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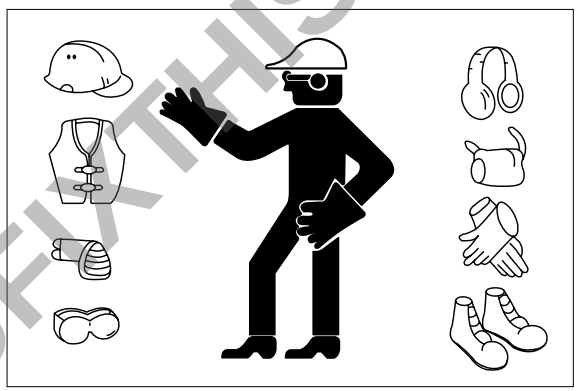
GROUP 1 SAFETY

FOLLOW SAFE PROCEDURE

Unsafe work practices are dangerous. Understand service procedure before doing work; Do not attempt shortcuts.

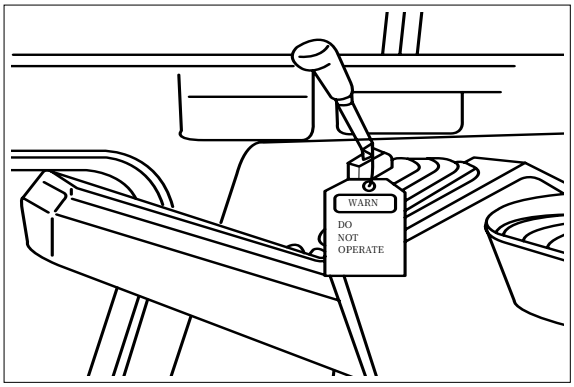
WEAR PROTECTIVE CLOTHING

Wear close fitting clothing and safety equipment appropriate to the job.



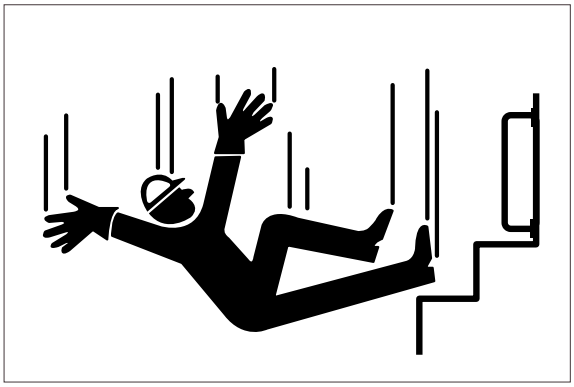
WARN OTHERS OF SERVICE WORK

Unexpected machine movement can cause serious injury.
Before performing any work on the excavator, attach a 「**Do Not Operate**」 tag on the right side control lever.



USE HANDHOLDS AND STEPS

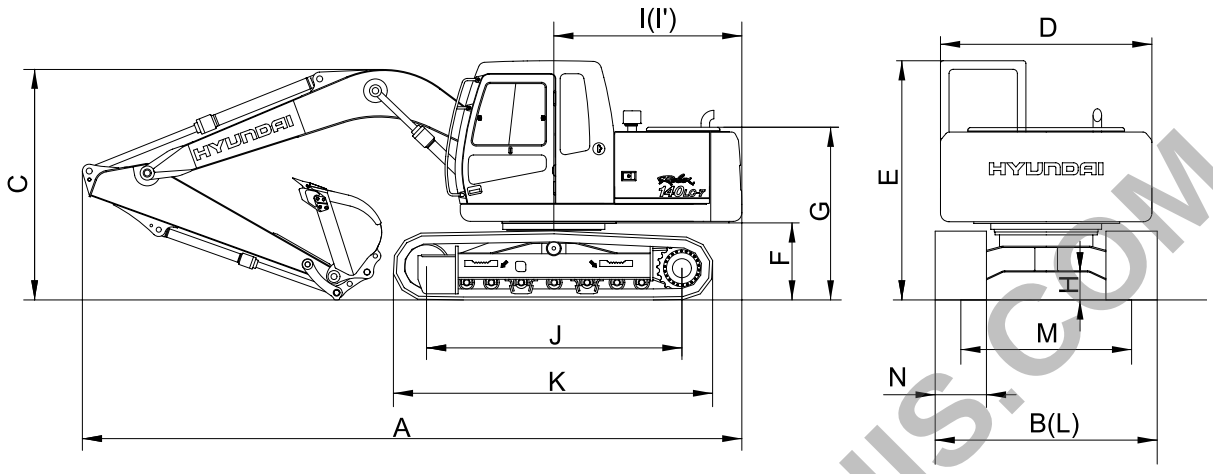
Falling is one of the major causes of personal injury.
When you get on and off the machine, always maintain a three point contact with the steps and handrails and face the machine. Do not use any controls as handholds.
Never jump on or off the machine. Never mount or dismount a moving machine.
Be careful of slippery conditions on platforms, steps, and handrails when leaving the machine.



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2. SPECIFICATIONS

1) R140LC-7



14072SP01

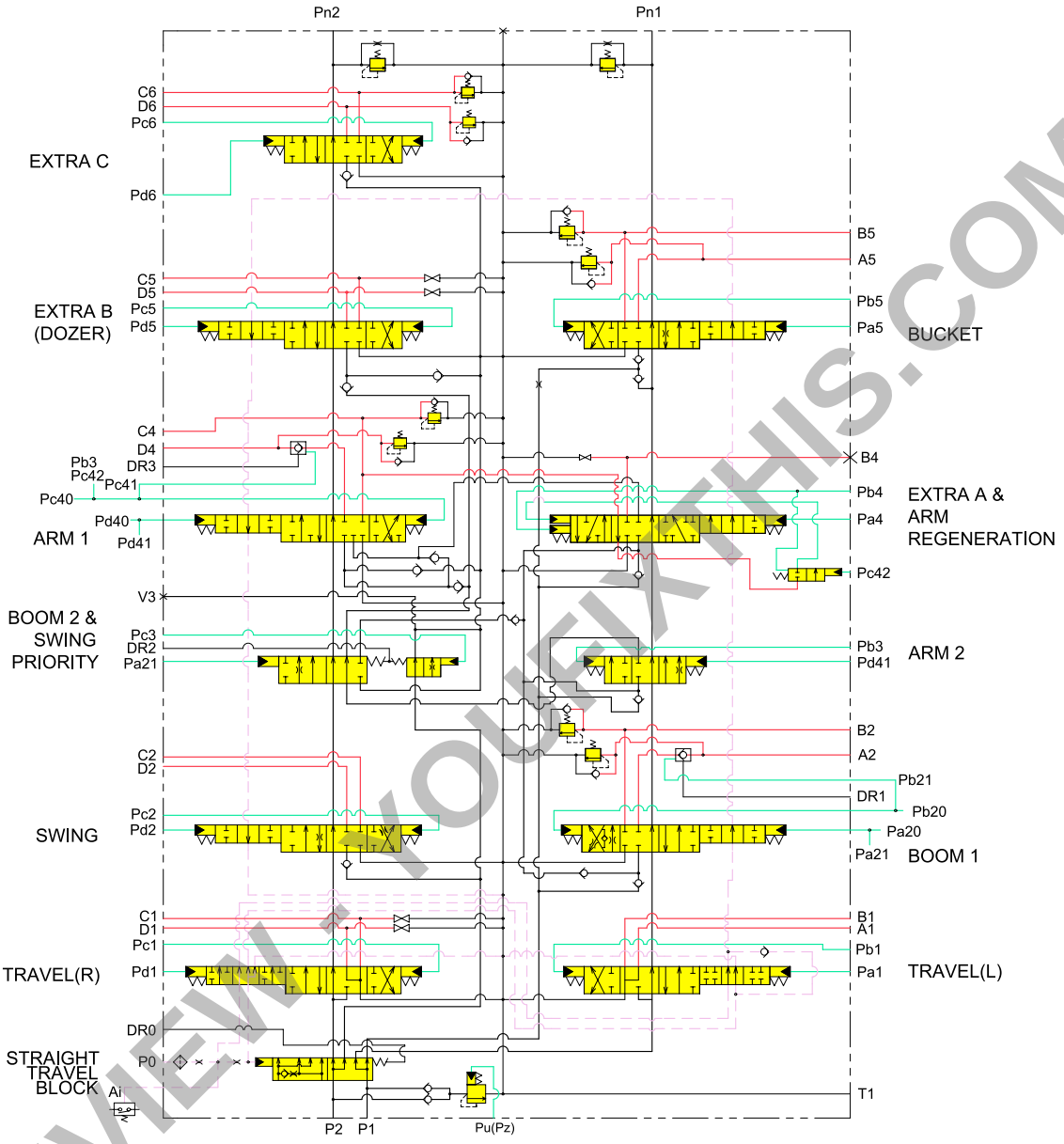
Description		Unit	Specification
Operating weight		kg(lb)	13980(30860)
Bucket capacity(PCSA heaped), standard		$m^3(yd^3)$	0.58(0.76)
Overall length	A	mm(ft-in)	7800(25' 7")
Overall width, with 600mm shoe	B		2600(8' 6")
Overall height	C		2760(9' 1")
Superstructure width	D		2500(8' 2")
Overall height of cab	E		2820(9' 3")
Ground clearance of counterweight	F		935(3' 1")
Engine cover height	G		2037(6' 8")
			*2200(7' 2")
Minimum ground clearance	H		440(1' 5")
Rear-end distance	I		2285(7' 6")
Rear-end swing radius	I'		2310(7' 7")
Distance between tumblers	J		3000(9'10")
Undercarriage length	K		3750(12' 4")
Undercarriage width	L		2600(8' 6")
Track gauge	M		2000(6' 7")
Track shoe width, standard	N		600(24")
Travel speed(Low/high)		km/hr(mph)	3.3/5.5(2.1/3.4)
Swing speed		rpm	13.6
Gradeability		Degree(%)	35(70)
Ground pressure(600mm shoe)		$kgf/cm^2(psi)$	0.36(5.12)

