Z45/450Z

Compact Excavator

Form No.
50940111
Revision A
Oct. 2012

Service Manual



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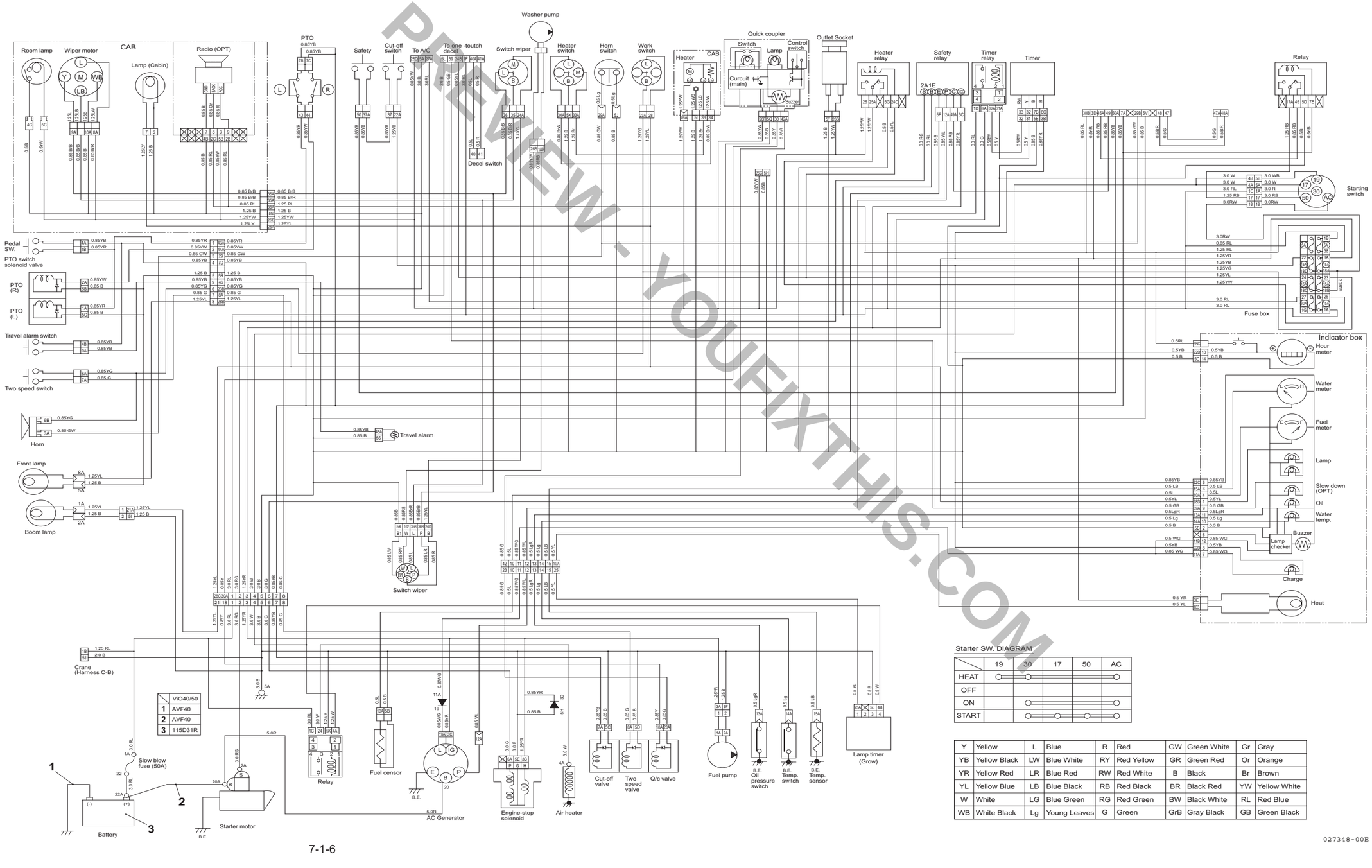
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1) Standard Specifications



Starter SW. DIAGRAM

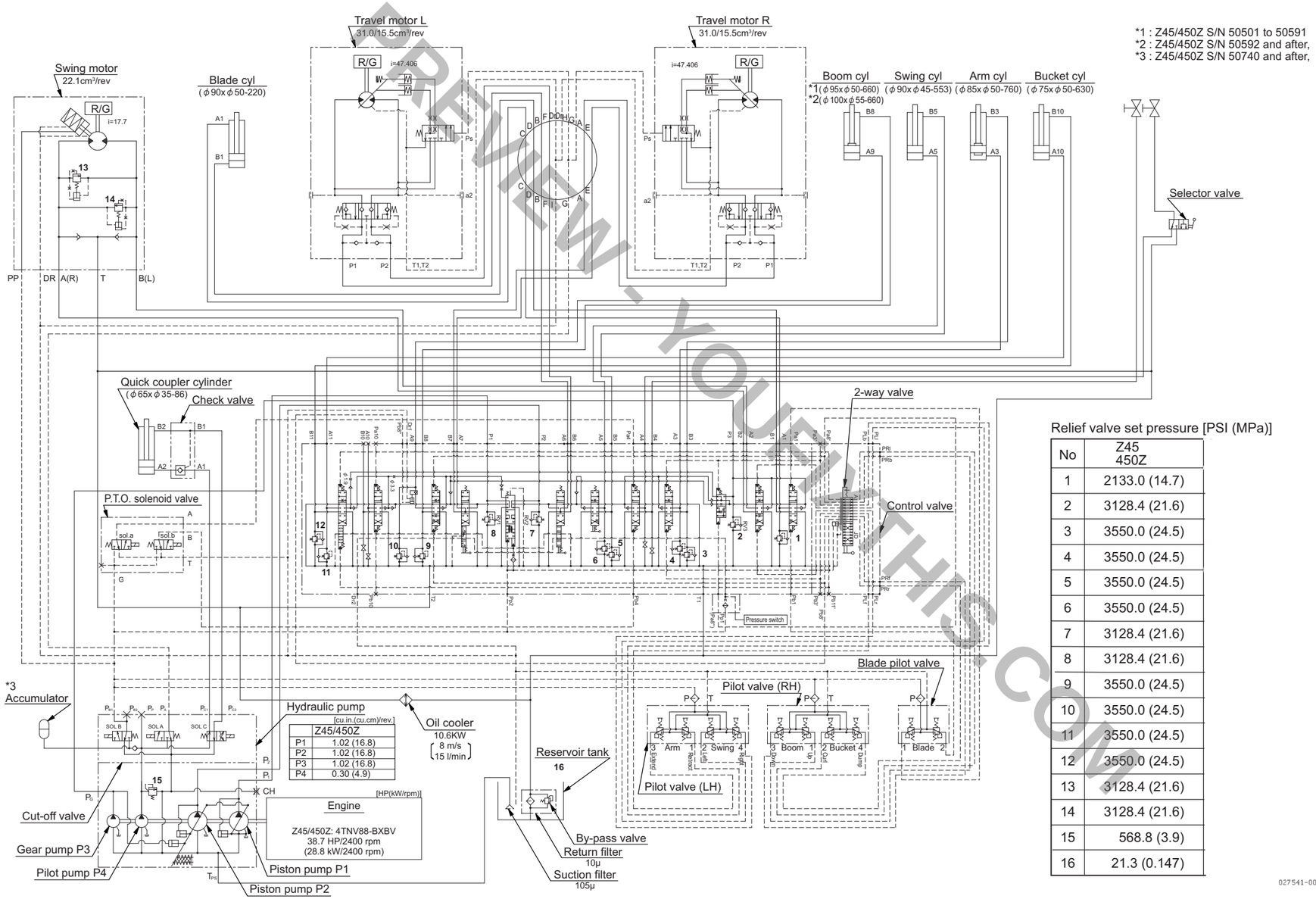
	19	30	17	50	AC
HEAT		○			
OFF					
ON		○			○
START		○		○	○

Y	Yellow	L	Blue	R	Red	GW	Green White	Gr	Gray
YB	Yellow Black	LW	Blue White	RY	Red Yellow	GR	Green Red	Or	Orange
YR	Yellow Red	LR	Blue Red	RW	Red White	B	Black	Br	Brown
YL	Yellow Blue	LB	Blue Black	RB	Red Black	BR	Black Red	YW	Yellow White
W	White	LG	Blue Green	RG	Red Green	BW	Black White	RL	Red Blue
WB	White Black	Lg	Young Leaves	G	Green	GrB	Gray Black	GB	Green Black

