SEN05276-03

Shop Manual

HYDRAULIC
EXCAVATOR

PC800 -8E0
PC800LC -8E0
PC800SE -8E0
PC850 -8E0
PC850SE -8E0

SERIAL NUMBERS 65001 and up

ecot3

KOMATSU

How to read the shop manual

(Rev. 2010/03)

- Some attachments and optional parts in this shop manual may not be delivered to certain areas. If one of them is required, consult KOMATSU distributors.
- Materials and specifications are subject to change without notice.
- Shop manuals are divided into the "Chassis volume" and "Engine volume". For the engine unit, see the engine volume of the engine model mounted on the machine.

1. Composition of shop manual

This shop manual contains the necessary technical information for services performed in a workshop. For ease of understanding, the manual is divided into the following sections.

00. Index and foreword

This section contains the index, foreword, safety and basic information. If any revision is made, the LIST OF REVISED PAGES will be added.

01. Specification

This section explains the specifications of the machine.

10. Structure and function

This section explains the structure and function of each component. It serves not only to give an understanding for the structure of each component, but also serves as reference material for troubleshooting.

20. Standard value table

This section explains the standard values for new machine and judgement criteria for testing, adjusting, and troubleshooting. This standard value table is used to check the standard values in testing and adjusting and to judge parts in troubleshooting.

30. Testing and adjusting

This section explains measuring tools and measuring methods for testing and adjusting, as well as the adjusting method of each part. The standard values and judgment criteria for "Testing and adjusting" are explained in "Standard value table".

40. Troubleshooting

This section explains how to find out failed parts and how to repair them. The troubleshooting is divided by failure modes. The "S mode" of the troubleshooting related to the engine may be also explained in the Chassis volume and Engine volume. In this case, see the Chassis volume.

50. Disassembly and assembly

This section explains the special tools and procedures for removing, installing, disassembling, and assembling each component, as well as precautions for them. In addition, tightening torque, and quantity and weight of coating material, oil, grease, and coolant necessary for the work are also explained.

60. Maintenance standard

This section gives maintenance standard values of each component. The maintenance standard sub-section explains the criteria and remedies for disassembly and service.

80. Appendix

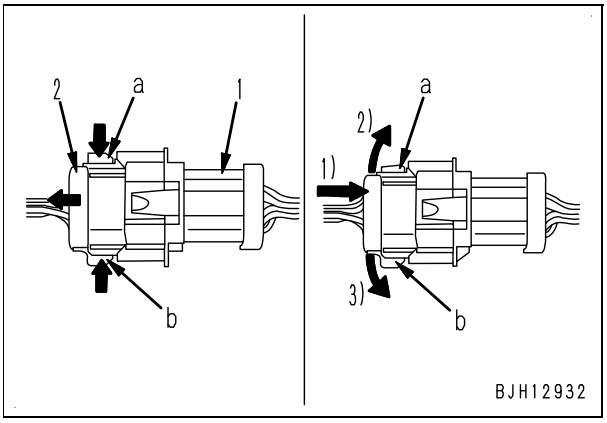
This section explains the structure, function, testing, adjusting, and troubleshooting for the equipment not classifiable in other sections.

90. Diagrams and drawings (chassis volume) /Repair and replacement of parts (engine volume)

- Chassis volume
  This section gives hydraulic circuit diagrams and electrical circuit diagrams.
- Engine volume
  This section explains the method of remanufacturing and repairing engine and replacing parts.

3) Deutsch connector (DT 8-pin, 12-pin)
   Disconnection (Left of figure)
   While pressing locks (a) and (b), pull out the female connector (2).
   Connection (Right of figure)
   1] Push in female connector (2) horizontally until the lock clicks.
      Arrow: 1)
   2] Since locks (a) and (b) may not be set completely, push in female connector (2) while moving it up and down until the locks are set normally.
      Arrow: 1), 2), 3)
      ★ Right of figure: Lock (a) is pulled down (not set completely) and lock (b) is set completely.
      (1): Male connector
      (2): Female connector
      (a), (b): Locks

- Disconnection
- Connection (Example of incomplete setting of (a))



2. **Table of tightening torque for split flanged bolts**

★ Unless otherwise specified, tighten split flanged bolts to the torque shown in the following table.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
10	14	59 – 74	6.0 – 7.5
12	17	98 – 123	10.0 – 12.5
16	22	235 – 285	23.5 – 29.5

3. **Table of tightening torque for O-ring boss piping joints**

★ Unless otherwise specified, tighten O-ring boss piping joints to the torque shown in the following table.

Nominal No.	Thread diameter	Width across flats	Tightening torque (Nm {kgm})	
	mm	mm	Range	Target
02	14	Varies depending on type of connector.	35 – 63 {3.5 – 6.5}	44 {4.5}
03, 04	20		84 – 132 {8.5 – 13.5}	103 {10.5}
05, 06	24		128 – 186 {13.0 – 19.0}	157 {16.0}
10, 12	33		363 – 480 {37.0 – 49.0}	422 {43.0}
14	42		746 – 1,010 {76.0 – 103}	883 {90.0}

4. **Table of tightening torque for O-ring boss plugs**

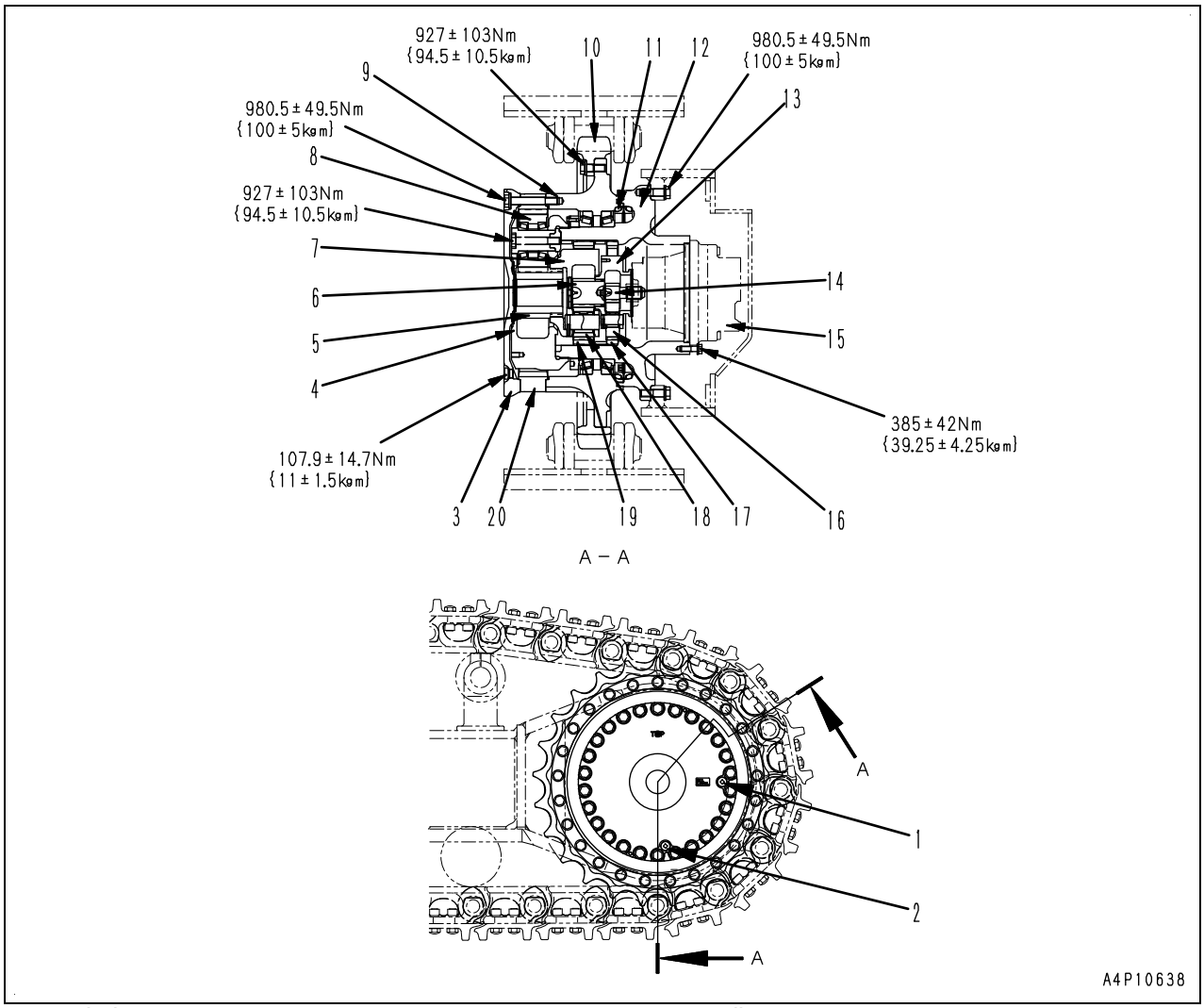
★ Unless otherwise specified, tighten O-ring boss plugs to the torque shown in the following table.

Nominal No.	Thread diameter	Width across flats	Tightening torque (Nm {kgm})	
	mm	mm	Range	Target
08	8	14	5.88 – 8.82 {0.6 – 0.9}	7.35 {0.75}
10	10	17	9.8 – 12.74 {1.0 – 1.3}	11.27 {1.15}
12	12	19	14.7 – 19.6 {1.5 – 2.0}	17.64 {1.8}
14	14	22	19.6 – 24.5 {2.0 – 2.5}	22.54 {2.3}
16	16	24	24.5 – 34.3 {2.5 – 3.5}	29.4 {3.0}
18	18	27	34.3 – 44.1 {3.5 – 4.5}	39.2 {4.0}
20	20	30	44.1 – 53.9 {4.5 – 5.5}	49.0 {5.0}
24	24	32	58.8 – 78.4 {6.0 – 8.0}	68.6 {7.0}
30	30	32	93.1 – 122.5 { 9.5 – 12.5}	107.8 {11.0}
33	33	–	107.8 – 147.0 {11.0 – 15.0}	127.4 {13.0}
36	36	36	127.4 – 176.4 {13.0 – 18.0}	151.9 {15.5}
42	42	–	181.3 – 240.1 {18.5 – 24.5}	210.7 {21.5}
52	52	–	274.4 – 367.5 {28.0 – 37.5}	323.4 {33.0}

Contents

Machine model				PC850SE-8E0		
Serial number				65001 and up		
Engine	Performance	Rated horsepower	kW/rpm {PS/rpm}	363/1,800 {493/1,800}		
		Max. torque	Nm/rpm {kgm/rpm}	2,169/1,350 {221/1,350}		
		Max. speed with no load	rpm	1,980		
		Min. speed with no load	rpm	825		
		Min. fuel consumption ratio	g/kW·h {g/PS·h}	215 {158}		
	Starting motor			24 V, 11 kW		
	Alternator			24 V, 60 A		
	Battery			12 V, 170 Ah x 2		
	Radiator type			CF68-4		
Undercarriage	Carrier roller			3 on each side		
	Track roller			8 on each side		
	Track shoe			Assembly-type double grouser, 47 on each side		
Fan system	Fan pump	Type		Variable swash plate type: LPV90		
		Operation pressure	MPa {kg/cm^2}	16.2 {165}		
	Fan motor	Type		Fixed swash plate type: LMF110		
		Set pressure	MPa {kg/cm^2}	24.5 {250}		
Hydraulic system	Hydraulic pump	Type and number of units		Main pump: Variable displacement piston type: HPV375+375 Fan pump: Variable displacement piston type: LPV90 Gear type: FBR00-2.5		
		Delivery	ℓ/min	Main pump: 494 + 494, Fan pump: 120, Gear type: 6		
		Set pressure	MPa {kg/cm^2}	Main pump: 31.4 {320}, Fan pump: 24.5 {250}		
	Control valve	Type and numbers		4-spool and 5-spool type: 1 piece		
		Operating method		Hydraulic		
	Hydraulic motor	Travel motor		MSF-340VP-EH11, Piston type (with brake valve, shaft brake): 2 pcs		
		Swing motor		KMF125AB-5, Piston type (with safety valve, shaft brake): 2 pcs		
	Hydraulic cylinder			Boom	Arm	Bucket
		Type		Double-acting piston	Double-acting piston	Double-acting piston
		Cylinder inner diameter	mm	200	185	225
		Piston rod diameter	mm	140	120	160
		Stroke	mm	1,950	1,610	1,420
		Max. distance between pins	mm	4,880	3,990	3,910
		Min. distance between pins	mm	2,930	3,380	2,490
	Hydraulic tank			Box-shaped, with breather		
	Hydraulic oil filter			Tank return side		
	Hydraulic oil cooler			Air cooled type (CF42-1)		

Final drive

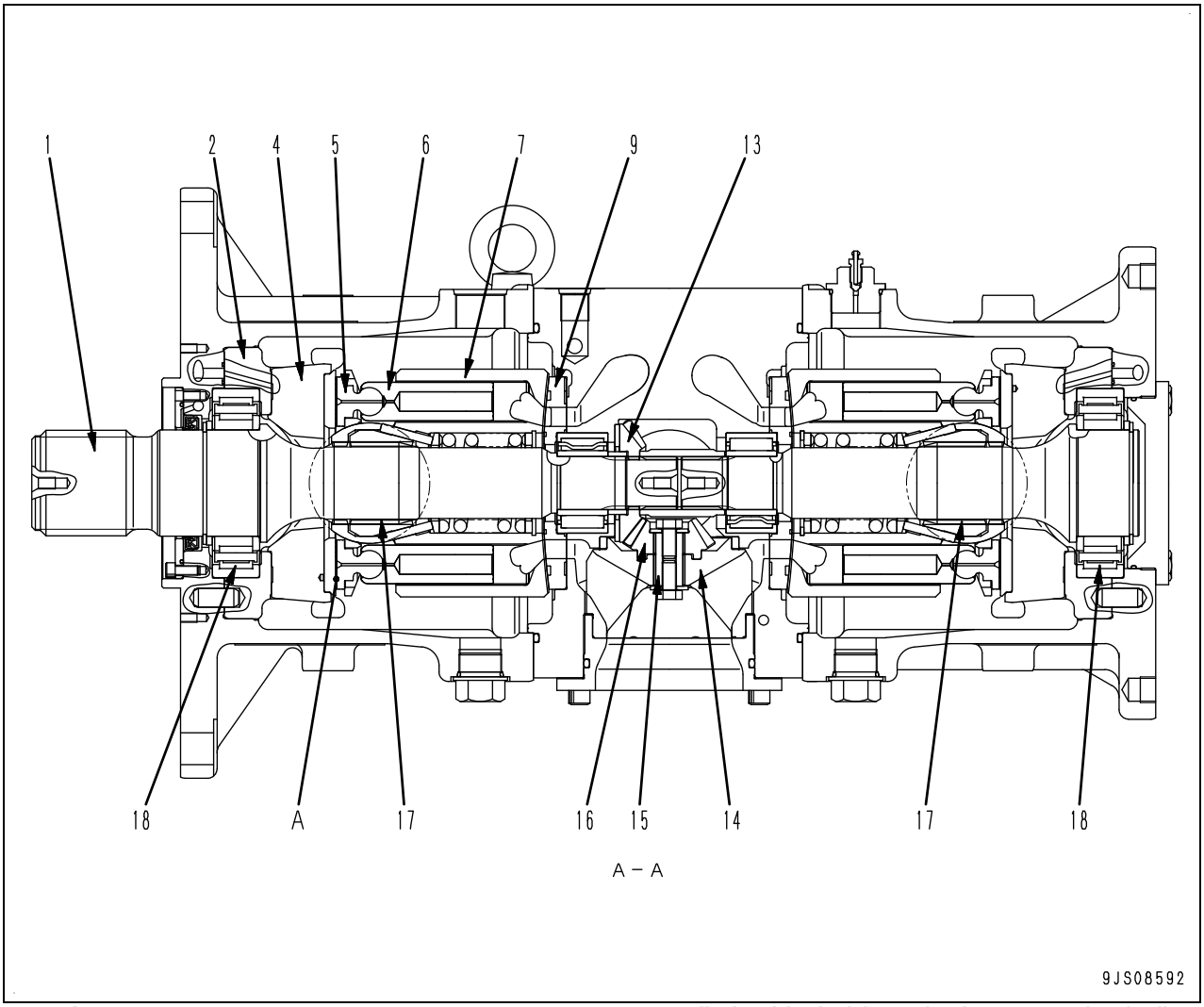


1. Level plug
2. Drain plug
3. Cover
4. No.2 planetary carrier
5. No.2 sun gear (number of teeth: 19)
6. Drive gear (number of teeth: 19)
7. No.1 planetary carrier
8. No.2 planetary gear (number of teeth: 24)
9. Hub
10. Sprocket
11. Floating seal
12. Case
13. Coupling
14. No.1 sun gear (number of teeth: 13)
15. Travel motor
16. Idler gear (number of teeth: 27)
17. No.1 ring gear (number of teeth: 68)
18. No.1 planetary gear (Number of teeth: 24)
19. Driven gear (number of teeth: 69)
20. No.2 ring gear (number of teeth: 69)

Specifications

Reduction ratio:

-((13 + 68) / 13) x ((19 + 69) / 19) x (69 / 19) = -104.802



Function

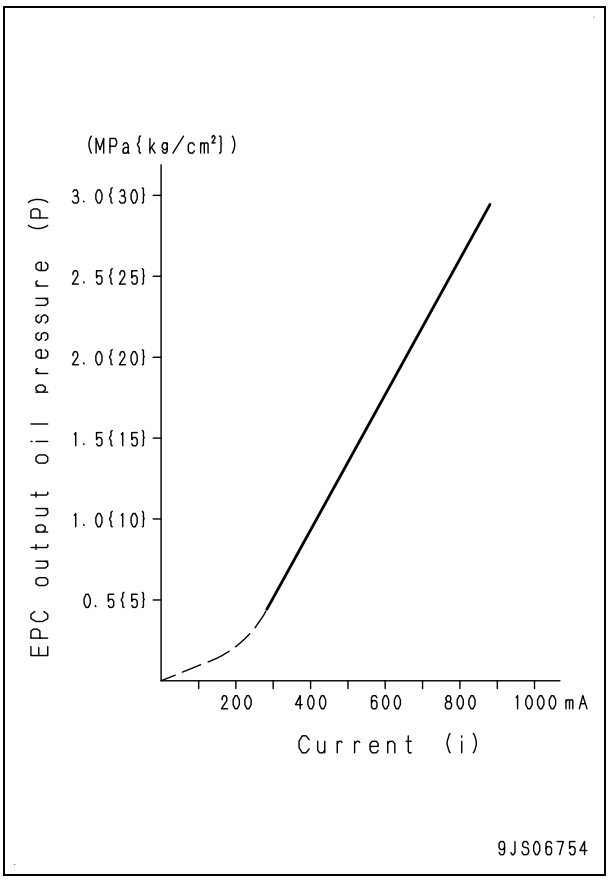
- The engine rotation and torque transmitted to the pump shaft is converted into the hydraulic energy and the pressurized oil corresponding to the load is discharged.
- It is possible to change the delivery by changing the swash plate angle.

Structure

- Cylinder block (7) is supported on front shaft (1) through spline (17).
- Shaft (1) is supported by each bearing (18) at the front and rear.
- The tip of piston (6) is shaped as a concave sphere and is crimped together with shoe (5).
- Piston (6) and shoe (5) form a spherical bearing.
- Rocker cam (4) has flat surface (A), and shoe (5) is always pressed against this surface while sliding along an elliptic orbit.
- Rocker cam (4) transmits high pressure oil to cylindrical surface with cradle (2), which is secured to the case, and forms a static pressure bearing with oil when it pivots.
- Piston (6) performs the reciprocation axially inside each cylinder chamber of cylinder block (7).
- Cylinder block (7) seals the pressurized oil to valve plate (9) and performs relative rotation.
- This surface is designed so that the oil pressure balance is maintained at a suitable level.
- The pressurized oil is sucked in and discharged from each cylinder chamber in cylinder block (7) through valve plate (9).
- Impeller pump (14) and impeller pinion (16) are integrated as a single unit by impeller shaft (15), and are connected to shaft (1) through bevel gear (13).
- As they rotate together with the shaft, the sucked pressurized oil is sent into the cylinder block (7) by centrifugal force to help suction.

Function

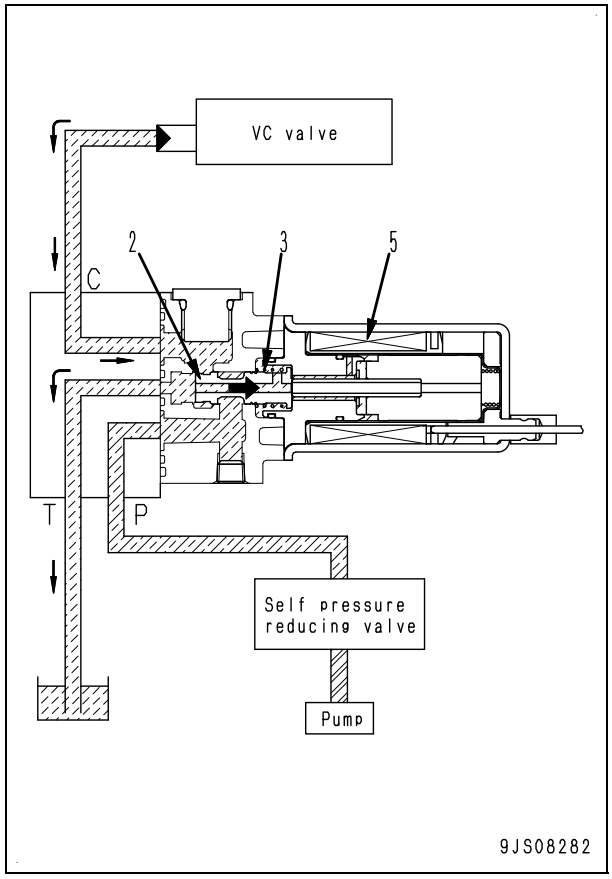
- The EPC valve consists of the proportional solenoid and the hydraulic valve.
- When signal current (i) from the controller is received, an EPC output pressure proportional to the amperage of current is generated and output to the VC valve.



Operation

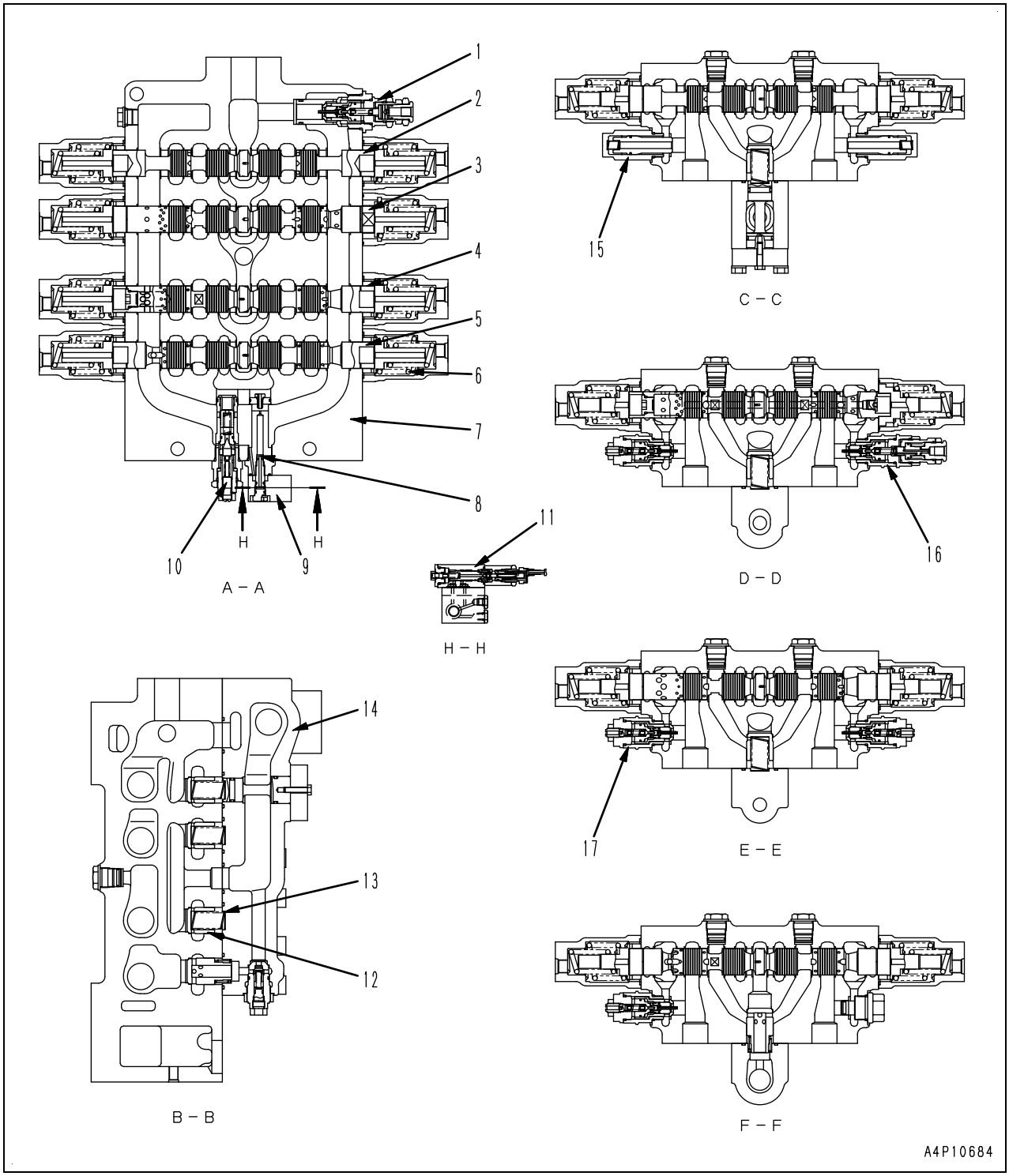
1. When signal current is 0 (coil is de-energized)

- When there is no signal current flowing from the controller to coil (5), the coil is de-energized.
- Spool (2) is pushed to the right by spring (3).
- Port (P) is closed, and the pressurized oil from the self-pressure reducing valve does not flow to the control valve.
- The pressurized oil from the VC valve flows through port (C) and then port (T), and is drained to the tank.

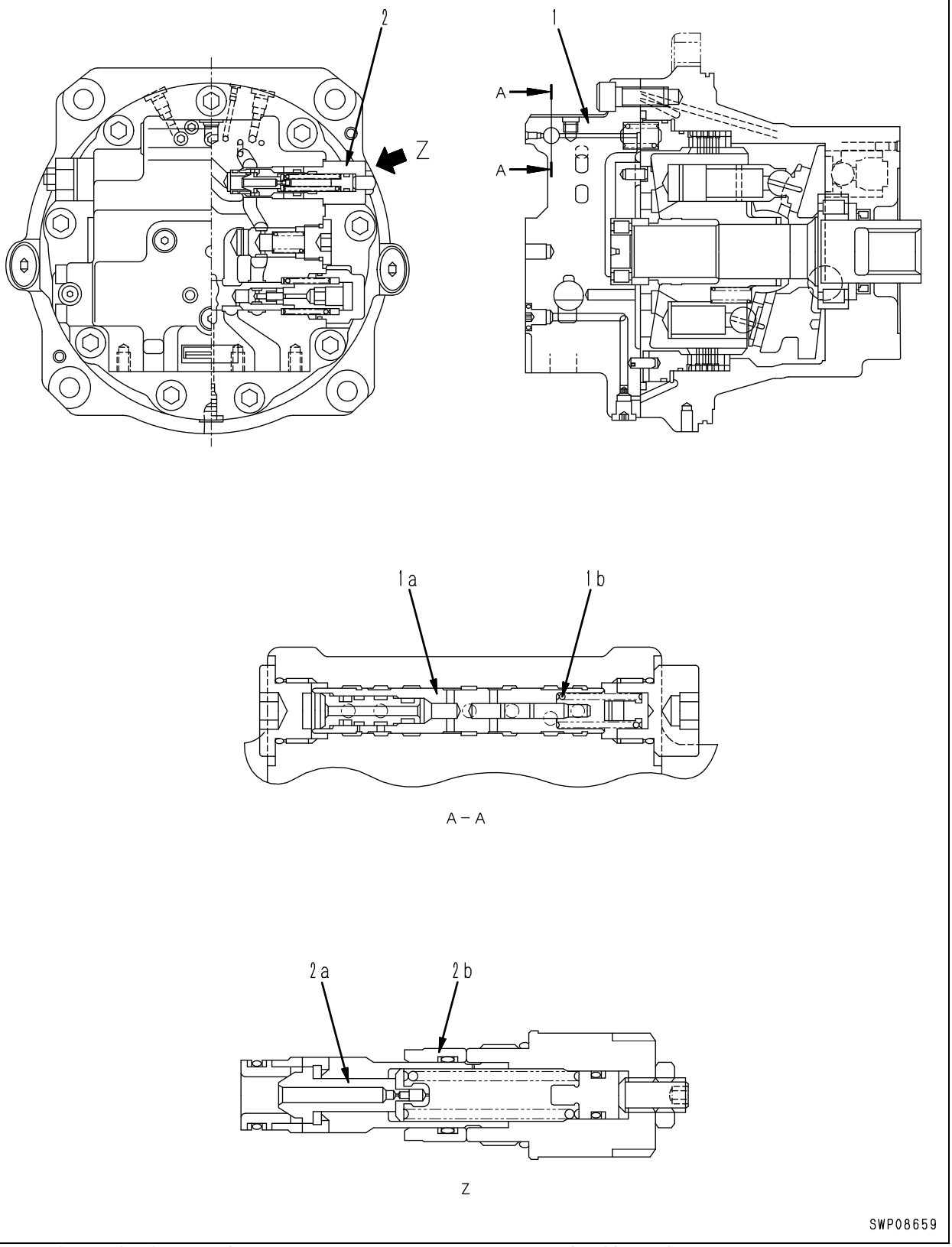


Operation

- The EPC valve output pressure enters the piston chamber and presses the piston (6). Piston (6) pushes spool (5) until it moves to a position where it is balanced with the force of spring.
- Then, the notch in spool (5) aligns with land (PE) in the servo piston pressure passage and the pump delivery pressure passage. Pump delivery pressure is transmitted to the servo piston.
- The servo piston is pushed up by the rocker cam. Then a positioning feedback is applied, and the lever moves in the direction compressing the spring.
- If spool (5) is pushed back, the pump discharge pressure passage is disconnected from the servo piston circuit. The pressure in the servo piston chamber lowers and the rocker cam returns toward the position for the maximum swash plate angle.
- These processes are repeated until the swash plate stabilizes at an angle where the EPC output pressure is balanced with the force of spring.
- Accordingly, as the EPC output pressure increases, the swash plate angle decreases. As the EPC output pressure lowers, the swash plate angle increases.

