CONTENTS

SECTION 1 GENERAL

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	2.73 ~ 4.12	19.7 ~ 29.8
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 79.5	9.8 ~ 15.8	71 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 167
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.5	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 343
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	350 ~ 457	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.5	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1655
M36 × 4.0	174 ~ 236	1261 ~ 1703	250 ~ 310	1808 ~ 2242

(2) Fine thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8 × 1.0	2.17 ~ 3.37	15.7 ~ 24.3	3.04 ~ 4.44	22.0 ~ 32.0
M10 × 1.25	4.46 ~ 6.66	32.3 ~ 48.2	5.93 ~ 8.93	42.9 ~ 64.6
M12 × 1.25	7.78 ~ 11.58	76.3 ~ 83.7	10.6 ~ 16.0	76.6 ~ 115
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 130	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 194	26.6 ~ 36.0	193 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 390	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 515	70.7 ~ 95.7	512 ~ 692
M24 × 2.0	67.9 ~ 91.9	491 ~ 664	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1338	182 ~ 248	1314 ~ 1795
M36 × 3.0	192 ~ 260	1389 ~ 1879	262 ~ 354	1893 ~ 2561

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. Apply loctite #277.

· Tightening torque : 23.4±3.5kgf · m (169±25.3 lbf · 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

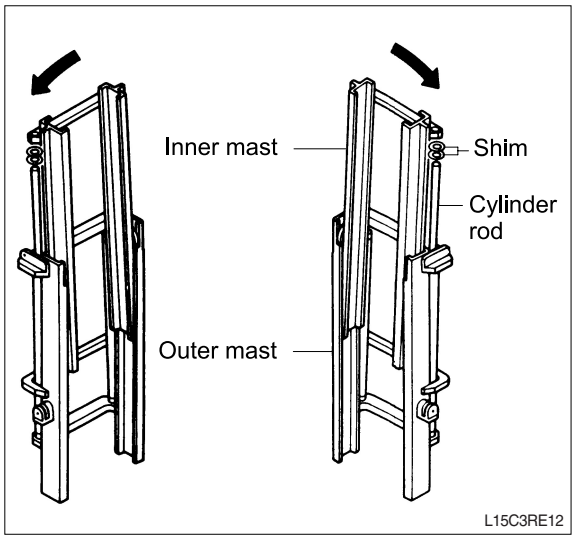
① Assemble the lift cylinder inside the outer mast, then tighten the stopper bolt. If the cylinder assembly has been replaced, adjust as follows so that the left and right cylinders are synchronized at the maximum lifting height.

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.

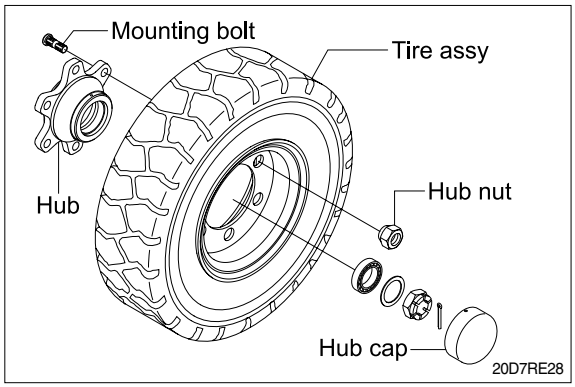
※ If play is to RIGHT, install adjustment shim to RIGHT cylinder.

· Shim thickness : 1.0mm (0.04in)

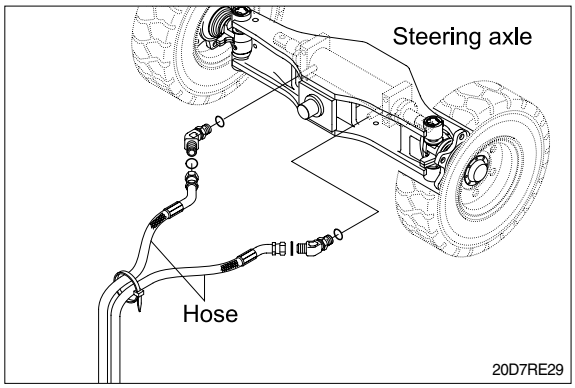


(2) Rear wheel

Remove mounting bolt and hub nut with socket wrench and then carefully take out the tire assembly.



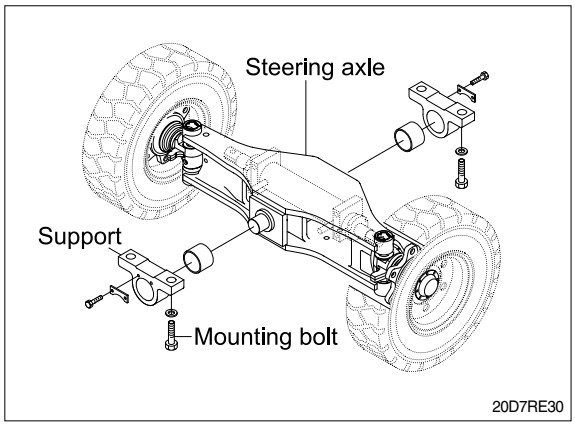
(3) Hose



(4) Mounting bolt

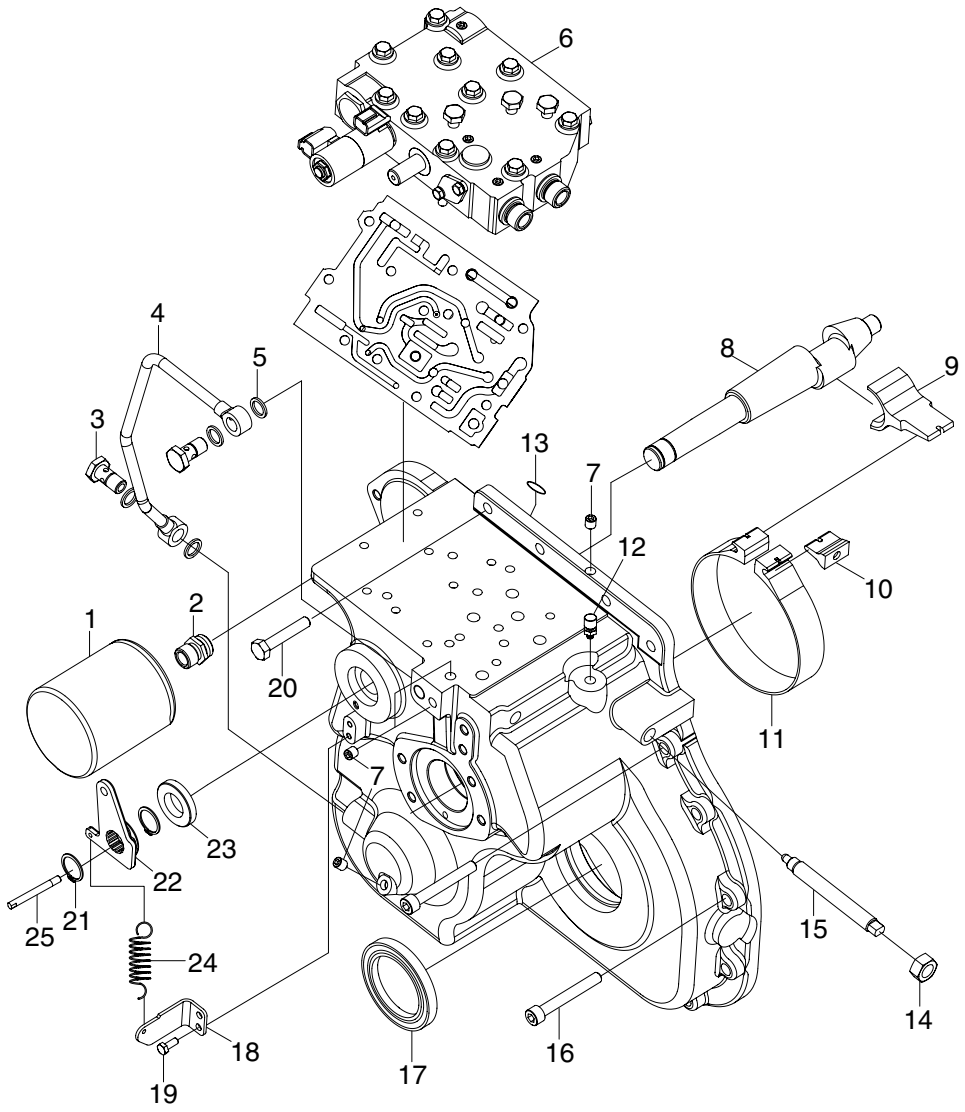
Put a block under the steering axle, support on a truck, an raise the frame with a crane. Remove the mounting bolts installing to the frame, and pull out to the rear.

There are shims between the support and steering axle to prevent play.



6) TRANSMISSION CASE, CONTROL VALVE, OIL PUMP AND PARKING BRAKE

(1) Structure



20D7PT07

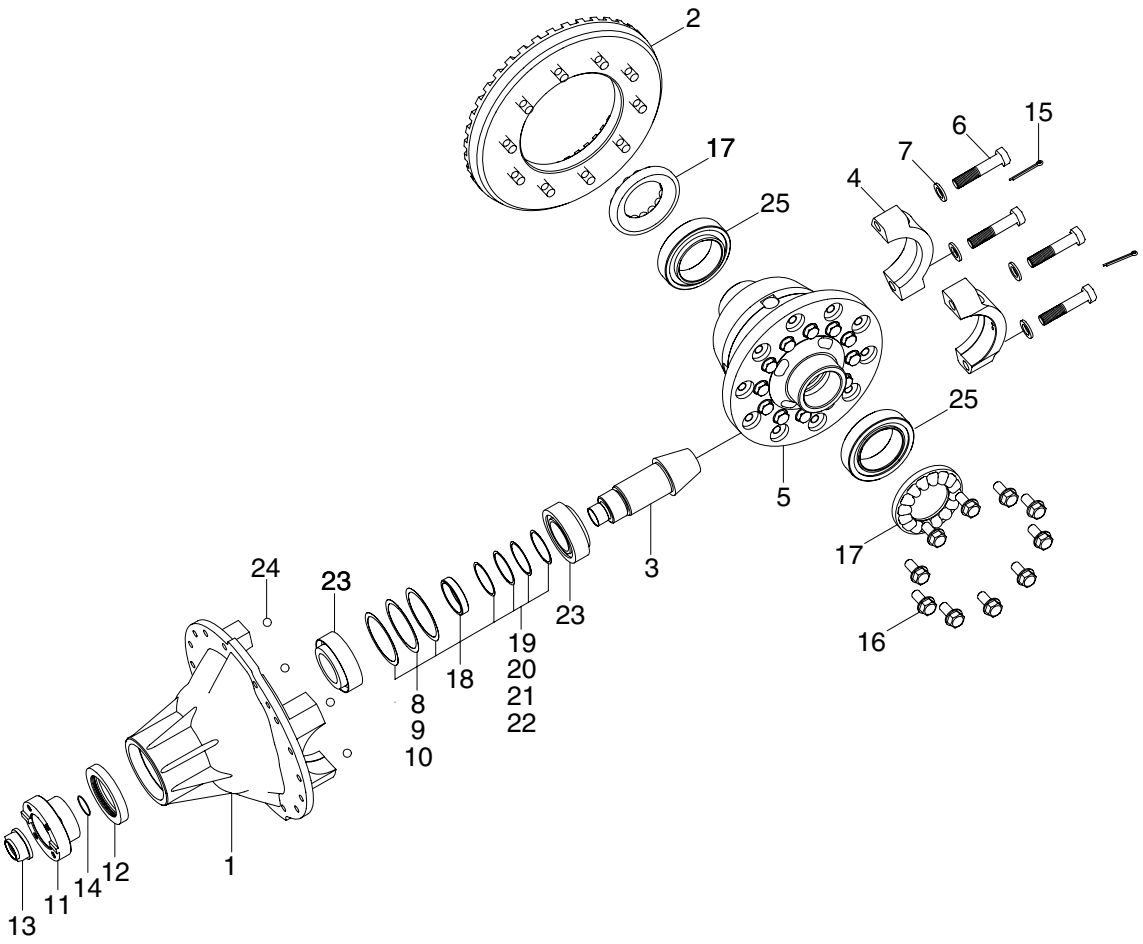
1	Oil filter	10	Parking brake connector (Small)	18	Parking bracket
2	Oil filter bolt	11	Band brake	19	Bolt
3	Bolt	12	Air breather	20	Bolt
4	Pipe	13	O-ring	21	Snap ring
5	Washer	14	Nut	22	Parking lever
6	Control valve	15	Parking brake control shaft	23	Oil seal
7	Plug	16	Bolt	24	Parking return spring
8	Cam shaft	17	Oil seal	25	Stopper pin
9	Parking brake connector (Large)				

