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.

Structure and function

This group 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.

Operational checks and troubleshooting

This group explains the system operational checks and troubleshooting charts correlating problem to remedy.

Tests and adjustments

This group explains checks to be amide before and after performing repairs, as well as adjustments to be made at completion of the checks and repairs.

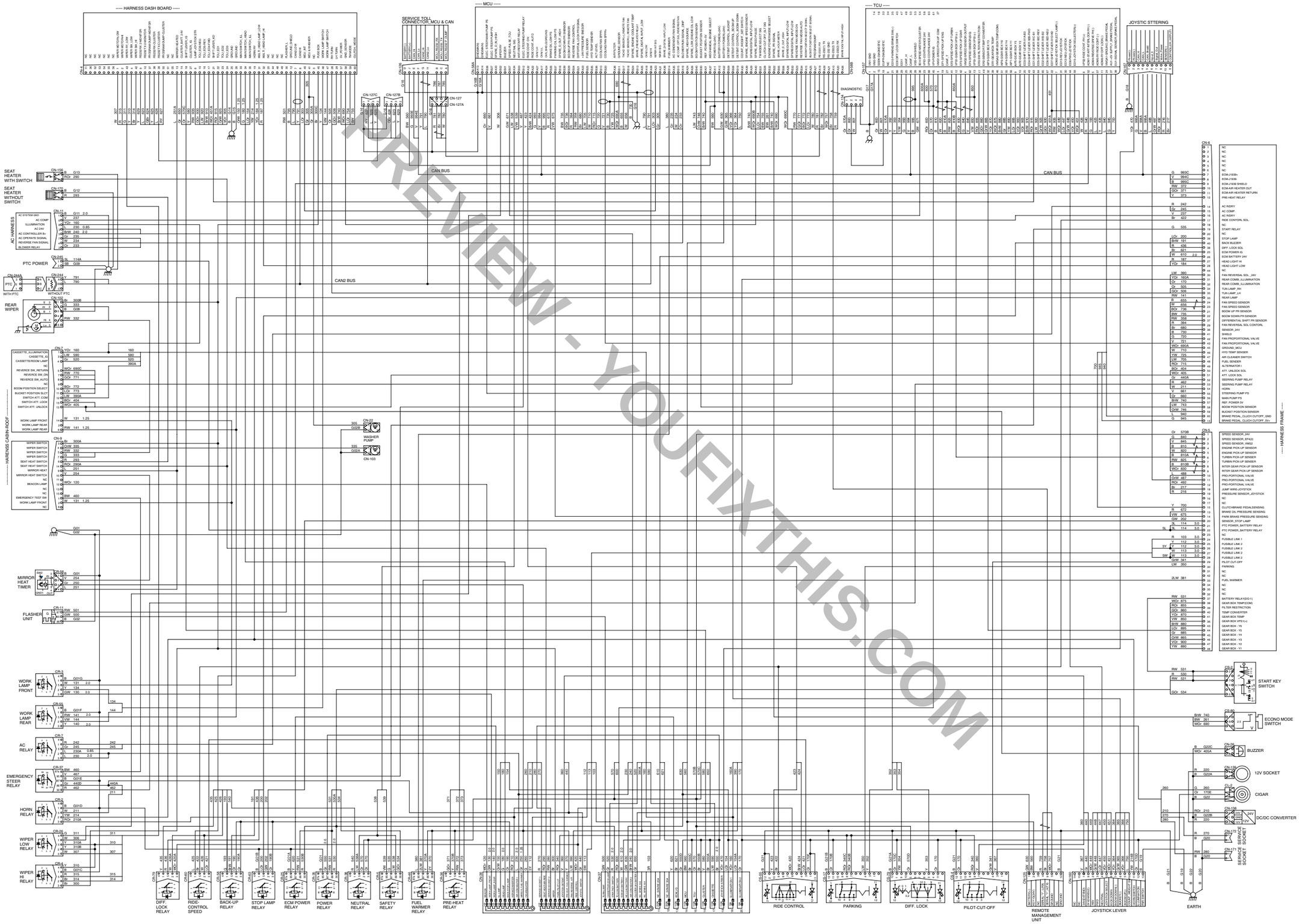
Disassembly and assembly

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.

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.

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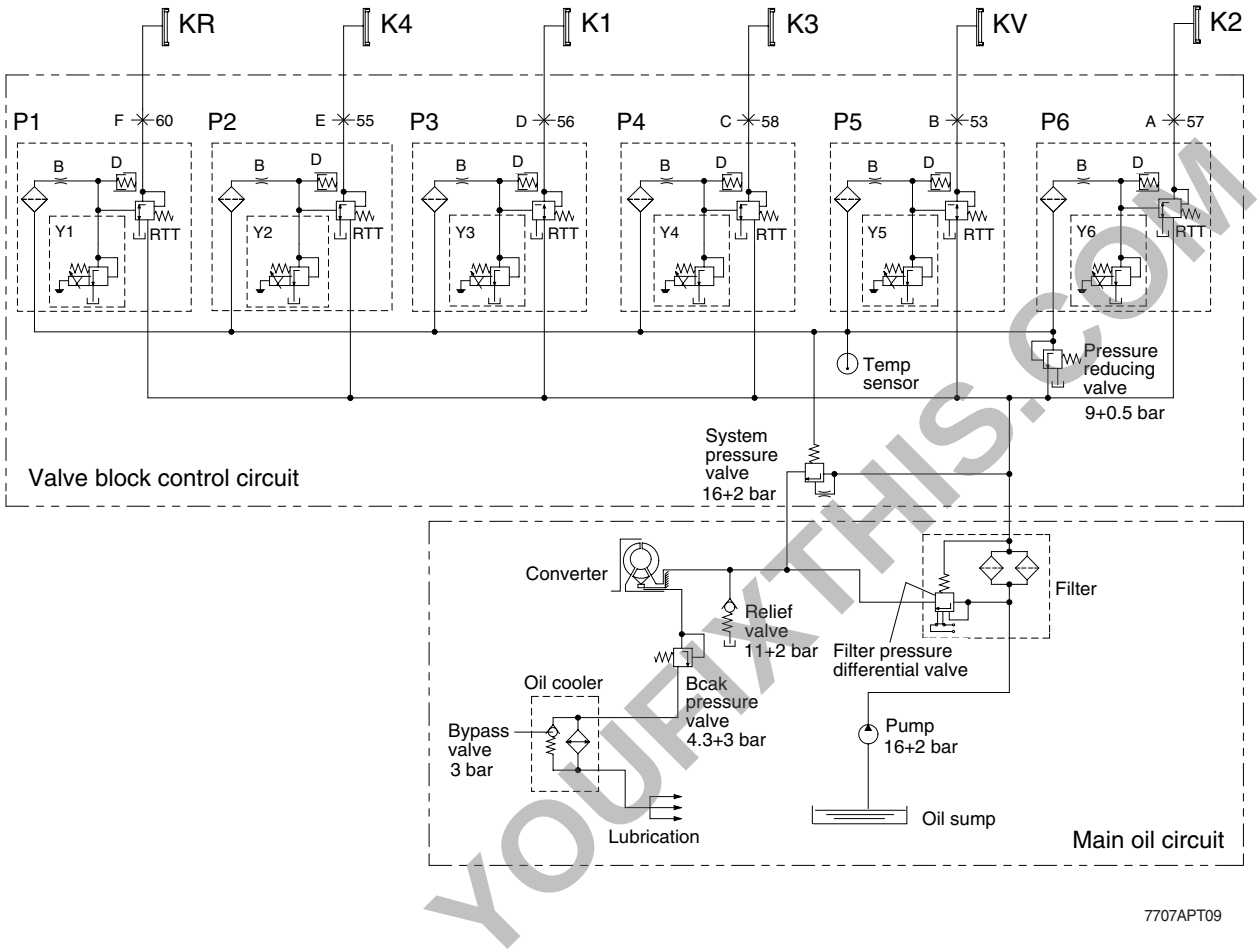
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HYDRAULIC CIRCUIT



