
Fuel (WP10)

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Fuel System

General

The parameters of the traditional mechanical fuel injection system (injection timing, injection quantity and injection pressure) are controlled by mechanical means. For example, the fuel injection quantity is controlled by a fuel supply gear rack in a fuel injection pump, and the injection timing is controlled by a mechanical timing device, i.e. the fuel injection is controlled by an adjusting device in advance. Therefore, the control range and accuracy are limited. The injection pressure is generated due to the rise of an injection pump plunger, the starting time of the fuel injector is also caused by the rise of the injection pressure, therefore, the control of the fuel injection time is inaccurate, and apparently, according to the needs of a diesel engine, pre-injection and regular repeated injection are even impossible to achieve.

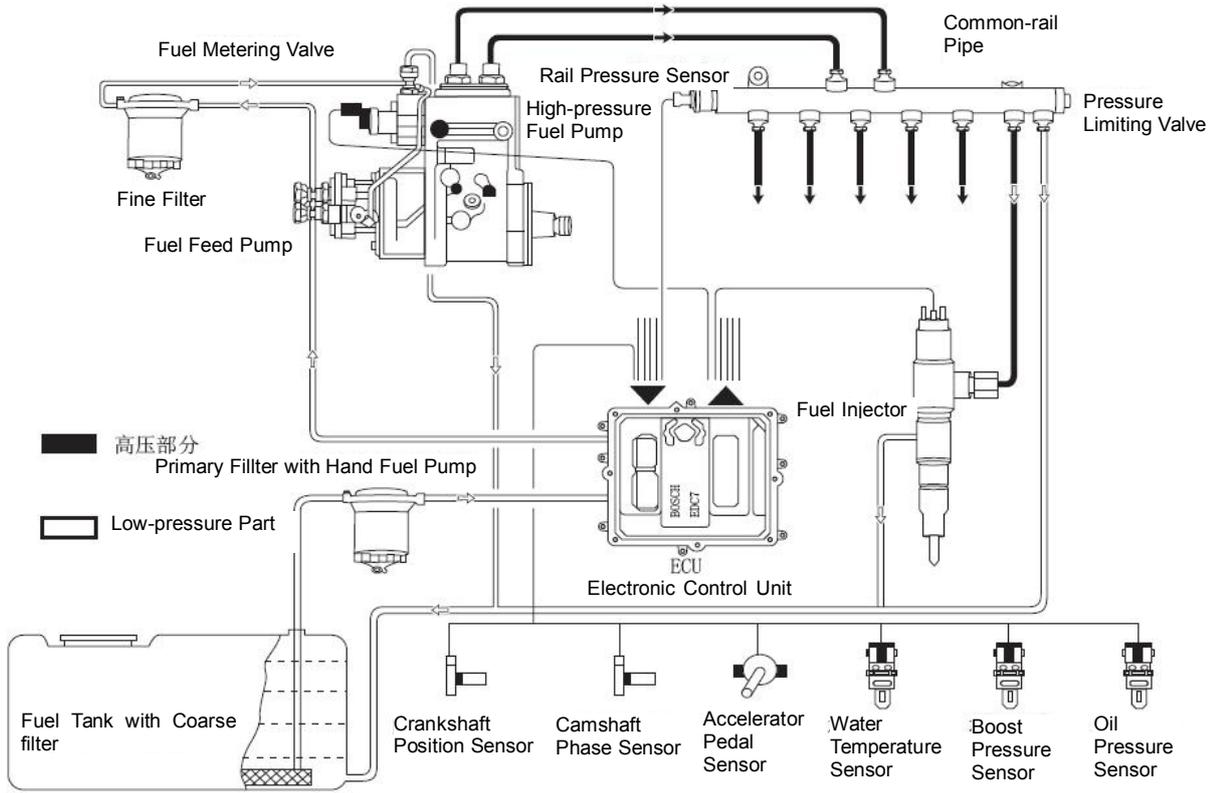
The ECU computer-controlled high-pressure common-rail fuel injection system has the following unique advantages:

1. **Generation of injection pressure is independent of engine speed, and the injection process is relatively independent, which can guarantee the stability of injection pressure.**
2. **Commencement of injection and fuel injection quantity are controlled completely separately, so random accurate control of injection timing can be achieved.**
3. **Multiple injection of pre-injection, main injection and compensation injection can be achieved, which is entirely determined by the performance and emission requirements of the diesel engine.**

In other words, according to the different requirements of diesel engine performance, the fuel injection process can be accurately controlled.

4. **The fuel injection system has sensitive response and can achieve injection control of a variety of speed ranges.**
5. **The accuracy of the fuel injection quantity is higher, and the minimum steady injection quantity is $1\text{mm}^3/\text{time}$.**
6. **The injection pressure is increased (from currently 160Mpa to 180Mpa), so the atomization effect is improved, fuel and air are fully mixed, and the emissions and noise are reduced.**
7. **The driving torque peak value of the fuel pump is smaller, which reduces the driving power and noise.**
8. **The high-pressure common-rail system can replace the traditional fuel injection system in case that the major structural of the diesel engine is unchanged, thereby speeding up the upgrading and improvement of the diesel engine.**

In short, the old mechanical pump is controlled by mechanical means, so the control accuracy, response speed and sensitivity are relatively rough. The high-pressure common-rail fuel system is controlled by a computer, so the control accuracy, response speed and sensitivity of controlling changes are very accurate.



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Seen from the drawing, the high-pressure common-rail fuel injection system basically consists of a low-pressure fuel line, a high-pressure fuel line, an information acquisition part and a control and actuating member, wherein the low-pressure fuel line consists of a fuel tank, a primary fuel filter with a hand fuel pump, a low-pressure fuel supply pump and a fuel fine filter; the high-pressure fuel line consists of a high-pressure fuel pump, a common-rail pipe and a fuel injector; the information acquisition part consists of a crankshaft position sensor, a camshaft phase sensor, an accelerator pedal sensor, a water temperature sensor, a boost pressure and temperature sensor, an oil pressure sensor and other sensors; and the control and actuating member consists of a central processing unit (ECU), a fuel metering valve, a fuel injector solenoid valve, etc. The system also provides a fuel return line, and surplus fuel passing through the high-pressure fuel pump and the fuel injector, and the fuel effluent from a pressure limiting valve after the common-rail pressure exceeds the limited pressure flows back to the fuel tank from the fuel return pipe.

Information Acquisition Content	To	Control Unit	To	Control and Actuating Content
Accelerator Pedal Position Sensor				Fuel Injection Time
Crankshaft Position Sensor				Fuel Injection Pressure
Camshaft Phase Sensor				Number of Times of Fuel Injection
Common-rail Pressure Sensor				Fuel Injection Quantity
Boost Pressure and Temperature Sensor		(ECU)		Common-rail Pressure
Water Temperature Sensor				Cold Start
Oil Pressure and Temperature Sensor				Start Control
Vehicle Speed Sensor				Air Conditioning Acceleration Control
Information Acquisition Content				Control Unit
Air Conditioning Sensor (Air Conditioning Switch)				
Start Signal Sensor (Neutral Position Switch)				

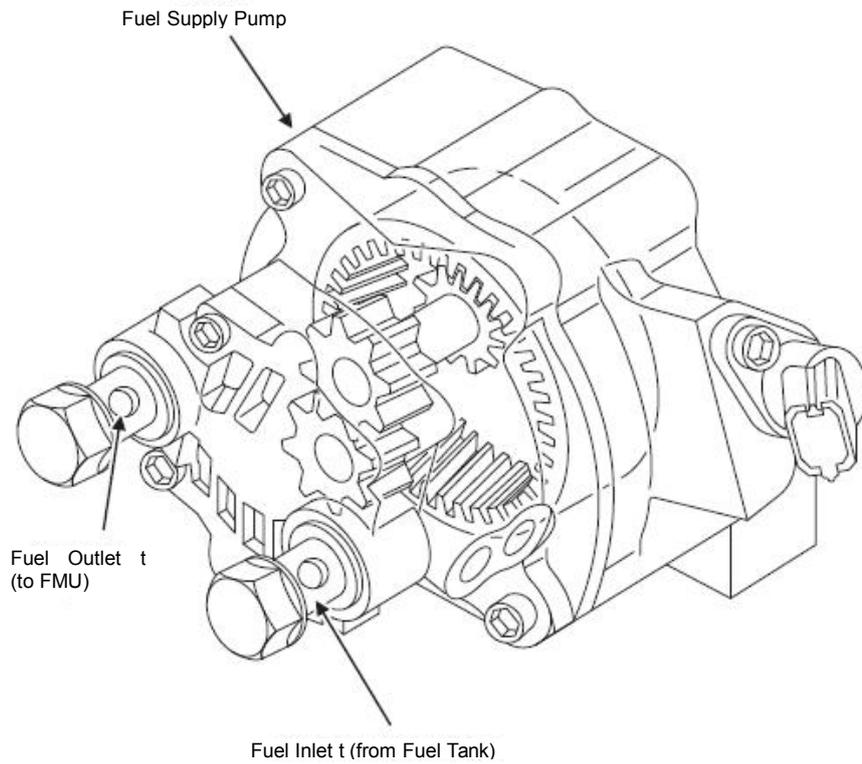
The above is the control process of the Bosch common-rail injection system. The ECU central processing unit collects all instant parameters influencing the dynamic property, economy and emission of diesel fuel, and simultaneously according to the driver's operational command - namely the position of the accelerator pedal, the ECU comprehensively calculates the optimum values of various actuating parameters such as the injection timing, fuel injection pressure, fuel injection quantity, number of times of fuel injection, etc., thereby achieving the optimum operation state of the diesel engine.

Primary Fuel Filter with Hand Fuel Pump

The primary fuel filter with a hand fuel pump is simultaneously provided with an oil-water separator. When the filter filters the fuel, water is gathered in a water collector, and the separated water shall be emptied from a drain screw in time in daily maintenance. The coarse filter is screwed on the filter housing and shall be replaced periodically in maintenance. A hand fuel pump is installed on the filter cover of the coarse filter, and when the filter is assembled for the first time or maintained and replaced, or air exists in the system, the air in the low-pressure loop shall be discharged by the hand fuel pump. An exhaust bolt is arranged on the housing of a filter connecting flange, by unscrewing the exhaust bolt and repeatedly pressing the hand fuel pump, fuel accompanied with air is exhausted from the exhaust bolt until the outflow fuel contains no air, and then the exhaust bolt is screwed.

