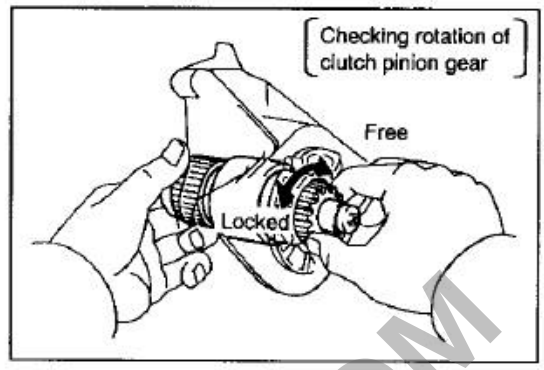
3.22.3.7.2 Check the clutch pinion gear

Secure the starter clutch and turn the pinion gear clockwise to check if it turns smoothly. Attempt to turn the pinion gear counterclockwise to check that it is locked. If needed, replace the clutch assembly.



3.22.3.7.3 Replace the clutch assembly

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3.8.9 Troubleshooting

Sufficient turbocharger performance and required engine output cannot be obtained if there is any fault. In such a case, first check each engine part to see if there is any fault. Then, inspect the turbocharger for troubleshooting according to the procedure shown below.

3.8.9.1 Excessively dense exhaust smoke

<Insufficient intake air amount>

Possible cause	Corrective action
1) Clogged air cleaner element	Replace or wash the element.
2) Blocked air intake port	Remove obstruction.
3) Leak from a joint in intake line	Inspect and repair.

<Turbocharger operation failure>

Possible cause	Corrective action
1) Deposit of impurities in oil sticking on the turbine side seal portion to hamper smooth turbine shaft rotation	• Turbocharger overhaul (disassembly and washing) and engine oil replacement
2) Bearing seizure • Insufficient lubrication or clogged lubrication piping • Excessively high oil temperature • Unbalanced rotating part • Insufficient warming up or sudden stop from loaded operation (no-load operation)	• Turbocharger overhaul (disassembly and repair) Inspect the oil system of the engine and repair faulty parts and replace the engine oil. • Replace or wash the faulty rotating part. • Strictly observe instructions in the operation manual.
3) Contact or breakdown of turbine wheel or compressor impeller • Over speed • Excessive exhaust temperature rise • Foreign matter invasion • Worn bearing • Faulty assembly	• Inspect and repair faulty engine parts. • Completely remove foreign matter after disassembling. Inspect the air cleaner and engine parts and repair as needed. • Disassemble turbocharger for repair. • Reassemble.

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3.22.4 Service Standard

- **Nut and bolt tightening torque**

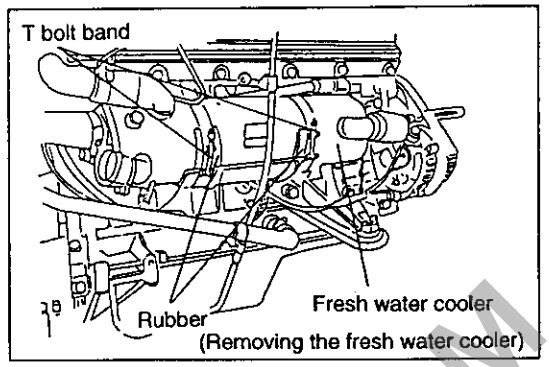
Tightening parts	kgf·cm (N·m)
Starter housing × magnetic switch	95 (9.32)
End cover × starter housing	95 (9.32)
Lead wire × terminal 50	41 (4.02)
Lead wire × terminal C	215 (21.08)

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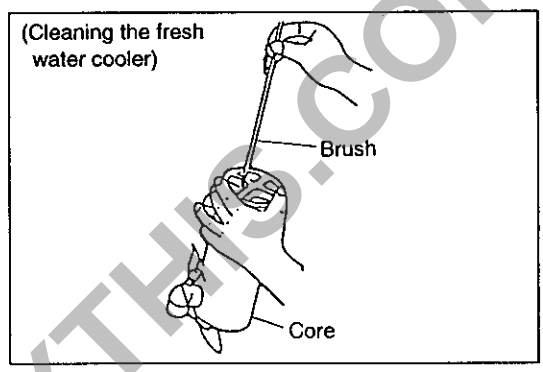
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3.16.2 Fresh Water Cooler

