

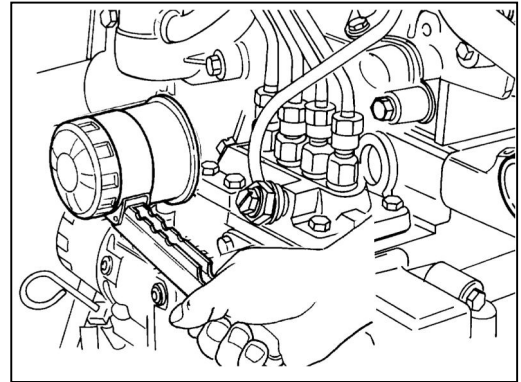


Lubrication System

Disassembly

Removal of the oil filter.

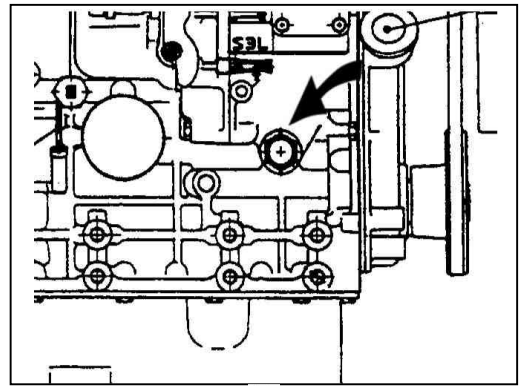
Place a suitable container under the filter to catch the oil, then unscrew the filter from the engine block using a filter wrench.



1.

Removal of the pressure relief valve.

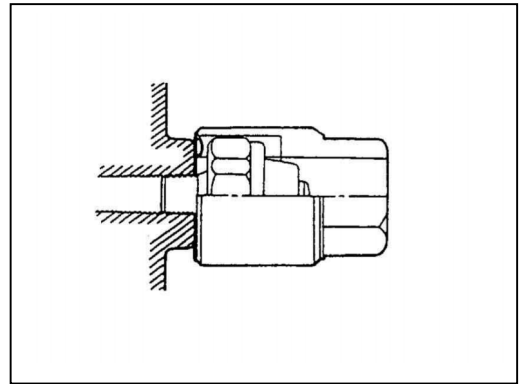
Remove the pressure relief valve from the engine block.



2.

Removal of the oil pressure switch.

Remove the oil pressure switch with the specific box wrench.



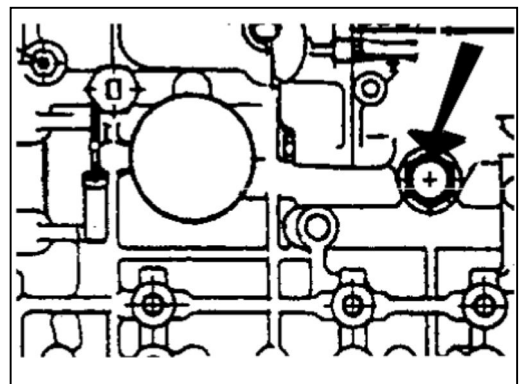
3.

Refitting

Refitting the pressure relief valve.

Locate the relief valve in the engine block and tighten it to the specified torque.

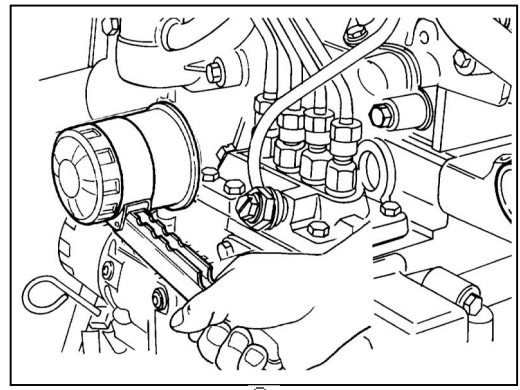
Tightening torque	$5 \pm 0.5 \text{ kgf} \times \text{m}$
	$(36 \pm 4 \text{ lbf} \times \text{ft})$
	$[49 \pm 5 \text{ N} \times \text{m}]$



1.

Refitting the oil filter.

