CONTENTS

SECTION 1 GENERAL

5. TORQUE CHART

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

Bolt size	8T		10T	
	kg · m	lb · ft	kg · m	lb · 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	19.5 ~ 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 × 3.0	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	
	kg · m	lb · ft	kg · m	lb · 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 truck 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 lubrication oil GTP 600 or 1000 PASTE.

· Tightening torque : 35.6±7.1 kgf · m (257±51.4 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

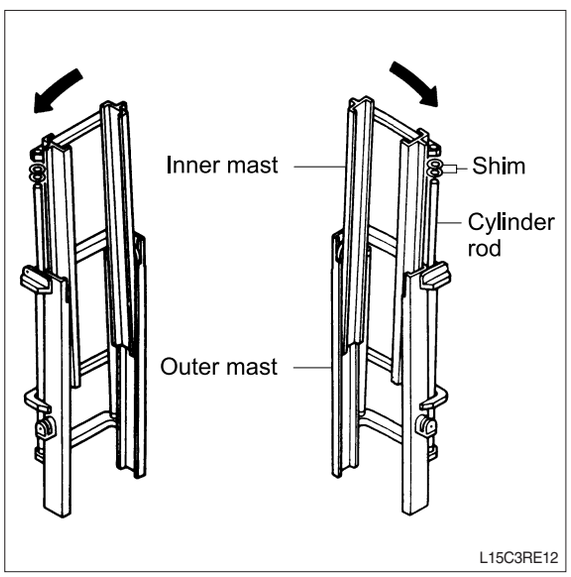
① Assemble the lift cylinder inside the outer mast, then tighten the stopper bolt. If the cylinder assembly has been replaced, adjust as follows so that the left and right cylinders are synchronized at the maximum lifting height.

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.

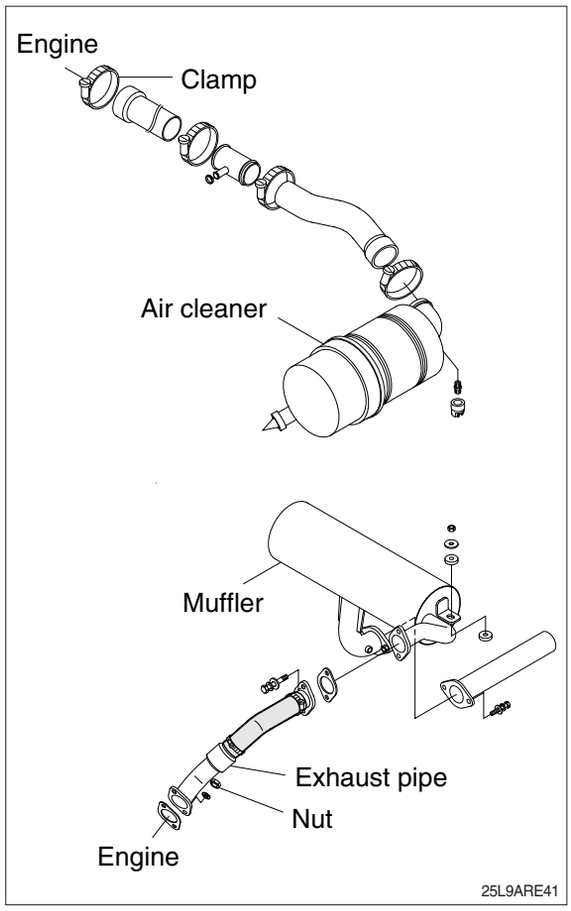
※ If play is to RIGHT, install adjustment shim to RIGHT cylinder.

· Shim thickness : 1.0 mm (0.04 in)



(6) Fuel hoses

Insert the fuel hose securely and fit clamps.

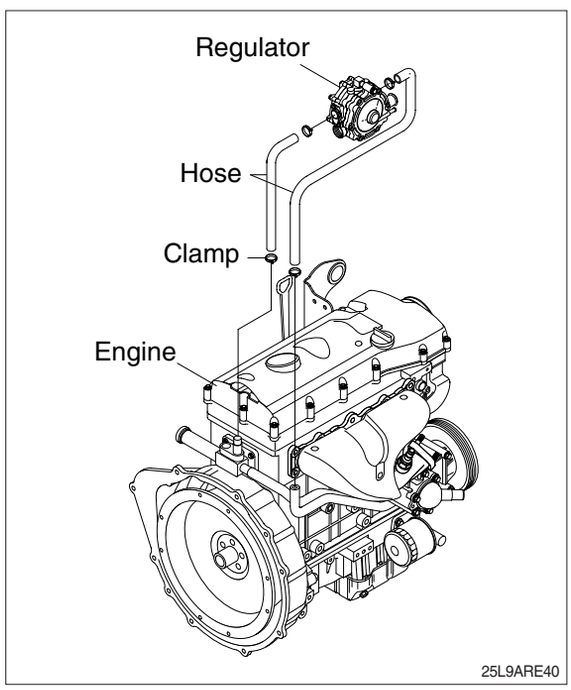


(7) Air cleaner hose and exhaust pipe

① Align the exhaust pipe to the engine securely and tighten the nuts.

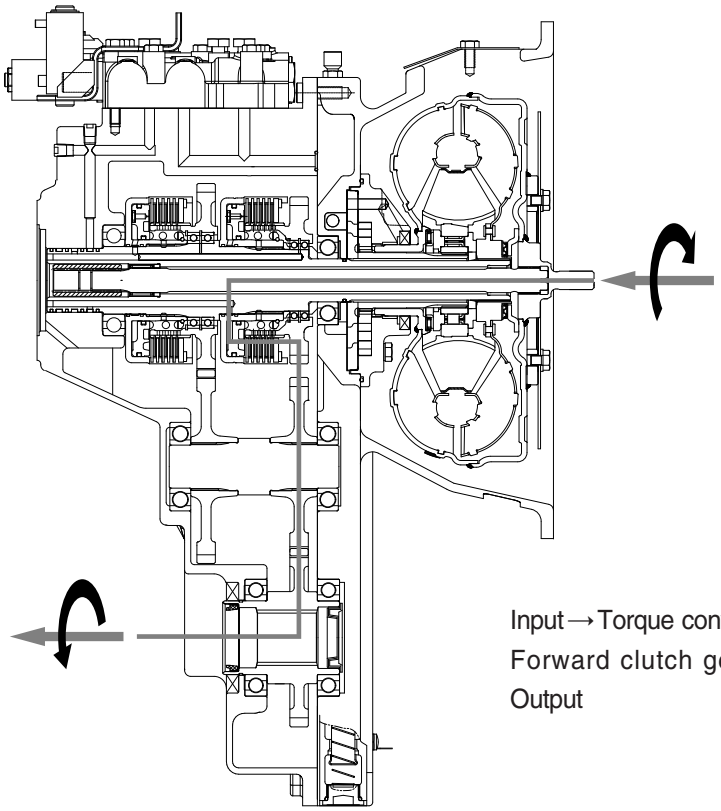
· Tightening torque : 4.0~6.0 kgf·m (28.9~43.4 lbf·ft)

② Insert the air cleaner hose securely and fit a clamp.



4) OPERATING MODES

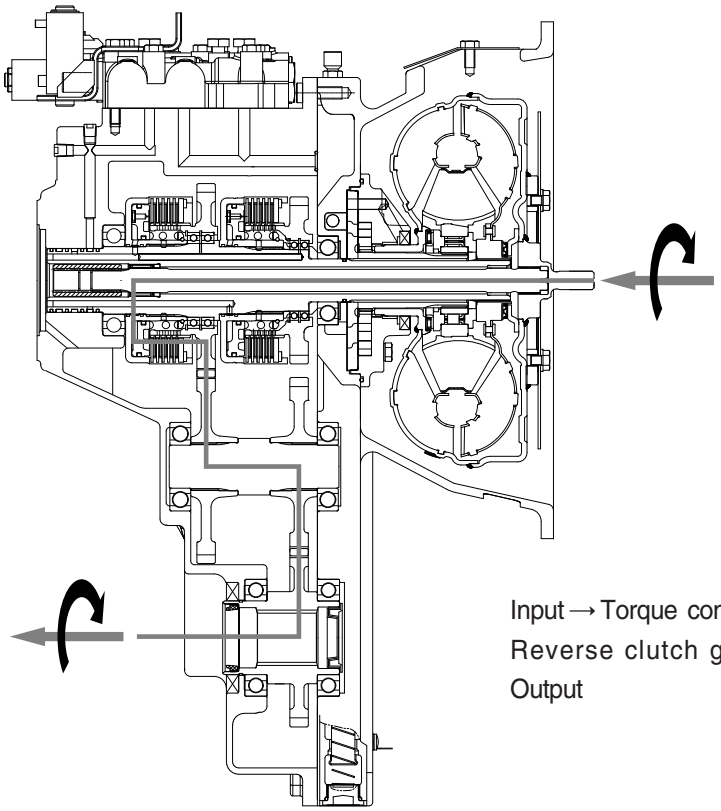
(1) Forward



Input → Torque converter → Clutch shaft → Forward clutch gear → Output gear → Output

15L7APT29

(2) Reverse



Input → Torque converter → Clutch shaft → Reverse clutch gear → Output gear → Output

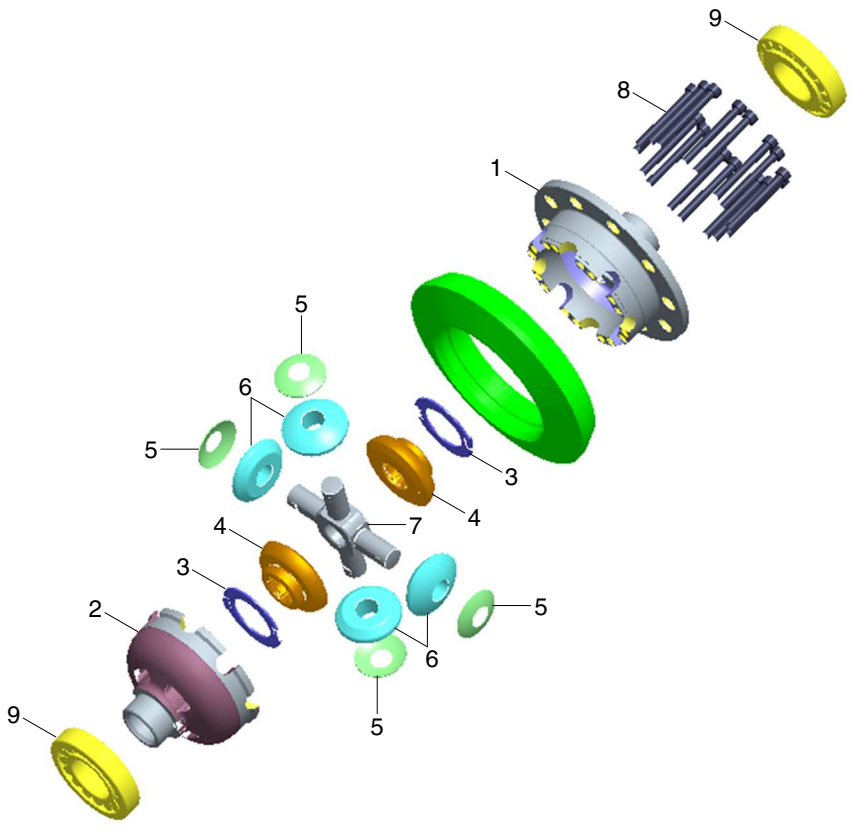
15L7APT30

4) DIFFERENTIAL DEVICE

(1) Operation

Since the ring gear is linked with the right of the differential case and the bolt, the power transferred to the ring gear makes the differential device revolve.
And also, the left and right of the differential case are connected with the left and right of the axle shaft and the spline respectively, it delivers the power to the final drive.
If the load concerning in the left and right of the final drive is different, the shock is transferred to the drive axle, the differential gear in the differential device runs, the power transferred to the differential device adjusts the delivering rate to the left and right axle shaft.
Consequently, it guarantees for safety of drivers.

