SHOP MANUAL

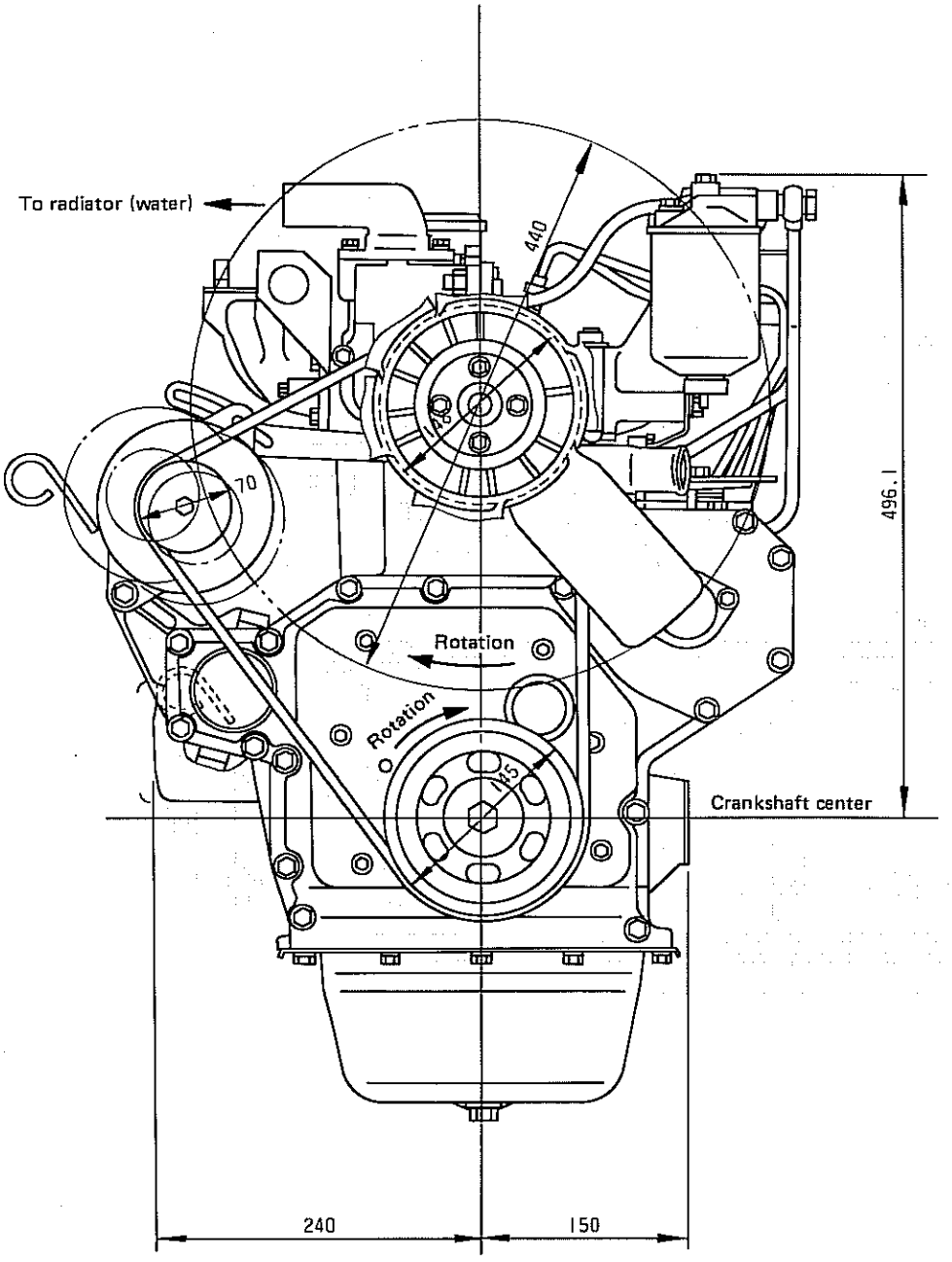
KOMATSU

95 SERIES

DIESEL ENGINE

KOMATSU FORKLIFT CO. LTD

4D95L-1 FRONT VIEW



GENERAL STRUCTURE

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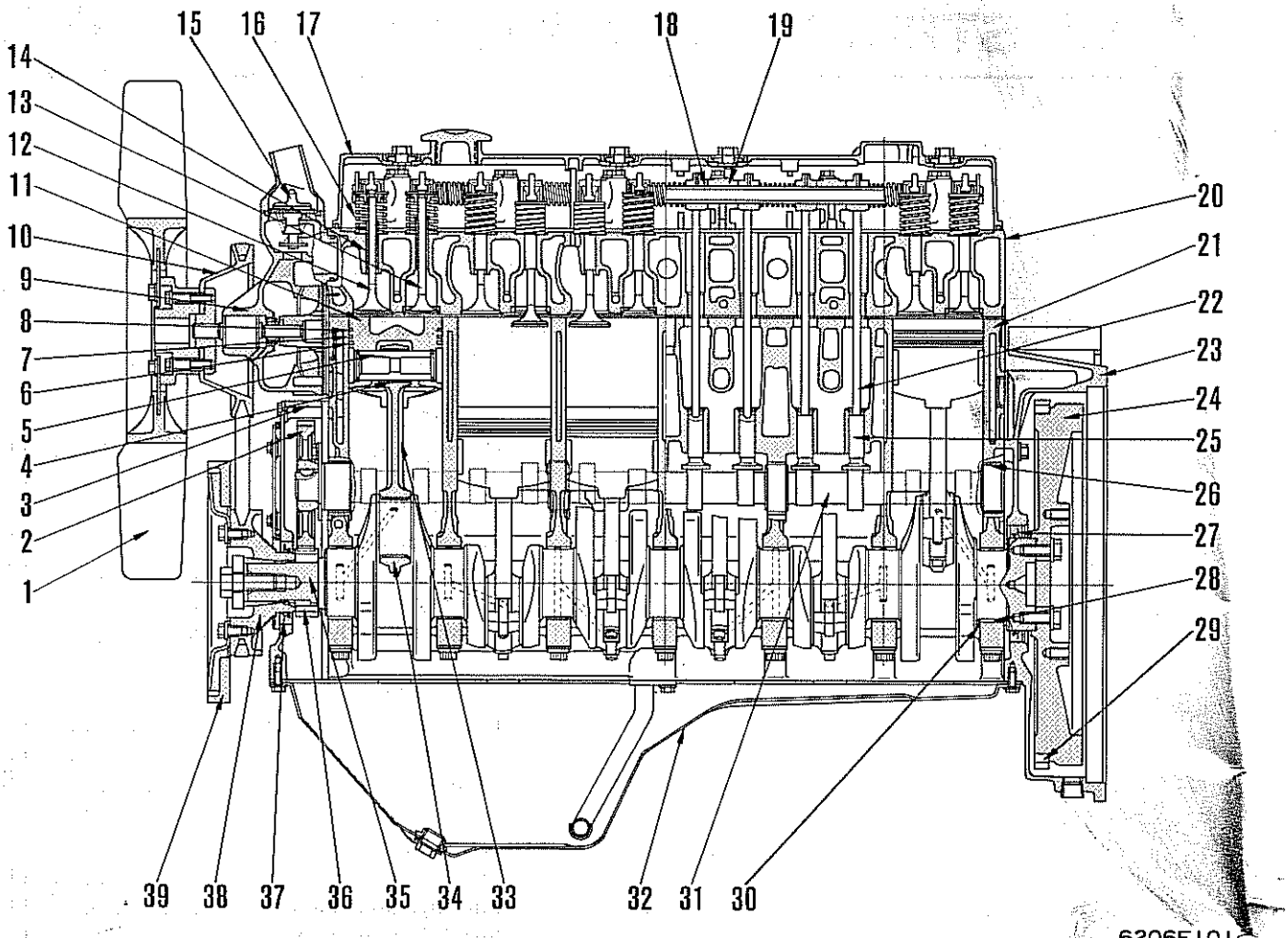

1. Fan
2. Camshaft gear
3. Front cover
4. Connecting rod bushing
5. Piston pin
6. Oil ring
7. Second ring
8. Top ring
9. Water pump
10. Fan pulley
11. Piston
12. Intake valve
