

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

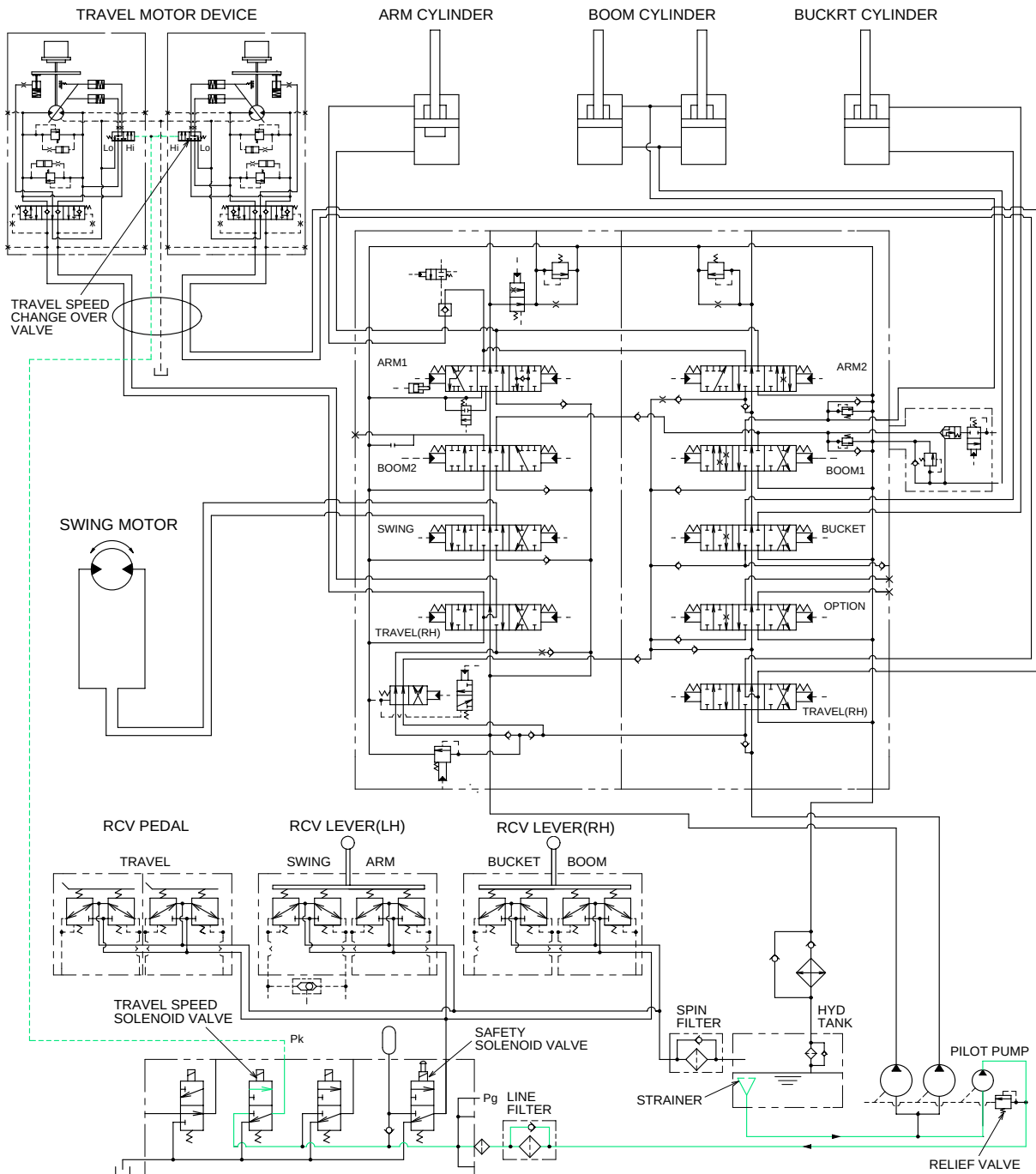
This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

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.

kg/cm² to lb/in²1kg / cm² = 14.2233 lb / in²

	0	1	2	3	4	5	6	7	8	9
10	142.2	156.5	170.7	184.9	199.1	213.4	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.3	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1010	1024	1038	1053	1067	1081	1095	1109	1124
80	1138	1152	1166	1181	1195	1209	1223	1237	1252	1266
90	1280	1294	1309	1323	1337	1351	1365	1380	1394	1408
100	1422	1437	1451	1465	1479	1493	1508	1522	1536	1550
110	1565	1579	1593	1607	1621	1636	1650	1664	1678	1693
120	1707	1721	1735	1749	1764	1778	1792	1806	1821	1835
130	1849	2863	1877	1892	1906	1920	1934	1949	1963	1977
140	1991	2005	2020	2034	2048	2062	2077	2091	2105	2119
150	2134	2148	2162	2176	2190	2205	2219	2233	2247	2262
160	2276	2290	2304	2318	2333	2347	2361	2375	2389	2404
170	2418	2432	2446	2460	2475	2489	2503	2518	2532	2546
180	2560	2574	2589	5603	2617	2631	2646	2660	2674	2688
200	2845	2859	2873	2887	2901	2916	2930	2944	2958	2973
210	2987	3001	3015	3030	3044	3058	3072	3086	3101	3115
220	3129	3143	3158	3172	3186	3200	3214	3229	3243	3257
230	3271	3286	3300	3314	3328	3343	3357	3371	3385	3399
240	3414	3428	3442	3456	3470	3485	3499	3513	3527	3542