High-pressure Fuel Pump

The high-pressure fuel pump integrates the low-pressure fuel line and the high-pressure fuel line. The high-pressure pump has two tasks: first, a gear pump connected with the high-pressure fuel pump is the fuel feed pump of the low-pressure fuel line, and the gear pump pumps fuel through the primary fuel filter and the ECU and supplies fuel to the high-pressure pump through the fuel fine filter; and second, two sets of plungers or the high-pressure fuel pump provides high-pressure fuel as high as 160Mpa to the high-pressure common rail.



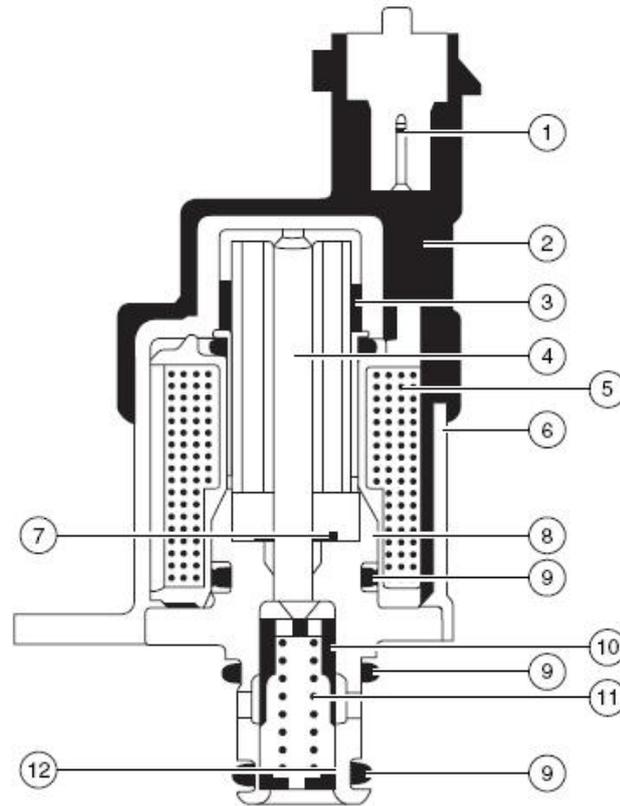
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In a low-pressure oil path, fuel flows through the ECU inner chamber to perform the function of cooling the ECU.

The fuel feed pump is a straight gear type fuel pump which is driven by driving a straight small gear by an inner ring gear integrated with a camshaft of a high-pressure pump. The fuel feed pump feeds the fuel from the fuel tank to the high-pressure fuel pump.

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The high-pressure part of the high-pressure fuel pump comprises two cam type camshafts, a roller type tappet rod, plungers, fuel outlet joints and a fuel metering valve. Two rows of cams are alternately arranged on the camshafts on three surfaces, and when the camshafts rotate, two pairs of plunger pistons simultaneously pump the fuel for six times back and forth. Two fuel outlet valves are arranged in two fuel outlet joints of the high-pressure fuel pump and can supply high-pressure fuel of 160MPa to common-rail pipes.

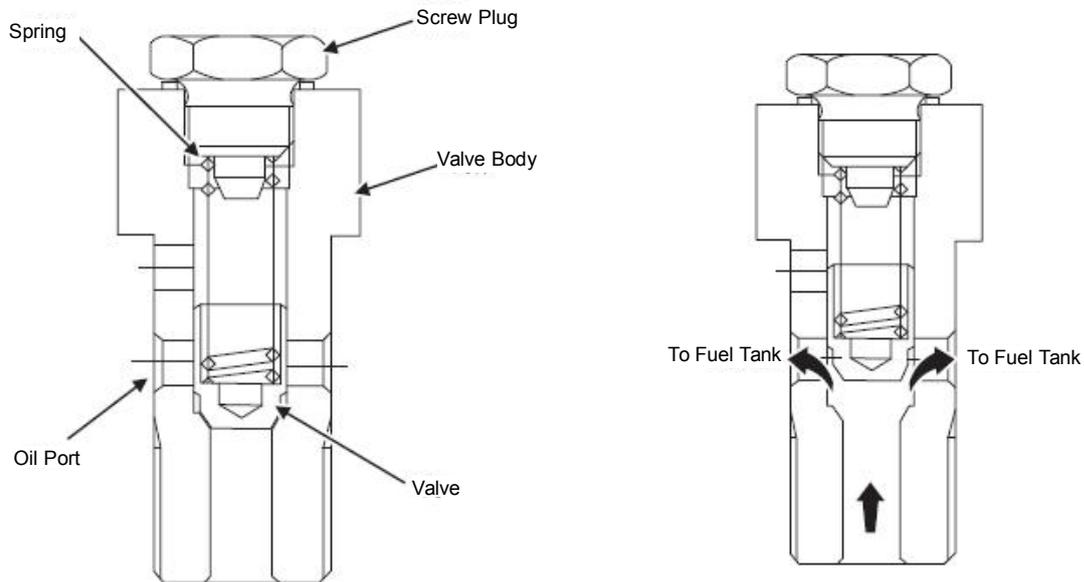


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1	Plug	7	Air Gap Gasket
2	Solenoid Valve Housing	8	Magnetic Core
3	Sleeve	9	O-Ring
4	Tappet	10	Plunger with Control Gap
5	Coil	11	Spring
6	Housing	12	Snap Ring

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A fuel metering valve is arranged on the fuel outlet pipeline of the high-pressure fuel pump and is mainly used for receiving the instruction of the ECU to randomly change the capacity of the fuel entering the high-pressure pump, thereby changing the high-pressure fuel feed pressure of the high-pressure pump, i.e. changing the common-rail pressure. When a fuel metering unit has a fault, the engine operates at the limited rotation speed of 1500r/min, and meantime, the resistance value of the metering valve is 2.6-3.4 ohm. The ECU controls the capacity of the fuel entering the high-pressure pump by the on-off time of pulse signals. It is noteworthy that when the coil of the fuel metering valve is not electrified, the metering valve is all-pass and can supply maximal fuel flow. In other words, maximal common-rail pressure can be formed.



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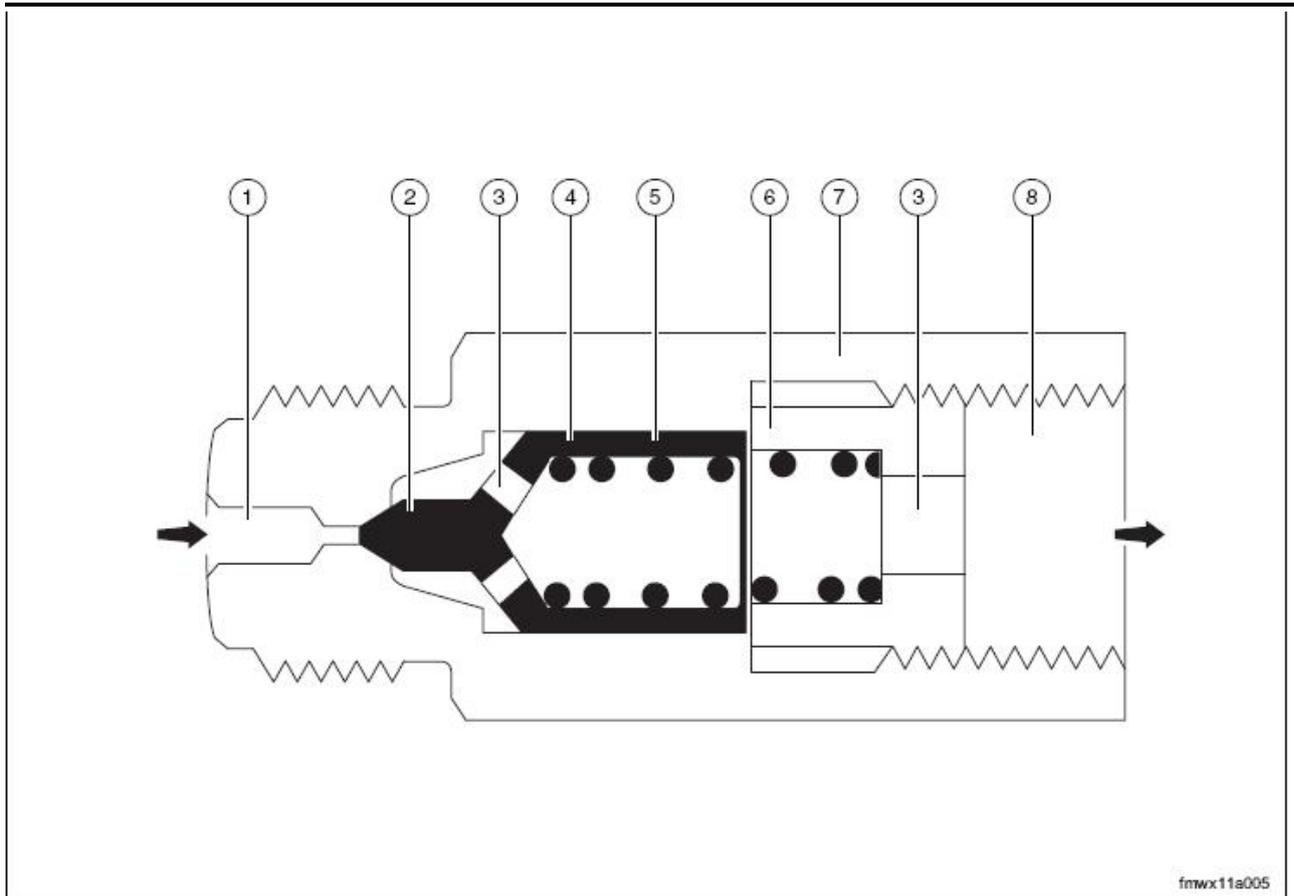
The low-pressure fuel feed side of the high-pressure fuel pump is connected with the fuel inlet of the fuel metering valve in parallel and is provided with a fuel return valve. The valve enables the low-pressure fuel path to keep a constant fuel feed pressure, and the fuel return pipeline of the high-pressure fuel pump is connected out of the fuel return valve.

A camshaft phase sensor is arranged in the position of the shell of the high-pressure fuel pump corresponding to a camshaft fluted disc and transfers the random position of the camshaft to the ECU, so that the ECU can recognize the running position of each cylinder of the diesel engine.

