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# SECTION 1 GENERAL



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## 5. TORQUE CHART

Use following table for unspecified torque.

### 1) BOLT AND NUT

#### (1) Coarse thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6 × 1.0	0.85 ~ 1.25	6.15 ~ 9.04	1.14 ~ 1.74	8.2 ~ 12.6
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.7 ~ 4.1	19.5 ~ 29.7
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60.0
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 81.0	9.8 ~ 15.8	70.9 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 163
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.0	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 344
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	349 ~ 458	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.0	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1656
M36 × 4.0	174 ~ 236	1261 ~ 1704	250 ~ 310	1808 ~ 2242

#### (2) Fine thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8 × 1.0	2.2 ~ 3.4	15.9 ~ 24.6	3.0 ~ 4.4	21.7 ~ 31.8
M10 × 1.2	4.5 ~ 6.7	32.5 ~ 48.5	5.9 ~ 8.9	42.7 ~ 64.4
M12 × 1.25	7.8 ~ 11.6	56.4 ~ 83.9	10.6 ~ 16.0	76.7 ~ 116
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 131	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 195	26.6 ~ 36.0	192 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 391	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 516	70.7 ~ 95.7	511 ~ 692
M24 × 2.0	67.9 ~ 91.9	491 ~ 665	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1339	182 ~ 248	1314 ~ 1796
M36 × 3.0	192 ~ 260	1390 ~ 1880	262 ~ 354	1894 ~ 2562

## 2) INSTALLATION

After assembling mast components totally without piping connections, install mast assembly to the equipment.

※ Installation procedure for each of mast component is the reverse of the removal procedure.

### (1) MAST SUPPORT CAP

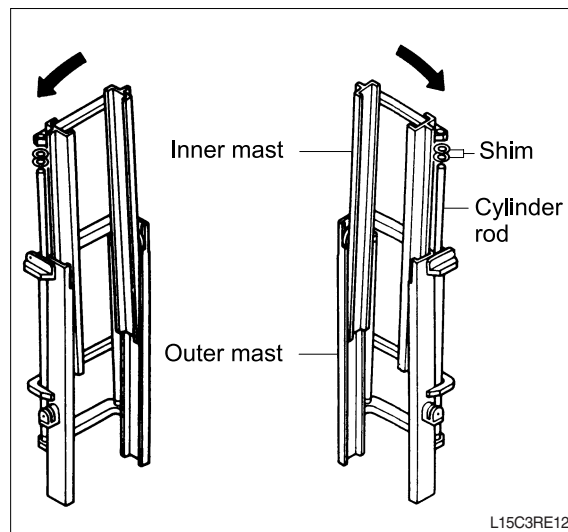
- ① Check the mast support cap and spring pin for wear.
- ② Jack up the machine so that the front is raised and then using an overhead hoist assemble outer mast to drive axle unit.
- ③ Tighten mounting bolts to mast support cap.
  - Tightening torque : 19.9~26.9kgf · m(144~194.5lbf · ft)

### (2) TILT CYLINDER PIN

Hold the mast with a crane, operate the tilt control lever and align the holes, then knock the pin.

### (3) LIFT CYLINDER INSTALLATION AND ADJUSTMENT

- ① Assemble the lift cylinder inside the outer mast, then tighten the stopper bolt. If the cylinder assembly has been replaced, adjust as follows so that the left and right cylinders are synchronized at the maximum lifting height.
  - ② Assemble the cylinder rod to the inner mast, and check the left-to-right play of the mast at the maximum lifting height.
- ※ If play is to LEFT, install adjustment shim to LEFT cylinder.
- ※ If play is to RIGHT, install adjustment shim to RIGHT cylinder.
- Shim thickness : 1.0mm(0.04in)

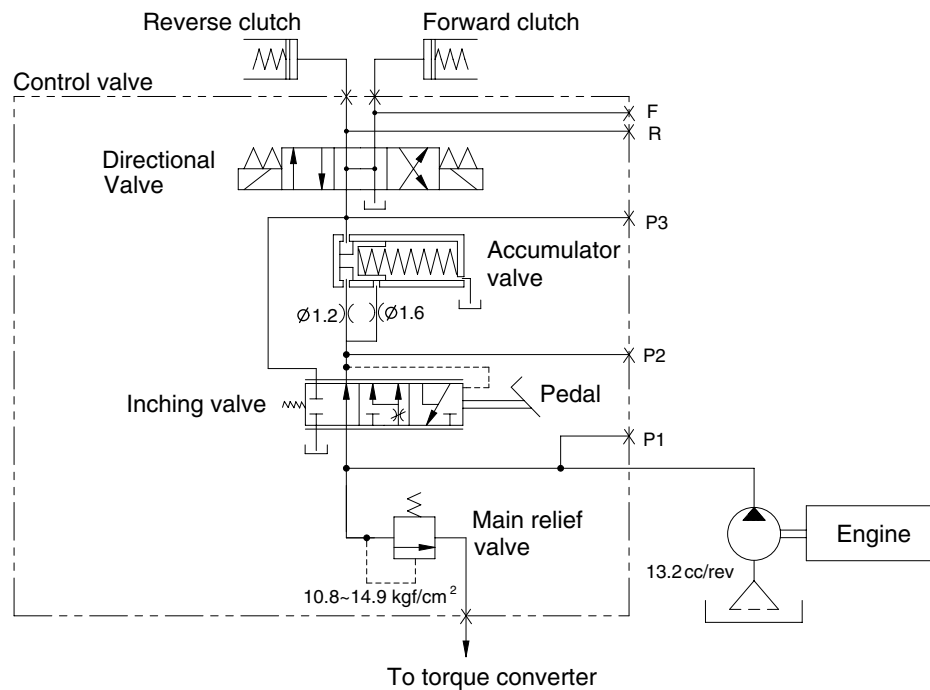


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## SECTION 3 POWER TRAIN SYSTEM

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## 2) HYDRAULIC CIRCUIT



D153PT11

## 3) OPERATION

The control valve mainly consists of the main relief valve, inching valve, accumulator valve and directional valve.

The discharged oil from the gear pump enters main relief valve of the control valve and its pressure is adjusted 10.8~14.9kgf/cm<sup>2</sup> (153.6~211.9psi).

The oil sent from the main relief valve flows into the torque converter. The main relief valve is built into the torque converter to prevent excessively raising the oil pressure in the converter due to oil viscosity rising when cold.

Pressure adjusted oil passes through pressure detecting valve, inching valve and directional valve, and operates the forward or reverse hydraulic clutch.

The pressure detecting valve and built in accumulator provide a soft plugging when changing gears. The pressure detecting valve allows the accumulator to absorb the small shocks of rapid pressure build-up and quick release during gear changes. When full pressure builds up, the pressure detecting valve shuts the accumulator off and allows it to empty so it is ready to function again during gear change.

