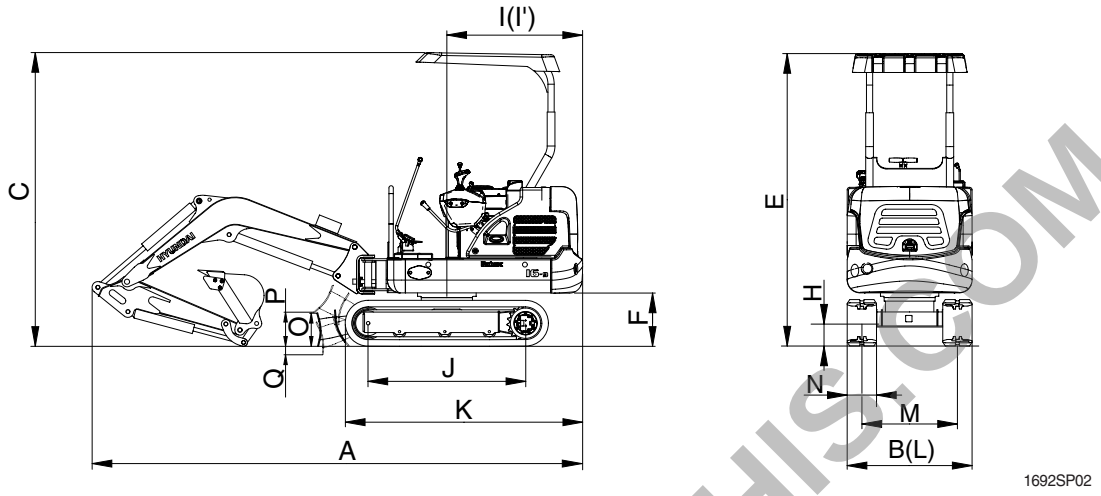
2. SPECIFICATIONS

1) 1.80 m (5' 11") MONO BOOM, 0.96 m (3' 2") ARM, WITH BOOM SWING POST

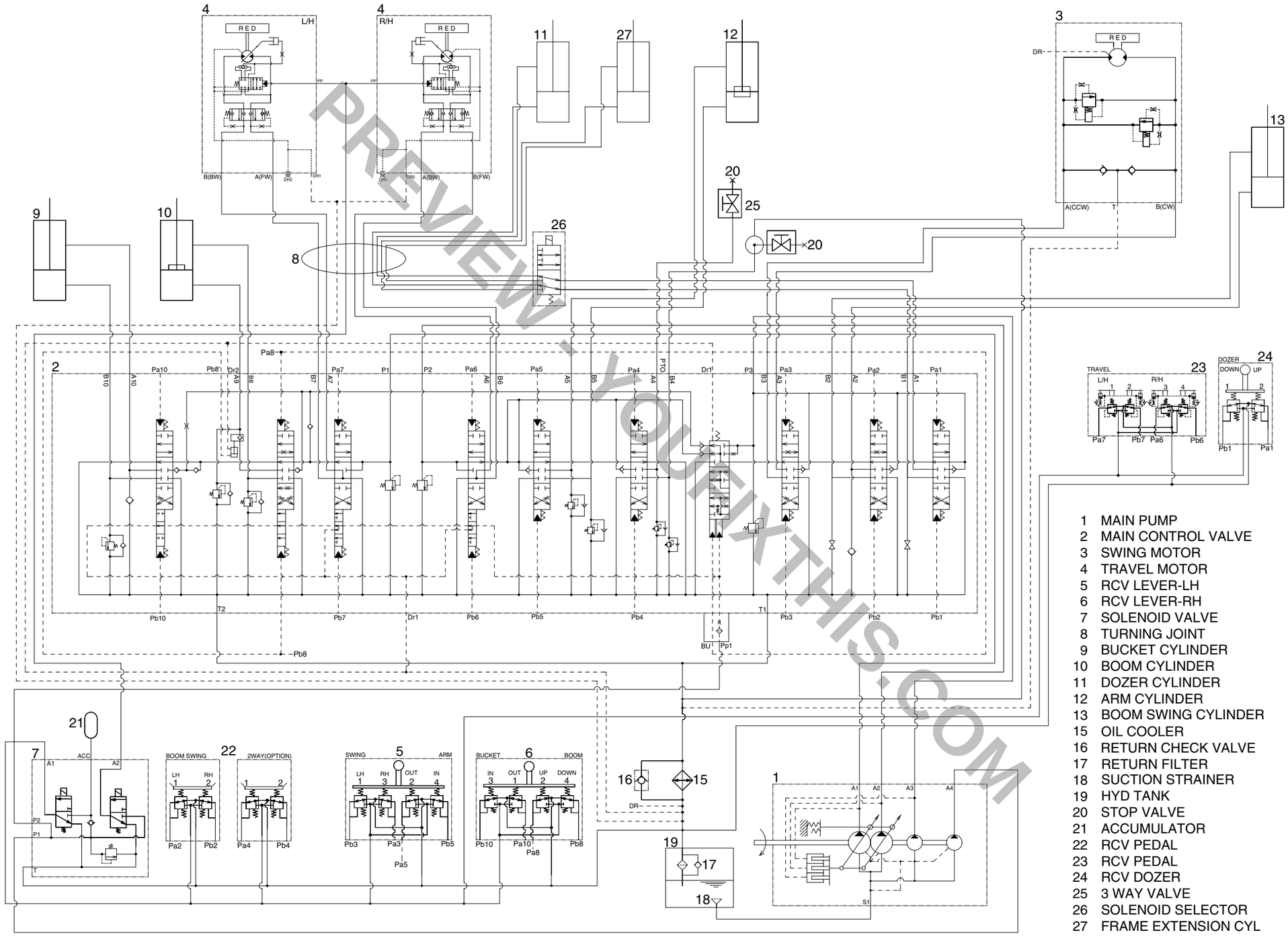


Description		Unit	Specification
Operating weight (canopy)		kg (lb)	1650 (3640)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.04 (0.05)
Overall length	A	mm (ft-in)	3840 (12' 7")
Overall width, with 230 mm shoe (extension crawler)	B		980~1250 (3' 3" ~ 4' 1")
Overall height	C		2300 (7' 7")
Overall height of canopy	E		2300 (7' 7")
Ground clearance of counterweight	F		415 (1' 4")
Minimum ground clearance	H		150 (0' 6")
Rear-end distance	I		1065 (3' 6")
Rear-end swing radius	I'		1065 (3' 6")