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High-pressure Common-rail Pipe

The common-rail pipe is a fuel pressure storing device which distributes the high-pressure fuel provided by the high-pressure fuel pump to each fuel injector and weakens the pulsation of the fuel feed pressure of the high-pressure fuel pump and the pressure oscillation generated by fuel injection of each fuel injector, so that the pressure fluctuation of the high-pressure fuel path is controlled in a certain range. Meanwhile, the fuel pressure in the common-rail pipe is also controlled by the fuel metering valve controlled by the ECU, thereby determining the fuel delivery of each fuel injector according to the working condition of the diesel engine. A common-rail pressure sensor is installed at the left end of the common-rail pipe, and the sensor transfers the fuel pressure in the common-rail pipe to the ECU at any time, so that the ECU can adjust the fuel flow valve as required to change the common-rail inner fuel pressure value. A pressure limiting valve is also arranged on the common-rail pipe, and the pressure limiting valve is opened when the pressure in the common-rail pipe exceeds 160Mpa, so that the maximum pressure in the common-rail pipe can not exceed the set value of 160Mpa.



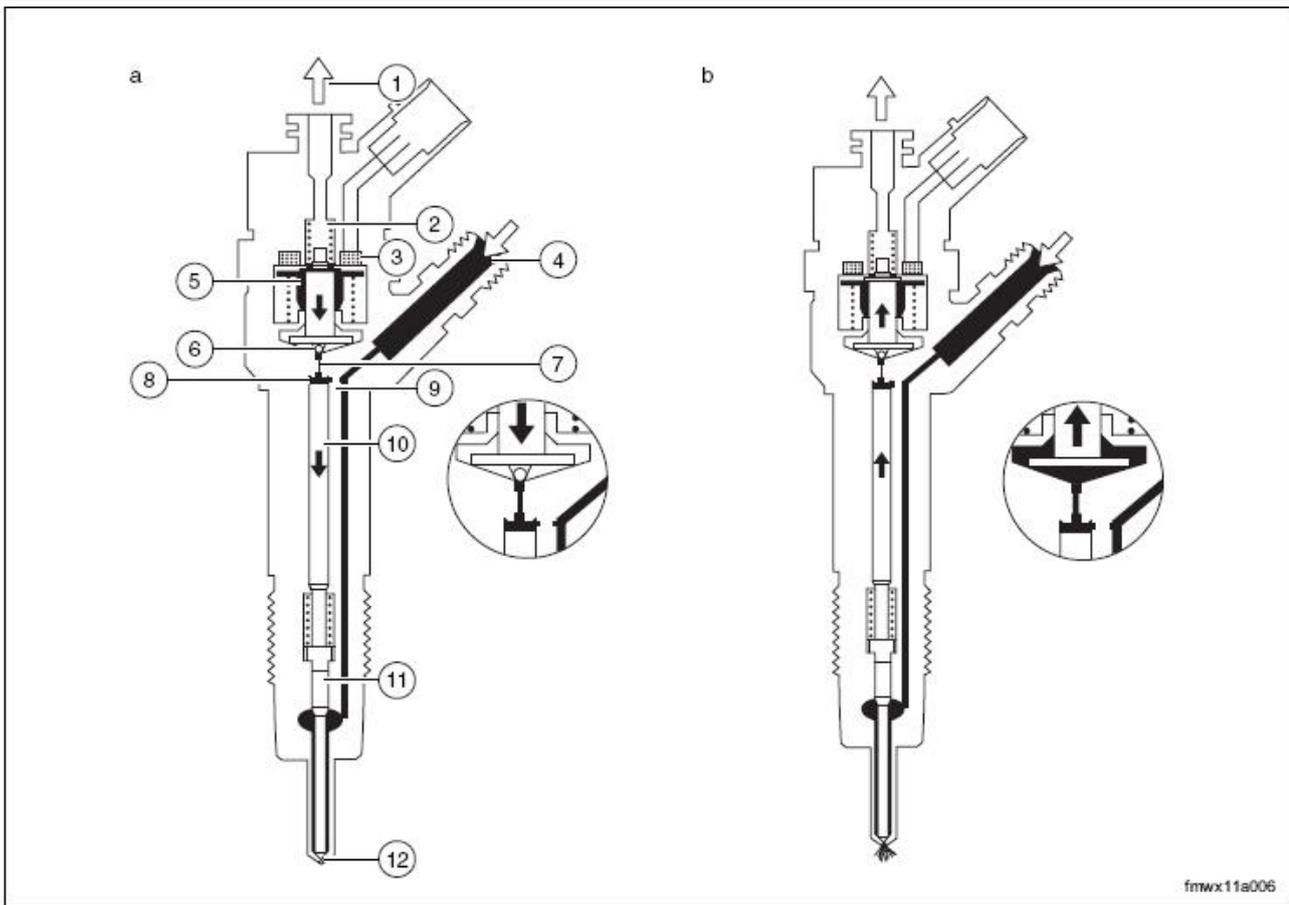
1	High-pressure Connector (to Common-rail Pipe)	5	Spring
2	Valve Needle	6	Limiting Sleeve
3	Channel	7	Valve Body
4	Valve Spool	8	Fuel Return Channel

Fuel Injector

An electric control fuel injector is a key position of a fuel injection system, and nearly all of the elements of an electric control system finally serve for the fuel injector. The injection of the fuel injector is controlled by the ECU, and the ECU controls the fuel injection quantity, the injection timing, the fuel injection pressure and the number of times of fuel injection of the fuel injector according to the state information input by each sensor of the engine and the instruction of the driver, thereby achieving optimal output of the instant state.

The control of the fuel injection pressure is generated on the common-rail pressure provided by the high-pressure fuel pump, and the injection timing, the fuel injection duration and the number of times of fuel injection are controlled by voltage signals output by the ECU through a solenoid valve at the upper part of the fuel injector. The fuel injection quantity of the fuel injector is obviously determined by the common-rail pressure and the opening time of the needle valve of the fuel injector, wherein the higher the fuel injection pressure is, the longer the opening time of the needle valve is, and the larger the fuel injection quantity is.

At present, a fuel injector with seven holes is used by the national III diesel engine.



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1	Fuel Return Connector	7	Drain Hole
2	Return Spring	8	Control Chamber
3	Solenoid Valve Coil	9	Fuel Inlet
4	Fuel Inlet Connector	10	Plunger
5	Solenoid Valve Spool	11	Needle Valve
6	Ball Valve	12	Nozzle

The high-pressure fuel from the common-rail pipe enters the fuel injector through the fuel inlet joint and enters the control chamber through fuel inlet holes, the high-pressure fuel generates downward pressure on the upper cross section of the plunger piston, and simultaneously, the high-pressure fuel enters the lower chamber and acts on the lower annular area of the needle valve to generate an acting force for pushing the plunger piston upward. Because the area of the upper cross section of the plunger piston is greater than the lower annular area of the needle valve, the downward force acting on the plunger piston is obviously greater than the upward force acting on the needle valve; meantime, the needle valve is tightly pressed on the injector nozzle under the action of the downward force of the plunger piston and the action of the spring of the needle valve; and meantime, the nozzle is closed, and the fuel injector is in an injection stopping state.

When the ECU switches on the solenoid valve of the fuel injector, the solenoid valve core is attracted upward, the ball valve pressing on the drain hole opens the drain hole, and the fuel pressure acting in the control chamber is unloaded through the throttling fuel feed hole; and meantime, the fuel pressure acting on the lower annular cross section of the needle valve overcomes the spring pressure to quickly push the needle valve upward, thereby opening the orifice of the nozzle for injecting fuel. When the voltage signals of the ECU disappear, the solenoid valve core enables the ball valve to close the drain hole under the action of the return spring, the plunger piston immediately enables the needle valve to return to the original position under the action of the high-pressure fuel of the control chamber, the fuel injection hole is closed, and the fuel injector stops

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injecting. Because lifting and closing of the needle valve are determined by the difference of the hydraulic pressure on the upper cross section of the plunger piston and the lower annular area of the needle valve, the force of the solenoid valve for lifting the valve core does not need to be very large, so that the reaction speed of the fuel injector is high and is 0.1-0.3ms generally, thus accurate and sensitive injection can be realized.

ECU (central processing unit)

The ECU is the nerve center of the electric control fuel injection system, is actually a simple computer, gathers various kinds of state information of running of the diesel engine through the sensor, simultaneously receives the instruction transferred by the driver through the accelerator pedal sensor, and determines the fuel injection quantity, the injection timing and the number of times of fuel injection of the fuel system through simple and quick operation (the ECU can control the fuel injector for injecting fuel for 5 times in each process of circulation, and only a preliminary injection process and a main injection process are used at present), so that the diesel engine can run in the optimal state in any working condition.

Another function of the ECU is to realize reliable self-control operation. For example, in order to ensure the safety in the process of starting the engine, a neutral switch is arranged on the gearbox, and the control circuits of the neutral switch and the starter are controlled by the ECU; and when the engine is started, if the gearbox is shifted in any gear, the starting circuits of the engine are broken, so that the engine can not be started. When the driver opens the air conditioner, the ECU controls the idle speed of the engine to be improved, so that the engine at the idle speed can not flame out; and if the PTO power is output, the ECU controls the engine to adapt to the needs of load change to automatically adjust the output of the torque, etc.

The ECU has self-diagnostic capability of faults, reflects the running faults of the diesel engine caused by the electric control fuel injection system in the form of fault flash codes, and can store the faults, so that the faults can be found visually or by a fault diagnosis instrument, thereby providing the convenience for quickly and accurately processing the faults.

The ECU also has a function of "limp home", i.e. when the diesel engine has a fault which affects the working reliability and safety, before the fault is eliminated, the ECU can output a "default" for each executive component, wherein the "default" means that under the preset condition which can not affect the fault extension, the engine only can maintain general running instructions; meantime, the rotation speed of the engine can not exceed 1500r/min, and the engine can not exert full power, thus the driver only can reluctantly drive the vehicle to the home or the maintenance point; and after the fault is eliminated, the vehicle can restore.