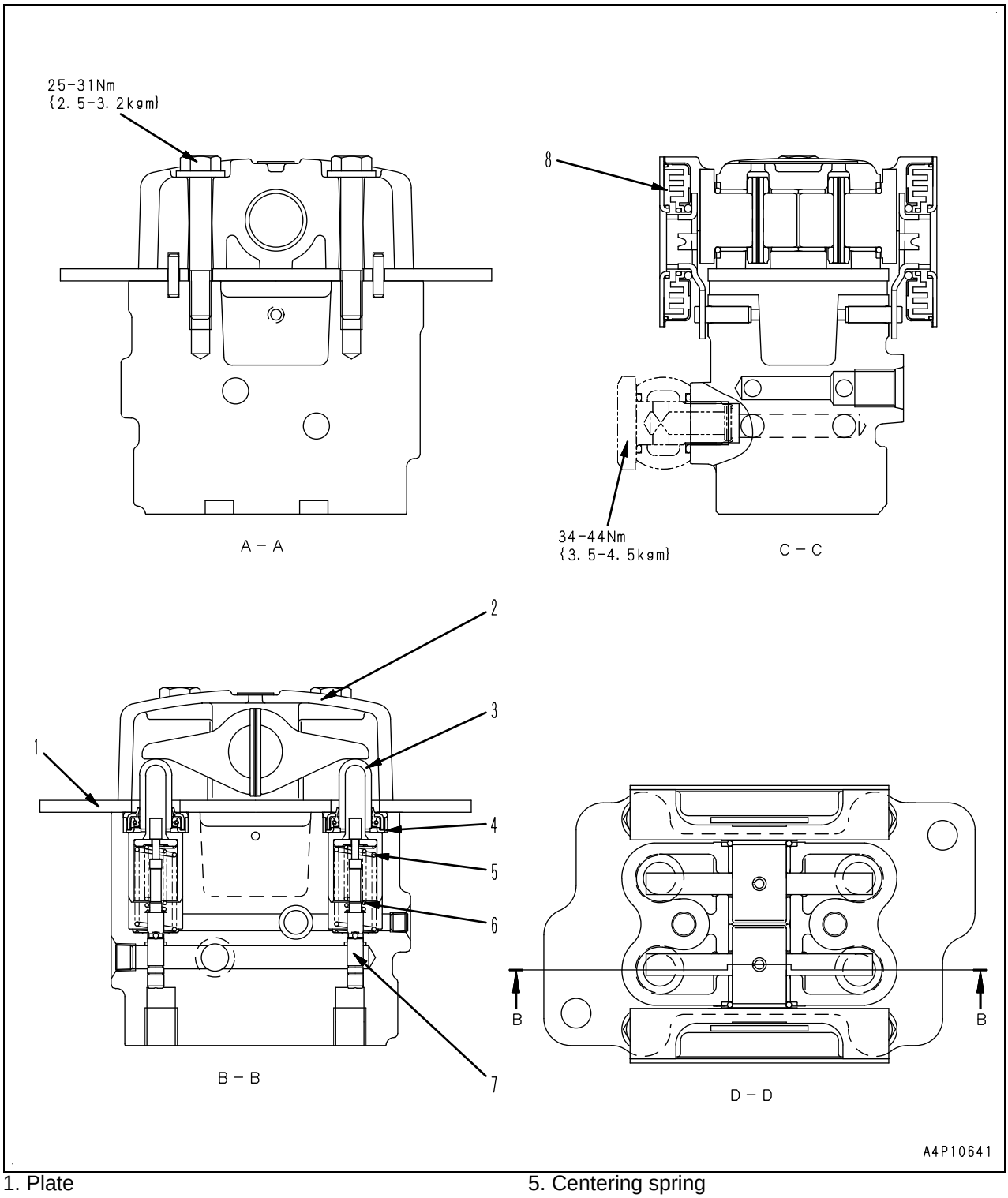

1
2
3
4
5
6
7
8
H
H
10
9
A – A
11
H – H
15
C – C
16
D – D
17
E – E
14
13
12
B – B
F – F
A4P10684

1. Travel motor, speed selector valve, and relief valve



1. Travel speed selector valve
   1a. Spool
   1b. Spring
2. Relief valve
   2a. Shockless piston
   2b. Poppet

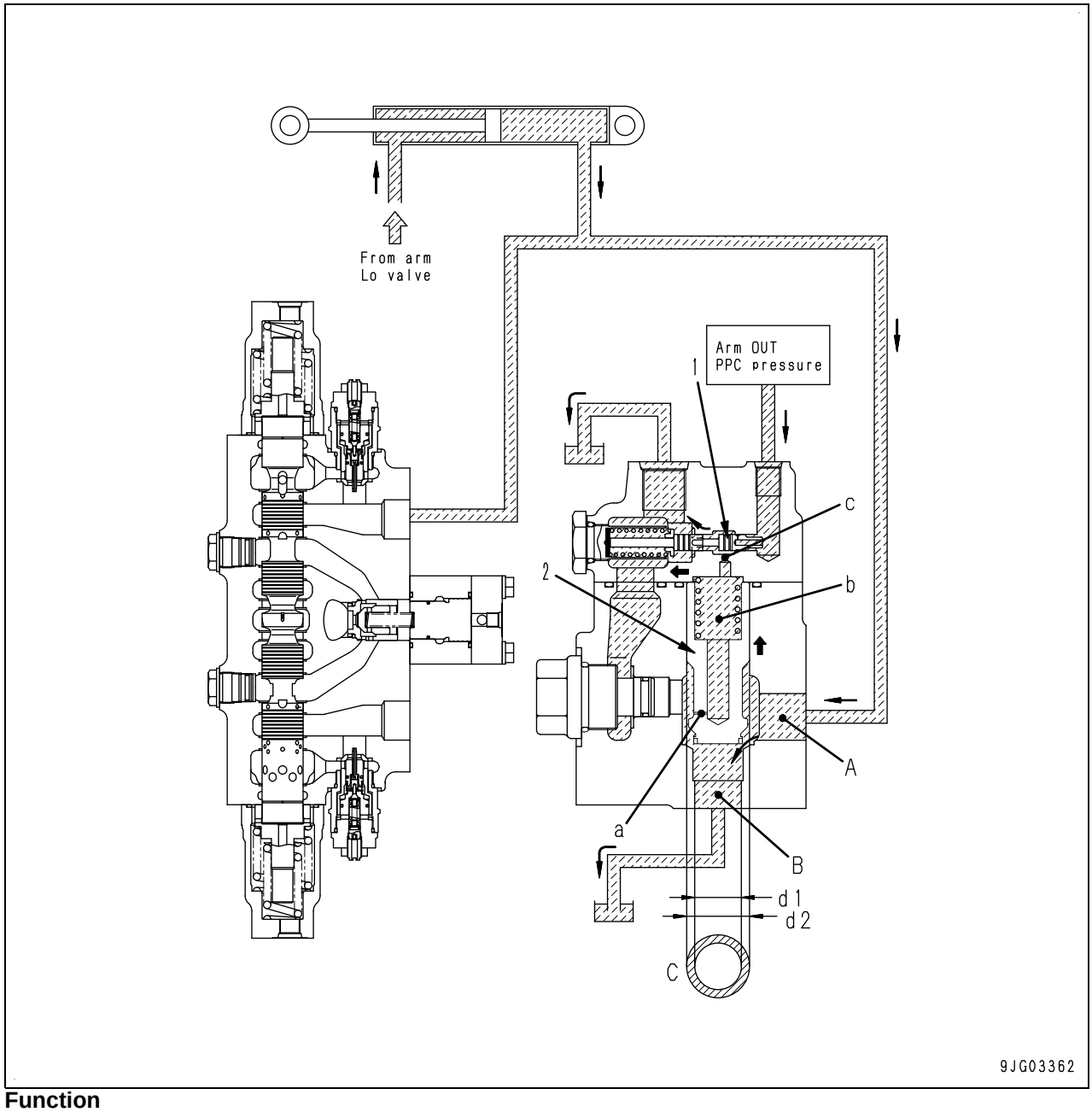
Travel PPC valve



1. Plate
2. Body
3. Piston
4. Collar
5. Centering spring
6. Metering spring
7. Valve
8. Damper

Quick return valve

1. When arm OUT is operated

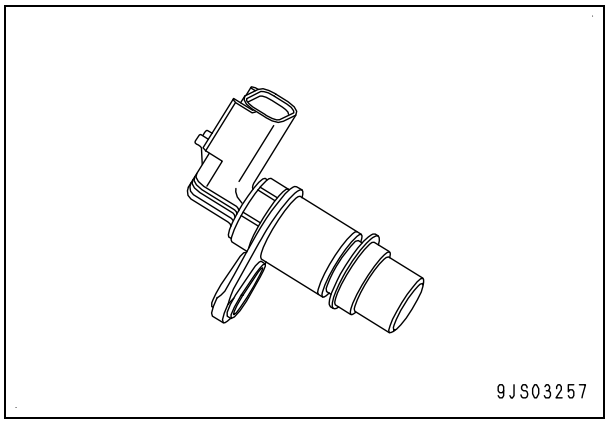


Function

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

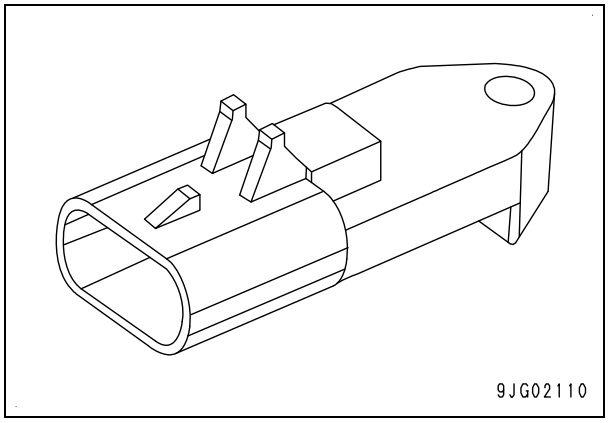
NE speed sensor (Crank angle sensor)

- If the signal hole made on the flywheel passes over the sensor, the magnetic line of force changes.
- The output voltage of the hall element sensor varies linearly in response to changes in magnetic field, however, the waveform shaping circuit built in the sensor converts the output voltage into 0-5 V pulses.

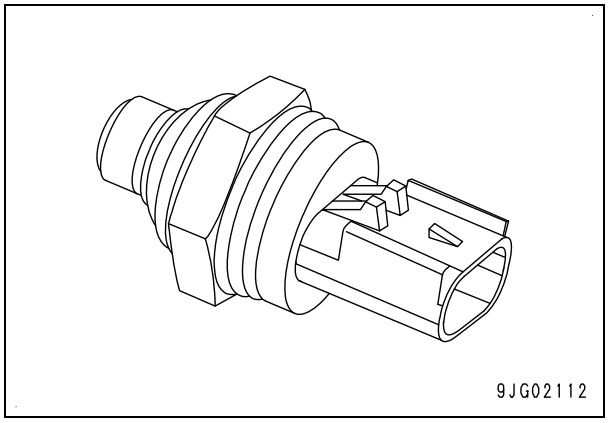


Ambient pressure sensor

- This sensor is used to correct altitude.

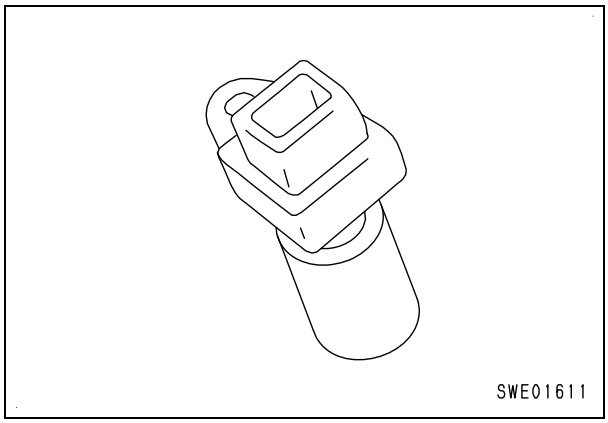


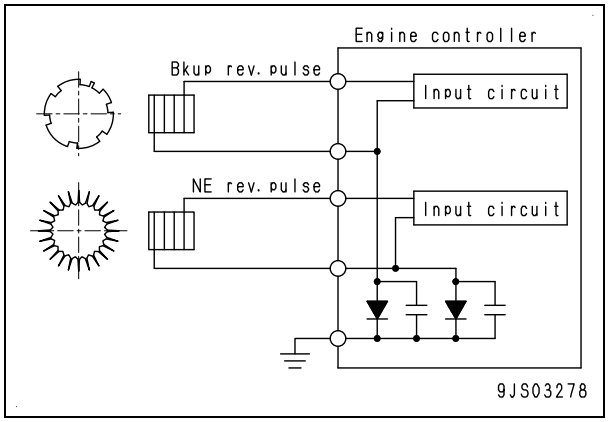
Common rail pressure sensor and oil pressure sensor



Bkup speed sensor (G sensor) (cylinder sensor)

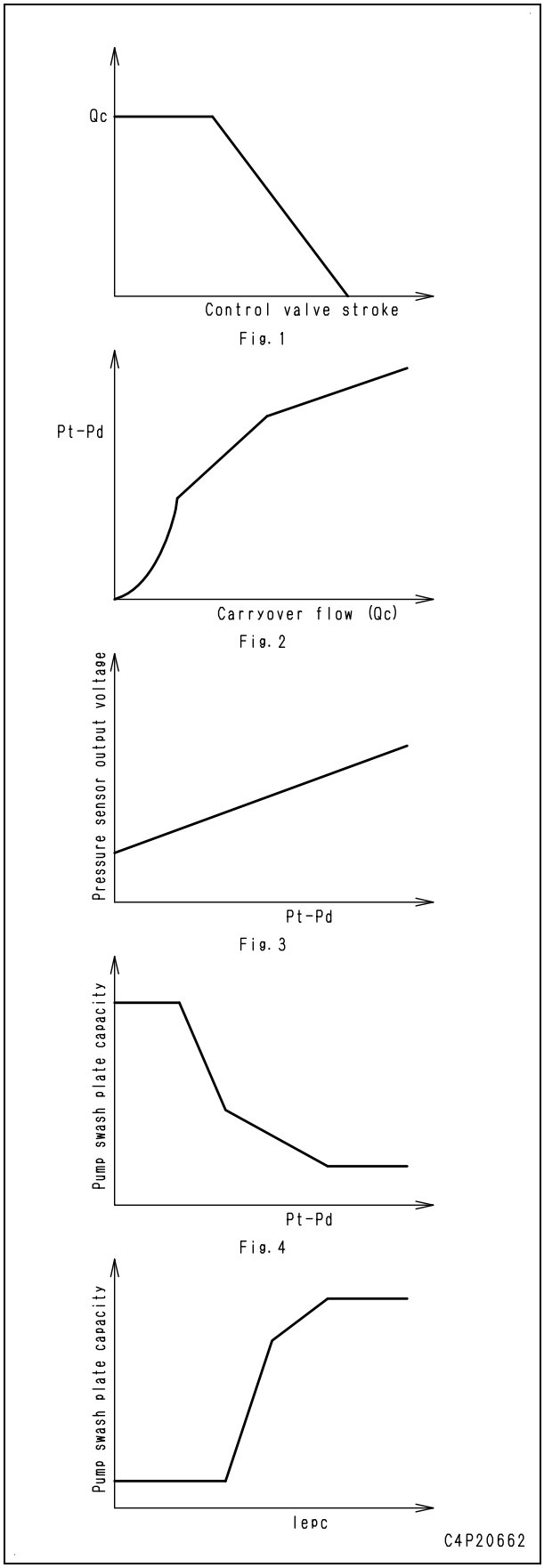
- Similar to the NE speed sensor, this sensor outputs 0 - 5 V pulses in response to magnetic field changes across the sensor.
- The disc gear installed to the central part of the camshaft of the high-pressure pump has teeth (cut parts) around it at intervals of 120 °.
- In addition to the above teeth, one more tooth is provided. Accordingly, seven pulses are generated every two rotations of the engine.
- The standard pulse of the No. 1 cylinder is recognized by the combination of the NE speed sensor pulse and Bkup speed sensor pulse.



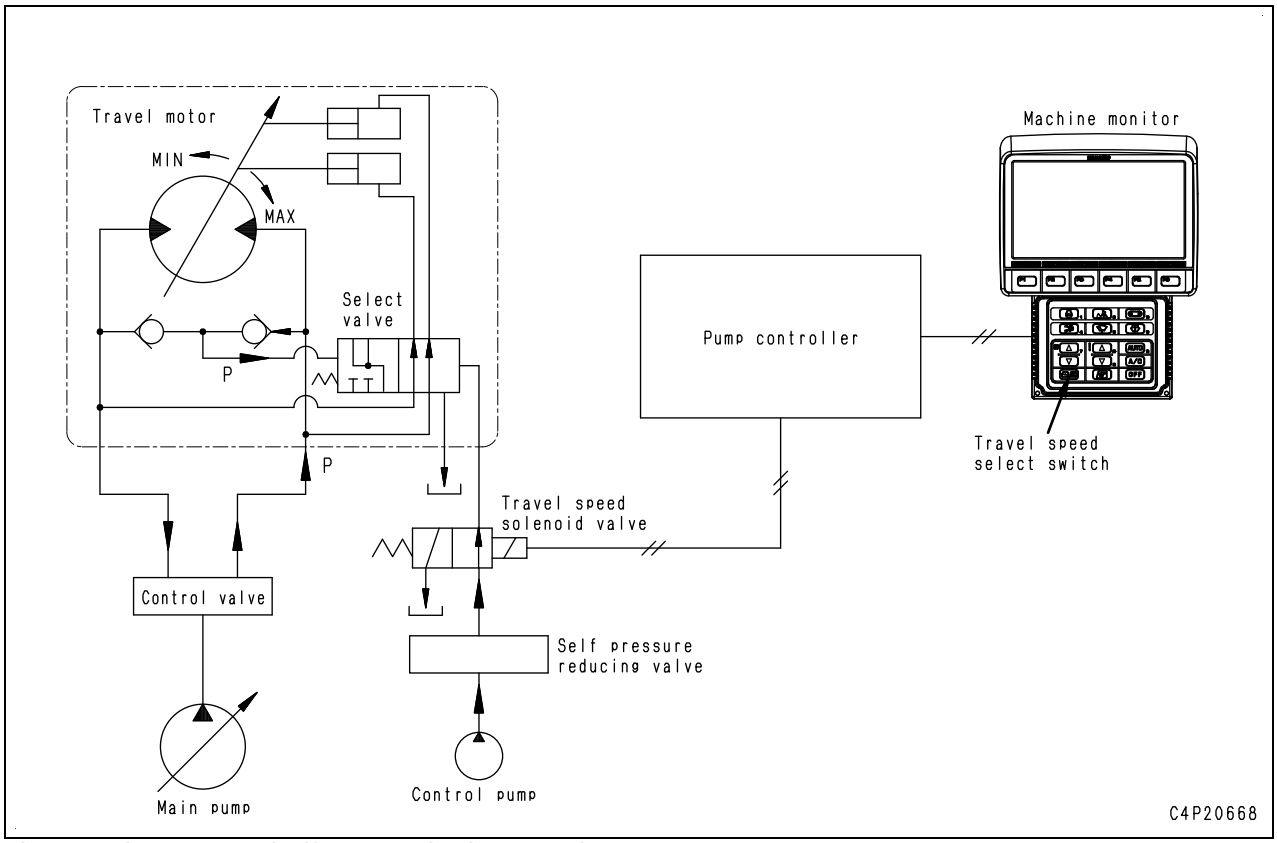


4) NC control function

- If the stoke increases during operation, the carry-over flow rate (QC) drops (see Fig. 1), and the jet sensor output pressure difference (Pt – Pd) decreases (see Fig. 2).
- The differential pressure (Pt – Pd) is applied to the differential pressure sensor and a voltage is output. The relation between the input and output signals is shown in Fig. 3. If the output pressure difference (Pt – Pd) is decreased, the output voltage increases.
- The output voltage of the differential pressure sensor is input to the controller.
- The pump capacity by the swash plate is set according to Fig. 4 and the controller supplies a current to the pump EPC valve according to the characteristics in Fig. 5.
- As the EPC output pressure (Pi) increases, the pump delivery amount grows larger.



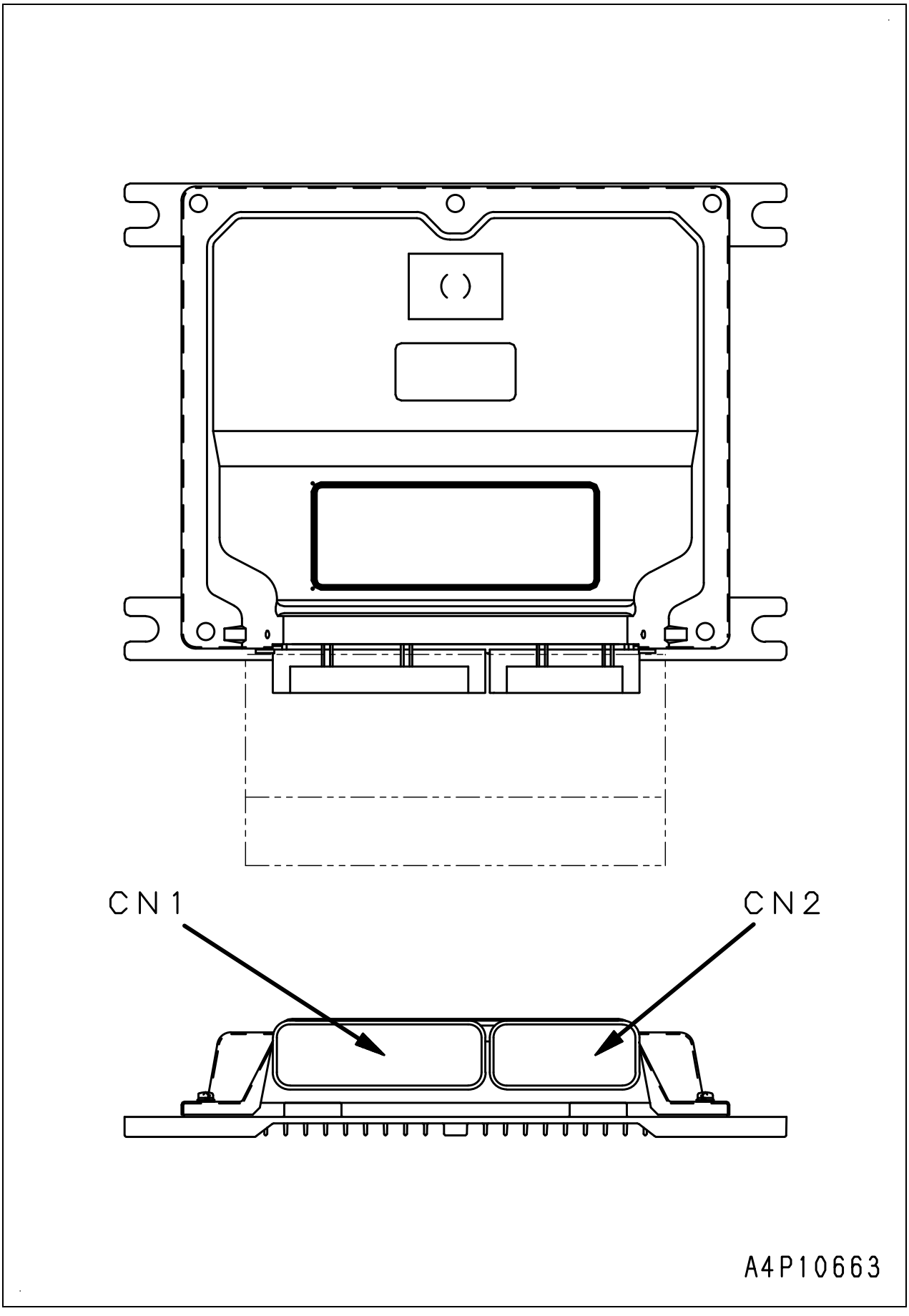
Travel speed control function

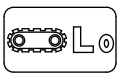
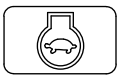
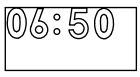


The travel pressure (self-pressure) changes the swash plate angle of travel motor and automatically shifts the speed range.

- If, during high-speed travel with the travel speed switch set to HI, the travel pressure rises to 22.6 MPa {230 kg/cm^2} or higher when travelling up a slope or the like, self-pressure will cause operation to switch to low speed travel. If travel continues in this condition and the ground again becomes level, causing the travel pressure to drop to 22.6 MPa {230 kg/cm^2} or lower, high-speed travel will be automatically restored.

Pump controller



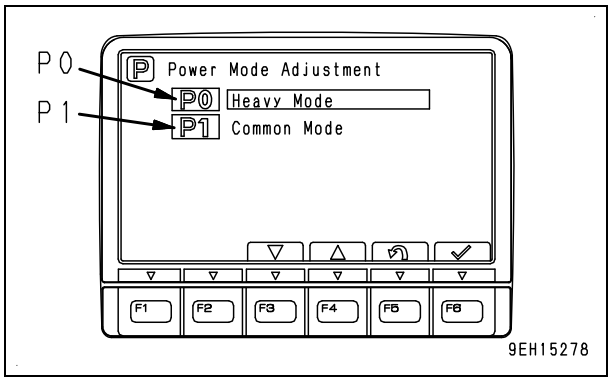
Display category	Symbol	Display item	Display range	Display method
Monitor		KOMTRAX message	Green:There is unread message. Blue:There is unreturned message.	Displays state of message (for only machine equipped with KOMTRAX).
		Air conditioner/Heater	ON ◄——► OFF	Displays operating condition.
		Wiper	——► INT ——► ON ——► OFF ——	Displays set condition.
		Working mode	P, E	Displays set mode.
		Travel speed	——► Lo ——► Mi ——► Hi ——	Displays operating condition.
		Auto-deceleration	ON ◄——► OFF	Displays operating condition.
		Auto-low idle	ON ◄——► OFF	Display operating condition.
ECO indicator		ECO indicator	Green:Work load is light-medium. Orange:Work load is heavy.	Displays average work load in 1 minute on 10 levels. (Does not display if ECO display is set OFF in service menu.)
Service meter		Service meter indicator	While service meter is working	Displays operating time. (Changes to clock if F4 is depressed.)
Clock		Clock	12-hour display ◄——► 24-hour display	Displays time. (Changes to service meter if F4 is depressed.)

C4P20675

Power mode adjustment

- To display the power mode adjustment screen, select “Power Mode Adjustment” on the user menu screen and press F6.
- By adjusting the high-load speed here, it is possible to improve the fuel consumption in P-mode.
- The following selections are available.

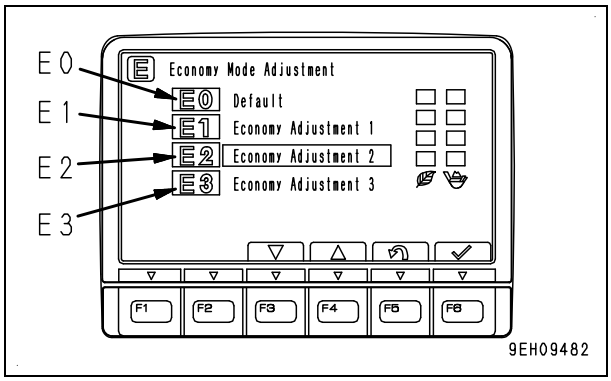
P0: Heavy Mode
P1: Common Mode



F3: Selects (highlights) an item one line down.
F4: Selects (highlights) an item one line up.
F5: Cancels the changes to return to the user menu.
F6: Confirms the changes to return to the user menu.

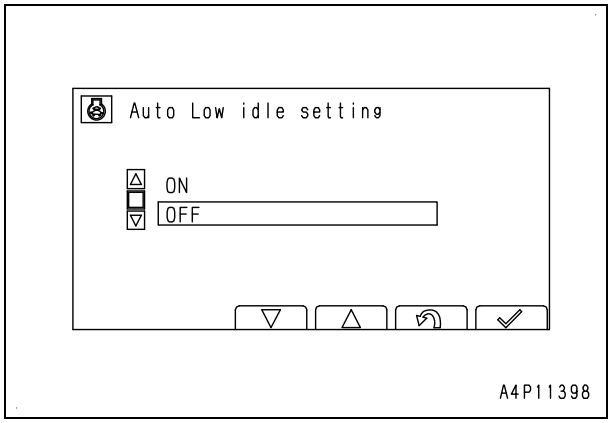
Economy mode adjustment

- Selecting the “Economy Mode Adjustment” from the user menu and pressing F6 switches to the Economy mode setting screen.
- By adjusting the high-load speed here, it is possible to improve the fuel consumption in P-mode.
- The fuel consumption level is specified to one of four levels from E0 to E3. The larger the value, the better the fuel consumption, but the smaller the work rate.



F3: Selects (highlights) an item one line down.
F4: Selects (highlights) an item one line up.
F5: Cancels the changes to return to the user menu.
F6: Confirms the changes to return to the user menu.

Auto low idle setting

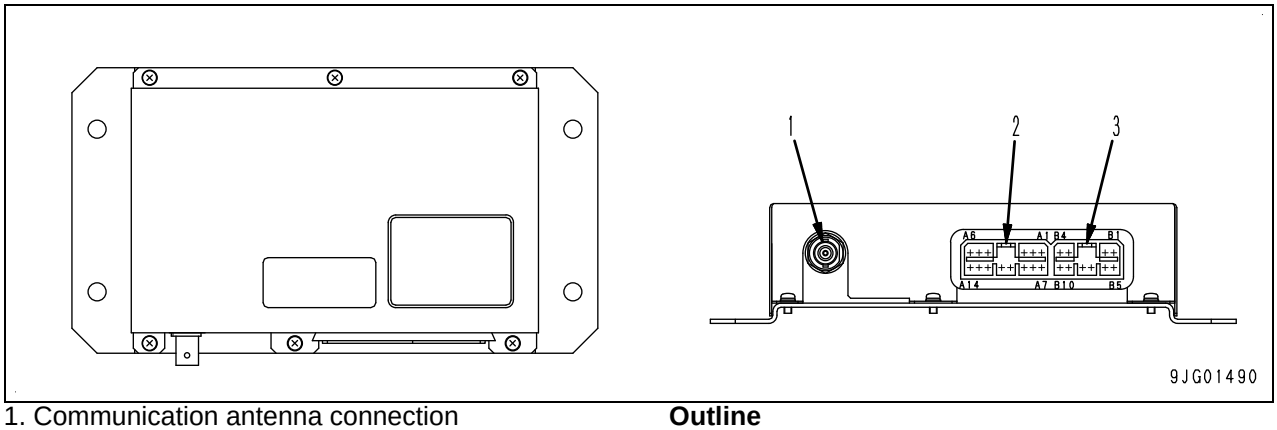


- Select “Auto Low idle setting” on the user menu screen and press F6, and the screen changes to the Auto low idle setting screen.
- In this menu, you can specify the auto-deceleration speed or low idle speed which is selected when the auto-deceleration switch is pressed.

ON: Low idle speed
OFF: Auto-deceleration speed

KOMTRAX terminal
Model: TH300

- The KOMTRAX system uses ground communication technology.



1. Communication antenna connection
2. Machine harness connection (AMP-14P)
3. Machine harness connection (AMP-10P)

Input/output signal

AMP-14P [CN-CK01]

Pin No.	Signal name	Input/Output signal
A1	Power supply (12 V)	Input
A2	NC (*)	–
A3	NC (*)	–
A4	Power supply voltage switching	Output
A5	NC (*)	–
A6	NC (*)	–
A7	GND	–
A8	GND	–
A9	NC (*)	–
A10	NC (*)	–
A11	NC (*)	–
A12	NC (*)	–
A13	NC (*)	–
A14	NC (*)	–

*: Never connect to NC, or malfunctions or failures will occur.

AMP-10P [CN-CK02]

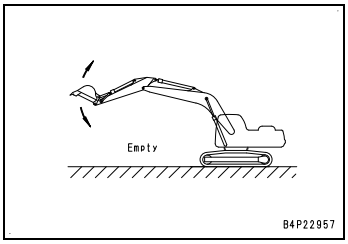
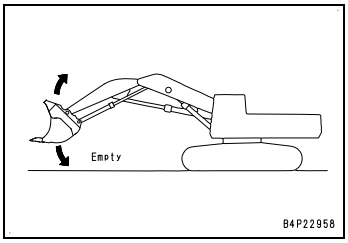
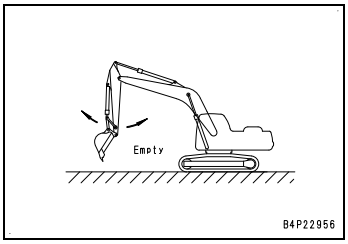
Pin No.	Signal name	Input/Output signal
B1	RS232C DCD	Output
B2	RS232C RXD	Output
B3	RS232C TXD	Input
B4	RS232C DTR	Input
B5	RS232C SGND	–
B6	RS232C DSR	Output
B7	NC (*)	Input
B8	NC (*)	Output
B9	NC (*)	Output
B10	NC (*)	–

*: Never connect to NC, or malfunctions or failures will occur.

Outline

- The terminal is a wireless communication equipment which transmits various machine information obtained by the machine monitor through network signals and input signals, as well as GPS positioning data. The terminal can transmit data via the communication antenna.
- The status of the terminal can be monitored on the machine monitor when it is in the service mode "KOMTRAX setting display".
- Use of KOMTRAX terminal must be limited for the countries in which such communication is allowed.

★ To use model TH300 out of Japan, you must sign up with a different satellite communication provider. Therefore, when operating the system out of Japan, install a KOMTRAX terminal dedicated for overseas use. Also, when operating the system out of Japan, you must give notice to the concerned authorities in that country.

Machine model					PC800, 800SE-8E0 PC850, 850SE-8E0			
Category	Item	Measurement conditions		Unit	Standard value		Repair limit	
Work equipment	Work equipment speed	Bucket Cylinder fully retracted ↑↓ Fully extracted	Working posture of backhoe  Working posture of loaking shovel  ● Hydraulic oil temperature: 45 – 55 °C ● Engine at high speed ● P mode	CURL*	sec.	Backhoe specification: PC800 3.3 ± 0.3, PC800SE 4.6 ± 0.5, PC850 3.6 ± 0.4, PC850SE 4.6 ± 0.5	PC800-8E0 Loading shovel specification: 4.3 ± 0.4	Backhoe specification: PC800 Max. 3.9, PC800SE Max. 5.6, PC850 Max. 4.4, PC850SE Max. 5.6	PC800-8E0 Loading shovel specification: Max. 5.2
				DUMP		Backhoe specification: PC800 3.2 ± 0.3, PC800SE 4.2 ± 0.4, PC850 3.4 ± 0.3, PC850SE 4.2 ± 0.4	PC800-8E0 Loading shovel specification: 4.0 ± 0.4	Backhoe specification: PC800 Max. 3.8, PC800SE Max. 5.0, PC850 Max. 6.0, PC850SE Max. 5.0	PC800-8E0 Loading shovel specification: Max. 5.0
		Bottom cylinder Cylinder fully retracted ↑↓ Fully extracted (PC800-8E0 Loading shovel specification)	Posture of work equipment:  ● Hydraulic oil temperature: 45 – 55 °C ● Engine at high speed	OPEN		–	1.6 ± 0.3	–	Max. 2.5
				CLOSE		–	1.7 ± 0.3	–	Max. 2.6

* Including cylinder cushion operating time

Testing exhaust gas temperature

★ Testing tools for exhaust gas temperature

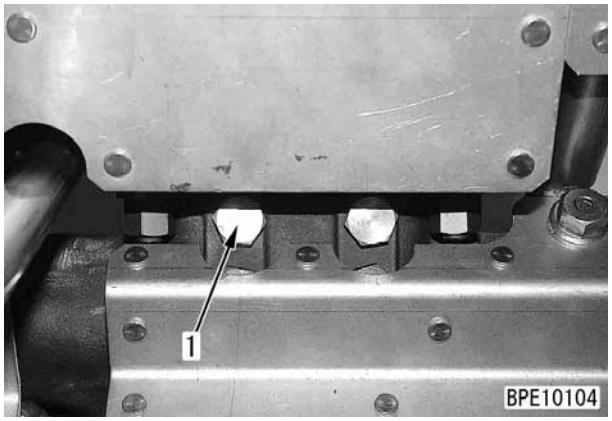
Symbol	Part number	Part name
B	799-101-1502	Digital thermometer

⚠ **Install or remove the testing tools after the exhaust manifold temperature has lowered.**

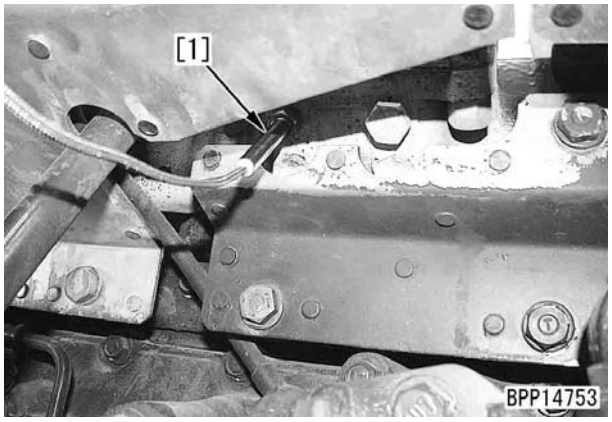
★ Measure the exhaust gas temperature under the following conditions.
- Engine coolant temperature: within operating range
- Hydraulic oil temperature: 45 - 55 °C

1. Open the engine compartment cover on the counterweight side.

2. Remove exhaust gas temperature pickup port plug (2).
   ★ You may remove either of the two plugs.

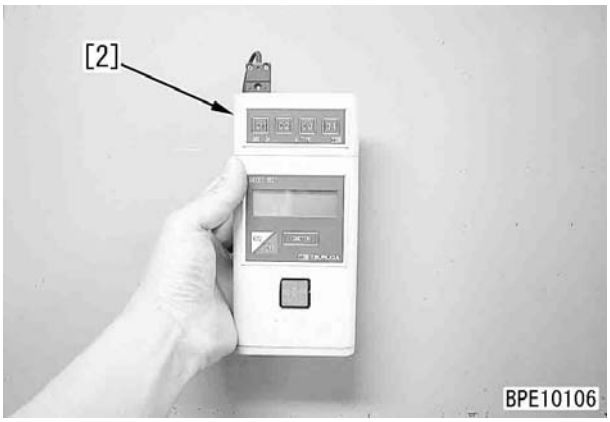


3. Install sensor [1] of digital thermometer **B** and connect it to meter [2].
   ★ Clamp the harness of the digital thermometer to prevent it from touching any hot part during measurement.



