3. SPECIFICATIONS AND PERFORMANCE

■ SPEED AND CLIMBING ABILITY

Item \ Model	SK150LCIII
Swing speed	11.4rpm
Travel speed	6.0 / 3.6km / h (3.7 / 2.2 MPH)
Gradeability	35° (70%)

■ ENGINE

Item \ Model			SK150LCIII
Model			ISUZU 4BD1T
Type			4-cycle, water-cooled direct injection type with turbo charger
Number of cylinder−Bore×Stroke			4−102mm(4in)×118mm(4.64in)
Total displacement			3,856c.c. (235cuin)
Rated output power/revolution	JISD1005 Net	※	100ps / 2,300rpm
	SAE1349 Net	※	100 HP / 2,300rpm
	DIN 6270B Net	※	100ps / 2,300rpm
Maximum torque/revolution	JISD1005 Net		32.5kgf·m / 1,600rpm
	SAED1349 Net		235.1lb·ft / 1,600rpm
	DIN 6270B Net		32.5kgf·m / 1,600rpm

☞ ※ Mounted for air cleaner, alternator and no muffler.

■ HYDRAULIC COMPONENTS

Item \ Model	SK150LCIII
Hydraulic pump	Double-pump variable displacement, axial piston + gear pump
Hydraulic motor (swing)	Axial piston motor
Hydraulic motor (travel)	Axial piston motor
Control valve	5-section multiple control valve + 1-section control valve (swing)
Cylinders (boom, arm, and bucket)	Double acting cylinder
Return filter	Safety valve containing filter type
Oil cooler	Air-cooled type

■ WEIGHT

Unit : kg (lbs)

Fully-equipped weight	15,300(33,700)	15,650(34,500)	16,000(35,300)
Upper machinery	6,360 (14,000)	←	←
Lower machinery (with 500mm (20″) groser shoe)	6,190 (13,600)	—	—
Lower machinery (with 600mm (24″) groser shoe)	—	6,350 (14,000)	—
Lower machinery (with 700mm (28″) groser shoe)	—	—	6,890 (15,200)
Attachment [5.15m(16ft 11in) boom + 3.06m (10ft) arm + 0.47m³ (0.61 cuyd) bucket]	2,750 (6,060)	←	←

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2. HYDRAULIC SYSTEM DIAGRAM

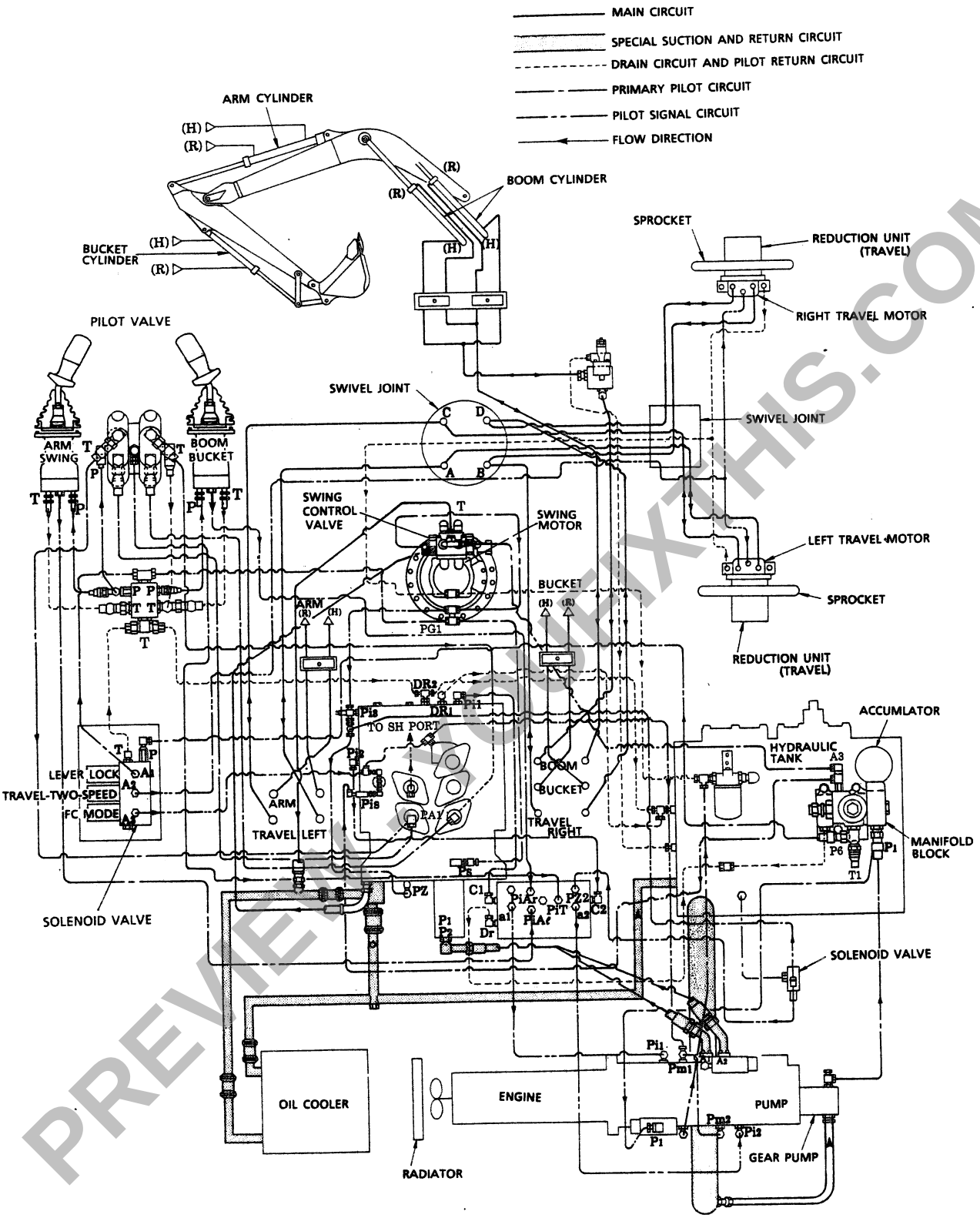


Fig. 1 Diagram of Major Hydraulic Circuits

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1. GENERAL

1.1 POWER PLANT

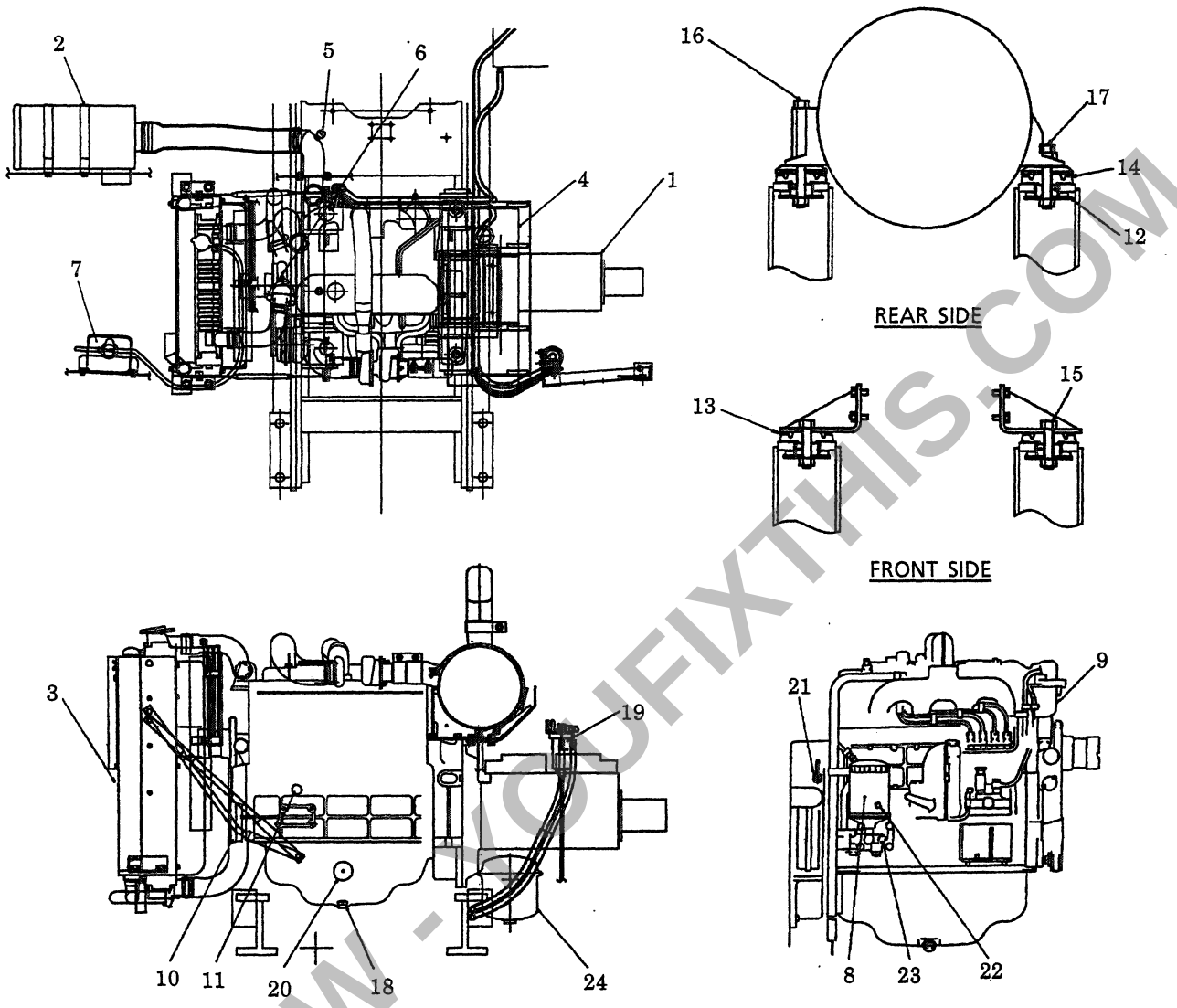


Fig. 1 Power plant

No.	NAME	Q'ty	No.	NAME	Q'ty	No.	NAME	Q'ty
1	HYDRAULIC PUMP	1	9	FUEL FILTER	1	17	CAPSCREW	1
2	AIR CLEANER	1	10	FAN BELT	1	18	OIL PAN DRAIN PLUG	1
3	RADIATOR	1	11	OIL PRESSURE SWITCH	1	19	WATER SEPARATOR	1
4	MUFFLER	1	12	CUSHION RUBBER	4	20	OIL LEVEL SENSOR	1
5	INDICATOR	1	13	CUSHION RUBBER	2	21	ROTARY SENSOR	1
6	OVERHEAT WATER SWITCH	1	14	CUSHION RUBBER	2	22	WATER DRAIN COCK	1
7	RADIATOR SUB TANK	1	15	CAPSCREW	2	23	OIL FILTER CLOGGING SWITCH	1
8	OIL FILTER	1	16	CAPSCREW	1	24	OIL FILTER	1

