

GROUP 5 MAIN PUMP

1. REMOVAL AND INSTALL

1) REMOVAL

▲ If engine is running or full up pressure into hydraulic system, absolutely does not repair or tighten hose, fitting.
As hydraulic line explode, dangerous accident may occur.

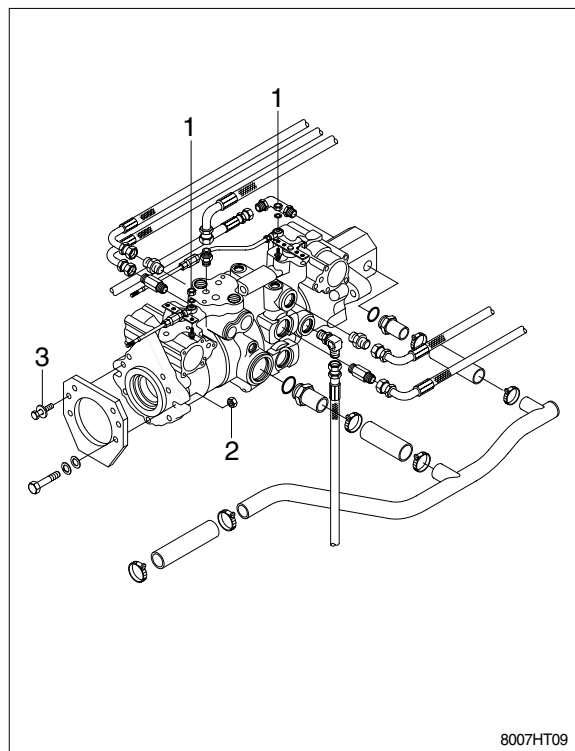
- (1) Lowered the bucket on the ground.
- (2) Shut off engine and raise the seat bar.
- (3) Raise canopy and remove the front cover.
※ For raising and lowering of the canopy, refer to page 4-15 of the operator's manual.
- (4) Loosen the nut(1) and disassemble control lever.
- (5) Disassemble hoses connected with main pump and auxiliary pump.
- (6) Loosen the nut(2) and bolt(3).

2) INSTALL

- (1) Install pump to frame by tightening the nut(2) and bolts(3).
 - Tightening torque
 - Nut(2) : $19.6 \pm 2.9 \text{ kgf} \cdot \text{m}$
($142 \pm 21.0 \text{ lbf} \cdot \text{ft}$)
 - Bolt(3) : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($49.9 \pm 10.1 \text{ lbf} \cdot \text{ft}$)
- (2) Assemble hose connected with main pump and auxiliary pump.
- (3) Fix control rod and control lever with lock washer and nut(1).
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($49.9 \pm 10.1 \text{ lbf} \cdot \text{ft}$)

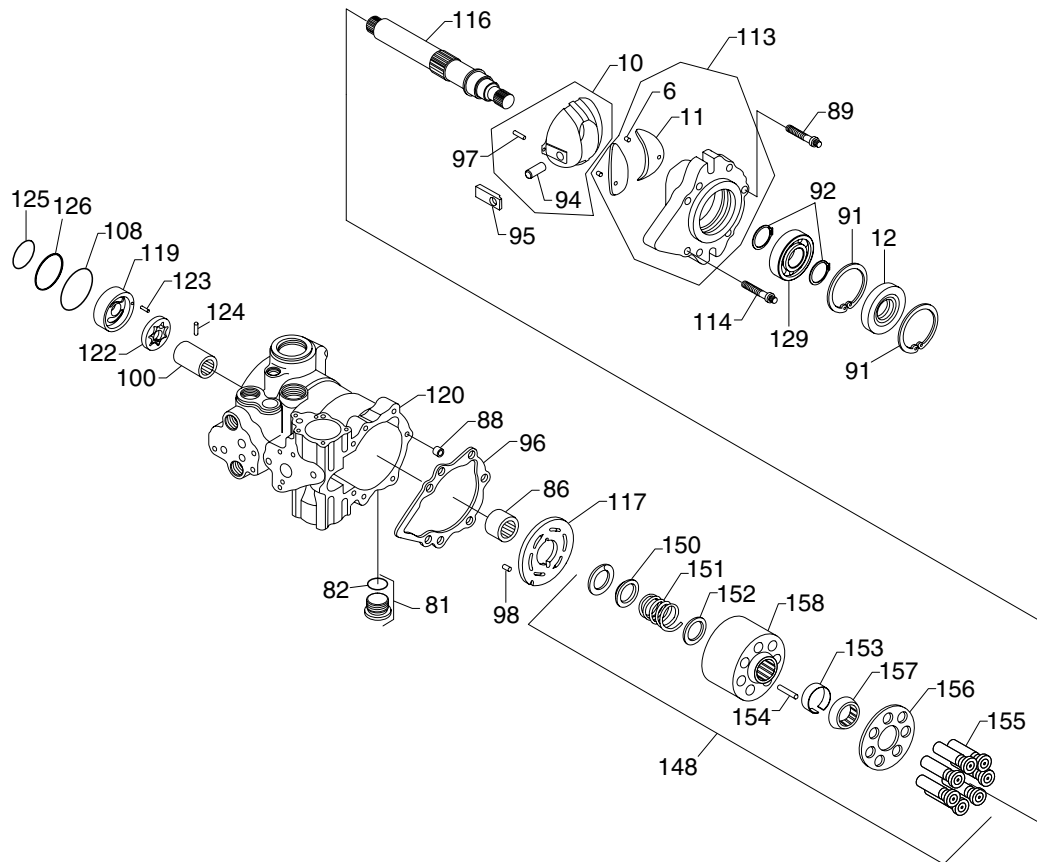


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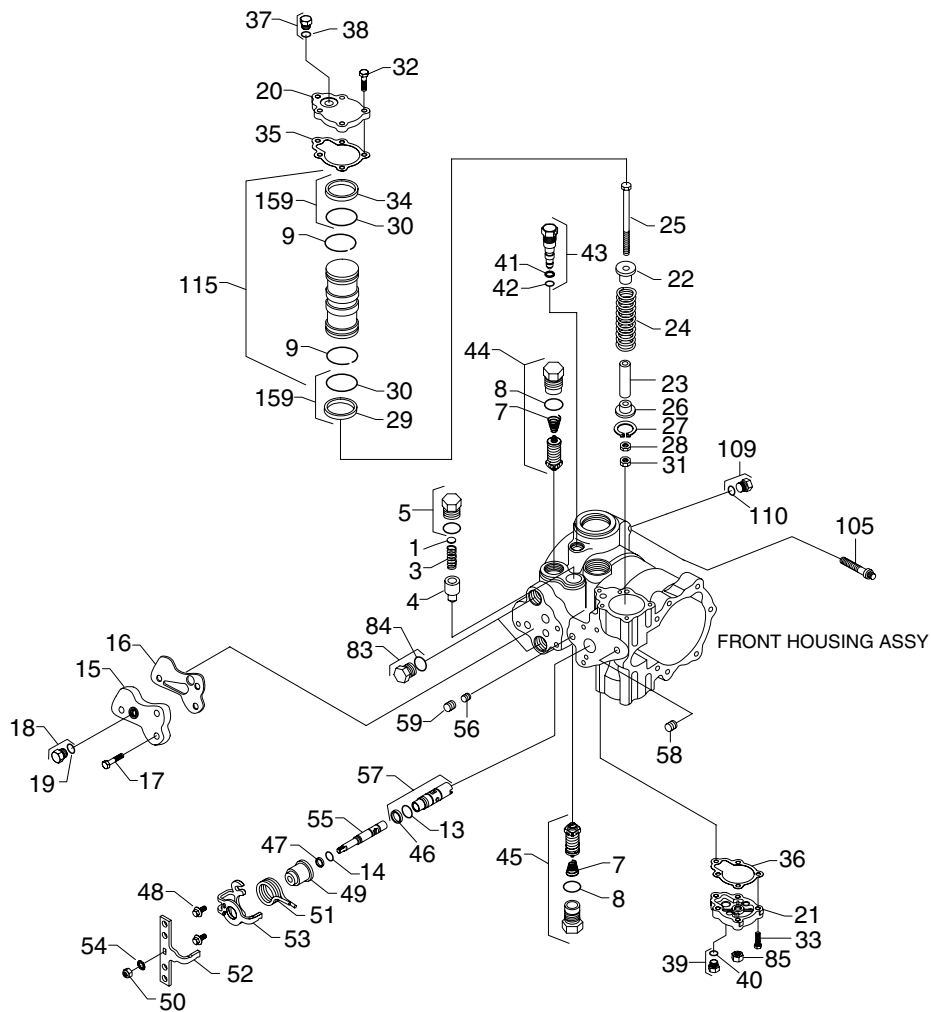
2. STRUCTURE(1/4)



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6	Spring pin	97	Pin	126	O-ring
10	Swashplate assy	98	Pin	129	Ball bearing
11	Journal bearing	100	Coupling	148	Cylinder block kit
12	Lip seal	108	O-ring	150	Washer
81	Plug	113	Front cover assy	151	Cylinder block spring
82	O-ring	114	Screw	152	Washer
86	Needle bearing	116	Pump shaft	153	Retainer
88	Spring pin	117	Valve plate-RH	154	Pin
89	Screw	119	Gerotor cover	155	Piston assy
91	Retaining ring	120	Front housing assy	156	Slipper guide
92	Ring	122	Rotor assy	157	Retainer guide
94	Pin	123	Pin	158	Cylinder block
95	Bearing sleeve	124	Pin		
96	Front cover gasket	125	O-ring		

