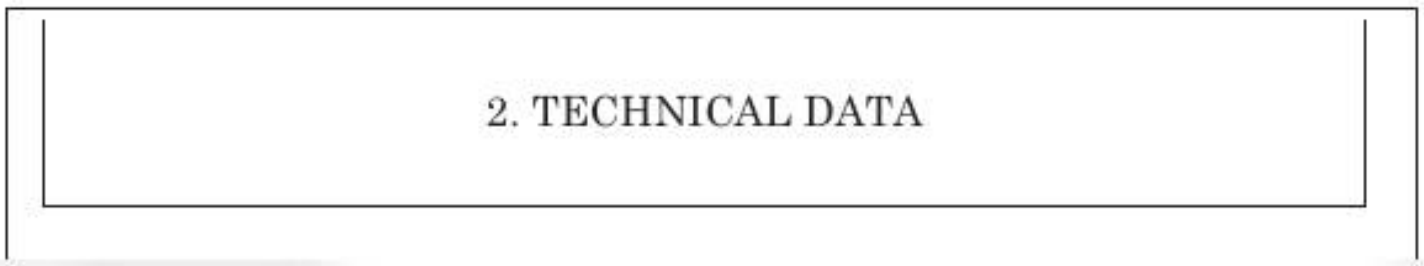
2. TECHNICAL DATA

2-9 Wiring Diagram

- **Reference numbers**

<Example>



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2. TECHNICAL DATA

2-8 Hydraulic Circuit Schematic



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4-2-5 Cylinder Head

2-Valve Cylinder Head

Cylinder Head Components

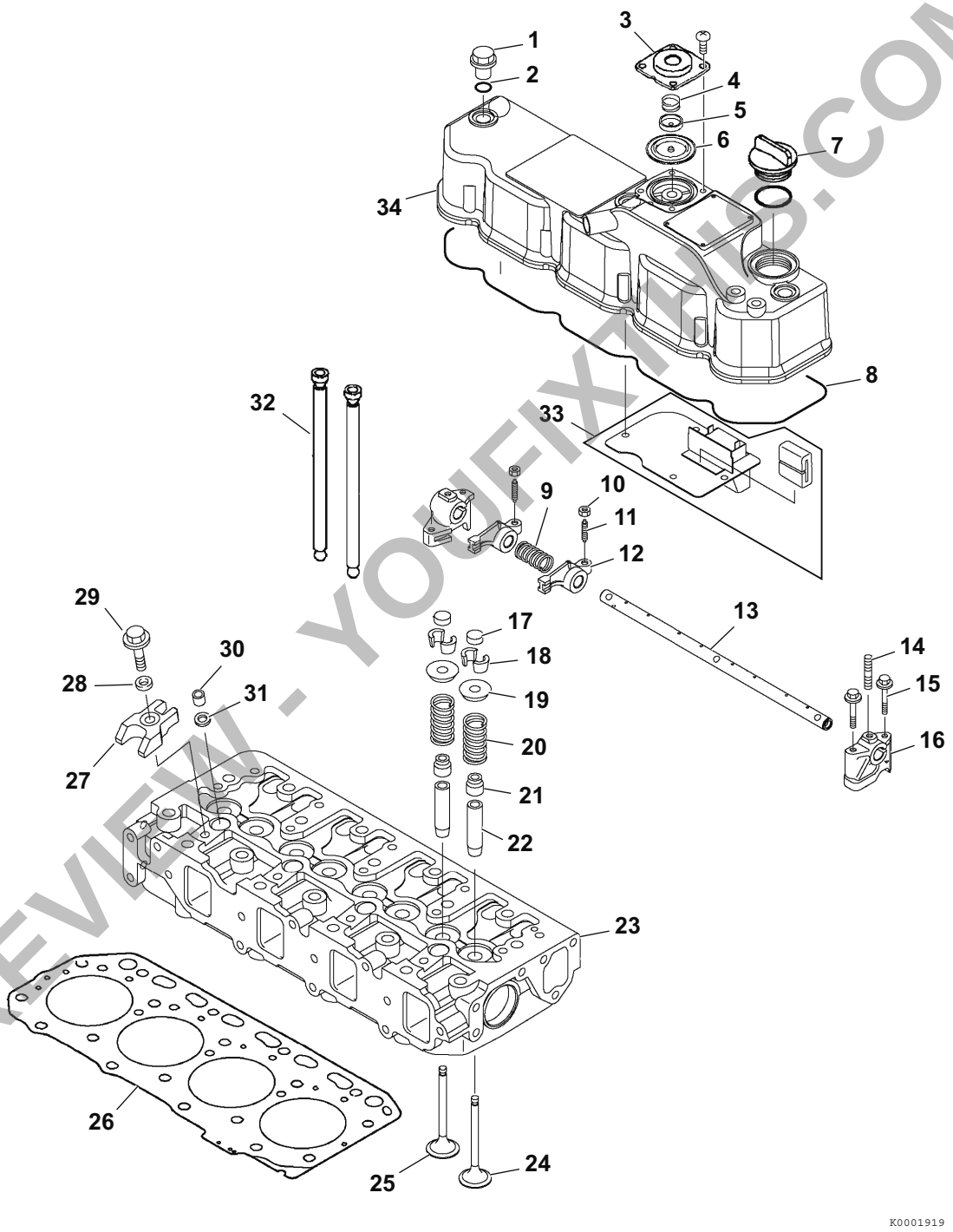


Figure 4-2-1

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3. SERVICE STANDARDS

3-7 List of Tightening Torque

3-7-1 Machine

Applicable model			ViO50-6A		
Equipment			Thread size	Tightening torque N•m	Adhesive
No		Tightening part			
Engine / Electrical equipment					

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■ 2-Valve Cylinder head

1. Remove the valve cover. *See Removal of Valve Cover.*

Note: If adjusting each cylinder individually, the cylinder to be adjusted first does not have to be the No. 1 cylinder. Select and adjust the cylinder where the piston is nearest to the top dead center after turning, and make adjustment for other cylinders in the order of firing by turning the crankshaft.

