1. STRUCTURE

This service manual has been prepared as an aid to improve the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every opportunity.
This service manual mainly contains the necessary technical information for operations performed in a service workshop.
For ease of understanding, the manual is divided into the following sections.

SECTION 1 GENERAL
This section explains the safety hints and gives the specification of the machine and major components.

SECTION 2 STRUCTURE AND FUNCTION
This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

SECTION 3 HYDRAULIC SYSTEM
This section explains the hydraulic circuit, single and combined operation.

SECTION 4 ELECTRICAL SYSTEM
This section explains the electrical circuit, monitoring system and each component. It serves not only to give an understanding electrical system, but also serves as reference material for trouble shooting.

SECTION 5 MECHATRONICS SYSTEM
This section explains the computer aided power optimization system and each component.

SECTION 6 TROUBLESHOOTING
This section explains the troubleshooting charts correlating **problems** to **causes**.

SECTION 7 MAINTENANCE STANDARD
This section gives the judgement standards when inspecting disassembled parts.

SECTION 8 DISASSEMBLY AND ASSEMBLY
This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

SECTION 9 COMPONENT MOUNTING TORQUE
This section shows bolt specifications and standard torque values needed when mounting components to the machine.

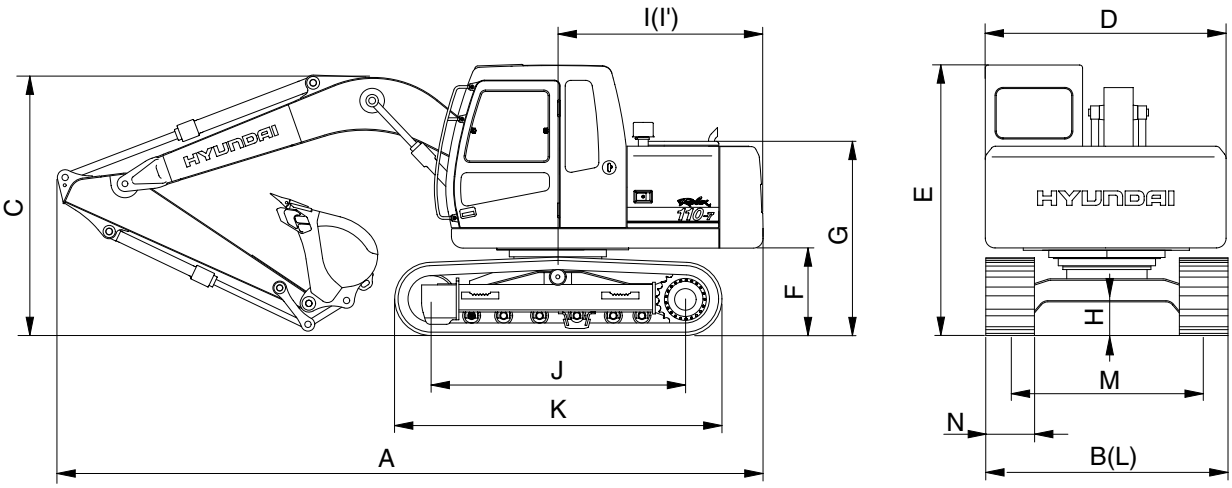
The specifications contained in this shop manual are subject to change at any time and without any advance notice. Contact your HYUNDAI distributor for the latest information.

SECTION 1 GENERAL

2. SPECIFICATIONS

1) R110-7

(1) 4.3m(14' 1") MONO BOOM, 2.26m(7' 5") ARM



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Description		Unit	Specification
Operating weight		kg(lb)	11200(24690)
Bucket capacity(SAE heaped), standard		$m^3(yd^3)$	0.45(0.59)
Overall length	A	mm(ft-in)	7270(23' 10")
Overall width, with 500mm shoe	B		2490(8' 2")
Overall height	C		2720(8' 11")
Superstructure width	D		2475(8' 1")
Overall height of cab	E		2800(9' 2")
Ground clearance of counterweight	F		900(2' 11")
Engine cover height	G		1990(6' 6")
Minimum ground clearance	H		440(1' 5")
Rear-end distance	I		2110(6' 11")
Rear-end swing radius	I'		2130(7' 0")
Distance between tumblers	J		2610(8' 7")
Undercarriage length	K		3340(10' 11")
Undercarriage width	L		2490(8' 2")
Track gauge	M		1990(6' 6")
Track shoe width, standard	N		500(20")
Travel speed(Low/high)		km/hr(mph)	3.4/5.5(2.1/3.4)
Swing speed		rpm	13.0
Gradeability		Degree(%)	35(70)
Ground pressure(500mm shoe)		$kgf/cm^2(psi)$	0.39(5.55)

4) SELECTION OF TRACK SHOE

Suitable track shoes should be selected according to operating conditions.

Method of selecting shoes

Confirm the category from the list of applications in **table 2**, then use **table 1** to select the shoe. Wide shoes(Categories B) have limitations on applications. Before using wide shoes, check the precautions, then investigate and study the operating conditions to confirm if these shoes are suitable.

Select the narrowest shoe possible to meet the required flotation and ground pressure. Application of wider shoes than recommendations will cause unexpected problem such as bending of shoes, crack of link, breakage of pin, loosening of shoe bolts and the other various problems.

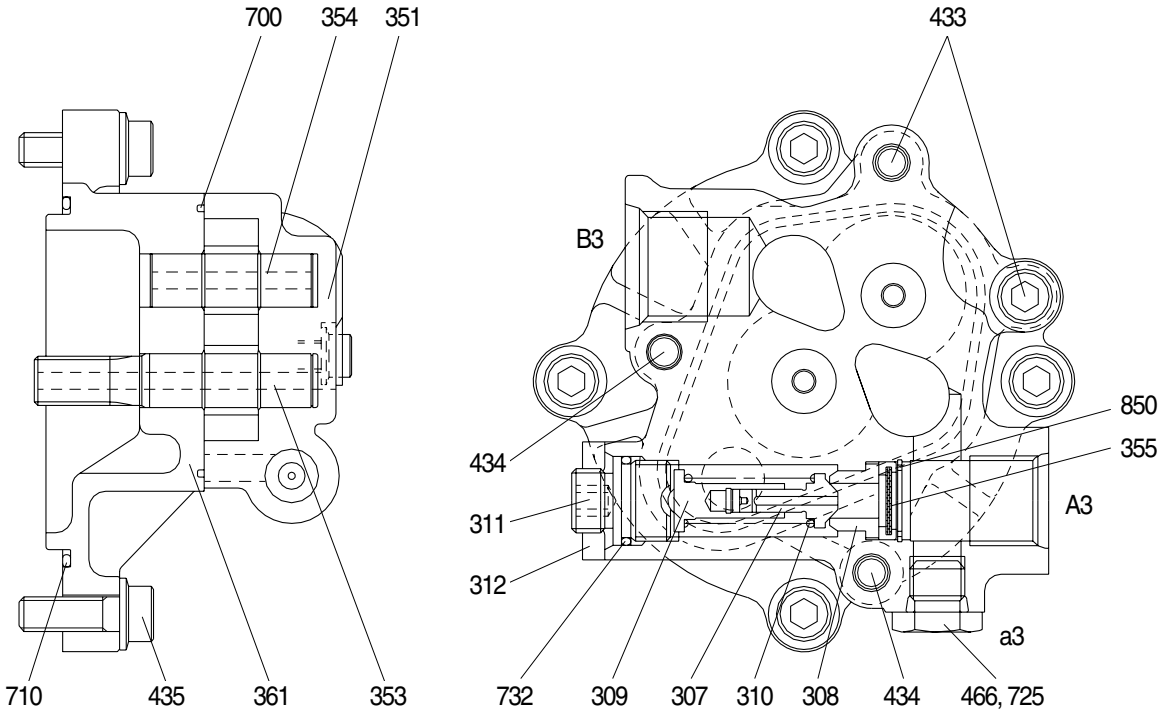
※ **Table 1**

Track shoe	Specification	Category
500mm triple grouser	Standard	A
600mm triple grouser	Option	A
700mm triple grouser	Option	B

※ **Table 2**

Category	Applications	Precautions
A	Rocky ground, river beds, normal soil	· Travel at low speed on rough ground with large obstacles such as boulders or fallen trees
B	Normal soil, soft ground	· These shoes cannot be used on rough ground with large obstacles such as boulders or fallen trees · Travel at high speed only on flat ground · Travel slowly at low speed if it is impossible to avoid going over obstacles

3) GEAR PUMP



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307	Poppet	353	Drive gear	466	Plug
308	Seat	354	Driven gear	700	Ring
309	Spring seat	355	Filter	710	O-ring
310	Spring	361	Front case	725	O-ring
311	Screw	433	Flange socket	732	O-ring
312	Nut	434	Flange socket	850	Snap ring
351	Gear case	435	Flange socket		

③ **Low tilting angle(Low flow) command preferential function**

As mentioned above, flow control and horsepower control tilting angle commands are transmitted to the feedback lever and spool via the large-hole sections(C & F) of levers 1 and 2. However, since sections C and F have the pins(ø 4) protruding from the large hole(ø 8), only the lever lessening the tilting angle contacts the pin(897) ; the hole(ø 8) in the lever of a larger tilting angle command is freed without contacting the pin(897). Such a mechanical selection method permits preference of the lower tilting angle command of the flow control and horsepower control.

④ **Adjustment of input horsepower**

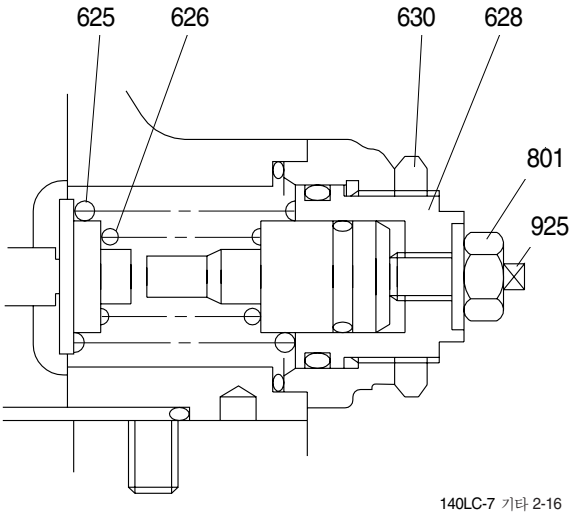
Since the regulator is of total cumulative horsepower type, adjust the adjusting screws of both the front and rear pumps, when changing the horsepower set values. The pressure change values by adjustment are based on two pumps pressurized at the same time, and the values will be doubled when only one pump is loaded.

a. Adjustment of outer spring

Adjust it by loosening the hexagon nut(630) and by tightening(or loosening) the adjusting screw C(628). Tightening the screw shifts the control chart to the right and increases the input horsepower as shown in the figure. Since turning the adjusting screw C by N turns changes the setting of the inner spring(626), return the adjusting screw QI(925) by N × A turns at first.(A=1.9)

※ **Adjusting values are shown in table**

Speed	Adjustment of outer spring		
	Tightenin amount of adjusting screw(C) (924)	Compens-ationg control pressure change amount	Input torque change amount
(min $^{-1}$)	(Turn)	(kgf/cm^2)	(kgf · m)
1950	+1/4	+19.2	+2.71



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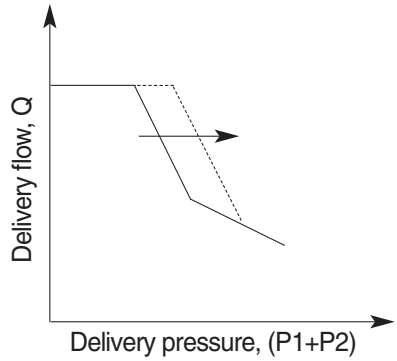
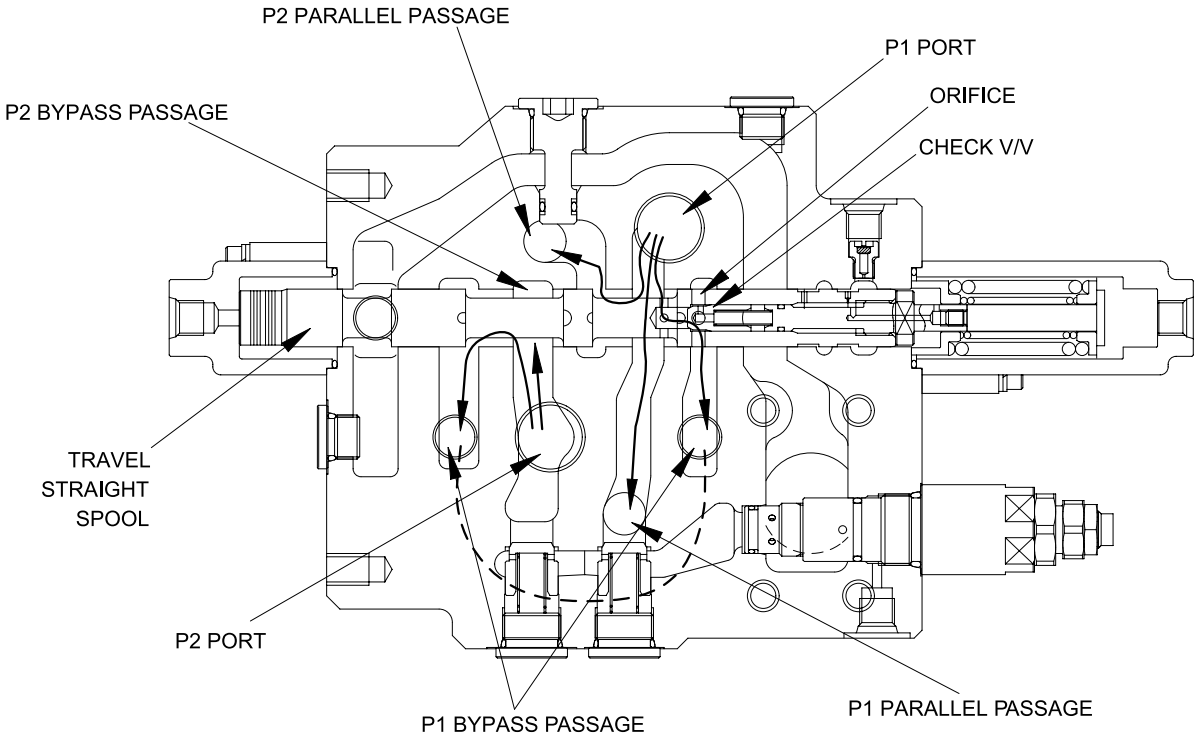


(2) TRAVEL STRAIGHT FUNCTION



This function keeps straight travel in case of simultaneous operation of other actuators(boom, arm, bucket, swing) during a straight travel.

① **During travel only :**

The hydraulic fluid of the pump P1 is supplied to the travel motor and the pump P2 is supplied to the other motor.

Thus, the machine keep travel straight.

② **The other actuator operation during straight travel operation :**

When the other actuator spool(s) is selected under straight travel operation, the straight travel spool is moved.

The hydraulic fluid from pump P1 is supplied actuator through P1 and P2 parallel pass and travel motors through orifice at side of straight travel spool.

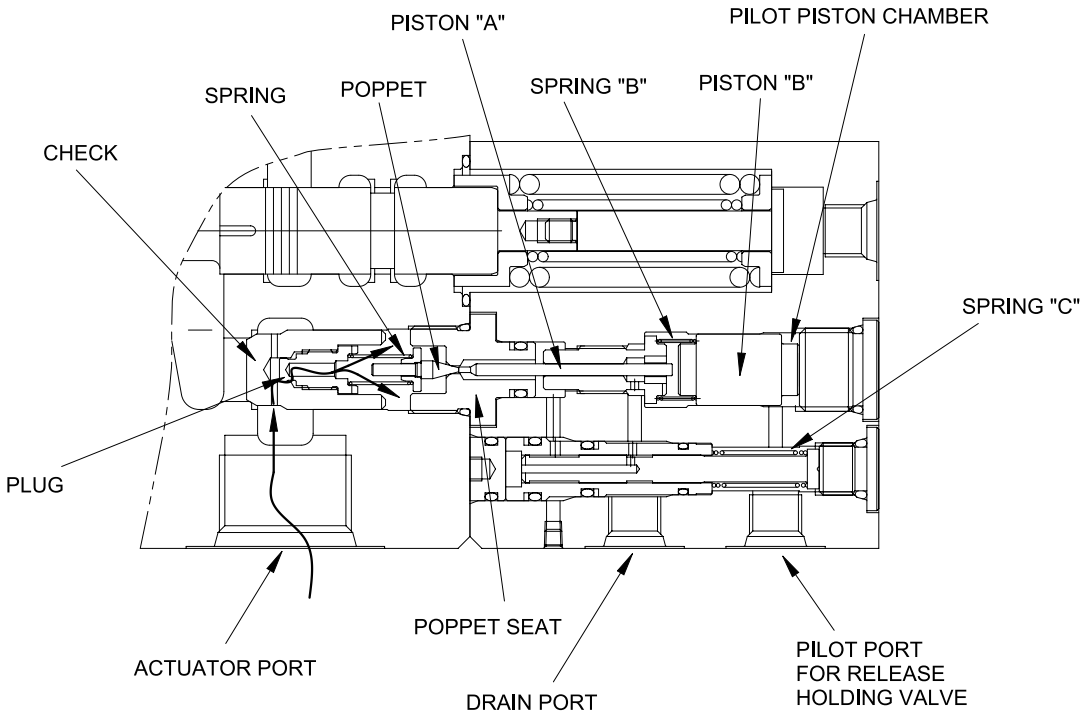
The hydraulic oil fluid from pump P2 is supplied to travel motors(left/right).

Therefore, the other actuator operation with straight travel operation, hydraulic oil fluid from pump P1 is mainly supplied to actuator, and the hydraulic oil fluid form pump P2 is mainly supplied to travel motors(left/right).

Then the machine keeps straight travel.