* : TIER II

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2. HYDRAULIC CIRCUIT

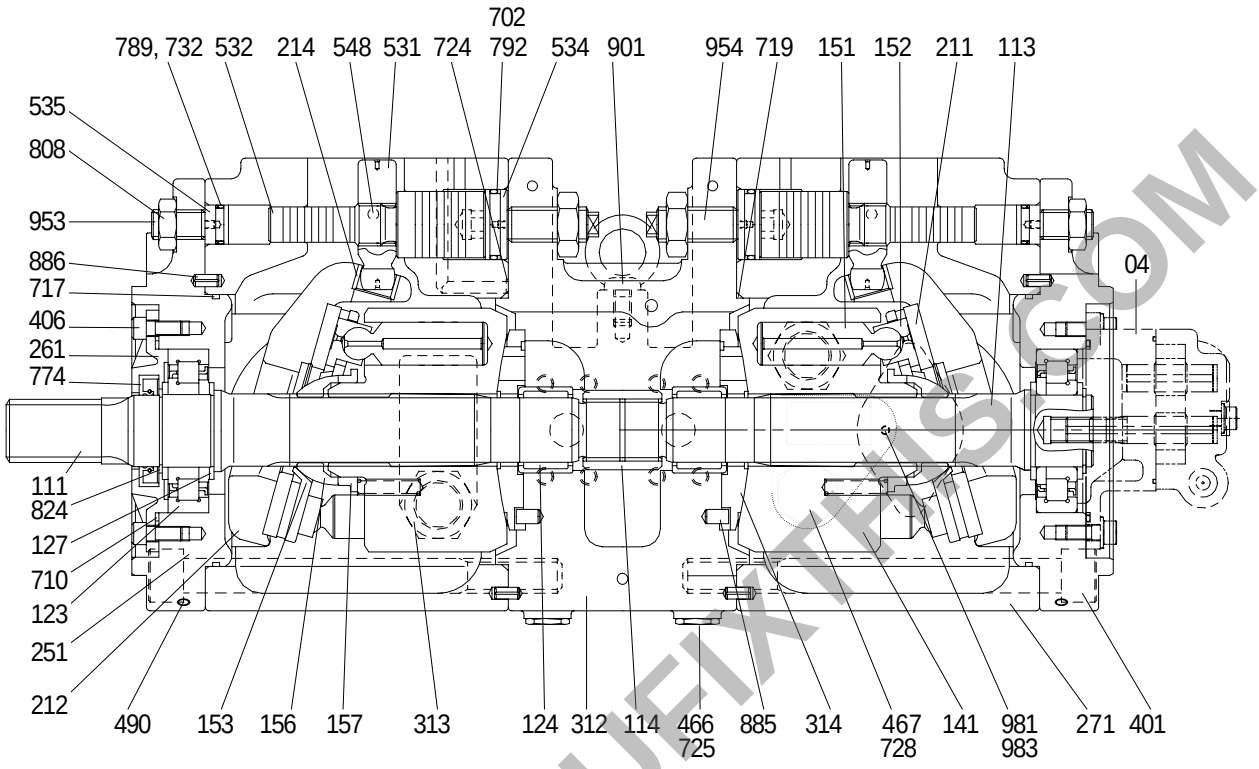


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1) MAIN PUMP(1/2)

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



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

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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 : 124 ℓ

(5) Remove socket bolts(74) and disconnect pipe(9).

(6) Disconnect pilot line hoses(48, 49, 55, 58, 64, 69, 71, 78).

(7) Remove socket bolts(72) and disconnect pump suction tube(3).

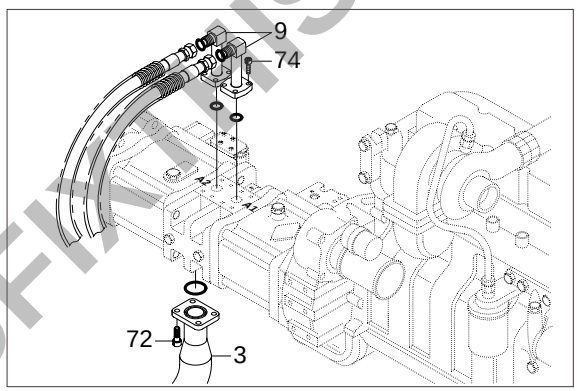
※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

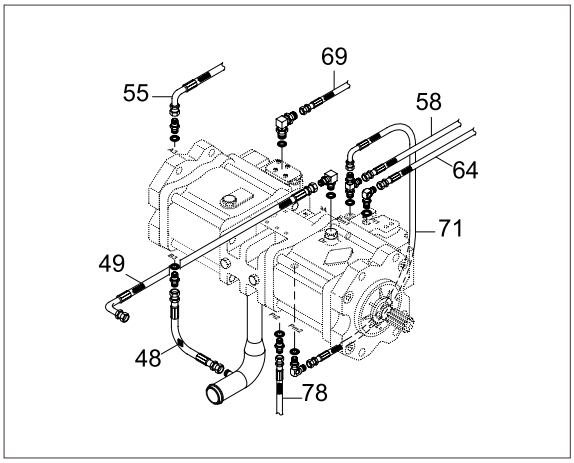
(8) Sling the pump assembly and remove the pump mounting bolts.