NFS	Follow-on slide	P3	Proportional valve clutch K1
D	Oscillation damper	P4	Proportional valve clutch K3
B	Orifice	P5	Proportional valve clutch KV
P1	Proportional valve clutch KR	P6	Proportional valve clutch K2
P2	Proportional valve clutch K4	Y1~Y6	Pressure regulator valve with filter

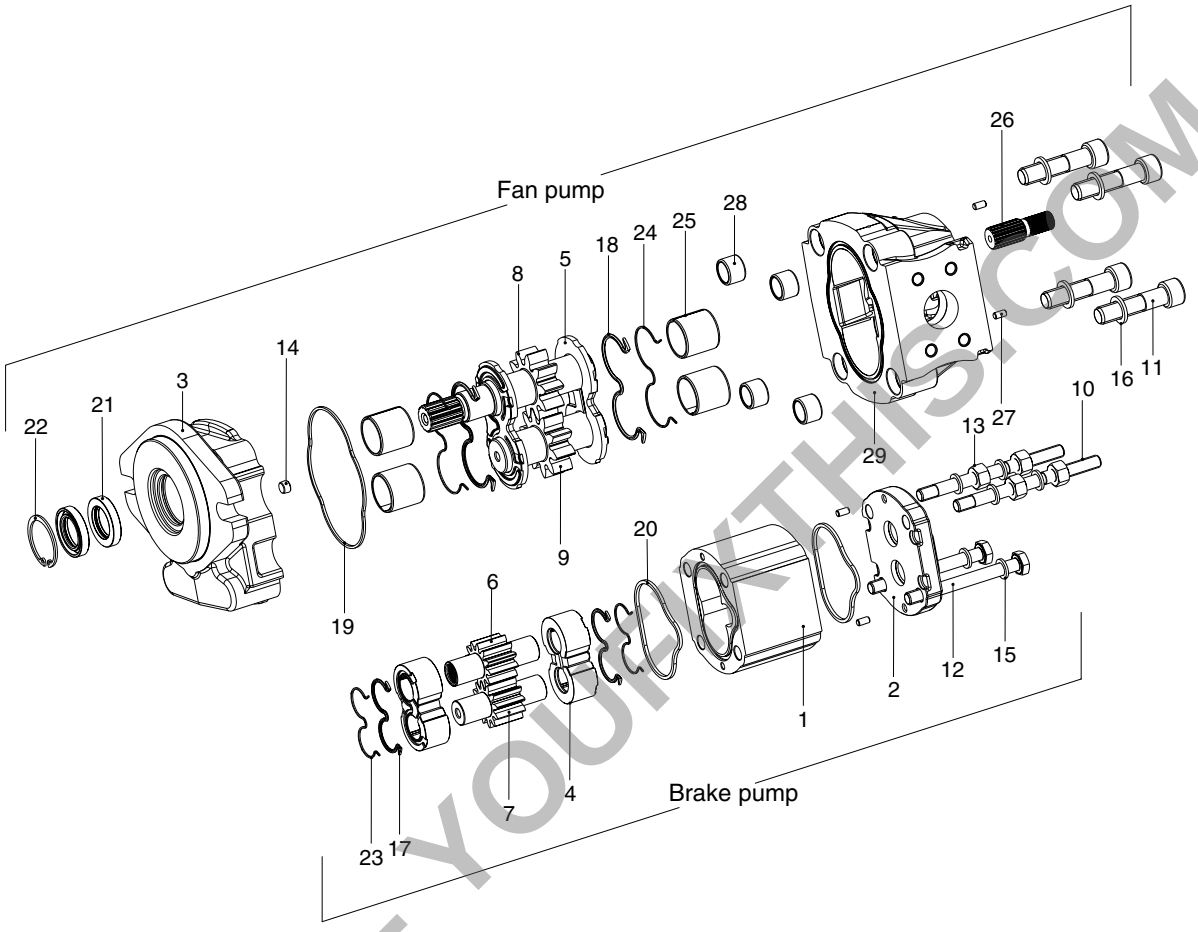
Speed	Forward				Reverse			Neutral	Engaged clutch	Positions on the valve block	Current No. of the measuring points
	1	2	3	4	1	2	3				
Y1					X	X	X		KR	F	55
Y2				X					K4	E	60
Y3	X				X				K1	D	56
Y4			X	X			X		K3	C	58
Y5	X	X	X						KV	B	53
Y6		X				X			K2	A	57
Engaged clutch	K1,KV	KV,K2	KV,K3	K4,K3	KR,K1	KR,K2	KR, K3		-	-	-

X : Pressure regulator under voltage

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3. BRAKE PUMP (+FAN PUMP)

1) STRUCTURE



78094BS06

1	Body	11	Screw	21	Shaft seal
2	Rear cover	12	Screw	22	Ring
3	Front cover	13	Nut	23	Ring
4	Thrust plate	14	Screw	24	Ring
5	Bushing	15	Washer	25	Sleeve bearing
6	Drive gear	16	Washer	26	Hub
7	Driven gear	17	Seal	27	Dowel pin
8	Drive shaft	18	Seal	28	Steel bushing
9	Driven gear	19	Seal	29	Housing
10	Stud bolt	20	Seal		

This gear pump have a maximum delivery pressure of 150 kgf/cm^2.
The pressure loaded type gear pump is designed so that the clearance between the gear and the bushing can be automatically adjusted according to the delivery pressure. Therefore, the oil leakage from the bushing is less than that in the case of the fixed bushing type under a high discharge pressure. Consequently, no significant reduction of the pump delivery occurs, even when the pump is operated under pressure.