Lightly oil the seal with engine oil and screw on the new filter by hand until the seal is in contact with the base, then tighten to the specified torque.

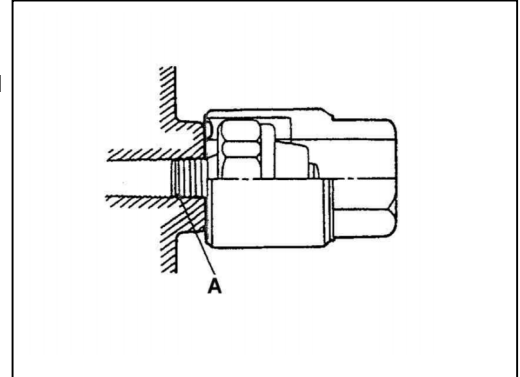


2.

Refitting the oil pressure switch.

Apply threadlocker to the thread (A) of the oil pressure switch, then install the pressure switch using the specific wrench.

- o Apply threadlocker to the threads *only*.
- o Do not over-tighten the oil pressure switch.



3.



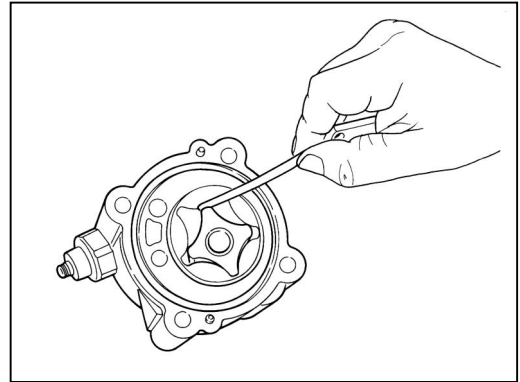
Inspection of the lubrication system

Inspection

Oil pump.

Visually check the pump for rough rotation or other defects.

- o Replace the pump assembly if defective.

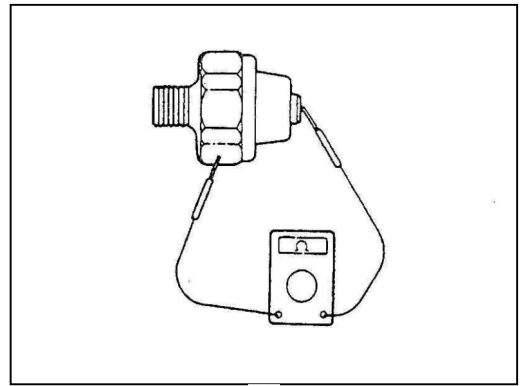


1.

Oil pressure switch.

Test for electrical continuity between the terminal and body using an ohmmeter, as shown in the figure.

- o If there is no electrical continuity, the switch must be renewed.



2.

Insert a small diameter rod into the oil hole in the switch and lightly push it in to test for electrical continuity, as shown in the figure.

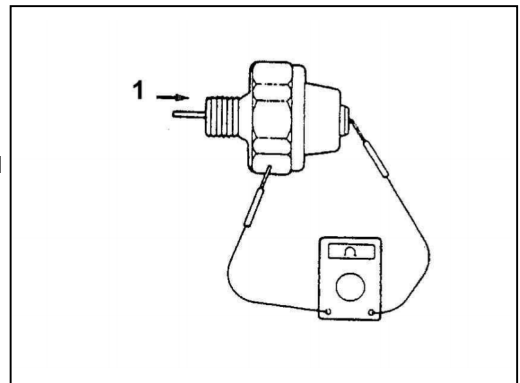
- o If there is no electrical continuity, renew the pressure switch.

Apply air pressure of 0.5 kgf/cm² (7 psi) [49 kPa] to the switch through the oil hole and test for continuity.

- o If there is no electrical continuity, renew the pressure switch.

Check for air leaks.

- o The presence of air leaks indicates that the membrane is broken, in which case the pressure switch must be renewed.



