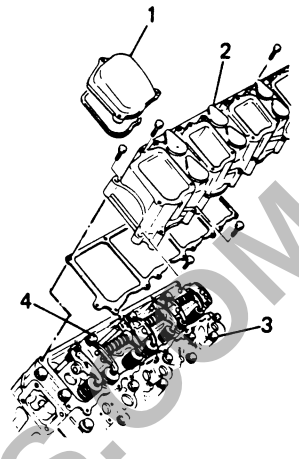
(1) Remove the following parts.

1 Rocker cover
2 Rocker case
3 Cylinder head bolt
4 Rocker bracket attaching bolt

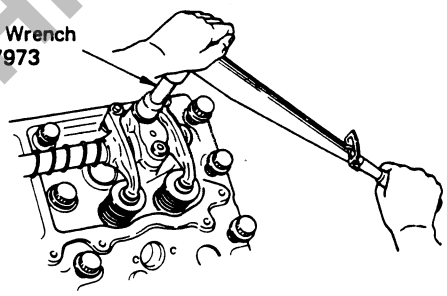


LE7638

NOTE: 1. Where the push rod is forcing the rocker up, the rocker adjusting screws should be loosened before all bolts are removed.

2. Use Socket Wrench (special tool) to remove the cylinder head bolts and the rocker bracket mounting bolts.

3. Loosen the cylinder head bolts is reverse order of tightening, beginning with M14 bolt.

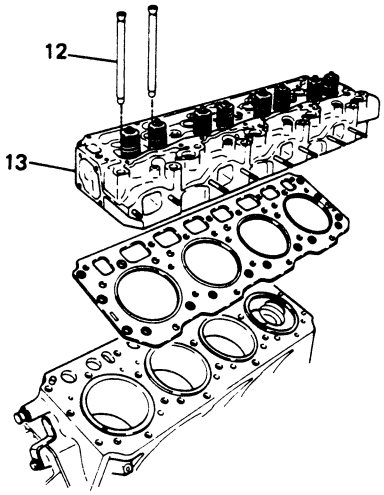


LE7639

(2) Withdraw the push rod 12 and remove the cylinder head 13 from the crankcase.

NOTE: 1. To remove the cylinder head, make sure that the injection nozzle is removed beforehand. If the cylinder head with nozzle mounted is placed on the work table, damage to the nozzle end projecting from the bottom surface of the cylinder head will result.