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5-2 Hydraulic Circuit Schematic



Relief valve set pressure [PSI (MPa)]

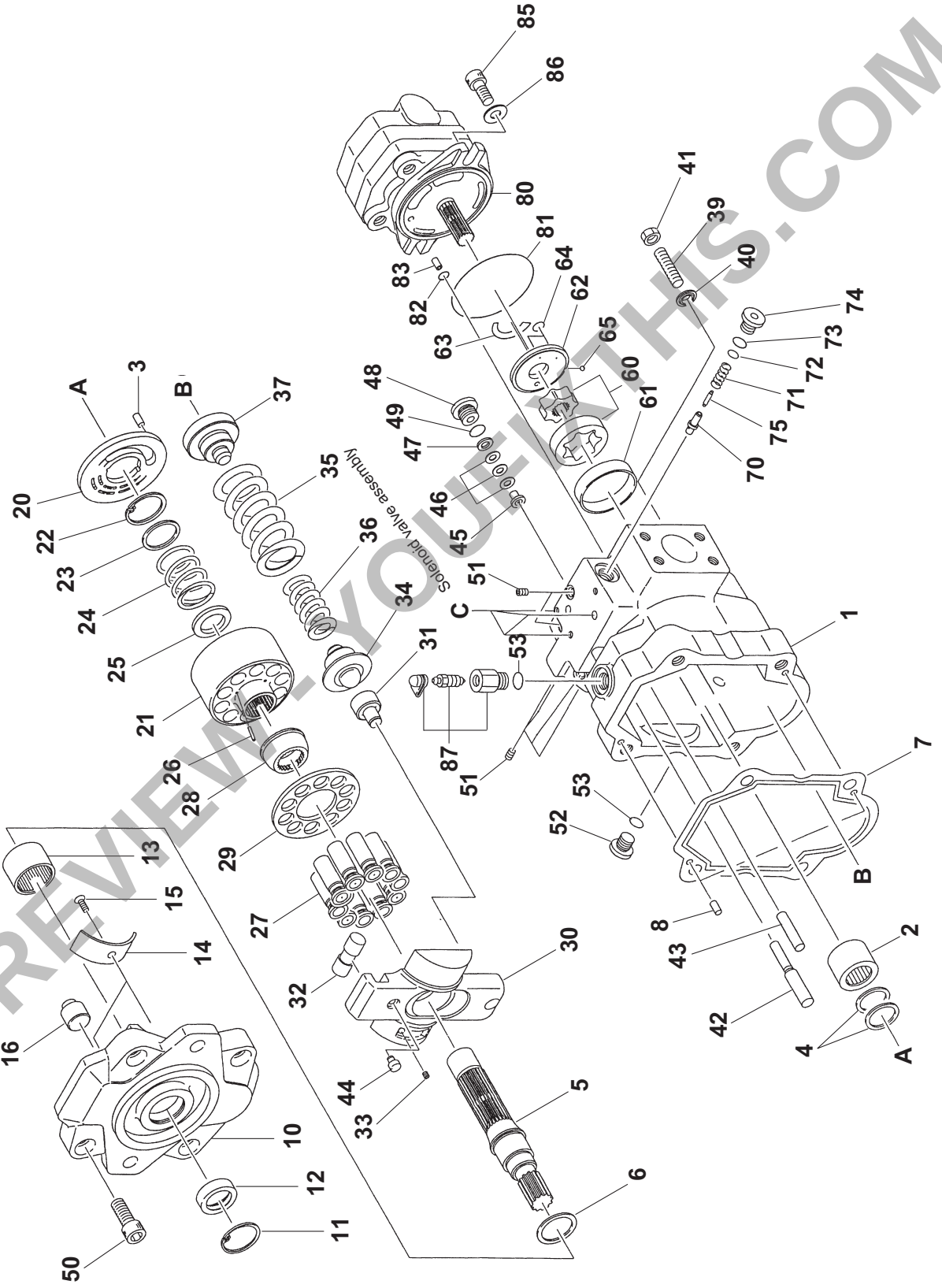
No	Z45 450Z
1	2133.0 (14.7)
2	3128.4 (21.6)
3	3550.0 (24.5)
4	3550.0 (24.5)
5	3550.0 (24.5)
6	3550.0 (24.5)
7	3128.4 (21.6)
8	3128.4 (21.6)
9	3550.0 (24.5)
10	3550.0 (24.5)
11	3550.0 (24.5)
12	3550.0 (24.5)
13	3128.4 (21.6)
14	3128.4 (21.6)
15	568.8 (3.9)
16	21.3 (0.147)

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3. Exploded View and Parts Comprised

1) Hydraulic Pump



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Torque Specifications

Note: Use these torque values when tightening hardware (excluding: locknuts and self-tapping, thread forming and sheet metal screws) unless specified otherwise.

Hydraulic fittings with various seals (light application). All torque values are in lb.-ft. (Nm) unless marked otherwise.

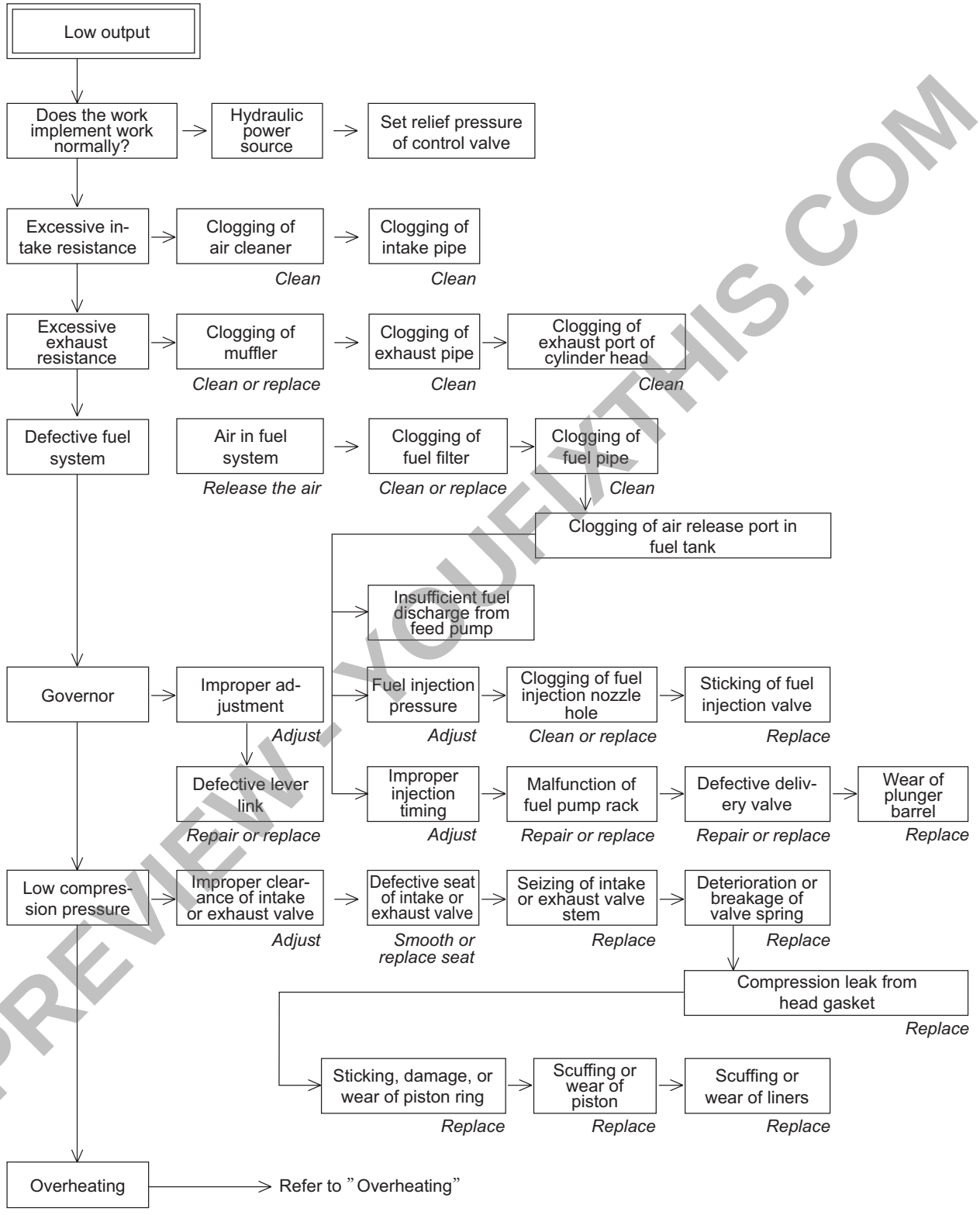
Thread	Straight pipe fitting with thread and screwed plug (GE)			Non-return valve with elastic seal	Identification aid outside Ø
	Sealing washer	Elastic seal	O-ring		
M10X1.0	7 (9)	13 (18)	11 (15)	13 (18)	0.4 in. (10 mm)
M12X1.5	15 (20)	18 (25)	18 (25)	18 (25)	0.5 in. (12 mm)
M14X1.5	26 (35)	33 (45)	26 (35)	26 (35)	0.6 in. (14 mm)
M16X1.5	33 (45)	41 (55)	30 (40)	37 (50)	0.6 in. (16 mm)
M18X1.5	41 (55)	52 (70)	33 (45)	52 (70)	0.7 in. (18 mm)
M22X1.5	48 (65)	92 (125)	44 (60)	92 (125)	0.9 in. (22 mm)
M27X2.0	66 (90)	133 (180)	74 (100)	107 (145)	1.0 in. (27 mm)
M33X2.0	111 (150)	229 (310)	118 (160)	155 (210)	1.3 in. (33 mm)
M42X2.0	177 (240)	332 (450)	155 (210)	266 (360)	1.7 in. (42 mm)
M48X2.0	214 (290)	398 (540)	192 (260)	398 (540)	1.9 in. (48 mm)
G1/8A	7 (9)	13 (18)	11 (15)	13 (18)	0.4 in. (9.73 mm)
G1/4A	26 (35)	26 (35)	22 (30)	26 (35)	0.5 in. (13.16 mm)
G3/8A	33 (45)	52 (70)	33 (45)	37 (50)	0.7 in. (16.66 mm)
G1/2A	48 (65)	66 (90)	41 (55)	48 (65)	0.8 in. (20.96 mm)
G3/4A	66 (90)	133 (180)	74 (100)	103 (140)	1.0 in. (26.44 mm)
G1A	111 (150)	229 (310)	118 (160)	140 (190)	1.3 in. (33.25 mm)
G1 1/4A	177 (240)	332 (450)	155 (210)	266 (360)	1.7 in. (41.91 mm)
G1 1/2A	214 (290)	398 (540)	192 (260)	398 (540)	1.9 in. (47.80 mm)

