CEBM012503

Shop Manual

PC400LC-7L

HYDRAULIC EXCAVATOR

SERIAL NUMBERS **PC400LC-7L A86001 and up**

ENGINE **SAA6D125E-3**

January 2011

Mark	Page	Rev
	90-2	
	90-3	
	90-4	
	90-5	
	90-6	
	90-7	
	90-8	
	90-9	
	90-10	
	90-11	
	90-12	
	90-13	
	90-14	
	90-15	
	90-16	
	90-17	
	90-18	
	90-19	
	90-20	
	90-21	
	90-22	
	90-23	
	90-24	
	90-25	
	90-26	
	90-27	
	90-28	
	90-29	
	90-30	
	90-31	
	90-32	
	90-33	
	90-34	

Mark	Page	Rev
	90-35	
	90-36	
	90-37	
	90-38	
	90-39	
	90-40	
	90-41	
	90-42	
	90-43	
	90-44	
	90-45	
	90-46	
	90-47	
	90-48	
	90-49	
	90-50	

Mark	Page	Rev

Mark	Page	Rev

TIGHTENING TORQUE OF HOSE NUTS

Use these torques for hose nuts.

Nominal No.	Thread diameter	Width across flat	Tightening torque	
	mm	mm	Nm	lbf ft
02	14	19	24.5 ± 4.9	18.0 ± 3.6
03	18	24	49 ± 19.6	36.1 ± 14.4
04	22	27	78.5 ± 19.6	57.8 ± 14.4
05	24	32	137.3 ± 29.4	101.2 ± 21.6
06	30	36	176.5 ± 29.4	130.1 ± 21.6
10	33	41	196.1 ± 49	144.6 ± 36.1
12	36	46	245.2 ± 49	180.8 ± 36.1
14	42	55	294.2 ± 49	216.9 ± 36.1

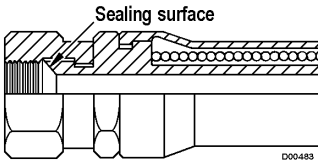
TIGHTENING TORQUE OF SPLIT FLANGE BOLTS

Use these torques for split flange bolts.

Thread diameter	Width across flat	Tightening torque	
mm	mm	Nm	lbf ft
10	14	65.7 ± 6.8	48.4 ± 5.0
12	17	112 ± 9.8	82.6 ± 7.2
16	22	279 ± 29	205.7 ± 21.3

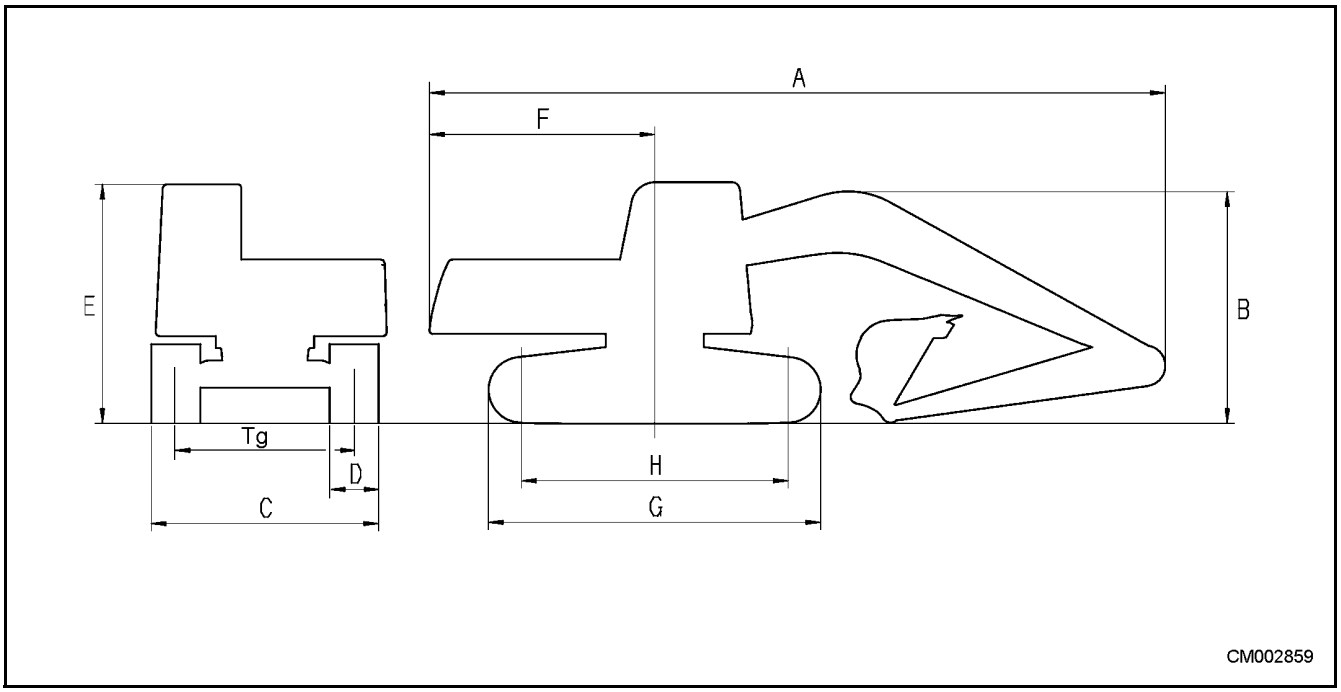
TIGHTENING TORQUE FOR FLARED NUTS

Use these torques for flared part of nut.

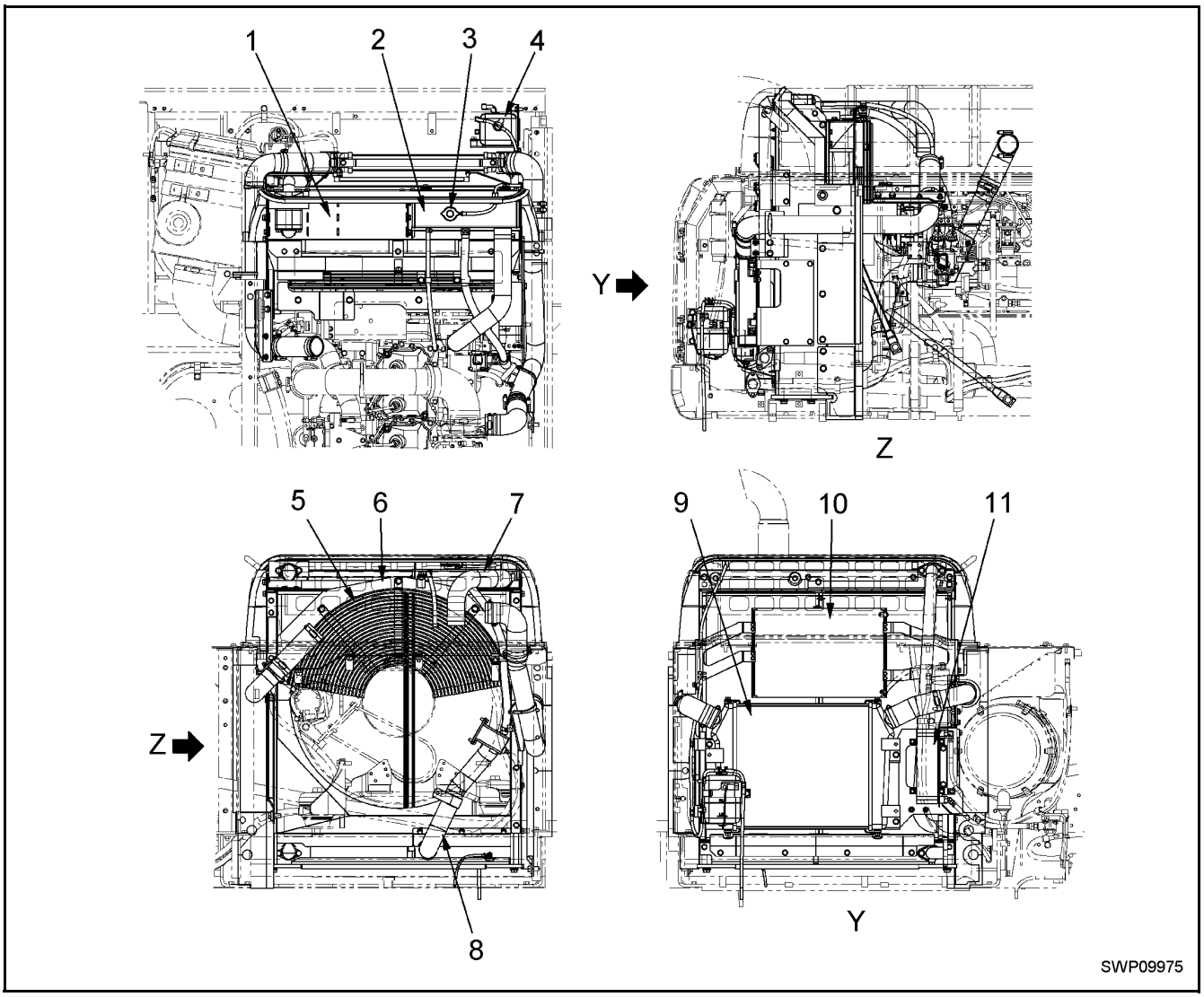


Thread diameter	Width across flat	Tightening torque	
mm	mm	Nm	lbf ft
14	19	24.5 ± 4.9	18.0 ± 3.6
18	24	49 ± 19.6	36.1 ± 14.4
22	27	78.5 ± 19.6	57.8 ± 14.4
24	32	137.3 ± 29.4	101.2 ± 21.6
30	36	176.5 ± 29.4	130.1 ± 21.6
33	41	196.1 ± 49	144.6 ± 36.1
36	46	245.2 ± 49	180.8 ± 36.1
42	55	294.2 ± 9	216.9 ± 36.1

- "Variable gauge specification" means the machine can extend and retract overall width (C) of the track frame.
  "Fixed gauge specification" means the machine cannot extend or retract overall width (C) of the track frame.



RADIATOR • OIL COOLER • AFTERCOOLER



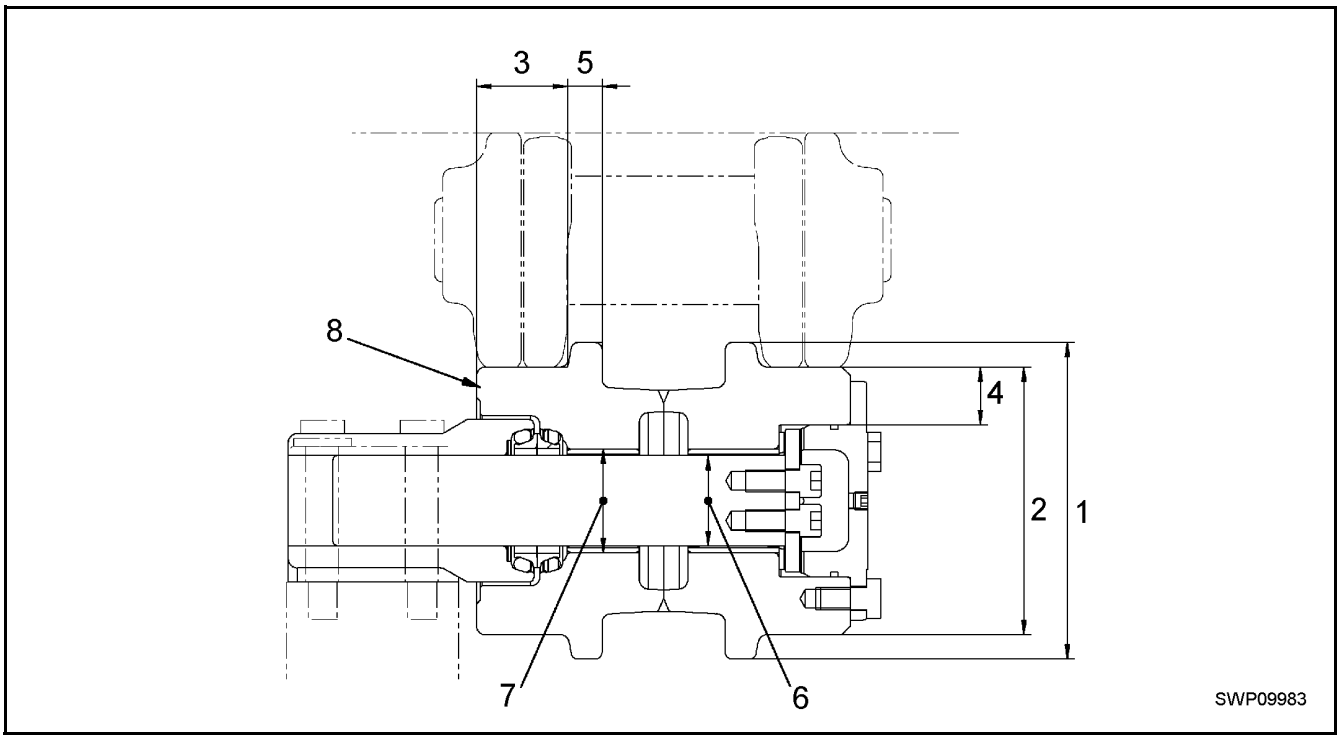
1. Oil cooler
2. Radiator
3. Radiator cap
4. Reservoir tank
5. Net
6. Shroud
7. Radiator inlet hose
8. Radiator outlet hose
9. Aftercooler
10. Condenser
11. Fuel cooler

Specifications

Radiator: ALW-4

Oil cooler: CF40-1

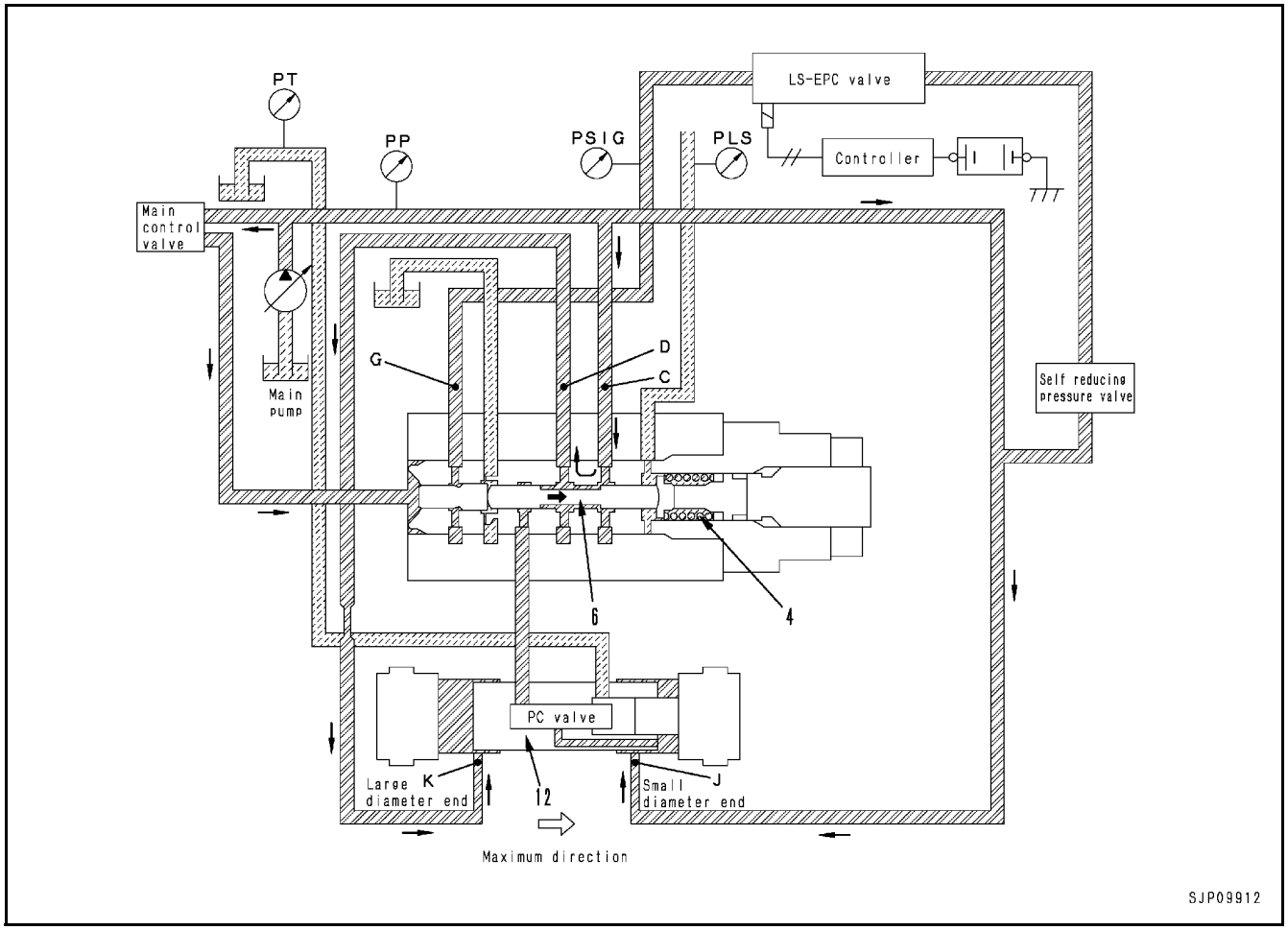
CARRIER ROLLER



Unit: mm

No.	Check item	Criteria					Remedy
1	Outside diameter of flange	Standard size			Repair limit		Replace
		175			---		
2	Outside diameter of tread	148			134		
3	Width of tread	50.3			---		
4	Thickness of tread	32			25		
5	Width of flange	19			---		
6	Interference between shaft and bushing	Standard size	Tolerance		Standard interference	Interference limit	
			Shaft	Hole			
		50	-0.250 -0.270	+0.099 -0.032	0.218 - 0.369	---	
7	Interference between roller and bushing	57	+0.117 +0.087	+0.040 0	0.047 - 0.177		
8	Axial clearance of roller	Standard clearance			Clearance limit		
		0.5 - 0.7			---		

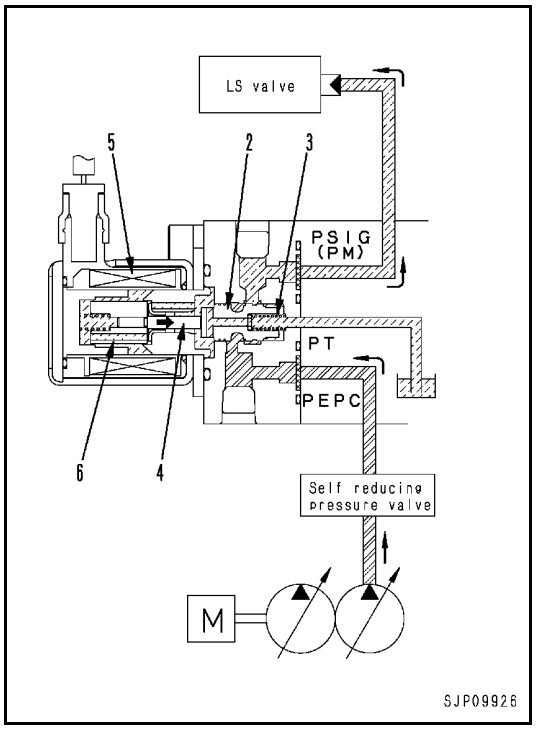
MEMORANDUM



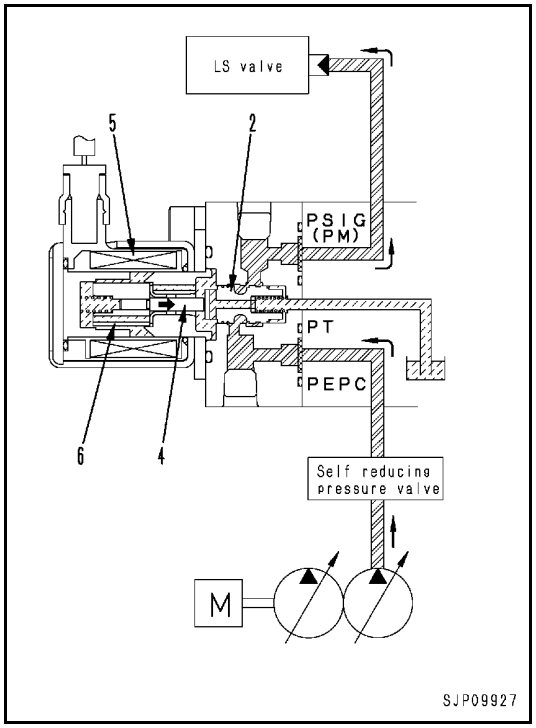
C. Operation in decrease direction for pump discharge amount

- The following explains the situation if the servo piston (12) moves to the right (the discharge amount becomes smaller). When LS differential pressure **ΔPLS** becomes larger (for example, when the area of opening of the control valve becomes smaller and pump pressure **PP** rises), pump pressure **PP** pushes spool (6) to the right.
- When spool (6) moves, main port pressure **PP** flows from port C and port **D** and from port **K**, it enters the large diameter end of the piston.
- Main pump pressure **PP** also enters port **J** at the small diameter end of the piston, but because of the difference in area between the large diameter end and the small diameter end of servo piston (12), servo piston (12) is pushed to the right.
- As a result, the swash plate moves in the direction to make angle smaller.
- If LS selection pressure **PSIG** enters port **G**, it acts to make the set pressure of spring (4) weaker.

2. When signal current is very small (coil energized)
   - When a very small signal current flows to coil (5), coil (5) is energized, and a propulsion force is generated which pushes plunger (6) to the left.
   - Push pin (4) pushes spool (2) to the left, and pressurized oil flows from port **PEPC** to port **PSIG(PM)**.
   - When the pressure at port **PSIG(PM)** rises and the load of spring (3) + the force acting on surface a of spool (2) becomes greater than the propulsion force of plunger (6), spool (2) is pushed to the right. The circuit between port **PEPC** and port **PSIG(PM)** is shut off, and at the same time, port **PSIG(PM)** and port **PT** are connected.
   - As a result, spool (2) is moved up or down until the propulsion force of plunger (6) is balanced with the load of spring (3) + pressure of port **PSIG(PM)**.
   - Therefore, the circuit pressure between the EPC valve and the LS valve is controlled in proportion to the size of the signal current.



3. When signal current is maximum (coil energized)
   - When the signal current flows to coil (5), coil (5) is energized.
   - When this happens, the signal current is at its maximum, so the propulsion force of plunger (6) is also at its maximum.
   - For this reason, spool (2) is pushed fully to the left by push pin (4).
   - As a result, the maximum flow of pressurized oil from port **PEPC** flows to port **PSIG(PM)**, and the circuit pressure between the EPC valve and LS valve becomes the maximum.
     At the same time, port **PT** closes and stops the oil from flowing to the tank.



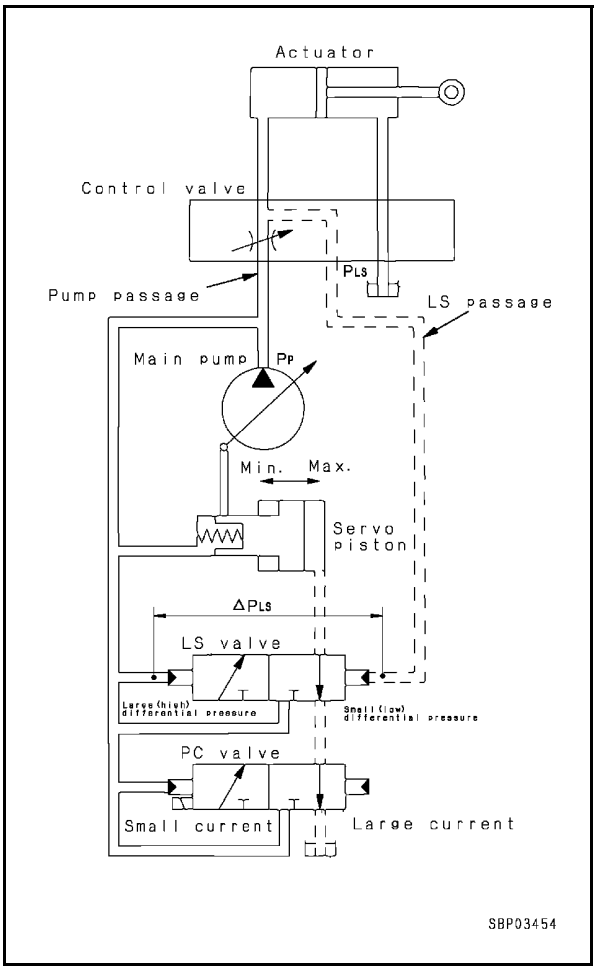
Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
18	Regeneration valve spring	Free length x OD	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replacespring
		31.5 x 10.3	19.5	6.2 N {0.6 kg}	---	4.9 N {0.5 kg}	
19	Piston return spring	36.9 x 11.1	28	29.4 N {3 kg}	---	23.5 N {2.4 kg}	
20	Piston return spring	36.9 x 11.1	28	29.4 N {3 kg}	---	23.5 N {2.4 kg}	

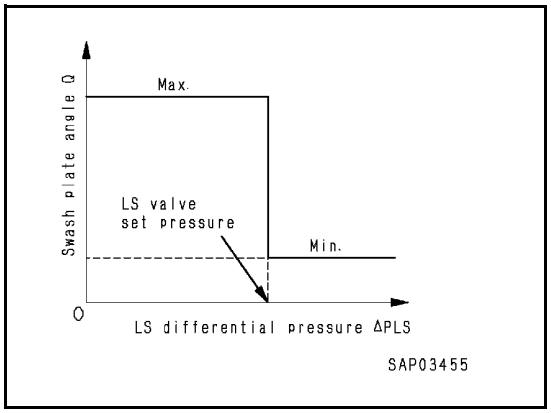
Item	Torque Nm	Torque lbf ft
21. Valve	147.1 - 186.3	108.4 - 137.4
22. Valve	137.0 - 157.0	101.0 - 115.7
23. Valve	49.0 - 58.8	36.1 - 43.3
24. Valve	372.7 - 411.9	274.8 - 303.8

Basic principle

1. Control of pump swash plate
   - The pump swash plate angle (pump discharge amount) is controlled so that LS differential pressure Δ**PLS** (the difference between pump pressure **PP** and control valve outlet port LS pressure Δ**PLS)** (load pressure of actuator) is constant.
     (LS pressure Δ**PLS** = Pump discharge pressure **PP** – LS pressure **PLS**)

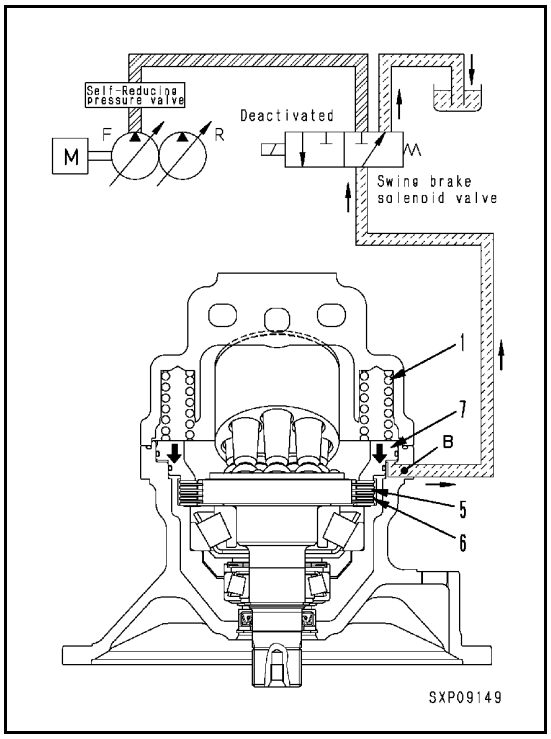


   - If LS differential pressure Δ**PLS** becomes lower than the set pressure of the LS valve (when the actuator load pressure is high), the pump swash plate moves towards the maximum position; if it becomes higher than the set pressure of the LS valve (when the actuator load pressure is low), the pump swash plate moves towards the minimum position.

