YANMAR

SERVICE MANUAL

EXCAVATOR

ViO10-2A

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2. TECHNICAL DATA

2. Technical Data

2-1 Specifications

Item				Unit	ViO10-2A
Main specifications of machine					
Dimensions					
Overall length (Transportation position)				in. (mm)	118.5 (3010)
Cabin	Overall height	Transportation position		in. (mm)	-
		Traveling position		in. (mm)	-
	Overall width	Full machine width		in. (mm)	-
Canopy	Overall height	Transportation position		in. (mm)	55.9 (1420)
		Traveling position		in. (mm)	55.9 (1420)
	Overall width	Full machine width (Maximum/Minimum)		in. (mm)	39.4 (1000) / 32.7 (830)
Tumbler center distance				in. (mm)	44.1 (1120)
Track gauge (Maximum/Minimum)				in. (mm)	32.3 (820) / 25.6 (650)
Minimum ground clearance				in. (mm)	5.5 (140)
Traveling performance					
Travel speed	Steel crawler	Low speed (Forward/Reverse)		MPH (km/hr)	-
		High speed (Forward/Reverse)		MPH (km/hr)	-
	Rubber crawler	Low speed (Forward/Reverse)		MPH (km/hr)	1.30 (2.1) / 1.30 (2.1)
		High speed (Forward/Reverse)		MPH (km/hr)	2.49 (4.0) / 2.49 (4.0)
Theoretical climbing ability				degrees	30
Permissible water depth limit				in. (mm)	11.4 (290)
Work performance					
Bucket	Width (Standard)			in. (mm)	15.7 (400)
	(Standard. JIS heaped capacity)			cu.ft. (cu.m)	0.99 (0.03)
	Number of teeth / Installation method			pcs.	3 / rubber pin lock type
Maximum digging depth	With blade raised			in. (mm)	70.9 (1800)
	With blade on the ground			in. (mm)	74.8 (1900)
Maximum depth of vertically digging				in. (mm)	59.1 (1500)
Maximum dumping height				in. (mm)	89.0 (2260)
Minimum front swing radius (with boom in front)				in. (mm)	51.2 (1300)
Minimum front swing radius (at 75 degrees right boom swing)			Cabin	in. (mm)	-
			Canopy	in. (mm)	40.9 (1040)
Rear end swing radius				in. (mm)	19.7 (500)
Boom swing angle		Cabin	Left	degrees	-
			Right	degrees	-
		Canopy	Left	degrees	50
			Right	degrees	90
Maximum digging force		Bucket		lbs. (kN)	3087 (13.7)
		Arm		lbs. (kN)	1477 (6.6)
Maximum tractive force (Oil pressure force) (rubber)				lbs. (kN)	2712 (12.1)
Maximum swing inclination angle (with standard bucket)				degrees	20 (at loading)

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3-7 List of Tightening Torque

3-7-1 Machine

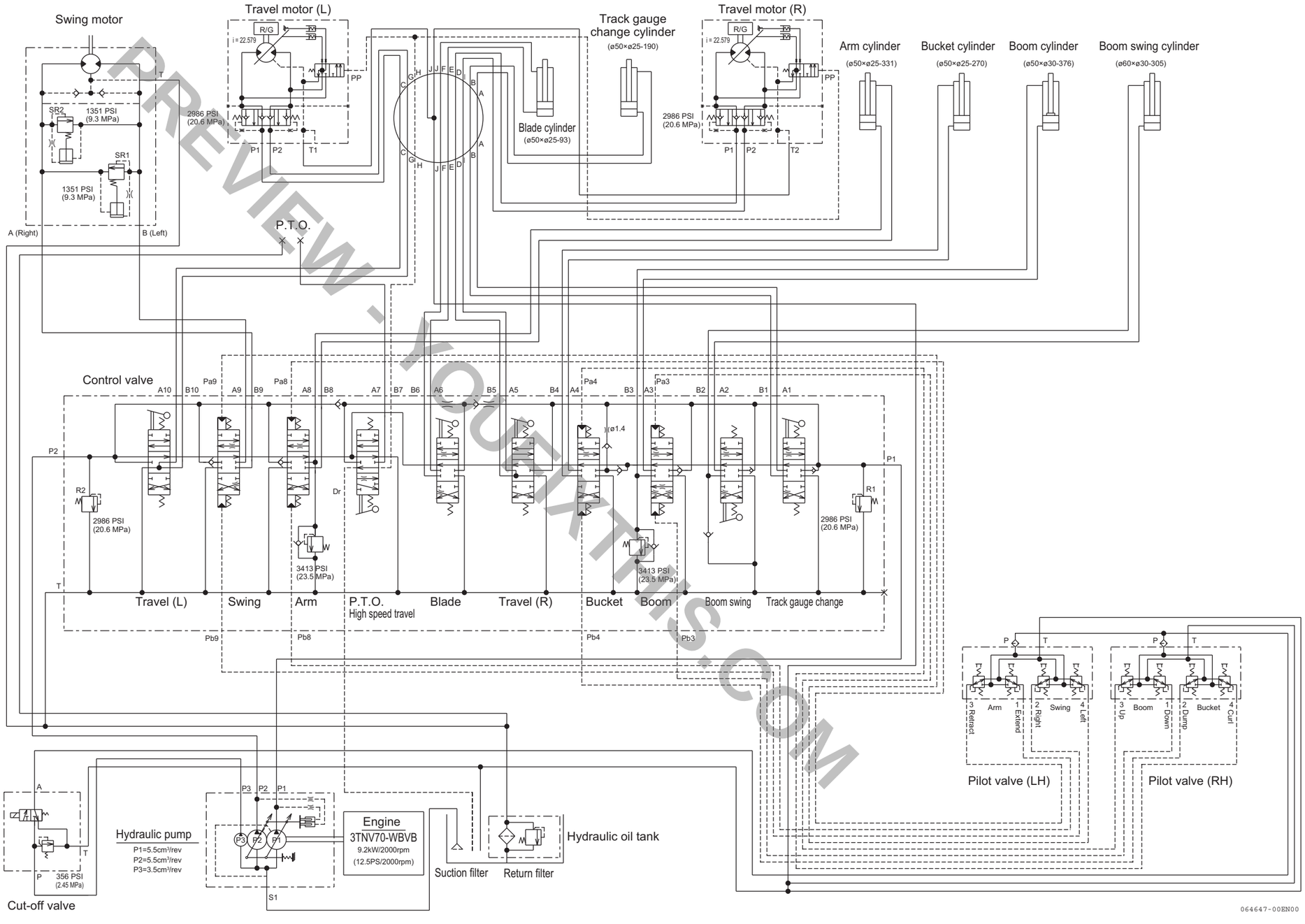
Unit : ft•lbf (N•m)