Hydraulic fittings with various seals (heavy application). All torque values are in lb.-ft. (Nm) unless marked otherwise.

Thread	Straight pipe fitting with thread and screwed plug (GE)			Non-return valve with elastic seal	Identification aid outside Ø
	Sealing washer	Elastic seal	O-ring		
M12X1.5	15 (20)	26 (35)	26 (35)	26 (35)	0.5 in. (12 mm)
M14X1.5	26 (35)	41 (55)	33 (45)	33 (45)	0.6 in. (14 mm)
M16X1.5	33 (45)	52 (70)	41 (55)	41 (55)	0.6 in. (16 mm)
M18X1.5	41 (55)	66 (90)	52 (70)	52 (70)	0.7 in. (18 mm)
M20X1.5	41 (55)	92 (125)	59 (80)	74 (100)	0.8 in. (20 mm)
M22X1.5	48 (65)	100 (135)	74 (100)	92 (125)	0.9 in. (22 mm)
M27X2.0	66 (90)	133 (180)	125 (170)	100 (135)	1.0 in. (27 mm)
M33X2.0	111 (150)	229 (310)	229 (310)	155 (210)	1.3 in. (33 mm)
M42X2.0	177 (240)	332 (450)	243 (330)	266 (360)	1.7 in. (42 mm)
M48X2.0	214 (290)	398 (540)	310 (420)	398 (540)	1.9 in. (48 mm)
G1/8A	26 (35)	41 (55)	33 (45)	33 (45)	0.5 in. (13.16 mm)
G1/4A	33 (45)	59 (80)	44 (60)	44 (60)	0.7 in. (16.66 mm)
G3/8A	48 (65)	85 (115)	55 (75)	74 (100)	0.8 in. (20.96 mm)
G1/2A	66 (90)	133 (180)	125 (170)	107 (145)	1.0 in. (26.44 mm)
G3/4A	111 (150)	229 (310)	229 (310)	192 (260)	1.3 in. (33.25 mm)
G1A	177 (240)	332 (450)	243 (330)	266 (360)	1.7 in. (41.91 mm)
G1 1/4A	214 (290)	398 (540)	310 (420)	398 (540)	1.9 in. (47.80 mm)

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2. Technical Data

2-1 Specifications

Item					Unit	Z45 - 450Z
Main specifications of machine						
Dimensions						
Overall length (Transportation position)					in. (mm)	207.1 (5260)
Cabin	Overall height	Transportation position			in. (mm)	103.1 (2620)
		Traveling position			in. (mm)	103.1 (2620)
	Overall width	Full machine width			in. (mm)	77.6 (1970)
Canopy	Overall height	Transportation position			in. (mm)	103.1 (2620)
		Traveling position			in. (mm)	103.1 (2620)
	Overall width	Full machine width			in. (mm)	77.6 (1970)
Tumbler center distance (steel/rubber)					in. (mm)	80.7 (2050)/81.5 (2070)
Track gauge					in. (mm)	65.7 (1670)
Minimum ground clearance					in. (mm)	14.2 (360)
Traveling performance						
Travel speed	Steel track	Low speed (Forward/Reverse)			MPH (km/hr)	1.4 (2.3)
		High speed (Forward/Reverse)			MPH (km/hr)	2.9 (4.6)
	Rubber track	Low speed (Forward/Reverse)			MPH (km/hr)	1.4 (2.3)
		High speed (Forward/Reverse)			MPH (km/hr)	2.9 (4.6)
Permissible water depth limit					in. (mm)	19.7 (500)
Work performance						
Bucket	Width (Standard) *including side cutter				in. (mm)	25.6 (650)
	(Standard. JIS heaped capacity)				cu.ft. (cu.m)	4.94 (0.14) [Old JIS 4.59 (0.13)]
	Number of teeth / Installation method				pcs.	4 / rubber pin lock type
Maximum digging depth	With blade raised				in. (mm)	144.9 (3680)
	With blade on the ground				in. (mm)	151.6 (3850)
Maximum depth of vertically digging					in. (mm)	106.3 (2700)
Maximum dumping height (canopy/cabin)					in. (mm)	153.9 (3910)
Minimum front swing radius (with boom in front) (canopy/cabin)					in. (mm)	92.1 (2340)
Minimum front swing radius (at 90 degrees right boom swing)				Cabin	in. (mm)	78.3 (1990)
				Canopy	in. (mm)	78.3 (1990)
Rear end swing radius					in. (mm)	38.4 (975)
Boom swing angle			Cabin	Left	degrees	70
				Right	degrees	70
			Canopy	Left	degrees	70
				Right	degrees	70
Maximum digging force			Bucket		lbs. (k•N)	6725 (29.9)
			Arm		lbs. (k•N)	4631 (20.6)

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8. Periodic Inspection and Servicing

8-1 List of Periodic Inspection and Servicing

◇ : Check ○ : Supply ● : Replace □ : Adjust (clean) ■ : Oil & grease

Check & service items			Daily	Every 50	Every 100	Every 250	Every 500	Every 1000 hrs
General	Check falling off, breakage of parts		◇					
	Check loosened bolts & nuts, retighten		◇					
	Check engine condition		◇					
	Clean		□					
Lube oil	*Swing gear case oil	Check, resupply				○		
		Replace			● 1st time			●
	Travel reduction gear oil	Check, resupply				○		
		Replace			● 1st time			●
	*Transmission oil	Check, resupply	◇					
		Replace			● 1st time			●
	*Differential gear oil	Check, resupply			◇			
		Replace			● 1st time			●
Hydraulic system	Hydraulic oil	Check, resupply	◇					
		Replace						●
	Clean suction filter					□ 1st time		□
	Replace return filter					● 1st time	●	
	Check for abnormality of hydraulic pump		◇					
Grease	Check grease-up positions, grease		■					
	Greasing the swing gears and the swing bearings			■				
	Greasing the track gauge change cylinder and the link fulcrum			■				
Undercar-riage	Check, adjust track tension		◇					
	*Check air pressure, wear, flaw in tyres		◇					
Steering equipment	*Check performance, play of steering lever		◇					
	Check performance, play of travel lever		◇					
	*Check performance of speed change lever		◇					
	*Check performance of forward/reverse pedal		◇					
	*Check performance, play of steering wheel		◇					
	*Brake pedal	Stroke	◇					
		Performance	◇					
	*Parking brake	Stroke	◇					
		Performance	◇					
	Check performance of accel. level		◇					
Electric equipment	Check front & work lights, horn		◇					
	Check hourmeter function		◇					
	Check function of change, oil and pilot lamps		◇					
	Check wire breakage, short-circuits, loosened terminals, retighten		◇					
	Check, resupply battery fluid		◇					
	Check specific gravity of electrolyte						□ As required	
	Check function of OK monitor		◇					

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1. GENERAL CAUTIONS FOR MAINTENANCE WORK

1. General Cautions for Maintenance Work

1-1 Correct Work

Correct work means the quickest possible completion of according to the correct procedures and the specified standards.

