CRAWLER CRANE

SHOP
MANUAL

model **CK1000-II**
CKE900

KOBELCO

BOOK CODE : S5GH00002ZE04

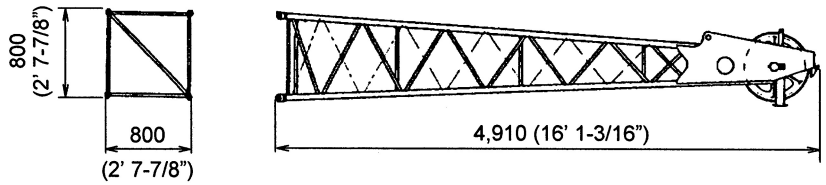
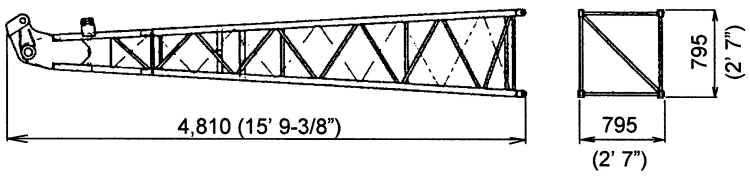
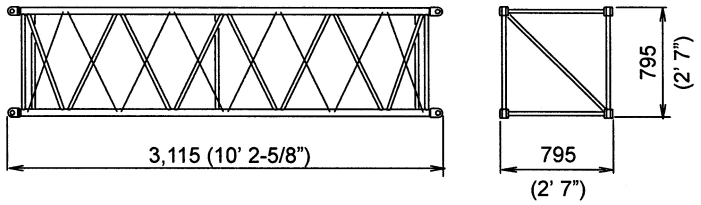
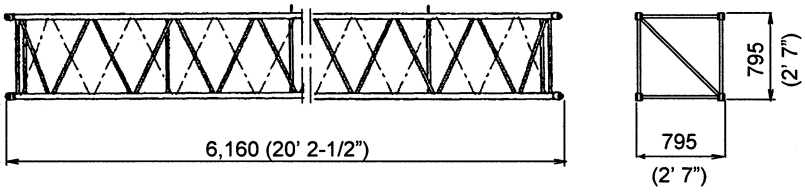
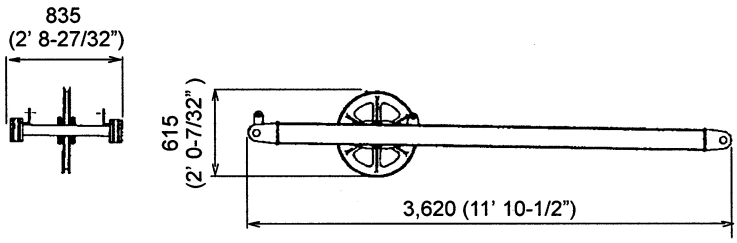
SAFETY

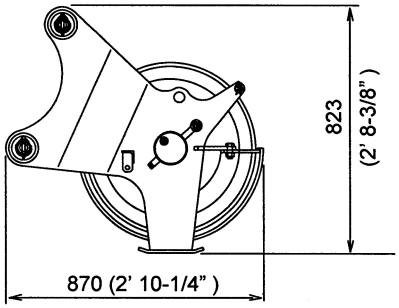
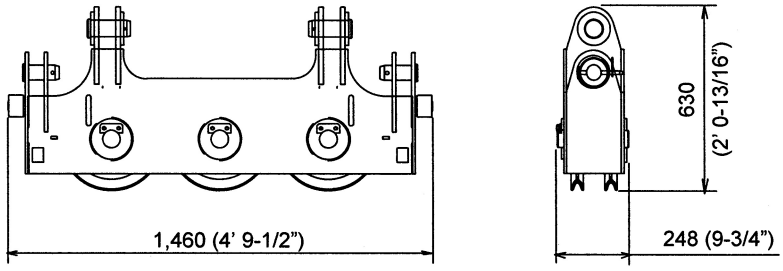
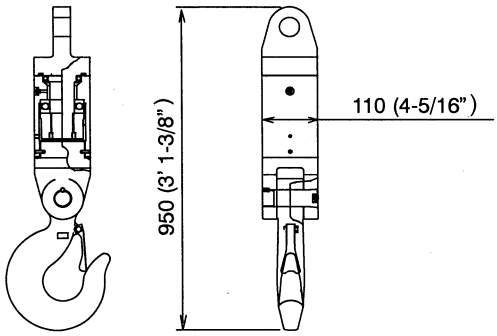
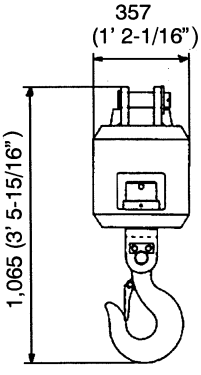
PRECAUTIONS FOR INSPECTION AND MAINTENANCE

1. Service and maintenance must be performed only by authorized personnel who are qualified in compliance with a relevant law or regulation.
2. Regular maintenance or inspection should be quickly performed after shutting down the machine and ensuring safety to personnel and equipment.
   Post an "INSPECTION IN PROGRESS. DO NOT START." warning sign on a readily visible location.

GENERAL SAFETY PRECAUTIONS

1. Wear safety shoes, helmets and clothing suitable for the job. Also use protective goggles, mask, gloves, etc., as required.
2. To ensure safe and correct maintenance, carefully study this SHOP MANUAL and get fully familiar with the instructions in it.
3. Place the machine in a safe place. Always maintain safe clearance around the machine.
4. Before starting crane operation, hold a safety meeting. Also, make agreement on standardized hand signals.
5. When inspecting or handling the battery or oil, do not use exposed flame nearby.
   To avoid fire accident, only use explosion-proof lighting equipment.
6. Start an inspection or maintenance work only after shutting down the engine.
7. Certain machine components remain hot immediately after the engine is shut down. Do not touch them.
8. Before removing the radiator cap, wait until the coolant water gets sufficiently cool. Next, carefully loosen the cap and release radiator pressure, and them remove the cap.
9. Before inspecting or maintaining an electrical system on the machine, power off the machine by, for example, disconnecting the battery cables.
10. When working at a high lift area, always wear a safety belt.
11. When leaving the operator's cab for an inspection or maintenance work, post an "INSPECTION IN PROGRESS. DO NOT START." warning sign on a readily visible location. Also, lock the cab for security.
12. Before starting a cleaning or lubrication work on the machine, always shut down the engine.
13. While adjusting tire pressure, be absolutely careful about rupture of a tire, flying of wheel part.
14. Use genuine KOBELCO replacement parts and oils only.
15. Always keep the oil containers clean. Protect them against ingress of dust or moisture. Also, fill clean, fresh oils only.
16. Once a maintenance work is complete, clean the machine.
    Protect grease nipples, breathers, and oil level gages against ingress of dust.
17. Always keep the subjects of regular inspection clean to allow problems such as oil leakage, crack, looseness, etc., to be readily detected.
18. During car washing, do not allow high pressure steam to be directly applied to electrical components and connectors.
19. After removing O-rings, oil seals, gaskets, etc., clean the mounting seats. Then, install fresh O-rings, oil seals, gaskets, etc. Also, remember to thinly apply oil to the seal faces of these parts before installation.
20. Before disconnecting pressurized piping, release the inside pressure.
21. CAUTIONs for repair work with welding: Turn OFF the key switch, disconnect the negative terminal on battery to power off the electrical circuit; provide grounding within 1 meter from a weld area; in advance, remove electronic components (for example, controller) to prevent possible damage.
22. Dispose industrial wastes according to a relevant law or regulation.
23. Extremely careful during an inspection or maintenance work under the carrier. Remember the possibility of being crashed.
    When jacking up the machine for an inspection or maintenance work, place blocks below it to prevent accidental falling.
24. Provide positive ventilation when refilling oils or fuel, rinsing parts, or starting the engine.

Name	Dimension mm (ft-in)	Weight kg (lbs)
Jib tip		280 (617)
Jib base		200 (440)
10ft (3.0m) Insert jib		100 (220)
20ft (6.1m) Insert jib		180 (395)
Strut		250 (550)

Name	Dimension mm (ft-in)	Weight kg
Auxiliary sheave		195 (430)
Upper spreader		235 (518)
Swing hook		100 (220)
Ball hook		292 (644)

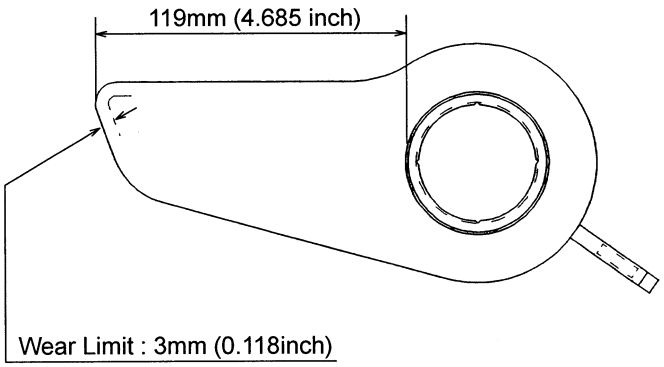


Fig.2-2 Pawl (GG82W01005P1)

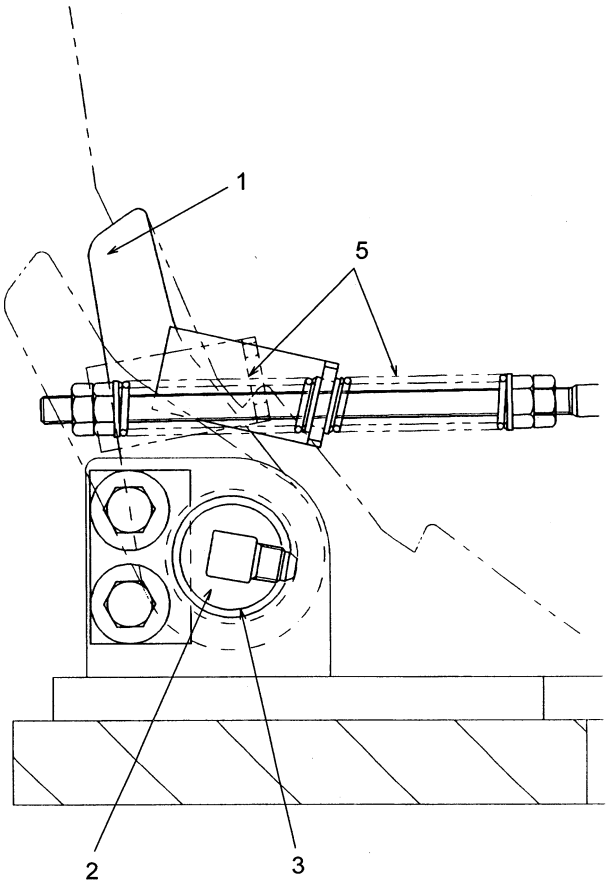


Fig.2-3 Boom Drum Lock

2.2 PERFORMANCE STANDARD AND TEST PROCEDURE

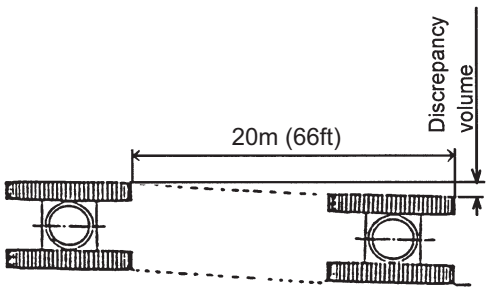
1. TERMINOLOGY

Standard value : Standard of assembling new machine.
When the value exceeds the standard, repair or replace the part as required to maintain machine performance and or safety.

Temperature of oil : It means temperature of hydraulic oil.

2. As to the items of which limit of use is not shown, referring to standard value as the guidance, repair or replace the part as required.

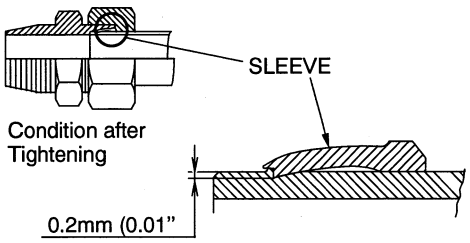
2.2.1 OPERATING SPEED

No.	Item	Test Condision	Test Procedure	Standard Value
1	Boom Drum Speed	• Engine revolution (min^{-1}) : High idling • Temperature of Hyd. oil : 45 to 55°C (113 to 131°F) • Loading : No load	Measure the time taken to rotate drum 10 times. (Start measuring after the preparation rotates of 10 seconds. Take average of 3 times mesuring.)	7.8 to 9.5 sec
2	Main and Aux.Drum Speed	• Engine revolution (min^{-1}) : High idling • Temperature of Hyd. oil : 45 to 55°C (113 to 131°F) • Loading : No load • Trimmer High	Measure the time taken to rotate drum 10 times. (Start measuring after the preparation rotates of 10 seconds. Take average of 3 times mesuring.)	1st speed 17.2 to 20.6 sec 2nd speed (2) 15.9 to 18.8 sec 2nd speed (1) 8.6 to 10.3 sec
3	Swing Speed	• Engine revolution (min^{-1}) : High idling • Temperature of Hyd. oil : 45 to 55°C (113 to 131°F) • Counterweight : None • Loading : No load	Measure the time taken to rotate machine one time. Measure the time for 2nd rotation after 1st preliminary rotation. Take average of 3 times measuring.	13.6 to 16.1 sec
4	Propel Speed	• Engine revolution (min^{-1}) : High idling • Temperature of Hyd. oil : 45 to 55°C (113 to 131°F) • Boom Length : Standard Boom	Measure the time taken to propel machine the distance of 20 m (66 ft). Propel machine first preliminary more than 2 m (6.6 ft) before starting the measuring. Take average of 3 times measuring.	L = 53.4 to 62.1 sec H = 34.1 to 39.8 sec
5	Propelling Discrepancy	• Engine revolution (min^{-1}) : High idling • Temperature of Hyd. oil : 45 to 55°C (113 to 131°F) • Boom Length : Standard Boom	Measure the discrepancy volume resulted from propelling the distance of 20 m (66 ft). Propel machine first preliminary more than 2 m (6.6 ft) before starting the measuring. Take average of 3 times measuring. 	Within 600 mm (23.6 inch)

3.1.5 TIGHTENING TORQUE OF HYDRAULIC FITTINGS

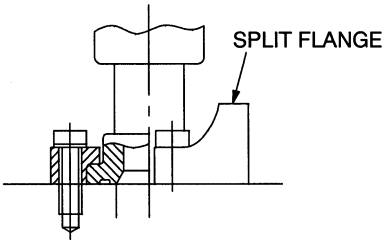
Excessive or insufficient tightening of hose or tube fittings can cause oil leak and deformation or damage to the metal fittings.
Therefore, to secure and obtain good fixing and performance of fittings it is necessary to tightin to the proper torque. The follows are the recommended torques.

1. BITE TYPE TUBE FITTINGS.

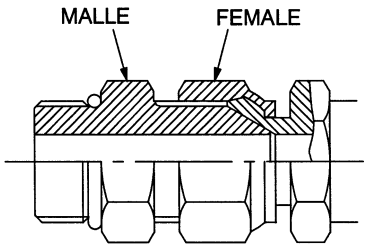
Size in mm (inch) (Outside diameter X thicknes	Tightening torque in kg-m (ft-lbs)	Remarks
10 (0.364) X 1.5 (0.059)	5 to 7 (36 to 51)	
15 (0.591) X 2.0 (0.079)	13 to 16 (94 to 116)	
18 (0.709) X 2.5 (0.098)	16 to 17 (116 to 123)	
22 (0.866) X 3.0 (0.118)	20 to 22 (145 to 159)	
28 (1.102) X 4.0 (0.157)	25 to 29 (181 to 210)	
35 (1.378) X 5.0 (0.197)	33 to 36 (239 to 260)	

2. SPLIT FIANGES

(From SAE Standard)

Size	Tightening torque in kg-m (ft-lbs)		Remarks
	3000 psi (210 kg/cm²)	6000 psi (420 kg/cm²)	
1/2"	2 to 2.6 (14.5 to 19)	-	
3/4"	2.9 to 4.0 (21 to 29)	3.45 to 4.6 (25 to 33)	
1"	3.75 to 4.9 (27 to 35)	5.75 to 6.9 (42 to 50)	
1 1/4"	4.9 to 6.3 (35 to 45)	8.6 to 10.3 (62 to 74)	
1 1/2"	6.3 to 8.0 (45 to 58)	16.1 to 18.4 (116 to 133)	
2"	7.5 to 9.5 (54 to 69)	27.6 to 30.0 (200 to 217)	

3. FLARE TYPE TUBE FITTINGS (30°FLARE, PF THREADS)

Size	Tightening torque in kg-m (ft-lbs)	Remarks
1/4"	2.5 to 3.5 (18 to 25)	
3/8"	5 to 7 (36 to 51)	
1/2"	6 to 8 (43 to 58)	
3/4"	12 to 16 (87 to 116)	
1"	15 to 19 (108 to 137)	
1 1/4"	17 to 23 (123 to 166)	
1 1/2"	22 to 28 (159 to 202)	
2"	26 to 34 (188 to 246)	

3.3.3 METER-FOOT CONVERSION TABLE

Foot	Meter	Foot	Meter	Foot	Meter
5	1.52	155	47.24	355	108.20
10	3.05	160	48.77	360	109.73
15	4.57	165	50.29	365	111.25
20	6.10	170	51.82	370	112.78
25	7.62	175	53.34	375	114.30
30	9.14	180	54.86	380	115.82
35	10.67	185	56.39	385	117.35
40	12.19	190	57.91	390	118.87
45	13.72	195	59.44	395	120.40
50	15.24	200	60.96	400	121.92
55	16.76	205	62.48	405	123.44
60	18.29	210	64.01	410	124.97
65	19.81	215	65.53	415	126.49
70	21.34	220	67.06	420	128.02
75	22.86	225	68.58	425	129.54
80	24.38	230	70.10	430	131.06
85	25.91	235	71.63	435	132.59
90	27.43	240	73.15	440	134.11
95	28.96	245	74.68	445	135.64
100	30.48	250	76.20	450	137.16
105	32.00	255	77.72	455	138.68
110	33.53	260	79.25	460	140.21
115	35.05	265	80.77	465	141.73
120	36.58	270	82.30	470	143.26
125	38.10	275	83.82	475	144.78
130	39.62	280	85.34	480	146.30
135	41.15	285	86.87	485	147.83
140	42.67	290	88.39	490	149.35
145	44.20	295	89.92	495	150.88
150	45.72	300	91.44	500	152.40

4.2.4 RE-INSTALLATION

Proceed as follows when re-installing the engine. (See page 4-8, 4-9)

1. Check to make sure that no fuel lines, coolant water hoses, mechanical connection parts or other items are left to interfer with the re-installation.
2. If the rubber mounts were removed, replace them.
3. Using a sufficiently strong engine lift, lift the engine and place it onto the mount pads.
4. Use Loctite #271 on the rubber mount holding bolts and tighten them to 559 ± 59 N-m (412 ± 44 ft-lbs) torque.
5. Install the radiator assembly and fan guard. The space between the fan shroud and the fan should be even all around.
   Use Loctite #271 on the bolts of the radiator assembly and tighten them to 314 ± 31 N-m (232 ± 23 ft-lbs) torque.
6. Connect all the electric lines that were disconnected when the engine was removed.
7. Install all the fuel lines that were removed when the engine was removed.
8. Install the guard, engine hood assembly and connect the battery cable.
9. Install the air inter cooler hose that were removed when the engine was removed.