4. A procedure of measuring the maximum in troubleshooting
   Measurement of the maximum exhaust gas temperature must be done under actual working conditions.
   ★ Use the digital thermometer in the PEAK mode.

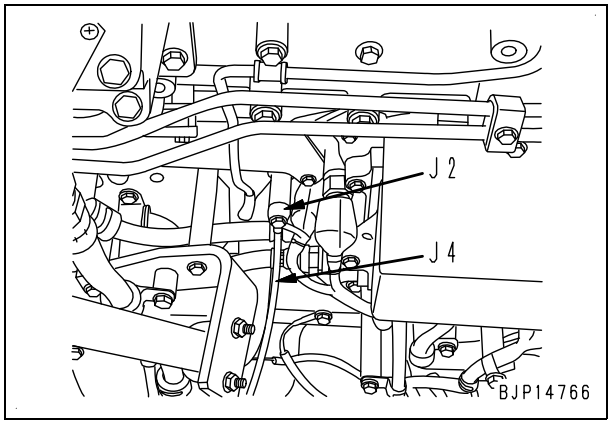
5. Procedure for testing periodically for preventive maintenance service (Pm clinic), etc.
   1) Set the working mode switch to the Power Mode (P).
   2) Set the heavy-duty lift mode switch to the ON position.
   3) Run the engine at high speed and then, relieve the boom circuit by raising the boom, and measure the exhaust gas temperature.
      ★ Measure and record the exhaust gas temperature after making sure it is stabilized.



6. After finishing test remove the testing tools and return the removed parts.
   - Clean the threaded portion of the removed plug, apply seizure prevention compound to the plug and install it again.

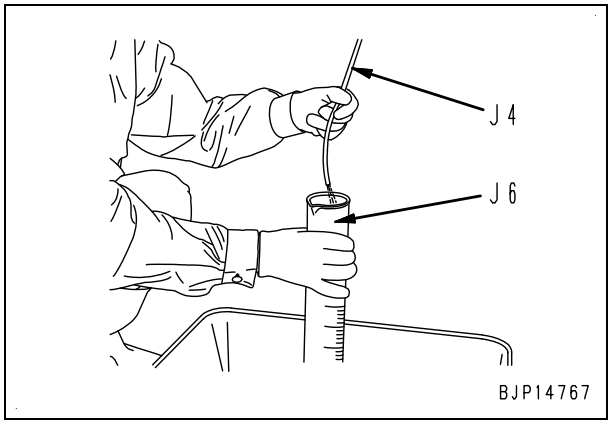
   Plug:
   Seizure prevention compound (LC-G)
   Plug:
   2.9 – 5.9 Nm {0.3 – 0.6 kgm}

3) Insert joint **J2** to common rail (1) side and tighten the currently removed joint bolt again.
   ★ Be sure to fit the gaskets to both ends of the joint.
4) Connect test hose **J4** to the end of joint **J2**.
   ★ Bind the connecting part of the test hose with a wire, etc. to prevent it from coming off.
   ★ The above is the preparation work for testing the leakage from the pressure limiter.



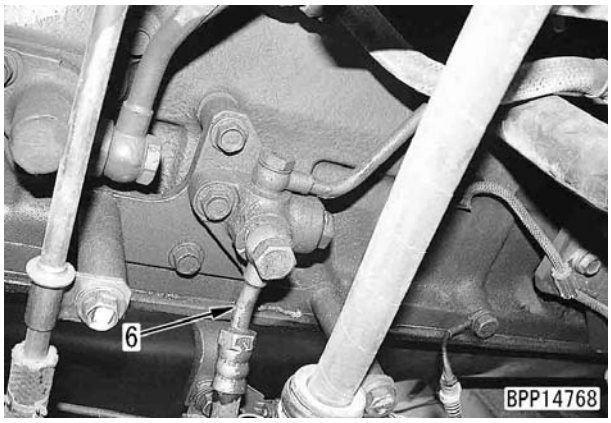
2. **Testing leakage from pressure limiter**
   1) Adjust the route of test hose **J4** so that it does not slacken and put its end in an oil container.
   2) Set the machine monitor so that it can measure the engine speed.
   3) Start the engine and keep it running at the rated load.
      (Boom RAISE relief in the Power Mode (P))
   4) After the engine speed is stabilized, test the oil leakage in 1 minute using measuring cylinder **J6**.
      ★ You may test for 20 seconds and judge by multiplying the result by 3.
      ★ If the leakage from the pressure limiter is in the following range, it is normal.

Engine speed (rpm)	Oil leakage (cc/min)
At rated output	Max. 10



   5) After finishing testing, stop the engine.

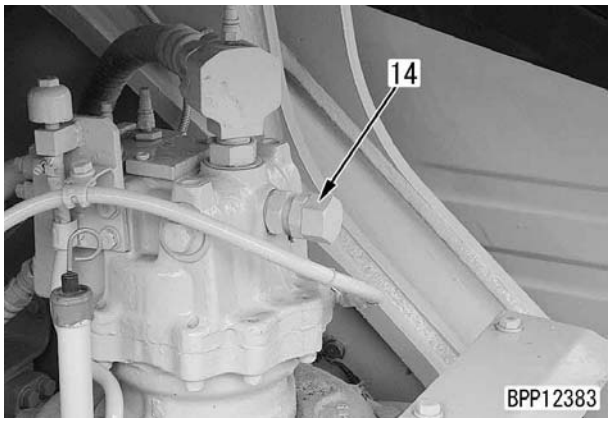
3. **Testing return rate from injector**
   ★ Keep the hose on the pressure limiter side connected and keep its end in the oil container while testing the return rate from the injector.
   1) Disconnect return hose (6) to fuel tank, install joint **J3**, and connect test hose **J5**.



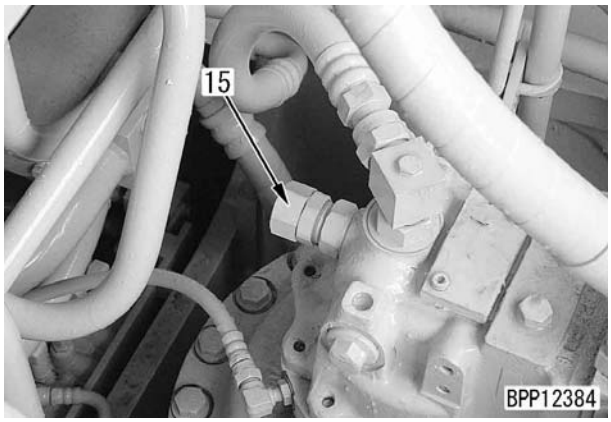
      ★ Bind the connecting part of the test hose with a wire, etc. to prevent it from coming off.

4. **Adjusting main relief valve (low-pressure setting) of R.H. 4-spool control valve**
   - ★ If the work equipment oil pressure in the rear pump circuit (during normal relief operation) is abnormal or the high-pressure setting side was adjusted, adjust the low-pressure setting side of main relief valve (13) of R.H. 4-spool control valve according to the following procedure.
   - ★ Adjust the right 4-spool control valve similarly to the left 5-spool control valve.

5. **Adjustment of swing motor safety valve**
   - ★ If the relief pressure of swing motor is abnormal, adjust safety valves (14) and (15) of swing motor according to the following procedure.
   - (14): Safety valve of front swing motor



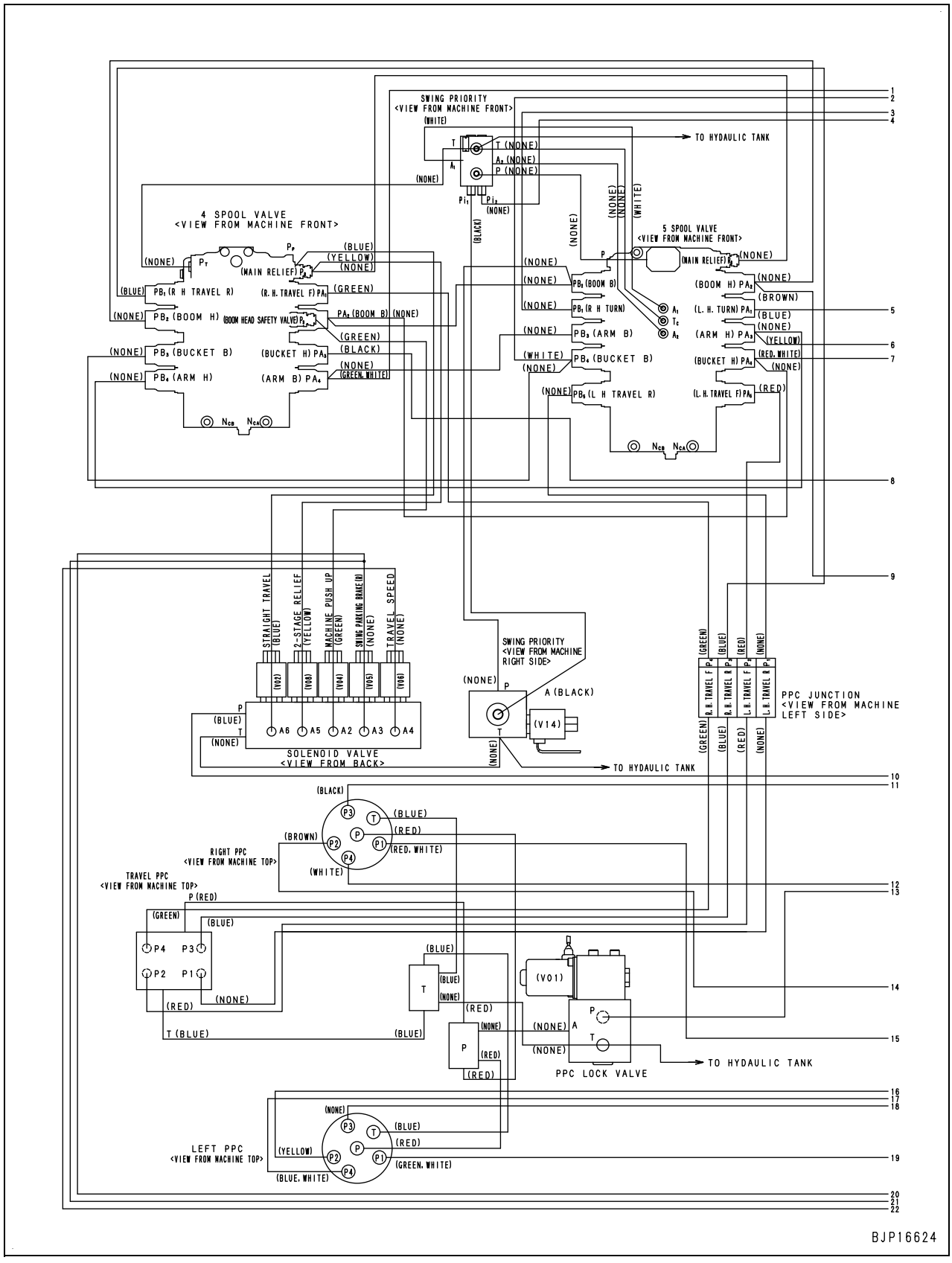
   - (15): Safety valve of rear swing motor



   - ★ Since the valves are branched to front and rear swing motors, adjust them in the following procedure.
   - ★ If swing starting force is not powerful, or if swing speed is not fast:

   1) Put match marks on the adjustment screw (16) and body for safety valves (14) and (15) of front and rear motors.
      - ★ The match marks are for returning the screw to the original position in the case where no fault is found.

Connection diagram of pilot piping (PPC and Solenoid circuit)



Measuring fan pump EPC current

★ The fan pump EPC current can be checked by using the monitoring function of the machine monitor.
(For the operating method, see "Special functions of machine monitor".)
- Monitoring code:
  31623 Fan Pump EPC Sol. Curr.
- The current is displayed in mA.

★ Measure the fan pump EPC current under the following condition.
- Hydraulic oil temperature: 45 – 55 °C

1. Start the engine and measure the EPC current while running the engine at high idle.

Upper part of machine monitor (diaplay portion)
(**a**): Multi-display
★ When the engine is started, the battery voltage may lower suddenly, depending on the ambient temperature and the condition of the battery.
In this case, the machine monitor goes off for a moment. This phenomenon is not a failure, however.

Upper part of machine monitor (switches portion)
[F1]: F1 function switch
[F2]: F2 function switch
[F3]: F3 function switch
[F4]: F4 function switch
[F5]: F5 function switch
[F6]: F6 function switch
★ The function of each function switch is indicated by a graphic in the multi-display (**a**) above the function switch.
★ If the graphic mark of a function switch is not displayed, that function switch is not working.

Lower part of machine monitor (switches portion)
[1]: Numeral 1 input switch/Auto-deceleration switch
[2]: Numeral 2 input switch/Working mode selector switch
[3]: Numeral 3 input switch/Travel speed selector switch
[4]: Numeral 4 input switch/Alarm buzzer stop switch
[5]: Numeral 5 input switch/Wiper switch
[6]: Numeral 6 input switch/Windshield washer switch
[7]: Numeral 7 input switch/Air conditioner control switch
[8]: Numeral 8 input switch/Air conditioner control switch
[9]: Numeral 9 input switch/Air conditioner control switch
[0]: Numeral 0 input switch/Air conditioner control switch
Switch having no numerals: Air conditioner control switch
★ Each switch has the function indicated by graphic mark and the function of inputting a numeral.
★ The machine monitor automatically judges which function of each switch is currently enabled according to the screen display of the multi-display panel (**a**).

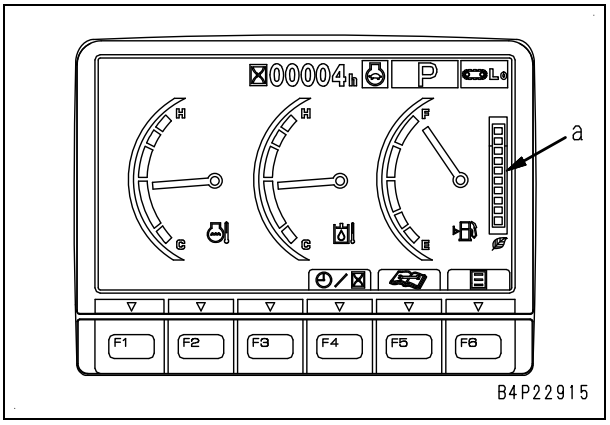
Reference
For the setup procedure after replacing the machine monitor assembly, see Service News (AT07196).

■ **Service mode**

To change the operator mode to the service mode, perform the following operation.
This operation is always required when you use the service mode.

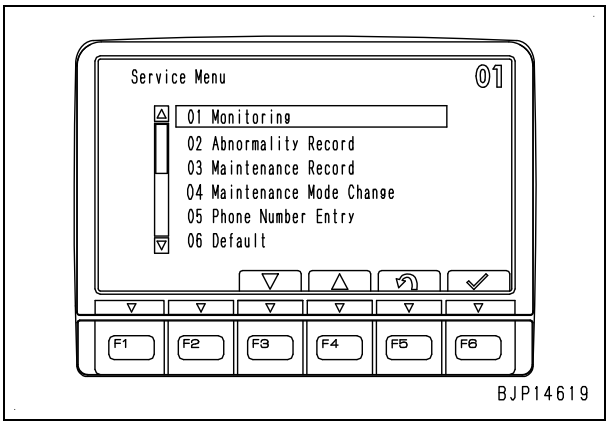
1. **Check of screen display and operation of switches**
   While the standard screen is displayed, perform the following operation with the numeral input switches.
   - Operation of switches (While pressing [4], perform the operation in order):
     [4]+[1]→[2]→[3]

   ★ This operation of the switches is accepted only while the standard screen is displayed.



2. **Selecting the service menu**
   When the "Service Menu" screen is displayed, the service mode is selected. Select a service menu you use by using the function switches or numeral input switches.
   - [F3]: Move to lower item
   - [F4]: Move to upper item
   - [F5]: Return to standard screen (operator mode)
   - [F6]: Confirm selection

   ★ You may enter a 2-digit code with the numeral input switches to select the menu of that code and confirm it with [F6].



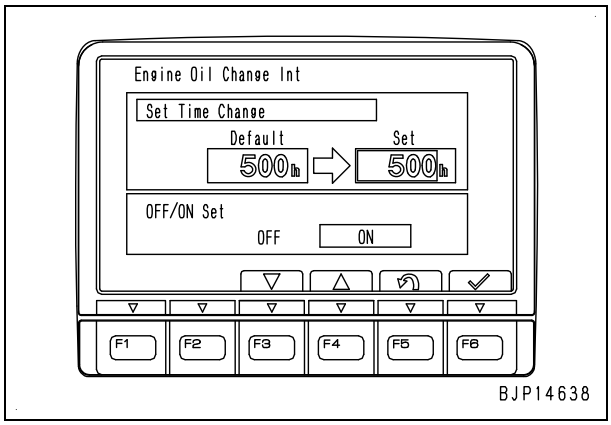
★ The items which can be selected in the service menu are as follows (including some items which need special operations).

01 Monitoring	
02 Abnormality Record	Mechanical system abnormality record
	Electrical system abnormality record
	Air-conditioning System/Heater System abnormality record
03 Maintenance Record	
04 Maintenance Mode Change	
05 Phone Number Entry	
06 Default	Key-on Mode
	Unit
	Setting of maintenance password
	Camera
	ECO Display
07 Adjustment	Pump Absorption Torque
	Fan rotation mode selection
	Fan 100% speed adjustment
	Fan 70% speed adjustment
08 Cylinder Cut-Out	
09 No Injection	
10 Fuel Consumption	
11 KOMTRAX Settings	Terminal Status
	GPS & Communication Status
	Modem S/N
12 Service message display	

4. Setting of each maintenance item
   After selecting each maintenance item, if the screen is displayed, set the item with the function switches.
   - Initial value: Maintenance interval set in machine monitor (Recommended by manufacturer and not changeable).
   - Set value: Maintenance interval which can be set freely. Maintenance functions in operator mode works according to this set time (which is increased or decreased by 50 hours).
   - ON: Maintenance reminder function of this item is enabled in operator mode.
   - OFF: Maintenance reminder function of this item is disabled in operator mode.
   - [F3]: Reduce set value (in upper column) or select OFF (in lower column).
   - [F4]: Increase set value (in upper column) or select ON (in lower column).
   - [F5]: Cancel setting before confirmation and return to “Maintenance Mode Change” screen.
   - [F6]: Confirm setting of upper or lower column

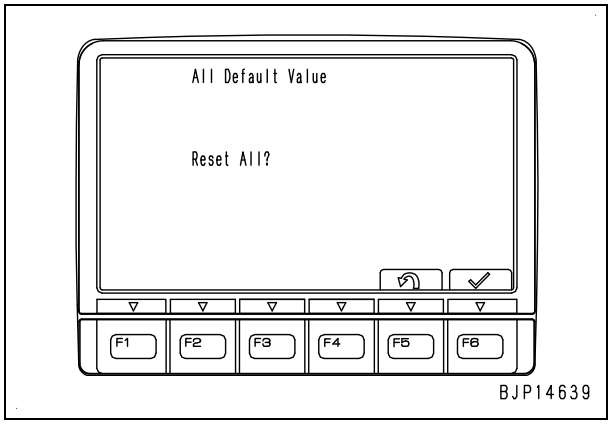
   ★ After the settings of the upper and lower columns are confirmed with [F6] and the screen changes to the Maintenance Mode Change screen with [F5], the settings are effective.

   ★ If the set value of an item of which maintenance reminder function is set to "ON" is changed after one operating hour or more from the setup, the change is recognized as a reset of the remaining time.



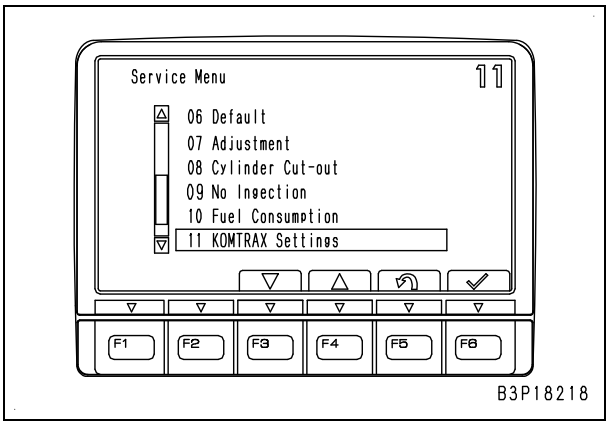
5. Function of initializing all items
   After selecting "All Default Value", if the screen is displayed, set it by using the function switches.
   - If this function is executed, the set values of all the maintenance items are initialized.
   - [F5]: Return to “Maintenance Mode Change” screen
   - [F6]: Perform initialization

   ★ A while after [F6] is pressed, the initialization completion screen is displayed. Then, return to the "Maintenance Mode Change" screen to complete the initialization.

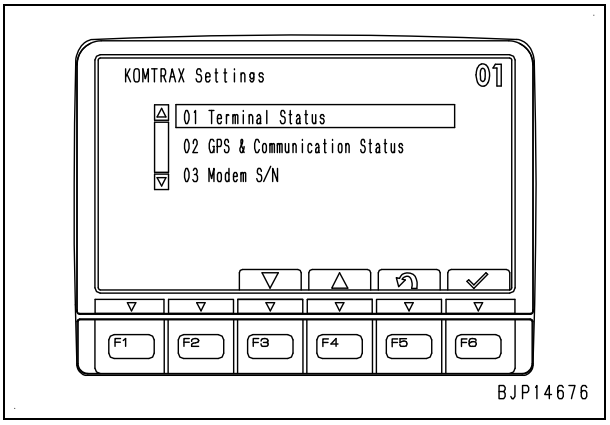


KOMTRAX Settings (Terminal Status)
The setting and operating status of KOMTRAX can be checked by using the menu of "KOMTRAX Settings".
"KOMTRAX Settings" is used to check the setting condition of the KOMTRAX terminal.

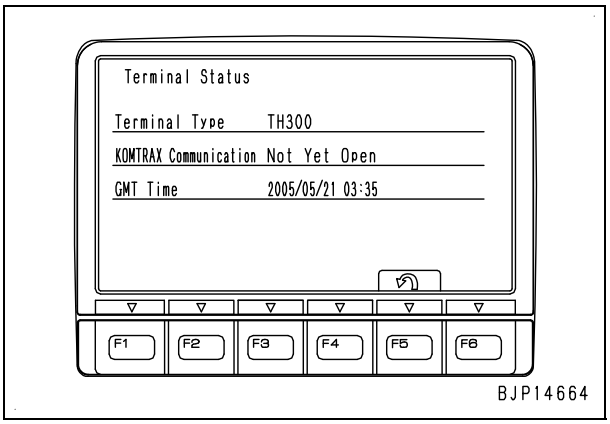
1. Selection of menu
   Select "KOMTRAX Settings" on the "Service Menu" screen.



2. Selecting sub menu
   After the "KOMTRAX Settings" screen is displayed, select "Terminal Status" by using the function switches or numeral input switches.
   ★ Select this item similarly to an item on the "Service Menu" screen.
   ★ The following figure shows the display when Model TH300 KOMTRAX is installed.
   When TH300 is installed, "03 Modem S/N" is displayed.



3. Contents displayed on Terminal Status screen
   On the "Terminal Status" screen, the following items are displayed.
   - Terminal type: Model name of KOMTRAX communication MODEM
   - KOMTRAX communication: Executing condition of station opening inspection
   - GMT time: Greenwich Mean Time
   - [F5]: Return to KOMTRAX Settings screen



Measurement items		Test conditions		Unit	Standard	Repair limit	Test results	Good	NG
4 Relief pressure	1. F pump relief pressure	Oil temperature: 45 – 55 °C Power Mode (P) Engine at high speed	Boom RAISE relief (heavy-duty lift mode; OFF)	MPa {kg/cm^2}	30.4 – 32.4 {310 – 330}	29.4 – 32.4 {300 – 330}			
			Boom RAISE relief (heavy-duty lift mode; ON)		32.8 – 34.8 {335 – 355}	31.8 – 34.8 {325 – 355}			
			Left travel relief		33.8 – 35.8 {345 – 365}	32.8 – 35.8 {335 – 365}			
			Left swing relief		28.4 – 31.4 {290 – 320}	28.4 – 31.4 {290 – 320}			
			Right swing relief		28.4 – 31.4 {290 – 320}	28.4 – 31.4 {290 – 320}			
	2. P pump relief pressure		Boom RAISE relief (heavy-duty lift mode; OFF)		30.4 – 32.4 {310 – 330}	29.4 – 32.4 {300 – 330}			
			Boom RAISE relief (heavy-duty lift mode; ON)		32.8 – 34.8 {335 – 355}	31.8 – 34.8 {325 – 355}			
			Right travel relief		33.8 – 35.8 {345 – 365}	32.8 – 35.8 {335 – 365}			
	3. Control pressure		All control levers in NEUTRAL		3.24 – 3.73 {33 – 38}	3.04 – 3.73 {31 – 38}			

5 OLSS oil pressure	1. F-EPC valve Output pressure (Pce1)	Oil temperature: 45 – 55 °C Power Mode (P) Engine at high speed	All control levers in NEUTRAL	MPa {kg/cm^2}	Max. 0.78 {Max. 8}	Max. 0.78 {Max. 8}			
			Left track idle-running (lever at travel end)		Min. 1.23 {Min. 12.5}	Min. 1.23 {Min. 12.5}			
	2. R-EPC valve Output pressure (Pce2)		All control levers in NEUTRAL		Max. 0.78 {Max. 8}	Max. 0.78 {Max. 8}			
			Right track idle-running (lever at travel end)		Min. 1.23 {Min. 12.5}	Min. 1.23 {Min. 12.5}			
	3. F-VC valve Source pressure (Pce1) 5. F-VC valve * Output pressure (Pce1)		All control levers in NEUTRAL (control pressure)		3.24 – 3.73 {33 – 38}	3.04 – 3.73 {31 – 38}			
			Boom RAISE relief (heavy-duty lift mode; OFF)		30.4 – 32.4 {310 – 330}	29.4 – 32.4 {300 – 330}			
			Boom RAISE relief (heavy-duty lift mode; ON)		32.8 – 34.8 {335 – 355}	31.8 – 34.8 {325 – 355}			
	4. R-VC valve Source pressure (Pce1) 6. R-VC valve * Output pressure (Pce1)		All control levers in NEUTRAL (control pressure)		3.24 – 3.73 {33 – 38}	Max. 0.78 {Max. 8}			
			Boom RAISE relief (heavy-duty lift mode; OFF)		30.4 – 32.4 {310 – 330}	29.4 – 32.4 {300 – 330}			
			Boom RAISE relief (heavy-duty lift mode; ON)		32.8 – 34.8 {335 – 355}	31.8 – 34.8 {325 – 355}			

6	Hydraulic drift in work equipment	Oil temperature: 45 – 55 °C No load on bucket PC800 Loading shovel type Rated load applied to bucket	Lowering distance of tooth tip		mm/15min.	Max. 900	Max. 1,000			
				PC800 Loading		Max. 1,500	Max. 1,800			
7	Hydraulic tank strainer	Visually check the strainer. (Metallic powder or rubber chips)			–	There must not be excessive metallic powder or foreign matter.				

MEMO

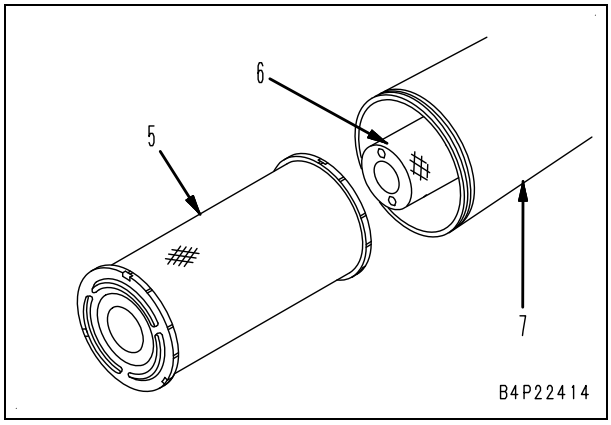
* Since the pump is at the swash plate intermediate point, "5-5, 5-6 (VC valve output pressure)" is about "0.5 – 0.6 times" (approx. 1/2) of the "5-3, 5-4 (VC valve basic pressure)".

Checks before troubleshooting

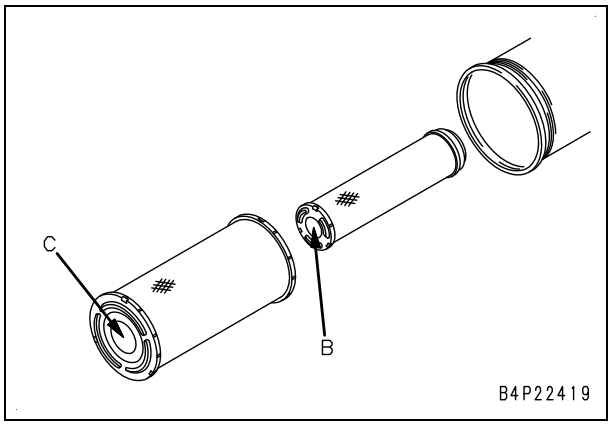
	No.	Item	Criterion	Remedy
a: Engine, lubricating oil and coolant	1	Check for unusual noise and smell	–	Repair
	2	Check for dirt around engine	–	Remove
	3	Check for water leakage around engine	–	Repair
	4	Check for oil leakage around engine	–	Repair
	5	Check for leakage from fuel line	–	Repair
	6	Check of radiator for clogging	–	Remove
	7	Check of level and type of fuel	–	Refill with oil
	8	Check for foreign material in fuel	–	Clean and drain
	9	Check of fuel pre-filter	–	Replace
	10	Check of fuel main filter	–	Replace
	11	Check of level (in oil pan) and type of engine oil	Between H and L	Refill with oil
	12	Check of coolant level (in sub tank)	Between H and L	Refill with coolant
	13	Check of air cleaner for clogging	Air cleaner clogging monitor is not displayed on machine monitor	Clean or replace
b: Hydraulic and mechanical equipment	1	Check for unusual noise and smell	–	Repair
	2	Check for oil leakage	–	Repair
	3	Check of hydraulic oil level	Between H and L	Refill with oil
	4	Check of hydraulic oil strainer	–	Clean or replace
	5	Check of hydraulic oil filter	–	Replace
	6	Check of swing machinery case oil level	Between H and L	Refill with oil
	7	Check of coupling case oil level	Between H and L	Refill with oil
	8	Check of coupling lubrication filter strainer	–	Clean or replace
	9	Check of final drive case oil level	–	Refill with oil
	10	Air bleeding	–	Air bleeding

Replacement of element

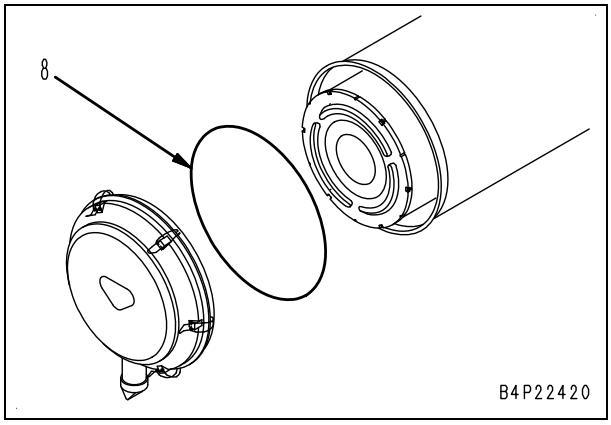
1. Remove outer element (5). For details, see "Cleaning of outer element".
2. Remove inner element (6) and install new inner element (6) quickly to air cleaner body (7).
   ★ Do not clean or reuse the inner element. When replacing the outer element, also replace the inner element.



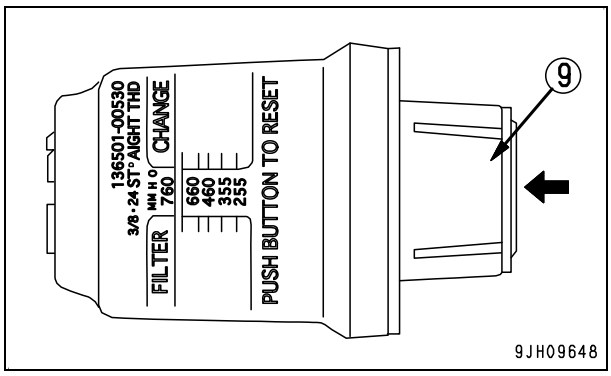
   ★ Install the air cleaner element with its bottom (end with no hole) (B) on cover (3) side.
   If the air cleaner element is installed in reverse, it may be broken and the engine may be damaged seriously.
   ★ If the outer element and cover are installed while the inner element is not installed securely, the outer element may be broken. Install the inner element securely.



3. Push the outer element straight into the air cleaner body by hand while swinging it up, down and laterally.
   ★ Install the air cleaner element with its bottom (end with no hole) (B) on cover (3) side.
   If the air cleaner element is installed in reverse, it may be broken and the engine may be damaged seriously.
4. Replace O-ring (8) of cover (3) with a new one.



5. Install cover (3). For details, see "Cleaning of outer element".
6. Replace the seal of cover (3) with a new one.
7. After replacing the element, press reset button (9) of dust indicator to return yellow display plate as before.



Classification and procedures for troubleshooting

Classification for troubleshooting

Mode	Contents
Display of code	Troubleshooting by failure code
E-mode	Troubleshooting of electrical system
H-mode	Troubleshooting of hydraulic and mechanical systems
S-mode	Troubleshooting of engine

Procedure for troubleshooting

If a problem occurs on the machine, proceed to the appropriate troubleshooting section according to the following procedure.

