SECTION 6 WORK EQUIPMENT

GROUP 1 STRUCTURE AND FUNCTION

1. HYDRAULIC SYSTEM OUTLINE

The loader hydraulic system is a pilot operated, closed center system which is supplied with flow from the variable displacement piston main hydraulic pump.

The loader system components are :

- Loader pump
- Main control valve
- Bucket cylinder
- Boom cylinders
- Remote control valve (Pilot control valve, EH type)
- Safety valve

Flow from the steering pump not used by the steering system leaves the flow amplifier EF port.
It flows to the inlet port plate of two section or three section block type main control valve.

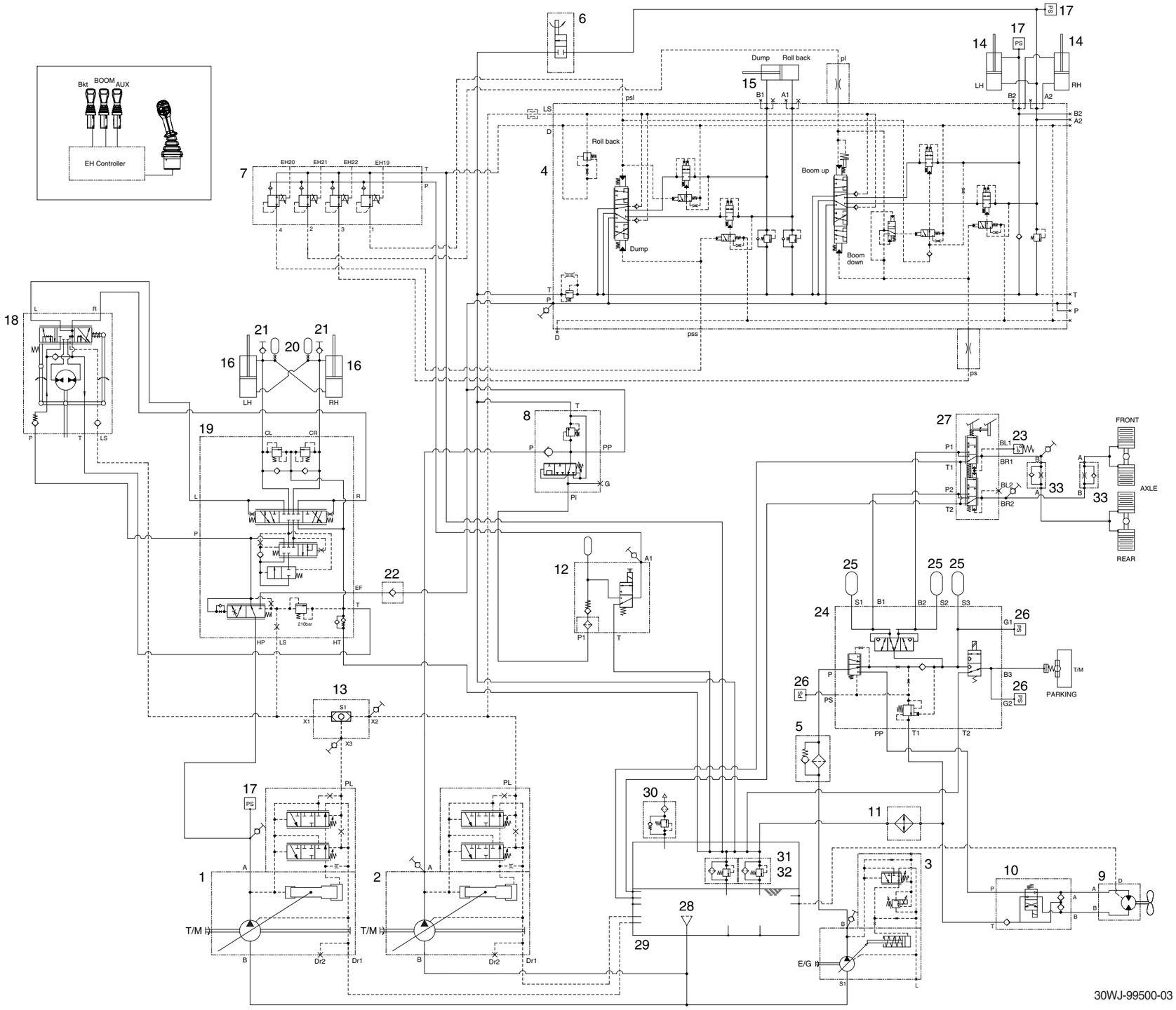
The main control valve is load pressure independent flow distribution system which routes flow to the boom, bucket or auxiliary cylinders (not shown) when the respective spools are shifted.

Flow from the loader pump is routed to the main control valve where pump outlet pressure is reduced to pilot circuit pressure. The main control valve flow to the remote control valve.
The remote control valve routed flow to either end of each spool valve section in the main control valve to control spool stroke.

A accumulator mounted on safety valve supplies a secondary pressure source to operated remote control valve so the boom can be lowered if the engine is off.

The return circuit for the main hydraulic system have return filter inside the hydraulic tank. The return filter uses a filter element and a bypass valve. The bypass valve is located in the upside of filter.

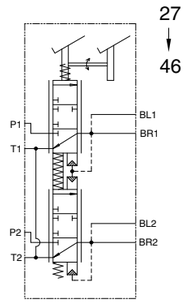
2. HYDRAULIC CIRCUIT (1/2)



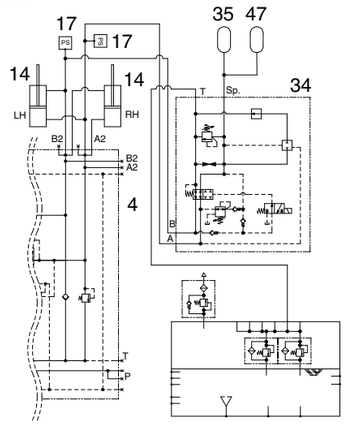
1 Steering pump
2 Main pump
4 Main control valve
5 Filter assy
6 Boom lowering valve
7 Remote control block
8 Function valve
9 Fan motor
10 Directional valve
11 Hyd oil cooler
12 Safety valve
12-1 Filter element
13 Shuttle valve
14 Boom cylinder
15 Bucket cylinder
16 Steering cylinder
17 Pressure sensor
18 Steering unit
19 Flow amplifier
20 Accumulator
21 Orifice
22 Check valve
23 Pressure switch
24 Cut off valve
25 Accumulator
26 Pressure sensor
27 Brake valve
28 Strainer
29 Hydraulic tank
30 Air breather
31 Return filter
32 Bypass valve
33 Orifice check

HYDRAULIC CIRCUIT (2/2)

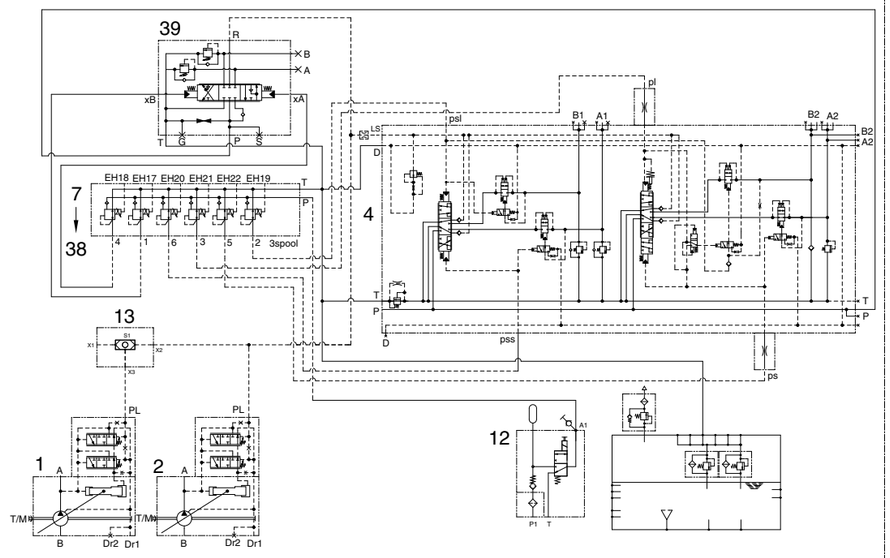
DUAL BRAKE PEDAL



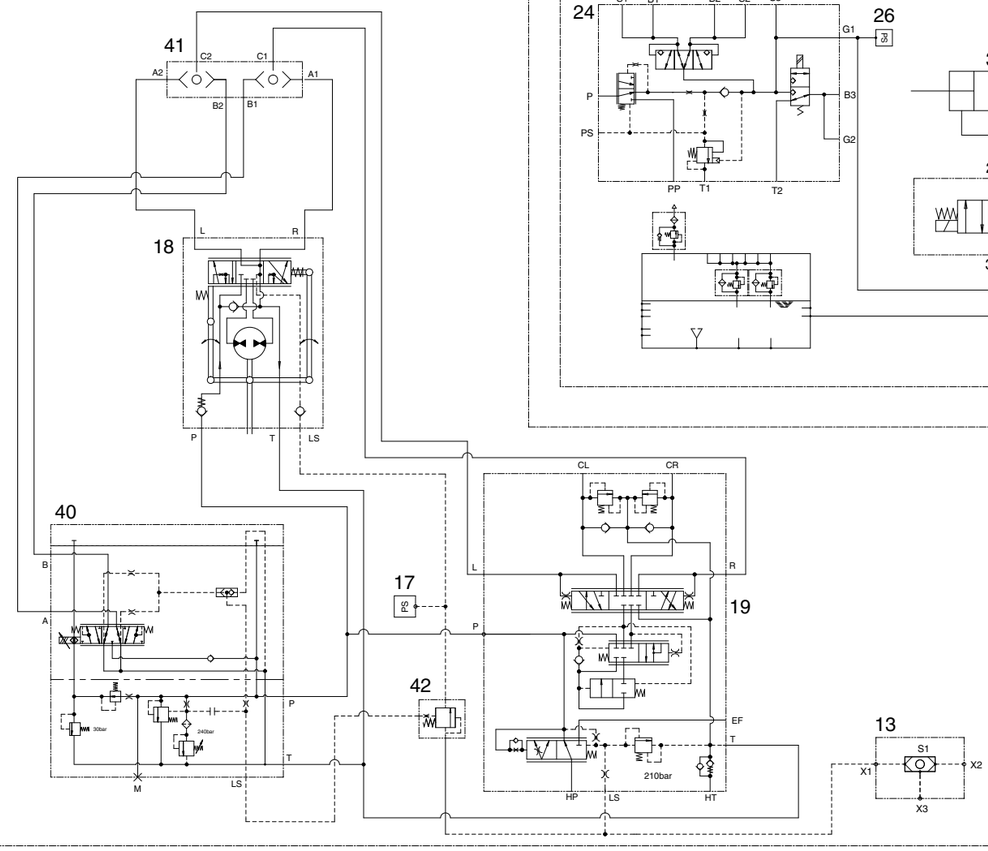
RIDE CONTROL



3-SPOOL PIPING

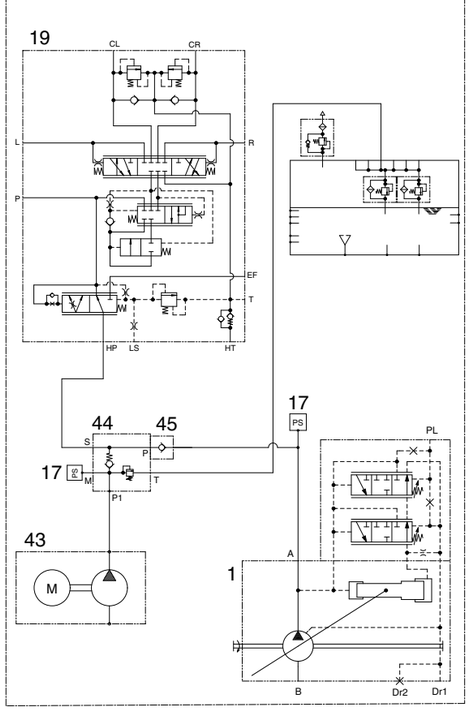


JOYSTICK STEERING



QUICK COUPLER

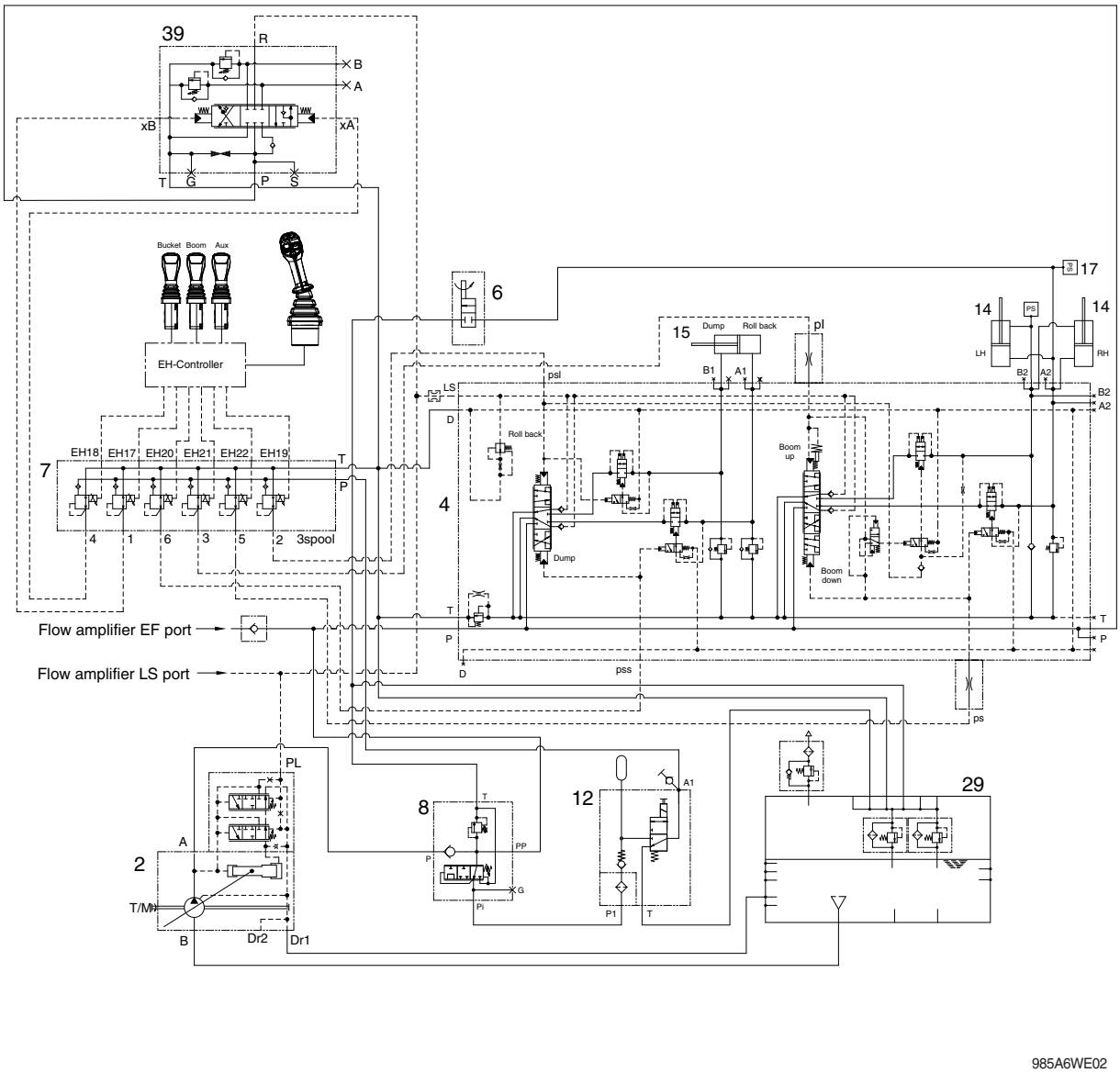
EMERGENCY STEERING



17 Pressure sensor
35 Accumulator
36 Solenoid valve
37 Quick coupler cylinder
38 Remote control block
39 Aux MCV
40 Proportional valve
41 Shuttle valve
42 LS compensating valve
43 Motor pump assy
44 Check vavle
45 Check valve
46 Dual brake valve
47 Accumulator

30WJ-99500-03

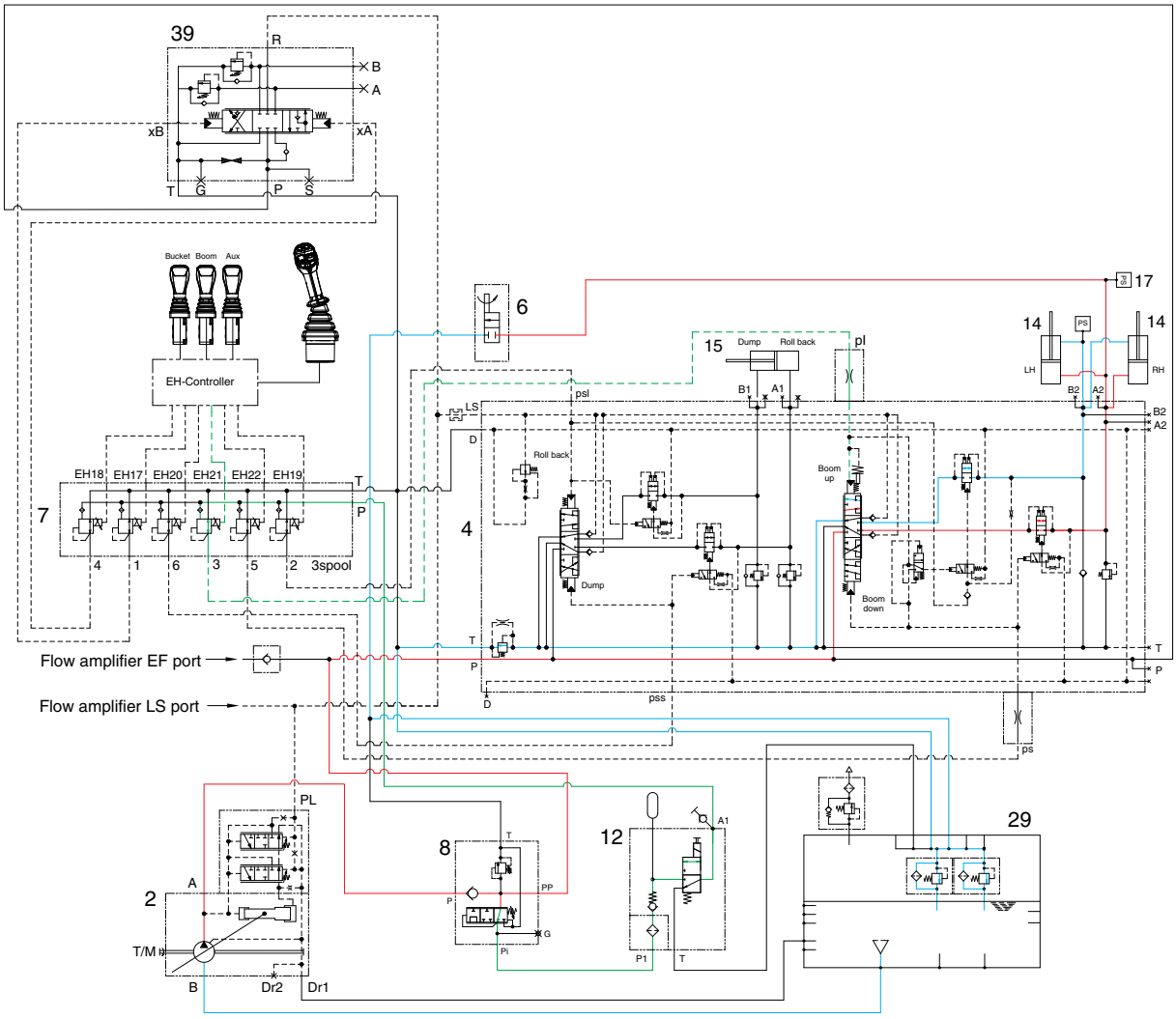
3. WORK EQUIPMENT HYDRAULIC CIRCUIT



985A6WE02

2 Loader pump
4 Main control valve
6 Boom lowering valve
7 EH control block
8 Function valve
12 Safety valve
14 Boom cylinder
15 Bucket cylinder
17 Pressure sensor
29 Hydraulic tank
39 Auxiliary main control valve (opt)