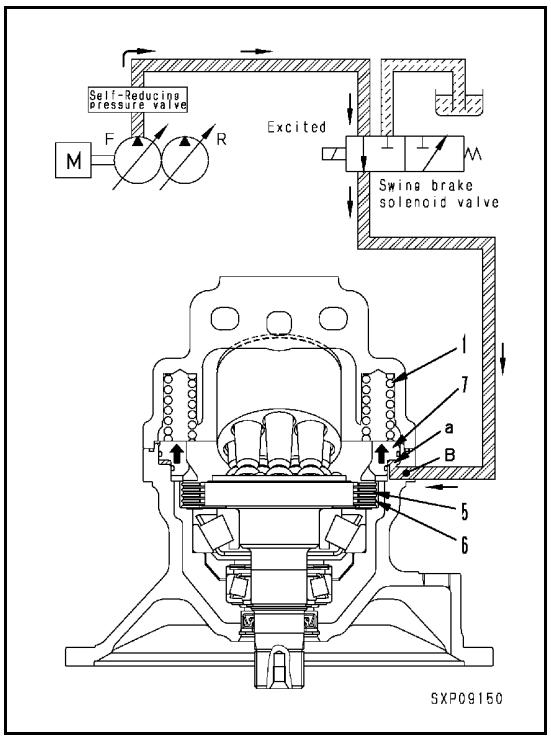


C. Operation of swing lock

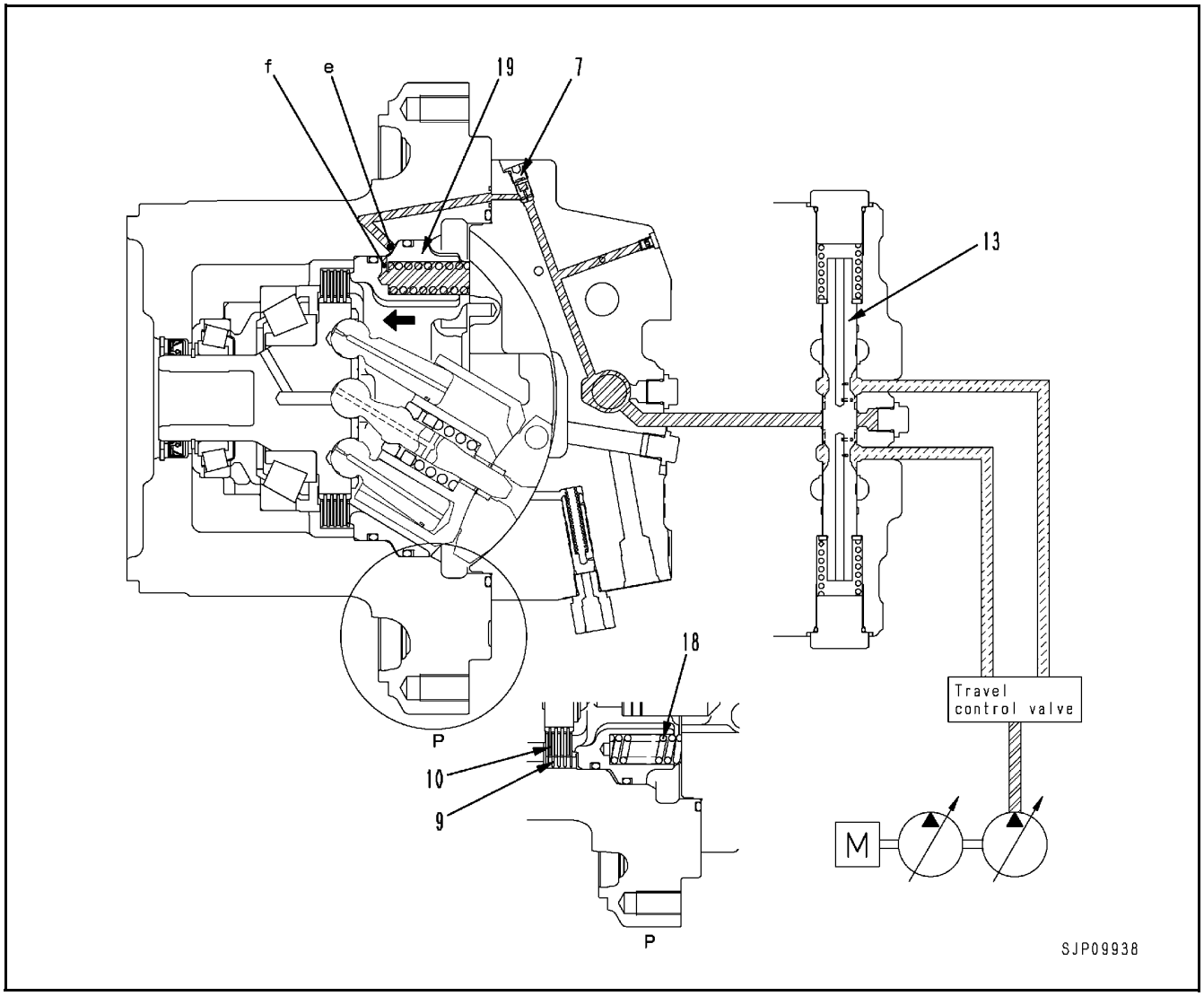
i. When swing lock solenoid valve is deactivated
When the swing lock solenoid valve is deactivated, the pressurized oil from the main pump is shut off and port **B** is connected to the tank circuit.
As a result, brake piston (7) is pushed down by brake spring (1), discs (5) and plates (6) are pushed together, and the brake is applied.



ii. When swing lock solenoid valve is activated
When the swing lock solenoid valve is activated, the valve is switched and the pressure oil from the main pump enters port **B** and flows to brake chamber **a**.
The pressure oil entering chamber a overcomes brake spring (1) and pushes brake piston (7) up. As a result, discs (5) and plates (6) are separated and the brake is released.



2. When stopping travel



Operation

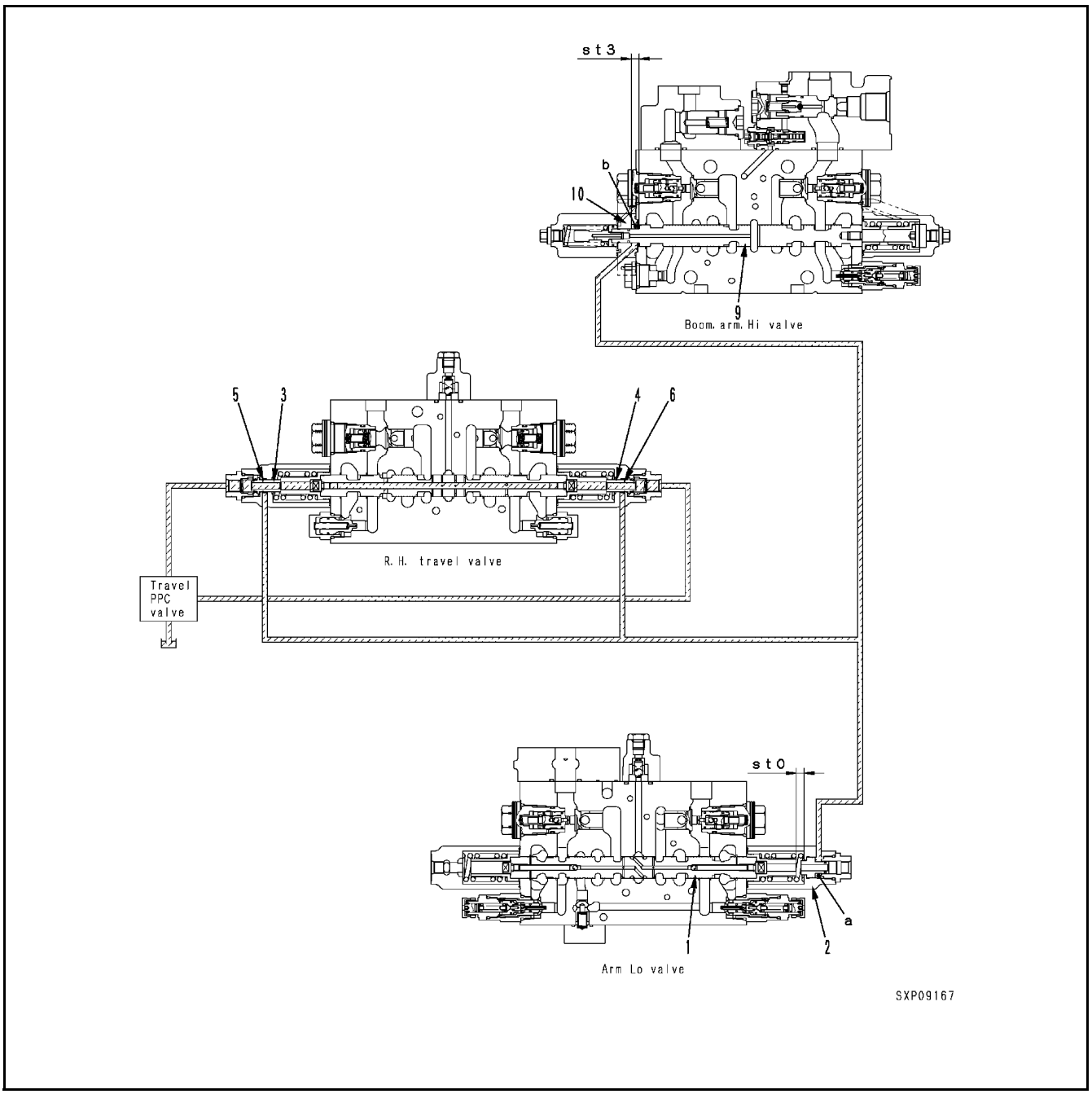
When the travel lever is placed in neutral, counterbalance valve spool (13) returns to the neutral position and the circuit to the parking brake is closed.

The pressurized oil in chamber **e** of brake piston (19) passes through the throttle of slow return valve (7) until spool (13) of the counterbalance valve returns to neutral.

When spool (13) of the counterbalance valve returns to the neutral position, the oil is drained inside the case from the throttle **f** of brake piston (19) and brake piston (19) is pushed fully to the left by spring (18).

As a result, plate (9) and disc (10) are pushed together, and the brake is applied.

A time delay is provided by having the pressurized oil pass through a throttle in slow return valve (7) when the brake piston returns, and this ensures that the brake is applied after the machine stops.


st3
b
10
9
Boom, arm, Hi valve
5
3
4
6
R.H. travel valve
Travel
PPC
valve
st0
a
1
2
Arm Lo valve
SXP09167

	Torque Nm	Torque lbf ft
4. Bolt	28 ±3	20.6 ±2.2
5. Bolt	23.5 ±3.9	17.3 ±2.8
6. Bolt	30.9 ±2.5	22.7 ±2.5
7. Plug	29.4 ±4.9	21.6 ±3.6

MEMORANDUM

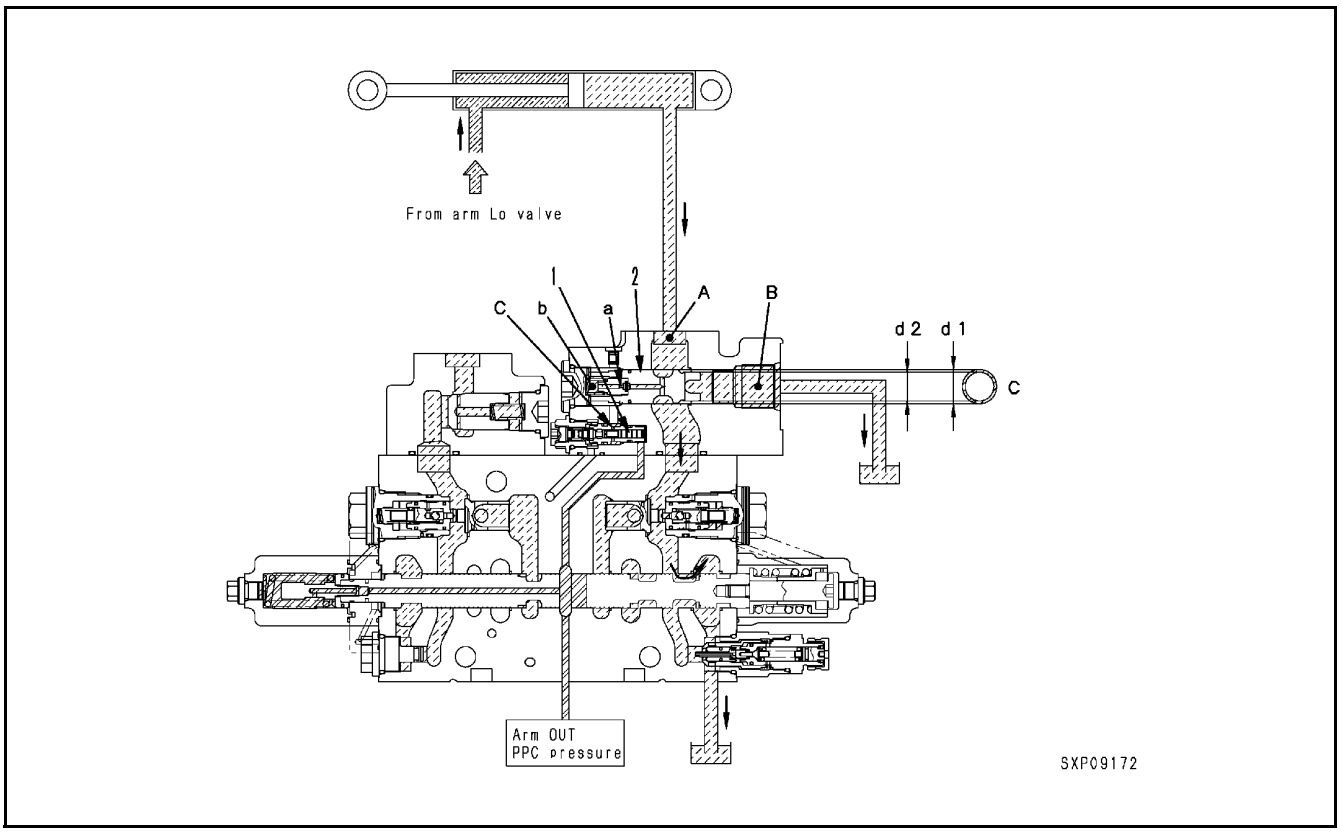
QUICK RETURN VALVE

Function

When arm OUT is operated, this valve reduces the pressure loss of the large amount of oil returning from the cylinder bottom.

Operation

1. Arm at OUT
   When arm OUT is operated, the pilot pressure from the PPC valve pushes pilot spool (1), and the pressure oil from chamber **b** inside the poppet is drained through orifice **c**.
   The oil at the bottom end of the arm flows from orifice **a** to chamber **b** to orifice **c** to drain, so the oil pressure in chamber **b** drops.
   When the pressure in chamber **b** drops below the pressure at port **A**, the pressure at port **A** and acts on ring shaped area **C** (= Area of ød1 – Area of ød2) because of the difference in the outside diameter **d1** of valve (2) and seat diameter **d2**. Valve (2) moves to the left and the pressure oil from port **A** goes to port **B**. From port **B**, the oil is drained directly to the tank.



Unit: mm

No.	Check item		Criteria					Remedy
		Cylinder	Standard size	Tolerance		Standard clearance	Clearance limit	
				Shaft	Hole			
1	Clearance between piston rod and bushing	Boom	110	-0.036 -0.090	+0.261 +0.047	0.083 - 0.351	0.412	Replace bushing
		Arm	120	-0.036 -0.090	+0.263 +0.048	0.084 - 0.353	0.412	
		Bucket	100	-0.036 -0.090	+0.257 +0.047	0.083 - 0.347	0.447	
2	Clearance between piston rod support pin and bushing	Boom	110	-0.036 -0.090	+0.169 +0.100	0.136 - 0.259	---	Replace pin or bushing
		Arm	110	-0.036 -0.090	+0.169 +0.100	0.136 - 0.259	---	
		Bucket	100	-0.036 -0.090	+0.187 +0.097	0.133 - 0.277	---	
3	Clearance between cylinder bottom support pin and bushing	Boom	100	-0.036 -0.090	+0.190 +0.070	0.106 - 0.280	---	
		Arm	110	-0.036 -0.090	+0.195 +0.099	0.135 - 0.285	---	
		Bucket	100	-0.036 -0.090	+0.187 +0.097	0.133 - 0.277	---	

BOOM CYLINDER

	Torque Nm	Torque lbf ft
4.	530 ±78.5	390.9 ±57.9
5.	294 ±29.4	216.8 ±21.6
6.	58.9 ±73.6	43.5 ±54.2

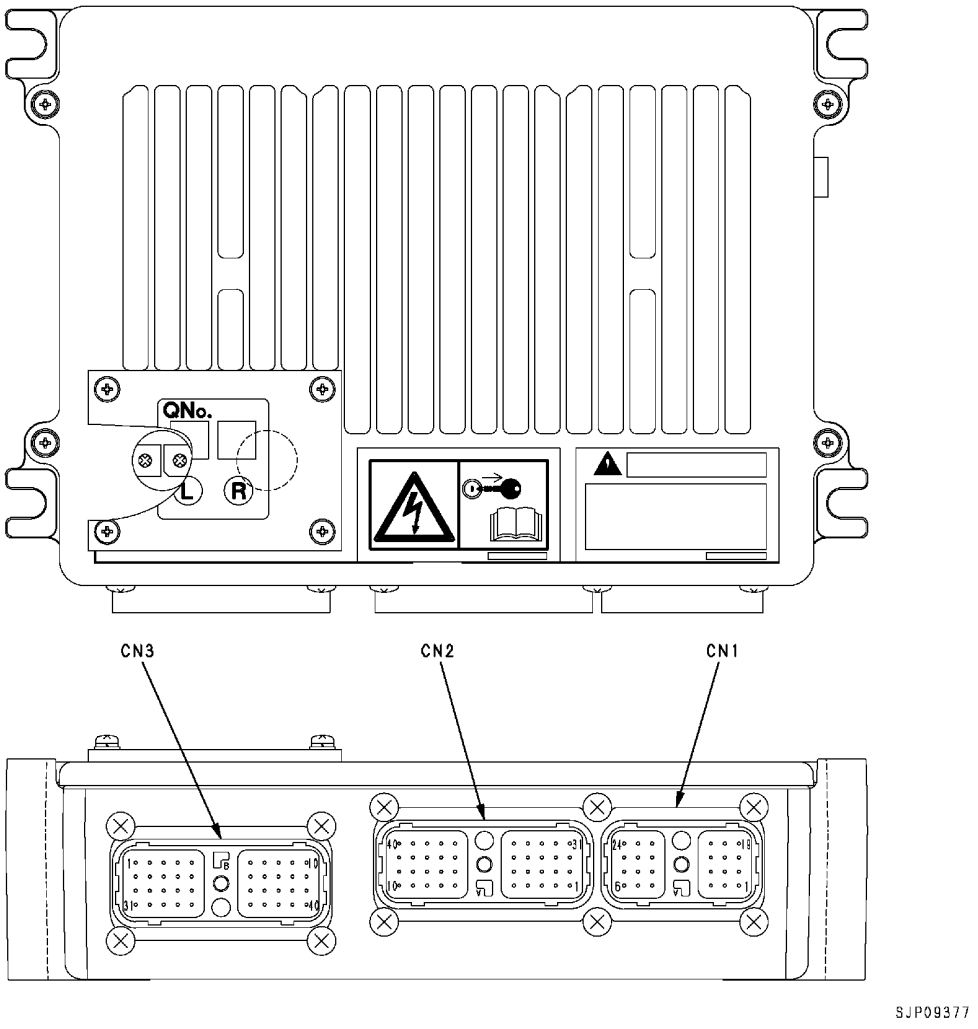
ARM CYLINDER

	Torque Nm	Torque lbf ft
4. Bolt	892 ±137	657.9 ±101.0
5. Piston	294 ±29.4	216.8 ±21.6
6. Set screw	58.9 ±73.6	43.5 ±54.2

BUCKET CYLINDER

	Torque Nm	Torque lbf ft
4. Bolt	530 ±78.5	390.9 ±57.9
5. Piston	294 ±29.4	216.8 ±21.6
6. Set screw	58.9 ±73.6	43.5 ±54.2

ENGINE CONTROLLER



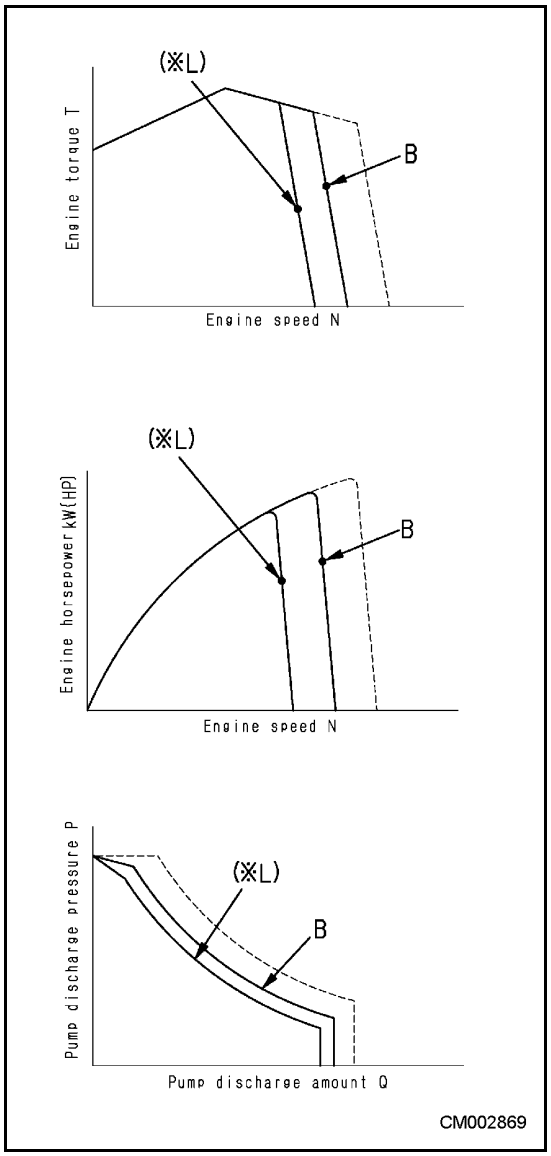
Mode B / (Mode ※L)

Mode	Mode B	Mode	L
Partial output point	82%	61%	

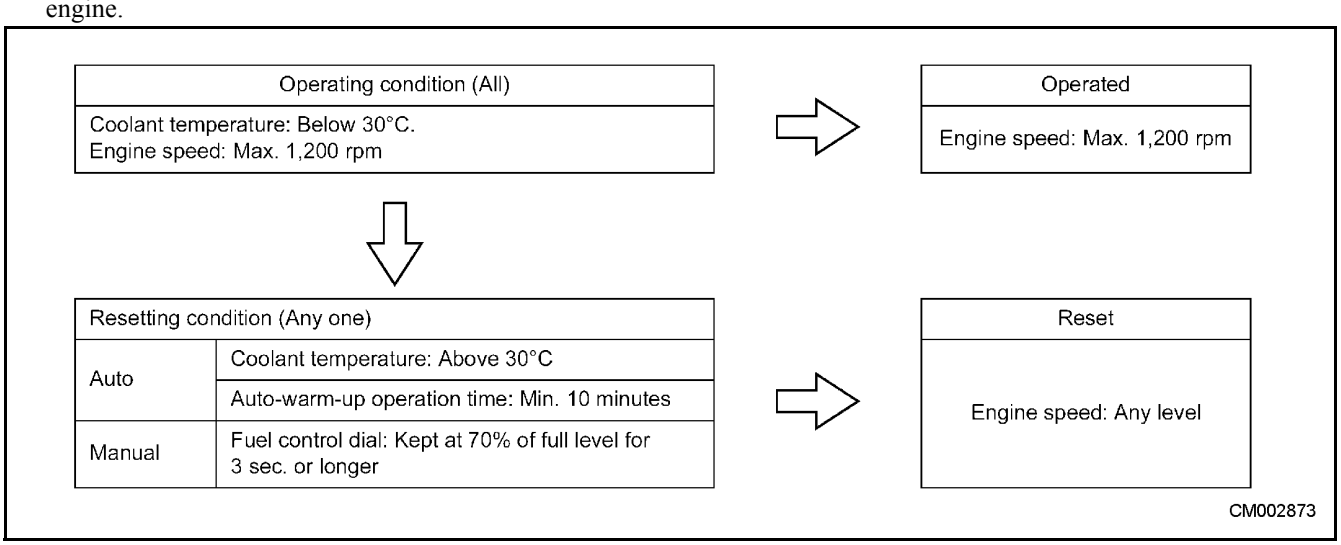
Mode B		194.9 kW/1,730 rpm {261 HP / 1,730 rpm}
Mode ※L		150.8 kW/1,250 rpm {202 HP / 1,250 rpm}

- At this time, the controller keeps the pump absorption torque along the constant horsepower curve and lower the engine horsepower by the composite control of the engine and pump.
  By this method, the engine is used in the low fuel consumption area.

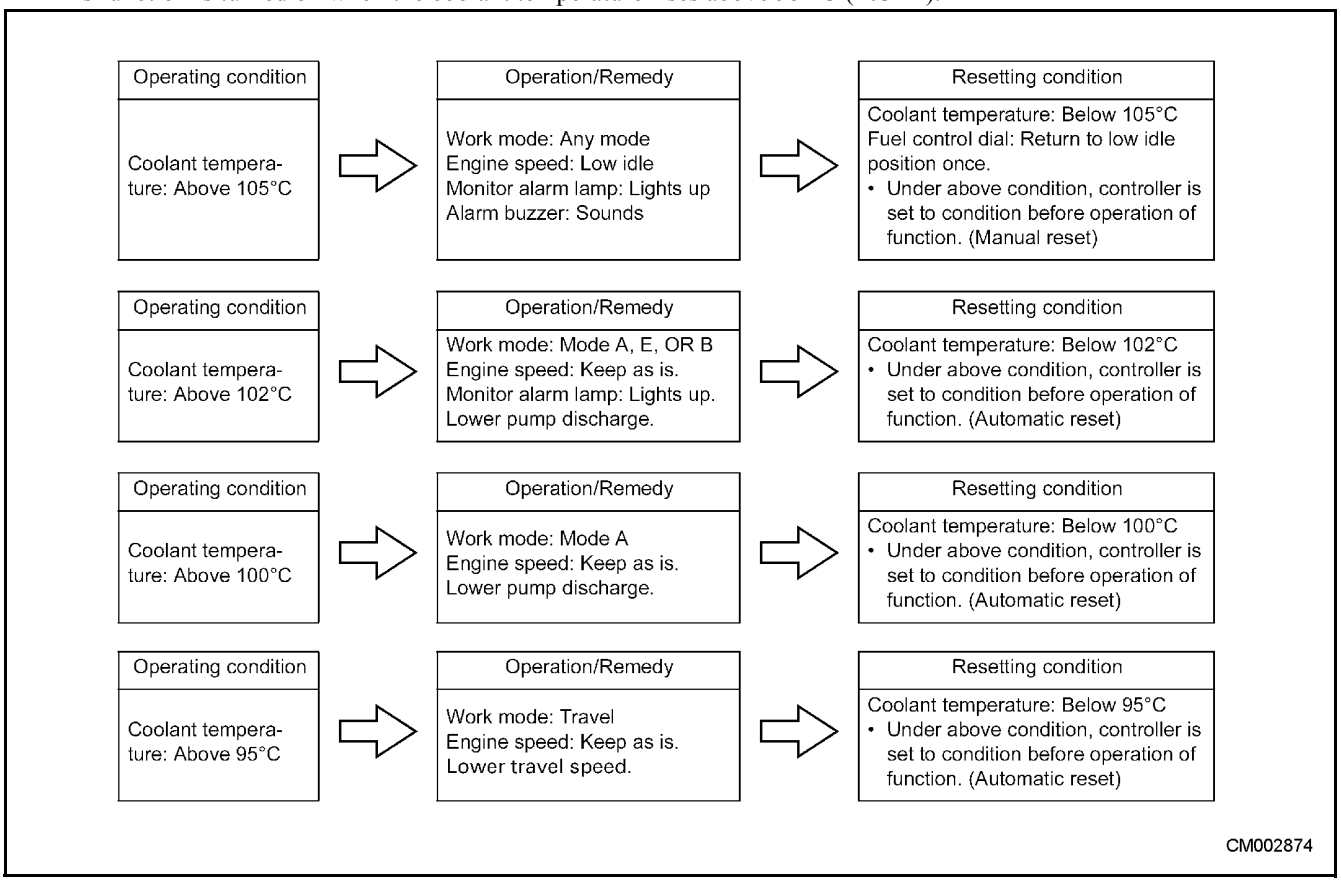
※: The L mode is on the multi-monitor specification machine only.