13. Exhaust valve
14. Valve guide
15. Thermostat
16. Valve spring
17. Cylinder head cover
18. Rocker arm shaft
19. Rocker arm bracket
20. Cylinder head
21. Cylinder block
22. Push rod
23. Flywheel housing
24. Flywheel
25. Tappet
26. Camshaft bushing
27. Rear oil seal
28. Main bearing
29. Ring gear
30. Thrust bearing

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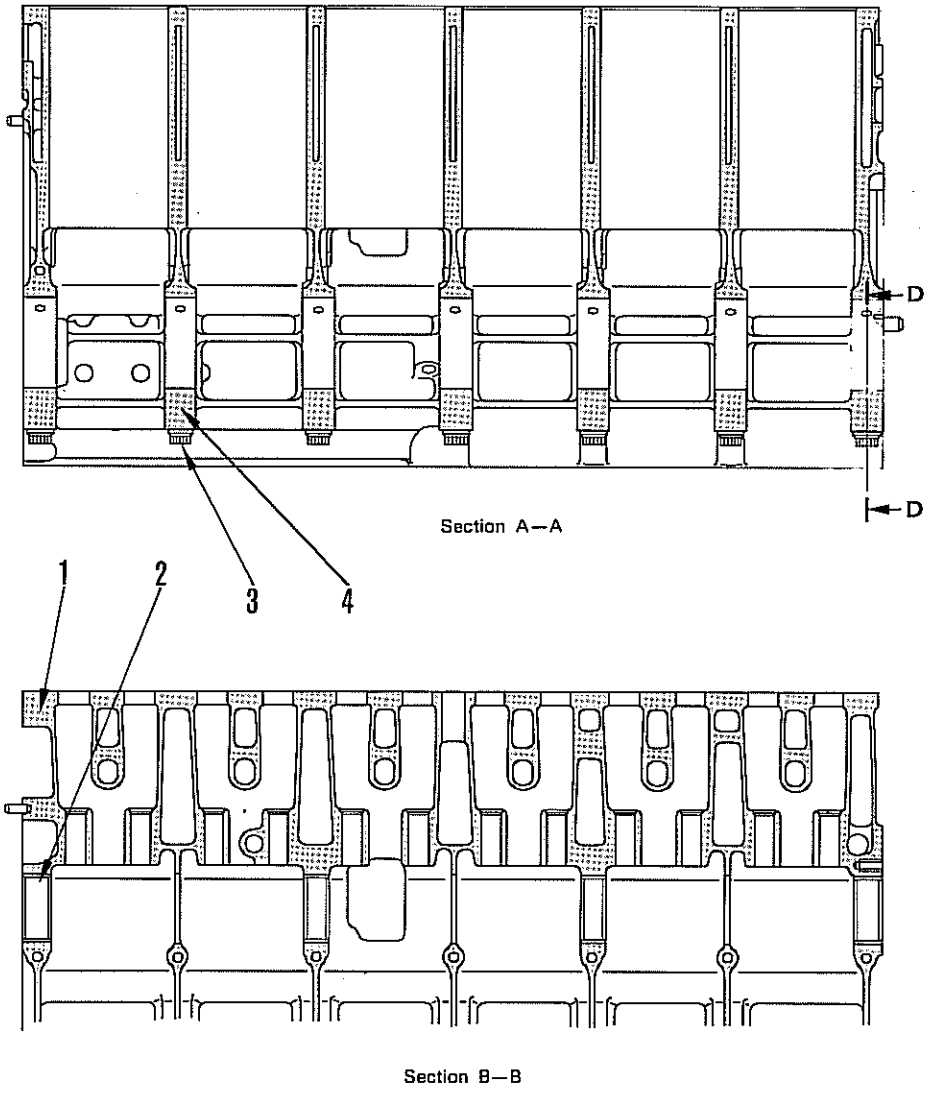