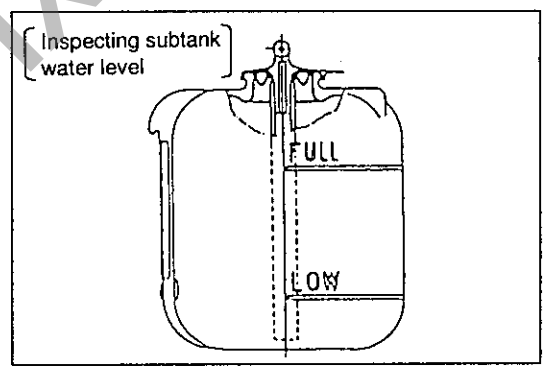


(Removing the fresh water cooler)

Te fresh water cooler is the multi-pipe core type. The sea water flows inside the core while the fresh water flows outside the core to be cooled by the sea water.
Disconnect the rubber hose connected to the fresh water cooler.
Remove the fresh water cooler in a way not to apply shocks. Frequently check the rubber seat holding the fresh water cooler for collapse and cracks. Replace it before failures occur. Check the hose band for damaged screw and nut and the plate portion for damage. Replace it at an early stage.
Remove the side cover from the fresh water cooler. Check the core for contamination by dust and foreign matter. If so, clean the core using a soft brush available in the market.

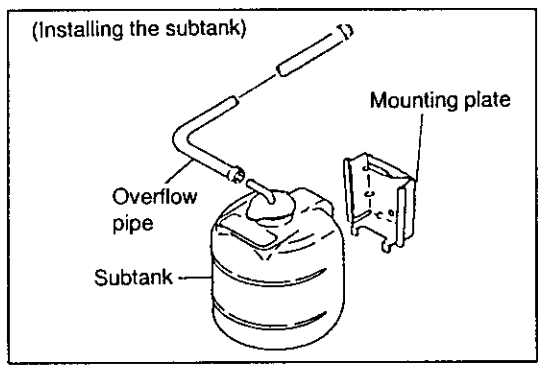


3.16.3 Subtank



When the engine is operated, the fresh water temperature increases and fresh water expands to increase the fresh water tank pressure. When the pressure in the fresh water tank exceeds 0.9 kgf/cm^2 (0.09 MPa), the pressure cap valve opens to release steam. If this steam is discharged to the atmosphere, the fresh water is consumed. In order to prevent the fresh water consumption, steam is discharged into the subtank. Steam discharged into the subtank condenses in the water, thus preventing discharge of fresh water to the atmosphere.
When the engine stops, the fresh water temperature decreases to drop the pressure in the fresh water tank. When the pressure in the fresh water tank drops, the negative pressure valve of the pressure cap activates to return the water from the subtank to the fresh water tank.
The water level in the subtank rises during the operation (hot state) or lowers during stopping (cold state).

3.16.3.1 Install the subtank



(1) Carry out the daily check of the fresh water level on the subtank. It is not required to remove the pressure cap.

(2) Install the overflow pipe at a length shorter than 1000 mm and without bending or extreme short curving.

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3.9 Fuel Filter Replacement

3.9.1 Removal of Fuel Filter

3.9.1.1 Disconnect the connector of the water alarm switch of the fuel filter

3.9.1.2 Drain fuel from the fuel filter

(1) Close the cocks of fuel tank, etc.

(2) Connect a vinyl hose to the filter drain cock and the other end of the hose to an oil container.

(3) Loosen the drain plug to drain the fuel.