1. Auto-warm-up function
   After the engine is started, if the engine coolant temperature is low, the engine speed is automatically raised to warm the engine.



2. Overheat prevention function
   If the engine coolant temperature rises too high during work, the pump load and engine speed are reduced to prevent overheating.
   This function is turned on when the coolant temperature rises above 95° C (203° F).



Input and output signals

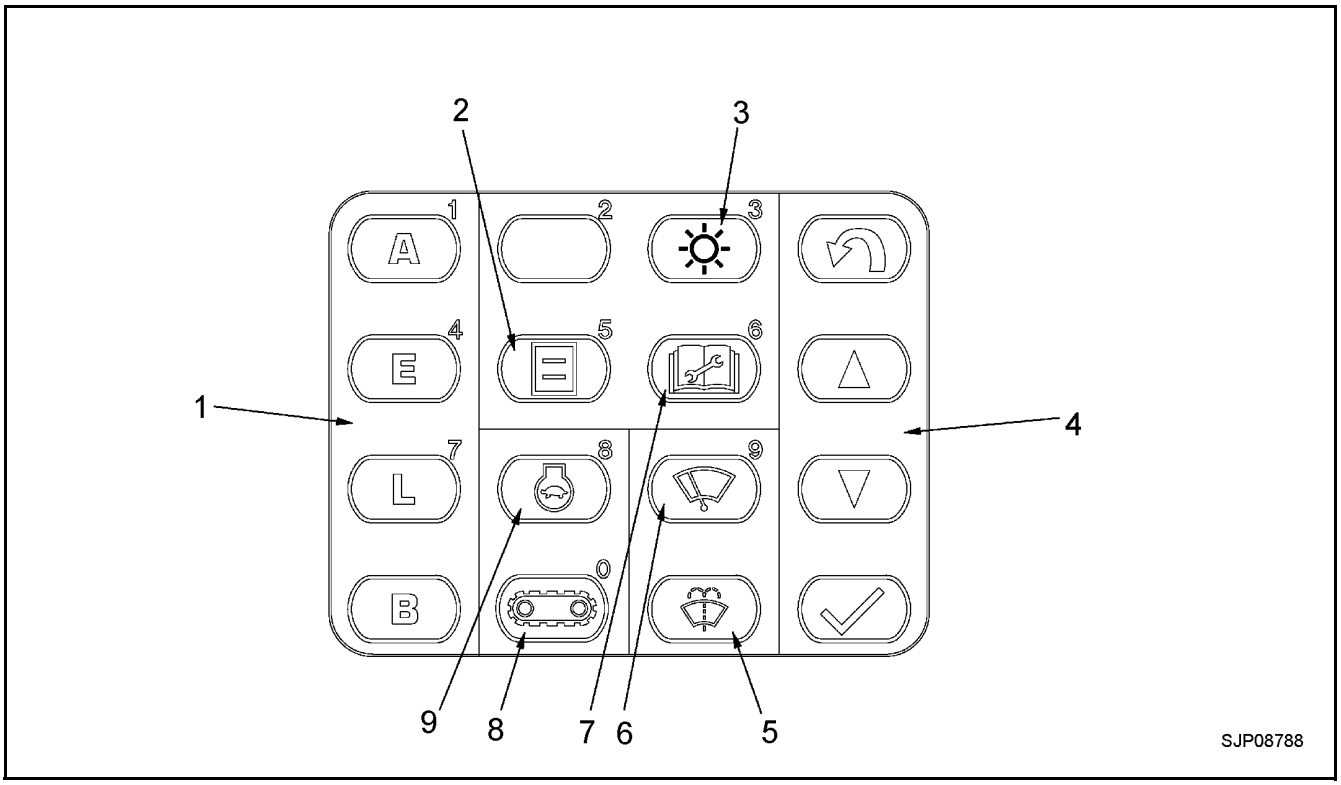
CN-1

Pin No.	Signal name	Input/ Output
1	NC	
2	R pump pressure sensor	Input
3	NC	
4	NC	
5	NC	
6	NC	Input
7	NC	
8	F boom pressure sensor	Input
9	NC	
10	Signal GND	
11	Knob SW	Input
12	NC	
13	Buchet CURL PPC pressure sensor	Input
14	NC	
15	NC	Input
16	NC	
17	Starting switch (Terminal C)	Input
18	NC	
19	Arm IN PPC pressure sensor	Input
20	NC	
21	NC	
22	POT_PWR	Output
23	Starting switch (terminal ACC)	Input
24	NC	

CN-2

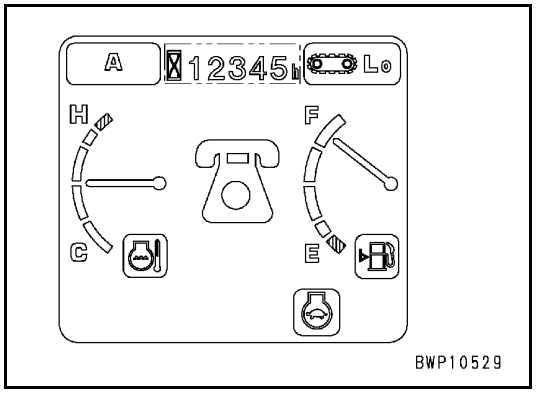
Pin No.	Signal name	Input/ Output
1	NC	
2	Swing emergency switch	Input
3	NC	Input
4	232C_RxD	Input
5	NC	
6	NC	
7	Model selection 4	Input
8	Attachment circuit selector signal	Output
9	NC	
10	NC	
11	NC	
12	CAN shield	
13	Model selection 5	Input
14	232C_TxD	Output
15	NC	
16	Travel steering signal pressure SW	Input
17	Model selection 3	Input
18	NC	
19	Auto deceleration signal	Output
20	NC	
21	S_NET	Input/output
22	CAN0_L	Input/output
23	NC	
24	FWE_SW	Input
25	NC	
26	NC	
27	Model selection 2	Input
28	NC	
29	GND (pulse GND)	
30	NC	
31	GND (S_NET GND)	
32	CAN0_H	Input/ output
33	NC	
34	GND (232C GND)	
35	Service valve pressure switch	Input
36	NC	
37	Model selection switch 1	Input
38	Swing lock switch	Input
39	GND (pulse GND)	
40	Engine speed sensor	Input

SWITCHES

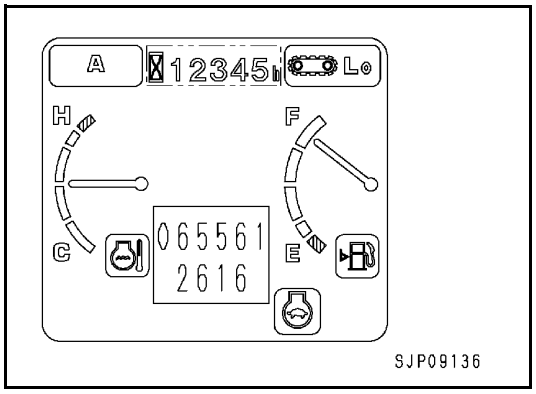


1. Selector switch
2. Selector switch
3. Display brightness, contrast adjustment switch
4. Control switch
5. Window washer switch
6. Wiper switch
7. Maintenance switch
8. Travel speed selector switch
9. Auto-deceleration switch

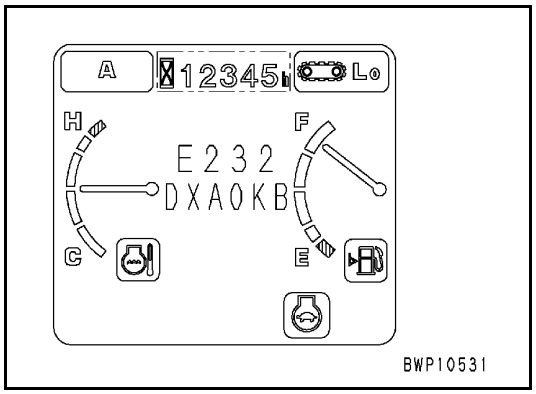
- While the user code is being displayed, if the input confirmation switch is pressed, the service code and failure code can be displayed.

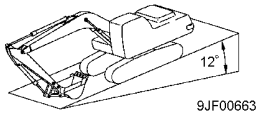
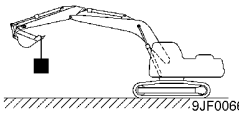


- If there is more than one service code or failure code, the display switches every 2 seconds and displays all the service codes/failure codes that caused the user code to be displayed. Even if service codes/ failure codes have occurred, if they did not cause the user code to be displayed, this function does not display them.



- If the telephone number has been set using the telephone number input on the service menu, it is possible to switch on the service code/failure code and display the telephone symbol and telephone number.
  For details of inputting and setting the telephone number, see SPECIAL FUNCTIONS OF MONITOR PANEL in the TESTING AND ADJUSTING section.



Category	Item		Measurement conditions	Unit	Standard value	Permissible value
Travel	Hydraulic drift of travel		 9JF00663 ●Hydraulic oil temperature: Within operating range ●Engine stopped ●Parking machine on slope 12 degrees with sprocket facing upslope ●Sliding distance for 5 minutes	mm	0	0
	Leakage of travel motor		●Hydraulic oil temperature: Within operating range ●Engine at high idling ●Travel: Lock sprocket. ●Oil leakage amount for one minute with traveling in relief condition	L/min	Max. 20	Max. 40
Work equipment	Hydraulic drift work equipment	Whole work equipment (tooth tip fall amount)	 9JF00664 ●Hydraulic oil temperature: Within operation range ●Flat and level ground ●Work equipment in measurement posture as illustrated above ●Bucket load: 3,060 kg (6746.15 lb) ●Engine stopped ●Work equipment control lever in NEUTRAL position ●Fall amount for 15 minutes as measured every 5 minutes starting immediately after initial setting	mm	Max. 600	Max. 900
		Boom cylinder (cylinder retraction amount)			Max. 25	Max. 38
		Arm cylinder (cylinder extension amount)			Max. 85	Max. 128
		Bucket cylinder (cylinder retraction amount)			Max. 30	Max. 45

ENGINE

Remark

To tune, test and troubleshoot the following procedures you must refer to the ENGINE SHOP MANUAL for the SAA6D125E-3 series engine, Section 12, for the tool requirements and proper procedures.

FUEL

BLEEDING AIR FROM FUEL CIRCUIT

FUEL PRESSURE

HANDLING FUEL SYSTEM DEVICES

INSPECTION OF FUEL CIRCUIT FOR LEAKAGE

RELEASING RESIDUAL FUEL SYSTEM PRESSURE

ADJUSTING ENGINE SPEED SENSOR

ADJUSTING VALVE CLEARANCE

BLOW-BY PRESSURE

COMPRESSION PRESSURE

ENGINE OIL PRESSURE

ENGINE SPEED SENSOR

EXHAUST GAS COLOR

EXHAUST TEMPERATURE

INTAKE AIR PRESSURE (BOOST PRESSURE)

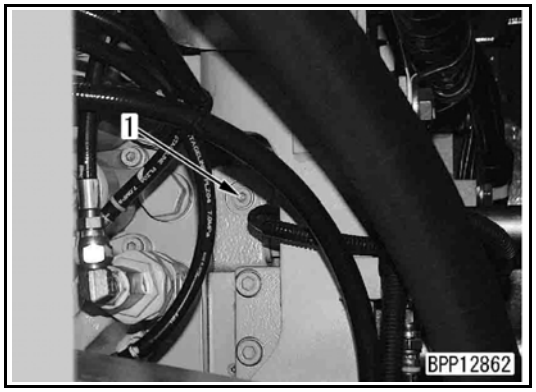
CONTROL CIRCUIT - BASIC PRESSURE

★ Measuring instruments for basic pressure in control circuit

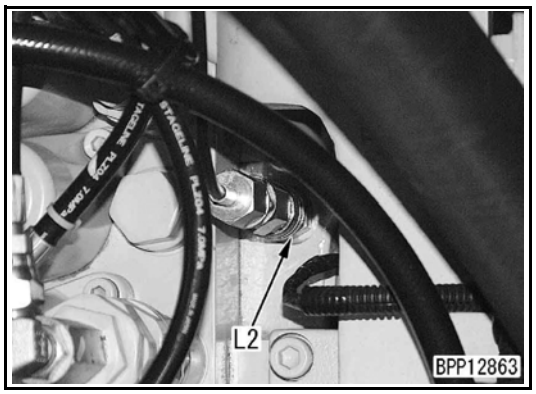
Symbol		Part No.	Part Name
L	1	799-101-1502	Hydraulic tester
		790-261-1203	Digital hydraulic tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

WARNING! Lower the work equipment to the ground and stop the engine. Operate the control levers several times to release the residual pressure in the piping, and then loosen the oil filler cap of the hydraulic tank slowly to release the internal pressure of the hydraulic tank.

1. Remove the control valve top cover and remove control circuit basic pressure pick-up plug (1).
   ★ The figure shows the control valve seen from inside of the pump room.



2. Install nipple **L2** and connect it to oil pressure gauge [1] of hydraulic tester **L1**.
   ★ Use the oil pressure gauges of 60 kg/cm^2 (853.4 psi)
3. Run the engine and raise the hydraulic oil temperature to the operating range.
4. Run the engine at high idling and set all the control levers in neutral and measure the oil pressure.
5. After finishing measurement, remove the measuring instruments and return the removed parts.



★ The relief valve for the control circuit basic pressure is not adjustable.

SOLENOID VALVE - OUTPUT PRESSURE

★ Measuring instruments for solenoid valve output pressure

Symbol		Part No.	Part Name
P	1	799-101-5002	Hydraulic tester
		790-261-1203	Digital hydraulic tester
	2	799-401-3100	Adapter (Size 02)
		799-401-3200	Adapter (Size 03)

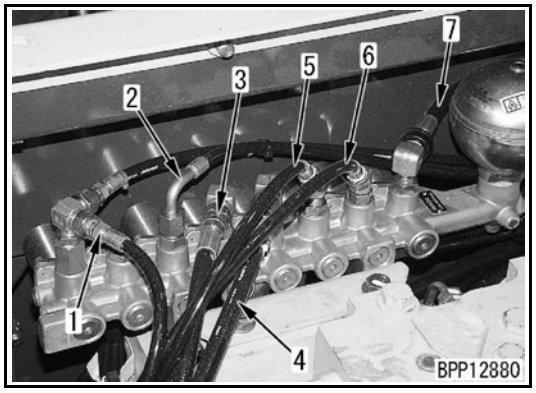
★ Before measuring the solenoid valve output pressure, check that the basic pressure in the control circuit is normal.

WARNING! Lower the work equipment to the ground and stop the engine. Operate the control levers several times to release the residual pressure in the piping, and then loosen the oil filler cap of the hydraulic tank slowly to release the internal pressure of the hydraulic tank.

1. Remove the control valve top cover and disconnect outlet hose (1) – (7) of the solenoid valve to be removed.
   ★ Since the outlet hoses of the PPC lock solenoid valves have quick couplers on the solenoid valve side, measure the pressure on the PPC valve side (on the back side of the operator's cab)

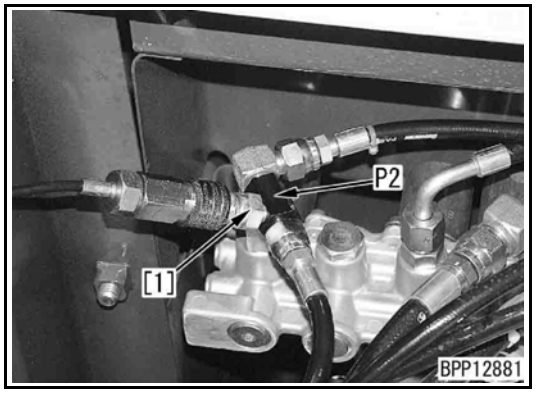
.

No.	Solenoid valve to be measured
1	2-stage relief solenoid valve
2	Machine push-up solenoid valve
3	Swing holding brake solenoid valve
4	Travel speed selector solenoid valve
5	Merge-divider solenoid valve
6	Travel junction solenoid valve
7	PPC lock solenoid valve



2. Install adapter **P2** and connect the disconnected hose again.

3. Install nipple [1] of hydraulic tester **P1** and connect it to hydraulic gauge [2].
   ★ Use the oil pressure gauges of 60 kg/cm² (853.4 psi).
   ★ The figure shows the measuring instruments connected to the outlet hose of the 2-stage relief solenoid valve.



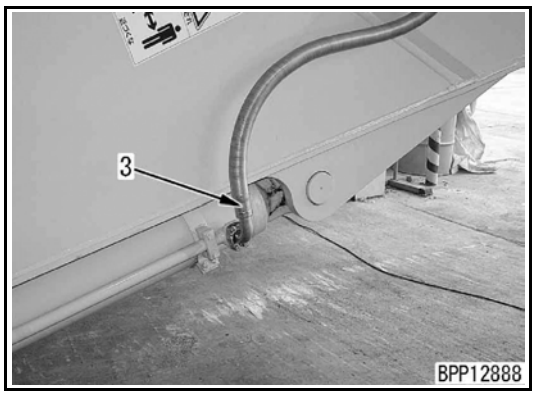
3. Measuring oil leakage from bucket cylinder.

   A. Run the engine and raise the engine oil temperature to the operating range.

   B. Move the bucket cylinder to the CURL stroke end and stop the engine.

WARNING! Release the residual pressure in the piping on the bucket cylinder head side. For details, see RELEASING RESIDUAL PRESSURE IN HYDRAULIC CIRCUIT (Operate the lever in the arm CURL direction only, however).

   C. Disconnect hose (3) on the cylinder head side and block the hose side with a plate.



WARNING! Take care not to disconnect the hose on the cylinder bottom side.

★ Use the following part to block the hose side.
07379-01044 (Flange #10)

   D. Run the engine at high idling and relieve the bucket circuit by curling the bucket.

WARNING! Take care not to “dump the bucket”.

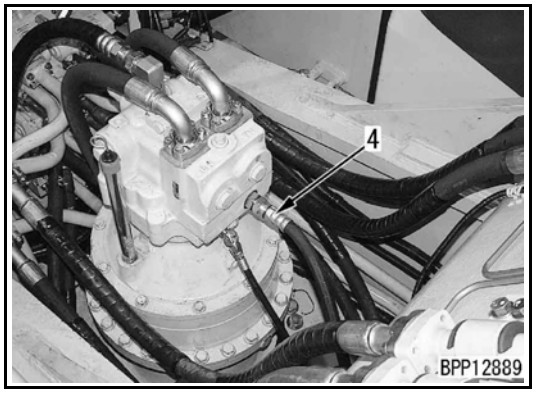
   E. Measure the oil leakage for 1 minute after 30 seconds since relieving is started.

   F. After finishing measurement, return the removed parts.

4. Measuring oil leakage from swing motor.

   A. Run the engine and raise the engine oil temperature to the operating range.

   B. Disconnect drain hose (4) and block the hose side with a plug.
   ★ Use the following part to block the hose side.
   07376-70522 (Plug #05)

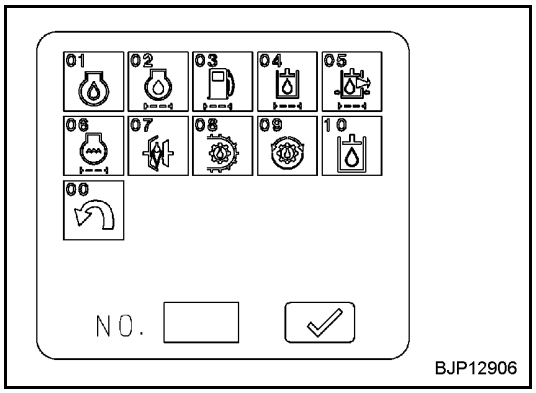


   C. Turn the swing lock switch ON.

   D. Run the engine at high idling and relieve the swing circuit by swinging.
   ★ Measure the oil leakage for 1 minute after 30 seconds since relieving is started.
   ★ After measuring 1 time, swing 180°, and then measure again.

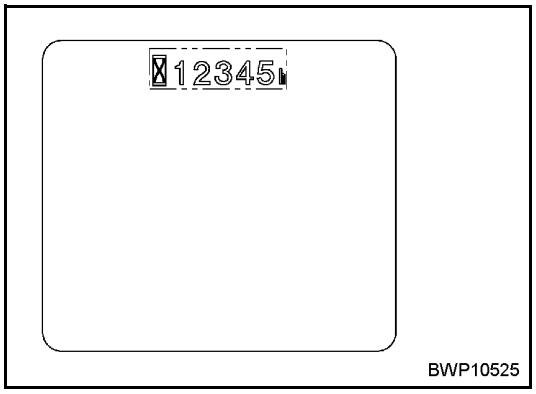
   E. After finishing measurement, return the removed parts.

9. Function of checking maintenance information.
   The operator can check the detailed information about the maintenance items (set time and elapsed time) and reset them after checking with the maintenance switches.
   ★ The maintenance function is set and reset and the maintenance time is set with the service menu.



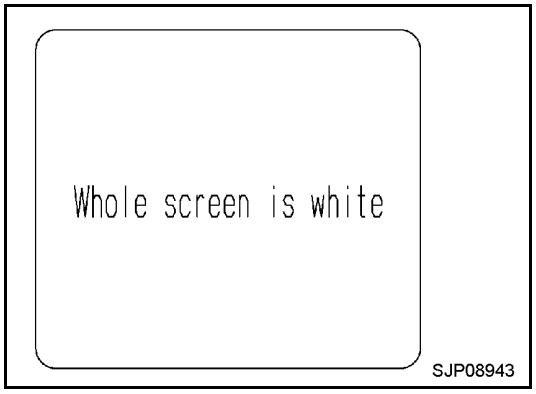
BJP12906

10. Function of displaying service meter.
    When the starting switch is turned OFF, the operator can display only the service meter by operating the following switches.
    ● Operation of switches: [↶] + [Δ] (Operate these switches simultaneously)



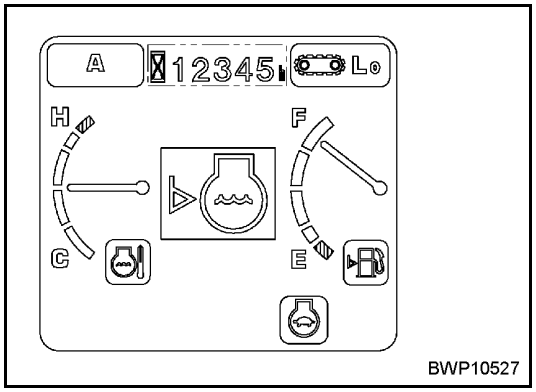
BWP10525

11. Function of checking display LCD.
    On the password inputting screen or ordinary screen, the operator can check the display LCD.
    ● Operation of switches: [↶] + [A] (Operate these switches simultaneously)
    ★ The whole LCD unit is turned ON and all the surface becomes white. If there is not any black part, the LCD unit is normal.
    ★ If any switch is operated while the LCD unit is being checked, the screen before the check is displayed again.



SJP08943

12. Function of displaying cautions.
    If there is any abnormal one in the calculation items, the corresponding symbol mark is displayed in large size for 2 seconds, and then it is displayed in small size until the abnormal item is repaired.

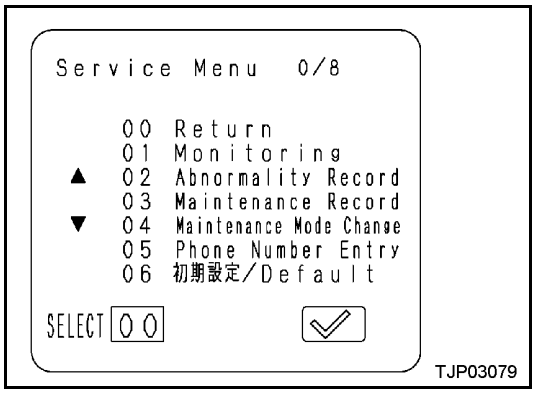


BWP10527

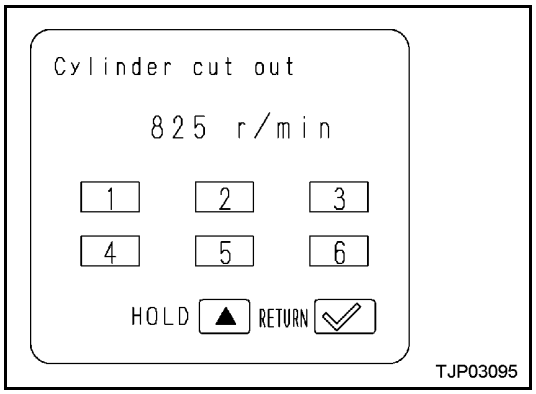
Code No.	Monitoring item		Unit (Default: ISO) SI meter inch	Remarks
01900	Pressure Switch 1	Swing	ON/OFF	
		Travel	ON/OFF	
		Boom Lower	ON/OFF	
		Boom Raise	ON/OFF	
		Arm Curl	ON/OFF	
		Arm Dump	ON/OFF	
01901	Pressure Switch 2	Bucket Curl	ON/OFF	
		Bucket Dump	ON/OFF	
		Service	ON/OFF	
		Travel Steering	ON/OFF	
02300	Solenoid 1	Travel Junction	ON/OFF	
		Swing Brake	ON/OFF	
		Merge-divider	ON/OFF	
		2-stage Relief	ON/OFF	
		Travel Speed	ON/OFF	
02301	Solenoid 2	Service Return	ON/OFF	
02200	Switch Input 1	Lever Sw.	ON/OFF	
		Swing Release Sw.	ON/OFF	
		Swing Brake Sw.	ON/OFF	
02201	Switch Input 2	Model Select 1	ON/OFF	
		Model Select 2	ON/OFF	
		Model Select 3	ON/OFF	
		Model Select 4	ON/OFF	
		Model Select 5	ON/OFF	
02202	Switch Input 3	Key Switch (ACC)	ON/OFF	
03700	Controller Output 1	Batt. Relay Dr.	ON/OFF	
04500	Monitor Input 1	Key Switch	ON/OFF	
		Start	ON/OFF	
		Preheat	ON/OFF	
		Light	ON/OFF	
		Rad. Level	ON/OFF	
04501	Monitor Input 2	Aircleaner	ON/OFF	
		Eng. Oil Level	ON/OFF	
		Battery Charge	ON/OFF	
04502	Monitor Input 3	Swing Brake Sw.	ON/OFF	
		Bzzr Cancel Sw.	ON/OFF	
		Window Limit Sw.	ON/OFF	
		W Limit Sw.	ON/OFF	
		P Limit Sw.	ON/OFF	

22. Function of cylinder cut out mode operation [09].
The operator can operate the machine in the cylinder cut out mode with the monitor panel. Cylinder cut out mode operation means to run the engine with 1 or more fuel injectors disabled electrically to reduce the number of effective cylinders. This operation is used to find out a cylinder which does not output power normally (or, combustion in it is abnormal).

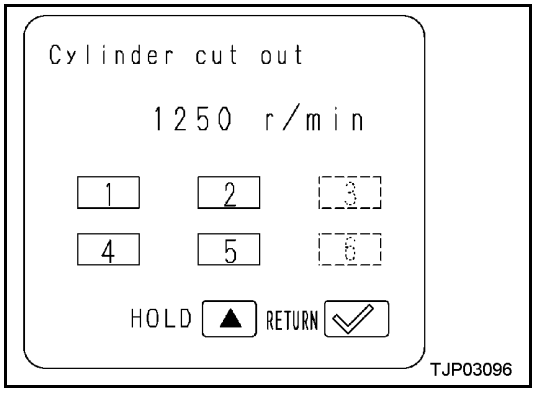
A. Selecting menu.
On the initial screen of the service menu, select "09 Cylinder cut out mode operation" and press the [✓] switch.