1. **Procedure for troubleshooting when user code and failure code are displayed on machine monitor:**
   If a user code and a failure code are displayed on the machine monitor, perform the troubleshooting for the corresponding "**Display of code**".
   ★ If multiple failure codes are displayed simultaneously, all the codes are displayed repeatedly in order. Note down all the codes.
2. **Procedure for troubleshooting when a user code and a failure code are not displayed on machine monitou:**
   Check the mechanical system failure code and the electrical system failure code by using the abnormailty record function of the machine monitor. (See [*1].)
   1) If failure code (s) is (are) recorded, perform troubleshooting for the failure code described in Troubleshooting [Display of code].
      ★ If electrical system failure code (s) is (are) recorded, delete all the codes and reproduce them in order to see if the problem remains unsolved. (See [*2].)
      ★ The failure code of the mechanical system cannot be deleted.
      ★ If an air conditioner system failure is recorded in the abnormality record , perform "Inspection by self-diagnosis function " in "Air conditioner ". (See [*3].)
   2) If no failure code is found in the abnormality record, a problem that the machine monitor cannot find out by itself may have occurred in the electrical system or hydraulic and mechanical system.
      In this case, check the phenomenon which is assumed to show a trouble again and select the same phenomenon from the list on the next page, and then perform troubleshooting corresponding to that phenomenon in the "**E-mode**", "**H-mode**", or "**S-mode**".

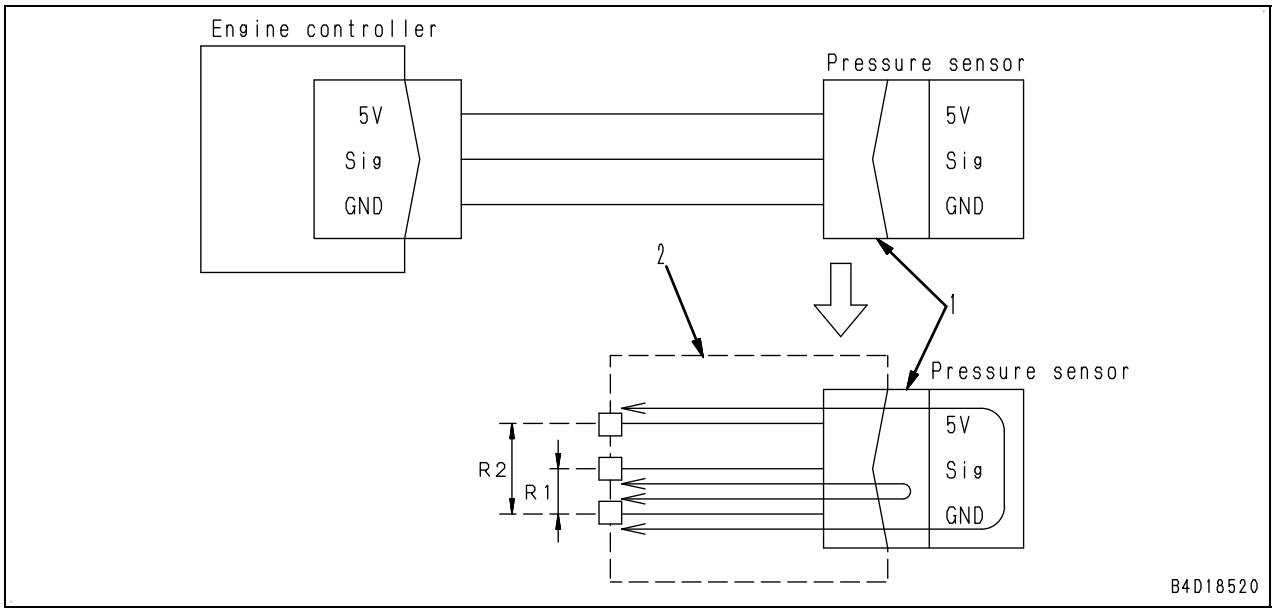
3. **Action to take after trouble is eliminated**
   Referring to the next page, clear all the failure codes in the electrical system abnormality record.

Troubleshooting method for open circuit in wiring harness of pressure sensor system

★ Since pressure sensors consisting not only of resistors but also electronic circuit components such as amplifiers have variation in measured value and its own polarities. So troubleshooting must be performed carefully.

Failure codes applicable to this diagnosis
- CA222: Ambient pressure sensor low error

Procedure
1. Measure and record resistance of pressure sensor unit.
   1) Disconnect pressure sensor connector (1) and connect socket (2) to the sensor side connector.
   2) Measure resistances R1 and R2 between pins.
      ★ If polarities of multimeter probes to apply are reversed, measured values may change. Therefore, when measuring resistances in steps 1 and 2, apply the multimeter probes to the pressure sensor connector so that their polaritied match these of the sensor.
      ★ If measured value is infinite, take measurements by applying the probes of opposite polarities and record the finite value obtained as a measured value.
      ★ Since measured values may be dispersed, take several measurements. Cause of this dispersion appears to be a charge in a sensor. Repeat steps 1 and 2 several times. Consider this dipersion when judging whether the wiring harness is open in step 3.



2. Measure and record resistance with the wiring harness between the pressure sensor and engine controller connected.
   1) Since 5 V power supply to the pressure sensor is supplied to other sensors, disconnect other sensor connectors first. (*)
   2) With the pressure sensor to measure connected, disconnect connector (3) on engine controller side, and connect T-adapter (4) to the harness side connector.
   3) Connect T-box (5) to T-adapter (4) and measure resistances R1' and R2' between respective pins.

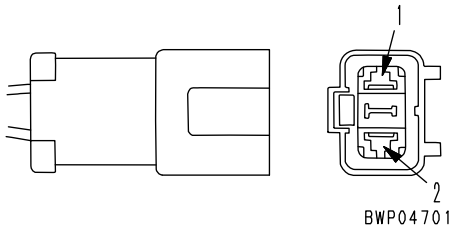
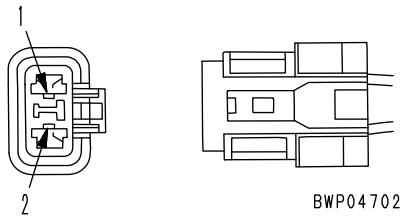
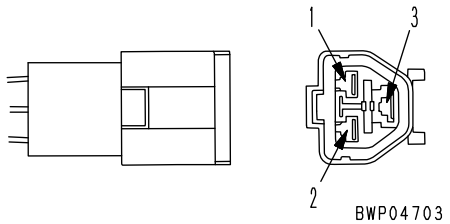
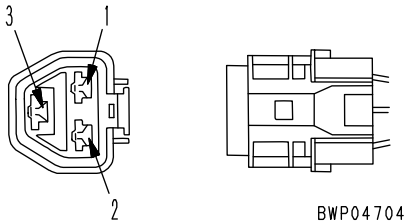
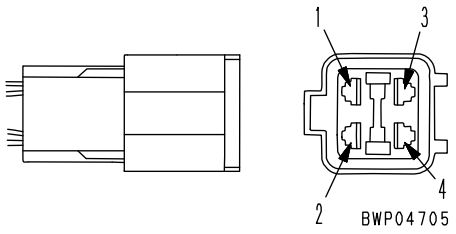
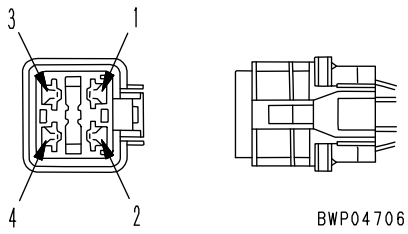
3. Judging open circuit
   ★ "Apparent difference" means a difference of 10 or more times.

   If there is an "apparent difference" between resistances R1 and R2 measured in step 1 and resistances R1' and R2' measured in step 2, "wiring harness is open".

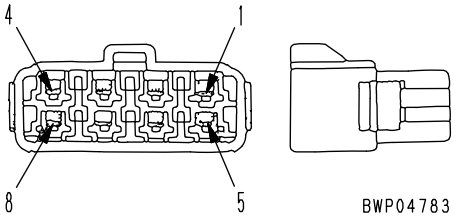
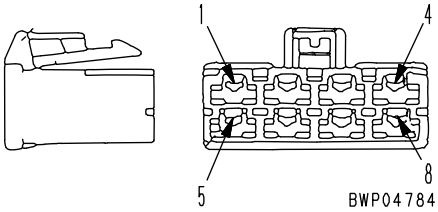
Connection table for connector pin numbers

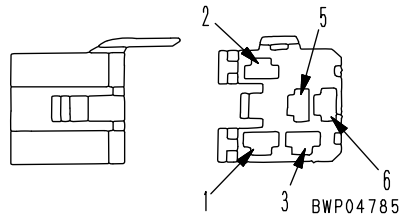
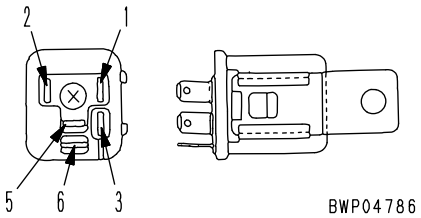
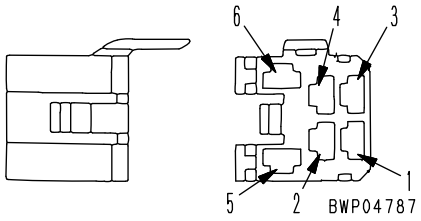
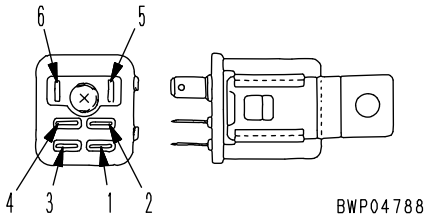
(Rev. 2009. 04)

★ The terms of male and female refer to the pins, while the terms of male housing and female housing refer to the mating portion of the housing.

No. of pins	X type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
1	Part No. : 08055-00181	Part No. : 08055-00191	99-601-7010 (T-adapter)
2	 BWP04701	 BWP04702	799-601-7020 (T-adapter)
	Part No. : 08055-00282	Part No. : 08055-00292	
3	 BWP04703	 BWP04704	799-601-7030 (T-adapter)
	Part No. : 08055-00381	Part No. : 08055-00391	
4	 BWP04705	 BWP04706	799-601-7040 (T-adapter)
	Part No. : 08055-00481	Part No. : 08055-00491	
—	Terminal part No. : 79A-222-3370 ·Electric wire size: 0.85 ·Grommet: Black ·Q'ty: 20	Terminal part No. : 79A-222-3390 ·Electric wire size: 0.85 ·Grommet: Black ·Q'ty: 20	—
—	Terminal part No. : 79A-222-3380 ·Electric wire size: 2.0 ·Grommet: Red ·Q'ty: 20	Terminal part No. : 79A-222-3410 ·Electric wire size: 2.0 ·Grommet: Red ·Q'ty: 20	—

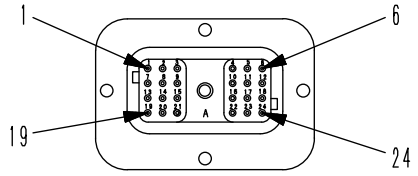
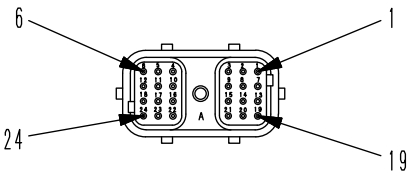
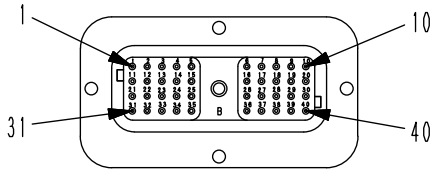
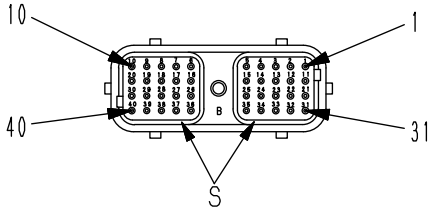
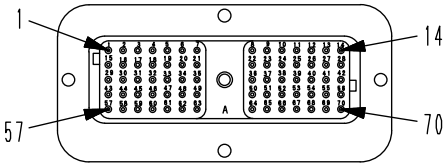
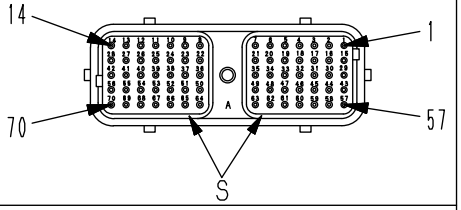
B4D18190

No. of pins	KES1 (Automobile) connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
8			—
	Part No. :08027-10810 (Natural color) 08027-10820 (Black)	Part No. :08027-10860 (Natural color) 08027-10870 (Black)	

No. of pins	Connector for relay (Socket type)		
	Male (female housing)	Female (male housing)	
5			799-601-7360 (T-adapter)
	—	—	
6			799-601-7370 (T-adapter)
	—	—	

B4D18403

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

No. of pins	DRC12, 16 Series connector		
	DRC12:Male pin (female housing)	DRC16:Female pin (male housing)	Testing connection use special tool Part No.
24 (A)※ (B) (C)			–
	–	–	
40 (A)※ (B) (C)			–
	–	Seal(S) Part No. : 17A-06-41830	
70 (A)※ (B) (C)			–
	–	Seal(S) Part No. : 17A-06-41840	

※ (A)、(B)、(C):Key position

B4D18416

Fuse locations

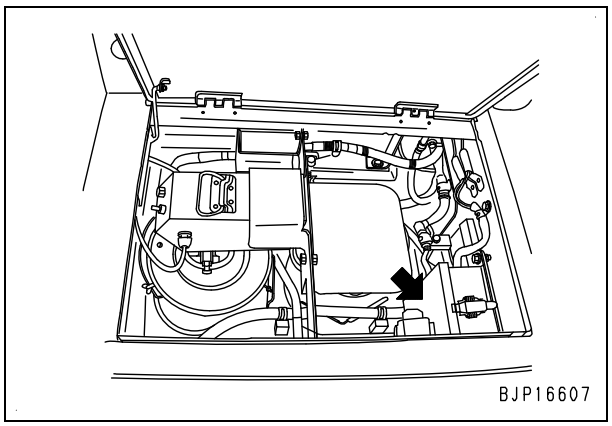
Connection table of circuit breaker

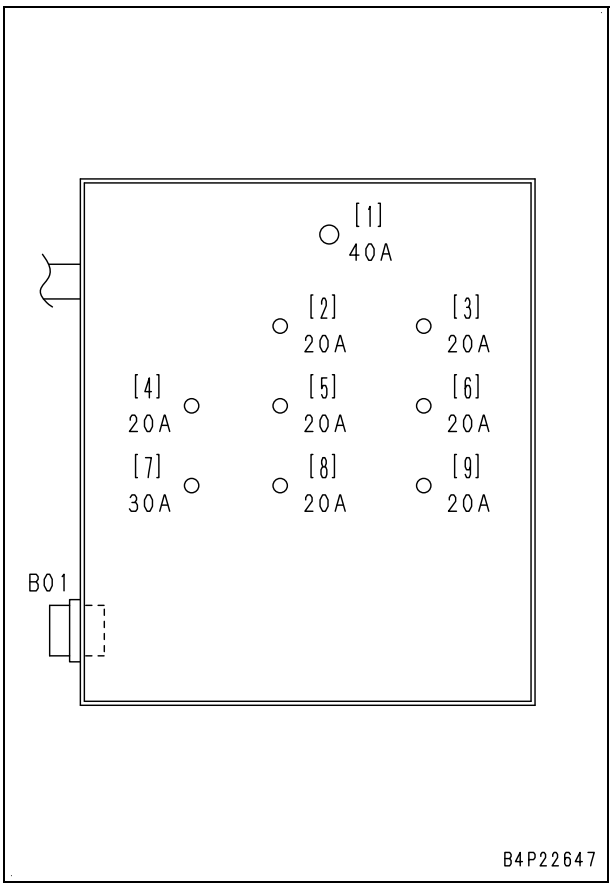
- This connection table shows the devices to which each power supply of the circuit breakers supplies power.
- When performing out troubleshooting related to the electrical system, check the circuit breakers first to see if the power is supplied properly.

★ If circuit breaker is turned ON, the button comes out. In such case, push in the button, turn the starting switch to ON position and start engine to see whether the button comes out again. If the button comes out again, cause of this failure is probably ground fault.

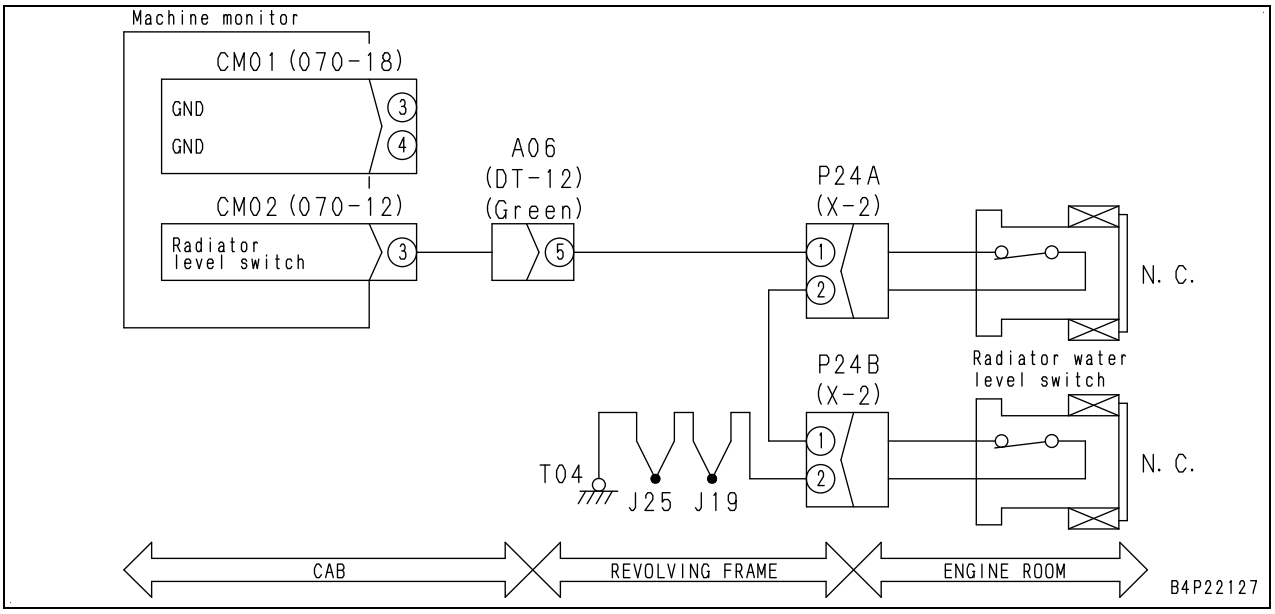
★ The switching power supply is the power which is supplied (battery relay output) while starting switch is in ON position. By contrast, the unswitched power supplies power (battery direct output) regardless of the starting switch position, ON or OFF.

Type of power supply	Circuit breaker No.	Circuit breaker capacity	Destination of power
Switching power supply (battery relay M terminal)	1	40 A	Fuse box (Fuses No. 1 - 15)
	2	20 A	Work equipment headlamp and right headlamp
	3	20 A	Electric grease pump
	4	20 A	Pump controller (solenoid power supply)
	5	20 A	Cab top headlamp and backup lamp
Unswitched power supply (battery relay B terminal)	6	20 A	Starting switch and pump controller (main power supply)
	7	30 A	Engine controller
	8	20 A	Machine monitor, Buzzer
	9	20 A	Fuse box (Fuse No.16 - 20)





Circuit diagram related to radiator coolant level switch

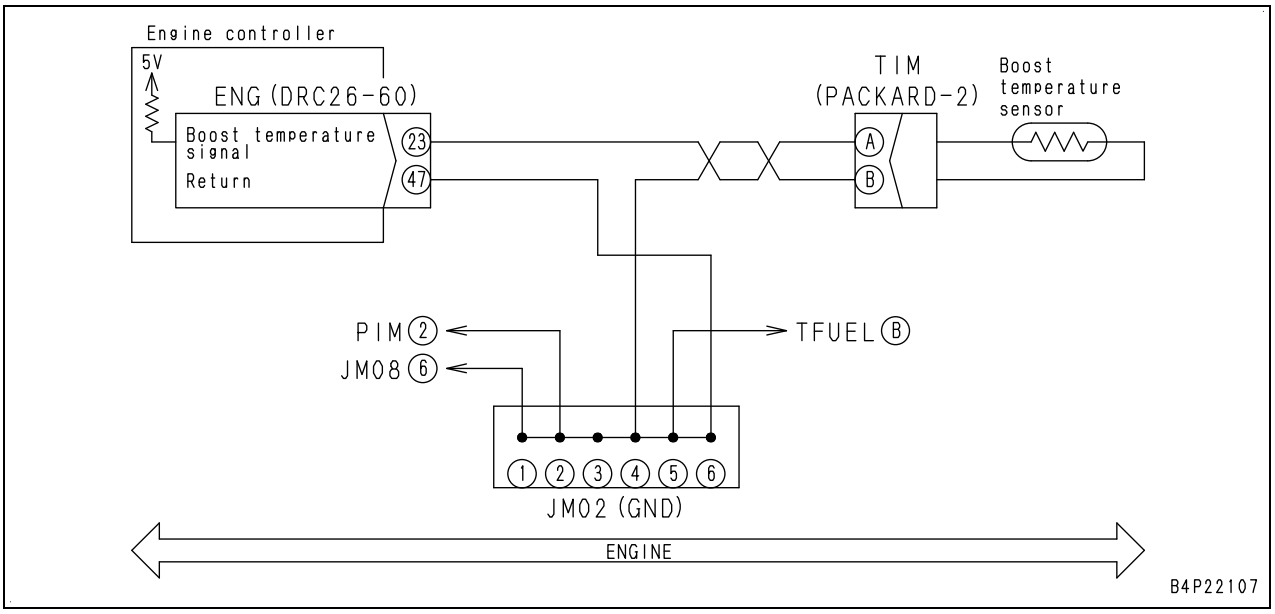


Failure code [CA132] Throttle Sensor Low Error

User code	Failure code	Failure	Throttle sensor low error (Engine controller system)
E14	**CA132**		
Detail of failure	● Low voltage appears in fuel control dial circuit.		
Action of controller	● Uses throttle value obtained before failure detection and allows engine to run if failure is detected with starting switch at ON position. ● Uses full throttle value to run engine if starting switch is set to ON position after detecting failure.		
Problem on machine	● Engine speed cannot be controlled with fuel control dial.		
Related information	● Signal voltage of fuel control dial can be checked by using monitoring function. (Code: **03000** Fuel control dial votage) ● Method of reproducing failure code: Turn starting switch to ON position.		

Cause		Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	See descriptions of wiring harness and connectors in "c: Electrical equipment" of "Checks before troubleshooting" in "General information on troubleshooting", and check them directly.		
2	Defective throttle sensor power supply system	If failure code [**CA2186**] is also displayed, perform troubleshooting for it first.		
3	Defective fuel control dial (throttle sensor)	1. Turn starting switch to OFF position. 2. Disconnect connector P20 and connect T-adapter to male side.		
		Between P20 (male) (1) and (3)	Resistance	4.0 - 6.0 kΩ
		Between P20 (male) (2) and (3)	Resistance	0.25 - 5.0 kΩ
		Between P20 (male) (1) and (2)	Resistance	0.25 - 5.0 kΩ
4	Open or short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector CE02, and connect T-adapter to female side.		
		Between CE02 (famale) (22) and (23)	Resistance	4.0 - 6.0 kΩ
		Between CE02 (famale) (9) and (23)	Resistance	0.25 - 5.0 kΩ
5	Open circuit in wiring harness (wire breakage or defective contact of connector)	★ If no failure is found by checks on cause 4, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors CE02 and P20, and connect T-adapters to each female side.		
		Between CE02 (female) (22) and P20 (female) (1)	Resistance	Max. 1 Ω
		Between CE02 (female) (9) and P20 (female) (2)	Resistance	Max. 1 Ω
		Between CE02 (female) (23) and P20 (female) (3)	Resistance	Max. 1 Ω
6	Short circuit in wiring harness	★ If no failure is found by checks on cause 4, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors CE02 and P20, and connect T-adapters to either female side.		
		Between CE02 (female) (9) and (23), or between P20 (female) (2) and (3)	Resistance	Min. 1 MΩ
7	Ground fault of wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors CE02 and P20, and connect T-adapters to either female side.		
		Between CE02 (female) (9) or P20 (female) (2) and ground	Resistance	Min. 1 MΩ

Circuit diagram related to boost temperature sensor

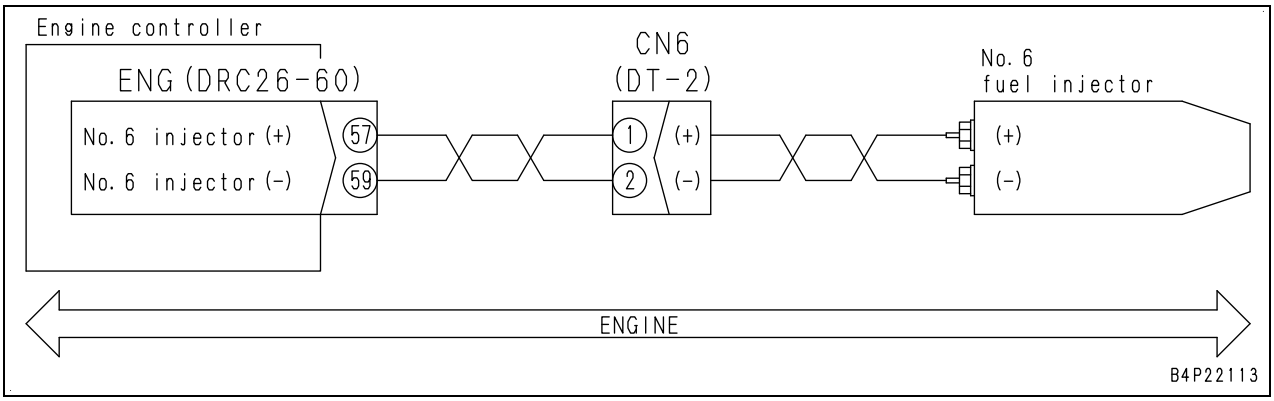


Failure code [CA265] Fuel Temp Sensor Low Error

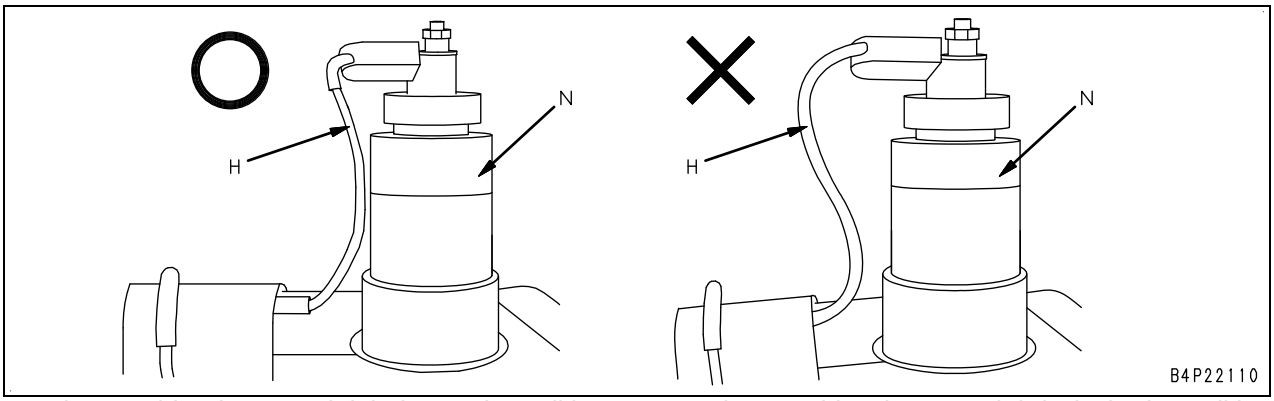
User code	Failure code	Failure	Fuel temperature sensor low error (Engine controller system)
E15	**CA265**		
Detail of failure	● Low voltage appears in fuel temperature sensor signal circuit.		
Action of controller	● Uses signals from coolant temperature sensor to perform fuel injection rate correction based on fuel temperature. (Takes it that fuel temperature is at fixed value (90 °C) and allows engine to run.)		
Problem on machine			
Related information	● Signal voltage from fuel temperature sensor can be checked by using monitoring function. (Code: 14201 (V)) ● Temperature sensed by fuel temperature sensor can be checked with monitoring function. (Code: 14200 (°C)) ● Method of reproducing failure code: Turn starting switch to ON position. ● If temperature sensor connector is disconnected, this failure code is not generated but failure code [**CA263**] for "High Error" is generated.		

Cause		Procedure, measuring location, criteria and remarks			
1	Defective wiring harness connector	See descriptions of wiring harness and connectors in "c: Electrical equipment" in "Checks before troubleshooting" of "General information on troubleshooting", and check them directly.			
2	Defective fuel temperature sensor	1. Turn starting switch to OFF position. 2. Disconnect connector TFUEL and connect socket to male side. ★ If coolant temperature sensor resistance is 700 Ω to 37 kΩ with coolant temperature above 0 °C, regard coolant temperature sensor as normal.			
		Between TFUEL (male)(A) and (B) ★ Fuel temperature-Resistance characteristic	0 °C	Resistance	30 – 37 kΩ
			25 °C	Resistance	9.3 – 10.7 kΩ
			50 °C	Resistance	3.2 – 3.8 kΩ
			80 °C	Resistance	1.0 – 1.3 kΩ
			95 °C	Resistance	700 – 800 Ω
		Between (B) and ground	All fuel temperature range	Resistance	Min. 1 MΩ
3	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector ENG and connect T-adapter to female side.			
		Between ENG (female) (30) and (47) (Fuel temperature: Min. 0 °C) ★ The resistance is the same as that shown in the resistance characteristics table of the coolant temperature sensor of cause 2.		Resistance	700 Ω – 37 kΩ
4	Ground fault in wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connector TFUEL, and connect T-adapter to female side of ENG.			
		Between ENG (female) (30) and ground		Resistance	Min. 1 MΩ
5	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal failure, troubleshooting cannot be performed.)			

Circuit diagram related to injector #6



- Improper installation of injector wiring harness (H)



○: Injector wiring harness (H) is in good condition being laid close to injector (N)

x: Injector wiring harness (H) is in bad condition without being laid close to injector (N)

★: Injector wiring harness (H) may interfere with rocker arm.

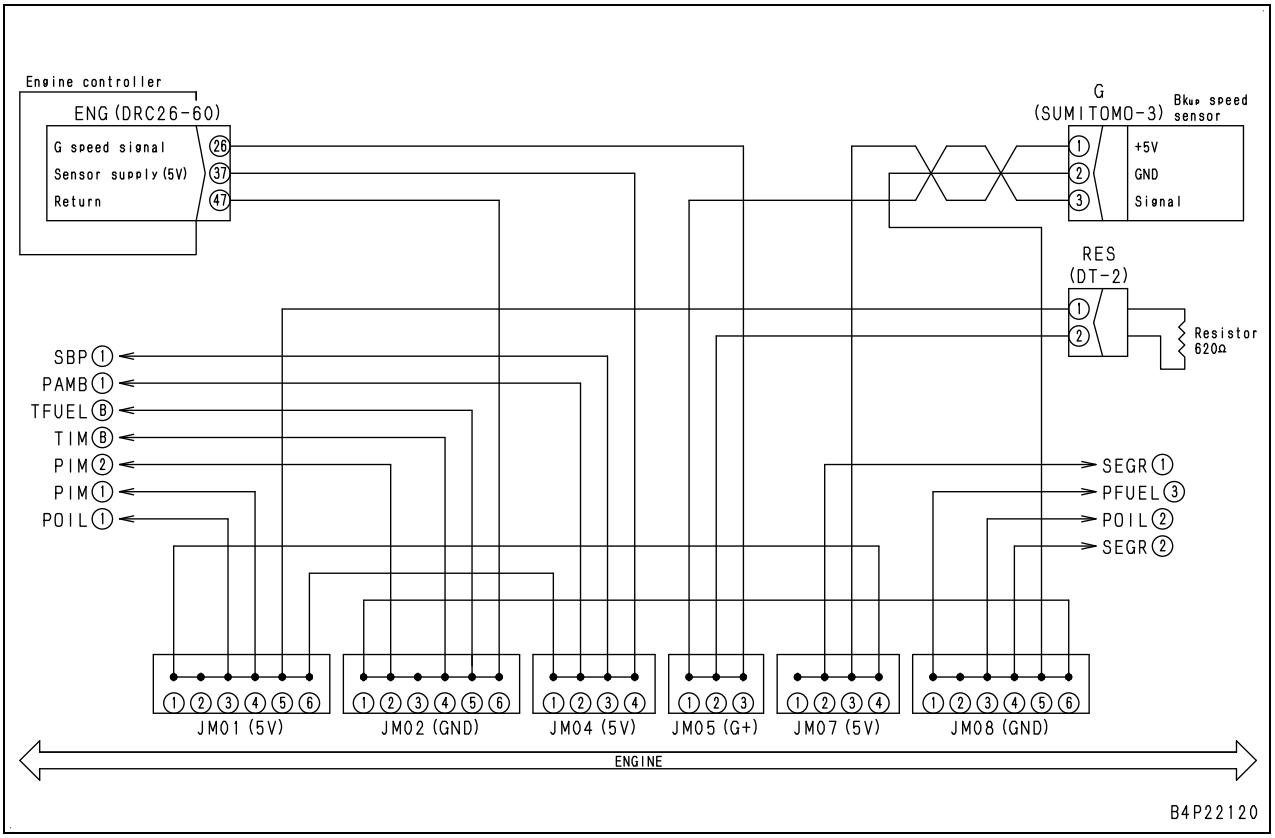
Failure code [CA452] Rail Press Sensor Low Error

User code	Failure code	Failure	Common rail pressure sensor low error (Engine controller system)
E11	**CA452**		
Detail of failure	● Low voltage appears in signal circuit of common rail pressure sensor.		
Action of controller	● Limits engine output (limits common rail pressure) and allows engine to run.		
Problem on machine	● Engine output lowers.		
Related information	● Signal voltage from common rail pressure sensor can be checked by using monitoring function. (Code: 36401 (V)) ● Common rail pressure sensed by common rail pressure sensor can be checked by using monitoring function. (Code: 36400 (MPa)) ● Method of reproducing failure code: Turn starting switch to ON position. ● If sensor connector is disconnected even in normal condition, failure code [**CA451**] for "High Error" is generated instead of this code.		