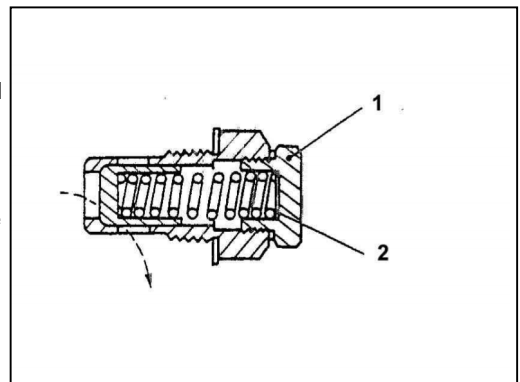
3.

Pressure relief valve.

Check the valve seat contact. Check the spring for damage. Measure the oil pressure at which the relief valve opens (the oil pressure with engine running at the rated rpm). The engine oil pressure test outlet is located on the right side of engine.

- o If the pressure is not correct, remove the cap nut and either increase or reduce the shim thickness accordingly.

Relief valve opening pressure	3,5 ± 0,5 kgf/cm ² (50 ± 7 psi) [343+49 kPa]
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1 - Cap nut.

2 - Shims.

4.



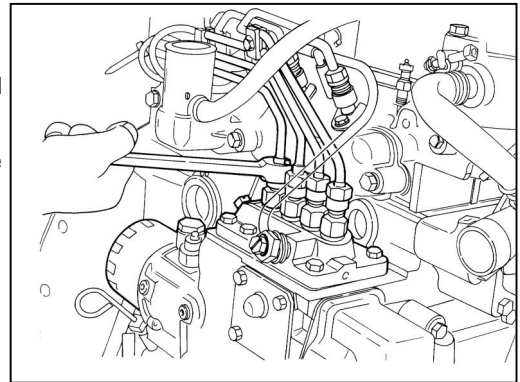
Fuel System

Disassembly

Removal of the fuel injection pipes.

Disconnect the fuel injection pipes and fuel leak-off pipe from the fuel injection pump and nozzles.

- Put plugs or caps on the openings of the injection pump and nozzle connectors.

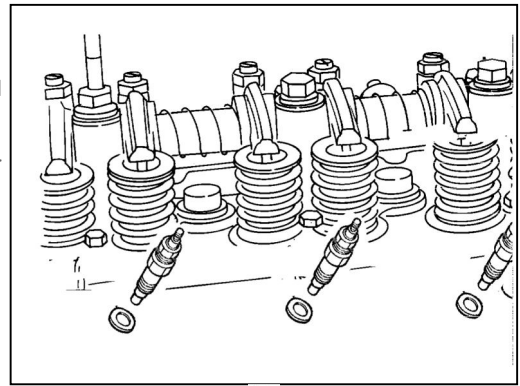


1.

Removal of the fuel injection nozzles.

Loosen the fuel injection nozzles with a wrench. Remove the nozzles and seals from the cylinder head.

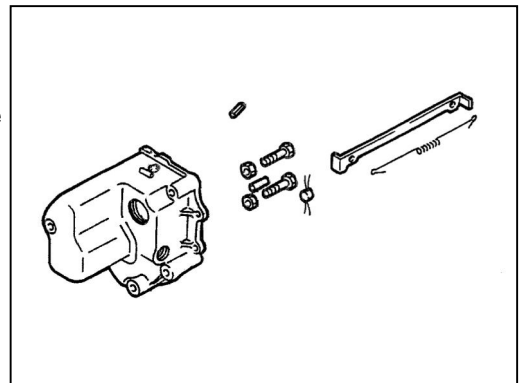
- Remove the seals from the cylinder head with a screwdriver or similar tool. Discard any defective seals.



2.

Removal of the governor assembly.

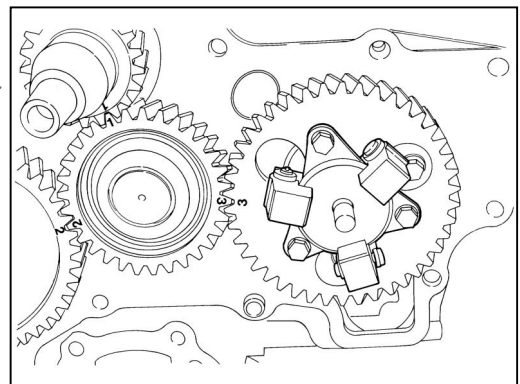
Remove the control rod cover; remove the control spring using pliers, and disconnect the control rod from the injection pump, then remove the governor assembly.



