CRAWLER CRANE

SHOP
MANUAL

model **CK850-II**
CKE800
CKE700

KOBELCO

BOOK CODE : S5GG00005ZE04

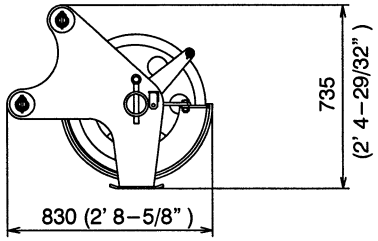
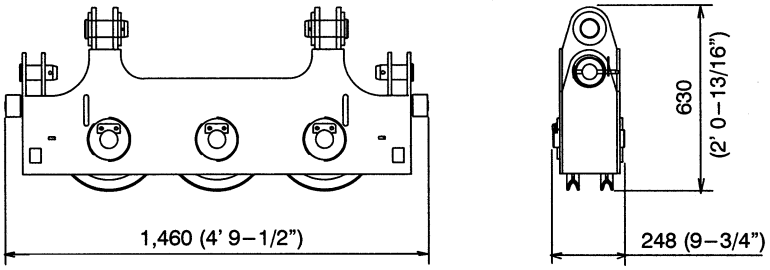
SAFETY

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)
Auxiliary sheave		145 (320)
Upper spreader		235 (518)

1.2.4 CKE800 STABILITY IN SWINGING AND TRAVELING

1. Without carbody weight

Attachment	Counterweight ton (lbs)	ALL-round swing		Propelling on slope	
		Crawler Extend	Crawler Retract	Forward	Backward
Without Attachment (Base machine only)	0	O	O	O	O
	9.0 (19,845) No.1 Only	O	X	X	O
	16.4 (36,160) No.1+No.2	X	X	X	O
	25.8 (56,890) No.1+No.2+No.3	X	X	X	O
With lower boom (Boom angle : 10 deg. or less)	0	O	O	O	O
	9.0 (19,845) No.1 Only	O	X	X	O
	16.4 (36,160) No.1+No.2	O	X	X	O
	25.8 (56,890) No.1+No.2+No.3	X	X	X	O
With base boom (Boom angle : 30 deg. or less)	0	O	O	O	O
	9.0 (19,845) No.1 Only	O	O	O	O
	16.4 (36,160) No.1+No.2	O	X	X	O
	25.8 (56,890) No.1+No.2+No.3	X	X	X	O

1. With carbody weight

Attachment	Counterweight ton (lbs)	ALL-round swing		Propelling on slope	
		Crawler Extend	Crawler Retract	Forward	Backward
Without Attachment (Base machine only)	0	O	O	O	O
	9.0 (19,845) No.1 Only	O	X	X	O
	16.4 (36,160) No.1+No.2	O	X	X	O
	25.8 (56,890) No.1+No.2+No.3	X	X	X	O
With lower boom (Boom angle : 10 deg. or less)	0	O	O	O	O
	9.0 (19,845) No.1 Only	O	X	O	O
	16.4 (36,160) No.1+No.2	O	X	X	O
	25.8 (56,890) No.1+No.2+No.3	X	X	X	O
With base boom (Boom angle : 30 deg. or less)	0	O	O	O	O
	9.0 (19,845) No.1 Only	O	O	O	O
	16.4 (36,160) No.1+No.2	O	X	X	O
	25.8 (56,890) No.1+No.2+No.3	O	X	X	O

O : Operation is available.

X : Operation is unavailable.

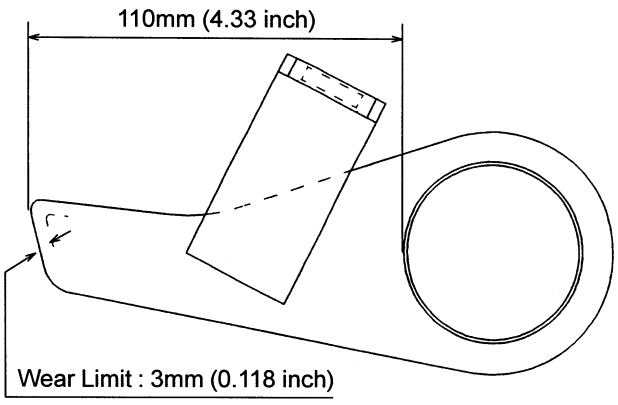


Fig.2-4 Pawl (GG82W01010P1)

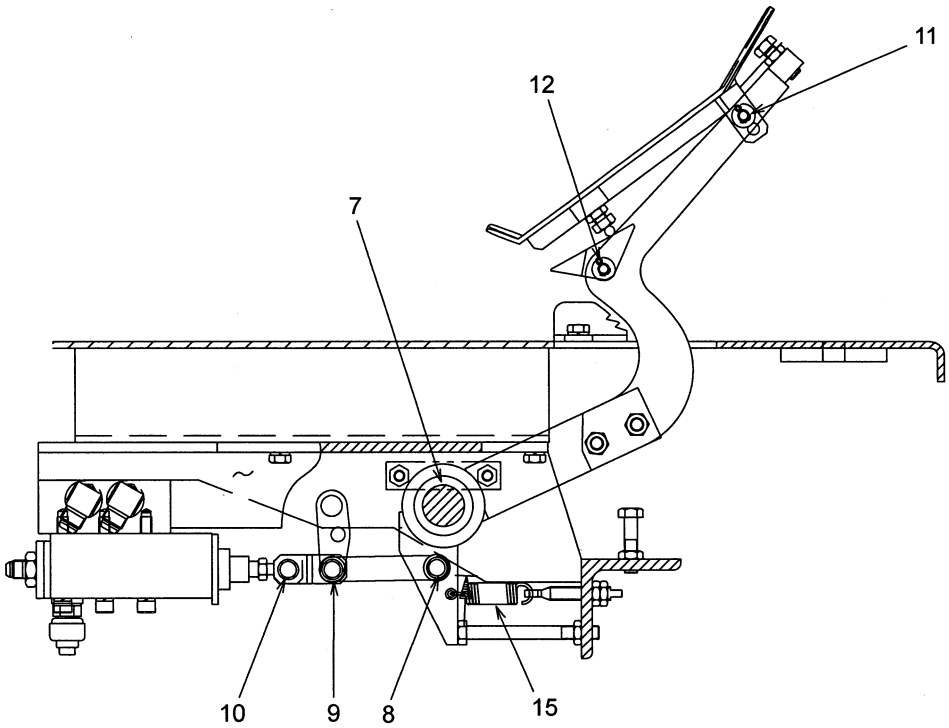


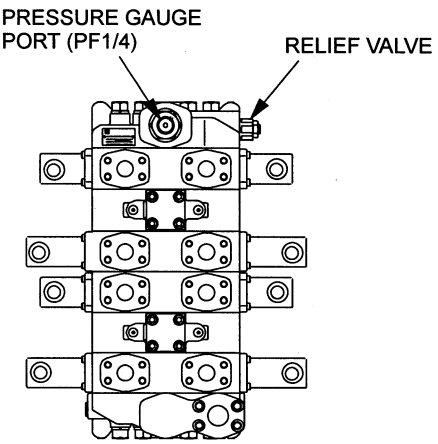
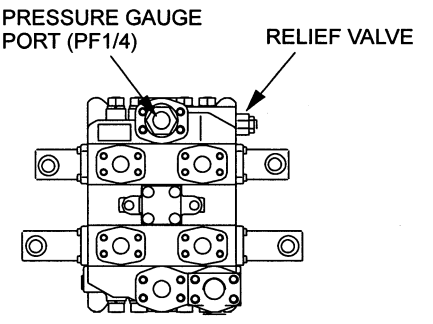
Fig.2-5 Brake Pedal

2.2.2 POINT AND METHOD OF MEASURING PRESSURE

Use a pressure gauge which has a surplus of more than 10 MPa (1450 psi) for pressures to be measured and which has passed the inspection.

Prior to pressure measurement, clean the port for pressure measurement so as to be free from oil and dust.

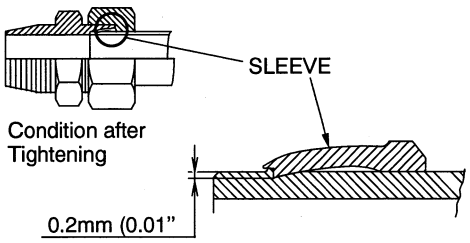
Connector and hose for measuring pressure.
Connector : GB03H01085P1
Hose : GG03H01068D1 (KPM004000001-20)

No.	Item	Test Condition	Test Procedure	Standard Value
1	Main • Propel Right • Boom • Rear Drum	• Engine revolution (min^{-1}) : High idling • Temperature of oil : 45 to 55°C (113 to 131°F)	1. Lower the rear drum hook onto the ground. 2. Lock the rear winch drum with the drum lock. 3. Set the mode selector switch (A) "TOWER" side. 4. Make the valve relieve by rear drum winch operation. 	31.9 MPa (4626 psi)
2	Main • Propel Left • Front Drum	• Engine revolution (min^{-1}) : High idling • Temperature of oil : 45 to 55°C (113 to 131°F)	1. Lower the front drum hook onto the ground. 2. Lock the front winch drum with the drum lock. 3. Set the mode selector switch (A) "TOWER" side. 4. Make the valve relieve by front drum winch lowering operation. 	31.9 MPa (4626 psi)

3.1.5 TIGHTENING TORQUE OF HYDRAULIC FITTINGS

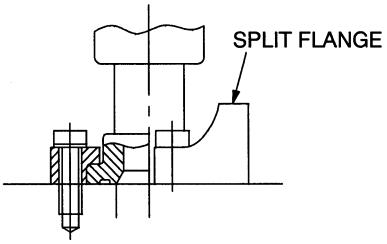
Excessive or insufficient tightening of hose or tube fittings can cause oil leak and deformation or damage to the metal fittings.
Therefore, to secure and obtain good fixing and performance of fittings it is necessary to tightin to the proper torque. The follows are the recommended torques.

1. BITE TYPE TUBE FITTINGS.

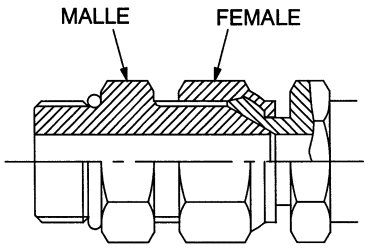
Size in mm (inch) (Outside diameter X thicknes	Tightening torque in kg-m (ft-lbs)	Remarks
10 (0.364) X 1.5 (0.059)	5 to 7 (36 to 51)	
15 (0.591) X 2.0 (0.079)	13 to 16 (94 to 116)	
18 (0.709) X 2.5 (0.098)	16 to 17 (116 to 123)	
22 (0.866) X 3.0 (0.118)	20 to 22 (145 to 159)	
28 (1.102) X 4.0 (0.157)	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 4-9, 4-10)

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 the pump side bolts (M20) to 500 to 618 N-m (368 to 455 ft-lbs) torque, the fan side bolts (M16) to 363 to 441 N-m (267 to 325 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 284 to 343 N-m (209 to 253 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

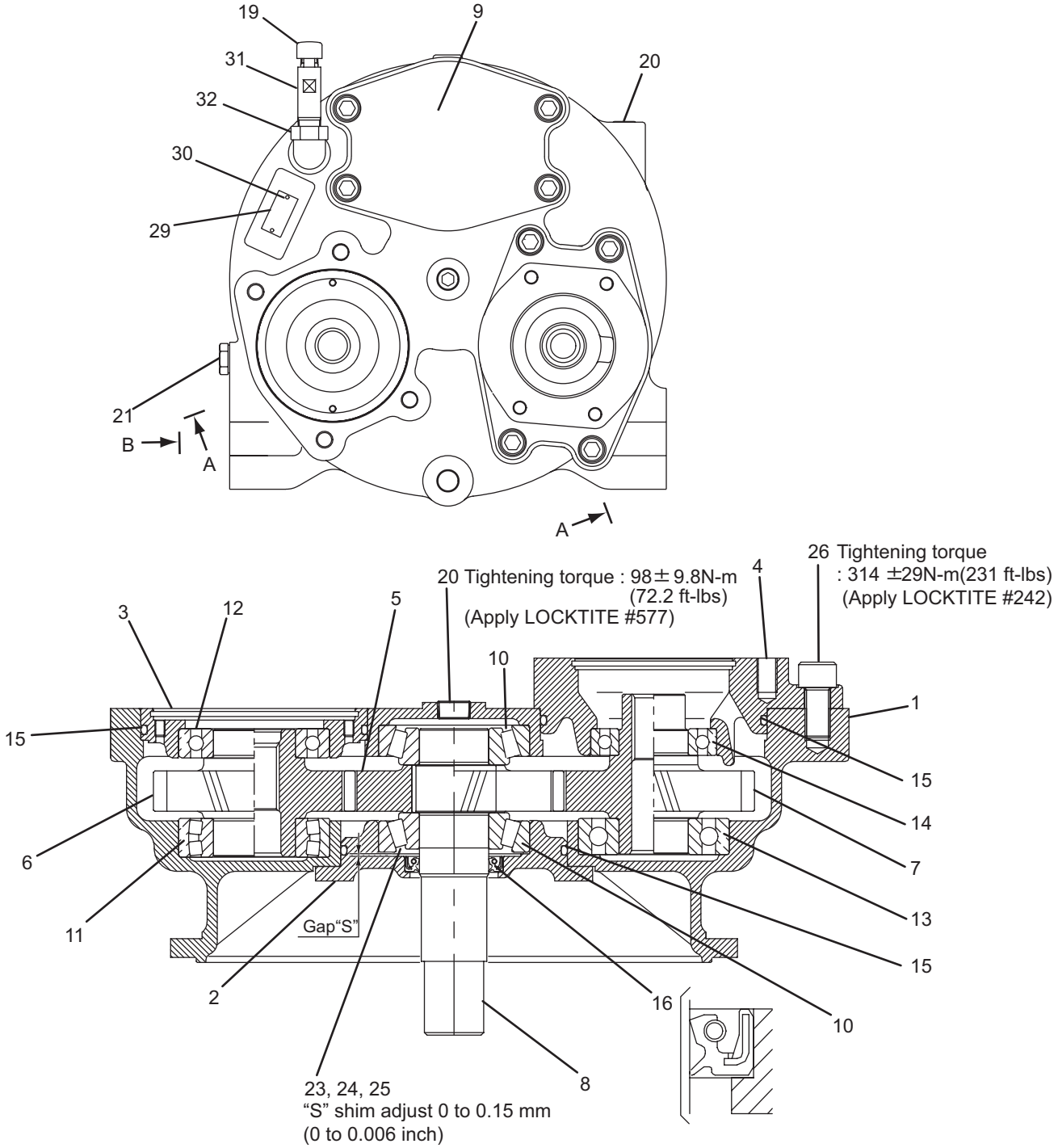
- **Do not bring a flame or spark close to the batteries.**
- **Since the battery electrolyte is dilute sulfuricacid, avoid battery acid contact with the skin, eyes, or clothing.**
  If accidentally contacted, immediately flush the area with water and consult a doctor immediately.
- **Wear eye glasses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

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

10. Install the air inlet hose and muffler.

11. Install hydraulic hoses to the hydraulic pumps.

Fig. 3-2 Power Divider (1/2)



SECTION A-A

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 : 252 ltr./min X 2 (66.5 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 (46.2 gals/min) Max. working Pressure : 27.5 MPa (3988 psi)	
4	Gear Pump	4-1 Control	Max. Delivery : 61.0 ltr./min (16.1 gals/min) Max. working Pressure : 7.0 MPa (1015 psi)	
		4-2 Gantry	Max. Delivery : 40 ltr./min (10.6 gals/min) Max. working Pressure : 20.6 MPa (2987 psi)	
5	Gear Pump [Option]	5-1 Brake cooling 5-2 Brake cooling	Max Delivery : 73 ltr./min X 2 (19.3 gals/min X 2)	
8	Motor (Front & Rear Drum)		Swash Plate Type, Variable Capacity Max. Oil Flow : 252 ltr./min (66.5 gals/min) Max. working Pressure : 31.9 MPa (4626 psi)	
9	Motor [Option] (Third Drum)		Swash Plate Type, Variable Capacity Max. Oil Flow : 252 ltr./min 66.5 gals/min) Max. working pressure 31.9MPa (4626 psi)	
10	Motor (Boom)		Bent Axis Type, Fixed Capacity Max. Oil Flow : 252 ltr./min (66.5 gals/min) Max. working pressure : 31.9 MPa (4626 psi)	
12	Motor (Swing)		Swash Plate Type, Fixed Capacity Max. Oil Flow : 175 ltr./min (46.2 gals/min) Max. working pressure : 27.5 MPa (3988 psi)	
13	Motor (Propel)		Swash Plate Type, Variable Capacity Max. Oil Flow : 252 ltr./min (66.5 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 : 252 ltr./min (66.5 gals/min) Set Pressure : 31.9 MPa (4626 psi)	
18	Control Valve		Max. Oil Flow : 252 ltr./min (66.5 gals/min) Set Pressure : 31.9 MPa (4626 psi)	
19	Control Valve [Option]		Max. Oil Flow : 252 ltr./min (66.5 gals/min) Set Pressure : 31.9 MPa (4626 psi)	
20	Control Valve (Swing)		Set Pressure : 27.5 MPa (3988 psi)	
22	Control Valve (Gantry)		Set Pressure	Up: 20.6 MPa (2987 psi) Down : 4.9 MPa (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)	