(8) HOLDING VALVE OPERATION

① Holding operation



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At neutral condition, the pilot piston chamber is connected to drain port through the pilot port.
And the piston "B" is supported with spring "B" and the pressured fluid from actuator entered to inside of the holding valve through the periphery hole of check, crevice of the check and the plug and the periphery hole of plug.
Then, this pressured oil pushed the poppet to the poppet seat and the check to the seat of body.
So the hydraulic fluid from actuator is not escaped and the actuator is not moved.

2. FUNCTION

1) ROTARY PART

When high pressurized oil enters a cylinder through port(a), which is the inlet of balance plate(1), hydraulic pressure acting on the piston causes axial force F. The pressure force F works via the piston(2) upon the return plate(3) which acts upon the swash plate(4) via an hydrostatic bearing. Force F1 perpendicular to swash plate(4) and force F2 perpendicular to cylinder center.

Being transferred to the cylinder block(5) through piston, force F2 causes rotational moment at surroundings of cylinder.

Since cylinder block has 9 equidistantly arrayed pistons, rotational torque is transmitted to cylinder shaft in order by several pistons connected to the inlet port of high pressurized oil. When the direction of oil flow is reversed, rotational direction of cylinder is also reversed. Output torque is given by the equation.

$$T = \frac{p \times q}{2\pi}, \quad q = Z \cdot A \cdot PCD \cdot \tan\theta, \quad F1 = \frac{F}{\cos\theta}, \quad F_2 = F\tan\theta, \quad S = PCD \times \tan\theta$$

Where p : Effective difference of pressure(kgf/cm^2)

q : Displacement(cc/rev)

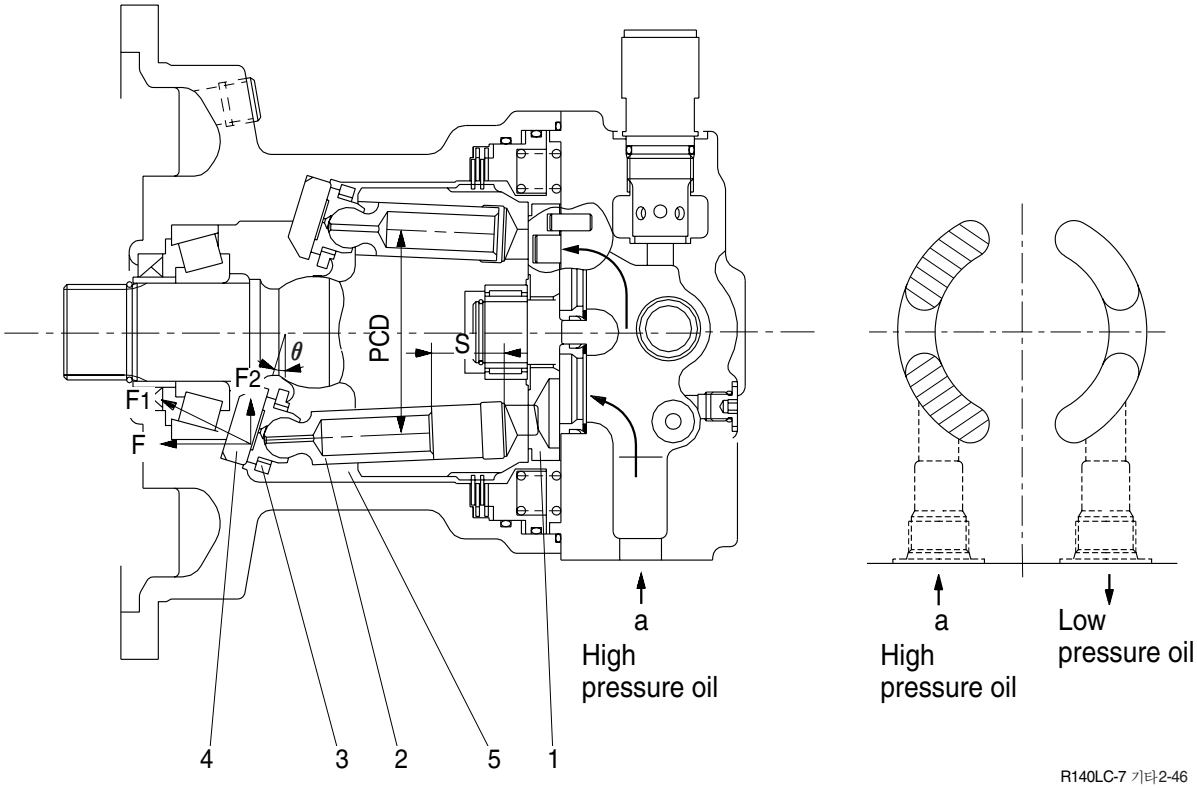
T : Output torque(kgf · cm)

Z : Piston number(9EA)

A : Piston area(cm^2)

θ : Tilting angle of swash plate(degree)

S : Piston stroke(cm)



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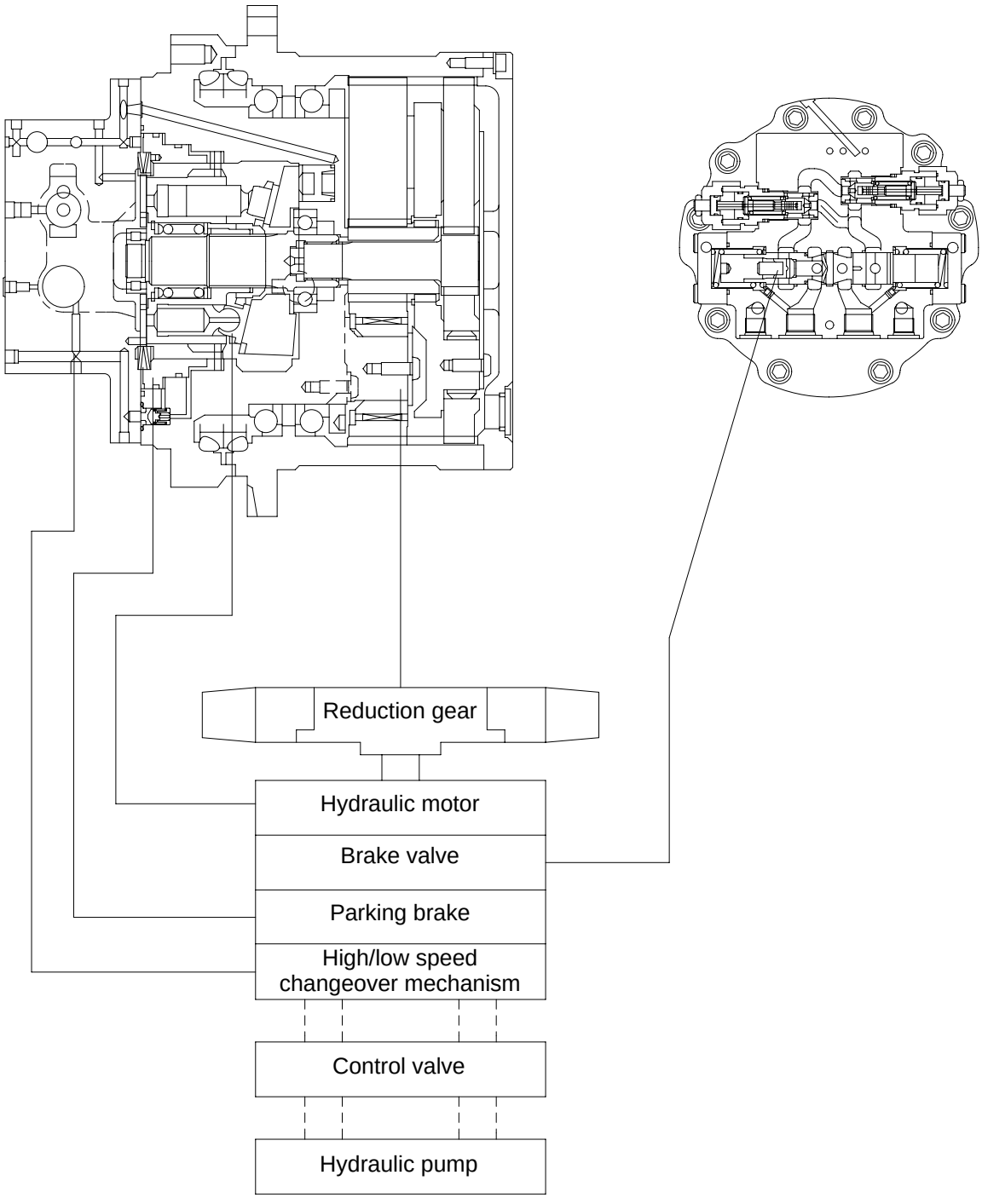
1) BASIC STRUCTURE



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Functions

Please refer to (1) shown above.

When the pilot pressure PP3 is NOT applied, SPOOL #1 is at the right position because of the spring behind the spool. Now the motor is always at low speed regardless of the position of SPOOL #2.

When the pilot pressure PP3 is applied, SPOOL #1 is at the left position because of PP3. Now the motor is at automatic 2-speed-shifting mode. The displacement of the motor can be changed based on the motor load pressure.

Please refer to (2)-1.

Now the pilot pressure is applied, and the motor is at automatic 2-speed-shifting mode. When the motor load pressure is low, SPOOL #2 is at the right position because of the spring behind the spool. And the load pressure is led to the chamber behind the speed-shifting piston and it pushes piston and changes the cam angle smaller. This means that the motor is at High speed.

Please refer to (2)-2.

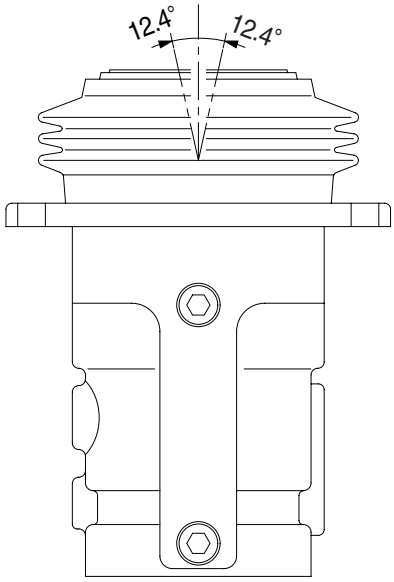
Now the pilot pressure is applied, and the motor is at automatic 2-speed-shifting mode. When the motor load pressure is high, SPOOL #2 is at the left position because of the motor load pressure pushing the spool to the left. Then the load pressure is locked at the SPOOL #2 and is NOT led to the chamber behind the speed-shifting piston. The cam angle remains big. This means that the motor is at Low speed.

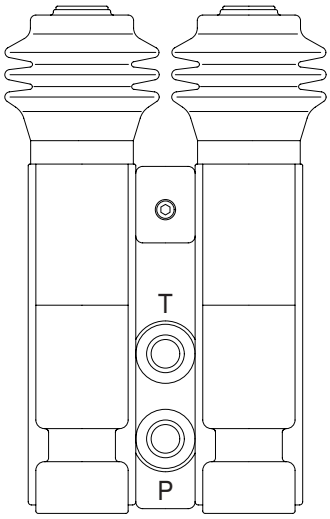
As to the detail of cam angle change, please refer to "1) Hydraulic motor section (2) speed-shifting function".

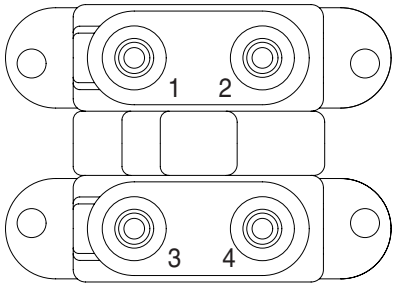
GROUP 6 RCV PEDAL

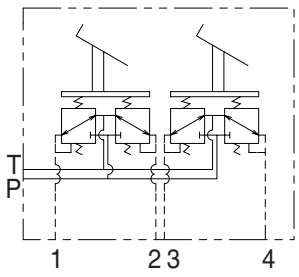
1. STRUCTURE

The casing(Spacer) has the oil inlet port P(Primary pressure), and the oil outlet port T(Tank). In addition the secondary pressure is taken out through ports 1, 2, 3 and 4 provided at the bottom face.









Hydraulic circuit

Port	Port	Port size
P	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	
1	Travel(LH, Forward)	
2	Travel(LH, Backward)	
3	Travel(RH, Forward)	
4	Travel(RH, Backward)	

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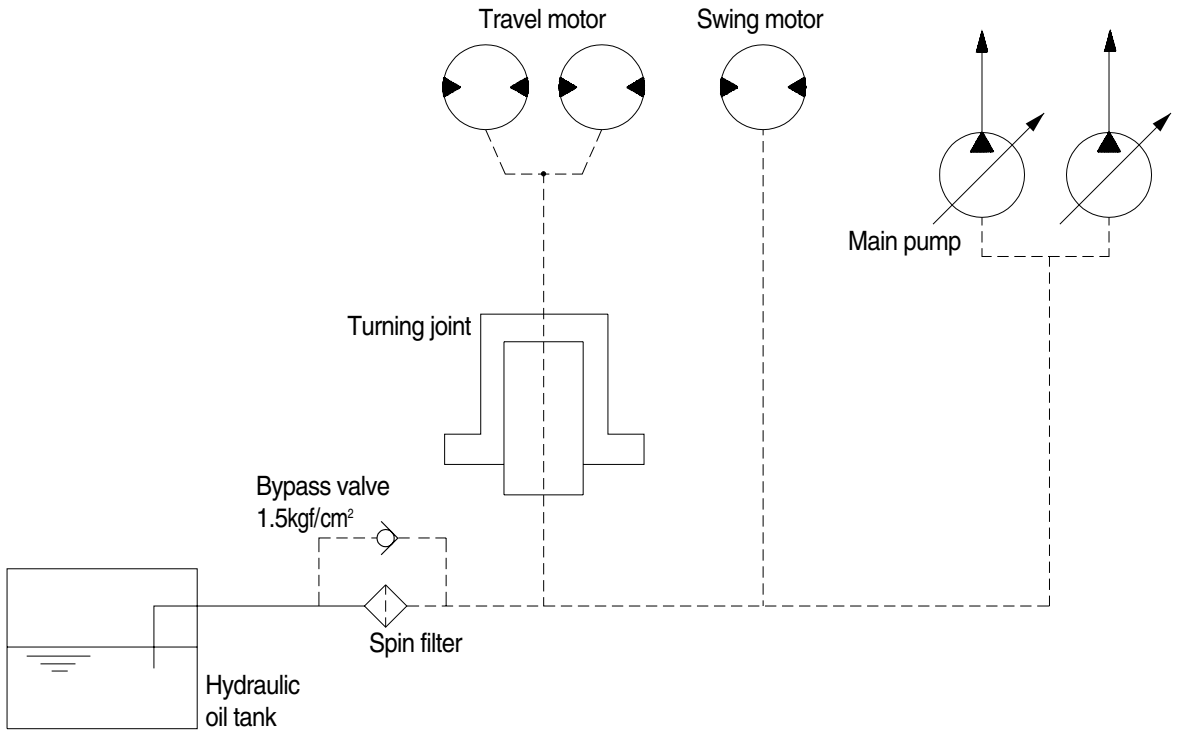
3. DRAIN CIRCUIT



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Besides internal leaks from the motors and main pump, the oil for lubrication circulates. These oil have to be fed to the hydraulic tank passing through spin filter.
When the drain oil pressure exceed 1.5kgf/cm²(21psi), the oil returns to the hydraulic tank directly.

1) TRAVEL MOTOR DRAIN CIRCUIT

Oil leaked from the right and left travel motors comes out of the drain ports provided in the respective motor casing and join with each other. These oils pass through the turning joint and return to the hydraulic tank after being filtered by spin filter.

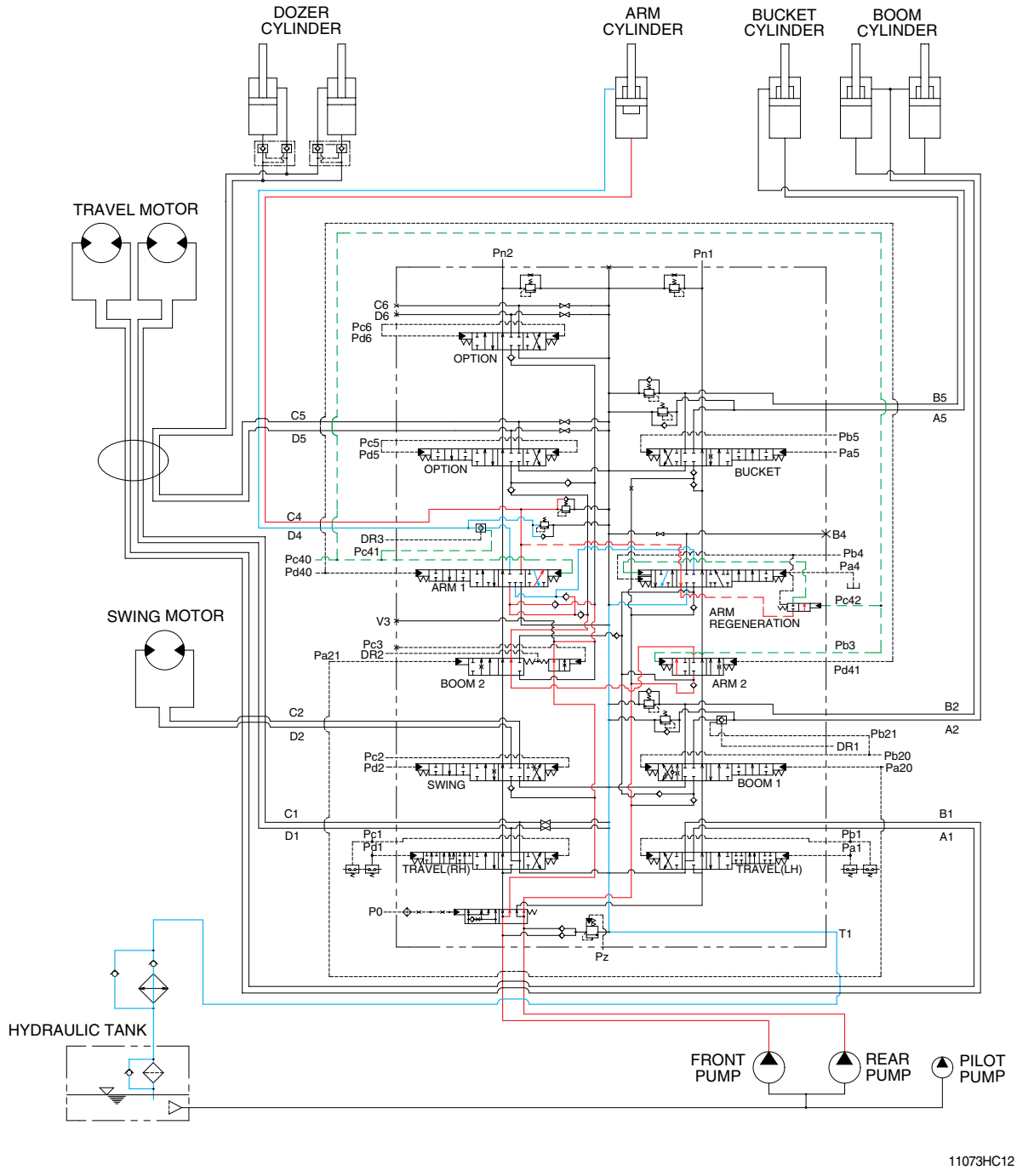
2) SWING MOTOR DRAIN CIRCUIT

Oil leaked from the swing motor returns to the hydraulic tank passing through a spin filter with oil drained from the travel circuit .