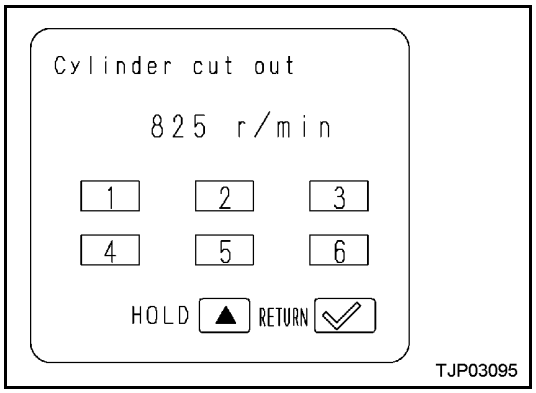


B. Setting cylinders to be disabled.
Press switches [1] - [6] on the monitor panel corresponding to the cylinder Nos. to be disabled.
★ After a switch is pressed, if the cylinder No. corresponding to it on the monitor panel is displayed white in a white frame, the cylinder is disabled (If setting is wrong, press the same switch again).
★ Only one or more cylinders can be disabled for the reduced cylinder mode operation.



C. Cancellation of disabled cylinders.
Press switches [1] - [6] on the monitor panel corresponding to the disabled cylinder Nos. to cancel disabling of those cylinders.
★ After a switch is pressed, if the cylinder No. corresponding to it on the monitor panel is displayed black in a black frame, disabling of the cylinder is cancelled.

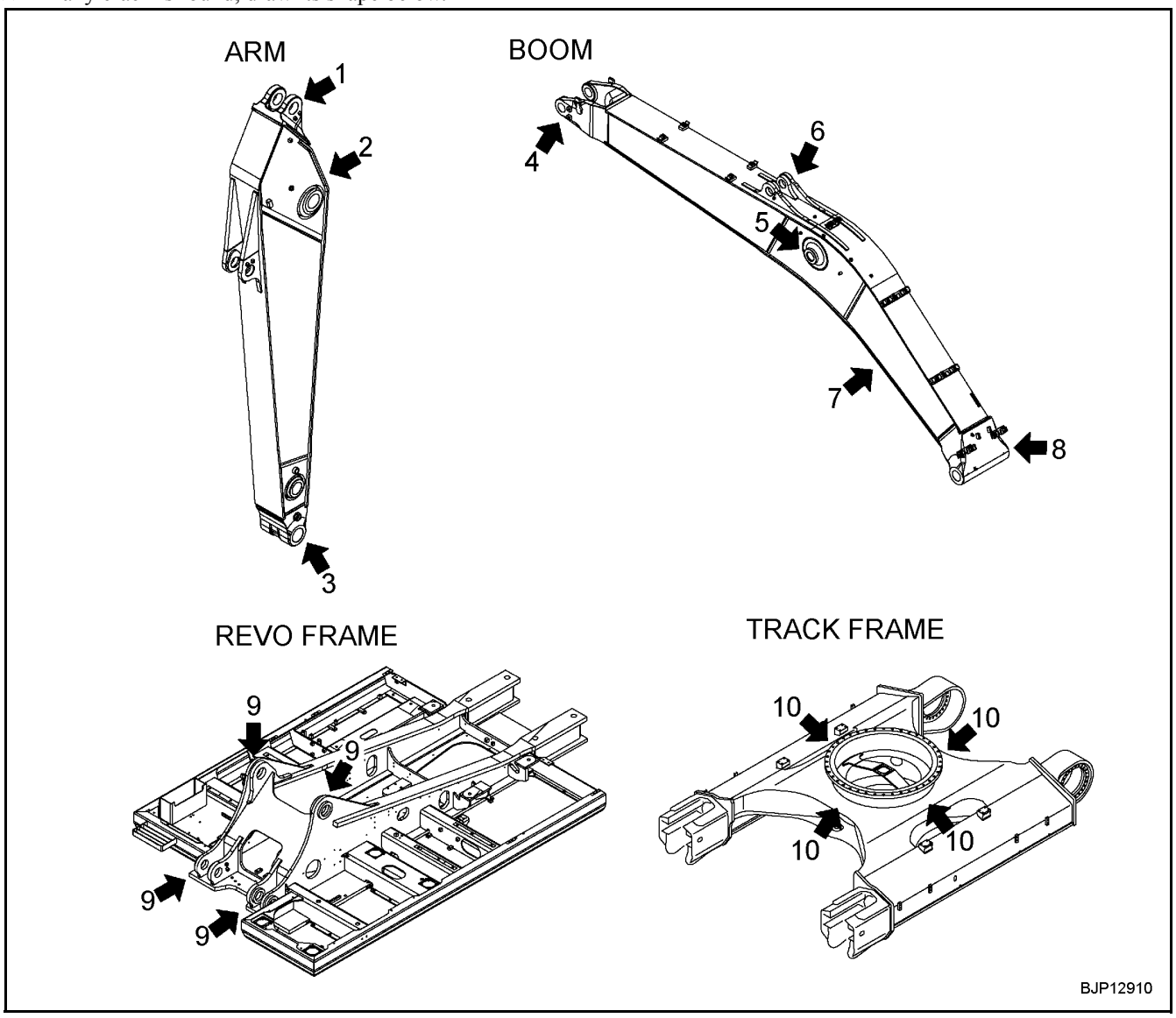




Pm-CLINIC SERVICE PC400 (LC)

Visual check of welded structures

★ If any crack is found, draw its shape below.



Arm

1. Arm cylinder bracket

❑ Left ❑ Right

2. Arm foot

❑ Left ❑ Right ❑ End plate

3. Arm top boss

❑ Left ❑ Right

Boom

4. Boom top bracket

❑ Left ❑ Right

5. Boom cylinder bracket

❑ Left ❑ Right

6. Arm cylinder bracket

❑ Left ❑ Right

7. Boom lower plate

❑ Left ❑ Right

8. Boom foot

❑ Left ❑ Right

Revolving frame

9. Boom bracket

❑ Left ❑ Right

Track frame

10. Circle bracket

❑ Front ❑ Rear

❑ Left ❑ Right

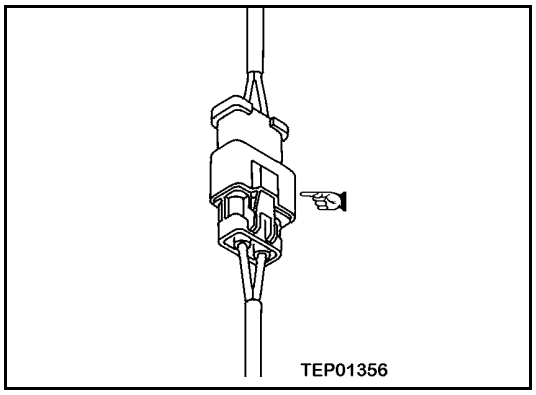
CONNECTING CONNECTORS

1. Check the Connector Visually

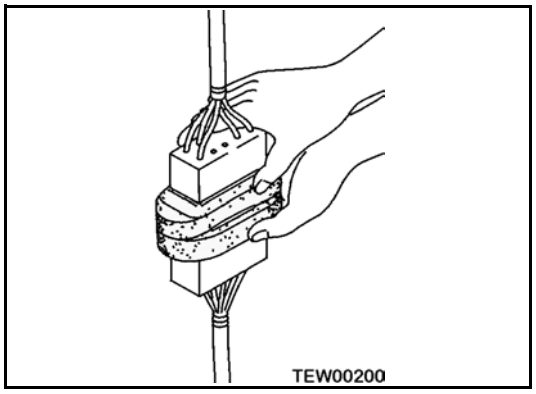
   A. Check that there is no oil, dirt, or water stuck to the connector pins (mating portion).

   B. Check that there is no deformation, faulty contact, corrosion, or damage to the connector pins.

   C. Check that there is no damage or breakage to the outside of the connector.

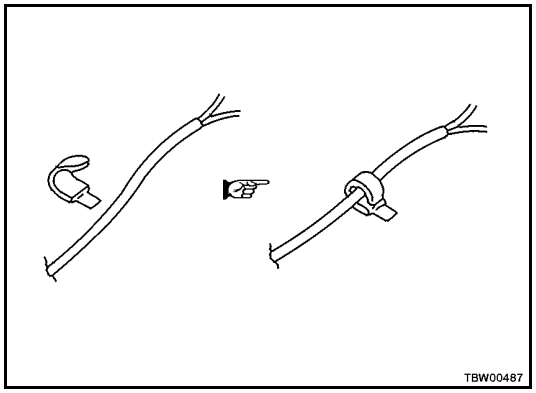


   ★ If there is any oil, water, or dirt stuck to the connector, wipe it off with a dry cloth. If any water has got inside the connector, warm the inside of the wiring with a dryer, but be careful not to make it too hot as this will cause short circuits.
   ★ If there is any damage or breakage, replace the connector.



2. Fix the Connector Securely
   Align the position of the connector correctly, then insert it securely. For connectors with lock stopper, push in the connector until the stopper clicks into position.

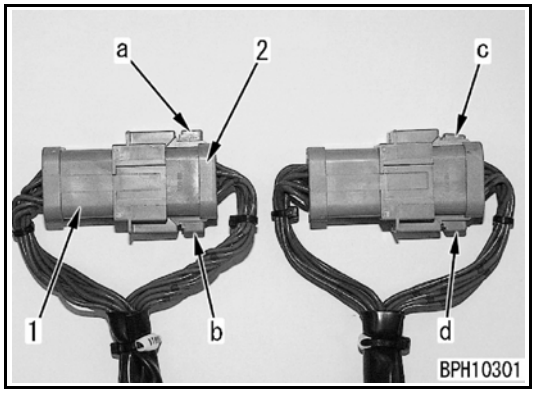
3. Correct any protrusion of the boot and any misalignment of the wiring harness For connectors fitted with boots, correct any protrusion of the boot. In addition, if the wiring harness is misaligned, or the clamp is out of position, adjust it to its correct position.
   ★ If the connector cannot be corrected easily, remove the clamp and adjust the position.



4. If the connector clamp has been removed, be sure to return it to its original position. Check also that there are no loose clamps.

5. Connecting connectors (DT type connector)
   Since the DT 8-pole and 12-pole DT type connectors have 2 latches respectively, push them in until they click 2 times.

   A. Male connector, 2. Female connector
      - Normal locking state (Horizontal): **a**, **b**, **d**
      - Incomplete locking state (Diagonal): **c**

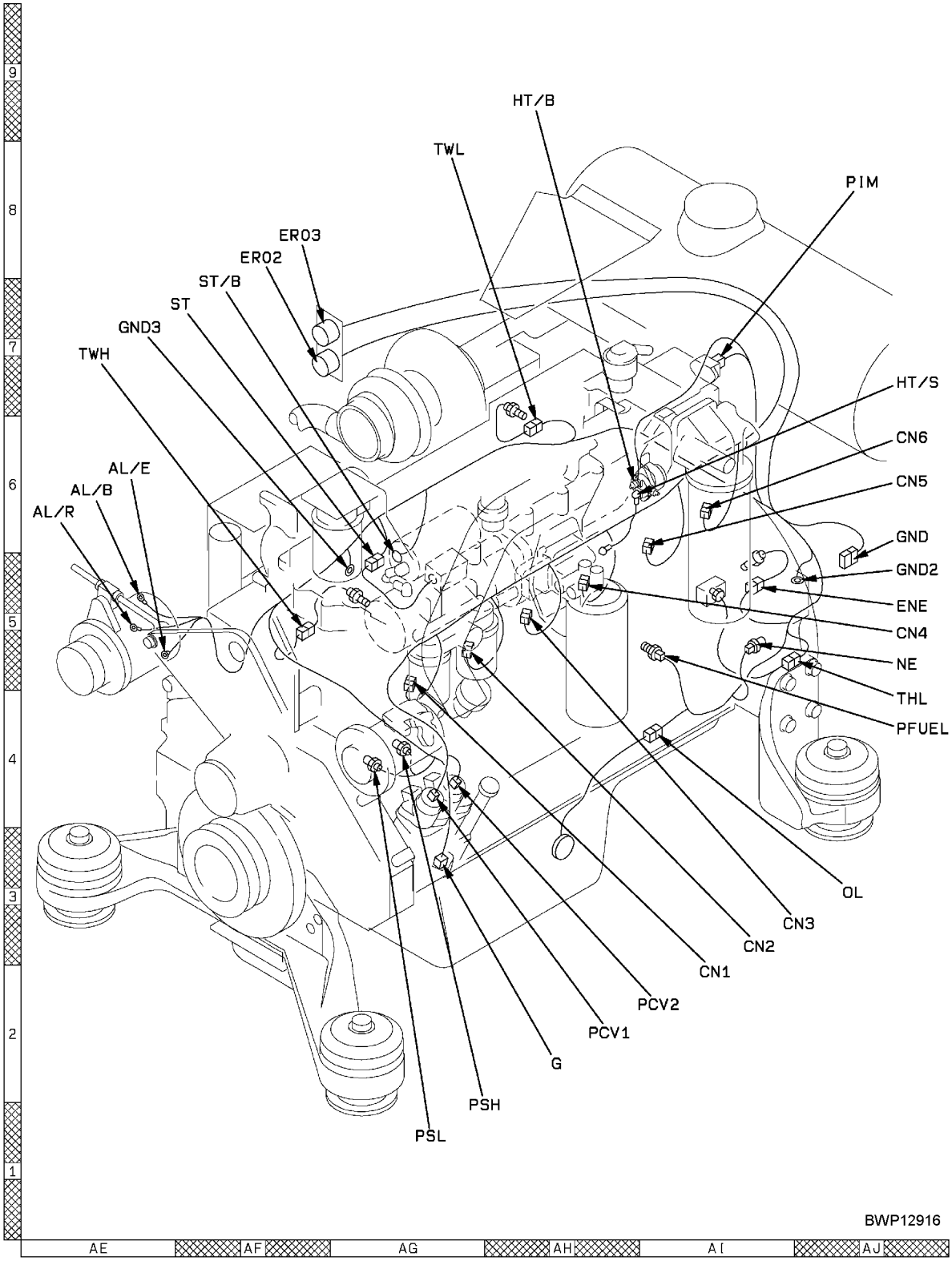


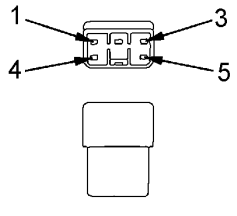
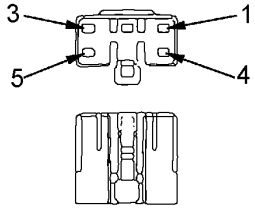
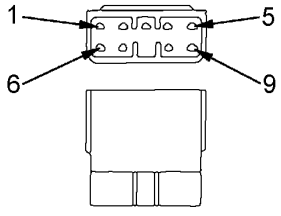
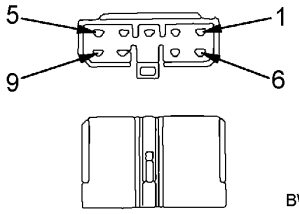
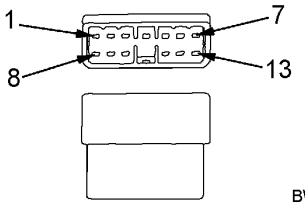
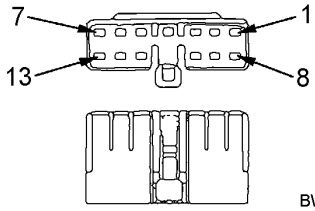
CONNECTOR ARRANGEMENT DRAWING

CONNECTORS LIST

★ The address of each connector roughly shows the place of the connector in the connectors stereogram and the circuit diagram of each system.

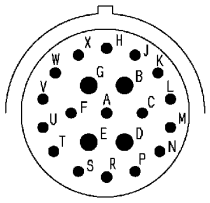
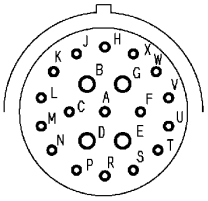
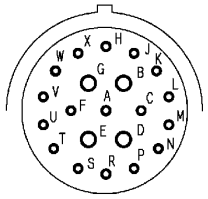
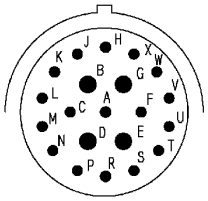
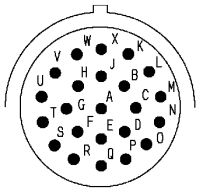
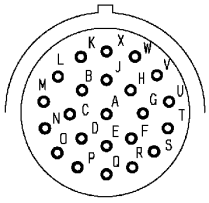
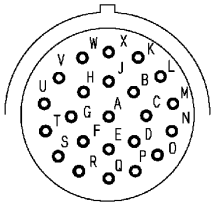
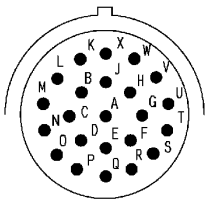
Connector No.	Type	No. of pins	Name of device	Address			
				Stereogram	M circuit	E circuit	P circuit
A01	X	4	Intermediate connector	T-1	H-6	D-7	G-7
A02	X	4	Intermediate connector	T-1	H-6		G-7
A03	DT	12	Intermediate connector	N-2	H-6	D-7	G-7
A04	SWP	6	Intermediate connector	O-1			G-6
A05	SWP	14	Intermediate connector	T-1	H-5		G-6
A06	SWP	14	Intermediate connector	O-1	H-5		G-5
A07	SWP	16	Intermediate connector	S-1	A-4	D-7	G-5
A09	SWP	8	Intermediate connector	N-2			G-5
A10	Terminal	1	Revolving frame grounding	H-2	I-1	F-1	J-8
A11	Terminal	1	Revolving frame grounding	I-2		F-1	
A12	Terminal	1	Revolving frame grounding	I-2	I-1		
A13	Terminal	1	Revolving frame grounding	I-2	I-1		J-8
A14	Terminal	1	Revolving frame grounding	F-1	I-1		J-8
A15	Terminal	1	Revolving frame grounding	J-3	I-1		J-8
A16	Terminal	1	Revolving frame grounding	J-3	I-1		K-8
A20	Terminal	1	Battery relay (Terminal E)	D-1	L-5		K-9
A21	Terminal	1	Battery relay (Terminal BR)	D-2	J-6		K-9
A22	Terminal	1	Battery relay (Terminal N)	F-2	J-5	D-8	K-9
A23	Terminal	1	Battery relay (Terminal B)	F-2	J-6		K-9
A31	D	2	Air cleaner clogging sensor	H-9	K-4		
A33	X	2	Radiator water level sensor	H-9	K-5		
A34	L	2	Fusible link (65 A)	D-2	K-6		K-9
A35	M	2	Fusible link (30 A)	G-9	K-6	D-9	K-9
A40	Terminal	1	Horn (Low tone)	G-9			
A41	Terminal	1	Horn (High tone)	G-9			
A42	M	1	Intermediate connector	H-9	J-7		
A43	D	2	Travel alarm	J-3			K-5
A44	M	1	Right headlamp	D-5	K-7		
A50	KES0	2	Windshield washer motor (Tank)	L-5	K-5		
A51	D	3	F pump oil pressure sensor	L-8			L-5
A52	D	3	R pump oil pressure sensor	L-7			L-5
A60	X	1	Fuel level sensor	G-9	K-4		
A61	D	2	Hydraulic oil temperature sensor	L-5	K-5		
A73	D	2	Fuel priming pump	G-9			
A80	DT	8	Intermediate connector	S-1	H-3	D-6	G-4
AL/B	Terminal	1	Alternator B terminal	AE-6			
AL/E	Terminal	1	Alternator E terminal	AE-6			
AL/R	Terminal	1	Alternator R terminal	AE-6			
C01	DRC	24	Pump controller	U-9	A-3	A-8	A-8
C02	DRC	40	Pump controller	U-9	A-3	A-8	A-7
C03	DRC	40	Pump controller	W-9	A-2		A-6
C09	S	8	Model selection connector (Pump controller)	W-9			B-1
CB1	DRC	24	Pump controller	I-9	K-1	A-6	L-8
CB2	DRC	40	Pump controller	I-9	K-1	A-5	L-8
CB3	DRC	40	Pump controller	J-9		A-3	


HT/B
TWL
PIM
ER03
ER02
ST/B
ST
GND3
TWH
HT/S
CN6
AL/E
AL/B
AL/R
CN5
GND
GND2
ENE
CN4
NE
THL
PFUEL
OL
CN3
CN2
CN1
PCV2
PCV1
G
PSH
PSL
BWP12916
9
8
7
6
5
4
3
2
1
AE
AF
AG
AH
AI
AJ

No.of pins	MIC type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
7	Body part No.: 79A-222-2640 (Q'ty: 5)	Body part No.: 79A-222-2630 (Q'ty: 5)	---
11	Body part No.: 79A-222-2680 (Q'ty: 5)	Body part No.: 79A-222-2670 (Q'ty: 5)	---
5	 BWP04741	 BWP04742	799-601-2710
	Body part No.: 79A-222-2620 (Q'ty: 5)	Body part No.: 79A-222-2610 (Q'ty: 5)	
9	 BWP04743	 BWP04744	799-601-2950
	Body part No.: 79A-222-2660 (Q'ty: 5)	Body part No.: 79A-222-2650 (Q'ty: 5)	
13	 BWP04745	 BWP04746	799-601-2720
	Body part No.: 79A-222-2710 (Q'ty: 2)	Body part No.: 79A-222-2690 (Q'ty: 2)	

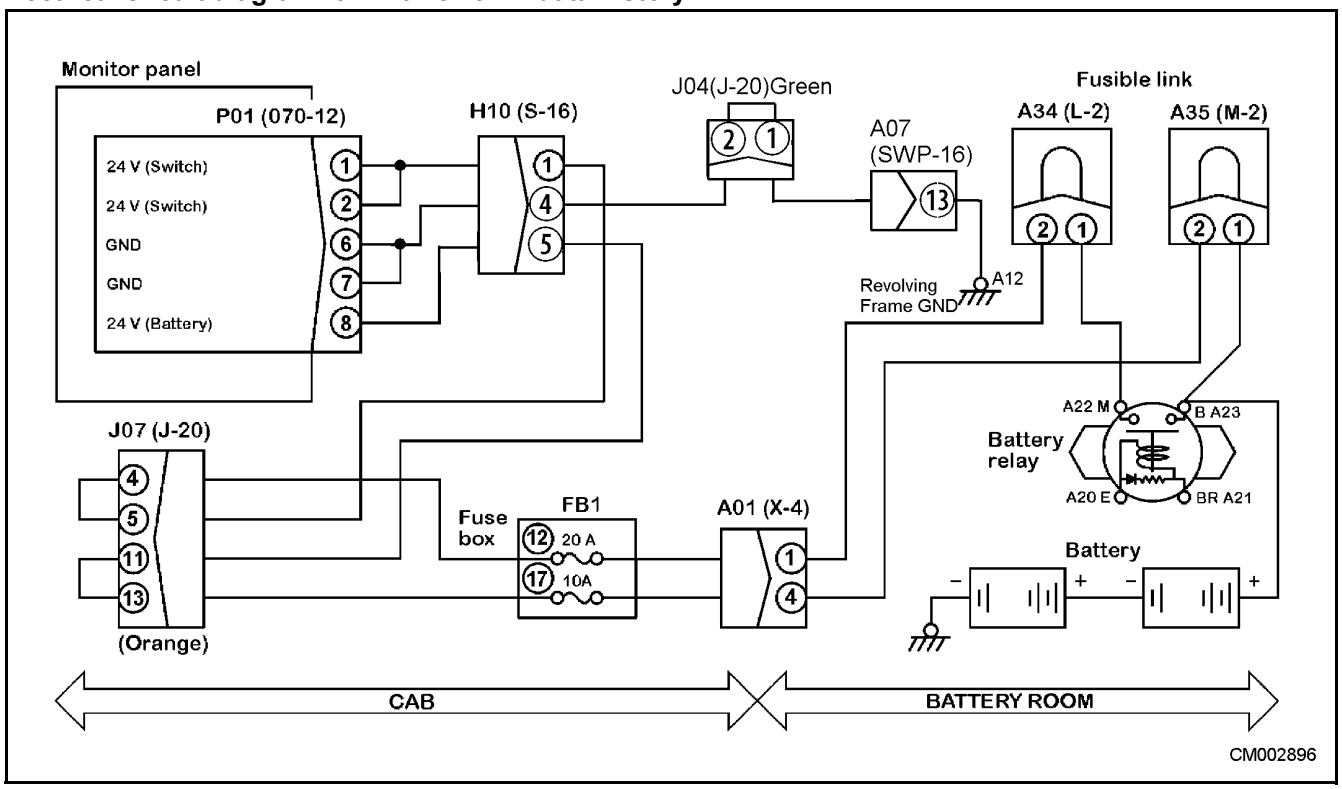
Remark

The pin No. is also marked on the connector (electric wire insertion end).