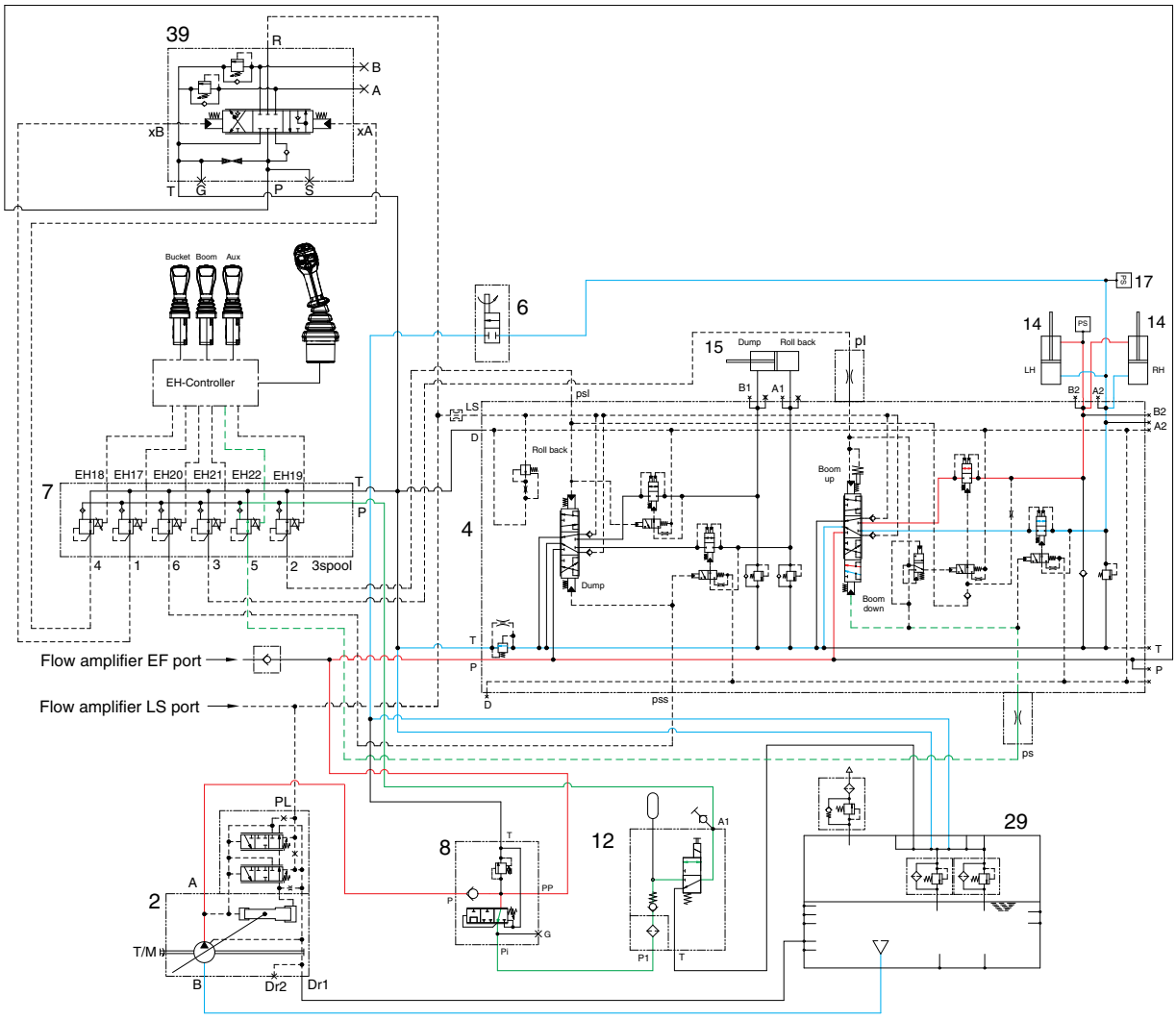
1) WHEN THE RCV LEVER IS IN THE RAISE POSITION



985A6WE03

- When the EH RCV lever (boom) is pulled back, the boom spool is moved to raise position by pilot oil pressure from EH control block (7).
- The oil from loader pump flows into main control valve (4) and then goes to the large chamber of boom cylinder (14).
- The oil from the small chamber of boom cylinder (14) returns to hydraulic oil tank (29) through the boom spool at the same time.
- When this happens, the boom goes up.

2) WHEN THE RCV LEVER IS IN THE LOWER POSITION

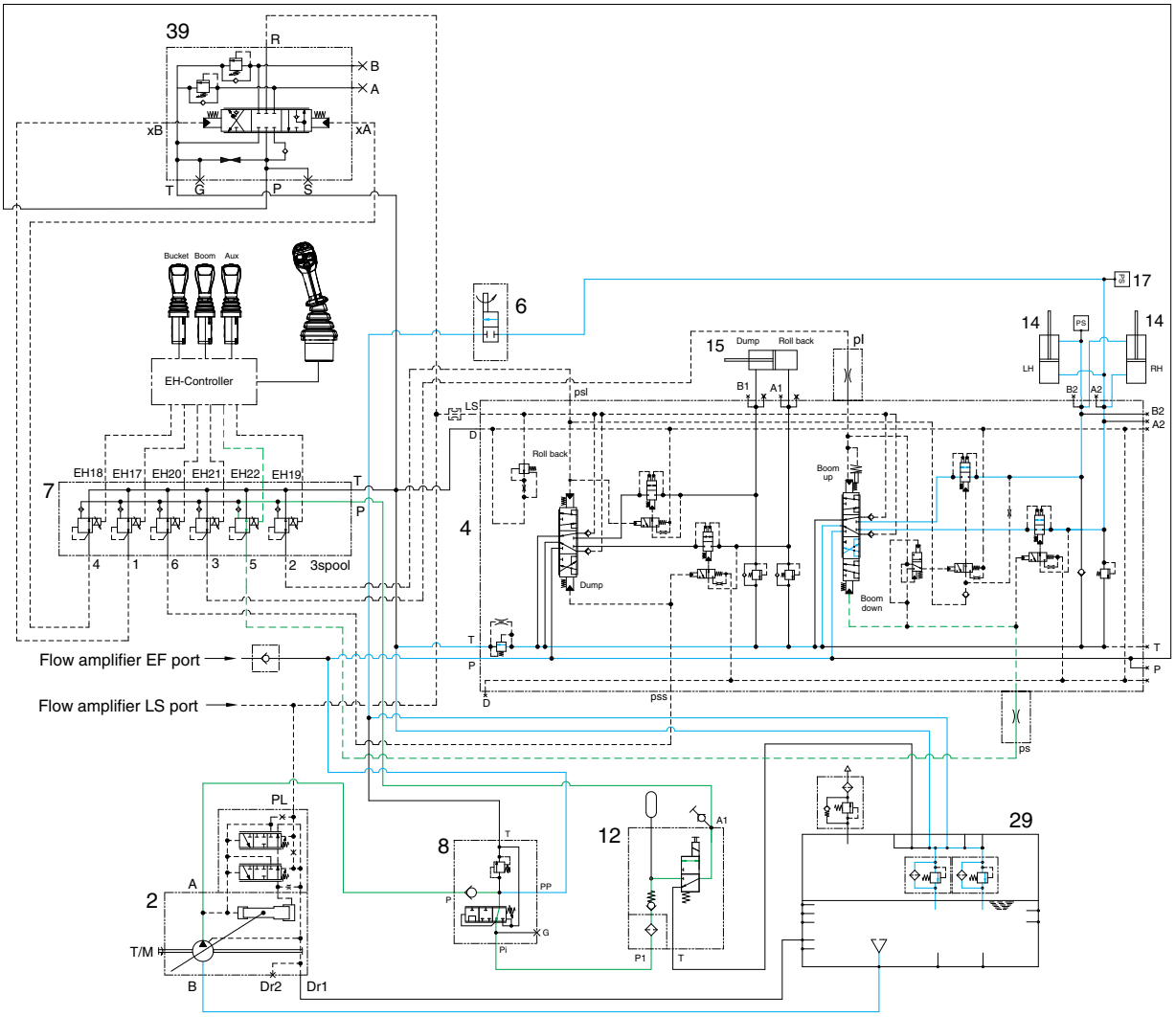


985A6WE04

- When the EH RCV lever (boom) is pushed forward, the boom spool is moved to lower position by pilot pressure from EH control block.
- The oil from loader pump flows into main control valve (4) and then goes to small chamber of boom cylinder (14) by pushing the load check valve of the boom spool.
- The oil returned from large chamber of boom cylinder (14) returns to hydraulic tank (29) through the boom spool at the same time.
- When the lowering speed of boom is faster, the return oil from the large chamber of boom cylinder combines with the oil from the pump through the regeneration check valve, and flows into the small chamber of the cylinder.

  This prevents cylinder cavitation by the negative pressure when the pump flow cannot match the boom down speed.

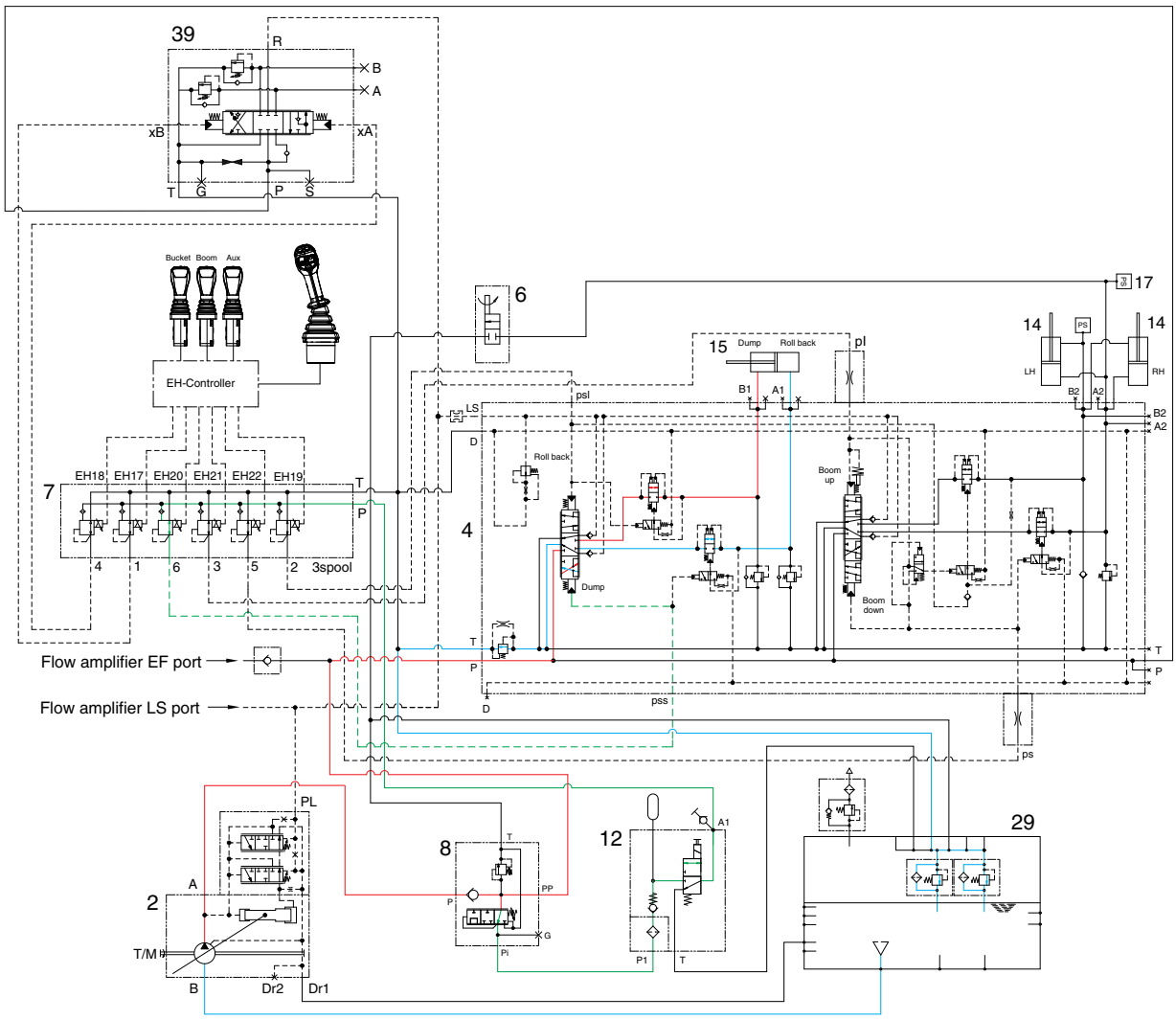
3) WHEN THE RCV LEVER IS IN THE FLOAT POSITION



985A6WE05

- When the EH RCV lever (boom) is pushed further forward from the lower position, the pilot pressure reaches to 13~15bar, then the boom spool is moved to floating position.
- The work ports (A2), (B2), (A3), (B3) and the small chamber and the large chamber are connected to the return passage, so the boom will be lowered due to it's own weight.
- In this condition, when the bucket is in contact with the ground, it can be move up and down in accordance with the shape of the ground.

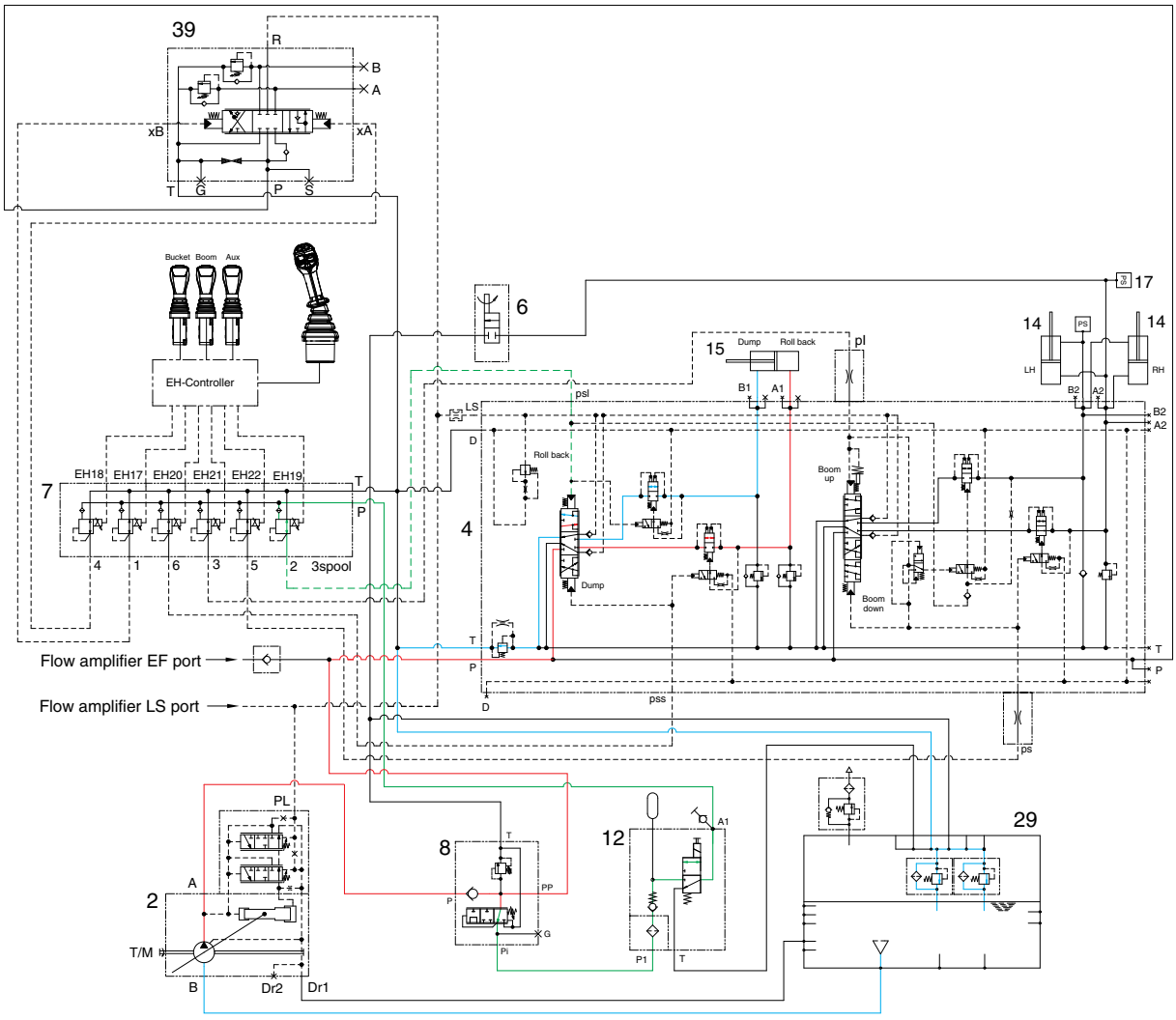
4) WHEN THE RCV LEVER IS IN THE DUMP POSITION



985A6WE06

- If the EH RCV lever (bucket) is pushed right, the bucket spool is moved to dump position by pilot oil pressure from EH control block.
- The oil from loader pump flows into main control valve (4) and then goes to the small chamber of bucket cylinder (15) by pushing the load check valve of the bucket spool.
- The oil at the large chamber of bucket cylinder (15) returns to hydraulic tank (29).
- When this happens, the bucket is dumped.
- When the dumping speed of bucket is faster, the oil returned from the large chamber of bucket cylinder combines with the oil from the pump, and flows into the small chamber of the cylinder.
  This prevents cylinder cavitation by the negative pressure when the pump flow cannot match the bucket dump speed.