2. Rotate the crankshaft clockwise as seen from the coolant pump end, to bring No. 1 piston to TDC on the compression stroke while watching the rocker arm motion and timing grid on the flywheel. (Position where both the intake and exhaust valves are closed.)
3. Insert a feeler gauge **(Figure 4-2-77, (1))** between the rocker arm and valve cap, and record the measured valve clearance. (Use the data for estimating the wear.)

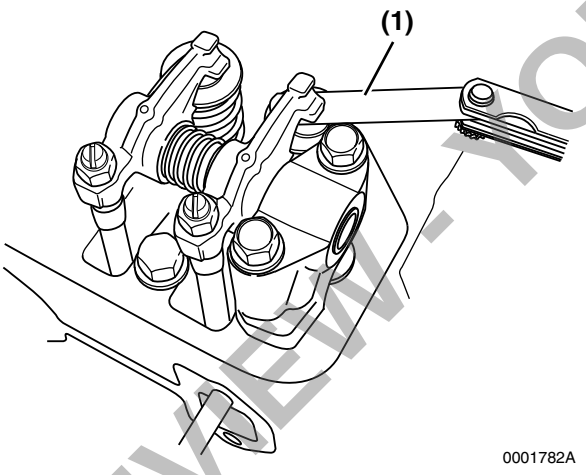


Figure 4-2-77

4. If adjustment is required, proceed to the next step.
5. Loosen the valve adjusting screw lock nut **(Figure 4-2-78, (1))** and valve adjusting screw **(Figure 4-2-78, (2))** on the rocker arm and check the valve for inclination of the valve cap, entrance of dirt, or wear.

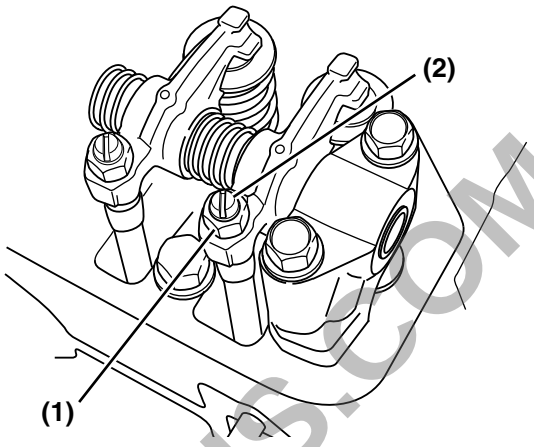


Figure 4-2-78

6. Insert a feeler gauge of the correct thickness **(Figure 4-2-79, (1))** *(see"3-2 Engine Service Standard" section)* between the rocker arm and valve cap. Turn the valve adjustment screw to adjust the valve clearance so there is a slight "drag" on the feeler gauge when sliding it between the rocker arm and the valve cap. Hold the adjusting screw while tightening the valve adjusting screw lock nut **(Figure 4-2-78, (1))**. Recheck the clearance.

Note: There is a tendency for the clearance to decrease slightly when the lock nut is tightened. It is suggested that you make the initial clearance adjustment slightly on the "loose" side before tightening the lock nut.

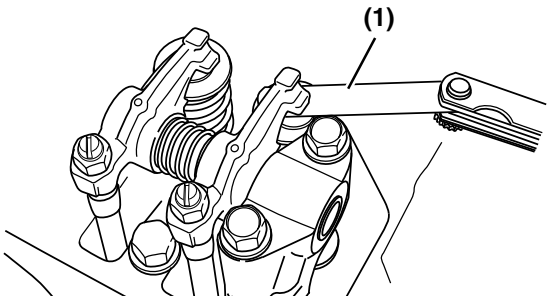


Figure 4-2-79

7. Apply oil to the contact surface between the adjusting screw and push rod.
8. Rotate the crankshaft. Measure and adjust the valves on the next cylinder. Continue until all the valves have been measured and adjusted.

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Disassembly of Cylinder Head

Prepare a clean, flat working surface on a workbench large enough to accommodate the cylinder head assembly. Discard all gaskets, O-rings and seals. Use new gaskets, O-rings and seals on reassembly of the cylinder head.

1. Drain the coolant from the engine into a suitable container.

NOTICE

Identify all parts and their location using an appropriate method. It is important that all parts are returned to the same position during the reassembly process.