3.

Removal of the governor flyweights.

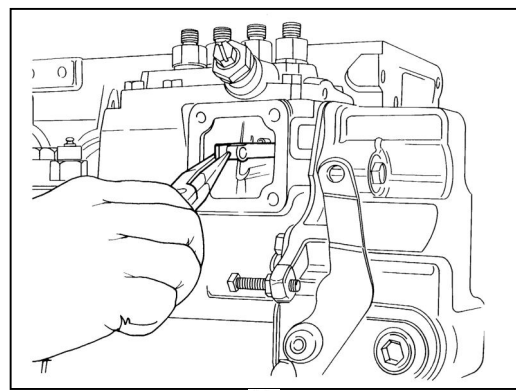
Remove the sliding sleeve, the sliding sleeve shaft and remove the governor flyweights.



4.

Removal of the fuel injection pump.

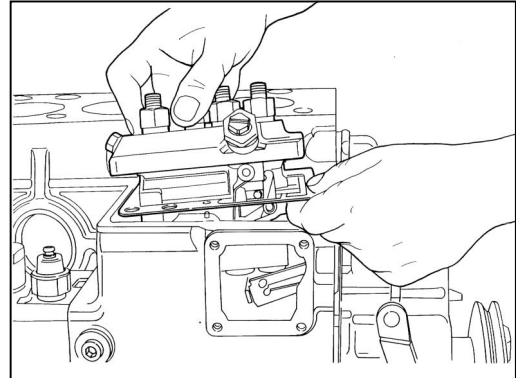
Remove the control rod cover and remove the control rod spring using pliers; disconnect the control rod from the injection pump.



5.

Remove the injection pump.

- o Make a note of the thickness of the shims for subsequent installation.



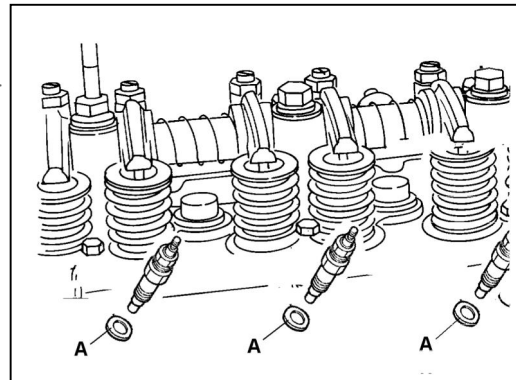
6.

Refitting

Refitting the fuel injection nozzles.

Fit the seal (A). Locate the nozzle assembly in the cylinder head and tighten it to the specified torque.

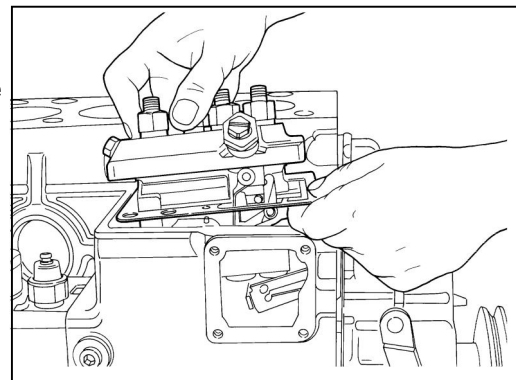
Tightening torque	$5.5 \pm 0.5 \text{ kgf x m}$
	$(40 \pm 4 \text{ lbf x ft})$
	$[54 \pm 5 \text{ N x m}]$



1.

Refitting the fuel injection pump

Locate the pump on the engine block and tighten the screws securing the pump to the specified torque.



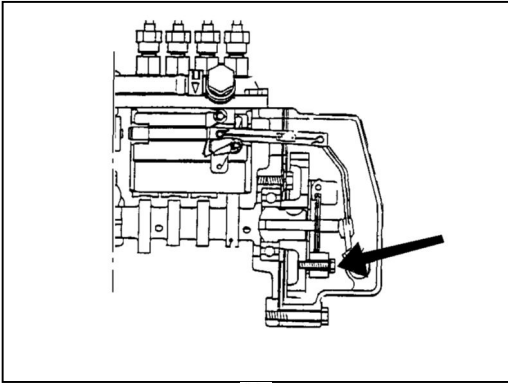
2.