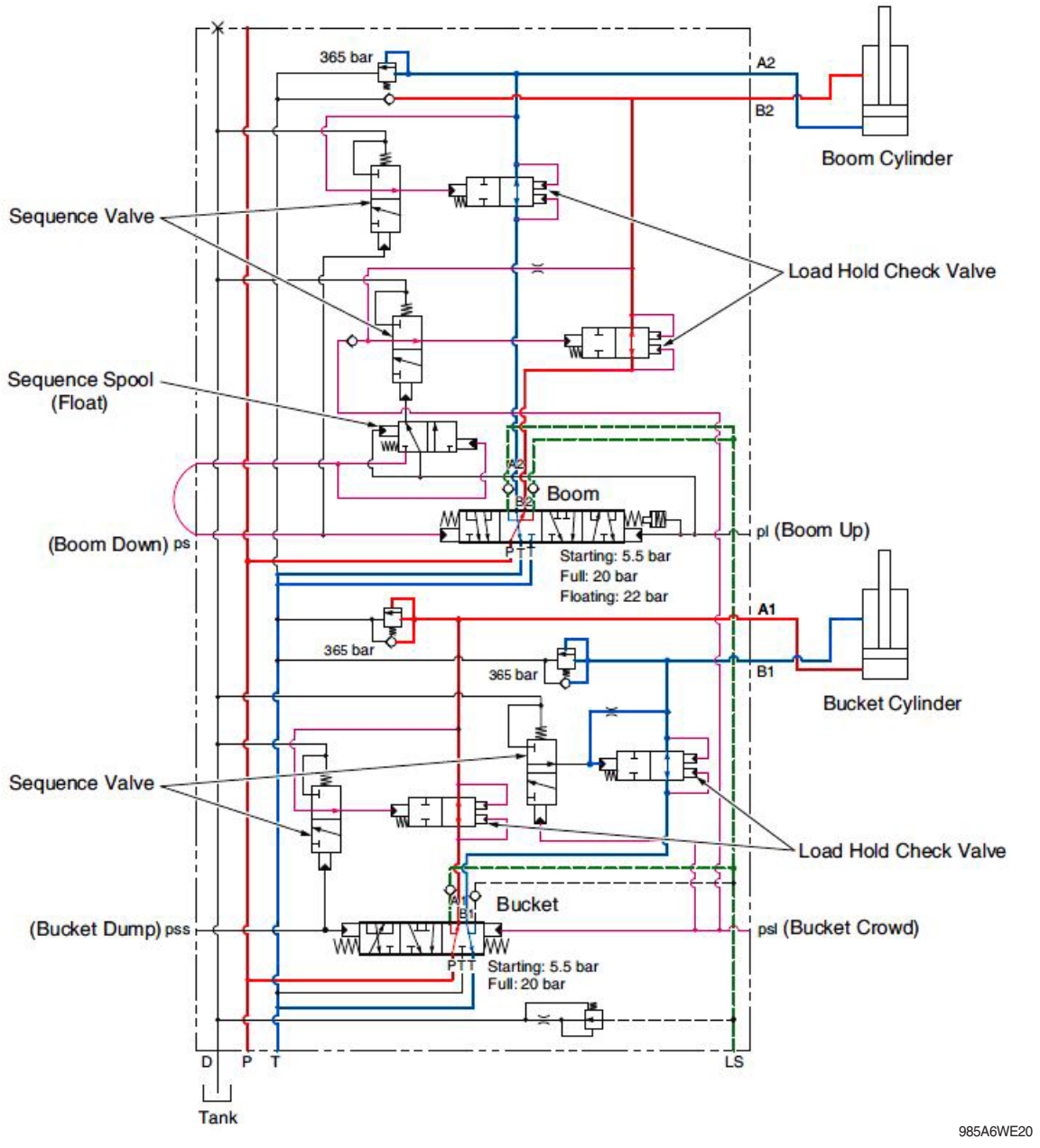
5) WHEN THE RCV LEVER IS IN THE ROLL BACK (retract) POSITION



985A6WE07

- If the EH RCV lever (bucket) is pulled left, the bucket spool is moved to roll back position by pilot oil pressure from EH control block.
- The oil from loader pump flows into main control valve (4) and then goes to the large chamber of bucket cylinder by pushing the load check valve of the bucket spool.
- The oil at the chamber of bucket cylinder (15) returns to hydraulic tank (29).
- When this happens, the bucket roll back.

6) COMBINED BUCKET ROLL BACK AND BOOM DOWN

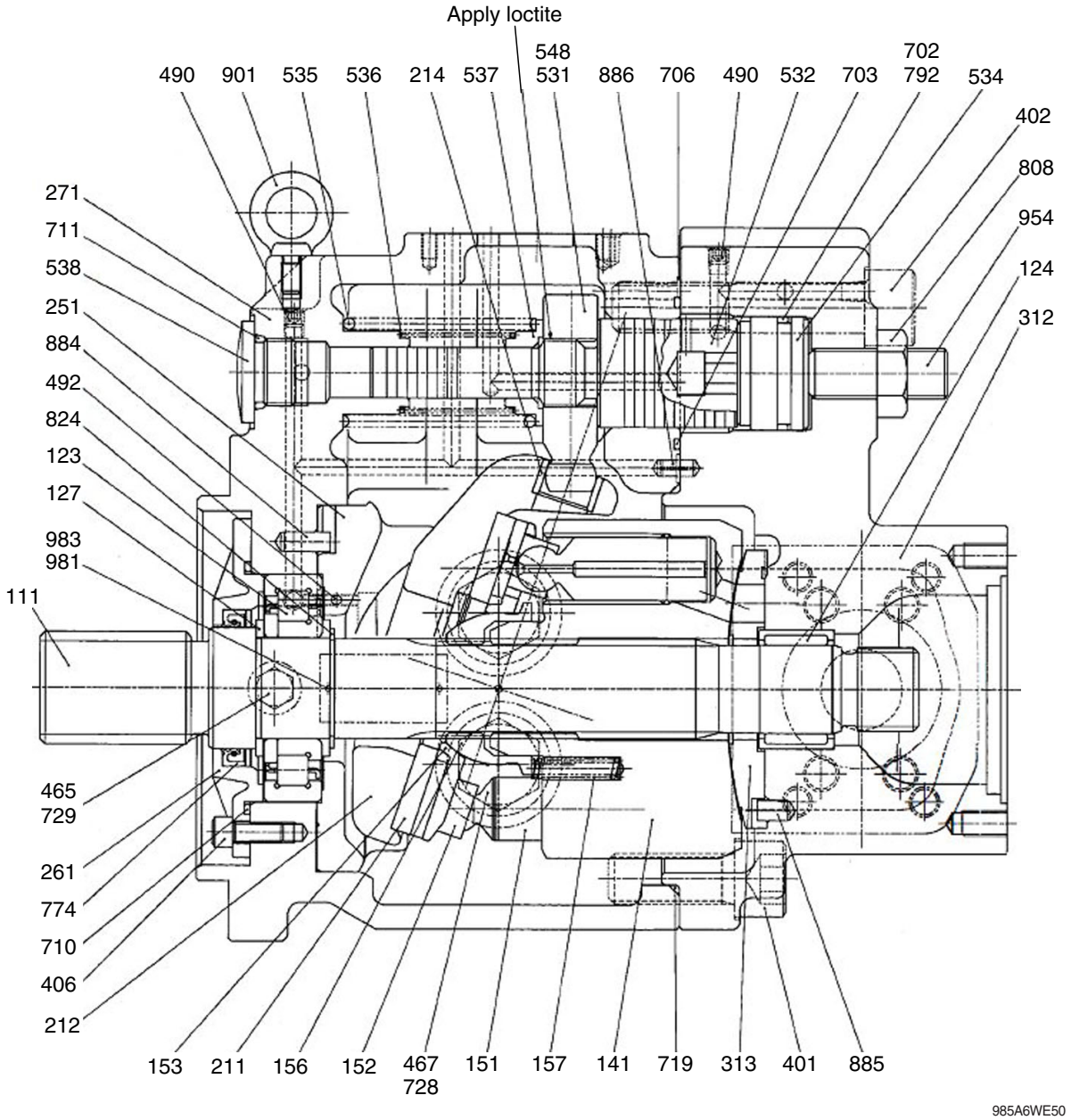


· When the operator activates the joystick lever to operate 'Bucket roll back' and 'Boom down' at the same time, the boom spool (ps port) and the bucket spool (psl port) of the main control valve begin to move, and hydraulic power from the main pump (P port) is supplied to the boom cylinder rod (B2 port) and the bucket cylinder head (A1) by the load hold valve.

· The hydraulic pilot flowed in the bucket spool (psl port) passes through the sequence valve and the boom load hold valve in adjusting the flow to the boom cylinder rod and supplying hydraulic power to the bucket cylinder head for efficient bucket crowd operation on the ground (combined movements).

4. MAIN PUMP (LOADER PUMP)

1) STRUCTURE



111	Shaft	166	Bushing	401	Screw
115	Key	211	Shoe plate	402	Screw
123	Roller bearing	212	Plate	406	Screw
124	Bearing steel	214	Bushing	465	Plug
127	Bearing spacer	251	Support	467	Plug
141	Cylinder block	261	Seal cover	490	Plug
151	Piston	271	Casing	492	Plug
153	Plate	312	Cover	531	Pin
162	Shoe	313	Plate	534	Stopper(L)

536	Spring	711	O-ring	824	Snap ring
537	Seat	719	O-ring	884	Pin
538	Plug	728	O-ring	885	Pin
648	Pin	729	O-ring	886	Pin
702	O-ring	774	Seal	901	Bolt
703	O-ring	792	Back-up ring	964	Screw
706	O-ring	808	Nut	981	Plate
710	O-ring	824	Snap ring	983	Pin

2) FUNCTION

The components of this pump are roughly divided into the rotary group doing rotary motion as main part of pump, the swash plate group to vary the delivery rate, and the valve cover group for switching between oil suction and delivery.

The rotary group is composed of the drive shaft (111), cylinder block (141), piston (151), shoes (152), set plate (153), spherical bush (156), and cylinder spring (157).
The drive shaft is supported at both its ends by bearings (123,124). The shoe is caulked over the end of piston, to form a spherical joint, and in addition, it has a pocket to balance hydraulic pressure so as to be allowed to slide lightly on the shoe plate (211) by reducing thrust due to applied pressure. The subgroup composed of pistons and shoes are pressed against the shoe plate by the cylinder spring through the set plate and spherical bush. The cylinder block is also pressed against the valve plate (313) similarly by the cylinder spring.

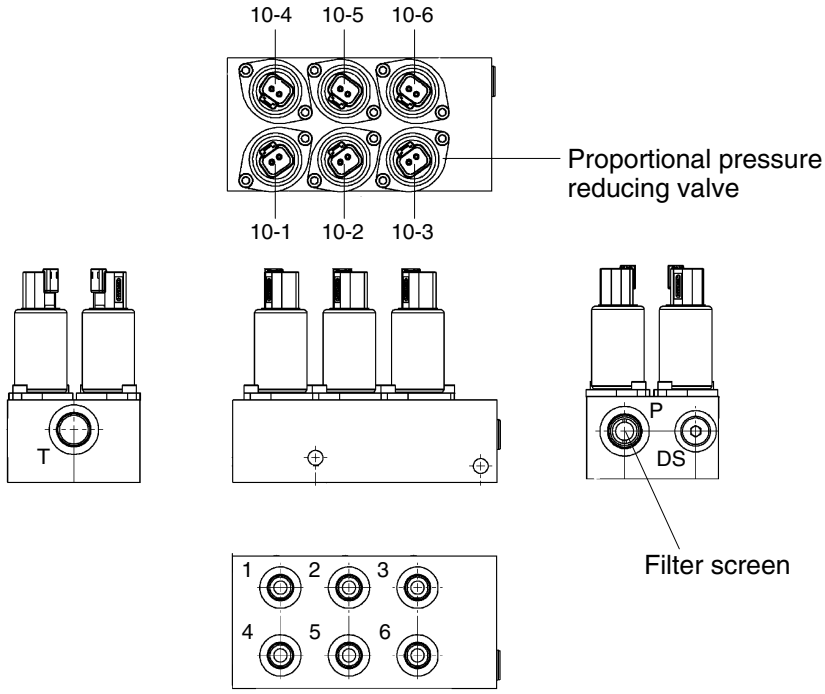
Thes swash plate group is composed of the swash plate (212), shoe plate (211), swash plate support (251), tilting bush (214), tilting pin (531) and servo piston (532). Swash plate is supported by the swash plate support on its cylindrical portion formed on the opposite side to the sliding plate face for shoes. When the servo piston moves right and left according to the conduction of hydraulic pressure controlled by the regulator into the pressure chambers provided on both the sides of the servo piston, the swash plate swings on the swash plate support through the spherical portion of the tilting pin and thus the tilting angle(a) can be varied.

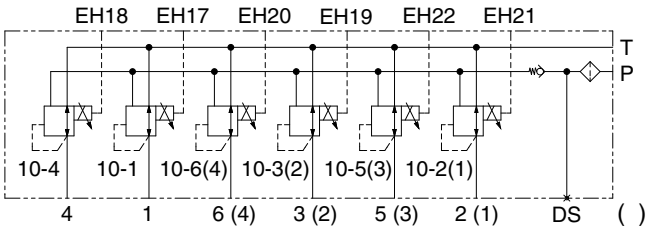
The valve cover group is composed of valve cover (312), valve plate (313) and valve plate pin (855). The valve plate with two melon-shaped ports is installed onto the valve cover, and, serves to supply oil to the cylinder block and withdraw it. The oil passage switched by the valve plate is connected to the external piping through the valve cover.

Now, when the drive shaft is driven by a prime mover(motor, engine, etc.), the cylinder block is rotated concurrently through spline coupling. If the swash plate is tilting, the pistons arranged in the cylinder block reciprocate relatively to the cylinder while they are rotating together with cylinder block.
Accordingly, paying attention to the one of the pistons, the piston do motion of going away from the valve plate (Oil suction stroke) for 180 degrees during one rotation of the cylinder block and do motion of approaching the valve plate (Oil delivery stroke) for the rest 180 degrees. If the tilting angle of the swash plate is zero, the piston makes no stroke and delivers no oil.

5. EH (electro hydraulic) CONTROL BLOCK

1) STRUCTURE





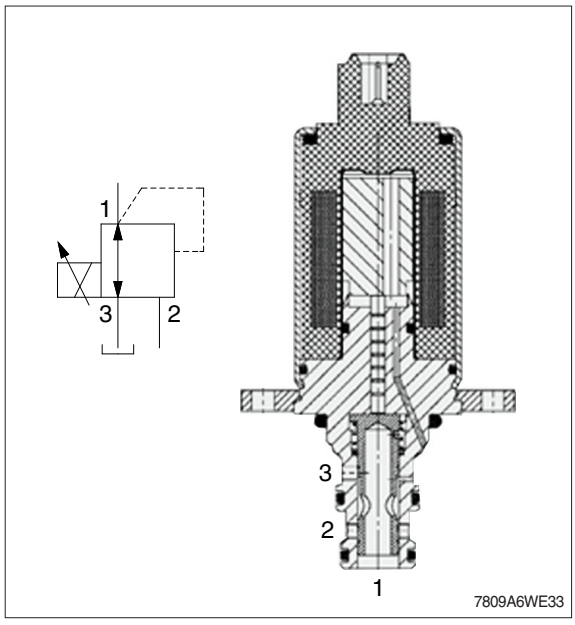
Port	Size
1 ~ 6	9/16-18UNF
DS	9/16-18UNF
P,T	3/4-16UNF

760F6WE33

Hydraulic circuit

2) OPERATION

The proportional pressure reducing valve (10-1~6) is a direct-acting spool-type valve. When de-energized, port 2 is closed and port 1 (delivery) is connected to port 3 (tank). When the inlet pressure fluctuates it provides an almost constant outlet pressure-depending on the energization of the coil. When the control current increases, the coil solenoid exerts a force on the control piston which is proportional to the control current and thereby defines the regulated pressure at port 1. This setting is proportional to the control current. Pressures at tank port 3 are additive to the set pressure. If, as a result of external factors, the pressure at port 1 rises above the preset pressure, the valve opens from port 1 to tank port 3.



