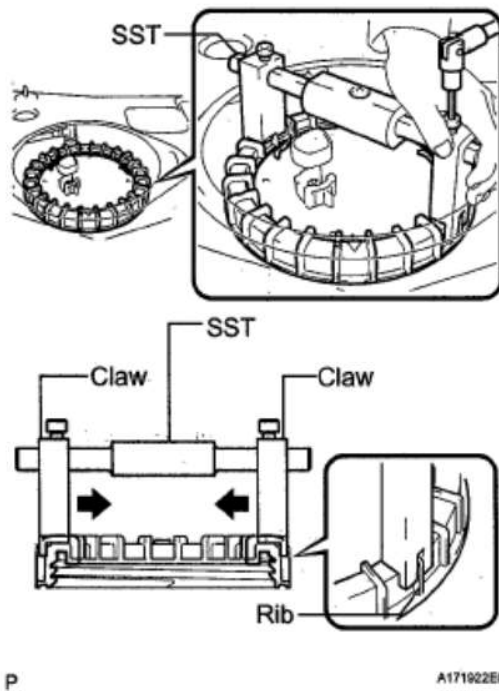


Fig. 85: Installing SST To Fuel Pump Gauge Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using SST, loosen the fuel pump gauge retainer.

SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

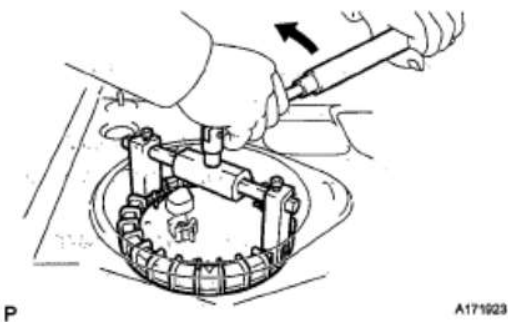


Fig. 86: Loosening Fuel Pump Gauge Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Do not use any tools other than specified in this operation. Damage to the fuel pump gauge retainer or the fuel tank may result.
- Loosen the retainer by turning it counterclockwise while holding SST down. Do not allow the claw of the tank suction tube support to slip out of its groove on the fuel tank.

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2009 ENGINE Fuel (1AR-FE) - Highlander

HINT:

The ribs on the fuel pump gauge retainer can be fitted into the tips of SST.

- d. Remove the fuel pump gauge retainer.
- e. Remove the fuel suction tube with pump and gauge.

NOTE: Be careful not to bend the arm of the fuel sender gauge.

- f. Remove the gasket from the fuel tank.

DISASSEMBLY

1. REMOVE FUEL SENDER GAUGE ASSEMBLY (See REMOVAL)

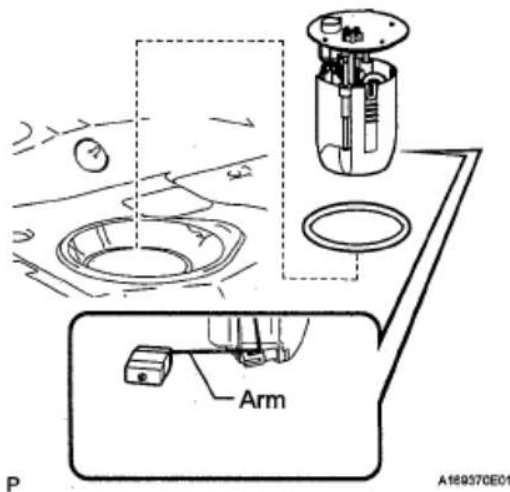
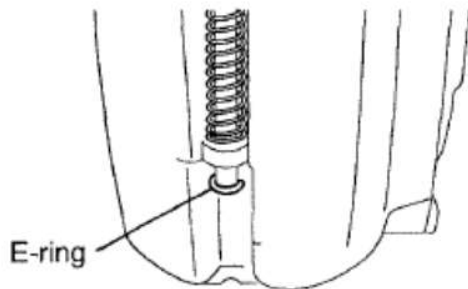


Fig. 87: Identifying Fuel Sender Gauge Arm And Fuel Pump Gauge Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. REMOVE FUEL SUCTION PLATE SUB-ASSEMBLY

- a. Using needle nozzle pliers, remove the E-ring.



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Fig. 88: Identifying E-Ring

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

- b. Disconnect the fuel pump harness connector.

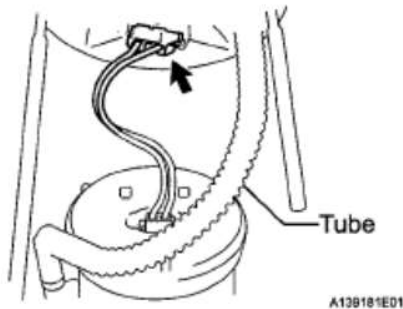


Fig. 89: Locating Fuel Pump Harness Connector

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

NOTE: Do not disconnect the tube shown in the illustration when disassembling the fuel suction tube assembly with pump and gauge. Doing so will cause reassembly of the fuel suction tube assembly with pump and gauge to be impossible as the tube is welded to the plate.

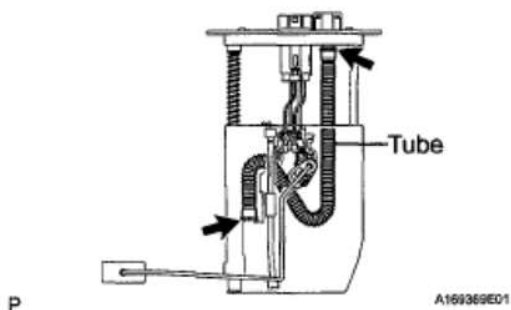


Fig. 90: Identifying Fuel Suction Tube Assembly With Pump And Gauge

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

- c. Disengage the 2 claws of the No. 1 fuel suction support and remove the fuel suction plate with the fuel filter from the No. 1 fuel sub-tank.
- d. Remove the spring from the fuel suction plate.

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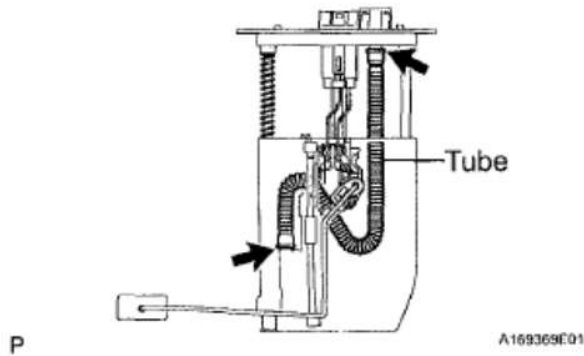


Fig. 91: Removing Fuel Suction Plate With Fuel Filter From No. 1 Fuel Sub-Tank
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Disengage the claw of the jet pump nozzle.
- f. Separate the fuel pump filter hose.

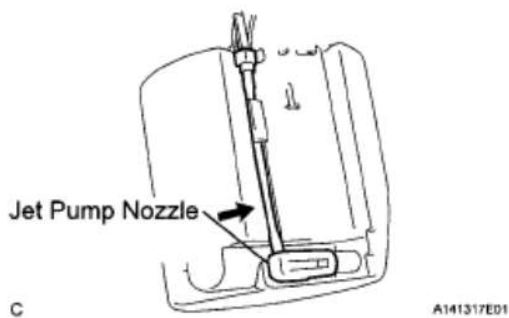


Fig. 92: Identifying Jet Pump Nozzle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE FUEL PUMP

- a. Using a screwdriver with its tip wrapped in protective tape, disengage the 5 claws on the filter and remove the fuel pump from the fuel filter.

NOTE:

- Do not damage the fuel filter.
- Do not remove the suction filter.
- Do not use either the fuel pump or the suction filter if the suction filter is removed from the fuel pump.

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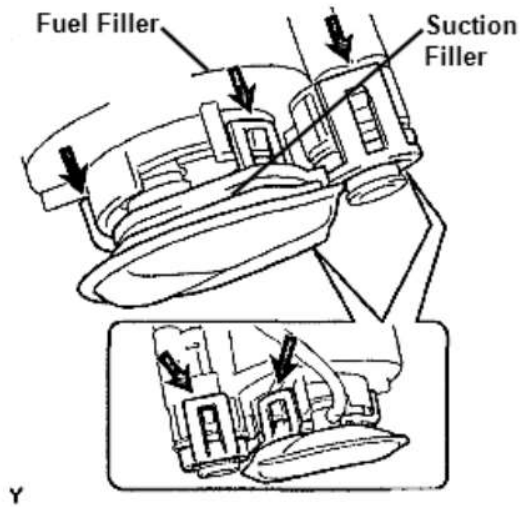
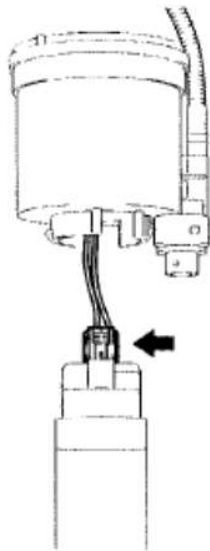


Fig. 93: Locating Claws On Filter

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

- b. Disconnect the fuel pump connector from the fuel pump and then remove the fuel pump harness.



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Fig. 94: Locating Fuel Pump Connector

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

- c. Remove the O-ring and spacer from the fuel pump.

NOTE: Be careful not to damage the sealing surface.

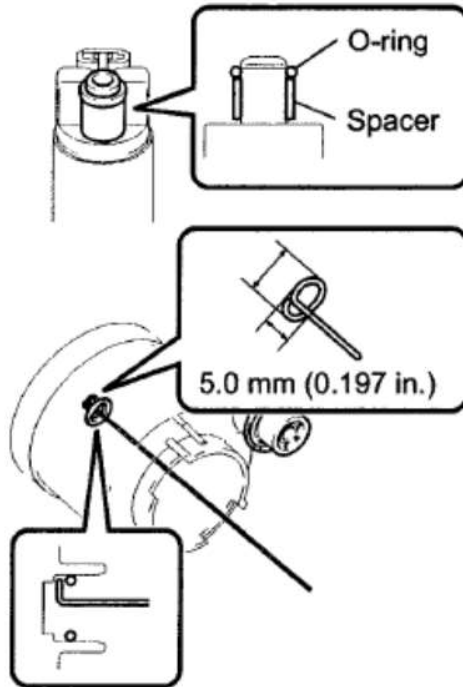
HINT:

If the O-ring still remains in the fuel filter, remove it using a wire tip (1 mm) that is formed as

2009 Toyota Highlander Limited

2009 ENGINE Fuel (1AR-FE) - Highlander

shown in the illustration.



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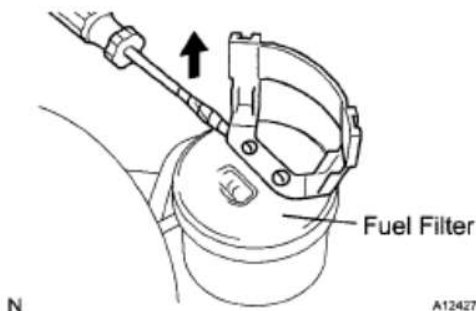
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Fig. 95: Removing O-Ring And Spacer From Fuel Pump

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

4. REMOVE NO. 1 FUEL SUCTION SUPPORT

- a. Using a screwdriver with the tip taped, disengage the claw and remove the No. 1 fuel suction support.



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Fig. 96: Removing No. 1 Fuel Suction Support

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

INSPECTION

1. INSPECT FUEL PUMP

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2009 ENGINE Fuel (1AR-FE) - Highlander

- a. Inspect fuel pump resistance.
1. Measure the resistance according to the value(s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	0.2 to 3.0 ohms

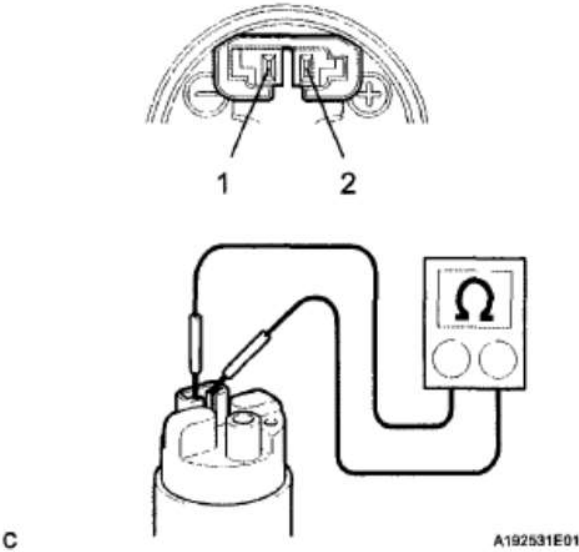


Fig. 97: Measuring Resistance Between Fuel Pump Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the result is not as specified, replace the fuel pump.

- b. Inspect fuel pump operation.
1. Connect a battery positive (+) lead to terminal 2 of the connector, and a negative (-) lead to terminal 1. Check that the fuel pump operates.

- NOTE:**
- These tests must be performed within 10 seconds to prevent the coil from burning out.
 - Keep the fuel pump as far away from the battery as possible.
 - Always switch the voltage on and off on the battery side, not the fuel pump side.

REASSEMBLY

1. **INSTALL NO. 1 FUEL SUCTION SUPPORT**
- a. Install the No. 1 fuel suction support to the fuel filter.