The inching control is actuated through the inching pedal. This permits the clutch to partially disengage, so that engine rpm can be increased for lifting while travel speed remains low.

## 2. HYDRAULIC PRESSURE

- 1) Block wheels of truck, and pull parking lever. Install oil pressure gauge at inlet of control valve.
- 2) Move direction control lever to FORWARD or REVERSE, depress accelerator pedal and run engine at 1500rpm. Measure clutch pressure and torque converter pressure and check that they are within specified range.

## 3. ENGINE STALL SPEED

Move direction control lever to FORWARD or REVERSE, and run engine at maximum speed. Check that maximum engine speed is within specified range.

- ※ This check raises the temperature of the oil in the torque converter, so do not run this test for a long period.

Model	Stall speed
KUBOTA V2203	1600rpm

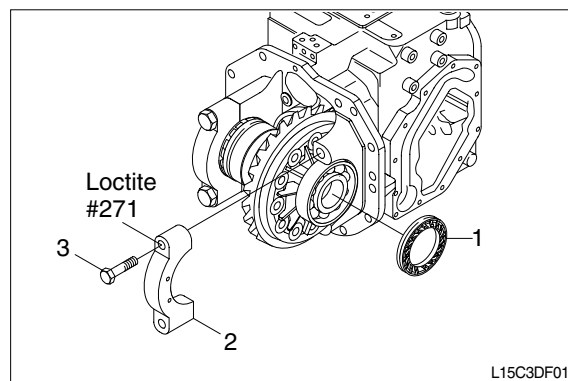
## 4. DIFFERENTIAL

### 1) Fitting differential assembly

- (1) Install the differential assembly and fit adjust screw gear(1).
- (2) Apply loctite in the hole of cap(2), and temporarily tighten with bolt(3).

### 2) Adjustment of backlash

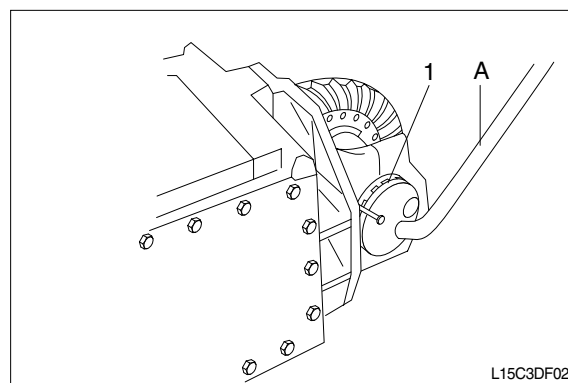
- ※ Tighten the adjust screw gear(1).



- (1) To adjust the backlash, loosen one adjustment screw gear 1 notch and tighten the other screw gear 1 notch. Gradually move the differential case in this way, and watch the indicator of the dial gauge to adjust to the correct value.

· Backlash between ring gear and pinion gear : 0.18~0.23mm(0.007~0.009in).

- (2) Turn the bevel gear to adjust screw gear(1) at 4 places.



## 5) MAINTENANCE STANDARDS

### (1) Hydraulic pressure

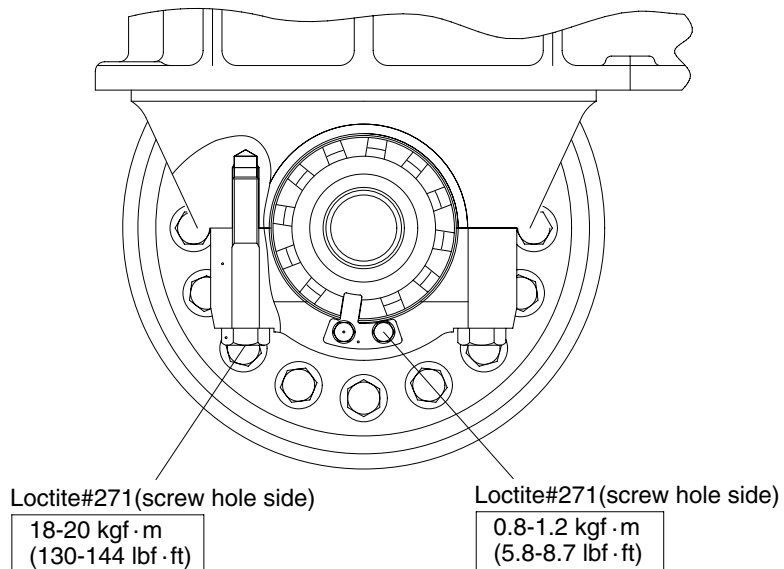
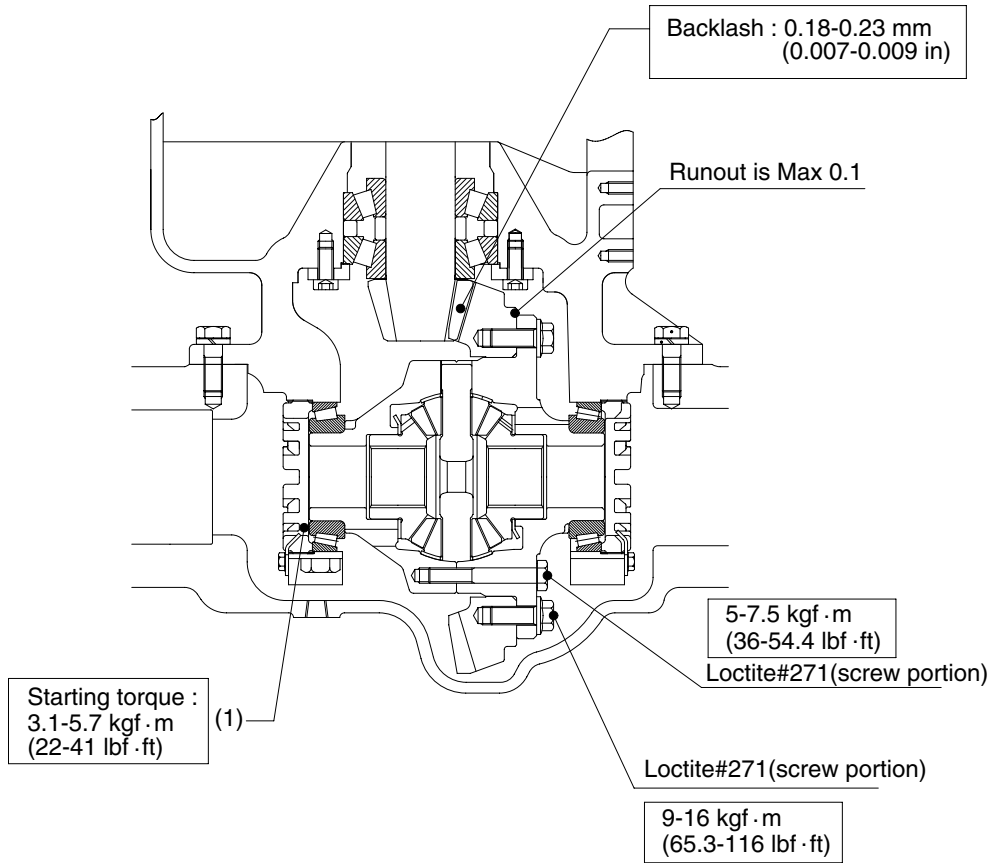
No	Location	Pressure (kgf/cm <sup>2</sup> )	Cracking pressure (kgf/cm <sup>2</sup> )
1	Torque converter input	3 ~ 7	5
2	Torque converter output	2 ~ 5.5	2.3

※ Cracking pressure means the pressure at which the valve begins to open.