Distance between tumblers	J		1230 (4' 0")
Undercarriage length	K		1590 (5' 3")
Undercarriage width (extension crawler)	L		980~1250 (3' 3" ~ 4' 1")
Track gauge (extension crawler)	M		750~1020 (2' 6" ~ 3' 4")
Track shoe width, standard	N		230 (9")
Height of blade	O		250 (0' 10")
Ground clearance of blade up	P		170 (0' 7")
Depth of blade down	Q		240 (0' 9")
Travel speed (low/high)		km/hr (mph)	2.2/4.1 (1.4/2.5)
Swing speed		rpm	9.3
Gradeability		Degree (%)	30 (58)
Ground pressure 230 mm rubber shoe (canopy)		kgf/cm^2 (psi)	0.27 (3.84)
Max traction force		kg (lb)	1550 (3420)

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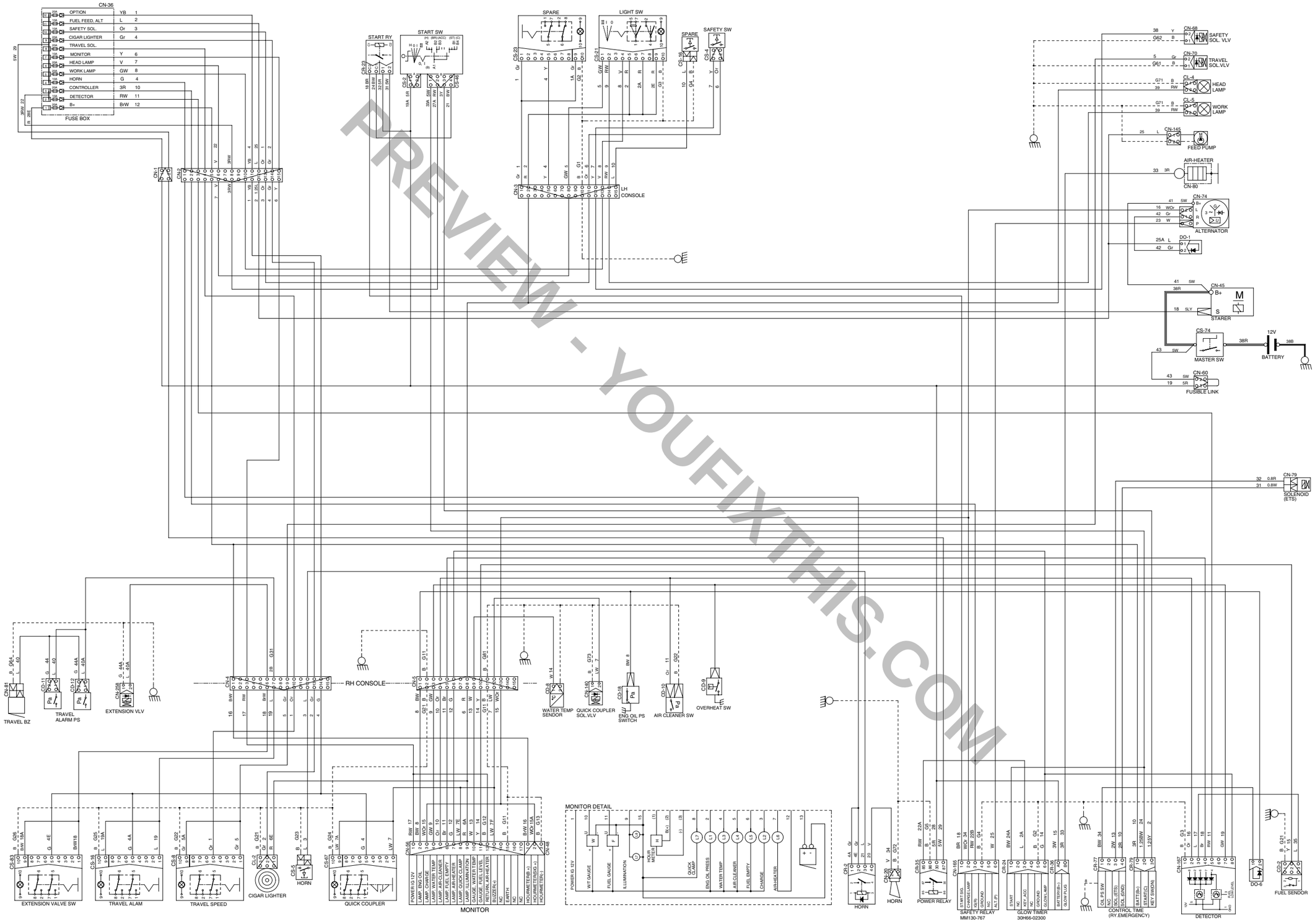
GROUP 1 HYDRAULIC CIRCUIT



