

SECTION 6C

FUEL SYSTEM

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Fuel System

Service Precautions

Parts of the fuel system such as the internal part of the fuel injector, and holes and clearances that form passages for fuel are finished to a very high degree of accuracy. They are therefore highly sensitive to foreign matter and the entry of foreign matter could cause damage to the fuel passage. Therefore, effective measures should be taken to prevent the entry of foreign matter.

If a water removal agent is used in the fuel then it will absorb moisture in the light oil and may cause rust. Therefore, do not use a water removal agent in the fuel tank.

When servicing the fuel system, every precaution must be taken to prevent the entry of foreign material into the system.

- Before beginning the service procedure, wash the fuel line and the surrounding area.
- Perform the service procedures with clean hands. Do not wear work gloves.
- Immediately after removing the fuel hose and/or fuel pipe, carefully tape vinyl bags over the exposed ends of the hose or pipe.
- If parts are to be replaced (fuel hose, fuel pipe, etc.) do not open the new part packaging until installation.

Discard gaskets and O-rings and replace them with new ones.

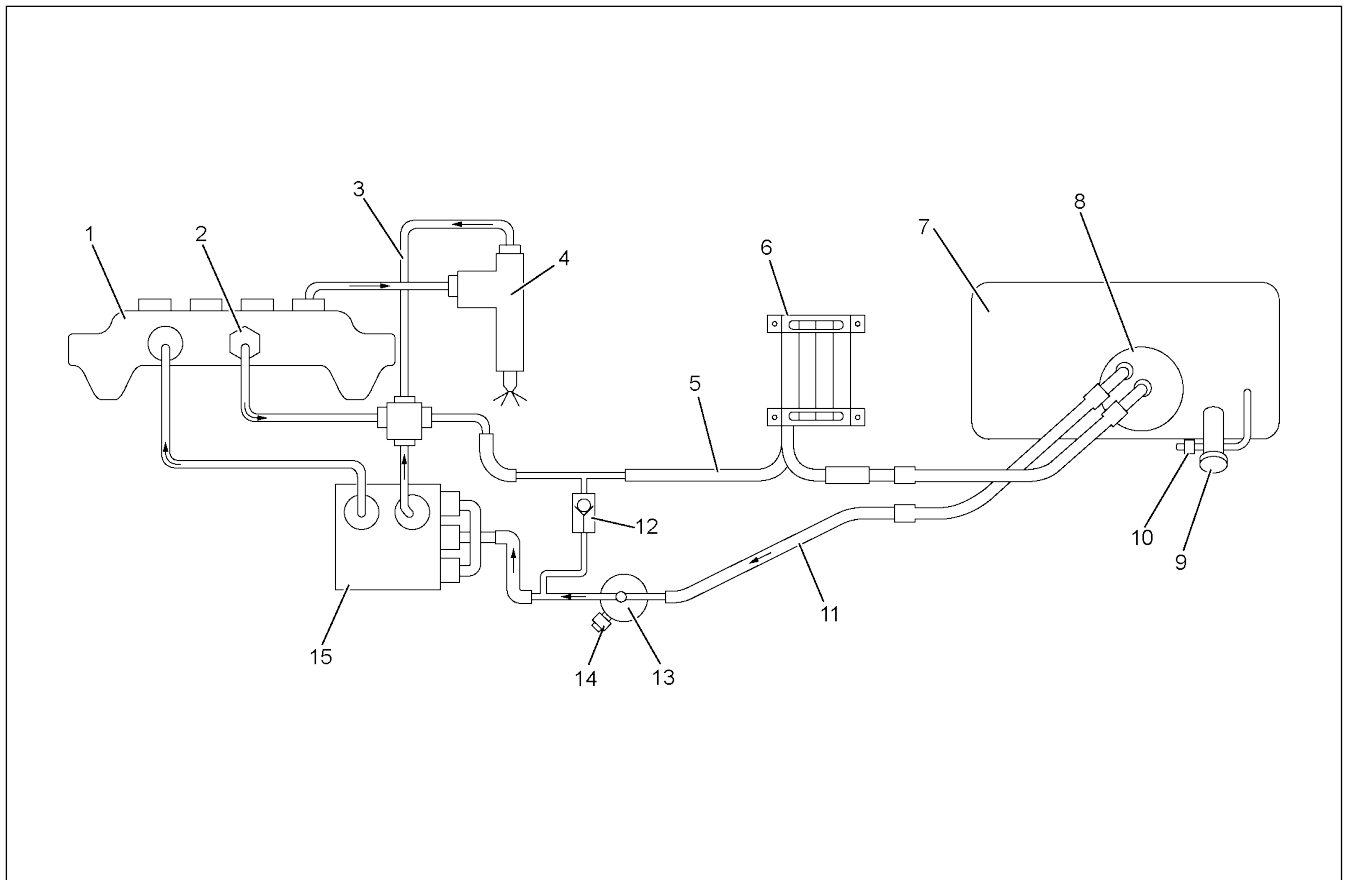
Work procedure

- The fuel opening must be quickly sealed when removing the fuel pipe, injection pipe, fuel injector, fuel supply pump, and fuel rail.
- The eyebolts and gasket must be stored in a clean parts box with a lid to prevent adhesion of foreign matter.
- Fuel leakage could cause fires. Therefore, after finishing the work, wipe off the fuel that has leaked out and make sure there is no fuel leakage after starting the engine.



Explanations on functions and operation

Fuel system diagram

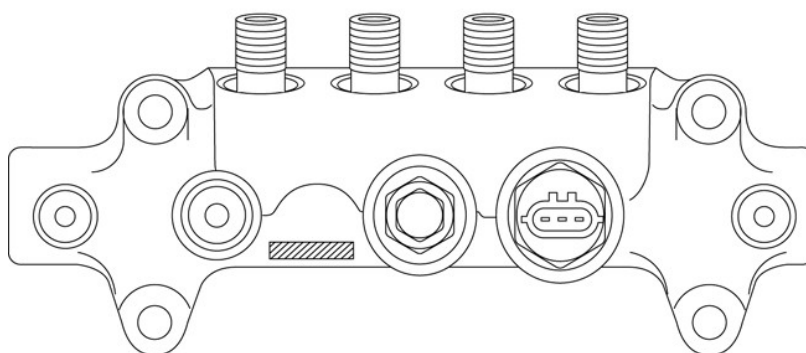
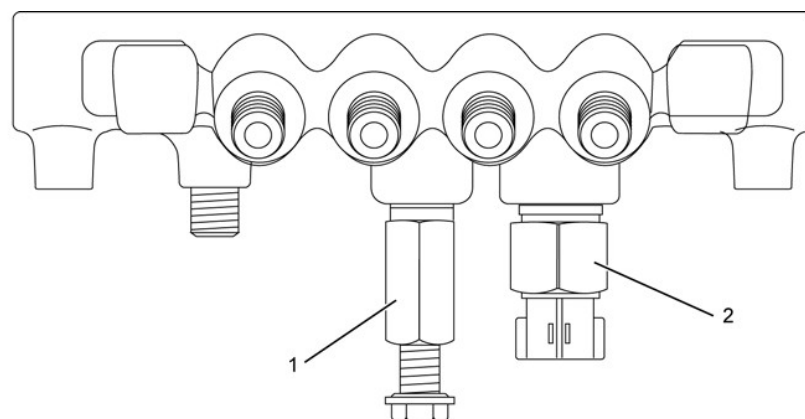


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Legend

- | | |
|----------------------------------|---------------------------------|
| 1. Fuel Rail | 9. Fuel Filler Cap |
| 2. Fuel Pressure Limiter | 10. Check Valve |
| 3. Leak Off Pipe | 11. Fuel Feed Pipe |
| 4. Fuel Injector | 12. One Way Valve |
| 5. Fuel Return Pipe | 13. Fuel Filter With Sedimenter |
| 6. Fuel Cooler | 14. Switch; Clogging Monitoring |
| 7. Fuel Tank | 15. Fuel Supply Pump |
| 8. Fuel Pump and Sender Assembly | |

Fuel rail assembly



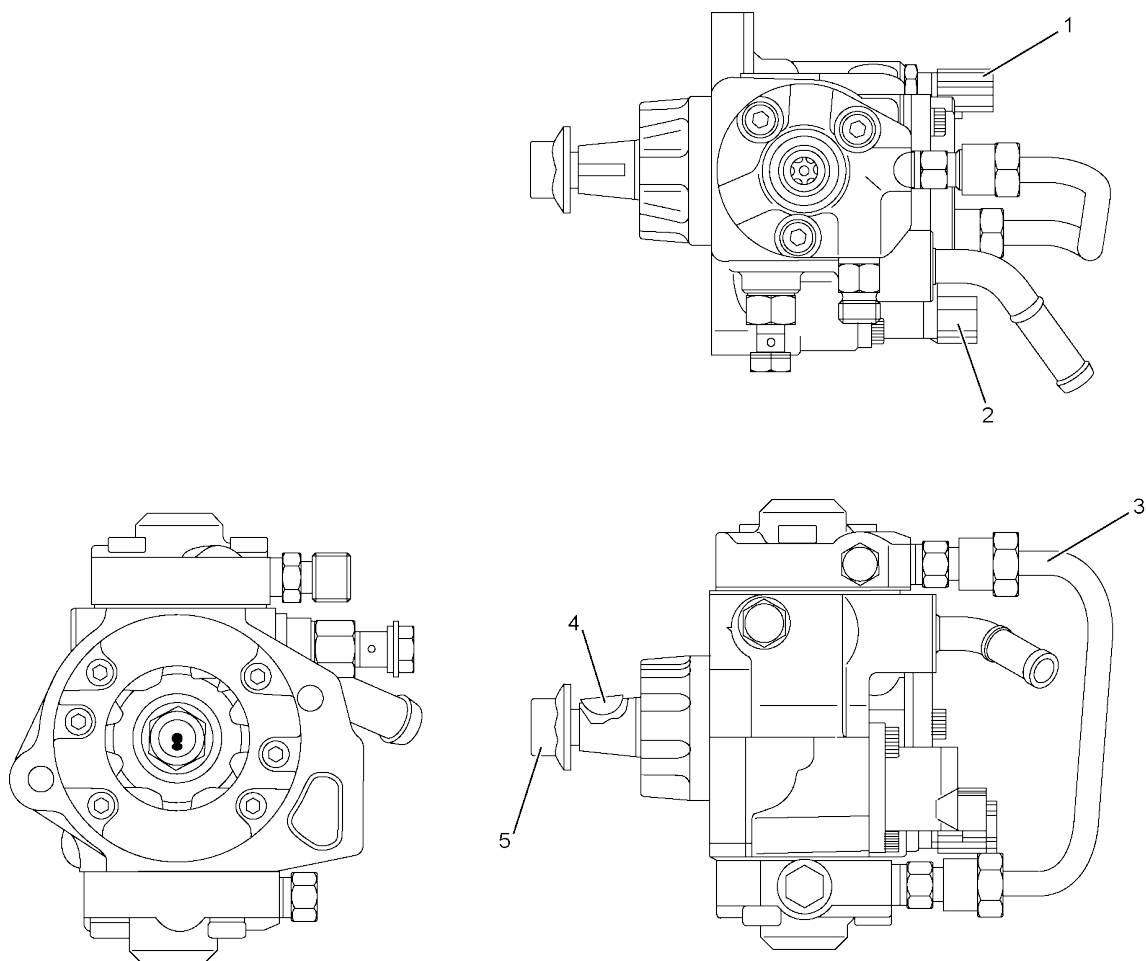
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Legend

1. Fuel Pressure Limiter

2. Fuel Rail Pressure Sensor

Fuel supply pump

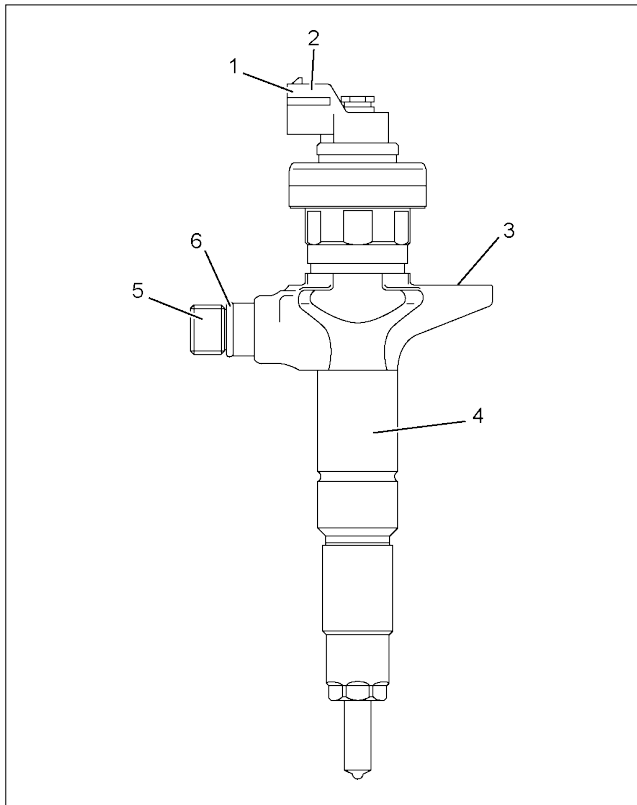


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Legend

- | | |
|----------------------------|-----------------|
| 1. Fuel Temperature Sensor | 4. Camshaft Key |
| 2. Suction Control Valve | 5. Camshaft Nut |
| 3. High Pressure Pipe | |

Fuel injector

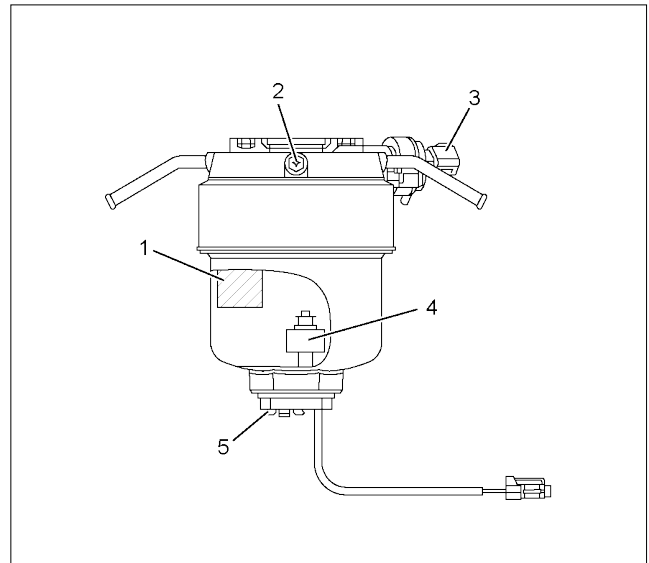


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Legend

1. Terminal
2. Fuel Injector ID Code
3. Two Dimensional Barcode
4. Parts Number
5. Port for Mounting the Injection Pipe
6. O-ring

Fuel filter



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Legend

1. Element
2. Air Bleeding Plug
3. Switch; Clogging Monitoring
4. Sensor; Water
5. Drain Plug

Functional check

Air bleeding

1. Ignition switch is turned to the ON position for 15 seconds.
2. Ignition switch is turned to the OFF position.
3. The above operation is repeated 5 times.

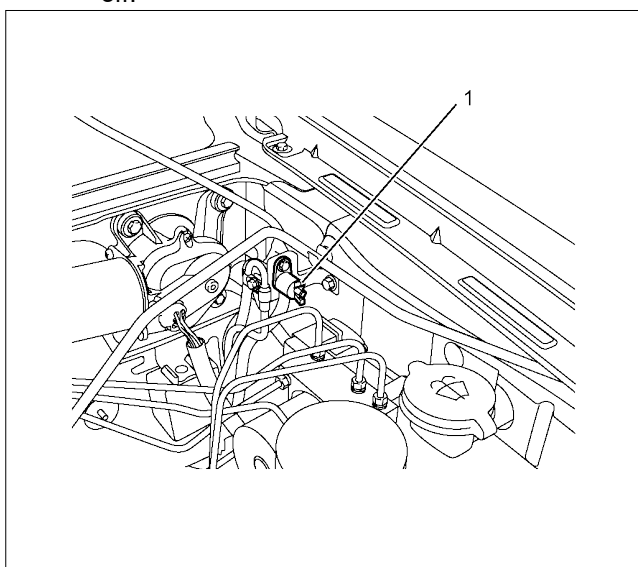
Note: If the air bleeding work is insufficient then it could lead to faults in the engine. Therefore, the procedures after starting the engine should always be implemented.

Water drain

A warning lamp will light up if water above the specified volume collects in the sediment. In such cases, drain out the water by performing the following operations:

1. Draining with fuel filter drain plug.
 - a. Set a container at the tip of the plastic hose.
 - b. Loosen the air bleeding plug and the drain plug.
 - c. Discharge the water.
 - d. Tighten the drain plug after discharging the water.
 - e. Tighten the air bleeding plug to the specified torque.
Tightening torque: 3 N·m(0.3 kg·m/26 lb in)
 - f. Ignition switch is turned ON for 15 seconds check for fuel leakage.

- g. Check that the warning lamp in the meter is off.
2. Draining with drain plug in engine room.
 - a. With the engine off, open the engine hood and loosen the drain plug (1) located on the left hand side of the engine room. (3-4 turns)
 - b. Turn the starter switch to the "ON" position for 10 seconds, and then turn the starter switch to the "OFF" position for 10 seconds. Then, once again turn the starter switch to the "ON" position for 10 seconds.
 - c. Tighten the drain plug firmly.
 - d. After starting the engine, check that there is no fuel leakage from the drain plug. Also check that the water separator indicator has turned off.



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NOTE:

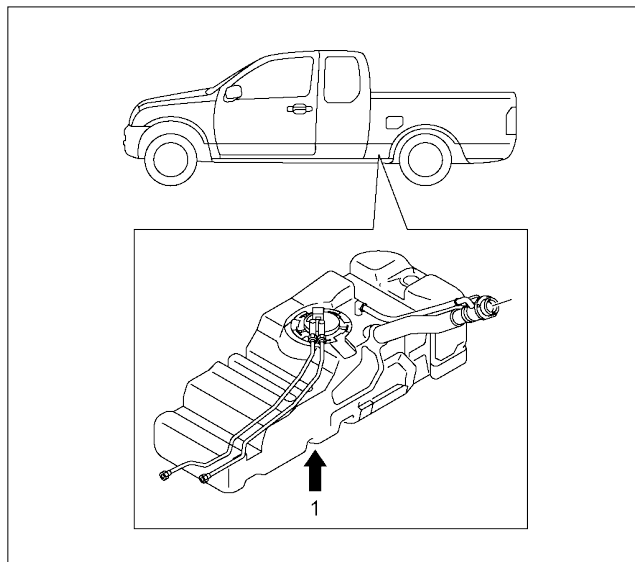
- If the water separator requires frequent draining, have the fuel tank drained at your ISUZU/GM Dealer.
- Be sure to stop the engine when draining the fuel tank.
- Confirm that there are no combustible materials under the drain hose, and use a receptacle to catch the drained water.

Engine starting cautions

- Before starting the engine, turn the ignition switch to the "ON" position. Wait 15 seconds. Return the switch to the "LOCK" position. Repeat this procedure 5 times.
- After starting the engine, allow it to idle for 10 minutes.

Fuel Pump Functional Check

1. Turn the starter switch to "ON" position.
2. Touch the under portion of the Fuel Tank by the hand as shown in the following figure within 12 seconds.



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Legend

1. Touch this area by the hand

3. Make sure a vibration by the Fuel Pump is detected.

Fuel Pump stops within 12 seconds of turning the starter switch to the "ON" position.

When the check is repeated, return the starter switch to the "LOCK" position for 10 – 15 seconds and perform procedures 1 – 3.

WARNING: FUEL PUMP FUNCTIONAL CHECK MUST BE CONDUCTED UNDER THE FOLLOWING CONDITIONS TO AVOID INJURY.

- **APPLY THE PARKING BRAKE.**
- **STOP THE ENGINE.**

Trouble Shooting

Problems with starting

Condition	Possible Cause	Correction
Problems with starting	Fuel tank is empty	Fill the tank.
	Air has entered the fuel system.	Bleed the air.
	Fuel line or fuel cooler is clogged or damaged. Connection to the fuel line is loose.	Repair or replace the fuel line and fuel cooler. Re-tighten the connection.
	Fuel filter element is clogged.	Replace the cartridge.
	Fault in the feed pump	Replace the fuel supply pump.
	Regulating valve is open.	Replace
	Sticking of the fuel injector	Replace the fuel injector.
	Defective engine control system	Diagnose the engine control system.