3) MAIN PUMP DRAIN CIRCUIT

Oil leaked from main pump returns to the hydraulic tank passing through spin filter.

3. ARM ROLL IN OPERATION



When the left control lever is pulled back, the arm spools in the main control valve are moved the to roll in position by the pilot oil pressure from the remote control valve.

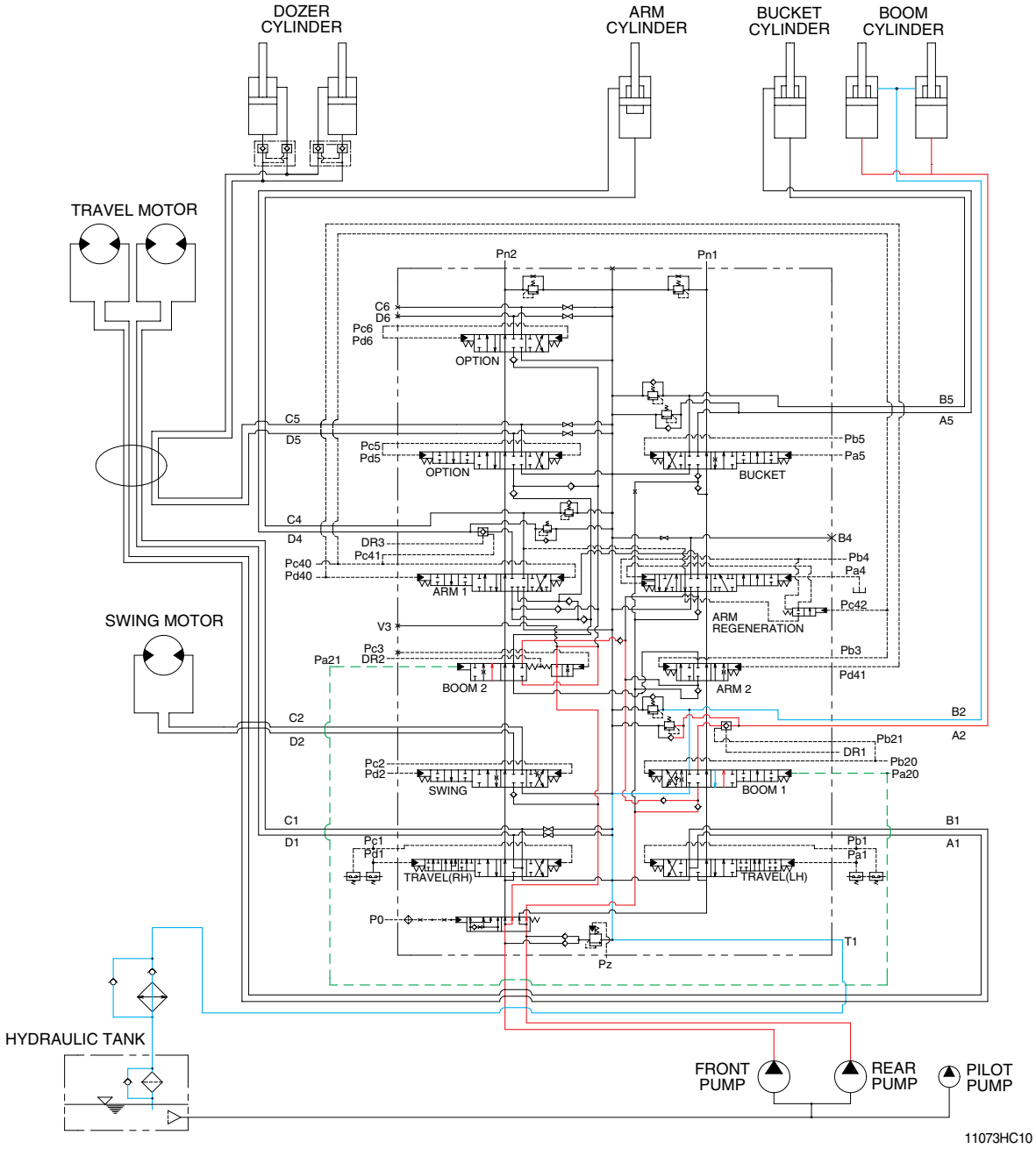
The oil from the front and rear pump flows into the main control valve and then goes to the large chamber of arm cylinder.

At the same time, the oil from small chamber of arm cylinder returns to the hydraulic oil tank through the arm spool in the main control valve. When this happens, the arm rolls in.

The cavitation which will happen to the bottom of the arm cylinder is also prevented by the make-up valve in the main control valve.

GROUP 4 SINGLE OPERATION

1. BOOM UP OPERATION



When the right control lever is pulled back, the boom spools in the main control valve are moved to the up position by the pilot oil pressure from the remote control valve.

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

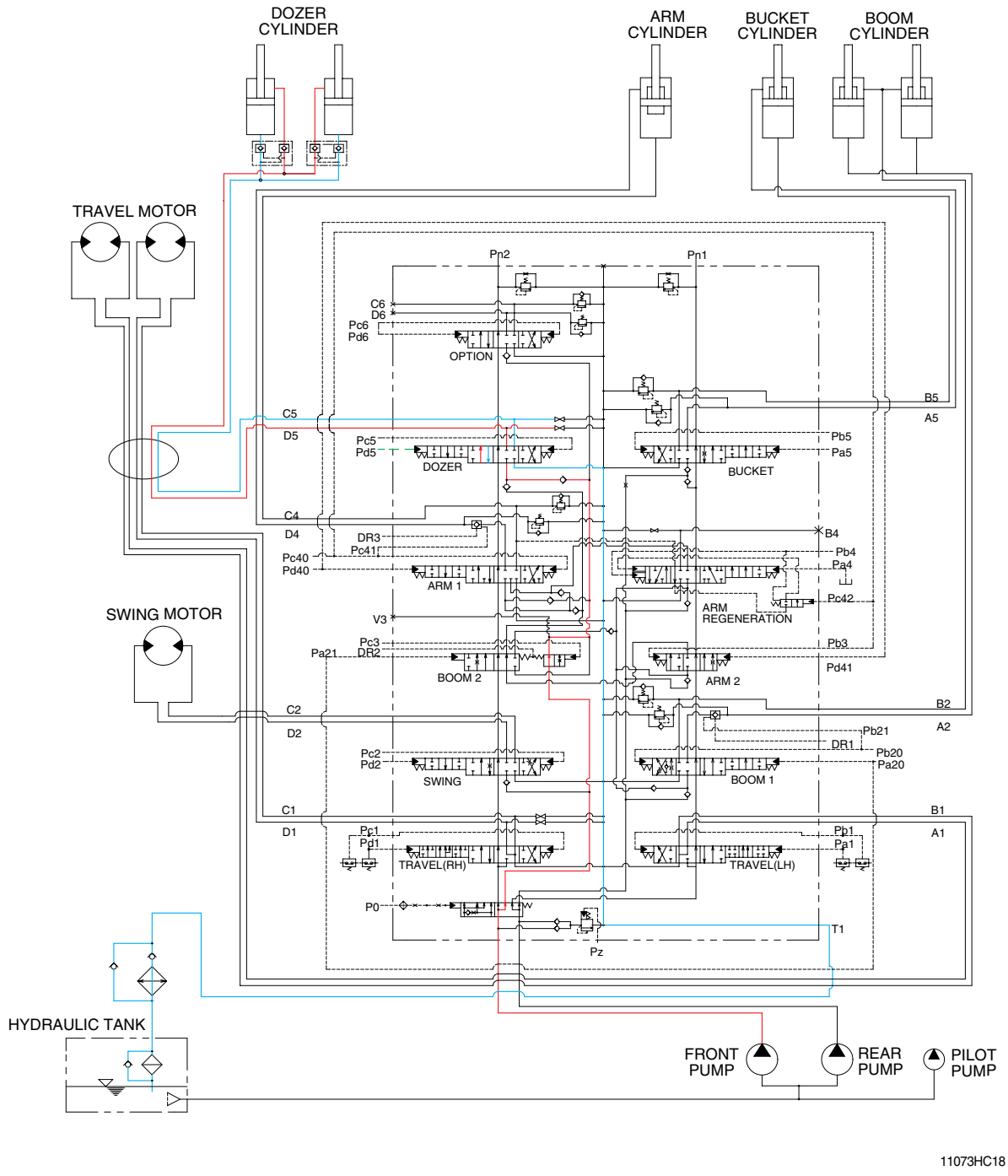
At the same time, the oil from the small chamber of boom cylinders returns to the hydraulic oil tank through the boom spool in the main control valve. When this happens, the boom goes up.

The excessive pressure in the boom cylinder bottom end circuit is prevented by relief valve.

When the boom is up and the control lever is returned to neutral position, the circuit for the holding pressure at the bottom end of the boom cylinder is closed by the boom holding valve.

This prevents the hydraulic drift of boom cylinder.

9. DOZER UP OPERATION

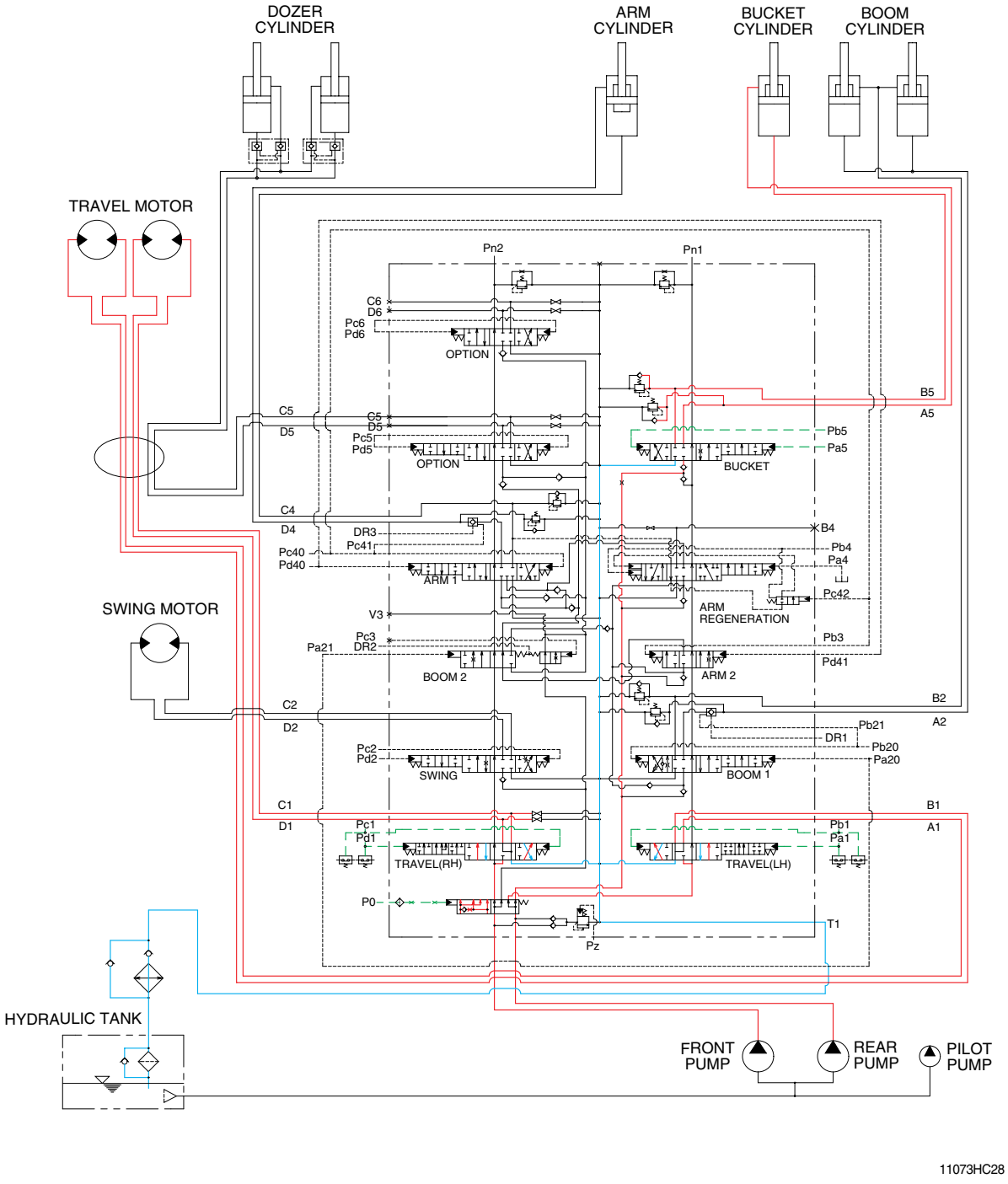


When the dozer control lever is pulled back, the dozer spool in the main control valve is moved to the dozer up position by the pilot oil pressure from the remote control valve.

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

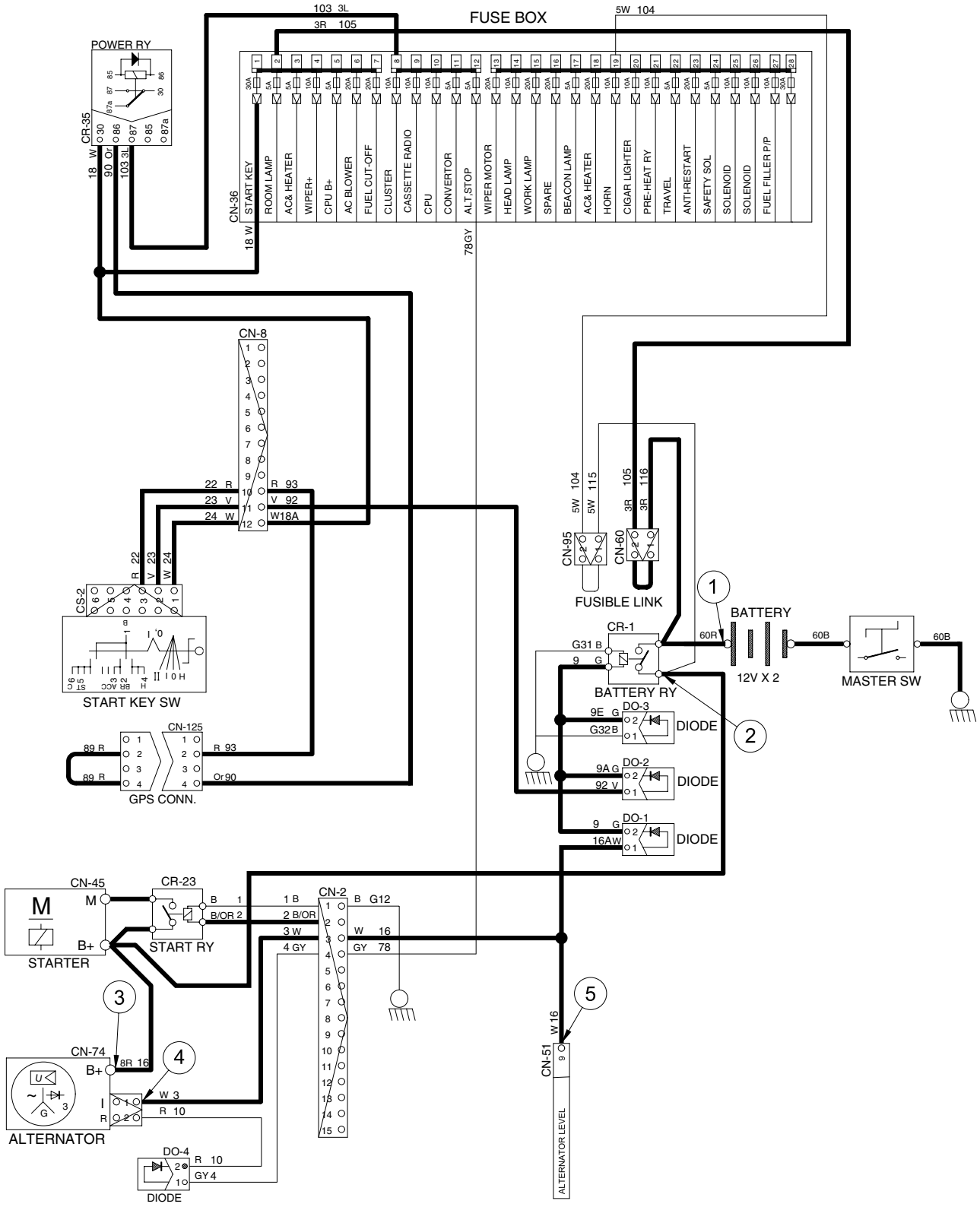
At the same time, the oil from the large chamber of dozer cylinders returns to the hydraulic oil tank through the dozer spool in the main control valve. When this happens, the dozer goes up.

