

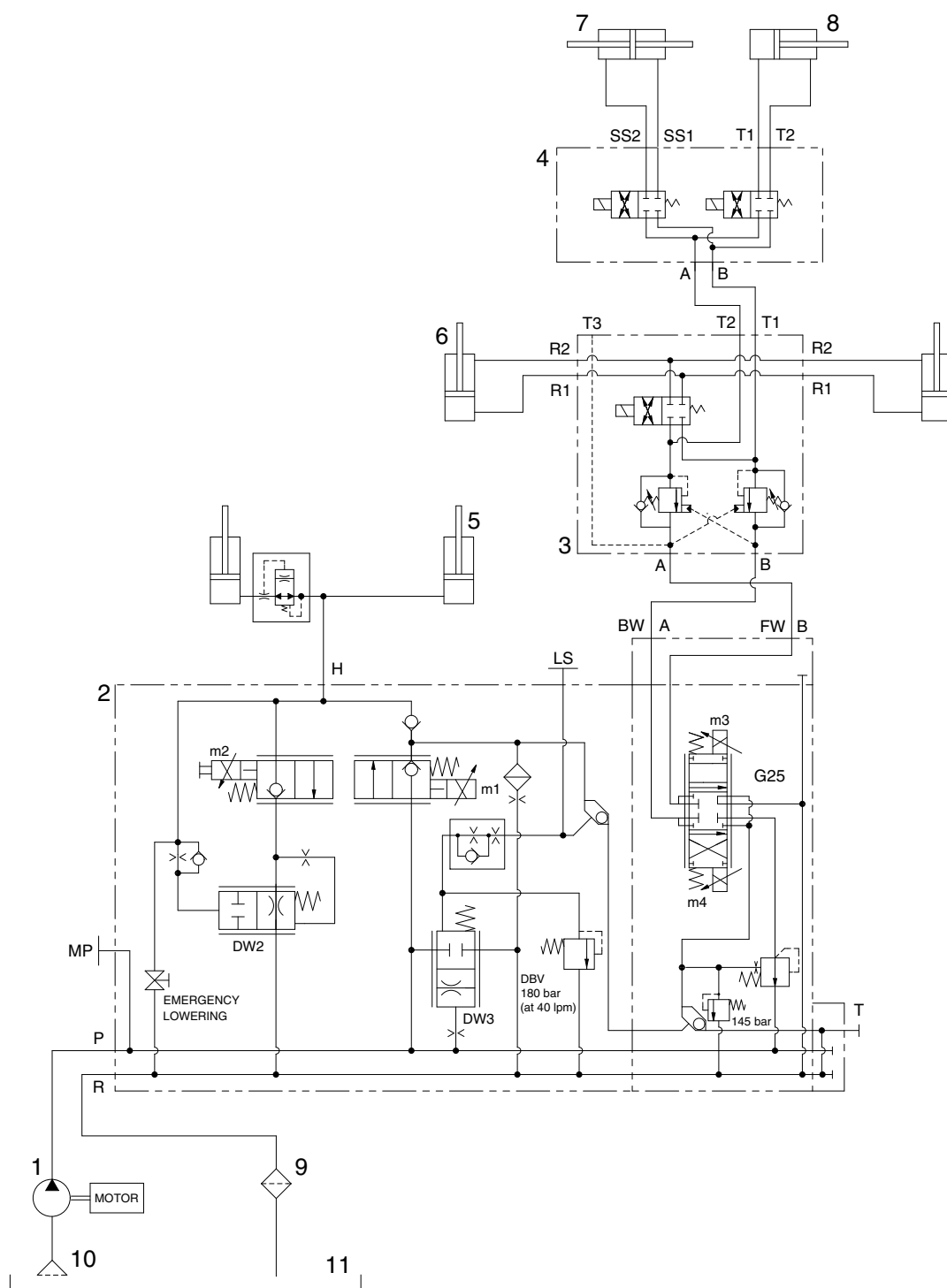
SECTION 6 HYDRAULIC SYSTEM

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SECTION 6 HYDRAULIC SYSTEM

GROUP 1 STRUCTURE AND FUNCTION

1. HYDRAULIC CIRCUIT

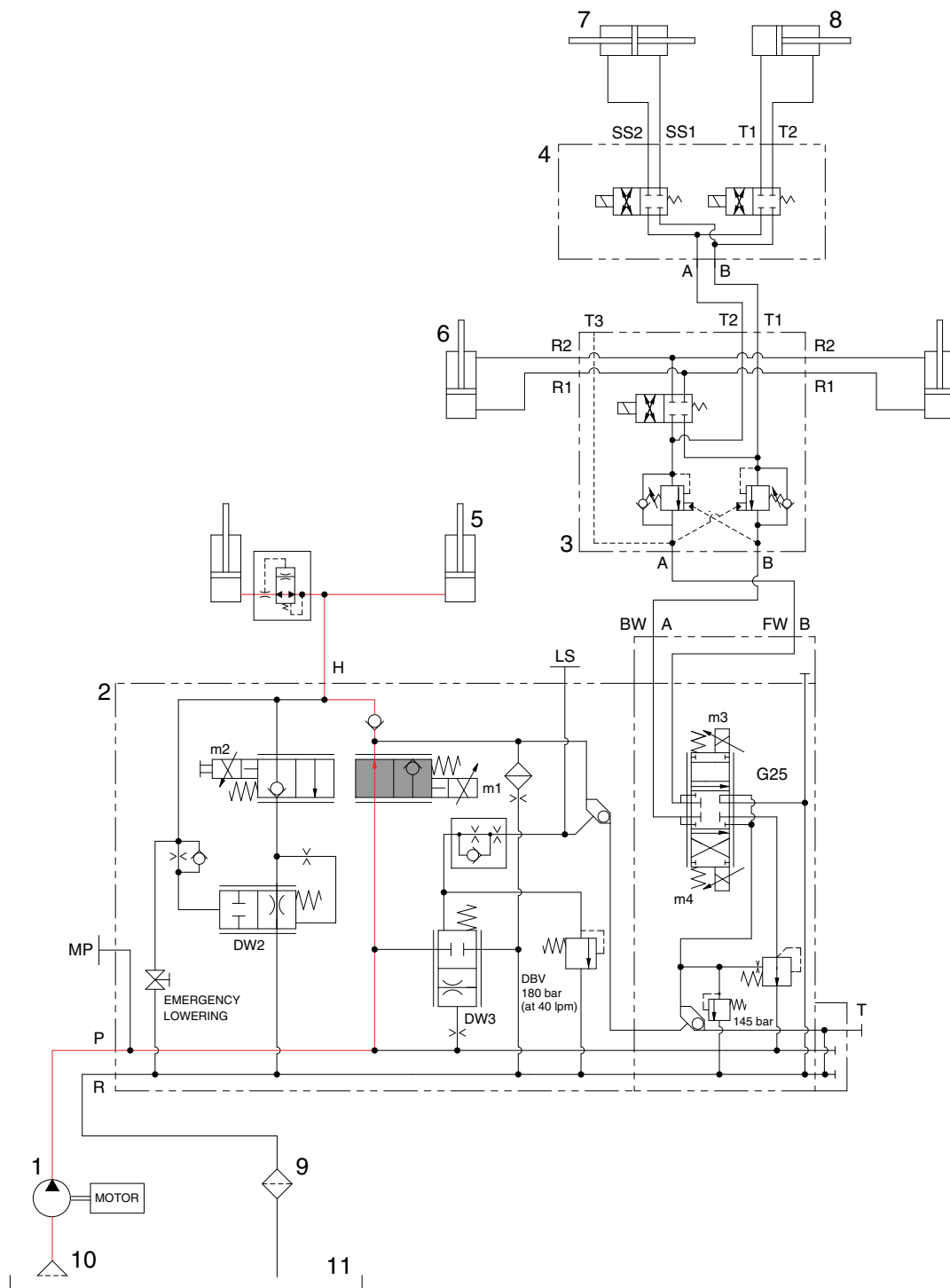


BRP7HS01

- | | | | | | |
|---|----------------------------|---|---------------------|----|--------------------|
| 1 | Hydraulic pump | 5 | Lift cylinder | 9 | Return filter |
| 2 | Main control valve | 6 | Reach cylinder | 10 | Strainer |
| 3 | Reach manifold | 7 | Side shift cylinder | 11 | Hydraulic oil tank |
| 4 | Tilt / side shift manifold | 8 | Tilt cylinder | | |

※ The circuit diagram may differ from the equipment, so please check before a repair.

1) WHEN THE JOYSTICK IS IN THE LIFT POSITION



BRP7HS02

When the joystick is pulled backward, the m1 valve in the lift block is moves to open position.

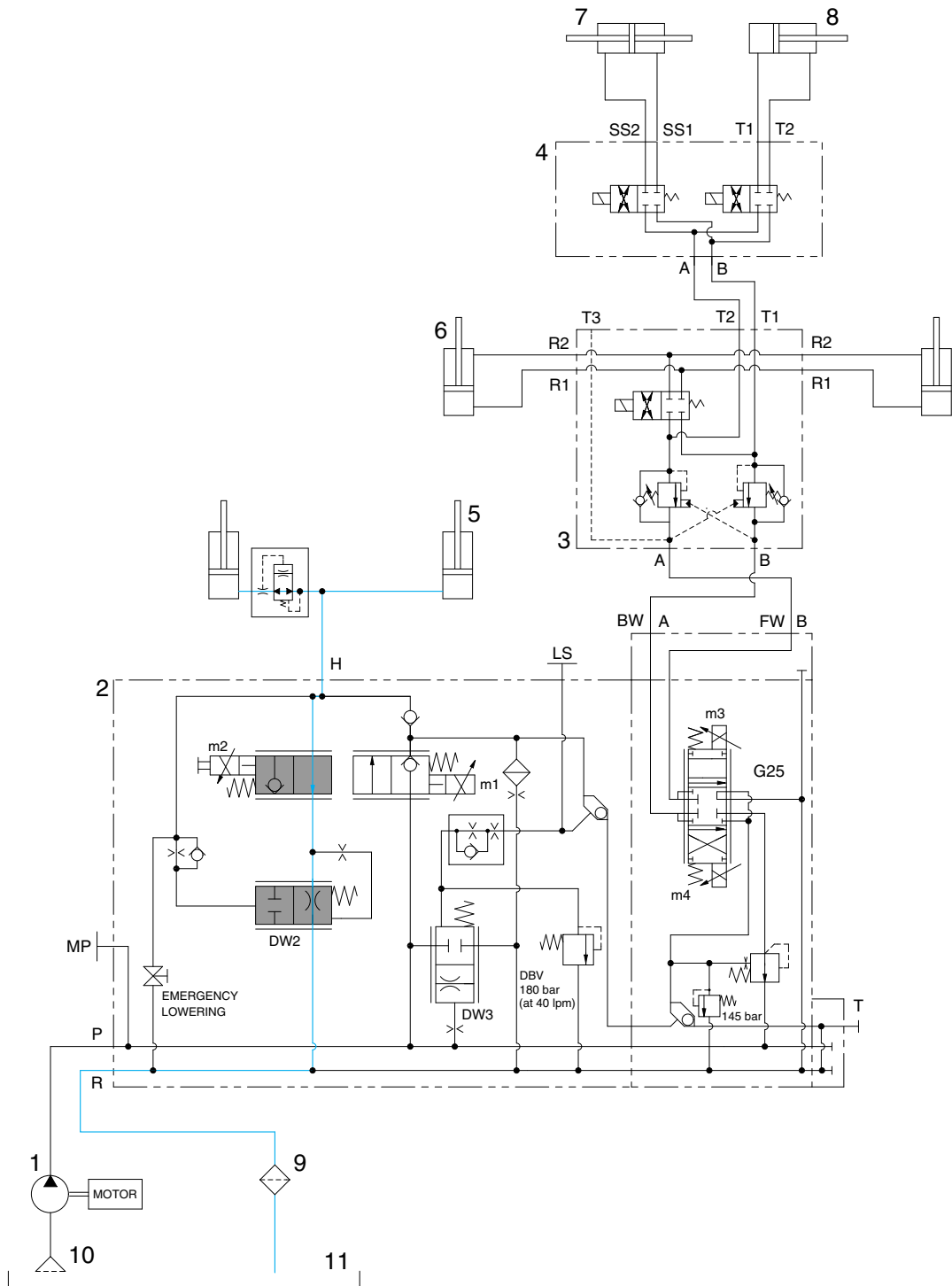
The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the large chamber of lift cylinder (5).

The air of the small chamber of lift cylinder (5) is compressed at the same time.

When this happens, the forks go up.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2) WHEN THE JOYSTICK IS IN THE LOWER POSITION

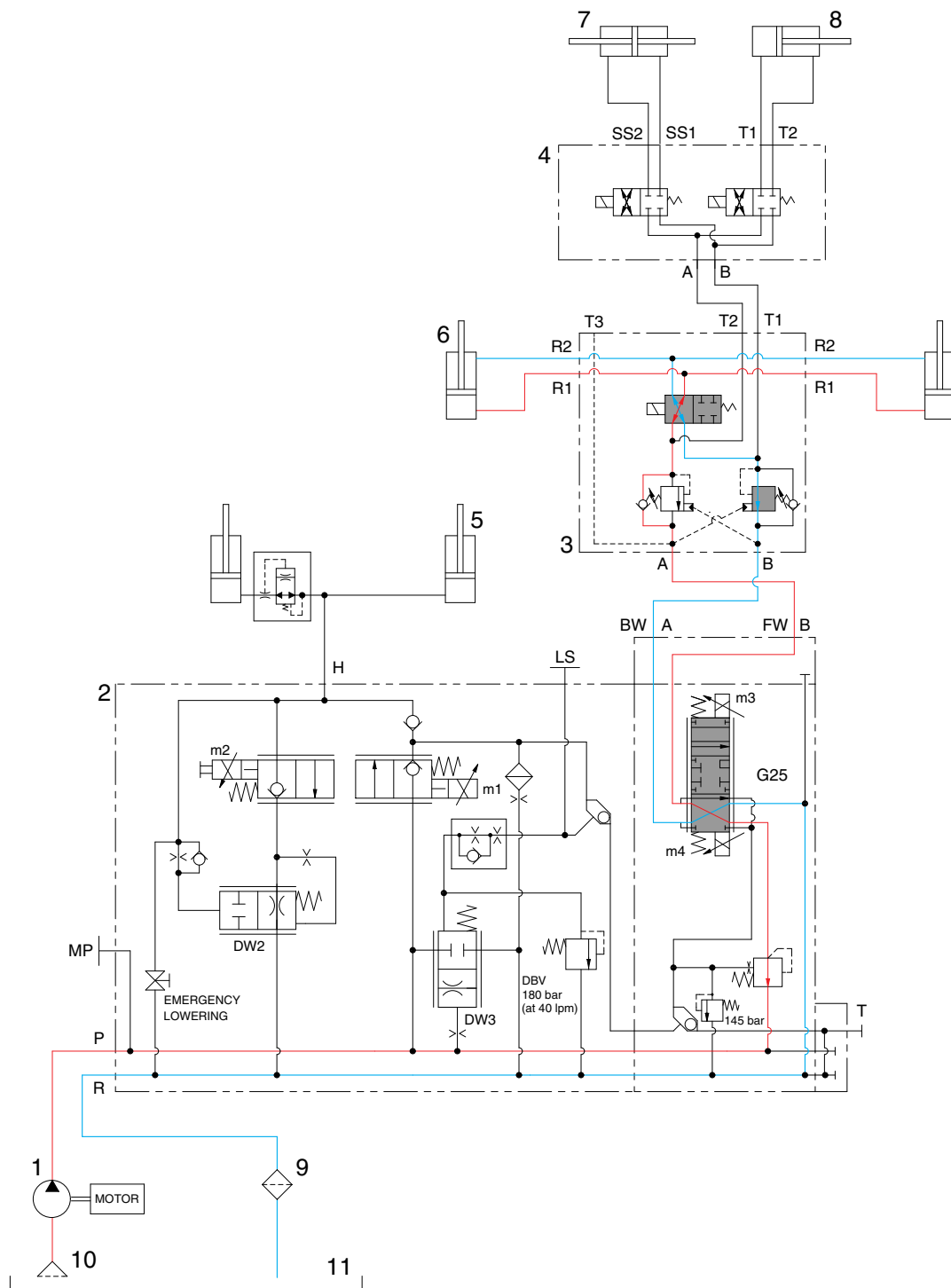


BRP7HS03

When the joystick is pushed forward, the m2 valve in the lift block is moved to open position. The work port (H) and the large chamber are connected to the return passage, so the lift will be lowered due to its own weight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3) WHEN THE BUTTON ON THE JOYSTICK IS PUSHED FOR THE REACH OUT POSITION