### (2) Tightening torques

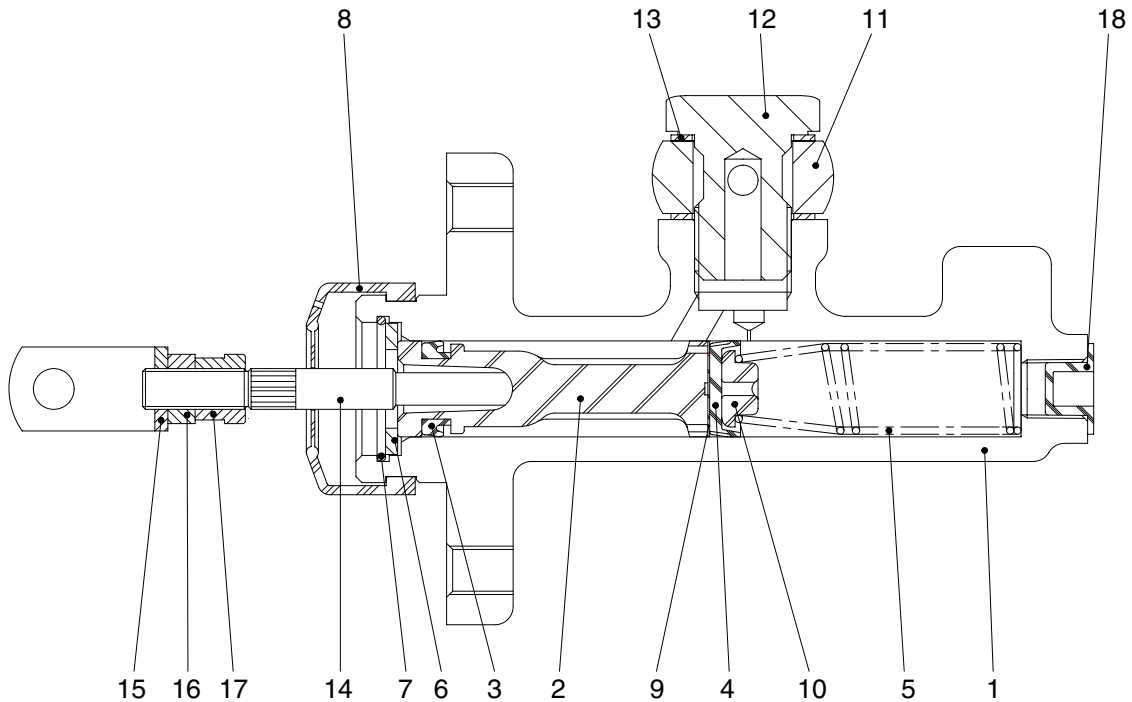
No	Location	Thread specifications		Tightening torque in kgf · m(lbf · ft)	
				Target	Maximum
1	Input plate	Small hexagonal bolt	M8 × 1.25 × 20	2.1(15.2)	2.7(19.5)
2	Pump	Small hexagonal bolt	M8 × 1.25 × 40	2.1(15.2)	2.7(19.5)
3	Valves	Plug	M16 × 1.25 × 10	5.0(36)	6.5(47)
4	Cover	Small hexagonal bolt	M8 × 1.25 × 12	0.98(7)	1.3(9)
5	Torque converter fluid outlets	Hexagonal plug with hole	PT 1/4	3.5(25.3)	4.4(31.8)
6	Pump assembly	Small flathead screw	M5 × 0.8 × 16	0.1(0.72)	0.3(2.2)
7	Blind plug	Hexagonal plug with hole	PT3/4	5.8(42)	7.2(52.1)

## 2) DIFFERENTIAL ASSEMBLY DRAWING



## 6. BRAKE MASTER CYLINDER

### 1) STRUCTURE



L15C3BS04

1	Body	7	Snap ring	13	Washer
2	Piston	8	Boot	14	Rod
3	Secondary cup	9	Spacer	15	Head
4	Primary cup	10	Spring seat	16	Head pin
5	Spring	11	Union	17	Nut
6	Plate	12	Union bolt	18	Cap

### 2) DISASSEMBLY

- (1) Remove the master cylinder boot(8) and remove the rod(14).
- (2) Remove the snap ring(7) and take out the plate(6), the piston(2), the piston primary cup(4), and piston spring(5).
- (3) Specification of master cylinder.
  - Cylinder bore diameter : 15.87mm
  - Piston stroke : 29.0mm

