5. Hydraulic Circuits

The hydraulic pump, directional control valve, and pressure control valve are required to operate this motor. This motor is exclusive for open circuit. Figure 2 shows the basic hydraulic circuits. Other items of equipment are connected as necessary to make up the hydraulic circuits. Should you have any questions or require further information about the hydraulic circuits, contact us at the address shown in Section 1.

Important Be sure to observe the instructions of Items 1 - 7 below. Failure to observe the instructions will degrade the performance of the motor. Also, damage or malfunction of the equipment may result.

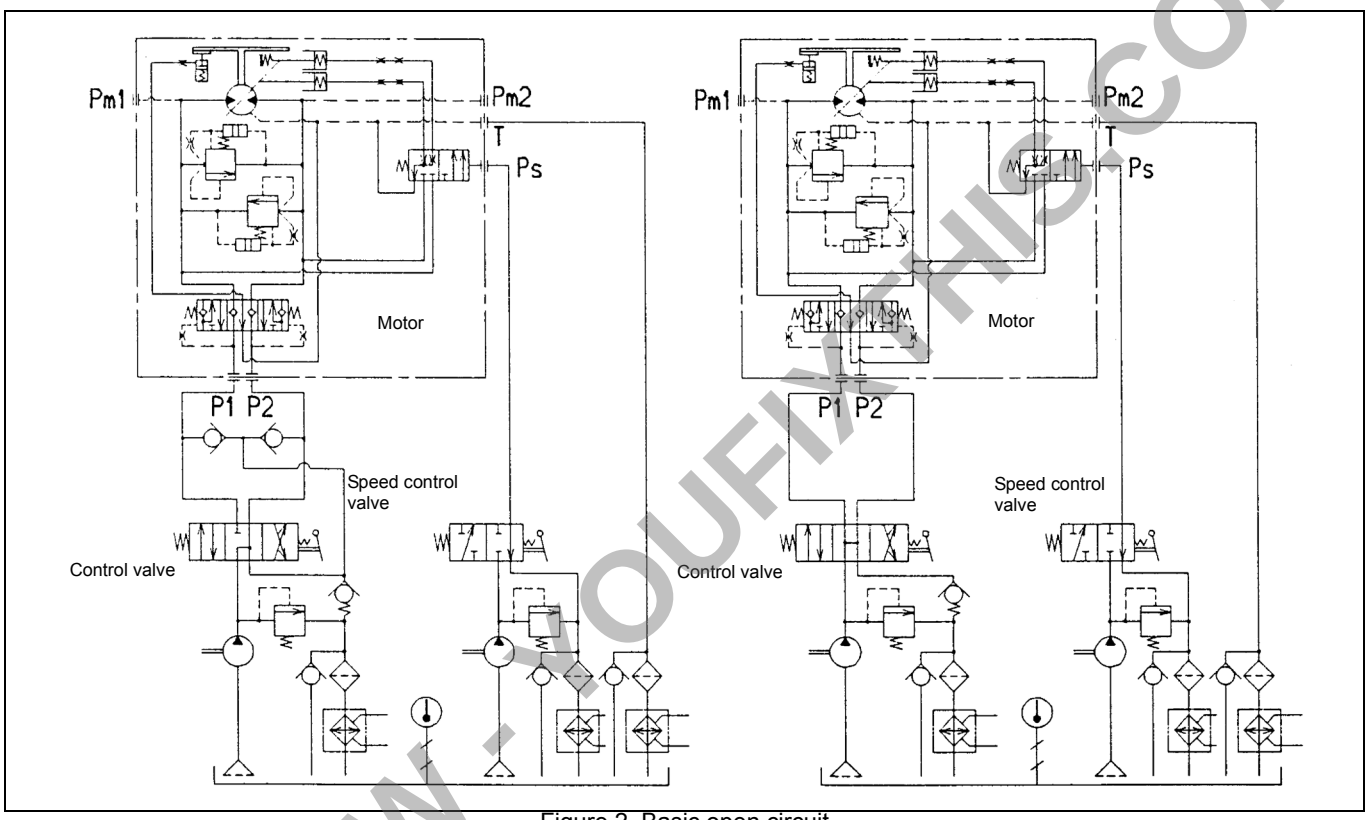
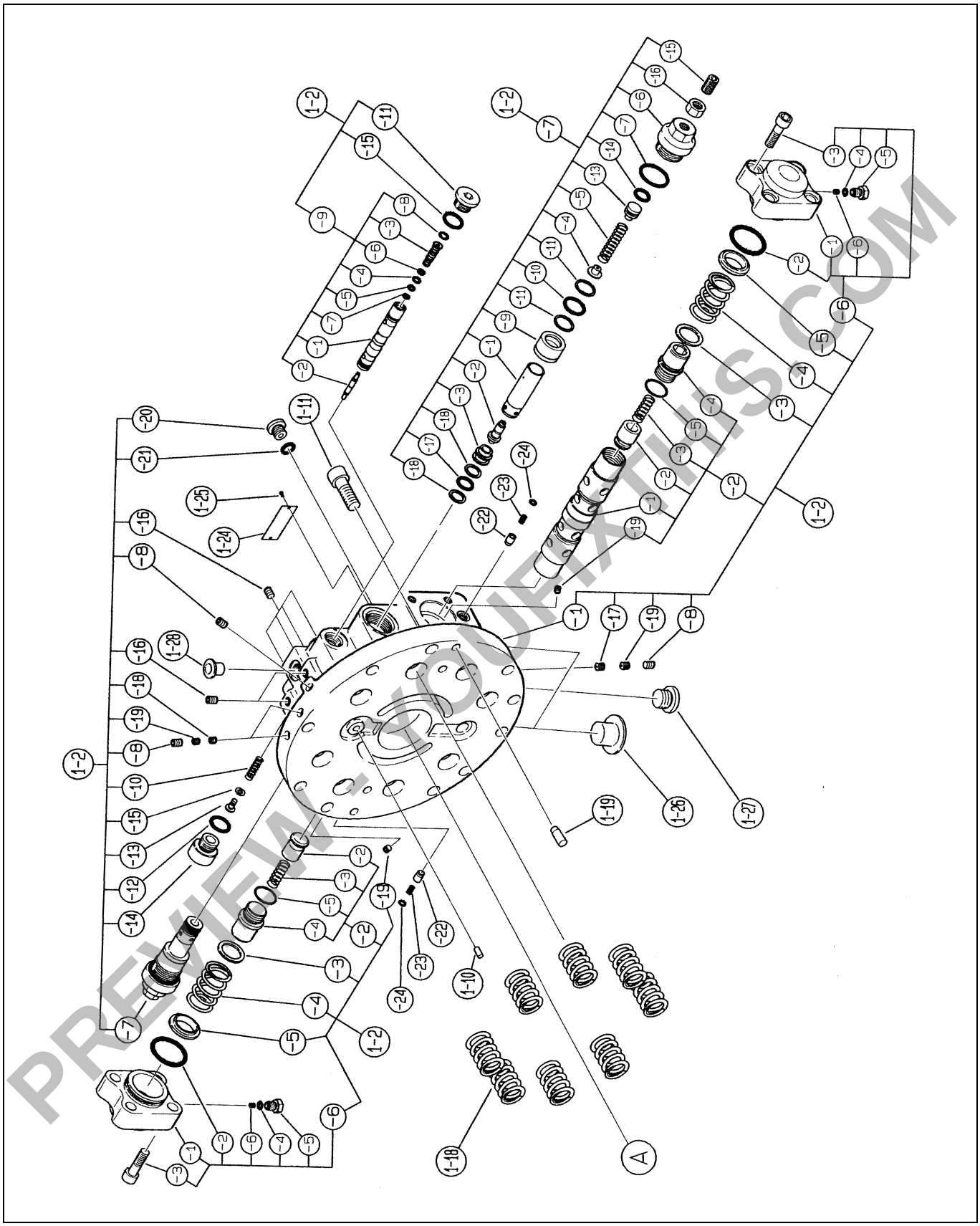


Figure 2. Basic open circuit

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

5-2 Lower Mechanism: Travel Drive Unit



PREVIEW: YOUFIXTHIS.COM

Download full manual at youfixthis.com

[2] Tightening torque

Table 4 shows tightening torques for respective joint sections.