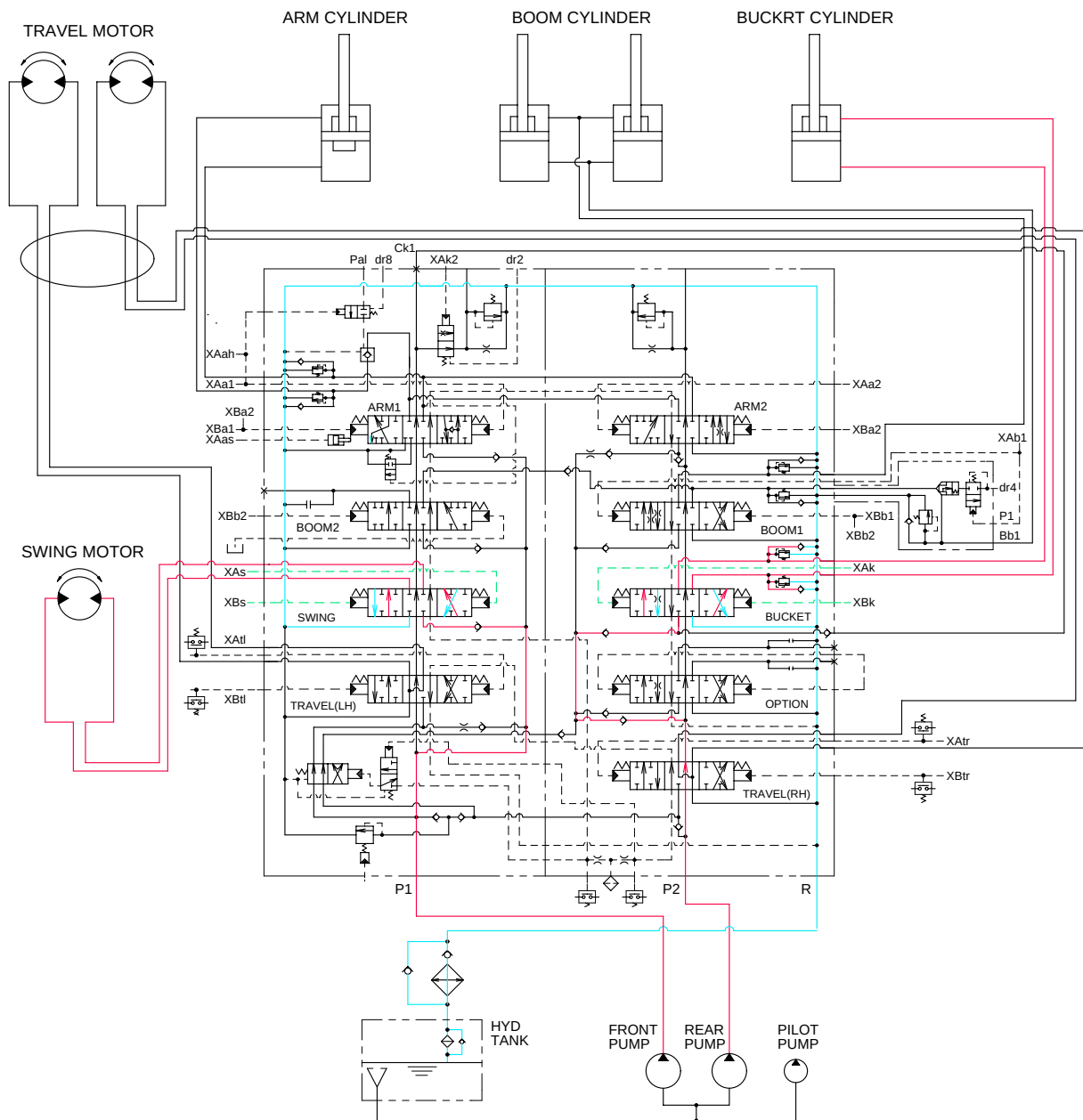
6. TRAVEL SPEED CONTROL PRESSURE



When the travel speed solenoid valve was placed in the Hi position, the pressure oil from pilot pump through last guard filter flows to port(Pk) of travel speed change over valve, and the control piston is pushed up, thus minimizing the displacement.