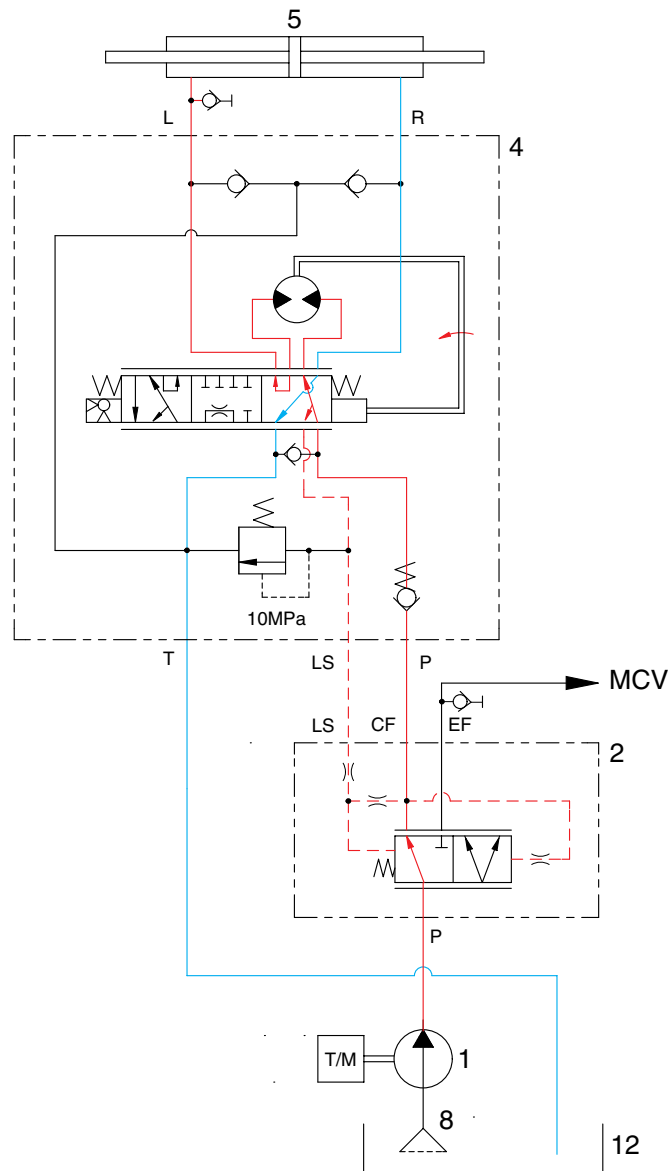
### 3) INSPECTION

- (1) Clean and check these components.
  - ※ Use isopropyl alcohol or brake fluid for washing the components. Do not use gasoline, kerosene or any other mineral oils. When using alcohol, do not leave rubber parts in the liquid for more than 30 seconds.
- (2) Inspect the inside wall of the master cylinder, and if any faults are found, replace the cylinder assembly.
- (3) Replace the boot(8), the primary cup(4), piston(2), if deformation or any other defect is found.

### 4) ASSEMBLY

- ※ Prior to assembly make sure again of no contaminant of the components. Apply a thin coat of brake oil to the components.
  - Assembly is in opposite order to disassembly.

## 2) LEFT TURN



D155SS04

When the steering wheel is turned to the left, the spool(G) within the steering unit(4) connected with steering column turns in left hand direction.

At this time, the oil discharged from the pump flows into the spool(G) the steering unit through the spool(D) of priority valve and flows the gerotor(H).

Oil flow from the gerotor flows back into the spool(G) where it is directed out the left work port(L).

Oil returned from cylinder returns to hydraulic tank(12).

When the above operation is completed, the machine turns to the left.

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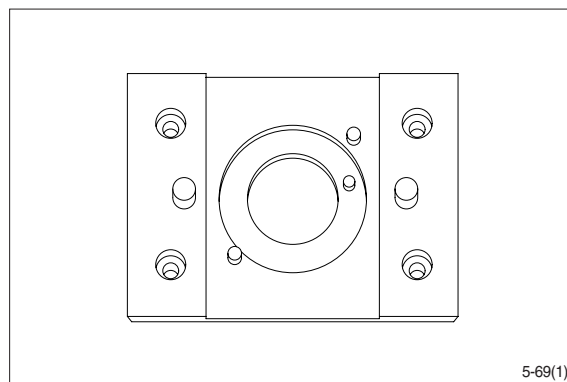


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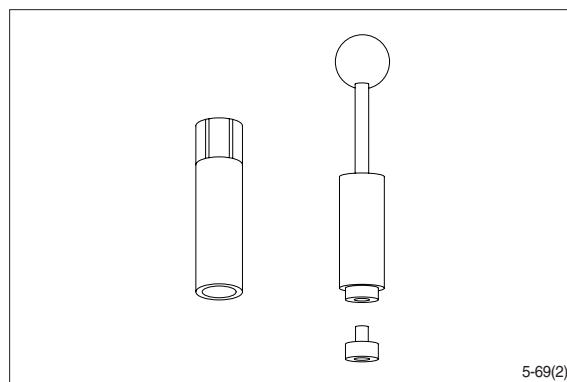
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## 2) TOOLS

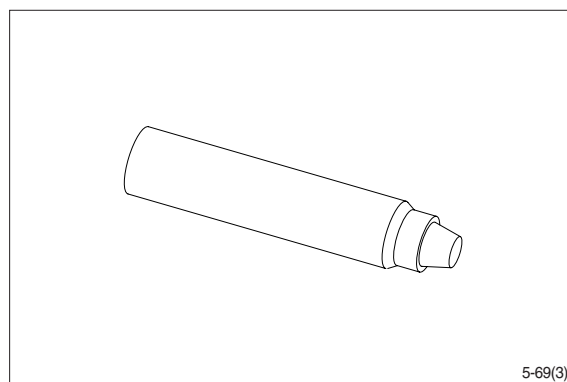
(1) Holding tool.



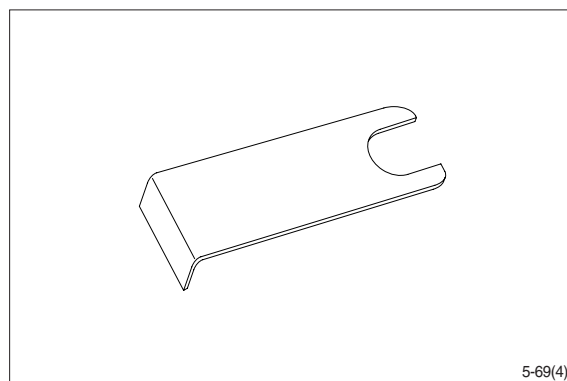
(2) Assembly tool for O-ring and kin-ring.



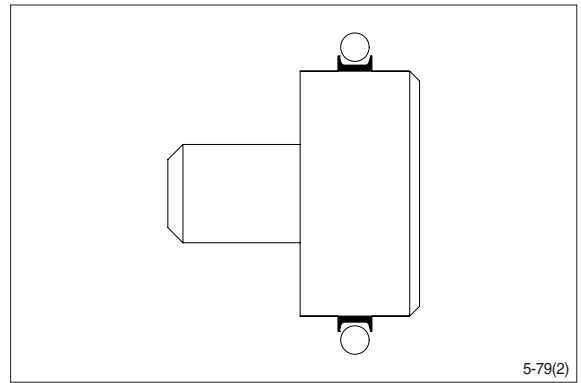
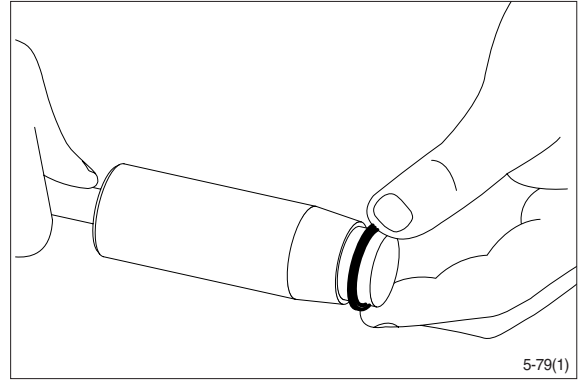
(3) Assembly tool for lip seal.