Section A—A

Section B—B

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1. Cylinder block
2. Camshaft bushing
3. Main bearing cap bolt
4. Main bearing cap
5. Oil pump drive shaft bushing
6. Oil pump driven shaft

VALVE SYSTEM

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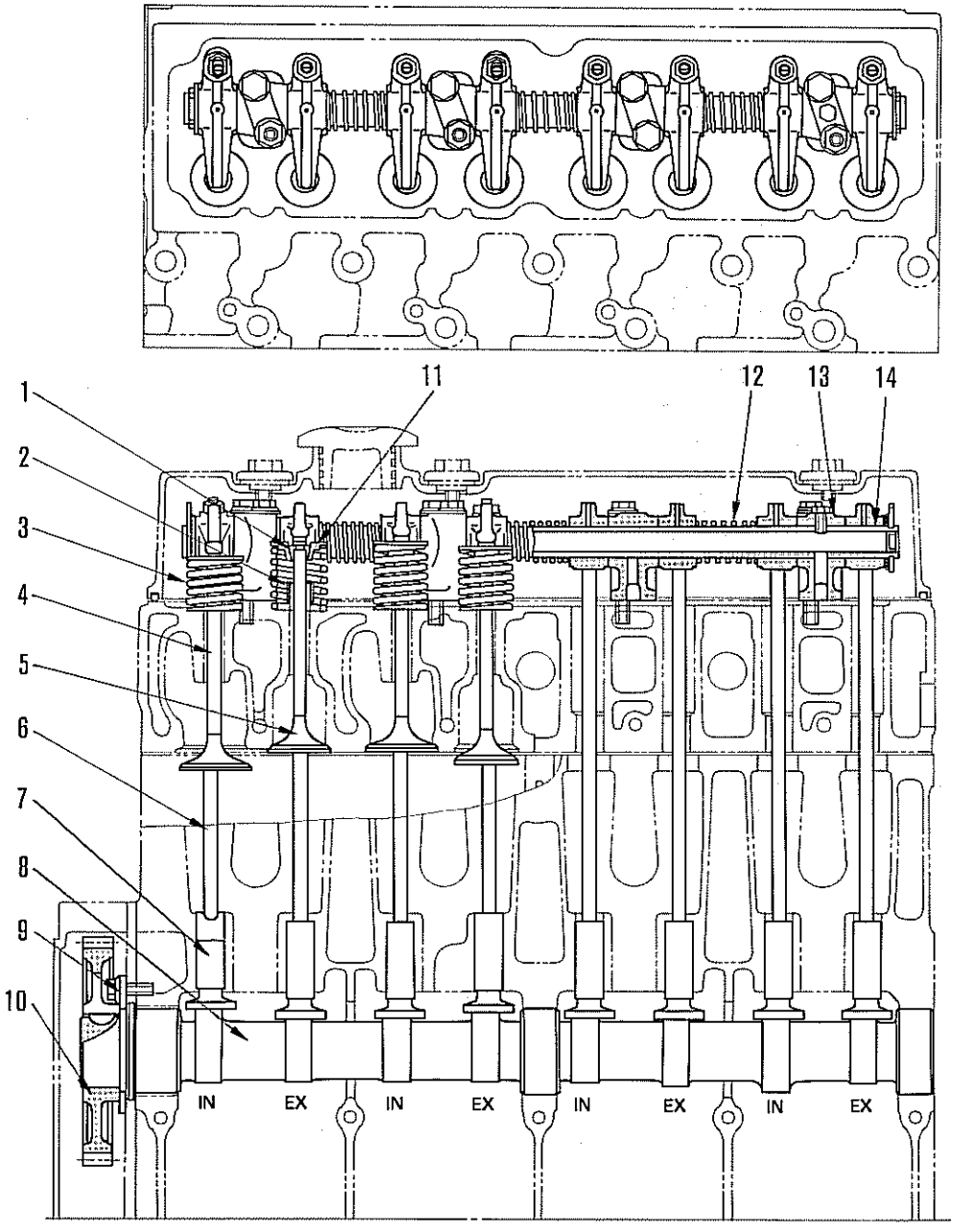
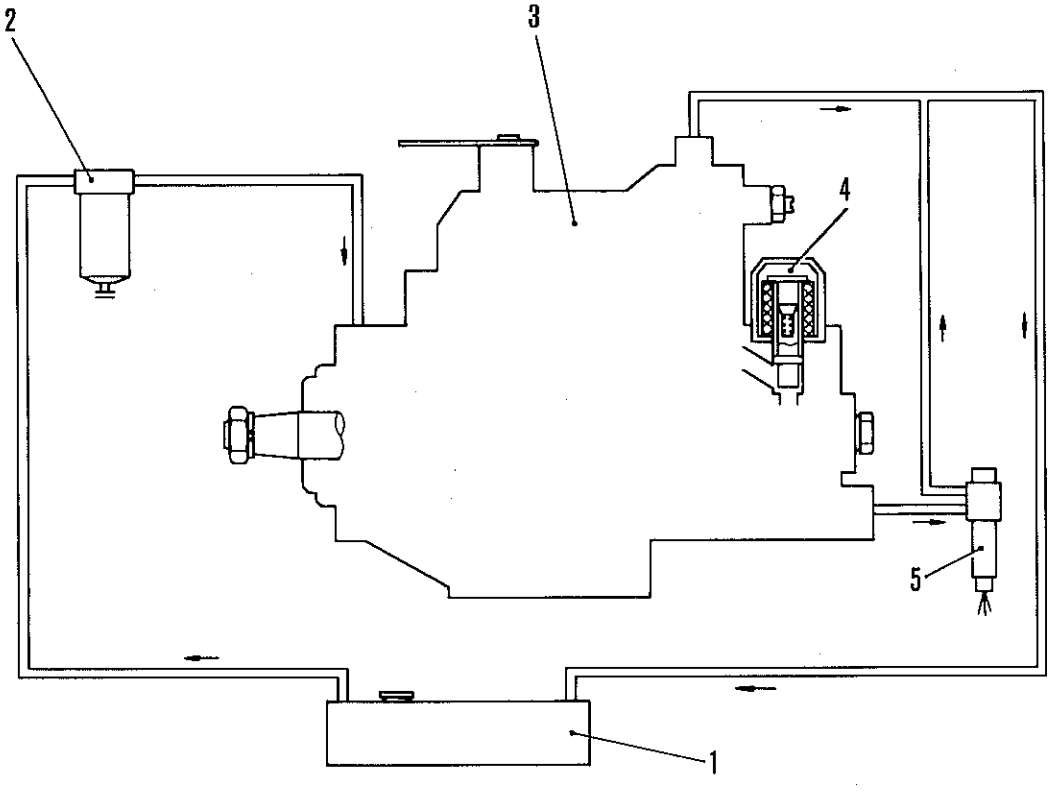


