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SECTION 1 GENERAL

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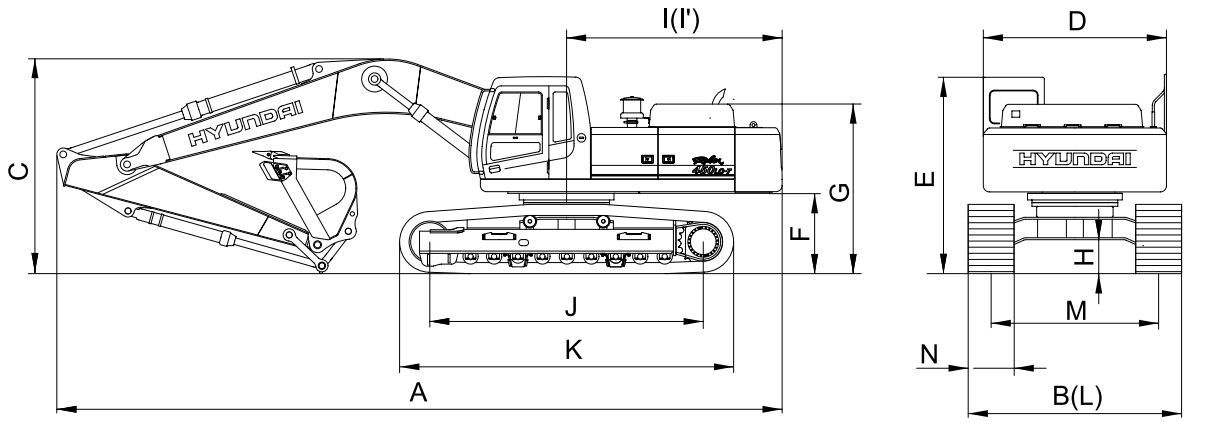
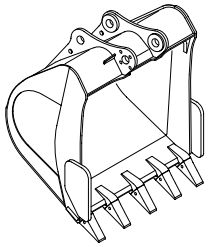
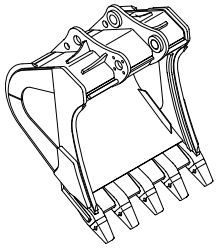
2. SPECIFICATIONS



45072SP01

Description		Unit	Specification
Operating weight		kg(lb)	44900(99000,~#0463) 45200(99650,#0464~)
Bucket capacity(SAE heaped), standard		$m^3(yd^3)$	2.15(2.81)
Overall length	A	mm(ft-in)	12000(39' 4")
Overall width, with 600mm shoe	B		3340(10'11")
Overall height	C		3600(11'10")
Superstructure width	D		2980(9' 9")
Overall height of cab	E		3250(10' 8")
Ground clearance of counterweight	F		1340(4' 5")
Engine cover height	G		2792(9' 2")
Minimum ground clearance	H		555(1'10")
Rear-end distance	I		3665(12' 0")
Rear-end swing radius	I'		3720(12' 2")
Distance between tumblers	J		4470(14' 8")
Undercarriage length	K		5462(17'11")
Undercarriage width	L		3340(10'11")
Track gauge	M		2740(8'12")
Track shoe width, standard	N		600(24")
Travel speed(Low/high)		km/hr(mph)	3.2/5.3(2.0/3.3)
Swing speed		rpm	10.3
Gradeability		Degree(%)	35(70)
Ground pressure(600mm shoe)		$kgf/cm^2(psi)$	0.78(11.09)

2) ROCK AND HEAVY DUTY BUCKET

	
◈ 2.2m³ SAE heaped bucket	⊙1.8m³ SAE ⊙2.2m³ SAE ⊙2.43m³ SAE ⊙3.20m³ SAE heaped bucket

Capacity		Width		Weight	Recommendation					
					7.06m (23' 2") boom					6.55m boom
SAE heaped	CECE heaped	Without side cutter	With side cutter		2.4m arm (7' 10")	2.9m arm (9' 6")	3.38m arm (11' 1")	4.0m arm (13' 1")	4.5m arm (14' 9")	2.4m arm (7' 10")
◈2.20m³ (2.88yd³)	1.80m³ (2.35yd³)	1840mm (72.4")	-	2140kg (4720lb)						
⊙1.80m³ (2.35yd³)	1.50m³ (1.96yd³)	1560mm (61.4")	-	2090kg (4610lb)						
⊙2.20m³ (2.88yd³)	1.80m³ (2.35yd³)	1810mm (71.3")	-	2190kg (4830lb)						
⊙2.43m³ (3.18yd³)	2.10m³ (2.75yd³)	1860mm (73.2")	-	2330kg (5140lb)						
⊙3.20m³ (4.19yd³)	2.80m³ (3.66yd³)	2080mm (81.9")	-	2790kg (6150lb)						

◈ : Heavy duty bucket

⊙ : Rock bucket

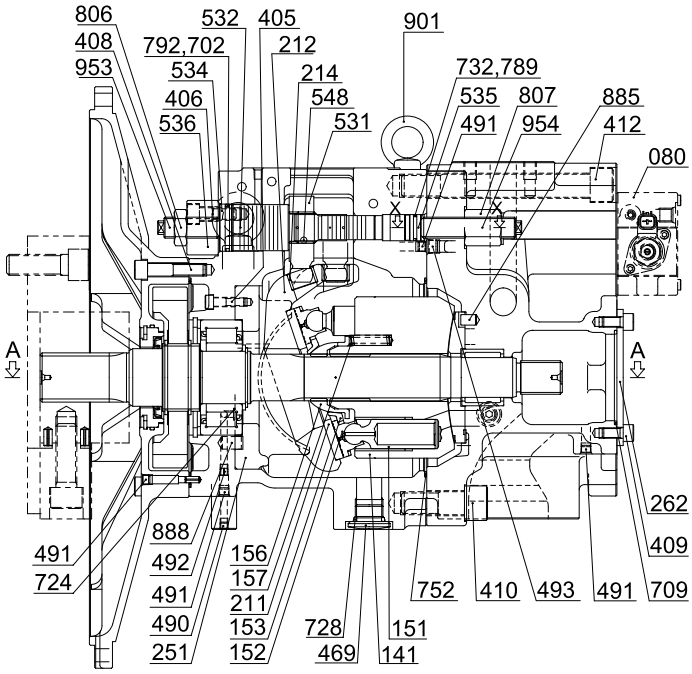
Applicable for materials with density of 2000kgf/m³ (3370lbf/yd³) or less

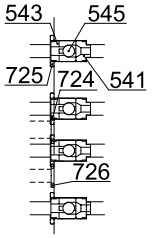
Applicable for materials with density of 1600kgf/m³ (2700lbf/yd³) or less

Applicable for materials with density of 1100kgf/m³ (1850lbf/yd³) or less

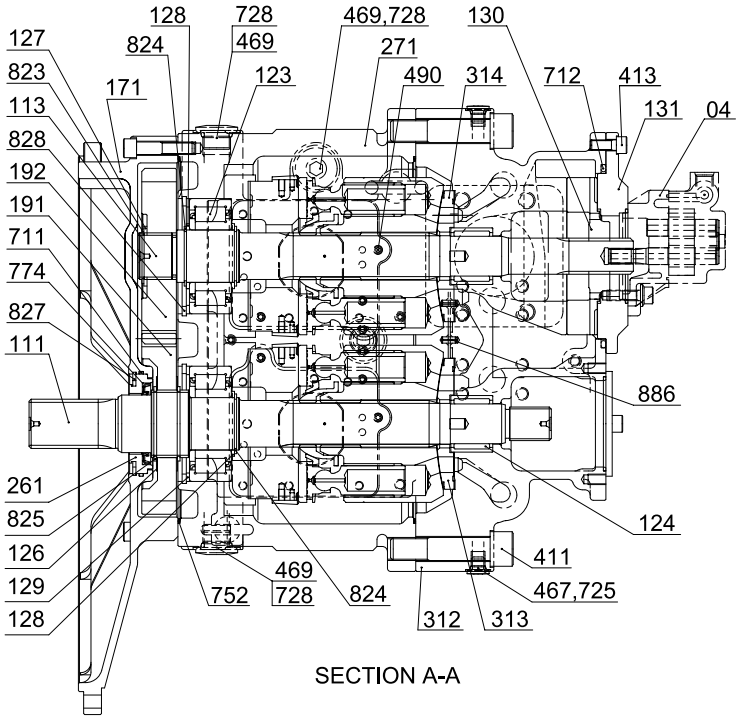
1) MAIN PUMP(1/2)

The main pump consists of two piston pumps(front & rear) and valve block.





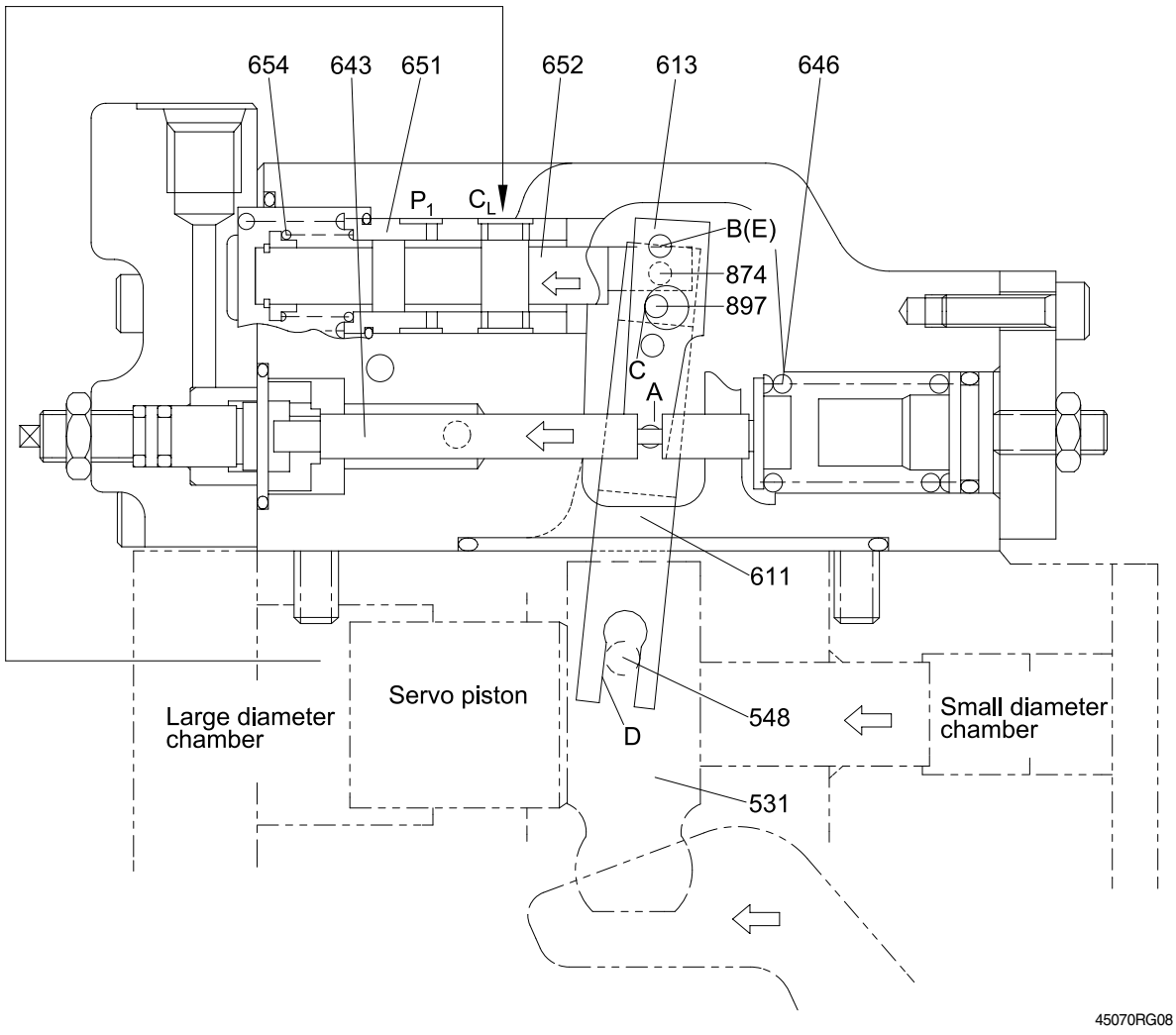
SECTION X-X



SECTION A-A

45070MP03

② Flow increasing function

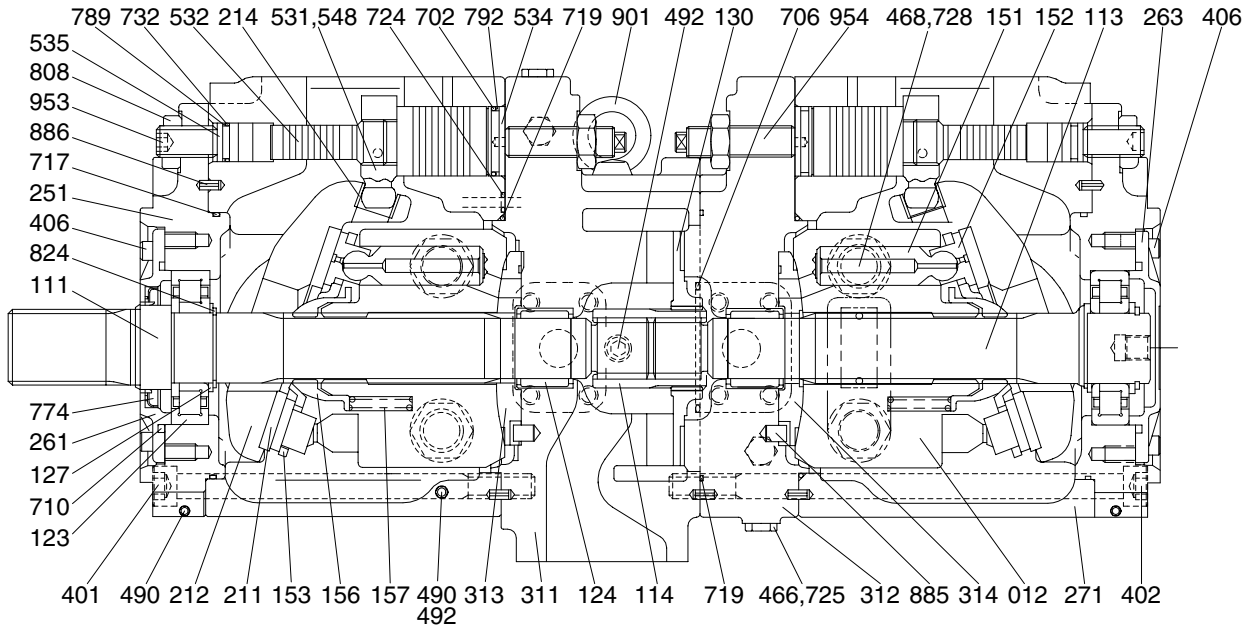


As the pilot pressure Pi decreases, the pilot piston(643) moves to the left by the action of the pilot spring(646) and causes lever 2(613) to rotate around the fulcrum of point B. Since the pin(897) is pressed against the large hole section(C) of lever 2 by the action of the return spring(654) via the spool(652), pin(874), and feedback lever(611), the feedback lever rotates around the fulcrum of point D as lever 2 rotates, and shifts the spool to the left. Port CL opens a way to the tank port as the spool moves. This deprives the large diameter section of the servo piston of pressure, and shifts the servo piston to the left by the discharge pressure P1 in the small diameter section, resulting in an increase in the flow rate.

As the servo piston moves, point D also moves to the left, the feedback lever rotates around the fulcrum of point C, and the spool moves to the right till the opening between the spool and sleeve is closed.

1) MAIN PUMP(1/2)

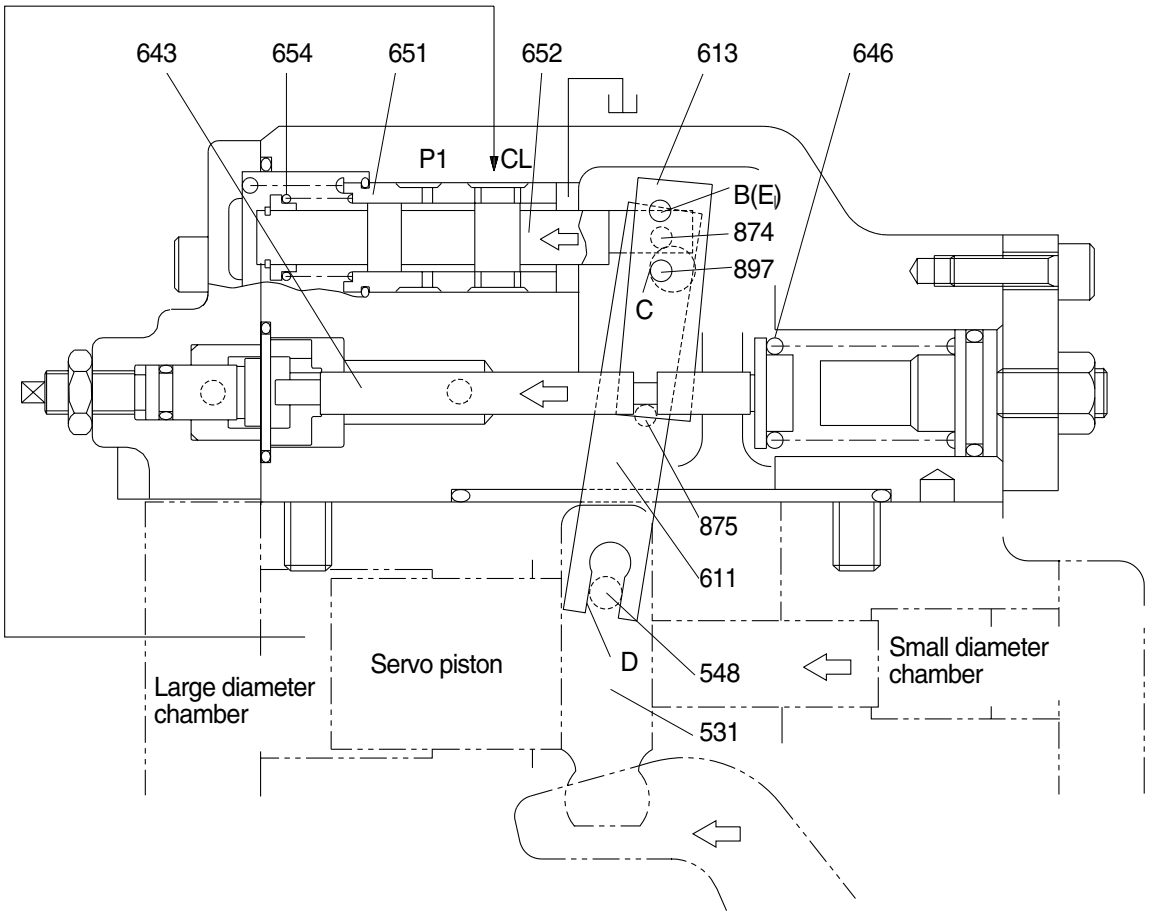
The main pump consists of two piston pumps(front & rear) and valve block.



470072MP02

012	Cylinder block	271	Pump casing	710	O-ring
111	Drive shaft(F)	311	Valve cover(F)	717	O-ring
113	Driven shaft(R)	312	Valve cover(R)	719	O-ring
114	Coupling	313	Valve plate(R)	724	O-ring
123	Roller bearing	314	Valve plate(L)	725	O-ring
124	Needle bearing	401	Hexagon socket bolt	728	O-ring
127	Spacer	402	Hexagon socket bolt	732	O-ring
130	Booster	406	Hexagon socket bolt	774	Oil seal
151	Piston	466	VP Plug	789	Back up ring
152	Shoe	468	VP Plug	792	Back up ring
153	Plate	490	VP Plug	808	Hexagon head nut
156	Bushing	492	VP Plug	824	Snap ring
157	Cylinder spring	531	Tilting pin	885	Pin
211	Shoe plate	532	Servo piston	886	Spring pin
212	Swash plate	534	Stopper(L)	901	Eye bolt
214	Bushing	535	Stopper(S)	953	Set screw
251	Support plate	548	Feed back pin	954	Set screw
261	Seal cover(F)	702	O-ring		
263	Seal cover(R)	706	O-ring		

② Flow increasing function

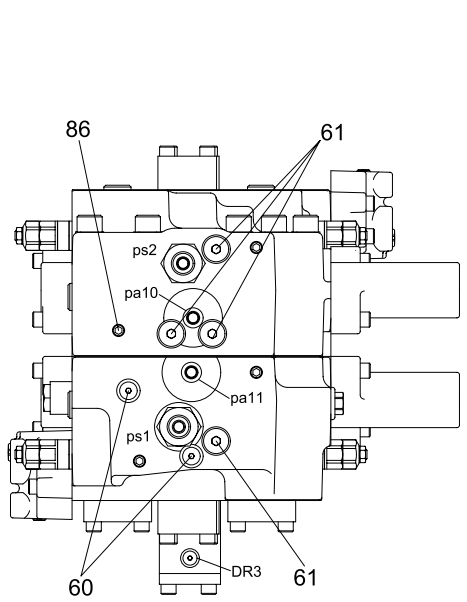


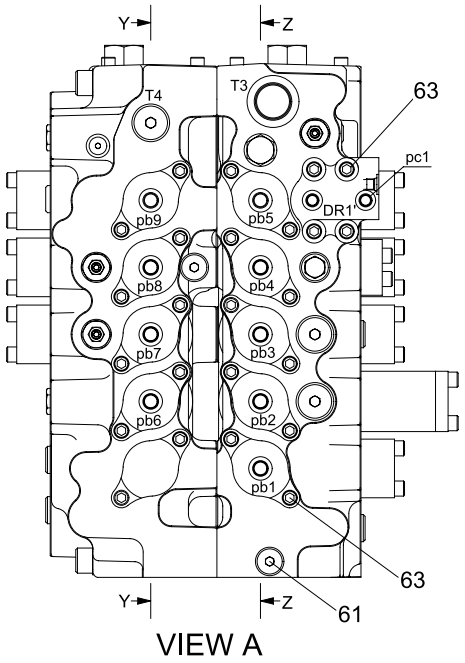
2-11

As the pilot pressure Pi decreases, the pilot piston(643) moves to the left by the action of the pilot spring(646) and causes lever 2(613) to rotate around the fulcrum of point B. Since the pin(897) is pressed against the large hole section(C) of lever 2 by the action of the return spring(654) via the spool(652), pin(874), and feedback lever(611), the feedback lever rotates around the fulcrum of point D as lever 2 rotates, and shifts the spool to the left. Port CL opens a way to the tank port as the spool moves. This deprives the large diameter section of the servo piston of pressure, and shifts the servo piston to the left by the discharge pressure P1 in the small diameter section, resulting in an increase in the flow rate.

