

 **HYUNDAI**
CONSTRUCTION EQUIPMENT
INDIA

SERVICE BOOK NO:
INDIA COPY: Feb 2019

HYDRAULIC EXCAVATOR

**SERVICE
MANUAL**

**Robex
130**

SMART

HYUNDAI

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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.

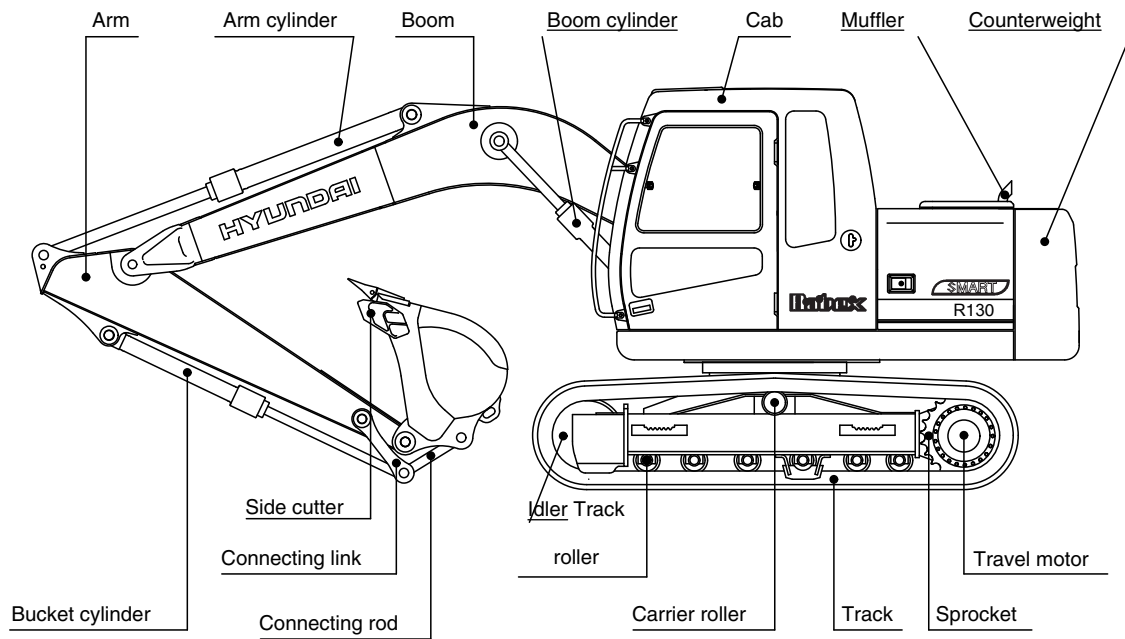
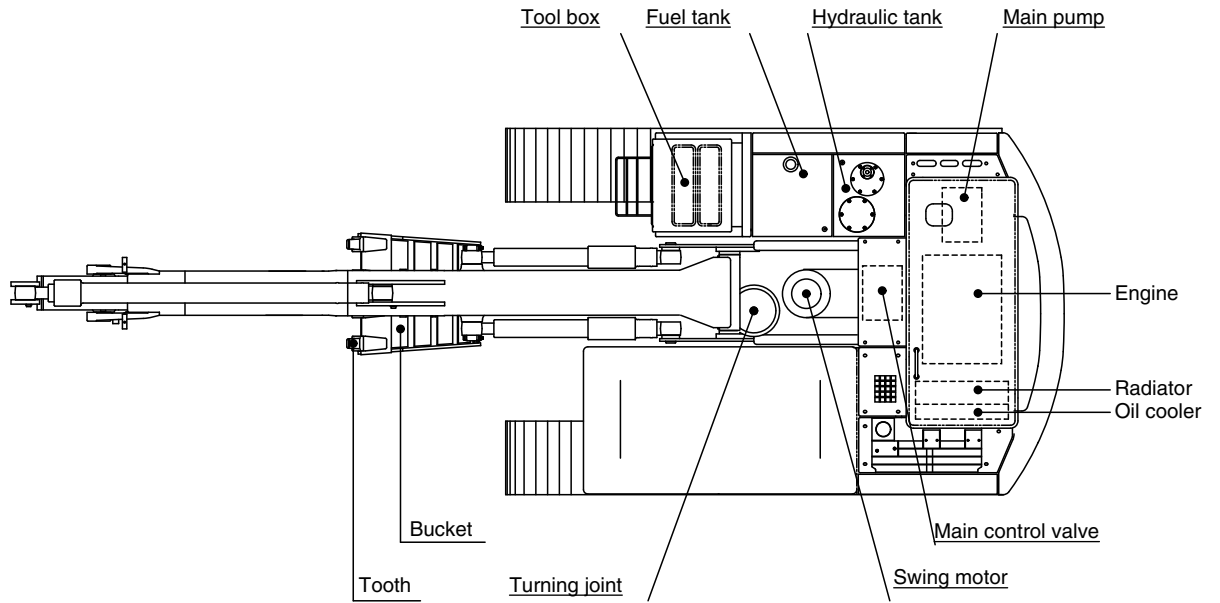
If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

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
-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

SPECIFICATIONS

1. MAJOR COMPONENT



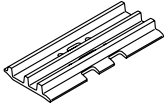
D11072SP01

7. UNDERCARRIAGE

1) TRACKS

X-leg type center frame is integrally welded with reinforced box-section track frames. The design includes dry tracks, lubricated rollers, idlers, sprockets, hydraulic track adjusters with shock absorbing springs and assembled track-type tractor shoes with triple grousers.

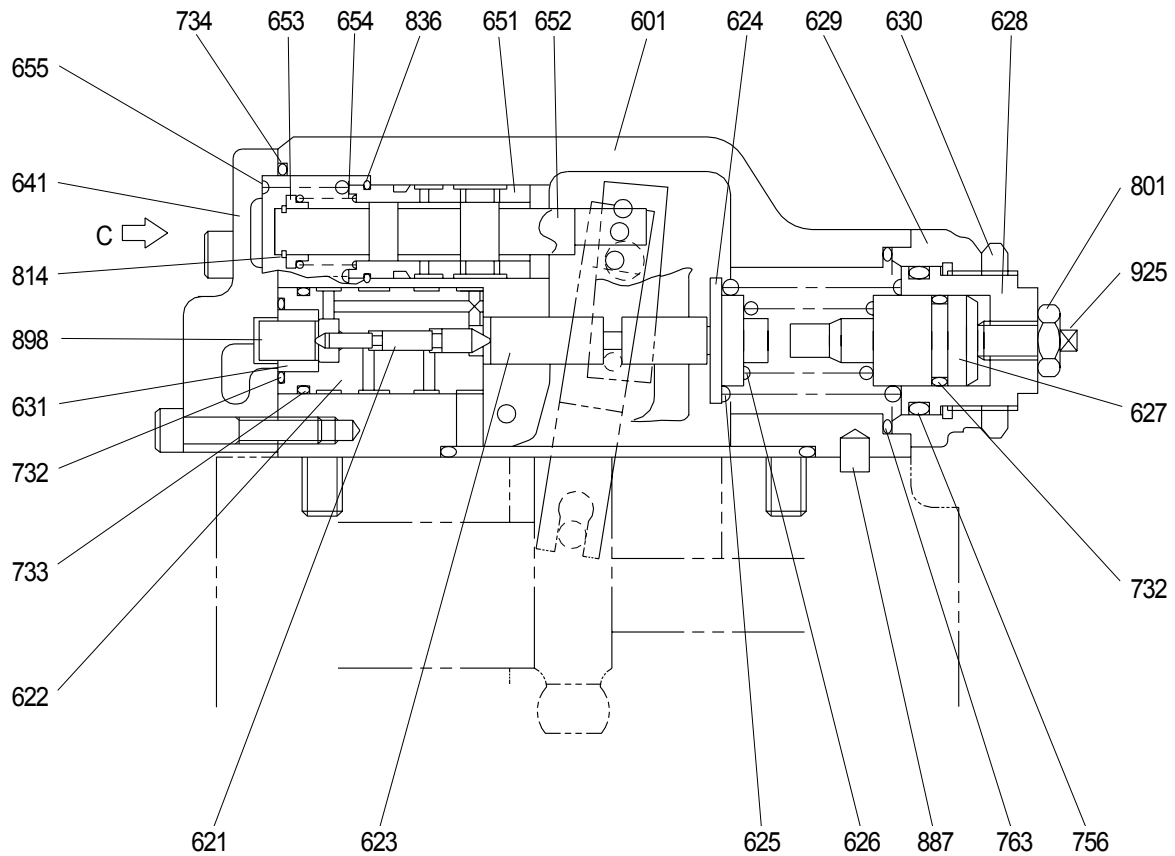
2) TYPES OF SHOES

Model	Shapes		Triple grouser		
					
R130	Shoe width	mm(in)	500(20)	600(24)	700(28)
	Operating weight	kg(lb)	11200(24690)	11500(25350)	11800(26010)
	Ground pressure	kgf/cm ² (psi)	0.39(5.55)	0.34(4.84)	0.30(4.27)
	Overall width	mm(ft-in)	2490(8' 2")	2590(8' 6")	2690(8'10")
R130	Shoe width	mm(ft-in)	500(20)	600(24)	700(28)
	Overall width	mm(ft-in)	11900(26230)	12200(26900)	12500(27560)
	Overall width	mm(ft-in)	0.42(5.97)	0.36(5.12)	0.31(4.41)
	Overall width	mm(ft-in)	2500(8' 2")	2590(8' 6")	2690(8'10")

3) NUMBER OF ROLLERS AND SHOES ON EACH SIDE

Item	Quantity
Carrier rollers	1EA
Track rollers	6EA
Track shoes	41EA

REGULATOR(2/2)



SECTION A-A

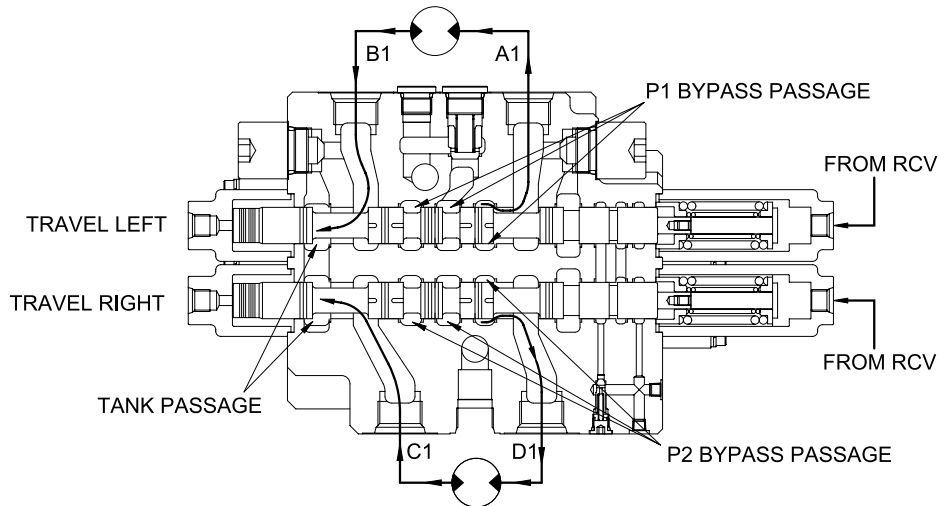
140LC-7 기타 2-5

405 Hexagon socket screw	629 Cover(C)	730 O-ring
412 Hexagon socket screw	630 Lock nut	732 O-ring
413 Hexagon socket screw	631 Sleeve, pf	733 O-ring
436 Hexagon socket screw	641 Pilot cover	734 O-ring
438 Hexagon socket screw	643 Pilot piston	735 O-ring
466 Plug	644 Spring seat(Q)	753 O-ring
496 Plug	645 Adjust stem(Q)	755 O-ring
601 Casing	646 Pilot spring	756 O-ring
611 Feed back lever	651 Sleeve	763 O-ring
612 Lever(1)	652 Spool	801 Nut
613 Lever(2)	653 Spring seat	814 Snap ring
614 Fulcrum plug	654 Return spring	836 Snap ring
615 Adjust plug	655 Set spring	858 Snap ring
621 Compensator piston	656 Block cover	874 Pin
622 Piston case	699 Valve casing	875 Pin
623 Compensator rod	708 O-ring	887 Pin
624 Spring seat(C)	722 O-ring	897 Pin
625 Outer spring	724 O-ring	898 Pin
626 Inner spring	725 O-ring	924 Set screw
627 Adjust stem(C)	728 O-ring	925 Adjust screw(QI)
628 Adjust screw(C)		

2) EACH SPOOL OPERATION

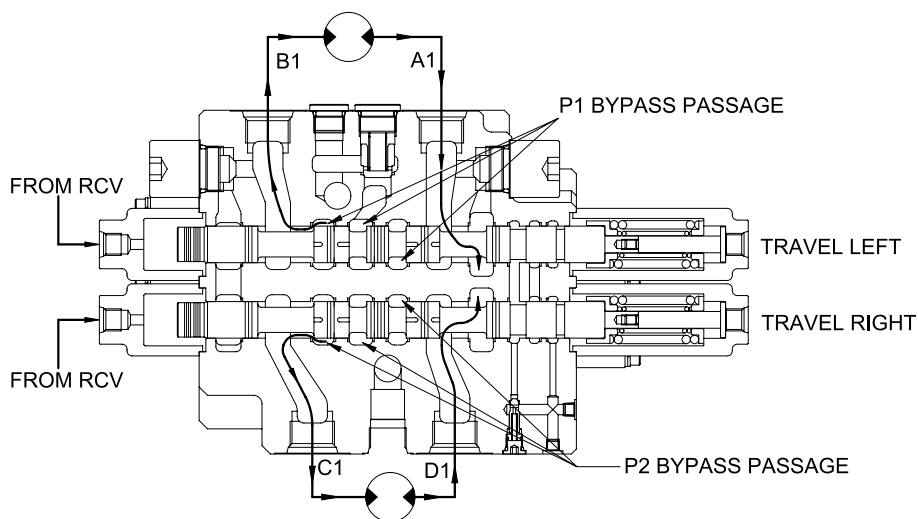
(1) TRAVEL OPERATION

① Travel forward operation



14072SF17

② Travel backward operation



14072SF18

During the travel operation, the hydraulic fluid of the pump P1 is supplied to the travel motor and the hydraulic fluid of the pump P2 is supplied to the other travel motor.

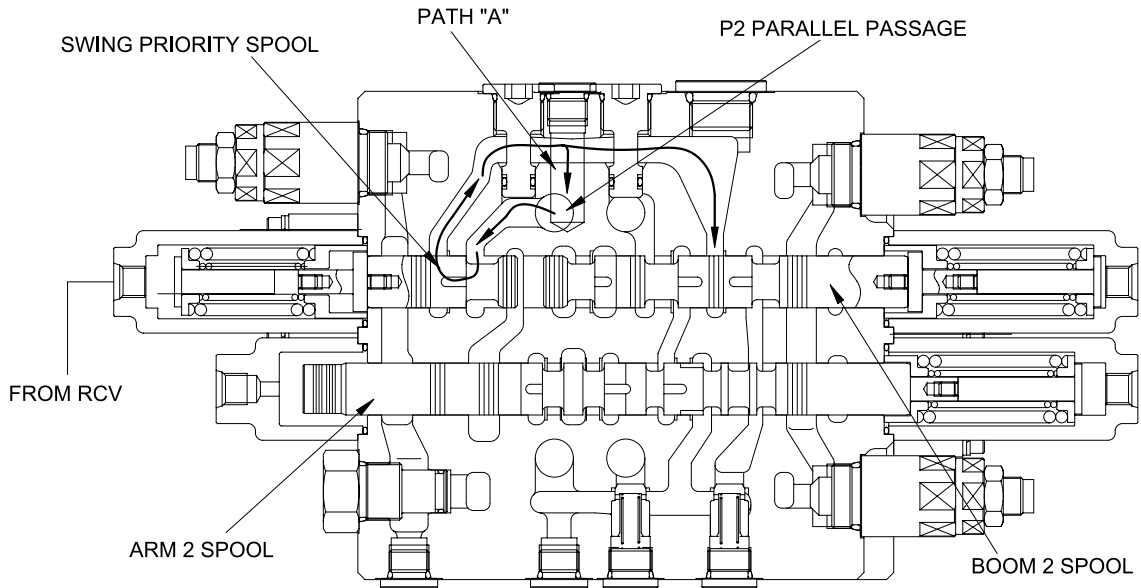
The pilot pressure from the pilot control valve is supplied to the spring side of pilot port (pa1, pd1).

