SHOP MANUAL

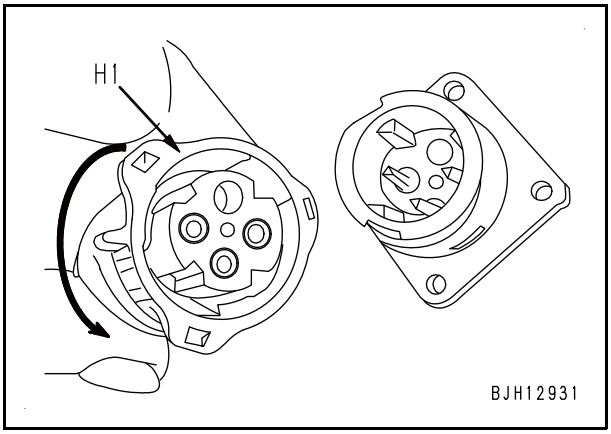
HYDRAULIC EXCAVATOR

HB215LC-2

Model	Serial Number
HB215LC-2	K60001 and up

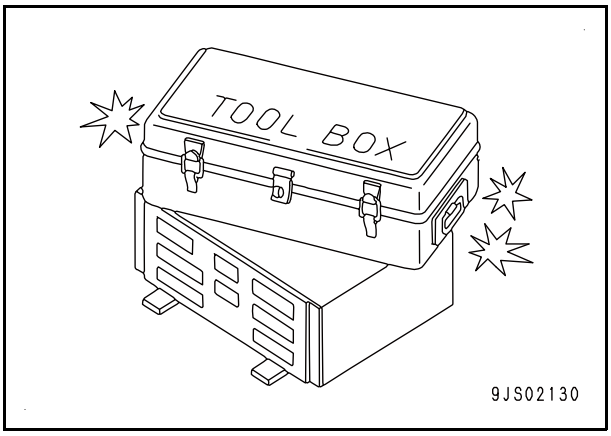
00 Index and foreword

Some machines are equipped with KDPF (Komatsu Diesel Particulate Filter).
KDPF is a system for purifying soot in exhaust gas.Its exhaust gas discharged during purification process (regeneration) can be at higher temperature than that from existing models. Do not bring any flammable material close to the outlet of the exhaust pipe.
  - When there are thatched houses, dry leaves or pieces of paper near the work site, set the system to disable the regeneration before starting work to prevent fire hazards due to highly heated exhaust gas.
    See the operation and maintenance manual for the setting procedure.
- **Explosion caused by lighting equipment**
  - When checking fuel, oil, battery electrolyte, or coolant, always use lighting equipment with anti-explosion specifications.
  - When taking the electrical power for the lighting equipment from the machine itself, follow the instructions in the operation and maintenance manual.

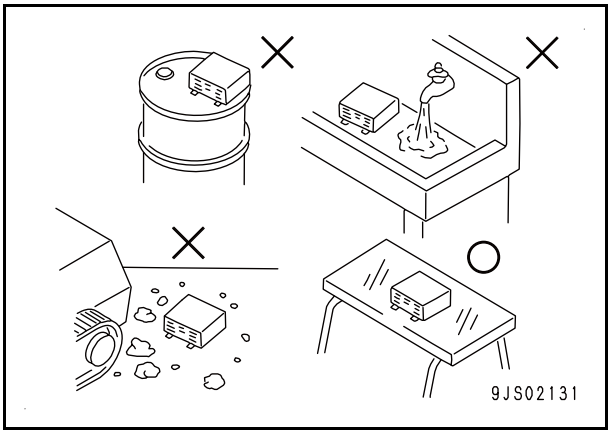


Handling controller

- The electronic circuits for control including the microcomputers are assembled in the controller. These electronic circuits in the controller must be handled with care as they control the machine.
- Do not place objects on top of the controller.



- Cover the control connectors with tape or a vinyl bag. Never touch the connector contacts.
- During rainy weather, do not leave the controller in a place where it is exposed to rain.
- Do not place the controller on oil, water, or soil, or in a place that can be heated to a high temperature even for a short period of time. (Place it on a suitable dry stand.)



- Precautions when performing arc welding

  When performing arc welding on the machine body, disconnect all the wiring harness connectors connected to the controller. Put the arc welding ground to the place close to the welding point.

Precautions for troubleshooting electrical circuits

- Be sure to turn the starting switch to "OFF" position before disconnecting or connecting the connectors.
- Before performing troubleshooting, check all the related connectors for loose connection.
  - ★ Check the related connectors for their performance by disconnecting and connecting them several times.
- Be sure to connect all the disconnected connectors before proceeding to the next step.
  - ★ If the starting switch is turned to "ON" position with the connectors disconnected, the failure which is not related to the part which is actually failed.
- When performing the troubleshooting for the circuit (measurement of voltage, resistance, continuity, current, etc.), shake the related wiring harnesses and connectors several times and check that the multimeter reading does not change.
  - ★ If there is any value change on the multimeter, there may be a defective contact in the circuit.

Standard tightening torque table *(ALL-M140-03BP01A)*

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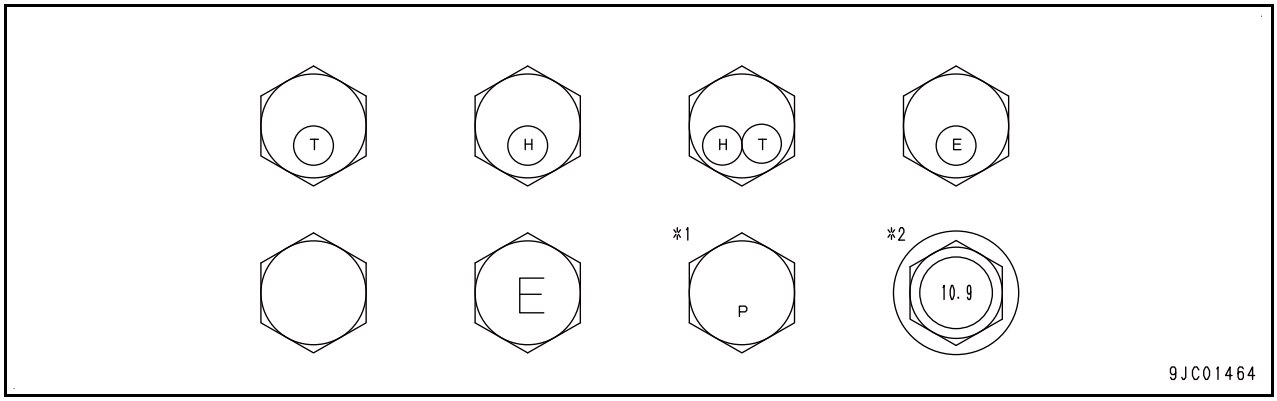
(Rev. 2012/10)

Table of tightening torque for bolts and nuts

Unless otherwise specified, tighten the metric bolts and nuts to the torque shown in the table below.

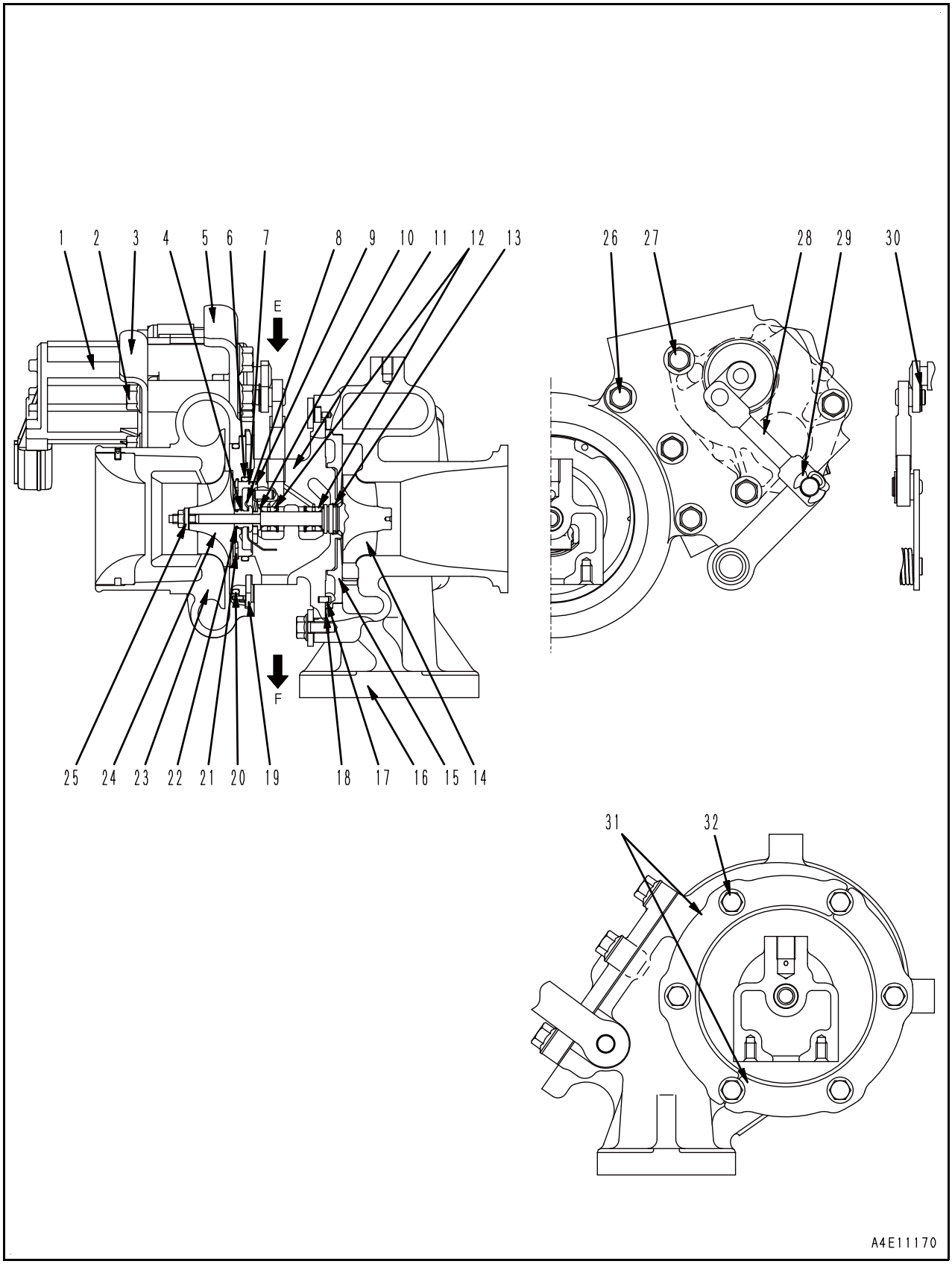


Thread diameter (mm)	Width across flats (mm)	Tightening torque (Nm {kgm})
6	10 (*2) 10	11.8 to 14.7 {1.2 to 1.5}
8	13 (*2) 12	27 to 34 {2.8 to 3.5}
10	17 (*1, *2) 14	59 to 74 {6.0 to 7.5}
12	19 (*1, *2) 17	98 to 123 {10.0 to 12.5}
14	22	157 to 196 {16 to 20}
16	24 (*1) 22	245 to 309 {25 to 31.5}
18	27	343 to 427 {35 to 43.5}
20	30	490 to 608 {50 to 62}
22	32	662 to 829 {67.5 to 84.5}
24	36	824 to 1,030 {84 to 105}
27	41	1,180 to 1,470 {120 to 150}
30	46	1,520 to 1,910 {155 to 195}
33	50	1,960 to 2,450 {200 to 250}
36	55	2,450 to 3,040 {250 to 310}
39	60	2,890 to 3,630 {295 to 370}

*1: Split flange bolt.
*2: Flanged bolt.

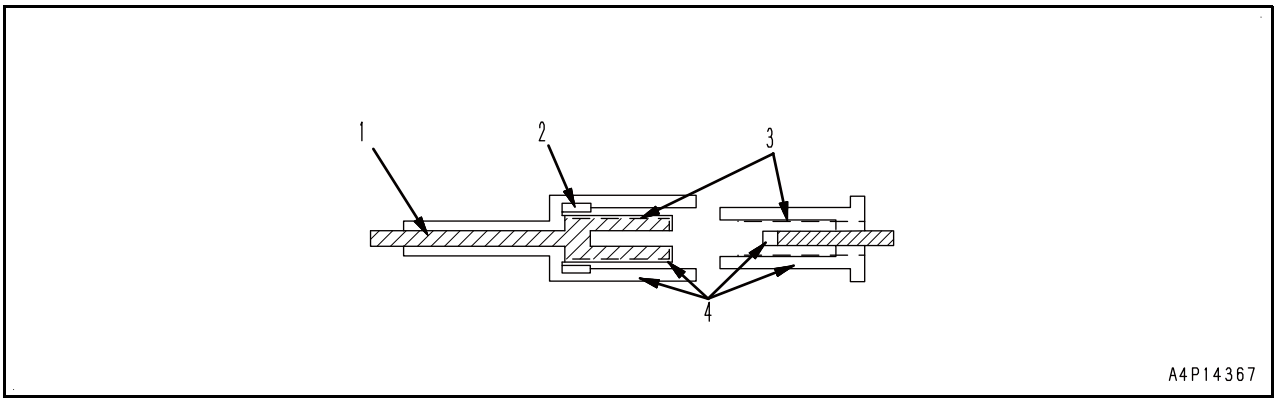
1°C = 33.8°F

°C		°F	°C		°F	°C		°F	°C		°F
-16.1	3	37.4	3.3	38	100.4	22.8	73	163.4	60.0	140	284.0
-15.6	4	39.2	3.9	39	102.2	23.3	74	165.2	62.7	145	293.0
-15.0	5	41.0	4.4	40	104.0	23.9	75	167.0	65.6	150	302.0
-14.4	6	42.8	5.0	41	105.8	24.4	76	168.8	68.3	155	311.0
-13.9	7	44.6	5.6	42	107.6	25.0	77	170.6	71.1	160	320.0
-13.3	8	46.4	6.1	43	109.4	25.6	78	172.4	73.9	165	329.0
-12.8	9	48.2	6.7	44	111.2	26.1	79	174.2	76.7	170	338.0
-12.2	10	50.0	7.2	45	113.0	26.7	80	176.0	79.4	175	347.0



1. VFT motor
2. Flange bolt
3. Bracket
4. Thrust sleeve
5. Bracket

One-touch connector



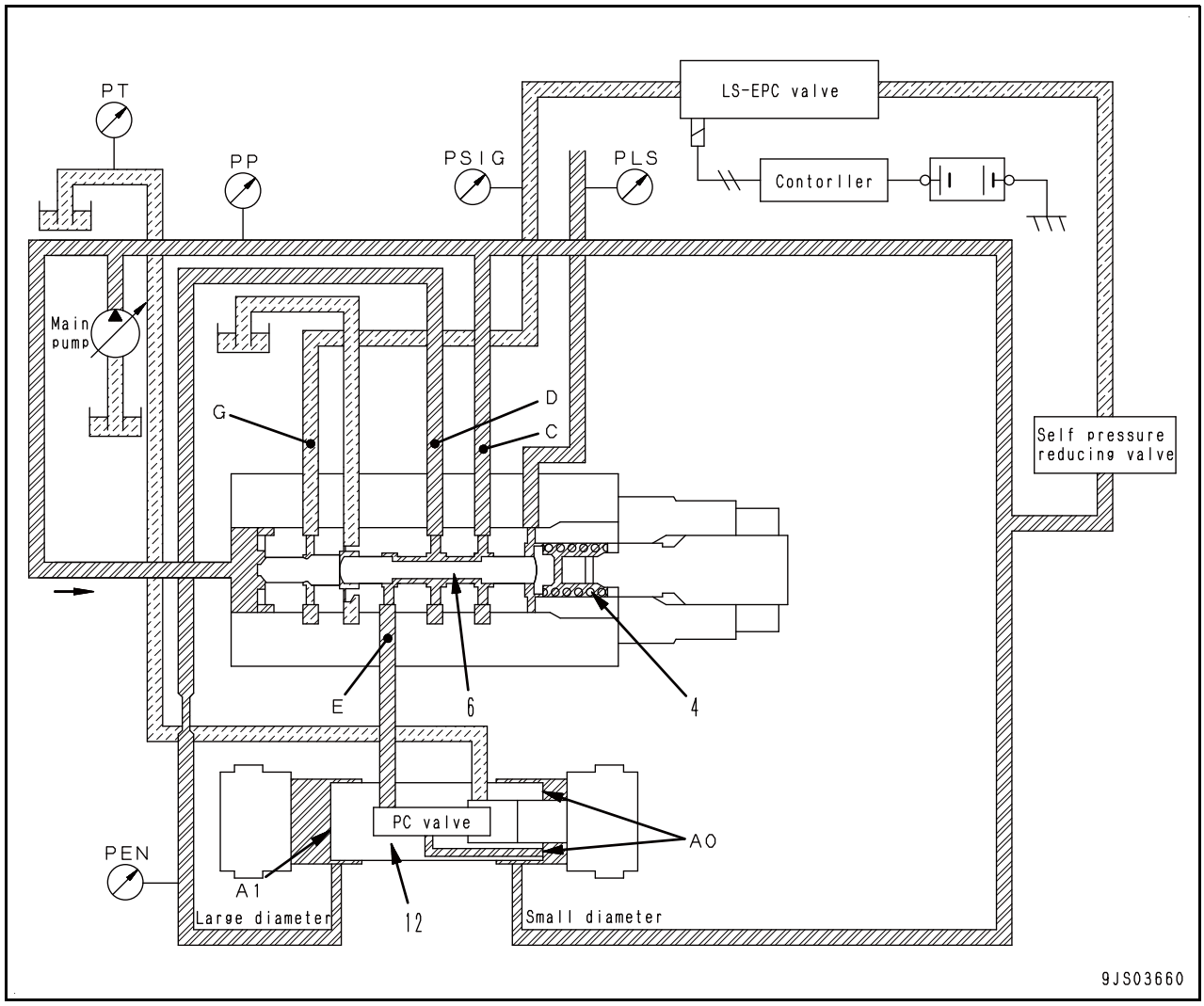
1. Core conductor
2. Waterproof seal
3. Electromagnetic shield
4. Insulator

- The electrodes of the one-touch connector are protected with waterproof seal (2) and insulator (4), and you cannot touch them easily.

1. Bucket cylinder
2. Arm cylinder
3. Boom cylinder
4. R.H. PPC valve for work equipment
5. Hydraulic tank
6. Main pump
7. Control valve
8. Accumulator (for PPC circuit)
9. Oil cooler
10. L.H. travel motor
11. Solenoid valve
12. R.H. travel motor
13. L.H. PPC valve for work equipment
14. 2nd-line attachment PPC valve (*1)
15. Travel PPC valve
16. 1st-line attachment PPC valve (*1)
17. Centre swivel joint

*1: Machines ready for installation of attachment

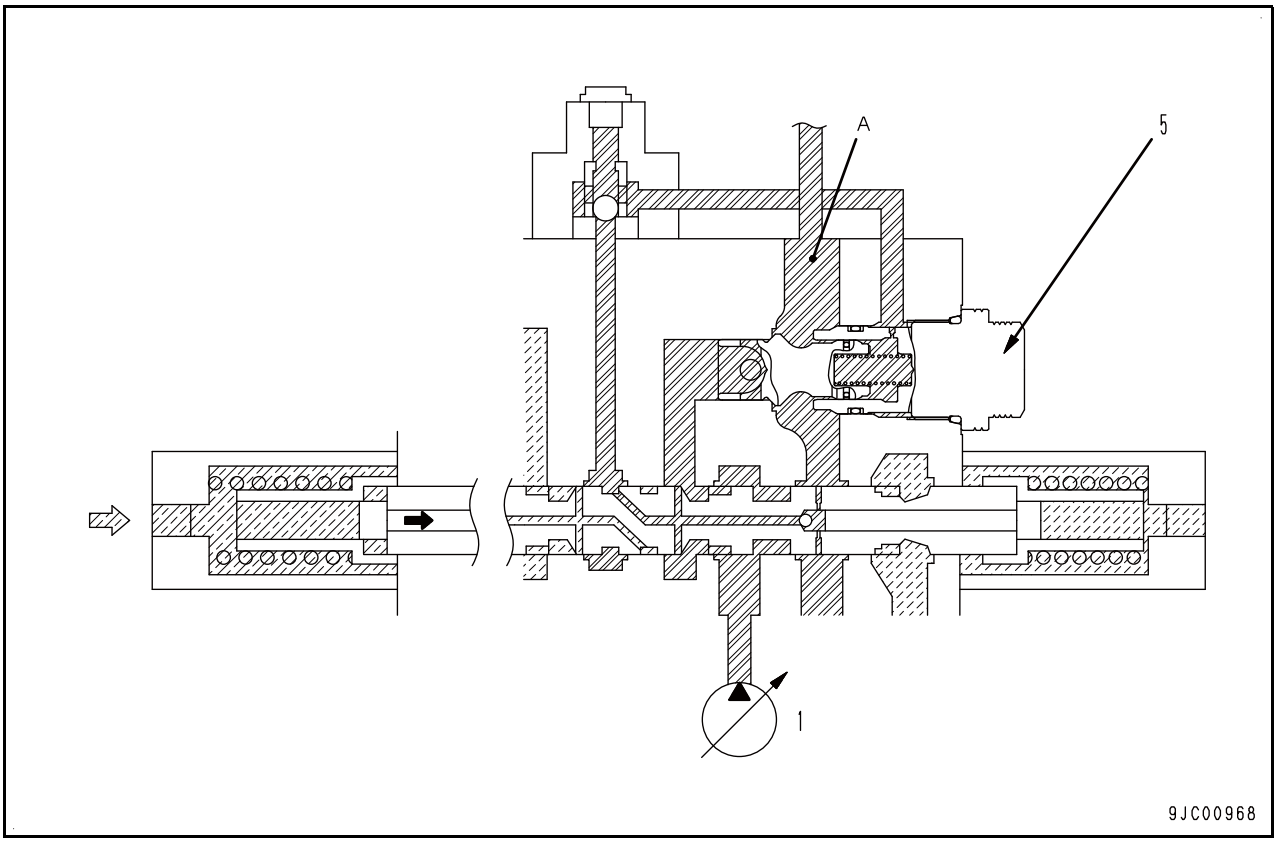
When servo piston is balanced



- The symbols (A1), (A0) and (PEN) represent the area receiving the pressure at the large diameter end of the piston, the area receiving the pressure at the small diameter end and the pressure transmitted to the large diameter end of the piston, respectively.
- When the force exerted by main pump pressure (PP) of the LS valve is balanced with the combined force exerted by LS pressure (PLS) and spring (4), and the relationship becomes (A0) x (PP) = (A1) x (PEN), servo piston (12) stops in that position.
- The swash plate of the pump is held at the intermediate position. [The swash plate stops at a position where the openings from port (D) to port (E) and from port (C) to port (D) of spool (6) are approximately equal]
- The relationship between the area receiving the pressure at both ends of servo piston (12) is (A0) : (A1) = 3 : 5, and the pressures transmitted to both ends of the piston when the piston is balanced is (PP) : (PEN) ≒ 5 : 3.
- The force of spring (4) is adjusted so that spool (6) can be balanced at the specified centre when (PP) - (PLS) = 1.7 MPa {17.75 kg/cm^2}.
- When (PSIG) [LS-EPC valve output pressure, 0 to 2.9 MPa {0 to 30 kg/cm^2}] is transmitted to port (G), the balanced position changes in proportion to the (PSIG) pressure within a range of (PP) - (PLS) = 1.7 MPa {17.75 kg/cm2} to 0.27 MPa {2.78 kg/cm^2}.

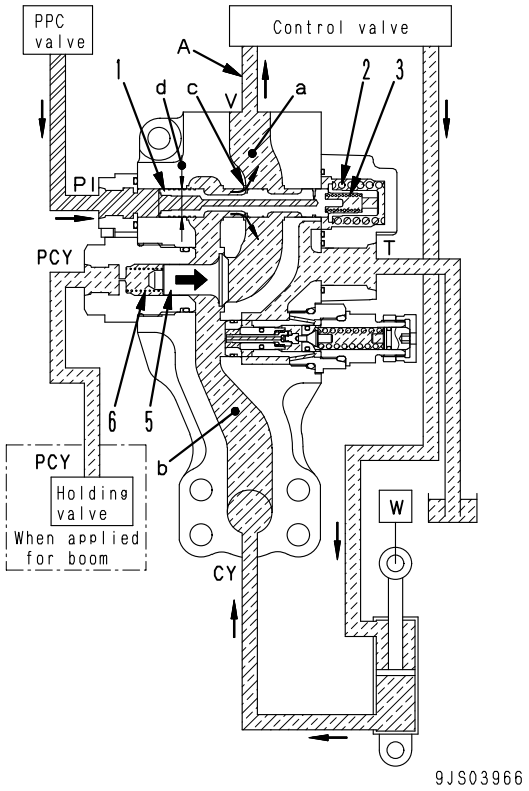
A1: To bucket cylinder head
A2: To L.H. travel motor
A3: To boom cylinder bottom
A4: Plug
A5: To R.H. travel motor
A6: To arm cylinder head
A-1: To attachment 1
ATT: From attachment
B1: To bucket cylinder bottom
B2: To L.H. travel motor
B3: To boom cylinder head
B4: Plug
B5: To R.H. travel motor
B6: To arm cylinder bottom
B-1: To attachment 1
BP5: From attachment selector solenoid valve
C: To oil cooler
P1: From bucket PPC, EPC valve (bucket DUMP)
P2: From bucket PPC, EPC valve (bucket CURL)
P3: From L.H. travel PPC valve (left travel REVERSE)
P4: From L.H. travel PPC valve (left travel FORWARD)
P5: From boom PPC, EPC valve (boom RAISE)
P6: From boom PPC, EPC valve (boom LOWER)
P9: From R.H. travel PPC valve (right travel REVERSE)
P10: From R.H. travel PPC valve (right travel FORWARD)
P11: From arm PPC, EPC valve (arm OUT)
P12: From arm PPC, EPC valve (arm IN)
P-1: From service 1, PPC valve
P-2: From service 1, PPC valve
PLS1: To rear pump LS valve
PLS2: To front pump LS valve
PLSC: LS pressure pickup port
PP1. From front pump
PP2: From rear pump
PP2S: Pressure sensor mounting port
PPC: Pilot source pressure pickup port
PPS1: Pressure sensor mounting port
PPS2: To front pump control
PR: To solenoid valve, PPC valve and EPC valve
PST: From travel junction solenoid valve
PX1: From 2-stage relief solenoid valve
PX2: From 2-stage relief solenoid valve
T: To tank
T1: To tank
TS: To tank
TSW: Plug
CN: From controller
IS1: From controller
IS2: From controller
1. Boom hydraulic drift prevention valve
2. 6-spool valve
3. Service valve 1
4. Cover A
5. Arm quick return valve
6. Cover B
7. Arm hydraulic drift prevention valve
8. Merge-divider valve

When travelling



Structure

- Since no holding pressure is generated at port (A) of the travel circuit, a pressure compensation valve without shuttle valve (5) is adopted.


PPC valve
Control valve
A
1
d
c
V
a
2
3
PI
PCY
T
6
5
b
PCY
Holding valve
When applied for boom
W
CY
9JS03966

Brake valve *(ALL-C4Q0-041K00A)*

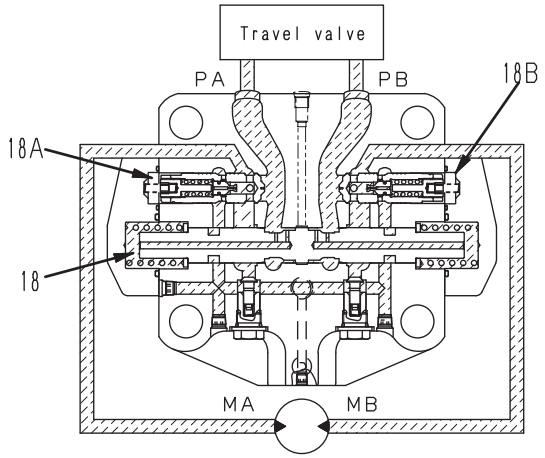
:

- Brake valve is comprised of suction safety valves (18A) and (18B), and counterbalance valve (18).

Counterbalance valve *(PC220-C4N0-042K00A)*

:

Function



- When the machine travels down a slope, its travel speed tends to get faster than the motor (engine) speed because of the downward force generated from its own weight.
- Travelling the machine with the engine running at a low speed may induce idle run of the motor that allows the machine to run out of control, posing a danger.
- These valves serve to prevent the above problem by enabling the machine to travel at a speed that matches the engine speed (pump discharged volume).

Operation *(PC-C4N0-044K00A)*

:

P: From self-pressure reducing valve
P1: To control valve (service valve 1 port)
P2: To control valve (service valve 1 port)
T: To hydraulic tank

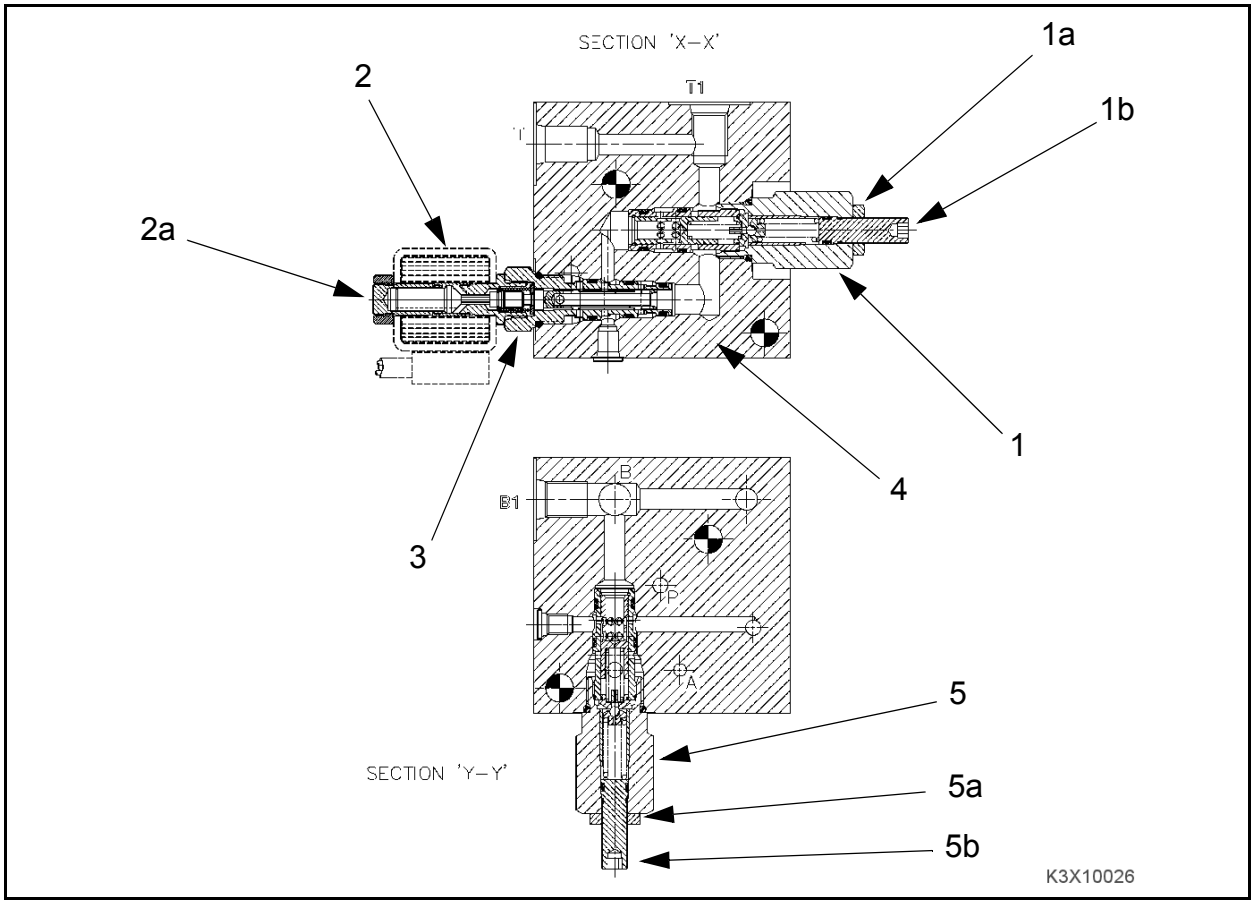
1. Spool
2. Piston
3. Lever
4. Plate
5. Retainer
6. Body
7. EPC valve

EPC valve *(PC200_10-PL2B-041K00A)*

:
(Machines ready for installation of attachment)

★ EPC: Abbreviation for Electromagnetic Proportional Control

Quick coupler control valve



1. Pressure regulating valve (Unlock)
   1a Lock nut
   1b Adjustment screw
2. Solenoid
   2a Nut
3. Directional control valve
4. Block
5. Pressure regulating valve (Lock)
   5a Lock nut
   5b Adjustment screw

Specification

Min. set pressure: 1 MPa (10.2 kg/cm^2)
Max. set pressure: 30 ± 5 MPa (306 ± 51 kg/cm^2)
Flow: 120 ℓ/min.