Hunting during idling

Condition	Possible Cause	Correction
Hunting during idling	Air has entered the fuel system.	Bleed air from the fuel system.
	Leakage or clogging of the fuel system	Repair or replace the fuel system.
	Drops of water have entered the fuel system.	Replace the fuel.
	Fuel filter element is clogged.	Replace the fuel filter element (cartridge).
	Sticking of the fuel injector	Replace the fuel injector.
	Defective engine control system	Diagnose the engine control system.

Insufficient horsepower

Condition	Possible Cause	Correction
Insufficient horsepower	Air has entered the fuel system.	Bleed air from the fuel system.
	Leakage or clogging of the fuel system	Repair or replace the fuel system.
	Water mixes in the fuel system	Replace the fuel.
	Fuel filter element is clogged.	Replace the element or the cartridge.
	Sticking of the fuel injector	Replace the fuel injector.
	Defective engine control system	Diagnose the engine control system.

Maximum engine speed is too low

Condition	Possible Cause	Correction
Maximum engine speed is too low	Fuel line, fuel cooler is clogged or damaged.	Repair or replace the fuel line, fuel cooler.
	Defective engine control system	Diagnose the engine control system.

Engine does not stop

Condition	Possible Cause	Correction
Engine does not stop	Defective engine control system	Diagnose the engine control system.

Exhaust gas is blue or black

Condition	Possible Cause	Correction
Exhaust gas is blue or black.	Reduction in injection-valve opening pressure or defective atomizing status	Replace the fuel injector.
	Engine control system malfunction	System diagnosis.

Fuel System Check

Description

Conforms to a fuel leak. Engine acceleration raises fuel pressure and which increases the leak.

Leak could be in the following pipes and locations.

- Between injectors and fuel rail.
- Between fuel rail and fuel supply pump.
- Between fuel supply pump and fuel filter.
- Between fuel filter and fuel tank.
- Between pressure limiter and fuel cooler.
- Between fuel cooler and fuel tank.
- Between injector over flow and leak off pipe.

Diagnostic Aids

Check the following items.

- Air in the fuel line
- Clogged fuel filter
- Fuel pipe malfunction (Crushing, breakage, clogging, disconnection, etc.)
- Fuel cooler malfunction (Crushing, breakage, clogging, disconnection, etc.)

- Fuel tank malfunction
- Injector malfunction
- Fuel supply pump malfunction
- Pressure limiter malfunction

An intermittent may be caused by a poor connection, rubbed-through wire insulation or a wire broken inside the insulation. Check for poor connections or a damaged harness.

Inspect the ECM harness and connector for improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection, and damaged harness.

ECU may set a DTC, if there is adequate air in fuel line.

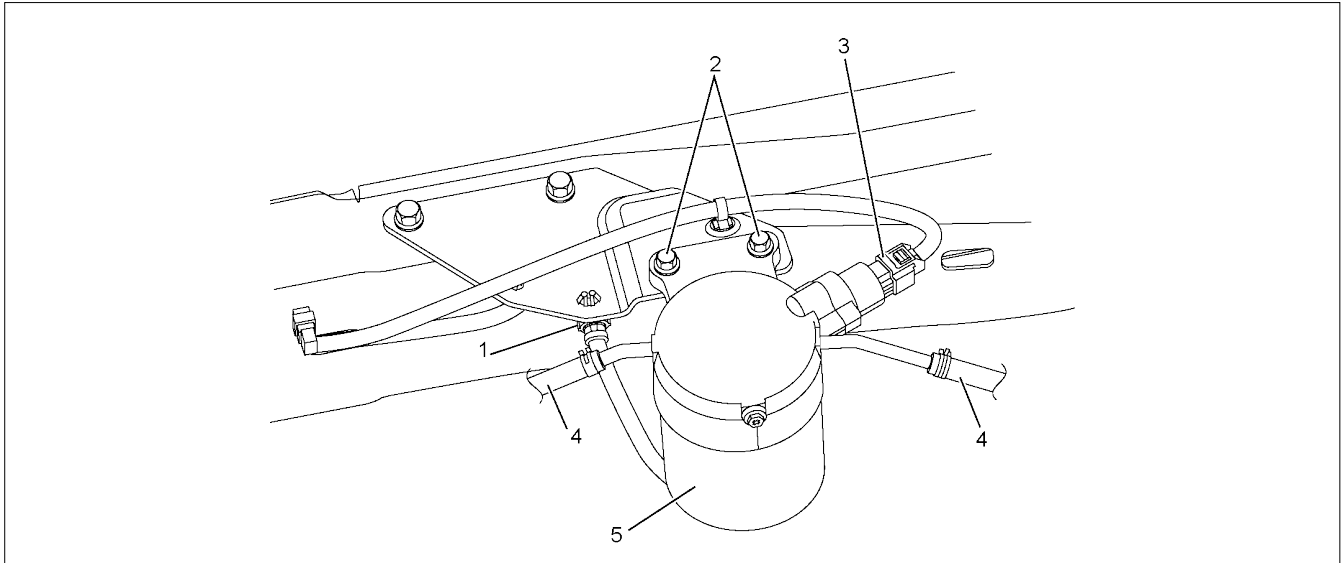
Schematic Reference: Engine Controls Schematics

Step	Action	Value(s)	Yes	No
1	Check the fuel quantity. Was a problem found?	—	Go to <i>Step 2</i>	Add fuel and Go to <i>Step 2</i>
2	Check the fuel quality. 1. Discharge the fuel from fuel tank 2. Replenish the tank with specified fuel 3. Bleed the air from the fuel system 4. Start the engine Could the engine be started?	—	Go to <i>Step 7</i>	Go to <i>Step 3</i>
3	Bleed the air from fuel system. Refer to Fuel System Air Bleeding in this section. Is the action complete?	—	Go to <i>Step 4</i>	—
4	Check the main fuel filter for clogging. Clean, repair, or replace as required. Notice: Replacement of a fuel filter is checking to a dealer. Is the action complete?	—	Go to <i>Step 5</i>	—
5	Check the fuel line and fuel cooler for damage and leakage. Clean, repair, or replace as required. • Crushed areas • Breakage • Cracks • Loose connections Is the action complete?	—	Go to <i>Step 6</i>	—

Step	Action	Value(s)	Yes	No
6	Check the fuel tank. If a problem is found, clean, repair, or replace as necessary. • Foreign material (Clogged suction port) • Bent or cracked suction pipe • Fuel tank distortion • Fuel tank improper installation • Fuel pump and sender malfunction • Clogged fuel cap hole • Water Is the action complete?	—	Go to <i>Step 7</i>	—
7	Bleed the air from the fuel pipe again. Refer to Fuel System Air Bleeding in this section. Is the action complete?	—	Verify repair	—

Fuel Filter Assembly

Components



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Legend

- | | |
|------------------------------|-------------------------|
| 1. Fuel Sedimenter Connector | 4. Fuel Hose |
| 2. Bolt | 5. Fuel Filter Assembly |
| 3. Harness Connector | |

Removal

1. Remove the fuel filler cap.
2. Remove the fuel sedimenter connector.
3. Disconnect the harness connector.
4. Remove the feed hose and the return hose from the fuel filter and plug it so that the fuel does not flow out.
5. Remove the bolts for mounting the fuel filter.
6. Remove the fuel filter assembly.

Installation

1. Install the fuel filter assembly.
2. Install the bolts for mounting the fuel filter.
3. Install the feed hose and the return hose.
4. Connect the harness connector.
5. Install the fuel sedimenter connector.
6. Install the fuel filler cap.
7. Bleed out the air.
 - Refer to "Fuel System".

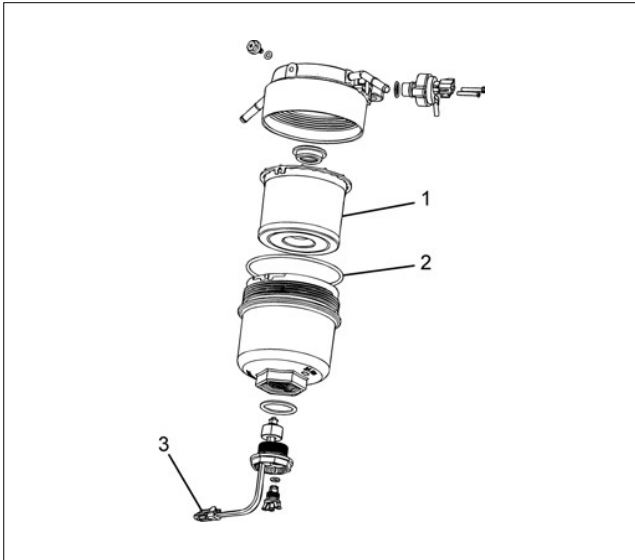
Fuel Filter Element

Removal

1. Detach the drain hose on the lower part of the fuel filter or the drain plug, loosen the air bleed plug, and drain the fuel from the fuel filter.
2. Detach the water-in-fuel switch harness.
3. Turn the element case counterclockwise to detach, and remove the filter element.
4. Replace the O-ring and confirm the snap-fit position, and fit a new filter element inside the element case.

NOTE

It is strongly advisable to use the ISUZU/GM genuine fuel filter for replacement.



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Legend

1. Element
2. O-ring
3. Sediment Sensor

Installation

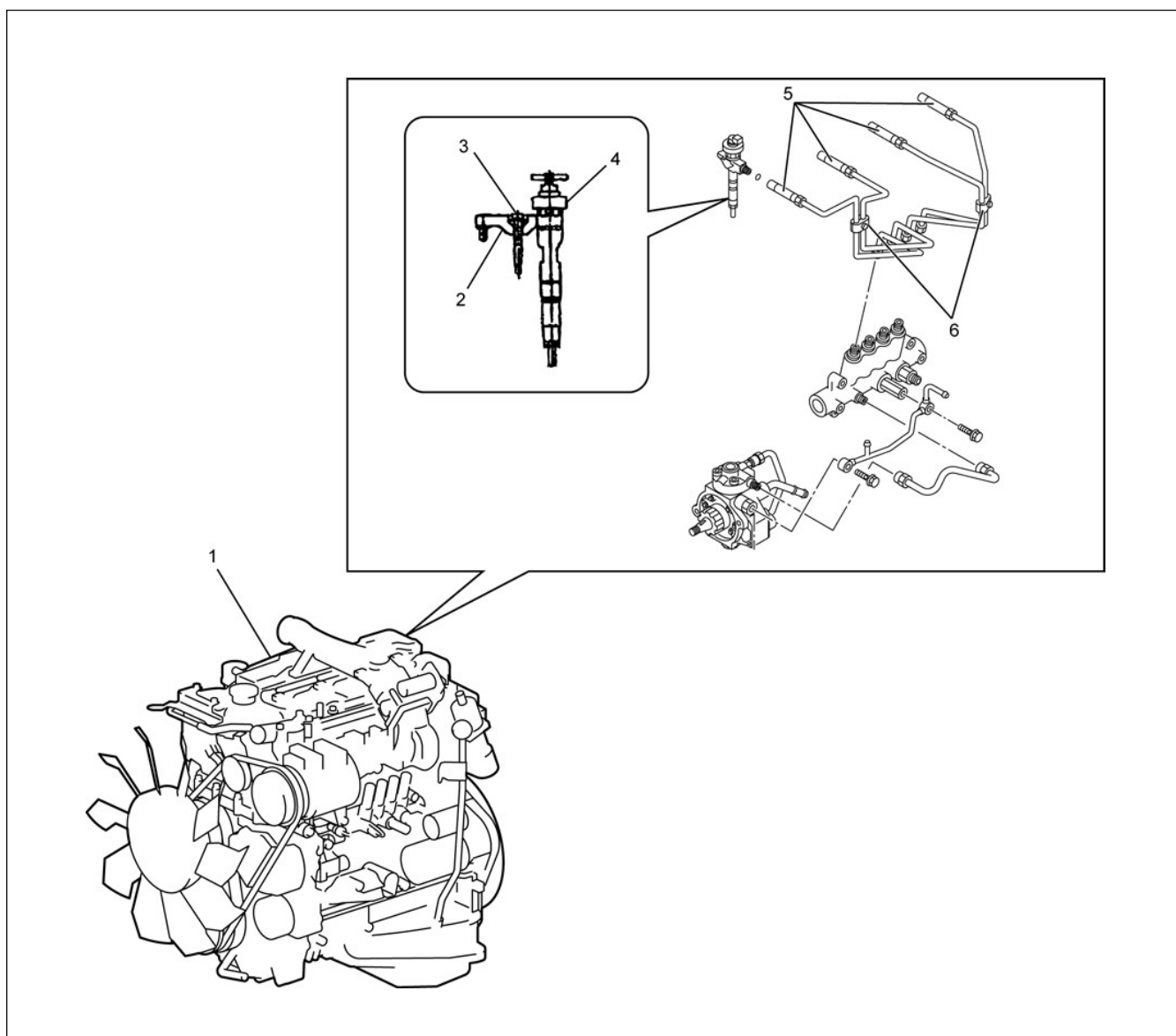
1. Apply a light coat of new diesel oil to the O-ring and gasket.
2. Turn the element case clockwise until it is completely seated against the upper cover. Then check that the drain hose is in its correct position, and then use a filter wrench and tighten to the specified torque.

Tightening torque: 25 N·m (2.5 kg·m / 18 lb ft)

3. Use a clip to fix the drain hose at the base of the fuel filter, and fit the water-in-fuel switch harness.

Fuel Injector

Components



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Legend

- | | |
|-----------------------------|-----------------------------|
| 1. Cylinder Head Cover | 4. Fuel Injector |
| 2. Fuel Injector Clamp | 5. Fuel Injection Pipe |
| 3. Fuel Injector Clamp Bolt | 6. Fuel Injection Pipe Clip |

The fuel system consists of many tiny holes and spaces that allow the movement of fuel from one place to another. These holes and spaces are milled to extremely high precision. This is especially true of the fuel injector.

The fuel injector is very sensitive to foreign material. Foreign material will result in fuel system breakdown. Exercise great care not to allow the entry of foreign material into the fuel system or fuel injector during the removal and installation procedure.

Note: To avoid electric shock;
Set the switch to the 'OFF' position and disconnect the negative battery cable before checking or repairing the fuel injector, wiring or/and connectors.

Removal

1. Remove the cylinder head cover.
Refer to the removal procedure for the cylinder head cover in this manual.

Remove the attachment bolt of the engine oil gauge guide tube.

2. Loosen the fuel injector clamp fixing bolts and remove the fuel injector.
If the fuel injector is difficult to remove, use the remover. Use a screwdriver to force the fuel injector clamp off the fuel injector.

Note: Do not remove the fuel injector sleeve.

Note: Cover the areas exposed during parts removal to prevent the entry of foreign material into the fuel system.

3. Mark each fuel injector with the number of the cylinder from which it was removed. Store the fuel injector in a safe place. Position the fuel injector so that the nozzle is protected.

Note: Do not tamper with the electromagnetic portion of the fuel injector. Reduced electromagnetic function will result in injector failure.

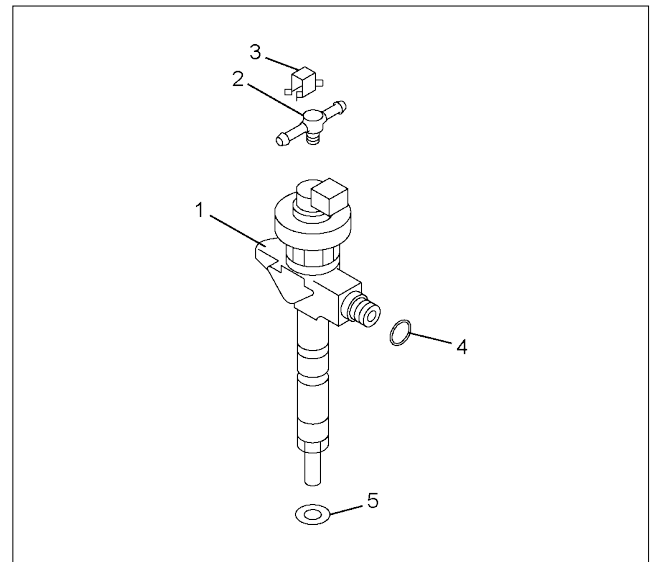
Note: After replacement of the fuel injector, perform the following procedure.

- All fuel injectors are replaced:
Remove the fuel injector ID code label on the cylinder head cover.
- Any fuel injector(s) is replaced:
Black out the replaced cylinder of the fuel injector ID code on the fuel injector ID code label with a marking pen or equivalent.

Installation

1. Install the new gasket and O-ring to each fuel injector.

Note: Do not reuse the clips (3).

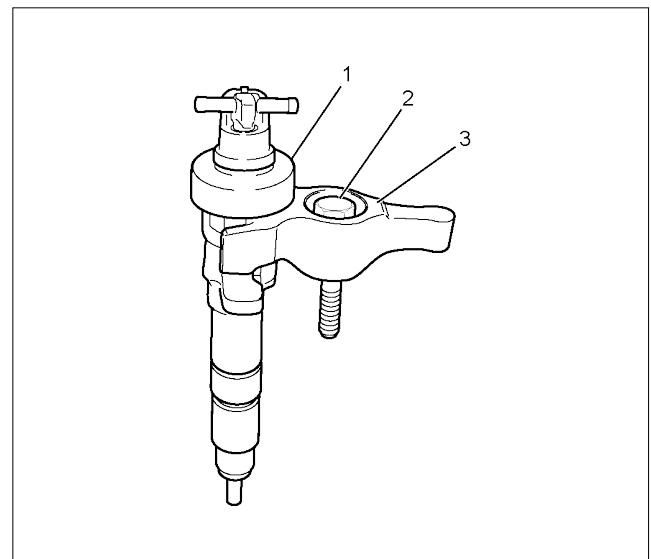


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Legend

1. Fuel Injector
2. Leak Off Pipe
3. Clip
4. O-ring
5. Gasket

2. Install the fuel injector clamps. Refer to the illustration.



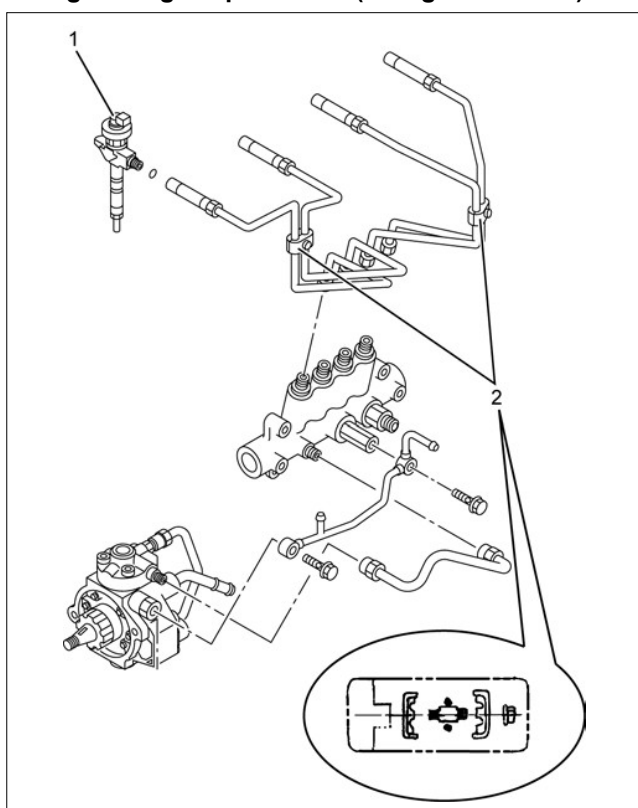
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Legend

1. Fuel Injector
2. Bolt
3. Fuel Injector Clamp

3. Apply Engine oil to the threads and seating surfaces of the clamp bolts.
4. Install the fuel injector clamps to the cylinder head.
5. Temporarily tighten the clamp bolts.
6. Apply a thin coat of engine oil to the outer surface of the fuel injector side sleeve nuts.
7. Install the fuel injector pipes to the position shown in the illustration.
8. Use a spanner to carefully tighten the sleeve nuts until the fuel injector pipes contact the fuel injector and fuel rail.
9. Tighten the fuel injector pipe clips to the specified torque.