And it shifts travel right and left spools in the left direction against springs. Hydraulic fluid from the pump P1 flow into the travel left spool through the bypass passage and hydraulic fluid from the pump P2 flow into the travel right spool through the bypass passage.

Then they are directed to the each travel motor through port A1 and D1. As a result, the travel motors turn and hydraulic fluid returns to the tank passage through the travel spools.

In case of the opposite operation, the operation is similar.

(7) SWING PRIORITY FUNCTION



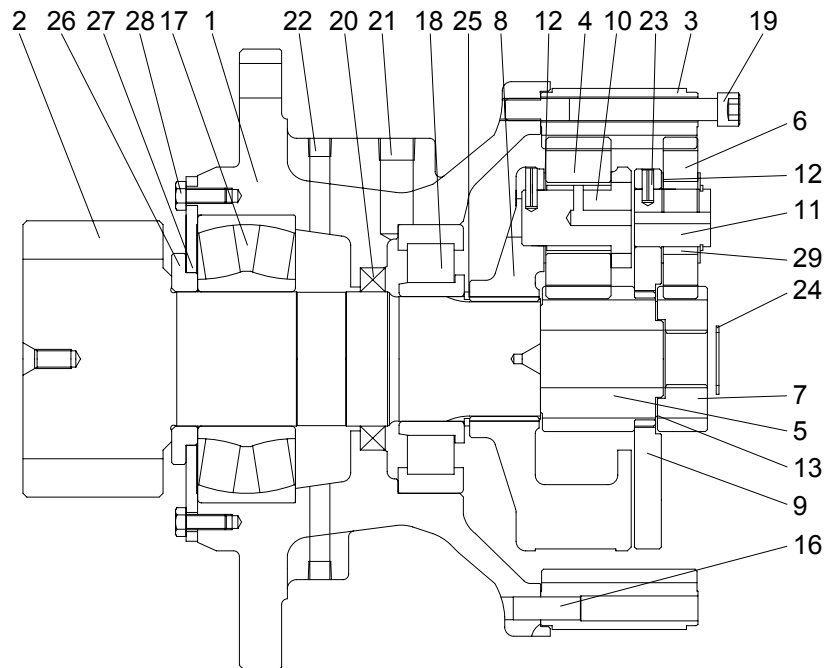
14072SF27

During swing priority operation, the pilot pressure is supplied to the port Pc3 and shift swing priority spool in the right direction.

The hydraulic fluid from P2 parallel passage flows into the parallel passage of arm1 side through swing priority spool and the passage "A" and also flows into the boom2 spool.

Due to shifting of the swing priority spool, the fluid from pump P2 flows to swing side more than next spools to make the swing operation most preferential.

2) REDUCTION GEAR



11072SM03

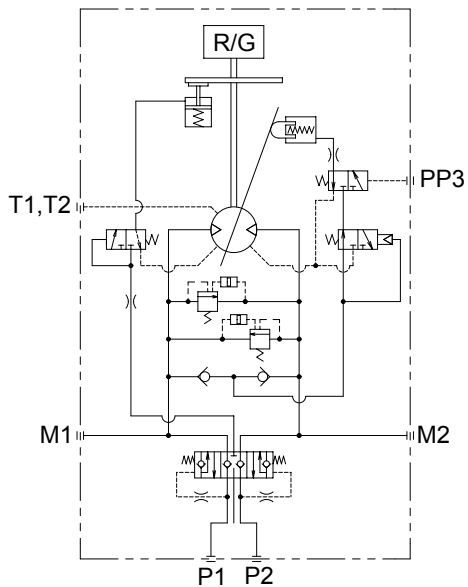
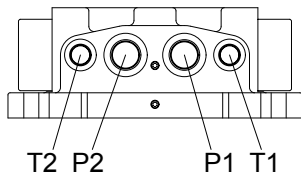
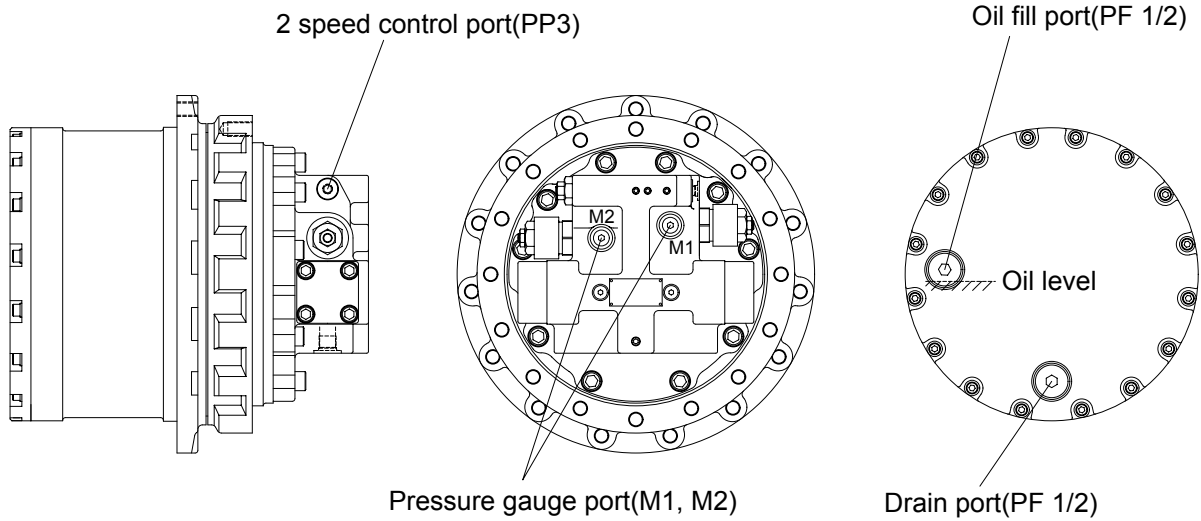
1	Casing	10	Pin No.2 assembly	21	Plug(B)
2	Drive shaft	11	Pin No.1	22	Plug(A)
3	Ring gear	12	Thrust washer(B)	23	Spring pin
4	Planet gear No.2	13	Thrust washer(A)	24	Stop ring
5	Sun gear No.2	16	Knock pin	25	Stop ring
6	Planet gear No.1	17	Sph roller bearing	26	Spacer
7	Sun gear No.1	18	Cyl roller bearing	27	Cover plate
8	Carrier No.2	19	Bolt	28	Bolt
9	Carrier No.1	20	Oil seal	29	Needle cage

GROUP 4 TRAVEL DEVICE

1. CONSTRUCTION

Travel device consists travel motor and gear box.

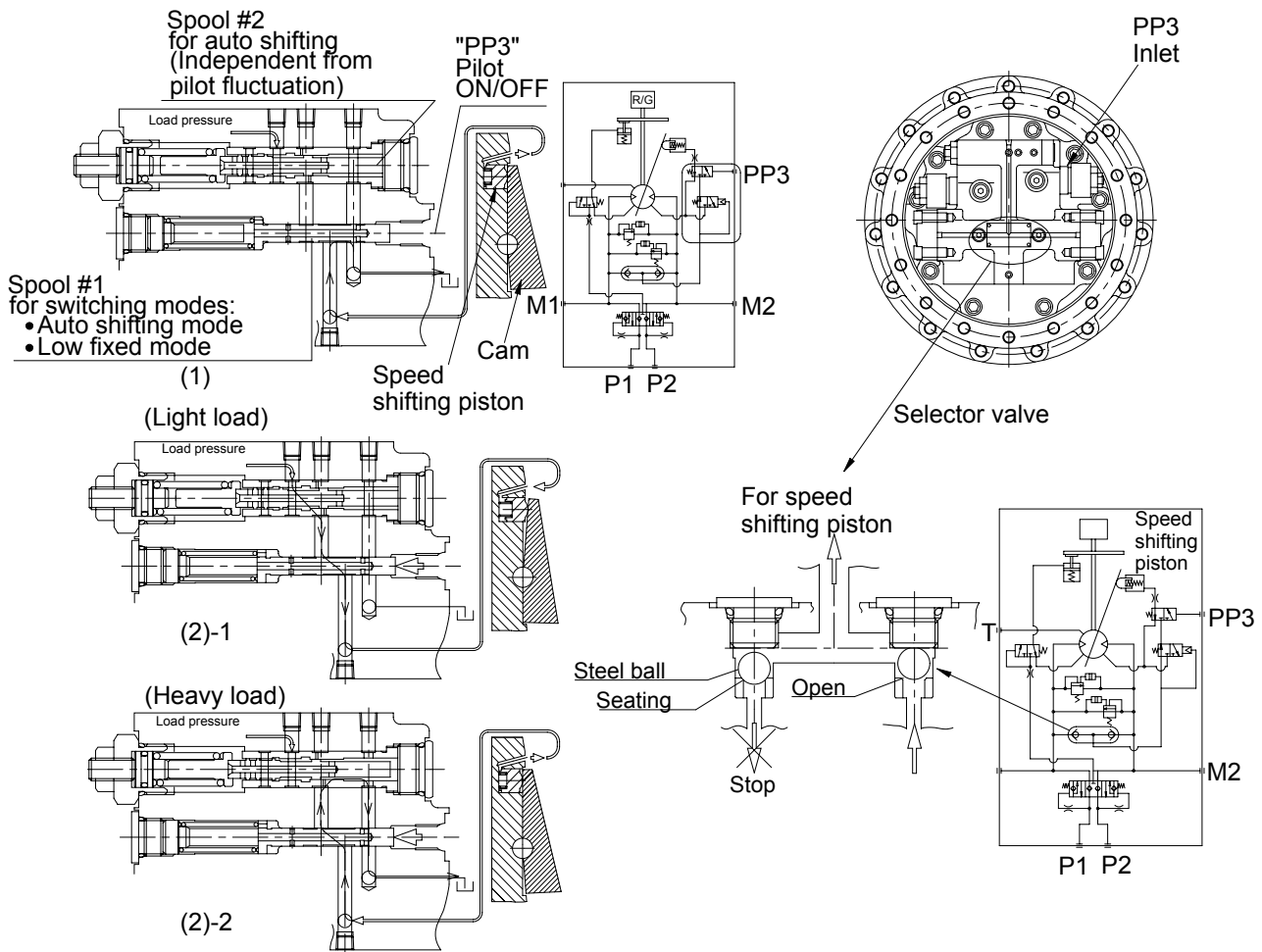
Travel motor includes brake valve, parking brake and high/low speed changeover mechanism.



Port	Port name	Port size
P1	Main port	SAE 5000psi 1"
P2	Main port	SAE 5000psi 1"
M1, M2	Gauge port	PT 1/4
T1, T2	Drain port	PF 1/2
PP3	2 speed control port	PF 1/4

11072TM01

(3) Automatic 2-speed shifting function



11072TM11

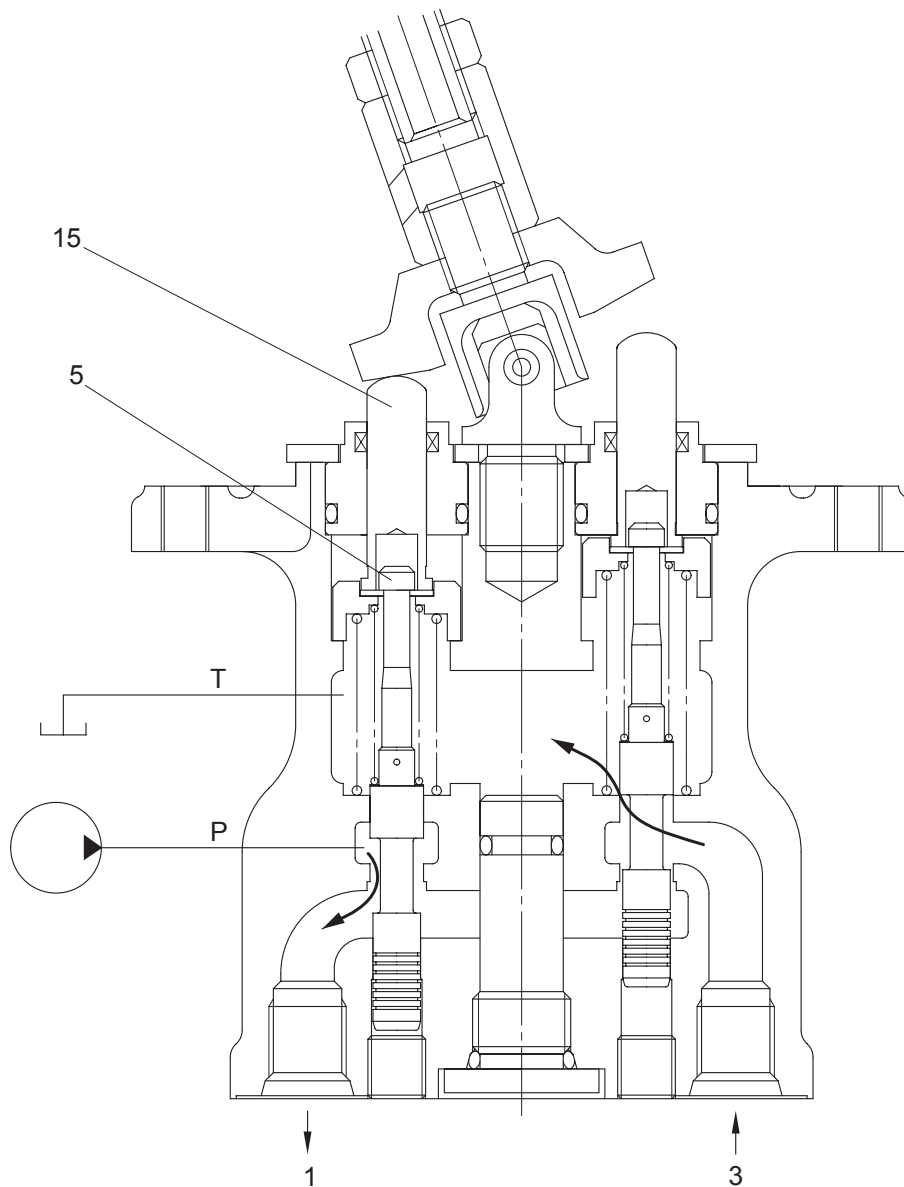
Automatic 2-speed shifting function has two modes (1) and (2) as below :

- (1) Low speed fixed mode... always low speed
- (2) Automatic 2-speed shifting mode
 - (2)-1 When motor load pressure is light, High speed.
 - (2)-2 When motor load pressure is heavy, Low speed.

This function above consists of three components.

- Spool #1 for switching modes
 - Auto-shifting mode(if PP3 is applied)
 - Low-speed-fixed mode (if PP3 is NOT applied)
- Spool #2 for auto shifting
 - If load pressure < set value then High-speed
 - If load pressure > set value then Low-speed
- Selector valve, which always picks out high pressure and provide it to the SPOOL #2 regardless of the rotating direction of motor.

(2) Case where handle is tilted



25032RL04

When the push rod(14) is stroked, the spool(5) moves downwards.

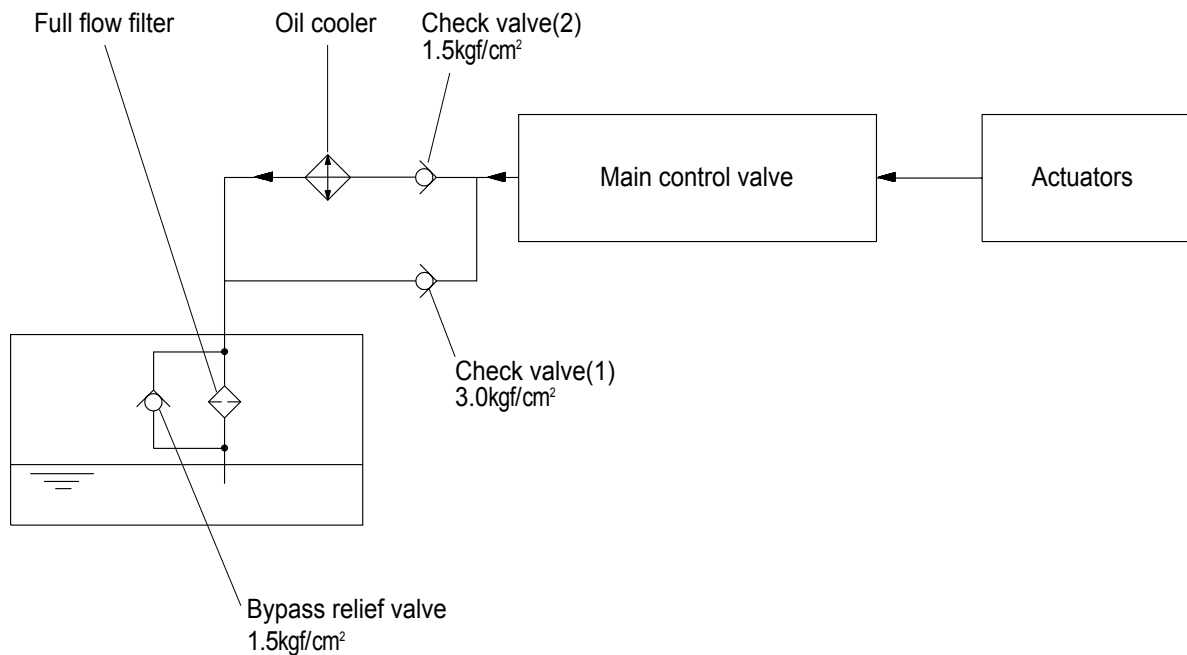
Then port P is connected with port(1) and the oil supplied from the pilot pump flows through port(1) to generate the pressure.