⚠ WARNING

- **Do not bring a flame or spark close to the batteries.**
- **Since the battery electrolyte is dilute sulfuricacid, avoid battery acid contact with the skin, eyes, or clothing.**
  If accidentally contacted, immediately flush the area with water and consult a doctor immediately.
- **Wear eye glasses to protect eyes when working with electrolyte.**

Failure to observe this precaution may result in serious injury or death.

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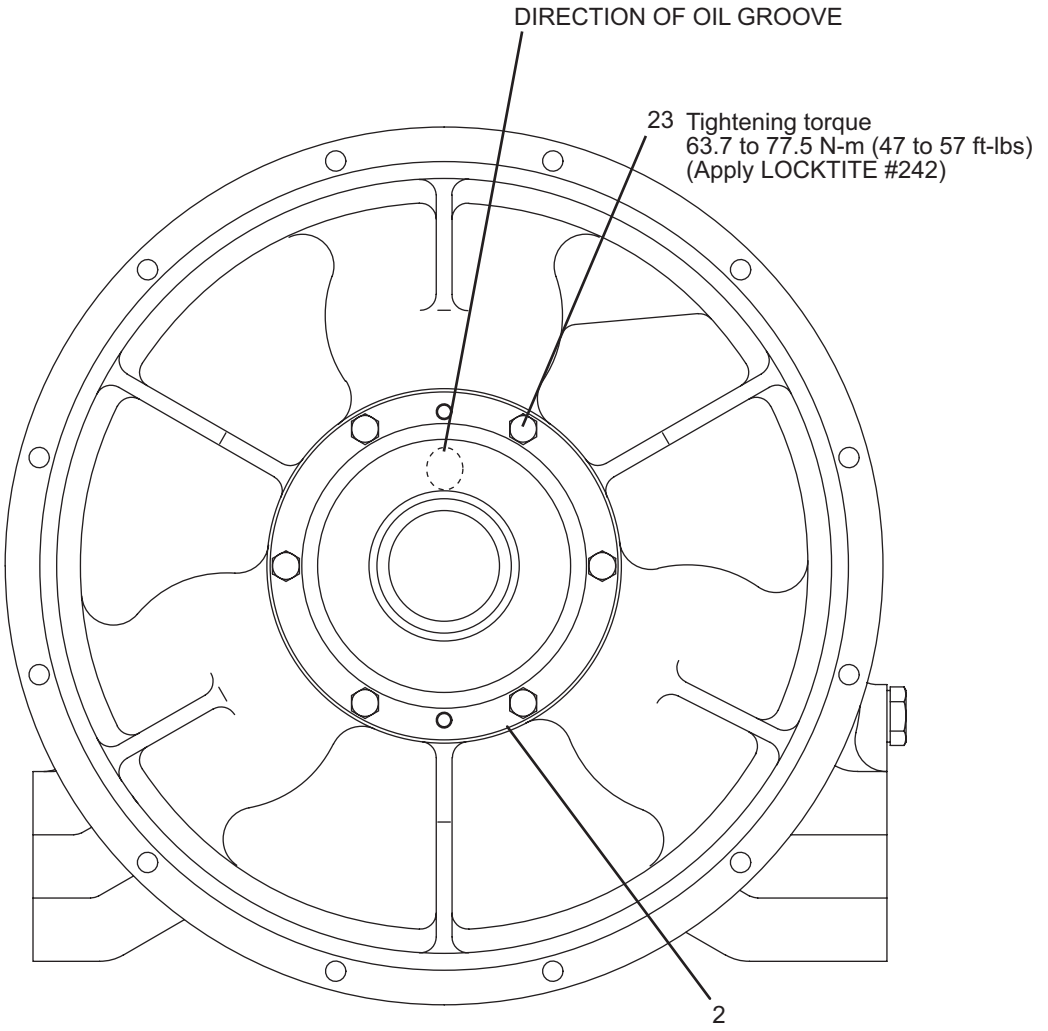
10. Install the air inlet hose and muffler.

11. Install hydraulic hoses to the hydraulic pumps.

Fig. 3-2 Power Divider (2/4)



1. Housing
2. Support
3. Support
4. Support
5. Gear
6. Gear
7. Gear
8. Shaft
9. Cover
10. Bearing (#30311)
11. Bearing (#22213)
12. Bearing (#22215)
13. Bearing (#6213)
14. Bearing (NJ213)
15. O-Ring (G170)
16. O-Ring (G190)
17. Oil Seal
18. Oil level gauge
19. Plug
23. Capscrew (M10)
24. Capscrew (M20)
25. Plate
26. Rivet
27. Shim (0.4)
28. Shim (0.5)
29. Shim (0.3)
39. Elbow
40. Cap
41. Tube
42. Drain cock
43. Connector

5.2.2 COMPONENT SPECIFICATIONS

Item	Name of Component		Specification	
1	Pump (Boom, Front & Rear Drum, Propel, Third)		Swash Plate Type, Variable Capacity Max. Delivery : 258 ltr./min X 2 (68 gals/min X 2) Max. working Pressure : 31.9 MPa (4626 psi)	
3	Pump (Swing, Crawler Ext./Ret.)		Swash Plate Type, Variable Capacity Max. Delivery : 175 ltr./min (46 gals/min) Max. working Pressure : 27.5 MPa (3988 psi)	
4	Gear Pump	4-1 Control	Max. Delivery : 61.0 ltr./min (16 gals/min) Max. working Pressure : 7.0 MPa (1015 psi)	
		4-2 Gantry	Max. Delivery : 40 ltr./min (11 gals/min) Max. working Pressure : 20.6 MPa (2987 psi)	
5	Gear Pump (Option)	5-1 Brake cooling (Fr.) 5-2 Brake cooling (Re.)	Max Delivery : 61 ltr./min X 2 (16 gals/min X 2)	
8	Motor (Front & Rear Drum)		Swash Plate Type, Variable Capacity Max. Oil Flow : 516 ltr./min (136 gals/min) Max. working Pressure : 31.9 MPa (4626 psi)	
9	Motor [Option] (Third Drum)		Swash Plate Type, Variable Capacity Max. Oil Flow 258 ltr./min (68gals/min) Max. working pressure 31.9MPa (4626psi)	
10	Motor (Boom)		Bent Axis Type, Fixed Capacity Max. Oil Flow : 258 ltr./min (68 gals/min) Max. working Pressure : 31.9 MPa (4626 psi)	
12	Motor (Swing)		Swash Plate Type, Fixed Capacity Max. Oil Flow : 175 ltr./min (46 gals/min) Max. working Pressure : 27.5 MPa (3988 psi)	
13	Motor (Propel)		Swash Plate Type, Variable Capacity Max. Oil Flow : 258 ltr./min (68 gals/min) Max. working Pressure : 31.9 MPa (4626 psi)	
14	Motor (Tagline) [Option]		Max. working Pressure : 13.7 MPa (1987 psi)	
17	Control Valve		Max. Oil Flow : 258 ltr./min (68 gals/min) Set Pressure : 31.9 MPa (4626 psi)	
18	Control Valve		Max. Oil Flow : 258 ltr./min (68 gals/min) Set Pressure : 31.9 MPa (4626 psi)	
19	Control Valve [Option]		Max. Oil Flow : 258 ltr./min (68 gals/min) Set Pressure : 31.9MPa (4626psi)	
20	Control Valve (Swing)		Set Pressure : 27.5 MPa (3988 psi)	
22	Control Valve (Gantry)		Set Pressure	Up: 20.6 MPa (2987 psi) Down : 4.9MPa (711 psi)
23	Control Valve (Crawler)		Set Pressure	Extension : 17.2 MPa (2494 psi) Retraction : 26.5 MPa (3843 psi)
24	Control Valve (Counterweight Self Removal)		Set Pressure : 20.6 MPa (2987 psi)	

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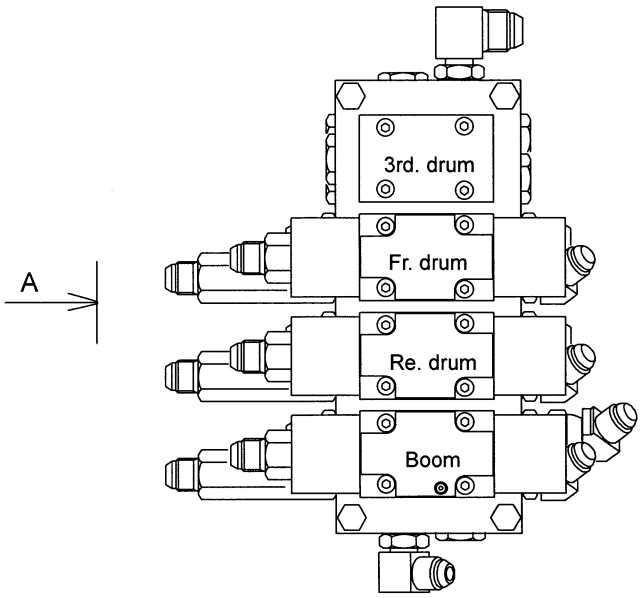
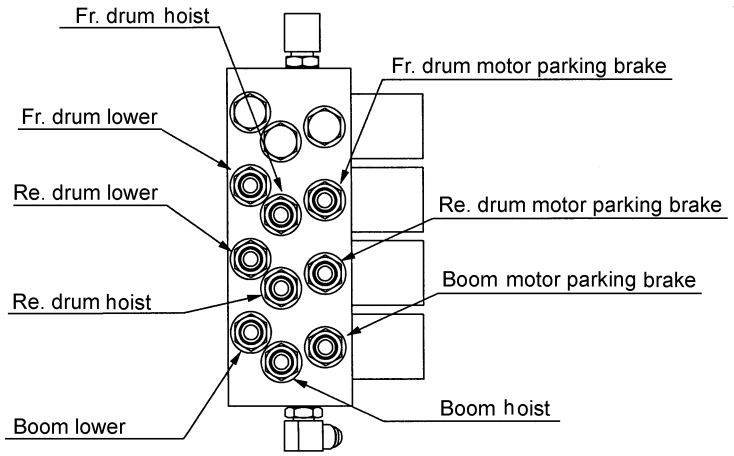
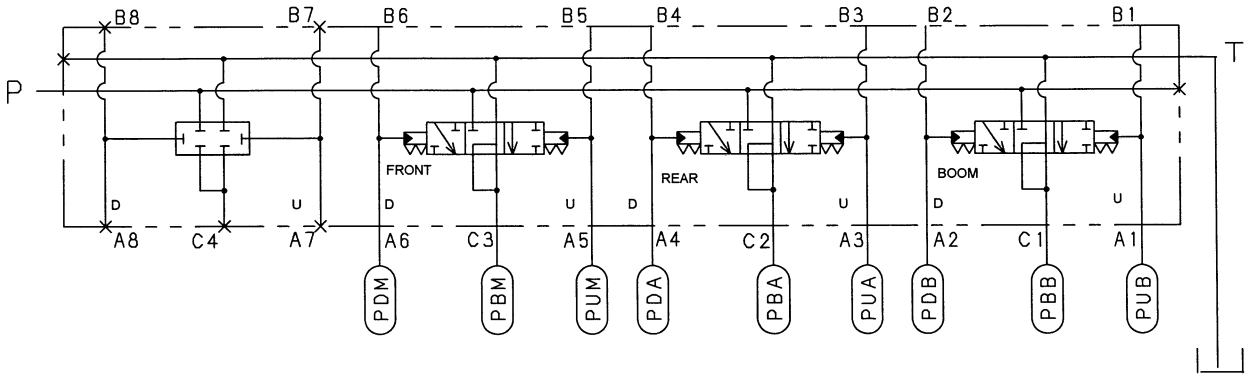
5.4 VALVES

4-Section Valve (GG20V00018F2)





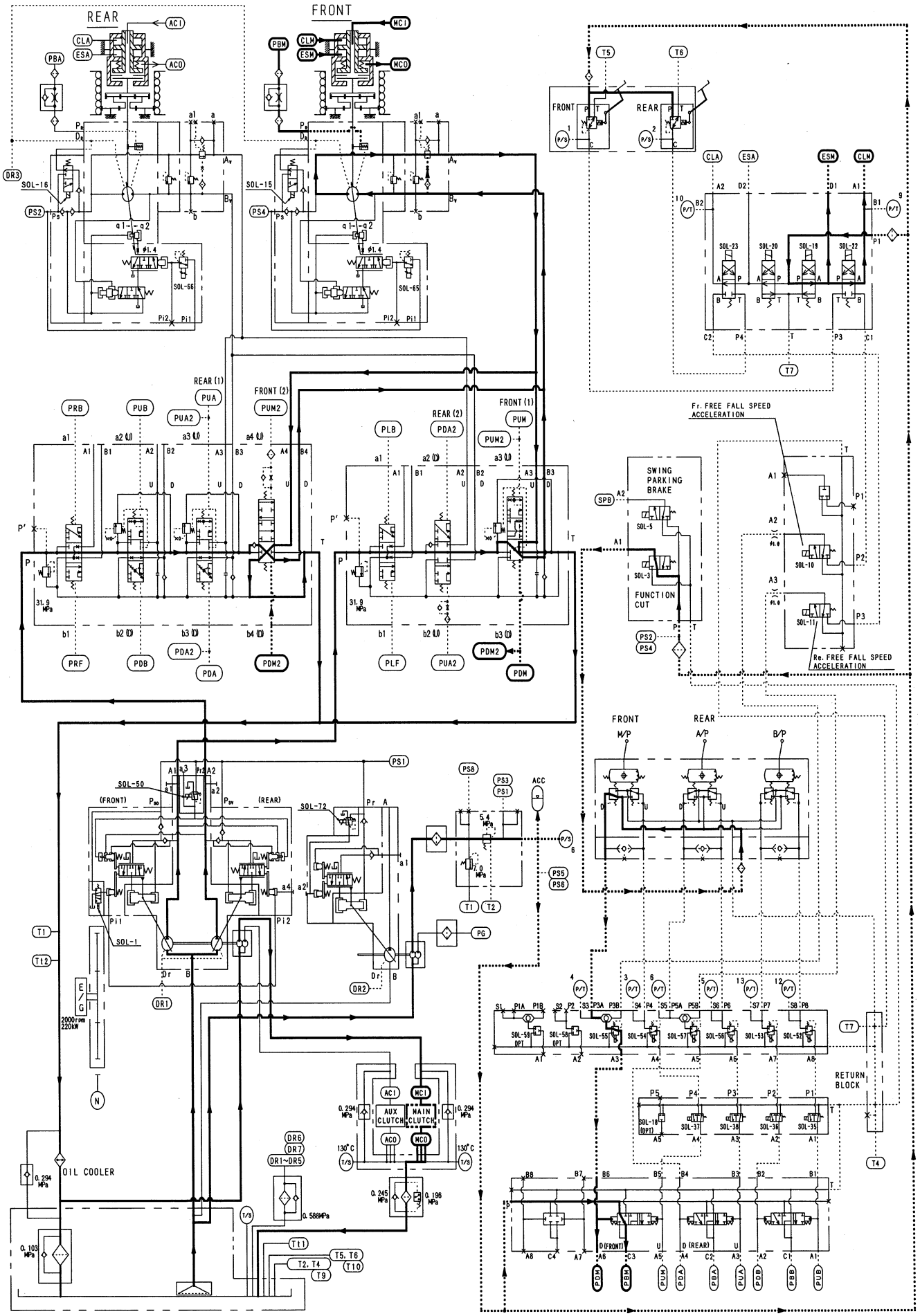
VIEW A



4-Section Valve Hydraulic Schematic

6. HOIST SYSTEM

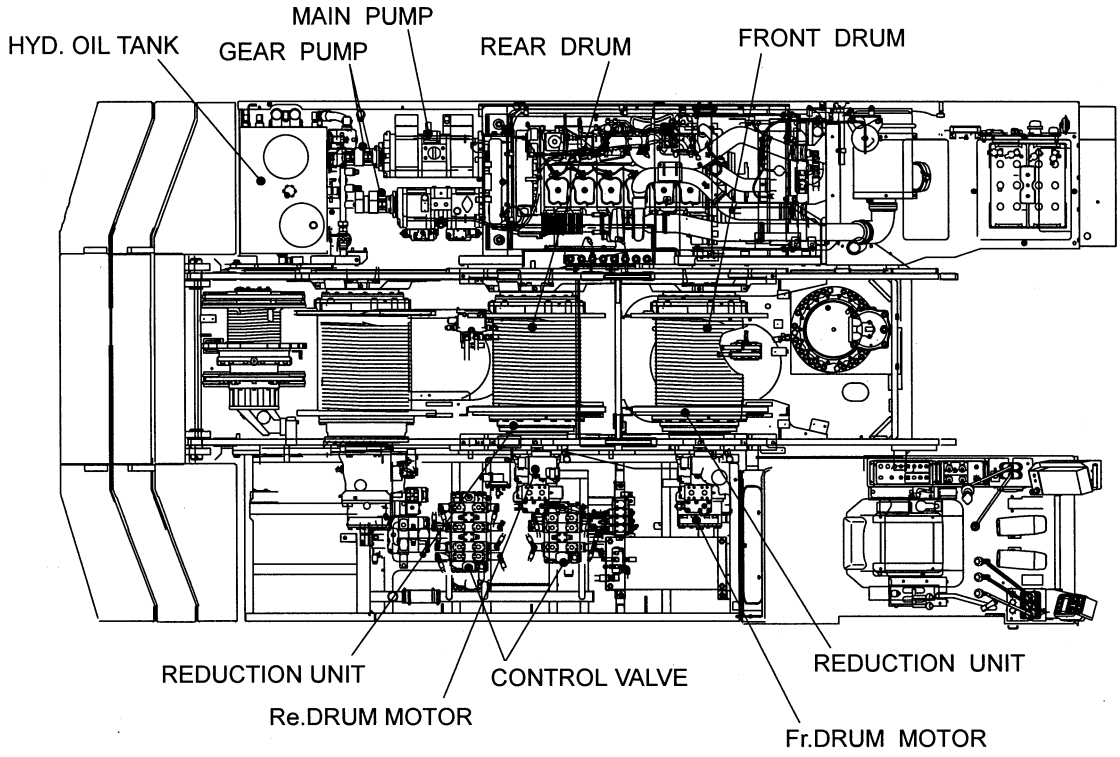
Lowering(Powered lowering)