Tightening torque: 8 N·m (0.8 kg·m / 69 lb in)



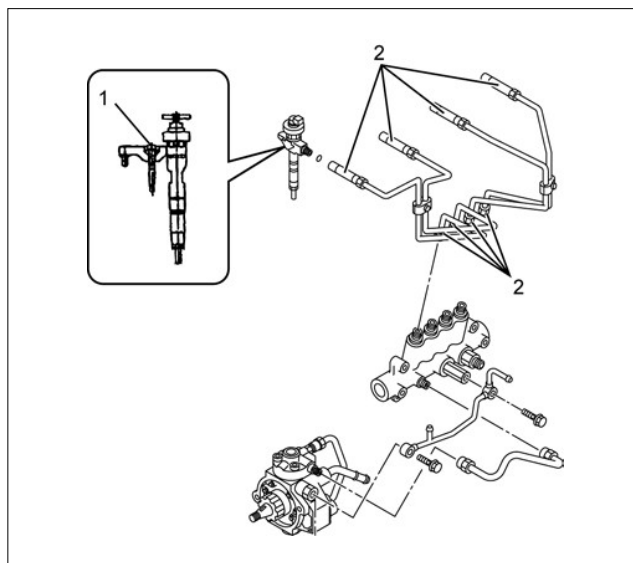
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Legend

1. Fuel Injector
2. Pipe Clip

10. Tighten the injection pipes to the specified torque.

Tightening torque: 30 N·m (3.1 kg·m / 22 lb ft)



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Legend

1. Clamp Bolt
2. Sleeve Nut

11. Tighten the fuel injector clamp bolts to the specified torque.

Tightening torque: 26 N·m (2.7 kg·m / 20 lb ft)

12. Tighten the engine oil level gauge guide tube.

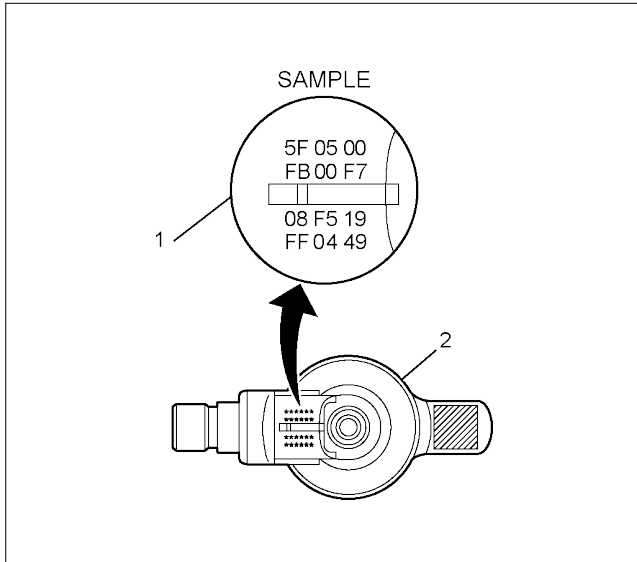
Tightening torque: 25 N·m (2.5 kg·m / 18 lb ft)

13. Install the cylinder head cover.

Refer to the install procedure for the cylinder head cover in this manual.

Record the Fuel Injector ID Code Data from each injector housing

1. Remove each fuel injector harness connector.
2. Record all numbers of each cylinder on the harness connector housing. The correct order for the fuel injector ID codes of the following illustration is as follows:
5F 05 00 FB 00 F7 08 F5 19 FF 04 49



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Legend

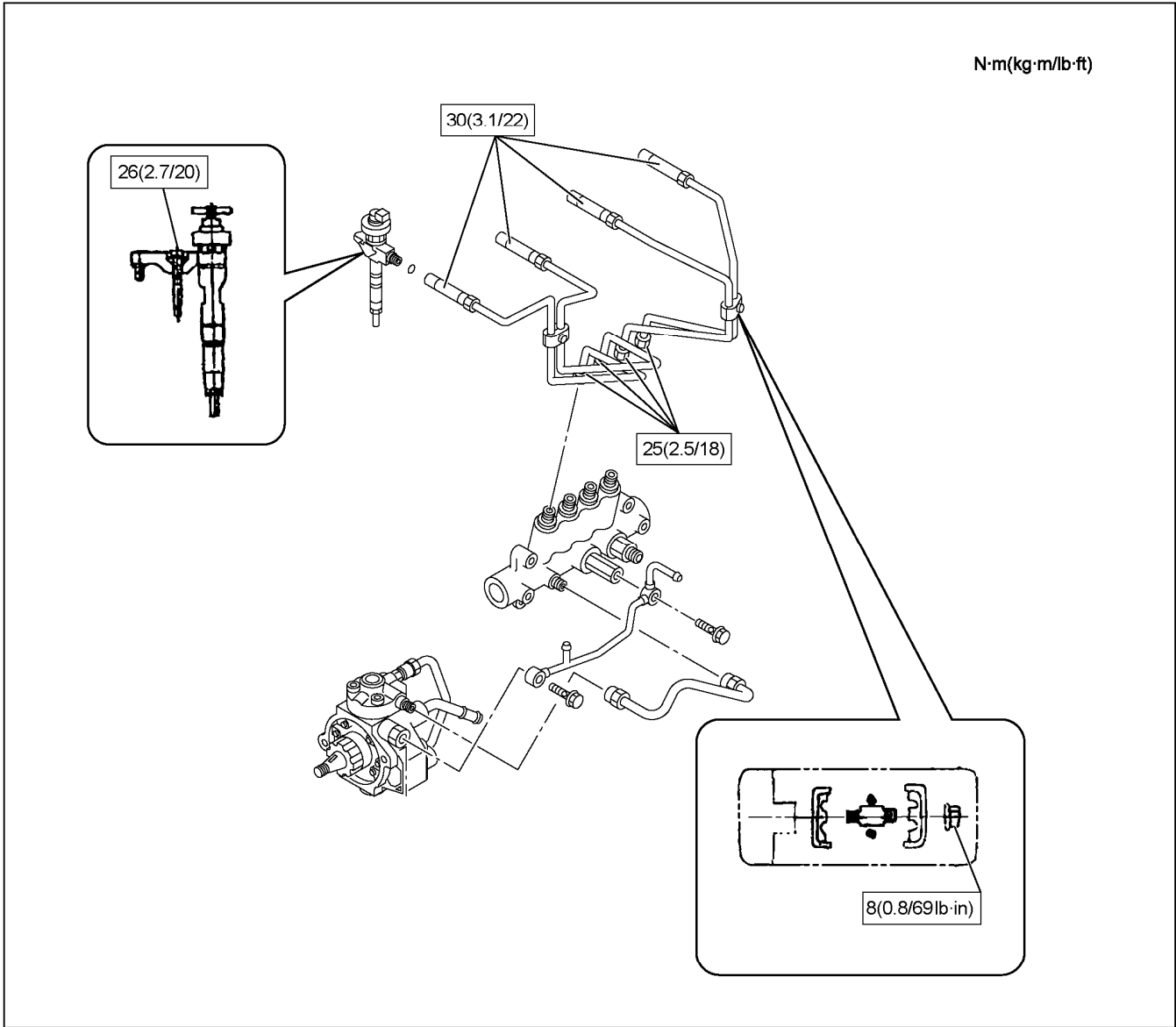
1. Fuel Injector ID Code
2. Fuel Injector

- g. Turn OFF the scan tool.
- h. Disconnect the scan tool from the terminal.
5. Reinstall a scan tool to the vehicle.
6. Turn ON the ignition, with the engine OFF.
7. Select Diagnostics > appropriate vehicle identification > 4JK1 or 4JJ1 > Programming > Replace Injector.
8. Enter 24 figures of replaced fuel injector ID code.
9. After complete the programming, turn OFF the ignition for 30 seconds.
10. Start the engine and let idle.
11. Inspect for a proper engine running condition and for no DTC's. Refer to the Diagnostic System Check - Engine Controls if needed.

Programming Fuel Injector ID Codes

1. Install a scan tool.
2. Turn ON the ignition, with the engine OFF.
3. Select Diagnostics > appropriate vehicle identification > 4JK1 or 4JJ1 > Programming > Replace Injector.
4. In order to get programming approval, the on-screen displays a message to user. Get programming approval from the TIS 2000 using the following procedure:
 - a. Connect a scan tool to the terminal that installed TIS 2000 with the latest software and the hardware key is plugged into port.
 - b. Turn ON the scan tool and keep at title screen.
 - c. Launch the TIS application.
 - d. Select the Security Access at the main screen.
 - e. Highlight the "Tech" 2 on the Diagnostic Tool Selection screen and click "Next".
 - f. Click "Close" on the Security Access Enabled screen.

Torque Specifications

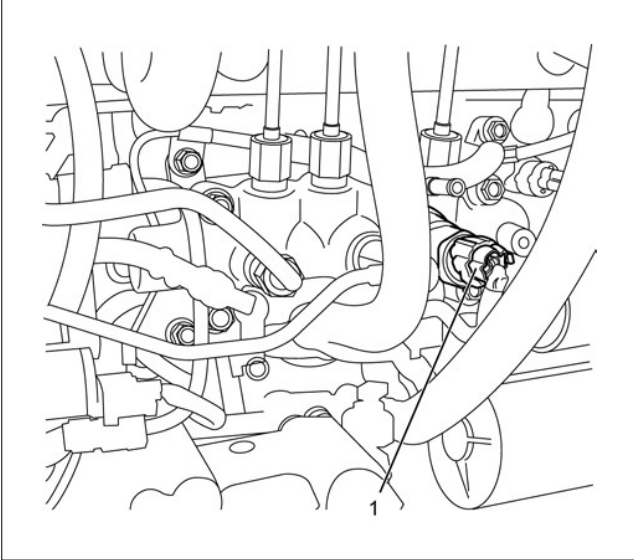


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Fuel Rail Pressure Sensor

Removal

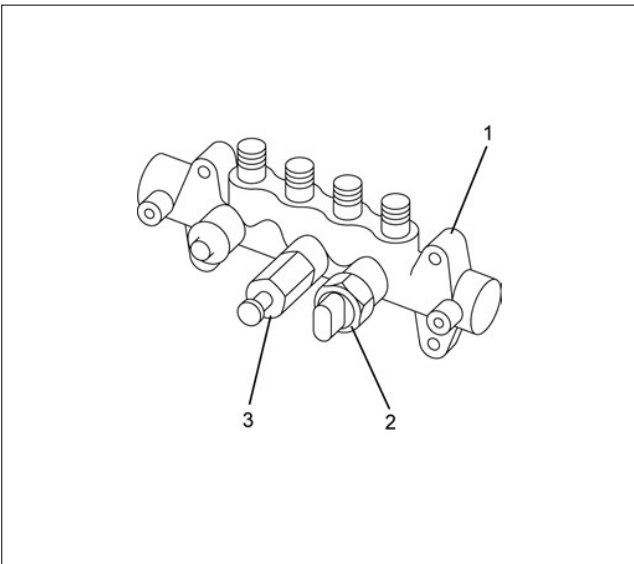
1. Disconnect the fuel pressure sensor harness connector (1).



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2. Remove the fuel pressure sensor (2).

Note: Cover the areas exposed during parts removal to prevent the entry of foreign material into the fuel system.



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Legend

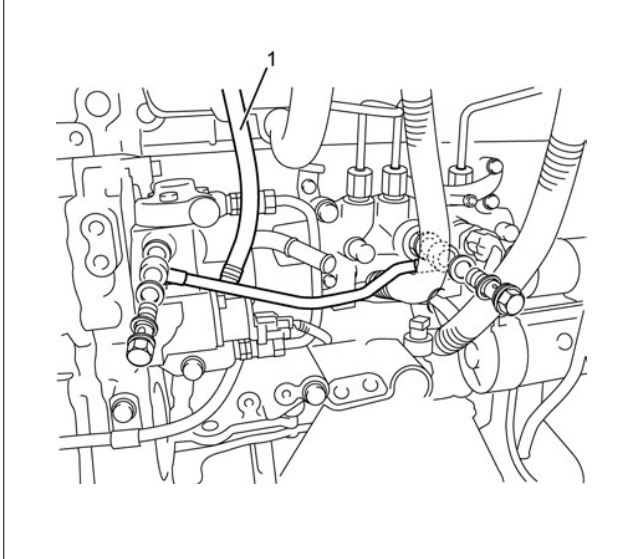
1. Fuel Rail
2. Fuel Rail Pressure Sensor
3. Fuel Pressure Limiter

Fuel Pressure Limiter

Removal

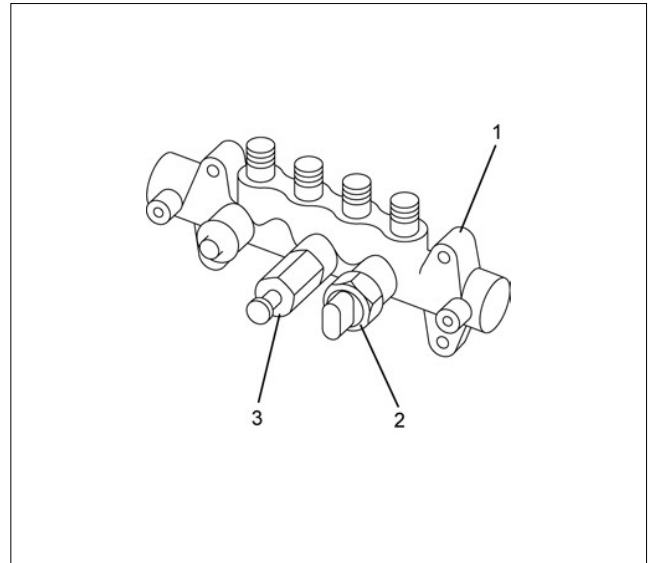
1. Remove the leak off pipe and hose (1).

Note: Cover the areas exposed during parts removal to prevent the entry of foreign material into the fuel system.



2. Remove the fuel pressure limiter.

Note: Cover the areas exposed during part removal to prevent the entry of foreign material into the fuel system.



Legend

1. Fuel Rail
2. Fuel Rail Pressure Sensor
3. Fuel Pressure Limiter

Installation

1. Install the fuel pressure limiter.

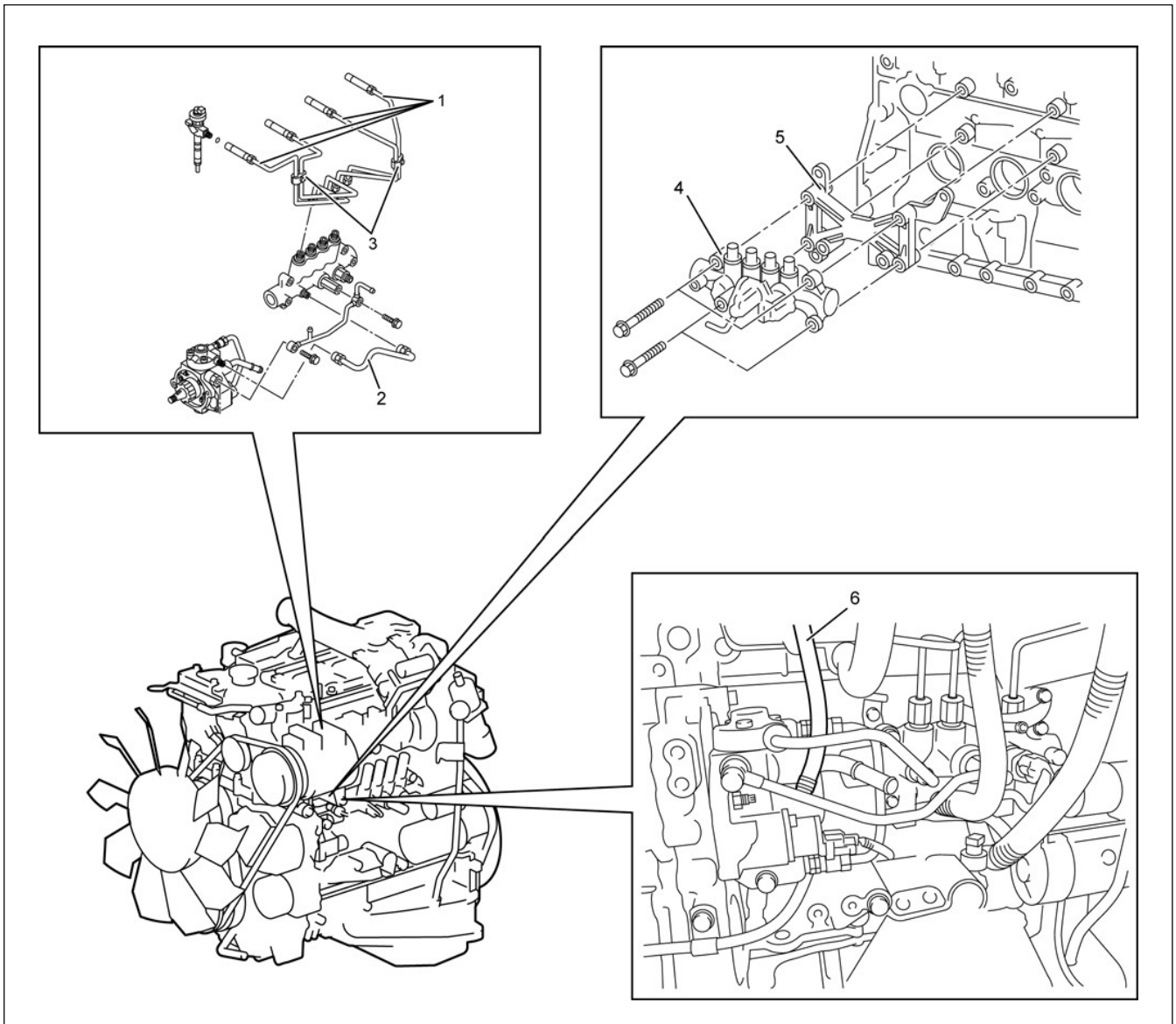
Tightening torque: 172 N·m (17.5 kg·m/127 lb ft)

2. Install the fuel leak off pipe and hose using the mounting eyebolt using the specified torque.

Tightening torque: 10 N·m (1.0 kg·m/87 lb in)

Fuel Rail Assembly

Components



RTW76CLF000301

Legend

- | | |
|------------------------------|--------------------------------|
| 1. Injection Pipe (#1 to #4) | 4. Fuel Rail |
| 2. Fuel Feed Pipe Assembly | 5. Fuel Rail Bracket |
| 3. Injection Pipe Clips | 6. Fuel Leak Off Pipe and Hose |

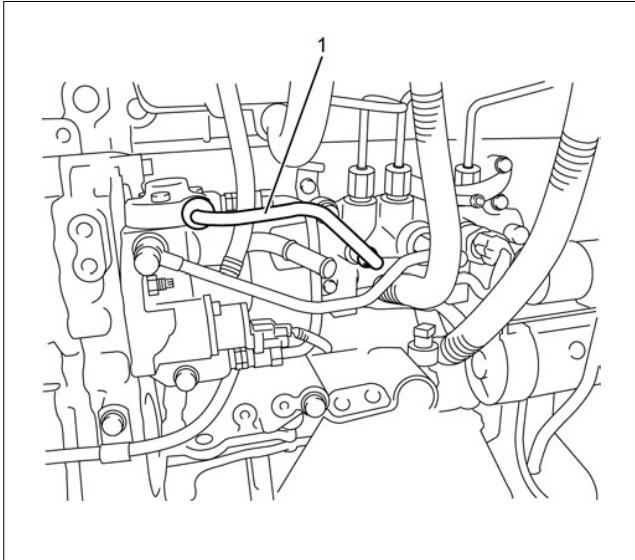
Parts of the fuel system such as the internal part of the fuel injector, holes and clearances that form passages for fuel are finished to a very high degree of accuracy.

They are therefore highly sensitive to foreign matter and the entry of foreign matter could cause damage to the fuel passage. Therefore, effective measures should be taken to prevent the entry of foreign matter.

Removal

1. Remove the starter motor.
 - Refer to the removal procedure for engine electricals in this manual.
2. Remove the fuel feed pipe (1) for supply pump.