When the pressure at port(1) increases to the value corresponding to the spring force set by tilting the handle, the hydraulic pressure force balances with the spring force. If the pressure at port(1) increases higher than the set pressure, port P is disconnected from port(1) and port T is connected with port(1). If it decreases lower than the set pressure, port P is connected with port(1) and port T is disconnected from port 1.

In this manner the secondary pressure is kept at the constant value.

Besides, in some type, when the handle is tilted more than a certain angle, the upper end of the spool contacts with the inside bottom of the push rod and the output pressure is left to be connected with port P.

2. RETURN CIRCUIT



140LC-77]타 3-03

All oil returned from each actuator returns to the hydraulic tank through the control valve.

The bypass check valves are provided in the return circuit.

The setting pressure of bypass check valves are 1.5kgf/cm²(21psi) and 3.0kgf/cm²(43psi). Usually, oil returns to the hydraulic tank from the left side of control valve through oil cooler.

When oil temperature is low, viscosity becomes higher and flow resistance increases when passing through the oil cooler. When the oil pressure exceeds 3.0kgf/cm²(43psi), the oil returns directly to the hydraulic tank, resulting in the oil temperature being raised quickly at an appropriate level.

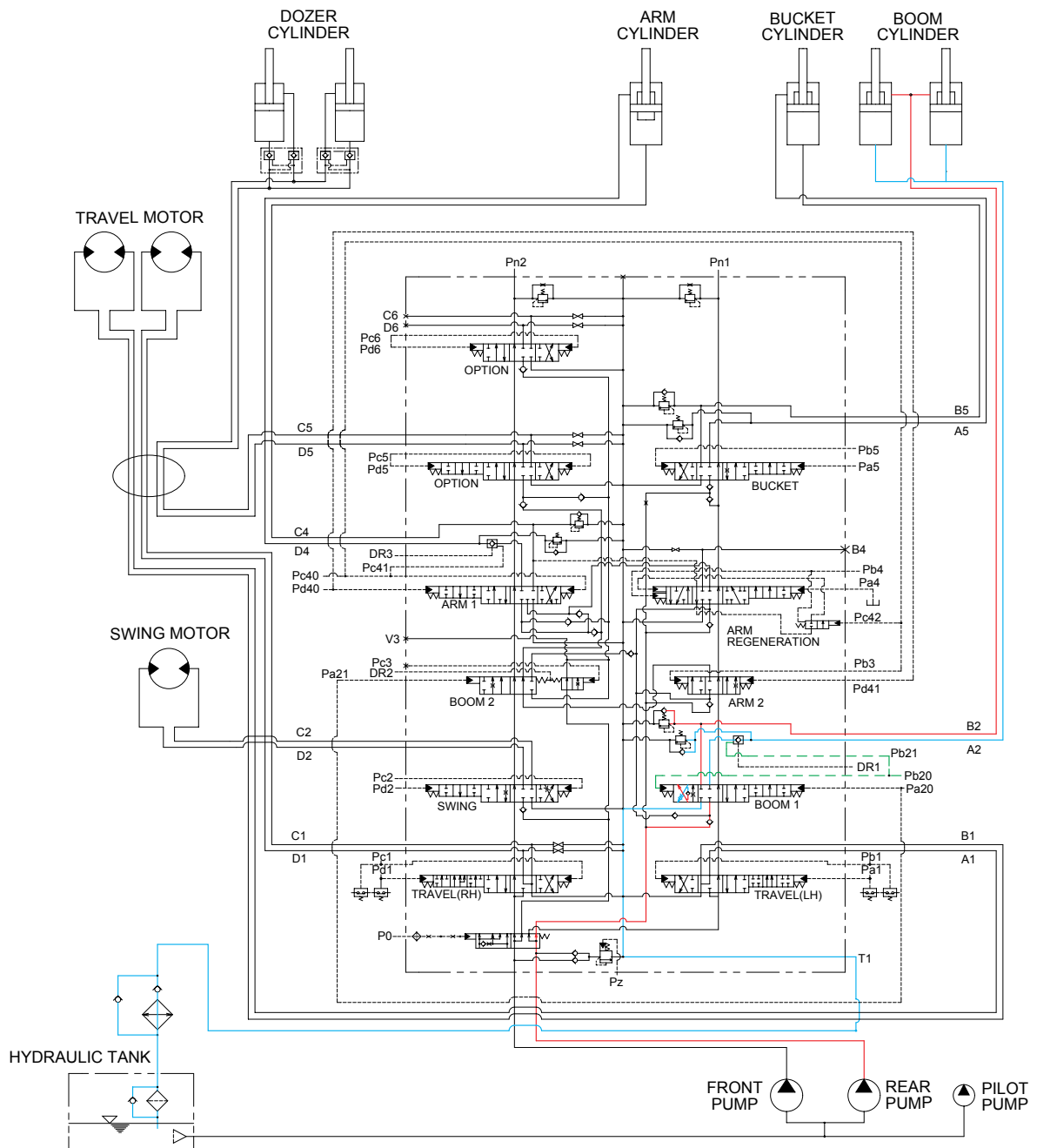
When the oil cooler is clogged, the oil returns directly to the hydraulic tank through bypass check valve(1).

The full-flow filter and bypass relief valve are provided in the hydraulic tank.

The oil returned from right and left side of control valve is combined and filtered by the full-flow filter. A bypass relief valve is provided in the full-flow filter.

When the filter element is clogged, the bypass relief valve opens at 1.5kgf/cm²(21psi) differential pressure.

2. BOOM DOWN OPERATION



11073HC11

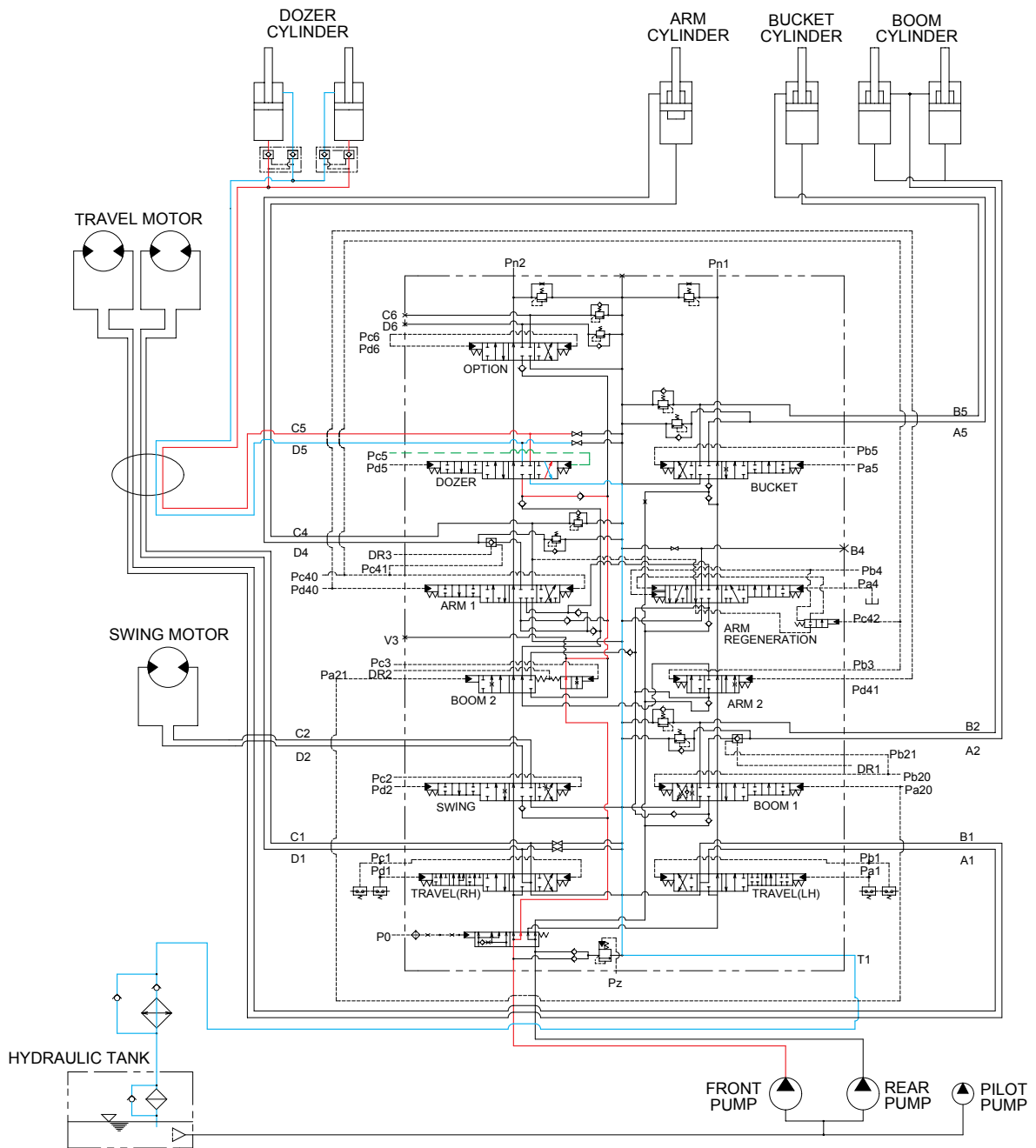
When the right control lever is pushed forward, the boom spools in the main control valve are moved to the down position by the pilot oil pressure from the remote control valve.

The oil from the front pump flows into the main control valve and then goes to the small chamber of boom cylinders. At the same time, the oil from the large chamber of boom cylinders returns to the hydraulic tank through the boom spool in the main control valve.

When the down speed of boom is faster, the oil returned from the large chamber of boom cylinder combines with the oil from the front pump, and flows into the small chamber of the cylinder.

This prevents cylinder cavitation by the negative pressure when the front pump flow can not match the boom down speed. And the excessive pressure in the boom cylinder rod end circuit is prevented by the relief valve.

10. DOZER DOWN OPERATION



11073HC19

When the dozer control lever is pushed forward, the dozer spool in the main control valve is moved to the dozer down position by the pilot oil pressure from the remote control valve.

The oil from the rear pump flows into the main control valve and then goes to the large chamber of dozer cylinders.

At the same time, the oil from the small chamber of dozer cylinders returns to the hydraulic oil tank through the dozer spool in the main control valve. When this happens, the dozer blade is down.

SECTION 4 ELECTRICAL SYSTEM

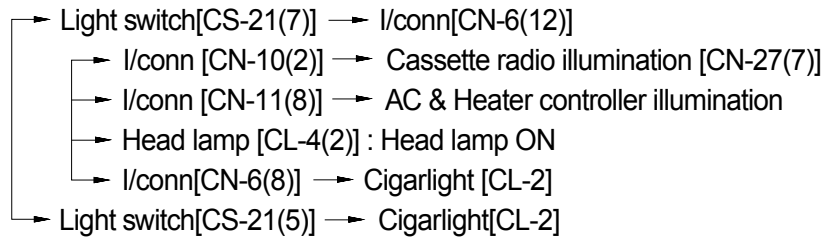
Group 1 Component Location	4-1
Group 2 Electrical Circuit	4-3
Group 3 Electrical Component Specification	4-23
Group 4 Connectors	4-35

4. HEAD LAMP CIRCUIT

1) OPERATING FLOW

Fuse box (No.14) → I/conn [CN-5(15)] → Light switch[CS-21(1)]

※ When lamp switch ON

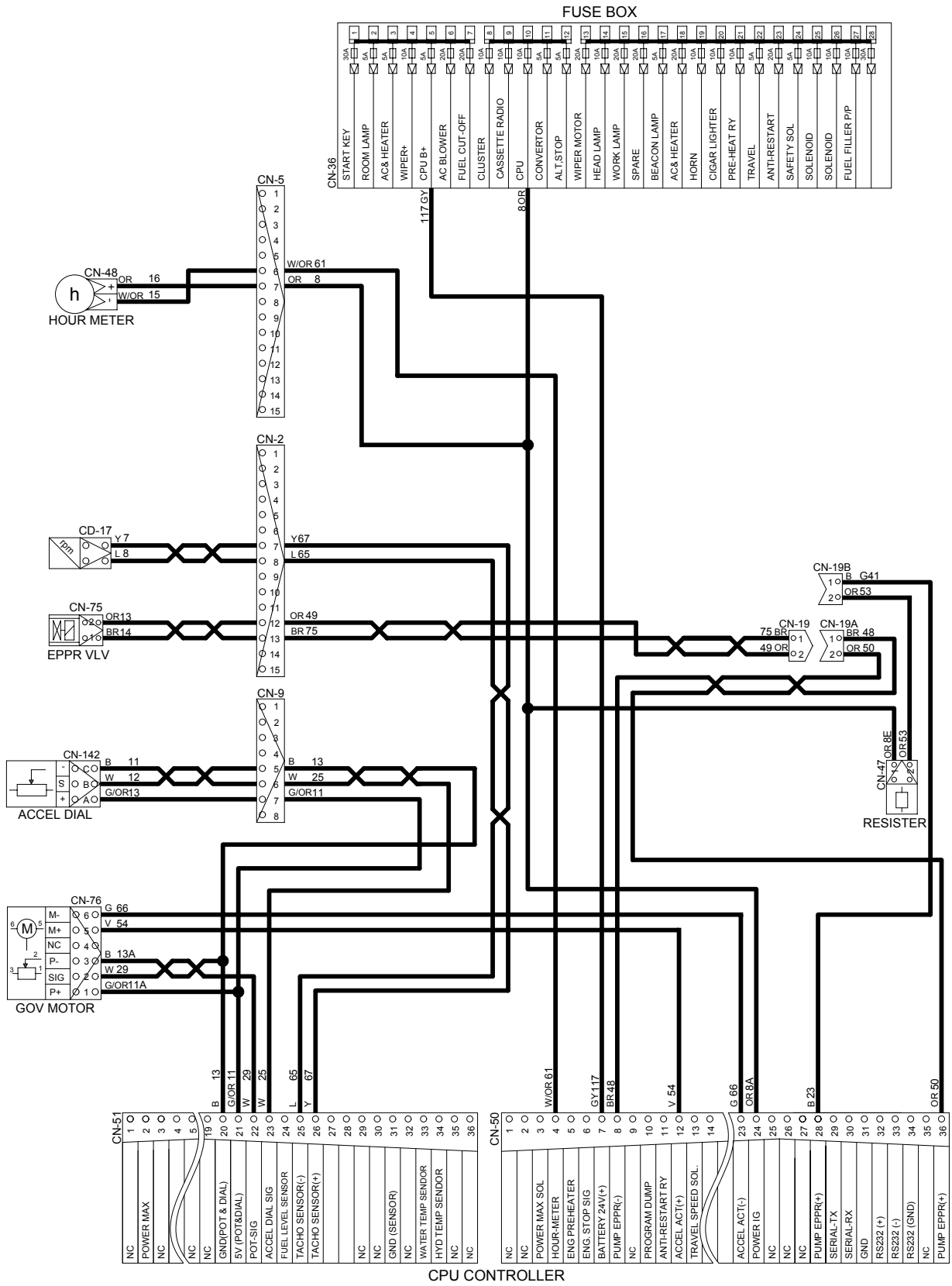


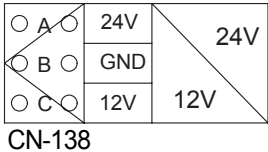
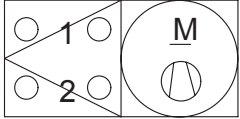
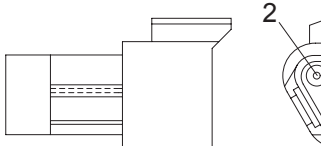
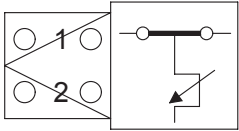
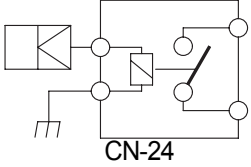
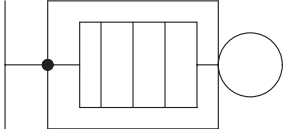
2) CHECK POINT