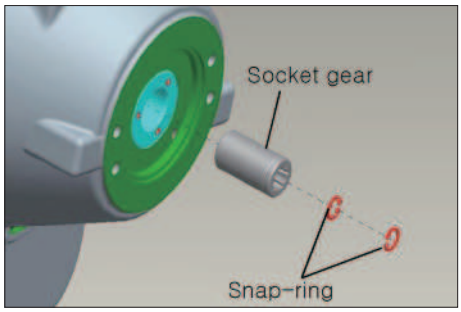
(2) Structure



22D9TPT19

1	Differential case (RH)	4	Differential gear	7	Differential spider
2	Differential case (LH)	5	Thrust washer	8	Socket bolt
3	Thrust washer	6	Differential gear	9	Taper roller bearing

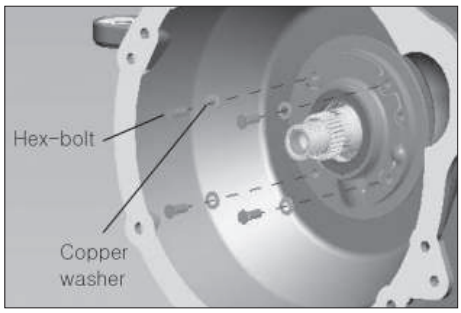
(5) Remove the socket gear.
Next remove the snap-ring at socket gear.



22D9TTM005

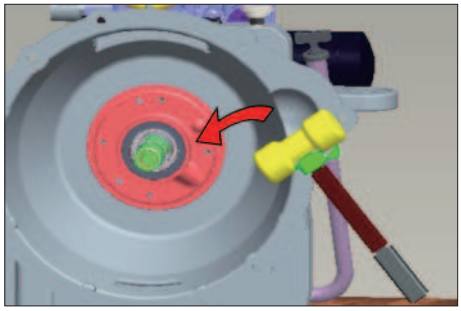
(6) Removal the oil pump sub assy.

① Remove the hexagon bolt (M8 × 1.25P × 38L), and then remove the copper washer.

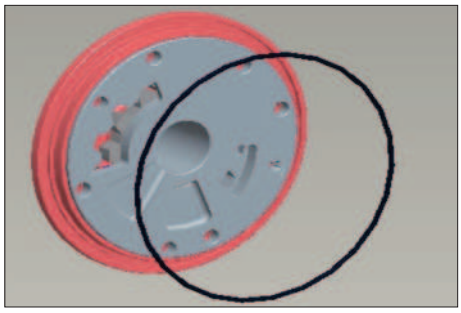


15L7ATM006

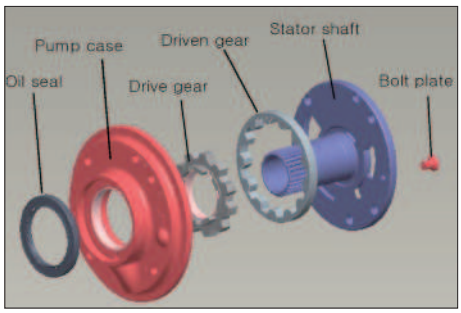
※ Use a plastic mallet to decomposition.


22D9TTM007

② Remove the O-ring at pump sub assy.

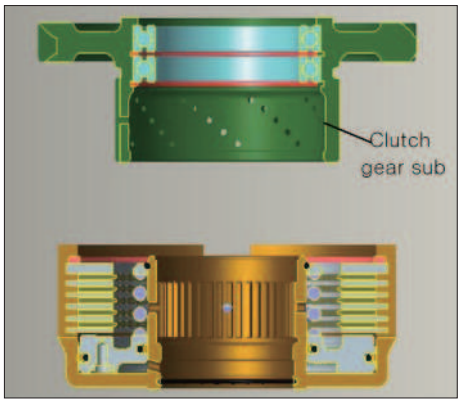

22D9TTM008

③ Remove the oil seal, pump case, drive gear, driven gear, stator shaft and bolt plate.



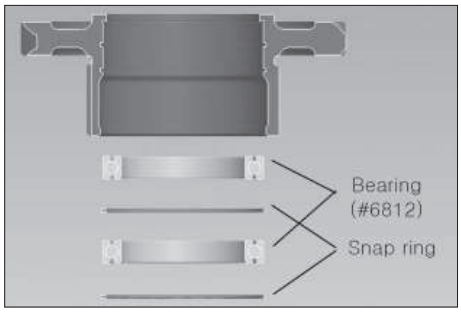
22D9TTM009

⑬ Remove the reverse clutch gear sub.



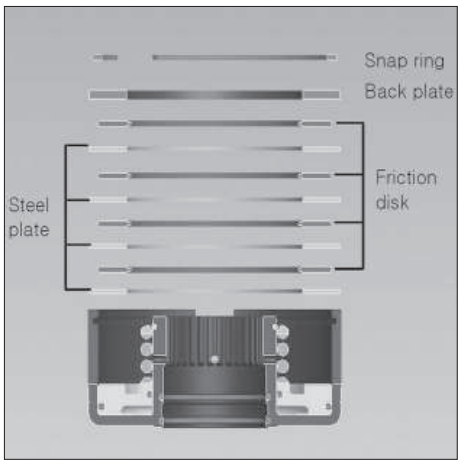
22D9TTM048

⑭ Remove the snap ring, and then remove the bearing.



15L7ATM049

⑮ Remove the snap ring, and then remove the back plate, friction disk, and steel plate.

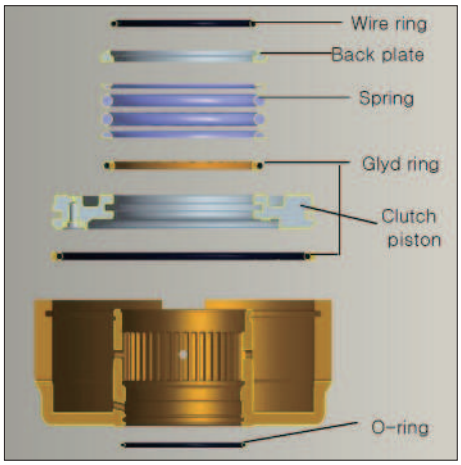


15L7ATM050

⑯ Remove the wire ring, and then remove the back plate and spring.

⚠ When you remove the wire-ring, it might be shot out by impact of spring.
Certainly fixing the spring, will have to remove.

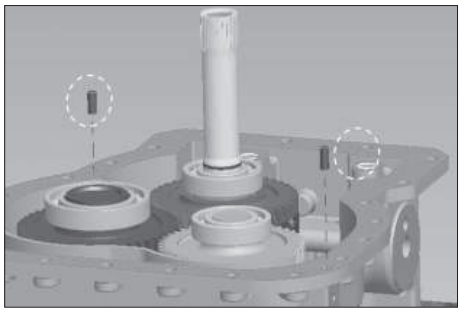
⑰ Pull out the clutch piston, and then remove the O-ring.
Next remove the glyd ring at the clutch piston.



22D9TTM051

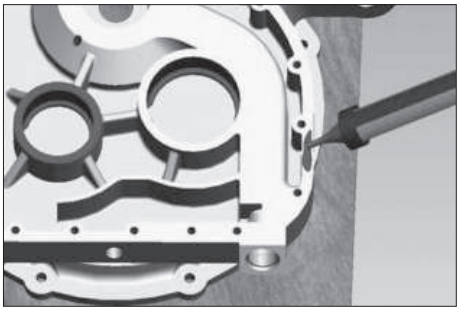
(6) Press the lock-pins.

※ After the assembling, please check whether you can turn the input (output) gear lightly by your hand.



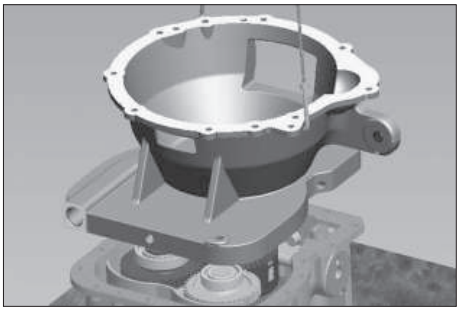
15L7ATM084

(7) Spread loctite #5127 on T/C housing space.



15L7ATM085

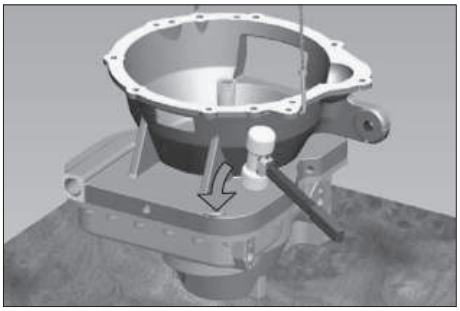
(8) Assemble the T/C housing.



15L7ATM086

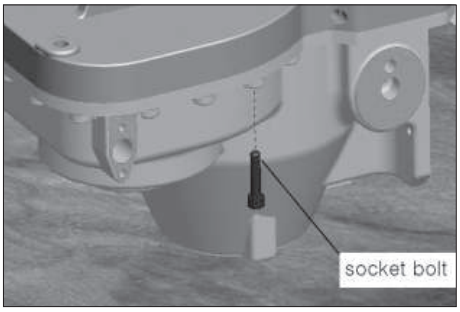
(9) Assemble the part slowly with hit the end side softly.