9. COMBINED BUCKET AND TRAVEL OPERATION



When the bucket and travel functions are operated, simultaneously the bucket spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure from the remote control valve, and the straight travel spool is pushed to the left by the oil pressure from pilot pump. The oil from the rear pump flows into the bucket cylinder through the bucket spool via the confluence oil passage. The oil from the front pump flows into the travel motors through the RH travel spool and the LH travel spool via the straight travel spool of the control valve.
The bucket is operated and the machine travels straight.

CHARGING CIRCUIT



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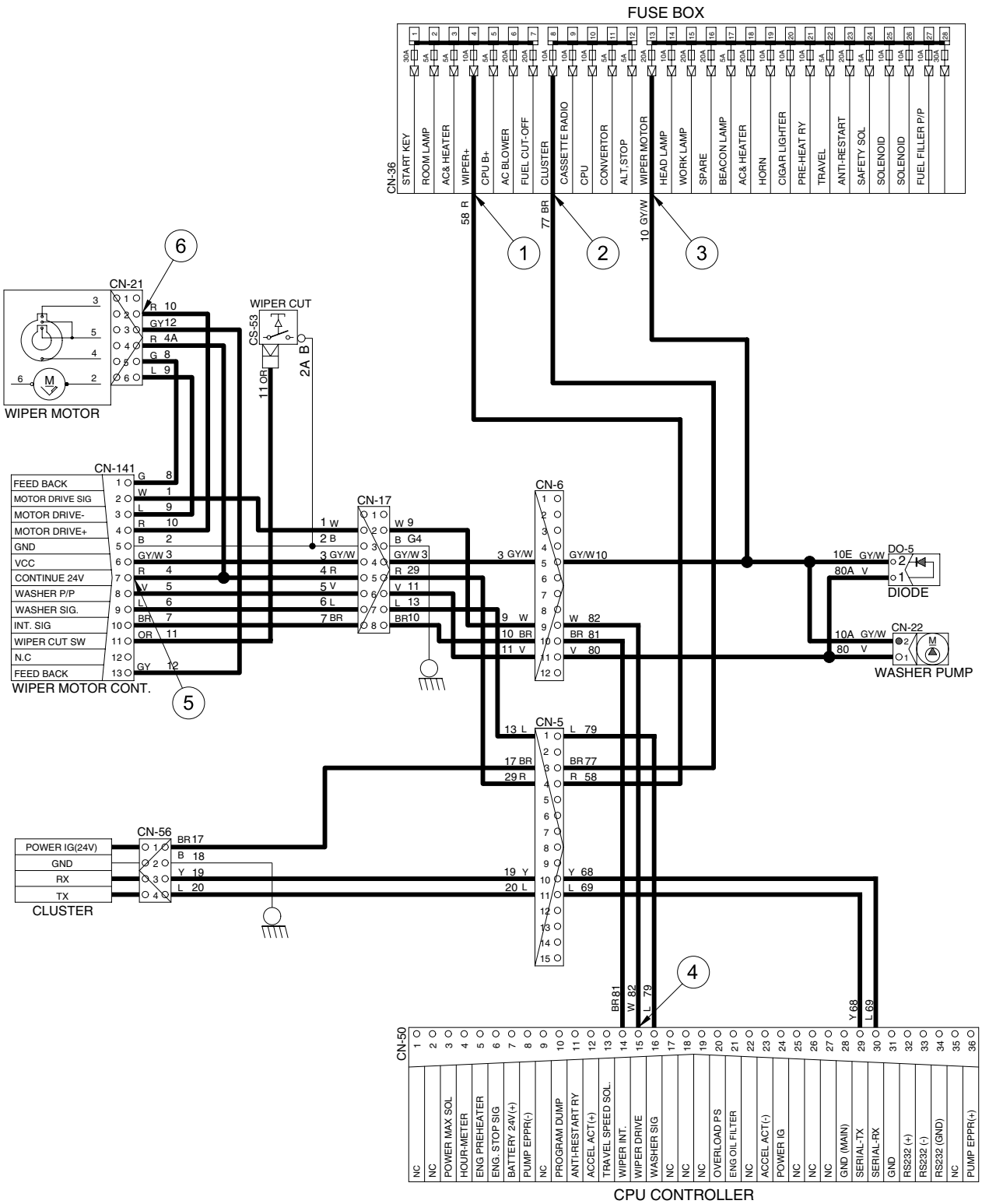
WIPER AND WASHER CIRCUIT



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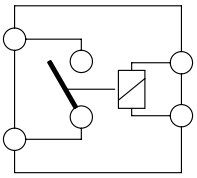
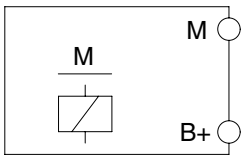
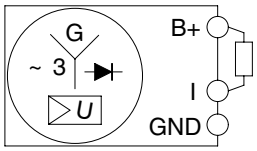
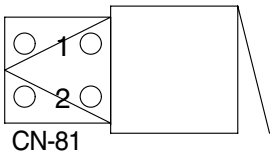
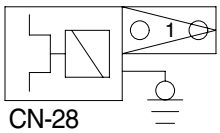
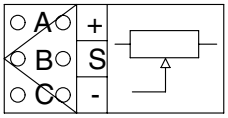
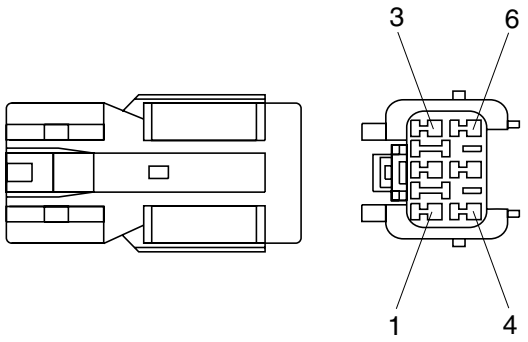
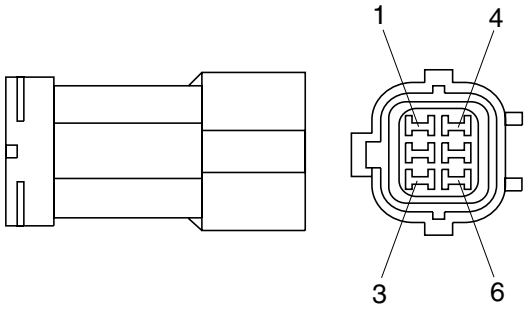
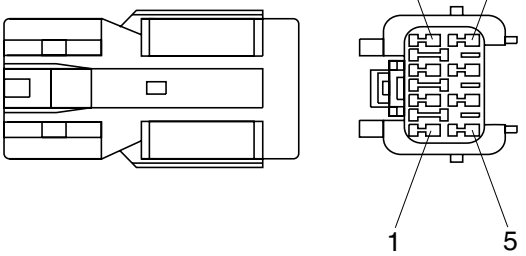
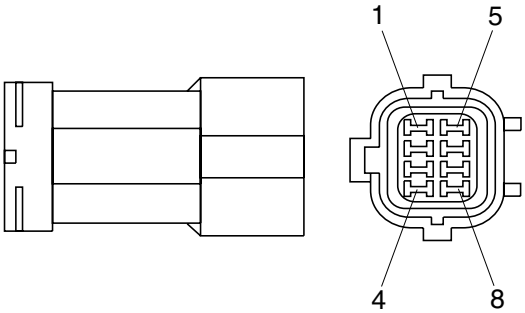
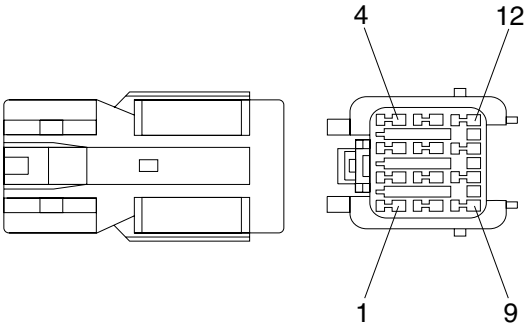
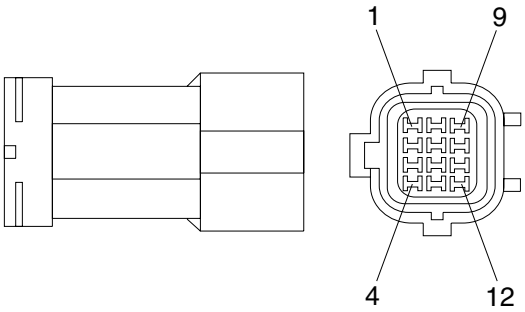
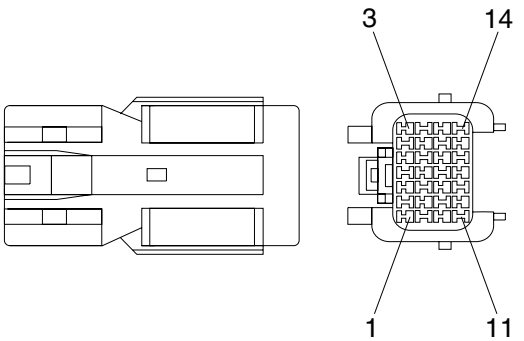
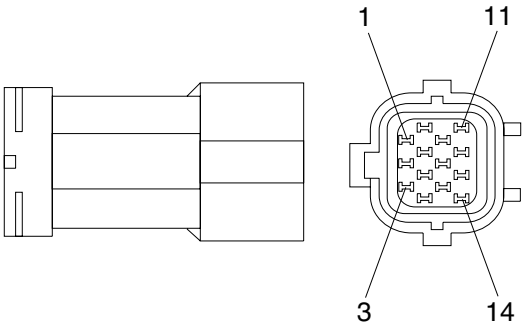
Part name	Symbol	Specification	Check
Start relay	 CR-23	24V 300A	※ Check contact Normal : 0.94 Ω (For terminal 1-2)
Starter	 CN-45	Delco Remy 28MT 24V	※ Check contact Normal : 0.1 Ω
Alternator	 CN-74	24V 60A	※ Check contact Normal : 0 Ω (For terminal B -1) Normal : 24 ~ 27.5V
Travel alarm	 CN-81	24V 0.5A	※ Check contact Normal : 5.2 Ω
Aircon compressor	 CN-28	24V 79W	※ Check contact Normal : 13.4 Ω
Accel dial	 CN-142	-	※ Check resistance Normal : About 5KΩ (For terminal A-C) ※ Check valtage Normal : About 5V (For terminal A-C) : 2 ~ 4.5V (For terminal C-B)

No. of pin	Receptacle connector(Female)	Plug connector(Male)
6	 S814-006000	 S814-106000
8	 S814-008000	 S814-108000
12	 S814-012000	 S814-112000
14	 S814-014000	 S814-114000

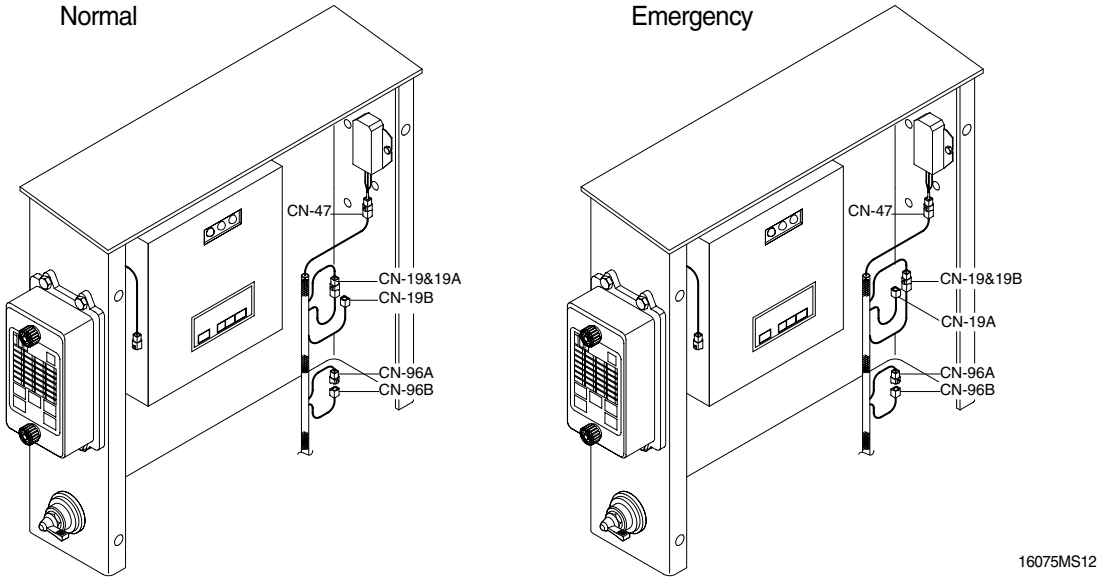
SECTION 5 MECHATRONICS SYSTEM

5. ERROR CODES TABLE

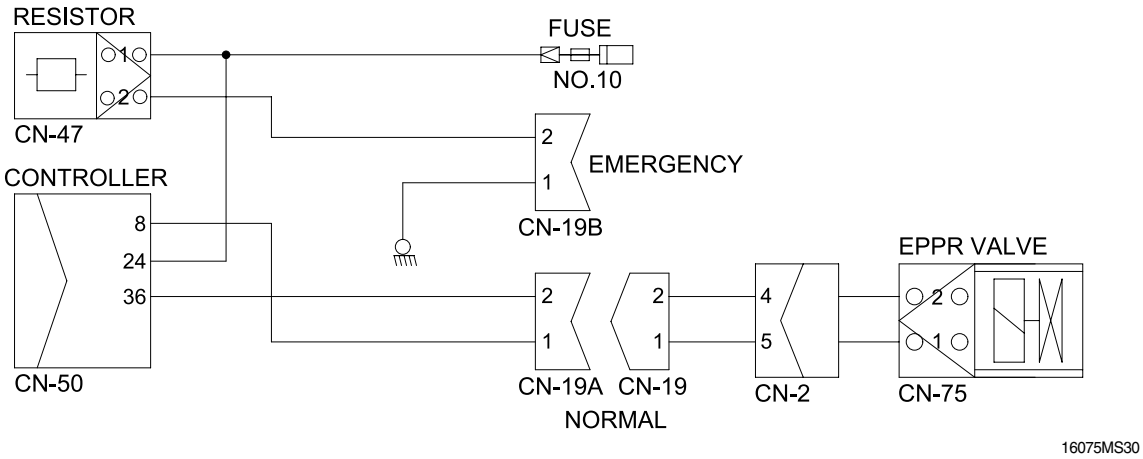
Fault code No.	Description
00	No error
01	Short circuit in accel actuator motor system
02	Potentiometer circuit is shorted to Vcc(5V) or battery +
03	Short circuit in pump EPPR valve system
05	Short circuit in travel speed solenoid system
10	Short circuit in hour-meter system
11	Accel dial circuit is shorted to Vcc(5V) or battery +
16	Accel actuator motor circuit is open or shorted to ground
17	Potentiometer circuit is open or shorted to ground
18	Pump EPPR valve circuit is open or shorted to ground
20	Travel speed solenoid circuit is open or shorted to ground
25	Hour-meter circuit is open or shorted to ground
26	Accel dial circuit is open or shorted to ground
31	Engine preheater circuit is open or shorted to ground
33	Alternator circuit is open or shorted to ground
34	Actuator input voltage is below 18V
35	Actuator input voltage is over 38V
36	Communication error with cluster
37	Engine speed sensor circuit is open or shorted to ground
40	There is more than 500rpm difference between target speed and actual speed
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
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 +
49	Engine preheater circuit is shorted to battery +

GROUP 11 PUMP PROLIX

Its the conversion connector to manual control temporarily when the electronic control system is out of order, until repair work be done.



1. OPERATING PRINCIPLE WIRING DIAGRAM



1) NORMAL

- EPPR valve supply specified amount of pilot pressure to the flow regulator of hydraulic pump and regulate hydraulic pump delivery amount depending upon the signal of CPU controller by selected mode.

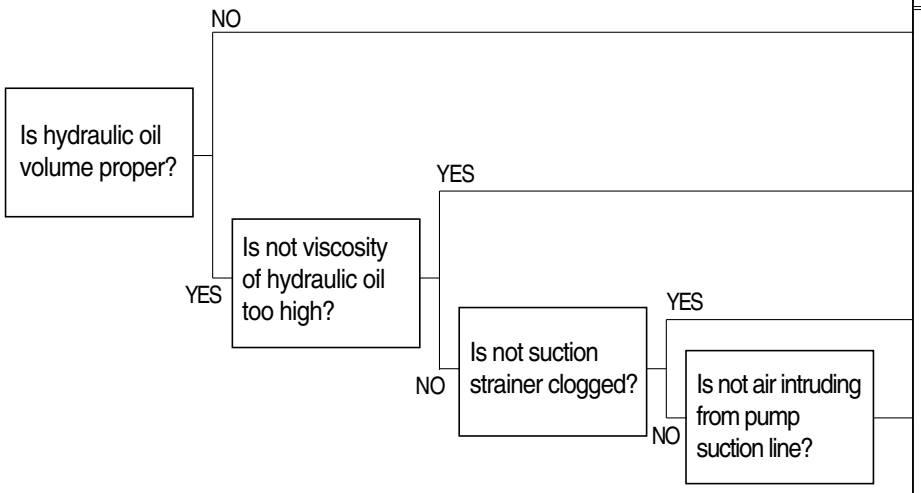
2) EMERGENCY

- If prolix resistor(CN-19) is connected with CN-19B when any abnormality occurs in NEW CAPO system, constant electric current from battery flows to EPPR valve so that EPPR valve can be fixed at the predetermined position.
- In this case excavator can be operated at an equivalent performance to S mode.