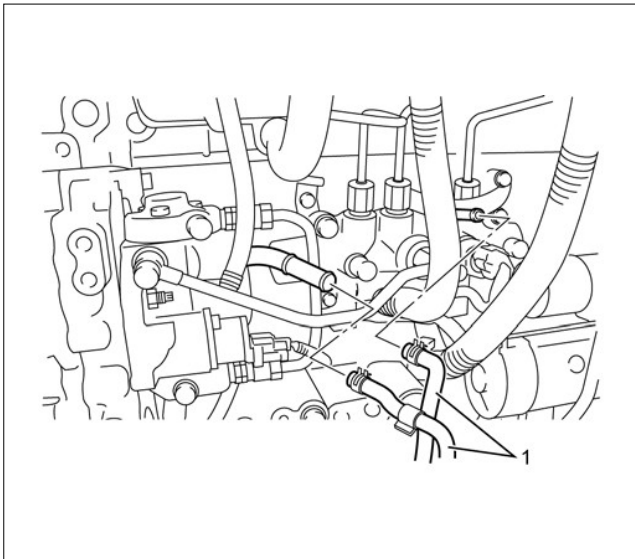
Note: Cover the areas exposed during parts removal to prevent the entry of foreign material into the fuel system.



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3. Remove the fuel hose (1).

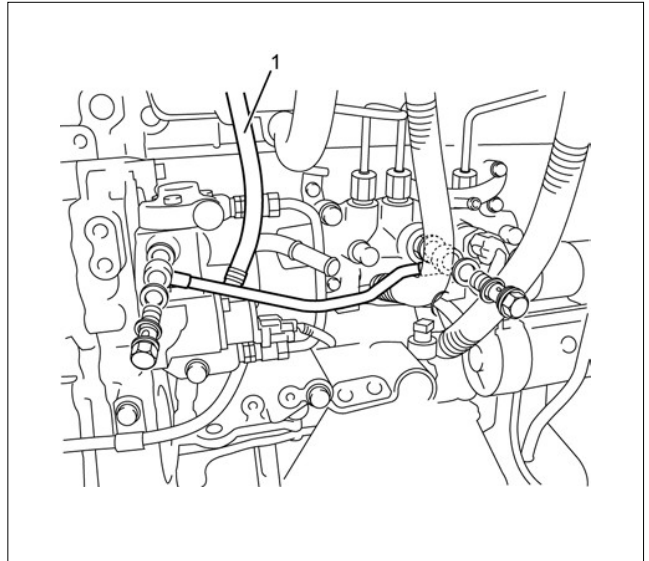
Note: Cover the areas exposed during parts removal to prevent the entry of foreign material into the fuel system.



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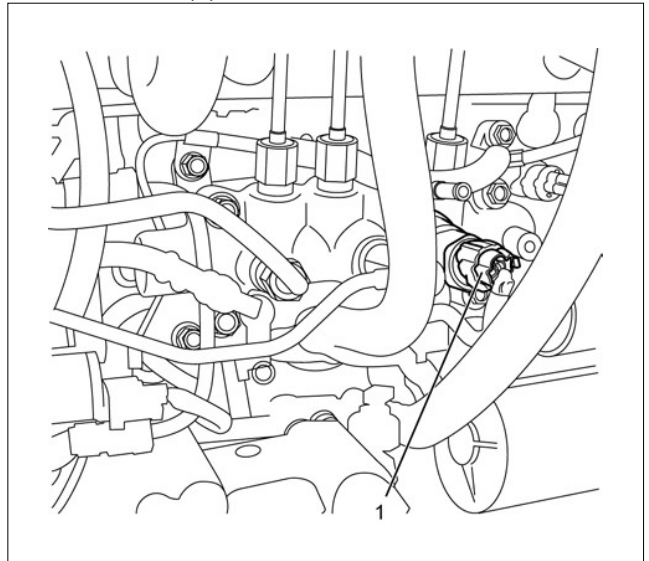
4. Remove the leak off pipe and hose (1).

Note: Cover the areas exposed during parts removal to prevent the entry of foreign material into the fuel system.



RTW76CSH000301

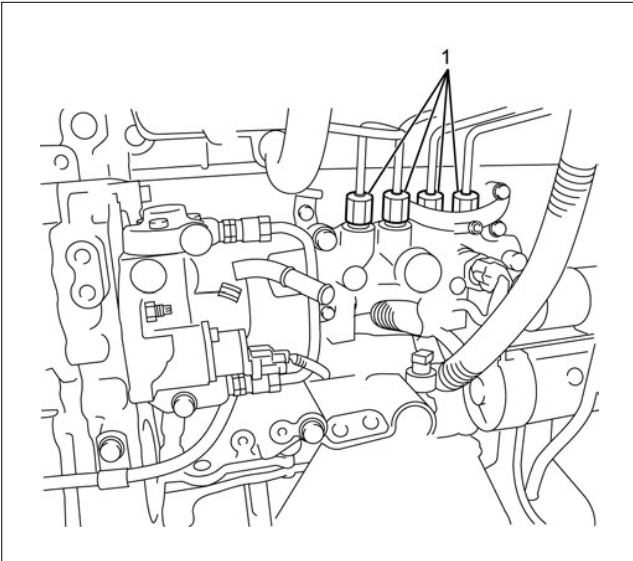
5. Disconnect the fuel rail pressure sensor harness connector (1).



LNW76CSH001601

6. Disconnect the injection pipe sleeve nut (1).

Note: Cover the areas exposed during parts removal to prevent the entry of foreign material into the fuel system.

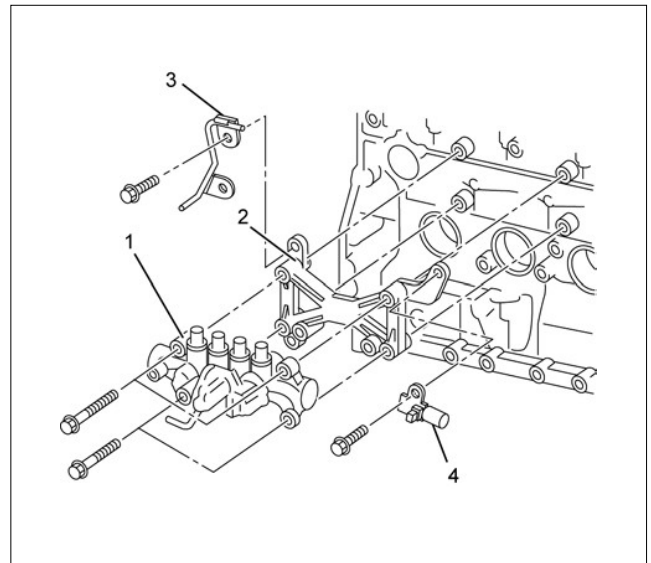


RTW76CSH000701

7. Disconnect the vacuum pipe and swirl control solenoid valve from the fuel rail bracket.
8. Remove the fuel rail and fuel rail bracket.

Note:

- Do not grasp the pressure sensor, during the fuel rail removal procedure.
- Take care not to damage the connector unit of the pressure sensor.



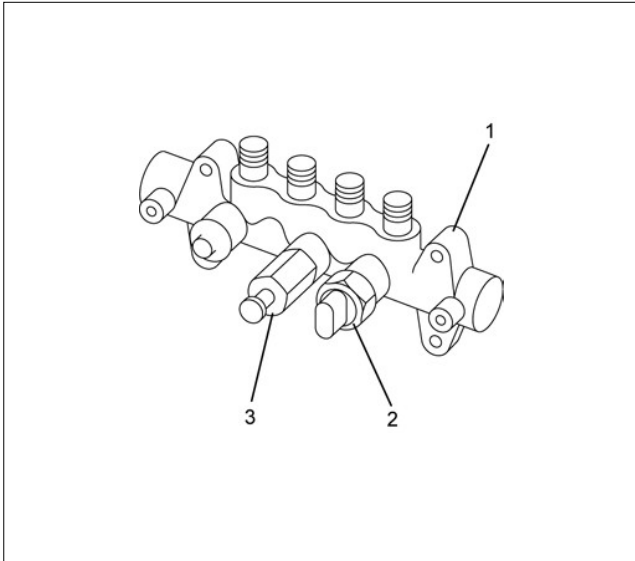
RTW76CSH000801

Legend

1. Fuel Rail
2. Fuel Rail Bracket
3. Vacuum Pipe
4. Swirl Control Solenoid Valve

Disassembly

1. Remove the fuel pressure limiter.
2. Remove the pressure sensor.



Legend

1. Fuel Rail
2. Fuel Rail Pressure Sensor
3. Fuel Pressure Limiter

Reassembly

1. Install the fuel pressure limiter.
Tightening torque: 172 N·m (17.5 kg·m/127 lb ft)
2. Install the fuel pressure sensor.
Tightening torque: 98 N·m (10.0 kg·m/72 lb ft)

Installation

1. Tighten the fuel rail bracket and fuel rail using the specified torque.

Tightening torque: 25 N·m (2.5 kg·m/18 lb ft)

2. Tighten the vacuum pipe to the fuel rail bracket using the specified torque.

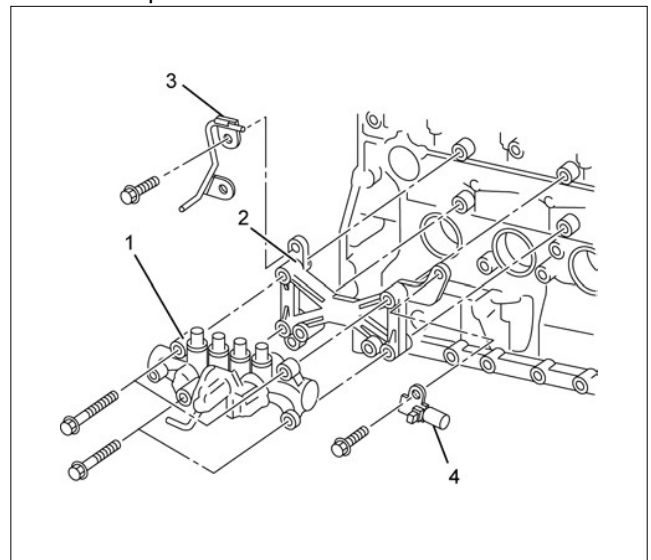
Tightening torque: 10 N·m (1.0 kg·m/87 lb in)

3. Tighten the swirl control solenoid valve to the fuel rail bracket using the specified torque.

Tightening torque: 20 N·m (2.0 kg·m/14 lb ft)

Note:

- Do not grasp the pressure sensor, during the fuel rail removal procedure.
- Take care not to damage the connector unit of the pressure sensor.



Legend

1. Fuel Rail
2. Fuel Rail Bracket
3. Vacuum Pipe
4. Swirl Control Solenoid Valve

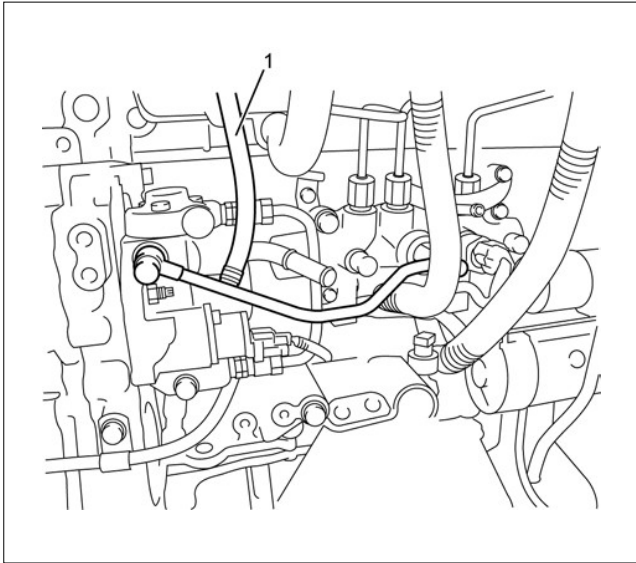
4. Tighten the fuel pipe using the mounting sleeve nut and the specified torque.

Tightening torque: 25 N·m (2.5 kg·m/18 lb ft)

5. Connect the fuel rail pressure sensor harness connector.

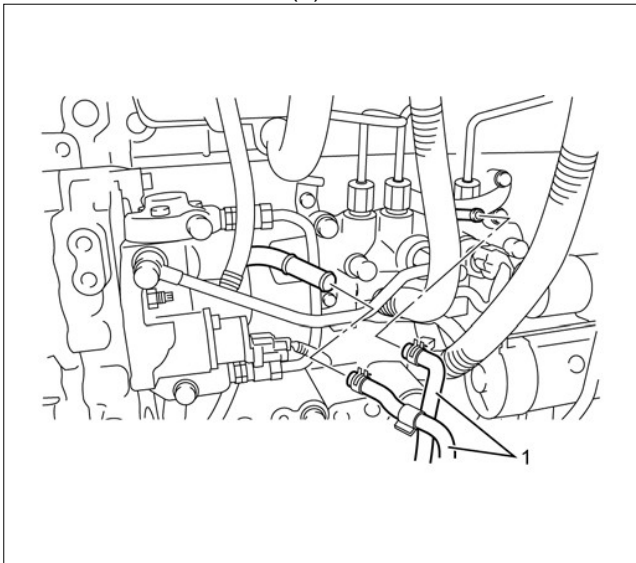
6. Tighten the fuel leak off pipe and hose (1) using the mounting eyebolt using the specified torque.

Tightening torque: 10 N·m (1.0 kg-m/87 lb in)



RTW76CSH000401

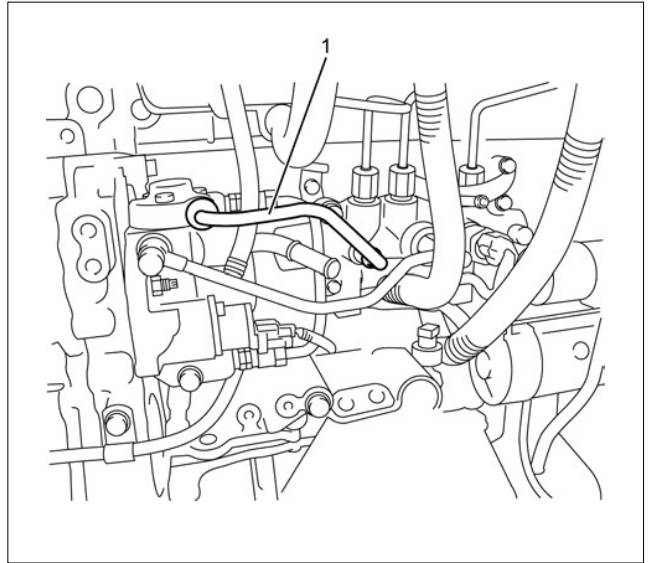
7. Install the fuel hose (1).



RTW76CSH000601

8. Install the fuel feed pipe (1) for supply pump and tighten the bolts to the specified torque.

Tightening torque: 44 N·m (4.5 kg-m/33 lb ft)

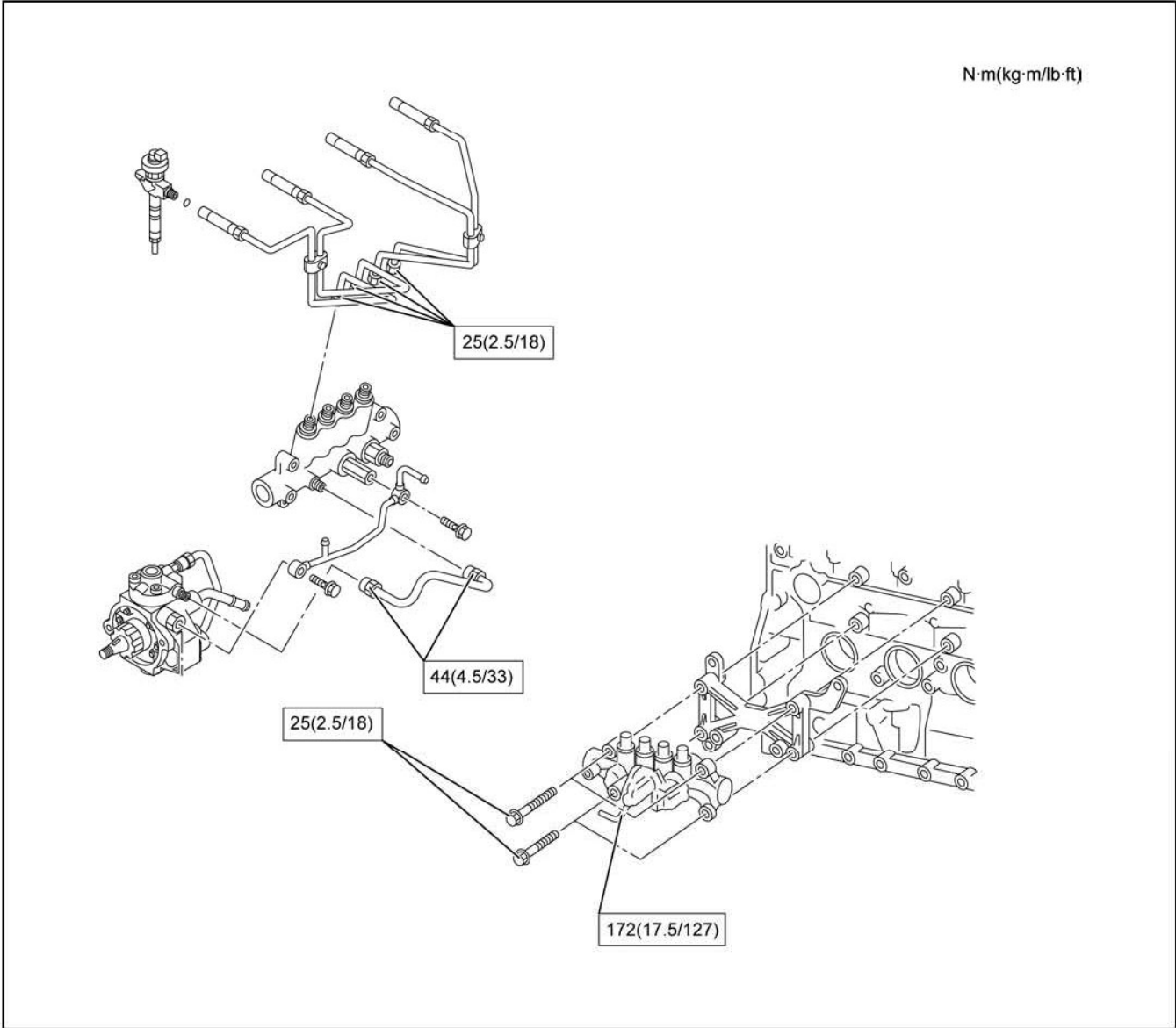


RTW76CSH000501

9. Install the starter motor.

- Refer to removal procedure for engine electricals in this manual.