Table 4. Tightening Torques

Reference Number	Part Name	Screw Dimensions	Width across Flat	Tightening Torque
1-2-2-4	Plug	M24 × 1.5	14	137±10 N•m
1-2-6-3	Socket head bolt	M12 × 1.75 × 40L	10	108±10 N•m
1-2-6-5	Plug	PF1/8	14	20.6±1.0 N•m
1-2-6-6	Orifice	M5 × 0.8 × 5L	2.5	2.45±0.49 N•m
1-2-7	Relief valve assembly	1-5/6 12UNF	27	373±20 N•m
1-2-8	Plug	NPTFR1/16	4	9.8±1.0 N•m
1-2-11	Plug	PF1/2	10	118±6 N•m
1-2-14	Plug	PF1/2	10	118±6 N•m
1-2-17	Orifice	M5 × 0.8 × 5L	2.5	2.45±0.49 N•m
1-2-18	Orifice	M5 × 0.8 × 5L	2.5	2.45±0.49 N•m
1-2-19	Orifice	M5 × 0.8 × 5L	2.5	2.45±0.49 N•m
1-2-20	Plug	PF1/4	6	36.8±2.5 N•m
1-11	Socket head bolt	M14 × 2.0 × 35L	12	205±10 N•m
8	Bolt	M20 × 2.0 × 70L	Torques: T90	539±28 N•m
14	Bolt	M20 × 2.0 × 130L	Torques: T90	539±28 N•m
24	Screw	M10 × 1.5	Torques: T50	58.8±4.9 N•m
28	Socket head bolt	M10 × 1.5 × 16L	8	73.4±3.63 N•m
29	Plugs	PF3/4	12	157±8 N•m

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

2-2 Engine: Procedures for Replacing Consumable Parts

1 Engine Oil

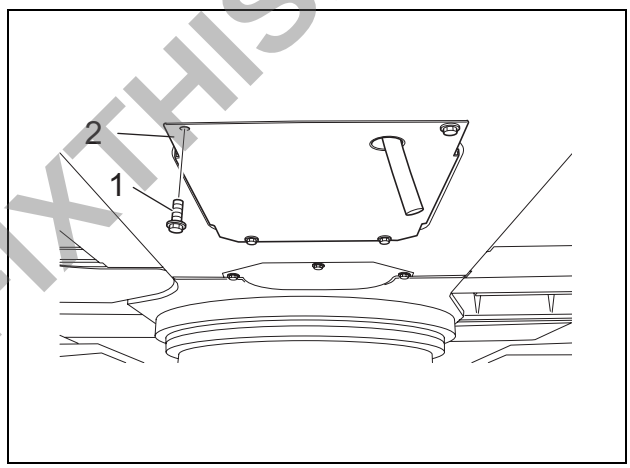
Warning	• Keep away from fire.

Caution	• Be sure to stop the engine before beginning work.

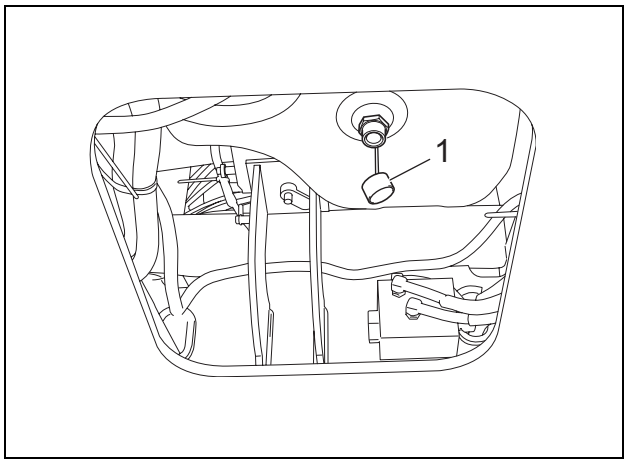
Items to prepare

- Wrench (19 mm)
- Specialized plug
- Waste oil can
- Rags
- Cleaning fluid

[1] Remove 4 mounting bolts (1) using a 19-mm wrench, and remove the under cover (2).



[2] Remove the drain plug (1).



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

15. Troubleshooting

If any kind of trouble occurs during a motor running, use the following troubleshooting information to investigate it and take countermeasure actions for it.

[1] Troubleshooting for piston motor

Trouble Description	Possible Cause	Countermeasure and Solution
Motor does not rotate.	Malfunction has occurred with equipment other than the piston motor and the reduction gear.	Check whether pressure has reached to the intake side of the motor and then inspect and repair the motor by identifying the causes of problems and countermeasures for it for each piece of equipment.
	The motor itself has a problem and the operation section is clogged up with dirt causing malfunction.	Disassemble and clean the unit to remove dirt and re-assemble it. If any part has been damaged by dirt, replace it.
	Pressure on the intake side of the motor is low.	Use the main relief of the circuit to rise the set pressure.
	The sliding section of the piston motor has abnormally worn and the pressurized oil is escaping.	Disassemble the unit to replace the abnormally worn part. Remove any scratches or burr on the surface, clean the part, and re-assemble the unit.
	The main part of the piston motor is damaged. In this case, abnormal noise comes from the piston motor.	Disassemble the unit to replace the damaged part. Clean the part, and re-assemble the unit.
	Too much load on the piston motor causes the relief valve to operate.	Investigate the load condition and adjust the load to the set pressure of the relief valve.
The rotation speed of the motor is not enough.	Due to a problem with hydraulic pump, the pressure control valve, the flow control valve, or other parts, the specified amount of flow does not enter into the piston motor, resulting in the insufficient rotation speed.	Check whether the specified amount of flow providos into the piston motor and then inspect and repair the motor by identifying the causes of problems and countermeasures for it for each piece of equipment.
	Wear of the sliding section of the piston motor causes the pressurized oil to flow from high-pressure side to low-pressure side (reduce volume efficiency), resulting in the insufficient rotation speed.	Disassemble the piston motor to check the wear state of the sliding section and repair or replace it by following the maintenance procedures.
	A loosened tightening bolt on the base plate of the piston motor increases internal leakage and results in the insufficient rotation speed.	Retighten the tightening bolt on the base plate to the specified torque.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

4. Motor Specifications

[1] Specifications

Table 1 shows specifications of the motor.

Table 1. Motor Specifications

Equivalent capacity			cm^3/rev	q × i
Motor capacity q	High capacity	q_1	cm^3/rev	129.3 to 181.3
	Low capacity	q_2	cm^3/rev	q_1 × 0.5 or more
Reduction ratio		i		43.246, (50.579)
2nd-speed pilot pressure	Low speed to high speed		MPa	1.5 or more
	High speed to low speed		MPa	0.4 or less
Parking brake			N•m	581 × i
Operating flow			L/min.	270 or less
Operating pressure			MPa	34.3 or less
Surge pressure			MPa	44.1 or less
Number of times operated when the pressure is greater than 34.3 MPa or less than 44.1 MPa			Times	1.20M or less
Rotation speed	Motor shaft	High capacity	rpm	
		Low capacity	rpm	2500 or less
	Reduction gear	High capacity	rpm	
		Low capacity	rpm	60 or less
Output torque			kN•m	37.3 or less
Input horsepower	Normal use		PS	
	Max.		PS	210 or less (30 or less consecutive seconds)
Drain pressure	Normal use		MPa	0.2 or less
	Moment max.		MPa	0.5 or less (0.3M pulse or less)
Mass			kg	250

Important Set the operating conditions within the above specifications. Use beyond the specified range will shorten the motor life.