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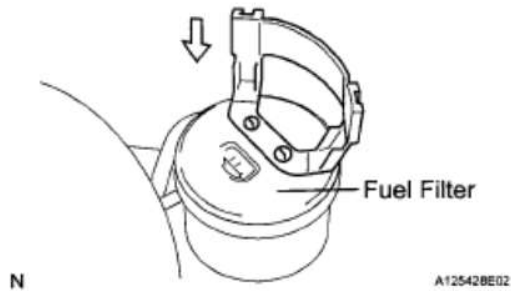


Fig. 98: Installing No. 1 Fuel Suction Support To Fuel Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL FUEL PUMP

- a. Apply gasoline to a new O-ring. Then install the O-ring and spacer to the fuel pump.

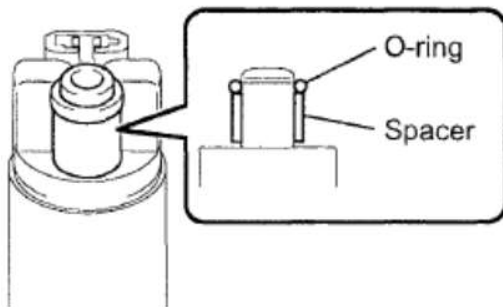


Fig. 99: Identifying Fuel Pump O-Ring And Spacer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

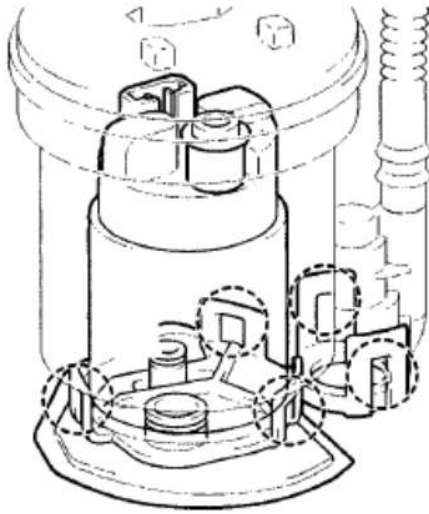
- b. Engage the 5 claws to install the fuel pump.

NOTE:

- Make sure that the O-ring is not cut or pinched during the installation.
- Engage the claws securely.

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2009 ENGINE Fuel (1AR-FE) - Highlander



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Fig. 100: Identifying Fuel Pump Claws

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

3. CONNECT FUEL PUMP HARNESS

- a. Connect the fuel pump harness connector.

NOTE: Do not separate the tube indicated in the illustration (See FUEL SYSTEM).

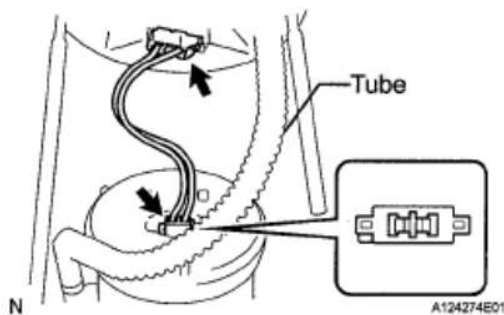


Fig. 101: Locating Fuel Pump Harness Connector

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

4. INSTALL FUEL SUCTION PLATE SUB-ASSEMBLY

- a. Install the fuel pump filter tube while aligning it to the installation position of the No. 1 fuel sub-tank.
- b. Connect the jet pump nozzle.

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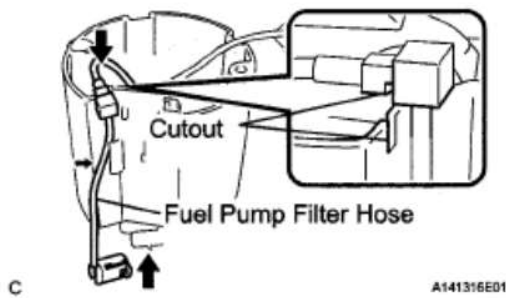


Fig. 102: Installing Fuel Pump Filter Tube To No. 1 Fuel Sub-Tank
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Make sure that the fuel tube passes under the protrusion of the fuel filter, and engage the claw of the No. 1 fuel suction support.
- d. Install the spring to the fuel suction plate shaft and install it to the No. 1 fuel sub-tank.

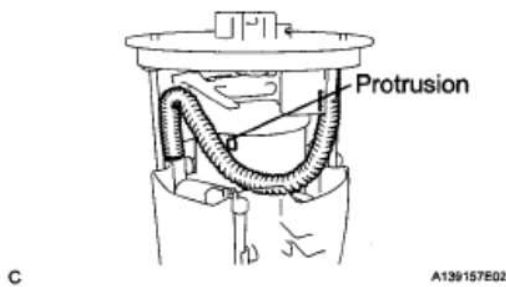


Fig. 103: Identifying Protrusion Of Fuel Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Install a new E-ring.

5. INSTALL FUEL SENDER GAUGE ASSEMBLY (See REMOVAL)

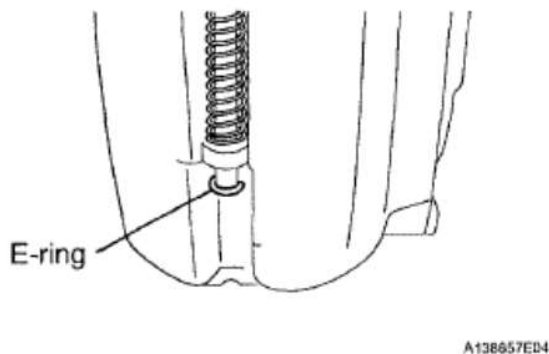


Fig. 104: Identifying E-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

2009 Toyota Highlander Limited

2009 ENGINE Fuel (1AR-FE) - Highlander

1. INSTALL FUEL SUCTION TUBE ASSEMBLY WITH PUMP AND GAUGE

- a. Install a new gasket to the fuel tank.
- b. Attach the fuel suction tube with pump and gauge to the fuel tank.

NOTE: Be careful not to bend the arm of the fuel sender gauge.

- c. Align the keyway of the fuel suction tube support with the key of the fuel suction tube with pump and gauge.

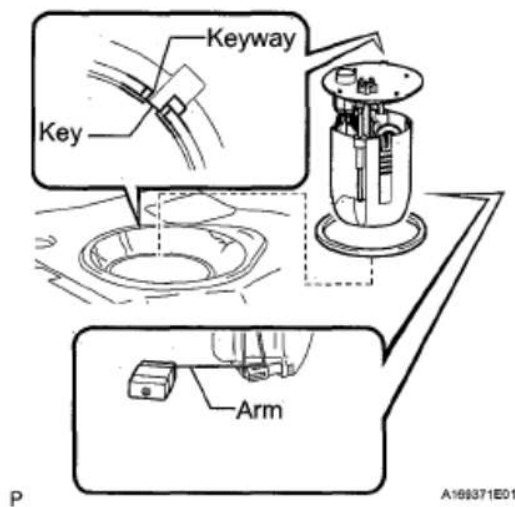


Fig. 105: Aligning Keyway Of Fuel Suction Tube Support With Key Of Fuel Suction Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Align the triangle mark on a new fuel pump gauge retainer with the "S" mark on the fuel tank while pushing down the fuel suction tube with pump and gauge, and attach the fuel pump gauge retainer.

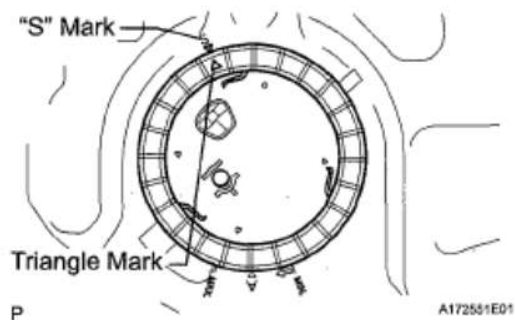


Fig. 106: Identifying Triangle Mark On Fuel Pump Gauge Retainer And S Mark On Fuel Tank
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Using a 6 mm socket hexagon wrench, install SST to the fuel pump gauge retainer.

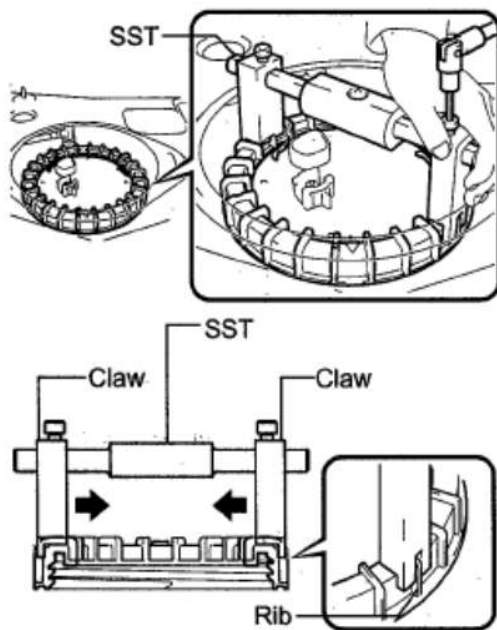
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SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

HINT:

- Engage the SST claws securely with the fuel pump gauge retainer ribs to secure SST.
- Install SST while pressing the SST claws toward the fuel pump gauge retainer (toward the center of SST).



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Fig. 107: Installing SST To Fuel Pump Gauge Retainer

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

- Rotate the fuel pump gauge retainer by hand, then tighten it one complete turn and another half turn using SST. The triangle mark on the fuel pump gauge retainer must be positioned between the "MIN" and "MAX" marks on the fuel tank.

SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

NOTE:

- Do not use any tools other than specified in this operation. Damage to the fuel pump gauge retainer or the fuel tank may result.
- Fully tighten the retainer by turning it clockwise while holding SST down. Do not allow the claw of the tank suction tube support to slip out of its groove on the fuel tank.

HINT:

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The ribs on the fuel pump gauge retainer can be fitted into the tips of SST.

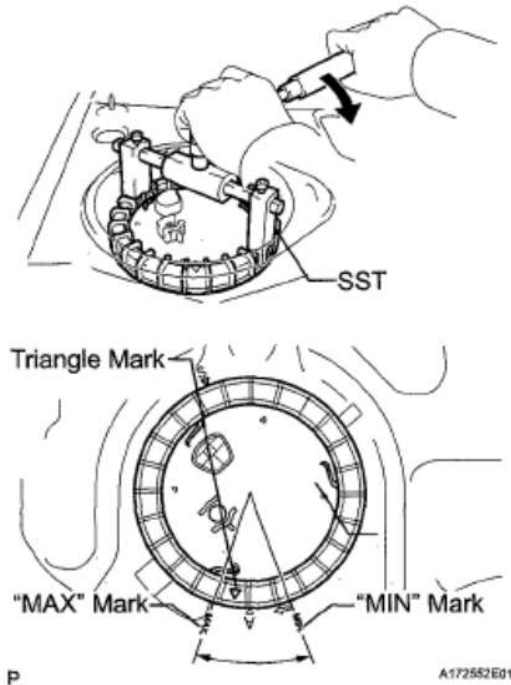


Fig. 108: Rotating Fuel Pump Gauge Retainer

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

- g. Install the fuel pump tube and the tube joint clip.

NOTE:

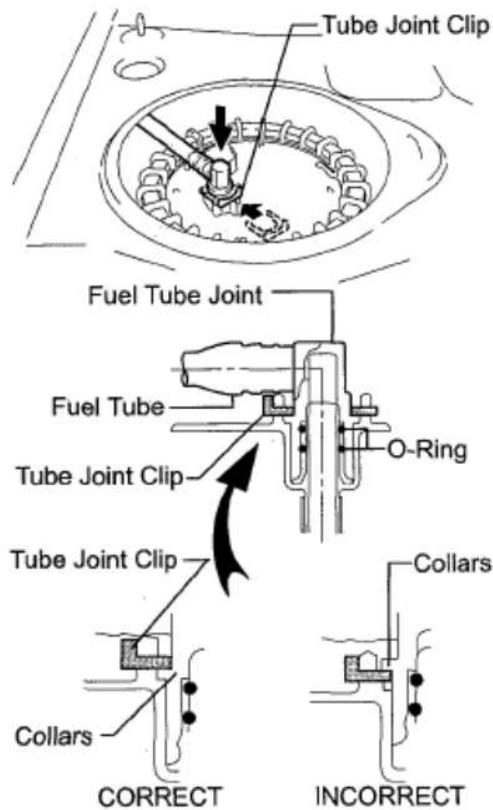
- Check that there are no scratches or foreign objects on the connecting part.
- Check that the fuel tube joint is inserted securely.
- Check that the tube joint clip is correctly located on the collar of the fuel tube joint.
- After installing the tube joint clip, check that the fuel tube joint has not been pulled out of position.

- h. Connect the fuel pump connector.

2. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
3. **INSPECT FUEL LEAK** (See ON-VEHICLE INSPECTION)
4. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

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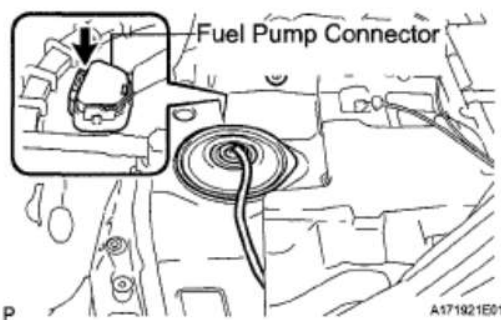
P

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Fig. 109: Installing Fuel Pump Tube And Tube Joint Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL REAR FLOOR SERVICE HOLE COVER

- a. Install new butyl tape to the rear floor service hole cover.
- b. Install the rear floor service hole cover.



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Fig. 110: Locating Fuel Pump Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the front floor carpet.