2. Disconnect the electrical wire from the intake air heater **(Figure 4-2-3, (1))**.

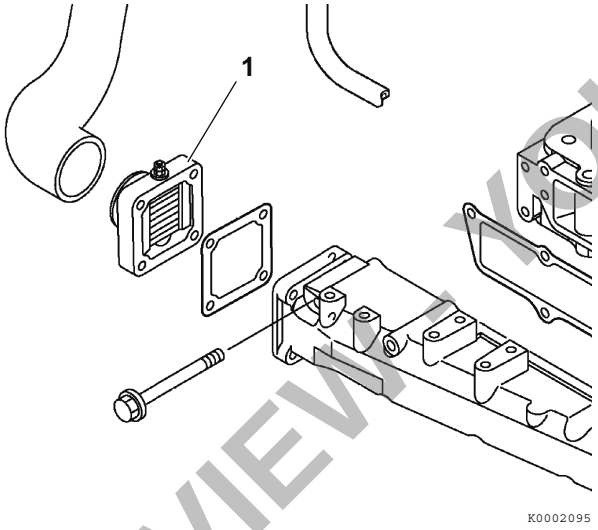


Figure 4-2-3

3. Disconnect the coolant hoses from the cold start device **(Figure 4-2-4, (1))** on the fuel injection pump.

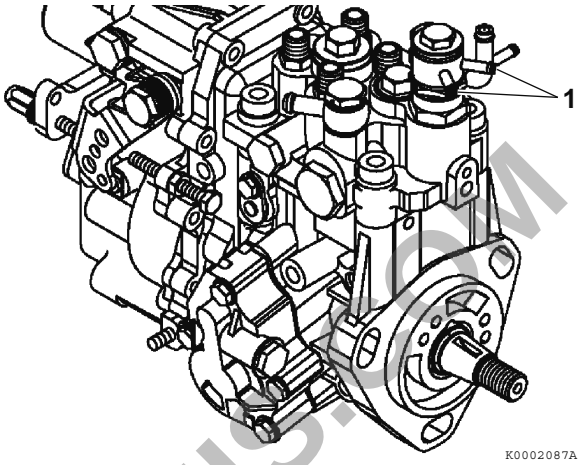


Figure 4-2-4

4. Remove the intake manifold bolts **(Figure 4-2-5, (1))**. Remove the intake manifold **(Figure 4-2-5, (2))**. Discard the intake manifold gasket **(Figure 4-2-5, (3))**.

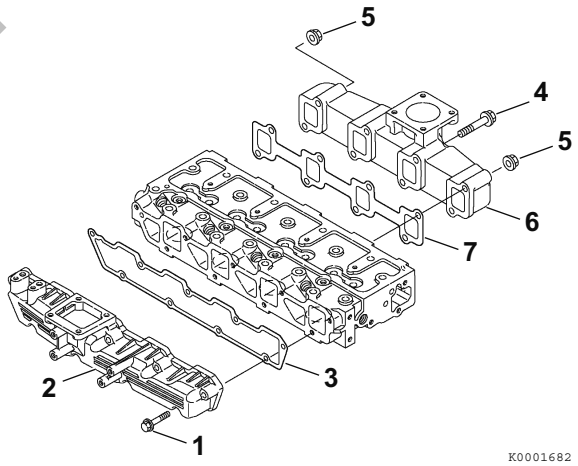


Figure 4-2-5

5. Remove the exhaust manifold bolts **(Figure 4-2-5, (4))** and nuts **(Figure 4-2-5, (5))**. Remove the exhaust manifold **(Figure 4-2-5, (6))** and the exhaust manifold gasket **(Figure 4-2-5, (7))**.
6. Remove the coolant pump. *See Disassembly of Engine Coolant Pump on page 4-4-6.*
7. Remove the high-pressure lines and fuel injectors from the cylinder head. *See Removal of Fuel Injectors on page 4-3-25.*

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1-9 Specifications of Hydraulic Hose

Specifications of the hydraulic hoses can be known by the part descriptions as explained below. (For the parts number, please refer to our Parts Catalog.)

Description	Hose	P	2	06	AB	075	W	—
	1	2	3	4	5	6	7	8

8 Other accessories

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■ Inspection of tappets

1. Inspect the tappet contact surfaces for abnormal wear **(Figure 4-2-119, (1))**. Normal wear will be even as shown in **(Figure 4-2-119, (2)).** Slight surface defects can be corrected using an oilstone.

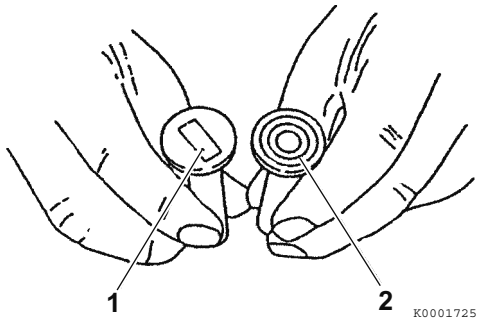


Figure 4-2-119

2. Measure the outside diameter of the tappet stem **(Figure 4-2-120, (1))**. *See "3-2 Engine Service Standard" section for the service limit.*

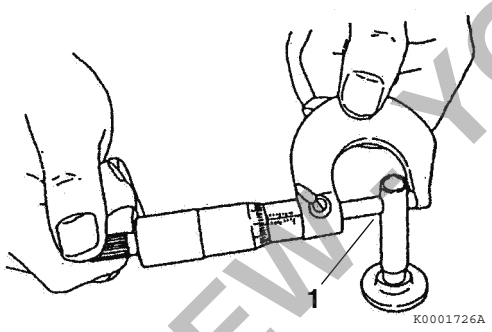


Figure 4-2-120

3. Measure the tappet bores in the cylinder block. *See "3-2 Engine Service Standard" section for the service limit.*

■ Inspection of crankshaft

1. Place the crankshaft end journals **(Figure 4-2-121, (4))** on V-blocks.
2. Place a dial indicator **(Figure 4-2-121, (3))** on a center main bearing surface.

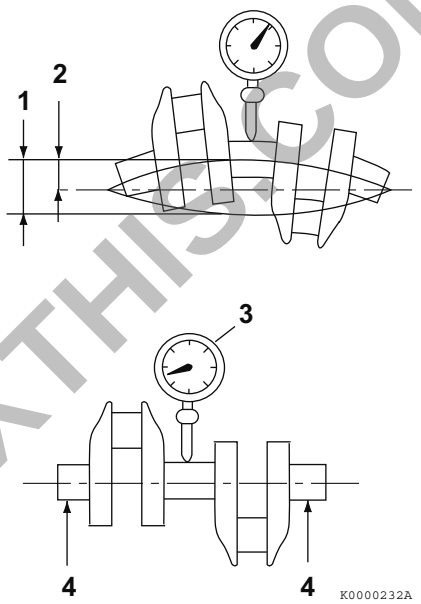


Figure 4-2-121

3. Rotate the crankshaft and observe runout. *See "3-2 Engine Service Standard" section for specifications.*
4. Use the color check method or Magnaflux® to inspect the crankshaft for cracks. Replace the crankshaft if evidence of fractures are found.

