

SECTION 1 GENERAL

Group 1 Safety Hints	1-1
Group 2 Specifications	1-10

SECTION 2 STRUCTURE AND FUNCTION

Group 1 Pump Device	2-1
Group 2 Main Control Valve	2-20
Group 3 Swing Device	2-54
Group 4 Travel Device	2-76
Group 5 RCV Lever	2-98
Group 6 RCV Pedal	2-105

SECTION 3 HYDRAULIC SYSTEM

Group 1 Hydraulic Circuit	3-1
Group 2 Main Circuit	3-2
Group 3 Pilot Circuit	3-5
Group 4 Single Operation	3-14
Group 5 Combined Operation	3-24

SECTION 4 ELECTRICAL SYSTEM

Group 1 Component Location	4-1
Group 2 Electric Circuit	4-3
Group 3 Electrical Component Specification	4-21
Group 4 Connectors	4-29

SECTION 5 MECHATRONICS SYSTEM

Group 1 Outline	5-1
Group 2 Mode selection System	5-3
Group 3 Automatic Deceleration System	5-6
Group 4 Power Boost System	5-7
Group 5 Travel Speed Control System	5-8
Group 6 Automatic Warming Up Function	5-9
Group 7 Engine Overheat Prevention Function	5-10
Group 8 Variable Power Control System	5-11

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TEMPERATURE

Fahrenheit-Centigrade Conversion.

A simple way to convert a fahrenheit temperature reading into a centigrade temperature reading or vice versa is to enter the accompanying table in the center or boldface column of figures.

These figures refer to the temperature in either Fahrenheit or Centigrade degrees.

If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

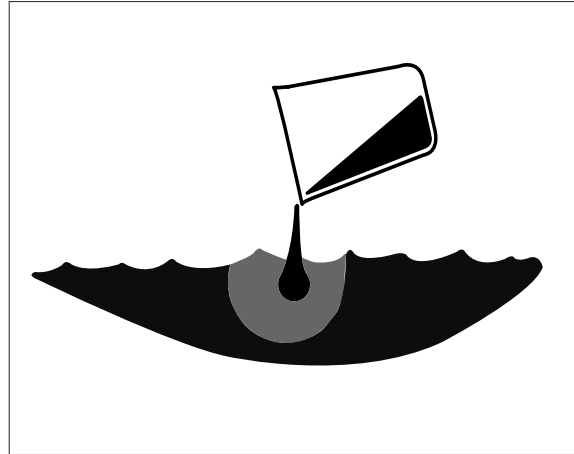
°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-40.4	-40	-40.0	-11.7	11	51.8	7.8	46	114.8	27.2	81	117.8
-37.2	-35	-31.0	-11.1	12	53.6	8.3	47	116.6	27.8	82	179.6
-34.4	-30	-22.0	-10.6	13	55.4	8.9	48	118.4	28.3	83	181.4
-31.7	-25	-13.0	-10.0	14	57.2	9.4	49	120.2	28.9	84	183.2
-28.9	-20	-4.0	-9.4	15	59.0	10.0	50	122.0	29.4	85	185.0
-28.3	-19	-2.2	-8.9	16	60.8	10.6	51	123.8	30.0	86	186.8
-27.8	-18	-0.4	-8.3	17	62.6	11.1	52	125.6	30.6	87	188.6
-27.2	-17	1.4	-7.8	18	64.4	11.7	53	127.4	31.1	88	190.4
-26.7	-16	3.2	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-26.1	-15	5.0	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-25.6	-14	6.8	-6.1	21	69.8	13.3	56	132.8	32.8	91	195.8
-25.0	-13	8.6	-5.6	22	71.6	13.9	57	134.6	33.3	92	197.6
-24.4	-12	10.4	-5.0	23	73.4	14.4	58	136.4	33.9	93	199.4
-23.9	-11	12.2	-4.4	24	75.2	15.0	59	138.2	34.4	94	201.2
-23.3	-10	14.0	-3.9	25	77.0	15.6	60	140.0	35.0	95	203.0
-22.8	-9	15.8	-3.3	26	78.8	16.1	61	141.8	35.6	96	204.8
-22.2	-8	17.6	-2.8	27	80.6	16.7	62	143.6	36.1	97	206.6
-21.7	-7	19.4	-2.2	28	82.4	17.2	63	145.4	36.7	98	208.4
-21.1	-6	21.2	-1.7	29	84.2	17.8	64	147.2	37.2	99	210.2
-20.6	-5	23.0	-1.1	35	95.0	21.1	70	158.0	51.7	125	257.0
-20.0	-4	24.8	-0.6	31	87.8	18.9	66	150.8	40.6	105	221.0
-19.4	-3	26.6	0	32	89.6	19.4	67	152.6	43.3	110	230.0
-18.9	-2	28.4	0.6	33	91.4	20.0	68	154.4	46.1	115	239.0
-18.3	-1	30.2	1.1	34	93.2	20.6	69	156.2	48.9	120	248.0
-17.8	0	32.0	1.7	35	95.0	21.1	70	158.0	51.7	125	257.0
-17.2	1	33.8	2.2	36	96.8	21.7	71	159.8	54.4	130	266.0
-16.7	2	35.6	2.8	37	98.6	22.2	72	161.6	57.2	135	275.0
-16.1	3	37.4	3.3	38	100.4	22.8	73	163.4	60.0	140	284.0
-15.6	4	39.2	3.9	39	102.2	23.3	74	165.2	62.7	145	293.0
-15.0	5	41.0	4.4	40	104.0	23.9	75	167.0	65.6	150	302.0
-14.4	6	42.8	5.0	41	105.8	24.4	76	168.8	68.3	155	311.0
-13.9	7	44.6	5.6	42	107.6	25.0	77	170.6	71.1	160	320.0
-13.3	8	46.4	6.1	43	109.4	25.6	78	172.4	73.9	165	329.0
-12.8	9	48.2	6.7	44	111.2	26.1	79	174.2	76.7	170	338.0
-12.2	10	50.0	7.2	45	113.0	26.7	80	176.0	79.4	172	347.0

DISPOSE OF FLUIDS PROPERLY

Improperly disposing of fluids can harm the environment and ecology. Before draining any fluids, find out the proper way to dispose of waste from your local environmental agency.

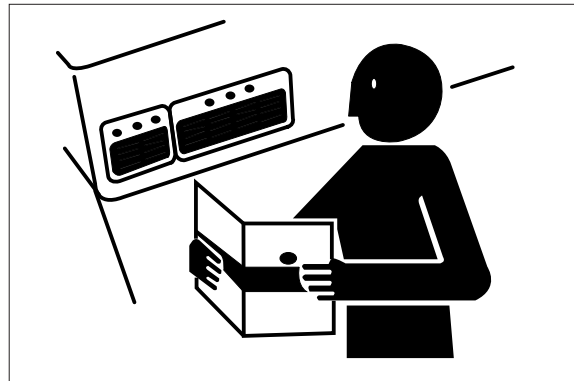
Use proper containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

DO NOT pour oil into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, brake fluid, filters, batteries, and other harmful waste.



REPLACE SAFETY SIGNS















Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.



LIVE WITH SAFETY

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems. Install all guards and shields.

(4) 5.68m(18' 8") boom, 3.90m(12' 10") arm equipped with 1.05m³(SAE heaped) bucket, 600mm (24") triple grouser shoe and 3800kg counterweight.

Load point height		Load radius												At max. reach			
		1.5 m (5 ft)		3.0 m (10 ft)		4.5 m (15 ft)		6.0 m (20 ft)		7.5 m (25 ft)		9.0 m (30 ft)		Capacity		Reach	
																m (ft)	
9.0m (30ft)	kg lb														*2490 *5490	*2490 *5490	7.66 (25.1)
7.5m (25ft)	kg lb									*1790 *3950	*1790 *3950			*2540 *5600	2390 5270	8.94 (29.3)	
6.0m (20ft)	kg lb									*2580 *5690	*2580 *5690			*2620 *5780	1930 4250	9.77 (32.1)	
4.5m (15ft)	kg lb									*2820 *6220	*2820 *6220	*1840 *4060	*1840 *4060	*2730 *6020	1670 3680	10.28 (33.7)	
3.0m (10ft)	kg lb							*3610 *7960	*3610 *7960	*3250 *7170	3050 6720	*2660 *5860	2110 4650	2860 6310	1530 3370	10.52 (34.5)	
1.5m (5ft)	kg lb			*10320 *22750	*10320 *22750	*6130 *13510	*6130 *13510	*4550 *10030	4190 9240	*3770 *8310	2850 6280	*3180 *7010	2010 4430	2810 6190	1480 3260	10.52 (34.5)	
Ground Line	kg lb	*5040 *11110	*5040 *11110	*10080 *22220	*10080 *22220	*7620 *16800	6080 13400	*5390 *11880	3870 8530	*4260 *9390	2680 *7170	*3250 4230	1920 6370	2890 3350	1520 (33.7)	10.27	
-1.5m (-5ft)	kg lb	*7150 *15760	*7150 *15760	*11070 *24410	*11070 *24410	*8460 *18650	5760 12700	*5970 *13160	3670 8090	*4610 *10160	2550 5620	*2160 *4760	1870 4120	3140 6920	1670 3680	9.75 (32.0)	
-3.0m (-10ft)	kg lb	*9500 *20940	*9500 *20940	*13560 *29890	11450 25240	*8650 *19070	5670 12500	*6170 *13600	3590 7910	4660 10270	2510 5530			*3550 *7830	1990 4390	8.91 (29.2)	
-4.5m (-15ft)	kg lb	*12290 *27090	*12290 *27090	*12370 *27270	11680 25750	*8140 *17950	5740 12650	*5820 *12830	3630 8000					*3670 *8090	2690 5930	7.62 (25.0)	
-6.0m (-20ft)	kg lb			*9790 *21580	*9790 *21580	*6520 *14370	6020 13270										

9. RECOMMENDED OILS

Use only oils listed below or equivalent.

Do not mix different brand oil.

Service point	Kind of fluid	Capacity l (U.S. gal)	Ambient temperature °C (°F)						
			-50 (-58)	-30 (-22)	-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)
Engine oil pan	Engine oil	24 (6.3)	★SAE 5W-40						
			SAE 30						
			SAE 10W						
			SAE 10W-30						
			SAE 15W-40						
Swing drive	Gear oil	5.0 (1.3)	★SAE 75W-90						
Final drive		5.8×2 (1.5×2)	SAE 85W-140						
Hydraulic tank	Hydraulic oil	Tank; 160 (42)	★ISO VG 15						
		System; 275 (73)	ISO VG 46						
			ISO VG 68						
Fuel tank	Diesel fuel	400 (106)	★ASTM D975 NO.1						
			ASTM D975 NO.2						
Fitting (grease nipple)	Grease	As required	★NLGI NO.1						
			NLGI NO.2						
Radiator (reservoir tank)	Mixture of antifreeze and soft water★1	35 (9.2)	Ethylene glycol base permanent type (50 : 50)						
			★Ethylene glycol base permanent type (60 : 40)						

SAE : Society of Automotive Engineers

API : American Petroleum Institute

ISO : International Organization for Standardization

NLGI : National Lubricating Grease Institute

ASTM : American Society of Testing and Material

★1 : Soft water

City water or distilled water

★ : Cold region

2) REGULATOR

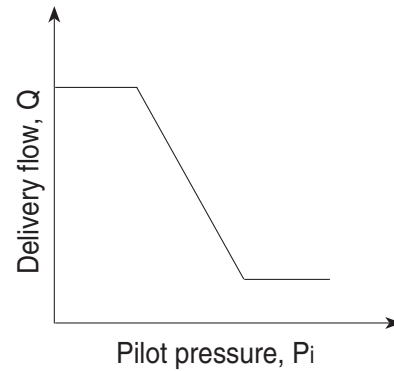
Regulator consists of the negative flow control, total horse power control and power shift control function.

(1) Negative flow control

By changing the pilot pressure P_i , the pump tilting angle (delivery flow) is regulated arbitrarily, as shown in the figure.

This regulator is of the negative flow control in which the delivery flow Q decreases as the pilot pressure P_i rises.

With this mechanism, when the pilot pressure corresponding to the flow required for the work is commanded, the pump discharges the required flow only, and so it does not consume the power uselessly.



(4) Adjustment of maximum and minimum flows

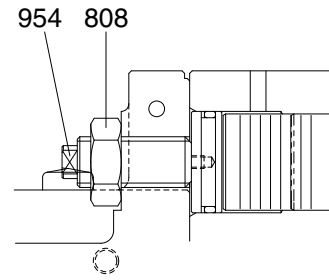
The regulator can adjust the maximum and minimum flows with the adjusting screws.

① Adjustment of maximum flow

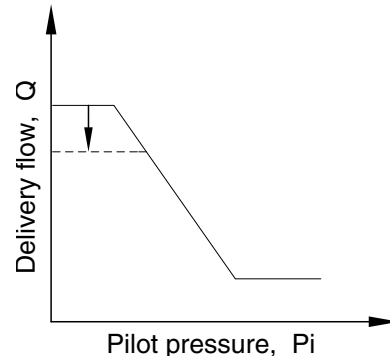
Adjust it by loosening the hexagon nut (808) and by tightening (or loosening) the set screw (954).

The maximum flow only is adjusted without changing other control characteristics.

Speed (min ⁻¹)	Adjustment of max flow	
	Tightening amount of adjusting screw (954) (Turn)	Flow change amount (l /min)
1900	+1/4	-5.5



21092MP23



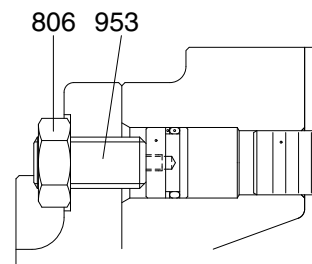
21092MP21

② Adjustment of minimum flow

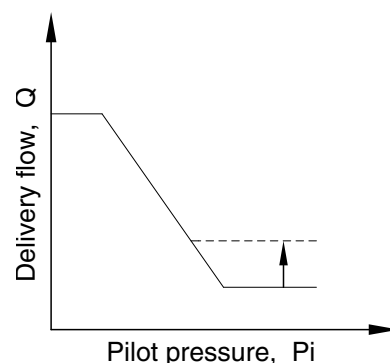
Adjust it by loosening the hexagon nut (806) and by tightening (or loosening) the hexagonal socket head set screw (953). Similarly to the adjustment of the maximum flow, other characteristics are not changed.

However, remember that, if tightened too much, the required horsepower during the maximum delivery pressure (or during relieving) may increase.

Speed (min ⁻¹)	Adjustment of min flow	
	Tightening amount of adjusting screw (953) (Turn)	Flow change amount (l /min)
1900	+1/4	+4.4



21092MP24



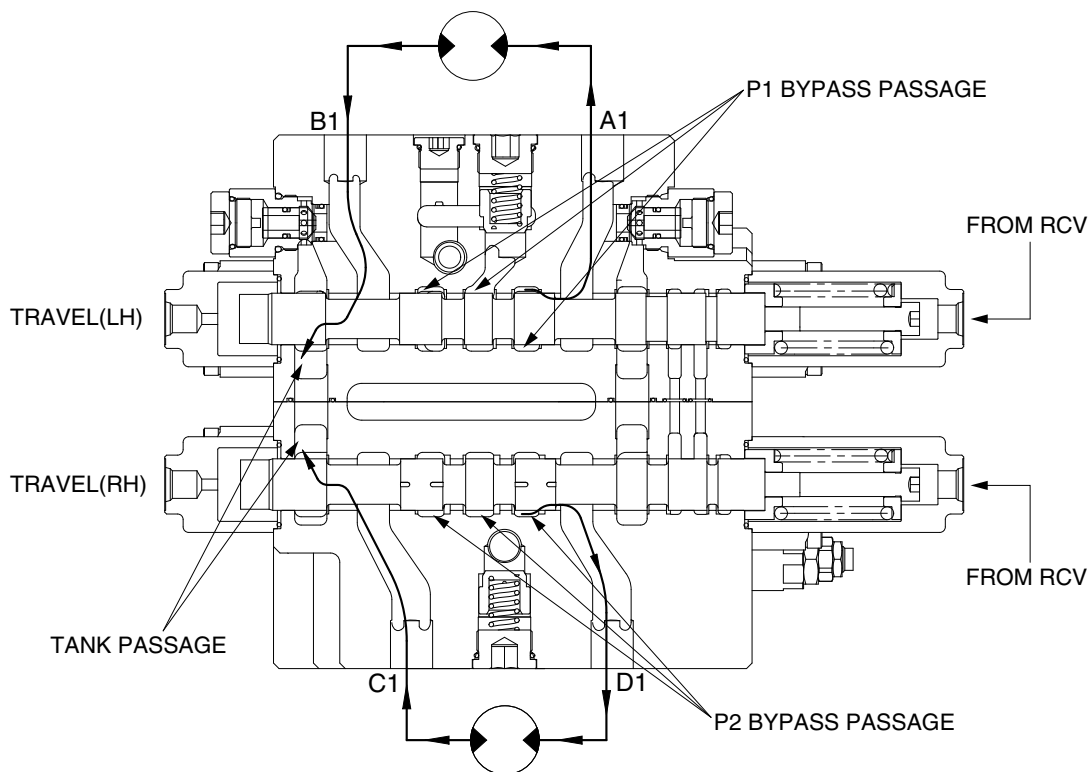
21092MP22

2) TRAVEL OPERATION

(1) TRAVEL FORWARD OPERATION

During the travel forward operation, the pilot pressure of RCV is supplied to the port of the spring side, and it shifts travel right and left spools in the left direction against springs. Hydraulic fluid from the pump flows into the bypass passage of travel spool through the land of the straight travel spool.

Then the bypass passage is shut off by the movement of the spool, they are directed to the each travel motor through port B1 and D1. At the same time, the hydraulic fluid from the each travel motor through port A1 and C1 returns to the tank passage through the travel spools.



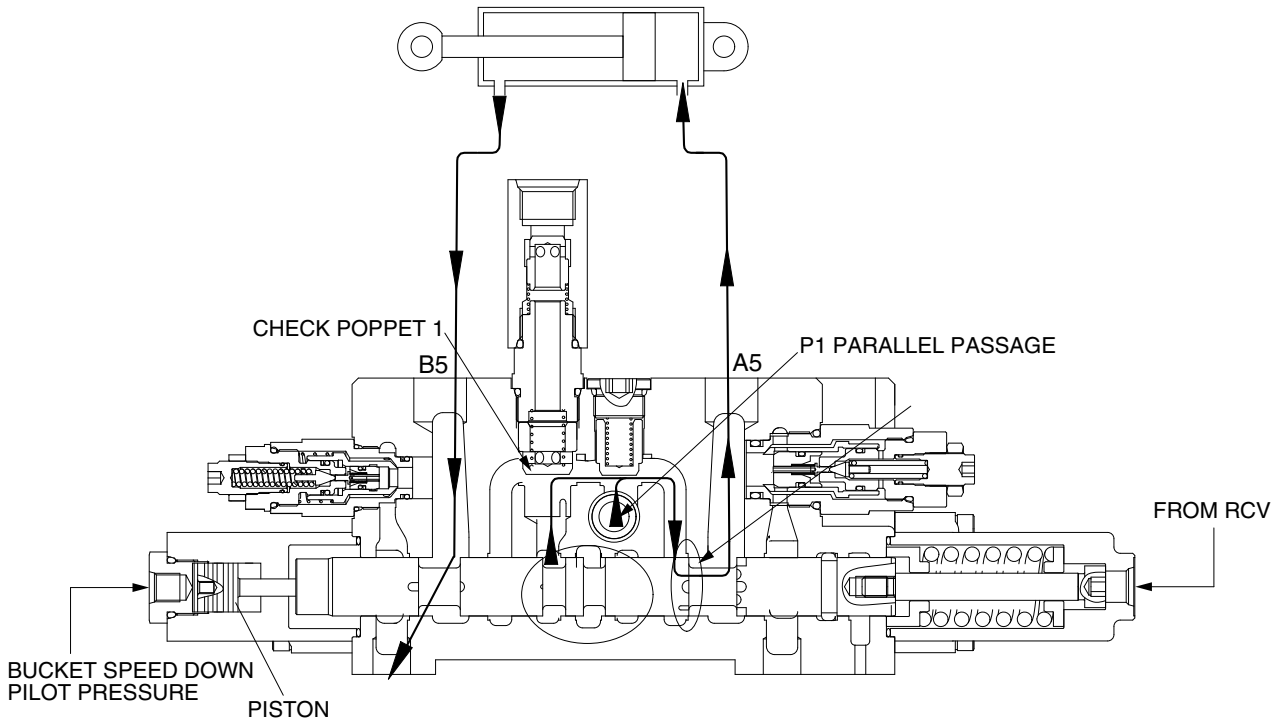
29092MC07

(3) BUCKET SLOW OPERATION

This function is used to speed up of the boom by reducing the bucket in speed when bucket operation with boom operation simultaneously.