1. Valve cotter
2. Valve guide
3. Valve spring
4. Intake valve
5. Exhaust valve
6. Push rod
7. Tappet
8. Camshaft
9. Thrust plate
10. Camshaft gear
11. Spring seat
12. Rocker arm spring
13. Rocker arm bracket
14. Rocker arm
15. Adjustment screw
16. Locknut
17. Rocker arm

FUEL SYSTEM
FUEL SYSTEM CHART
4D95L-1

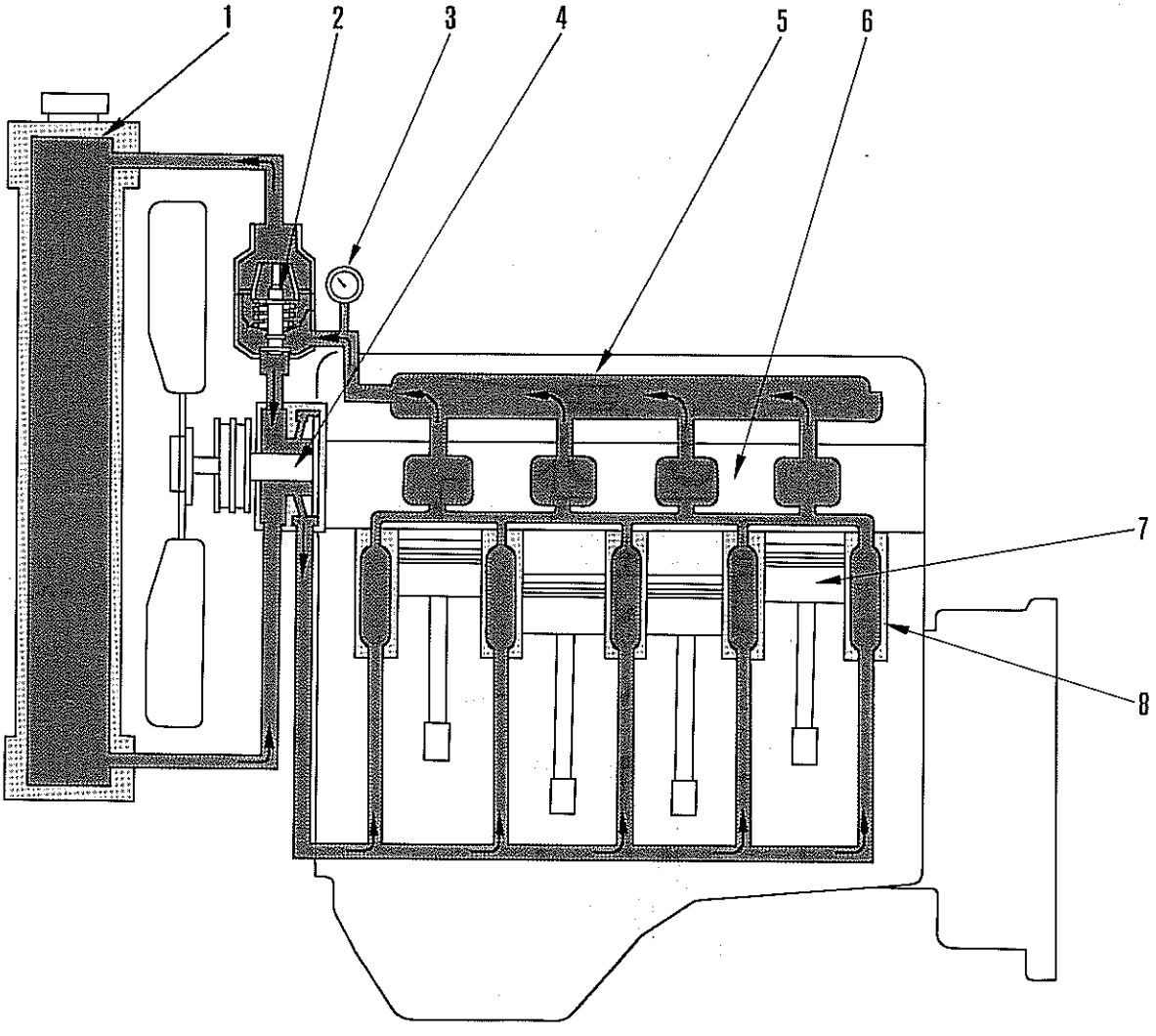


1. Fuel tank
2. Fuel filter with water separator
3. Fuel injection pump
4. Fuel-cut solenoid
5. Fuel injection nozzle

COOLING SYSTEM

COOLING SYSTEM CHART

4D95L-1



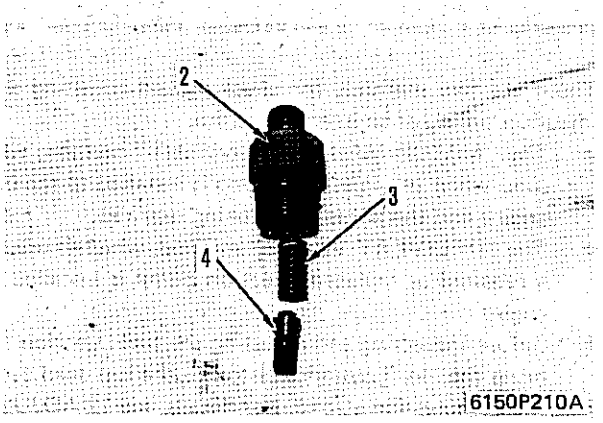
1. Radiator
2. Thermostat
3. Water temperature gauge
4. Water pump
5. Water manifold
6. Cylinder head
7. Piston
8. Cylinder block

2. Remove delivery valve holder (2).

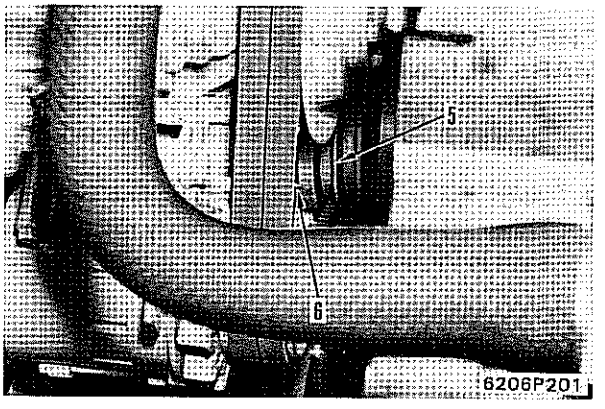
3. Remove spring (3) and delivery valve (4) from the delivery valve holder, and reassemble the delivery valve holder.

4. Place the fuel control lever in FULL position, slowly rotate the crankshaft in the normal direction while operating the priming pump, and observe the position when the fuel stops flowing out of the delivery valve holder.

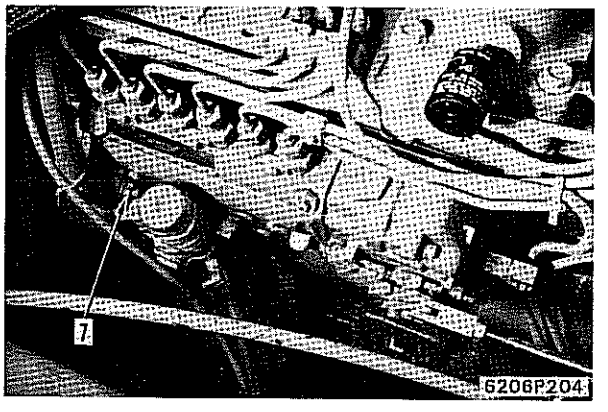
5. In the position where the outflow of fuel stops, check the injection timing stamp line on the crankshaft pulley (5) to see if it is aligned with the pointer (6).
   - ★ If the injection timing stamp line passed through the pointer: The injection timing is late.
   - ★ If the injection timing stamp line did not reach the pointer: The injection timing is advanced.