Operation

1. When solenoid is switched OFF
   - Since the signal from the operation switches is off, solenoid (2) is de-energized.
     For this reason, directional control valve (3) is in the default position and oil will flow from port P to port B.
   - Oil returning from the quick coupler will flow from port A to port T.
     1a. The setting of the pressure regulating valve (5) will determine the maximum pressure at port B.
     Note: if the settings of valve (1) is lower than valve (5), the maximum pressure at port B will then be determined by valve (1).
   - When the stroke end of the quick coupler cylinder is reached, the pressure at the cylinder will be the set pressure of the regulating valve (1).
   - The pressure regulating valve can be adjusted according to the specification of the coupler. The minimum setting is 1 MPa and the maximum setting is 30 MPa ± 5 MPa.
2. When solenoid is switched ON

Pump and valve control function *(HB205-C3W1-042K00A)*

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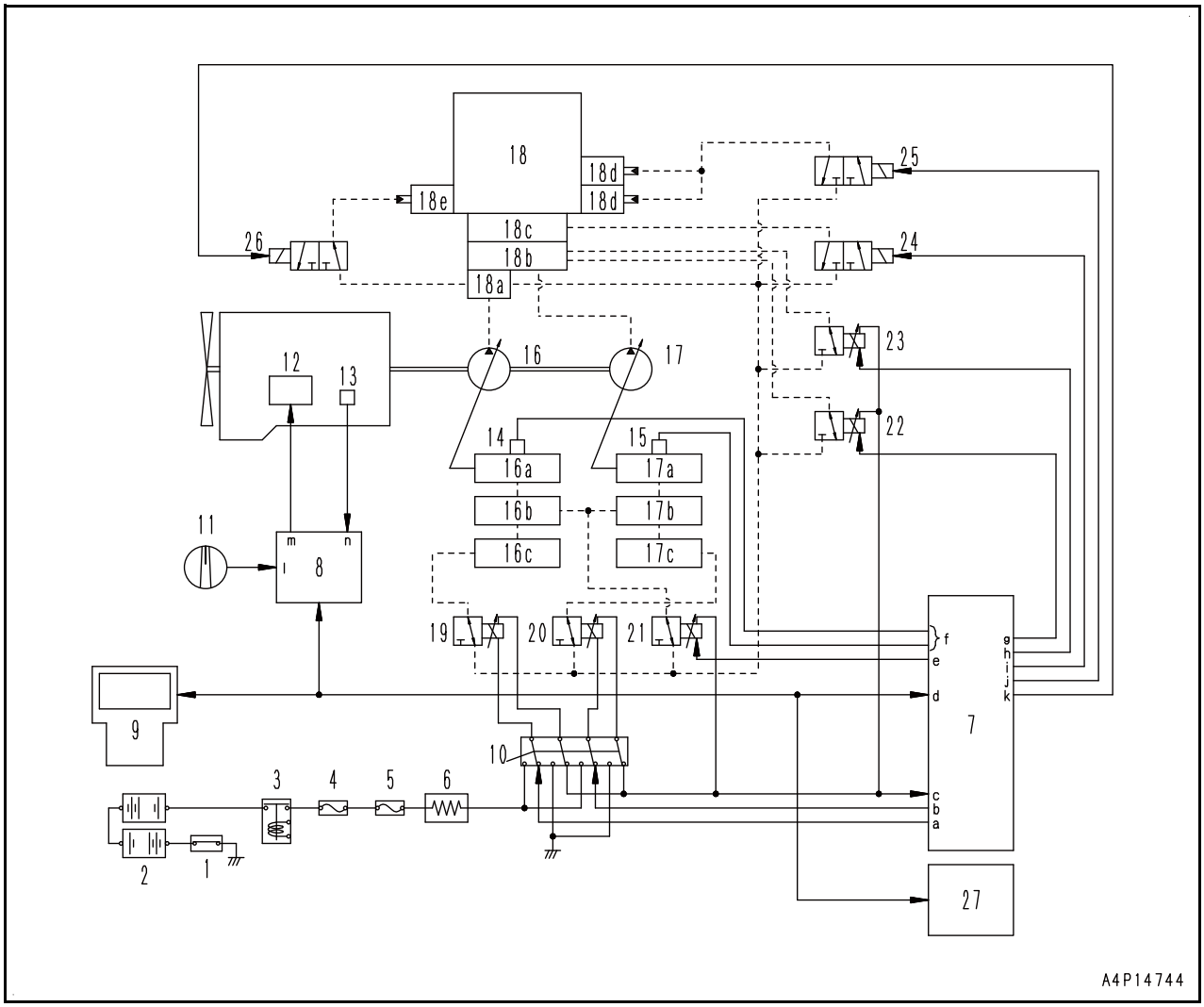
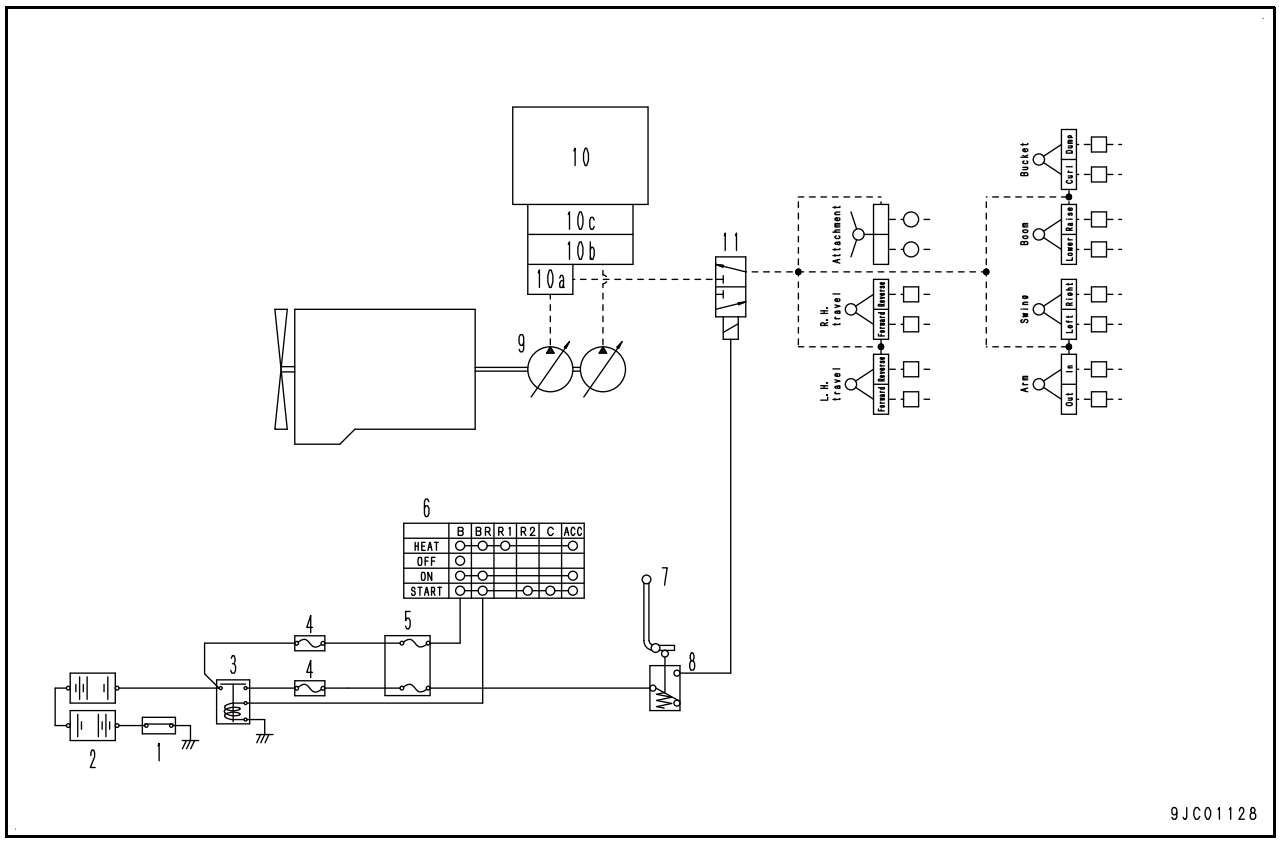


1. Battery disconnect switch
2. Battery
3. Battery relay
4. Fusible link
5. Fuse box
6. Resister for PC–EPC valve
7. Pump controller
8. Engine controller
9. Machine monitor
10. Emergency pump drive switch
11. Fuel control dial
12. Fuel supply pump
13. Various sensors
14. Front pump swash plate sensor
15. Rear pump swash plate sensor
16. Front pump
16a. Servo
16b. LS valve
16c. PC valve
17. Rear pump
17a. Servo
17b. LS valve

PPC lock function *(PC-PX16-042K00A)*

:

★ PPC: Abbreviation for Proportional Pressure Control



1. Battery disconnect switch
2. Battery
3. Battery relay
4. Fusible link
5. Fuse box
6. Starting switch
7. Lock lever
8. PPC lock switch
9. Main pump
10. Control valve
10a. Self-pressure reducing valve
10b. Merge-divider valve
10c. Travel junction valve
11. PPC lock solenoid valve

Function

- Interlocked with the lock lever, PPC lock switch is turned off when the lock lever is moved to “LOCK” position.
- When the PPC lock switch is turned off, current to the PPC lock solenoid valve is shut off. Even if each control lever or pedal is operated, the work equipment and machine do not move.

Inverter *(HB205-PQGK-041K00A)*

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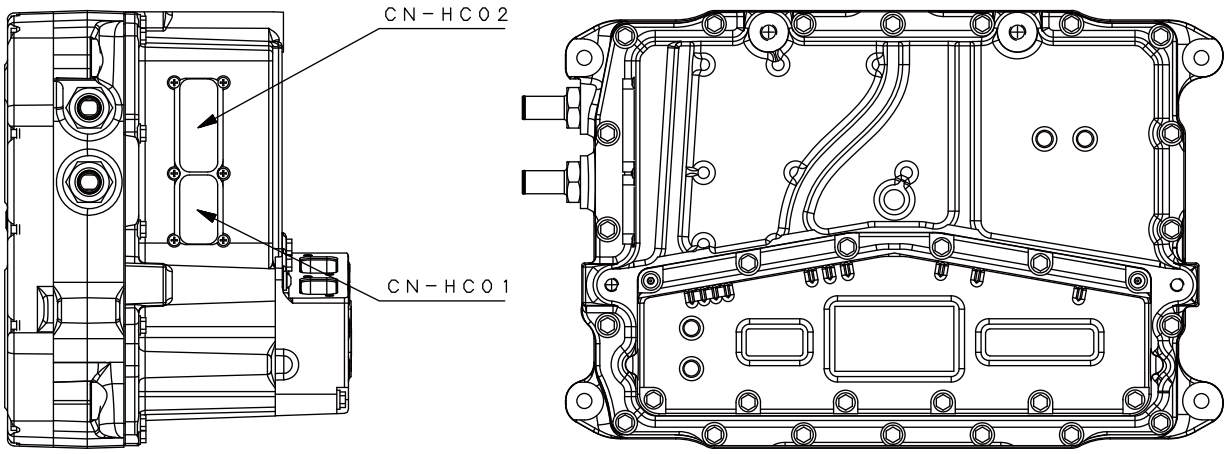
Hybrid



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Input and output signals of hybrid controller *(HB205-PQGK-03CK00A)*

:

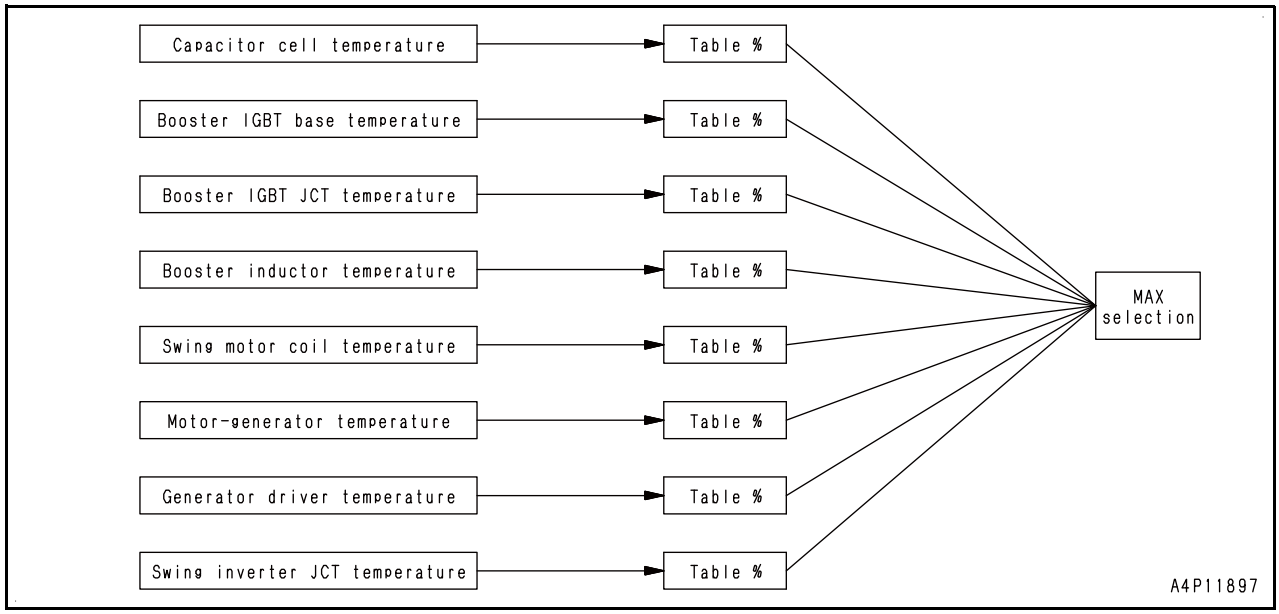
DRC26-24P [CN-HC01]

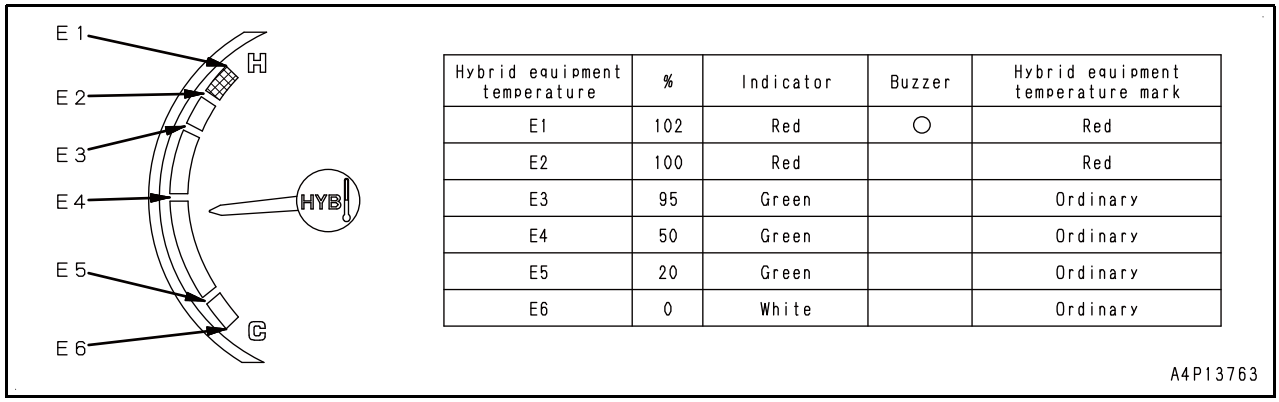
Pin No.	Signal name	Input/output
1	Battery relay terminal M power supply (24 V)	Input
2	NC (*1)	-
3	Capacitor contactor (+)	Output
4	NC (*1)	-
5	Continuous power supply (24 V)	Input
6	Starting switch (ACC)	Input
7	Battery relay terminal M power supply (24 V)	Input
8	Swing parking brake solenoid	Output

Hybrid temperature gauge (detailed)

Hybrid

The temperatures of the hybrid devices shown below are converted into percentages and their maximum values are indicated on the gauges.





Hybrid equipment temperature	%	Indicator	Buzzer	Hybrid equipment temperature mark
E1	102	Red	○	Red
E2	100	Red		Red
E3	95	Green		Ordinary
E4	50	Green		Ordinary
E5	20	Green		Ordinary
E6	0	White		Ordinary

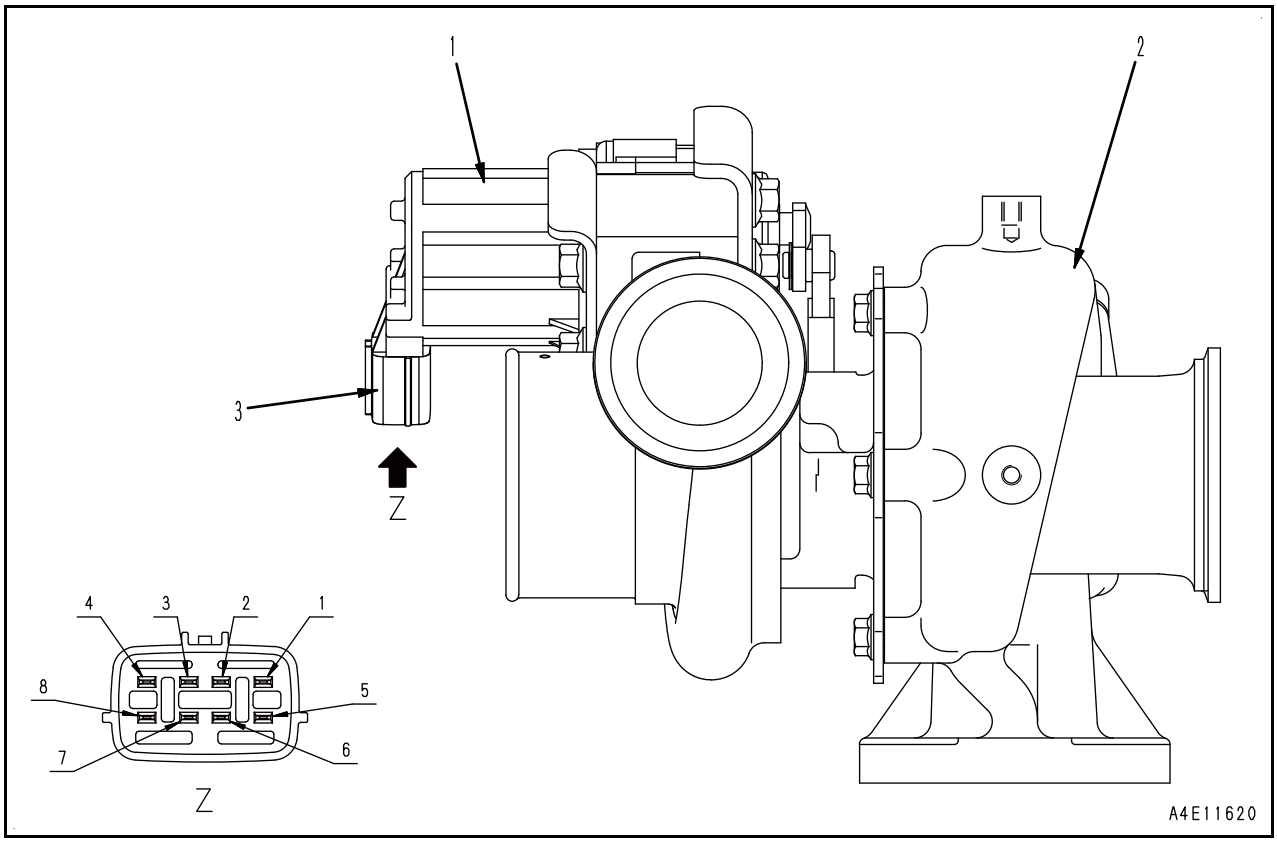
Hybrid device temperature	%	Capacitor Cell temperature	Booster IGBT base temperature	Booster IGBT JCT temperature	Booster inductor temperature
E1	102	65	80	130	125
E2	100	63	78	125	120
E3	95	60	75	110	110
E4	50	40	55	90	90
E5	20	0	0	0	0
E6	0	-30	-30	-30	-30

VFT motor (with built-in position sensor) *(ENG95-AA56-041K00A)*

:

★ VFT: Abbreviation for Variable Flow Turbocharger

★ The shape is subject to machine models.



1. VFT motor (brushless motor with built-in position sensor)
2. Turbine part
3. Connector

Function *(ENG95-AA56-042K00A)*

:

- Controls the flow control valve with a DC motor.
- The VFT motor has a position sensor in it to sense the valve position.

3. Distribution blocks
4. Metering units
5. Secondary grease lines
6. Grease pressure switch
7. Primary grease line A
8. Primary grease line B

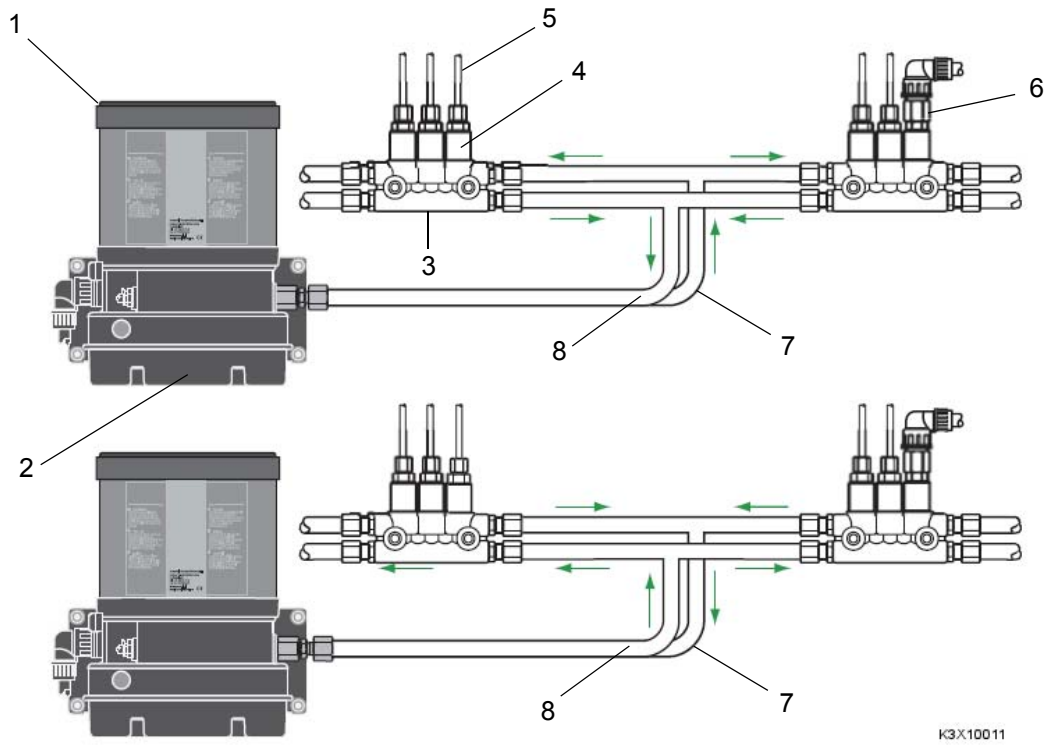


Figure 1 Overview of the automatic greasing system

Components

(a) The Grease Pump

The relief valve

A relief valve is mounted in the grease line between the plunger-pump and the diverter-valves. When the grease pressure exceeds 250 bar during the pumping phase, the relief valve will redirect the grease to the reservoir.

The maximum grease pressure will be exceeded when:

- A malfunction of the grease pressure switch, which is mounted in the system occurs.
- A malfunction in the cable of the grease pressure switch occurs.

The grease pressure switch is intended to end the pumping phase, as soon as the minimum required grease pressure is reached.

The minimum-level switch

A level switch maintains the grease level in the reservoir. When the grease reaches the minimum level, the level switch will notify the control unit. At the beginning of every following grease cycle a signal lamp in the cabin will flash as a warning that the reservoir has to be filled.

The test push-button

The grease system can be tested by starting one or more test cycles by means of the test push-button on the pump unit. This button also can be used to reset the control unit.

Machine model				HB215LC-2	
Item	Measurement condition		Unit	Standard value for new machine	Repair limit
PC valve outlet pressure (servo piston inlet pressure)	• Hydraulic oil temperature: 45 to 55°C • Engine: High idle • Working mode: P mode • Swing lock switch: ON • Work equipment control: Arm IN relief	Front pump discharged pressure	MPa {kg/cm^2}	36.1 to 38.8 {368 to 395}	36.1 to 38.8 {368 to 395}
		Servo piston inlet pressure		Above value x approx. 0.6	Above value x approx. 0.6
		Rear pump discharged pressure		36.1 to 38.8 {368 to 395}	36.1 to 38.8 {368 to 395}
		Servo piston inlet pressure		Above value x approx. 0.6	Above value x approx. 0.6
PC mode selector pressure (PC-EPC valve output pressure)	• Hydraulic oil temperature: 45 to 55°C • Working mode: P mode • Swing lock switch: ON • Work equipment control lever: NEUTRAL	Low idle	MPa {kg/cm^2}	Approx. 2.9 {Approx. 30} (Reference value)	Approx. 2.9 {Approx. 30} (Reference value)
		High idle		0 {0}	0 {0}
LS valve output pressure (servo piston inlet pressure)	• Hydraulic oil temperature: 45 to 55°C • Engine: High idle • Working mode: B mode • Front pump circuit: Right track • Rear pump circuit: Left track	Control lever and pedal: NEUTRAL	MPa {kg/cm^2}	2.9 to 4.9 {30 to 50} (*2)	2.9 to 4.9 {30 to 50} (*2)
		Right or left track: Idle turn		Pump pressure x Approx. 0.6	Pump pressure x Approx. 0.6
LS set selector pressure (LS-EPC valve output pressure)	• Hydraulic oil temperature: 45 to 55°C • Engine: High idle • Working mode: P mode • Swing lock switch: OFF • Travel control lever: Fine control	Travel speed: Lo	MPa {kg/cm^2}	Approx. 2.9 {Approx. 30} (Reference value)	Approx. 2.9 {Approx. 30} (Reference value)
		Travel speed: Hi		0 {0}	0 {0}

Equipment name	Procedure, measuring location, criteria and remarks		
Fuel control dial (throttle sensor)	1. Turn starting switch to OFF position. 2. Disconnect connector P20, and connect T-adapter to male side.		
	Voltage	Between P20 (male) (1) and (3)	4.0 to 6.0 kΩ
		Between P20 (male) (2) and (3)	0.25 to 5.0 kΩ
		Between P20 (male) (1) and (2)	0.25 to 5.0 kΩ

6) Place the contaminated filter paper on the clean filter paper (at least 10 sheets) in the filter paper holder and read the indicated value.
7) After finishing the test, remove the testing tools, and restore the machine.

Handling cylinder cutout mode operation *(PC400-AD00-34FK00A)*

:

★ The cylinder cut-out test mode operation means to run the engine with the fuel injectors of one or more cylinders disabled electrically to reduce the number of active cylinders. The purposes and effects of this operation are as follows.

1. This mode is used to find out a cylinder which does not output power properly (or, combustion in it is abnormal).
2. When a cylinder is selected for Cylinder Cut-out Mode operation, if the engine speed and output do not change from the normal operation (all-cylinder operation), that cylinder has one or more defects.
   The following problems can be considered:
   - Compression leak from cylinder head gasket
   - Defective injection from injector
   - Defective piston, piston ring or cylinder liner
   - Defective valve mechanism (valve operating system)
   - Defective electrical system
3. The injector of each cylinder is separately controlled electronically in the common rail fuel injection system, so the cylinder cut-out test can be performed easily by the simple operations of the switches compared with the mechanical fuel injection system. This allows to find out a defective cylinder easily.

Testing and adjusting oil pressure in work equipment and travel circuits

(HB380-C000-360K00A)

:

★ Testing tools

Symbol		Part No.	Part name
M	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-101-5220	Nipple (M10x1.25 mm)
	3	07002-11023	O-ring

⚠ Place the machine on a level ground and lower the work equipment to the ground. Then, release the remaining pressure from the hydraulic system. For details, see "Releasing remaining pressure from hydraulic system".

★ Check this item under the following conditions.
- Hydraulic oil temperature: 45 to 55°

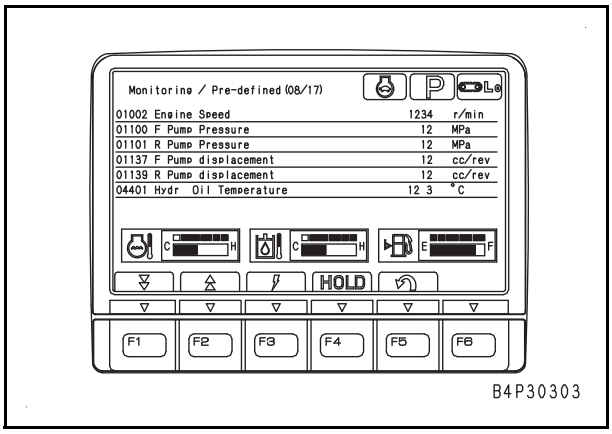
Testing *(HB205-C000-362K01A)*

:

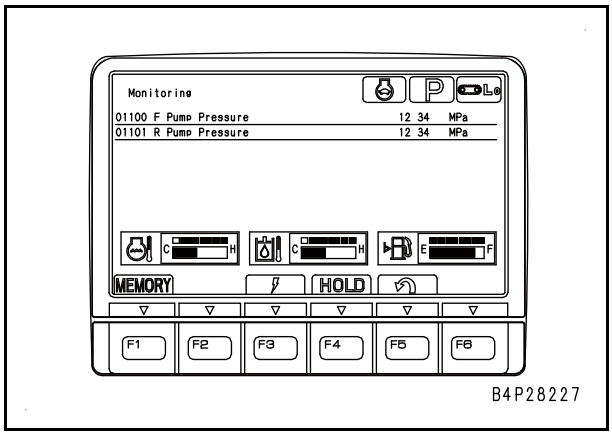
★ The oil pressures in the work equipment, swing, and travel circuits (pump discharged pressures) can be checked from “Monitoring/Pre-defined” or “Monitoring / Custom” screen of the machine monitor.