Table 1 shows general specifications of the motor. Refer to the external shape diagrams at the end of the book for the specifications of individual models.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

14. Maintenance and Inspection

Perform maintenance and inspection of the motor regarding the following items, as long as the motor has no problem in operation.

[1] Pre-operation Inspection

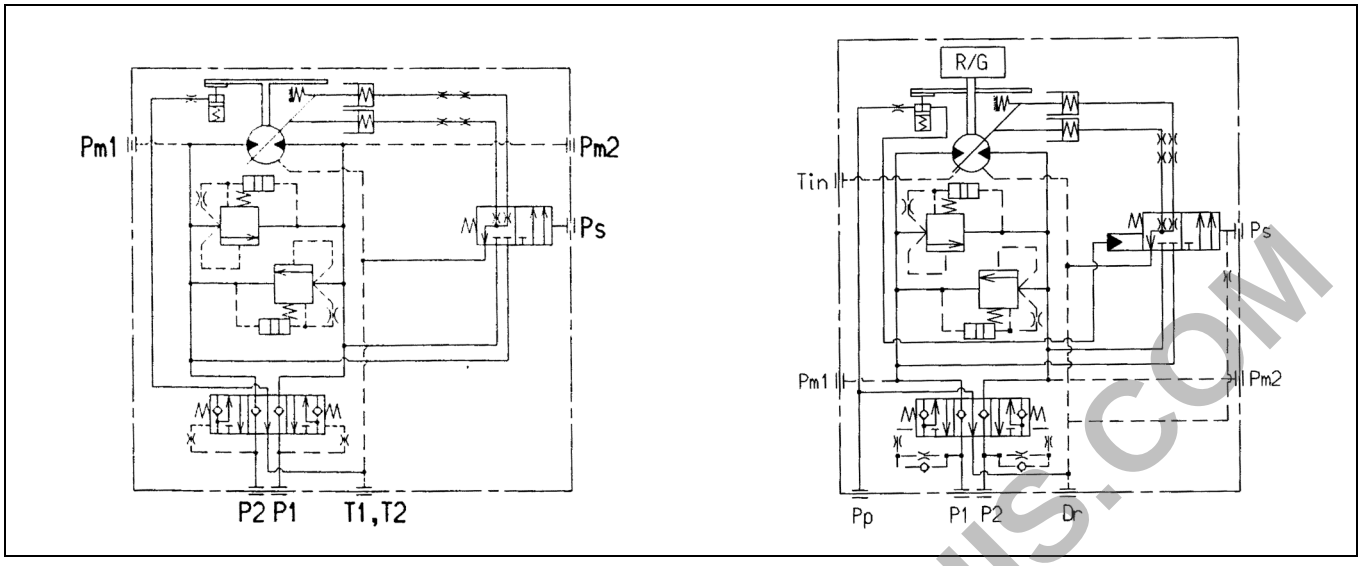
Perform a pre-operation inspection before starting the motor by using the information in Figure 30 and Table 17.

Table 17. Items and Tasks of a Pre-operation Inspection and Solutions

Inspection Item	Inspection Task	Solution
Oil leak from pipe parts	Clean the pipe port section and check for oil leak from the section.	If there is oil leaking, check to see whether the pipe ports have been tightened. If they have not been sufficiently tightened, tighten the pipe ports to the specified torque. In addition, check the oil amount in the hydraulic oil tank by following the instructions for the machine main unit. If the pipe ports are tightened enough, replace the pipe connections by following the instructions for the machine main unit.
Oil leak from alignment surface	1. Piston motor Clean the alignment surfaces of the piston motor (see Figure 24) and check for oil leak.	If there is oil leaking, check to see whether the bolts on the alignment surfaces are tightened. If the tightening is not enough, tighten bolts to the specified torque. In addition, check the amount of oil in the hydraulic oil tank by following the instructions for the machine main unit. If the bolts are tightened enough, disassemble the motor and replace the seal by following the maintenance procedures.
	2. Reduction gear Clean the alignment surfaces of the reduction gear (see Figure 24) and check for oil leak.	If there is oil leaking from the cover, remove the cover and apply liquid packing again by following the maintenance procedures. If there is oil leaking from the other parts, check the tightening for the parts. If the tightening is not enough, tighten them to the specified torque. If they are tightened enough, replace the seal. Check the amount of the lubricating oil in the reduction gear.
Leak of reduction gear lubricating oil	Clean the reduction gear floating seal section and check for oil leak.	If there is oil leak from the floating seal section, disassemble the reduction gear and replace the floating seal by following the maintenance procedures.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