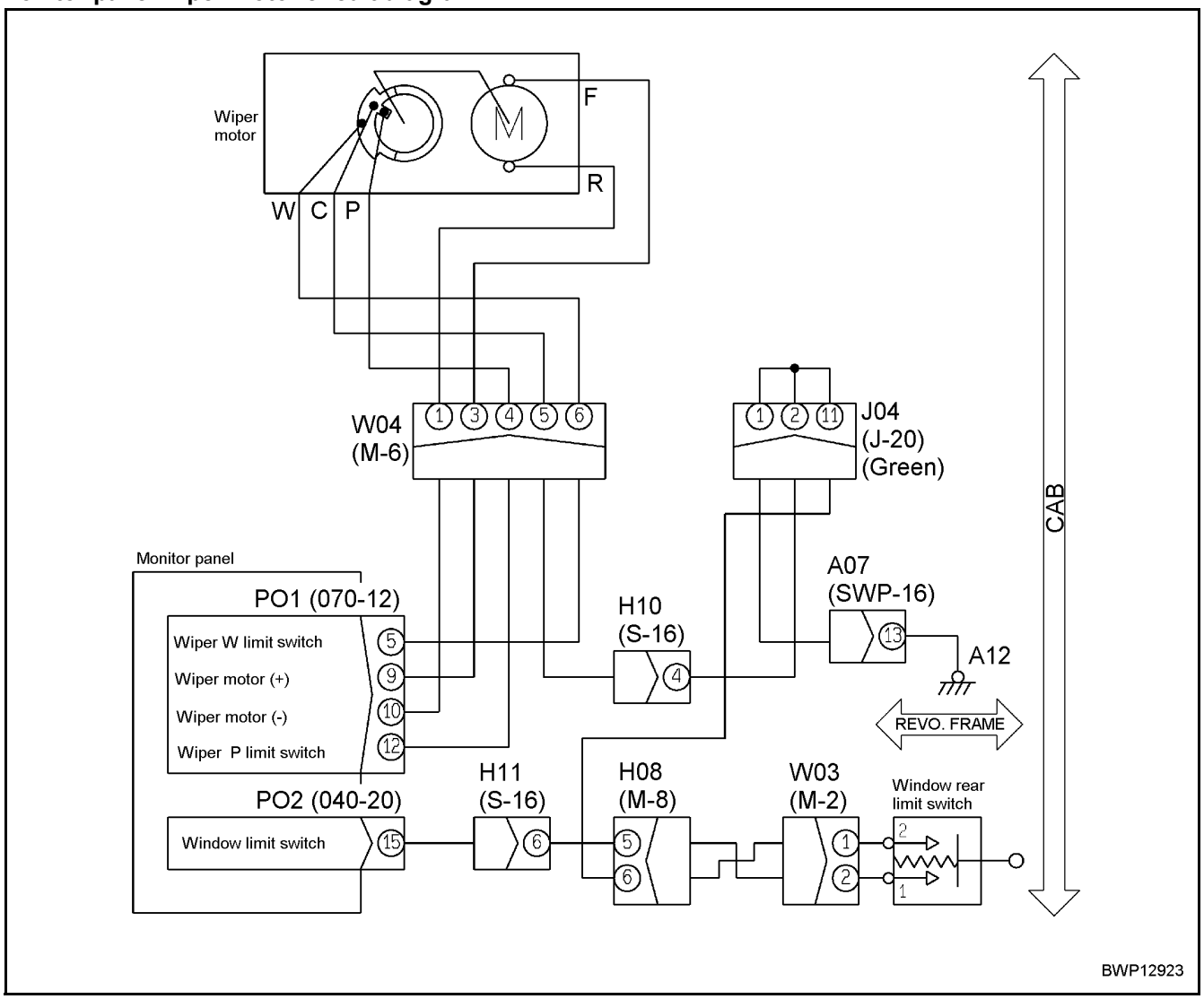
Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
24-21 (7)	Pin (male terminal)	Pin (female terminal)	799-601-9270
	 BWP05025	 BWP05026	
	Part No.: 08191-71201, 08191-71202, 08191-71205, 08191-71206	Part No.: 08191-74101, 08191-74102, 08191-74105, 08191-74106	
	Pin (female terminal)	Pin (male terminal)	799-601-9270
	 BWP05027	 BWP05028	
	Part No.: 08191-72201, 08191-72202, 08191-72205, 08191-72206	Part No.: 08191-73101, 08191-73102, 08191-73105, 08191-73106	
24-22 (8)	Pin (male terminal)	Pin (female terminal)	799-601-9280
	 BWP05029	 BWP05030	
	Part No.: 08191-81201, 08191-81202 08191-81203, 08191-81204 08191-81205, 08191-80206	Part No.: 08191-84101, 08191-84102 08191-84103, 08191-84104 08191-84105, 08191-84106	
	Pin (female terminal)	Pin (male terminal)	799-601-9280
	 BWP05031	 BWP05032	
	Part No.: 08191-82201, 08191-82202 08191-82203, 08191-82204 08191-82205, 08191-82206	Part No.: 08191-83101, 08191-83102 08191-83103, 08191-83104 08191-83105, 08191-83106	

TROUBLESHOOTING ERROR CODES IN MONITOR SYSTEM

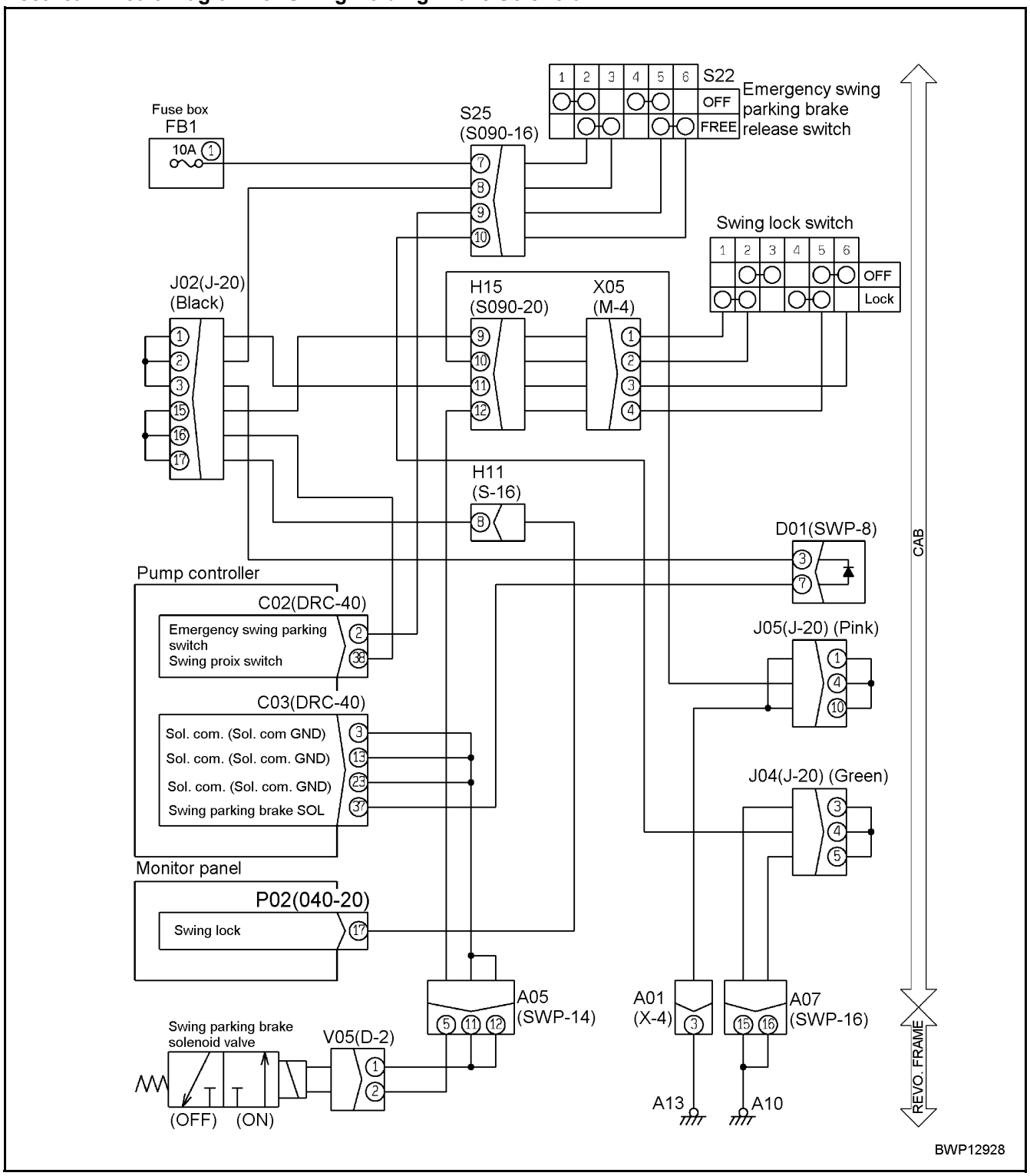
Electrical circuit diagram for E101 error in data history



Monitor panel wiper motor circuit diagram

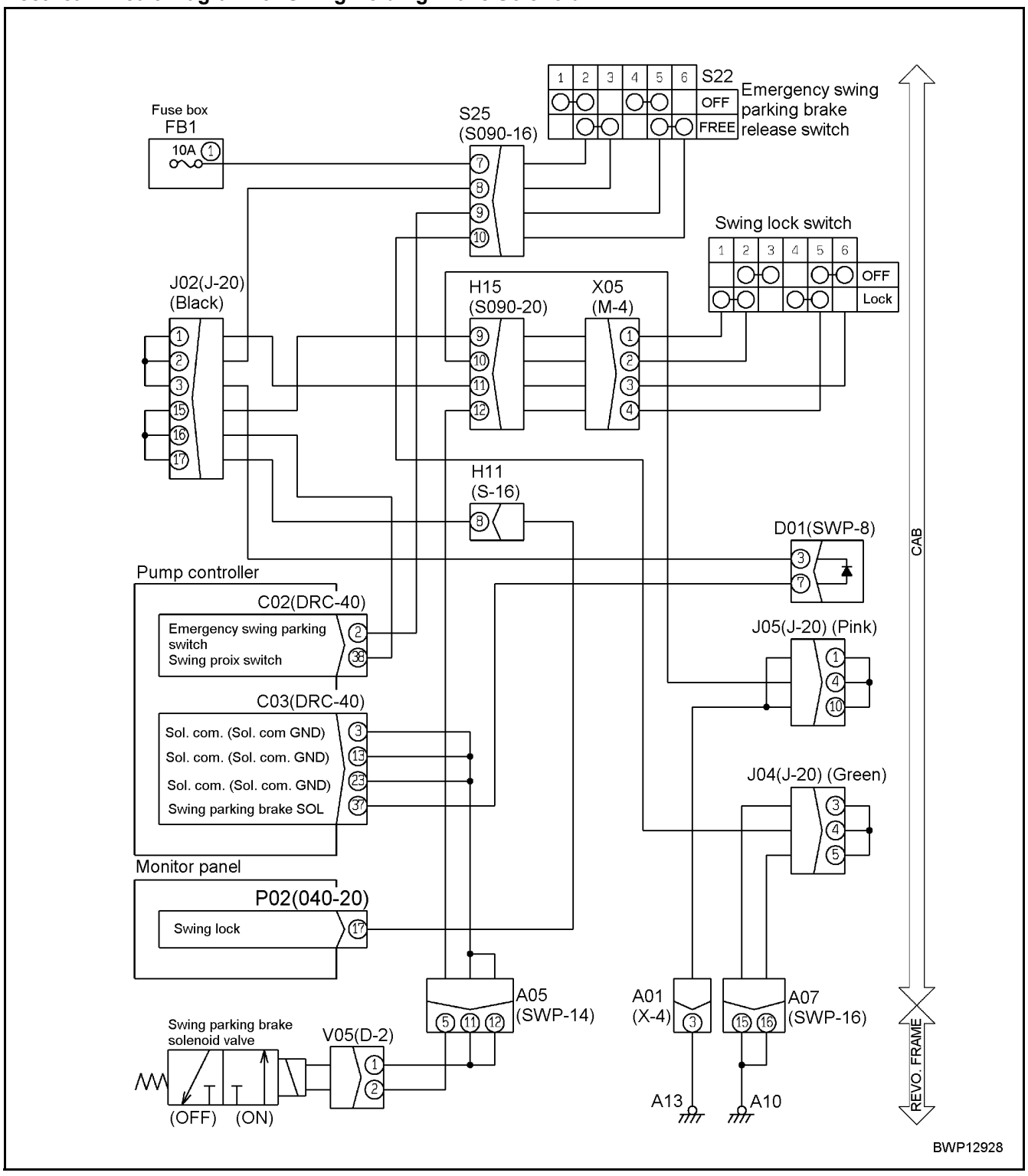


Electrical Circuit Diagram for Swing Holding Brake Solenoid



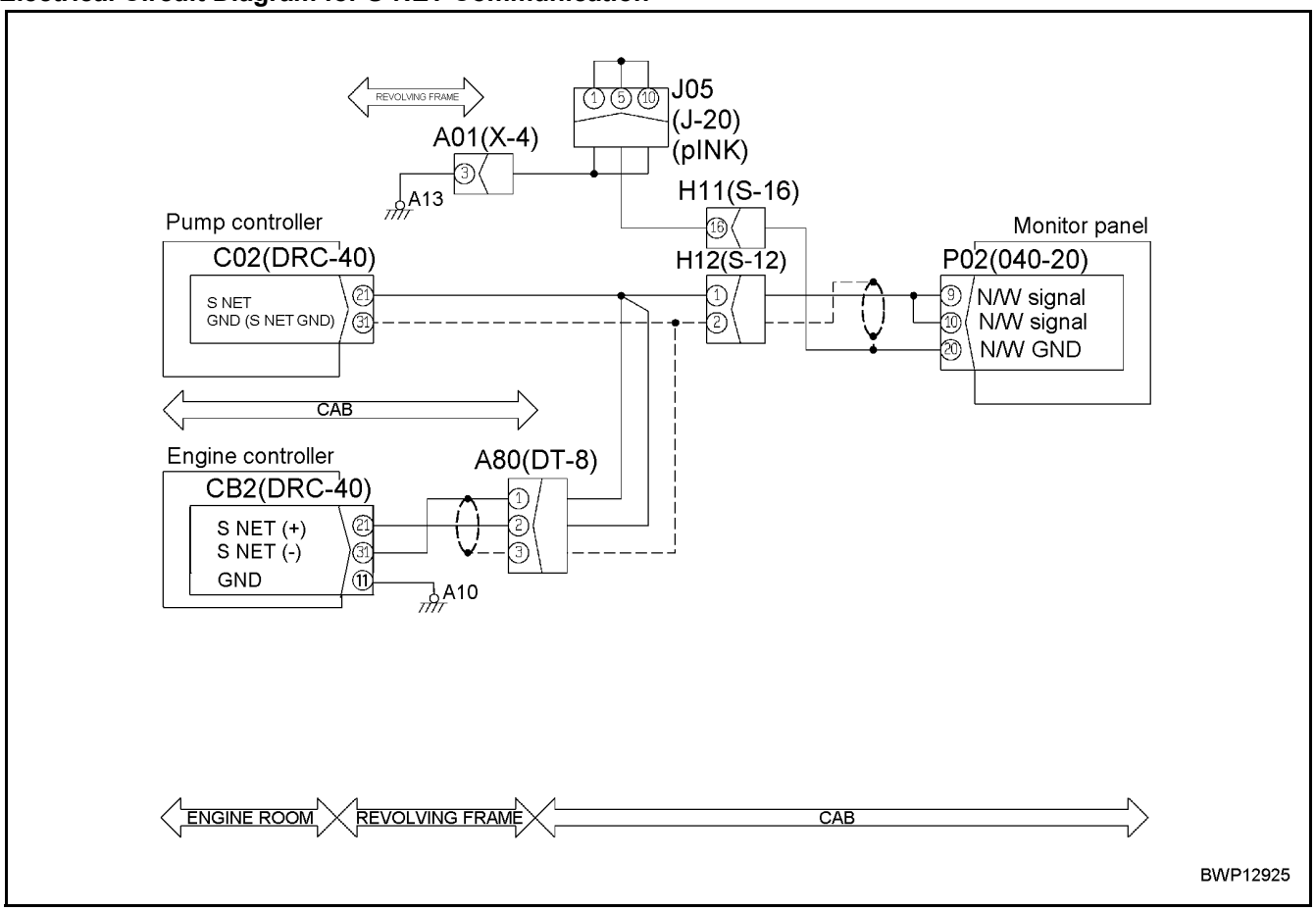
Steps	Circuit Diagnostic Procedures For Code [E203]			Specifications	No.	Readings
---	---	Voltage	At connectors C03 (37) and D01 (7) and ground	Below 1V	**10**	
5. Pump controller • With ignition switch in OFF position. • Disconnect C03 connector from controller and install T-adapter on C03connector. • Disconnect D01 and connect pins (3) and (7) of female side for test. • Hold ignition switch in OFF position during troubleshooting.						
A. Defective pump controller test		Resistance Ω	At C03 (17) and between pins (3), (13), (23)	20 - 60Ω	**11**	

Electrical Circuit Diagram for Swing Holding Brake Solenoid

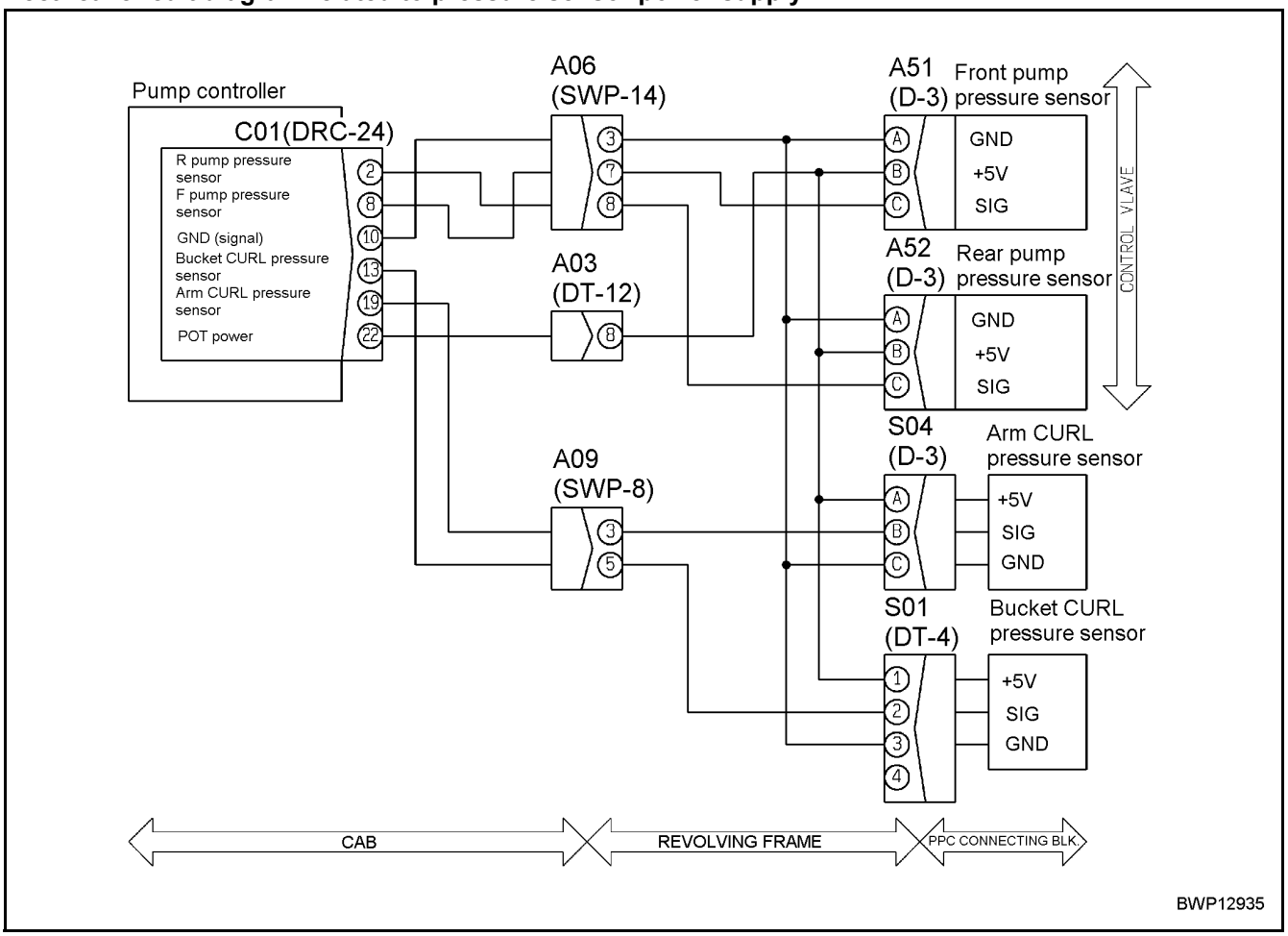


Steps	Circuit Diagnostic Procedures For Code [E218]			Specifications	No.	Readings
5.	**Pump controller test** • With ignition switch in the OFF position. • Disconnect C02 connector from monitor and install T-adapter. • Turn ignition switch to the ON position during the troubleshooting.					
A.	Monitor panel test	Voltage	C02, between (21) and (31)	6 - 9V	**12**	

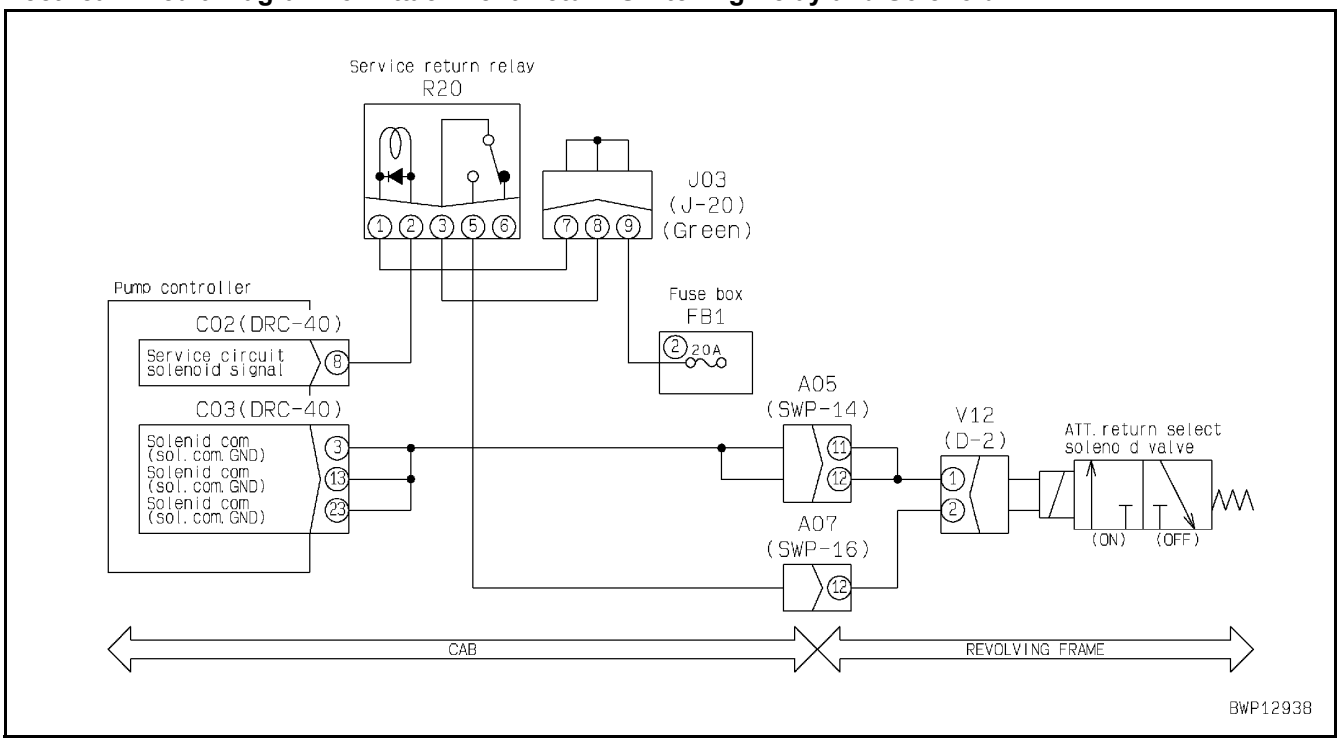
Electrical Circuit Diagram for S-NET Communication



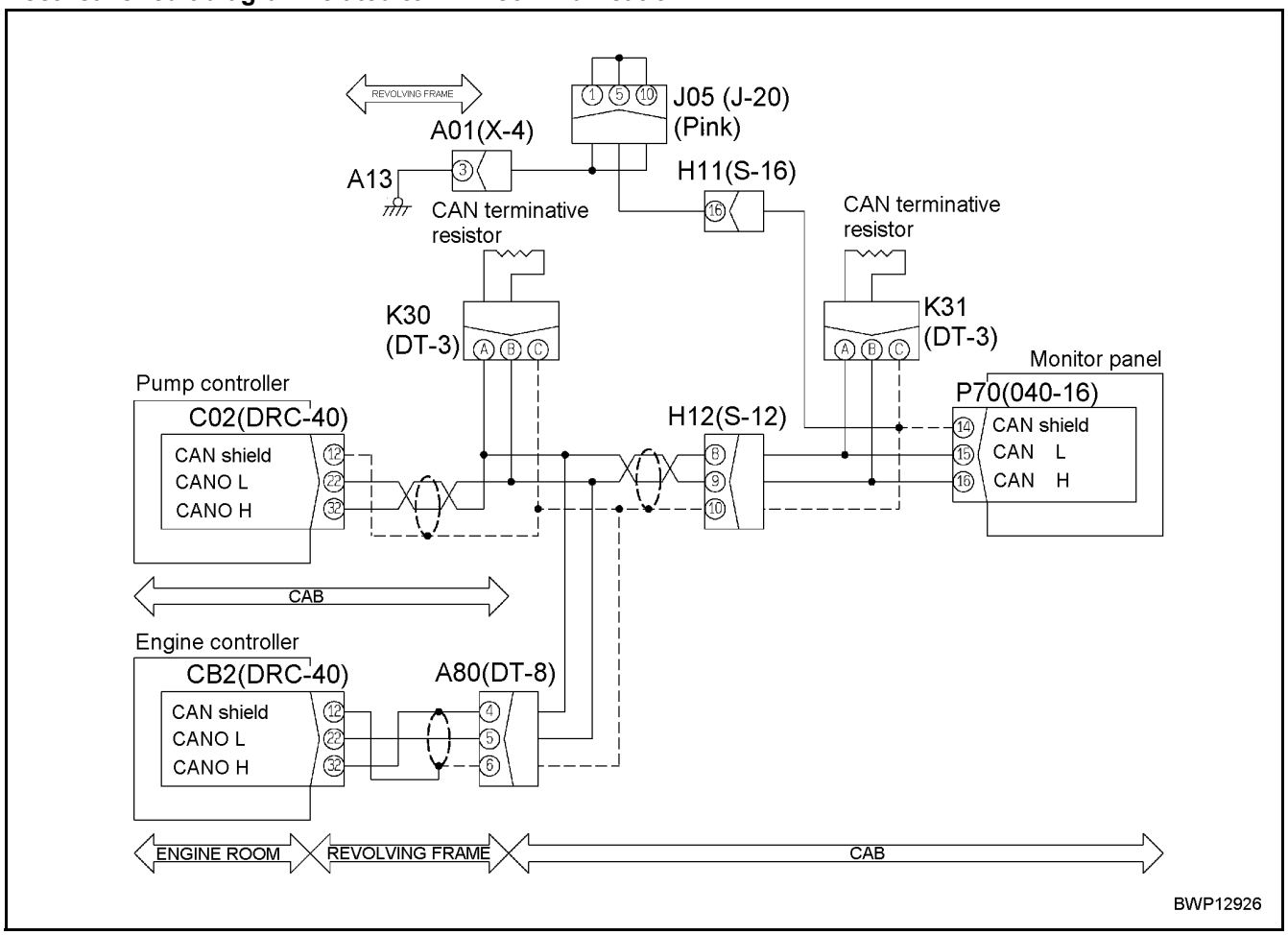
Electrical circuit diagram related to pressure sensor power supply