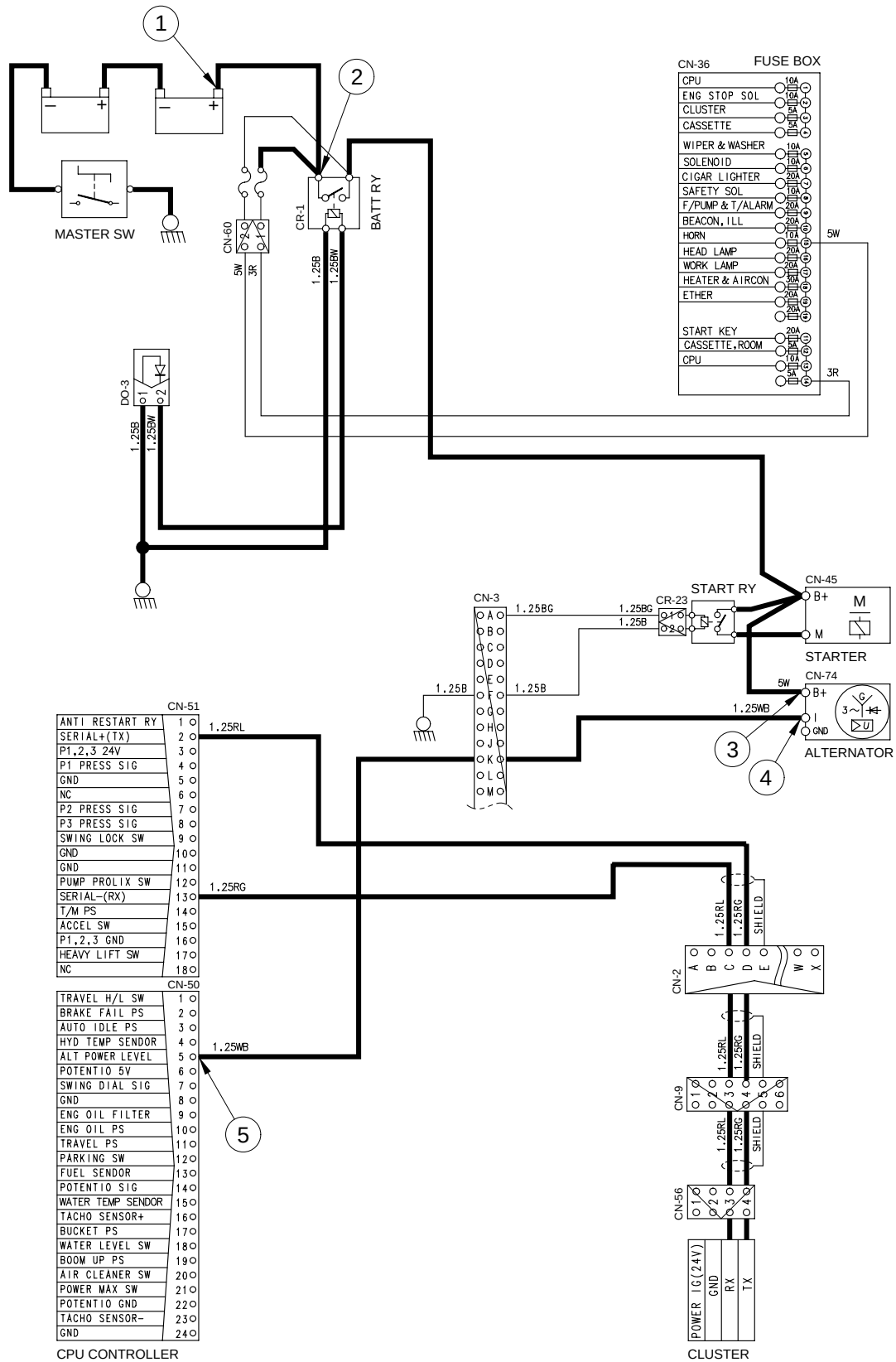
When the travel speed solenoid valve was placed in the Lo position, the oil of Pk port return to the tank and the control piston is returned, thus maximizing the displacement.

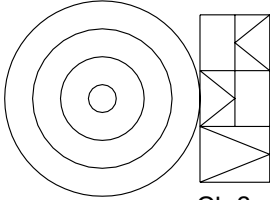
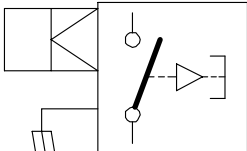
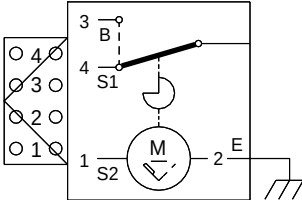
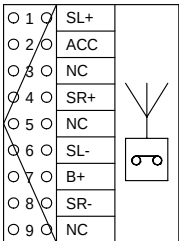
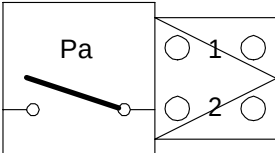
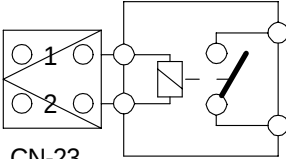
4. COMBINED SWING AND BUCKET OPERATION



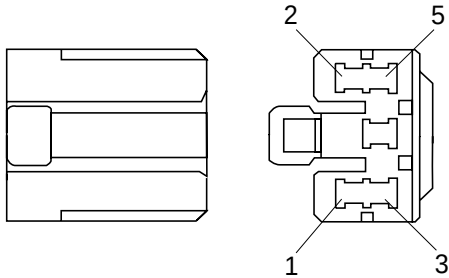
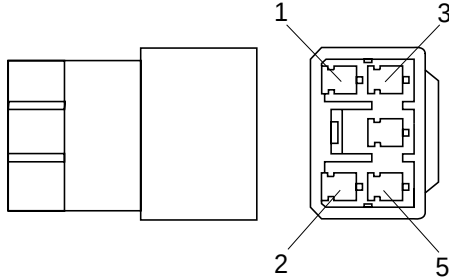
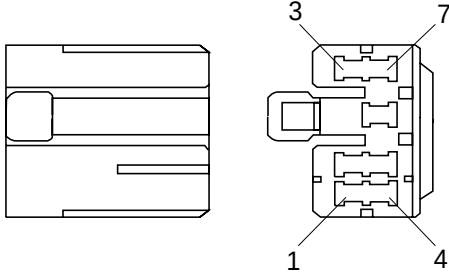
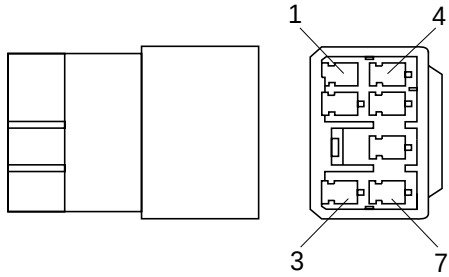
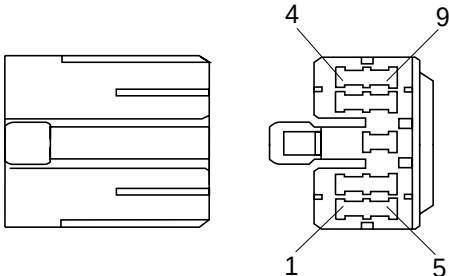
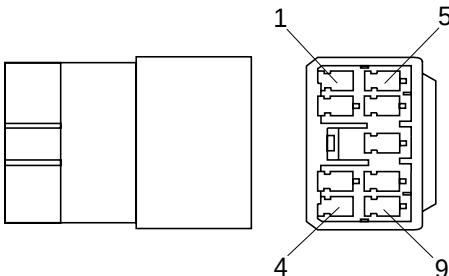
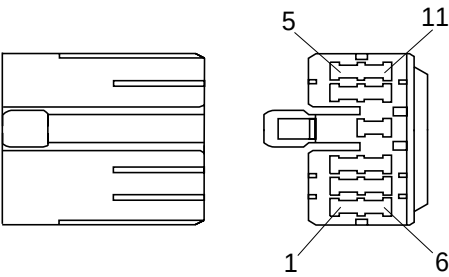
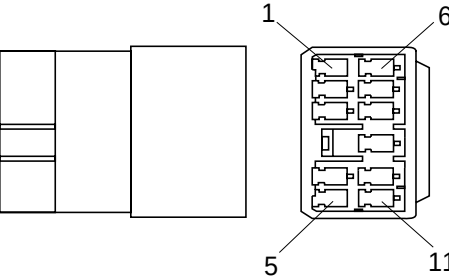
When the swing and bucket functions are operated, the swing and bucket spools changed. The oil flows from the rear pump through the bucket section of the main control valve to the bucket cylinder and the bucket function. The oil flows from front pump through swing section of the main control valve to the swing motor and swing the superstructure.