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2. TECHNICAL DATA

2. Technical Data

2-1 Specifications

Item	Unit	ViO50-6A
Main specifications of machine		

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2. TECHNICAL DATA

2-7 Fuel, Lube Oil and Grease Recommended

Components	Fluid	Temperatures °C								Quantity prescribed (L)	
		-	-20	-10	0	10	20	30	+		
Thermal engine	Engine oil	[redacted]	SAE 10W CJ-4			[redacted]					
		[redacted]	SAE 10W-30 CJ-4							7,4	
[redacted]	[redacted]	[redacted]									
[redacted]	[redacted]	[redacted]									
[redacted]	[redacted]	[redacted]									

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2-6 Periodic Inspection and Servicing

○: Verification and adjustment ●: Replacement □: Cleaning ■: Greasing

Parts & Operations		Daily	Every 50h	Every 500h	Every 1000h / Every year	Every 2000h / Every two years
General	Missing or broken parts	○				
	Tightening of nuts and bolts	○				
	engine and battery in good condition	○				
	Machine	□				
Transmissions	Travel gears		● 1st time	○	●	
Hydraulic circuit	Hydraulic oil	○			●	
	Aspiration filter				□	
	Hydraulic oil return filter		● 1st time	●		
	Control filters				●	
	Operation of the accumulator	○				
Greasing	Greasing points	■				
	Rotation pin and crown		■			
Chassis	Bearing rollers and bearings, idler wheels	○			■	
	Track tension	○				
Electrical equipment	Headlights, horn, travel alarm	○				
	Dashboard and indicators	○				
	System state	○				
Engine	Water separator	○				
	GO filter			●		
	Air filter (dusty atmosphere every 250 h)			●		
	Engine oil	○	● 1st time	●[8]		
	Oil filter		● 1st time	●[8]		
	Cooling fluid	○				●
	Belt	○			●	
	Radiator vents	○		□		
	Fuel hose, coolant hose					●
	Intake and exhaust valves				○	
	Injectors and injection pressure					○
	Air conditioning				○	

8. Every 500h / Every year

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3. SERVICE STANDARDS

3-4 Controls

Applicable model		ViO50-6A		
Item	Measuring conditions	Unit	Standard	Allowable limit
Controls				
Operating force				
Right control lever	• Engine : stopped		12.8	17.7

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CHAPTER 3

SERVICE STANDARDS

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CHAPTER 1

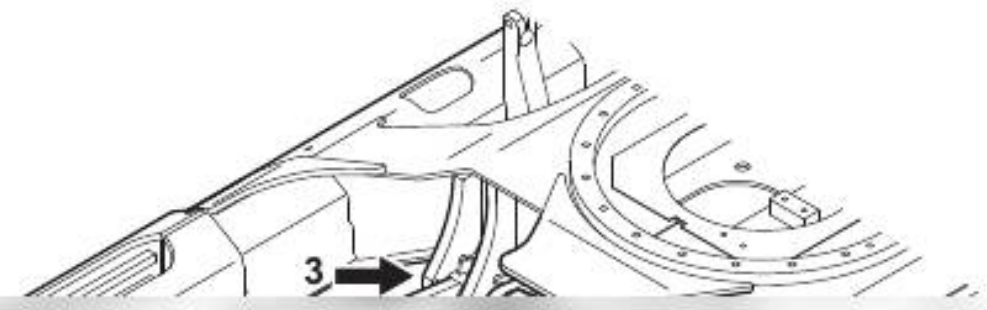
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3-6-2 Blade Moving Device



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4-2-7 Crankshaft and Camshaft Components