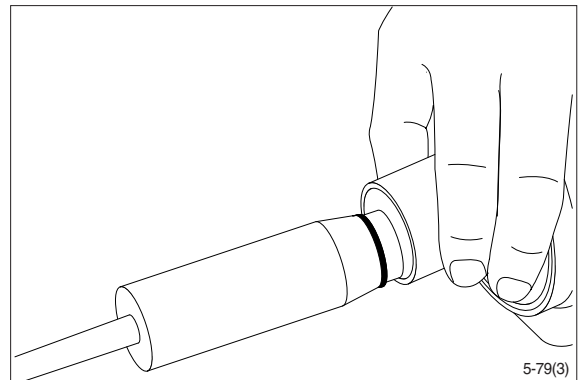
(4) Assembly tool for cardan shaft.



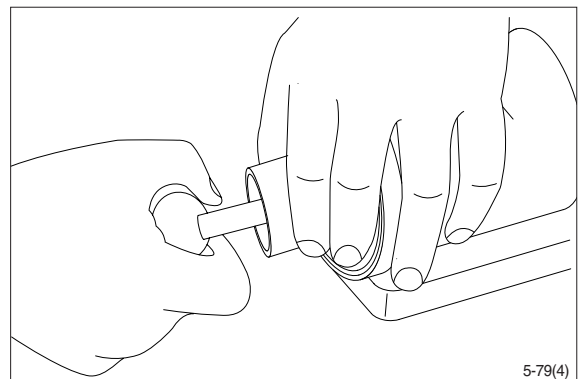
(11) Grease O-ring with hydraulic oil and place them on the tool.



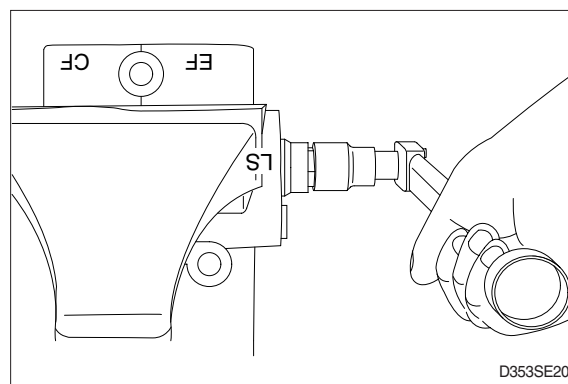
(12) Hold the outer part of the assembly tool in the bottom of the steering unit housing and guide the inner part of the tool right to the bottom.



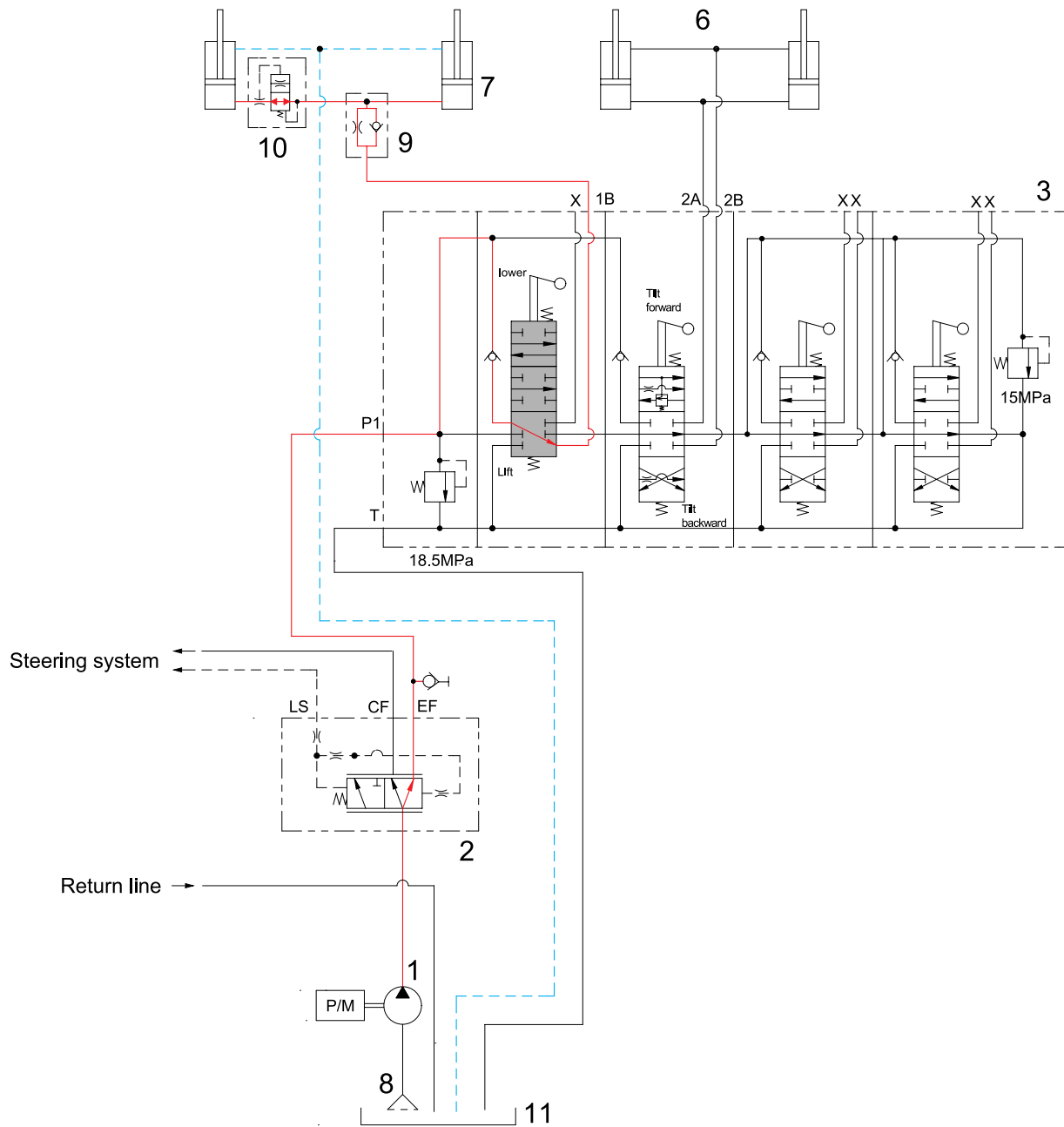
(13) Press and turn the O-ring into position in the housing.