When the boom up operation, the boom up pilot pressure is supplied the pilot port of bucket spool stroke limit and the piston is shifted to the right and then the bucket spool stroke is limited and the open of the bucket spool is reduced.

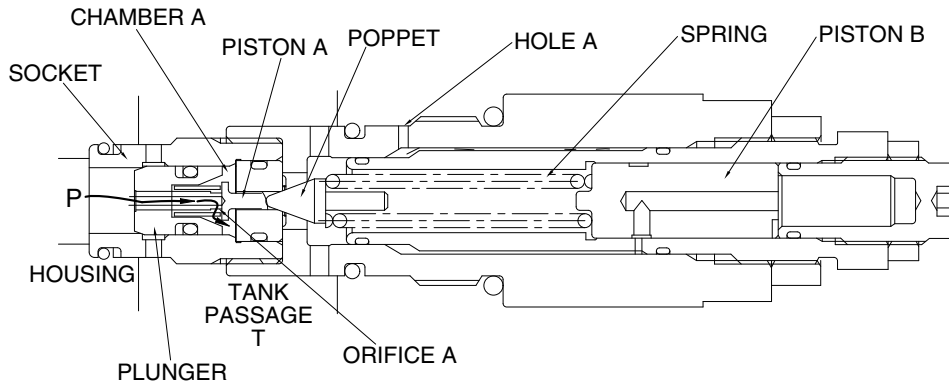
Accordingly, the oil of the bucket spool is reduced and the boom speed up.



300H2MC17

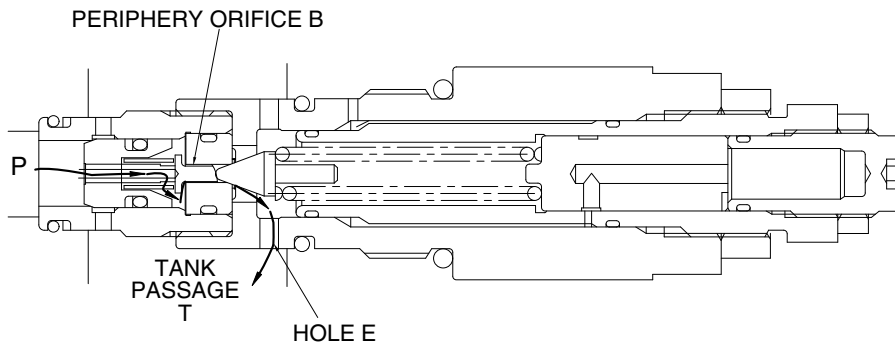
12) OPERATION OF MAIN RELIEF VALVE

- (1) The pressurized oil passes through the orifice (A) of the plunger is filled up in chamber A of the inside space, and seats the plunger against the housing securely.



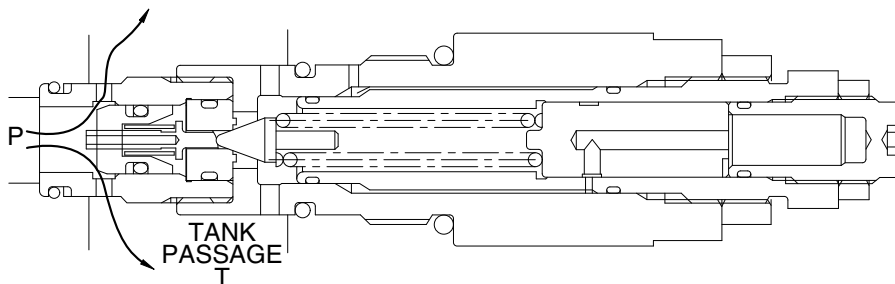
29092MC29

- (2) When the pressure at (P) becomes equal to the set pressure of the spring the hydraulic oil passes through the piston (A) pushes open the poppet and flows to tank passage (T) through the plunger internal passage, periphery orifice A, chamber A, periphery orifice B and the hole (E).



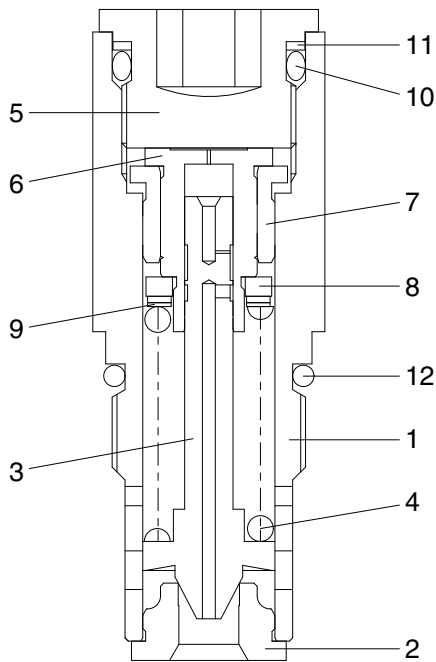
29092MC30

- (3) Opening the poppet causes the pressure in chamber A to fall and the plunger to open. As the result the pressurized oil at port P runs into tank passage (T).



29092MC31

3) RELIEF VALVE



- 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

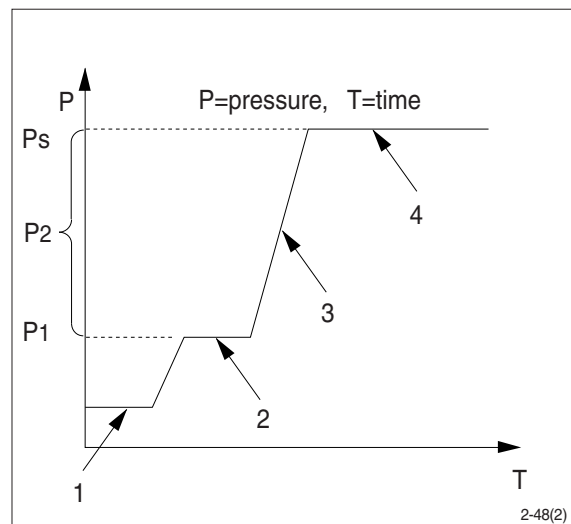
14007A2SM05

(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.



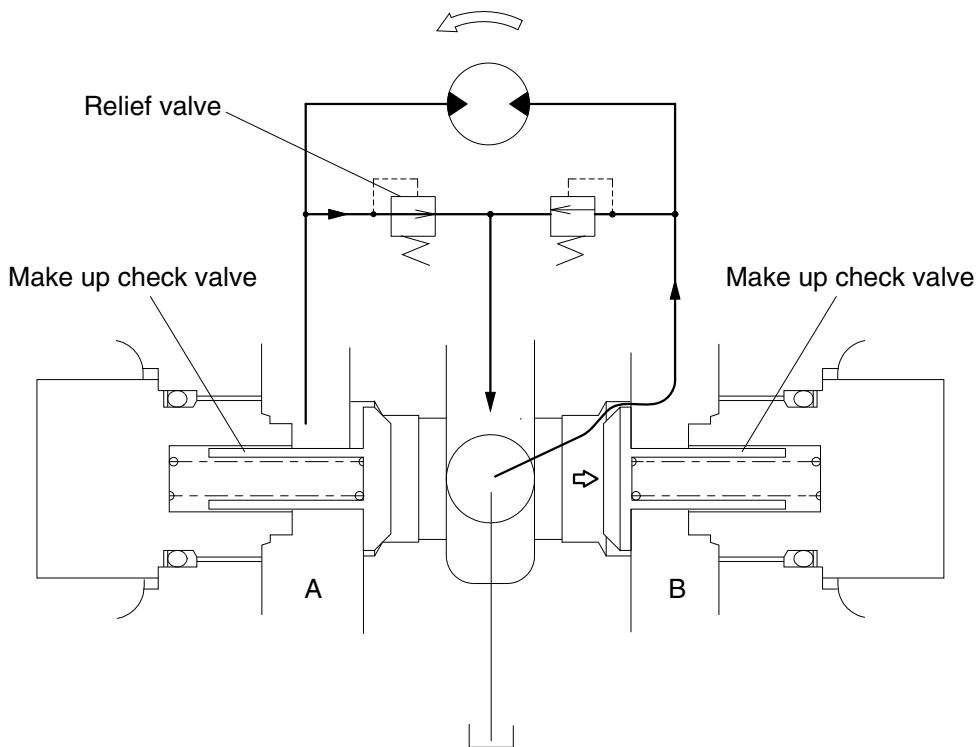
2) MAKE UP VALVE

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.



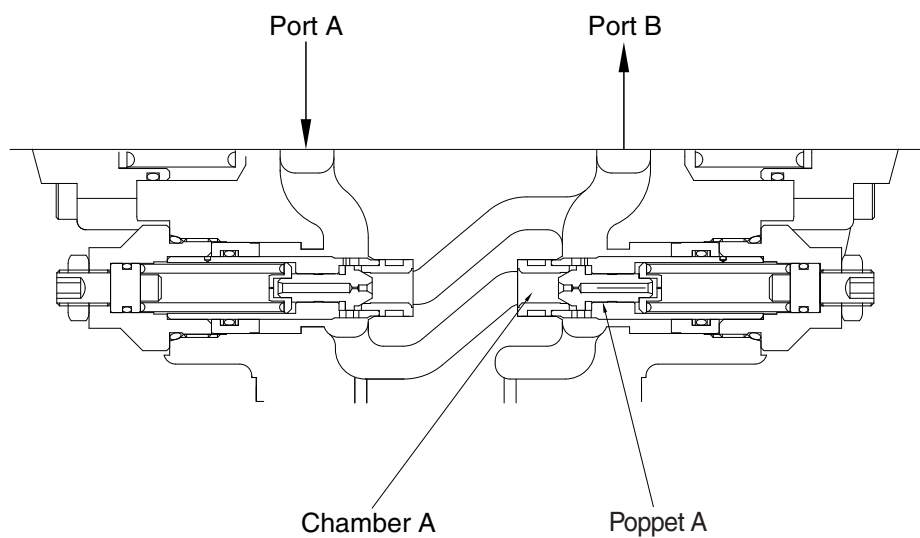
21092SM04

2.2 Working of relief valve

Relief valve carries on two functions of followings.

- 1) It standardizes a pressure in case of driving a hydraulic motor ; bypasses and extra oil in a motor inlet related to acceleration of an inertia to an outlet.
- 2) In case of an inertia stopped, it forces an equipment stopped, according to generating the pressure of a brake on the projected side.

Room A is always connected with port A of a motor. If the pressure of port is increased, press poppet A. And if it is higher than the setting pressure of a spring, the oil of an hydraulic flows from room A to port B, because poppet A is detached from the contact surface of seat A.



21078TM06A

3) CAPACITY CONTROL MECHANISM

Figure typically shows the capacity control mechanism.

When high speed pilot line is charged with the pressure P_A that overcome the spring (51), the spring (51) is compressed and spool (47) shifts to the right to connect the port P and port C.

Then, the highest pressure is selected by the check valve (56) from inlet and outlet pressure of the motor and high speed pilot line pressure and pushes shifter piston (6). As a result, swash plate (17) turns around the line L which connect the two pivots (16) as shown by dotted lines. The turn stops at the stopper (1-1) of casing and swash plate (17) keeps the position.

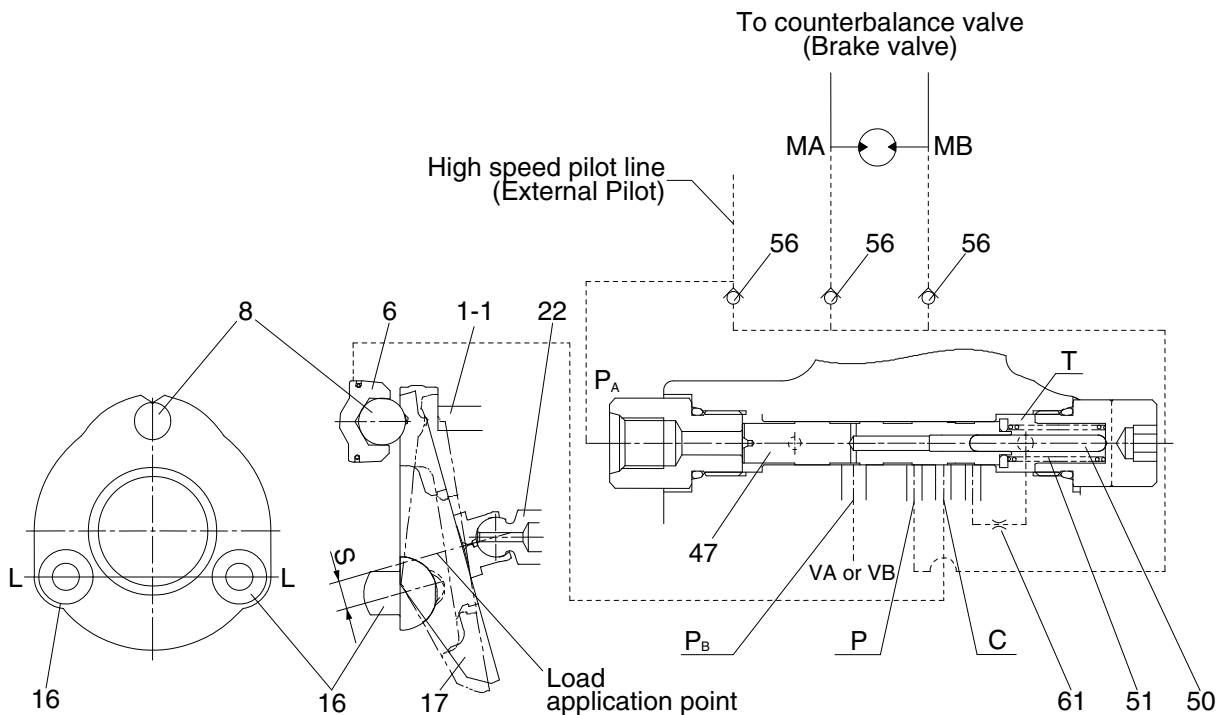
In this case, the piston stroke become shorter and motor capacity become smaller and motor rotates faster, around 1.60 times, by the same volume of oil.

When no pressure is in the high speed pilot line P_A , spool (35) is pushed back by the spring (51) and pressure that pressed the shifter piston (6) is released to the hydraulic tank through restrictor (61).

Here, nine pistons are there and they equally spaced on the swash plate (17). The force that summed up those of pistons comes to almost the center of the swash plate (17) as shown. Since the pivots (16) are off-set by S from the center, the rotating force of product S and the force moves swash plate (17) to the former position and the speed returns to low.

When the power demand exceeds the engine power, such as in steep slope climbing or turning at high speed mode, the system step down to the low speed automatically. The mechanism is that: pump pressure is led to the port P_B and this pressure activate on pin (50). When the pressure at P_B exceeds predetermined value, spool (47) returns to the left by the counter-pressure against pin (50) and the pressure on the shifter piston (6) through port C is released to the tank and the motor comes to low speed.

When P_B goes down, the spool (47) moves to the right and the speed become high.



25092TM19

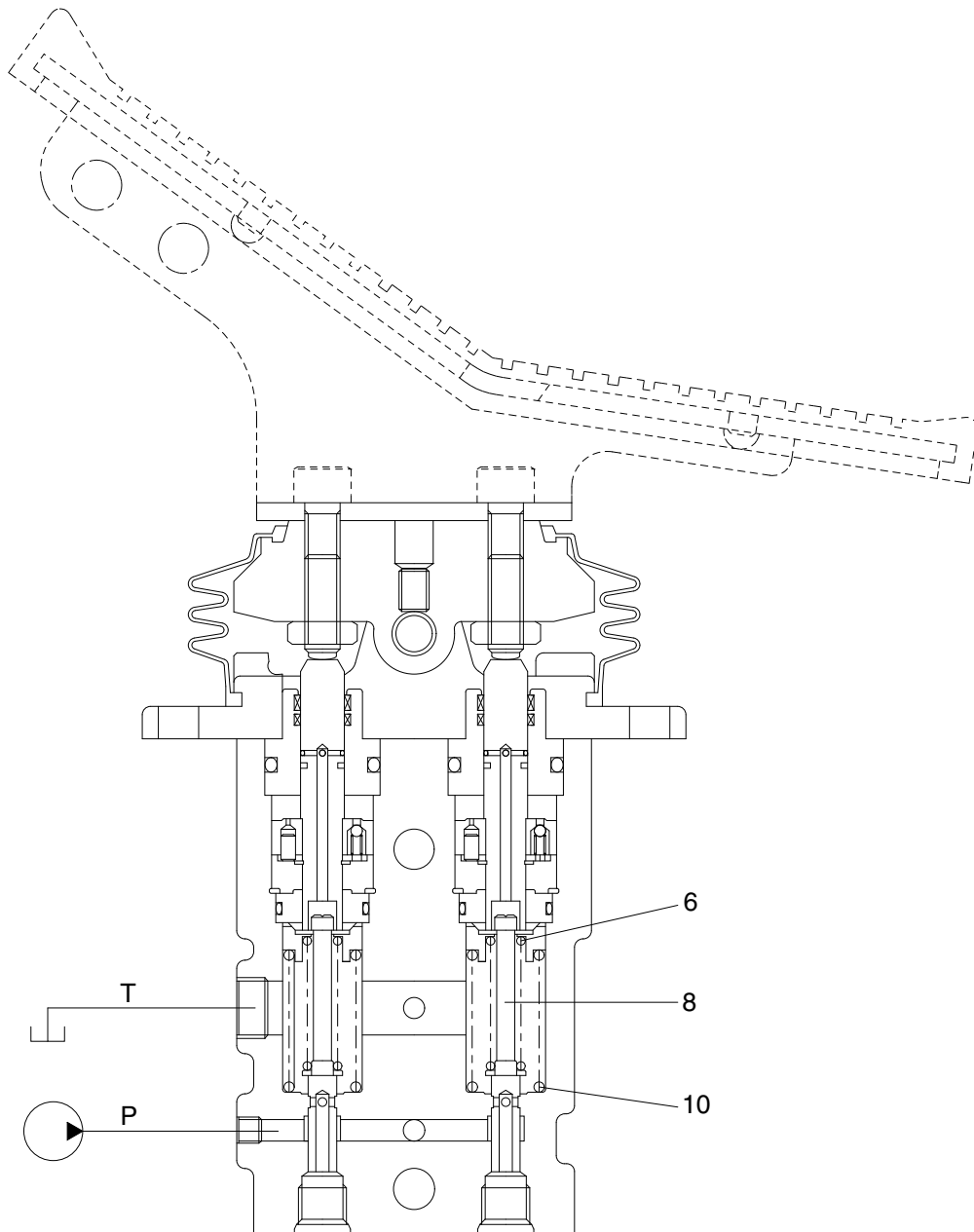
CROSS SECTION

The construction of the pilot valve is shown in the attached cross section drawing. The casing has vertical holes in which reducing valves are assembled.

The pressure reducing section is composed of the spool (3), spring (5) for setting secondary pressure, return spring (9), stopper (7), spring seat (6, 12) and shim (4). The spring for setting the secondary pressure has been generally so preset that the secondary pressure is 5 to 20.5 kgf/cm² (depending on the type). The spool is pushed against the push rod (8, 10) by the return spring.

When the push rod is pushed down by tilting the handle, the spring seat comes down simultaneously and changes setting of the secondary pressure spring.