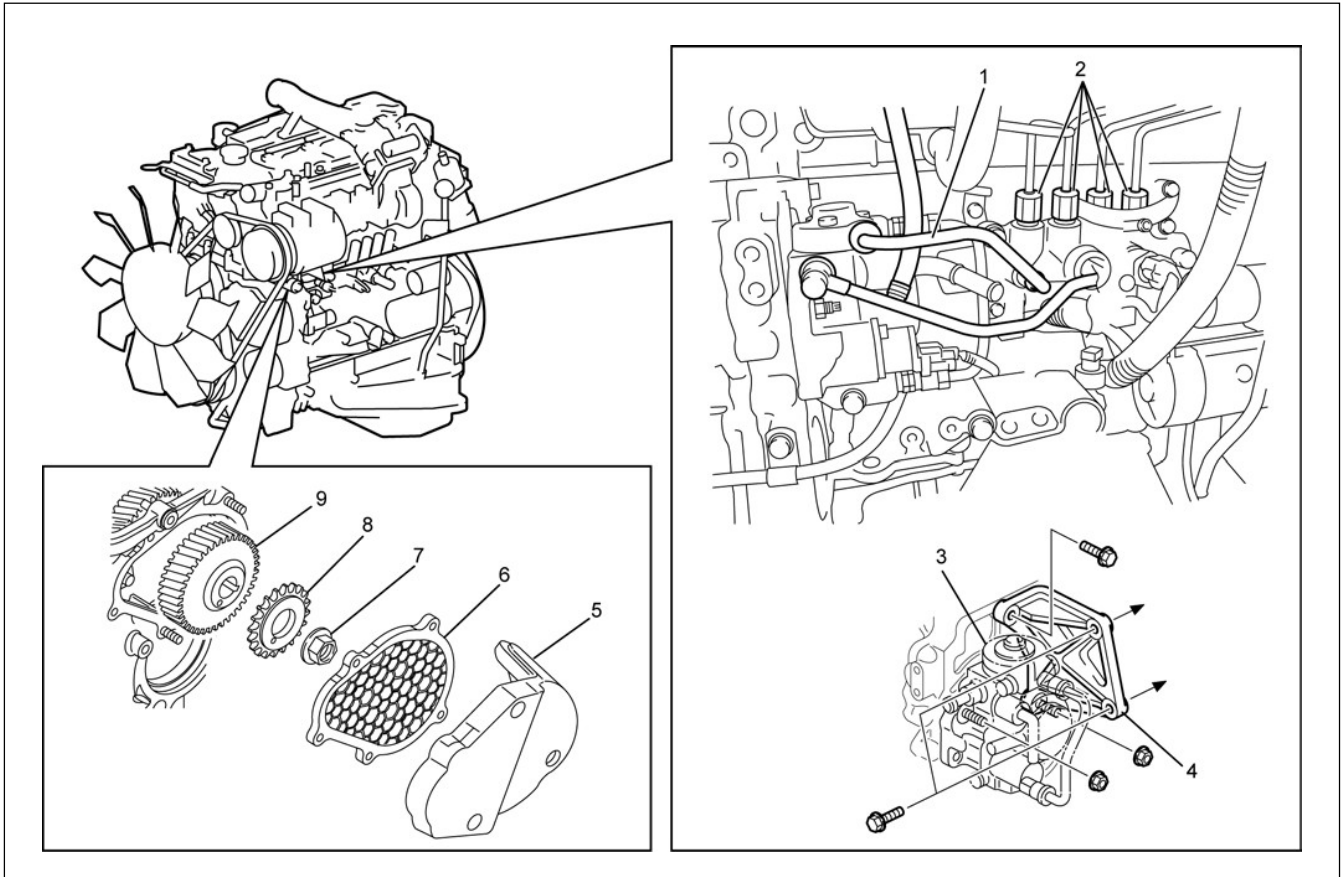
Torque Specifications



RTW76CLF000401

Fuel Supply Pump

Components



RTW76CMF000201

Legend

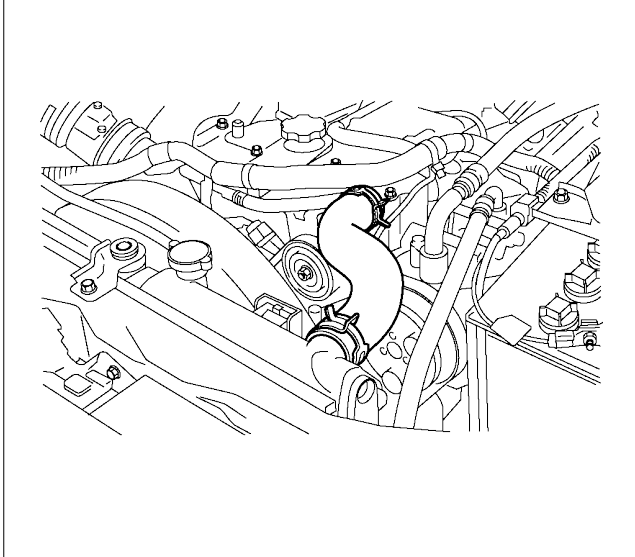
- | | |
|------------------------------|-----------------------------|
| 1. Fuel Feed Pipe Assembly | 6. Timing Chain Cover Lower |
| 2. Injection Pipe Sleeve Nut | 7. Nut |
| 3. Fuel Supply Pump | 8. Sprocket |
| 4. Bracket | 9. Fuel Supply Pump Gear |
| 5. Noise Cover | |

The fuel system consists of many tiny holes and spaces that allow the movement of fuel from one place to another. These holes and spaces are milled to extremely high precision. This is especially true of the fuel injector.

The fuel injector is very sensitive to foreign material. Foreign material will result in fuel system breakdown. Exercise great care not to allow the entry of foreign material into the fuel system or fuel injector during the removal and installation procedure.

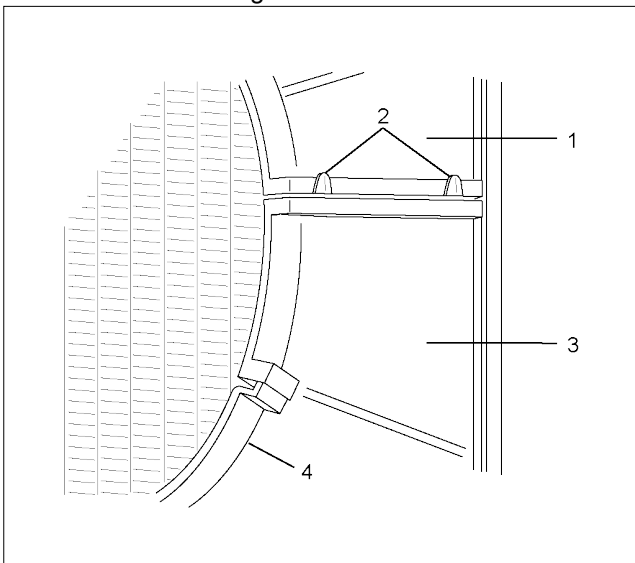
Removal

1. Partially drain the engine coolant.
Refer to drain procedure for engine cooling in this manual.
2. Remove the radiator upper hose.



RTW56FSH000101

3. Remove the fan guide.

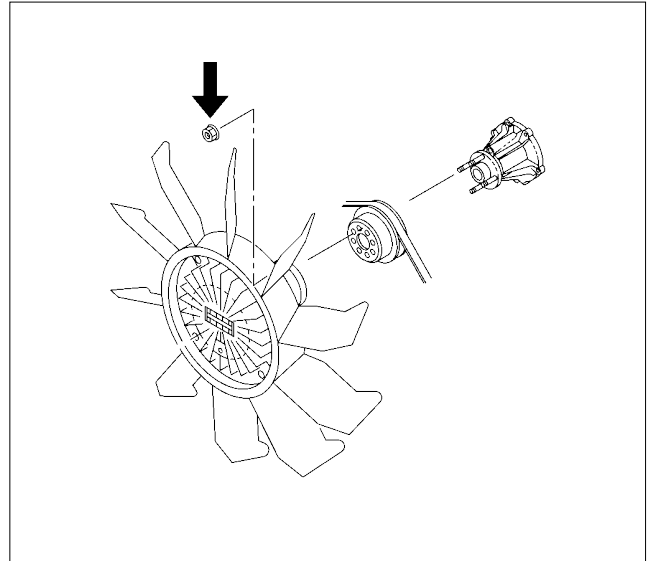


RTW46BSH000101

Legend

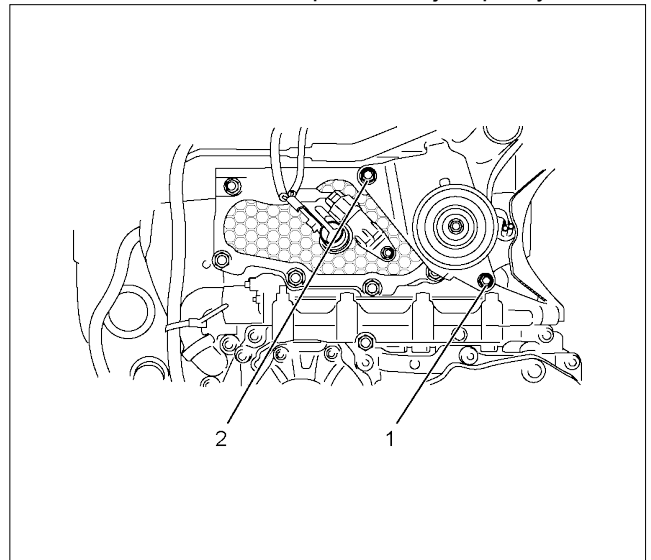
1. Fan Guide
2. Clips
3. Lower Fan Guide
4. Fan Shroud

4. Remove the cooling Fan.



RTW56ASH025401

5. Remove the A/C compressor drive belt.
6. Remove the A/C compressor adjust pulley.



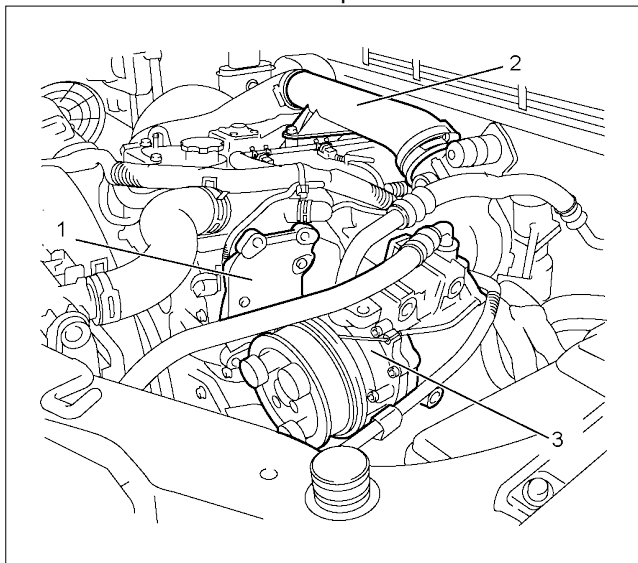
RTW56ASH010601

Legend

1. Bolt
2. Nut

7. Remove the battery.

8. Disconnect the A/C compressor.



RTW56ASH024201

Legend

- 1. A/C Compressor Bracket
- 2. Intake Duct
- 3. A/C Compressor

9. Remove the A/C compressor bracket.

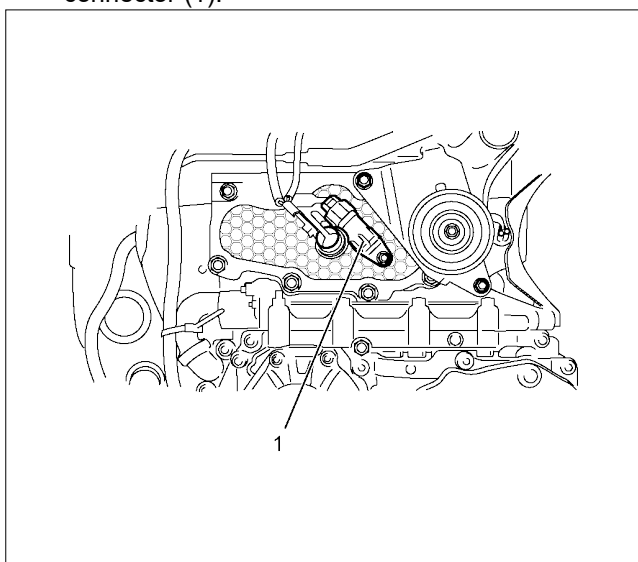
10. Remove the fuel rail assembly.

Refer to "Fuel Rail Assembly".

11. Remove the cylinder head cover.

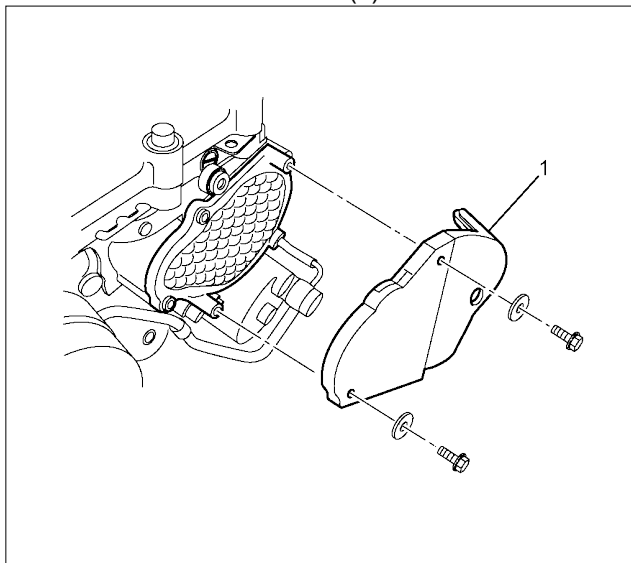
Refer to "Cylinder Head Cover" in ENGINE MECHANICAL section.

12. Disconnect the camshaft position sensor connector (1).



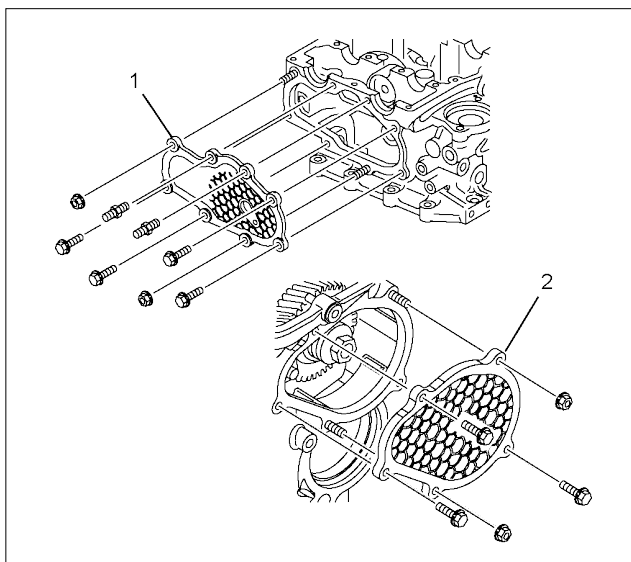
RTW56ESH003201

13. Remove the noise cover (1).



RTW56CSH001401

14. Remove the timing chain cover assembly. Upper & lower.

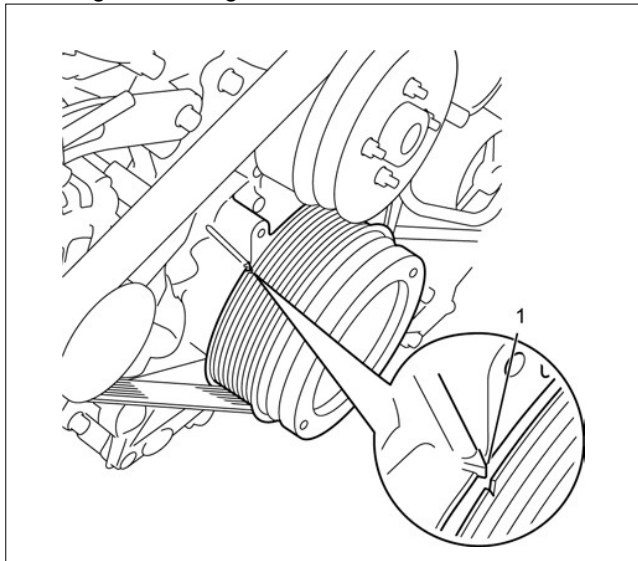


RTW56CSH001501

Legend

- 1. Timing Chain Cover Upper
- 2. Timing Chain Cover Lower.

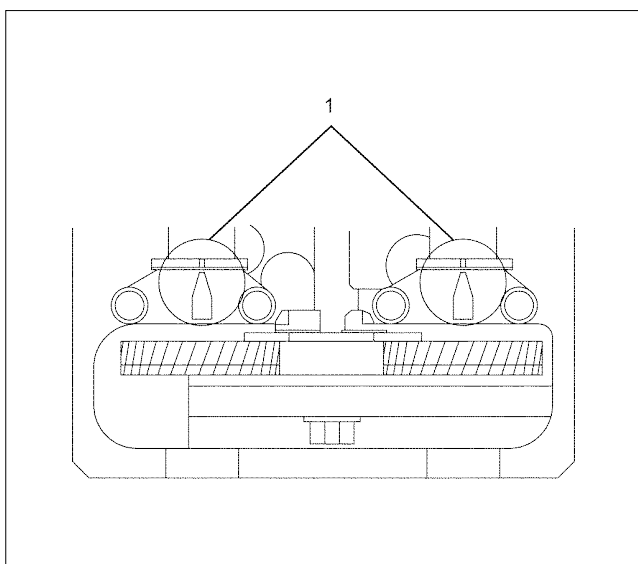
15.Align the timing marks at 3 locations as shown.



RTW76ASH001301

Legend

1. TDC

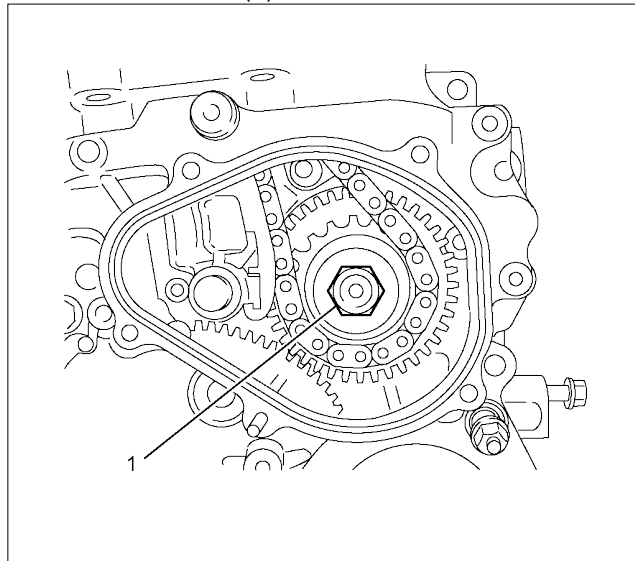


RTW56ASH006901

Legend

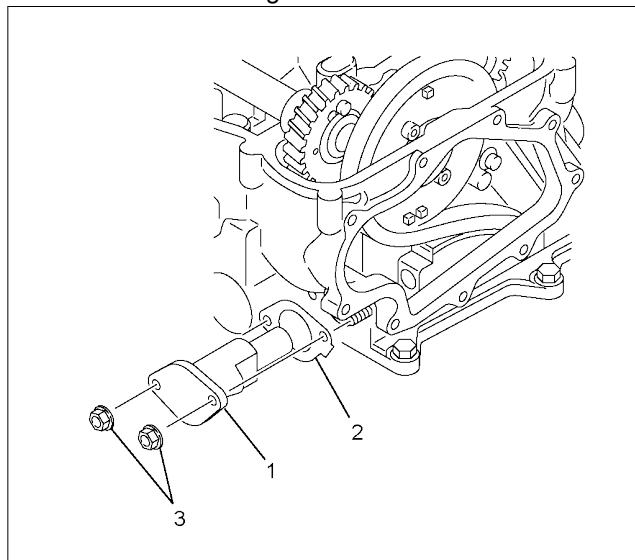
1. Align mark on intake camshaft and exhaust camshaft to mark of bearing cap

16.Loosen the nut (1).



RTW56CSH001601

17.Remove the timing chain tensioner.

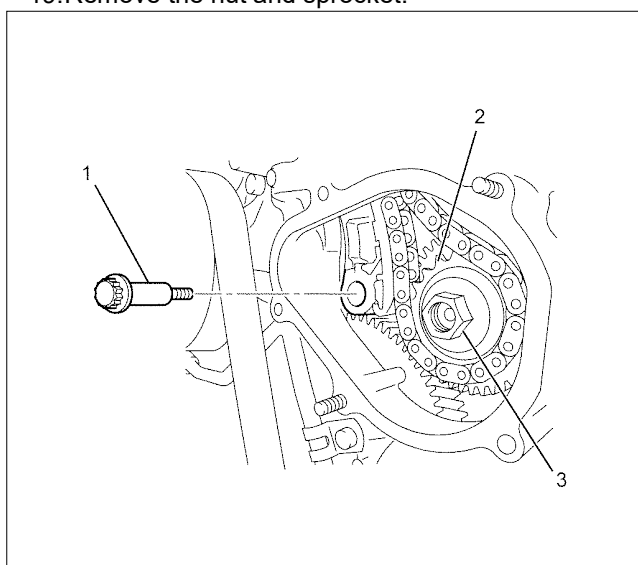


RTW56CSH003701

Legend

1. Timing Chain Tensioner.
2. Gasket
3. Nut

- 18.Remove the timing chain tension lever pivot.
- 19.Remove the nut and sprocket.