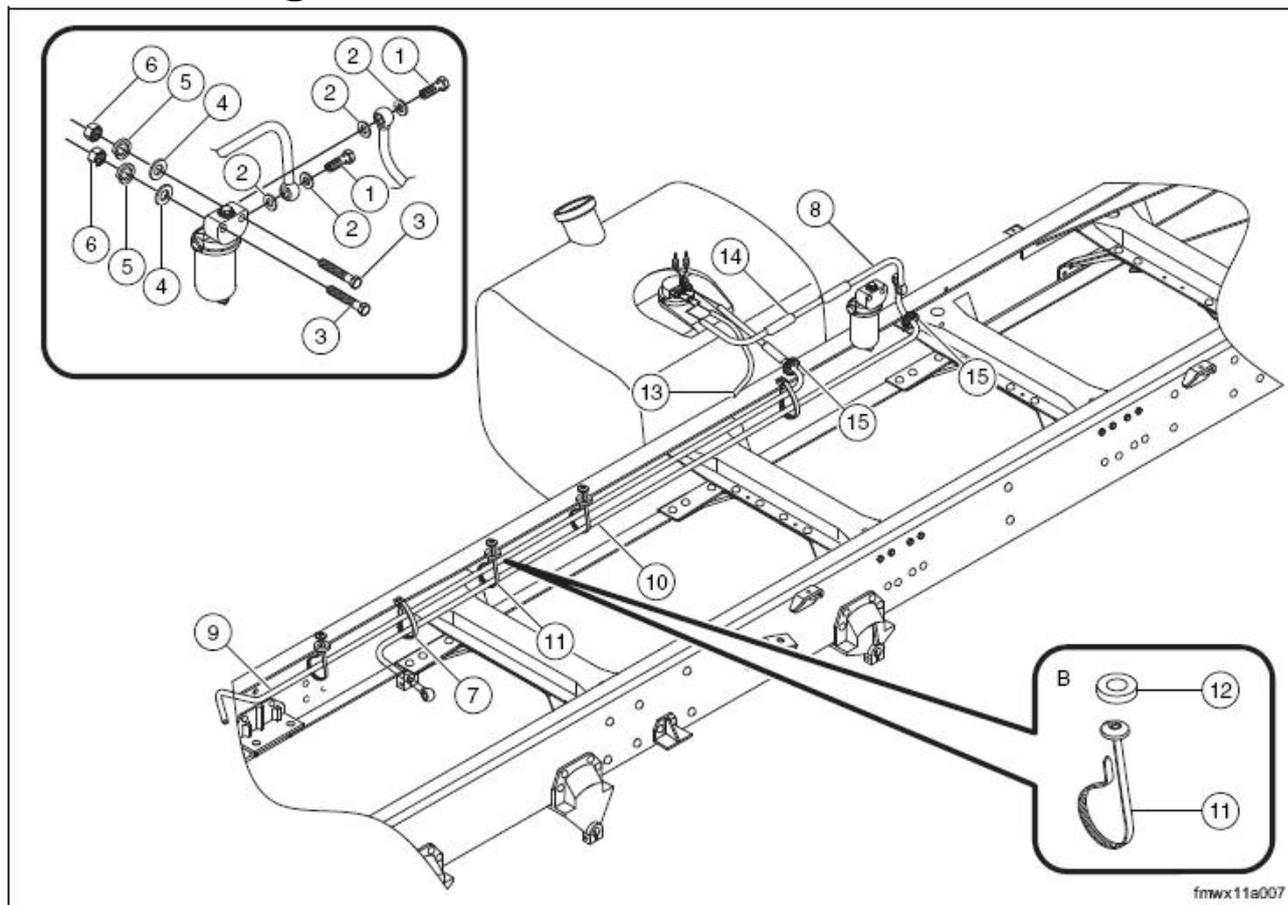
The ECU is provided with three sockets of the connector assembly, wherein one socket has 36 pins and is connected with the wiring harness of the sensors, one socket has 16 pins and is connected with the fuel injector and other executive components, and the maximal socket has 89 pins (only more than 40 pins are used currently) and is connected with the wiring harness of the whole vehicle. The wiring harness of the whole vehicle is not only connected with each sensor of the whole vehicle (such as the neutral switch of the gearbox, the master cylinder switch of the clutch, the gas pressure sensor, etc.) and is also provided with a CAN communication bus (not arranged on the vehicle) and a K line. The CAN bus is a communication bus connected with other computer devices of the whole vehicle, and the K line is a fault finding cable connected with the electric control injection diagnosis instrument.

The ECU is generally installed at the intake pipe side of the diesel engine and simultaneously needs to be cooled by the fuel.

Precautions

1. Before checking and maintaining the fuel system, disconnect the battery negative cable.
2. Because the fuel is an inflammable substance, when the fuel system is operated, enable cigarettes, naked flame, indicating lamps, arc equipment and switches to be far from the working area, and provide ventilating equipment in the working area to avoid occurrence of personal injury or even death.
3. In order to avoid personal injury, never loosen any fuel pipe joint when the engine runs.
4. Keep the fuel away from rubber or leather components.
5. Manufacture the diesel fuel injection equipment according to very accurate tolerance and gaps. Thus, when the fuel system is operated, absolutely clean working environment is very important. Use special plugs to close all openings.
6. Before disconnecting the fuel system pipeline, check and confirm whether dirt or impurity exists around the fuel pipe joint or not, and if the dirt or impurity exists around the fuel pipe joint, clean the dirt or impurity, wherein the dirt or impurity may damage the fuel system or the engine.
7. Do not forcibly bend or twist the fuel system pipeline.
8. Before connecting each pipeline of the fuel system, ensure that each fuel pipe joint is not damaged, and if the fuel pipe joint is damaged or has cracks, replace the fuel pipe assembly and ensure that no dirt exists on the surface of the fuel pipe connecting surface.

Part Drawing



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1	Hinged Bolt	9	Fuel Return Pipe
2	Flat Washer	10	Fuel Supply Pipe - Coarse filter to Engine
3	Hex Head Bolt	11	Cable Tie
4	Flat Washer	12	Rubber Cushion Block
5	Spring Washer	13	Air Bleed Pipe
6	Hex Head Nut-Style 1	14	Spiral Sleeve
7	Tightening Strap	15	Rubber Ring - Through Hole
8	Fuel Supply Pipe - Fuel Tank to Coarse filter		

Testing & Adjustment

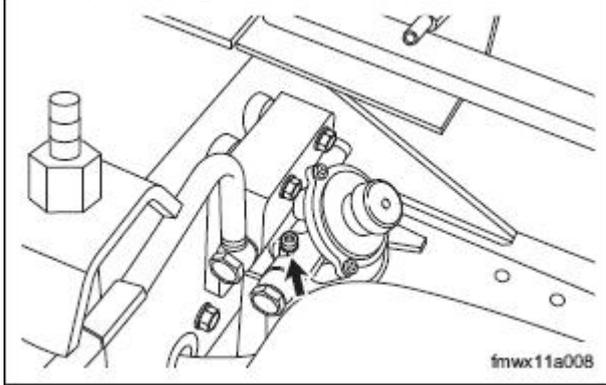
Exhaust of Fuel System

When replacing the coarse filter, reassembling the fuel delivery pipe, or emptying the fuel tank, air will enter the fuel system. If air enters the fuel system, the flow of fuel to the engine will be hindered and can not flow smoothly. To prevent this from happening, the fuel system shall be exhausted.

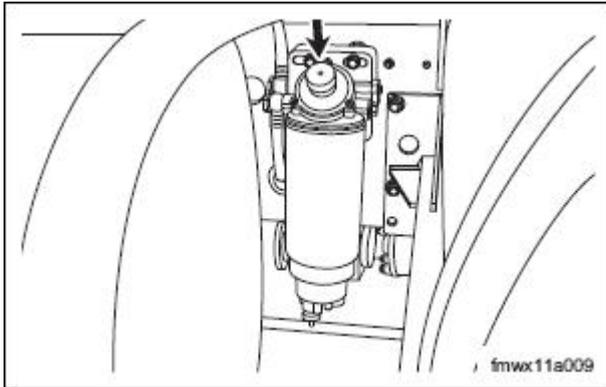
Hint:

Part Drawing, refer to Chapter 11A, Fuel - Oil-water Separator, Part Drawing

1. Stop the engine.



2. Dismantle air bleed screw



3. Inflate with hand pump

- (a). Inflate with a hand pump until only fuel flows out from the air bleed screw.

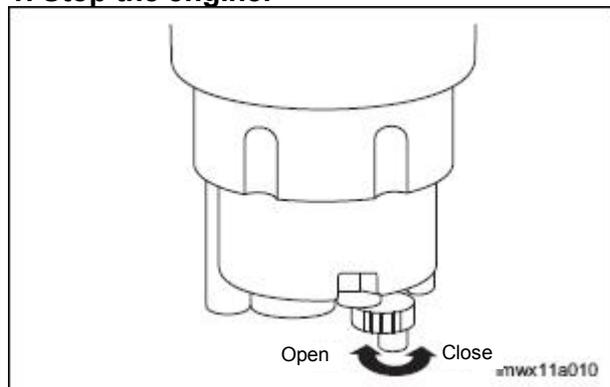
4. Install air bleed screw

Drain water collector

When the water collector is full, drain the collected water.

Warning:

There is danger of freezing. Drain the water before freezing.