BRP7HS05

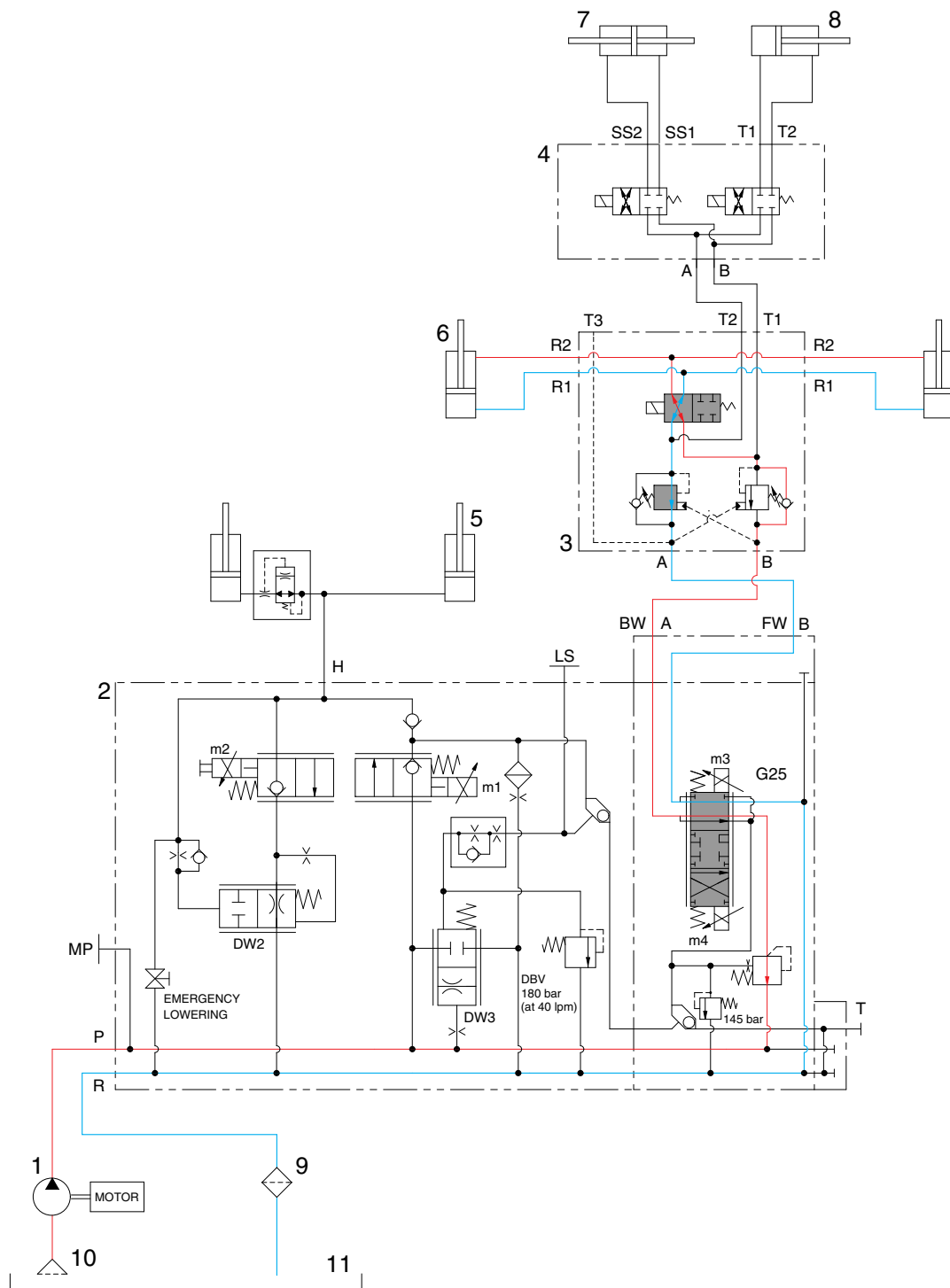
When the button on the joystick is pushed upward, the spool in the tilt block is moved to reach out position.

The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the large chamber of reach cylinder (6).

The oil at the small chamber of reach cylinder (6) returns to hydraulic oil tank (11) at the same time. When this happens, the mast reaches out.

※ The circuit diagram may differ from the equipment, so please check before a repair.

4) WHEN THE BUTTON ON THE JOYSTICK IS PUSHED FOR THE REACH IN POSITION



BRP7HS04

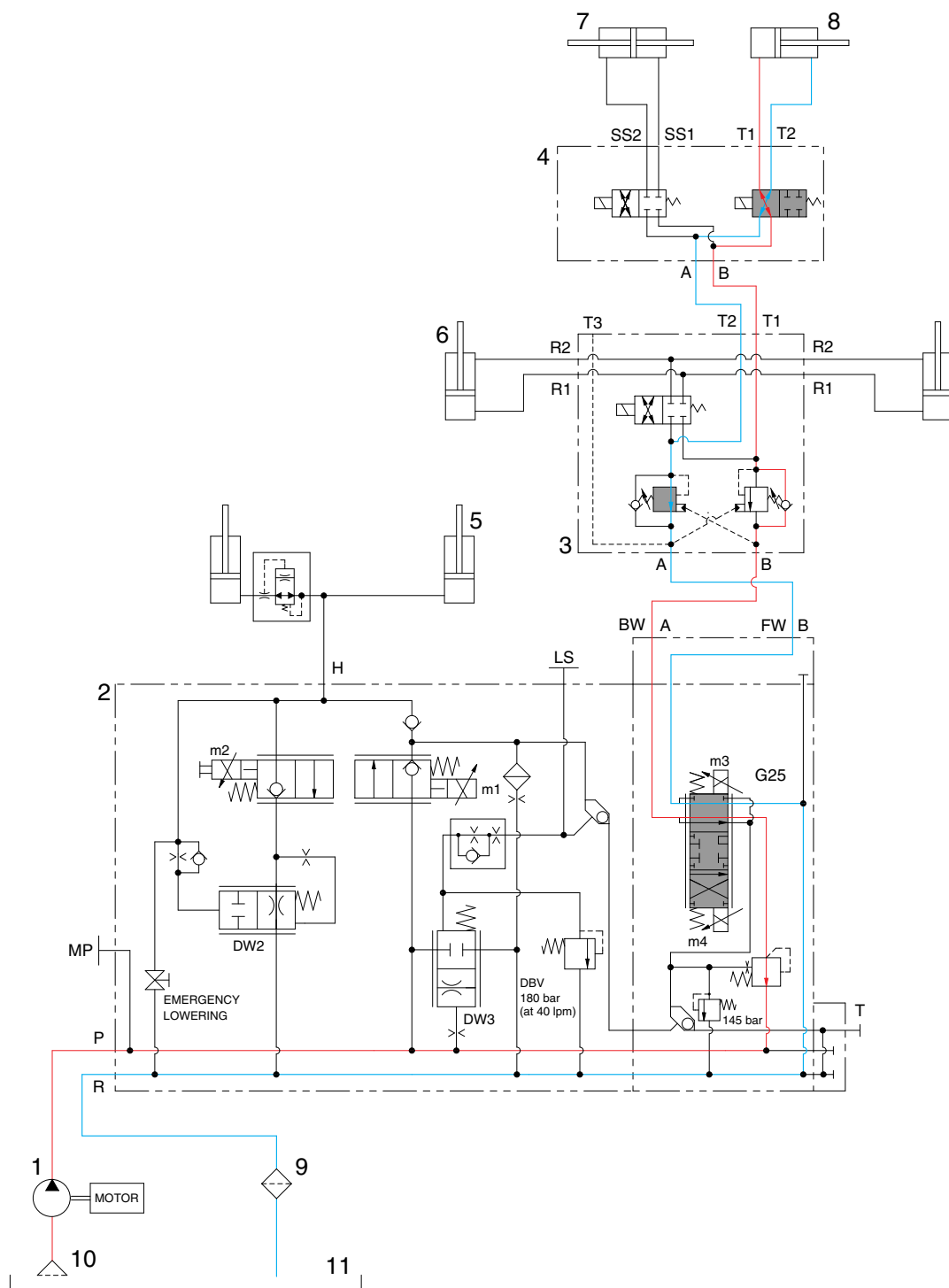
When the button on the joystick is pushed downward, the spool in the tilt block is moved to reach in position.

The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the small chamber of reach cylinder (6).

The oil at the large chamber of reach cylinder (6) returns to hydraulic oil tank (11) at the same time. When this happens, the mast reaches in.

※ The circuit diagram may differ from the equipment, so please check before a repair.

5) WHEN THE JOYSTICK IS IN THE BACKWARD TILT POSITION



BRP7HS06

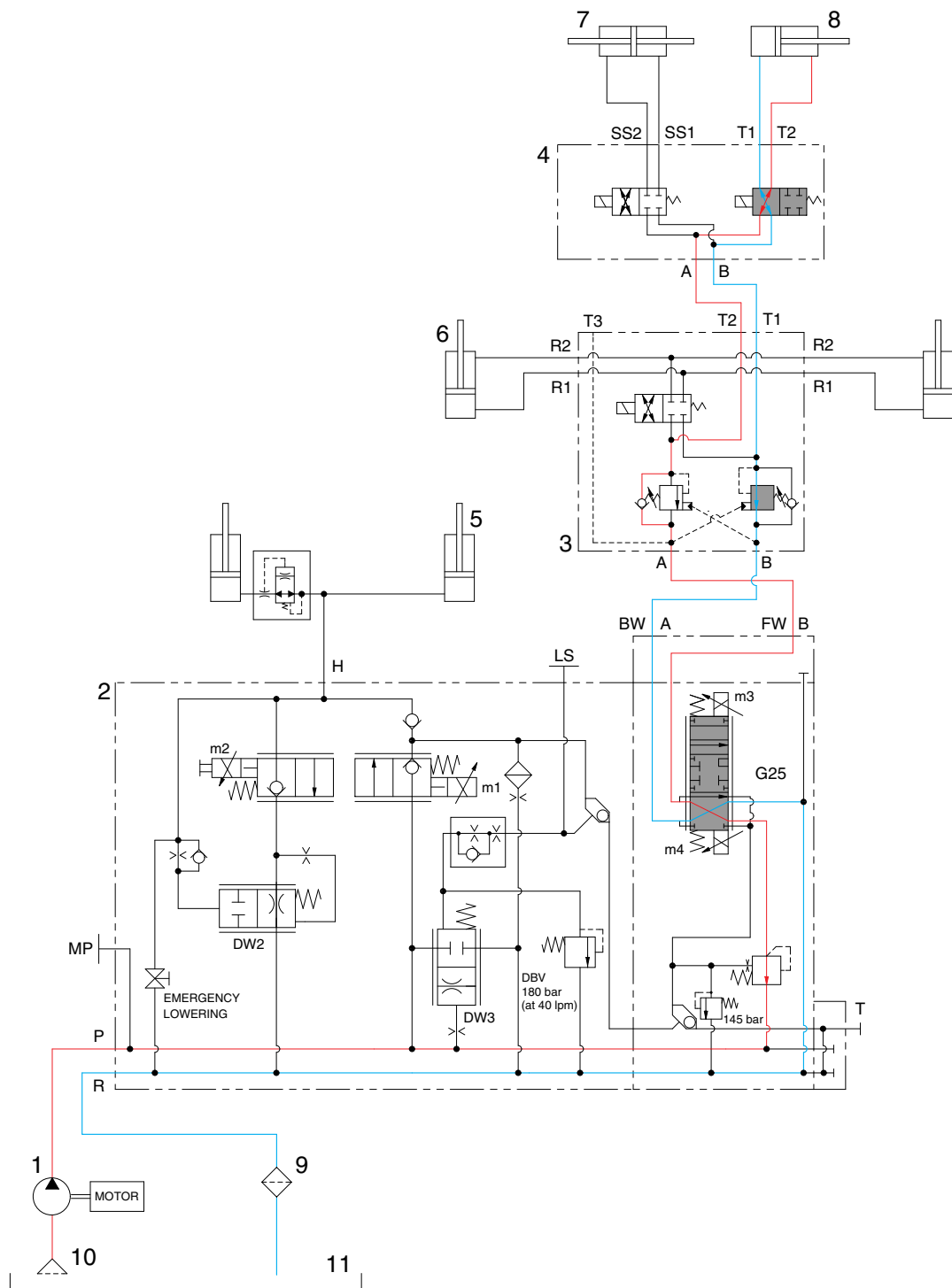
When the joystick is pulled during pressing the tilt button, the spool in the tilt block is moved to tilt backward position.

The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the large chamber of tilt cylinder (8).

The oil at the small chamber of tilt cylinder (8) returns to hydraulic oil tank (11) at the same time.

※ The circuit diagram may differ from the equipment, so please check before a repair.