Applicable model:			ViO10-2A			
Equipment No.		Tightening part	Thread size	Tightening torque	Adhesive	Remarks
Engine / Electrical equipment						
	1	Engine bracket	M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	Fan side
	2	Engine mount vibroisolating rubber	Nut M10	18.1 to 23.9 (24.5 to 32.3)		Radiator side
	3	Engine mount vibroisolating rubber	M14 (fine)	50.6 to 61.5 (68.6 to 83.3)		Flywheel side
	4	Engine stopper	M10	32.6 to 42.8 (44.1 to 58.0)	Three Bond 1324 or its equivalent	2 places
	5	Radiator vibroisolating rubber	Nut M8	9.4 to 12.3 (12.7 to 16.7)		
	6	Radiator hose band	32, 38	2.2 (2.9)		
	7	Air cleaner hose	Hose clip 60	1.4 to 2.2 (2.0 to 2.9)		
	8	Fuel tank band (Upper side)	Flanged nut M10	2.2 (2.9)		
Travel device						
	1	Track roller	M12	57.9 to 72.3 (78.4 to 98.0)	Three Bond 1324 or its equivalent	
	2	Sprocket	Hexagon socket head bolt M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	
	3	Idler	M12	57.9 to 72.3 (78.4 to 98.0)	Three Bond 1324 or its equivalent	
	4	Idler fork	Plug R1/8	6.5 to 7.2 (8.8 to 9.8)	Loctite 262 or its equivalent	
	5	Nipple valve	M16	36.2 (49.0)		
	6	Nut (Stopper)	M16	123.0 to 151.9 (166.6 to 205.8)	Three Bond 1324 or its equivalent	
	7	Blade	M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	
Controls						
	1	Control lever grip	Binding head screw M4	1.4 to 2.2 (2.0 to 2.9)	Three Bond 1324 or its equivalent	
	2	Blade lever fulcrum	M8	16.6 to 21.0 (22.5 to 28.4)	Three Bond 1324 or its equivalent	
	3	Boss in blade lever shaft section	M8	16.6 to 21.0 (22.5 to 28.4)	Three Bond 1324 or its equivalent	
	4	Lock lever R	M6	8.7 to 12.3 (11.8 to 16.7)	Three Bond 1324 or its equivalent	
	5	L-ball, link-ball 8 (male screw)	M8	9.4 to 12.3 (12.7 to 16.7)		
	6	L-ball, link-ball 8 (female screw)	M8	5.8 to 7.2 (7.8 to 9.8)		
	7	L-ball, link-ball 6 (male screw)	M6	5.8 to 7.2 (7.8 to 9.8)		
	8	L-ball, link-ball 6 (female screw)	M6	3.6 to 5.1 (4.9 to 6.9)		
	9	Support	M12	79.6 to 94.0 (108 to 127)	Three Bond 1324 or its equivalent	

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S/N 22701 to 28645

(Due to the implementation of new travel motors)



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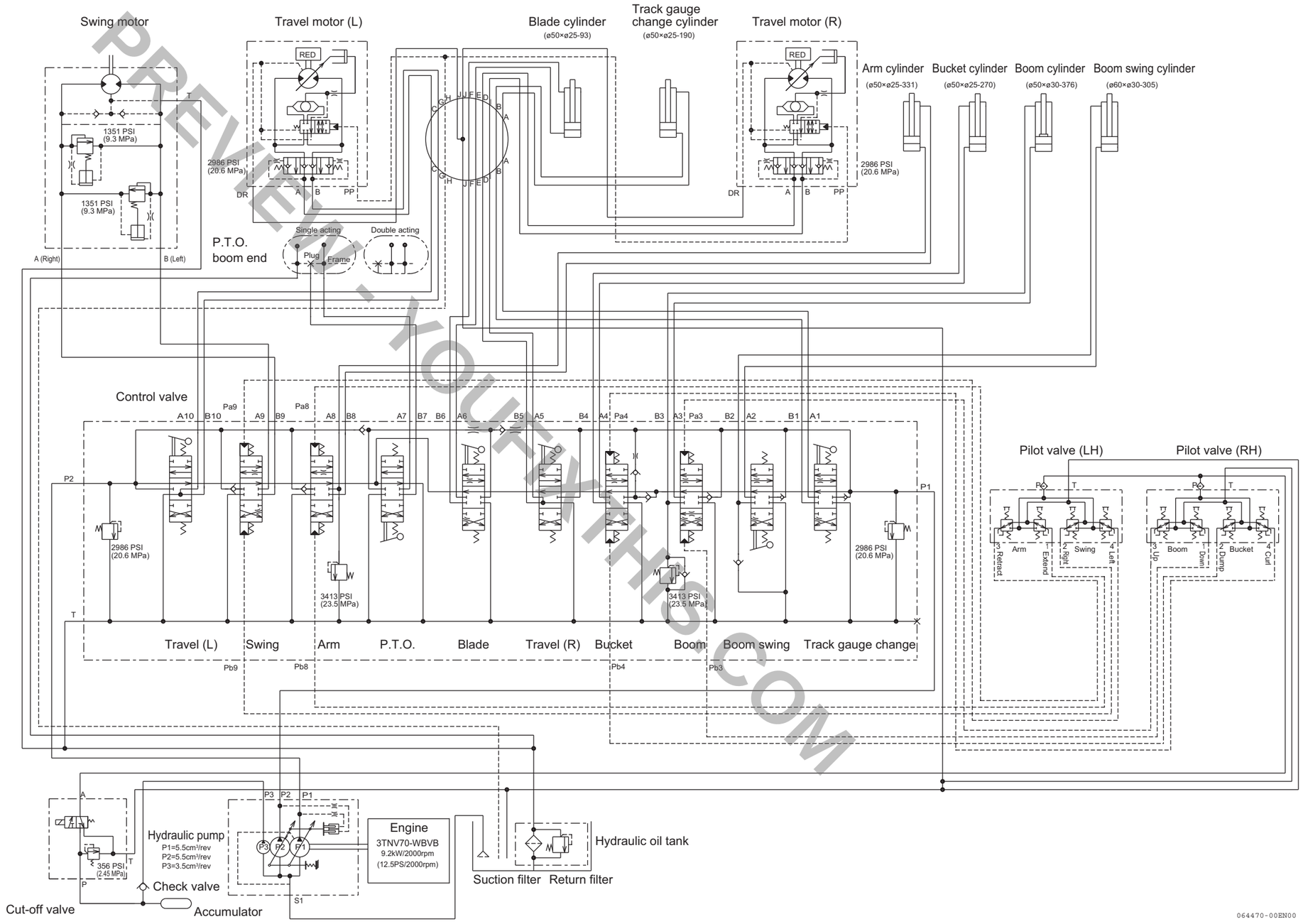
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5. HYDRAULIC SYSTEM