3) CARRIER ASSEMBLY

(1) Operation

The pinion shaft is supported by the taper roller bearing in the carrier case and the bolt at the end of a pinion shaft and transfers the power which is delivered from the universal joint to the ring gear assembled from bolts at a differential device.
This power makes the differential device run.
Since the differential device is connected with an axle shaft and a spline, the power transferred to differential device is delivered to final drive through the axle shaft.

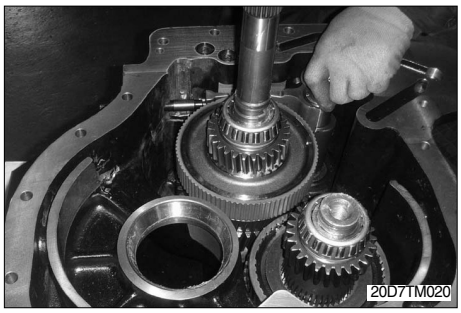
(2) Structure



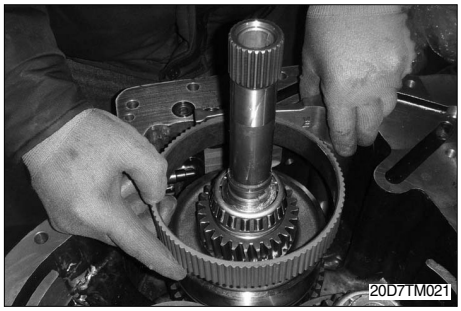
20D7PT18

1	Carrier case	9	Shim	17	Bearing control ring bolt
2	Spiral ring gear	10	Shim	18	Spacer
3	Pinion shaft	11	Universal joint flange	19	Shim
4	Carrier cap	12	Oil seal	20	Shim
5	Differential device	13	Nut	21	Shim
6	Cap bolt	14	O-ring	22	Shim
7	Washer	15	Cotter pin	23	Taper roller bearing
8	Shim	16	Bolt	24	Ball
				25	Bearing

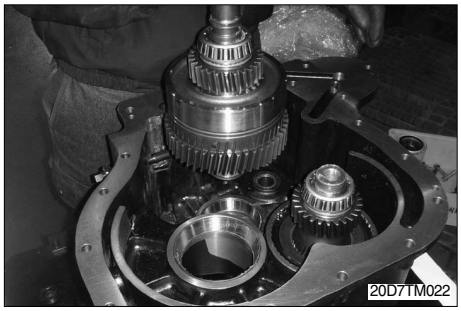
⑲ Disassemble connection.



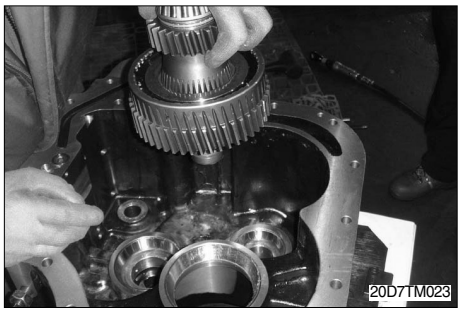
⑳ Extract band brake.



㉑ Disassemble forward clutch gear.

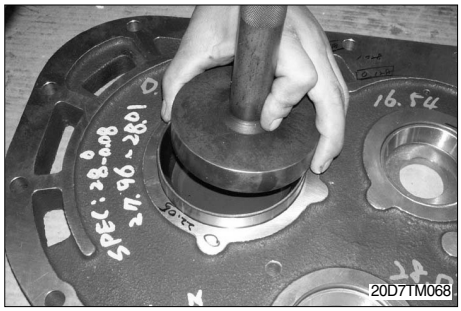


㉒ Disassemble reverse clutch gear.



㉓ After disassemble.

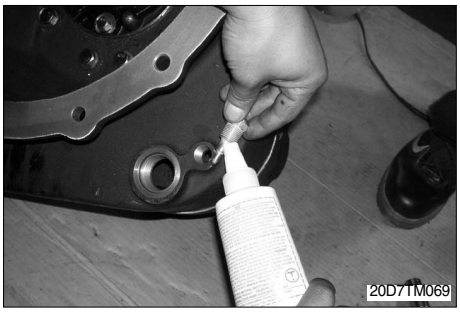
③ Pressurize O part of bearing out wheel.



(4) Assembly of torque converter housing sub assembly

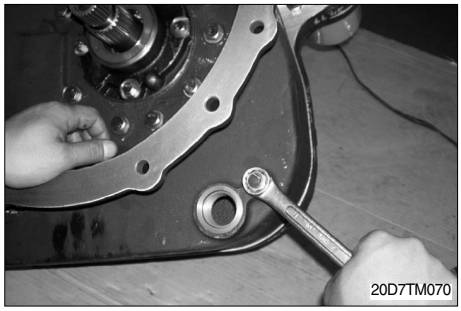
Assembly of temperature sensor and O-ring

① Spread loctite #577 on temperature sensor.

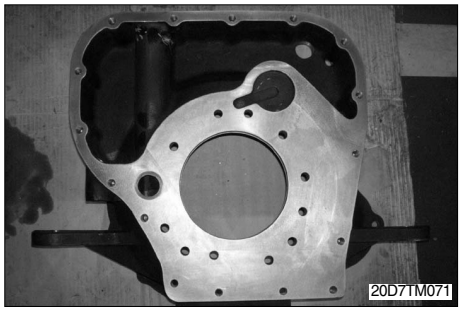


② Confirm assembly and torque.

· Tightening torque : 3.0~4.0 kgf · m
(22~29 lbf · ft)



③ Assemble O-ring and spread grease.

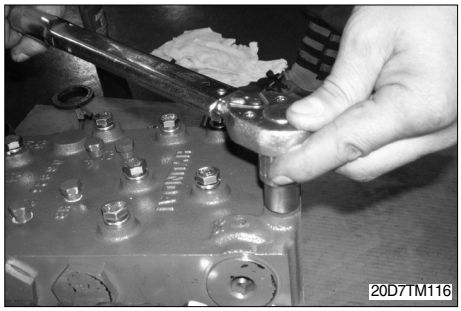


Oil strainer assembly

① Fix spring in strainer.

③ Assemble hex bolt and confirm torque.

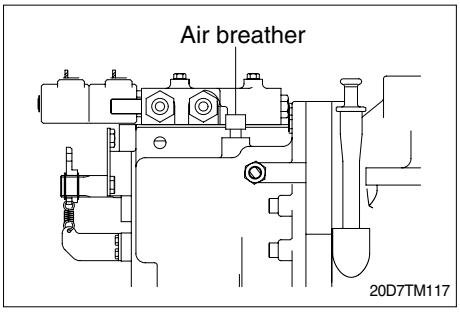
· Tightening torque : 3~4 kgf · m
(22~29 lbf · ft)



Air breather and oil level gauge guide pipe assembly

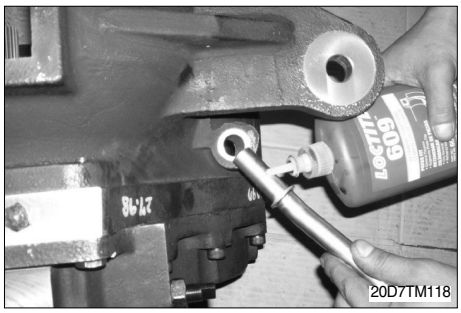
① Assemble air breather.

※ Spread loctite #577 on air breather.

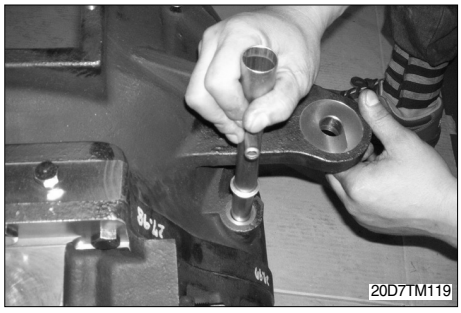


② Spread sealant on oil level gauge guide.

※ Spread loctite #608 on pipe.



③ Pressurize guide.



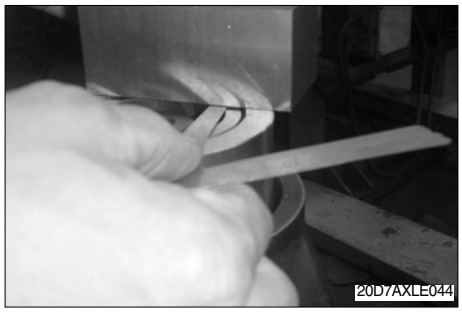
⑮ Measure a gap (B).

※ Determine shim X.

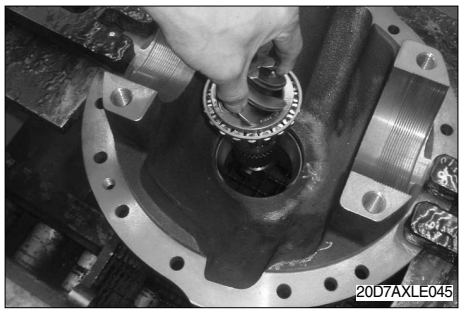
· X = B - End play (0.03~0.06)

Ex 1) B = 0.5,

X = 0.5 - (0.03~0.06) = 0.47~0.44㎜

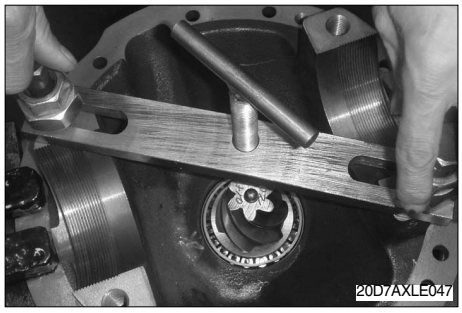


⑯ Remove the pinion shaft.

