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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.

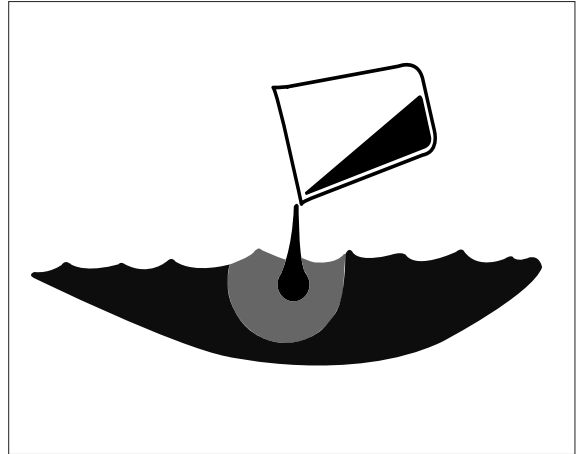
°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-40.4	-40	-40.0	-11.7	11	51.8	7.8	46	114.8	27.2	81	117.8
-37.2	-35	-31.0	-11.1	12	53.6	8.3	47	116.6	27.8	82	179.6
-34.4	-30	-22.0	-10.6	13	55.4	8.9	48	118.4	28.3	83	181.4
-31.7	-25	-13.0	-10.0	14	57.2	9.4	49	120.2	28.9	84	183.2
-28.9	-20	-4.0	-9.4	15	59.0	10.0	50	122.0	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.

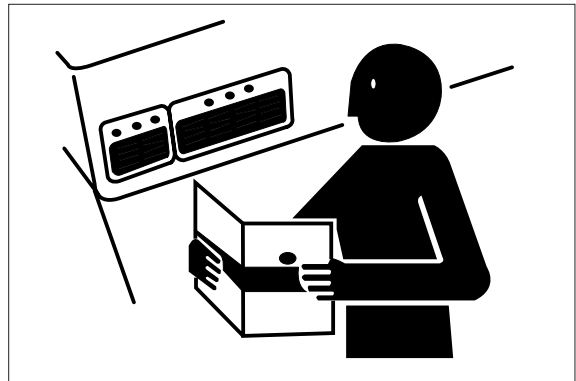
Use proper containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

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.

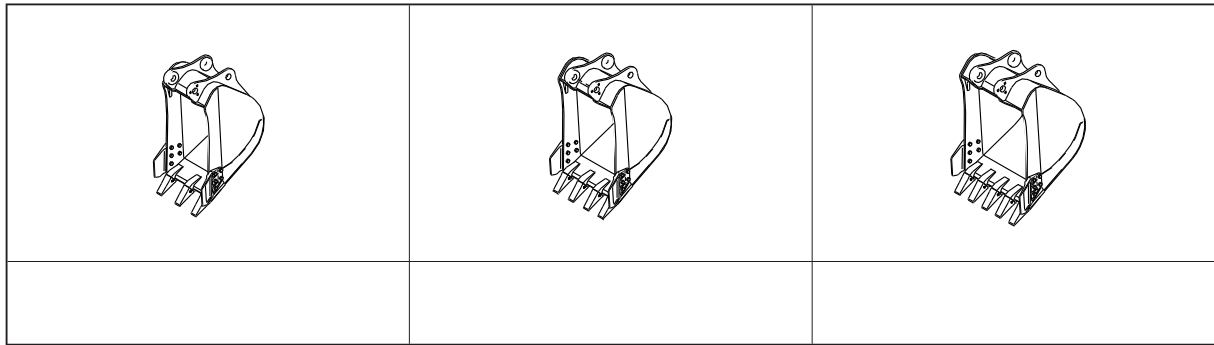
4. WEIGHT

1) R140LC-9S, R140LCD-9S

Item	R140LC-9S		R140LCD-9S	
	kg	lb	kg	lb
Upper structure assembly	5630	12420	←	
Main frame weld assembly	1160	2560	←	
Engine assembly	330	730	←	
Main pump assembly	100	220	←	
Main control valve assembly	140	310	←	
Swing motor assembly	120	260	←	
Hydraulic oil tank assembly	160	350	←	
Fuel tank assembly	130	290	←	
Counterweight	2000	4410	←	
Cab assembly	440	970	←	
Lower chassis assembly	5340	11760	6160	13580
Track frame weld assembly	1590	3510	1840	4060
Swing bearing	190	410	←	
Travel motor assembly	480	1060	←	
Turning joint	50	110	←	
Track recoil spring	210	460	←	
Idler	250	550	←	
Carrier roller	40	90	←	
Track roller	490	1080	←	
Track-chain assembly (600 mm standard triple grouser shoe)	1010	2230	←	
Dozer blade assembly	-		550	1220
Front attachment assembly (4.6 m boom, 2.5 m arm, 0.58 m ³ SAE heaped bucket)	2420	5330	←	
4.6 m boom assembly	830	1830	←	
2.5 m arm assembly	435	960	←	
0.58 m ³ SAE heaped bucket	480	1060	←	
Boom cylinder assembly	130	290	←	
Arm cylinder assembly	160	350	←	
Bucket cylinder assembly	100	220	←	
Bucket control rod assembly	90	200	←	
Dozer blade cylinder assembly	-		55	120

3) R140LCM-9S

(1) General bucket




Capacity		Width		Weight	Recommendation			
					4.6 m (15' 1") boom			
SAE heaped	CECE heaped	Without side cutter	With side cutter		1.9 m arm (6' 3")	2.1 m arm (6' 11")	2.5 m arm (8' 2")	3.0 m arm (9' 10")
0.23 m ³ (0.30 yd ³)	0.20 m ³ (0.26 yd ³)	520 mm (20.5")	620 mm (24.4")	335 kg (740 lb)				
0.40 m ³ (0.52 yd ³)	0.35 m ³ (0.46 yd ³)	760 mm (29.9")	860 mm (33.9")	410 kg (900 lb)				
0.46 m ³ (0.60 yd ³)	0.40 m ³ (0.52 yd ³)	850 mm (33.5")	950 mm (37.4")	435 kg (960 lb)				
0.52 m ³ (0.68 yd ³)	0.45 m ³ (0.59 yd ³)	935 mm (36.8")	1035 mm (40.7")	460 kg (1010 lb)				
※ 0.58 m ³ (0.76 yd ³)	0.50 m ³ (0.65 yd ³)	1030 mm (40.6")	1130 mm (44.5")	480 kg (1060 lb)				
0.65 m ³ (0.85 yd ³)	0.55 m ³ (0.72 yd ³)	1110 mm (43.7")	1210 mm (47.6")	500 kg (1100 lb)				
0.71 m ³ (0.93 yd ³)	0.60 m ³ (0.78 yd ³)	1205 mm (47.4")	1305 mm (51.4")	540 kg (1190 lb)				

※ : Standard bucket

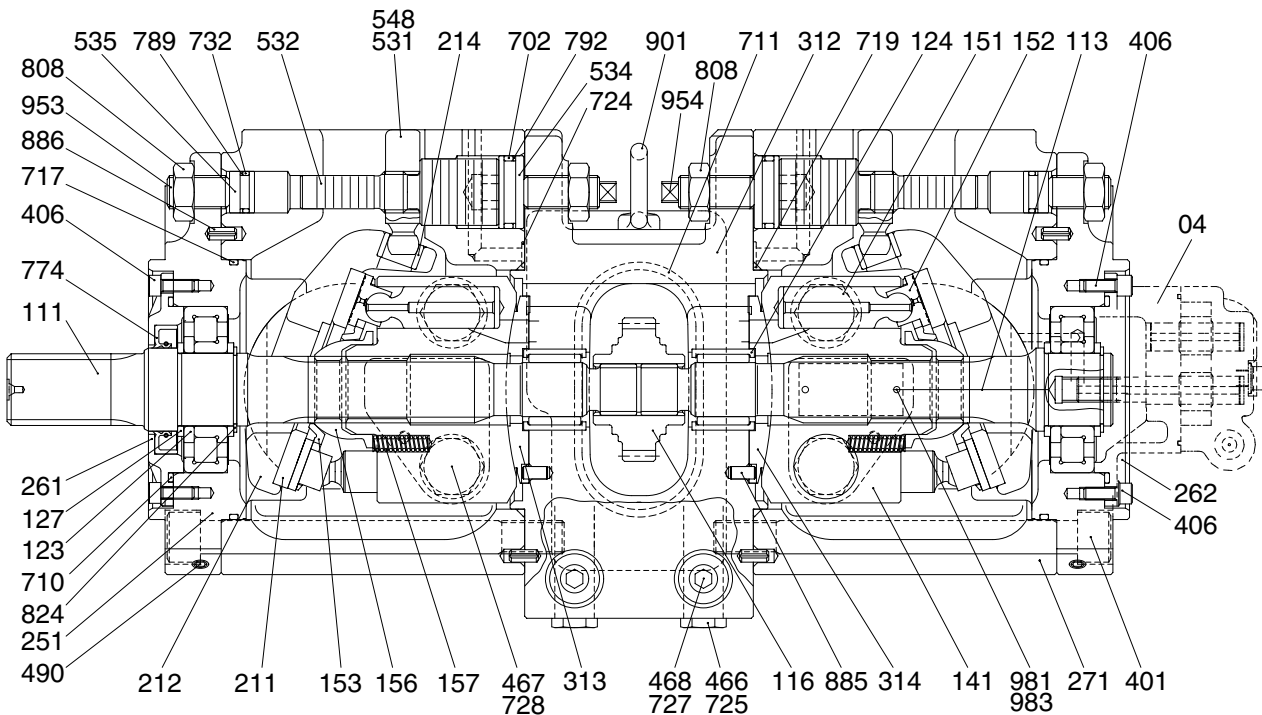
 Applicable for materials with density of 2000 kg/m³ (3370 lb/yd³) or less

 Applicable for materials with density of 1600 kg/m³ (2700 lb/yd³) or less

 Applicable for materials with density of 1100 kg/m³ (1850 lb/yd³) or less

1) MAIN PUMP (1/2)

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



14092MP02

04	Gear pump	312	Valve block	717	O-ring
111	Drive shaft (F)	313	Valve plate (R)	719	O-ring
113	Drive shaft (R)	314	Valve plate (L)	724	O-ring
116	1st Gear	326	Cover	725	O-ring
123	Roller bearing	401	Hexagon socket bolt	727	O-ring
124	Needle bearing	406	Hexagon socket bolt	728	O-ring
127	Bearing spacer	414	Hexagon socket bolt	732	O-ring
141	Cylinder block	466	Plug	774	Oil seal
151	Piston	467	plug	789	Back up ring
152	Shoe	468	Plug	792	Back up ring
153	Set plate	490	Plug	808	Hexagon head nut
156	Bushing	531	Tilting pin	824	Snap ring
157	Cylinder spring	532	Servo piston	885	Pin
211	Shoe plate	534	Stopper (L)	886	Spring pin
212	Swash plate	535	Stopper (S)	901	Eye bolt
214	Bushing	548	Pin	953	Set screw
251	Support	702	O-ring	954	Set screw
261	Seal cover (F)	710	O-ring	981	Plate
271	Pump casing	711	O-ring	983	Pin

(2) Total horsepower control

The regulator decreases the pump tilting angle (delivery flow) automatically to limit the input torque within a certain value with a rise in the delivery pressure P_1 of the self pump and the delivery pressure P_2 of the companion pump.

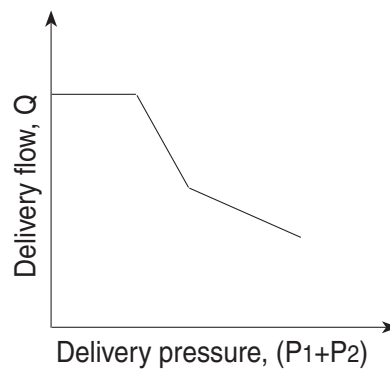
(The input horsepower is constant when the speed is constant.)

Since the regulator is of the simultaneous total horsepower type that operates by the sum of load pressures of the two pumps in the tandem double-pump system, the prime mover is automatically prevented from being overloaded, irrespective of the load condition of the two pumps, when horsepower control is under way.

Since this regulator is of the simultaneous total horsepower type, it controls the tilting angles (displacement volumes) of the two pumps to the same value as represented by the following equation :

$$\begin{aligned} T_{in} &= P_1 \times q/2\pi + P_2 \times q/2\pi \\ &= (P_1+P_2) \times q/2\pi \end{aligned}$$

The horsepower control function is the same as the flow control function and is summarized in the following. (For detailed behaviors of respective parts, refer to the section of flow control).



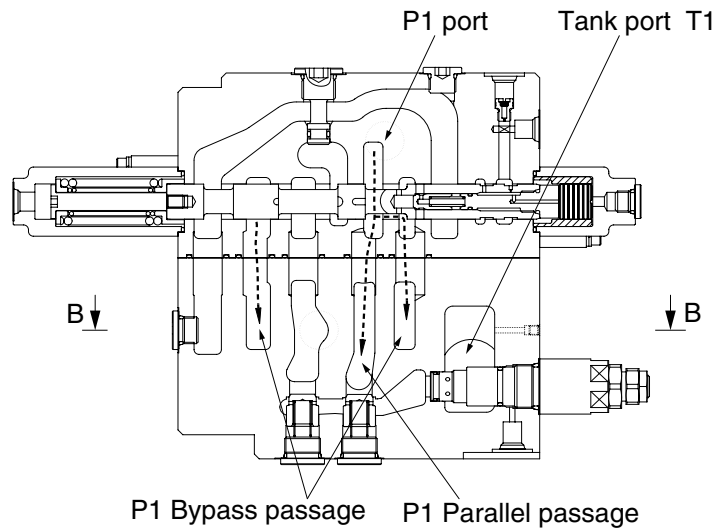
3. FUNCTION

1) CONTROL IN NEUTRAL

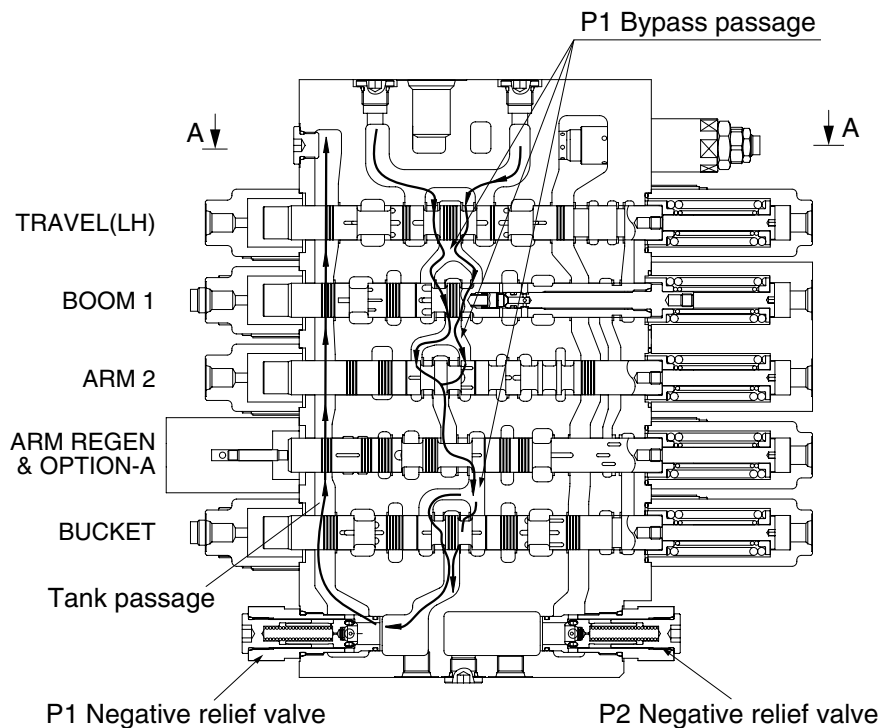
(1) P1 SIDE

The hydraulic fluid from pump A2 flows into the main control valve through the inlet port "P1", pass the straight travel spool into the P1 bypass passage and P1 parallel passage.

The hydraulic fluid from the pump A2 is directed to the tank through the bypass passage of spools : travel left, boom 1, arm 2, arm regeneration & option A and bucket, the negative relief valve of P1, tank passage, and the tank port "T1"



SECTION A-A



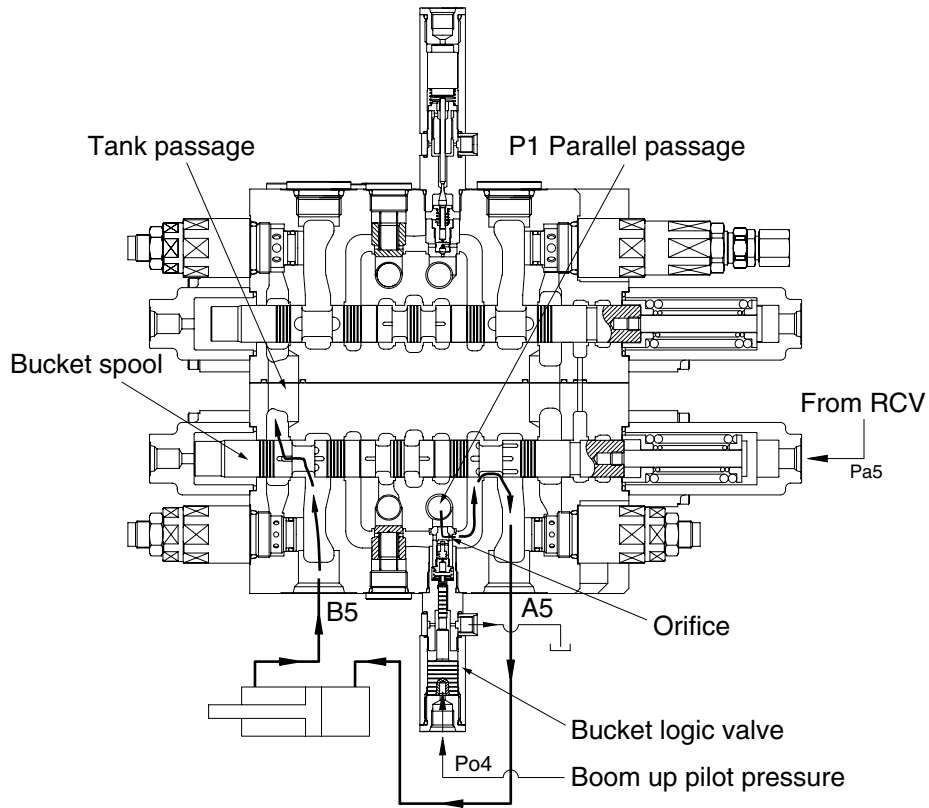
SECTION B-B

14092MC11

(3) BUCKET IN OPERATION WITH BOOM OPERATION

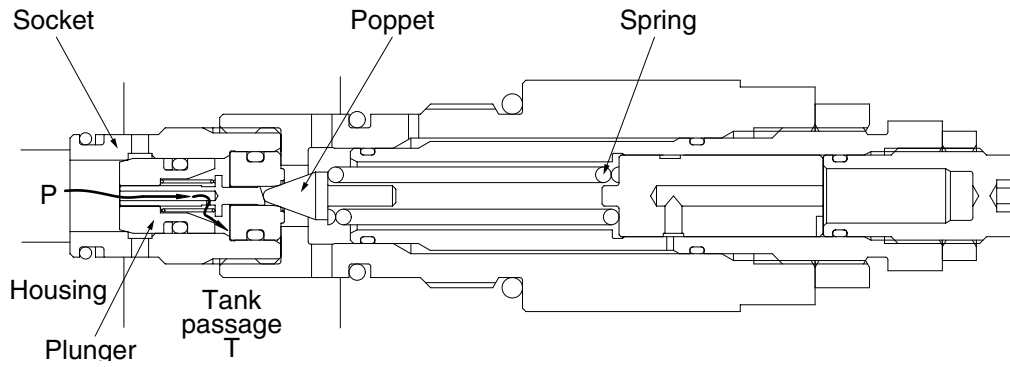
When combined operation, mostly same as previous page but the fluid from P1 bypass passage is empty.