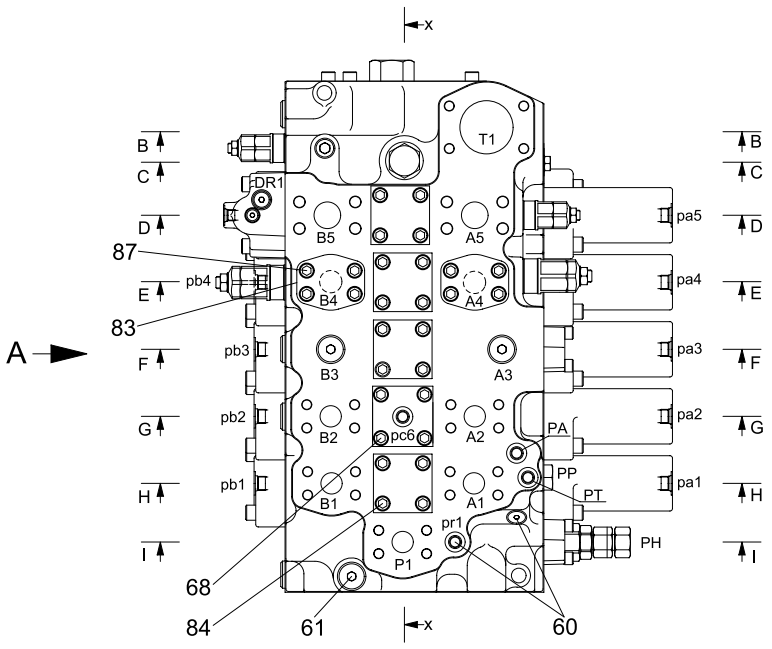
As the servo piston moves, point D also moves to the left, the feedback lever rotates around the fulcrum of point C, and the spool moves to the right till the opening between the spool and sleeve is closed.

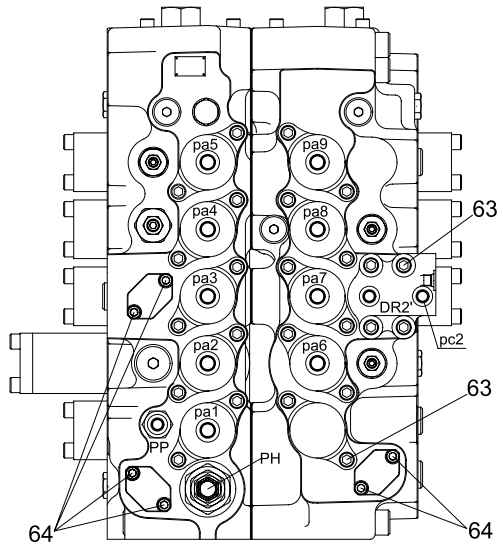
1. STRUCTURE

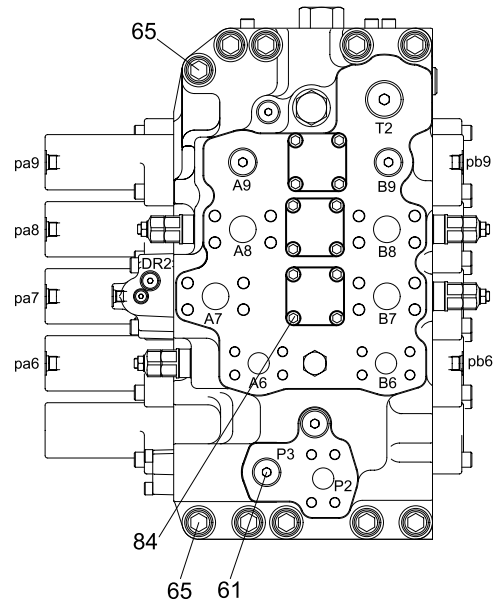


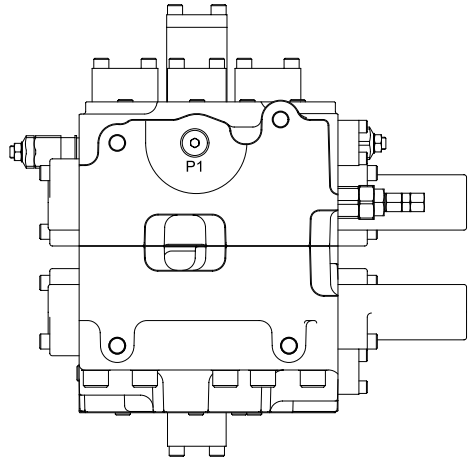


VIEW A









Mark	Port size	Thread depth (mm)
DR1, DR2, DR3, DR1', DR2', pr1, ps1, ps2, pc1, pc2, pc6, pa10, pa11, PA, PP, PH	PF 1/4	12
pa1~pa9, pb1~pb9	PF 3/8	14
A3, A9, B3, B9, P1, P3	PF 1/2	16
T3, T4	PF 3/4	17
T2	PF 1	21

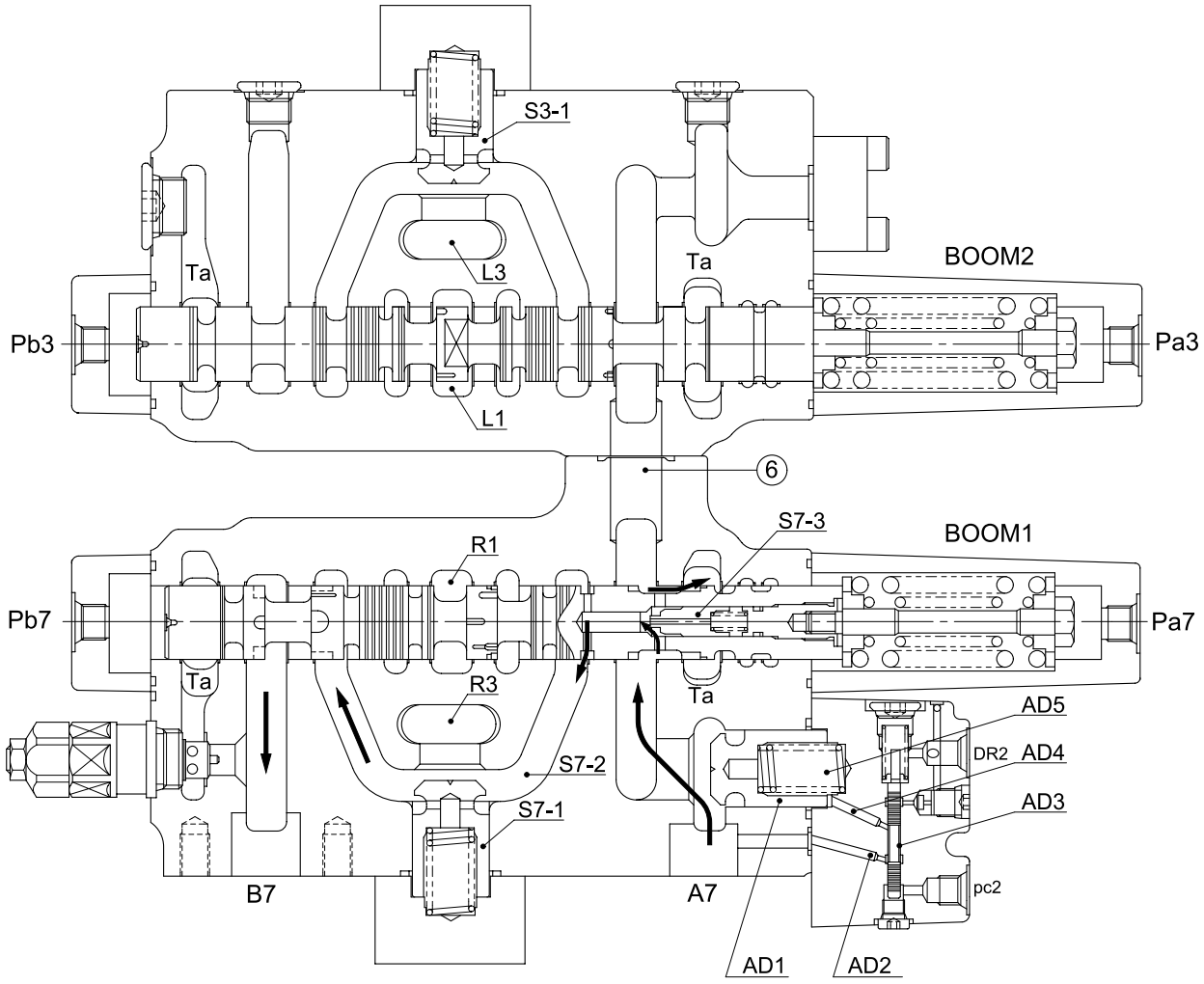
1	Valve housing	41	Back up ring
2	Valve housing	42	Body
3	Spool assy(AM2)	43	Piston
4	Spool assy(BKT)	44	Flange
5	Spool assy(BM1)	45	O-ring
6	Spool assy(TR)	46	Poppet
7	Spool assy(S/TR)	47	Body assy
8	Spool assy(AM1)	48	Relief valve kit
9	Spool assy(SER)	49	Relief valve kit
10	Spool assy(BM2)	50	Relief valve assy
11	Spool assy(SW)	51	Plug assy
12	Cap	52	Poppet
13	Cap	53	Spring
14	O-ring	54	Plug
15	Poppet	55	O-ring
16	Spring	56	Flange
17	Spacer	57	O-ring
18	O-ring	59	Plug assy
19	Back up ring	60	Plug assy
20	Spool assy	61	Plug assy
21	Spring seat(A)	62	Plug assy
22	Spring	63	Socket head bolt
23	Plug	64	Socket head bolt
24	Spool assy	65	Socket head bolt
25	Spring	68	Socket head bolt
26	O-ring	69	Poppet
27	Plug	72	Relief valve kit
28	Poppet	76	O-ring
29	Spring	77	O-ring
30	Poppet	78	O-ring
31	Poppet	79	O-ring
32	Poppet	80	Cap
33	Spring	81	Cap
34	Flange	82	Steel ball
35	O-ring	83	Flange
36	Poppet assy	84	Socket head bolt
37	Spring	85	O-ring
38	Sleeve	86	Socket head bolt
39	Piston	87	Socket head bolt
40	O-ring		

45071MC21

(3) Boom down(recycling)

When the boom 1 spool is pushed to the right by the pilot pressure of port Pb7, the neutral passage(R1) is closed, the oil discharged from pump P2 flows into the port B7 via parallel passage(R3) and the load check valve(S7-1). At the same time, as the port pc2 is pressurizing, the spool(AD3) of anti-drift valve is pushed up, the pressure of spring chamber(AD5) is released and the poppet(AD1) is opened and then the oil from port A7 flows into the tank passage(Ta). Some of returned oil makes the poppet(S7-3) inside boom 1 spool to open and is connected to the passage(S7-2) and flows together into the port B7.

This prevents the cavitation of cylinder rod side.



45071MC08

5. ANTI-DRIFT VALVE

The anti-drift valve is provided the boom bottom and arm rod side of cylinder port for prevention of self drifting by boom weight or bucket loads.

1) WHEN NEUTRAL

The oil from cylinder port flows into spring chamber(AD5) via passage(AD2), the around of spool(AD3) and passage(AD4).

Because of the difference of poppet area and spring force, the poppet(AD1) is seated certainly.

2) WHEN BOOM UP OR ARM OUT

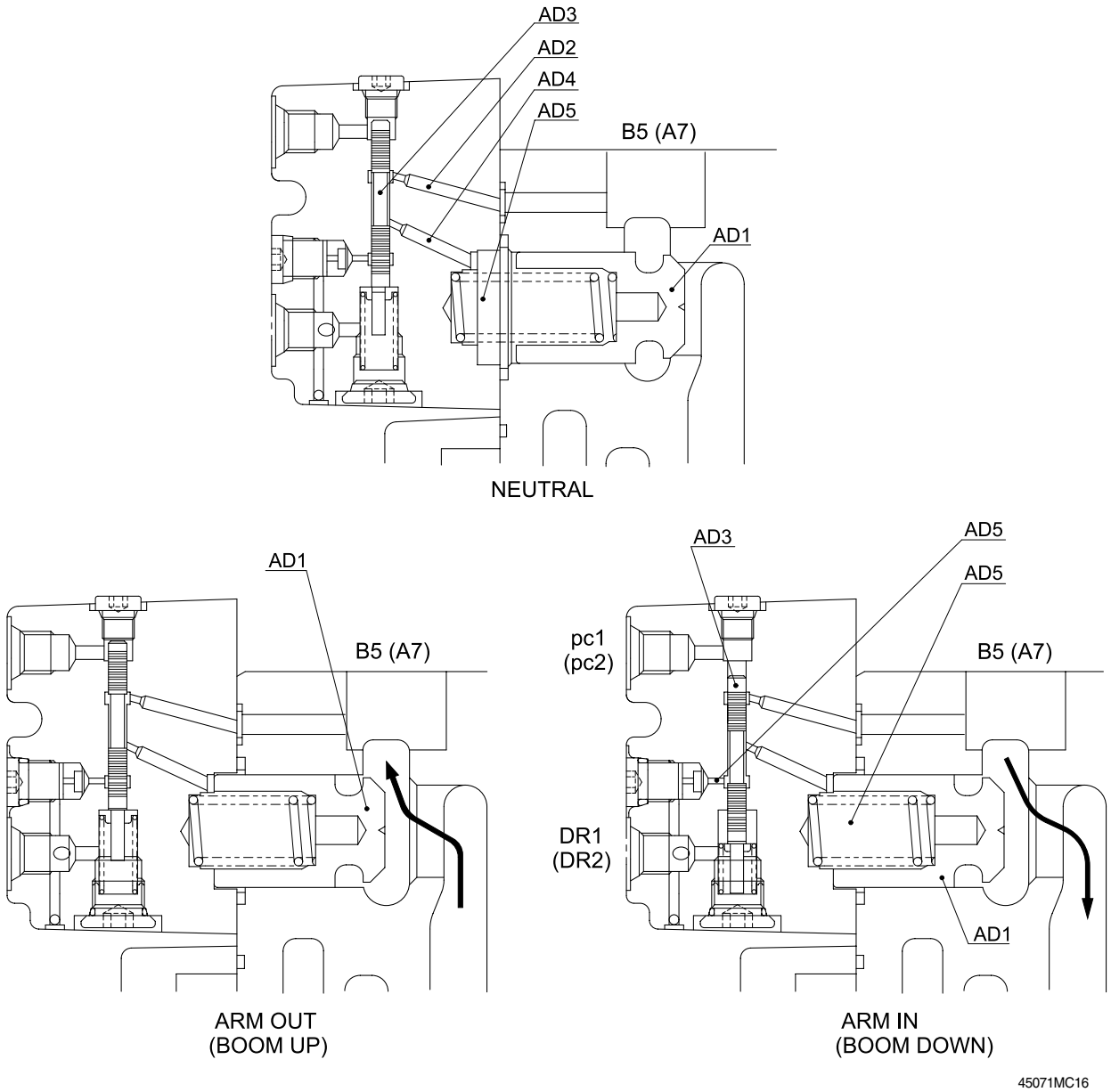
The oil from pump flows into cylinder by pushes open the poppet(AD1).

3) WHEN BOOM DOWN OR ARM IN

The spool(AD3) is pushed down by the pressure of pc1(pc2).

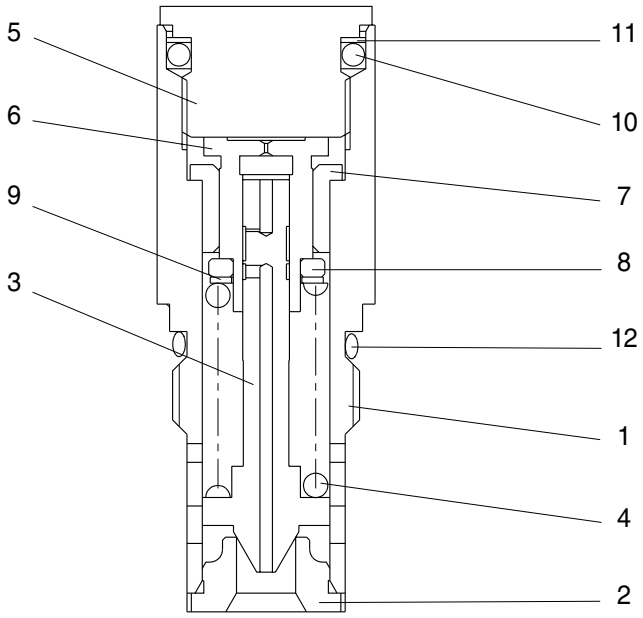
Then the oil of spring chamber(AD5) flows into the drain port DR1(DR2) and pushes open the poppet(AD1).

As a result, the oil from the cylinder port returns to tank passage(Ta).



45071MC16

3) RELIEF VALVE



R130SM05

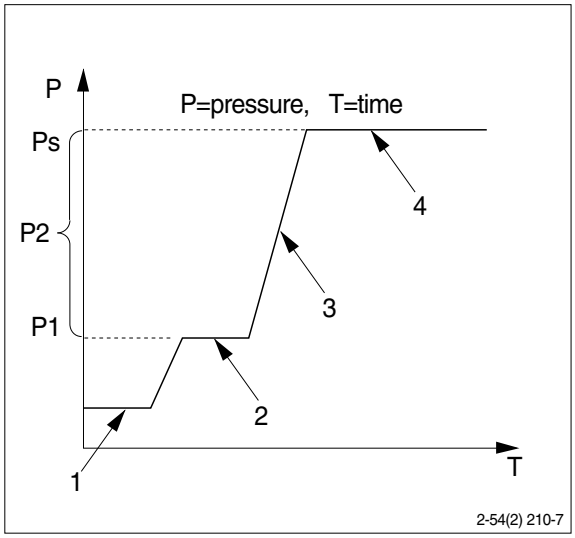
1 Body
2 Seat
3 Plunger
4 Spring
5 Adjusting screw
6 Piston
7 Bushing
8 Spring seat
9 Shim
10 O-ring
11 Back up ring
12 O-ring

(1) Construction of relief valve

The valve casing contains two cartridge type relief valves that stop the regular and reverse rotations of the hydraulic motor. The relief valves relieve high pressure at start or at stop of swing motion and can control the relief pressure in two steps, high and low, in order to insure smooth operation.

(2) Function of relief valve

Figure illustrates how the pressure acting on the relief valve is related to its rising process. Here is given the function, referring to the figure following page.



2-54(2) 210-7

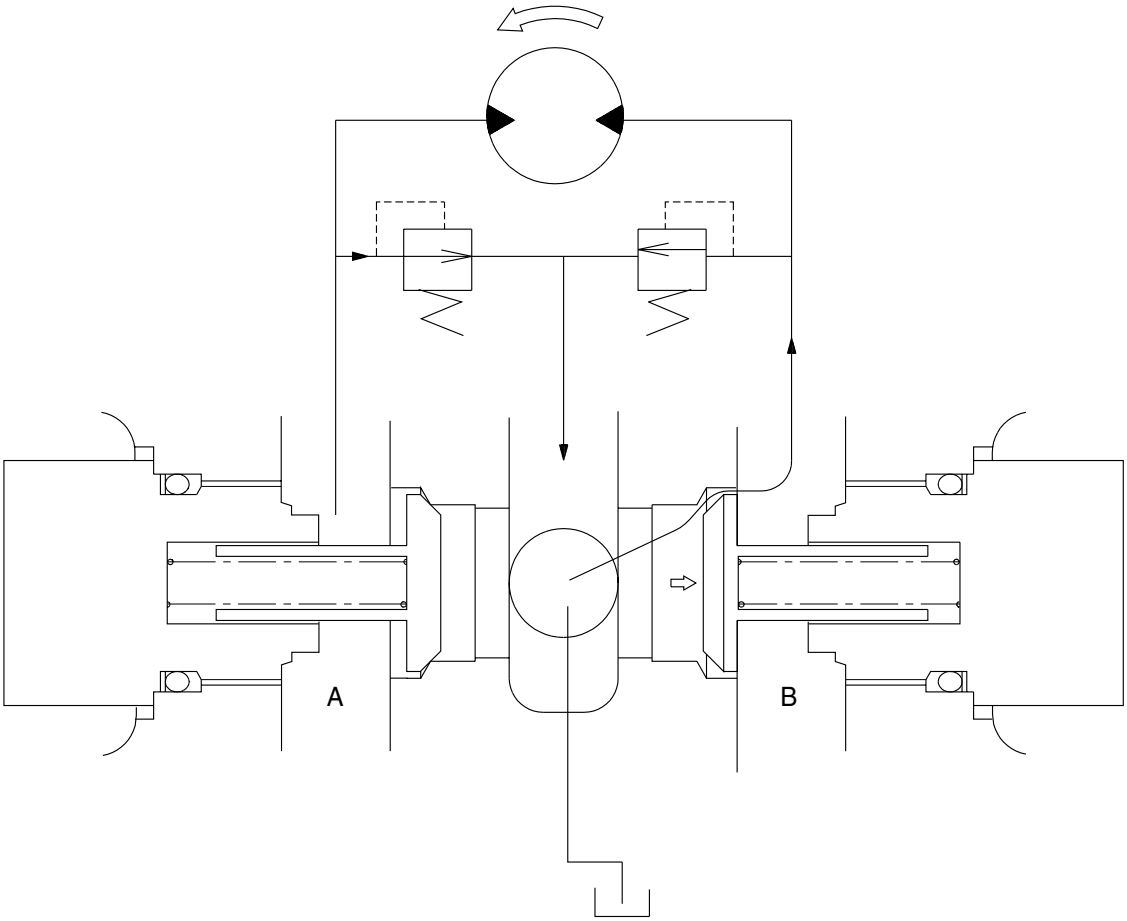
2) MAKE UP VALVE

In the system using this type of motor, there is no counter balance functioning valve and there happens the case of revolution exceeding hydraulic supply of motor. To prevent the cavitation caused by insufficient oil flow there is a make up valve to fill up the oil insufficiency.

A make up valve is provided immediately before the port leading to the hydraulic oil tank to secure feed pressure required when the hydraulic motor makes a pumping action. The boost pressure acts on the hydraulic motor's feed port via the make up valve.