Engine	Key switch	Check point	Voltage
STOP	ON	① - GND (Fuse box) ② - GND (Switch power input) ③ - GND (Switch power output)	20~25V

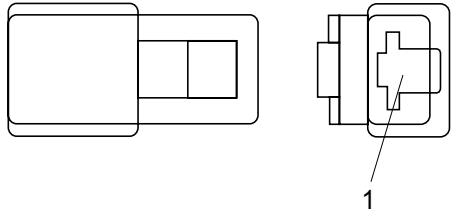
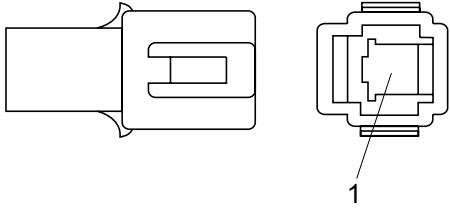
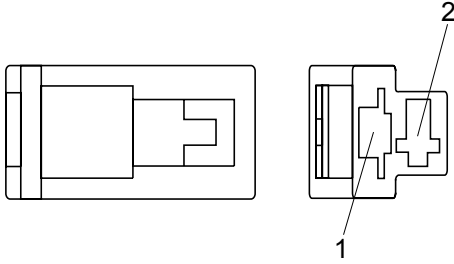
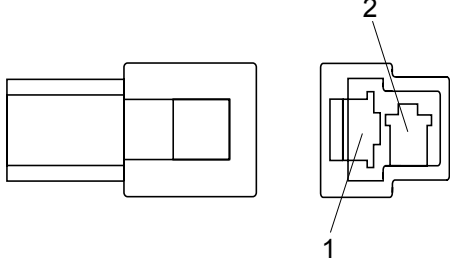
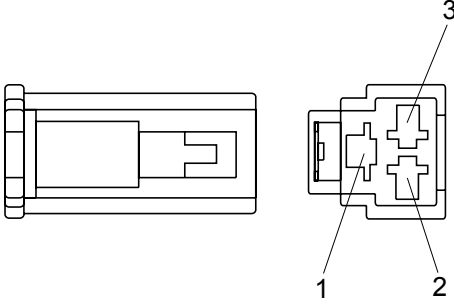
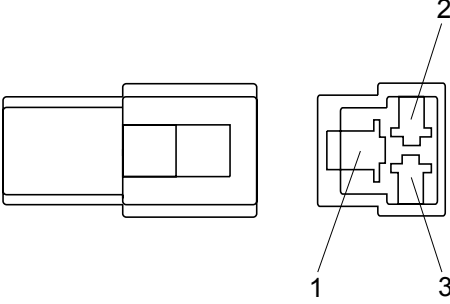
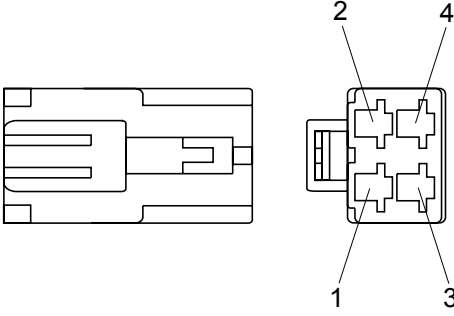
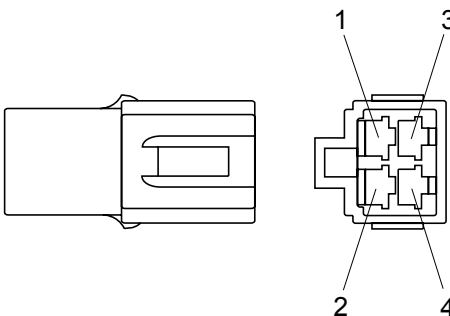
※ GND : Ground

CONTROLLER CIRCUIT



Part name	Symbol	Specification	Check
DC/DC Converter	 <p>CN-138</p>	12V 3A	24V(A-B) 12V(B-C)
Blower motor		24V 9.5A	※ Check resistance 2.5 Ω (For terminal 1-2)
Resistor		-	※ Check resistance 1.12 Ω (For terminal 4-2) 2.07 Ω (For terminal 2-3) 3.17 Ω (For terminal 3-1)
Duct sensor (Switch)		1°C OFF 4°C ON	※ Check resistance : 0 Ω (For terminal 1-2, the atmosphere temp : over 4°C)
Preheater relay	 <p>CN-24</p>	24V 200A	※ Check contact Normal : 0.94 Ω (For terminal 1-GND)
Preheater		24V 200A	※ check resistance : 0.25 ~ 0.12 Ω

4) CN TYPE CONNECTOR

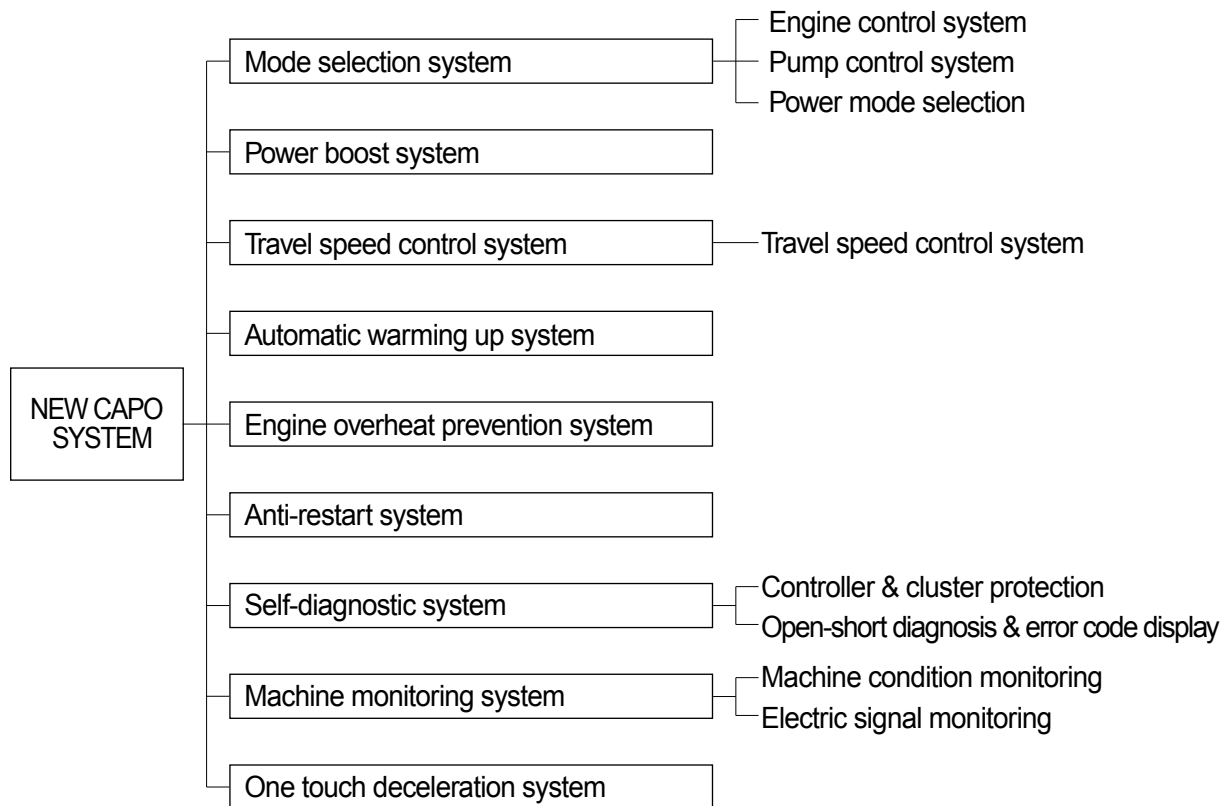
No. of pin	Receptacle connector(Female)	Plug connector(Male)
1	 <p style="text-align: center;">S810-001202</p>	 <p style="text-align: center;">S810-101202</p>
2	 <p style="text-align: center;">S810-002202</p>	 <p style="text-align: center;">S810-102202</p>
3	 <p style="text-align: center;">S810-003202</p>	 <p style="text-align: center;">S810-103202</p>
4	 <p style="text-align: center;">S810-004202</p>	 <p style="text-align: center;">S810-104202</p>

SECTION 5 MECHATRONICS SYSTEM

GROUP 1 OUTLINE

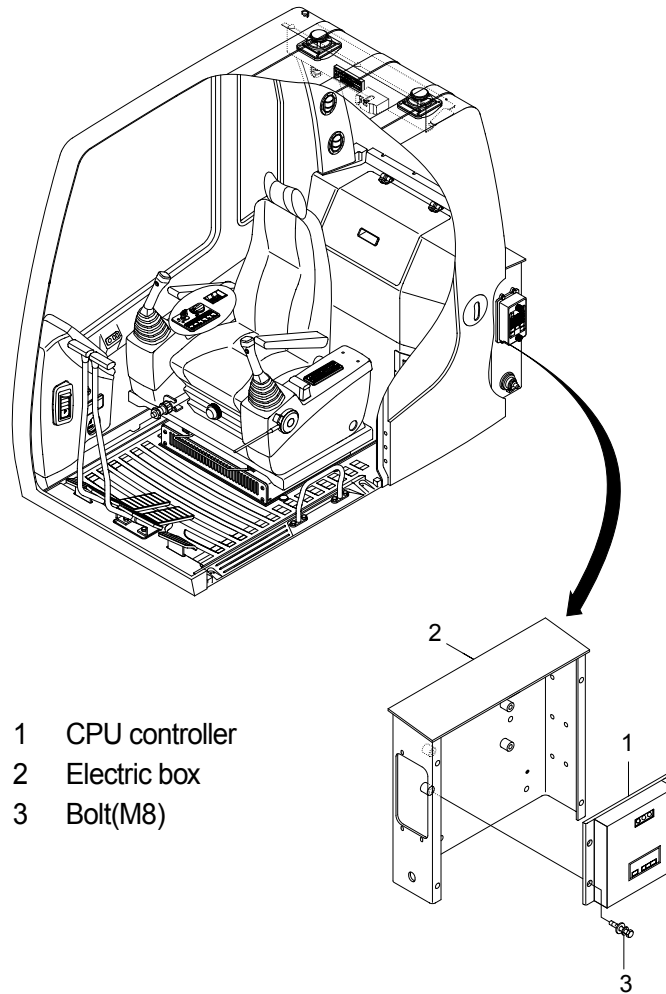
The NEW CAPO(Computer Aided Power Optimization) system controls engine and pump mutual power at an optimum and less fuel consuming state for the selected work by mode selection, one touch deceleration, power boost function, etc. It monitors machine conditions, for instance, engine speed, coolant temperature, hydraulic oil temperature, and hydraulic oil pressure, etc.

It consists of a CPU controller, a cluster, an accel actuator, an EPPR valve, and other components. The CPU controller, and the cluster protect themselves from over-current and high voltage input, and diagnose malfunctions caused by short or open circuit in electric system, and display error codes on the cluster.



GROUP 9 ENGINE CONTROL SYSTEM

1. CPU CONTROLLER MOUNTING



11075MS12

2. CPU CONTROLLER ASSEMBLY

- 1) Remove four pieces of bolt(3) of electric box(2).
- 2) Disconnect 2 connectors from CPU controller.
- 3) Remove 6 pieces of screw and open the cover of CPU controller.
- 4) Inspection : Check PCB(Printed Circuit Board)
 - (1) If any damage is found, replace CPU controller assembly.
 - (2) If not, but CAPO system does not work please report it to HHI dealer or A/S department.

GROUP 12 MONITORING SYSTEM

1. OUTLINE

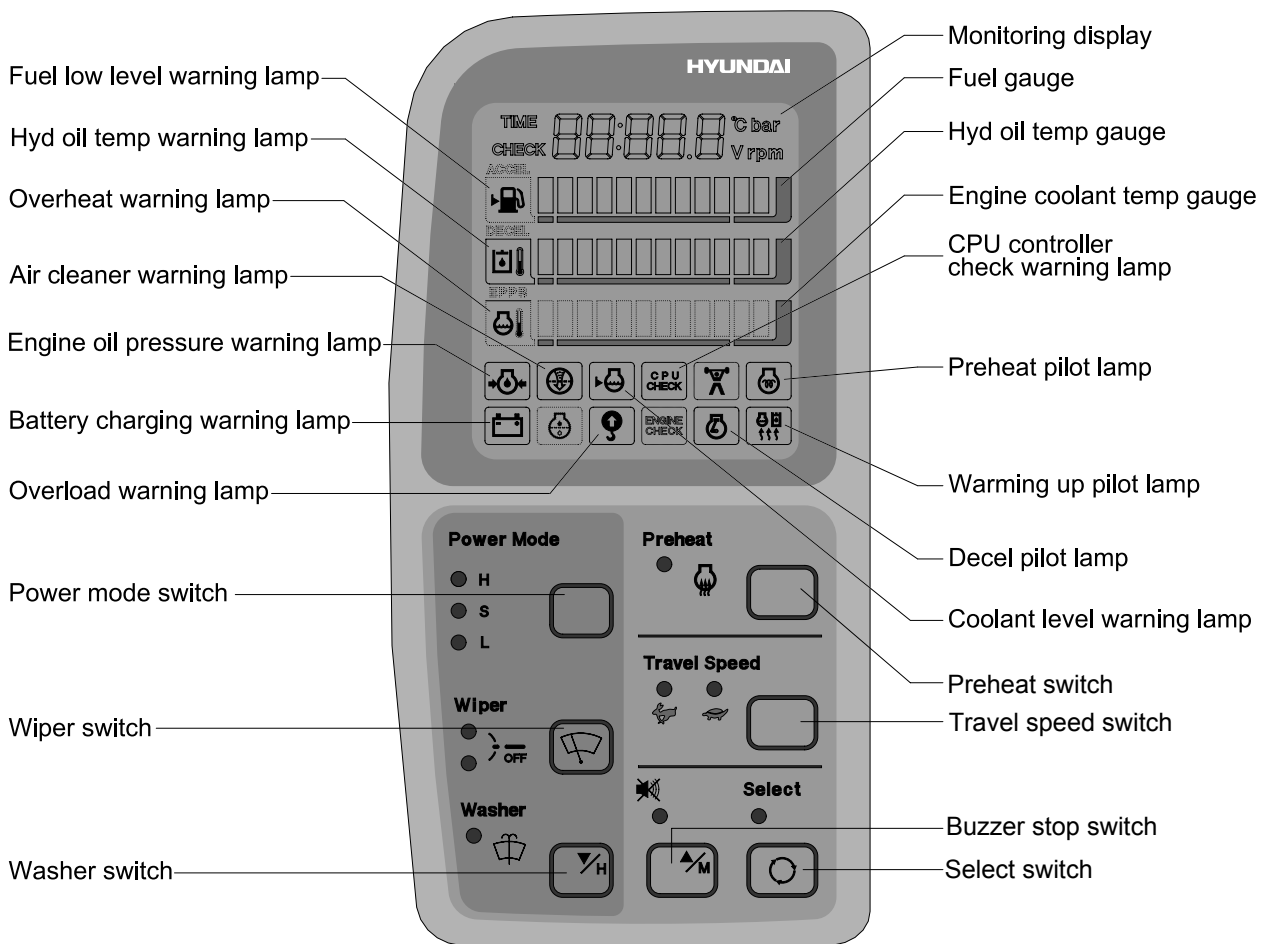
Monitoring system consists of the monitor part and switch part.