2) DESCRIPTION OF MONITORING DISPLAY

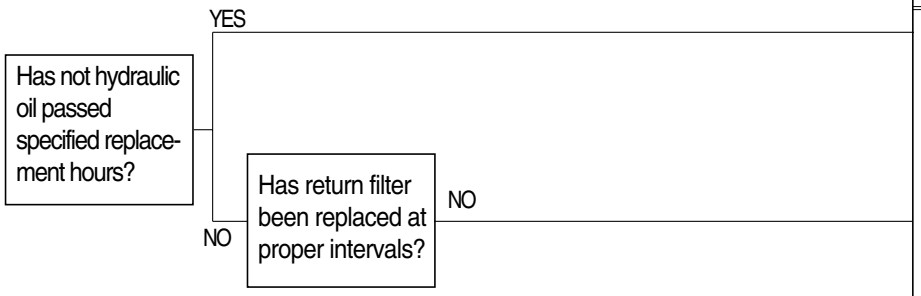
Group	Display	Name	Description
Group 0	2250 rpm	Engine speed	It displays current engine speed detected by engine speed sensor from 500 to 3000rpm. Range : 500~3000rpm by 10rpm
	TIME 12 : 30	Time	It displays current time(12 is hour and 30 is minute) Range : Hour(1~12), minute(00~59)
	EP : 10bar	Power shift pressure of EPPR valve	It shows that pump power shift pressure of EPPR valve being controlled by the CPU controller is 10bar. Range : 00~50bar by 1bar
	11 : C1.0	Model and CPU program version	It shows that machine model(R110-7) and the program version of the CPU controller is 1.0. Version display range : 0.0~9.9 by 0.1
Group 1	b24 : 8V	Battery voltage	It shows that battery power of 24.8V is supplied into CPU controller. Range : 00.0~48.0V by 0.1V
	Po : 2.5V	Potentiometer voltage	It shows that potentiometer signal voltage is 2.5V. Range : 0.0~5.0V by 0.1V
	dL : 3.8V	Accel dial voltage	It shows that accel dial signal voltage is 3.8V. Range : 0.0~5.0V by 0.1V
	Hd : 50℃	Hydraulic oil temperature	It shows that hydraulic oil temperature detected by temperature sensor is 50℃. Range : 0~150℃ by 1℃
	Ct : 85℃	Coolant temperature	It shows that coolant oil temperature detected by temperature sensor is 50℃. Range : 0~150℃ by 1℃
Group 2	CHECK Er : 03	Current error	It shows that current error of 03(Short circuit in pump EPPR valve system) is diagnosed by self diagnosis system in the CPU controller. If more than 2 errors, when pressing ▼ or ▲ switch, other error codes show. Range : 00~58
	TIME Er : 03	Recorded error	It shows recorded error code of 03 which is diagnosed before. If more than 2 error codes, when pressing ▼ or ▲ switch, other error codes show. Range : 00~58
	TIME Er : 00	Recorded error deletion	It shows all recorded error codes are removed in the CPU controller memory.

3) CAVITATION OCCURS WITH PUMP



Cause	Remedy
	Replenish specified oil to the standard level. Replace oil with one of proper viscosity. Clean suction strainer. Check for air intrusion in suction line and retighten or replace parts.

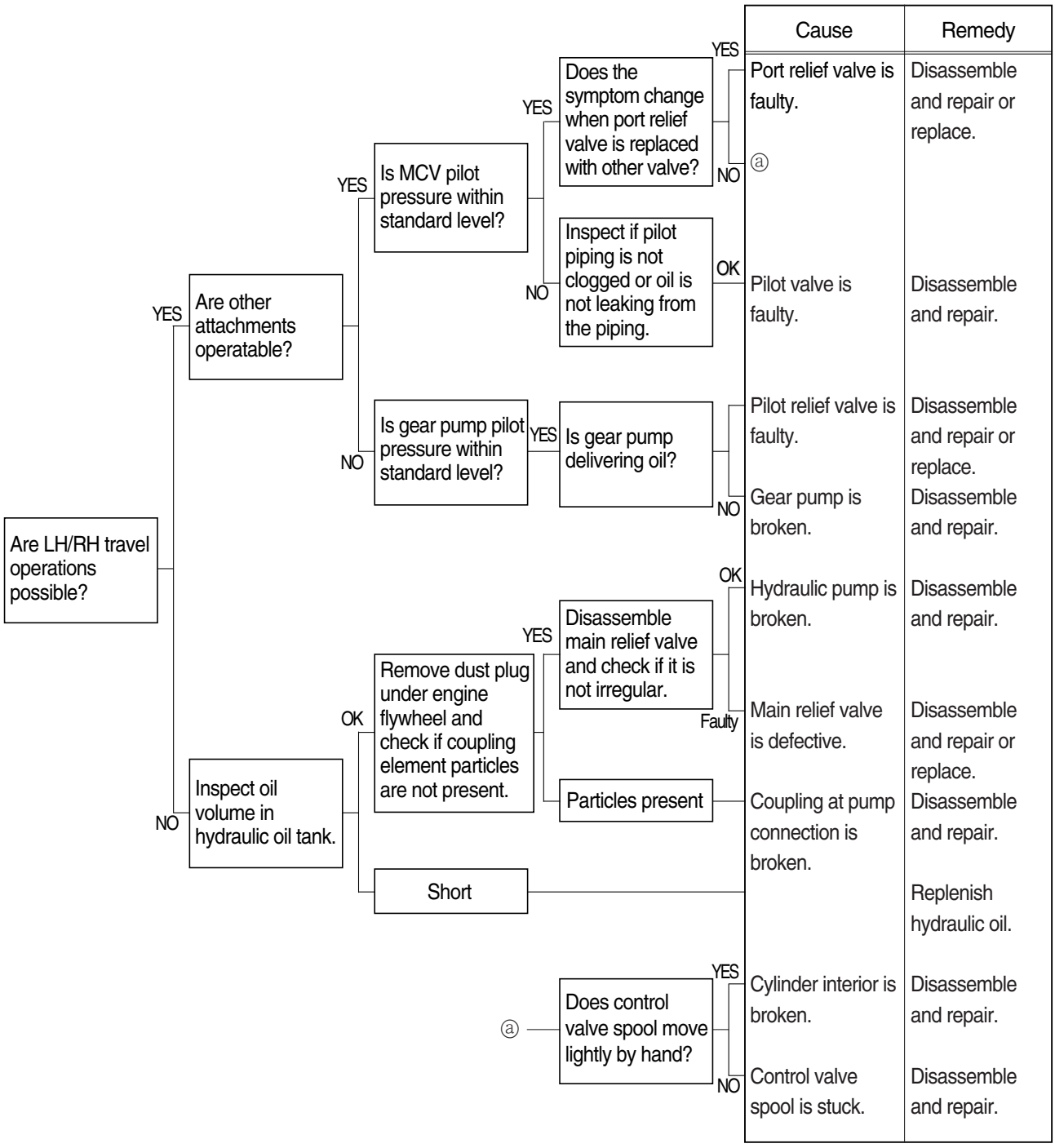
4) HYDRAULIC OIL IS CONTAMINATED



Cause	Remedy
	Replace hydraulic oil to be specified. Flush with hydraulic oil and replace return filter.

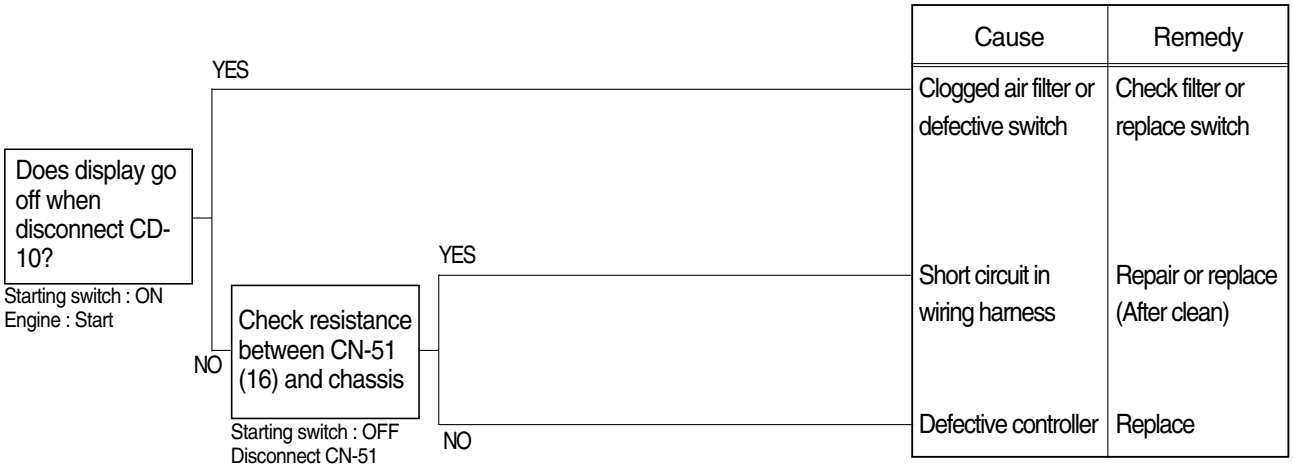
6. ATTACHMENT SYSTEM

1) BOOM OR ARM ACTION IS IMPOSSIBLE AT ALL



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.



Cause	Remedy
Clogged air filter or defective switch	Check filter or replace switch
Short circuit in wiring harness	Repair or replace (After clean)
Defective controller	Replace

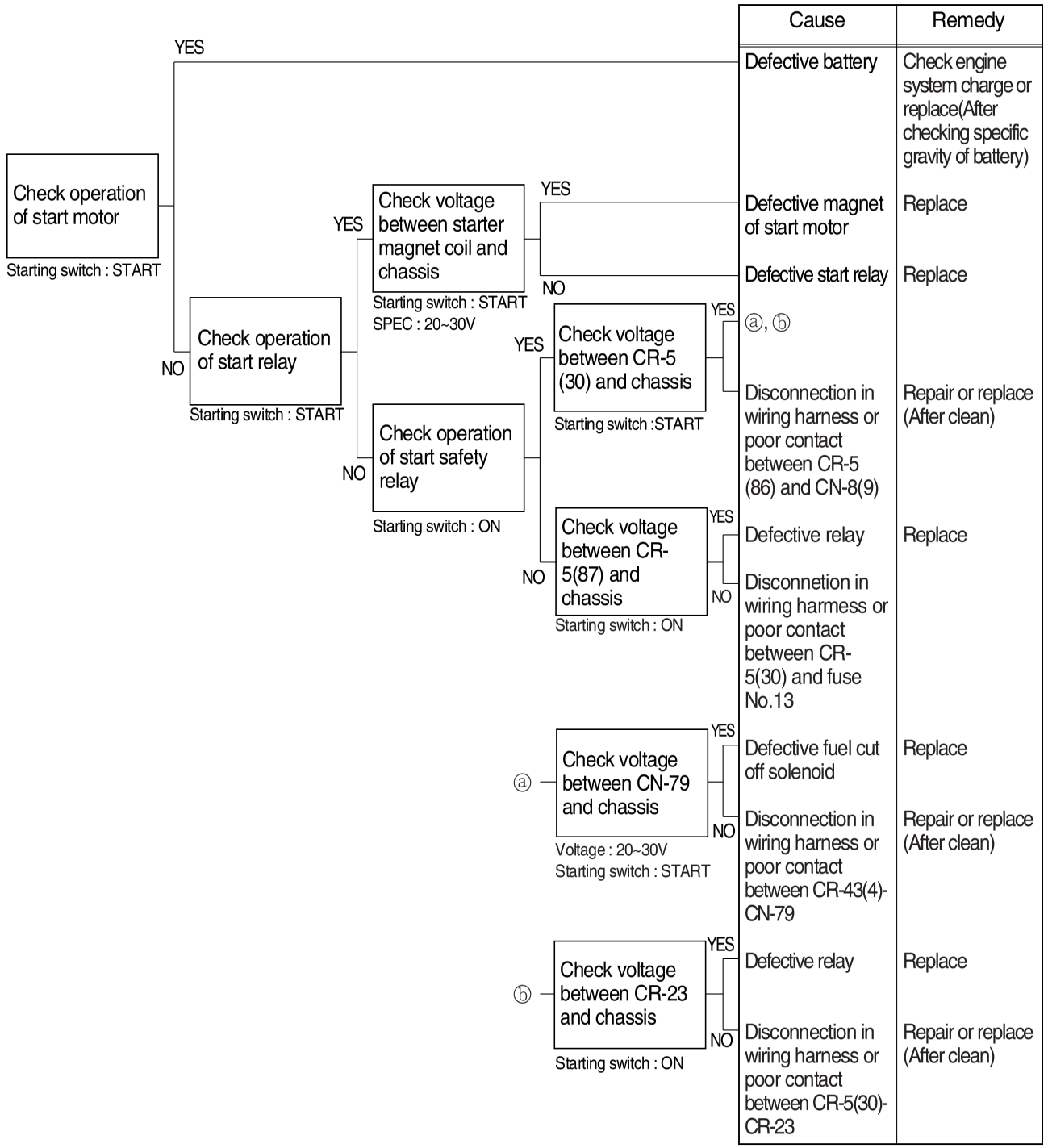
Check resistance

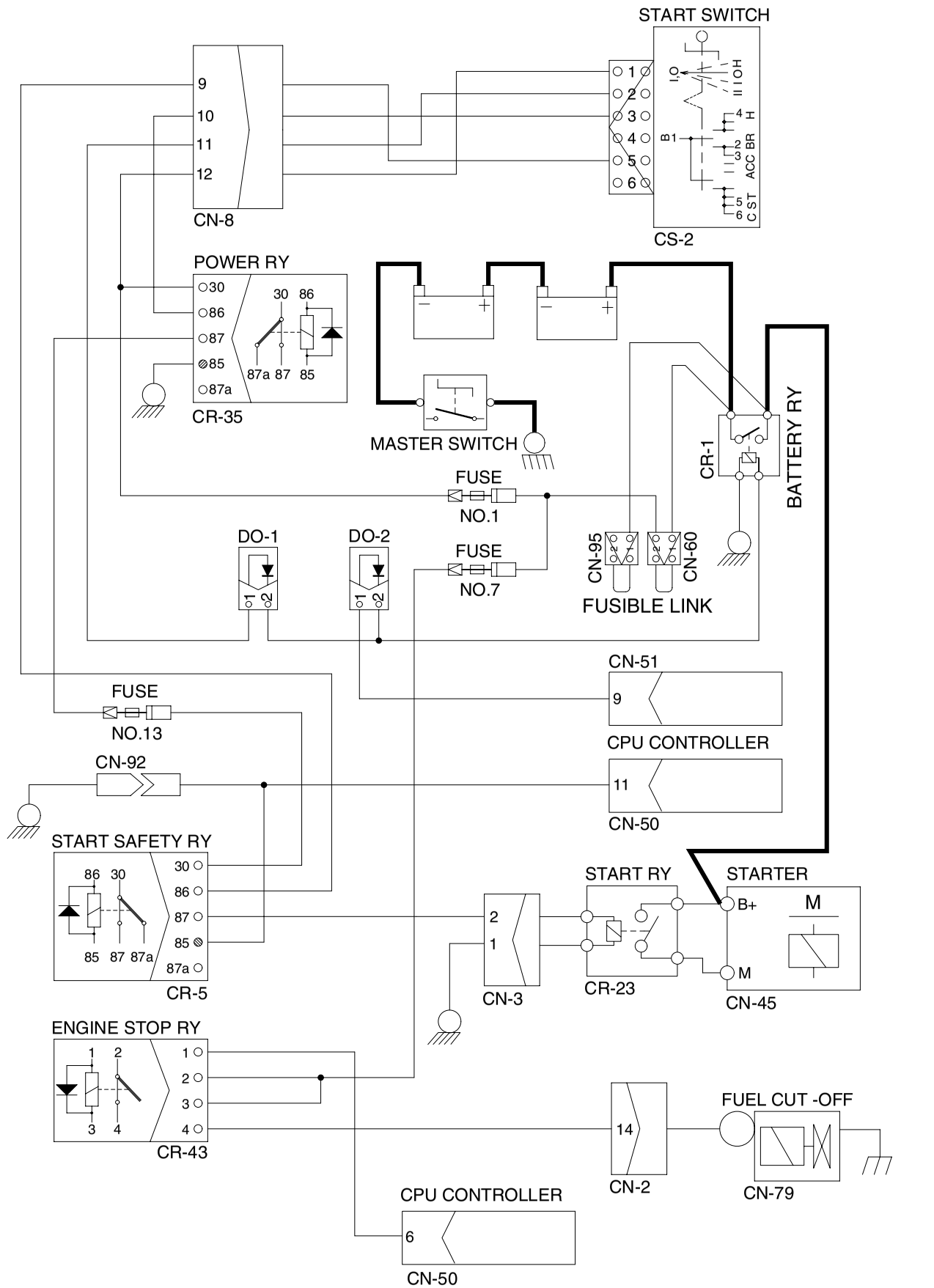
YES	MAX 1Ω
NO	MIN 1M Ω

25036EL05

15. WHEN ENGINE DOES NOT START

- Check supply of the power at engine stop solenoid while starting switch is 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.