Measuring method by using machine monitor

1. Start the engine and display “Monitoring/Pre-defined” or “Monitoring/Custom” screen. For details, see "Special functions of machine monitor".
   - Monitoring code: 01100 “F Pump Pressure”
   - Monitoring code: 01101 “R Pump Pressure”
   - “Monitoring/Pre-defined (08/17)” screen



   - “Monitoring” screen



2. Increase the hydraulic oil temperature to 45 to 55°C and measure the pump discharged pressure.

Testing by using the testing tools

1. Open the side cover on the left side of machine, and remove oil pressure pickup plugs (1) and (2) of main pump.
   - (1): Front pump discharged pressure pickup port (P_{FC}) (rear side of machine)
   - (2): Rear pump discharged pressure pickup port (P_{RC}) (front side of machine)

Testing PPC valve outlet pressure *(HB380-PW11-360K00A)*

:

★ Testing tools

Symbol		Part No.	Part name
S	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-401-3100	Adapter (size: 02)
		02896-11008	O-ring
	3	799-401-3200	Adapter (size: 03)
		02896-11009	O-ring

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

★ Before testing PPC valve outlet pressure, check that the control circuit oil pressure is normal.

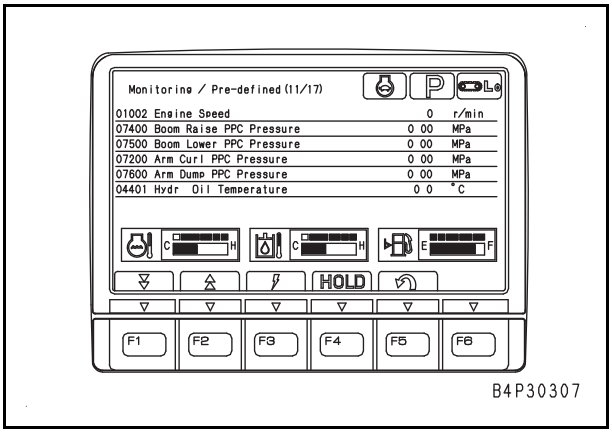
★ Check this item under the following conditions.
- Hydraulic oil temperature: 45 to 55°

Testing *(HB205-PW11-362K01A)*

:

Testing with machine monitor

1. Start the engine and display the “Monitoring/Pre-defined” or “Monitoring/Custom” screen. For details, see "Special functions of machine monitor".
   - Monitoring code: 07200 “Arm Curl (IN) PPC Pressure”
   - Monitoring code: 07600 “Arm Dump (OUT) PPC Pressure”
   - Monitoring code: 07300 “Bucket Curl PPC Pressure”
   - Monitoring code: 07301 “Bucket Dump PPC Pressure”
   - Monitoring code: 07400 “Boom Raise PPC Pressure”
   - Monitoring code: 07500 “Boom Lower PPC Pressure”
   - Monitoring code: 09001 “Swing Left PPC Pressure”
   - Monitoring code: 09002 “Swing Right PPC Pressure”
   - Monitoring code: 07102 “Travel Fwd L.H. PPC Pressure”
   - Monitoring code: 07103 “Travel Fwd R.H. PPC Pressure”
   - Monitoring code: 07104 “Travel Rev L.H. PPC Pressure”
   - Monitoring code: 07105 “Travel Rev R.H. PPC Pressure”
   - “Monitoring/Pre-defined (11/17)” screen



2. Increase the hydraulic oil temperature to 45 to 55°.
3. Run the engine at high idle, set the control levers of the tested circuit to NEUTRAL position, and then measure the oil pressure at full stroke.
   ★ For standard values, see "Standard value table for machine".

Testing by using the testing tools

1. Disconnect hydraulic hoses (1) to (10) of PPC circuit to be tested.

↓ (Special operation)

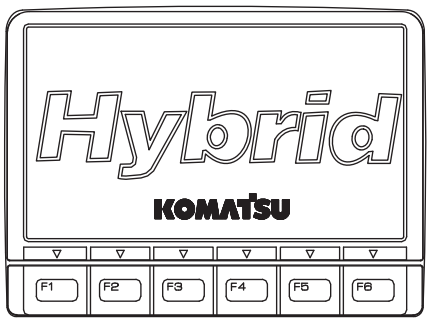
Function of checking display of LCD (Liquid Crystal Display) (PC-Q1LE-100K00A) (PAGE 30-111)Function of checking display of LCD (Liquid Crystal Display)
Function of checking service meter (PC-Q1MB-100K00A) (PAGE 30-112)Function of checking service meter
Function of Usage Limitation Setting/ Change Password (HB380-Q19X-100K00A) (PAGE 30-112)Function of Usage Limitation Setting/ Change Password

★ Display pattern of operator mode
The contents of display from when the starting switch is turned to ON position to when the standard screen appears depend on the settings and conditions of the machine.
A: When engine start lock is enabled
B: When engine start lock is disabled
C: When working mode at start is set to breaker mode (B)
D: When there is abnormal item in "Check before starting" items
E: When there is maintenance item which exceeded due time
- The values in the table show the displaying order in each pattern.

Display of KOMATSU logo *(HB205-Q180-044K04A)*

:
When starting switch is turned to ON position, KOMATSU logo is displayed for 2 seconds.

★ After the KOMATSU logo is displayed for 2 seconds, the screen changes to "Password input (if password is set)" screen, or "Check before starting" screen.



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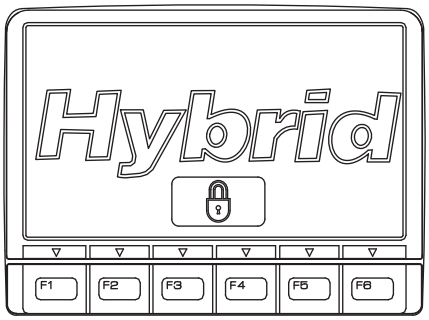
★ The following screen may sometimes be displayed instead of the above "Password input" screen.

★ If this screen is displayed, call the person responsible for the operation of KOMTRAX in your Komatsu distributor and ask for remedy.



B4P28794

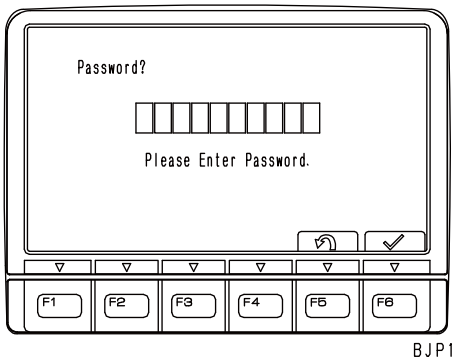
Password input *(HB205-Q180-044K06A)*

:
After KOMATSU logo is displayed, display the screen to input the "Engine Start Lock" password.

★ This screen is displayed only when the engine start lock function is enabled.

★ When correct password is input, the screen changes to "Check before starting" screen.

★ The machine monitor has some password functions other than the "Engine Start Lock". Those passwords are individually set.



BJP14601

Monitoring/ Pre-defined screen (15/17) Hybrid system temperature (1)

Hybrid

No.	ID	Item name	Unit (SI)	Applicable component
4	09403	Booster IGBT Base Temperature	°C	HYB
5	09404	Booster IGBT Junc. Temperature	°C	HYB
6	01142	Service Press. Sensor (HYB W Pump)	MPa	PUMP

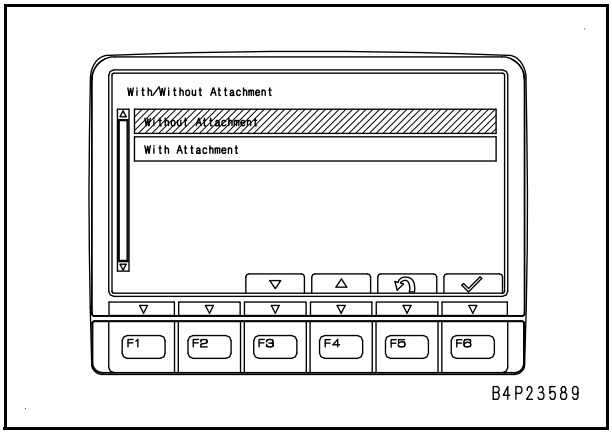
Monitoring/ Pre-defined screen (16/17) Hybrid system temperature (2)

Hybrid

No.	ID	Item name	Unit (SI)	Applicable component
1	01002	Engine Speed	r/min	ENG
2	09101	Swing Motor Coil Temperature	°C	HYB
3	09507	Swing Motor IGBT Junc. Temp.	°C	HYB
4	09600	Generator Motor Temperature	°C	HYB
5	09607	Gen. Motor IGBT Base Temp. #0	°C	HYB
6	09608	Gen. Motor IGBT Base Temp. #1	°C	HYB

- [F6]: Enters selection and returns the screen to “Default ”screen

  ★ The attachment setting in the operator mode cannot be performed without performing this setting correctly when attachment is installed. As a result, the attachment may not work normally or the hydraulic components may be damaged.



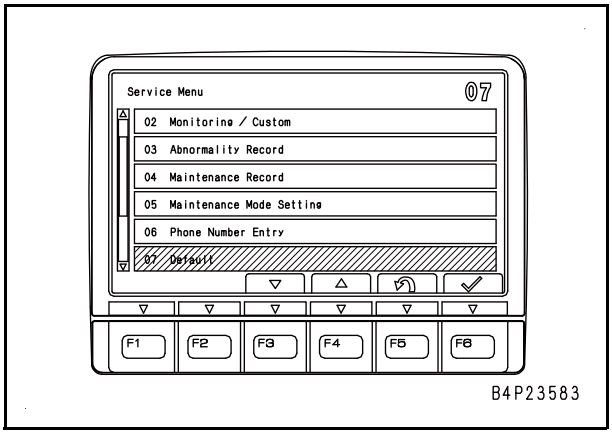
Default (Camera) *(HB205-Q1F6-100K01A)*

:

Use the menu of "Default" to check or change various settings of the machine monitor and machine.

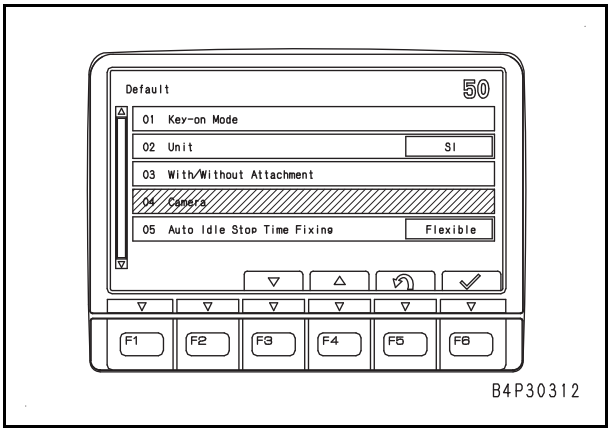
Camera setting is for setting of camera when the camera is installed or removed.

1. Selecting a menu
   Select “Default” on “Service Menu” screen.



2. Selecting a sub menu
   After “Default” screen is displayed, select “Camera” by using the function switch or numeral input switches.

   ★ Selecting method is the same as on “Service Menu” screen.



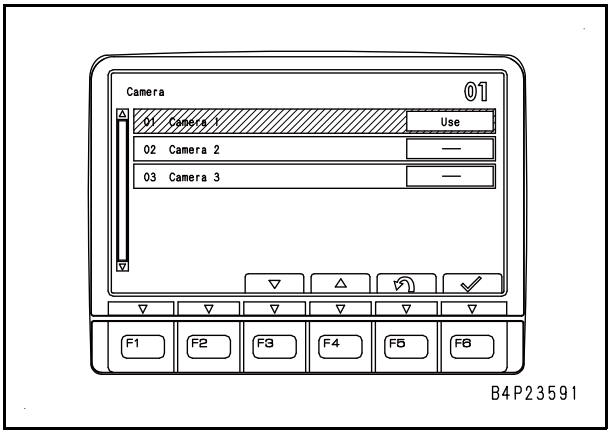
3. Selecting camera setting
   After “Camera” screen is displayed, select a setting by using the function switch.
   - “Not Use”: Camera is not used
   - “Use”: Images from connected camera are displayed as a normal image.
   - [Я]: Reverse images (mirror images if it is used for rear view monitor) are displayed.
   - [R]: Normal images (visual images if it is used for front or side monitor) are displayed.
   - [F3]: Moves selection downward
   - [F4]: Moves selection upward.
   - [F5]: Cancels contents of setting before entry and returns to “Default” screen
   - [F6]: Enters selection in each line

   ★ You cannot switch camera 1 between [Я] and [R].

   ★ Enter selection in each line with [F6], and return to "Default" screen with [F5], and then your setting is validated.

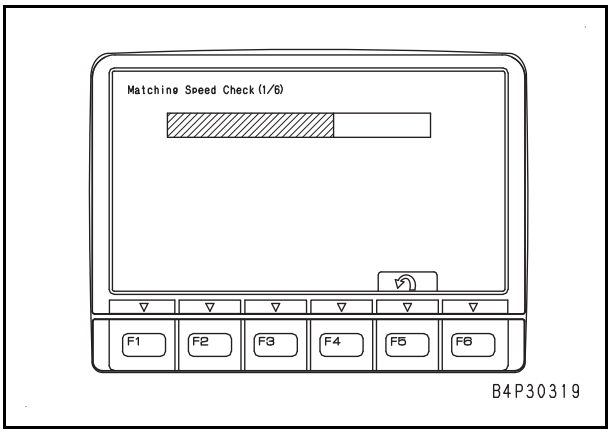
   ★ Unless setting is normally set with this function when the camera is connected, the graphic mark of camera is not displayed at [F3] in the operator mode. Accordingly, the image of the camera cannot be used.

   ★ When the camera is installed, check that the right and left portions of the displayed image are correct.

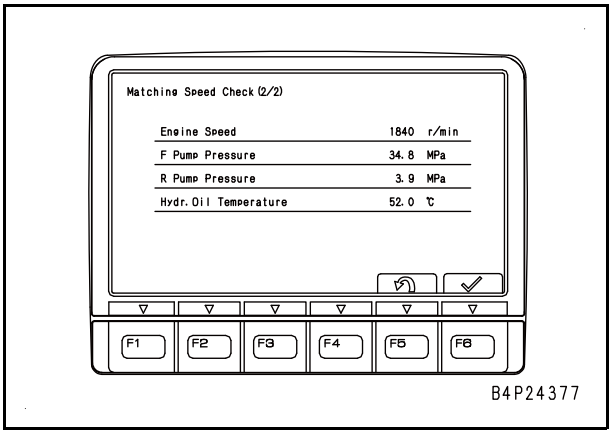


- Fuel control dial: MAX
- Swing lock switch: ON
- Air conditioner: OFF

3) Keep bucket CURL relief state. When the engine speed is stabilized, hold down [F1] on the machine monitor to start checking. During matching speed check, a bar is displayed on the screen. Keep relief operation until the check is finished.
   - It takes approximately 10 seconds to start the bar graph operation.



4) If the check is normally completed, the result is displayed.
   Press [F6] to move to the next



If check is finished unsuccessfully, "NG" is displayed for the State of check and the failure cause code is displayed. Referring to the failure cause codes in Table 1, find out and remove the cause and repeat matching speed check.

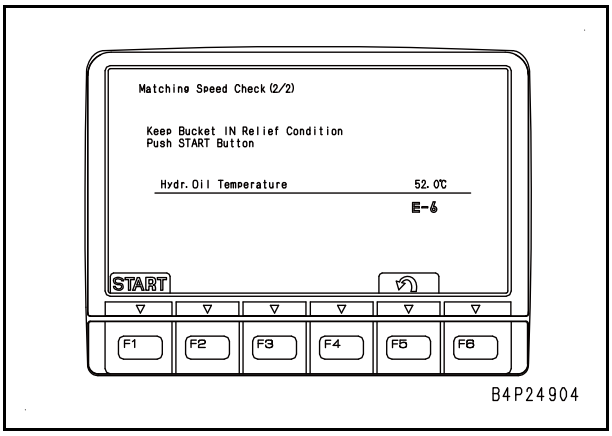


Table 1. Failure cause codes
Calibration failure cause codes (Displayed in descending order of priority)

Cause code	Object			Content	Remedies
	MIN swash plate calibration	MAX swash plate calibration	Pump calibration		
A-1	●	●	●	Engine speed signal is 0 rpm	Check that engine is started
A-2	●	●	●	Hydraulic oil temperature is low	Check hydraulic oil temperature (Min. 45°C)
A-3	●	●	●	Hydraulic oil temperature is high	Check hydraulic oil temperature. (Calibration of swash plate: Max. 85°C, Calibration of pump: Max. 55°C)
A-4	●	●	●	Overheating	Check for overheating.
A-6	●	●	●	Pump pressure sensor (F, R) is defective	Perform troubleshooting for pump pressure sensor
A-7	●	●	-	Pump swash plate (F, R) sensor is defective.	Perform troubleshooting for pump swash plate sensor

Pm clinic *(ALL-2160-001A00A)*

:

Pm Clinic service *(HB205-2160-209A01A)*

:

Model	Serial No.	Service meter
□ HB215LC-2		h

User name	Date of inspection	Inspector

Specification		
Main parts	Attachment	Shoe width
Boom □ Standard () Arm □ Standard () Bucket □ Standard ()	□ Breaker □ ()	□ 600 mm □ () □ 700 mm

Check of oil and coolant levels		
□ Radiator coolant	□ Hydraulic oil	□ Motor-generator case oil
□ Hybrid radiator coolant	When necessary	□ Electric swing motor case oil
□ Engine oil	□ Final drive case oil	□ Machinery case oil

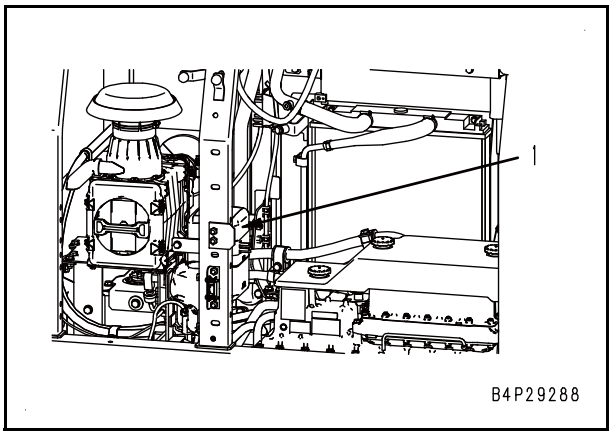
Ambient temperature	Altitude
°C	m

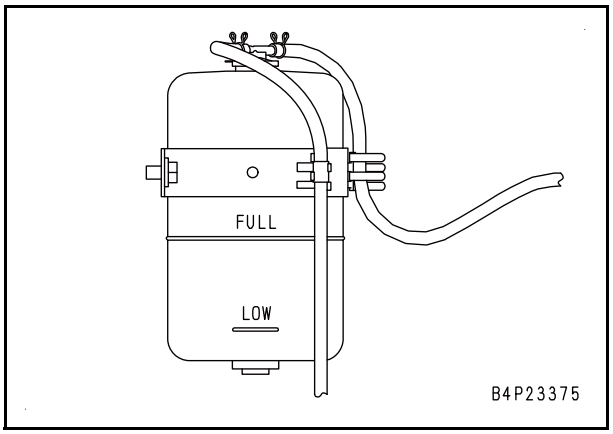
Operator's comment

Result of visual inspection

Abnormality record in mechanical systems				Abnormality record in electrical systems			
989EKX	Times/First time	h/Latest	h		Times/First time	h/Latest	h
A900FR	Times/First time	h/Latest	h		Times/First time	h/Latest	h
A900NY	Times/First time	h/Latest	h		Times/First time	h/Latest	h
A900N6	Times/First time	h/Latest	h		Times/First time	h/Latest	h
AA10NX	Times/First time	h/Latest	h		Times/First time	h/Latest	h

1. Open side cover on the rear left of the machine, check the coolant level is within "FULL - LOW" range at reservoir tank (1) (shown in the figure below). If coolant is insufficient, add coolant up to FULL level through water filler port at reservoir tank (1).
2. After refilling with coolant, tighten the cap securely.
3. If the reservoir tank is vacant, coolant may have leaked.
   If any abnormality is found in the check for leakage, repair it immediately. If no abnormality is found, check the level of the coolant in the radiator. If it is low, add coolant to the radiator and then to the reservoir tank.
4. If reservoir tank (1) is dirty and it is difficult to check the coolant level, clean it.





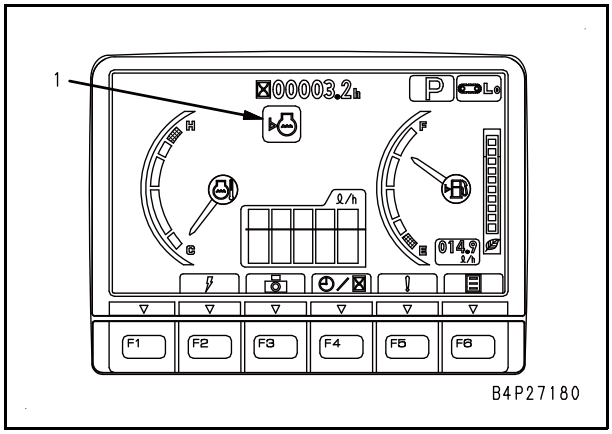
a14. Check of air cleaner for clogging

⚠ **When using compressed air for cleaning, put on personal protective items such as protective eyeglasses, gloves, dust mask, etc. to protect yourself from dirt that will fly out.**

⚠ **When removing the primary element from the air cleaner body, do not forcibly pull it out, otherwise it can be dangerous.**
Be careful not to fall from a high location on unsafe scaffolding as a reaction when pulling out the primary element.

Diagnostic Tests

If air cleaner clogging monitor (1) on monitor panel lights up, clean the air cleaner element.

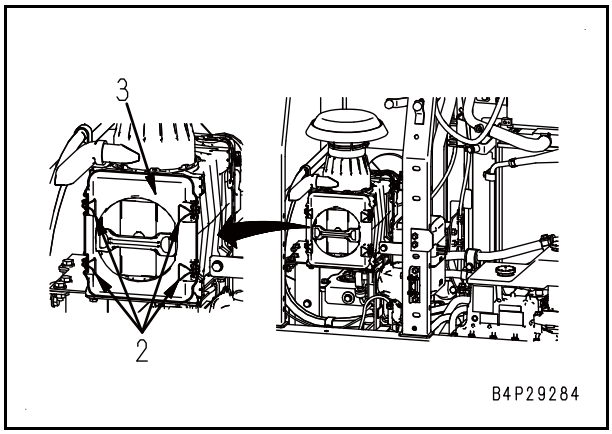


★ Do not clean the element until the air cleaner clogging monitor on the monitor panel lights up. If you clean the element frequently before the air cleaner clogging monitor lights up on the monitor panel, the true performance of the air cleaner is not used and the filtration efficiency deteriorates.

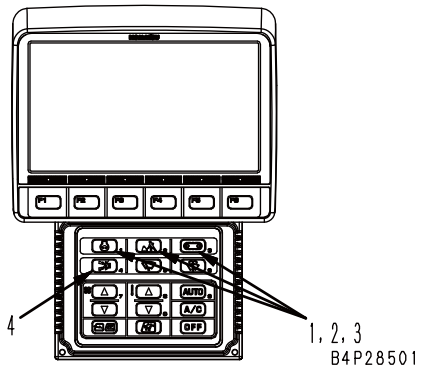
★ Inspection, cleaning or servicing while the engine is running allows entry of dusts and can damage the engine since dusts attached to the element drop into the secondary element more frequently during the cleaning process. Be sure to stop the engine before cleaning.

Cleaning of primary element

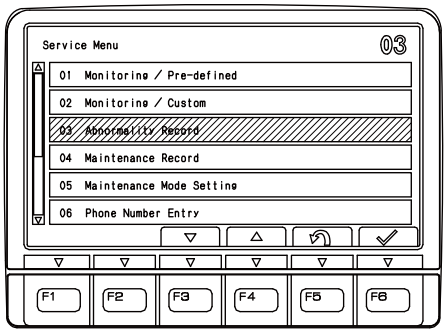
1. Open the side cover at the rear left side of the machine and disengage 4 clips (2) to remove cover (3).



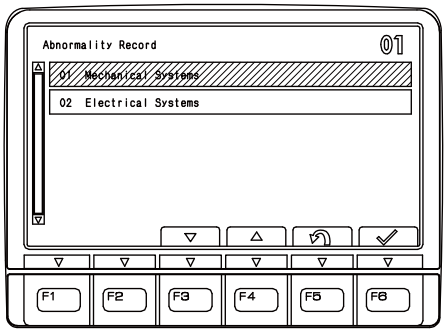
2. Remove primary element (4).
   ★ Never remove secondary element (5). If it is removed, dirt will enter and can lead to engine troubles.
   ★ Do not clean and reuse the secondary element.
   ★ Replace the primary element with a new one when replacing the primary element.



2. On the service menu screen, press switch [F3] (▽) in the panel switch section twice, and then select "03 Abnormality Record".
3. Press switch [F6] in the panel switch section to confirm, and then enter the "Abnormality record" screen.

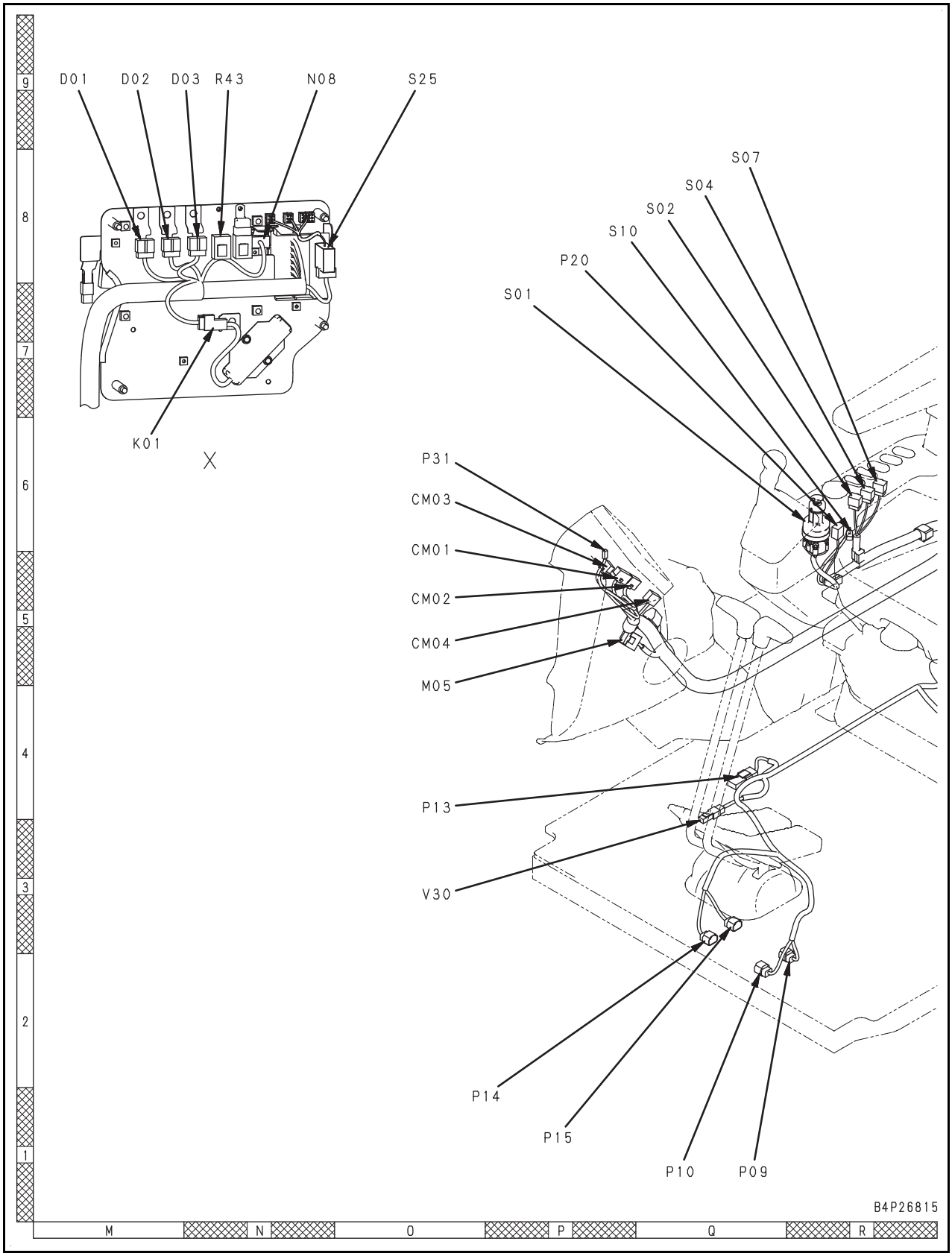


4. Press switch [F6] in the panel switch section to confirm, and then enter the "Mechanical system failure record" screen.



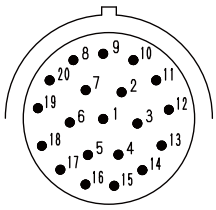
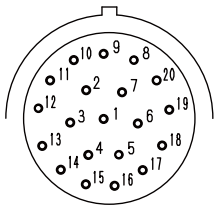
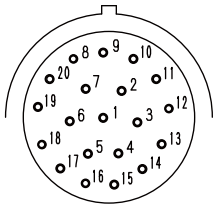
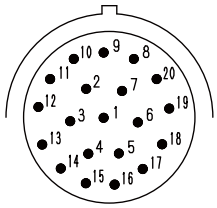
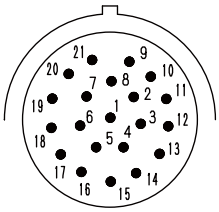
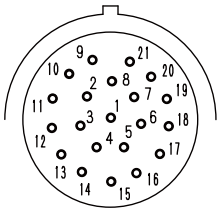
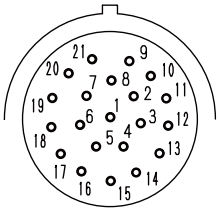
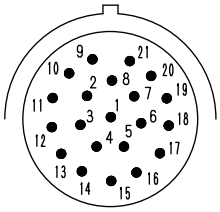
5. Press switch [F3] (▽) in the panel switch section to check failure codes one by one and take record of all information of all failure codes.