5.3 HYDRAULIC SYSTEM

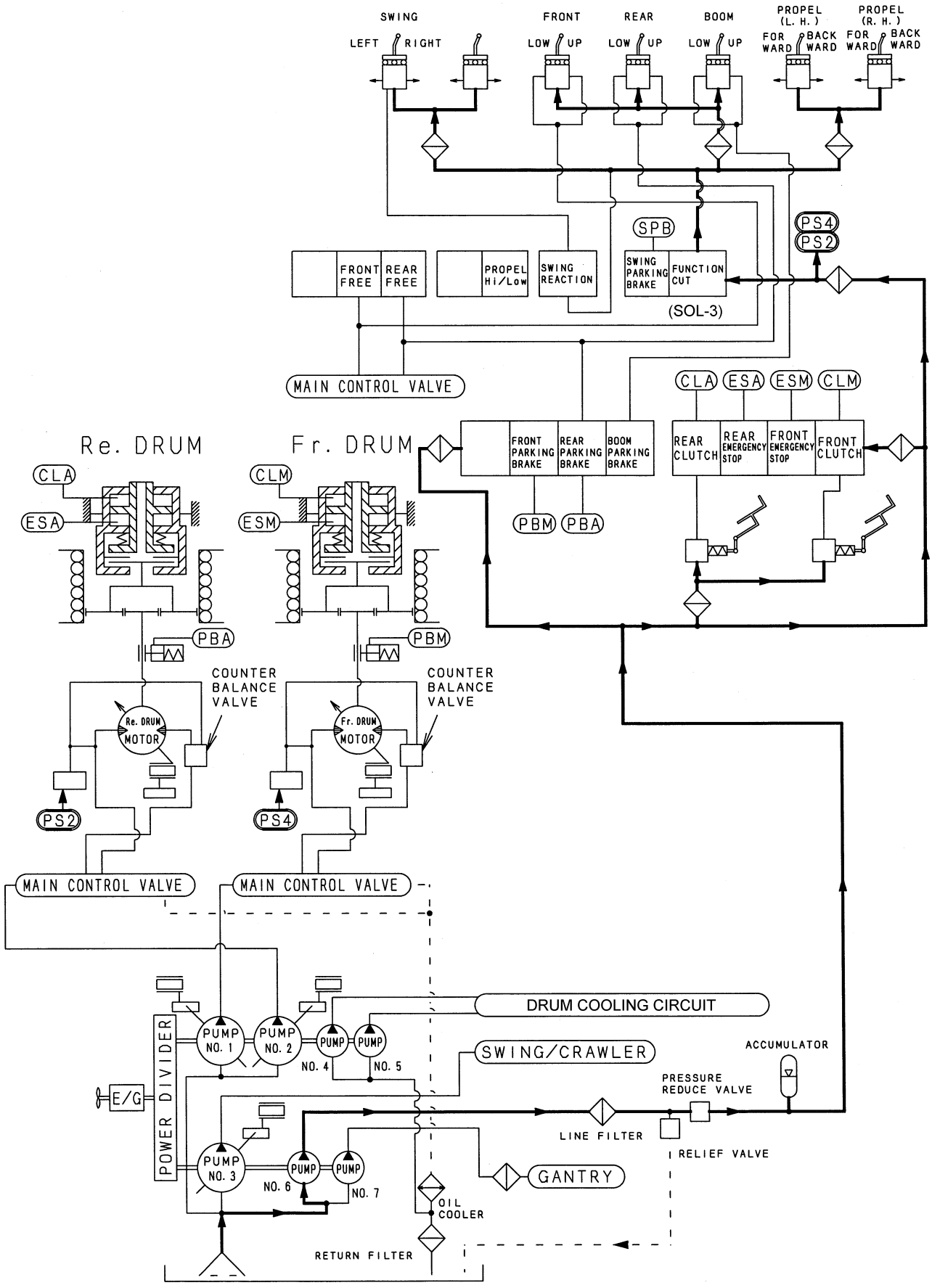
5.3.1 PREFACE

This chapter provides a general outline of the overall hydraulic system. For more detailed explanations of each circuit, please refer to the specific sections relating to each systems.

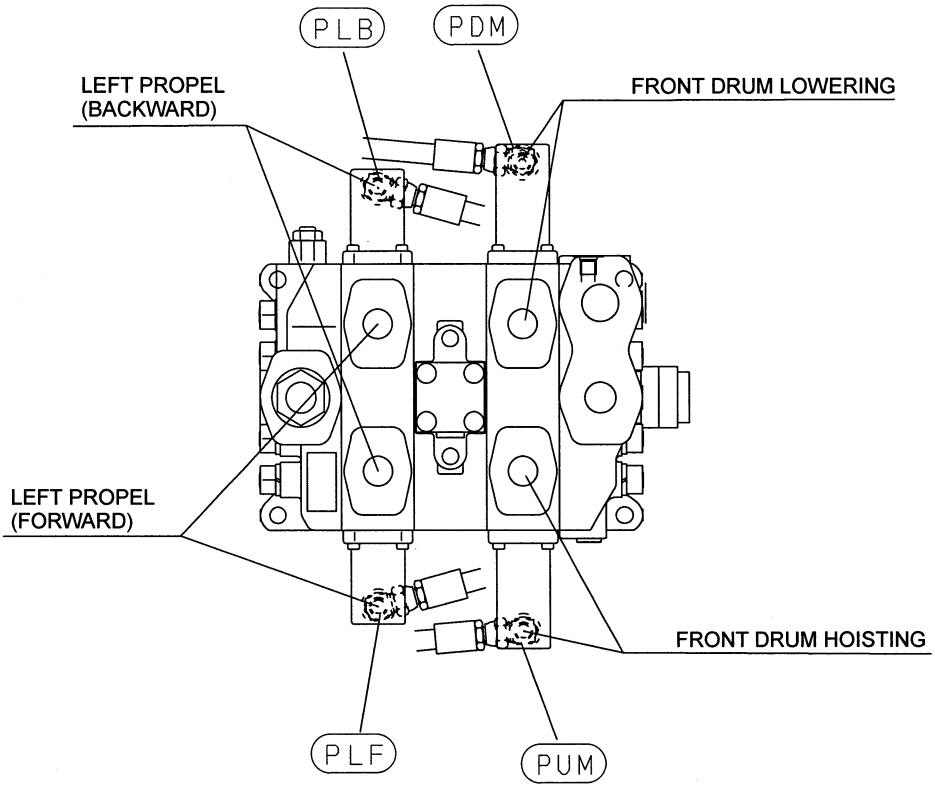
5.3.2 OUTLINE

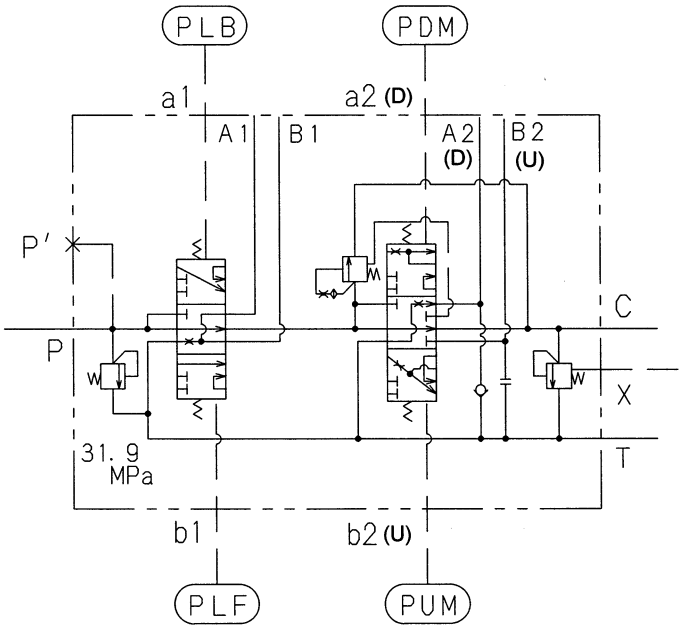
The pressurized hydraulic oil flowing through these circuits is supplied by seven pumps (three variable displacement, four fixed gear) installed on the power divider mounted directly on the engine. The tandem-mounted variable displacement double pump (main pump) powers the front and rear drums, the boom drum and the propel system. The other variable displacement single pump (mounted in tandem with the tandem gear double pump), powers the swing system and crawler Ext./Ret.
The tandem gear double pump directly connected to the main pump are provided for the main and aux. winch drum brake cooling system.
The inner pump of the tandem gear double pump directly connected to the swing pump are provided for controlling, while the other pump is provided for raising and lowering the gantry and counterweight removal cylinders.

Oil Flow From No.6 Pump (When the function lock lever is "work" position)

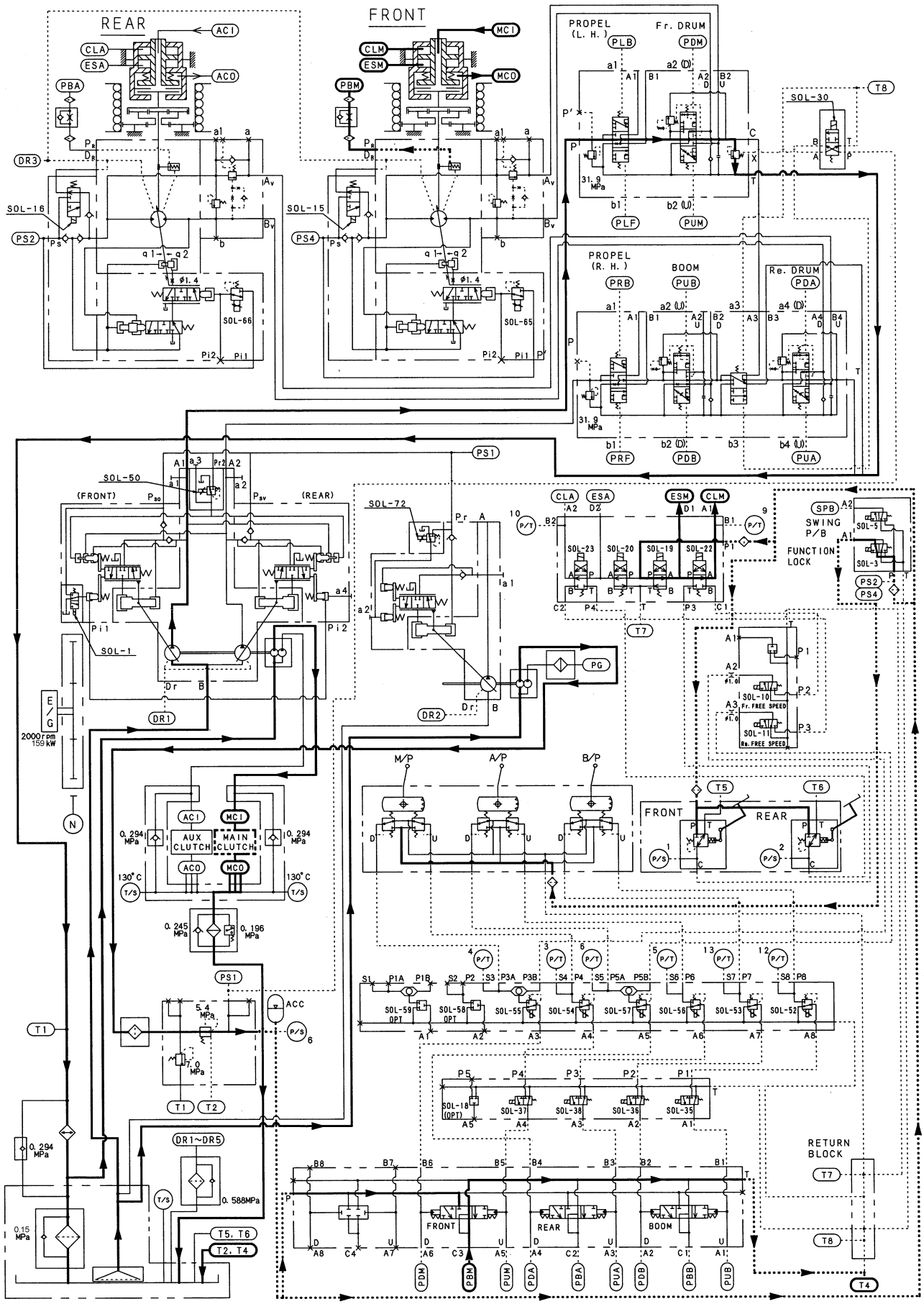


Main Control Valve (2-Section)





Holding


REAR
FRONT
PROPEL (L. H.)
Fr. DRUM
PROPEL (R. H.)
BOOM
Re. DRUM
SOL-16
SOL-15
SOL-66
SOL-65
SOL-30
SOL-50
SOL-72
SOL-1
SOL-23
SOL-20
SOL-19
SOL-22
SOL-10
Fr. FREE SPEED
SOL-11
Re. FREE SPEED
SWING P/B
FUNCTION LOCK
SOL-59
SOL-58
SOL-55
SOL-54
SOL-57
SOL-56
SOL-53
SOL-52
SOL-18 (OPT)
SOL-37
SOL-38
SOL-36
SOL-35
AUX CLUTCH
MAIN CLUTCH
RETURN BLOCK
DR1~DR5
2000rpm 159kW

6.2.7 FRONT DRUM/REAR DRUM HYD-CIRCUIT SELECTION

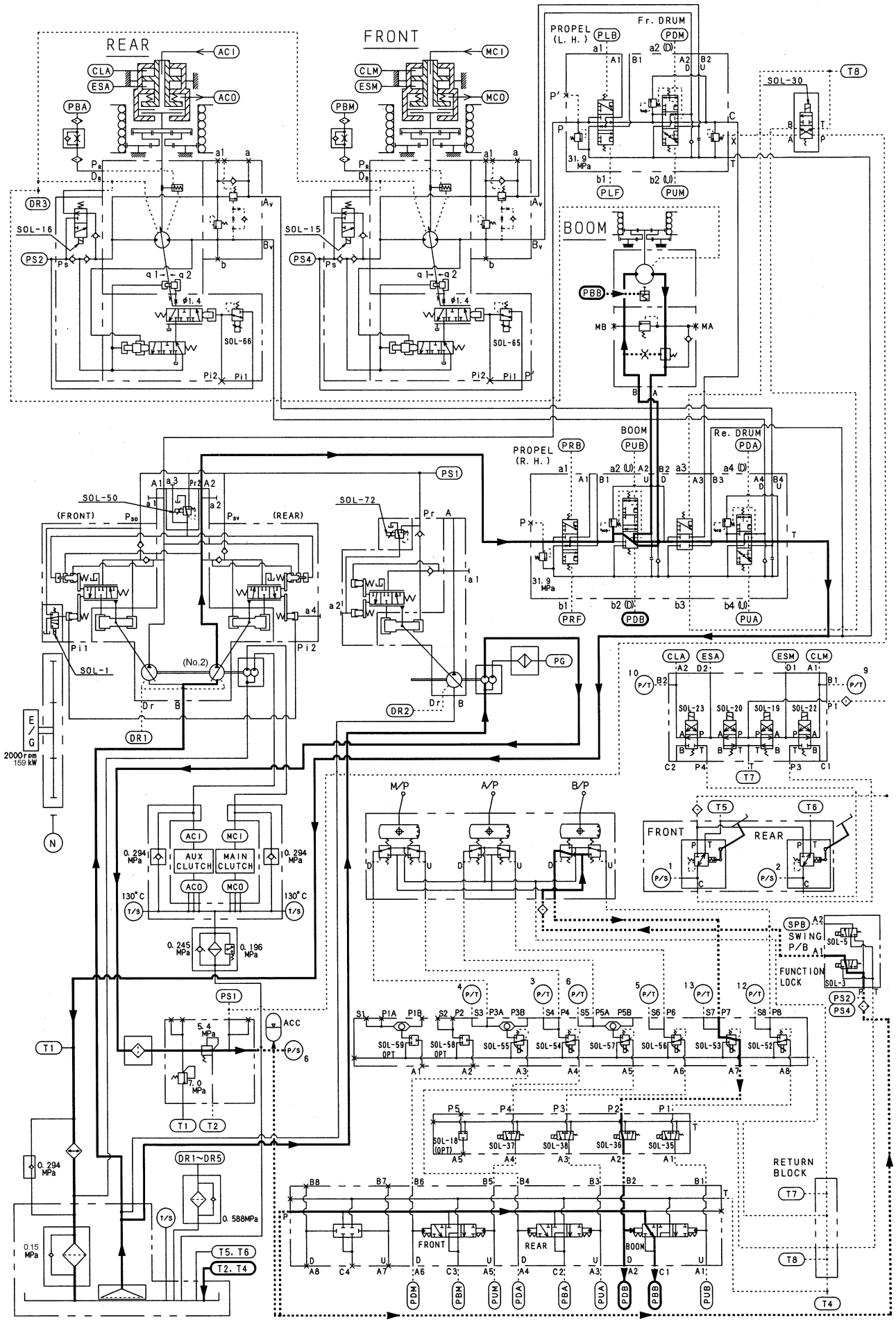
- When the "MODE SELECTOR SWITCH (A)" is set to the "TOWER" side
  Pressurized oil fed from the main pump (No.1) returns to the tank through the front drum section of the control valve.
  Pressurized oil from the main pump (No.2) also returns to the tank after going through the boom raising section and the rear drum section.
  Since the front drum circuit is separated from the boom raising circuit and the rear drum circuit in this way fluctuation in front drum speed decreases.
- When the "MODE SELECTOR SWITCH (A)" is set to the "CRANE" side
  When the mode selector solenoid valve (SOL30) is switched, pressurized oil moves the spool in the mode selector section of the main control valve through the mode selector solenoid valve. Pressurized oil fed from the main pump (No.1) passes through the front drum section in the front drum side control valve, and returns from the mode selector section to the tank line through the rear drum section. Oil from the main pump (No.2) also returns to the tank after going through the boom raising section.
  Since the front/rear drum circuit is separated from the boom raising circuit in this way, fluctuation in boom drum speed decreases.
  However, interference with speed will occur when both of the front and rear drums are simultaneously operated, since the front drum circuit and the rear drum circuit are related to each other.