· Weight : 85kg(188lb)

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







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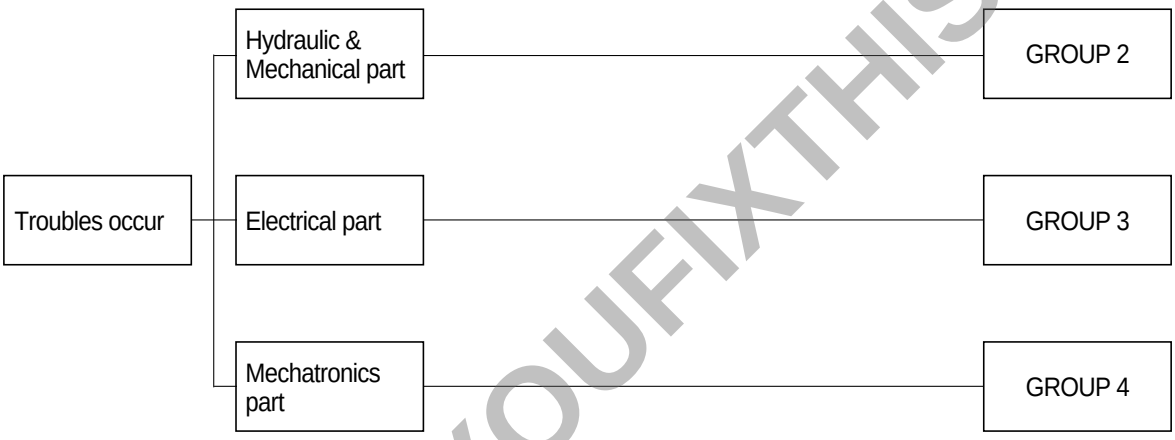
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GROUP 1 BEFORE TROUBLESHOOTING

1. INTRODUCTION

When a trouble is occurred in the machine, this section will help an operator to maintain the machine with easy.

The trouble of machine is parted Hydraulic & Mechanical system, Electrical system and Mechatronics system. At each system part, an operator can check the machine according to the troubleshooting process diagram.



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GROUP 2 TIGHTENING TORQUE

1. MAJOR COMPONENTS

No.	Descriptions		Bolt size	Torque	
				kgf · m	lbf · ft
1	Engine	Engine mounting bolt, nut	M20 × 2.5	55 ± 3.5	397.7 ± 25.3
2		Radiator mounting bolt	M12 × 1.75	12.8 ± 3	92.5 ± 21.6
3		Coupling mounting socket bolt	M16 × 2.0	22 ± 1	159.1 ± 7.2
4		Main pump housing mounting bolt	M10 × 1.5	6.9 ± 0.3	49.9 ± 2.2
5	Hydraulic system	Main pump mounting socket bolt	M16 × 2.0	22.1 ± 2.4	159.8 ± 17.4
6		Main control valve mounting bolt	M12 × 1.75	12.8 ± 3	92.5 ± 21.6
7		Fuel tank mounting bolt	M20 × 2.5	45 ± 5.1	325.4 ± 36.9
8		Hydraulic oil tank mounting bolt	M20 × 2.5	45 ± 1	325.4 ± 7.2
9		Turning joint mounting bolt, nut	M12× 1.75	12.3 ± 1.3	88.9 ± 9.4
10	Power train system	Swing motor mounting bolt	M16 × 2.0	29.7 ± 4.5	214.7 ± 32.5
11		Swing bearing upper part mounting bolt	M18 × 2.5	41.3 ± 6.2	298.6 ± 44.8
12		Swing bearing lower part mounting bolt	M16 × 1.5	31.3 ± 4.7	226.3 ± 34
13		Travel motor mounting bolt	M16 × 2.0	23 ± 2.5	166.3 ± 18.1
14		Sprocket mounting bolt	M16 × 2.0	23 ± 2.5	166.3 ± 18.1
15	Under carriage	Carrier roller mounting bolt, nut	M16 × 2.0	23 ± 2.5	166.3 ± 18.1
16		Track roller mounting bolt	M16 × 2.0	29.6 ± 3.2	214 ± 23.1
17		Track tension cylinder mounting bolt	M16 × 2.0	21.9 ± 3.3	158.3 ± 23.9
18		Track shoe mounting bolt, nut	5/8 - 18UNF	42 ± 4	303.7± 28.9
19	Others	Counter weight mounting bolt	M27 × 3.0	140 ± 15	1013 ± 108
20		Cab mounting bolt	M12 × 1.75	12.2 ± 1.3	88.2 ± 9.4
21		Operator's seat mounting bolt	M 8 × 1.25	2.5 ± 0.5	18.1 ± 3.6

※ For tightening torque of engine and hydraulic components, see each component disassembly and assembly.

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5. ERROR CODES TABLE

Fault code No.	Description
1	Short circuit in governor motor system
2	Potentiometer circuit is shorted to Vcc(5V) or battery +
3	Short circuit in pump EPPR valve system
4	Short circuit in boom down EPPR valve system
5	Short circuit in travel speed solenoid system
6	Short circuit in power boost solenoid system
7	Short circuit in max flow solenoid system
10	Short circuit in hour-meter system
11	Accel dial circuit is shorted to Vcc(5V) or battery +
12	P1 pressure sensor circuit is shorted to power supply(24V) line
13	P2 pressure sensor circuit is shorted to power supply(24V) line
14	P3 pressure sensor circuit is shorted to power supply(24) line
15	Boom down pressure circuit is shorted to power supply(24V) line
16	Governor 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
19	Boom down EPPR valve circuit is open or shorted to ground
20	Travel speed solenoid circuit is open or shorted to ground
21	Power boost solenoid circuit is open or shorted to ground
22	Max flow 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
27	P1 pressure sensor circuit is open or shorted to ground
28	P2 pressure sensor circuit is open or shorted to ground
29	P3 pressure sensor circuit is open or shorted to ground
30	Boom down pressure sensor circuit is open or shorted to ground
31	Engine preheater circuit is open or shorted to ground
32	Travel alarm buzzer circuit is open or shorted to ground
33	Alternator circuit is open or shorted to ground
34	Controller input voltage is below 18V
35	Controller input voltage is over 38V
36	Communication error with cluster
37	Engine speed sensor circuit is open or shorted to ground
38	Anti-restart relay circuit is open or shorted to ground
39	Accel actuator does not stop at a target position
40	There is more than 500rpm difference between target speed and actual speed