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1. Install the front floor carpet with the 3 clips, (w/rear No. 2 seat)

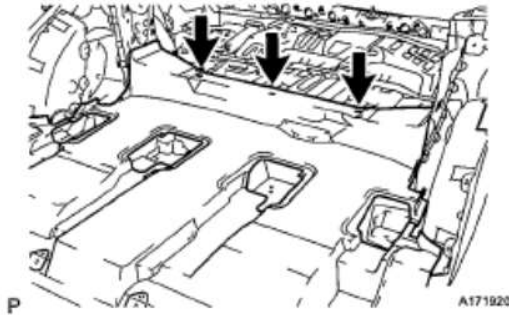


Fig. 111: Locating Front Floor Carpet Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Engage the 3 claws to install the front floor carpet, (w/o rear No. 2 seat)

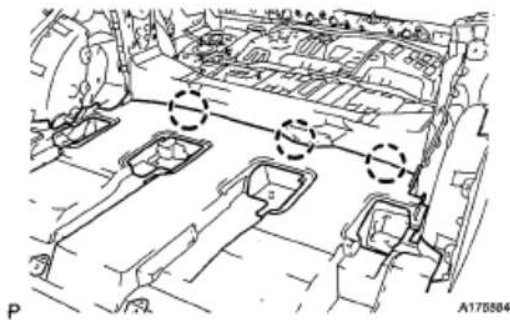


Fig. 112: Identifying Front Floor Carpet Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSTALL DECK TRIM SIDE PANEL ASSEMBLY LH** (See INSTALLATION)
7. **CONNECT REAR NO. 1 SEAT OUTER BELT ASSEMBLY LH** (See INSTALLATION)
8. **INSTALL FRONT DECK SIDE TRIM COVER LH** (See INSTALLATION)
9. **INSTALL NO. 2 DECK SIDE TRIM HOOK** (See INSTALLATION)
10. **INSTALL ROPE HOOK ASSEMBLY (for LH Side)** (See INSTALLATION)
11. **INSTALL REAR DECK TRIM COVER (w/o Remote Folding Function)** (See INSTALLATION)
12. **INSTALL RECLINING REMOTE CONTROL LEVER BEZEL LH (w/Remote Folding Function)** (See INSTALLATION)
13. **INSTALL REAR POWER OUTLET SOCKET COVER** (See INSTALLATION)
14. **INSTALL REAR POWER POINT SOCKET ASSEMBLY** (See INSTALLATION)
15. **INSTALL REAR COMBINATION LIGHT SERVICE COVER LH** (See INSTALLATION)
16. **INSTALL SIDE TRIM COVER LH (w/o Rear Seat Entertainment System)** (See INSTALLATION)
17. **INSTALL POWER OUTLET SOCKET BEZEL (w/Rear Seat Entertainment System)** (See

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INSTALLATION)

18. **INSTALL DECK SIDE TRIM LH** (See INSTALLATION)
19. **INSTALL DECK SIDE TRIM COVER LH** (See INSTALLATION)
20. **INSTALL REAR FLOOR FINISH PLATE** (See INSTALLATION)
21. **INSTALL REAR NO. 2 SEAT ASSEMBLY (w/Rear No. 2 Seat)** (See INSTALLATION)
22. **CONNECT REAR SEAT LAP TYPE BELT ASSEMBLY LH (w/Rear No. 2 Seat)** (See INSTALLATION)
23. **CONNECT REAR SEAT LAP TYPE BELT ASSEMBLY RH (w/Rear No. 2 Seat)** (See INSTALLATION)
24. **INSTALL REAR NO. 2 SEAT INNER BELT ASSEMBLY (w/Rear No. 2 Seat)** (See INSTALLATION)
25. **INSTALL REAR DECK FLOOR BOX (w/o Rear No. 2 Seat)** (See INSTALLATION)
26. **INSTALL DECK FLOOR BOARD ASSEMBLY (w/o Rear No. 2 Seat)** (See INSTALLATION)
27. **INSTALL REAR MAT** (See INSTALLATION)
28. **INSTALL DECK FLOOR BOARD ASSEMBLY (w/Rear No. 2 Seat)** (See INSTALLATION)
29. **INSTALL DECK SIDE TRIM BOX LH** (See INSTALLATION)
30. **INSTALL REAR SEAT SIDE COVER LH (w/Rear No. 2 Seat)** (See INSTALLATION)
31. **INSTALL DECK SIDE TRIM BOX RH** (See INSTALLATION)
32. **INSTALL JACK CARRIER ASSEMBLY** (See INSTALLATION)
33. **INSTALL JACK ASSEMBLY** (See INSTALLATION)
34. **INSTALL JACK CARRIER CUSHION** (See INSTALLATION)
35. **INSTALL JACK CARRIER SUPPORT**
36. **INSTALL REAR SEAT SIDE COVER RH (w/Rear No. 2 Seat)** (See INSTALLATION)
37. **INSTALL REAR NO. 1 FLOOR BOARD (w/o Rear No. 2 Seat)** (See INSTALLATION)
38. **INSTALL TONNEAU COVER ASSEMBLY (w/Tonneau Cover)**
39. **INSTALL NO. 2 DECK BOARD SUB-ASSEMBLY** (See INSTALLATION)
40. **INSTALL NO. 3 DECK BOARD SUB-ASSEMBLY** (See INSTALLATION)
41. **INSTALL DECK BOARD ASSEMBLY** (See INSTALLATION)
42. **INSTALL REAR DOOR OPENING TRIM WEATHERSTRIP LH** (See INSTALLATION)
43. **INSTALL REAR DOOR SCUFF PLATE LH** (See INSTALLATION)
44. **INSTALL REAR NO. 1 SEAT ASSEMBLY RH**
 - a. Install the rear No. 1 seat assembly RH (See INSTALLATION).
45. **INSTALL REAR NO. 1 SEAT ASSEMBLY LH**
 - a. Install the rear No. 1 seat assembly LH (See INSTALLATION).
46. **INSTALL REAR CENTER SEAT ASSEMBLY**
47. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

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FUEL TANK

COMPONENTS

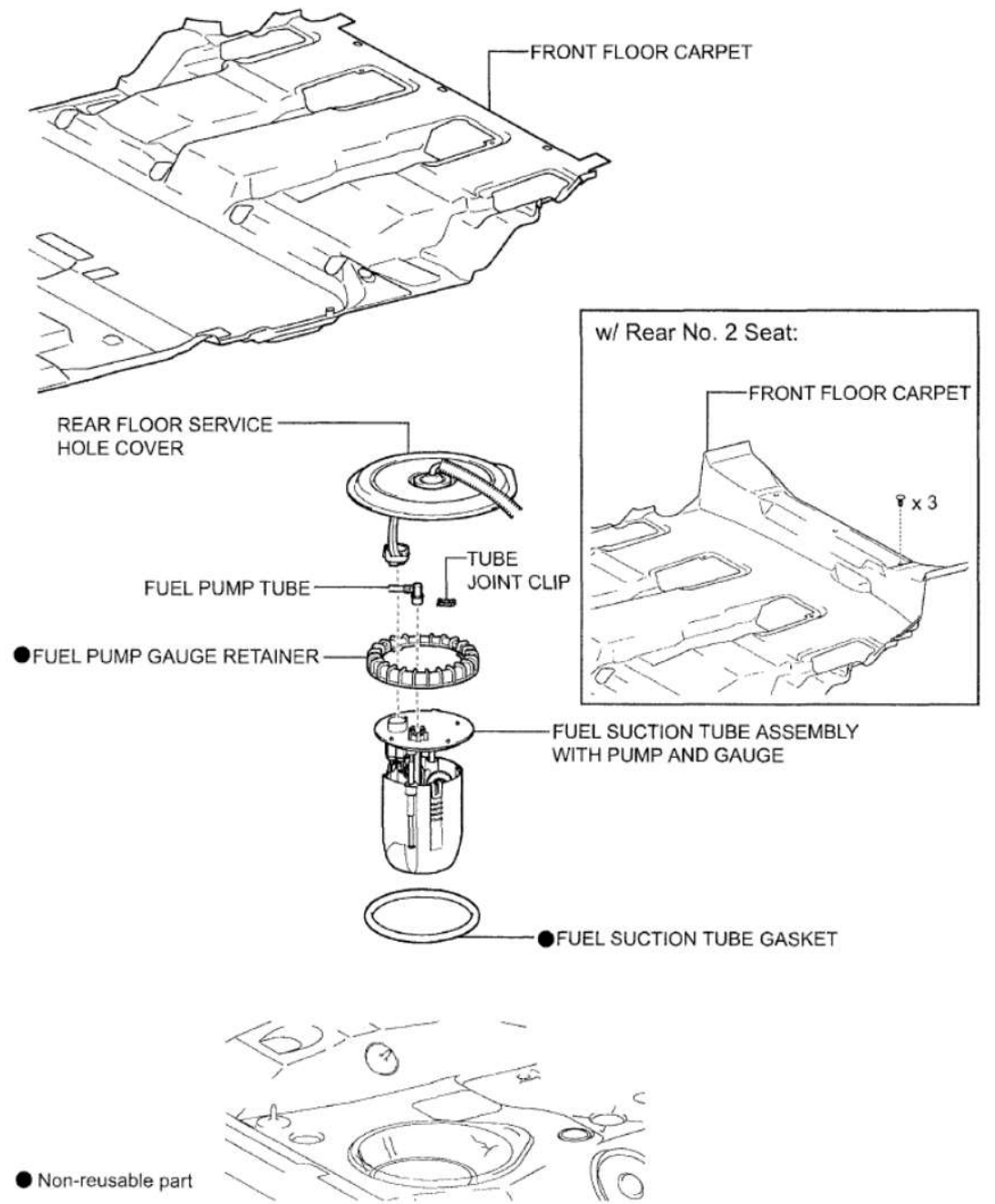


Fig. 113: Identifying Fuel Tank Components With Torque Specification (1 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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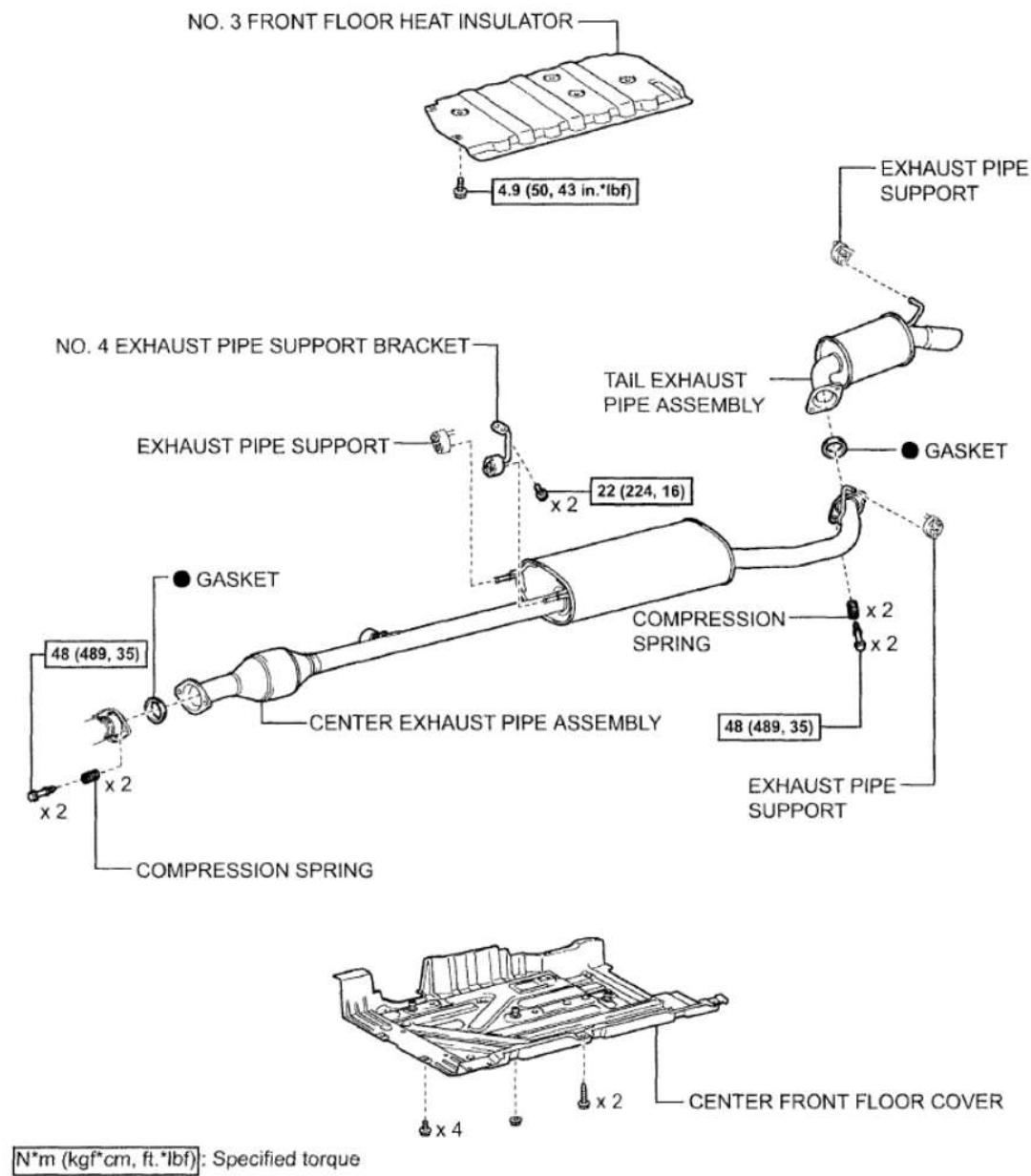
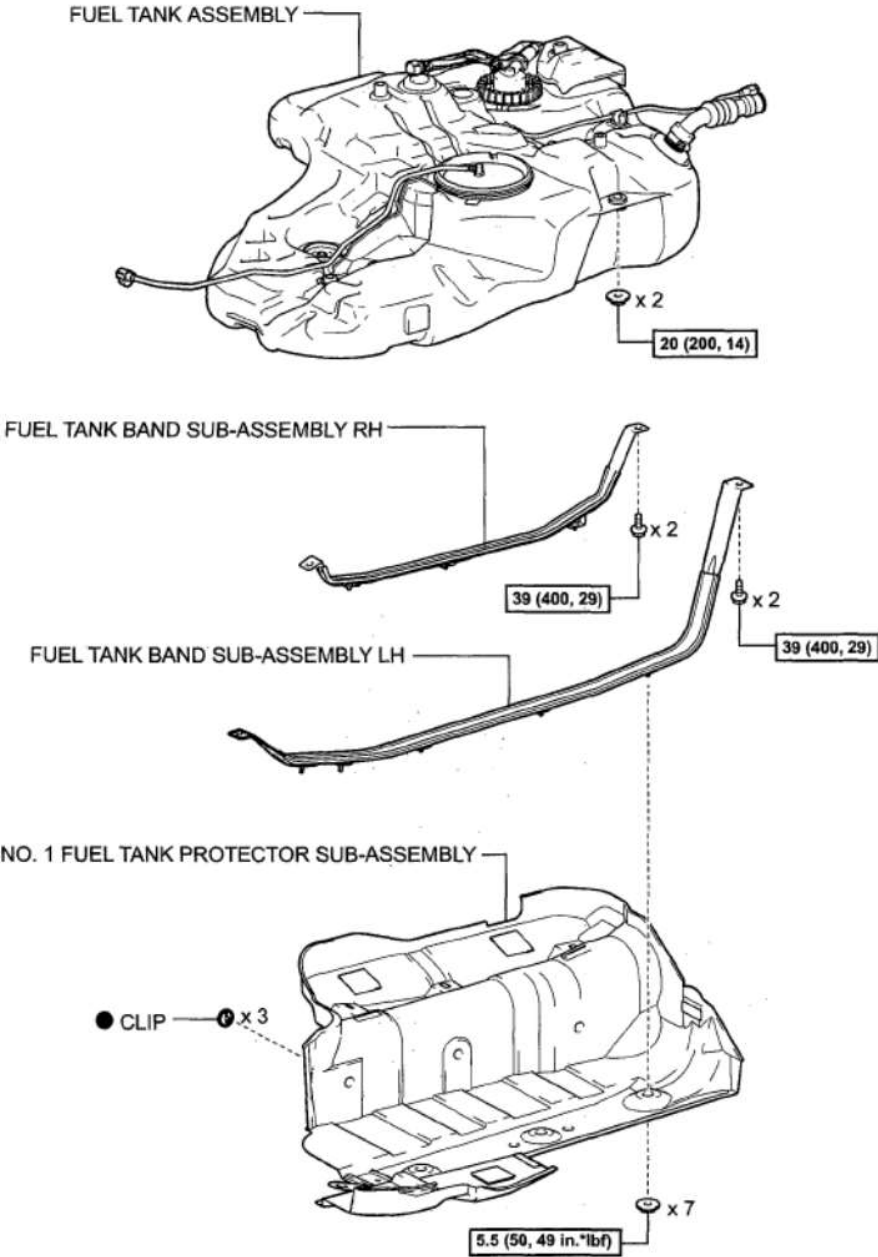