2. When the cylinder head gasket is removed, use care not to scratch or dent the cylinder head and crankcase.

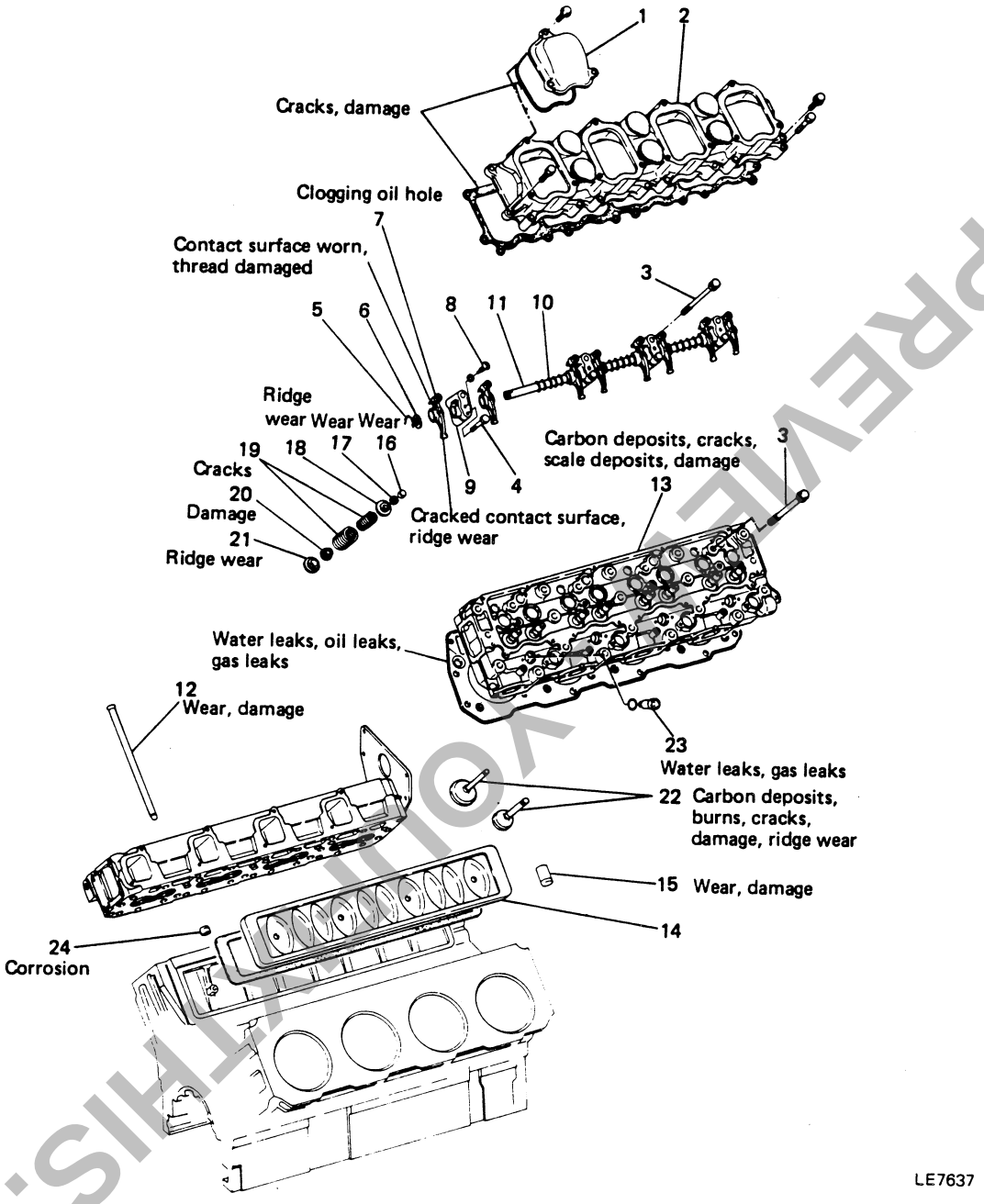


LE7641

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6-1-1 Cylinder Head and Valve Mechanism



1	Rocker cover	9	Rocker shaft bracket	17	Valve cotter
2	Rocker case	10	Rocker shaft spring	18	Upper retainer
3	Cylinder head bolt	11	Rocker shaft	19	Valve spring
4	Rocker bracket attaching bolt	12	Push rod	20	Valve stem seal
5	Snap ring	13	Cylinder head	21	Lower retainer
6	Washer	14	Crankcase side cover	22	Valve
7	Rocker	15	Tappet	23	Nozzle tube
8	Set screw	16	Valve cap	24	Water director

NOTE: When the valve stem seal was removed, make sure that a new one is installed.

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3. SPECIAL TOOLS 3
4. DETERMINING TIME TO OVERHAUL, ENGINE ADJUSTMENT AND BREAK-IN OPERATION 4
5. REMOVAL AND INSTALLATION OF AUXILIARIES 5
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COMPILATION OF THIS MANUAL

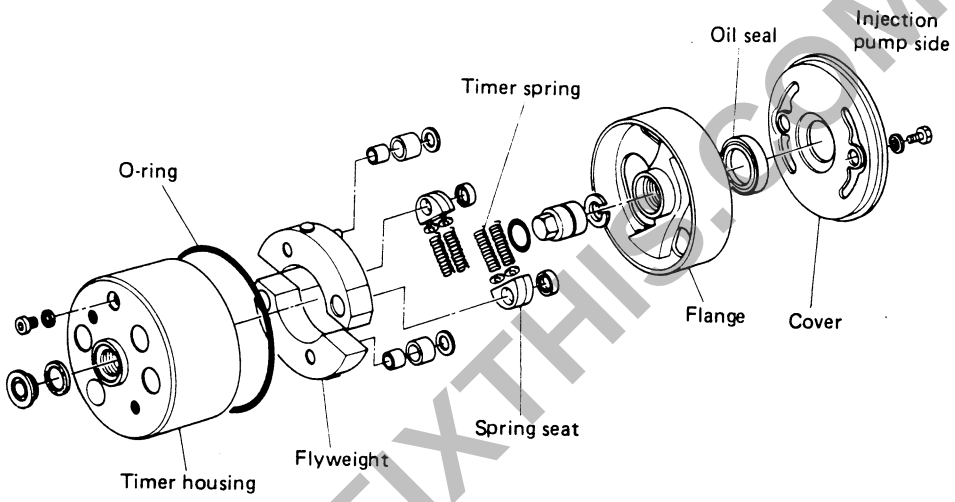
1. The contents of this shop manual are divided as shown below when edited.