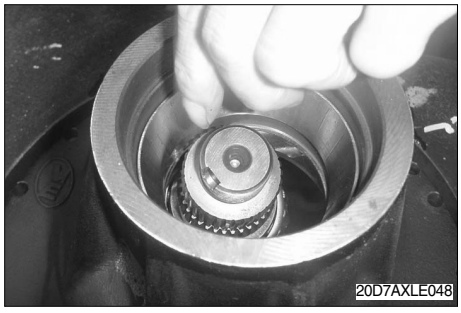


⑰ Assemble the bearing cup.

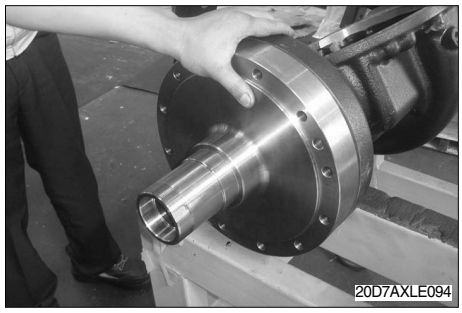
⑱ Assemble and fit the pinion.



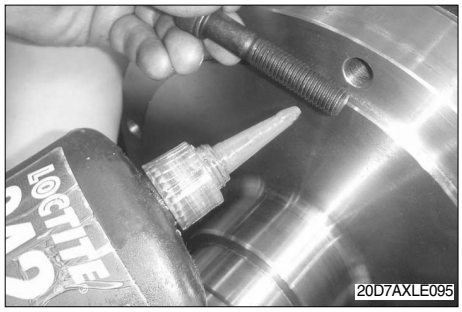
⑲ Assemble the shim.



④ Fit flange into drive axle housing.

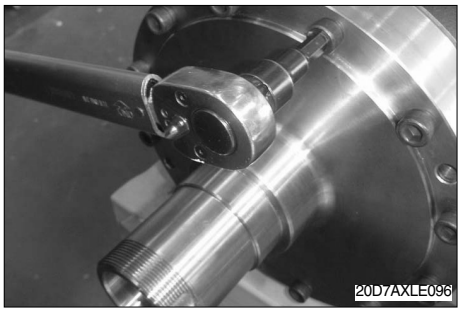


⑤ Spread loctite #242 on bolt.



⑥ Fasten bolt.

· Tightening torque : 9~11.5 kgf · m
(65~83 lbf · ft)

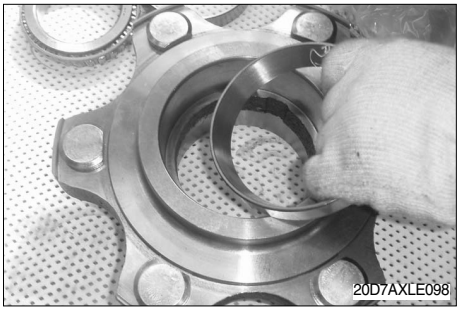


(3) Hub assembly

Hub sub assembly

① Pressurize bolt.

② Put a bearing cup on the upper and lower of hub.



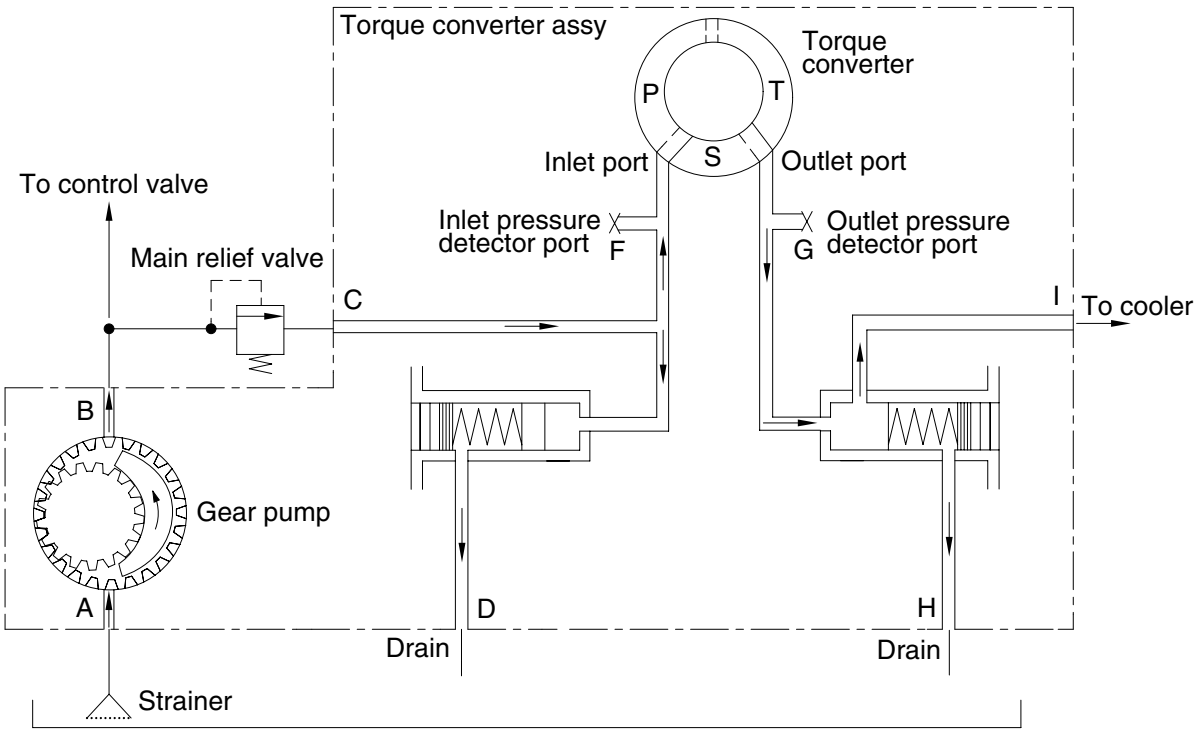
2) OPERATION

The torque converter is connected with a flywheel by a flexible plate, engine output is delivered from the flywheel to the flexible plate.

The exterior of the torque converter is protected by the torque converter housing.

The torque converter housing forms the oil path for the oil pump, it includes the oil strainer filtering sucked oil through this oil path and the oil level gauge measuring oil level of the transmission inside.

3) TORQUE CONVERTER HYDRAULIC CIRCUIT



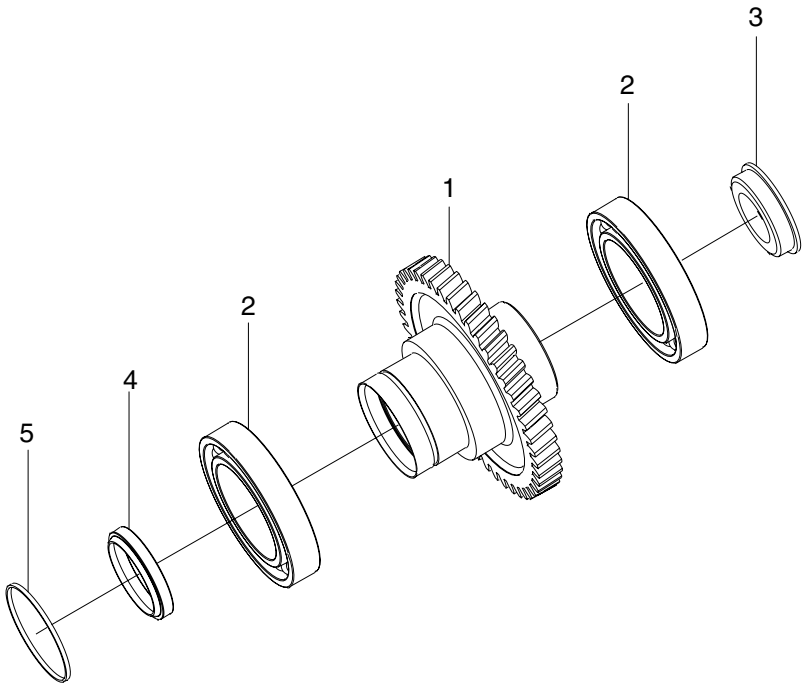
20D7PT04

8) OUTPUT GEAR

(1) Operation

The output gear is engaging the forward clutch gear and reverse clutch gear together.
If a driver selects forward, the forward clutch gets plugging, the forward clutch gear revolves and the power of forward clutch gear is delivered to output gear.
If a driver selects reverse, the reverse clutch gets plugging, the reverse clutch gear revolves and the power of reverse clutch gear is delivered to output gear.

(2) Structure

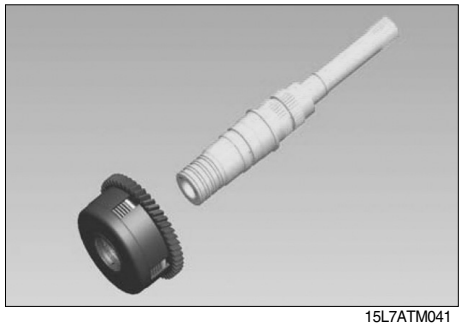


15L7APT14

1 Output gear
2 Ball bearing
3 Cover
4 Oil seal
5 Seal ring

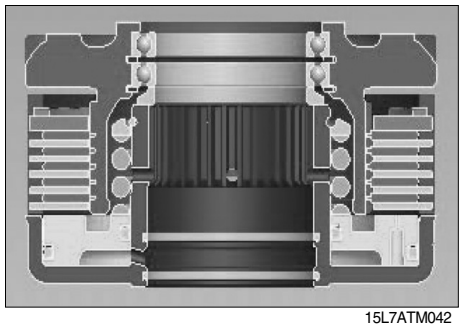
Trouble symptom	Probable cause	Remedy
4. Brake does not apply		
1) Service brake. - Low or no pressure to brake.	· Empty fluid reservoir.	· Fill reservoir to correct level with specified fluid.
	· Damaged hydraulic system.	· Check hydraulic system.
	· Leakage of brake actuation fluid.	· Refer to "Brake leaks actuation fluid" in trouble shooting.
2) Parking brake	· Parking brake not adjusted properly.	· Adjust parking brake lever as described in chapter 3.2) Assembly. · Carrier case cover assemble. (Chapter 3.2) Assembly)
5. Brake does not release		
1) Hydraulic system - Vehicle does not move.	· Damaged hydraulic system.	· Check hydraulic system.
2) Service brake - Brakes dragging.	· Damaged piston return spring assembly.	· Check piston return spring assembly.
	· Piston not returning.	· Check piston seals for swelling or damage (Replace as necessary).
	· Wrong cooling and/or actuation fluid used.	· Check piston seals for swelling or damage. Replace as necessary. Purge system and use specified fluid.
3) Differential	· Damaged diff pinion and side gear.	· Change the damaged part.
	· Damaged diff spider.	· Change the damaged part.
	· Damaged differential case.	· Change the damaged part.
	· Damaged ring gear and pinion gear.	· Change the damaged part.
6. Braking performance		
1) Service brake - Noticeable change or decrease in stopping performance.	· Inadequate actuation fluid supply to brakes.	· Replenish fluid in brake system. Check for leakage and correct cause.
	· Inadequate pressure to apply brakes.	· Check brake apply system. Check for leakage in brake system or brakes, and correct cause.
	· Worn or damaged discs.	· Inspect and replace discs if necessary. *As disc wear occurs, make sure brake system can supply adequate fluid to fully apply brakes.
	· Overheated seals and/or discs.	· Inspect and replace discs and seals, if necessary.
- Brake feel spongy/soft.	· Brakes or brake system not properly bled.	· Bleed brakes and brake system.