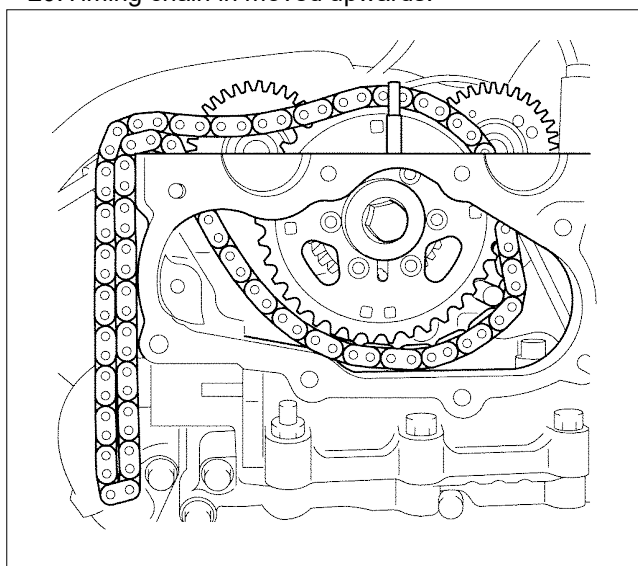


RTW56CSH004101

Legend

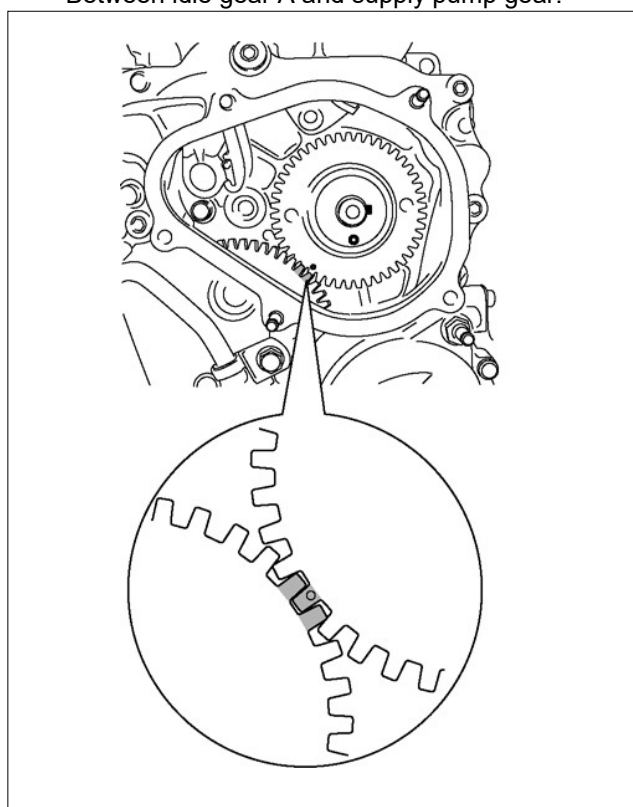
1. Tension Lever Pivot
2. Sprocket
3. Nut

- 20.Timing chain in moved upwards.



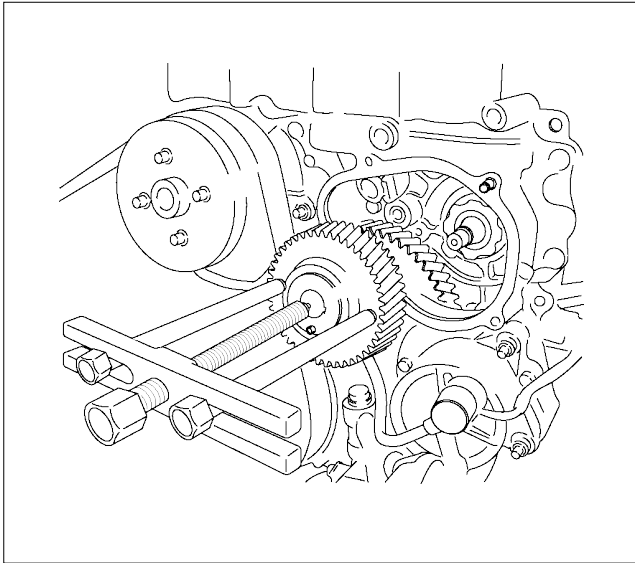
RTW56CSH003301

- 21.Paint the alignment mark.
Between idle gear A and supply pump gear.



RTW56AMH000401

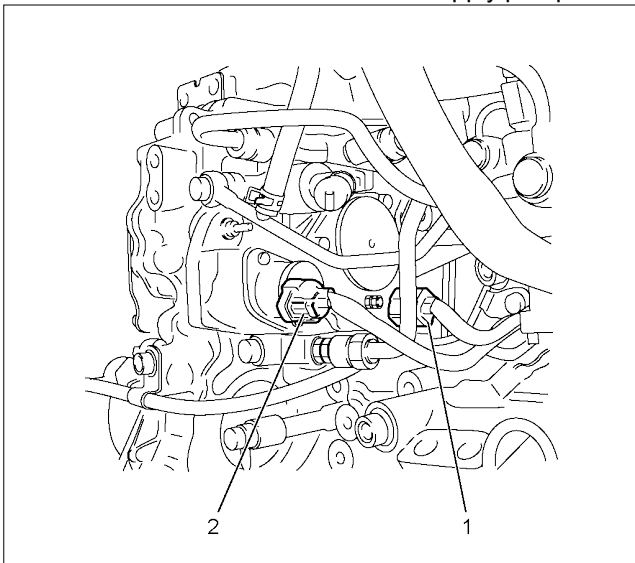
22. Use a gear puller to remove the fuel supply pump gear.



RTW56CSH002901

23. Remove the supply pump (1) and supply pump bracket (2).

- Disconnect the connector of supply pump.



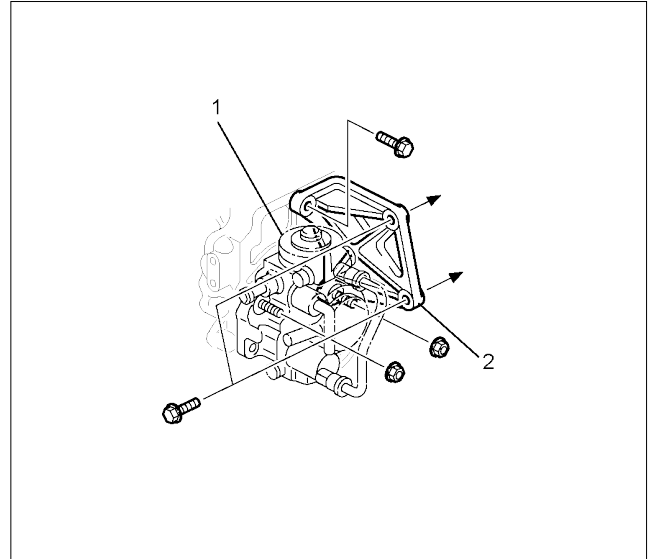
RTW58ESH002901

Legend

1. Fuel Temperature (FT) Sensor
2. Suction Control Valve (SCV)

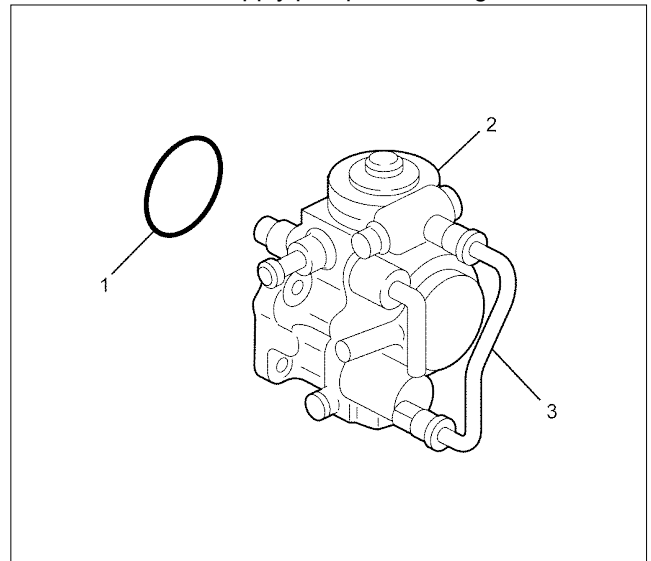
Note:

- Do not hold the high pressure pipe, during the supply pump removal procedure.
- Do not grasp the high pressure pipe, when moving the supply pump from one location to another.



RTW56CSH002001

24. Remove the supply pump and O-ring.



RTW56CSH002501

Legend

1. O-ring
2. Supply Pump
3. High Pressure Pipe

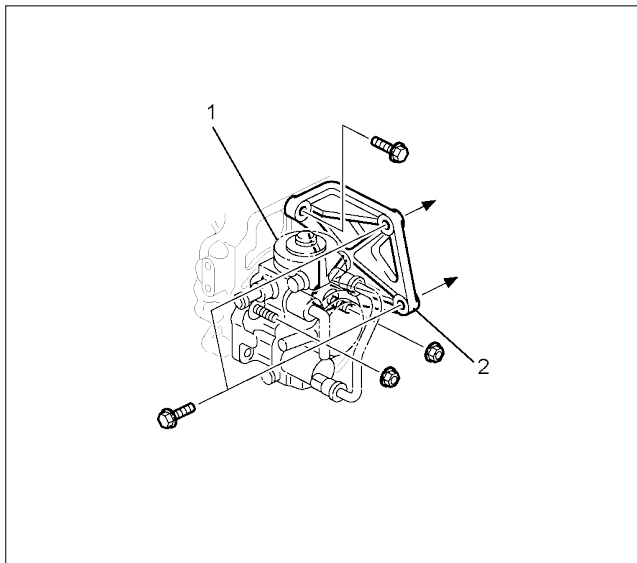
Installation

1. Install the O-ring to the fuel supply pump.
2. Install the fuel supply pump.
Apply soapy water to the O-ring before attaching.

Note: Take care not to twist the O-ring.

3. Install the fuel supply pump bracket.
Temporarily tighten with the bolts and nuts (Gear case side).
Temporarily tighten with the bolts (Cylinder body side).
Fully tighten the nuts and bolts (Gear case side).
Fully tighten the bolts (Cylinder body side).

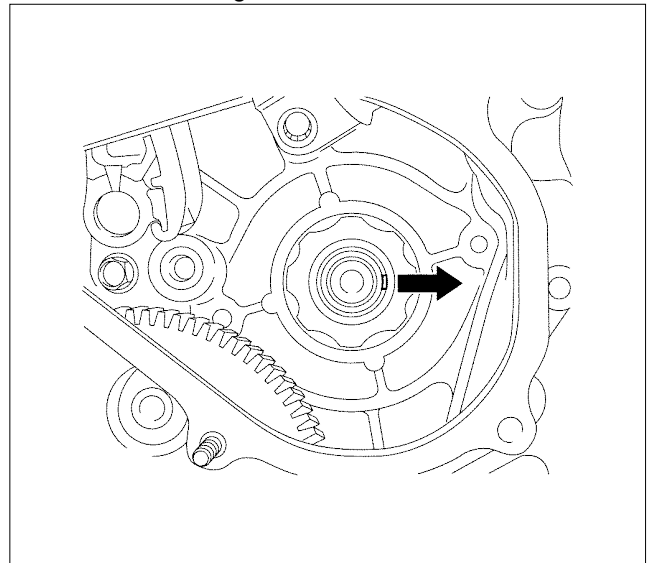
Tightening torque: 25 N·m (2.5 kg·m /18 lb ft)



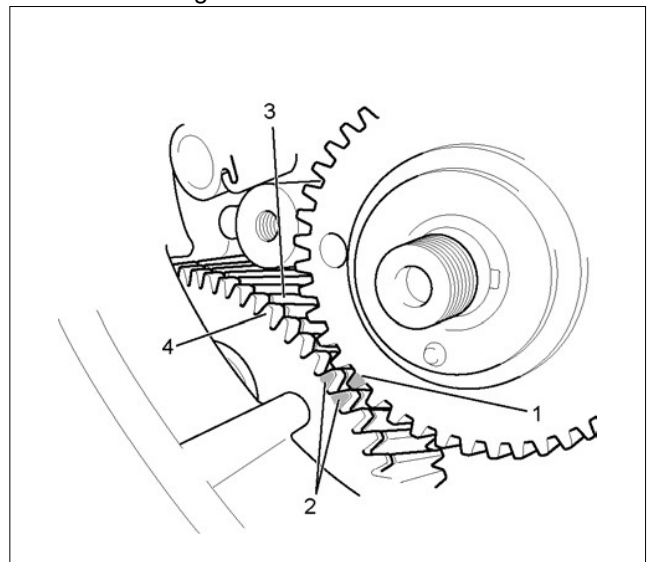
Legend

1. Fuel Supply Pump
2. Fuel Supply Pump Bracket

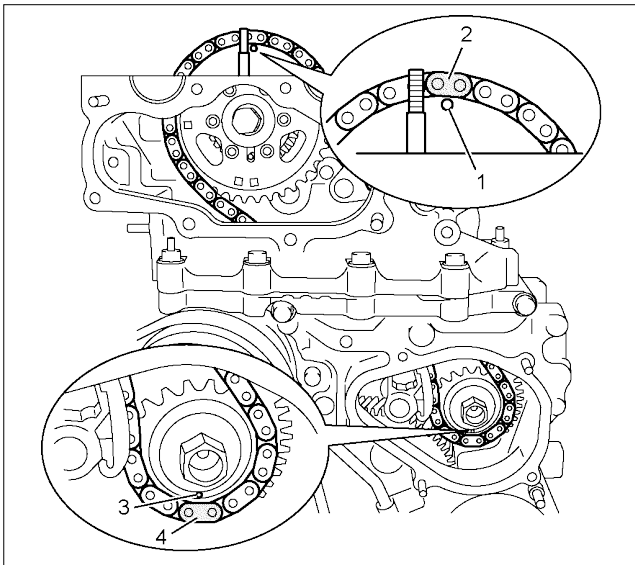
4. Confirm that the supply pump camshaft key is turned to the right and is horizontal.



5. Install the fuel supply pump gear to the pump shaft.
 - a. Align the fuel pump gear timing mark (1) with the idle gear A paint marks (2).
 - b. Ensure that the pump gear is bitten with main gear (3) of the idle gear A. Depress the pump gear when it is bitten with scissors gear (4) of the idle gear A.

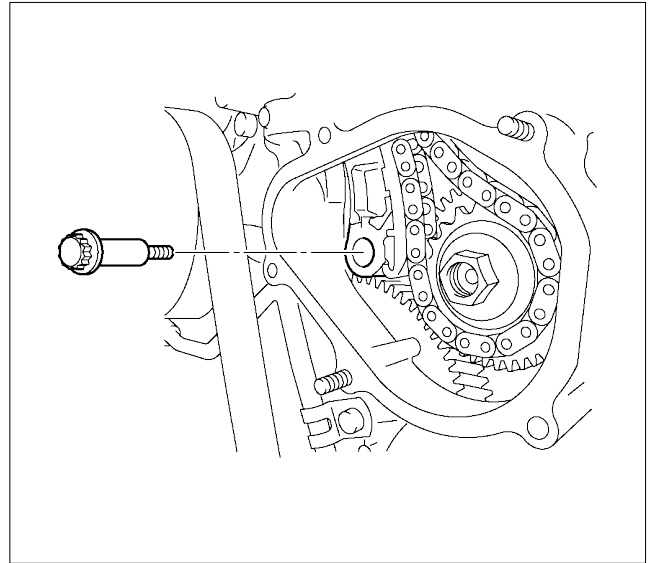


6. Install the timing chain to the each sprocket and install the fuel supply pump sprocket to the pump shaft.
 - a. Align the camshaft sprocket timing mark (1) with the dark plate timing chain link (2).
 - b. Align the fuel supply pump sprocket timing mark (3) with the yellow plate timing chain link (4).
 - c. Install the fuel supply pump sprocket to the fuel pump shaft by aligning the dowel pin that is attached to the gear.
 - d. Hand-tighten the fuel supply pump shaft nut.



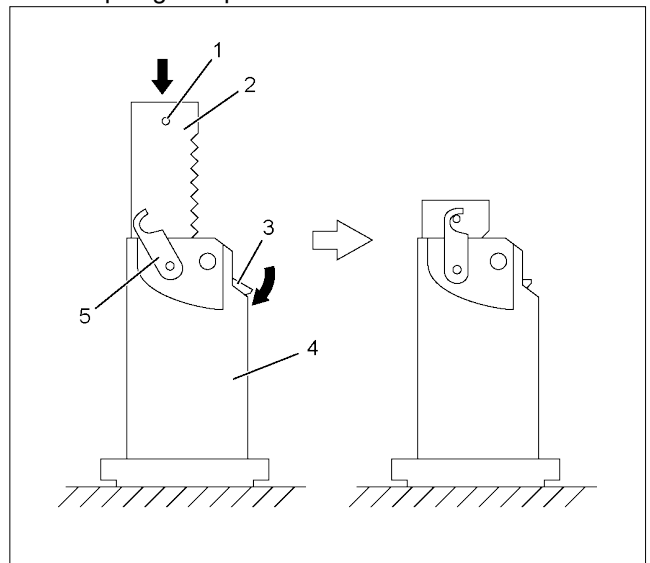
RTW56CSH005001

7. Install the timing chain tension lever pivot. Hand-tighten the pivot bolt.
 - Confirm the tension lever moves smoothly.



RTW56ASH019401

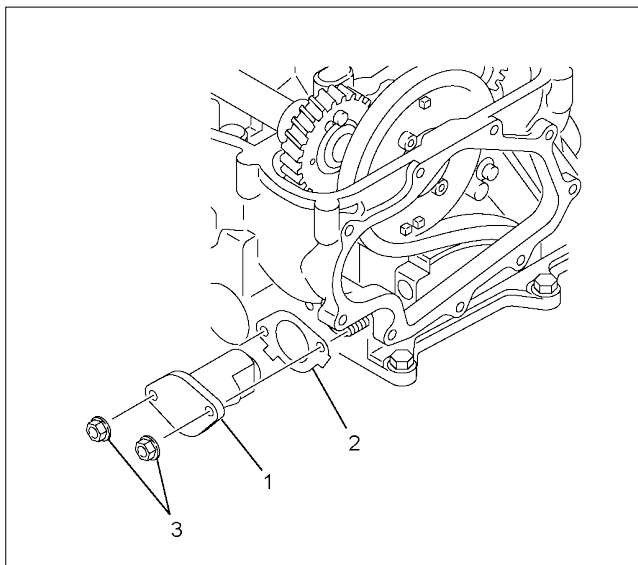
8. Attach the hook of the timing chain tensioner.
 - Hold the latch (3) depressed. Insert the plunger (2). Attach the hook (5) to the pin (1) to hold the plunger in place.



RTW56CSH004401

9. Install the timing chain tensioner.
Tighten the nut to the specified torque.

Tightening torque: 10 N·m (1.0 kg-m/ 87 lb in)

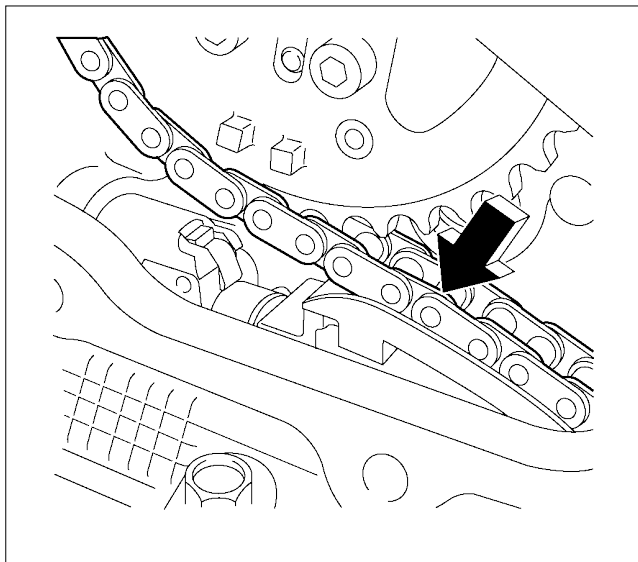


RTW56CSH001701

Legend

1. Timing Chain Tensioner
2. Gasket
3. Nut

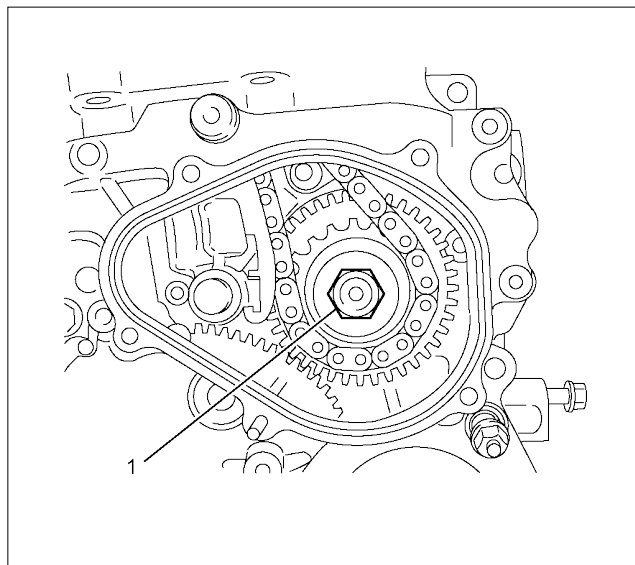
10. Unlock the tensioner hook.
- Press the place of the arrow in the figure.
 - The hook is opened. The plunger pushes the tension lever.