Fig. 114: Identifying Fuel Tank Components With Torque Specification (2 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

● Non-reusable part

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Fig. 115: Identifying Fuel Tank Components With Torque Specification (3 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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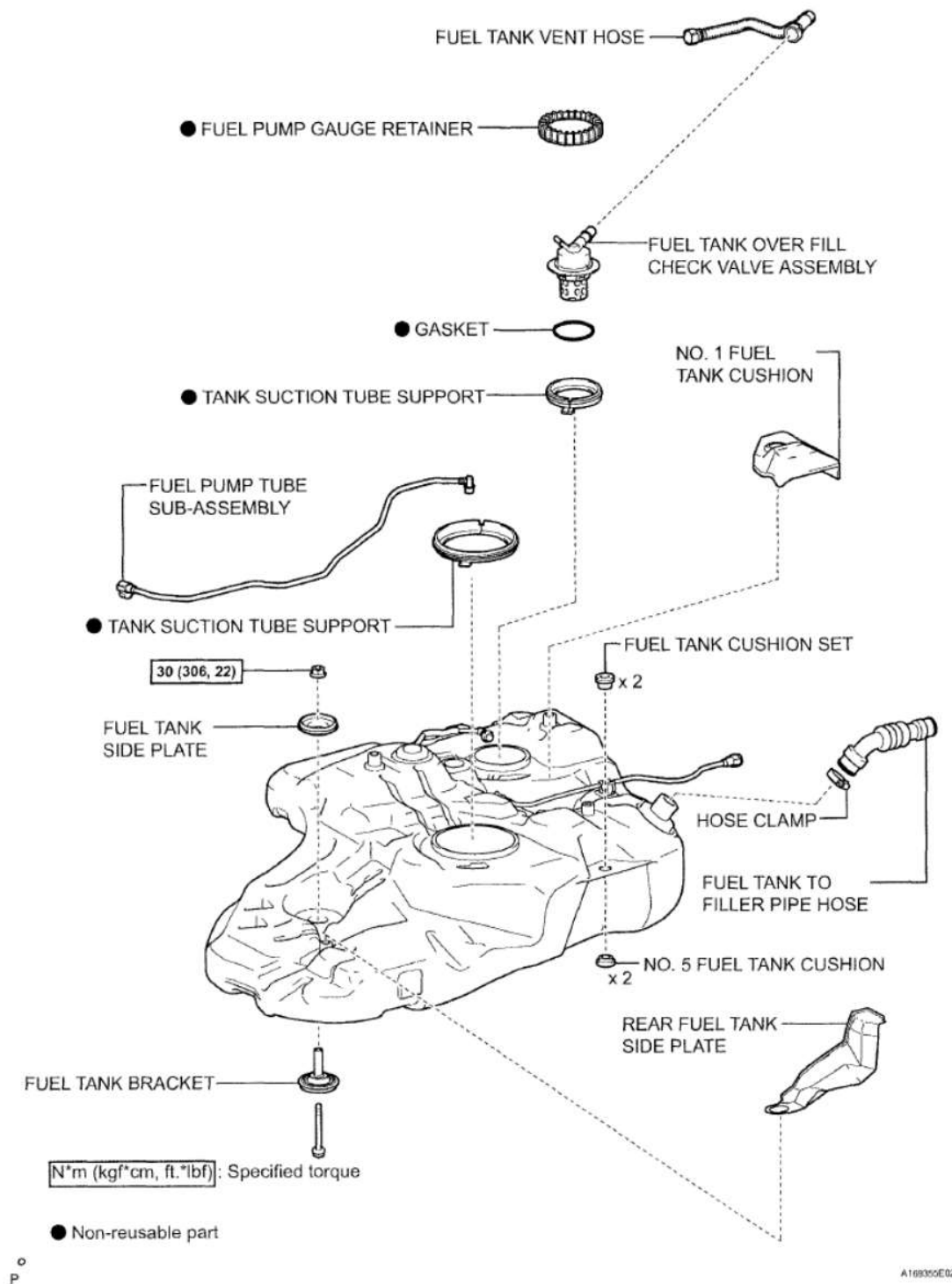


Fig. 116: Identifying Fuel Tank Components With Torque Specification (4 Of 4)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

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1. REMOVE FUEL SUCTION TUBE ASSEMBLY WITH PUMP AND GAUGE

- a. Remove the fuel suction tube assembly with pump and gauge (See **REMOVAL**).

2. DRAIN FUEL

3. REMOVE CENTER FRONT FLOOR COVER (See **REMOVAL**)

4. REMOVE TAIL EXHAUST PIPE ASSEMBLY (See **REMOVAL**)

5. REMOVE CENTER EXHAUST PIPE ASSEMBLY (See **REMOVAL**)

6. REMOVE NO. 4 EXHAUST PIPE SUPPORT BRACKET

- a. Remove the 2 bolts, and then remove the No. 4 exhaust pipe support bracket.

7. REMOVE NO. 3 FRONT FLOOR HEAT INSULATOR (See **REMOVE**)

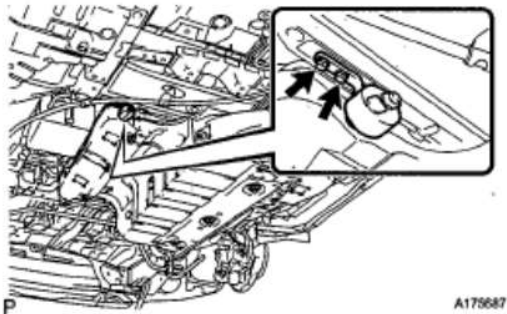


Fig. 117: Locating No. 4 Exhaust Pipe Support Bracket Bolts

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

8. REMOVE NO. 1 FUEL TANK PROTECTOR SUB-ASSEMBLY

- a. Remove the 3 clips (A) and 7 nuts, and then remove the No. 1 fuel tank protector sub-assembly.

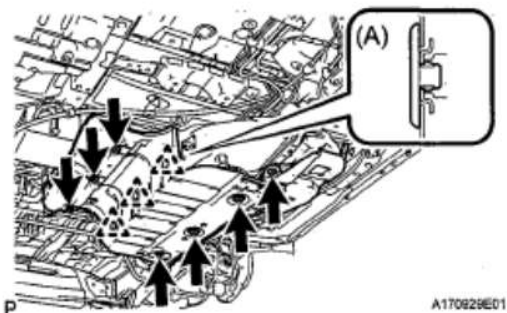


Fig. 118: Locating No. 1 Fuel Tank Protector Sub-Assembly Clips And Nuts

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

9. REMOVE FUEL TANK ASSEMBLY

- a. Disconnect the fuel pump tube.
 1. Pinch the tab of the retainer to disengage the lock claws and pull it down as shown in the illustration.
 2. Pull out the fuel pump tube.

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NOTE:

- Check if there is any dirt or mud around the connector before this operation and clean the connector if necessary.
- It is necessary to prevent mud or dirt from entering the quick connector. If any foreign objects enter the connector, the O-rings may not seal properly.
- Do not use any tools in this operation.
- Do not bend or twist the nylon tube. Protect the connector by covering it with a plastic bag.
- When the pipe and connector are stuck, push and pull the connector to release it and pull the connector out carefully.

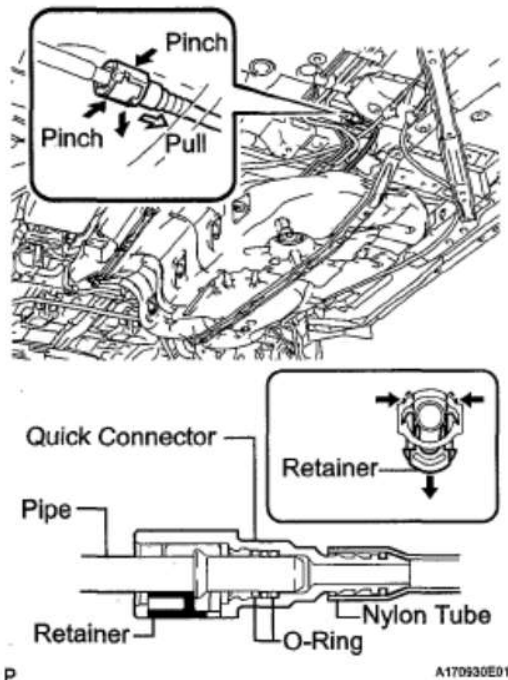


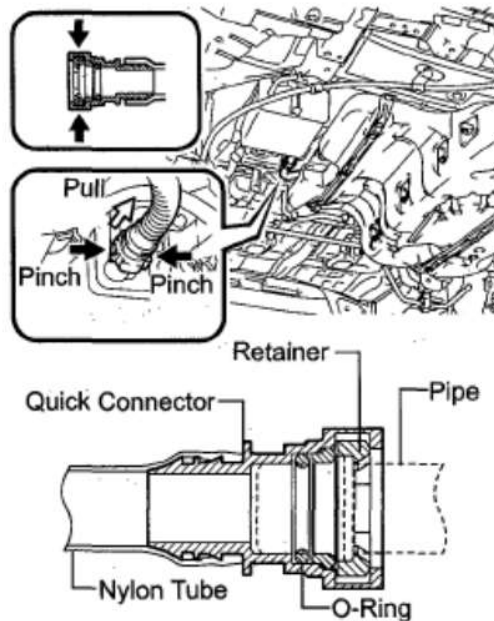
Fig. 119: Disconnecting Fuel Pump Tube

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

- Disconnect the fuel tank vent hose from the charcoal canister assembly.
 - Pinch the retainer and pull out the quick connector while pushing the quick connector against the pipe to disconnect the fuel tank vent hose from the charcoal canister assembly.

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Fig. 120: Disconnecting Fuel Tank Vent Hose From Charcoal Canister Assembly
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Remove dirt or foreign objects on the quick connector before this work.
- Do not allow any scratches or foreign objects on the parts when disconnecting as the fuel hose connector has the O-ring that seals the pipe.
- Perform this work by hand. Do not use any tools.
- Do not forcibly bend, twist or turn the nylon tube.
- Protect the connected part by covering it with a plastic bag after disconnecting the fuel tank vent hose.
- If the quick connector and pipe are stuck, push and pull them to release.

c. Disconnect the No. 3 fuel tank breather tube.