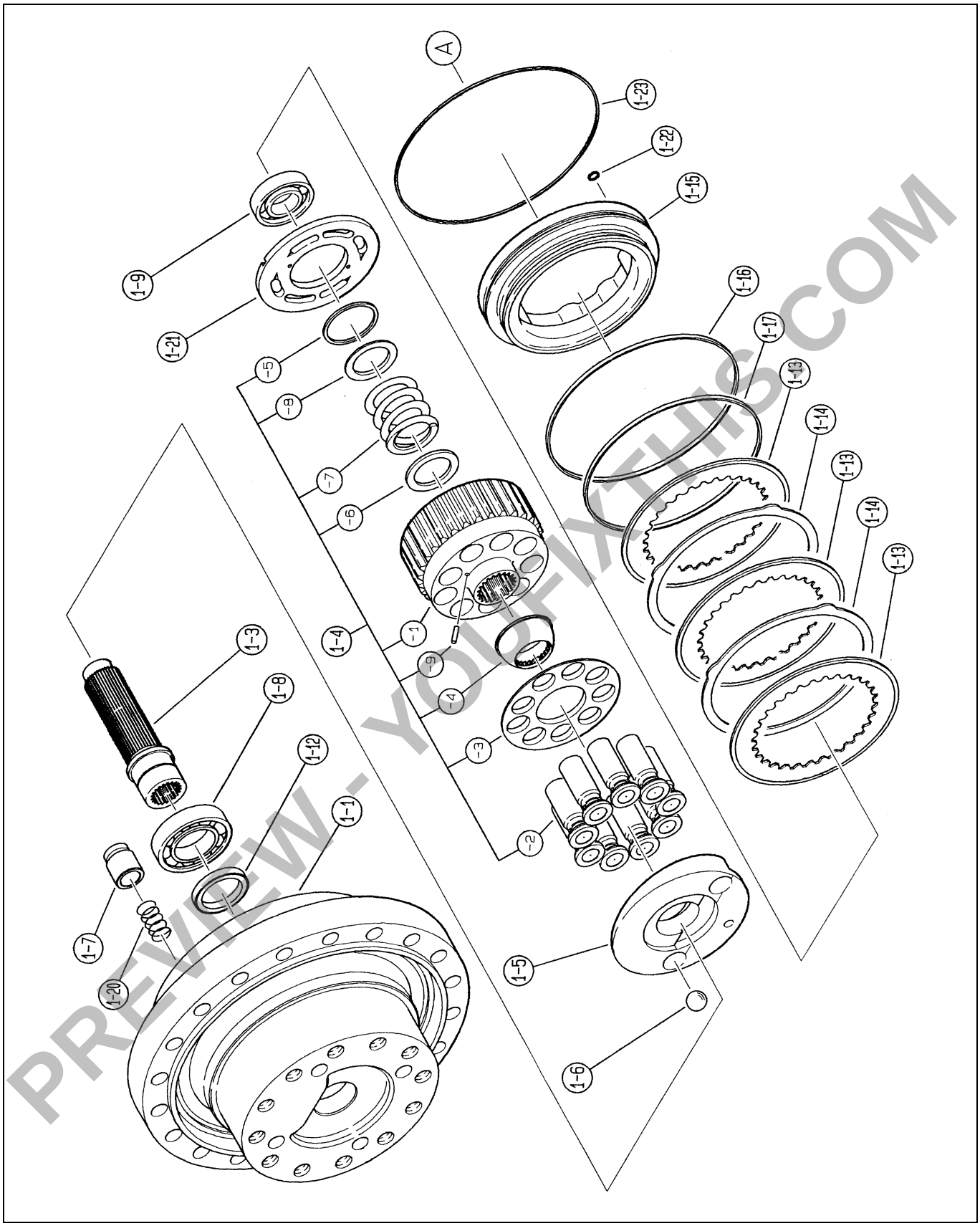
Manual 2nd-speed type

Automatic 2nd-speed type

Figure 4. Hydraulic circuit diagram

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

3) Piping work

The piston motor is sensitive to foreign matter in the hydraulic oil. Therefore, acid wash inside the pipes to thoroughly eliminate the foreign matter such as scales in the pipes before starting piping work. Be careful not to let any foreign matter, such as dust and sand, enter into the piston motor from pipe port section during piping work.

Make sure to tighten each pipe with a torque specified in Table 16. If there are specifications defined by the manufacturer of the machine main unit, follow them.

Table 16. Tightening Torques for Pipe Ports

Pipe Port Name	Port Size	Specified Tightening Torque
Port P1 and P2	PF3/4	372±20 N•m
Port T1 and T2	PF1/2	92.2±3.9 N•m
Port Ps	PF1/4	22.6±1.0 N•m

After piping work, flush inside the pipe line.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

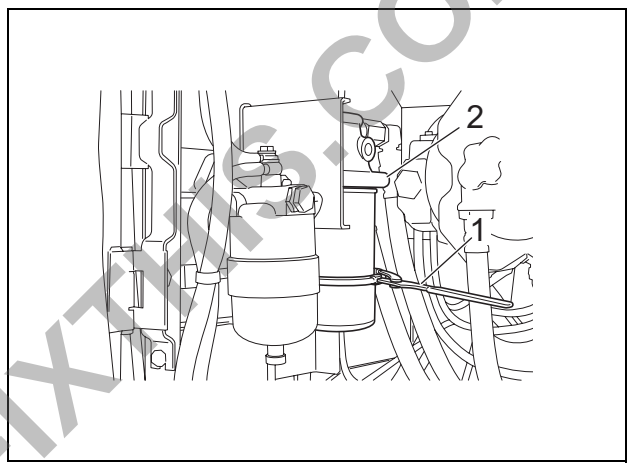
2 Removal and Installation of Engine Oil Element

Caution	• Be sure to stop the engine before beginning work.

Items to prepare

- Specialized wrench
- Rags
- Cleaning fluid

[1] Use a specialized wrench (1) to remove the engine oil element (2).



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Trouble Description	Possible Cause	Countermeasure and Solution
The motor has a great rotation fluctuation.	A worn sliding section of the piston motor causes high-pressure oil to flow out from the oil drain port and the extremely reduced rotation speed results in the rotation fluctuation.	Disassemble the unit to check the wear state of the sliding section and repair or replace it by following the maintenance procedures.
	A hunting occurred at the double counter balance valve when going down a slope results in the rotation fluctuation.	Disassemble the unit to check the wear state of the double counter balance valve and repair or replace it by following the maintenance procedures.
Loud noise	The shaft axial alignment may have a problem and the driven part touching the shaft generates noise.	Precisely align the shaft axis.
	A worn or damaged bearing, spring, or other part of the piston motor generates noise.	Disassemble the unit to replace the damaged bearing, spring, or other part. Clean the parts and re-assemble the unit.
Oil leak	A loosened bolt on the alignment surface or other place causes oil leak.	Retighten the tightening bolt to the specified torque.
	A damaged oil seal, O-ring, packing, or other seal causes oil leak.	Disassemble the unit to replace the seal. Check the temperature of the hydraulic oil. When the temperature of the hydraulic oil in operation is above 80°C, review the cooler and reduce the temperature of the hydraulic oil to below 80°C.
	A worn sliding section of the piston motor increases drain volume and the damaged oil seal causes oil leak.	Disassemble the unit to check the wear state of the sliding section and repair or replace it by following the maintenance procedures. Replace the oil seal. Clean the part, and re-assemble the unit.
	A clogged or long and narrow drain pipe rises the drain pressure and the damaged oil seal causes oil leak.	Disassemble the unit to replace the oil seal. Clean the drain pipe to remove any foreign matter. Review the piping system and reduce the pipe line resistance.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

2. Specification

Table 1. Equipment Specification

Theoretical capacity cm^3		180.1
Pressure MPa	Rating	32.4
	Maximum	39.2
Revolution ($min.^{-1}$)	Maximum	1680
Theoretical output torque N•m		928Note)
Brake torque N•m		1250
Brake release pressure MPa		3.4
Weight (kg)		71

The above are typical values. For more information, see the dimensional outline drawing.
Note) The theoretical value does not include the machine efficiency at the rated pressure.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