6) WHEN THE JOYSTICK IS IN THE FORWARD TILT POSITION



BRP7HS07

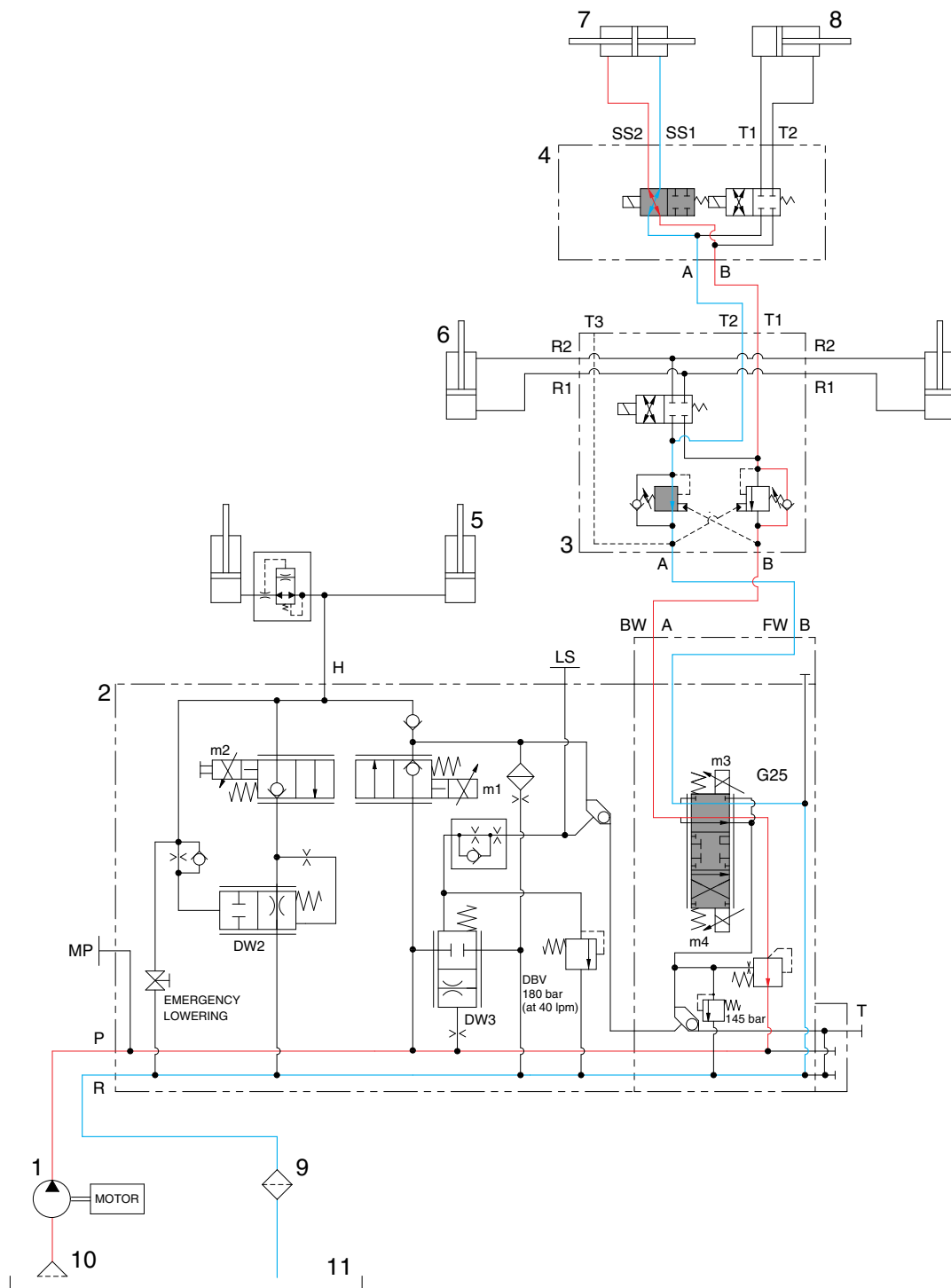
When the joystick is pushed forward during pressing the tilt button, the spool in the tilt block is moved to tilt forward position.

The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the small chamber of tilt cylinder (8).

The oil at the large chamber of tilt cylinder (8) returns to hydraulic oil tank (11) at the same time.

※ The circuit diagram may differ from the equipment, so please check before a repair.

7) WHEN THE JOYSTICK IS IN THE RIGHT POSITION FOR THE SIDE SHIFT MOVEMENT



BRP7HS08

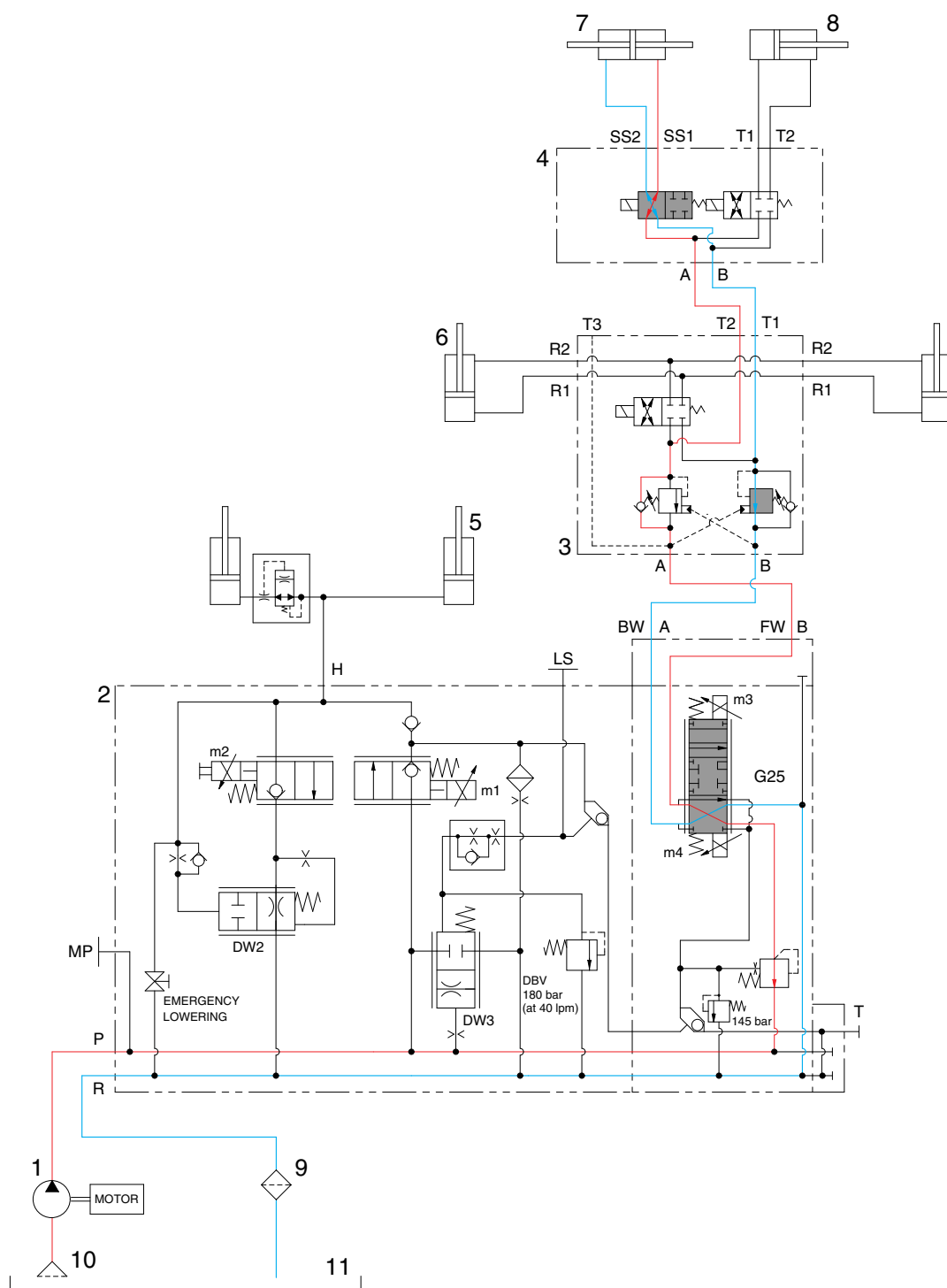
When the joystick is pulled backward during pressing the side shift button, the spool in the tilt block is moved to side shift right position.

The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the large chamber of side shift cylinder (7).

The oil at the small chamber of side shift cylinder (7) returns to hydraulic oil tank (11) at the same time.

※ The circuit diagram may differ from the equipment, so please check before a repair.

8) WHEN THE JOYSTICK IS IN THE LEFT POSITION FOR THE SIDE SHIFT MOVEMENT



BRP7HS09

When the joystick is pushed forward during pressing the side shift button, the spool in the tilt block is moved to side shift left position.

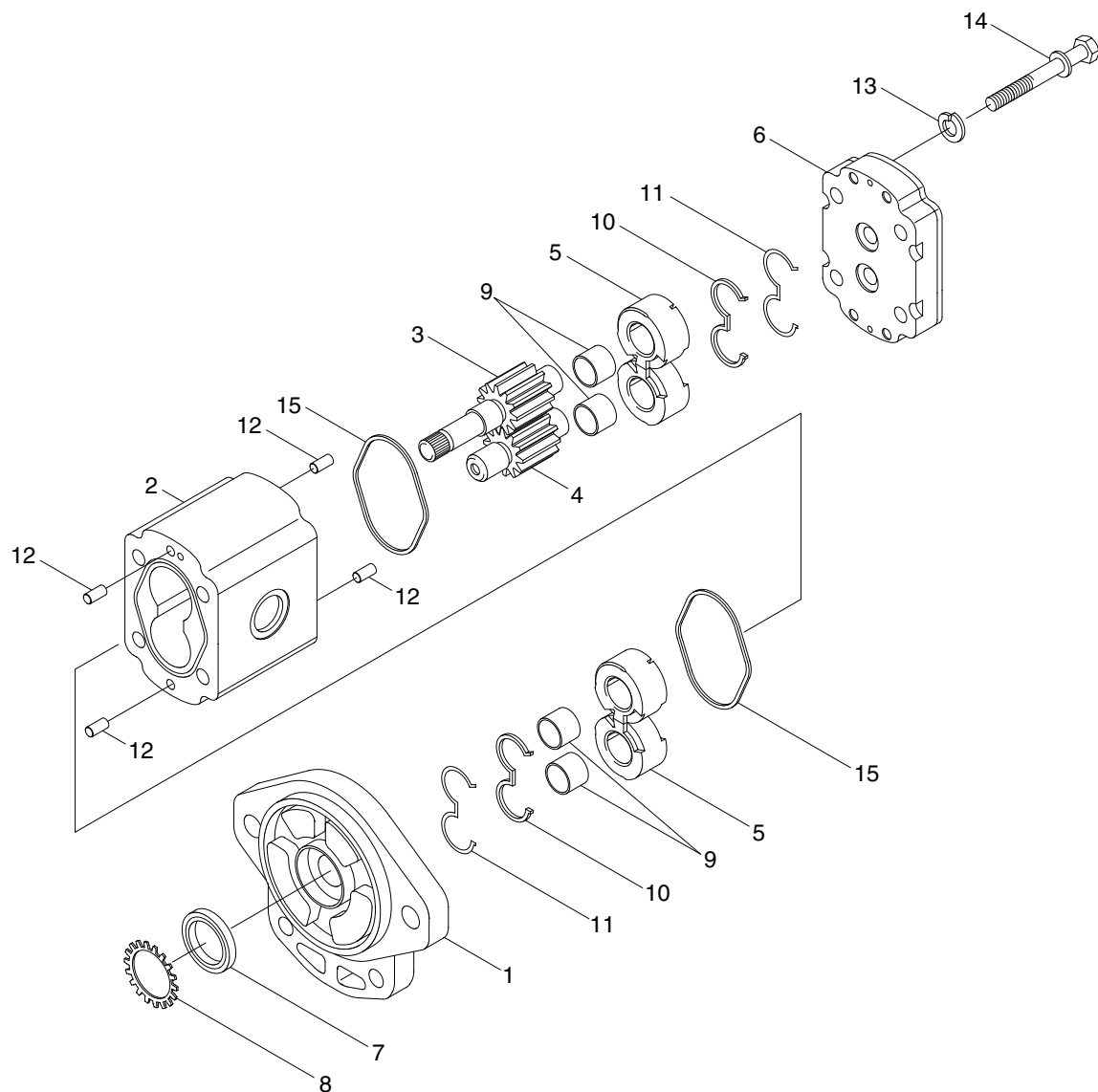
The oil from hydraulic gear pump (1) flows into main control valve (2) and then goes to the large chamber of side shift cylinder (7).

The oil at the small chamber of side shift cylinder (7) returns to hydraulic oil tank (11) at the same time.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. HYDRAULIC GEAR PUMP

1) STRUCTURE



14BRJ9HS19

- | | | | | | |
|---|------------|----|------------|----|---------------|
| 1 | Housing | 6 | Rear cover | 11 | E-backup ring |
| 2 | Body | 7 | oil seal | 12 | Pin |
| 3 | Drive gear | 8 | Snap ring | 13 | Washer |
| 4 | Idle gear | 9 | DU bush | 14 | Hex bolt |
| 5 | Side plate | 10 | E-seal | 15 | O-ring |

2) OPERATION

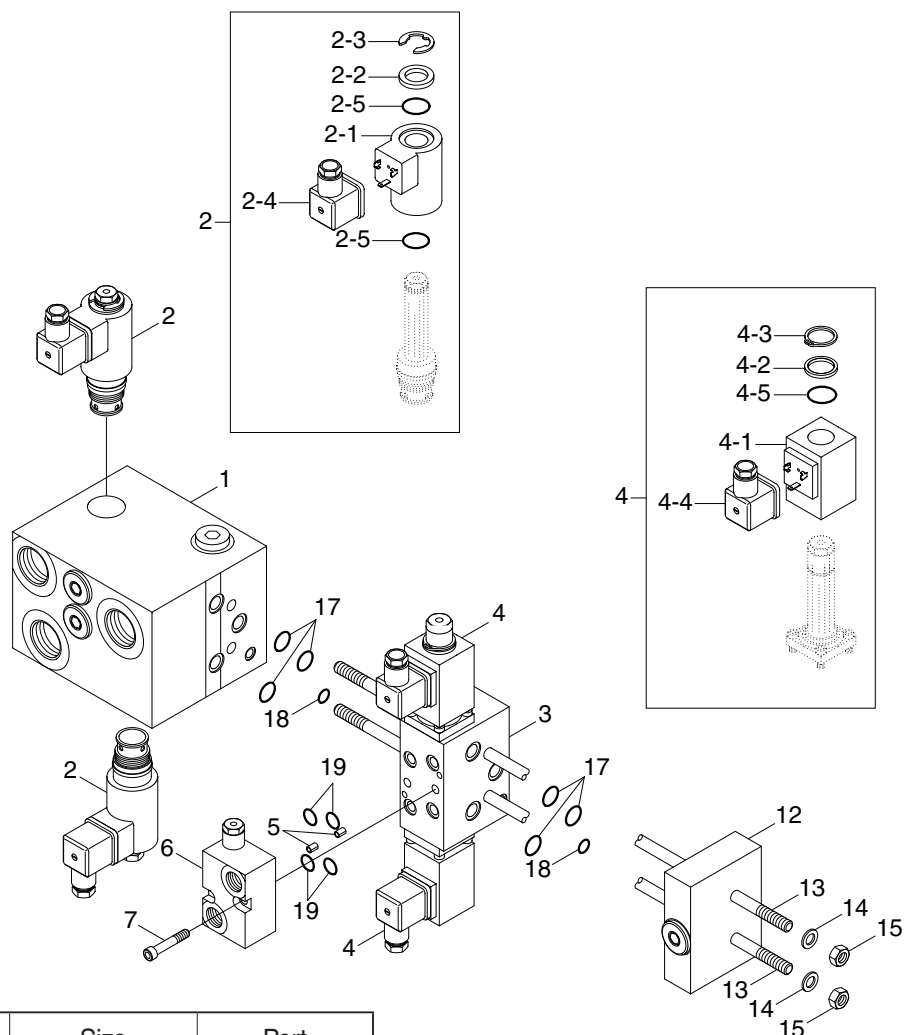
This pump comprises of an rear cover, a body, bushings and a housing bolted together with bolts. The gear journals are supported in side plate within pressure balanced bushings to give high volumetric and mechanical efficiencies.