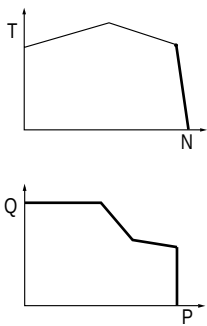
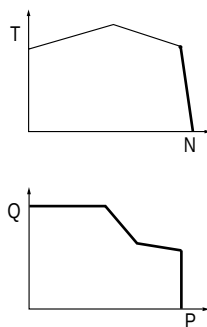
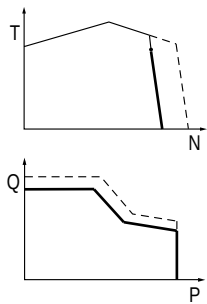
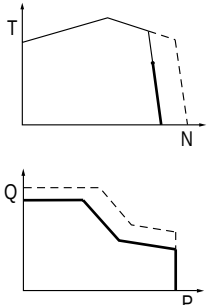
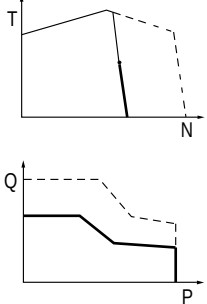
CHARGING CIRCUIT



Part name	Symbol	Specifications	Check
Cigar lighter	 CL-2	24V 5A 1.4W	※ Check coil resistance Normal : About 1M Ω ※ Check contact Normal : $\infty \Omega$ Operating time : 5~15sec
Door switch	 CS-1	24V 20W	※ Check resistance Normal : About 5M Ω
Wiper motor	 CN-21	24V 2A	※ Check contact Normal : 10.5 Ω (For terminal 1-2) Washer spray : 0.2 Ω (For terminal 1-4) Wiper operating : 24V (For terminal 1-4) : 0V (For terminal 2-GND)
Cassette radio	 CN-27	24V 2A	※ Check contact Power ON : 15W+15W, 4 Ω +4 Ω (For terminal 1-6, 4-8) 24~27V (For terminal 7-GND, 2-GND)
Receiver drier	 CN-29	24V 2.5A	※ Check contact Normal : 0 Ω
Start relay	 CN-23	24V 300A	※ Check contact Normal : 0.94 Ω (For terminal 1-2)

3) PA TYPE CONNECTOR

No. of pin	Receptacle connector(Female)	Plug connector(Male)
5	 S811-005002	 S811-105002
7	 S811-007002	 S811-107002
9	 S811-009002	 3S811-109002
11	 S811-011002	 S811-111002

Mode	Power boost switch OFF		Power boost switch ON		Other functions	
	Power set	Level of achievement	Power set	Level of achievement	Auto decel	Overheat prevention
H	100HP/ 2200rpm	Full power used by engine speed sensing. 	161HP/ 2200rpm	- Full power used by engine speed sensing. - Power increased by power boost solenoid valve. 	ON / OFF	ON
S	85HP/ 2000rpm	Fuel consumption improved by partial use of engine power. 			ON / OFF	ON
L	70HP/ 2000rpm	Slow and precise machine operation. 		←	ON / OFF	ON
F	50HP/ 1500rpm	- Increase of fine control range. - High improvement in fuel consumption by lowering engine speed. 		←	ON / OFF	ON