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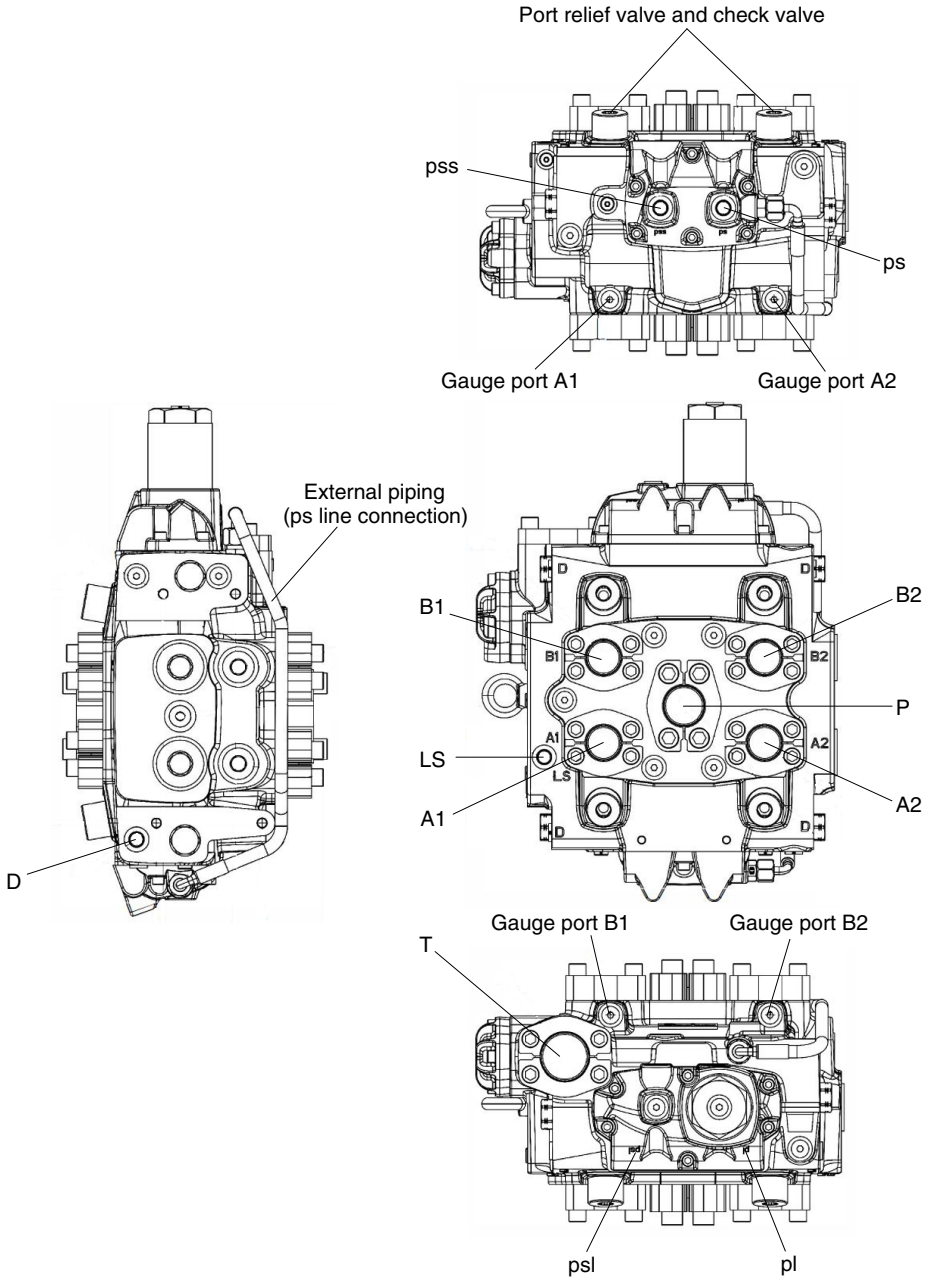
6. MAIN CONTROL VALVE

1) STRUCTURE (1/3)



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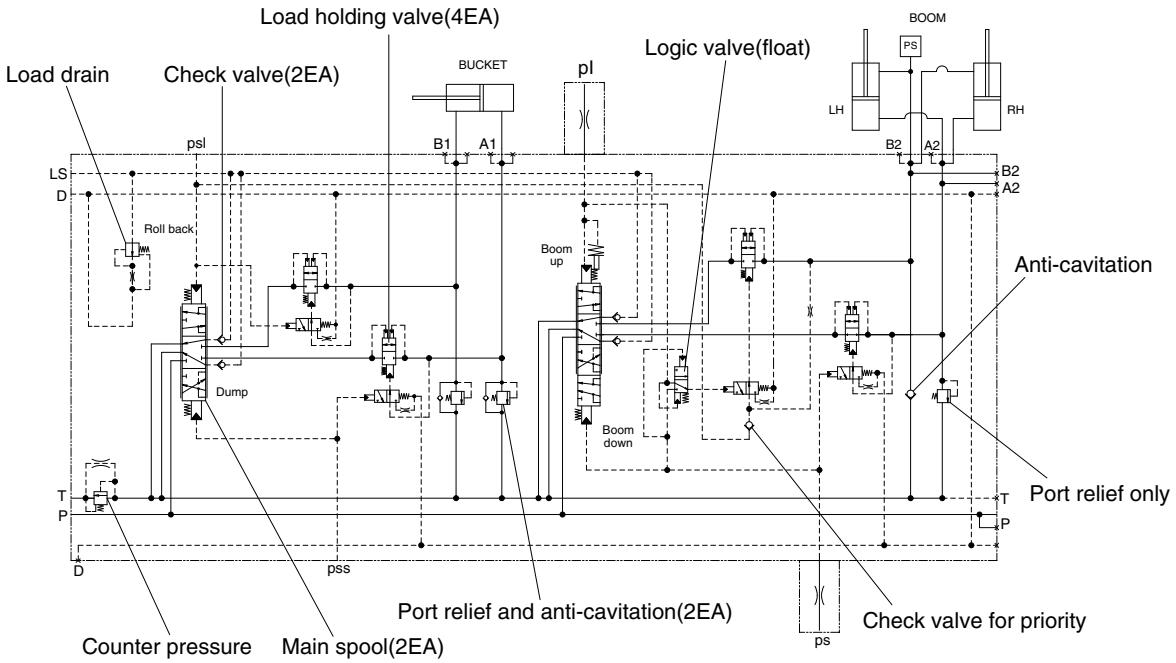
Port	Port name	Port size
P	From main pump	SAE 1 1/4"
T	To hydraulic tank	SAE 1 1/2"
A2, B2	To boom cylinder ports	SAE 1"
A1, B1	To bucket cylinder ports	SAE 1"
LS, D, pss, ps, psl, pl	LS, D, pss, ps, psl, pl ports	9/16-18UNF-2B
Gauge ports	A1, B1, A2, B2 ports	9/16-18UNF-2B

2) HYDRAULIC CIRCUIT



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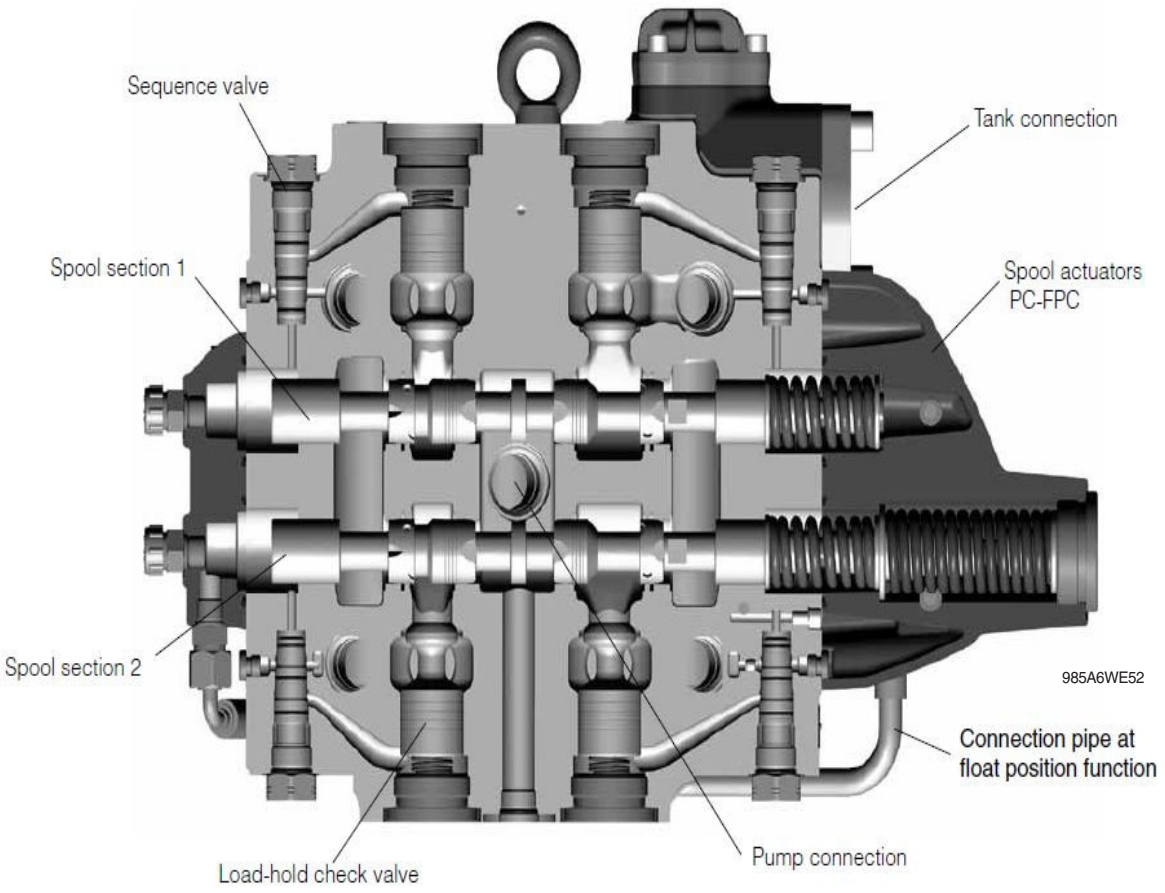
3) SECTION VIEW



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4) LOAD SENSING

The pump control system operates with the LS-method. The pump is controlled by sensing the movements of the spool and using the difference between pump pressure (at the entry of the spool of pump) and LS pressure (at the actuator after spool).

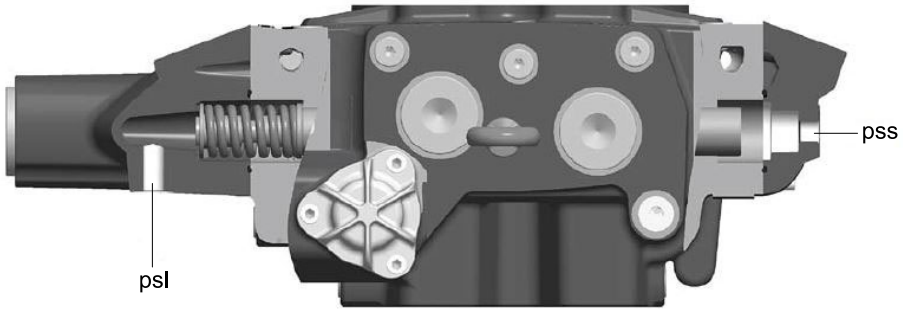
When the spool moves a little, the pressure difference between the pump and the LS increases whereas the hydraulic flow from the pump decreases; conversely, when the spool moves a lot, the pressure difference between the pump and the LS decreases whereas the hydraulic flow increases.

A. Description of functions

1. Spool control

1) Bucket spool

- Break away pressure : 5.5 bar
- Final pressure : 20 bar (max 35 bar)



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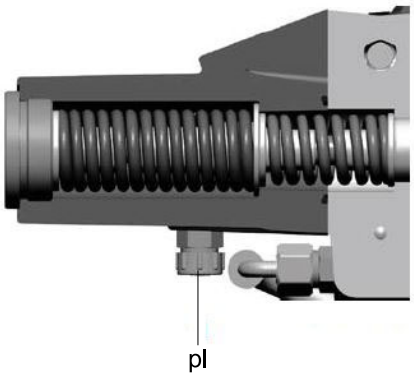
2) Boom spool

- Break away pressure : 5.5 bar
- Final pressure : 20 bar
- Pressure for float position : Min 22 bar (Max 35 bar)



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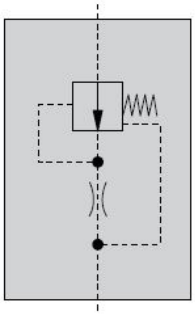
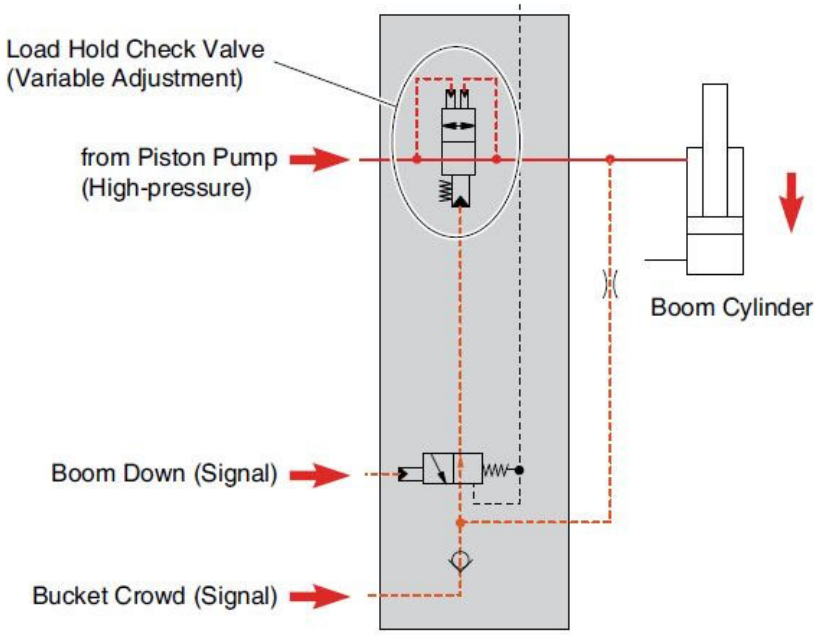
2. LS drain valve

The LS input signals activate a constant amount of hydraulic flow by the LS drain valve to the tank. When thelever is returned to the neutral position, LS pressure is to be bled off (drained into the tank).



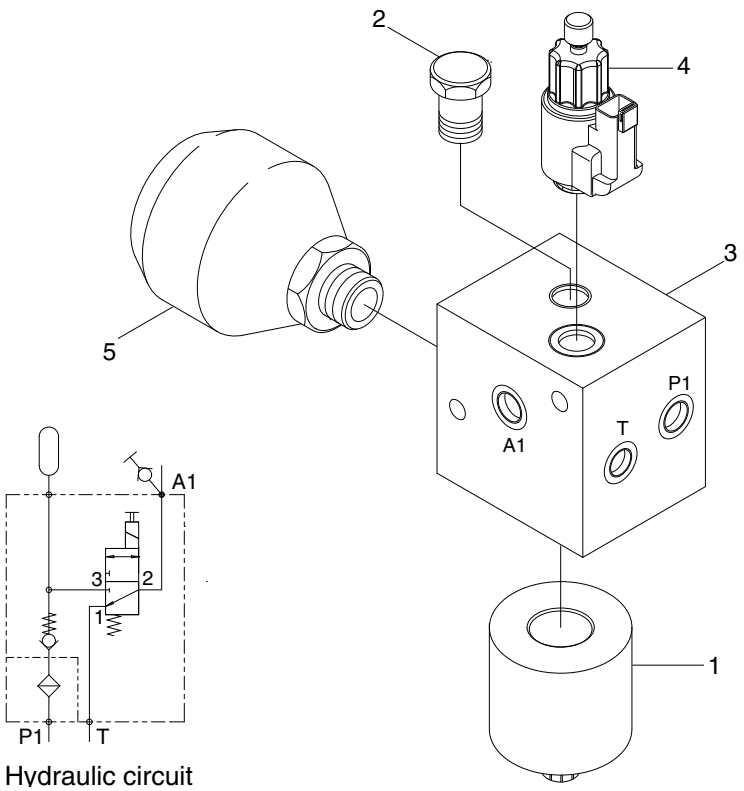
3. Prioritizing function (prior control function with simultaneous movements)

When operating boom down (small load) and bucket crowd (heavy load) simultaneously in the empty bucket state, the hydraulic power supplied to the boom cylinder is controlled by pilot signal input.



7. SAFETY VALVE

1) STRUCTURE



Hydraulic circuit

Port	Port name	Port size
P1	From MCU	PF 3/8"
A1	Supply to RCV lever	PF 1/4"
T	To hydraulic tank	PF 1/4"

75796WE16

1 Bowl and element assy
2 Check valve
3 Cartridge
4 Solenoid valve
5 Accumulator

2) OPERATION

This valve is used to cut off the pilot circuit.

When the pilot cut off switch in the cab is pressed to ON position, the solenoid valve is activated and then the pilot oil flow into the pilot circuit.

The accumulator satisfied short term peak power demands and is a source of emergency power in case of main circuit pressure failures.

8. BOOM AND BUCKET CYLINDER

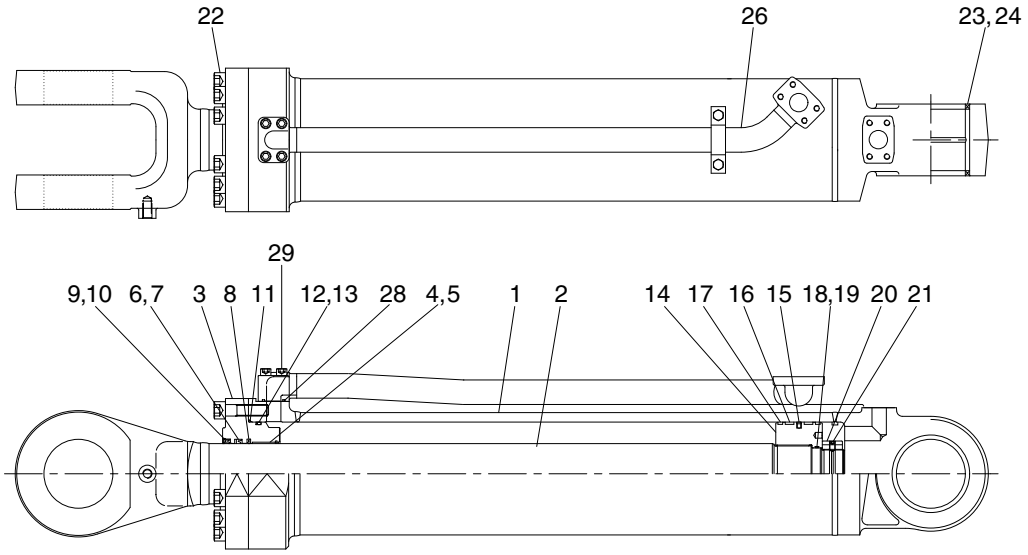
The boom cylinders are two unit and the bucket cylinder is one unit. They use a bolt on rod guide.

The piston (14) threads on to the rod (2) and is retained by a nut (20) and set screw (21).

The piston seals against the tube (1) with piston seal (15). Two wear rings (16) are located on each side of the piston seal.

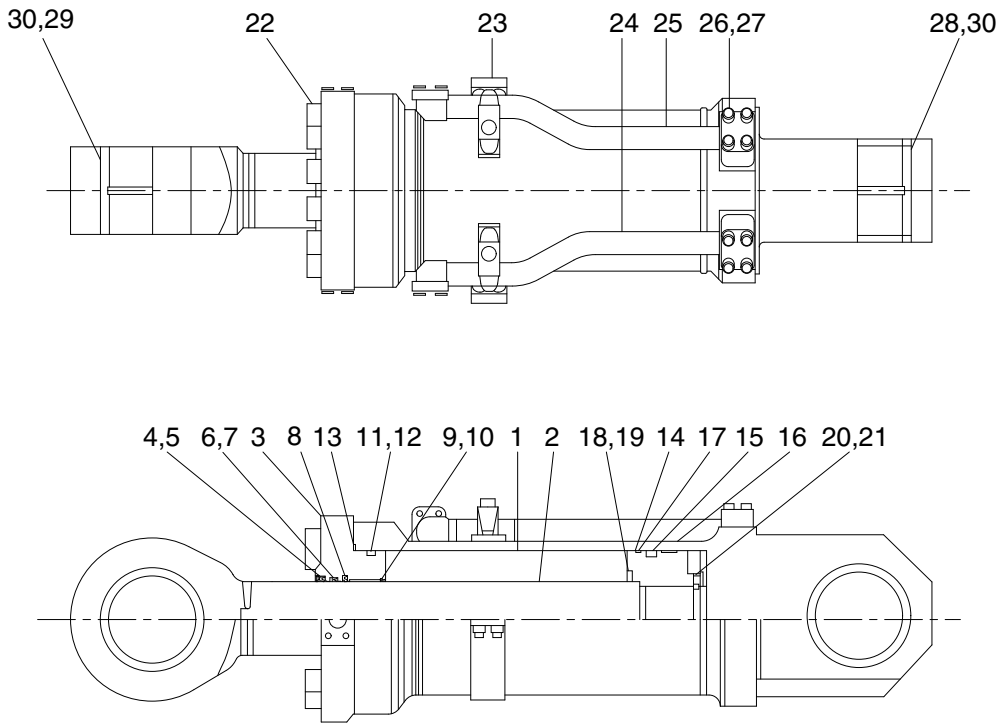
The gland (3, the rod guide) seals against the tube with an O-ring (12). The cylinder thread seals against the rod with a lip type buffer ring (8) and a rod seal (5). A dust wiper (9) cleans the rod when it is retracted.