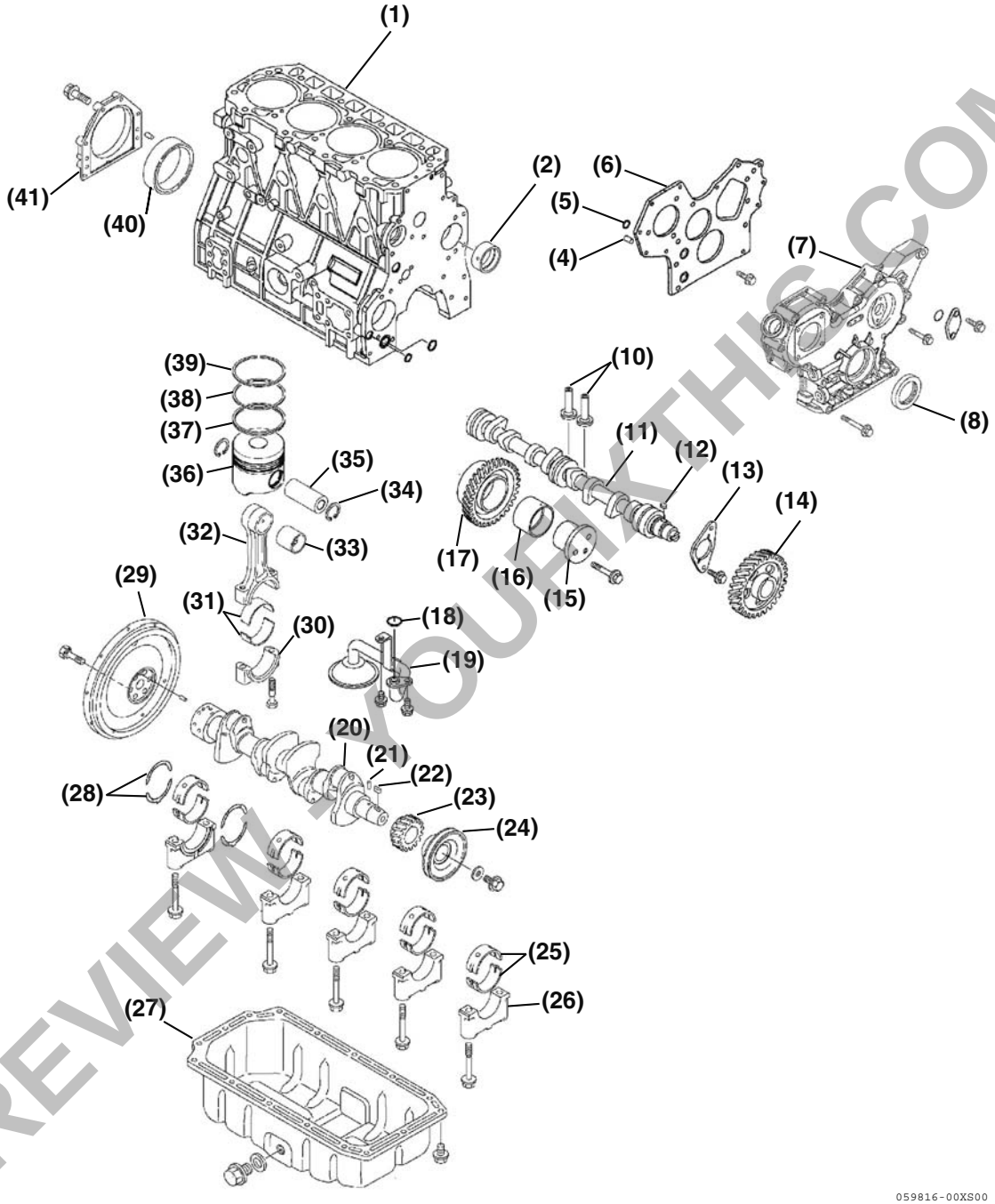


Figure 4-2-87

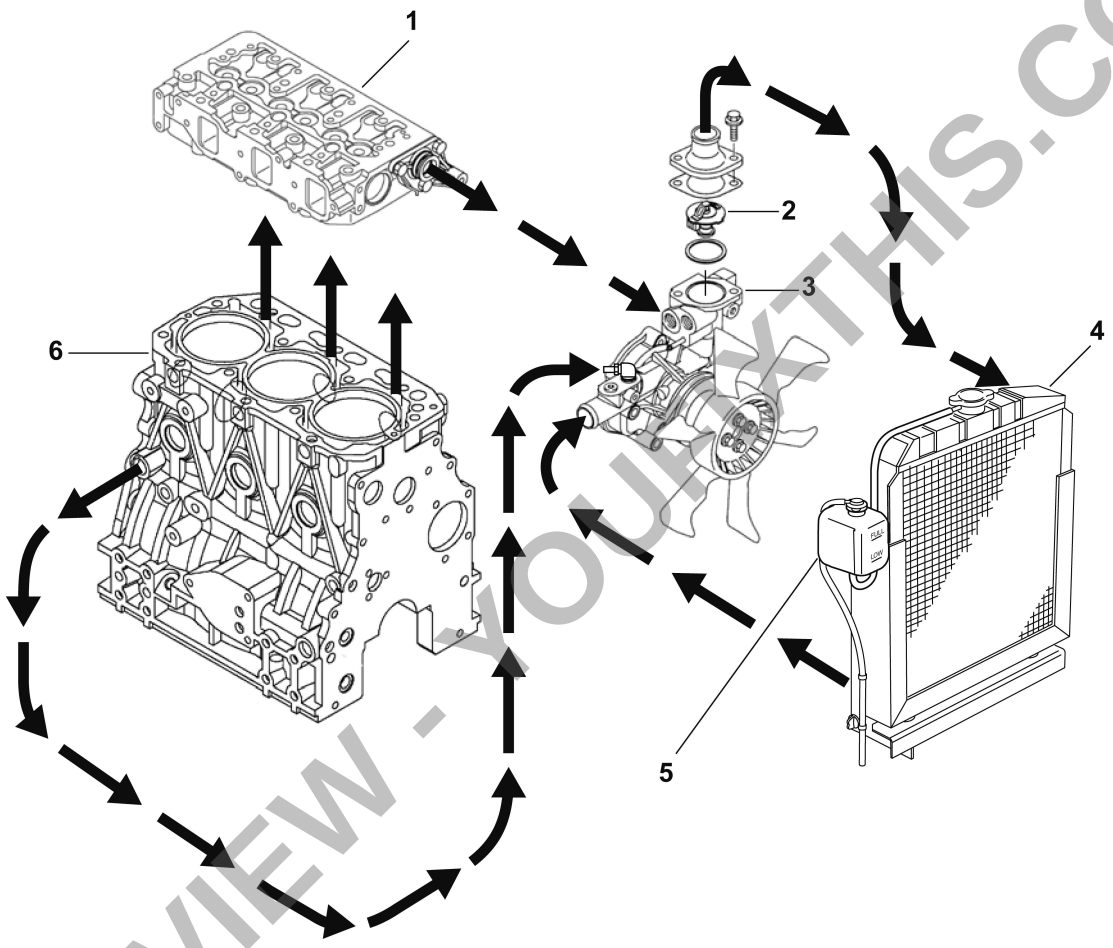
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4-4-2 Introduction

This section of the Service Manual describes the procedures necessary to service an engine coolant pump. This engine coolant pump is representative of the coolant pumps used on other TNV model engines. For specific part detail, see the parts catalog for the engine you are working on.

4-4-3 Cooling System Diagram



1 – Cylinder head
2 – Thermostat
3 – Engine coolant pump
4 – Radiator
5 – Coolant recovery tank
6 – Cylinder block

Figure 4-4-1

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CHAPTER 5

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6-2-8 Non-Deviation Travel (with Boom, Arm or Boom Swing Operation)

Oil Flow from Hydraulic Pump

1) Travel Section

The oil from the piston pump P1 and that from the piston pump P2 flow through the ports P1 and P2 of the inlet section to the right and left travel sections, respectively. The right and left travel sections are each connected in series in their respective section groups and located the most upstream in the circuits of the piston pumps P1 and P2, respectively. Therefore, all of the oil from each piston pump flows to the travel motor when the travel lever is operated.

2) Boom Section

The oil from the gear pump P3 flows through the parallel-flow divider and the parallel passage to the boom section. Therefore, the machine can travel with no deviation even when the boom control lever is moved while the machine is traveling.