Refitting the flyweight assembly.

Locate the flyweight assembly on the rear end of the fuel injection pump camshaft and tighten the sliding sleeve shaft to the specified torque.

Tightening torque	$3.6 \pm 0.6 \text{ kgf x m}$
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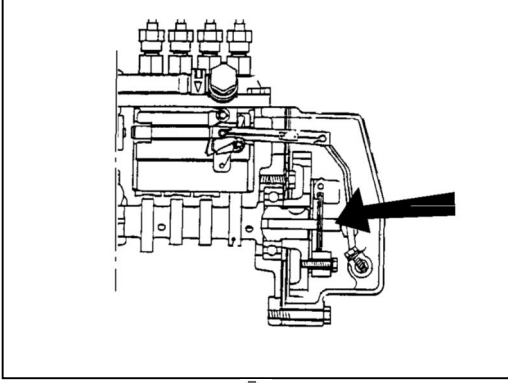
	(26 ± 4.3 lbf x ft)
	[35 ± 6 N x m]



3.

Refitting the sliding sleeve.

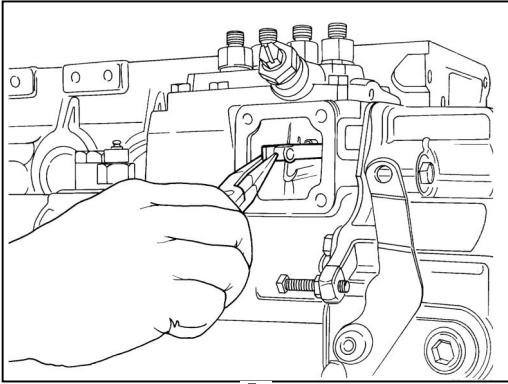
Install the sliding sleeve on the sliding sleeve shaft and make sure the sleeve moves freely.



4.

Refitting the governor assembly.

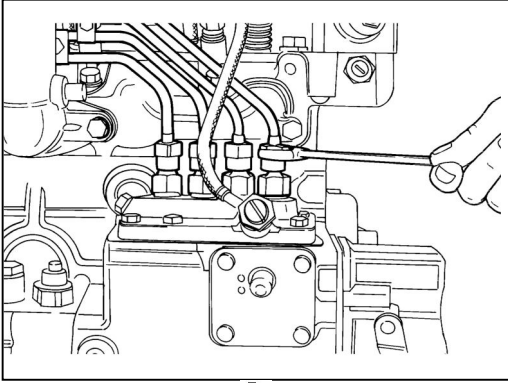
Locate the governor assembly while simultaneously installing the control rod and spring in the injection pump; attach the control rod to the pin of the control rack and secure it with the spring, then locate the control rod cover.



5.

Refitting the fuel injection system pipes.

Locate the fuel leak-off line and connect it to the fuel injection nozzles; then locate the fuel injection pipes and connect them to the fuel injection pump. Install the clamps.



6.

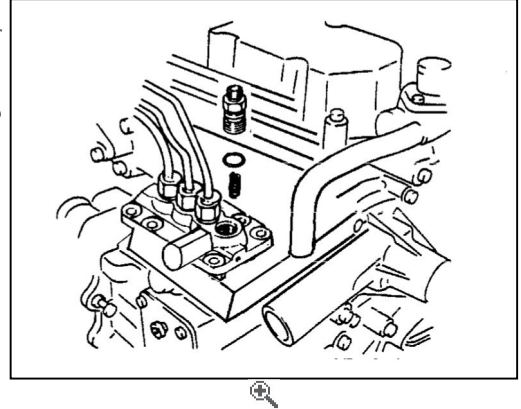


Inspection and adjustment of the fuel system

Maintenance

Preparation

Close the fuel filter valve. Disconnect the fuel injection pipe from the cylinder head and from the injection pump. Remove the delivery valve holder from the injection pump. Remove the delivery valve and spring from the holder. Refit the delivery valve holder to the injection pump only. Connect the pipe to the injection pump. Hold the speed control lever in the low revs position.