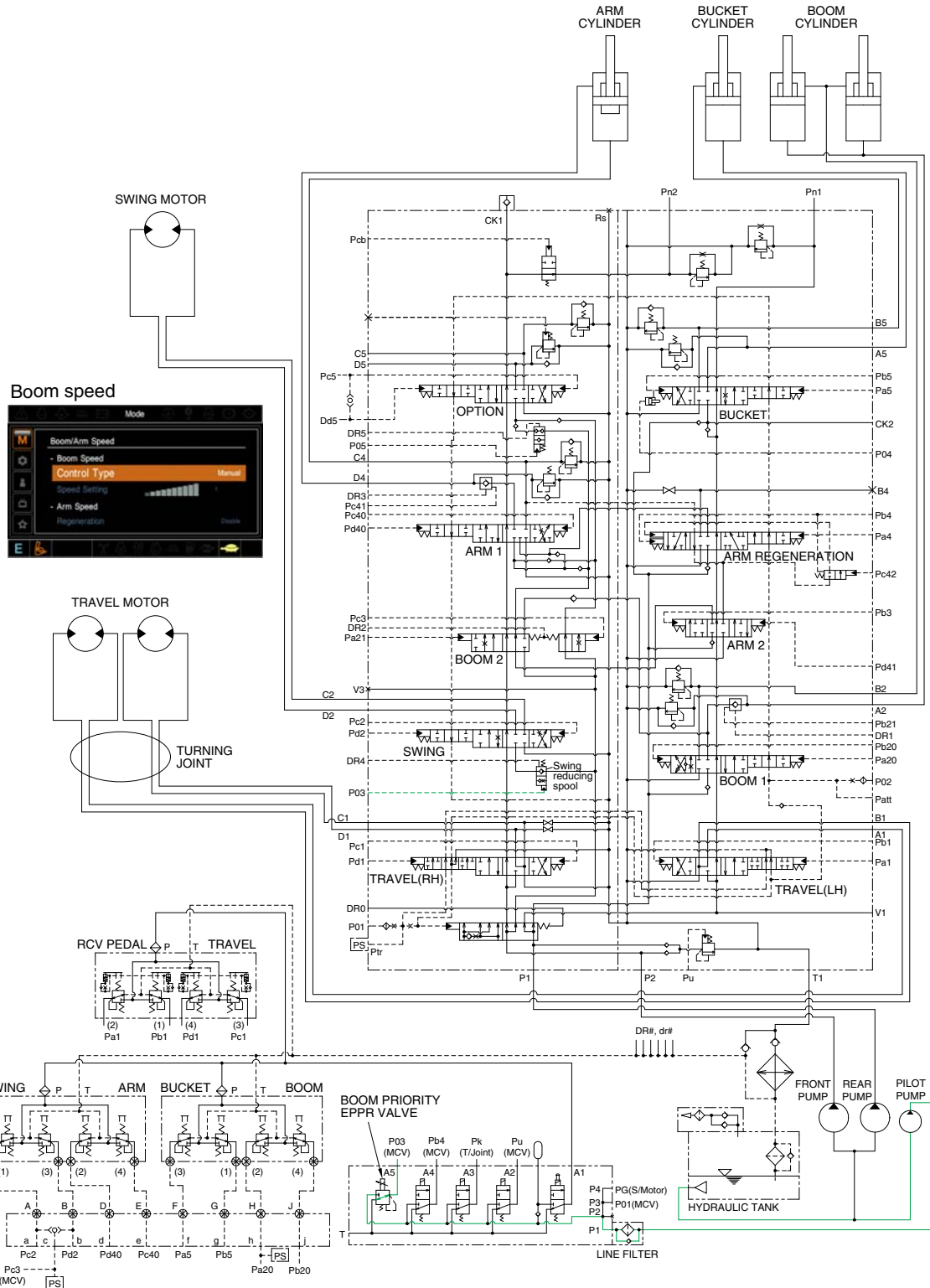
(1) Case where pedal is in neutral position



21092RP03

The force of the spring (6) that determines the output pressure of the pilot valve is not applied to the spool (8). Therefore, the spool is pushed up by the spring (10) to the position of port 2 in the operation explanation drawing. Then, since the output port is connected to tank port T only, the output port pressure becomes equal to tank pressure.

3. BOOM PRIORITY SYSTEM



2209SB3HC04

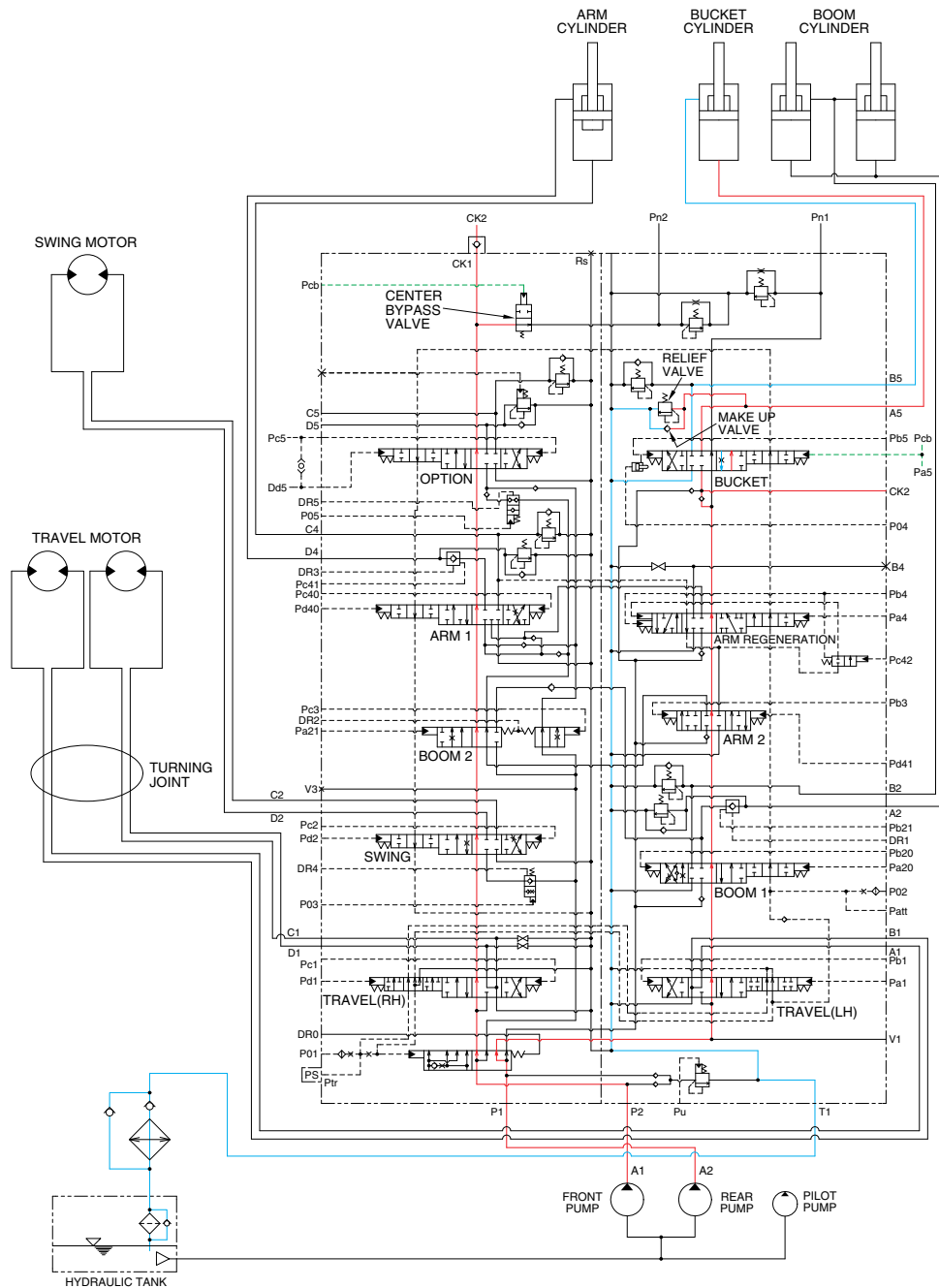
When carrying out the combined operation of swing and boom up, the boom up operating speed is slower than normal operation.

To increase working efficiency, swing speed reducing system is used.

The pilot oil from pilot pump flow into **P03** port in main control valve through boom EPPR valve. **P03** oil pressure moves swing reducing spool to upper position and oil flow rate to the swing motor decreased.

Then, the boom up speed is increased. This is called the boom priority system.

5. BUCKET IN OPERATION



2209SB3HC14

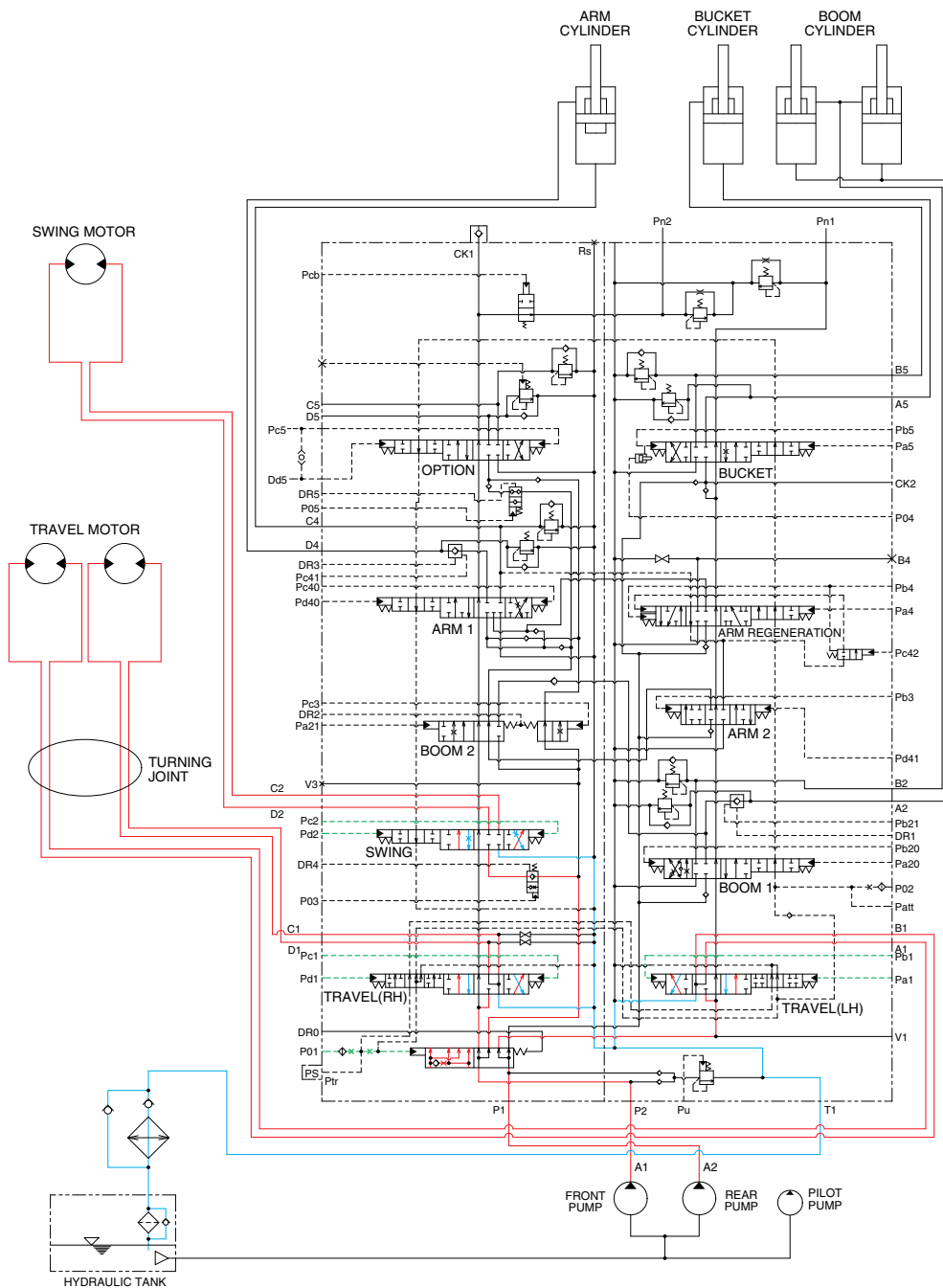
When the RH control lever is manually placed in the bucket roll in position. Then the oil flows from pilot pump through the pilot valve to bucket section of the main control valve. Here the spool position is moved to bucket roll in position.

The center bypass valve is change over by the pilot pressure (Pcb) and then the oil from A2 pump is joint to the flow of A1 pump via check 1 and external piping.

The oil flows from both pump through rod end of the cylinder through the bucket section returned to the hydraulic tank.

The cavitation which will happen to the bottom of the bucket cylinder is prevented by a make up valve, on other hand. The excessive pressure is also prevented by an overload relief valve in the main control valve.

5. COMBINED SWING AND TRAVEL OPERATION



2209SB3HC24

When the swing and travel functions are operated, simultaneously the swing spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure from the remote control valve. At the same time, the straight travel spool is pushed to the right by the pilot oil pressure from the pilot pump.

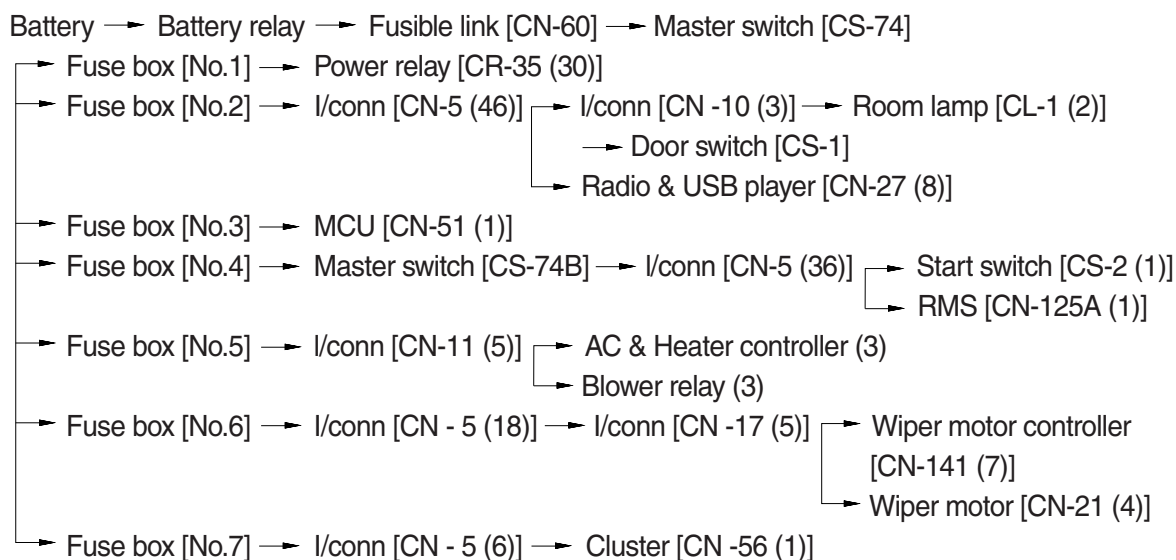
The oil from the A2 pump flows into the swing motor through the swing spool. The oil from the A1 pump flows into the travel motor through the RH travel spool of the right control valve and the LH travel spool of the left control valve via the straight travel spool.

The superstructure swings and the machine travels straight.

1. POWER CIRCUIT

The negative terminal of battery is grounded to the machine chassis through master switch.
When the start switch is in the OFF position, the current flows from the positive battery terminal as shown below.

1) OPERATING FLOW



※ I/conn : Intermediate connector

2) CHECK POINT

Engine	Start switch	Check point	Voltage
OFF	OFF	① - GND (battery 1EA) ② - GND (battery 2EA) ③ - GND (battery 2EA) ④ - GND (fusible link)	10~12.5V 20~25V 20~25V 20~25V

※ GND : Ground

6. WIPER AND WASHER CIRCUIT

1) OPERATING FLOW

(1) Key switch ON

Fuse box (No.11) → I/conn [CN-5 (57)] → Switch panel [CN-116 (10)]

Fuse box (No.6) → I/conn [CN-5 (18)] → I/conn [CN-17 (5)] → Wiper motor controller [CN-141(7)]
 → Wiper motor [CN-21(4)]

Fuse box (No.17) → I/conn [CN-5 (24)] → I/conn [CN-17 (4)] → Wiper motor controller [CN-141 (6)]
 → Washer pump [CN-22 (2)]

(2) Wiper switch ON : 1st step (Intermittent)

Wiper switch ON [CN-116 (3)] → I/conn [CN-17 (8)] → Wiper motor controller [CN-141 (10) → (3)]
 → Wiper motor intermittently operating [CN-21 (6)]

(3) Wiper switch ON : 2nd step (continual)

Wiper switch ON [CN-116(4)] → I/conn[CN-17(2)] → Wiper motor controller [CN-141(2) → (4)]
 → Wiper motor operating [CN-21(2)]

(4) Washer switch ON

Washer switch ON [CN-116 (5)] → I/conn [CN-17 (7)] → Wiper motor controller [CN-141 (9) → (8)]
 → I/conn [CN-17 (6)] → I/conn [CN-5 (19)] → Washer pump [CN-22 (1)] → Washer operating
 Wiper switch ON [CN-116 (4)] → I/conn[CN-17 (2)] → Wiper motor controller [CN-141 (2) → (4)]
 → Wiper motor operating [CN-21 (2)]

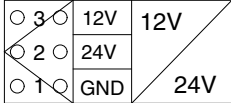
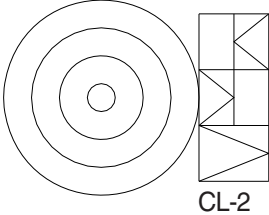
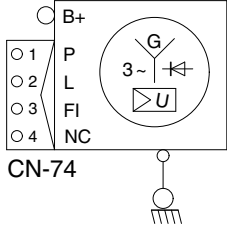
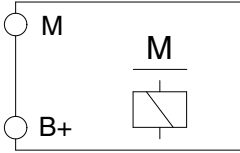
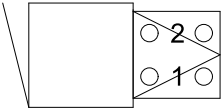
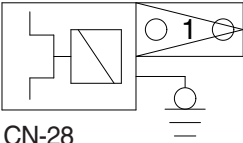
(5) Auto parking (when switch OFF)

Switch OFF [CN-116 (4)] → Wiper motor parking position by wiper motor controller

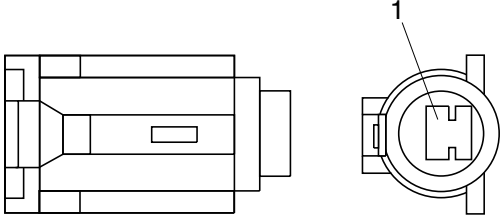
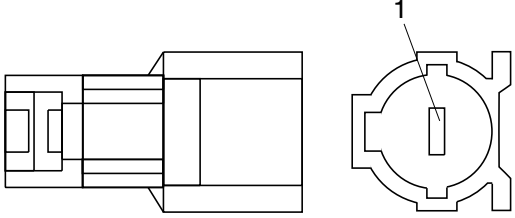
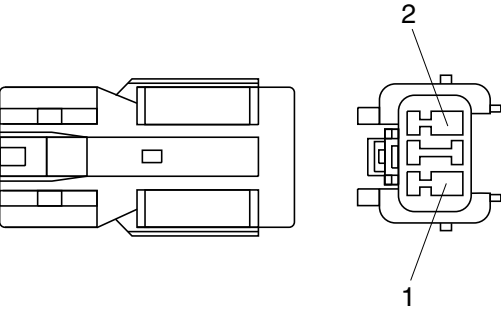
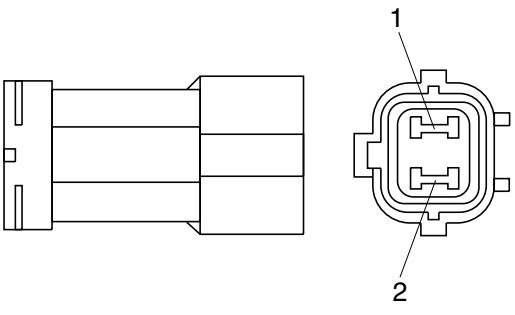
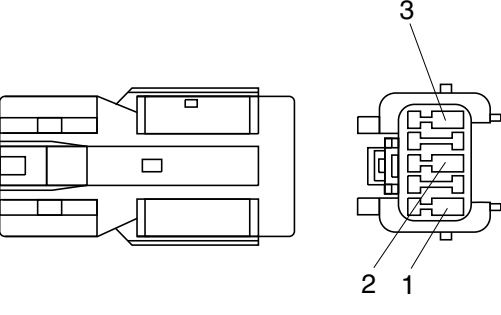
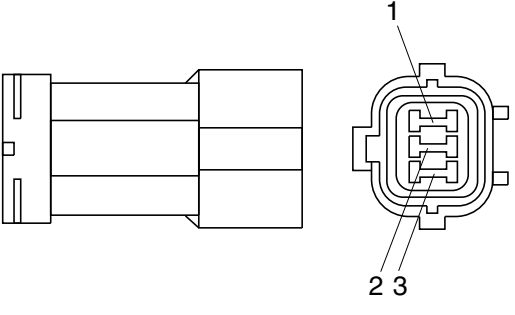
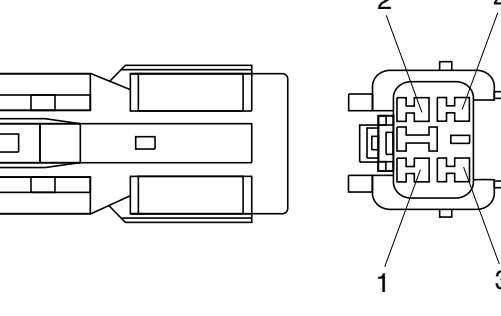
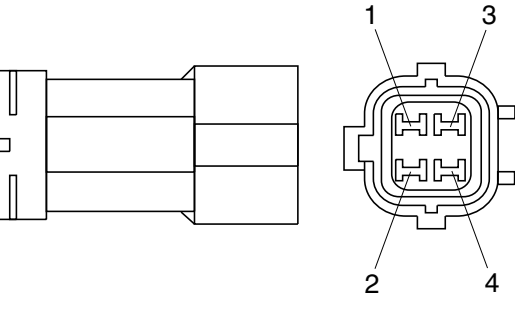
2) CHECK POINT