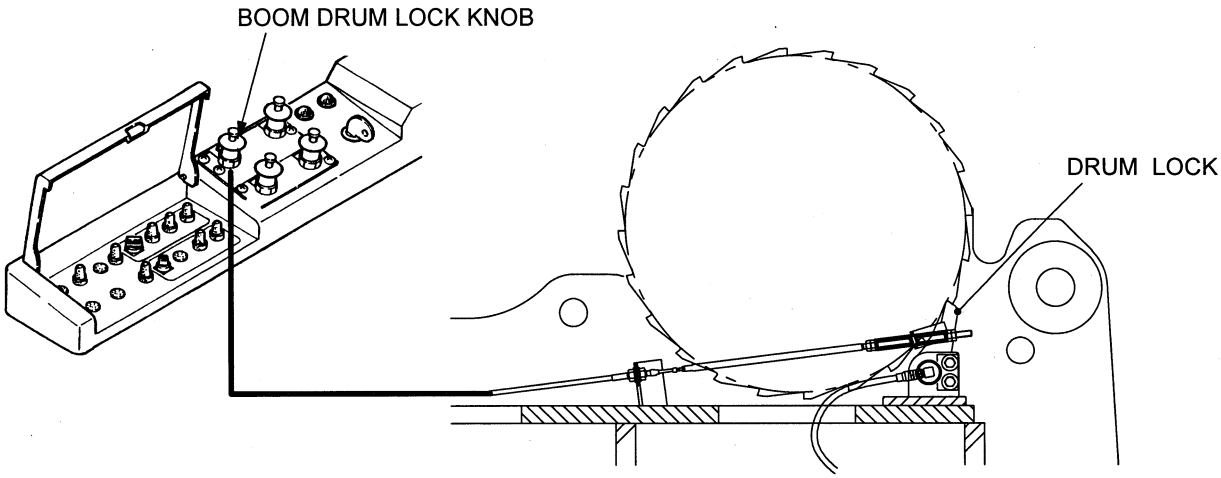


1. Hub
2. Spider
3. Ring gear
4. Housing
5. Sun gear
6. Retainer
7. Sun gear
8. Support
9. Ring gear
10. Spider
11. Coller
12. Bearing
14. Oil seal
15. Sleeve
16. Sleeve
17. Bearing
18. Thrust washer
19. Retaining ring
20. Spacer
21. Pin
22. Thrust washer
23. Bearing
24. Pinion
25. Spring pin
26. Capscrew
27. Retaining ring
28. Retaining ring
29. Ball bearing
30. Spring pin
31. Thrust washer
32. Needle bearing
33. Piston
34. Pin
35. Retaining ring
36. Shim

7.1 APPARATUS AND LOCATION OF COMPONENTS

The boom hoist system consists of the boom drum motor, a reduction unit, the boom drum itself and the drum lock mechanism.
The pressurized oil for the boom hoist system is supplied by the No.2 pump installed on the engine's power divider. From this pump, the oil flows through the control valve to power the motor for the boom drum.



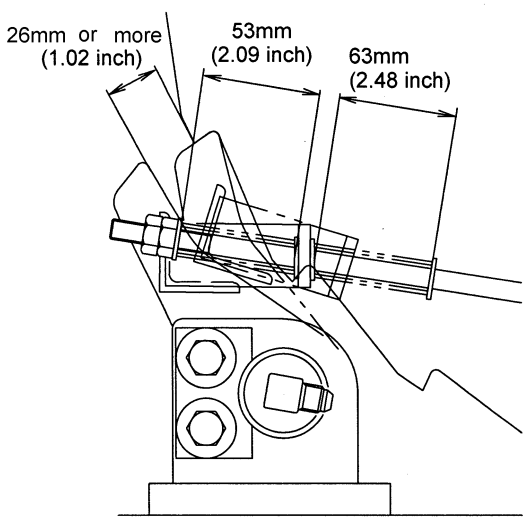


7.3.2 ADJUSTING THE BOOM DRUM LOCK

WARNING

Do not adjust the boom hoist drum lock until the boom has been lowered to the ground.
Failure to observe this precaution may result in serious injury or death.

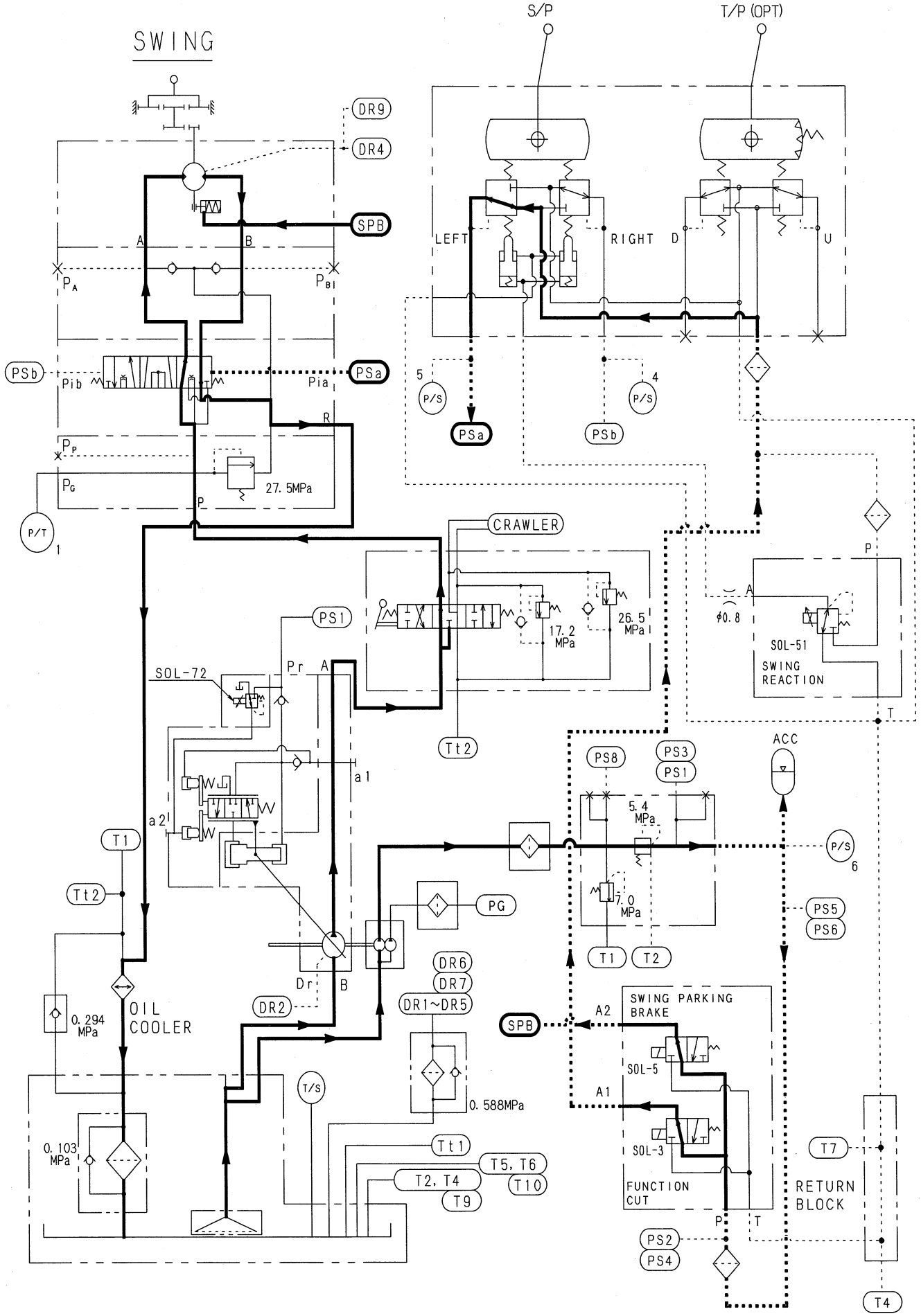
1. Pull the drum lock knob in the LOCK position and check to see that the pawl is engaged in the bottom of the drum ratchet with the drum lock condition.
   If the pawl is not engaged in the bottom of the ratchet, adjust the spring dimension to allow the pawl to be engaged in the bottom.
2. With the condition of step 1., adjust the respective dimension as shown in the figure.
3. Push the drum lock knob in the RELEASE position and check to see that the pawl is clear of the ratchet by at least 26mm (1.02 inch).
   Operate the knob to the LOCK position and to the RELEASE position and confirm that the pawl moves smoothly.



WARNING

Keep hands and clothing clear of the rotating drum.
Failure to observe this precaution may result in serious injury or death.

Swing


SWING
S/P
T/P (OPT)
LEFT
RIGHT
D
U
DR9
DR4
SPB
A
B
PA
PBI
PSb
Pib
PSa
Pia
R
PP
PG
27.5MPa
P
P/T
1
5
4
P/S
PSa
PSb
CRAWLER
17.2 MPa
26.5 MPa
PS1
SOL-72
Pr
A
a1
a2
Tt2
T1
PS8
PS3
PS1
ACC
5.4 MPa
7.0 MPa
P/S
6
PS5
PS6
PG
DR6
DR7
DR1~DR5
Dr
B
DR2
0.294 MPa
OIL COOLER
T/S
0.588MPa
0.103 MPa
Tt1
T5, T6
T10
T2, T4
T9
SWING PARKING BRAKE
A2
A1
SOL-5
SOL-3
FUNCTION CUT
SPB
P
T
PS2
PS4
T7
RETURN BLOCK
T4
φ0.8
SOL-51
SWING REACTION

9. PROPEL SYSTEM

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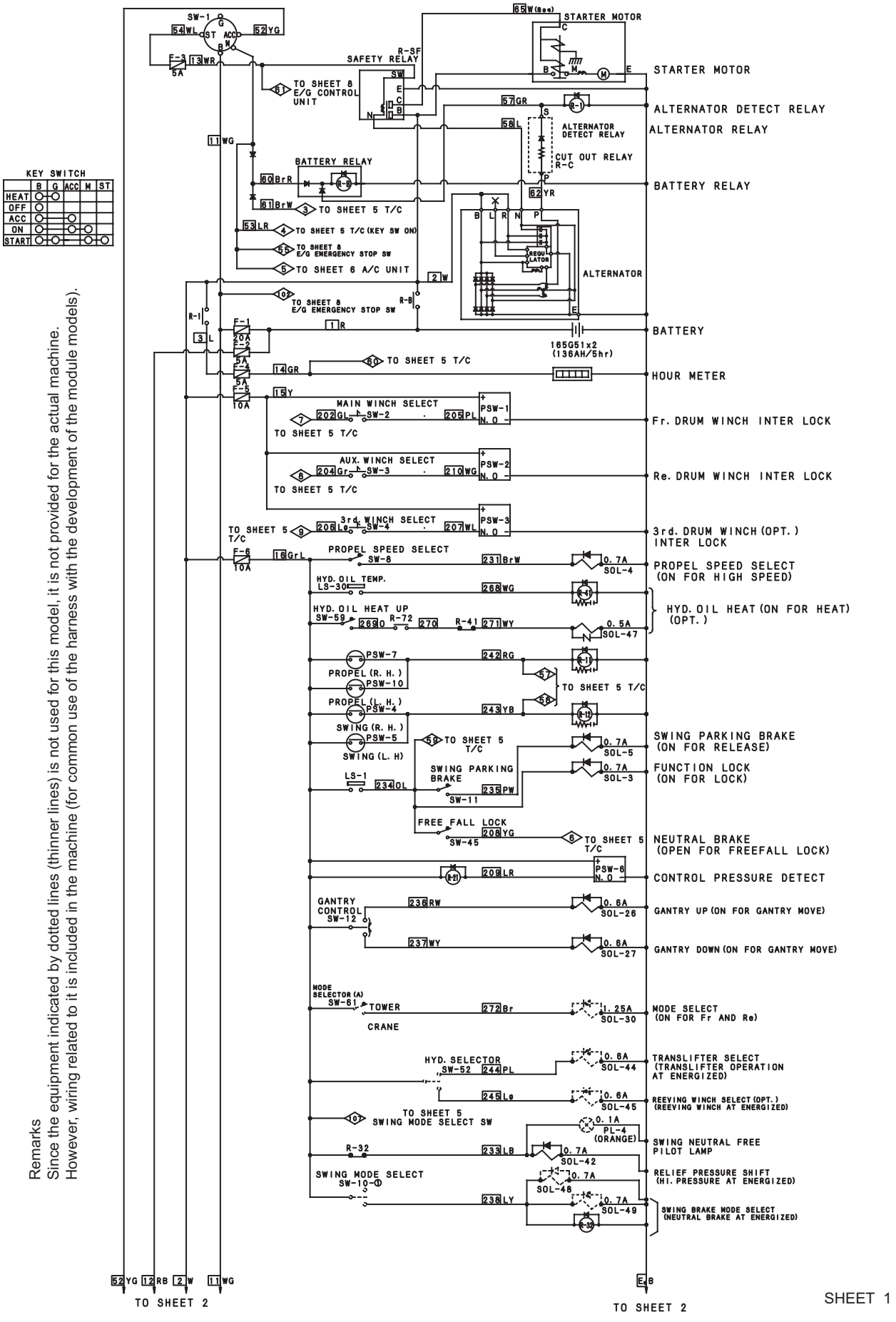
10.1 ELECTRICAL WIRING SCHEMATIC



Remarks
Since the equipment indicated by dotted lines (thinner lines) is not used for this model, it is not provided for the actual machine.
However, wiring related to it is included in the machine (for common use of the harness with the development of the module models).

F U S E

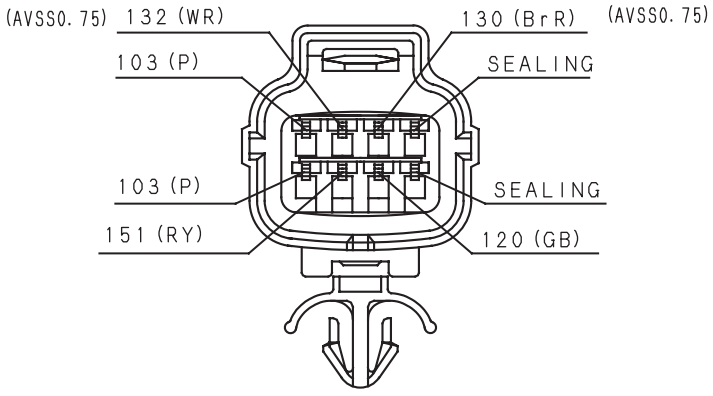
F-NO.	RATED	LINE NO.	U S E	SHEET NO.	KOBELCO PART NO.
F- 1	20A	1—11	ELECTRIC POWER SOURCE	1	2479Z2812D9
F- 2	5A	1—12	BACK-UP	1	2479Z2812D5
F- 3	5A	54—13	ENG. START	1	2479Z2812D5
F- 4	5A	3—14	HOUR METER	1	2479Z2812D5
F- 5	10A	2—15	WINCH	1	2479Z2812D7
F- 6	10A	2—16	EACH SOLENOID	1	2479Z2812D7
F- 7	5A	2—17	CONTROL POWER SOURCE	2	2479Z2812D5
F- 8	5A	2—18	LMI OUT PUT POWER SOURCE	2	2479Z2812D5
F- 9	20A	2—19	WIPER	6	2479Z2812D9
F-10	20A	2—20	AIR CONDITIONER	6	2479Z2812D9
F-11	10A	52—21	ONE-WAY·RADIO	6	2479Z2812D7
F-12	30A	2—22	TOTAL CONTROLLER	4	2479Z2812D11
F-13	10A	2—23	GAUGE CLUSTER MONITOR·CAMERA	7	2479Z2812D7
F-14	10A	2—24	SWING FLASHER	6	2479Z2812D7
F-15	10A	2—25	FUEL PUMP·FUN	6	2479Z2812D7
F-16	10A	2—26	COUNTER WEIGHT SELF REMOVAL CONTROL BOX	7	2479Z2812D7
F-17	10A	2—27	REDUNDANCY CIRCUIT	7	2479Z2812D7
F-18	10A	2—28	SPARE	7	2479Z2812D7
F-19	10A	2—29	SPARE	7	2479Z2812D7
F-20	10A	2—30	HYDRAULIC	7	2479Z2812D7
F-21	1A	18—103	OVER HOIST	2	2479Z2812D1
F-26	15A	2—36	E/G CONTROL UNIT	8	2479Z2812D8

F U S E

F-NO.	RATED	LINE NO.	U S E	SHEET NO.	KOBELCO PART NO.
F-27	10A	879—877	PCV1	8	2479Z2812D7
F-28	10A	879—878	PCV2	8	2479Z2812D7
F-29	2A	2—39	E/G CONTROL UNIT	8	2479Z2812D2

P R E S S U R E S E N S O R

PT-NO.	LINE NO.	U S E	SHEET NO.	KOBELCO PART NO.
PT- 1	351—350, 349	SWING PUMP PRESSURE SENSOR	4	LC52S00012P1
PT- 3	382—384, 383	Fr. DRUM HOISTING PRESSURE SENSOR	4	LC52S00011P1
PT- 4	385—384, 386	Fr. DRUM LOWERING PRESSURE SENSOR	4	LC52S00011P1
PT- 5	387—389, 388	Re. DRUM HOISTING PRESSURE SENSOR	4	LC52S00011P1
PT- 6	390—389, 391	Re. DRUM LOWERING PRESSURE SENSOR	4	LC52S00011P1
PT- 7	353—355, 354	3rd. (JIB) DRUM HOISTING PRESSURE SENSOR	4	LC52S00011P1
PT- 8	356—355, 357	3rd. (JIB) DRUM LOWERING PRESSURE SENSOR	4	LC52S00011P1
PT- 9	454—456, 455	Fr. DRUM CLUTCH PRESSURE SENSOR	4	GN52S00002P1
PT-10	457—456, 458	Re. DRUM CLUTCH PRESSURE SENSOR	4	GN52S00002P1
PT-11	459—472, 460	3rd. DRUM CLUTCH PRESSURE SENSOR	4	GN52S00002P1
PT-12	343—345, 344	BOOM RAISE PRESSURE SENSOR	4	LC52S00011P1
PT-13	369—345, 370	BOOM LOWER PRESSURE SENSOR	4	LC52S00011P1



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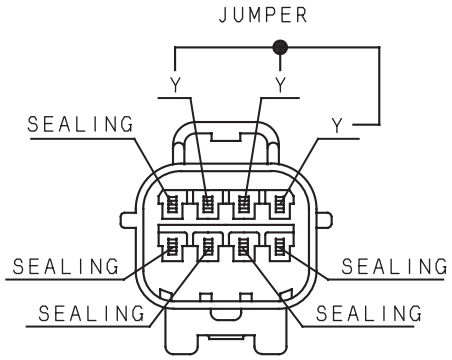