Lever operation	Switch position	
	(TOWER)	(CRANE)
Simultaneous operation of boom hoisting and front drum	O	O
Simultaneous operation of boom hoisting and rear drum		O
Simultaneous operation of front and rear drums	O	

* Selection of the switch positions with O-marks shown in the table above leads to less shock due to fluctuation in speed that is generated when the single operation mode is shifted to the simultaneous operation mode.

7. BOOM HOIST SYSTEM

Lowering the Boom



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1. Method of bolt tightening

(1) Temporarily tighten two axisymmetrically bolts positioned in the lower frame with a tightening torque of 147 N-m (108 ft-lbs).

(2) Temporarily tighten two bolts, which are positioned 90 deg. apart from the bolts tightened in step (1), with a tightening torque of 147 N-m (108 ft-lbs).

(3) Similarly, tighten all the bolts, in pairs of axisymmetrically located two, with a tightening torque of 147 N-m (108 ft-lbs)

(4) Fully tighten all the bolts with a tightening torque of 1.94 kN-m (1430 ± 143 ft-lbs).

(5) Drive roll pins (code No. 4) in front and back (2 pos.) of the upper unit. Then, place it so that it fits to a bearing.

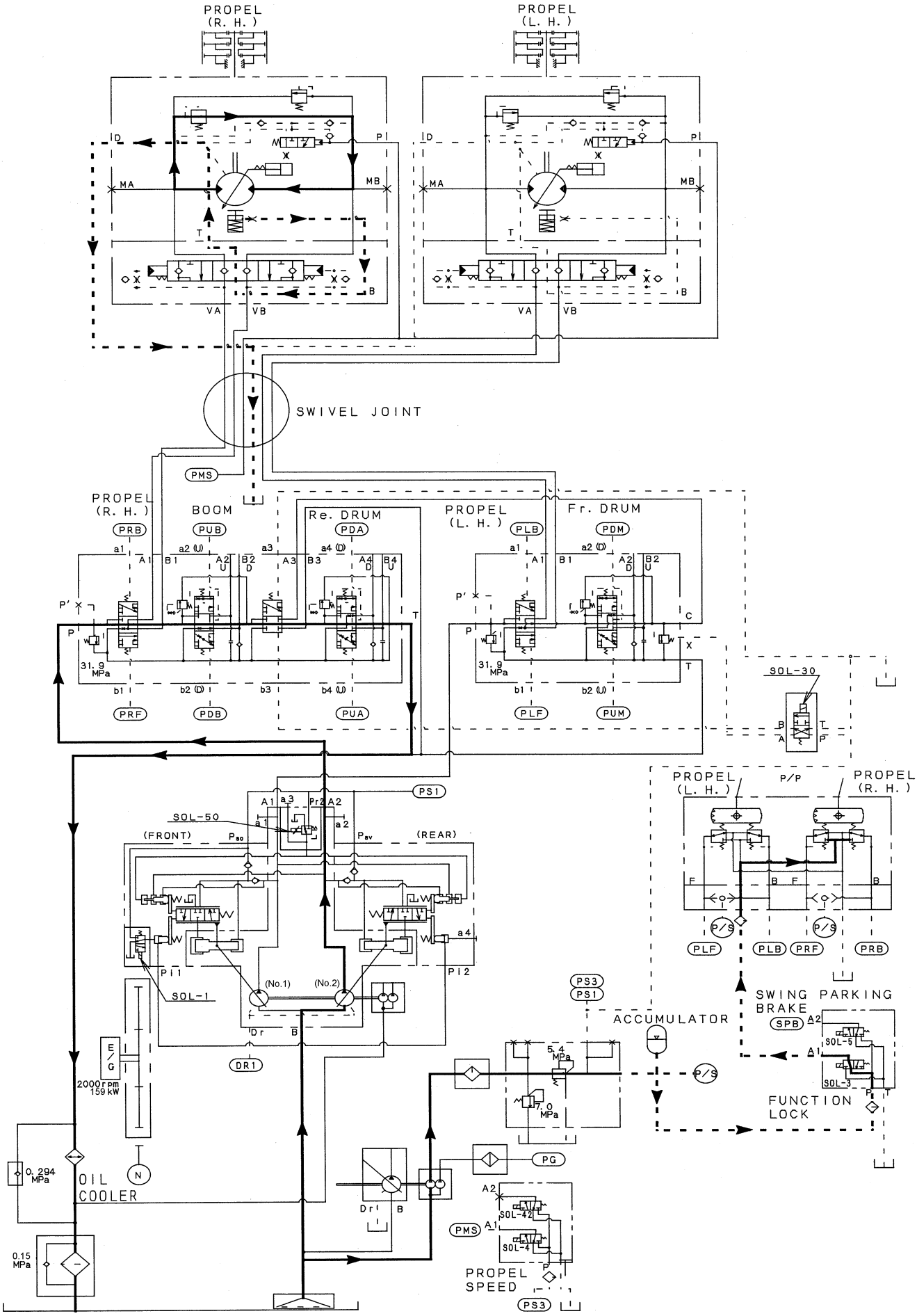
(6) Tighten the four bolts located on the front and rear sides of the swing frame with a tightening torque of 108 ft-lbs (147 N-m).

(7) Tighten axisymmetrically positioned bolts with a tightening torque of 147 N-m (108 ft-lbs).

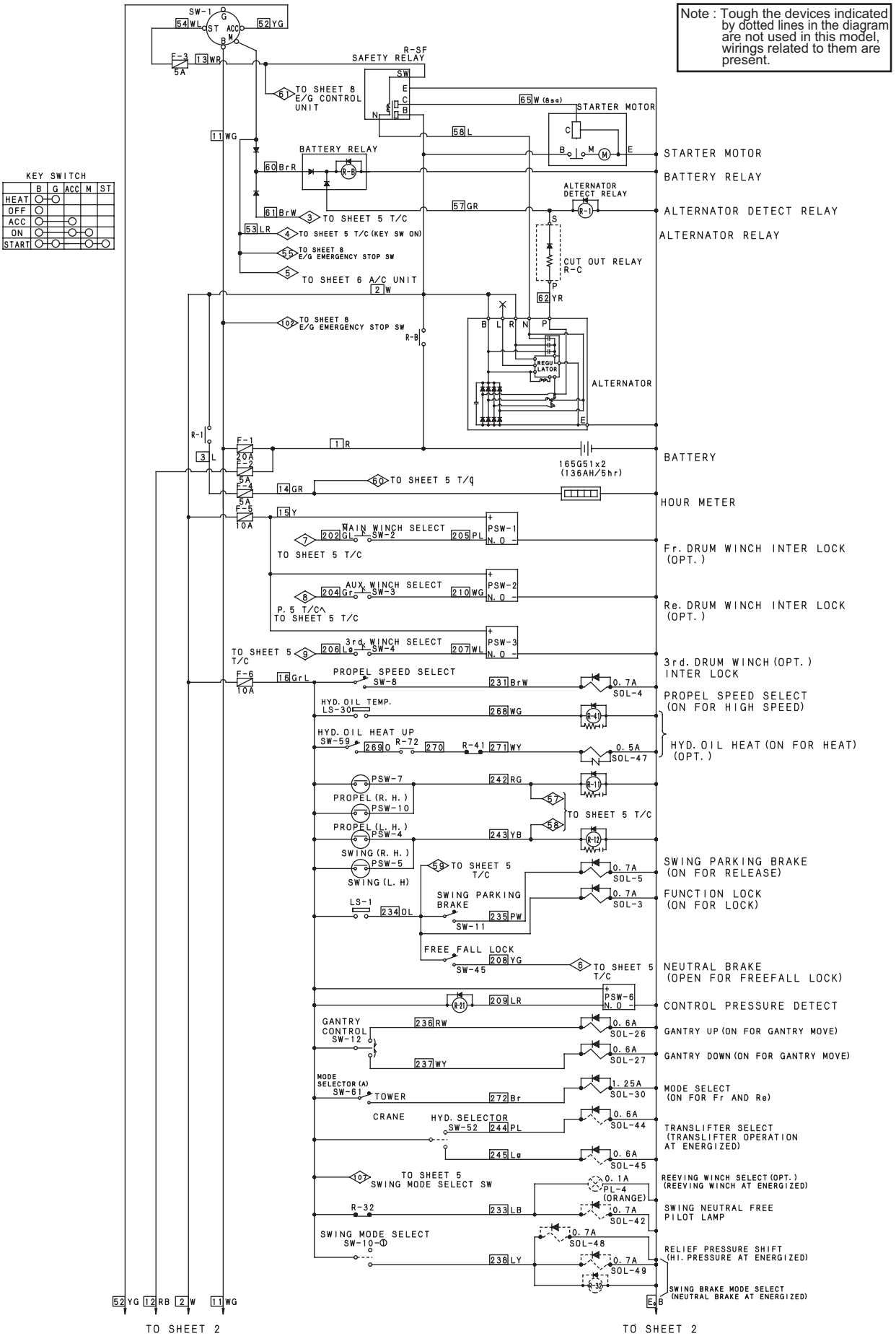
(8) Fully tighten all the bolts with a tightening torque of 1.37 kN-m (1011 ± 101 ft-lbs).

2. The bearing inside circle soft zone (S mark position) against the lower unit should be positioned as illustrated.
   Total weight of unit assembly: Approx. 740 kg (1632 lbs)

Propel stop hydraulic schematic



10.1 ELECTRICAL WIRING SCHEMATIC

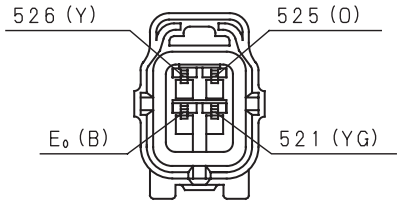


RELAY

R NO.	COIL LINE NO.	SHEET NO.	TERMINAL LINE NO.	TYPE	USE	SHEET NO.	KOBELCO PART NO.
R-39	115—E_0	2	569—570	N. O.	CRANE JIB OVERHOIST	3	GG24E00024F1
			577—578	N. O.	CRANE JIB OVERHOIST	3	
			189—E_0	N. O.	CRANE JIB OVERHOIST	3	
R-41	268—E_0	1	270—271	N. C.	HYD. OIL TEMP.	1	
R-42	107—E_0	2	197—E_0	N. O.	TOWER JIB HOOK OVERHOIST	3	
R-43	101—E_0	2	167—E_0	N. O.	CRANE MAIN HOOK OVERHOIST	3	
R-44	104—E_0	2	168—E_0	N. O.	CRANE AUX. HOOK OVERHOIST	3	
R-45	117—E_0	2	563—564	N. O.	HOOK OVERHOIST	3	
			570—138	N. O.	HOOK OVERHOIST	3	
			578—579	N. O.	HOOK OVERHOIST	3	
			581—582	N. O.	HOOK OVERHOIST	3	
			586—587	N. O.	HOOK OVERHOIST	3	
R-46	106—E_0	2	564—137	N. O.	TOWER JIB HOOK OVERHOIST	3	
			572—169	N. O.	TOWER JIB HOOK OVERHOIST	3	
			579—142	N. O.	TOWER JIB HOOK OVERHOIST	3	
R-47	18—136	3	103—117	N. O.	HOOK OVERHOIST RELEASE	2	
			106—107	N. C.	HOOK OVERHOIST RELEASE	2	
			106—103	N. O.	HOOK OVERHOIST RELEASE	2	
R-48	187—E_0	3	136—E_0	N. O.	SET UP MODE	3	
			136—110	N. C.	SET UP MODE	3	
			103—120	N. O.	SET UP MODE	2	
R-49	147—E_0	3	103—108	N. O.	SELF REMOVAL	2	
R-55	18—112	3	575—141	N. O.	BOOM OVERHOIST RELEASE	3	
R-56	120—E_0	2	560—561	N. O.	TOWER BOOM OVERHOIST LUFFING BOOM OVERHOIST (NO. 2)	3	
			565—567	N. O.	TOWER BOOM OVERHOIST LUFFING BOOM OVERHOIST (NO. 2)	3	
			573—574	N. O.	TOWER BOOM OVERHOIST LUFFING BOOM OVERHOIST (NO. 2)	3	
			551—552	N. O.	TOWER BOOM OVERHOIST LUFFING BOOM OVERHOIST (NO. 2)	2	
			119—E_0	N. O.	TOWER BOOM OVERHOIST LUFFING BOOM OVERHOIST (NO. 2)	3	
R-57	130—E_0	2	123—576	N. O.	STRUT RAISE OVERHOIST	3	
			583—584	N. O.	STRUT RAISE OVERHOIST	3	
			129—E_0	N. O.	STRUT RAISE OVERHOIST	3	
R-58	132—E_0	2	122—573	N. O.	STRUT LOWER OVERHOIST	3	
			587—588	N. O.	STRUT LOWER OVERHOIST	3	
			131—E_0	N. O.	STRUT LOWER OVERHOIST	3	

RELAY

R NO.	COIL LINE NO.	SHEET NO.	TERMINAL LINE NO.	TYPE	USE	SHEET NO.	KOBELCO PART NO.
R-59	584—E_0	3	476—477	N. O.	JIB/3rd. HOIST STOP	4	GG24E00024F1
R-60	588—E_0	3	432—435	N. O.	JIB/3rd. LOWER STOP	4	
R-62	143—E_0	3	113—151	N. C.	LUFFING SELECT	2	
			103—115	N. O.	LUFFING SELECT	2	
			146—582	N. O.	LUFFING SELECT	3	
			103—130	N. C.	LUFFING SELECT	2	
			103—132	N. C.	LUFFING SELECT	2	
			124—109	N. C.	LUFFING SELECT	2	
			103—108	N. O.	LUFFING SELECT	2	
			180—586	N. O.	LUFFING SELECT	3	
			586—587	N. C.	LUFFING SELECT	3	
R-65	171—E_0	2	18—173	N. C.	Fr. DRUM SELECT (CEN)	2	
			18—175	N. O.	Fr. DRUM SELECT (CEN)	2	
			135—560	N. O.	Fr. DRUM SELECT (CEN)	3	
R-66	172—E_0	2	173—174	N. C.	Re. DRUM SELECT (CEN)	2	
			139—565	N. O.	Re. DRUM SELECT (CEN)	3	
			121—571	N. O.	Re. DRUM SELECT (CEN)	3	
R-67	174—E_0	2	146—580	N. O.	3rd. DRUM SELECT (CEN)	3	
			180—585	N. O.	3rd. DRUM SELECT (CEN)	3	
R-68	184—E_0	2	175—176	N. O.	Fr. DRUM OVER PAY OUT (CEN)	2	
R-69	185—E_0	2	571—572	N. O.	Re. DRUM OVER PAY OUT (CEN)	3	
R-70	186—E_0	2	585—586	N. O.	3rd. DRUM OVER PAY OUT (CEN)	3	
R-71	176—E_0	2	352—329	N. O.	Fr. DRUM LOWER STOP	4	
R-72	267—E_0	5	269—270	N. O.	HYD. OIL HEAT UP	1	
R-73	480—E_0	4	311—310	N. O.	TOTAL CONTROLLER REDUNDANCY	4	
			311—312	N. C.	TOTAL CONTROLLER REDUNDANCY	4	
			314—E_0	N. O.	TOTAL CONTROLLER REDUNDANCY	4	
			314—315	N. C.	TOTAL CONTROLLER REDUNDANCY	4	
			317—316	N. O.	TOTAL CONTROLLER REDUNDANCY	4	
			317—318	N. C.	TOTAL CONTROLLER REDUNDANCY	4	
			320—E_0	N. O.	TOTAL CONTROLLER REDUNDANCY	4	
			320—321	N. C.	TOTAL CONTROLLER REDUNDANCY	4	