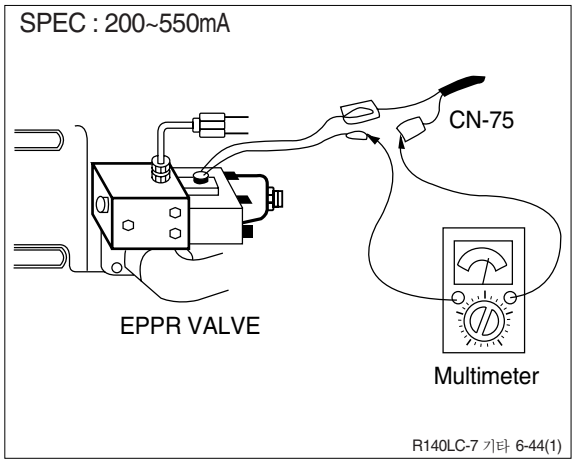


11076TS25

2) TEST PROCEDURE

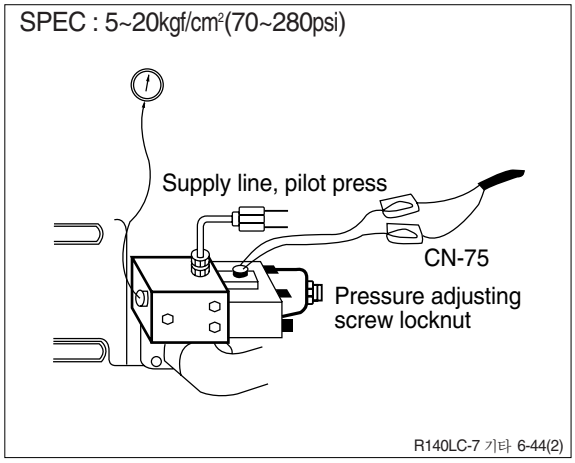
(1) **Test 9 :** Check electric current at EPPR valve at S-mode

① Install multimeter as figure.
② Start engine.
③ Set the accel dial at "10"(max)
④ Set S-mode with 1950±50rpm.
⑤ Check electric current.



(2) **Test 10 :** Check pressure at EPPR valve at S-mode

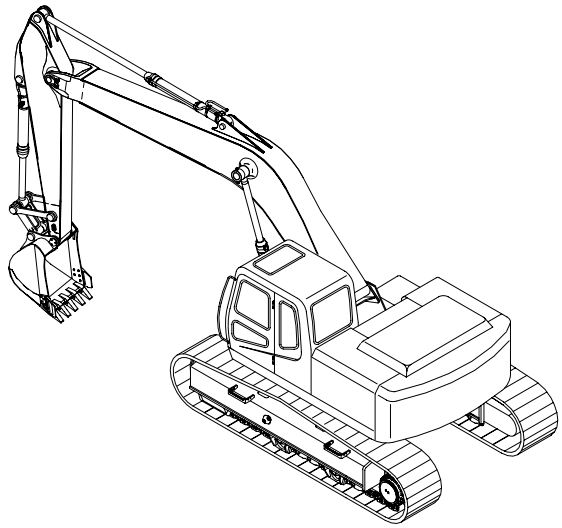
① Connect pressure gauge at EPPR valve.
② Start engine.
③ Set the accel dial at "10"(max)
④ Set S-mode with 1950±50rpm.
⑤ Operate bucket lever completely push or pull.
⑥ Hold arm lever at the end of stroke.
⑦ Check pressure at relief position.



2. TERMINOLOGY

1) STANDARD

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

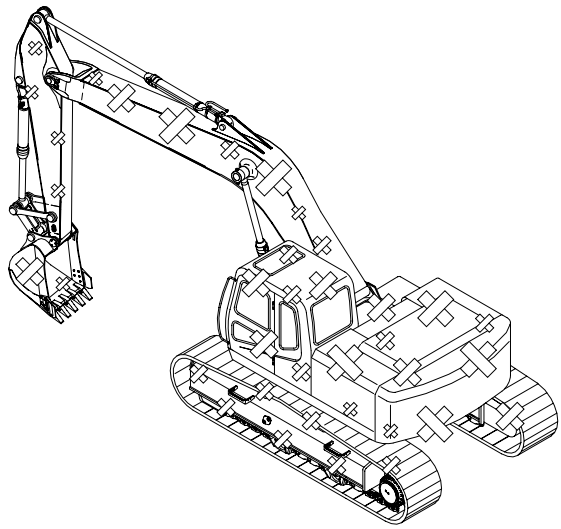


140LC-7MS02

2) SERVICE LIMIT

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

Necessary parts and components must be replaced.



140LC-7MS03

- Bucket cylinders

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

(4) Evaluation

The average measured time should meet the following specifications.

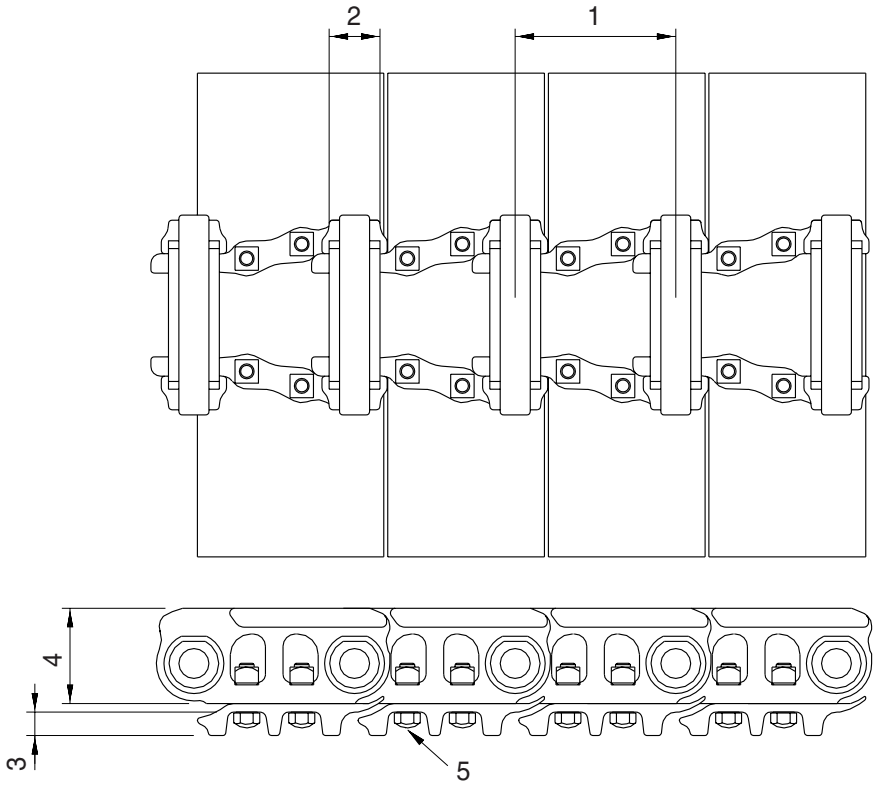
Unit : Seconds

Model	Function	Standard	Maximum allowable	Remarks
R110-7	Boom raise	2.9±0.4	3.5	
	Boom lower	2.6±0.4	3.2	
	Arm in	2.9±0.4	3.5	
	Arm out	2.8±0.3	3.4	
	Bucket load	3.6±0.4	4.4	
	Bucket dump	2.1±0.3	2.5	

2. MAIN CONTROL VALVE

Part name	Inspection item	Criteria & measure
Casing	· Existence of scratch, rusting or corrosion.	· In case of damage in following section, replace part. - Sliding sections of casing fore and spool, especially land sections applied with holded pressure. - Seal pocket section where spool is inserted. - Seal section of port where O-ring contacts. - Seal section of each relief valve for main, travel, and port. - Other damages that may damage normal functions.
Spool	· Existence of scratch, gnawing, rusting or corrosion. · O-ring seal sections at both ends. · Insert spool in casing hole, rotate and reciprocate it.	· Replacement when its outside sliding section has scratch(Especially on seals-contacting section). · Replacement when its sliding section has scratch. · Correction or replacement when O-ring is damaged or when spool does not move smoothly.
Poppet	· Damage of poppet or spring · Insert poppet into casing and function it.	· Correction or replacement when sealing is incomplete. · Normal when it can function lightly without being caught.
Around spring	· Rusting, corrosion, deformation or breaking of spring, spring seat, plug or cover.	· Replacement for significant damage.
Around seal for spool	· External oil leakage. · Rusting, corrosion or deformation of seal plate.	· Correction or replacement. · Correction or replacement.
Main relief valve, port relief valve & negative control relief valve	· External rusting or damage. · Contacting face of valve seat. · Contacting face of poppet. · Abnormal spring. · O-rings, back up rings and seals.	· Replacement. · Replacement when damaged. · Replacement when damaged. · Replacement. · 100% replacement in general.
Balance plate	· Worn less than 0.03mm · Worn more than 0.03mm · Sliding surface has a seizure(Even through small).	· Lapping · Replace · Replace

4) TRACK



21037MS04

Unit : mm

No.	Check item	Criteria		Remedy
1	Link pitch	Standard size	Repair limit	Turn or replace
		171.45	175.45	
2	Outside diameter of bushing	ø 50.6	ø 40.8	Rebuild or replace
3	Height of grouser	20	16	
4	Height of link	90	82	
5	Tightening torgue	Initial tightening torque : 42±4kgf · m		Retighten

GROUP 3 PUMP DEVICE

1. REMOVAL AND INSTALL

1) REMOVAL

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

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping

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

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

(4) Loosen the drain plug under the hydraulic tank and drain the oil from the hydraulic tank.

- Hydraulic tank quantity : 100 ℓ

(5) Remove socket bolts(75) and disconnect pipe(74).

(6) Disconnect pilot line hoses(11, 13, 14, 35, 37,47).

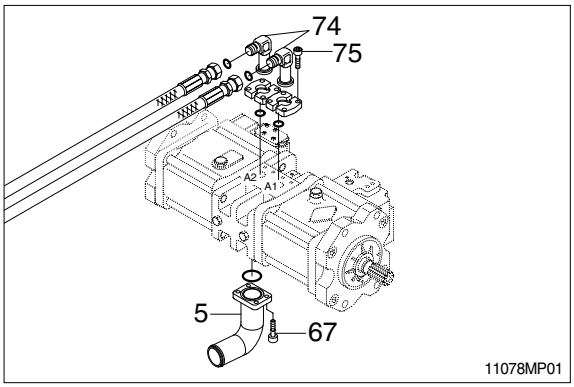
(7) Remove socket bolts(67) and disconnect pump suction tube(5).

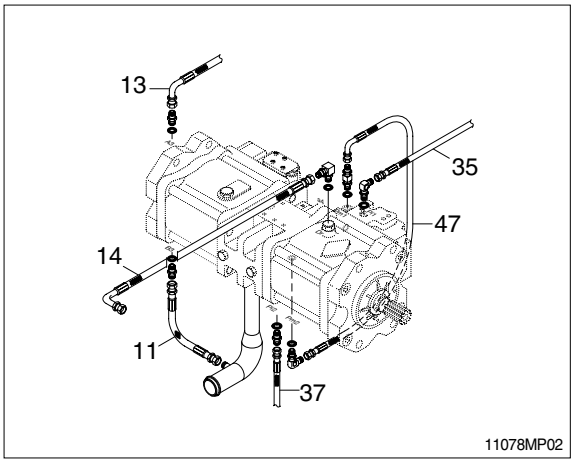
※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

(8) Sling the pump assembly and remove the pump mounting bolts.

- Weight : 90kg(200lb)

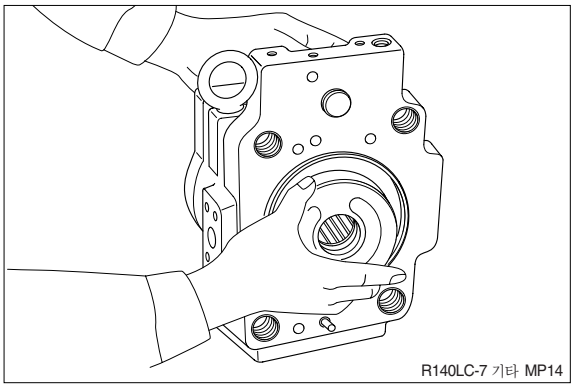
※ Pull out the pump assembly from housing. When removing the pump assembly, check that all the hoses have been disconnected.





(7) Fit valve plate(313) to valve block(312), entering pin into pin hole.

※ Take care not to mistake suction / delivery directions of valve plate.



R140LC-7 기타 MP14

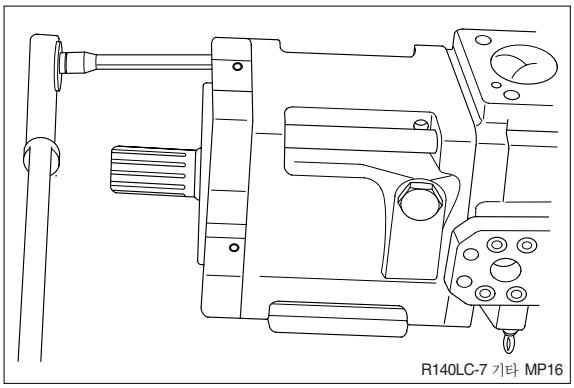
(8) Fit valve block(312) to pump casing(271) and tighten hexagon socket head bolts (401).

※ At first assemble this at rear pump side, and this work will be easy.

※ Take care not to mistake direction of valve block.

※ Clockwise rotation(Viewed from input shaft side) - Fit block with regulator up and with delivery flange left, viewed from front side.

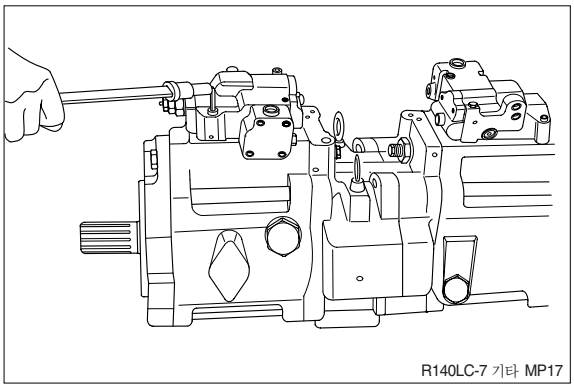
※ Counter clockwise rotation(Viewed from input shaft side) - Fit block with delivery flange right, viewed from front side.



R140LC-7 기타 MP16

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

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



R140LC-7 기타 MP17

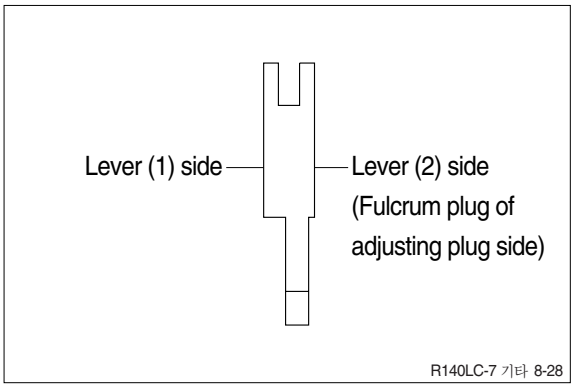
(10) Fit drain port plug(468).

This is the end of reassembling procedures.

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

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

※ Take care not to mistake direction of feedback lever.

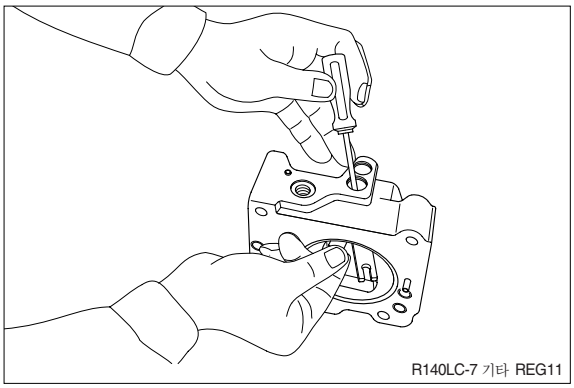


R140LC-7 기타 8-28

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

※ Confirm that pilot piston slides smoothly without binding.

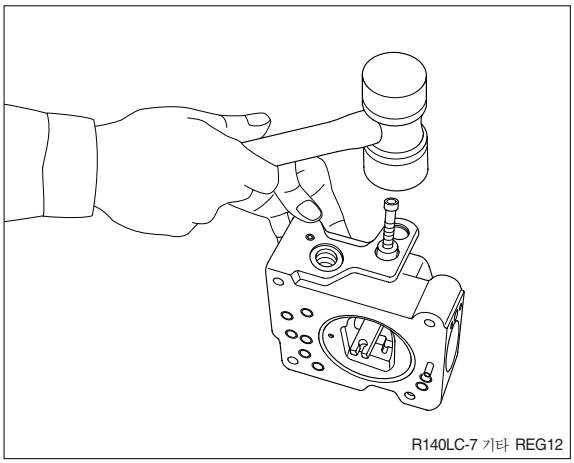
(7) Put pin force-fitted in lever(2, 613) into groove of pilot piston.
Then fix lever(2).


R140LC-7 기타 REG11

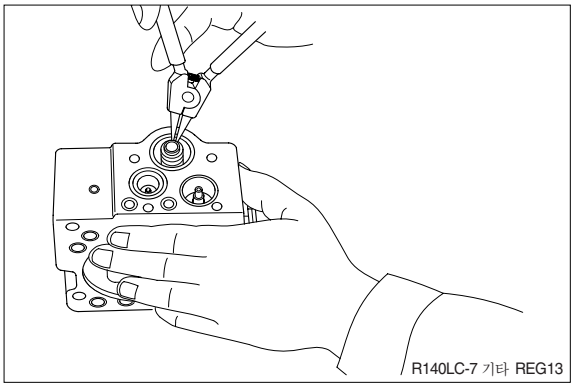
(8) Fit fulcrum plug(614) so that pin force-fitted in fulcrum plug(614) can be put into pin hole of lever(2).
Then fix locking ring(858).