   ★ A failure code of the mechanical system cannot be deleted.
6. Press switch [F5] (return) in the panel switch section to return to the "Abnormality record" screen.
7. Similarly to 2 and 3, enter the "Electrical system abnormality record" screen.


D01
D02
D03
R43
N08
S25
K01
X
S07
S04
S02
S10
P20
S01
P31
CM03
CM01
CM02
CM04
M05
P13
V30
P14
P15
P10
P09
B4P26815
9
8
7
6
5
4
3
2
1
M
N
O
P
Q
R

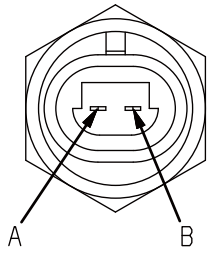
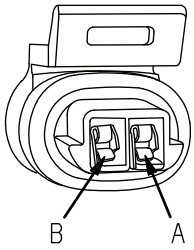
(4/6)

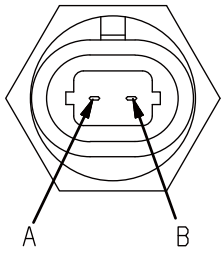
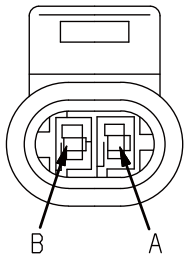
[The pin No. is also marked on the connector (electric wire insertion end)]

Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	Testing connection use special tool Part No.
18-20 (3)	Pin (male terminal)	Socket (female terminal)	799-601-9230 (T-adapter)
	 BWP05009	 BWP05010	
	Part No. :08191-31201, 08191-31202	Part No. :08191-34101, 08191-34102	
	Socket (female terminal)	Pin (male termial)	799-601-9230 (T-adapter)
	 BWP05011	 BWP05012	
	Part No. :08191-32201, 08191-32202	Part No. :08191-33101, 08191-33102	
18-21 (4)	Pin (male terminal)	Socket (female terminal)	799-601-9240 (T-adapter)
	 BWP05013	 BWP05014	
	Part No. :08191-41201, 08191-42202	Part No. :08191-44101, 08191-44102	
	Socket (female terminal)	Pin (male termial)	799-601-9240 (T-adapter)
	 BWP05015	 BWP05016	
	Part No. :08191-42201, 08191-42202	Part No. :08191-43101, 08191-43102	

B4D18406

PACKARD conncetor for engine

No. of pins	Temperature sensor of coolant, fuel and lubricating oil (95, 107, 114, 125, 140 engine)		
	Sensor side (plug)	Harness side (receptacle)	Testing connection use special tool Part No.
2			795-799-5530 (Socket) (Kit : 799-601-4101) (Kit : 799-601-4201)
	☆ Non-polarity	—	

No. of pins	Boost (air intake) temperature sensor (125, 140 engine)		
	Sensor side (plug)	Harness side (receptacle)	
2			795-799-5540 (Socket) (Kit : 799-601-4101) (Kit : 799-601-4201)
	☆ Non-polarity	—	

B4W21630

Failure code	Failure (Displayed on screen)	Applicable component	Action level	History category	Remarks
GA00NS	Failure code [GA00NS] HYB Equipment Overheat (HB380-GA00NS-400AZ0A) (PAGE 40-564)	HYB	L02	Electrical system	
GA01KA	Failure code [GA01KA] Power Cable Interlock Open Circuit (HB205-GA01KA-400AZ0A) (PAGE 40-565)	HYB	L03	Electrical system	
GA01KB	Failure code [GA01KB] Power Cable Interlock Short Circuit (HB205-GA01KB-400AZ0A) (PAGE 40-568)	HYB	L03	Electrical system	
GA02KZ	Failure code [GA02KZ] DC Line Open & Short Circuit (HB380-GA02KZ-400AZ0A) (PAGE 40-572)	HYB	L04	Electrical system	
GA04KG	Failure code [GA04KG] Abnormal DC HW Volt. Before Booster (HB205-GA04KG-400AZ0A) (PAGE 40-573)	HYB	L03	Electrical system	
GA05KG	Failure code [GA05KG] Abnormal DC SW Volt. Before Booster (HB205-GA05KG-400AZ0A) (PAGE 40-574)	HYB	L03	Electrical system	
GA05KP	Failure code [GA05KP] Low DC SW Output Volt. Bef. Booster (HB205-GA05KP-400AZ0A) (PAGE 40-575)	HYB	L03	Electrical system	
GA06KZ	Failure code [GA06KZ] DC Vlt. Sen. Opn./ Shrt.Cir. Bef. Booster (HB380-GA06KZ-400AZ0A) (PAGE 40-576)	HYB	L03	Electrical system	
GA08KG	Failure code [GA08KG] Abnorm. DC HW Volt. After Booster (HB205-GA08KG-400AZ0A) (PAGE 40-577)	HYB	L03	Electrical system	
GA09KG	Failure code [GA09KG] Abnorm. DC SW Volt. After Booster (HB205-GA09KG-400AZ0A) (PAGE 40-578)	HYB	L03	Electrical system	
GA09KP	Failure code [GA09KP] Low DC SW Output Volt. After Booster (HB205-GA09KP-400AZ0A) (PAGE 40-579)	HYB	L03	Electrical system	
GA0AKZ	Failure code [GA0AKZ] DC Vlt. Sen. Op./Shrt Cir. Aft. Booster (HB205-GA0AKZ-400AZ0A) (PAGE 40-580)	HYB	L03	Electrical system	
GA0BKZ	Failure code [GA0BKZ] AC Line Open & Short Circuit (HB380-GA0BKZ-400AZ0A) (PAGE 40-581)	HYB	L04	Electrical system	
GA10MA	Failure code [GA10MA] HYB Controller Malfunction (HB205-GA10MA-400AZ0A) (PAGE 40-582)	PUMP	L04	Electrical system	
GA10MC	Failure code [GA10MC] HYB Controller Error (HB205-GA10MC-400AZ0A) (PAGE 40-583)	HYB	—	Electrical system	

Failure code [A900NY] Abrupt Engine Stop by Auto Idle Stop 2 *(HB205-A900NY-400AZ0A)*

:

Action level	Failure code	Failure	Abrupt Engine Stop by Auto Idle Stop 2
L01	A900NY		
Detail of failure	• Accumulated count of abrupt engine stops is high because engine speed just before the engine is stopped by auto idle stop function is high.		
Action of controller	• Turn the auto-deceleration setting ON. • Auto idle stop sudden stop monitor is displayed in red on machine monitor. • Is reset when next auto idle stop countdown starts or starting switch is turned OFF.		
Problem on machine	• Turbocharger may get damaged.		
Related information	• This failure code is displayed when activation of failure code [A900N6] exceeds 1,000 times. • This failure code will be cleared after replacing the turbocharger assembly and resetting the auto idle stop sudden engine stop counter. • Method of reproducing failure code: Before resetting the auto idle stop sudden engine stop counter, let the engine stop by auto idle stop function with auto-deceleration turned OFF and fuel dial set at maximum.		

No.	Cause	Procedure, measuring location, criteria, and remarks
1	Defective machine monitor	If this repeatedly occurs even when the auto idle stop function is OFF, machine monitor may be defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Failure code [CA144] Coolant Temp Sens High Error *(D61-CA144-400AZ0A)*

:

Action level	Failure code	Failure	Coolant temperature sensor high error (Engine controller system)
L01	CA144		
Detail of failure	• High voltage is detected in engine coolant temperature sensor signal circuit.		
Action of controller	• Sets coolant temperature to fixed temperature (100 °C), and allows engine to run.		
Problem on machine	• Engine does not start easily at low temperature. • Overheat prevention function does not work.		
Related information	• Signal voltage from engine coolant temperature sensor can be checked with monitoring function (Code: 04105 (V)). • Temperature sensed by engine coolant temperature sensor can be checked with monitoring function. (Code: 04107 (°C)) • Method of reproducing failure code: Turn starting switch to ON position. • This failure code is displayed if temperature sensor connector is disconnected. • Because troubleshooting "socket" for this sensor features female connector only, it is not connectable to female connector of sensor wiring harness, and thus not usable for checking open circuit (not designed for T-adapter).		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in "c: Electrical equipment" in "Checks before troubleshooting" of "General information on troubleshooting", and check it. 2. Turn starting switch to ON position.			
		If this failure code does not appear, wiring harness connector is defective. ★ If this failure code appears, perform following.			
2	Defective coolant temperature sensor	1. Turn starting switch to OFF position. 2. Disconnect connector COOLANT TEMP, and connect socket to male side. ★ If coolant temperature sensor has resistance of 700 Ω to 37 kΩ with coolant temperature above 0 °C, regard coolant temperature sensor as normal.			
		Resistance	Between COOLANT TEMP (male) (A) and (B) ★ Coolant temperature - Resistance characteristics	0 °C	30 to 37 kΩ
				25 °C	9.3 to 10.7 kΩ
				50 °C	3.2 to 3.8 kΩ
				80 °C	1.0 to 1.3 kΩ
				95 °C	700 to 800 Ω

Failure code [CA271] IMV/PCV1 Short Error *(D65-CA271-400AZ0A)*

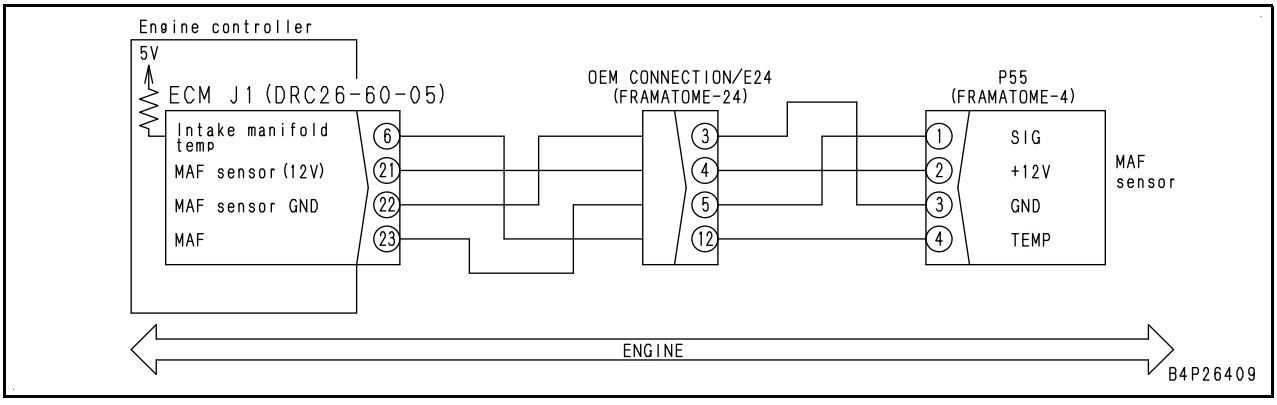
:

Action level	Failure code	Failure	IMV/PCV1 Short Error (Engine controller system)
L03	CA271		
Detail of failure	• Short circuit is detected in drive circuit of supply pump actuator (IMV).		
Action of controller	• None in particular.		
Problem on machine	• Engine speed does not increase from low idle speed. • Engine output decreases. • Common rail fuel pressure rises above command value.		
Related information	• Method of reproducing failure code: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective harness connector	1. See descriptions of wiring harness and connectors in "c: Electrical equipment" in "Checks before troubleshooting" of "General information on troubleshooting", and check it. 2. Turn starting switch to ON position.		
		If this failure code disappears, harness connector is defective. ★ If this failure code appears, perform following checks.		
2	Defective supply pump actuator	1. Turn starting switch to OFF position. 2. Disconnect connector INLET METERING VALVE. 3. Turn starting switch to ON position. If failure code changes from [CA271] to [CA272], supply pump actuator is defective.		
3	Short circuit or ground fault in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector ECM J1 and connect T-adapters to female side.		
		Resistance	Between ECM J1 (female) (30) and (40)	1 to 5 Ω
			Between ECM J1 (female) (30) and ground	Min. 100 kΩ
4	Short circuit in wiring harness	★ If no failure is found by check on cause 3, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and INLET METERING VALVE, and connect T-adapters to female side of ECM J1.		
		Resistance	Between ECM J1 (female) (30) and (40)	Min. 100 kΩ

No.	Cause	Procedure, measuring location, criteria, and remarks		
5	Open circuit in wiring harness (Wire breakage or defective contact of connector)	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and P55, and connect T-adapters to each female side.		
		Resistance	★ If no failure is found by check on cause 4, this check is not required. Between ECM J1 (female) (21) and P55 (female) (2)	Max. 10 Ω
			★ If no failure is found by check on cause 4, this check is not required. Between ECM J1 (female) (22) and P55 (female) (3)	Max. 10 Ω
			Between ECM J1 (female) (23) and P55 (female) (1)	Max. 10 Ω
6	Ground fault in wiring harness (Contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and P55, and connect T-adapter to either female side.		
		Resistance	Between ground and J1 (female) (23) or P55 (female) (1)	Min. 100 kΩ
7	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and P55, and connect T-adapter to female side of ECM J1. ★ Check by using multimeter in continuity mode.		
		Resistance	Between ECM J1 (female) (23) and each pin other than pin (23)	Min. 100 kΩ
8	Hot short circuit in wiring harness	1. Be ready with starting switch at OFF position. 2. Disconnect connector P55 and connect T-adapter to female side. 3. Turn starting switch to ON position. ★ Ignore displayed failure codes.		
		Voltage	Between P55 (female) (1) and (3)	Max. 1 V
9	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit diagram related to mass air flow sensor



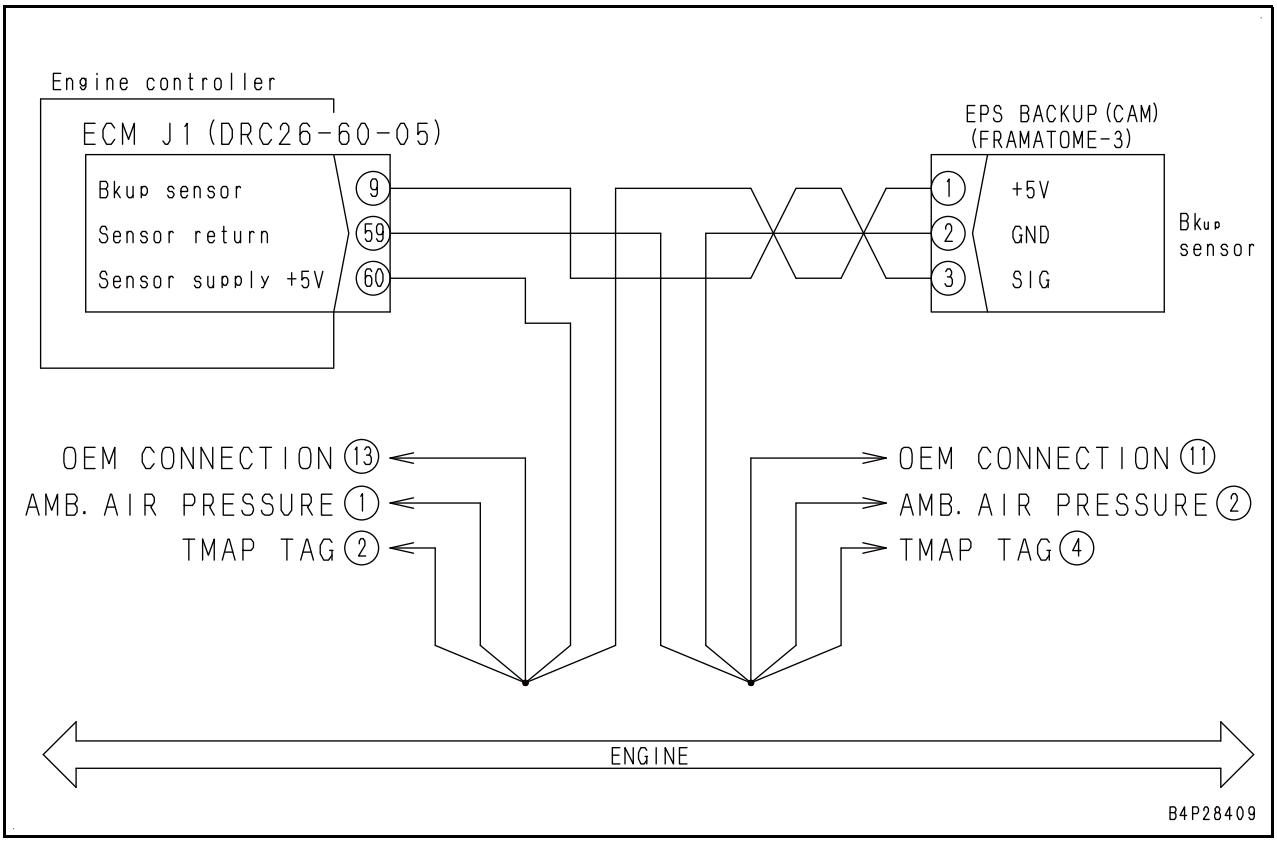
Failure code [CA516] Rail Press Sens Sup Volt Low Error *(WA380_7-CA516-400AZ0A)*

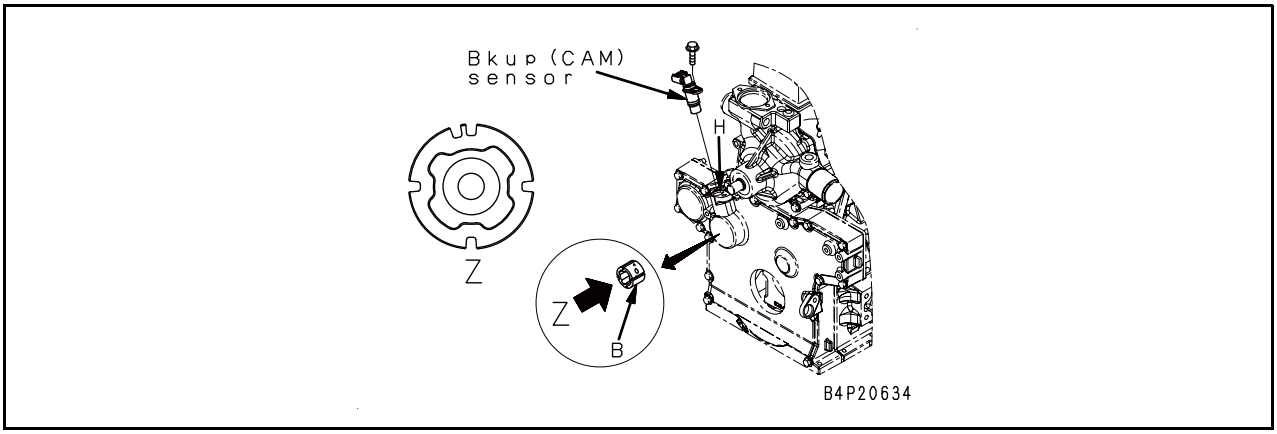
:

Action level	Failure code	Failure	Rail Pressure Sensor Supply Voltage Low Error (Engine controller system)
L03	CA516		
Detail of failure	• Low voltage appears in common rail pressure sensor power supply (5 V) circuit.		
Action of controller	• Limits engine output and allows engine to run.		
Problem on machine	• Engine output decreases.		
Related information	• Signal voltage from common rail pressure sensor can be checked with monitoring function. (Code: 36401 (V)) • Pressure sensed by common rail pressure sensor can be checked with monitoring function. (Code: 36400 (MPa)) • Since female connector alone is provided for "socket" used for troubleshooting of this sensor, it is not usable for check of open circuit in wiring harness and voltage at sensor connector (.not designed as T-adapter). • Method of reproducing failure code: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective harness connector	1. See descriptions of wiring harness and connectors in "c: Electrical equipment" in "Checks before troubleshooting" of "General information on troubleshooting", and check it. 2. Turn starting switch to ON position.
		If this failure code disappears, harness connector is defective. ★ If this failure code appears, perform following checks.
2	Defective common rail pressure sensor (internal defect)	1. Turn starting switch to OFF position. 2. Disconnect connector FUEL RAIL PRESS. 3. Turn starting switch to ON position. If this failure code disappears, sensor is defective. ★ Other failure codes (many codes) are also displayed. They are generated because of disconnection of connector. Ignore failure codes other than this code.
3	Defective wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector ECM J2. 3. Turn starting switch to ON position. If this failure code does not appear, wiring harness may be defective. Perform following troubleshooting. ★ Other failure codes (many codes) are also displayed. They are generated because of disconnection of connector. Ignore failure codes other than this code.

Circuit diagram related to engine Bkup speed sensor





CA778 (107 series engine)

Check of camshaft ring for looseness

Remove front cover and check camshaft ring for looseness.

★ See Disassembly and assembly, "Removal and installation of engine front oil seal".

★ Keep the front seal, liquid gasket LG-7 and front seal tool (795-799-6400) on hand.

Removal

1. Remove fan and fan belt. For details, see Disassembly and assembly, "Removal and installation of engine front seal".
2. Remove damper assembly (1).

Failure code [CA2311] IMV Solenoid Error *(D65-CA2311-400AZ0A)*

:

Action level	Failure code	Failure	Defective IMV solenoid (Engine controller system)
L03	CA2311		
Detail of failure	• Resistance value of supply pump actuator circuit is unusually high or low. Or rail pressure error.		
Action of controller	• None in particular		
Problem on machine	• Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine.		

No.	Cause	Procedure, measuring location, criteria, and remarks
1	Defective IMV solenoid	Perform troubleshooting for failure codes [CA271] and [CA272].
2	Rail pressure error	Perform troubleshooting for failure code [CA449].

Failure code [CA2556] Grid Htr Relay Volt High Error *(HB205-CA2556-400AZ0A)*

:

Action level	Failure code	Failure	Grid Heater Relay Voltage High Error (Engine controller system)
L01	CA2556		
Detail of failure	• Short circuit is in preheat relay drive circuit (primary circuit).		
Action of controller	• None in particular		
Problem on machine	• Intake air heater does not work in auto preheating mode (resulting in degraded startability and emission of white smoke at low temperatures).		

Related information	• Temperature sensed by charge temperature sensor (boost temperature sensor) can be checked with monitoring function. (Code: 18500 Charge Temperature)
	• Method of reproducing failure code: Turn starting switch to ON position (boost temperature: Max. -4°C).
	• Troubleshooting of this failure code covers circuits from engine controller to primary circuit (coil) of preheat relay R18.
	• For troubleshooting of heater relay and secondary circuit of preheat relay R18, see following E-mode troubleshooting.
	  • E-2 Manual preheating system does not work
	  • E-3 Automatic preheating system does not work
	  • E-4 While preheating is working, preheating monitor does not light up		

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in "c: Electrical equipment" in "Checks before troubleshooting" of "Related information on troubleshooting", and check it. 2. Turn starting switch to ON position.		
		If this failure code is not displayed, wiring harness connector is defective. ★ If this failure code is displayed, perform following checks.		
2	Defective preheating relay R18	1. Turn starting switch to OFF position. 2. Disconnect relay R18, and connect T-adapter to male side.		
		Resistance	Between R18 (male) (1) and (2)	200 to 400 Ω
		1. Turn starting switch to OFF position. 2. Replace relay R18 with another one. 3. Turn starting switch to ON position.		
		If this failure code disappears, original preheat relay R18 is defective.		
3	Ground fault in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector CE03 and relay R18, and connect T-adapter to either female side.		
		Resistance	Between ground and CE03 (female) (4) or R18 (female) (1)	Min. 100 kΩ

Failure code [D19JKZ] Personal Code Relay Abnormality *(HB205-D19JKZ-400AZ0A)*

:

Action level	Failure code	Failure	Personal Code Relay Abnormality (Machine monitor system)
L03	D19JKZ		
Detail of failure	• Open error or short circuit occurs in primary (coil) circuit of personal code relay.		
Action of machine monitor	• None in particular (when open error occurred) • Stops driving personal code relay (when short circuit occurred). • If cause of failure disappears, machine becomes normal by itself (when open error occurred). • Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position (when short circuit occurred).		
Problem on machine			
Related information	• This failure code is displayed only when engine lock function is enabled. • Method of reproducing failure code: Turn starting switch to ON position (when open circuit occurred). Failure code cannot be reproduced on the machine (when short circuit occurred). • Troubleshooting for this failure code covers circuits from fuse No. 3 in fuse box F01 through primary (coil) circuit of personal code relay R07 to machine monitor.		

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Defective fuse No. 3 (3rd from the top right) of fuse box F01	If fuse is blown, circuit may have ground fault.		
2	Defective personal code relay R07	1. Turn starting switch to OFF position. 2. Disconnect relay R07, and connect T-adapter to male side.		
		Resistance	Between R07 (male) (1) and (2)	200 to 600 Ω
		1. Turn starting switch to OFF position. 2. Replace relay R07 with preheating relay R18. 3. Turn starting switch to ON position.		
		If this failure code disappears, original personal code relay R07 is defective.		
3	Open circuit, short circuit, or ground fault in wiring harness	1. Turn starting switch to OFF position. 2. Remove fuse No. 3 (3rd from the top right) in fuse box F01. 3. Disconnect connectors CM01 and S14, and connect T-adapter to female side of CM01.		
		Resistance	Between F01-3 and CM01 (female) (6)	200 to 600 Ω
			Between F01-3 or CM01 (female) (6) and ground	Min. 1 MΩ

Failure code [DA2LKA] Operating Lamp Open Circuit (Pump Con) *(HB205-DA2LKA-400AZ0A)*

:

Action level	Failure code	Failure	Operating Lamp Open Circuit (Pump Controller) (Pump controller system)
-	DA2LKA		
Detail of failure	• Pump controller determines that system operating lamp circuit is open because voltage of output circuit remains at approximately 5 V or below for approximately 3 seconds after starting switch is turned to ON position, during which pump controller outputs no current to system operating lamp.		
Action of controller	• None in particular		
Problem on machine	• While system operating lamp is lit, battery disconnect switch must not be turned to OFF position. Turning battery disconnect switch to OFF position may destroy data stored in pump controller memory.		
Related information	• Method of reproducing failure code: Turn starting switch to ON position. • Although work equipment controller is not able to light up system operating lamp, no trouble will result unless battery disconnect switch is turned to OFF position. • When controller lights up system operating lamp, output circuit voltage is at low level. • Since no controller drives system operating lamp for approximately 3 seconds after starting switch is turned to ON position, open circuit can be detected.		

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Defective fuse No. 16 in fuse box F01.	★ If room lamp lights up, this check is not required. If fuse is blown, circuit probably has ground fault.		
2	Open circuit in wiring harness (Wire breakage or defective contact of connector)	1. Turn starting switch to OFF position. 2. Remove fuse No. 16 in fuse box F01. 3. Disconnect connectors CP02 and L19, and connect T-adapters to each female side.		
		Resistance	Between CP02 (female) (100) and L19 (female) (2)	Max. 1 Ω
			Between F01-16 and L19 (female) (1)	Max. 1 Ω
3	Pump controller is defective.	If no failure is found by above checks, pump controller is defective. (Since this is an internal defect, troubleshooting cannot be performed).		

Circuit diagram related to system operating lamp

<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria, and remarks</th></tr>
<tr><td rowspan="9">3</td><td rowspan="9">Open or short circuit in wiring harness</td><td colspan="3">• CAN communication line
★ CAN terminating resistor of 120 Ω is also located in machine monitor. That is, 2 CAN terminating resistors of 120 Ω are connected in parallel. When circuit resistance is measured at connector of controller other than machine monitor, if combined resistance is 60 Ω, wiring harness does not have open circuit.
1. Turn starting switch to OFF position.
2. Turn the battery disconnect switch to OFF position.
3. Disconnect related connectors and connect T-adapters to connectors to be measured.
★ If short circuit is found (resistance between 2 terminals is 1 Ω or below), disconnect all CAN communication connectors of every controller and check whether short circuit occurs between wiring harnesses or inside controller.</td></tr>
<tr><td rowspan="8">Resistance</td><td>Between CM02 (female) (8) and (9)</td><td>Approx. 120 Ω</td></tr>
<tr><td>Between CE03 (female) (17) and (18)</td><td>Approx. 60 Ω</td></tr>
<tr><td>Between CP01 (female) (45) and (64)</td><td>Approx. 60 Ω</td></tr>
<tr><td>Between AC01 (female) (1) and (2)</td><td>Approx. 60 Ω</td></tr>
<tr><td>Between CK01 (female) (10) and (11)</td><td>Approx. 60 Ω</td></tr>
<tr><td>Between CC01 (female) (3) and (9)</td><td>Approx. 60 Ω</td></tr>
<tr><td>Between HC02 (female) (1) and (11)</td><td>Approx. 60 Ω</td></tr>
<tr><td>Between K02 (female) (A) and (B)</td><td>Approx. 120 Ω</td></tr>
</table>

No.	Cause	Procedure, measuring location, criteria, and remarks		
2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, carry out troubleshooting without turning starting switch ON.		
		Resistance	Wiring harness between M23 (female) (6) - CP01 (female (63)	Max. 1 Ω
			Wiring harness between M23 (female) (7) - CP01 (female (18)	Max. 1 Ω
			Wiring harness between M23 (female) (9) - CP01 (female (48)	Max. 1 Ω
3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, carry out troubleshooting without turning starting switch ON.		
		Resistance	Wiring harness between M23 (female) (6) - CP01 (female (63)	Min. 100 kΩ
			Wiring harness between M23 (female) (9) - CP01 (female (67)	Min. 100 kΩ
4	Hot short (Short circuit with 5 Volts circuit) in wiring harness	★ Prepare with starting switch OFF, carry out troubleshooting without turning starting switch ON.		
		Resistance	Wiring harness between M23 (female) (9) - M23 (female (6) (Measure it disconnecting M23 connector)	Min. 100 kΩ
5	Ground fault in wiring harness (No secure GND from pump controller)	★ Prepare with starting switch OFF, carry out troubleshooting without turning starting switch ON.		
		Resistance	Wiring harness between M23 (female (7) - chassis GND	Max. 30 Ω
6	Defective pump controller	If cause 1 – 5 are not detected, pump controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out).		

Failure code [DHS9MA] Boom Lower PPC Press Sensor Abnormality

(HB205-DHS9MA-400AZ0A)

:

Action level	Failure code	Failure	Boom LOWER PPC pressure sensor abnormality (pump controller system)
L01	DHS9MA		
Detail of failure	• Signal voltage of boom LOWER pressure sensor circuit is 0.3 V and below or 4.5 V and above.		
Action of controller	• Fixes boom LOWER PPC pressure at 0 MPa {0 kg/cm^2} and continues control. • If cause of failure disappears, machine becomes normal by itself. • Low speed matching function does not work normally.		
Problem on machine	• Automatic deceleration does not cancel. • Poor operability of boom LOWER operation • Low speed matching function is disabled.		
Related information	★ If 5 V circuit (3) and ground circuit (1) of pressure sensor are connected inversely, pressure sensor will break. Accordingly, take extreme care when checking. • As T-adapter for pump controller connector is "socket-type box", operating voltage cannot be measured at pump controller connector. • Boom LOWER PPC pressure can be checked with monitoring function. (Code: 07500) • Method of reproducing failure code: Turn starting switch to ON position or start engine.		