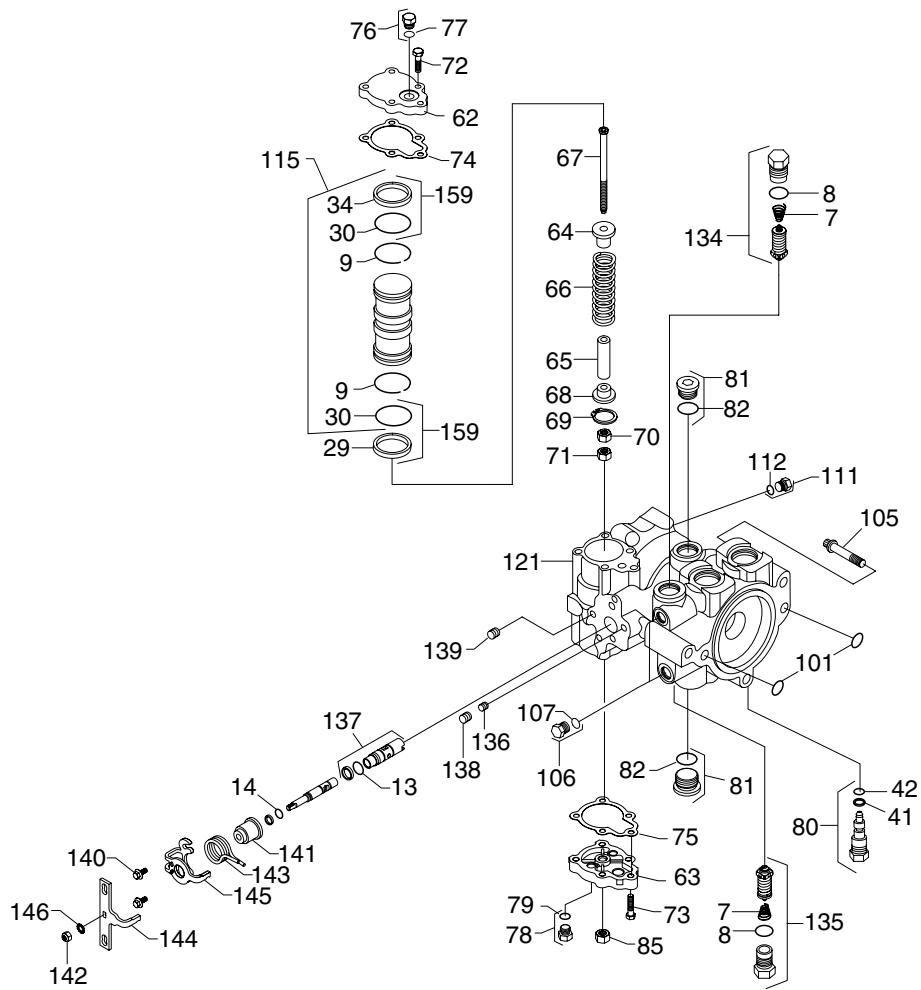
STRUCTURE(2/4)



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1	Shim kit	27	Retaining ring	48	Screw
3	Charge relief valve spring	28	Lock nut	49	Guide spring
4	Charge relief valve	29	Piston ring	50	Nut
5	Charge relief valve plug	30	O-ring	51	Neutral return spring
7	Spring	31	Nut	52	Control handle
8	O-ring	32	Screw	53	Neutral return bracket
9	Bearing	33	Screw	54	Washer
13	O-ring	34	Piston ring	55	Spool assembly
14	O-ring	35	Servo cover gasket	56	Orifice plug
15	Suction filter adapter	36	Servo cover gasket	57	Control sleeve assy
16	Suction filter adapter seal	37	Plug	58	Plug
17	Screw	38	O-ring	59	Plug
18	Plug	39	Plug	83	Plug
19	O-ring	40	O-ring	84	O-ring
20	Servo cover	41	Back-up ring	85	Seal nut
21	Servo cover	42	O-ring	105	Screw
22	Spring guide	43	By pass valve assy	109	Plug
23	Servo stop	44	Service kit	110	O-ring
24	Servo spring	45	Service kit	115	Servo piston assy
25	Screw	46	Back-up ring	159	Piston ring, O-ring kit
26	Spring guide	47	Back-up ring		

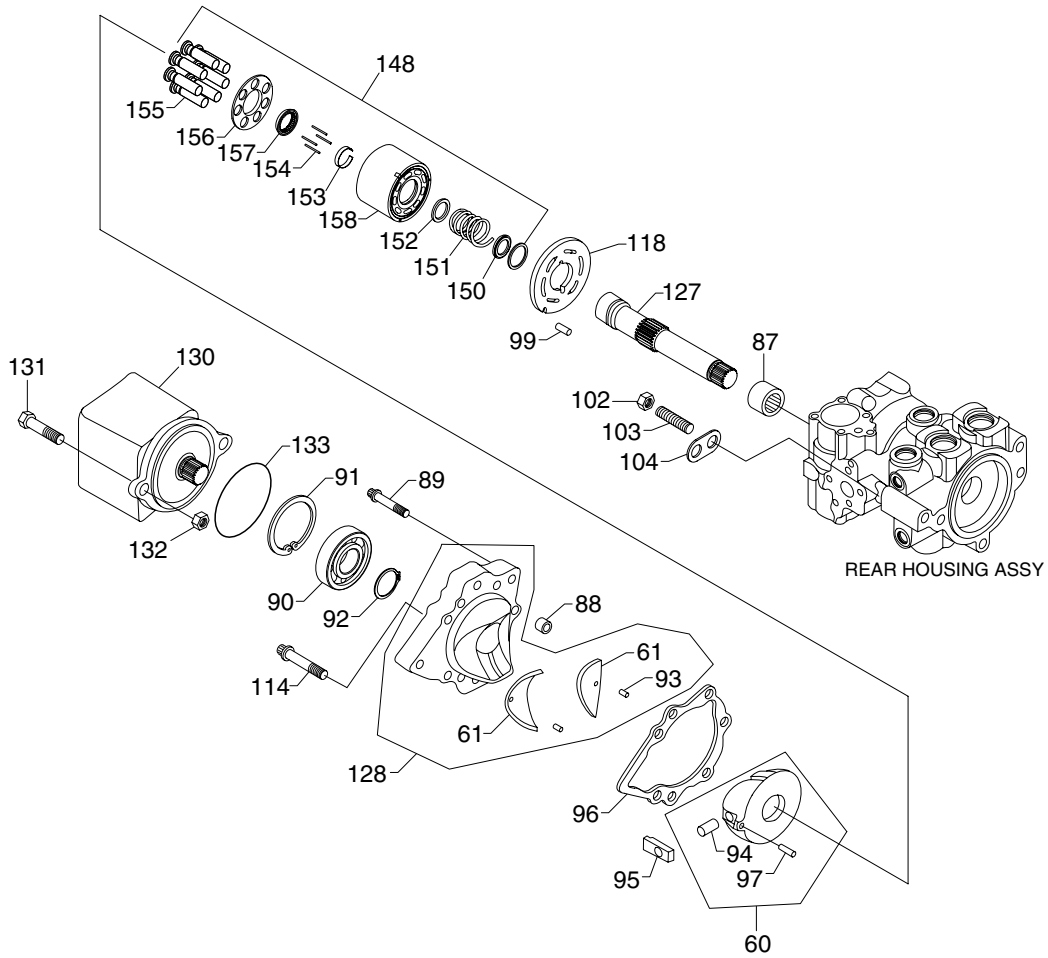
STRUCURE(3/4)



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|----|----------------|-----|--------------------|-----|-------------------------|
| 7 | Spring | 70 | Lock nut | 111 | Plug |
| 8 | O-ring | 71 | Nut | 112 | O-ring |
| 9 | Bearing | 72 | Screw | 115 | Servo piston assy |
| 13 | O-ring | 73 | Screw | 121 | Rear housing assy |
| 14 | O-ring | 74 | Servo cover gasket | 134 | Service kit |
| 29 | Piston ring | 75 | Servo cover gasket | 135 | Service kit |
| 30 | O-ring | 76 | Plug | 136 | Orifice plug |
| 34 | Piston ring | 77 | O-ring | 137 | Control sleeve assy |
| 41 | Back-up ring | 78 | Plug | 138 | Plug |
| 42 | O-ring | 79 | O-ring | 139 | Plug |
| 62 | Servo cover | 80 | Bypass valve assy | 140 | Screw |
| 63 | Servo cover | 81 | Plug | 141 | Guide spring |
| 64 | Spring guide | 82 | O-ring | 142 | Nut |
| 65 | Servo stop | 85 | Seal nut | 143 | Neutral return spring |
| 66 | Servo spring | 101 | O-ring | 144 | Control handle |
| 67 | Screw | 105 | Screw | 145 | Neutral return bracket |
| 68 | Spring guide | 106 | Plug | 146 | Washer |
| 69 | Retaining ring | 107 | O-ring | 159 | Piston ring, O-ring kit |

STRUCTURE(4/4)



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- | | | | | | |
|----|--------------------|-----|-----------------|-----|-----------------------|
| 60 | Swashplate assy | 97 | Pin | 133 | O-ring |
| 61 | Journal bearing | 99 | Pin | 148 | Cylinder block kit |
| 87 | Needle bearing | 102 | Nut | 150 | Washer |
| 88 | Spring pin | 103 | Stud bolt | 151 | Cylinder block spring |
| 89 | Screw | 104 | Lifting bracket | 152 | Washer |
| 90 | Ball bearing | 114 | Screw | 153 | Retainer |
| 91 | Retaining ring | 118 | Valve plate-LH | 154 | Pin |
| 92 | Ring | 127 | Pump shaft | 155 | Piston assy |
| 93 | Spring pin | 128 | Rear cover assy | 156 | Slipper guide |
| 94 | Pin | 130 | Gear pump | 157 | Retainer guide |
| 95 | Bearing sleeve | 131 | Screw | 158 | Cylinder block |
| 96 | Front cover gasket | 132 | Nut | | |