GROUP 14 MONITORING SYSTEM

1. OUTLINE

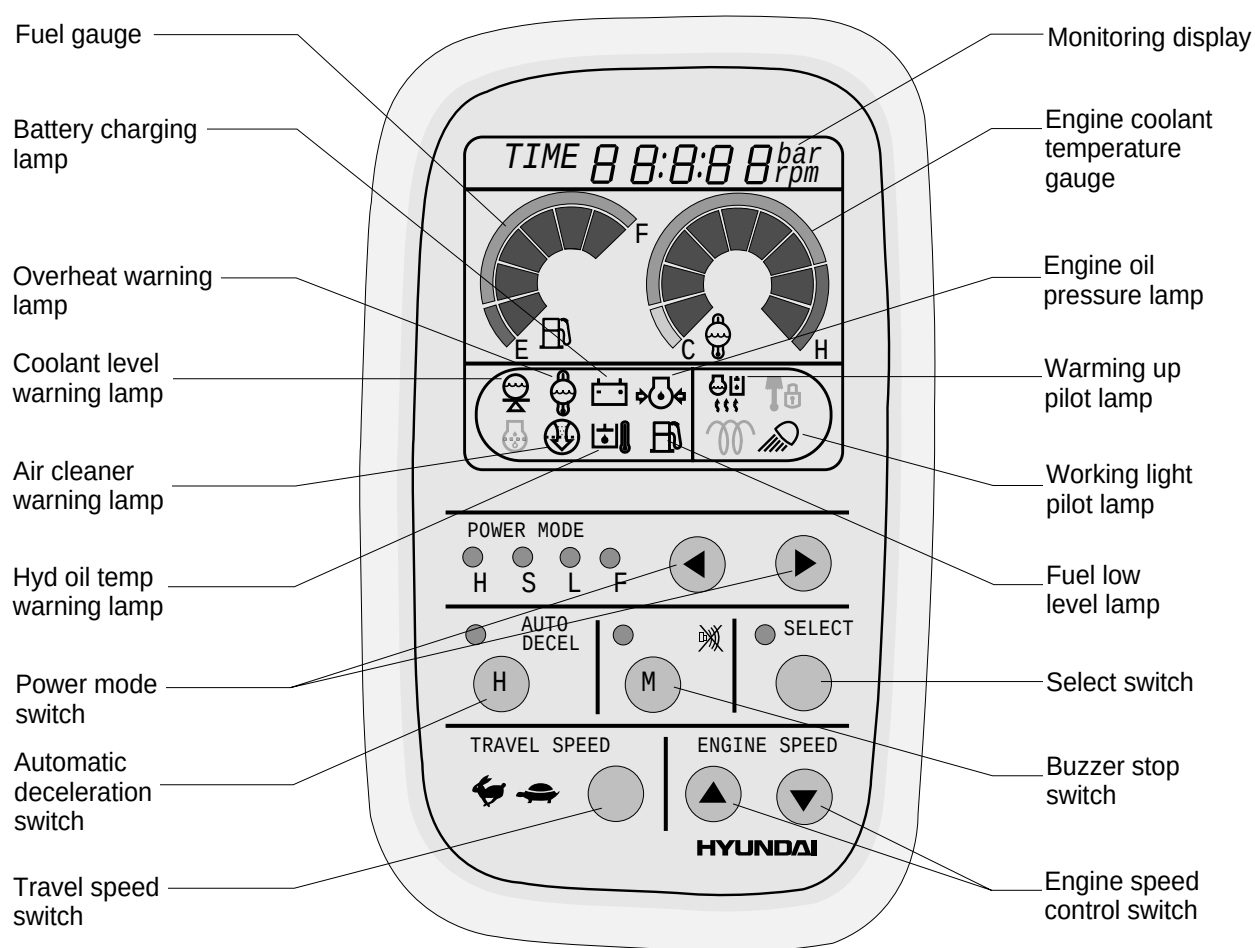
Monitoring system consists of the monitor part and switch part.

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

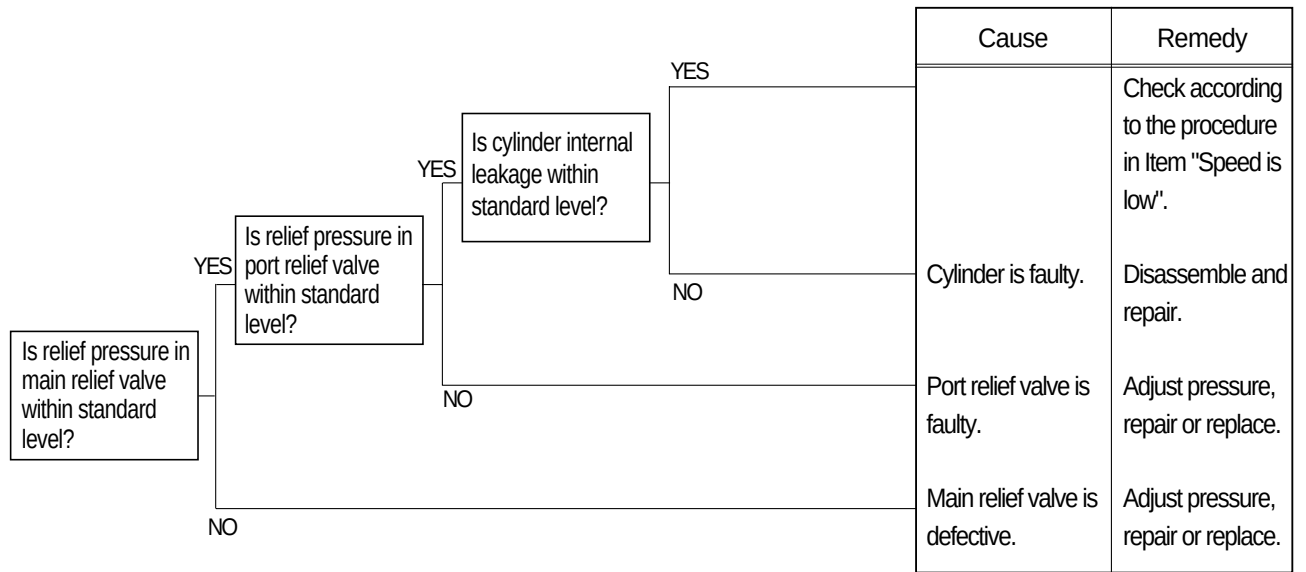
Various select switches are built into the monitor panel, which act as the control portion of the machine control system.