It is important when conducting certain operations always to bear in mind the equipment, tools, gauges, materials, oil and grease, etc. that you must have ready, as well as items to be checked, adjusted, or disassembled, and cautions to watch out for.

1-2 Safety Precautions

(1) Never attempt servicing while engine is running or immediately after stopping operation.
(2) Wear work cloths, safety shoes and helmet.
(3) Check the equipment and tools before use. Especially, be sure to check the crane, lifting equipment and tools.
(4) When working together with other persons, allocate everyone's share of job, arrange the signals and act in concert with the other persons.
(5) The operation of the crane and slinging work must be performed by qualified persons.
(6) Do not enter or pass under the raised load.
(7) Lift and support the massive parts by crane before removing the installation bolts.
(8) Disconnect cables from battery before repairing the electric system.
(9) Remove the battery when welding the machine.

1-3 Preparations

(1) Check the service record of the machine. (That is, check how many months or hours the machine has been used since the preceding overhaul, what was the trouble then and what parts were replaced.)
(2) Have all servicing tools ready, i.e., tools, measuring devices (which have received periodic maintenance), containers, oil & grease, etc.
(3) Have the service literature (operation manual, parts catalog, etc.) ready.

1-4 Cautions for Disassembly and Reassembly

(1) Clean the machine before disassembly.
(2) Check and record the condition of the machine before disassembly :
- Model, machine number, operation hours
- Reasons for repair, history of repair
- Contamination of filters
- Fuel and oil condition
- Damage to parts, etc.

(3) Place alignment marks on the necessary parts to facilitate reassembly.
(4) Clean all the removed parts and new replacement parts and put them in order.
(5) Use new seals, split pins, etc. for reassembly.

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CHAPTER 4
Engine

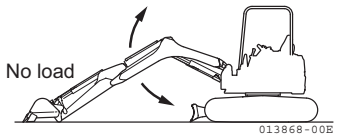
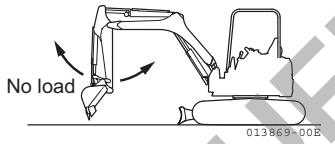
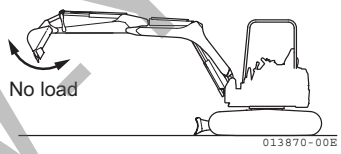
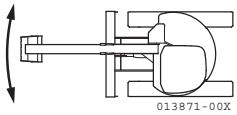
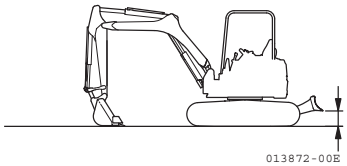
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3. Service Standards

3-1 Machine Performance

Item	Measuring condition		Unit	Standard	Allowance
Applicable model					
Machine performance					
Working speed					
Boom speed Max. cylinder extension ⇕ Bucket teeth grounded	Machine position  • Engine : rated speed • Hydraulic oil temp. : 122 to 140 °F (50 to 60 °C) • Site : Firm, flat ground	Up	sec.	2 : 2.4	2 : 2.7
		Down		2 : 2.9	2 : 3.2
Arm speed Max. cylinder retraction ⇕ Max. cylinder extension	Machine position  • Engine : rated speed • Hydraulic oil temp. : 122 to 140 °F (50 to 60 °C) • Site : Firm, flat ground	Extend	sec.	2.5	2.8
		Retract		3.4	3.7
Bucket speed Max. cylinder retraction ⇕ Max. cylinder extension	Machine position  • Engine : rated speed • Hydraulic oil temp. : 122 to 140 °F (50 to 60 °C) • Site : Firm, flat ground	Dump	sec.	2.4	2.7
		Curl		4.0	4.3
Boom offset speed Max. cylinder retraction ⇕ Max. cylinder extension	Machine position  • Engine : rated speed • Hydraulic oil temp. : 122 to 140 °F (50 to 60 °C) • Site : Firm, flat ground	Right swing	sec.	6.5	8.0
		Left swing		6.5	8.0
Blade speed Max. cylinder retraction ⇕ Blade grounded	Machine position  • Engine : rated speed • Hydraulic oil temp. : 122 to 140 °F (50 to 60 °C)	Up	sec.	0.9	1.2
		Down		1.1	1.4

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[2] Measuring valve clearance
Insert a 0.008 or 0.012 in. (0.2 or 0.3 mm) thickness gage between the rocker arm and valve cap and adjust the valve clearance. Tighten the adjusting screw.

Standard valve clearance :
0.006 to 0.01 in. (0.15 to 0.25 mm)

[3] Apply oil to the contact surface between adjusting screw and push rod.
[4] Adjusting other cylinders
Turn the crankshaft 180° then and make adjustment for the No.3 cylinder. Then adjust the No.4 and No.2 cylinders in this order.
The cylinder to be adjusted first does not have to be the No.1 cylinder. Select and adjust the cylinder where the piston is the nearest to the top dead center after turning, and make adjustment for other cylinders in the order of ignition by turning the crankshaft 180° each time.

4-3-6 Inspecting the Fuel Injection Valve Injection Pressure and Spray Pattern

⚠ CAUTION

Wear protective glasses when testing injection from the fuel injection valve. Never approach the injection nozzle portion with a hand. The oil jetting out from the nozzle is at a high pressure to cause loss of sight or injury if coming into careless contact with it.

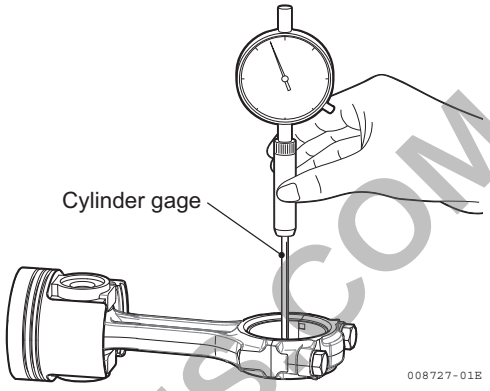
1) Injection Pressure Measurement
Standard : 2850 to 2950 PSI (19.6 to 20.6 MPa)

*Remove carbon deposit at the nozzle hole thoroughly before

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Calculate the oil clearance of a crank pin metal and a crank pin from the measured values of the crank pin metal inner diameter and the crank pin outside diameter.
Replace a crank pin metal if the oil clearance becomes about the limit dimension of the below table.
Correct by grinding if unevenly wear, roundness exceeding the limit or insufficient outside diameter is found. Also use an undersized metal.

Notice :
When measuring the inside diameter of the rod big end, install the crankpin metals in the rod big end not to mistake the top and bottom of the metals and tighten the rod bolts by the standard torque.