3. MAIN CONTROL VALVE

1) STRUCTURE (2 Spool)

Machine serial number

15BRP : -#0089, 18BRP : -#0055, 20BRP : -#0066, 23BRP :- #0049



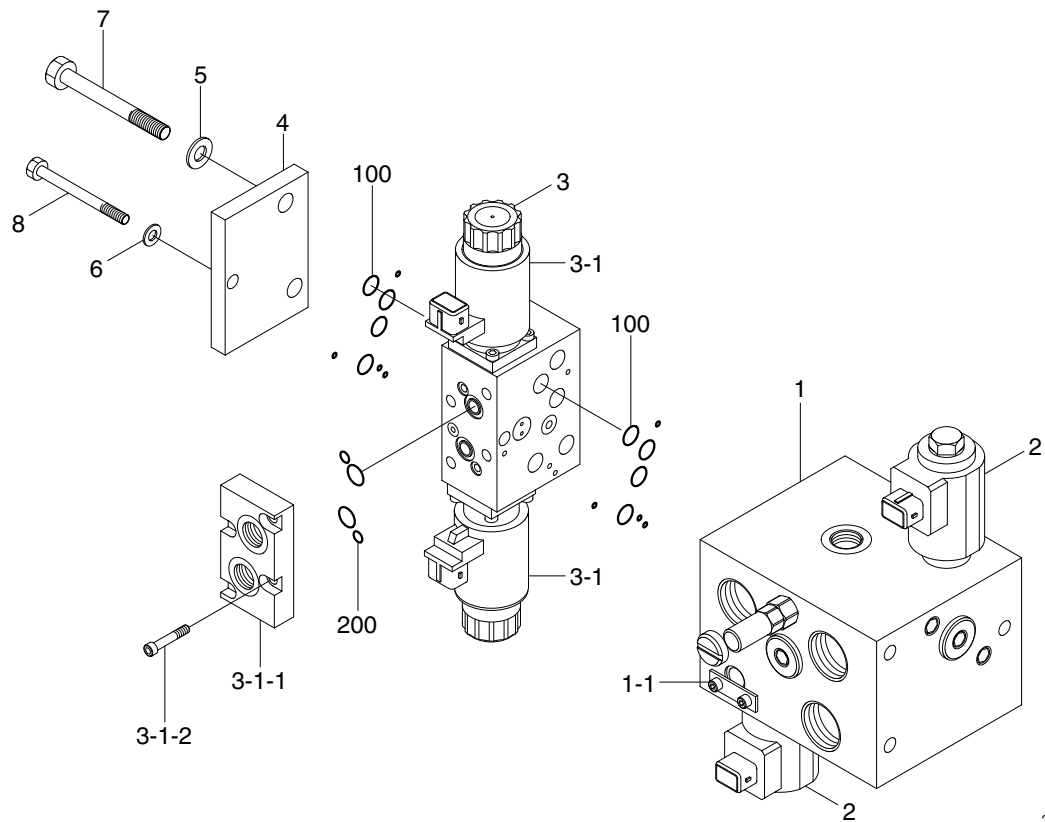
Port name	Size	Port
Inlet port	1 1/16-12UN	P
Outlet port	1 1/16-12UN	R
Work port	1 1/16-12UN	H
Work port	9/16-18 UNF	A, B

BRP7HS12

- | | | |
|-------------------------|------------------|-----------------|
| 1 Main block | 4 Solenoid valve | 7 Head screw |
| 2 Solenoid valve (Lift) | 4-1 Coil | 12 End block |
| 2-1 EVI coil | 4-2 Disc | 13 Tension rod |
| 2-2 Washer | 4-3 Circlip | 14 Shape washer |
| 2-3 Lock washer | 4-4 Black plug | 15 Hexagon nut |
| 2-4 Black plug | 4-5 O-ring | 17 O-ring |
| 2-5 O-ring | 5 Roll pin | 18 O-ring |
| 3 Tilt block | 6 Adapter | 19 O-ring |

Machine serial number

15BRP : #0090-, 18BRP : #0056-, 20BRP : #0067-, 23BRP : #0050-



31HR-02600

- | | | | | | |
|-----|-----------------|-------|-------------------|-----|--------------------------|
| 1 | Main block | 3-1-1 | Ancillary block | 7 | Socket head screw |
| 1-1 | Emergency drain | 3-1-2 | Socket head screw | 8 | Socket head screw |
| 2 | EPM 31 | 4 | End plate | 100 | Section seal kit |
| 3 | EDL 2 | 5 | Washer | 200 | Ancillary block seal kit |
| 3-1 | Coil | 6 | Washer | | |

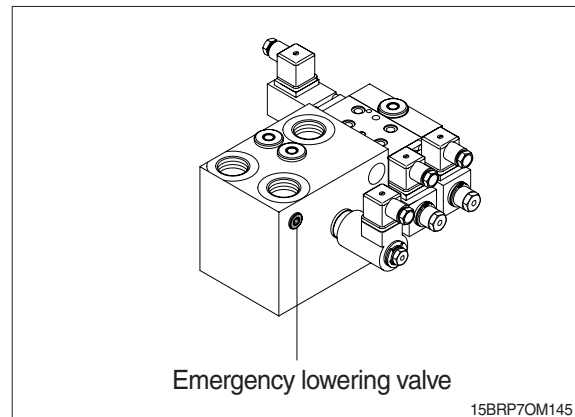
2) EMERGENCY LOWERING

In case of the mast cannot be lowered due to a problem in the controller, active the emergency lowering valve on the valve block with hexagonal wrench.

- (1) Turn off the electric emergency switch.
- (2) Open the lowering valve using the 5mm hexagonal wrench. Slowly lower the mast and the load carriage.
- (3) After lowering, close the emergency lowering valve.

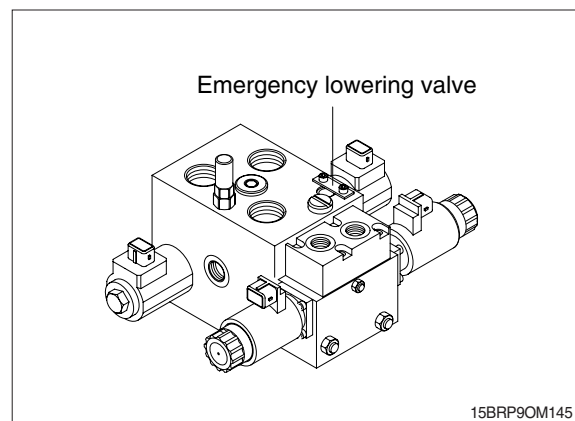
Machine serial number

15BRP : -#0089, 18BRP : -#0055,
20BRP : -#0066, 23BRP :- #0049

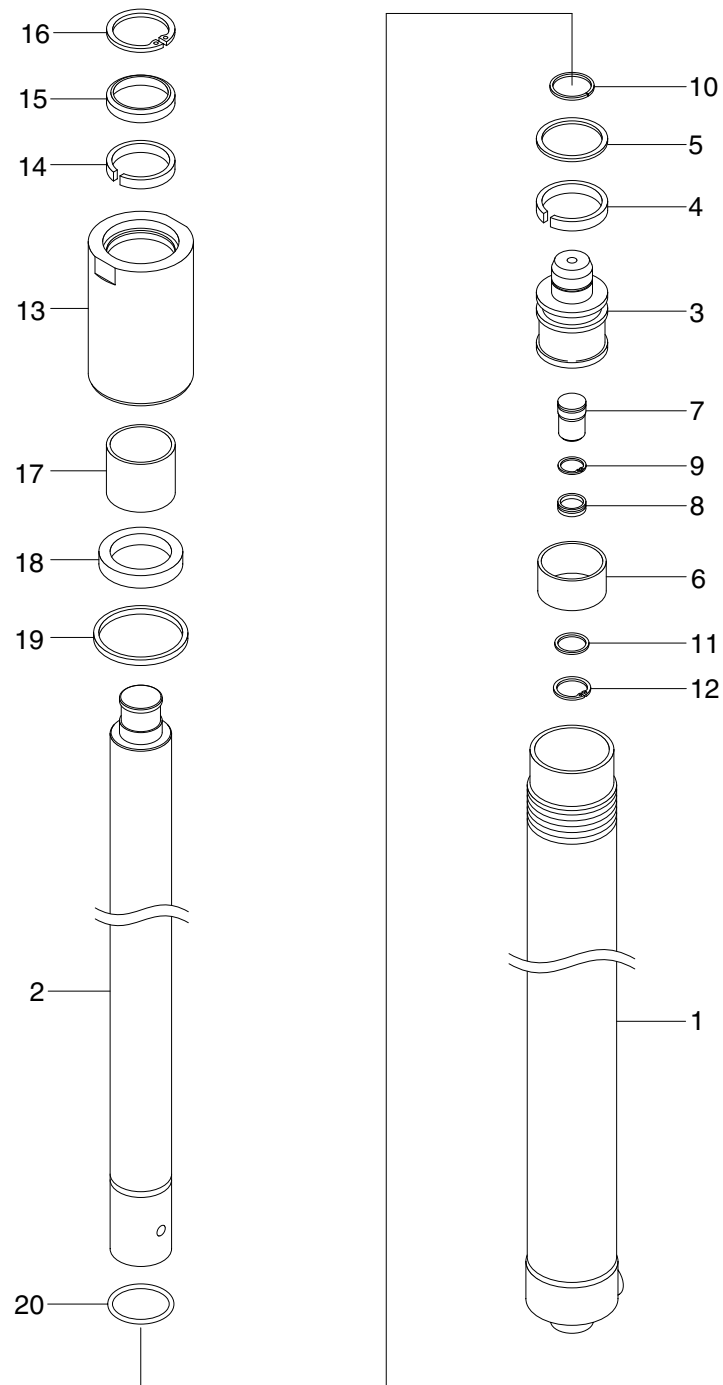


Machine serial number

15BRP : #0090-, 18BRP : #0056-,
20BRP : #0067-, 23BRP : #0050-



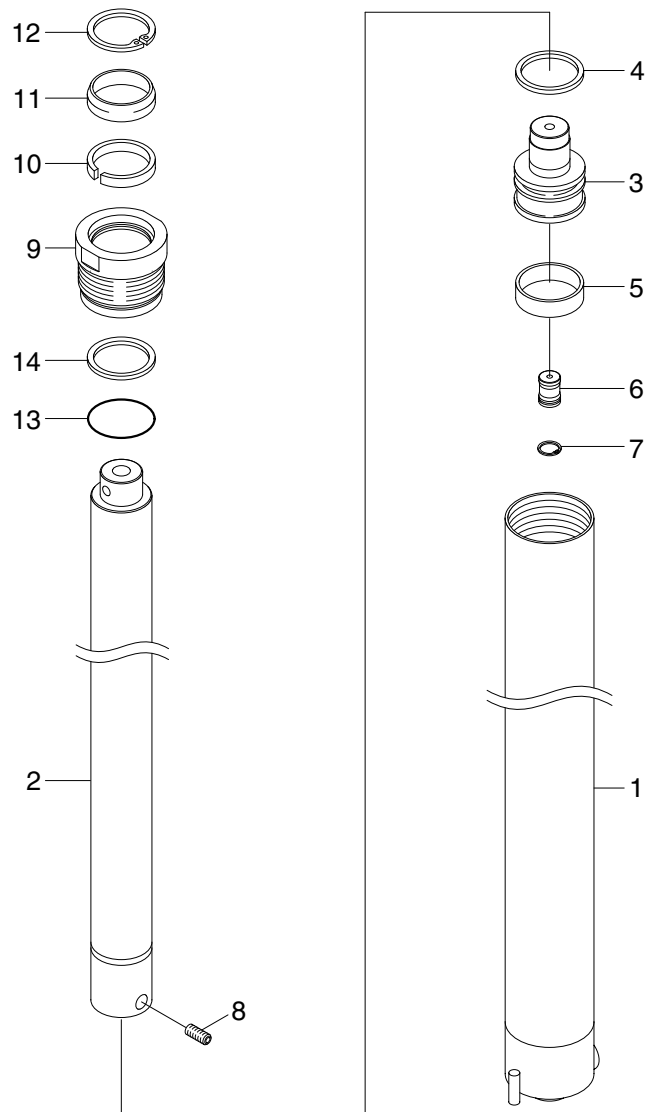
4. LIFT CYLINDER



BRP9HS21

- | | | | | | |
|---|--------------|----|----------------|----|----------------|
| 1 | Tube assy | 8 | Spacer | 15 | Dust wiper |
| 2 | Rod | 9 | Retaining ring | 16 | Retaining ring |
| 3 | Piston | 10 | Stop ring | 17 | Rod bushing |
| 4 | U-packing | 11 | Cushion seal | 18 | Spacer |
| 5 | Back up ring | 12 | Retaining ring | 19 | O-ring |
| 6 | Wear ring | 13 | Rod cover | 20 | Stop ring |
| 7 | Check valve | 14 | U-packing | | |

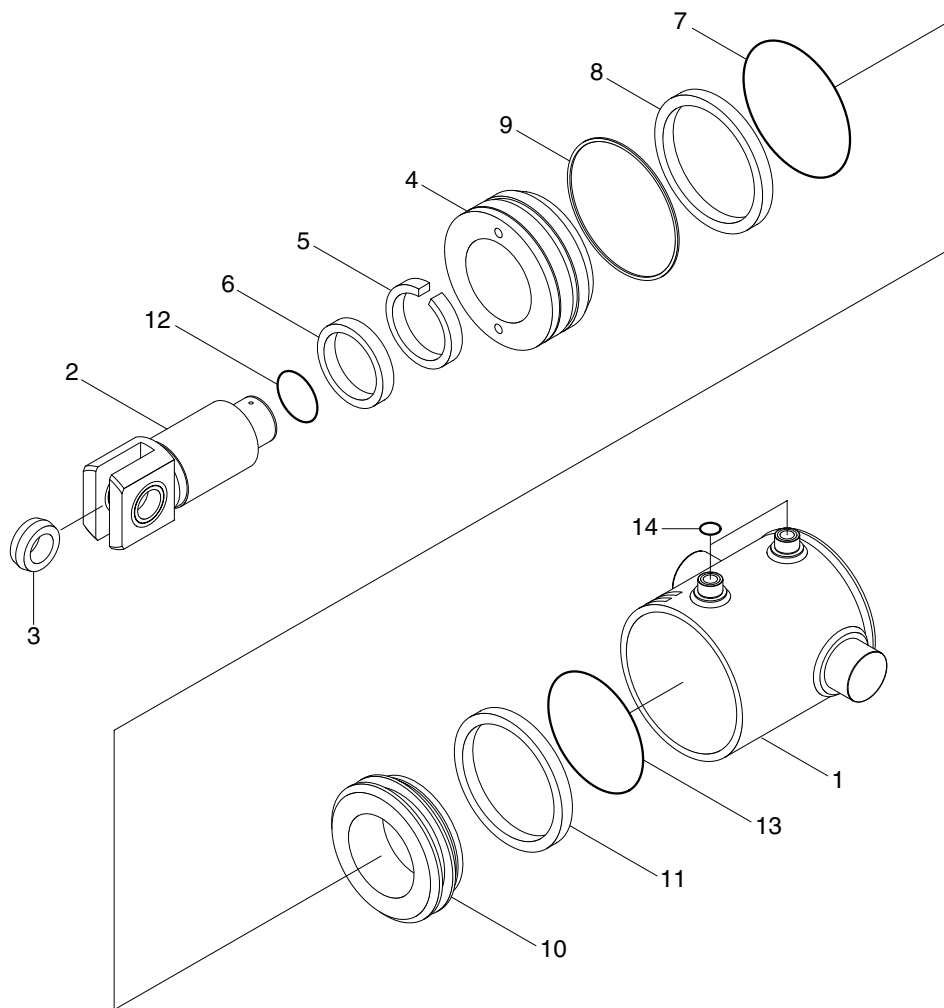
5. FREE LIFT CYLINDER



- | | | | | | |
|---|-------------|----|----------------|----|----------------|
| 1 | Tube assy | 6 | Check valve | 11 | Dust wiper |
| 2 | Rod | 7 | Retaining ring | 12 | Retaining ring |
| 3 | Piston | 8 | Set screw | 13 | O-ring |
| 4 | Piston seal | 9 | Rod cover | 14 | Back up ring |
| 5 | Wear ring | 10 | U-packing | | |