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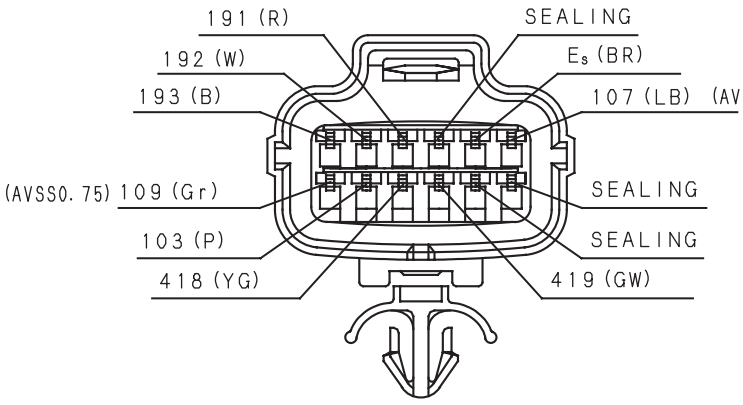

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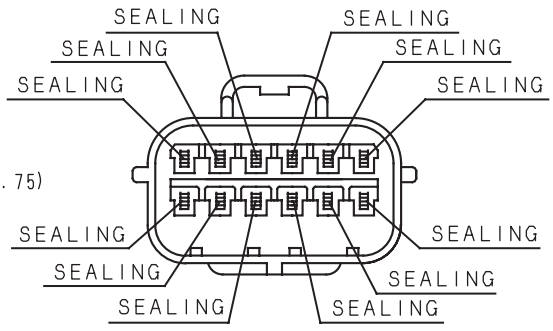

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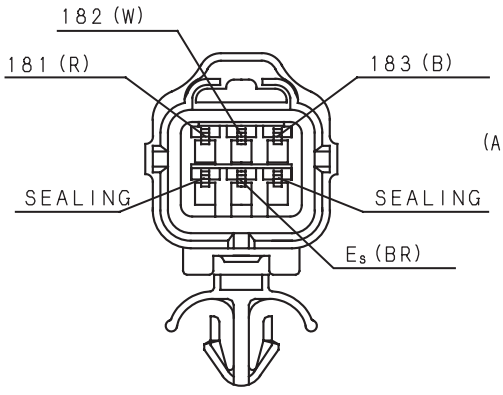

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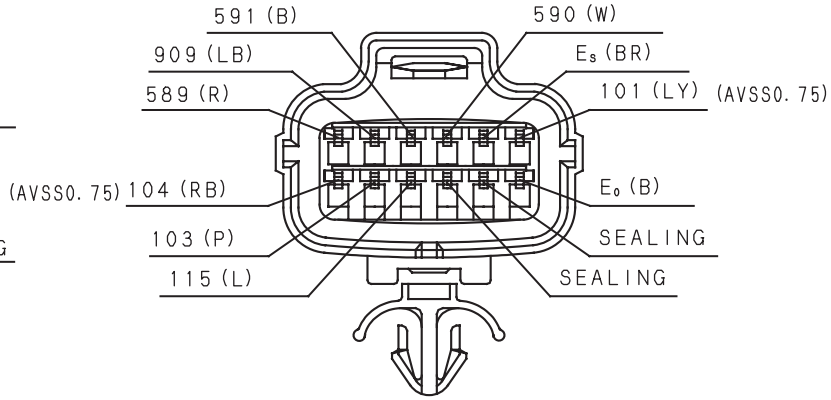

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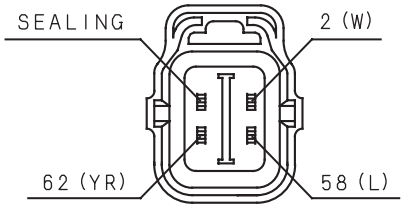

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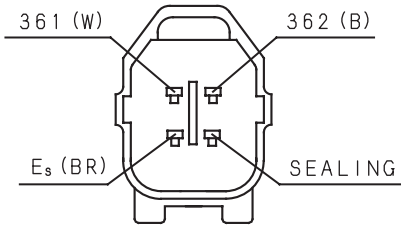
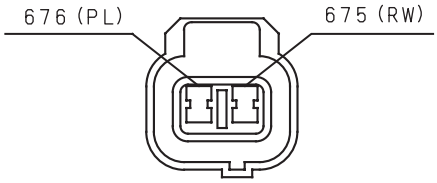


CN-217F

(0.75sq 2 CORE SHIELDED ①)



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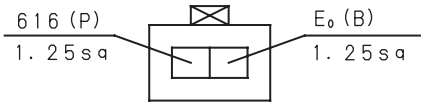

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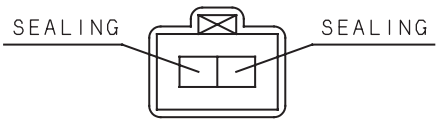

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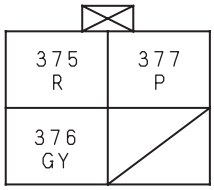

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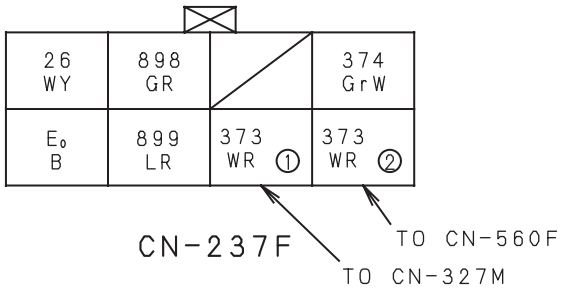

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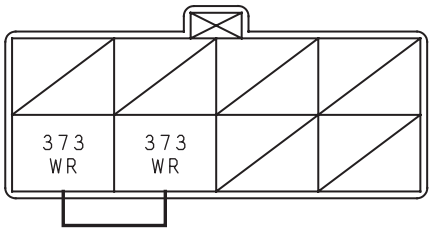

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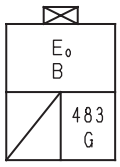

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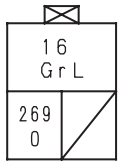

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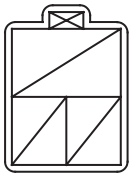

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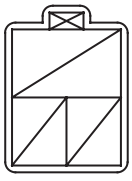

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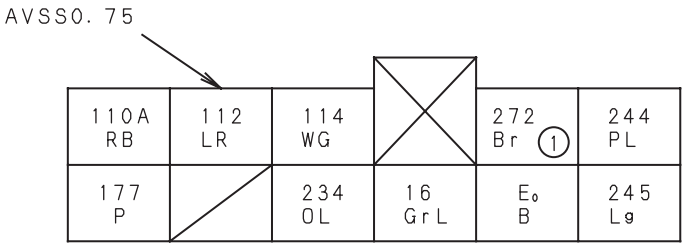

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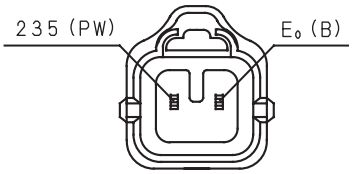

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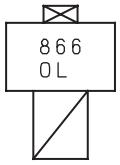

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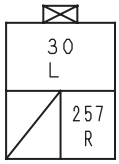
(AVSS0. 5)



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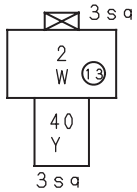

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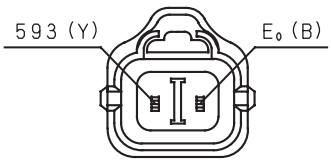

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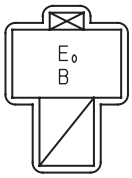

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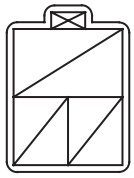

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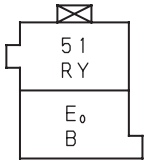

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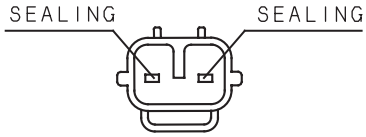

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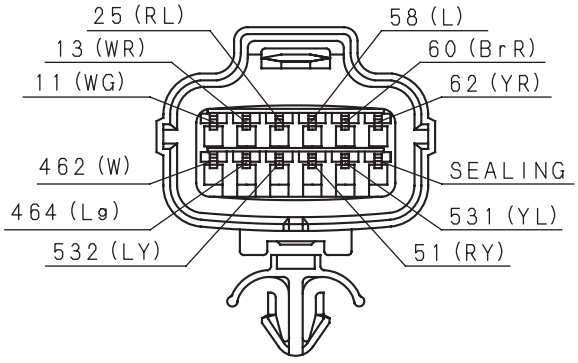

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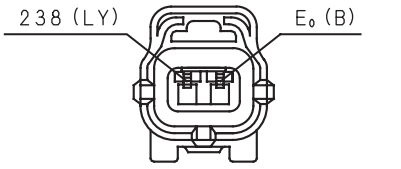

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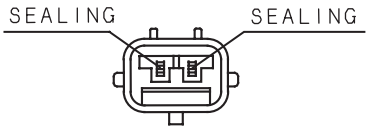

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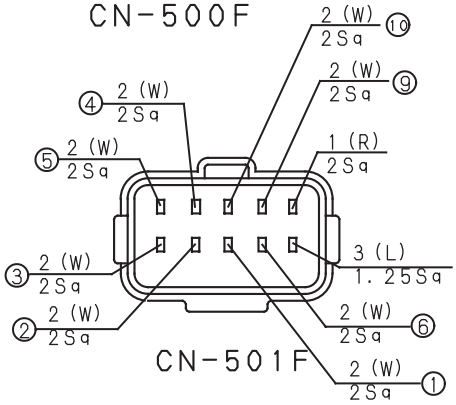

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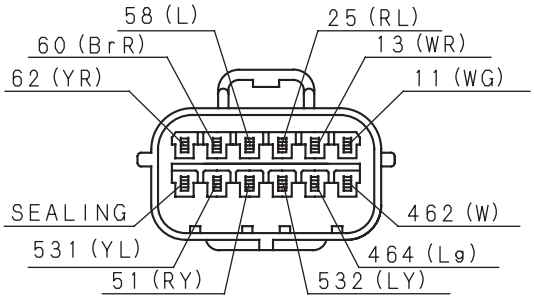

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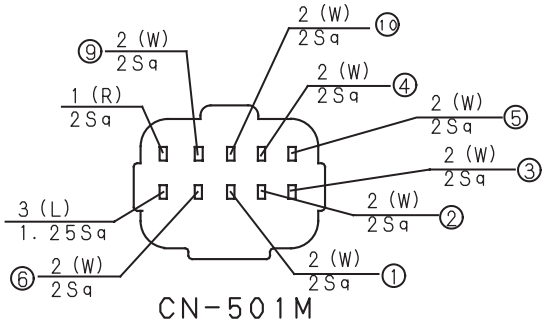

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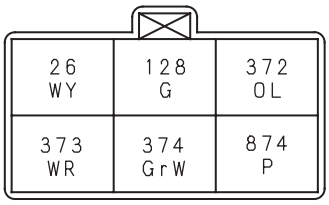

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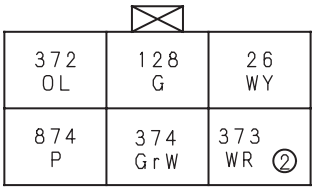

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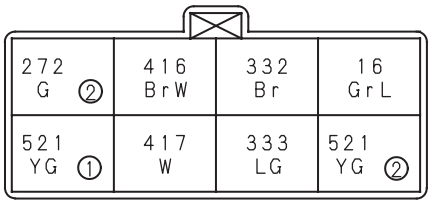

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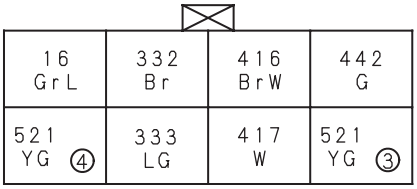

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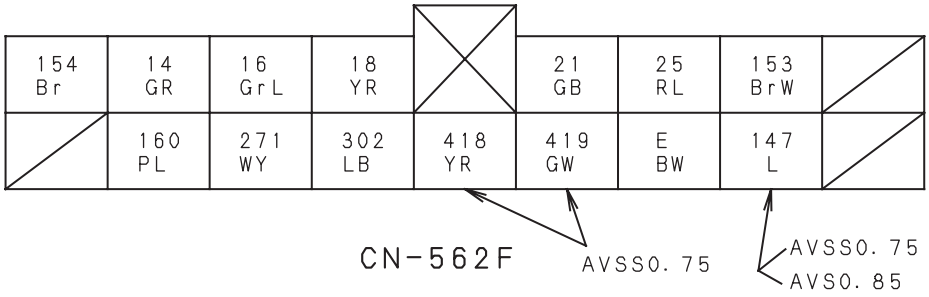

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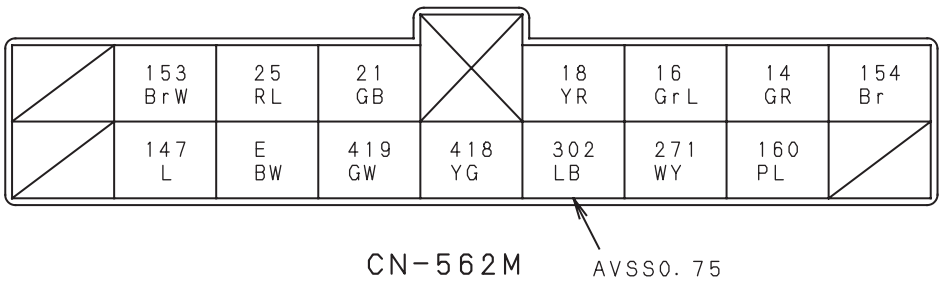

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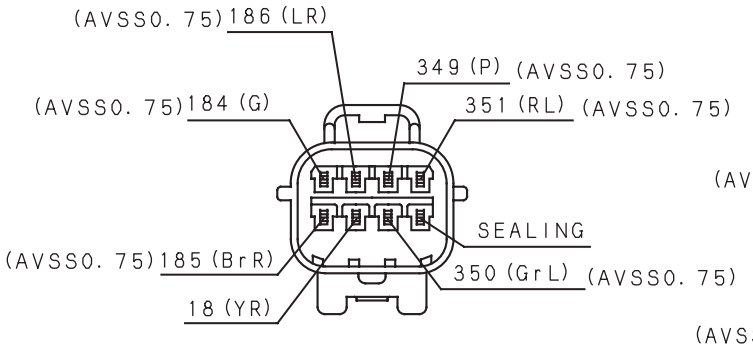

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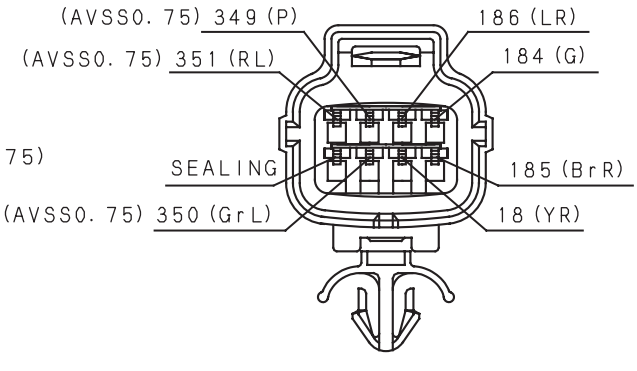

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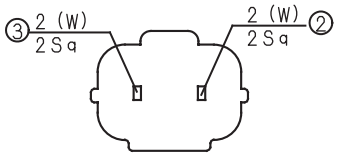

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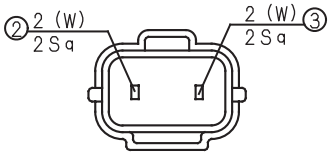
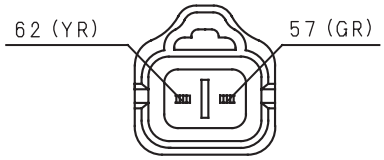
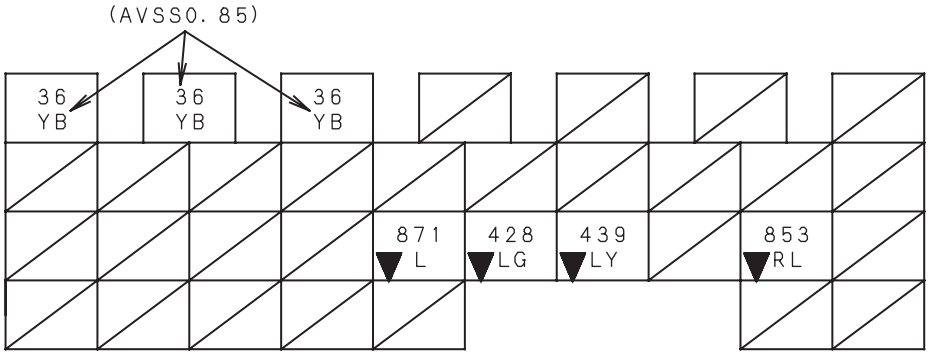