So only the fluid from P1 parallel passage is supplied to the bucket cylinder. Also, parallel passage is installed the orifice of bucket logic valve for supplying the fluid from pump A2 to the boom operation prior to the bucket operation. In case of the bucket out operation with boom



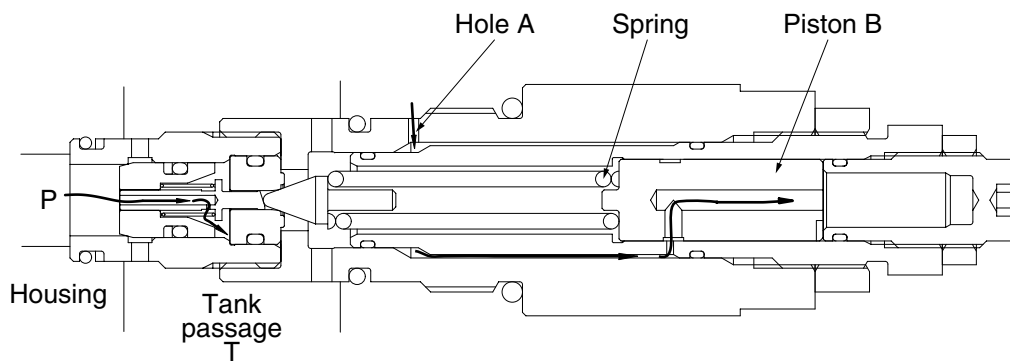
14W92MC29

- (4) The pressure at port P becomes lower than set pressure of the spring, the poppet is seated by spring force. Then the pressure at port P becomes equal to set pressure of the spring and the plunger is seated to the socket.



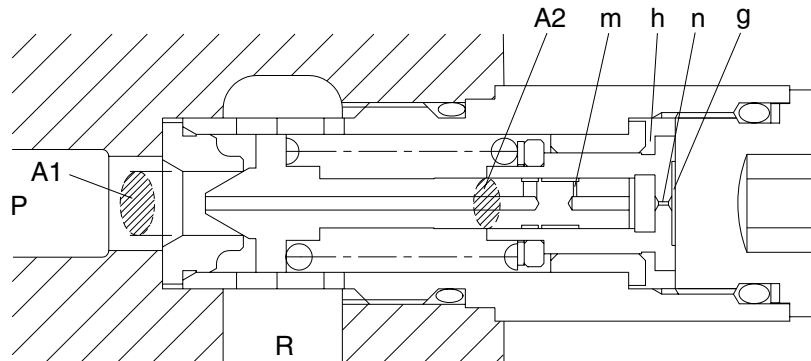
14W92MC39

- (5) When the power boost switch is ON, the pilot pressure enters through hole A. It pushes the piston (B) in the left direction to increase the force of the spring and change the relief set pressure to the high pressure.



14W92MC40

① Ports (P,R) at tank pressure.

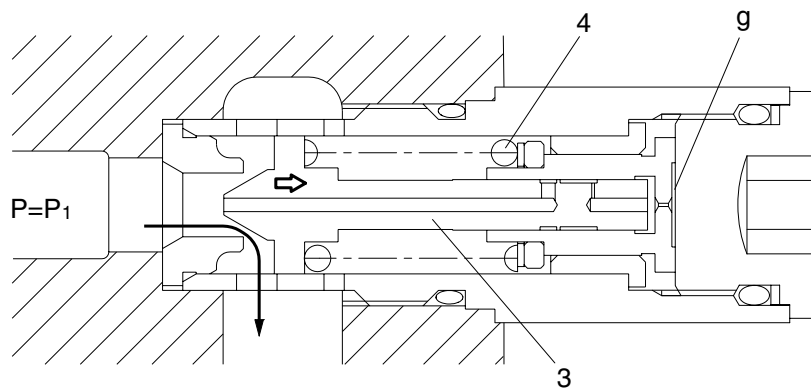


14007A2SM06

② When hydraulic oil pressure ($P \times A_1$) reaches the preset force (F_{SP}) of spring (4), the plunger (3) moves to the right as shown.

$$P_1 \times A_1 = F_{SP} + P_g \times A_2$$

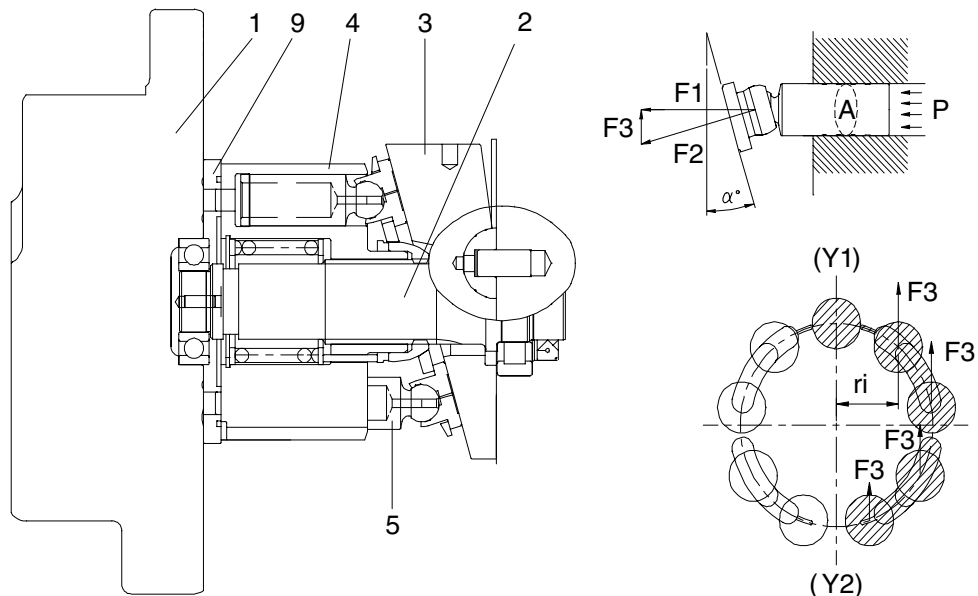
$$P_1 = \frac{F_{SP} + P_g \times A_2}{A_1}$$



14007A2SM07

2) OPERATING PRINCIPLE

(1) Hydraulic motor



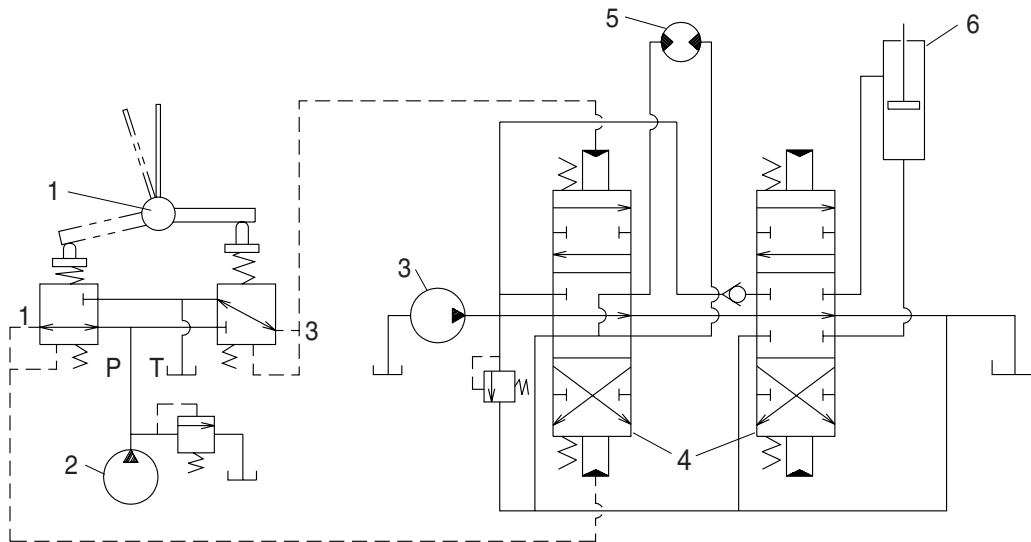
14092TM05

The pressurized oil delivered from the hydraulic pump flows to rear flange (1) of the motor, passes through the brake valve mechanism and is introduced into cylinder block (4) via timing plate (9). This oil constructively introduced only to one side of (Y1) - (Y2) connecting the upper and lower dead points of stroke of piston (5). The pressurized oil fed to one side in cylinder block (4) pushes each piston (5) (four or five) and generates a force ($F \text{ kgf} = P \text{ kgf/cm}^2 \times A \text{ cm}^2$). This force acts on swash plate (3) and is resolved into components (F2 and F3) because swash plate (3) is fixed at an angle (α°) with the axis of drive shaft (2). Radial component (F3) generates respective torques ($T = F3 \times r_i$) for (Y1) - (Y2). This residual of torque ($T = S (F3 \times r_i)$) rotates cylinder block (4) via piston (5). Cylinder block (4) is spline coupled with drive shaft (2). So the drive shaft (2) rotates and the torque is transmitted.

3) OPERATION

The operation of the pilot valve will be described on the basis of the hydraulic circuit diagram shown below and the attached operation explanation drawing.

The diagram shown below is the typical application example of the pilot valve.



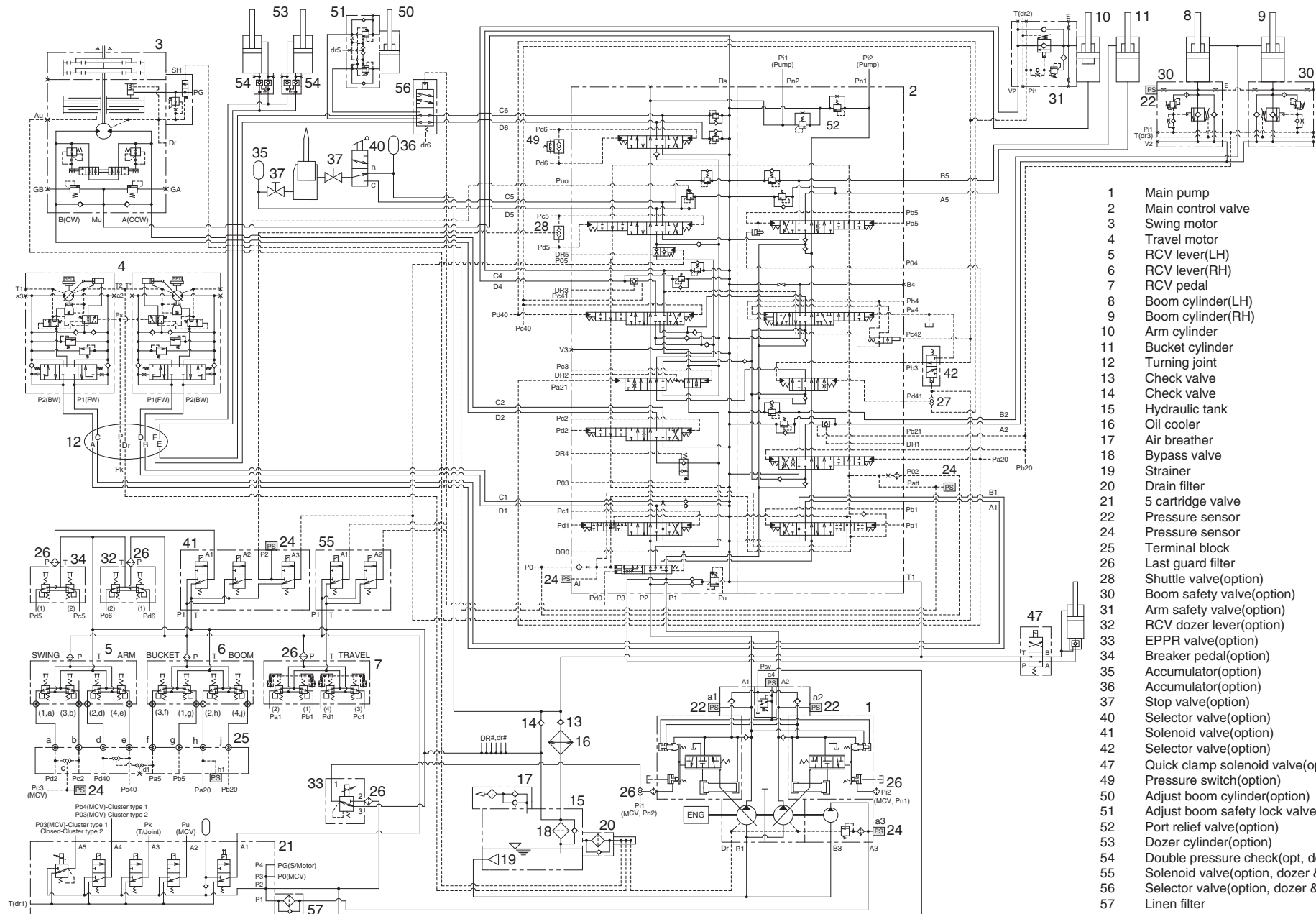
2-70

- 1 Pilot valve
- 2 Pilot pump

- 3 Main pump
- 4 Main control valve

- 5 Hydraulic motor
- 6 Hydraulic cylinder

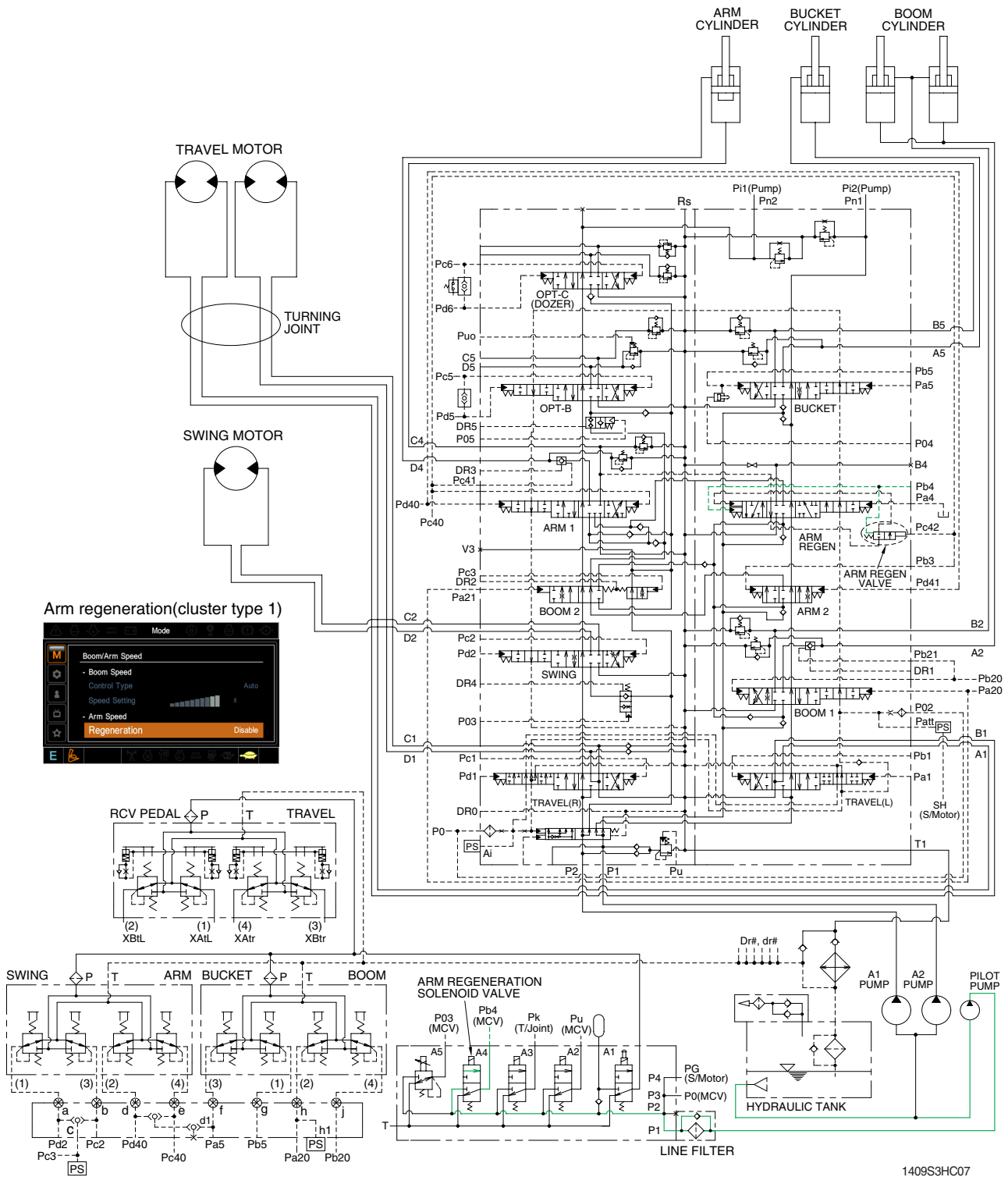
GROUP 1 HYDRAULIC CIRCUIT



- 1 Main pump
- 2 Main control valve
- 3 Swing motor
- 4 Travel motor
- 5 RCV lever(LH)
- 6 RCV lever(RH)
- 7 RCV pedal
- 8 Boom cylinder(LH)
- 9 Boom cylinder(RH)
- 10 Arm cylinder
- 11 Bucket cylinder
- 12 Turning joint
- 13 Check valve
- 14 Check valve
- 15 Hydraulic tank
- 16 Oil cooler
- 17 Air breather
- 18 Bypass valve
- 19 Strainer
- 20 Drain filter
- 21 5 cartridge valve
- 22 Pressure sensor
- 24 Pressure sensor
- 25 Terminal block
- 26 Last guard filter
- 28 Shuttle valve(option)
- 30 Boom safety valve(option)
- 31 Arm safety valve(option)
- 32 RCV dozer lever(option)
- 33 EPPR valve(option)
- 34 Breaker pedal(option)
- 35 Accumulator(option)
- 36 Accumulator(option)
- 37 Stop valve(option)
- 40 Selector valve(option)
- 41 Solenoid valve(option)
- 42 Selector valve(option)
- 47 Quick clamp solenoid valve(option)
- 49 Pressure switch(option)
- 50 Adjust boom cylinder(option)
- 51 Adjust boom safety lock valve(option)
- 52 Port relief valve(option)
- 53 Dozer cylinder(option)
- 54 Double pressure check(opt, dozer)
- 55 Solenoid valve(option, dozer & adjust)
- 56 Selector valve(option, dozer & adjust)
- 57 Linen filter

1409S3HC01

6. ARM REGENERATION CUT SYSTEM (CLUSTER TYPE 1)



1409S3HC07

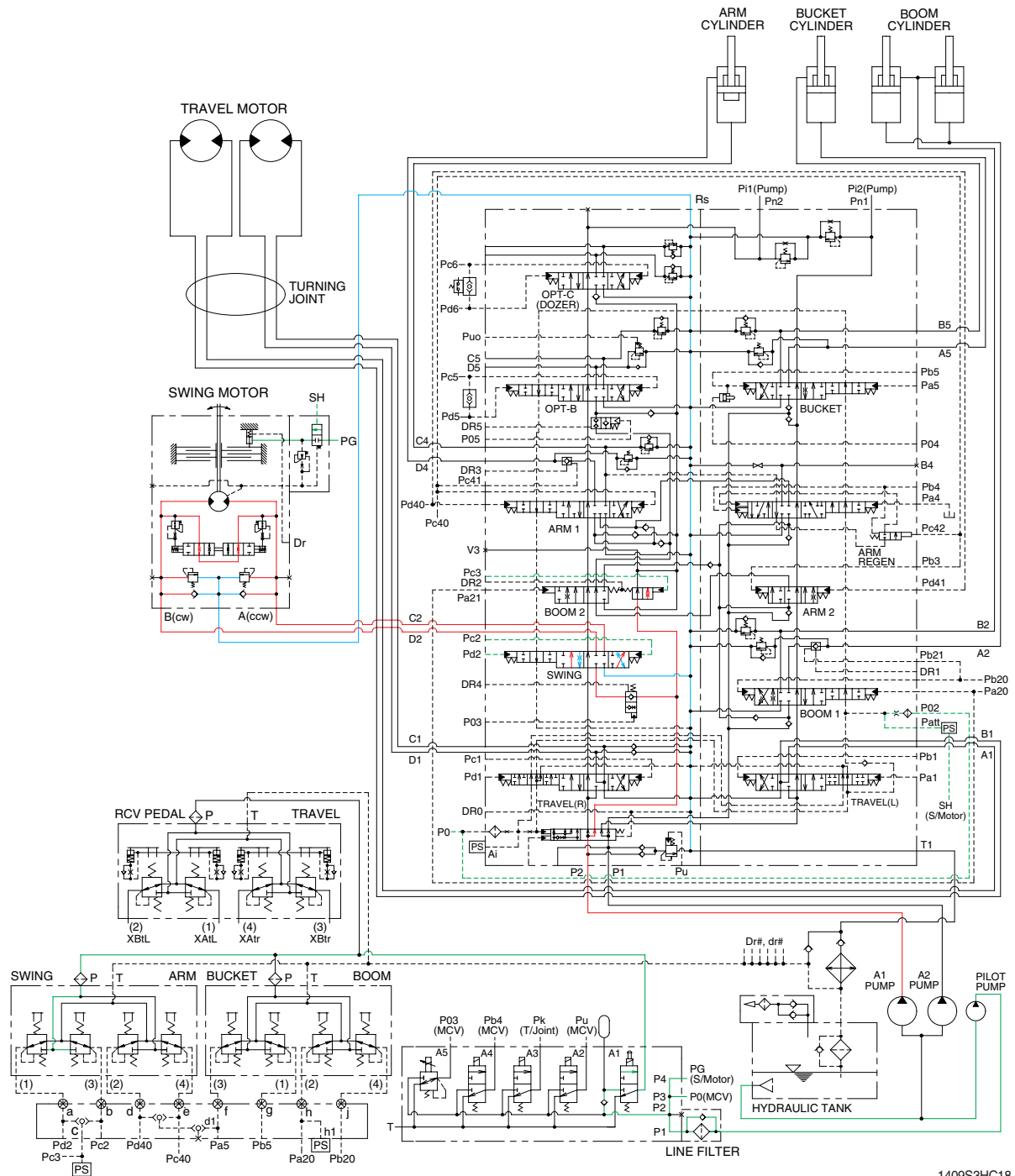
When the arm regeneration is selected to disable on the cluster, the arm regeneration solenoid valve is activated. The pilot oil from pilot pump flows into **Pb4** port in main control valve through solenoid valve and the arm regeneration spool is shifted to left.