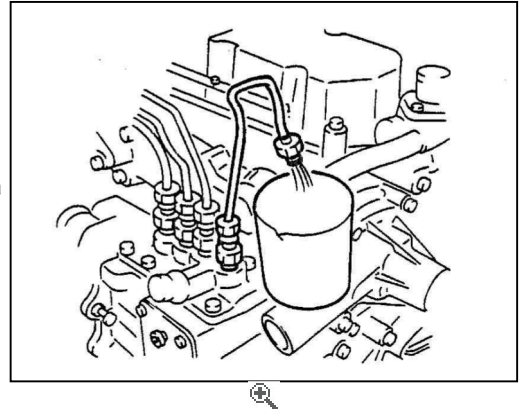
1.

Inspection

Fuel system.

Open the fuel filter valve. Turn the starter switch key to ON position.

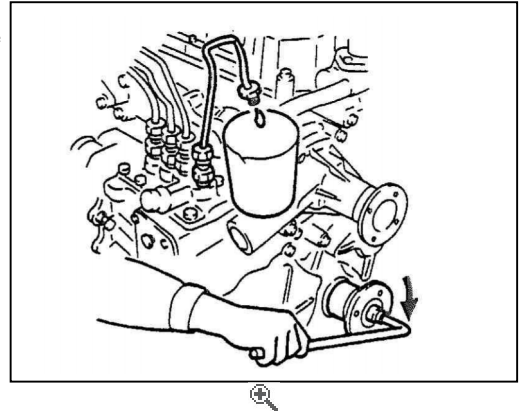
- Fuel will flow from the injection pipe at high pressure when the starter switch key is turned to the ON position if the engine is equipped with an electric lift pump. Direct the fuel flow into a container.



1.

Slowly turn the crankshaft clockwise, while watching the free end of the injection pipe. The instant the fuel stops flowing represents the fuel injection timing.

- Rotate the crankshaft in reverse direction just a little and repeat the operation described above again to recheck the injection timing.



2.

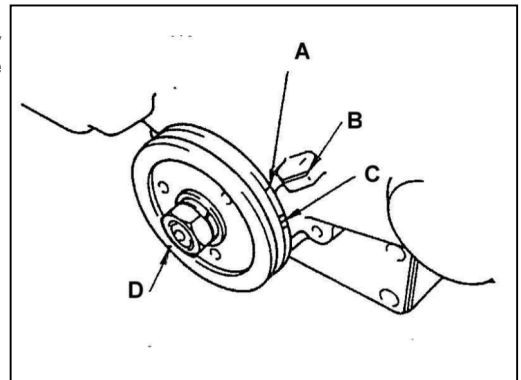
The fuel injection timing is correct if the timing mark on the crankshaft pulley is aligned with the mark on the timing cover when fuel stops flowing from the injection pipe.

Fuel injection timing (BTDC)	17° (standard)
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A - TDC (top dead center) mark for pistons No. 1 and No. 4

B - Timing mark on timing cover.

C - IT (injection timing) mark.



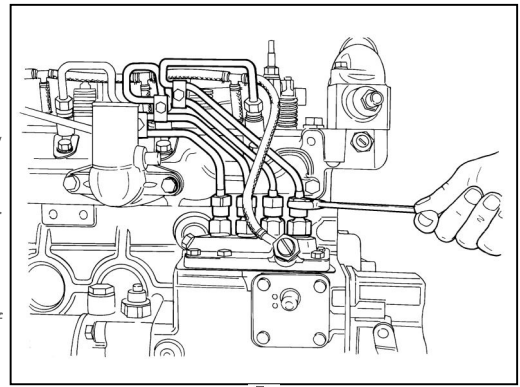
D - TDC mark for pistons No. 2 and No. 3.

3.

Alternative method.

In the fuel flow method, the delivery valve has to be removed. As a result, there is a good chance for dirt particles to get inside the fuel injection pump. In this alternate method, however, it is not necessary to remove the delivery valve.