Electrical Circuit Diagram for Attachment Return Switching Relay and Solenoid

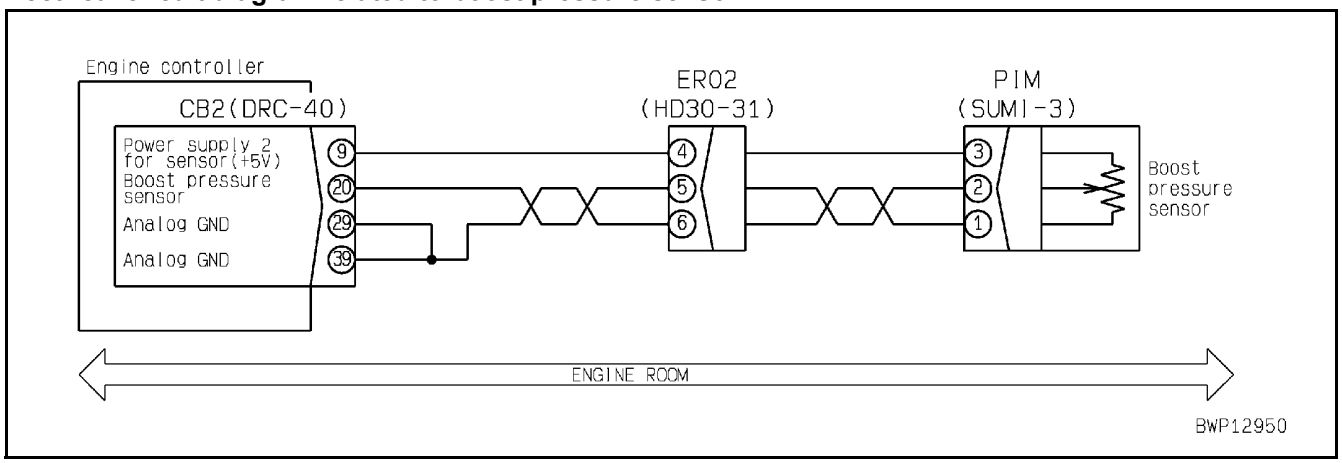


Electrical circuit diagram related to CAN communication

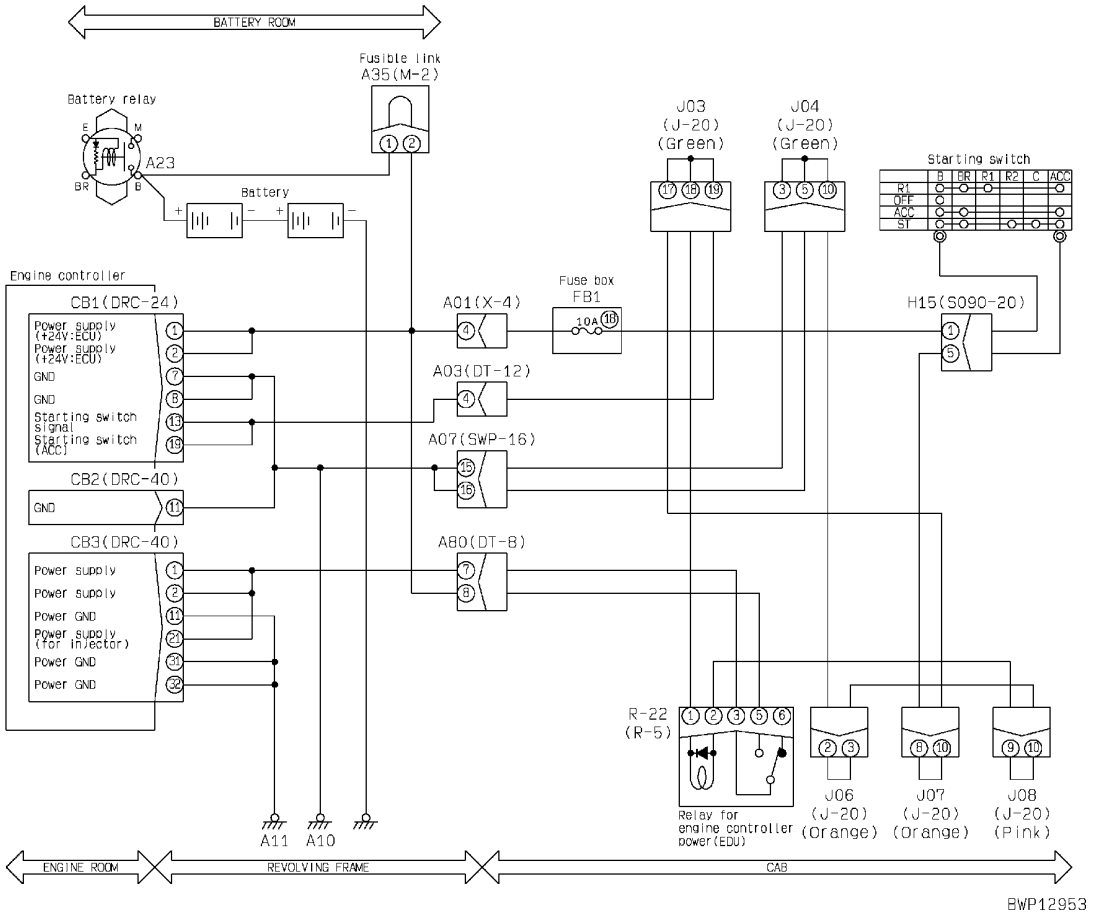


MEMORANDUM

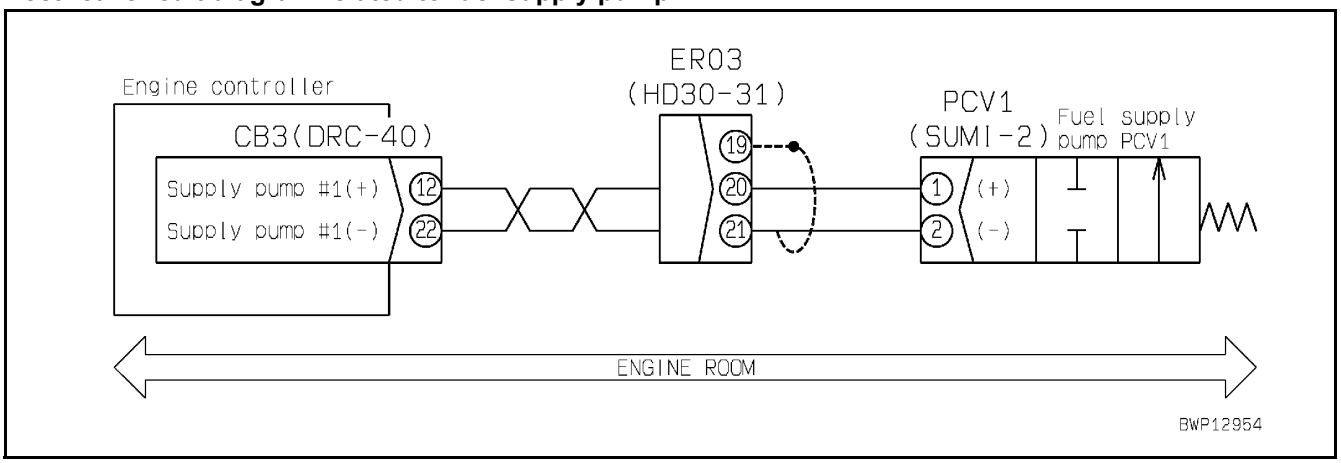
Electrical circuit diagram related to boost pressure sensor



Electrical circuit diagram related to engine controller power supply



Electrical circuit diagram related to fuel supply pump PCV1



E97D

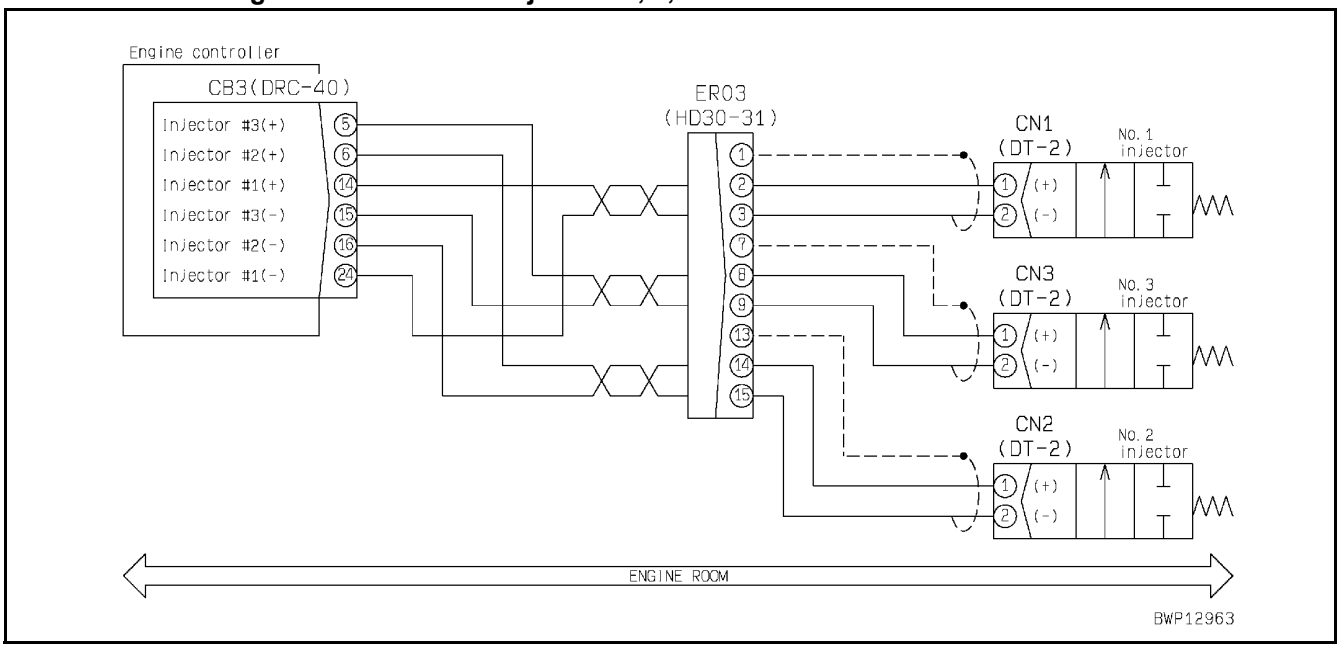
RAIL PRESSURE OUT OF CONTROL

Contents Of Trouble	• Abnormal fuel pressure was generated in the common rail. (Engine controller system) • Failure code **AD10MA**.
Response from controller	• The machine is driven under the normal control. • Even after the failure cause disappears by itself, the machine operation does not return to normal, unless the engine ignition switch is turned OFF.
Phenomenon occurring on machine	• The output lowers (The engine output lowers about 20% and the pump absorption torque is reduced). • The output lowers (Only the pump absorption torque is reduced). • The engine speed does not rise above low idling.
Relative information	• Input from the common rail pressure sensor (voltage and pressure) can be checked in the monitoring function. (Code No.: 36401 Common rail pressure sensor voltage Code No.: 36400 Common rail fuel pressure)

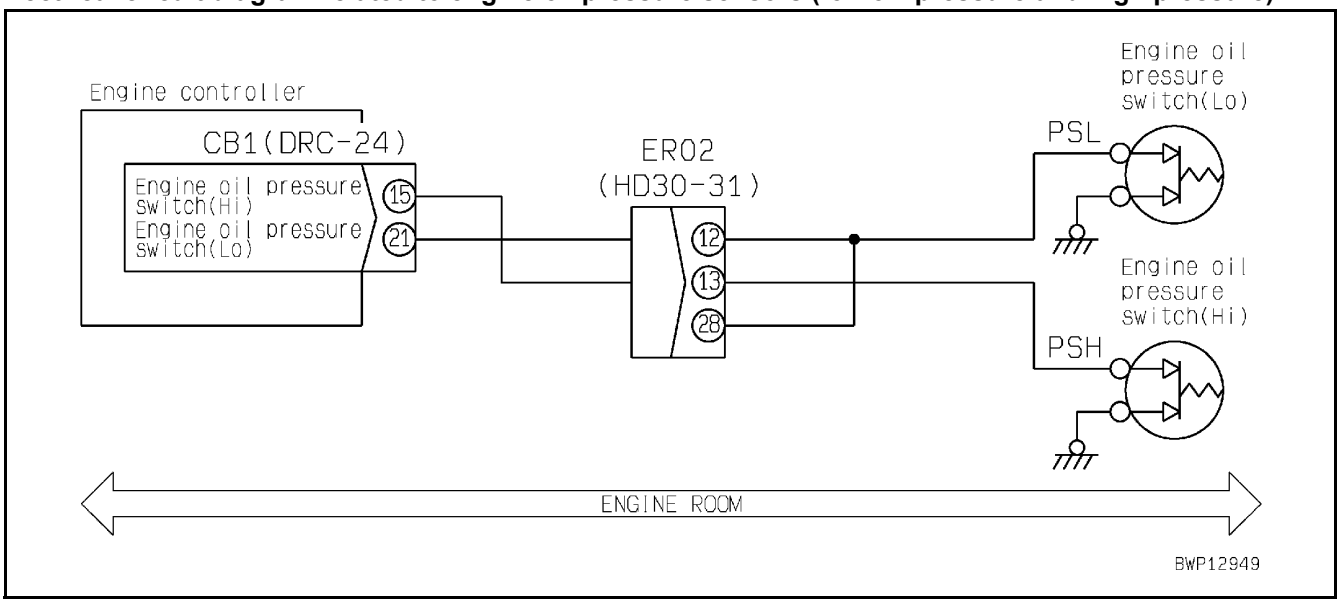
Steps	Cause	Standard value in normal and references for troubleshooting
1.	**Common rail related device defective**	Carry out troubleshooting for error code E97B.

Steps	Circuit Diagnostic Procedures For Code [E98A]			Specifications	No.	Readings
5.	**Wiring harness assembly** • With ignition switch in OFF position. • Disconnect engine controller CB3 and install T-adapters. • Ignition switch should remain in the ON position during troubleshooting.					
	A. Wiring harness test Contact with 24V circuit	Voltage	Between CB3 (14) and CN1 (1) and grounding	Below 1V	**13**	
			Between CB3 (24) and CN1 (2) and grounding	Below 1V	**14**	
			Between CB3 (6) and CN2 (1) and grounding	Below 1V	**15**	
			Between CB3 (16) and CN2 (2) and grounding	Below 1V	**16**	
			Between CB3 (5) and CN3 (1) and grounding	Below 1V	**17**	
			Between CB3 (15) and CN3 (2) and grounding	Below 1V	**18**	
6.	**Engine controller** • With ignition switch in OFF position. • Disconnect engine controller CB3 and install T-adapter. • Ignition switch OFF during troubleshooting.					
	A. Engine controller test	Resistance Ω	At CB3, between (14) and (24)	0.4 - 1.1Ω	**19**	
			At CB3, between (6) and (16)	0.4 - 1.1Ω	**20**	
			At CB3, between (5) and (15)	0.4 - 1.1Ω	**21**	
			At CB3, between (5) and grounding	Above 1MΩ	**22**	
			At CB3, between (6) and grounding	Above 1MΩ	**23**	
			At CB3, between (14) and grounding	Above 1MΩ	**24**	
			At CB3, between (15) and grounding	Above 1MΩ	**25**	
			At CB3, between (16) and grounding	Above 1MΩ	**26**	
			At CB3, between (24) and grounding	Above 1MΩ	**27**	

Electrical circuit diagram related to fuel injectors 1, 2, and 3



Electrical circuit diagram related to engine oil pressure sensors (for low pressure and high pressure)



TROUBLESHOOTING OF ELECTRICAL SYSTEM (E MODE)

E-2

PREHEATER DOES NOT OPERATE

PREHEATING MONITOR DOES NOT LIGHT

Failure information	• The preheater does not operate.	1. When the starting switch is turned to the HEAT position, the preheating monitor does not light up.
Relative information	• The preheating monitor starts lighting when the starting switch is turned to the HEAT position. After about 30 seconds, it start flashing to notify that preheating is finished (It stops flashing in about 10 seconds). • Input of the preheating signal (ON or OFF) can be checked in the monitoring function. (Code No. 04500: Monitor input 1)	

Tools and Procedures	• Digital Volt Ohm Meter. T-adapter kit. • Do not mark on original page of service manual. Remove this page from the service manual and make a copy for recording information while performing these tests. • If you are unable to copy this page, record readings on a separate paper referring to the (**No.**) numbers listed on the right of the procedure. • Follow each step throughout this procedure, do not skip steps, jump ahead or stop when a fault is found unless otherwise instructed to in the procedure. It is important to complete all steps and record information for final analyzing.

Steps	Circuit Diagnostic Procedures For Code [---]			Specifications	No.	Readings
1. Ignition switch system defective	If the preheater does not operate (the heater unit is not warmed), carry out troubleshooting					
2. Wiring harness • With ignition switch in the OFF position. • Disconnect P02 and install T-adapter. • Keep ignition switch to the OFF position for this test.						
A. Wiring harness test Disconnection or defective contact with connector	Resistance Ω	Between P02 (18) and J02 (7)		Below 1Ω	**1**	
3. Monitor panel • Prepare with ignition switch in the OFF position. • Disconnect P02 and install T-adapter. • Hold ignition switch in OFF position or HEAT position during troubleshooting.						
A. Monitor panel test	Voltage	At P02, between (18) and ground	Ignition switch - OFF	Below 1V	**2**	
			Ignition switch - HEAT	20 - 30V	**3**	

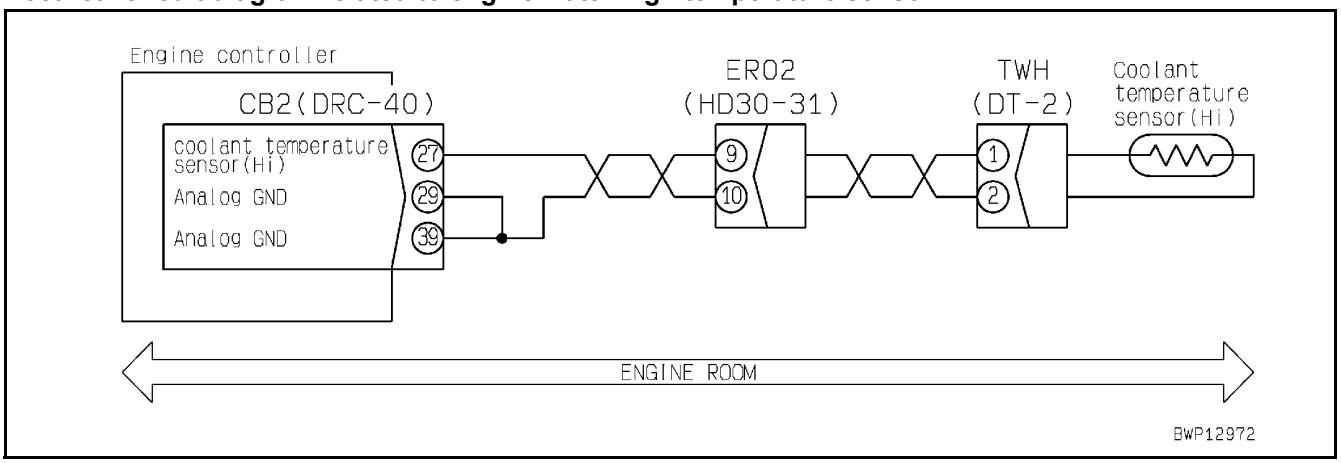
MACHINE PUSH-UP FUNCTION IS NOT TURNED OFF

Failure information	• Machine push-up function does not operate normally.	(2)The machine push-up function is not turned OFF.
Relative information	• When the machine push-up function is set in the low pressure position, the solenoid is turned ON.	

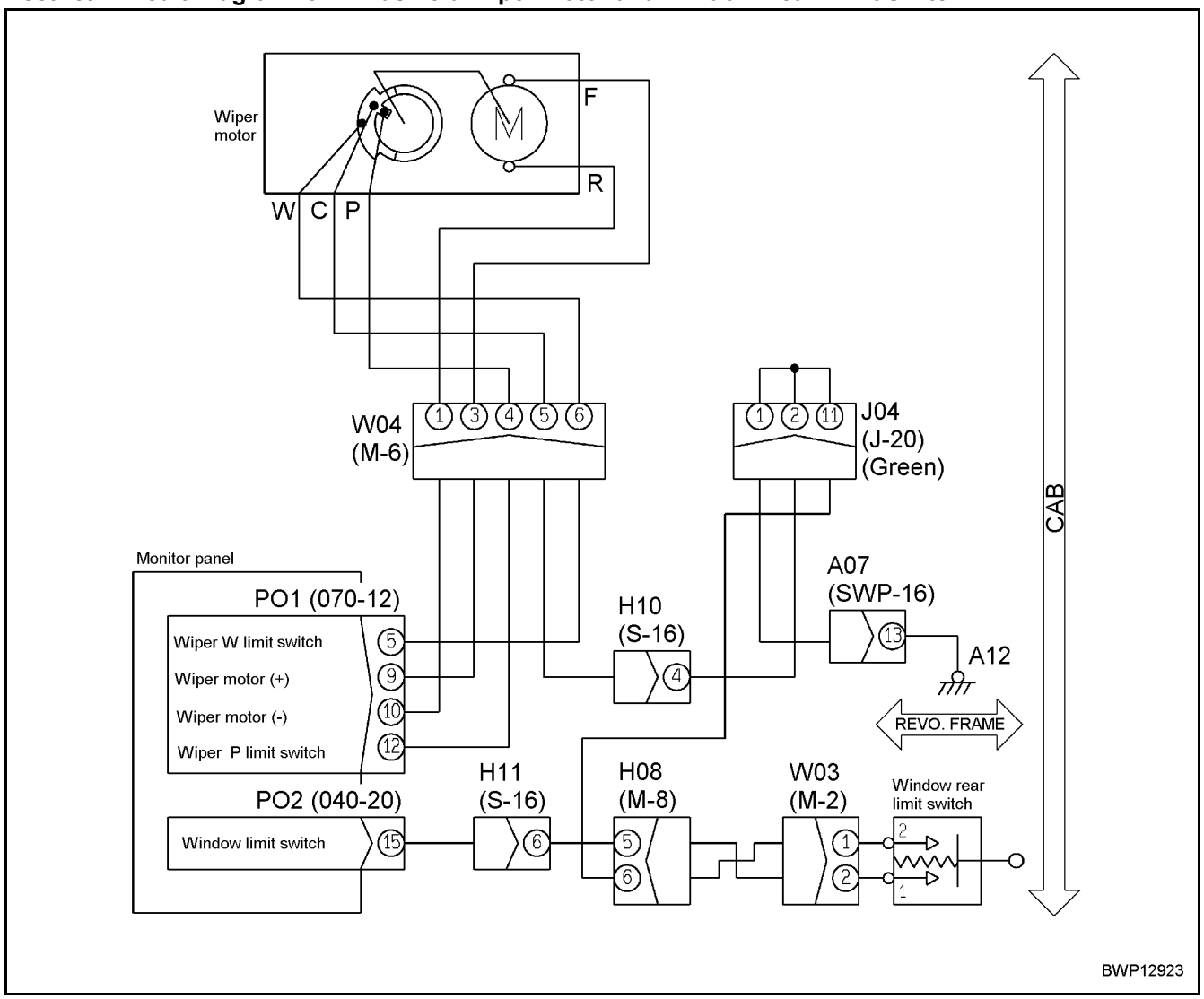
Tools and Procedures	• Digital Volt Ohm Meter. T-adapter kit. • Do not mark on original page of service manual. Remove this page from the service manual and make a copy for recording information while performing these tests. • If you are unable to copy this page, record readings on a separate paper referring to the (**No.**) numbers listed on the right of the procedure. • Follow each step throughout this procedure, do not skip steps, jump ahead or stop when a fault is found unless otherwise instructed to in the procedure. It is important to complete all steps and record information for final analyzing.

Steps	Circuit Diagnostic Procedures For Code [---]				Specifications	No.	Readings
1.	**Fuse No. 2 fault**	If the fuse is blown, there is a big possibility that grounding fault occurred in the circuit. See Step 4B.					
1.	**Machine push-up switch** • With ignition switch in the OFF position. • Disconnect M38 and install T-adapter. • Hold ignition switch in OFF position.						
				Machine push-up switch			
	A. Machine push-up switch test Internal disconnection	Resistance Ω	At M38, between (1) and (2)	Low pressure position	Below 1Ω	**1**	
				High pressure position	Above 1MΩ	**2**	
2.	**Machine push-up solenoid** • With ignition switch in the OFF position. • Disconnect V06 and install T-adapter. • Hold ignition switch in OFF position.						
	A. Machine push-up solenoid Internal disconnection, short circuit or ground fault	Resistance Ω	At V06, between (1) and (2)		20 - 60Ω	**3**	
			At V06, between (2) and grounding		Above 1MΩ	**4**	
3.	**Assembled type diode D02** • With ignition switch in the OFF position. • Keep ignition switch to the OFF position for this test.						
	A. Assembled type diode D02 Internal short	Resistance Ω	At D02, between (3) and (7)		Above 1MΩ (No Continuity)	**5**	
4.	**Wiring harness** • With ignition switch in the OFF position. • Keep ignition switch to the OFF position for this test.						
	A. Wiring harness test Disconnection or defective contact with connector	Resistance Ω	Between FB1 (2) outlet and M38 (1)		Below 1Ω	**6**	
			Between M38 (2) and J07 - V06 (2)		Below 1Ω	**7**	
			Between V06 (1) and ground		Below 1Ω	**8**	
	B. Wiring harness test Contact with grounding circuit	Resistance Ω	Between FB1 (2) outlet and M38 (1) and related circuits and grounding		Above 1MΩ	**9**	
			Between M38 (2) to J07 - V06 (2) and grounding		Above 1MΩ	**10**	
			Between M38 (2) and D02 (3) and grounding		Above 1MΩ	**11**	

Electrical circuit diagram related to engine water high temperature sensor



Electrical Circuit Diagram for Windshield Wiper Motor and Window Rear Limit Switch



E-23

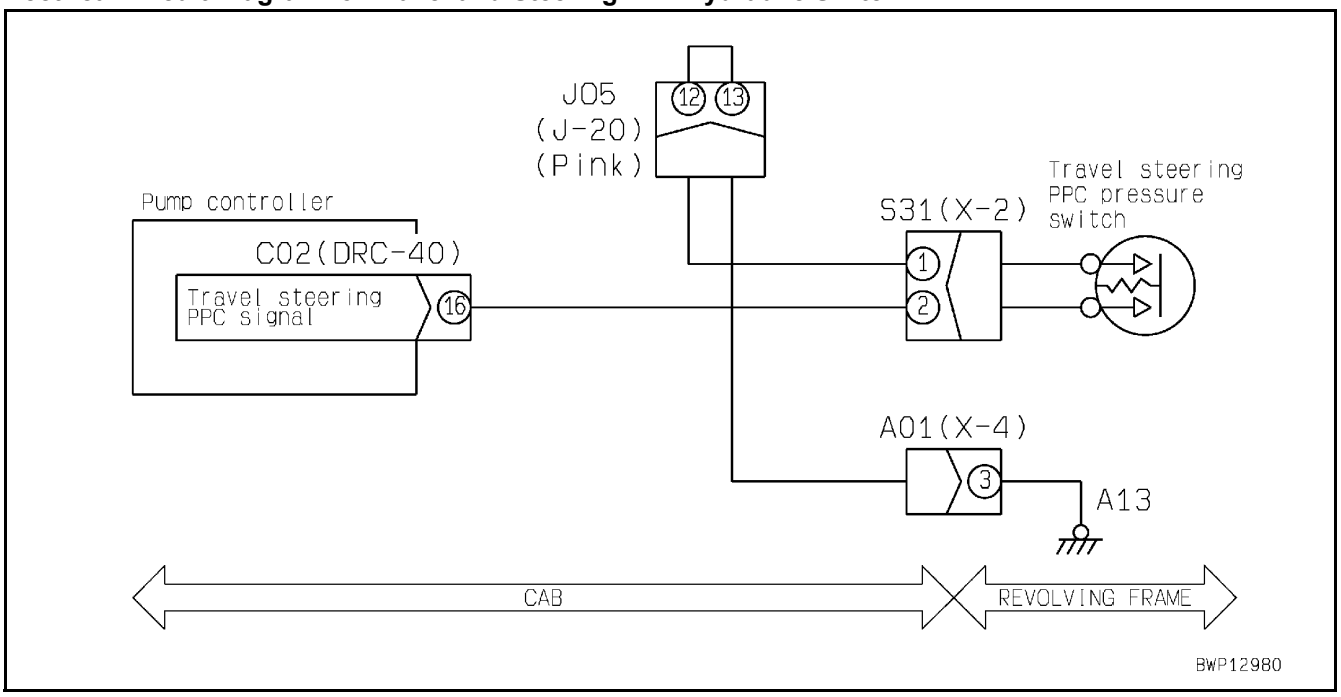
"ARM DUMPING" IS NOT CORRECTLY DISPLAYED IN MONITOR FUNCTION

Failure information	• Arm DUMPING is not correctly displayed in monitor function • Arm DUMPING is not correctly displayed in the monitor function (special function) on the monitor panel.
Relative information	---

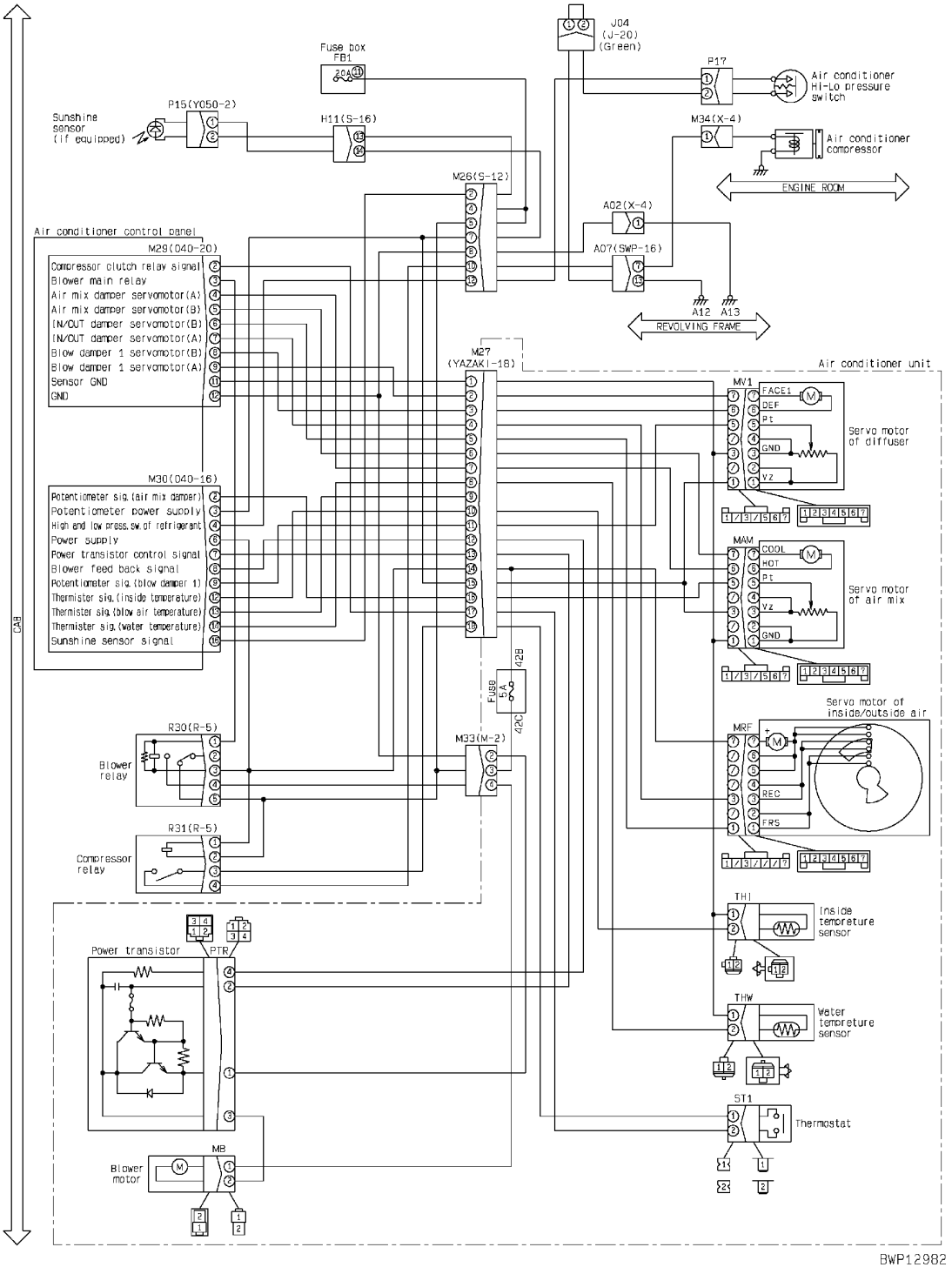
Tools and Procedures	• Digital Volt Ohm Meter. T-adapter kit. • Do not mark on original page of service manual. Remove this page from the service manual and make a copy for recording information while performing these tests. • If you are unable to copy this page, record readings on a separate paper referring to the (**No.**) numbers listed on the right of the procedure. • Follow each step throughout this procedure, do not skip steps, jump ahead or stop when a fault is found unless otherwise instructed to in the procedure. It is important to complete all steps and record information for final analyzing.