★ If the inspection shows that the injection timing is out of adjustment, adjust the fuel injection timing in the following manner.
★ After the checking and adjusting, be sure to reassemble the spring and the delivery valve.



1) Rotate the crankshaft 30° to 40° in the reverse direction, starting from TOP position in No. 1 cylinder.
2) Align the injection timing stamp line on crankshaft pulley (5) with pointer (6) by slowly rotating the crankshaft in the normal direction.
3) Loosen nut (7) on the injection pump mounting flange slot, and rotate the flange on the pump side little by little by operating the priming pump until no fuel flows out of the delivery valve holder.
4) Tighten the nut on the injection pump mounting flange slot.
   - ★ Recheck the injection timing to see if it is properly adjusted.
5) Align match mark a with mark b and stamp the marks.



STANDARD VOLUME OF FUEL INJECTION

Engine	Applicable machine	Type of injection pump	Rack position (mm)	Pump speed (rpm)	Injection volume (mm^3/st)	Max. speed (mm^3/st)
4D95L-1	FD20H-8 FD25H-8 FD30H-8	Distribution	(Full load)	800	Average: 49 ± 1	≦2.5
				500	Average: 45.5 ± 2.5	≦2.5
				1,100	Average: 44.5 ± 2.5	≦2.5
				100	Average: 75 ± 10	≦5
			(Idling)	350	Average: 10.5 ± 2.5	≦2.5
				500	Average: min. 1	—
			(High speed control)	1,250	Average: 12.5 ± 2.5	—
				1,300	Average: min. 1	—
6D95L-1	FD35Z, 40Z-4 FD35, 40, 45-4 FD33S, 35S, 40S, 45S-4	Series	9.7	★ 1,075	31 ± 1	± 2.5 (%)
			8.7	350	10.5 ± 1	± 15 (%)

★: Standard rotation

TROUBLESHOOTING TABLE

1. Starting defective or badness.

1) Engine does not turn.