⑤ Pull out the reverse clutch sub assy.



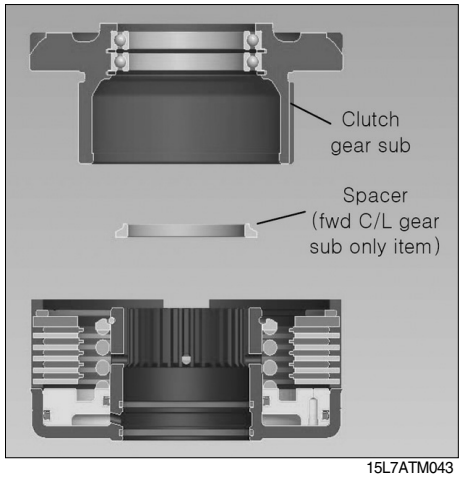
15L7ATM041

⑥ Forward clutch sub assy.



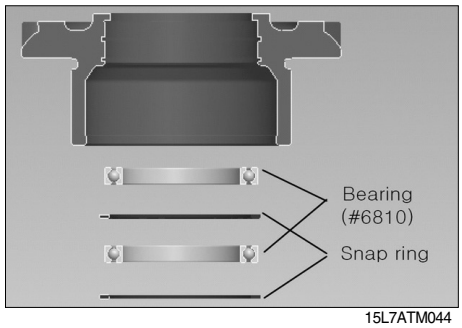
15L7ATM042

⑦ Remove the forward clutch gear sub, and then remove the spacer.



15L7ATM043

⑧ Remove the snap ring, and then remove the bearing.

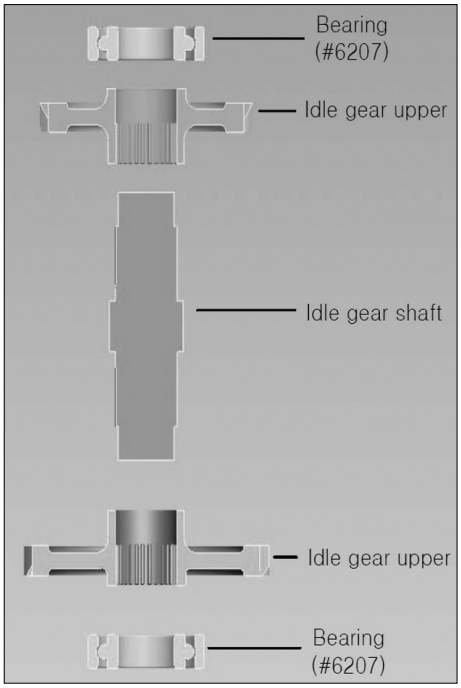


15L7ATM044

Assembling of idle gear assembly.

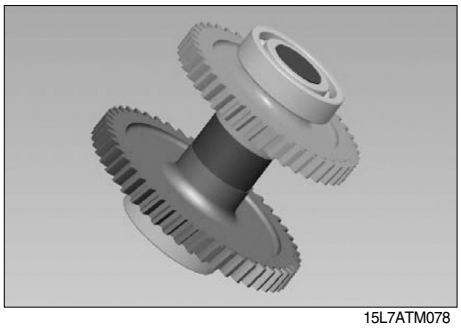
① Press the idle gear upper and idle gear lower at the idle gear shaft, and then assemble the bearing.
- Used method of heating bearing

※ All bearings should never be heated above 120° C

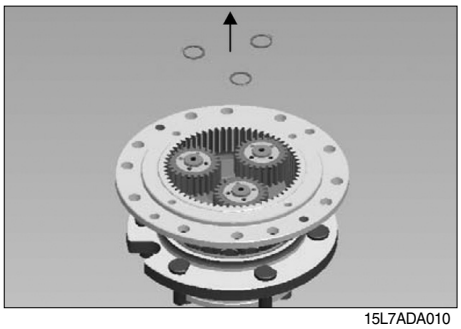


15L7ATM077

② Idle gear assy.

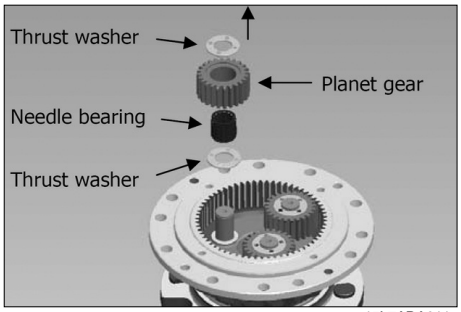

15L7ATM078

(10) Remove all snap rings.



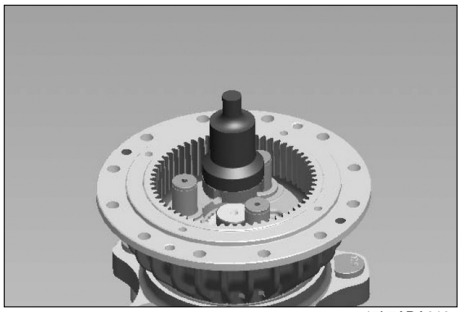
15L7ADA010

(11) Remove all each parts in order of thrust washer → planet gear → needle bearing → thrust washer.



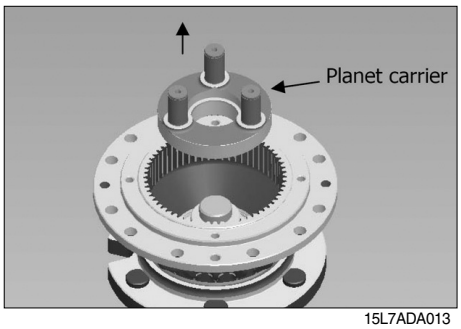
15L7ADA011

(12) Loose lock nut by using jig.



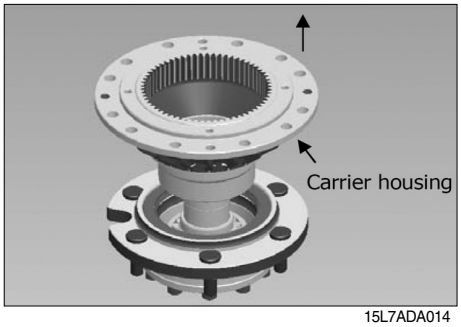
15L7ADA012

(13) Extract planet carrier.



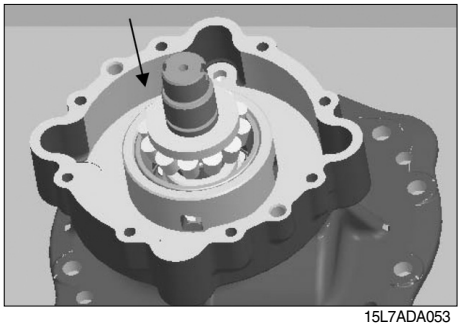
15L7ADA013

(14) Extract carrier housing with bearing.



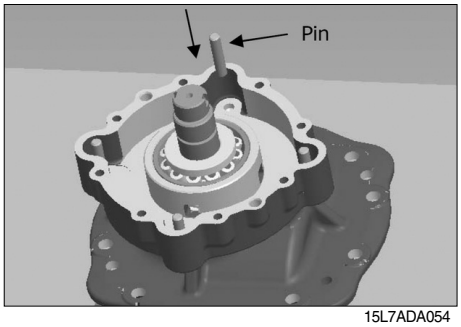
15L7ADA014

⑰ Assemble bearing cone.
Assemble after paste grease on bearing cone roller.


15L7ADA053

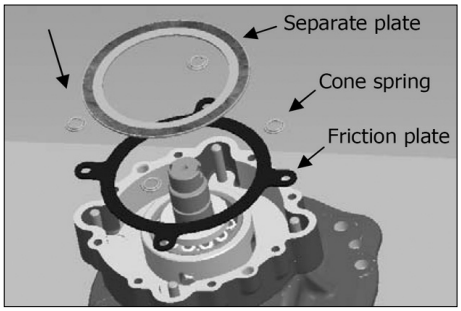
Assemble of parking sub assembly

① Assemble pin into carrier case.



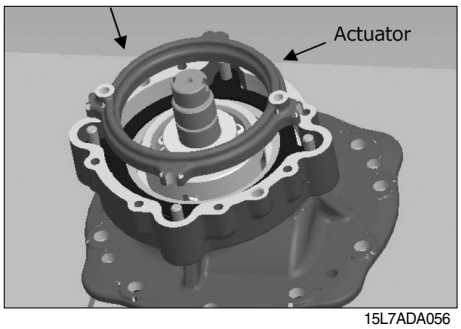
15L7ADA054

② Assemble in order of separate plate → cone spring → friction plate.
But assemble separate plate lastly.
- Separate plates : 4EA
- Friction plates : 3EA



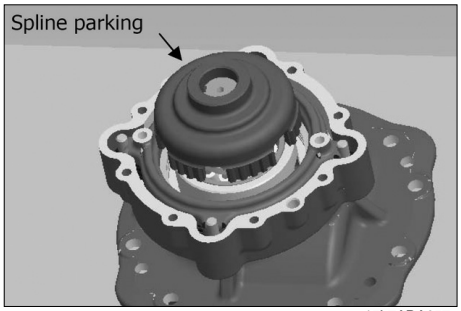
15L7ADA055

③ Assembles actuator in assembly direction.



15L7ADA056

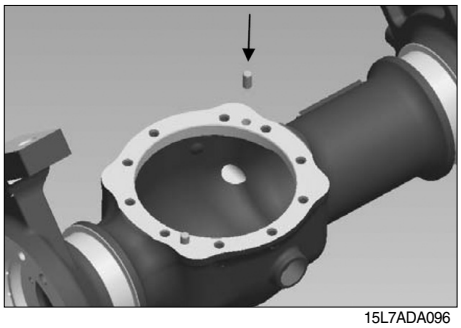
④ Assemble spline parking maching with friction plate spline.



15L7ADA057

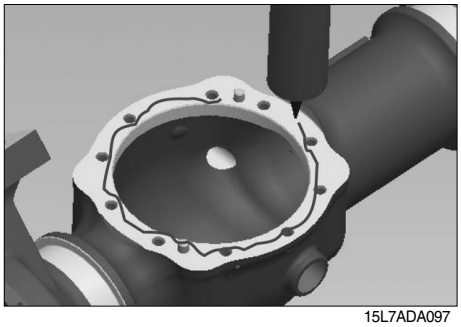
(2) Assemble of carrier assembly

① Pressurize lock pin into axle housing.