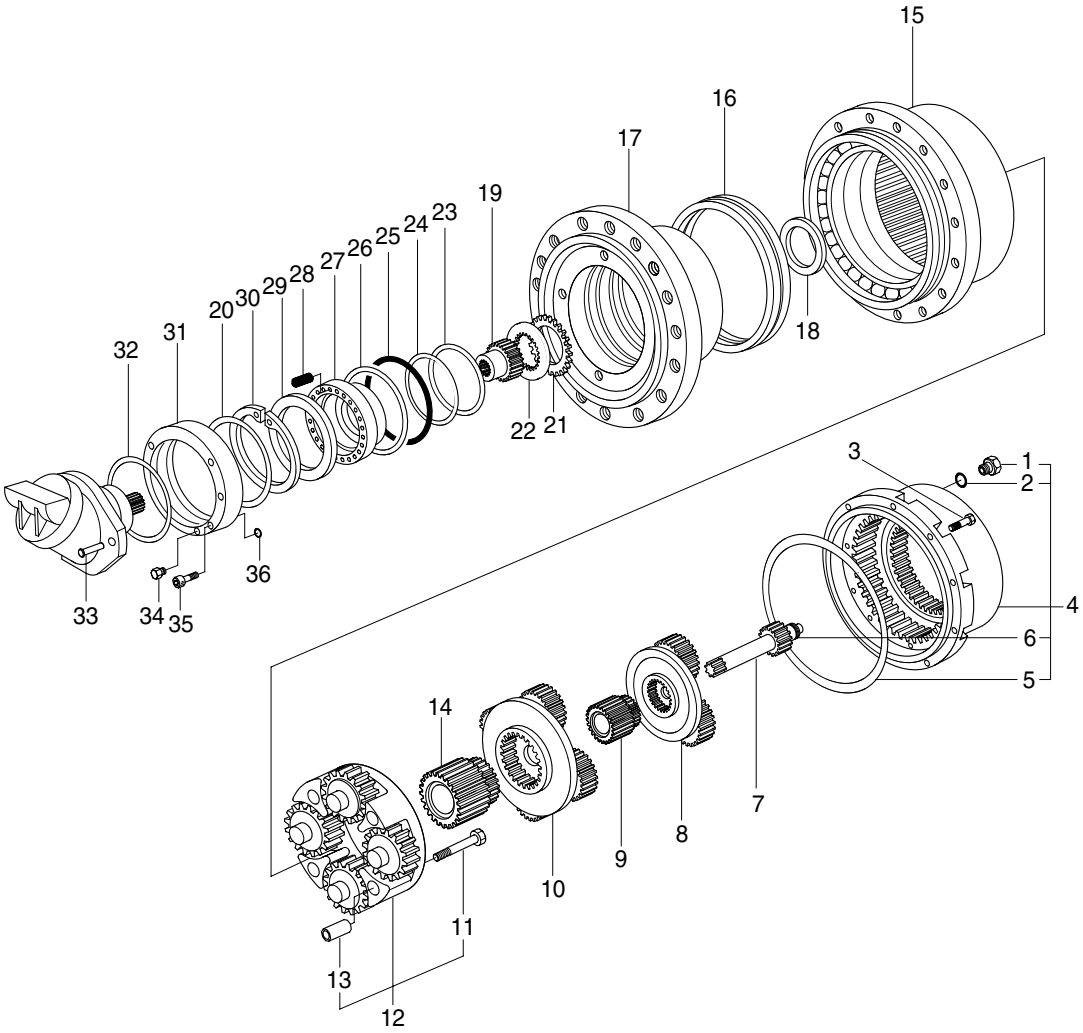
Pressurized oil into the port B, the motor rotate counterclockwise.

If the plunger of MCV moves neutral position, the oil in the motor is drain via left relief valve, the drain oil run into motor via right make up valve, which prevent the cavitation of motor.



R130SM03

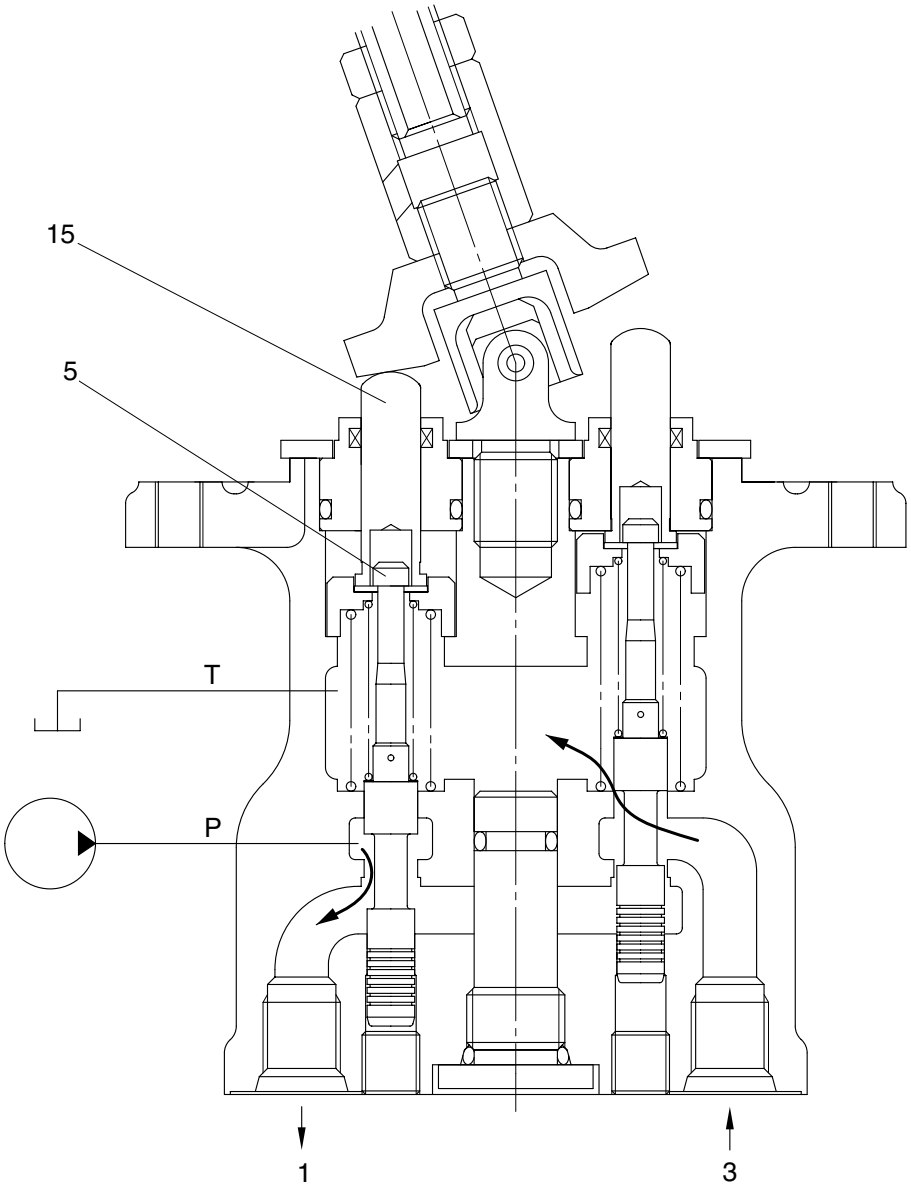
2) REDUCTION GEAR



450A8TR01

1	Washer	13	Bushing	25	O-ring
2	Breather plug	14	Sun gear	26	Spiral ring
3	Screw	15	Housing	27	Piston
4	Cover set	16	Lifetime seal	28	Spring
5	O-ring	17	Hub	29	Spacer
6	Pad	18	Spacer	30	Circlip
7	Sun gear	19	Brake shaft	31	Flange
8	Reduction assy(1st)	20	O-ring	32	O-ring
9	Sun gear	21	Brake disc	33	Screw
10	Reduction assy(2nd)	22	Steel ring	34	Plug
11	Screw	23	Back up ring	35	Screw
12	Reduction assy(3rd)	24	O-ring	36	O-ring

(2) Case where handle is tilted



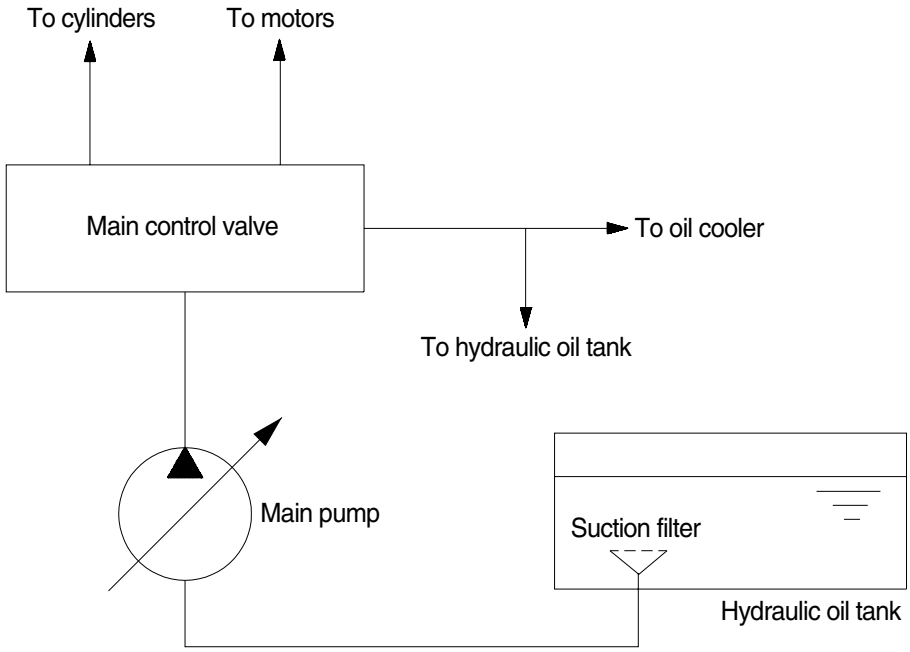
25032RL04

When the push rod(14) is stroked, the spool(5) moves downwards.
Then port P is connected with port(1) and the oil supplied from the pilot pump flows through port(1) to generate the pressure.
When the pressure at port(1) increases to the value corresponding to the spring force set by tilting the handle, the hydraulic pressure force balances with the spring force. If the pressure at port(1) increases higher than the set pressure, port P is disconnected from port(1) and port T is connected with port(1). If it decreases lower than the set pressure, port P is connected with port(1) and port T is disconnected from port 1.
In this manner the secondary pressure is kept at the constant value.
Besides, in some type, when the handle is tilted more than a certain angle, the upper end of the spool contacts with the inside bottom of the push rod and the output pressure is left to be connected with port P.

GROUP 2 MAIN CIRCUIT

The main hydraulic circuit consists of suction circuit, delivery circuit, return circuit and drain circuit.
The hydraulic system consists of one main pump, one control valve, one swing motor, four cylinders and two travel motors.
The swash plate type variable displacement tandem axial piston pump is used as the main pump and is driven by the engine at ratio 1.0 of engine speed.

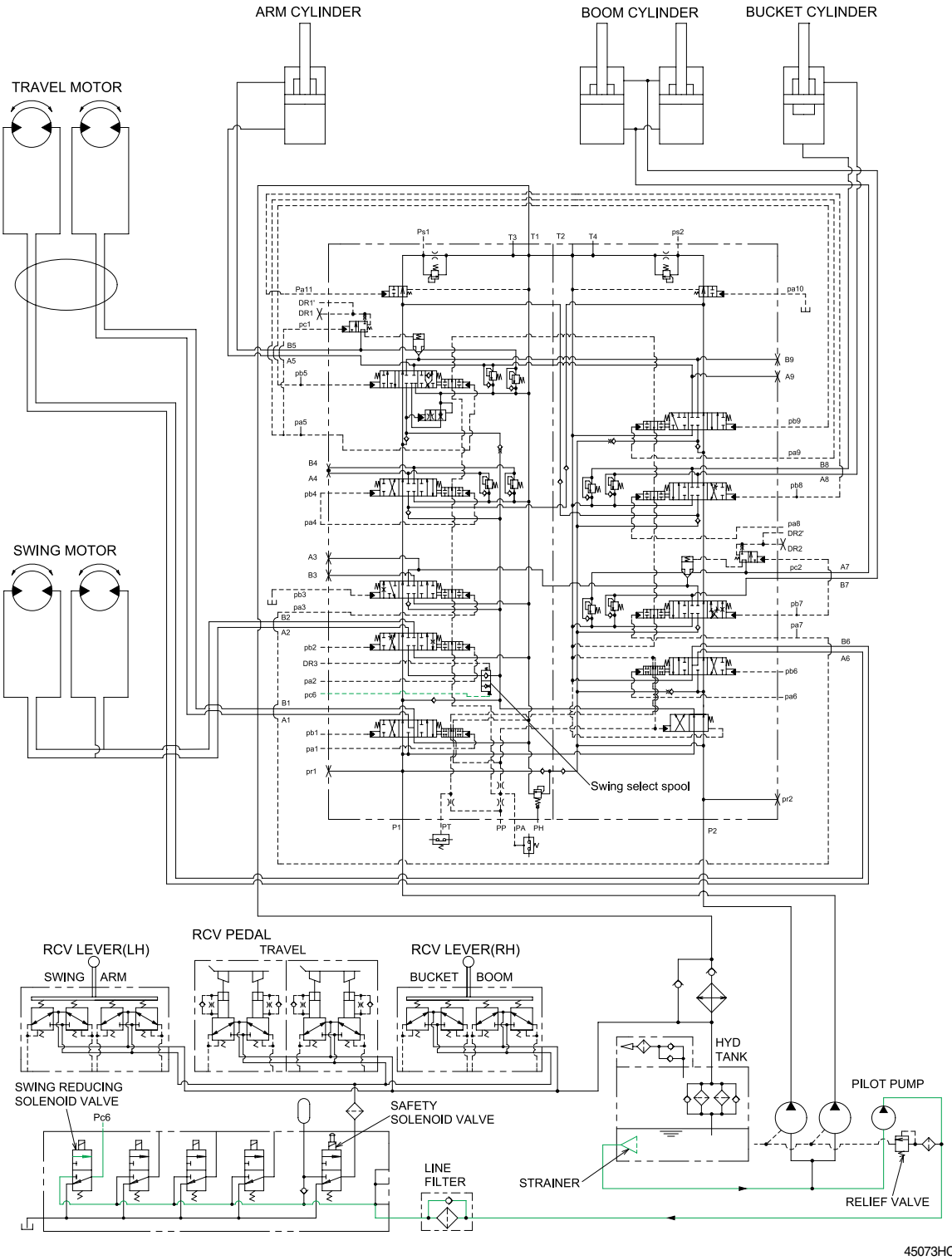
1. SUCTION AND DELIVERY CIRCUIT



3-02 (210-7)

The pumps receive oil from the hydraulic tank through a suction filter. The discharged oil from the pump flows into the control valve and goes out the tank ports.
The oil discharged from the main pump flows to the actuators through the control valve.
The control valve controls the hydraulic functions.
The return oil from the actuators flows to the hydraulic tank through the control valve and the oil cooler.

7. BOOM PRIORITY SYSTEM



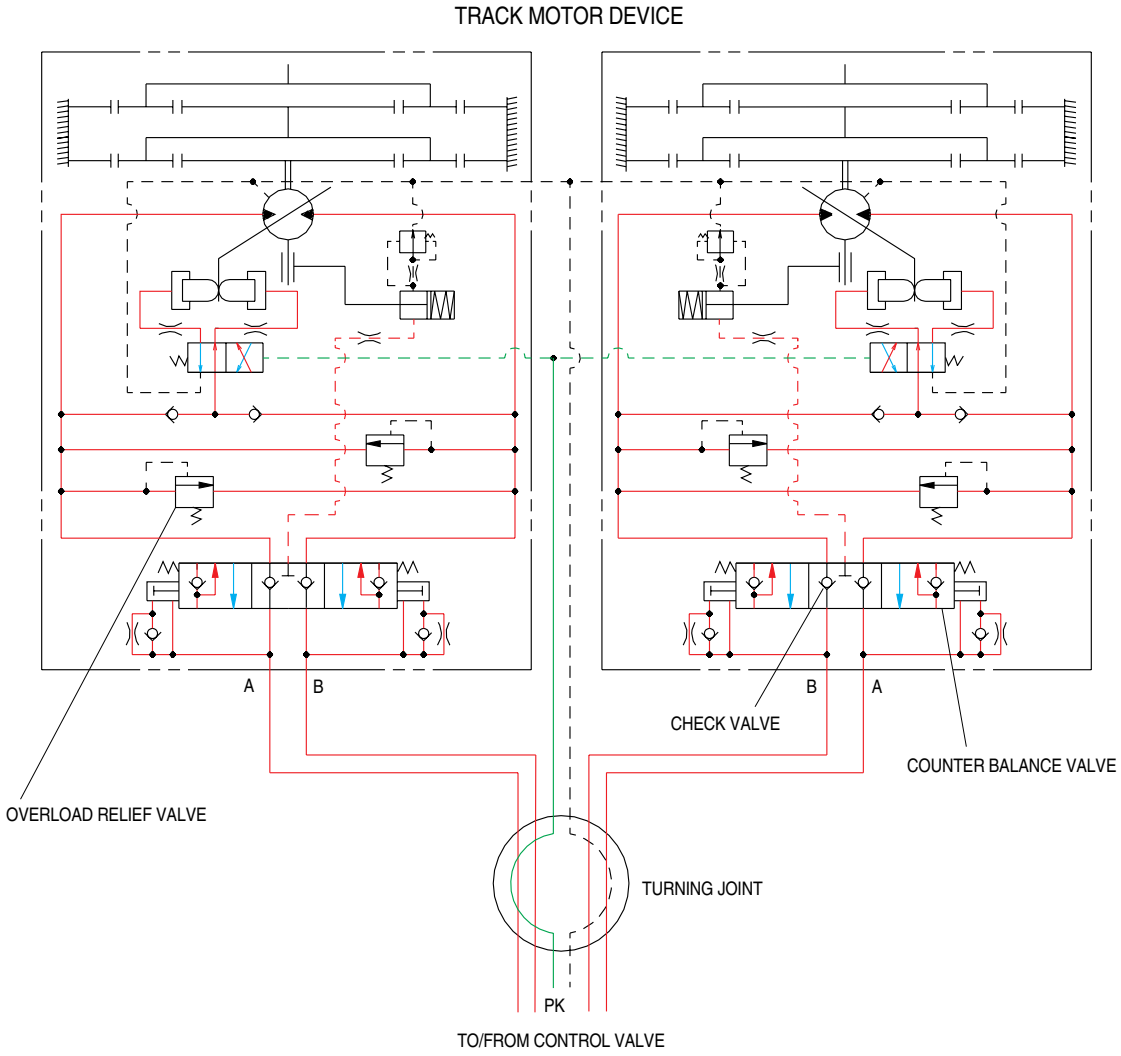
When carrying out the combined operation of swing and boom or arm, the boom or arm speed can be lowered than operating speed of swing. When the heary duty working mode in work mode is selected on the cluster, swing reducing solenoid valve actuates automatically.

The oil from pilot pump flows into the solenoid valve through the line filter.

6Pc pressure from solenoid valve change the swing select spool and decreases the oil flow rate to the swing section by orifice.

This is called the boom priority system.

TRAVEL CIRCUIT OPERATION



3-20 (210-7)

Valves are provided on travel motors to offer the following functions.

1) CHECK VALVE

Stopping the motor, this valve sucks the oil from lower pressure passage for prevention the negative pressure and the cavitation of the motor.

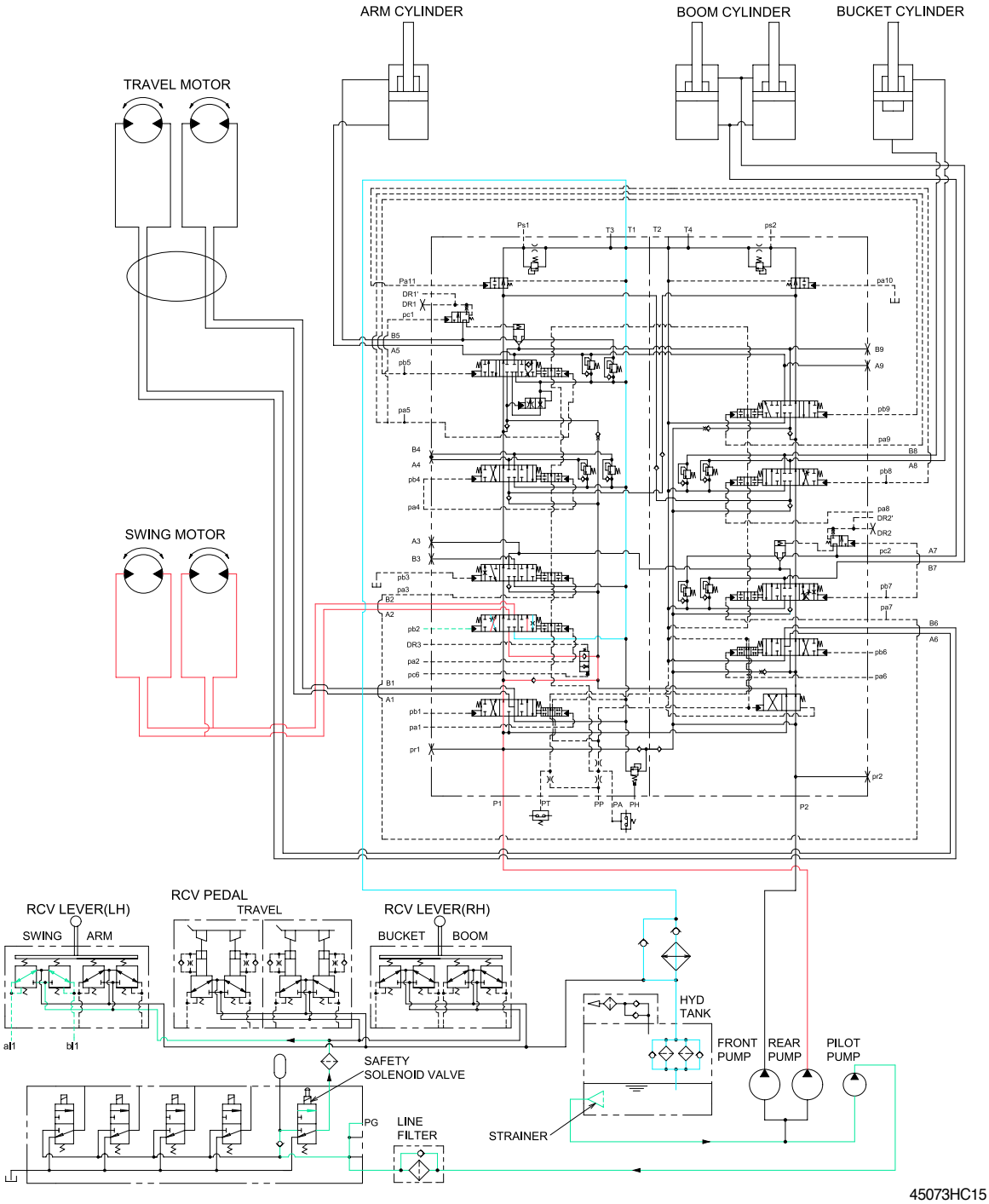
2) COUNTER BALANCE VALVE

When stopping the motor of slope descending, this valve to prevent the motor over run.

3) OVERLOAD RELIEF VALVE

Relief valve limit the circuit pressure below 345kgf/cm^2 to prevent high pressure generated at a time of stopping the machine. Stopping the motor, this valve sucks the oil from lower pressure passage for preventing the negative pressure and the cavitation of the motor.