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

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


R140LC-7 기타 REG12

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


R140LC-7 기타 REG13

(3) Disassembly of the holding valve

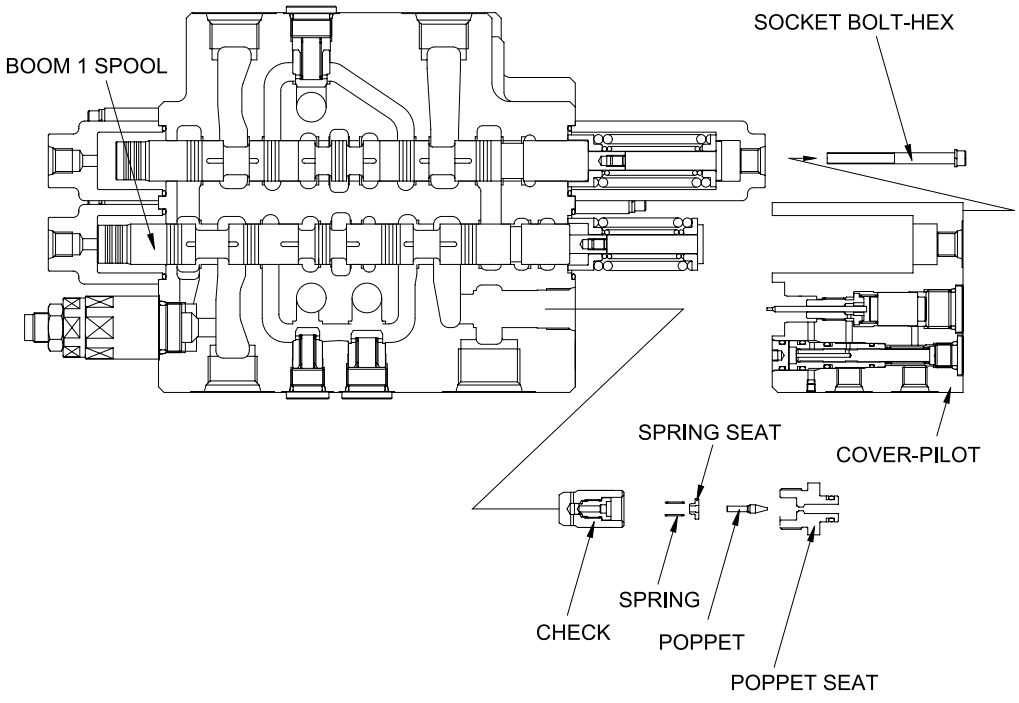
① Remove the pilot cover with the holding valve as discribed on previous page.

※ Do not disassembled internal parts of the pilot cover.

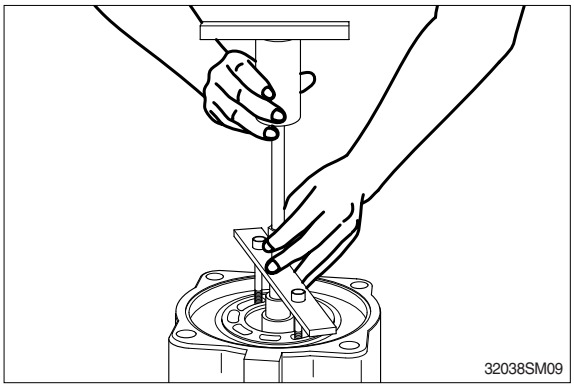
② Loosen the poppet seat and remove the poppet, the spring seat, the spring and the check. (Spanner : 32㎜)

※ Pay attention not to lose the poppet.

※ Do not disassembled internal parts of the check.

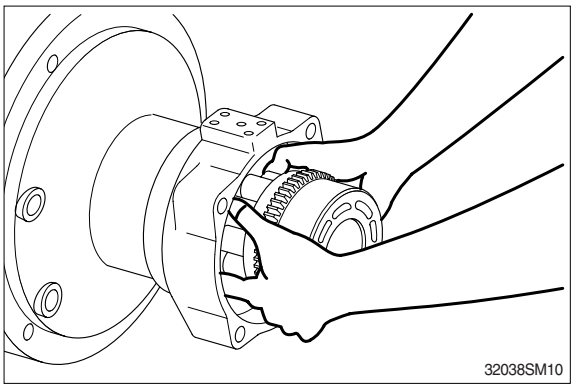


(9) Remove brake piston(16) from body(1).

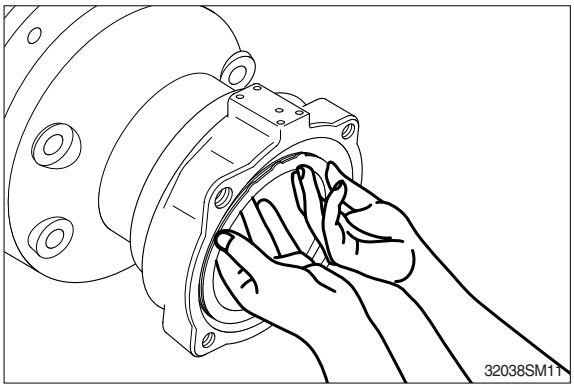


(10) Remove the cylinder(9) from the output shaft(5) with the motor positioned horizontally. Remove ball guide(11), set plate(12), piston(13) and shoe plate(8).

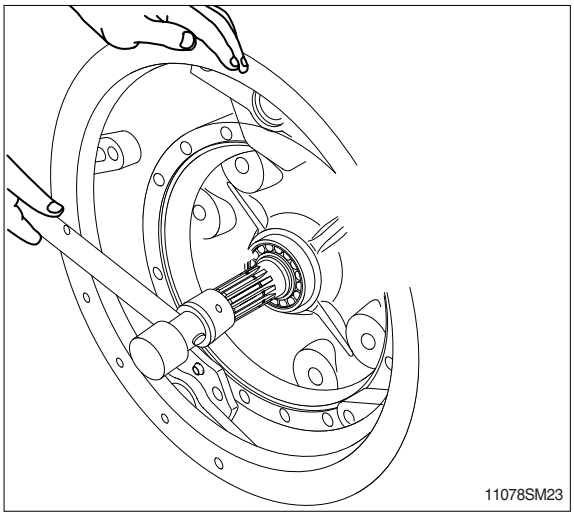
※



(11) Remove friction plate(14) and separate plate(15) from body(1).



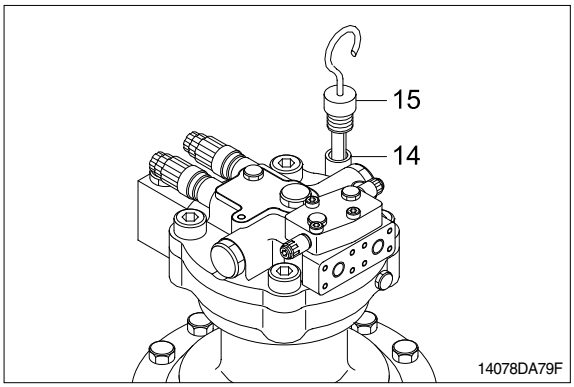
(12) Remove snap ring(4) and remove drive shaft(5) from body(1).



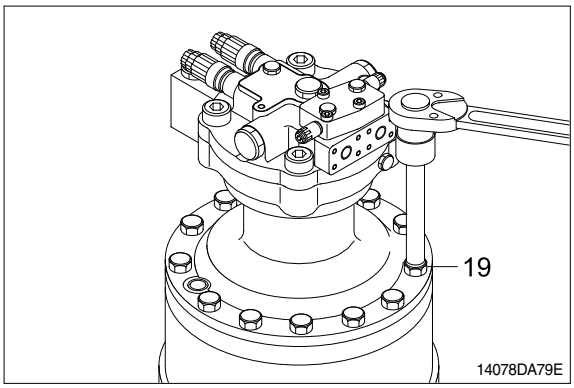
2) DISASSEMBLY

(1) Remove gauge bar(14) and gauge pipe (15) from the swing motor casing.

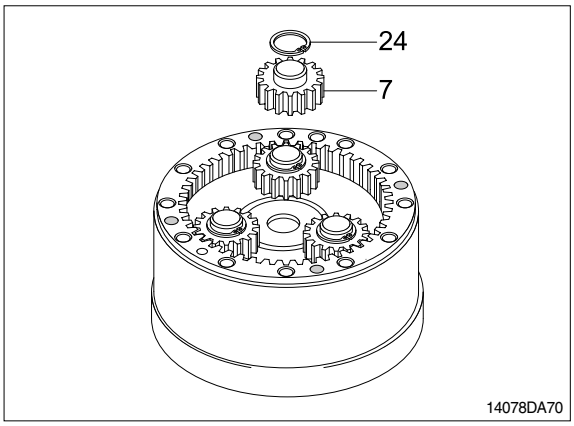
※ Pour the gear oil out of reduction gear into the clean bowl to check out the friction decrease.



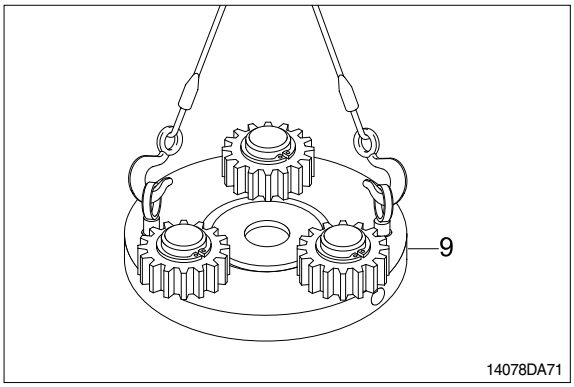
(2) Loosen the socket bolts(19) to separate swing motor from reduction gear.



(3) Remove stop ring(24) and then sun gear1(7).

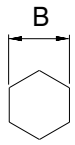


(4) Tighten two M10 eye bolts to carrier1(9) and lift up and remove carrier1(9) as subassembly.



2) TOOLS AND TIGHTENING TORQUE

(1) Tools

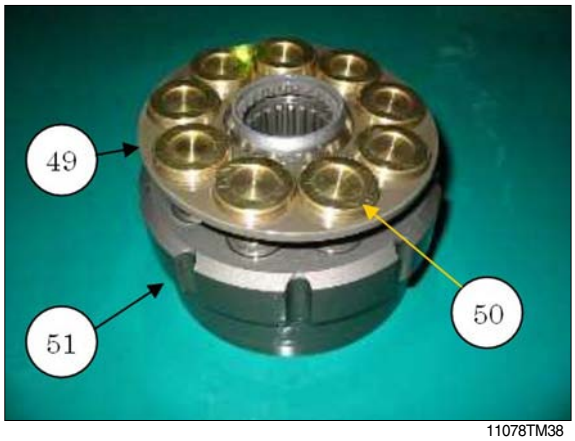
Tool name		Remark	
Allen wrench		5, 6, 8, 10, 14	
OSocket for socket wrench, spanner	Socket	22, 30, 32, 41	
	Rod	5, 6, 8, 10, 14, 19	
Torque wrench		Capable of tightening with the specified torques	
Pliers		-	
(-) Driver		150mm	
Plastic and iron hammer		Wooden hammer allowed. Normal 1 or so	
Steel rod approx		7×7×200mm	
Monkey wrench		-	
Oil seal inserting jig		-	
Bearing pliers		-	
Seal tape		-	
Eye bolt		PF1/2, M16	
Press(0.5 ton)		-	
Oil stone		-	
Bearing assembling jig		-	
Liquid packing		Loctite #577	
Screw lock		Loctite #243	

(2) Tightening torque

Part name	Item	Size	Torque	
			kgf · m	lbf · ft
Screw	98	M10	7.0±0.5	50.6±3.6
Bolt	103	M8	3.6±0.2	26.0±1.4
Plug	104	PF3/4	10.0±1.0	72.3±7.2
Bolt	42	M14	19.5±1.5	141.0±10.8
Orifice	43	NPTF1/16	1.0±0.1	7.2±0.7
Plug	44	M20	8.6±0.8	62.2±5.8
Bolt	49	M12	8.0±0.8	57.9±5.8
Orifice	50	NPTF1/16	1.0±0.1	7.2±0.7
Plug	54	PF3/8	5.0±0.5	36.2±3.6
Orifice	56	NPTF1/16	1.0±0.1	7.2±0.7
Plug	58	PF1/8	2.0±0.2	14.5±1.4
Relief valve body	60-1	M28	20.0±2.0	144.7±14.5
Cap nut	60-7	M38	20.0±2.0	144.7±14.5
Screw	60-10	M10	3.5±0.2	25.3±1.4
Plug	61	3/4-16UNF	7.0±0.5	50.6±3.6
Plug	63	NPTF1/16	1.0±0.1	7.2±0.7
Plug	64	9/16-18UNF	5.0±0.5	36.2±3.6
Plug	65	PT1/8	2.0±0.2	14.5±1.4
Plug	70	7/8-14UNF	8.0±0.8	57.9±5.8
Plug	74	7/8-14UNF	8.0±0.8	57.9±5.8
Screw	76	M10	3.5±0.2	25.3±1.4

(26) Be aware that in re-assembling, retainer(49), piston assemblies(50) and cylinder barrel(51) must be installed in the original locations.
For this purpose, it is strongly recommended to record the original positions of the parts before and during disassembling process.

(27) Remove retainer(49) and piston assemblies(50) from barrel(51). Separate the piston assemblies from the retainer.

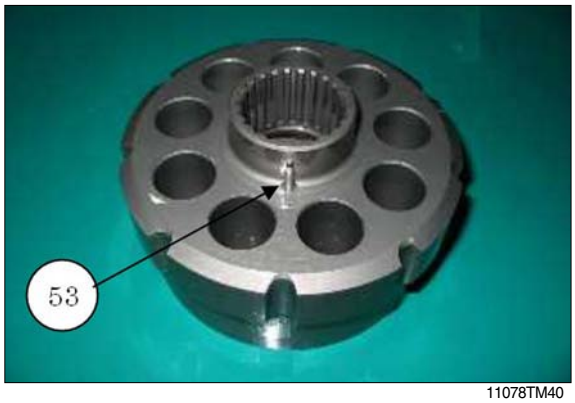


11078TM38

(28) Remove retainer ball(52) from the cylinder barrel.

11078TM39

(29) Remove three pins(53) from the cylinder barrel.

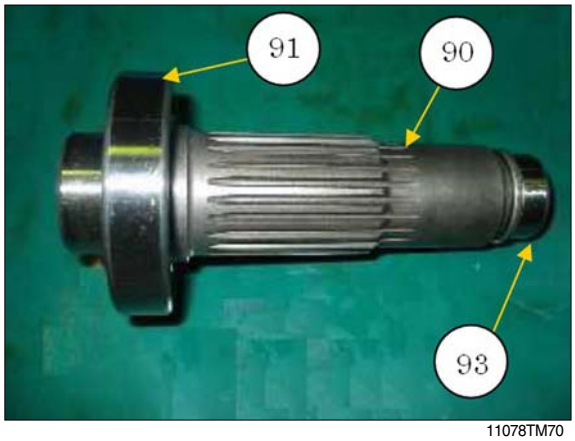


11078TM40

2) ASSEMBLING PROCEDURE

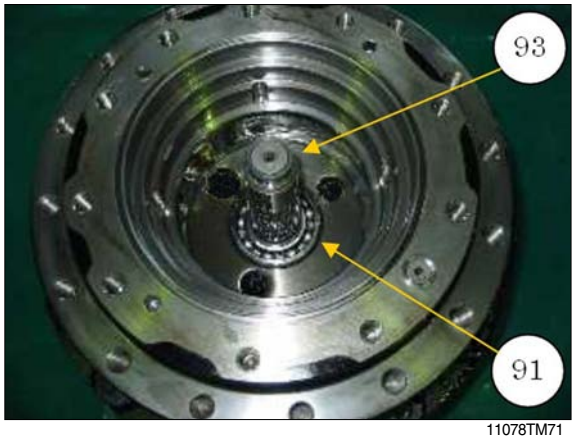
(1) Make sure that all the parts are completely clean and free of dirt and debris before assembling.
Check the condition of all O-rings, back-up rings, and oil seal used in the travel motor. If any of them have any damage, replace them with new ones.
Put the body casing on a clean sheet spread on the flat base.

(2) Install oil seal to body casing.
Put bearing(91) and inner race(93) on shaft(90).
Install shaft(90) into the body casing.



11078TM70

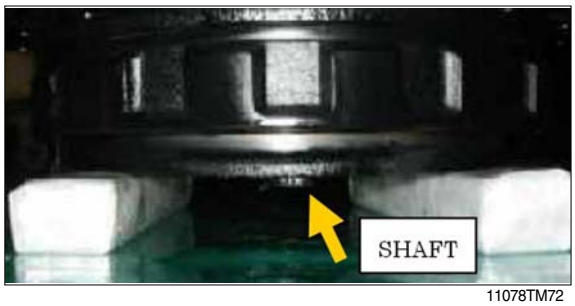
※ Before installing floating seals, make the O-ring(=rubber) and seal ring(=metal) clean and dry.
After installing the seals, put clean SAE30 engine oil or gear oil 80W-90 on the contact surfaces of the metal seals.



11078TM71

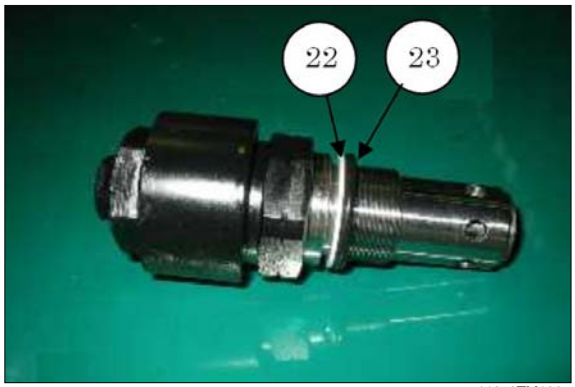
(3) Place the body casing on wood blocks or other proper jigs with the shaft side down.

⚠ To avoid damaging shaft, don't put the body casing directly on a flat ground.