No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Defective 5 V sensor power supply 2 system	If failure code [DA25KP] is also displayed, perform troubleshooting for it first.			
		1. Turn starting switch to OFF position. 2. Disconnect connector P02 and connect T-adapter to female side. 3. Turn starting switch to ON position. ★ If power supply voltage is abnormal, go to check on cause 3 and after.			
		Voltage	Between P02 (female) (3) and (1)	Power supply	4.5 to 5.5 V

Failure code [DHSHMA] Travel Rev LH PPC Press Sensor Abnormality

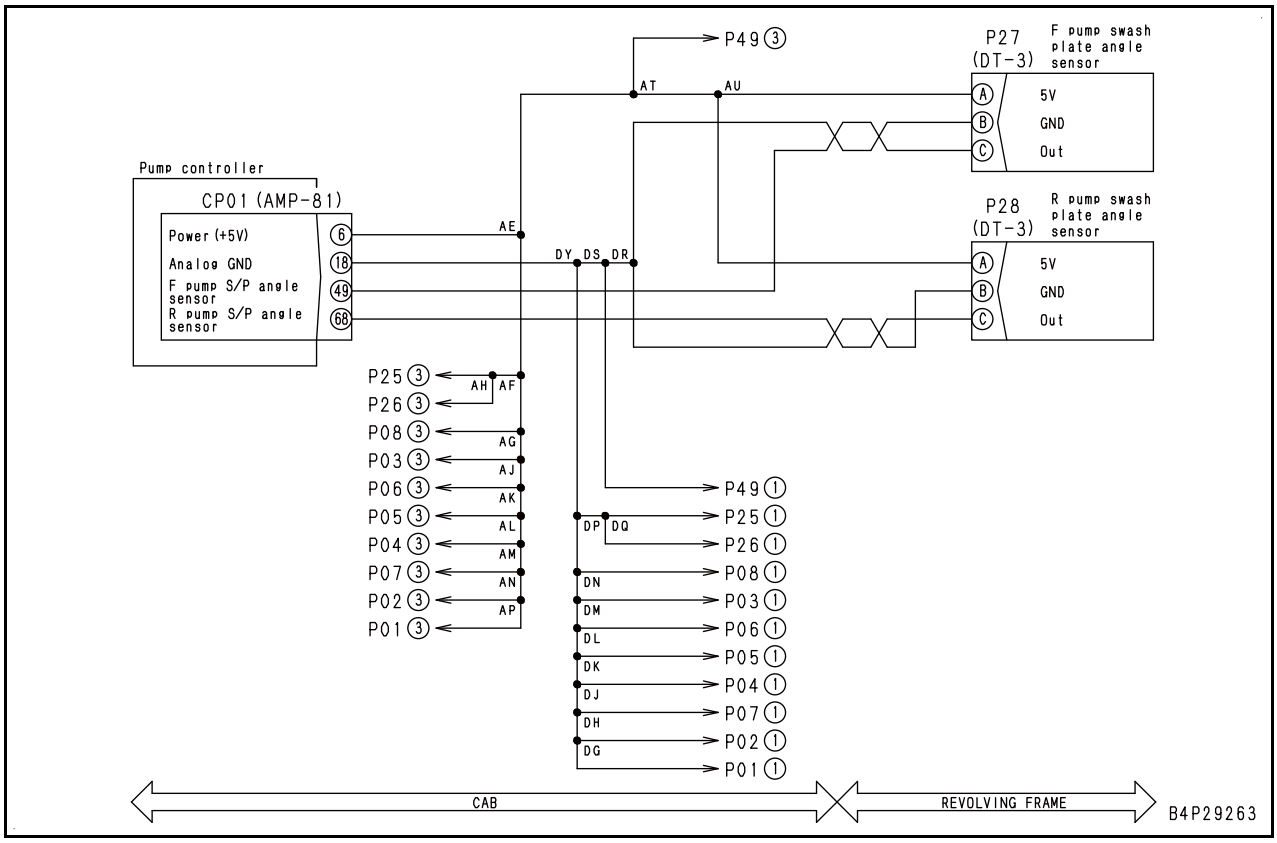
(HB205-DHSHMA-400AZ0A)

:

Action level	Failure code	Failure	Travel Reverse LH PPC Pressure Sensor Abnormality (Pump controller system)
L01	DHSHMA		
Detail of failure	• Signal voltage of left travel REVERSE PPC pressure sensor is below 0.3 V or above 4.5 V.		
Action of controller	• Controls machine by regarding left travel REVERSE PPC pressure as 0 MPa {0 kg/cm^2}. • If cause of failure disappears, machine becomes normal by itself. • Low speed matching function does not work normally.		
Problem on machine	• Automatic deceleration does not cancel. • Controllability of travel deteriorates. • Low speed matching function is disabled.		
Related information	★ If 5 V circuit (3) and ground circuit (1) of pressure sensor are connected inversely, pressure sensor will break. Accordingly, take extreme care when checking. • As T-adapter for pump controller connector is "socket-type box", operating voltage cannot be measured at pump controller connector. • Left travel REVERSE PPC pressure can be checked with monitoring function. (Code: 07104) • Method of reproducing failure code: Turn starting switch to ON position or start engine.		

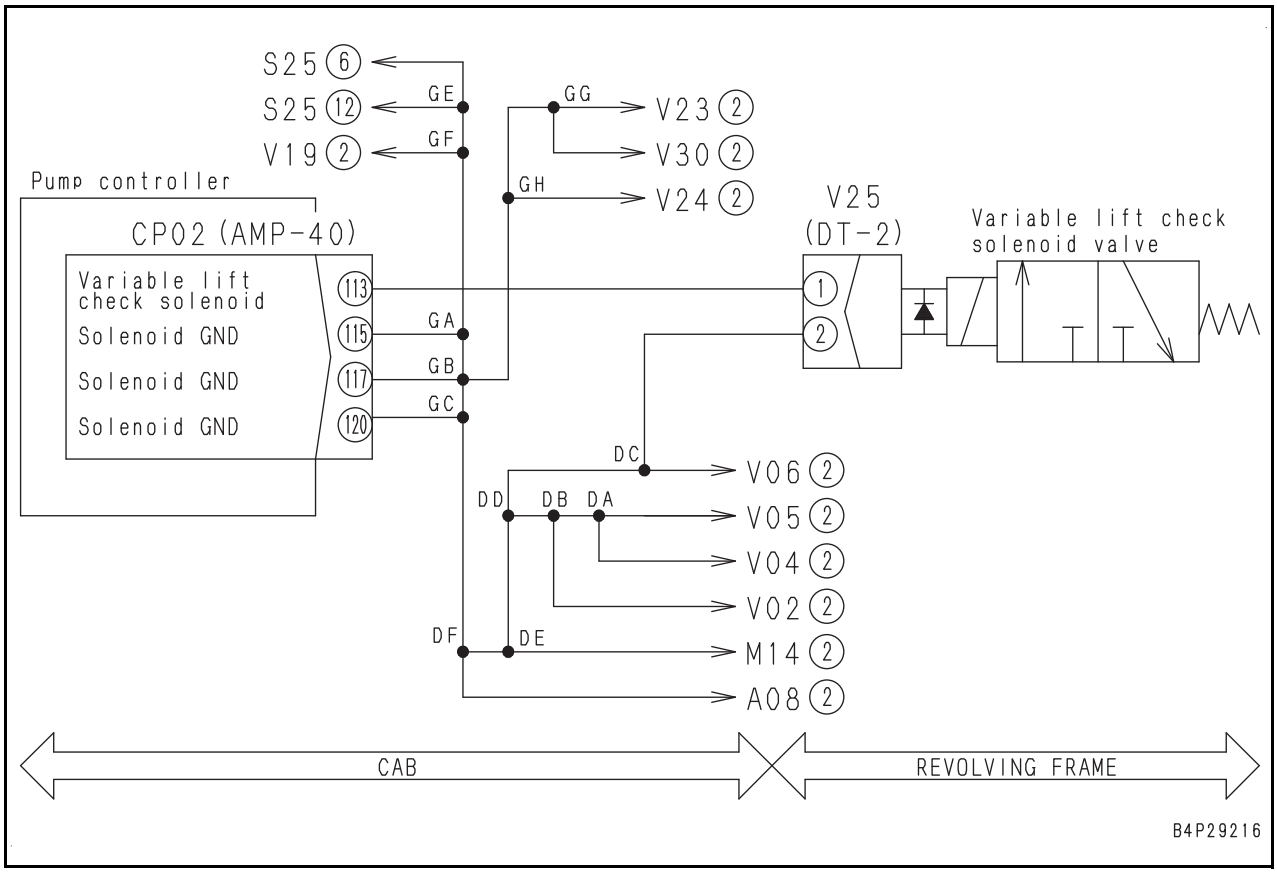
No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Defective 5 V sensor power supply 1 system	If failure code [DA26KP] is also displayed, perform troubleshooting for it first.			
		1. Turn starting switch to OFF position. 2. Disconnect connector P10 and connect T-adapter to female side. 3. Turn starting switch to ON position. ★ If power supply voltage is abnormal, proceed to check on cause 3.			
		Voltage	Between P10 (female) (3) and (1)	Power supply	4.5 to 5.5 V
2	Defective left travel REVERSE PPC pressure sensor (Internal defect)	1. Turn starting switch to OFF position. 2. Insert T-adapter into connector P10. 3. Turn starting switch to ON position.			
		Voltage	Between P10 (2) and (1)	Sensor output	0.5 to 4.5 V
		★ If power supply voltage is normal and sensor output voltage is abnormal, it is difficult to judge whether cause of failure is defective sensor, ground fault or hot short circuit in wiring harness. Check as below. 1. Turn starting switch to OFF position. 2. Interchange connector P10 with connector of other PPC pressure sensor. 3. Turn starting switch to ON position and display "Abnormality Record" screen of electrical system on machine monitor. 4. If E mark is not displayed in this failure code column, travel REVERSE LH PPC pressure sensor is defective. ★ After finishing test, restore connectors.			

Circuit diagram related to F and R pump swash plate sensor



<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria, and remarks</th></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Ground fault in wiring harness
(Contact with ground circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Remove fuse No.1 (upper right, 5 A) in fuse box F01 and diode D01.
3. Disconnect connectors HC01, D01, and V03.
4. Connect T-adapters to female side of connectors HC01 and D01.</td></tr>
<tr><td rowspan="2">Resist-ance</td><td>Between HC01 (female) (8) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between D01 (female) (3) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Short circuit in wiring harness</td><td colspan="3">1. Turn starting switch to OFF position.
2. Remove fuse No.1 (upper right, 5 A) in fuse box F01 and diode D01.
3. Disconnect connector HC01.
4. Connect T-adapters to female side of connectors D01 and HC01.</td></tr>
<tr><td>Resist-ance</td><td>Between D01 (female) (3) and HC01 (female) (13) or ground</td><td>20 to 60 Ω</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>6</td><td>Pump controller is defective.</td><td colspan="3">If cause is not found by above checks, pump controller is defective.
(Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

Circuit diagram related to variable back pressure solenoid



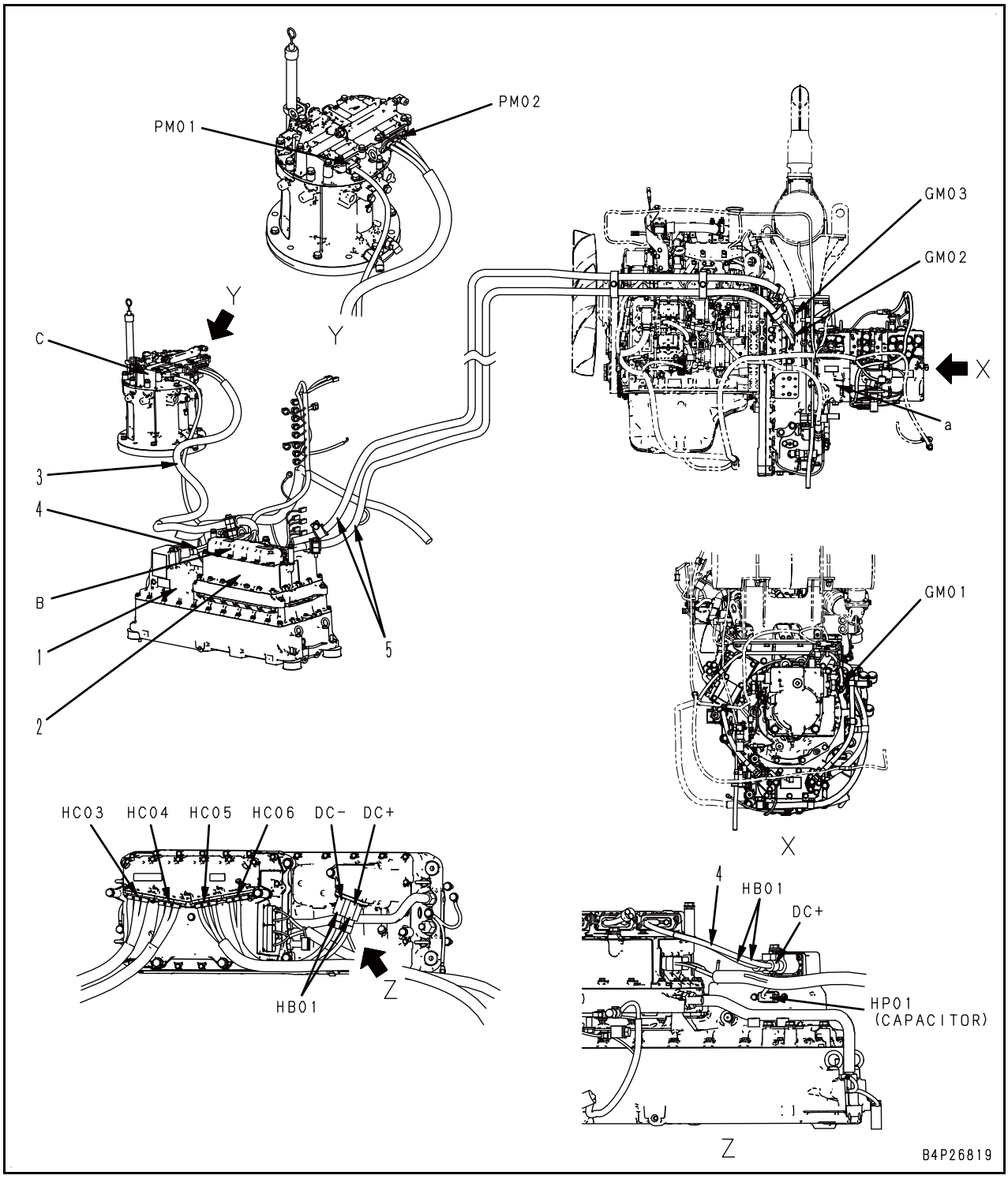
Failure code [DXE5KB] Merge-divide Main Sol Short Circuit *(HB205-DXE5KB-400AZ0A)*

:

Action level	Failure code	Failure	Merge-divider Main Solenoid Short Circuit (Pump controller system)
L01	DXE5KB		
Detail of failure	• Abnormal current flows when pump controller drives merge-divider (main) EPC solenoid, so pump controller determines that short circuit exists in merge-divider (main) EPC solenoid circuit.		
Action of controller	• Stops output command to merge-divider main solenoid and merge-divider LS solenoid to put pump in merging condition constantly. • Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position.		
Problem on machine	• Single operation speed of work equipment is high in fine control mode (L). • Machine does not turn easily during travel.		
Related information	• Drive current to merge-divider main EPC solenoid can be checked with monitoring function. (Code: 08000 Merge-divide Sol Current Main) • Method of reproducing failure code: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Defective merge-divider main EPC solenoid (internal short circuit or ground fault)	1. Turn starting switch to OFF position. 2. Disconnect connector V23, and connect T-adapter to male side.		
		Resistance	Between V23 (male) (1) and (2)	3 to 14 Ω
			Between V23 (male) (1) and ground	Min. 1 MΩ
2	Short circuit or ground fault in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector CP02 and connect T-adapter to female side.		
		Resistance	Between CP02 (female) (112) and each of (115), (117), and (120)	3 to 14 Ω
			Between CP02 (female) (112) and ground	Min. 1 MΩ
3	Ground fault in wiring harness (Contact with ground circuit)	★ If no failure is found by check on cause 2, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors CP02 and V23, and connect T-adapter to either female side.		
		Resistance	Between ground and CP02 (female) (112) or V23 (female) (1)	Min. 1 MΩ
4	Defective pump controller	If cause is not found by above checks, pump controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

High voltage equipment, power cable, and connectors layout drawing

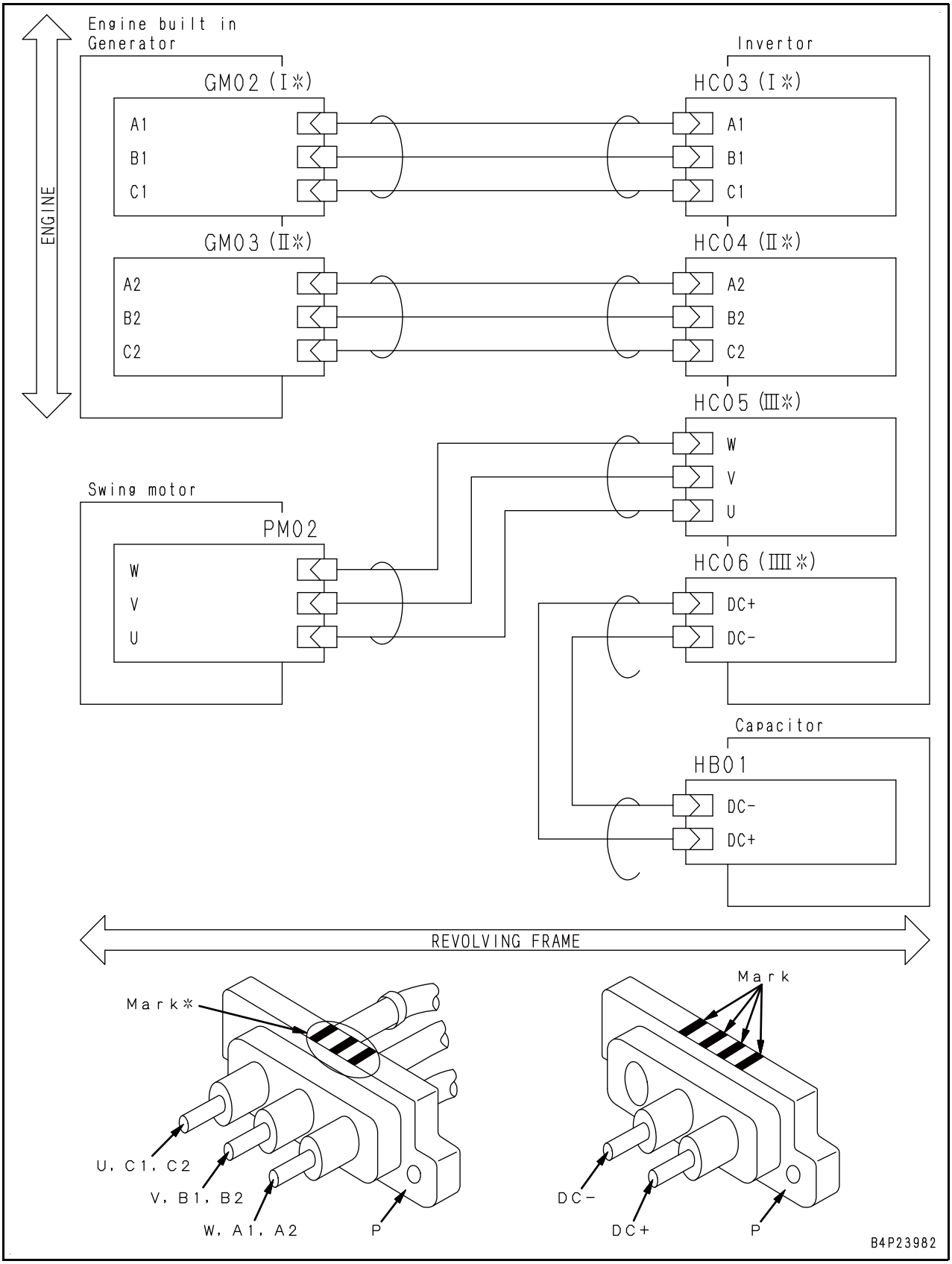


1. Capacitor enclosure
2. Inverter enclosure
3. High-voltage wiring (electric swing motor)
4. High-voltage wiring (capacitor)
5. High-voltage wiring (motor generator)

A: Motor-generator
B: Electric control unit
C: Electric swing motor

★ Connector GM01 is located at the bottom of the motor-generator (A) housing.

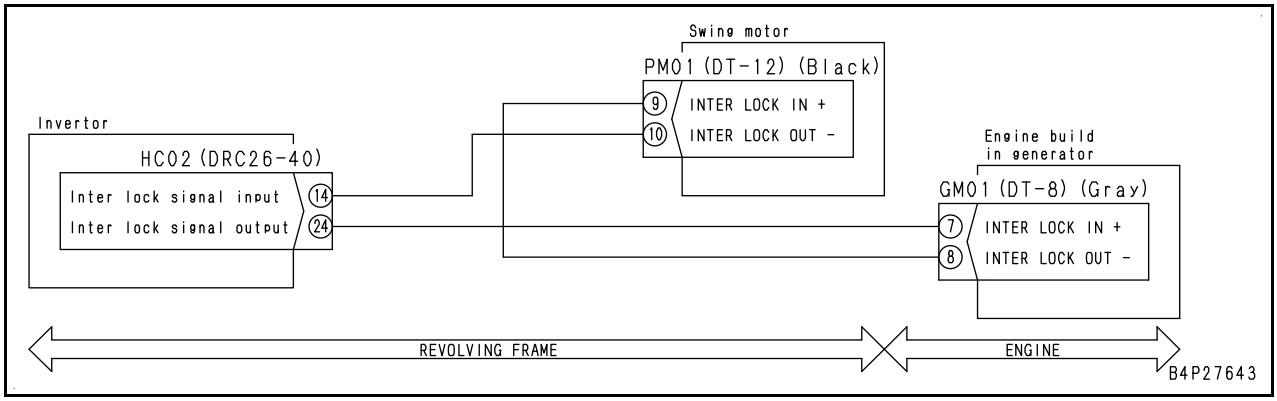
Precautions for connecting the power cable



Note 1: I*, II*, III*, and IIII* indicate the number of marks.
Note 2: Mark* means the number of marks is 1 to 3.
Note 3: When mating a connector, match the number of marks and the marked side of the body and harness connectors (harness connectors are asymmetrical and have different upper and lower sides).
Note 4: Marks on the engine motor-generator are as follows:

Cause		Procedure, measuring location, criteria, and remarks		
8	Open circuit in wiring harness (Internal open circuit)	★ If no failure is found by check on cause 4, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors HC02, PM01 and GM01, and connect T-adapters to each female side.		
		Resistance	Between HC02 (female) (14) and PM01 (female) (10)	Max. 1 Ω
			Between PM01 (female) (9) and GM01 (female) (8)	Max. 1 Ω
			Between GM01 (female) (7) and HC02 (female) (24)	Max. 1 Ω
9	Ground fault in wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connector HC02 and connect T-adapter to female side.		
		Resistance	Between ground and HC02 (female) (14) or (24)	Min. 1 MΩ
10	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector HC02 and connect T-adapter to female side. 3. Turn starting switch to ON position.		
		Voltage	Between ground and HC02 (female) (14) or (24)	Max. 1 V
11	Defective inverter (hybrid controller)	If no failure is found by checks on causes 1 to 9, inverter (hybrid controller) may be defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit diagram related to power cable interlock



Failure code [GA19KR] Gen. Motor Driver Sub-CPU Comm. Failure *(HB205-GA19KR-400AZ0A)*

:

⚠ Discharge the capacitor by using a discharging tool (generator): 796-426-1800 in advance.

Hybrid

Action level	Failure code	Failure	Generator Motor Driver Sub-CPU Communication Failure (Hybrid controller systems)
L01	GA19KR		
Detail of failure	• Communication failure is detected in sub-CPU of motor-generator driver.		
Action of controller	• Motor-generator control is stopped. • Even if cause of failure disappears, machine does not become normal until starting switch is set to OFF position.		
Problem on machine	• None in particular		
Related information	• Method of reproducing failure code: Turn starting switch to ON position or start engine.		

Cause		Procedure, measuring location, criteria, and remarks
1	Defective inverter (hybrid controller)	Since this is an internal defect, troubleshooting cannot be performed.

Failure code [GA1VFS] Capacitor Contactor Locked *(HB205-GA1VFS-400AZ0A)*

:

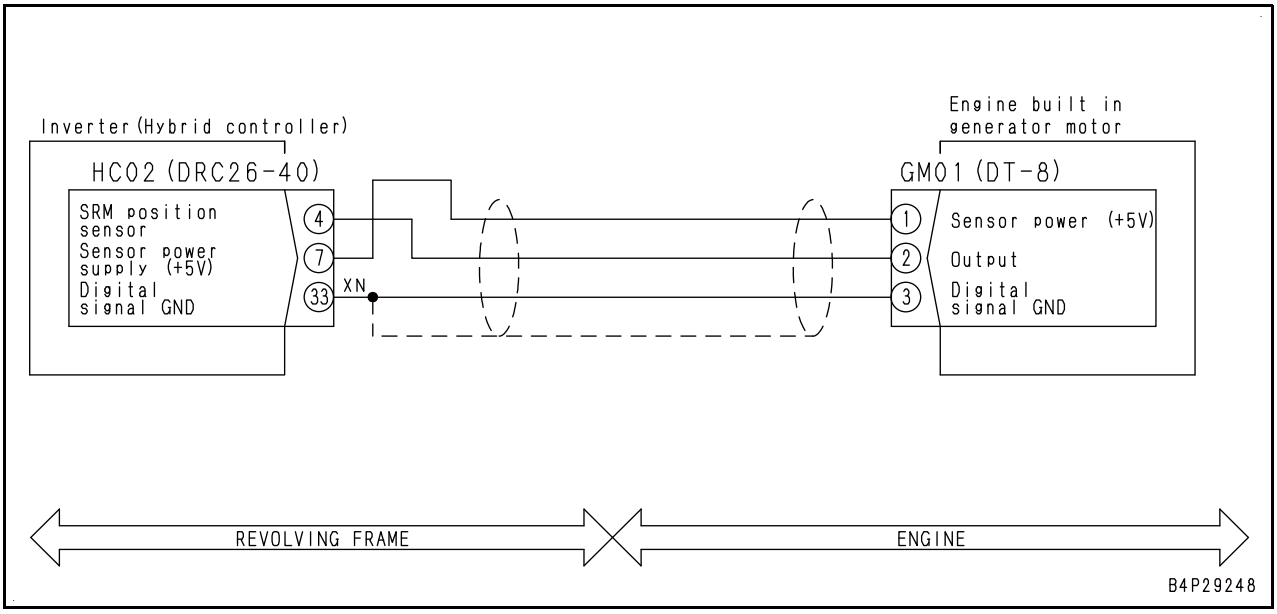
⚠ Discharge the capacitor by using a discharging tool (generator): 796-426-1800 in advance.

Hybrid

Action level	Failure code	Failure	Capacitor Contactor Locked (Hybrid controller systems)
L03	GA1VFS		
Detail of failure	• Contactor is fused inside capacitor • A power cable connector is connected with the wrong side up (harness side connector is turned 180° from its correct position).		
Action of controller	• Limits the swing speed etc. • Even if cause of failure disappears, machine does not become normal until starting switch is set to OFF position.		
Problem on machine	• Swing speed, etc. are limited.		
Related information	• Method of reproducing failure code: Turn starting switch to ON position or start engine. • If failure code [GA01KA] is also displayed, power cable connector HC06 may be loose, or connected 180° wrong. • Capacitor voltage can be checked with monitoring function. (Code: 09300)		

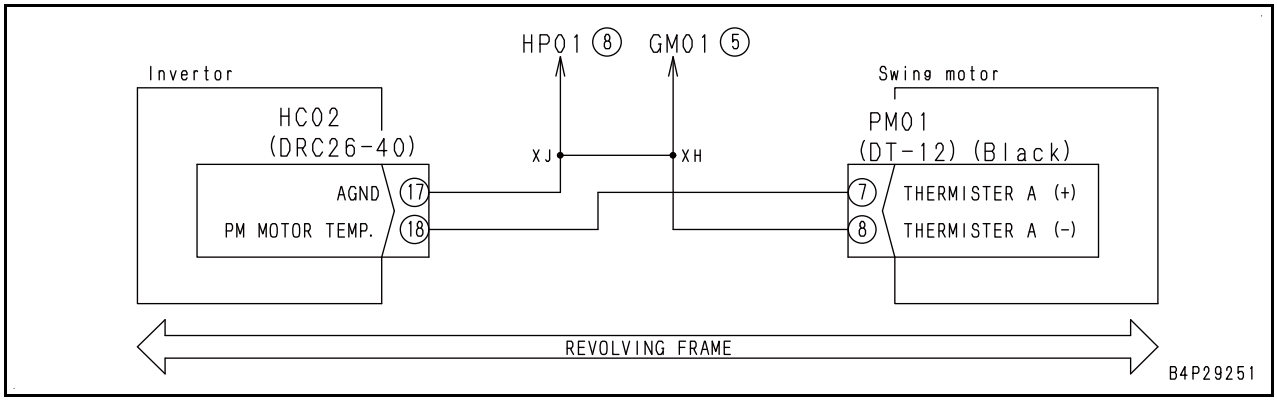
Cause		Procedure, measuring location, criteria, and remarks		
1	Improper connection of power cable connector	1. Check if mark (4 lines) on power cable connector HC06 and mark (4 lines) on body side are at the same side (whether the harness side connector is turned 180° wrong or not). 2. Check power cable connector HC06 for loosening.		
2	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector HP01 and connect T-adapter to female side. 3. Turn starting switch to ON position.		
		Voltage	Between HP01 (female) (6) and ground	Max. 1 V
			Between HP01 (female) (7) and ground	Max. 1 V
3	Defective capacitor	When the power supply is OFF, check the capacitor LED window before discharging (capacitor voltage 30 V or above). If both LEDs are lit, capacitor is defective.		
4	Defective inverter (hybrid controller)	Since this is an internal defect, troubleshooting cannot be performed.		