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5. TIGHTENING TORQUE OF MAJOR COMPONENT

No.	Descriptions		Bolt size	Torque	
				kgf · m	lbf · ft
1	Engine	Engine mounting bolt, nut (rubber, 4EA)	M24×3.0	100 ± 15.0	723 ± 108
2		Engine mounling bolt (fly wheel housing, 8EA)	M16×2.0	19.4 ± 3.0	140 ± 21.7
3		Engine mounting bolt (gear housing, 6EA)	M10×1.5	4.6 ± 0.7	33.3 ± 5.1
4		Radiator mounting bolt	M20×2.5	57.9 ± 8.7	419 ± 62.9
5		Fuel tank mounting bolt, nut	M16×2.0	29.7 ± 4.5	215 ± 32.5
6	Hydraulic system	Main pump housing mounting bolt	M14×2.0	19.6 ± 2.9	142 ± 21.0
7		Steering pump housing mounting bolt	M14×2.0	19.6 ± 2.9	142 ± 21.0
8		Main control valve mounting bolt	M12×1.75	12.8 ± 3.0	92.6 ± 21.7
9		Steering unit mounting bolt	M10×1.5	6.9 ± 1.4	49.9 ± 10.1
10		Flow amplifier mounting bolt	M10×1.5	6.9 ± 1.4	49.9 ± 10.1
11		Brake valve mounting bolt	M8×1.25	2.5 ± 0.5	18.1 ± 3.6
12		Cut-off valve mounting bolt	M12×1.75	12.3 ± 2.0	89.0 ± 14
13		Remote control lever mounting bolt	M6×1.0	1.1 ± 0.2	8.0 ± 1.4
14		Stop valve	M10×1.5	6.9 ± 1.4	50 ± 10.1
15		Safety valve	M10×1.5	6.9 ± 1.4	50 ± 10.1
16		Hydraulic oil tank mounting bolt	M20×2.5	57.9 ± 8.7	419 ± 62.9
17	Power train system	Transmission bolt, nut (rubber, 4EA)	M24×3.0	100 ± 15.0	723 ± 108
18		Transmission bolt (bracket, converter side)	M16×2.0	18.4 ± 2.0	133 ± 14.5
19		Front axle mounting bolt, nut	M36×3.0	270 ± 30	1950 ± 217
20		Rear axle support mounting bolt, nut	M36×3.0	270 ± 30	1950 ± 217
21		Tire mounting nut	M22×1.5	79 ± 2.5	571 ± 18
22		Drive shaft joint mounting bolt, nut	M20×2.5	57.9 ± 8.7	419 ± 62.9
23	Others	Counterweight mounting bolt	M30×2.0	199 ± 30	1439 ± 217
24		Operator's seat mounting bolt	M8×1.25	3.4 ± 0.8	24.6 ± 5
25		ROPS Cab mounting bolt (4EA)	M20×2.5	58 ± 8.7	419 ± 63