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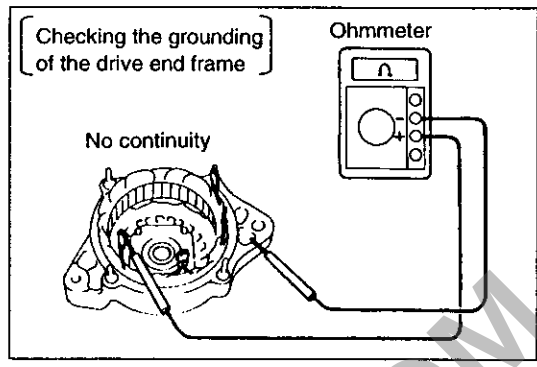


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3.23.4.4.2 Check grounding of the drive end frame

Check that the circuit between the coil lead and drive end frame is not continuity using an ohmmeter. If they are continuity, replace the drive end frame assembly.



3.23.4.5 Brush

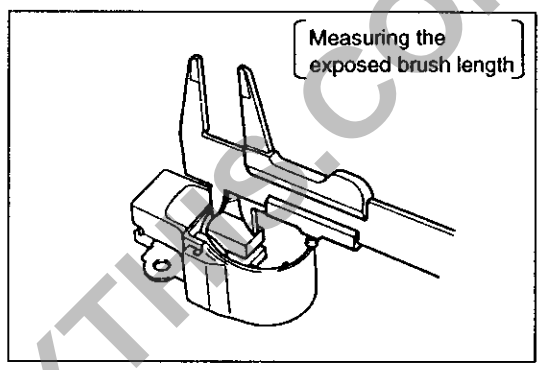
3.23.4.5.1 Check the exposed brush length

Check the exposed brush length using calipers.

Standard exposed length: 10.5 mm

Minimum exposed length: 1.5 mm

If the measured length is below the specified minimum, replace the brush holder.



3.23.4.6 Rectifier (rectifier holder)

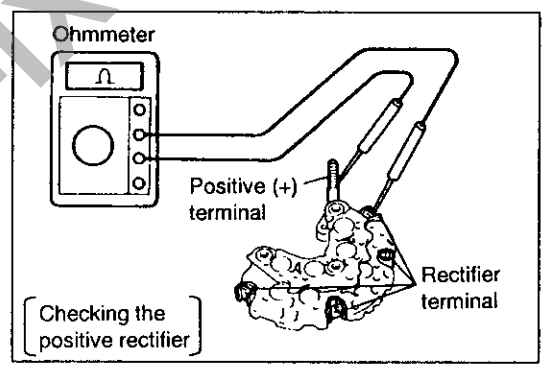
3.23.4.6.1 Check the positive rectifier

(1) Connect one of tester probes of an ohmmeter to the positive (+) terminal and the other probe to the rectifier terminal.

(2) Reverse polarities of the probes and repeat the procedure.

(3) Check that one of continuity shows the state while the other connection results in no continuity state.

If the continuity check results are not as described above, replace the rectifier.



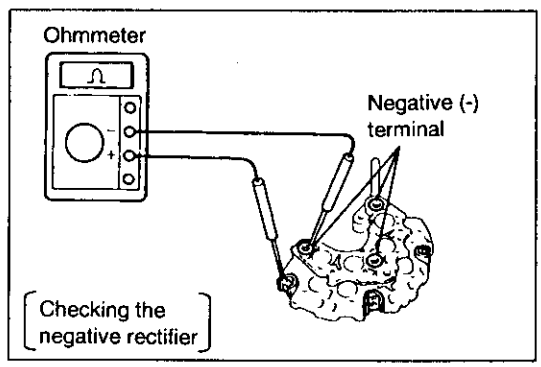
3.23.4.6.2 Check the negative rectifier

(1) Connect one of tester probes of an ohmmeter to the negative (–) terminal and the other probe to the rectifier terminal.

(2) Reverse polarities of the probes and repeat the procedure.

(3) Check that one of connections shows the continuity state while the other connection results in no continuity state.

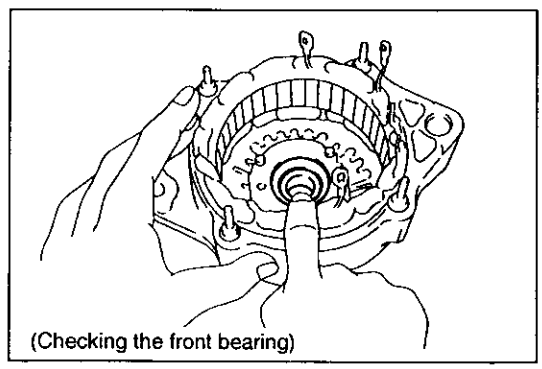
If the continuity check results are not as described above, replace the rectifier holder.