Group No.	Group Name	Contents
1	General	General description, outside view photograph and cross section view of engine, specifications, construction and operation
2	Service standards	Engine service standards, service standards table, tightening torque table, sealant and grease table
3	Special tools	Shapes and usages of special tools
4	Determining time to overhaul	Decision on time to overhaul, measurement of compression pressure
5	Removal and installation of auxiliaries	Removal and installation of auxiliaries such as injection pump, starter, alternator and compressor
6	Engine proper	Disassembly, inspection and reassembly of engine proper, including cylinder head, valve mechanism, camshaft, piston, crankshaft, timing gear, flywheel, etc.
7	Inlet and exhaust	Disassembly, inspection and reassembly of air cleaner, turbocharger, etc.
8	Lubrication	Disassembly inspection and reassembly of lubrication system, including oil pump, oil filter, oil cooler, etc.
9	Cooling	Disassembly, inspection and reassembly of cooling system, including water pump, thermostat, radiator, etc.
10	Fuel	Disassembly, inspection and reassembly of fuel system, including injection pump, injection nozzle, fuel filter, water separator, etc.
11	Electrical	Inspection of starter, starter relay, alternator, etc.
12	Other equipment	Disassembly, inspection and reassembly of air compressor, automatic stop device.
13	Clutch	Disassembly, inspection and reassembly of clutch, bearing case.

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If the engine speed changes from a high to low speed, the centrifugal force of the flyweights will decrease and the flyweights will return to their original positions. At the same time, the pins of the flyweight holder will be pushed back by the timer springs.

(b) SP type automatic timer

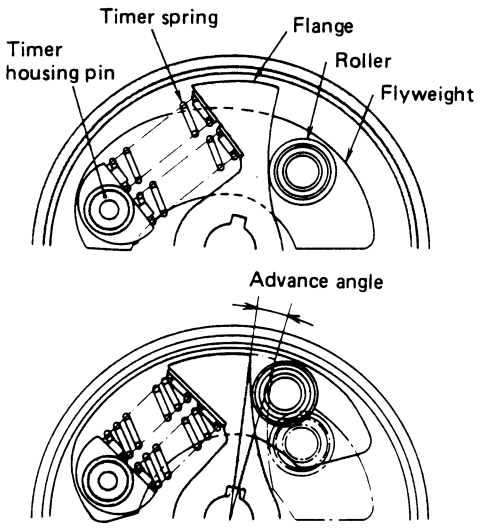


LE7053

Two flyweights are fitted on the pins of the timer housing and are held in the timer housing. On the other hand, the injection pump connection side flange has a curved surface, and the roller fitted on the pin installed in the flyweight touches the curved surface. Timer springs are held between the spring seats fitted on the timer housing pins which extend through the flange and flyweight. These parts are housed in the timer housing and are totally enclosed with a cover, O-ring and oil seal.

When the engine is running at a low speed, the timer spring pressure is stronger than the centrifugal force of flyweight, so the roller of flyweight is held down by the flange, creating no advance state.

When the engine reaches a high speed, the centrifugal force of flyweight becomes stronger, the roller of flyweight pushes the curved surface of flange with the timer housing pin as the fulcrum, and the flyweight opens outward, while compressing the timer springs.



LE5061

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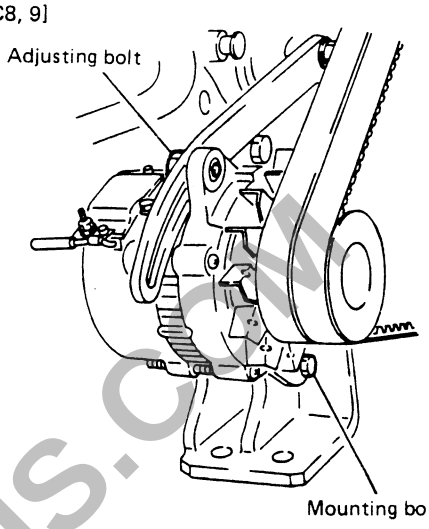
(2) Adjustment

[8DC8, 9]

(a) Alternator

Slightly loosen the bolts that hold the alternator and adjusting plate. Adjust the belt tension by shifting the alternator as much as required.