Engine	Start switch	Check point	Voltage
STOP	ON	① - GND (fuse box)	24V
		② - GND (switch power input)	
		③ - GND (switch power output)	0 ~ 5V
		④ - GND (wiper power input)	
		⑤ - GND (wiper power output)	24V
		⑥ - GND (wiper motor)	0 or 24V

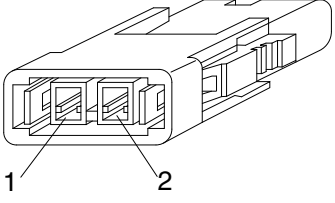
※ GND : Ground

Part name	Symbol	Specifications	Check
DC/DC Converter	 <p>CN-138</p>	12V 3A	24V (1-2) 12V (1-3)
Cigar lighter	 <p>CL-2</p>	24V 5A 1.4W	※ Check coil resistance Normal : About 1M Ω ※ Check contact Normal : ∞ Ω Operating time : 5~15sec
Alternator	 <p>CN-74</p>	24V 50A	※ Check contact Normal : 0 Ω (for terminal B ⁺ -I) Normal : 24~27.5V
Starter	 <p>CN-45</p>	Denso 24V 4.5kW	※ Check contact Normal : 0.1 Ω
Travel alarm	 <p>CN-81</p>	24V 0.5A	※ Check contact Normal : 5.2 Ω
Aircon compressor	 <p>CN-28</p>	24V 79W	※ Check contact Normal : 13.4 Ω

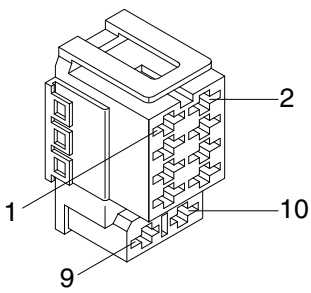
3) SWP TYPE CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
1	 <p data-bbox="687 685 836 712">S814-001000</p>	 <p data-bbox="1241 685 1390 712">S814-101000</p>
2	 <p data-bbox="687 1088 836 1115">S814-002000</p>	 <p data-bbox="1241 1088 1390 1115">S814-102000</p>
3	 <p data-bbox="687 1498 836 1525">S814-003000</p>	 <p data-bbox="1241 1498 1390 1525">S814-103000</p>
4	 <p data-bbox="687 1908 836 1935">S814-004000</p>	 <p data-bbox="1241 1908 1390 1935">S814-104000</p>

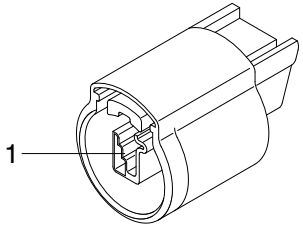
15) MOLEX 2CKTS CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 <p data-bbox="702 683 837 712">35215-0200</p>	

16) ITT SWF CONNECTOR

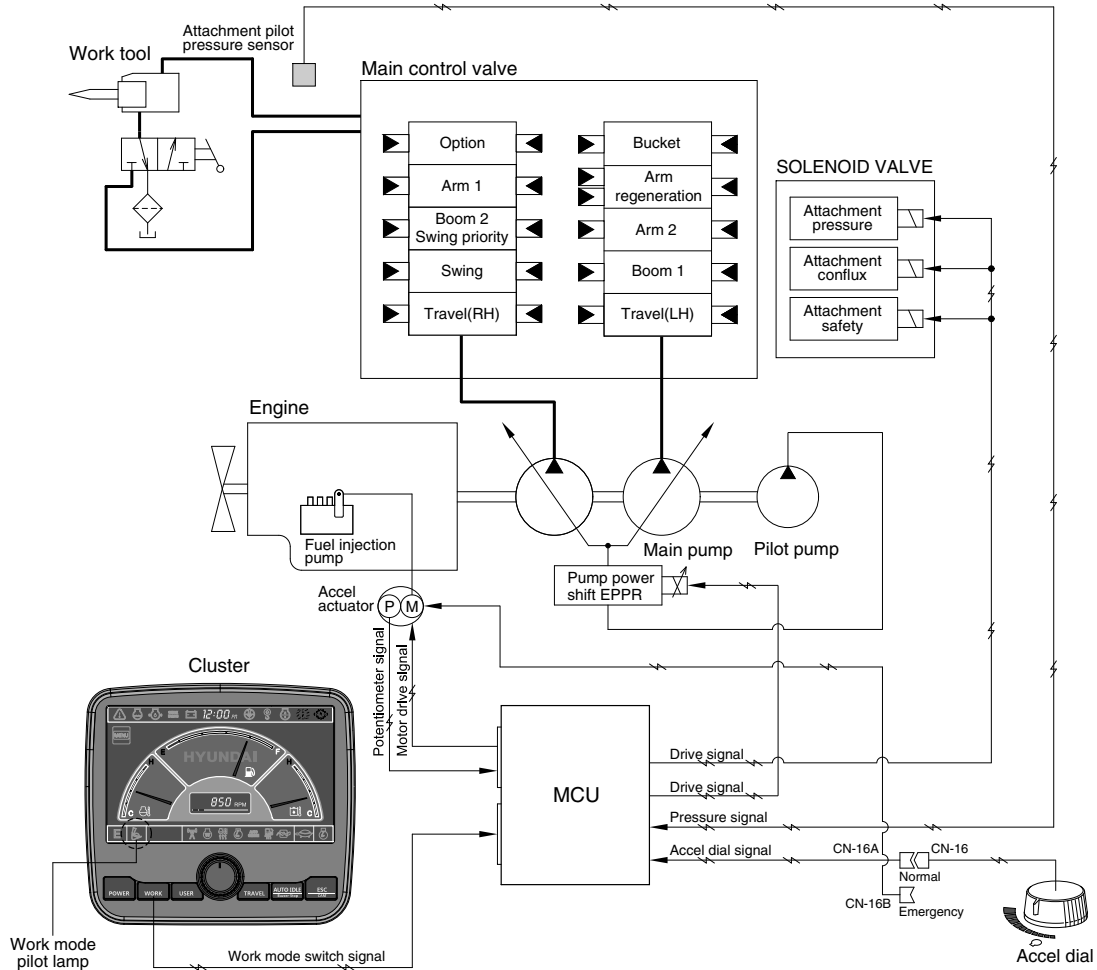
No. of pin	Receptacle connector (female)	Plug connector (male)
10	 <p data-bbox="694 1288 837 1317">SWF593757</p>	

17) MWP NMWP CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
1	 <p data-bbox="686 1892 837 1921">NMWP01F-B</p>	

2. WORK MODE SELECTION SYSTEM

Work mode consists of the general operation (bucket) and the optional attachment (breaker, crusher).



2209S5MS03

1) GENERAL WORK MODE (bucket)

This mode is used to general digging work.

2) ATT WORK MODE (breaker, crusher)

It controls the pump flow and system pressure according to the operation of breaker or crusher.

Description	General mode		Work tool	
	Bucket	Breaker	Crusher	
Attachment safety solenoid	OFF	ON	ON	
Attachment pressure solenoid	OFF	OFF	ON	
Attachment conflux solenoid	OFF	OFF	ON/OFF	
Attachment flow EPPR current	100 mA	100~700 mA	100~700 mA	

GROUP 11 SELF-DIAGNOSTIC SYSTEM

1. OUTLINE

When any abnormality occurs in the ADVANCED CAPO system caused by electric parts malfunction and by open or short circuit, the MCU diagnoses the problem and sends the error codes to the cluster and also stores them in the memory.

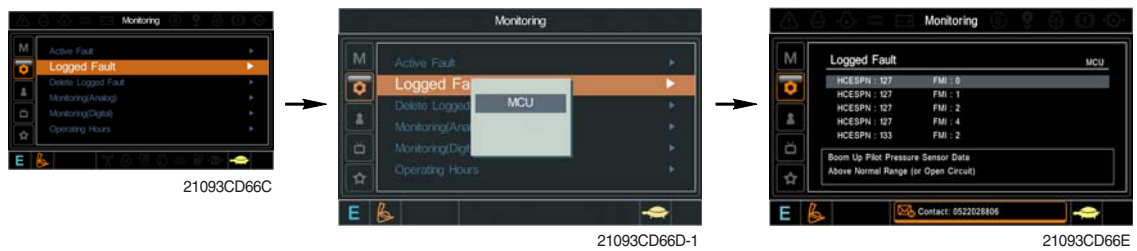
2. MONITORING

1) Active fault



- The active faults of the MCU can be checked by this menu.

2) Logged fault



- The logged faults of the MCU can be checked by this menu.

3) Delete fault



- The logged Fault faults of the MCU can be deleted by this menu.

GROUP 14 MONITORING SYSTEM

1. OUTLINE

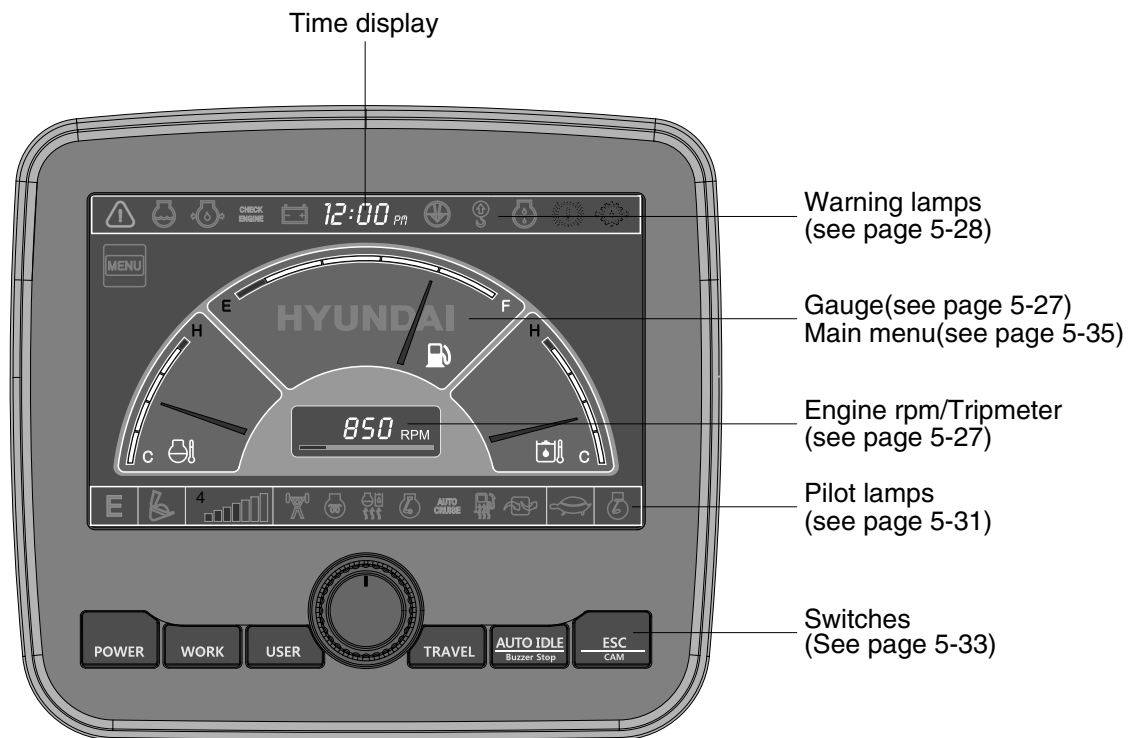
Monitoring system consists of the monitor part and switch part.

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.

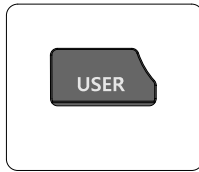
2. CLUSTER

1) MONITOR PANEL



1609SB5MS30

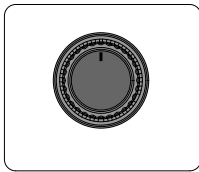
(3) User mode switch



21093CD45D

- ① This switch is used to memorize the current machine operating status in the MCU and activate the memorized user mode.
 - Memory : Push more than 2 seconds.
 - Action : Push within 2 seconds.
 - Cancel : Push this switch once more within 2 seconds.
- ② Refer to the page 5-36 for another set of user mode.

(4) Select switch



21093CD45E

- ① This switch is used to select or change the menu and input value.
- ② Knob push
 - Long (over 2 sec) : Return to the operation screen
 - Medium (0.5~2 sec) : Return to the previous screen
 - Short (below 0.5 sec) : Select menu
- ③ Knob rotation

This knob changes menu and input value.

 - Right turning : Down direction / Increase input value
 - Left turning : Up direction / Decreased input value

(5) Auto idle / buzzer stop switch

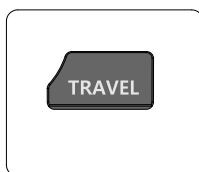


21093CD45F



- ① This switch is used to activate or cancel the auto idle function.
 - Pilot lamp ON : Auto idle function is activated.
 - Pilot lamp OFF : Auto idle function is cancelled.
- ② The buzzer sounds when the machine has a problem.

In this case, push this switch and buzzer stops, but the warning lamp blinks until the problem is cleared.

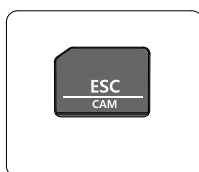
(6) Travel speed control switch



21093CD45G

- ① This switch is used to select the travel speed alternatively.
 -  : High speed
 -  : Low speed

(7) Escape / Camera switch

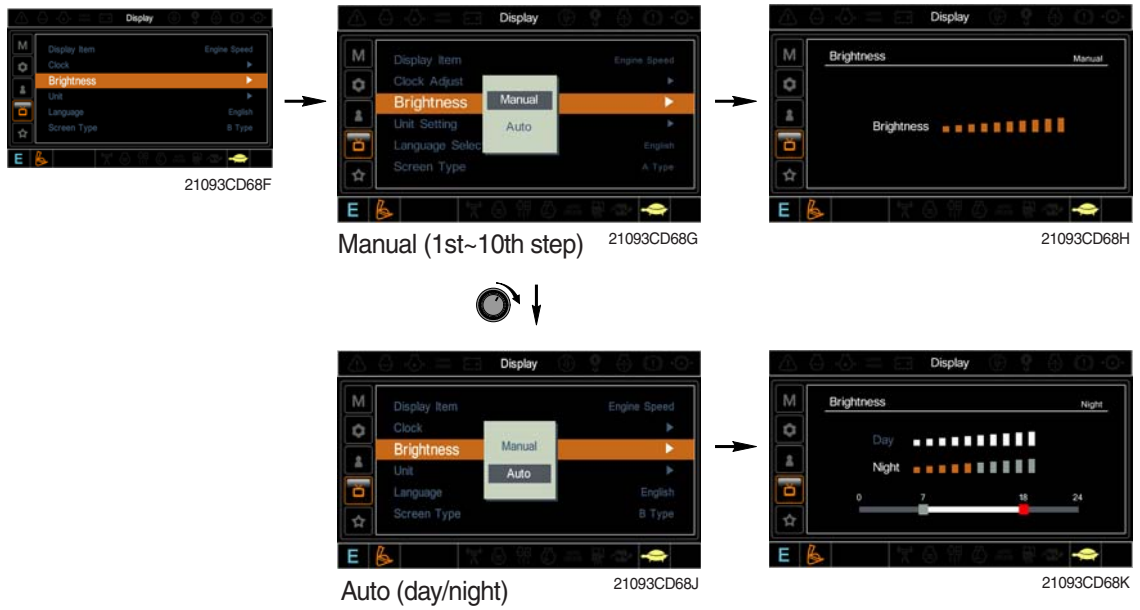


21093CD45H

- ① This switch is used to return to the previous menu or parent menu.
- ② In the operation screen, pushing this switch will display the view of the camera on the machine (if equipped).

Please refer to page 5-46 for the camera.
- ③ If the camera is not installed, this switch is used only ESC function.

③ Brightness



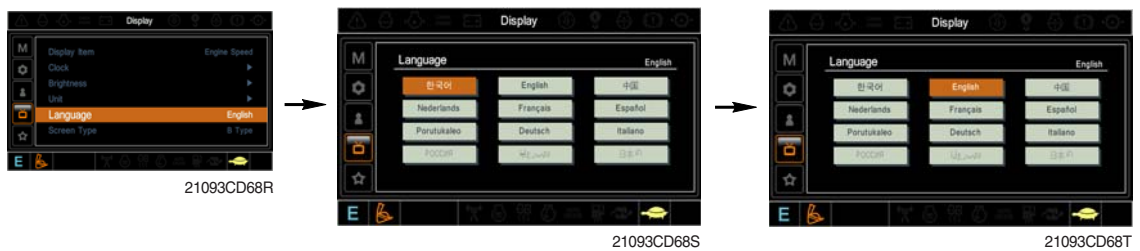
- ※ If "Auto" is chosen, brightness for day and night can be differently set up. Also by using the bar in lower side, users can define which time interval belongs to day and night. (in bar figure, gray area represents night time while white shows day time)

④ Unit



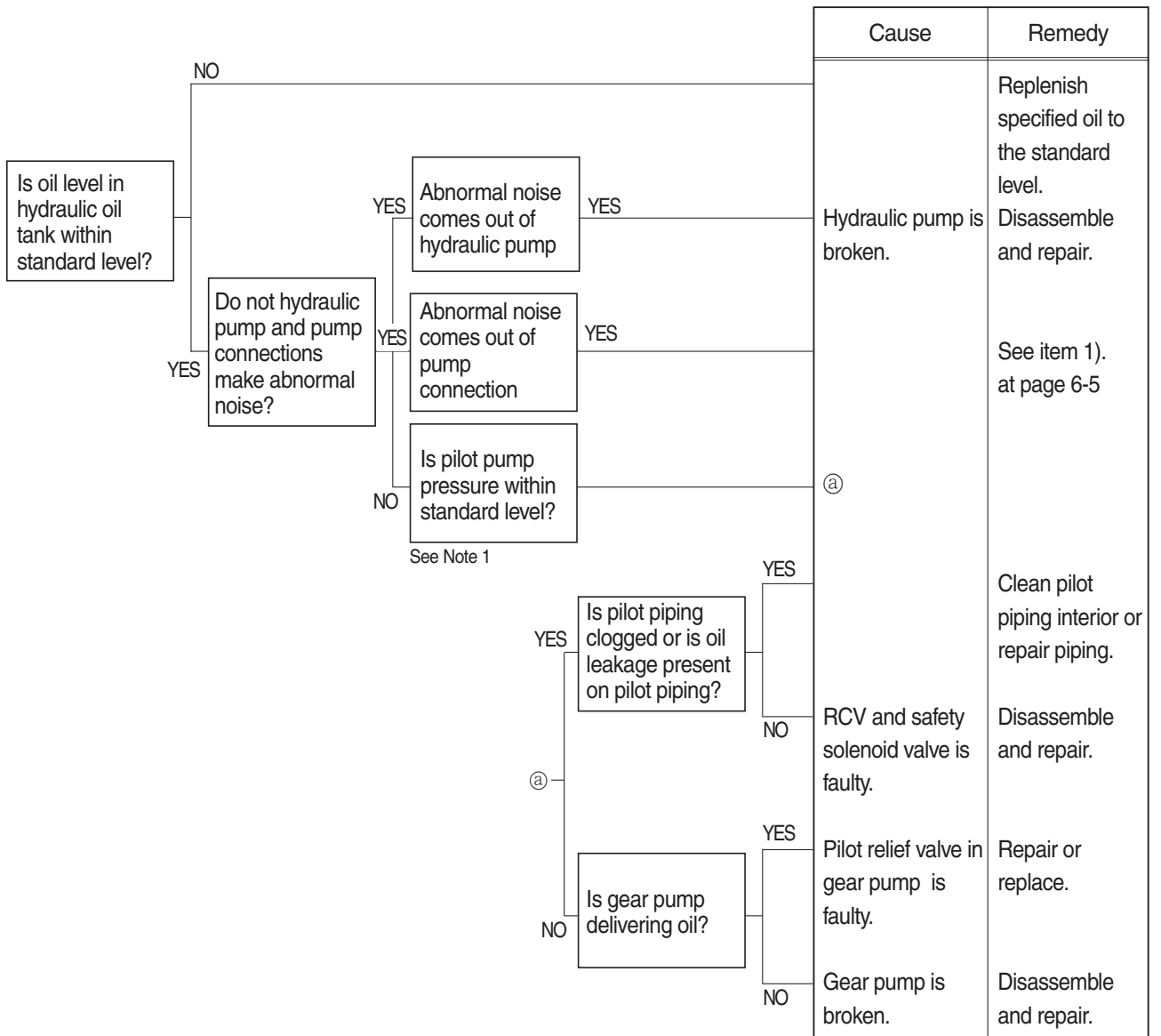
- Temperature : °C ↔ °F
- Pressure : bar ↔ MPa ↔ kgf/cm²
- Flow : lpm ↔ gpm
- Date format : yy/mm/dd ↔ mm/dd/yy ↔ dd-Mar-yy