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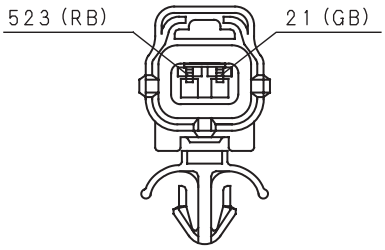

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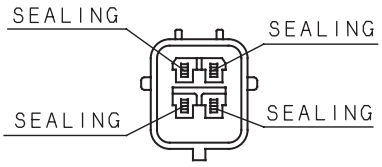

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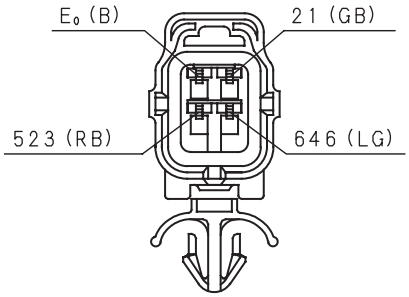

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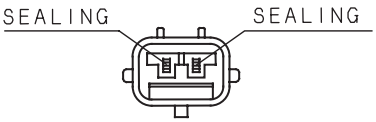

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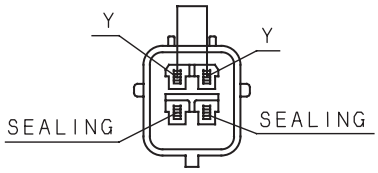

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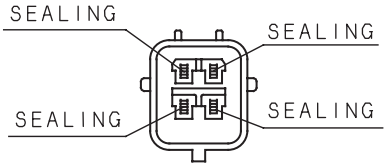

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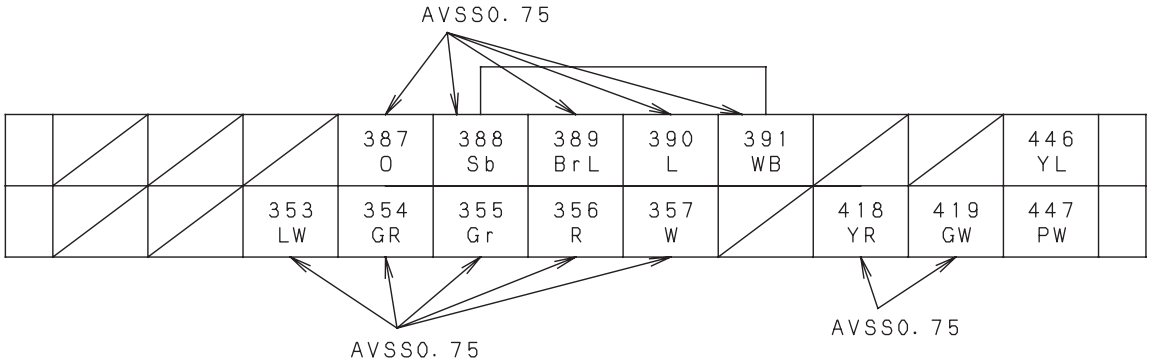

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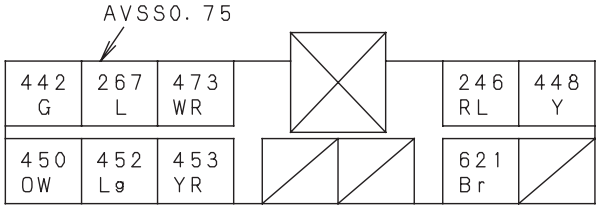

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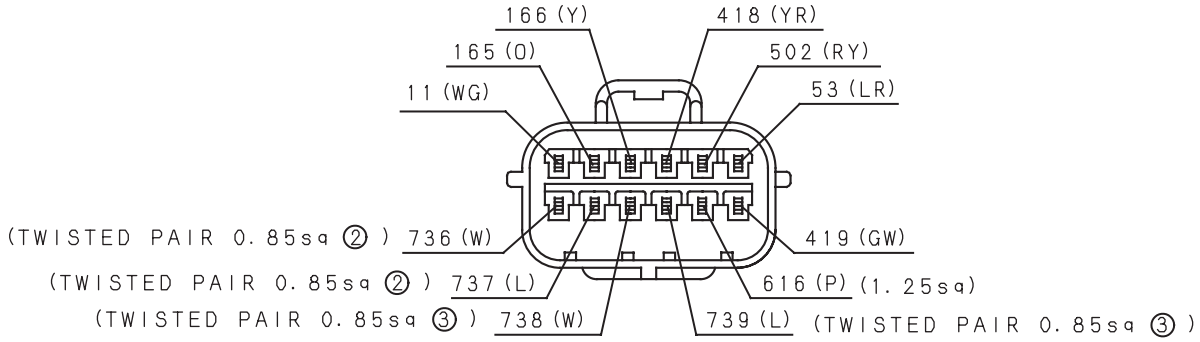

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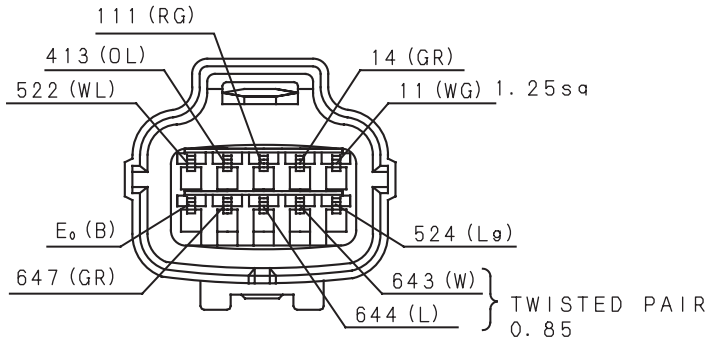

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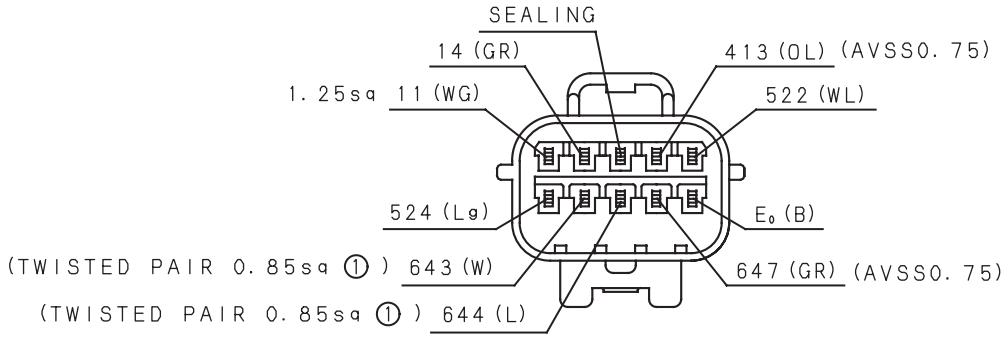

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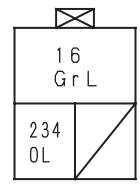

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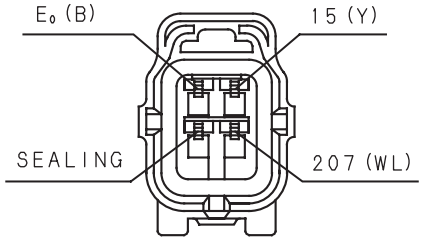

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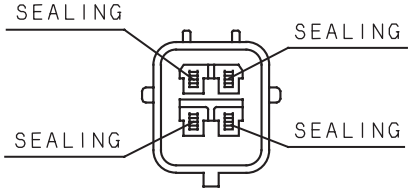

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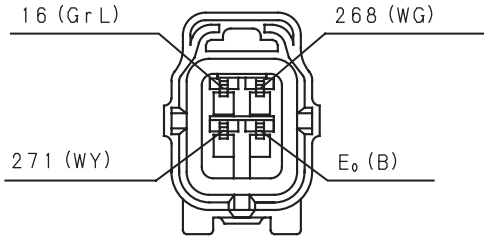

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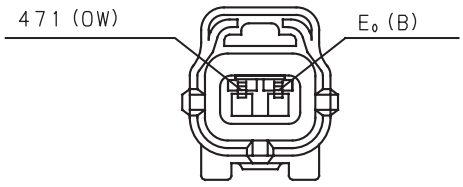

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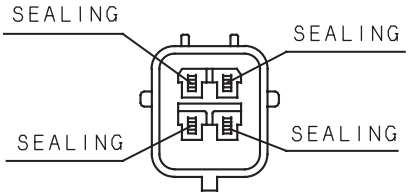

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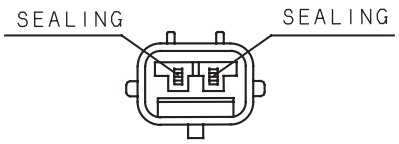

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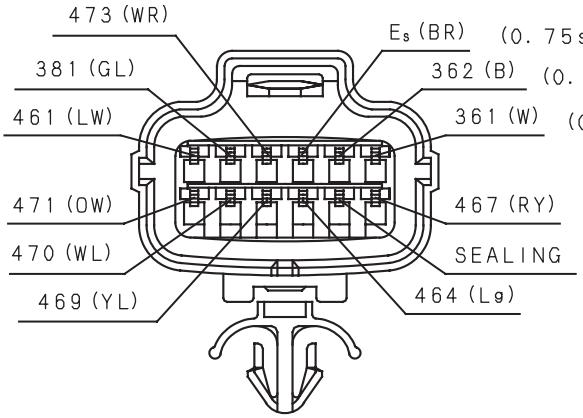

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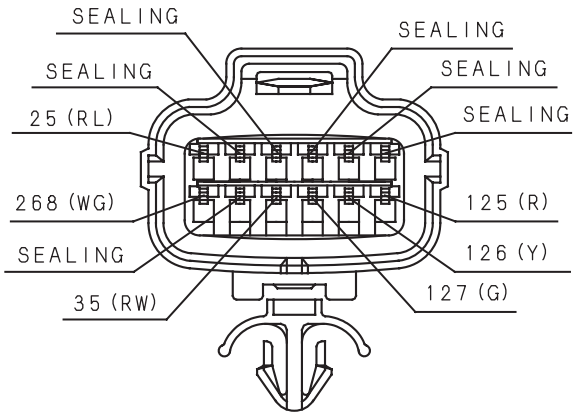

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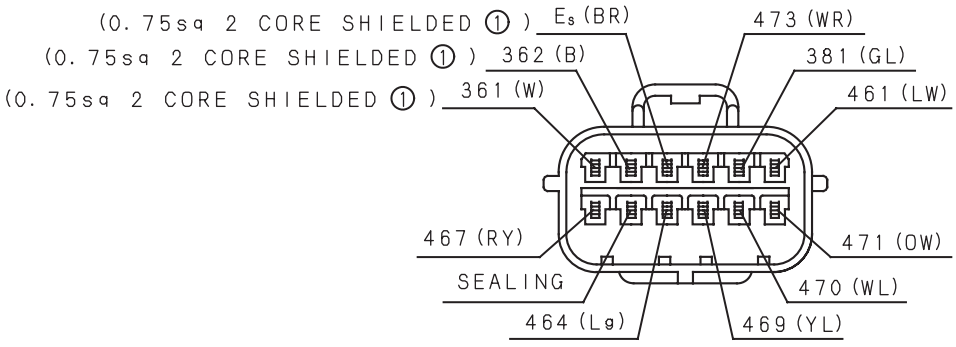

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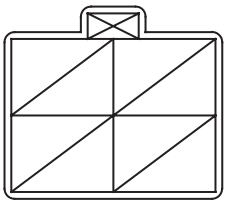

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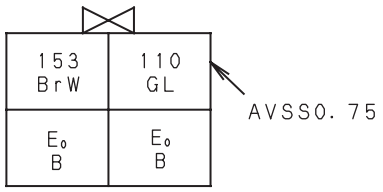

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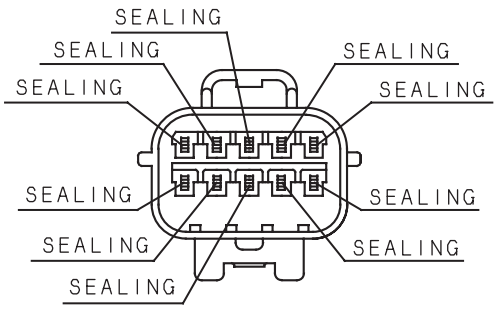

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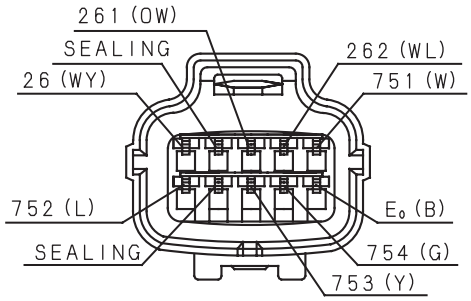

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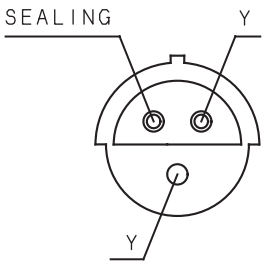

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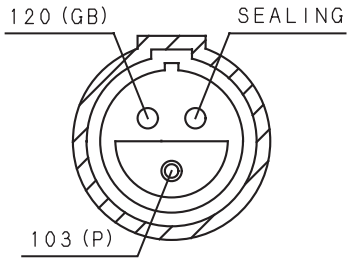

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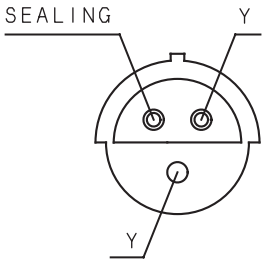

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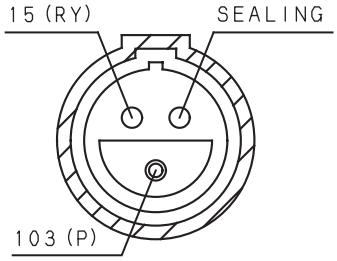

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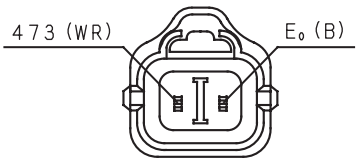

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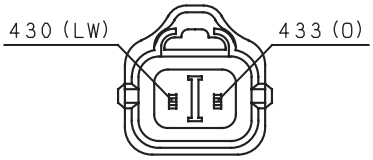

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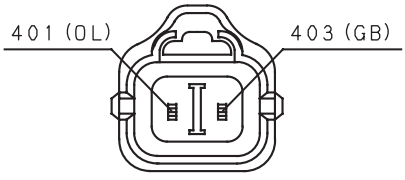

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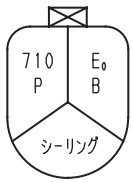

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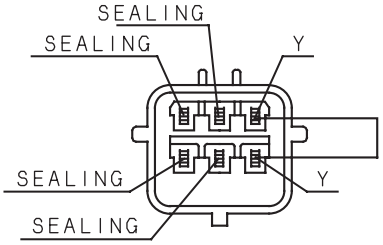

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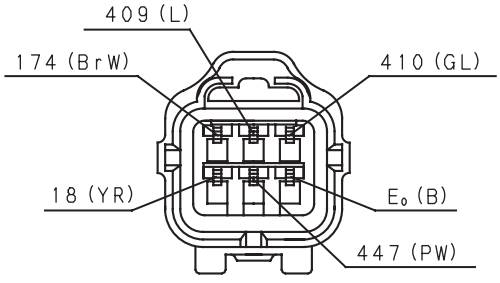

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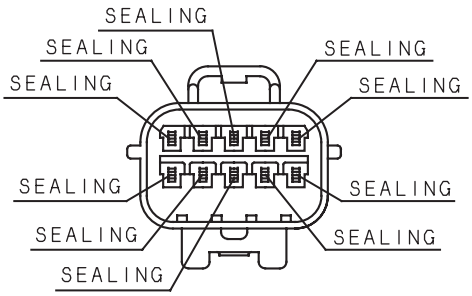

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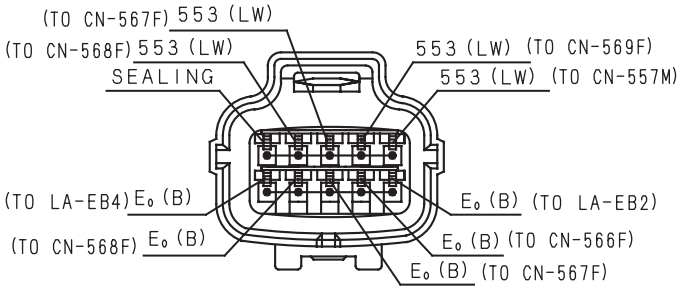