Disconnect No. 1 fuel injection pipe at the fuel injection nozzle (cylinder head). Prime the fuel lift pump. Slowly turn the crankshaft clockwise until the point where fuel flows freely from the open end of the injection pipe and then check the position of the timing mark relative to the mark on the timing cover. The timing is retarded by approximately 1° . Take this retard angle of 1° into account when adjusting the shims.



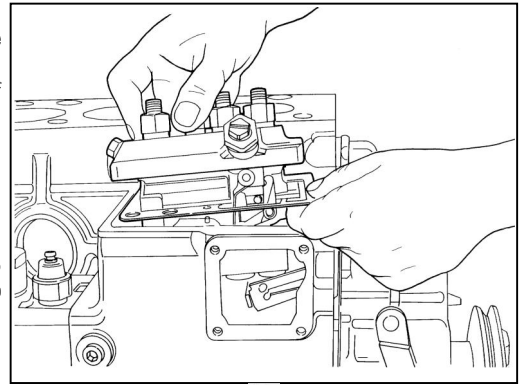
4.

Adjustment

If the fuel injection timing is incorrect, alter the thickness of shims under the fuel injection pump. An increase or decrease in shim thickness of 0.1 mm (0.004 in.) will result in a 1° change in the timing. Increase the thickness of the shims to retard the timing or decrease it to advance the timing.

Adjustment range	standard $\pm 1.5^\circ$
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Four shims are available in thicknesses 0.2 mm (0.0079 in.), 0.3 mm (0.0118 in.), 0.4 mm (0.0157 in.) and 0.8 mm (0.0315 in.). These shims have no identification markings; measure the thickness of each shim with a calipers before using it.



1.

- o Apply sealant to both faces of each shim to prevent oil leaks.

After adjusting the timing, check that the operation was performed correctly. Close the fuel filter valve and restore the delivery valve and injection pipe to the original state.

A - TDC mark.

B - Injection advance angle.

C - Mark on timing cover.

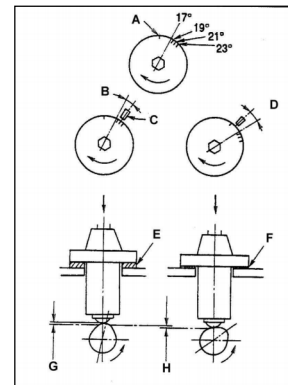
D - Injection retard angle.

E - Increase shim thickness.

F - Decrease shim thickness.

G - Retarded.

H - Advanced.



2.



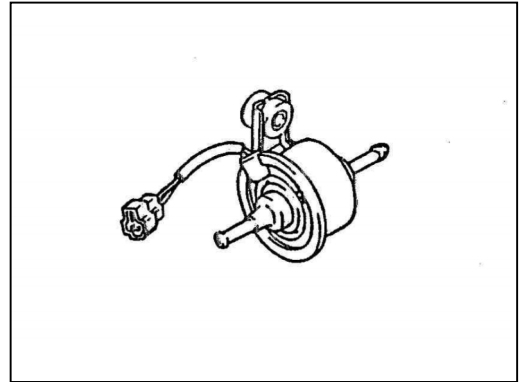
Inspection of the fuel lift pump

Inspection

Examine the exterior of the pump for defects and test its performance.

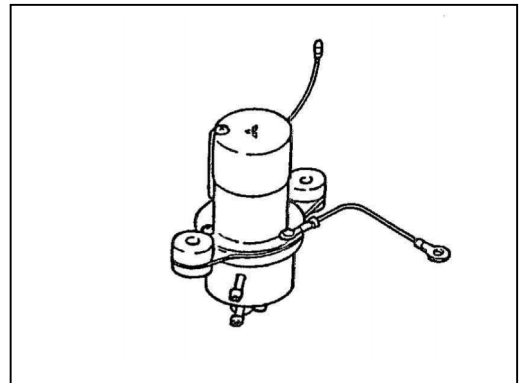
- Do not attempt to disassemble the pump.

Plunger-type fuel lift pump.



1.

Diaphragm-type fuel lift pump.



2.

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