3. GENERAL DESCRIPTION

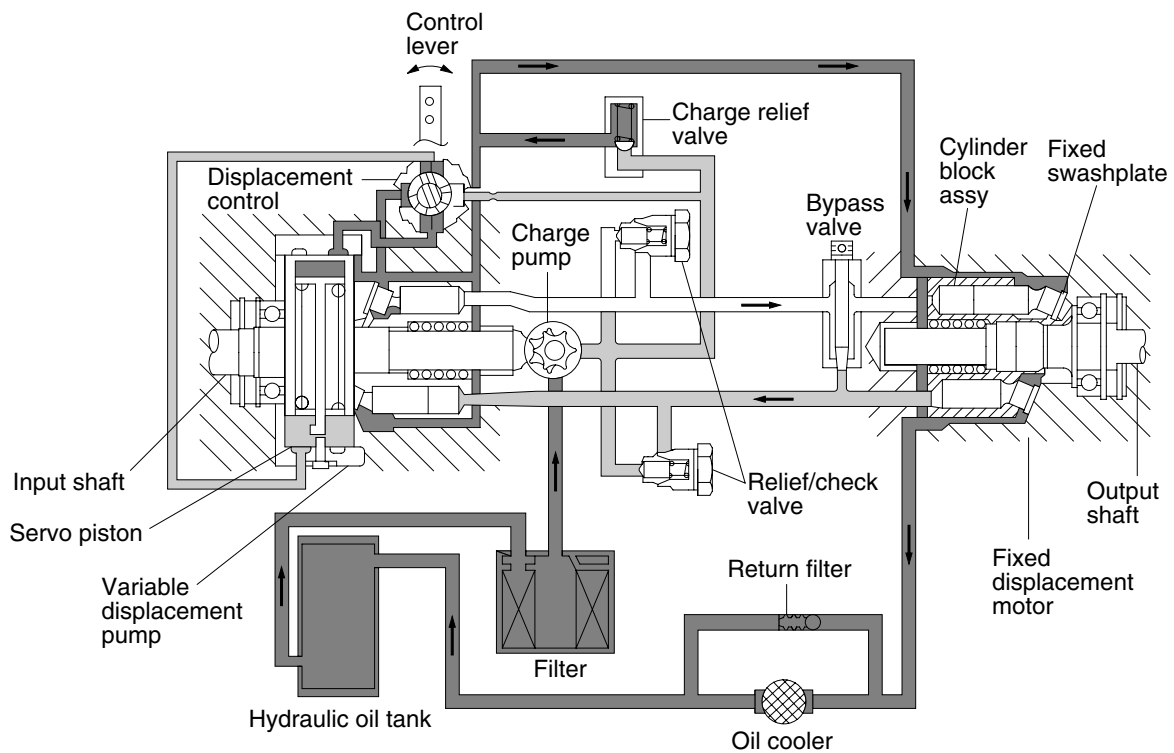
The main pump is a compact, state-of-the-art design, using the parallel axial piston design in conjunction with a tiltable swashplate to vary the pump's displacement. Reversing the direction of tilt of the swashplate reverses the flow of oil from the pump and thus reverses the direction of the motor output rotation.

The main pump is controlled by a compact responsive hydro-mechanical, closed loop control system.

A charge relief valve and charge check valves are included in the pump end cap to control the makeup and cooling oil flow for the system. The charge check valves also incorporate the high pressure relief valve function into their design.

The main pump is including a 1.4in/rev(22.9cc/rev) integral gerotor type charge pump.

The fixed displacement motors also incorporate the parallel axial piston design. Fixed displacement motors utilize a fixed swashplate angle.



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4. TRANSMISSION HYDRAULIC SUPPORT SYSTEM

The main pumps are easy to install, requiring no adjustments and few auxiliary components. They have their own hydraulic support system which is discussed in this section.

1) BASIC CLOSED CIRCUIT

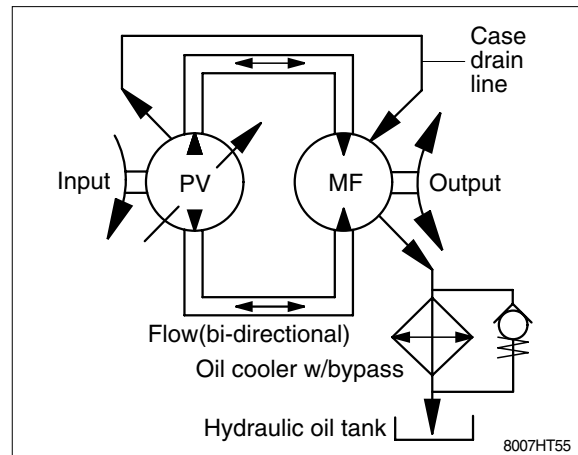
The main ports of the pump are connected by hydraulic lines to the main ports of the motor. Fluid flows, in either direction, from the pump to the motor then back to the pump in this closed circuit. Either of the hydraulic lines can be under high pressure. The direction and speed of fluid flow (and the motor output shaft rotation) depends on the position of the pump swashplate. The system pressure is determined by the machine load.

2) CASE DRAIN AND HEAT EXCHANGER

The pump and motor require case drain lines to remove hot fluid from the system. The pump case should be drained from its upper drain port to insure the case remains full of fluid. The pump case drain is then connected to the lower drain port on the motor housing. The upper motor housing drain port is then connected to the reservoir.

A heat exchanger, with a bypass valve, may be required to cool the case drain fluid before it returns to the reservoir.

- ※ **When operating pump near rated speed, some case flow may have to be diverted around the motor to ensure pump case pressure remain within recommended limits.**
- ※ **Continuous case pressure should not exceed 25psi(1.7bar).**



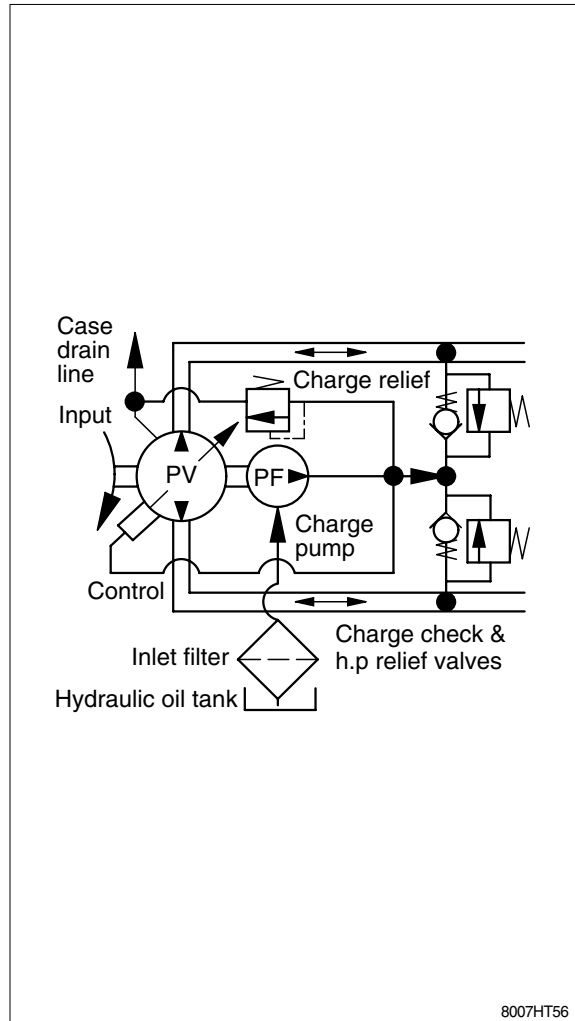
3) CHARGE SYSTEM AND INLET FILTER

The charge pump supplies cool fluid to the system and keeps the closed loop charged to prevent cavitation. The charge pump draws its fluid from the system reservoir.

- ※ **The inlet vacuum, measured at the charge pump inlet should not exceed 5in.Hg(0.8bar abs), except during cold starts.**

Since either or the main hydraulic lines can be high pressure, two charge check valves are used to direct the charge supply into the low pressure line. These check valves are incorporated into the high pressure relief valves in the pump end cap. Any charge flow not being used for the closed circuit is discharged over a direct operating charge relief valve, through the pump and motor housings and back to the system reservoir. The charge pressure relief valve is 290psi (20bar).

- ※ **Charge pressure must not be less than 220psi(15.2bar) for satisfactory operation. Pressure less than this may result in premature unit failure or loss of control.**



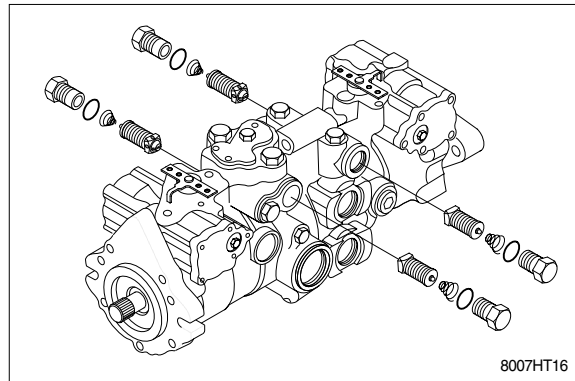
4) HIGH PRESSURE RELIEF VALVES

Two optional combination check / high pressure relief valves may be provided in the pump end cap for overload protection. These cartridge type relief valves are factory set and are not field adjustable. Changing the maximum system pressure can be accomplished by installing different cartridges with the desired setting.

⚠ Certain service procedures may require the machine to be disabled (Wheels raised off the ground, work function disconnected, etc.) while performing them in order to prevent injury to the technician and bystanders.

⚠ Use caution when dealing with hydraulic fluid under pressure. Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury. This fluid may also be hot enough to burn. Serious infection or reactions can develop if proper medical treatment is not administered immediately.

⚠ Some cleaning solvents are flammable. To avoid possible fire, do not use cleaning solvents in an area where a source of ignition may be present.