1 MAIN PUMP
2 MAIN CONTROL VALVE
3 SWING MOTOR
4 TRAVEL MOTOR
5 RCV LEVER-LH
6 RCV LEVER-RH
7 SOLENOID VALVE
8 TURNING JOINT
9 BUCKET CYLINDER
10 BOOM CYLINDER
11 DOZER CYLINDER
12 ARM CYLINDER
13 BOOM SWING CYLINDER
15 OIL COOLER
16 RETURN CHECK VALVE
17 RETURN FILTER
18 SUCTION STRAINER
19 HYD TANK
20 STOP VALVE
21 ACCUMULATOR
22 RCV PEDAL
23 RCV PEDAL
24 RCV DOZER
25 3 WAY VALVE
26 SOLENOID SELECTOR
27 FRAME EXTENSION CYL

1693HC01

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1694EL03

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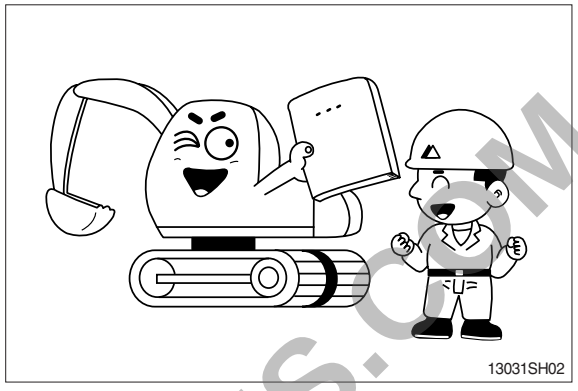
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2. DIAGNOSING PROCEDURE

To carry out troubleshooting efficiently, the following steps must be observed.

STEP 1. Study the machine system

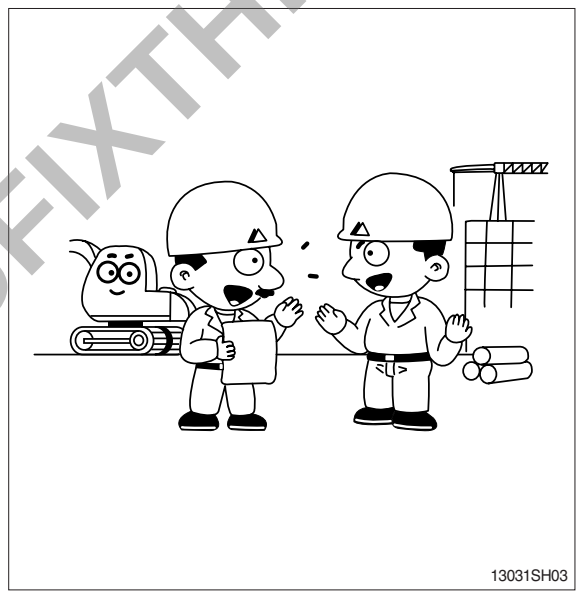
Study and know how the machine is operating, how the system is composing, what kinds of function are installed in the machine and what are specifications of the system components by the machine service manual.
Especially, deepen the knowledge for the related parts of the trouble.


13031SH02

STEP 2. Ask the operator

Before inspecting, get the full story of malfunctions from a witness --- the operator.

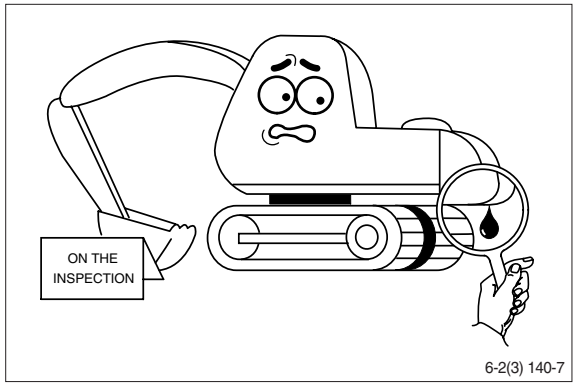
1) How the machine is used and when it is serviced?
2) When the trouble was noticed and what work the machine was doing at that time?
3) What is the phenomenon of the trouble? Was the trouble getting worse, or did it come out suddenly for the first time?
4) Did the machine have any troubles previously? If so, which parts were repaired before.


13031SH03

STEP 3. Inspect the machine

Before starting troubleshooting, check the machine for the daily maintenance points as shown in the operator's manual.

And also check the electrical system including batteries, as the troubles in the electrical system such as low battery voltage, loose connections and blown out fuses will result in malfunction of the controllers causing total operational failures of the machine.



6-2(3) 140-7

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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 : 20 ℓ (5.3 U.S.gal)

(5) Disconnect hoses (71) and remove connectors (32, 33).

(6) Disconnect pilot line hoses (70, 72) and remove connectors (10, 30, 32).

(7) Remove socket bolts (54) and disconnect pump suction tube (9).