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1. INTRODUCTION

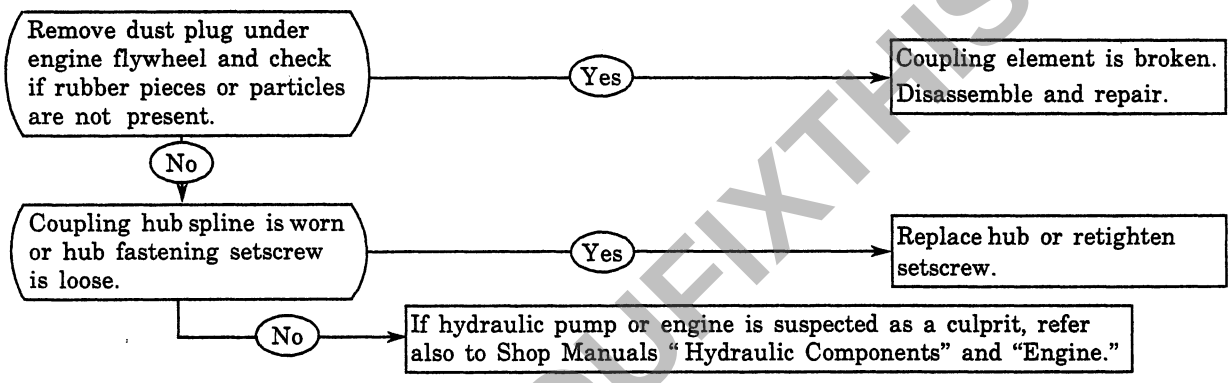
1.1 MACHINE IN GENERAL

(1) If even a minor fault is left intact and operation is continued, a fatal failure may be caused, entailing a large sum of expenses and long hours of restoration. Therefore when even a small trouble occurs, do not rely on your intuition and experience, but look for the cause based on the troubleshooting principle and perform maintenance and adjustment to prevent major failure from occurring.
Keep in mind that a fault results from a combination of different causes.

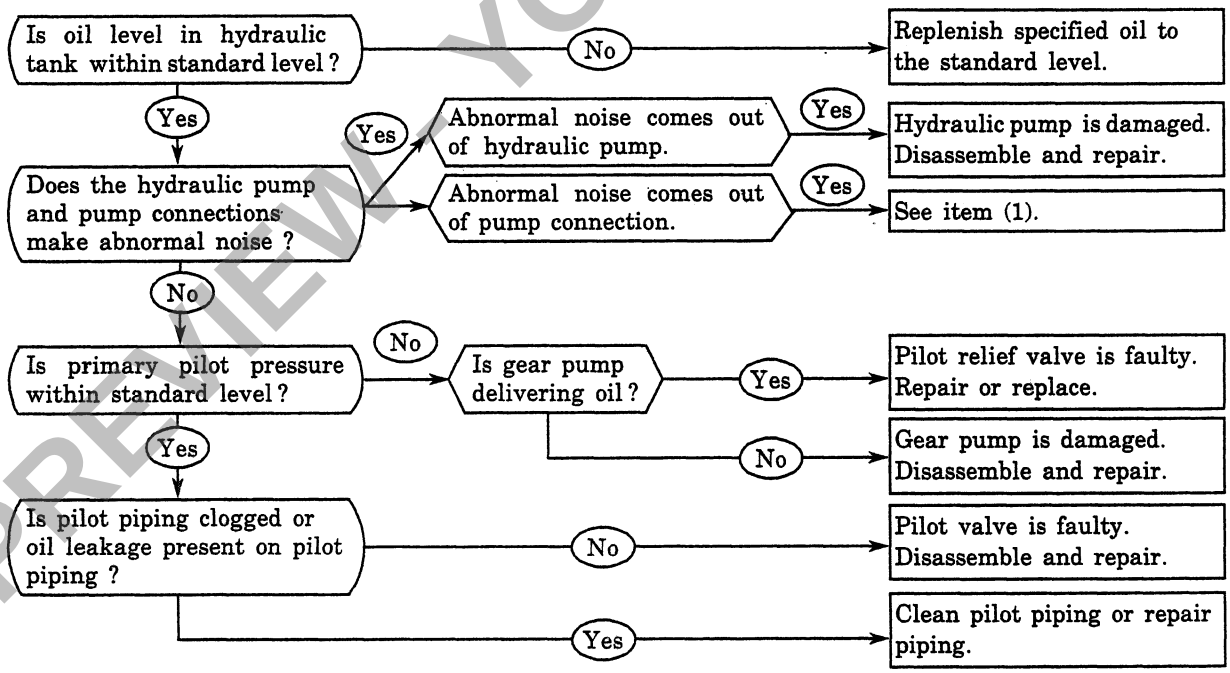
(2) The following lists up commonly occurring faults and possible causes with this machine. For the troubleshooting of the engine, refer to the Shop Manual-Engine. For the troubleshooting of hydraulic components, refer to a separate Shop Manual-Hydraulic Components.

2. DRIVE SYSTEM

(1) Unusual noise comes out of pump connection.



(2) Engine starts but machine does not operate.



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2. REMOVAL AND INSTALLATION OF HYDRAULIC PUMP

2.1 REMOVING HYDRAULIC PUMP

1) After stopping the engine, dismantle the cover assy and the bracket the top guard of the hydraulic pump.

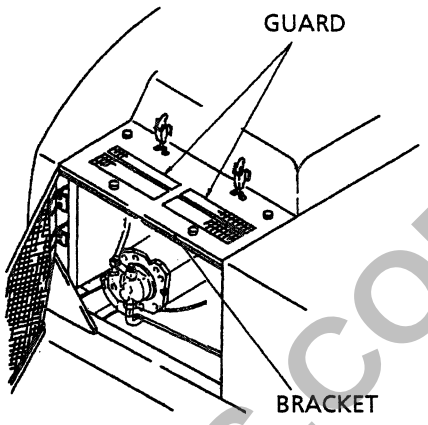


Fig. 3 Removing cover assy and bracket

2) Install the suction stopper on the suction port of the hydraulic oil tank.

⚠ Be sure to loosen the air breather and bleed any residual pressure from the tank before removing the tank cover and flange.

☞ Regarding the suction stopper, refer to 6. "Suction Stopper Detail".

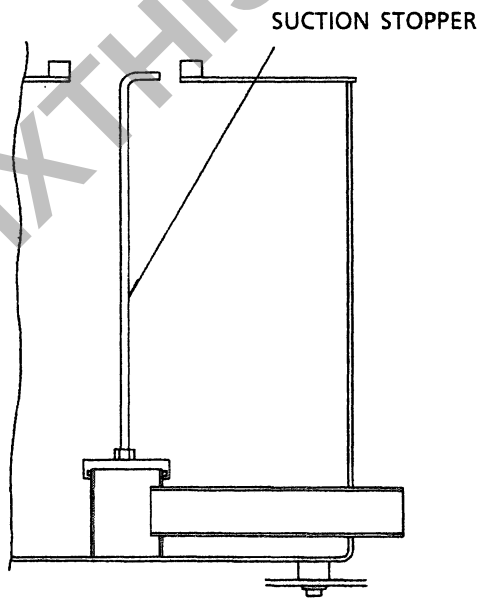


Fig. 4 Install the suction stopper (32)

3) Disconnect all hoses and pipes connected to the hydraulic pump. Then put a plug to each hose fitting and each port on the hydraulic pump side.

4) Loosen slightly the 4 hex capscrews (22) holding the pump.

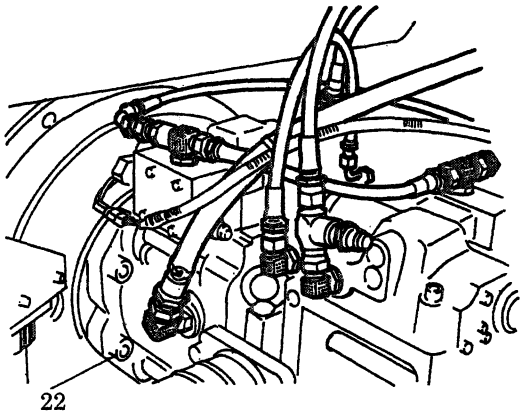


Fig. 5 Disconnecting hoses

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1. TIGHTENING TORQUES FOR CAPSCREWS AND NUTS

Tables 1 and 2 indicate tightening torques applicable to cases where no special note is given. Overtightening of bolts may result in a twist-off and a fracture under load. Undertightening may lead to a loosening or loss of bolts. Always tighten bolts to proper torques.

Table 1 Standard tightening torques for metric coarse screw threads kgf · m (ft-lbs)

Classification	4	T	7	T	10	T
Nominal size	No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M 6 P=1	0.45±0.05 (3.2±0.4)	0.38±0.04 (2.7±0.3)	0.98±0.1 (7.1±0.7)	0.83±0.08 (6.0±0.6)	1.77±0.18 (12.8±1.3)	1.5±0.15 (10.8±1.1)
M 8 P=1.25	1.09±0.11 (7.9±0.8)	0.92±0.09 (6.6±0.7)	2.4±0.2 (17.3±1.4)	2.0±0.2 (14.4±1.4)	4.3±0.4 (31.0±2.9)	3.6±0.4 (26.0±2.9)
M10 P=1.5	2.2±0.2 (15.9±1.4)	1.83±0.18 (13.2±1.3)	4.7±0.5 (33.9±3.6)	4.0±0.4 (28.9±2.9)	8.5±0.9 (61.3±6.5)	7.2±0.7 (52.0±5.1)
M12 P=1.75	3.7±0.4 (26.7±2.9)	3.2±0.3 (23.1±2.2)	8.1±0.8 (58.5±5.8)	6.8±0.7 (49.1±5.1)	14.6±1.5 (105±10.8)	12.3±1.2 (88.8±8.7)
M14 P=2	5.9±0.6 (42.6±4.3)	5.0±0.5 (36.1±3.6)	12.8±1.3 (92.5±9.4)	10.8±1.1 (78.0±7.9)	23±2 (166±14)	19.5±1.9 (140±14)
M16 P=2	9.0±0.9 (64.9±6.5)	7.6±0.7 (54.8±5.1)	19.5±2.0 (140±14.4)	16.4±1.6 (118±11.5)	35±4 (252±28.9)	29±3 (209±21.6)
M18 P=2.5	12.4±1.2 (89.6±8.7)	10.5±1.0 (75.8±7.2)	27±3 (195±22)	23±2 (166±14)	49±5 (354±36)	41±4 (296±29)
M20 P=2.5	17.5±1.7 (126±12.3)	14.7±1.4 (106±10.1)	38±4 (274±29)	32±3 (231±22)	68±7 (491±51)	57±6 (412±43)
M22 P=2.5	23±2 (166±14)	19.6±2.0 (142±14)	51±5 (368±36)	43±4 (310±29)	92±9 (663±65)	77±8 (555±58)
M24 P=3	30±3 (217±22)	24±3 (173±22)	65±7 (469±51)	53±5 (383±36)	118±12 (852±87)	96±10 (693±72)
M27 P=3	44±4 (318±29)	36±3 (260±22)	96±10 (693±72)	78±8 (563±58)	173±17 (1250±120)	140±14 (1010±100)
M30 P=3.5	60±6 (433±43)	50±5 (361±36)	131±13 (946±94)	110±11 (794±79)	235±24 (1700±170)	198±20 (1430±140)
M33 P=3.5	81±8 (585±58)	68±7 (491±51)	176±18 (1270±130)	148±15 (1070±110)	317±32 (2290±230)	266±27 (1920±200)
M36 P=4	105±10 (758±72)	88±9 (636±65)	227±23 (1640±170)	190±19 (1370±140)	409±41 (2950±300)	343±34 (2480±250)