7. SWING OPERATION



When the LH control lever is placed left or right, the swing spool in the main control valve is moved to the left or right swing position by the pilot oil pressure from the remote control valve.

The oil from the rear pump flows into the main control valve and then goes to the swing motor.

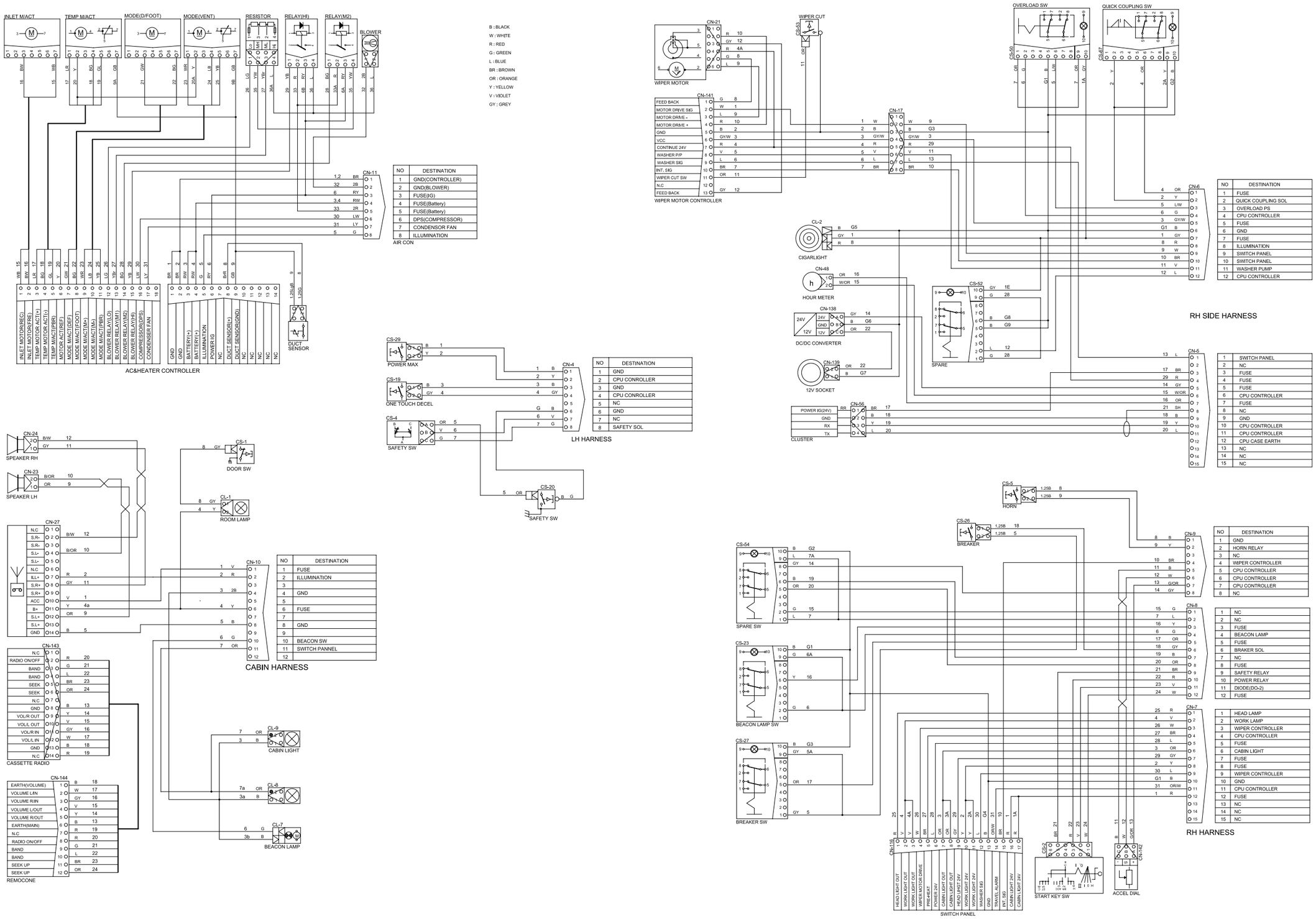
At the same time, the return oil from the swing motor returns to the hydraulic oil tank through the swing spool in the main control valve.

When thin happens, the superstructure swings to the left or right.

The swing parking brake, make up valve and the motor brake valve are provide in the swing motors. The cavitation which will happen to the swing motor is also prevented by the make up valve in the swing motor itself.

GROUP 2 ELECTRICAL CIRCUIT

• ELECTRICAL CIRCUIT(1/2)



45074EL03

5. BEACON LAMP AND CAB LIGHT CIRCUIT

1) OPERATING FLOW

Fuse box (No.19) → I/conn 〔CN-8(3)〕 → Beacon lamp switch 〔CN-23(6)〕
Fuse box (No.18) → I/conn 〔CN-7(12)〕 → Switch panel 〔CN-116(16, 17)〕

(1) Beacon lamp switch ON

Beacon lamp switch ON 〔CS-23(2)〕 → Switch Indicator lamp ON 〔CS-23(9)〕
→ I/conn 〔CN-8(4)〕 → I/conn 〔CN-10(11)〕
→ Beacon lamp ON 〔CL-7〕

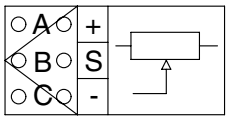
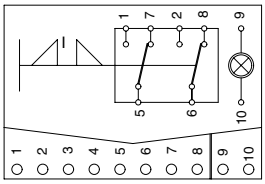
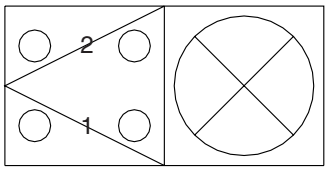
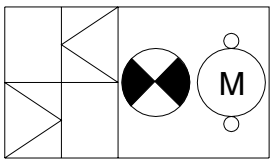
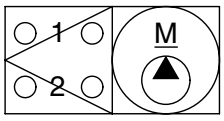
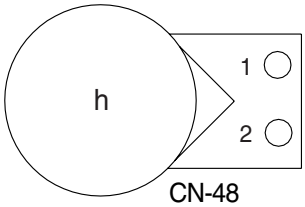
(2) Cab light switch ON

Cab light switch ON 〔CN-116(7, 8)〕 → I/conn 〔CN-7(6)〕 → I/conn 〔CN-10(12)〕
→ Cab light ON 〔CL-8(2), CL-9(2)〕

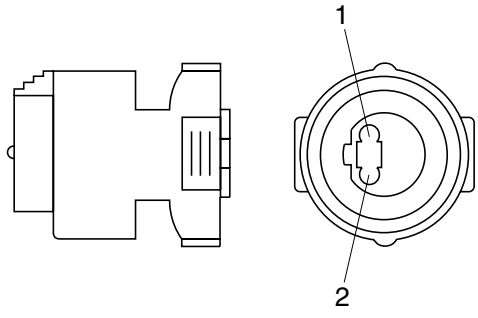
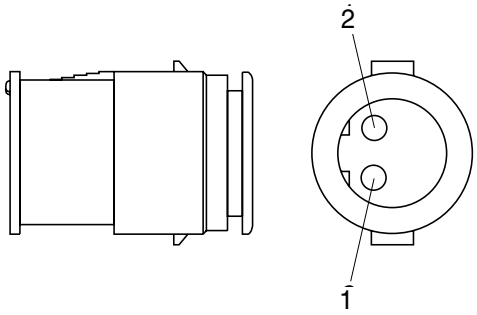
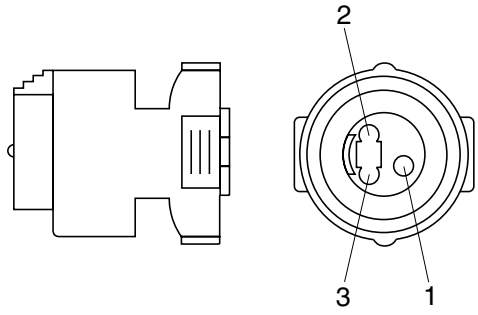
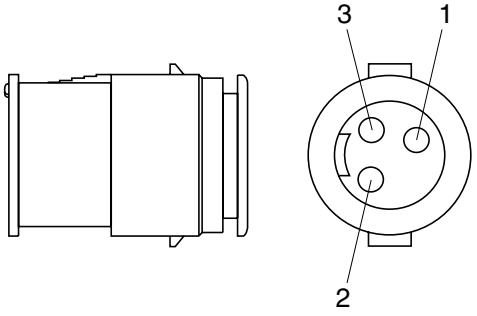
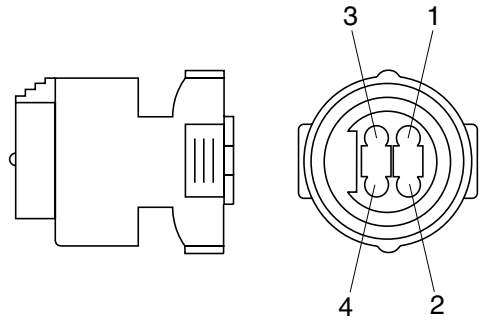
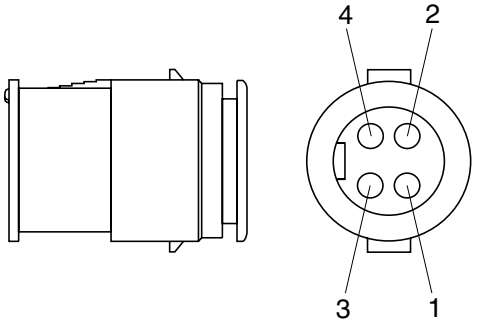
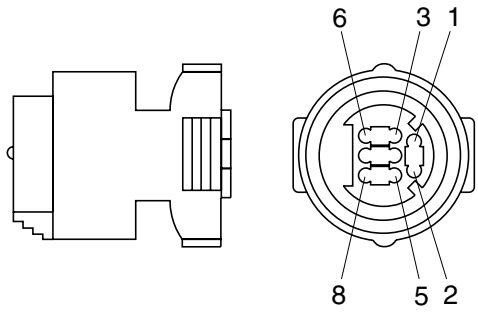
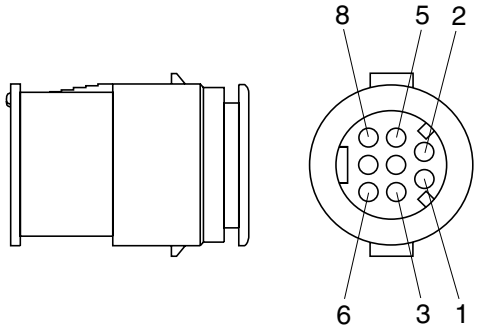
2) CHECK POINT

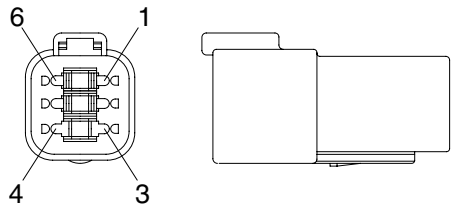
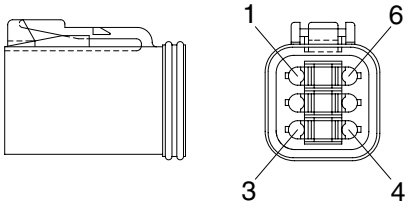
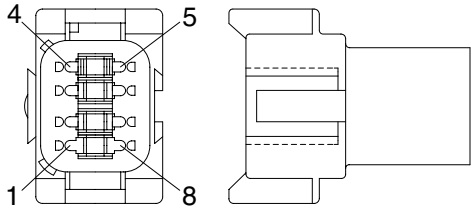
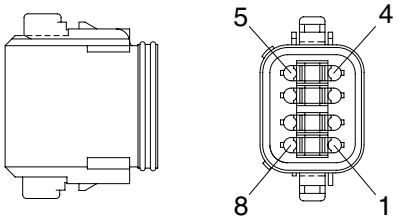
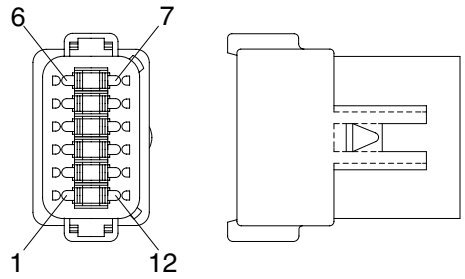
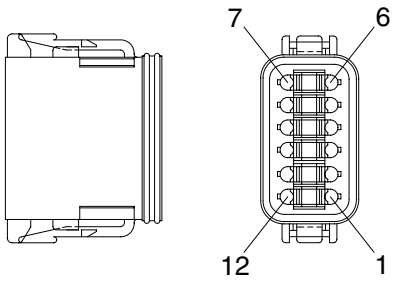
Engine	Start switch	Check point	Voltage
STOP	ON	① - GND(Fuse box) ② - GND(Switch power input) ③ - GND(Switch power output) ④ - GND(Beacon lamp)	20~25V
STOP	ON	⑤ - GND(Fuse box) ⑥ - GND(Switch power input) ⑦ - GND(Switch power output) ⑧ - GND(Cab light)	20~25V

※ GND : Ground

Part name	Symbol	Specifications	Check
Accel dial	 CN-142	-	※ Check resist Normal : About 5kΩ (For terminal A-C) Normal : Abowt 5V (For terminal A-C) : 2~4.5V (For terminal C-B)
Switch	 CS-67	24V 8A	※ Check disconnection Normal : 1.0Ω ON : 0Ω (For terminal 1-5, 2-6) ∞Ω (For terminal 5-7, 6-8) OFF : ∞Ω (For terminal 1-5, 6-8) 0Ω (For terminal 5-7, 6-8)
Head lamp, Work lamp, Room lamp, Cab lamp	 CL-1 CL-4 CL-5 CL-6 CL-8 CL-9	24V 70W (H3 Type) 24V 10W (Room lamp)	※ Check disconnection Normal : A few Ω
Beacon lamp	 CL-7	21V 70A (H1 type)	※Check disconnection Normal : A few Ω
Fuel filler pump	 CN-61	24V 10A 35 ℓ /min	※Check resistance Normal : 1.0Ω
Hour meter	 CN-48	16~32V	※Check operation Supply power(24V) to terminal No.2 and connect terminal No.1 and ground

2) J TYPE CONNECTOR

No. of pin	Receptacle connector(Female)	Plug connector(Male)
2	 S816-002001	 S816-102001
3	 S816-003001	 S816-103001
4	 S816-004001	 S816-104001
8	 S816-008001	 S816-108001

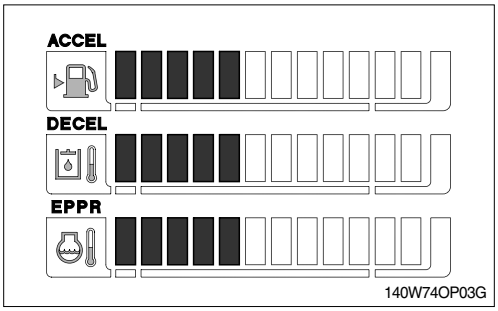
No. of pin	Receptacle connector(Female)	Plug connector(Male)
6	 DT06-6S	 DT04-6P
8	 DT06-8S	 DT04-8P
12	 DT06-12S	 DT04-12P

3. USER MODE SELECTION SYSTEM

Through 2 memory sets of MI and MII, an operator can change the engine and pump power and memorize it for his preference.

Mode	Operation
U	High idle rpm, auto decel rpm EPPR pressure can be modulated and memorized separately

HOW TO MODULATE THE MEMORY SET



140W74OP03G

1) Each memory mode has a initial set which are mid-range of max engine speed, auto decel rpm, and EPPR valve input current. When you select "U", cluster LCD displays.

2) To change the engine high idle speed, press the USER mode switch and SELECT switch at the same time and then ACCEL blinks at 0.5 seconds interval.
   - By pressing ▲ or ▼ switch, ▮ will increase or decrease.

3) To change DECEL rpm, press the USER mode switch and SELECT switch once more and then DECEL blinks at 0.5 seconds interval.
   - By pressing ▲ or ▼ switch, ▮ will increase or decrease.

4) To change EPPR current, press the USER mode switch and SELECT switch one more and then EPPR blinks at 0.5 seconds interval.
   - By pressing ▲ or ▼ switch, ▮ will increase or decrease.

36075MS03C

· LCD segment vs parameter setting

Segment (▮)	ACCEL (rpm)	DECEL (rpm)	EPPR (mA)
1	High idle-900	Low idle(800)	150
2	High idle-800	850	200
3	High idle-700	900	250
4	High idle-600	950	300
5	High idle-500	Decel rpm(1000)	350
6	High idle-400	1050	400
7	High idle-300	1100	450
8	High idle-200	1150	500
9	High idle-100	1200	550
10	High idle	1250	600

5) To memorize the final setting, press the USER mode switch and SELECT switch one more time.

6. ENGINE FAULT CODE INFORMATION (For QSM11)

Fault code No.	Reason	Effect(only when fault code is active)
111	Error internal to the ECM related to memory hardware failures or internal ECM voltage supply circuits.	Engine will not start.
115	No engine speed signal detected at both engine position sensor circuits.	Engine will die and will not start.
121	No engine speed signal detected from one of the engine position sensor circuits.	None on performance.
122	High voltage detected on the intake manifold pressure circuit.	Derate in power output of the engine.
123	Low voltage detected on the intake manifold pressure circuit.	Derate in power output of the engine.
131	High voltage detected at the throttle position signal circuit.	Severe derate(power and speed). Limp home power only.
132	Low voltage detected at the throttle position signal circuit.	Severe derate(power and speed). Limp home power only.
133	High voltage detected at the remote throttle position signal circuit.	None on performance if remote throttle is not used.
134	Low voltage detected at the remote throttle position signal circuit.	None on performance if remote throttle is not used.
135	High voltage detected at the oil pressure circuit.	No engine protection for oil pressure.
141	Low voltage detected at the oil pressure circuit.	No engine protection for oil pressure.
143	Oil pressure signal indicates oil pressure below the low oil pressure engine protection limit.	Progressive power and speed derate with increasing time after alert. If engine protection shutdown feature is enable, engine will shut down 30 seconds after red lamp starts flashing.
144	High voltage detected at the coolant temperature circuit.	Possible white smoke. Fan will stay on if controlled by the electronic control module (ECM). No engine protection for coolant temperature.
145	Low voltage detected at the coolant temperature circuit.	Possible white smoke. Fan will stay on if controlled by electronic control module (ECM). No engine protection for coolant temperature.
147	A frequency of less then 100Hz was detected at the frequency throttle signal pin of the actuator harness connector at the ECM.	Calibration dependent power and speed derate.
148	A frequency of more than 100Hz was detected at the frequency throttle signal pin of the actuator harness connector at the ECM.	Calibration dependent power and speed derate.
151	Coolant temperature signal indicates coolant temperature above 104°C(220°F).	Progressive power derate with increasing time after alert. If engine protection shutdown feature is enabled, engine will shut down 30 seconds after red lamp starts flashing.
153	High voltage detected at the intake manifold temperature circuit.	Possible white smoke. Fan will stay on if controlled by electronic control module (ECM). No engine protection for coolant temperature.
154	Low voltage detected at the intake manifold temperature circuit.	Possible white smoke. Fan will stay on if controlled by electronic control module (ECM). No engine protection for coolant temperature.
155	Intake manifold temperature signal indicates temperature above 87.8°C(190°F).	Progressive power derate with increasing time after alert. If engine protection shutdown feature is enabled, engine will shut down 30 seconds after red lamp starts flashing.
187	Low voltage detected on the ECM voltage supply line to some sensors(VSEN2 supply).	Engine will run derated. No engine protection for oil pressure and coolant level.

GROUP 12 MONITORING SYSTEM

1. OUTLINE

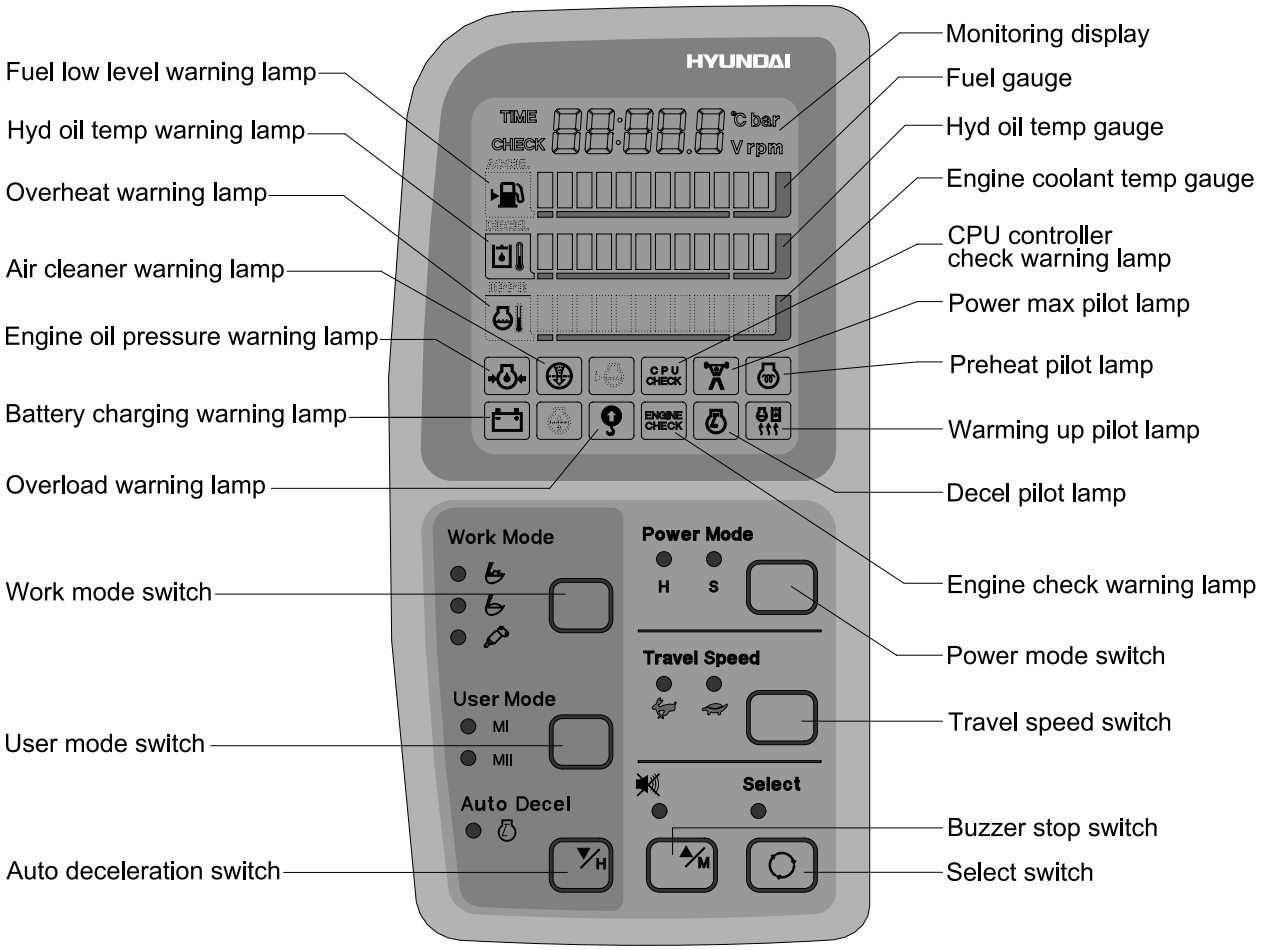
Monitoring system consists of the monitor part and switch part.