5-2 Hydraulic Circuit Schematic

5-2-1 For Standard Type Machines

S/N 22644 and before



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5-3 Circuit Operation

5-3-1 Boom

1) Boom “Up”

(1) Pilot oil flow

When the boom control lever is pulled back to raise the boom, the oil from the pilot pump P3 flows through the port A of the cut-off valve and the port 3 of the pilot valve (RH) to the port a3 of the boom section to move its spool.

(2) Oil flow from hydraulic pump

The oil discharged from the piston pump P1 flows to the boom section through the port P1 of the inlet section and the parallel passage and flows through the port A3 to BU of the boom cylinder to extend its cylinder rod, raising the boom. The return oil from BD of the boom cylinder flows back to the hydraulic oil tank through the port B3 of the boom section, the port T of the control valve and the return filter.

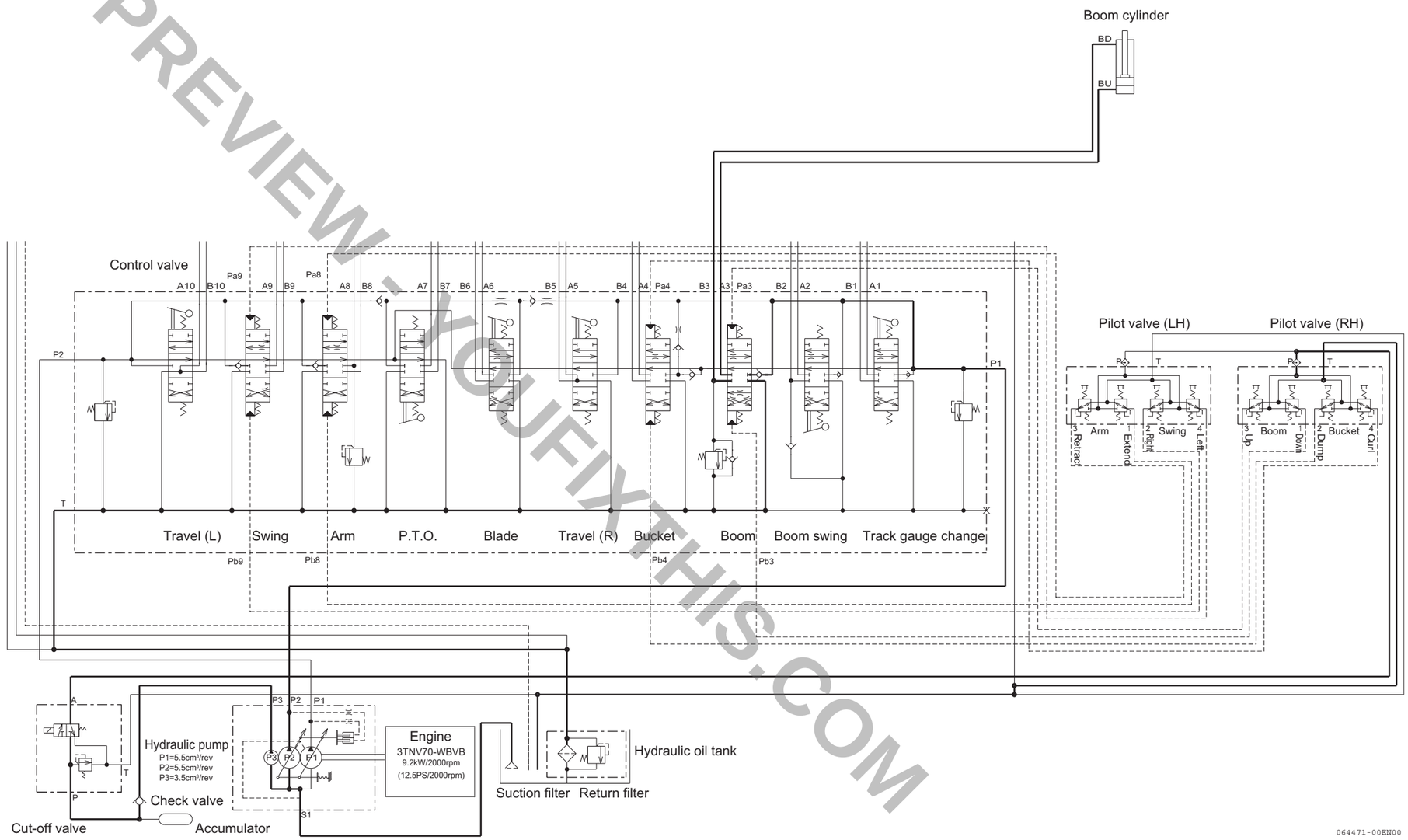
2) Boom "Down"

(1) Pilot oil flow

When the boom control lever is pushed forward to lower the boom, the oil from the pilot pump P3 flows through the port A of the cut-off valve and the port 1 of the pilot valve (RH) to the port b3 of the boom section to move its spool.

(2) Oil flow from hydraulic pump

The oil flows in the opposite direction to the oil flow in the boom up operation with regard to the boom cylinder.