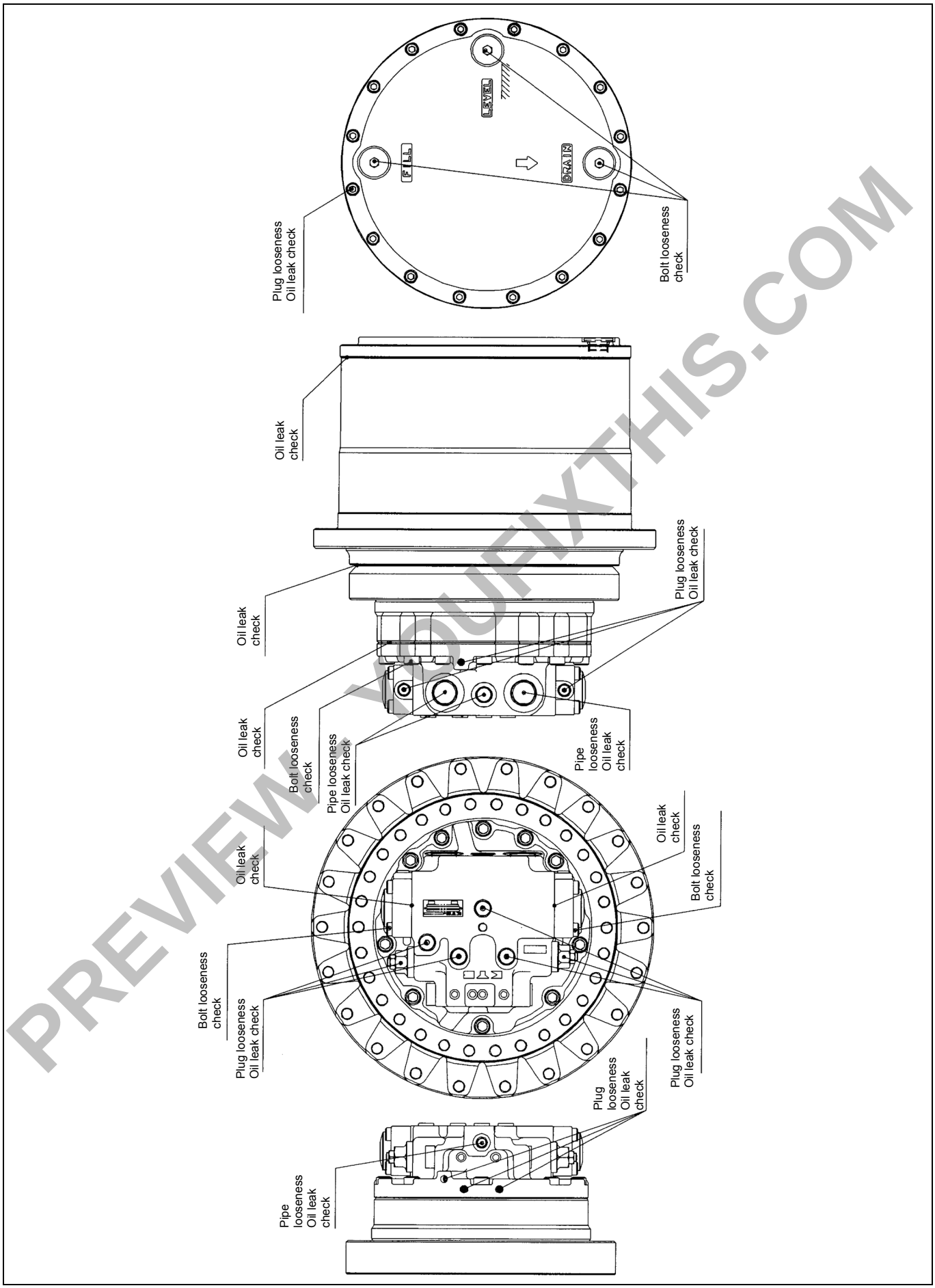
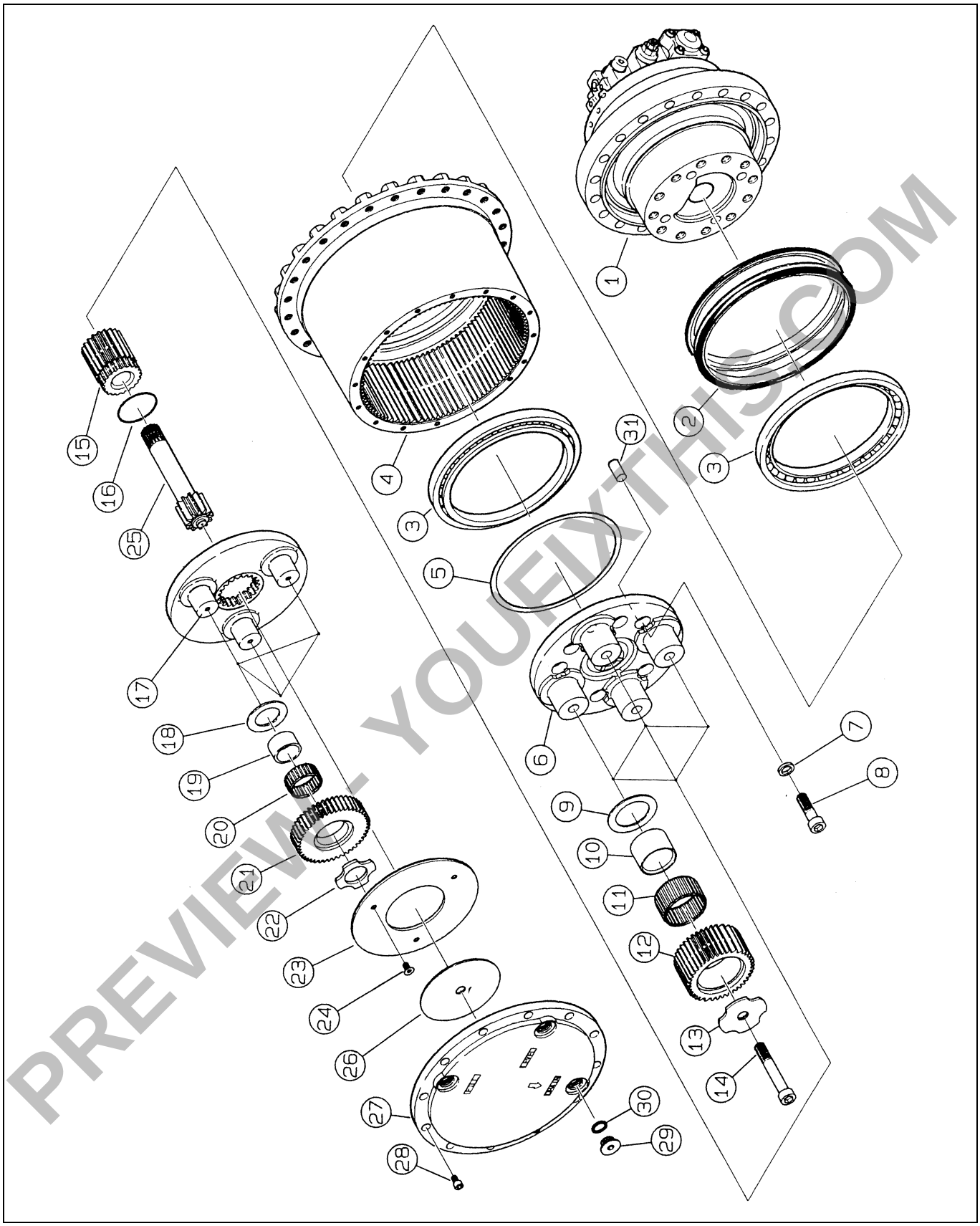


Figure 30. Points to be inspected before operation

Download full manual at youfixthis.com

5-2 Lower Mechanism: Travel Drive Unit



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

6. Assembly and Disassembly

[1] Bolt tightening torque

Table 1 shows the tightening torque for the bolts used on the motor. When assembling the motor, tighten the bolts securely referencing Table 1.

Table 1.

Screw Size	Name	Tightening Torque N•m	Applicable Part Code
M 20	Hexagon socket head bolt	431	401
M 33 × P 1.5	Relief valve	177	051
M 36 × P 1.5	ROMH plug	539	469
PF1/4	ROH plug	36	467

If the part in hand is not consistent with the above part code, reference the assembly cross-section diagram.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

3 Fuel Filter

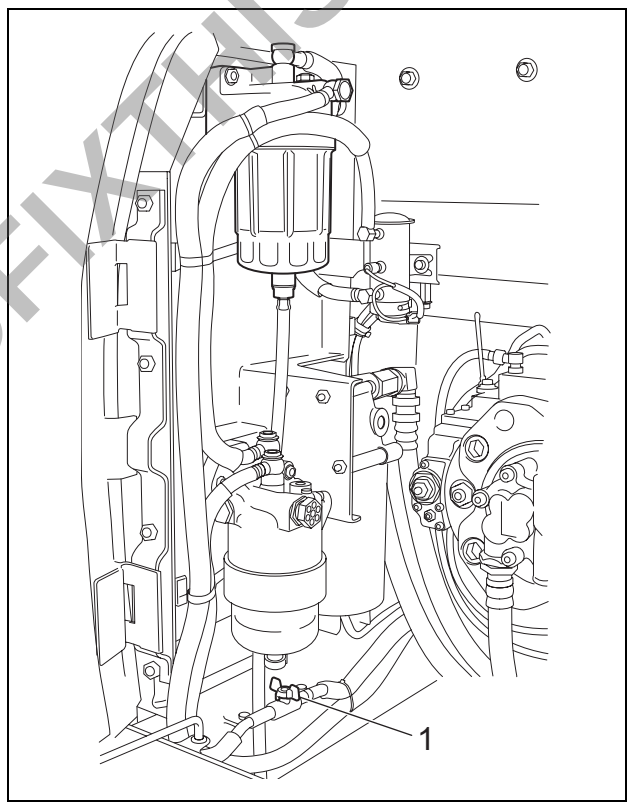
Warning	• Keep away from fire.

Cautions	• Always bleed the air from fuel system if you have emptied the fuel tank, drained the water from fuel tank, or replaced the filter element. • Be sure to stop the engine before beginning work.