BRP9HS23

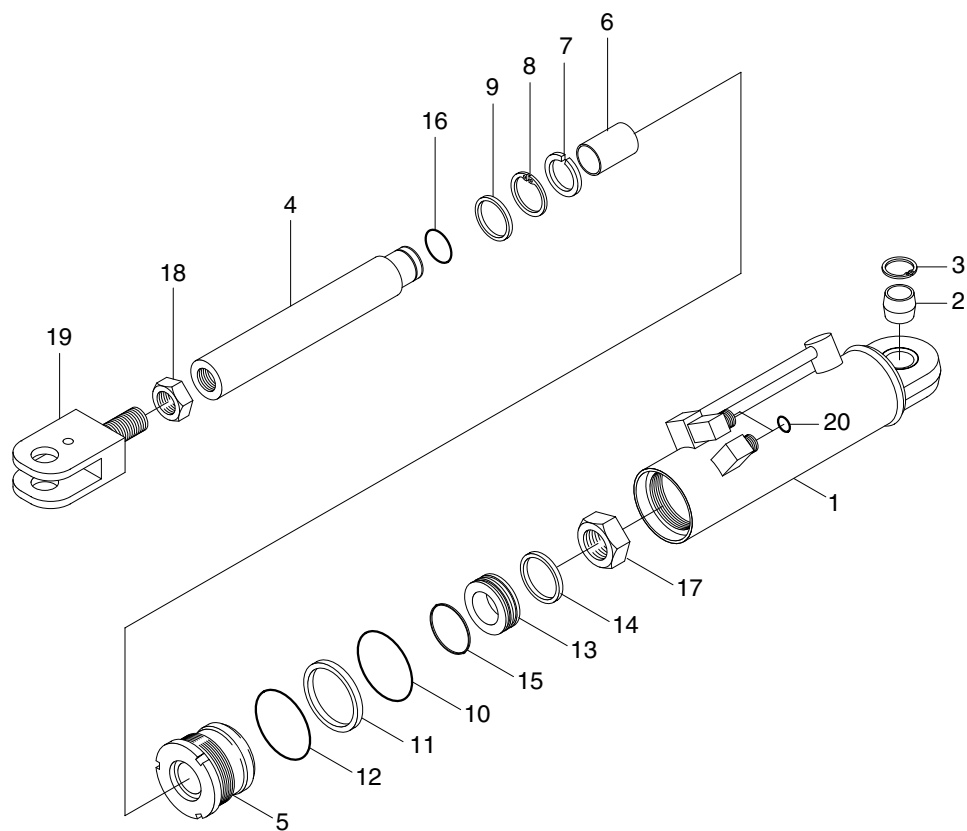
6. TILT CYLINDER



BRP7HS25

- | | | | | | |
|---|-----------|----|--------------|----|--------------|
| 1 | Tube assy | 6 | Dust wiper | 11 | Piston seal |
| 2 | Rod | 7 | O-ring | 12 | O-ring |
| 3 | Bushing | 8 | Back up ring | 13 | Locking ring |
| 4 | Rod cover | 9 | Locking wire | 14 | O-ring |
| 5 | U-packing | 10 | Piston | | |

7. REACH CYLINDER



BRP7HS27

- | | | | | | |
|---|-------------------|----|--------------|----|-----------|
| 1 | Tube assy | 8 | Back up ring | 15 | Wear ring |
| 2 | Spherical bearing | 9 | Dust wiper | 16 | O-ring |
| 3 | Retaining ring | 10 | O-ring | 17 | Nylon nut |
| 4 | Rod | 11 | Back up ring | 18 | Hex nut |
| 5 | Rod cover | 12 | O-ring | 19 | Eye |
| 6 | Bushing | 13 | Piston | 20 | O-ring |
| 7 | U-packing | 14 | Piston seal | | |

GROUP 2 OPERATIONAL CHECKS AND TROUBLESHOOTING

1. OPERATIONAL CHECKS

1) CHECK ITEM

- (1) Check visually for deformation, cracks or damage of rod.
- (2) Load maximum load, set mast vertical and raise 1m from ground. Wait for 10 minutes and measure hydraulic drift (amount forks move down and amount mast tilts forward).

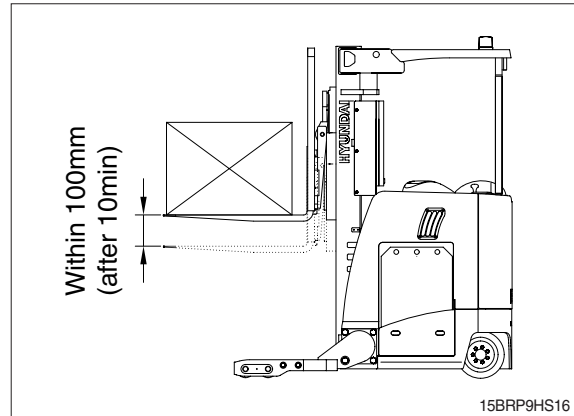
· Hydraulic drift

- Down (Downward movement of forks)
: Within 100 mm (3.9 in)
- Forward (Extension of tilt cylinder)
: Within 5°

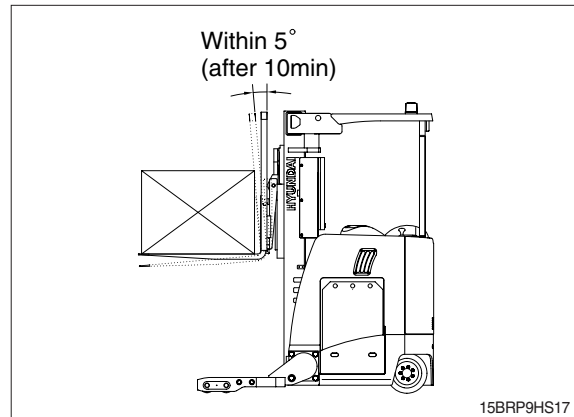
If the hydraulic drift is more than the specified value, replace the control valve or cylinder packing.

- (3) Check that clearance between tilt cylinder bushing and mounting pin is within standard range.

	mm (in)
Standard	Under 0.6 (0.02)



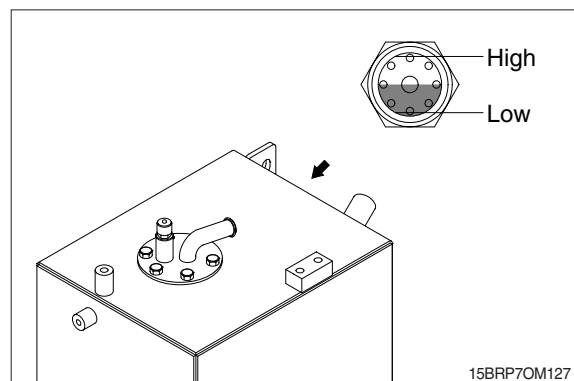
15BRP9HS16



15BRP9HS17

2) HYDRAULIC OIL

- (1) Check the hydraulic oil level, and fill oil if necessary.
- (2) When changing hydraulic oil, clean suction strainer (screwed into outlet port pipe) and return filter (screwed into inlet pipe). Return filter uses paper element, so replace periodically (2000 hours).



15BRP7OM127

3) CONTROL VALVE

- (1) Raise forks to maximum height and measure oil pressure.
Check that oil pressure is 180 kgf/cm².
(2560psi)

2. TROUBLESHOOTING

1) SYSTEM

Problem	Cause	Remedy
Large fork lowering speed	<ul style="list-style-type: none"> · Seal inside control valve defective. · Oil leaks from joint or hose. · Seal inside cylinder defective. 	<ul style="list-style-type: none"> · Replace spool or valve body. · Replace. · Replace packing.
Large spontaneous tilt of mast	<ul style="list-style-type: none"> · Tilting backward : Check valve defective. · Tilting forward : tilt lock valve defective. · Oil leaks from joint or hose. · Seal inside cylinder defective. 	<ul style="list-style-type: none"> · Clean or replace. · Clean or replace. · Replace. · Replace seal.
Slow fork lifting or slow mast tilting	<ul style="list-style-type: none"> · Lack of hydraulic oil. · Hydraulic oil mixed with air. · Oil leaks from joint or hose. · Excessive restriction of oil flow on pump suction side. · Relief valve fails to keep specified pressure. · Poor sealing inside cylinder. · High hydraulic oil viscosity. · Mast fails to move smoothly. · Oil leaks from lift control valve spool. · Oil leaks from tilt control valve spool. 	<ul style="list-style-type: none"> · Add oil. · Bleed air. · Replace. · Clean filter. · Adjust relief valve. · Replace packing. · Change to ISO VG 46. · Adjust roll to rail clearance. · Replace spool or valve body. · Replace spool or valve body.
Hydraulic system makes abnormal sounds	<ul style="list-style-type: none"> · Excessive restriction of oil flow pump suction side. · Gear or bearing in hydraulic pump defective. 	<ul style="list-style-type: none"> · Clean filter. · Replace gear or bearing.
Control valve lever is locked	<ul style="list-style-type: none"> · Foreign matter jammed between spool and valve body. · Valve body defective. 	<ul style="list-style-type: none"> · Clean. · Tighten body mounting bolts uniformly.
High oil temperature	<ul style="list-style-type: none"> · Lack of hydraulic oil. · High oil viscosity. · Oil filter clogged. 	<ul style="list-style-type: none"> · Add oil. · Change to ISO VG46. · Clean filter.

2) HYDRAULIC GEAR PUMP

Problem	Cause	Remedy
Pump does not develop full pressure	<ul style="list-style-type: none"> · System relief valve set too low or leaking. · Oil viscosity too low. · Pump is worn out. 	<ul style="list-style-type: none"> · Check system relief valve for proper setting. · Change to proper viscosity oil. · Repair or replace pump.
Pump will not pump oil	<ul style="list-style-type: none"> · Reservoir low or empty. · Suction strainer clogged. 	<ul style="list-style-type: none"> · Fill reservoir to proper level. · Clean suction strainer.
Noisy pump caused by cavitation	<ul style="list-style-type: none"> · Oil too thick. · Oil filter plugged. · Suction line plugged or too small. 	<ul style="list-style-type: none"> · Change to proper viscosity. · Clean filters. · Clean line and check for proper size.
Oil heating	<ul style="list-style-type: none"> · Oil supply low. · Contaminated oil. · Setting of relief valve too high or too low. · Oil viscosity too low. 	<ul style="list-style-type: none"> · Fill reservoir to proper level. · Drain reservoir and refill with clean oil. · Set to correct pressure. · Drain reservoir and fill with proper viscosity.
Foaming oil	<ul style="list-style-type: none"> · Low oil level. · Air leaking into suction line. · Wrong kind of oil. 	<ul style="list-style-type: none"> · Fill reservoir to proper level. · Tighten fittings, check condition of line. · Drain reservoir, fill with non-foaming oil.
Shaft seal leakage	<ul style="list-style-type: none"> · Worn shaft seal. · Worn shaft in seal area. 	<ul style="list-style-type: none"> · Replace shaft seal. · Replace drive shaft and seal.

3) MAIN RELIEF VALVE

Problem	Cause	Remedy
Can't get pressure	<ul style="list-style-type: none"> · Poppet D, E or K stuck open or contamination under seat. 	<ul style="list-style-type: none"> · Check for foreign matter between poppets D, E or K and their mating parts. Parts must slide freely.
Erratic pressure	<ul style="list-style-type: none"> · Pilot poppet seat damaged. · Poppet C sticking in D. 	<ul style="list-style-type: none"> · Replace the relief valve. · Clean and remove surface marks for free movement.
Pressure setting not correct	<ul style="list-style-type: none"> · Normal wear. Lock nut & adjust screw loose. 	<ul style="list-style-type: none"> · See ★Test of main control valve.
Leaks	<ul style="list-style-type: none"> · Damaged seats. · Worn O-rings. · Parts sticking due to contamination. 	<ul style="list-style-type: none"> · Replace the relief valve. · Install seal and spring kit. · Disassemble and clean.

★ A good pressure gauge must be installed in the line which is in communication with the main relief. A load must be applied in a manner to reach the set pressure of the main relief unit.

Then, follow these steps:

- Loosen lock nut.
- Set adjusting nut to desired pressure setting.
- If desired pressure setting cannot be achieved, tighten or loosen the adjusting screw as required.
- Tighten lock nut.
- Retest in similar manner as above.

4) LIFT CYLINDER

Problem	Cause	Remedy
Oil leaks out from rod cover through rod	<ul style="list-style-type: none"> · Foreign matters on packing. · Unallowable score on rod. · Unusual distortion of dust seal. · Chrome plating is striped. 	<ul style="list-style-type: none"> · Replace packing. · Smooth rod surface with an oil stone. · Replace dust seal. · Replace rod.
Oil leaks out from cylinder rod cover thread	<ul style="list-style-type: none"> · O-ring damaged. 	<ul style="list-style-type: none"> · Replace O-ring.
Rod spontaneously retract	<ul style="list-style-type: none"> · Scores on inner surface of tube. · Unallowable score on the inner surface of tube. · Foreign matters in piston seal. 	<ul style="list-style-type: none"> · Smooth rod surface with an oil stone. · Replace cylinder tube. · Replace piston seal.
Wear (clearance between cylinder tube and wear ring)	<ul style="list-style-type: none"> · Excessive clearance between cylinder tube and wear ring. 	<ul style="list-style-type: none"> · Replace wear ring.
Abnormal noise is produced during tilting operation	<ul style="list-style-type: none"> · Insufficient lubrication of anchor pin or worn bushing and pin. · Bent tilt cylinder rod. 	<ul style="list-style-type: none"> · Lubricate or replace. · Replace.

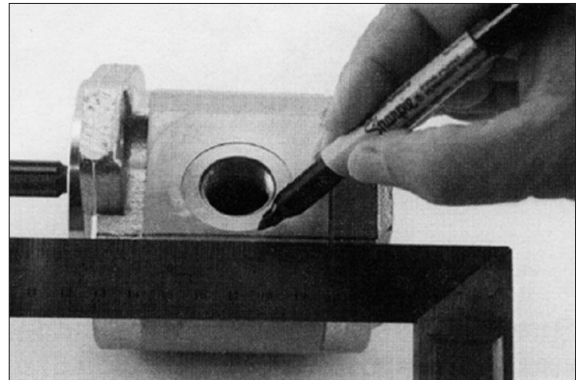
GROUP 3 DISASSEMBLY AND ASSEMBLY

1. HYDRAULIC GEAR PUMP

※ Tools required

- Metric socket set
- Internal snap ring pliers
- Shaft seal sleeve
- Torque wrench

- (1) It is very important to work in a clean work area when repairing hydraulic products. Plug ports and wash exterior of pump with a proper cleaning solvent before continuing.
- (2) Remove port plugs and drain oil from pump.
- (3) Use a permanent marker pen to mark a line across the mounting flange, gear housing and end cover. This will assure proper reassembly and rotation of pump.
- (4) Remove key from drive shaft if applicable.