RTW56ASH020401

11. Tighten the fuel supply pump shaft nut.
Tighten the nut (1) to the specified torque.

Tightening torque: 130 N·m (13.3 kg-m / 96 lb ft)

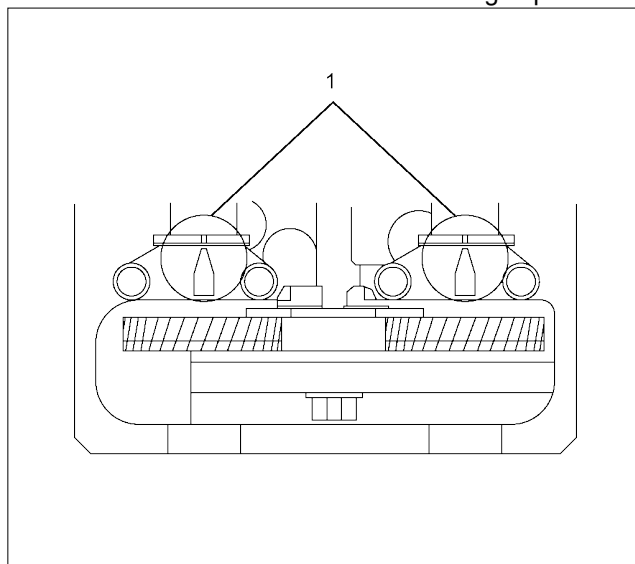


RTW56CSH001601

12. Tighten the timing chain tension lever pivot bolt to the specified torque.

Tightening torque: 27 N·m (2.8 kg-m / 20 lb ft)

13. Turn the crank pulley two rotations (720°CA).
14. Check mark (1) on intake camshaft and exhaust camshaft to mark of camshaft bearing cap.



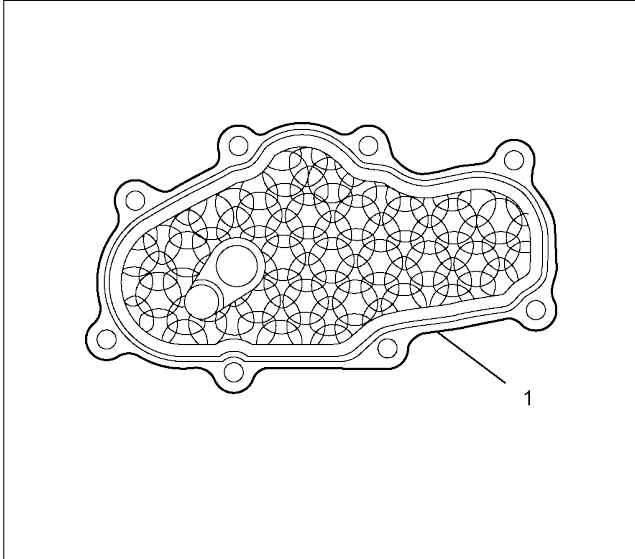
RTW56ASH006901

15. Install the cylinder head cover.

Refer to "Cylinder Head Cover" in ENGINE MECHANICAL section.

16. Apply liquid gasket (ThreeBond TB-1207C or equivalent) to timing chain cover upper (1).

- Attach cover within 5 minutes after the application of gasket.



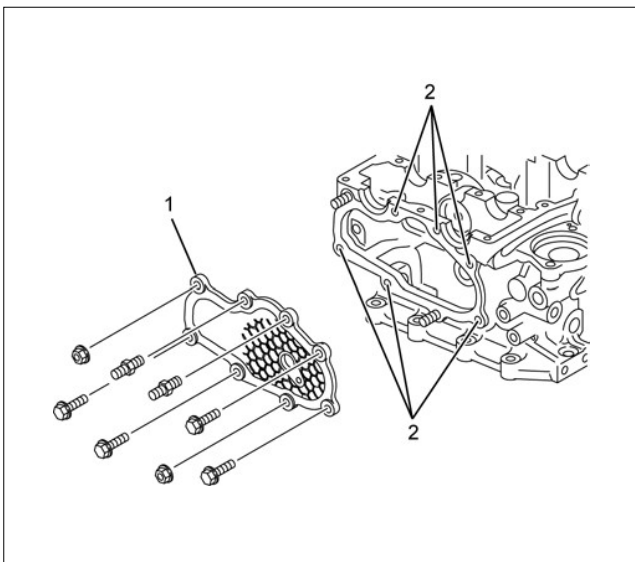
RTW56CSH002101

17. Install the timing chain cover upper (1).

Tighten the bolt to the specified torque.

- Apply Loctite #262 or equivalent to the bolt and stud threads of cylinder head side (2).

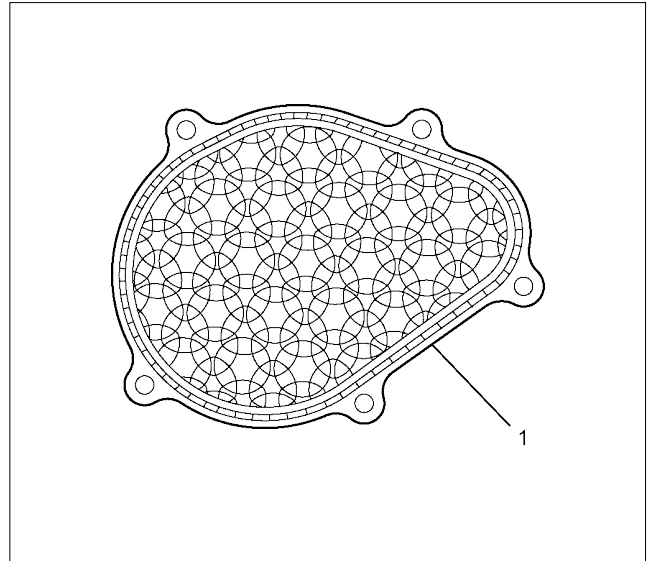
Tightening torque: 25 N·m (2.5 kg·m / 18 lb ft)



RTW76CSH001201

18. Apply liquid gasket (ThreeBond TB-1207C or equivalent) to the timing chain cover lower (1).

- Attach the cover within 5 minutes of applying the liquid gasket.



RTW56CSH002301

19. Install the timing chain cover lower.

Tighten the nuts and bolts to the specified torque.

Tightening torque: 10 N·m (1.0 kg·m / 87 lb in)

20. Install the noise cover to the timing chain cover lower.

Tighten the bolts to the specified torque.

Tightening torque: 10 N·m (1.0 kg·m / 87 lb in)

21. Connect the connectors.

- Supply pump
- Camshaft position sensor

22. Install the fuel rail assembly.

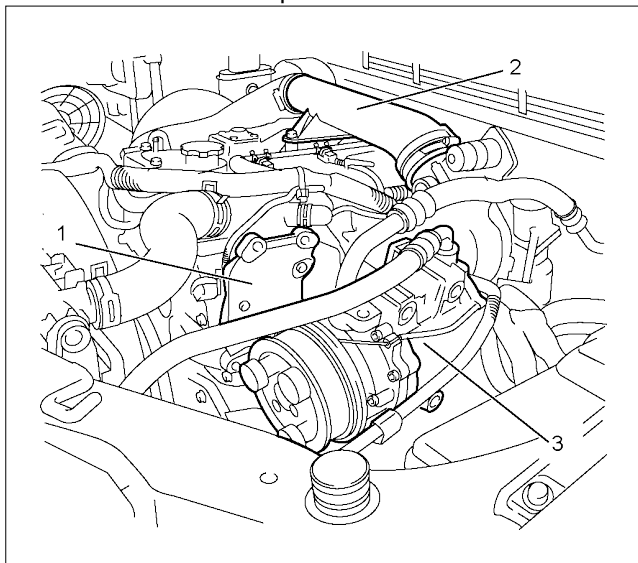
- Refer to the Install procedure for "Fuel rail assembly" in this manual.

23. Install the A/C compressor bracket.

Tighten the bolts to the specified torque.

Tightening torque: 25 N·m (2.5 kg·m / 18 lb ft)

24. Install the A/C compressor.



RTW56ASH004201

Legend

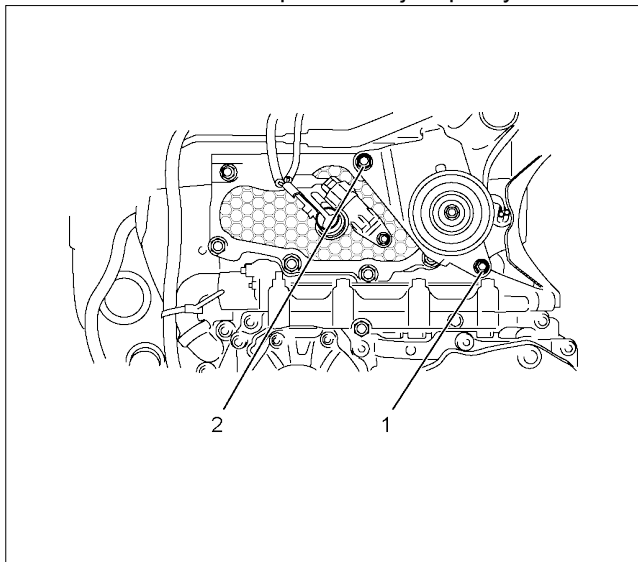
1. A/C Compressor Bracket
2. Intake Duct
3. A/C Compressor

Tighten the bolts to the specified torque.

Tightening torque: 44 N·m (4.5 kg·m / 33 lb ft)

25. Install the battery.

26. Install the A/C compressor adjust pulley.



RTW56ASH010601

Legend

1. Bolt
2. Nut

Tighten the nut and bolt to the specified torque.

Bolt Tightening torque: 25 N·m (2.5 kg·m/18 lb ft)

Nut Tightening torque: 25 N·m (2.5 kg·m/18 lb ft)

27. Install the A/C compressor drive belt.

Refer to the drive belt tension check procedure for Heating and air conditioning in this manual.

28. Install the cooling fan.

29. Install the fan guide.

30. Install the radiator upper hose.

31. Replenish the engine coolant.

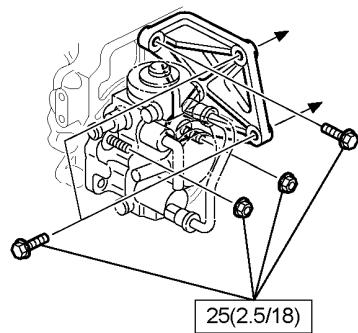
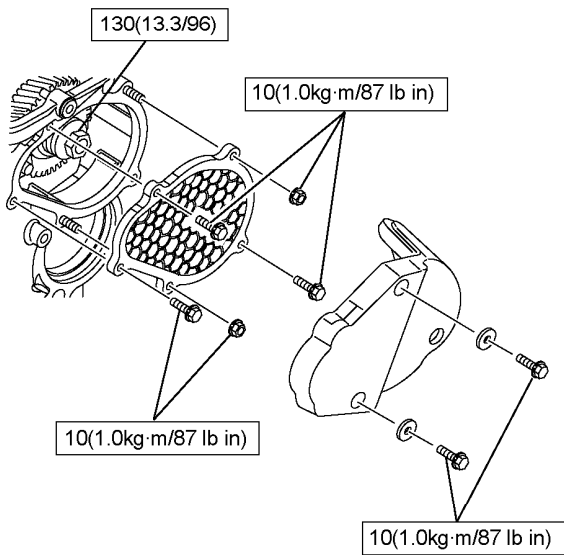
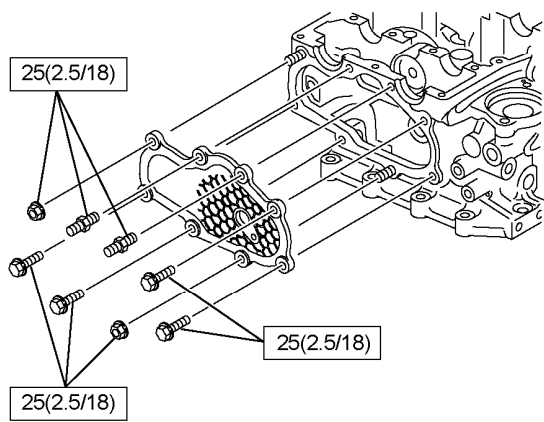
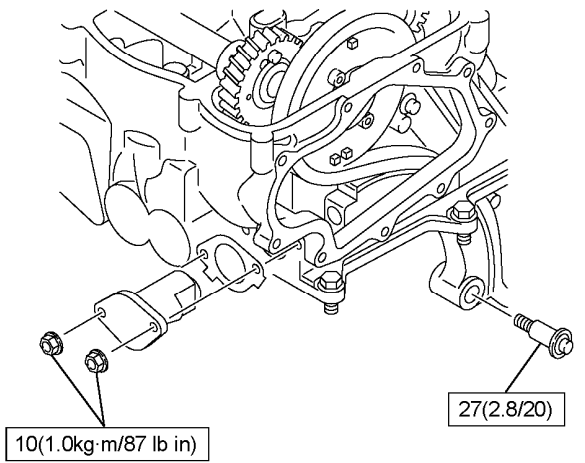
Fuel Supply Pump Relearn Procedure

The ECM goes through a fuel supply pump learn procedure to fine tune the current supplied to the fuel rail pressure (FRP) regulator. This learning process is only performed when the engine is idling.

1. Install the scan tool.
2. Turn ON the ignition, with the engine OFF.
3. Command the Supply Pump Learn Reset with the scan tool.
4. Observe the Supply Pump Status parameter with the scan tool. Confirm the scan tool indicates Not Learn.
5. Start the engine and let idle until engine coolant temperature (ECT) reads 149°F (65°C) or higher while observing Supply Pump Status parameter with the scan tool. The scan tool changes status Not Learn > Learning > Learned.
6. If the ECM has correctly learned the fuel supply pump current adjustment, the Supply Pump Status parameter on the scan tool will repeatedly indicate Learning and Learned.

Torque Specifications

N·m(kg·m/lb ft)

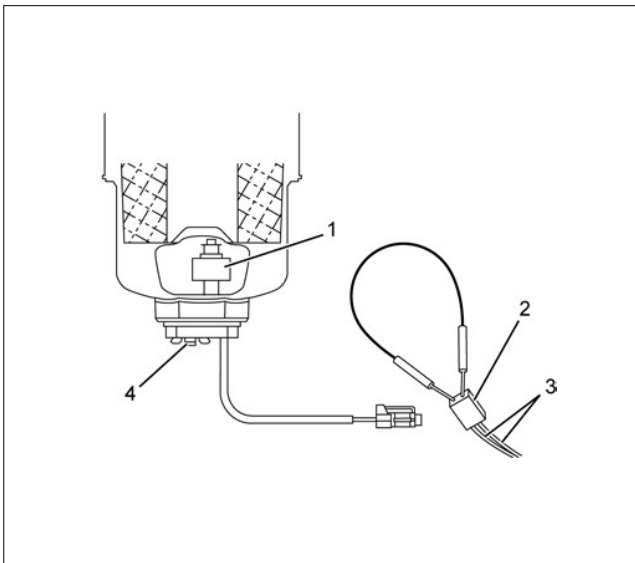


Fuel Sedimeter Switch

Inspection

1. Check that there is continuity between the switch connector terminals when the float in the fuel sedimeter is above the water drain line.
2. Turn on the ignition switch, remove the fuel sedimeter connector, and connect the terminals of the connectors on the harness side. Confirm that the sedimeter warning lamp lights up.

If abnormalities are detected during the check, replace the switch parts and carry out repairs in case of defective connection between circuits or short circuits.



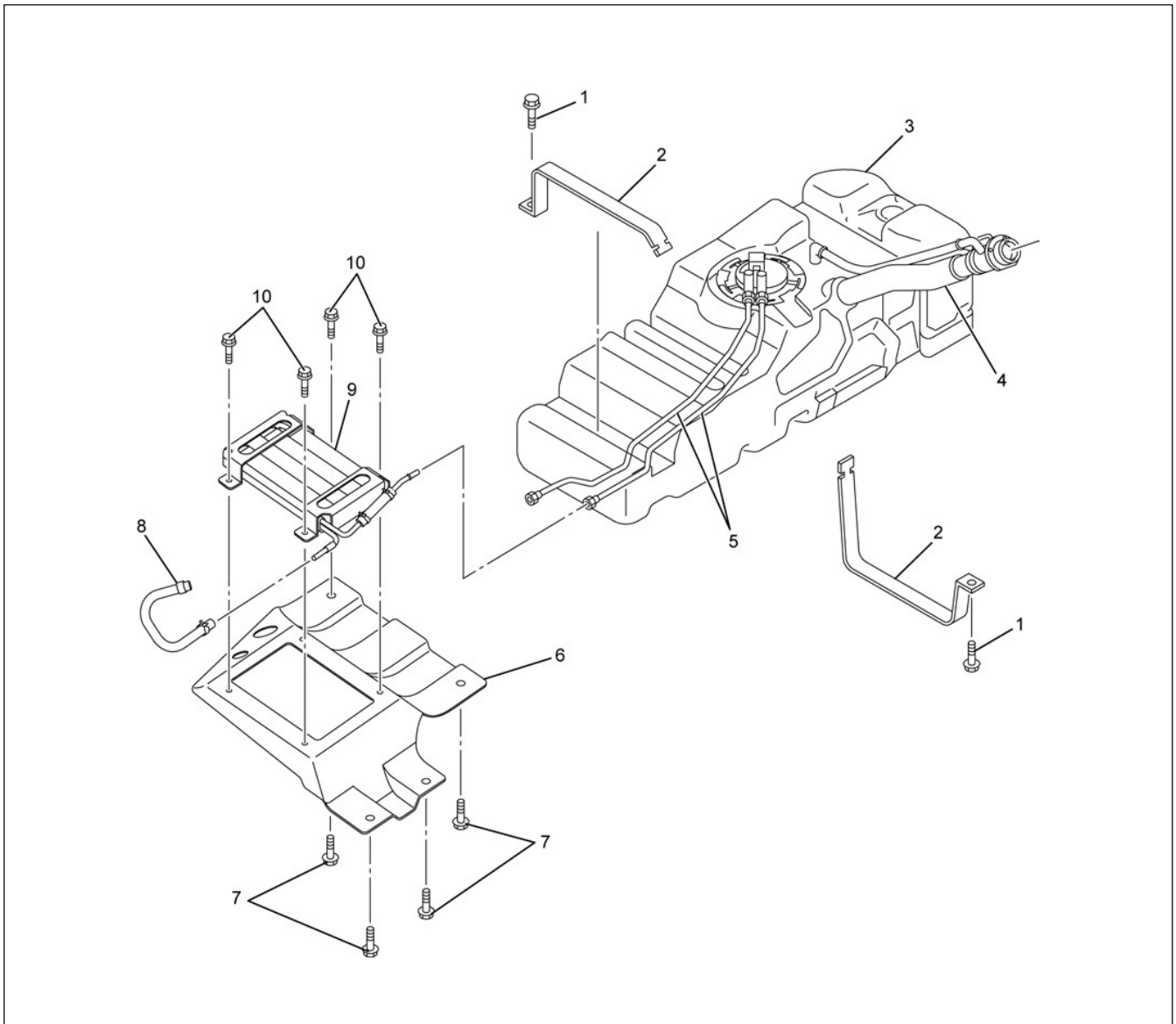
RTW76CSH001101

Legend

1. Sensor
2. Connector on The Vehicle Side
3. Harness
4. Drain Valve

Fuel Tank and Fuel Cooler

Fuel Tank and Associated Parts



RTW76CLF000501

Legend

- | | |
|------------------------------|------------------------------|
| 1. Bolt; Fuel Tank | 6. Bracket; Fuel Cooler |
| 2. Fuel Tank Band | 7. Bolt; Fuel Cooler Bracket |
| 3. Fuel Tank | 8. Fuel Return Hose |
| 4. Fuel Filler Hose and Pipe | 9. Fuel Cooler |
| 5. Fuel Tube/Quick Connector | 10. Bolt; Fuel Cooler |

Removal

Note: When repairs to the fuel system have been completed, start the engine and check the fuel system for loose connections or leakage. For the fuel system diagnosis, see Section "Drivability and Emission".

1. Disconnect the battery ground cable.
2. Slowly loosen the fuel filler cap.

Note: Be careful that fuel does not spout out because of change of pressure in the fuel tank.