1) BOOM CYLINDER



1	Tube assembly	11	O-ring	21	Set screw
2	Rod assembly	12	O-ring	22	Bolt
3	Gland	13	Back up ring	23	Bushing
4	Bushing	14	Piston	24	Dust seal
5	Snap ring	15	Piston seal	26	Pipe assembly
6	Rod seal	16	Wear ring	28	O-ring
7	Back up ring	17	Dust ring	29	Bolt
8	Buffer ring	18	O-ring		
9	Dust wiper	19	Back up ring		
10	Snap ring	20	Lock nut		

2) BUCKET CYLINDER



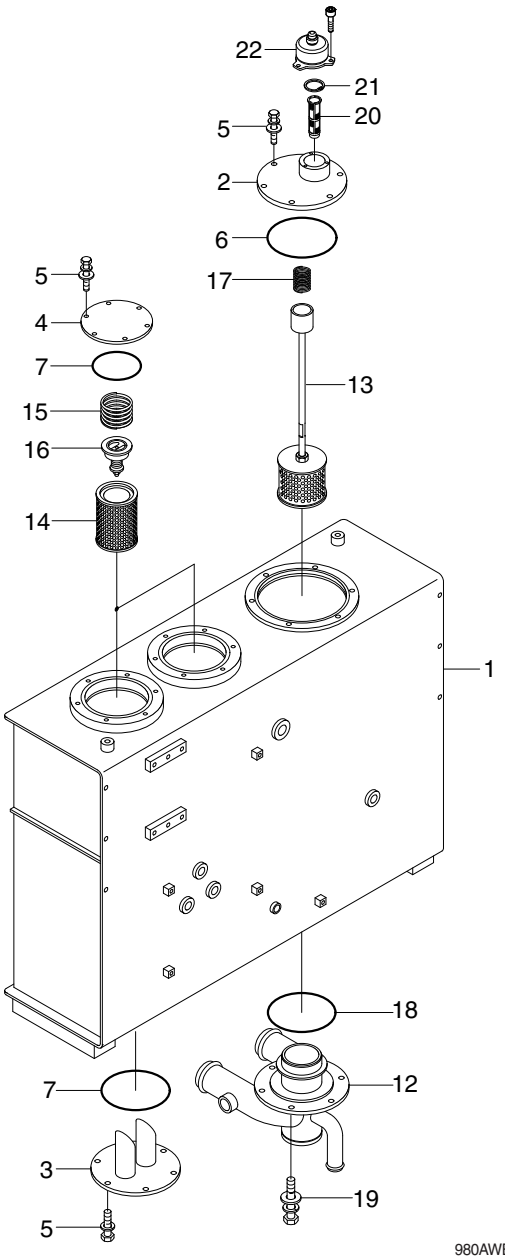
9806WE18

1	Tube assembly	11	O-ring	21	Set screw
2	Rod assembly	12	Back up ring	22	Bolt
3	Gland	13	O-ring	23	Band assembly
4	Dust wiper	14	Piston	24	Pipe assembly
5	Snap ring	15	Piston seal	25	Pipe assembly
6	Rod seal	16	Wear ring	26	Bolt
7	Back up ring	17	Dust ring	27	O-ring
8	Buffer ring	18	O-ring	28	Pin bushing
9	Bushing	19	Back up ring	29	Pin bushing
10	Snap ring	20	Steel ball	30	Dust seal

9. HYDRAULIC OIL TANK

1) STRUCTURE

- The oil from the hydraulic tank is sent from the pump through main control valve to the cylinders. In the return circuit, the oil from various parts merges.
- A part of oil is cooled in the oil cooler, passes through the hydraulic filter and returns to the hydraulic tank (1).
- If the hydraulic return oil filter becomes clogged, return filter bypass valve (16) acts to allow the oil to return directly to the hydraulic tank (1). This prevents damage to the hydraulic filter (14). The bypass valve (16) is also actuated when negative pressure is generated in the circuit.



980AWE22

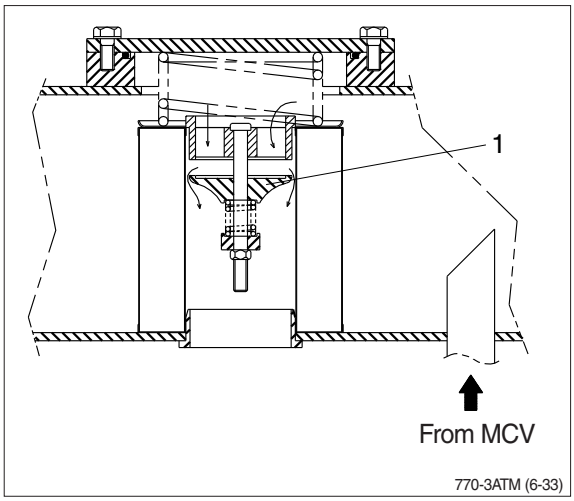
1 Hydraulic tank wa
2 Cover
3 Cover
4 Cover
5 Bolt
6 O-ring
7 O-ring
8 Bolt
12 Suction pipe
13 Strainer
14 Return filter
15 Spring
16 Bypass valve
17 Spring
18 O-ring
19 Bolt
20 Strainer
21 Retaining ring
22 Air breather

2) RETURN OIL FILTER BYPASS VALVE

(1) When the filter is clogged

Bypass valve (1) is opened and the oil returns directly to the tank without passing through the filter.

· Bypass valve set pressure : 1.36 kg/cm^2 (19.3 psi)



3) AIR BREATHER

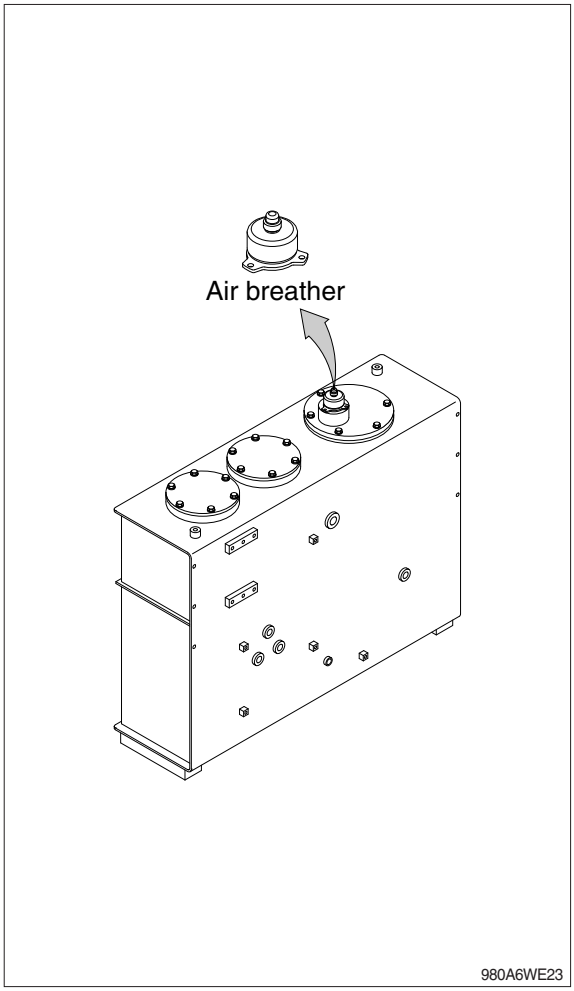
The air breather is equipped with the capacity to perform three functions simultaneously-as an air filter, breathing valve, and as a lubrication opening.

(1) Preventing negative pressure inside the tank

The tank is a pressurized sealed type, so negative pressure is formed inside the hydraulic tank when the oil level drops during operations. When this happens, the difference in pressure between the tank and the outside atmospheric pressure opens the poppet in the breather, and air from the outside is let into the tank or prevent negative pressure.

(2) Preventing excessive pressure inside the tank

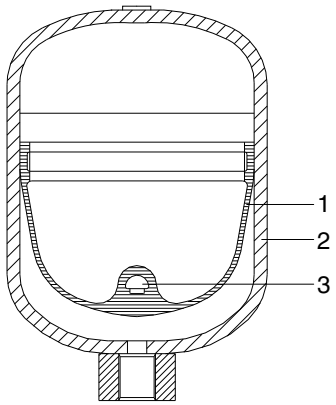
When the hydraulic cylinder is being used, the oil level in the hydraulic system increases and as temperature rises. If the hydraulic pressure rises above the set pressure, breather is actuated to release the hydraulic pressure inside the tank.



10. ACCUMULATOR

The accumulator is installed at the safety valve. When the boom is left the raised position, and the control levers are operated with the engine stopped the pressure of the compressed nitrogen gas inside the accumulator sends pilot pressure to the control valve to actuate it and allow the boom and bucket to come down under their own weight.

Type of gas	Nitrogen gas (N_2)
Volume of gas	0.75 ℓ (0.2 U.S.gal)
Charging pressure of gas	16 kg/cm^2 (228 psi)
Max actuating pressure	128 kg/m^2 (1820 psi)



1 Diaphragm
2 Steel pressure vessel
3 Closure button

7803AWE56

11. RIDE CONTROL SYSTEM (option)

1) ACCUMULATORS

(1) Pre-charging

Use an inert gas such as nitrogen for pre-charging accumulator.

※ **Do not use oxygen or shop air.**

※ **Nitrogen source and all components must be rated for a pressure at least as high as the nitrogen source.**

Accumulator having gas valve as per figure 1.

① Remove gas valve guard and gas valve cap.

② Back gas chuck "T" handle (A) all the way out (counter clockwise) before attaching charging & gauging kit to accumulator gas valve.

③ Close bleed valve (B).

④ Making sure not to loop or twist the hose, attach swivel nut (C) to gas valve and tighten 11.5~17 kgf·cm (10~15 lbf·ft).

⑤ Turn gas chuck "T" handle (A) until the gauge starts showing the pressure in the accumulator. Do not turn the "T" handle all the way down, as it will damage the valve core.

⑥ Crack open nitrogen bottle valve (D) and **slowly** fill accumulator. Shut off when gauge indicates desired pre-charge.

⑦ Let the pre-charge set for 10 to 15 minutes. This will allow the gas temperature to stabilize. If the desired pre-charge is exceeded, close nitrogen bottle valve (D), then slowly open bleed valve (B). Do not reduce pre-charge by depressing valve core with a foreign object. High pressure may rupture rubber valve seat.

⑧ When finished pre-charging accumulator, turn "T" handle (A) all the way out on gas chuck, then open bleed valve (B).

⑨ Hold gas valve to keep from turning, loosen swivel nut (C), remove assembly. Check for pre -charge leak using a common leak reactant.

⑩ Replace gas valve cap 11.5~17 kgf·cm (10~15 lbf·ft) and valve guard. (Gas valve cap serves as a secondary seal.)

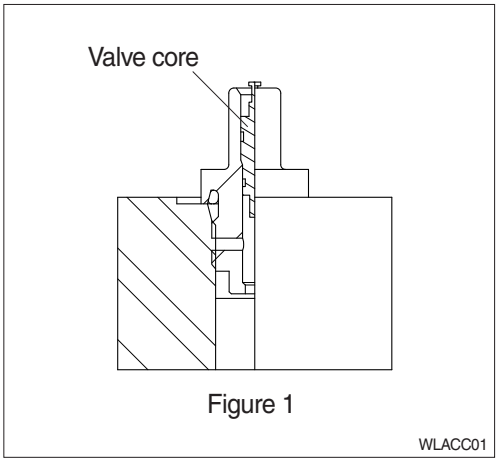
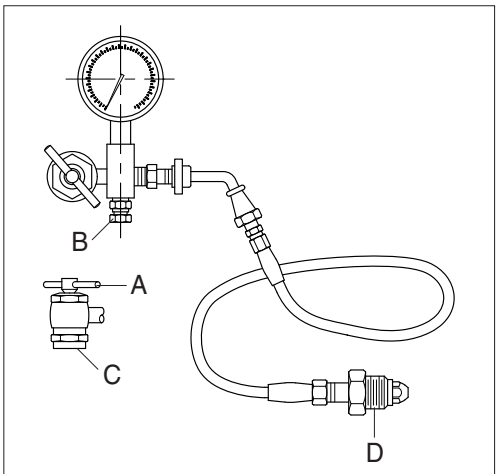


Figure 1

WLACC01



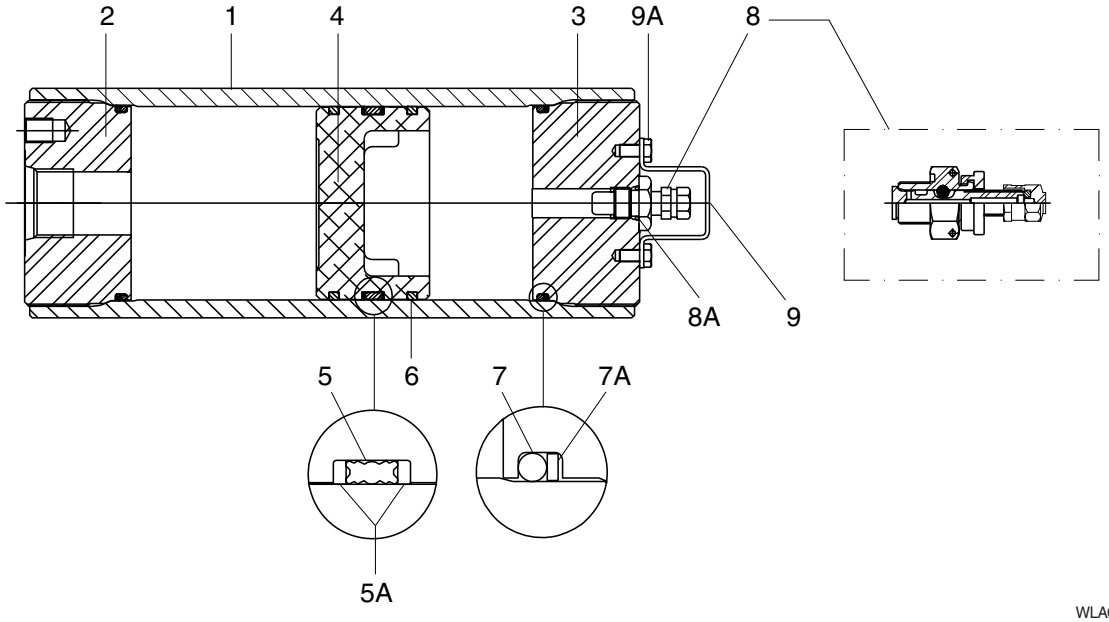
Charging and gauging kit (31LM-90100)

WLACC02

(2) Pre-charge checking procedure

Using appropriate valve in the hydraulic system, discharge all oil from accumulator and allow piston to bottom against hydraulic end cap.

(3) Structure



WLACC03

1	Body	5A	V-O-ring back-up washers	8A	Gas valve O-ring
2	Hydraulic cap	6	Piston ring (piston)	9	Gas valve guard
3	Gas cap	7	O-ring	9A	Screw
4	Piston	7A	O-ring back-up washer		
5	V-O-ring	8	Gas valve		

2) REMOVE FROM HYDRAULIC SYSTEM

⚠ Attention

1) Before carrying out any maintenance work the accumulators must be unloaded (zero pressure).

2) For this, loosen the nut (4) and bolt (B) counterclockwise with 10 mm spanner.

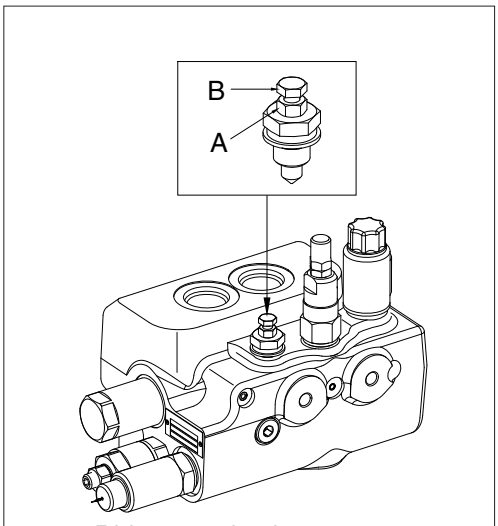
※ The accumulator will be unloaded (zero pressure) in less than a minute.

3) The lifting system must firstly be secured against lowering.

4) After carrying out maintenance work, screw the bolt (B) and nut (A).

· Tightening torque

A : 2.04 kgf · m (14.8 lbf · ft)



Ride control valve

7609A6WE28

GROUP 2 OPERATIONAL CHECKS AND TROUBLESHOOTING

1. OPERATIONAL CHECKS

This procedure is designed so the mechanic can make a quick check of the system using a minimum amount of diagnostic equipment. If you need additional information, read structure and function, Group 1.
A location will be required which is level and has adequate space to complete the checks.

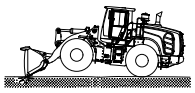
The engine and all other major components must be at operating temperature for some checks.

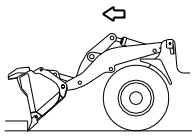
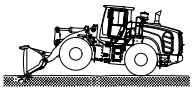
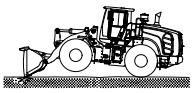
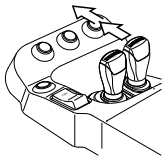
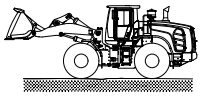
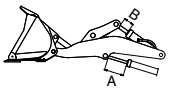
Locate system check in the left column and read completely, following the sequence from left to right. Read each check completely before performing.

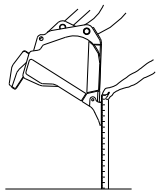
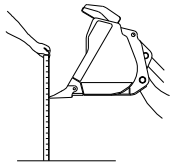
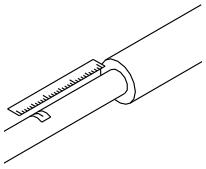
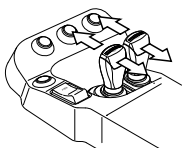
At the end of each check, if no problem is found (OK), that check is complete or an additional check is needed. If problem is indicated (NOT OK), you will be given repair required and group location.
If verification is needed, you will be given next best source of information:

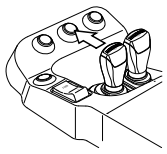
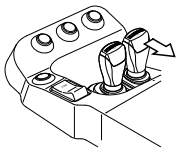
- Chapter 2 : Troubleshooting
- Group 3 : Tests and adjustments

※Hydraulic oil must be at operating temperature for these checks (refer to page 6-40).