Cause		Procedure, measuring location, criteria and remarks			
1	Defective wiring harness connector	See descriptions of wiring harness and connectors in "c: Electrical equipment" of "Checks before troubleshooting" in "General information on troubleshooting", and check them directly.			
2	Defective common rail pressure sensor power supply line	★ If failure code [**CA352**] or [**CA386**] is displayed, perform troubleshooting for it first.			
		1. Turn starting switch to OFF position. 2. Disconnect connector PFUEL and connect T-adapter to female side. 3. Turn starting switch to ON position.			
		Between PFUEL (female) (1) and (3)	Power supply input	Voltage	4.75 – 5.25 V
3	Defective common rail pressure sensor	1. Turn starting switch to OFF position. 2. Disconnect connector PFUEL 3. Turn starting switch to ON position.			
		If failure code [**CA452**] changes to [**CA451**] , sensor is defective.			
4	Ground fault in wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors ENG and PFUEL , and connect T-adapter to female side of ENG			
		Between ENG (female) (25) and ground		Resistance	Min. 1 MΩ
5	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors ENG and PFUEL , and connect T-adapter to female side of ENG			
		Between ENG (25) and (47)		Resistance	Min. 1 MΩ
6	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal failure, troubleshooting cannot be performed.)			

Cause		Procedure, measuring location, criteria and remarks		
9	Ground fault in harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors ENG and G and connect T-adapters to either female side.		
		Between ENG (female) (26) or G (female) (3) and ground	Resistance	Min. 1 MΩ
10	Hot short circuit in wiring harness (contact with 24 V circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors G and RES, and connect T-adapter to female side. 3. Turn starting switch to ON position.		
		Between G (female) (3) and ground	Voltage	Max. 1 V
11	Defective engine Bkup speed sensor	If no failure is found by above checks, engine Bkup speed sensor may be defective. (Since this is an internal failure, troubleshooting cannot be performed.)		
12	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal failure, troubleshooting cannot be performed.)		

Circuit diagram related to engine Bkup speed sensor

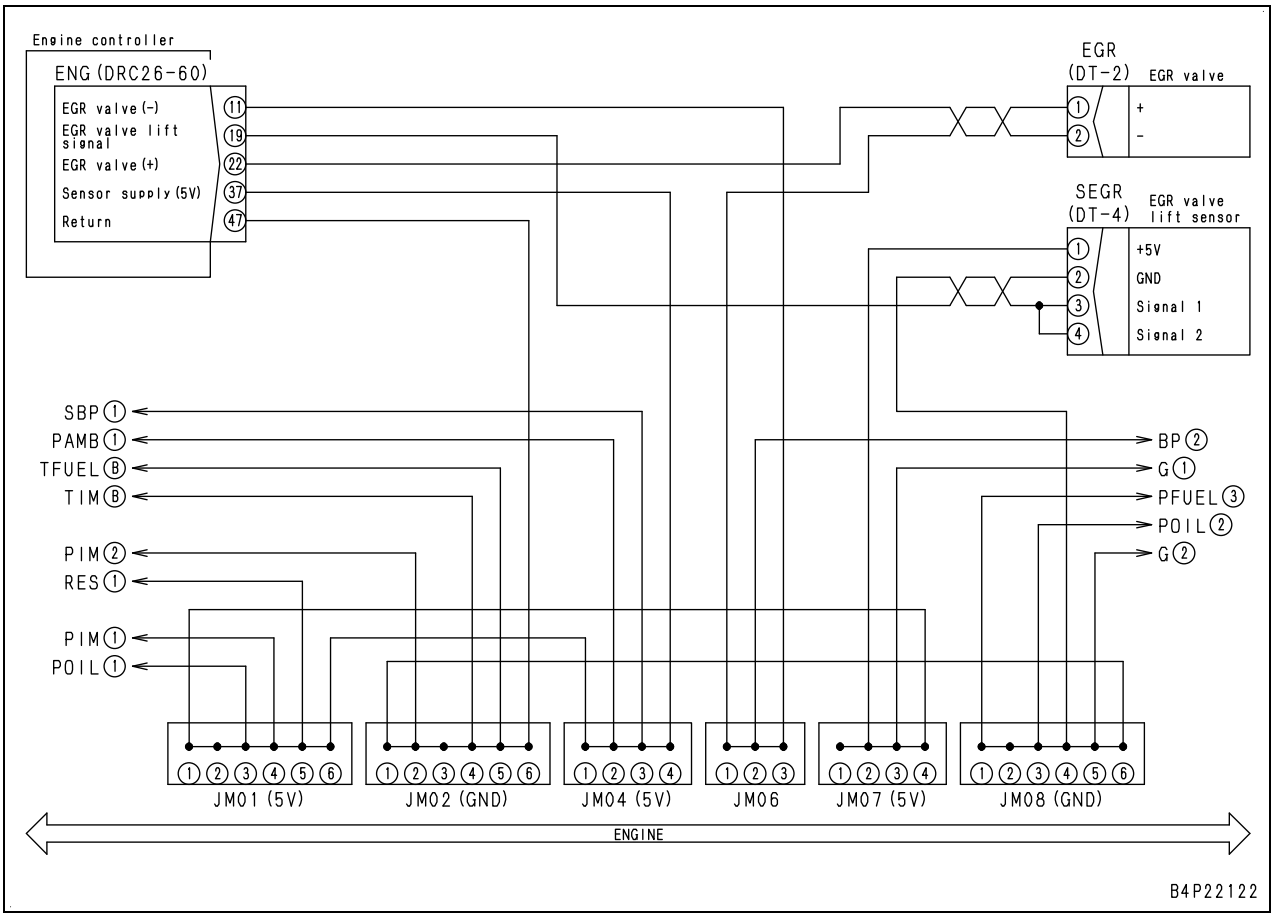


Failure code [CA1633] KOMNET Datalink Timeout Error

User code	Failure code	Failure	KOMNET datalink timeout error (Engine controller system)
E0E	**CA1633**		
Detail of failure	● Engine controller detects communication error in KOMNET communication circuit between engine controller and pump controller or machine monitor.		
Action of controller	● Allows engine to run in default mode or keeps control conditions at the time of failure detection. ● If cause of failure disappears, machine becomes normal by itself.		
Problem on machine	● Machine may not operate normally because informations which are exchanged through KOMNET communication are not transmitted properly. (Failure symptom depends on failed section.)		
Related information	● Method of reproducing failure code: Turn starting switch to ON position.		

Cause	Procedure, measuring location, criteria and remarks
Perform troubleshooting for failure code [**DA2RMC**].	

Circuit diagram related to EGR valve solenoid

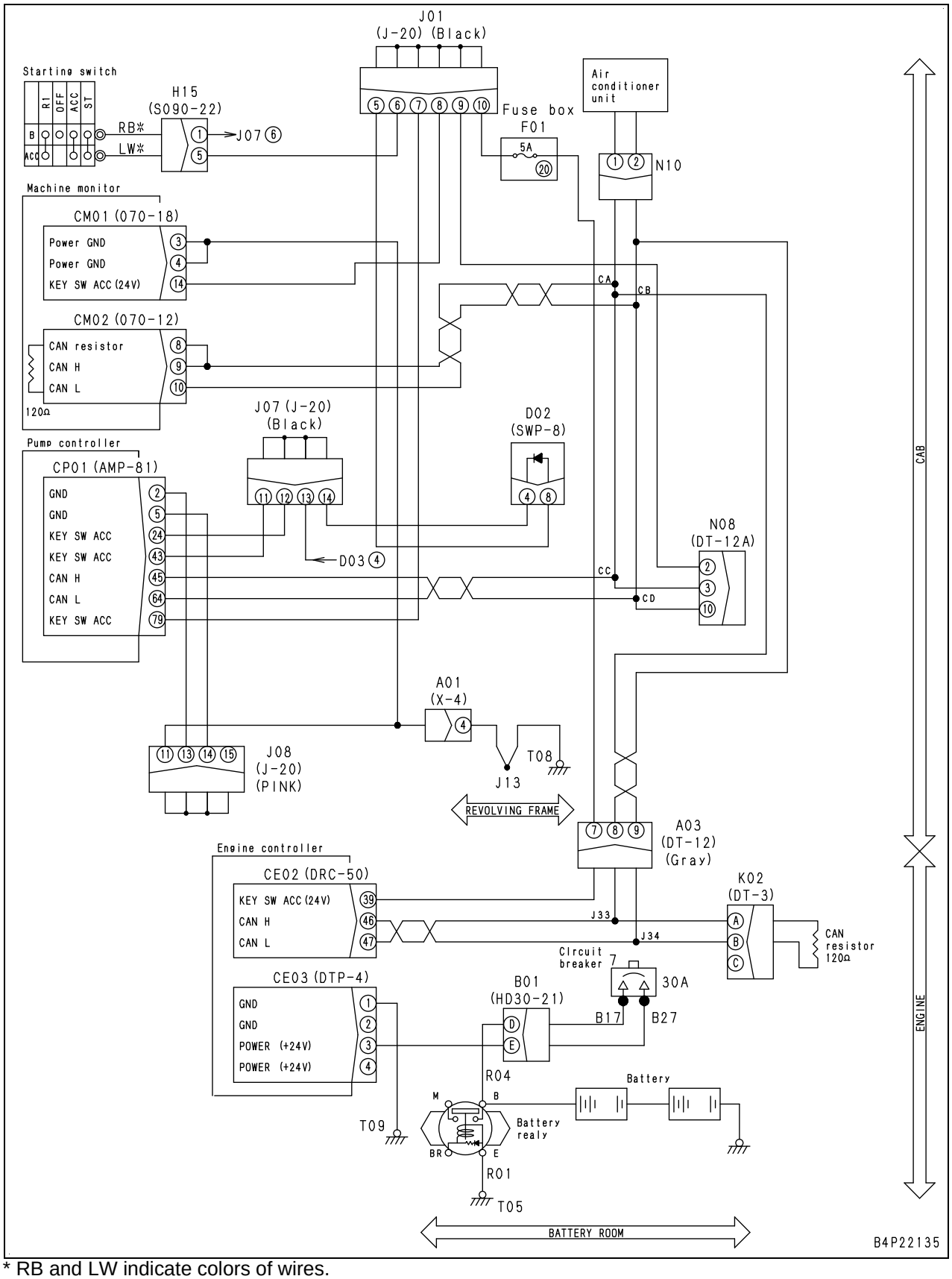


Failure code [D19JKZ] Personal Code Relay Abnormality

User code	Failure code	Failure	Personal code relay abnormality (KOMTRAX system in machine monitor)
E01	**D19JKZ**		
Detail of failure	● Open circuit or short circuit was detected in primary coil side of personal code relay circuit.		
Action of machine monitor	● None in particular (in the case of open circuit) ● Stops output to personal code relay (when short circuit is detected). ● If cause of failure disappears, machine becomes normal by itself (when open circuit is detected). ● Even if cause of failure disappears, machine does not become normal starting switch is turned to OFF position (when short circuit is detected).		
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 (open circuit). Trouble cannot be reproduced on machine (short circuit). ● Troubleshooting for this failure code covers circuit starting from No. 3 of fuse F01, through primary (coil) circuit of personal code relay R07, to machine monitor.		

Cause		Procedure, measuring location, criteria and remarks		
1	Defective No. 3 of fuse F01 (3rd fuse from the right top)	When fuse is blown, ground fault may have probably occurred in circuit.		
2	Defective personal code relay R07	1. Turn starting switch to OFF position. 2. Disconnect relay R07, and connect T-adapter to male side.		
		Between R07 (male) (1) and (2)	Resistance	200 – 600 Ω
		1. Turn starting switch to OFF position. 2. Replace relay R07 with heater relay R18. 3. Turn starting switch to ON position.		
		If this failure code disappears, original personal code relay R07 is defective.		
3	Open circuit or short circuit or ground fault in harness	1. Turn starting switch to OFF position. 2. Remove fuse No. 3 of F01 (3rd fuse from the right top). 3. Disconnect connectors CM01 and S14, and connect T-adapter to female side of CM01.		
		Between F01-3 and CM01 (female) (6)	Resistance	200 – 600 Ω
		Between F01-3 and ground, or between CM01 (female) (6) and ground	Resistance	Min. 1 MΩ
4	Open circuit in harness	★ If no abnormality is found in checks on cause 3, this check is not required. 1. Turn starting switch to OFF position. 2. Remove fuse No. 3 of F01 (3rd fuse from the right top). 3. Disconnect connector CM01 and relay R07, and connect T-adapters to each female side.		
		Between F01-3 and R07 (female) (1)	Resistance	Max. 1 Ω
		Between R07 (female) (2) and CM01 (female) (6)	Resistance	Max. 1 Ω
5	Ground fault in harness	★ If no abnormality is found in checks on cause 3, this check is not required. 1. Turn starting switch to OFF position. 2. Remove fuse No. 3 of F01 (3rd from right top). 3. Disconnect connector CM01 and relay R07, and connect T-adapters to either female side.		
		Between F01-3 and ground, or between R07 (female) (1) and ground	Resistance	Min. 1 MΩ
		Between R07 (female) (2) and ground, or between CM01 (female) (6) and ground	Resistance	Min. 1 MΩ
6	Short circuit in harness	1. Turn starting switch to OFF position. 2. Remove fuse No. 3 of F01 (3rd fuse from the right top). 3. Disconnect connectors CM01 and relay R07, and connect T-adapter to female side of connector CM01. ★ Check by using multimeter tester in continuity mode.		
		Between CM01 (female) (6) and each pin other than pin (6)	No continuity (No sound is heard)	
7	Machine monitor (KOMTRAX portion is defective.)	If no abnormality is found by the above checks, the machine monitor (KOMTRAX portion) is defective. (Since this is an internal failure, troubleshooting cannot be performed.)		

Circuit diagram related to CAN communication



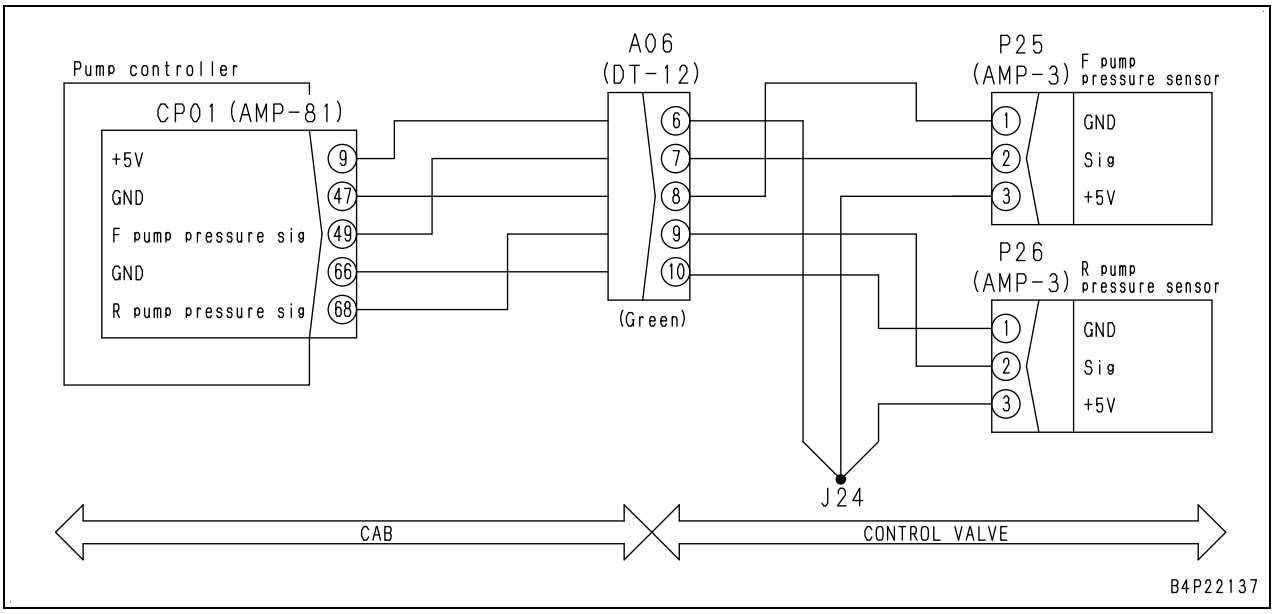
* RB and LW indicate colors of wires.

Failure code [DGH2KB] Hyd Oil Sensor Short

User code	Failure code	Failure	Hydraulic oil temperature sensor ground fault (Pump controller system)
–	**DGH2KB**		
Detail of failure	● Signal voltage of hydraulic oil temperature sensor circuit is below 1 V and ground fault is detected while engine is running. (Signal voltage of hydraulic oil temperature sensor is equivalent to 102 °C or above.)		
Action of controller	● None in particular ● If cause of failure disappears, machine becomes normal by itself.		
Problem on machine	● If machine is operated as it is, hydraulic components may be damaged. ● While hydraulic oil temperature rises normally, hydraulic oil temperature gauge does not move from top of white range (bottom of green range).		
Related information	● If the hydraulic oil temperature monitor on the machine monitor lights up in red while the engine is running, this failure code is recorded. ● Signal voltage of hydraulic oil temperature sensor can be checked by using monitoring function. (Code: 04402 Hydraulic oil temperature sensor voltage) ● Method of reproducing failure code: Start engine.		

Cause		Procedure, measuring location, criteria and remarks			
1	Defective hydraulic oil temperature sensor (internal open circuit or short circuit)	1. Turn starting switch to OFF position. 2. Disconnect connector P22 and connect T-adapter to male side.			
		Between P22 (male) (1) and (2) ★ Temperature-resistance characteristics of oil temperature sensor	10 °C	Resistance	Approx. 90 kΩ
			30 °C	Resistance	Approx. 35 kΩ
			80 °C	Resistance	Approx. 6.5 kΩ
			100 °C	Resistance	Approx. 3.5 kΩ
		Between P22 (male) (2) and ground		Resistance	Min. 1 MΩ
2	Open circuit or short circuit or ground fault or hot short circuit in harness	1. Turn starting switch to OFF position. 2. Disconnect connector P22 and connect T-adapter to female side. 3. Turn starting switch to ON position. ★ If voltage is 0 V, harness has open circuit or ground fault or short circuit, and if voltage is 24 V, harness has hot short circuit. ★ Voltage of approximately 5 V is applied to temperature sensor signal lines through resistor in machine monitor.			
		Between P22 (female) (1) and (2)		Voltage	Approx. 5 V
3	Short circuit or ground fault in harness	1. Turn starting switch to OFF position. 2. Disconnect connector CP01 and connect T-adapter to female side. ★ Use temperature-resistance characteristics table for troubleshooting on cause 1. ★ If resistance is above 1 MΩ, harness has open circuit. If resistance is below 1 Ω, harness has short circuit.			
		Between CP01 (female) (29) and (65)		Resistance	3.5 – 90 kΩ
		Between CP01 (female) (29) and ground		Resistance	Min. 1 MΩ
4	Ground fault in harness (contact with ground circuit)	★ If cause 2 is not the cause of failure, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors CP01 and P22, and connect T-adapters to either female side.			
		Between CP01 (female) (29) and ground, or between P22 (female) (1) and ground		Resistance	Min. 1 MΩ
5	Defective pump controller	If no abnormality is found by above checks, pump controller is defective. (Since this is an internal failure, troubleshooting cannot be performed.)			

Circuit diagram related to front pump pressure sensor

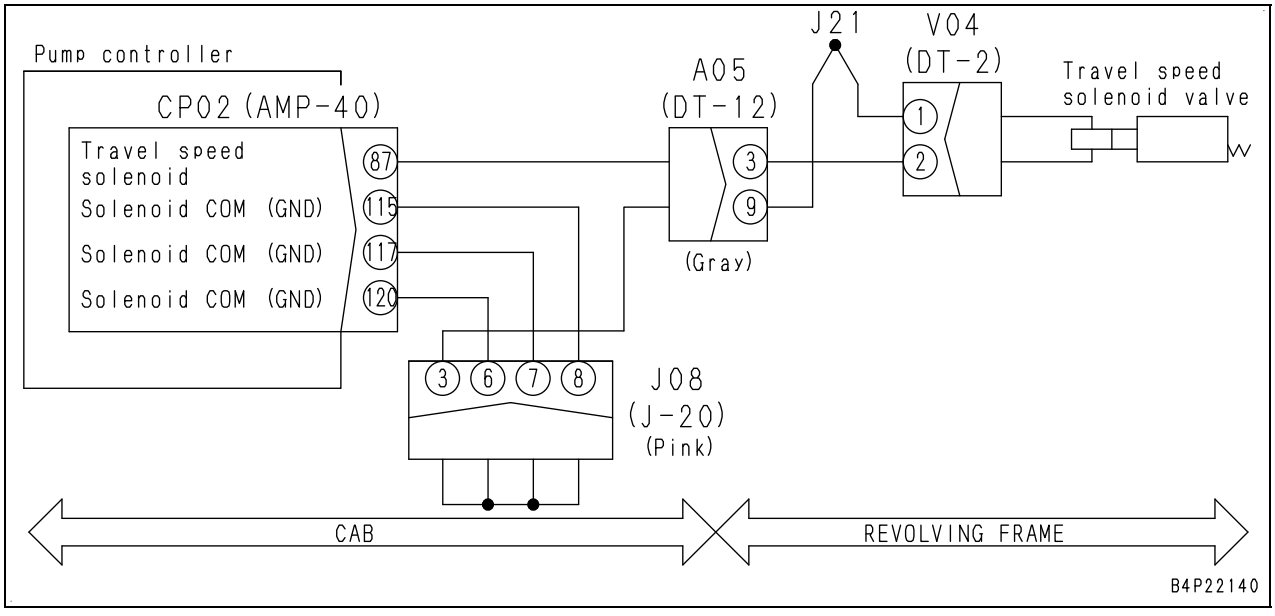


Failure code [DW43KB] Travel Speed Sol Short Circuit

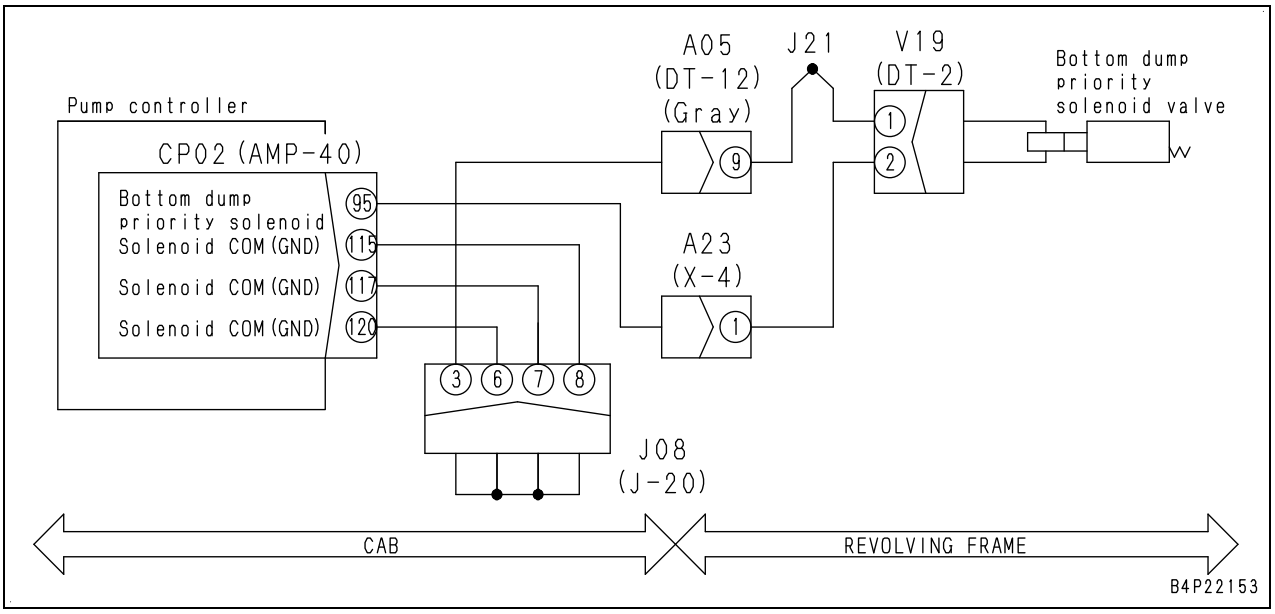
User code	Failure code	Failure	Travel speed solenoid system short circuit (Pump controller system)
–	**DW43KB**		
Detail of failure	● Abnormal current flowed when driving travel speed selector solenoid circuit.		
Action of controller	● Power supply to the travel speed selector solenoid circuit is stopped. ● Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position.		
Problem on machine	● Travel speed does not shift to Hi. (The swash plate angle of travel motor is not minimized.)		
Related information	● Travel speed selector solenoid is not energized when engine speed is below 1,200 rpm. ● Controller's command (ON/OFF) to travel speed selector solenoid can be checked by using monitoring function. (If controller sends solenoid ON command, monitoring display is ON even if solenoid is not energized due to open circuit.) (Code: 02300 Solenoid 1) ● As T-adapter for pump controller connector is "socket-type box", operating voltage cannot be measured at pump controller connector. ● Method of reproducing failure code: Run engine at full throttle.		

Cause		Procedure, measuring location, criteria and remarks		
1	Defective travel speed solenoid (internal short circuit or ground fault)	1. Turn starting switch to OFF position. 2. Disconnect connector V04, and connect T-adapter to male side.		
		Between V04 (male) (1) and (2)	Resistance	20 – 60 Ω
2	Ground fault in harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors CP02 and V04, and connect T-adapters to either female side.		
		Between CP02 (female) (87) and ground, or between V04 (female) (2) and ground	Resistance	Min. 1 MΩ
3	Short circuit in harness	1. Turn starting switch to OFF position. 2. Disconnect connectors CP02 and V04, and connect T-adapters to either female side.		
		Between CP02 (female) (87) and (115) or (117) or (120), or between V04 (female) (1) and (2)	Resistance	Min. 1 MΩ
4	Defective pump controller	If no abnormality is found by the above checks, pump controller may be defective. (Since this is an internal failure, troubleshooting cannot be performed.)		

Circuit diagram related to travel speed selector solenoid



Circuit diagram related to bottom damp priority solenoid

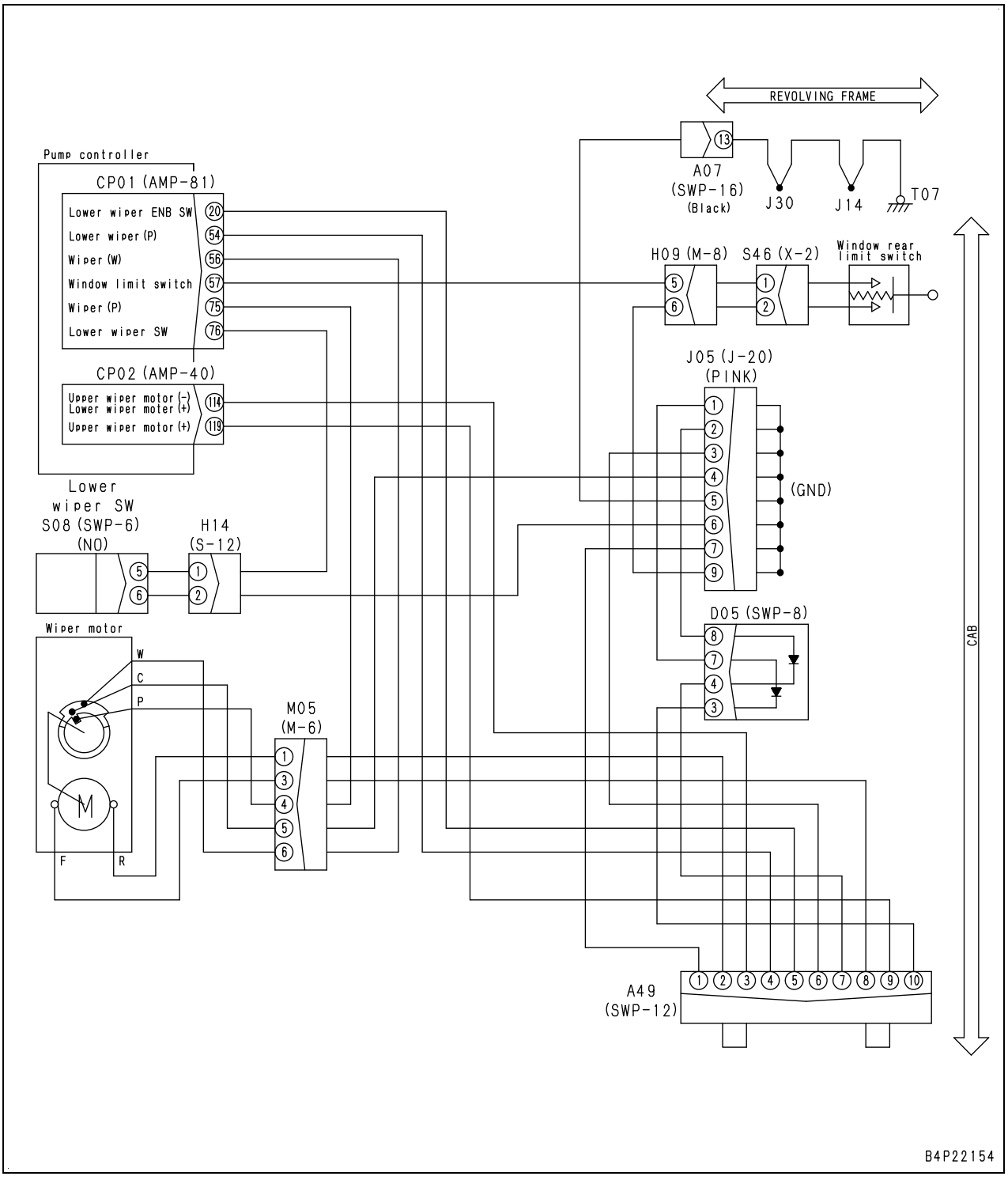


Failure code [DXAAKA] F Pump EPC Sol Open Circuit

User code	Failure code	Failure	Frout pump EPC solenoid system open circuit (Pump controller system)
E07	**DXAAKA**		
Detail of failure	● Pump controller detected open circuit that current did not flow to circuit when it tried to energized front pump EPC solenoid.		
Action of controller	● When the abnormality was detected during travel, controller sets both F pump and R pump to the minimum flow rate. ● Energizes "straight travel solenoid", once lever is set to neutral. ● Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position.		
Problem on machine	● Travel and work equipment speeds lower.		
Related information	● Current to energize front pump EPC solenoid can be checked by using monitoring function. (Code: 01300 F pump EPC solenoid current) ● As T-adapter for pump controller connector is "socket-type box", operating voltage cannot be measured at pump controller connector. ● Method of reproducing failure code: Turn starting switch to ON position.		

Cause		Procedure, measuring location, criteria and remarks			
1	Defective front pump EPC solenoid (internal orpen circuit)	1. Turn starting switch to OFF position. 2. Disconnect connector V11, and connect T-adapter to male side.			
		Between V11 (male) (1) and (2)		Resistance	3 – 14 Ω
2	Defective emergency pump drive switch (internal open circuit in harness)	1. Turn starting switch to OFF position. 2. Disconnect connector S25, and connect T-adapter to male side.			
		Between S25 (male) (3) and (2)	Switch: Normal (bottom)	Resistance	Max. 1 Ω
			Switch: Emergency (top)	Resistance	Min. 1 MΩ
		Between S25 (male) (6) and (5)	Switch: Normal (bottom)	Resistance	Max. 1 Ω
			Switch: Emergency (top)	Resistance	Min. 1 MΩ
3	Open or short circuit in harness	1. Turn starting switch to OFF position. 2. Disconnect connector CP02 and connect T-adapter to female side. ★ Check that emergency pump drive switch is at normal position (lower side). ★ If resistance is above 1 MΩ, harness has open circuit. If resistance is below 1 Ω, harness has short circuit.			
		Between CP02 (female) (96) and (115) or (117) or (120)		Resistance	3 – 14 Ω
4	Open circuit in harness (wire breakage or defective contact of connector)	★ If cause 3 is not the cause for the trouble, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors CP02 and V11, and connect T-adapters to each female side.			
		Between CP02 (female) (96) and V11 (female) (1)		Resistance	Max. 1 Ω
		Between each of CP02 (female) (115), (117) and (120) and V11 (female) (2)		Resistance	Max. 1 Ω
		★ If an abnormality is still present, continue troubleshooting after disconnecting connector S25.			
		Between CP02 (female) (96) and S25 (female) (3)		Resistance	Max. 1 Ω
		Between S25 (female) (2) and V11 (female) (1)		Resistance	Max. 1 Ω
		Between S25 (female) (6) and CP02 (female) (115) or (117) or (120)		Resistance	Max. 1 Ω
		Between S25 (female) (5) and V11 (female) (2)		Resistance	Max. 1 Ω
5	Defective pump controller	If no abnormality is found by the above checks, pump controller may be defective. (Since this is an internal failure, troubleshooting cannot be performed.)			