3) Arm Section

The oil from the gear pump P3 flows through the parallel-flow divider, blade and swing sections and the parallel passage to the arm section. Therefore, the machine can travel with no deviation even when the arm control lever is moved while the machine is traveling.

4) Boom Swing Section

All the oil in the circuit of the piston pump P2 is supplied to the travel section in the most upstream for the pump P2, and the boom swing section in the downstream is supplied with no oil. None of the oil from the gear pump P3 is supplied to the boom swing section, either, so that the boom does not swing while the machine is traveling.

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3. Operation of Directional Control Valves

1) Travel Operation

When the left [right] control lever is pushed forward, the spool is pulled up. The oil from the port P2 [P1] flows to the by-pass passage of the left [right] travel spool through the inlet spool land.

The oil in the by-pass passage of the left [right] travel spool flows to the port A6 [A7], which is opened as the spool has been moved, and is fed to the travel motor.

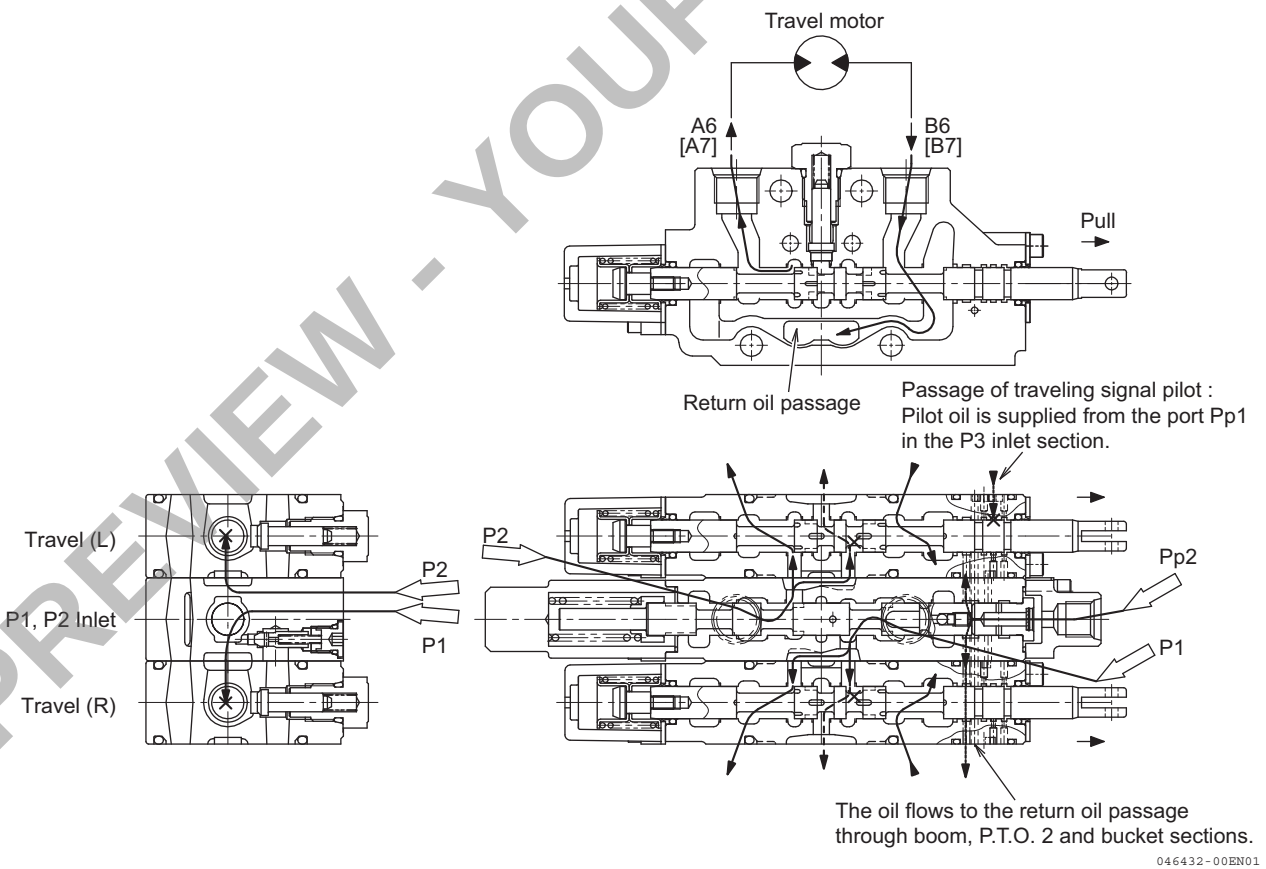
Meanwhile, the return oil from the travel motor flows into the control valve through the port B6 [B7] and flows to the return passage, which is opened as the spool has been moved.

The oil from the port Pp2 flows to the passage of traveling signal pilot through the orifice of the piston in the P1 and P2 inlet section.

The passage opened when the travel section spool is in the neutral position is blocked by its movement, but as long as the bucket section spool is not moved, the pressure in the passage of traveling signal pilot equals to that in the return oil passage because both the passages are connected in the bucket section and the P1, P2 inlet section spool does not move.

Note :

The words in brackets are for the right travel operation.