Steps	Circuit Diagnostic Procedures For Code [---]				Specifications	No.	Readings
1.	**Arm DUMPING PPC hydraulic switch** • With ignition switch in the OFF position. • Disconnect S08 and install T-adapter. • Keep the engine running during troubleshooting.			LH work equipment control lever			
	A. Arm DUMPING PPC hydraulic switch test - Internal disconnection	Resistance Ω	At S08, between (1) and (2)	NEUTRAL	Above 1MΩ	**1**	
				Arm DUMPING	Below 1Ω	**2**	
2.	**Wiring harness** • With ignition switch in the OFF position. • Disconnect C03 and S08 and install T-adapter. • Keep ignition switch to the OFF position for this test. ★ Have ignition switch ON for this test.						
	A. Wiring harness test Disconnection or contact with connector	Resistance Ω	Between C03 (40) and S08 (2)		Below 1Ω	**3**	
			Between S08 (1) and grounding		Below 1Ω	**4**	
	B. Wiring harness test Contact with grounding circuit	Resistance Ω	Between C03 (40) and S08 (2) and grounding		Above 1MΩ	**5**	
	C. Wiring harness test Contact with 24V circuit	Voltage	★ Between C03 (40) and S08 (2) and grounding		Below 1V	**6**	
3.	**Pump controller** • With ignition switch in the OFF position. • Disconnect C03 and install T-adapter. • Start the engine during the troubleshooting.		LH work equipment control lever				
	A. Pump controller test	Voltage	NEUTRAL	At C03, between (40) and ground	20 - 30V	**7**	
			Arm DUMPING		Below 1V	**8**	

Electrical Circuit Diagram for Travel and Steering PPC hydraulic Switch



Electrical Circuit Diagram for Air Conditioner



INFORMATION CONTAINED IN TROUBLESHOOTING TABLE

★ Troubleshooting Table and Related Circuit Diagram collectively carry the following information. Carry out troubleshooting work after fully grasping their contents.

Failure information	Phenomena occurring on machine
Relative information	Information on occurred failures and troubleshooting

Presumed cause and standard value	Cause		Standard value in normalcy and references for troubleshooting
	1	Cause for presumed failure (The attached No. for filing and reference purpose only. It does not stand for any priority)	<Contents> • The standard values in normalcy by which to judge “good” or “no good” about presumed causes. • References for making judgement of “good” or “no good”.
	2		
	3		
	4		
	5		

H-15

MACHINE PUSH-UP FUNCTION DOES NOT WORK

Failure information	The machine push-up function does not work
Relative information	When carrying out troubleshooting, set the working mode in A-mode.

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting	
	1	Malfunction of machine push-up solenoid valve	★ Prepare with starting switch OFF, then run engine at high idling and carry out troubleshooting.	
			Machine push-up switch	Solenoid outlet pressure
			OFF	Min. 2.75 MPa {Min. 28 kgf/cm^2} (Min. 398 psi)
			ON	0 MPa {0 kgf/cm^2}
	2	Malfunction of boom 2 control valve (safety-suction valve)	The safety-suction valve of the boom control valve (Lo) (on the high-pressure setting side on the head side) may be malfunctioning. Check it directly.	

H-16

IN COMPOUND OPERATION, WORK EQUIPMENT WITH LARGER LOAD MOVES SLOWLY

Failure information	In a compound operation, work equipment with larger load tends to move slowly.
Relative information	---

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting		
	1	Malfunctioning of pressure compensation valve for work equipment with larger load	The pressure compensation valve for the work equipment with larger load is presumed to malfunction. Check the valve itself.		
			Combination of compound operation	Work equipment with larger load	Work equipment with smaller load
			Boom RAISE + arm DIGGING	Boom	Arm
			Boom RAISE + arm DUMPING	Arm	Boom
			Boom RAISE + bucket DIGGING	Boom	Bucket
			Arm DUMPING + bucket DIGGING	Arm	Bucket
			Boom LOWER + arm DUMPING	Arm	Boom

H-29

SWING NATURAL DRIFT IS TOO BIG

Failure information	Swing natural drift is too big. (1) When the swing holding brake is activated.
Relative information	• When the swing lock switch is ON position, or the swing holding brake release switch is in the normal position, the swing brake is activated and the swing is fixed with a disc brake. • Set the working mode in A mode for troubleshooting.

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting	
	1	Swing and holding brake solenoid valve malfunctioned	★ Stop engine for preparations. Start troubleshooting at engine high idling.	
			R.H. work equipment control lever	Solenoid valve output pressure
			NEUTRAL	0 MPa {0 kgf/cm^2} (0 psi)
			Swing operated	2.84 - 3.43 MPa {29 - 35 kgf/cm^2}(412 - 497 psi)
	2	Swing motor (parking brake portion) malfunctioned	The parking portion of the swing motor is suspected of malfunctioning and interior failure. Check that portion directly.	

Failure information	Swing natural drift is too big. (2) When the swing holding brake is released.
Relative information	• When the swing holding brake release switch is in the emergency condition, the swing brake is released and the swing is retained only hydraulically. • Set the working mode in A mode for troubleshooting.

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting
	1	Swing control valve (spool) malfunctioned	The seal in the spool of the swing control valve is suspected of defect. Check the spool itself directly.
	2	Swing control valve (pressure compensation valve) malfunctioned	The pressure compensation valve seal in the swing control valve is suspected of defect. Check the valve itself directly.
	3	Swing motor (safety valve) defective	The safety valve seal in the swing motor is suspected of defect. Check the valve itself directly.
	4	Swing motor (suction valve) defective	The suction valve seal in the swing motor is suspected of defect. Check the valve itself directly.
	5	Swing motor (check valve) defective	The check valve seal in the swing motor is suspected of defect. Check the valve itself directly.
	6	Swing motor (shockless valve) malfunctioned or seal defective	The shockless valve in the swing motor is suspected of malfunction or the seal is suspected of defect. Check the valve or seal itself directly.

PRECAUTIONS WHEN COMPLETING THE OPERATIONS

- If the coolant has been drained, tighten the drain valve, and add coolant to the specified level. Run the engine to circulate the coolant through the system. Then check the coolant level again.
- If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
- If the piping or hydraulic equipment, such as hydraulic cylinders, pumps, or motors, have been removed for repair, bleed air from the system after reassembling the parts.
  - ★ For details, see TESTING AND ADJUSTING, Bleeding air.
- Add the specified amount of grease (molybdenum disulfide grease) to the work equipment related parts.

OTHER PRECAUTIONS

- To maintain the performance of the machine and to prevent failures, it is particularly important to pay attention to the degree of cleanliness of the oil in the hydraulic circuits. When adding oil or changing the oil, or when replacing the filters, check that the oil container and area around the filler of the hydraulic tank are clean.
- To keep the hydraulic circuits clean and to protect the hydraulic equipment, be careful of the following points when disassembling or assembling.
  - Before disassembling, wash the machine. Be particularly careful to completely clean the area that is to be disassembled.
  - Do not let dirt or dust get into the hydraulic circuits when disassembling or assembling.
  - Carry out thorough flushing of the parts, and be particularly careful to do this thoroughly for the circuits or parts that have failed.
  - When disassembling or after flushing, always mask the openings of the piping or hydraulic equipment completely.
  - Do not use seal tape for the thread of the plug mounts or connections.
- If any internal part of the hydraulic equipment breaks, disassemble and clean all the hydraulic equipment and circuits to remove any dirt or pieces from the circuit. If any parts of the hydraulic circuits are disassembled and assembled, also carry out thorough flushing of the hydraulic circuits.
- When changing the oil in the hydraulic tank, or when removing the piston pump or piston pump piping, always bleed the air before starting the engine to prevent seizure of the pump. For details, see TESTING AND ADJUSTING, Bleeding air from piston pump.

Remark

After replacing or flushing the hydraulic tank oil, filter element, or strainer, or when removing and installing any hydraulic cylinder, hydraulic pump or any other hydraulic equipment or work equipment piping, always bleed the air as follows after completion of installation.

A. Run the engine at low idling, and extend and retract the steering, bucket, and lift arm cylinders 4 - 5 times without going to the end of this stroke. (Stop approximate 100 mm before the end of the stroke.)
   ★ If the engine is run at high speed from the start, or the cylinders are operated to the end of this stroke, the air inside the cylinder will cause damage to the piston packing.

B. Operate the steering, bucket, and lift arm cylinders 3 - 4 times to the end of the stroke, then stop the engine and bleed the air from the plugs at the top of the hydraulic tank filter.

C. Raise the engine speed and repeat Step B to bleed the air. Repeat this procedure until no more air comes out from the plugs.

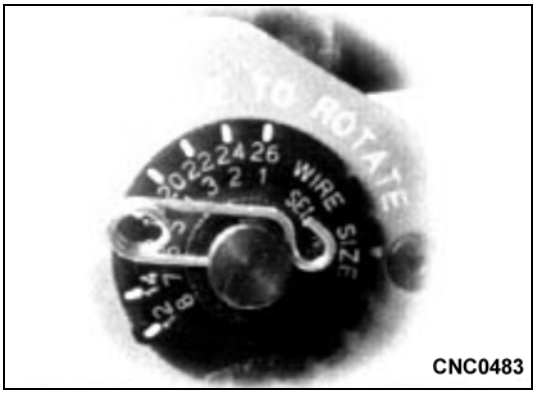
D. After completing bleeding the air, tighten the plugs.

Plug: 11.3 ± 1.5 Nm (8.33 ± 1.10 lbf ft)

E. After repair or long storage, follow the same procedure.

CRIMPING CONTACT TERMINAL (HD30 TYPE)

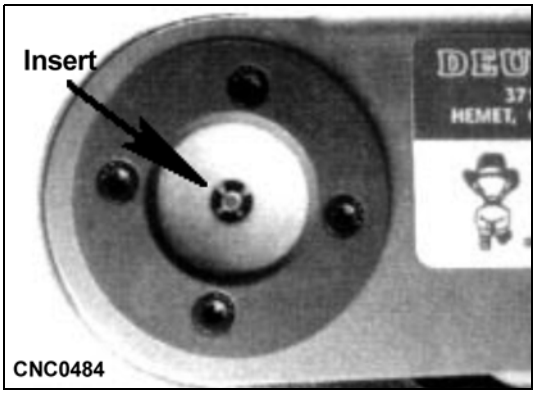
1. After insulation has been striped from the wire and contact terminal is ready for crimping, raise selector knob on Crimp Tool #HDT48-00 and rotate until arrow is aligned with wire size to be crimped.



CNC0483

2. Loosen locknut, turn adjusting screw in until it stops.

3. Insert contact terminal with barrel up. Turn adjusting screw counterclockwise until contact terminal surface is flush with indenter cover. Tighten locknut.

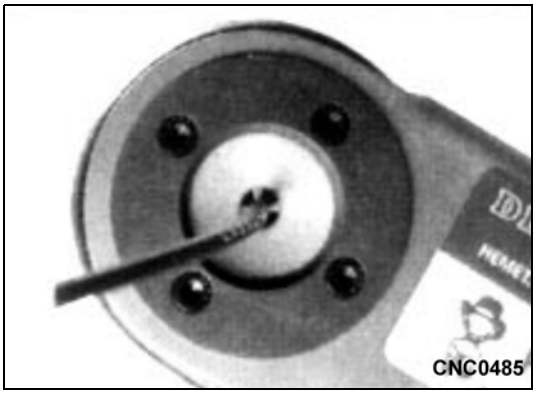


CNC0484

4. Insert wire into contact terminal. Be sure contact terminal is centered between indicators.

5. Close crimp tool handle until crimp cycle is completed.

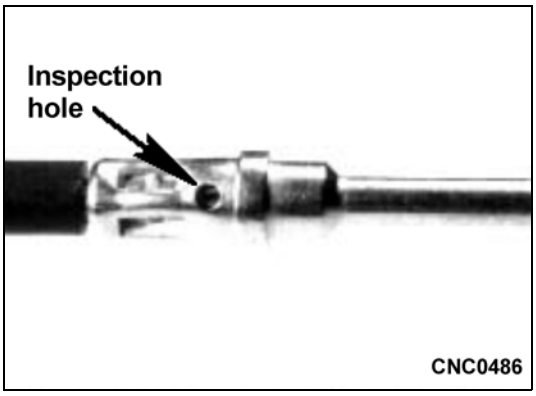
6. Release the tool handle and remove the crimped contact terminal.


CNC0485

7. Using the inspection hole in the contact terminal inspect the crimped contact terminal to ensure that all strands are in the crimped barrel.

Remark

The tool must be readjusted for each type/size of contact. Use Crimp tool HDT04-08 for size 8 and 4 contacts.

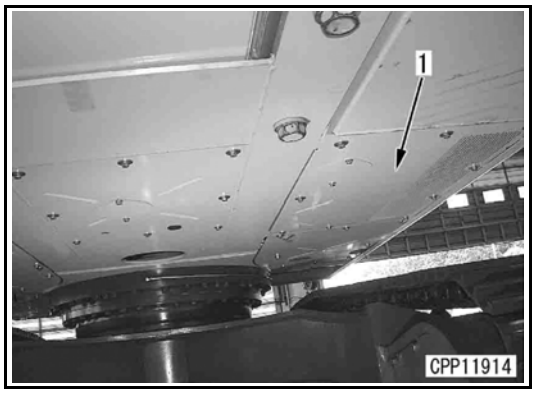


CNC0486

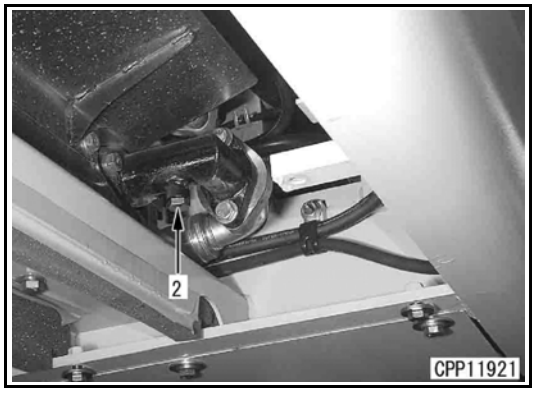
HYDRAULIC OIL COOLER

REMOVAL

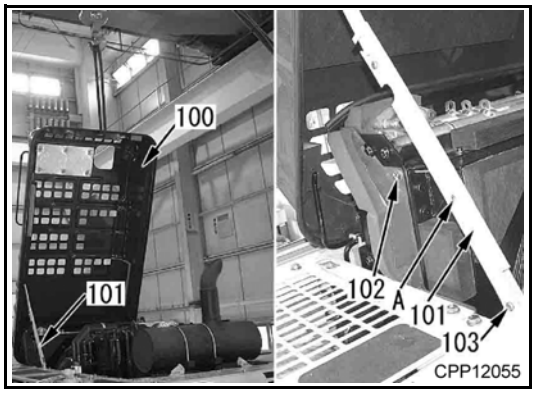
1. Remove cover (1).



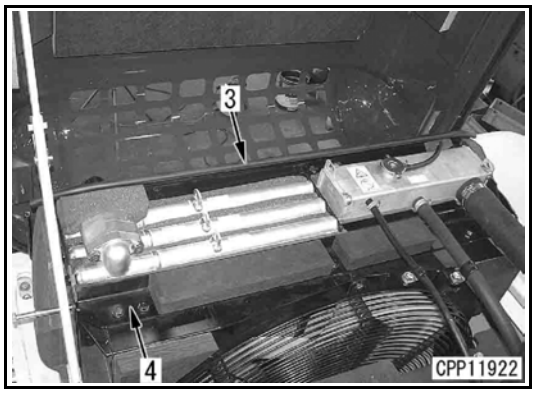
2. Remove plug (2) of the hydraulic oil cooler drain hose to drain the hydraulic oil.
   ★ Before draining, open the hydraulic tank cap to release the pressure in the tank. Then, drain the oil through the cooler hose.



3. Erect the engine hood according to the following procedure.
   A. Open engine hood (100) and sling it temporarily.
      ★ When slinging the engine hood, take care not to damage the rubber seal.
   B. Prepare M10 bolt [1].
   C. Remove bolt (102).
   D. Remove pin (103) from the lower part of stay (101).
   E. Adjust the engine hood so that center hole A of stay (101) will be at the bolt (102).
   F. Install stay (101) with bolt [1] and fix engine hood (100) vertically.



4. Remove covers (3) and (4).



INSTALLATION

- Install in reverse order of removal.

[*1]

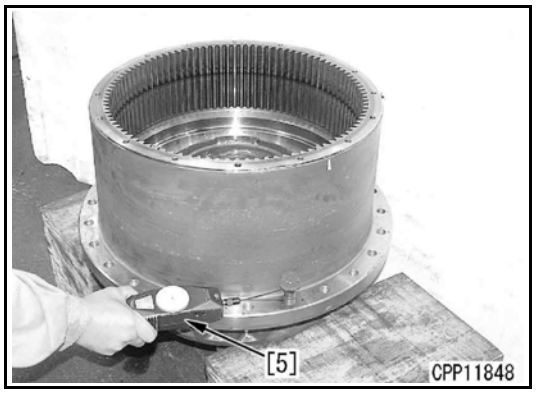
Mount bolt: 824 - 1,030 Nm {84 - 105 kgm} (608 - 759 lbf ft)

- Refilling hydraulic oil
  Refill hydraulic oil through the oil filler port to the specified level. Let the oil circulate in the hydraulic system by starting the engine. Then check the oil level again.
- Air bleeding
  Refer to the Air Bleeding of Various Parts section in the TESTING AND ADJUSTING chapter of this manual.

- Refilling with oil
  Tighten the drain plug and add engine oil (EO30-CD, or SHC 5W-30K for extremely cold district) through the oil filler to the specified level.

Swing machinery case: Approximately 21 L (5.5 gal)

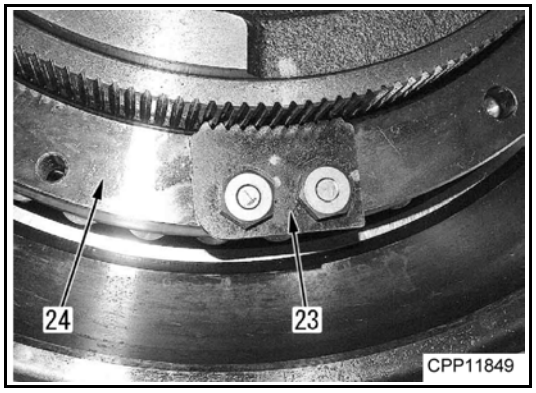
J. Using push-pull gauge [5], measure the rotating force of the hub in its revolving direction on the motor case.
★ Rotating force: Max. 765 N {78 kg} (171.9 lbf)
★ The rotating force means the maximum force at the tangent to the bolt circle at the beginning of rotation.



K. Install lock plate (23), fitting it to the motor spline.

Threads of mount bolt: Adhesive (LT-2)

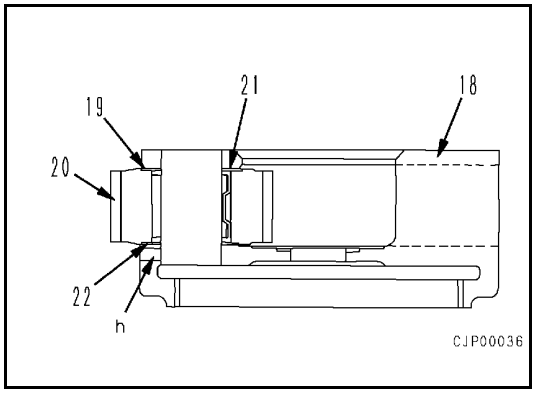
Mount bolt:
66.2 ± 7.4 Nm {6.75 ± 0.75 kgm} (48.8 ± 5.4 lbf ft)



3. No. 2 carrier assembly

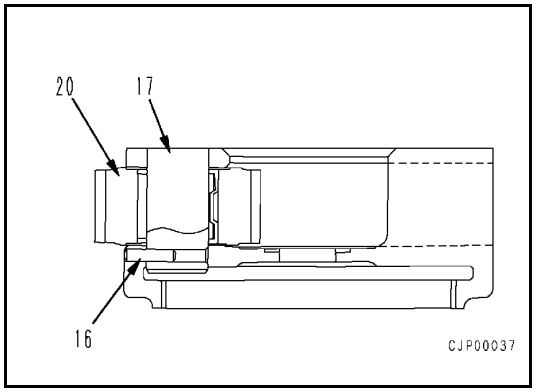
A. Assemble the No. 2 carrier assembly according to the following procedure.
★ There is a caulking mark made when the pin was inserted at the end of carrier side hole "**h**" and the inside wall of the hole is swelled at that mark. Flatten the swelled part in advance.

i. Install bearing (21) to gear (20) and fit top and bottom thrust washers (19) and (22), and then set the gear assembly to carrier (18).

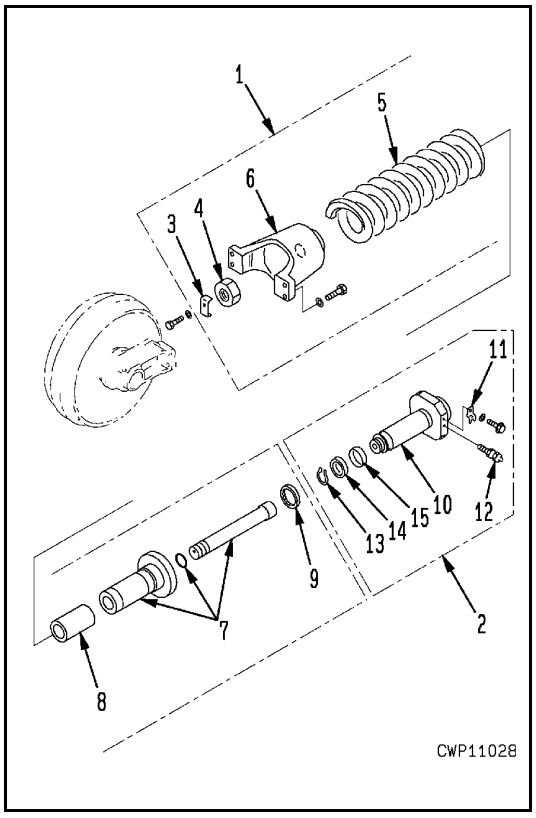


ii. Aligning the pin holes of shaft (17) and carrier, lightly hit the shaft with a plastic hammer, etc. to install.
★ When installing the shaft, revolve the planetary gear and take care not to damage the thrust washers.

iii. Insert pin (16).
★ After inserting the pin, caulk the pin part of the carrier.
★ After assembling the carrier assembly, check that the gear (20) turns smoothly.



RECOIL SPRING



SPECIAL TOOLS

Symbol		Part No.	Part Name	Necessity	Qty	New/Remodel	Sketch
j	1	791-685-8006	Compressor	■	1		
		791-635-3160	Extension	■	1		
		790-101-1600	Cylinder (686 kN {70 t})	■	3		
		790-101-1102	Pump	■	3		
	2	790-201-1500	Push tool kit		1		
		● 790-201-1660	● Plate				
		● 790-101-5021	● Grip				
		● 01010-50816	● Bolt				

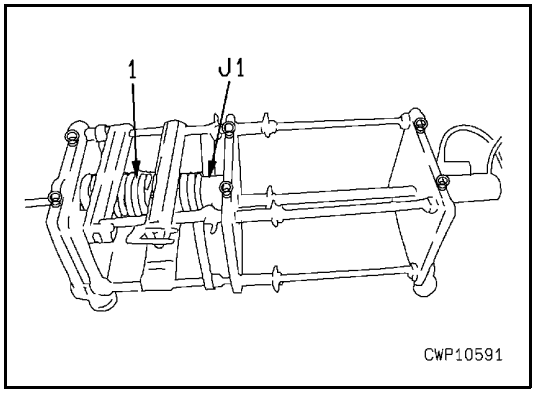
kg Recoil spring (Excluding idler): 900 kg (1985 lb)

DISASSEMBLY

1. Remove piston assembly (2) from recoil spring assembly (1).
2. Disassembly of recoil spring assembly
   A. Set tool **J1** to recoil spring assembly (1).

WARNING! Since the installed load of the spring is large and dangerous, set the tool securely.

Installed load of spring: 239.037 kN {24,375 kg} (53,738 lbf)



   B. Apply oil pressure gradually to compress the spring and remove lock plate (3) and nut (4).
      ★ Compress the spring to a degree that you can loosen the nut.
      ★ Release the oil pressure gradually to reduce the spring tension to 0 (zero).
      ★ Free length of spring: 845.3 mm (33.2 in)
   C. Remove yoke (6), cylinder (7), collar (8), and dust seal (9) from spring (5).
3. Disassembly of piston assembly
   A. Remove lock plate (11) from piston (10), and then remove valve (12).
   B. Remove snap ring (13), U-packing (14), and ring (15).

MONITOR

REMOVAL

WARNING! Disconnect the cable from the negative (–) terminal of the battery.