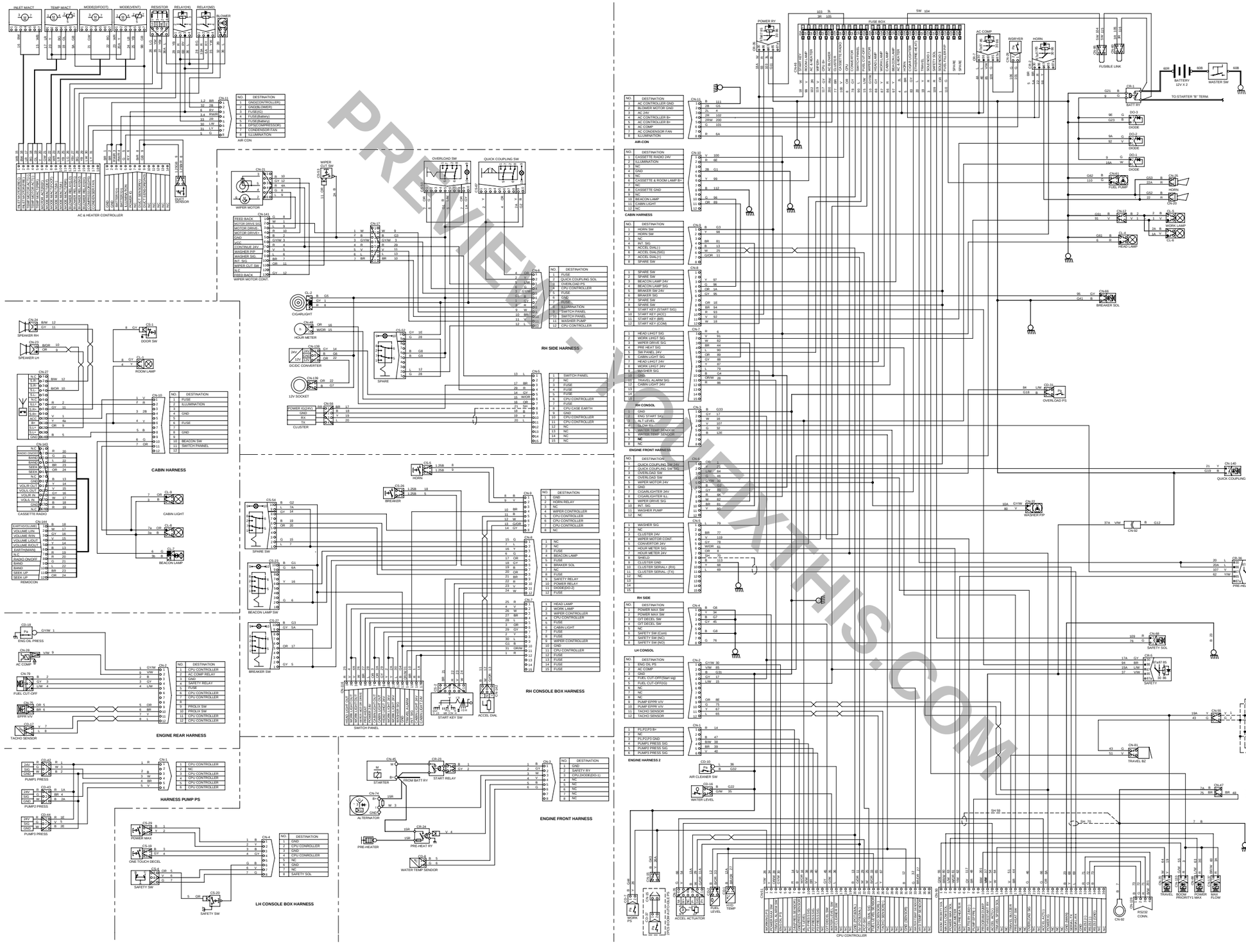
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GROUP 2 ELECTRICAL CIRCUIT

1) UP TO #0255



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2. HOW TO READ THE SERVICE MANUAL

Distribution and updating

Any additions, amendments or other changes will be sent to HYUNDAI distributors.
Get the most up-to-date information before you start any work.

Filing method

1. See the page number on the bottom of the page.
   File the pages in correct order.
2. Following examples shows how to read the page number.
   Example 1

   2 - 3
   - 2: Item number(2. Structure and Function)
   - 3: Consecutive page number for each item.

3. Additional pages : Additional pages are indicated by a hyphen(-) and number after the page number. File as in the example.

   10 - 4
   10 - 4 - 1 ┐
   10 - 4 - 2 ┘ Added pages
   10 - 5

Revised edition mark(①②③…)

When a manual is revised, an edition mark is recorded on the bottom outside corner of the pages.

Revisions

Revised pages are shown at the **list of revised pages** on the between the contents page and section 1 page.

Symbols

So that the shop manual can be of ample practical use, important places for safety and quality are marked with the following symbols.

Symbol	Item	Remarks
	Safety	Special safety precautions are necessary when performing the work.
		Extra special safety precautions are necessary when performing the work because it is under internal pressure.
	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing the work.

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(4) 4.60m(15' 1") boom, 3.00m(9' 10") arm equipped with 0.58m³(PCSA heaped) bucket and 800mm (32") triple grouser shoe.

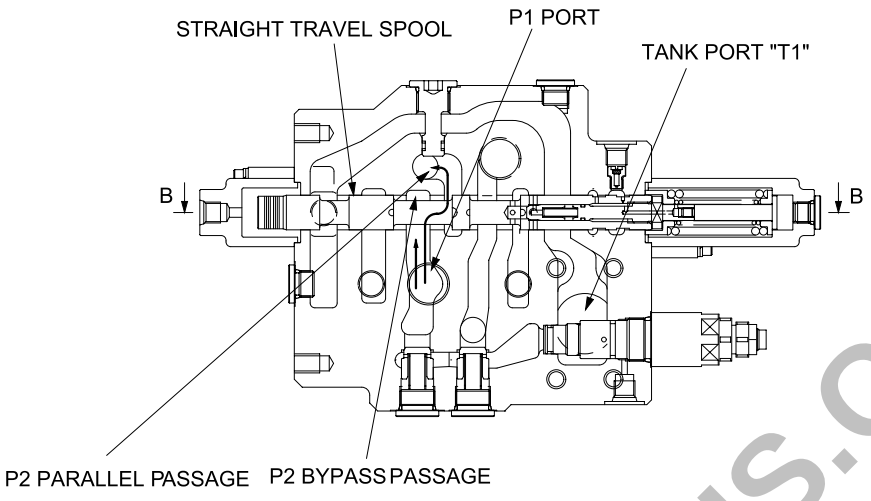
Load point height		Load radius								At max. reach		
		1.5m(5ft)		3.0m(10ft)		4.5m(15ft)		6.0m(20ft)		Capacity		Reach
												m(ft)
6.0m (20ft)	kg									*2550	2170	6.87
	lb									*5620	4780	(22.5)
4.5m (15ft)	kg					*2790	*2790	*2800	2670	*2650	1750	7.63
	lb					*6150	*6150	*6170	5890	*5840	3860	(25.0)
3.0m (10ft)	kg			*5100	*5100	*3700	*3700	*3160	2570	2520	1560	7.99
	lb			*11240	*11240	*8160	*8160	*6970	5670	5560	3440	(26.2)
1.5m (5ft)	kg			*7860	7300	*4790	3860	*3650	2450	2470	1520	8.01
	lb			*17330	16090	*10560	8510	*8050	5400	5450	3350	(26.3)
Ground Line	kg	*3630	*3630	*8780	6940	*5560	3670	3800	2360	2610	1610	7.70
	lb	*8000	*8000	*19360	15300	*12260	8090	8380	5200	5750	3550	(25.3)
-1.5m (-5ft)	kg	*6260	*6260	*9050	6880	*5780	3590	3760	2320	3040	1890	7.00
	lb	*13800	*13800	*19950	15170	*12740	7910	8290	5110	6700	4170	(23.0)
-3.0m (-10ft)	kg	*9470	*9470	*8000	6990	*5220	3630			*3190	2640	5.74
	lb	*20880	*20880	*17640	15410	*11510	8000			*7030	5820	(18.8)