Items to prepare

- Wrench (10 mm, 22 mm)
- Specialized filter wrench
- Waste oil can
- Rags
- Cleaning fluid

[1] Tighten and close the cock (1).



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

5-18 Light

1 Removal and Installation of Boom Light 514
2 Removal and Installation of Tool Box Light.....515

5-20 Procedures for Removal and Installation of Cab Inner and Outer Parts

1 Removal and Installation of Cab Assembly 516
2 Removal and Installation of Operator's Seat 523
3 Removal and Installation of Wiper 525
4-1 Removal and Installation of Wiper Controller.....526
4-2 Removal and Installation of Wiper Motor 529
5 Removal and Installation of Monitor.....532
6 Removal and Installation of Cab Front Glass 533
7 Adjustment Procedure of Window Lock.....535

5-21 Hydraulic Equipment

1 Accumulator 537
2 Suction Filter 538
3 Return Filter 540
4 Pilot Filter 542

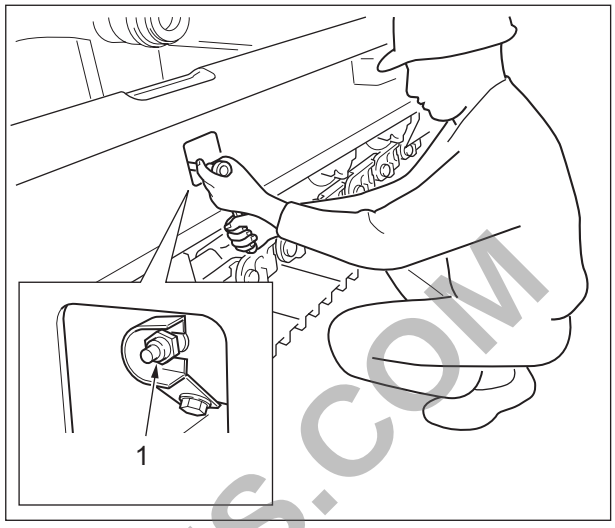
5-23 Others

1 Removal and Installation of Side Door.....543
2 Draining Oil from Hydraulic Oil Tank.....544

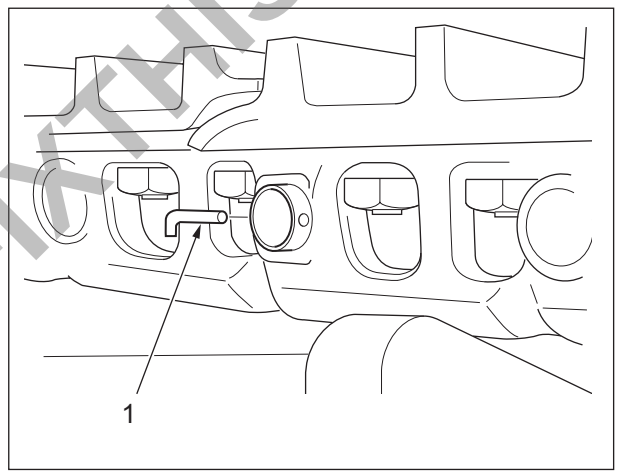
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

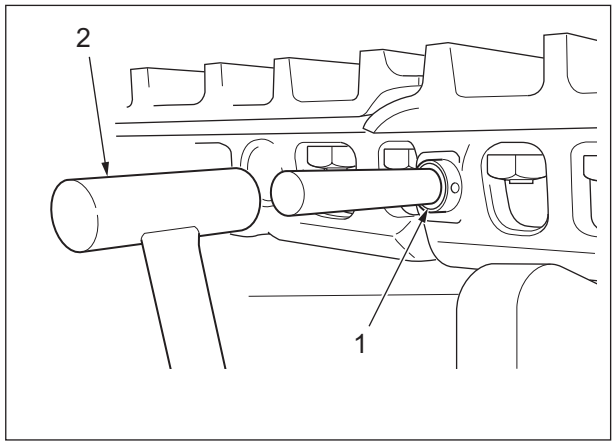
[5] Use a 19-mm box wrench to rotate the grease cylinder check valve (1) and loosen the shoe tension.
- Grease flows out, so provide rags. If the check valve is loosened too much at this time, it may fly off. Be careful not to stand in front of the check valve.



[6] Pull out the S pin (1) from the rear of the joint section.



[7] Place a pipe or similar object against the master pin (1) and hit with a hammer (2) to remove the master pin (1) to the outside.



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

[2] Selecting pipes

1. Pipe size

When selecting pipes, check and determine the type of the hydraulic oil, temperature, maximum pressure, whether surge pressure is produced or not, maximum flow, and piping length to achieve full hydraulic circuit functions.
Use steel pipes for pressure piping and precision steel pipes for hydraulic piping. If equipment that involves position changes is included, use rubber hoses.
Select pipe size based on Table 12 "Required Pipe Size" and Table 13 "Required Flow Velocity in the Pipe".

Table 12. Required Pipe Size

Pipe Port Name	Pipe Size
Inflow port (P1 or P2)	1" or higher
Outflow port (P1 or P2)	1" or higher
Oil drain port (T1 or T2)	1/2" or higher
2nd-speed switching pilot port (Ps)	1/4" or higher

Do not use a pipe smaller than the size shown in the table. Otherwise, abnormally high pressure or other problems may occur.

Table 13. Required Flow Velocity in the Pipe

Position in a Pipe	Required Flow Velocity (m/s)
High pressure circuit	5.0 m/s
Low pressure return circuit	1.5 m/s
Pump suction circuit	1.0 m/s

In particular, when the piping length is large and the temperature of the hydraulic oil is low, pressure loss by flow will be large. In that case, a problem may have been caused. Choose larger pipes and reduce the flow velocity to minimize pressure loss.
For a drain pipe, select pipe size with which drain pressure in the motor oil drain port section does not exceed the tolerance range shown in Table 14.
For the low pressure return piping, select pipe size with which back pressure in the motor outflow port (P1 or P2) section will be equal or less than 2.0 MPa.

Table 14. Drain Pressure Tolerance Range

	Drain Pressure Tolerance Range
Normal use	0.2 MPa max.
Instant maximum	0.5 MPa max.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

6. Piston motor

A swash plate-type piston motor is used as the piston motor.
Figure 20 shows a structural diagram of the piston motor.
9 pistons (4-2) are incorporated in the cylinder block (4-1) and the end of the cylinder block (4-1) touches valve plate (22) that has 2 sausage-shaped ports, B and C. The pressurized oil discharged from the hydraulic pump flows in from the P1 port or the P2 port and while the piston motor rotates, flows out from the P2 port or P1 port. Also, the drain oil in the case that has leaked from the sliding sections and the gap returns to the hydraulic tank from the base plate (2-1) T1 or T2 port.

(1) The high-pressurized oil from the P1 port enters the valve plate (22) sausage-shaped B port, the piston (4-2) is pressurized, and the top of the swash plate (5) rotates and moves from top dead center to bottom dead center.
(2) The P2 port becomes the low-pressure side and while the piston (4-2) rotates and moves from bottom dead center to top dead center, the oil is discharged to the P2 port via the valve plate (22) sausage-shaped C port.
(3) Accompanying the reciprocal movement of the piston (4-2), cylinder block (4-1) and shaft (3) spline coupled to it rotate in the counter-clockwise direction of the arrow in the figure.
(4) When the piston motor rotates clockwise, the P1 port side becomes the low-pressure side and the P2 port side becomes the high-pressure side.

In this way, the piston motor converts the fluid energy of the pressurized oil sent from the hydraulic pump into mechanical energy and outputs high-speed, low-torque rotation power. Also, the piston motor torque and speed are determined by the pressure and flow. Therefore, the larger the pressure and flow, the higher the piston motor torque and speed.