Circuit diagram related to capacitor contactor


Inverter(Hybrid controller)
HC02 (DRC26-40)
SRM position sensor
Sensor power supply (+5V)
Digital signal GND
4
7
33
XN
Engine built in generator motor
GM01 (DT-8)
1
2
3
Sensor power (+5V)
Output
Digital signal GND
REVOLVING FRAME
ENGINE
B4P29248

<table>
<tr><td rowspan="3">3</td><td rowspan="3">Open circuit in wiring harness (Wire breakage or defective contact of connector)</td><td colspan="3">★ If no failure is found by check on cause 2, this check is not required.
1. Turn starting switch to OFF position.
2. Disconnect connectors HC02 and PM01, and connect T-adapters to each female side.</td></tr>
<tr><td rowspan="2">Resist-ance</td><td>Between HC02 (female) (18) and PM01 (female) (7)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between HC02 (female) (17) and PM01 (female) (8)</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Ground fault in wiring harness (Contact with ground circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors HC02 and PM01, and connect T-adapter to either female side.</td></tr>
<tr><td>Resist-ance</td><td>Between ground and HC02 (female) (18) or PM01 (female) (7)</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Hot short circuit in wiring harness</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connector PM01, and connect T-adapter to female side.
3. Turn starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td>Between PM01 (female) (7) and ground</td><td>Max. 5.5 V</td></tr>
<tr><td>6</td><td>Defective swing motor</td><td colspan="3" rowspan="2">Since this is an internal defect, troubleshooting cannot be performed.</td></tr>
<tr><td>7</td><td>Defective inverter (hybrid controller)</td></tr>
</table>

Circuit diagram related to hybrid swing motor temperature sensor



<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria, and remarks</th></tr>
<tr><td rowspan="7">18</td><td rowspan="7">Open circuit in wiring harness (Wire breakage or defective contact of connector)</td><td colspan="3">• Battery relay
1. Turn starting switch to OFF position.</td></tr>
<tr><td>Resist-ance</td><td>Between terminal R02 and H15A (female) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">• Battery relay
1. Turn starting switch to OFF position.
2. Turn starting switch to ON position.
★ Check where 24 V power is reached to, and locate open section.</td></tr>
<tr><td rowspan="4">Voltage</td><td>Between terminals R04 and R01</td><td>20 to 30 V</td></tr>
<tr><td>Between terminals R02 and R01</td><td>20 to 30 V</td></tr>
<tr><td>Between terminals R03 and R01</td><td>20 to 30 V</td></tr>
<tr><td>Between terminal R01 and ground</td><td>Max. 1 V</td></tr>
</table>

E-12 Air cleaner clogging monitor lights up in yellow while engine is running *(PC400-FER-400AZ0A)*

:

Failure	Air cleaner clogging monitor lights up in yellow while engine is running
Related information	• Air cleaner clogging switch signal can be checked with monitoring function. (Code 04501)

Cause		Procedure, measuring location, criteria and remarks
1	Clogging of air cleaner (when system works properly)	Air cleaner may be clogged. Check it, then clean or replace if necessary.
2	Defective air cleaner clogging switch system	Perform troubleshooting for failure code [**AA10NX**].

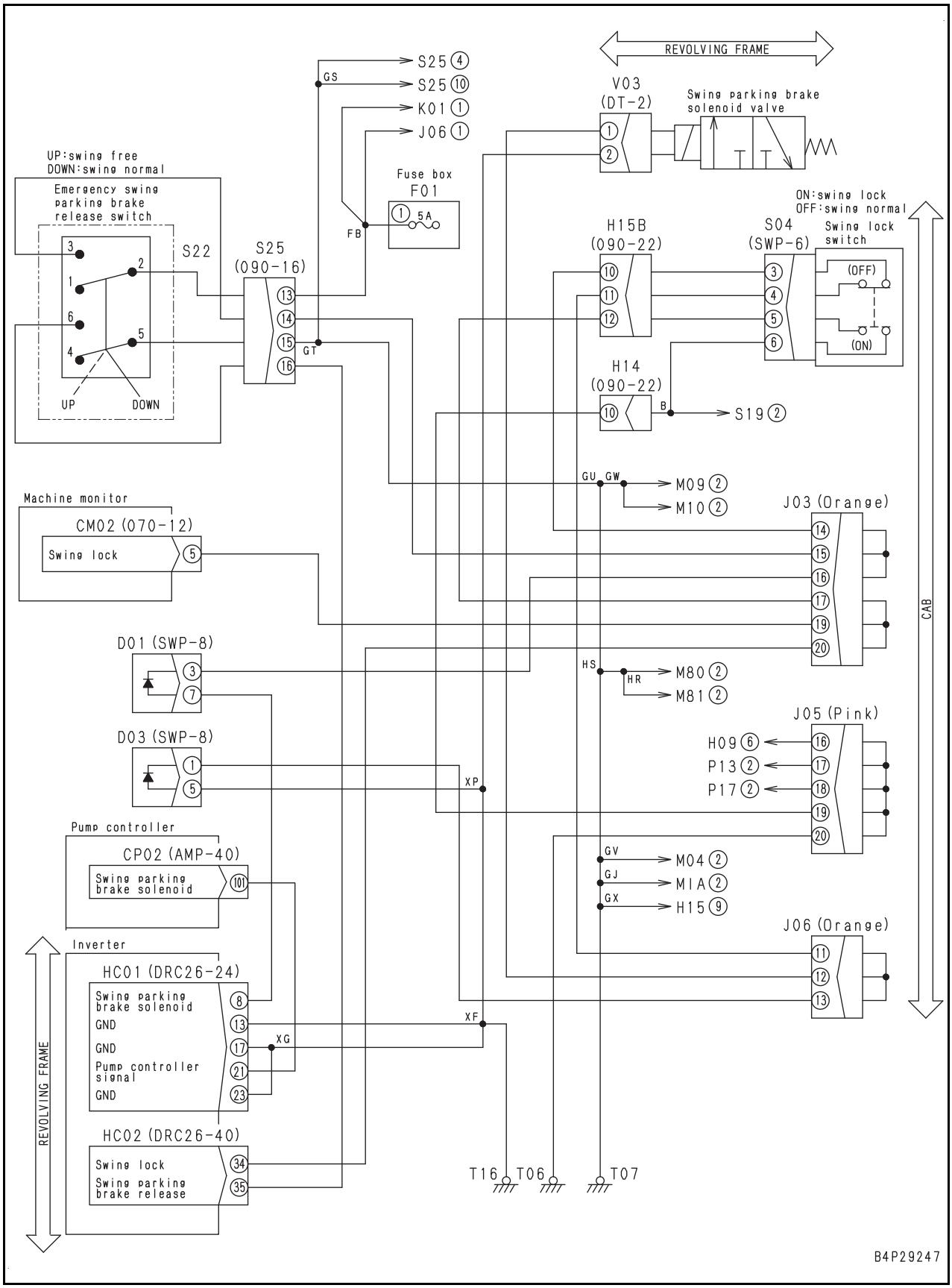
E-29 Automatic warm-up system does not operate (in cold season) *(HB205-FEN-400AZ0A)*

:

Failure	Automatic warm-up system does not operate (in cold season).
Related information	• Automatic warm-up function increases engine speed to 1,200 rpm when coolant temperature is below 30°C. • With starting switch at ON position or after engine is started, if fuel control dial is kept at 70% or more of full open range for 3 seconds, automatic warm-up operation is cancelled. • For the machine equipped with the air conditioner, the warm-up function of heater increases the engine speed to 1,300 rpm under the following conditions; blower is ON, ambient temperature is 5°C and below, engine coolant temperature is below 55°C. When the engine coolant temperature reaches 60°C, the warm-up function of heater is cancelled. • When engine oil pressure is below 50 kPa {0.51 kg/cm2}, turbocharger protection function works to keep engine speed 1,050 rpm and below for 20 seconds at the longest after engine is started.

No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Defective engine coolant temperature signal system	★ Turn starting switch to ON position or start engine to perform troubleshooting.			
		★ If level indication of engine coolant temperature gauge differs from actual coolant temperature, perform following troubleshooting. • E-20 Engine coolant temperature gauge display does not move from minimum or maximum • E-21 Engine coolant temperature gauge indicates incorrect temperature (indicates neither minimum nor maximum)			
		Coolant temperature level	Monitoring code 04107 (Engine coolant temperature)	Engine coolant temperature 105°C	6 (a: Red)
				Engine coolant temperature 102°C	5 (a: Red)
				Engine coolant temperature 100°C	4 (a: Blue)
				Engine coolant temperature 85°C	3 (a: Blue)
				Engine coolant temperature 60°C	2 (a: Blue)
				Engine coolant temperature 30°C	1 (a: White)
2	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)			

Circuit diagram related to swing parking brake solenoid



E-60 Service is not displayed correctly with monitoring function *(HB205-FFW-400AZ0A)*

:

Failure	Service is not displayed correctly with monitoring function.
Related information	• Monitoring code: 01901 Pressure Switch 2 • For safety, use "short socket adapter" 799-601-7230 for 2-pin X connector in tests for Causes 1 and 2. ⚠ **Do not check oil pressure switch connector while engine is running.**

No.	Cause	Procedure, measuring location, criteria, and remarks
1	Defective PPC oil pressure switch (P14) for front end of attachment control pedal	A. If monitoring function does not indicate that attachment control pedal is operated when engine is started and attachment control pedal is depressed at front end. 1. Turn starting switch to OFF position. 2. Disconnect connector P14 and connect "short socket adapter" to female side. 3. Turn starting switch to ON position. ★ After finishing test, restore connectors. • If monitoring function indicates that "Service" is "ON", PPC oil pressure switch (P14) for front end of attachment control pedal is defective (Note 1).
		B. If monitoring function indicates that attachment control pedal is operated when starting switch is turned to ON position. 1. Turn starting switch to OFF position. 2. Disconnect connector P14. 3. Turn starting switch to ON position. • If monitoring function indicates that "Service" is "OFF", PPC oil pressure switch (P14) for front end of attachment control pedal is defective (Note 2).
2	Defective PPC oil pressure switch (P15) for rear end of attachment control pedal	A. If monitoring function does not indicate that attachment control pedal is operated when engine is started and attachment control pedal is depressed at rear end. 1. Turn starting switch to OFF position. 2. Disconnect connector P15 and connect "short socket adapter" to female side. 3. Turn starting switch to ON position. ★ After finishing test, restore connectors. • If monitoring function indicates that "Service" is "ON", PPC oil pressure switch (P15) for rear end of attachment control pedal is defective (Note 1).
		B. If monitoring function indicates that attachment control pedal is operated when starting switch is turned to ON position. 1. Turn starting switch to OFF position. 2. Disconnect P15. 3. Turn starting switch to ON position. • If monitoring function indicates that "Service" is "OFF", PPC oil pressure switch (P15) for rear end of attachment control pedal is defective (Note 2).

H-3 None of work equipment or travel works *(HB205-FT5-400AZ1A)*

:

Failure	• None of work equipment, or travel works.
Related information	• Perform all troubleshooting with working mode set in power (P) mode.

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Malfunction of work equipment lock solenoid valve	★ Be ready with engine stopped, then perform troubleshooting with engine at high idle.		
		Solenoid output pressure	When locked	0 MPa {0 kg/cm^2}
			When disengaged	2.9 MPa {30 kg/cm^2}
2	Malfunction of self-pressure reducing valve	★ Be ready with engine stopped, then perform troubleshooting with engine at high idle.		
		Control circuit source pressure	All control levers in NEUTRAL	2.84 to 3.43 MPa {29 to 35 kg/cm^2}
		★ Since relief valve of self-pressure reducing valve is not adjustable, replace self-pressure reducing valve assembly if normal pressure is not obtained.		
3	Defective piston pump	Piston pump may malfunction or has internal defect. Check it by following method. • Crank the engine with main oil pressure pickup port plug removed. → If any oil flows out, piston pump is normal.		

H-11 Hydraulic drift of arm is large *(PC200LC_10-MS4-400AZ0A)*

:

Failure	• Hydraulic drift of arm is large.
Related information	• Perform all troubleshooting with working mode set in P mode.

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective arm cylinder	★ Be ready with engine stopped, then perform troubleshooting with engine running at high idle.		
		Leak from arm cylinder	Arm IN hydraulic relief	Max. 20 cc/min
2	Malfunction of arm control valve (safety valve for lock valve)	★ Be ready with engine stopped, then perform troubleshooting with engine running at high idle.		
		Boom relief pressure and arm relief pressure	Boom RAISE hydraulic relief, arm IN hydraulic relief, and arm OUT hydraulic relief	33.1 to 37.2 MPa {338 to 380 kg/cm^2}
		★ Among above relief pressures, if arm OUT relief pressure and boom RAISE relief pressure is below standard value, safety valve may be defective. Check safety valve for damaged sealing material. ★ Since relief pressure cannot be adjusted with safety valve installed on machine, replace safety valve assembly if safety valve is found to be defective.		
3	Malfunction of arm control valve (lock valve) (if equipped)	• Check that pilot piston and poppet are seated on lock valve body in position (they are not trapped halfway). • Check for locked or trapped pilot piston and poppet in lock valve body (pilot piston and poppet must move smoothly). • Remove pilot piston and poppet from valve body and check them for defects and dirt. • Check poppet spring for setting and deformation.		
4	Malfunction of arm control valve (suction-safety valve) (arm IN side)	★ Be ready with engine stopped, then perform troubleshooting with engine running at high idle.		
		Arm relief pressure	Arm IN hydraulic relief	33.1 to 37.2 MPa {338 to 380 kg/cm^2}
		★ If arm IN relief pressure is below standard value, suction-safety valve may be defective. Check it. • Check that check valve of suction-safety valve is seated on valve body in position (it is not trapped halfway). ★ Since relief pressure cannot be adjusted with safety valve installed on machine, replace safety valve assembly if safety valve is found to be defective.		

H-23 Upper structure swings only to the right or left *(HB205-L42-400AZ1A)*

:

Failure	• Upper structure swing only to the right or left.
Related information	• Perform all troubleshooting with working mode set in power (P) mode.

Perform troubleshooting. For the failure code details, see "Troubleshooting for hybrid systems (Y mode)" since this failure relates to hybrid systems.

No.	Cause	Point to check, remarks	Remedy
14	Broken or seized piston connecting rod	• Metal particles are found in oil drained from oil pan. • Remove oil pan and check piston and connecting rod. (Reference: Unusual noise is heard and engine stops suddenly, or stops due to overheat.)	Replace piston and connecting rod.
15	Broken or seized crankshaft bearing	• Metal particles are found in oil drained from oil pan. • Remove oil pan and check crankshaft main bearing	Replace crankshaft main bearing.
16	Defective wiring harness of engine controller power supply	• Check wiring harness of engine controller power supply. (Reference: See Troubleshooting, "Failure code [CA343]".)	Repair wiring harness of engine controller power supply.
17	Defective starting switch wiring	• Check starting switch wiring harness.	Perform troubleshooting for E-1 and take remedies.
18	Defective hydraulic system	• See H-mode, "H-2 Engine speed lowers significantly or engine stalls".	Perform troubleshooting for failure symptom H-2 and take appropriate measures.

Y-1 Hybrid monitor does not go out *(HB205-K11-400AZ0A)*

:

Hybrid

Failure	Hybrid monitor stays lit and does not go out.
Related information	• Hybrid controller SW input can be checked with monitoring function. (Code: 09702 Hybrid controller SW input) • Method of reproducing failure code: Turn starting switch to ON position or start engine.

Cause		Procedure, measuring location, criteria, and remarks
1	Low voltage in capacitor	If capacitor voltage is less than150 V, run the engine at low idle for more than 5 minutes.
2	Defective hybrid system	If the error of action level L02 to L04 is displayed, perform troubleshooting for it first.
3	Defective inverter (hybrid controller)	If no failure is found by checks on causes 1 and 2, hybrid controller may be defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Precautions related to hybrid equipment *(HB380-PQG9-012K06A)*

:

Hybrid

⚠ Before performing testing and adjusting related to hybrid equipment, understand the following items fully.

1. Only personnel who completed the special training for low-voltage electric work can perform removal of hybrid equipment (motor-generator, capacitor, inverter, electric swing motor) and high-voltage wires.
2. Even qualified personnel can never disassemble the equipment listed above for quality assurance reasons.
3. Replace hybrid equipment and high-voltage wires (orange conduit windings) as units.
4. Before removing hybrid equipment, make sure to discharge the capacitors first.
   (For details, see Testing and Adjusting, "Discharge of capacitor electric charge" in "Special functions of machine monitor".)

★ However, capacitors can be discharged by using the machine monitor only when the hybrid system is operating normally.

★ If any of failure code GA**** explained in the next page is displayed indicating the hybrid system is abnormal, capacitors cannot be discharged by using the machine monitor even if the monitor instructs to perform the discharge operation. (Conditions to consume the electric charge of the capacitors are not met.) Therefore, use the special capacitor discharging generator 796-426-1800.

★ Capacitor voltage may not be completely 0 V when its charge is 0 %. Voltage tends to be restored after discharge due to the characteristics of the capacitor. Take extreme care when removing power cable connectors.

★ Avoid key switch operations as described below after discharging the capacitors, since this will cause the capacitors to be recharged.
- After turning the key switch to the OFF position, the switch should not be turned to the ON position before the engine stops completely.
- After turning the key switch to the OFF position and the engine stops completely, the engine should not be started by turning the key switch to the ON position.

⚠ The items with the mark relate to handling of hybrid equipment. Before performing work,

Hybrid

understand 00-200 Foreword, Safety, Basic information, "Handling Hybrid Equipment and High-Voltage Wires".

★ For monitoring items applicable to troubleshooting of hybrid equipment, refer to list in Failure code [GA----] (Separate sheet 1).

★ For the check sheet to record results of diagnostic checks on abnormal hybrid equipment, refer to Failure code [GA----] (Separate sheet 2). (This check sheet is used when making inquiries to the factory.)

⚠ Discharge capacitors first by using discharging tool (generator) 796-426-1800.

⚠ After discharging the capacitor, confirm that both capacitor charge LEDs (1) are OFF.

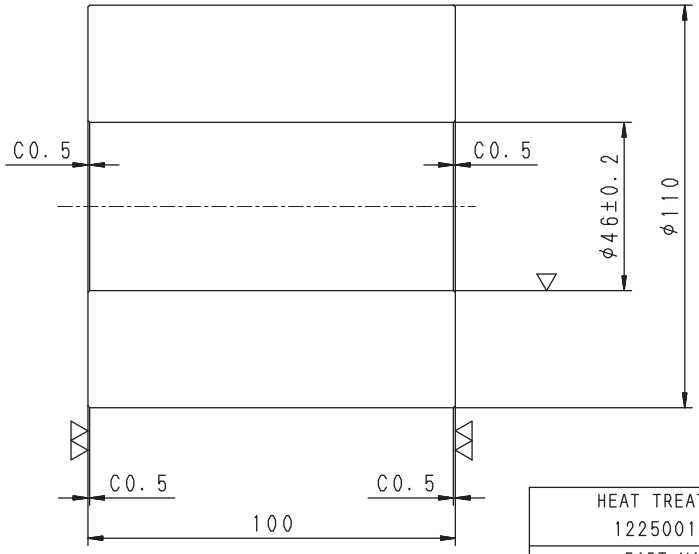
⚠ A voltage not exceeding 50 V will still remain in the capacitor after the discharging process is complete. Do not work with bare hands. Always wear insulating gloves.

★ When a connector is removed at the capacitor side, cover the connector halves (harness and capacitor sides) with plastic bags, etc. to prevent entry of foreign material.

★ Perform troubleshooting with the engine stopped.

★ Do not connect the tester directly to the connector at the capacitor (female) side.

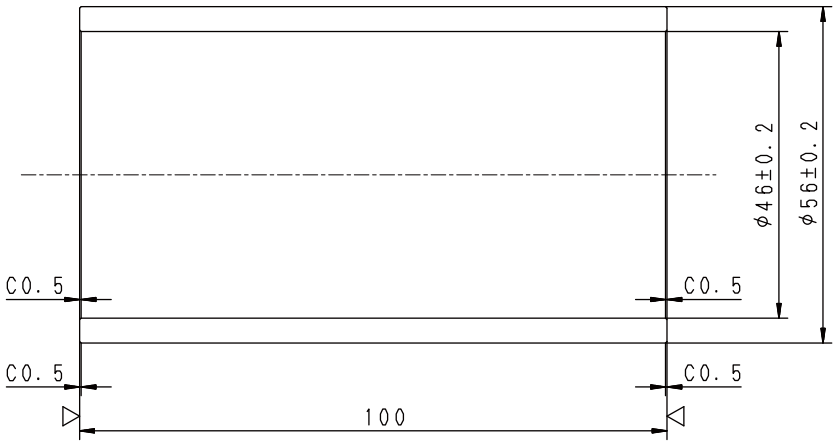
Note) Komatsu does not take any responsibility for special tools manufactured according to these sketches.
L5: Push tool



C4P31266

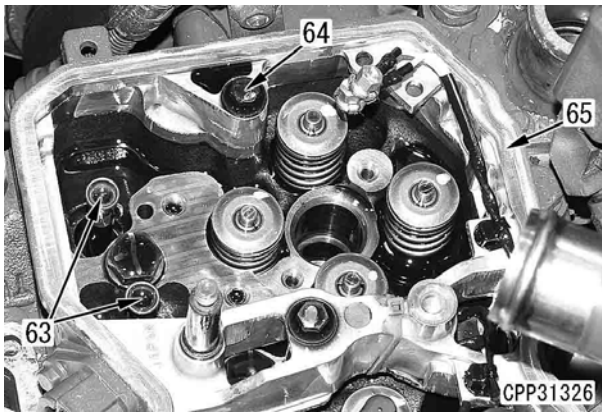
HEAT TREATMENT	MATERIAL
1225001400	S45C
PART NAME	Q'TY
PUSH TOOL	1
796T-430-1310 △	

L6: Spacer

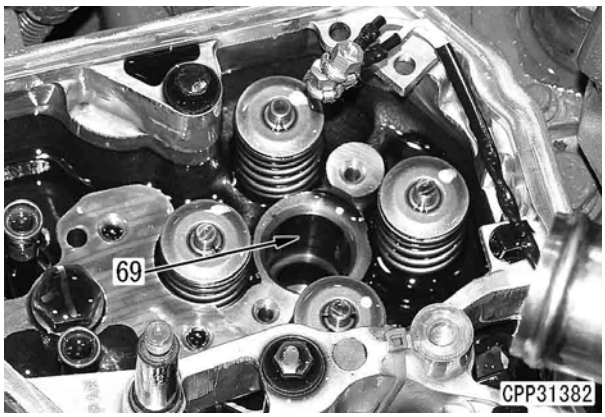


C4W25161

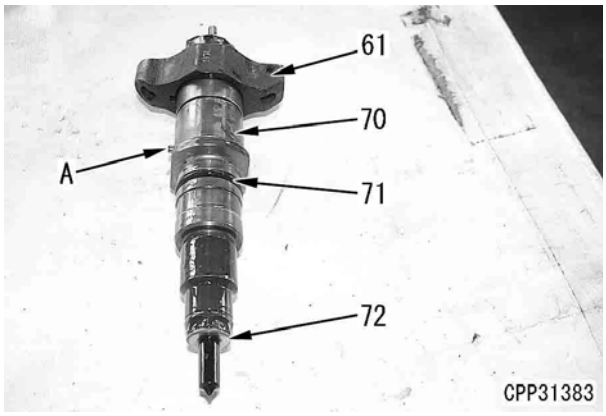
HEAT TREATMENT	MATERIAL
----	STKM13A
PART NAME	Q'TY
SPACER	1
793T-417-1310 △	



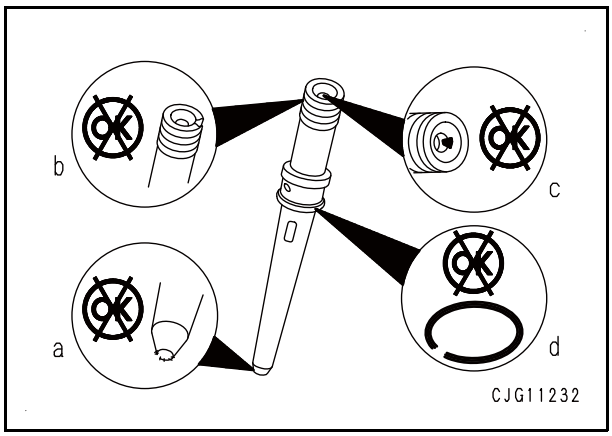
4. Injector assembly
   - ★ When replacing an injector assembly with a new one, be sure to replace the inlet connector with a new one as well.
   - ★ Check that injector sleeve (69) is free from scratches and dirt.



1) Install O-ring (71) and gasket (72) to injector (70).
   - ★ Replace O-ring and gasket with new ones.
2) Apply engine oil to O-ring (71) of injector (70) and the cylinder head side.
   - O-ring (71) of injector (70) and cylinder head side: Engine oil (EO15W-40)
3) While aligning convex and concave shapes (A), install holder (61) to injector (70).



4) Direct fuel inlet hole of injector assembly (62) toward air intake manifold, and install it to the cylinder head.
5) Tighten holder mounting bolt (60) by 3 to 4 threads.
6) Check inlet connector on the following points. If any abnormality is found, replace it.
   1] When burrs or wear are found on front-end part (a) or rear-end part (b) of inlet connector
   2] When foreign matters are found in the edge filter at rear-end (c) of the inlet connector
   3] When there are cracks or deterioration on the O-ring of the inlet connector upper (d) part.



   4] When wear or uneven contact are found on seat surface (e) at tip-end of the inlet connector.
   - ★ If high-pressure fuel leaks through the inlet connector, seat surface has fine streaks or cracks.

Removal and installation of engine, motor-generator, and main pump assembly *(HB205-R400-924K00A)*

:

Hybrid

⚠ The removal and installation in this section must be performed by persons "who completed the special training for low-voltage electric work".
Before performing work, understand 00 Foreword, Safety, Basic information, "Safety notice 1. Precautions Specific to Hybrid Equipment" and "Handling Hybrid Equipment and High-Voltage Wires".

★ Special tools

Symbol		Part No.	Part name	Necessity	Q'ty
A	8	796T-401-1110	Plate	●	1
	9	795-790-9300	Lifting tool	●	1
	12	Commercially available	Megohm tester	■	1
B	1	7875-35-2910	Cap	■	2
R	1	796-460-1210	Oil stopper	●	1
	2	796-770-1320	Adapter	●	1

⚠ Stop the machine on a level surface, lower the work equipment to the ground so that it is stable, and stop the engine.

⚠ Discharge the capacitors. For details, see "—Capacitor discharge procedure—" in 00 Foreword, Safety, Basic information, "Handling Hybrid Equipment and High-Voltage Wires".

⚠ Turn the battery disconnect switch to OFF position, and remove the key.

⚠ Before opening the water filler cap or draining coolant, check that the coolant temperature cools down to the temperature safe enough for anyone not to get burn.

⚠ If you drain the coolant when it is still hot, you may be scalded. Wait until the coolant temperature drops before starting the work.

⚠ When draining coolant, be careful that coolant does not contact your skin or enter your eye. The super coolant mixed in the coolant is poisonous. If the coolant sticks to your skin or enters your eye, immediately rinse with water thoroughly and see a doctor.

★ Note the installing positions, connector numbers, and hose band colors of the wirings and pipings not to install them wrongly.

⚠ After the engine is stopped, the parts are very hot. Wait until all parts are cooled down.

Removal *(HB205-R400-520K00A)*

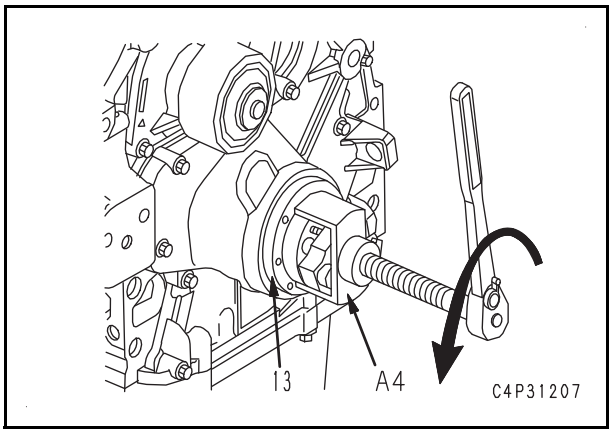
:

1. Open left side inspection cover (1).

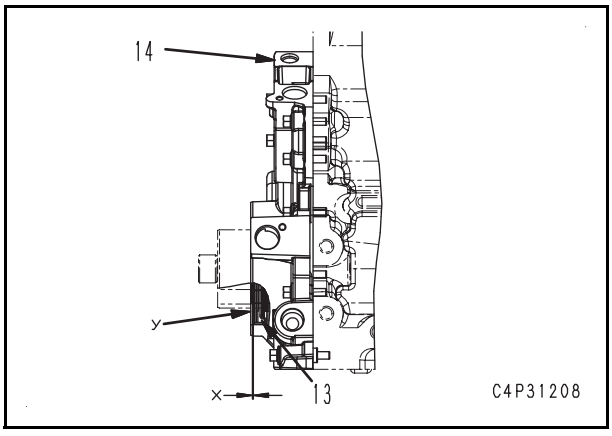
Installation *(HB205-A350-720K00A)*

:

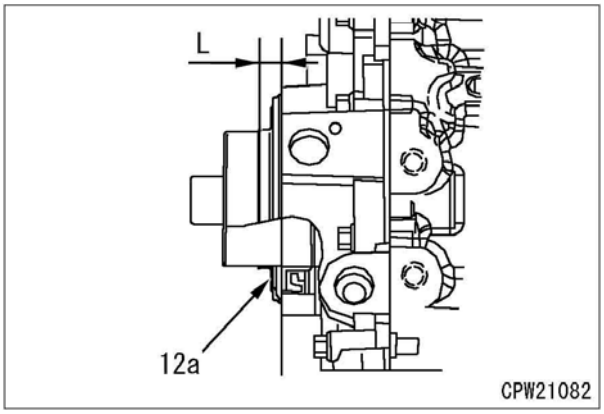
1. Remove engine front seal (13) by using tool A4.
   - ★ Replace the engine front seal with a new one.
   - ★ Before installing the engine front seal, check that the end corner and the seal lip sliding surface of the crankshaft are free from a flaw, burr, fin, and rust.
   - ★ When installing the engine front seal, do not apply oil or grease to the crankshaft and seal lip. Also, thoroughly wipe off oil or grease from the crankshaft.



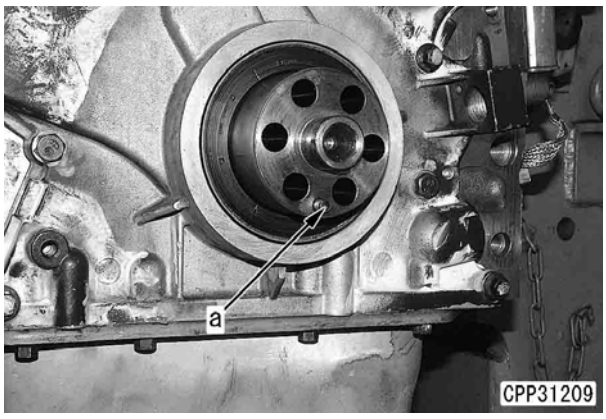
   - ★ The protrusion and facial runout of engine front seal (13) from cover (14) are as follows.
     - Protrusion (x): Max. 0.38 mm
     - Facial runout (y): Max. 0.25 mm



2. Install dust seal (12a).
   - ★ Check the installed dimension (L)
     - Installed dimension (L): 12(+0.1/0) mm



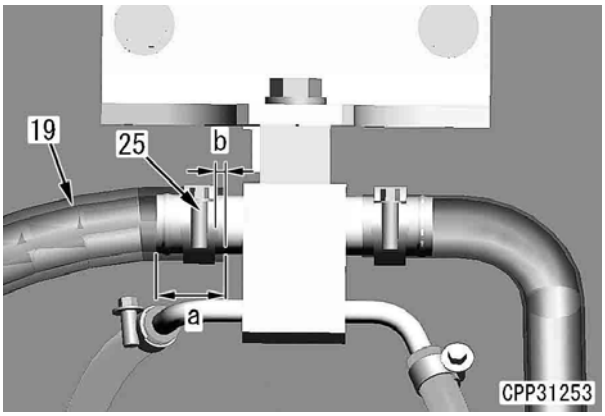
3. Crankshaft pulley
   1) Insert dowel pin (a) to the tip of the crankshaft.