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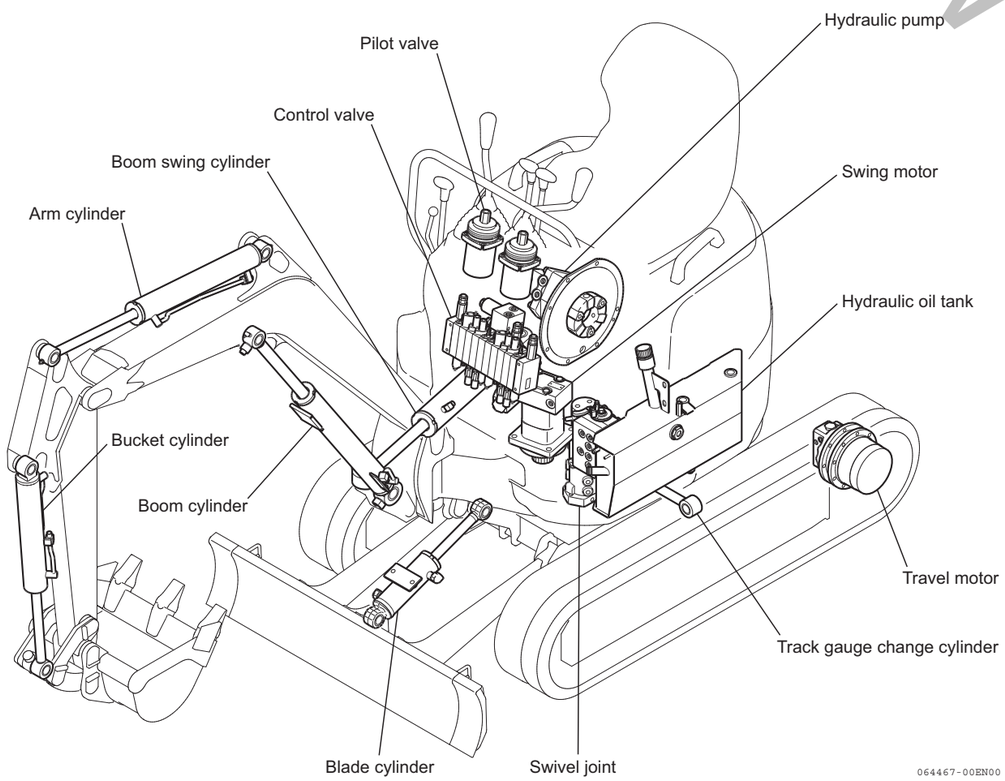
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5. HYDRAULIC SYSTEM

5. Hydraulic System

5-1 Outline

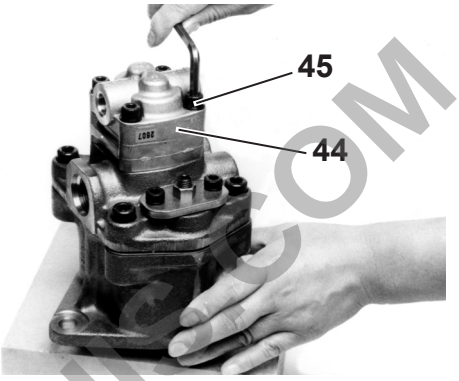
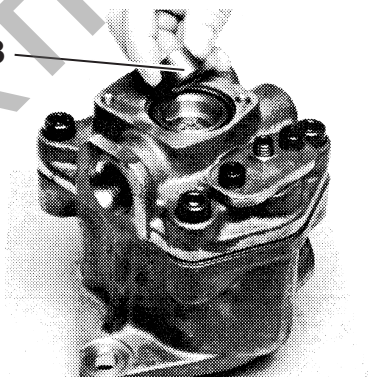
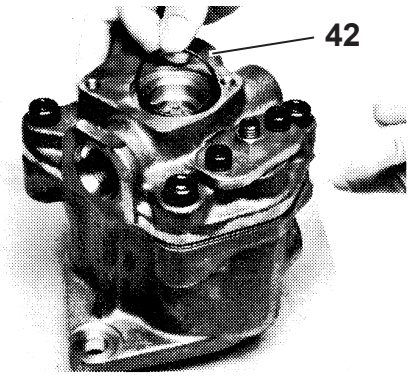
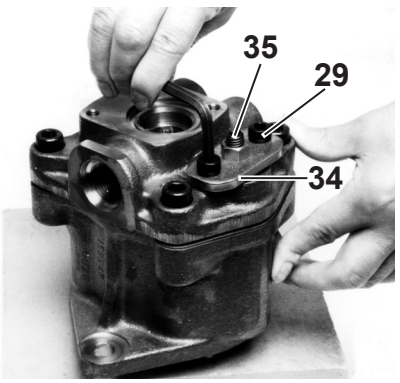
The hydraulic system consists of an engine, variable displacement piston pumps, a control valve, a boom cylinder, an arm cylinder, a bucket cylinder, a boom swing cylinder, a blade cylinder, a swing motor, a swivel joint, a track gauge change cylinder, two travel motors and a hydraulic oil tank. The oil discharged from the variable displacement piston pumps flows to the actuators through the control valve.
The hydraulic pilot control system comprises a pilot pump, a cut-off valve and two pilot valves. The oil discharged from the pilot pump flows into the pilot ports of the control valve through the cut-off valve and the pilot valves to control the valve spool movement in proportion to the pressure at the port.



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3) Disassembly

Procedure	
(1) Remove two hexagon socket head bolts **45** to take gear pump **44** off.	
(2) Remove coupling **43.**	
(3) Remove O-ring **42.**	
(4) Remove two hexagon socket head bolts **29** to remove plate **34** for adjustment of spring **32.** ***Note :*** *Do not loosen hexagon nut **35**, or the output characteristics will be changed.*	

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5. HYDRAULIC SYSTEM

1) Hydraulic Pump

The variable displacement piston pumps and the pilot pump are linked to the flywheel of the engine through the coupling. The number of revolutions of each hydraulic pump is identical to the engine speed.