5. CONTROLS AND OPTIONS

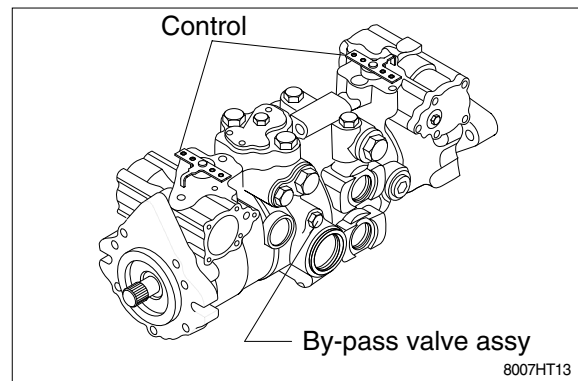
1) MANUAL DISPLACEMENT CONTROL

With the manual displacement control (MDC), the pump displacement and output flow, in either direction, is approximately proportional to the angular movement of the control handle. The control will return to neutral if the pump control handle is released the control centering mechanism is not sufficient to overcome external control linkage friction.

This control may have various sized orifices installed in the supply and drain passages for controlling maximum acceleration and deceleration (Control response).

2) BY- PASS VALVE

In some applications it is desirable to bypass fluid, allowing, for example, a vehicle to be moved short distances at low speeds without running the prime mover. This is accomplished by a manually operated bypass valve installed in the pump housing. When open (Unscrewed 2 turns maximum), this valve connects both sides of the pump/motor closed circuit and allows the motor to turn. This valve must be fully closed for normal operation.



6. START UP AND MAINTENANCE

1) START UP PROCEDURE

- (1) The following start up procedure should always be followed when starting up a new main pump installation or when restarting an installation in which either the pump or motor had been removed from the system.
 - ※ **The following procedure may require the machine to be disabled(Wheels raised off the ground, work function disconnected, etc.) while performing the procedure in order to prevent injury to the technician and bystanders. Take necessary safety precautions before moving the machine.**
- (2) Prior to installing the pump and/or motor, inspect the units for damage incurred during shipping and handling. Make certain all system components(Reservoir, hoses, valves, fittings, heat exchanger, etc.) are clean prior to filling with fluid.
- (3) Fill the reservoir with recommended hydraulic fluid, which should be passed through a 10 micron(Normal, no bypass) filter prior to entering the reservoir. The use of contaminated fluid will cause damage to the components, which may result in unexpected machine movement.
- (4) The inlet line leading from the reservoir to the pump should be filled prior to start up. Check inlet line for properly tightened fittings and make sure it is free of restrictions and air leaks.
- (5) Be certain to fill the pump and/or motor housing with clean hydraulic fluid prior to start up. Fill the housing by pouring filtered oil into the upper case drain port.
- (6) Install a 0 to 500psi(35bar) pressure gauge in the charge pressure gauge port to monitor the charge pressure during start up.
- (7) It is recommended that the external control input signal be disconnected at the pump control until after initial start up. This will allow the pump to remain in its neutral position.
- (8) Jog or slowly rotate prime mover until charge pressure starts to rise. Start the prime mover and run at the lowest possible rpm until charge pressure has been established. Excess air may be bled from the high pressure lines through the high pressure gauge ports.
 - ※ **Do not start prime mover unless pump is in neutral position(0 swashplate angle). Take precautions to prevent machine movement in case pump is actuated during initial start up.**
- (9) Once charge pressure has been established, increase speed to normal operating rpm. Charge pressure should be approximately 290psi(20bar) minimum. If charge pressure is incorrect, shut down and determine cause for improper pressure.
 - ※ **Inadequate charge pressure will affect the operator's ability to control the machine.**
- (10) Shut down prime mover and connect external control input signal. Start prime mover, checking to be certain pump remains in neutral. With prime mover at normal operating speed, slowly check for forward and reverse machine operation.
- (11) Charge pressure should remain at 290psi(20bar) minimum during forward or reverse operation. Continue to cycle slowly between forward and reverse for at least 5 minutes.
- (12) Shut down prime mover, remove gauges, and plug ports. Check reservoir level and add fluid if necessary.
- (13) The transmission is now ready for operation.

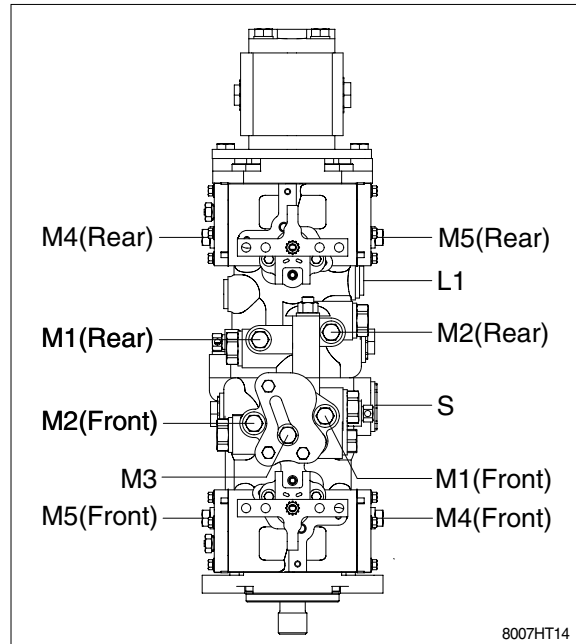
2) MAINTENANCE

- (1) To insure optimum service life on this pump, regular maintenance of the fluid and filter must be performed.
- (2) Check the reservoir daily for proper fluid level, the presence of water(Noted by a cloudy to milky appearance, or free water in bottom of reservoir), and rancid fluid order(Indicating excessive heat).
- (3) It is recommended that the fluid and filter be changed per the machine every 500hrs.
- (4) It may be necessary to change the fluid more frequently than the above intervals if the fluid becomes contaminated with foreign matter(Dirt, water, grease, etc.) or if the fluid has been subjected to temperature levels greater than the maximum recommended. Never reuse fluid.
- (5) The filter should be changed whenever the fluid is changed or whenever the filter indicator shows that it is necessary to change the filter.

7. TROUBLESHOOTING

1) GAUGE INSTALLATION

- (1) Various pressure and vacuum gauge readings can be a great asset in troubleshooting problems with this transmission or support system.
- (2) It will be necessary to install a high pressure gauge into the system pressure gauge ports to check the setting of the high pressure relief valve.
- (3) Measuring the charge pump inlet vacuum will help locate restrictions in the inlet lines, filter, etc.
- (4) Case pressure readings can help locate restrictions in the return lines, oil cooler and return filter.

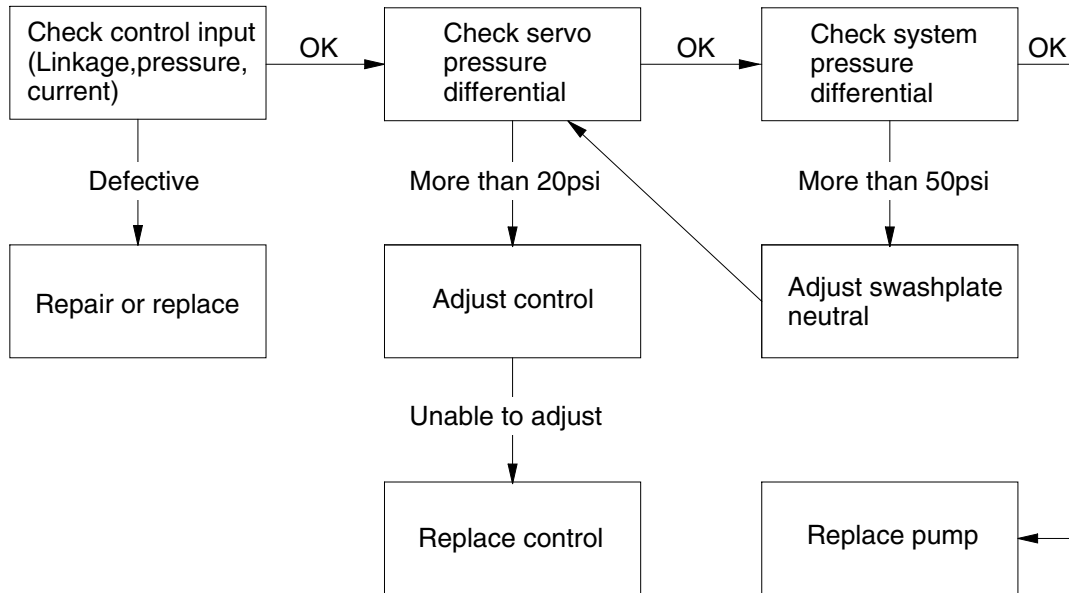


Port		Description
M1	System pressure port A	6000psi or 400bar gauge
		9/16 - 18 O-ring fitting
M2	System pressure port B	6000psi or 400bar gauge
		9/16 - 18 O-ring fitting
M3	Charge pressure	1000psi or 70bar gauge
		9/16 - 18 O-ring fitting or tee into charge pressure filter outlet line
L1	Case pressure	1000psi or 70bar gauge
		1-1/16 - 12 O-ring fitting
S	Charge pump inlet vacuum	Vacuum gauge
		Tee into charge pump inlet line
M4, M5	Servo pressure	1000psi or 60bar gauge
		9/16 - 18 O-ring fitting

※ Snubbers are recommended to protect pressure gauge. Frequent gauge calibration is necessary to insure accuracy.