1. Pinch the tube connector and then pull out the No. 3 fuel tank breather tube.

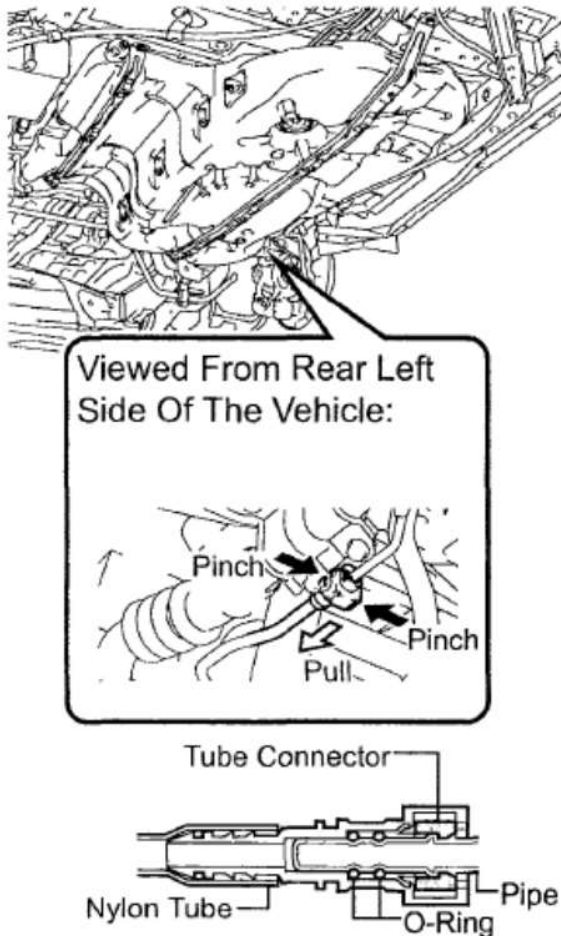
NOTE:

- Check if there is any dirt or mud around the connector before this operation and clean the connector as necessary.
- It is necessary to prevent mud or dirt from entering the quick connector. If any foreign objects enter the connector, the O-rings may not seal properly.

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- Do not use any tools in this operation.
- Do not bend or twist the nylon tube. Protect the connector by covering it with a plastic bag.
- When the pipe and connector are stuck, push and pull the connector to release it and pull the connector out carefully.



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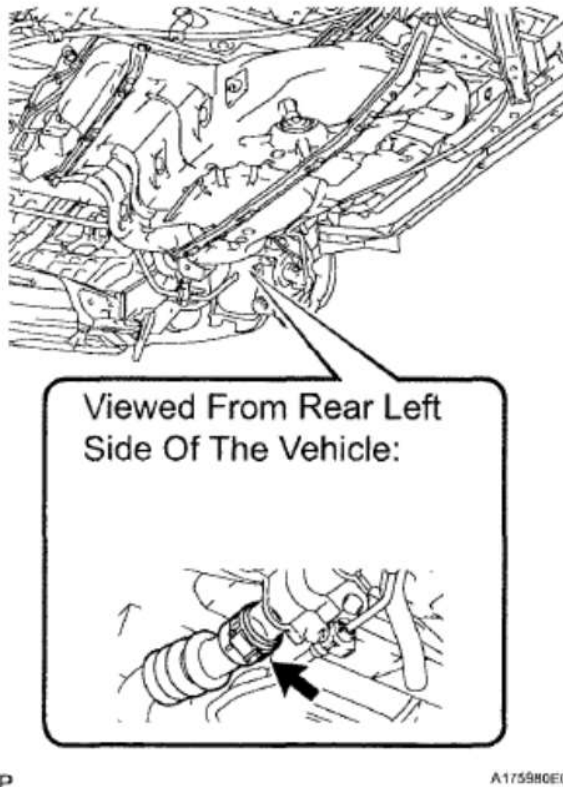
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Fig. 121: Pinching Tube Connector And Pulling Out No. 3 Fuel Tank Breather Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Loosen the hose clamp bolt and disconnect the fuel tank to filler pipe hose.
- Set a transmission jack under the fuel tank.
- Remove the 4 bolts, and then remove the 2 fuel tank bands.
- Remove the 2 nuts.

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**Fig. 122: Locating Hose Clamp Bolt**

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

- h. Operate the transmission jack to remove the fuel tank.

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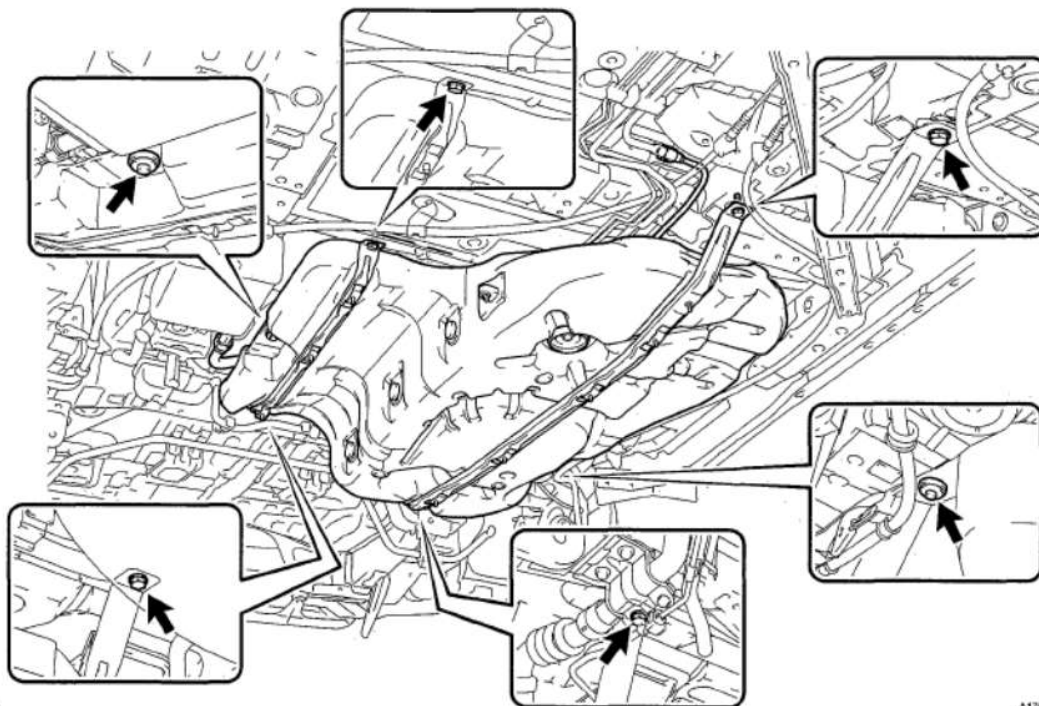


Fig. 123: Locating Fuel Tank Assembly Bolts, Nuts And Fuel Tank Bands
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. REMOVE REAR FUEL TANK SIDE PLATE

- Remove the rear fuel tank side plate.



Fig. 124: Identifying Rear Fuel Tank Side Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. REMOVE NO. 1 FUEL TANK CUSHION

- Remove the No. 1 fuel tank cushion.

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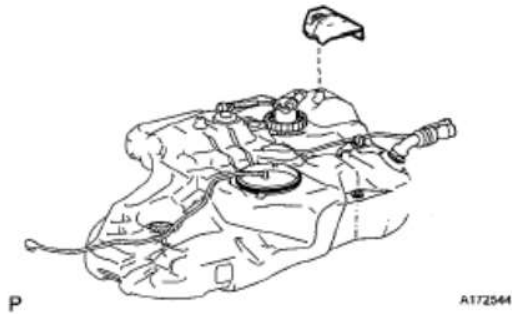


Fig. 125: Identifying No. 1 Fuel Tank Cushion
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. REMOVE FUEL PUMP TUBE SUB-ASSEMBLY

- a. Release the 2 claws, and then remove the fuel pump tube.

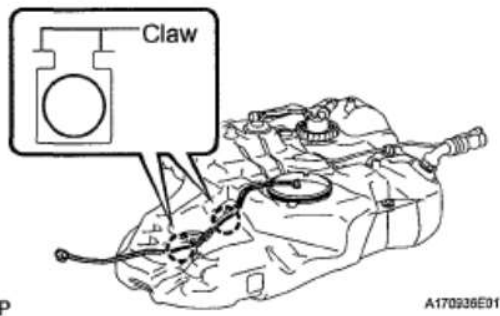


Fig. 126: Identifying Fuel Pump Tube Claws
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. REMOVE FUEL TANK TO FILLER PIPE HOSE

- a. Loosen the hose clamp bolt, and then remove the fuel tank to filler pipe hose.

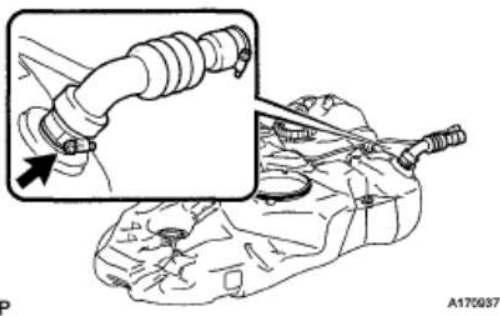


Fig. 127: Locating Hose Clamp Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

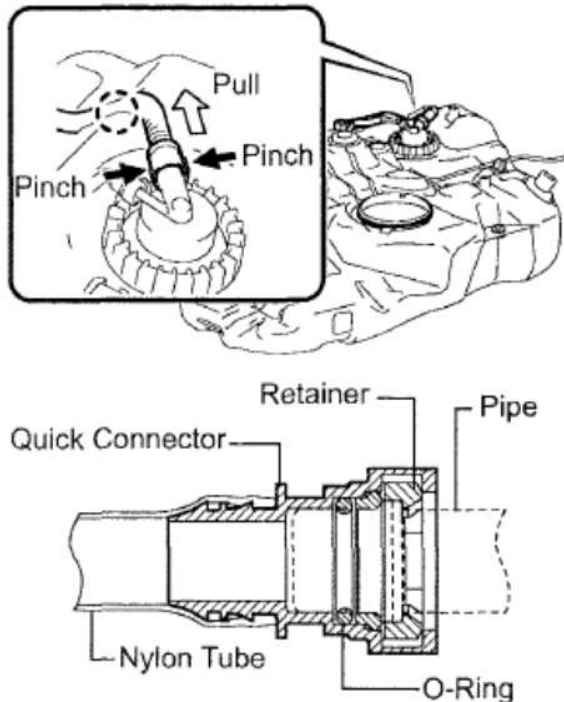
14. REMOVE FUEL TANK VENT HOSE

- a. Disconnect the fuel tank vent hose from the fuel tank over fill check valve assembly.

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1. Pinch the retainer and pull out the quick connector while pushing the quick connector against the pipe to disconnect the fuel tank vent hose from the fuel tank over fill check valve assembly.



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Fig. 128: Disconnecting Fuel Tank Vent Hose From Fuel Tank Over Fill Check Valve Assembly

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

NOTE:

- Remove dirt or foreign objects on the quick connector before this work.
- Do not allow any scratches or foreign objects on the parts when disconnecting as the fuel hose connector has the O-ring that seals the pipe.
- Perform this work by hand. Do not use any tools.
- Do not forcibly bend, twist or turn the nylon tube.
- Protect the connected part by covering it with a plastic bag after disconnecting the fuel tank vent hose.
- If the quick connector and pipe are stuck, push and pull them to release.

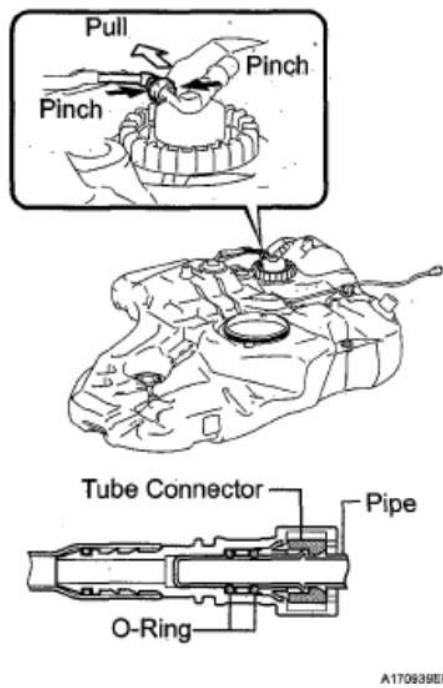
- b. Disconnect the No. 1 evaporation vent tube.

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NOTE:

- Check if there is any dirt or mud around the connector before this operation and clean the connector as necessary.
- It is necessary to prevent mud or dirt from entering the quick connector. If any foreign objects enter the connector, the O-rings may not seal properly.
- Do not use any tools in this operation.
- Do not bend or twist the nylon tube. Protect the connector by covering it with a plastic bag.
- When the pipe and connector are stuck, push and pull the connector to release it and pull the connector out carefully.



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Fig. 129: Disconnecting No. 1 Evaporation Vent Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. REMOVE FUEL TANK OVER FILL CHECK VALVE ASSEMBLY

- Using a 6 mm socket hexagon wrench, install SST to the fuel pump gauge retainer.