⑤ Language

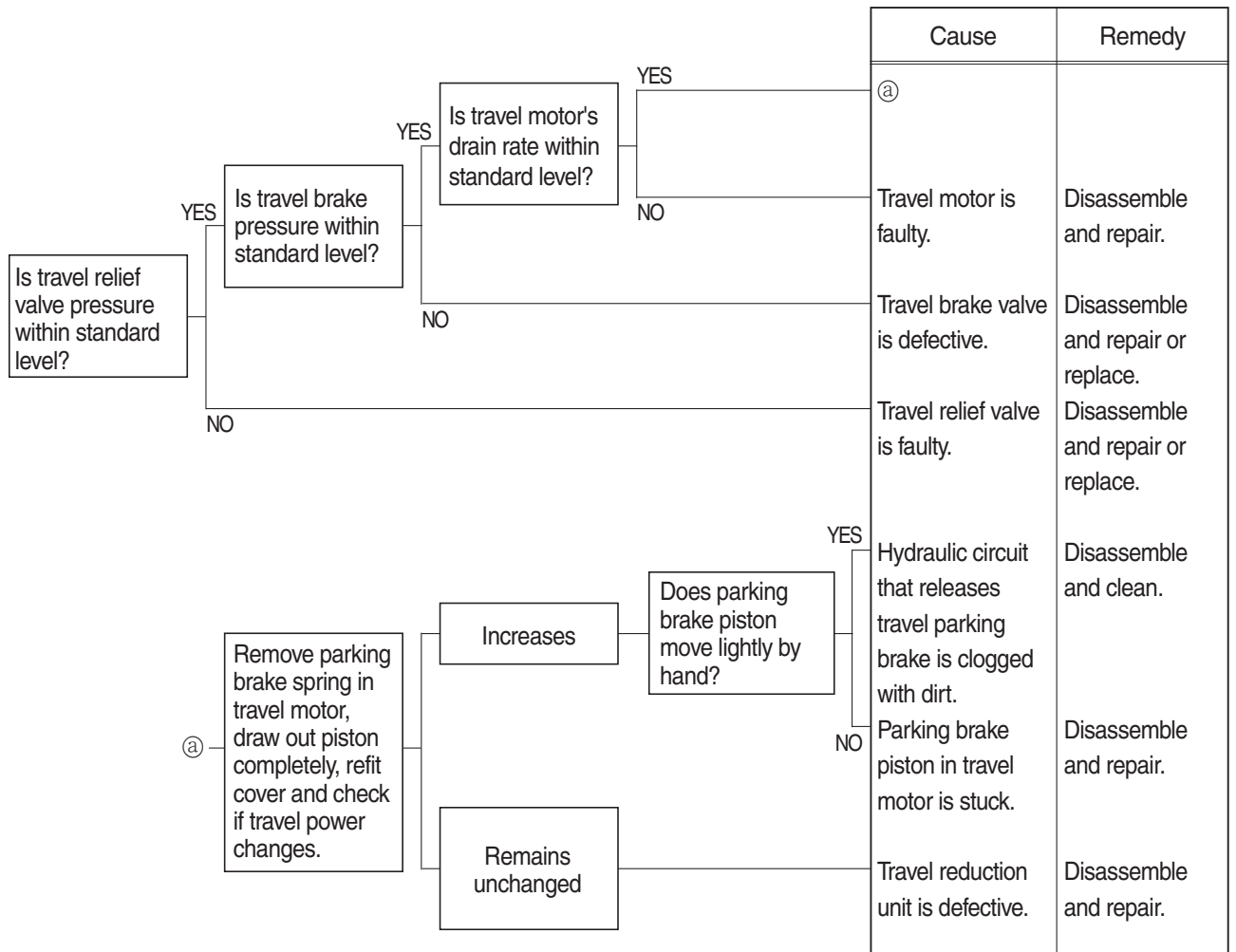


- User can select preferable language and all displays are changed the selected language.

2) ENGINE STARTS BUT MACHINE DOES NOT OPERATE AT ALL



5) TRAVEL ACTION IS POWERLESS (travel only)



6) MACHINE RUNS RECKLESSLY ON A SLOPE



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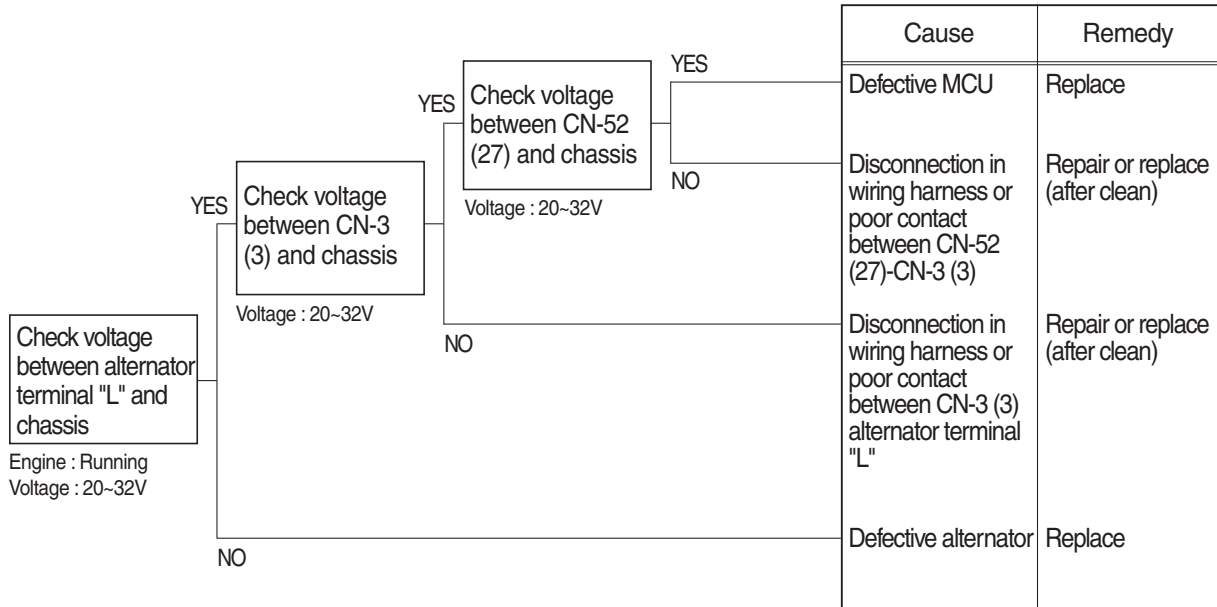


- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

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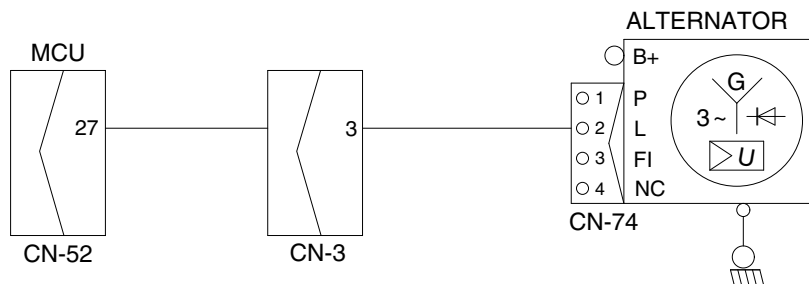
3. BATTERY CHARGING WARNING LAMP LIGHTS UP (Starting switch : ON)

- 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.



Check voltage

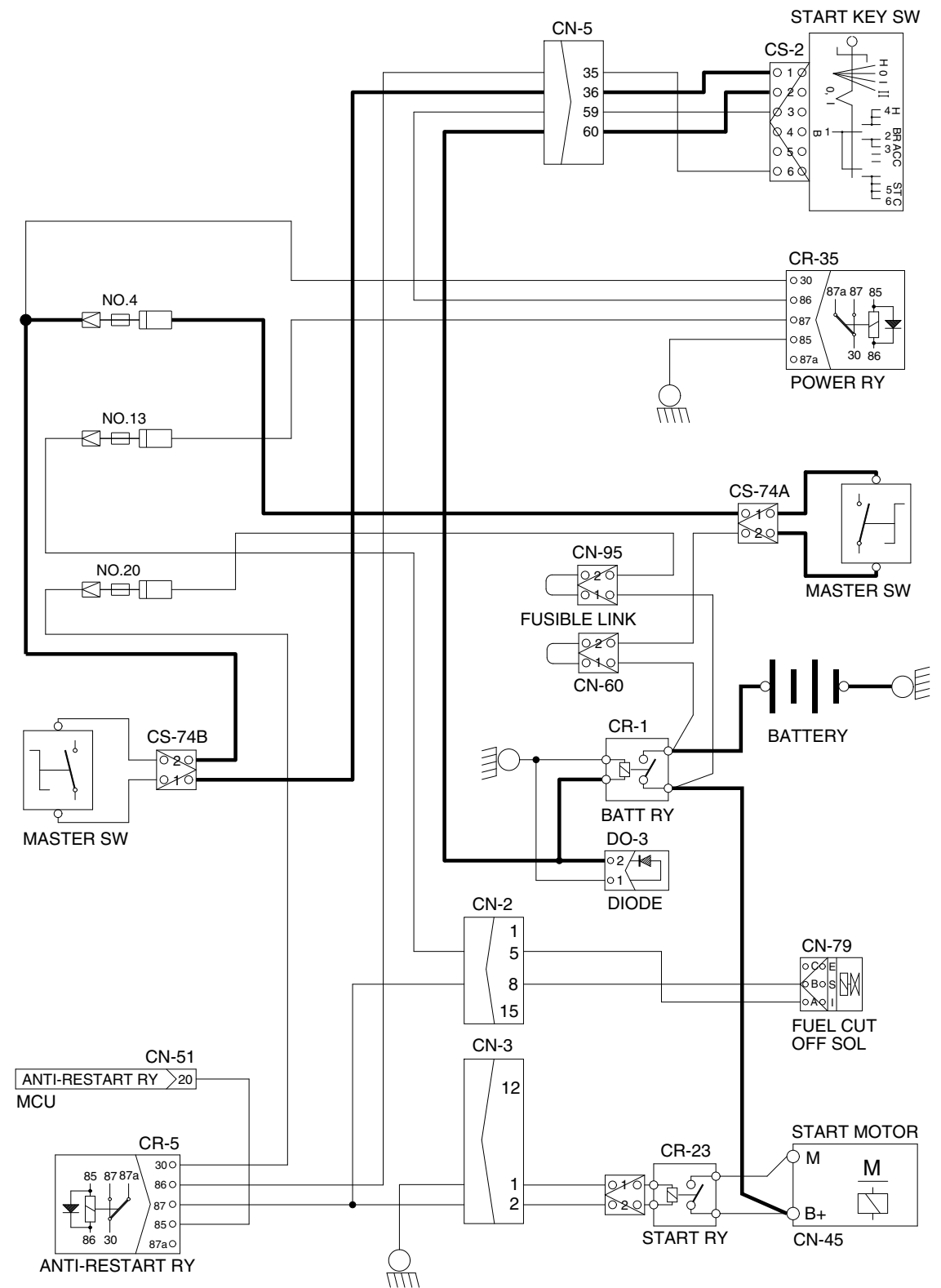
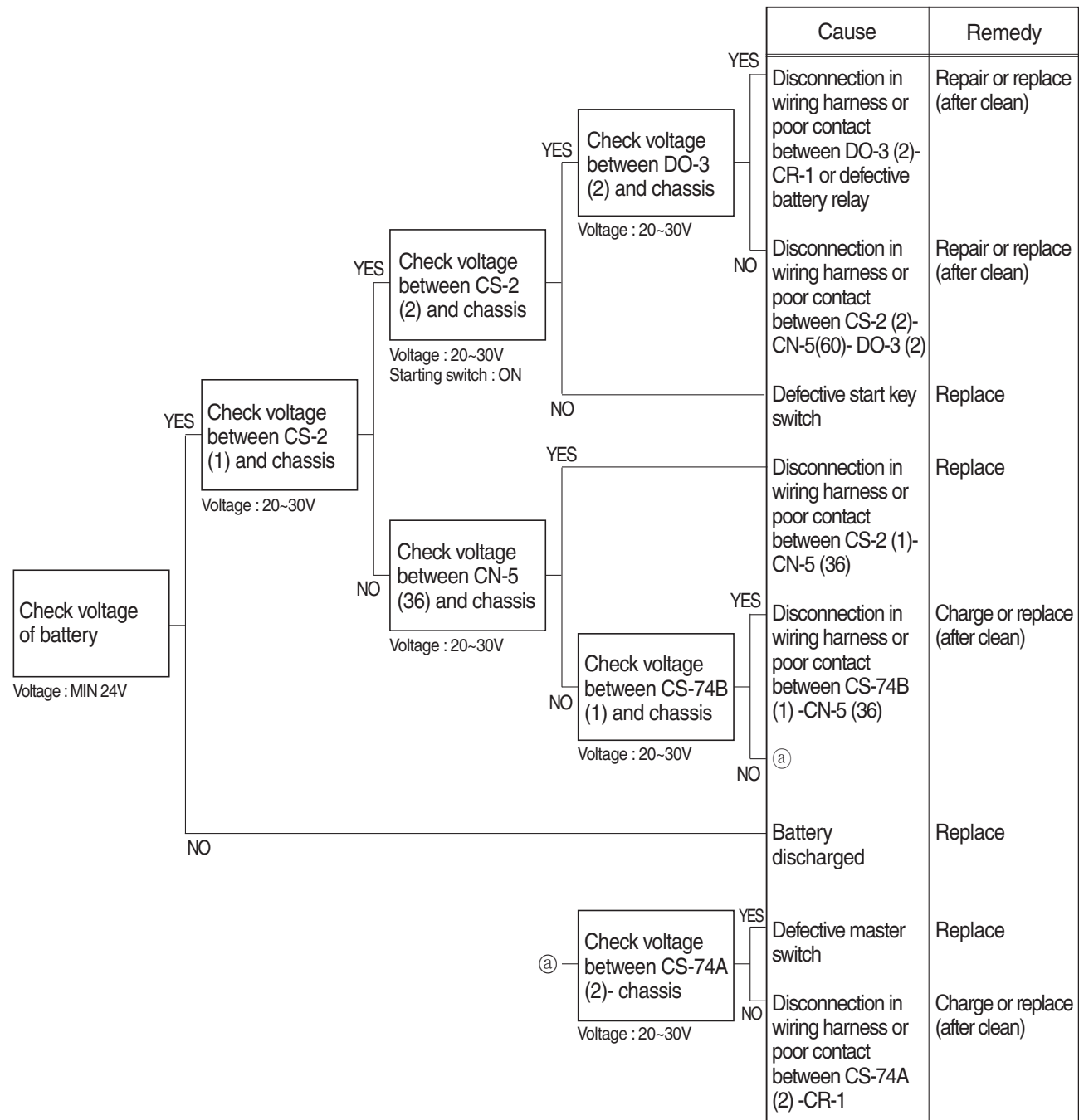
YES	20~32V
NO	0V



1409S6ES03

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, master switch ON and check open circuit of fusible link (CN-60).
- After checking, insert the disconnected connectors again immediately unless otherwise specified.

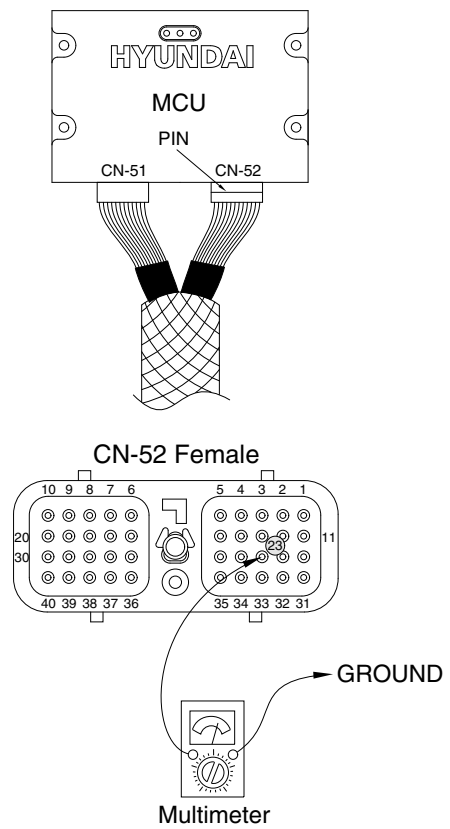


2) TEST PROCEDURE

(1) **Test 6** : Check voltage at CN-52(23) and ground.

- ① Prepare 1 piece of thin sharp pin, steel or copper.
- ② Insert prepared pin to rear side of connectors : One pin to (23) of CN-52.
- ③ Starting key ON.
- ④ Check voltage as figure.

SPEC : Actuator operating : 1~5 V



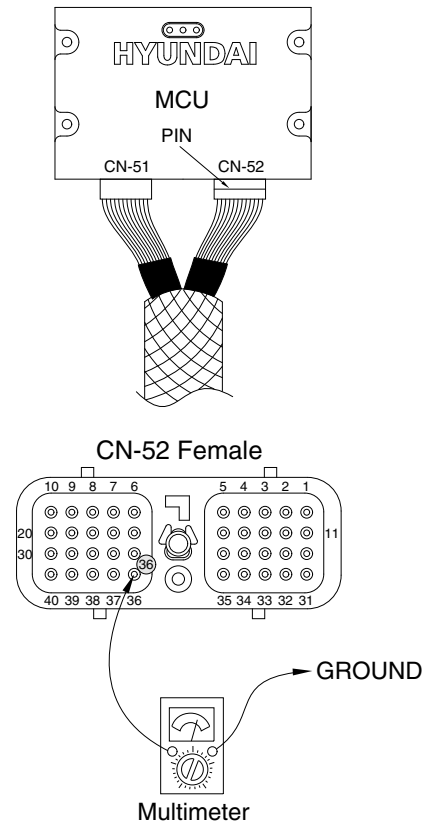
1409S6MS04A

2) TEST PROCEDURE

(1) Test 14 : Check voltage at CN-52(36) and ground.

- ① Prepare 1 piece of thin sharp pin, steel or copper.
- ② Insert prepared pin to rear side of connectors : One pin to (36) of CN-52.
- ③ Starting key ON.
- ④ Check voltage as figure.

SPEC : Actuator operating : 1~5 V

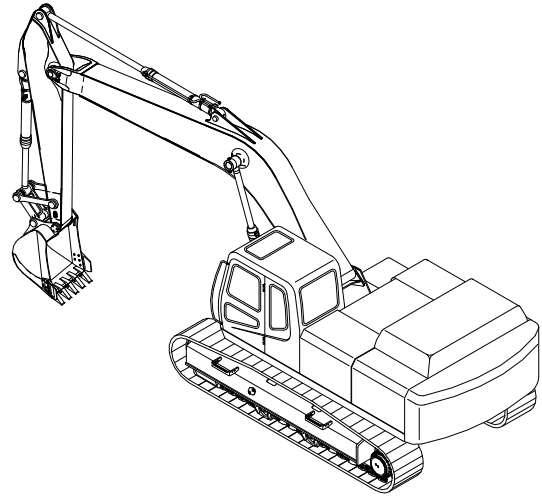


1409S6MS11A

2. TERMINOLOGY

1) STANDARD

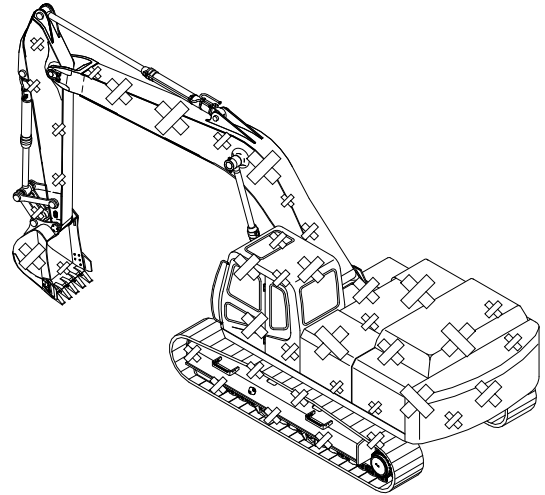
Specifications applied to the brand-new machine, components and parts.



21077MS02

2) SERVICE LIMIT

The lowest acceptable performance level. When the performance level of the machine falls below this level, the machine must be removed from work and repaired. Necessary parts and components must be replaced.



21077MS03

- Bucket cylinders
Measure the time it takes to roll in the bucket, and the time it takes to roll out the bucket. To do so, position the bucket at one stroke end, then move the control lever to the other stroke end as quickly as possible.
- Repeat each measurement 3 times and calculate the average values.

(4) Evaluation

The average measured time should meet the following specifications.