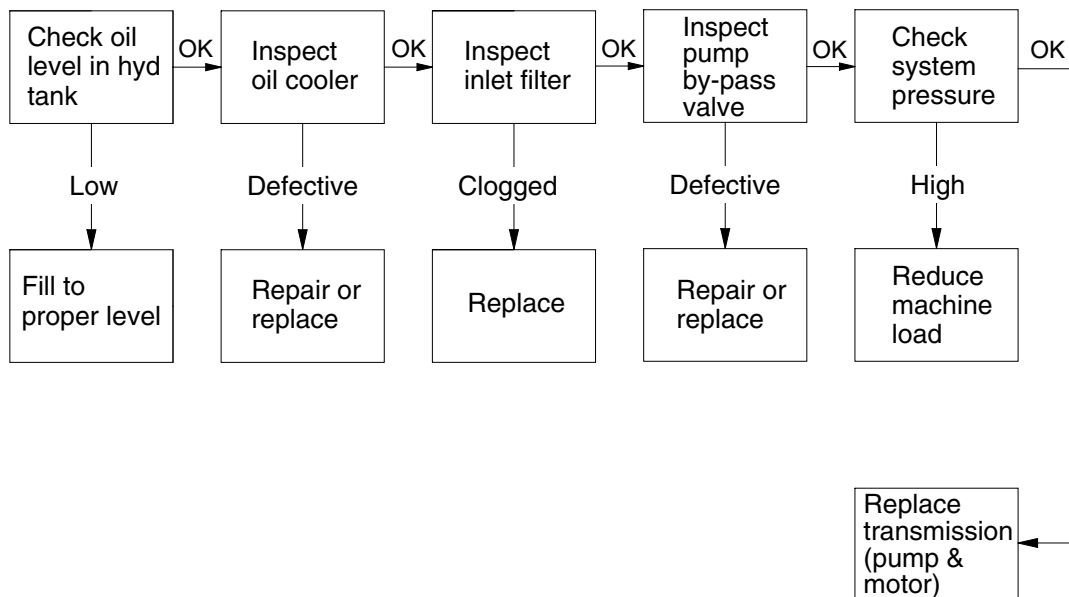
2) LOGIC DIAGRAM FAULT

(1) Neutral difficult or impossible to find



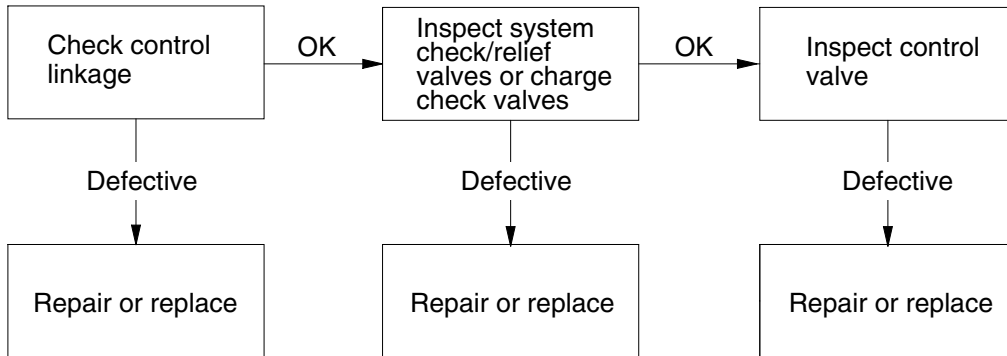
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(2) System operating hot



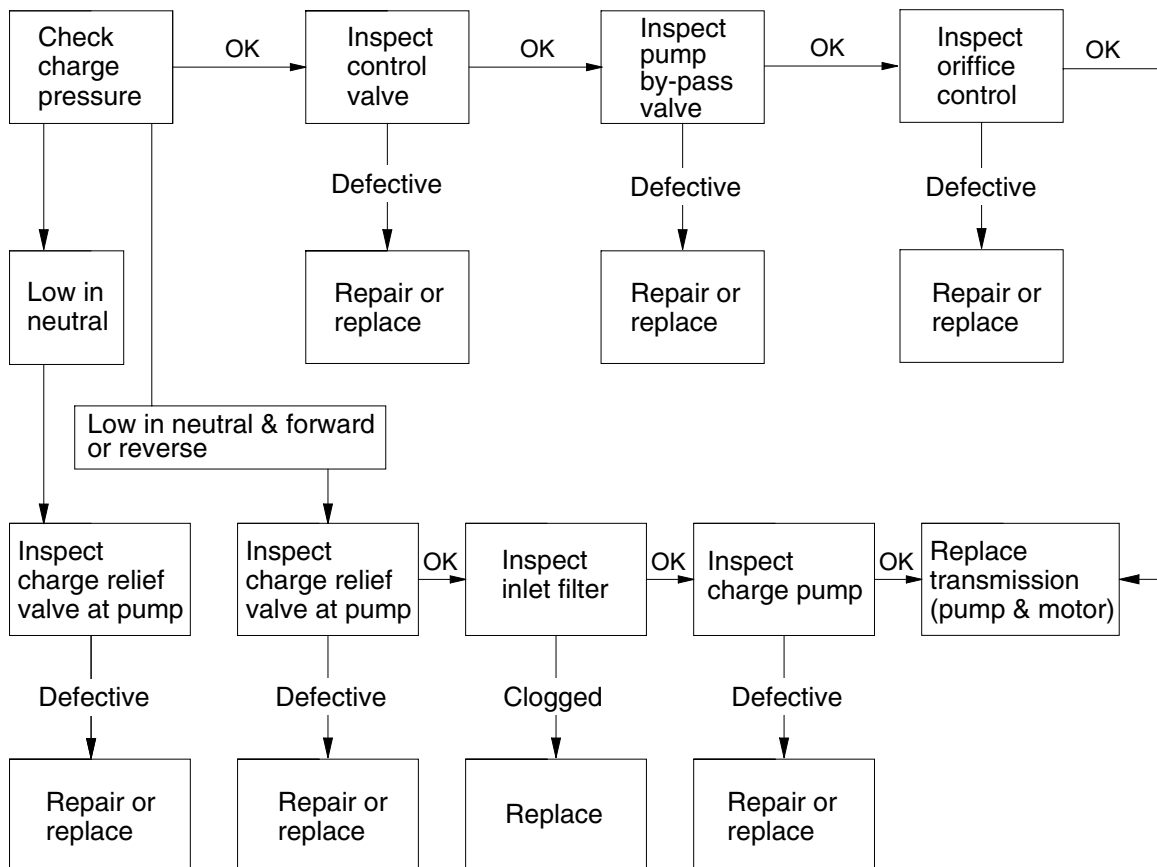
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(3) Transmission operates in one direction only



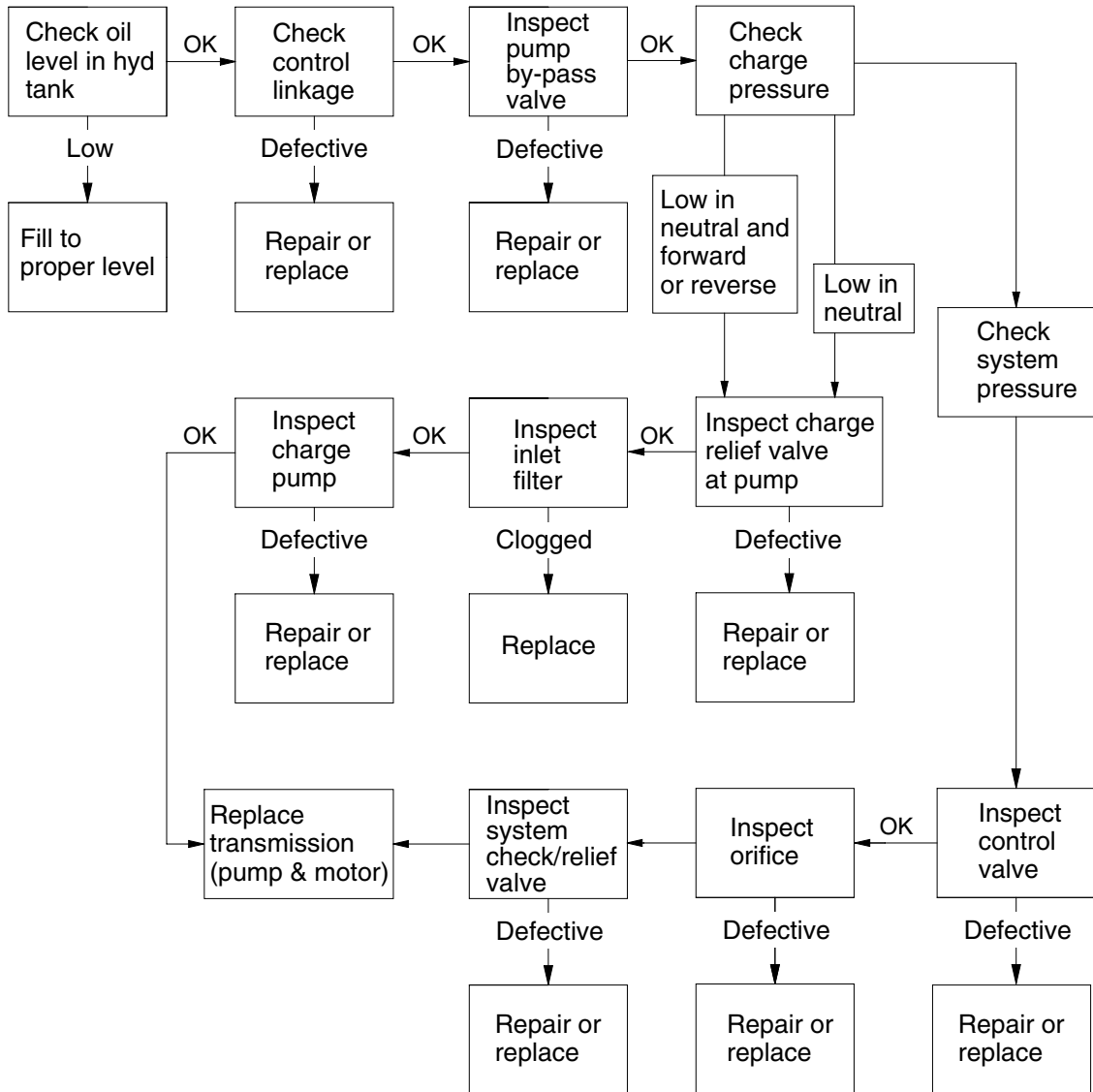
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(4) System response is sluggish



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(5) System will not operate in either direction



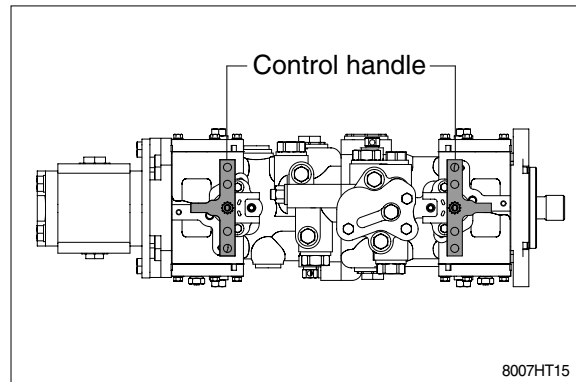
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8. INSPECTIONS AND ADJUSTMENTS

1) MANUAL DISPLACEMENT CONTROL

Disconnect the external control linkage from the control handle and check for neutral by manually operating the control handle. Releasing the control handle should allow the pump to return to neutral. If operation is satisfactory with the external control linkage disconnected, the problem is not in the hydrostatic transmission.