Table 2 Standard tightening torques for metric fine screw threads kgf · m (ft-lbs)

Classification	4	T	7	T	10	T
Nominal size	No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M 8 P=1	1.15±0.11 (8.3±0.8)	0.97±0.1 (7.0±0.7)	2.5±0.2 (18.0±1.4)	2.1±0.2 (15.2±1.4)	4.5±0.4 (32.5±2.9)	3.8±0.4 (27.4±2.9)
M10 P=1.25	2.3±0.2 (16.6±1.4)	1.91±0.19 (13.8±1.4)	4.9±0.5 (35.4±3.6)	4.2±0.4 (30.3±2.9)	8.9±0.9 (64.2±6.5)	7.5±0.7 (54.2±5.1)
M12 P=1.25	4.0±0.4 (28.9±2.9)	3.4±0.3 (24.5±2.2)	8.7±0.9 (62.8±6.5)	7.3±0.7 (52.7±5.1)	15.7±1.6 (113±12)	13.2±1.3 (95.3±9.4)
M16 P=1.5	9.4±0.9 (67.9±6.5)	7.9±0.8 (57.0±5.8)	20±2 (144±14)	17.2±1.7 (124±12)	37±4 (267±29)	31±3 (224±22)
M20 P=1.5	19±1.9 (137±14)	15.8±1.6 (114±12)	41±4 (296±29)	34±3 (246±22)	74±7 (535±51)	62±6 (448±43)
M24 P=2	32±3 (231±22)	27±3 (195±22)	70±7 (506±51)	58±6 (419±43)	126±12 (910±87)	105±10 (758±72)
M30 P=2	65±6 (469±43)	54±5 (390±36)	142±14 (1030±100)	118±12 (852±87)	255±26 (1840±190)	212±21 (1530±150)
M36 P=3	109±11 (787±79)	91±9 (657±65)	238±23 (1720±170)	198±20 (1430±140)	428±43 (3090±310)	357±36 (2580±260)

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HYDRAULIC EXCAVATOR

SHOP MANUAL

model SK150LC III

This is the shop manual for KOBELCO hydraulic excavator. Contained is the necessary technical data concerning the maintenance and repair of this model. The manual is divided into the following four major sections; GENERAL, SYSTEMS, COMPONENTS and PROCEDURE.

*GENERAL

YM01. SPECIFICATION
— OPERATION AND CONTROLS
YM03. LOCATION AND WEIGHT OF COMPONENTS
YM04. MAINTENANCE STANDARD AND TEST PROCEDURE
YM05. TROUBLE SHOOTING
— PREVENTIVE MAINTENANCE (Refer to Operators Manual)
YM07. WORKING STANDARD

*SYSTEMS

YM11. DRIVE SYSTEM
YM12. HYDRAULIC SYSTEM
YM15. SWING SYSTEM
YM18. TRAVEL SYSTEM
YM21. ATTACHMENTS
YM22. CONTROL SYSTEM
YM23. UPPER FRAME
YM25. ELECTRICAL SYSTEM
YM26. FRESH AIR HEATER
YM50. ENGINE

*COMPONENTS

12. HYDRAULIC PUMP
13. CONTROL VALVE
14. OTHER VALVES
15. HYDRAULIC MOTOR
16. SWIVEL JOINT
17. HYDRAULIC CYLINDER
21. REDUCTION UNIT

*PROCEDURE

When checking or repairing the machine we suggest that you refer to this manual carefully. We hope that reference to this manual will help to maintain a high level of working efficiency and reliability. For further details on maintenance and checks refer to the "OPERATORS MANUAL" which has been supplied with the machine.

Although all data was correct at the time of printing, due to continual design changes and improvements, some contents may not conform to the actual machine. Take special care to order parts only after confirming the validity of the part number in the "PARTS MANUAL".

If you notice any explanatory discrepancies, after consulting one of our representatives, please update your manual according to the latest data. However, in the event of any specification changes, we will issue revised edition.

INDEX

KOBELCO

Book code No. S5YM0001E

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⚠ WARNING

SAFETY

⚠ WARNING

The proper and safe lubrication and maintenance for this machine, recommended by KOBELCO are outlined in the OPERATION & MAINTENANCE GUIDE for this machine.

Improper performance of lubrication or maintenance procedures is dangerous and could result in injury or death. Read and understand the OPERATION & MAINTENANCE GUIDE before performing any lubrication or maintenance.

The serviceman or mechanic may be unfamiliar with many of the systems on this machine. This makes it important to use caution when performing service work. A knowledge of the system and or components is important before the removal or disassembly of any component.

Because of the size of some of the machine components, the serviceman or mechanic should check the weights noted in this Manual. Use proper lifting procedures when removing any components.

Following is a list of basic precautions that should always be observed.

1. Read and understand all Warning plates and decals on the machine before operating, lubricating or repairing this product.

2. Always wear protective glasses and protective shoes when working around machines. In particular, wear protective glasses when pounding on any part of the machine or its attachments with a hammer or sledge. Use welders gloves, hood/goggles, apron and other protective clothing appropriate to the welding job being performed. Do not wear loose-fitting or torn clothing. Remove all rings from fingers when working on machinery.

3. Disconnect battery and discharge any capacitors before starting to work on machine. Hang "Do Not Operate" tag in the Operator's Compartment.
4. If possible, make all repairs with the machine parked on a level, hard surface. Block machine so it does not roll while working on or under machine.

5. Do not work on any machine that is supported only by lift jacks or a hoist. Always use blocks or jack stands to support the machine before performing any disassembly.

⚠ WARNING

Do not operate this machine unless you have read and understand the instructions in the OPERATOR'S MANUAL. Improper machine operation is dangerous and could result in injury or death.

---

6. Relieve all pressure in air, oil or water systems before any lines, fittings or related items are disconnected or removed. Always make sure all raised components are blocked correctly and be alert for possible pressure when disconnecting any device from a system that utilizes pressure.

7. Lower the bucket, blade, ripper or other implements to the ground before performing any work on the machine. If this cannot be done, make sure the bucket, blade, ripper or other implement is blocked correctly to prevent it from dropping unexpectedly.

8. Use steps and grab handles when mounting or dismounting a machine. Clean any mud or debris from steps, walkways or work platforms before using. Always face machine when using steps, ladders and walkways. When it is not possible to use the designed access system, provide ladders, scaffolds, or work platforms to perform safe repair operations.

9. To avoid back injury, use a hoist when lifting components which weigh 23 kg (50 lbs) or more. Make sure all chains, hooks, slings, etc., are in good condition and are in the correct capacity. Be sure hooks are positioned correctly. Lifting eyes are not to be side loaded during a lifting operation.

10. To avoid burns, be alert for hot parts on machines which have just been stopped and hot fluids in lines, tubes and compartments.

11. Be careful when removing cover plates. Gradually back off the last two bolts or nuts located at opposite ends of the cover or device and pry cover loose to relieve any spring or other pressure, before removing the last two bolts or nuts completely.

12. Be careful when removing filler caps, breathers and plugs on the machine. Hold a rag over the cap or plug to prevent being sprayed or splashed by liquids under pressure. The danger is even greater if the machine has just been stopped because fluids can be hot.

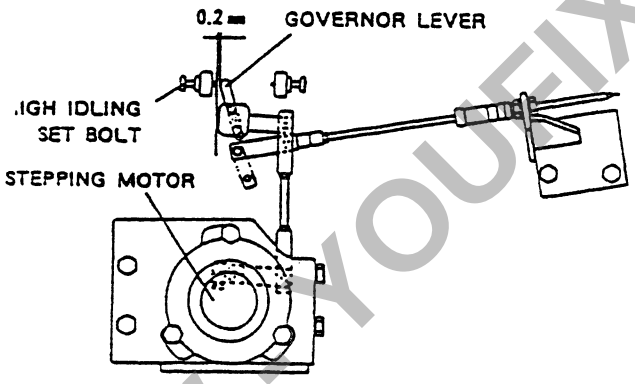
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to proper clearance specification. Note: Never adjust the linkage again in this procedure!

10. Depress-push and release the adjustment harness switch once quickly. This will signal the CPU to turn the power off to the stepping motor assembly. Manually (by hand) push or pull, depending on installation design, the stepping motor, linkage, and throttle lever to the high idle stop bolt assembly, as close as possible. Depress-push the adjustment harness switch again once quickly. This will signal the CPU to turn on the power to the stepping motor and hold it in this position.

⚠ CAUTION: Never manually (by hand) push or pull stepping motor linkage, or rotate stepping motor while power is on to stepping motor, or damage may occur!



11. Now clearance between the high idle stop bolt and the throttle lever must be set to 0.2mm (.008"). Insert a feeler gauge between the high idle stop bolt and throttle lever to determine this clearance.

Note: Do not adjust linkage to obtain correct clearance between high idle stop bolt and throttle lever. If you do you will mis-adjust engine stop position. Also, do not adjust high idle stop bolt on fuel pump.

Clearance between the high idle stop bolt and throttle lever will be set by utilizing the buzzer stop switch and the position of the auto accel-decel switch. Refer to the following chart for switch position and movement:

Auto Accel-Decel Switch Position	Buzzer Stop Switch	Clearance Between High Idle Stop Bolt and Throttle Lever
ON	Pushing On & Off	Decreases approx. .04mm (.001") with every push of buzzer stop switch
OFF	Pushing On & Off	Increases approx. .04mm (.001") with every push of buzzer stop switch

Utilize above chart to set correct clearance of .2mm (.008") between high idle stop bolt and throttle lever on fuel pump.