- (4) Install the O-ring(6) onto plug(3) and install the plug(3) into the body(1).  
· Tighten torque : 4.5kfg · m(32.5lbf · ft)



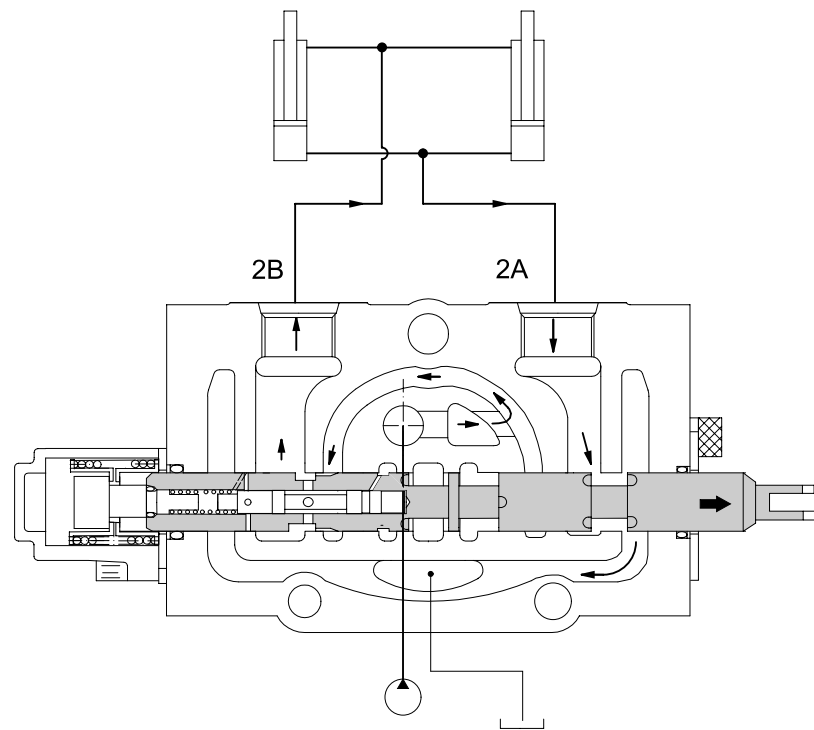
# 1) WHEN THE LIFT CONTROL LEVER IS IN THE LIFT POSITION



D155HS02

When the lift control lever is pulled back, the spool on the first block moves to lift position. The oil from hydraulic gear pump(1) flows into main control valve(3) and then goes to the large chamber of lift cylinder(7) by pushing the load check valve of the spool. The oil from the small chamber of lift cylinder(7) returns to hydraulic oil tank(11) at the same time. When this happens, the forks go up.

## (2) Tilt backward position



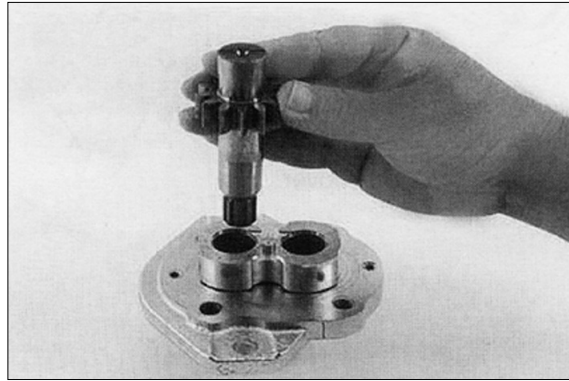
D155HS12

When the tilt control lever is pulled back, the spool moves to the right and the neutral passage is closed.

The oil supplied from the pump pushes up the load check valve(1) and flows into tilt cylinder port(2B). The pump pressure reaches proportionally the load of cylinder and fine control finished by shut off of the neutral passage.

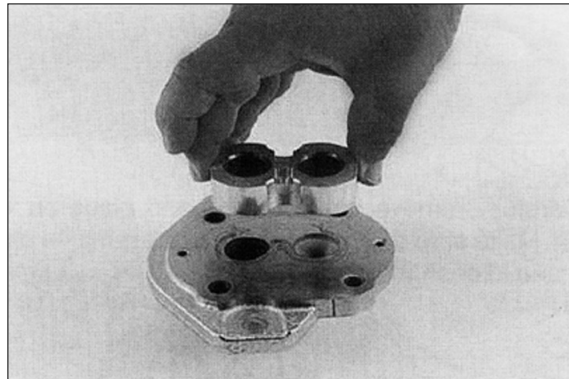
The return oil from cylinder port(2A) flows into the tank via the low pressure passage.

- (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.



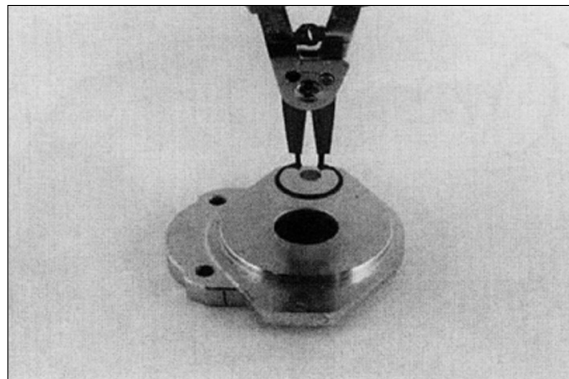
PUMP 07

- (13) Remove the front bearing block.



PUMP 08

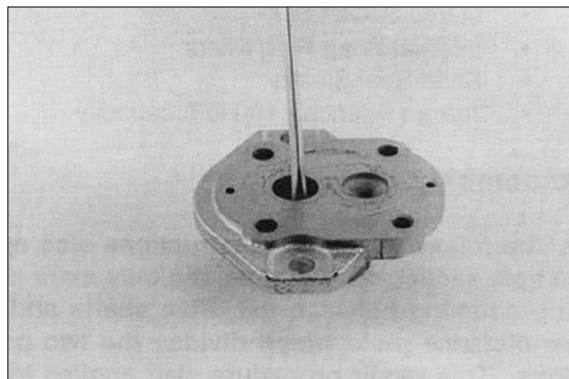
- (14) Turn mounting flange over, with shaft seal up, and remove the retaining ring with proper snap ring pliers.



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.

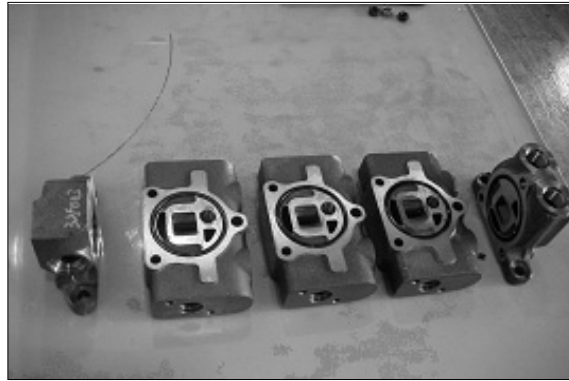


PUMP 10

## 2) ASSEMBLY

### (1) Assembly of load check valve.

Install check poppet, spring, O-ring orderly to each section.