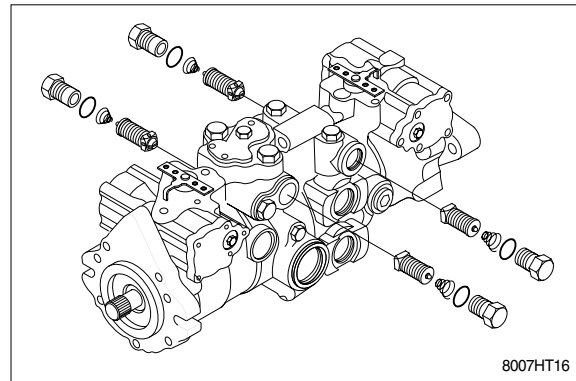
If operation is not satisfactory with the external control linkage disconnected from the handle, the control may be incorrectly adjusted.



2) CHECK / HIGH PRESSURE RELIEF VALVE

The system check/relief valves have the dual purpose of providing make up oil during by directional rotation and providing protection from system over pressure. When the problem occurs in one direction only, interchange the check/relief valves to see if the problem changes to the other direction. If so, one check/relief valve cartridge is either malfunctioning or does not have the proper setting.

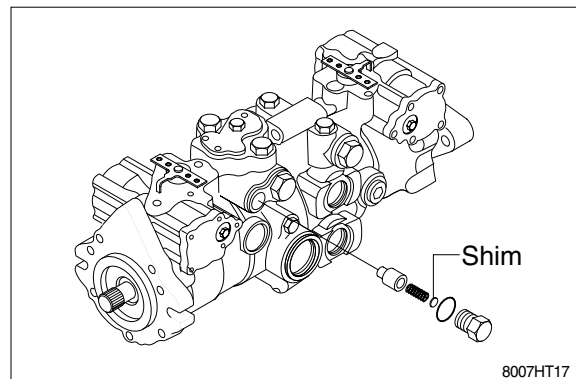
- ※ **The relief valves are factory set and should not be tampered with except for replacing the entire cartridge. Disassembly may change the setting and cause erratic unit operation or premature failure.**



3) PUMP CHARGE RELIEF VALVE

If charge pressure is low(Less than 290psi (20bar) above case pressure), the charge relief valve should be inspected. Inspect for foreign material holding the poppet open, and for scoring or wear on the poppet and seat in the housing.

Adjustment of the charge pressure is accomplished by changing the shim thickness behind the spring.



4) MANUAL DISPLACEMENT CONTROL NEUTRAL BRACKET ADJUSTMENT

(1) Remove the external control linkage(1) from the control handle(2). Remove the servo cross-port line (Installed while making the swashplate neutral adjustment) and install a 0 to 500psi (0 to 35bar) gauge in each servo gauge port.

(2) Loosen the washer head screw(3) to allow the neutral bracket(4) to move, but not freely.

※ **The following procedure may require the machine to be disabled(Wheels raised off the ground, work function disconnected, etc.) while performing the procedure in order to prevent injury to the technician and bystanders.**

(3) Start the prime mover and slowly accelerate to normal operating rpm.

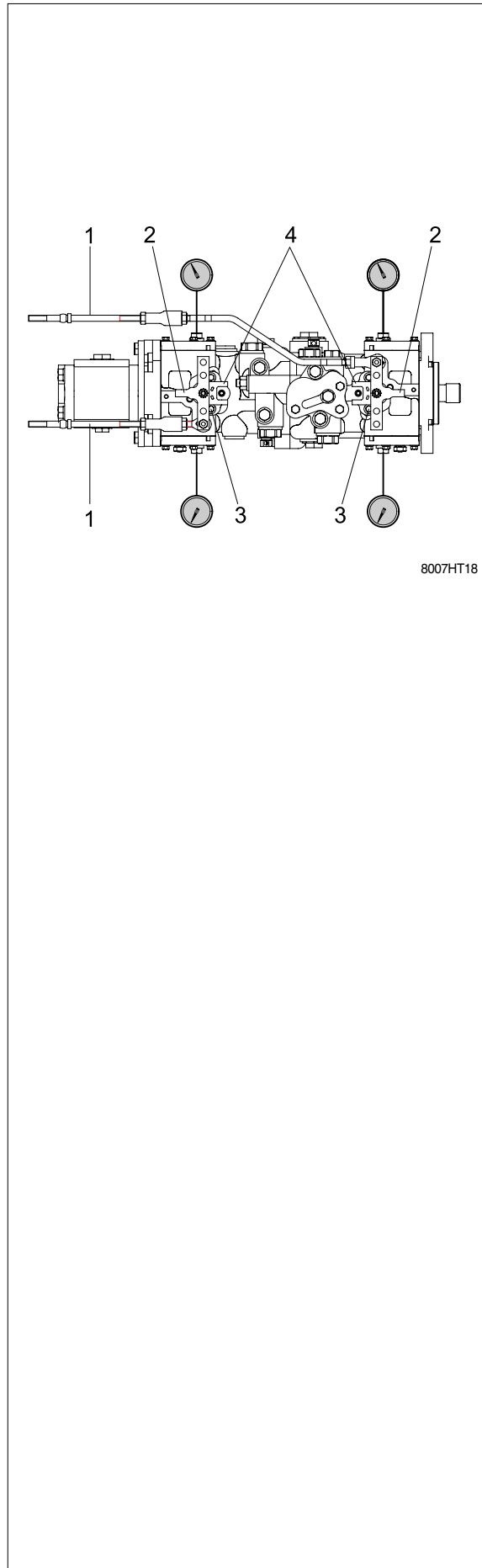
(4) Insert screwdriver into the 1/4" clearance hole and engage the slot of the neutral adjust bracket. Slowly rotate the neutral adjust bracket, using the screwdriver, until the pressure is equal on both servo gauges.

(5) Slowly rotate the neutral adjust bracket until one of the servo gauges starts to increase in pressure. Mark the position of the neutral adjust bracket.

(6) Slowly rotate the neutral adjust bracket in the opposite direction until the other servo gauge begins to increase in pressure. Mark the position of the neutral adjust bracket.

(7) Rotate the neutral adjust bracket to a position between the two marks and hold while torquing the washer head screw(3) to 95 to 132in · lbs(10.8 to 14.9Nm).

(8) Stop the prime mover. Remove the gauges and install the gauge port plugs. Install and adjust, if necessary, the external control linkage.



9. DISASSEMBLY AND ASSEMBLY

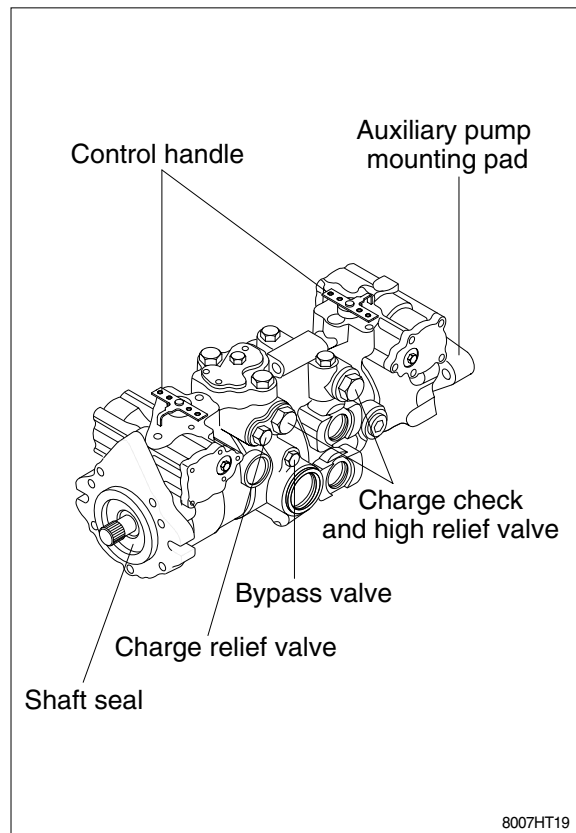
1) GENERAL

- (1) Minor repairs may be performed, following the procedures in this section, without voiding the unit warranty.

Cleanliness is a primary means of assuring satisfactory transmission life, on either new or repaired units. Cleaning parts by using a clean solvent wash and air drying is usually adequate. As with any precision equipment, all parts must be kept free of foreign materials and chemicals.