※ Using a plastic hammer.



15L7ATM087

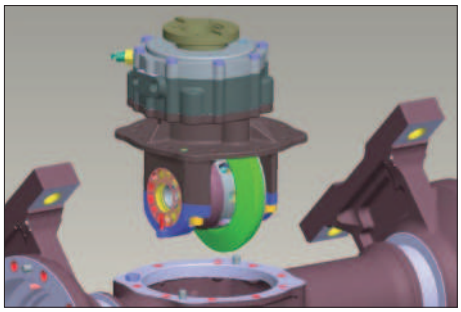
(10) Assemble the socket bolts.
(T/M case + T/C housing softly fastening)



15L7ATM088

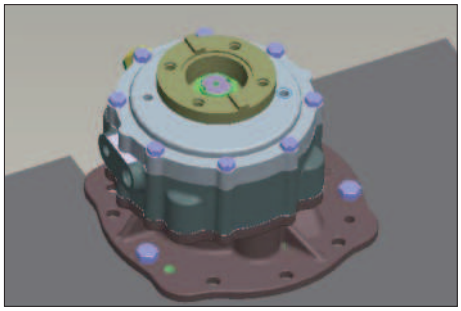
(18) Extract carrier assembly.

※ Using lifting device.



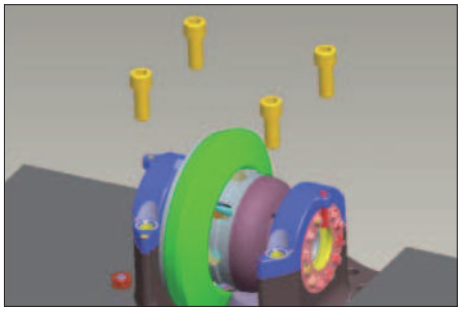
22D9TDA018

(19) Fix carrier assembly to a jig.



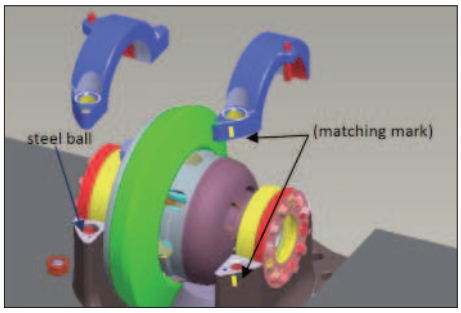
22D9TDA019

(20) Remove carrier cap bolt.



22D9TDA020

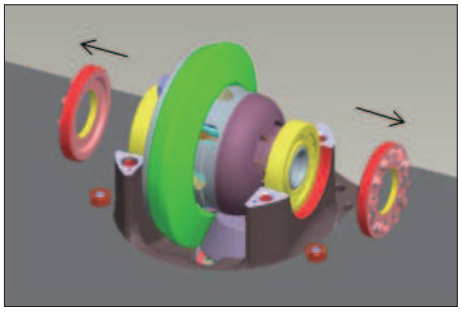
(21) Extract the carrier cap (apply marking a match).



22D9TDA021

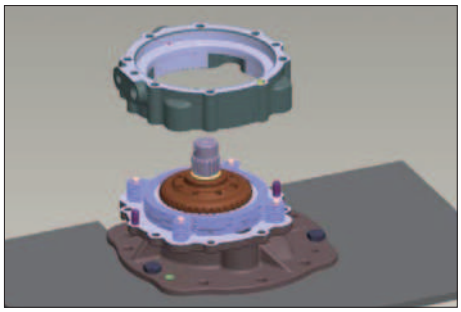
(22) Remove adjusting ring of both sides bearing cup.

※ Using dedicated fixtures and brass drift punch.



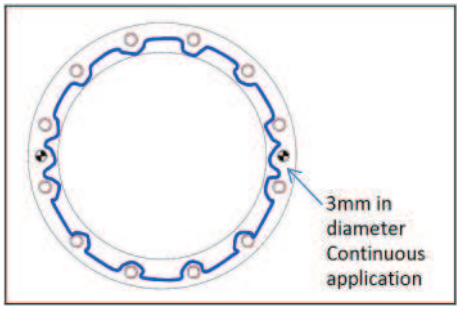
22D9TDA022

④ Assemble the piston housing. (paste loctite #5127)



22D9TDA057

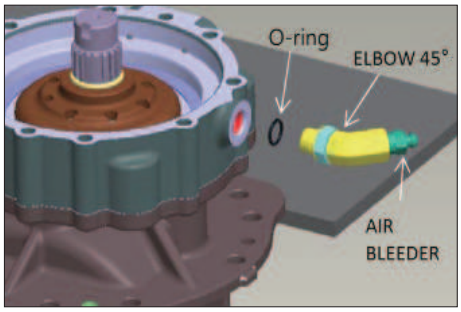
※ Example of paste loctite.



22D9TDA057A

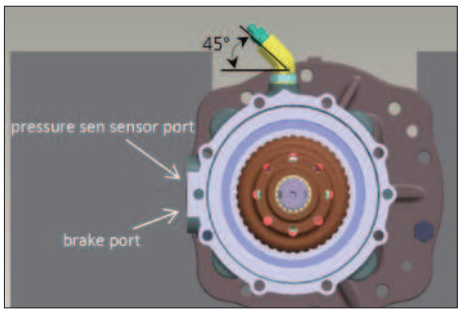
⑤ Assemble O-ring, air bleeder and elbow 45°.
(when assemble O-ring, paste oil or greace).

- Tightening torque of elbow 45° : 3.8~4.2 kgf·m
- Tightening torque of air bleeder : 1.5~2.0 kgf·cm



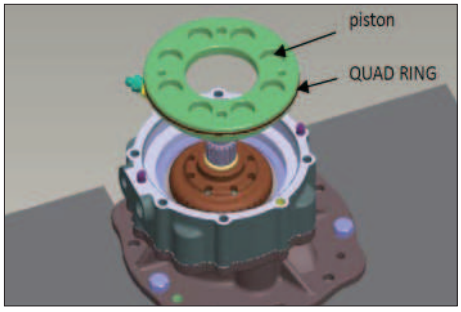
22D9TDA058

※ Attention of direction on assembly.



22D9TDA058A

⑥ Assemble piston.
Check twist of quad ring.
Paste oil or greace on surrounding of quad ring.

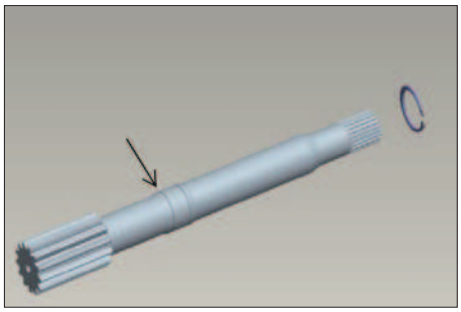


22D9TDA059

(3) Traveling brake system assembly

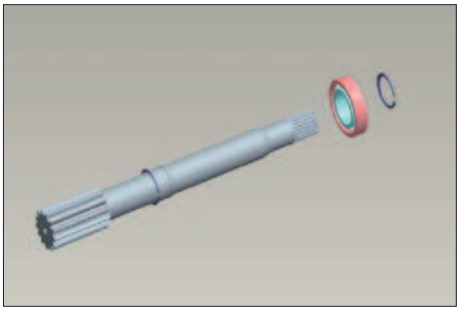
Axle shaft assembly

① Insert snap ring on the axle shaft.



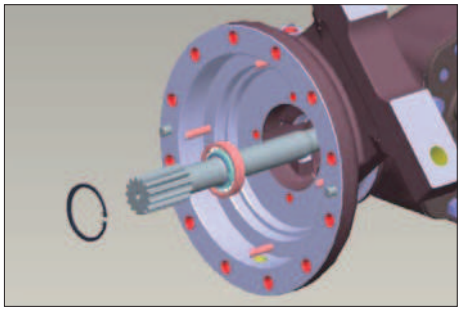
22D9TDA100

② After put the ball bearing, fix it with snap ring.



22D9TDA101

③ After put axle shaft into axle housing fix with snap ring.

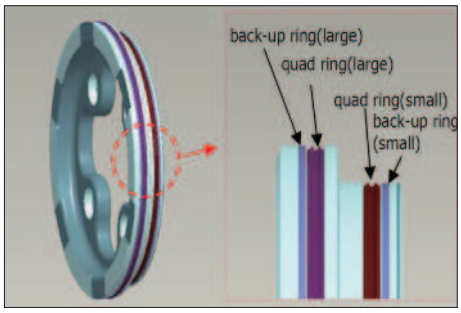


22D9TDA102

Brake piston assembly

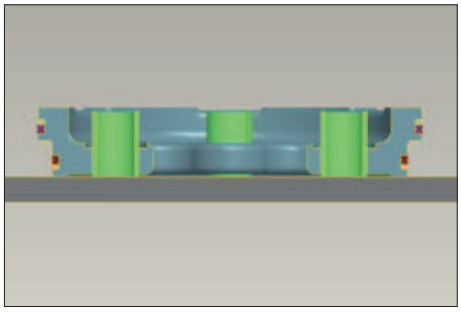
① Assemble ring (Quad ring + Back up ring) at piston brake.

※ When assembling seal pay attend to chopping.
※ Before assemble ring coating oil or grease.
※ Careful assembly direction of Quad ring + Back up ring



22D9TDA103

② Assemble sleeve at piston.
Same with sleeve and piston surface on floor.



22D9TDA104

(7) Functional test of hydraulic apply brake

※ The following procedure describes how to test the hydraulic apply brake system only.
To perform this test, use a device that allows you to observe possible leaks through oil seals and that also allows you to verify that the piston return system works correctly . For an accurate evaluation, the device must allow piston displacement of 0.4~0.6 ㎜.

① Brake bleeder valve while supplying hydraulic oil to the pressure inlet. Pump oil through the brake until oil coming out of the bleeder does not contain air bubbles.
Close the brake bleeder valve.

② Actuate the piston at least five times with 60 bar. Check for leaks and free movement of piston.

③ If you find a leak : Disassemble the hub sub assembly. Determine the cause of the leak and correct the problem. Check the seal surfaces for sharp edges, nicks and burrs.

④ Wait five minutes. Apply 60 bar to the piston and lock pressure on. Pressure must not drop after one minute.