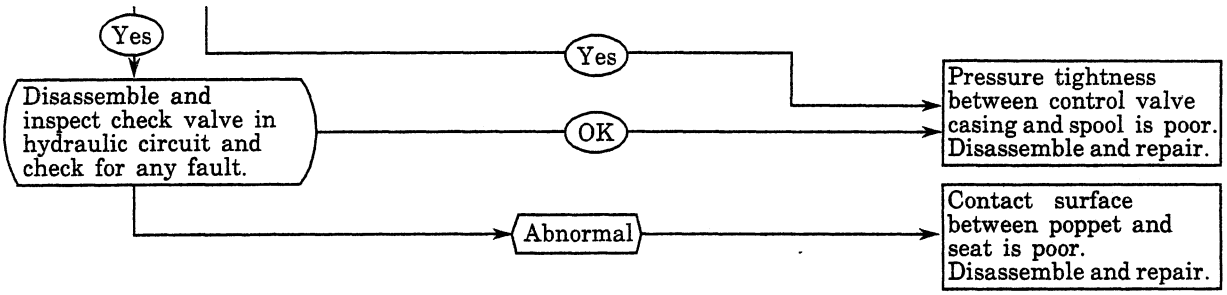
12. When correct clearance has been obtained, depress-push the adjustment harness switch quickly to allow the mechatronic controller to memorize this position of the stepping motor as high idle position. The stepping motor will then rotate automatically to the engine stop position and then to engine start position. Also the gauge cluster display will change from CPU controller to Mark III. Do not turn off ignition key switch at this point, because Adjustment A procedure is not complete yet.

13. Set switch settings and conditions as indicated in the following chart for next part of Adjustment A procedure:

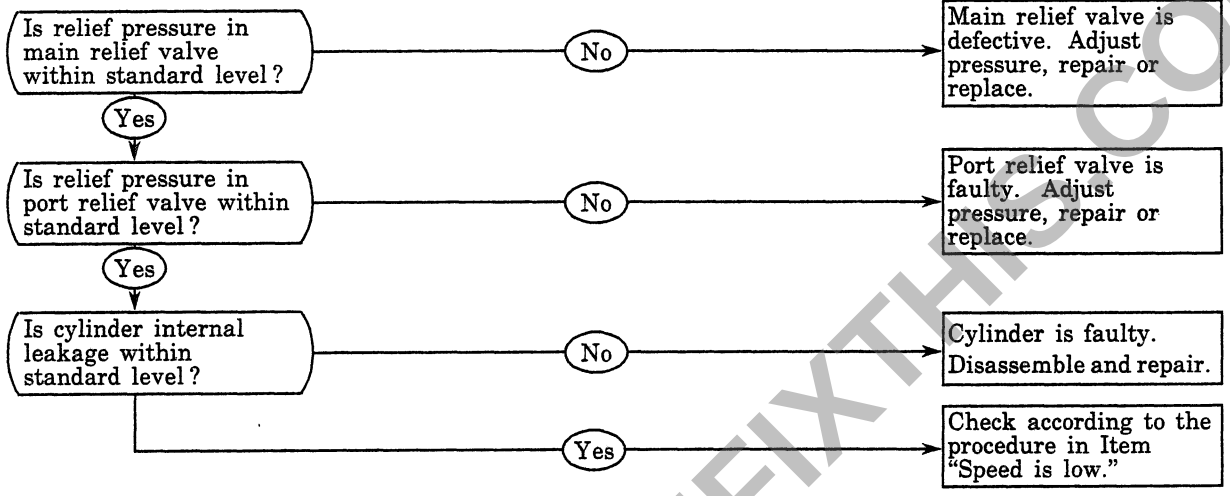
ITEM	POSITION
CPU Test-Run Switch	Test Position
KPSS Mode Switch	H-Mode Position
Auto Accel-Decel Switch	Off Position
Throttle Lever-In Cab	Low Idle Position
Key Switch	On Position
Engine	Running

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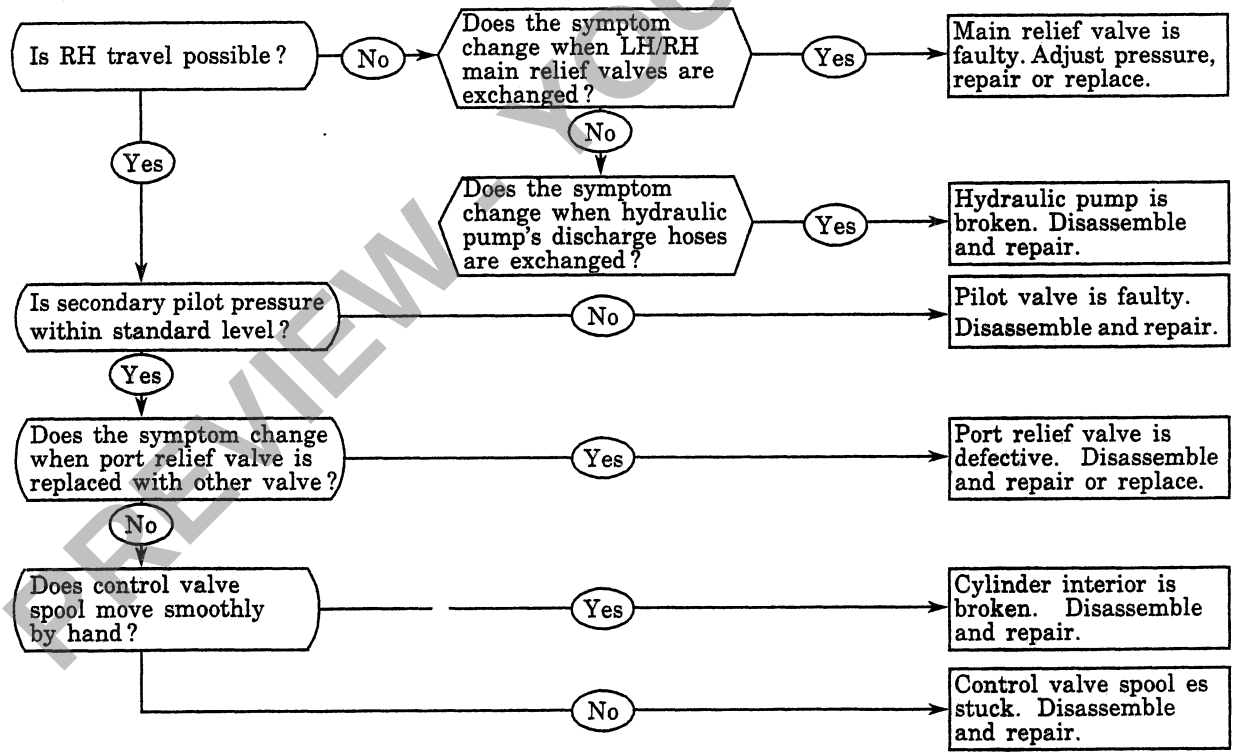
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(4) Boom, arm or bucket power is weak.



(5) Only bucket operation is totally impossible.



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4.2.5 1-SPEED TRAVEL (ADVANCE) / BOOM RAISING MOTION

(1) Pilot circuit

1) Switching over the travel spool by the secondary pressure of the travel spool

If travel operation is performed, the secondary pilot pressure PAL and PAR goes out of travel pilot valve (37), enters pilot port PBℓ and PBr of control valve (3) and changes over the travel spool.

2) Switching over the boom spool by the secondary pilot pressure for the boom raising motion

If boom raising operation is performed, secondary pilot pressure PA1 goes out of operation pilot valve (11), enters pilot port PAb of the control valve and changes over the boom spool. At the same time the pressure changes over the following spools :

PA1 → PAb; Changes over the boom spool.

PA1 → PB1; → Changes over the conflux valve.

PB1; → Changes over the neutral cut valve.

3) Switching over the straight travel valve by composite operation

If the a composite motion of the travel spool and the boom raising operations are performed, the secondary pilot pressure in the servo pressure port PS increases the side bypass circuit pressure and changes over the following valves :

Solenoid valve , Control valve

(28) A1 → PS → Changes over the straight travel valve

4) Actuation of automatic deceleration switch

The pressure oil from port PDS of the independent travel valve (26) actuates the pressure switch which acts as an automatic deceleration switch when the automatic deceleration switch is on.

(2) Main circuit

The right and left travel motors receive drive oil that is branched off from the No.2 pump. For boom raising motion, drive oil is supplied by the No.1 pump.

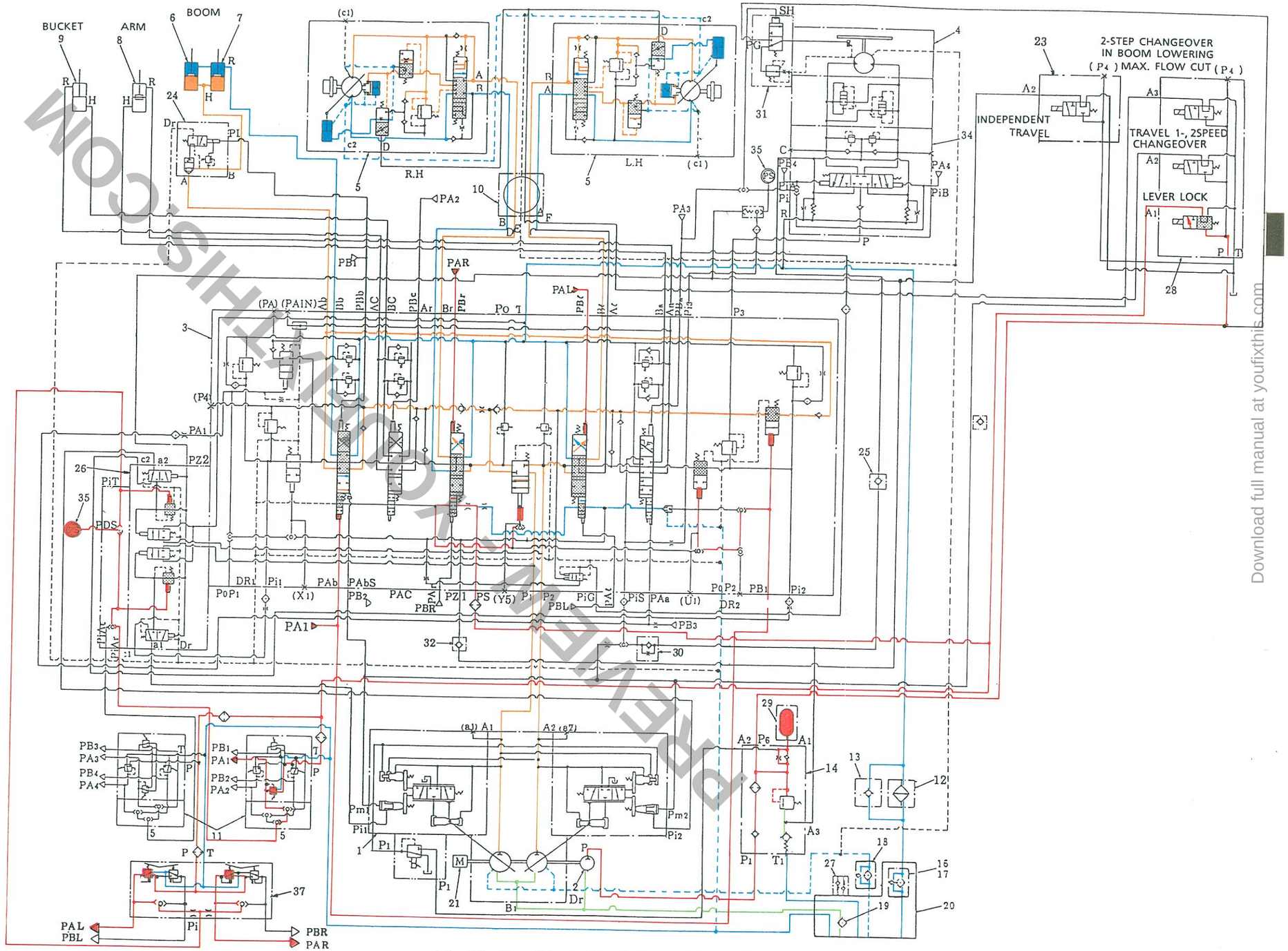


Fig. 11 Travel in 1st Speed Forward / Boom Raising

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6) Apply a master pin removal jig to the master pin (8), and by hammering the jig, remove the master pin.