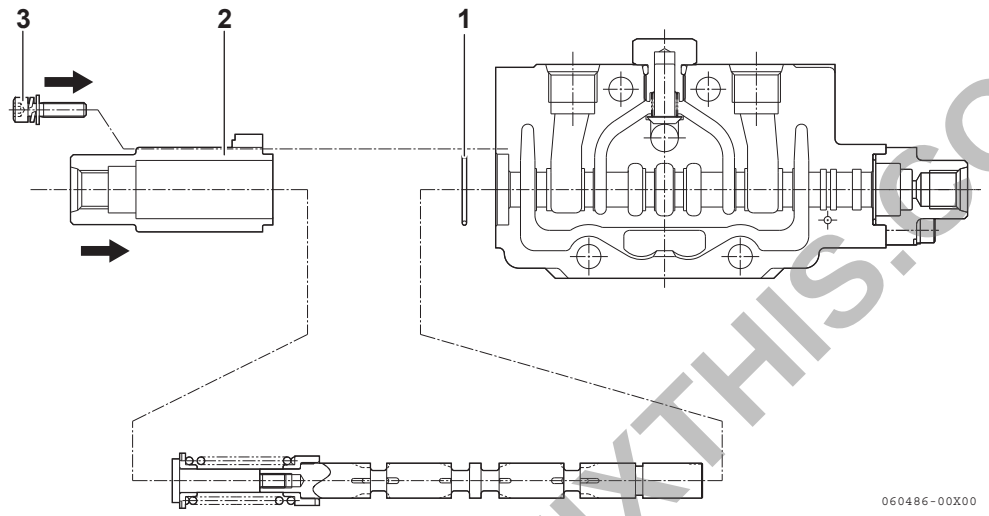


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4)-5. Reassembly of spools

(1) Pilot operated type

Taking the swing spool as an example, the assembly procedure is described below.



Pilot operated type

[1] Check that no dirt or any other foreign matter is attached to the spool assembly or around the spool bore of the valve body and that O-ring 1 is securely installed on the flanged bottom of the valve body. Then insert the spool assembly into the spool bore of the valve body in the correct position and direction.

Note:

Before inserting the spool assembly, apply a small amount of hydraulic oil to the spool.

CAUTION:

Carefully insert the spool assembly horizontally into the bore.

If the spool assembly is not inserted easily, do not force it into the bore. Doing so may cause dents inside the bore or on the spool, resulting in malfunction of the machine.

If the spool assembly is not installed into the bore smoothly, do not forcibly insert it. Remove it and check it for dirt, flaws and burrs.

If there are any flaws or burrs, be sure to replace the spool assembly together with the valve body to avoid malfunctions.

Note:

Even if the spool assembly is inserted smoothly, take it in and out several times to check again that it moves smoothly.

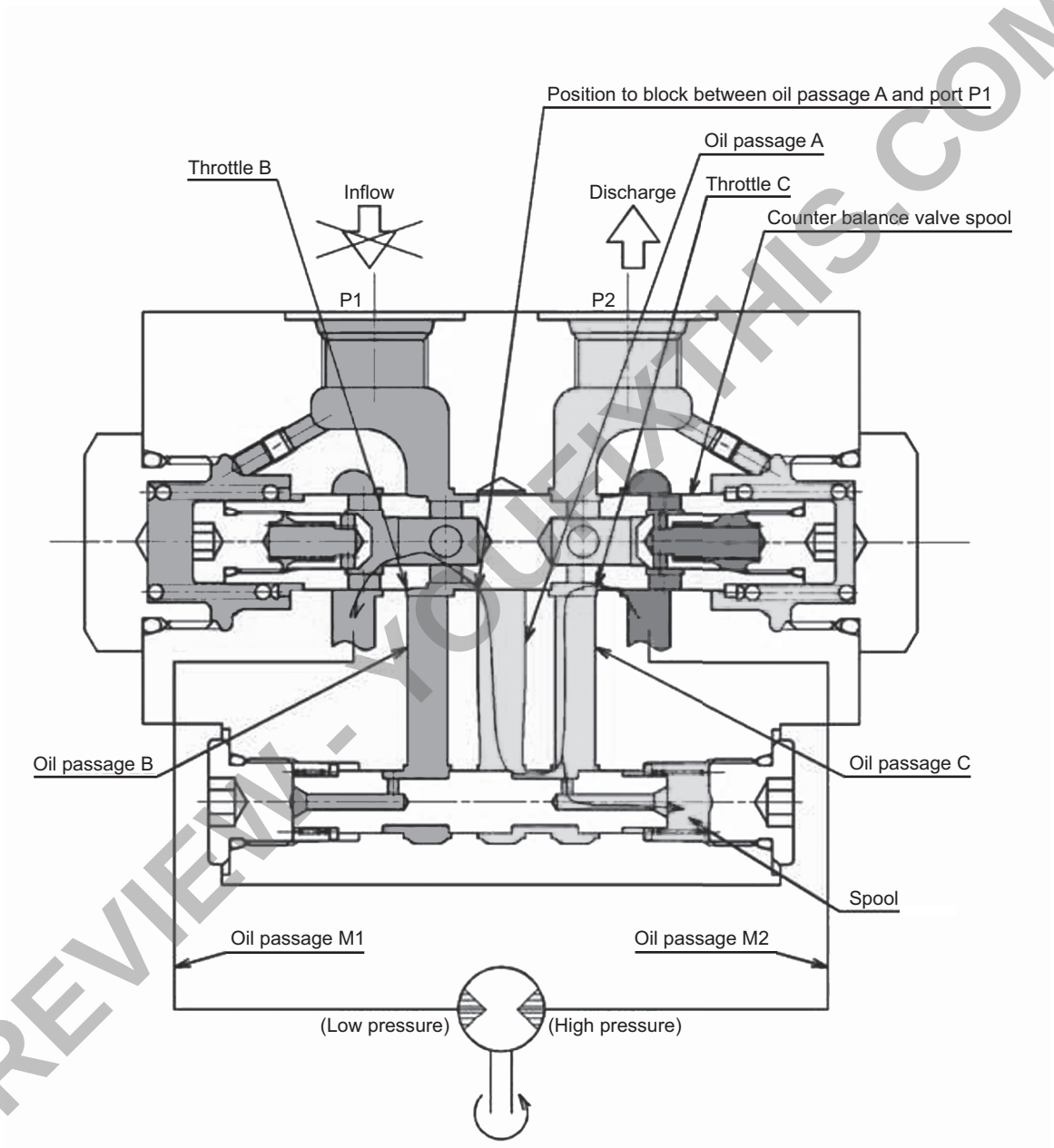
[2] Install pilot oil chamber case **2** so that it fits securely onto the flange portion of the valve body from which the spring of the spool assembly is protruding. Then install and tighten hexagon socket head bolts (w/washer) **3** to the specified torque with a hexagon bar wrench (4 mm).