Rod bushing I.D. measurement

Tightening torque of rod bolt

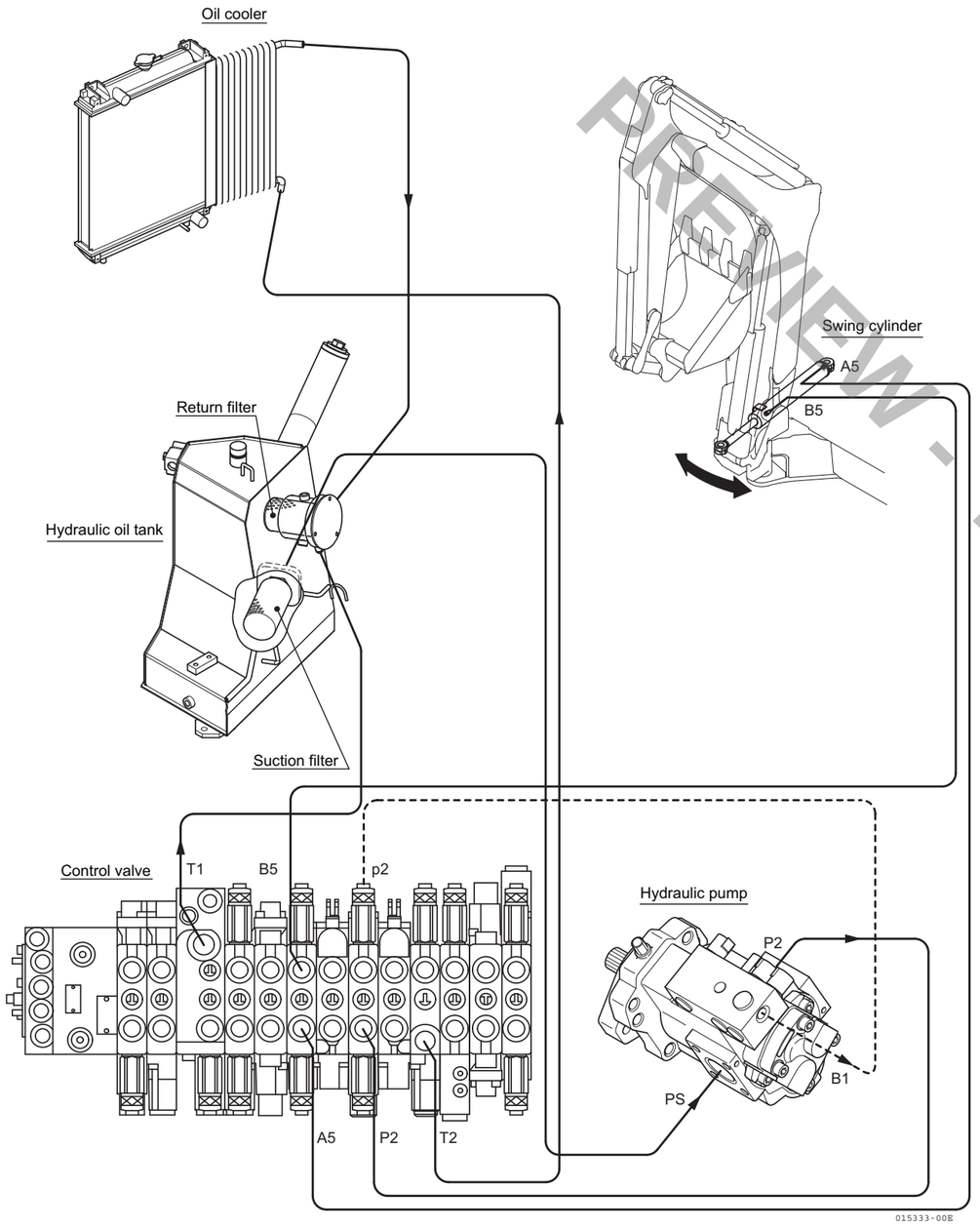
Tightening torque ft•lbf (N•m)	Lubricating oil application (threaded portion, and bearing seat surface)
33 to 36 (44.1 to 49.0)	Lube. oil applied

Standard of rod big end in. (mm)

Item	Standard	Limit
Rod I.D. bushing	1.8879 to 1.8883 (47.952 to 47.962)	1.8859 (47.902)
Crankpin O.D.	1.8898 to 1.8908 (48.000 to 48.026)	-
Metal thickness	0.0587 to 0.0591 (1.492 to 1.500)	-
Clearance	0.0015 to 0.0029 (0.038 to 0.074)	0.0059 (0.150)

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5. Disassembly and Reassembly

1) Precautions for Disassembly and Reassembly

(1) Since the parts of this hydraulic system are precision-made for tight clearances, be sure to perform disassembly and reassembly in a clean area that is free from dust.
(2) Prepare clean tools and cleaning oil and handle the parts carefully.
(3) First clean the external surface of the removed assemblies.
(4) Before beginning disassembly, review the drawings of the internal construction and prepare the required parts according to the purpose and extent of the disassembly.
(5) Never disassemble or readjust the adjust screws unless required. If they are disassembled or readjusted, it may cause the set horsepower to be changed and have a negative influence.
(6) In principle, the removed seals and rings must be replaced with new ones. As some replacement parts are available only in subassemblies, refer to the parts catalog to prepare the necessary subassemblies in advance.
(7) Handling of O-rings
    [1] Lubricate the O-rings and the O-ring fitting seats with clean grease or hydraulic oil.
    [2] The O-rings may not be damaged in handing or distorted by heat.
    [3] Do not permanently deform the O-rings.
    [4] Avoid rolling the O-rings when fitting them.
        A distorted O-ring may not return to its original shape, and therefore may cause oil leak.
(8) Before beginning reassembly, check the mating surfaces of each section to be sure that there is no cleaning oil or hydraulic oil on the outer surface of the O-ring grooves. If reassembly is performed without cleaning such oil, it may be mistaken for oil leak.
(9) Use a torque wrench to tighten the bolts following the torque specification.
(10) When installing or removing snap rings, take care not to let snap rings jump out. It may damage the other parts.

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7) P.T.O. 1 Operation

When the P.T.O. 1 is operated, the oil discharged from the pilot oil pump P4 flows through the cut-off valve and the P.T.O. solenoid valve to the port Pa4 to move the spool of the P.T.O. 1 section.

The P2 by-pass passage is blocked by the P.T.O. 1 spool as it has been moved, so that the oil from the port P2 flows through the passage installed between the boom swing section body and the P.T.O. 1 section body to the parallel passage of the P.T.O. 1 section.

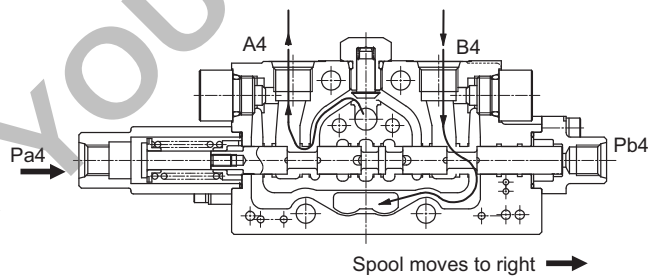
As the P2 by-pass passage is blocked by the P.T.O. 1 section spool as it has been moved, the oil from the port P2 flows to the parallel passage of the P.T.O. 1 section through the oil passage installed between the boom swing section and the P.T.O. 1 section.

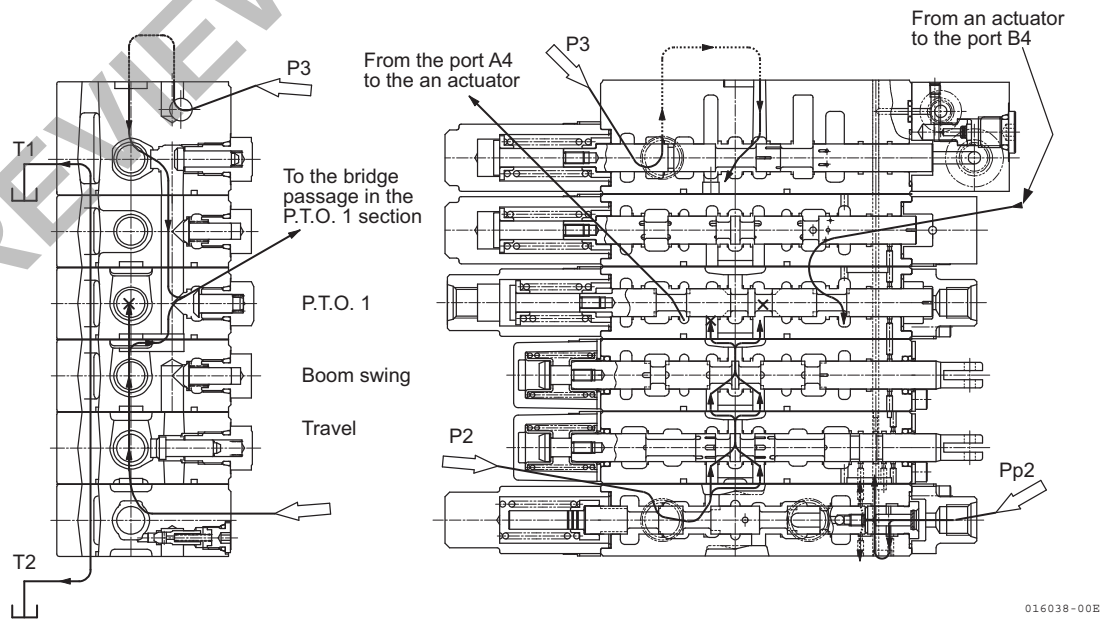
The passage between the port A4 and the bridge passage is opened as the P.T.O. 1 section spool has been moved, so that the oil from the parallel passage flows through the load check valve in the P.T.O. 1 section and the bridge passage to an attachment actuated by the P.T.O. 1.