⑤ If pressure drops off : Disassemble the hub sub assembly. Determine the cause of the leak and correct the problem. Repeat step ① - ⑤.

※ You must check that the brake completely releases after you apply the brake.
Do not operate the brake system with the brake partially released. Damage to brake components can result.

3) INSPECTION AND ASSEMBLY

(1) Clean all parts thoroughly and lubricate the parts either with mineral or with hydraulic oil, according to their use destination.

(2) All single parts are to be checked for damage and replaced, if required.

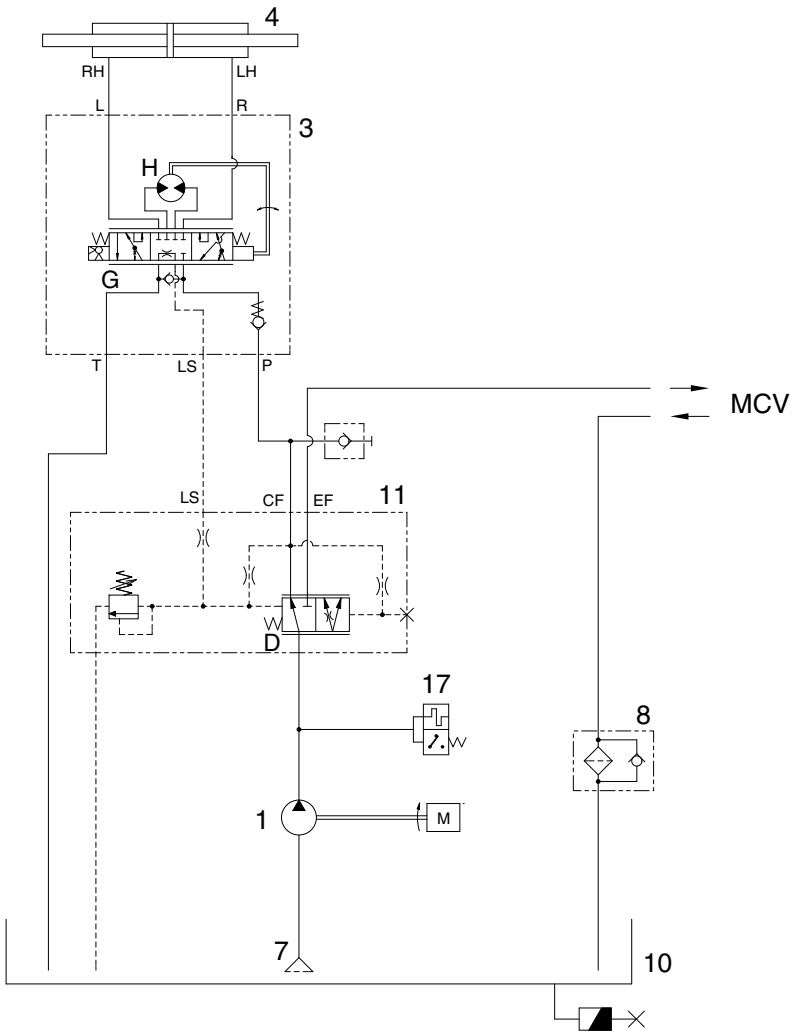
(3) Assembly is in opposite order to disassembly.

(4) Seal kit : XKAU-00176

⚠ Use only brake fluid (Azolla ZS 32, ISO VG 32) into the compensation reservoirs.

2. HYDRAULIC CIRCUIT

· NON-BOOSTER TYPE (PRIORITY VALVE)

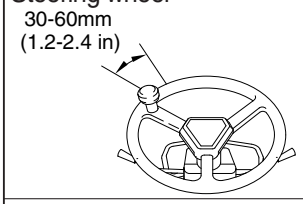


25L9ASS03

1	Gear pump with priority valve	8	Return filter
3	Steering unit	10	Hydraulic tank
4	Steering cylinder	11	Priority valve
7	Suction strainer	17	Pressure/temperature sensor

GROUP 2 OPERATIONAL CHECKS AND TROUBLESHOOTING

1. OPERATIONAL CHECKS

Check item	Checking procedure
Steering wheel 	· Set rear wheels facing straight forward, then turn steering wheel to left and right. Measure range of steering wheel movement before rear wheel starts to move. Range should be 30~60 mm at rim of steering wheel. If play is too large, adjust at gear box. Test steering wheel play with engine at idling.
Knuckle	· Check knuckle visually or use crack detection method. If the knuckle is bent, the tire wear is uneven, so check tire wear.
Steering axle	· Put camber gauge in contact with hub and measure camber. If camber is not within 0±0.5° ; rear axle is bent. · Ask assistant to drive truck at minimum turning radius. · Fit bar and a piece of chalk at outside edge of counterweight to mark line of turning radius. · If minimum turning radius is not within±100 mm (±4 in) of specified value, adjust turning angle stopper bolt. Min turning radius (Outside)
Hydraulic pressure of power steering	Remove plug from outlet port of flow divider and install oil pressure gauge. Turn steering wheel fully and check oil pressure. ※ Oil pressure : 90 kgf/cm² (1280 psi)

25L-9A	2076 mm (82 in)	33L-9A	2136 mm (84 in)
30L-9A	2136 mm (84 in)	-	-

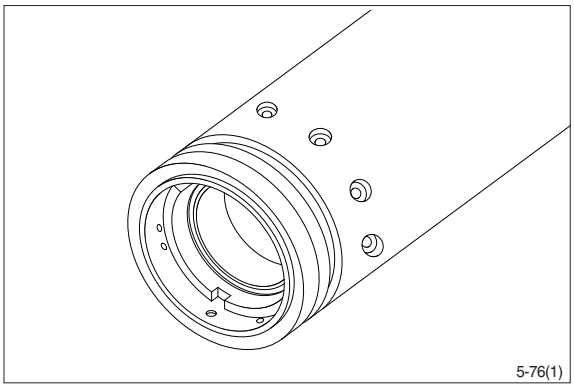
2. TROUBLESHOOTING

Problem	Cause	Remedy
Steering wheel drags.	· Low oil pressure. · Bearing faulty. · Spring spool faulty. · Reaction plunger faulty. · Ball-and-screw assembly faulty. · Sector shaft adjusting screw excessively tight. · Gears poorly meshing. · Flow divider coil spring fatigued.	· Check lockout. Repair. · Clean or replace. · Clean or replace. · Replace. · Clean or replace. · Adjust. · Check and correct meshing. · Replace.
Steering wheel fails to return smoothly.	· Bearing faulty. · Reaction plunger faulty. · Ball-and-screw assy faulty · Gears poorly meshing.	· Clean or replace. · Replace. · Clean or replace. · Check and correct meshing.

5) ASSEMBLY

(1) Assemble spool and sleeve.

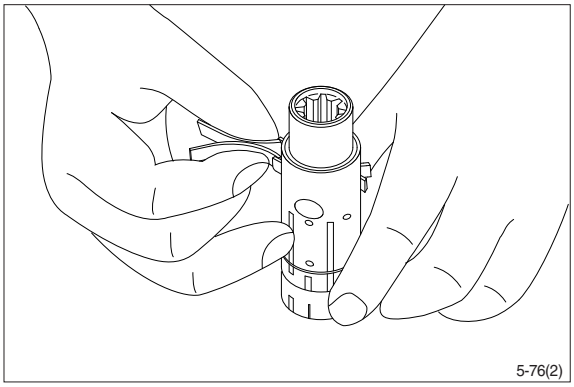
※ When assembling spool and sleeve only one of two possible ways of positioning the spring slots is correct. There are three slots in the spool and three holes in the sleeve in the end of the spool / sleeve opposite to the end with spring slots. Place the slots and holes opposite each other so that parts of the holes in the sleeve are visible through the slots in the spool.



5-76(1)

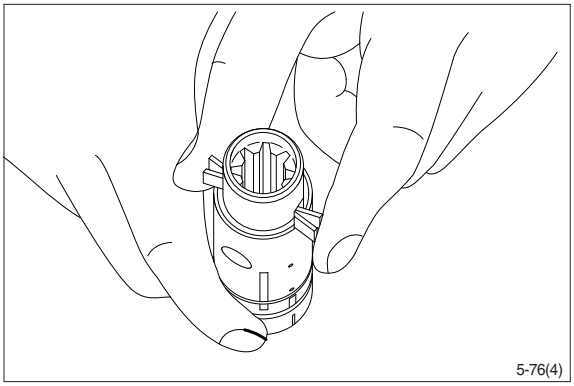
(2) Place the two flat neutral position springs in the slot.

Place the centering springs between the flat ones and press them into place (see assembly pattern).



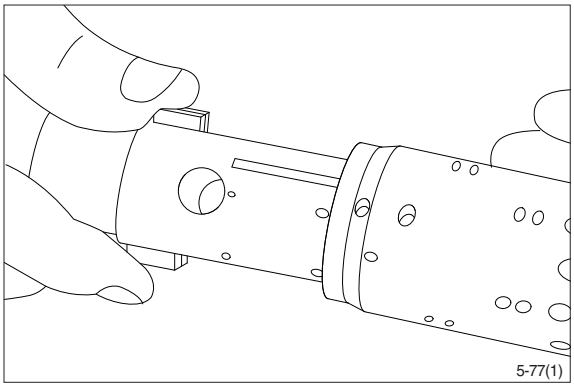
5-76(2)

(3) Line up the spring set.



5-76(4)

(4) Guide the spool into the sleeve. Make sure that spool and sleeve are placed correctly in relation to each other.