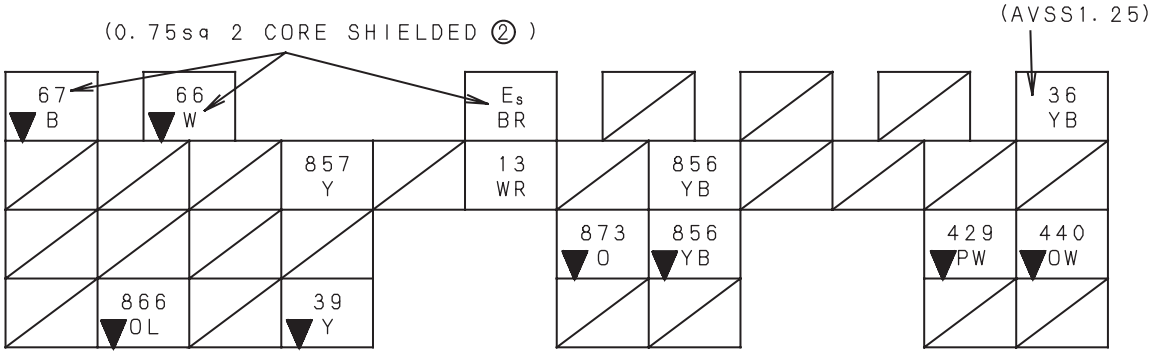
CN-945F



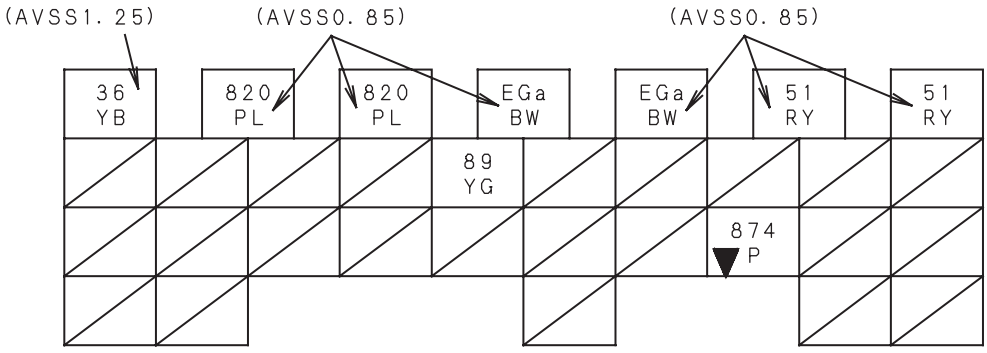
CN-949F



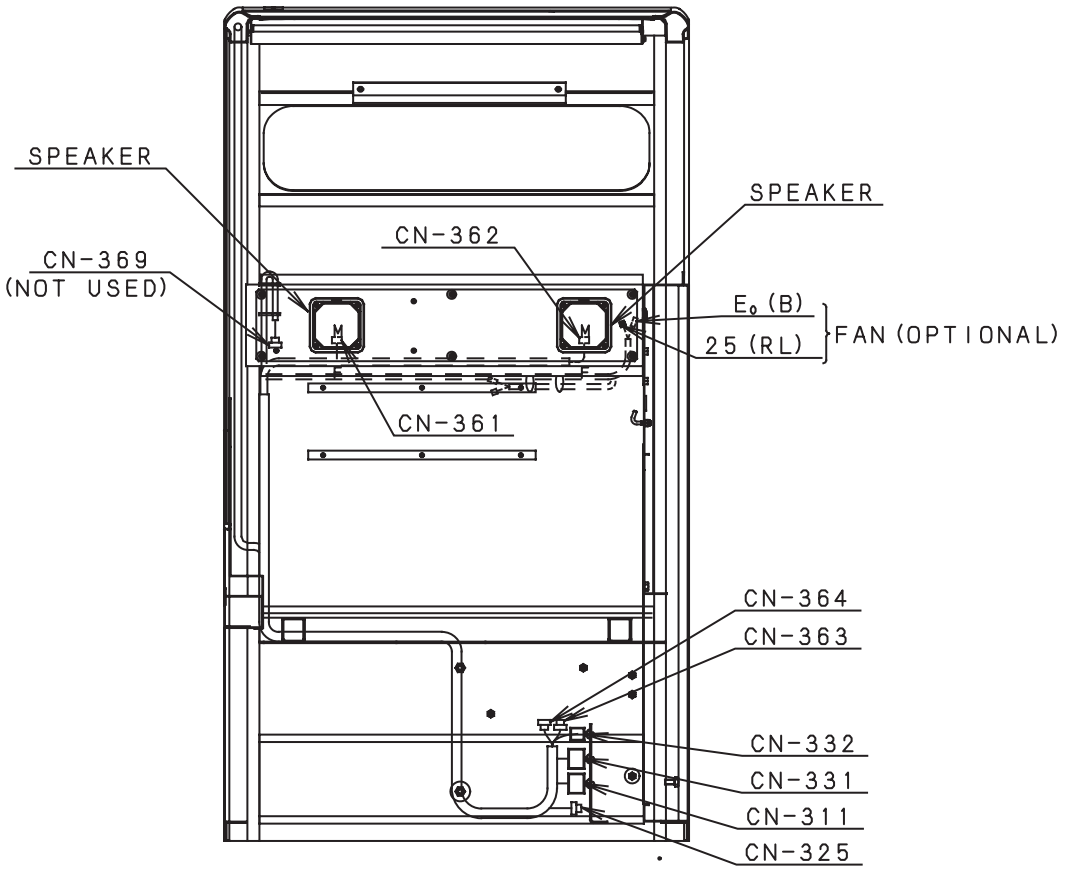
CN-953F A26
(AVSS0.5)



CN-954F
(AVSS0.5) A27



CN-955F A28
(AVSS0.5)


SPEAKER
CN-369
(NOT USED)
CN-362
SPEAKER
E₀ (B)
25 (RL)
FAN (OPTIONAL)
CN-361
CN-364
CN-363
CN-332
CN-331
CN-311
CN-325

VIEW D

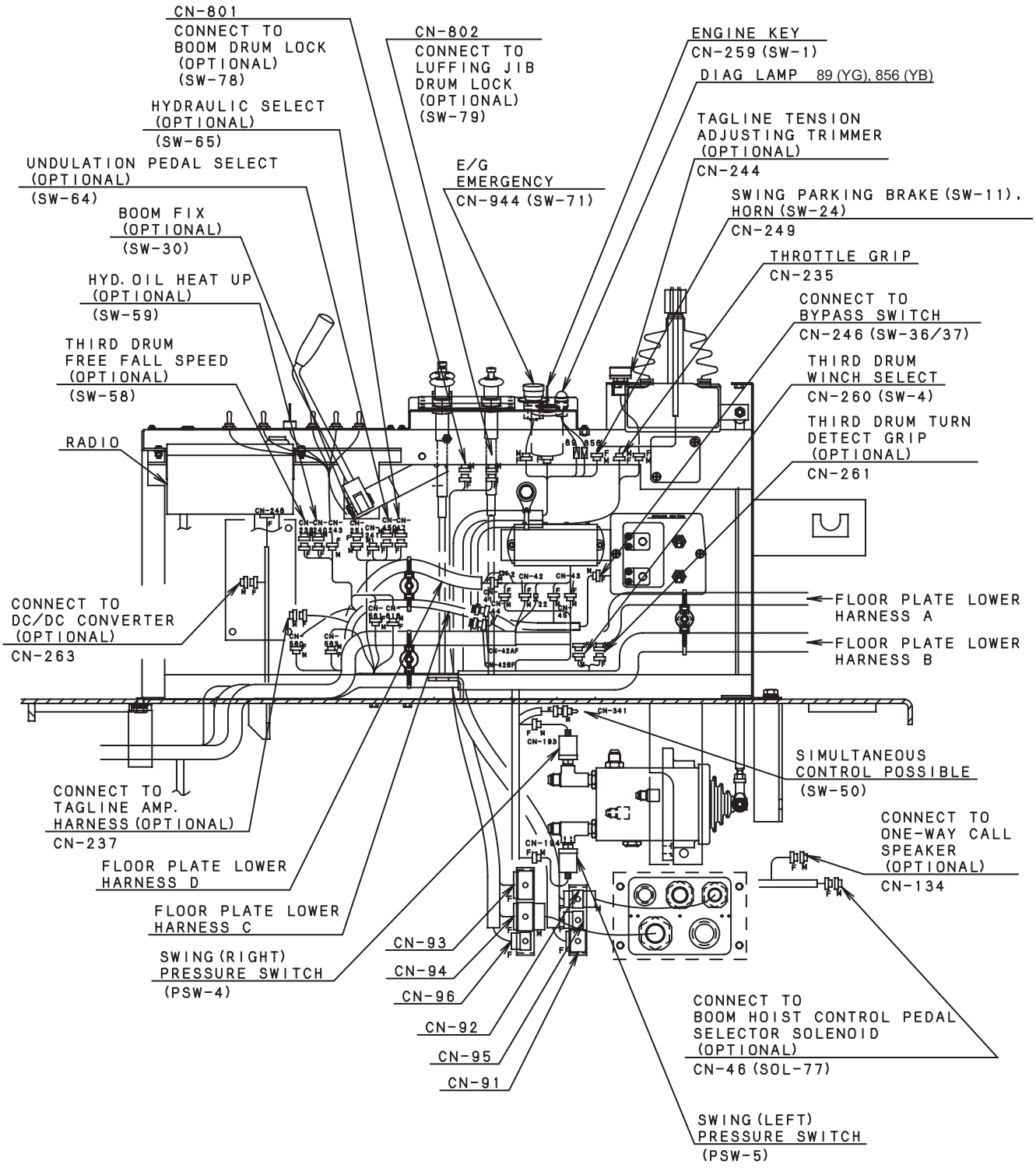


Fig.10-10 GG01E00068 (2/5)

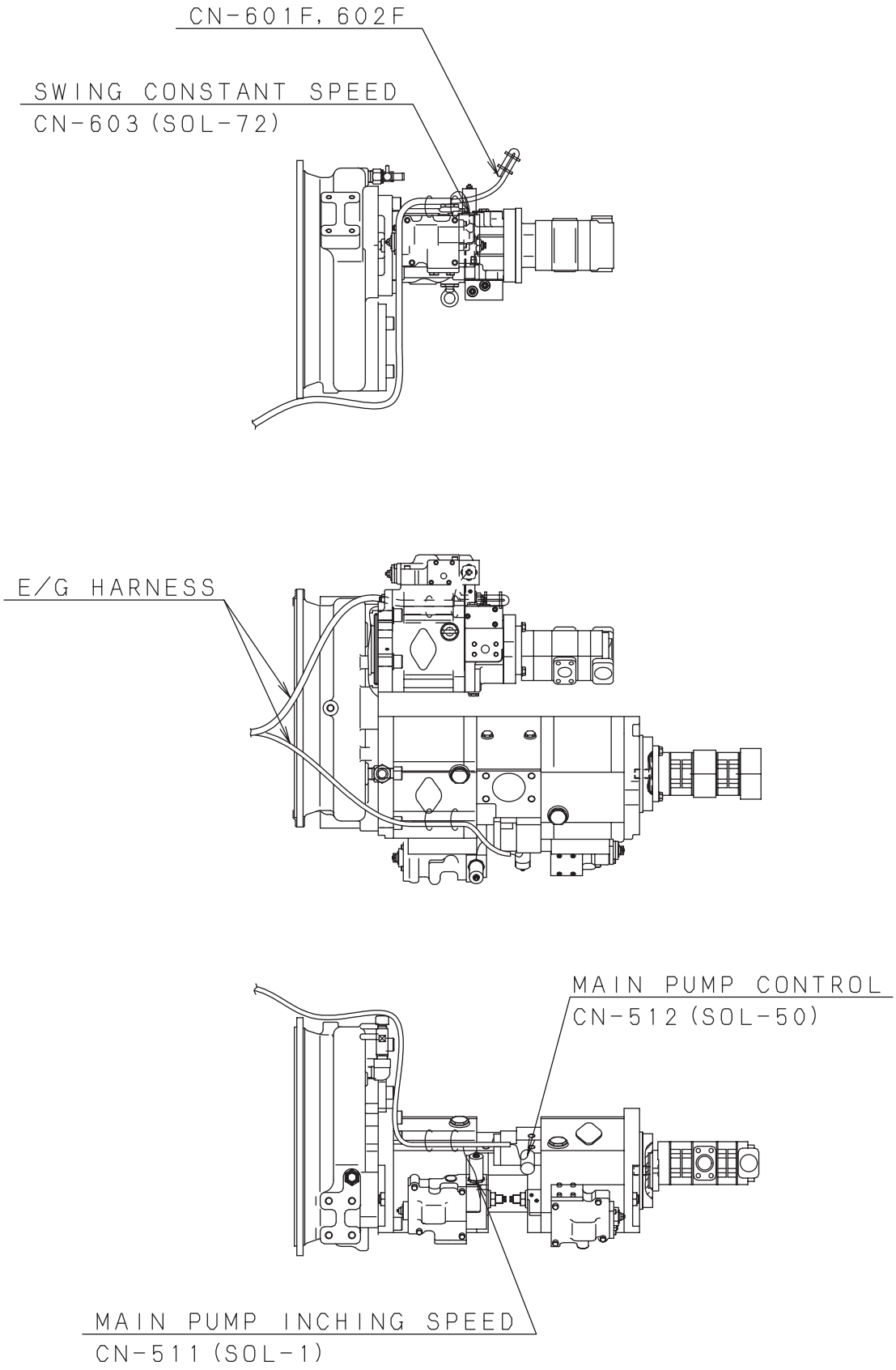
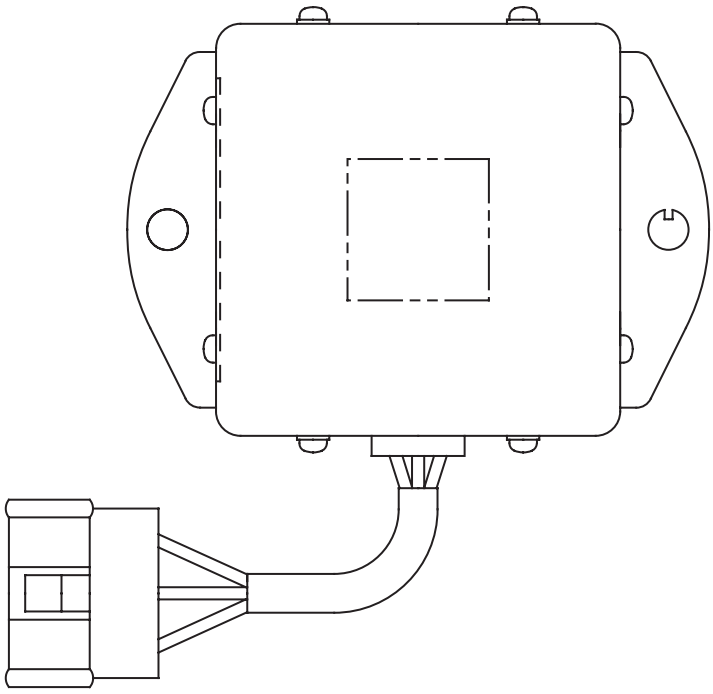
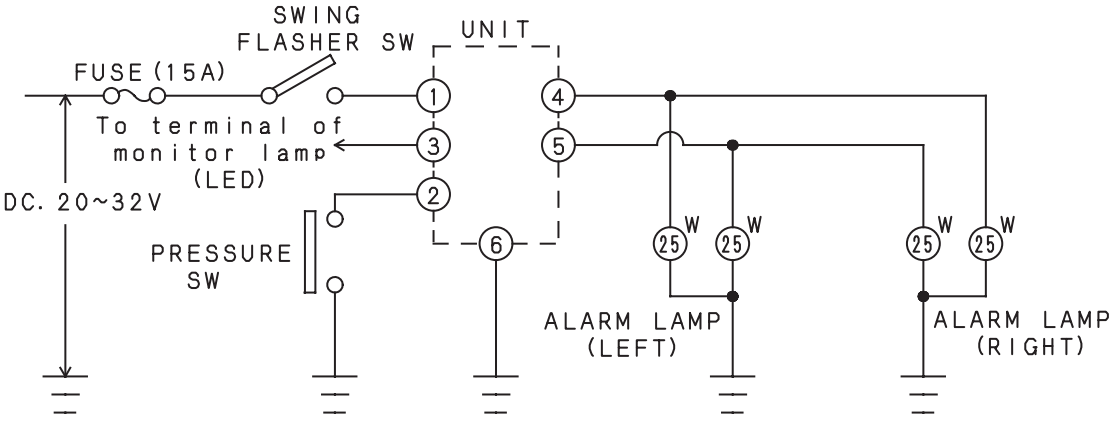
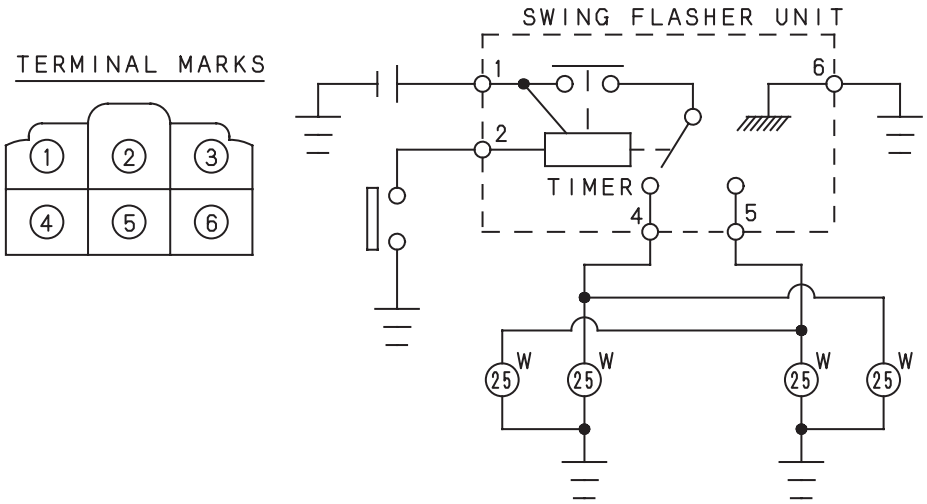


Fig.10-19 GH01E00001 (6/7)

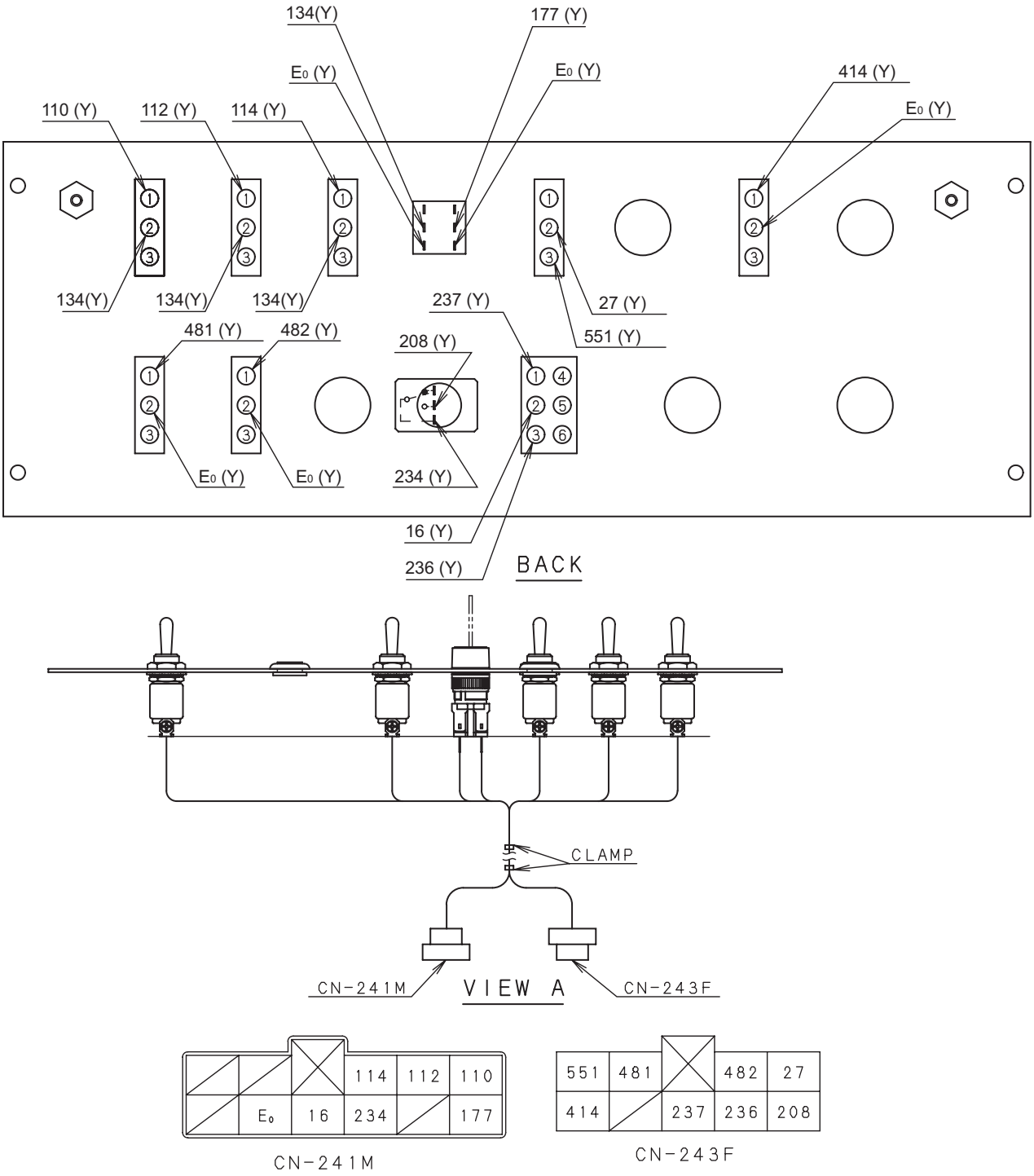
10.4.4 SWING FLASHER UNIT (2480U306)