MCV09

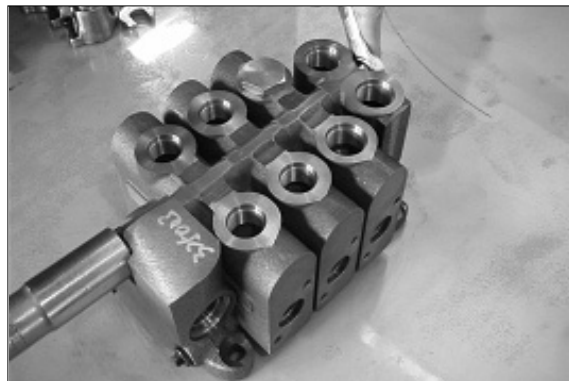
### (2) Array inlet, lift, tilt, aux and outlet block orderly and assemble them with stud bolts so that the O-rings and springs are not to fall off.

Tighten nuts at following torque.

- Tighten in diagonal order.
- Keep the torque value when assembling.
- Tightening torque

M10 : 2.7~3.3kgf · m (19.5~23.9lbf · ft)

M8 : 2.4~2.9kgf · m (17.3~21.0lbf · ft)



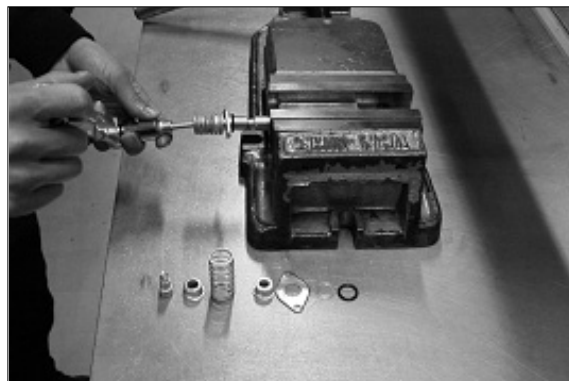
MCV10

### (4) Vise the spool assembly, using a jig.

Install in the order of O-ring, dust wiper, seal plate, spring seat, spring, and special bolt orderly.

#### ※ Install dust wiper with its wing side facing outside.

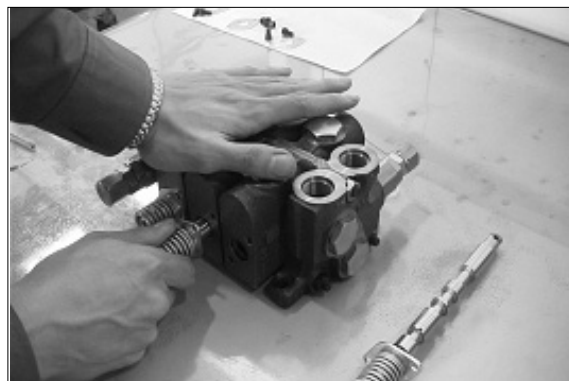
- Tightening torque 1.8~2.2kgf · m  
(13.0~15.9lbf · ft)



MCV11

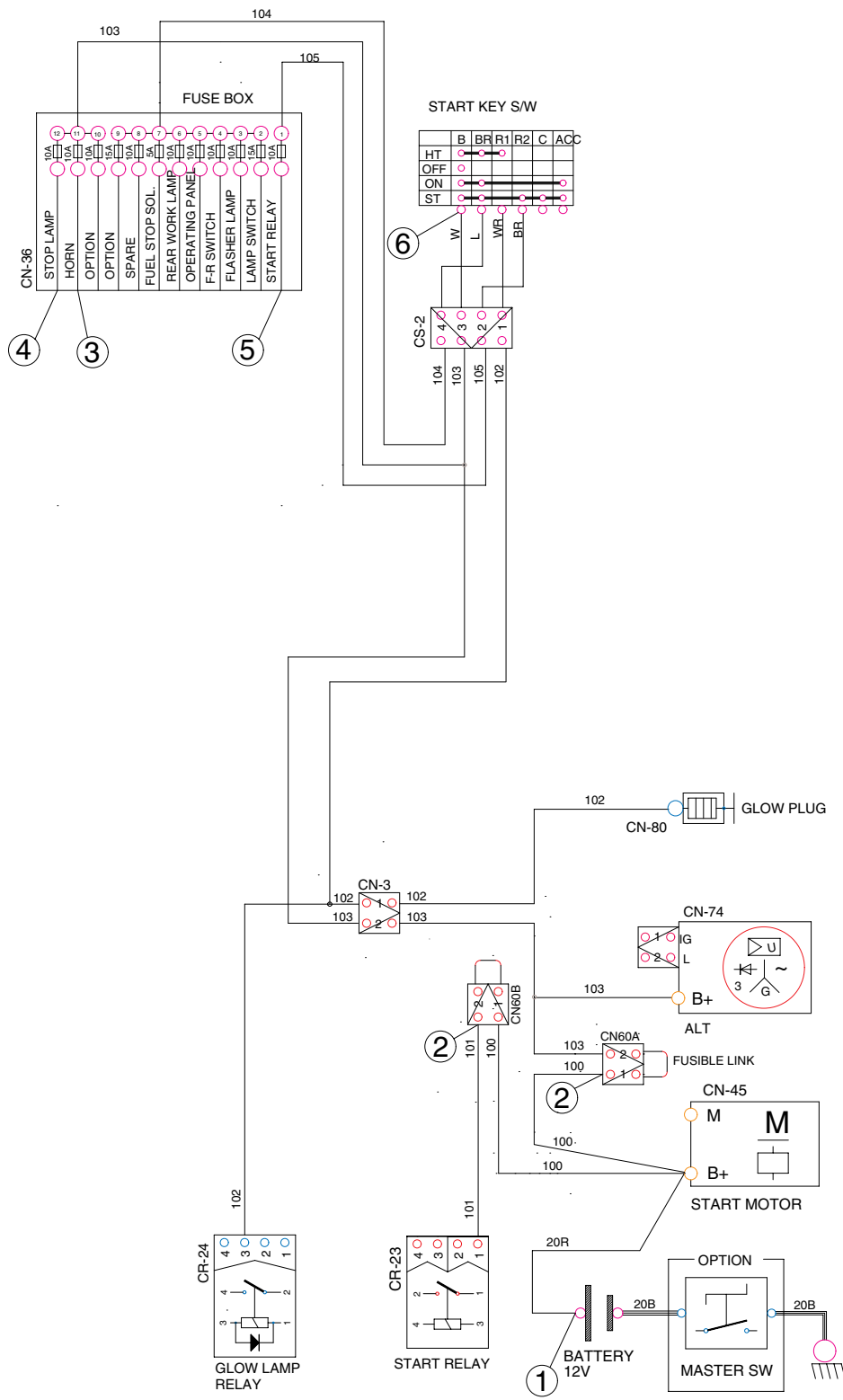
### (5) Install spool assembly to section body smoothly.

- Be careful of damaging the body by forcing the spool into the body.