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4. FAULT CODE

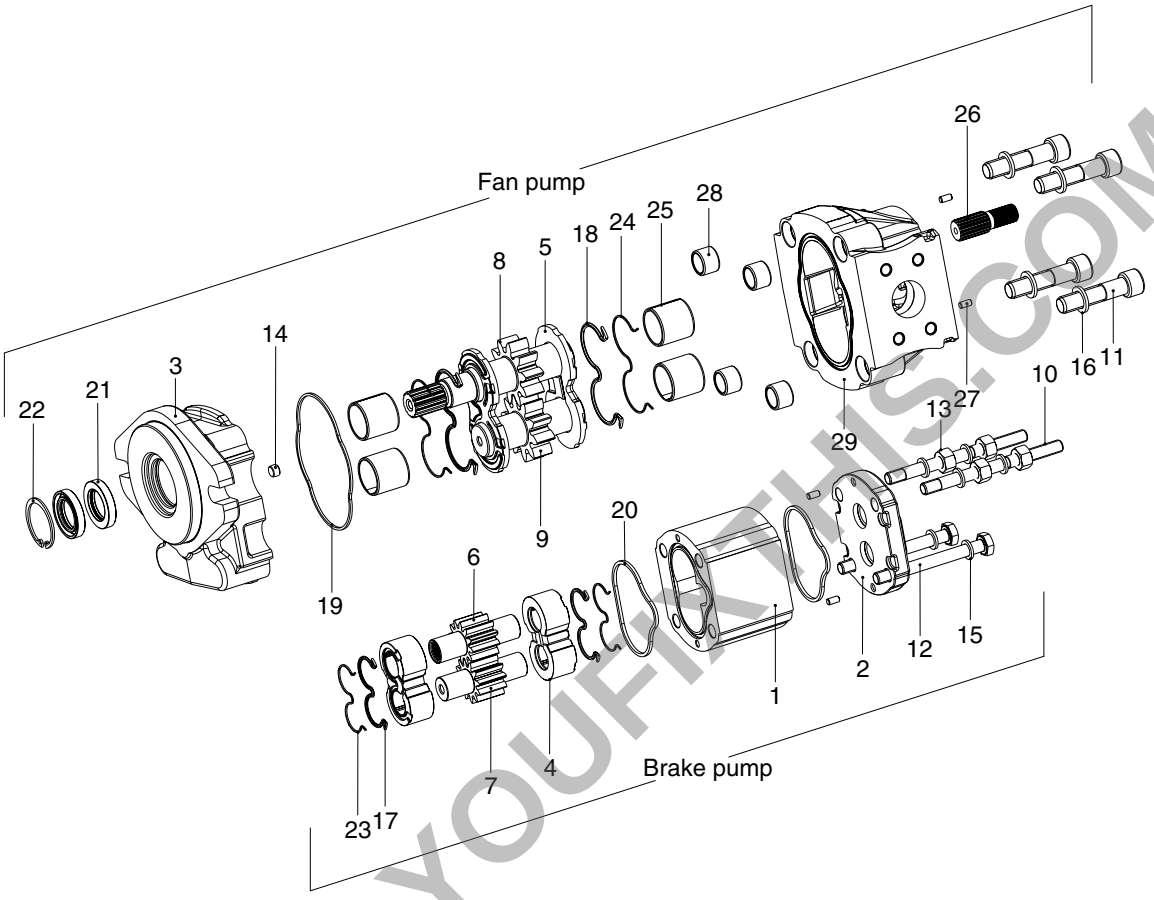
1) MACHINE FAULT CODE

HCESPN	FMI	Description
101	3	Hydraulic oil temperature sensor circuit - Voltage above normal, or shorted to high source (or open circuit)
	4	Hydraulic oil temperature sensor circuit - Voltage below normal, or shorted to low source
145	5	Engine cooling fan EPPR valve circuit - Current below normal, or open circuit
	6	Engine cooling fan EPPR valve bircuit - Current above normal
172	4	Boom up lever detent solenoid circuit - Voltage below normal, or shorted to low source (or open circuit)
	6	Boom up lever detent solenoid circuit - Current above normal
173	4	Boom down lever detent solenoid circuit - Voltage below normal, or shorted to low source (or open circuit)
	6	Boom down lever detent solenoid circuit - Current above normal
174	4	Bucket lever detent solenoid circuit - Voltage below normal, or shorted to low source (or open circuit)
	6	Bucket lever detent solenoid circuit - Current above normal
181	4	Engine cooling fan reverse solenoid circuit - Voltage below normal, or shorted to low source (or open circuit)
	6	Engine cooling fan reverse solenoid circuit - Current above normal
183	4	Engine cooling fan reverse driving status signal circuit - Voltage below normal, or shorted to low source (or open circuit)
	6	Engine cooling fan reverse driving status signal circuit - Current above normal
187	4	Emergency steering pump relay circuit - Voltage below normal, or shorted to low source (or open circuit)
	6	Emergency steering pump relay circuit – Current above normal
202	0	Steering main pump pressure sensor data above normal range (or open circuit)
	1	Steering main pump pressure sensor data below normal range
	2	Steering main pump pressure sensor data error
	4	Steering main pump pressure sensor circuit - Voltage below normal, or shorted to low source
203	0	Emergency steering pump pressure sensor data above normal range (or open circuit)
	1	Emergency steering pump pressure sensor data below normal range
	2	Emergency steering pump pressure sensor data error
	4	Emergency steering pump pressure sensor circuit - Voltage below normal, or shorted to low source
204	0	Boom cylinder pressure sensor data above normal range (or open circuit)
	1	Boom cylinder pressure sensor data below normal range
	2	Boom cylinder pressure sensor data error
	4	Boom cylinder pressure sensor circuit - Voltage below normal, or shorted to low source
205	0	Bucket cylinder pressure sensor data above normal range (or open circuit)
	1	Bucket cylinder pressure sensor data below normal tange
	2	Bucket cylinder pressure sensor data error
	4	Bucket cylinder pressure sensor circuit - Voltage below normal, or shorted to low source

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2) DISASSEMBLY



78094BS06-1

※ Before disassembling ensure that the unit itself, bench and tools are thoroughly clean.

(1) Lightly mark the rear cover (2), body (1) and housing (29) to ensure reassembly in the correct position.

(2) Remove the screws (12) and separate the brake pump unit from the fan pump using a soft faced hammer.

(3) Remove the hub (26).

(4) Remove the seal element (17, 23) and the body seal (20).

(5) Remove the rear cover (2) from the body (1).

(6) Remove the seal element (17, 23) and the body seal (20).

※ Before removing the internal components each bushing (4) must be marked to denote its location within the body. On the plain area of the bush away from the seal location, lightly mark.

(7) With the unit laying on its side grasp hold of the drive gear (6) and pull it squarely out of the body (1) bringing the bushing (4) with it.

(8) Remove the driven gear (7) and the remaining bushing (4).

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2. TROUBLESHOOTING

1) TRANSMISSION

※ **Diagnose malfunction charts are arranged from most probable and simplest to verify, to least likely, more difficult to verify. Remember the following steps when troubleshooting a problem :**

Step 1. Operational check out procedure (See group 3 in section 1.)
Step 2. Operational checks (In this group.)
Step 3. Troubleshooting
Step 4. Tests and/or adjustments (See group 3.)

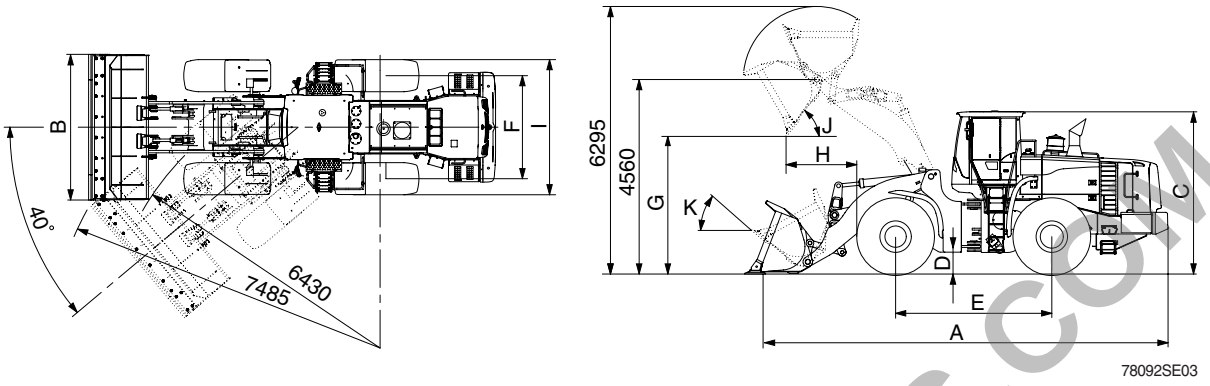
Problem	Cause	Remedy
Transmission slippage	Low oil level.	Add oil.
	Wrong oil grade.	Change oil.
	Restricted transmission pump suction screen.	Remove and clean screen.
	Leak in transmission control valve or gasket.	Remove valve and inspect gaskets.
	Low transmission pump flow due to worn pump.	Do transmission pump flow test.
	Weak or broken pressure regulating valve spring.	Do transmission system pressure test.
Error code on display	Something wrong in transmission.	Go to transmission error code group at page 3-32~3-51.