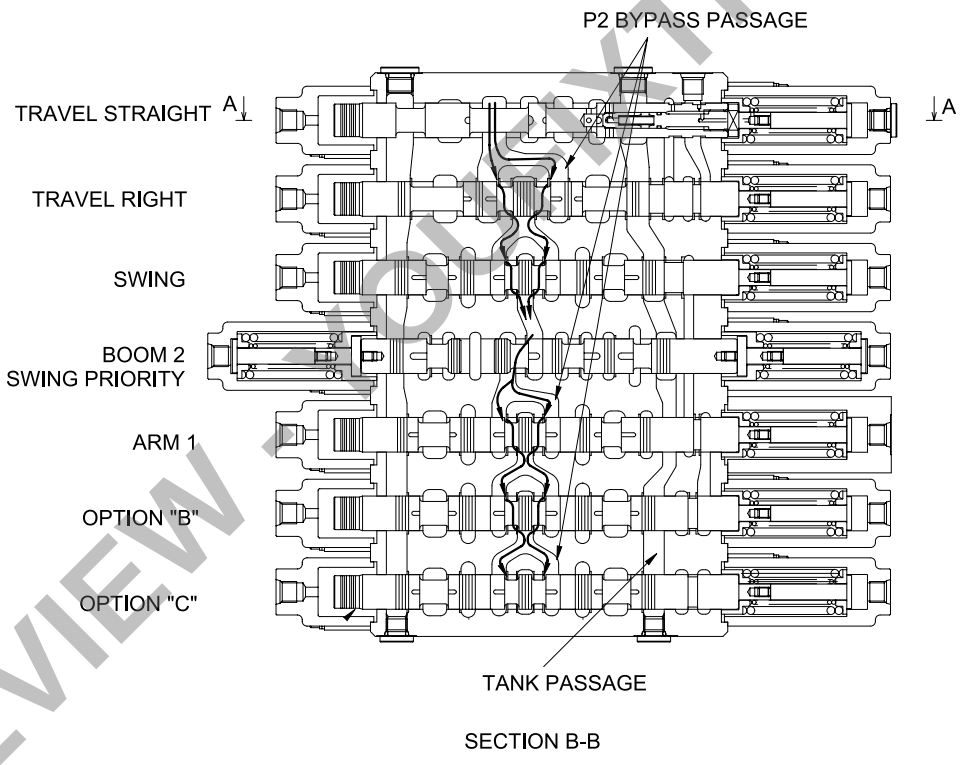
Note 1. Lifting capacity are based on SAE J1097 and ISO 10567.
2. Lifting capacity of the ROBEX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.
3. The load point is a hook located on the back of the bucket.
4. *indicates load limited by hydraulic capacity.

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(2) P2 SIDE





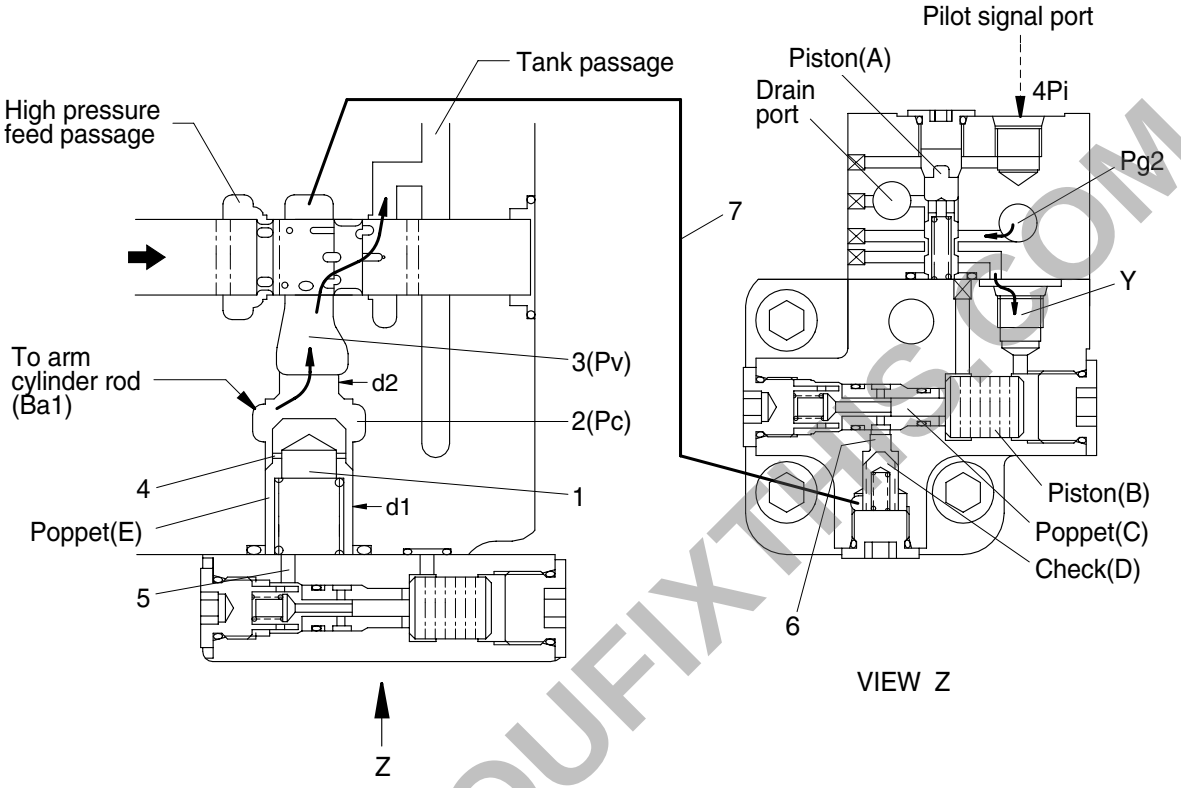
The hydraulic fluid from pump P2 flows into the main control valve through the inlet port "P2", pass the straight travel spool, into the P2 bypass passage and P2 parallel passage.

The hydraulic fluid from the pump P2 is directed to the tank through the bypass passage of spools : travel right, swing, boom2 & swing priority, arm1, option "B" and option "C", and the negative relief valve with the tank passage.

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· **If Pc is higher than Pv**(In the case of arm in operation)



When the pressure of pilot signal enters, piston(A) moves to down.

When the pressure signal(Pg2) enters to chamber(Y), piston(B) moves to left and poppet(C) opens ; Passages(5) and (6) are connected.

If pressure Pc of cylinder port chamber(2) is higher than pressure Pv of chamber(3)(In the case of arm in operation) oil from chamber(1) pushes up check valve(C) via passages(5) and (6) and enters chamber(3) through passage(7). Chamber(3) is connected with the tank passage because the arm plunger is moved to right. Therefore, pressure Pc is applied to(Area d_1- area d_2), pushing open poppet(E), and return oil from the cylinder rod side flows into the tank passage.

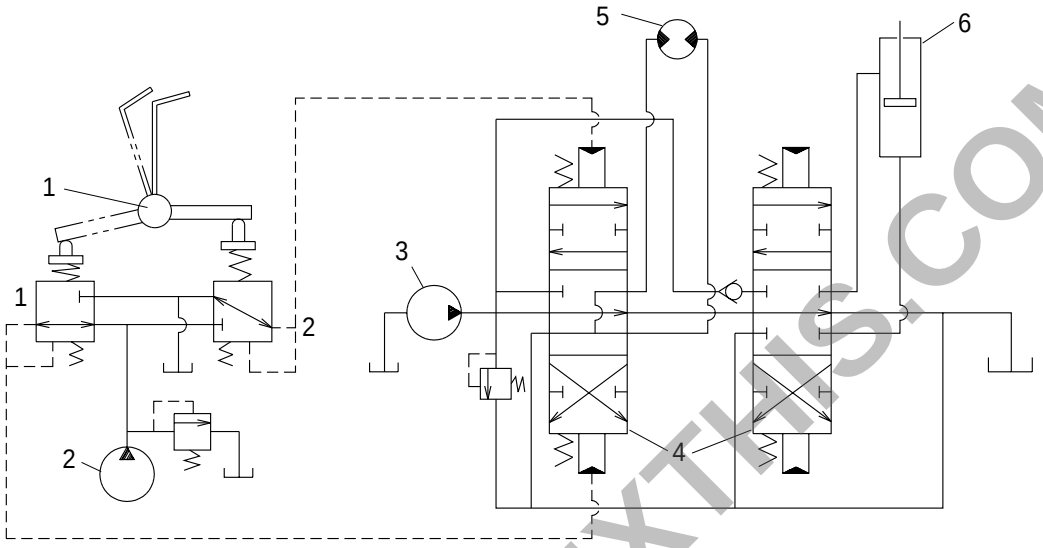
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3) OPERATION