Then, the oil from arm regeneration passage returns to tank and the arm regeneration function is deactivated.

When the arm regeneration is selected to enable on the cluster, the arm regeneration function is activated and arm in operation speed is increased.

Refer to page 2-36 for the arm regeneration function.

9. SWING OPERATION



When the left control lever is pushed 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.

Also the swing operation preference function is operated by the pilot pressure Pc3 (refer to page 2-38).

The oil from the A1 pump flows into the main control valve and then goes to the swing motor.

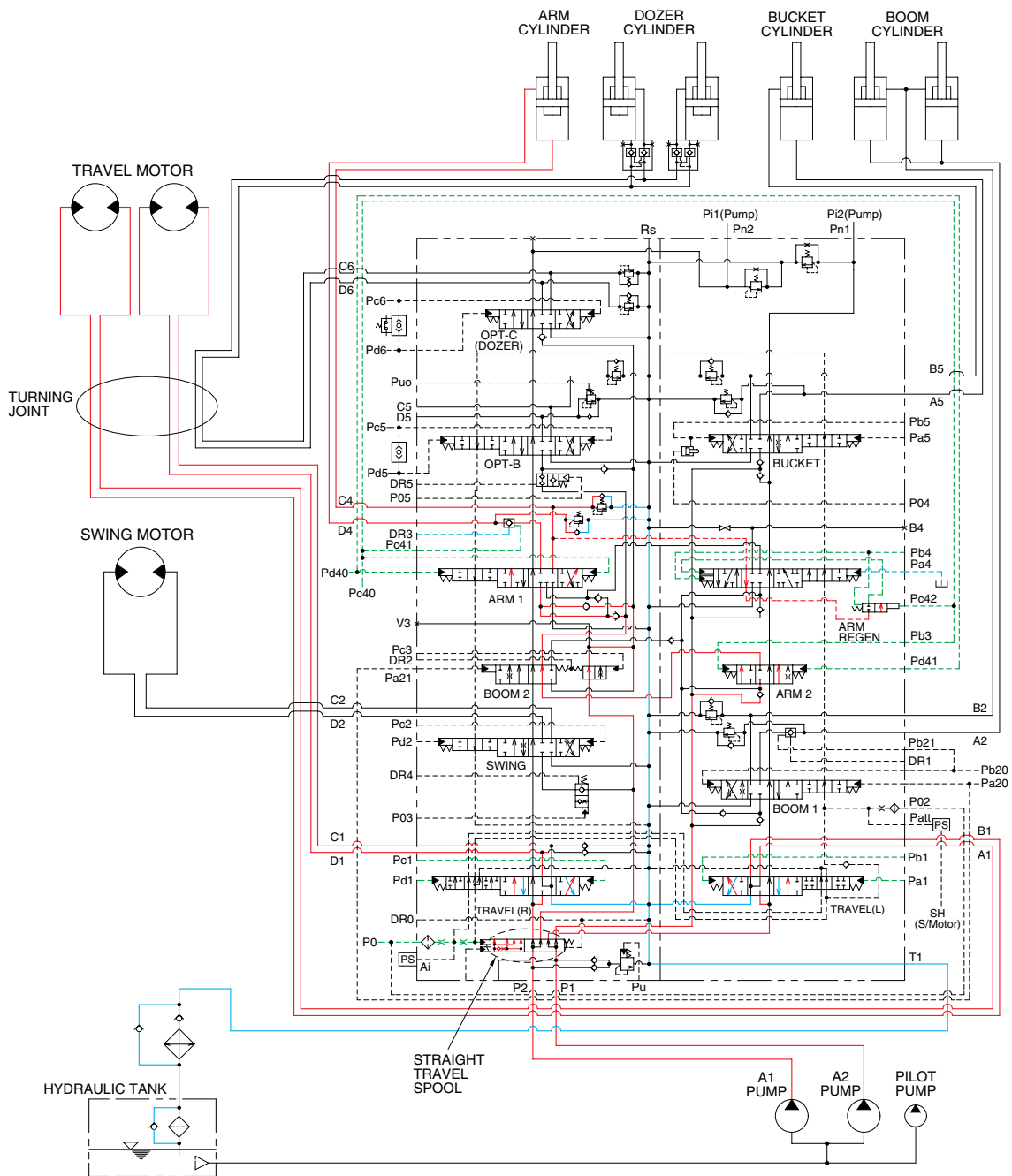
At the same time, the return oil from the swing motor returns to the hydraulic oil tank through the swing spool in the main control valve.

When this happens, the upper structure swings to the left or right.

The swing parking brake, make up valve and the motor brake valve are provided in the swing motor.

The cavitation which will happen to the swing motor is also prevented by the make up valve in the swing motor itself.

7. COMBINED ARM AND TRAVEL OPERATION



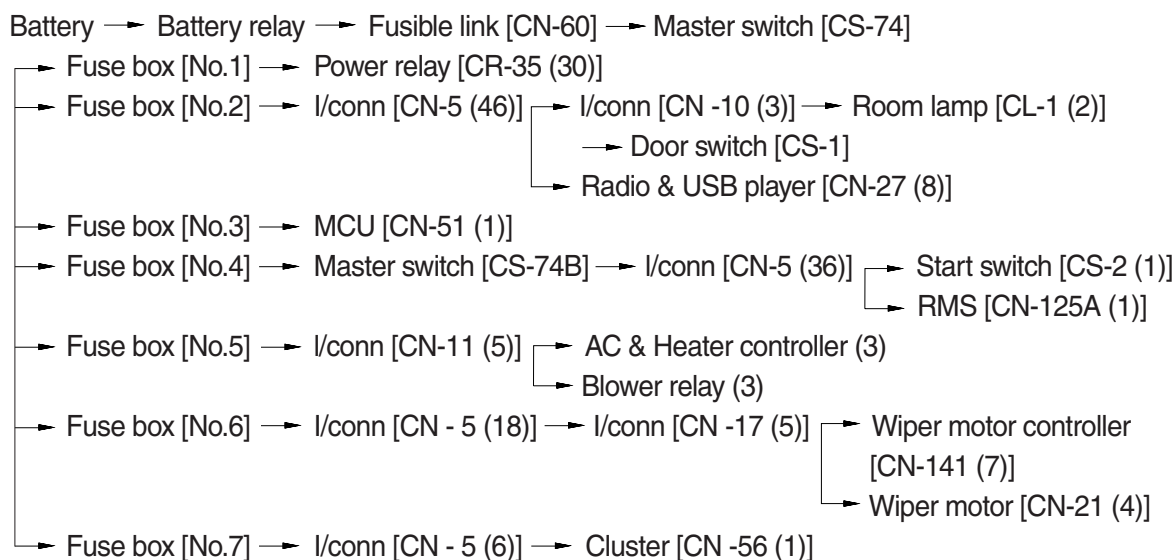
1409S3HC29

When the arm and travel functions are operated, simultaneously the arm spools and travel spools in the main control valve are moved to the functional position by the pilot oil pressure from the remote control valve and the straight travel spool is pushed to the right by the oil pressure from pilot pump. The oil from the A1 pump flows into the travel motors through the RH travel spool of the left control valve and the LH travel spool of the right control valve via the straight travel spool. The oil from the A2 pump flows into the arm cylinders through the arm 1 spool and arm 2 spool via the parallel and confluence oil passage. Also, the oil from the A2 pump flows into the travel motors through the LH travel spool via the check valve and orifice in the straight travel spool. The arm is operated and the machine travels straight.

1. POWER CIRCUIT (CLUSTER TYPE 1)

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. CHARGING CIRCUIT (CLUSTER TYPE 2)

When the starter is activated and the engine is started, the operator releases the key switch to the ON position.

Charging current generated by operating alternator flows into the battery through the battery relay [CR-1].

The current also flows from alternator to each electrical component and controller through the fuse box.

1) OPERATING FLOW

(1) Warning flow

Alternator "L" terminal → I/conn [CN-3 (3)] → MCU alternator level [CN-51 (9)]

Cluster charging warning lamp(Via serial interface)

(2) Charging flow

Alternator "B+" terminal → Battery relay(M8) → Battery(+) terminal
 → Fusible link [CN-60] → Master switch [CS-74]
 → Fuse box

2) CHECK POINT

Engine	Start switch	Check point	Voltage
Run	ON	① - GND (battery voltage) ② - GND (battery relay) ③ - GND (alternator B ⁺ terminal) ④ - GND (alternator L terminal) ⑤ - GND (MCU)	20~30V

※ GND : Ground

11. WIPER AND WASHER CIRCUIT (CLUSTER TYPE 1)

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)

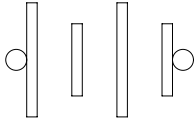
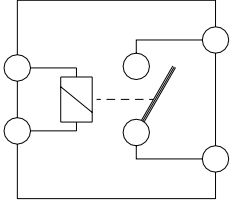
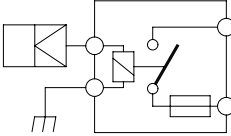
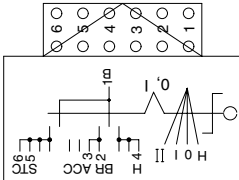
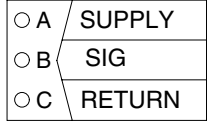
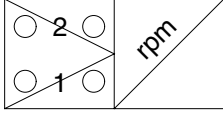
Switch OFF [CN-116 (4)] → Wiper motor parking position by wiper motor controller

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

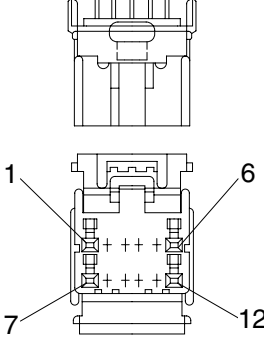
※ GND : Ground

GROUP 3 ELECTRICAL COMPONENT SPECIFICATION

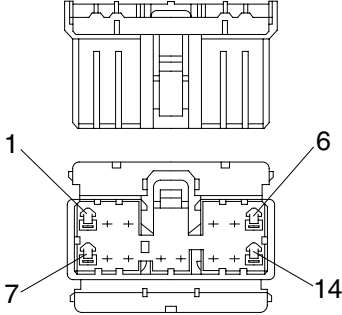
Part name	Symbol	Specifications	Check
Battery		12V × 80Ah (2EA)	※ Check specific gravity 1.280 over : Over charged 1.280 ~ 1.250 : Normal 1.250 below : Recharging
Battery relay	 <p style="text-align: center;">CR-1</p>	Rated load : 24V 100A (continuity) 1000A (30seconds)	※ Check coil resistance(M4 to M4) Normal : About 50 Ω ※ Check contact Normal : ∞ Ω
Glow plug relay	 <p style="text-align: center;">CR-24</p>	24V 200A	※ Check contact Normal : 0.942 Ω (For terminal 1-GND)
Start key	 <p style="text-align: center;">CS-2</p>	B-BR : 24V 1A B-ACC : 24V 10A B-ST : 24V 40A	※ Check contact OFF : ∞ Ω (for each terminal) ON : 0 Ω (for terminal 1-3 and 1-2) START : 0 Ω (for terminal 1-5)
Pressure sensor	 <p style="text-align: center;"> CD-6 CD-7 CD-42 CD-43 CD-44 • CLUSTER TYPE 1 (CD-24, CD-31, CD-32, CD-69) </p>	8~30V	※ Check contact Normal : 0.1 Ω
Speed sensor	 <p style="text-align: center;">CD-17</p>	-	※ Check resistance Normal : 300 Ω (For terminal 1, 2)

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CR-24	AMP	1	Preheat relay	S822-014000	-
CR-35	-	5	Power relay	-	-
CR-36	-	5	Preheat relay	-	-
CR-46	-	5	Fuel warmer relay	-	-
CR-51	-	5	Fuel cut off relay (cluster type 1)	-	-
CR-62	-	5	Breaker relay	-	-
· Switch					
CS-1	SHUR	1	Door switch	S822-014002	S822-114002
CS-2	WP	6	Start key switch	S816-006100	-
CS-4	DEUTSCH	3	Safety switch	DT06-3S-EP06	-
CS-5	DEUTSCH	2	Horn switch	-	DT04-2P-E005
CS-19	DEUTSCH	2	One touch decel switch	-	DT04-2P-E005
CS-20	AMP	1	Safety switch	S822-014002	-
CS-23	SWF	12	Beacon lamp switch	SWF589790	-
CS-26	DEUTSCH	2	Breaker switch	DT06-2S-EP06	-
CS-26A	AMP	2	Breaker pedal switch	S816-002002	S816-102002
CS-27	SWF	10	Breaker switch	SWF 593757	-
CS-29	DEUTSCH	2	Power max switch	DT06-2S-EP06	-
CS-33	AMP	6	Emergency engine stop switch	S816-006002	S816-106002
CS-50	SWF	12	Overload switch	SWF589790	-
CS-53	AMP	1	Wiper cut switch	S822-014002	-
CS-67	SWF	12	Quick clamp switch	SWF 589790	-
CS-74A	AMP	2	Master switch	S813-030201	-
CS-74B	DEUTSCH	2	Master switch	DT06-2S-EP06	-
CS-82	SWF	12	Heated seat switch	SWF 589790	-
CS-83	SWF	12	Spare switch	SWF589790	-
CS-99	SWF	12	Spare switch	SWF 589790	-
CS-100	SWF	12	Spare switch	SWF 589790	-
· Light					
CL-1	KET	3	Room lamp	MG651032	-
CL-2	AMP	1	Cigar light	S822-014002	S822-114002
CL-3	DEUTSCH	2	Head lamp-LH	DT06-2S-EP06	DT04-2P-E005
CL-4	DEUTSCH	2	Head lamp-RH	DT06-2S-EP06	DT04-2P-E005
CL-5	AMP	2	Work lamp-LH	180923-0	-
CL-6	AMP	2	Work lamp-RH	180923-0	-
CL-7	SHUR	1	Beacon lamp	S822-014002	S822-114002
CL-8	DEUTSCH	2	Cab light-LH	DT06-2S-EP06	DT-2P
CL-9	DEUTSCH	2	Cab light-RH	DT06-2S-EP06	DT04-2P

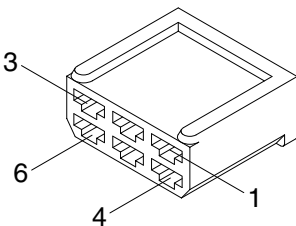
8) AMP 040 MULTILOCK CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
12	 <p style="text-align: right;">174045-2</p>	

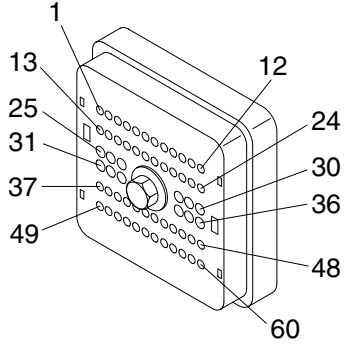
9) AMP 070 MULTILOCK CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
14	 <p style="text-align: right;">173852</p>	

10) AMP FASTIN - FASTON CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 <p style="text-align: right;">925276-0</p>	

24) DEUTSCH INTERMEDIATE CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
60	 <p style="text-align: center;">DRB16-60SAE-L018</p>	

3. USER MODE SELECTION SYSTEM

An operator can change the engine and pump and memorize it for his preference.

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

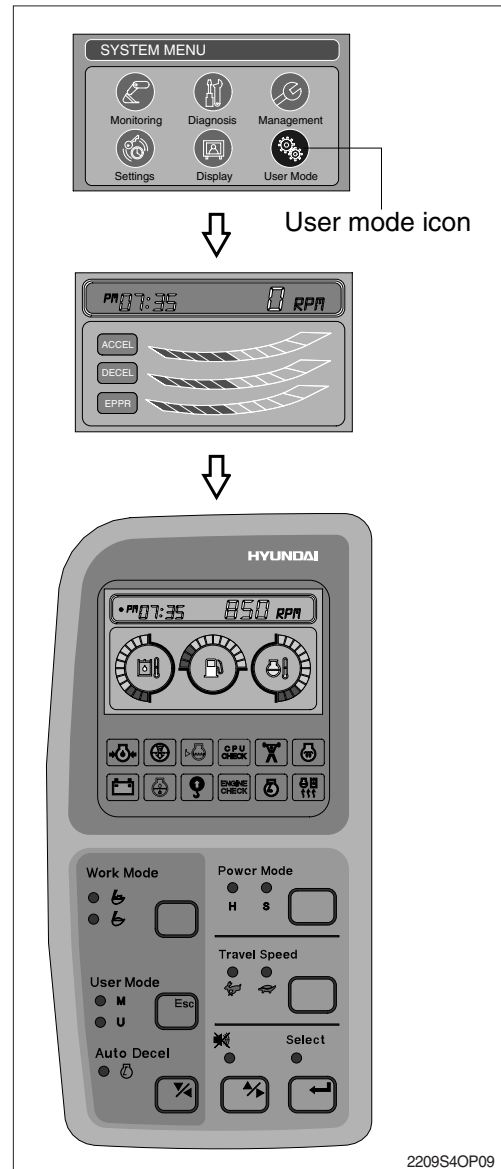
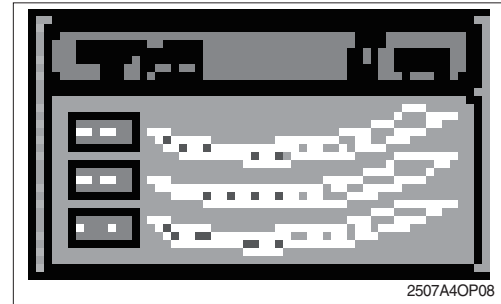
HOW TO MODULATE THE MEMORY SET

- 1) Each memory mode has a initial set which are mid-range of max engine speed, auto decel rpm, and EPPR valve input current.
- 2) High idle rpm, auto decel rpm, EPPR pressure can be modulated and memorized separately in the U-mode.