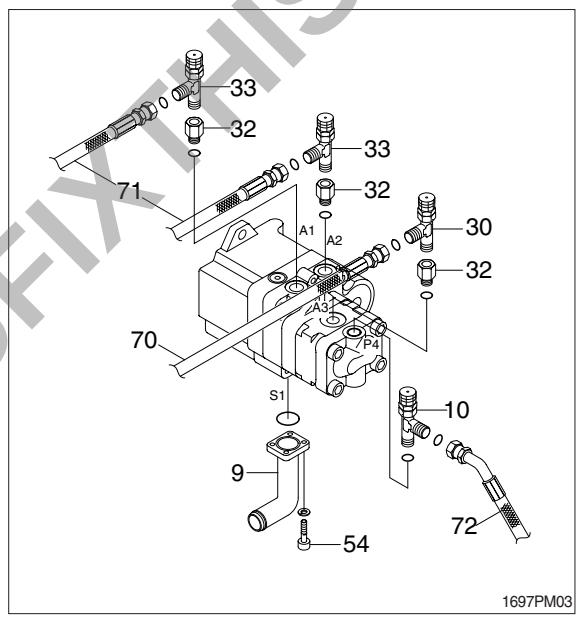
※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

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

- Weight : 17 kg (37 lb)

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





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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 (engine-bracket)	M10 × 1.25	7.4±1.5	53.5±11.0
2		Engine mounting bolt (bracket-frame)	M12 × 1.75	12.3±1.5	89±11.0
3		Radiator mounting bolt, nut	M 8 × 1.25	1.17±0.1	8.5±0.7
4		Coupling mounting bolt	M10 × 1.5	5.15±0.25	37.2±1.8
5	Hydraulic system	Main pump mounting bolt	M12 × 1.75	10±1.0	72±7.2
6		Main control valve mounting bolt	M10 × 1.5	6.9±1.4	50±10.0
7		Fuel tank mounting bolt	M10 × 1.5	6.9±1.4	50±10.0
8		Hydraulic oil tank mounting bolt	M10 × 1.5	6.9±1.4	50±10.0
9		Turning joint mounting bolt, nut	M10 × 1.5	6.9±1.4	50±10.0
10	Power train system	Swing motor mounting bolt	M12 × 1.75	12.8±3.0	93±22.0
11		Swing bearing upper mounting bolt	M12 × 1.75	12.8±3.0	93±22.0
12		Swing bearing lower mounting bolt	M12 × 1.75	12.8±3.0	93±22.0
13		Travel motor mounting bolt	M10 × 1.5	6.9±1.4	50±10.0
14		Sprocket mounting bolt	M10 × 1.5	6.9±0.7	50±5.1
15	Under carriage	Track roller mounting bolt	M12 × 1.75	12.3±1.2	89±8.7
17	Others	Counterweight mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
18		Canopy mounting bolt, nut	M12 × 1.75	12.8±3.0	92±22.0
19		Operator's seat mounting bolt	M 8 × 1.25	1.17±0.1	8.5±0.7

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

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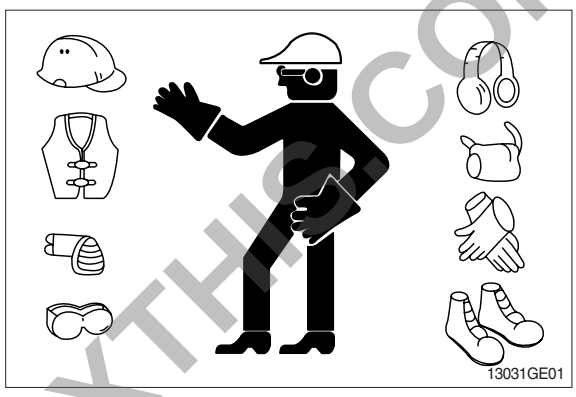
GROUP 1 SAFETY

FOLLOW SAFE PROCEDURE

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

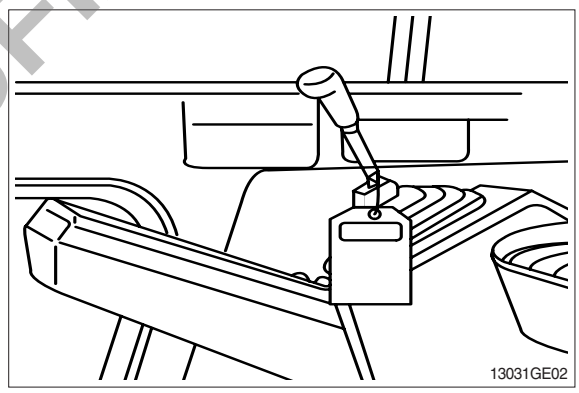
WEAR PROTECTIVE CLOTHING

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



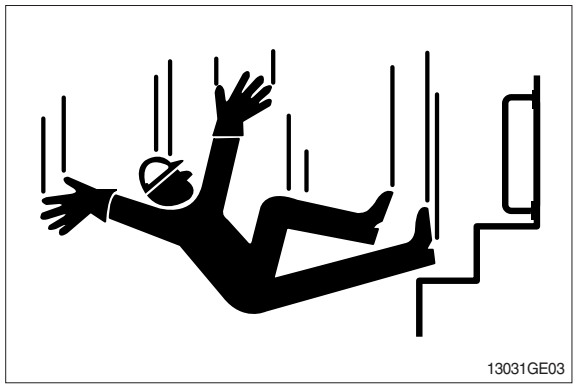
WARN OTHERS OF SERVICE WORK

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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Millimeters to inches

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0		0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Kilogram to Pound

1 kg = 2.2046 lb

	0	1	2	3	4	5	6	7	8	9
0		2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84
10	22.05	24.25	26.46	28.66	30.86	33.07	35.27	37.48	39.68	41.89
20	44.09	46.30	48.50	50.71	51.91	55.12	57.32	59.5.	61.73	63.93
30	66.14	68.34	70.55	72.75	74.96	77.16	79.37	81.57	83.78	85.98
40	88.18	90.39	92.59	94.80	97.00	99.21	101.41	103.62	105.82	108.03
50	110.23	112.44	114.64	116.85	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21
90	198.42	200.62	202.83	205.03	207.24	209.44	211.64	213.85	216.05	218.26