3.23.4.7 Bearing

3.23.4.7.1 Check the front bearing

Check that the front bearing is not worn.



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Engine model	6LPA-DTP	6LPA-DTZP
Type	Vertical water-cooled 4-cycle diesel engine	
Number of cylinders – Bore × stroke mm	6– ϕ 94 × 100	
Displacement ℓ	4.164	
Fuel stop power at crankshaft kW{hp}/rpm	*191 {260} / 3800 **182 {248) / 3800	
Cont. power at crankshaft kW{hp}/rpm	154 {210} / 3600	
High idling (rpm)	4200 ± 25	

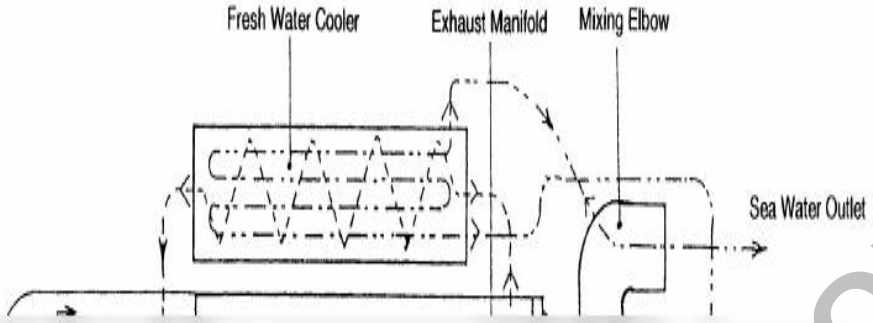
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2.3 Piping

- 6LP-DTE/-STE



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CONTENTS

Notice: *The descriptions for the 6LP-DTE series also apply to 6LPA-DTP series. The descriptions for the 6LP-STE series also apply to 6LPA-STP series.*

1. For Safe Operation 1-1

1.1 Warning Symbols 1-1

1.2 Precautions for Safe Servicing 1-2

1.3 Location for Product Safety Labels 1-6

2. General 2-1

2.1 Specifications 2-1

2.2 External Views 2-2

2.3 Piping Diagram 2-4

2.4 Performance Curves 2-6

2.5 Front Power Take-Off (PTO) Output 2-8

2.6 Fuel Oil 2-10

2.7 Lube Oil 2-11

2.8 Cooling Water 2-11

2.9 Location of Senders and Warning Switches 2-12

3. Engine Overhaul 3-1

3.1 Cylinder Head 3-1

3.1.1 Components 3-1

3.1.2 Removal of Cylinder Head 3-4

3.1.2.1 Drain the engine cooling water. 3-4

3.1.2.2 Remove the turbocharger 3-4

3.1.2.3 Remove the fresh water tank. 3-4

3.1.2.4 Remove the fuel filter 3-4

3.1.2.5 Remove the intake manifold and intercooler. 3-4

3.1.2.6 Remove the fuel injection pipe and fuel injection nozzle (For 6LP-DTE series). 3-4

3.1.2.7 Remove the bonnet. 3-5

3.1.2.8 Remove the semi-circular plug 3-5

3.1.2.9 Remove the timing belt and pulley 3-5

3.1.2.10 Remove the camshaft oil seal retainer 3-5

3.1.2.11 Remove the fuel injection nozzle (6LP-STE series) 3-5

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FOREWORD

This manual describes the service procedures for the 6LP and 6LPA series marine diesel engine.

Please use this manual for accurate, quick and safe servicing of the respective engine. Since the explanation herein assumes the standard type engine, the specifications and components may partially be different from the engine installed on each boat. Please also refer to the service manual for each boat for details.

The specifications and components are subject to change for improvement of the engine quality. If any modification of the contents described in this manual becomes necessary, it will be notified in the form of a correction notice each time.