Re-tighten the bolts securely after the adjustment.

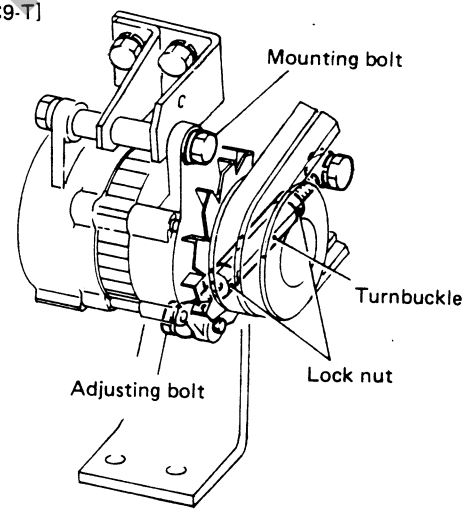


DC616

Slightly loosen the lock nut. Adjust the belt tension by turning the turnbuckle as much as required.

Re-tighten the lock nut securely after the adjustment.

[8DC9-T]

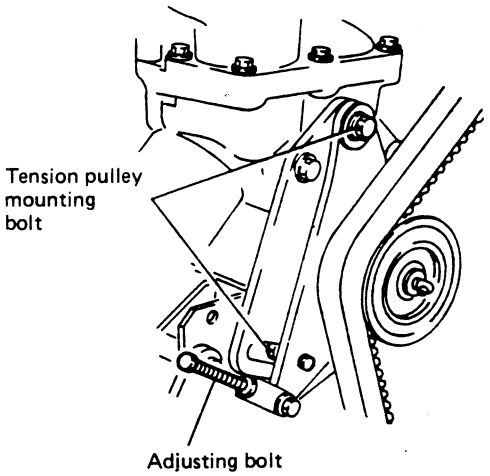


PE9250

(b) Tension pulley

Slightly loosen the bolts that holds the tension pulley, and adjust the belt tension by turning the adjusting bolt in either direction as required. A clockwise turn increases the tension.

Re-tighten the nut securely after the adjustment.



DC617

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6-3 REASSEMBLY

Assemble as follows.

1. Thoroughly clean all parts to be assembled. Prior to assembly, make sure that the mating surfaces of the parts are free from dust, oil and water.

2. Replace gaskets, O-rings, packings, lock washers, split pins, etc. with new ones. Make use of gasket kits when overhauling.

3. In principle, sealants are not applied. However, apply authorized sealants to the specified portions.

4. When tightening torques are specified, always tighten it to the specified torque. Unless otherwise specified, tighten bolts and nuts to the standard torque.

5. Unless otherwise specified, assemble the moving parts after applying engine oil.

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8. LUBRICATION

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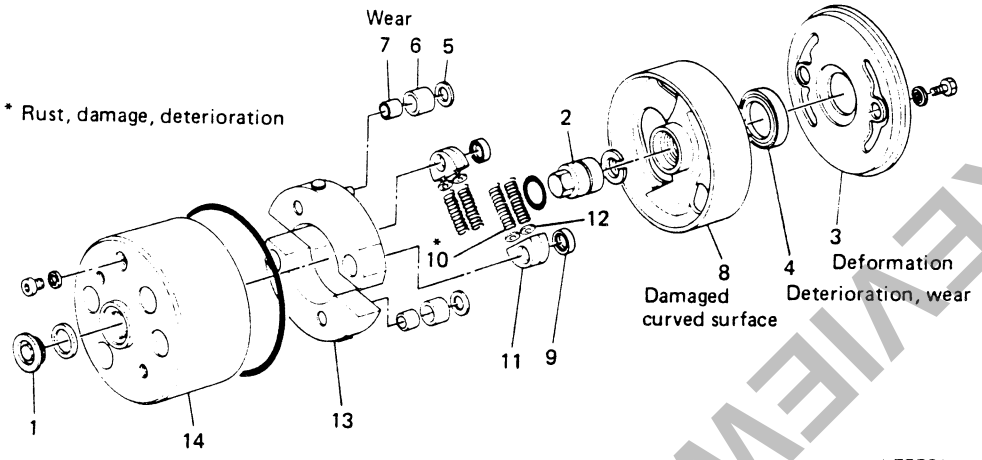
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10-1-7 SP Type Automatic Timer

In servicing the SP type automatic timer, use special tools.