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

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

2. CLUSTER

1) MONITOR PANEL

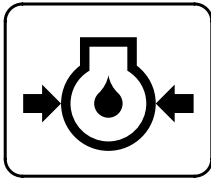


7075MS11

Group	Display	Name	Description
Group 3	od : on or oFF	One touch decel switch	od : on Shows that one touch decel switch is pressed. od : oFF Shows that one touch decel switch is released.
	PH : on or oFF	Preheat switch	PH : on Shows that preheat switch is pressed. PH : oFF Shows that preheat switch is released.
	ol : on or oFF	Overload pressure switch	ol : on Shows that overload pressure switch is turned ON. ol : oFF Shows that overload pressure switch is turned OFF.
Group 4	Ho : on or oFF	Hourmeter	Ho : on Shows that hourmeter is activated by CPU controller. Ho : oFF Shows that hourmeter is turned off.
	nr : on or oFF	Neutral relay (Anti-restart relay)	nr : on Shows that neutral relay for anti-restarting function is activated(Engine start is possible). nr : oFF Shows that neutral relay is turned off to disable the engine restart.
	ts : on or oFF	Travel speed solenoid	ts : on Shows that travel speed solenoid is activated (High speed). ts : oFF Shows that travel speed solenoid is released (Low speed).
	PR : on or oFF	Preheat relay	PR : on Shows that preheat relay is activated. PR : oFF Shows that preheat relay is released.

4) Warning and pilot lamp

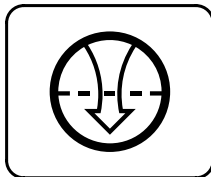
(1) Engine oil pressure warning lamp



21073CD07

- ① This lamp blinks and the buzzer sounds after starting the engine because of the low oil pressure.
- ② If the lamp blinks during engine operation, shut OFF engine immediately. Check oil level.

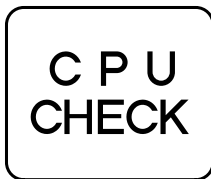
(2) Air cleaner warning lamp



21073CD08

- ① This lamp blinks and the buzzer sounds when the filter of air cleaner is clogged.
- ② Check the filter and clean or replace it.

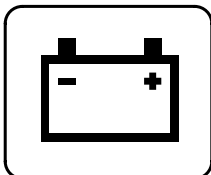
(3) MCU controller check warning lamp



21073CD10

- ① If any fault code is received from MCU controller, this lamp blinks and the buzzer sounds.
- ② Check the communication line between MCU controller and cluster.

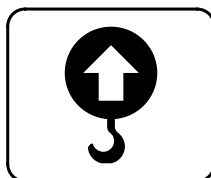
(4) Battery charging warning lamp



21073CD13

- ① This lamp blinks and the buzzer sounds when the starting switch is ON, it is turned OFF after starting the engine.
- ② Check the battery charging circuit when this lamp blinks during engine operation.

(5) Overload warning lamp



21073CD15

- ① When the machine is overload, the overload warning lamp blinks during the overload switch is ON.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

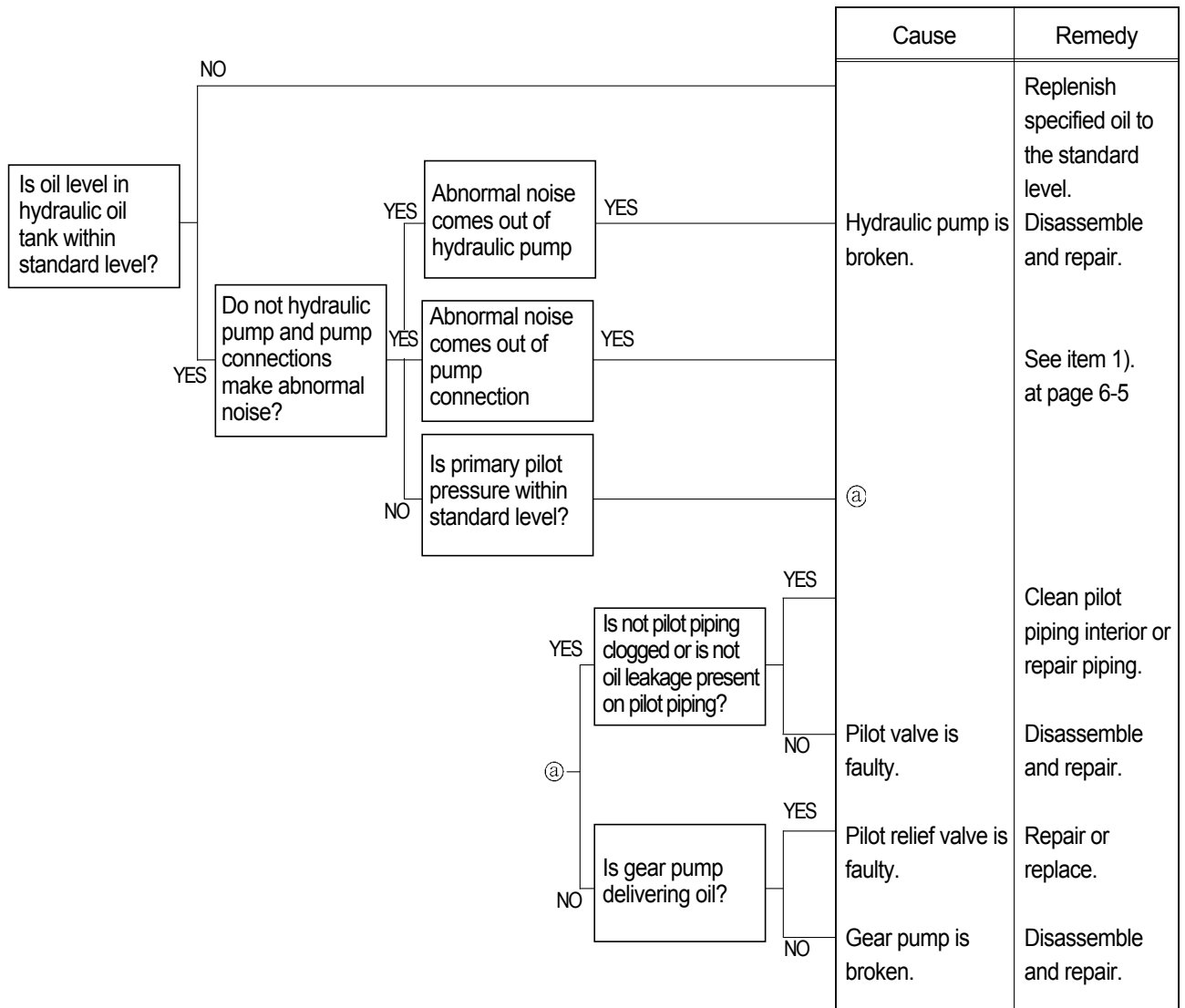
- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



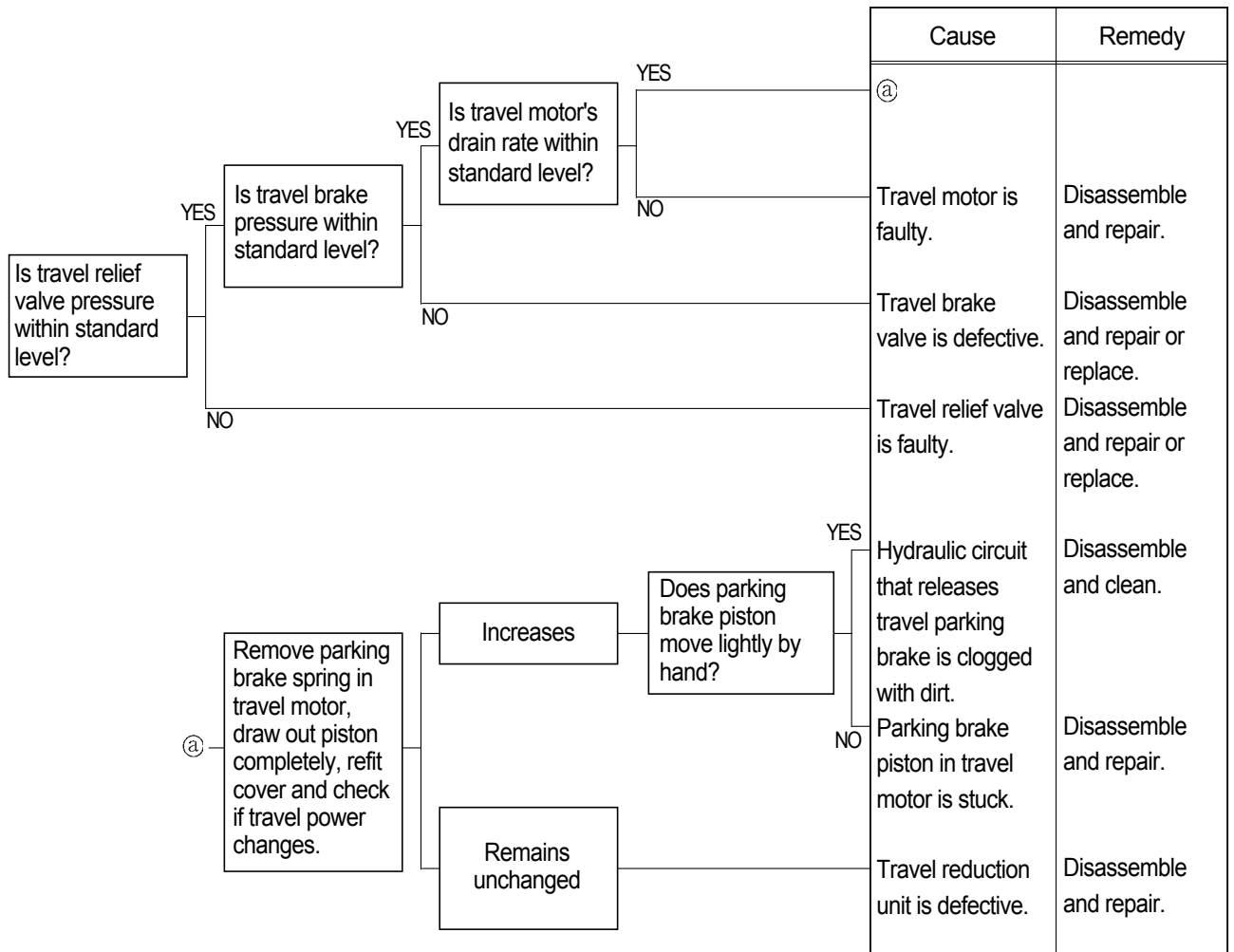
- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

2) ENGINE STARTS BUT MACHINE DOES NOT OPERATE AT ALL



5) TRAVEL ACTION IS POWERLESS(Travel only)

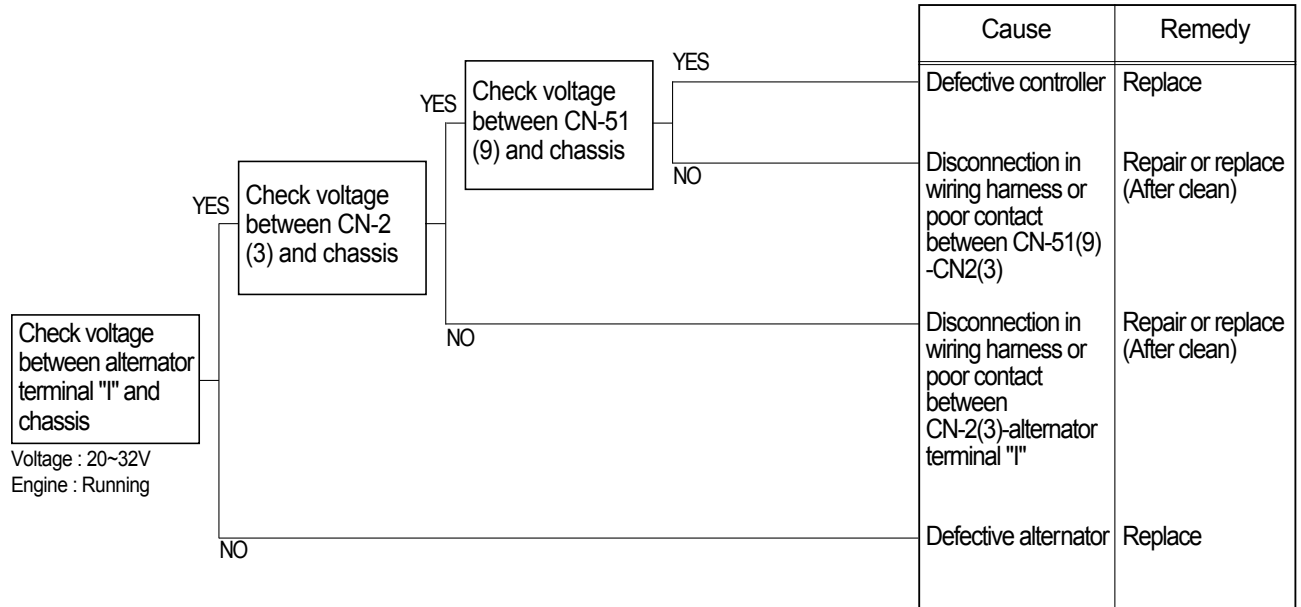


6) MACHINE RUNS RECKLESSLY ON A SLOPE



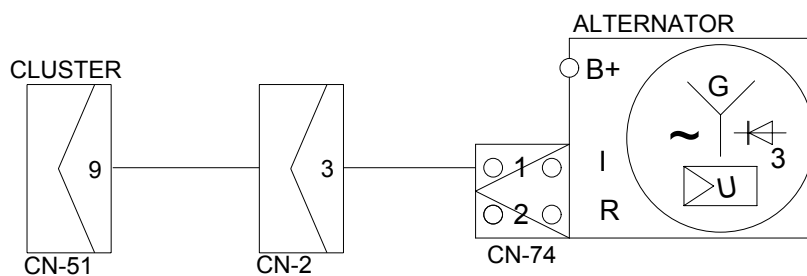
3. BATTERY CHARGING WARNING LAMP LIGHTS UP(Starting switch : ON)

- 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

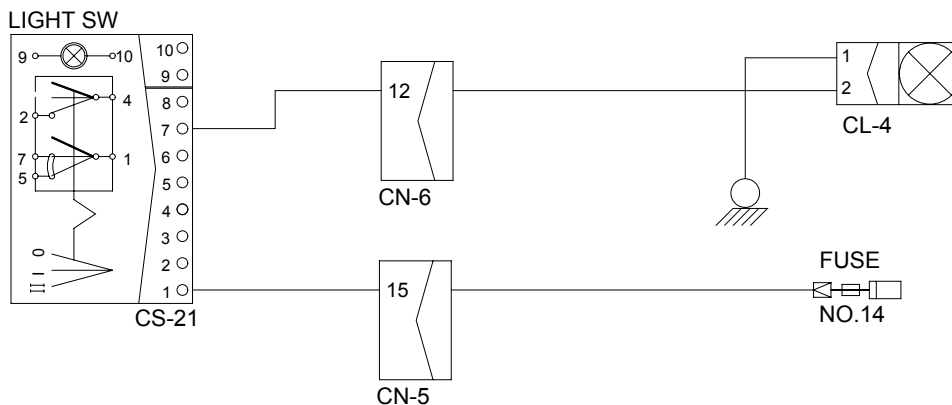
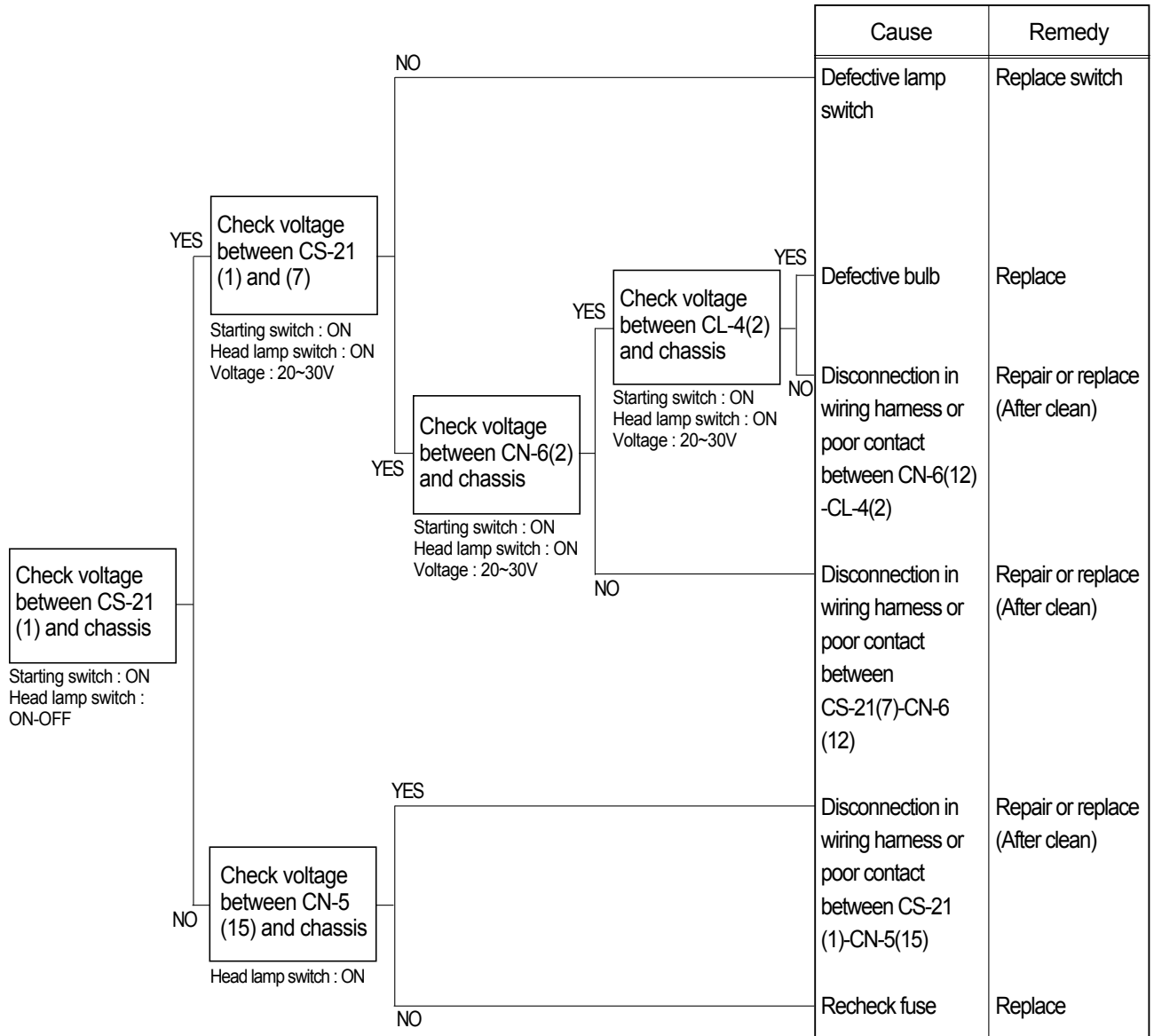
YES	20 ~ 32V
NO	0V