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

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



1	Pilot valve	3	Main pump	5	Hydraulic motor
2	Pilot pump	4	Main control valve	6	Hydraulic cylinder

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SECTION 4 ELECTRICAL SYSTEM

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Group 3 Electrical Component Specification ---------- 4-23
Group 4 Connectors ---------- 4-32

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Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-78	KET	2	Water level	S814-022100	-
CN-79	-	3	Fuel cut-off	S818-020311	-
CN-81	DEUTSCH	2	Travel buzzer	DT06-2S-P012	DP04-2P-P012
CN-88	DEUTSCH	2	Power max solenoid valve	DT06-2S-P012	-
CN-91	DEUTSCH	2	Over load harness	DT06-2S	DT04-2P
CN-92	AMP	1	Safety	S814-101100	S814-001100
CN-116	-	17	Switch panel	S811-017002	-
CN-126	DEUTSCH	4	RS232C connector	DT06-4S	DT04-4P-E004
CN-133	DEUTSCH	2	Boom priority solenoid valve	DT06-2S-P012	-
CN-137	DEUTSCH	2	Max flow solenoid valve	DT06-2S-P012	-
CN-138	DEUTSCH	3	DC/DC converter	DT06-3S	DT04-3P
CN-139	DEUTSCH	2	12V Socket	-	DT04-2P
CN-141	AMP	13	Wiper motor control unit	172498-1	-
CN-142	DEUTSCH	3	Accel dial	DT06-3S	-
CN-143	KET	14	Cassette radio	MG610406	-
CN-144	AMP	12	Remocon	174045-2	-
RELAY					
CR-1	RING TERM	1	Battery relay	S820-104002	-
CR-23	-	2	Start relay	S814-102001	-
CR-24	-	1	Pre-heater relay	S822-014000	-
SWITCH					
CS-1	CB104	1	Door switch	S822-014004	-
CS-2	-	6	Start key switch	S814-006000	-
CS-4	DEUTSCH	3	Safety switch	DT06-3S	-
CS-5	DEUTSCH	2	Horn switch		DT04-2P
CS-19	DEUTSCH	2	One touch decel	DT06-2S	DT04-2P
CS-20	AMP	1	Safety switch	S822-014002	-
CS-23	SWF	10	Beacon lamp switch	SWF593757	-
CS-26	DEUTSCH	2	Breaker switch	DT06-2S	-
CS-27	SWF	10	Breaker switch	SWF593757	-
CS-29	DEUTSCH	2	Power max	DT06-2S	DT04-2P
CS-50	SWF	10	Quick coupling switch	SWF593757	-
CS-52	SWF	10	Spare switch	SWF593757	-
CS-53	AMP	1	Wiper cut switch	S822-014002	-
CS-54	SWF	10	Spare switch	SWF593757	-
CS-67	SWF	10	Overload switch	SWF593757	-
LAMP					
CL-1	KET	2	Cabin room lamp	MG610392	-
CL-2	-	1	Cigar light	S822-014002	-
CL-4	DEUTSCH	2	Head lamp	-	DT04-2P-P012
CL-5	DEUTSCH	2	Work lamp-LH	-	DT04-2P

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GROUP 11 EPPR VALVE

1. COMPOSITION OF EPPR VALVE

EPPR(Electro Proportional Pressure Reducing) valve consists of electro magnet and spool valve installed at main hydraulic pump.

1) ELECTRO MAGNET VALVE

Receive electric current from CPU controller and move the spool proportionally according to the specific amount of electric current value.

2) SPOOL VALVE

Is the two way direction control valve for pilot pressure to reduce hydraulic pump flow.
When the electro magnet valve is activated, pilot pressure enters into flow regulator of hydraulic pump.
So, pump flow decreases to prevent engine stall.

3) PRESSURE AND ELECTRIC CURRENT VALUE FOR EACH MODE

TIER I (UP TO #1000)

Mode		Pressure		Electric current (mA)	Engine rpm (At accel dial 10)
		kgf/cm²	psi		
Standard (Ver : 1.x)	H	0 ± 3	0 ± 40	160 ± 30	2350 ± 50
	S	11 ± 3	160 ± 40	340 ± 30	2200 ± 50
Option (Ver : 2.x)	H	8 ± 3	116 ± 40	290 ± 30	2300 ± 50
	S	15 ± 3	218 ± 40	390 ± 30	2200 ± 50
★		19 ± 3	275 ± 40	440 ± 30	-

TIER II (#1001 AND UP)

Mode		Pressure		Electric current (mA)	Engine rpm (At accel dial 10)
		kgf/cm²	psi		
Standard (Ver : 5.x)	H	5 ± 3	73 ± 40	250 ± 30	2250 ± 50
	S	8 ± 3	116 ± 40	290 ± 30	2100 ± 50
Option (Ver : 6.x)	H	5 ± 3	73 ± 40	250 ± 30	2200 ± 50
	S	11 ± 3	160 ± 40	340 ± 30	2100 ± 50
★		19 ± 3	275 ± 40	440 ± 30	-

★ Manually operated condition when prolix switch is selected emergency position.

2. HOW TO SWITCH THE VERSION(1.x ↔ 2.x) ON THE CLUSTER

You can switch the EPPR valve pressure set by selecting the version(1.x ↔ 2.x).

Step 1. Turn the key switch **ON**.

Step 2. Press the **SELECT** switch 3 times.

Step 3. While 7 segment on the cluster shows the version of the CPU controller program, for example **14C1.2(14C5.0)** press the buzzer stop switch( ) + travel speed control switch( ) at the same time for 2 seconds.

The display changes to **14C2.2(14C6.0)**, and it indicates that version 2.2(6.0)(Option) is selected.