Discharge volume of each pump

cu. in. (cu. cm) / rev

No.	Pump		Discharge volume
1	Piston pump	P1	0.336 (5.5)
2	Piston pump	P2	0.336 (5.5)
3	Pilot pump	P3	0.214 (3.5)

2) Oil Flow

(when the lock lever is in the unlock position)

(1) Piston pumps P1 and P2

(when the lock levers are in the unlock position)

The pumps take in oil through the suction filter from the hydraulic oil tank and discharge it. The discharged oil flows to the ports P1 and P2 of the control valve and returns from the port T to the hydraulic oil tank through the return filter. This circulation is repeated.

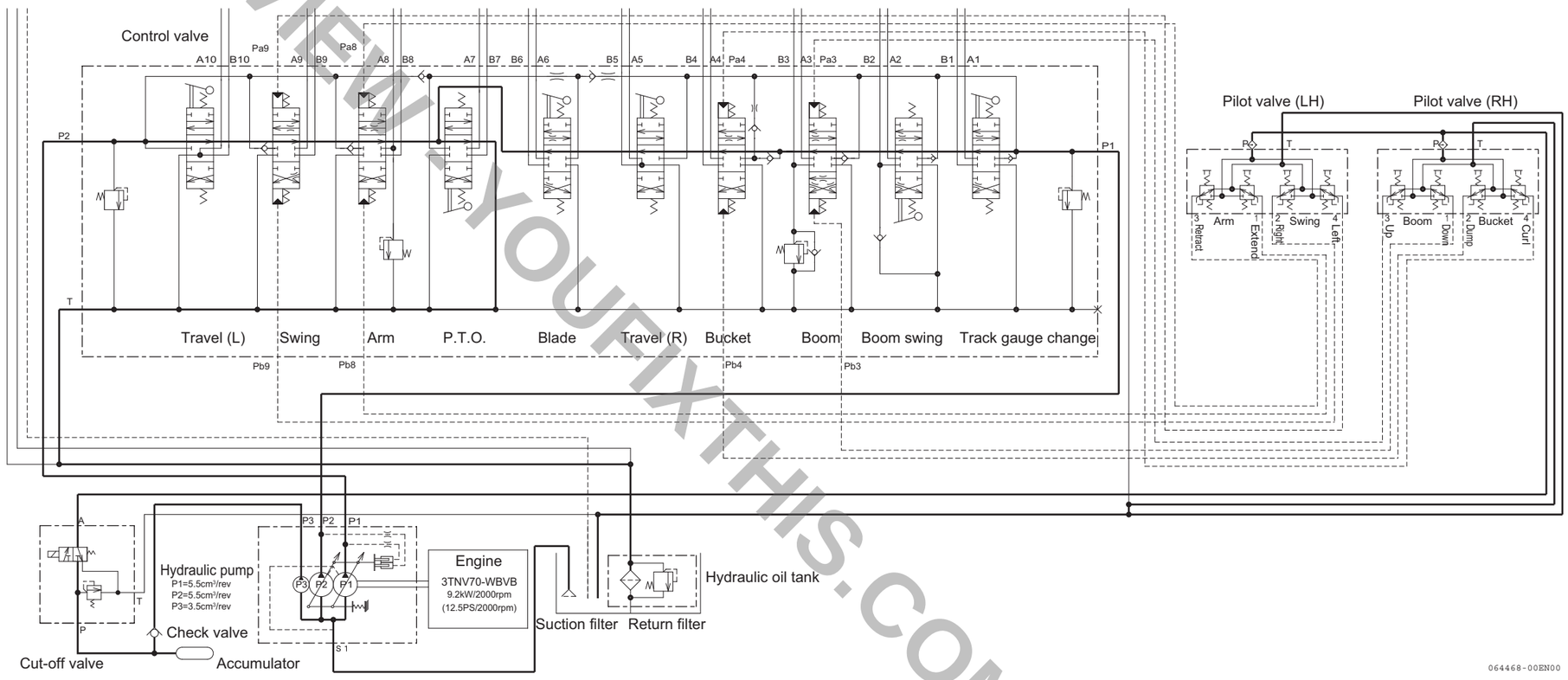
The bypass valve in the return filter opens at a differential pressure of 21.3 PSI (0.147 MPa).

(2) Pilot pump P3

The oil from the pilot pump P3 flows back to the hydraulic oil tank through the port A of the cut-off valve and the pilot valves.

3) System Relief Valve

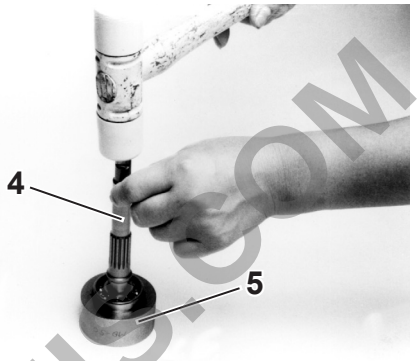
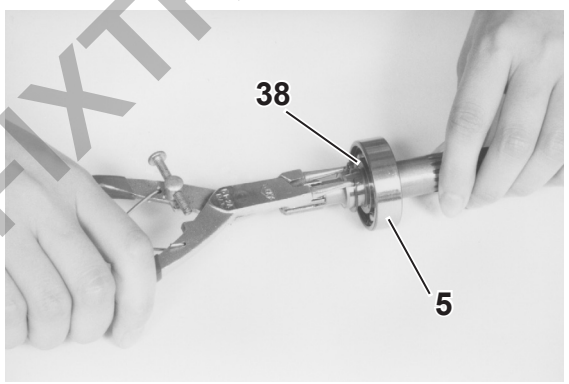
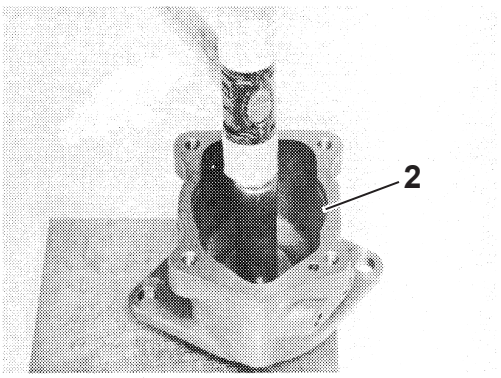
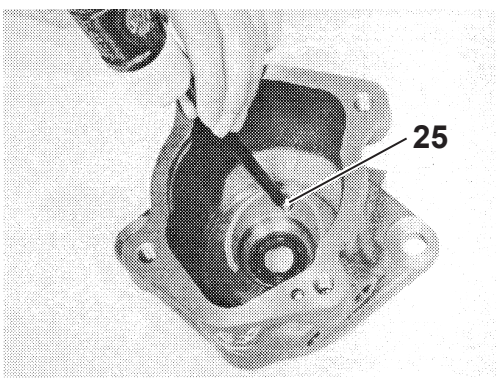
The system relief valves R1 and R2 of the control valve control the discharge pressure of the pumps.