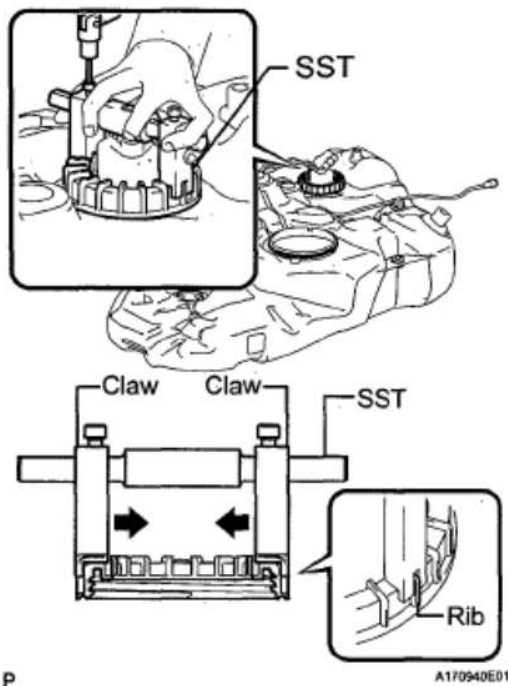
SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

HINT:

- Engage the SST claws securely with the fuel pump gauge retainer ribs to secure SST.
- Install SST while pressing the SST claws toward the fuel pump gauge retainer (toward the center of SST).

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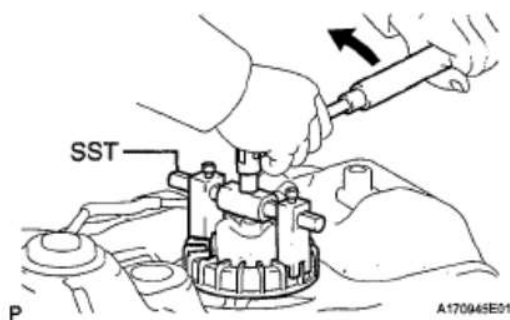
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Fig. 130: Installing SST To Fuel Pump Gauge Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST, loosen the fuel pump gauge retainer.

SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

NOTE: Loosen the retainer by turning it counterclockwise while holding SST down. Do not allow the claw of the tank suction tube support to slip out of its groove on the fuel tank.



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Fig. 131: Loosening Fuel Pump Gauge Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

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2009 ENGINE Fuel (1AR-FE) - Highlander

The ribs on the fuel pump gauge retainer can be fitted into the tips of SST.

- c. Remove the fuel pump gauge retainer.
- d. Remove the fuel tank over fill check valve assembly and gasket.



Fig. 132: Identifying Fuel Tank Over Fill Check Valve Assembly And Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Remove the tank suction tube support from the fuel tank.

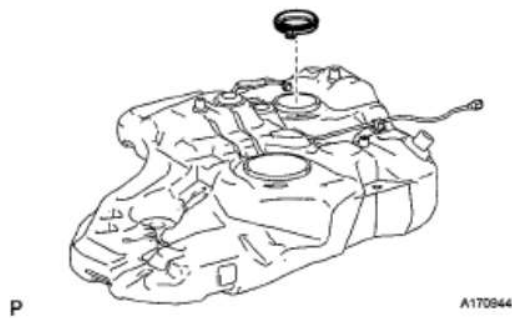


Fig. 133: Identifying Tank Suction Tube Support And Fuel Tank
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. REMOVE TANK SUCTION TUBE SUPPORT

- a. Remove the tank suction tube support from the fuel tank.



Fig. 134: Identifying Tank Suction Tube Support

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

17. REMOVE FUEL TANK SIDE PLATE

- a. Remove the bolt and nut, and then remove the fuel tank side plate and fuel tank bracket.

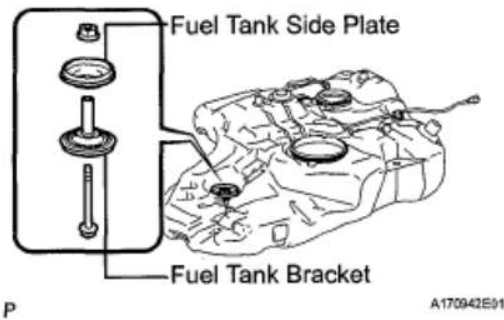


Fig. 135: Identifying Fuel Tank Side Plate And Fuel Tank Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. REMOVE FUEL TANK CUSHION SET

- a. Remove the fuel tank cushion sets and No. 5 fuel tank cushions.

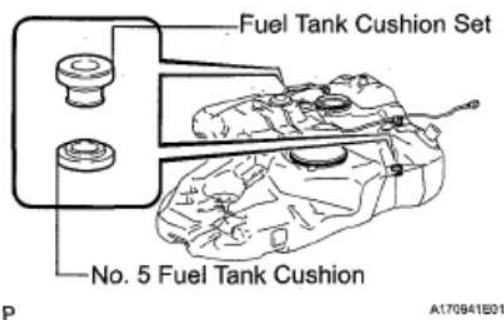


Fig. 136: Identifying Fuel Tank Cushion Set And No. 5 Fuel Tank Cushions
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION**1. INSTALL FUEL TANK CUSHION SET**

- a. Install the fuel tank cushion sets and No. 5 fuel tank cushions.

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2009 ENGINE Fuel (1AR-FE) - Highlander

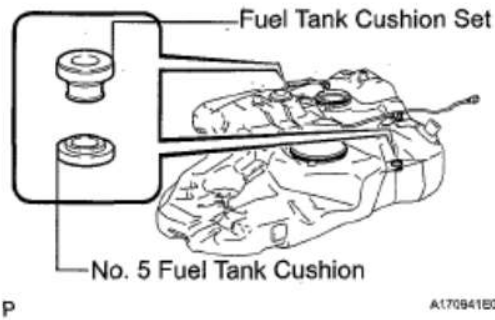


Fig. 137: Identifying Fuel Tank Cushion Sets And No. 5 Fuel Tank Cushions
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL FUEL TANK SIDE PLATE

- Install the fuel tank side plate and the fuel tank bracket with the bolt and nut.

Torque: 30 N*m (306 kgf*cm, 22 ft.*lbf)

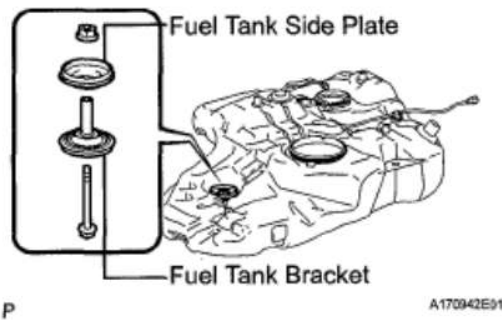


Fig. 138: Identifying Fuel Tank Side Plate And Fuel Tank Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL TANK SUCTION TUBE SUPPORT

- Install a new tank suction tube support as shown in the illustration.

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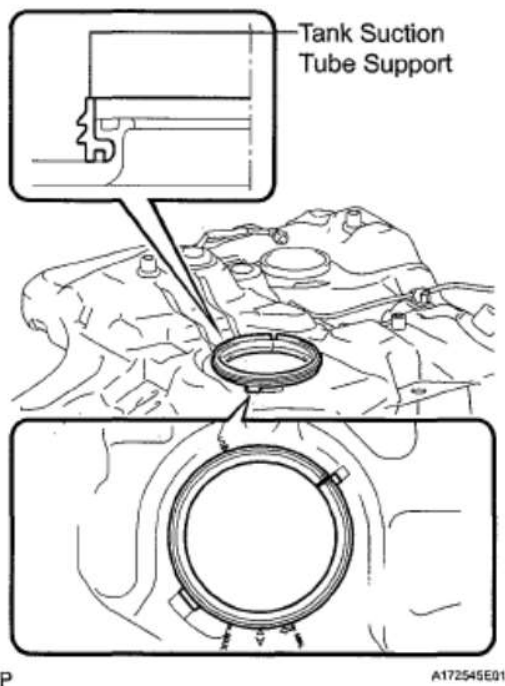
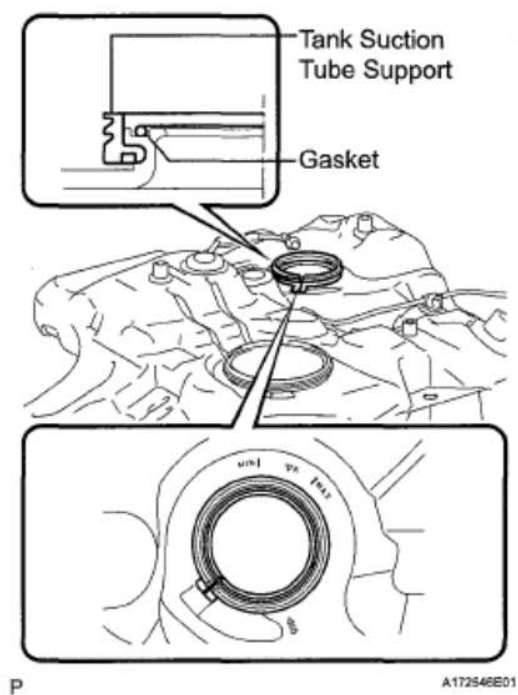


Fig. 139: Identifying Tank Suction Tube Support
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL FUEL TANK OVER FILL CHECK VALVE ASSEMBLY

- a. Install a new tank suction tube support and new gasket as shown in the illustration.



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Fig. 140: Identifying Tank Suction Tube Support And Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Attach the fuel tank over fill check valve assembly to the fuel tank.
- c. Align the keyway of the fuel suction tube support with the key of the fuel tank over fill check valve assembly.

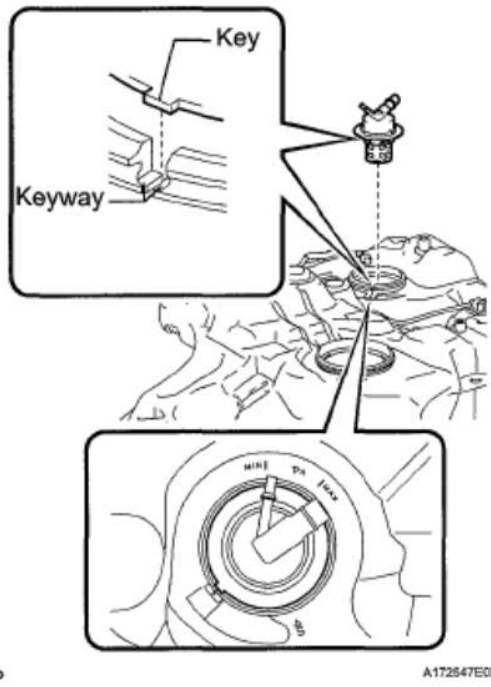


Fig. 141: Aligning Keyway Of Fuel Suction Tube Support With Key Of Fuel Tank Over Fill Check Valve Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Align the triangle mark on a new fuel pump gauge retainer with the "S" mark, and attach the fuel pump gauge retainer.

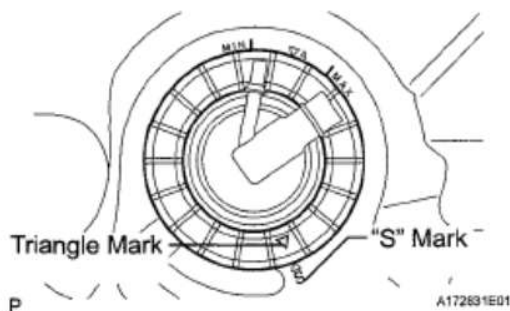


Fig. 142: Identifying Triangle And S Mark On Fuel Pump Gauge Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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- e. Using a 6 mm socket hexagon wrench, install SST to the fuel pump gauge retainer.

SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

HINT:

- Engage the SST claws securely with the fuel pump gauge retainer ribs to secure SST.
- Install SST while pressing the SST claws toward the fuel pump gauge retainer (toward the center of SST).

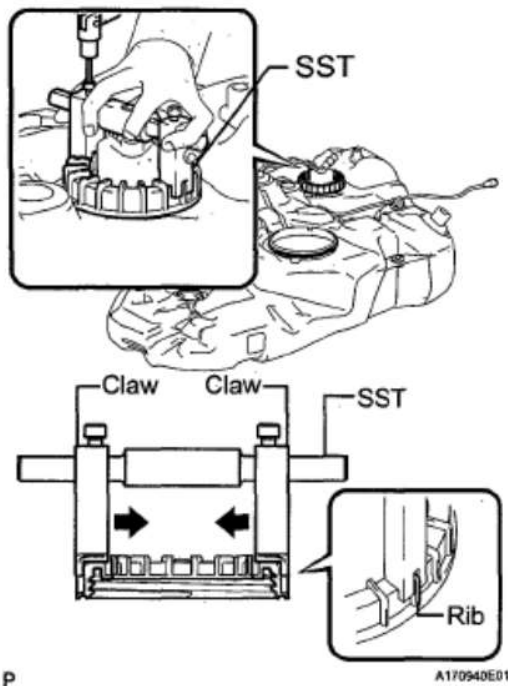


Fig. 143: Installing SST To Fuel Pump Gauge Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Rotate the fuel pump gauge retainer by hand, then tighten it one complete turn and another half turn using SST. The triangle mark on the fuel pump gauge retainer must be positioned between the "MIN" and "MAX" marks on the fuel tank.

SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

NOTE:

- Do not use any tools other than specified in this operation. Damage to the fuel pump gauge retainer or the fuel tank may result.
- Fully tighten the retainer by turning it clockwise while holding SST down. Do not allow the claw of the tank suction tube support to slip out of its groove on the fuel tank.

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HINT:

The ribs on the fuel pump gauge retainer can be fitted into the tips of SST.