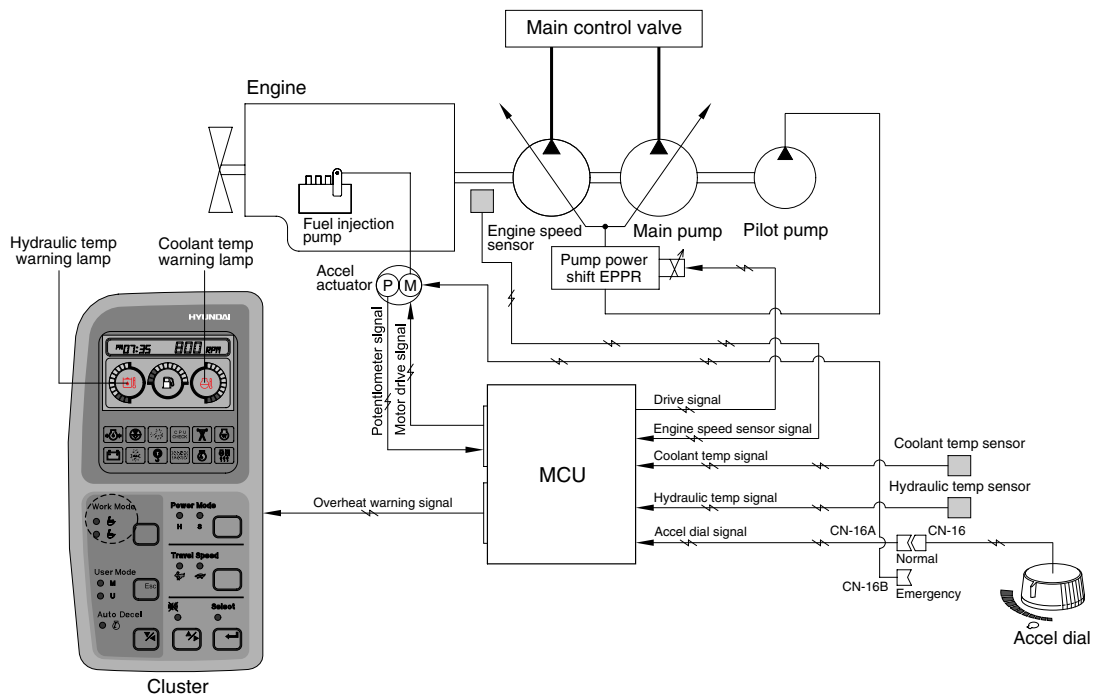
※ Refer to the page 5-30 for set of user mode.

· LCD segment vs parameter setting

Segment (I)	ACCEL (rpm)	DECEL (rpm)	EPPR (mA)
1	1550	1050 (low idle)	150
2	1600	1100	200
3	1700	1150 (decel rpm)	250
4	1800	1200	300
5	1900	1250	350
6	2000	1300	400
7	2050	1350	450
8	2100	1400	500
9	2150	1450	550
10	2200	1500	600



ENGINE OVERHEAT PREVENTION SYSTEM (CLUSTER TYPE 2)



1409S5MS60

1. If the engine coolant temperature or the hydraulic oil temperature is overheated over 100°C, the warning lamp is ON and the pump input torque or the engine speed is reduced as below logic table.

2. LOGIC TABLE

Description		Condition	Function
First step warning	Activated	- Coolant or hydraulic oil temperature : Above 100°C	- Warning lamp : ON - Pump absorption torque is reduced.
	Canceled	- Coolant or hydraulic oil temperature : Less than 95°C	- Return to pre-set the pump absorption torque.
Second step warning	Activated	- Coolant or hydraulic oil temperature : Above 105°C	- Emergency warning lamp pops up on the center of LCD and the buzzer sounds. - Engine speed is reduced after 10 seconds.
	Canceled	- Coolant or hydraulic oil temperature : Less than 100°C	- Return to pre-set the engine speed. - Hold pump absorption torque on the first step warning.

Error code No.	Description
41	Hydraulic oil temperature sensor circuit is shorted to ground
42	Fuel level sensor circuit is shorted to ground
43	Coolant temperature sensor circuit is shorted to ground
44	Boom up pressure sensor circuit is shorted to power supply (24V) line
45	Hydraulic oil temperature sensor circuit is open or shorted to battery +
46	Fuel level sensor circuit is open or shorted to battery +
47	Coolant temperature sensor circuit is open or shorted to battery +
48	Boom up pressure sensor circuit is open or shorted to ground
49	Engine preheater circuit is shorted to battery +
51	Boom priority solenoid circuit is open or shorted to ground
56	Travel alarm buzzer circuit is shorted to battery +
58	Boom priority solenoid circuit is shorted to battery +

2) CLUSTER CHECK PROCEDURE

(1) Start key : ON

① Check monitor

- a. Buzzer sounding for 4 seconds with HYUNDAI logo on cluster.
- ※ If the ESL mode is set to the enable, enter the password to start engine.

② After initialization of cluster, the operating screen is displayed on the LCD.

Also, self diagnostic function is carried out.

- a. Engine rpm display : 0 rpm
- b. Engine coolant temperature gauge : White range
- c. Hydraulic oil temperature gauge : White range
- d. Fuel level gauge : White range

③ Indicating lamp state

- a. Power mode pilot lamp : E mode or U mode
- b. Work mode pilot lamp : General operation mode (bucket)
- c. Travel speed pilot lamp : Low (turtle)

(2) Start of engine

① Check machine condition

- a. RPM display indicates at present rpm
- b. Gauge and warning lamp : Indicate at present condition.
- ※ When normal condition : All warning lamp OFF
- c. Work mode selection : General work
- d. Power mode selection : E mode or U mode
- e. Travel speed pilot lamp : Low (turtle)

② When warming up operation

- a. Warming up pilot lamp : ON
- b. After engine started, engine speed increases to 1150 rpm.
- ※ Others same as above.

③ When abnormal condition






- a. The warning lamp lights up and the buzzer sounds.
- b. If BUZZER STOP switch is pressed, buzzer sound is canceled but the lamp warning lights up until normal condition.
- ※ The pop-up warning lamp moves to the original position and blink when the select switch is pushed. Also the buzzer stops.

6) MAIN MENU

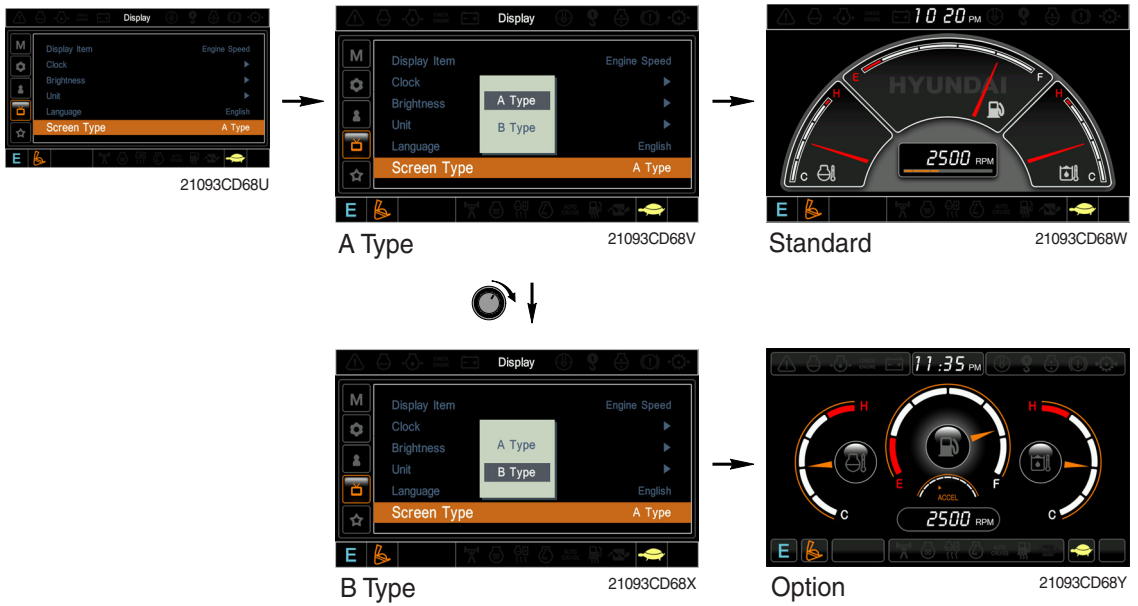


※ Please refer to select switch, page 5-48 for selection and change of menu and input value.

(1) Structure

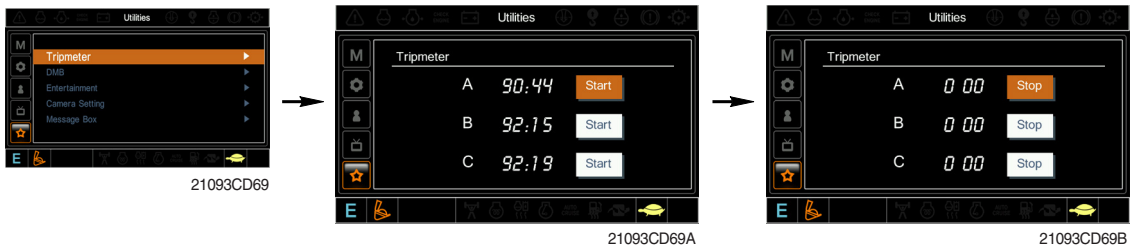
No	Main menu	Sub menu	Description
1	 Mode 21093CD64D	Work tool U mode power Boom/Arm speed Auto power boost Initial mode Cluster switch (back up)	Breaker, Crusher, Not installed User mode only Boom speed, Arm speed Enable, Disable Default, U mode Switch function
2	 Monitoring 21093CD64E	Active fault Logged fault Delete logged fault Monitoring (analog) Monitoring (digital) Operating hours	MCU MCU All logged fault delete, Initialization canceled Machine information Switch status, Output status Operating hours for each mode
3	 Management 21093CD64F	Maintenance information Machine security Machine Information A/S phone number Service menu	Replacement, Change interval oils and filters ESL mode setting, Password change Cluster, MCU, Engine, Machine A/S phone number, A/S phone number change Power shift, Hourmeter, Replacement history, Update
4	 Display 21093CD64G	Display item Clock Brightness Unit Language Screen type	Engine speed, Tripmeter A, Tripmeter B, Tripmeter C Clock Manual, Auto Temperature, Pressure, Flow, Date format Korean, English, Chinese A type, B type
5	 Utilities 21093CD64H	Tripmeter DMB Entertainment Camera setting Message box	3 kinds (A, B, C) DMB select, DAB select, Channel scan, Exit Play MP4, codec. Basic direction, Display switching, Full screen Record for fault, attachment etc.

⑥ Screen type



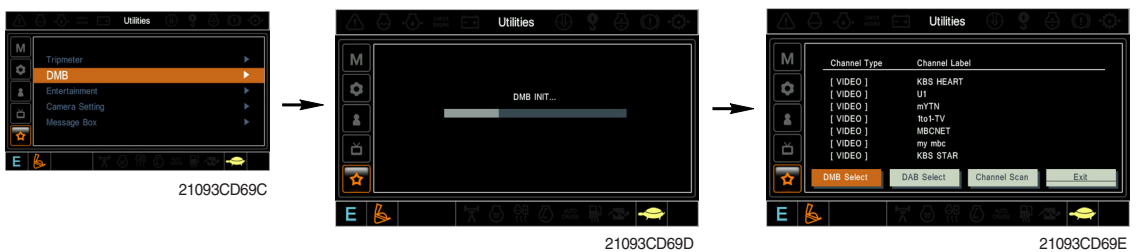
(6) Utilities

① Tripmeter



- Maximum 3 kinds of tripmeters can be used at the same time.
- Each tripmeter can be turned on by choosing "Start" while it also can be turned off by choosing "Stop".
- If the tripmeter icon is activated in the operation screen, it can be controlled directly there.

② DMB



- DMB select : TV channel can be selected by this menu.
- DAB select : Audio channel can be selected by this menu.
- Channel scan : This menu can be used other region for TV/Audio.
- Exit : Exit DMB menu

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GROUP 2 HYDRAULIC AND MECHANICAL SYSTEM

1. INTRODUCTION

1) MACHINE IN GENERAL

(1) If even a minor fault is left intact and operation is continued, a fatal failure may be caused, entailing a large sum of expenses and long hours of restoration.

Therefore when even a small trouble occurs, do not rely on your intuition and experience, but look for the cause based on the troubleshooting principle and perform maintenance and adjustment to prevent major failure from occurring. Keep in mind that a fault results from a combination of different causes.

(2) The following lists up commonly occurring faults and possible causes with this machine. For the troubleshooting of the engine, refer to the coming troubleshooting and repair.

(3) When carrying out troubleshooting, do not hurry to disassemble the components. It will become impossible to find the cause of the problem.

(4) Ask user or operator the following.

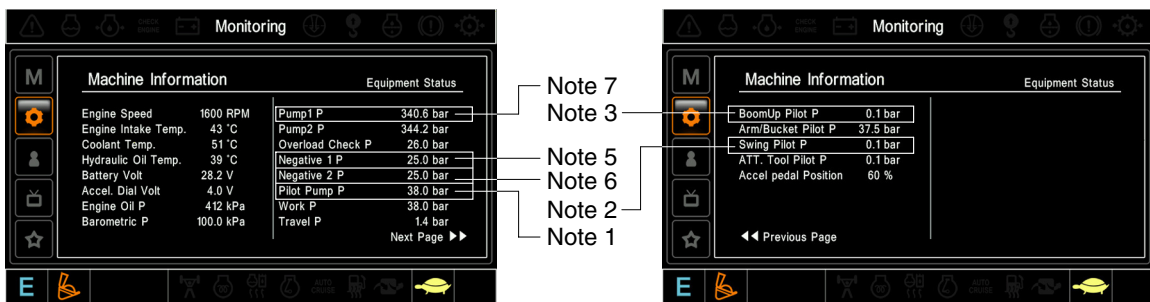
- ① Was there any strange thing about machine before failure occurred?
- ② Under what conditions did the failure occur?
- ③ Have any repairs been carried out before the failure?

(5) Check before troubleshooting.

- ① Check oil and fuel level.
- ② Check for any external leakage of oil from components.
- ③ Check for loose or damage of wiring and connections.

2) MACHINE STATUS MONITORING ON THE CLUSTER (CLUSTER TYPE 1)

(1) The machine status such as the engine rpm, oil temperature, voltage and pressure etc. can be checked by this menu.



Analog 1

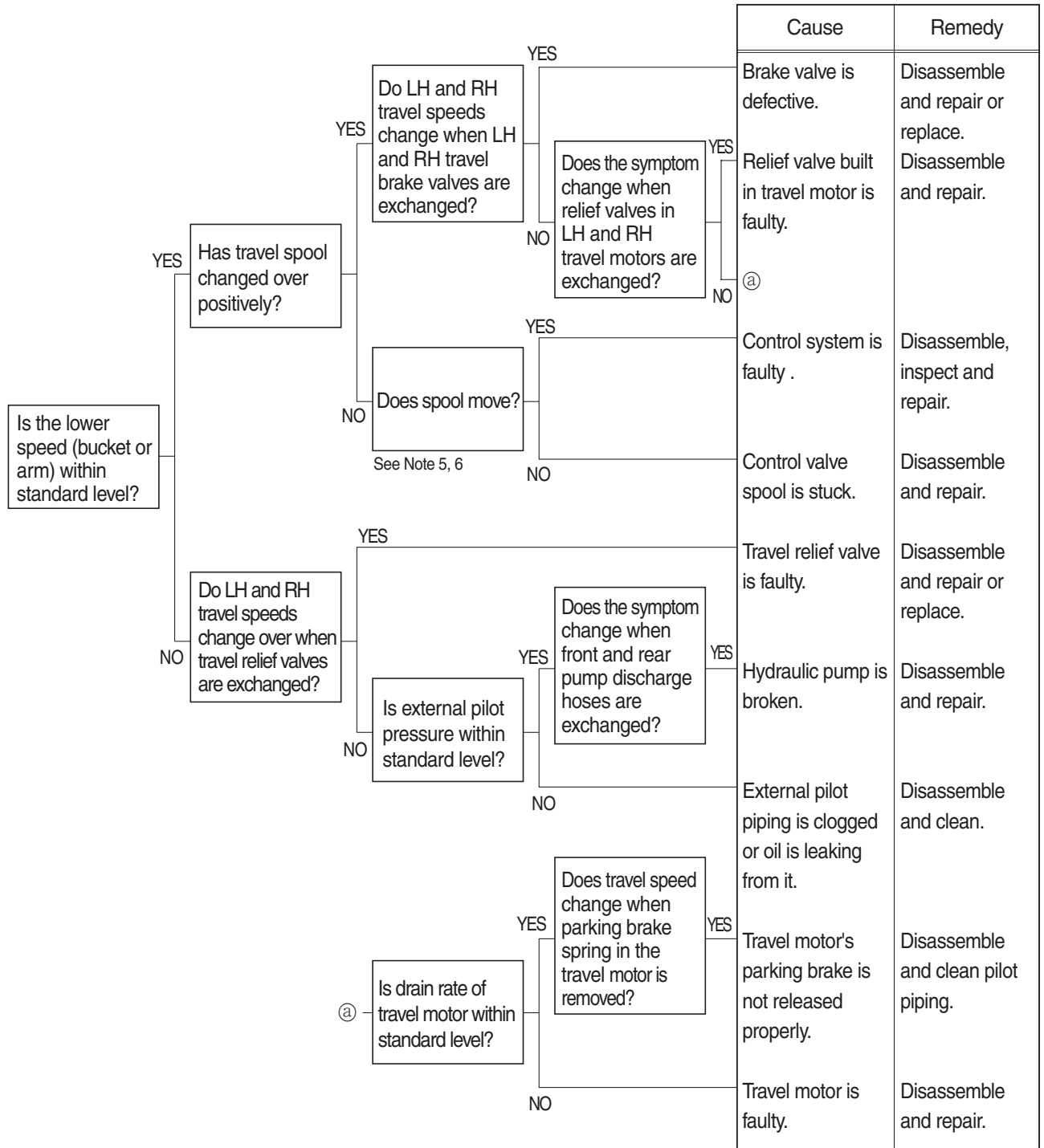
Analog 2

1409S6HS01

(2) Specification

No.	Description	Specification
Note 1	Pilot pump pressure	40 ⁺² ₀ bar
Note 2	Swing pilot pressure	0~40 bar
Note 3	Boom up pilot pressure	0~40 bar
Note 5	P1 pump control pressure	0~25 bar
Note 6	P2 pump control pressure	0~25 bar
Note 7	Pump 1 pressure	350 bar

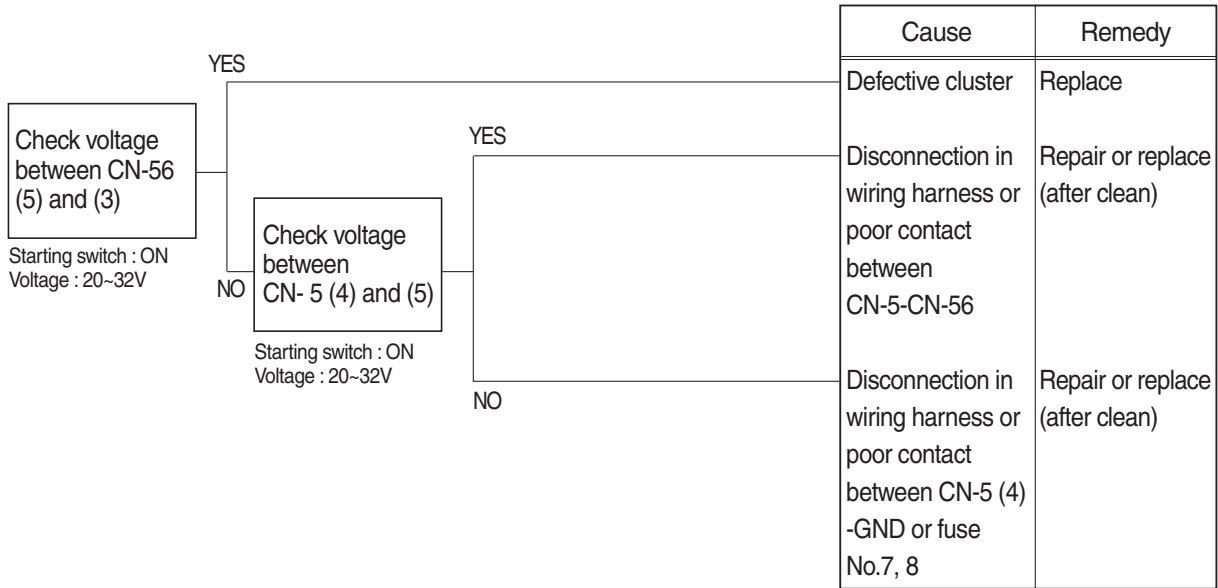
2) SPEED ON ONE SIDE FALLS AND THE MACHINE CURVES