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4) Reassembly

Procedure	
(1) Use bearing **5** as a stand to install shaft **4** into the bearing by tapping the shaft on its end with a plastic hammer.	
(2) Install external snap ring **38** onto the shaft to hold bearing **5.**	
(3) Install oil seal **28** straight into housing **2**, using the oil seal installation jig and a plastic hammer. ***Note :*** *Apply silicon to the lip of the oil seal before installing it.*	
(4) Install dowel pin **25** for positioning into the housing, using a special jig and a plastic hammer.	

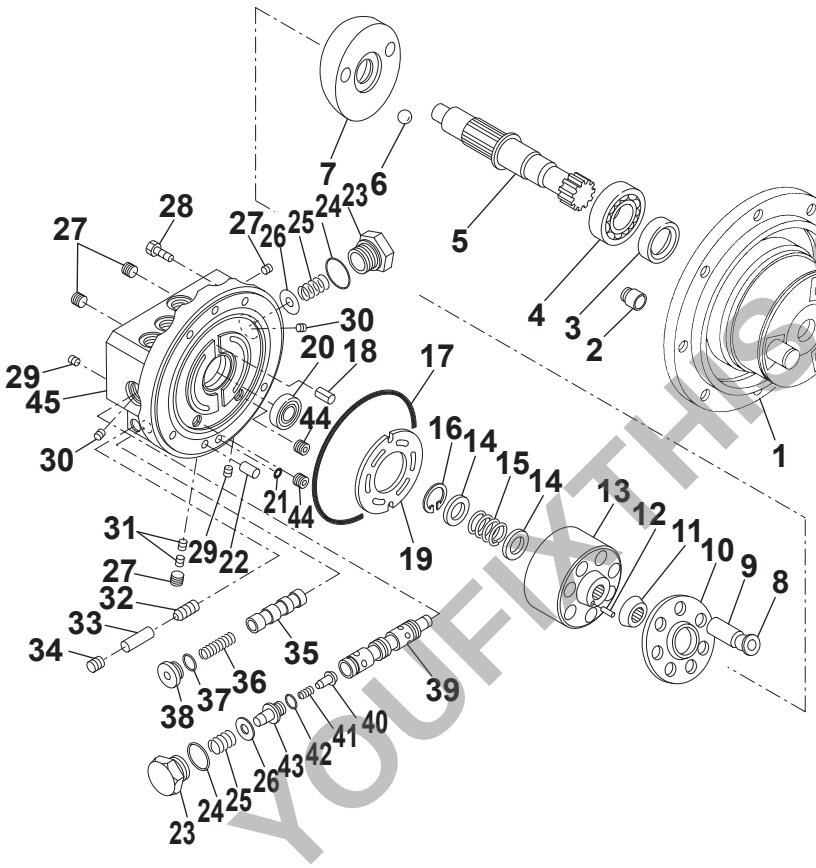
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6) Troubleshooting

Trouble	Cause	Measure
1. Oil leak from spool	(1) Damaged oil seal (2) Damaged spool surface (3) Foreign substances on spool surface	(1) Replace oil seal. (2) Replace spool. (3) Remove foreign substances.
2. Spool does not work smoothly or return to neutral position.	(1) Foreign substances caught inside (2) Bent spool (3) Off-center of control valve linkage (4) Excessive tightening of tie rod (5) Too high temperature of hydraulic oil	(1) Clean hydraulic circuit and valves. (2) Replace spool. (3) Check and adjust linking condition of linkage. (4) Retighten tie rod at specified tightening torque. Tightening torque: 10.1 to 10.8 ft·lbf (13.7 to 14.7 N•m) (5) Keep oil temperature within specified range.
3. Actuator does not operate or operates slowly (at low pressure).	(1) Spool stroke is not full. (2) Foreign substances caught between regulating valve and seat surface. (3) Improper set pressure, or sticking or breakage of relief valve	(1) Check and adjust link portion. (2) Disassemble and clean parts. (3) Adjust set pressure, disassemble and clean parts or replace relief valve.
4. Actuator does not operate or operates slowly (at high pressure).	(1) Overload (2) High resistance of piping	(1) Relieve load. (2) Replace piping with proper sized one.
5. Oil pressure can not be maintained in neutral position of spool.	(1) Neutral position of spool is not in right place. (2) Oil leak from clearance between spool and body (3) Internal leakage of hydraulic cylinder	(1) Adjust neutral position of spool. (2) Replace spool or valve section. (3) Repair or replace hydraulic cylinder.
6. Oil pressure lowers when spool is moved from neutral position.	(1) Dust or foreign substances caught between load check valve and seat surface. (2) Sticking or breakage of poppet. (3) Damaged seat surface.	(1) Disassemble and clean parts. (2) Replace poppet. (3) Replace valve section.