Item		Description	Service action
Hydraulic system warm-up procedure Run engine at high idle.		Hold a hydraulic function over relief to heat oil. (don't keep relief condition over 5 seconds at a time) Periodically cycle all hydraulic functions to distribute warm oil. Repeat procedure until oil is at operating temperature. **FEEL** : Hydraulic reservoir must be uncomfortable to hold your hand against. (approximately 40 ~50˚C)	**OK** Check completed.
Hydraulic pump performance check Heat hydraulic oil to operating temperature. Run engine at high idle.		With bucket flat on ground, actuate boom raise. Time how long it takes to raise boom to full height. **LOOK** : Boom must raise to full height in less than 7 seconds.	**OK** Check completed. **NOT OK** Go to priority valve (in flow amplifier) high pressure check at page 5-31. **IF OK** Do steering system leakage check at page 5-30. **IF OK** Do main hydraulic pump flow test at page 6-41.
Control valve lift check Run machine at low idle.		With bucket partially dumped, lower boom to raise front of machine. Slowly move boom control lever (RCV lever) to boom lower position. Slowly move bucket control lever to bucket dump position. **LOOK** : Boom must not raise before moving down. Bucket must not rollback before dumping.	**OK** Check complete. **NOT OK** Repair lift checks in loader control valve.

Item	Description	Service action
Bucket rollback circuit relief valve check	 Position bucket at a 45˚ angle against an immovable object. Engage transmission in 3rd speed forward. **LOOK** : Bucket angle must not change.	**OK** Check complete. **NOT OK** Replace boom lower check valve.
Bucket dump circuit relief valve low pressure check	 Raise front of machine which bucket at 45˚ angle. Backdrag with bucket while observing bucket angle. **LOOK** : Bucket must not rollback	**OK** Go to next check. **NOT OK** Do loader system and circuit relief valve test at page 6-42.
Pilot control valve float check Run engine at low idle.	 With the bucket partially dumped, lower boom to raise front of machine. Push control lever to the float detent position and release lever.  **LOOK** : Front of machine lower to the ground and valve must remain in float position when lever is released.	**OK** Check complete. **NOT OK** Do pilot control valve pressure test in group 3.
Boom cylinder and bucket cylinder drift check Heat hydraulic oil to operating temperature.	 Set the boom and bucket horizontal, then stop the engine. Stop the engine, wait for 5 minutes, then start measuring. Measure the amount the lift and dump cylinder rods retract during 15 minutes. (unloaded bucket)  A : Retraction of boom cylinder rod B : Retraction of bucket cylinder rod Boom cylinder must drift less than 30 mm Bucket cylinder must drift less than 20 mm	**OK** Check complete. **NOT OK** Go to next check.

Item	Description	Service action
Boom cylinder leakage check Heat hydraulic oil to operating temperature.	 Dump bucket until teeth or cutting edge is perpendicular to the ground. Raise boom until cutting edge is about 1 m (3 ft) above ground. Stop engine. Measure drift from tooth or cutting edge to ground for 1 minute. Wait 10 minutes. Measure drift from tooth or cutting edge to ground for 1 minute. **LOOK** : Compare the drift rate between the first measurement and the second measurement.	**OK** Drift is approximately the same between first and second measurement. Repair loader control valve or circuit relief valve. **NOT OK** If drift is considerably less on second measurement, repair cylinder.
Bucket cylinder leakage check Heat hydraulic oil to operating temperature.	 Raise bucket about 1 m (3 ft) off ground with bucket level. Stop engine. Place a support under boom. Measure drift from tooth or cutting edge to ground for 1 minute. Wait 10 minutes. Measure drift from tooth or cutting edge to ground for 1 minute. **LOOK** : Compare the drift rates between the first measurement and the second measurement.	**OK** Drift is approximately the same between first and second measurement. Repair loader control valve or circuit relief valve at page 6-59. **NOT OK** Drift is considerably less on second measurement. Repair cylinder.
Check valve of safety valve leakage check Heat hydraulic oil to operating temperature.	 Put bucket level and position about 1.2 m (4 ft) above ground. Place a piece of tape on cylinder rod at least 51 mm (2 in) from rod guide. Run engine at low idle in safety-release position. **LOOK** : Bucket must not drift up.	**OK** Check complete. **NOT OK** Check or replace safety valve.
Pilot control valve (RCV lever) check	 Stop engine. Turn key switch to OFF position. Move control lever to all positions and then release. **LOOK** : Lever must return to neutral when released from all positions.	**OK** Check completed. **NOT OK** Repair pilot control valve.

Item	Description		Service action
Bucket leveler (positioner) check Run engine at low idle.		Position bucket fully dumped just above ground level. Move control lever to bucket leveler detent position and release. **LOOK** : Bucket must rollback to the level position and control lever must return to neutral. If bucket is in a rolled back position when key is turned ON, control lever must be returned to neutral manually if placed in the bucket leveler detent position. After bucket is dumped once, bucket leveler will work normally.	**OK** Check complete. **NOT OK** Do bucket leveler checks.
Boom height kickout check Run engine at low idle.		Position bucket flat on ground. Move control lever to boom raise detent position and release. **LOOK** : Boom must raise to the set height and stop. Control lever must return to neutral.	**OK** Check complete. **NOT OK** Do boom height kickout check.
Cycle time check Heat hydraulic oil to operating temperature. Run engine at high idle.	Function Boom raise Boom lower Bucket dump Bucket rollback Steering [No. of turns]	Operating condition. Bucket flat on ground to full height. Full height to level ground. Boom at full height. Boom at full height. Frame stop to frame stop.	Maximum cycle time 6.1 sec 4.3 sec 1.7 sec 2.2 sec 4.3 turns **OK** Check complete. **NOT OK** Go to slow hydraulic functions in group 2.

※MEASURING BOOM AND BUCKET CYCLE TIME

1) MEASUREMENT CONDITION

- Coolant temperature : Inside operating range
- Steering position : Neutral
- Hydraulic temperature : 40~50˚C
- Bucket : Unloaded
- Engine speed : High idling

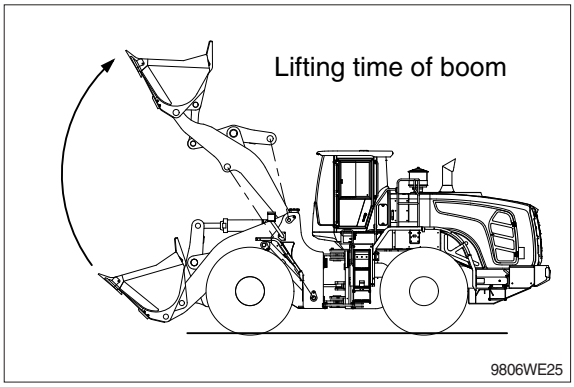
2) MEASURING TOOL

- Stop watch (1EA)

3) MEASURING PROCEDURE

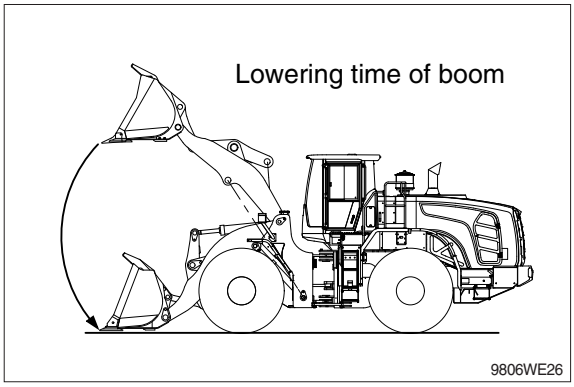
(1) LIFTING TIME OF BOOM

Set the bucket near the maximum tilt back position and at the lowest position on the ground. Raise the bucket and measure the time taken for bucket to reach the maximum height of the boom.



(2) LOWERING TIME OF BOOM

Set the bucket horizontal with the boom at the maximum height, lower the bucket and measure the taken for the bucket to reach the lowest position on the ground.

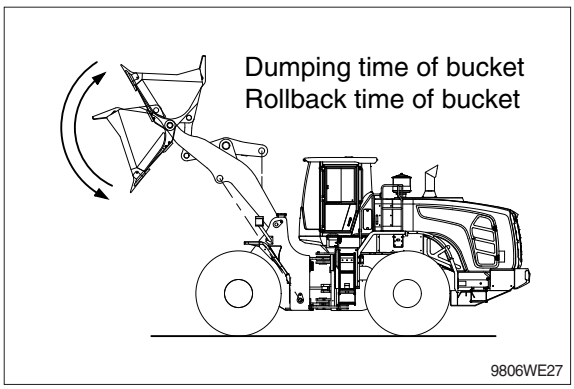


(3) DUMPING TIME OF BUCKET

Raise the boom to the maximum height and measure the time taken for the bucket to move from the maximum tilt back position to the maximum dump position

(4) ROLL BACK TIME OF BUCKET

Raise the boom to the maximum height and measure the time taken for the bucket to reach the maximum tilt back position.



2. TROUBLESHOOTING

※ Diagnose malfunction charts are arranged from most probable and simplest to verify, to least likely, more difficult to verify. Remember the following steps when troubleshooting a problem :

Step 1. Operational check out procedure (see section 1)
Step 2. Operational checks (see group 2)
Step 3. Troubleshooting
Step 4. Tests and adjustments (see group 3)

Problem	Cause	Remedy
Noisy hydraulic pump	Low oil supply or wrong viscosity.	Fill reservoir with recommended oil.
	Plugged or pinched suction line.	Clean or replace line.
	Air in oil.	Check for foamy oil. Tighten connections. Replace O-rings and or lines.
	Plugged suction strainer.	Inspect and clean strainer in reservoir.
	Loose or missing hydraulic line clamps.	Tighten or replace clamps.
	Hydraulic lines in contract with frame.	Inspect and repair.
	Worn or damaged pump.	Do hydraulic pump performance check in group 2. Do hydraulic pump flow test in group 3.
No or Slow hydraulic functions	Failed or worn hydraulic pump.	Do performance check.
	Cold oil.	Warm oil up.
	Slow engine speed.	Adjust engine speed. Check high idle speed.
	Suction line air leak.	Check for foamy oil.
	Low oil supply.	Add recommended oil.
	Wrong oil viscosity.	Use recommended oil.
	Oil leaking past cylinders or control valve.	Check cylinder drift in group 2.
	Blocked or damaged line.	Inspect lines.
	Faulty pilot control valve (RCV).	Do pilot control valve (RCV) pressure test in group 3.
	Binding loader control valve (MCV) spool.	Inspect valve.
	Faulty flow amplifier.	Check priority valve, orifice of flow amplifier specification.

Problem	Cause	Remedy
No steering or hydraulic function	Low oil level.	Add recommended oil.
	Failed hydraulic pump.	Remove and inspect return filter for metal pump particles.
No hydraulic functions steering normal	Failed hydraulic pump.	Remove and inspect return filter for metal pump particles, or replace the pump.
	Failed line filter.	Remove and inspect line filter for RCV.
	Faulty safety valve.	Safety valve leakage test or ON, OFF function test.
	Stuck open port relief valve.	Replace relief valve.
Boom float function does not work	Low pilot control pressure.	Do pressure reducing valve pressure test in group 3.
	Faulty pilot control valve (RCV).	Replace relief valve.
	Loader control valve (MCV) spool binding in bore.	Do pressure reducing valve pressure test in group 3.
One hydraulic function does not work.	Faulty pilot control valve (RCV).	Do pilot control valve pressure test. Inspect and repair valve.
	Stuck open port relief valve.	Replace relief valve.
	Oil leaking past cylinder packings.	Do boom and bucket cylinder leakage test in group 3.
	Blockage in oil lines or valve.	Inspect lines for damage. Disconnect and inspect lines for internal blockage.
	Loader control valve (MCV) spool stuck in bore.	Inspect and repair valve.
Low hydraulic power	Leakage within work circuit.	Do cylinder drift check in group 2.
	Low system relief valve (main relief valve) setting.	Do loader system and port relief valve pressure test in group 3.
	Low port relief valve setting.	Do loader system and port relief valve pressure test in group 3.
	Leaking system relief valve.	Remove and inspect valve.
	Worn hydraulic pump.	Do hydraulic pump performance check in group 2.
	Faulty pilot control valve (RCV).	Do pilot control valve pressure test in group 3.

Problem	Cause	Remedy
Function drifts down	Leaking cylinders.	Do cylinder leakage checks in group 3.
	Leaking seals in circuit relief valve (port relief valve) or valve stuck open.	Inspect seals. Replace relief valve.
	Leaking loader control valve (MCV).	Repair or replace valve section.
Boom drifts up	Leakage in boom down spool.	Remove and inspect boom down spool.
Boom down does not work (engine off)	Safety valve not operated.	Operate valve.
	Stuck pilot control valve.	Inspect.
	Faulty line filter.	Remove and inspect filter.
	Accumulation not operated.	Inspect.
	MCV spool stuck.	Inspect and repair valve.
Oil overheats	Low oil viscosity in hot weather.	Use recommended oil.
	Excessive load.	Reduce load.
	Holding hydraulic system over relief.	Reduce load.
	Leakage in work circuit.	Do boom and bucket cylinder leakage test in group 3.
	Plugged fins in oil cooler.	Inspect and clean oil cooler.
	Internally plugged oil cooler.	Do hydraulic oil cooler restriction test.
	Incorrect system or circuit relief valve setting.	Do loader system and circuit relief valve pressure test in group 3.
	Restriction in oil lines or loader control valve (MCV).	Inspect for dented or kinked lines.
	Malfunctioning steering valve.	Do hydraulic system restriction test in group 3.
	Leaking system main relief valve.	Do hydraulic system restriction test in group 3. Remove and inspect valve and seals.
	Worn hydraulic pump (internal leakage).	Do hydraulic pump performance check in group 2.
Function drops before raising when valve is activated	Stuck open lift check valve.	Do control valve lift check in group 2.

Problem	Cause	Remedy
Hydraulic oil foams	Low oil level.	Add recommended oil.
	Wrong oil.	Change to recommended oil.
	Water in oil.	Change oil.
	Loose or faulty suction lines (air leak in system).	Tighten or install new lines.
Remote control valve (RCV) leaking	Leaking plunger seals.	Remove, inspect and replace plunger seals.

※ Followings are general precautions for the hydraulic system and equipment.

1) Every structure has its limit of strength and durability. The relief valve is installed to limit the pressure on the hydraulic equipment and protect various parts of the wheel loader from possible damage. Therefore, never change the preset pressure of the relief valve unless absolutely necessary.

2) Since the hydraulic equipment is built with precision, the presence of only the slightest amount of dust and / or other particles in the hydraulic circuit might cause wear and/or damage, resulting in unstable functions and/or damage, resulting in unstable functions and/or unexpected accidents. Therefore, always keep hydraulic oil clean. Periodically, check the filter in the return circuit and replace the element as necessary.

3) Extract about 200cc of hydraulic oil from the tank as a sample every 6 months. If possible, have it analyzed by a specialist to confirm that the oil can still be used. Never extract the oil for sampling until the oil temperature has become the normal operating temperature. Since the replacement period varies depending on operating conditions, refer to **Operator's Manual** and change oil.

4) Should the equipment get damaged due to the presence of metal particles and/or foreign matter in the circuit drain out the hydraulic oil and carry out flushing. Also, replace the filter element and clean the hydraulic tank. Change the hydraulic oil entirely.

5) When checking the filter, if found metal particles in the element, drain out the hydraulic oil entirely, flush the whole circuit, and then fill with new oil. The presence of metal particles may indicate internal damage to the equipment. In such a case, check carefully before flushing, and repair or replace as required.

6) To add and/or change the hydraulic oil, always use recommended oil. (Refer to the list of recommended oils and lubricants at page 1-20, **Recommended lubricants.**) Never mix oil of different makes of kinds.

7) To change the hydraulic oil, use a clean vessel and funnel for pouring it into the tank. Never use cloth because it might cause the presence of lint in the circuit.

8) When removing the hydraulic equipment, be sure to put plugs or caps on hoses, tube lines and ports. Also, enter mating marks for later identification.

9) Disassemble and/or assemble the hydraulic equipment only in a clean place free of dust. When disassembling, be careful about the interchangeability of parts, and clean the disassembled parts with pure and clean mineral cleansing oil. Clean the internal passages as well. After the parts have dried, wipe them off with a clean lint-free cloth.

10) When overhauling the hydraulic equipment replace all O-rings, backup rings, etc. with new ones. Assemble O-rings with grease or vaseline applied.

11) After installing the equipment, add more hydraulic oil to make up for that lost during disassembly.

12) Tighten joints correctly. Loose joints will cause the hydraulic oil to leak. If the oil leaks, the tank oil level drops and air gets sucked in, so the pump will break down. Also loose joints in suction lines will take air in and might cause abnormal noise, malfunction or damage to pumps.

1. HYDRAULIC OIL CLEAN UP PROCEDURE USING PORTABLE FILTER CADDY

※ Service equipment and tool
- · Portable filter caddy
- · Two 4000 mm × 1in 100R1 Hoses
- · Quick disconnect fittings.
- · Discharge wand
- · Various size fittings.

※ Brake system uses oil from hydraulic oil tank. Flush all lines in the brake, pilot, steering system and cut off system. Disassemble and clean major components for brake and steering system. Remove and clean pilot caps from main control valve.
Brake and steering components may fail if brake and steering system is not cleaned after hydraulic oil tank contamination.

1) If hydraulic system is contaminated due to a major component failure, remove and disassemble steering cylinders to clean debris from cylinders.

2) Install a new return filter element. Inspect filter housing before installing new element.

※ For a failure that creates a lot of debris, remove access cover from hydraulic oil tank. Drain and clean hydraulic oil tank of fill the specified oil to hydraulic oil tank through upper cover.

3) To minimize oil loss, pull a vacuum in hydraulic oil tank using a vacuum pump. Connect filter caddy suction line to drain port at bottom of hydraulic oil tank using connector. Check to be sure debris has not closed drain port.

4) Put filter caddy discharge line into hydraulic oil tank filler hole so end is as far away from drain port as possible to obtain a thorough cleaning of oil.

5) Start the filter caddy. Check to be sure oil is flowing through the filters.
   Operate filter caddy approximately 10 minutes so oil in hydraulic oil tank is circulated through filter a minimum of four times.

※ Hydraulic oil tank capacity : 200 ℓ (52.8 U.S. gal)
   Leave filter caddy operation for the next steps.

6) Start the engine and run it at high idle.

※ For the most effective results, cleaning procedure must start with the smallest capacity circuit then proceed to the next largest capacity circuit.