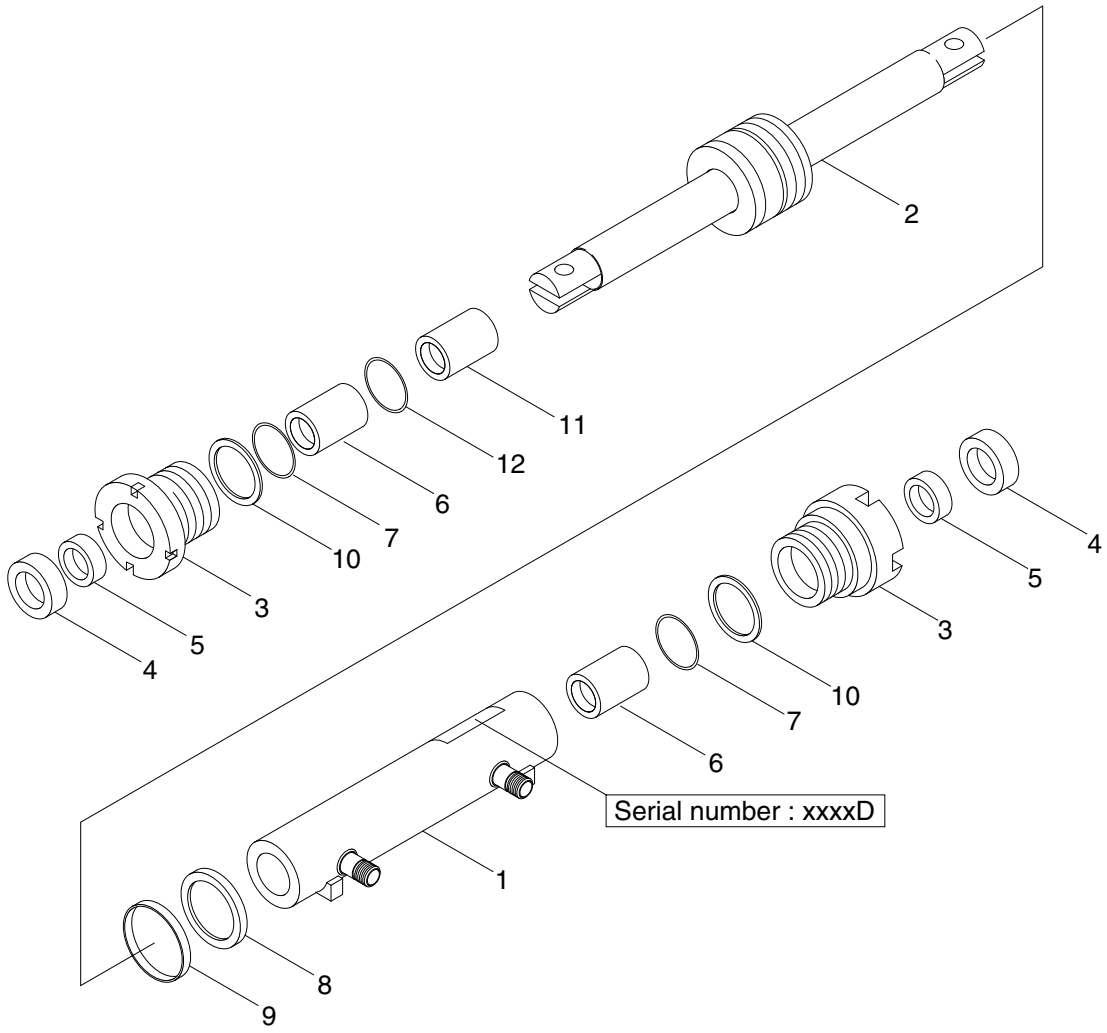


5-77(1)

2. STEERING CYLINDER

1) STRUCTURE

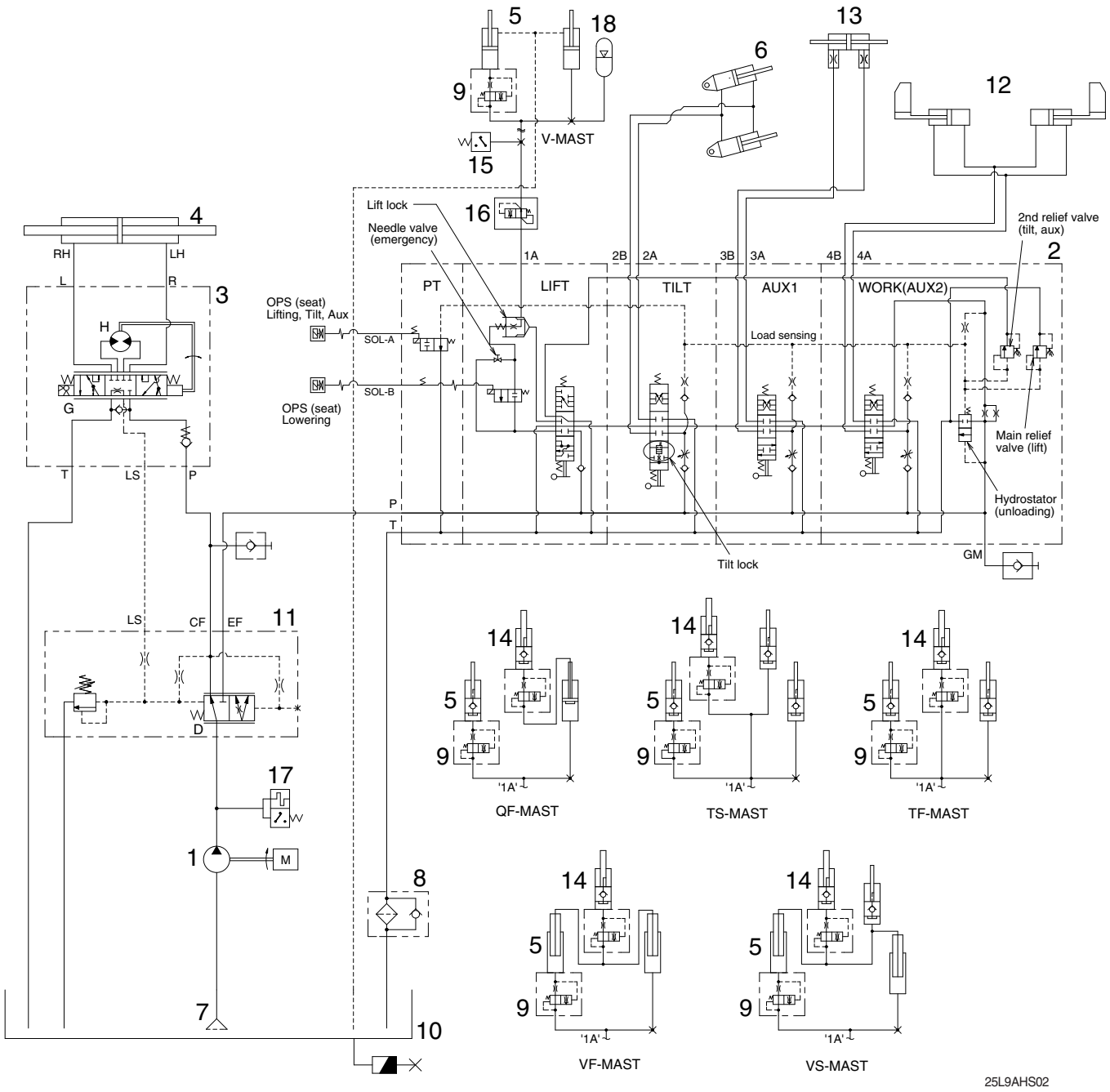
(1) Type 1



25L9ASS10

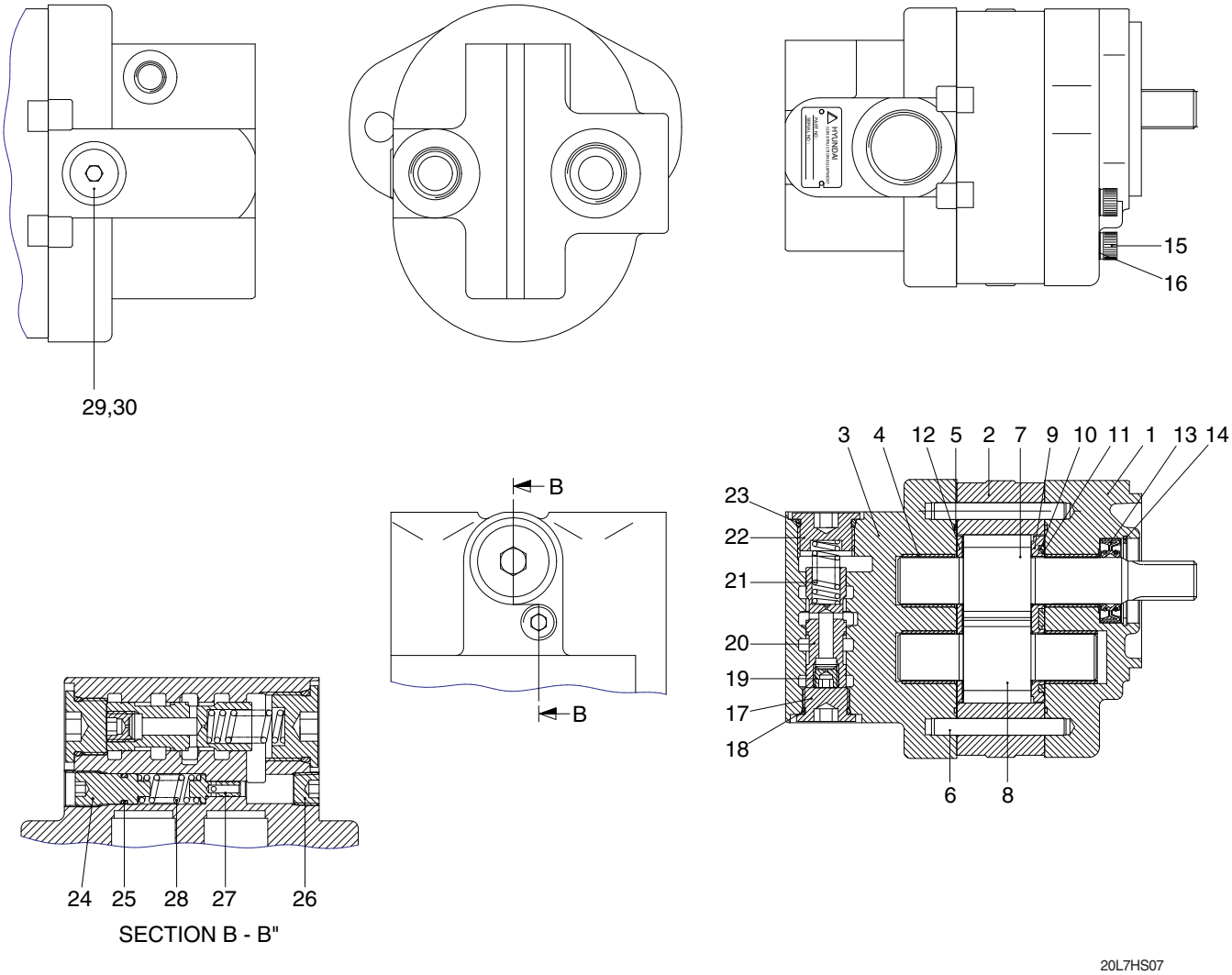
1	Tube assembly	5	Rod seal	9	Wear ring
2	Rod	6	DD-bushing	10	Lock washer
3	Rod cover	7	O-ring	11	Spacer
4	Dust wiper	8	Piston seal	12	O-ring