11076TS21

13. WHEN STARTING SWITCH IS TURNED ON, HEAD LAMP DOES NOT LIGHTS UP

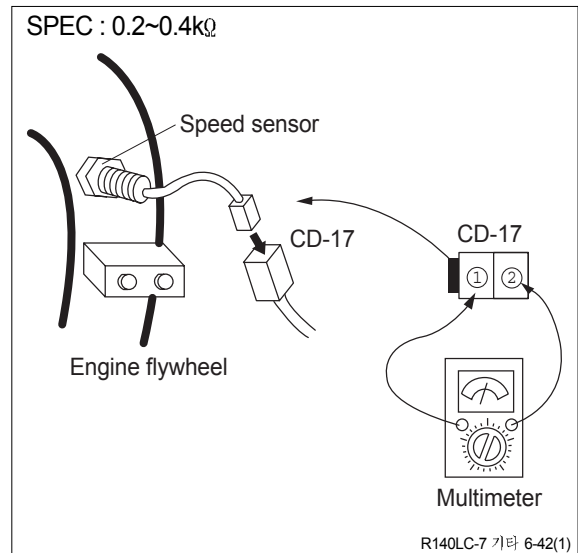
- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No.14.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



11076TS27

(4) **Test 8** : Check resistance at speed sensor.

- ① Starting key OFF.
- ② Disconnect connector CD-17 of speed sensor at engine flywheel housing.
- ③ Check resistance as figure.



SECTION 7 MAINTENANCE STANDARD

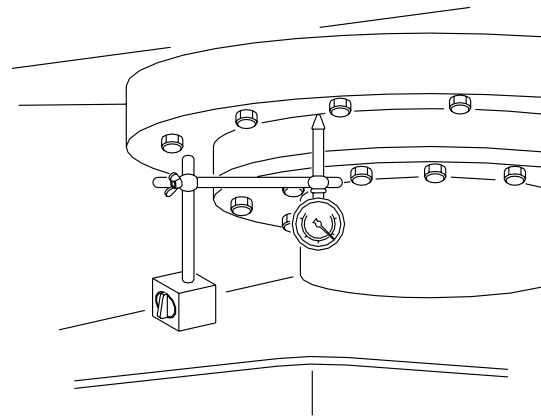
Group 1	Operational Performance Test	7-1
Group 2	Major Components	7-21
Group 3	Track and Work Equipment	7-28

8) SWING BEARING PLAY

- (1) Measure the swing bearing play using a dial gauge to check the wear of bearing races and balls.

(2) Preparation

- ① Check swing bearing mounting cap screws for loosening.
- ② Check the lubrication of the swing bearing. Confirm that bearing rotation is smooth and without noise.
- ③ Install a dial gauge on the track frame as shown, using a magnetic base.
- ④ Position the upperstructure so that the boom aligns with the tracks facing towards the front idlers.
- ⑤ Position the dial gauge so that its needle point comes into contact with the bottom face of the bearing outer race.
- ⑥ Bucket should be empty.



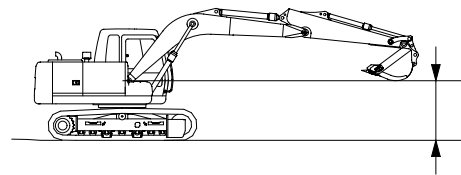
140LC-7 기타 7-10(1)

(3) Measurement

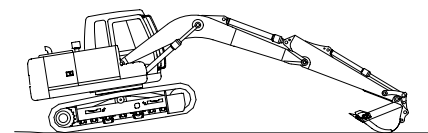
- ① With the arm rolled out and bucket rolled in, hold the bottom face of the bucket to the same height of the boom foot pin. Record the dial gauge reading(h1).
- ② Lower the bucket to the ground and use it to raise the front idler 50cm. Record the dial gauge reading(h2).
- ③ Calculate bearing play(H) from this data(h1 and h2) as follows.

$$H = h2 - h1$$

Measurement : (h1)



Measurement : (h2)



11077MS09

(4) Evaluation

The measured drift should be within the following specifications.

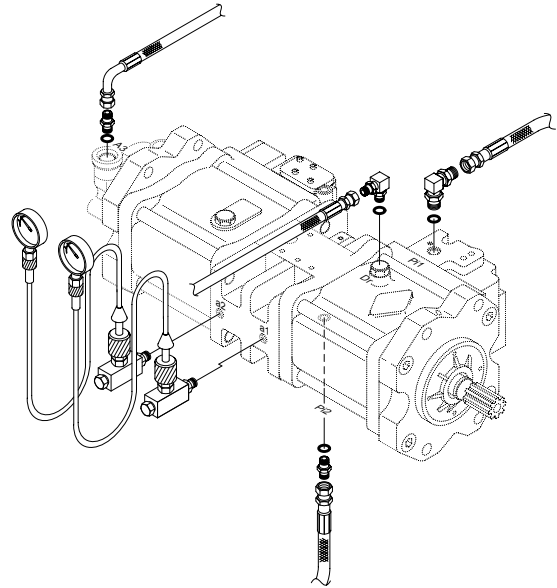
Unit : mm

Model	Standard	Maximum allowable	Remarks
R130	0.5 ~ 1.5	3.0	

17) SYSTEM PRESSURE REGULATOR RELIEF SETTING

(1) Preparation

- ① Stop the engine.
- ② Push the pressure release button to bleed air.
- ③ To measure the system relief pressure.
Install a connector and pressure gauge assembly main pump gauge port, as shown.
- ④ Start the engine and check for oil leakage from the port.
- ⑤ Keep the hydraulic oil temperature at $50 \pm 5^{\circ}\text{C}$.



(2) Measurement

- ① Select the following switch positions.
 - Mode selector : H mode
- ② Slowly operate each control lever of boom, arm and bucket functions at full stroke over relief and measure the pressure.
- ③ In the swing function, place bucket against an immovable object and measure the relief pressure.
- ④ In the travel function, lock undercarriage with an immovable object and measure the relief pressure.

11077MS14

(3) Evaluation

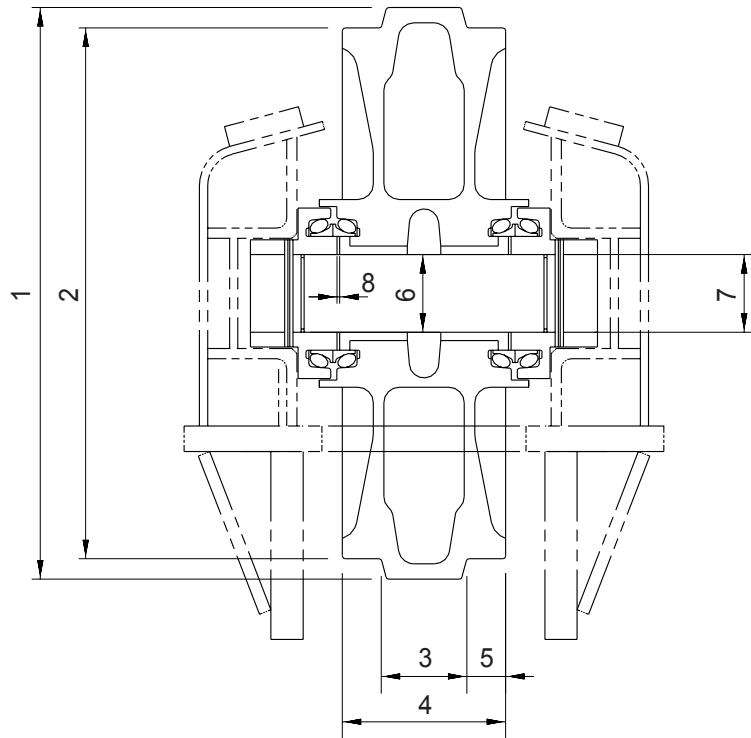
The average measured pressure should be within the following specifications.

Unit : kgf/cm^2

Model	Function to be tested	Standard	Port relief seting
R130	Boom, Arm, Bucket	$330(360) \pm 10$	390 ± 10
	Travel	330 ± 10	-
	Swing	240 ± 10	-

() : Power boost

3) IDLER



21037MS03

Unit : mm

No.	Check item	Criteria		Remedy		
		Standard size	Repair limit			
1	Outside diameter of protrusion	ø 510	-	Rebuild or replace		
2	Outside diameter of tread	ø 470	ø 460			
3	Width of protrusion	67	-			
4	Total width	135	-			
5	Width of tread	34	39			
6	Clearance between shaft and bushing	Standard size & tolerance		Standard clearance	Clearance limit	Replace bushing
		Shaft	Hole			
		ø 70 $\begin{matrix} 0 \\ -0.03 \end{matrix}$	ø 70.3 $\begin{matrix} +0.05 \\ 0 \end{matrix}$	0.3 to 0.38	2.0	
7	Clearance between shaft and support	ø 70 $\begin{matrix} 0 \\ -0.03 \end{matrix}$	ø 70 $\begin{matrix} +0.07 \\ +0.03 \end{matrix}$	0.03 to 0.1	1.2	Rebuild or Replace
8	Side clearance of idler (Both side)	Standard clearance		Clearance limit		Replace bushing
		0.25~1.15		2.0		

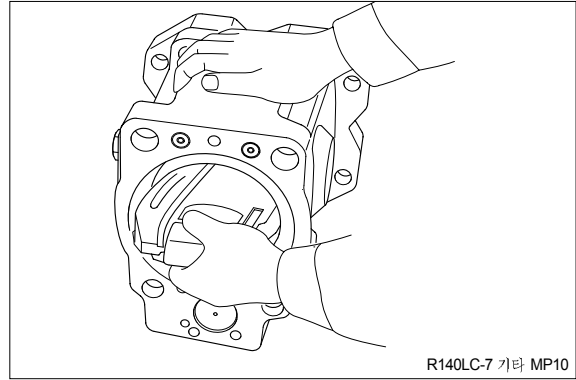
3) PIPE AND HOSE

Thread size	Width across flat(mm)	kgf · m	lbf · ft
1/4"	19	3	21.7
3/8"	22	4	28.9
1/2"	27	5	36.2
3/4"	36	12	86.8
1"	41	14	101

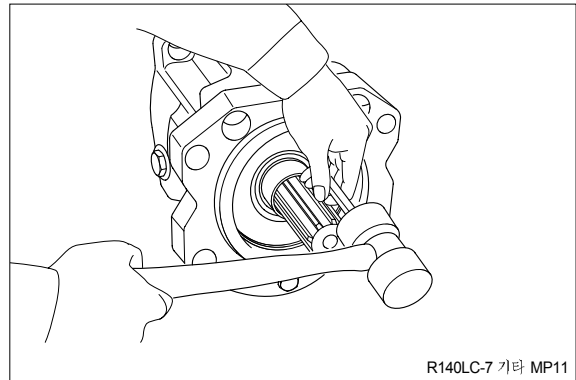
4) FITTING

Thread size	Width across flat(mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	6	43.4
3/4"	36	13	94.0
1"	41	15	109

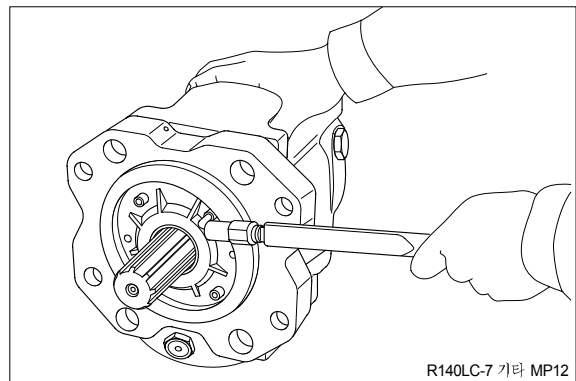
- (3) Place pump casing with its regulator fitting surface down, fit tilting bush of swash plate to tilting pin(531) and fit swash plate (212) to swash plate support(251) correctly. Confirm with fingers of both hands that
- ※ swash plate can be removed smoothly.
- Apply grease to sliding sections of swash plate and swash plate support, and drive shaft can be fitted easily.



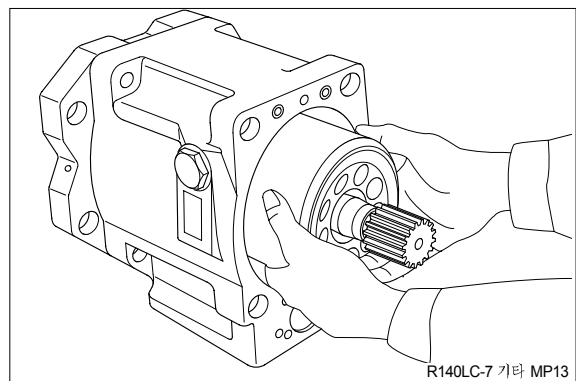
- (4) To swash plate support(251), fit drive shaft(111) set with bearing(123), bearing spacer(127) and snap ring(824).
- ※ Do not tap drive shaft with hammer or so on.
 - ※ Assemble them into support, tapping outer race of bearing lightly with plastic hammer.
- Fit them fully, using steel bar or so on.



- (5) Assemble seal cover(F, 261) to pump casing(271) and fix it with hexagon socket head bolts(406).
- ※ Apply grease lightly to oil seal in seal cover(F).
 - ※ Assemble oil seal, taking full care not to damage it.
- For tandem type pump, fit rear cover(263) and seal cover(262) similarly.



- (6) Assemble piston cylinder subassembly [cylinder block(141), piston subassembly (151, 152), set plate(153), spherical bush (156), spacer(158) and cylinder spring (157)].
- Fit spline phases of retainer and cylinder. Then, insert piston cylinder subassembly into pump casing.



4) ASSEMBLY

(1) For assembly, reverse disassembly procedures, but pay attention to the following items.