7) Operate all functions, one at a time, through a complete cycle in the following order: Clam, steering, bucket, and boom. Also include all auxiliary hydraulic functions. Repeat procedure until the total system capacity has circulated through filter caddy seven times, approximately 30 minutes.
   Each function must go through a minimum of three complete cycles for a through cleaning for oil.

※ Filtering time for machines with auxiliary hydraulic functions must be increased because system capacity is larger.

8) Stop the engine. Remove the filter caddy.

9) Install a new return filter element.

10) Check oil level in reservoir; Add oil if necessary.

2. BOOM HEIGHT KICKOUT ADJUSTMENT

The bucket can be adjusted to a height desired by using the boom kick-out device.

⚠ **Park the machine on level ground and block the tires to prevent sudden movement of the machine.**

⚠ **Press the parking brake switch.**

⚠ **Fix the front and rear frames by using the safety lock bar.**

⚠ **Do not work underneath the work equipment.**

1) ADJUSTMENT OF THE BOOM KICKOUT AND BUCKET LEVELER

(1) Lift kickout position

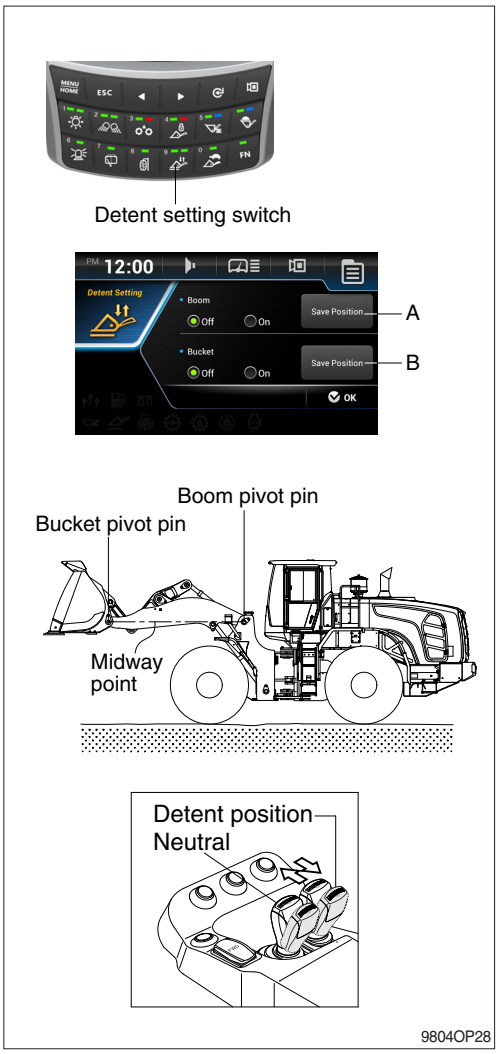
To set the lift kickout, raise the bucket to the desired position above the midway point. Then push icon (Save Position , A) for 2~3 seconds. The boom will return to the programmed position when the raise detent is activated and the boom is below the kickout position.

(2) Lower kickout position

To set the lower kickout, lower the bucket to the desired position below the midway point. Then push icon (Save Position , A) for 2~3 seconds. The boom will return to the programmed position when the float detent is activated and the boom is at least a foot above the kickout position.

(3) Bucket leveler position

To set the bucket leveler, roll back the bucket to the desired position. Then push icon (Save Position , B) for 2~3 seconds. The bucket will return to the programmed position when the roll back detent is activated and the bucket is below the leveler position.



3. TEST TOOLS

1) CLAMP-ON ELECTRONIC TACHOMETER INSTALLATION

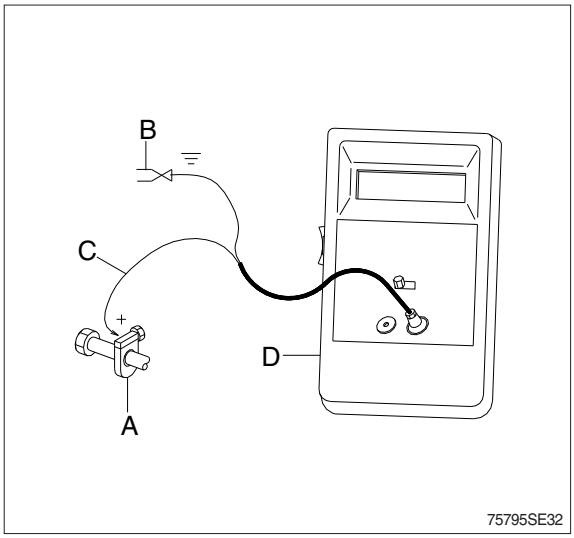
· Service equipment and tools
Tachometer

A : Clamp on tachometer.
Remove paint using emery cloth and connect to a straight section of injection line within 100 mm (4 in) of pump. Finger Tighten only-do not over tighten.

B : Black clip (-). Connect to main frame.

C : Red clip (+). Connect to transducer.

D : Tachometer readout. Install cable.



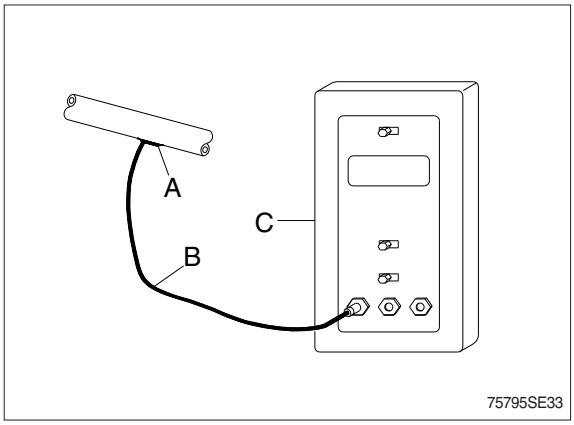
2) DIGITAL THERMOMETER INSTALLATION

· Service equipment and tools
Digital thermometer

A : Temperature probe.
Fasten to a bare metal line using a tie band. Wrap with shop towel.

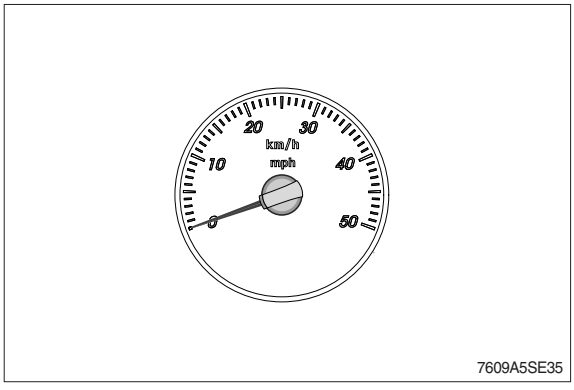
B : Cable.

C : Digital thermometer.



3) DISPLAY MONITOR TACHOMETER

The display monitor tachometer is accurate enough for test work.



4. HYDRAULIC OIL WARM UP PROCEDURE

1) Install temperature reader (see temperature reader installation procedure in this group).
2) Run engine at high idle.
3) Hold a hydraulic function over relief to heat the oil.
4) Periodically cycle all hydraulic functions to distribute warm oil.
5) Heat oil to test specification (approx. 45˚C).

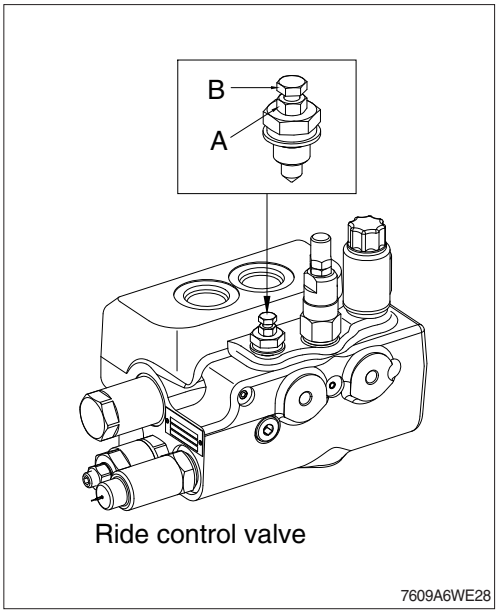
※ RIDE CONTROL SYSTEM (OPTION)

⚠ Attention

1) Before carrying out any maintenance work the accumulators must be unloaded (zero pressure).
2) For this, loosen the nut (4) and bolt (B) counterclockwise with 10 mm spanner.

※ The accumulator will be unloaded (zero pressure) in less than a minute.

3) The lifting system must firstly be secured against lowering.
4) After carrying out maintenance work, screw the bolt (B) and nut (A).
   · Tightening torque
   A : 2.04 kgf · m (14.8 lbf · ft)



Ride control valve
7609A6WE28

5. MAIN HYDRAULIC PUMP FLOW TEST

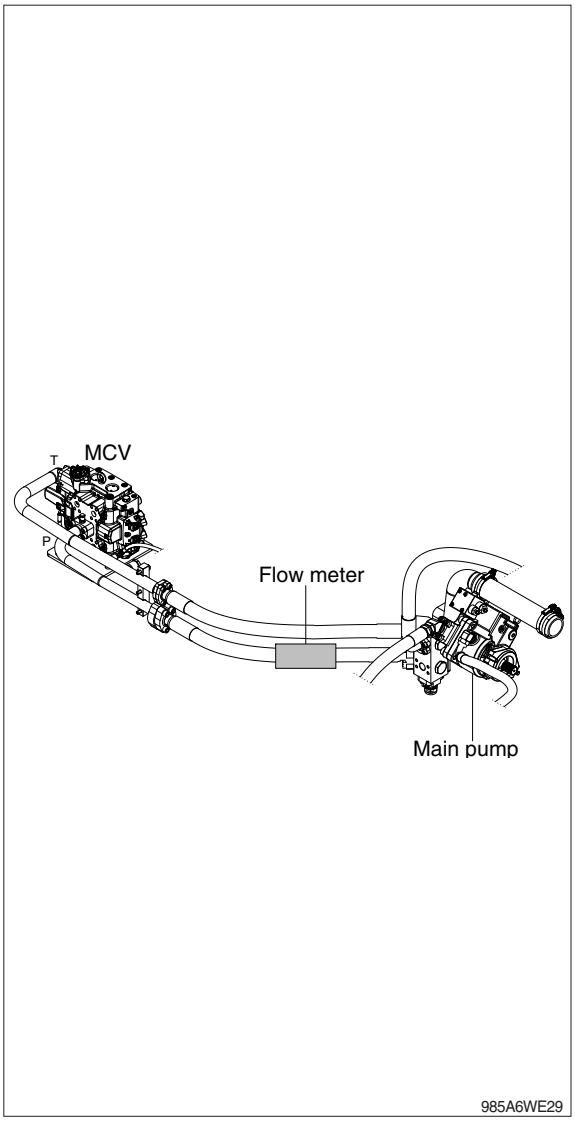
· **SPECIFICATION**

Oil temperature	45±5˚C (113±9˚F)
Engine speed	2100±25 rpm
Test pressure	315±5 bar
Maximum pump flow (steering+loader pump)	520 ℓ/min (137 gpm)

· **FLOW METER, GAUGE AND TOOL**

Gauge 0~35 MPa (0~350 bar, 0~5000 psi)
Temperature reader

1) Make test connections.
2) Install temperature reader. (see temperature reader installation procedure in this group)
3) Heat hydraulic oil to specifications. (see hydraulic oil warm up procedure in this group)
4) Run engine at test specifications.
5) Close flow meter loading valve to increase pressure to test specifications.
6) Read flow meter.
7) If flow is below specifications, check suction line and suction pressure for abnormality before removing pump.



6. LOADER SYSTEM AND PORT RELIEF VALVE PRESSURE TEST

· **SPECIFICATION**

Oil temperature (40~50˚C)

Relief valve	Engine speed	Relief pressure
System (M)	Low	315±5 kg/cm² (4570±70 psi)
Boom raise (U)	Low	365±10 kg/cm² (5290±140 psi)
Bucket rollback (R)	Low	365±10 kg/cm² (5290±140 psi)
Bucket dump (D)	Low	365±10 kg/cm² (5290±140 psi)

· Gauge and tool

Gauge 0~35 MPa (0~350 bar, 0~5000 psi)

M : System (main) relief valve

R : Bucket rollback relief

D : Bucket dump relief

U : Boom raise relief

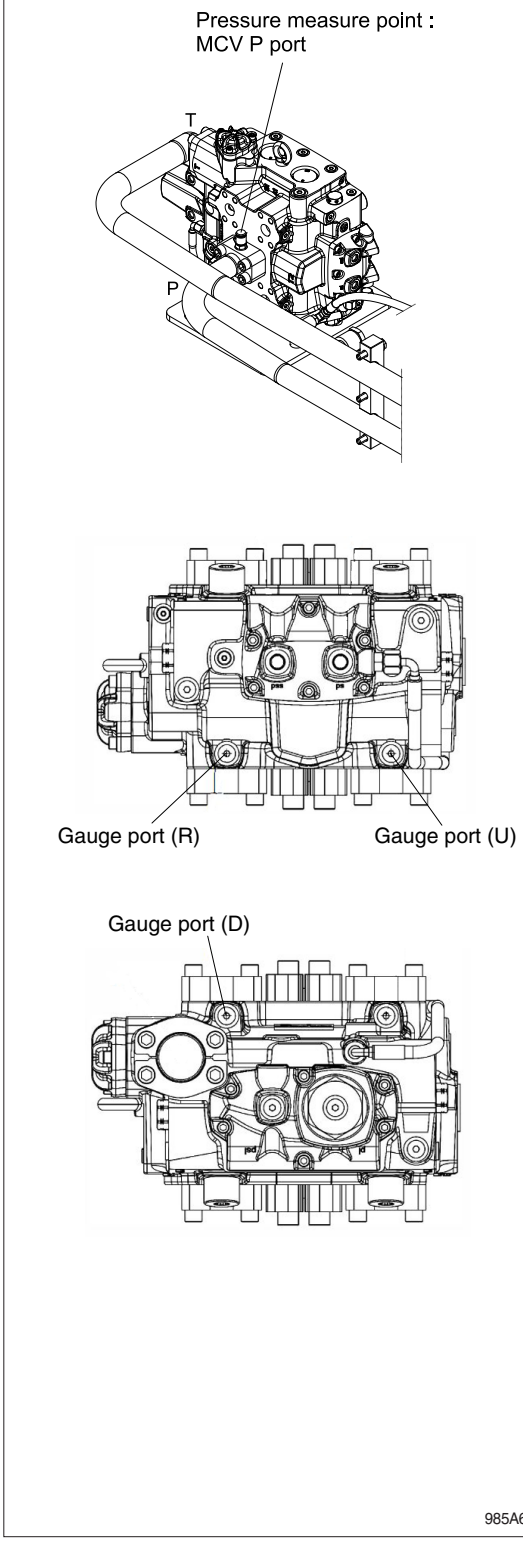
1) Install fitting and pressure gauge to test port in pump delivery line.

2) Install temperature reader.
(see temperature reader installation procedure in this group)

3) Heat hydraulic oil to specifications.
(see hydraulic oil warm up procedure in this group)

4) To check the system relief (M), run engine at low idle. Lower boom to bottomed position.
Slowly activate boom down function while watching pressure gauge. If pressure is not to specification, loosen lock nut on system relief valve (M) and adjust to specification.

※ Do not adjust the system relief valve above 315 kg/cm² (4570 psi). Damage to the pump will result from excessive pressure settings.



985A6WE30

7. LOADER CYLINDER DRIFT TEST

· **SPECIFICATION**

Oil temperature 45±5˚C(113±9˚F)
Boom horizontal
Bucket horizontal
Bucket unloaded

Item	Standard value
Retraction of boom cylinder rod	30 mm
Retraction of bucket cylinder rod	20 mm

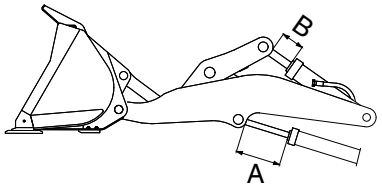
· **GAUGE AND TOOL**

Stop watch
Temperature reader

⚠ Put the safety lock lever in the lock position.

⚠ Do not go under the work equipment.

1) Set the boom and bucket horizontal, then stop the engine.
2) Stop the engine, wait for 5 minutes, then start measuring.
3) Measure the amount the boom and bucket cylinder rods retract during 15 minutes.



A : Retraction of boom cylinder rod
B : Retraction of bucket cylinder rod

7577AWE31

8. BOOM AND BUCKET CYLINDER LEAKAGE TEST

· **SPECIFICATION**

Oil temperature 45±5°C(113±9°F)
Engine speed Low idle
Maximum leakage 15 mℓ/min (1/2 oz/min)

· **GAUGE AND TOOL**

Temperature reader
Stop watch
Measuring container

1) Fasten temperature sensor to head end port of cylinder to be tested. Cover sensor with a shop towel.

2) Heat hydraulic oil to specifications (see hydraulic oil warm up procedure in this group).

⚠ **Never work under raised equipment unless it is supported with a hoist or support stands.**

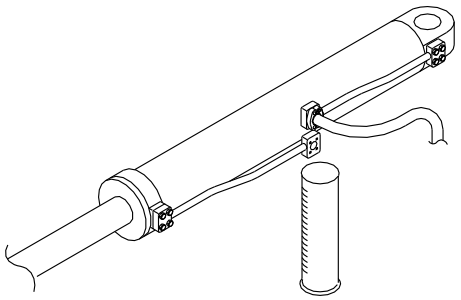
3) Full extend the cylinder to be tested. If testing the boom cylinders, restrain boom in the fully raised position using a hoist or a stand.

※ Check cylinders for leakage in the fully extended position only. In the retracted position contacts the end of the cylinder and seals off piston seal leakage.

4) Remove and plug cylinder rod end hose or line.

5) Run engine at slow idle. Activate control lever to extend cylinder for 1 minute over relief while measuring leakage for open port.

If leakage is within specification, excessive cylinder drift is caused by leakage in the loader control valve or circuit relief valve.