☞ If the master pin is hammered without the shoe plate in place, the track will twist, making it difficult to remove the master pin.

⚠ • Be careful for flying object when using bigger hammer.
• Alway use safety glasses and long sleeve shirt.

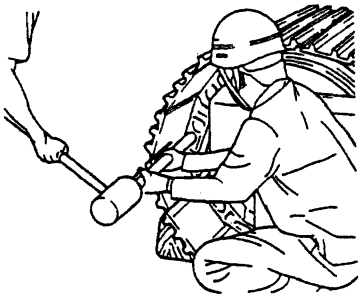


Fig. 8

7) Drive the machine slowly backward and off the track. At this time, drive the machine onto a replacement track or planks.

⚠ Do not get near the sprockets as the track shoe plate may fall on your feet, which is very dangerous.

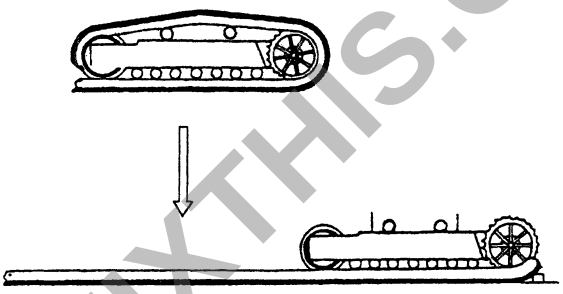


Fig. 9

3.1.2 INSTALLING THE TRACKS

1) While an assistant drives the machine slowly, insert a bar into the master pin bore located at the track end, and help the track engage with the sprocket.

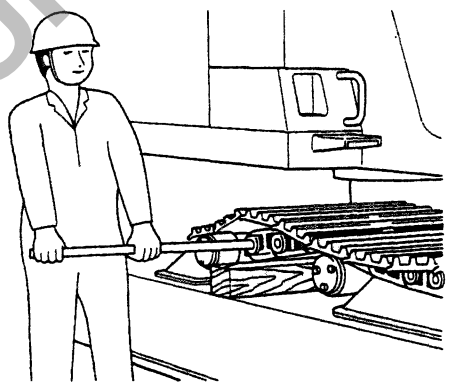


Fig. 10

2) When aligning the master pin bores in the track links, use wooden blocks A and B to join the track ends.

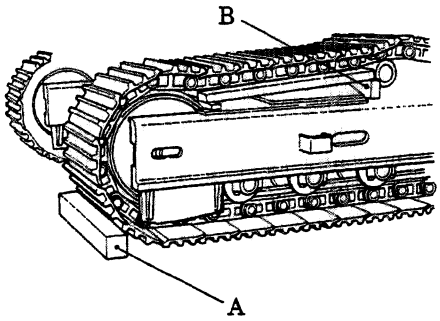
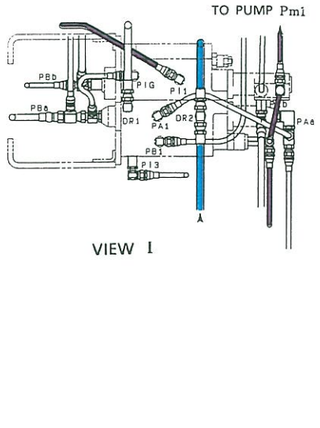
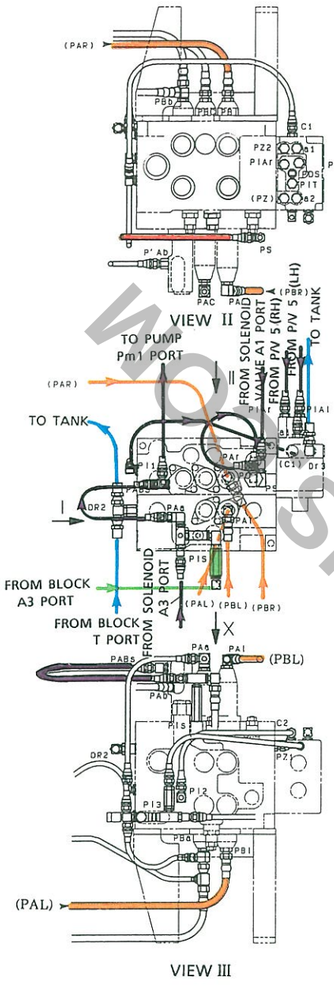


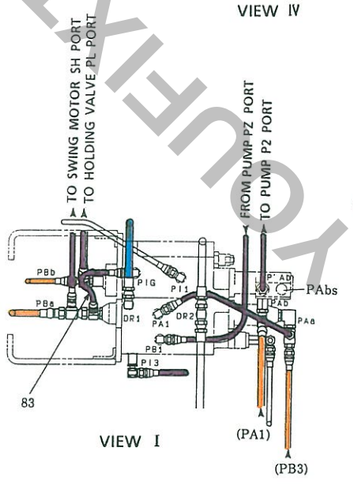
Fig. 11

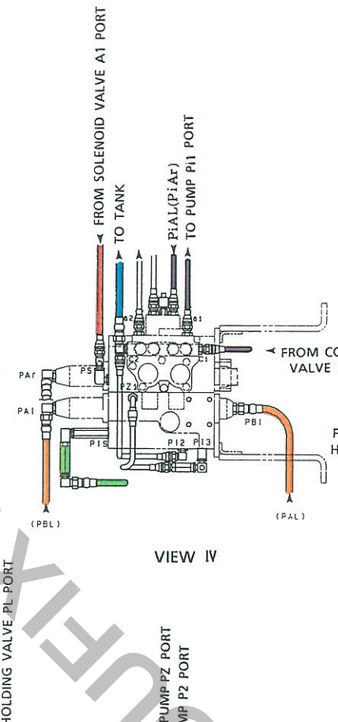
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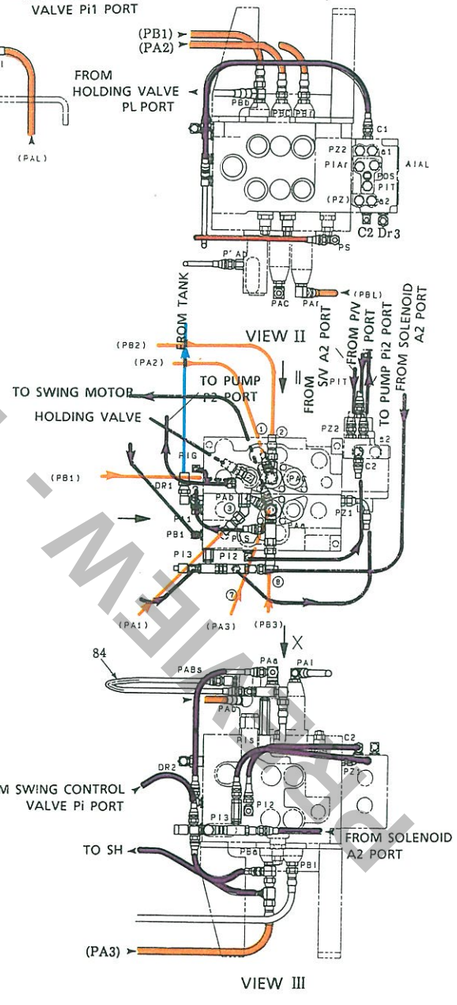
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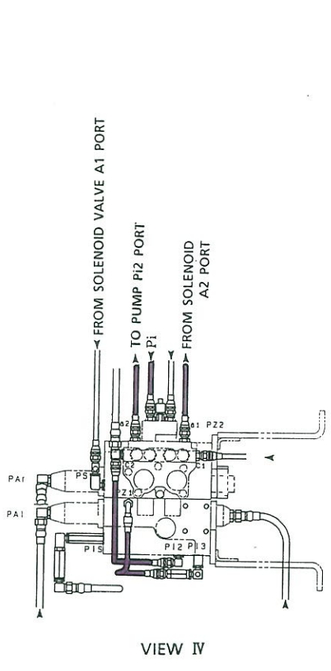


Fig. 2 Attachment pilot piping (3/3)

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2. CONSTRUCTION OF MAIN COMPONENTS

2.1 HEATER ASSY

☞ T=Tightening torque kgf·m (ft·lbs)