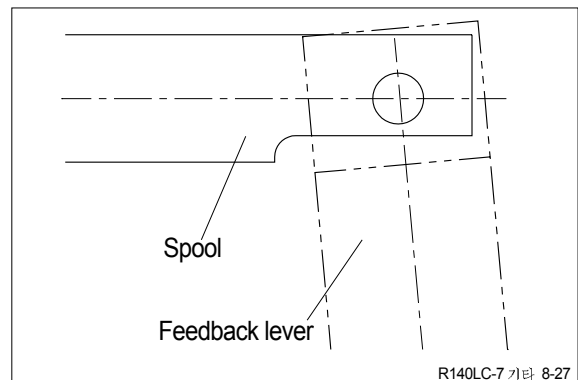
- ① Always repair parts that were scored at disassembly.
- ② Get replacement parts ready beforehand.
Mixing of foreign matter will cause malfunction.
Therefore, wash parts well with cleaning oil, let them dry with jet air and handle them in clean place.
- ③ Always tighten bolts, plugs, etc. to their specified torques.
- ④ Do not fail to coat sliding surfaces with clean hydraulic oil before assembly.
- ⑤ Replace seals such as O-ring with new ones as a rule.

(2) Put compensating rod(623) into compensating hole of casing(601).

(3) Put pin force-fitted in lever(1, 612) into groove of compensating rod and fit lever (1) to pin force-fitted in casing.

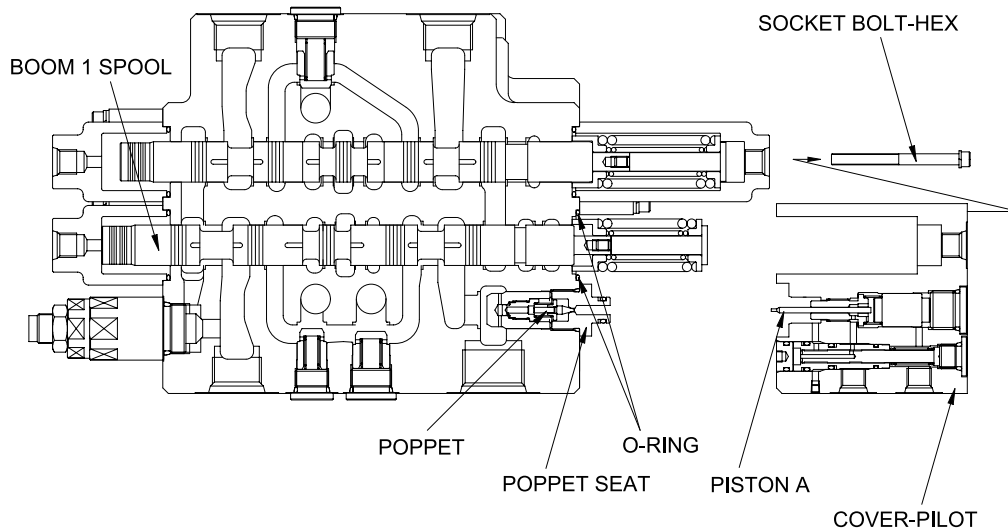
(4) Fit spool(652) and sleeve(651) into hole in spool of casing.

- ※ Confirm that spool and sleeve slide smoothly in casing without binding.
- ※ Pay attention to orientation of spool.



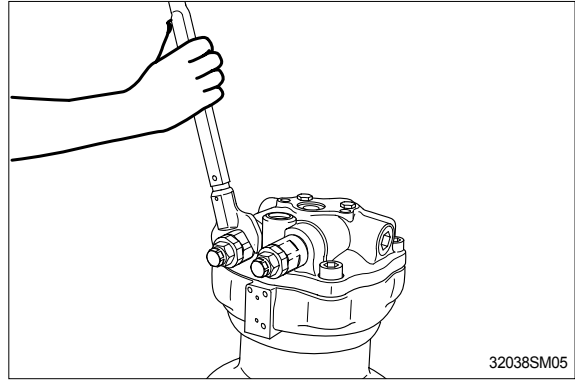
(2) Disassembly of spools with holding valve(Boom 1, Arm 1 spool)

- ① Loosen hexagon socket head bolts with washer
(Hexagon wrench : 5mm)
- ② Remove the pilot cover with internal parts.
 - ※ Pay attention not to lose the O-ring and the poppet under the pilot cover.
 - ※ Pay attention not to damage the "piston A" under pilot cover.
- ③ Remove the spool assembly from the body by hand slightly.
 - ※ When extracting each spool from its body, pay attention not to damage the body.
 - ※ When extracting each spool assembly, it must be extracted from spring side only.
 - ※ When any abnormal parts are found, replace it with completely new spool assembly.
 - ※ When disassembled, tag the components for identification so that they can be reassembled correctly.

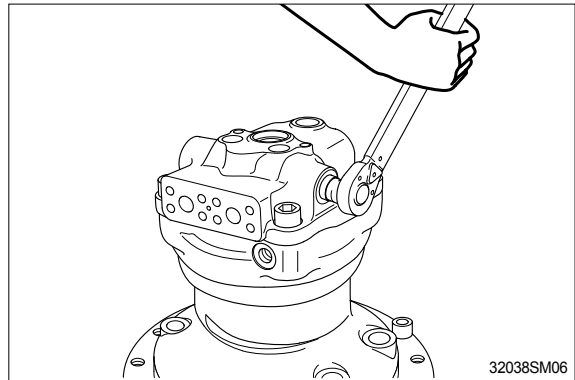


1408DA22

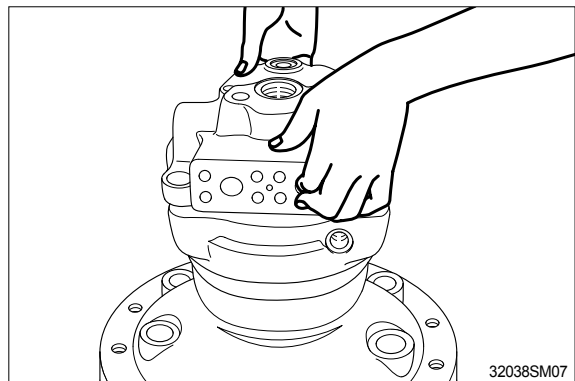
- (5) Remove the relief valve(32) from rear cover(20).



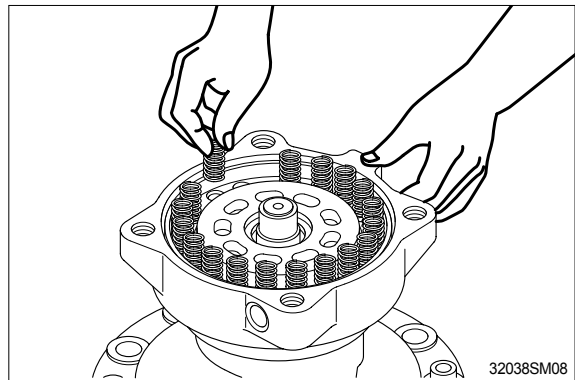
- (6) Remove plug(27) from rear cover(20) and spring(30), check(31).
※ Be careful not to damage the check seat assembly.



- (7) Remove rear cover(20) from body(1).
Then, remove the valve plate(23) from rear cover(20) with care.

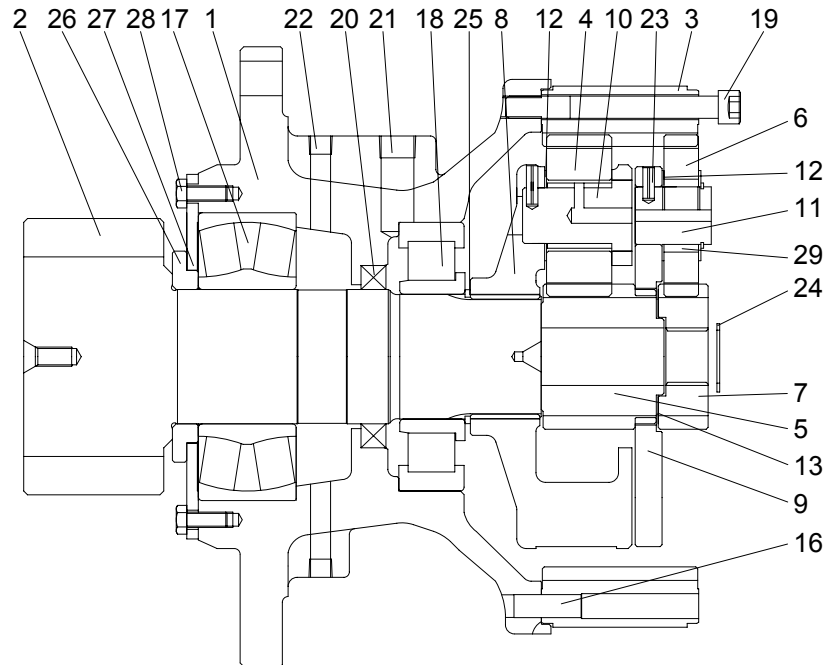


- (8) Remove the brake spring(19) from brake piston(16).



4. DISASSEMBLY AND ASSEMBLY OF REDUCTION GEAR

1) STRUCTURE

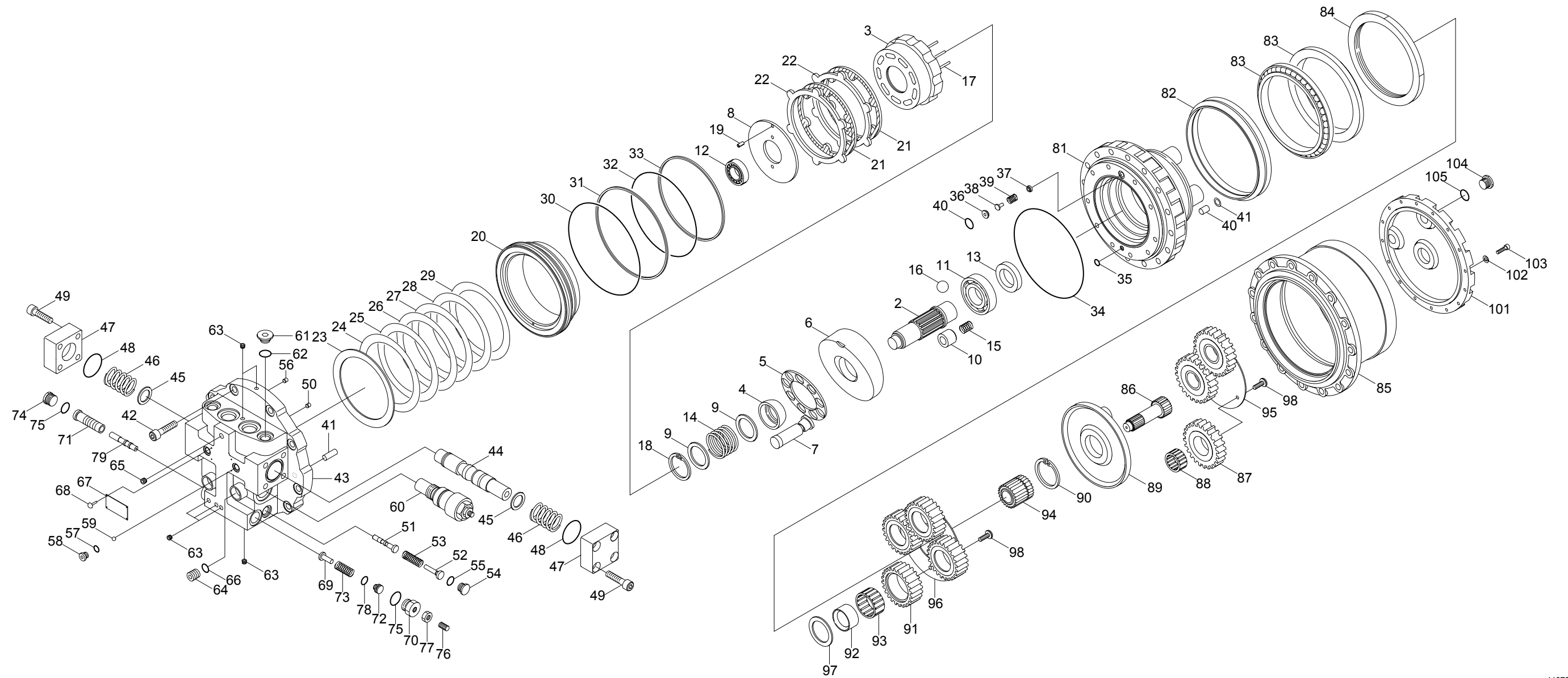


11072SM03

1	Casing	10	Pin No.2 assembly	21	Plug(B)
2	Drive shaft	11	Pin No.1	22	Plug(A)
3	Ring gear	12	Thrust washer(B)	23	Spring pin
4	Planet gear No.2	13	Thrust washer(A)	24	Stop ring
5	Sun gear No.2	16	Knock pin	25	Stop ring
6	Planet gear No.1	17	Sph roller bearing	26	Spacer
7	Sun gear No.1	18	Cyl roller bearing	27	Cover plate
8	Carrier No.2	19	Bolt	28	Bolt
9	Carrier No.1	20	Oil seal	29	Needle cage

2. TRAVEL MOTOR

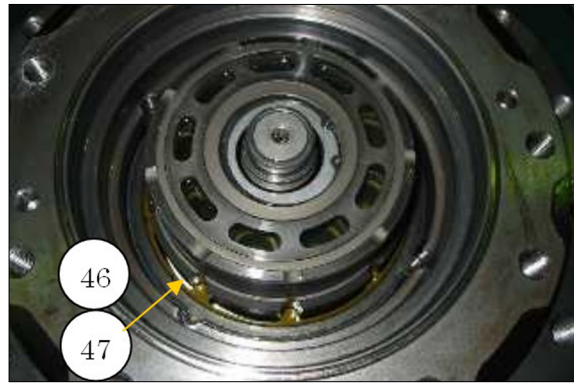
2) STRUCTURE



2 Shaft	20 Brake piston	37 Retainer	54 Plug	71 Sleeve	89 Carrier
3 Cylinder barrel	21 Friction plate	38 Poppet	55 O-ring	72 Stopper	90 Sun gear B
4 Ball retainer	22 Steel plate	39 Spring	56 Orifice	73 Spring	91 Planetary gear B
5 Retainer	23 Disk spring	40 O-ring	57 Steel ball	74 Plug	92 Bushing
6 Cam	24 Shim(1.0T)	41 Pin	58 Plug	75 O-ring	93 Needle bearing B
7 Piston assembly	25 Shim(1.2T)	42 Bolt	59 O-ring	76 Screw	94 Snap ring
8 Valve plate	26 Shim(1.4T)	43 Motor cover assembly	60 Relief valve assembly	77 Nut	95 Thrust plate(2)
9 Plate	27 Shim(1.6T)	44 Spool assembly	61 Plug	78 O-ring	96 Thrust plate(3)
10 Piston assembly	28 Shim(1.8T)	45 Washer	62 O-ring	79 Rod	97 Thrust plate(4)
11 Ball bearing	29 Shim(2.0T)	46 Spring	63 Plug	81 Casing body	98 Screw
12 Roller bearing	30 O-ring	47 Cover	64 Plug	82 Floating seal	99 Washer
13 Oil seal	31 Back up ring	48 O-ring	65 Plug	83 Angular bearing	100 Parallel pin
14 Spring	32 O-ring	49 Bolt	66 O-ring	84 Ring nut	101 Cover
15 Spring	33 Back up ring	50 Orifice	67 Name plate	85 Casing gear	102 Spring washer
16 Steel ball	34 O-ring	51 Spool	68 Rivet	86 Sun gear A	103 Bolt
17 Pin	35 O-ring	52 Stopper	69 Spring guide	87 Planetary gear A	104 Plug
18 Snap ring	36 Seat	53 Spring	70 Plug	88 Needle bearing A	105 O-ring

11072TM04

(24) Remove two friction plates(46) and two steel plates(47) from the body casing, using a steel wire, a magnet, etc. Don't pull off the cylinder barrel component yet.

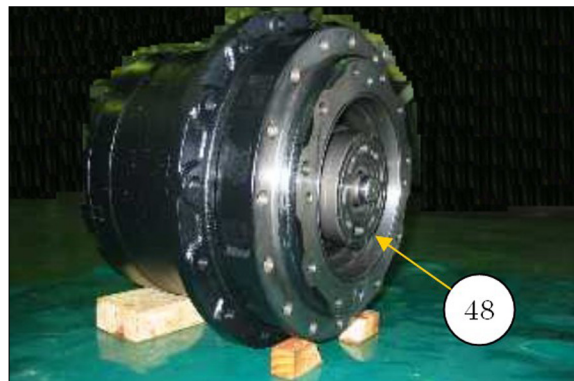


11078TM34



11078TM35

(25) Position the travel motor as shown on a wood block and apply wood wedges that prevent the travel drive from rolling around. Remove cylinder barrel assembly (48) from the body casing.