The monitor part gives warnings when any abnormality occurs in the machine and informs the condition of the machine.

Various select switches are built into the monitor panel, which act as the control portion of the machine control system.

2. CLUSTER

1) MONITOR PANEL

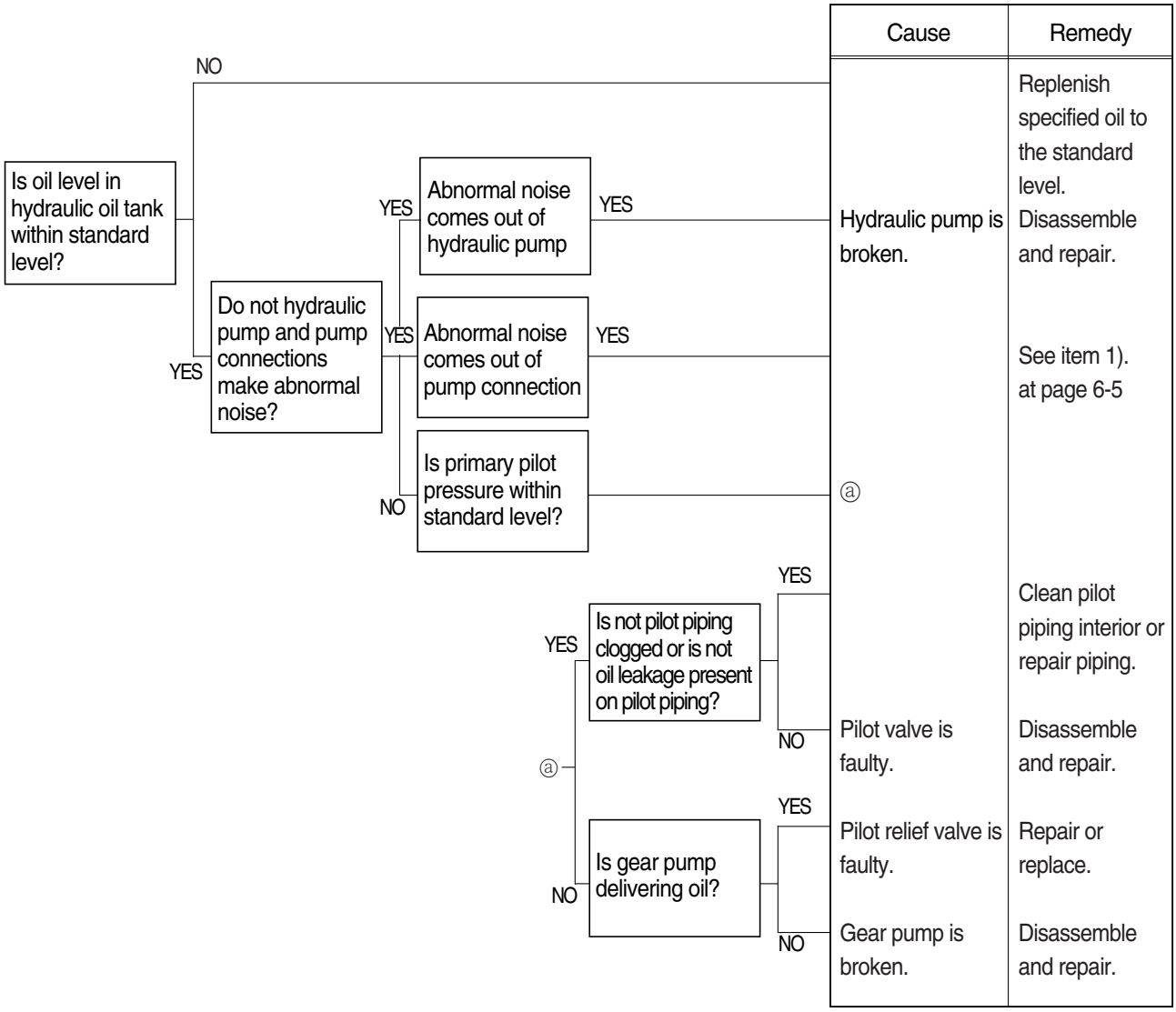


36075MS10

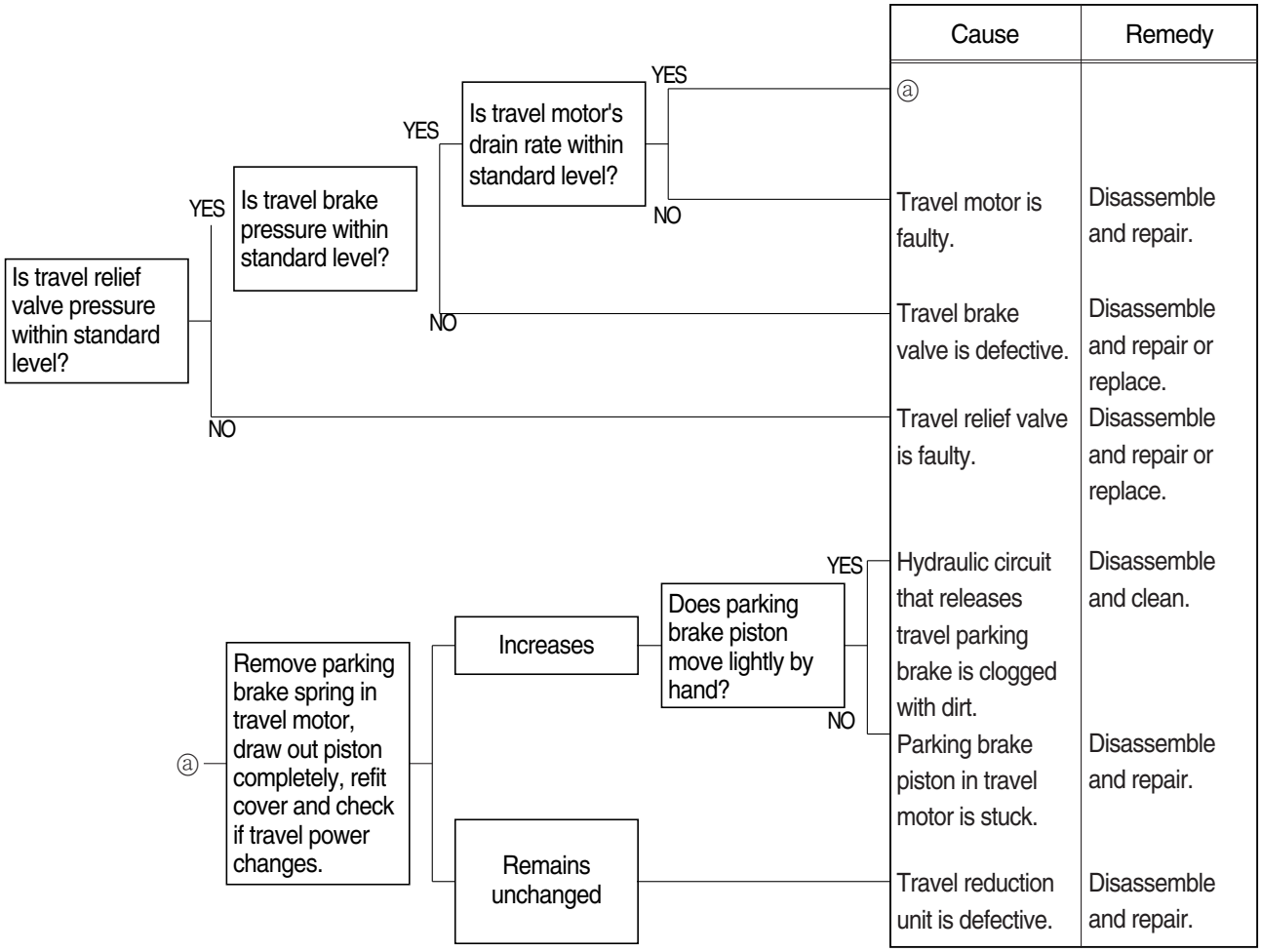
Display group	How to select display mode		Name	Display on the cluster
	Group selection	Display mode selection		
Group 4 (Output)	Touch **SELECT** switch **4 times** while pressing **BUZZER STOP.** In this group **SELECT** LED blinks at 1sec interval	Default	Hourmeter	Ho:on or oFF
		Touch **SELECT** 1 time	Neutral relay (Anti-restart relay)	nr:on or oFF
		Touch **SELECT** 2 times	Travel speed solenoid	tS:on or oFF
		Touch **SELECT** 3 times	Power boost solenoid (2-stage relief solenoid)	PS:on or oFF
		Touch **SELECT** 4 times	Boom priority solenoid	bS:on or oFF
		Touch **SELECT** 5 times	Travel alarm	AU:on or oFF
		Touch **SELECT** 6 times	Max flow cut off solenoid	FS:on or oFF
		Touch **SELECT** 7 times	Preheat relay	PA:on or oFF

※ By touching **SELECT** switch once while pressing **BUZZER STOP**, display group shifts.
Example : Group 0 → 1 → 2 → 3 → 4 → 0

2) ENGINE STARTS BUT MACHINE DOES NOT OPERATE AT ALL



5) TRAVEL ACTION IS POWERLESS(Travel only)



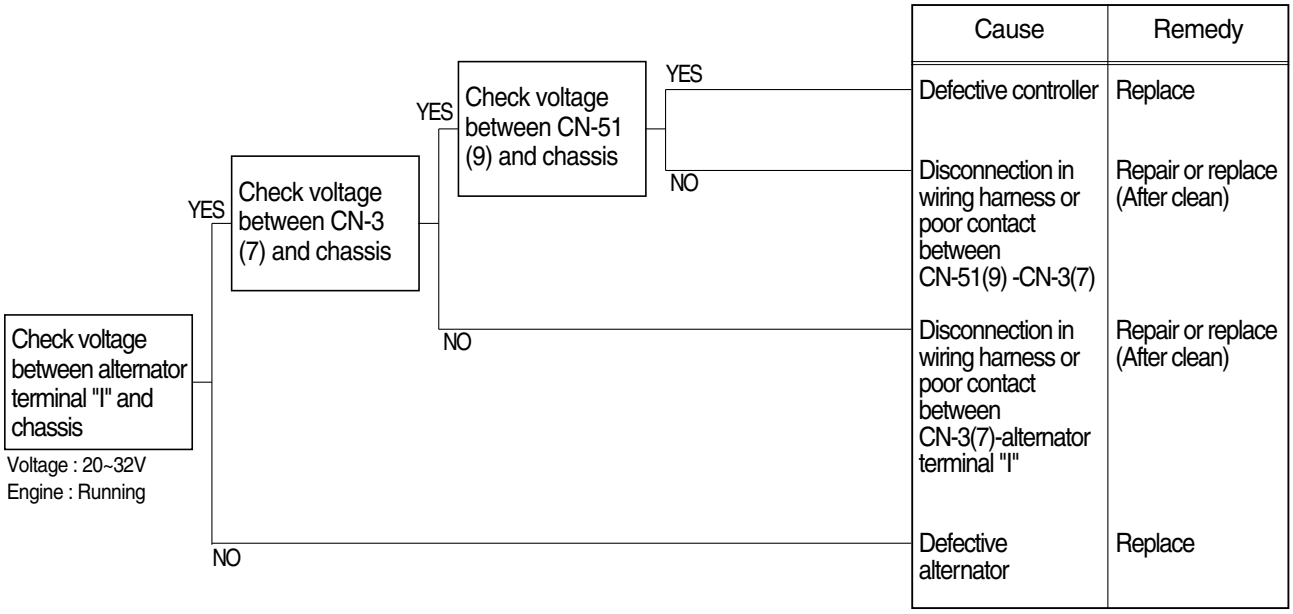
Cause	Remedy
ⓐ	
Travel motor is faulty.	Disassemble and repair.
Travel brake valve is defective.	Disassemble and repair or replace.
Travel relief valve is faulty.	Disassemble and repair or replace.
Hydraulic circuit that releases travel parking brake is clogged with dirt.	Disassemble and clean.
Parking brake piston in travel motor is stuck.	Disassemble and repair.
Travel reduction unit is defective.	Disassemble and repair.

6) MACHINE RUNS RECKLESSLY ON A SLOPE

Cause	Remedy
	Disassemble and repair or replace.

3. BATTERY CHARGING WARNING LAMP LIGHTS UP(Starting switch : ON)

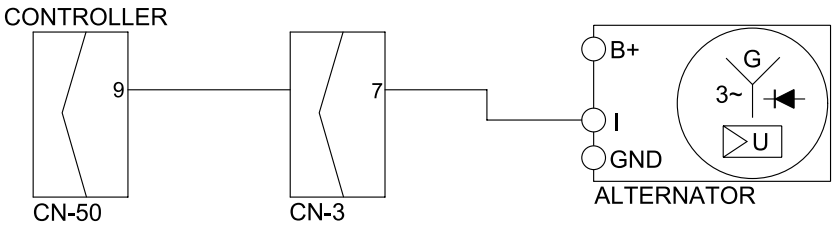
- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



Cause	Remedy
Defective controller	Replace
Disconnection in wiring harness or poor contact between CN-51(9) -CN-3(7)	Repair or replace (After clean)
Disconnection in wiring harness or poor contact between CN-3(7)-alternator terminal "I"	Repair or replace (After clean)
Defective alternator	Replace

Check voltage

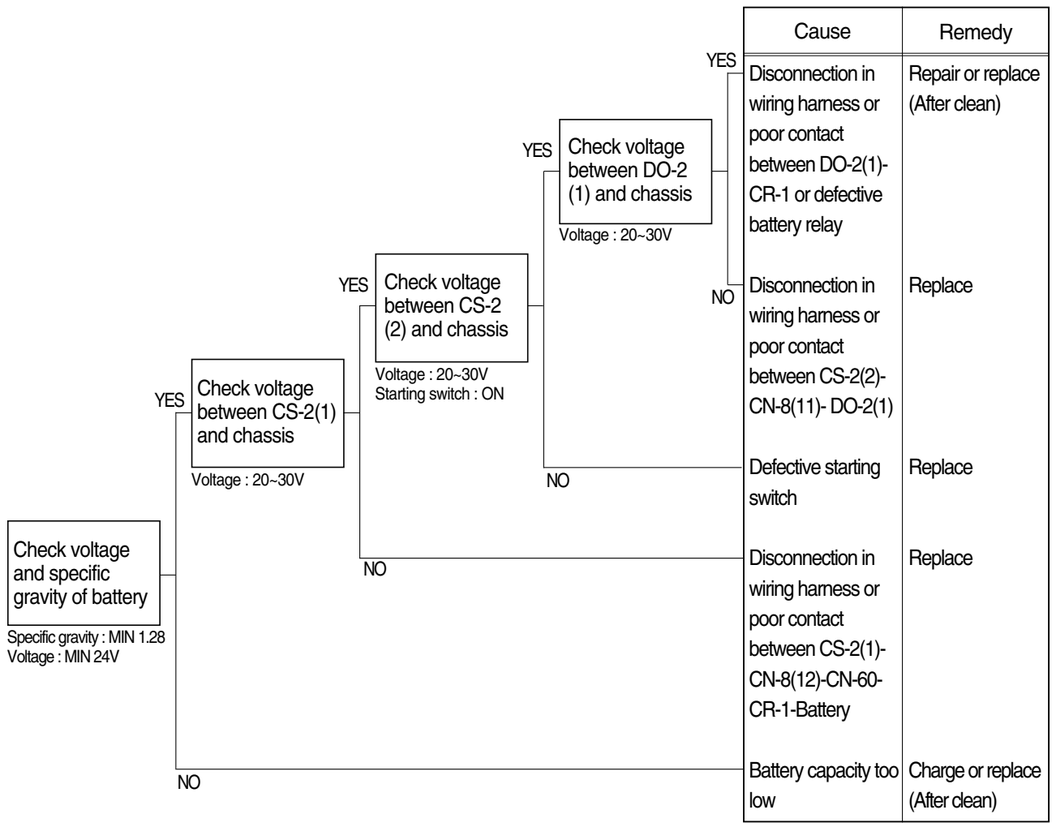
YES	20 ~ 32V
NO	0V



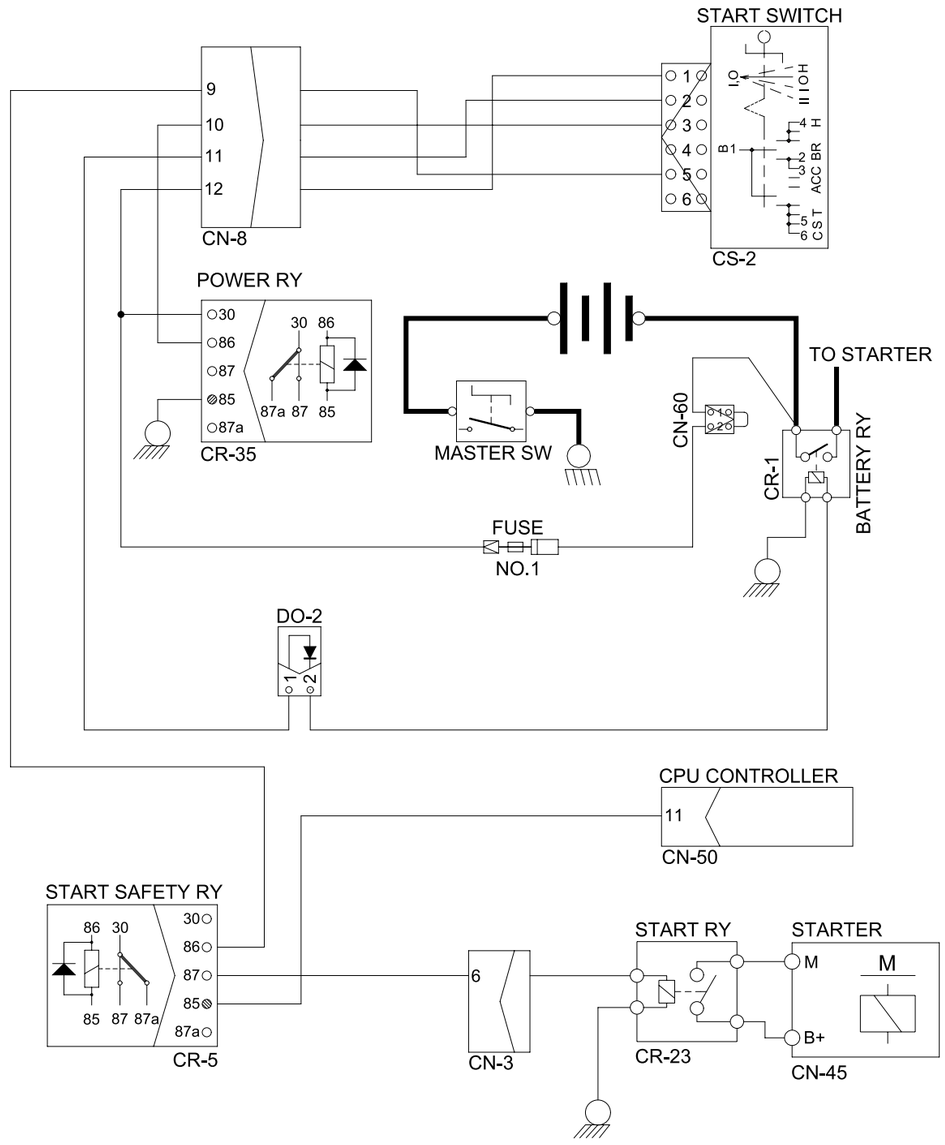
45076ES01

13. WHEN STARTING SWITCH ON DOES NOT OPERATE

- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted and master switch ON.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



Cause	Remedy
Disconnection in wiring harness or poor contact between DO-2(1)-CR-1 or defective battery relay	Repair or replace (After clean)
Disconnection in wiring harness or poor contact between CS-2(2)-CN-8(11)- DO-2(1)	Replace
Defective starting switch	Replace
Disconnection in wiring harness or poor contact between CS-2(1)-CN-8(12)-CN-60-CR-1-Battery	Replace
Battery capacity too low	Charge or replace (After clean)



45076ES08

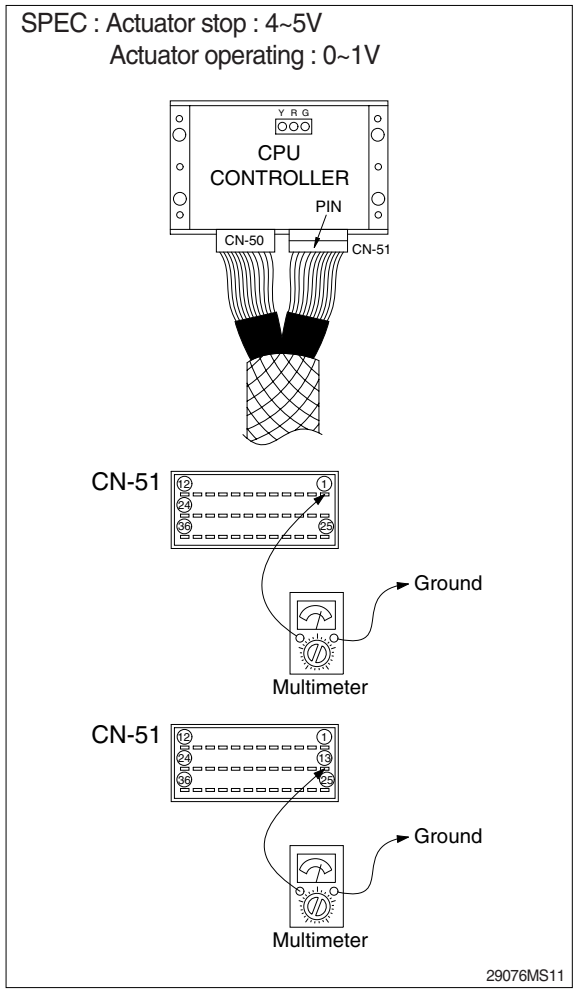
2) TEST PROCEDURE

(1) Test 6 : Check voltage at CN-51(1) and ground.

① Prepare 1 piece of thin sharp pin, steel or copper.
② Starting key ON.
③ Insert prepared pin to rear side of connectors : One pin to (1) of CN-51.
④ Check voltage as figure.