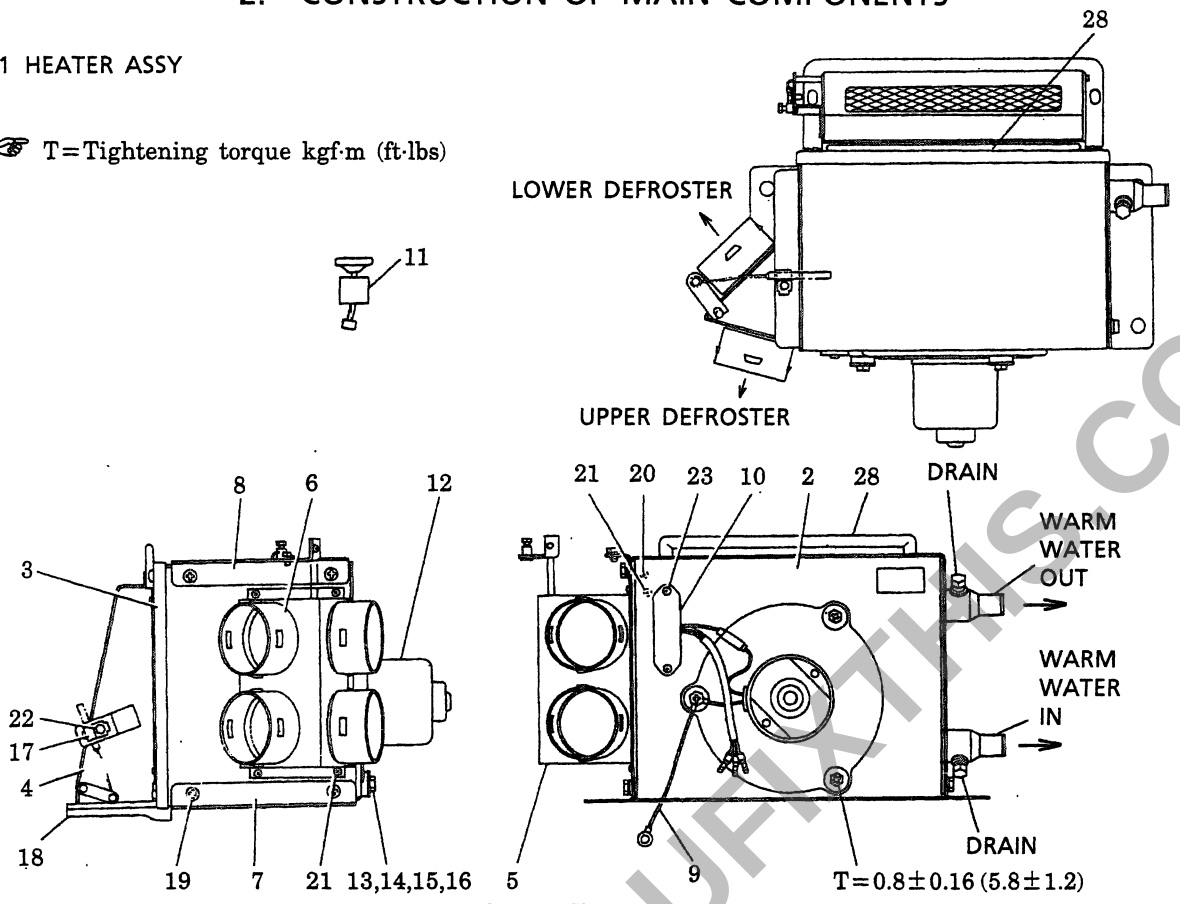


Fig. 2 Heater assy

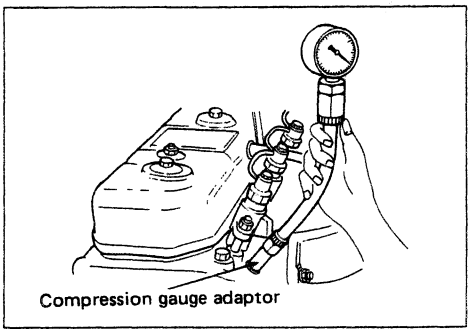
2.2 SPECIFICATION

Item	Specification
Model of heater	VH40-RD
Heat capacity	4000kcal/h
Wind capacity	280m³/h (366yd³/h)
Blower R.P.M	2900rpm
Consumption power	95v
Standard voltage	24v
Weight	27kg (60 lb)

No.	NAME	Q,ty	No	NAME	Q,ty	No	NAME	Q,ty
1	PIPE ASSY	1	9	HARNESS	1	17	BRACKET	2
2	CASE	1	10	RESISTOR	1	18	PACKING	1
3	COVER	1	11	SWITCH	1	19	BOLT	6
4	DUCT	1	12	MOTOR ASSY	1	20	SCREW	4
5	DUCT	1	13	BOLT	3	21	SCREW,TAPPING	8
6	FAN	1	14	INSERT	3	22	BOLT	2
7	BRACKET	2	15	BUSHING	3	23	SCREW,TAPPING	2
8	BRACKET	1	16	PACKING	1			

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Compression gauge adaptor

COMPRESSION PRESSURE MEASUREMENT

1. Operate the engine to warm-up until the coolant temperature reachs to 75°C (167°F).
2. Remove all of the glow plugs and the injection pipes.
3. Attach a compression gauge to the No. 1 cylinder glow plug installation threads.

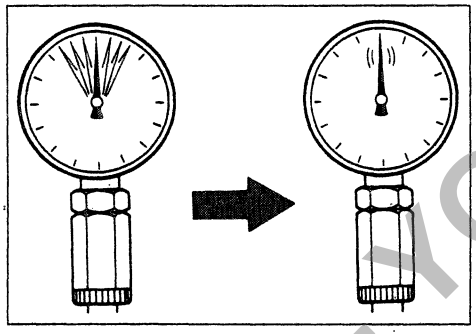
Note:

Compression pressure may be measured starting at any cylinder and in no particular cylinder order. However, it is very important that the compression pressure be measured in each cylinder.

Therefore, start at the No. 1 cylinder and work back. In this way, you will be sure to measure the compression pressure in each cylinder.

Compression Gauge:

Compression Gauge Adapter: 5-85317-001-0 (JKM-1015)



4. Crank the engine with the starter motor and take the compression gauge reading.

kg/cm²(psi) at 200 rpm at sea level

Standard	Limit
31.0 (441)	26.0 (370)

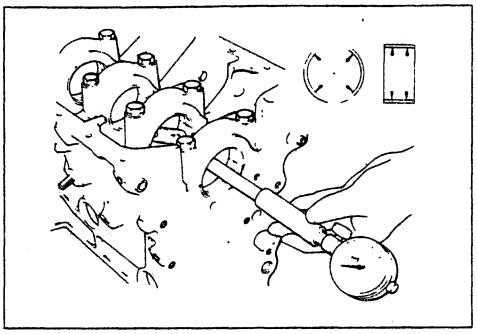
5. Repeat the procedure (Steps 2 and 3) for the remaining cylinders.

   Compression pressure should be approximately the same for each cylinder. A variation exceeding 2.0 kg/cm² (28.44 psi) is unacceptable.

   If the measured value exceeds the specified limit, the related parts must be checked.

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Crankshaft Journal Bearing Inside Diameter

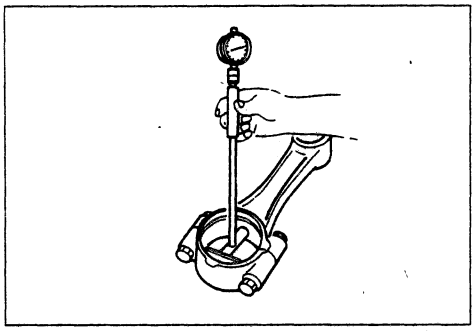
1. Install the main bearing cap with bearings to the cylinder body with the specified torque and facing the arrow mark on the bearing cap toward front. Place them in order of punched cylinder numbers.
2. Use an inside dial indicator to measure the main bearing diameters.

kg·m(lb.ft)

Main Bearing Cap Torque	24.1 ± 1 (173.5 ± 7.2)

mm(in)

Main Bearing Nominal Diameter	80 (3.150)



Connecting Rod Bearing Inside Diameter

Tighten the connecting rod and the bearing cap with specified torque, and use inside dial indicator to measure the connecting rod bearing inside diameter.

kg·m(lb.ft)

	1st step	2nd step
Connecting Rod and Bearing Cap Bolt Tightening Torque	4 (28.9)	$60^{\circ}{}^{+30^{\circ}}_{0^{\circ}}$

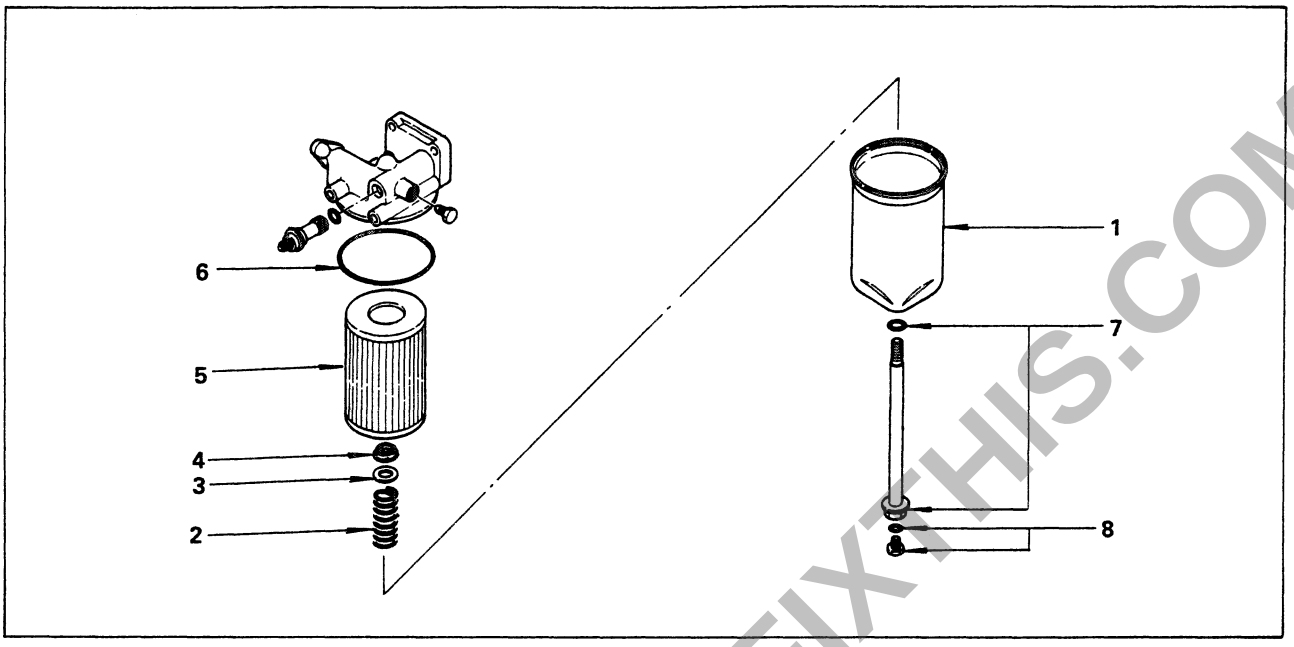
mm(in)

Connecting Rod Bearing Nominal Diameter	64 (2.520)

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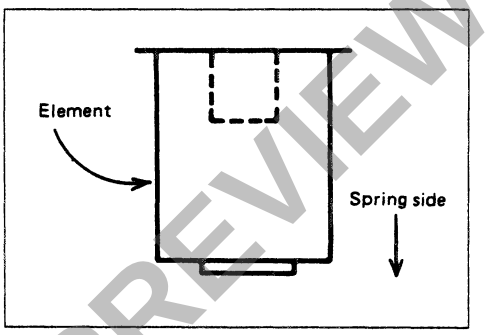
REASSEMBLY



Reassembly Steps

1. Oil filter body
2. Coil spring
3. Spring seat
4. Element gasket
▲ 5. Oil filter element
6. Cover gasket
▲ 7. Center bolt
▲ 8. Drain plug

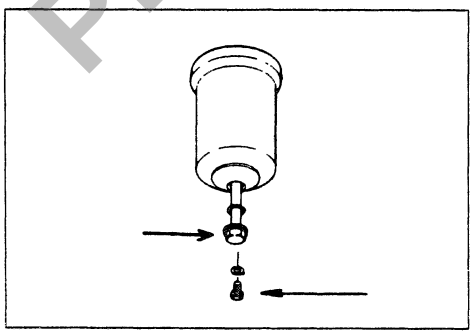
Refer to Page 2-2 of the MAINTENANCE for information on the cartridge type (spin-on type) oil filter.