· Non boosted brake + travel/mast OPSS



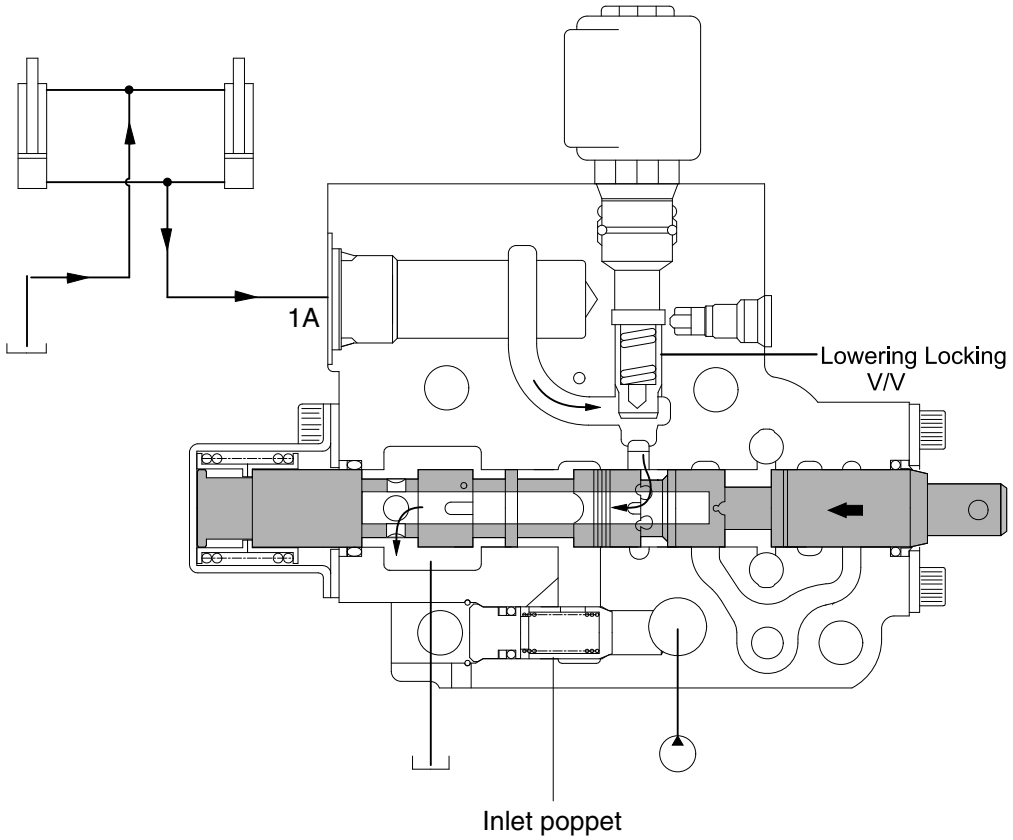
1	Hydraulic gear pump	7	Suction strainer	13	Side shift cylinder (opt)
2	Main control valve	8	Return filter	14	Free lift cylinder
3	Steering unit	9	Down safety valve	15	Load sensor
4	Steering cylinder	10	Hydraulic tank	16	Flow regulator
5	Lift cylinder	11	Priority valve	17	Pressure/temperature sensor (opt)
6	Tilt cylinder	12	Fork positioner cylinder (opt)	18	Accumulator (opt)

STRUCTURE (Non booster brake)



1	Housing	11	Back up ring	21	Spring
2	Body	12	Side plate	22	Plug
3	Priority valve body	13	Oil seal	23	O-ring
4	Bushing	14	Snap ring	24	Adjust screw
5	O-ring	15	Bolt	25	O-ring
6	Pin	16	Washer	26	Bolt plug
7	Drive gear	17	Plug	27	Poppet
8	Idle gear	18	O-ring	28	Relief spring
9	Side plate	19	Orifice plug	29	Plug
10	O-ring	20	Spool	30	O-ring

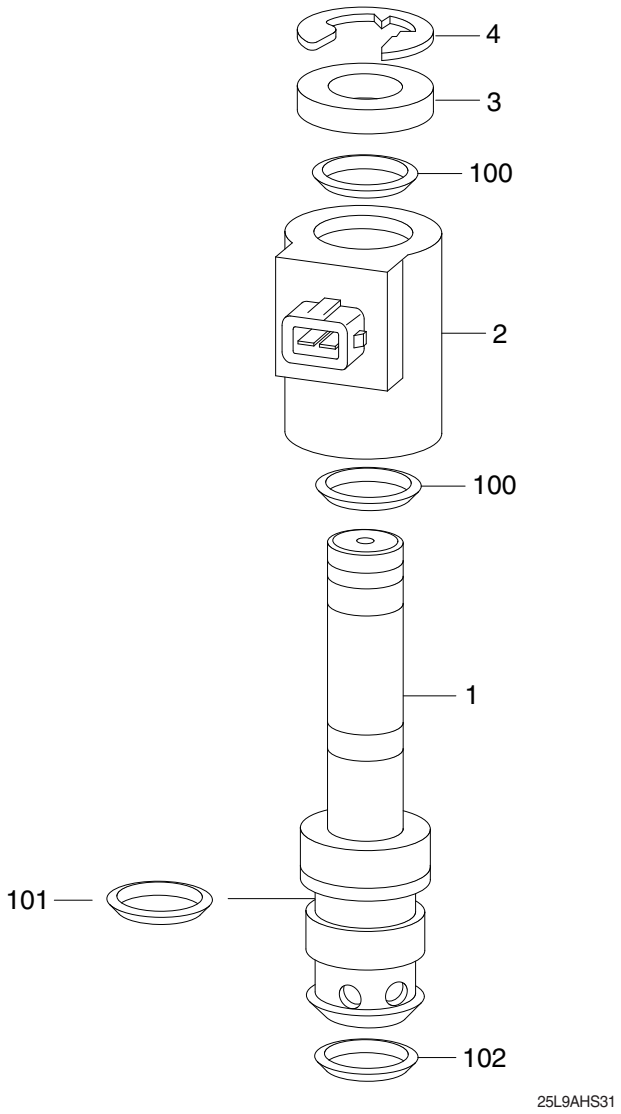
(2) Lower position



25L9AHS20

When the lift control lever is pushed forward, the spool moves to the left and the neutral passage is closed.
The spool moves to the lift lower position, opening up the neutral passage to tank and (1A) → T.
In lift lower position the fork drops due to its own weight.

(7) Solenoid valve



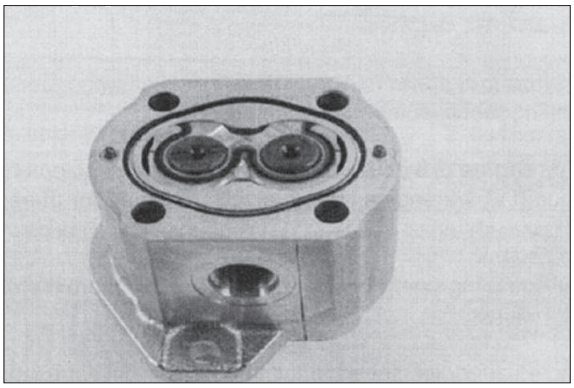
1 Cartridge
2 AMP coil
3 Washer
4 Lock washer
100 O-ring
101 O-ring
102 O-ring

2. TROUBLESHOOTING

1) SYSTEM

Problem	Cause	Remedy
Large fork lowering speed.	· Seal inside control valve defective. · Oil leaks from joint or hose. · Seal inside cylinder defective.	· Replace spool or valve body. · Replace. · Replace packing.
Large spontaneous tilt of mast.	· Tilting backward : Check valve defective. · Tilting forward : tilt lock valve defective. · Oil leaks from joint or hose. · Seal inside cylinder defective.	· Clean or replace. · Clean or replace. · Replace. · Replace seal.
Slow fork lifting or slow mast tilting.	· 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.	· Add oil. · Bleed air. · Replace. · Clean filter. · Adjust relief valve. · Replace packing. · Change to SAE10W, class CJ engine oil. · Adjust roll to rail clearance. · Replace spool or valve body. · Replace spool or valve body.
Hydraulic system makes abnormal sounds.	· Excessive restriction of oil flow pump suction side. · Gear or bearing in hydraulic pump defective.	· Clean filter. · Replace gear or bearing.
Control valve lever is locked.	· Foreign matter jammed between spool and valve body. · Valve body defective.	· Clean. · Tighten body mounting bolts uniformly.
High oil temperature.	· Lack of hydraulic oil. · High oil viscosity. · Oil filter clogged.	· Add oil. · Change to SAE10W, class CF engine oil. · Clean filter.

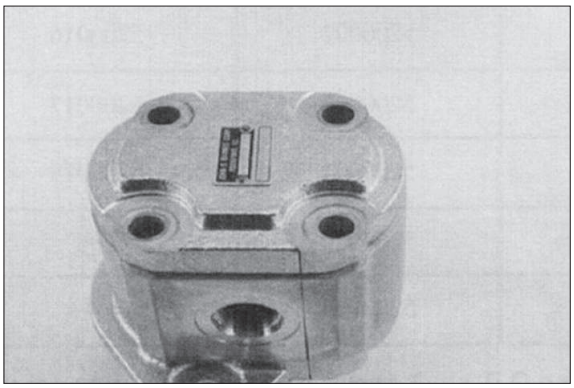
(13) Gently slide the gear housing over the rear bearing block assembly, slide housing down until the housing engages the dowel pins. Press firmly in place with hands, do not force or use any tool.
Check to make sure the intake port in the housing in on the same side as the open end of the E-seal and that the marked lines on the mounting flange and gear housing are in alignment.



PUMP 23

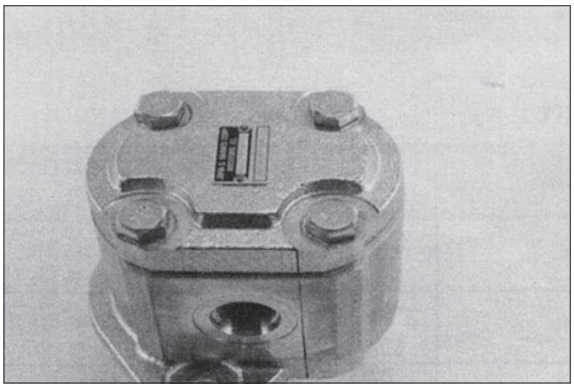
(14) The surface of the rear bearing block should be slightly below the face of the gear housing. If the bearing block sits higher then the rear face of the gear housing then the E-seal or O-ring have shifted out of the groove. If this is the case, remove the gear housing and check for proper seal installation.