(2) Test 7 : Check voltage at CN-51(13) and ground.

① Prepare 1 piece of thin sharp pin, steel or copper
② Starting key ON.
③ Insert prepared pin to rear side of connectors : One pin to (13) of CN-51
④ Check voltage as figure.



4) TRACK REVOLUTION SPEED

(1) Measure the track revolution cycle time with the track raised off ground.

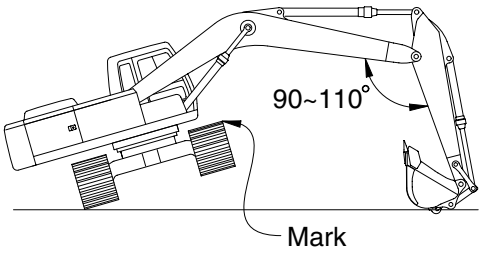
(2) Preparation

① Adjust the tension of both side tracks to be equal.

② On the track to be measured, mark one shoe with chalk.

③ Swing the upperstructure 90° and lower the bucket to raise the track off ground. Keep the boom-arm angle between 90 to 110° as shown. Place blocks under machine frame.

④ Keep the hydraulic oil temperature at 50±5℃.



21077MS06

(3) Measurement

① Select the following switch positions.

- Travel mode switch : 1 or 2 speed
- Mode selector : M mode
- Auto decel switch : OFF

② Operate the travel control lever of the raised track in full forward and reverse.

③ Rotate 1 turn, then measure time taken for next 3 revolutions.

④ Raise the other side of machine and repeat the procedure.

⑤ Repeat steps ③ and ④ three times and calculate the average values.

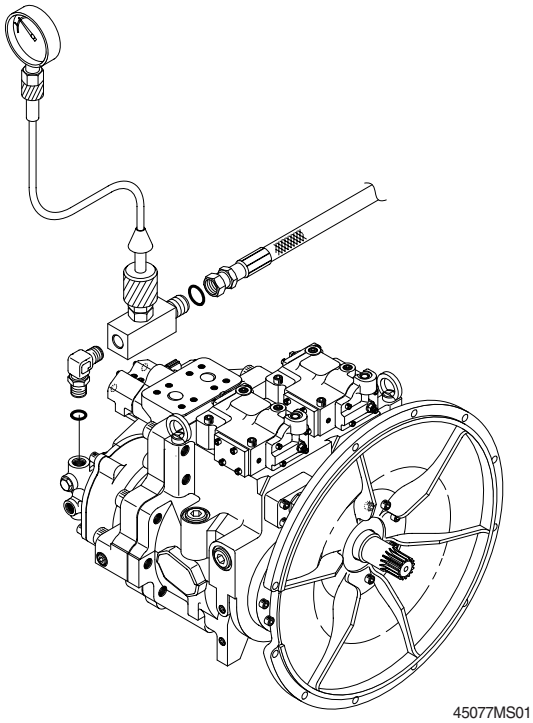
(4) Evaluation

The revolution cycle time of each track should meet the following specifications.

Unit : Seconds / 3 revolutions

Model	Travel speed	Standard	Maximum allowable
R450LC-7	1 Speed	38.5±2.0	48
	2 Speed	24±2.0	30

13) PILOT PRIMARY PRESSURE(~#0464)



(1) Preparation

① Stop the engine.
② Remove the top cover of the hydraulic tank oil supply port with a wrench.
③ Loosen and remove plug on the pilot pump delivery port and connect pressure gauge.
④ Start the engine and check for oil leakage from the port.
⑤ Keep the hydraulic oil temperature at 50±5℃.

(2) Measurement

① Select the following switch positions.
- Mode selector : H mode
- Auto decel switch : OFF

② Measure the primary pilot pressure in the H mode.

(3) Evaluation

The average measured pressure should meet the following specifications:

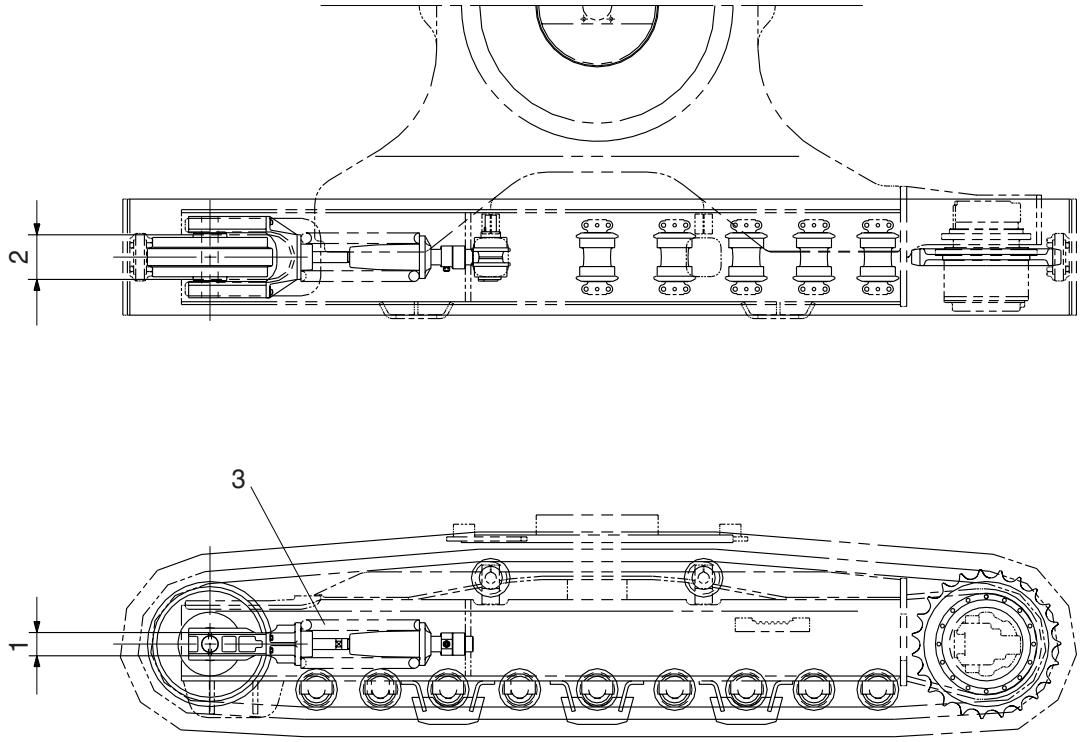
Unit : kgf / cm^2

Model	Engine speed	Standard	Allowable limits	Remarks
R450LC-7	H mode	33±5	-	

2. MAIN CONTROL VALVE

Part name	Inspection item	Criteria & measure
Casing	· Existence of scratch, rusting or corrosion.	· In case of damage in following section, replace part. - Sliding sections of casing fore and spool, especially land sections applied with holded pressure. - Seal pocket section where spool is inserted. - Seal section of port where O-ring contacts. - Seal section of each relief valve for main, travel, and port. - Other damages that may damage normal functions.
Spool	· Existence of scratch, gnawing, rusting or corrosion. · O-ring seal sections at both ends. · Insert spool in casing hole, rotate and reciprocate it.	· Replacement when its outside sliding section has scratch(Especially on seals-contacting section). · Replacement when its sliding section has scratch. · Correction or replacement when O-ring is damaged or when spool does not move smoothly.
Poppet	· Damage of poppet or spring · Insert poppet into casing and function it.	· Correction or replacement when sealing is incomplete. · Normal when it can function lightly without being caught.
Around spring	· Rusting, corrosion, deformation or breaking of spring, spring seat, plug or cover.	· Replacement for significant damage.
Around seal for spool	· External oil leakage. · Rusting, corrosion or deformation of seal plate.	· Correction or replacement. · Correction or replacement.
Main relief valve, port relief valve & negative control relief valve	· External rusting or damage. · Contacting face of valve seat. · Contacting face of poppet. · Abnormal spring. · O-rings, back up rings and seals.	· Replacement. · Replacement when damaged. · Replacement when damaged. · Replacement. · 100% replacement in general.

5) TRACK FRAME AND RECOIL SPRING



21073MS05

Unit : mm

No.	Check item	Criteria					Remedy
1	Vertical width of idler guide		Standard size	Tolerance	Repair limit		Rebuild or replace
		Track frame	123	+2 0	127		
		Idler support	120	0 -1.5	116		
2	Horizontal width of idler guide	Track frame	292	+2 0	296		
		Idler support	290	-	287		
3	Recoil spring	Standard size			Repair limit		Replace
		Free length	Installation length	Installation load	Free length	Installation load	
		ø 276 × 865	707	28840kg	-	23072kg	

2) INSTALL

(1) Carry out installation in the reverse order to removal

(2) Remove the suction strainer and clean it.

(3) Replace the return filter with a new one.

(4) Remove breather and clean it.

(5) After adding oil to the hydraulic tank to the specified level.

(6) Bleed the air from the hydraulic pump.
① Remove the air vent plug(2EA)
② Tighten plug lightly
③ Start the engine, run at low idling, and check oil come out from plug.
④ Tighten plug.

(7) Start the engine, run at low idling(3~5 minutes) to circulate the oil through the system.

(8) Confirmed the hydraulic oil level and check the hydraulic oil leaks or not.

(16) Remove snap ring(828) and bearing spacer(129) and take out drive shaft(111) and driven shaft(113) tapping lightly ends of them.

45078MP08

(17) If necessary, remove snap rings(824, 825), bearing spacer(128), and roller bearing(123) from drive shaft(111) and driven shaft(113).

※ Do not remove roller bearing as far as possible, except when it is considered to be out of its life span. Use a specified jig in removing because roller bearing is shrinkage fitted to shaft.

(18) Loosen hexagon socket head cap screws(405) which tighten swash plate supports(251) and pump casing(271).

※ Adhesive(No.1305N of threebond make) is applied to hexagon socket head cap screws(405).

(19) Remove swash plate supports(251) from pump casing(271).

※ This is the end of disassembling procedures.

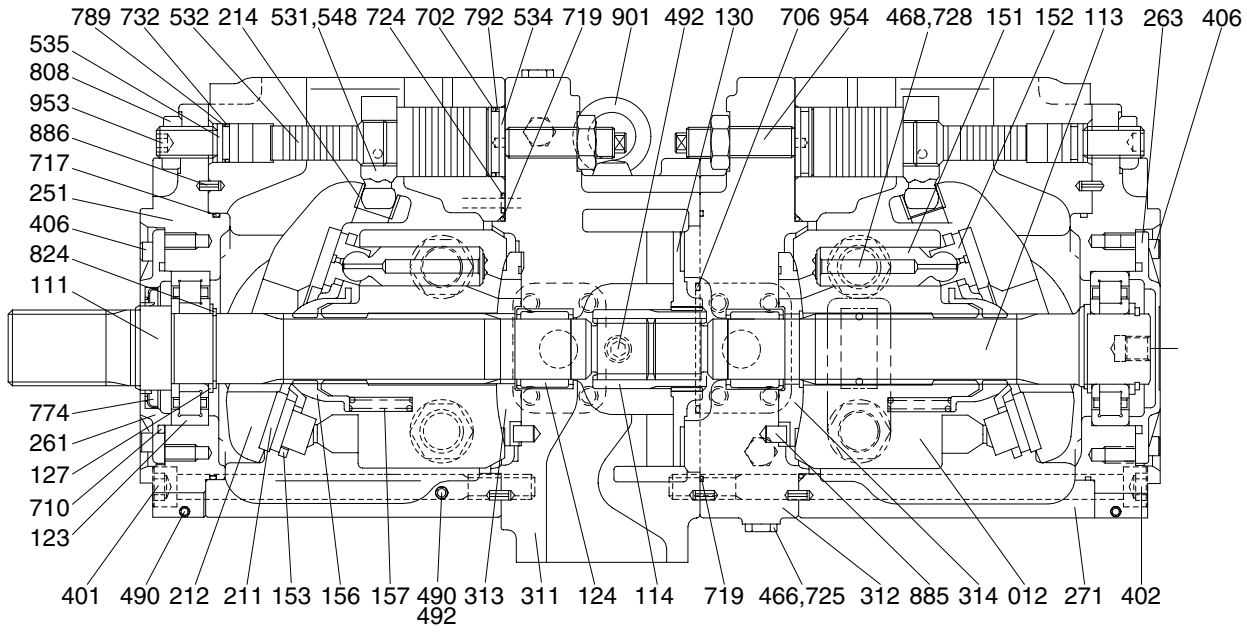
45078MP09

(2) Tightening torque

Part name	Bolt size	Torque		Wrench size	
		kgf · m	lbf · ft	in	mm
Hexagon socket head bolt Material : SCM435)	M 5	0.7	5.1	0.16	4
	M 6	1.2	8.7	0.20	5
	M 8	3.0	21.7	0.24	6
	M10	5.8	42.0	0.31	8
	M12	10.0	72.3	0.39	10
	M14	16.0	116	0.47	12
	M16	24.0	174	0.55	14
	M18	34.0	246	0.55	14
	M20	44.0	318	0.67	17
PT Plut(Materal : S45C) ※Wind a seal tape 1 1/2 to 2 turns round the plug	PT1/16	0.7	5.1	0.16	4
	PT 1/8	1.05	7.59	0.20	5
	PT 1/4	1.75	12.7	0.24	6
	PT 3/8	3.5	25.3	0.31	8
	PT 1/2	5.0	36.2	0.39	10
PF Plut(Materal : S35C)	PF 1/4	3.0	21.7	0.24	6
	PF 1/2	10.0	72.3	0.39	10
	PF 3/4	15.0	109	0.55	14
	PF 1	19.0	137	0.67	17
	PF 1 1/4	27.0	195	0.67	17
	PF 1 1/2	28.0	203	0.67	17

2. MAIN PUMP(1/2)

1) STRUCTURE

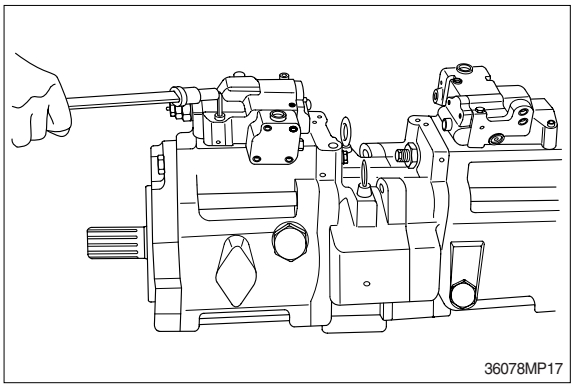


470072MP02

012	Cylinder block	271	Pump casing	710	O-ring
111	Drive shaft(F)	311	Valve cover(F)	717	O-ring
113	Driven shaft(R)	312	Valve cover(R)	719	O-ring
114	Coupling	313	Valve plate(R)	724	O-ring
123	Roller bearing	314	Valve plate(L)	725	O-ring
124	Needle bearing	401	Hexagon socket bolt	728	O-ring
127	Spacer	402	Hexagon socket bolt	732	O-ring
130	Booster	406	Hexagon socket bolt	774	Oil seal
151	Piston	466	VP Plug	789	Back up ring
152	Shoe	468	VP Plug	792	Back up ring
153	Plate	490	VP Plug	808	Hexagon head nut
156	Bushing	492	VP Plug	824	Snap ring
157	Cylinder spring	531	Tilting pin	885	Pin
211	Shoe plate	532	Servo piston	886	Spring pin
212	Swash plate	534	Stopper(L)	901	Eye bolt
214	Bushing	535	Stopper(S)	953	Set screw
251	Support plate	548	Feed back pin	954	Set screw
261	Seal cover(F)	702	O-ring		
263	Seal cover(R)	706	O-ring		

(11) Putting feedback pin of tilting pin into feedback lever of regulator, fit regulator and tighten hexagon socket head bolts(412,413).

※ Take care not to mistake regulator of front pump for that of rear pump.



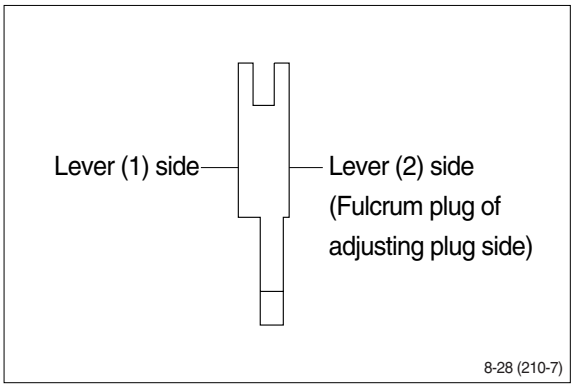
(12) Fit drain port plug(468).

This is the end of reassembling procedures.

(5) Fit feedback lever(611), matching its pin hole with pin hole in spool.
Then insert pin(874).

※ Insert pin in feedback lever a little to ease operation.

※ Take care not to mistake direction of feedback lever.

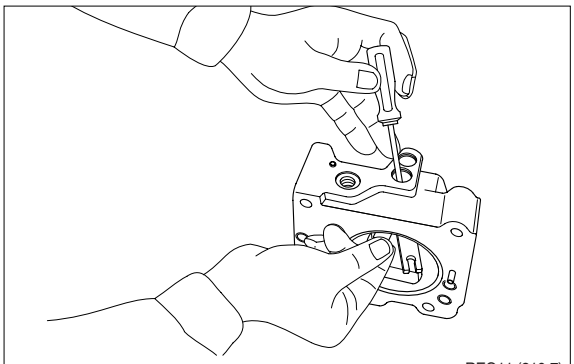


8-28 (210-7)

(6) Put pilot piston(643) into pilot hole of casing.

※ Confirm that pilot piston slides smoothly without binding.

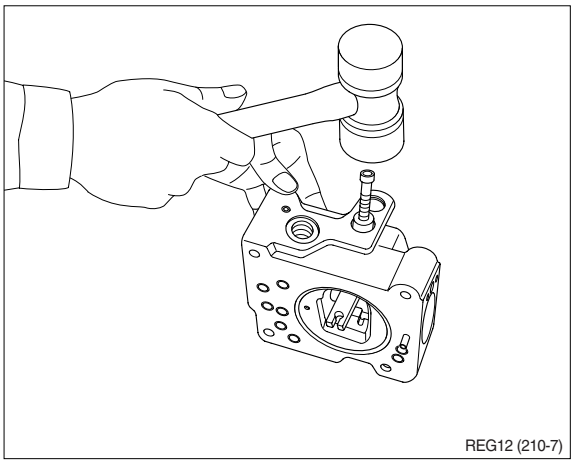
(7) Put pin force-fitted in lever(2, 613) into groove of pilot piston.
Then fix lever(2).


REG11 (210-7)

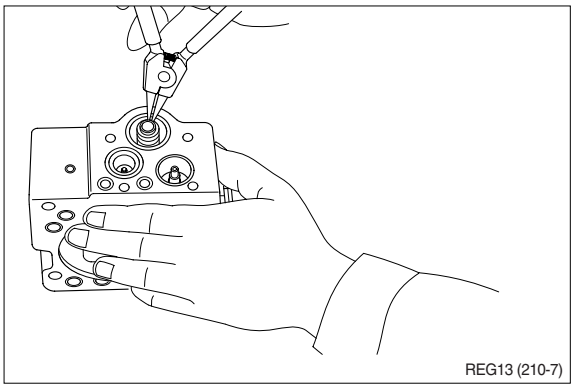
(8) Fit fulcrum plug(614) so that pin force-fitted in fulcrum plug(614) can be put into pin hole of lever(2).
Then fix locking ring(858).

(9) Insert adjusting plug(615) and fit locking ring.

※ Take care not to mistake inserting holes for fulcrum plug and adjusting plug.
At this point in time move feedback lever to confirm that it has no large play and is free from binding.


REG12 (210-7)

(10) Fit return spring(654) and spring seat (653) into spool hole and attach snap ring (814).


REG13 (210-7)

④ Spool sub assy(5).

45078MC11

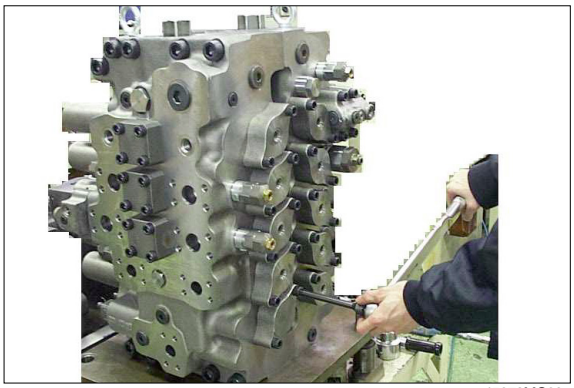
⑤ Spool sub assy(8).

※ When disassemble the spool assembly, fix the spool with vise. On this occasion attach wood between vise blades to prevent the spool from damaging.

※ Heat the outer race of spool with industrial drier and then loosen easily . (Temperature : 200~250℃)

45078MC12

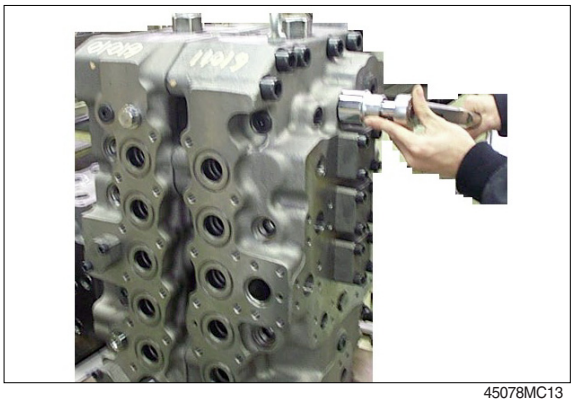
⑥ Loosen the socket head bolt(63) and remove the short cap(13, 81).
Pull out O-ring(14) from valve housing.



45078MC09

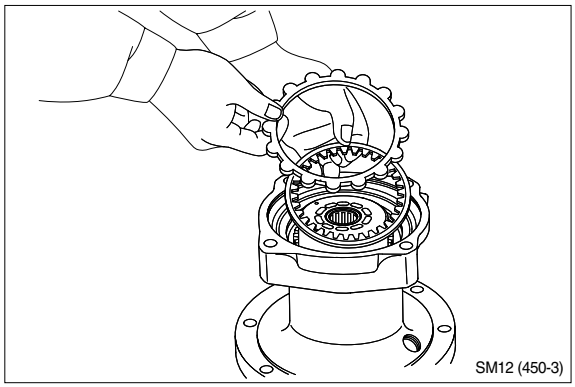
(3) Center bypass cut spool assy(24)

① Loosen the plug(27) and remove spring(25), spring seat(21) and the spool(24).



45078MC13

(13) Remove friction plate(9) and lining plate(10) from housing(26).