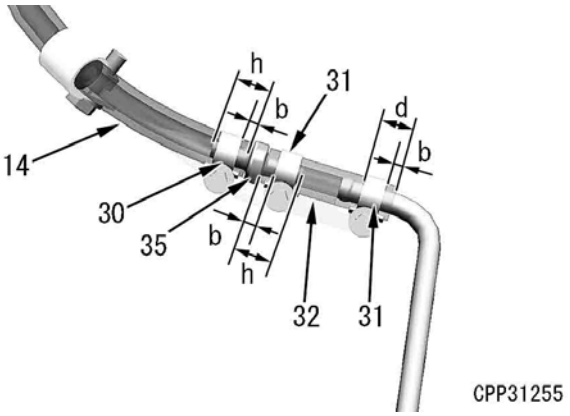


   2) Check the dowel pin insertion position, and insert crankshaft pulley and plate to the crankshaft.
   3) Tighten mounting bolts (11) according to the following procedure.

      Mounting bolt (11):

      1] Tighten the bolts diagonally with a torque of 55 ± 5 Nm {5.6 ± 0.5 kgm}.
      2] Loosen bolts by 180 deg.
      3] Tighten the bolts diagonally with a torque of 55 ± 5 Nm {5.6 ± 0.5 kgm}.
      4] Tighten the bolts by 90 deg. ± 5 deg. in a diagonal order. (Use angle tightening tool A6)



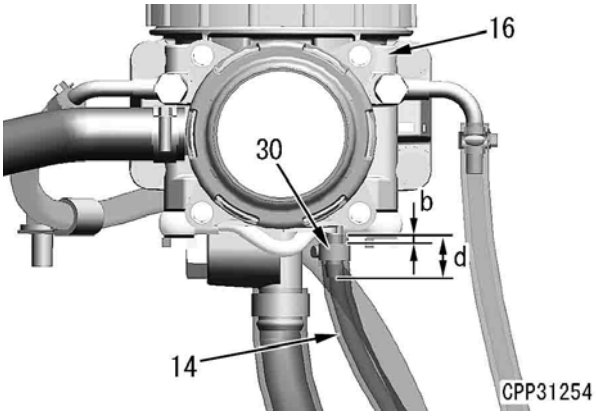


- Install oil drain hose (14) according to the following procedure.

  ★ The following is the method of replacing hose (14) between KCCV ventilator assembly (16) and check valve (35).

  Hose insertion depth (d): 25 mm
  Between hose tip and clamp (b): 5 mm

  Hose clamp (30):
  4.4 ± 0.49 Nm {0.45 ± 0.05 kgm}



  ★ The following is the method of replacing hose (32) between check valve (35) and engine.

  Hose insertion depth (d): 25 mm
  Hose insertion depth (h): 17 mm
  Between hose tip and clamp (b): 5 mm

  Hose clamp (31):
  3.3 ± 0.49 Nm {0.34 ± 0.05 kgm}

Installation *(HB205-PQGV-720K00A)*

:

- Perform installation in the reverse order to removal.

[*1]

Capacitor drain plug (6):
5.88 to 8.82 Nm {0.6 to 0.9 kgm}

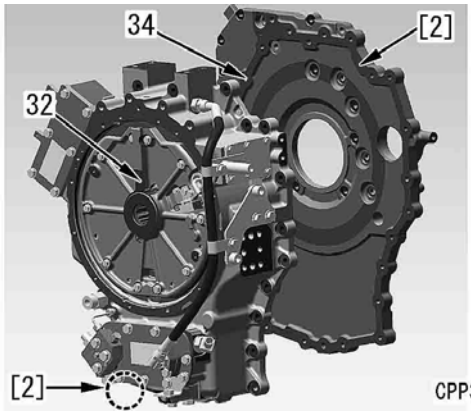
- Refilling with coolant
  Refill with coolant to the specified level through the hybrid radiator filler port of the radiator. Run the engine to circulate the coolant. Then check the coolant level again.
  Hybrid radiator:
  6.0ℓ
- Refilling with coolant and bleeding air
  ★ Refill the hybrid radiator with coolant and bleed air. For details, see "Procedures for draining coolant, refilling with coolant, and bleeding air for hybrid system".

Installation *(HB205-RA22-720K00A)*

:

- Install motor-generator and housing assembly (32) according to the following procedure.

1. Install the dowel pin to rear flange (34).
2. Install guide bolt [2] to rear flange (34).



3. Apply liquid gasket on the mating face of rear flange (34) and motor-generator housing.

   Rear flange mating surface:
   Liquid gasket (LG-7)

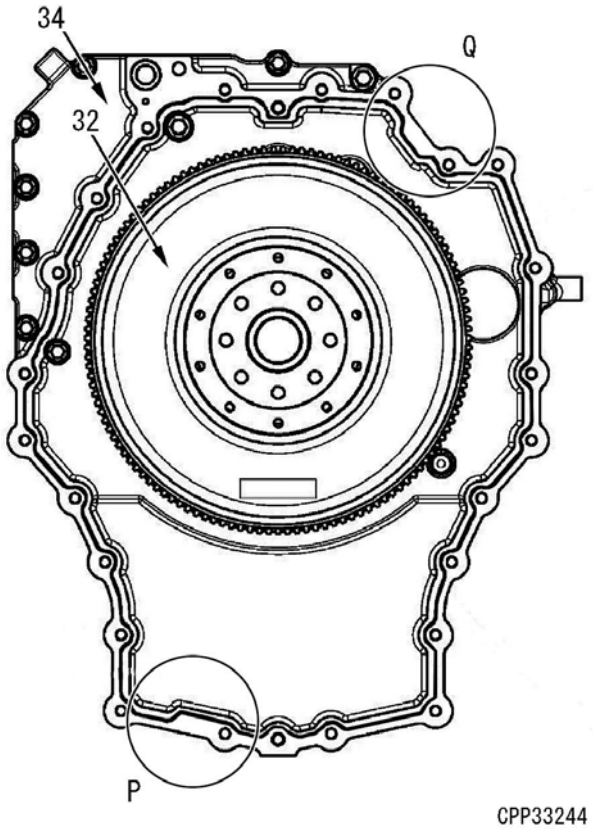
   ★ Before applying liquid gasket, clean the mating surface of rear flange (34) and motor-generator housing.

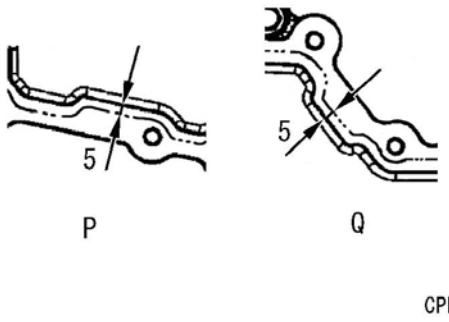
   ★ Apply liquid gasket (LG-7) in diameter (t) without a break.
   t = 1 to 2 mm

   ★ The liquid gasket (LG-7) is quick drying. Apply it immediately before installing the motor-generator and housing assembly.

   ★ If it is left for 5 minutes or more after liquid gasket (LG-7) is applied, the surface of the gasket will be hardened, causing oil leakage after motor-generator and housing assembly (32) is installed.

   ★ For P and Q parts, apply the gasket at a point 5 mm from rear flange not to overlap forcing tap of motor-generator housing.



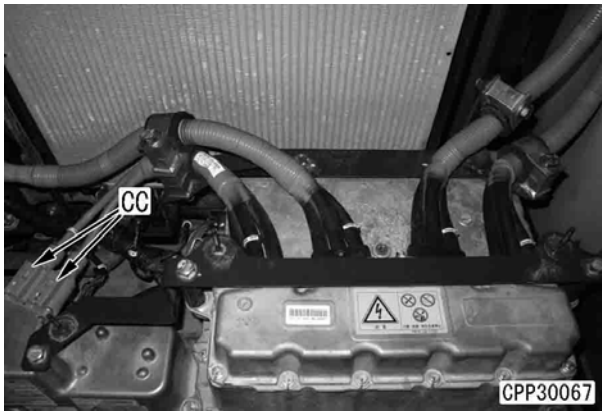


4. Sling motor-generator and housing assembly (32), and install them.
5. Insert tool B2 into the spline part of the motor-generator.

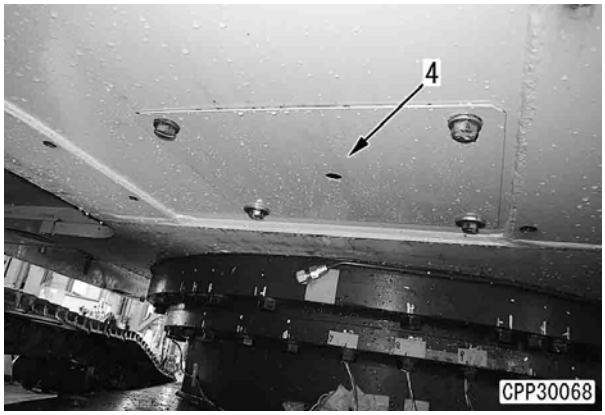
   ★ While turning tool B2 clockwise and counterclockwise, push in motor-generator and housing assembly (32) along the guide bolt until the entire mating surface of motor-generator and housing assembly (32) touches the rear flange.

6. Remove tool B2.

★ When disconnecting the clamp and wiring, protect the hybrid radiator core portion from damages by using corrugated fiberboard.

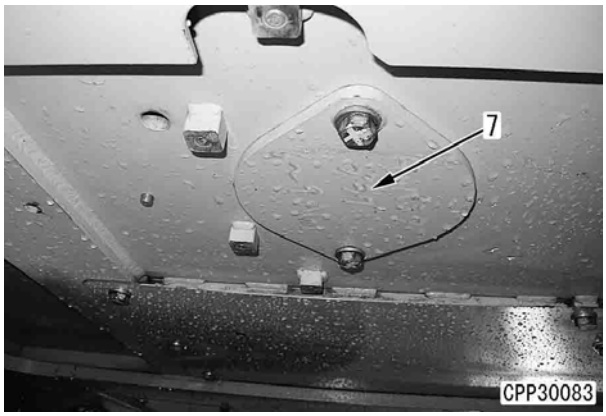


4. Remove undercover (4).

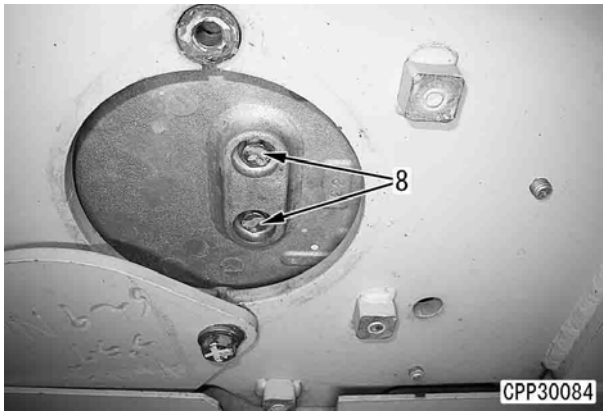


5. Loosen oil drain plug (5), and drain the oil.
   Electric swing motor case:
   1.6 ℓ
6. Loosen oil drain plug (6), and drain the oil.
   Swing machinery case:
   6.5 ℓ

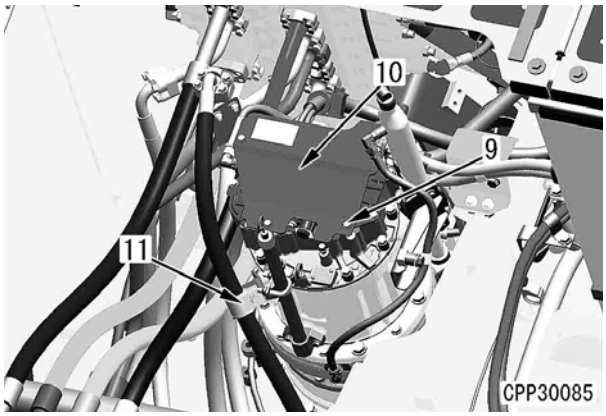
7. Remove cover (7) under the capacitor.



8. Remove capacitor drain valves (8), and drain the coolant. [*1]
   Hybrid radiator:
   6.0ℓ

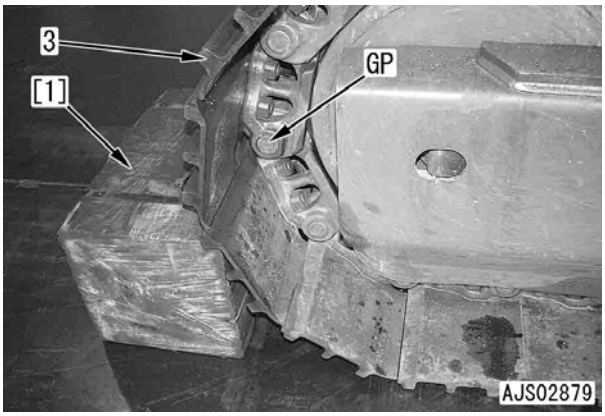


9. Remove mounting bolt (9), and remove cover (10).
10. Remove clamp (11).



11. Remove clip (12).
12. Disconnect connector (13).
13. Remove swing motor clamp PM01 (14).
14. Remove bolts (15) (2 pieces), and disconnect high voltage wiring (power cable) PM02 (16). [*2]

★ After disconnecting the high voltage wiring, make sure to install tool B1.



6. Pull out guide pin (GP), and move the machine back slowly to separate track (3). **[*3]**
   ★ Put some blocks between the track and the track frame to prevent damages.

Installation *(HB205-H110-720K01A)*

:

Perform installation in the reverse order to removal.

[*1]

Hoses are connected to the following places.

- Hose (6): Swing motor port (T)
- Hose (7): Travel speed increase solenoid valve
- Hose (8): Control valve port (B2)
- Hose (9): Control valve port (B5)
- Hose (10): Control valve port (A2)
- Hose (11): Control valve port (A5)

[*2]

Swivel circle mating surface:
Liquid gasket (LG-6)

Threads of revolving frame mounting bolt:
Adhesive (LT-2)

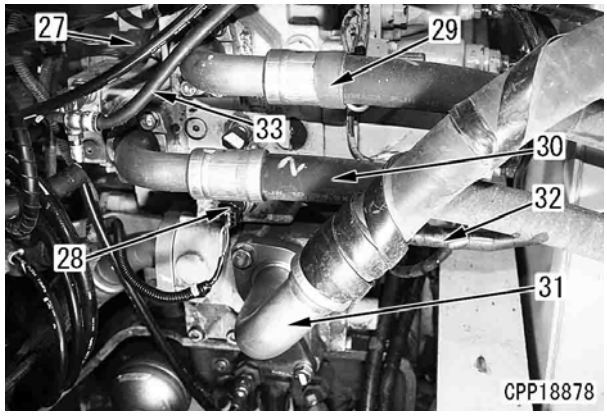
- In case of angle tightening

  Initial torque:
  294.2 ± 29.4 Nm {30 ± 3 kgm}

  Then, rotate the bolt by 60±6°.

- Refilling of oil (hydraulic tank)
  Supply oil through the oil filler port to the specified level. Run the engine to circulate the oil through the system. Then, check the oil level again.
- Bleeding air
  Bleed air from the hydraulic pump circuit. For details, see Testing and adjusting, "Bleeding air from hydraulic circuit".

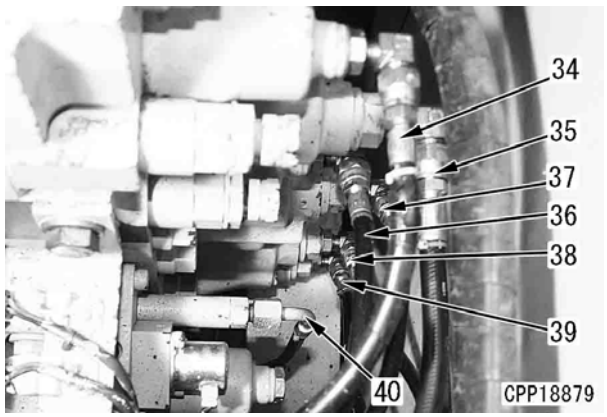
6) Disconnect hoses (29) to (33).
- (29): PP1 port hose (from rear pump)
- (30): PP2 port hose (from front pump)
- (31): T port hose (to hydraulic tank)
- (32): PPS2 port hose (to front pump control)
- (33): PR port hose (to solenoid valve)



10.Disconnect the hoses on the right side of the control valve according to the following procedure.

1) Disconnect PPC hoses (34) to (39).
- (34): (Attachment)
- (35): P2 port hose (bucket curl PPC)
- (36): P4 port hose (L.H travel PPC)
- (37): P6 port hose (boom lower PPC)
- (38): P10 port hose (R.H travel PPC)
- (39): P12 port hose (arm IN PPC)

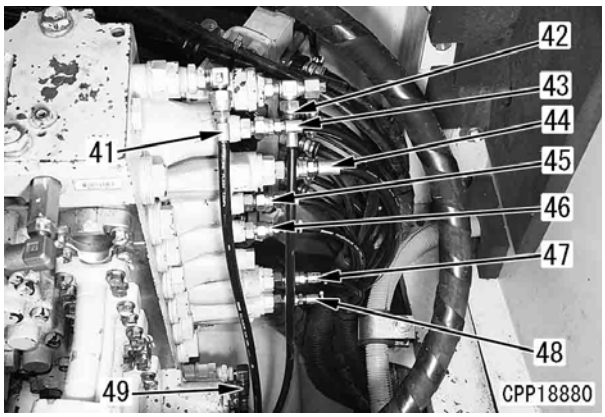
2) Disconnect PST port hose (solenoid valve) (40).



11.Disconnect the hoses on the left side of the control valve according to the following procedure.

1) Disconnect PPC hoses (41) to (48).
- (41): PX1 (main relief pressure selector)
- (42): (Attachment selector)
- (43): (Attachment)
- (44): P1 port hose (Bucket DUMP)
- (45): P3 port hose (L.H travel PPC)
- (46): P5 port hose (boom lower PPC)
- (47): P9 port hose (R.H travel PPC)
- (48):P11 port hose (Arm OUT PPC)

2) Disconnect PX2 port hose (main relief pressure selector) (49).



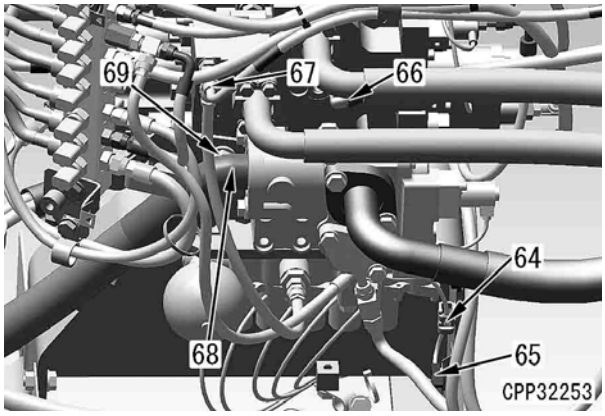
12.Open clip (64), and disconnect connector V25 (65).

13.Disconnect pressure sensor inlet hose (66).

14.Disconnect PPC source pressure hose (67).

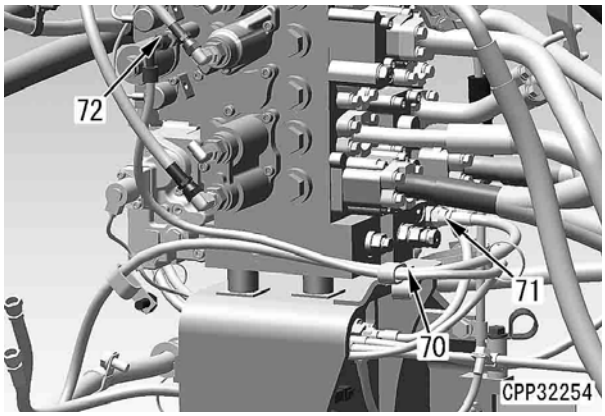
15.Disconnect oil cooler supply hose (68).

16.Remove relay block bracket (69).

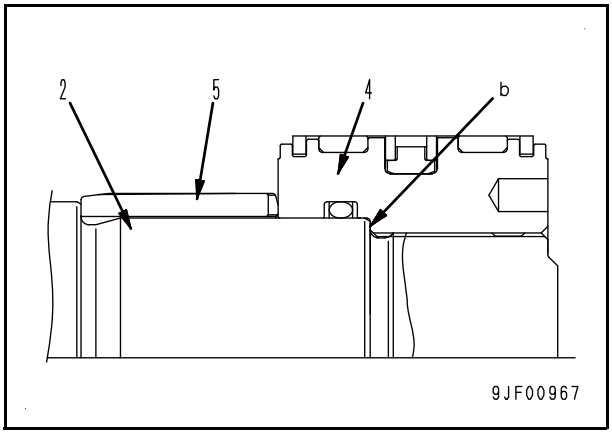


17.Remove clip (70), and disconnect TS port hose (71).

18.Disconnect PST travel junction hose (72).



19.Remove cover (50).

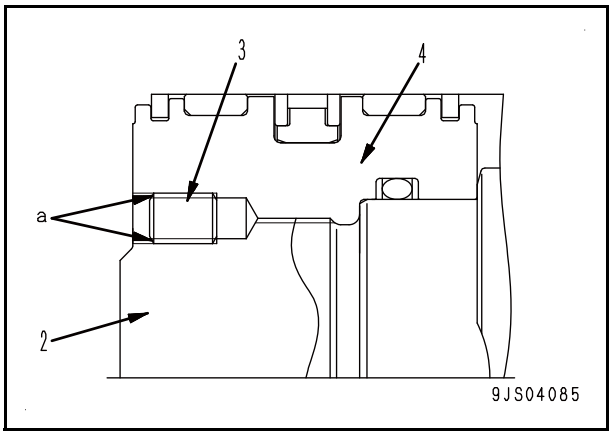


2) Install screw (3) to lock piston assembly (4) and piston rod assembly (2).

Threaded part of screw (3):
Adhesive (Loctite #262)

Screw (3):
58.9 to 73.6 Nm {6 to 7.5 kgm}

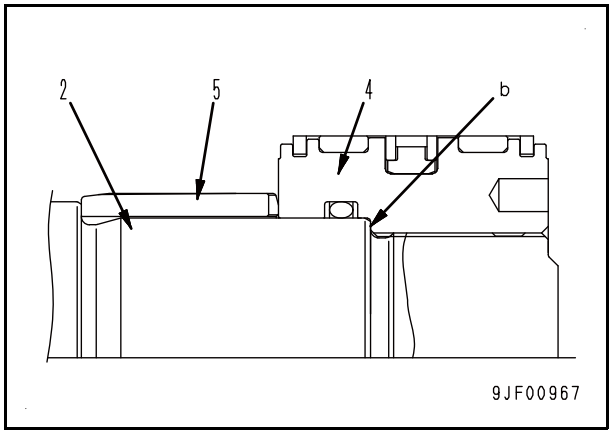
★ After installing screw (3), crimp the screw at 4 peripheral places (a).



7. When replacing either or both of piston rod assembly (2) and piston assembly (4) with new ones, assemble the new ones according to the following procedure.
   1) By using tool U2, tighten piston assembly (4) until it touches end face (b) of the rod.
      ★ If the cylinder has the bottom cushion, put a mark to indicate the tightening position of the ball cap on the rod end.

      Piston assembly (4):
      294 ± 29.4 Nm {30 ± 3.0 kgm}

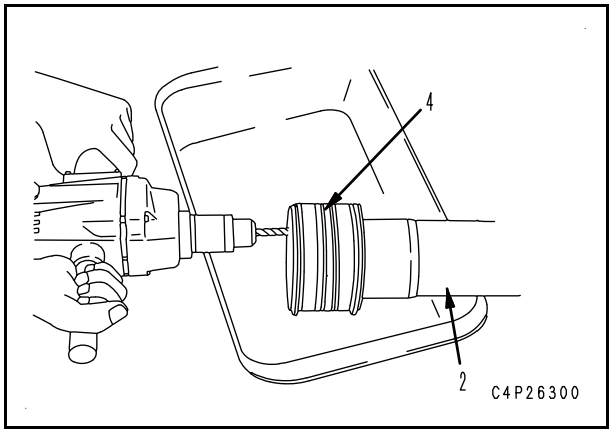
      ★ For a cylinder with head cushion, check that plunger (5) has a certain play after installing piston assembly (4).
      - Only for boom cylinder and arm cylinder



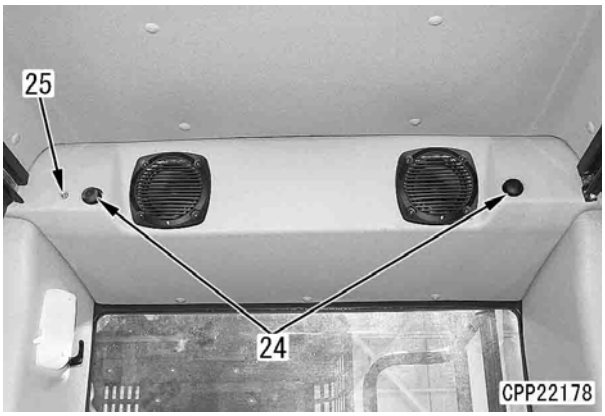
   2) Drill a screw hole in the threaded parts of piston rod assembly (2) and piston assembly (4).
      ★ With a drill aligned with V groove in piston assembly (4) and piston rod assembly (2), drill a hole horizontally.
      ★ The cylinder with the bottom cushion must not be machined in the cap machining hole position.
      - Drilling dimensions (mm):

Tap drill hole diameter	10.3
Depth for drilling tap hole	27
Screw hole size	12 x 1.75
Screw hole depth	20

      ★ After tapping the screw hole, remove chips and other dirt and thoroughly clean the area.

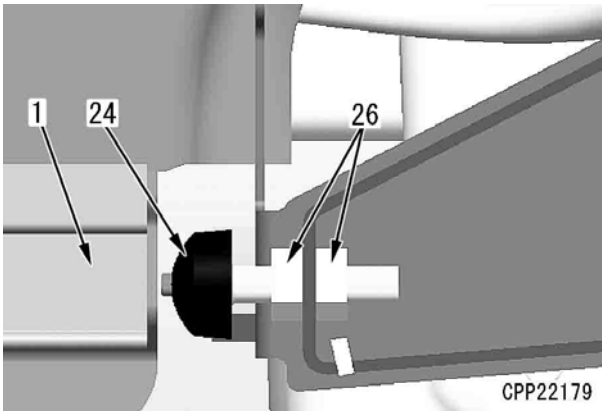


   3) Install screw (3) to lock piston assembly (4) and piston rod assembly (2).
      ★ After installing screw (3), crimp the screw (3) at 4 peripheral places (a).

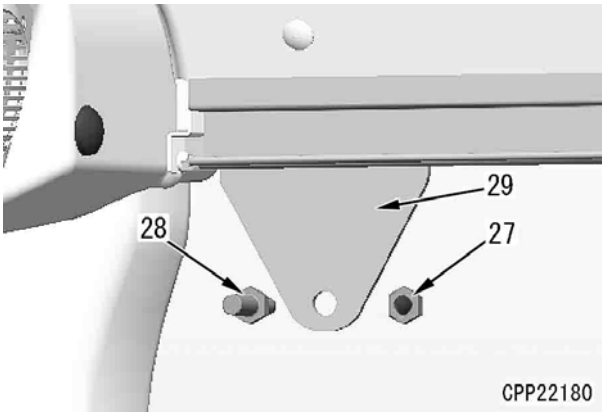


- When adjustment is needed after performing check in step 8;

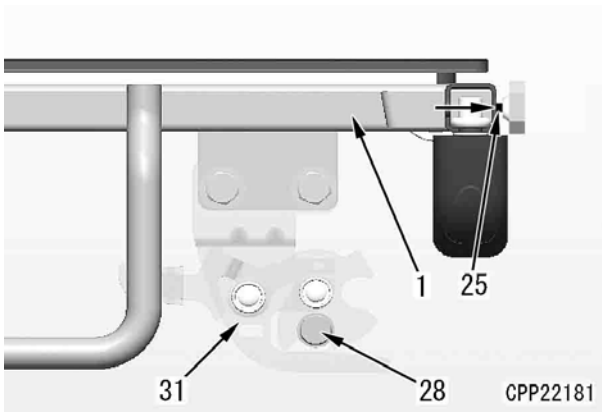
3) Close front window assembly (1).
4) Loosen locknuts (26) of right and left rubber stoppers (24) and move the stoppers backward so that front window assembly (1) does not touch the stoppers when it is locked in its "open" position.



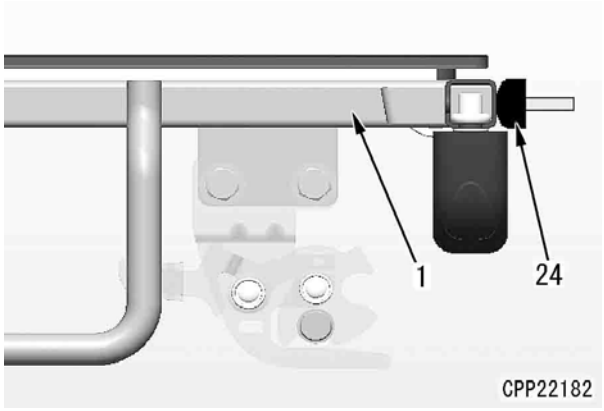
5) Loosen lock nut (27) at both sides, and adjust the position of striker bolt (28).
   - Striker bolt (28): M10
   - Diameter of hole in plate (29): 14.5 mm



- Front window assembly (1) (locked in "open" position) must be pushing the limit switch (25) backward by 4 to 7 mm.
- Working condition of lock (31).



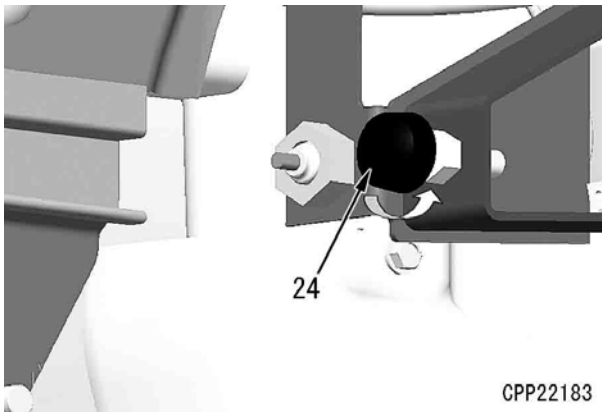
6) Adjustment of right and left rubber stoppers (24)
   - Bring right and left rubber stoppers (24) into contact with front window assembly (1) (locked in "open" position).



- Close front window assembly (1).
- Turn right and left rubber stoppers (24) to the left one and a half rotation.

★ One turn of rubber stopper (24) to the left is equivalent to squashing the rubber by approximately 1.5 mm.

★ When front window assembly (1) is locked in "open" position, front window assembly (1) must be pushing right and left rubber stoppers (24) by 1.5 to 3.0 mm.