Important Operation

5. Oil Filter Element

The protruding portion of the oil filter element must be facing the spring.



7. Center Bolt

8. Drain Plug

Install the center bolt and drain plug and tighten them to the specified torque.

kg·m(lb.ft)

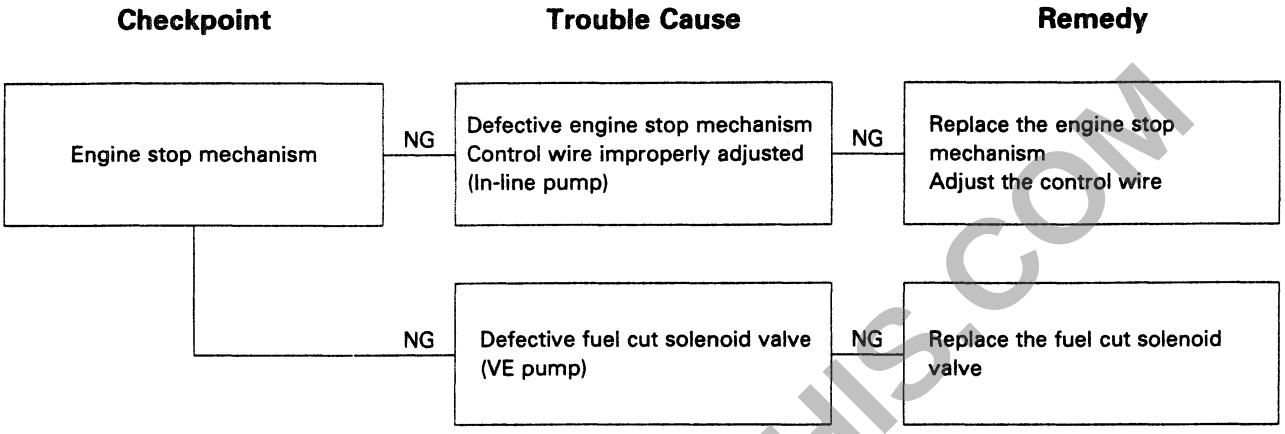
Center Bolt Torque	5.3 ± 1 (38.3 ± 7.2)
Drain Plug Torque	1.8 ± 0.2 (13.0 ± 1.4)

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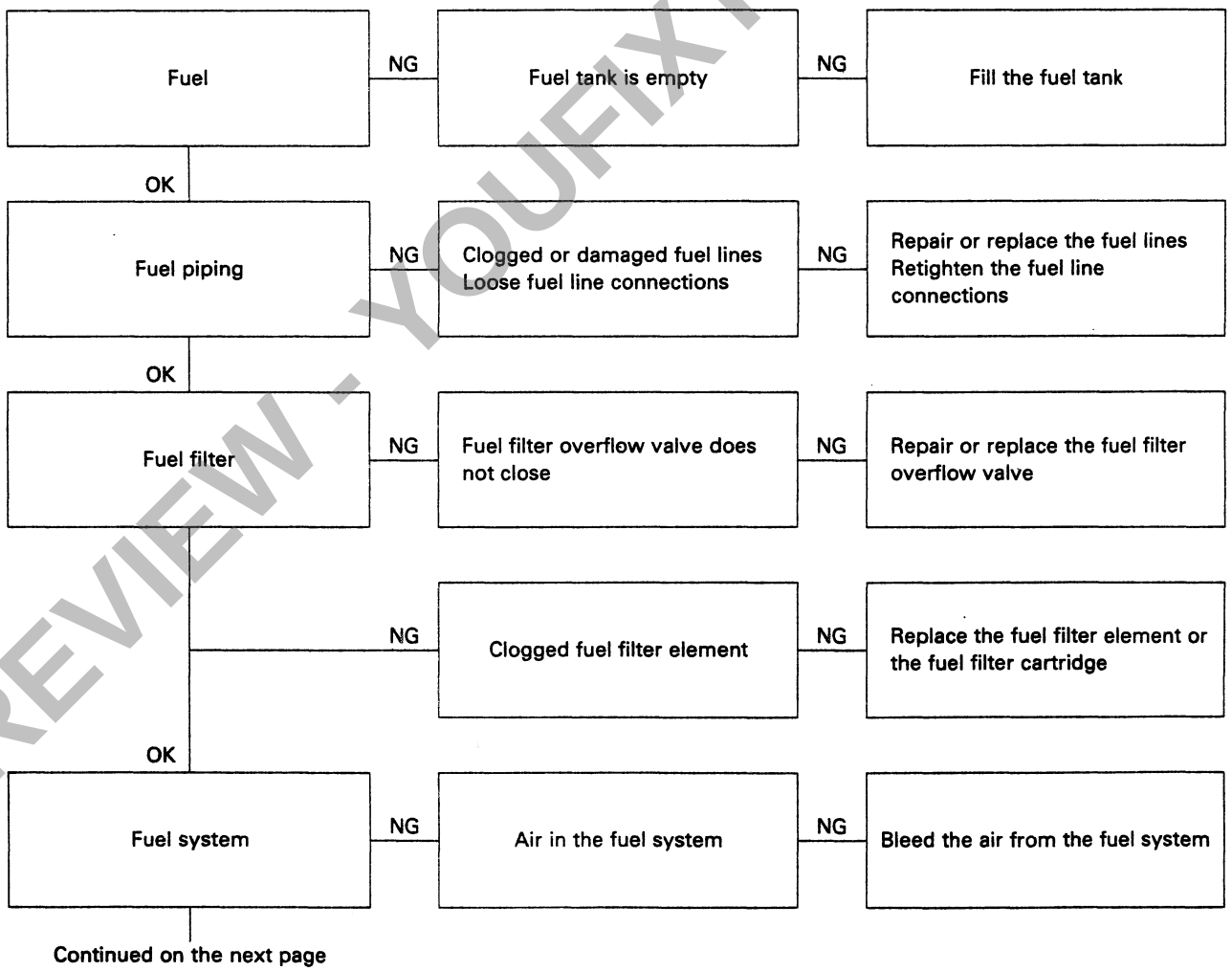
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HARD STARTING

4) ENGINE TURNS OVER BUT DOES NOT START



FUEL IS NOT BEING DELIVERED TO THE INJECTION PUMP



Continued on the next page

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☞ Although the balance seal is symmetrical with respect to its center, it has a face and back.
The face with a groove is the mounting flange side while the flot face is the gear side. Reversed fitting will cause a fusion of gears.

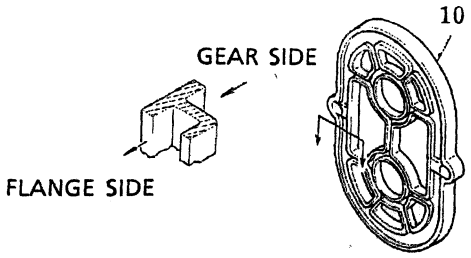


Fig.19 Checking the face and back of the balance seal

3) Mount gaskets B (9) on the balance seal (10) and then gasket A (8) on top of it, in that order.

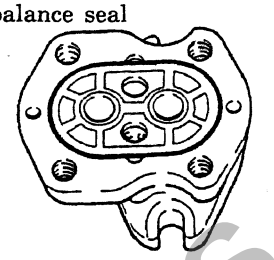


Fig. 20 Attaching a gasket

☞ • Gaskets A and B are symmetrical with each other.
• Gasket A is about 1.5mm (0.06in) thick and gasket B about 0.5mm(0.02in) thick.
• Fit gasket A with its square edges facing the gear side.

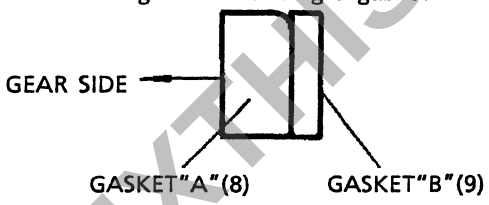
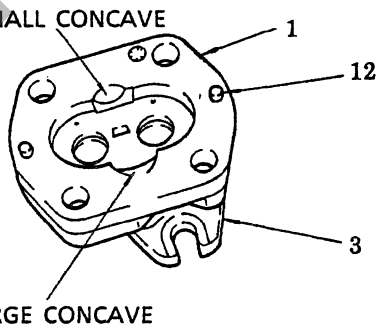


Fig. 21 Checking corner contact of gasket

4) Put dowel pin (12) in gear plate (1) and assemble it into mounting flange (3).
The face with a large concave is the suction side.
Assemble with the concave side up or facing the cover side.



☞ • Two dowel pins(12)are for positioning.
• The assembling direction is as shown below.

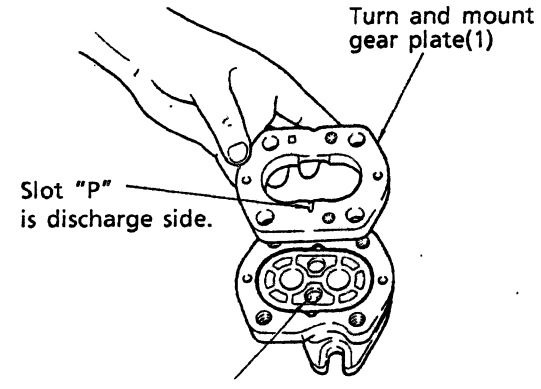


Fig. 22 Fitting the gear plate

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3) Fit spool (652) and sleeve (651) into the hole in the spool of casing (601).

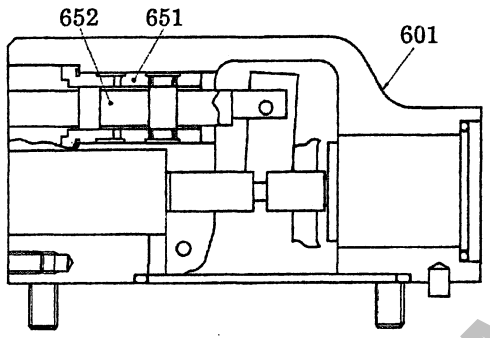


Fig. 32 Assembling the spool (652), sleeve (651)

☞ • Confirm that the spool (652) and the sleeve (651) slide smoothly in the casing without binding.
• Pay attention to the orientation of the spool (652).



Fig. 33

4) Fit feedback lever (611), match the pin hole in the feedback lever with the pin hole in the spool. Then insert pin (874).

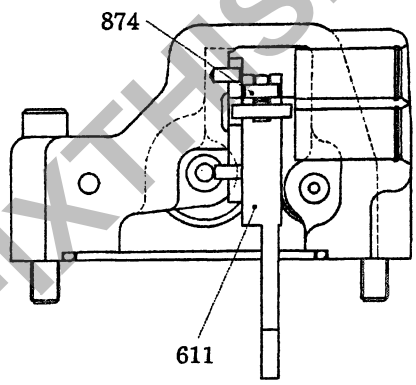


Fig. 34 Insert pin (874)

☞ • Insert the pin (874) in the feedback lever (611) a little to ease operating.
• Use care so as not to mistake the direction of the feedback lever (611).