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California
Proposition 65 Warning

Diesel engine exhaust and some of its constitutions are known to the State of California to cause cancer, birth defects, and other reproductive harm.

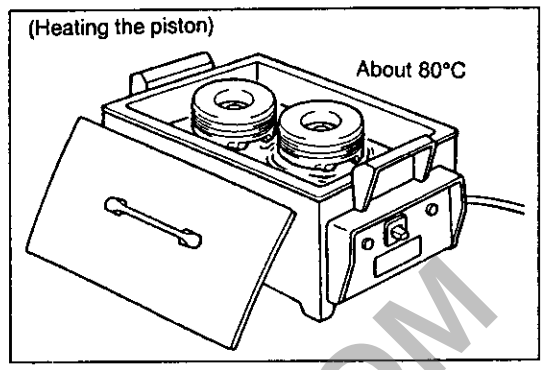
California
Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm.

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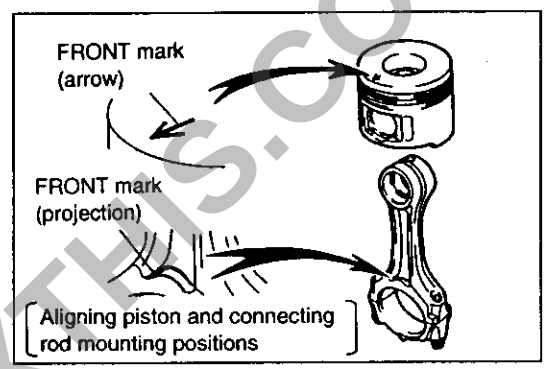
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(2) Slowly heat the piston to about 80°C.

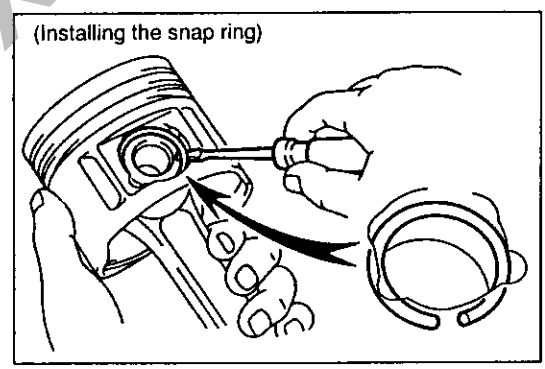


(3) Apply engine oil to the piston pin.

(4) Align front marks of the piston and connecting rod and press in the piston pin by the thumb.



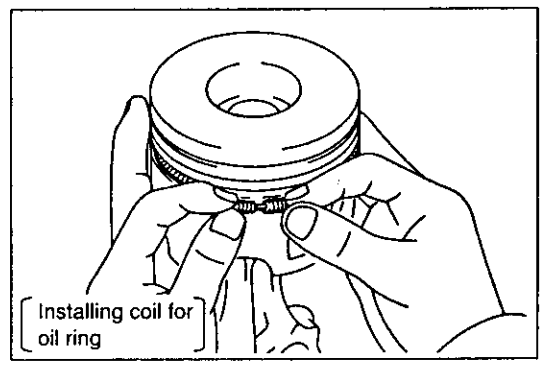
(5) Install a new snap ring to the piston pin hole on the opposite side.



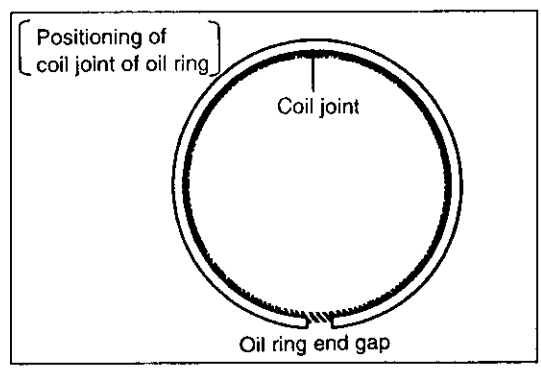
3.2.9.2 Install the piston ring

(1) Manually install the coil for oil ring

(2) Using the piston ring expander, install the oil ring.



- Install the oil ring so that the ring end faces the opposite side of the coil joint.