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2. SPECIFICATIONS

1) WITH BOLT-ON CUTTING EDGE TYPE BUCKET (HL780-9)



Description			Unit	Specification
Operating weight			kg (lb)	30000 (66100)
Bucket capacity		Struck	m^3 (yd^3)	4.6 (6.0)
		Heaped		5.4 (7.1)
Overall length		A	mm (ft-in)	9630 (31' 7")
Overall width		B		3450 (11' 4")
Overall height		C		3865 (12' 8")
Ground clearance		D		495 (1' 7")
Wheelbase		E		3700 (12' 2")
Tread		F		2440 (8' 0")
Dump clearance at 45˚		G		3300 (10' 10")
Dump reach (full lift)		H		1430 (4' 8")
Width over tires		I		3220 (10' 7")
Dump angle		J	degree (˚)	47
Roll back angle (carry position)		K		48
Cycle time		Lift (with load)	sec	6.0
		Dump (with load)		1.4
		Lower (empty)		3.7
Maximum travel speed			km/hr (mph)	36.5
Braking distance			m (ft-in)	12 (39' 4")
Minimum turning radius (center of outside tire)				6.43 (21' 1")
Gradeability			degree (˚)	30
Travel speed	Forward	First gear	km/hr (mph)	6.1 (3.8)
		Second gear		11.5 (7.2)
		Third gear		18.0 (11.2)
		Fourth gear		36.5 (22.7)
	Reverse	First gear		6.1 (3.8)
		Second gear		11.5 (7.2)
		Third gear		25.0 (15.6)

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Millimeters to inches

1mm = 0.03937in

	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

1kg = 2.2046lb

	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

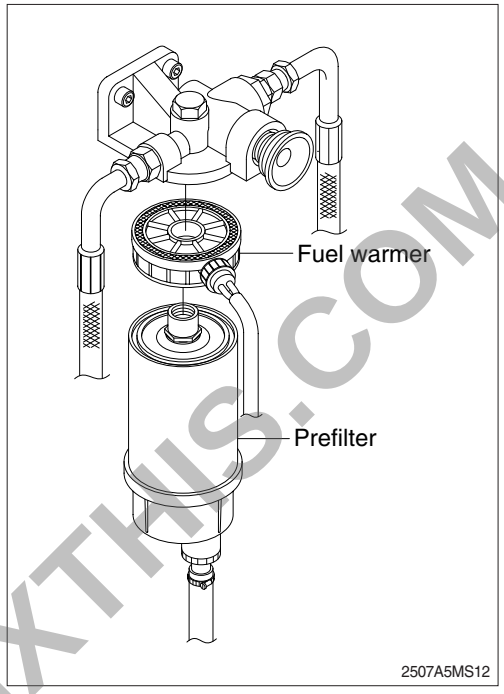
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GROUP 3 FUEL WARMER SYSTEM

1. SPECIFICATION

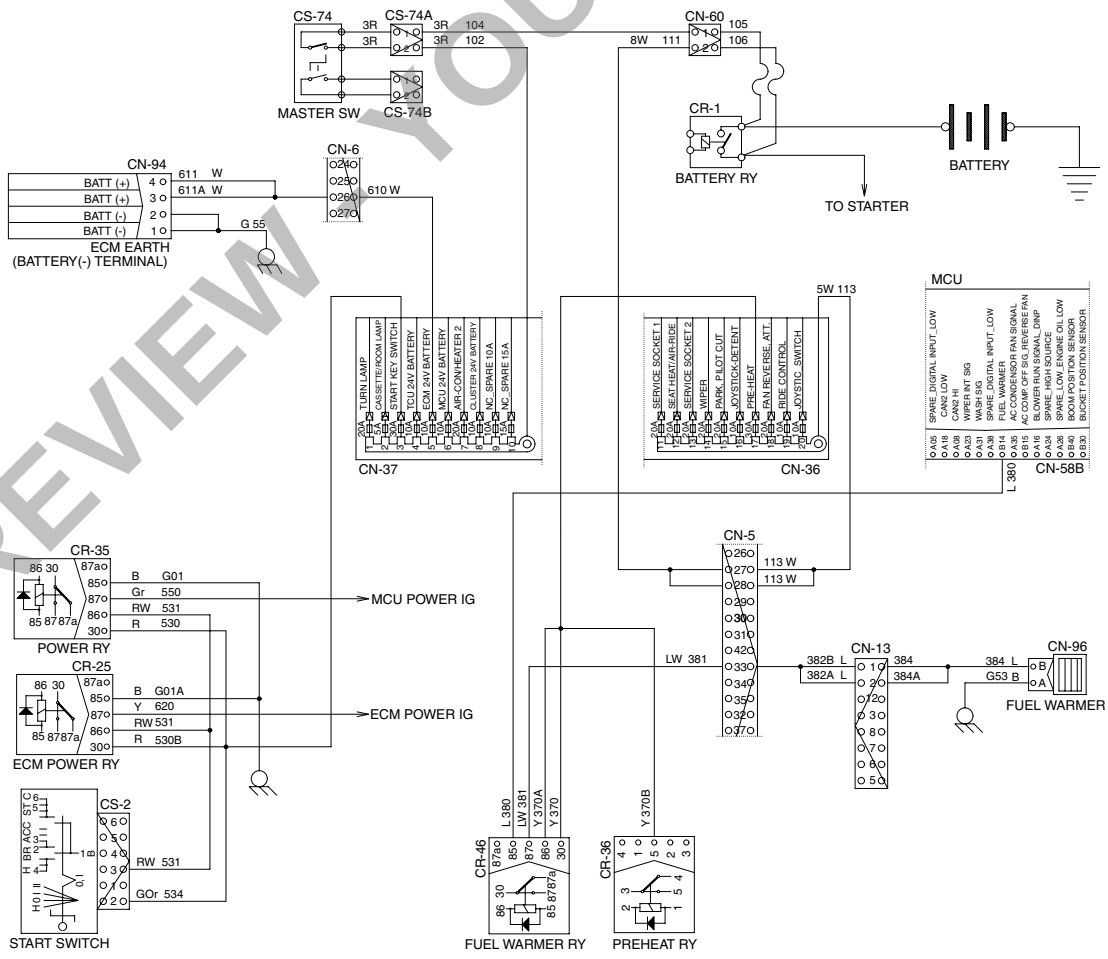
1) Operating voltage : 24±4V
2) Power : 350±50W
3) Current : 15A