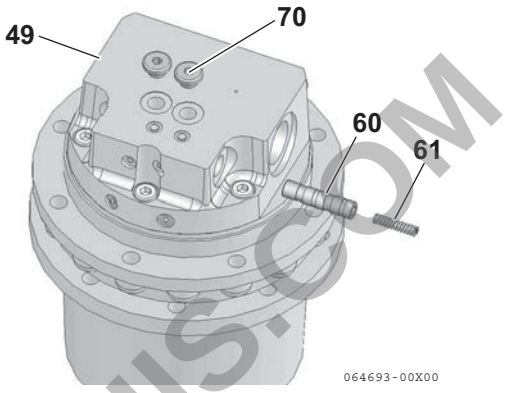
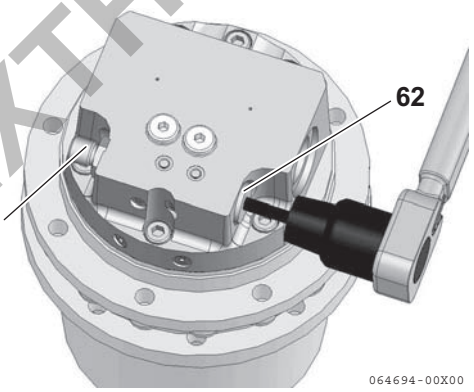
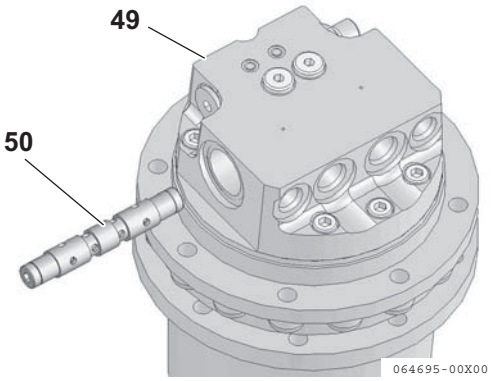
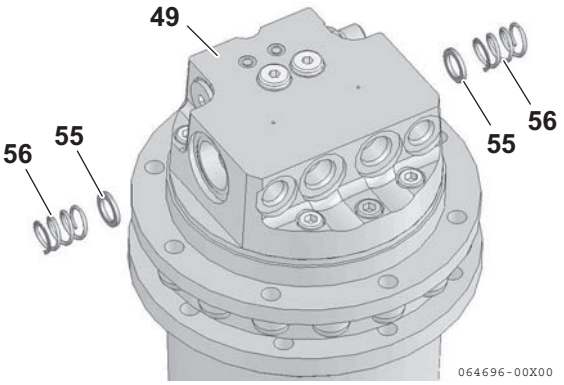
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3) Exploded View and Component Parts (Motor Section and Valve Section)



No.	Part	Q'ty	No.	Part	Q'ty
1	Body 2	1	24	O-ring 1BP18	2
2	Control piston	1	25	Spring V2	2
3	Oil seal	1	26	Ring	2
4	Bearing 6004	1	27	Plug 1 / 16	4
5	Shaft	1	28	Hexagon socket head bolt	7
6	Ball	2	29	Plug	6
7	Swash plate	1	30	Choke 0.4	2
8	Shoe	7	31	Choke 0.5	2
9	Piston	7	32	Shuttle spool	1
10	Shoe holder	1	33	Pin	2
11	Barrel holder	1	34	Plug 1 / 16	2
12	Pin	3	35	High-speed spool	1
13	Cylinder barrel	1	36	Spring V3	1
14	Retainer	2	37	O-ring 1BP14	2
15	Spring C	1	38	Plug	2
16	Internal snap ring 28	1	39	Spool	1
17	O-ring 1B105	1	40	Check valve	2
18	Spring pin	1	41	Spring V1	2
19	Valve plate	1	42	O-ring 1A10	2
20	Bearing 6201	1	43	Spring guide	2
21	O-ring 1BP6	1	44	Plug 1 / 8	2
22	Pin 6 × 14	1	45	Body 1	1
23	Plug	2			

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Procedure	
(29) Install spool **60**, spring **61** and plugs **70** in base plate **49**. ***Note:*** • *Slowly insert spool **60** while turning it.* • *Apply hydraulic oil to spool **60** before installation.* Tightening torque: 9.1 to 13.4 ft·lbf (12.3 to 18.3 N·m)	
(30) Install plugs **62** and **65** fitted with O-ring **63** each.	
(31) Install spool assembly **50** to base plate **49**. ***Note:*** • *Apply hydraulic oil to spool assembly **50** before installation.* • *Slowly insert spool assembly **50** while turning it.*	
(32) Install spring seats **55** and springs **56**.	

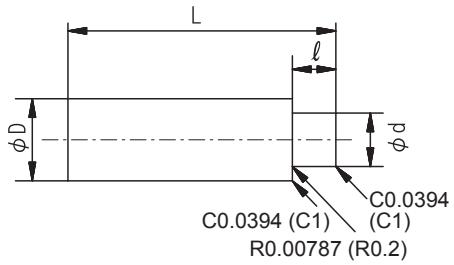
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7-3-2 Mechanical Control Linkage

1) Points of Assembly

(1) Use a jig to install the bushing into the link.

Bushing press-fitting jig

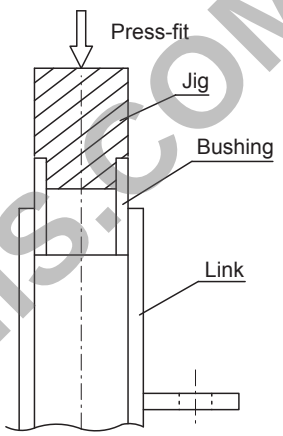


Unit : in. (mm)

	Jig No.	
	F-001	F-002
ϕ D	1.18 (30)	←
ϕ d	0.55 (14)	0.79 (20)
L	4.72 (120)	←
ℓ	0.55 (14)	←

Notes : *F-001 : Valve support*
: Track gauge change lever
F-002 : Valve support
: Travel levers
: Others