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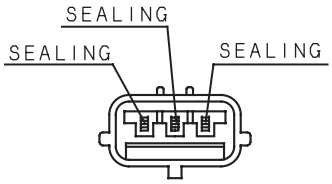

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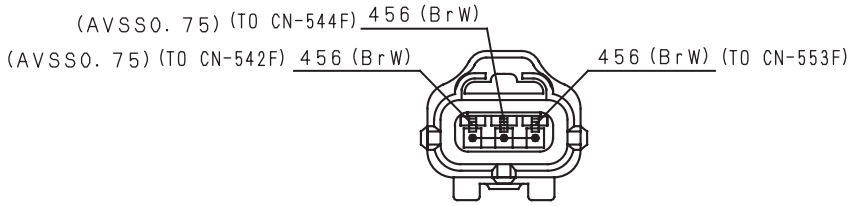

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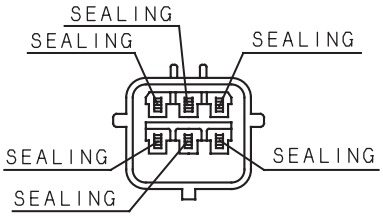

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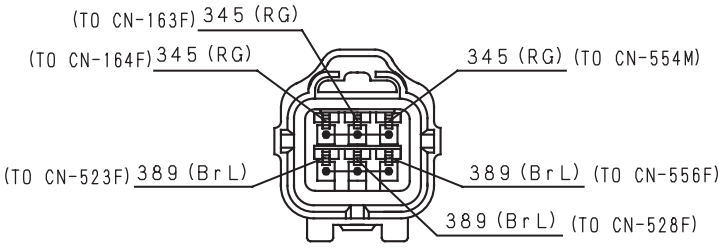
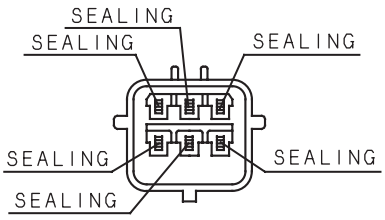
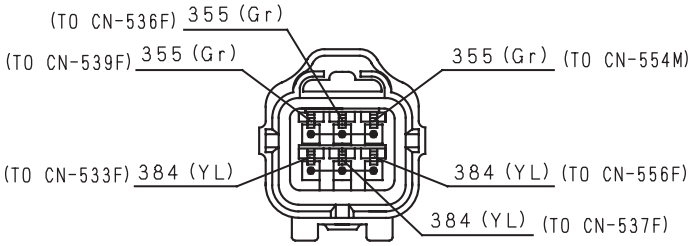


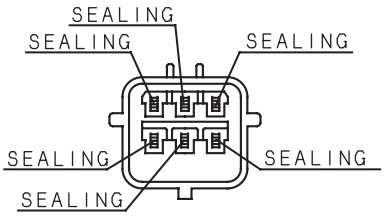
CN-J9F
(AVSS0. 75)



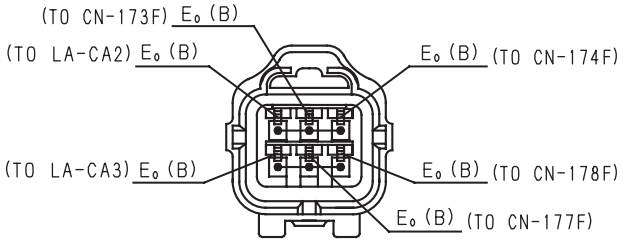
CN-J10M



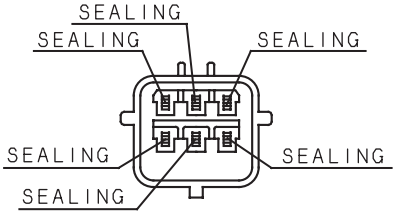
CN-J10F
(AVSS0. 75)



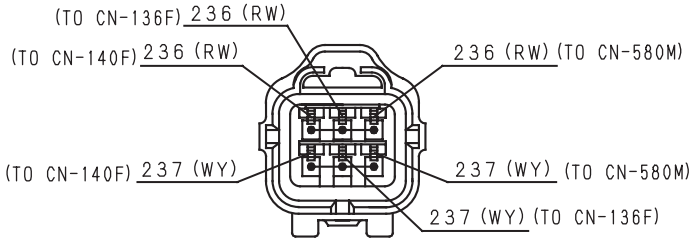
CN-J11M



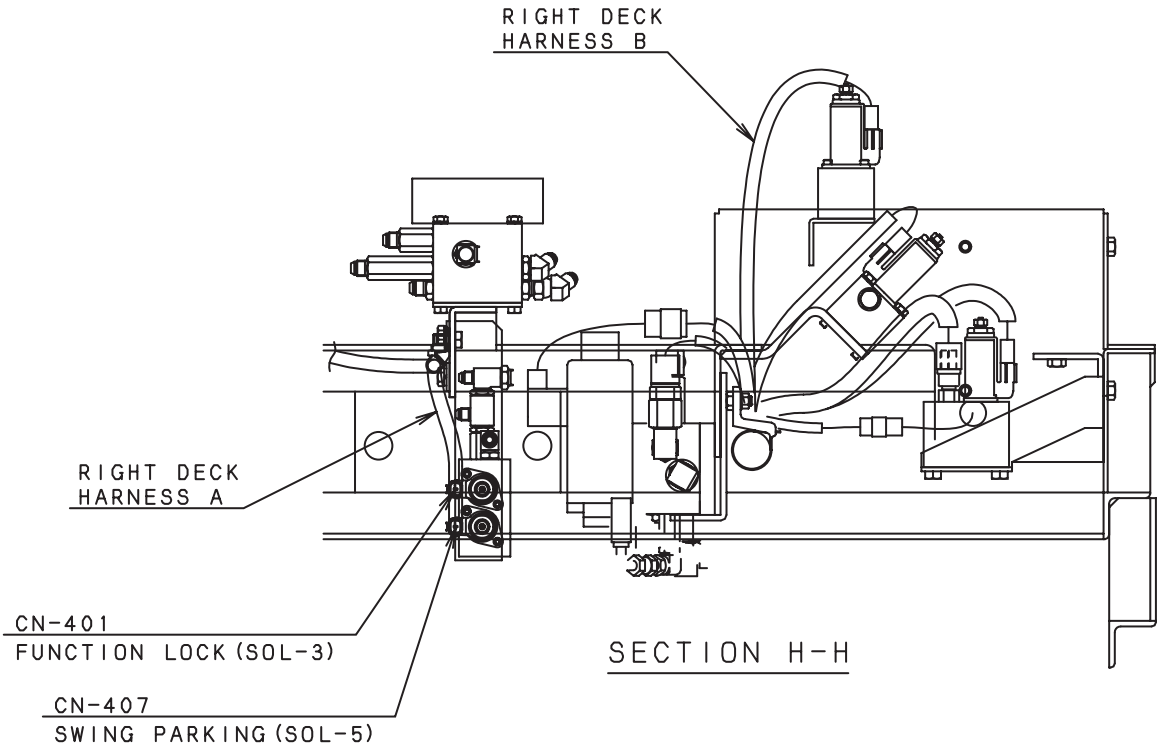
CN-J11F



CN-J12M



CN-J12F



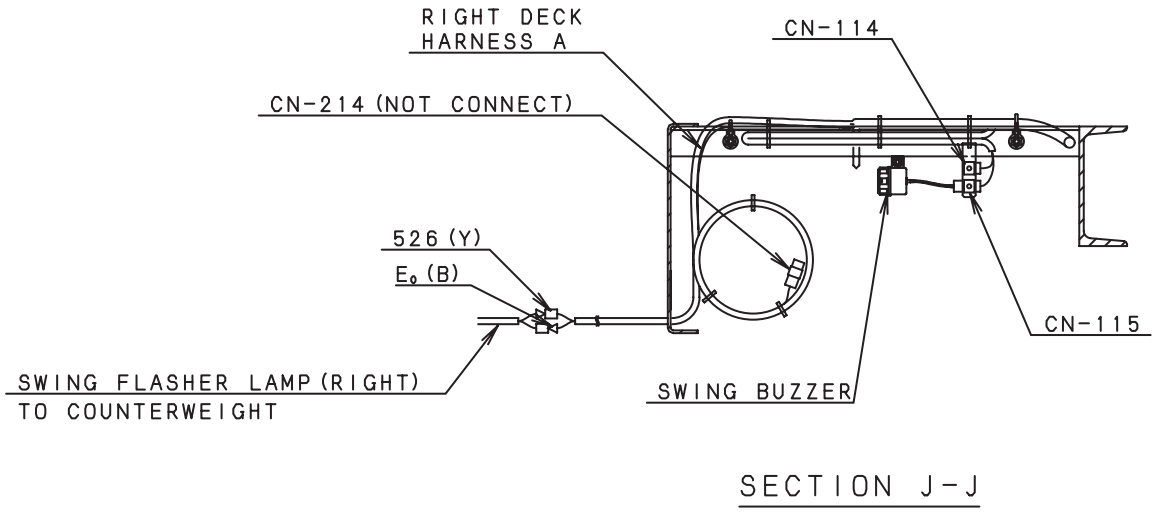
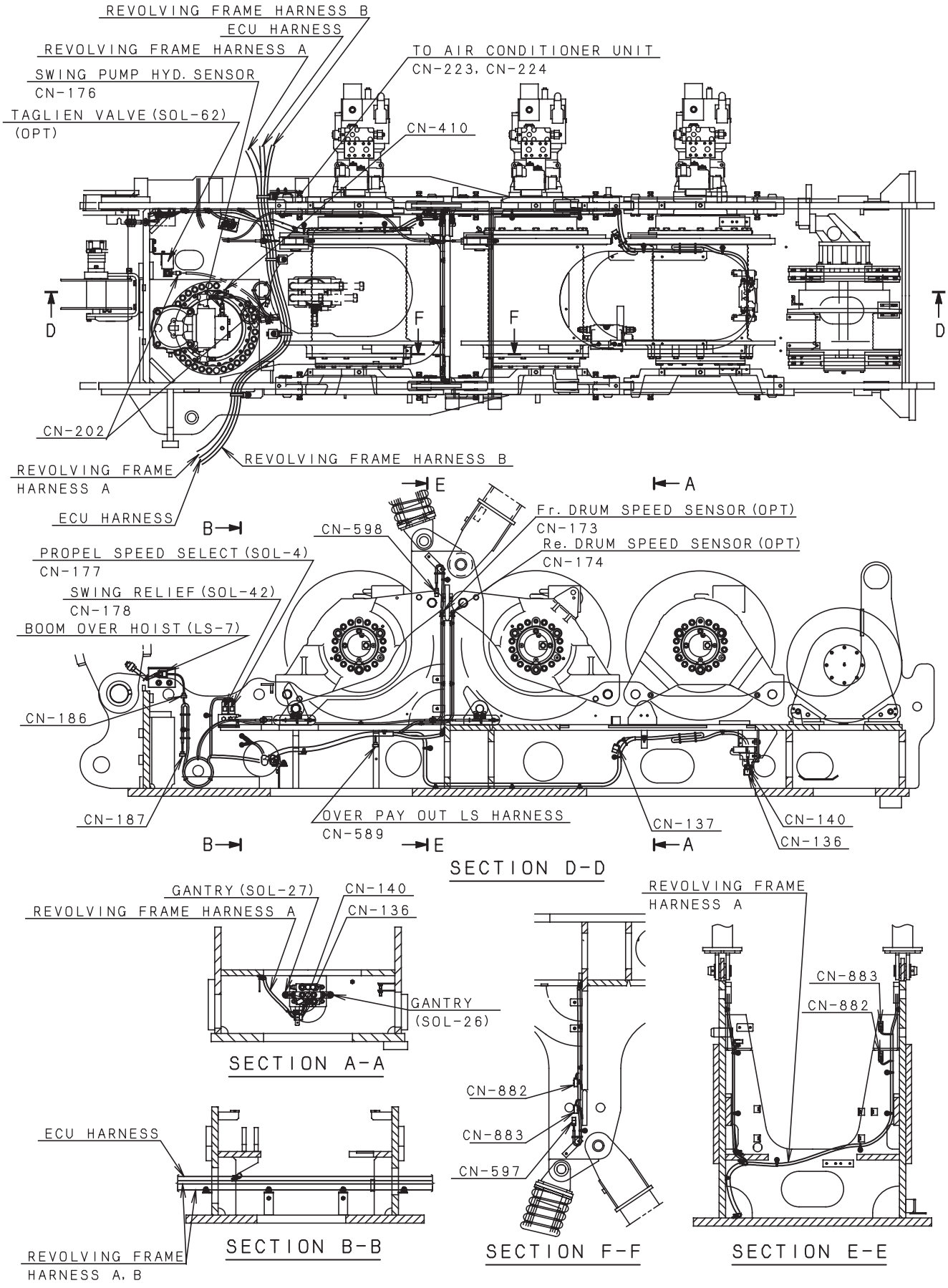


Fig.10-4 GG01E00071 (4/8)

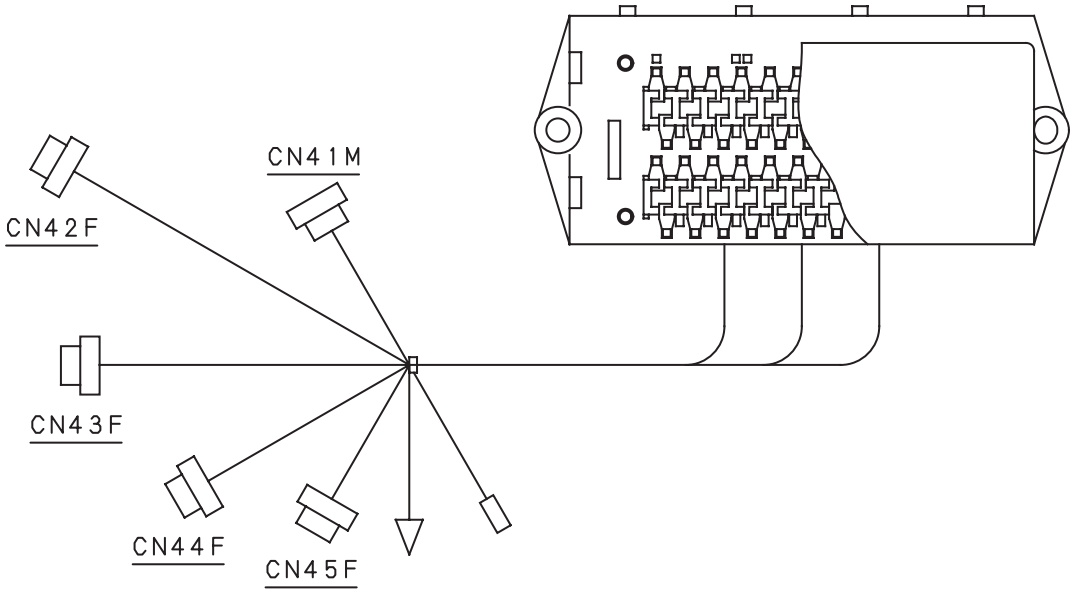
10.3.4 ELECTRICAL PART OF REVOLVING FRAME

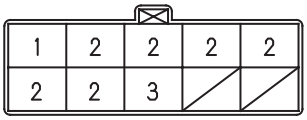


10.4.2 FUSE BOX (GG73E00004F1)

DANGER

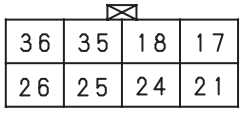
1. **In the case that a same fuse is frequently burnt out, it is considered that burning out of the fuse may be due to some fault in the electric circuit and it is not yet repaired. In such case, absolutely do not replace the burnt fuse simply with a fuse over the specified capacity. This could cause damage to the wiring and electrical apparatus.**
2. **In the above case, or when installing a new optional apparatus, be sure to consult the service shop of our representative. They will make a proper treatment or give a proper instruction.**
3. **When replacing the fuse with a new one, be sure to turn the key switch off.**





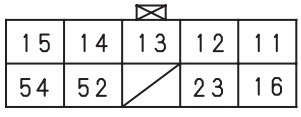
CN41M

Connector No. 7122-2107
(YAZAKI)



CN42F

Connector No. 7123-2186
(YAZAKI)