GROUP 3 ELECTRICAL SYSTEM (CLUSTER TYPE 1)

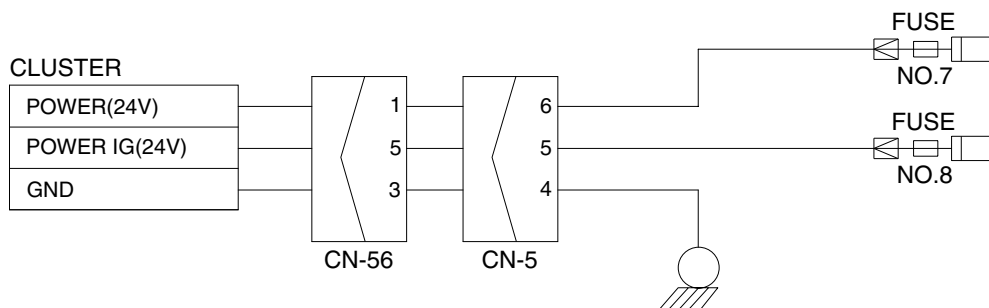
1. WHEN STARTING SWITCH IS TURNED ON, MONITOR PANEL DISPLAY DOES NOT APPEAR

- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted and fuse No.7 and 8 burnt out.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



Check voltage

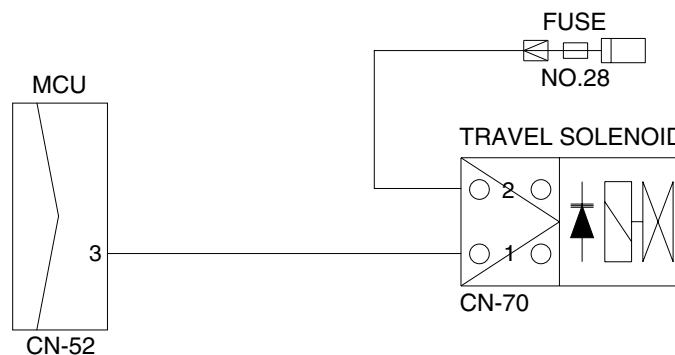
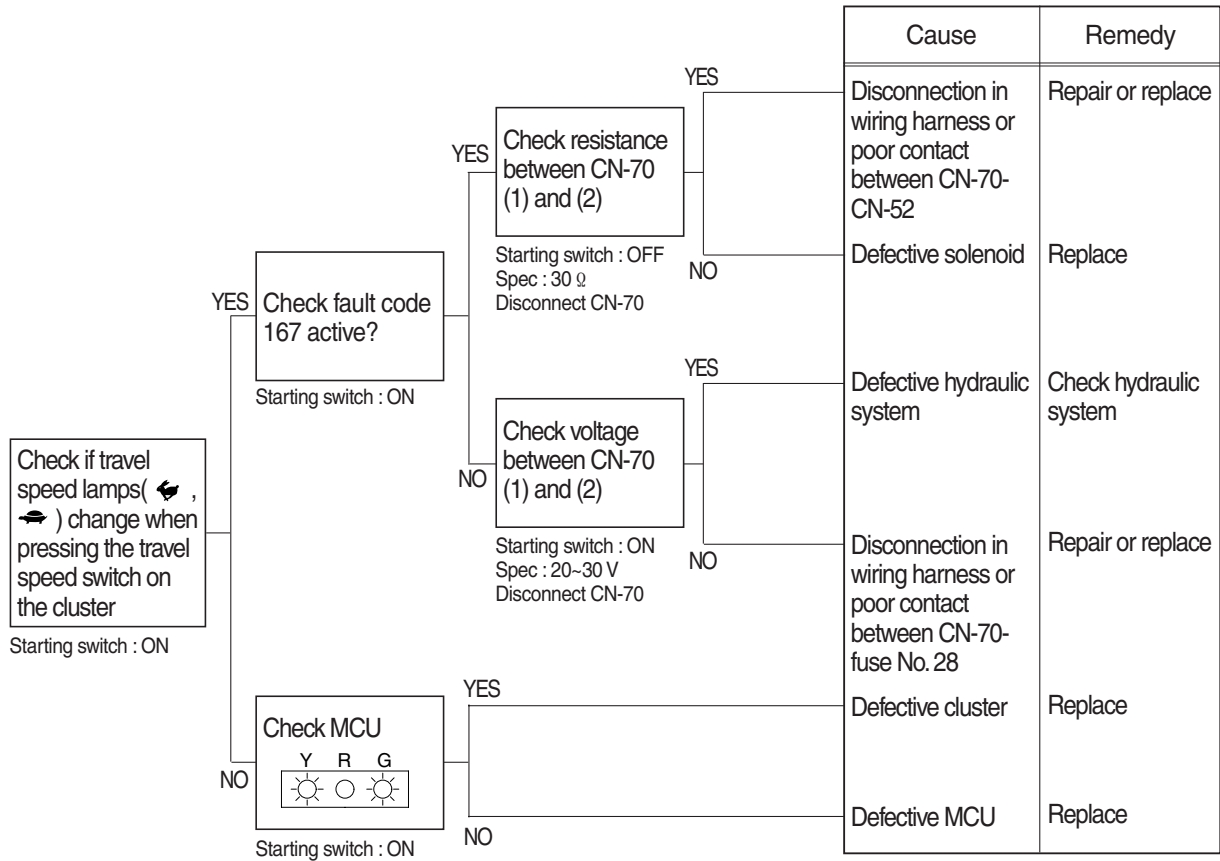
YES	20~32V
NO	0V



1409S6ES01

11. WHEN TRAVEL SPEED 1, 2 DOES NOT OPERATE (HCESPN 167, FMI 5 or 6)

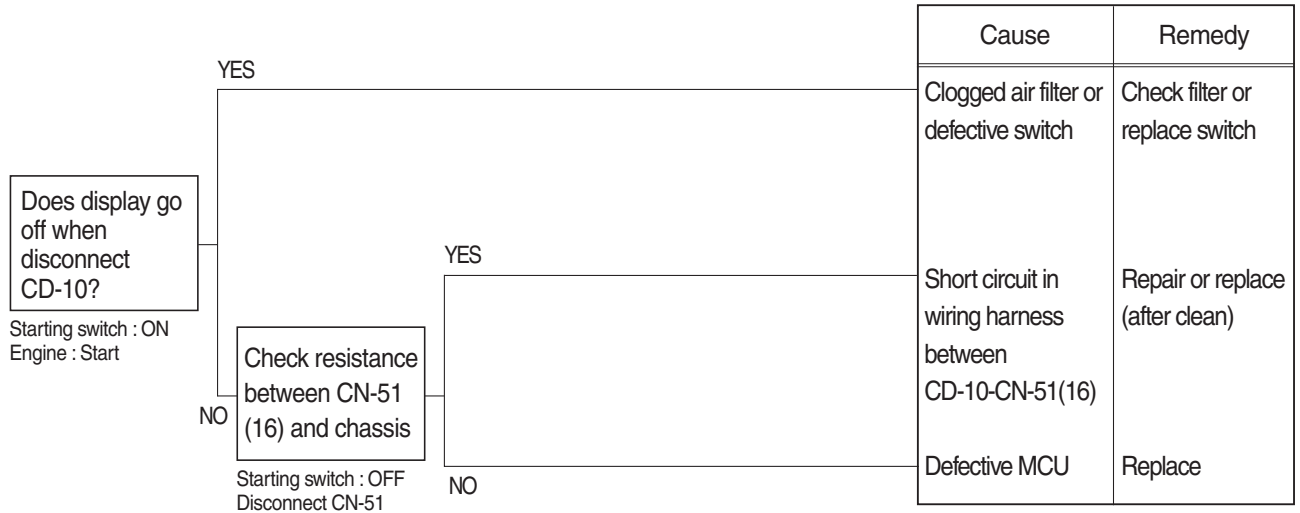
- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted and fuse No. 28 burnt out.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



1409S6ES11

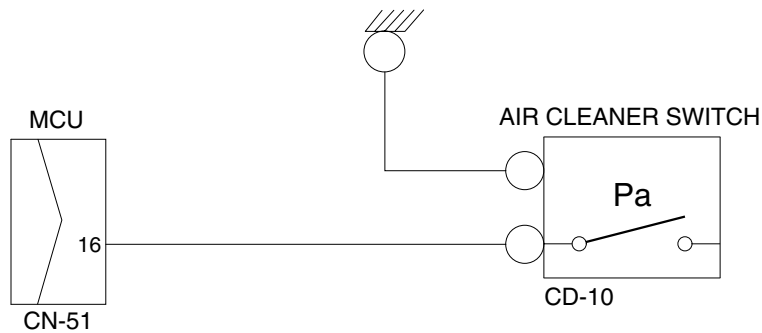
5. WHEN AIR CLEANER WARNING LAMP LIGHTS UP (engine is started)

- 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 resistance

YES	MAX 1Ω
NO	MIN 1M Ω



1409S6ES55

2) TEST PROCEDURE

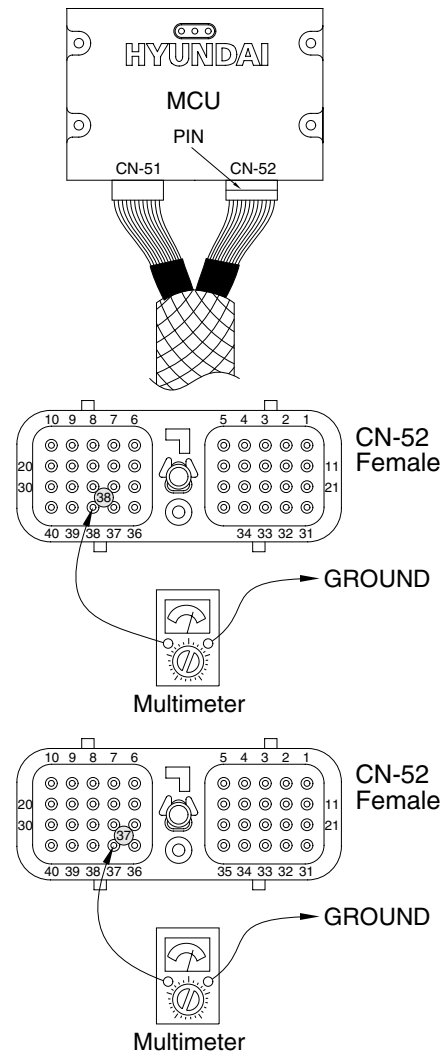
(1) **Test 7** : Check voltage at CN-52(38) and ground.

- ① Prepare 1 piece of thin sharp pin, steel or copper.
- ② Insert prepared pin to rear side of connectors : One pin to (38) of CN-52.
- ③ Starting key ON.
- ④ Check voltage as figure.

(2) **Test 8** : Check voltage at CN-52(37) 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 (37) of CN-52.
- ③ Starting key ON.
- ④ Check voltage as figure.

SPEC : Actuator operating : 1~5 V

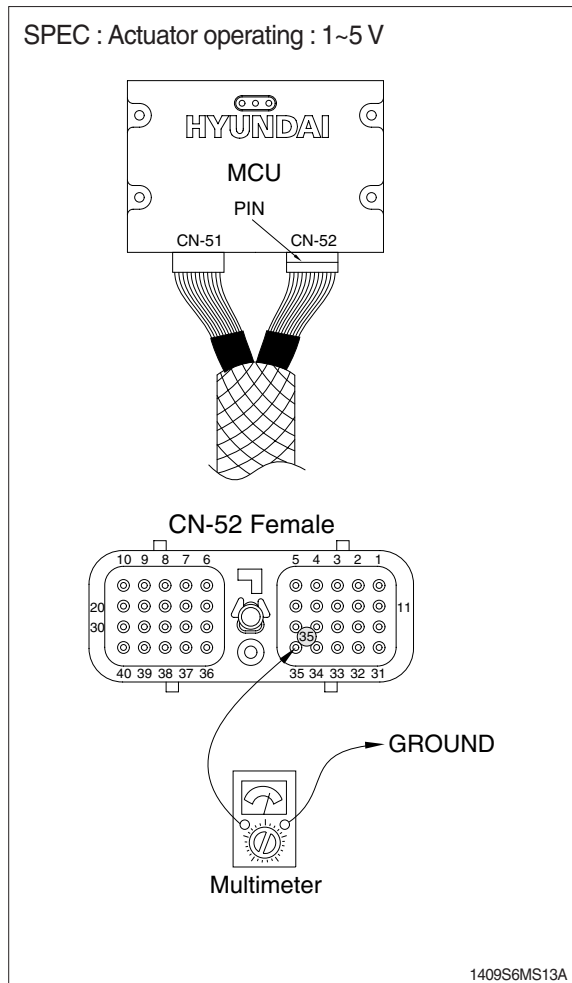


1409S6MS05A

2) TEST PROCEDURE

(1) **Test 16** : Check voltage at CN-52(35) and ground.

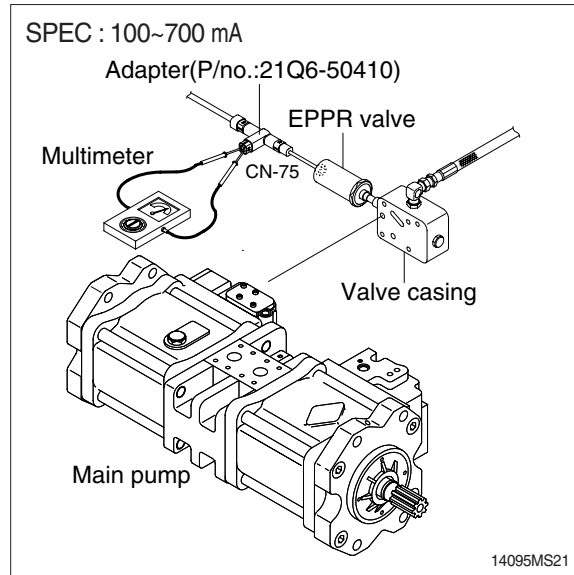
- ① Prepare 1 piece of thin sharp pin, steel or copper.
- ② Insert prepared pin to rear side of connectors : One pin to (35) of CN-52.
- ③ Starting key ON.
- ④ Check voltage as figure.



2) TEST PROCEDURE

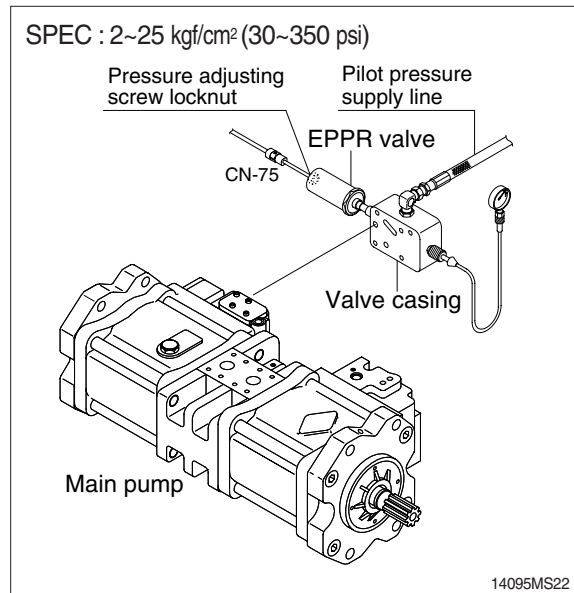
(1) Test 4 : Check electric current at EPPR valve.

- ① Disconnect connector CN-75 from EPPR valve.
- ② Insert the adapter to CN-75 and install multimeter as figure.
- ③ Start engine.
- ④ Set H-mode and cancel auto decel mode.
- ⑤ Position the accel dial at 10.
- ⑥ If rpm display approx 2050 ± 50 rpm check electric current at bucket circuit relief position.



(2) Test 5 : Check pressure at EPPR valve.

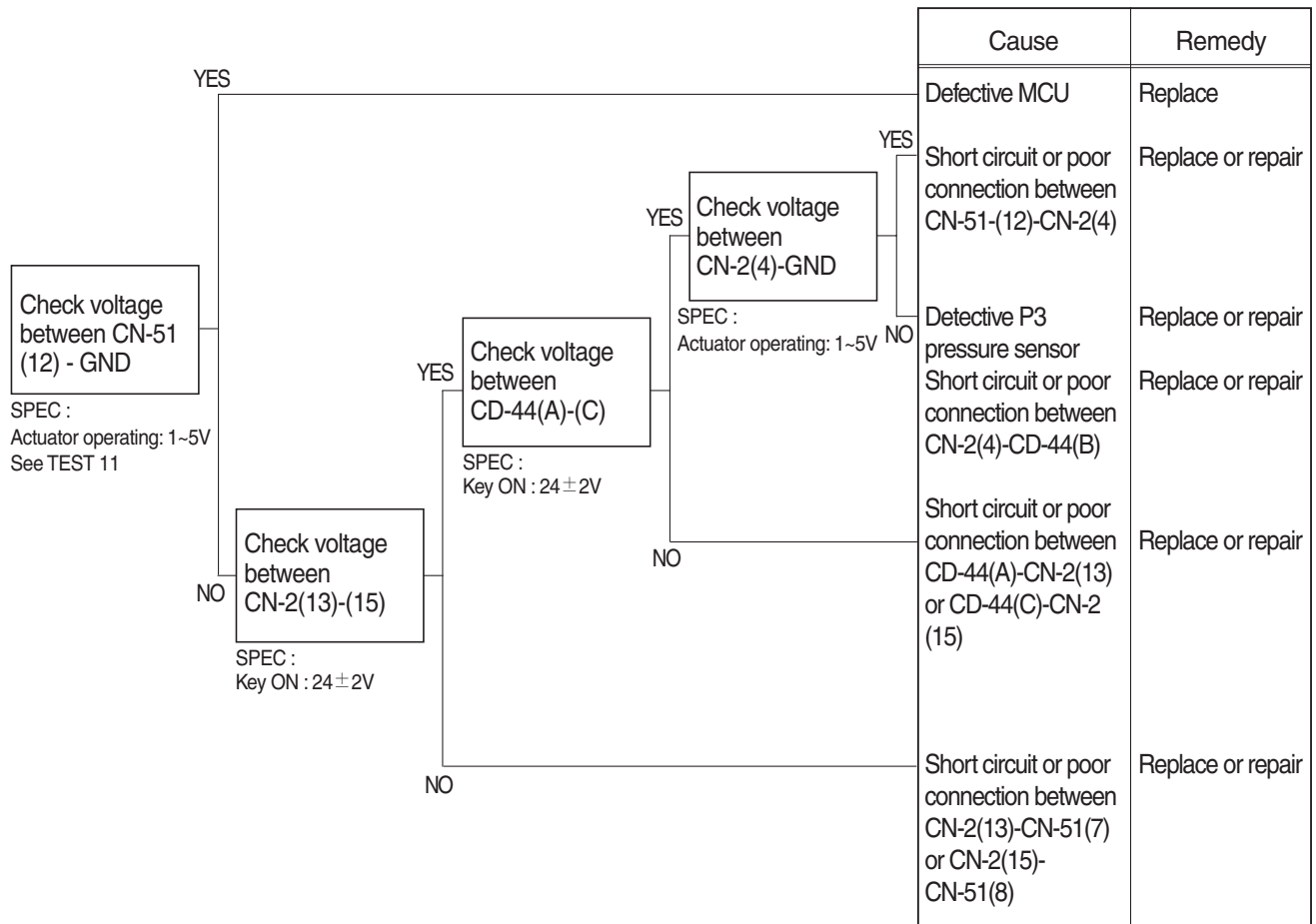
- ① Remove plug and connect pressure gauge as figure.
 - Gauge capacity : 0 to 50 kgf/cm²
(0 to 710 psi)
- ② Start engine.
- ③ Set H-mode and cancel auto decel mode.
- ④ mode.
- ⑤ Position the accel dial at 10.
If rpm display approx 2050 ± 50 rpm check pressure at relief position of bucket circuit
- ⑥ by operating bucket control lever.
- ⑦ If pressure is not correct, adjust it.
After adjust, test the machine.