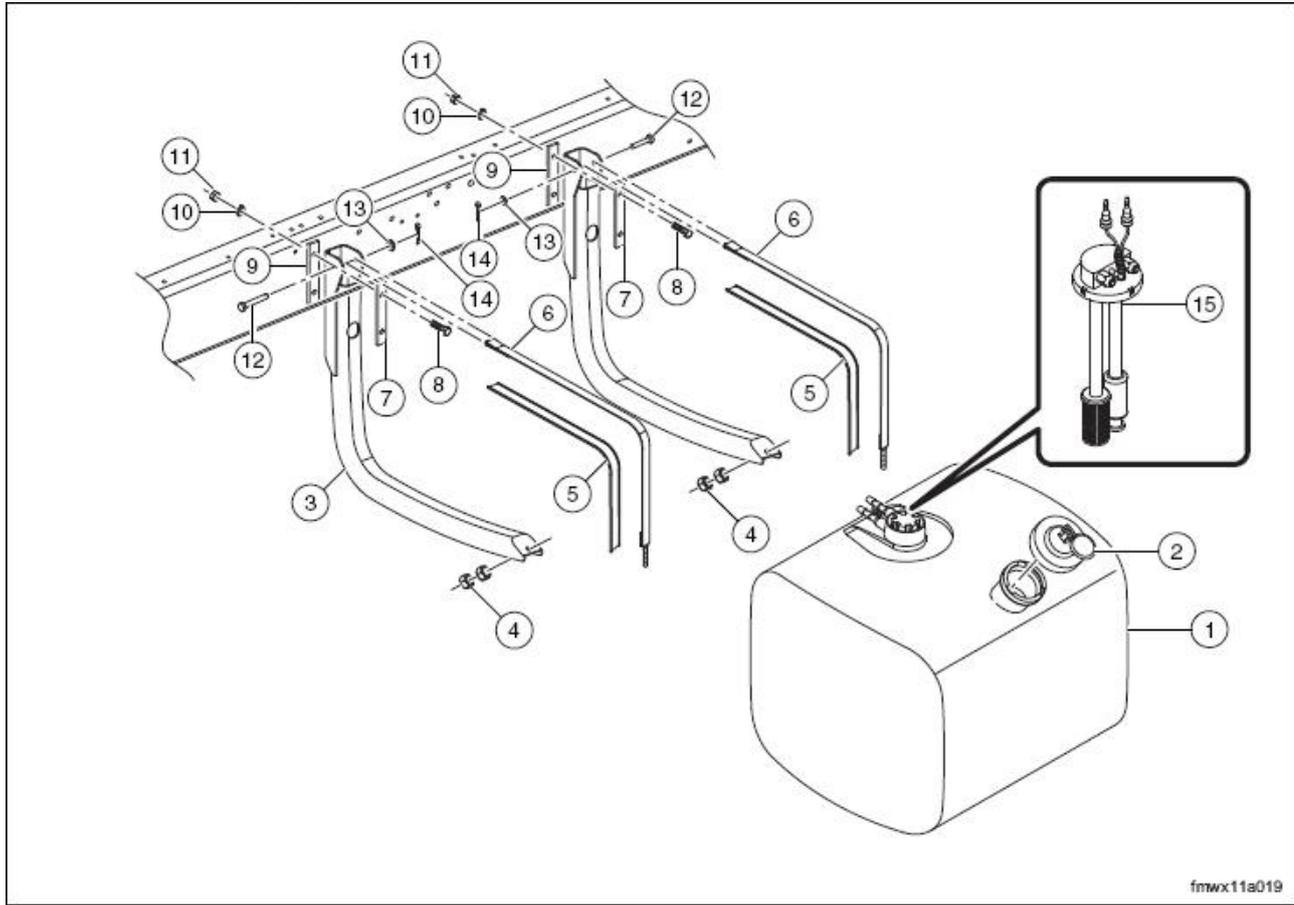
1. Stop the engine.**2. Dismantle drain screw**

- (a). Open the drain screw at the bottom of the water collector to drain the water.

3. Install drain screw

Fuel Tank

Part Drawing



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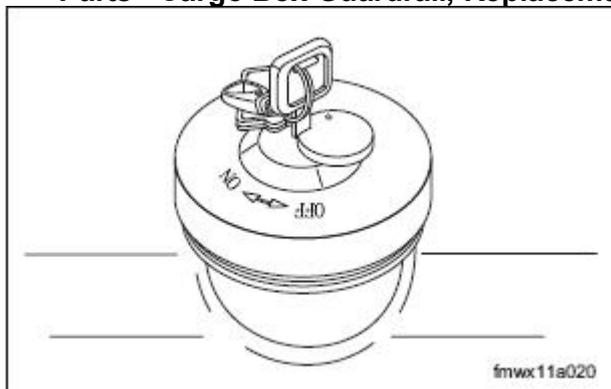
1	Fuel Tank Assembly, 260L, Aluminum Alloy	9	Base Plate - Fuel Tank
2	Fuel Tank Lock Assembly	10	Spring Washer
3	Bracket Assembly	11	Hex Head Nut, Style 1 - Fine Thread
4	Hex Head Nut - Style 1	12	Pin Shaft
5	Rubber Rim Strip	13	Flat Washer
6	Tightening Pull Strap Assembly	14	Cotter Pin
7	Base Plate - Fuel Tank	15	Fuel Sensor
8	Hex Head Bolt - Fine Thread		

Replacement

Hint:

Part Drawing, refer to Chapter 11A, Fuel - Fuel Tank, Part Drawing

1. Open cargo box
2. Disconnect battery negative cable
3. Dismantle guardrail assembly of cargo box, refer to Chapter 77, Interior & Exterior Trim Parts - Cargo Box Guardrail, Replacement

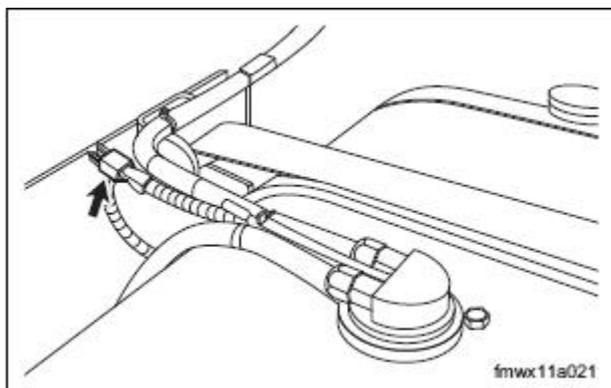


4. Release fuel pressure

- (a). Insert the key to open the fuel tank lock.
- (b). Unscrew the fuel tank lock assembly.

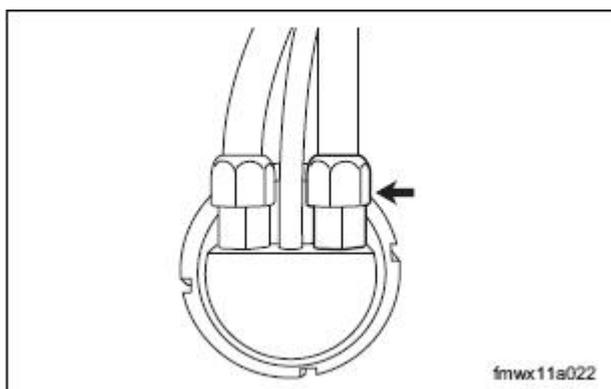
Caution:

Be sure to use clean, soft cloth to plug the fuel filler.



5. Disconnect connector of fuel sensor

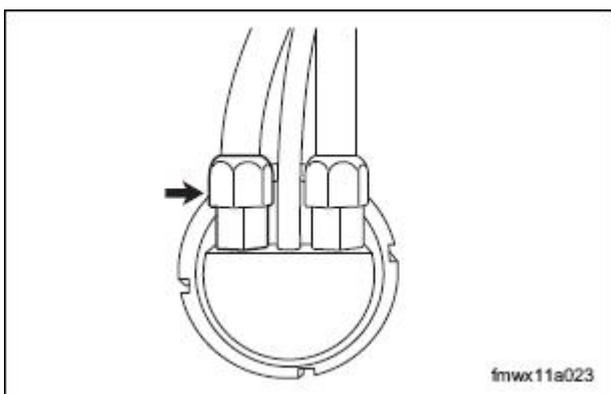
- (a). Disconnect the connector of the fuel sensor.



6. Disconnect outlet pipe of fuel tank

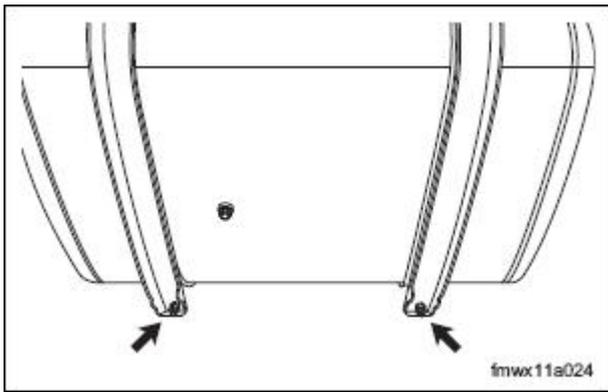
- (a). Disconnect the connector nut of the outlet pipe of the fuel tank.

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7. Disconnect fuel return pipe of fuel tank

- (a). Disconnect the connector nut of the fuel return pipe of the fuel tank.

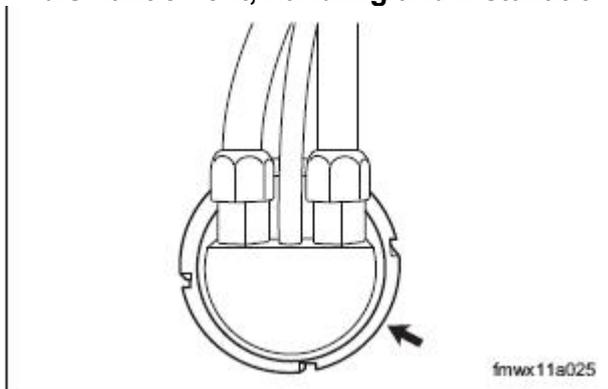


8. Dismantle fuel tank assembly

- (a). Dismantle the fixing nut of the tightening pull strap.
- (b). Take off the tightening pull strap of the fuel tank.
- (c). Dismantle the fuel tank assembly.

Caution:

- Before operation, check and make sure there is no lines, wiring harness or other foreign matters around the fuel tank, and clean up if necessary.
- When lifting the fuel tank, due to large size, use appropriate tools or operate with the help of others if necessary.
- Because the fuel tank is an aluminum alloy workpiece, avoid collision in the process of dismantlement, handling and installation.

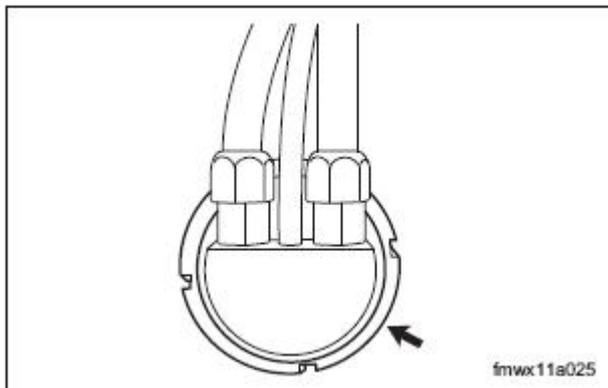


9. Dismantle fuel sensor

- (a). Loosen the sealing cover of the fuel sensor with a special tool.
- (b). Rotate the fuel sensor to a proper angle and take it out lightly.