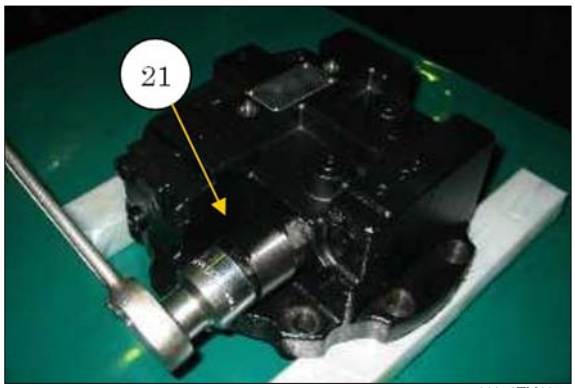
11078TM72

(31) Install back-up ring(22) and O-rings(23) on the relief valve as shown.



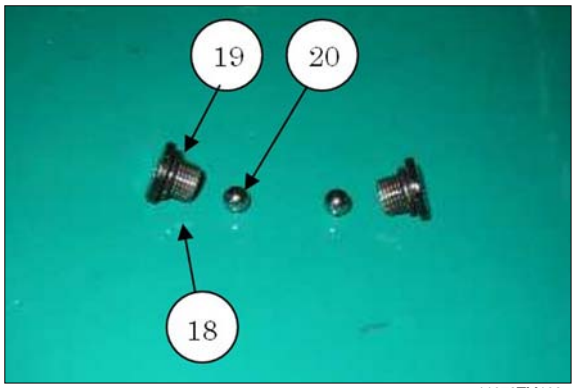
11078TM106

(32) Install relief valve(21) in the travel brake valve body as shown. Tighten the relief valve body to a torque of **196±19.6N¡/m (145±14.5lbf¡/ft)**.

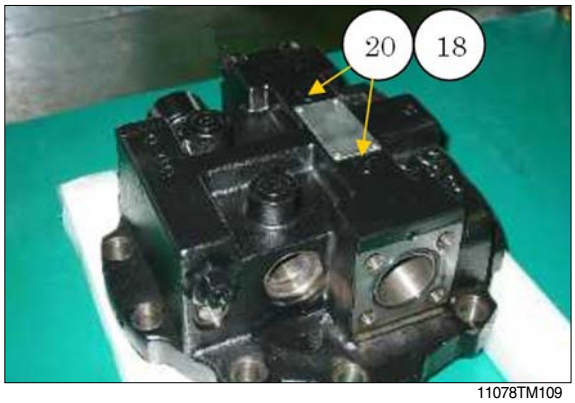


11078TM107

(33) Install two balls(20) in the brake valve. Put O-rings(19) on plugs(18). Install the plugs to the travel brake valve. Tighten the plugs to a torque of **19.6±2.0N¡/m (14.5±1.5lbf¡/ft)**.



11078TM108



11078TM109

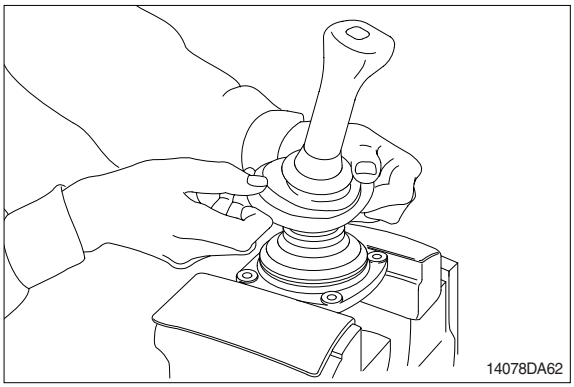
3) DISASSEMBLY

(1) Clean pilot valve with kerosene.

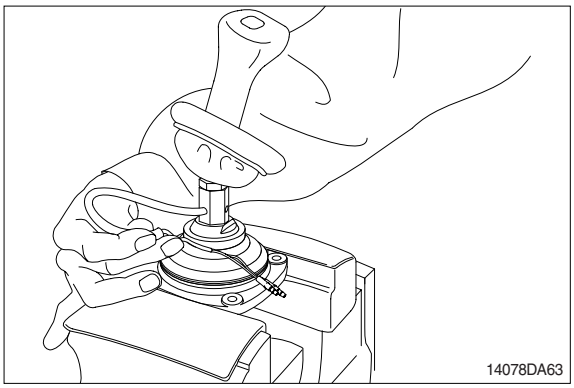
※ Put blind plugs into all ports

(2) Fix pilot valve in a vise with copper(or lead) sheets.

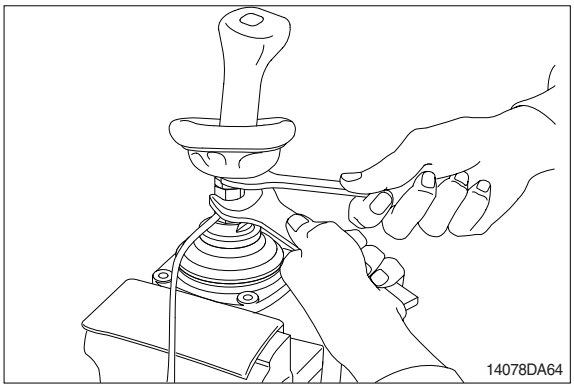
(3) Remove end of boot(26) from case(1) and take it out upwards.



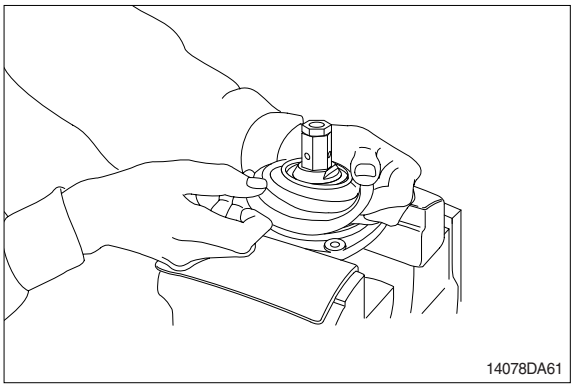
※ For valve with switch, remove cord also through hole of casing.



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

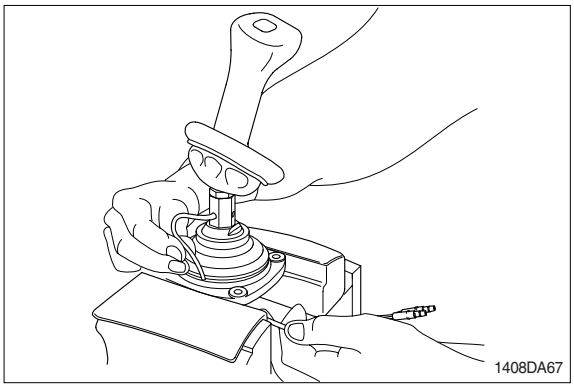


(5) Remove the boot(40)

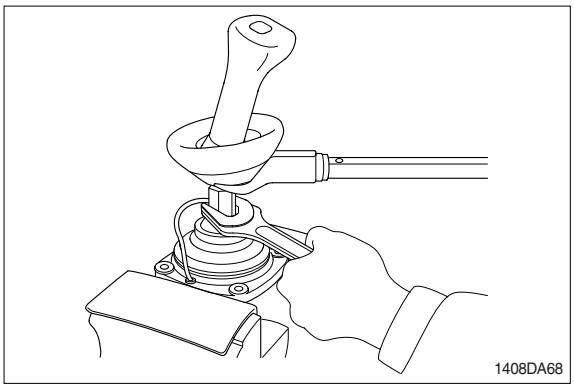


(17) Assemble bushing(17) to plate and pass cord and tube through it.

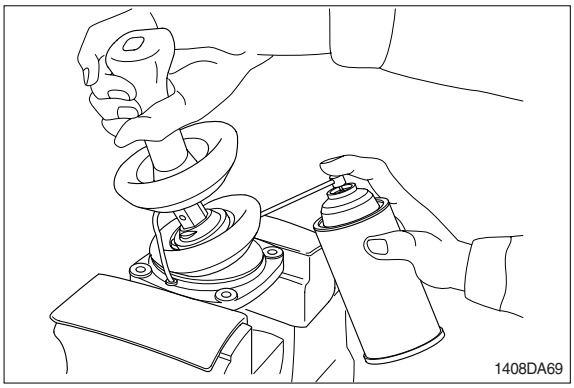
※ Provide margin necessary to operation.



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

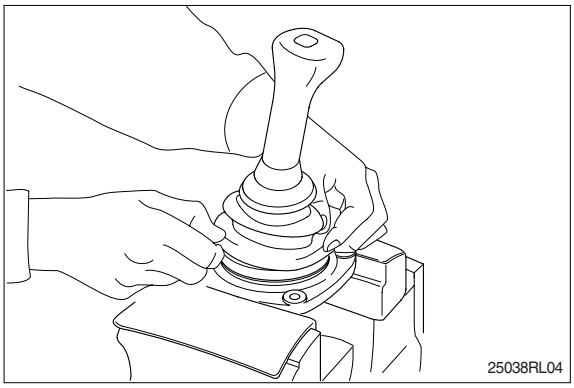


(19) Apply grease to rotating section of joint and contacting faces of disk and push rod.



(20) Assemble lower end of bellows to casing.

(21) 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.

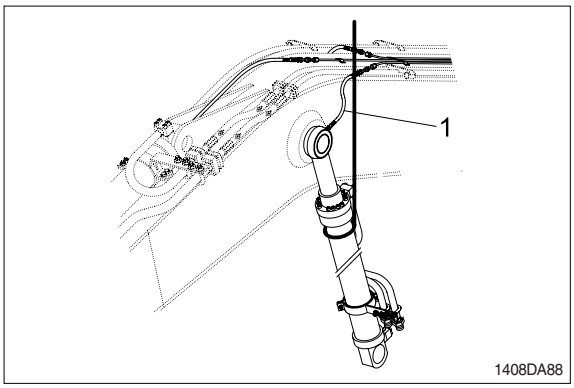
※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

⚠ 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.

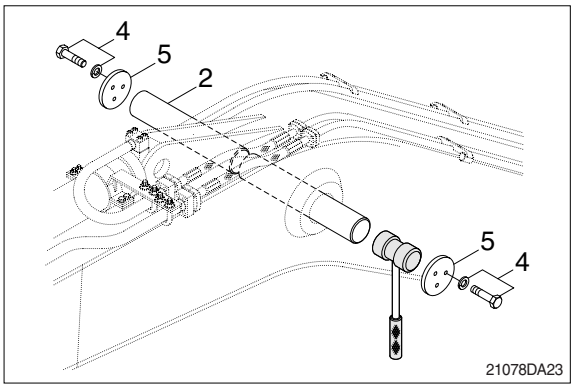
① Disconnect greasing hoses(1).

② Sling boom cylinder assembly.

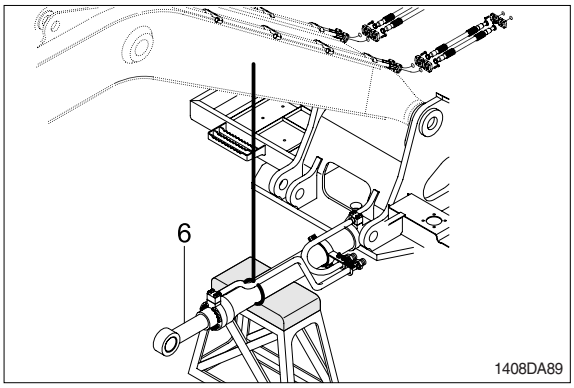


③ Remove bolt(4), stop plate(5) and pull out pin(2).

※ Tie the rod with wire to prevent it from coming out.



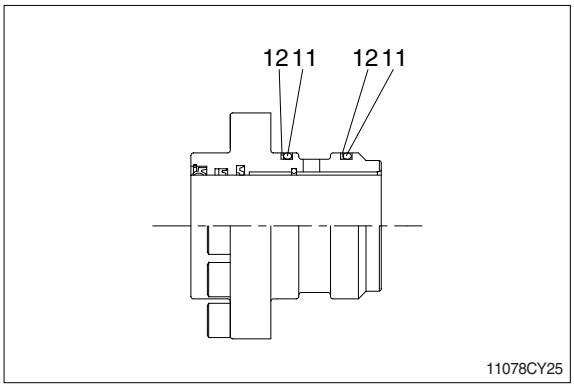
④ Lower the boom cylinder assembly(6) on a stand.



⑤ Fit back up ring(12) to gland(3).

※ Put the backup ring in the warm water of 30~50℃.

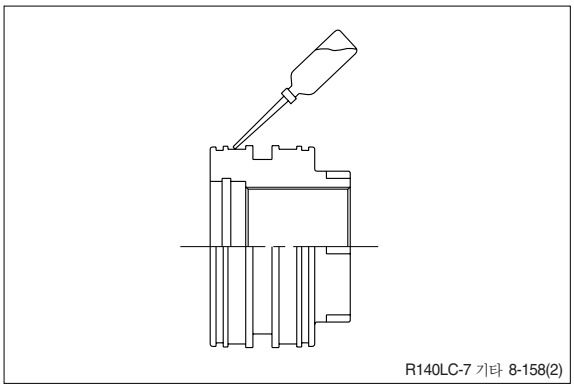
⑥ Fit O-ring(11) to gland(3).



(2) Assemble piston assembly

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

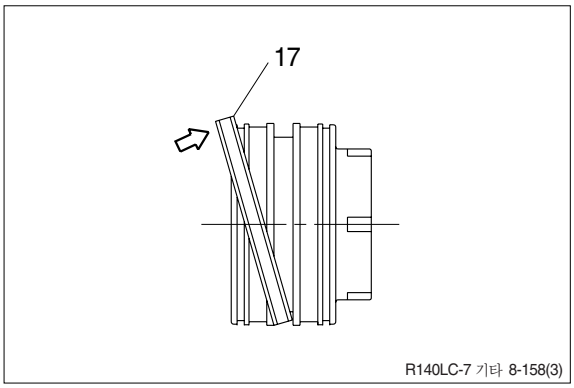
① Coat the outer face of piston(14) with hydraulic oil.



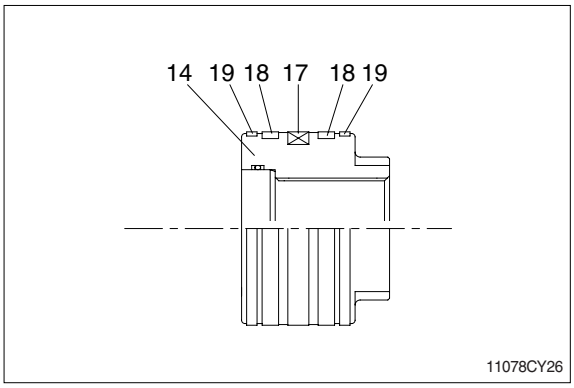
② Fit piston seal(17) to piston.

※ Put the piston seal in the warm water of 60~100℃ for more than 5 minutes.

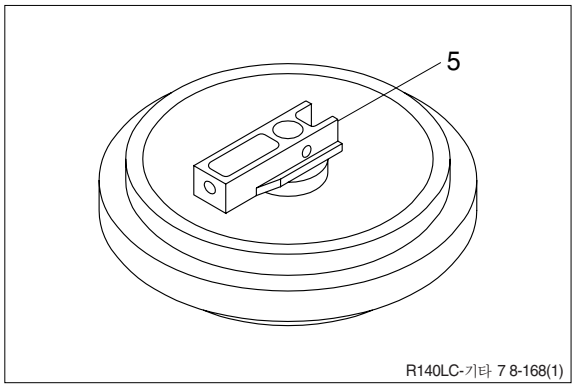
※ After assembling the piston seal, press its outer diameter to fit in.



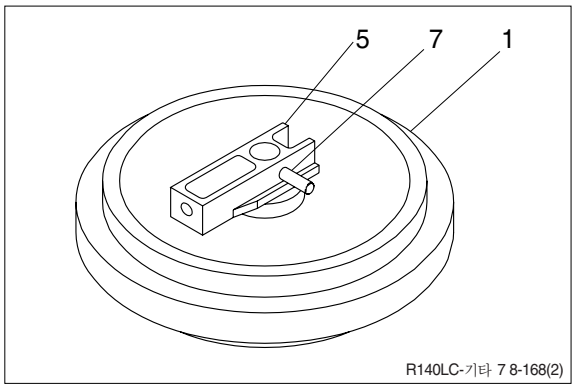
③ Fit wear ring(18) and dust ring(19) to piston(14).



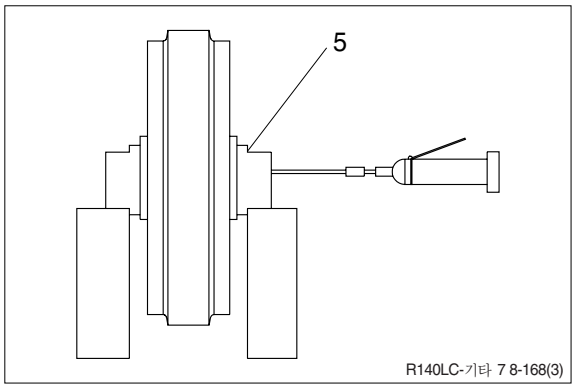
⑥ Install bracket(5) attached with seal(3).



⑦ Knock in the spring pin(7) with a hammer.



⑧ Lay bracket(5) on its side.
Supply engine oil to the specified level, and tighten plug.



SECTION 9 COMPONENT MOUNTING TORQUE

GROUP 1 INTRODUCTION GUIDE

1. This section shows bolt specifications and standard torque values needed when mounting components to the machine.
2. Use genuine Hyundai spare parts.
   We expressly point out that Hyundai will not accept any responsibility for defects resulted from non-genuine parts.
   In such cases Hyundai cannot assume liability for any damage.

※ **Only metric fasteners can be used and incorrect fasteners may result in machine damage or malfunction.**

※ **Before installation, clean all the components with a non-corrosive cleaner. Bolts and threads must not be worn or damaged.**