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(14) When the motor has reached the operation speed, check the operation while applying the load to the actuator.
(15) Check the monitoring or measuring instrument if installed.
(16) Check the noise level.
(17) Check the oil level in the tank. Supply the oil. If required.
(18) Check the setting of the pressure control valve while applying the load to the actuator.
(19) Check the parts for any leakage.
(20) Stop the motor.
(21) Retighten all the bolts and plugs even when they have proved to by free from Leakage.
(Be sure to remove the pressure from the circuit before retightening.)
(22) Check the oil level in the tank.
(23) Check if the pump and actuator function correctly.
(24) Irregular operation of the actuator indicates that an air is left still in the circuit. When the air is bleeded completely from the circuit, all the parts operates smoothly without any irregular movement and there is no bubble in the oil of the tank.
(25) Check the oil temperature.
(26) Stop the motor.
(27) Check the filter if the element is fouled.
(28) If the element is heavily fouled, carry out flashing in the circuit.

※ **To prevent damage to the pump, be sure to observe the following cautions during the operation which may allow entry of the actuator, hydraulic oil change, etc :**

(1) After oil supply, fill the pump housing with the hydraulic oil.
(2) Start the pump with the speed of 1000 rpm or less and take care not to allow the oil level to lower below the specified level of the oil level gauge.
(3) When bleeding an air from the hydraulic circuit, keep the motor speed at 1000 rpm or less. Operate each actuator for three or more cycles and carry out idling for 5 minutes or more.

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3) HYDRAULIC VALVE SECTION

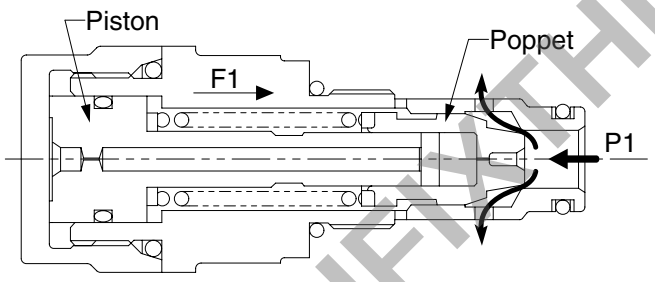
(1) Shockless relief valve

The shockless relief valve consists of the direct relief valve (poppet) and the piston for changing the spring force with two stages.

When the hydraulic motor is stopped, even after closing IN and OUT port of the hydraulic motor, the motor tries to run with inertia. Motor works as like a pump, and the pressure (brake pressure) is made on the OUT port side. The shockless relief valve releases this brake pressure with two stages of operation. This makes the shock smooth, and prevents the motor being damaged. It also makes the start of the motor smooth.

① **First stage**

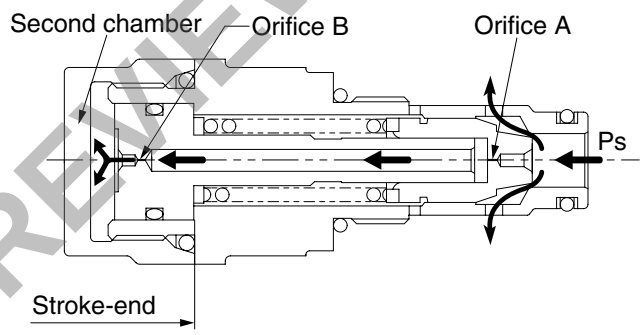
When the P1 pressure is going up, the poppet opens due to the pressure of the spring force F1.



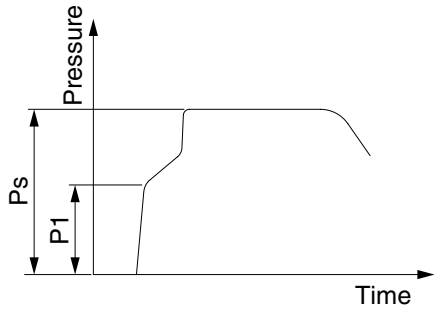
1692SM09

② **Second stage**

When P1 pressure enters the second chamber through the orifice A and B, the piston moves to its stroke-end. With this action, the spring is compressed, the spring force becomes stronger, and the P1 pressure is increased to the setting pressure Ps.



1692SM10



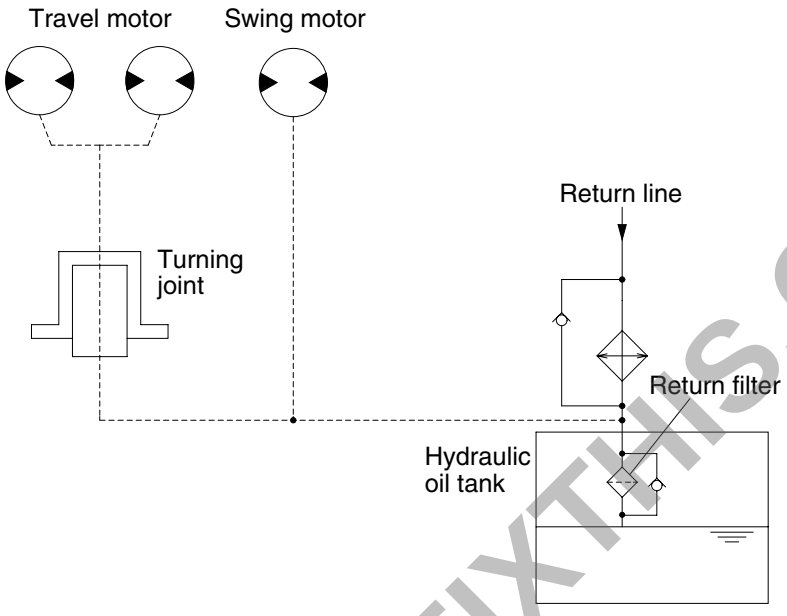
1692SM11

With the above two stages of operation, the motor starts and stops smoothly.