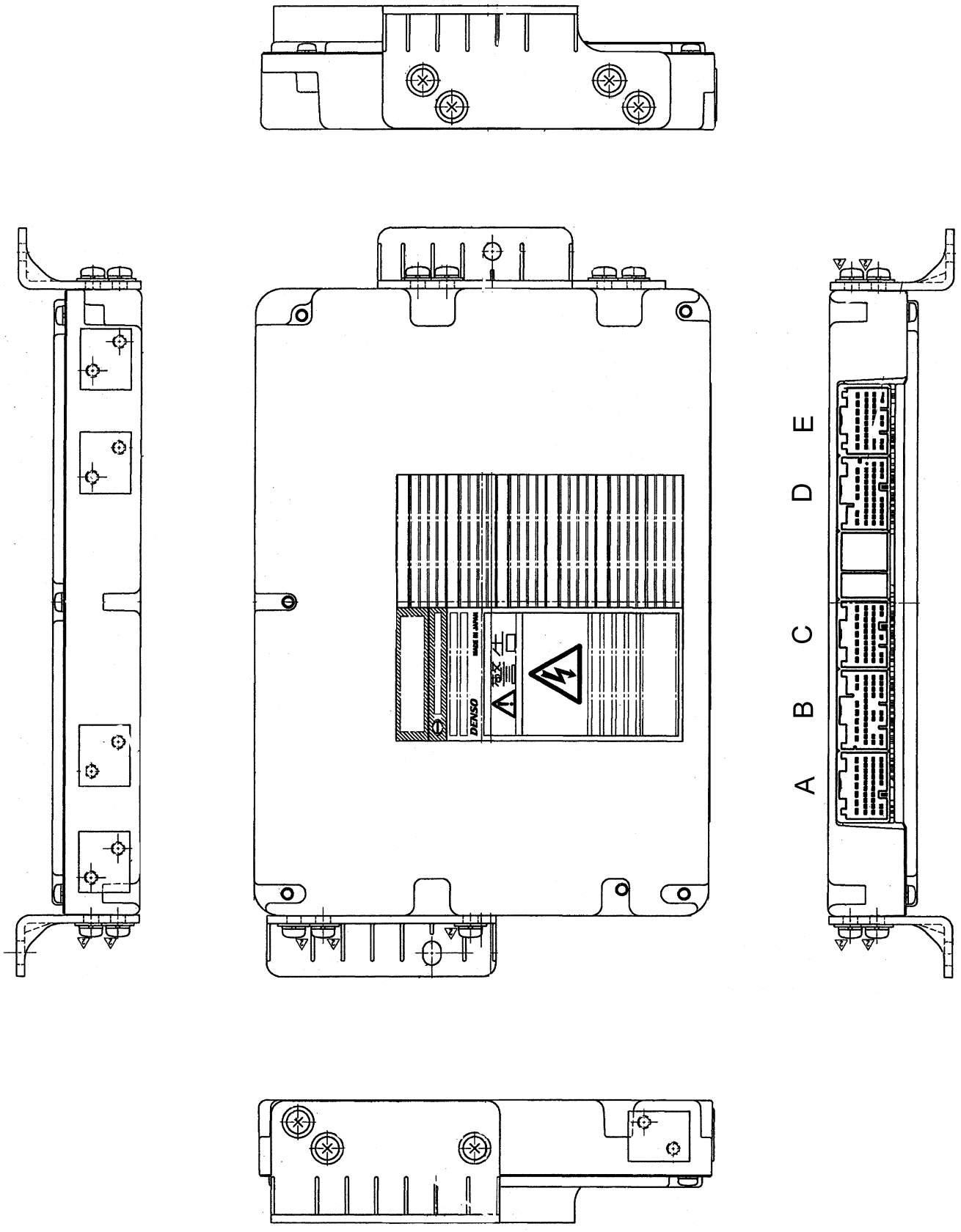




CKE900

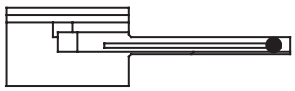

134(Y)
177 (Y)
E0 (Y)
E0 (Y)
414 (Y)
E0 (Y)
110 (Y)
112 (Y)
114 (Y)
134(Y)
134(Y)
134(Y)
237 (Y)
27 (Y)
551 (Y)
481 (Y)
482 (Y)
208 (Y)
E0 (Y)
E0 (Y)
234 (Y)
16 (Y)
236 (Y)
BACK
CLAMP
CN-241M
VIEW A
CN-243F
114 112 110
E0 16 234 177
CN-241M
551 481 482 27
414 237 236 208
CN-243F

10.5.4 ENGINE ECU

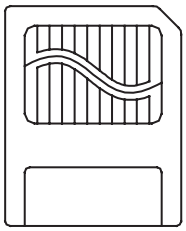


5. COVER
   DO NOT open unless you need to load the memory card or operate the setting and adjusting switches.

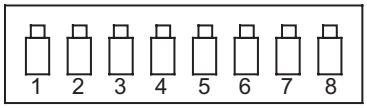
6. MEMORY CARD SLOT
   Insert the data memory card here.



7. MEMORY CARD
   This card contains the data related to the crane capacity.
   Insert this card into the data card slot unless otherwise specified.



8. SETTING AND ADJUSTING SWITCHES
   This switches are used for upgrading of programs or adjustment only.
   DO NOT touch them unless otherwise absolutely necessary.

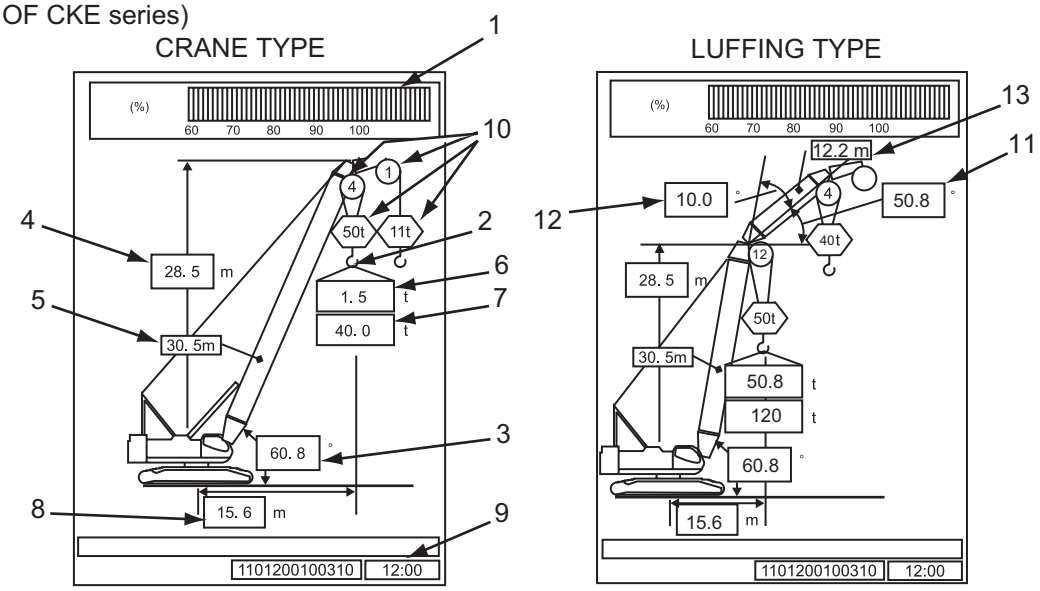


The dip switches are used to make adjustments. The following chart explains the dip switch functions.

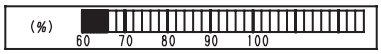
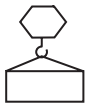
Dip switches

Dip switches No.								Function
1	2	3	4	5	6	7	8	
ON	-	-	-	-	-	-	-	Permission of upgrading indication program
-	ON	-	-	-	-	-	-	Permission of upgrading control program
-	-	ON	-	-	-	-	-	Permission of writing adjustment value
-	-	-	ON	-	-	-	-	Display of maintenance screen
-	-	-	-	ON	-	-	-	Making LVL function available
-	-	-	-	-	-	ON	-	None
-	-	-	-	-	ON	-	-	Initialization of load and trouble records

(IN CASE OF CKE series)



* The indicating units depend on the choice done in the steps described in "11.5.6 CHOICE OF LANGUAGE (CKE SERIES ONLY)".

No.	Indicator	Details
1	Moment ratio indicator (bar indicator) 	Moment ratio is indicated from 60 to 126% by the 2%. When moment ratio is less than 90%, it is indicated in green color. When it is 90% or more and less than 100%, it is indicated in yellow. When it is 100% or more, it is indicated in red.
2	Mode indicator 	When the ⇨ switch is pressed, the mode changes. The actual load and rated load of the hook at the selected side are displayed.
3	Boom angle indicator 	Current boom angle is indicated. When it is in the range from 0 to 9.9 to 99.9 deg., it is indicated by the 0.1 deg. When it is in the range from -150 to -10 deg., it is indicated by the 1 deg.
4	Point height indicator 	Boom point elevation or jib point elevation is indicated. When it is in the range from -9.9 to 99.9 m, it is indicated by the 0.1 m. When it is in the range from 100 to 999 m or in the range from -99 to 10 m, it is indicated by the 1.0 m.
5	Boom length indicator 	The selected boom length is displayed.

11.4 UPGRADING PROGRAMS

When upgrading the programs in the controller, use the program memory card.
Two types of programs, comprising "indication programs" and "control programs", are stored in the controller. The program memory card for upgrading always contains these two types of programs.

11.4.1 PROCEDURES

Open the cover, and press the push button located on the left side of the loading port to partially eject the data memory card. Then, remove the card from the loading port with your fingers.
Check the version on the label attached to the program memory card, and fully insert the card into the loading port.

Use the dip switch located on the left side of the card loading port to enable the upgrading of programs.
Turn the dip switch No.1 ON to upgrade indication programs, and turn the dip switch No.2 ON to upgrade control programs.

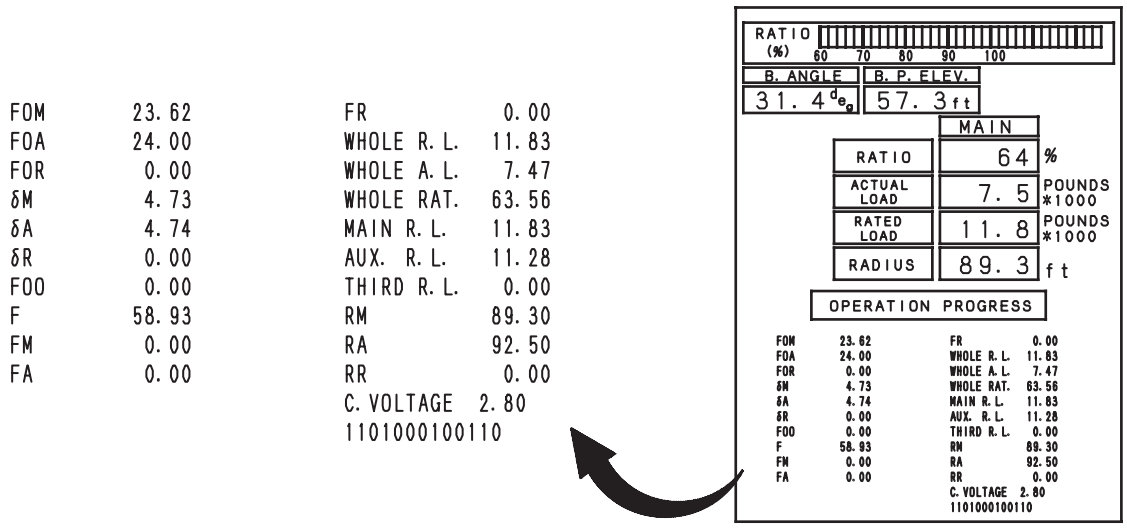
⚠CAUTION

When upgrading both of display programs and control programs, be sure to upgrade the display programs first, and then, upgrade the control programs.

Insertion and removal of card
The card can be removed or inserted even when power supply to the controller is turned on, except for the time that the controller accesses the card. Messages including "Reading" or "Transferring" appear during the access. In such a status, DO NOT remove the card.

11.5.2 OPERATION PROGRESS

On the "STATUS CHECK" screen, move the cursor ⇨ onto the "OPERATION PROGRESS", and press the SET switch. Then, the screen shown below appears.



Symbols	Details
FOM	Tare weight component during main winch lifting with current radius
FOA	Tare weight component during aux. winch lifting with current radius
FOR	Tare weight component during third winch lifting with current radius
δM	Load coefficient during main winch lifting with current radius
δA	Load coefficient during aux. winch lifting with current radius
δR	Load coefficient during third winch lifting with current radius
F00	Tare weight component other than weight of hook block with current radius (during simultaneous lifting only) (Not used)
F	Raising guy line tension
FM	Main winch wire rope tension (w/ main winch load cell) (Not used)
FA	Aux. winch wire rope tension (w/ aux. winch load cell) (Not used)
FR	Third winch wire rope tension (w/ third winch load cell) (Not used)
WHOLE R.L.	Whole rated load (rated load during selected mode other than simultaneous lifting mode)
WHOLE A.L.	Whole actual load (actual load during selected mode other than simultaneous lifting mode)
WHOLE RAT.	Whole moment ratio (value indicated in bar graph)
MAIN R.L.	Main winch rated load with current radius on the basis of data
AUX. R.L.	Aux. winch rated load with current radius on the basis of data
THIRD R.L.	Third winch rated load with current radius on the basis of data
RM	Calculated main winch operating radius before correction by radius adjustment
RA	Calculated aux. winch operating radius before correction by radius adjustment
RR	Calculated third winch operating radius before correction by radius adjustment
C. VOLTAGE	Control voltage of liquid crystal
13-digits number	Data judgment code

11.5.4.6 ADJUSTMENT VALUE OF WORKING RADIUS

On the "ADJUSTMENT VALUE" screen, move the cursor ⇨ onto the "RADIUS", and press the SET switch. Then, the table showing the adjustment value of working radius appears on the screen.

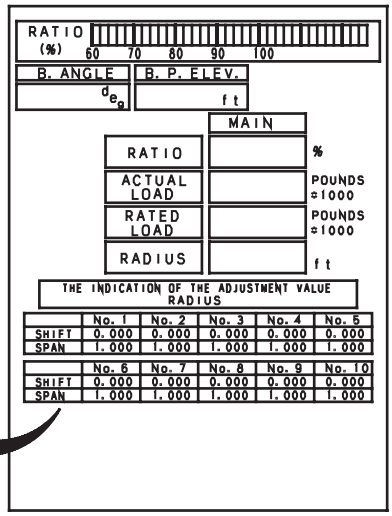
Adjustment values of group No. 1 to 30 can be displayed on this screen, and the table of group No. 1 to 10 is displayed first. To display the table of groups No. 11 to 20, press the ⇨ switch.

While adjustment is not provided, "0.000 (in the lines of SHIFT)" and "1.000 (in the lines of SPAN)" are indicated.

THE INDICATION OF THE ADJUSTMENT VALUE
RADIUS

	No. 1	No. 2	No. 3	No. 4	No. 5
SHIFT	0. 000	0. 000	0. 000	0. 000	0. 000
SPAN	1. 000	1. 000	1. 000	1. 000	1. 000

	No. 6	No. 7	No. 8	No. 9	No. 10
SHIFT	0. 000	0. 000	0. 000	0. 000	0. 000
SPAN	1. 000	1. 000	1. 000	1. 000	1. 000



Since limitations are provided for these adjustments, they cannot be completed when the adjusted values are excessively deviated. In such a case, ensure that the sensors are free from any fault, crane configuration is input correctly, and adjustment procedures are appropriate.

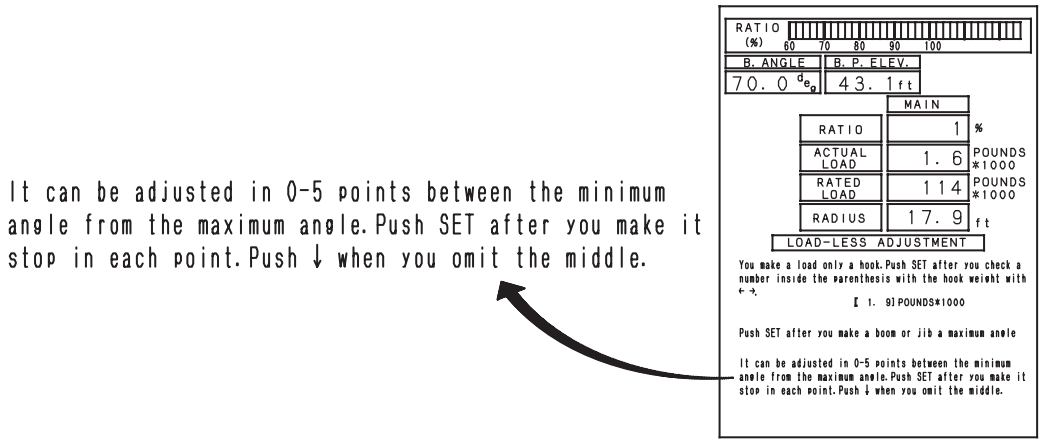
LOAD ADJUSTMENT

This adjustment is intended for emergency, and there is no limitation of adjustment values. It is valid for adjusted attachments only. After the attachments are changed, it is invalid.