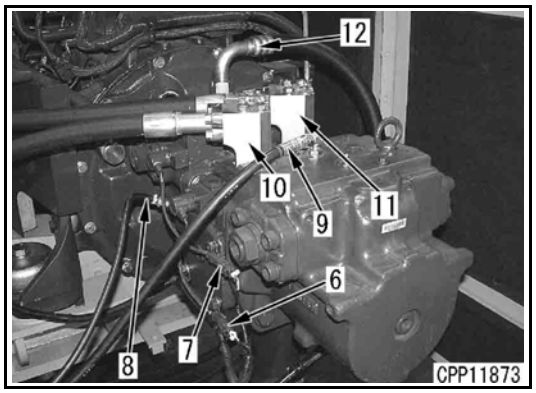
1. Remove cover (1) and disconnect wiring connector P15 of air conditioner sunlight sensor (2).
   ★ Raise and remove the cover.
2. Remove the 3 mount screws and monitor assembly (3).
   ★ Disconnect monitor panel wiring connectors P01, P02, and P70 before removing the monitor assembly.

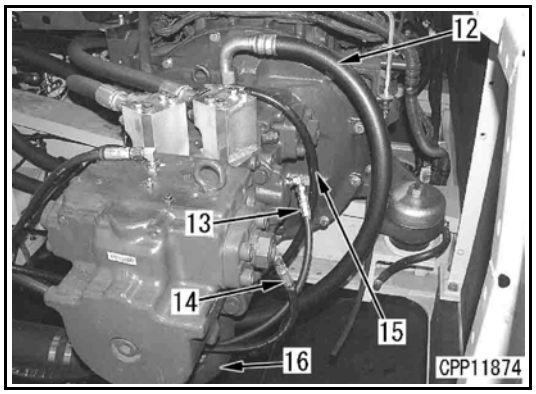
INSTALLATION

- Carry out installation in the reverse order to removal.

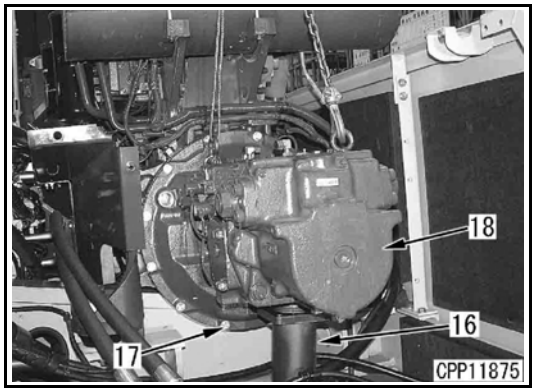
9. Disconnect the following 2 pump wiring connectors.
   - (6): V22 (PC-EPC solenoid valve) Band color: Red
   - (7): V21 (LS-EPC solenoid valve) Band color: White

10. Disconnect the following 10 hoses and 1 tube.
   - (8): EPC basic pressure port hose (Band color: Yellow)
   - (9): Rear pump pressure input port hose (Band color: Red)
   - (10): Rear pump discharge port hose
   - (11): Front pump discharge port hose
   - (12): Drain port hose
   - (13): Front load pressure input port hose
   - (14): Rear load pressure input port hose (Band color: Red)
   - (15): Front pump pressure input port hose
   - (16): Pump suction port tube





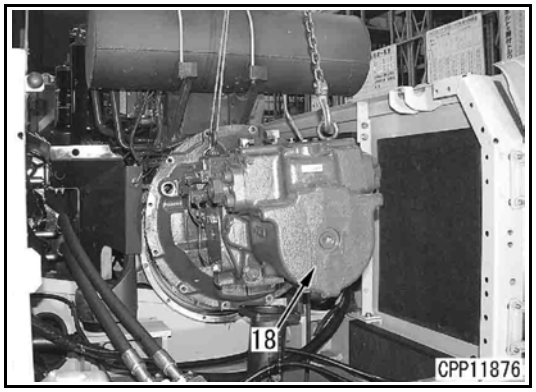
11. Sling hydraulic pump assembly (18) temporarily and remove 12 mount bolts (17).



12. Lift off hydraulic pump assembly (18). [*1]

kg

Hydraulic pump assembly: 255 kg (563 lb)



- Control valve top and bottom covers

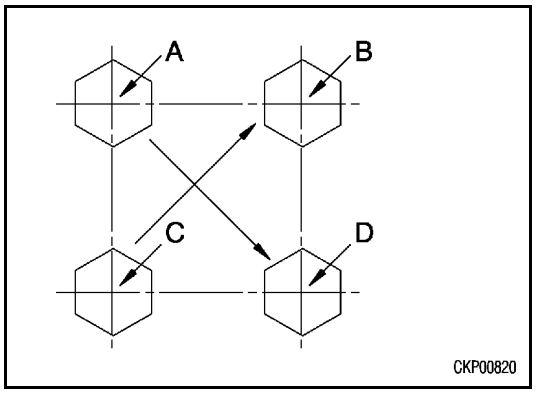
Mating faces of control valve top and bottom covers: SEALEND 242 or equivalent

★ Use 2 washers (W2) each for only 2 places of the control valve top cover.

- Tighten the mount bolts of the control valve top and bottom covers in the following order.

(A → D → C → B)

Mount bolt of control valve top and bottom covers: 156.9 - 176.5 Nm {16 - 18 kgm} (115.7 - 130.1 lbf ft)



- Merge-divider valve

Mating face of merge-divider valve: SEALEND 242 or equivalent

- Tighten the mount bolts of the merge-divider valve similarly to those of the control valve covers.

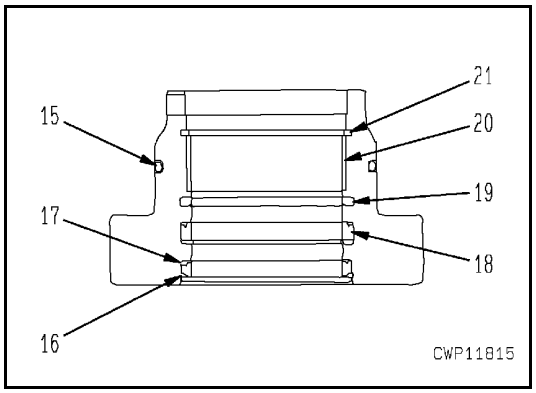
Mount bolt of merge-divider valve:
156.9 - 176.5 Nm {16 - 18 kgm} (115.7 - 130.1 lbf ft)

- Tighten the mount bolts of the boom Hi check valve, quick return valve, lock valve, and arm plate similarly to those of the control valve covers.

Mount bolt of boom Hi check valve, quick return valve, lock valve, and arm plate:
58.8 - 73.6 Nm {6 - 7.5 kgm} (43.3 - 54.2 lbf ft)

ASSEMBLY

★ Take care not to damage the packings, dust seals, O-rings, etc.
★ Clean the all parts. After installing them, cover the piping ports and pin holes to prevent dirt from entering.
★ Do not insert each backup ring forcibly, but warm it in water at 50 - 60°C (122 - 140°F) and then insert it.



1. Assembly of cylinder head assembly

   A. Using tool **N5**, press fit bushing (20).

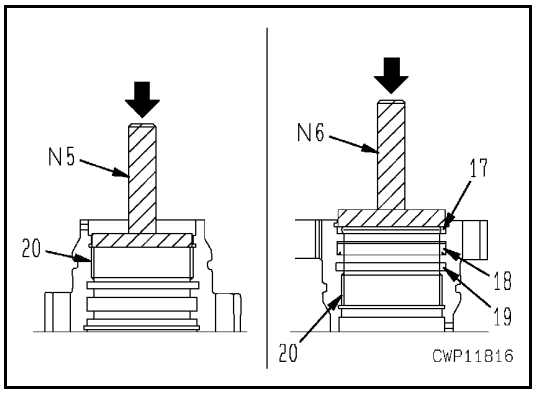
   B. Install buffer ring (19).

   C. Install rod packing (18).

   D. Using tool **N6**, install dust seal (17) and secure it with snap ring (16).

   E. Install backup ring and O-ring (15).

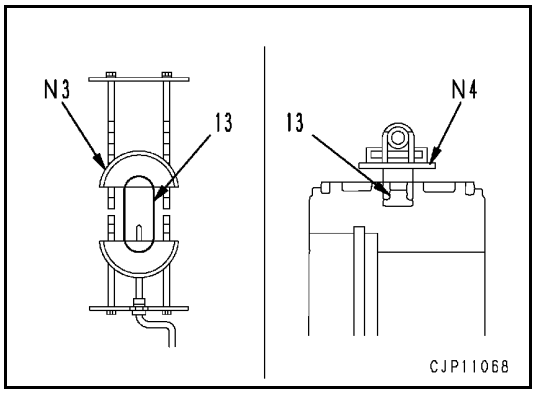
   F. Install snap ring (21).



2. Assembly of piston assembly

   A. Using tool **N3**, expand piston ring (13).
      ★ Set piston ring (13) to tool **N3** and turn the handle 8 - 10 times to expand the piston ring.

   B. Set tool **N4** and contract piston ring (13).

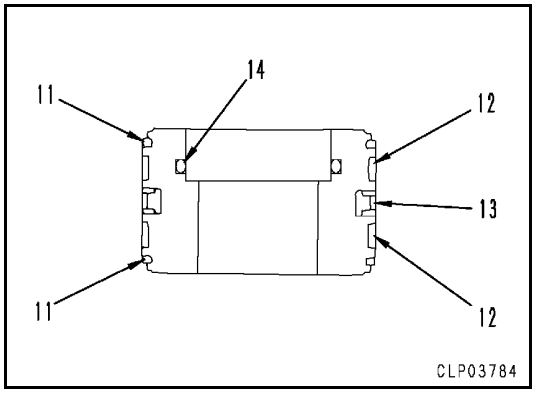


   C. Install backup ring and O-ring (14).

   D. Install wear ring (12).

   E. Install ring (11).
      ★ Do not increase the closed gap of the ring too much.

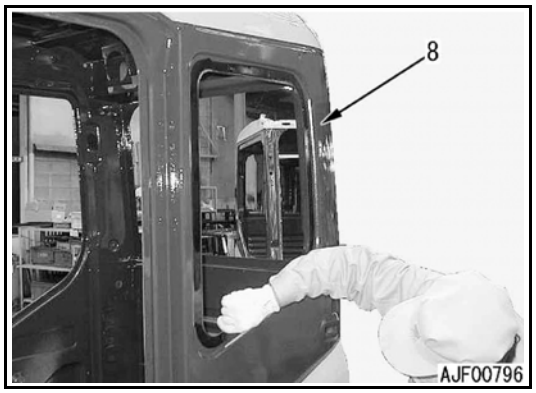
Ring groove: Grease (G2-LI)



C. Evenly apply paint primer to the surfaces to stick both-sided adhesive tapes and the surfaces out of those surfaces on operator's cab (8) which will be coated with the adhesive.

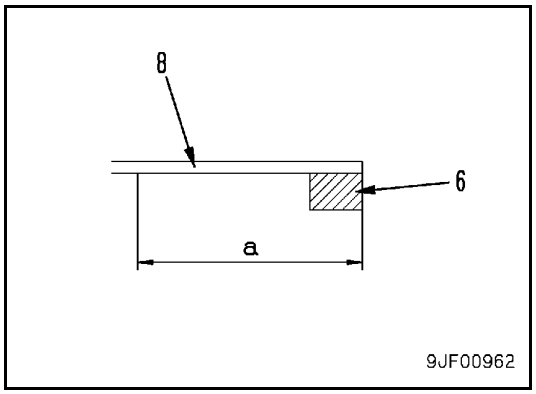
Paint primer: Yokohama M-300 or equivalent

★ Do not apply the primer more than 2 times. (If it is applied more than 2 times, its performance will be lowered.)



★ Parts to be coated with primer: Apply the primer all over dimension (a).

● Dimension to apply primer (a): 25 mm

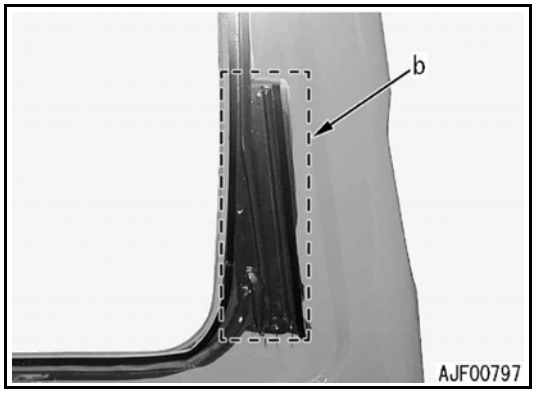


★ In addition to the above parts, apply the primer to right side window glass (1) and door lower window glass (3).

● Range to apply primer additionally for right side window glass (1): (b)

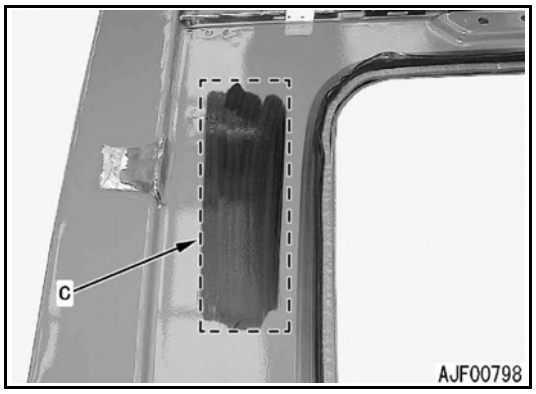
● Range to apply primer additionally for door lower window glass (3): (c)

★ After applying the primer, leave it for at least 5 minutes (within 8 hours) to dry.

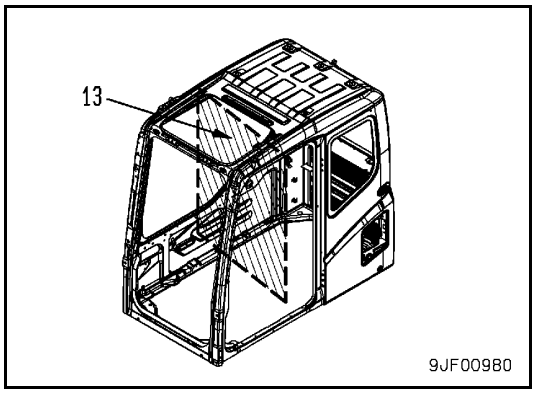


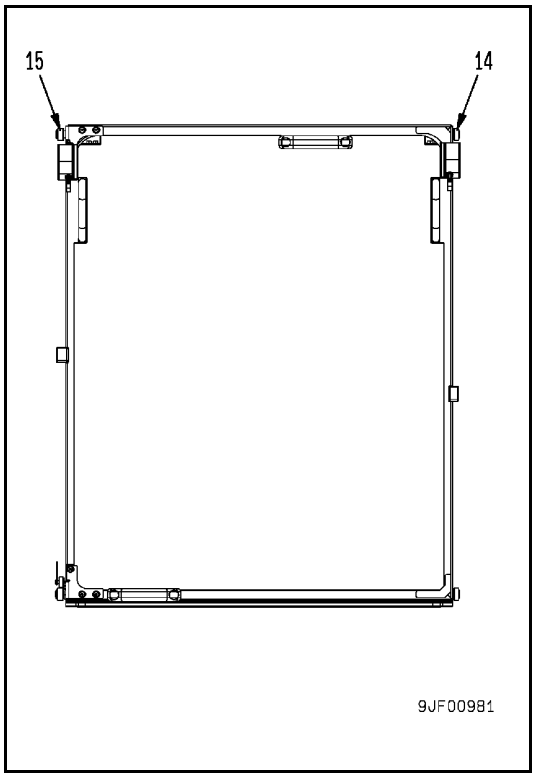
Remark

Never apply wrong primer. If the glass primer is applied by mistake, wipe it off with white gasoline.

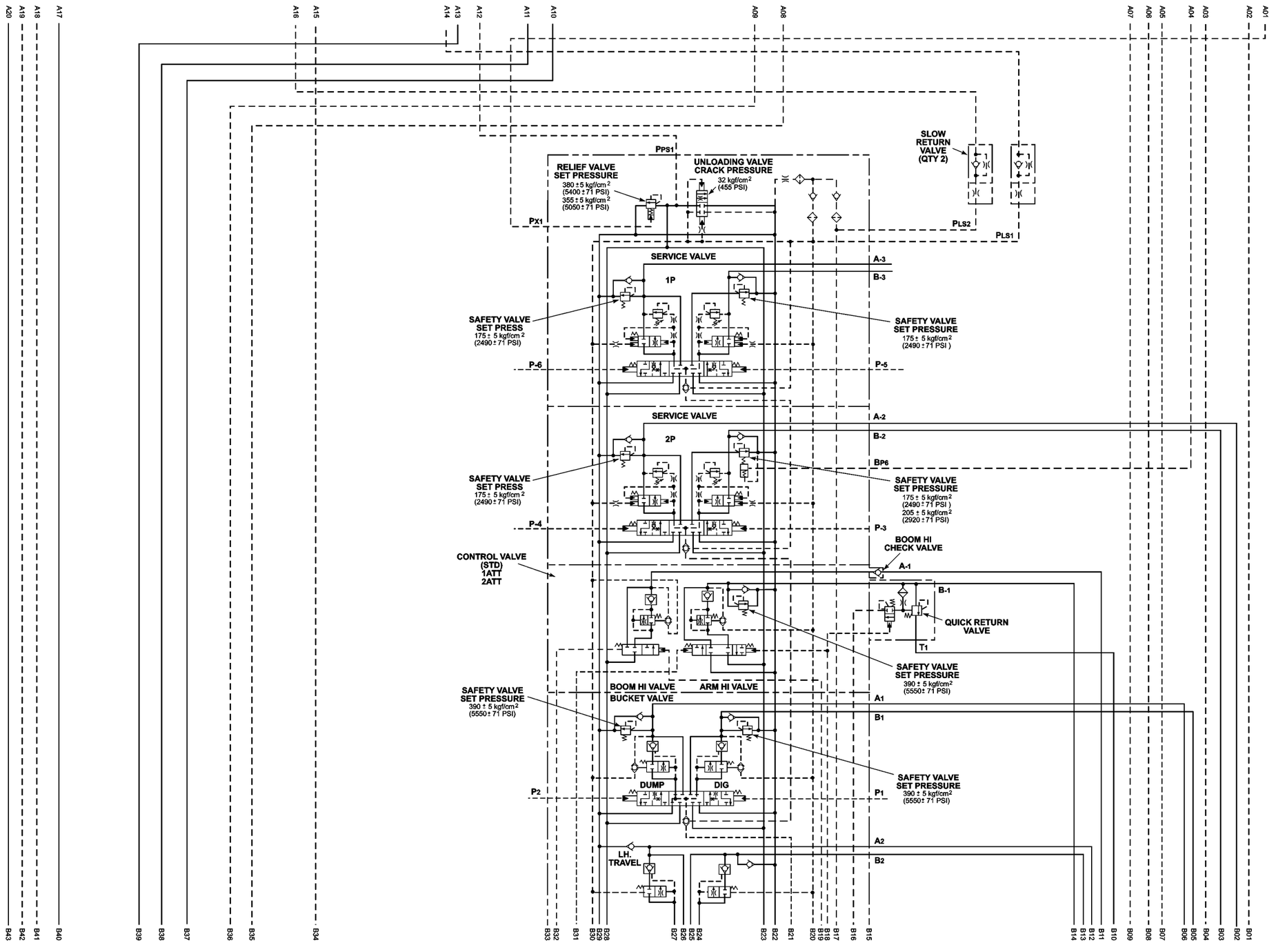


11. Twist front window assembly (13) to the right and left to remove both upper rollers (14) and (15) from the rails, and then remove front window assembly (13).



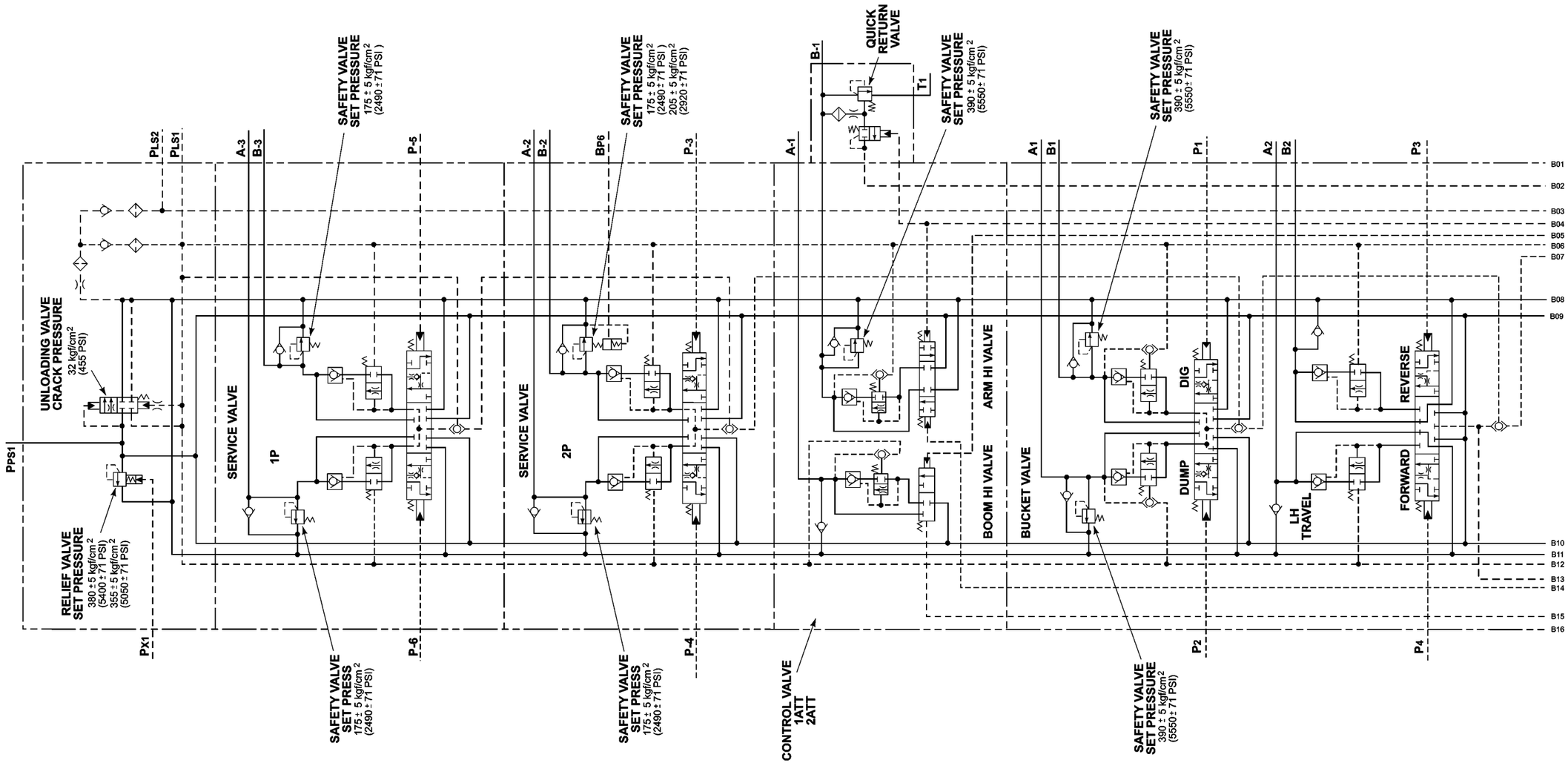


HYDRAULIC DIAGRAM SHEET 1/2 (PART 2 OF 4) FOLDOUT 2



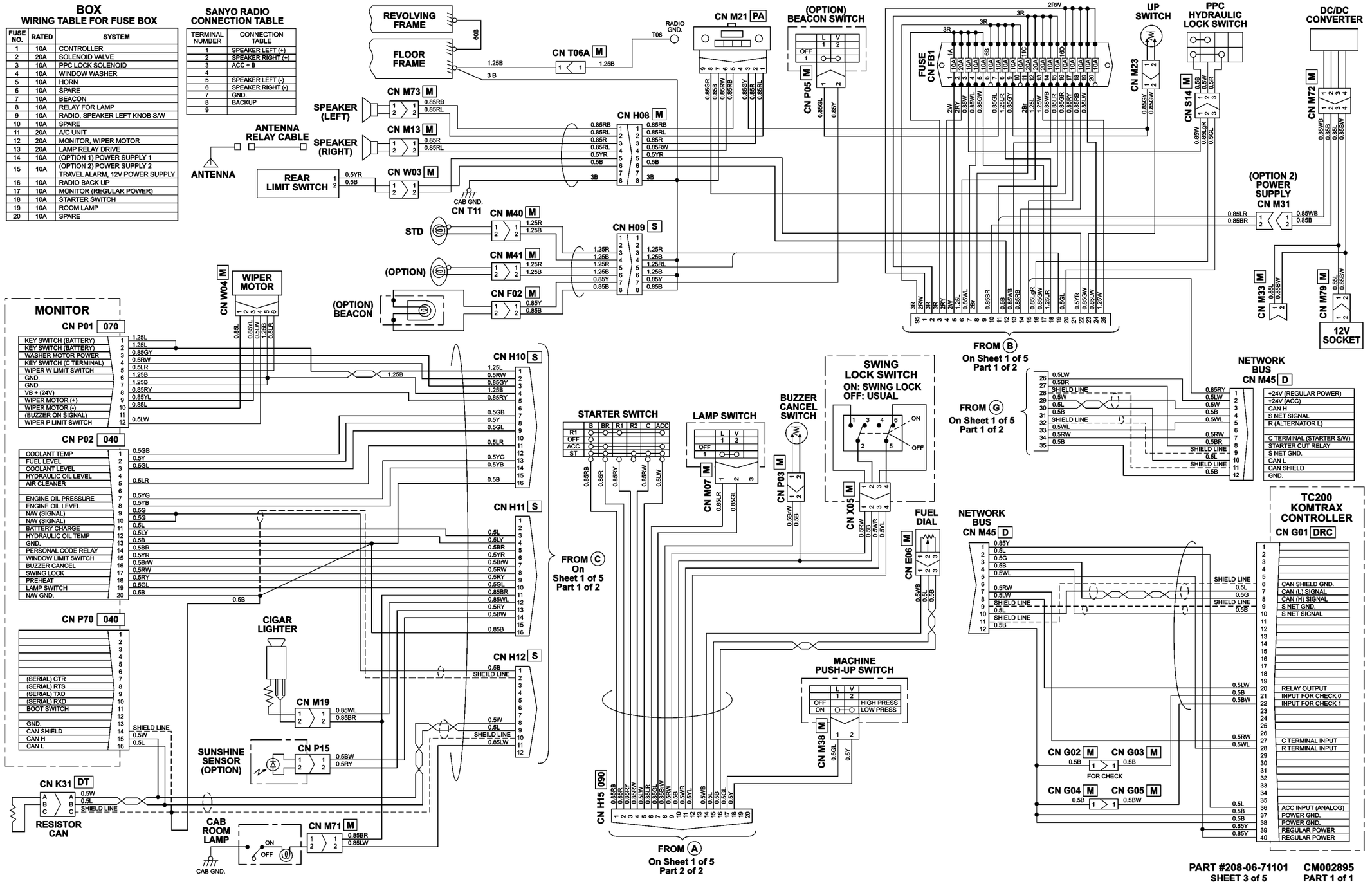
PART #208-60-72100 **CM002733**
SHEET 1 of 2 PART 2 of 4

HYDRAULIC DIAGRAM SHEET 2/2 (PART 3 OF 4) FOLDOUT 7



PART #208-60-72100 CM002738
SHEET 2 of 2 PART 3 of 4

ELECTRICAL DIAGRAM SHEET 3/5 (PART 1 OF 1) FOLDOUT 12



PART #208-06-71101 SHEET 3 of 5 CM002895 PART 1 of 1

M CIRCUIT (MONITOR PANEL SYSTEM DIAGRAM) (PART 1 OF 2) FOLDOUT 17