Questions to ask operator before starting troubleshooting

1. Did machine stop suddenly during operation? → Damage or seizure of internal parts.
2. Did machine make abnormal noise during operation? → Damaged parts.

★ **Cause h:** battery charging rate

Temperature \ Charging rate	100%	90%	80%	75%	70%
20°C	1.28	1.26	1.24	1.23	1.22
0°C	1.29	1.27	1.25	1.24	1.23
−10°C	1.30	1.28	1.26	1.25	1.24

- Specific gravity should be at least figure for 70% charging rate.
- In cold weather, specific gravity must be at least figure for 75% chrging rate.

No.	Problems \ Remedy	Stopping piston from moving by foreign matter in cylinder. (a)	Damage to connecting rod or crankshaft (b)	Bushing and bearing biting into each other (c)	Intake and exhaust valves are blocked in cylinder (d)	Damage to pump or other accessory (e)	Failure in power train (f)	Seizure of moving parts (g)	Battery insufficiently charged → See No. 20 (h)	Damage to pinion or ring gear (i)	Pinion movement force insufficient, wrong meshing position (j)	Battery terminal connection defective, wiring defective (k)	Electrical system defective → See No. 19 (l)
		X	X	X	X	X	X	X	X	X △	△ X	—	
1	When setting the starting switch to START; 1) No sound of pinion moving out.											○	
	2) Pinion grates.									○			
	3) Pinion engages but does not turn.	○	○	○	○	○	○						
2	When checking battery, electrolyte level or specific gravity is low.							○					
3	When cranking engine with barring tool; 1) Does not move.						○						
	2) Moves backlash only.				○								
	3) Can be turned in reverse direction.	○	○	○									
4	Remove head cover. When checking valve cotter, it is out of place.			○									
5	Remove oil pan. When checking internal parts, they are abnormal.		○										
6	Remove cylinder head. When checking internal parts, foreign matter appears.	○											

The following symbols are used to indicate the action to be taken when a cause of failure is located.

X: Replace △: Repair
A: Adjust C: Clean

10. Oil quickly becomes dirty.

Before starting the troubleshooting, ask the operator the following questions.

1. Were oil and oil filter changed in accordance with the "Operation and Maintenance Manual"?
3. Was improper oil used?

No.	Problems \ Remedy / Cause	XΔ	X	XΔ
		a	b	c
		Leak of exhaust gas through seal on turbocharger turbine side	Piston or piston ring worn	Valve or valve guide worn
1	Exhaust gas is blue when engine is run at high speed with light load.		○	○
2	Compression pressure is lack.		○	○
3	Blow-by is excessive.		○	
4	After running at high idling for approx. 10 min., oil can be seen leaking from turbocharger turbine outlet.	○		
5	Turbocharger shaft play is excessive.	○		

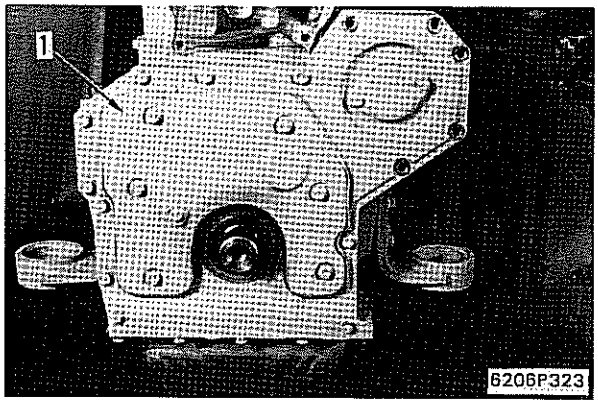
★ If the above problems does not reveal the cause, a common secondary cause of dirty oil is carbon from incomplete combustion mixing with the oil. In this case follow problems in "6. Exhaust gas is black".

The following symbols are used to indicate the action to be taken when a cause of failure is located.

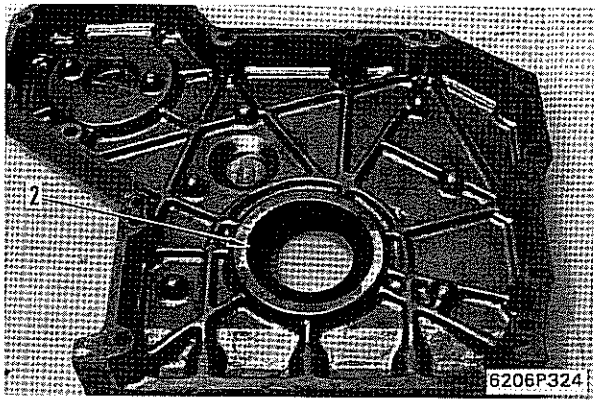
X: Replace Δ: Repair
A: Adjust C: Clean

21. Gear case cover

1) Remove gear case cover (1).