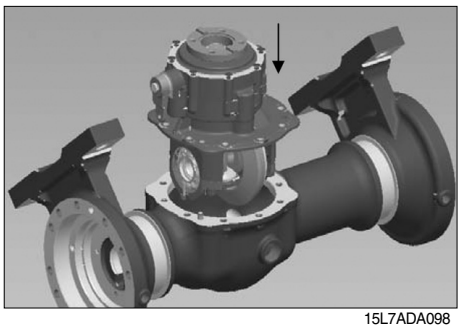
15L7ADA096

② Paste sealant on axle housing.
(Loctite #5127)



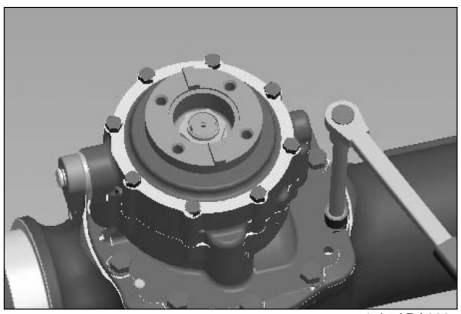
15L7ADA097

③ Assemble carrier assembly on axle housing.



15L7ADA098

④ Fasten bolt.
Assemble bolt after spread loctite #277.
Confirm torque : 610~650 kgf · cm



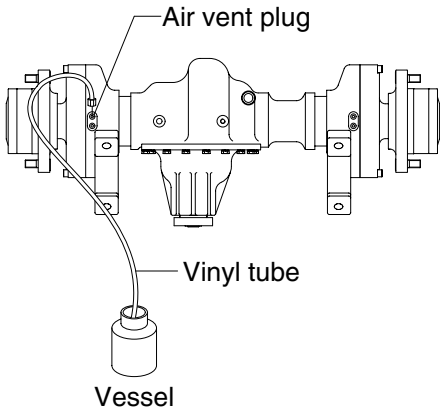
15L7ADA099

SECTION 4 BRAKE SYSTEM

GROUP 3 TESTS AND ADJUSTMENTS

1. AIR BLEEDING OF BRAKE SYSTEM

1) Air bleeding should be performed by two persons :
   One rides on truck for depressing and releasing brake pedal : the other person is on the ground and removes cap from air vent plug on wheel cylinder.
2) Block the front wheel securely and apply parking brake.
3) Start the engine.
4) Attach a vinyl tube to air vent plug and immerse other end of tube into a vessel filled with hydraulic oil.
5) Loosen air vent plug by turning it 3/4 with a wrench. Depress brake pedal to drain oil mixed with air bubbles from plug hole.
6) Depress brake pedal until no air bubbles come out of air vent plug hole.
7) After completion of air bleeding, securely tighten air vent plug. Install cap on plug.



20D7BS09

2. ADJUSTMENT OF PEDAL

1) BRAKE PEDAL

(1) Pedal height from floor plate

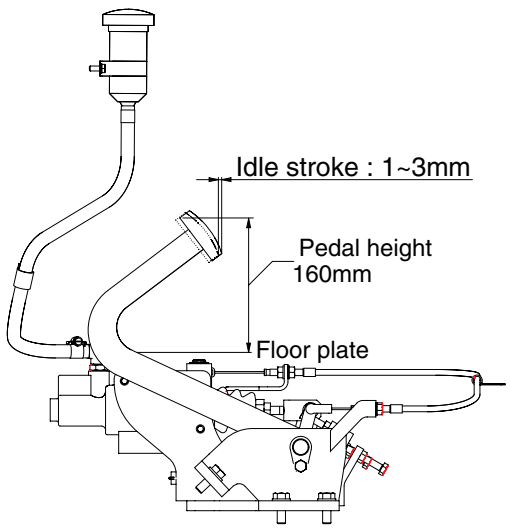
Adjust with stopper bolt.

· Pedal height : 160mm (6.3in)

(2) Idle stroke

Adjust with rod of master cylinder

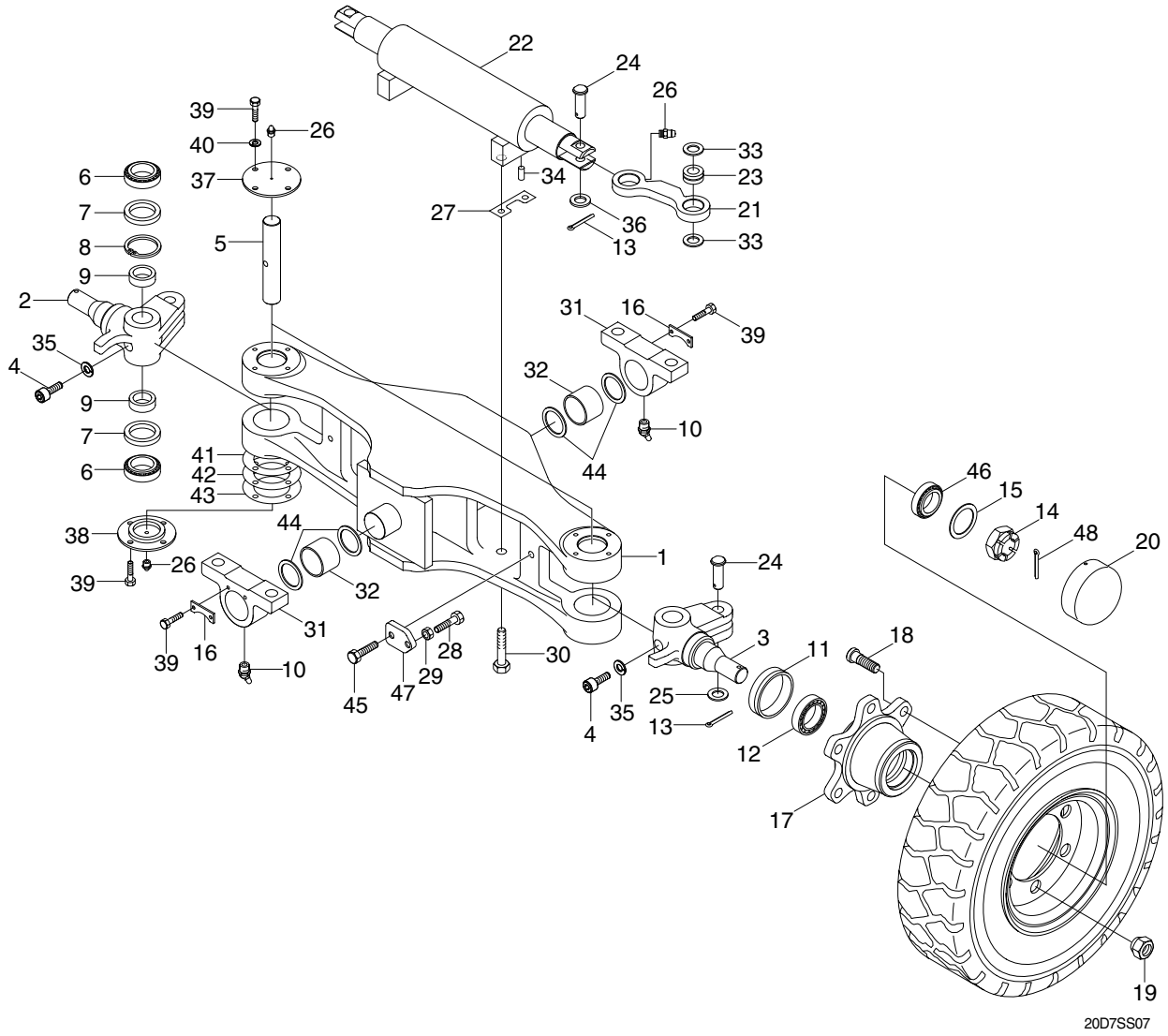
· Play : 1~3mm



20D7BS10

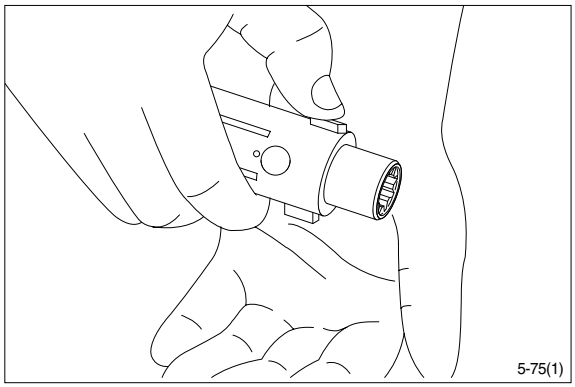
4. STEERING AXLE

1) STRUCTURE

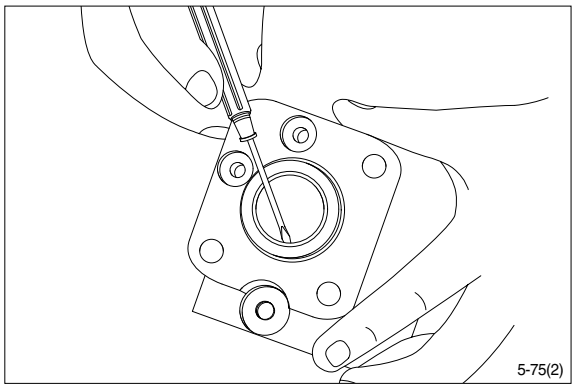


1	Steering axle	17	Hub	33	Thrust washer
2	Knuckle-RH	18	Hub bolt	34	Pin
3	Knuckle-LH	19	Hub nut	35	Spring washer
4	Special bolt	20	Hub cap	36	Hardened washer
5	King pin	21	Steering link	37	Upper cover
6	Taper roller bearing	22	Steering cylinder	38	Lower cover
7	Oil seal	23	SPH plain bearing	39	Hex bolt
8	Retaining ring	24	Steer link pin	40	Spring wahser
9	Collar	25	Plain washer	41	Shim (0.1)
10	Grease nipple	26	Grease nipple	42	Shim (0.15)
11	Oil seal	27	Lock plate	43	Shim (0.3)
12	Taper roller bearing	28	Bolt	44	Spacer(0.5)
13	Split pin	29	Hex nut	45	Hex bolt
14	Nut	30	Hex bolt	46	Taper roller bearing
15	Washer	31	Trunnion block	47	Plate
16	Plate	32	Bushing	48	Split pin

(12) Press the neutral position springs out of their slots in the spool.

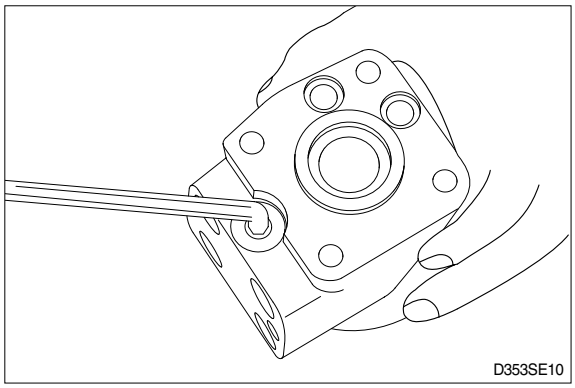


(13) Remove dust seal and O-ring.