The oil from the port P3 flows through the swing and blade sections and the check valve in the P3 inlet section to the parallel passage in the P.T.O. 1 section, so that the combined oil discharged from the pumps P2 and P3 is fed to the parallel passage in the P.T.O. 1 section.

Meanwhile, the return oil from the attachment connected to the P.T.O. 1 port flows through the port B4 to the return oil passage, which is opened as the P.T.O. 1 spool has been moved.

When the pilot oil is supplied to the port for the operation of a double acting attachment, oil flows to the other way but the valve actuation theory is the same.





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4) Reassembly

(1) Precautions for reassembly

1] Handling the O-rings

[1] Lubricate the O-rings and the O-ring fitting seats with clean grease or hydraulic oil.

[2] The O-rings may not have any defects in molding, or be damaged in handling or distorted by heat.

[3] Do not stretch any O-rings with such great force as to permanently deform them.
Prevent any O-ring from being damaged when it is set to the spool from its sharp end.

[4] Avoid rolling the O-rings when fitting them.
A distorted O-ring may not return to its original shape; therefore it may cause oil leakage.

2] Before beginning reassembly, check that there is no treated oil or hydraulic oil on the outer surface of the O-ring groove in the mating face of each section. If reassembly is performed without cleaning such oil, it may be mistaken for oil leakage.

3] Reassembly of control valve sections
Put the control valve sections with the actuator port down in the order shown in the figure below.

Note :

The symbol representing for each valve section is as follows and is carved on the upper surface (the actuator port side) of each valve body except the end cover.

(2) Tools

Tool	Q'ty	Size
Hexagon bar wrench (mm)	1 (for each)	2, 3, 4, 6
Torque wrench [ft·lb (N·m)]	1	1.5 to 151 (1.96 to 19.6)
Torque wrench [ft·lb (N·m)]	1	15 to 75 (19.6 to 98.1)
Magnet	1	
Pliers	1	
Screwdriver	1	
Tweezers	1	

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3)-3. Disassembly of anti-drift valve

When the anti-drift valve malfunctions, replace it as an anti-drift valve assembly. For reference, the disassembly procedure for examination is shown below.

[1] Remove the two hexagon socket head bolts **A** with a hexagon bar wrench (5 mm).

[2] Remove the anti-drift valve case **B**.

[3] Take care not to drop the two dowel pins **C** on the anti-drift valve body side.

Note :

Take care not to lose and damage the pins.

[4] Remove the anti-drift valve **1** and the needle valve **9**.

Notes :

- *Remove the needle valve **9** first and keep it as it is easily removed.*
- *The anti-drift valve should not be disassembled but it should be kept as an anti-drift valve assembly (**1**-**7**, **10**).*

[5] Hold the anti-drift valve case with a vice and remove the bush **17** with a wrench or socket wrench (26 mm).

Note :

Set the vice on any side face other than the port side to hold the anti-drift valve.

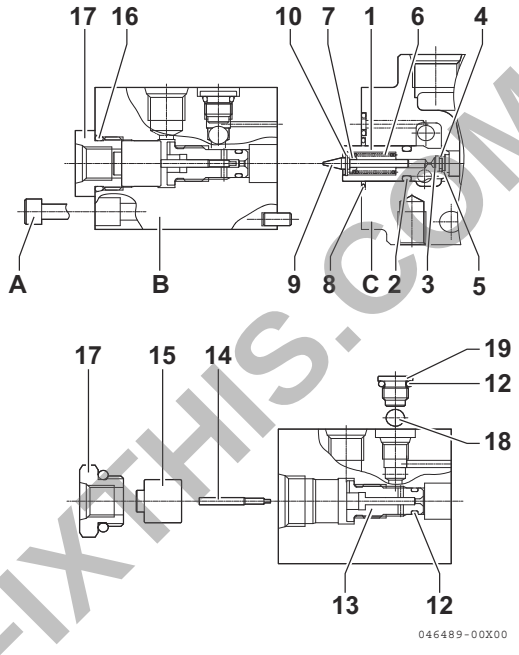
[6] Remove the piston B **15** and piston A1 **14** in the bore, which the bush has been removed from, with tweezers or a magnet.

Notes :

- *Make marks on the piston B and the piston A1 so that they can be reassembled in the same direction as it was before.*
- *The piston guide **13** should not be disassembled, but it should be kept together with the anti-drift valve case B.*

[7] Remove the ball retainer **19** with a hexagon bar wrench (4 mm).

[8] Remove the steel ball **18** of Ø 0.28 in. (7 mm) from the bore, which the ball retainer has been removed from, using a magnet.



No.	Part
1	Anti-drift valve
2	Cap seal 1 BE10
3	Filter
4	Spacer
5	Snap ring AR7
6	Anti-drift valve spring A
7	Spring holder
8	O-ring AS 1B17
9	Needle valve
10	Internal snap ring 9
11	O-ring 1A P6
12	O-ring 1B P8
13	Piston guide
14	Piston A1
15	Piston B
16	O-ring 1B P18
17	Bush PF1/2×1/4
18	Steel ball Ø0.28 in. (7 mm)
19	Ball retainer

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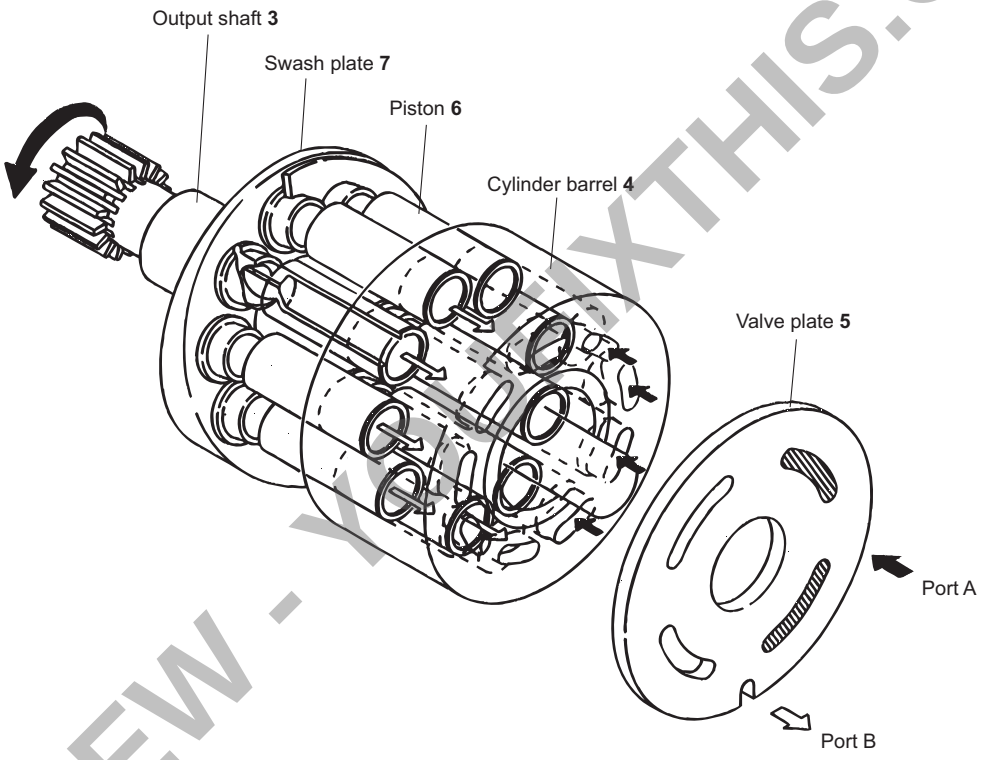
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2. Theory of Operation

1) Hydraulic Motor

Hydraulic oil supplied from the pump through the control valve is fed to the valve plate **5** through the relief valve. When the hydraulic oil is supplied to the port **A**, the oil flows into the cylinder ports of the cylinder barrel **4** which correspond to the port **A**, and presses the piston **6**. The pressing force the piston receives from the hydraulic oil is converted into rotating force through the swash plate **7** and transmitted to the output shaft **3** splined to the cylinder barrel **4**.