Important

- Do not run the motor beyond the specified range shown in Section 4.
- If the motor speed exceeds the specified range, it may cause seizure or wear of the sliding part, rendering the motor unable to rotate.
- If the pressure exceeds the specified range, it may cause problems such as acceleration of damage to the piston motor bearing, rendering the motor unable to rotate.
- If the input horsepower exceeds the specified range, it may cause the temperature of the hydraulic oil to abnormally rise on the motor circuit, causing seizure or abnormal wear of the sliding part, or breakage of the reduction gear parts.

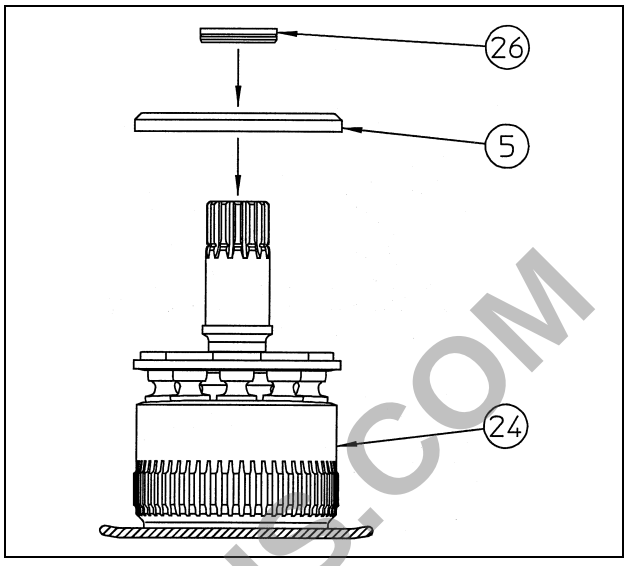
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

4)

Coat the shoe sliding surface of the piston assembly (7) with hydraulic oil and then assemble the cam plate (5) at the cylinder (24).

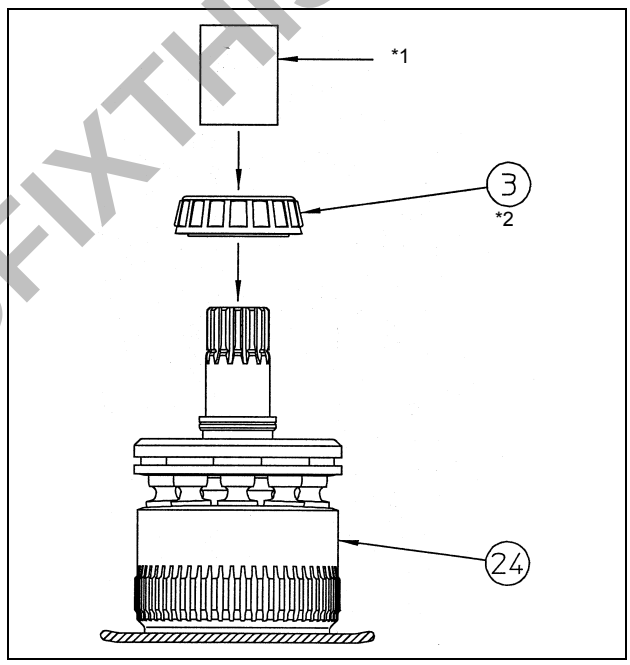
Then assemble the collar (26) to the cylinder (24).



5)

Manually press the inner race of tapered roller bearings (3) to the cylinder (24) using the press-fit jig.

- When press fitting the inner race, protect the end face of the cylinder (24) from damage by using a soft rag.