Circuit diagram related to wiper motor (single wiper specification)



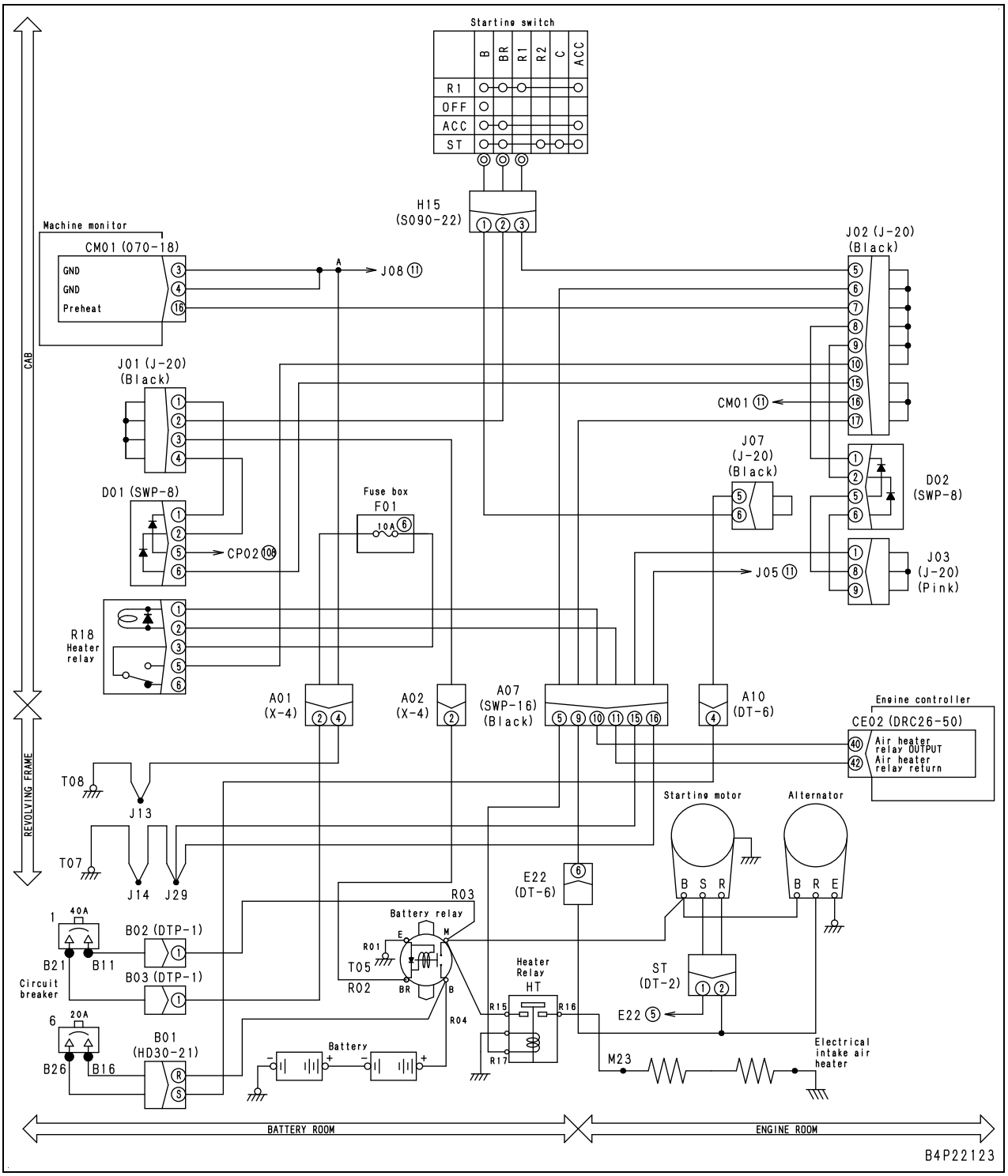
Failure code [DY2FMA] Upper Wiper Working Abnormality

Double wiper specification alone

User code	Failure code	Failure	Abnormality detected while upper wiper is working (Pump controller system)
–	**DY2FMA**		
Detail of failure	● While upper wiper is working, P signal that indicates both ends of rest area is not input.		
Action of controller	● Stops output to upper wiper motor. ● If cause of failure disappears, machine becomes normal by itself.		
Problem on machine	● Upper wiper motor does not work.		
Related information	● Signal input (ON/OFF) of P contact signal of upper wiper rest area end can be checked by using monitoring function. (Code: **02204** Switch input 5) ● As T-adapter for pump controller connector is "socket-type box", operating voltage cannot be measured at pump controller connector. ● Method of reproducing failure code: Turn starting switch to ON position and set wiper switch to INT or ON position.		

Cause		Procedure, measuring location, criteria and remarks			
1	Defective upper wiper motor (internal open circuit in harness)	1. Turn starting switch to OFF position. 2. Disconnect connector M05 and connect T-adapter to female side.			
		Between M05 (female) (6) and (5)	Upper wiper position: rest area	Resistance	Max. 1 Ω
			Upper wiper position: other than rest area	Resistance	Min. 1 MΩ
		Between M05 (female) (1) and (3)	Upper wiper position: whole range	Resistance	Max. 20 Ω
2	Defective diode (D05)	1. Turn starting switch to OFF position. 2. Disconnect connector D05. 3. Turn starting switch to ON position. 4. Turn wiper switch to ON position.			
		If this code does not appear, diode (D05) is defective.			
3	Open or short circuit in harness	1. Turn starting switch to OFF position. 2. Disconnect connectors CP01, CP02 and D05, and connect T-adapters to each female side.			
		Between CP01 (female) (75) and ground	Upper wiper position: rest area	Resistance	Max. 1 Ω
			Upper wiper position: other than rest area	Resistance	Min. 1 MΩ
		Between CP02 (female) (119) and ground	Upper wiper position: whole range	Resistance	Max. 20 Ω
4	Open circuit in harness (wire breakage or defective contact of connector)	★ If cause 2 is not the cause of failure, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors CP01, CP02, and M05. 3. Connect T-adapters to female sides of connector CP01 and CP02 and male side of M05.			
		Between CP01 (female) (75) and M05 (male) (4)		Resistance	Max. 1 Ω
		Between M05 (male) (5) and ground (T07)		Resistance	Max. 1 Ω
		Between M05 (male) (1) and ground (T07)		Resistance	Max. 1 Ω
		Between CP02 (female) (119) and M05 (male) (3)		Resistance	Max. 1 Ω
5	Defective pump controller	If no abnormality is found by above checks, pump controller is defective. (Since this is an internal failure, troubleshooting cannot be performed.)			

Circuit diagram related to preheating of engine



E-10 Displays on machine monitor are different from those for actual machine

Failure	● Displays on machine monitor are different from those for applicable model.
Related information	

Cause		Procedure, measuring location, criteria and remarks	
1	Defective model code signal	★ Turn starting switch to ON position and perform troubleshooting (with monitoring function).	
		Monitoring code	Correct display
		00200 Controller model code	PC800
		If display on monitor is incorrect, perform troubleshooting for failure code [**DA29KQ**].	
2	Defective machine monitor	If no failure is found in check on cause 1, machine monitor is defective. (Since this is an internal failure, troubleshooting cannot be performed.)	

E-11 Some areas of machine monitor screen are not displayed

Failure	● Machine monitor does not display some items
Related information	● LCD panel may have black pixels (that do not light up) or bright pixels (that stay on). If number of the bright pixels and black pixels do not exceed ten, it does not indicate a failure or a defect.

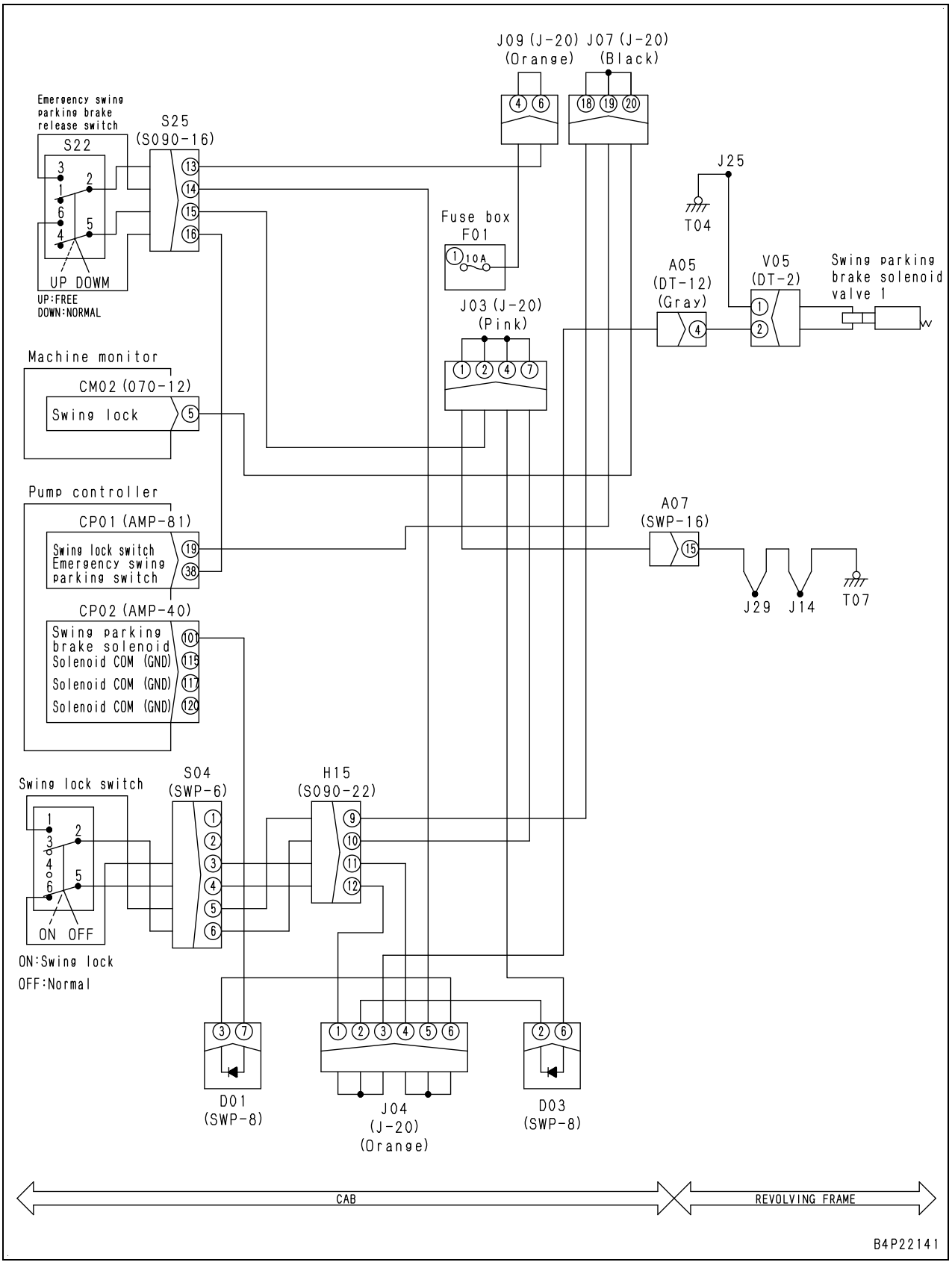
Cause		Procedure, measuring location, criteria and remarks
1	Defective machine monitor (LCD panel)	★ Turn starting switch to ON position and perform troubleshooting.
		When following switches are operated, if whole LCD panel is lighted up (whole surface becomes white), LCD panel has no failure. ● Operation of switches: [4] and [F2] (Press simultaneously)
2	Defective machine monitor (body)	If no failure is found in check on cause 1, machine monitor may be defective. (Since this is an internal failure, troubleshooting cannot be performed.)

E-12 Function switch does not operate

Failure	● Function switch does not work.
Related information	● Condition of signal of function switch can be checked with the monitoring function. (Code: 04503 Monitor function switch)

Cause		Procedure, measuring location, criteria and remarks
1	Defective machine monitor	Machine monitor may be defective. (Since this is an internal failure, troubleshooting cannot be performed.)

Circuit diagram related to swing brake solenoid

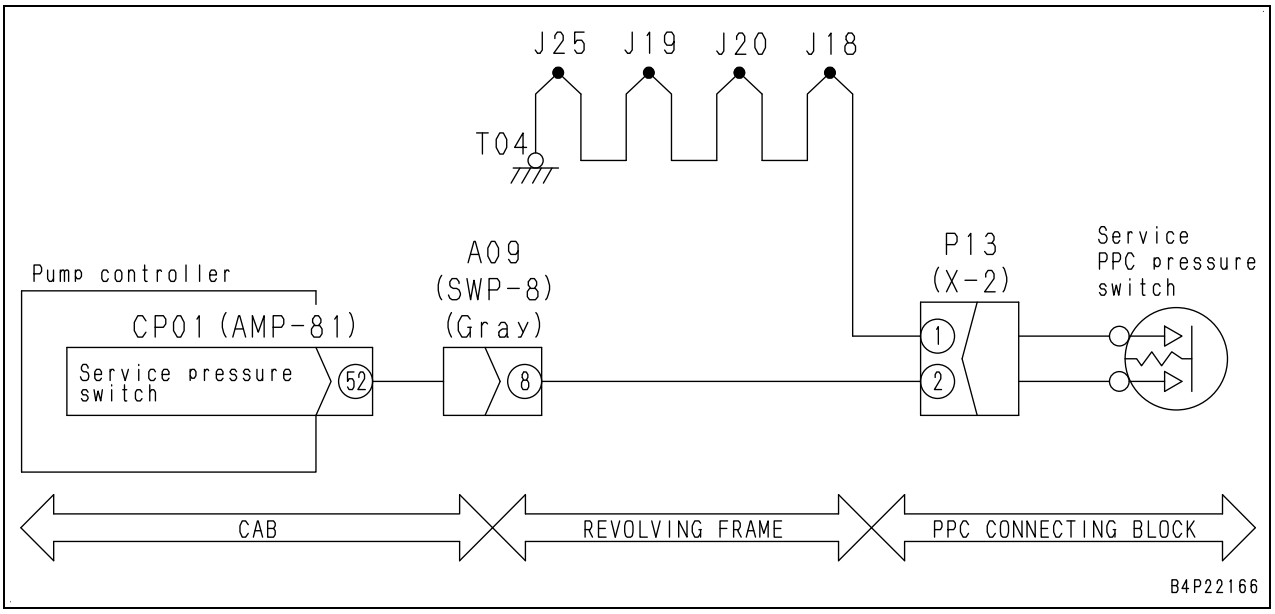


E-29 Arm OUT indicator is not displayed properly with monitoring function

Failure	"Arm OUT" is not displayed properly with monitoring function.
Related information	● Monitoring code: 01900 Pressure switch 1 ● Use "short connector" 799-601-7230 for 2-pin X connector in test for Cause 6. ● As pump controller connector uses "socket-type box" T-adapter, operating voltage cannot be measured at pump controller connector.

Cause		Procedure, measuring location, criteria and remarks			
1	Defective Arm OUT PPC oil pressure switch (open or short circuit in internal wiring)	1. Turn starting switch to OFF position. 2. Disconnect connector P08 and connect T-adapter to male side. 3. Start engine 4. Operate L.H. work equipment control lever and perform troubleshooting.			
		Between P08 (male) (1) and (2)	L.H. work equipment control lever: NEUTRAL	Resistance	Min. 1 MΩ
			L.H. work equipment control lever: Arm OUT	Resistance	Max. 1 Ω
2	Defective harness or pump controller	1. Turn starting switch to OFF position. 2. Insert T-adapter into connector P08. 3. Start engine 4. Operate L.H. work equipment control lever and perform troubleshooting.			
		Between P08 (2) and (1)	L.H. work equipment control lever: NEUTRAL	Voltage	Approx. 7 V
			L.H. work equipment control lever: Arm OUT	Voltage	Max. 1 V
3	Open circuit in wiring harness (wire breakage or defective contact of connector)	★ If no failure is found in checks on cause 2, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors CP01 and P08, and connect T-adapters to each female side.			
		Between CP01 (female) (15) and P08 (female) (2)		Resistance	Max. 1 Ω
		Between P08 (female) (1) and ground (T04)		Resistance	Max. 1 Ω
4	Ground fault in wiring harness (contact with ground circuit)	★ If no failure is found in checks on cause 2, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors CP01 and P08, and connect T-adapters to either female side.			
		Between CP01 (female) (15) and ground, or between P08 (female) (2) and ground		Resistance	Min. 1 MΩ
5	Hot short circuit in wiring harness (contact with 24 V circuit)	★ If no failure is found in checks on cause 2, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connector P08, and connect T-adapter to female side. 3. Turn starting switch to ON position.			
		Between P08 (female) (2) and ground		Voltage	Approx. 7 V
6	Defective pump controller	1. Turn starting switch to OFF position. 2. Disconnect connector P08, and connect T-adapter to female side. 3. Connect "short connector" to male side of T-adapter. 4. Turn starting switch to ON position.			
		If voltage between P08 (2) and (1) is below 1 V but "OFF" is displayed for "Arm OUT", pump controller is defective.			

Circuit diagram related to attachment PPC oil pressure switch



3. Judgment for cause of failure that "work equipment speed is low and machine deviates to left"

- Possible failure of this problem:
  1) Defective main relief valve of L.H. 4-spool control valve
  2) Defective jet sensor of L.H. 4-spool control valve
  3) Defective differential pressure sensor of R.H. 4-spool control valve
  4) Defective rear pump EPC solenoid valve
  5) Defective servo valve of rear pump
  6) Defective rear pump
- For the judgement, measure the following pressure: relief pressure for main relief valve, differential pressure for jet sensor, and output voltage for differential pressure sensor.
- The pump EPC solenoid valve can be checked by measuring its output pressure.
- To judge if the problem is in the servo valve or the pump, remove the servo valve and perform the unit tests, or measure the stroke of the servo piston.

★ For details, perform the judgement procedure in accordance with "4.Judgement chart for failure that work equipment speed is low and machine deviates".

4. Judgment chart for failure that work equipment speed is low and machine deviates (next page)

★ Sequentially check the failure on the list, and locate the possible cause indicated by the largest number of ● symbols.

1) To check the servo valve, remove the servo valve and perform the unit test, or measure the stroke of the servo piston.
   ★ The unit test of the servo piston must be performed by the qualified workshop.
2) If there is a big drop in speed and it seems that there is an abnormality in the pump, check the line filter also.
3) If there is only a small drop in speed and the problem is not corrected by adjusting each equipment, check the line filter also.
4) To check the movement of the servo piston, remove the caps from both sides of it and move the servo piston by hand.

H-6 Arm operation lacks speed or power

Failure	● Speed or power of arm is low.
Related information	● Check that other work equipment, travel, and swing system are normal. (If any of them is abnormal, perform troubleshooting related to it.) ● Check that machine does not deviate. (If the machine deviates, perform the related troubleshooting.) ● Perform all troubleshooting with working mode in POWER (P) mode. ● Perform troubleshooting after checking that the electric circuit related to arm control is normal.

	Cause		Criteria and troubleshooting procedure	
Probable causes and criteria	1	Malfunction of L.H. PPC valve (arm circuit)	★ Prepare with engine stopped, then troubleshoot with engine at full speed.	
			Left work equipment control lever	PPC valve output pressure
			Arm IN or OUT at lever stroke end	2.9 (+0.8/-0.2) MPa {30 (+8/-2) kg/cm^2}
	2	Malfunction of arm control valve (spool)	Spool of arm control valve (Lo or Hi) may malfunction. Check it directly.	
	3	Malfunction of arm control valve (suction-safety valve)	Suction-safety valve of arm control valves (Lo or Hi) may have malfunction. Check it directly. (The suction-safety valve may be checked by replacing it with one for another work equipment circuit. After checking, however, be sure to restore it since its set pressure is different from the others.)	
	4	Defective arm control valve (control valve itself)	Arm control valve (Lo or Hi) may have malfunction. Check it directly.	
	5	Defective sealing for arm cylinder	★ Prepare with engine stopped, then troubleshoot with engine at full speed.	
			Left work equipment control lever	Leakage from cylinder
			Arm IN to hydraulic relief	Max. 20 cc/min

H-20 One of tracks does not run

Failure	● Track does not move (only track on one side)	(1) Machine does not travel in either direction.
Related information		

		Cause	Criteria and troubleshooting procedure
Probable causes and criteria	1	Malfunction of travel motor (parking brake)	Parking brake of travel motor may malfunction. Check it directly.
	2	Internal defect of travel motor (travel motor itself)	Travel motor may have an internal defect, check the motor directly.
	3	Internal defect of final drive	Final drive may have internal failure. Check it directly. (It may be checked by unusual sound, unusual heat, metal chips in drain oil, etc.)

Failure	● Track does not move (only track on one side)	(2) Machine does not travel in only forward or reverse direction.
Related information	● Perform all troubleshooting with working mode in POWER (P) mode.	

		Cause	Criteria and troubleshooting procedure	
Probable causes and criteria	1	Malfunction of travel PPC valve	★ Prepare with engine stopped, then troubleshoot with engine at full speed.	
			Travel lever	PPC valve output pressure
			FORWARD, REVERSE at lever stroke end	2.9 (+0.8/-0.2) MPa {30 (+8/-2) kg/cm^2}
	2	Malfunction of travel control valve (spool)	Spool of travel control valve may malfunction. Check it directly.	
	3	Defective travel control valve (suction valve)	Suction valve of travel control valve may malfunction. Check valve directly. (Suction valve can be checked by replacing it with normal one.)	
	4	Malfunctioning of travel motor (safety valve)	★ Prepare with engine stopped, then troubleshoot with engine at full speed.	
			Travel lever	Travel relief pressure
			When relieved on one side (in non-traveling direction)	34.8 (+1.0/-2.0) MPa {355 (+10/-20) kg/cm^2}
	5	Malfunction of travel motor (counterbalance valve)	Counterbalance valve of travel motor may malfunction. Check it directly.	

This troubleshooting chart marks the content of the questions and check items with △, ○ or ◎ according to their closer relationship with the causes.

△: Reference information for estimation of the cause
○: Information and inspection result that indicate the cause of the failure
◎: A cause particularly probable among those marked with ○ above.

★ Count the priority level of each marking as ◎ > ○ when determining the cause.
Don't count △ when determining the cause. The item with this marking may be counted, however, if no difference is present than this and the cause cannot be determined.

S-6 Engine lacks power

General causes why engine lacks power

- Insufficient intake of air
- Insufficient supply of fuel
- Improper fuel injection
- Improper selection of fuel
- Engine overheating
  → See "S-14 Coolant temperature becomes too high (overheating)"
- Controller is controlling in derate mode.
  (limiting injection rate (power) because of an error in electrical system)

			Cause																	
			Clogged air cleaner element	Air leakage from air intake piping and aftercooler	Seizure or interference at turbocharger	Defective contact of valve with valve seat	Improper valve clearance	Worn piston ring or cylinder liner	Clogged air breather hole in fuel tank cap	Clogged or leaking fuel piping	Clogged fuel filter, strainer	Clogging of feed pump gauze filter	Stuck or seized supply pump plunger	Clogged injector nozzle, or defective spray (dirt in injector)	Defective injector drive (signal or solenoid)	Defective installation of charge air pressure sensor (air leakage)	Defective boost pressure sensor or wiring harness	Defective fuel temperature sensor, wiring harness
Questions	Check recent repair history.																			
	Machine operation hours	Operated for long period	△			△		△			△	△								
	Power was lost	Suddenly		○											○	○	○			
		Gradually	○			○		○			○	○		○		○				
	Fuel other than specified one is used.										○	○								
	The filter was not replaced as specified by the Operation and Maintenance Manual.		◎																	
	Engine oil must be added more frequently					○	○	○												
	Dust indicator indicates a red zone (if indicator is installed)		◎																	
	Air breather hole in fuel tank cap is clogged								◎											
	Fuel is leaking from fuel piping.									◎										
	Power becomes insufficient after short stop of operation.																			◎
Check items	Color of exhaust smoke:	Black	◎	◎	◎		◎													
		Blue under light load																		
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low.													◎						
	While engine is running, interference sound is heard around turbocharger.				◎															
	When engine is cranked, unusual noise is heard around cylinder head.						◎													
	High idle speed is too high.														○					
	High idle speed is normal, but speed suddenly drops when load is applied.										◎	◎	○							
	Engine does not pick up smoothly and combustion is irregular.			◎					○	○				◎						
	The engine hunts. (unstable engine rotation)								○	○	○	○								
	Blowby gas is excessive.				◎															
Troubleshooting	Check air cleaner.		●																	
	Check air intake piping.			●																
	When boost pressure is measured, it is found to be low.		●	●	●															
	When compression pressure is measured, it is found to be low					●		●												
	Check valve clearance.						●													
	Check fuel filter or strainer.										●									
	Check feed pump gauze filter.											●								
	Perform troubleshoot according to "Rail Press Very Low Error" (*1).												●							
	Even if a cylinder is cut out, engine speed does not change.													●	●					
	Check boost pressure sensor mount															●				
	Perform troubleshooting according to "Charge Air Press Sensor Error (*3)"																●			
	Perform troubleshooting according to "Abnormality in fuel temperature sensor (*2)"																			●
		Remedy	Clean	Correct	Replace	Replace	Adjust	Replace	Clean	Correct	Replace	Clean	Replace	Replace	Replace	Correct	Replace	Replace		

For *1,*2 and *3, see the next page.

S-15 Unusual noise is made

General causes why unusual noise is heard

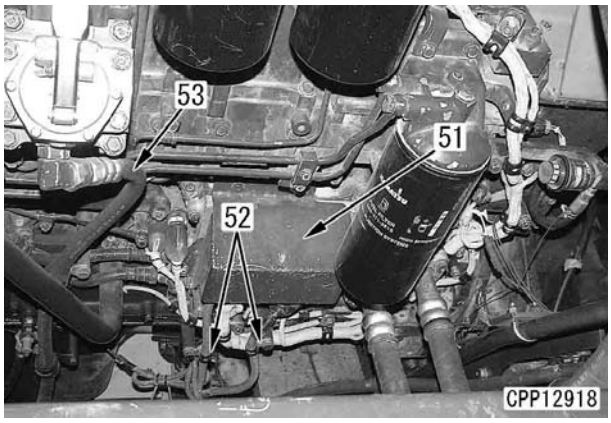
- Abnormality due to defective parts
- Abnormal combustion
- Air sucked in from air intake system
- ★ Judge if the noise is an internal noise or an external noise before starting troubleshooting.
- ★ The engine is operated in the low-temperature mode while it is not warmed up sufficiently. Accordingly, the engine sound becomes a little larger. This does not indicate abnormality, however.
- ★ When the engine is accelerated, it is operated in the acceleration mode and its sound becomes a little larger for up to about three seconds. This does not indicate abnormality, however.

			Cause													
			Air leakage at between turbocharger and cylinder head	Seizure or interference at turbocharger	Cracked EGR gas piping or gas leakage	Damage of valve system (valve or rocker lever)	Defective inside of muffler (partition board out of position)	Improper valve clearance	Worn piston ring or cylinder liner	Improper gear train backlash	Coming off or seizure of gear train bushing	Deformation and damage of fan	Clogged or seized injector	Dirt caught in injector	Defective fuel injection timing (defective coolant temperature sensor)
Questions	Check recent repair history.														
	Machine operation hours	Operated for long period							△						
	Abnormal noise	Gradually occurred.							○			○			
		Suddenly occurred.		○	○	○					○				
	Fuel other than specified one is used.												○		
	Engine oil must be added more frequently.								◎						
	Metal particles are found in the removed oil filter.								◎		◎				
	Air leakage between turbocharger and cylinder head.		◎												
Check items	While engine is running, interference sound is heard around turbocharger.			◎											
	When engine is running, unusual noise is generated around EGR gas piping				◎										
	While engine is running, unusual noise is heard around cylinder head.					◎		◎							
	While engine is running, beat noise is heard around muffler.						◎								
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low.												◎	○	
	Color of exhaust smoke:	Blue under light load							◎						
		Black	○	◎				○							
	Engine does not pick up smoothly and combustion is irregular												◎		
	Unusual noise is loud when engine is accelerated							○		○		○	○		
	Blowby gas is excessive.			◎					◎						
Troubleshooting	When turbocharger is rotated by hand, it is found to be heavy.			●											
	Check EGR gas piping				●										
	Check valve system.					●									
	If muffler is removed, unusual noise disappears.						●								
	Check valve clearance.							●							
	When compression pressure is measured, it is found to be low								●						
	Check gear train.									●	●				
	Check fan.											●			
	Even if a cylinder is cut out, engine speed does not change.												●	●	
	Unusual noise is heard only when engine is cranked.													●	
	Check the condition by using monitoring function of machine monitor.														●
		Remedy	Replace	Replace	Replace	Correct	Replace	Replace	Replace	Replace	Replace	Correct	Replace	Correct	Correct

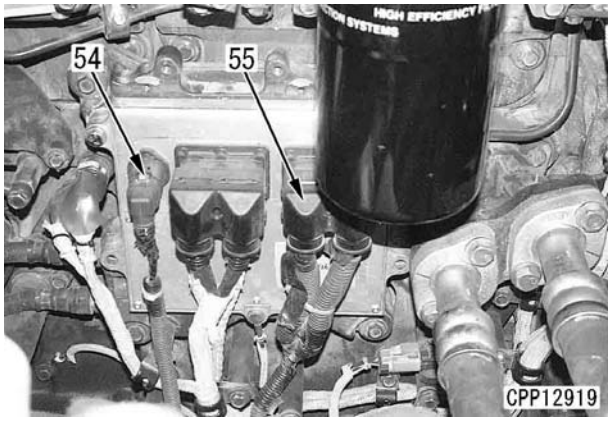
Work	Symbol		Part number	Part name	Necessity	Q'ty	New/redesign	Sketch	Contents of work and remarks
Disassembly and assembly of one link assembly in field	N	1	791-680-9580	Adapter	■	1			
			791-680-9590	Guide	■	1			
			01010-52760	Bolt	■	2			
			01010-51440	Bolt	■	2			
		2	790-101-1102	Pump	■	1			
			790-101-4300	Cylinder	■	1			1,471 kN {150 ton}
		3	791-685-9510	Frame	■	1			
			791-685-9520	Frame	■	1			
			791-685-9530	Rod	■	1			
			791-685-9550	Nut	■	1			
			791-685-9560	Bolt	■	4			
			791-680-9570	Adapter	■	1			
			01010-51030	Bolt	■	1			
			04530-12030	Eyebolt	■	1			
			790-101-1102	Pump	■	1			
			790-101-4300	Cylinder	■	1			1,471 kN {150 ton}
		4	791-685-9540	Rod	■	1			
			791-685-9550	Nut	■	3			
		5	791-685-9510	Frame	■	1			
			791-685-9520	Frame	■	1			
			791-685-9530	Rod	■	1			
			791-685-9550	Nut	■	1			
			791-685-9560	Bolt	■	4			
			791-126-0150	Adapter	■	1			
			791-680-5520	Guide	■	1			
			791-126-0140	Pusher	■	1			
			791-680-9570	Adapter	■	1			
			01010-51030	Bolt	■	1			
			04530-12030	Eyebolt	■	1			
			791-685-9620	Extension	■	1			
			790-101-1102	Pump	■	1			
			790-101-4300	Cylinder	■	1			1,471 kN {150 ton}
		6	790-101-1102	Pump	■	1			
			790-101-4200	Puller	■	1			294 kN {30 ton}

41. Remove controller cover (51).
42. Remove clamp (52).
    ★ Note that there are spacers.
43. Disconnect fuel hose (53).

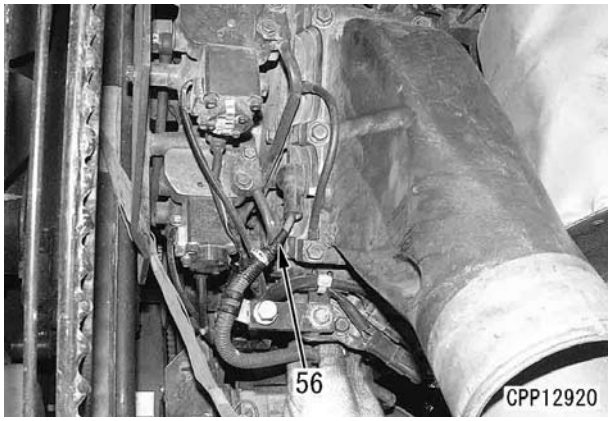
[*5]



44. Disconnect connectors CE03 (54) and CE02 (55).

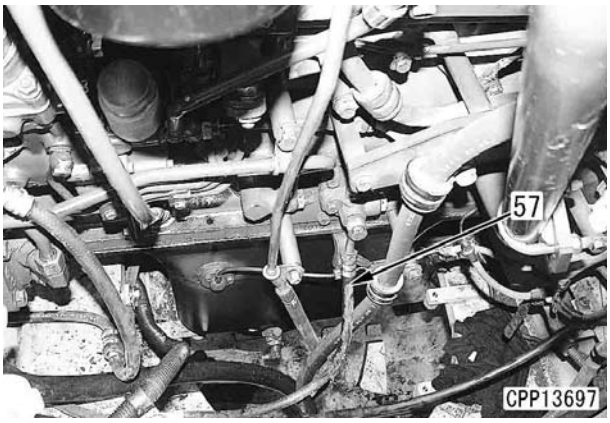


45. Disconnect terminal M23 (56) located between the fan guard and engine.
    ★ Disconnect the harness clamp as well.



46. Disconnect fuel hose (57).

[*6]



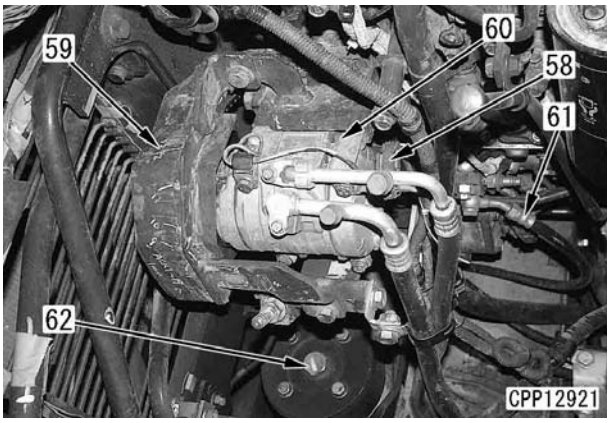
47. Disconnect connector M34 (58).
48. Remove air conditioner cover (59).
49. Loosen mounting bolts and remove air conditioner compressor (60).

[*8]

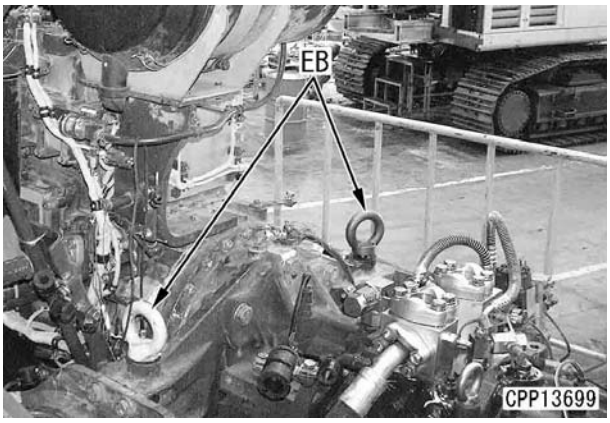
50. Disconnect fuel hose (61).

[*7]

51. Remove mounting bolt (62).



52. Install two eyebolts (EB) (M30) to the PTO.



Installation

- **Perform installation in the reverse order to removal.**

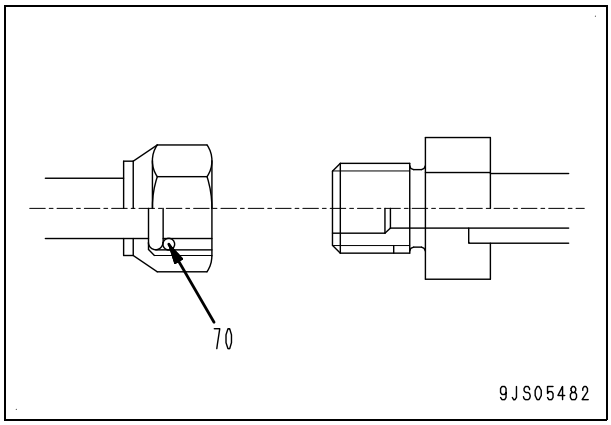
[*1]

★ Install the hose without twisting it.

★ Care must be taken when connecting the air condtioner hoses to prevent dusts, dirt and water from entering in the air conditioner circuit.

★ When connecting the air conditioner hoses, check that O-rings (70) are fitted to their joints.