SM12 (450-3)

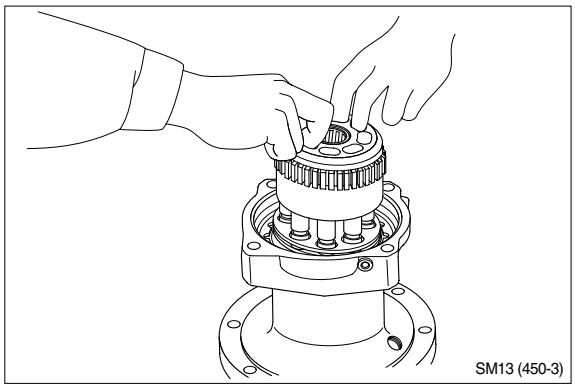
(14) Removal of cylinder assembly

Holding end of cylinder assembly(25) with hand, draw out cylinder assembly from housing.

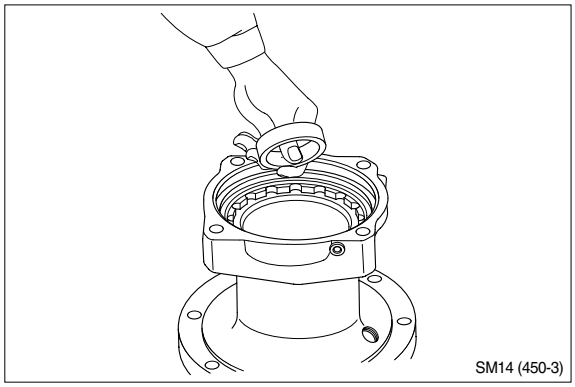
※ Oil seal(2) and outer race of taper roller bearing(3) are left inside of housing.

※ End surface of cylinder(25) is sliding face . So, protect the surface with a scrap of cloth against damage.

※ Make a matching mark on piston hole of cylinder(25) and piston assembly(8) to fit piston into the same hole when reassembling.


SM13 (450-3)

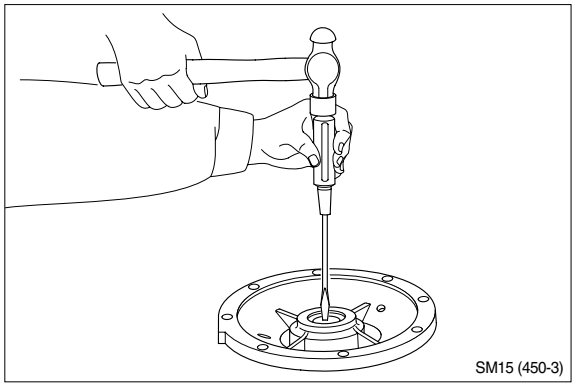
(15) Separate outer race of taper roller bearing(3) from housing.


SM14 (450-3)

(16) Removal of oil seal

Remove oil seal(2) from housing(26) with driver and hammer.

※ Do not reuse oil seal after removal.


SM15 (450-3)

3. REMOVAL AND INSTALL OF REDUCTION GEAR

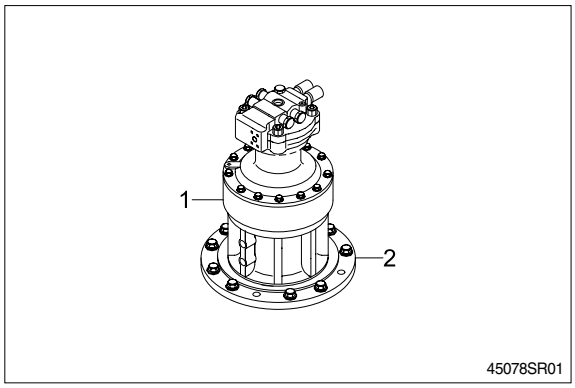
1) REMOVAL

(1) Remove the swing motor assembly.
For details, see **removal of swing motor assembly.**

(2) Sling reduction gear assembly(1) and remove mounting bolts(2).

(3) Remove the reduction gear assembly.
· Reduction gear device weight : 180kg (397lb)

2) INSTALL



(1) Carry out installation in the reverse order to removal.
· Mounting bolt : 49.2~66.6kgf · m (356~481lbf · ft)

GROUP 5 SWING DEVICE(#0409~)

1. REMOVAL AND INSTALL OF MOTOR

1) REMOVAL

(1) Lower the work equipment to the ground and stop the engine.

(2) Loosen the breather slowly to release the pressure inside the hydraulic tank.

⚠ **Escaping fluid under pressure can penetrate the skin causing serious in injury.**

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

(3) Disconnect pipe assy(4, 5, 6, 7).

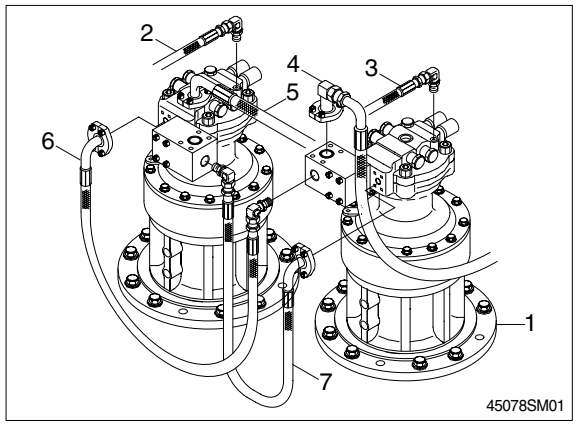
(4) Disconnect pilot line hoses(2, 3, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17).

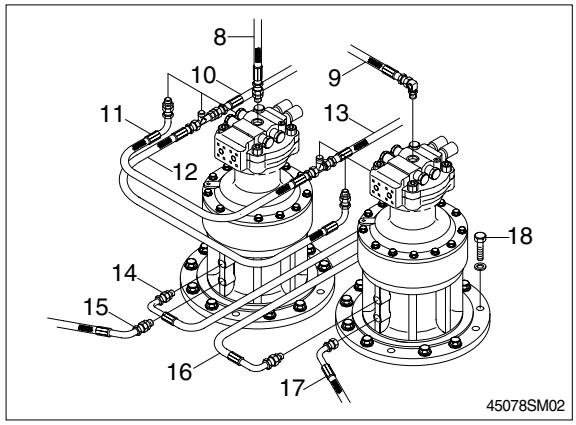
(5) Sling the swing motor assembly(1)and remove the swing motor mounting bolts(18).

- Motor device weight : 63kg(139lb)
- Tightening torque : 58.4kgf · m (422.4lbf · ft)

(6) Remove the swing motor assembly.

※ When removing the swing motor assembly, check that all the piping have been disconnected.





2) INSTALL

(1) Carry out installation in the reverse order to removal.

(2) Bleed the air from the swing motor.

① Remove the air vent plug.

② Pour in hydraulic oil until it over flows from the port.

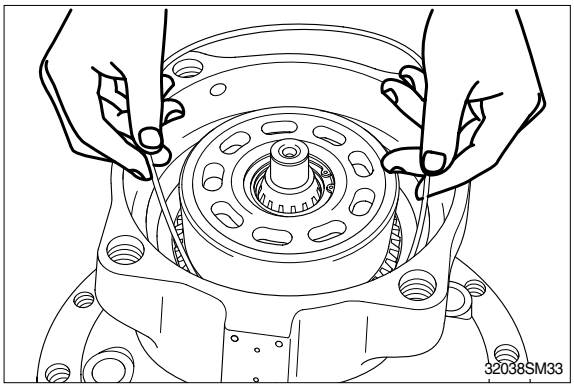
③ Tighten plug lightly.

④ Start the engine, run at low idling, and check oil come out from plug.

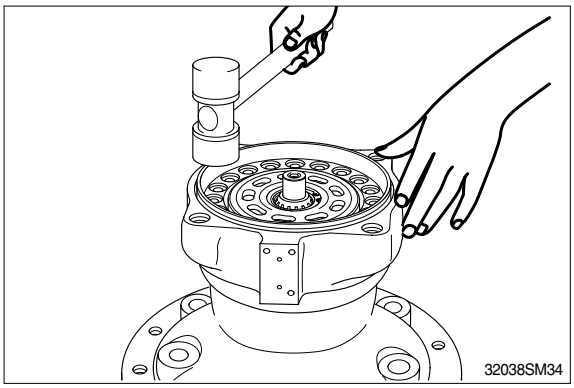
⑤ Tighten plug fully.

(3) Confirmed the hydraulic oil level and check the hydraulic oil leak or not.

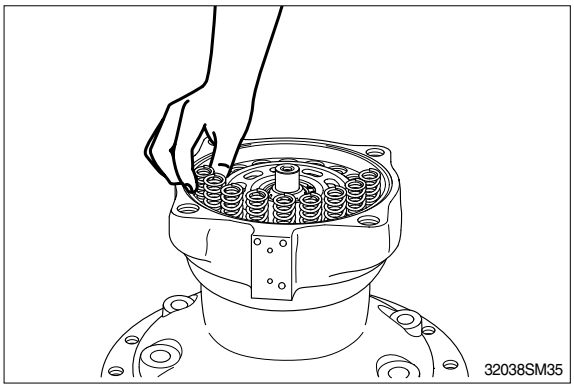
(12) Insert O-ring(706, 707) inside the casing (301).



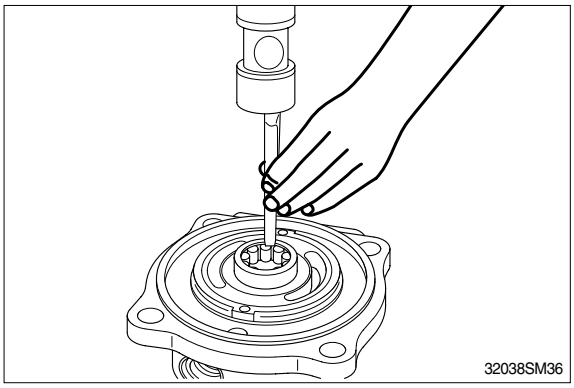
(13) Reassemble brake piston(702) to the casing(301).



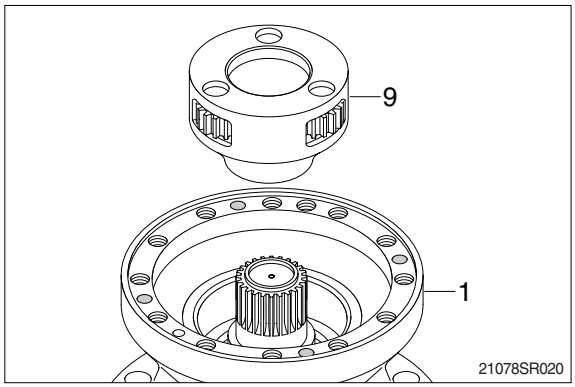
(14) Reassemble brake spring(712) to the brake piston(702).



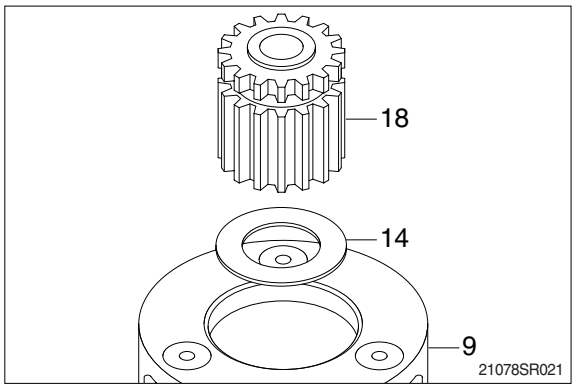
(15) When assembling the roller bearing(444), insert the roller bearing(444) into valve casing(303) by hammering.



(5) Assemble carrier2(9) assembly correctly to the drive shaft(2).



(6) Assemble sun gear2(18) and thrust washer(14) to the center of the carrier2(9) assembly.



(7) Assembling carrier1(19) assembly.

① Assemble the pin1(21) to the carrier1(19) and then press the spring pin(17) by hammering.

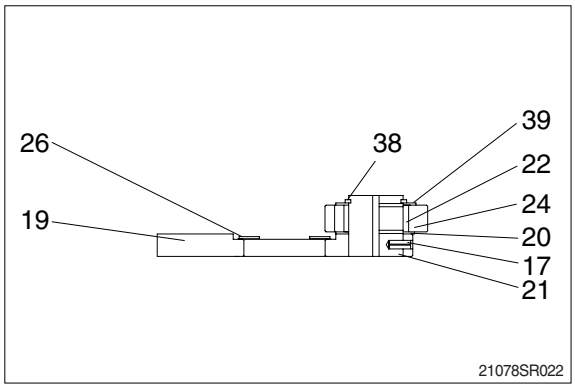
② Punch 2 points of the spring pin's(17) lip.

③ Install side plate3(26) onto the center of carrier1(19).

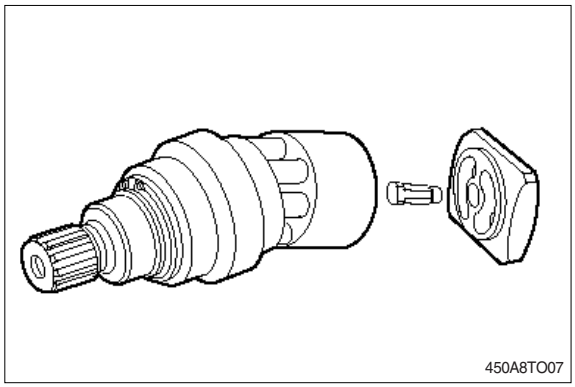
④ Install needle cage(22) into the planet gear1(24).

⑤ Assemble side plate(20), planet gear1 (24), side plate2(39) and then stop ring (38) to the pin1(21).

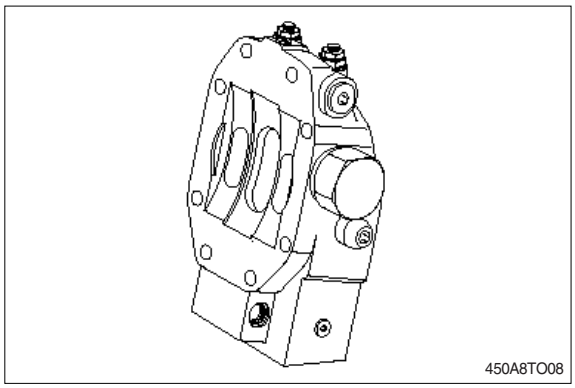
※ Take care not to mistake the matching marks of each part.



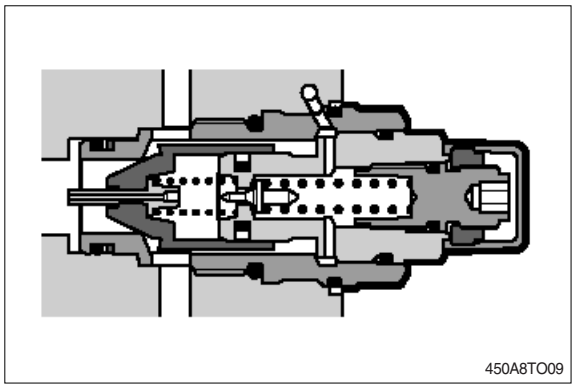
⑨ Complete rotary group.



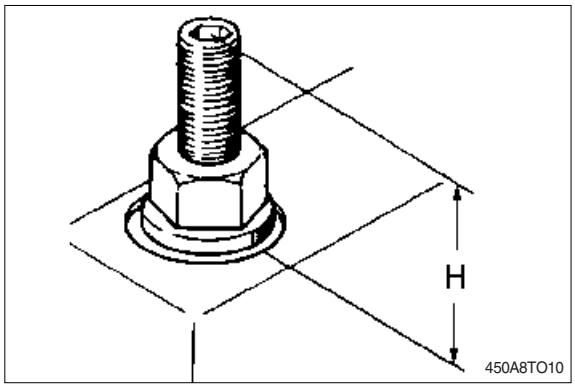
⑩ Port plate with control piston and counter-balance valve.



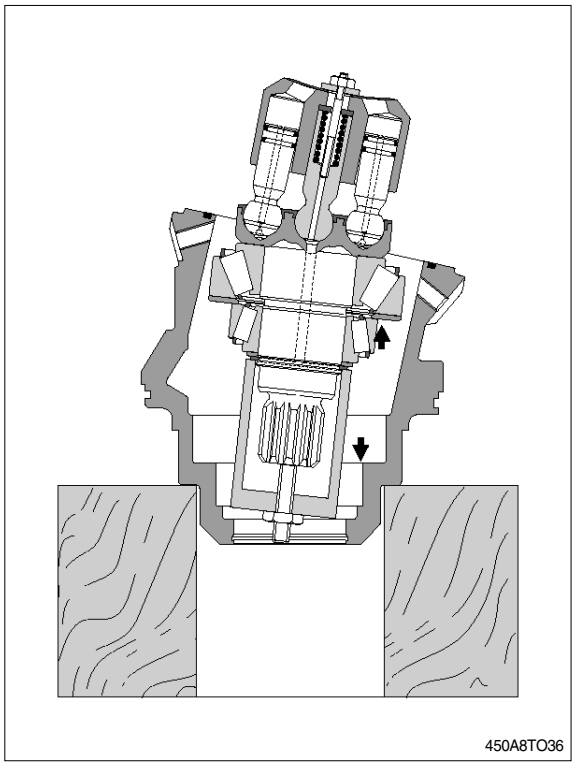
⑪ Relief valve/Make up check valve



⑫ Replace seal nut.
First measure and record setting height.



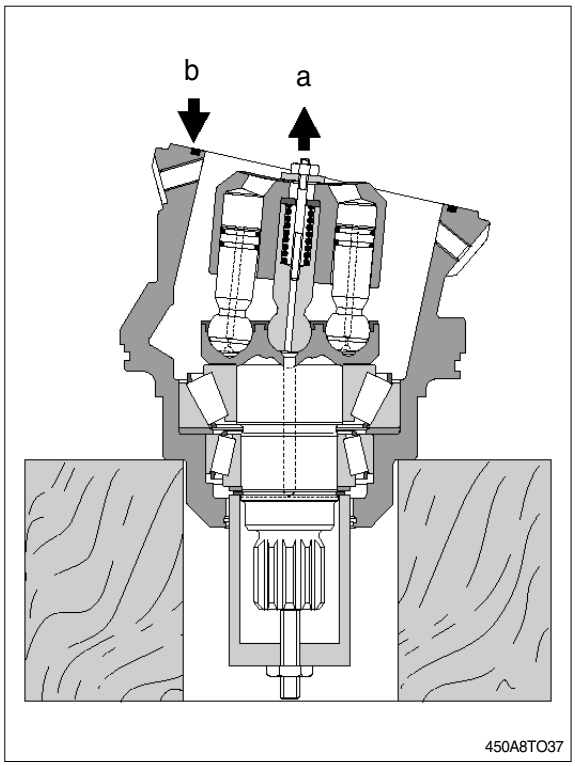
④ Insert rotary group into housing to seat position.



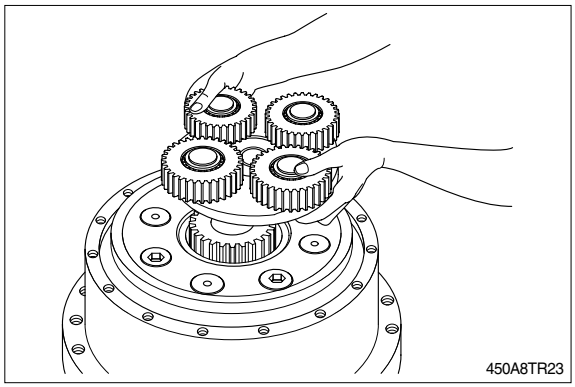
⑤ Fix zero position of cylinder with Q_{max}-screw.

a. Disassemble cylinder fixing screw.

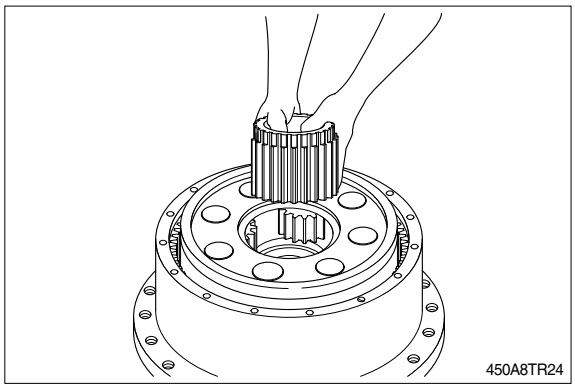
b. Insert O-ring.



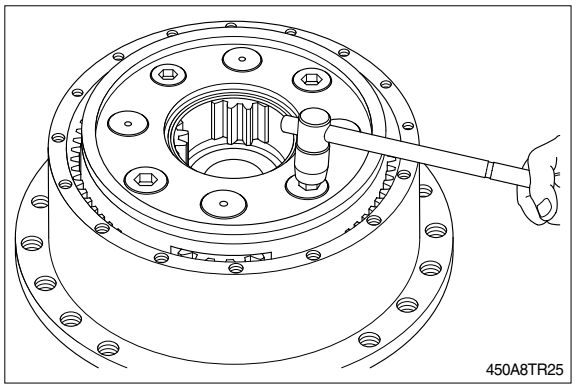
(20) Remove the 2nd reduction assembly(10).



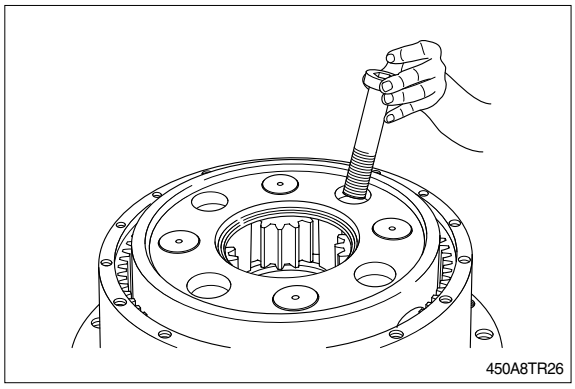
(21) Remove the 3rd stage sun gear(14).



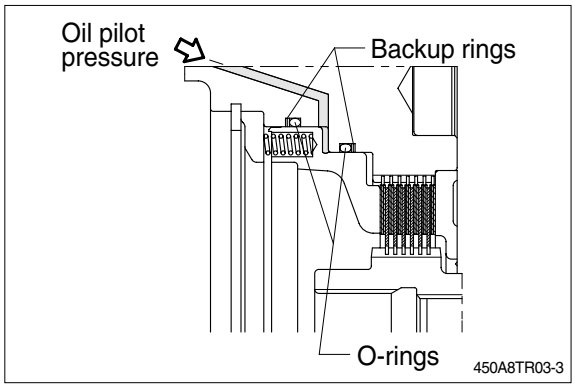
(22) Unscrew the 4 socket head screws(11), fixing the 3rd reduction assembly(12) to the flanged hub(17).