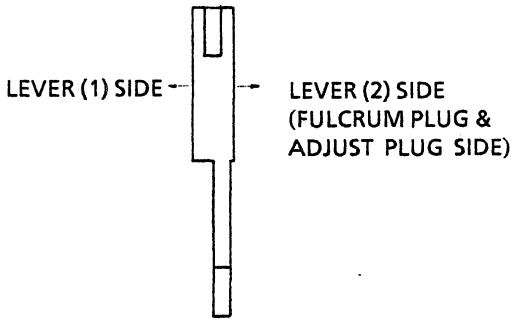


Fig. 35

5) Put pilot piston (643) into the negative control hole in the casing (601).

☞ Confirm that the pilot piston (643) slides smoothly without binding.

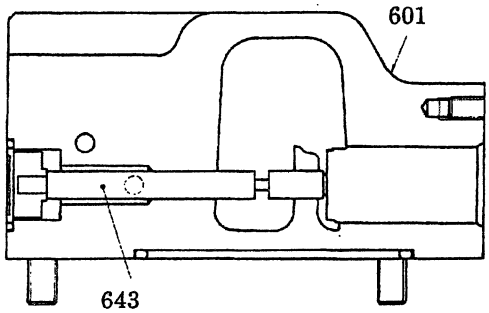
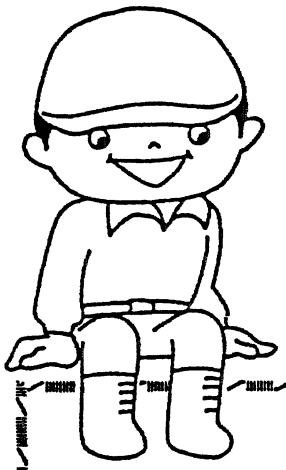


Fig. 36 Assembling the pilot piston (643)

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PREFACE

This is a composite valve that holds the circuit pressure within safe ranges by means of relief valves, changeover valves, conflux valves and sequence valves, in addition to changing the control directions of the operating part (actuators) as circuits are changed over.

Models	Applicable Machines	Notes	Models	Applicable Machines	Notes
SK150LCIII	YM-00101~				

Revision	Date of Issue	Remarks
First edition	March, 1993	S5130793E K

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4.2 TIGHTENING TORQUE

(1) Control valve

1) Hydraulic port

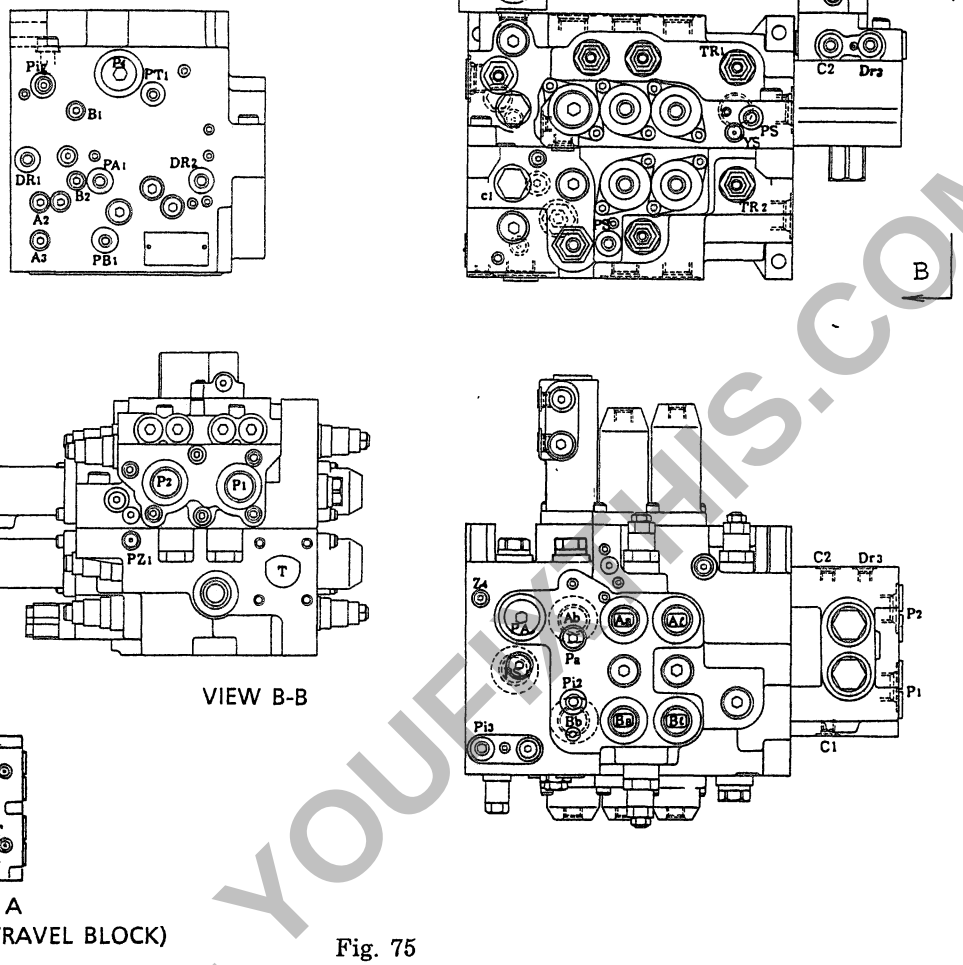


Fig. 75

Table 7 Unit : kgf · cm (ft · lbs)

Port code	Size	Tightening torque
Aa , Ba , Aℓ , Bℓ , (PA), Ab , Bb , Ac Bc , Ar , Br , P1 , P2 , P3 , (P4), (P5)	PF3/4	1500~1800 (108 ~130)
PDS	PF1/8	85~ 115 (6.14~ 8.31)
PAℓ, PAr, PBℓ, PBr, PAb , PBb , PAa , PBa ,PAc , PBc	PF3/8	700~ 800 (50.6 ~ 57.8)
DR1 , DR2 , PA1 , PB1 , Pis , PABs , Pi1 , Pi2 , Pi3 , PiG , Ps , PAb , Pz2 , PiAr , PiAℓ , PiT , a1 , a2 , Po , C1 , C2 , Dr3 , (Pop1), (Pop2), (PAbs), (PAb)	PF1/4	350~ 390 (25.3 ~ 28.2)
Tie bolt	M14	1600~1700 (116 ~123)
T port	M10	500~ 660 (36.1 ~ 47.7)
T1 port	PF1/2	1000~1200 (72.2 ~ 86.7)
U1 , X1 , Y5 , Z4 , X4 , P's , Pi , Pz1 , Dr4	PF1/8	150~ 190 (10.8 ~ 13.7)

Pressure measuring port ; Z4, U1, X1, Y5, PS', Pi, Dr4, X4

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c) Functional Description of Automatic Change-over to Low Speed During High Speed Motion

If load increases during high speed motion, the pressure from port (A) or (B) increases also. When the pressure arrives at 300gkfg/ cm^2 (4270 psi), it overcomes the pilot pressure [50kgf/cm^2 (711 psi)] from port (D), so that spool (186) is pushed upward. Then the pressure of port (C) is shut off, so that the oil in chamber (P) is released into the motor casing via spool (186). As the result, the swash plate hits surface Y of the spindle and is held on that surface. On that occasion, swash plate (103) takes the mini-mum tilting angle θ1 which maximizes the displacement of the hydraulic motor pistons to run the motor at low speed.

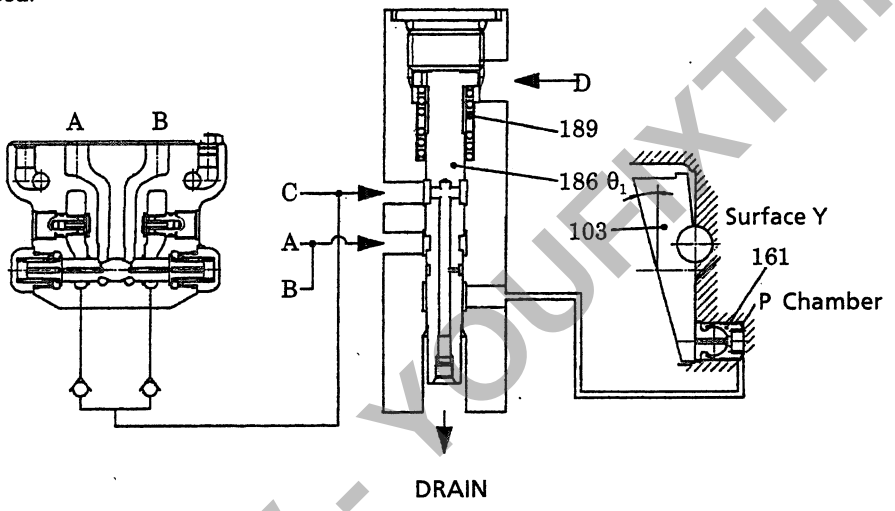


Fig. 15

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4. MAINTENANCE STANDARDS

4.1 INSPECTION PROCEDURE AND REMEDY

Table 3

Interval	Check Item	Checking Procedure	Remedy
2,000Hrs.	Seal for oil leakage outside	Check oil leakage outside	Replace O ring, if any oil leakage can be found.
4,000Hrs. In principle, disassemble and check regardless of oil leakage or not.	All sealing parts		Replace all sealing parts such as slipper seal with square seal and O ring.
	All rubbing parts	Check abnormal wear, scoring or corrosion caused by foreign particles or burning.	Repair or replace referring to their limit of serviceability.
When disassembled for repair	All parts	Check them for burning, foreign particles, abnormal wear, and defect of seals.	Repair or replace referring to their limit of serviceability. O rings should be replaced.

4.2 USABLE LIMIT OF THE PARTS

Table 4

Parts		Maintenance Standards	Remedy
Body, Stem	Sliding surface with sealing sections	Plating worn or peeled due to seizure or contamination.	Replace
	Sliding surface between body and stem other than sealing sections	1) Worn abnormality or damaged more than 0.1mm (0.0039in) in depth due to seizure contamination.	Replace
		2) Damaged more than 0.1mm (0.0039in) in depth.	Smooth with oilstone.
	Sliding surface with thrust plate	1) Worn more than 0.5mm (0.02in) or abnor-mality.	Replace
		2) Worn less than 0.5mm (0.02in).	Smooth
		3) Damage due to seizure or contamination remediable within wear limit 〔0.5mm (0.02in)〕.	Smooth
Cover	Sliding surface with thrust plate	1) Worn more than 0.5mm (0.02in) or abnor-mality.	Replace
		2) Worn less than 0.5mm (0.02in).	Smooth
		3) Damage due to seizure or contamination remediable within wear limit 〔0.5mm (0.02in)〕.	Smooth

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