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9. PILOT CONTROL VALVE (EH CONTROL BLOCK) PRESSURE TEST

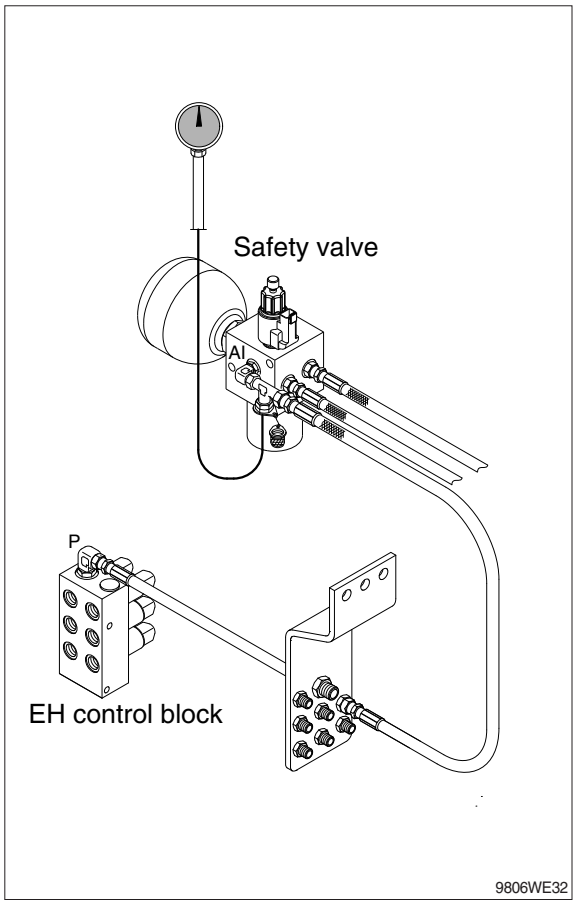
· **SPECIFICATION**

Oil temperature	45±5°C (113±9°F)
Engine speed	High idle
Maximum pressure	3.0 MPa (30 bar, 427 psi)

· **GAUGE AND TOOL**

Gauge 0~7 MPa (0~70 bar, 0~1000 psi)

1) Lower boom to ground.
2) Connect gauge to the pilot pressure port of function to be checked.
3) Install temperature reader (see temperature reader installation procedure in this group).
4) Heat hydraulic oil to specification (see hydraulic oil warm up procedure in this group).



10. CYCLE TIME TEST

· **SPECIFICATION**

Oil temperature —— 45±5˚C(113±9˚F)

Engine speed ——— High idle

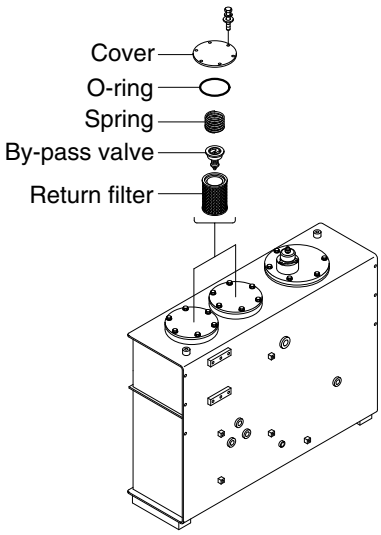
Function	Operating conditions	Maximum cycle time (seconds)
Boom raise	Bucket flat on ground to full height	6.1
Boom lower (float)	Full height to ground level	4.3
Bucket dump	Boom at full height	1.7
Bucket rollback	Boom at full height	2.2
Steering (number of turns)	Frame stop to stop	4.3 turns

11. HYDRAULIC OIL FILTER INSPECTION PROCEDURE

1) Lower the bucket to the ground, stop the engine, move the control lever back and forth several times, and clean all over the upper surface of the hydraulic oil tank.
2) Remove the bolts and take out the filter case cover and O-ring.
3) Remove the spring and bypass valve.
4) Remove the filter element from the tank.
5) Check the element and the filter case bottom for debris. Excessive amounts of brass and steel particles can indicate a failed hydraulic pump or a pump failure in process. A rubber type of material can indicated cylinder packing or other packing failure.

※ The hydraulic oil filter in the filter case of the hydraulic oil tank should be replaced every 250 operating hours or more often. When the filter element is replaced, please keep as follows.

(1) Clean the inside of the filter case.
(2) Place new element in the proper positions inside the filter case.
(3) Install the bypass valve and spring. Make sure the element stand upright, and check for complete contact of the element bottom with the filter case bottom.
(4) Install the O-ring and filter case covers. Tighten them with bolt. Replace the O-ring with new one if damaged.



980A6WE24

GROUP 4 DISASSEMBLY AND ASSEMBLY

1. MAIN PUMP

1) DISASSEMBLY

(1) Select an appropriate place to disassemble.

※ The place must be clean.

※ Spread a rubber sheet, cloth, etc. to prevent parts from being damaged.

(2) Remove dust, rust and so on from the surface of the pump with cleaning solvent.

(3) Remove the drain plug (467) and drain hydraulic oil out pump casing (271).

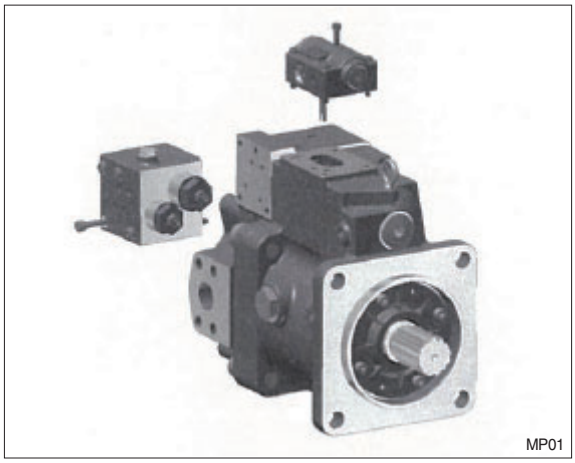
※ Drain off as much as possible.

(4) Remove hexagon socket head bolt (M6) and then remove the regulator from the pump.

※ When disassembling the regulator, refer to the regulator manual.

※ Be careful not to lose the O-rings from the sealing surface of the regulator.

※ Prevent dust from entering into the regulator.



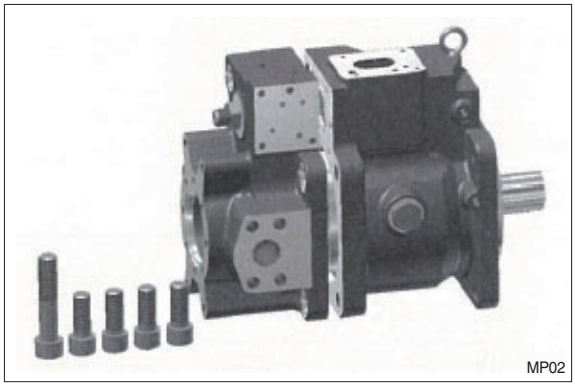
MP01

(5) Loosen hexagon socket head bolts (401, 402), holding valve cover (312) and the pump casing (271) together.

※ Remove the regulator before loosening the bolts.

※ If through drive kit is installed, remove sub-plate adapter (317) and coupling (116) beforehand.

※ Oil will come out from between the pump casing (271) and the valve cover (312). Be careful and remove oil to keep the area clean.



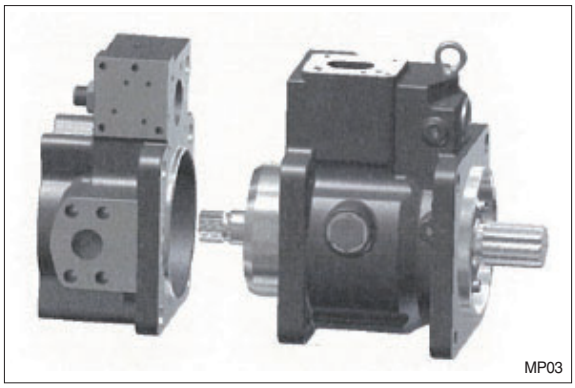
MP02

(6) Place the pump horizontally on workbench.
Separate pump casing (271) from valve cover (312).

※ Pull out valve cover perpendicular to the direction of the shaft. (In order to prevent damage of needle bearing and the contacting surface of the shaft.)

※ Be careful not to damage the contacting surfaces between the valve cover and the pump casing.

※ When removing valve cover, valve plate comes out attached to valve cover.
Valve plate may easily detach from the valve cover and fall down.
Be careful not to damage the valve plate.


MP03

(7) When necessary, remove needle bearing (124) and valve plate from valve cover (312).

※ Do not remove the needle bearing unless the bearing is considered to be near the end of its expected life.

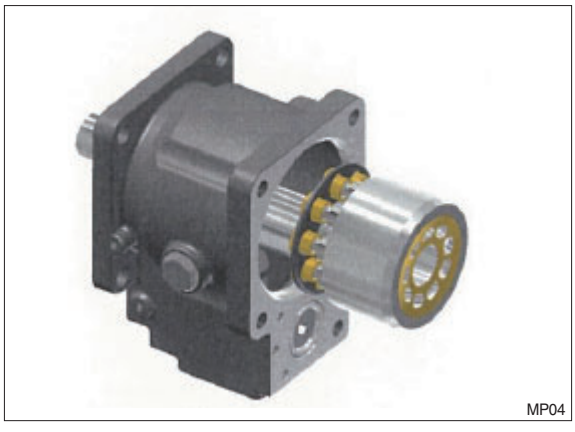
※ Do not loosen nut (808).

※ Delivery flow rate will change when nut is loosened.

(8) Pull cylinder out from pump casing straight over drive shaft.
Pull out piston-sub (011), set plate (153), spherical bushing (156), cylinder springs (157) at the same time.

※ Be careful not to damage sliding surfaced of cylinder, spherical bushing (156), piston-sub (011), and swash plate-sub (030).

※ Be careful not to damage surface of the shaft contacting needle bearing.

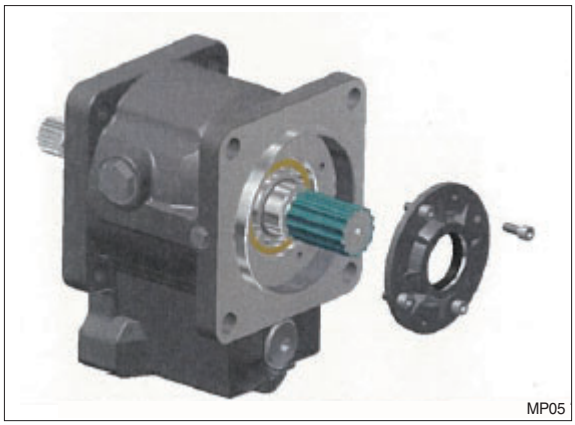

MP04

(9) Remove retaining ring (406) or hexagon socket head bolts (406). Remove seal cover (261).

※ To remove seal cover, insert two bolts into the female thread holes and pull.

※ Be careful not to damage oil seal (774) on seal cover (261).

※ In case of spline shaft, cover splines with plastic tape so as not to damage oil seal. In case of key shaft, remove key before seal cover is removed.


MP05

(10) Tap drive shaft (111) lightly on the end of valve cover side with a plastic hammer to extract drive shaft from pump casing.

※ Hold front side of shaft when tapping to prevent shaft from flying out.

※ Tap shaft horizontally (in accordance with shaft direction) not to damage front roller bearing.

※ Do not remove front roller bearing unless it is considered to be near the end of its expected life, because front roller bearing and shaft are fit tightly (shrinkage fit).


MP06

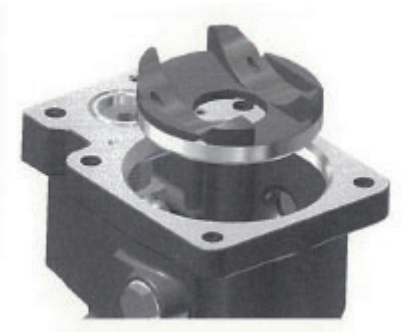
(11) Push down servo piston (532) to remove swash plate-sub (030) and shoe plate (211) from pump casing.

※ Be careful not to damage the shoe plate, and the sliding round surface of the swash plate.


MP07

(12) Remove swash plate support (251) from pump casing (271).

※ Use both hands to lift up swash plate support (251).



MP08

(13) Only when necessary, remove servo piston (532), tilting pin (530), outer/inner servo bias springs (535 and 536), spring seat (537), and plug (538).

※ When removing servo piston, use a special jig not to damage head part of tilting pin-sub.

※ Adhesive (Three bond No. 1305B) has been applied on the connecting part between tilting pin-sub and servo piston. Be careful not to damage servo piston.

※ Be careful not to pinch fingers in springs when removing tilting pin-sub form pump casing.

2) ASSEMBLY

(1) General precautions

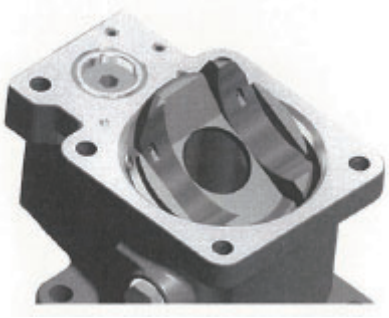
When assembling, the order of procedures is the reverse of disassembly.
Be careful with the next items.

① Before assembling, make sure that all parts are prepared and all damaged parts are fixed or replaced with new ones.
② Before assembling, wash each part with cleaning solvent and dry it with compressed air.
Select an appropriate clean place to assemble. When dust enters, it may cause trouble.
③ When assembling, apply clean working fluid on the sliding surfaces and bearings.
④ Do not reuse O-ring, oil seal, and other seal parts.
Replace with new ones.
⑤ When assembling parts that easily detach, like an O-ring, apply clean grease to prevent them from falling off.
⑥ Tighten bolts and plugs using a torque wrench with standard torque setting shown on each pump size drawing.

(2) Select an appropriate place to assemble.
※ The place must be clean.
※ Spread a rubber sheet, cloth, etc. to prevent part from being damaged.

(3) If servo piston, titling pin, servo bias springs, spring seat, and plug were removed, reinstall all parts before inserting swash plate support.
※ Be careful not to injure fingers when installing springs.
※ Use special jig not to damage head of tilting pin and feed-back pin.
Apply adhesive (Three bond NO.1305B) on thread of servo piston.

(4) Fit swash plate support (251) in pump casing (271).
※ Pin (884) has been installed on the inside surface of pump casing.
When installing the swash plate support, make sure that the pin enters into the slit of swash plate support (251).
※ Be careful not to install swash plate support crooked.
※ In case of K3VL200, fix the swash plate support by tightening hexagon socket head bolts (407) with a standard torque.

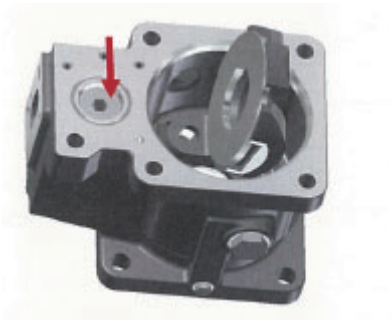


MP10

(5) Insert the swash plate-sub (030) into the tilting pin (530) of the servo piston (532), then install swash plate-sub, and shoe plate (211) in pump casing (271).

※ While pushing down on the servo piston, insert swash plate-sub into tilting pin and insert swash plate-sub into groove of swash plate support correctly.

※ It is easier to install swash plate and swash plate support if grease is applied to their sliding surfaces.

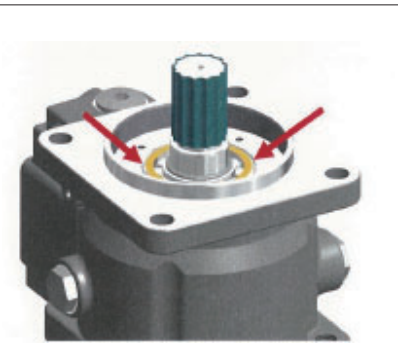


MP11

(6) Insert drive shaft (111) into pump casing (271) tapping shaft lightly so that height of surface of the pump casing and height of end of roller bearing are nearly the same.

※ When tapping shaft, keep the shaft vertical.
If tapped strongly, roller bearing may break.

※ Be careful not to push the top surface of roller bearing deeper than the surface of pump casing.
If the top surface is deeper than the surface of pump casing, there is a possibility for swash plate support to be detached.



MP12

(7) Tape the splined or keyed area of the shaft.
Insert seal cover (261) slightly into pump casing.

※ Tighten hexagon socket head bolts (406) uniformly to stopping position of the seal cover and then tighten bolts with a standard torque.
Use the hammer to lightly tap the seal cover to the position where the groove for locking ring can be seen and then install retaining ring (406).

※ Apply a little grease on lip of seal installed in seal cover.

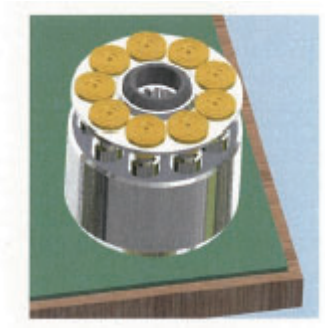
※ Be careful not to damage lip of oil seal.

※ Make sure to tighten the four hexagon socket head screws evenly.


MP13

(8) Assemble cylinder, piston-sub (011) spherical bushing (156), set plate (153), and cylinder springs (157) into the sub assembly.

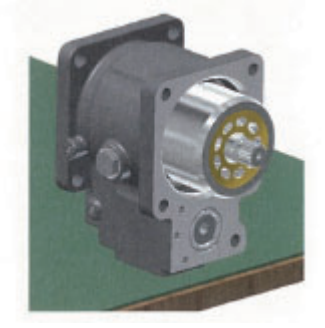
※ Be careful not to damage sliding surface between piston and cylinder bore, and between cylinder and valve plate.


MP14

(9) Place pump casing (271) horizontally, with surface of regulator downward.
Install piston-cylinder sub-assembly into pump casing.

※ Be careful not to drop parts for piston-cylinder sub-assembly such as cylinder spring and roller.

※ Be careful not to damage bearing-contacting surface of the shaft when installing a piston-cylinder sub-assembly.


MP15

(10) Install valve plate on valve cover (312).

※ In case that stopper (534), max flow set screw (954), and max flow set screw lock nut (808) have been removed, install these parts on valve cover (312) beforehand.

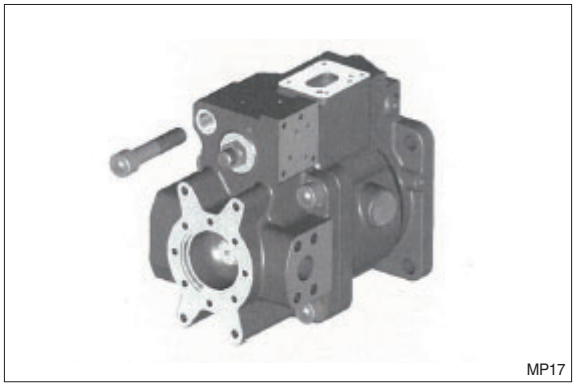
※ Do not mistake suction/delivery direction of valve plate.
When installing valve plate, make sure that pin (885) enters into the slit of valve plate.

※ It is easier to install valve cover (312) if grease is applied to contacting surfaces of valve cover and valve plate.


MP16

(11) Install valve cover (312) on pump casing (271).
Tighten hexagon socket head bolts (411 and 412).

※ While assembling valve cover, be careful not to damage shaft and contacting surface of needle bearing.


MP17

(12) Install regulators on the valve cover (312) or pump casing (271).
When installing torque limit regulator, make sure that feed back lever of regulator is engaged with feed back pin of tilting pin (530).

※ Make sure that O-rings on the sealing surface of regulator do not drop out.


MP18