2. OPERATION

1) The current of fuel warmer system is automatically controlled without thermostat according to fuel temperature.
2) At the first state, the 15A current flows to the fuel warmer and engine may be started in 1~2 minutes.
3) If the fuel starts to flow, ceramic-disk in the fuel warmer heater senses the fuel temperature to reduce the current as low as 1.5A.
   So, fuel is protected from overheating by this mechanism.

3. ELECTRIC CIRCUIT



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Fault code (Hex)	Meaning of the fault code possible reason for fault detection	Reaction of the TCU	Possible steps to repair
C3	Overtemp converter output TCU measured a oil temperature at the converter output that is the allowed threshold	No reaction OP mode : Normal	· Cool down machine · Check oil level · Check temperature sensor
C4	S.C. to ground at joystick status indicator TCU detected a wrong voltage at the output pin, that looks like a S.C. to vehicle ground · Cable is defective and is contacted to vehicle ground · Joystick status indicator has an internal defect · Connector pin is contacted to vehicle ground	No reaction OP mode : Normal	· Check the cable from TCU to joystick status indicator · Check the connectors from joystick status indicator to TCU · Check the resistance* of joystick status indicator * See page 3-52
C5	S.C. to battery voltage at joystick status indicator TCU detected a wrong voltage at the output pin, that looks like a S.C. to battery voltage · Cable is defective and is contacted to battery voltage · Joystick status indicator has an internal defect · Connector pin is contacted to battery voltage	No reaction OP mode : Normal	· Check the cable from TCU to joystick status indicator · Check the connectors from joystick status indicator to TCU · Check the resistance* of joystick status indicator * See page 3-52
C6	O.C. at joystick status indicator TCU detected a wrong voltage at the output pin, that looks like a O.C. for this output pin · Cable is defective and has no connection to TCU · Joystick status indicator has an internal defect · Connector pin has no connection to TCU	No reaction OP mode : Normal	· Check the cable from TCU to joystick status indicator · Check the connectors from joystick status indicator to TCU · Check the resistance* of joystick status indicator * See page 3-52

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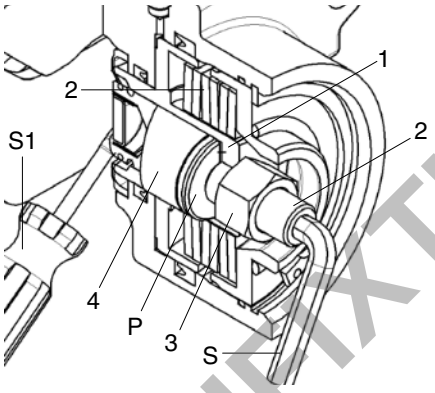
5) MAINTENANCE AND REPAIR WORK

(1) Maintenance and exchange of brake pads

The brake pads themselves are maintenance free. All that is required here is a check for damaged parts, as well as inspection to ensure that the brake disk remains easy running.

The thickness of the brake lining must be subjected to a visual inspection at regular intervals, which depend on vehicle usage, but every six months at the latest. In the event of a minimal residual lining thickness, these intervals must be reduced accordingly in order to avoid major damage to the brake or disk.

Min. residual thickness 2.0 ㎜ per lining pad (8 ㎜ carrier plate thickness).



100D7BS113

1	Piston	S	Socket wrench
2	Adjusting screw	S1	Screwdriver
3	Lock nut	P	Inside of the piston
4	Thrust bolt		

※ Only original spare lining plates may be used. If any other spare parts are used, no warranty claims will be accepted either for the brakes or their functional characteristics.

① Stand the vehicle on an even surface and secure against rolling away.
② Release the parking brake by applying the required release pressure.
③ Release the screw cap and unscrew.
④ Release the lock nut (size 24 or 30) and turn the adjusting screw with socket wrench size 8 or 10 manually clockwise until it lies flush with the inside of the piston.
⑤ Press back the thrust bolt using a suitable screwdriver until it has contact with the piston.

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5) Start the filter caddy. Check to be sure oil is flowing through the filters.
   Operate filter caddy approximately 10 minutes so oil in hydraulic oil tank is circulated through filter a minimum of four times.

※ Hydraulic oil tank capacity 234 ℓ (61.8U.S. gal).
   Leave filter caddy operating for the next steps.

6) Start the engine and run it at high idle.

※ For the most effective results, cleaning procedure must start with the smallest capacity circuit then proceed to the next largest capacity circuit.

7) Operate all functions, one at a time, through a complete cycle in the following order: clam, steering, bucket, and boom. Also include all auxiliary hydraulic functions.

   Repeat procedure until the total system capacity has circulated through filter caddy seven times, approximately 30 minutes.
   Each function must go through a minimum of three complete cycles for a through cleaning for oil.

※ Filtering time for machines with auxiliary hydraulic functions must be increased because system capacity is larger.

8) Stop the engine. Remove the filter caddy.

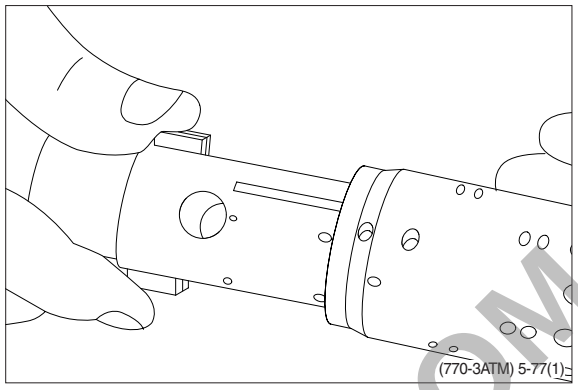
9) Install a new return filter element.

10) Check oil level in hydraulic oil tank ; Add oil if necessary.