CN43F

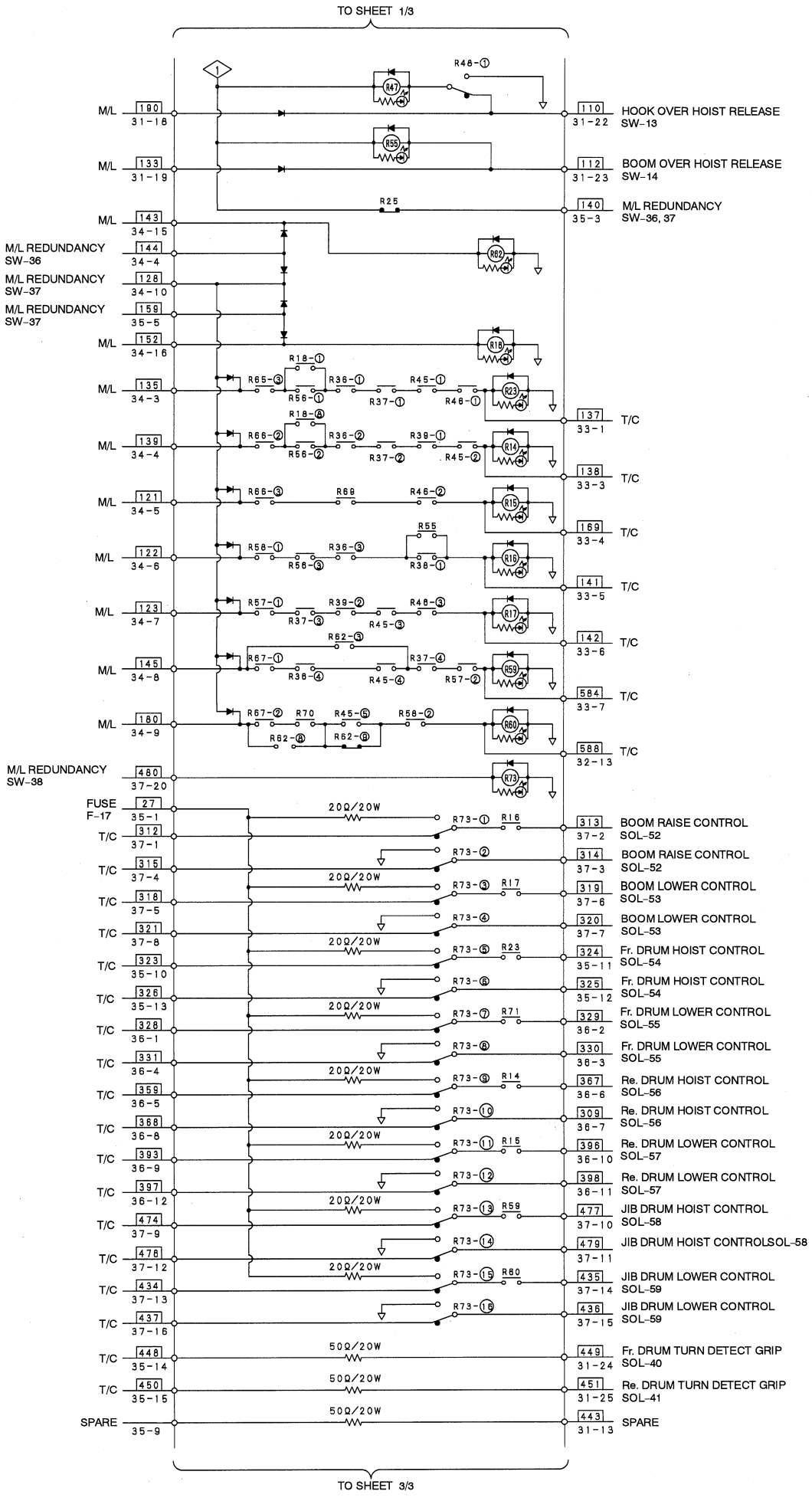
Connector No. 7123-2107
(YAZAKI)

CN44F

Connector No. 7123-2237
(YAZAKI)

CN45F

Connector No. 7123-2228
(YAZAKI)


TO SHEET 1/3
M/L 190 31-18
M/L 133 31-19
M/L 143 34-15
M/L REDUNDANCY SW-36 144 34-4
M/L REDUNDANCY SW-37 128 34-10
M/L REDUNDANCY SW-37 159 35-5
M/L 152 34-16
M/L 135 34-3
M/L 139 34-4
M/L 121 34-5
M/L 122 34-6
M/L 123 34-7
M/L 145 34-8
M/L 180 34-9
M/L REDUNDANCY SW-38 480 37-20
FUSE F-17 27 35-1
T/C 312 37-1
T/C 315 37-4
T/C 318 37-5
T/C 321 37-8
T/C 323 35-10
T/C 326 35-13
T/C 328 36-1
T/C 331 36-4
T/C 359 36-5
T/C 368 36-8
T/C 393 36-9
T/C 397 36-12
T/C 474 37-9
T/C 476 37-12
T/C 434 37-13
T/C 437 37-16
T/C 448 35-14
T/C 450 35-15
SPARE 35-9
110 31-22 HOOK OVER HOIST RELEASE SW-13
112 31-23 BOOM OVER HOIST RELEASE SW-14
140 35-3 M/L REDUNDANCY SW-36, 37
137 33-1 T/C
138 33-3 T/C
169 33-4 T/C
141 33-5 T/C
142 33-6 T/C
584 33-7 T/C
588 32-13 T/C
313 37-2 BOOM RAISE CONTROL SOL-52
314 37-3 BOOM RAISE CONTROL SOL-52
319 37-6 BOOM LOWER CONTROL SOL-53
320 37-7 BOOM LOWER CONTROL SOL-53
324 35-11 Fr. DRUM HOIST CONTROL SOL-54
325 35-12 Fr. DRUM HOIST CONTROL SOL-54
329 36-2 Fr. DRUM LOWER CONTROL SOL-55
330 36-3 Fr. DRUM LOWER CONTROL SOL-55
367 36-6 Re. DRUM HOIST CONTROL SOL-56
309 36-7 Re. DRUM HOIST CONTROL SOL-56
396 36-10 Re. DRUM LOWER CONTROL SOL-57
398 36-11 Re. DRUM LOWER CONTROL SOL-57
477 37-10 JIB DRUM HOIST CONTROL SOL-58
479 37-11 JIB DRUM HOIST CONTROLSOL-58
435 37-14 JIB DRUM LOWER CONTROL SOL-59
436 37-15 JIB DRUM LOWER CONTROL SOL-59
449 31-24 Fr. DRUM TURN DETECT GRIP SOL-40
451 31-25 Re. DRUM TURN DETECT GRIP SOL-41
443 31-13 SPARE
20Ω/20W
50Ω/20W
TO SHEET 3/3

SAE code	System	Diagnosis code	Function	Check lamp On	Failure criteria	Recovery timing	Injection amount restriction	Action to engine	EGR control	Remarks
P0540	Vehicle system	25	Preheating unit failure	○		Immediate	No limitation	Do not stop	Continue	
P0686	Vehicle system	5	Main relay failure	○		Immediate	No limitation	Do not stop	Continue	
P0219	Vehicle system	7	Engine overrunning	○	At 130% rating	Immediate	No limitation	Do not stop	Continue	
P0617	Vehicle system	45	Starter switch failure	○		Immediate	No limitation	Do not stop	Continue	

＊How to output the diagnosis codes

1.SAE code：The code is output when the failure is checked by the failure diagnosis. Failure code is displayed per present and past cases. Past failures can be deleted only with the failure diagnosis tool.

2.Diagnosis code：Blinking times of the engine check lamp is checked. Only the present error is displayed.(Past failures cannot be viewed.)

Note:

When the diagnosis switch is turned OFF (User mode) to check the lighting status of the engine check lamp, the check lamp lights on when the “diagnosis output” failure as mentioned above took place.When the diagnosis switch is turned ON, the 2-digit code is displayed by the check lamp’ s blinking condition.In this case, if no error is generated, the lamp blinks continuously to show that the status is normal.

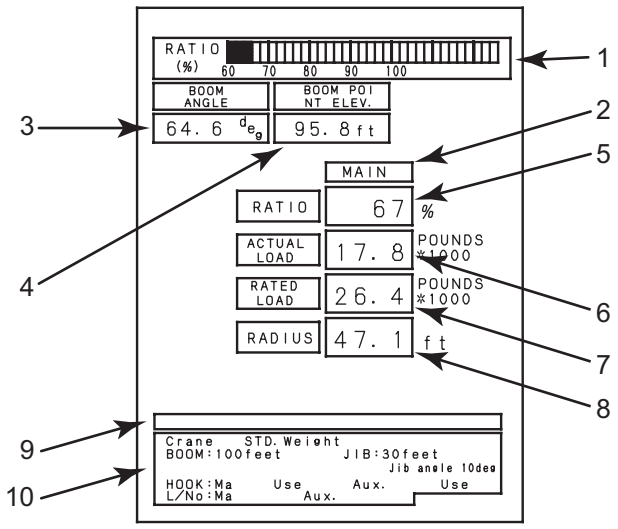
Note

1. Buzzers warning overhoist
   Buzzers warning boom overhoist are issued when the limit switch is actuated. Buzzers warning hook overhoist are issued when the limit switch is actuated to stop the hook blocks, and the winch lever is set to the "WINCH" position or the boom lever is set to the "LOWER" position.
   (No warning buzzer is issued while the levers are set to the "NEUTRAL" positions.)
2. Buzzers warning working area limit
   Unless the prenotice point is set, warning buzzers are issued when the boom reaches the position 5 degree before or 1 feet or 1 m before the stop point.

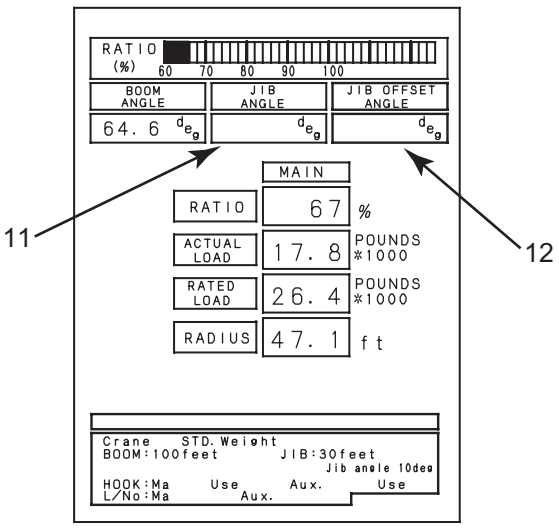
11.1.4 DETAILS OF INDICATORS ON MAIN DISPLAY SCREEN

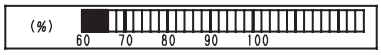
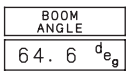
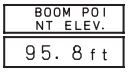
(IN CASE OF CK series)

CRANE TYPE



LUFFING TYPE



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 	After the ⇨ switch is pressed and the "MAIN" or the "AUX." mode is selected, the selected mode is indicated.
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 feet. When it is in the range from 100 to 999 feet or in the range from -99 to 10 m, it is indicated by the 1.0 feet. You can choose whether this item should be displayed or not. (Refer to "3.5.1 SETTING SCREEN" of the operation manual)
5	Moment ratio indicator (digital indicator) 	Moment ratio is indicated from 0 to 200% by the 1 %.

11.2 PREPARATION FOR USE

Prior to installation, be sure to correctly identify and verify all the connecting lines, then connect them to the CN11M to CN18M connectors, on the back of the unit. (The CN-12BM and CN-14M are not connected. Refer to page 11-19)

11.5.1 SIGNAL CHECK

Statuses of signals input from the sensors and limit switches or those of automatic stop signal output can be checked.

On the "STATUS CHECK" screen, move the cursor ⇨ onto the "INPUT AND OUTPUT SIGNAL CONDITION", and press the SET switch. Then, the screen shown below appears.

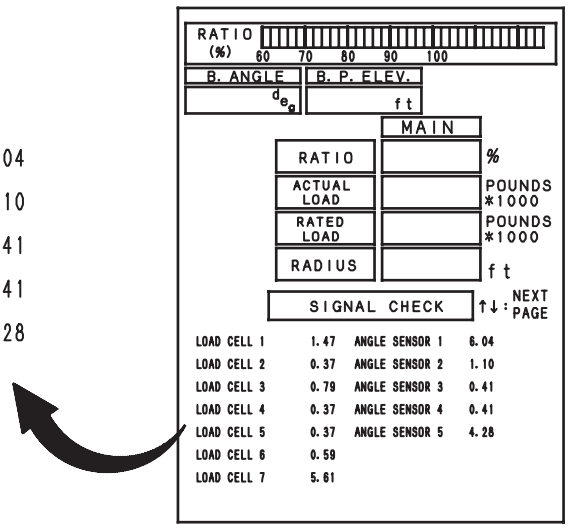
Statuses of analogue signals from the load cells and angle detectors are displayed on this first displayed screen.

Up to seven load cells and up to five angle detectors can be connected to this controller.

Refer to "Chart1. System Input/Output, Connector Designations" page11-20 for details of connection.

For the cells and sensors that are not connected to the controller, values close to 0.4 are displayed.

LOAD CELL 1	1.47	ANGLE SENSOR 1	6.04
LOAD CELL 2	0.37	ANGLE SENSOR 2	1.10
LOAD CELL 3	0.79	ANGLE SENSOR 3	0.41
LOAD CELL 4	0.37	ANGLE SENSOR 4	0.41
LOAD CELL 5	0.37	ANGLE SENSOR 5	4.28
LOAD CELL 6	0.59		
LOAD CELL 7	5.61		



11.5.4.4 RESULT OF MANUFACTURE ADJUSTMENTS "NO LOAD" AND "SOME LOAD"

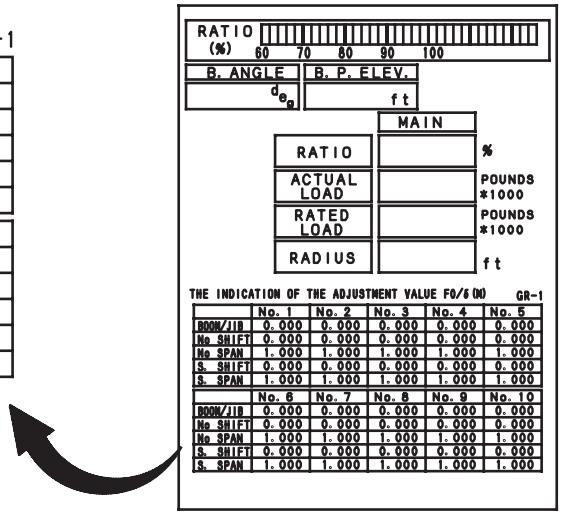
On the "ADJUSTMENT VALUE" screen, move the cursor ⇨ onto the "Fo/δ (MANUFACTURER)", and press the SET switch. Then, the table showing the results of manufacturers adjustments, "NO LOAD" and "SOME LOAD", appears on the screen.

(Fo = NO LOAD, δ = SOME LOAD)

THE INDICATION OF THE ADJUSTMENT VALUE FO/δ (M) GR-1

	No. 1	No. 2	No. 3	No. 4	No. 5
BOOM/JIB	0. 000	0. 000	0. 000	0. 000	0. 000
No SHIFT	0. 000	0. 000	0. 000	0. 000	0. 000
No SPAN	1. 000	1. 000	1. 000	1. 000	1. 000
S. SHIFT	0. 000	0. 000	0. 000	0. 000	0. 000
S. SPAN	1. 000	1. 000	1. 000	1. 000	1. 000

	No. 6	No. 7	No. 8	No. 9	No. 10
BOOM/JIB	0. 000	0. 000	0. 000	0. 000	0. 000
No SHIFT	0. 000	0. 000	0. 000	0. 000	0. 000
No SPAN	1. 000	1. 000	1. 000	1. 000	1. 000
S. SHIFT	0. 000	0. 000	0. 000	0. 000	0. 000
S. SPAN	1. 000	1. 000	1. 000	1. 000	1. 000



For group No. 1 to 30, adjustment with a load or without load for ten types of boom lengths is possible.

First, the table of group No. 1 is displayed. ("GR-1" can be seen in the upper right side of the screen.) Whenever the ⇨ switch is pressed, the screen changes from GR-1 to GR-30.

Whenever the ⇦ switch is pressed, screens appear in the following orders: GR-1, GR-30, GR-29, ….

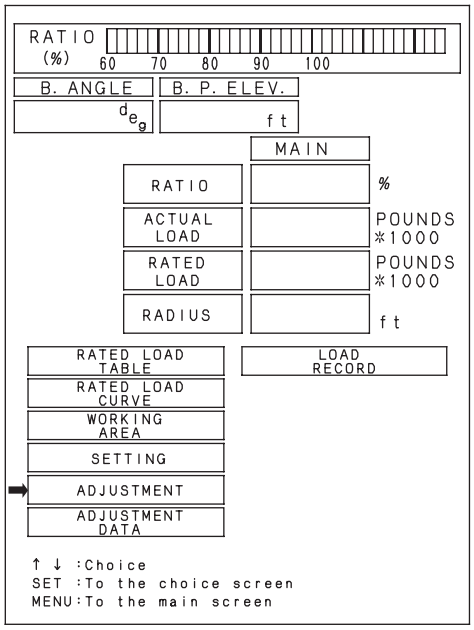
In respect of No.1 to 10, boom length or Jib length (BOOM/JIB) on which adjustment is conducted, shift and span of adjustment without load (No SHIFT, No SPAN), and shift and span of adjustment with a load (S. SHIFT, S. SPAN) are indicated.