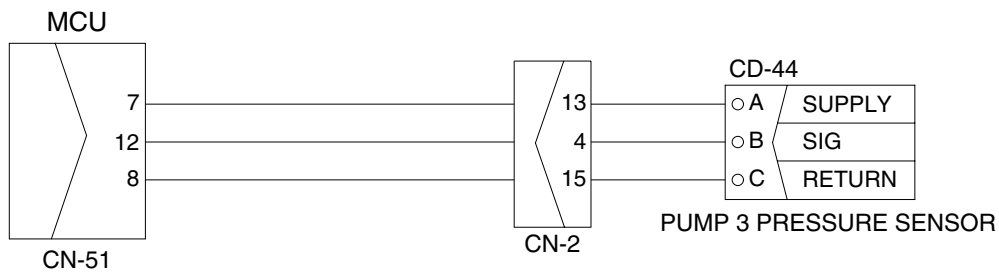
8. MALFUNCTION OF PUMP 3 PRESSURE SENSOR

※ Before carrying out below procedure, check all the related connectors are properly inserted.

1) INSPECTION PROCEDURE



Wiring diagram



■ ENGINE SPEED (CLUSTER TYPE 2)

(1) Measure the engine speed at each power mode

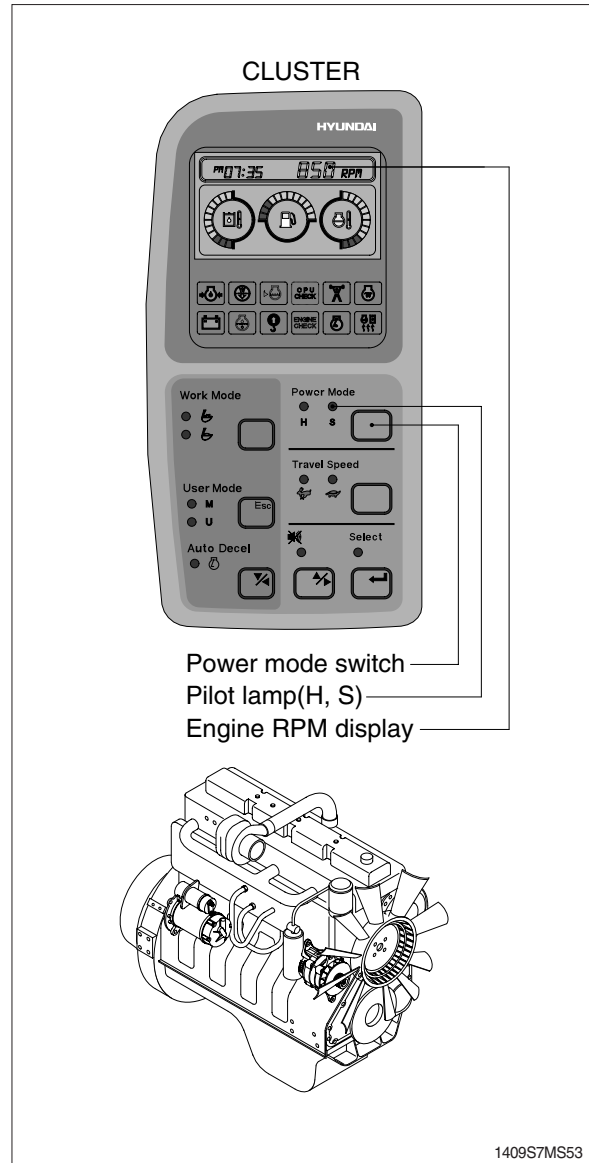
※ The engine speed at each power mode must meet standard RPM; if not, all other operational performance data will be unreliable. It is essential to perform this test first.

(2) Preparation

- ① Warm up the machine, until the engine coolant temperature reaches 50°C or more, and the hydraulic oil is 50±5°C.
- ② Set the accel dial at 10 (Max) position.
- ③ Measure the engine RPM.

(3) Measurement

- ① Start the engine. The engine will run at start idle speed. Measure engine speed with a engine rpm display.
- ② Measure and record the engine speed at each mode (M, H, S).
- ③ Select the M-mode.
- ④ Lightly operate the bucket control lever a few times, then return the control lever to neutral; The engine will automatically enter the auto-idle speed after 4 seconds.
- ⑤ Measure and record the auto deceleration speed.



(4) Evaluation

The measured speeds should meet the following specifications.

Unit : rpm

Model	Engine speed	Standard	Remarks
R140LC-9S	Start idle	1050±100	
	M mode	2150±50	
	H mode	2050±50	
	S mode	1950±50	
	Auto decel	1150±100	
	One touch decel	1050±100	

Condition : Set the accel dial at 10 (Max) position.

11) CONTROL LEVER OPERATING FORCE

- (1) Use a spring scale to measure the maximum resistance of each control lever at the middle of the grip.

(2) Preparation

- ① Keep the hydraulic oil temperature at $50 \pm 5^{\circ}\text{C}$.

(3) Measurement

- ① Start the engine.
- ② Select the following switch positions.
 - Power mode switch: P mode
- ③ Operate each boom, arm, bucket and swing lever at full stroke and measure the maximum operating force for each.
- ④ Lower the bucket to the ground to raise one track off the ground. Operate the travel lever at full stroke and measure the maximum operating force required. When finished, lower the track and then jack-up the other track.
- ⑤ Repeat steps ③ and ④ three times and calculate the average values.

(4) Evaluation

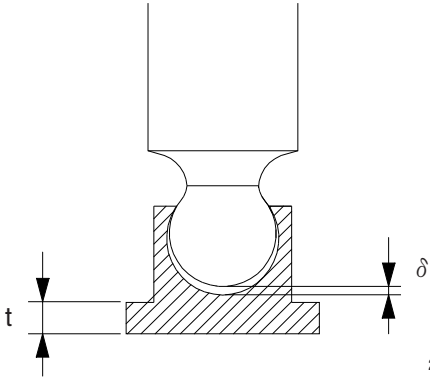
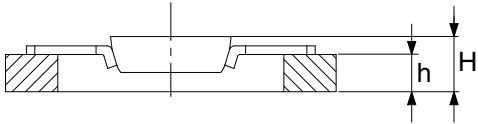
The measured operating force should be within the following specifications.

Unit : kgf

Model	Kind of lever	Standard	Maximum allowable	Remarks
R140LC-9S	Boom lever	1.7 or below	2.0	
	Arm lever	1.7 or below	2.0	
	Bucket lever	1.4 or below	2.0	
	Swing lever	1.4 or below	2.0	
	Travel lever	2.1 or below	3.15	

3. SWING DEVICE

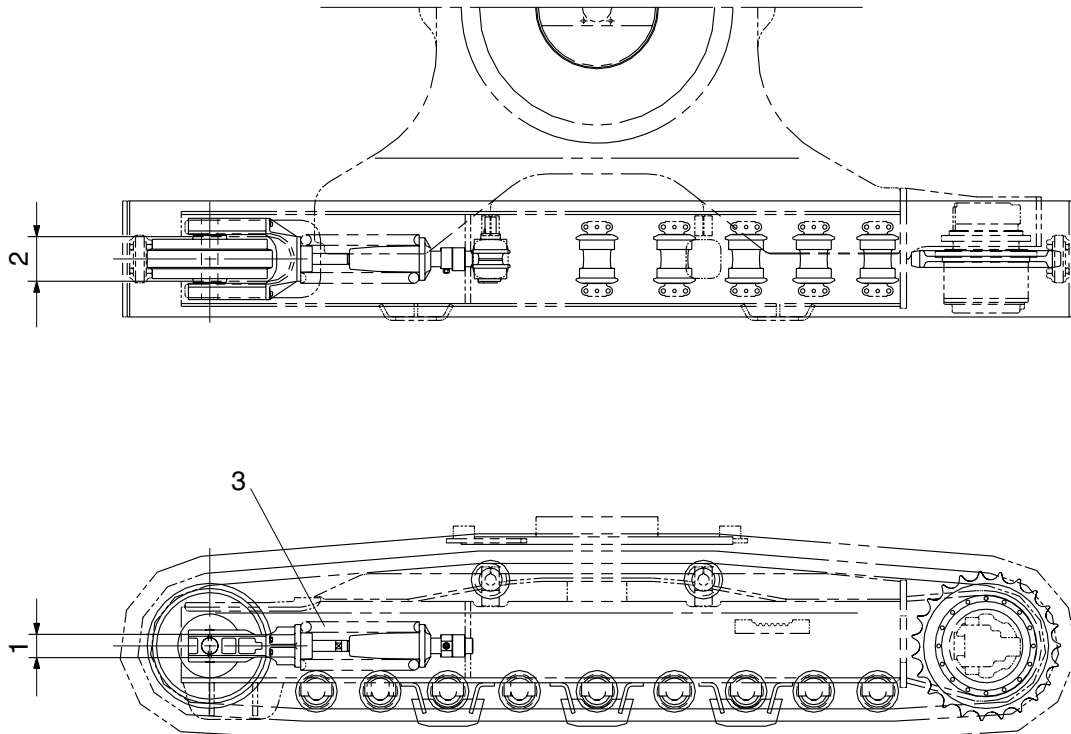
1) WEARING PARTS

Inspection item	Standard dimension	Standard dimension	Counter measures
Clearance between piston and cylinder block bore	0.028	0.058	Replace piston or cylinder block
Play between piston and shoe caulking section (δ)	0	0.3	Replace assembly of piston and shoe
Thickness of shoe (t)	5.5	5.3	Replace assembly of piston and shoe
Combined height of retainer plate and spherical bushing (H-h)	6.5	6.0	Replace set of retainer plate and spherical bushing
Thickness of friction plate	4.0	3.6	Replace
 <p>2507A7MS04</p>		 <p>2507A7MS05</p>	

2) SLIDING PARTS

Part name	Standard roughness	Allowable roughness	Remark
Shoe	0.8-Z (Ra=0.2) (LAPPING)	3-Z (Ra=0.8)	
Shoe plate	0.4-Z (Ra=0.1) (LAPPING)	3-Z (Ra=0.8)	
Cylinder	1.6-Z (Ra=0.4) (LAPPING)	12.5-Z (Ra=3.2)	
Valve plate	0.8-Z (Ra=0.2) (LAPPING)	6.3-Z (Ra=1.6)	

5) TRACK FRAME AND RECOIL SPRING



21037MS05

Unit : mm

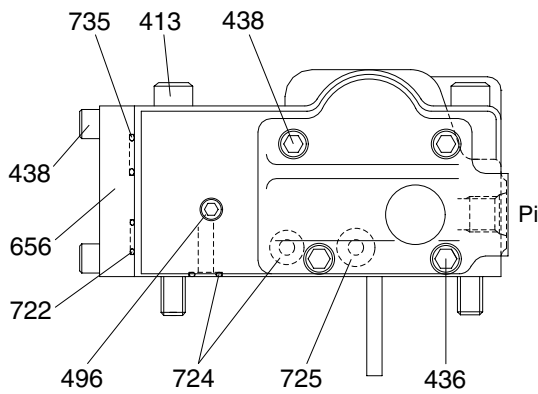
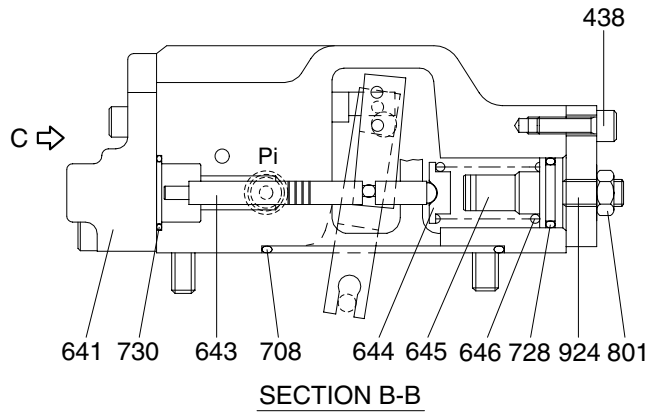
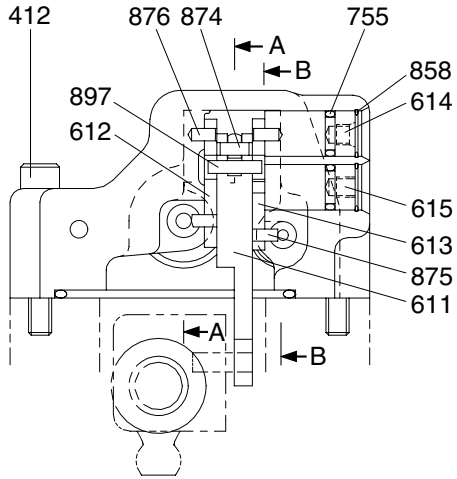
No.	Check item	Criteria				Remedy	
			Standard size	Tolerance	Repair limit		
1	Vertical width of idler guide	Track frame	103	+2 0	107	Rebuild or replace	
		Idler support	100	0 -0.5	98		
2	Horizontal width of idler guide	Track frame	192	+2 0	196		
		Idler support	190	-	188		
3	Recoil spring	Standard size			Repair limit		Replace
		Free length	Installation length	Installation load	Free length	Installation load	
		∅ 192 × 470	405	8,497kg	-	6,978kg	

2) INSTALL

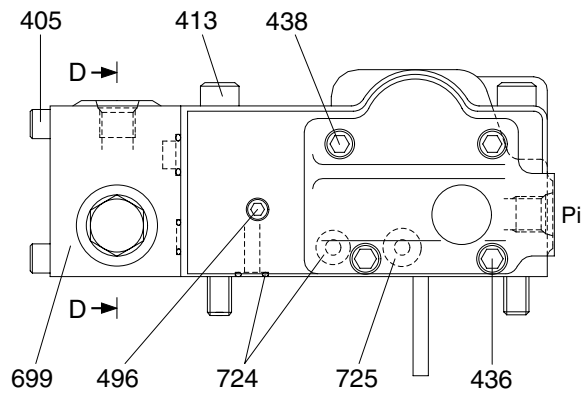
- (1) Carry out installation in the reverse order to removal.
- (2) Remove the suction strainer and clean it.
- (3) Replace return filter with new one.
- (4) Remove breather and clean it.
- (5) After adding oil to the hydraulic tank to the specified level.
- (6) Bleed the air from the hydraulic pump.
 - 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) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

3. REGULATOR

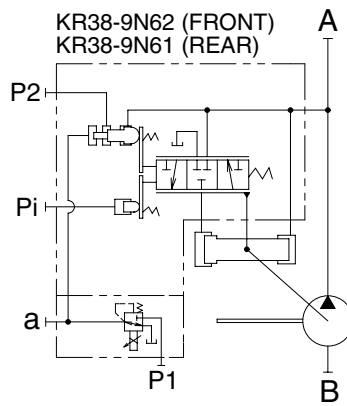
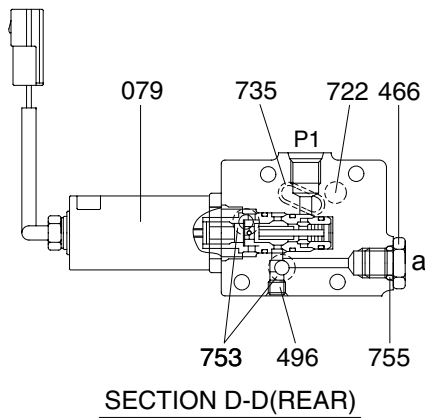
1) STRUCTURE (1/2)



VIEW C (FRONT)

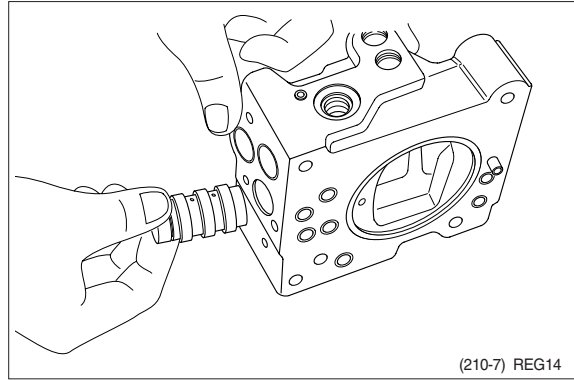


VIEW C (REAR)



- (11) Fit set spring (655) to spool hole and put compensating piston (621) and piston case (622) into compensating hole.

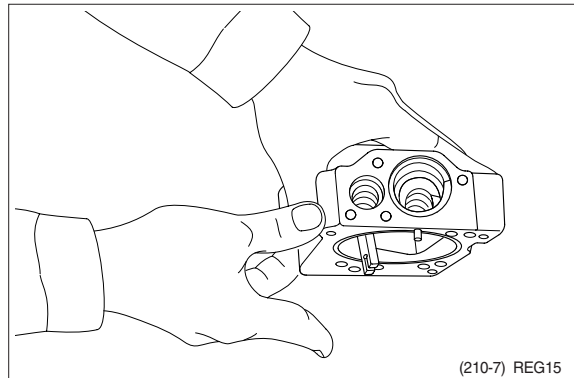
Fit pilot cover (641) and tighten it with hexagonal socket head screws (436, 438).



(210-7) REG14

- (12) Put spring seat (644), pilot spring (646) and adjusting ring (Q, 645) into pilot hole. Then fix spring seat (624), inner spring (626) and outer spring (625) into compensating hole.

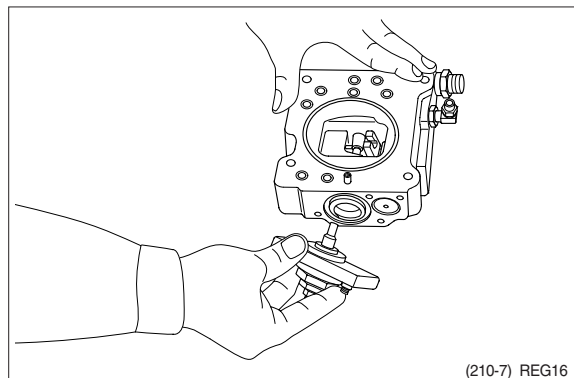
※ When fitting spring seat, take care not to mistake direction of spring seat.



(210-7) REG15

- (13) Install cover (C, 629) fitted with adjusting screws (628), adjusting ring (C, 627), lock nut (630), hexagon nut (801) and adjusting screw (924).

Then tighten them with hexagonal socket head screws (438).