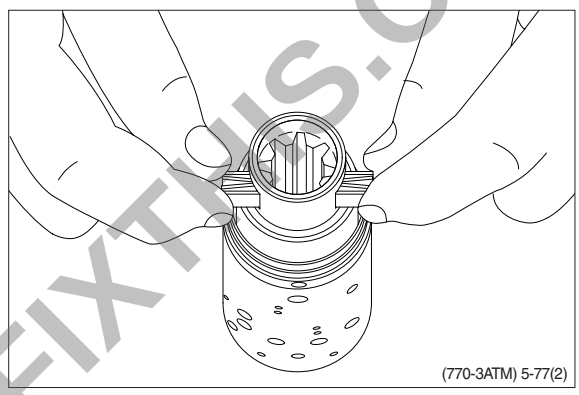
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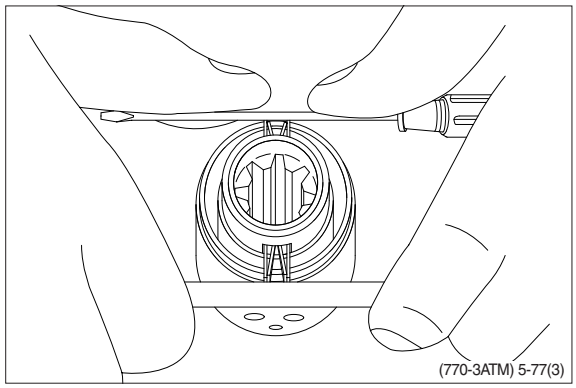
(4) Guide the spool into the sleeve. Make sure that spool and sleeve are placed correctly in relation to each other (see page 3-76, No.(1)).


(770-3ATM) 5-77(1)

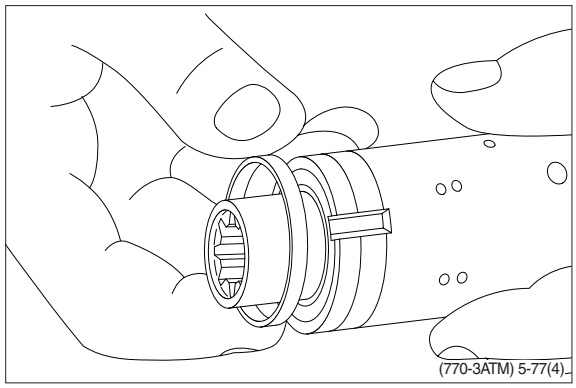
(5) Press the springs together and push the neutral position springs into place in the sleeve.


(770-3ATM) 5-77(2)

(6) Line up the springs and center them.


(770-3ATM) 5-77(3)

(7) Guide the ring down over the sleeve.
※ The ring should be able to rotate free of the springs.

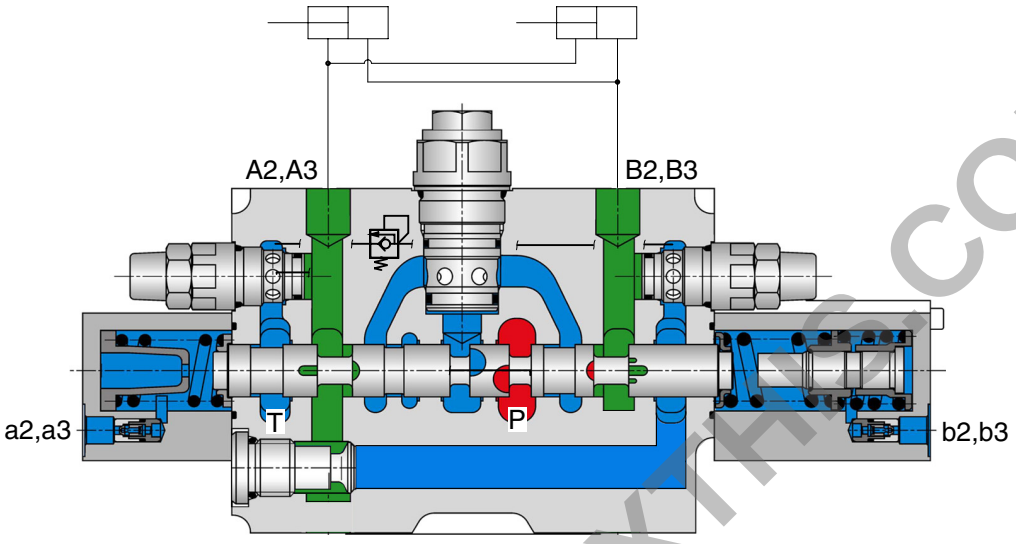

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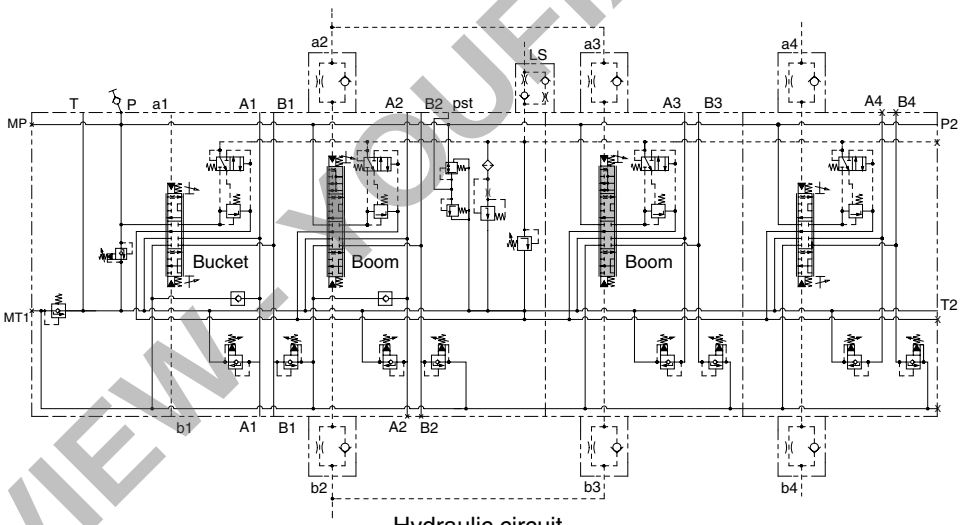
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3) BOOM SECTION OPERATION

(1) Spool in neutral





Hydraulic circuit

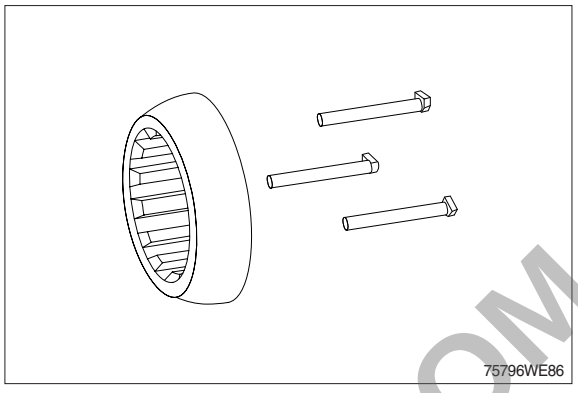
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When the boom spool is in neutral position, oil from the pump will be blocked.
Then, the pumps are at low pressure stand by.