(1) Disassembly and Inspection

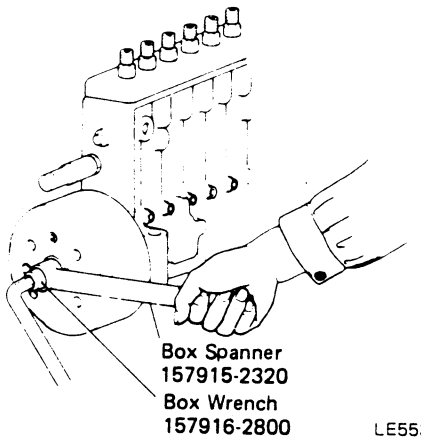


LE5531

1	Cap screw	8	Flange
2	Round nut	9	Retainer
3	Cover	10	Timer spring
4	Oil seal	11	Spring seat
5	Washer	12	Shim
6	Roller	13	Flyweight
7	Bushing	14	Timer housing

(a) Remove the coupling from the timer.

(b) Remove the cap screw 1 of the timer. While using special tool (Box Spanner), remove the round nut 2 with special tool (Box Wrench).

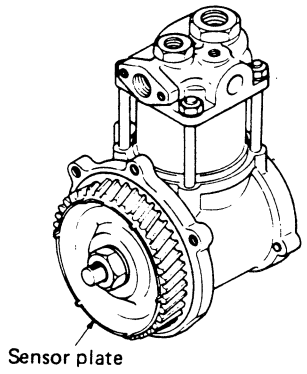


LE5532

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On the injection pump gear, a sensor plate is installed. The sensor plate has the claws for timing sensor at six places. As the sensor plate is smaller than the injection pump gear, the air compressor can be removed or installed at any position of the gear, provided that the timing marks are to be in alignment when the air compressor is installed.



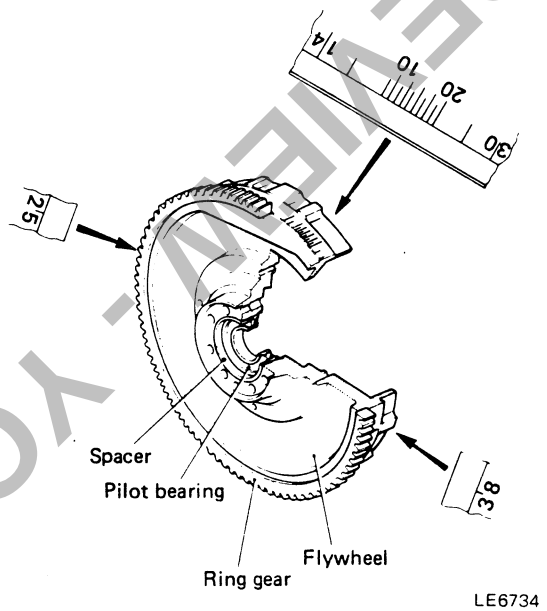
LE7759

(8) Flywheel

The flywheel is made of cast iron. The pilot bearing of the transmission drive pinion is installed to the center of the flywheel. The ring gear which meshes with the starter pinion is shrinkage-fitted on the flywheel.

The ring gear teeth crests are induction hardened to assure high durability. One side of the teeth is chamfered to make sure that the starter pinion fits easily.

The cylinder numbers and angle scale are stamped on the outside periphery of the flywheel as shown.



LE6734

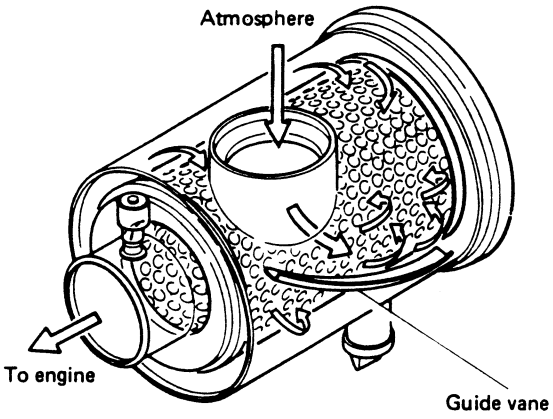
1-3-2 Inlet and Exhaust

(1) Air Cleaner

The paper filter is plastic coated and heat treated for better water and oil resistance.

A polluted element can be rinsed and reused.

The incoming air is whirled by the guide vanes or blades at a high speed and the larger particles of dusts are centrifugally separated by the "cyclone effect". The smaller particles of dusts are eliminated by the filter paper element, and the air filtered clean is sucked by the engine.