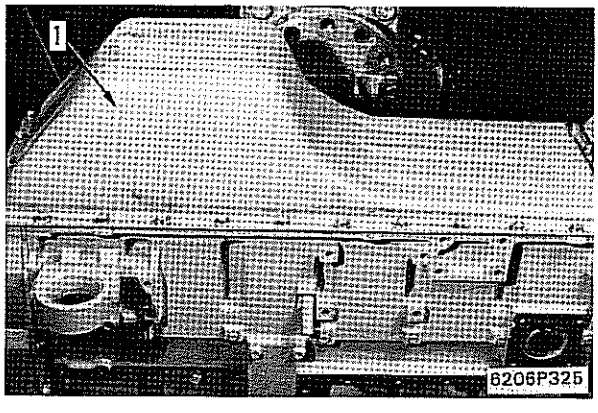


2) Remove front oil seal (2).



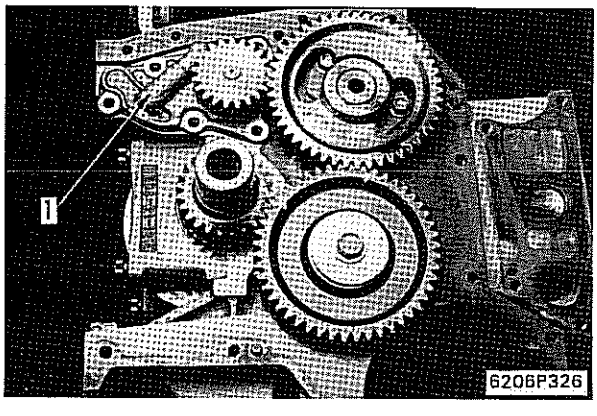
22. Oil pan

Remove oil pan (1).



23. Oil pump

Remove oil pump (1).



5) Tighten mounting bolts of main bearing cap as follows.
   ★ Coat the bolt thread and seat face with engine oil.
   ★ When tightening the mounting bolts of the main bearing cap, start in the middle and work to the outside. Tighten to the following torque.

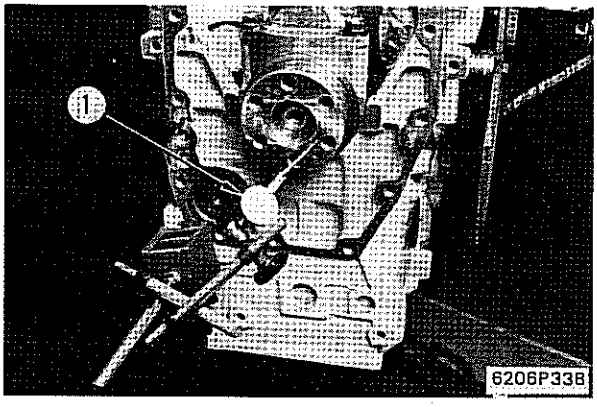
   kgm Mounting bolt of main bearing cap

Unit: kgm

Order	Target	Range
1st step	11.5	11 – 12
2nd step	0	Loosen completely
3rd step	13.5	13 – 14

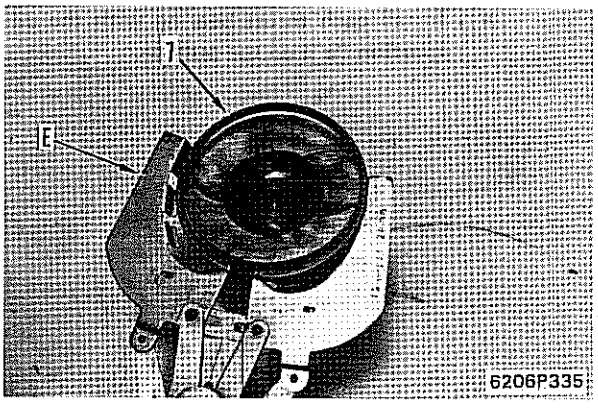
   ★ After tightening the mounting bolts, check that the crankshaft rotates smoothly.

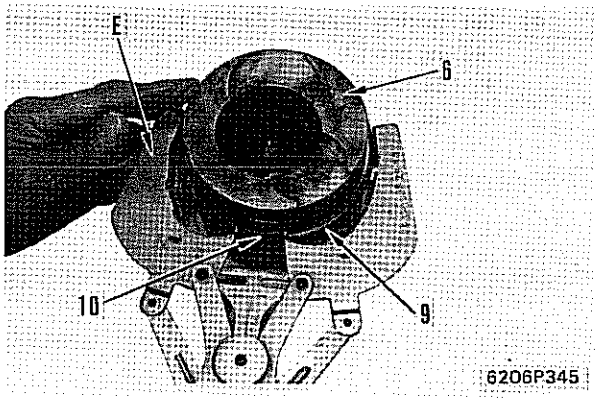
6) Measuring end play of crankshaft
   Put probe of dial gauge ① in contact with end face of crankshaft. Read movement of gauge when crankshaft is moved forward and backward.
   ★ Permissible range of end play: 0.13 – 0.35 mm



5. Piston, connecting rod assembly

1) Assemble piston and connecting rod assembly as follows.
   i) Set piston ring with stamped mark at end gap facing up, then use piston ring tool **E** to assemble piston rings (7) on piston (6).
      ★ Be careful not to damage the piston or break the piston rings.
      ★ Fit expander (10) in the groove on the inside diameter of oil ring (9) before installing. Check that the expander is completely fitted into the ring groove.
      ★ The end gap of the ring should be at 180° to the join of the coil in the expander.