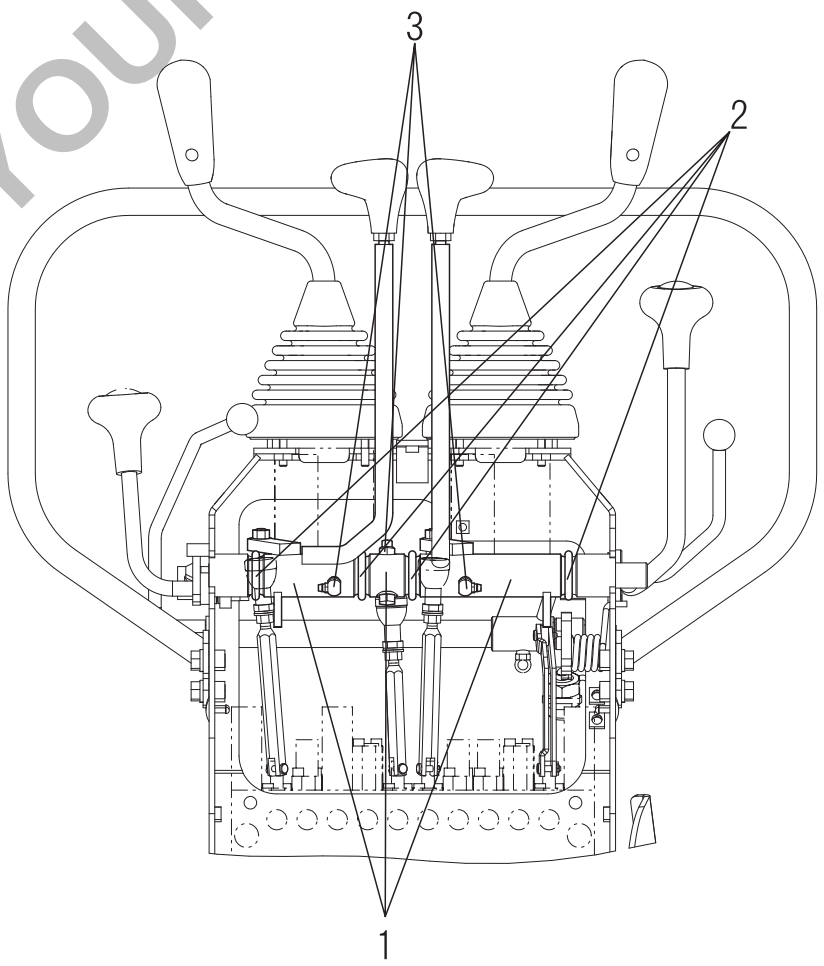
Bushing installation



(2) Apply grease to the links **1** and install them.

Note :
*Take care not to damage the O-rings **2** when installing the links.*

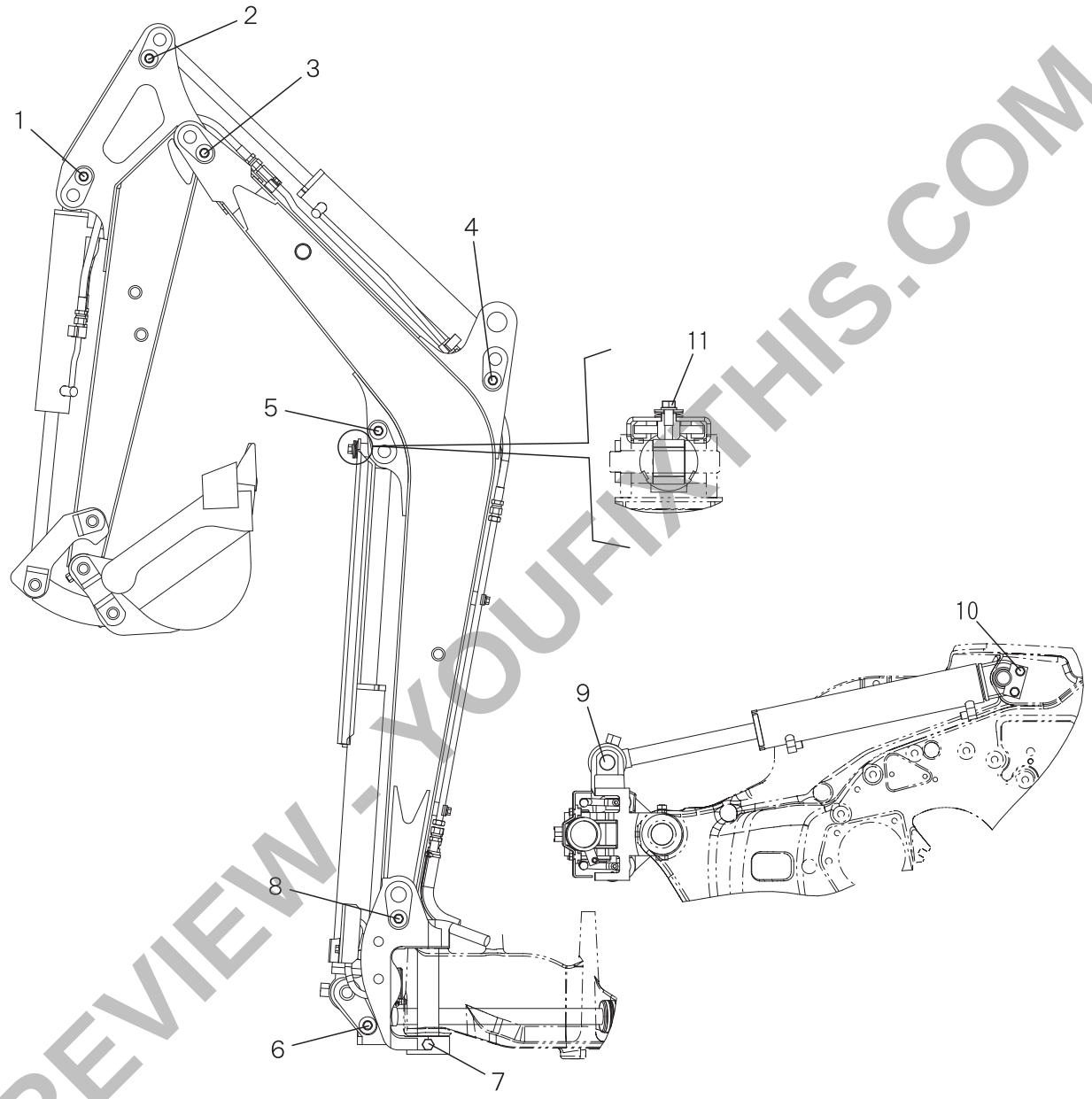
(3) Add grease to the grease nipples **3** after installation.



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6) Reinstallation

Reinstall the implement in the reverse order of the removal procedure.



Tightening Torque and Adhesive

No.	Size	Tightening torque	Adhesive
1 – 6, 8, 10 and 11	M10	32.6 to 43.4 ft·lbf (44.1 to 58.8 N·m)	Apply Three Bond 1324 or its equivalent.
9	M12	18.1 to 23.9 ft·lbf (24.5 to 32.3 N·m)	
7			

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