★ Apply sufficient amount of compressor oil [DENSO: ND-OIL8, ZEXEL: ZXL100PG] (equivalent to PAG46) for **R134a** to each O-ring.



Tightening torque for air conditioner refrigerant piping fastener:

Thread size	Tightening torque
16 x 1.5	11.8 – 14.7 Nm {1.2 – 1.5 kgm}
22 x 1.5	19.6 – 24.5 Nm {2.0 – 2.5 kgm}
24 x 1.5	29.4 – 34.3 Nm {3.0 – 3.5 kgm}

- **Filling air conditioner circuit with refrigerant (R134a)**

  Refill the air conditioner circuit with refrigerant (**R134a**).

  ★ Amount of refrigerant: **1330 ± 50 g**

- **Refilling of compressor oil**

  ★ If the air conditioner condenser is replaced, add compressor oil [DENSO: ND-OIL8, ZEXEL: ZXL100PG] (equivalent to PAG46) for R134a to the air conditioner compressor by **40 mℓ. (Cooling ability will decrease if too much oil is added.)**

  Air conditioner compressor:
  Compressor oil [DENSO: ND-OIL8, ZEXEL: ZXL100PG] (equivalent to PAG46) for R134a 40 mℓ

  ★ If any air conditioner hose is replaced, add the compressor oil [DENSO: ND-OIL8, ZEXEL: ZXL100PG] (equivalent to PAG46) for R134a to the air conditioner compressor by the following quantity. (Take care not to add the compressor oil too much. If do so, the cooling performance lowers.)

  Air conditioner compressor:
  Compressor oil [DENSO: ND-OIL8, ZEXEL: ZXL100PG (equivalent to PAG46) for R134a
  : 45 mℓ
  (After replacement of hose between compressor and condenser)
  : 30 mℓ
  (After replacement of hose between condenser and receiver drier)
  : 21 mℓ
  (After replacement of hose between receiver drier and air conditioner unit)
  : 80 mℓ
  (After replacement of hose between compressor and air conditioner unit)

  ★ Since the compressor oil for R134a absorbs moisture very easily, put the cap on the oil container to shut off air immediately after supplying the oil.

  ★ The compressor oil for R134a can dissolve acrylic resin and polystyrene. Care must be taken for the use of the oil.

Removal and installation of cylinder head assembly

Special tools

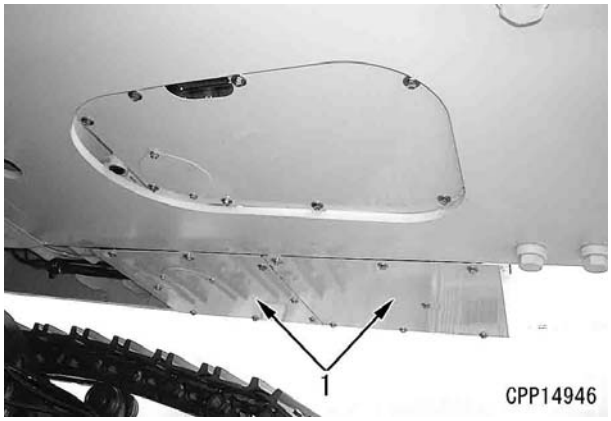
Symbol		Part number	Part name	Necessity	Q'ty	New/redesign	Sketch
A	**2**	790-331-1110	Wrench (angle)	●	1		

Removal

⚠ **Lower the work equipment to the ground and stop the engine.**

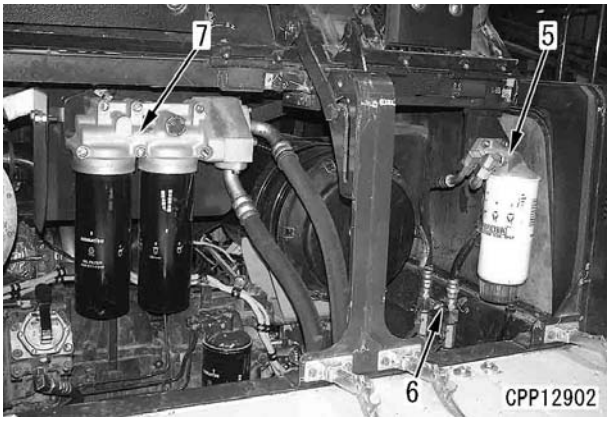
⚠ **Disconnect the cable from the negative(-) terminal of the battery.**

1. Remove the counterweight. For details, see "Removal and installation of counterweight assembly".
2. Remove under cover (1).

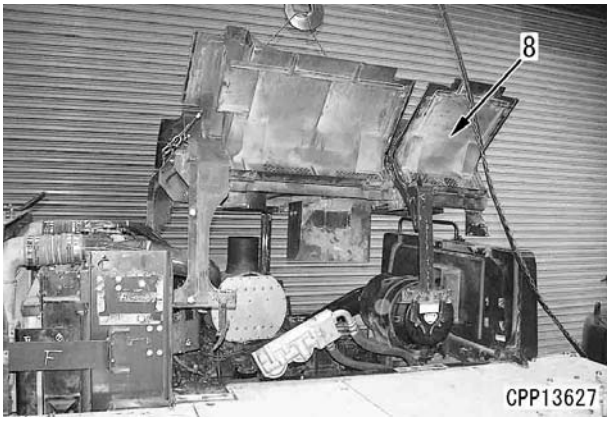


3. Drain the coolant.
   Coolant:
   100 ℓ
4. Remove covers (2) and (3).
5. Open engine hood (4).
   ★ Open the rear side as well.

6. Remove filter (5).
7. Remove clamp (6).
8. Remove filter (7).
   ★ Disconnect the hose clamp.

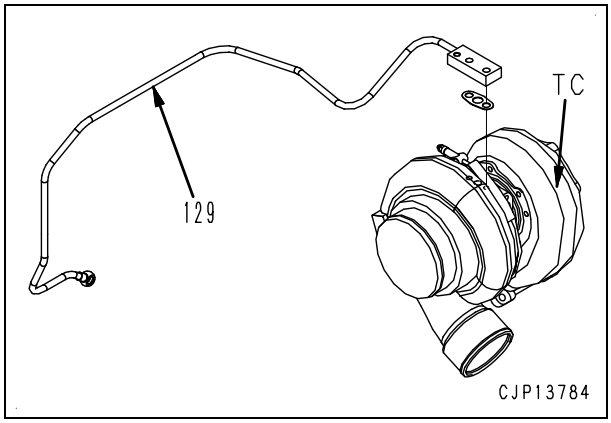


9. Sling and remove engine hood (8).

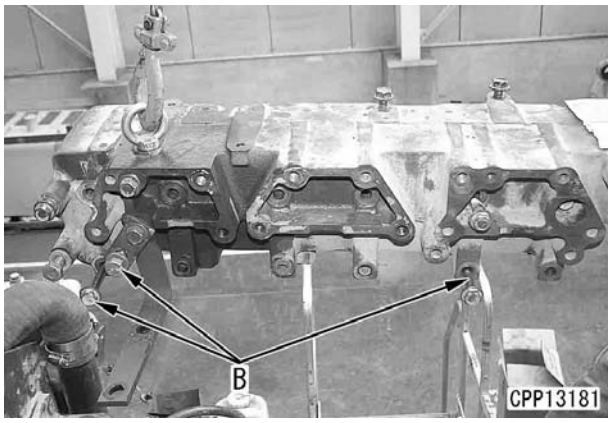


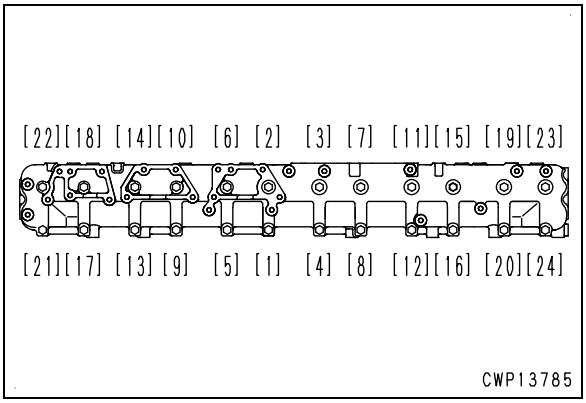
10. Remove cover **A**.
11. Remove cover (9).

14. Place the lubrication tube (129) for turbocharger (TC) inside beforehand.
    ★ The lubrication tube cannot be placed inside after the air intake manifold is installed.

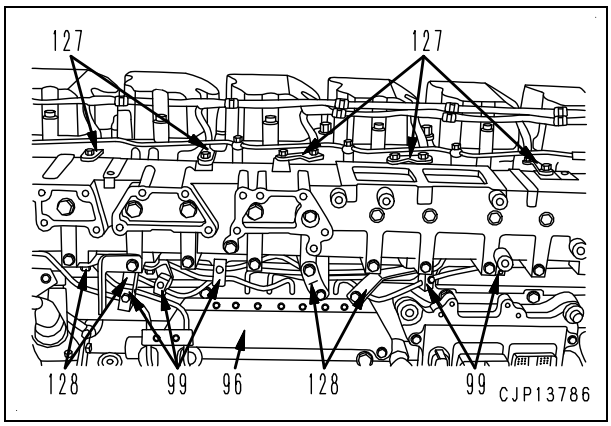


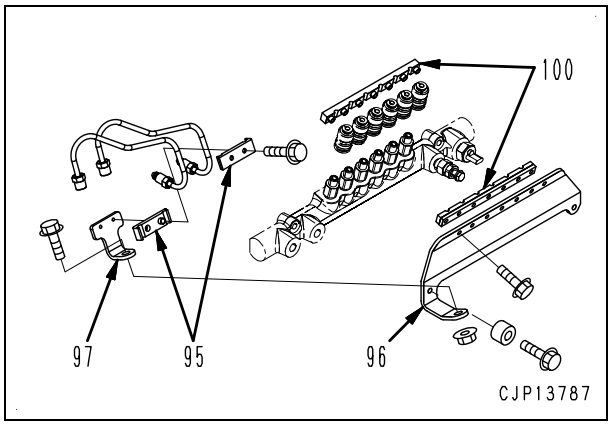
15. Install the air intake manifold.
    ★ Before installing the air intake manifold, insert three bolts (B).
    ★ Tighten the mounting bolts of air intake manifold assembly in the order of [1] to [24] shown below.
    Air intake manifold assembly mounting bolt:
    59 – 74 Nm {6.0 – 7.5 kgm}





16. **High-pressure pipe clamp**
    1) Tighten the fixtures for high-pressure pipe clamps (126) and stays (127) on the air intake manifold (described above) to their specified torques.
       ★ Bend the rubber beforehand.
       Clamping bolt:
       9.8 ± 1 Nm {1 ± 0.1 kgm}
    2) Fasten stays (128) of clamps (99) under the air intake manifold (described above) lightly.
    3) Finger-tighten the bolts for high-pressure pipe clamp (100) and bracket (96).
    4) Lightly install high-pressure pipe clamp (95) and bracket (97).
    5) First, tighten the bolts for high-pressure pipe clamps (100) and (95) to the specified torque.
       Clamping bolt:
       9.8 ± 1Nm {1 ± 0.1 kgm}
    6) Tighten fixtures for bracket (96) and (97) to the specified torque.
    7) Tighten fixtures for high-pressure pipe clamp (99) to the specified torque.
       Clamping bolt:
       9.8 ± 1 Nm {1 ± 0.1 kgm}
    8) Tighten fixtures for stay (128) to the specified torque.



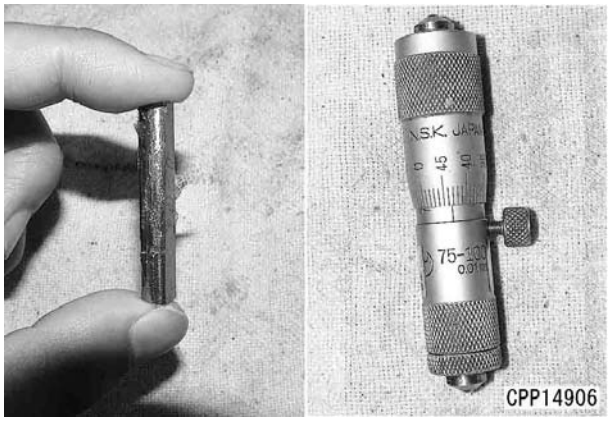


Power train
Removal and installation of PTO assembly

Special tools

Symbol		Part number	Part name	Necessity	Q'ty	New/redesign	Sketch
B	2	Commercially available	Pin gauge pin (7.50 mm diameter,´6.30 mm notch height) for the bore of module of 3.75 mm	■	2	N	
	3	Commercially available	Micrometer for the bore(75 – 100 mm)	■	1	N	
	4	Commercially available	Pin gauge pin (9.00 mm diameter) for the shaft of module of 5.0 mm	■	2	N	
	5	Commercially available	Pin gauge pin (10.00 mm diameter x 8.40 mm notch height) for the bore of module of 5.0 mm	■	2	N	
	6	Commercially available	Micrometer for the bore (100 – 125 mm)	■	1	N	
S	1	796-770-1301	Oil stopper	●	1		

Figure on the left: pin gauge, figure on the right: micrometer for the bore



Removal

⚠ **Lower the work equipment to the ground and stop the engine.**

⚠ **Loosen the cap of the hydraulic tank gradually to release the internal pressure of the hydraulic tank.**

⚠ **Disconnect the cable from the negative(-) terminal of the battery.**

★ Before disconnecting the hoses and tubes, put match marks on them. After disconnecting them, install oil stopper plugs to them.

1. Remove the hydraulic tank strainer and stop the oil using oil stopper tool **S1**.
   - When not using tool **S1**, remove the drain plug and drain the oil.

     Hydraulic tank:

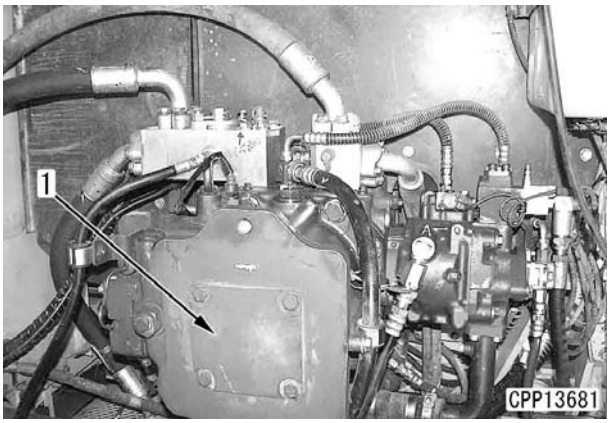
     470 ℓ
2. Drain the oil in the PTO case.

   PTO case:

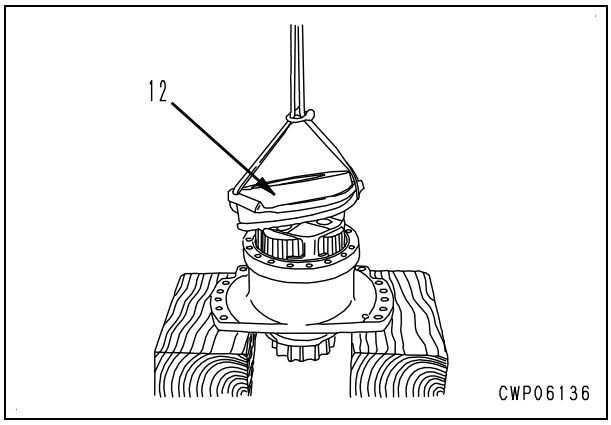
   approx. 6 ℓ
3. Remove main pump and cooling fan pump assembly (1). For details, see "Removal and installation of main pump assembly".

   Main pump and cooling fan pump assembly:

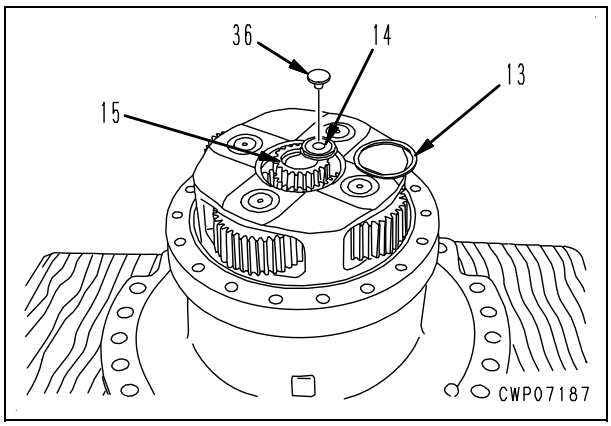
   560 kg



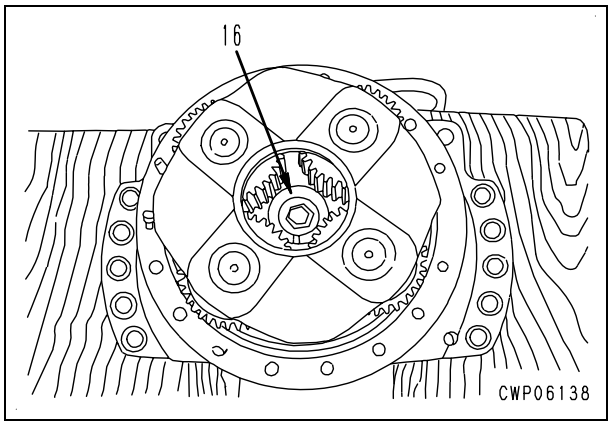
5. **Ring gear**
   Sling and remove ring gear (12).



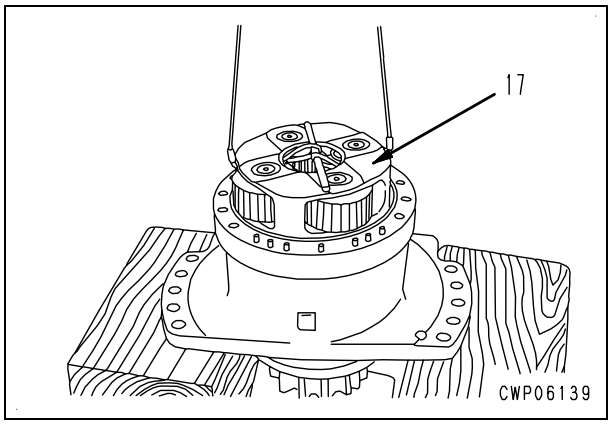
6. **No. 1 sun gear**
   1) Remove thrust washer (13).
   2) Remove button (36) and spacer (14).
   3) Remove No. 1 sun gear (15).



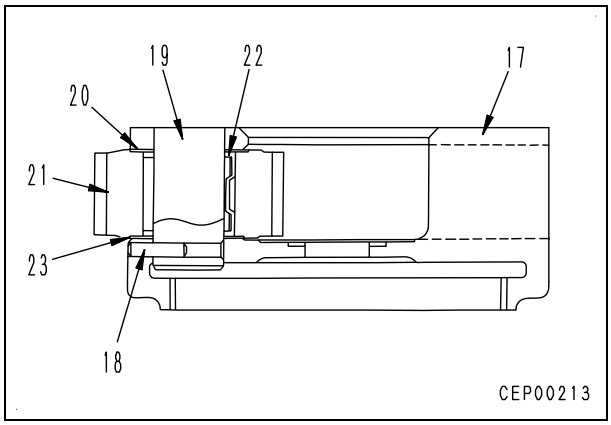
   4) Remove thrust washer (16).
      ★ Remove the washer after removing No. 2 carrier assembly (17).



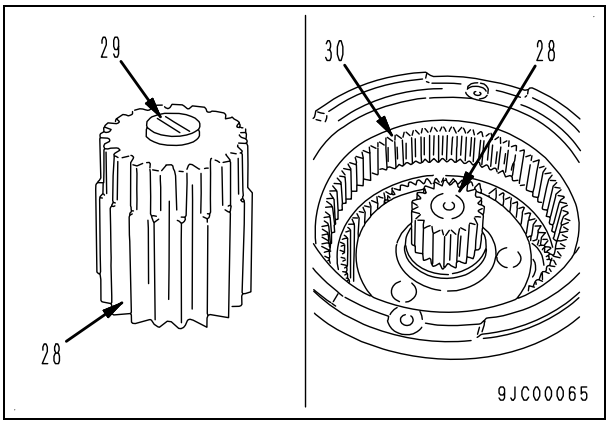
7. **No. 2 carrier assembly**
   Sling and remove No. 2 carrier assembly (17).



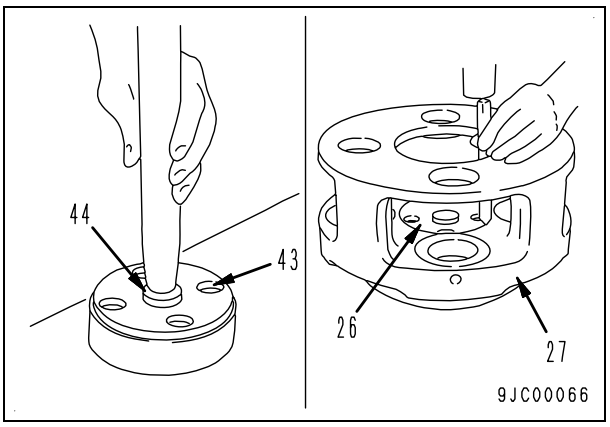
8. **Disassemble No. 2 carrier assembly according to the following procedure.**
   1) Push in pin (18) and drive out shaft (19) from carrier (17).
      ★ After removing the shaft, remove pin (18).
   2) Remove thrust washer (20), gear (21), bearing (22) and thrust washer (23).



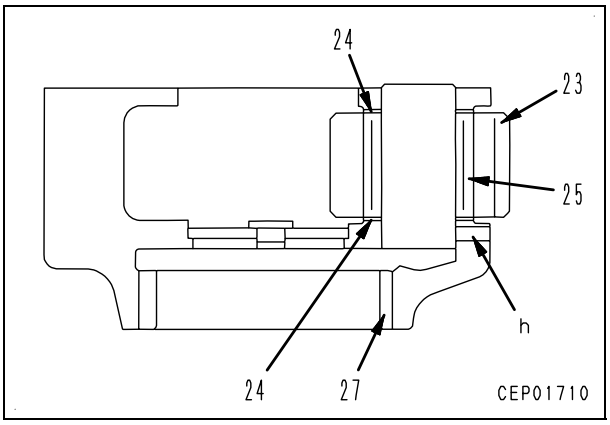
6. **No. 2 sun gear**
   1) Press-fit thrust (29) into No. 2 sun gear (28).
   2) Install No. 2 sun gear (28).
7. **No. 2 ring gear**
   Install No. 2 ring gear (30).



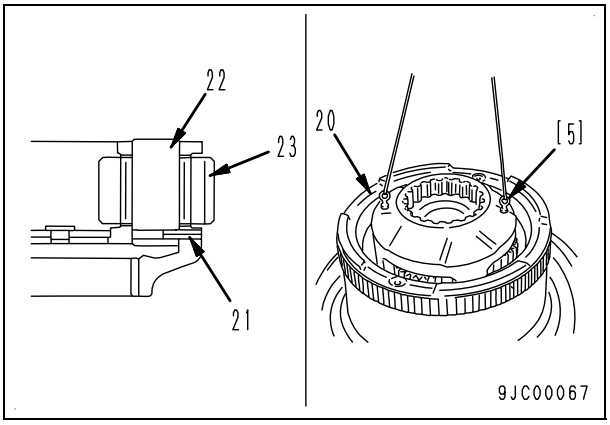
8. **No. 2 carrier assembly**
   1) Build up No. 2 carrier assembly according to the following procedure.
      1] Press-fit thrust (44) into plate (43).
      2] Press-fit thrust assembly (26) into carrier (27).



      ★ There is a punching mark made when the pin was inserted at the end face of carrier side hole **h** and the inside wall of the hole is swelled at that mark. Flatten the swelled part in advance.
      3] Install bearing (25) into gear (23), fit thrust washers (24) on both sides, then set the gear to carrier (27).
      4] Align the pin holes of the shaft and carrier, then install shaft (22) by lightly tapping it with a plastic hammer.
      ★ When installing the shaft, rotate the gear, and be careful not to damage the thrust washer.



      5] Install pin (21).
      ★ Check the pin groove and protruding part of the pin for fatigue. If the pin is defective, replace it with a new part.
      ★ If the pins are reused, avoid the position previously used for punching.
      ★ After inserting the pin, punch the carrier at the portion (indicated by arrow) of the pin. (Refer to 5-1)-3].)
      ★ After building the carrier assembly, check that gear (33) rotates smoothly.
   2) Install No. 2 carrier assembly (20) using eyebolts [5].



Disassembly and assembly of idler assembly

Special tools

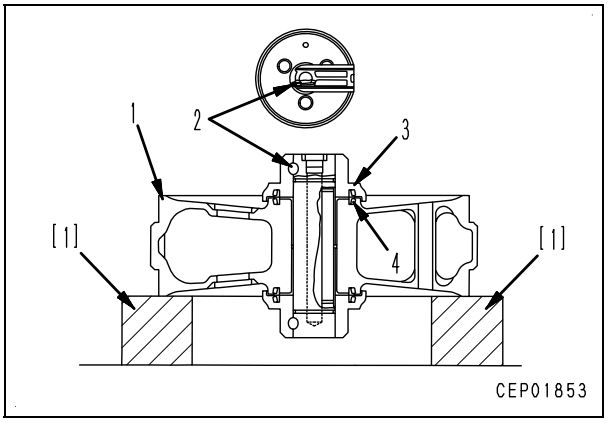
Symbol		Part number	Part name	Necessity	Q'ty	New/redesign	Sketch
L	**1**	790-201-2680	Plate	■	1		
	2	796-675-1510	Installer	■	1		
	11	791-601-1000	Oil pump ass'y	●	1		

Disassembly

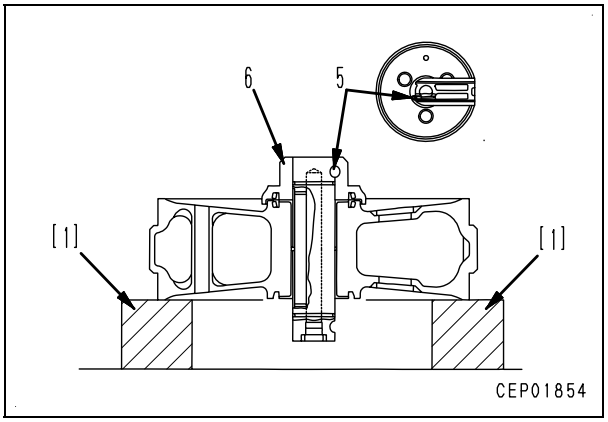
1. Remove the plug and drain the oil.
   Idler:
   Approx. 550 – 630 cc

2. Set idler assembly (1) on blocks [1], remove bolt and nut (2), then remove support (3).

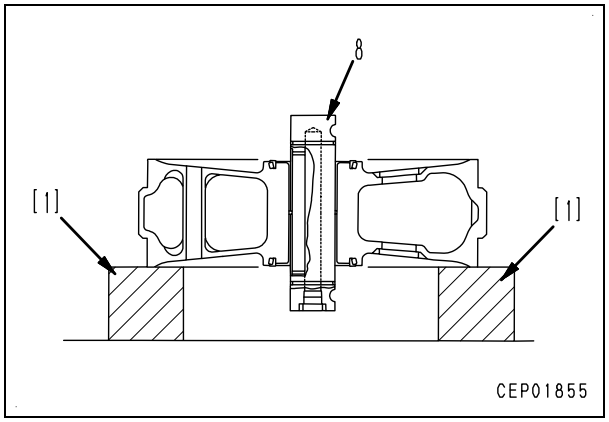
3. Remove floating seal (4).



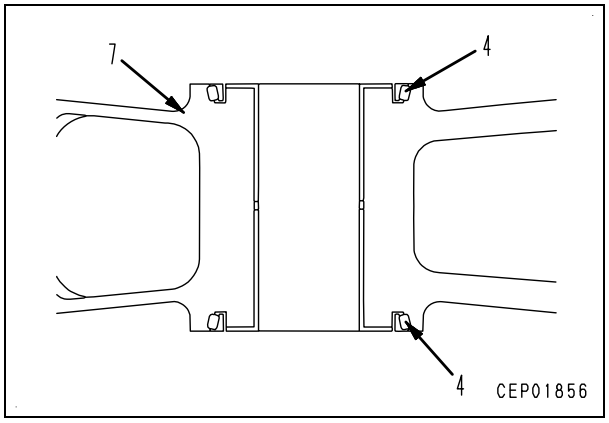
4. Turn over the idler assembly, remove bolt and nut (5), then remove support (6).



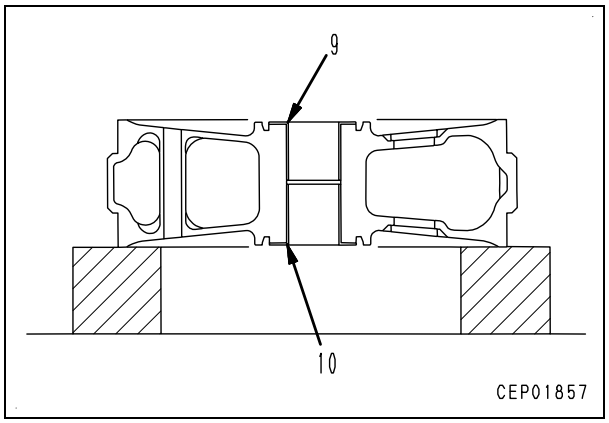
5. Remove shaft (8) from the idler.



6. Remove floating seal (4) from idler (7).



7. Remove bushings (9) and (10) from the idler.



Disassembly and assembly of track roller assembly

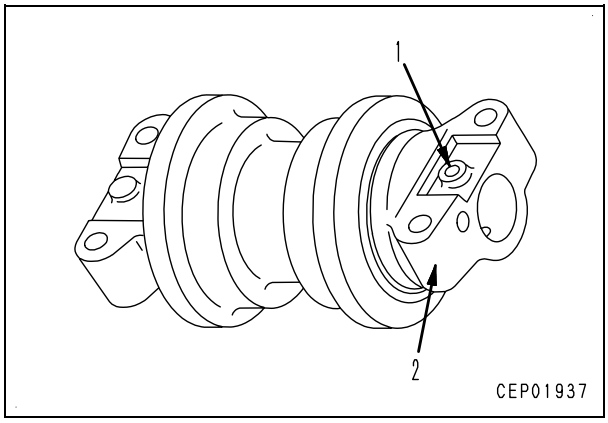
Special tools

Symbol		Part number	Part name	Necessity	Q'ty	New/redesign	Sketch
L	8	791-580-1520	Installer	■	1		
	9	790-201-2670	Plate	■	1		
	10	791-601-1000 or 791-646-8002	Oil pump assembly Oil lubricator	■	1		
		790-701-3000	Seal checker	■	1		

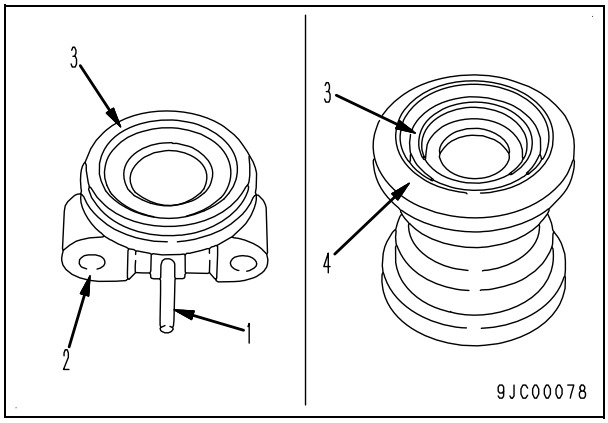
Disassembly

1. Remove the plug and drain the oil.
   ★ Drain the oil while rotating the shaft.
   Track roller:
   Approximately 420 – 480 cc

2. Remove pin (1), then remove collar (2).

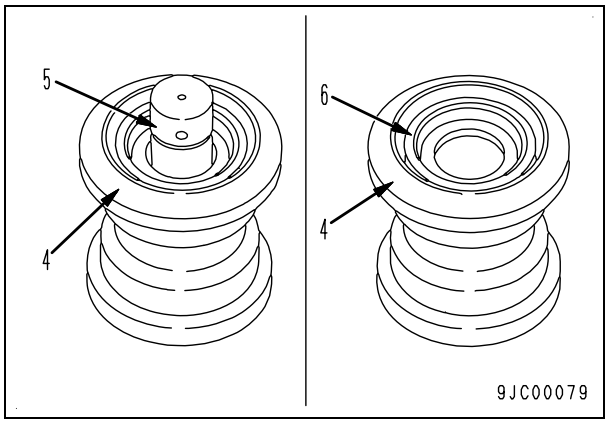


3. Remove floating seals (3) from collar (2) and roller (4).



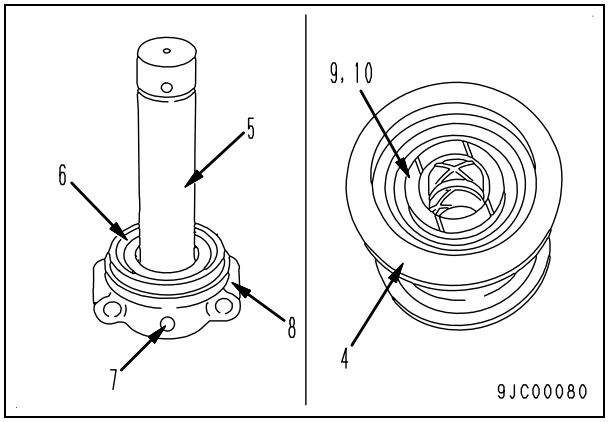
4. Pull out shaft (5) from roller (4).
   ★ It is filled with 420 to 480 cc of oil, so drain the oil at this point or lay a cloth to prevent the area from becoming dirty.