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3. DRAIN CIRCUIT



Besides internal leaks from the motors and main pump, the oil for lubrication circulates.

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 return filter.

2) SWING MOTOR DRAIN CIRCUIT

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

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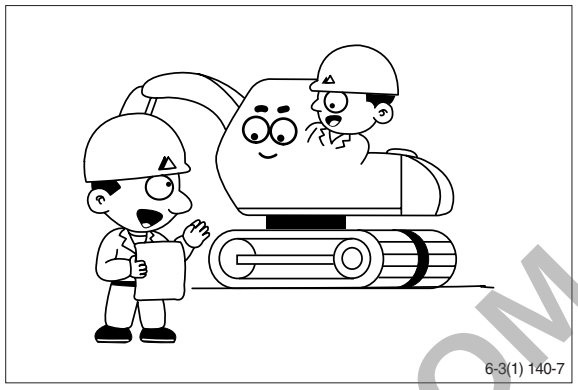
MEMORANDUM

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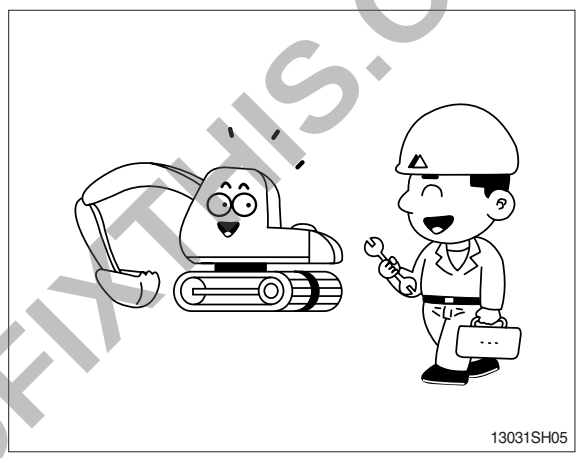
STEP 4. Inspect the trouble actually on the machine

In case that some trouble cannot be confirmed, obtain the details of the malfunction from the operator.
Also, check if there are any in complete connections of the wire harnesses are or not.


6-3(1) 140-7

STEP 5. Perform troubleshooting

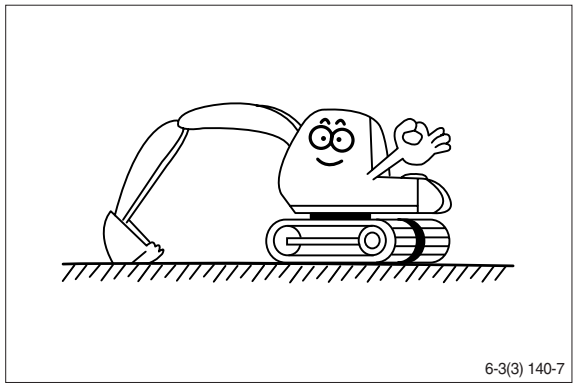
According to where the trouble parts are located, hydraulic & mechanical system part or electrical system part or mechatronics system part, perform troubleshooting the machine refer to the each system part's troubleshooting process diagram.


13031SH05

STEP 6. Trace a cause

Before reaching a conclusion, check the most suspectible causes again. Try to trace what the real cause of the trouble is.

Make a plan of the appropriate repairing procedure to avoid consequential malfunctions.


6-3(3) 140-7

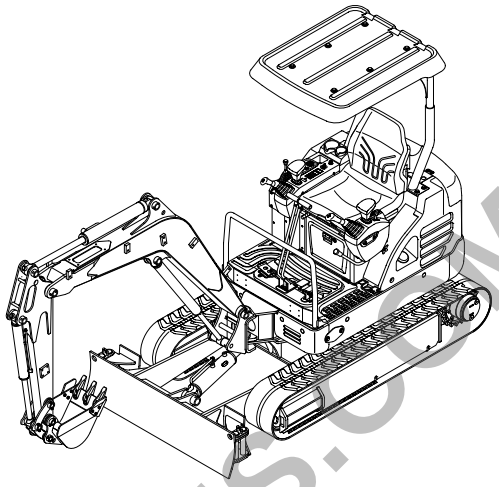
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2. TERMINOLOGY

1) STANDARD

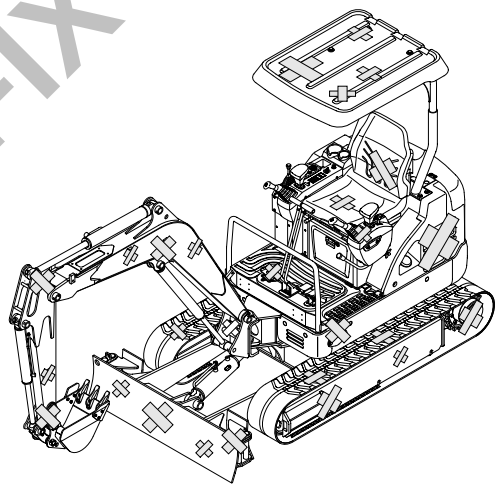
Specifications applied to the brand-new machine, components and parts.