2. CLUSTER

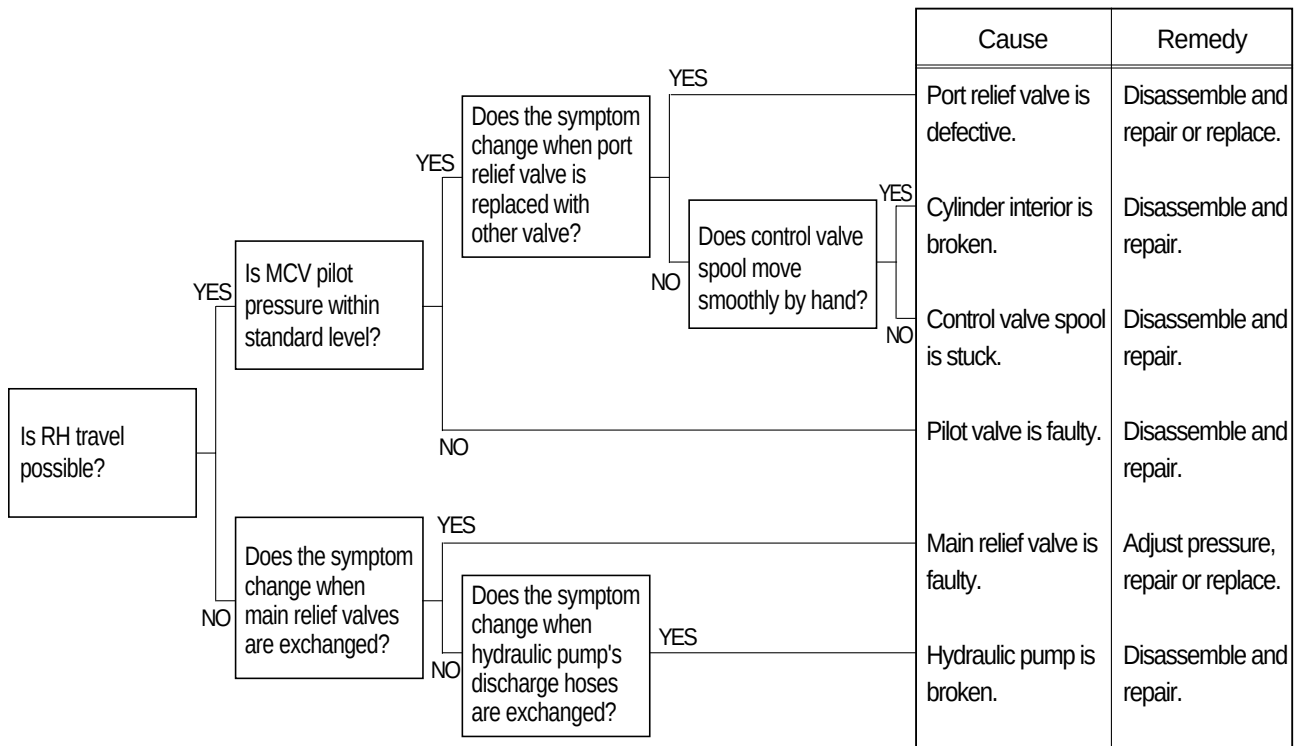
1) MONITOR PANEL



4) BOOM, ARM OR BUCKET POWER IS WEAK

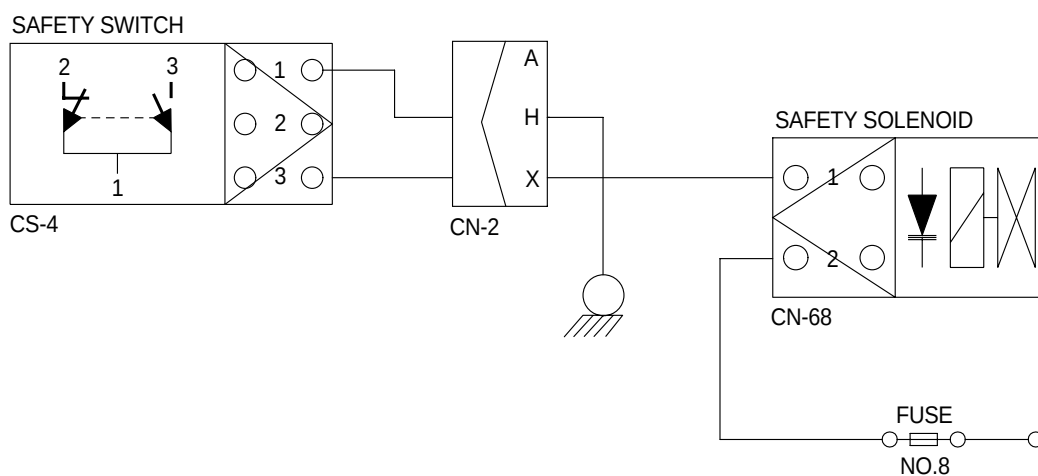
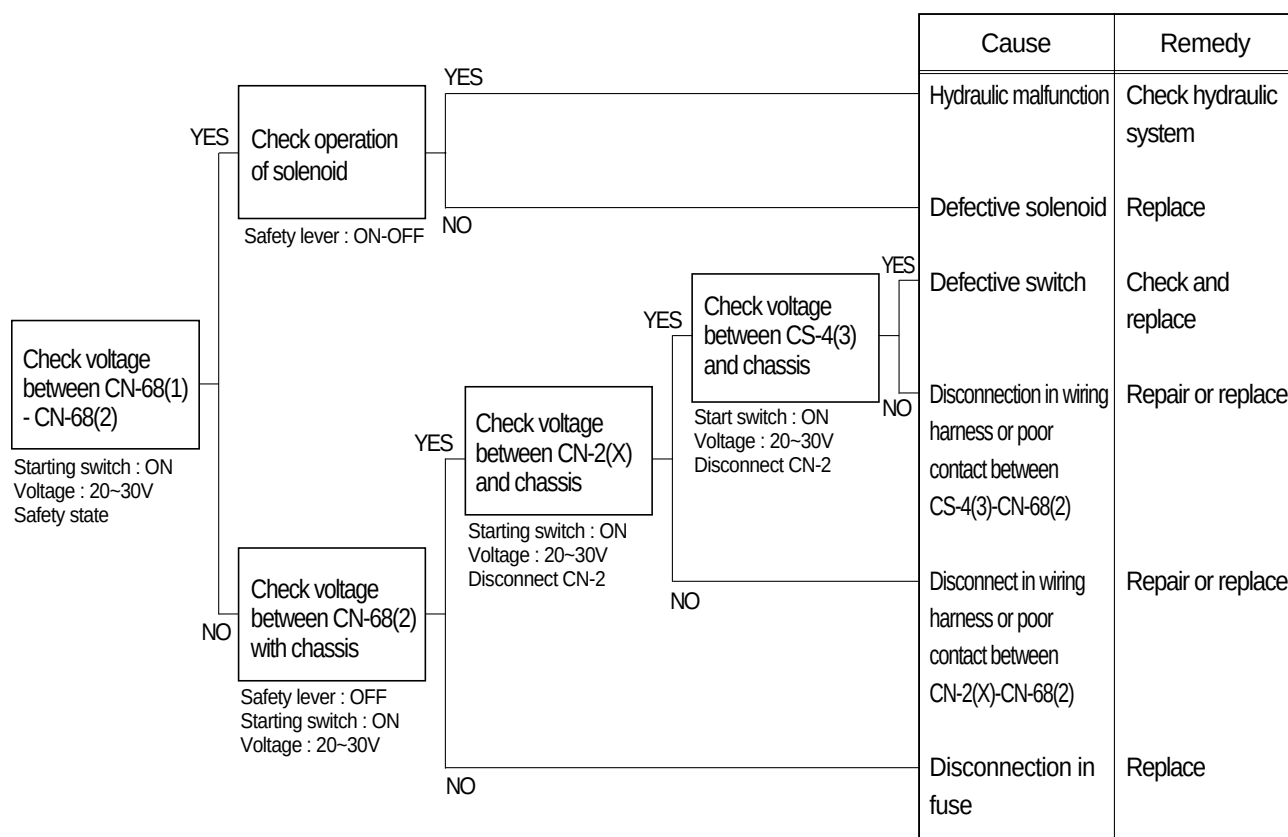