(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.



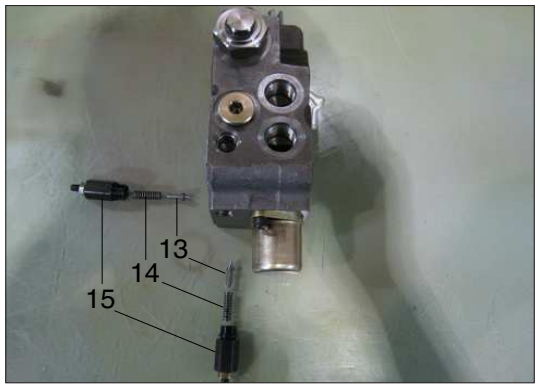
PUMP 24

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



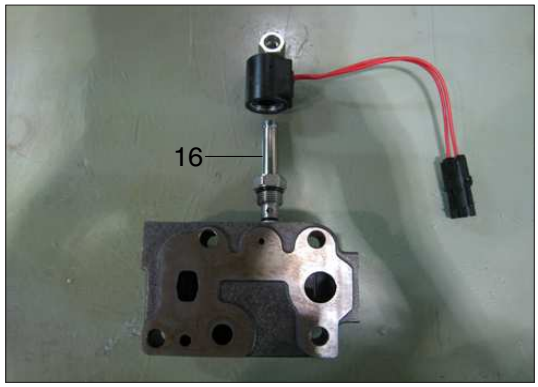
PUMP 25

12) Remove relief plugs (15), springs (14) and poppets (13).
 · Relief plugs torque (15) : 2.5 kgf · m



20D7MCV09

13) Remove normal open solenoid valve (16, Opt) from the valve body.

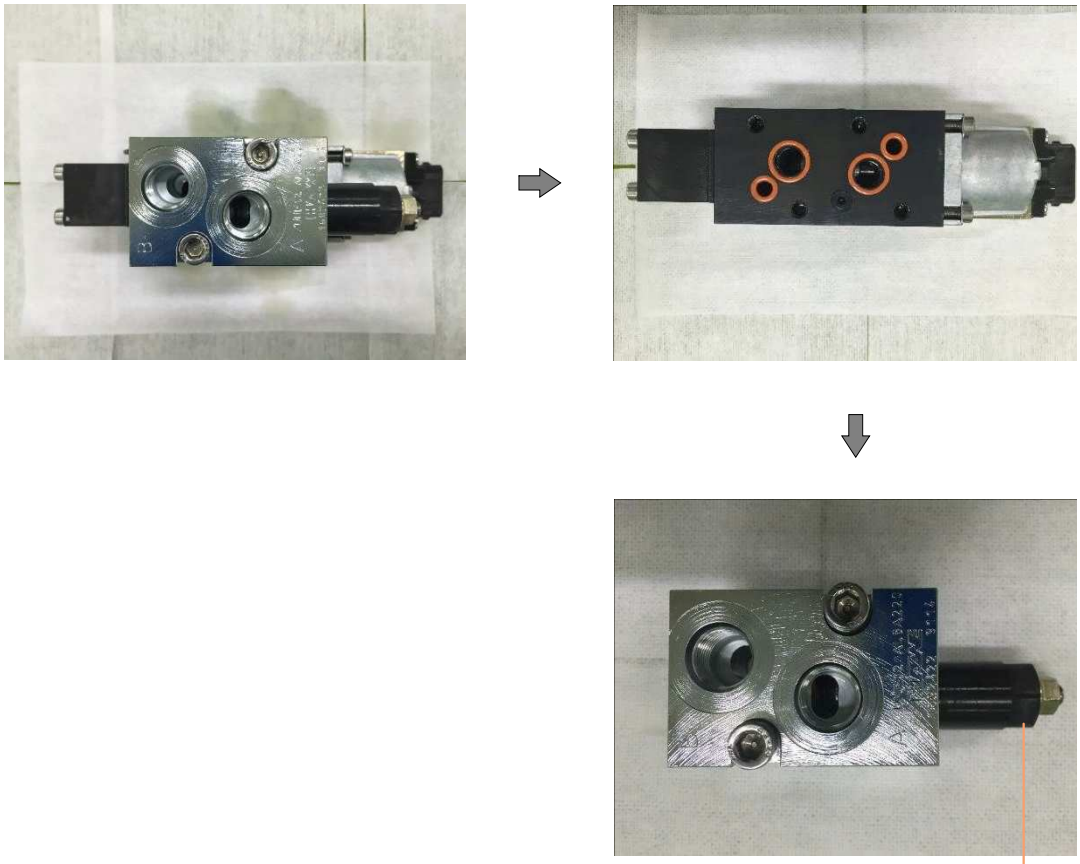


20D7MCV10

14) Assembly procedure of the main control valve is the reverse order of the removal procedure.

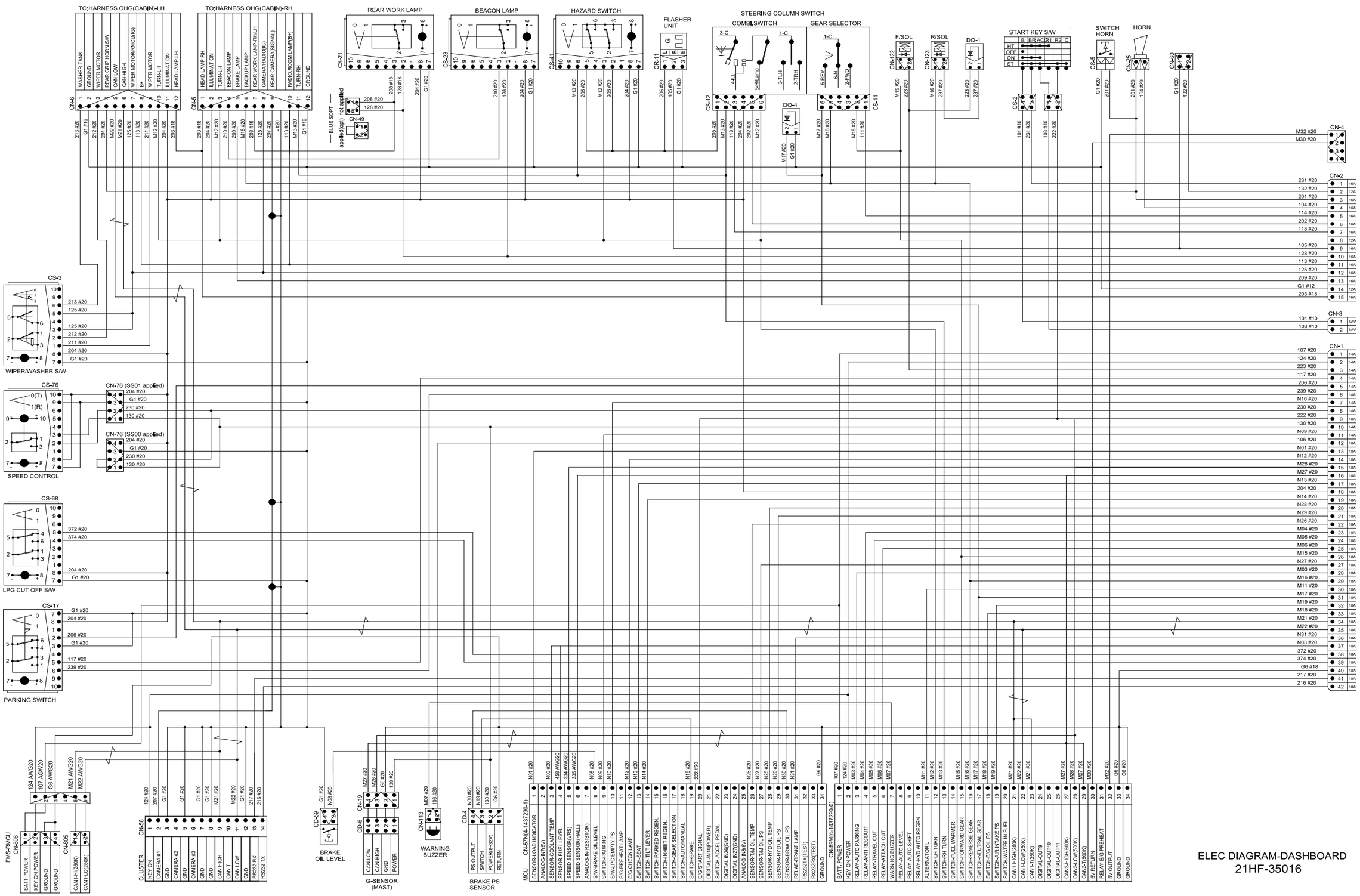
(4) Counter balance valve

※ Counter balance valve needs during tilting out operation.