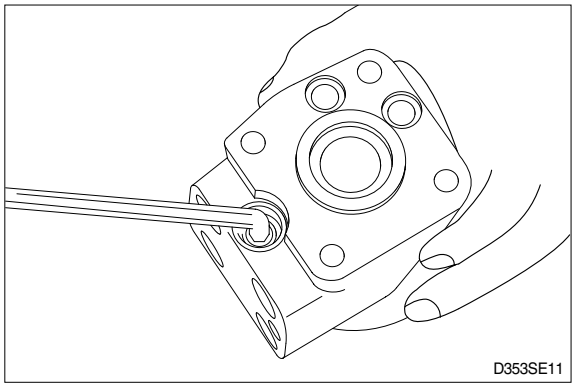


Disassembling the pressure relief valve

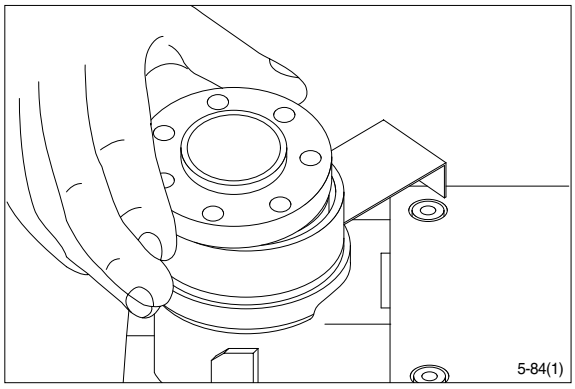
(14) Screw out the plug using an 8㎜ hexagon socket spanner.
Remove seal washers.



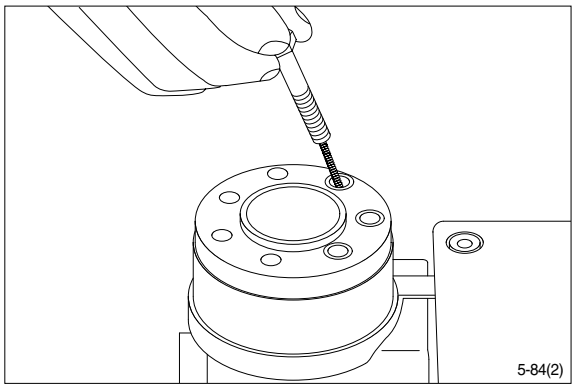
(15) Unscrew the setting screw using an 8㎜ hexagon socket spanner.



(29) Place the end cover in position.

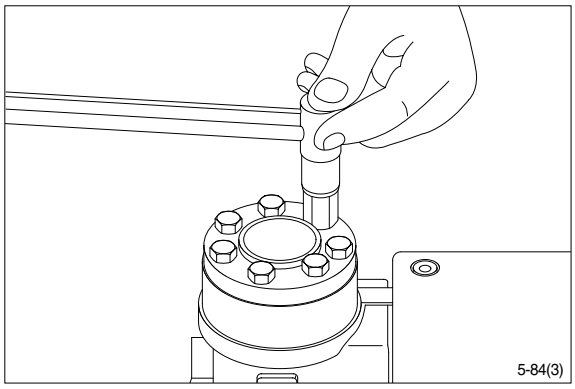


(30) Fit the special screw with washer and place it in the hole shown.

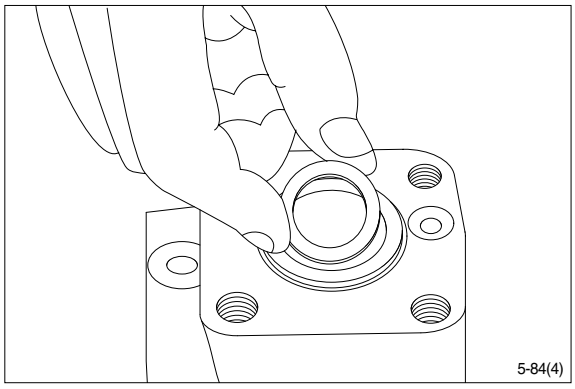


(31) Fit the six screws with washers and insert them. Cross-tighten all the screws and the rolled pin.

· Tightening torque : 3.0 ± 0.6kgf · m
(21.7 ± 4.3lbf · ft)



(32) Place the dust seal ring in the housing.

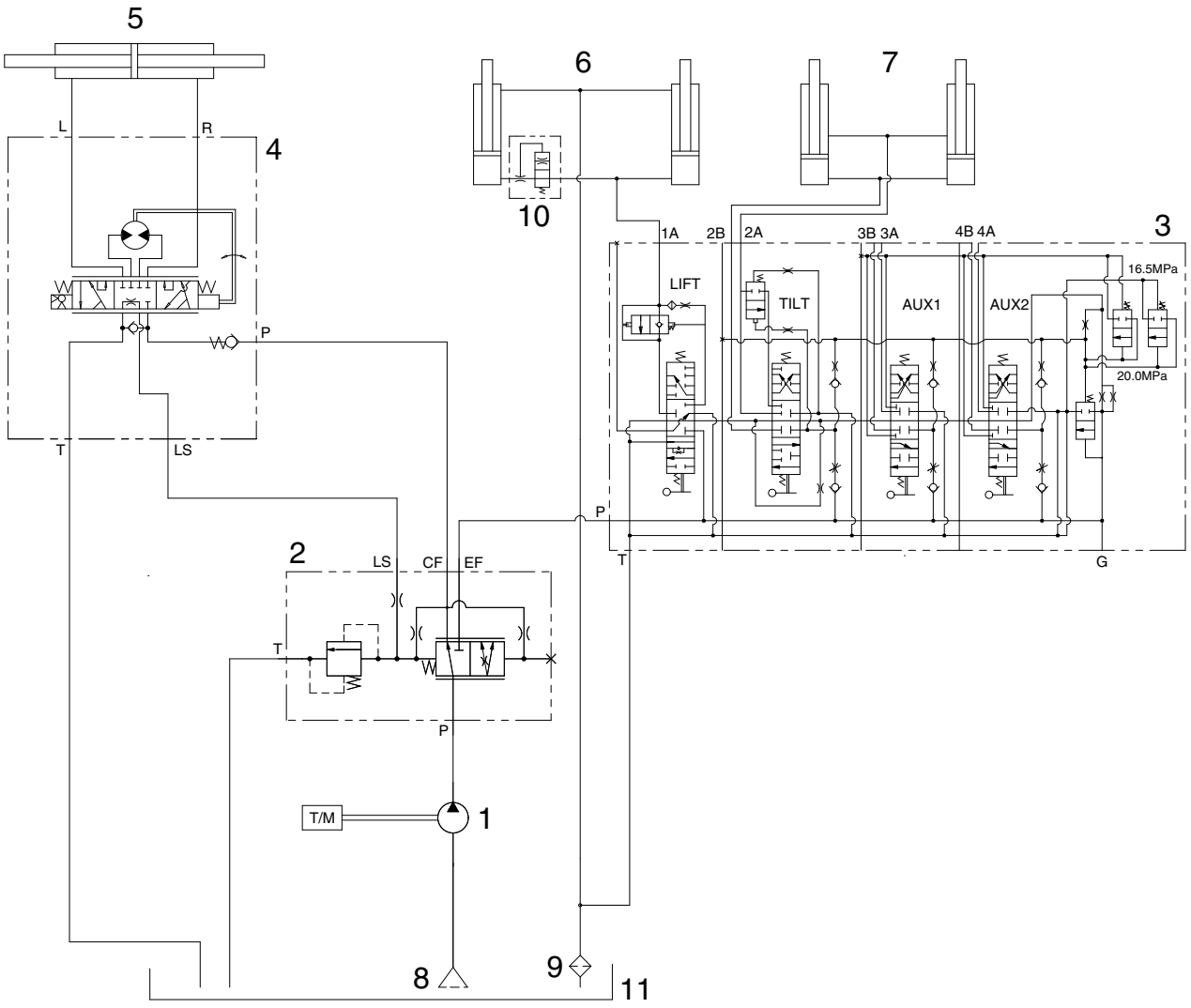


SECTION 6 HYDRAULIC SYSTEM

GROUP 1 STRUCTURE AND FUNCTION (OLD MCV)

(20D-7E:-#0074, 25D-7E:-#0314, 30D-7E:-#0524, 33D-7E:-#0138)

1. HYDRAULIC CIRCUIT (Non OPSS and non boosted brake)

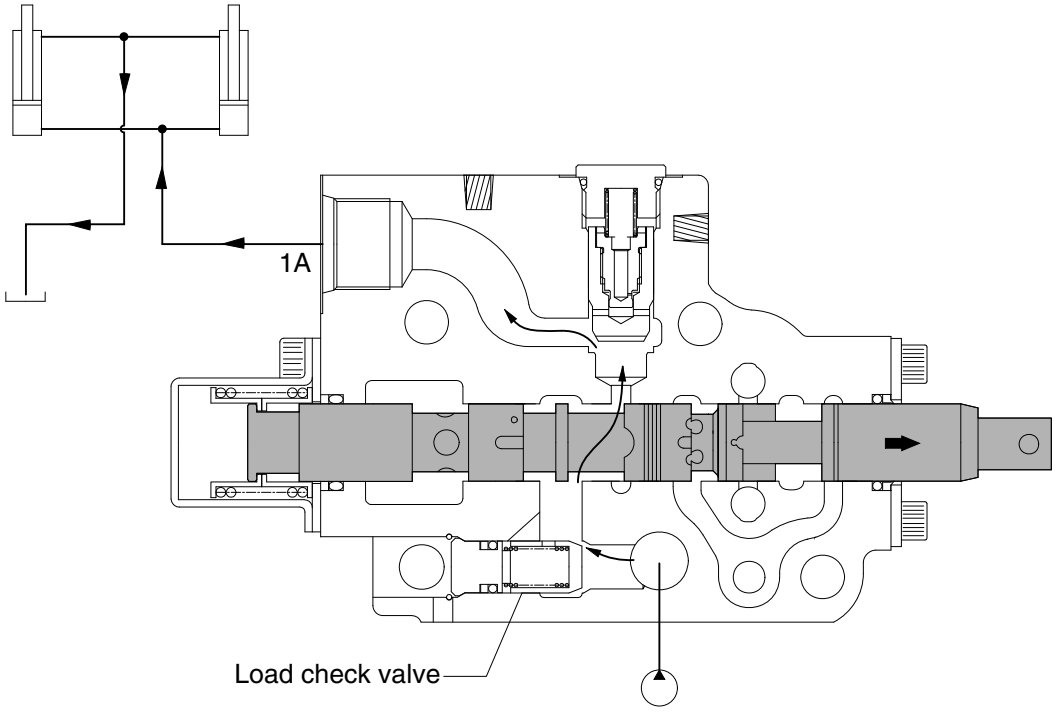


20D7HS01

1 Hydraulic gear pump
2 Priority valve
3 Main control valve
4 Steering unit
5 Steering cylinder
6 Lift cylinder
7 Tilt cylinder
8 Suction strainer
9 Return filter
10 Down safety valve
11 Hydraulic tank