LOAD-LESS ADJUSTMENT	This adjustment should be performed when "LOAD-LESS ADJUSTMENT" of MANUFACTURE ADJUSTMENT is rejected. It is valid for adjusted attachments only.
SOME LOAD ADJUSTMENT	This adjustment should be performed when "SOME LOAD ADJUSTMENT" of MANUFACTURE ADJUSTMENT is rejected. It is valid for adjusted attachments only.

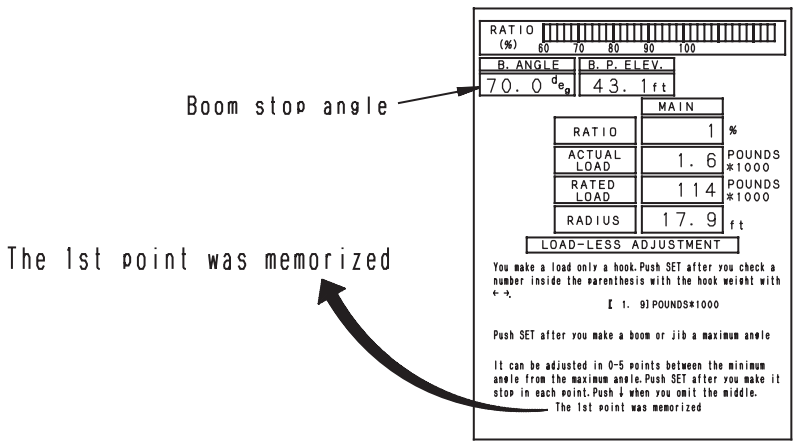
2. Then, the load can be adjusted at zero to five points to the minimum boom angle point.
   Lower the boom to arbitrary points, stop it, and press the SET switch.
   Make the hook position the same as the position instructed in step 1 at any point.
   The maximum and minimum boon angle points are absolutely necessary for this adjustment, and five points between them can be set arbitrarily or omitted (there is no rule of the number of points, and intervals of points).
   However, note that fine adjustment is possible when many points are set in the boom angle range as wide as possible.

   To omit the points set arbitrarily, press the ⇩ switch. Then, the message instructing to lower the boom to the minimum boom angle is displayed.

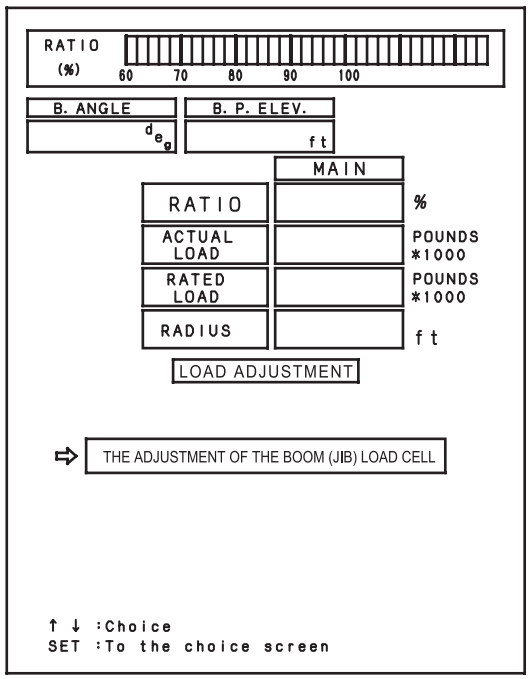


For example,

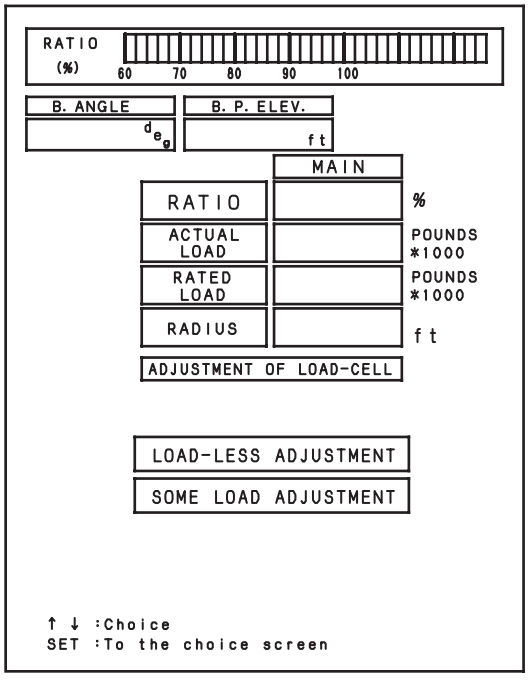
- When the boom is lowered to 70 deg. and stopped as the first arbitrary point, and the SET switch is pressed, the message informing that the first point is recorded appears.



3. When the cursor is moved onto the "Load adjustment" and the SET switch is pressed, the screen shown below appears.



4. When the SET switch is pressed next, the screen shown below appears.
Procedures of "LOAD-LESS ADJUSTMENT" and "SOME LOAD ADJUSTMENT" are the same as those of the "Manufacturers adjustment".



Code and the Message	CKE series code No.	Buzzer	Display conditions (machine status)
(56) Check mode. (Over load condition)	(J056)	peep	In the overload check mode
(58) Strut is raised too much.	(J058)	peep	The strut overhoist limit switch is activated.
(59) Strut is lowered too much.	(J059)	peep	The strut lowering limit switch is activated.
(60) Boom over hoist	(J060)	peep	The boom overhoist limit switch (second backstop) is activated.
(61) Jib reeving rope tends to draw.	(J061)	beep, beep...	The tension of the hoist wire rope exceeds the forecast alarm value, during erecting the tower.
(62) Jib reeving rope is drawn tight.	(J062)	beep	The tension of the hoist wire rope exceeds the warning alarm value, during erecting the tower.
(64) Danger!! Set the gantry fixing links.	(J064)	beep	Without the gantry fixing links when you raise the boom.
(65) Change to the self removal mode.	(J065)	beep	When you lower the gantry fixing links while inputting the posture of work.
(66) Danger!! The jib is in contact with the ground.	(J066)	beep	The jib over lowering limit switch is actuated upon detection of jib top ground contact during the tower lowering operation.
(67) Boom reeving rope is drawn tight.	(J067)	beep	When boom reeving rope is drawn tight it with the crane mast entrusted to the gantry fixing links.

When any fault occurs, the corresponding error message is displayed on the message display. If any error code for the load detector and the boom angle detector is issued, the machine is automatically stopped, and the buzzer sounds are emitted. Note that cancellation by using the release switch of the load safety device is enabled.

				Alarm output		Crane control output						
						Automatic stop						
				Alarm output conditions	Alarm cancel conditions	Winch 1	Winch 2		Raise/Lower 1		Raise/Lower 2	
						Main winch	Aux. winch		Boom		Jib	
						Up	Up	Down	Up	Down	Up	Down
Power OFF			—	—	—	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Allowable working area			01	—	—	ON	ON	ON	ON	ON	ON	ON
Load	Main/Aux. /Jib single mode	Overload prenotice	11	K	B	—	—	—	—	—	—	—
		Overload	12	L	C	OFF	OFF	ON	ON	OFF	ON	OFF
	Main hook max. load set point (area limitation prenotice)		21	K	B	—	—	—	—	—	—	—
	Main hook max. load set point (area limitation alarm)		22	L	C	OFF	OFF	ON	ON	OFF	ON	OFF
	Jib hook max. load set point (area limitation prenotice)		23	K	B	—	—	—	—	—	—	—
	Jib hook max. load set point (area limitation alarm)		24	L	C	OFF	OFF	ON	ON	OFF	ON	OFF
	Aux hook load set point (area limitation prenotice)		25	K	B	—	—	—	—	—	—	—
	Aux hook load set point (area limitation alarm)		26	L	C	OFF	OFF	ON	ON	OFF	ON	OFF
Radius	Boom over-lowering (only for main lifting)		31	N	D	OFF	OFF	ON	ON	OFF	ON	OFF
	Boom over-raising (only for main lifting)		32	M	D	ON	ON	ON	OFF	ON	ON	ON
	Jib over-lowering (only for jib lifting)		33	N	D	OFF	OFF	ON	ON	OFF	ON	OFF
	Jib over-raising (only for jib lifting)		34	M	D	ON	ON	ON	ON	ON	OFF	ON
	Main hook radius excess (area limitation prenotice)		35	M	J	—	—	—	—	—	—	—
	Main hook radius excess (area limitation alarm)		36	M	J	—	—	—	—	OFF	—	OFF
	Jib hook radius excess (area limitation prenotice)		37	M	J	—	—	—	—	—	—	—
	Jib hook radius excess (area limitation alarm)		38	M	J	—	—	—	—	OFF	—	OFF
	Aux hook radius excess (area limitation prenotice)		39	M	J	—	—	—	—	—	—	—
	Aux hook radius excess (area limitation alarm)		40	M	J	—	—	—	—	OFF	—	OFF
Angle	Boom over-lowering (area limitation prenotice)		41	M	D	—	—	—	—	—	—	—
	Boom over-lowering (area limitation alarm)		42	M	D	—	—	—	—	OFF	—	—
	Boom over-raising (area limitation prenotice)		43	M	D	—	—	—	—	—	—	—
	Boom over-raising (area limitation alarm)		44	M	D	—	—	—	OFF	—	—	—
	Jib over-lowering (area limitation prenotice)		45	M	D	—	—	—	—	—	—	—
	Jib over-lowering (area limitation alarm)		46	M	D	—	—	—	—	—	—	OFF
	Jib over-raising (area limitation prenotice)		47	M	D	—	—	—	—	—	—	—
	Jib over-raising (area limitation alarm)		48	M	D	—	—	—	—	—	OFF	—
	Boom low. limit angle (only for jib lifting)		49	N	D	OFF	OFF	ON	ON	OFF	—	—
	Boom upp. limit angle (only for jib lifting)		50	N	D	ON	ON	ON	OFF	ON	—	—
	Jib offset low. limit angle (only for main lifting)		51	N	D	—	—	—	ON	OFF	OFF	ON
	Jib offset upp. limit angle (only for main lifting)		52	N	D	OFF	OFF	ON	OFF	ON	ON	OFF
Elevation	Point elevation (area limitation prenotice)		61	M	J	—	—	—	—	—	—	—
	Point elevation (area limitation alarm)		62	M	J	—	—	—	OFF	—	OFF	—
Jib hook / Limit switch	Main winch hook overhoist		71	P	A	OFF	OFF	ON	ON	OFF	ON	OFF
	Aux. winch hook overhoist		72	P	A	OFF	OFF	ON	ON	OFF	ON	OFF
	Boom overhoist (1st)		73	Q	A	ON	ON	ON	OFF	ON	ON	ON
	Boom overhoist (2nd)		74	Q	A	OFF	OFF	ON	OFF	ON	ON	ON
	Jib overhoist		76	Q	A	OFF	OFF	ON	ON	OFF	OFF	ON
	Strut over-raising		77	Q	A	ON	ON	ON	ON	OFF	OFF	ON
	Strut over-lowering		78	Q	A	ON	ON	ON	OFF	ON	ON	OFF
Others	Head wind alarm		81	—	—	—	—	—	—	—	—	—
	Attachment self-standing and stowing		91	—	—	(ON)	(ON)	ON	(ON)	(ON)	(ON)	(ON)
	Attachment assembly and disassembly		92	—	—	ON	ON	ON	ON	ON	ON	ON

11.9.1.2 ALARM SOUND

1. Crane

O : emitted (Peep--) △: emitted (Beep-) X : not emitted

Condition	Operation							
	Main winch up	Main winch down	Aux. winch up	Aux. winch down	3rd winch up	3rd winch down	Boom raise	Boom lower
Hook overhoist (main)	O	X	O	X	O	X	X	O
Hook overhoist (Jib / aux.)	O	X	O	X	O	X	X	O
Boom upper limit angle	X	X	X	X	X	X	O	X
Boom overhoist (L/sw)	O : regardless of operation							
Overload	△ : regardless of operation							
Crane jib overhoist (Not used)	O : regardless of operation							

- When any hazardous condition occurs, and any circle is found in the line of the hazardous condition in the table above, alarm sounds are emitted.

2. Luffing

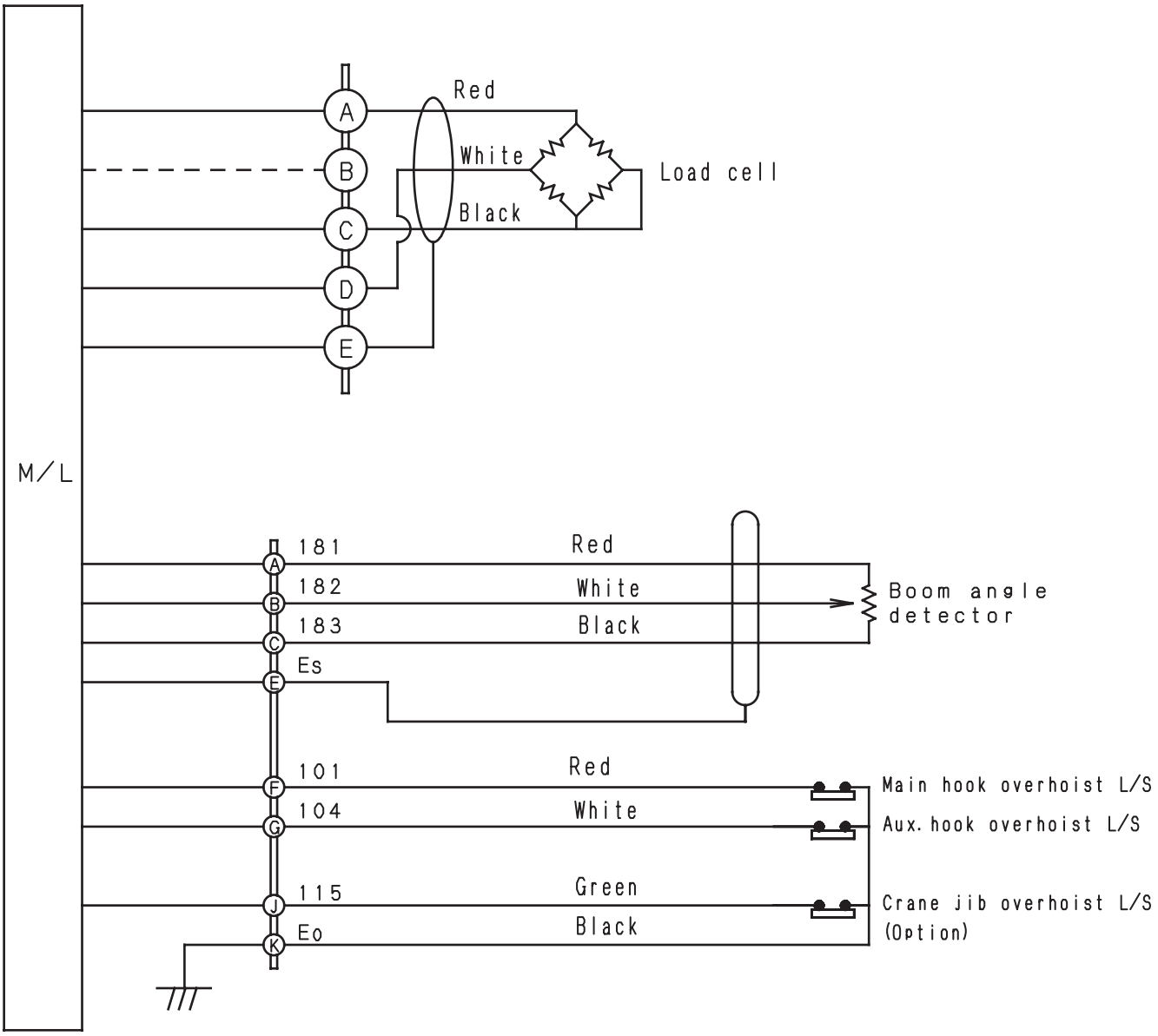
O : emitted (Peep--) △: emitted (Beep-) X : not emitted

Condition	Operation							
	Main winch up	Main winch down	Aux. winch up	Aux. winch down	Boom raise	Boom lower	Jib raise	Jib lower
Hook overhoist (main)	O	X	O	X	X	O	X	O
Hook overhoist (Jib/aux.)	O	X	O	X	X	O	X	O
Boom upper limit angle	X	X	X	X	O	X	X	X
Jib upper limit angle	X	X	X	X	X	X	O	X
Boom overhoist (No.1 L/sw)	O : regardless of operation							
Boom overhoist (No.2 L/sw)	O : regardless of operation							
Jib overhoist (L/sw)	O : regardless of operation							
Boom low. limit angle	△ : regardless of operation							
Jib low. limit amgle	△ : regardless of operation							
Overload	△ : regardless of operation							

- When any hazardous condition occurs, and any circle is found in the line of the hazardous condition in the table above, alarm sounds are emitted.