The return oil from the cylinder ports flows out of the port **B** of the valve plate **5**. In the opposite rotation to the above, the hydraulic oil is taken in from the port **B** and the return oil flows out of the port **A**.



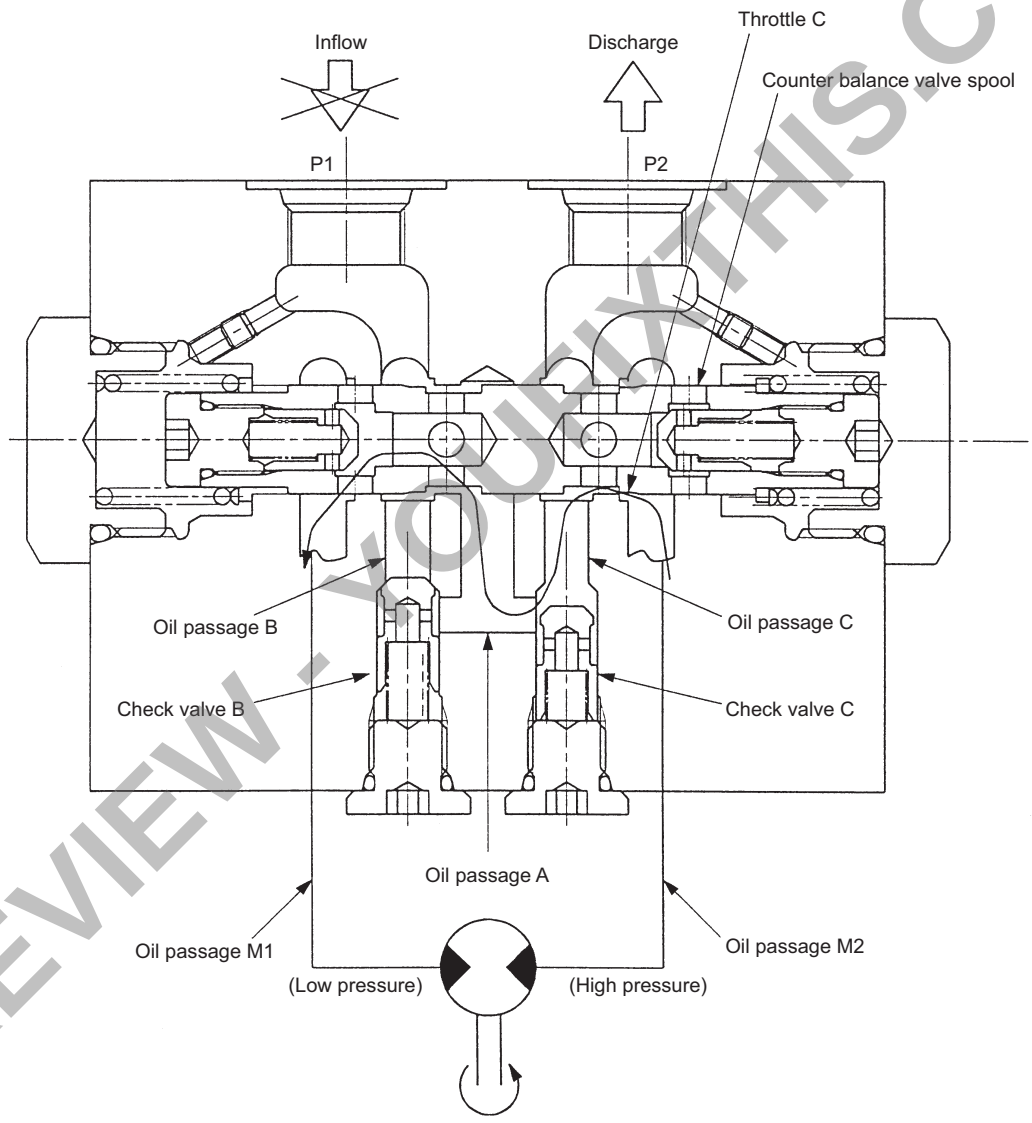
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(4) Regular rotation of motor → in speed reduction

When reducing the motor speed, the hydraulic oil flows through the oil passage M2 out of the port P2 while the counter balance valve is open although the motor still keeps rotating with the inertia force. Then the cavitation occurs on the oil passage M1 side due to the shortage of oil supply from the port P1.

However, with this anti-cavitation mechanism, the hydraulic oil passes through the oil passage M2, the counter balance valve throttle C, the oil passage C, the check valve C, the oil passage A, and the oil passage M1, and returns to the motor to reduce the cavitation while the counter balance valve spool is returning to the neutral position.

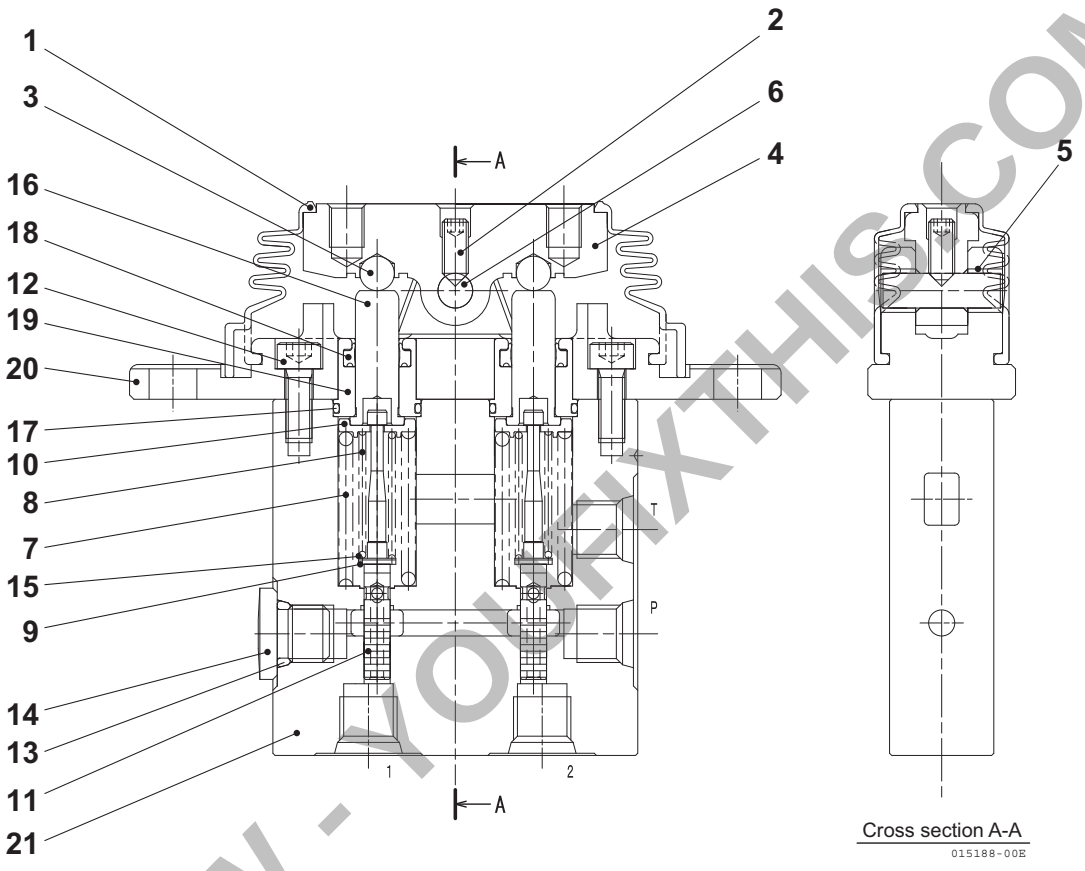


Anti-cavitation valve (In speed reduction)