Caution:

- Before operation, check and make sure there is no dirt or other foreign matters around the fuel sensor, and clean up if necessary.
- There is a rubber seal ring in the sealing cover of the fuel sensor. Do not damage the seal ring while dismantling.

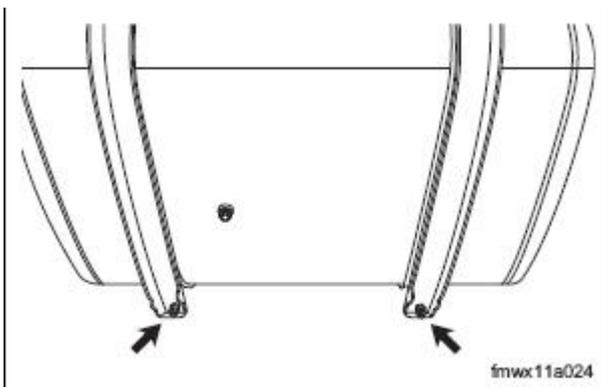


10. Install fuel sensor

- (a). Rotate the fuel sensor to a proper angle and install to the right position of the fuel tank.
- (b). Screw down the sealing cover of the fuel sensor with a special tool.

Caution:

When installing the fuel sensor, insert after rotating to the proper angle, and do not cause warp or deformation.



11. Install fuel tank assembly

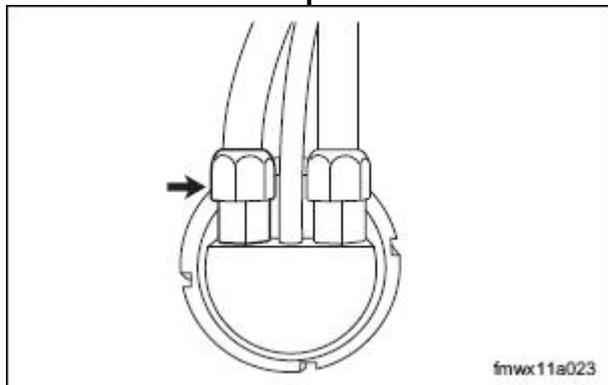
- (a). Install the fuel tank assembly on the fuel tank bracket and fix to the right position.
- (b). Install the fixing nut of the tightening pull strap of the fuel tank.

Torque: 45±5N.m(M10)

Torque: 81±8N.m(M12)

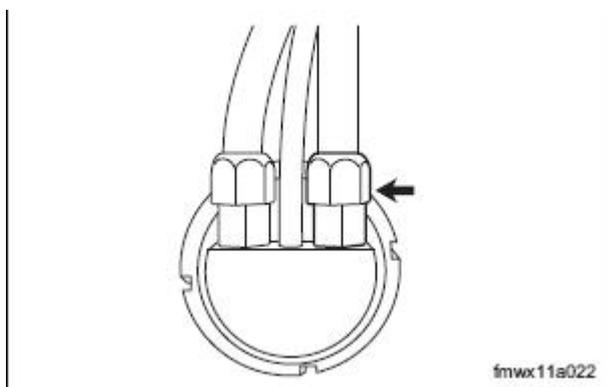
Caution:

- The tightening pull strap of the fuel tank and the connecting nut of the fuel tank bracket shall be fastened to the specified torque. Excessive torque will cause deformation of the fuel tank.
- The fuel tank shall be connected firmly and reliably without abnormal vibration.
- Each rubber rim strip shall be even and level.

**12. Install fuel return pipe of fuel tank**

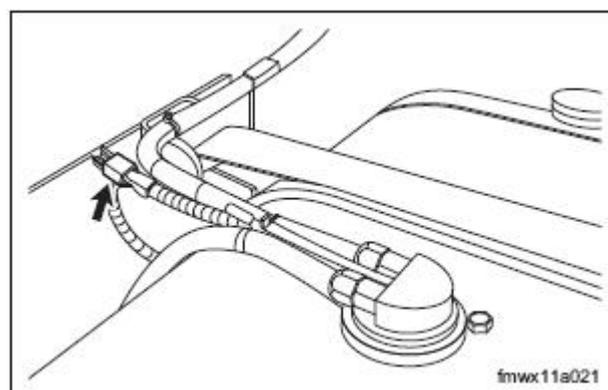
- (a). Install the connector nut of the fuel return pipe of the fuel tank.

Torque: 46±5N.m

**13. Install outlet pipe of fuel tank**

- (a). Install the connector nut of the outlet pipe of the fuel tank.

Torque: 46±5N.m

**14. Install connector of the fuel sensor**

- (a). Install the connector of the fuel sensor.

15. Install fuel tank lock assembly

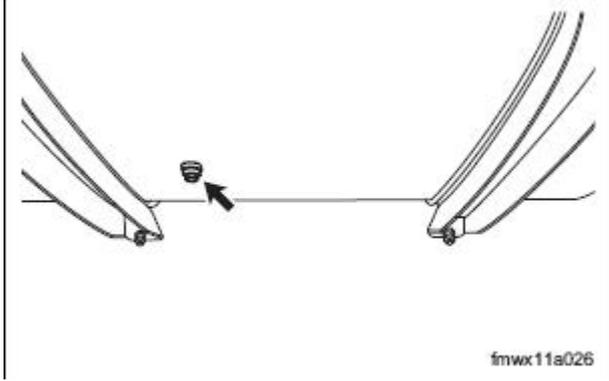
- (a). Check whether the fuel tank lock and gasket are deformed or damaged. Replace the fuel tank lock assembly if necessary.
- (b). Periodically lubricate the rotating part.

16. Exhaust of Fuel System, refer to Chapter 11A, Fuel - Fuel System, Testing & Adjustment**17. Install battery negative cable****18. Inspect**

- (a). After ensuring that the connector assemblies are connected well, open the ignition switch, check whether the fuel gauge of the meter shows normal, start the engine, and check whether there is oil leakage at the fuel pipe joints of the fuel system.

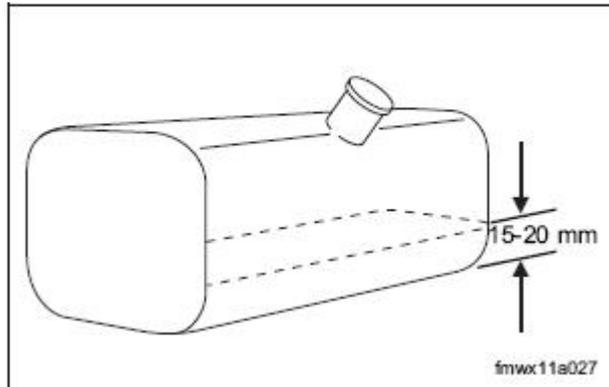
19. Install the guardrail assembly of the cargo box, refer to Chapter 77, Interior & Exterior Trim Parts - Cargo Box Guardrail, Replacement**20. Put down cargo box**

Cleaning



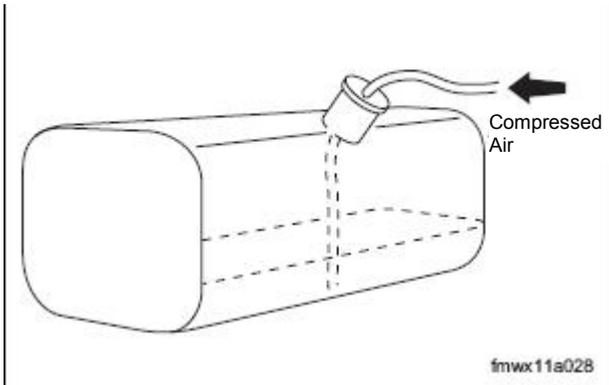
1. Drain fuel

- (a). Open the fuel tank lock assembly, unscrew the drain plug of the fuel tank, after draining the trapped fuel, clean up dirt on the drain plug and then install the drain plug.



2. Fill clean fuel

- (a). Fill up the fuel tank with fuel until the distance from the fuel level to the bottom of the fuel tank is 15-20mm.



3. Clean fuel tank assembly

- (a). Insert a hose with a spraying nozzle into the bottom of the fuel tank.
- (b). Connect the hose with an air duster gun.
- (c). Plug the fuel filler with a clean, soft cloth, and open the switch of the air duster gun for flushing.
- Change the position of the spraying nozzle while flushing so that precipitate and adherent matters are flipped along with fuel.

4. Clean fuel tank assembly for many times

- (a). After flushing the whole fuel tank with the spraying nozzle, unscrew the drain plug to drain the dirty oil, and repeat twice to thrice to clean completely