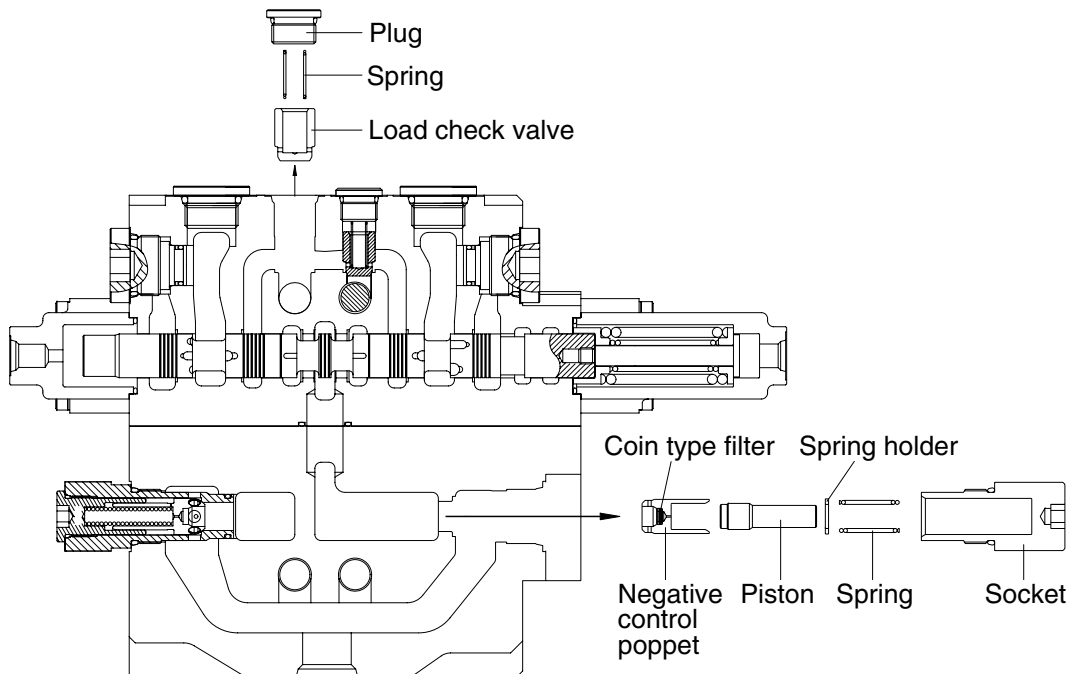


(210-7) REG16

This completes assembly.

(4) Disassembly of the load check valve and the negative relief valve

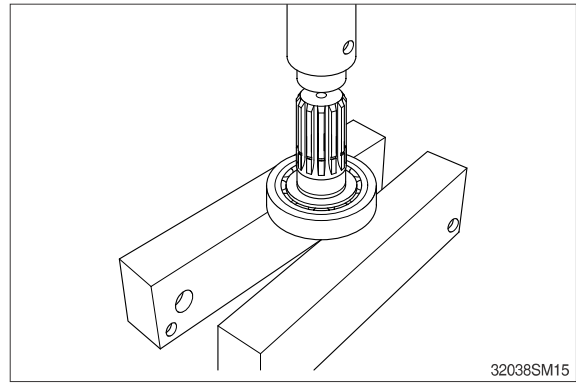
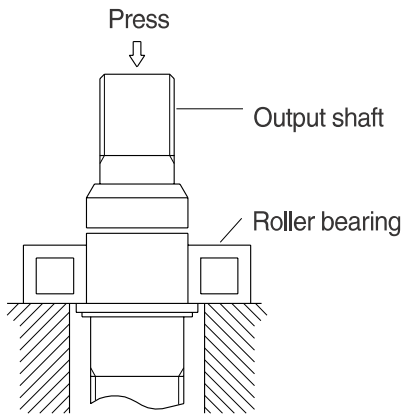
- ① The load check valve
 - a. Fix the body to suitable work bench.
 - ※ Pay attention not to damage the body.
 - b. Loosen the plug (hexagon wrench : 10 mm).
 - c. Remove the spring and the load check valve with pincers or magnet.
- ② The negative relief valve
 - a. Loosen the socket (spanner : 32 mm).
 - b. Remove the spring, spring holder, piston and negative control poppet.



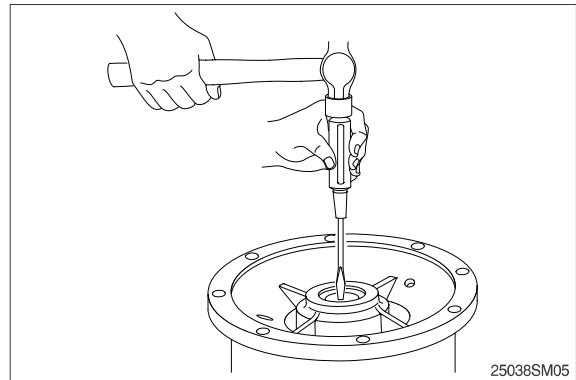
14W98MC13

(13) Remove the cone of roller bearing (3) by press.

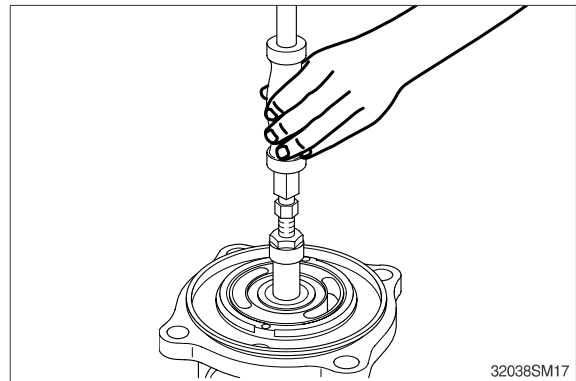
※ Do not reuse bearings.



(14) Remove bushing (6) and oil seal (2) from body (1).



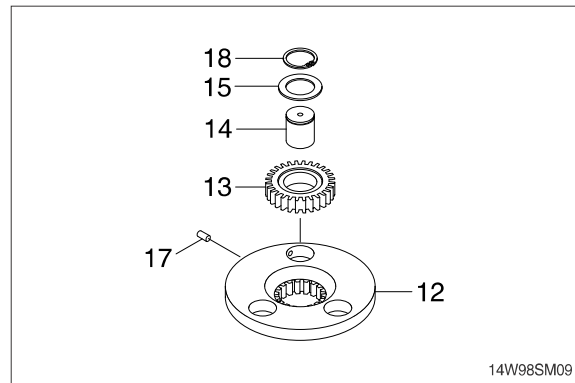
(15) Remove the needle bearing (21) from the rear cover (20) by using slide hammer bearing puller.



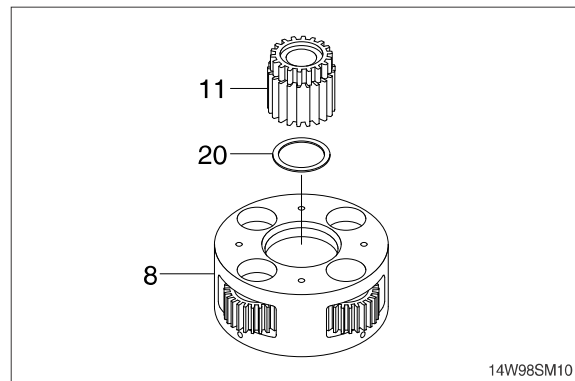
(5) Disassembling carrier 1 (12) assembly.

- ① Remove stop ring (18).
- ② Remove thrust washer (15) and planet gear 1(13) from the carrier 1 (12).
- ③ Using M8 solid drill, crush spring pin (17) so that the pin 1 (14) can be removed by hammering.

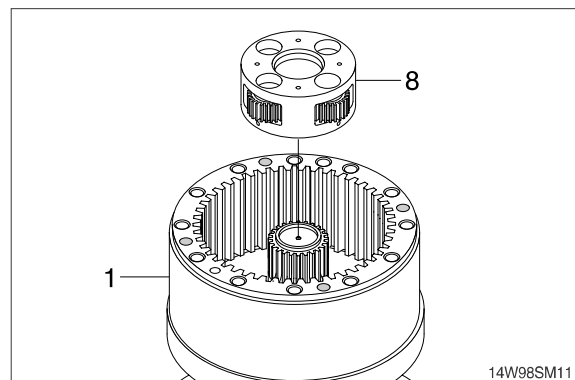
- * Do not reuse spring pin (17).
- * Do not remove pin 1 (14), carrier 1 (12) and spring pin (17) but in case of replacement.
- * Put matching marks on the planet gear 1 (13) and the pin 1 (14) for easy reassembly.



(6) Remove sun gear 2 (11) and side plate 1 (20) from carrier 2 (8).



(7) Remove carrier 2 (8) assembly from casing (1).



(9) Remove plug (29) (1EA), plug (27) (2EA) using 4 mm, 6 mm hexagon wrench.



125LCR8SM11

(10) Remove plug (25) using 32 mm socket wrench and separate spring ; spring (24) and check valve (23). (same for the set on opposite side)



125LCR8SM12

(11) Separate each one of O-ring (40) and spring (38).

- ※ Do not lose spring.
- ※ Do not mix spring with other springs.



125LCR8SM13

(12) Remove spool (36) and spring seat (37).



125LCR8SM14

(27) Apply grease on steel side of valve plate (20) to prevent plate from sliding.

Assemble valve plate with the copper side facing upwards.

- ※ Pay attention to the assembly direction.
- ※ Take care not to damage sliding surface.



125LCR8SM49

(28) Assemble valve casing by matching its holes and pins of casing and parking piston. And tighten bolt; socket (42) (4EA) using 12 mm hexagon wrench.

- ※ Tightening torque : 17.5 kgf · m (127 lbf · ft)
- ※ Make sure valve plate stays in place.
- ※ When tightening bolts, make sure mating surfaces between casing and valve casing maintain parallel to each other.



125LCR8SM50

(29) Assemble relief valve assembly (31) using 36 mm socket wrench in valve casing.

- ※ Spread grease on O-ring part of relief valve assembly.
- ※ Tightening torque : 18 kgf · m (130 lbf · ft)



125LCR8SM51

(30) Assemble snap ring (4) in shaft by using snap ring plier.



125LCR8SM52

3) ASSEMBLY

※ Even though assembly is accomplished by reversing disassembly steps, be careful of the following.

- ① Repair the damaged part when disassembling and prepare parts for exchange in advance.
- ② All parts should be cleaned with cleaner, dried with compressed air.
- ③ Sliding surface, O-ring, bearing and oil seal should be lubricated with clean hydraulic oil, prior to final assembly.
- ④ Replacement of O-ring and oil seal with new parts is generally recommended.
- ⑤ Use a torque wrench to make sure that assembly fasteners are tightened to specified values.
- ⑥ When assembling bolt, spread loctite.

Carrier No.1 sub assembly

- (1) After heating the carrier No.1 (17), assemble carrier pin No.1 (21) to the side without the hole.



125LCR8SM84

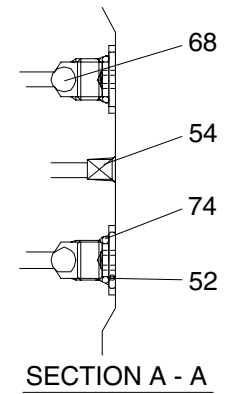
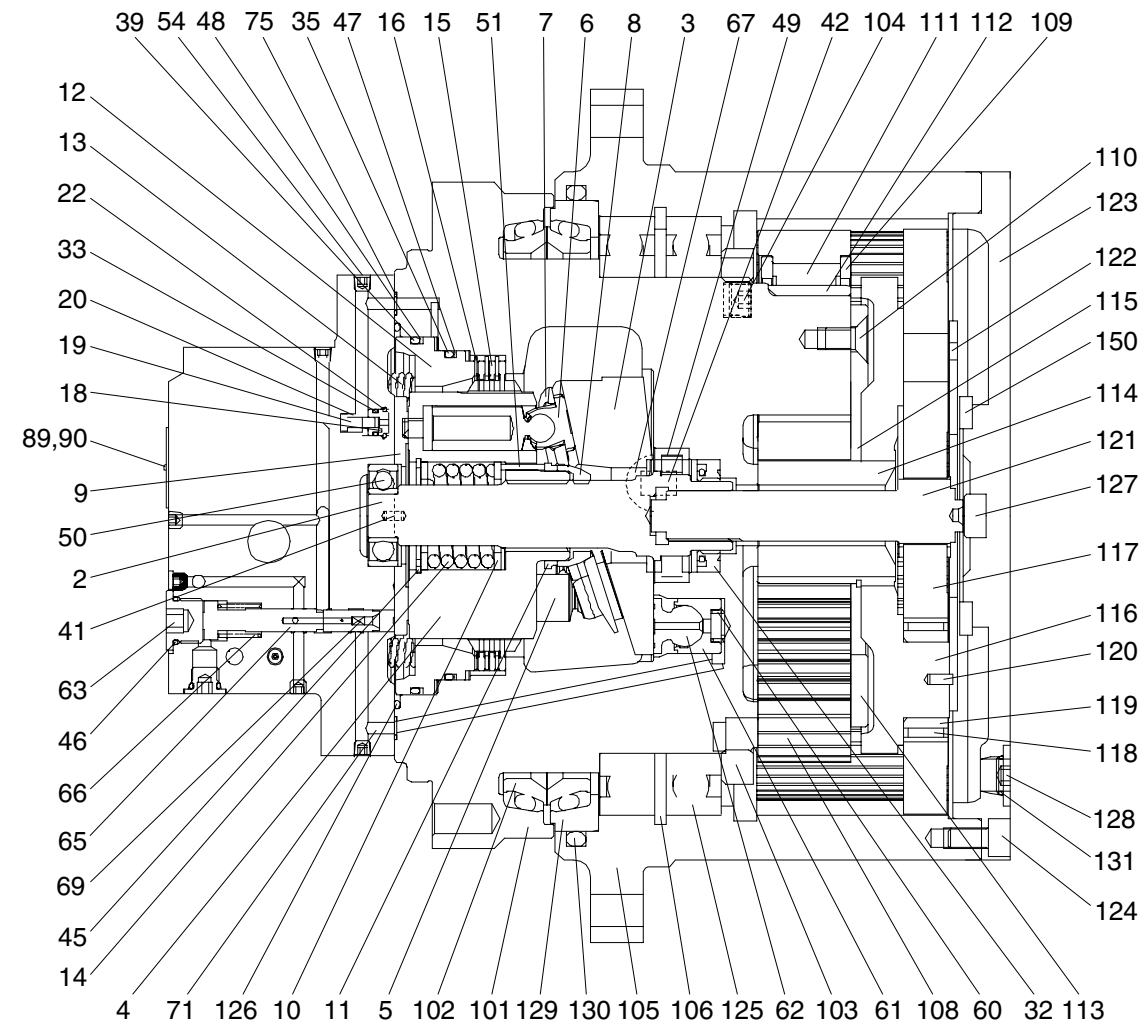
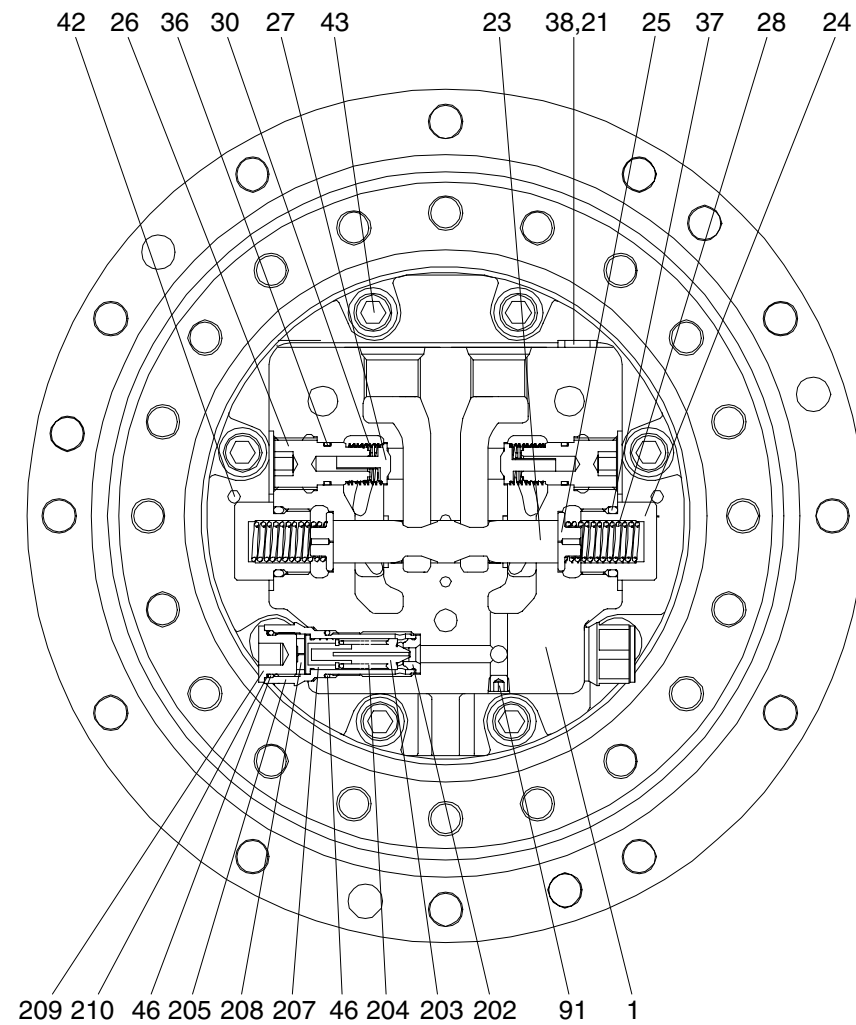
- (2) After drilling $\varnothing 6$ hole, assemble spring pin (15).(3 pcs)



125LCR8SM85

2. TRAVEL MOTOR

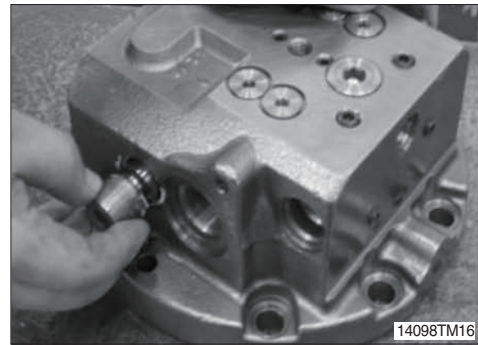
1) STRUCTURE



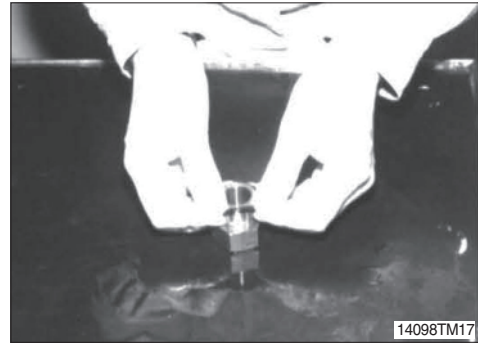
1	Rear flange	19	Valve	39	O-ring	65	2 Speed spool	108	Planetary gear	125	Angular bearing
2	Shaft	20	Spring	41	Parallel pin	66	2 Speed spring	109	Thrust washer	126	O-ring
3	Swash plate	21	Plug	42	Parallel pin	67	Pivot	110	Screw	127	Thrust washer
4	Cylinder block	22	Ring	43	Socket bolt	68	Steel ball	111	Needle bearing	128	Plug
5	Piston	23	Main spool	45	Snap ring	69	Set screw	112	Collar	129	Seal ring
6	Shoe	24	Main plug	46	O-ring	71	Orifice	113	Thrust plate	130	O-ring
7	Retainer plate	25	Retainer spring	47	Back up-ring	74	O-ring	114	Sun gear	131	O-ring
8	Thrust ball	26	Check plug	48	Back up-ring	75	O-ring	115	Snap ring	150	Thrust plate
9	Timing plate	27	Check valve	49	Roller bearing	89	Name plate	116	Holder	205	Body
10	Washer	28	Main spring	50	Ball bearing	90	Set screw	117	Planetary gear	206	Shim
11	Washer-collar	30	Check spring	51	Roller	91	Plug	118	Needle bearing	207	Piston
12	Piston-parking	32	Oil seal	52	Plug	101	Spindle	119	Inner race	208	Rod
13	Spring	33	O-ring	54	Plug	102	Floating seal	120	Spring pin	209	Plug
14	Spring	35	O-ring	60	Spring	103	Nut ring	121	Drive gear	210	Back up-ring
15	Friction plate	36	O-ring	61	Piston	104	Plug	122	Thrust plate		
16	Mating plate	37	O-ring	62	Shoe	105	Hub	123	Cover		
18	Seat valve	38	O-ring	63	Plug	106	Snap ring	124	Socket bolt		

14092TM03

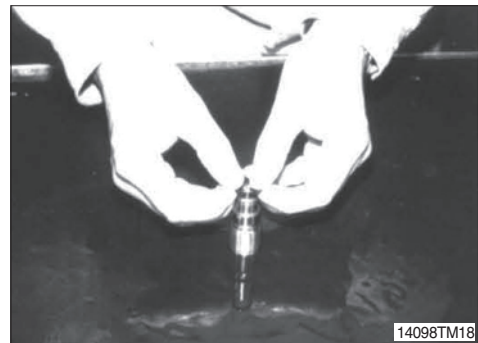
- ⑤ Remove the springs (30, 2EA), valves (27, 2EA) from rear flange (1).