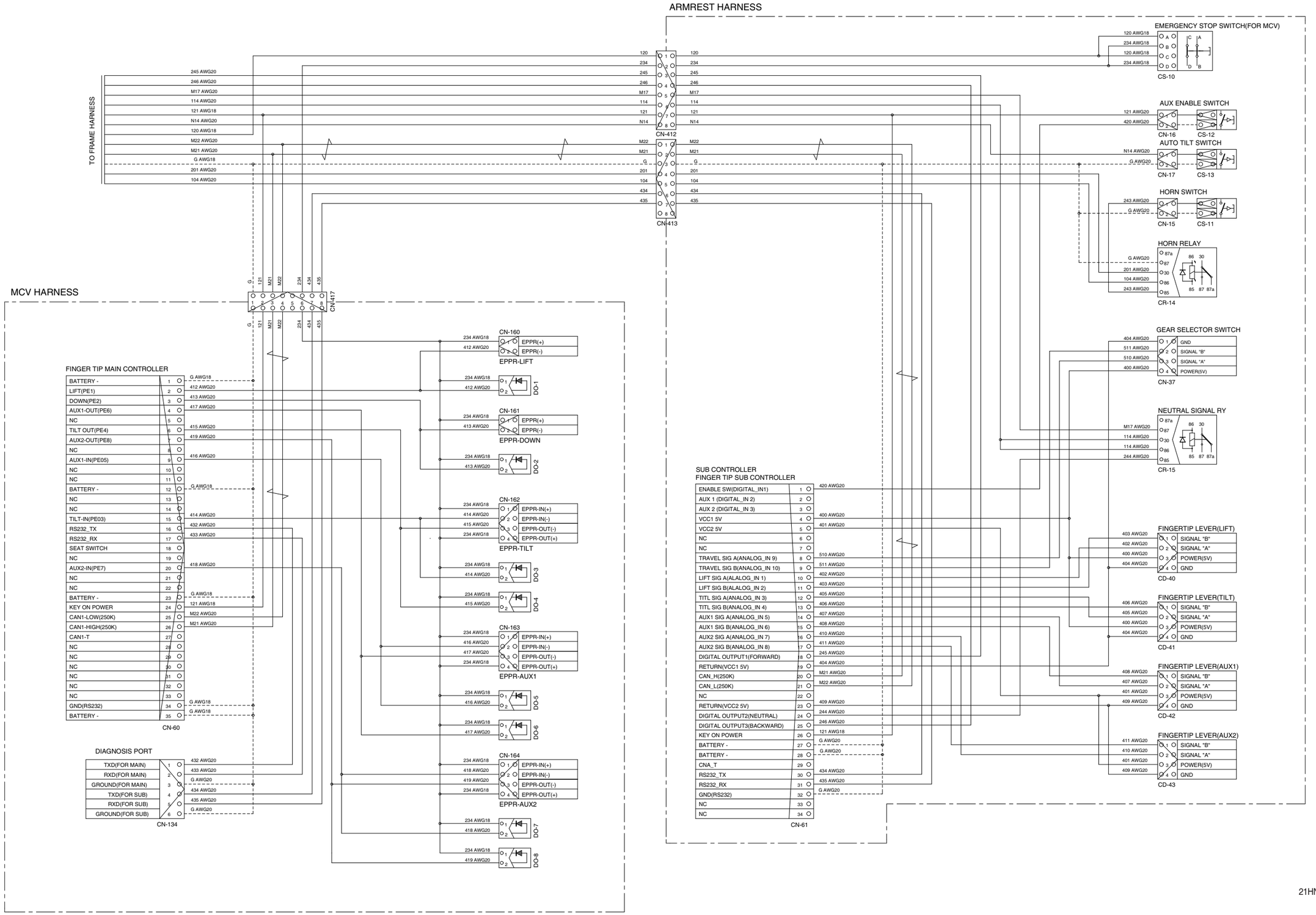


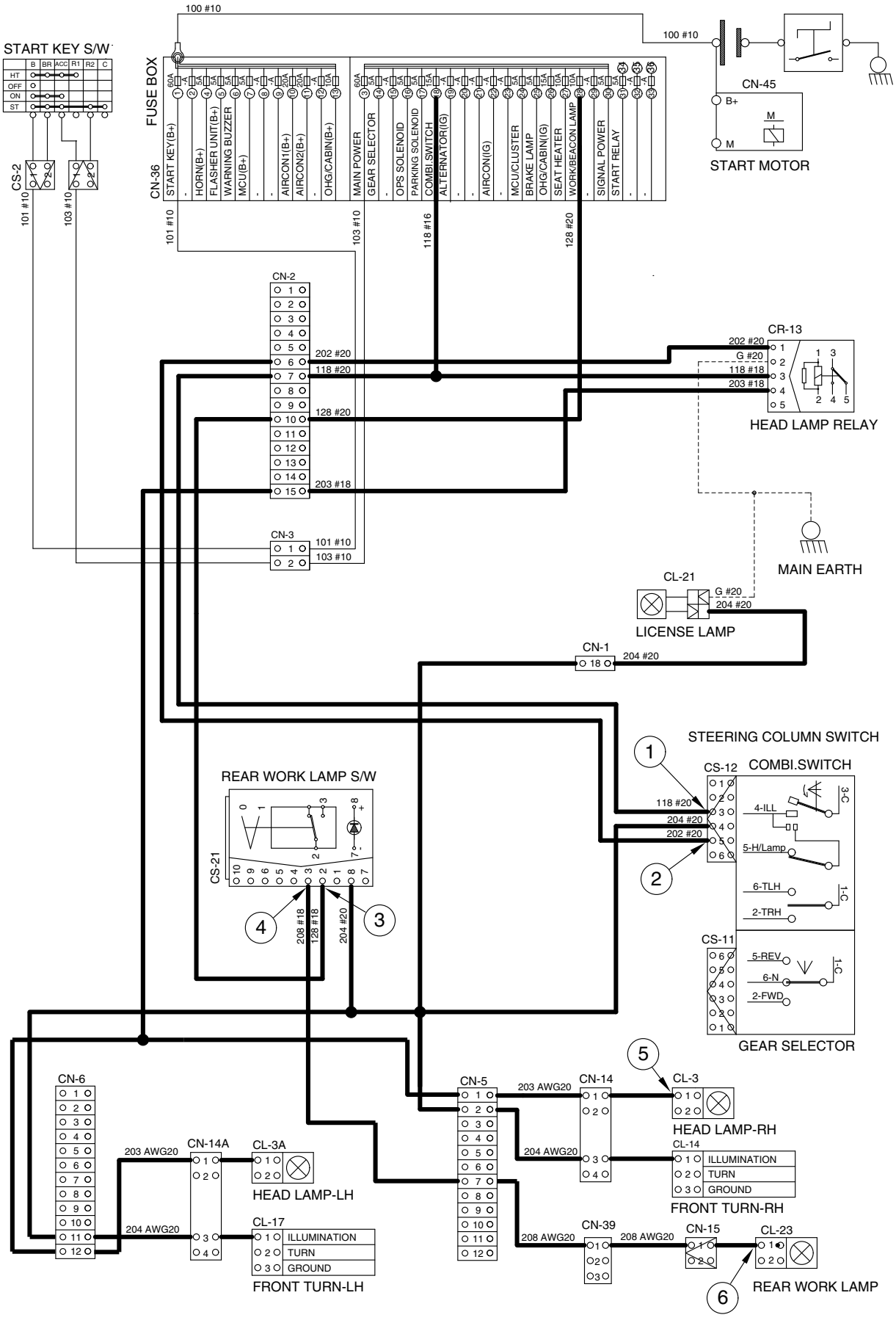
SECTION 7 ELECTRICAL SYSTEM

·ELECTRICAL CIRCUIT (2/6-3, DASHBOARD 25L-9A : ~#0522, 30L-9A : ~#0343, 33L-9A : ~#0074, 35LN-9A : ~#0143)



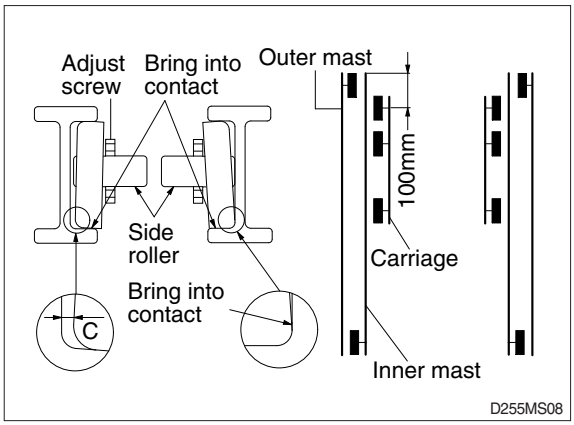
·ELECTRICAL CIRCUIT (6/6, FINGERTIP)




START KEY S/W
B
BR
ACC
R1
R2
C
HT
OFF
ON
ST
CS-2
101 #10
103 #10
100 #10
FUSE BOX
CN-36
START KEY(B+)
HORN(B+)
FLASHER UNIT(B+)
WARNING BUZZER
MCU(B+)
AIRCON1(B+)
AIRCON2(B+)
OHG/CABIN(B+)
MAIN POWER
GEAR SELECTOR
OPS SOLENOID
PARKING SOLENOID
COMBI.SWITCH
ALTERNATOR(IG)
AIRCON(IG)
MCU/CLUSTER
BRAKE LAMP
OHG/CABIN(IG)
SEAT HEATER
WORK/BEACON LAMP
SIGNAL POWER
START RELAY
118 #16
128 #20
CN-45
B+
M
START MOTOR
CN-2
202 #20
118 #20
128 #20
203 #18
CR-13
G #20
HEAD LAMP RELAY
CN-3
MAIN EARTH
CL-21
LICENSE LAMP
204 #20
CN-1
18
STEERING COLUMN SWITCH
REAR WORK LAMP S/W
CS-21
CS-12
COMBI.SWITCH
4-ILL
5-H/Lamp
6-TLH
2-TRH
CS-11
5-REV
6-N
2-FWD
GEAR SELECTOR
208 #18
CN-6
CN-14A
CL-3A
HEAD LAMP-LH
CL-17
ILLUMINATION
TURN
GROUND
FRONT TURN-LH
203 AWG20
204 AWG20
CN-5
CN-14
CL-3
HEAD LAMP-RH
CL-14
FRONT TURN-RH
CN-39
208 AWG20
CN-15
CL-23
REAR WORK LAMP
25L9AEL06

SECTION 8 MAST

3) CARRIAGE LOAD ROLLER



(1) Measure the clearance when the center of the carriage upper roller is 100 mm from the top of the inner mast.

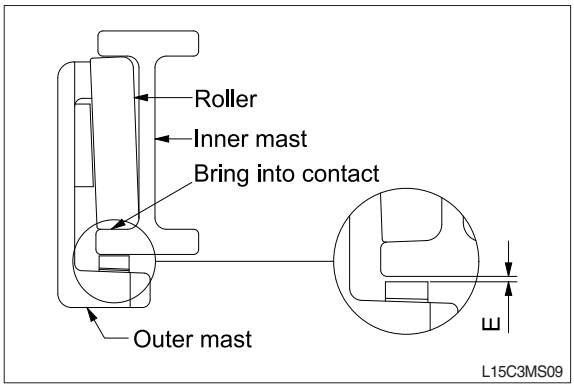
(2) Measure the clearance at upper, middle and lower rollers after loosen the adjust screws from the side rollers. Shift the carriage to one side to bring the roller into contact with the inner mast, and measure the clearance between the roller side face and mast at the closest position on the opposite side to the following value by inserting the carriage roller shim.

- Standard clearance C = 0~0.6 mm
- Shim thickness 0.5, 1.0 mm

(3) Distribute the shim thickness equally to the left and right roller. Refer to Carriage assembly.

(4) After the adjustment, the carriage should move smoothly along the overall mast length.

4) MAST BACK UP LINER



(1) Measure the clearance with the middle mast at the bottom position.

(2) With the middle mast in contact with the outer mast roller, adjust the clearance between the mast back up liner and middle mast to the following value by inserting the back up liner shim.

- Standard clearance E = 0.2 ~ 0.6 mm
- Shim thickness 0.5, 1.0 mm

(3) After the adjustment, the mast should move smoothly.