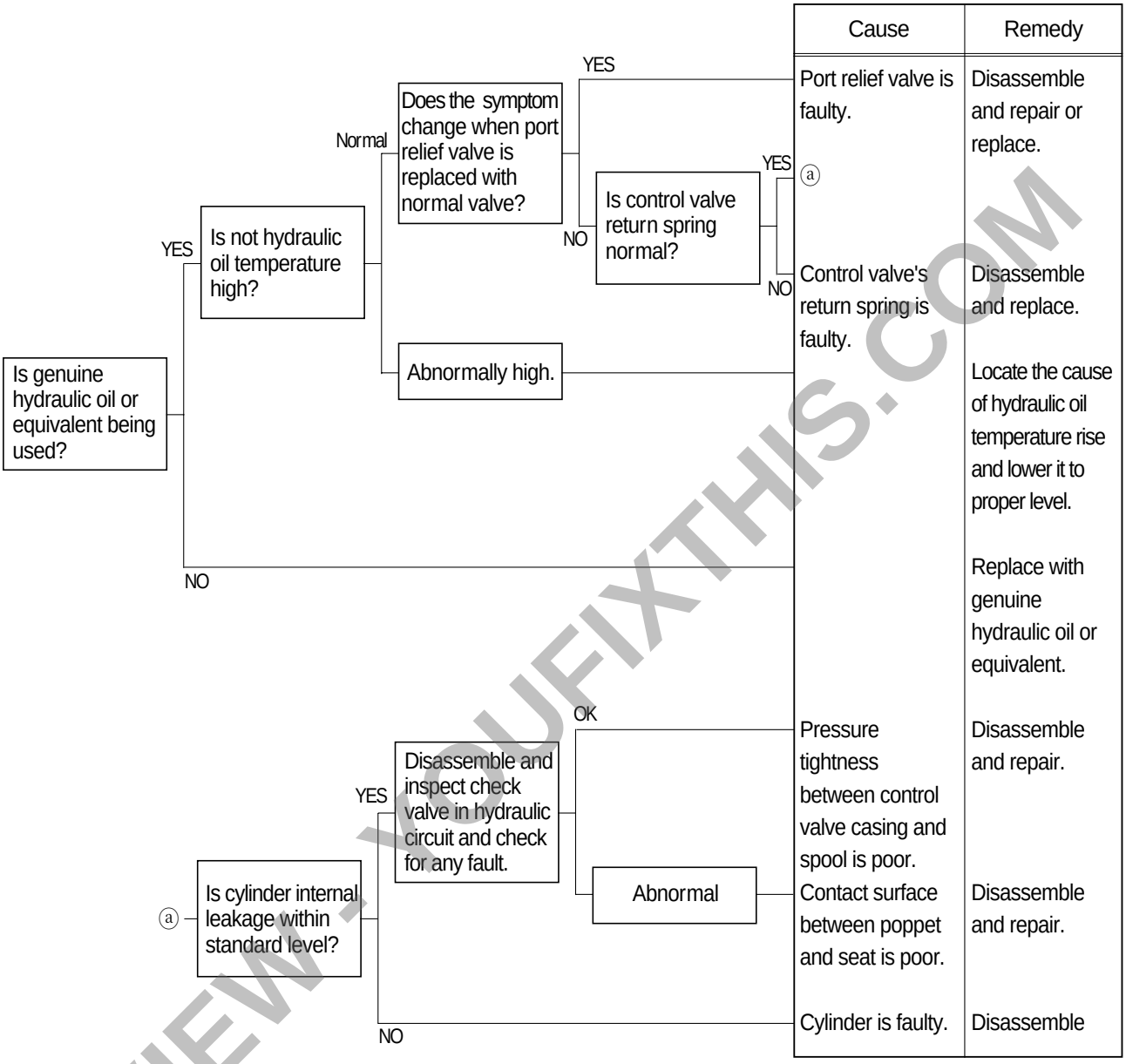
※ If you want to get back to ver:1.x(5.x), go to step 1~3.

※ ( ) : TIER II (#1001-)

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3) BOOM, ARM OR BUCKET CYLINDER EXTENDS OR CONTRACTS ITSELF AND ATTACHMENT FALLS



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SECTION 7 MAINTENANCE STANDARD

Group 1 Operational Performance Test ---------- 7-1
Group 2 Major Components ---------- 7-21
Group 3 Track and Work Equipment ---------- 7-29

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3. COMPLETING WORK

1) If the coolant has been drained, tighten the drain valve, and add water to the specified level. Run the engine to circulate the water through the system. Then check the water level again.
2) If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
3) If the piping or hydraulic equipment, such as hydraulic cylinders, pumps, or motors, have been removed for repair, always bleed the air from the system after reassembling the parts.
4) Add the specified amount of grease(Molybdenum disulphied grease) to the work equipment related parts.

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4) ASSEMBLY

(1) General precaution

① In this assembly section, explanation only is shown.
For further understanding, please refer to the figures shown in the previous structure & disassembly section.
② Pay close attention to keeping all seals free from handling damage and inspect carefully for damage before using them.
③ Apply clean grease or hydraulic oil to the seal so as to ensure it is fully lubricated before assembly.
④ Do not stretch seals so much as to deform them permanently.
⑤ In fitting O-rings, pay close attention not to roll them into their final position in addition, a twisted O-ring cannot easily untwist itself naturally and could thereby cause inadequate sealing and thereby both internal and external oil leakage.
⑥ Tighten fitting bolts for all sections with a torque wrench adjusted to the respective tightening torque.
⑦ Do not reuse removed O-rings and seals.

(2) Load check valve

① Assemble the load check valve and spring.
② Put O-rings on to plug.
③ Tighten plug to the specified torque.
· Hexagon wrench : 10㎜
· Tightening torque : 6~7kgf · m(43.4~50.6lbf · ft)

(3) Negative control relief valve

① Assemble the nega-con poppet, piston, spring holder and spring together into body.
② Put O-ring on to plug and tighten the latter to its specified torque.
· Hexagon wrench : 12㎜
· Tightening torque : 8~9kgf · m(57.8~65.1lbf · ft)

(4) Main relief, port relief valves

Install main relief valve, overload relief valve into the body and tighten to the specified torque.

Component	Tools	Tightening torque	
		kgf · m	lbf · ft
Main relief valve	Spanner 32㎜	8~9	57.8~65.1
Overload relief valve	Spanner 32㎜	8~9	57.8~65.1

(5) Main spools

① Carefully insert the previously assembled spool assemblies into their respective bores within of body.
※ Fit spool assemblies into body carefully and slowly. Do not under any circumstances push them forcibly in.

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(5) Disassembling carrier1(9) assembly.

① Remove stop ring(24).

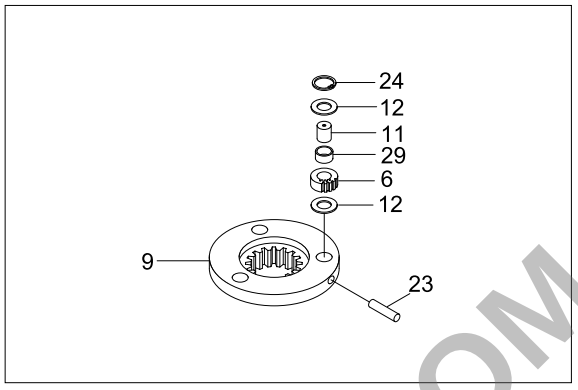
② Remove thrust washer(12), planet gear1 (6), needle cage(29), and thrust washer(12) from the carrier.

③ Using M8 solid drill, crush spring pin(23) so that the pin1(11) can be removed by hammering.

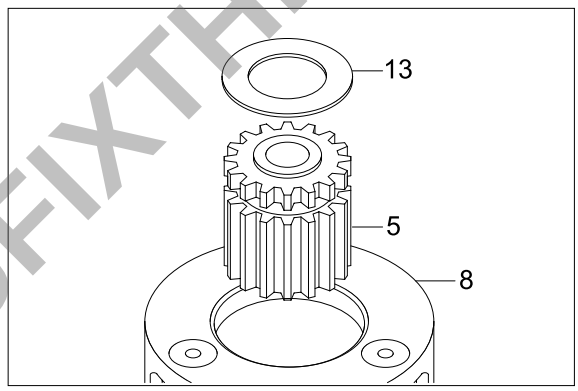
※ Do not reuse spring pin(23).

※ Do not remove pin1(11), carrier1(9) and spring pin(23) but in case of replacement.