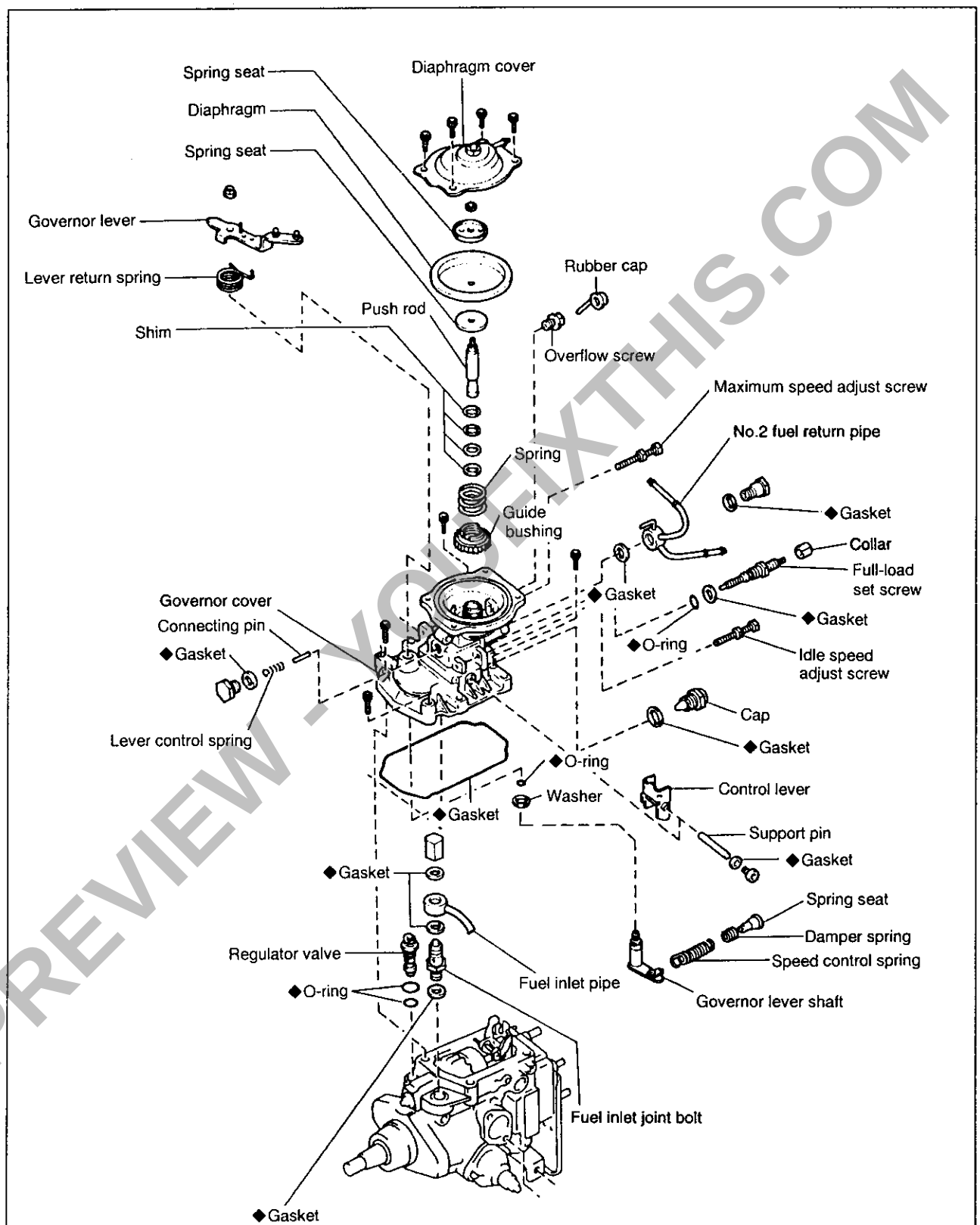
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3.11.2 Components

Note: ***Since professional knowledge and special equipment are required for disassembly and adjustment of the fuel injection pump, consult the DENSO.***

Components (to be continued)



◆ Non-reusable part

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