LE6394

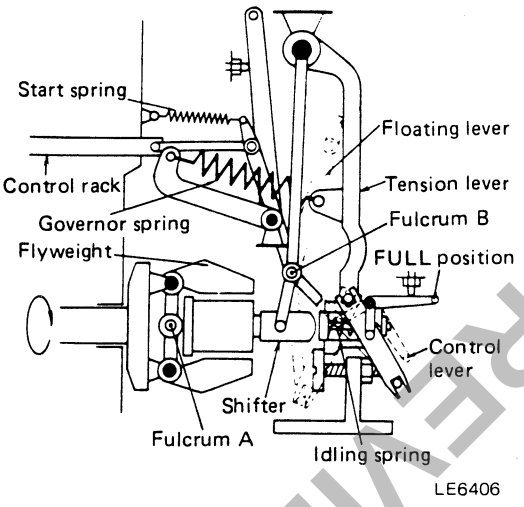
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1) Start of engine and control of idling

When the engine is stationary, the flyweight is in closed position, pushed by the governor spring, idling spring and start spring.

If, in this condition, the load control lever is moved all the way to the FULL position (in the direction of greater fuel delivery), the start spring and idling spring will cause the control rack to move to the fuel increasing position.

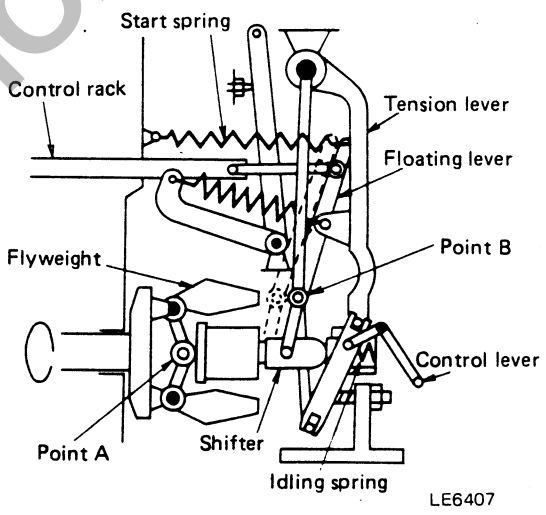


If the load control lever is placed to the idling position after the engine has started, the floating lever will move the control rack back to a position where a fuel injection rate suitable for the idling speed is available, with the point B as the fulcrum.

As the engine speed increases, the flyweights will move outward by the centrifugal force and will shift the shifter by the point A until the shifter compresses the idling spring.

At this time, the fulcrum B will also slightly move toward the tension lever and will move the control rack back in the direction for reducing the fuel injection rate.

As the engine speed decreases, the centrifugal force of the flyweights will decrease and the flyweights will move inward, so the point A will return toward the pump housing. This will set the shifter in the free state, pushing it back toward the pump housing by idling spring force.



At the same time, the fulcrum B will also slightly move toward the pump housing to push the control rack back in the direction for decreasing the fuel injection rate.

In this manner, the idling speed is maintained stable by slight adjustment of the injection rate.

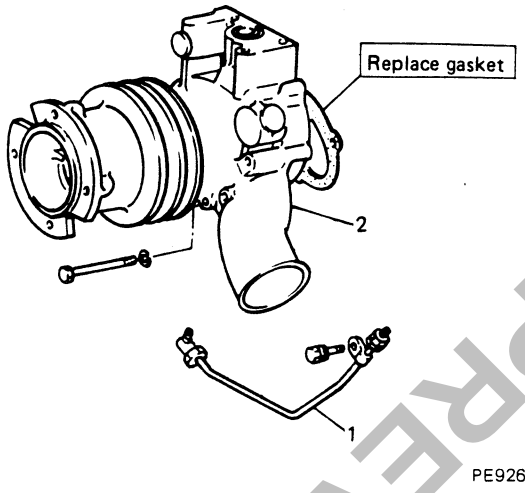
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(3) Water pump

[8DC, 9]