Installation *(PC220-K710-720K00A)*

:

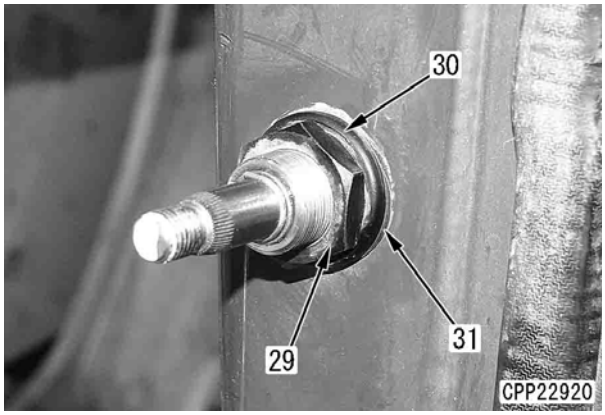
1. Install wiper motor assembly (33).

   Mounting bolt (32):
   Adhesive (LT-2)

2. Install packing (31), washer (30) and tighten nut (29) to the specified torque.

   ★ Install washer (30) with its chamfered face toward cab front.

   Nut (29):
   10.8 to 12.7 Nm {1.10 to 1.30 kgm}



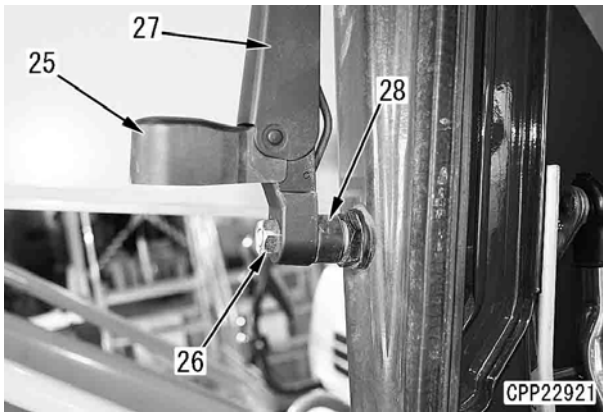
3. Install cap (28) and wiper arm (27).

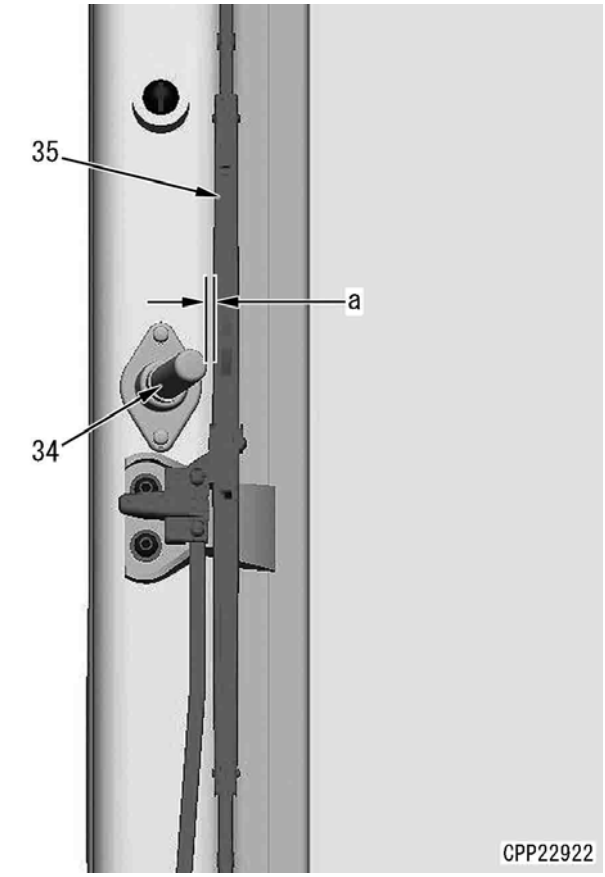
   ★ Install wiper arm (27) so that clearance "a" between washer nozzle (34) and wiper blade (35) becomes following dimension.

   • Dimension "a": 7 mm

4. Tighten nut (26) and close cap (25).

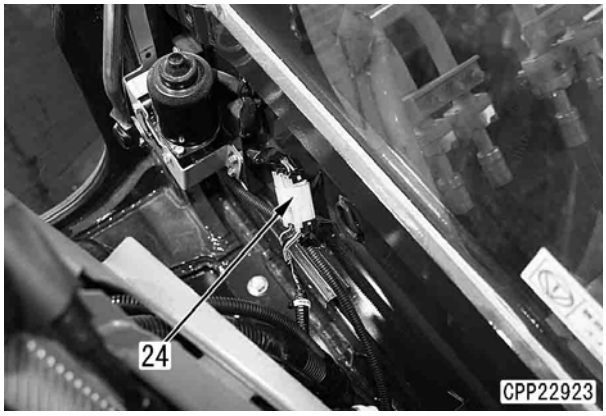
   Nut (26):
   11.8 to 15.7 Nm {1.20 to 1.60 kgm}





5. Check the operation of the wiper arm according to the following procedure.

   1) Connect connector M05 (24) and P31 (14).



Removal and installation of mass air flow and temperature sensor *(PC220-A96H-924K00A)*

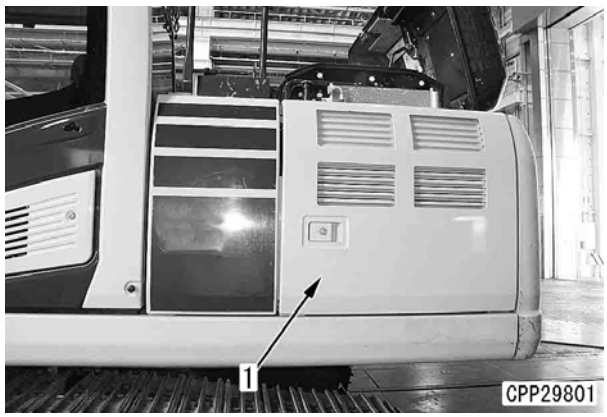
:

⚠ Turn the battery disconnect switch to the OFF position and remove the key.

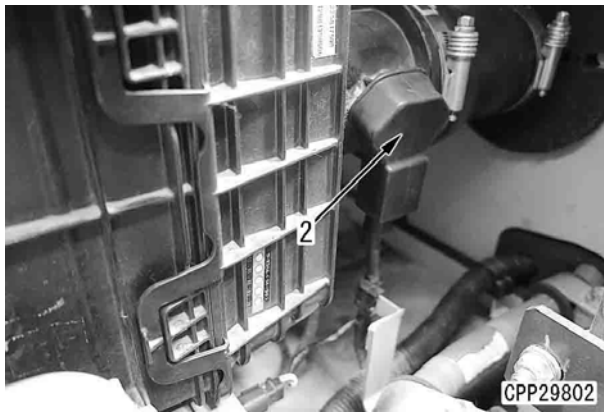
Removal *(HB205-A96H-520K01A)*

:

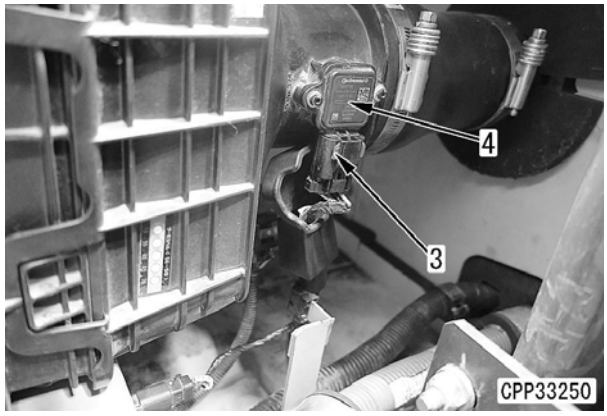
1. Open side door (1) on the left side of the machine.



2. Remove connector cover (2).

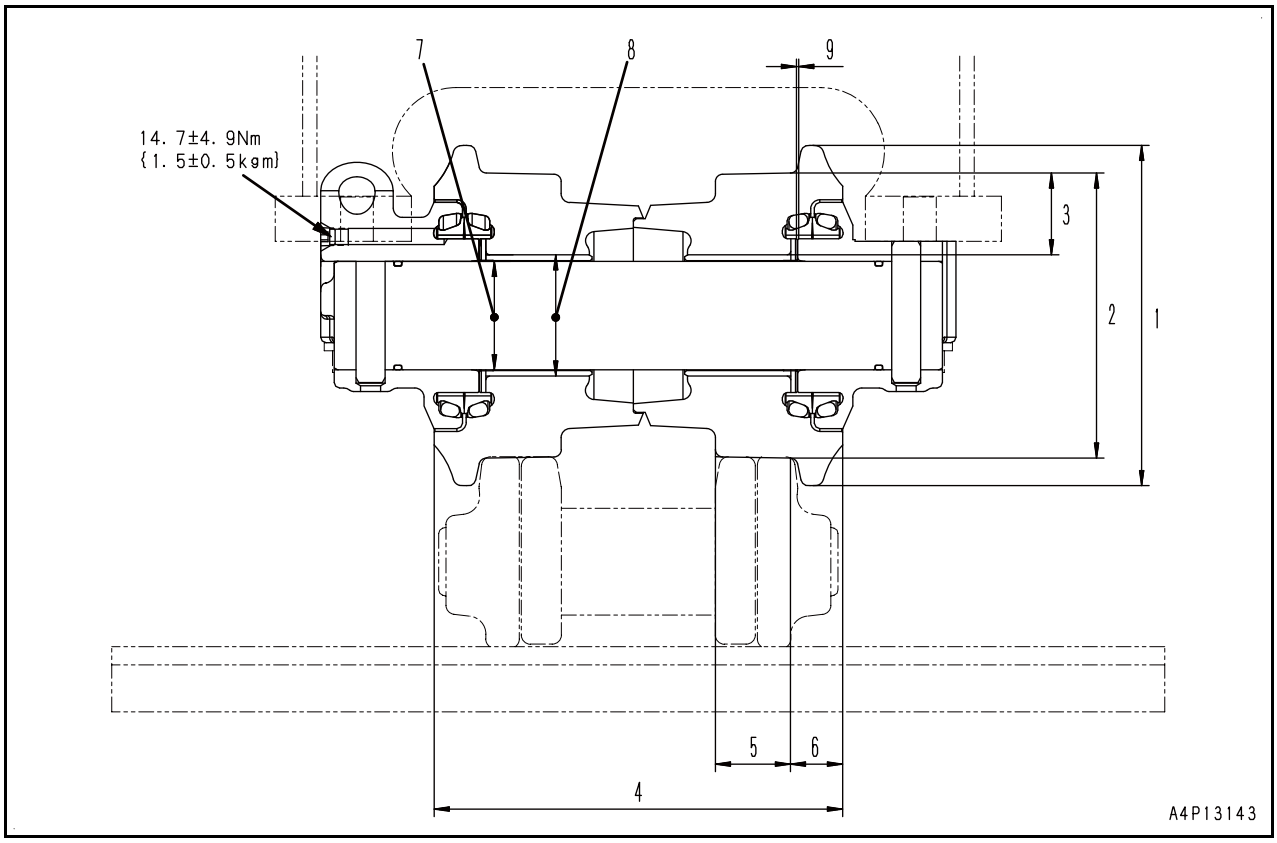


3. Disconnect connector (3).
   Connector No.(3): P55
4. Remove intake air flow/temperature sensor (4). **[*1]**
   ★ Be careful about dust from entering into air cleaner.



Track roller *(PC200_10-DTD0-034K00A)*

:

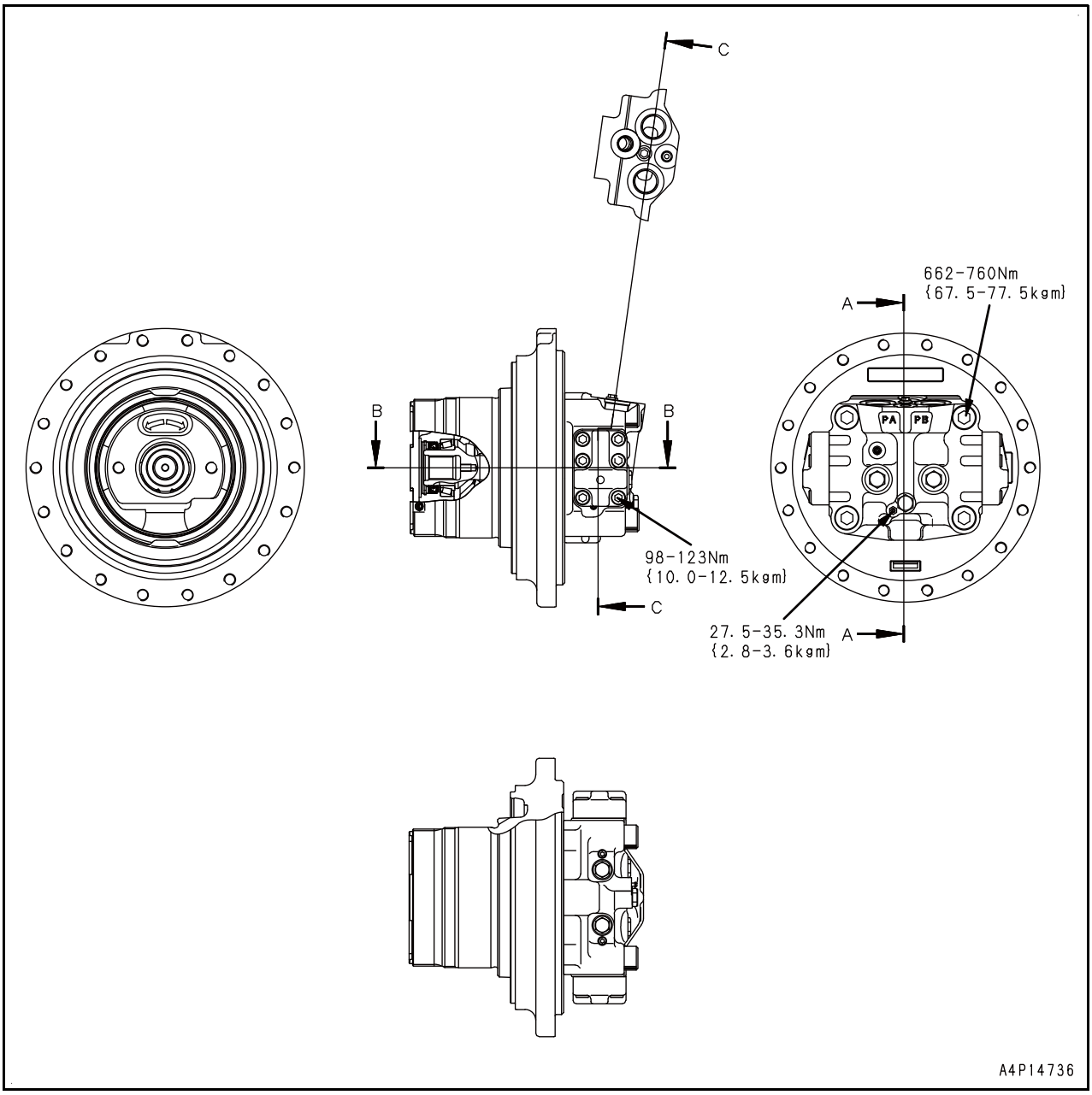


Unit:mm

No.	Item	Criteria		Remedy
1	Outside diameter of flange	Standard dimension	Repair limit	Build-up welding for rebuilding or replace
		188	-	
2	Outside diameter of tread	156	144	
3	Thickness of tread	44.5	38.5	
4	Ovevall width	225	-	
5	Width of tread	44.5	-	
6	Width of flange	25.5	-	

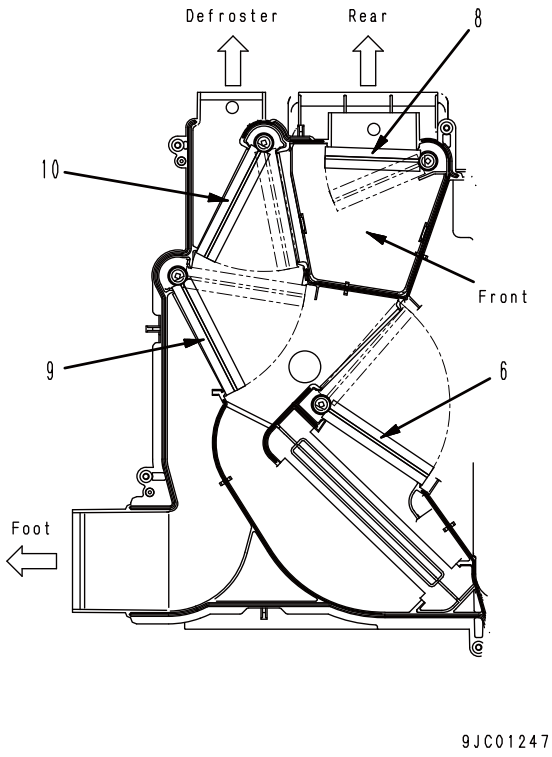
Travel motor *(HB205-C400-034K01A)*

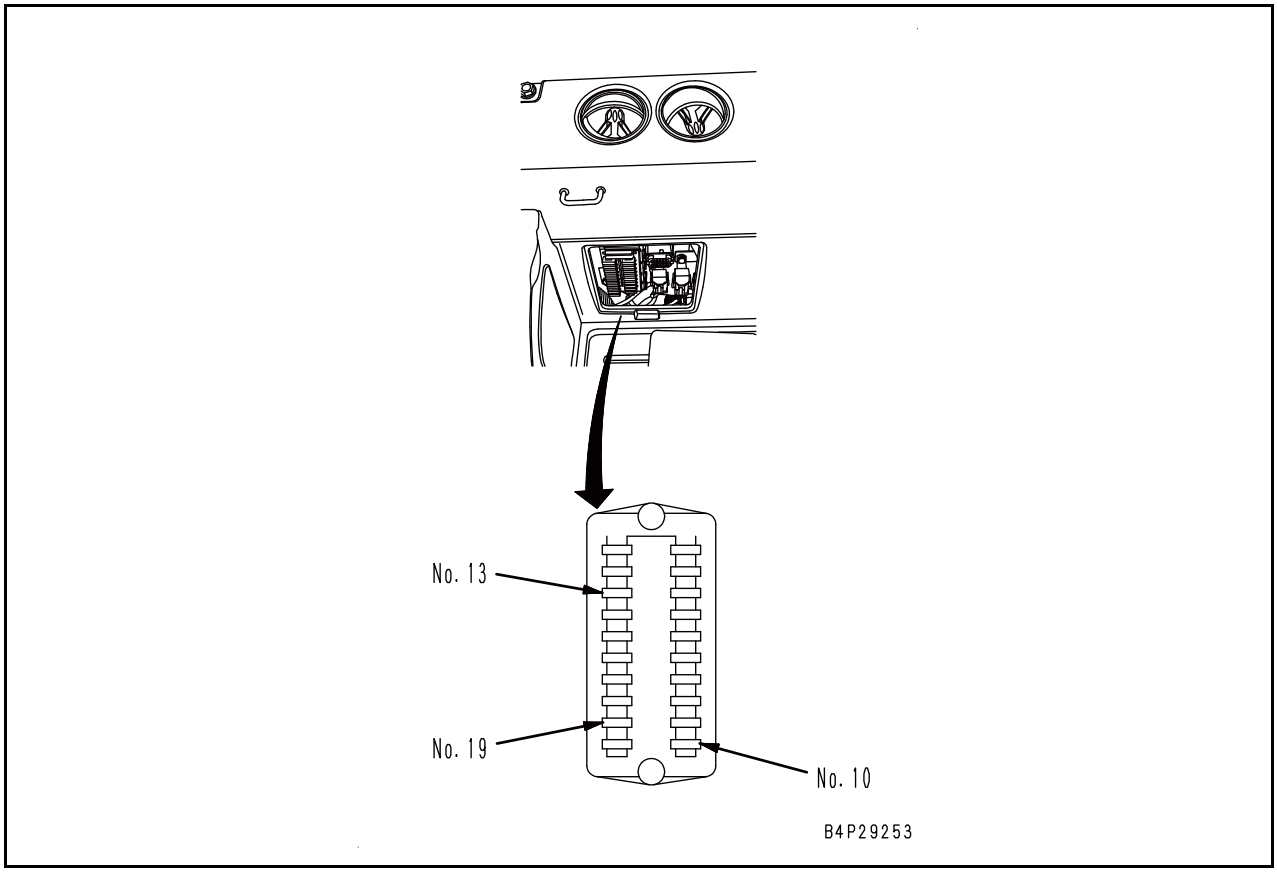
:



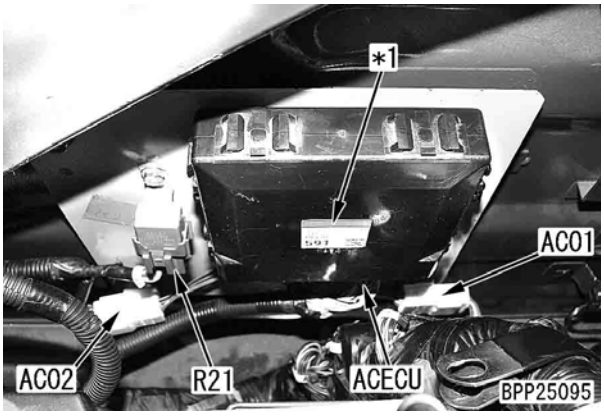
Unit: mm

No.	Item	Greasing interval	Criteria					Remedy
			Width of boss		Width of hinge		Standard clearance	
			Standard dimension	Tolerance	Standard dimension	Tolerance		
11	Joint of revolving frame and boom		625.5	0 -0.5	632	+1 -2	4.5 to 8.0	Adjust clearance to 1.0 mm or less by using shims
		(*2) 500 hours	L11: Adjust by combining shims 2.0 mm thick (2), 2.5 mm thick (1), 3.0 mm thick (1), and 3.5 mm thick (1) R11: Insert shim 2.0 mm thick (1)					
12	(*1) Joint of revolving frame and boom cylinder		96	±1.2	99.3	+1.5 0	2.1 to 6.0	Adjust clearance to 1.5 mm or less by using shims
		(*2) 500 hours	L12: Adjust by combining shims 1.0 mm thick (1) and 2.0 mm thick (2) R12: Insert shim 1.0 mm thick (1)					
13	Joint of boom and boom cylinder		695	±2.4	701	+3 –1	2.6 to 11.4	Adjust clearance to 1.5 mm or less by using shims
		(*2) 500 hours	L13-1: Adjust by combining shims 1.0 mm thick (1) and 2.0 mm thick (2) L13-2: Insert shim 1.0 mm thick (1) R13-1: Insert shim 1.0 mm thick (1) R13-2: Insert shim 1.0 mm thick (1)					
14	Joint of boom and arm cylinder		96	±1.2	99.3	+1.5 0	2.1 to 6.0	Adjust clearance to 1.5 mm or less by using shims
		(*2) 500 hours	L14: Insert shim 1.0 mm thick (1) R14: Adjust by combining shims 1.0 mm thick (1) and 2.0 mm thick (2)					
15	Joint of boom and arm		305.5	0 –0.5	310	+0.5 0	4.5 to 5.5	Adjust clearance to 1.0 mm or less by using shims
		(*2) 500 hours	L15: Insert shim 2.0 mm thick (1) R15: Adjust by using shim 2.0 mm thick (1), 2.5 mm thick (1), or 3.0 mm thick (1)					
16	Joint of arm cylinder and arm		106	±1.2	109.3	+1.5 0	2.1 to 6.0	Replace shim
		(*2) 500 hours	L16: Insert shim 1.0 mm thick (1) R16: Insert shim 1.0 mm thick (1)					
17	Joint of arm and bucket cylinder		96	±1.2	99.3	+1.5 0	2.1 to 6.0	Adjust clearance to 1.5 mm or less by using shims
		(*2) 500 hours	L17: Insert shim 1.0 mm thick (1) R17: Adjust by combining shims 1.0 mm thick (1) and 2.0 mm thick (2)					
18	Joint of link and bucket		325	±0.5	326.5	±1	0 to 3.0	-
		(*2) 500 hours	L18: - R18: -					


Defroster
Rear
8
10
Front
9
6
Foot
9JC01247



2. Air conditioner controller: *1
   - AC01: Intermediate connector
   - AC02: Intermediate connector
   - ACECU: Air conditioner controller connector
   - R21: Air conditioner compressor solenoid clutch relay connector



3. Air conditioner unit

   ★ [2], [5], [6], and [7] are unlabeled connectors.

   ★ Rear side of air conditioner unit (Connectors cannot be disconnected while the unit is mounted on the machine except connector [2])
   [2]: Power transistor (*2) connector
   [5]: FRESH/RECIRC air changeover servomotor connector
   [6]: Inside air temperature sensor connector
   [7]: Evaporator temperature sensor connector
   *2: Power transistor

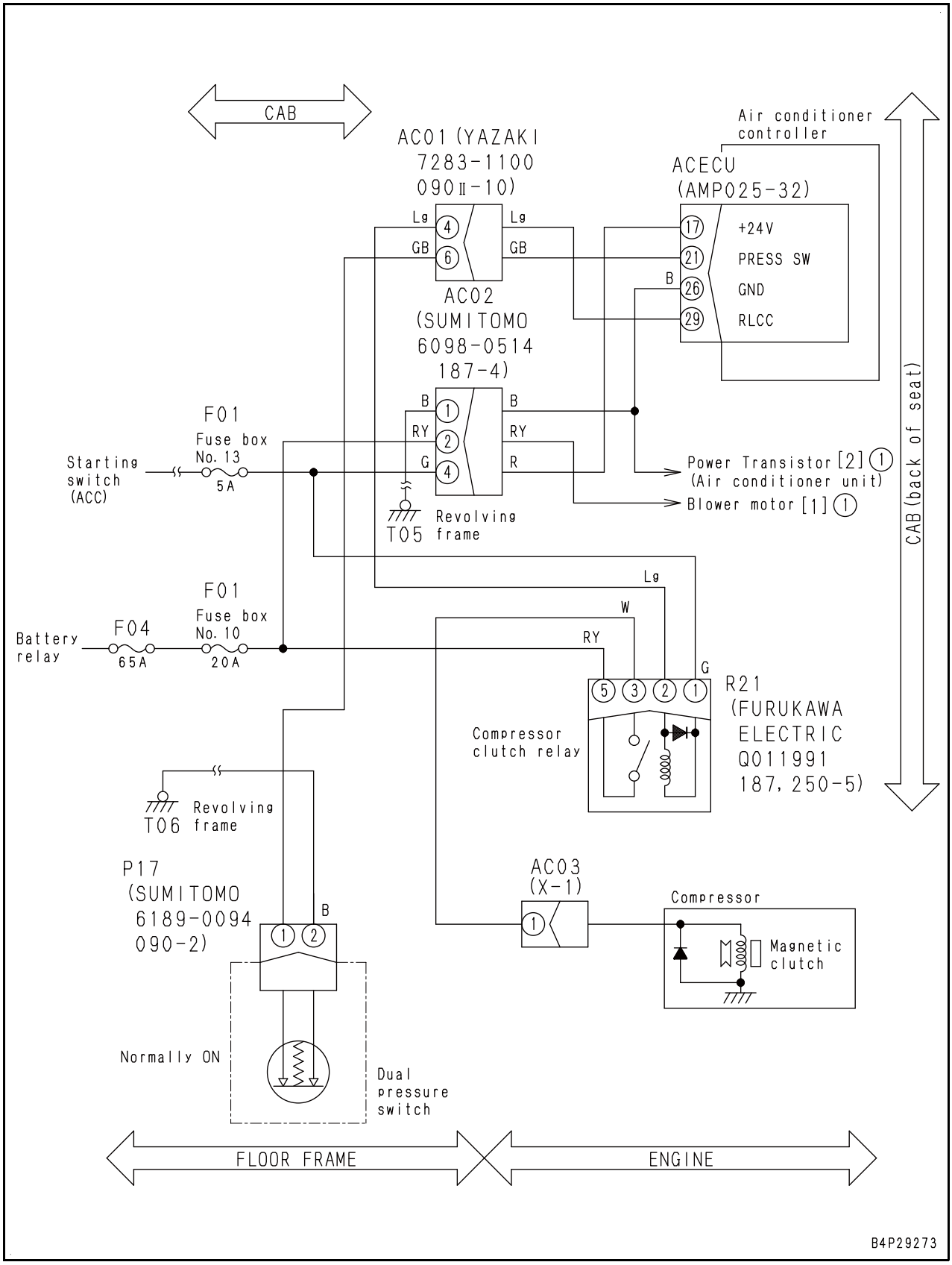
Related circuit diagram

This is the extracted circuit diagram related to failure
- Indicates connector No., and pin No.
- See "Circuit diagram and arrangement of connector pins" and "Parts and connectors layout" for connector location
- The circuit diagram shows the size and colors of wires.
  W: White, B: Black, R: Red, G: Green, Y: Yellow, L: Blue, V: Purple, P: Pink, O: Orange, Br: Brown, Gr: Gray, Sb: Sky blue, Lg: Light green, Dg: Dark green, Ch: Dark brown

  ★ When there are two colors

  Example: WY: Yellow line on white background

  ★ The number before the wire color indicates the wire size.
- N.C.: Normally closed (Normally ON)
- [1], [2], ... are numbers of unlabeled connectors.
- The arrow (⟷) indicates their rough installation position on the machine.


CAB
AC01 (YAZAKI
7283-1100
090Ⅱ-10)
Air conditioner
controller
ACECU
(AMP025-32)
Lg
GB
4
6
Lg
GB
17
21
26
29
+24V
PRESS SW
GND
RLCC
B
AC02
(SUMITOMO
6098-0514
187-4)
B
RY
G
1
2
4
B
RY
R
F01
Fuse box
No. 13
5A
Starting
switch
(ACC)
Power Transistor [2] 1
(Air conditioner unit)
Blower motor [1] 1
T05
Revolving
frame
CAB (back of seat)
F01
Fuse box
No. 10
F04
65A
20A
Battery
relay
Lg
W
RY
G
5
3
2
1
R21
(FURUKAWA
ELECTRIC
Q011991
187, 250-5)
Compressor
clutch relay
T06
Revolving
frame
P17
(SUMITOMO
6189-0094
090-2)
B
1
2
AC03
(X-1)
Compressor
Magnetic
clutch
Normally ON
Dual
pressure
switch
FLOOR FRAME
ENGINE
B4P29273

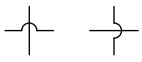
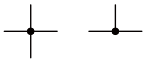
Hydraulic circuit diagram *(ALL-C000-001K90A)*

:

Symbols in hydraulic circuit diagram *(PC220-0000-007K00A)*

:

(Rev. 2013/09)

Symbols	Substances
9JC01473	Main piping line
9JC01474	Pilot or drain line
 9JC01475	Flexible pipe (hose etc.)
 9JC01476	Lines intersecting without jointing
 9JC01477	Lines jointing (junction with a black dot)
9JC01478	Direction of flow
 9JC01479	Throttle in passage
 9JC01480	Variable
 9JC01481	Electricity

Electric circuit diagram (4/7)
HB215LC-2

★ This figure covers the equipment and devices that are unavailable as optional items in some areas.