3) LIFT SECTION OPERATION

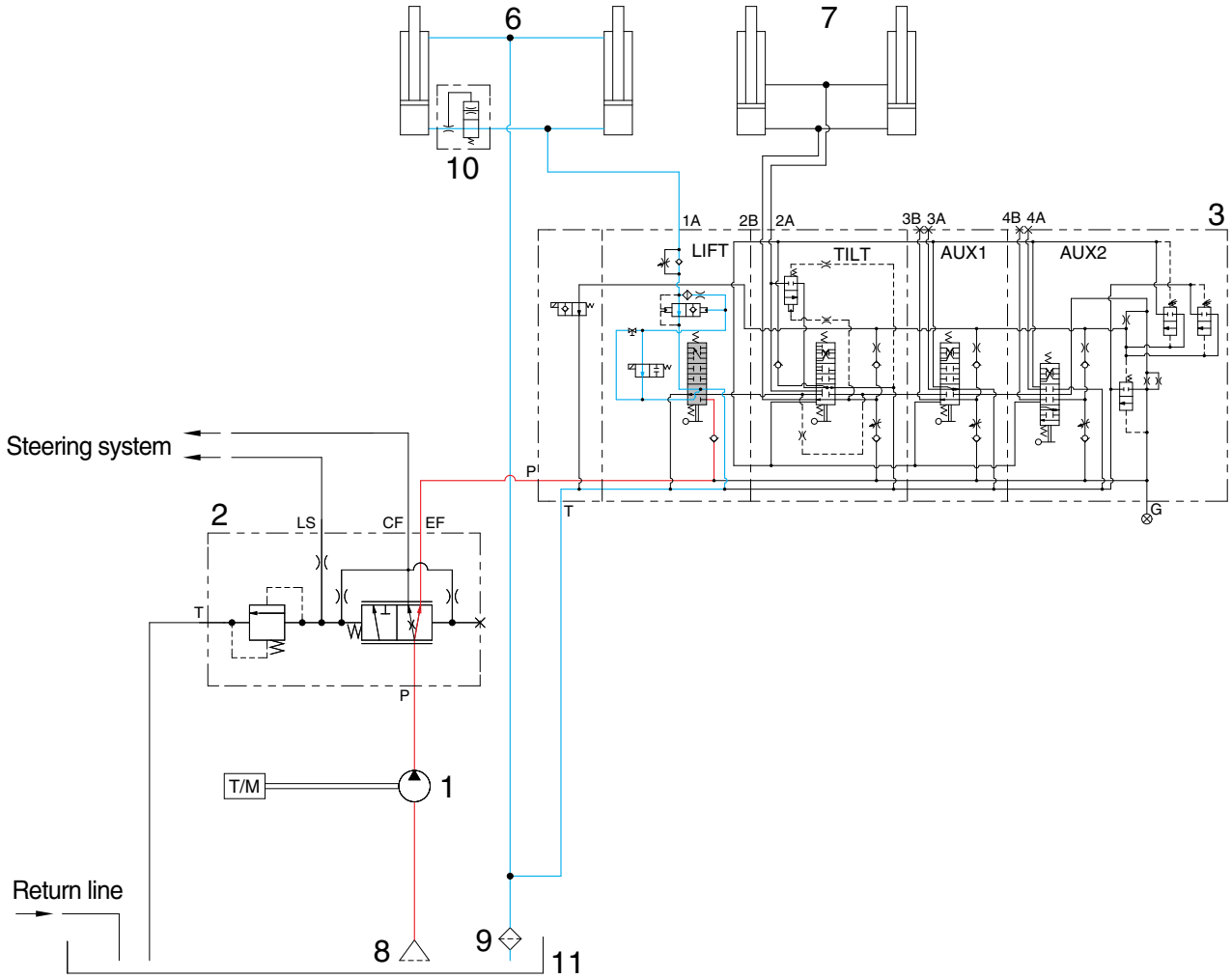
(1) Lift position



20D7HS09

When the lift 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 and flow into lift cylinder port(1A).
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 flows into the tank.

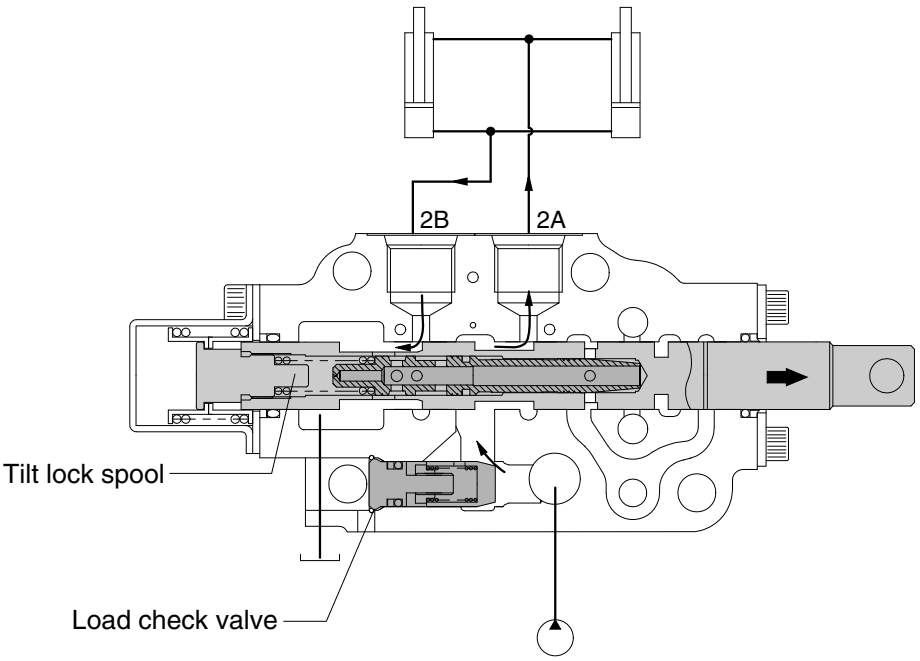
2) WHEN THE LIFT CONTROL LEVER IS IN THE LOWER POSITION



20DEHS04

When the lift control lever is pushed forward, the spool on the first block moves to lower position. The work port(1A) and the small and the large chamber of lift cylinder are connected to the return passage, so the fork will be lowered due to its own weight.

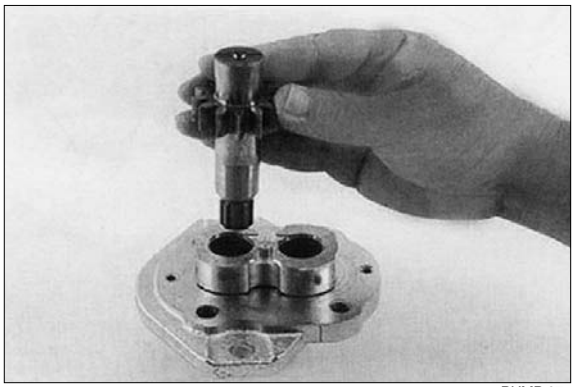
(2) Tilt backward position



20D7HS12

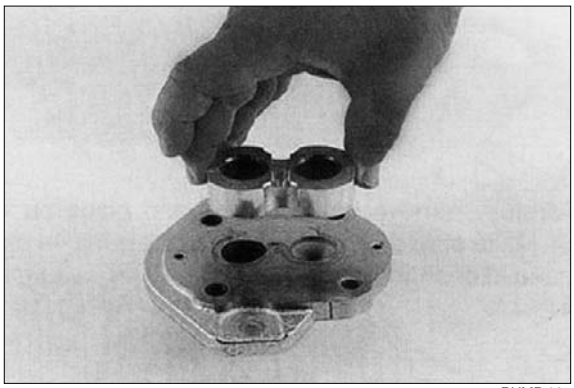
When the tilt control lever is pulled back, the spool moves to the right and the neutral passage is closed.
The oil supplied from the pump pushes up the load check valve and flows into tilt cylinder port(2A).
The pump pressure reaches proportionally the load of cylinder and fine control finished by shut off of the neutral passage.
The return oil from cylinder port(2B) 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.



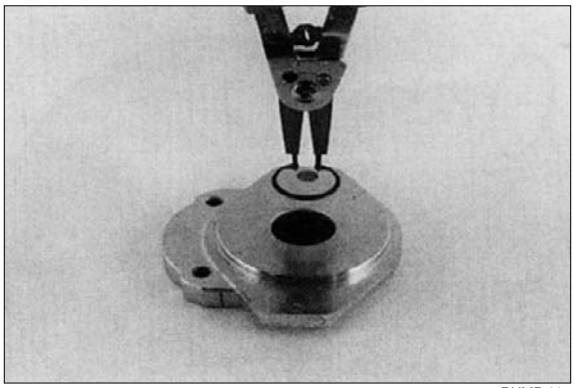
PUMP 07

(13) Remove the front bearing block.



PUMP 08

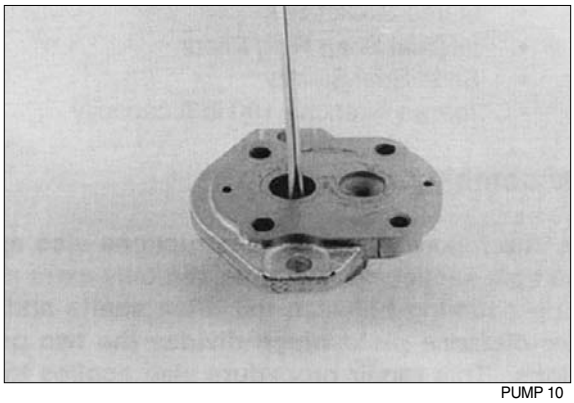
(14) Turn mounting flange over, with shaft seal up, and remove the retaining ring with proper snap ring pliers.



PUMP 09

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

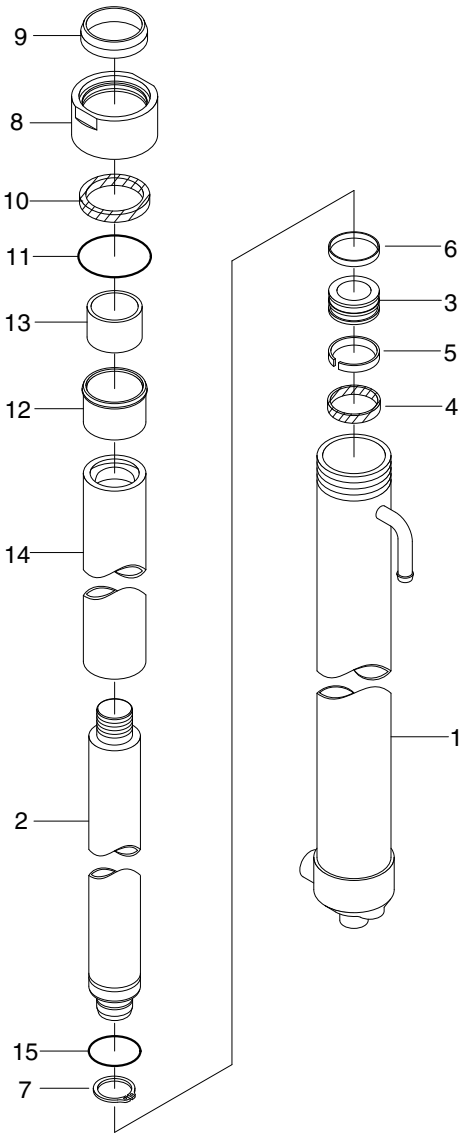
(16) Remove the dowel pins from the gear housing. Do not lose pins.