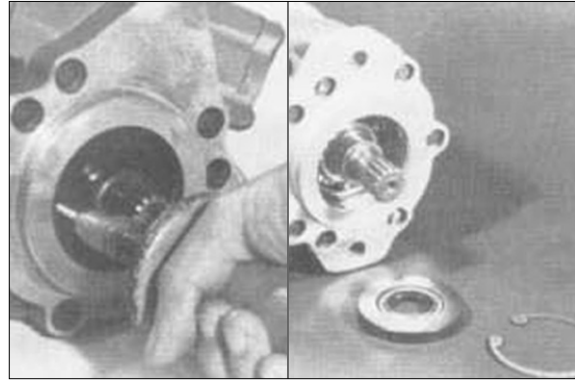
Protect all exposed sealing surfaces and open cavities from damage and foreign material.

It is recommended that all gaskets and O-rings be replaced. Lightly lubricate all O-rings with clean petroleum jelly prior to assembly. All gasket sealing surfaces must be cleaned prior to installing new gaskets.

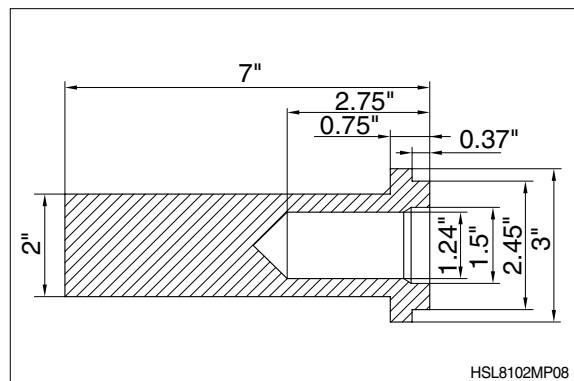


2) SHAFT SEAL

- (1) Lip type shaft seals are used on this pumps. These seals can be replaced without major disassembly of the unit. However, replacement of the shaft seal requires removal of the pump from the machine.
- (2) Remove the retaining ring from the housing.
- (3) Carefully remove the seal from the housing bore. The face of the seal may be punctured with a sharp instrument (Such as a screw driver) to aid in prying the seal out, or a slide hammer type puller may be used to remove the seal. Care must be taken so as not to damage the housing bore or shaft. Once removed, the seal is not reusable.
- (4) Prior to installing the new seal inspect the sealing area on the shaft for rust, wear or contamination. Polish the sealing area on the shaft if necessary.
- (5) Wrap the spline or key end of shaft with thin plastic to prevent damage to the seal lip during installation. Lubricate the inside diameter of the new seal with petroleum jelly.
- ※ The outside diameter of the seal may be lightly coated with a sealant (Such as loctite high performance sealant #59231) prior to installation. This will aid in preventing leaks caused by damage to the housing seal bore.
- (6) Slide the new seal over the shaft and press it into the housing bore. Be careful not to damage seal. A seal installer tool can be made to aid in installing the seal. Dimensions for this tool are shown in the right drawing.
- (7) Reinstall the seal retaining ring.



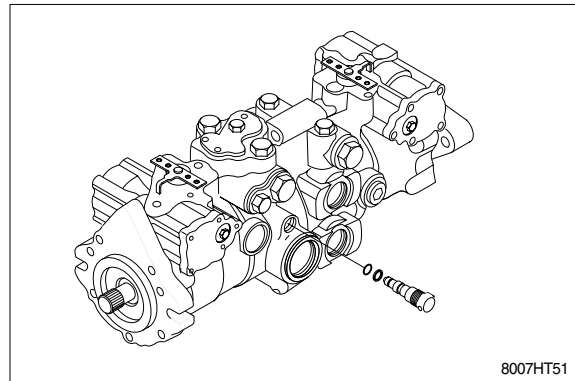
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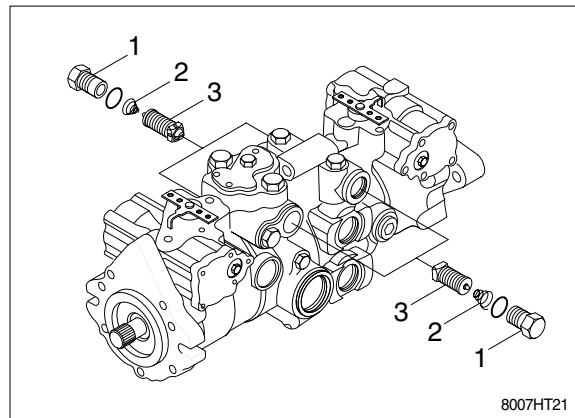
3) BYPASS VALVE

- (1) Unscrew the bypass valve from the housing. Inspect the valve and mating seat for damage or foreign material. It is recommended that the O-ring and back up ring be replaced.
- (2) Reinstall the bypass valve into the housing.
 - Torque to 7~10lbf · ft (9.5~13.6Nm).



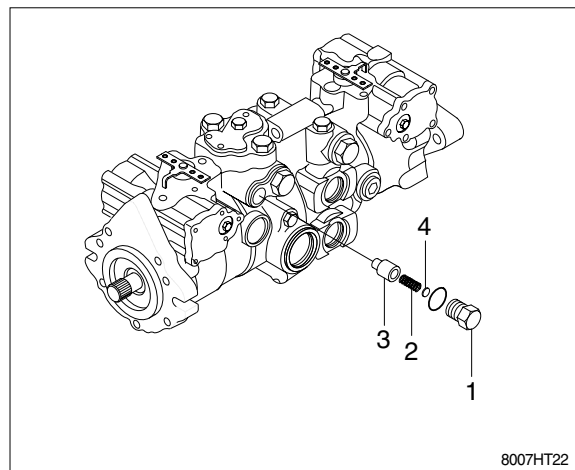
4) CHARGE CHECK AND HIGH PRESSURE RELIEF VALVES

- (1) Remove the charge check and high pressure relief valve hexagon plug(1).
- (2) Remove the spring(2) and check poppet (3) from the housing. Inspect the valve and mating seat in the housing for damage or foreign material. It will be necessary to replace the housing if the seat is damaged.
- (3) Reinstall the valve poppet, spring and plug(With O-ring) into the housing. Torque the plug to 30~70lbf · ft(41~95Nm).
 - ※ The relief valves are factory set and should not be tampered with except for replacing the entire cartridge. Disassembly may change the setting and cause erratic unit operation or premature failure.



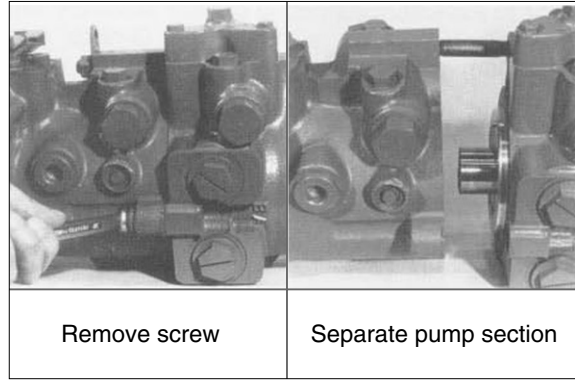
5) CHARGE PRESSURE RELIEF VALVE

- (1) Remove charge relief valve hexagon plug(1).
- (2) Remove the spring(2) and poppet(3) from the housing. Do not alter the shims(4) or interchange parts with another valve. Inspect the poppet and mating seat in the end cap for damage or foreign material.
- (3) Reinstall the poppet, spring and plug(With shims and O-ring) into the housing. Torque the plug to 30~70lbf · ft(41~95Nm).



6) INTEGRAL CHARGE PUMP

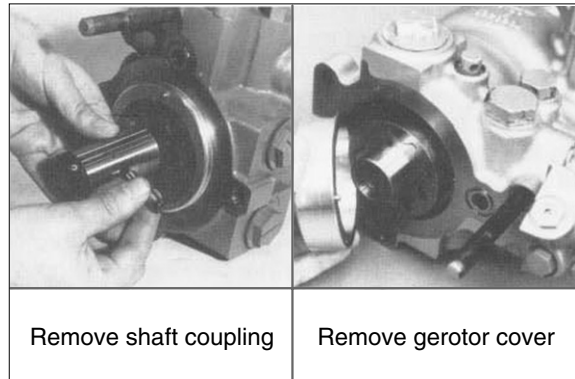
(1) Remove the two 12 point head screws (using a 1/2" wrench) and the hex nut(using a 3/4" wrench) which retain the front and rear pump sections together. Separate the front and rear sections of the pump.



8007HT23

(2) Remove the two small O-ring and large seal ring.

(3) On pumps with a one piece gerotor cover, remove the gerotor cover and pin. Note the orientation of the gerotor cover and pin for reassembly. Remove the shaft coupling and pin from the front section. Remove the gerotor assembly.

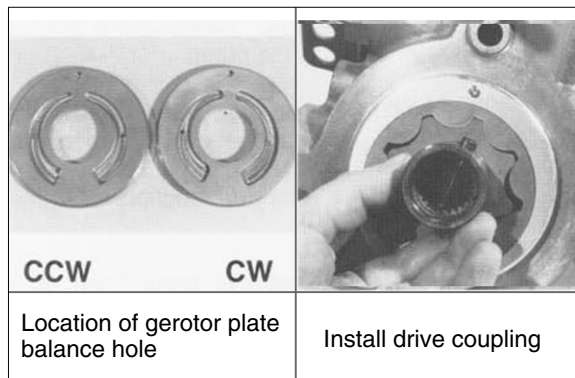


8007HT24

(4) Remove the outer O-ring from the rear section of the pump. Remove the inner O-ring from the gerotor cover. Each part should be inspected separately if they are to be reused. If either of the gerotor assembly parts needs to be replaced, they must both be replaced. Always replaced the O-rings (and gaskets, where used).

(5) Prior to assembly, lubricate the gerotor assembly with clean hydraulic oil. Lubricate the O-rings with Petroleum jelly. Install the front gerotor spacer plate into the front pump housing.