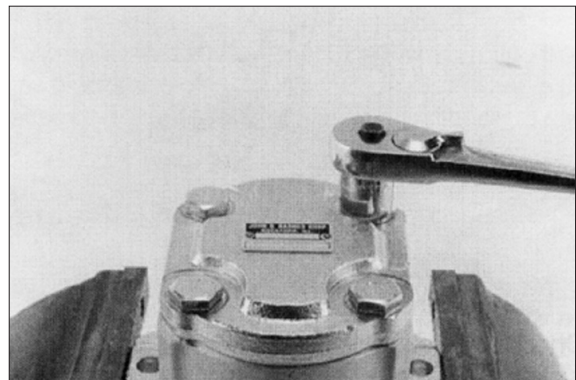


PUMP 01

(5) Clamp mounting flange in a protected jaw vise with pump shaft facing down.

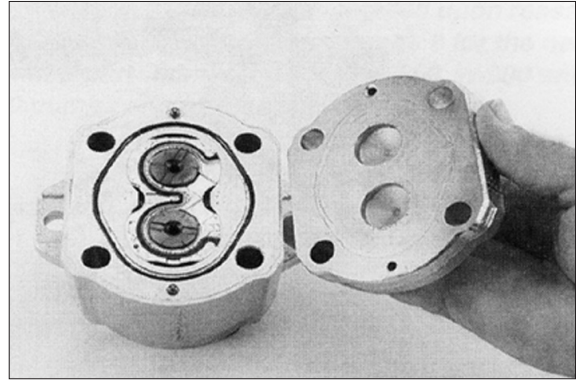
(6) Loosen the four metric hexagon head bolts.

Remove pump from vise and place on clean workbench, remove the four hexagon head bolts and spacers applicable.



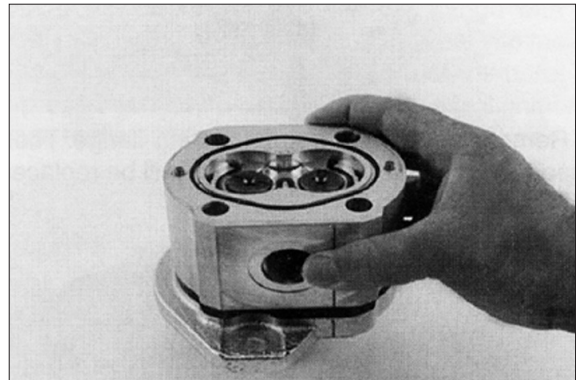
PUMP 02

(8) Lift and remove end cover.



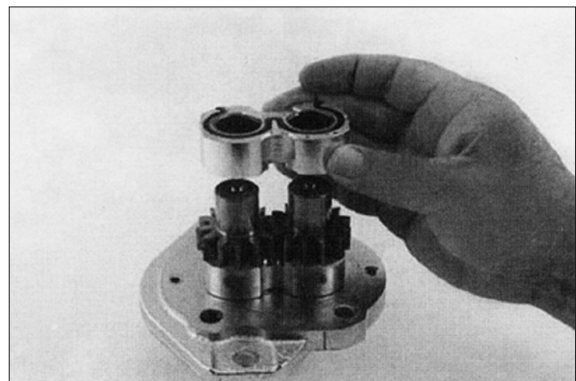
PUMP 03

(9) Carefully remove gear housing and place on work bench. Make sure the rear bearing block remains on the drive and idler shafts.



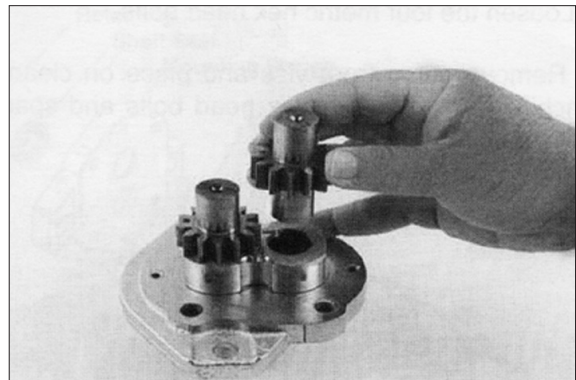
PUMP 04

(10) Remove rear bearing block from drive and idler shafts.



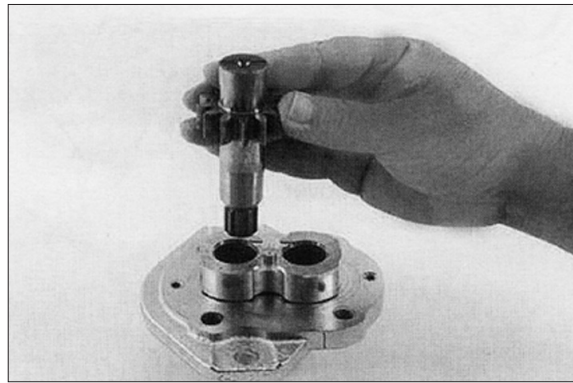
PUMP 05

(11) Remove idler shaft from bearing block.



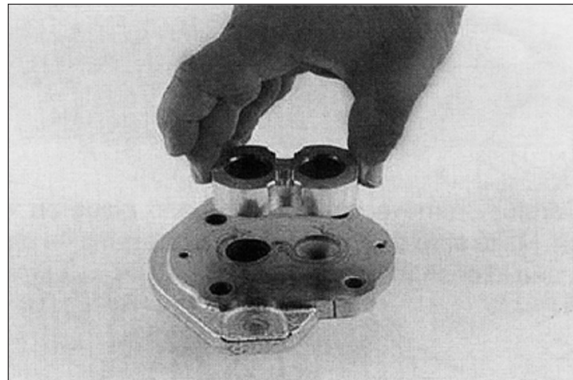
PUMP 06

(12) Remove drive shaft from mounting flange. There is no need to protect the shaft seal as it will be replaced as a new item.



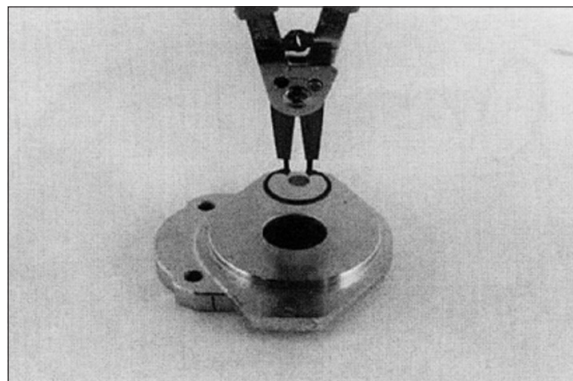
PUMP 07

(13) Remove the front bearing block.



PUMP 08

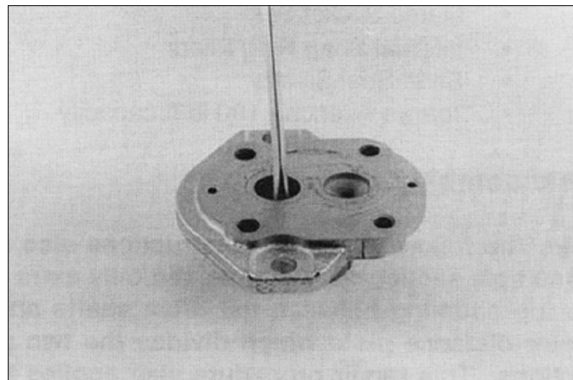
(14) Turn mounting flange over, with shaft seal up, and remove the retaining ring with proper snap ring pliers.



PUMP 09

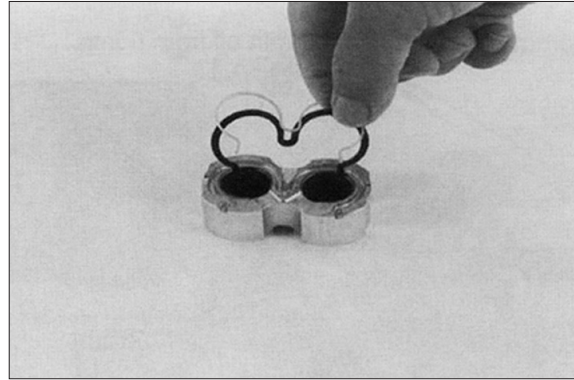
(15) Remove the oil seal from mounting flange, be careful not to mar or scratch the seal bore.

(16) Remove the dowel pins from the gear housing. Do not lose pins.



PUMP 10

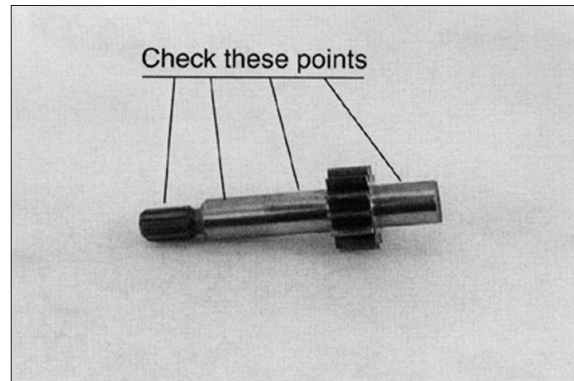
- (17) Remove seals from both bearing blocks and discard.



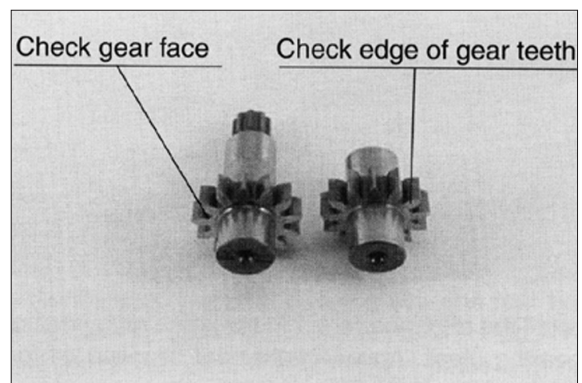
PUMP 11

2) INSPECT PARTS FOR WEAR

- (1) Clean and dry all parts thoroughly prior to inspection. It is not necessary to inspect the seals as they will be replaced as new items.
- (2) Check drive shaft spline for twisted or broken teeth, check keyed drive shaft for broken or chipped keyway. No marks or grooves on shaft in seal area, some discoloration of shaft is allowable.
- (3) Inspect both the drive gear shaft and idler gear shafts at the bearing points and seal area for rough surfaces and excessive wear.
- (4) Inspect gear face for scoring or excessive wear. If the face edge of gear teeth are sharp, they will mill into the bearing blocks. If wear has occurred, the parts are unusable.



PUMP 12



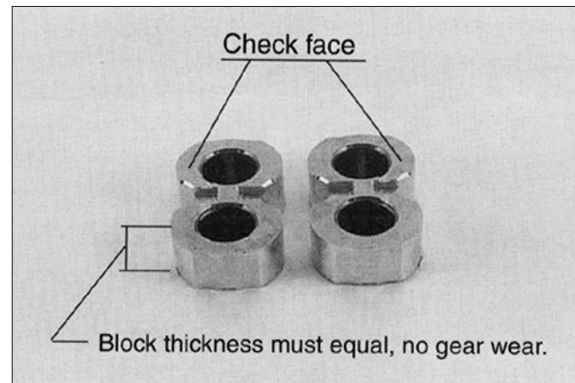
PUMP 13

- (5) Inspect bearing blocks for excessive wear or scoring on the surfaces which are in contact with the gears. Also inspect the bearings for excessive wear or scoring.
- (6) Inspect the area inside the gear housing. It is normal for the surface inside the gear housing to show a clean "wipe" on the inside surface on the intake side. There should not be excessive wear or deep scratches and gouges.

※ **General information**

It is important that the relationship of the mounting flange, bearing blocks and gear housing is correct. Failure to properly assemble this pump will result with little or no flow at rated pressure.

- ※ **This pump is not bi-rotational.**

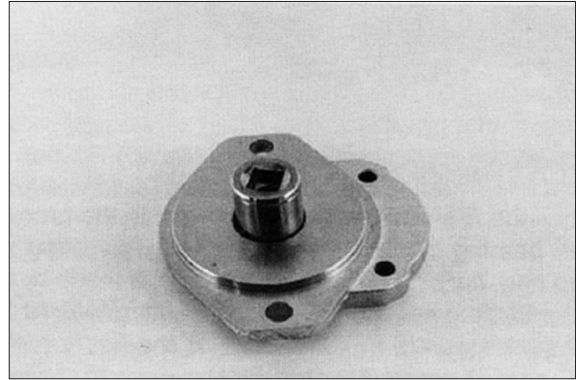


PUMP 14

3) ASSEMBLY

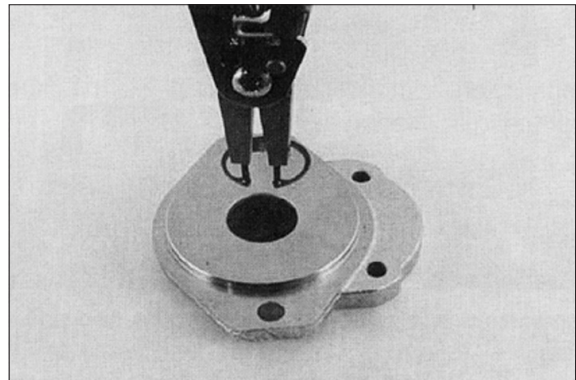
※ **New seals should be installed upon reassembly of pump.**

- (1) Install new shaft seal in mounting flange with part number side facing outboard. Press the seal into the seal bore until the seal reaches the bottom of the bore. Uniform pressure must be used to prevent misalignment or damage to the seal.



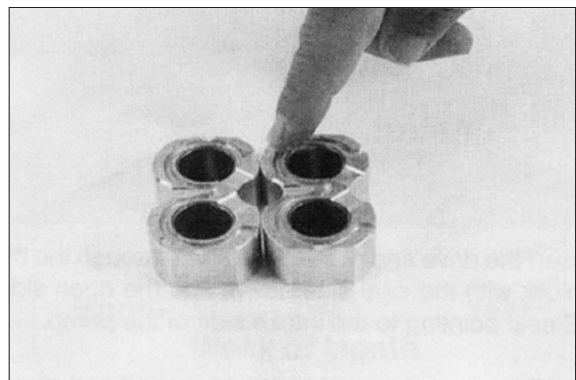
PUMP 15

- (2) Install retaining ring in groove in seal bore of mounting flange.



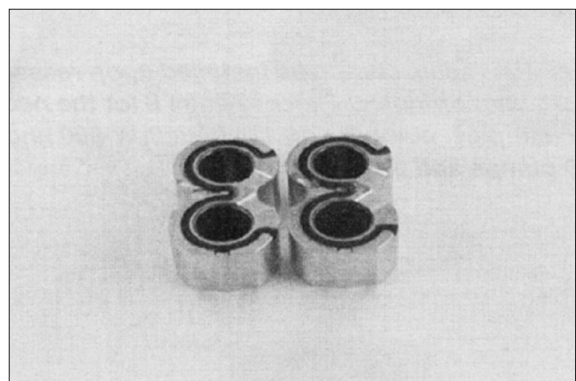
PUMP 16

- (3) Place front and back bearing blocks on a clean surface with the E-seal grooves facing up. Apply a light coating of petroleum jelly in the grooves. Also coat the E-seal and backup with the petroleum jelly, this will help keep the seals in place during assembly.