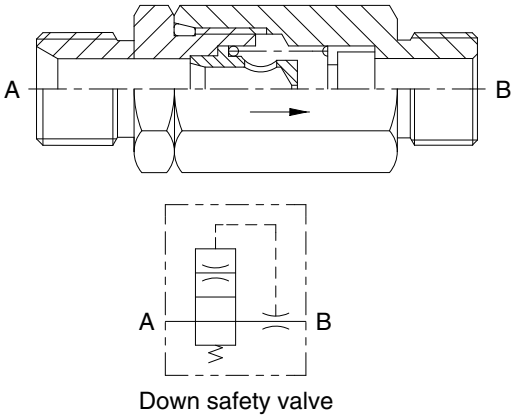


PUMP 10

3. LIFT CYLINDER

1) STRUCTURE



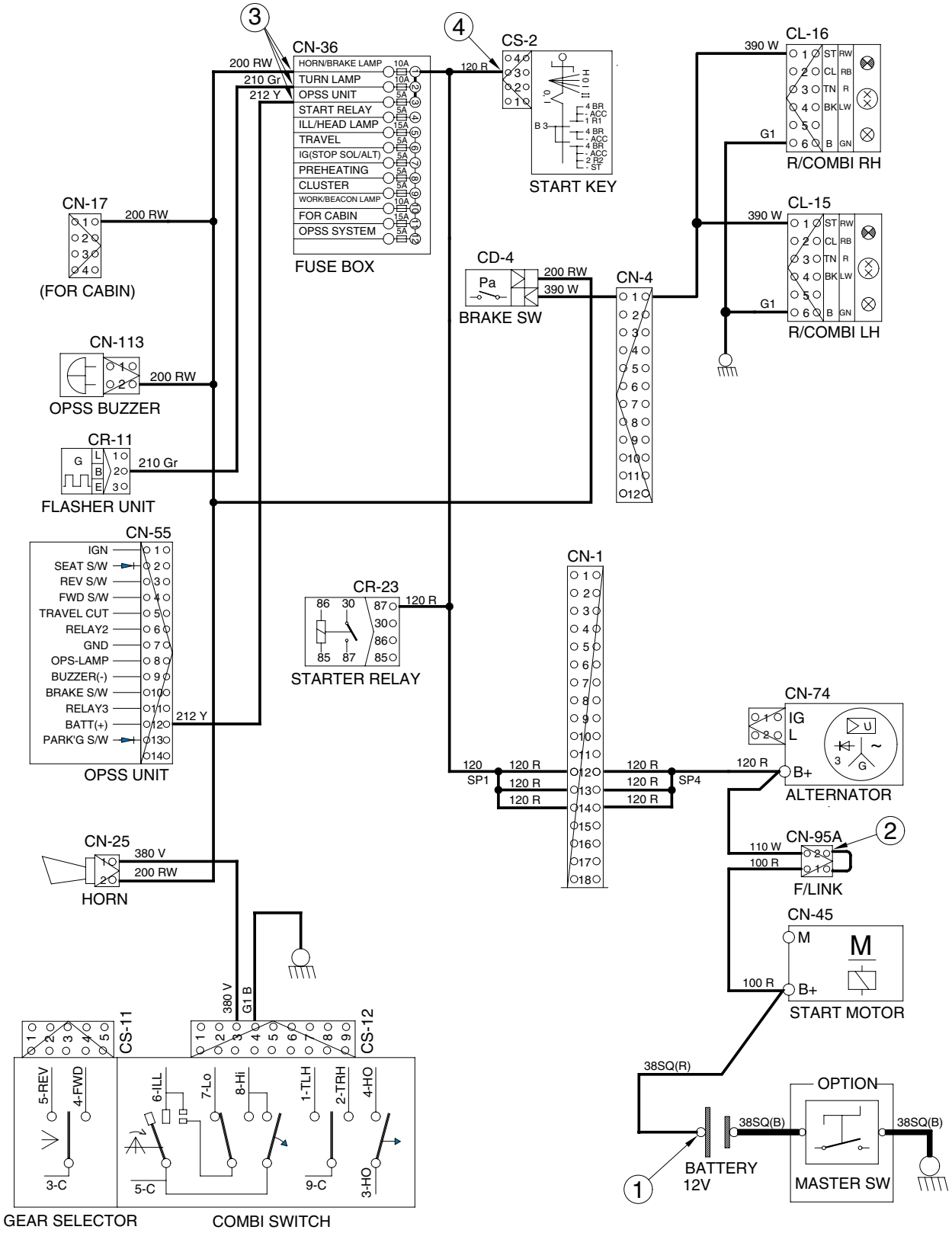


Down safety valve

D255HS24

1	Tube assy	6	Wear ring	11	O-ring
2	Rod assy	7	Retaining ring	12	Guide
3	Piston	8	Gland	13	Du bushing
4	Piston seal	9	Dust wiper	14	Spacer
5	Back up ring	10	Rod seal	15	O-ring

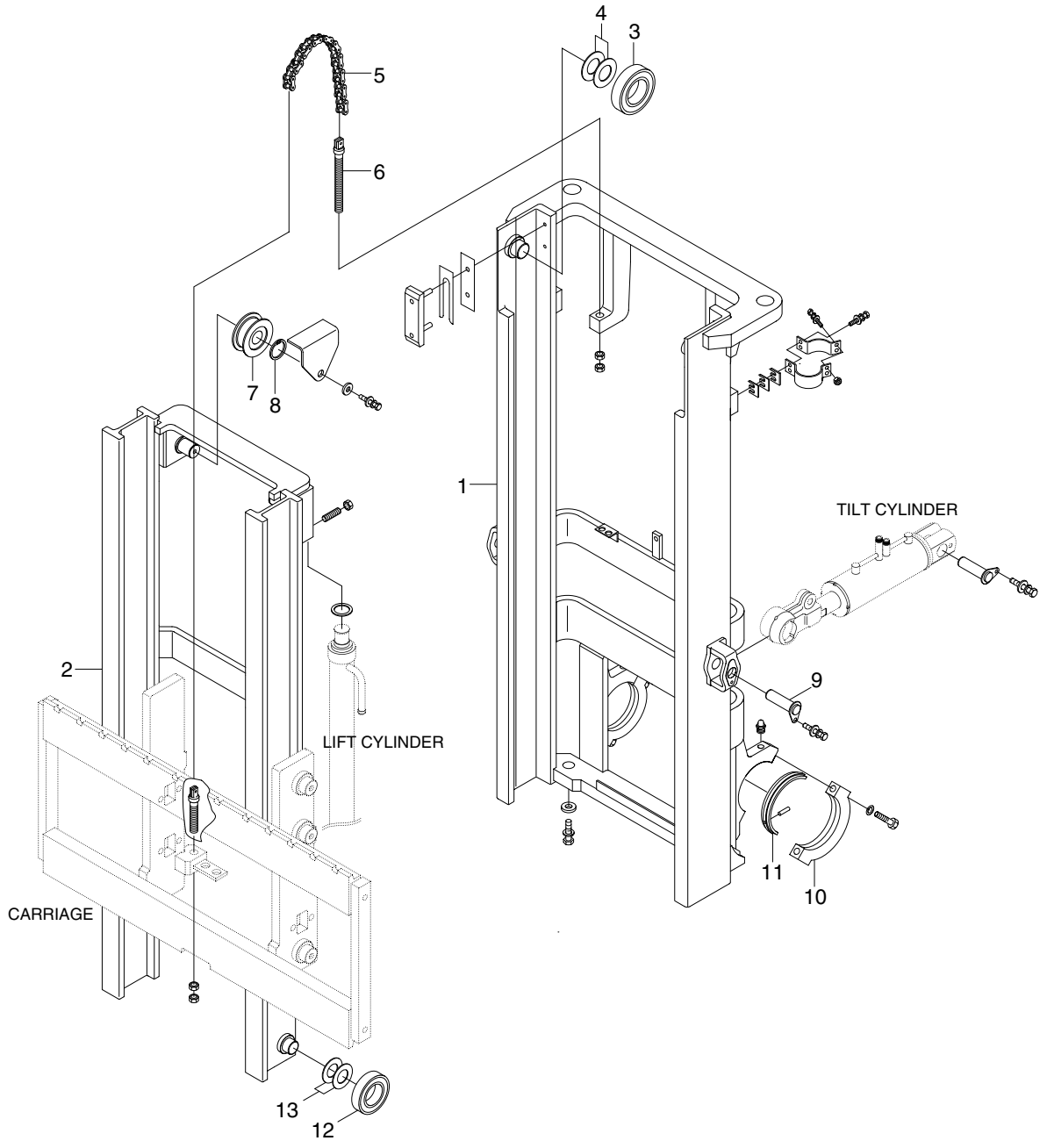
POWER CIRCUIT



20D7EEL03

GROUP 1 STRUCTURE

1. 2 STAGE MAST(V MAST)

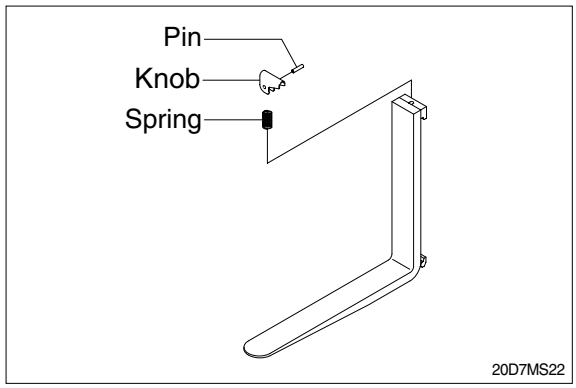


1	Outer mast	6	Anchor bolt	10	Trunnion cap
2	Inner mast	7	Chain wheel bearing	11	Bushing
3	Roller	8	Retaining ring	12	Roller
4	Shim(0.5, 1.0t)	9	Tilt cylinder pin	13	Shim(0.5, 1.0t)
5	Chain				

GROUP 4 REMOVAL AND INSTALLATION

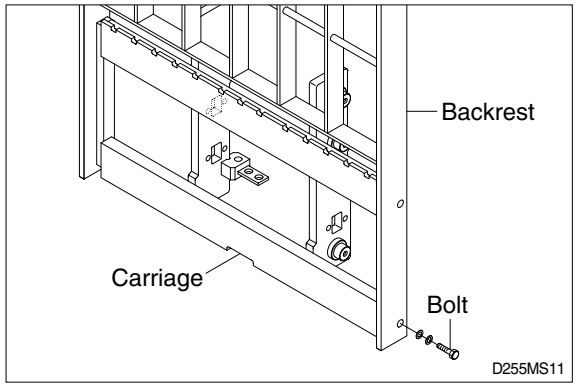
1. FORKS

1) Lower the fork carriage until the forks are approximately 25mm(1inch) from the floor.
2) Turn knob up 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 pars.
(6) Reverse the above steps to reinstall.

⚠ Replace the split pin of chain anchor with new one.