5) ONLY BUCKET OPERATION IS TOTALLY IMPOSSIBLE



11. WHEN SAFETY SOLENOID DOES NOT OPERATE

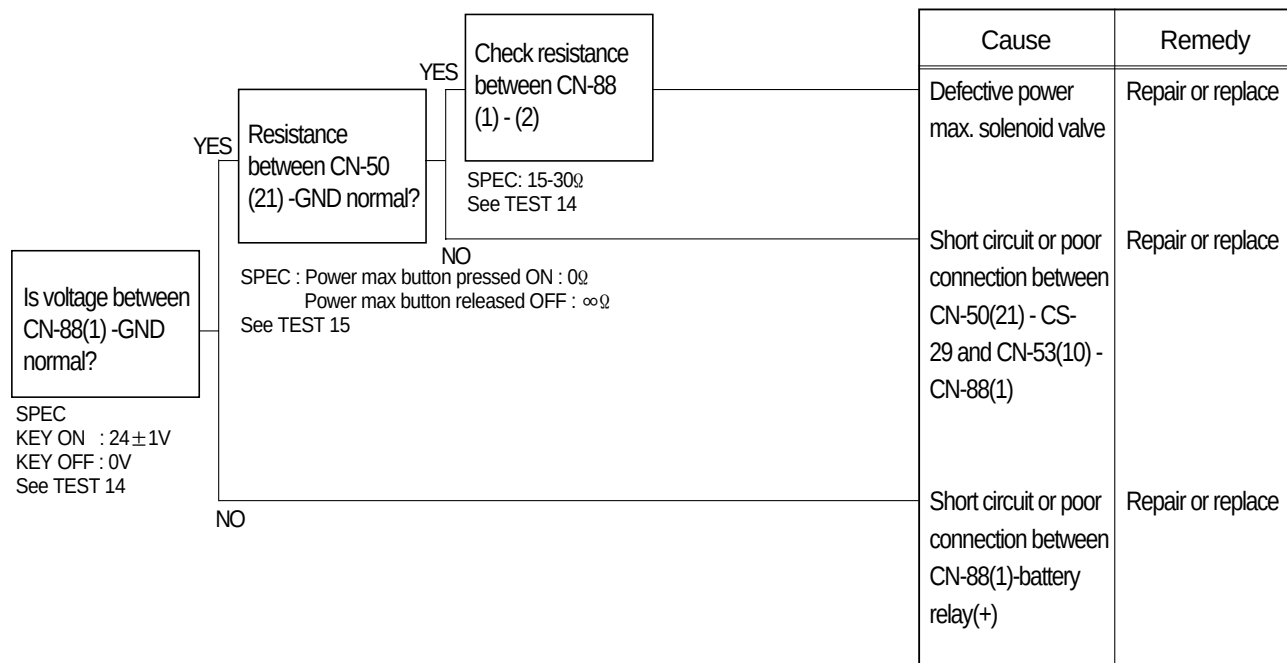
- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No.8.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