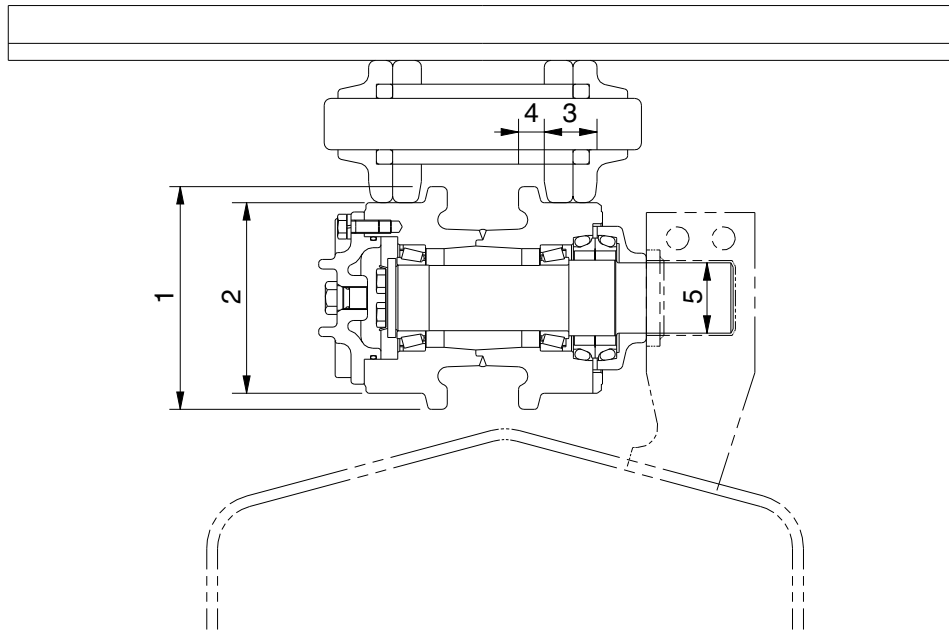
Unit : Seconds

Model	Function	Standard	Maximum allowable	Remarks	
R220LC-9	Boom raise	3.5±0.4	4.1		
	Boom lower	2.2±0.4	3.2		
	Arm in	Regen ON	3.2±0.4	3.8	
		Regen OFF	3.7±0.4	4.5	
	Arm out	3.0±0.3	3.8		
	Bucket in	2.4±0.4	3.3		
	Bucket out	2.3±0.3	2.9		

2. MAIN CONTROL VALVE

Part name	Inspection item	Criteria & measure
Casing	<ul style="list-style-type: none"> Existence of scratches, rust or corrosion. 	<ul style="list-style-type: none"> In case of damage in following section, replace casing. Sliding sections of casing hole and spool, especially land sections applied with held pressure. Seal pocket section where spool is inserted. Sealing section of port where O-ring contacts. Sealing section of each relief valve for main and port. Sealing section of plug. Other damages that may damage normal function.
Spool	<ul style="list-style-type: none"> Existence of scratch, gnawing, rusting or corrosion. O-ring seal sections at both ends. Insert spool into casing hole, rotate and reciprocate it. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Damage of spring Damage of poppet Insert poppet into casing and function it. 	<ul style="list-style-type: none"> Replacement. Correction or replacement when sealing is incomplete. Normal when it can function lightly and smoothly without sticking.
Spring and related parts	<ul style="list-style-type: none"> Rusting, corrosion, deformation or breakage of spring, spring seat, plug or cover. 	<ul style="list-style-type: none"> Replacement for significant damage.
Around seal for spool	<ul style="list-style-type: none"> External oil leakage. Rusting, corrosion or deformation of seal plate. 	<ul style="list-style-type: none"> Correction or replacement. Correction or replacement.
Main relief valve, port relief valve & posi-nega conversion valve	<ul style="list-style-type: none"> External rusting or damage. Contacting face of valve seat. Contacting face of poppet. O-rings and back up rings. 	<ul style="list-style-type: none"> Replacement. Replacement when damaged. Replacement when damaged. Replacement in principle.

2) CARRIER ROLLER



21037MS02

Unit : mm

No.	Check item	Criteria				Remedy
		Standard size		Repair limit		
1	Outside diameter of flange	ø 169		-		Rebuild or replace
2	Outside diameter of tread	ø 144		ø 134		
3	Width of tread	44		49		
4	Width of flange	17		-		
5	Clearance between shaft and support	Standard size	Tolerance		Standard clearance 0.15 to 0.4	
		ø 55	Shaft	Hole		
			-0.05 -0.1	+0.3 +0.1		

2. TORQUE CHART

Use following table for unspecified torque.

1) BOLT AND NUT

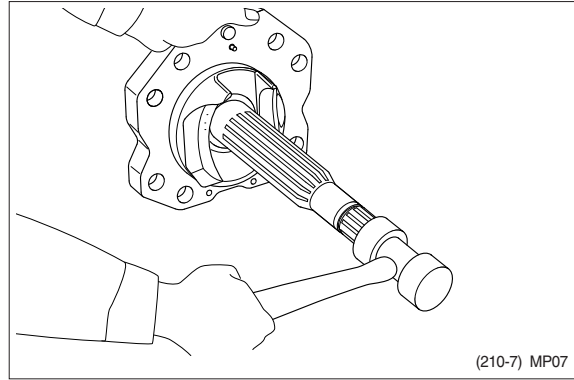
(1) Coarse thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6 × 1.0	0.85 ~ 1.25	6.15 ~ 9.04	1.14 ~ 1.74	8.2 ~ 12.6
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.73 ~ 4.12	19.7 ~ 29.8
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 79.5	9.8 ~ 15.8	71 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 167
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.5	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 343
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	350 ~ 457	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.5	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1655
M36 × 4.0	174 ~ 236	1261 ~ 1703	250 ~ 310	1808 ~ 2242

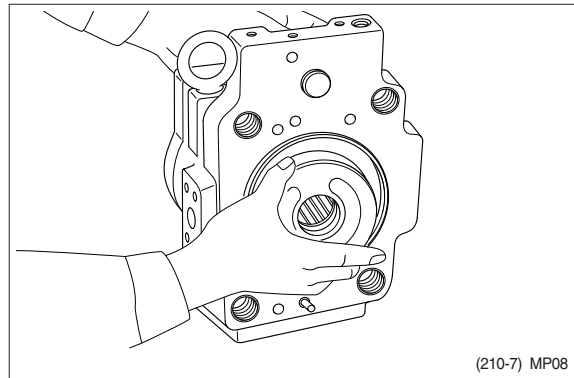
(2) Fine thread

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

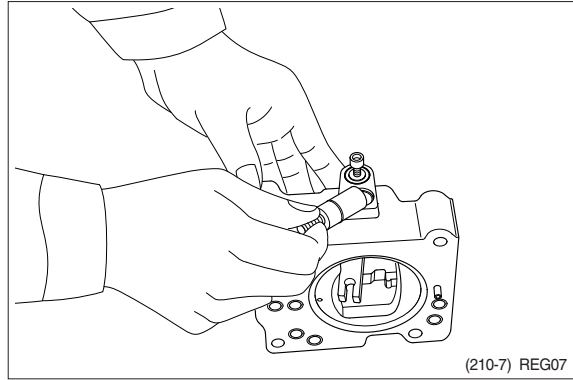
- (12) Tapping lightly shaft ends of drive shafts (111, 113) with plastic hammer, take out drive shafts from swash plate supports.



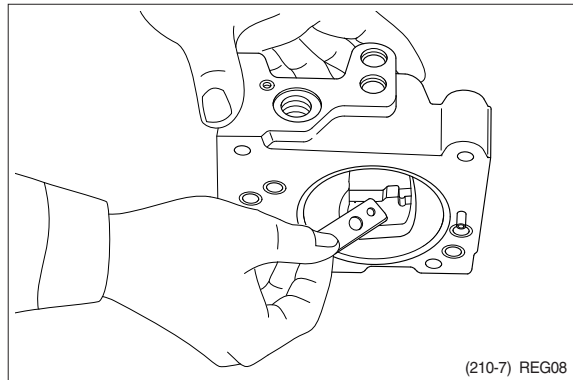
- (13) Remove valve plates (313, 314) from valve block (312).
※ These may be removed in work (6).



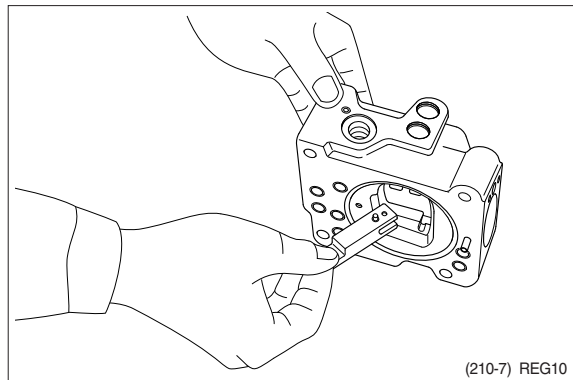
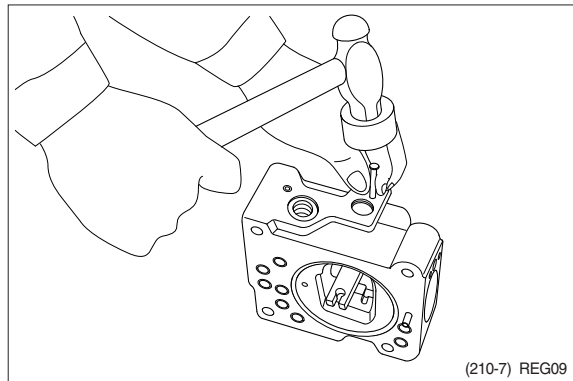
- (14) If necessary, remove stopper (L, 534), stopper (S, 535), servo piston (532) and tilting pin (531) from pump casing (271), and needle bearing (124) and splined coupling (114) from valve block (312).
- ※ In removing tilting pin, use a protector to prevent pin head from being damaged.
 - ※ Since loctite is applied to fitting areas of tilting pin and servo piston, take care not to damage servo piston.
 - ※ Do not remove needle bearing as far as possible, except when it is considered to be out of its life span.
 - ※ Do not loosen hexagon nuts of valve block and swash plate support.
If loosened, flow setting will be changed.

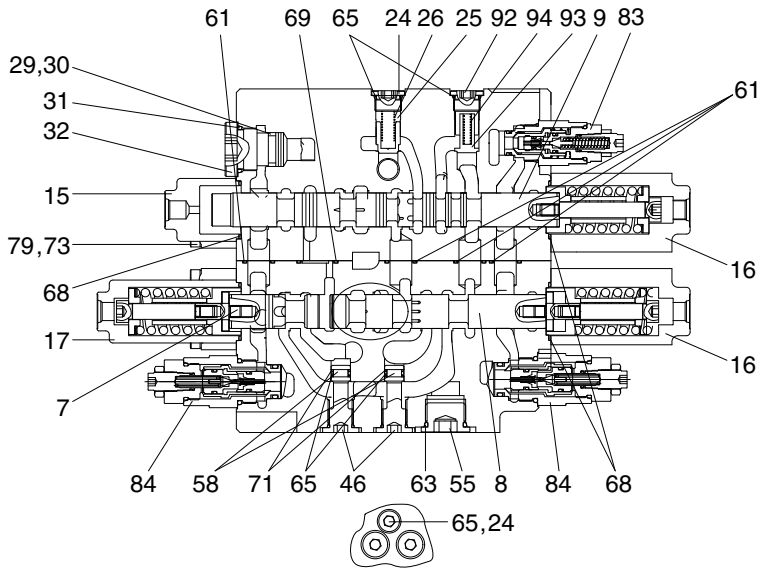


- (9) Remove lever (2, 613). Do not draw out pin (875).
※ Work will be promoted by using pincers or so on.

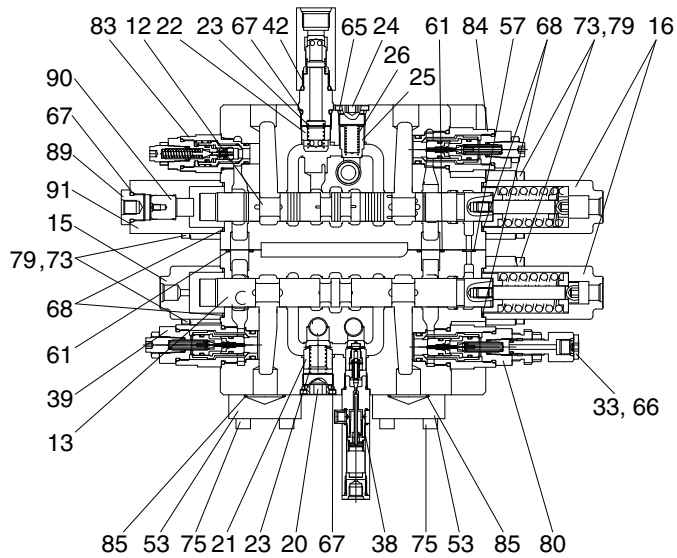


- (10) Draw out pin (874) and remove feedback lever (611).
Push out pin (874, 4 mm in dia.) from above with slender steel bar so that it may not interfere with lever (1, 612).

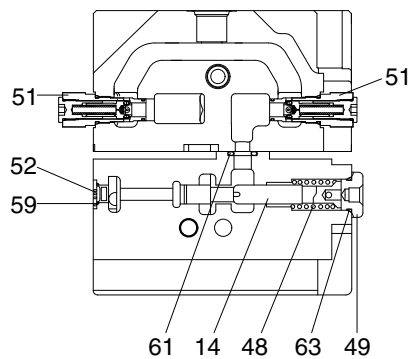




D-D' (SWING PRIORITY-BOOM 2 & ARM 2)



F-F' (OPTION & BUCKET)



G-G' (CENTER BYPASS CUT-OFF & NEGATIVE CONTROL)

- 7 Spool-swing priority
- 8 Spool-boom 2
- 9 Spool-arm 2
- 12 Spool-bucket
- 13 Spool-option
- 14 BC spool
- 15 Cover-pilot A
- 16 Cover-pilot B1
- 17 Cover-pilot B2
- 20 Plug
- 21 Poppet 1-check valve
- 22 Poppet L/C-bucket
- 23 Spring 1-check valve
- 24 Plug
- 25 Poppet 2-check valve
- 26 Spring 2-check valve
- 29 O-ring
- 30 Back-up ring
- 31 O-ring
- 32 Plug
- 33 Plug
- 38 Load check valve assy
- 39 Overload relief valve
- 42 Check valve
- 46 Plug
- 48 Spring-BC spool
- 49 Plug-BC spool
- 51 Negative control valve
- 52 Plug
- 53 Flange
- 55 Plug
- 57 O-ring
- 58 O-ring
- 59 O-ring
- 61 O-ring
- 63 O-ring
- 65 O-ring
- 66 O-ring
- 67 O-ring
- 68 O-ring
- 69 O-ring
- 71 Back-up ring
- 73 Hex socket head bolt
- 75 Socket bolt
- 79 Washer
- 80 Overload relief valve
- 83 Overload relief valve
- 84 Overload relief valve
- 85 O-ring
- 89 Plug
- 90 Piston
- 91 Pilot cover C1
- 92 Plug
- 93 Poppet
- 94 Spring

2209SB2MC14

(2) Assembly

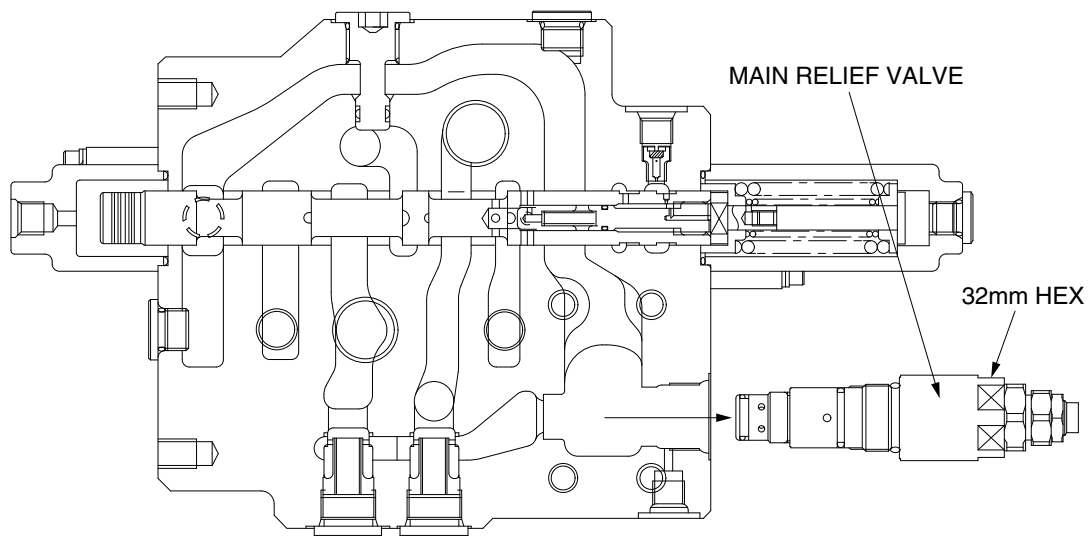
Explanation only is shown for the assembly, refer to the figures shown in the previous disassembly section.

① Main relief and overload relief valve

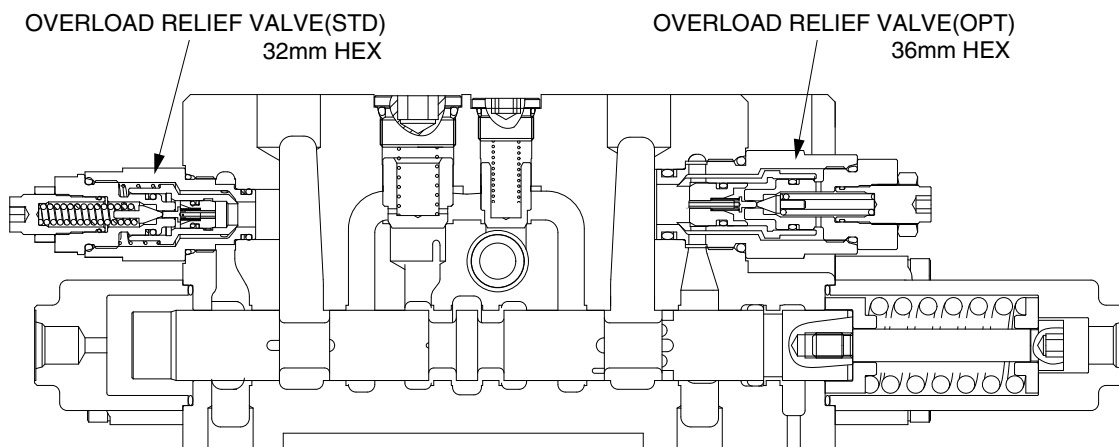
Fix the valve body to suitable work bench.

Install main relief valve and overload relief valve into the body and tighten to the specified torque by 32 mm torque wrench.

· Tightening torque : 8~9 kgf·m (57.8~65.1 lbf·ft)

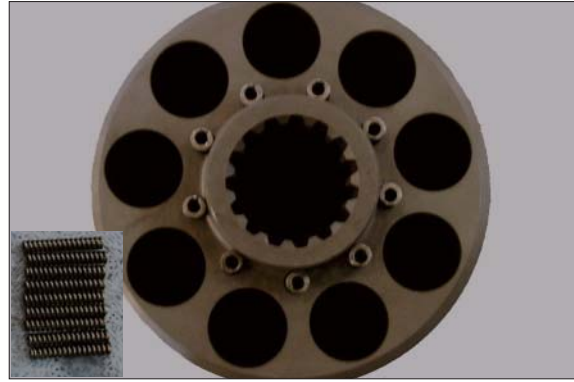


29098MC06



29098MC07

- ③ Disassemble spring (11) from cylinder block (10).



14078SM208/208A

- ④ Disassemble shoe plate (9) from body (1).



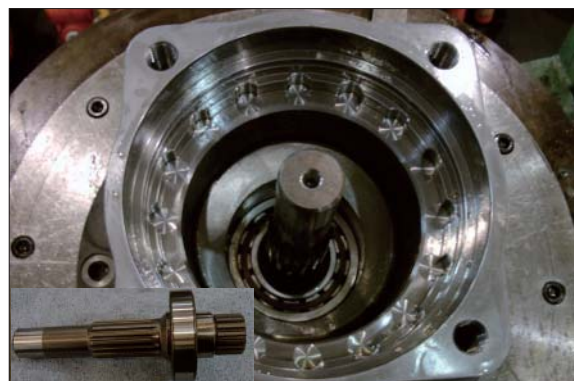
14078SM209/209A

- ⑤ Using a plier jig, disassemble snap ring (4) from shaft (5).