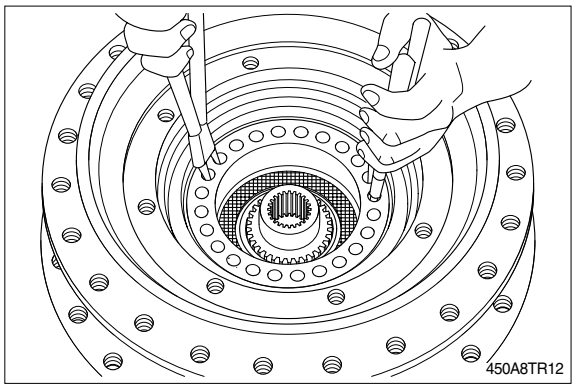
(23) Remove the 4 screws(11).



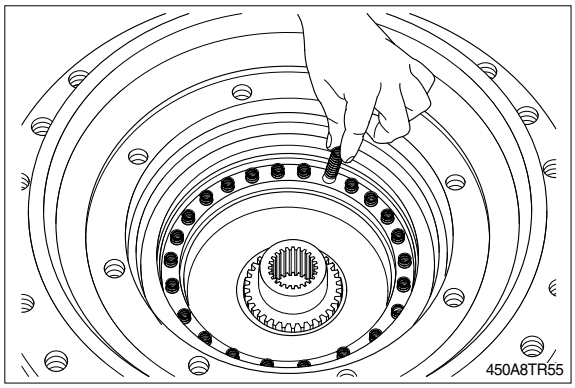
※ An O-ring and a backup ring must be fitted in the grove paying attention that the backup ring must always be beyond the O-ring against the oil flow.



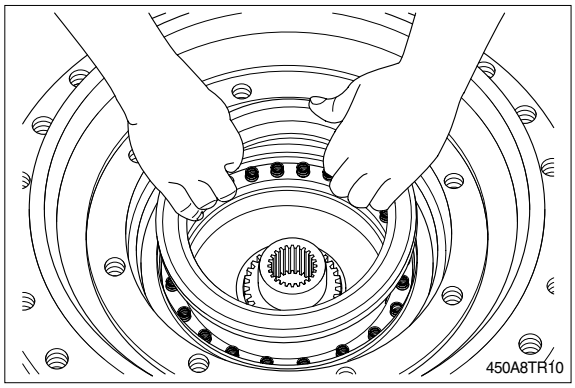
(29) Insert the brake piston(27) inside the flanged hub(17), paying attention not to damage the seals already fitted.

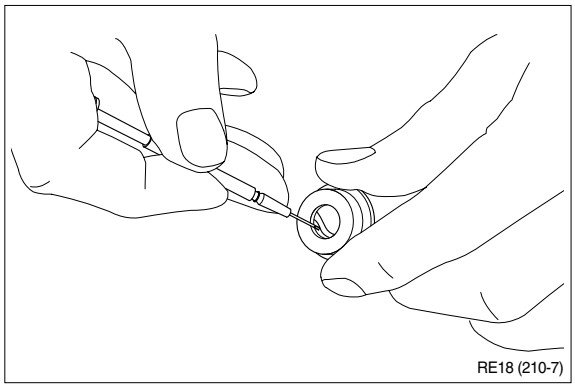


(30) Insert the springs(28) into the groves in the brake piston(27).

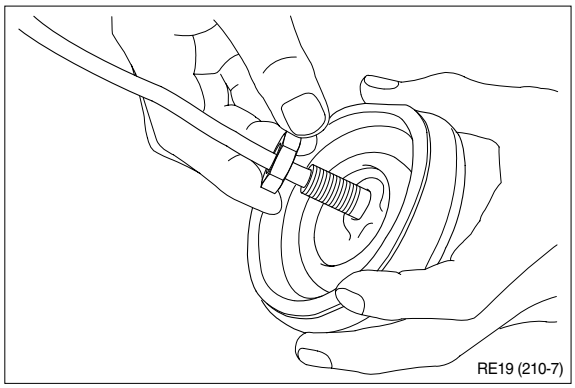


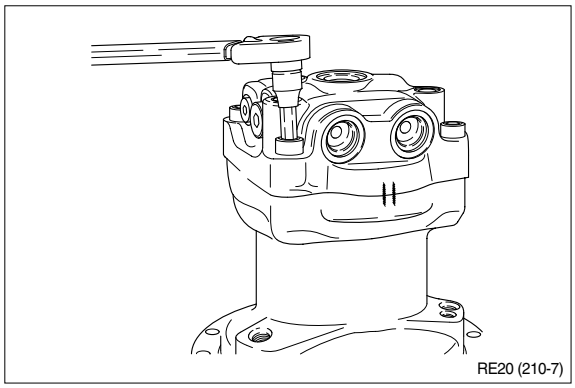
(31) Insert the retainer disc(29).




RE18 (210-7)

(15) Remove lock nut(20) and then boot(25).


RE19 (210-7)

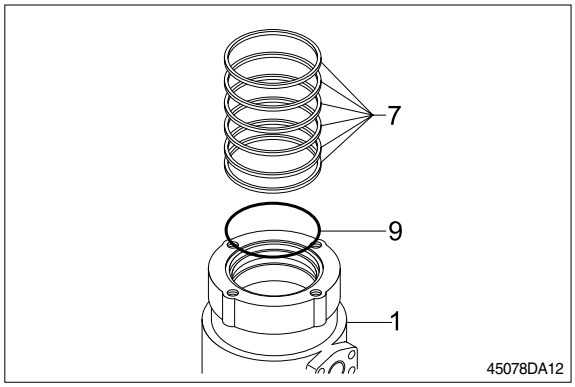

RE20 (210-7)

3) ASSEMBLY

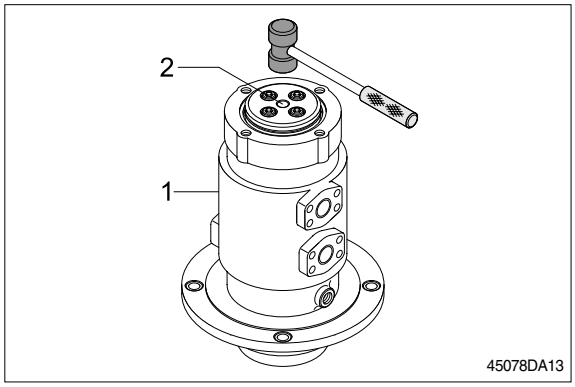
※ Clean all parts.
※ As a general rule, replace oil seals and O-ring.
※ Coat the sliding surfaces of all parts with engine oil or grease before installing.

(1) Fix seven slipper seal(7) and O-ring(9), to body(1).

(2) Fit O-ring(8) to shaft(2).



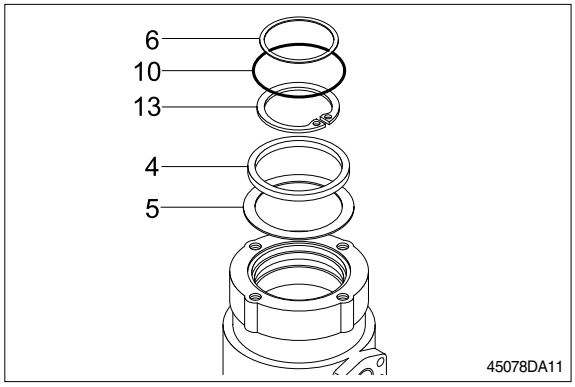
(3) Set shaft(2) on block, tap body(1) with a plastic hammer to install.



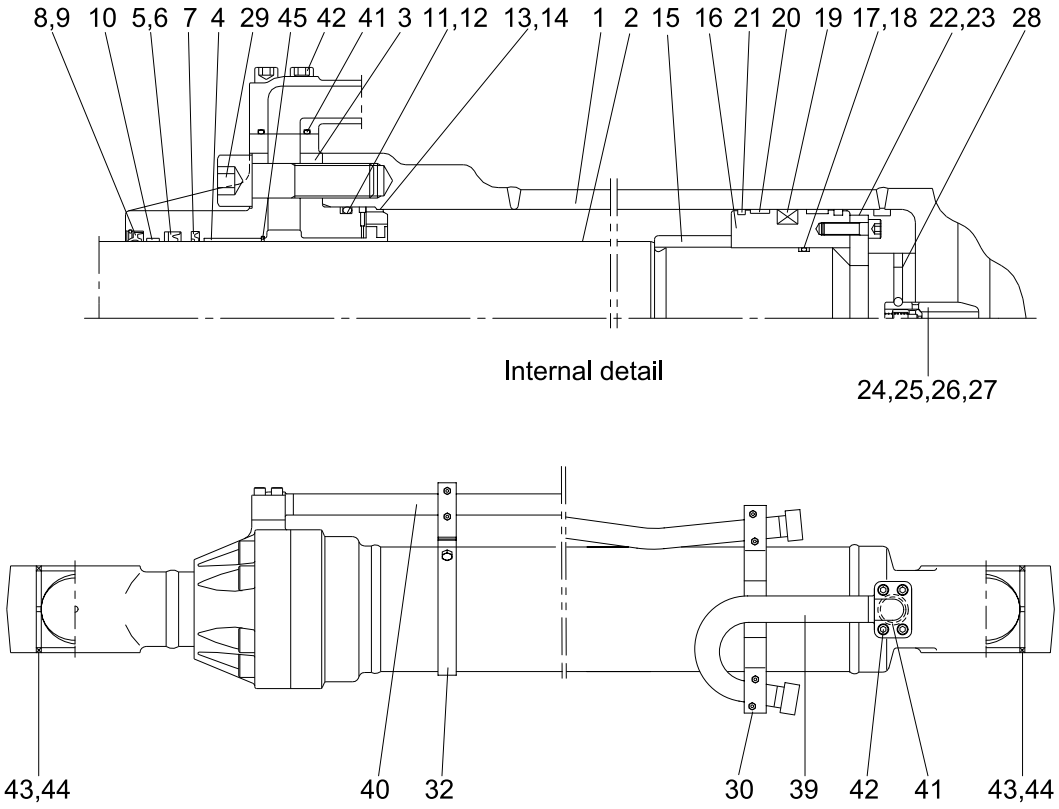
(4) Fit shim(5), spacer(4) and retainer ring (13) to shaft(2).

(5) Fit O-ring(10) to body(1).

(6) Fit shim(6) to shaft(2).



(2) Arm cylinder(~#0261)



45078AM12

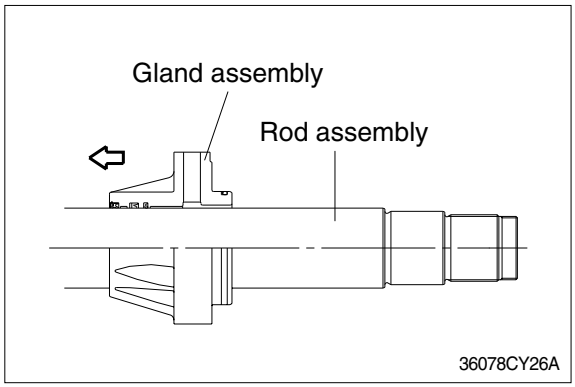
1	Tube assembly	14	Ring	27	Steel ball
2	Rod assembly	15	Cushion ring	28	Set screw
3	Gland	16	Piston	29	Hexagon socket head bolt
4	DD2 bushing	17	O-ring	30	Band assembly
5	Rod seal	18	Back up ring	32	Band assembly
6	Back up ring	19	Piston seal	39	Pipe assembly
7	Buffer ring	20	Wear ring	40	Pipe assembly
8	Dust wiper	21	Piston ring	41	O-ring
9	Snap ring	22	Spacer	42	Hexagon socket head bolt
10	Wear ring	23	Hexagon socket head bolt	43	Pin bushing
11	O-ring	24	Cushion spear	44	Dust seal
12	Back up ring	25	Check valve	45	Snap ring
13	Collar	26	Coil spring		

(3) Install piston and cylinder head

① Fix the rod assembly to the work bench.

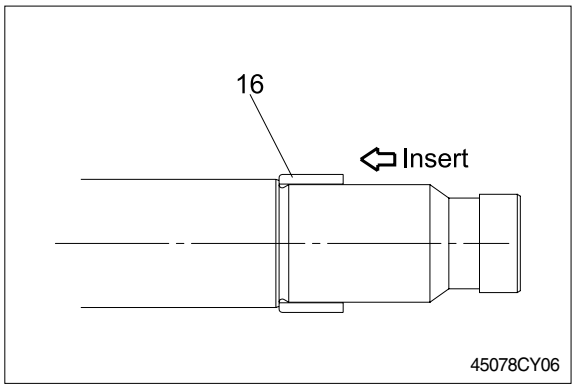
② Apply hydraulic oil to the outer surface of rod assembly(2), the inner surface of piston and cylinder head.

③ Insert cylinder head assembly to rod assembly.

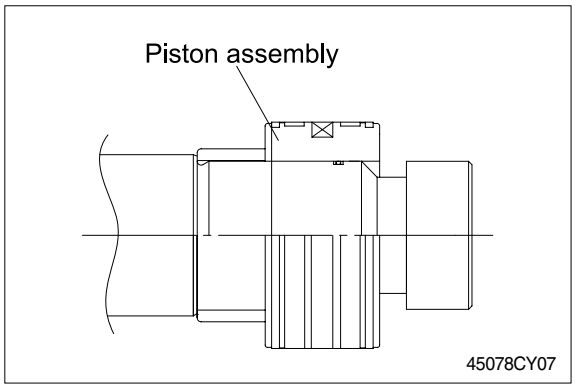


④ Insert cushion ring(16) to rod assembly.

※ Note that cushion ring(16) has a direction in which it should be fitted.



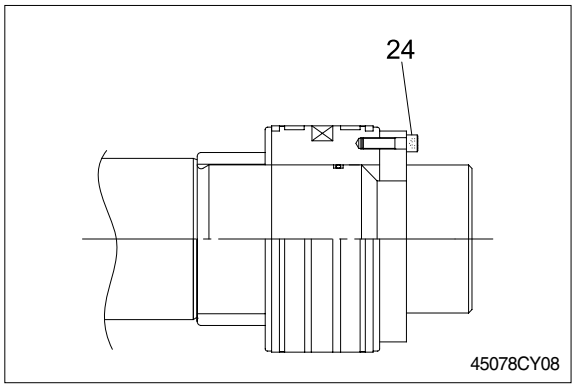
⑤ Fit piston assembly to rod assembly.



⑥ Fit spacer(23) and tighten the bolt(24).

· Tightening torque :

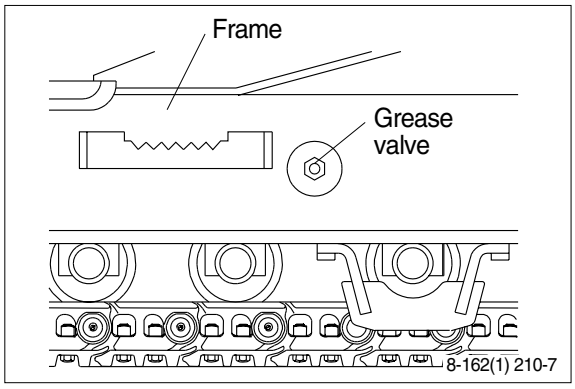
Item		kgf · m	lbf · ft
Bucket	24	15.0±2.0	108.5±14.5
Boom	23	15.0±2.0	108.5±14.5
Arm	23	32.0±3.0	231.5±21.7



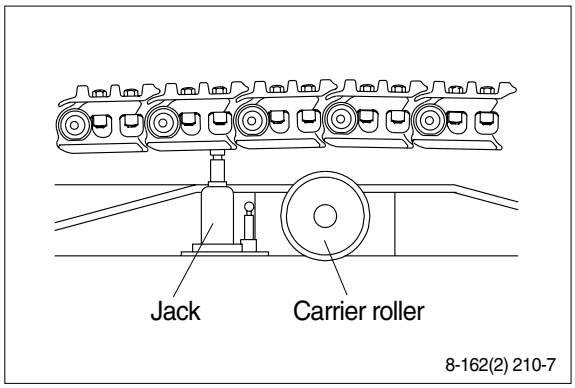
2. CARRIER ROLLER

1) REMOVAL

(1) Loosen tension of the track link.

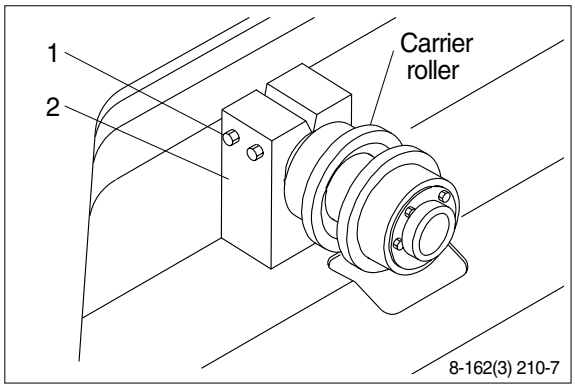


(2) Jack up the track link height enough to permit carrier roller removal.



(3) Loosen the lock nut (1).

(4) Open bracket(2) with a screwdriver, push out from inside, and remove carrier roller assembly.
- Weight : 80kg(180lb)

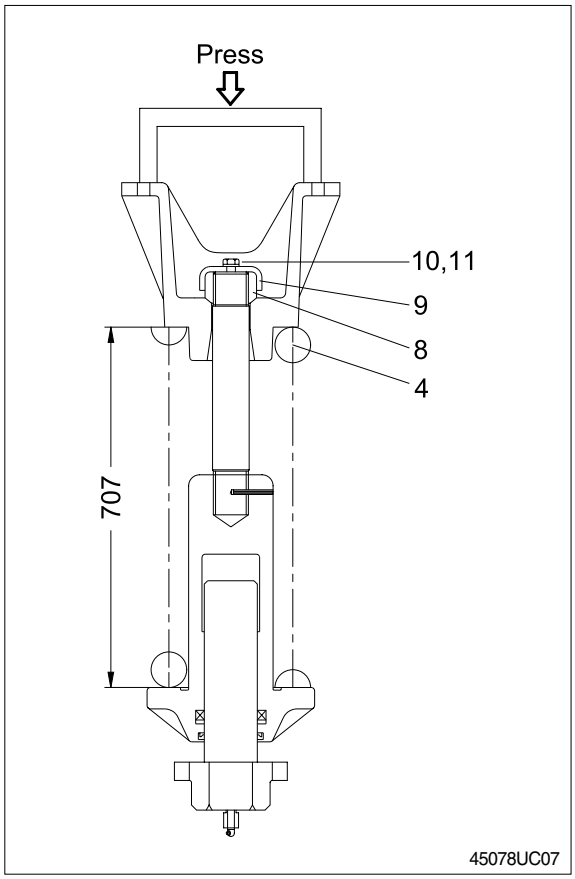


2) INSTALL

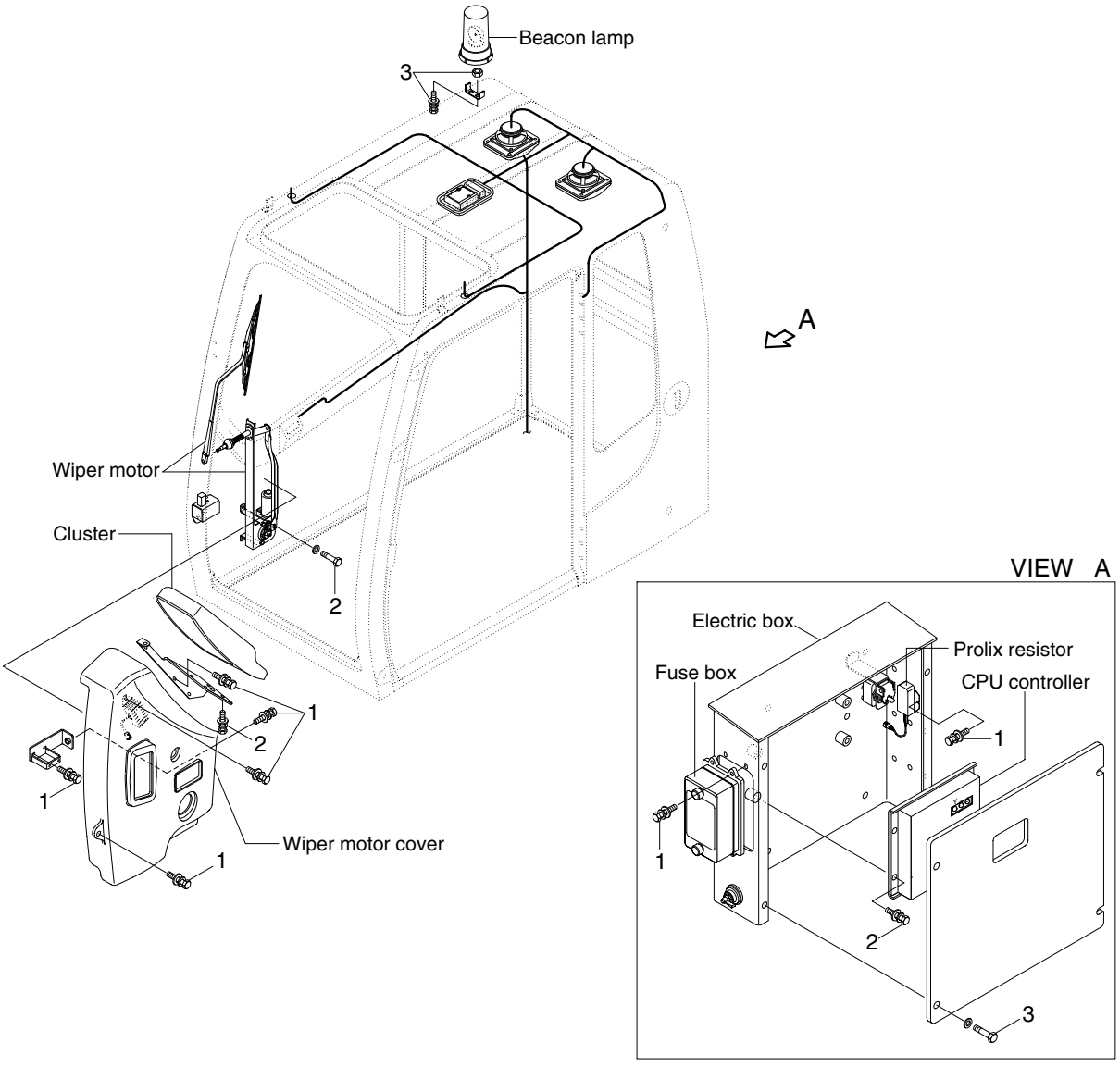
(1) Carry out installation in the reverse order to removal.

⑥ Lighten the press load and confirm the set length of spring(4).

⑦ After the setting of spring(4), install lock plate(9), spring washer(11) and bolt(10).



ELECTRIC COMPONENTS MOUNTING 2



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· Tightening torque

Item	Size	kgf · m	lbf · ft
1	M 6×1.0	1.05±0.2	7.6±1.45
2	M 8×1.25	2.5±0.5	18.1±3.6

Item	Size	kgf · m	lbf · ft
3	M10×1.5	6.9±1.4	49.9±10.1
-	-	-	-