5. Check fuel tank assembly

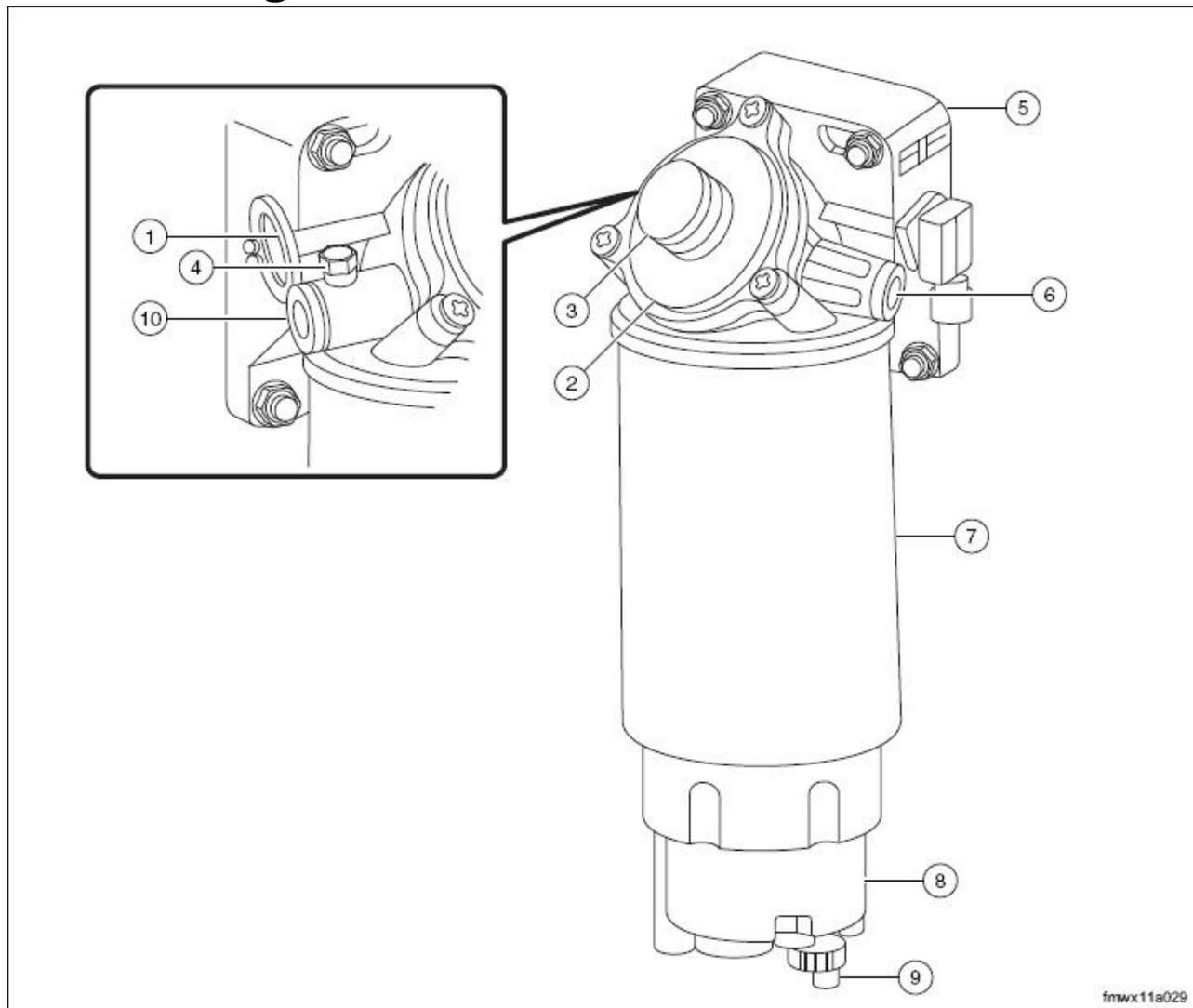
- (a). After cleaning the fuel tank, check whether the fuel tank is damaged, and the damage shall be promptly dealt.

6. Install fuel tank lock assembly

- (a). Check and clean the filter screen of the filler port of the fuel tank.

Oil-water Separator

Part Drawing



fmwx11a029

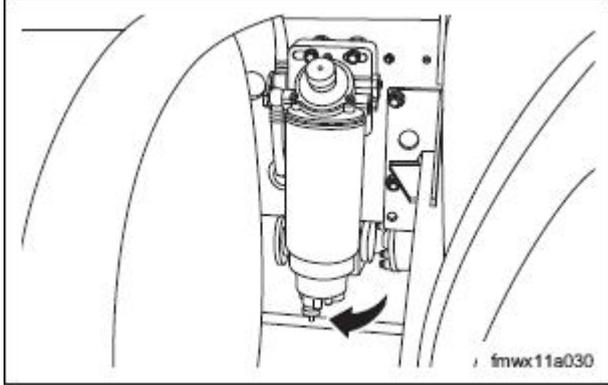
1	Fuel Inlet	6	Fuel Outlet
2	Filter Cover	7	Spinning Filter
3	Hand Pump	8	Water Collector
4	Air Bleed Screw	9	Drain Screw
5	Mounting Flange	10	Fuel Outlet

11A

Replacement

Hint:

Part Drawing, refer to Chapter 11A, Fuel - Oil-water Separator, Part Drawing

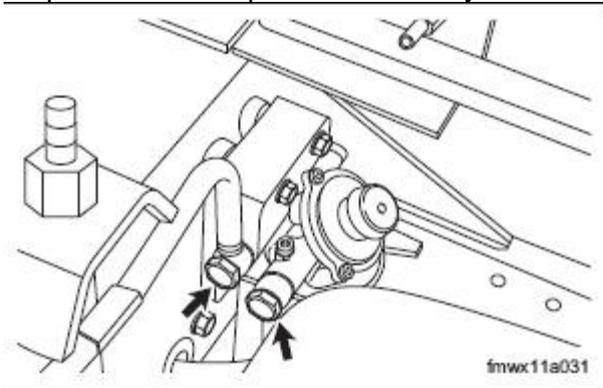


1. Dismantle oil-water separator

- (a). Counterclockwise rotate with a fuel filter wrench to disantle the oil-water separator.

2. Check oil-water separator seat

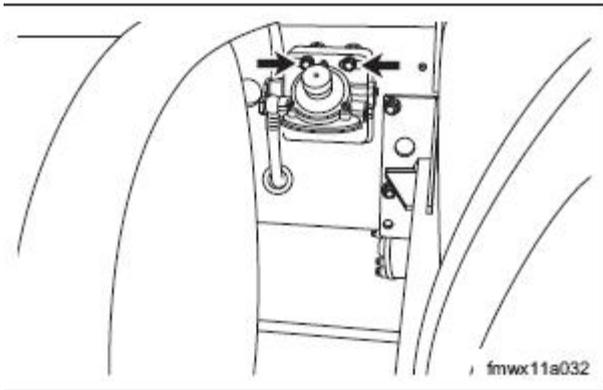
- (a). Check whether the fuel filter seat has defects such as cracks, scratches, obvious damage, etc. Replace with new parts if necessary.



3. Dismantle oil-water separator seat

- (a). Dismantle the hinged bolts of the inlet and outlet pipes.

- (b). Dismantle the fixing bolt of the oil-water separator seat.

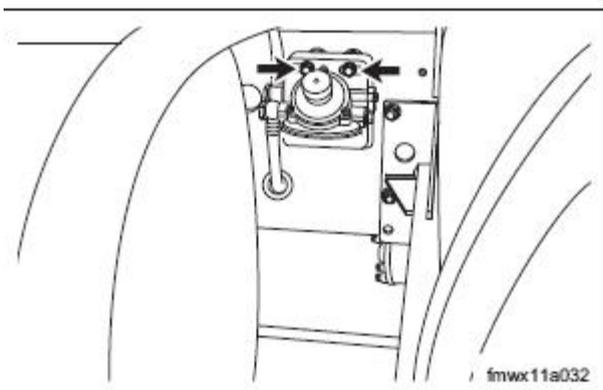


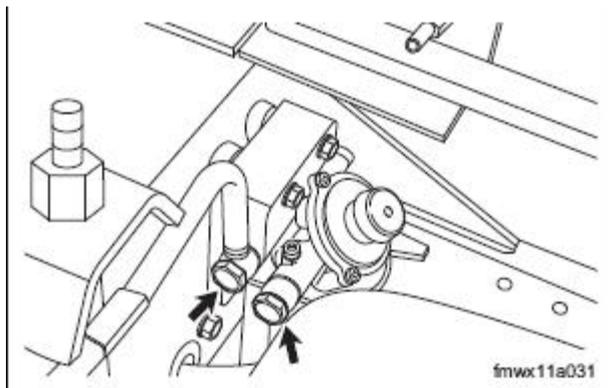
4. Install oil-water separator seat

- (a). Install the fixing bolt of the oil-water separator seat.

Torque: 45±5N.m(M10)

Torque: 81±8N.m(M12)



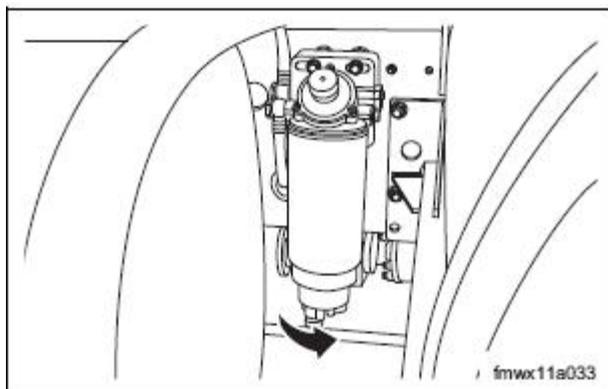


(b). Install the hinged bolts of the inlet and outlet pipes.

Torque: $45 \pm 5 \text{N.m}$

Caution:

Check the washers of the inlet and outlet pipes, and replace with new parts if necessary.



5. Install oil-water separator

- (a). Apply a small amount of lubricating oil on the seal ring of the oil-water separator.
- (b). Screw on the oil-water separator by hand until the seal ring is combined with the interface.
- (c). Clockwise screw down the oil-water separator with the fuel filter wrench (for about 3/4 round).

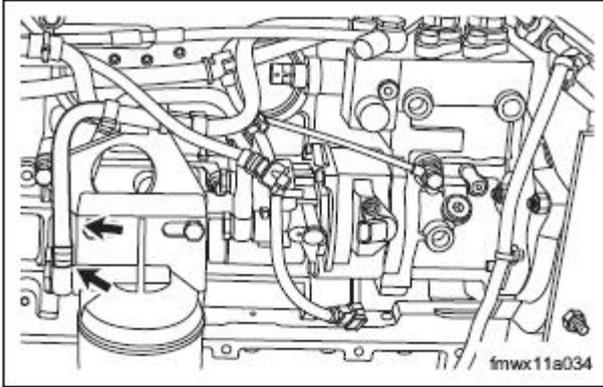
6. Exhaust of Fuel System, refer to Chapter 11A Fuel - Fuel System, Testing & Adjustment

7. Inspect

- (a). After ensuring that the connector assemblies are connected well, open the ignition switch, check whether the fuel gauge of the meter shows normal, start the engine, and check whether there is oil leakage at the fuel pipe joint of the fuel system.

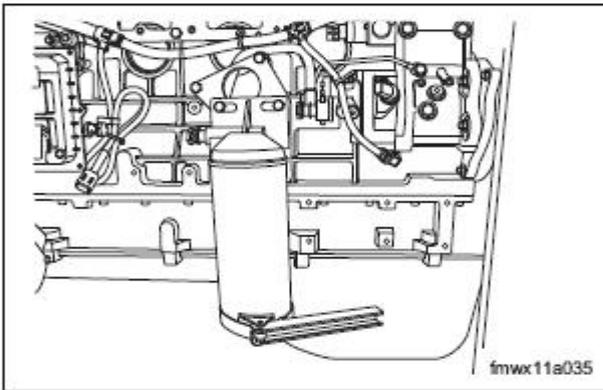
Fuel Fine Filter

Replacement

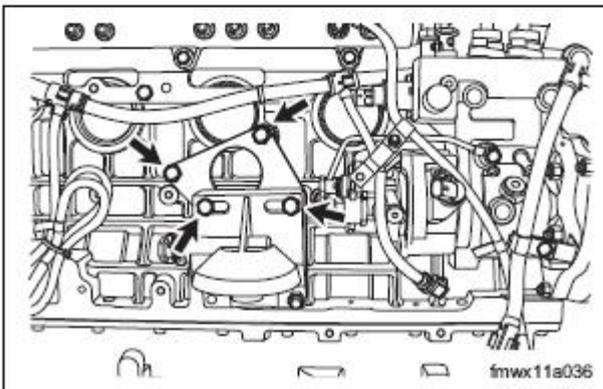


1. Dismantle fuel fine filter

(a). Dismantle the inlet and outlet pipes of the fuel fine filter.