While adjustment is not provided, "0.000 (in the lines of BOOM/JIB, No SHIFT, S. SHIFT)" and "1.000 (in the lines of No SPAN, S. SPAN)" are indicated.

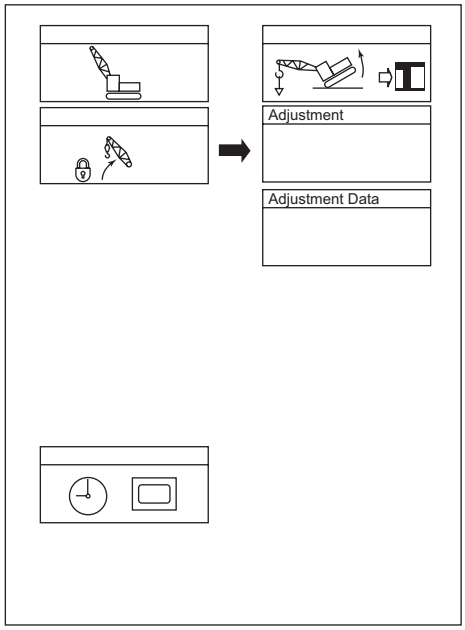
If the lengths of the two or more booms have been already adjusted and the length of the boom that has not been adjusted yet is used, the adjusted two lengths that are closest to it are corrected, and the adjusted length of the boom that has not been adjusted yet is calculated, accordingly.

11.6.2 ADJUSTMENT

While the menu screen is displayed, turn ON the dip switch No.3 of the controller.
Then, the "ADJUSTMENT" screen is displayed.

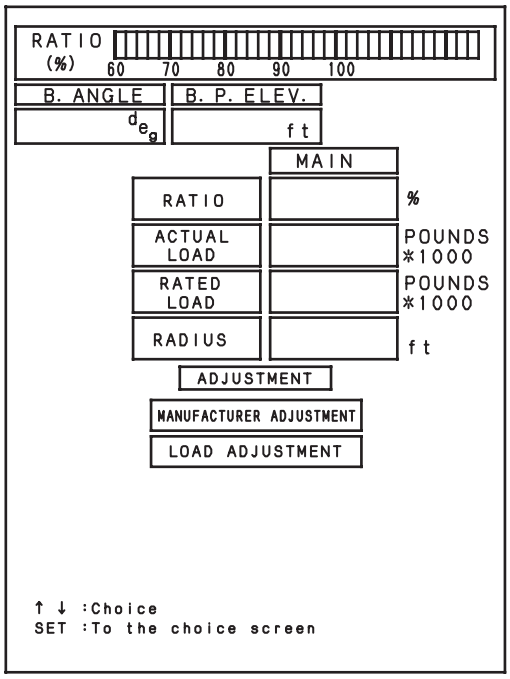


CK SERIES



CKE SERIES

Move the cursor ⇨ onto the "ADJUSTMENT", and press the SET switch. Then, the screen shown below appears.



- The current lifted load must be the load of the hook block only.
- Adjust the value in [ ] to the weight of hook block.
- For the weight of hook block to be entered, refer to the following table.

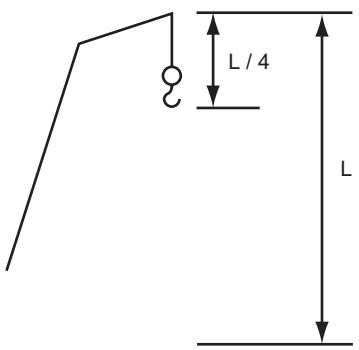
(CKE Series)

Type of attachments	Mode	Weight of hook block to be entered during adjustment	Weight of hook block when load is adjusted	
			Hook of mode selected	Other hooks
Crane	Main lifting	Main hook	Boom foot	—
Crane with auxiliary sheave	Main lifting	Main hook	Boom foot	*1
	Auxiliary sheave lifting	Auxiliary sheave hook	Boom foot	*1
Crane with jib	Main lifting	Main hook	Boom foot	*1
	Jib lifting	Jib hook	Boom foot	*1
Tower crane	—	Main hook	Boom foot	*1
Luffing crane (with main hook)	Main lifting	Main hook	Boom foot	*1
	Jib lifting	Jib hook	Boom foot	*1
Luffing crane (with aux. sheave hook)	Jib lifting	Jib hook	Boom foot	*1
	Auxiliary sheave lifting	Auxiliary sheave hook	Boom foot	*1
Luffing crane (jib hook only)	Jib lifting	Jib hook	Boom foot	*1

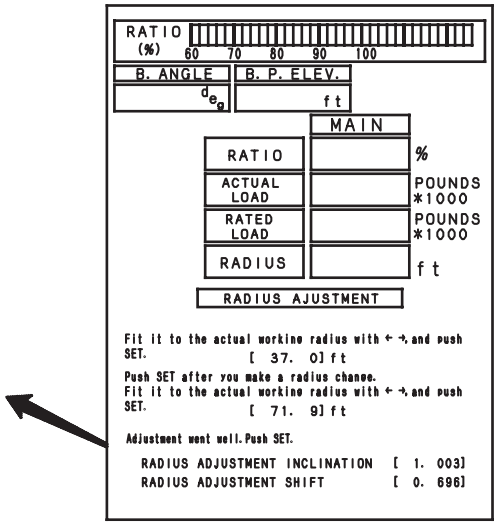
(CK Series)

Type of attachments	Mode	Weight of hook block to be entered during adjustment	Weight of hook block when load is adjusted	
			Hook of mode selected	Other hooks
Crane	Main lifting	Main hook	Boom foot	—
Crane with auxiliary sheave	Main lifting	Main hook + Aux. sheave hook	Boom foot	*1
	Auxiliary sheave lifting	Main hook + Aux. sheave hook	Boom foot	*1
Crane with jib	Main lifting	Main hook + Jib hook	Boom foot	*1
	Jib lifting	Main hook + Jib hook	Boom foot	*1
Luffing crane (with main hook)	Main lifting	Main hook + Jib hook	Boom foot	*1
	Jib lifting	Jib hook	Boom foot	*1
Luffing crane (with aux. sheave hook)	Jib lifting	Jib hook + Aux. sheave hook	Boom foot	*1
	Auxiliary sheave lifting	Jib hook + Aux. sheave hook	Boom foot	*1
Luffing crane (jib hook only)	Jib lifting	Jib hook + Aux. sheave hook	Boom foot	*1

*1 = 1/4 of distances from boom point sheave to ground.



3. When the adjustment is successfully completed, the screen shown below appears. To return to the previous screen, press the SET switch.



Adjustment went well. Push SET.
RADIUS ADJUSTMENT INCLINATION [1. 003]
RADIUS ADJUSTMENT SHIFT [0. 696]

4. If the adjustment is failed, the messages shown below appear. In such a case, retry it.

Adjustment is failure. Push SET, and adjust again.
RADIUS ADJUSTMENT INCLINATION [1.003]
RADIUS ADJUSTMENT SHIFT [-9.999]

11.7 ERROR CODE (ABNORMALITY DETECTION) AND COUNTERMEASURES

When an abnormality is detected, error messages are displayed in the message display window. Some abnormalities may cause lamp displays too. The machine will stop and a steady alarm sound comes on. The auto-stop mechanism can be bypassed by using the Over-hoist Release switch, but the alarm sound will continue.

Note

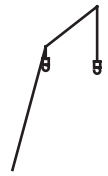
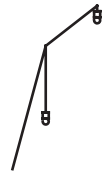
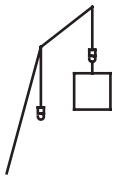
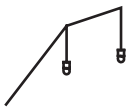
This list is the table common to all models. Accordingly, the table contains items that do not correspond to this product.

Message Table

Code and the Message	CKE series code No.	Buzzer	Display conditions (machine status)
(1) Out of angle.	(J001)	peep	Out of capacity set range
(2) Stop by the hook over hoist is canceled.	(J002)	-	The hook overhoist automatic stop release switch is actuated.
(3) Stop by the boom/jib over hoist is canceled.	(J003)	-	The boom overhoist automatic stop release switch is actuated.
(4) Stop by the over load is canceled.	(J004)	-	Overload status is canceled.
(5) Over load condition.	(J005)	beep	The loading ratio exceeds the specified level.
(6) Head wind is strong.	(J006)	-	The head wind load alarm is issued.
(7) Boom is lowered too much.	(J007)	beep	The boom is out of the maximum working radius area.
(8) Boom is raised too much.	(J008)	peep	The boom is out of the minimum working radius area.
(9) Jib is lowered too much.	(J009)	beep	The jib is out of the maximum working radius range.
(10) Jib is raised too much.	(J010)	peep	The jib is within the minimum working radius range.
(11) Boom is lowered too much.	(J011)	beep	The main boom angle is smaller than the lower limit.
(12) Boom is raised too much.	(J012)	beep	The main boom angle exceeds the upper limit.
(13) Jib is lowered too much.	(J013)	beep	The jib offset angle exceeds the upper limit.
(14) Jib is raised too much.	(J014)	peep	The jib offset angle is smaller than the lower limit.
(15) Mast is raised too much.	(J015)	peep	The mast angle exceeds the upper limit.
(16) Mast is lowered too much.	(J016)	peep	The mast angle is smaller than the lower limit.
(17) Hook over hoist.	(J017)	peep	The main hook overhoist limit switch is actuated.

				Digital indication								
				Actual load (3-digits)			Rated load (3-digits)			Working radius (4-digits)		
				Main	Jib	Aux.	Main	Jib	Aux.	Main	Jib	Aux.
Power OFF			—	Not indicated	Not indicated	Not indicated	Not indicated	Not indicated	Not indicated	Not indicated	Not indicated	Not indicated
Allowable working area			01	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
Load	Main/Aux. /Jib single mode	Overload prenotice	11	Indicated			Indicated			Indicated	Indicated	Indicated
		Overload	12	Indicated			Indicated			Indicated	Indicated	Indicated
	Main hook max. load set point (area limitation prenotice)		21	Indicated	Indicated	Indicated	Indicated in green	Indicated	Indicated	Indicated	Indicated	Indicated
	Main hook max. load set point (area limitation alarm)		22	Indicated	Indicated	Indicated	Indicated in green	Indicated	Indicated	Indicated	Indicated	Indicated
	Jib. hook max. load set point (area limitation prenotice)		23	Indicated	Indicated	Indicated	Indicated	Indicated in green	Indicated	Indicated	Indicated	Indicated
	Jib. hook max. load set point (area limitation alarm)		24	Indicated	Indicated	Indicated	Indicated	Indicated in green	Indicated	Indicated	Indicated	Indicated
	Aux. hook load set point (area limitation prenotice)		25	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated in green	Indicated	Indicated	Indicated
	Aux. hook load set point (area limitation alarm)		26	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated in green	Indicated	Indicated	Indicated
Radius	Boom over-lowering (only for main lifting)		31	———	———	———	0.0	0.0	0.0	Indicated in red	Indicated in red	Indicated in red
	Boom over-raising (only for main lifting)		32	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Jib over-lowering (only for jib lifting)		33	———	———	———	0.0	0.0	0.0	Indicated in red	Indicated in red	Indicated in red
	Jib over-raising (only for jib lifting)		34	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Main hook radius excess (area limitation prenotice)		35	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated in yellow	Indicated	Indicated
	Main hook radius excess (area limitation alarm)		36	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated in yellow	Indicated	Indicated
	Jib. hook radius excess (area limitation prenotice)		37	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated in yellow	Indicated
	Jib. hook radius excess (area limitation alarm)		38	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated in yellow	Indicated
	Aux. hook radius excess (area limitation prenotice)		39	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated in yellow
	Aux. hook radius excess (area limitation alarm)		40	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated in yellow
Angle	Boom over-lowering (area limitation prenotice)		41	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Boom over-lowering (area limitation alarm)		42	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Boom over-raising (area limitation prenotice)		43	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Boom over-raising (area limitation alarm)		44	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Jib over-lowering (area limitation prenotice)		45	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Jib over-lowering (area limitation alarm)		46	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Jib over-raising (area limitation prenotice)		47	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Jib over-raising (area limitation alarm)		48	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Boom low. limit angle (only for jib lifting)		49	Indicated	Indicated	Indicated	0.0	0.0	0.0	Indicated	Indicated	Indicated
	Boom upp. limit angle (only for jib lifting)		50	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Jib offset low. limit angle (only for main lifting)		51	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Jib offset upp. limit angle (only for main lifting)		52	Indicated	Indicated	Indicated	0.0	0.0	0.0	Indicated	Indicated	Indicated
Elevation	Point elevation (area limitation prenotice)		61	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Point elevation (area limitation alarm)		62	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
Limit switch	Main hook overhoist		71	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Jib. hook / Aux. hook overhoist		72	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Boom overhoist (1st)		73	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated in red	Indicated in red	Indicated in red
	Boom overhoist (2nd)		74	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated in red	Indicated in red	Indicated in red
	Jib overhoist		76	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated in red	Indicated in red	Indicated in red
	Strut over-raising		77	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Strut over-lowering		78	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
Others	Head wind alarm		81	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated	Indicated
	Attachment self-standing and stowing		91				0.0	0.0	0.0	Indicated	Indicated	Indicated
	Attachment assembly and disassembly		92	—								

Luffing Crane Release Chart (Jib 1/2)

Stop Condition	Release Switch Operation	Boom		Jib		Hook Hoist Up	
		Raise	Down	Raise	Down	Main	Auxiliary
Hook overhoist (Main) 	No Operation	O	X	O	X	X	X
	Hook overhoist	O	O	O	O	O	O
	Boom overhoist	O	X	O	X	X	X
	Overload	O	X	O	X	X	X
Hook overhoist (Auxiliary) 	No Operation	O	X	O	X	X	X
	Hook overhoist	O	O	O	O	O	O
	Boom overhoist	O	X	O	X	X	X
	Overload	O	X	O	X	X	X
Overload 	No Operation	O	X	O	X	X	X
	Hook overhoist	O	X	O	X	X	X
	Boom overhoist	O	X	O	X	X	X
	Overload	O	O	O	O	O	O
Boom up. limit angle (Controlled by LMI) 	No Operation	X	O	O	O	O	O
	Hook overhoist	X	O	O	O	O	O
	Boom overhoist	O	O	O	O	O	O
	Overload	X	O	O	O	O	O
Boom low. limit angle (Controlled by LMI) 	No Operation	O	X	O	O	X	X
	Hook overhoist	O	X	O	O	X	X
	Boom overhoist	O	X	O	O	X	X
	Overload	O	O	O	O	O	O

11.10.4.7 EXTERNAL STORAGE ELEMENT

Smart media	Capacity : 4MB or 8MB Application : Storage of capacity data, adjustment values, and set values Format : Only for this unit (Reading and writing with the PC is performed through the special adapter)

11.10.4.8 OTHERS

Clock and calendar functions	Back-up with the super capacitor Charged when the power is supplied. Buck-up for approx. one month is possible when fully charged.

Priority	No.	Display items	Input signal for total controller *1		Detection condition		Input delay *2	Buzzer alarm *3
			Disappeared from screen	Displayed on screen	Standstill E/G	Running E/G		
A	1	CPU MECHATRO FAILURE (H-1)	Normal communication	Faulty communication	O	O	-	O
	2	M/L STOP RELEASE (H-2)	By communication with M/L			O	O	△
	3	M/L BYPASS (W-21)	-	1	O	O	O	△
	4	ENGAG THE DRUM LOCK (W-31)	-	1	O	O	-	O
B	5	ENGINE PREHEAT (W-1)	-	1	O		-	
	6	FINISH PREHEAT (W-2)	-	1	O		-	
C	7	Fault log display						
	8	Mechatronic adjustment						
	9	Status display						
D	10	ENGINE OIL PRESS (W-5)	-	0		O	◎	◎
			0	-	O		◎	◎
	11	ENGINE WATER TEMP (W-8)	Water temperature is less than 105°C (221° F)	Water temperature is 105°C or more (221° F)	O	O	O	O
	12	FR-SAFETY ESM ON (W-16)	When the machine is in the neutral brake mode, clutch pressure is 570 psi or less		O	O	O	O
	13	RE-SAFETY ESA ON (W-17)			O	O	O	O
	14	3RD WINCH EST ON (W-18)			O	O	O	O
	15	ENGINE OIL FILTER (W-9)	-	0	O	O	O	
	16	ENGINE AIR CREANER (W-10)	-	0	O	O	-	-
E	17	Self check function						O
F	18	CHARGING PROBLEM (W-3)	1	-		O	◎	
			-	1	O		◎	
	19	LOW FUEL LEVEL (W-11)	Fuel gauge communication exceeds 05 hx	Fuel gauge communication is 05 hx or less	O	O	◎	
	20	RADIATOR WATER LVL (W-6)	-	0	O	O	O	
	21	CONTROL MAIN PRESS (W-4)	-	0		O	O	
			0	-	O		O	
	22	HYD OIL TEMP (W-12)	-	0	O	O	O	
	23	FR-WINCH OIL TEMP (W-13)	-	0	O	O	O	O
	24	RE-WINCH OIL TEMP (W-14)	-	0	O	O	O	O
	25	WINCH FILTER (W-15)	-	0		O	O	O
	26	HOOK RAISE STOP REL. (W-19)	By communication with M/L			O	O	△
	27	BOOM RAISE STOP REL. (W-20)	By communication with M/L			O	O	△
G	28	MOISTURE DETECTION OF THE FUEL FILTER (G-25) *4	-	1	O	O	-	-

*1. Input signal 1 : +24 V level 0 : GND level - : Opem level

*2. Input delay ◎ : 5.0 sec. O : 1.5sec. - : No delay

*1. Buzzer alarm

◎ : Buzzer sounds emission intermittently continues for 0.2 sec. with intervals of 0.3 sec (it cannot be stopped with the buzzer stop switch).