PUMP 17

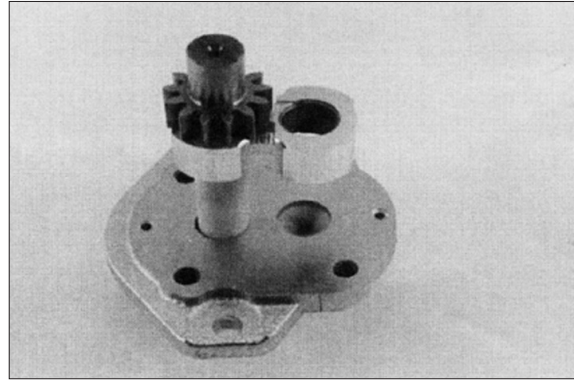
- (4) Place the E-seals, flat side outward, into the grooves in both bearing blocks. Follow by carefully placing the backup ring, flat side outward, in the groove made by the E-seal and the groove in the bearing block.
- (5) Place mounting flange, with shaft seal side down, on a clean flat surface.
- (6) Apply a light coating of petroleum jelly to the exposed face of the front bearing block.



PUMP 18

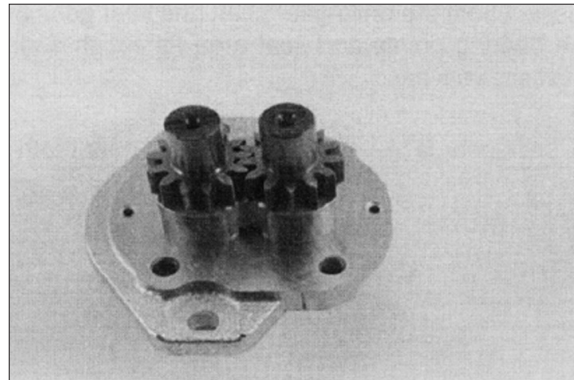
Insert the drive end of the drive shaft through the bearing block with the seal side down, and the open side of the E-seal pointing to the intake side of the pump.

Install the seal sleeve over the drive shaft and carefully slide the drive shaft through the shaft seal. Remove the seal sleeve from shaft.



PUMP 19

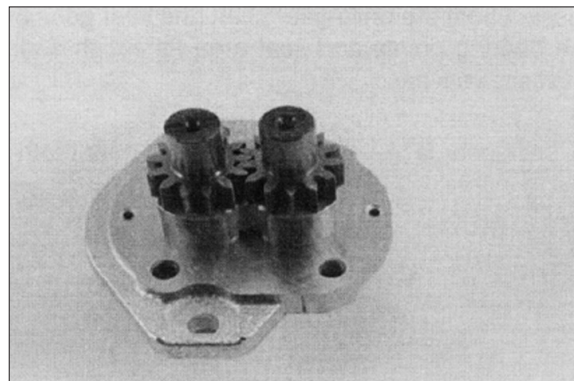
(9) Install the idler gear shaft in the remaining position in the bearing block. Apply a light coat of clean oil to the face of the drive and idler gears.



PUMP 20

(10) Pick up the rear bearing block, with seal side up and with open end of the E-seal facing the intake side of the pump, place over the drive and idler gear shafts.

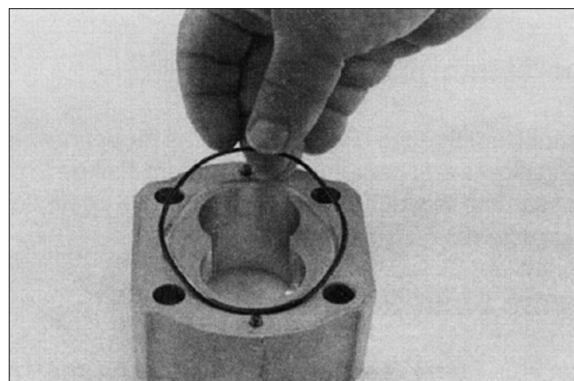
(11) Install two dowel pins in the holes in the mounting flange or two long dowel pins through gear housing if pump is a multiple section pump.



PUMP 21

(12) To install the O-rings in the gear housing, apply a light coating of petroleum jelly in the grooves on both sides of the gear housing.

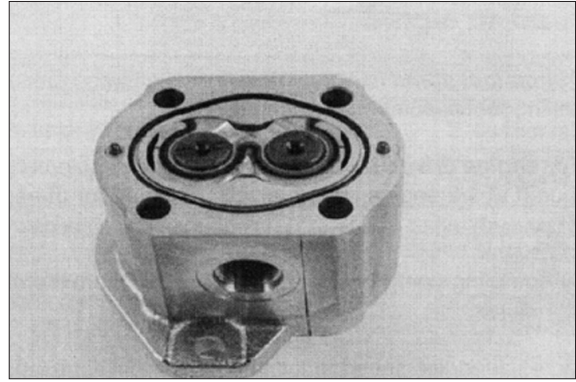
Also coat the new O-ring and install them in the grooves.



PUMP 22

- (13) Gently slide the gear housing over the rear bearing block assembly, slide housing down until the housing engages the dowel pins. Press firmly in place with hands, do not force or use any tool.

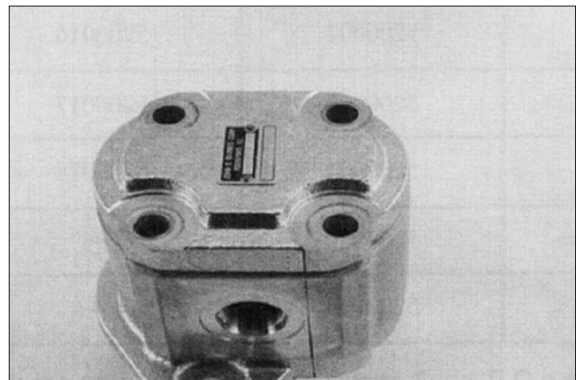
Check to make sure the intake port in the housing is on the same side as the open end of the E-seal and that the marked lines on the mounting flange and gear housing are in alignment.



PUMP 23

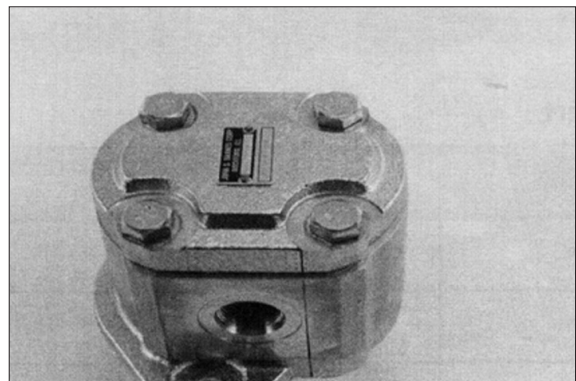
- (14) The surface of the rear bearing block should be slightly below the face of the gear housing. If the bearing block sits higher than the rear face of the gear housing then the E-seal or O-ring have shifted out of the groove. If this is the case, remove the gear housing and check for proper seal installation.

- (15) Install the two remaining dowel pins in the rear of the gear housing and place the end cover over the back of the pump.



PUMP 24

- (16) Install the four spacers and hexagon head bolts through the bolt holes in the end cover, hand tighten.



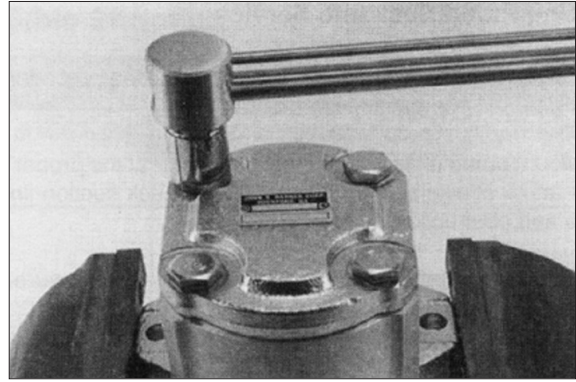
PUMP 25

- (17) Place mounting flange of the pump back in the protected jawed vise and alternately torque the bolts.

· Tighten torque : 6~7 kgf · m
(43.4~50.6 lbf · ft)

- (18) Remove pump from vise.

- (19) Place a small amount of clean oil in the inlet of the pump and rotate the drive shaft away from the inlet one revolution. If the drive shaft binds, disassemble the pump and check for assembly problems, then reassemble the pump.

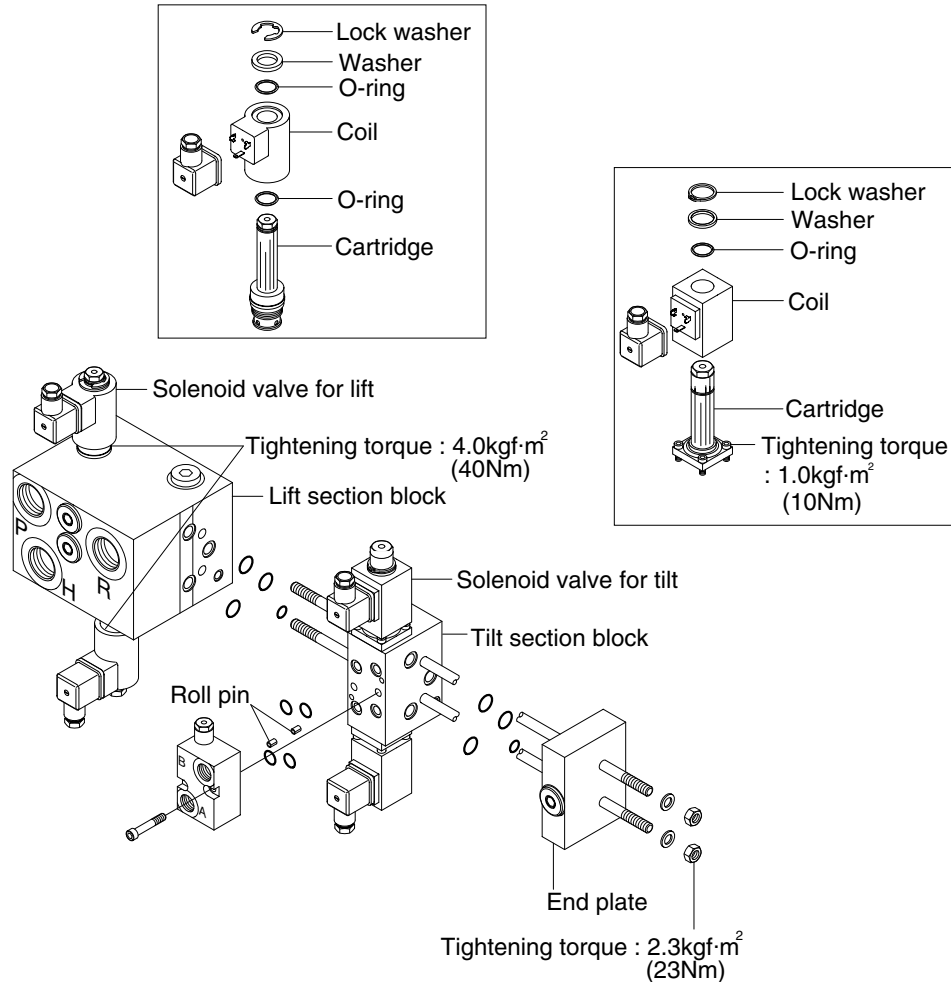


PUMP 26

2. MAIN CONTROL VALVE

Machine serial number

15BRP : -#0089, 18BRP : -#0055, 20BRP : -#0066, 23BRP :- #0049



BRP7HS13

1) ASSEMBLY INSTRUCTION

(1) General

- ① Ensure that the assembly area will be clean and free of contamination.
Use a flat (within 0.5 mm) work surface when bolting the valve sections together.
Use calibrated torque wrenches and instrumentation.

(2) Block subassembly

- ① Attach all the O-ring to the appropriate grooves between the spool section.
- ② Stack the valve section as above picture on a flat surface.
- ③ Insert all the tie rod through the drilled holes in each of the housings.
- ④ Press the sections together being careful not to damage sealing surface or seals.
- ⑤ Install nuts to tie rod and progressively torque in a circular pattern until reaching a torque of 2.3 kgf · cm² (23 Nm) on all the rods.

(3) Lift block solenoid assembly

- ① The solenoid is installed upper side and below side cavities in lift block. Torque to 4.1 kgf · cm² (40 Nm)
- ② Install the O-ring, coil, O-ring and washer to the assembled cartridge.
- ③ Insert the lock washer to the groove of the cartridge.

(4) Tilt & Auxiliary section assembly

- ① The solenoid is installed upper side and below side in tilt & auxiliary block with bolts.
Torque to 1 kgf · m (10 Nm)
- ② Install the coil, O-ring and washer to the assembled cartridge.
- ③ Insert the snap ring to the groove of the cartridge.
- ④ Insert the roll pin to the pin hole on the front side of each block.
- ⑤ Place the O-rings in the O-ring grooves.
- ⑥ Install the ancillary blocks to the each body with bolts.

2) DISASSEMBLY INSTRUCTION

(1) General

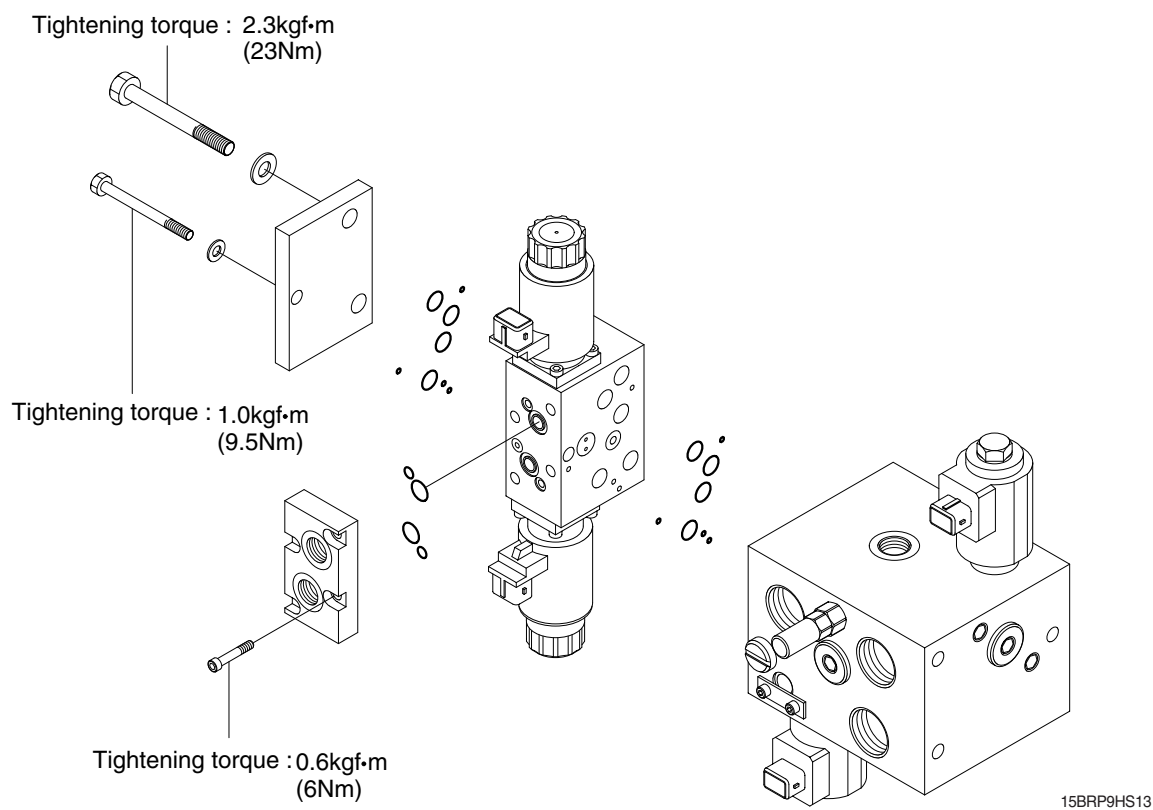
- ① Disassemble the valve sections on the flat working surface.
- ② Ensure that the disassembly area will be clean and free of contamination.
- ③ Keep the disassembly area neat to avoid loss or damage of parts.