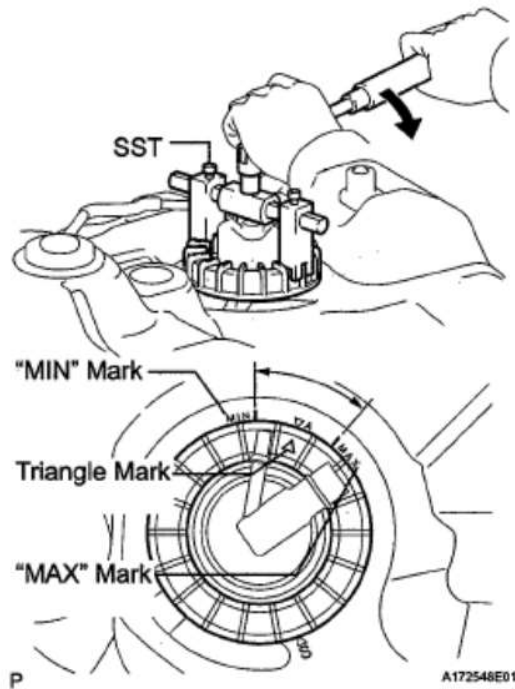


Fig. 144: Rotating Fuel Pump Gauge Retainer
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL FUEL TANK VENT HOSE

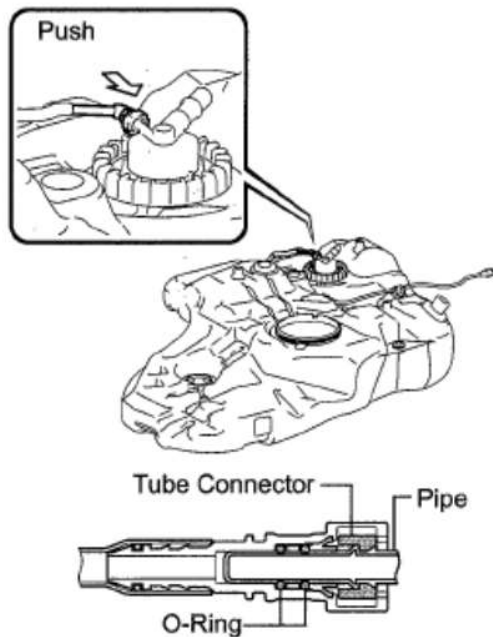
- a. Connect the No. 1 evaporation vent tube.
 1. Align the axis of the connector with the axis of the pipe. Push the pipe into the connector until the connector makes a click sound. If the connection is too tight, apply a small amount of fresh engine oil to the tip of the pipe.

NOTE:

- Check for damage or foreign objects on the parts that are to be connected.
- After connecting, check that the fuel tube connector and the pipe are securely connected by pulling on them.

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Fig. 145: Pushing Pipe Into Connector

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

b. Connect the fuel tank vent hose.

1. Align the axis of the connector with the axis of the pipe. Push the pipe into the connector until the connector makes a click sound. If the connection is too tight, apply a small amount of fresh engine oil to the tip of the pipe.

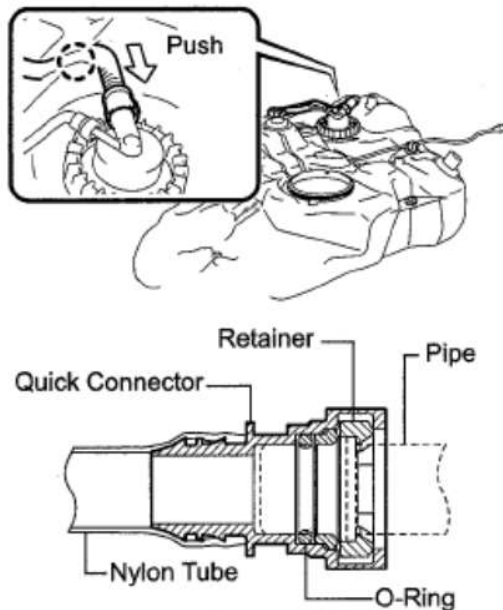
NOTE:

- Check for damage or foreign objects on the parts that are to be connected.
- After connecting, check that the fuel tube connector and the pipe are securely connected by pulling on them.

2. Install the fuel tank vent hose, and engage the claw.

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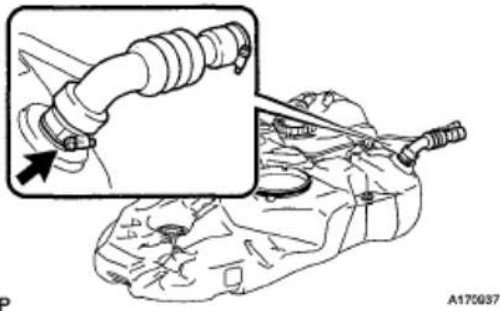
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Fig. 146: Pushing Pipe Into Connector

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

6. INSTALL FUEL TANK TO FILLER PIPE HOSE

- Install the fuel tank to filler pipe hose with the hose clamp.



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Fig. 147: Locating Hose Clamp Bolt

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

7. INSTALL FUEL PUMP TUBE SUB-ASSEMBLY

- Install the fuel pump tube, and engage the 2 claws.

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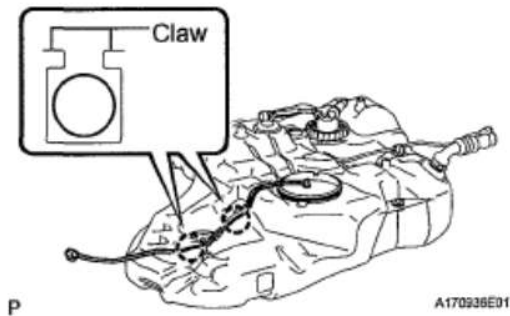


Fig. 148: Identifying Fuel Pump Tube Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **INSTALL NO. 1 FUEL TANK CUSHION**
- a. Apply new butyl tape to the positions of the No. 1 fuel tank cushion as shown in the illustration.

Length

DIMENSION REFERENCE

Dimension	Length
A	55 mm (2.17 in.)
B	20 mm (0.79 in.)
C	60 mm (2.36 in.)
D	20 mm (0.79 in.)
E	80 mm (3.15 in.)
F	20 mm (0.79 in.)
G	53.4 mm (2.10 in.)
H	49.2 mm (1.94 in.)
I	18.9 mm (0.74 in.)
J	43.3 mm (1.70 in.)

- b. Install the No. 1 fuel tank cushion.

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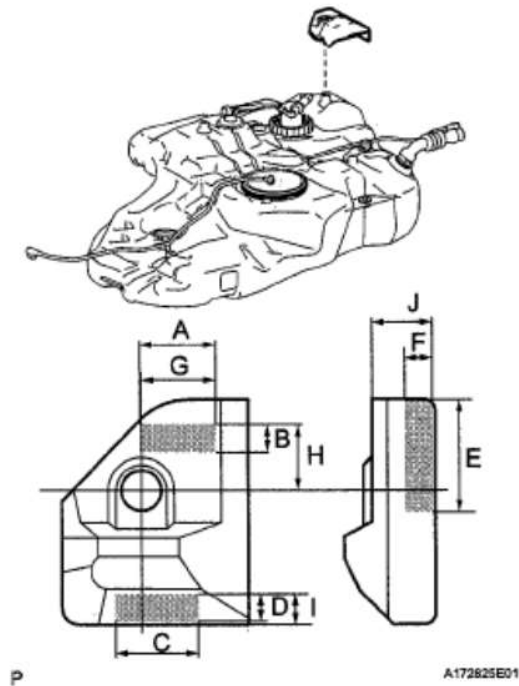


Fig. 149: Identifying No. 1 Fuel Tank Cushion Dimension
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL REAR FUEL TANK SIDE PLATE

- Install the rear fuel tank side plate.

10. INSTALL FUEL TANK ASSEMBLY

- Set the fuel tank onto a transmission jack.
- Operating the transmission jack, install the fuel tank.

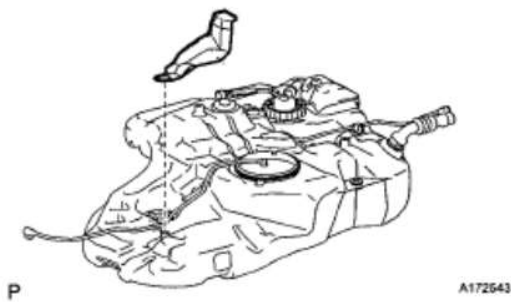


Fig. 150: Identifying Rear Fuel Tank Side Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Tighten the 2 nuts.

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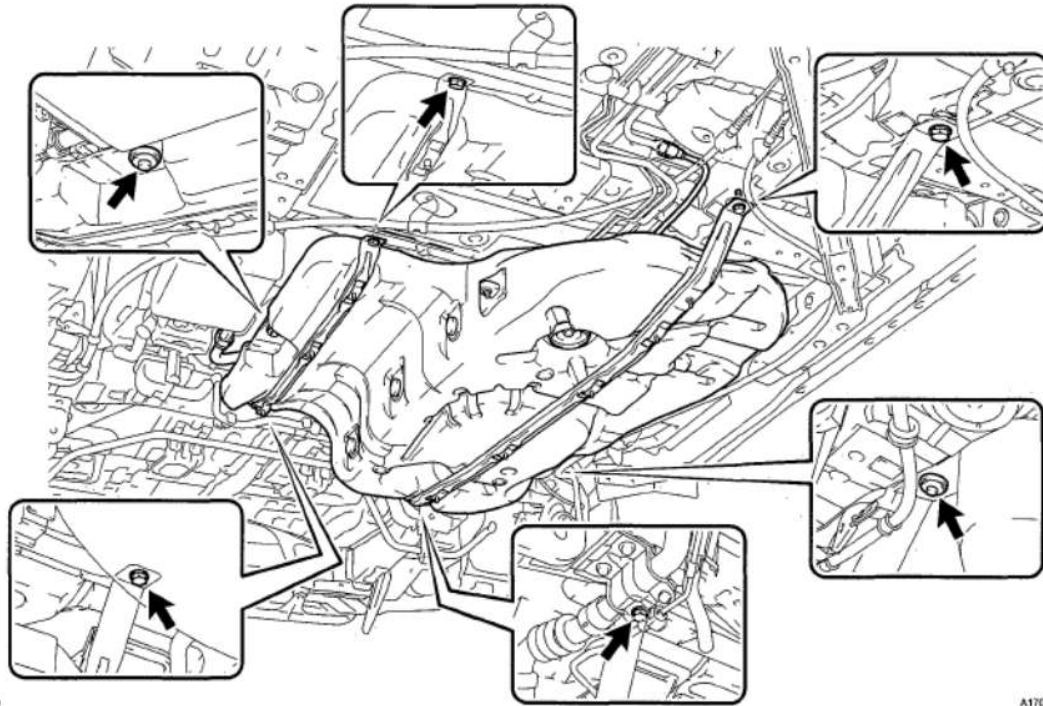


Fig. 151: Locating Fuel Tank Assembly Bolts, Nuts And Fuel Tank Bands
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 20 N*m (200 kgf*cm, 14 ft.*lbf)

- d. Install the 2 fuel tank bands with the 4 bolts.

Torque: 39 N*m (400 kgf*cm, 29 ft.*lbf)

- e. Align the matchmarks and install the fuel tank to filler pipe hose to the fuel tank.
 f. Install the hose clamp within the range shown in the illustration.

HINT:

- A = 45°
- B = 120°

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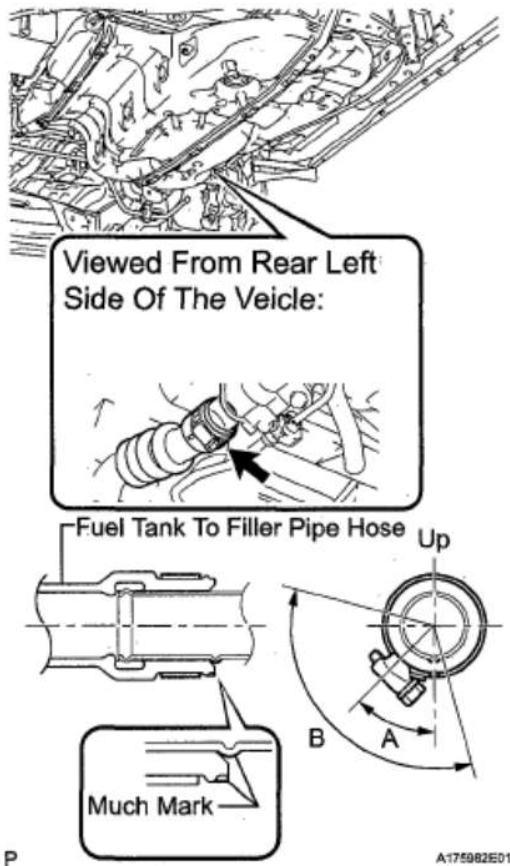


Fig. 152: Installing Hose Clamp

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

g. Connect the fuel tank vent hose.

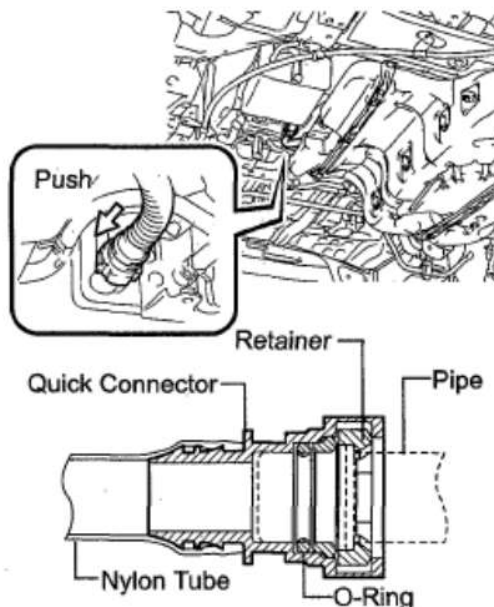
1. Align the quick connector with the pipe, then push in the quick connector until the retainer makes a click sound to connect the charcoal canister fuel hose to the charcoal canister assembly.