14078SM210/210A

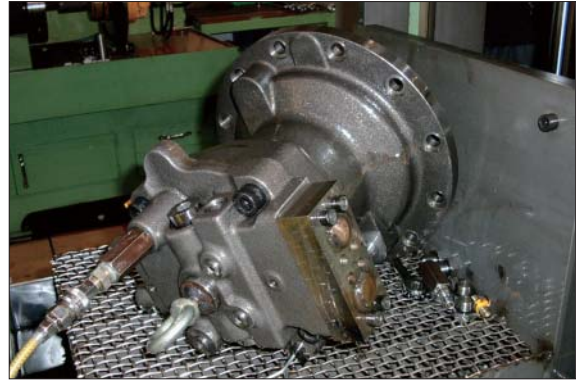
- ⑥ Disassemble shaft assy from body (1).



14078SM211/211A

(4) Air pressing test

Be sure of leakage, after press air into assembled motor



14078SM232

(5) Leakage check

After cleaning motor by color check No.1, paint No.3 and be sure of leakage.



14078SM233/233A

(6) Mount test bench

Mounting motor test bench, test the availability of each part.



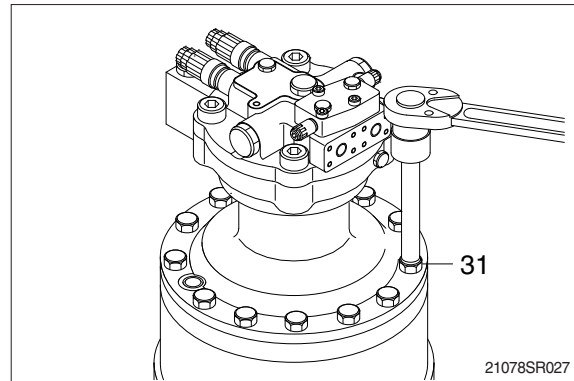
220078SM14

(13) Apply loctite to the tapped holes of the ring gear (11) and then mount swing motor onto the ring gear (11).

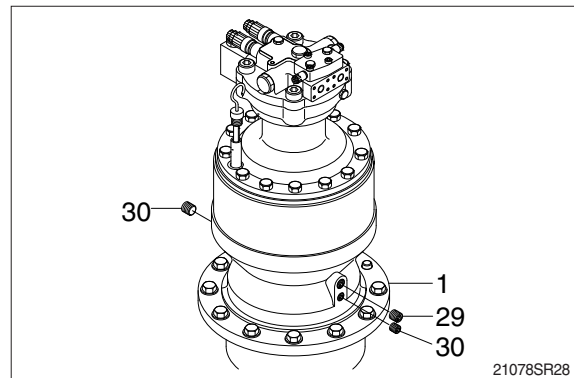
※ Don't fail to coincide the gauge bar (33) hole.

(14) Tighten socket bolts (31) around the swing motor assembly.

· Tightening torque : 24kgf · m (173lb · ft)



(15) Assemble plugs (29, 30).



(16) Turn the swing motor assembly upside down and assemble cover plate (34) by tightening the hexagon bolts (35).

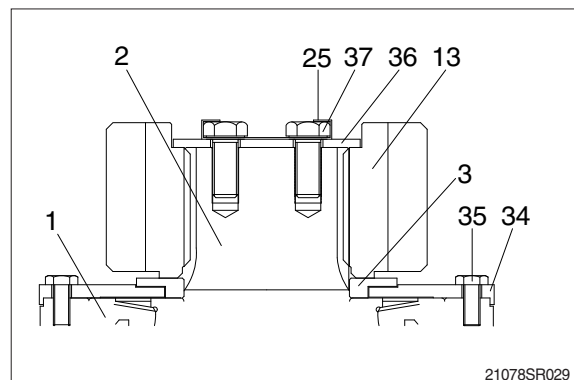
Install spacer (3) and pinion gear (13) to the drive shaft (2).

Assemble lock plate (36) on the pinion gear (13).

Assemble 2 lock washers (25) on the lock plate (36) with their 2 hole coincided individually to the tapped holes of drive shaft (2).

Tighten hexagon bolts (37) to the drive shaft (2) and then fold all the lock washer (25) corners over the hexagon bolts (37).

· Tightening torque : 24kgf · m (173lb · ft)



(17) Inject oil into the reduction gear.

(4) Assemble drive shaft sub

- ① Using a jig, assemble oil sealing (2) into casing (1).



2209A8SM78

- ② Fit shaft sub (shaft+roller bearing) into casing (1).



2209A8SM79

- ③ Using a plier jig, assemble snap ring (4) to shaft (3).
 - Snap ring × 1EA



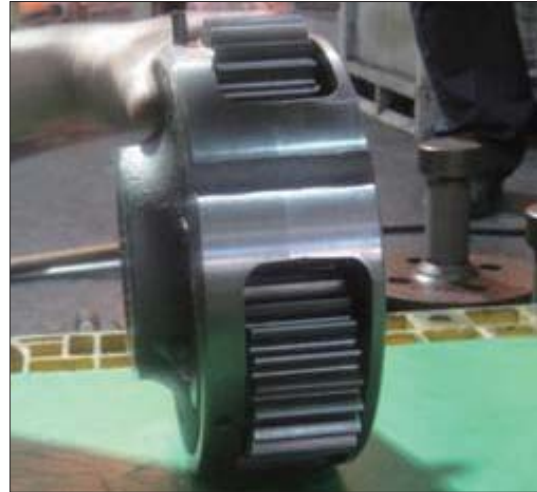
2209A8SM80

- ④ Apply some grease swash plate (7) and assemble it into casing (1).
 - Swash plate × 1EA



2209A8SM81

- (3) Make of spring pin hole No.1 pin and No.1 carrier of spring pin hole in line, press No.1 spring pin into the holes.
 Make No.1 spring pin hole head for No.1 planetary gear.



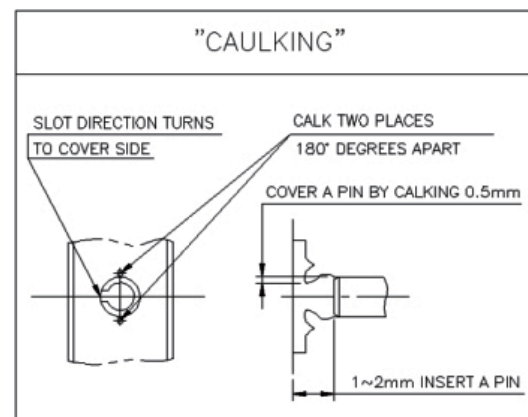
2209A8SM14

- (4) Caulk carrier holes to make No.1 spring pin settle down stably.



2209A8SM15

- ※ Refer to “Caulking details”
 Use paint marker for marking after caulking.



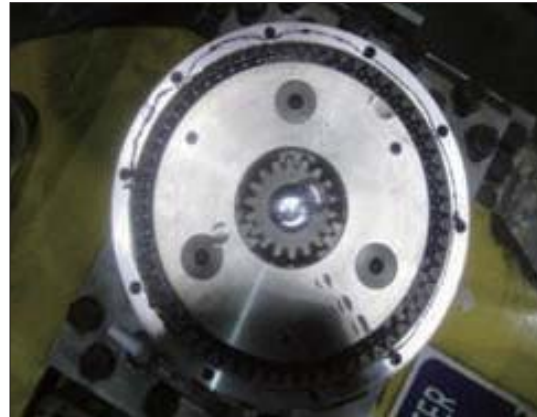
2209A8SM16

- (3) Put No.1 carrier sub assy into No.2 sun gear along spline.
- Screw M10 I-bolt to No.1 carrier sub assy.
 - Lifting up No.1 carrier sub assy and align planetary gear and tooth of ring gear by rotating planetary gear by hands.
 - Rotate No.1 carrier sub assy by hands to fit No.1 carrier into No.2 sun gear spline.



2209A8SM47

- (4) Put No.1 sun gear into No.1 carrier sub assy. Be sure to maintain it vertical with ground. And align with No.1 planetary gear spline.
- (5) Rotate No.1 carrier sub assy by hands to check noise.



2209A8SM48

8) MEASURING CLEARANCE & ASSEMBLING NAME PLATE

- (1) Check the clearance between ring gear and No.1 sun gear using a tool with dial gauge.
- Check the clearance
Dial gauge = -0.3 ~ +2.95



2209A8SM49

4. OUTLINE FOR ASSEMBLING

1) GENERAL SUGGESTIONS

- (1) After washing each parts cleanly, dry it with compressed air.
Provided that you do not wash friction plate with treated oil.
- (2) In bonding each part, fasten bond torque.
- (3) When using a hammer, do not forget to use a plastic hammer.

4.1 ASSEMBLING

■ Assemble the sub of turning axis

- 1) Using a jig, assemble oil seal (3) into shaft casing (1)



21078TM43

- 2) Have a bearing (8) thermal reacted into shaft (6).



21078TM44

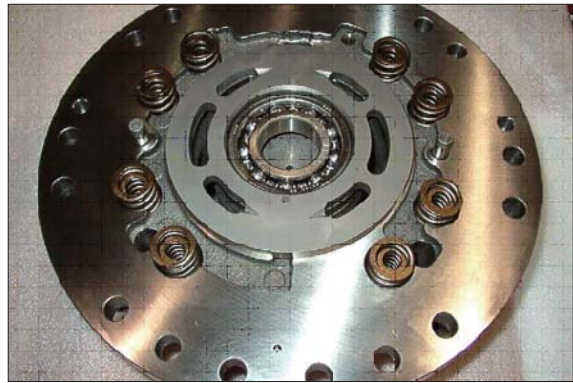


21078TM45



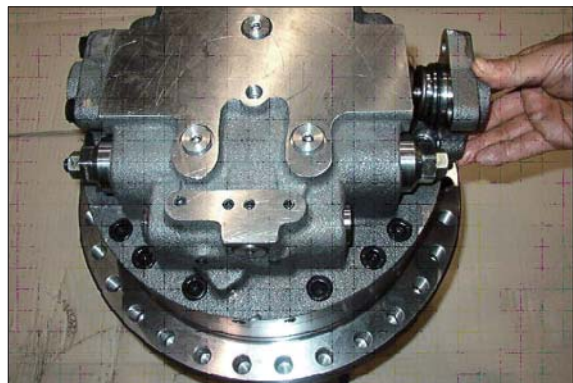
21078TM76

21) Assemble valve plate (70) into rear cover (29).



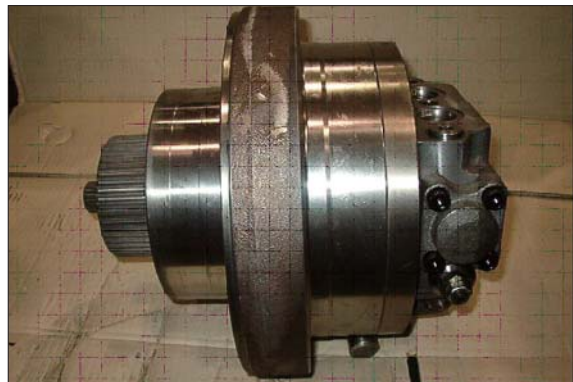
21078TM77

22) After assembling shaft casing (1) and rear cover (29).
Assemble spool assembly (30), spring (38),
spool (39), cover (37) after then complete
assembly with wrench bolt (45).



21078TM78

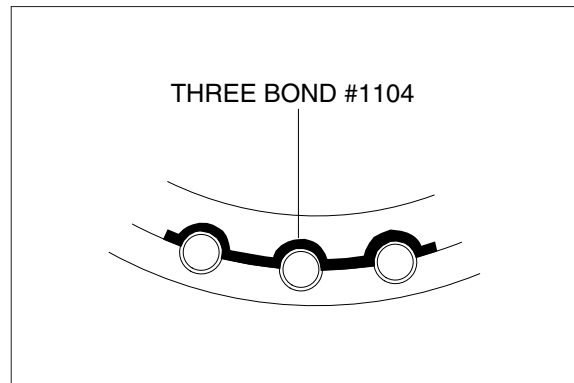
23) Finish assembly.



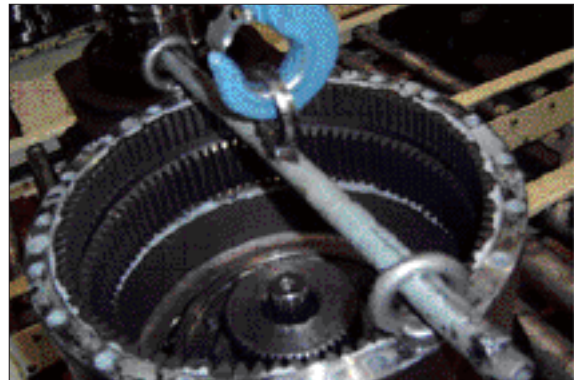
21078TM79

9) Installing ring gear

- (1) Apply three bone #1104 (loctite #515) on housing for ring gear without gap.
- (2) Insert lock pin into housing hole.
- (3) Install M14 eye-bolt on the tap of ring gear.
- (4) Lift ring gear and then, assemble into housing in order for hole of ring gear and parallel pin of housing to be in line.
- (5) Temporarily secure 4EA of M12 hexagon socket bolt and shim with cover thickness having appropriate torque.



21078TM112A



21078TM113

10) Installing No.2 carrier sub assembly

- (1) Install M10 eye-bolt on No.2 carrier assembly.
- (2) Lift No.2 carrier assembly and then, slowly put it down on ring gear.
- (3) Rotate planetary gear by hands and install on ring gear.

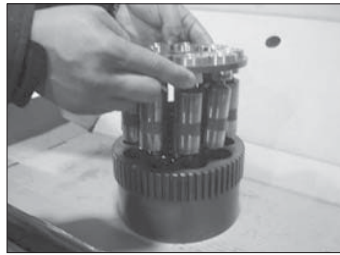


21078TM114

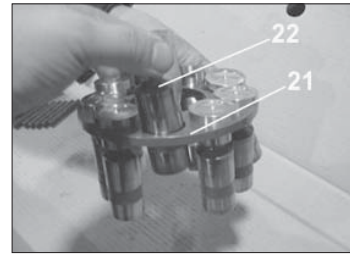
(8) Disassemble the cylinder block (18), retainer plate (21), piston assy (22), ball guide (20) and spring (19) from the cylinder block kit.



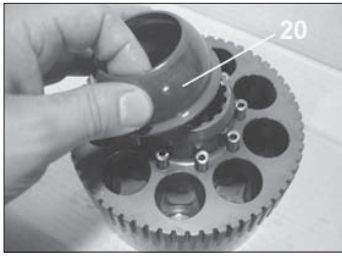
25098TM046



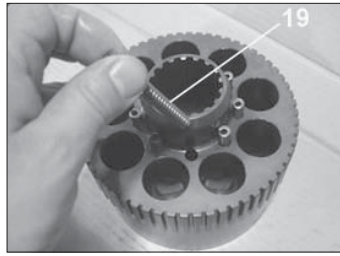
25098TM047



25098TM048



25098TM049

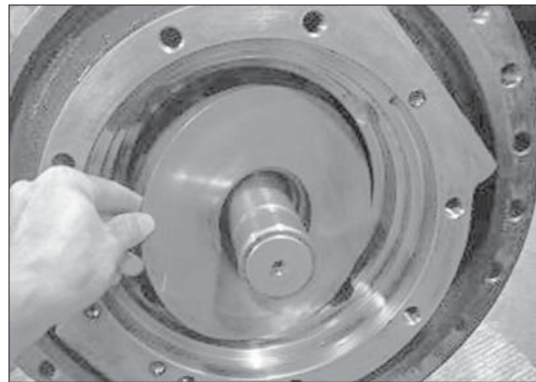


25098TM050

(9) Disassemble the swash plate (17) from the casing.

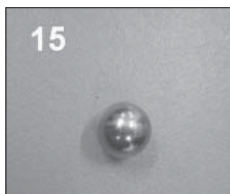


25098TM051

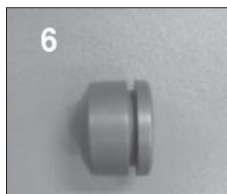


25098TM052

(10) Disassemble the steel ball (15) and swash piston (6) from the casing.



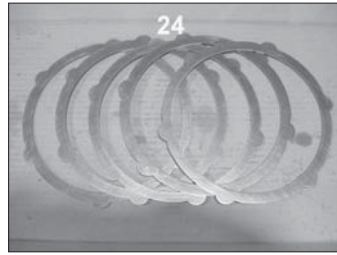
25098TM053



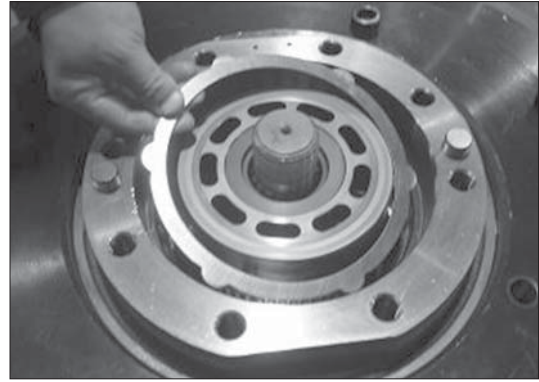
25098TM054



25098TM055

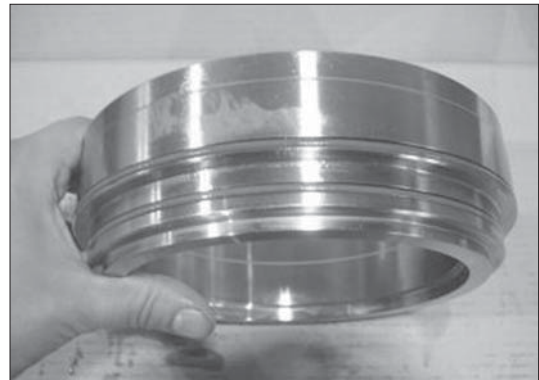


25098TM114



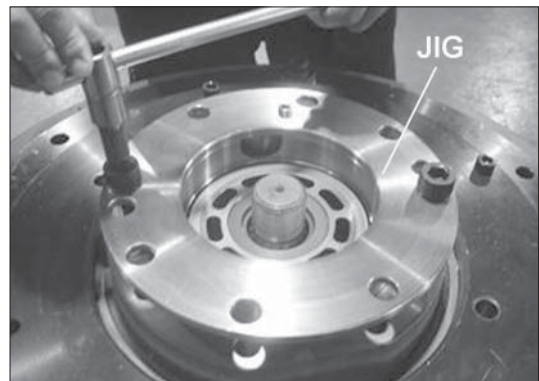
25098TM115

(23) Apply some grease on the D-ring and assemble it parking piston.



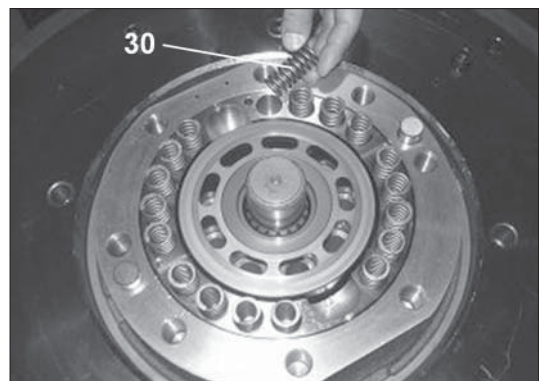
25098TM116

(24) Insert the parking piston into the casing and assemble it by using jig.



25098TM117

(25) Assemble the brake spring (30, 18EA) into the piston.



25098TM118

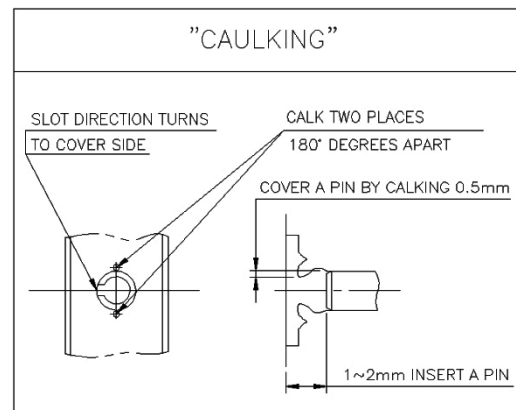
(4) Caulk carrier holes as shown on the picture.



25098TM146

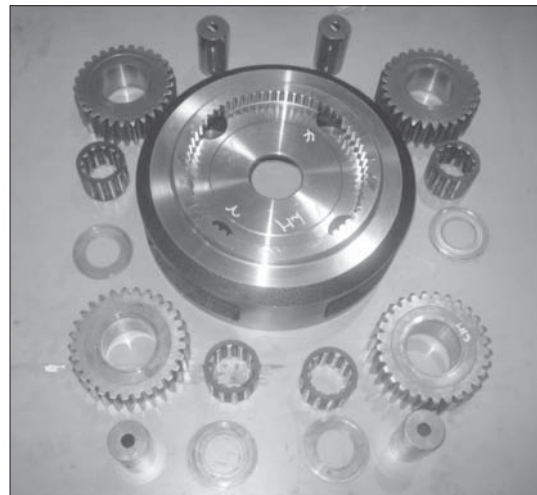
3) ASSEMBLING CARRIER 2 ASSY

- (1) Put No.2 carrier on a flat place.
- (2) Install No.2 needle bearing into No.2 planetary gear, put 2EA of No.2 thrust washer on both sides of planetary gear, and then, install it into carrier.