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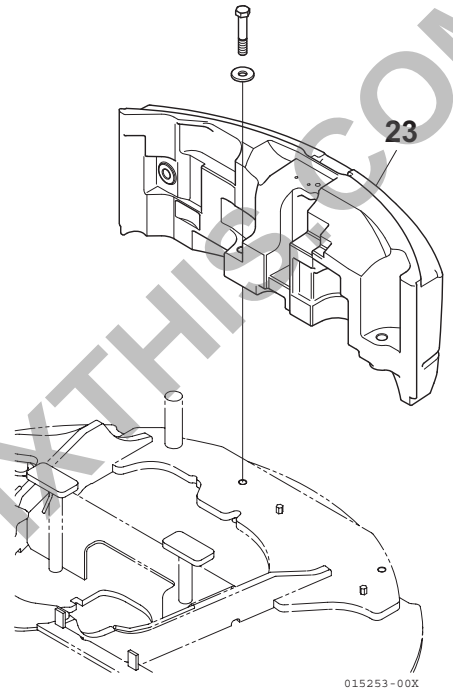
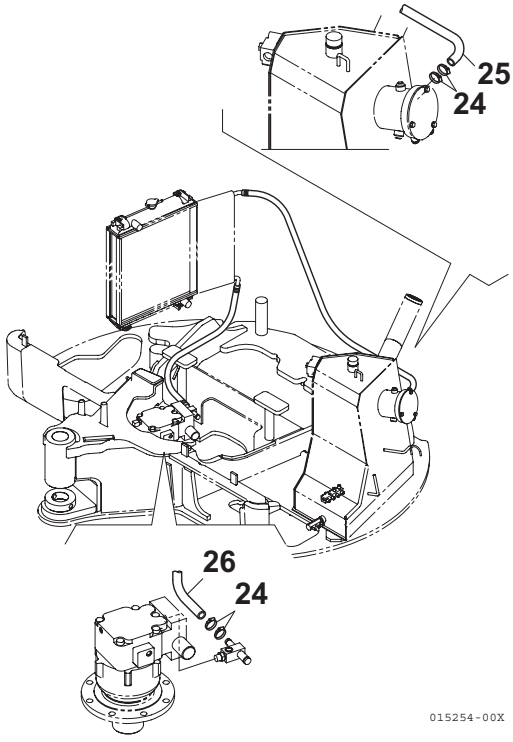
3. Cross Section Drawing and Component Parts



No	Description	Q'ty	No	Description	Q'ty
1	Rubber boot	1	12	Allen head cap screw	2
2	Allen head screw	1	13	O-ring	1
3	Steel ball	2	14	Plug	1
4	Cam	1	15	Shim	2
5	Bushing	2	16	Push rod	2
6	Cam shaft	1	17	O-ring	2
7	Spring (Return)	2	18	Gasket	2
8	Spring (Secondary side pressure regulating)	2	19	Plug	2
9	Washer	2	20	Cover	1
10	Spring seat	2	21	Casing	1
11	Spool	2			

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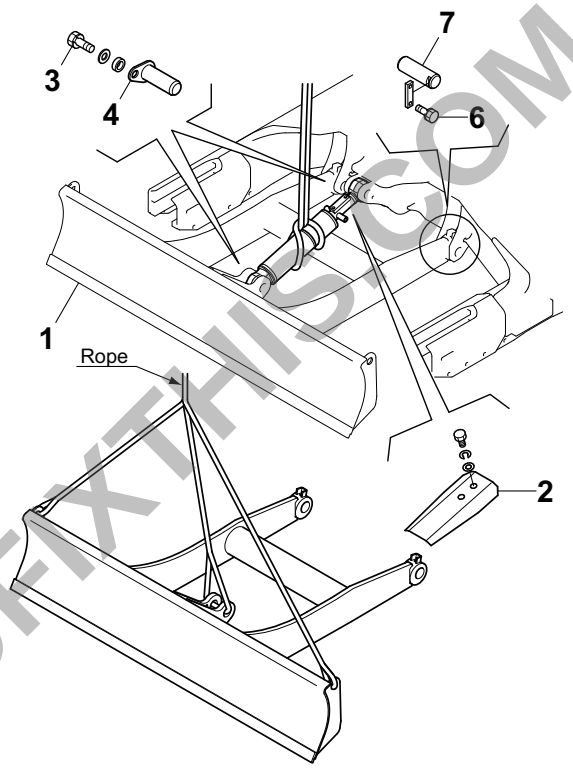
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Procedure	
(20) Remove the rear weight **23**.	
(21) Loosen two hose clips **24** to disconnect the hose (oil cooler - reservoir) from the reservoir. (22) Loosen two hose clips **24** to disconnect the hose (oil cooler - swing motor) from the swing motor.	

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4) Removal of Blade

Procedure	
(1) Turn the implement to the blade side, lower the bucket and the blade **1** to the ground and stop the engine. (2) Remove the blade cover **2**, and then the hydraulic hose. (3) After putting rope round the blade cylinder **5**, remove the bolt **3** (M10) to pull out the pin 4 and remove the blade cylinder **5**. (4) After putting rope onto the blade **1**, remove the bolt **6** (M10) to pull out the pin **7** and remove the blade. ***Note :*** *Use a lifting device to remove the blade cylinder or the blade.*	

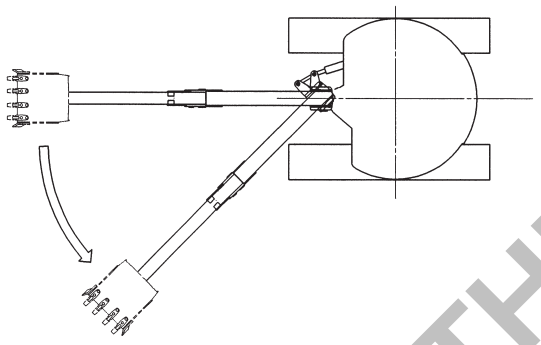
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10-1-6 Telescopic Motion of Boom Swing Cylinder with Lock Lever Set to Lock Position

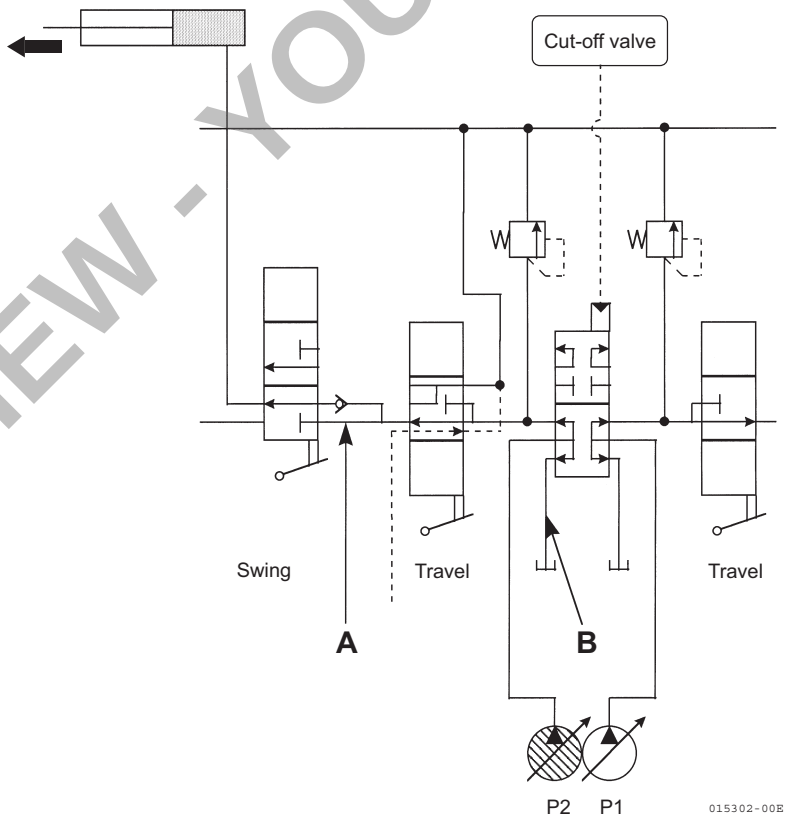
Phenomenon

When the boom swing pedal is moved with the lock lever set to the Lock position, the boom swings at very low speed.



Reason

When the lock lever is in the Lock position, the oil flowing through the passage A of the control valve from the hydraulic pump is unloaded into the hydraulic oil tank through the passage B. However, a very small pressure is generated by the resistance in the piping to the hydraulic oil tank. Therefore, when the boom swing pedal is moved, the very small pressure is applied to the boom swing cylinder and the boom swings at very low speed.



Note :

Typical schematic is shown above just for example. Refer to the chapter 5 for more details.

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