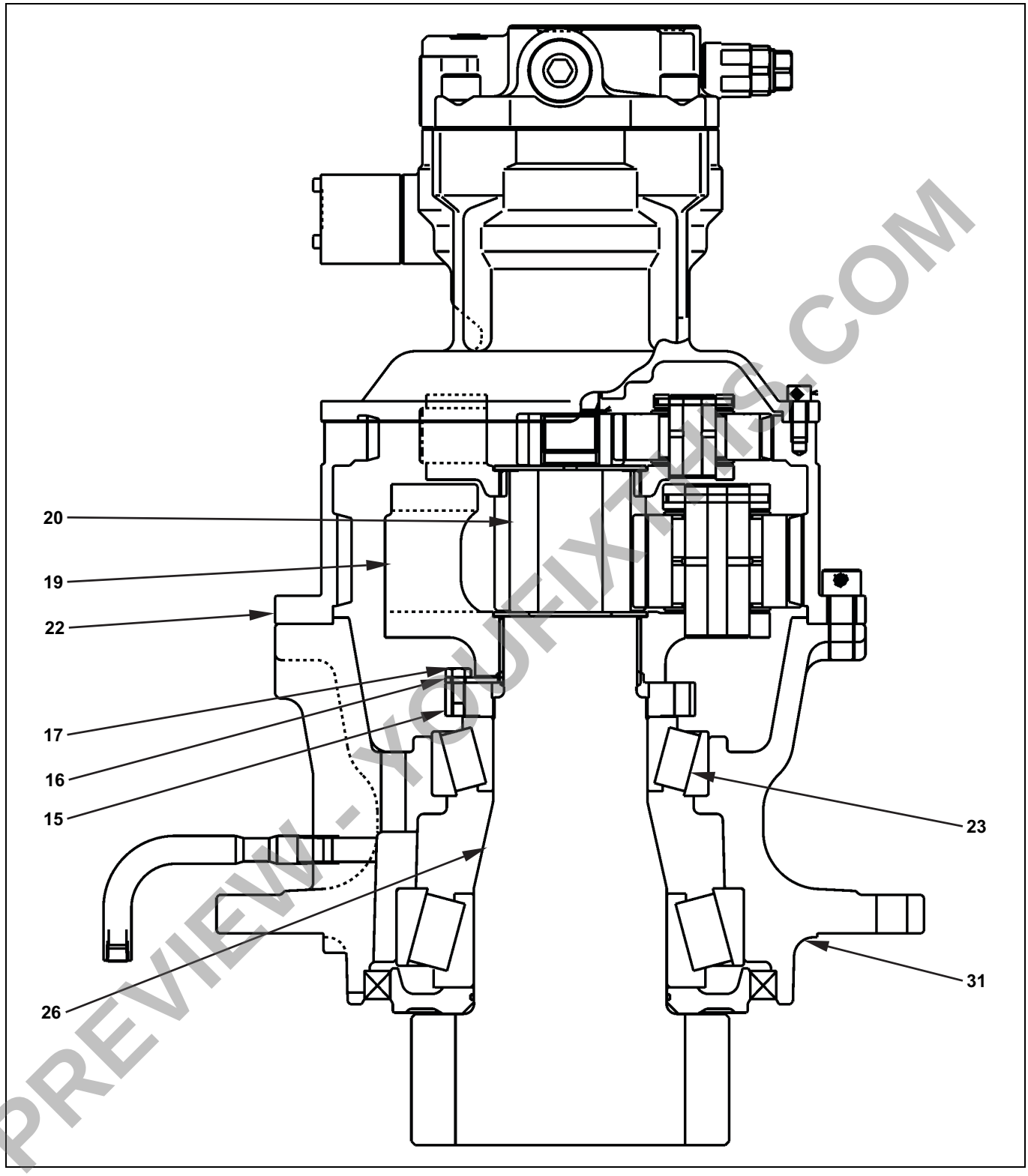


*1 Jig1
*2 (Inner race)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

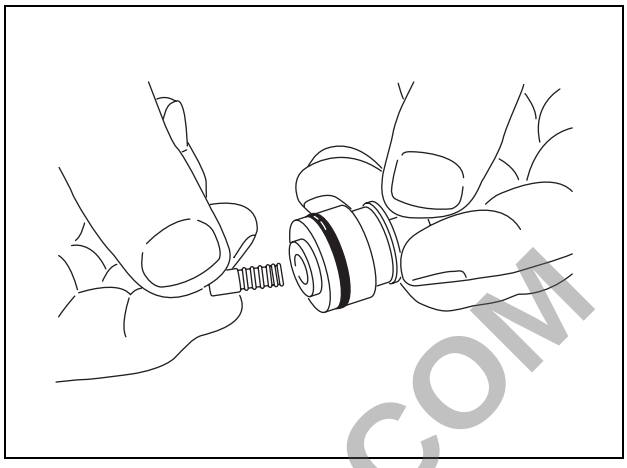
5-7 Swing Body: Swing Driving Unit



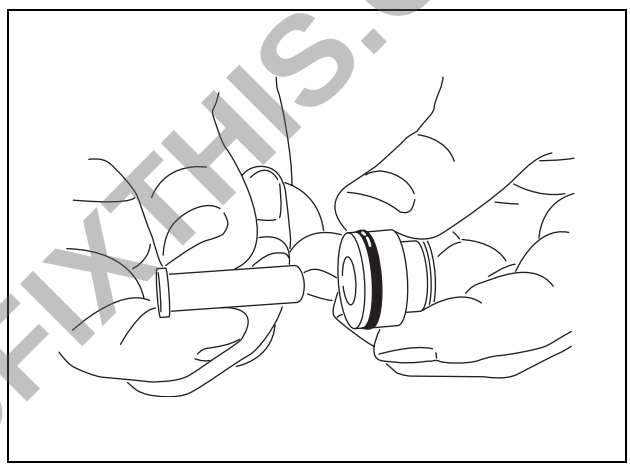
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

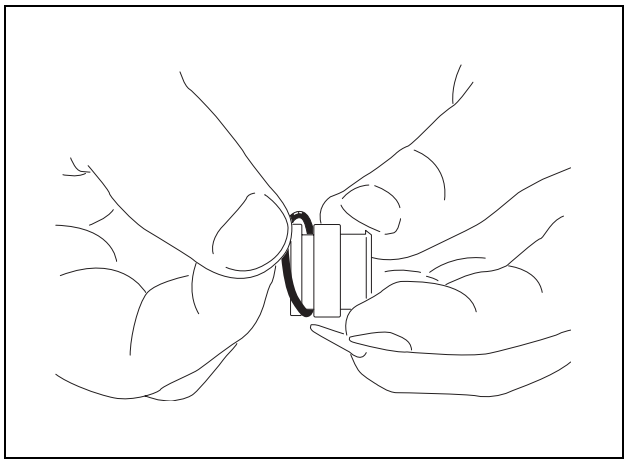
10. If the two-step folding the spring (246) and the spring seat (218) are used, remove them from the pushrod (212).

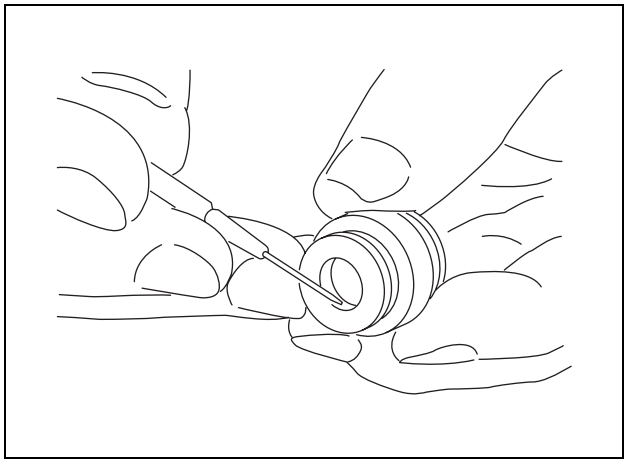


11. Pull out the pushrod (212) from the plug (211).



12. Remove the O-ring (214) and seal (213) from the plug (211). Use a small flathead screwdriver to remove the seal (213).

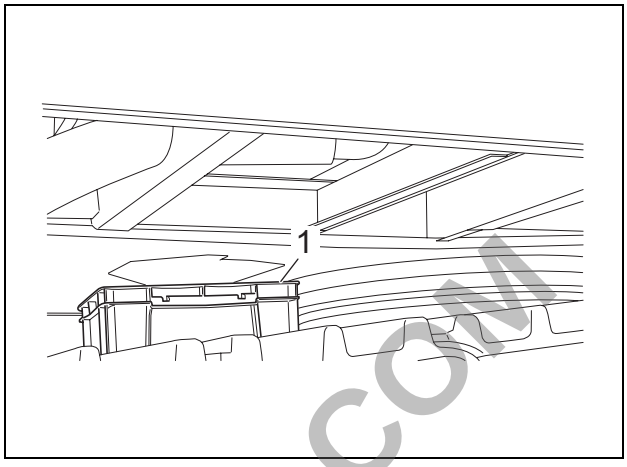




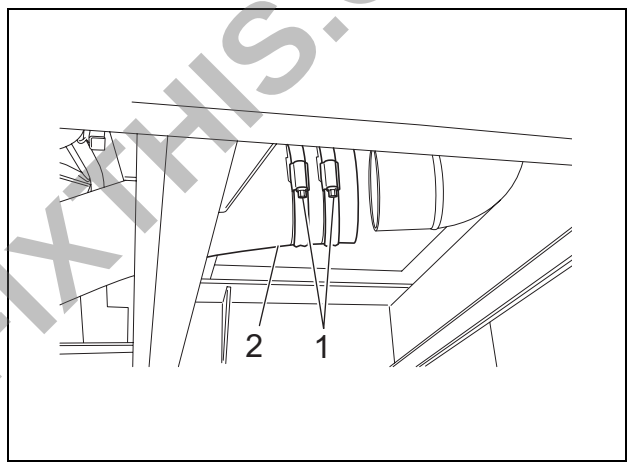
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

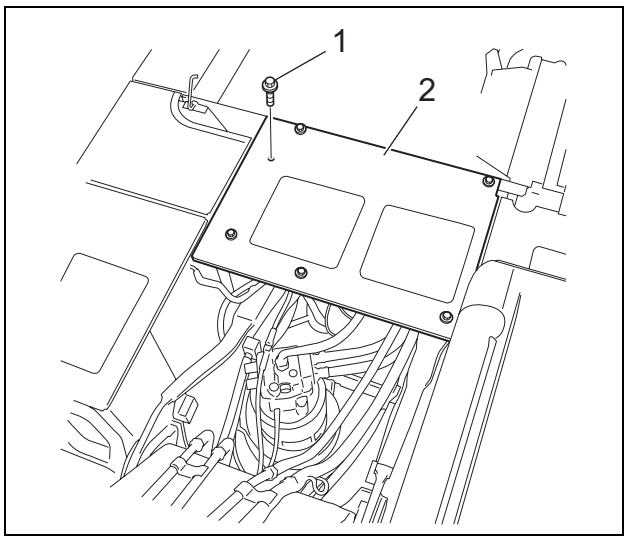
[3] Prepare a waste oil can (1) under the hydraulic oil tank.



[4] Use a 7-mm wrench to loosen the hosebands (1), and then remove the hose (2).
- Use caps to cover the hoses and prevent the entry of water, dust or dirt.



[5] Use a 19-mm wrench to remove the 6 installation bolts (1), and then remove the center cover (2).



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

PREVIEW ONLY

You're viewing 25 of 550 pages

The full manual includes:

- All 550 pages, complete
- Searchable PDF (find any keyword)
- No watermarks
- Instant download
- Print-ready quality

GET FULL MANUAL NOW

Takeuchi 210 X2, 240 X2 Shop Manual

Scan or click anywhere
youfixthis.com

Click anywhere on this page to get the full manual