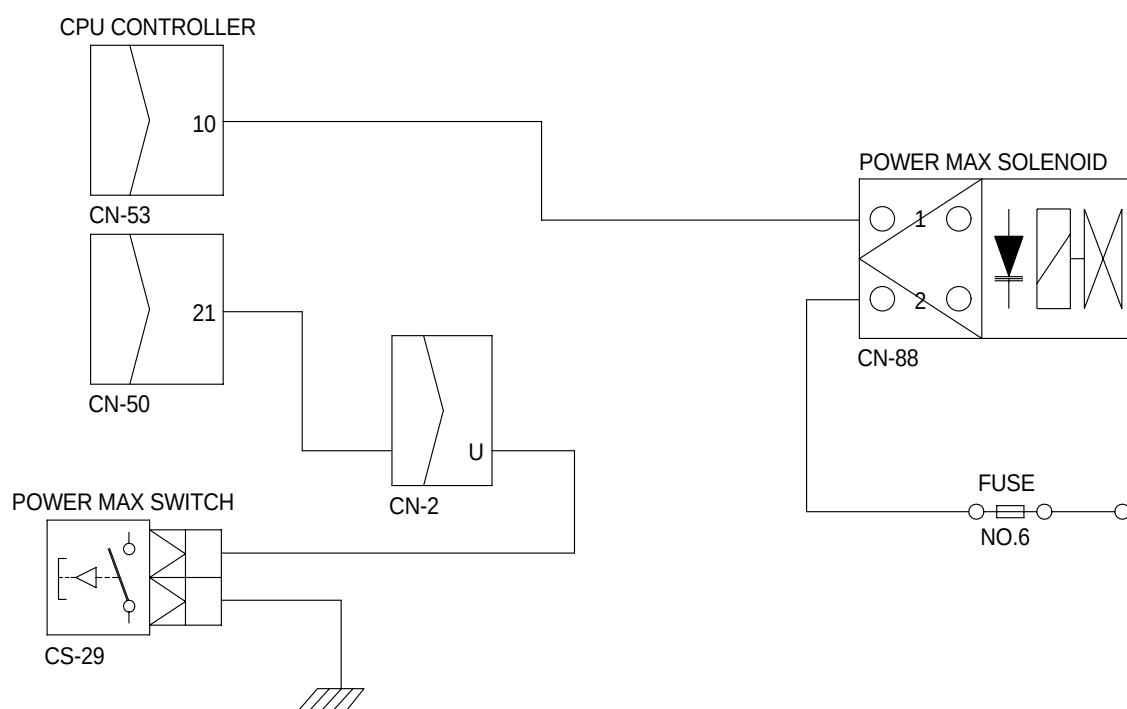
8. MALFUNCTION OF POWER MAX

※ Before carrying out below procedure, check all the related connectors are properly inserted.

1) INSPECTION PROCEDURE



Wiring diagram



12) CONTROL LEVER STROKE

(1) Measure each lever stroke at the lever top using a ruler.

※ When the lever has play, take a half of this value and add it to the measured stroke.

(2) Preparation

Keep the hydraulic oil temperature at $50 \pm 5^{\circ}\text{C}$.

(3) Measurement

① Stop the engine.

② Measure each lever stroke at the lever top from neutral to the stroke end using a ruler.

③ Repeat step ② three times and calculate the average values.

(4) Evaluation

The measured drift should be within the following specifications.

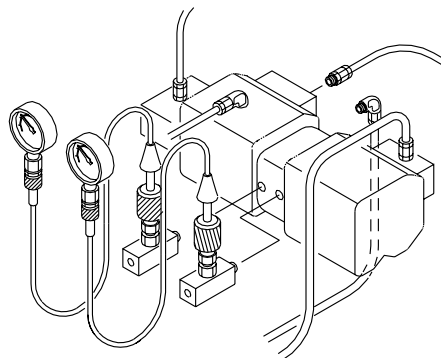
Unit : mm

Model	Kind of lever	Standard	Maximum allowable	Remarks
R160LC-3	Boom lever	83 ± 10	103	
	Arm lever	83 ± 10	103	
	Bucket lever	83 ± 10	103	
	Swing lever	83 ± 10	103	
	Travel lever	150 ± 10	195	

18) SYSTEM PRESSURE REGULATOR RELIEF SETTING

(1) Preparation

- ① Stop the engine.
- ② Remove the top cover of the hydraulic tank oil supply port with a wrench.
- ③ Push the pressure release button to bleed air.
- ④ To measure the system relief pressure.
Install a connector and pressure gauge assembly main pump gauge port, as shown.
- ⑤ Start the engine and check for oil leakage from the port.
- ⑥ Keep the hydraulic oil temperature at $50 \pm 5^{\circ}\text{C}$.



(2) Measurement

- ① Select the following switch positions.
 - Mode selector : H mode
 - Auto decel switch : OFF
- ② Slowly operate each control lever of boom, arm and bucket functions at full stroke over relief and measure the pressure.
- ③ In the swing function, place bucket against an immovable object and measure the relief pressure.
- ④ In the travel function, lock undercarriage with an immovable object and measure the relief pressure.
- ⑤ In the power boost function, pushing the power boost switch at the top of right control lever an immovable object and measure the relief pressure.

(3) Evaluation

The average measured pressure should be within the following specifications.

Unit : kgf / cm^2

Model	Function to be tested	Normal	Power boost	Overload
R160LC-3	Boom, Arm, Bucket	320 ± 10	350 ± 10	380
	Travel	350 ± 10	350 ± 10	-
	Swing	260	260	-

2. TORQUE CHART

The torques given are standard figures. Any figures specifically described in this manual has priority.

1) METRIC BOLT - Coarse thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6 × 1.0	0.85 ~ 1.25	6.15 ~ 9.04	1.14 ~ 1.74	8.2 ~ 12.6
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.73 ~ 4.12	19.7 ~ 29.8
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 79.5	9.8 ~ 15.8	71 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 167
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.5	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 343
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	350 ~ 457	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.5	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1655
M36 × 4.0	174 ~ 236	1261 ~ 1703	250 ~ 310	1808 ~ 2242

2) METRIC BOLT - Fine thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8 × 1.0	2.17 ~ 3.37	15.7 ~ 24.3	3.04 ~ 4.44	22.0 ~ 32.0
M10 × 1.25	4.46 ~ 6.66	32.3 ~ 48.2	5.93 ~ 8.93	42.9 ~ 64.6
M12 × 1.25	7.78 ~ 11.58	76.3 ~ 83.7	10.6 ~ 16.0	76.6 ~ 115
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 130	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 194	26.6 ~ 36.0	193 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 390	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 515	70.7 ~ 95.7	512 ~ 692
M24 × 2.0	68 ~ 92	491 ~ 664	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1338	182 ~ 248	1314 ~ 1795
M36 × 3.0	192 ~ 260	1389 ~ 1879	262 ~ 354	1893 ~ 2561