[3] To assemble other spools of the same pilot operated type, follow the same procedure as above.

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(4) In Motor Speed Reduction → Stop

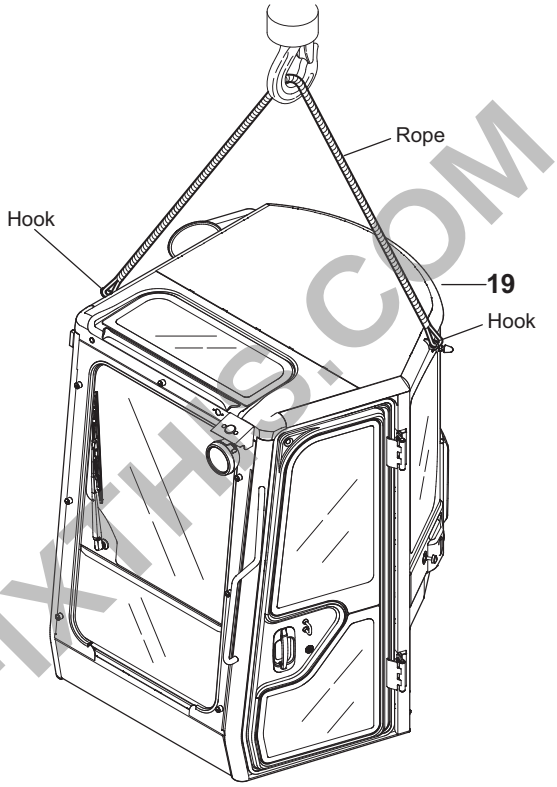
The anti-cavitation mechanism works until the oil flow from the passage A to the P1 port is blocked at the point shown in the figure below.

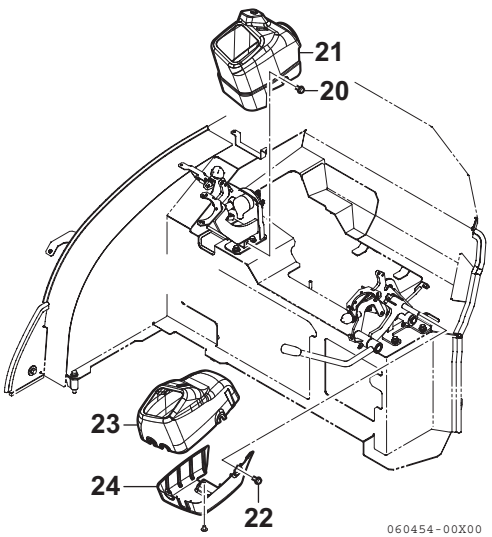


Anti-cavitation valve (in stop)

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Procedure	
(15) Remove the cabin **19** by following the procedure at Section "7-7-1 Removal and Reinstallation of Cabin".	

(16) Remove two bolts **20** and lever R cover **21**. (17) Remove three bolts **22** to remove lever cover L (top) **23** and lever cover L (bottom) **24**.	

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2) Reinstallation

Reinstall the control valve in the reverse order to the removal procedure.

Hydraulic pump mounting bolt (M12)	
Tightening torque	32.5 to 43.4 ft·lbf (44.1 to 58.8.1 N·m)

Notes :

- *Be careful not to contact the hoses with other hoses when reinstalling the hoses.*

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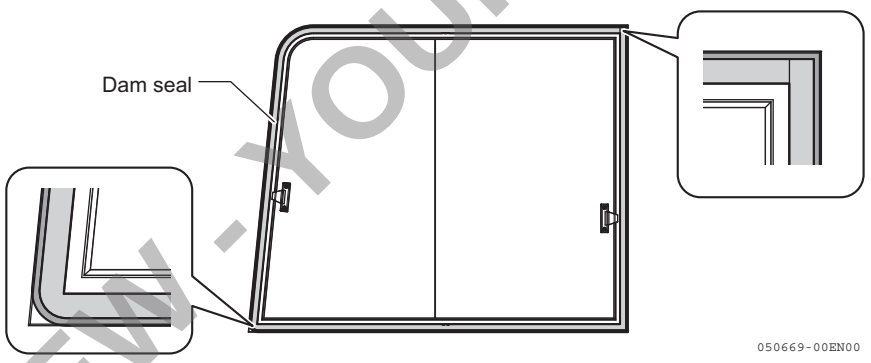
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3. Attachment of glass (Right sash)

1) Installation of dam seal and application of primer

Key points for procedure

- Clean the surface where the dam seal is to be installed using white gasoline to remove grease and foreign matter such as dust.
- Join both ends of the dam seal in the rear upper corner. (See the enlarged view shown to the right of the figure below.)
- Install the dam seal on the sash along the outer edge.
- During installation of the dam seal, be careful not to touch the sash surface where the primer is to be applied to prevent contamination.
- Do not stretch the dam seal too much during installation because it can become loose over time and come off easily.
- Use SUNSTAR Paint Primer 435-95.
- Apply the primer to the surface of the sash along the dam seal with a cotton swab or the like. The primer applica-tion width should be approximately 10 mm but the primer may be applied to the entire area where adhesive is to be applied.
- Be careful that the primer does not protrude outside the application area and that excess primer does not drip off.



2) Application of primer to the area where the sash is to be attached

Key points for installation

- Protect the area around the area where the primer is to be applied with paper tape.
- Clean the surface where the primer is to be applied using white gasoline to remove grease and foreign matter such as dust and secure the protective paper tape well by pressing it.
- Use SUNSTAR Paint Primer 435-95.
- Apply the primer to the surface of the cabin frame along the protective paper tape with a cotton swab or the like.
- Be careful that the primer does not protrude outside the application area and that excess primer does not drip off.

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