NOTE:

- Check that there are no scratches or foreign objects around the connected part of the quick connector and pipe before this work.
- After connecting the charcoal canister fuel hose, check if the quick connector and the pipe are securely connected by pulling on them.

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**Fig. 153: Connecting Fuel Tank Vent Hose**

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

- h. Connect the No. 3 fuel tank breather tube.
1. Push the quick connector to the pipe until it makes a click sound.

NOTE:

- Check if there is any damage or foreign objects on the connected part.
- After connecting, check if the quick connector and the pipe are securely connected by pulling on them.

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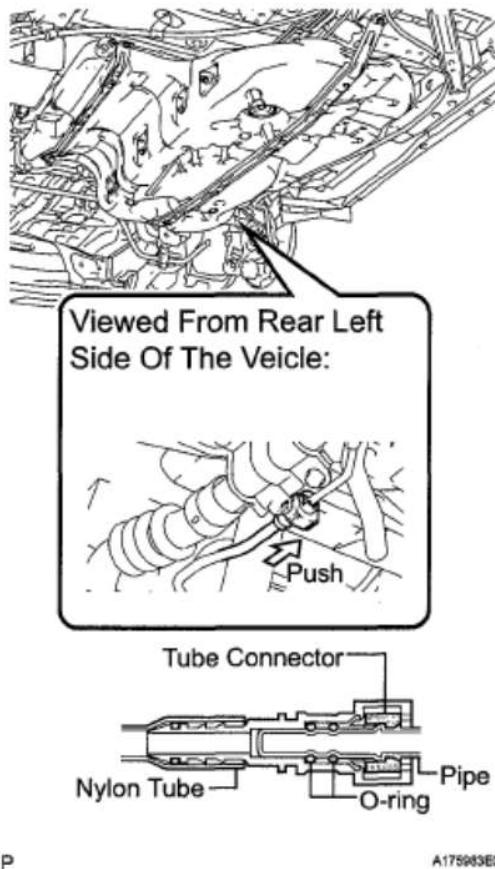


Fig. 154: Connecting No. 3 Fuel Tank Breather Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- i. Connect the fuel pump tube.
 1. Push the quick connector and push in the retainer to lock the claws.

NOTE:

- Check if there is any damage or foreign objects on the connected part.
- After connecting, check if the quick connector and the pipe are securely connected by pulling on them.

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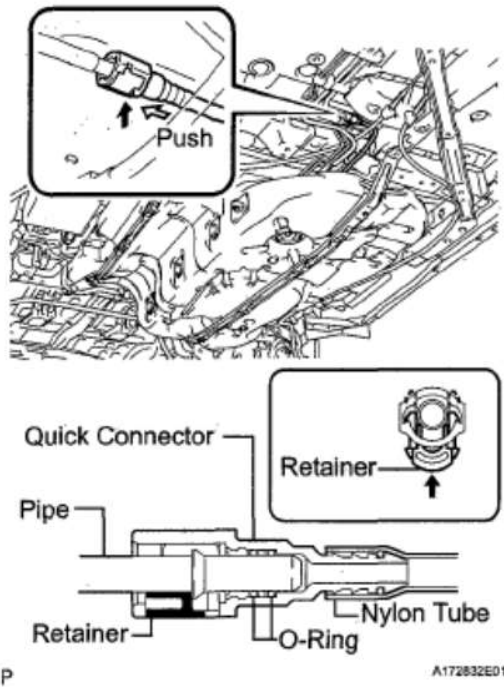


Fig. 155: Connecting Fuel Pump Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. INSTALL NO. 1 FUEL TANK PROTECTOR SUB-ASSEMBLY

- a. Install the No. 1 fuel tank protector sub-assembly with the 7 nuts.

Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)

- b. Install 3 new clips (A).

12. INSTALL NO. 3 FRONT FLOOR HEAT INSULATOR (See INSTALLATION)

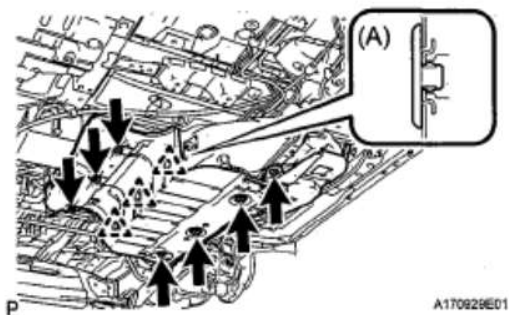


Fig. 156: Locating No. 1 Fuel Tank Protector Sub-Assembly Clips And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. INSTALL NO. 4 EXHAUST PIPE SUPPORT BRACKET

- a. Install the No. 4 exhaust pipe support bracket with the 2 bolts.

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Torque: 22 N*m (224 kgf*cm, 16 ft.*lbf)

14. **INSTALL CENTER EXHAUST PIPE ASSEMBLY** (See INSTALLATION)
15. **INSTALL TAIL EXHAUST PIPE ASSEMBLY** (See INSTALLATION)

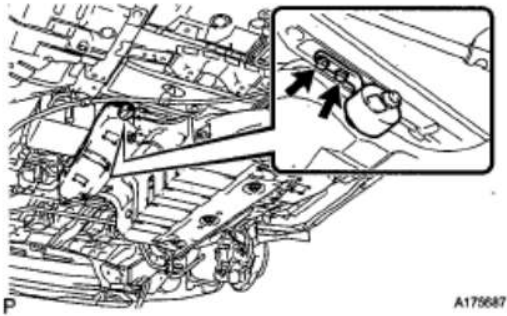


Fig. 157: Locating No. 4 Exhaust Pipe Support Bracket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

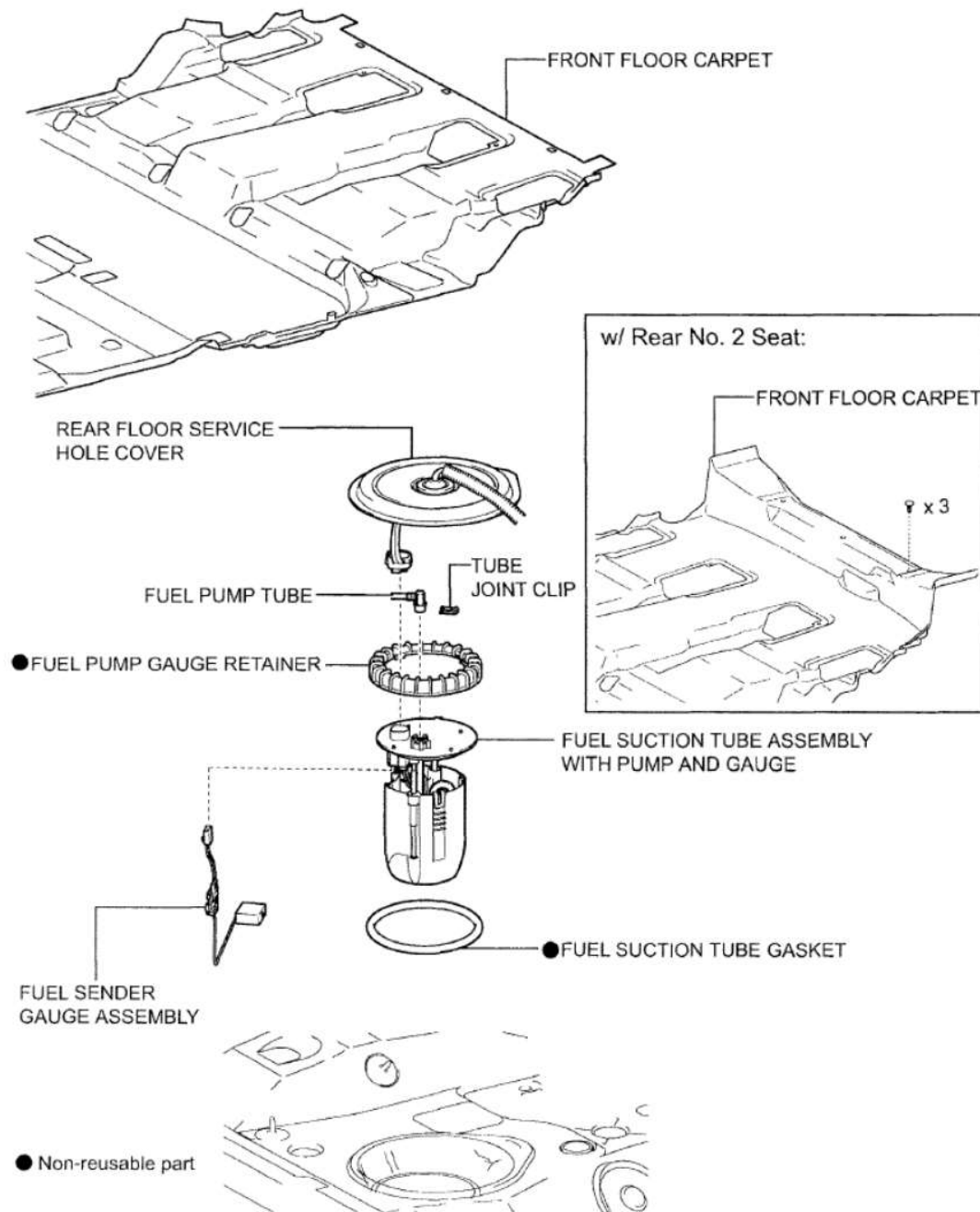
16. **INSTALL CENTER FRONT FLOOR COVER** (See INSTALLATION)
17. **INSTALL FUEL SUCTION TUBE ASSEMBLY WITH PUMP AND GAUGE**
 - a. Install the fuel suction tube assembly with pump and gauge (See INSTALLATION).
18. **INSPECT EXHAUST GAS LEAK**

FUEL SENDER GAUGE ASSEMBLY

COMPONENTS

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Fig. 158: Identifying Fuel Sender Gauge Assembly Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE FUEL SUCTION TUBE ASSEMBLY WITH PUMP AND GAUGE**
 - a. Remove the fuel suction tube assembly with pump and gauge (See **REMOVAL**).
2. **REMOVE FUEL SENDER GAUGE ASSEMBLY**

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- a. Disconnect the connector and remove the fuel sender gauge from the fuel suction tube.

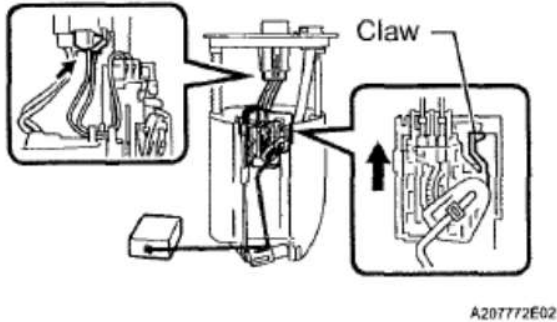


Fig. 159: Removing Fuel Sender Gauge From Fuel Suction Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION**1. INSPECT FUEL SENDER GAUGE ASSEMBLY**

- Remove the fuel sender gauge assembly.
- Check the operation of the float moving smoothly between F and E.
- Measure the resistance between terminals 2 (FE) and 3 (FS) of the connector according to the value (s) in the table below.

OK**RESISTANCE SPECIFICATION**

Float Level	Resistance (Ω)
F	3.0 to 5.0
E	109.0 to 111.0

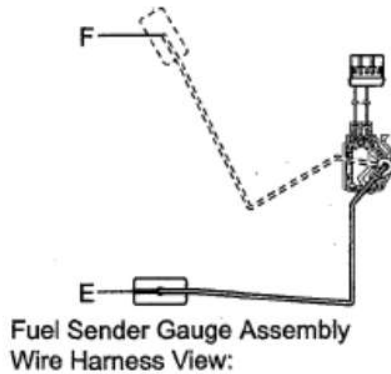
HINT:

If the value is not as specified, replace the fuel sender gauge assembly.

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Fuel Sender Gauge Assembly:



Fuel Sender Gauge Assembly
Wire Harness View:

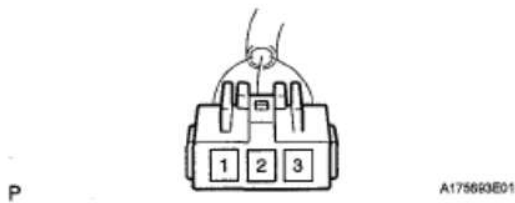


Fig. 160: Measuring Resistance Between Fuel Sender Gauge Assembly Terminals 2 (FE) And 3 (FS) Of Connector

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

INSTALLATION

1. **INSTALL FUEL SENDER GAUGE ASSEMBLY**
 - a. Slide the fuel sender gauge to fit the claw.
2. **INSTALL FUEL SUCTION TUBE ASSEMBLY WITH PUMP AND GAUGE**
 - a. Install the fuel suction tube assembly with pump and gauge (See **INSTALLATION**).

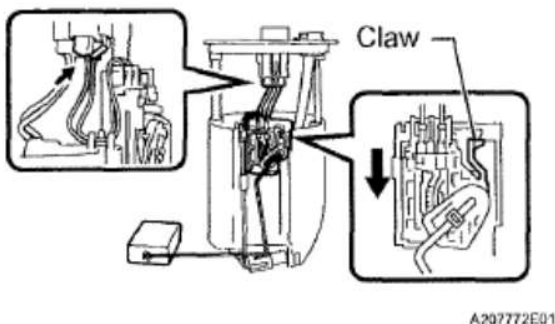


Fig. 161: Installing Fuel Sender Gauge Assembly With Claw

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