1696MS02

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.



1696MS03

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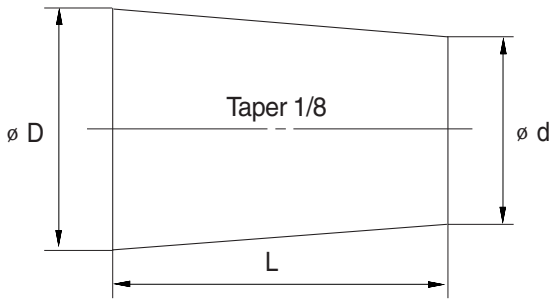
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GROUP 1 PRECAUTIONS

1. REMOVAL WORK

1) Lower the work equipment completely to the ground.
   If the coolant contains antifreeze, dispose of it correctly.
2) After disconnecting hoses or tubes, cover them or fit blind plugs to prevent dirt or dust from entering.
3) When draining oil, prepare a container of adequate size to catch the oil.
4) Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake when assembling.
5) To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors.
6) Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
7) Check the number and thickness of the shims, and keep in a safe place.
8) When raising components, be sure to use lifting equipment of ample strength.
9) When using forcing screws to remove any components, tighten the forcing screws alternately.
10) Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.
11) When removing hydraulic equipment, first release the remaining pressure inside the hydraulic tank and the hydraulic piping.
12) If the part is not under hydraulic pressure, the following corks can be used.

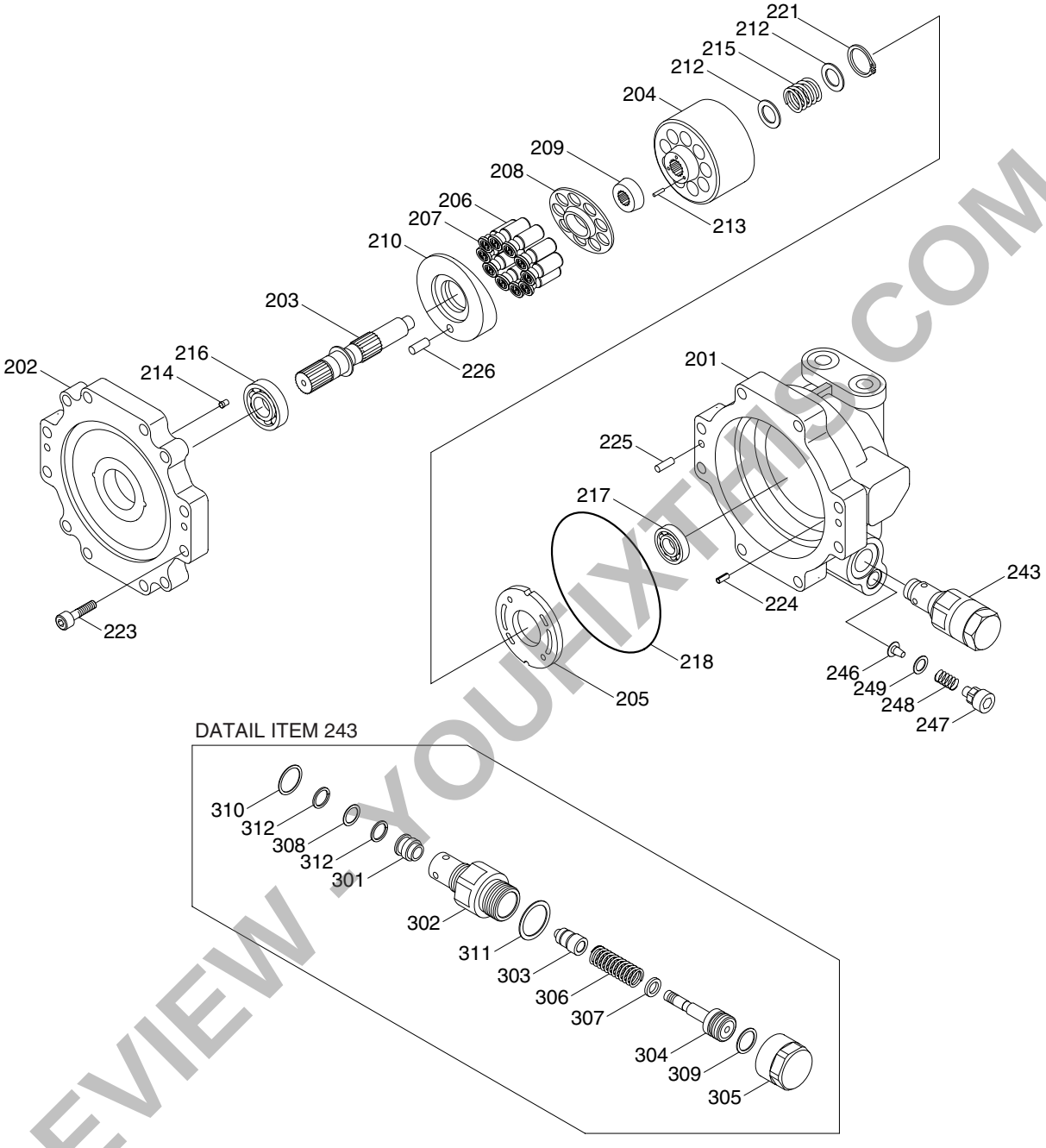
Nominal number	Dimensions		
	D	d	L
06	6	5	8
08	8	6.5	11
10	10	8.5	12
12	12	10	15
14	14	11.5	18
16	16	13.5	20
18	18	15	22
20	20	17	25
22	22	18.5	28
24	24	20	30
27	27	22.5	34