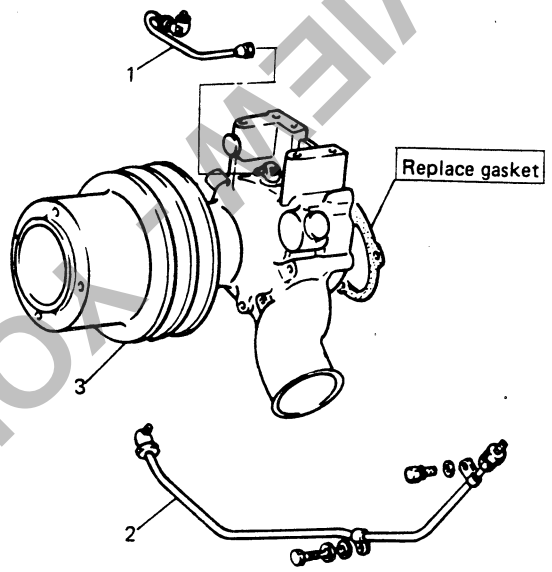
1 Oil pipe
2 Water pump



PE9260

[8DC9-T]

1 Air escape pipe
2 Oil pipe
3 Water pump



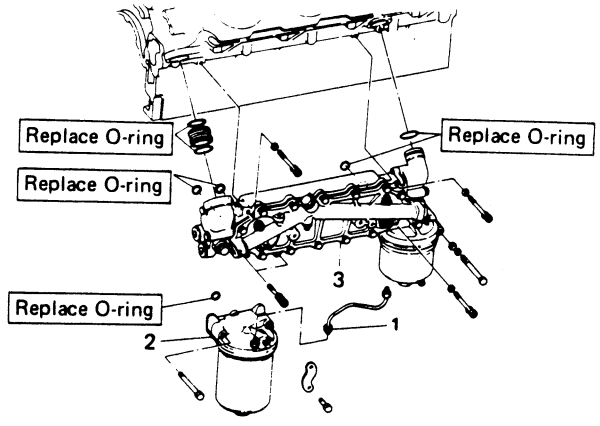
PE9261

5-2-6 Lubrication

(1) Oil Filter and Oil Cooler

1 Oil pipe
2 Bypass oil filter
3 Oil cooler and oil filter

Apply engine oil to each O-ring when installing.



LE7723

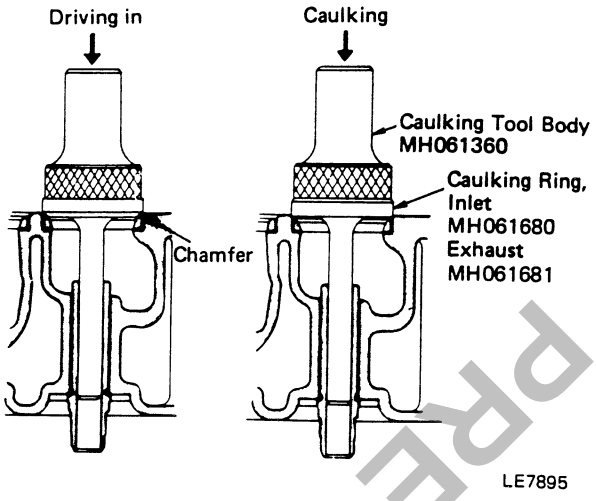
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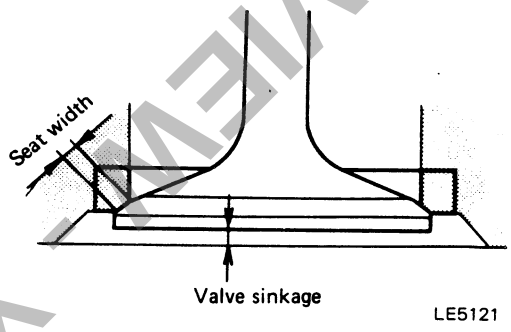
(d) Install the valve seat insert in the cylinder head with Caulking Tool Body and Caulking Ring (special tool).

When any insert was replaced with a new one, caulk the entire periphery of the new one.

NOTE: When the valve seat insert is installed, direct the chamfered side of the caulking ring toward the valve seat insert.



(e) Reface the valve seat insert so that the seat width and sinkage of valve may be within the nominal values.



(8) Lapping of Valve and Valve Seat Insert

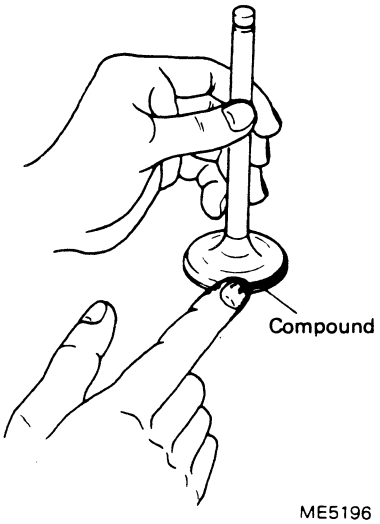
The valve and valve seat insert must be uniformly contacted. When the valve or valve seat insert has been corrected or replaced, make sure that they are properly seated.