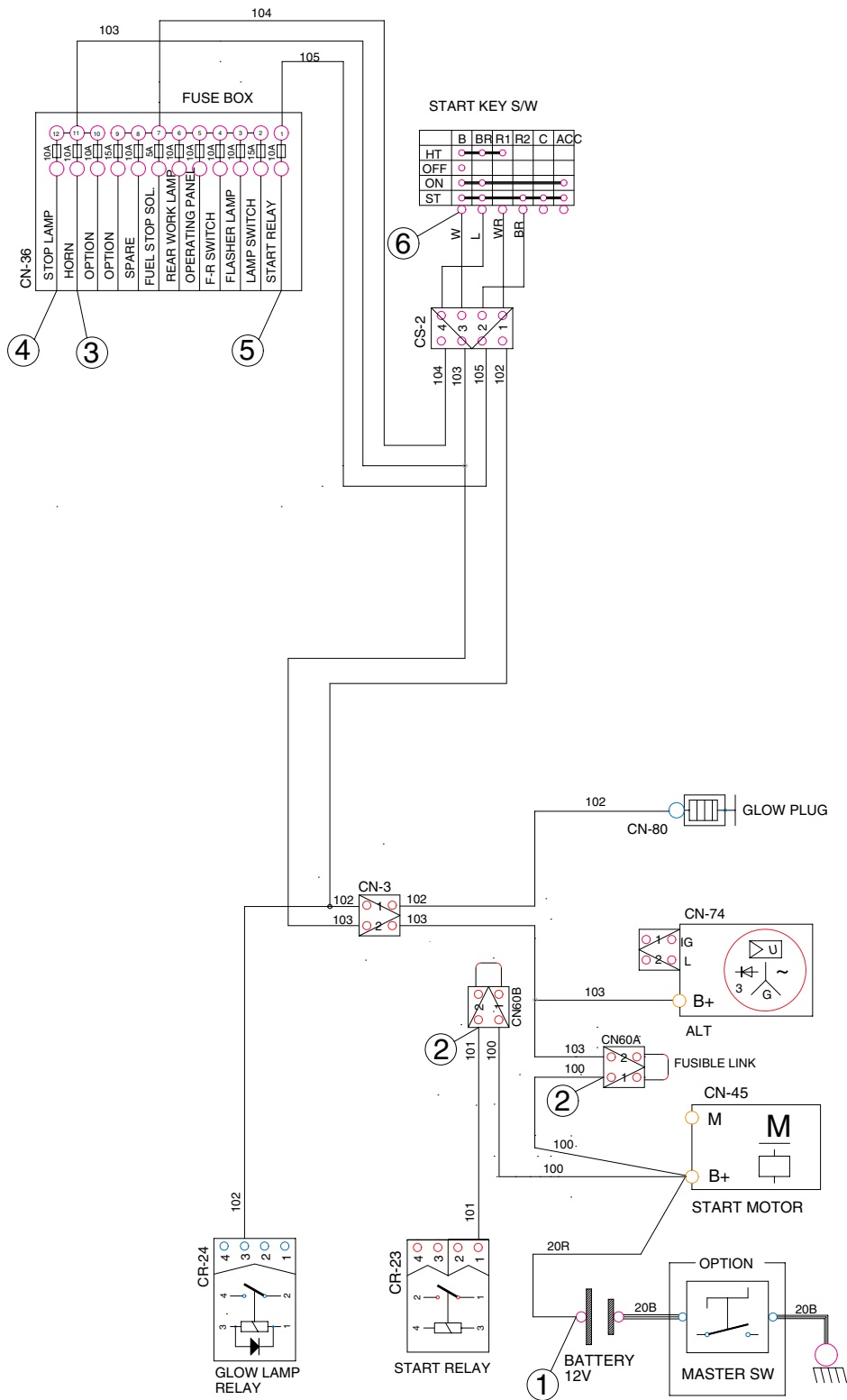


MCV12

# POWER CIRCUIT



# POWER CIRCUIT



D155EL02

# SECTION 8 MAST

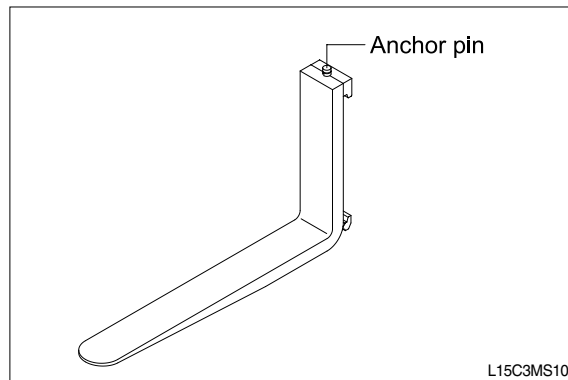


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## GROUP 4 REMOVAL AND INSTALLATION

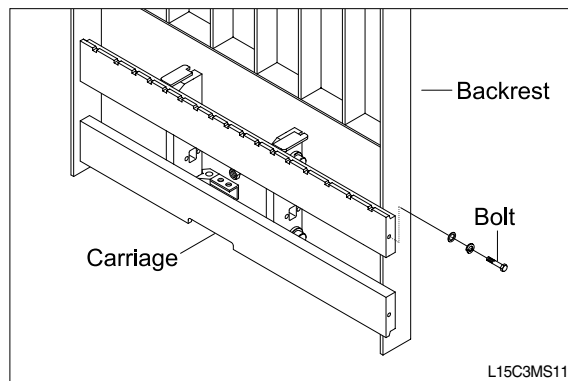
### 1. FORKS

- 1) Lower the fork carriage until the forks are approximately 25mm(1inch) from the floor.
- 2) Release fork anchor pins and slide forks, one by one, toward the center of the carriage where a notch has been cut in the bottom plate for easy fork removal.
- 3) Remove the fork one by one. On larger forks it may be necessary to use a block of wood.
- 4) Reverse the above procedure to install load forks.



### 2. BACKREST

- 1) Remove bolts securing backrest to fork carriage. Lift backrest straight up and remove from carriage.
- 2) Position backrest on carriage and lower in place. Install and tighten bolts.



### 3. CARRIAGE ASSEMBLY

#### 1) CARRIAGE

- (1) With the mast vertical, raise the carriage high enough to place blocks under the load forks. This is done to create slack in the load chains when the carriage is lowered. Lower the carriage all the way down to the floor. Make sure the carriage is level, this will prevent any binding when the mast is raised.
- (2) While supporting lift chains, remove the split pin and slide out chain anchor pins from the chain anchors of stationary upright.
- (3) Pull the chains out of the sheaves and drape them over the front of the carriage.
- (4) Slowly raise elevating upright until mast clears top of fork carriage. Move carriage to work area and lower mast.

**▲ Make sure carriage remains on floor and does not bind while mast is being raised.**

- (5) Inspect all parts for wear or damage. Replace all worn or damaged parts.
- (6) Reverse the above steps to reinstall.

**▲ Replace the split pin of chain anchor with new one.**

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