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2) COMPONENTS (1/2)



1692SM06

201	Body	212	Retainer	225	Pin	304	Piston
202	Plate	213	Pin	226	Pin	305	Cap
203	Shaft	214	Filter	243	Relief valve	306	Spring
204	Cylinder barrel	215	Spring C	246	Check valve	307	Spacer
205	Valve plate	216	Bearing	247	Plug	308	O-ring
206	Piston	217	Bearing	248	Spring	309	O-ring
207	Shoe	218	O-ring	249	O-ring	310	O-ring
208	Shoe holder	221	Snap ring	301	Seat	311	O-ring
209	Barrel holder	223	Screw	302	Retainer	312	Back up-ring
210	Swash plate	224	Spring pin	303	Poppet		

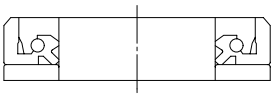
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(6) Press-fit the oil seal into the body 2.

※ Apply grease to the periphery of the oil seal.

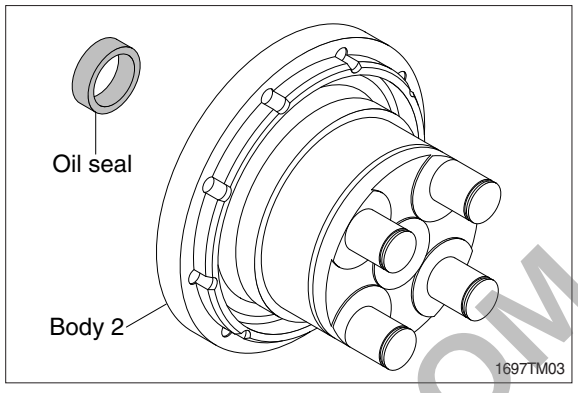
※ Pay attention to the direction of the oil seal, and do not slant it.



UP

DOWN

R27Z97TM52



(7) Place the pin into the body 2.

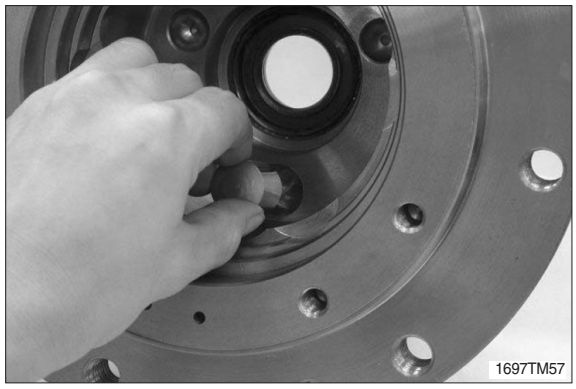


(8) Press-fit the bearing with the shaft.



(9) Insert the control piston into the body 2.

※ Assemble the control piston, which spherical surface should be upper side.



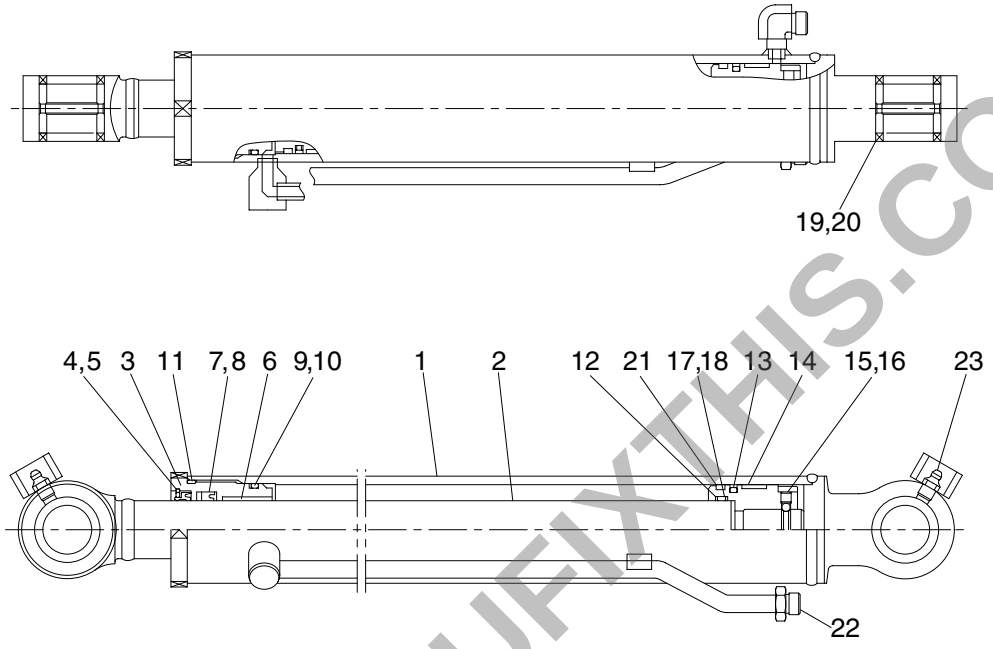
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2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

(1) Bucket cylinder



1697CY03

1	Tube assembly	9	O-ring	17	O-ring
2	Rod assembly	10	Back-up ring	18	Back up ring
3	Gland	11	O-ring	19	Pin bushing
4	Dust wiper	12	Piston	20	Dust seal
5	Retaining ring	13	Piston seal	21	Dust ring
6	Bushing	14	Wear ring	22	O-ring
7	Rod seal	15	Set screw	23	Grease nipple
8	Back-up ring	16	Steel ball		

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