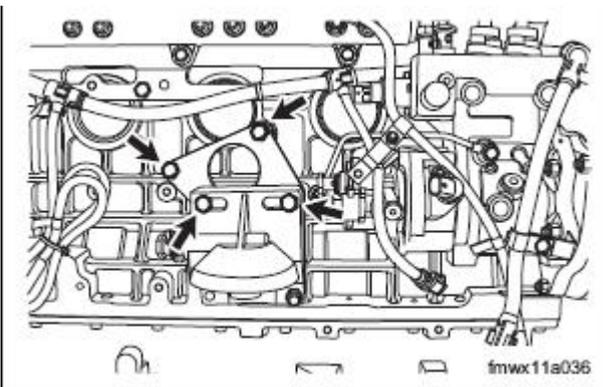


(b). Dismantle the fuel fine filter with a fuel filter wrench.



(c). Dismantle the fuel fine filter seat.

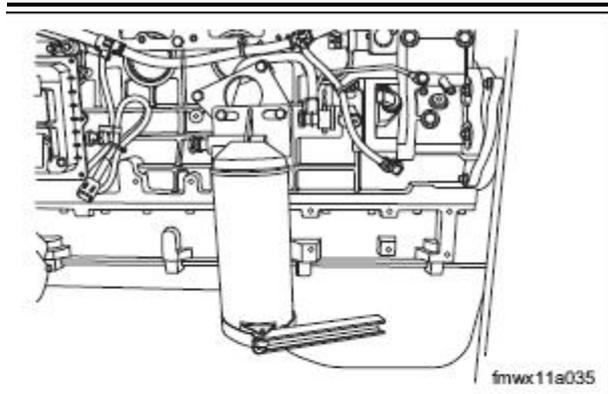
11A



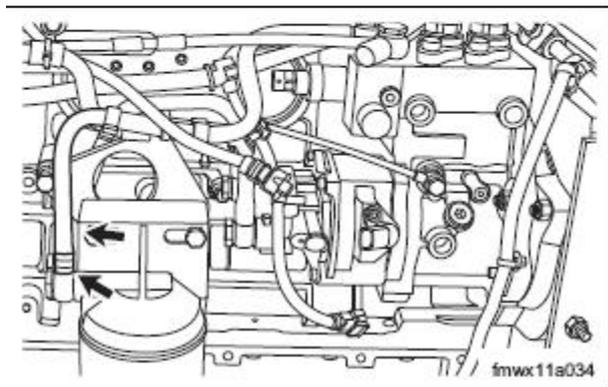
2. Install fuel fine filter

(a). Install the fuel fine filter seat.

Fuel (WP10) – Fuel System



(b). Install the fuel fine filter with a fuel filter wrench.

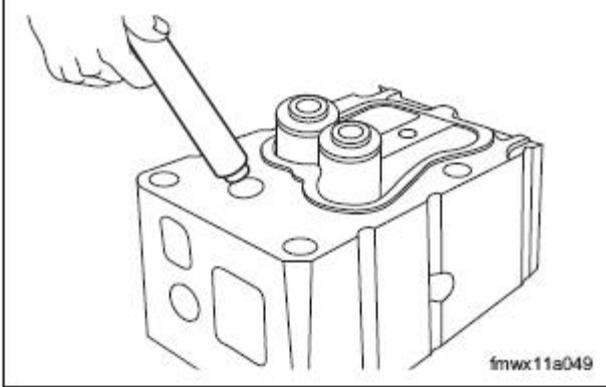


(c). Install the inlet and outlet pipes of the fuel fine filter.

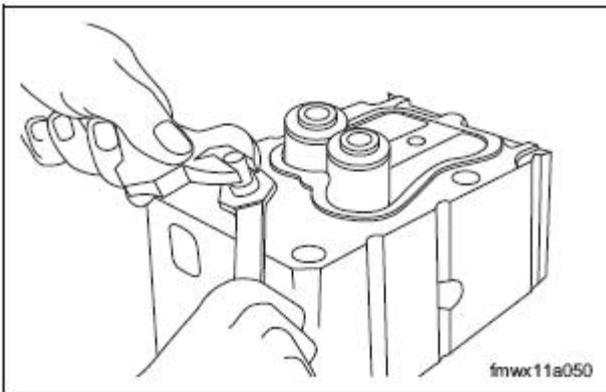
Fuel Injector Sleeve

Replacement

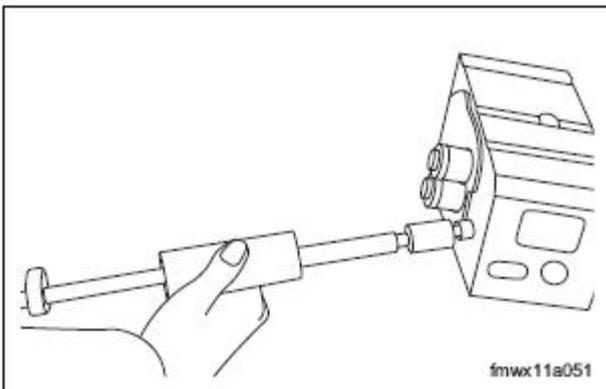
1. Dismantle the fuel injector, refer to Chapter 17, Engine Control - Fuel Injector, Replacement



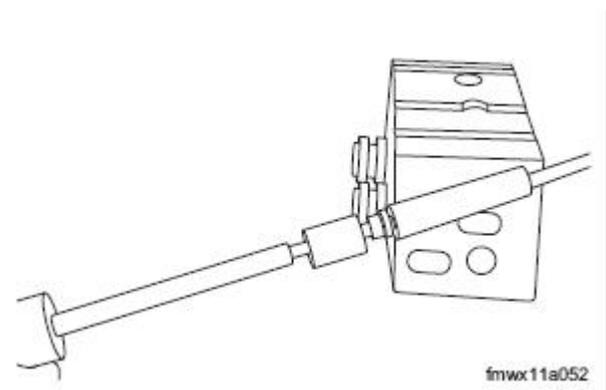
2. Insert shifting block into sleeve



3. Screw down expansion nut of shifting block

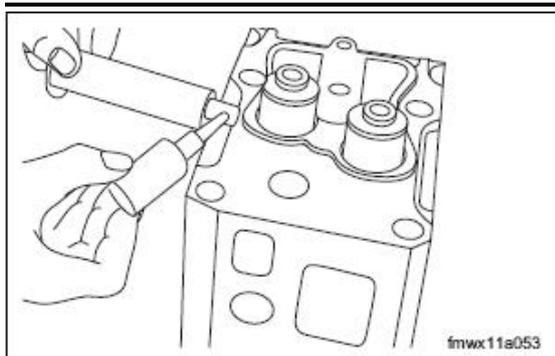


4. Pull old sleeve with puller punch hammer

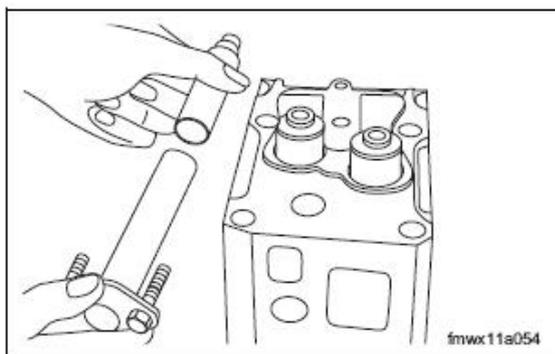


5. Pull out old sleeve

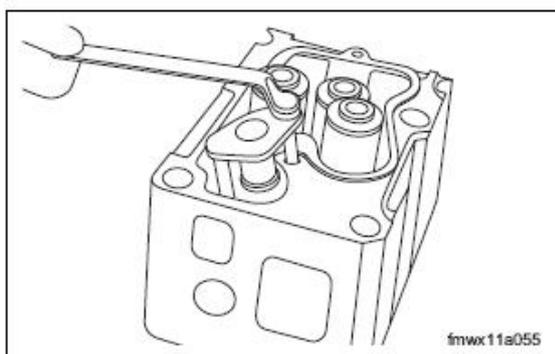
11A



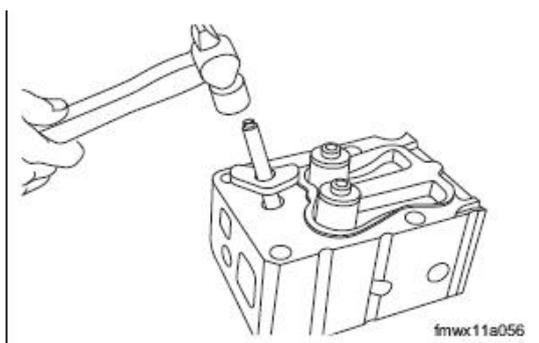
6. Apply 602 sealant at small end of sleeve



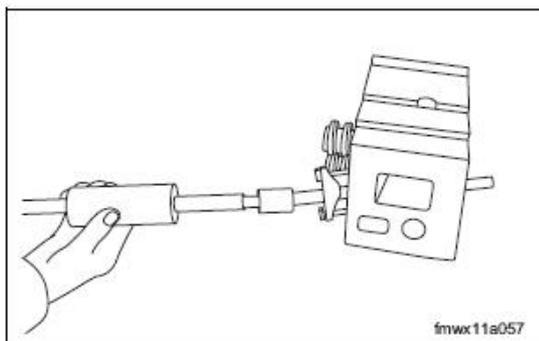
7. Insert new sleeve into pressing sleeve



8. Press pressing sleeve and new sleeve into cylinder head with pressure plate of fuel injector



9. Drive expanding arbor into pressing sleeve



10. Pull out expanding arbor with puller