(a) Apply a thin coat of compound uniformly to the seating surface of the valve.

NOTE: 1. Take care not to adhere compounds on the valve stem.

2. Apply medium mesh type compound first (120 - 150 meshes) and then fine mesh type (200 meshes or more) for finishing.

3. Add a small amount of engine oil to the compound so as to apply it uniformly.



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9. COOLING

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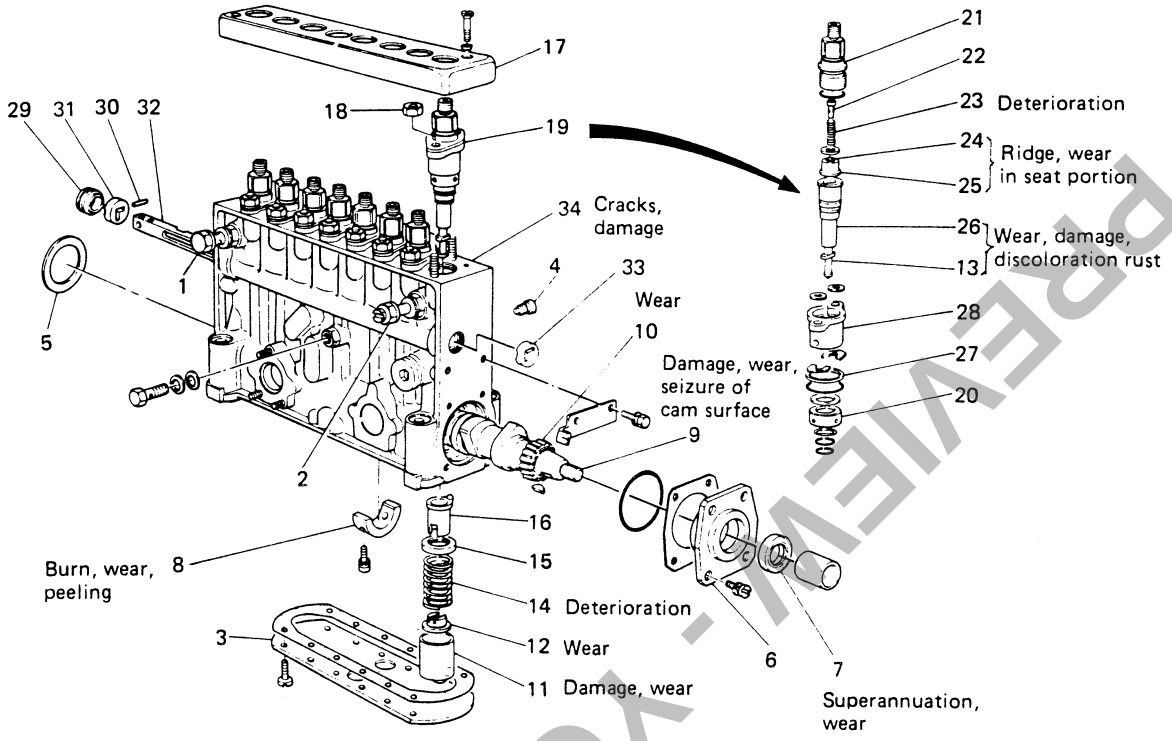
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10-1-2 P Type Injection Pump

(1) Disassembly



1	Pipe joint bolt	18	Nut
2	Overflow valve	19	Plunger lock assembly
3	Bottom cover	20	Deflector
4	Screw plug	21	Delivery valve holder
5	Shim	22	Stopper
6	Bearing cover	23	Delivery valve spring
7	Oil seal	24	Delivery valve
8	Center bearing	25	Delivery valve seat
9	Camshaft	26	Plunger barrel
10	Roller bearing inner race	27	Distance ring
11	Tappet assembly	28	Flange sleeve
12	Lower spring seat	29	Screw bushing
13	Plunger	30	Pin
14	Plunger spring	31	Bushing
15	Upper spring seat	32	Control rod
16	Control sleeve	33	Bushing
17	Cover	34	Pump housing

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