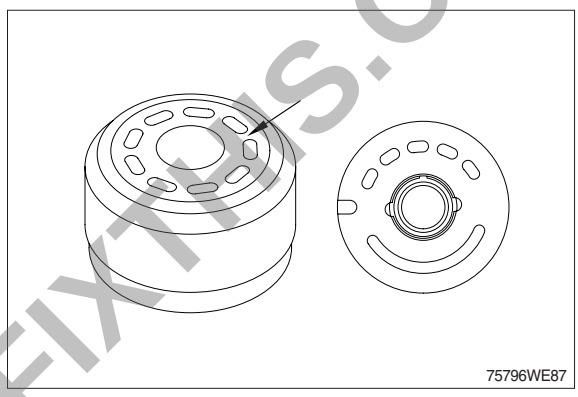
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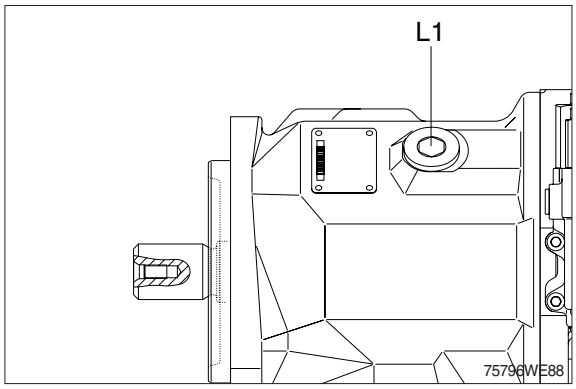
(8) Free of grooves, no signs of wear.



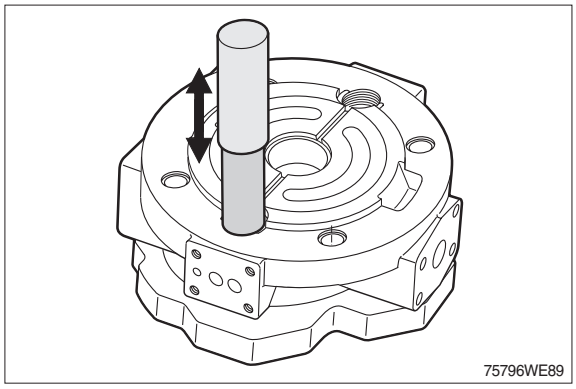
(9) Check :
Cylinder sliding surface free of grooves, no wear, no embedded foreign particles. That there are no scratches on the control plate. (Only replace them as a set).



(10) Check :
Mounting surface - control plate undamaged.



(11) Check :
Check running conditions of the control piston.



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⑥ Speed meter setting

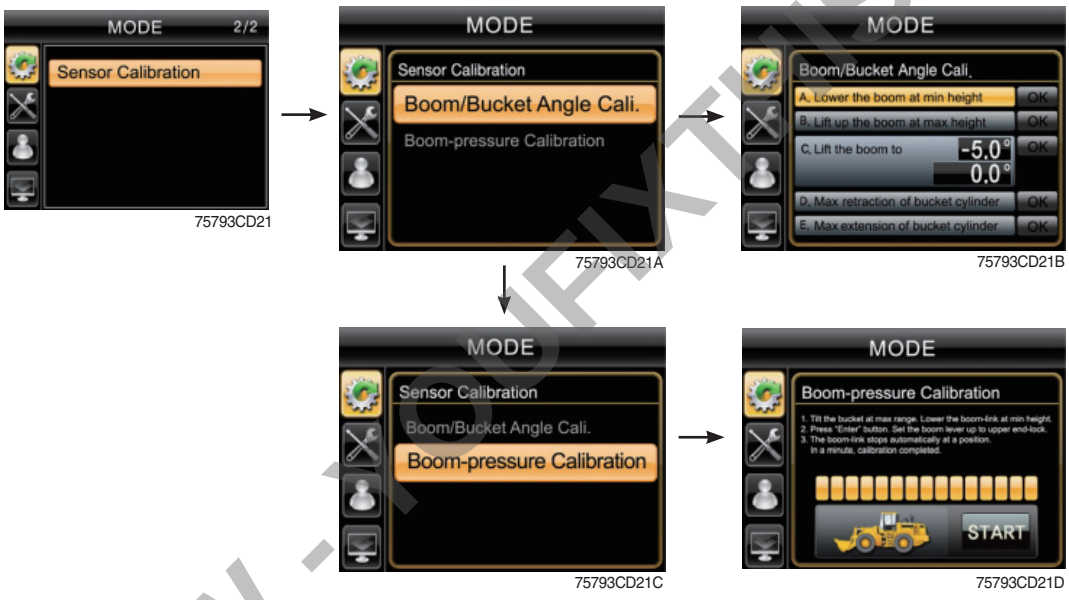


75793CD20 75793CD20B 75793CD20A

- Press ↵ and hold for 3 seconds.
- To change the pulse value, press ◀ or ▶/🔇.
- To change the position, press ↵.

※ Only for the serviceperson.

⑦ Sensor calibration



75793CD21 75793CD21A 75793CD21B 75793CD21C 75793CD21D

- **Boom / Bucket angle calibration**
  - The angle sensors can be calibrated by this menu.
  - Follow the each instruction and press ↵.
  - If all step is completed, shows "Calibration Complete" message. Then, press ↵.
- **Boom pressure calibration**
  - Follow the each instruction and press ↵.
  - If it show "Succeed" message in a moment, press ↵.

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