Note: Cover opening of the filler neck to prevent any dust entering.

3. Jack up the vehicle.
4. Disconnect the quick connector (5) of the fuel tube at the fuel cooler way.
5. Remove fuel return hose (8) from the pipe.
6. Remove fixing bolt (7) of the bracket fuel cooler and remove bracket fuel cooler (6).

Note: Cover the opening of the pipe to prevent any dust and fuel leakage.

Note: For remove fuel cooler, Remove bolts (10) of the fuel cooler and remove fuel cooler.

7. Support underneath of the fuel tank with a lifter.
8. Remove the inner liner of the wheel house at rear left side.
9. Remove fixing bolt of the filler neck from the body.
10. Disconnect the quick connector (5) of the fuel tube from the fuel pipe and the evapo tube from evapo joint connector.

Note: Cover the quick connector to prevent any dust entering and prevent fuel leakage.

Note: Refer to "Fuel Tube/Quick Connector Fittings" in this section when performing any repairs.

11. Remove fixing bolt (1) of the tank band and remove the tank band (2).
12. Disconnect the pump and sender connector on the fuel pump and remove the harness from the weld clip on the fuel tank.
13. Lower the fuel tank (3).

Note: When lowering the fuel tank from the vehicle, do not scratch the hoses and tubes by contact with other parts.

Installation

1. Raise the fuel tank.

Note: When raising the fuel tank to the vehicle, do not scratch the hoses and tubes by contact with other parts.

2. Connect the pump and sender connector to the fuel pump and install the harness to the weld clip on the tank.

Note: The connector must be securely connected against the stopper.

3. Install the tank band and fasten bolt.

Torque: 68 N·m (6.9 kg·m /50 lb ft)

Note: The anchor of the tank band must be securely installed to the guide hole on the frame.

4. Connect the quick connector of the fuel tube to the fuel pipe and the evapo tube from evapo joint connector.

Note: Pull off the left checker on the fuel pipe.

Note: Refer to "Fuel Tube/Quick Connector Fittings" in this section when performing any repairs.

5. Install the filler neck to the body with bolt.

Note: For install the fuel cooler to the bracket with bolt.

Torque: 6.5 N·m (0.7 kg·m /61 lb in)

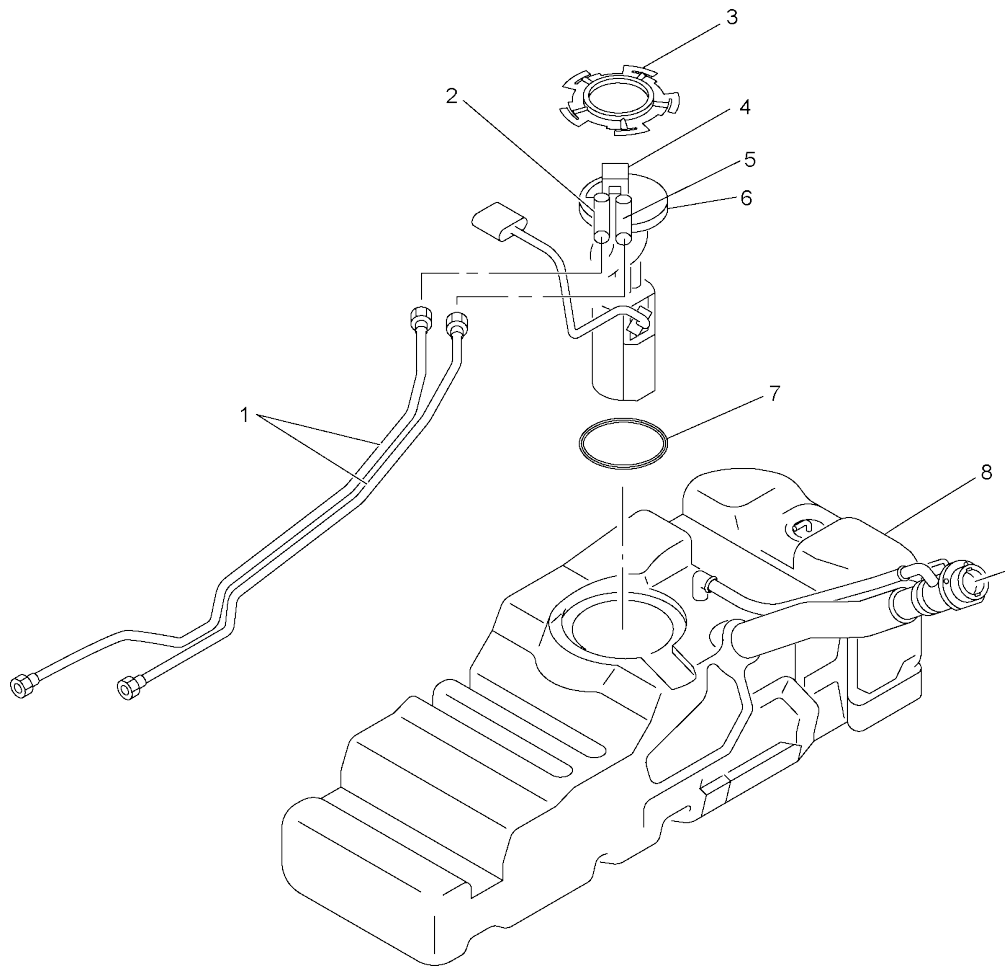
6. Install the bracket to Frame with bolt.

Torque: 48 N·m (4.9 kg·m /35 lb ft)

7. Install the fuel return hose at the fuel cooler way.
8. Install the quick connector at the fuel cooler way.
9. Install the inner liner of the wheel house at rear left side.
10. Remove lifter from the fuel tank.
11. Lower the vehicle.
12. Tighten the filler cap until at least three clicks.
13. Connect the battery ground cable.

Fuel Gauge Unit

Fuel Gauge Unit and Associated Parts



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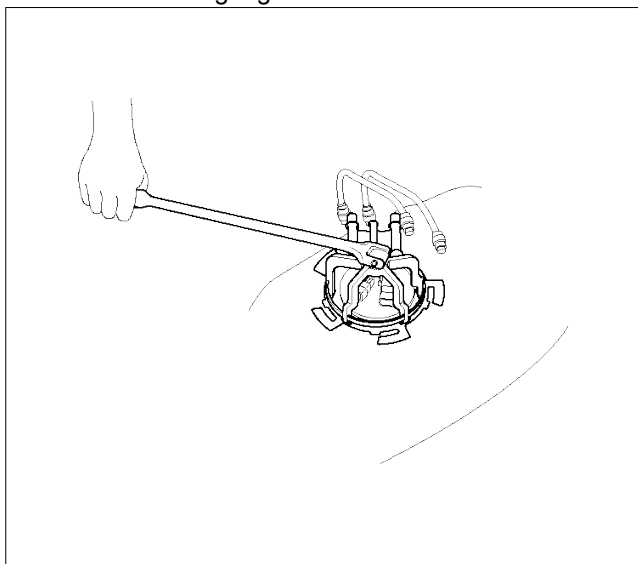
Legend

- | | |
|---|--|
| 1. Fuel Tube/Quick Connector | 5. Fuel Return Port |
| 2. Fuel Feed Port | 6. Fuel Gauge Unit and Sender Assembly |
| 3. Retainer Ring (Fuel Gauge Unit Lock) | 7. Seal; Fuel Gauge Unit |
| 4. Connector; Fuel Gauge Unit | 8. Fuel Tank Assembly |

Removal

Note: When repairs to the fuel system have been completed, start the engine and check the fuel system for loose connections or leakage. For the fuel system diagnosis, see Section "Drivability and Emission".

1. Remove the fuel tank assembly (8). Refer to "Fuel Tank Removal" in this section.
2. Disconnect the quick connector (1) of the fuel tube from the fuel gauge unit.



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3. Remove the retainer ring (3) from the fuel tank with the removal tool 5-8840-2602-0.
4. Slowly remove the fuel gauge unit (6) from the fuel tank as no bend float arm.

Note: Cover opening for the fuel gauge unit on the fuel tank to prevent any dust entering.

5. Discard the fuel gauge unit seal (7) because it cannot be reused.

Installation

1. Clean the seal surface of the fuel tank and the fuel gauge unit.

Note: If there is dust on the seal surface, it can cause a fuel leak.

2. Install the new fuel gauge unit seal (7) to the opening of the fuel tank along the groove.
3. Slowly install the fuel gauge unit (6) into the fuel tank so there is no bend in the float arm.
4. Set the flange of the fuel gauge unit on the fuel gauge unit seal as mating convexity of the fuel gauge unit and reentrant of the fuel tank.
5. Slowly lock the retainer ring (3) to the fuel tank with the remover tool 5-8840-2602-0.
6. Connect the quick connector (1) of the fuel tube to the gauge unit.

Note: Pull off the left checker of the fuel pipe.

Note: Refer to "Fuel Tube/Quick Connector Fittings" in this section when performing any repairs.

7. Check for leak.

Method of leak check.

1. Plug the end of the quick connector and breather hose (Pull off the breather hose from fuel tank) and tighten fuel filler cap until at least one click is heard.
2. Apply soapy water around the fuel gauge unit seal area.
3. Pressure air into the fuel tank from the end of the breather pipe at 34.3 kPa (0.35 kg / cm² / 5 psi) over 15 seconds.
4. Verify that no bubbles from around the fuel gauge unit seal area.
8. Install the fuel tank assembly (8).

Note: Refer to "Install the fuel tank" in this section.

Special Tool

ILLUSTRATION	PART NO. PART NAME
5884026020	5-8840-2602-0 Remover: fuel pump retainer ring

Fuel Tube / Quick - Connector Fittings

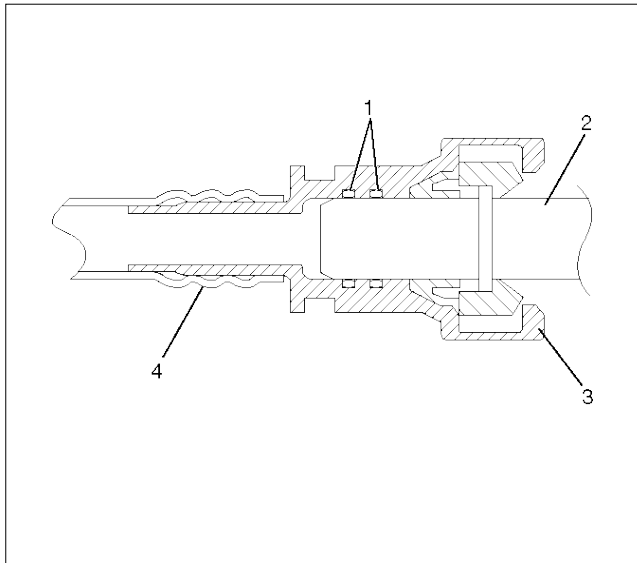
Precautions

- Do not light a match or create a flame.
- Keep flames away from your work area to prevent flammable materials from catching fire.
- Disconnect the battery ground cable to prevent electrical shorts.
- Pre-treat the piping system or associated parts from thermal damage or from spattering when welding or similar heat-generating work.

Cautions During Work

Do not expose the assembly to battery electrolyte or do not wipe the assembly with a cloth used to wipe off spilt battery electrolyte.

Piping that has been splattered with battery electrolyte or battery electrolyte soaked cloth that was wiped on the piping cannot be used.



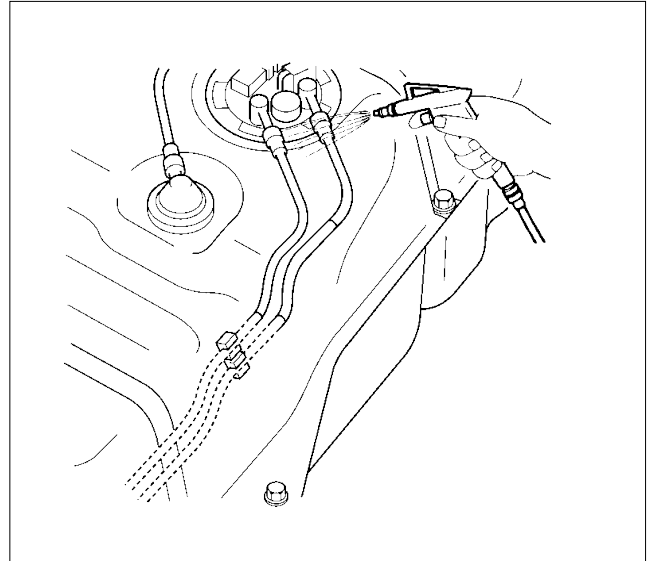
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Legend

1. O-ring
2. Port
3. Connector
4. Plastic Tube

Removal

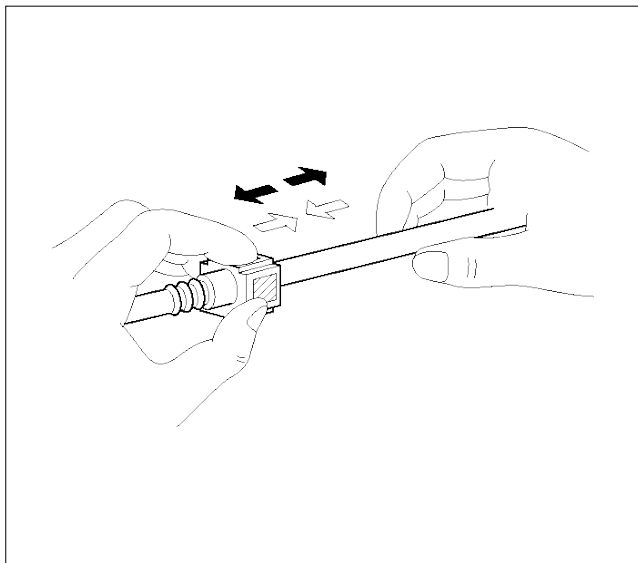
1. Open the fuel cap to relieve the fuel pressure in the tank. Use compressed air to remove any dirt on the fuel quick connect fittings prior to disconnecting the fittings. When disconnecting the fuel pipe, cover the area with a cloth to prevent fuel from splashing as the fuel pipe may still have some pressure in it.



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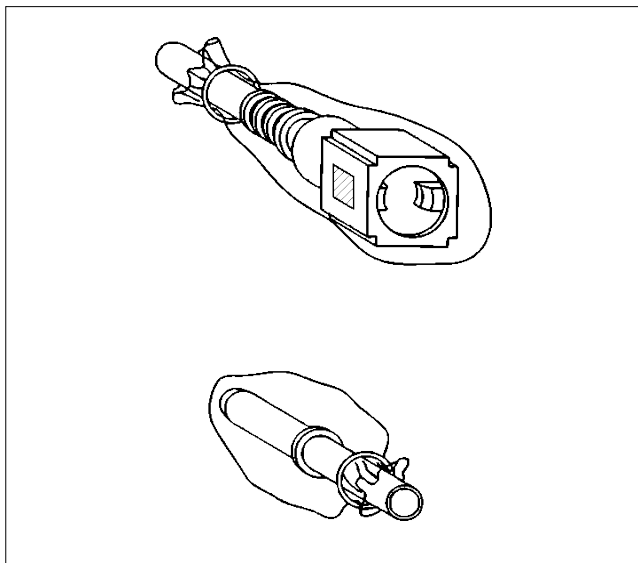
2. For removal of the quick connector, hold the quick connector in one hand, and pull out the connector with the other hand while pressing the square release button of the connector, as illustrated.

Note: Do not use tools of any kind. Only use bare hands when disconnecting the connector. Use a lubricant (light oil) and/or push and pull the connector until the pipe is disconnected.



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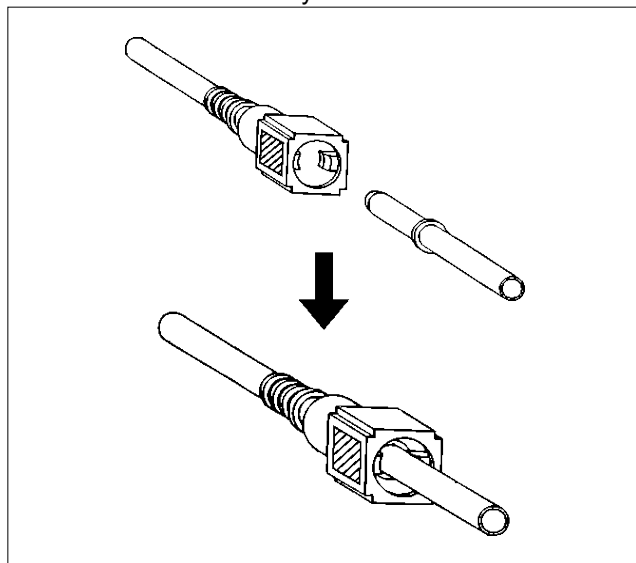
Cover the connectors that were removed with a plastic bag, to prevent dust or rain water from entering.



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Reuse of Quick-Connector

- Replace the port and connector if a scratch, dent or crack is found.
- Remove any dirt build up on the port when installing the connector. Replace the connector, if there is any rust, dents or scratches.
- After cleaning the port, insert it straight into the connector until it clicks. After it clicks, try pulling it out at 49 N (5 kg / 11 lb) to make sure that it is not drawn and is securely locked.



140R100036

Assembling Advice

By applying engine oil or light oil to the pipe, port makes pipe assembly easier. The pipe assembly should take place immediately after applying oil (to prevent dust from sticking to the pipe surface - which may decrease sealing ability).

Test/Inspection After Assembling

1. Reconnect the battery negative cable.
2. Start the engine and observe the engine idle speed. The presence of dirt in the fuel system may affect the fuel injection system.
3. Check for fuel leakage from the connector.

Filler Neck

Removal

1. Remove the fuel tank.

Note: Refer to "Fuel Tank" in this section.

2. Put a marking on the following points as the filler neck assembly is restored.
 - Each joint area of the hose (to restore axial direction and insertion length of the hose)
 - Each fasten area of the clamp (to restore axial direction and position of the clamp)
 - Each bolt in the clamp (to restore fasten length of bolt in the clamp)
 - The band clip (to restore position and fasten length of the band clip)

Note: Cover end of each hose and pipe to prevent any dust entering.

Installation

1. Align each marking and restore the following point.
 - Each joint area of the hose (Restore axial direction and insertion length of the hose)
 - Each fasten area of the clamp (Restore axial direction and position of the clamp)

Tightening torque: 2.5 N·m (0.25 kg·m /21.7 lb in)

Filler neck side except flat deck model.

- Each bolt in the clamp (Restore fasten length of bolt in the clamp)

Tightening torque: 2.5 N·m (0.25 kg·m /21.7 lb in)

Filler neck side except flat deck model.

- The band clip (Restore position and fasten length of the band clip)

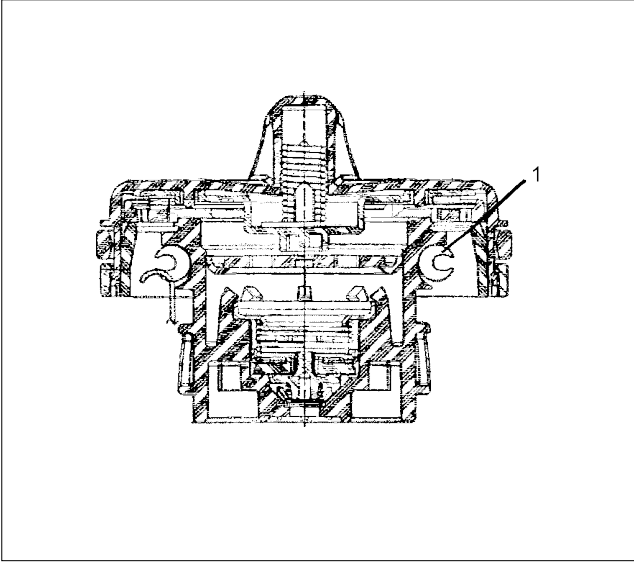
2. Install the fuel tank.

Note: Refer to "Fuel Tank" in this section.

Fuel Filler Cap

General Description

A vacuum valve and pressure valve are built into the fuel filler cap which adjusts the fuel pressure in the fuel tank to prevent fuel tank damage.



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Legend

- 1. Seal Ring

Inspection

The fuel filler cap must be inspected for seal condition.

The fuel filler cap must be replaced if found defective.

Note: A replacement fuel filler cap must be the same as the original. The fuel filler cap valve was designed primarily for this application and must be replaced with the same type or decreased engine performance may occur.