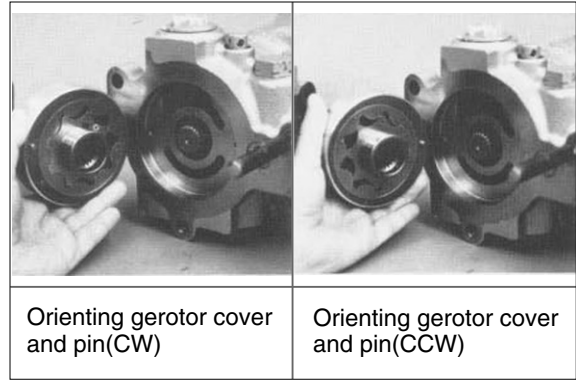
※ The charge pump rotation is determined by the position of the gerotor cover and locating pin in the front pump housing. In addition, the gerotor cover has a pressure balance hole which must always be installed on the outlet (pressure) side of the charge pump, opposite the charge inlet port. Different gerotor covers are used for clockwise and counterclockwise rotation pumps.



8007HT26

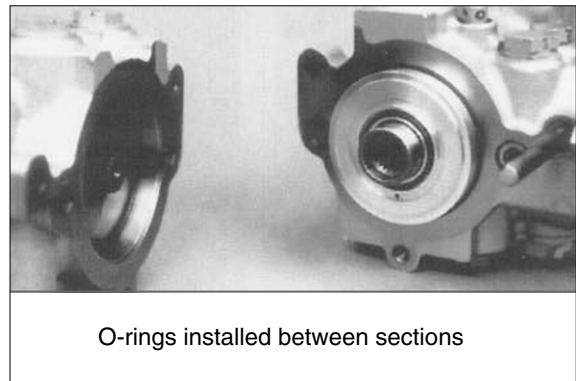
(6) Install the drive pin into the drive shaft coupling. Install the gerotor assembly into the gerotor cover. Install the assembled gerotor and cover onto the coupling, being certain the drive pin engages the slot in the gerotor

(7) For pumps with a one piece gerotor cover, install the locating pin into the gerotor cover. Install the gerotor cover (with gerotor and coupling) into the pump housing, orienting it for the proper input shaft rotation direction. The locating pin in the gerotor cover should be closest to the control for clockwise (CW) input rotation, and away from the control for counter clockwise (CCW) input rotation. The pressure balance hole in the gerotor cover must always be located opposite the charge pump inlet. Be certain the drive pin engages the slot in the gerotor. Install the outer and inner O-ring in the grooves on the back of the gerotor cover.



8007HT29

(8) Install the small O-ring and the gasket (two small O-rings and a large seal ring on units). Slide the front and rear sections of the pump together, rotating the front pump shaft to align the splines on the coupling and rear pump shaft. Install the two 12 point head screws and the hex nut to retain the front and rear pump sections together. Torque the screws and nut to 67 to 82lbf · ft(91 to 111Nm). Check for proper internal assembly by slowly rotating the pump shaft while tightening these screws and nut.

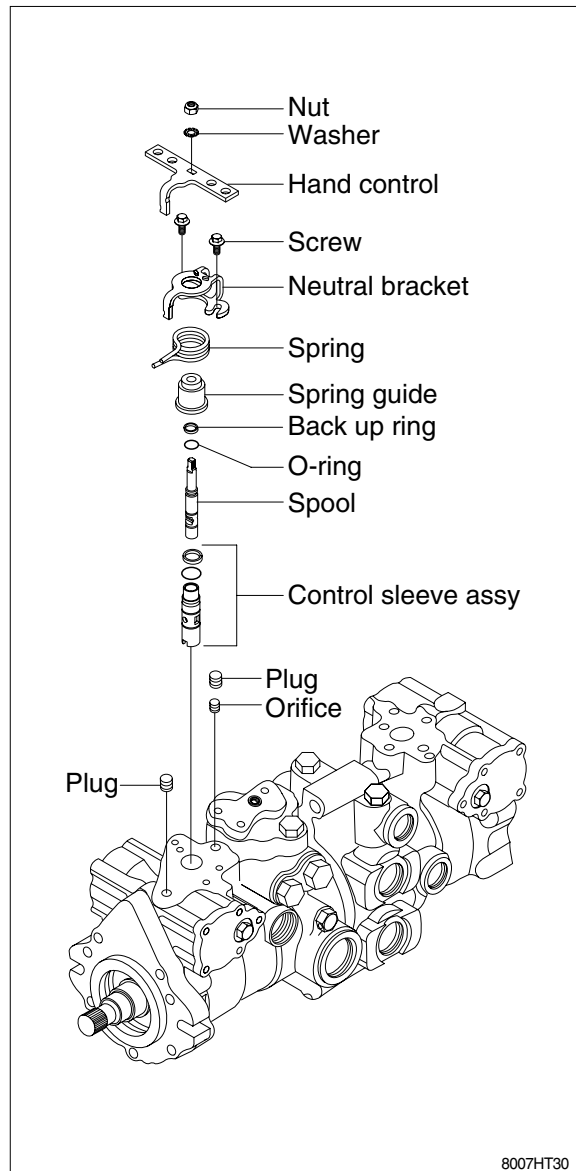


8007HT30

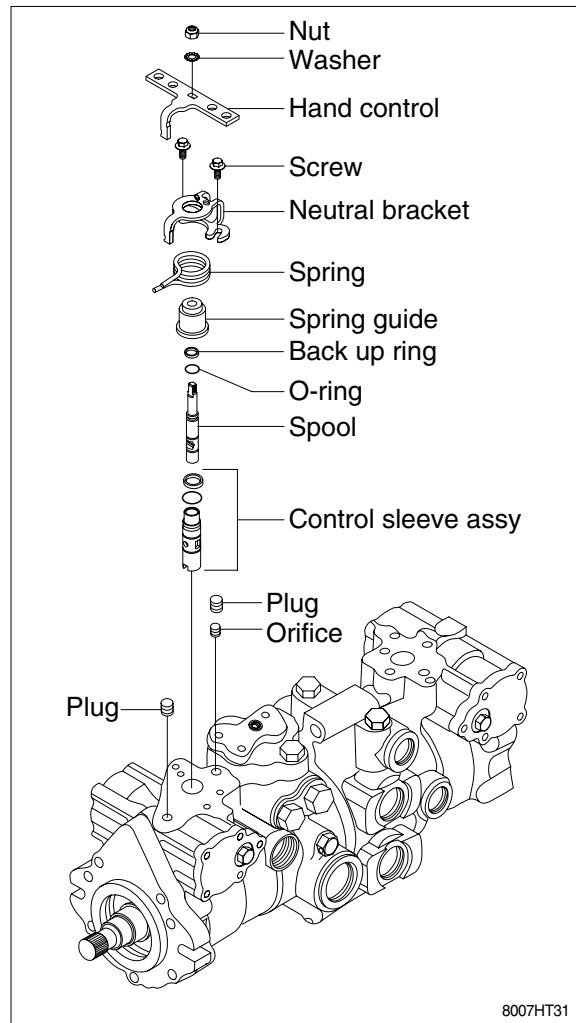
7) CONTROL SPOOL

※ **The removal of any portion of the control mechanism may result in the loss of neutral, which will necessitate readjustment.**

- (1) Before disassembly, note the position of the control handle and neutral bracket as either up or down.
- (2) Remove the screw and washer or flange head screw retaining the neutral bracket to the housing using a 7/16" or 3/8" wrench.
- (3) The spool (With neutral bracket, neutral spring, control handle and nut) can now be removed from the unit.
- (4) Remove the control sleeve from the unit by carefully gripping the end of the sleeve with pliers and pulling out.
- (5) If it is necessary to remove the control handle and neutral bracket from the spool, remove the nut from the spool using a 1/2" hexagon wrench. Remove the lock washer. Disengage the neutral spring from the handle and remove the handle from the spool. The neutral spring and neutral bracket can now be removed from the spool.



- (6) To gain access to the control inlet orifice, remove the plug located between the control sleeve bore and the filter adapter, using an internal hexagon wrench(3/16"). Remove the inlet orifice plug using an internal hexagon wrench(5/32").
- (7) After disassembly, all parts should be thoroughly cleaned in a suitable solvent. Replace the O-rings with a small amount of clean petroleum jelly prior to assembly.
- (8) Inspect the control inlet orifice for plugging.
- (9) Always install a control inlet orifice with a screen when servicing the pump. Pumps not equipped with an inlet orifice should have a screen plug with a 3.96mm(0.156") through hole installed in the inlet orifice position.
- (10) Inspect the control drain orifice, which is incorporated into the control valve sleeve.
- (11) Install the control inlet orifice/screen plug and torque to 20~30lbf · ft(2.2~3.4Nm). Install the external plug. Apply a thread sealant to the external pipe plug used on later units.



- (12) Install the neutral bracket and neutral Install spring onto the spool.
Install the handle onto the spool, aligning the marks made at disassembly. Engage the neutral spring with the handle and neutral bracket. Install the external tooth lock washer and nut onto the spool and torque to 10~20lbf · ft (13.6~16.3Nm).
- (13) Align the control sleeve so its slot will engage the swashplate feedback pin(Slot positioned toward the pump cover) and insert the sleeve into the housing. Install the special washer onto the control sleeve.
- (14) Install the control spool assembly into the control sleeve, being certain that the control handle is oriented as noted during disassembly.
The slot in the handle end of the spool must be oriented toward the pump cover.
- (15) Orient the control sleeve washer so its flat clears the neutral bracket. Align the marks made at disassembly and fasten the neutral bracket to the housing with the locking flange head screw. Pumps using a hexagon head screw and star lock washer to retain the neutral bracket should have this hardware replaced with the locking flange head screw. Refer to the appropriate service parts manual for the part number.
- (16) Readjust the neutral position of the control. Refer to the inspections and adjustment section at page 2-41 for details.