O : Buzzer sounds emission intermittently continues for 0.5 sec. with intervals of 0.5 sec (it can be stopped with the buzzer stop switch).

△ : Buzzer sounds emission intermittently continues for 0.2 sec. with intervals of 0.3 sec., and is stopped 5 sec. later.

Blank: None

*4. Normal display for other items except (G-25).

12.4 FAULT LOG DISPLAY

The logs of faults which have been found by the self check of the total controller are stored in the controller, and can be displayed on the display screen of the gauge cluster. If faults do not re-appear on job sites, first, check the fault log display for the convenience of troubleshooting.

1. Display procedures

(1) Set the key switch to the "ON" position.

(2) Enter the fault finding mode.
(Push both of the check switch and buzzer switch at the same time and hold them for 5 sec. or longer.)

(3) Push the check switch and hold it for 5 sec. or longer while the machine is in the status display mode. Then, the fault logs are displayed.

(Example)
If no fault has occurred in the past:

NO ERROR

If faults have occurred in the past:

5000 Hr
A-2 A/I ERROR
C-7 D/O ERR.R
F-1 S/M ERROR

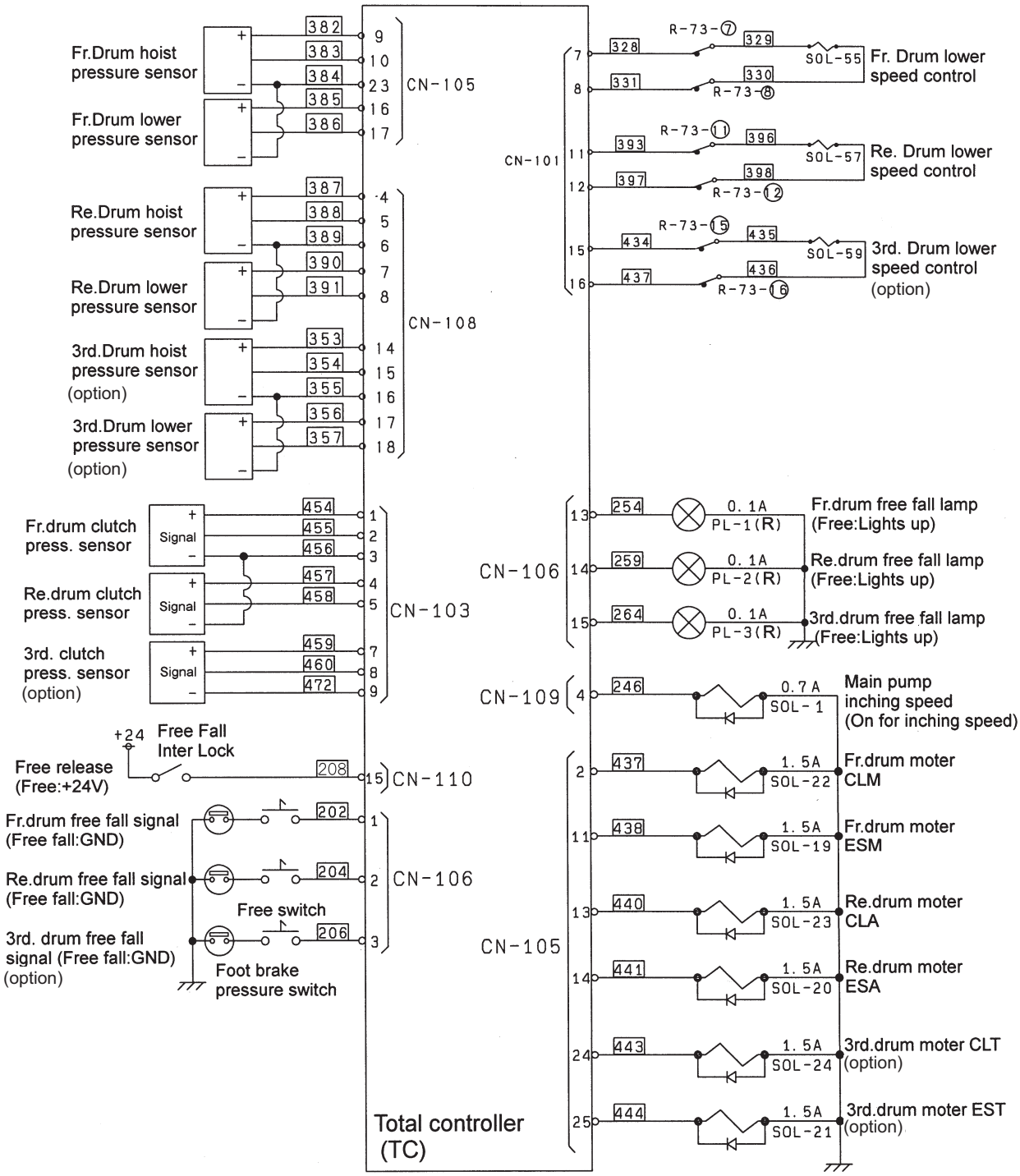
13.2.1 OUTPUT RELATION TO CONTROLLER

Items	Input/Output	Signal types	Outline
Indicator (GAUGE CLUSTER)	Input/Output	Serial communication	The SW setting data are received from the indicator. The indication signals of the OK monitor, engine speed, lifting height, wind speed, faults, etc. are transmitted depending on the SW setting conditions.
M/L (LMI)	Input/Output	Serial communication + Digital input	The changes in lifting height during boom and jib hoisting, faults signals, and number of part lines are transmitted from the M/L. The operating direction of the winch operation lever is transmitted to the M/L. The signals referring to automatic stop are input from the M/L in digital form.
Maintenance personal computer	Input/Output	Serial communication	This PC is used for down-loading of programs.
Hand throttle	Input	Analogue 0 to 5 V	The grip signals from the engine throttle are input.
Sensor	Input		The values from the pressure sensor, engine turn sensor, wind speed sensor, etc. are input.
Cab inside switch/ trimmer	Input		The values from the switches and trimmers in the cab are input.
Proportional valve	Output	24 V 100 to 700 mA	PWM (Pulse Width Modulation) output Constant current circuit (Max 1 A) Disconnection detection W/short-circuit protection
Solenoid valve	Output	24 V 1 A	Disconnection detection W/short-circuit protection

12. WINCH CONTROL

(1) Control Lever Neutral Mode Selection

(2) Winch Operation Solenoid Valve Control



(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 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 (375 mA : constant).

Output current at the drum motor control proportional valve should be adjusted to 350 mA (constant)(only while the lever is being operated).

20. CONTROL OF COMMUNICATION WITH M/L

Communications

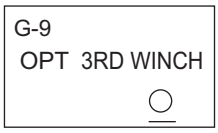
M/L→TC		TC→M/L
Main/jib	Number of part lines on main winch	Main winch raising ON/OFF
Crane/luffing	Number of part lines on aux. winch	Aux. winch raising ON/OFF
	Boom point height	Aux. winch lowering ON/OFF
	Jib point height	Third winch raising ON/OFF
Hook overhoist release ON/OFF	Boom angle	Boom raising ON/OFF
Boom overhoist release ON/OFF	Jib angle	Boom lowering ON/OFF
Overload and overhoist release ON/OFF	Boom length	
Main hook overhoist ON/OFF	Jib length	
Aux. hook overhoist ON/OFF		Third winch lowering ON/OFF
Crane boom overhoist ON/OFF	Working mode/working range outside mode	Main winch lowering ON/OFF
	Working mode/set up mode	
Luffing jib overhoist ON/OFF		
Luffing boom overhoist ON/OFF		
Crane jib overhoist ON/OFF		

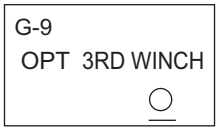
13.4.4 ARRANGEMENT OF TOTAL CONTROLLER CONNECTOR PIN

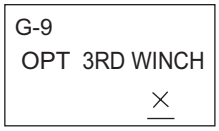
Connector No.	Pin No.	Port name	Specifications
CN100	1	+24V	Power supply
	2	+24V	
	3	GND	Grounding
	4	GND	
	5		Vacancy

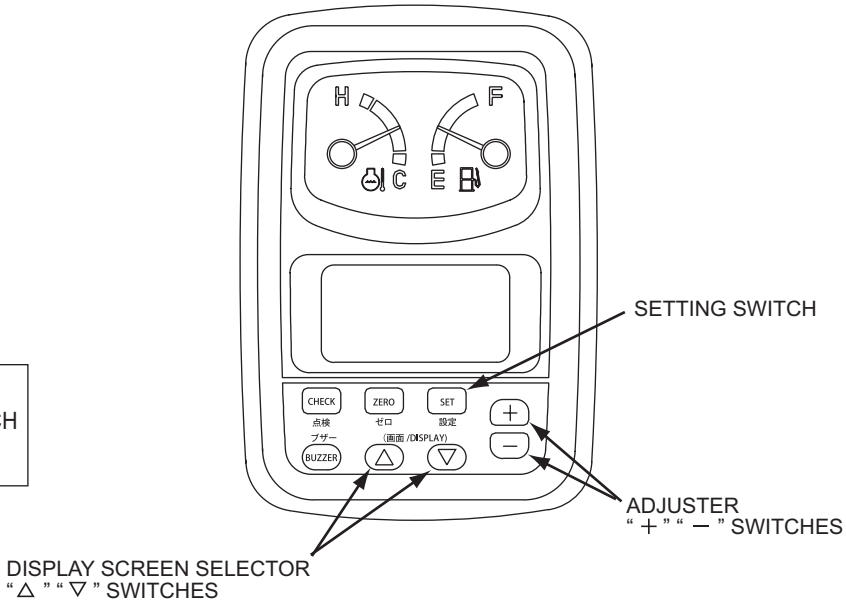
Connector No.	Pin No.	Port name	Specifications
CN101	1	D1+	Boom raising speed control proportional valve
	2	D1-	
	3	D2+	Boom lowering speed control proportional valve
	4	D2-	
	5	D3+	Fr. drum hoisting speed control proportional valve
	6	D3-	
	7	D4+	Fr. drum lowering speed control proportional valve
	8	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.









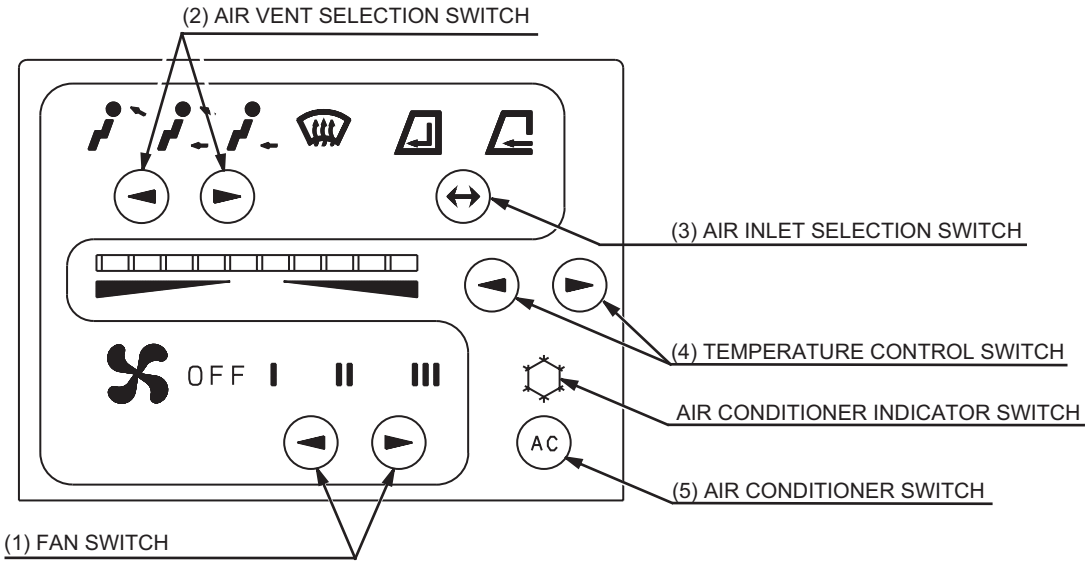
6. After the completion of input of "O" or "X" against all the items, push the "Setting switch" on the cluster.

- 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

14.1 OPERATION ITEMS



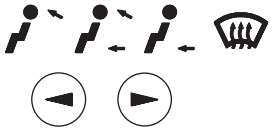
(1) FAN SWITCH

The switches control the air conditioner ON/OFF function and the blower speed.

- I ------ position Low
- II ------ position Medium
- III ------ position High

(2) AIR VENT SELECTION SWITCH

These switches control the open/close position of each air vent.
Select the desired air flow mode from the three mode position.
The selected position is always shown by a lamp.
Select if the front glass is misted.



(3) AIR INLET SELECTION SWITCH

This switch selects the open or close position of air inlet.

	Selector switch for selection between internal air circulation and open intake.
	When this position is selected, the air inlet is closed which causes the air to recirculate inside the cab.
	When this position is selected, the air inlet is opened which allows fresh air to be introduced into the cab.

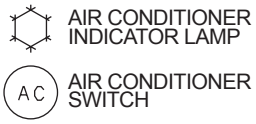
(4) TEMPERATURE CONTROL SWITCH

These switches control the temperature of air coming out of the air vents to any of five levels during heating (red label) and cooling (green label).

1. Push the left switch (◀), and the range of the GREEN lights decrease and the air temperature goes down.
2. Push the right switch (▶), and the range of the LED lights increase and the air temperature goes up.

(5) AIR CONDITIONER SWITCH

This is used to turn ON and OFF the cooling function during cooling or dehumidification heating.
Push once to change over from ON/OFF to OFF/ON.
When the switch is turned ON, the lamp on the upper part of the switch lights up.



14.3.2.3 EVAPORATOR OR EXPANSION VALVE REPLACEMENT

CAUTION

1. Remove all the coolant in the cooling circuit in advance.
2. Replace with new O-rings at this time.
3. Plug or cover the removed pipe to prevent dust from getting in.

1. Removal

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

(2) Lift up the evaporator Assy (10) to remove. [See Figure-6]

(3) Remove the insulation (15) and take out the stay (16).

(4) Loosen the nuts (f), (g), and take off each pipe.

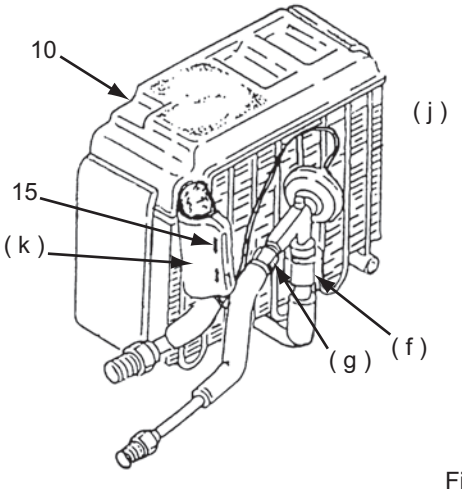


Figure-7

2. Installation

Proceed with reassembly in the reverse order of disassembly, with the following special notations.

(1) Install the temperature sensing tube (h) as shown on Figure-8.

(2) Roll an extra length of the capillary tube (i) to approx. 20.

(3) The insulation (15) can not be reused, so replace it.

(4) Apply the insulation carefully so that the temperature sensing tube (h) is completely insulated from outside air.
As when it was removed, the seam in the insulation should not touch the in/out air dumper.

(5) After installing the upper case (8), be sure to check the following.

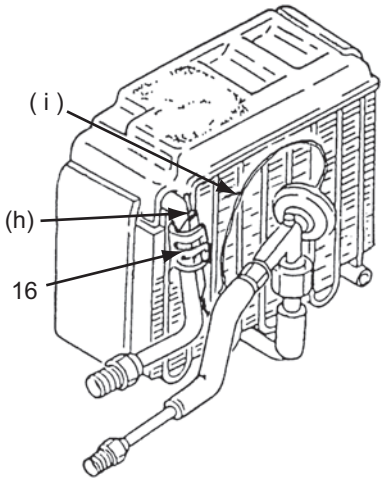


Figure-8