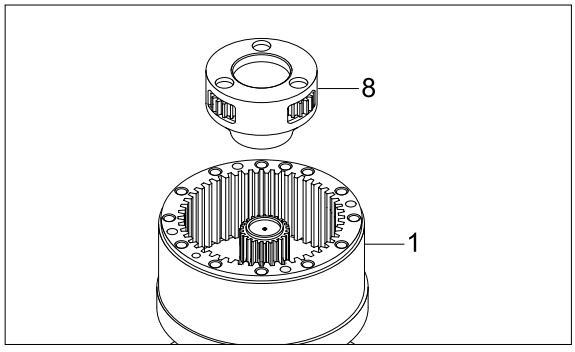
※ Put matching marks on the planet gear1 (6) and the pin1(11) for easy reassembly.



(6) Remove sun gear2(5) and thrust washer (13).



(7) Remove carrier2(8) assembly from casing (1).



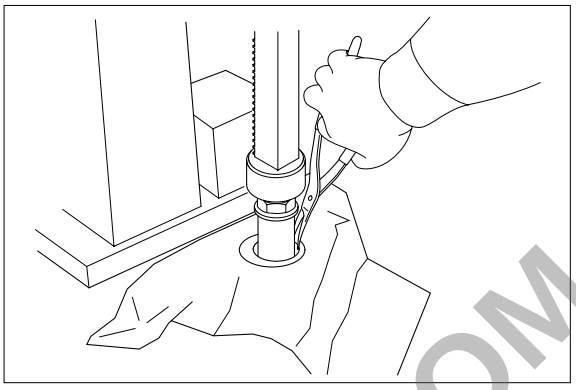
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② Set cylinder block in the press in order to compress the spring(114).
Place retainer on the washer(110) and push down this tool with the press arbor until the snap ring groove becomes cleared.
Fit snap ring(145) into the groove.

※ When working on the cylinder block, protect its sliding face by covering it with a vinyl sheet.

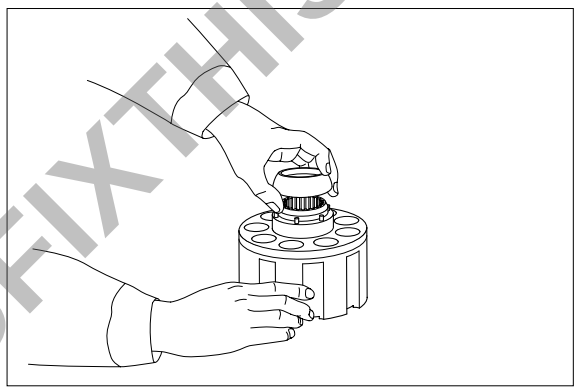
※ A push of about 200kgf(440.9lbf) will be needed to compress the spring.



(11) Assembly of piston motor sub assembly

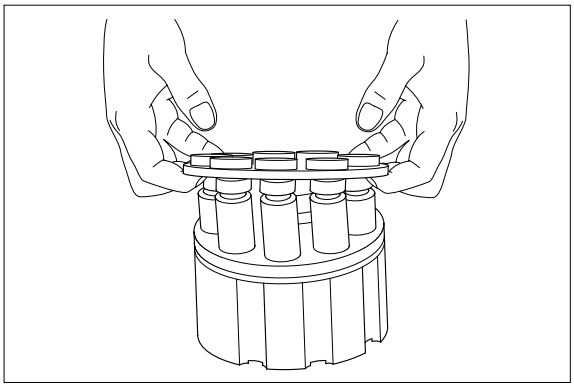
① Fit 5-rollers(151) into the pin holes of cylinder block(104), and then, put collor(111) and thrust ball(108) on it.

※ Immerse piston assembly in hydraulic oil.



② Insert piston assembly into retainer plate(107).

③ Mount the piston assembly in the cylinder block(104).
After mounting, immerse the entire them in a working fluid.



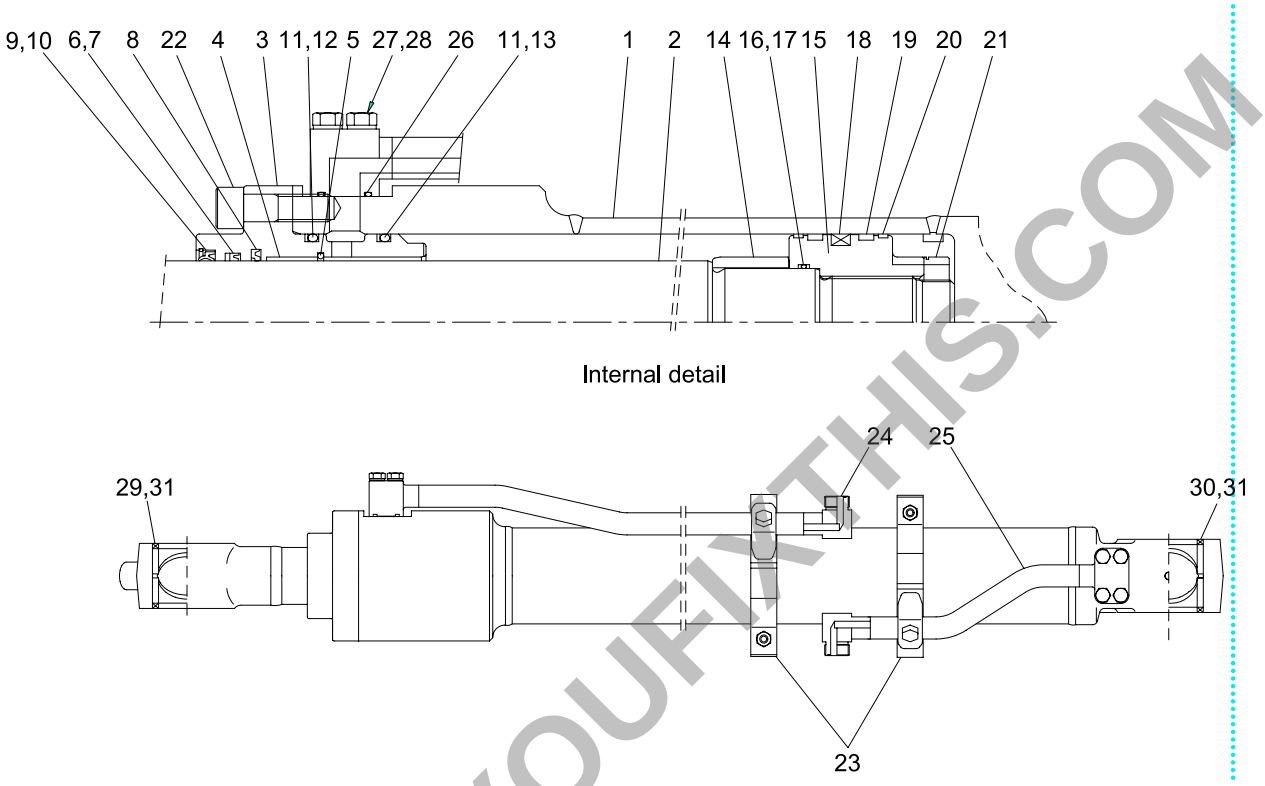
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2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

(1) Bucket cylinder



1	Tube assembly	11	O-ring	21	Nut-lock
2	Rod assembly	12	Ring-back up	22	Bolt-hexagon socket head
3	Gland	13	Ring-back up	23	Band assembly
4	DD2 bush	14	Ring-cushion	24	Pipe assembly(R)
5	Ring-snap	15	Piston	25	Pipe assembly(B)
6	Seal-rod	16	O-ring	26	O-ring
7	Ring-back up	17	Ring-back up	27	Bolt-hexagon head
8	Ring-buffer	18	Seal-piston	28	Washer-spring
9	Wiper-dust	19	Ring-wear	29	Bush-pin
10	Ring-snap	20	Ring-dust	30	Bush-pin
				31	Seal-dust

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