- ⑥ Remove the O-ring (37) from plug (24).
※ Do not reuse the O-ring (37).

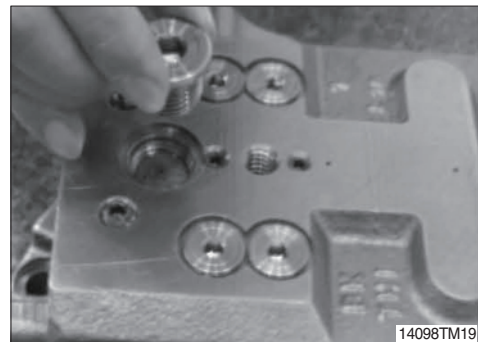


- ⑦ Remove the O-ring (36) from plug (26).
※ Do not reuse the O-ring (36).



(9) Disassembling the two speed change valve

- ① Remove the plug (63) from the rear flange (1).
※ User can work easily if sub-disassembly was done on the reversal table.
※ Tools
· Hexagon wrench 10



⑦ Install spring retainer (25) and spring (28) into the plug (24).

⑧ Install plug (24) into the rear flange (1).

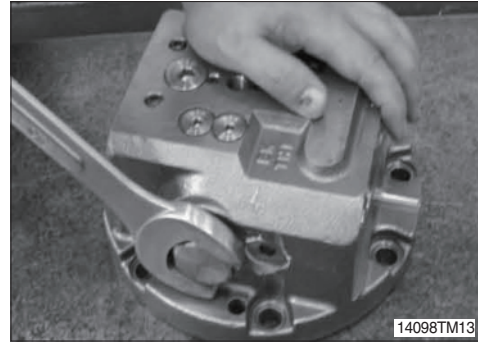
⑨ Tighten the plug (24) to the required torque.

※ Tightening torque : $36 \pm 5.4 \text{ kgf} \cdot \text{m}$ ($260 \pm 39 \text{ lbf} \cdot \text{ft}$)

※ Socket (#36) / Torque for hexagon wrench.

※ Tools

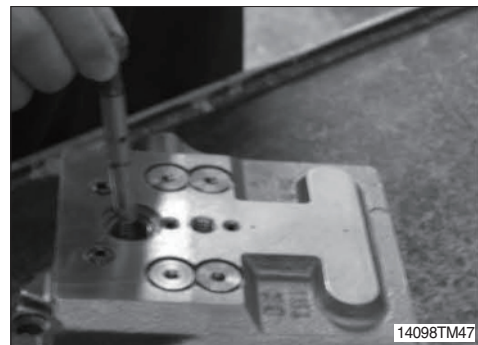
- Hexagon socket 36
- Torque wrench



(2) Reassemble the two speed change valve

① Install spring (66) into the valve (65).

② Insert the valve (65) into the rear flange (1).

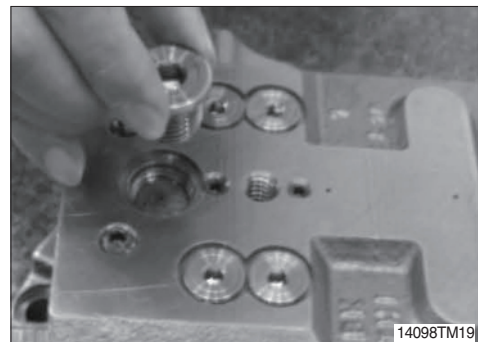


③ Insert a plug (63) into the rear flange (1).

※ Tightening torque : $13 \pm 2.6 \text{ kgf} \cdot \text{m}$ ($94 \pm 18.8 \text{ lbf} \cdot \text{ft}$)

※ Tools

- Adapter for hexagon wrench 10
- Torque wrench



(3) Reassemble the parking brake valve

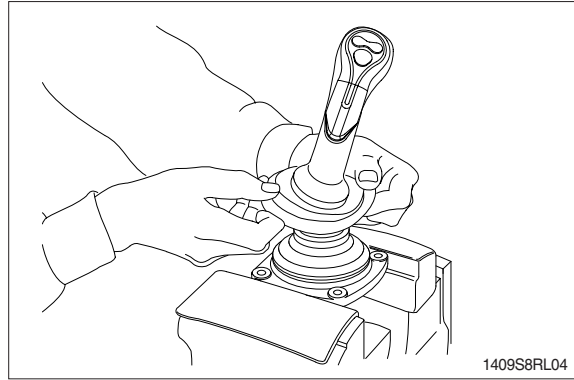
① Install O-ring (33) on the valve seat (18).

※ Do not reuse the O-ring (33).

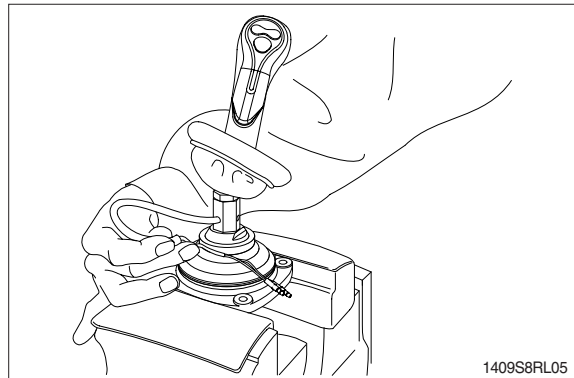


3) DISASSEMBLY

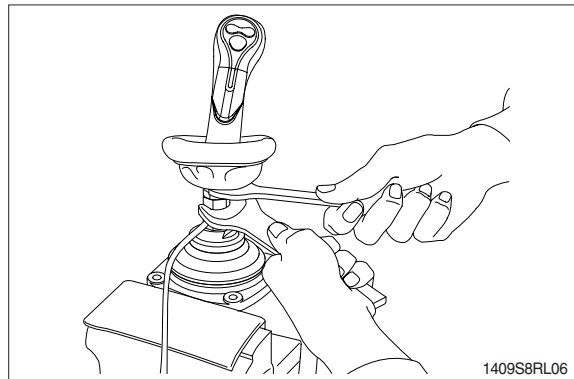
- (1) Clean pilot valve with kerosene.
 - ※ Put blind plugs into all ports
- (2) Fix pilot valve in a vise with copper (or lead) sheets.
- (3) Remove end of boot (25) from case (1) and take it out upwards.



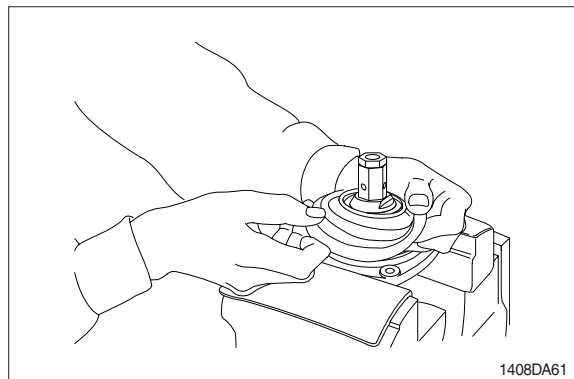
- ※ For valve with switch, remove cord also through hole of casing.



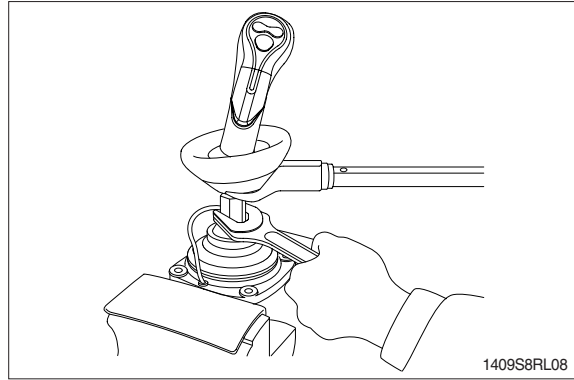
- (4) Loosen lock nut (21) and adjusting nut (20) with spanners on them respectively, and take out handle section as one body.



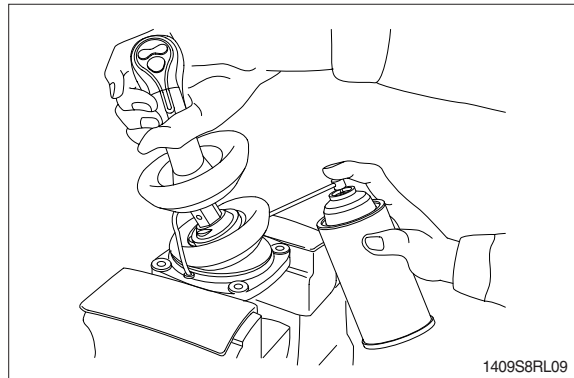
- (5) Remove the boot (17).



(17) Determine handle direction, tighten lock nut (21) to specified torque to fix handle.

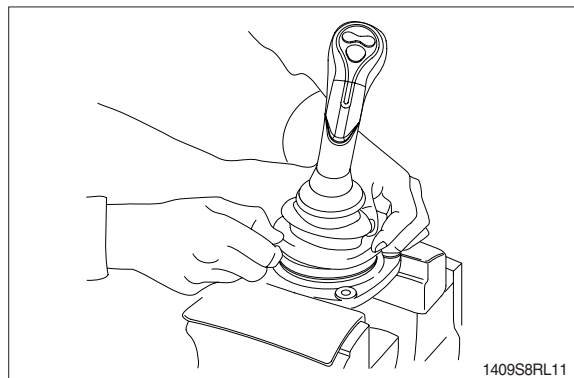


(18) Apply grease to rotating section of joint and contacting faces of disk and push rod.



(19) Assemble lower end of bellows to casing.

(20) Inject volatile rust-preventives through all ports and then put blind plugs in ports.



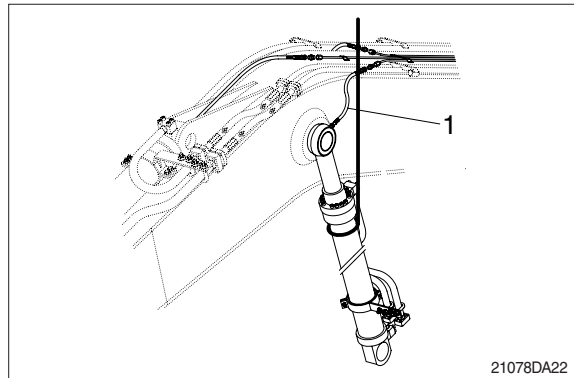
3) BOOM CYLINDER

(1) Removal

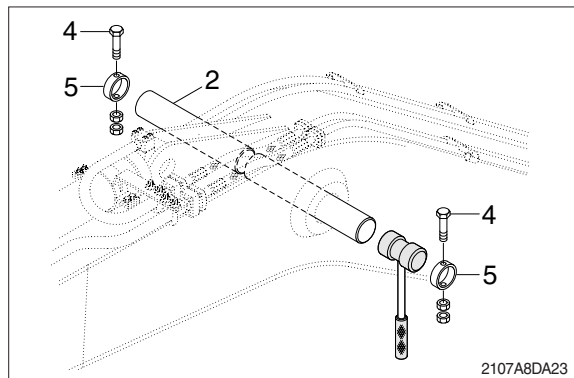
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

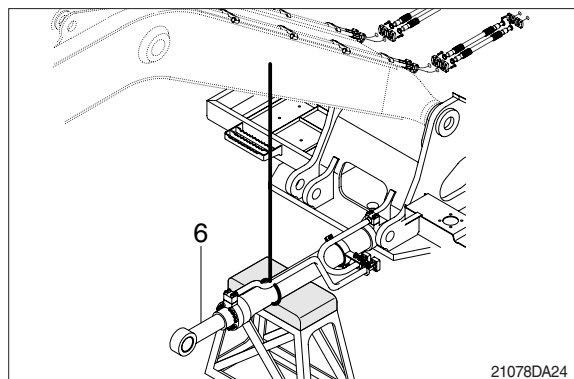
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.
- ① Disconnect greasing hoses (1).
 - ② Sling boom cylinder assembly.



- ③ Remove bolt (4), stopper (5) and pull out pin (2).
- ※ Tie the rod with wire to prevent it from coming out.



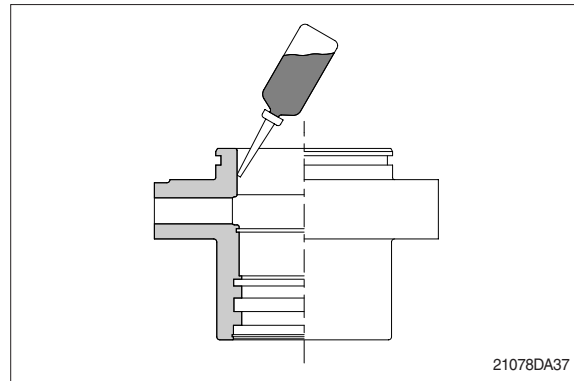
- ④ Lower the boom cylinder assembly (6) on a stand.



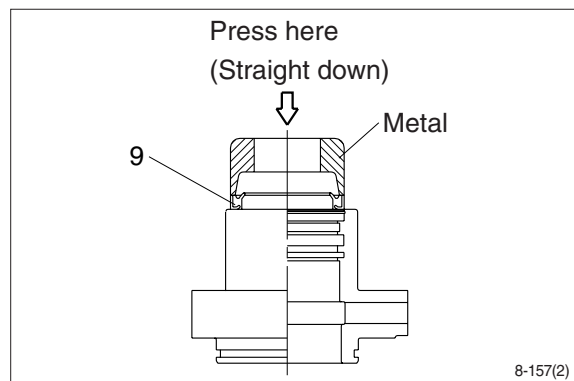
3) ASSEMBLY

(1) Assemble cylinder head assembly

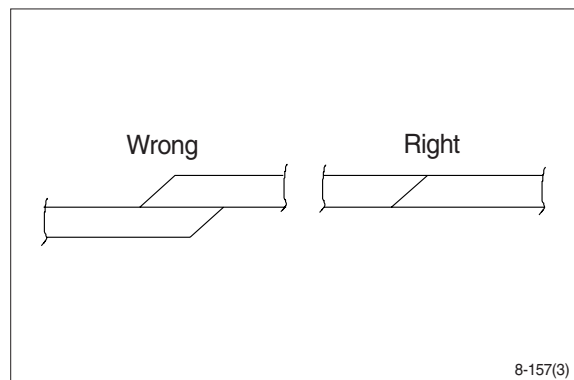
- ※ Check for scratches or rough surfaces if found smooth with an oil stone.
- ① Coat the inner face of gland (3) with hydraulic oil.



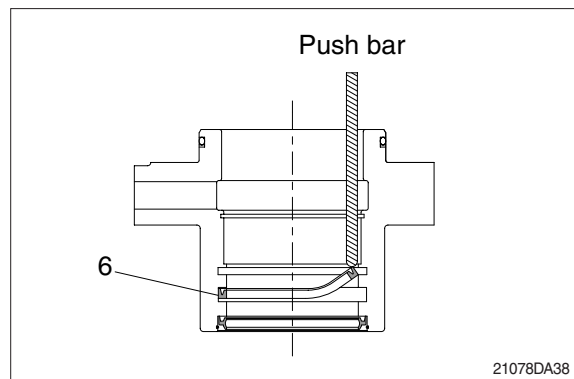
- ② Coat dust wiper (9) with grease and fit dust wiper (9) to the bottom of the hole of dust seal.
At this time, press a pad metal to the metal ring of dust seal.
- ③ Fit snap ring (10) to the stop face.



- ④ Fit back up ring (7), rod seal (6) and buffer ring (8) to corresponding grooves, in that order.
※ Coat each packing with hydraulic oil before fitting it.
※ Insert the backup ring until one side of it is inserted into groove.



- ※ Rod seal (6) has its own fitting direction. Therefore, confirm it before fitting them.
- ※ Fitting rod seal (6) upside down may damage its lip. Therefore check the correct direction that is shown in fig.

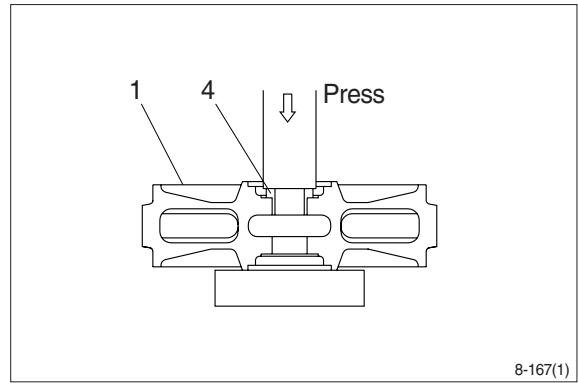


(3) Assembly

- ※ Before assembly, clean the parts.
- ※ Coat the sliding surfaces of all parts with oil.

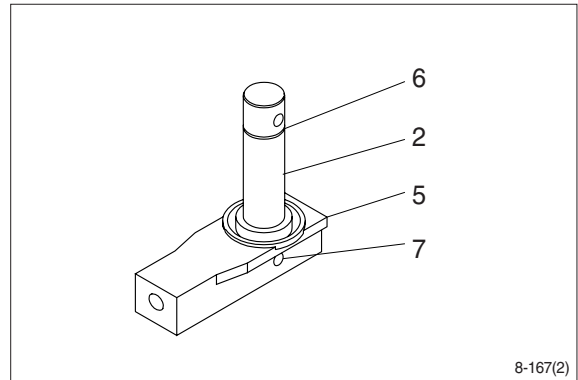
① Cool up bushing (4) fully by some dry ice and press it into shell (1).

Do not press it at the normal temperature, or not knock in with a hammer even after the cooling.

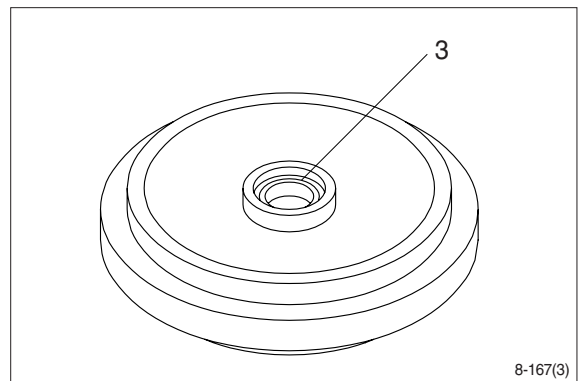


② Coat O-ring (6) with grease thinly, and install it to shaft (2).

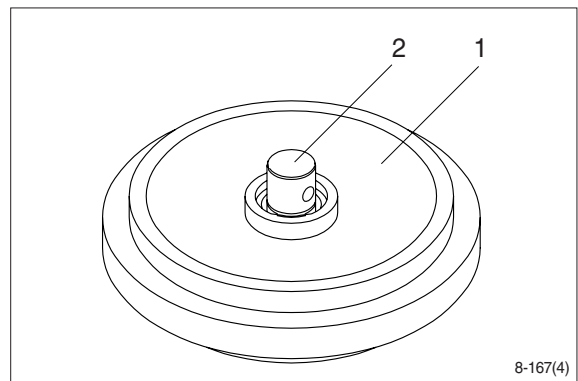
③ Insert shaft (2) into bracket (5) and drive in the spring pin (7).



④ Install seal (3) to shell (1) and bracket (5).



⑤ Install shaft (2) to shell (1).



SECTION 9 COMPONENT MOUNTING TORQUE

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