(2) Perform the assembly in reverse order

- ① Remove the solenoid valves and ancillary blocks from the main blocks.
- ② Loosen the tie-rods from the valve section.
- ③ Remove the seals between valve section.
- ④ Valve components are precision items, and care must be taken when handling them to avoid damage or the introduction of contamination that could adversely affect performance.

Machine serial number

15BRP : #0090-, 18BRP : #0056-, 20BRP : #0067-, 23BRP : #0050-



1) ASSEMBLY INSTRUCTION

(1) General

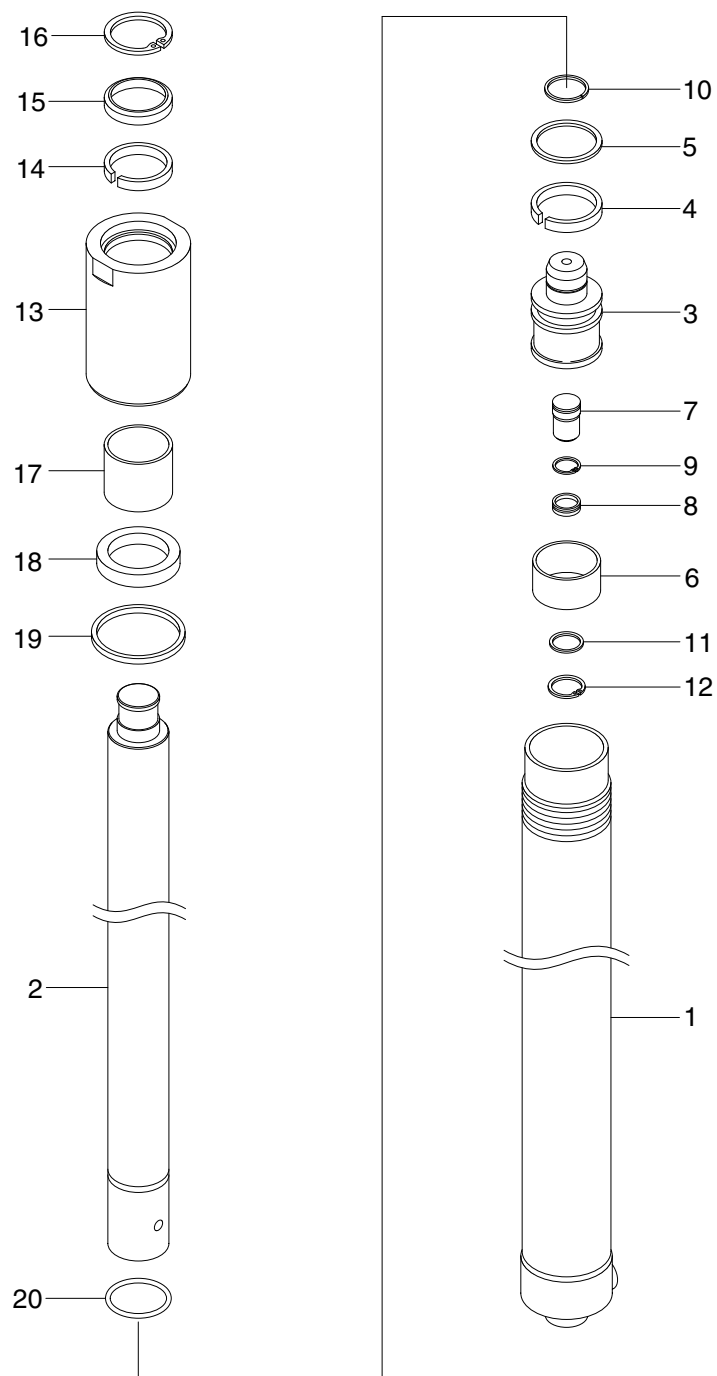
- ① Ensure that the assembly area will be clean and free of contamination.
Use a flat (within 0.5 mm) work surface when bolting the valve sections together.
Use calibrated torque wrenches and instrumentation.

(2) Block subassembly

- ① Attach all the O-ring to the appropriate grooves between the spool section.
- ② Stack the valve section as above picture on a flat surface.
- ③ Insert all the tie rod through the drilled holes in each of the housings.
- ④ Press the sections together being careful not to damage sealing surface or seals.
- ⑤ Install nuts to tie rod and progressively torque in a circular pattern until reaching a torque of 2.3 kgf · cm² (23 Nm) on all the rods.

3. LIFT CYLINDER

1) STRUCTURE



1 Tube assy

2 Rod

3 Piston

4 U-packing

5 Back up ring

6 Wear ring

7 Stop ring

8 Cushion seal

9 Retaining ring

10 Spacer

11 O-ring

12 Stopper

13 Rod bush

14 Rod cover

15 U-packing

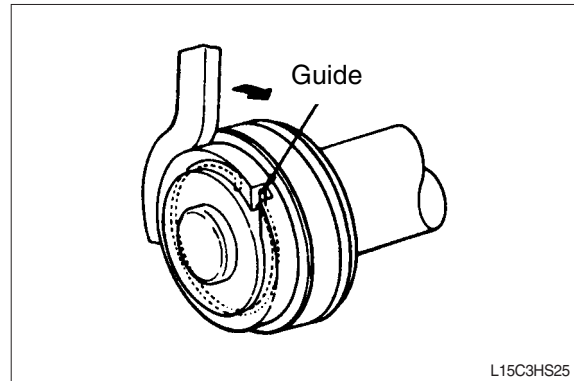
16 Dust wiper

17 O-ring

BRP9HS21

2) DISASSEMBLY

- (1) Hold the cylinder tube in a vice, loosen the cylinder head and remove it.
Remove the spacer from the cylinder tube and knock out the bushing. Hook a wrench in the hole in the retainer at the piston end and turn. Lever up the edge of the guide, then turn the guide in again and the guide can be removed.



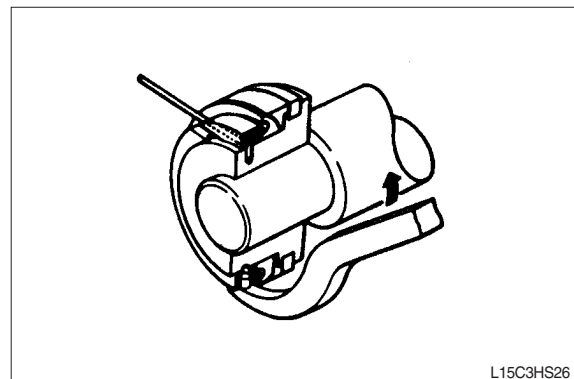
3) CHECK AND INSPECTION

mm (in)

Check item	Standard size	Repair limit	Remedy
Clearance between cylinder rod & bushing	0.072~0.288 (0.003~0.011)	0.5 (0.020)	Replace bushing
Clearance between piston ring & tube	0.05~0.030 (0.002~0.012)	0.5 (0.020)	Replace piston ring

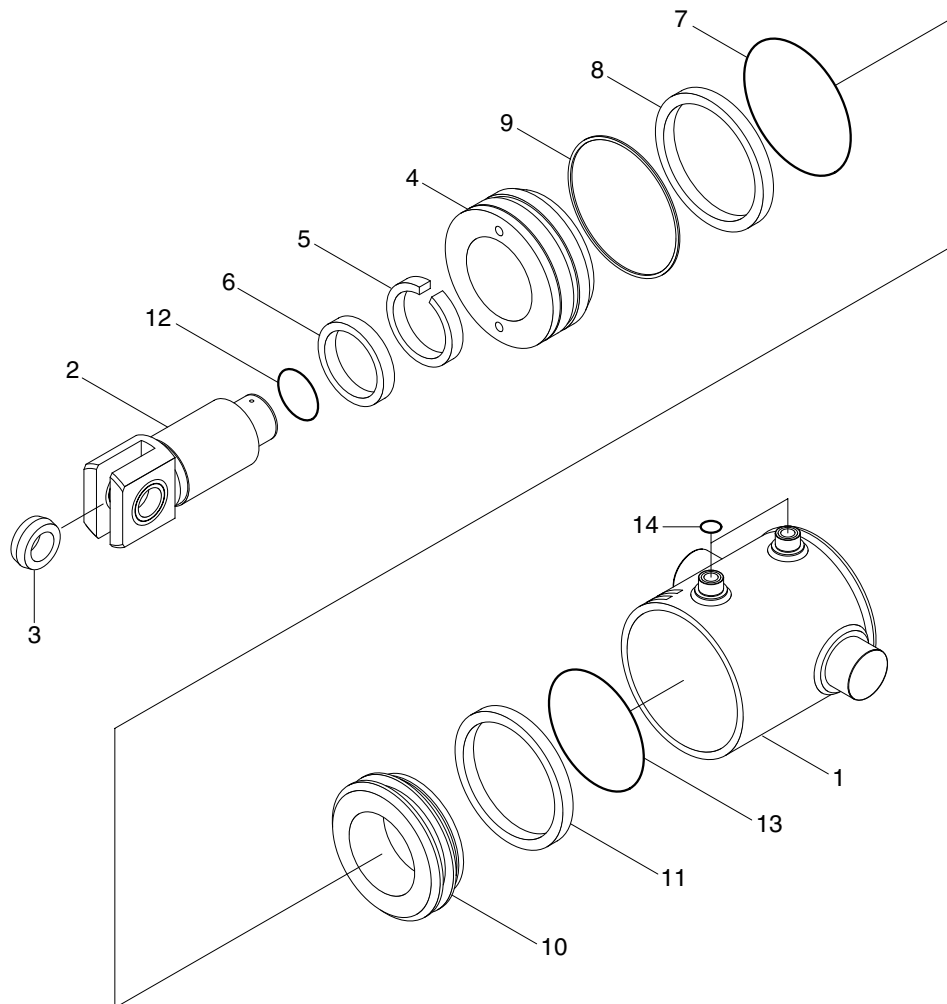
4) ASSEMBLY

- (1) Soak the piston ring in hydraulic oil at a temperature of 40 to 50°C, expand the inside diameter and assemble on the piston. Install a piston seal.
Bend the edge of the guide and rotate it to install the guide completely.



4. TILT CYLINDER

1) STRUCTURE



BRP7HS25

- | | | | | | |
|---|-------------|----|------------|----|--------|
| 1 | Tube assy | 6 | Nylon nut | 11 | O-ring |
| 2 | Rod | 7 | Gland | 12 | O-ring |
| 3 | O-ring | 8 | DU bushing | 13 | O-ring |
| 4 | Piston | 9 | Rod seal | | |
| 5 | Piston seal | 10 | Dust wiper | | |

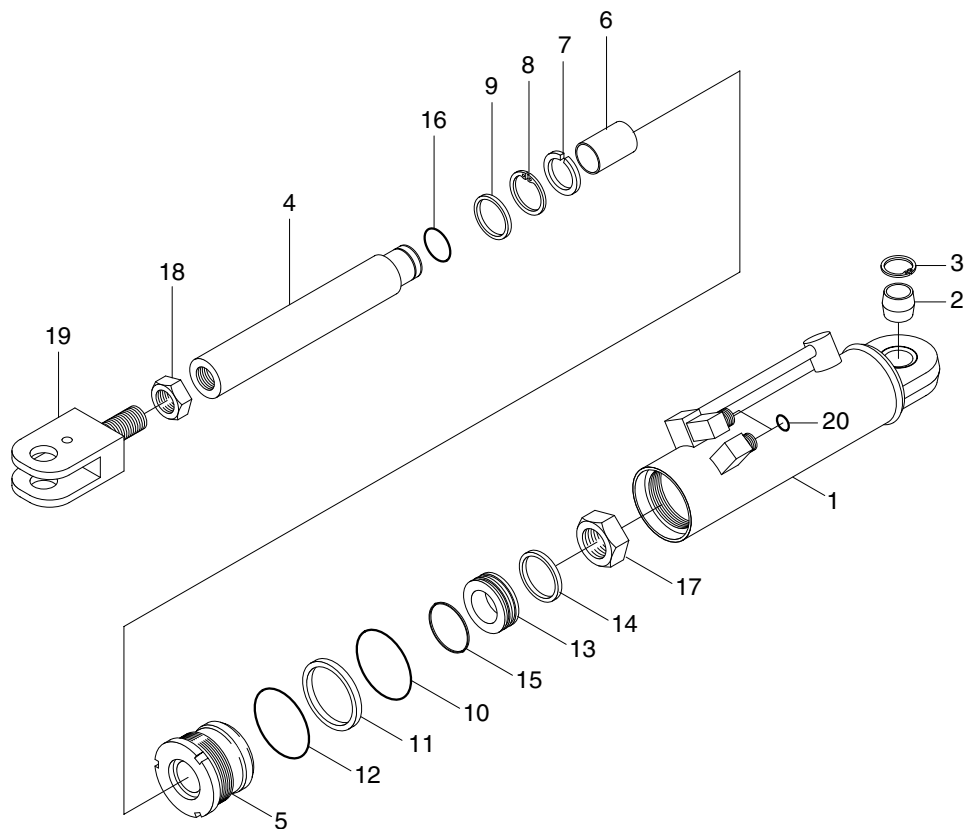
2) CHECK AND INSPECTION

mm (in)

Check item	Standard size	Repair limit	Remedy
Clearance between cylinder rod & bushing	0.072~0.288 (0.003~0.011)	0.5 (0.020)	Replace bushing
Clearance between rod head bushing & pin	0.10~0.35 (0.004~0.014)	0.6 (0.024)	Replace bushing

5. REACH CYLINDER

1) STRUCTURE



BRP7HS27

- | | | | | | |
|---|-------------------|----|--------------|----|--------------|
| 1 | Tube assy | 7 | Rod cover | 13 | Back up ring |
| 2 | Spherical bearing | 8 | Rod bush | 14 | O-ring |
| 3 | Retaining ring | 9 | U-packing | 15 | Piston |
| 4 | Spherical bearing | 10 | Back up ring | 16 | Piston seal |
| 5 | Retaining ring | 11 | Dust wiper | 17 | O-ring |
| 6 | Rod assy | 12 | O-ring | 18 | Hex nut |

2) CHECK AND INSPECTION

mm (in)

Check item	Standard size	Repair limit	Remedy
Clearance between cylinder rod & bushing	0.072~0.288 (0.003~0.011)	0.5 (0.020)	Replace bushing
Clearance between rod head bushing & pin	0.10~0.35 (0.004~0.014)	0.6 (0.024)	Replace bushing