11078TM36



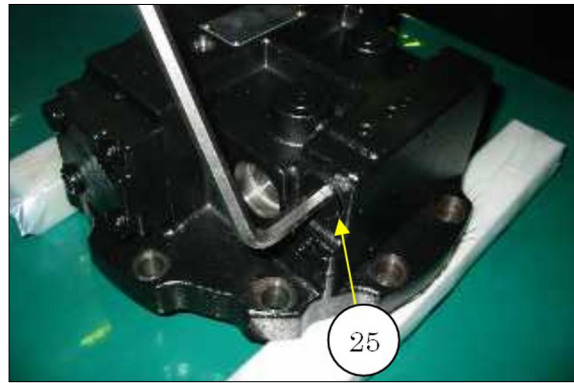
11078TM37

4. ASSEMBLY

1) GENERAL PRECAUTIONS

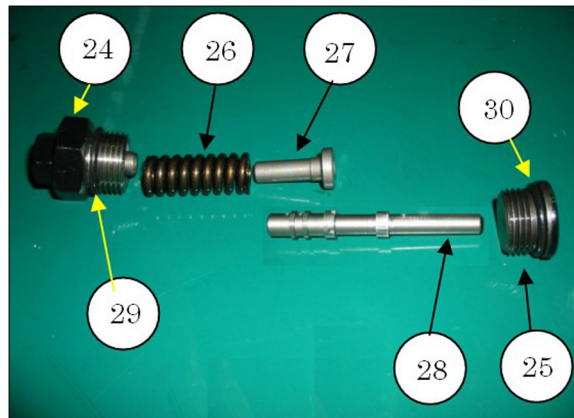
- (1) Reassemble in a work area that is clean and free from dust and grit.
- (2) Handle parts with bare hands to keep them free of linty contaminants.
- (3) Repair or replace the damaged parts.
Each part must be free of burrs at its corners.
- (4) Do not reuse O-rings, oil seal and floating seal that were removed in disassembly.
Provide the new parts.
- (5) Wash all parts thoroughly in a suitable solvent.
Dry thoroughly with compressed air.
Do not use the cloths.
- (6) When reassembling oil motor components of motor, be sure to coat the sliding parts of the motor and valve with fresh hydraulic oil. (NAS class 9 or above)
- (7) Use a torque wrench to tighten bolts and plugs, to the torque specified as follows.

(28) Put O-ring(30) on plug(25). Install plug (25) to the brake valve. Tighten the plug(25) to a torque of $78.5 \pm 7.8 \text{ N} \cdot \text{m}$ ($57.9 \pm 5.8 \text{ lbf} \cdot \text{ft}$).

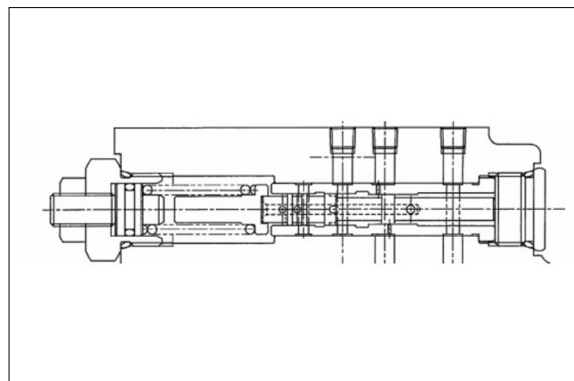


11078TM104

(29) Install rod(28), spring guide(27) and spring(26) to the brake valve.

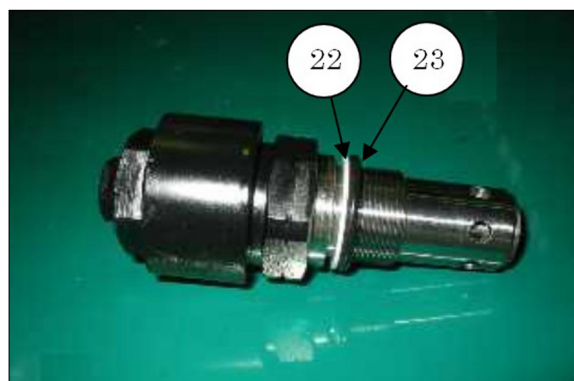


11078TM102



11078TM103

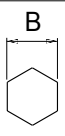
(30) Put O-ring(29) on plug assembly(24). Install plug assembly(24) to the brake valve. Tighten the plug assembly(24) to a torque of $78.5 \pm 7.8 \text{ N} \cdot \text{m}$ ($57.9 \pm 5.8 \text{ lbf} \cdot \text{ft}$).



11078TM106

2) TOOLS AND TIGHTENING TORQUE

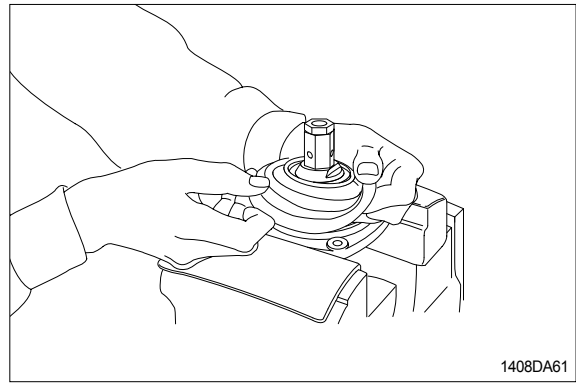
(1) Tools

Tool name	Remark	
Allen wrench	6	
Spanner	22	
	27	
(+) Driver	Length 150	
(-) Driver	Width 4~5	
Torque wrench	Capable of tightening with the specified torques	

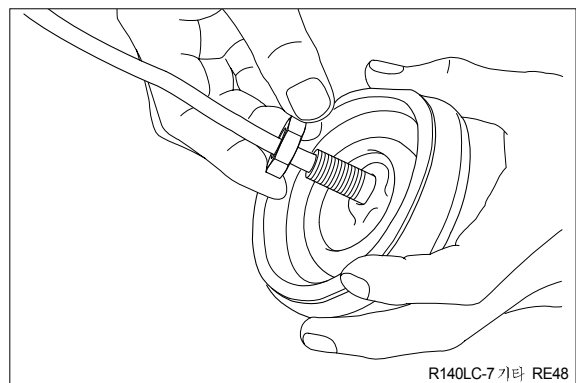
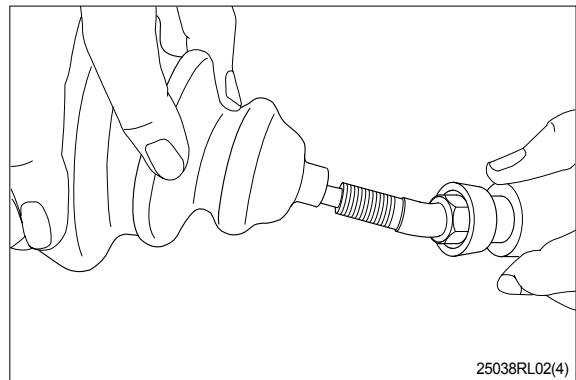
(2) Tightening torque

Part name	Item	Size	Torque	
			kgf · m	lbf · ft
Plug	2	PT 1/8	3.0	21.7
Joint	18	M14	3.5	25.3
Swash plate	19	M14	5.0±0.35	36.2±2.5
Adjusting nut	20	M14	5.0±0.35	36.2±2.5
Lock nut	21	M14	5.0±0.35	36.2±2.5
Screw	29	M 3	0.05	0.36

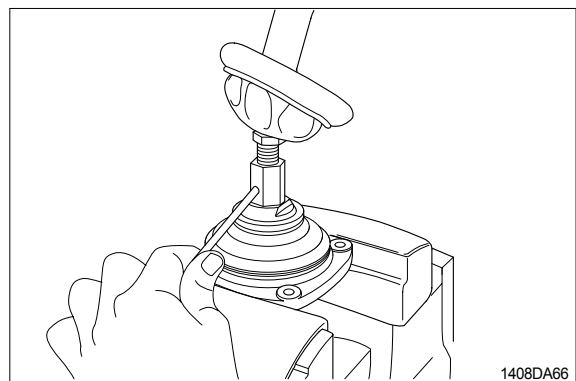
(14) Fit boot(40) to plate.



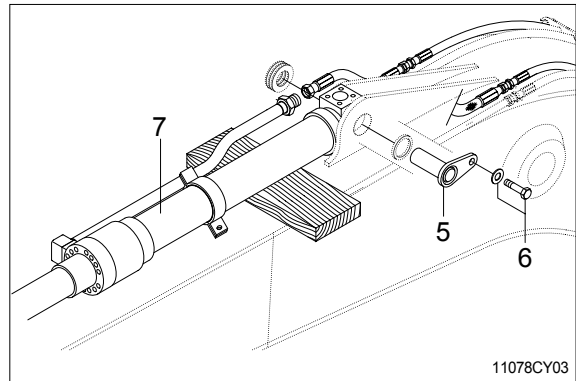
(15) Fit boot(26) and lock nut(21), and handle subassembly is assembled completely.



(16) Pull out cord and tube through adjusting nut hole provided in direction 60° to 120° from casing hole.



- ⑤ Sling arm assembly(7) and remove bolt (6) then pull out pin(5).
- ⑥ Remove arm cylinder assembly(7).
 - Weight : 140kg(310lb)



(2) Install

- ① Carry out installation in the reverse order to removal.

▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.

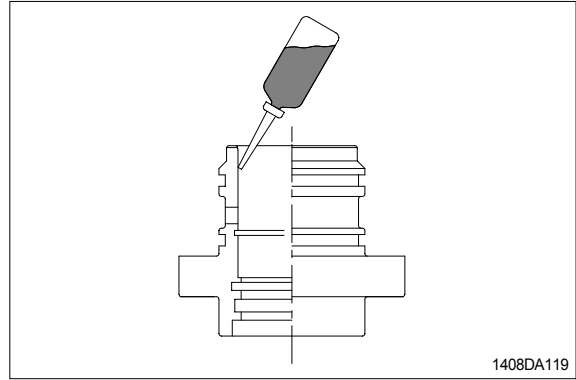
- ※ Bleed the air from the arm cylinder.
- ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

3) ASSEMBLY

(1) Assemble cylinder head assembly

※ Check for scratches or rough surfaces if found smooth with an oil stone.

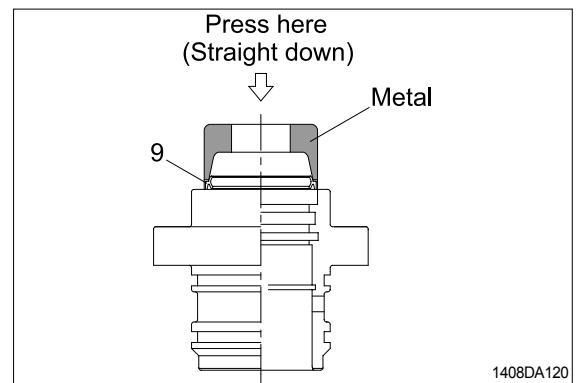
- ① Coat the inner face of gland(3) with hydraulic oil.



- 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.

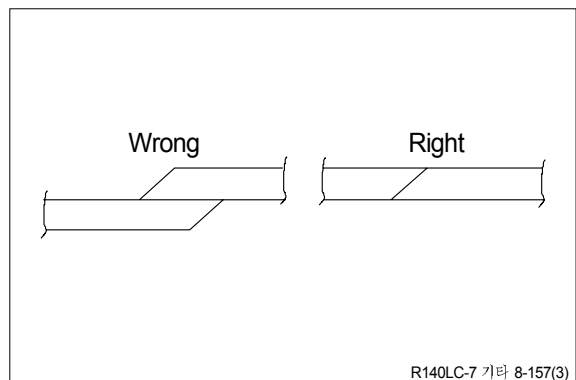
- ③ Fit snap ring(10) to the stop face.



- ④ Fit back up ring(7), rod seal(6) and buffer ring(8) to corresponding grooves, in that order.

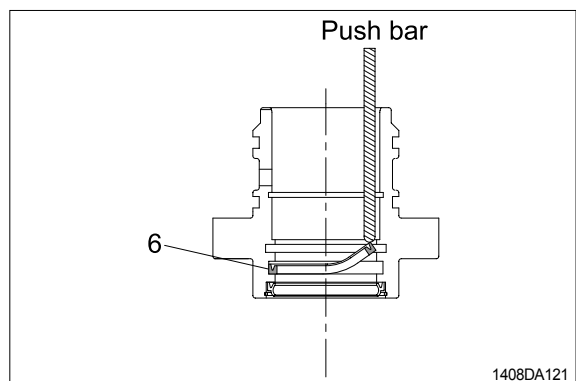
※ Coat each packing with hydraulic oil before fitting it.

※ 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.

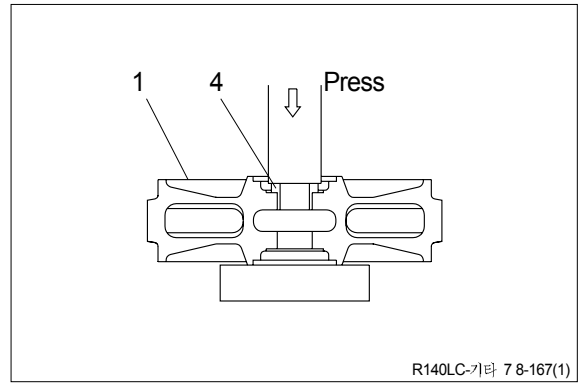


(3) Assembly

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

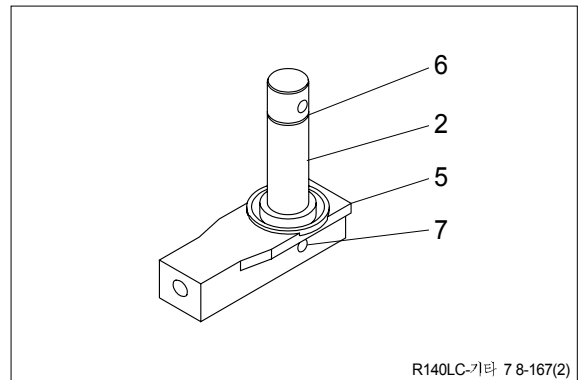
① Cool up bushing(4) fully by some dry ice and press it into shell(1).

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

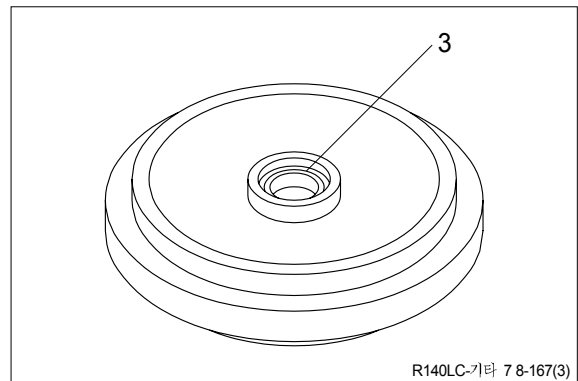


② Coat O-ring(6) with grease thinly, and install it to shaft(2).

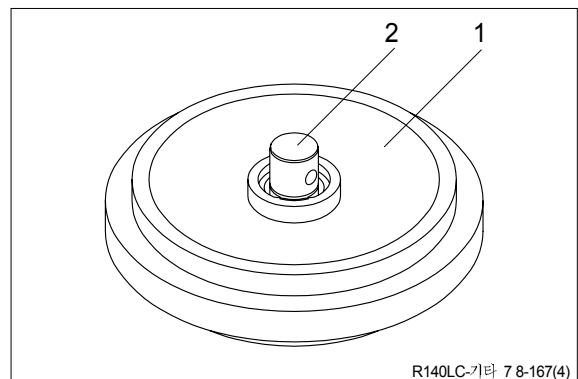
③ Insert shaft(2) into bracket(5) and drive in the spring pin(7).



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



⑤ Install shaft(2) to shell(1).



SECTION 9 COMPONENT MOUNTING TORQUE

Group 1	Introduction guide	9-1
Group 2	Engine system	9-2
Group 3	Electric system	9-4
Group 4	Hydraulic system	9-6
Group 5	Undercarriage	9-10
Group 6	Structure	9-11
Group 7	Work equipment	9-14

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