11.12 ELECTRIC SCHEMATIC DIAGRAM

11.12.1 CRANE TYPE

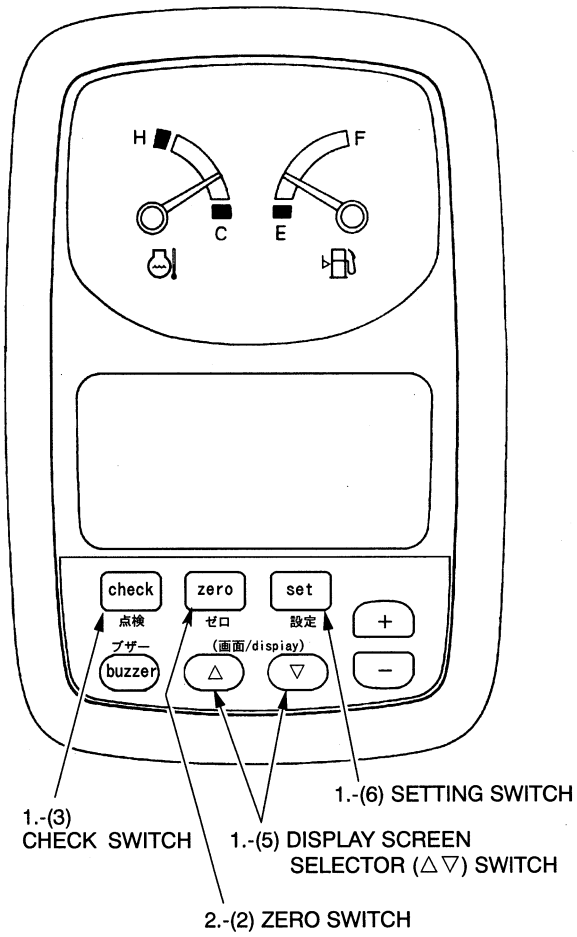


CONTENTS OF STATUS DISPLAY

Display example	Use in CK1000-II, CKE900	Operation instruction	Range of indicated values		Remarks
NO. 1 MAIN CONT. P/N GH30S00002D3 PROGRAM VER VER 1.03					*The part number and version vary by model and specification.
NO. 2 ENGINE SET 2205 MEAS 2201		The setting value is changed depending on the positions of the hand throttle or foot throttle.	Low 700 to 780 rpm	High 2100 to 2180 rpm	
ENGINE PRS. LIVE			With E/G oil pressure: LIVE No E/G oil pressure: DEAD		
No.3 A-7			Low	High	The components are normal if the values of the "POS." are changed between 0 and 100% when the E/G speed is changed between low and high. *If they are not changed to 0 or 100%, re-adjust.
GRIP VOLT. 4.2V		The values are changed depending on the hand throttle operation, low or high.	0.5V	5.0V	
POS. 100%			0%	100%	
MOTOR STEP 256 POS. 100%	NO USE				
No.4 STEP. MOTOR F-1 COIL-A 0.5A	COMMAND TO ECU	The set valves are changed depending on the position of the throttle.	Low	High	
F-2 COIL-B 0.6A			1.0V	4.0V	
LIMIT OFF	NO USE				
No.5 DIGITAL OUTPUT C-1 COMP. OFF MEAS. OFF	BATTERY RELAY		It remains set to the "ON" while the power is supplied.		* COMP.: command value from controller * MEAS.: feed back value The fault (disconnection) is indicated by displaying the following codes COMP.OFF MEAS.ON Connector voltag ON : 24 V OFF : 6 to 8V (disconnection) Check procedures 1) Measure the voltage at the connector. 2) Measure the resistance of the solenoid valves. 3) Replace with nearby solenoid valves and connectors.
C-2 COMP. - MEAS. -	SPARE				
No.6 DIGITAL OUTPUT	HYD. OIL HEAT RELAY	Status of the relay that switches the hydraulic oil heating circuit ON/OFF is displayed.			
C-3 COMP. OFF		All the control levers, for main aux., and third winches, boom, travel, and swing, are set to the neutral positions.	ON		
MEAS OFF		Any of the control levers, for main, aux., and third winches, boom, travel, and swing, are being operated.	OFF		
C-4 COMP. - MEAS. -	SPARE				
No.7 DIGITAL OUTPUT	MAIN PUMP INCHING SOL.				
C-5 COMP. OFF		When the main, aux., and third winch control levers are at the neutral positions and the inching switch is turned on.	ON		
MEAS. OFF		Conditions other than the above, or in the free fall mode.	OFF		
C-6 COMP. - MEAS. -	-				
No.8 DIGITAL OUTPUT		Status of the main winch (front drum) clutch solenoid valve (SOL-22) is displayed.			
C-7 COMP. OFF	MAIN WINCH (FRONT DRUM) CLUTCH CLM SOL	When the main winch is in the free fall mode and the lever is at the neutral position.	ON		
MEAS. OFF		Conditions other than the above.	OFF		
C-8 COMP. OFF		Status of the main winch (front drum) clutch emergency solenoid valve (SOL-19) is displayed.			
MEAS. OFF	MAIN WINCH (FRONT DRUM) CLUTCH ESM SOL	The clutch pressure decreases although the main winch is in the brake mode.	ON		
		The clutch pressure decreases when the main winch is in the free fall mode and the lever is operated.	ON		
		Conditions other than the above.	OFF		

3. Notes on fault logs

- Even when a fault occurs, if the same type fault already occurred in the past, and the log of the fault has already been stored, a new log of the fault is not stored.
- The hour indicated in the hourmeter on the display is a reference (for the replacement of the controller), and indicates the total period of the controller operation. It is not related to the hourmeter on the carrier.



Owing to the facts above, be sure to delete fault logs after faults are corrected.
It is recommended to record the hourmeter value of the controller together with that of the hourmeter of the carrier.

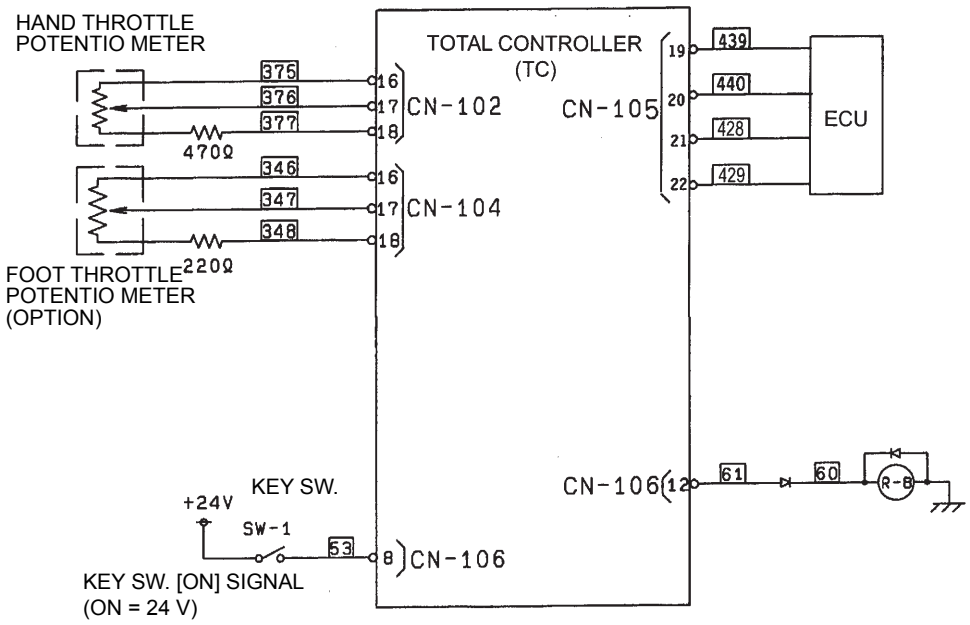
1. ACCELERATOR CONTROL & POWER OFF

(1) Accelerator control

Commands are sent to the ECU (Engine control unit) according to the input from the hand throttle or foot throttle. If the machine is equipped with both the throttles, priority is given to the throttle issuing more commands.

(2) Measures against engine stop

- Four seconds after the key switch is set to the OFF position, the battery relay is de-energized.



If wiring of both the hand throttle and foot throttle is disconnected, output voltage to the ECU is 0 V.
Low speed rotation and middle speed rotation can be switched by turning "ON" the auxiliary accelerator switch after turning "ON" the by-pass switch.

1) When power is supplied
The machine always starts running in the neutral brake mode.

2) Switching from the brake mode to the free fall mode

Condition		Output
A. The free fall lock switch is set released. And function lock lever is neutral position.	→ Free release "ON"	• Select the free mode. • Light up the free fall indicator lamp. • Release the main pump control.
B. The foot brake is depressed (the pressure switch is set to the "ON" position). C. The free selector switch is set to the "ON" position.	→ Each drum free fall signal "ON"	

3) Change from free fall mode to brake mode
Depress the foot brake again, and set the free fall mode selector switch to the ON position. Or, when the free fall permission signal is in the "OFF" status.

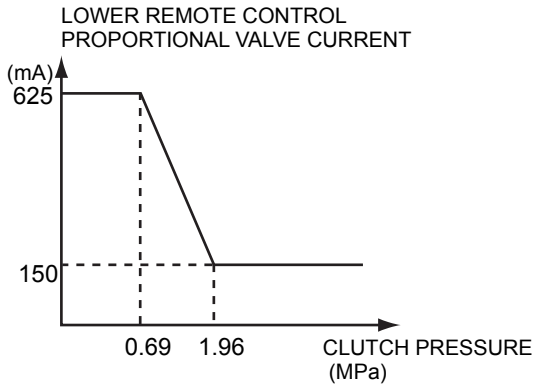
4) Control of solenoid valve in free fall/brake mode
The front drum CLM (SOL-22) is controlled as shown in the table below.

	Mode	
Lever control	Neutral free	Neutral brake
Hoisting	X	X
Lowering	X	X
Neutral	O	X

O : Energized X : De-energized

- The ON/OFF status of the lever operation is judged by the value from the pressure sensor. (Lever operation is judged to be ON if the pressure is 0.343 MPa or more. It is judged to be OFF if the pressure is not more than 0.196 MPa or less.)

The rear drum CLA (SOL-23) and the third drum CLT (SOL-24) are controlled in a similar manner. When the lever is at the neutral position while the free fall mode is selected, output from the front drum (rear drum and third drum) down remote control proportional valve should depend on the clutch pressure.



(3) When the function lock signals are in the "ON" status
Input at the pressure sensors is checked, and the minimum value when the lever is set to the "ON" position is maintained. Once the lever is set to the neutral position, the proportional valve is normally controlled. When the lever is at the neutral position, the proportional valve is normally controlled.

(4) When the function lock signals are in the "OFF" status
When the function lock signals are set to the "ON" status, the procedures shown in the 3) above are performed.

(5) This interlock is actuated whenever electricity generation signals or function lock signals are set to the "OFF" status.

19. CONTROL OF HOIST DECELERATION WHEN HOOK BLOCK OVERHOIST STOP IS CANCELED

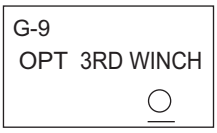
When overhoist is canceled (judged by M/L communication data), current at the remote control proportional valves for hoisting the front drum and rear drum is adjusted to that of the inching speed control (425 mA : constant).
Output current at the drum motor control proportional valve should be adjusted to 300 mA (constant)(only while the lever is being operated).

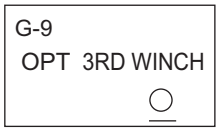
13.4.4 ARRANGEMENT OF TOTAL CONTROLLER CONNECTOR PIN

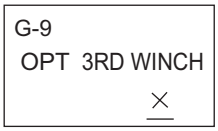
Connector No.	Pin No.	Port name	Specifications
CN100	1	+24V	Power supply
	2	+24V	
	3	GND	Grounding
	4	GND	
	5		Vacancy

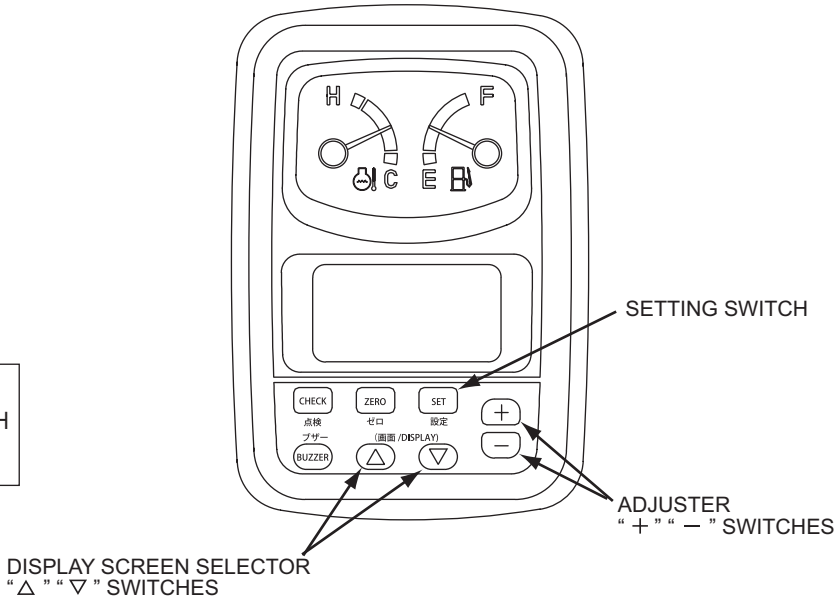
Connector No.	Pin No.	Port name	Specifications
CN101	1	D1+	Boom raising speed control proportional valve
	2	D1-	
	3	D2+	Boom lowering speed control proportional valve
	4	D2-	
	5	D3+	Fr. drum hoisting speed control proportional valve
	6	D3-	
	7	D4+	Fr. drum lowering speed control proportional valve
	8	D4-	
	9	D5+	Re. drum hoisting speed control proportional valve
	10	D5-	
	11	D6+	Re. drum lowering speed control proportional valve
	12	D6-	
	13	D7+	3rd. drum hoisting speed control proportional valve
	14	D7-	
	15	D8+	3rd. drum lowering speed control proportional valve
	16	D8-	
	17	D9+	Fr. drum motor control proportional valve
	18	D9-	
	19	D10+	Re. drum motor control proportional valve
	20	D10-	
	21	D11+	Swing speed control
	22	D11-	
	23	D12+	Main pump control proportional valve
	24	D12-	
	25	D13+	3rd. drum motor control proportional valve
	26	D13-	
	27	D14+	Swing reaction proportional valve
	28	D14-	
	29	D15+	Tagline tension proportional valve
	30	D15-	
	31	E1+	Engine turn sensor
	32	E1-	
	33	E2	Fr. drum turn sensor
	34	E3	Re. drum turn sensor

3. The option setting items are displayed on the display screen of the cluster.
4. Select any intended option item with the adjuster " △" and " ▽" switches on the cluster.
5. If the option setting is necessary, input "O" with the adjuster "+" or "-" switch.
   If the option setting is unnecessary, input "X" with the "+" or "-" switch.









6. After the completion of input of "O" or "X" against all the items, push the "Setting switch" on the cluster.

- Adjustment values can be input into the controller by pushing the "Setting switch".
  Remember that the adjustment becomes ineffective unless the "Setting switch" is pushed.

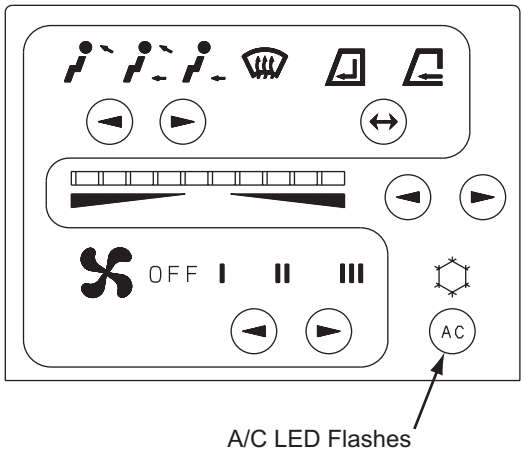
7. Return the adjustment switch to the "RUN" position.

Option setting procedure	
A. Adjustment switch:	"TEST" position
B. Operation mode selector switch:	" ▽" and " △"
C. "O" and "X"	
D. Setting switch:	Press
E. Adjustment switch:	"RUN" position

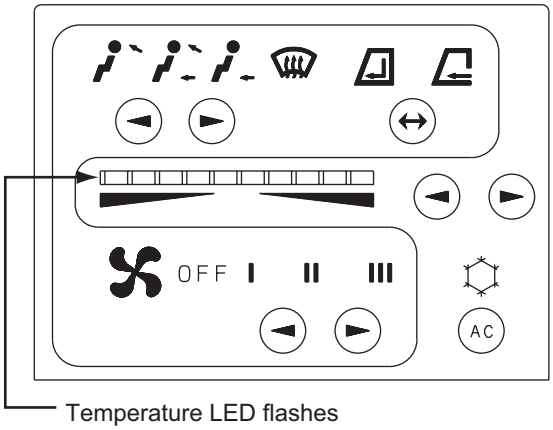
14.2 SAFETY MONITOR FUNCTIONS

This control panel displays the following self-monitoring functions.

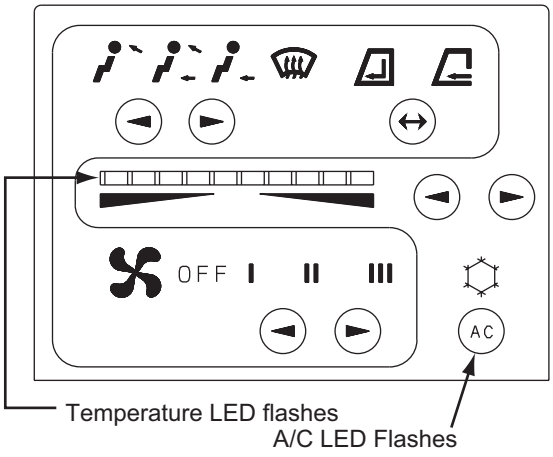
(1) Thermostat Cutoff and short Monitor.
When a cutoff or short occurs on the thermostat circuit, this function detects it and the A/C display LED flashes while the air conditioner remains ON.



(2) Temperature Motor Actuator Lock and Circuit Monitor.
When there is insufficient motion after the motor actuator starts, it detects this as a short and the appropriate LED based on the set temperature flashes.



(3) Thermostat Cutoff/Short and Temperature Motor Actuator Lock/Cutoff/Short Monitor.
When thermostat or motor circuit malfunctions occurs, the appropriate LED and the A/C switch LED flash (while the air conditioner is on).



- Turn the linkage bushing (17) toward the arrow, and remove the rod (18).

CAUTION

Do not release the rod clamp (19).
It has been removed, reassemble it again as explained in Section to follow.

- Turn the intake dumper shaft (20) to be sure that the dumper (21) does not interfere with the capillary tube (i).
  There must be more than 5 mm clearance.
- Install the rod (18) to the linkage bushing (17).

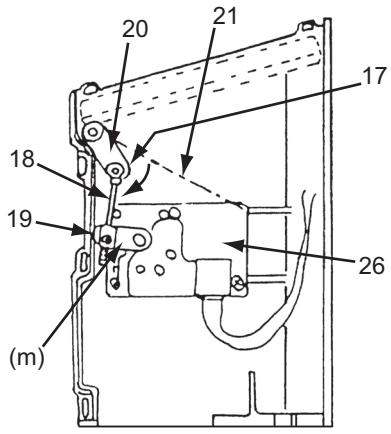


Figure-9

14.3.2.4 HEATER CORE REPLACEMENT

CAUTION

- Make sure the water temperature is low.
- Be careful not to drain the cooling water.

1. Removal

(1) Remove the upper case (8) as explained in Section 14.3.2.1.

(2) Take off the tapping screw (30) to remove the retainer (31)

(3) Loosen 2 hose clamps (22) to remove the heater hose (23), and lift the heater core to remove. (2)

2. Installation
   Proceed with reassembly in the reverse order from disassembly, with the following special notations.

(1) Replace the heater hose (23) and the insulator (32).

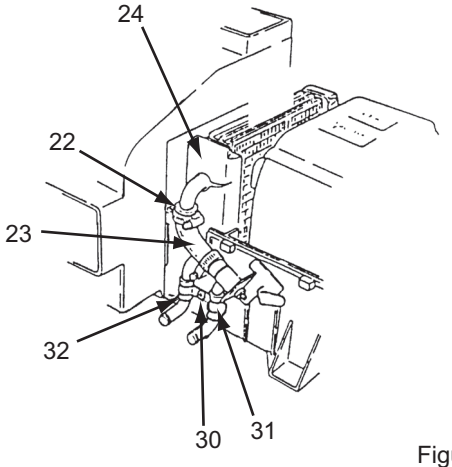


Figure-10