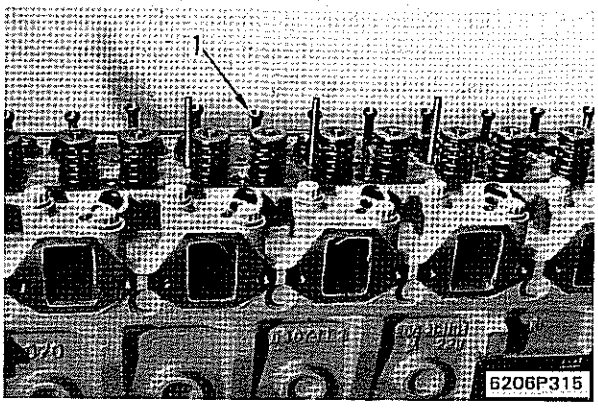


18. Push rods

Insert push rods (1) in tappet guides.

★ The same part is used for the intake and exhaust push rods.

★ If there is no abnormality in the push rod, install in the same position as before disassembly.



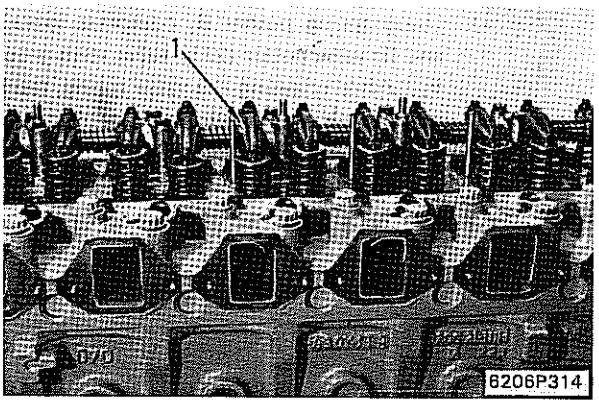
19. Rocker arm assembly

1) Install rocker arm assembly (1).

2) Check that ball of adjustment screw is fitted properly into socket of push rod, then tighten the nuts and bolts uniformly.

kgm Mounting bolt: 2.5 ± 0.5 kgm

★ If the valve spring tension pushes against the rocker arm, loosen the locknut and turn the adjustment screw back 2 to 3 turns to prevent strain on the push rod.



20. Adjusting valve clearance

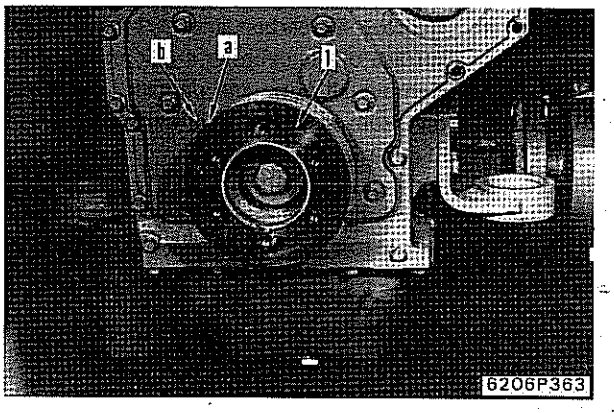
● Adjust clearance between valve and rocker arm as follows.

★ Valve clearance (cold)

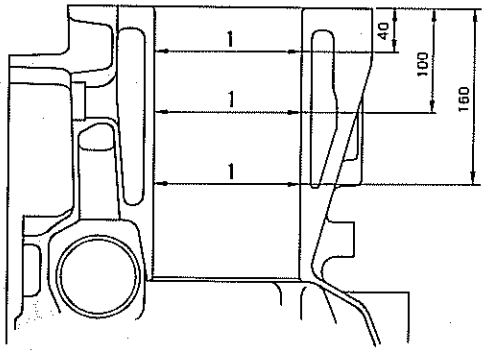
Unit: mm

Intake valve	Exhaust valve
0.35	0.50

1) Rotate the crankshaft in the normal direction to align pointer (b) on the gear case cover with the 1.6 TOP mark (a) on crankshaft pulley (1). When rotating, check the movement of the valves of No. 6 cylinder.



CYLINDER BLOCK



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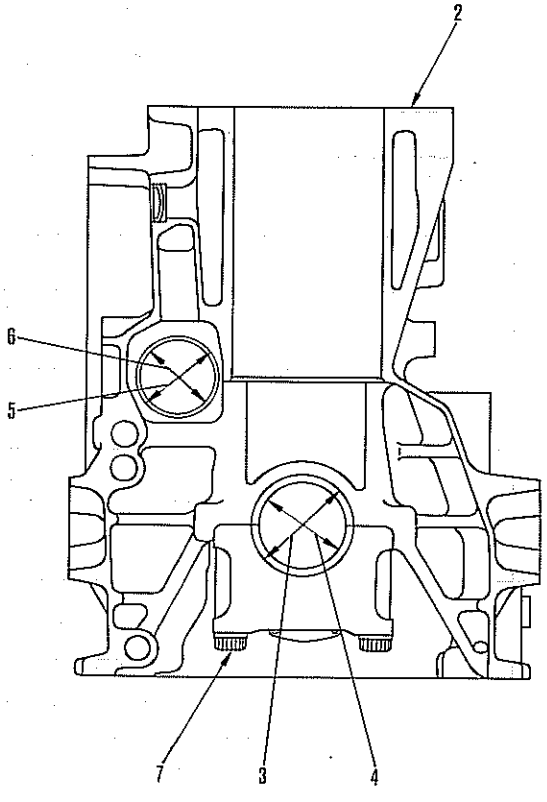

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Unit: mm

No.	Check Item	Criteria				Remedy
1	Inside diameter of cylinder	Piston size	Standard size	Tolerance	Repair limit	Repair by using over size piston, replace cylinder block or insert cylinder liner
		STD	95.00	+0.020 0	95.15	
		0.25 O.S.	95.25		95.40	
		0.50 O.S.	95.50		95.65	
	Roundness of cylinder	Repair limit: 0.02				
	Cylindricity of cylinder	Repair limit: 0.02				