25098TM147

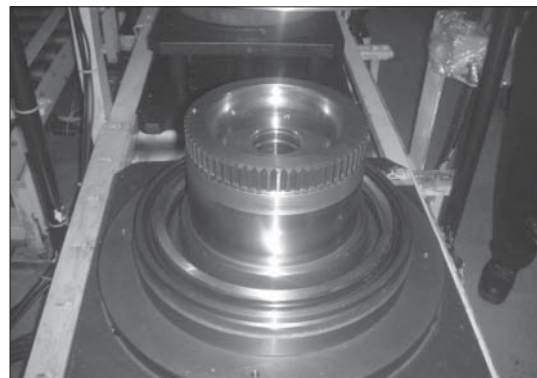
- (3) After install solid pin into the holes, install No.2 pin into No.1 carrier where the holes for No.1 pin are to be in line with those of No.1 carrier, and then, install spring pins into the holes.
- (4) Caulk carrier holes as shown on the picture.



25098TM148

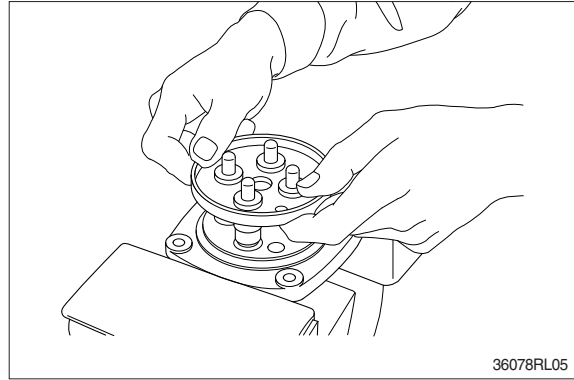
4) ASSEMBLING FLOATING SEAL

- (1) Assemble floating seal into motor by use of pressing jig.
Grease the contact parts for floating seal which is assembled into motor.
- ※ Be sure to maintain it vertical with the ground when assembling bearing and floating seal.



25098TM149

(8) Remove plate (17).



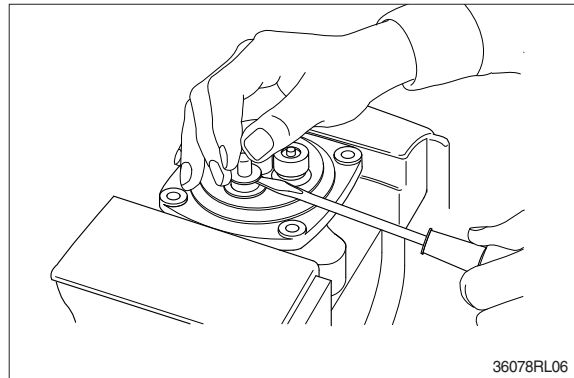
(9) When return spring (10) is weak in force, plug (14) stays in casing because of sliding resistance of O-ring.

※ Take it out with minus screwdriver.

Take it out, utilizing external periphery groove of plug and paying attention not to damage it by partial loading.

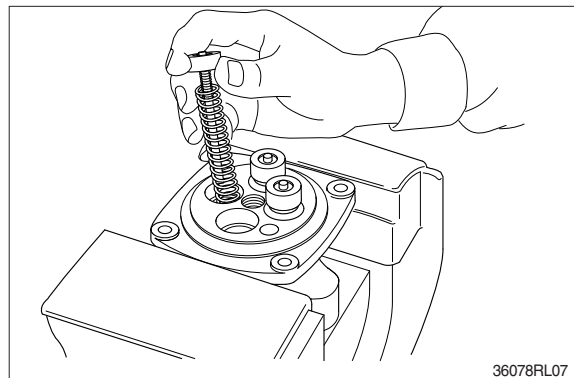
※ During taking out, plug may jump up due to return spring (10) force.

Pay attention to this.

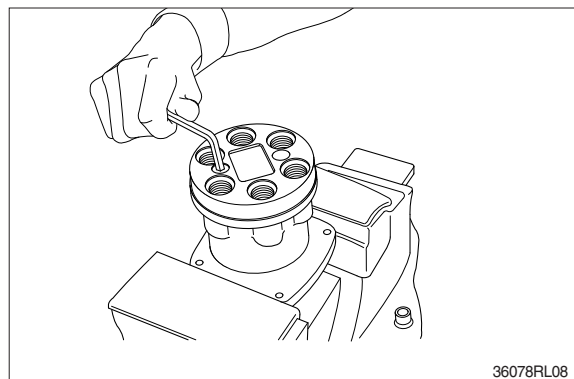


(10) Remove reducing valve subassembly and return spring (10) out of casing.

※ Record relative position of reducing valve subassembly and return springs.

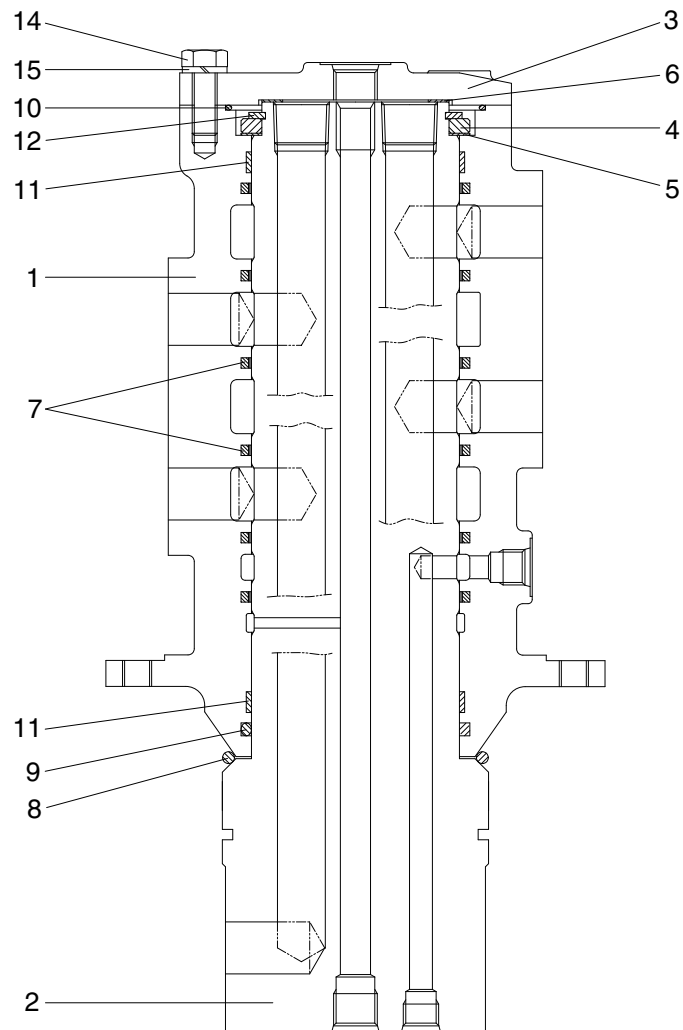


(11) Loosen hexagon socket head plug(2) with hexagon socket screw key.



2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE



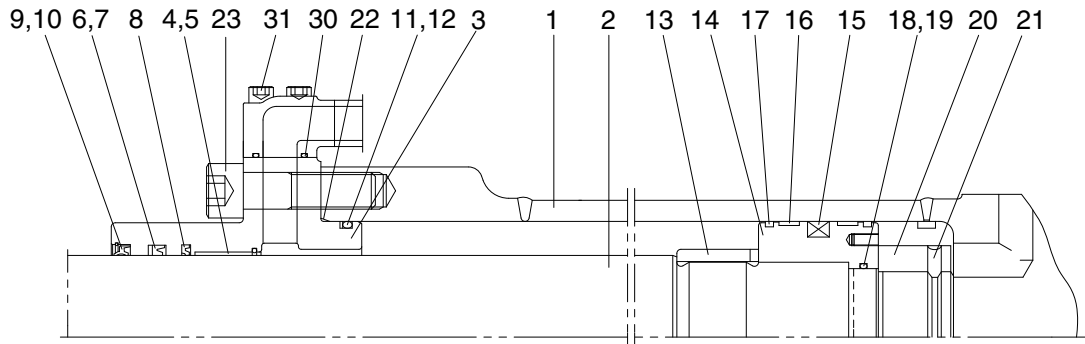
21098TJ01

- | | | | | | |
|---|--------|----|--------------|----|---------------|
| 1 | Hub | 6 | Shim | 11 | Wear ring |
| 2 | Shaft | 7 | Slipper seal | 12 | Retainer ring |
| 3 | Cover | 8 | O-ring | 13 | Plug |
| 4 | Spacer | 9 | O-ring | 14 | Hexagon bolt |
| 5 | Shim | 10 | O-ring | 15 | Spring washer |

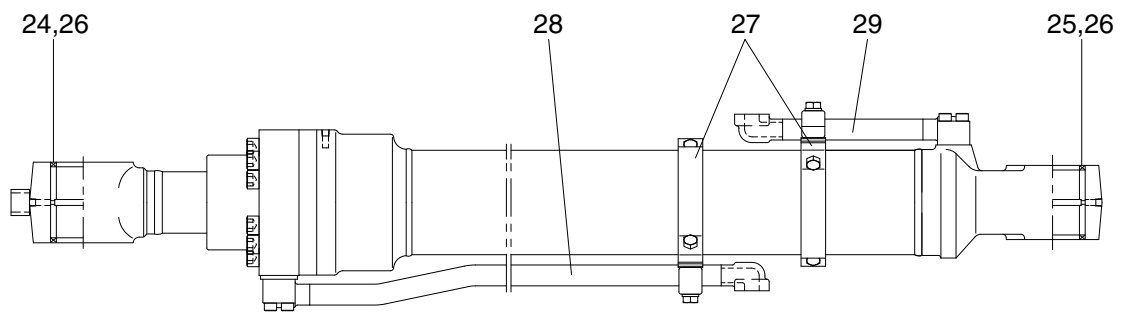
2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

(1) Bucket cylinder



Internal detail

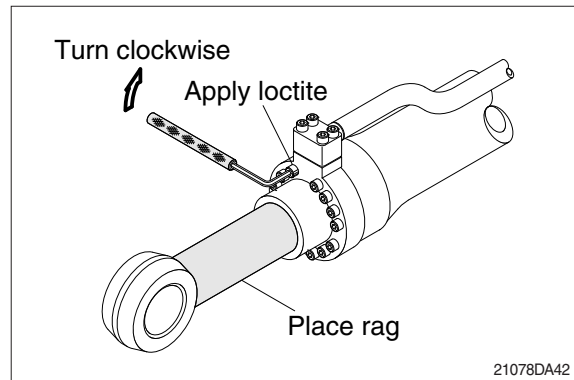
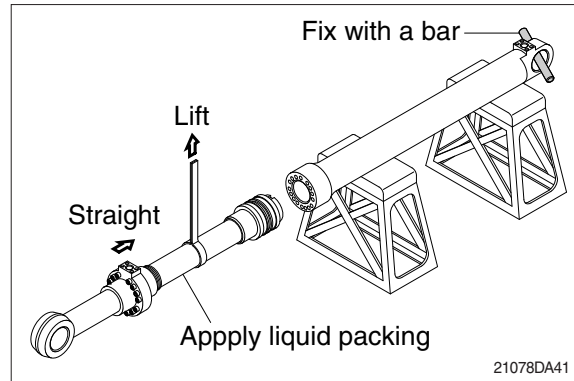


21098CY01

1	Tube assembly	12	Back up ring	23	Hexagon socket head bolt
2	Rod assembly	13	Cushion ring	24	Pin bushing
3	Gland	14	Piston	25	Pin bushing
4	DD2 bushing	15	Piston seal	26	Dust seal
5	Snap ring	16	Wear ring	27	Band assembly
6	Rod seal	17	Dust ring	28	Pipe assembly-R
7	Back up ring	18	O-ring	29	Pipe assembly-B
8	Buffer ring	19	Back up ring	30	O-ring
9	Dust wiper	20	Lock nut	31	Hexagon socket head bolt
10	Snap ring	21	Hexagon socket set screw		
11	O-ring	22	O-ring		

(3) Overall assemble

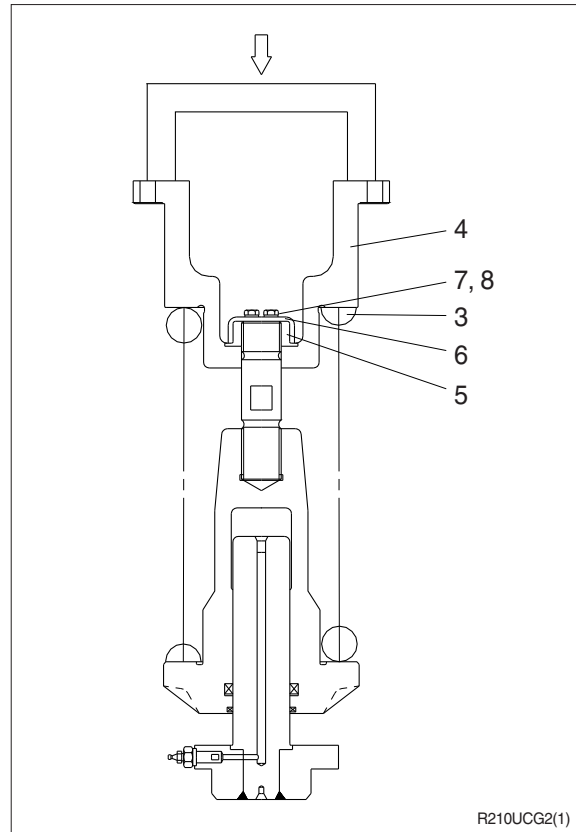
- ① Place a V-block on a rigid work bench.
Mount the tube assembly (1) on it and fix the assembly by passing a bar through the clevis pin hole to lock the assembly.
- ② Insert the rod assembly in to the tube assembly, while lifting and moving the rod assembly with a crane.
 - ※ Be careful not to damage piston seal by thread of tube assembly.
- ③ Match the bolt holes in the cylinder head flange to the tapped holes in the tube assembly and tighten socket bolts to a specified torque.
 - ※ Refer to the table of tightening torque.



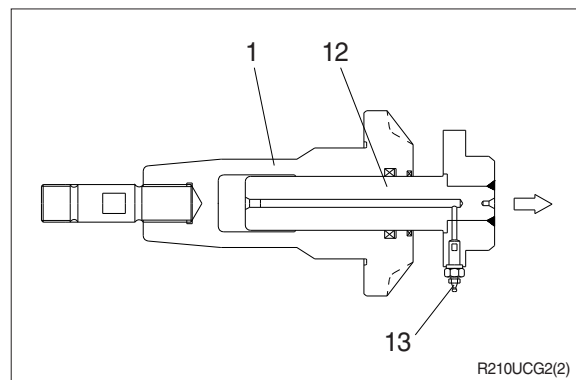
(2) Disassembly

- ① Apply pressure on spring (3) with a press.
 - ※ The spring is under a large installed load. This is dangerous, so be sure to set properly.
 - Spring set load : 13716 kg (30238 lb)
- ② Remove bolt (7), spring washer (8) and lock plate (6).
- ③ Remove lock nut (5).

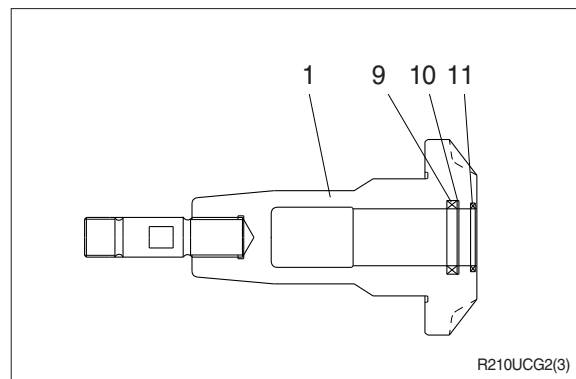
Take enough notice so that the press which pushes down the spring, should not be slipped out in its operation.
- ④ Lighten the press load slowly and remove bracket (4) and spring (3).



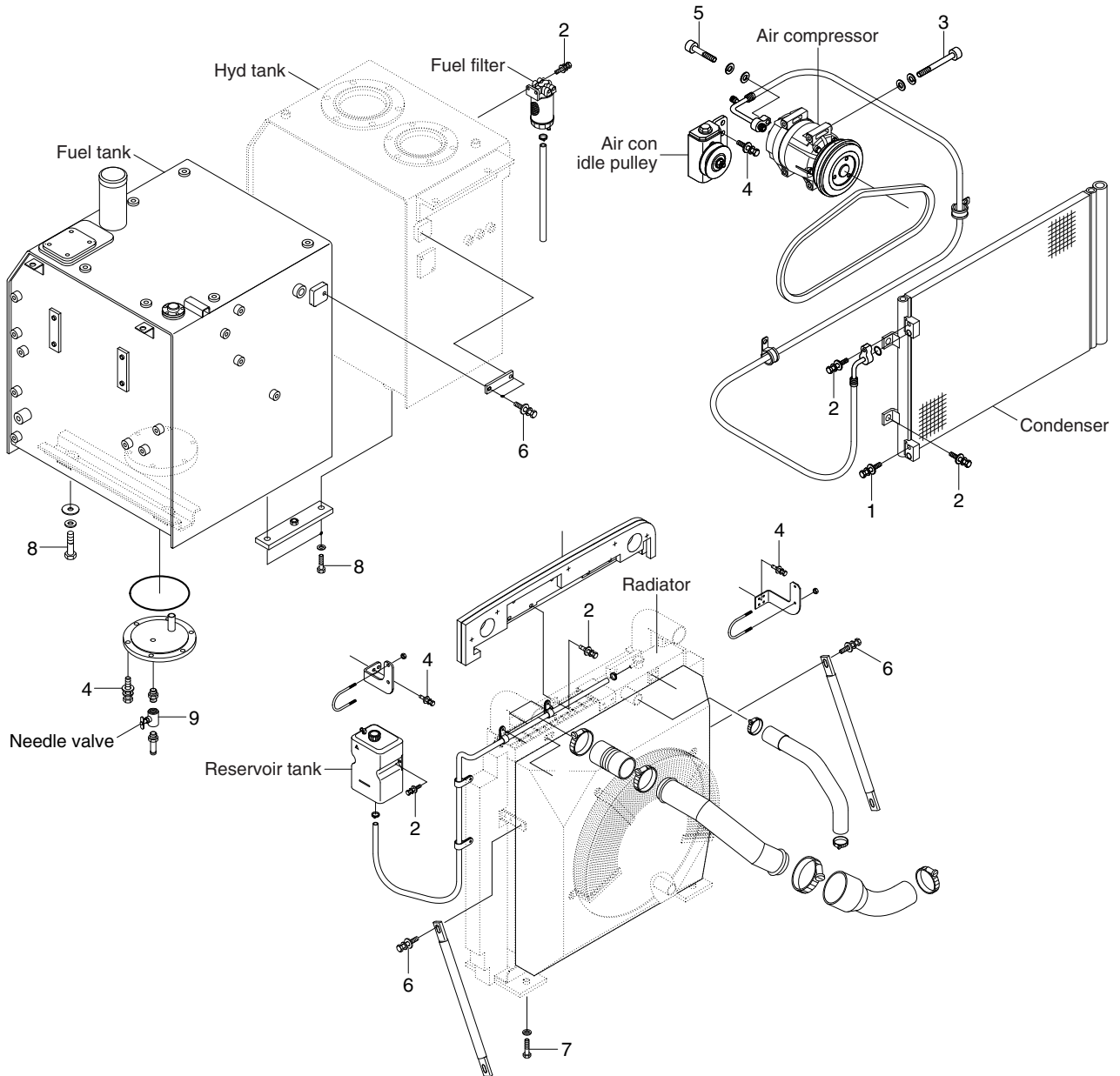
- ⑤ Remove rod (12) from body (1).
- ⑥ Remove grease valve (13) from rod (12).



- ⑦ Remove rod seal (9), back up ring (10) and dust seal (11).



2. COOLING SYSTEM AND FUEL TANK MOUNTING



RD22099CM02

· 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
3	M 8×1.25	4.05±0.8	29.3±5.8
4	M10×1.5	6.9±1.4	49.9±10.1
5	M10×1.25	7.4±1.5	53.5±10.8

Item	Size	kgf · m	lbf · ft
6	M12×1.75	12.8±3.0	92.6±21.7
7	M16×2.0	29.7±4.5	215±32.5
8	M20×2.5	57.9±8.7	419±62.9
9	-	2.3±0.6	16.6±4.3
-	-	-	-

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