5. Remove floating seal (6) from roller (4) and collar (8) on the opposite side.

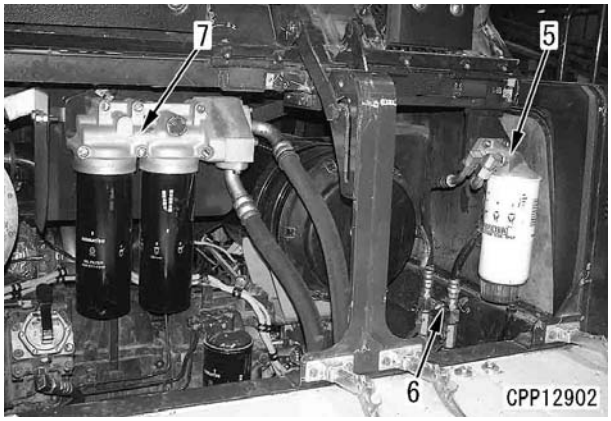


6. Remove pin (7), then remove collar (8) from shaft (5).

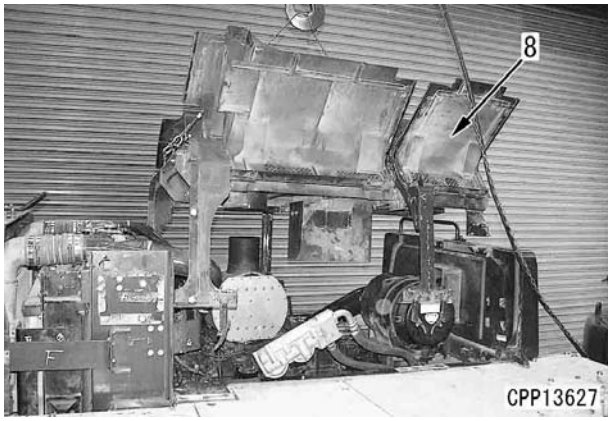
7. Remove bushings (9) and (10) from roller (4).



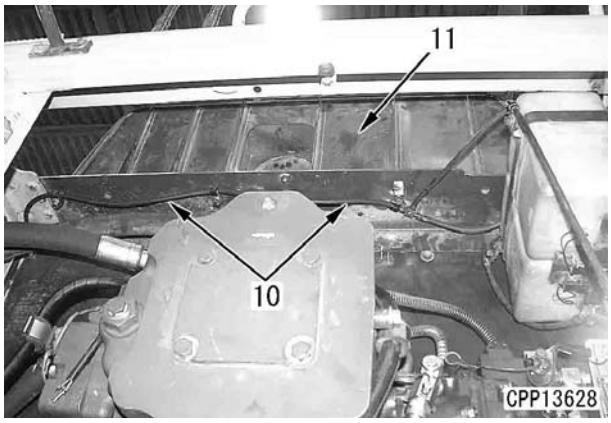
6. Remove filter (5).
7. Disconnect clamp (6).
8. Remove filter (7).
   ★ Disconnect the hose clamp.



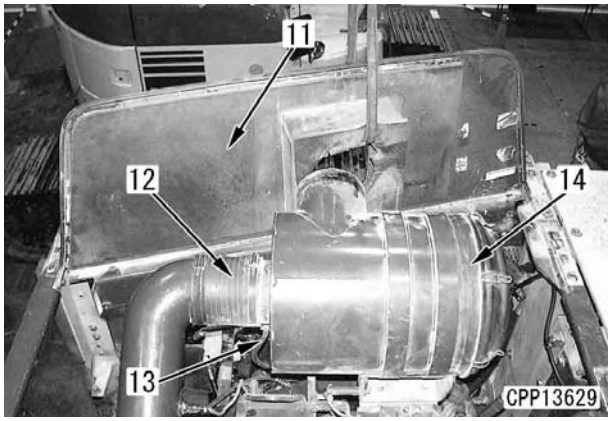
9. Sling and remove engine hood (8).
10. Remove cover **A**.
11. Remove cover (9).



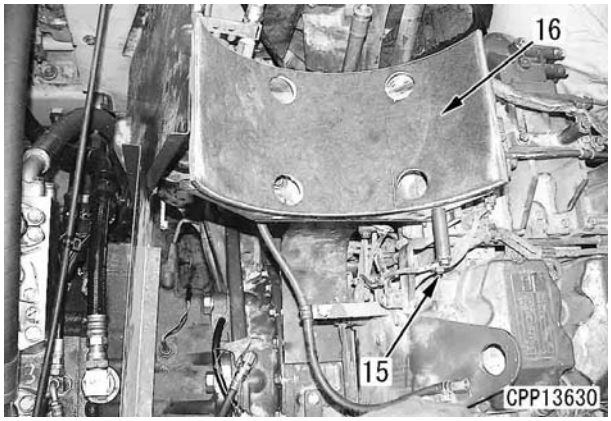
12. Remove reservoir tank hose (10) from the bottom of cover (11).



13. Sling and remove cover (11).
14. Disconnect hose (12). [*1]
15. Disconnect hose (13).
16. Remove air cleaner (14). [*2]



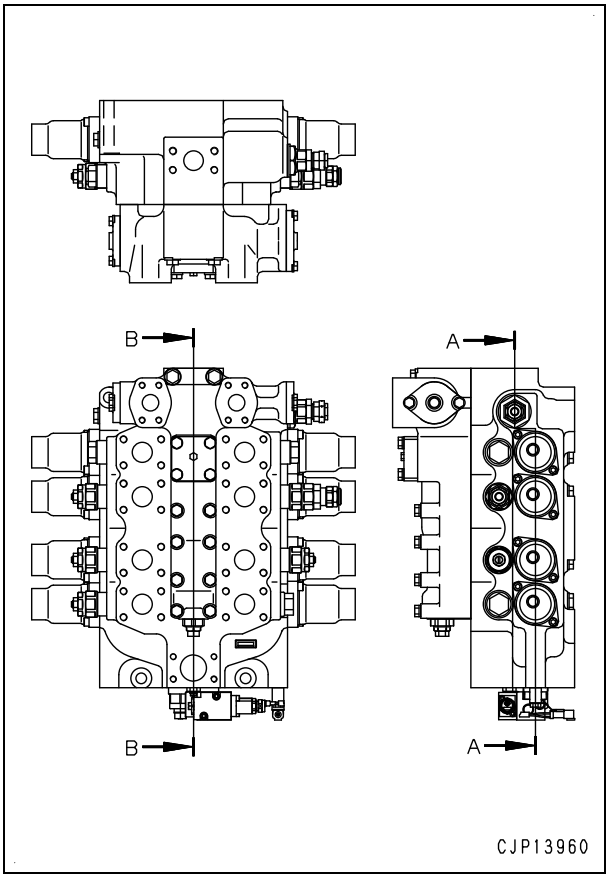
17. Disconnect clamp (15).
18. Remove bracket (16).



Assembly of control valve assembly

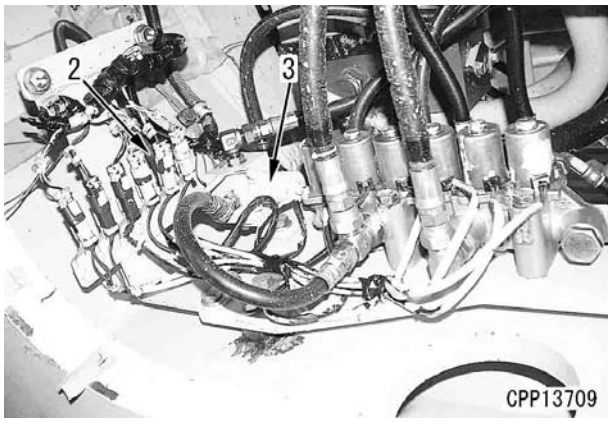
★ In this section, only the precautions for assembling the control valve assembly are described.

4-spool control valve



3. **Swing priority selector valve**
   1) Access through hole (1) on the bottom of the revolving frame.

   2) Disconnect wiring connector (2) (V14).
   3) Remove coil (3).
      ★ V14: Swing priority selector valve



Installation

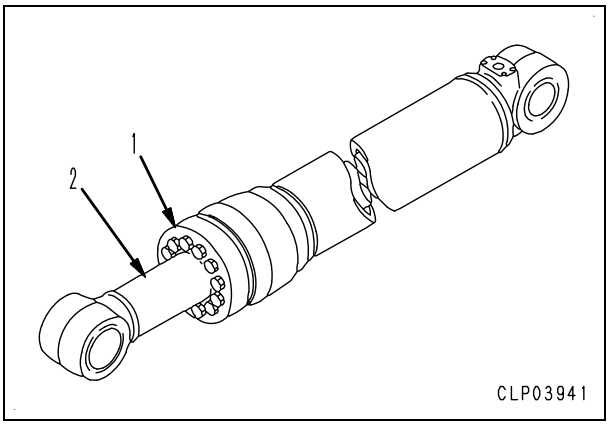
- Perform installation in the reverse order to removal.

★ Take care that dirt does not stick to the coil insertion parts.

9) Install and tighten head assembly (1) with mounting bolts.

Mounting bolt:

Cylinder name	Tightening torque
Standard bucket, standard arm	892 ± 137 Nm {91.0 ± 14 kgm}
Civil engineering specification arm, boom	1.27 ± 0.20 kNm {130 ± 20 kgm}
SE Bucket	1.67 ± 0.25 kNm {170 ± 25 kgm}



10) Install piping.

Installation

- **Perform installation in the reverse order to removal.**

[*1]

⚠ **When aligning the mounting holes for the pin, never insert your fingers in the pin hole.**

[*2]

⚠ **When aligning the mounting holes of the pin, never insert your fingers in the pin hole.**

★ Adjust with shims so that the clearance at the cylinder bottom end is less than 1 mm.

★ Bleed the air from the work equipment circuit. For details, see Testing and adjusting, “Bleeding air from hydraulic cylinder (work equipment circuit)”.

- **Refilling of oil**
  ★ Add oil through the oil filler port to the specified level. Circulate the oil through the system. Then check the oil level again.

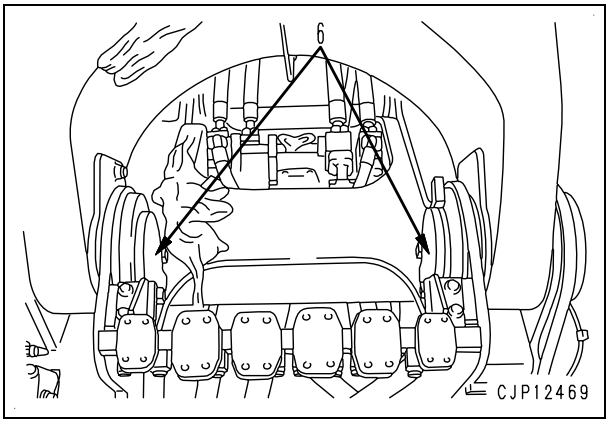
7. Using forcing screws (thread dia. = 16 mm, pitch = 2 mm), pull out left and right boom foot pins (6), then remove boom assembly (7).

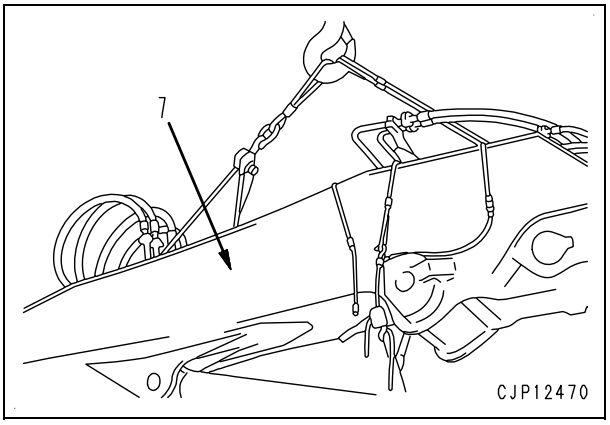
[*2]

★ Check and record the quantity and thickness of the shims, and keep them in a safe place.

Boom assembly:

5,320 kg





Installation

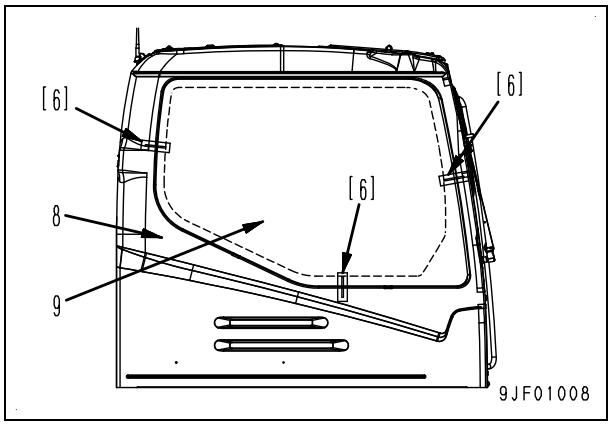
- **Perform installation in the reverse order to removal.**

[*1] [*2]

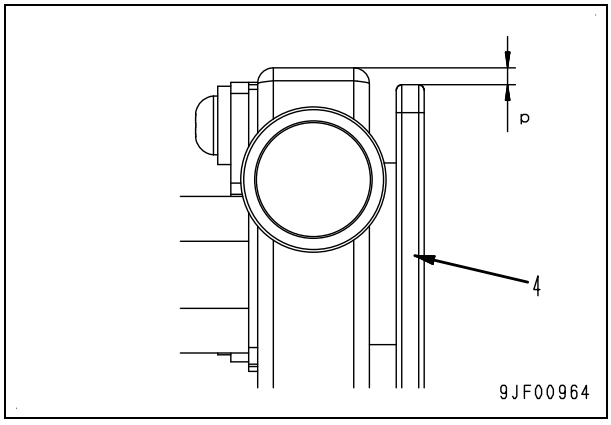
⚠ **When aligning the mounting holes for the pin, never insert your fingers in the pin hole.**

★ Bleed the air from the work equipment circuit. For details, see Testing and adjusting, “Bleeding air from hydraulic cylinder”. After completion of the air bleeding operation, add hydraulic oil to the hydraulic tank to the specified level.

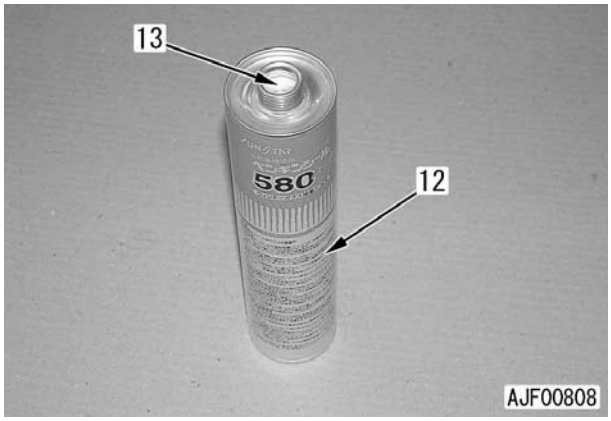
5. Position the new window glass.
   1) Check the clearances between the window glass and the operator's cab on the right, left, upper, and lower sides, and then position the window glass with the clearance evenly.
   2) Stick tapes [6] between window glass (9) and operator's cab (8) and draw a positioning line (**n**) on the tape.
      ★ Stick tapes [6] to three points, that is, right, left and lower portions of the right side window glass, left side rear window glass, and door lower window glass for accurate positioning.
   3) Cut the tape between window glass (9) and operator's cab (8) with a knife, etc. and then remove the window glass.
      ★ Do not remove the tapes left on the window glass and the operator's cab before installing the window glass.



   ★ When positioning front window glass (4), set right and left installing position to the frame width.
   And set its vertical position to make the height difference (p) between the frame top and the front window glass (4) 3 mm.

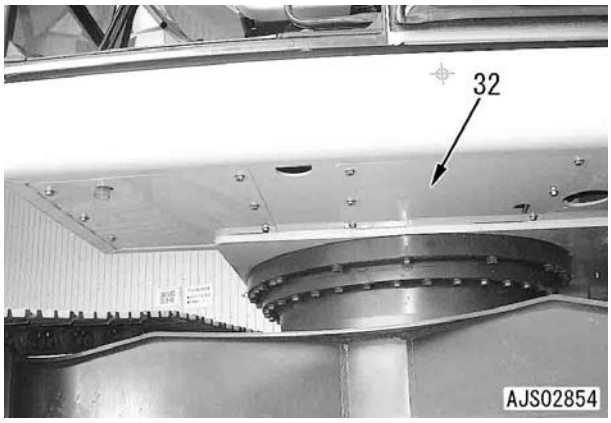


6. Apply adhesive.
   ★ Use either of two types of adhesives according to the season.
   Adhesive (summer):
   SUNSTAR penguine seal 580 super "S"
   Adhesive (winter):
   SUNSTAR penguine seal 580 super "W"
   ★ The effective period of the adhesive is four months after the date of manufacture. Do not use the adhesive after this limit.
   ★ Keep the adhesive in a dark place where the temperature is below 25 °C.
   ★ Never heat the adhesive higher than 30 °C.
   ★ When reusing the adhesive, remove all the hardened part from the nozzle tip.
   1) Remove aluminum seal (13) of the outlet of adhesive cartridge (12) and install the nozzle.



   2) Cut the tip of the adhesive nozzle (14) so that dimensions (**q**) and (**r**) are as follows.
      - Dimension (**q**): **10 mm**
      - Dimension (**r**): **15 mm**

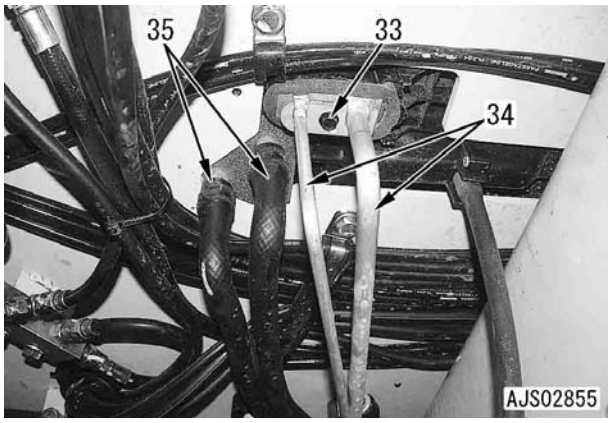
23. Remove cover (32).



24. Remove mounting bolt (33) and air conditioner tubes (34).

[*1]

25. Disconnect heater hoses (35).
    ★ Check the connecting points.



26. Remove the seven mounting bolts and remove air conditioner unit assembly (36).

Installation

- Perform installation in the reverse order to removal.

[*1]

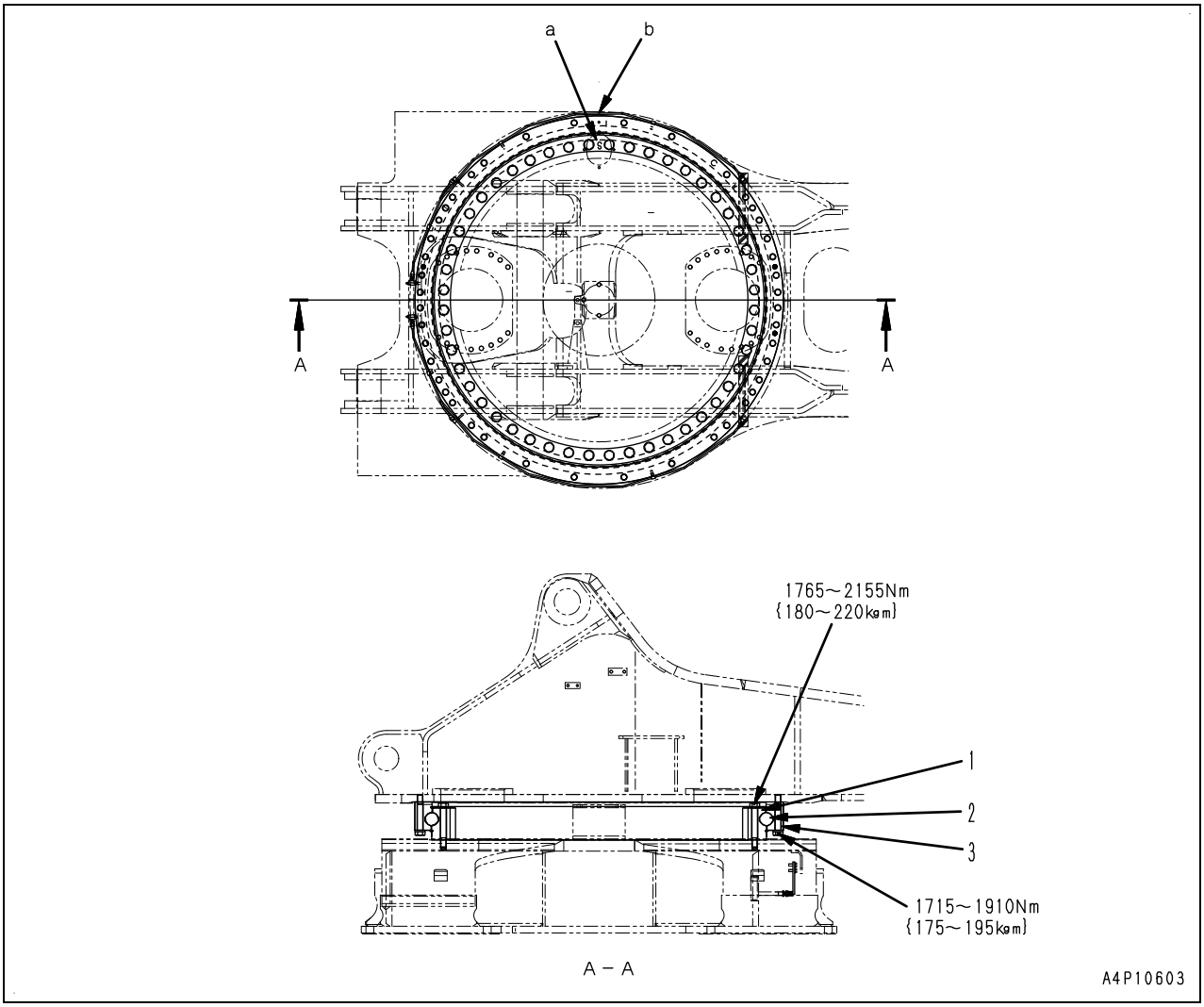
★ When installing the air conditioner hose, take care so that dust, dirt or water does not enter the hose.
★ Make sure before the installation that there is an O-ring in the connecting part of the air conditioner hose.
★ Check that there is no defect or deterioration on the O-ring.
★ When connecting the refrigerant piping, coat the O-ring with compressor oil **(Dense: ND-OIL8) for new refrigerant (R134a).**

Mounting bolt:
8 – 12 Nm {0.8 – 1.2 kgm}

- **Charging air conditioner with refrigerant**
  Refill the air conditioner circuit with refrigerant (**R134a**).
  ★ Amount of refrigerant: **1330 ± 50 g**

- **Refilling of coolant**
  Supply coolant through the coolant filler port to the specified level. Run the engine to circulate the coolant through the system. Then, check the coolant level again.

Coolant:
approx. 100 ℓ

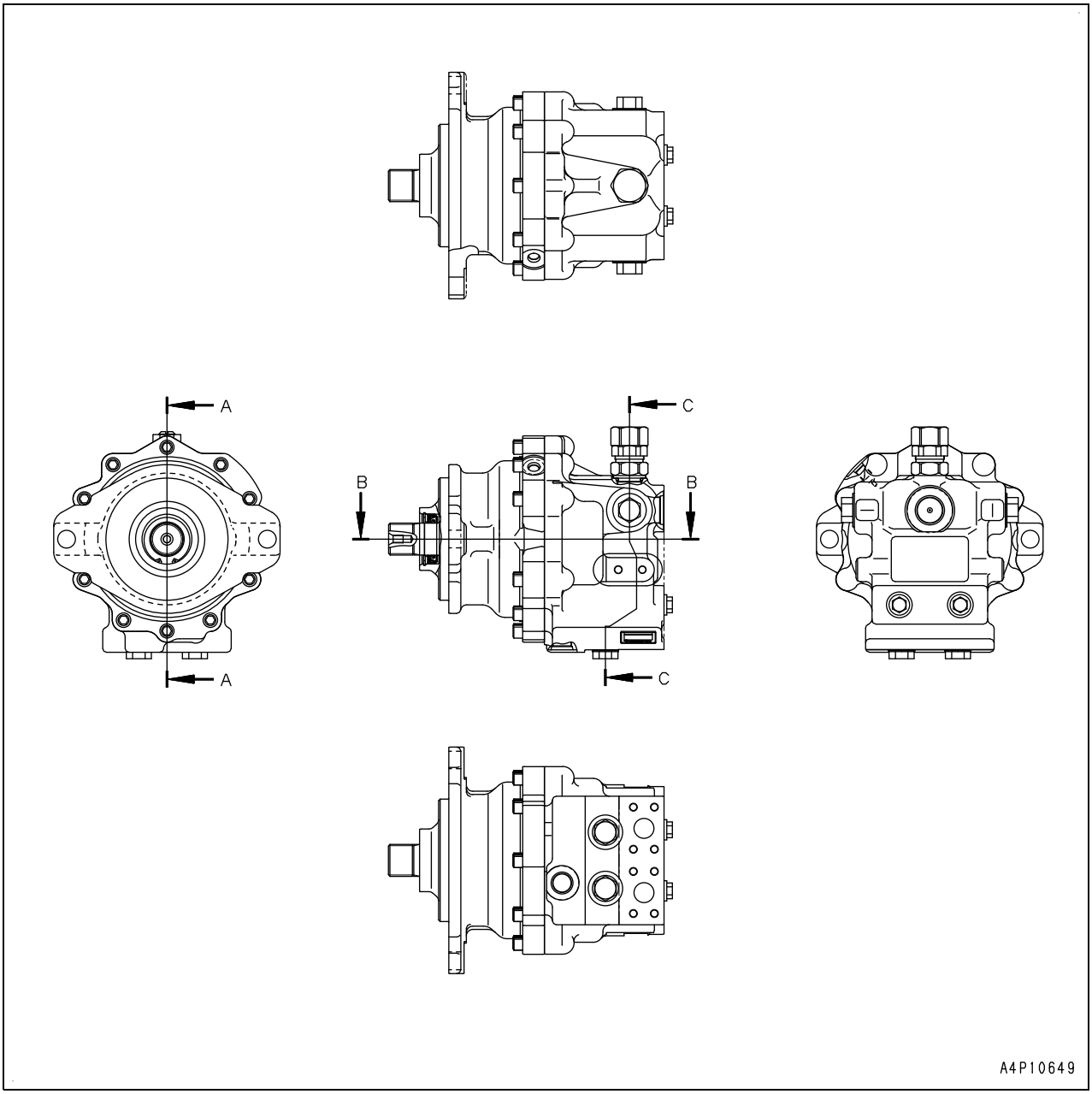

a
b
A
A
1765~2155Nm
{180~220kgm}
1
2
3
1715~1910Nm
{175~195kgm}
A – A
A4P10603

Unit: mm

No.	Item		Criteria					Remedy
1	Outside diameter of outer flange		Standard dimension		Repair limit			Build-up welding for rebuilding or replace
			298		–			
2	Outside diameter of inner flange (double flange)		295		–			
3	Outside diameter of tread		255		243			
4	Thickness of tread		73.7		67.7			
5	Ovevall width		328		–			
6	Width of tread	Single flange	72		–			
		Double flange	72		–			
7	Width of outer flange	Single flange	29		–			
		Double flange	29		–			
8	Width of inner flange (double flange)		33		–			
9	Axial play		0.42 – 0.99		–			
10	Clearance between shaft and bushing		Standard dimension	Tolerance		Standard clearance	Allowable clearance	Replace bushing
				Shaft	Hole			
			100	-0.140 -0.207	+0.375 +0.235	0.375 – 0.582	–	
11	Interference between roller and bushing		Standard dimension	Tolerance		Standard interference	Allowable interference	
				Shaft	Hole			
			107.6	+0.087 +0.037	+0.020 -0.015	0.017 – 0.102	–	

Swing motor

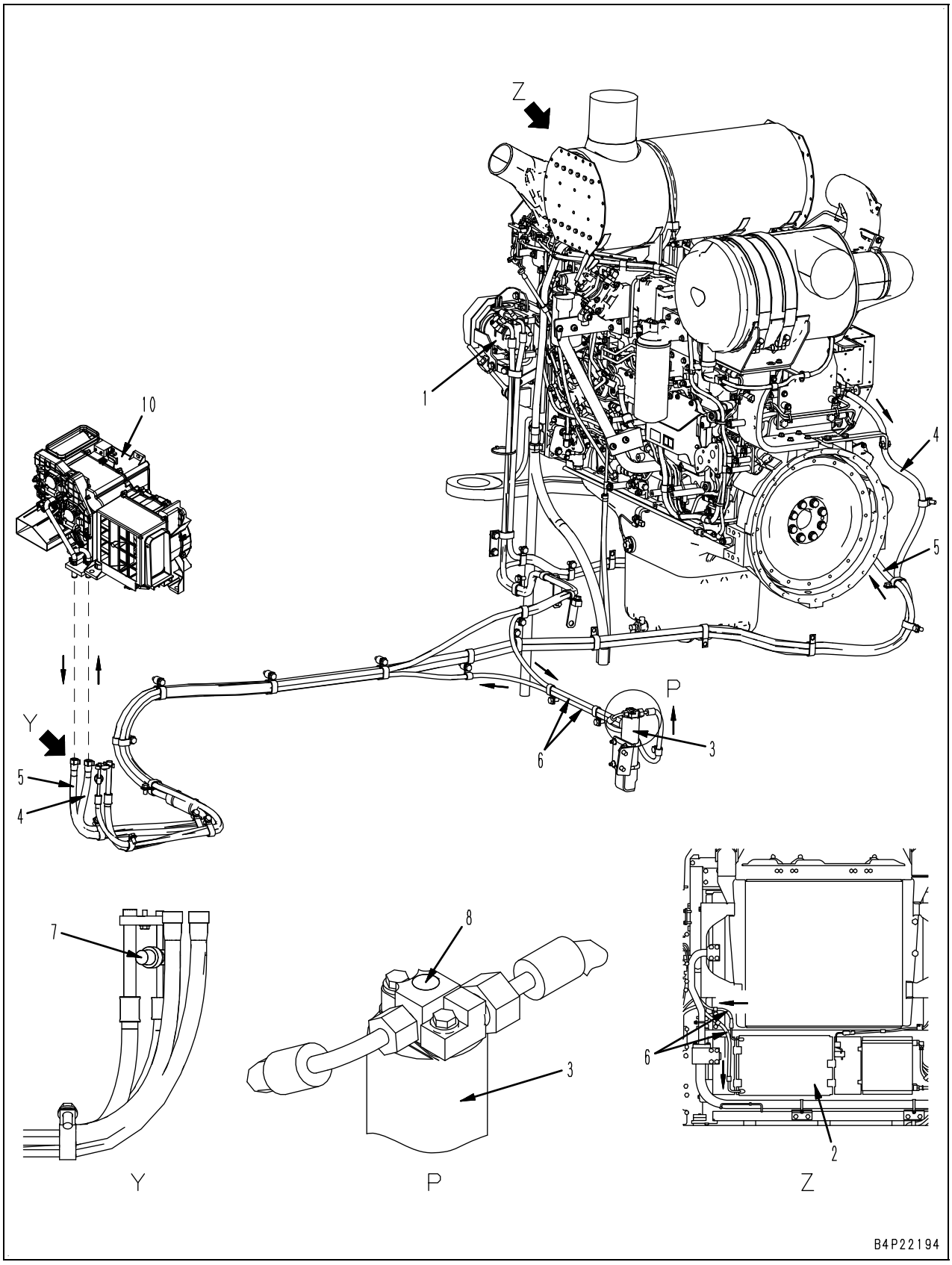
Model: KMF125AB-5



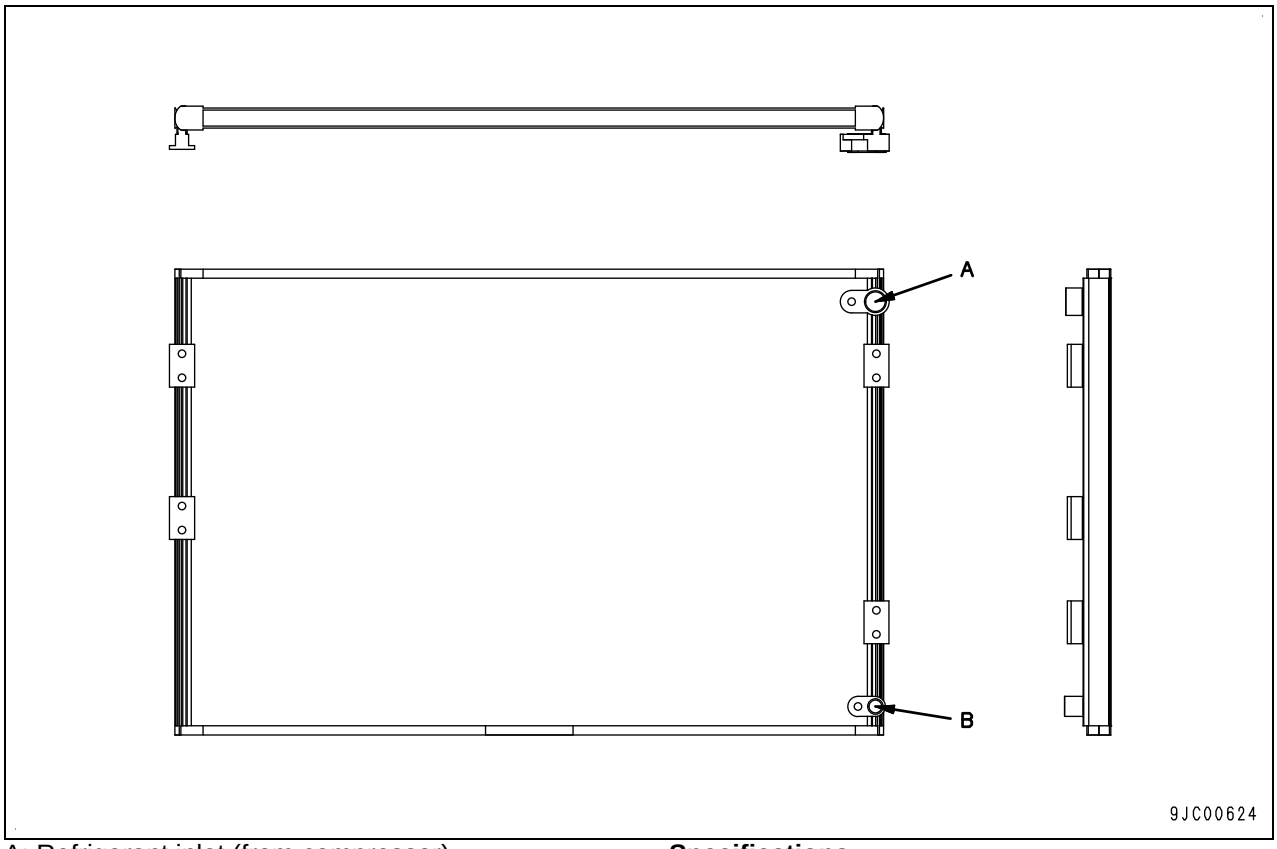
Unit: mm

No.	Model	PC800-8E0			PC850-8E0	PC800SE-8E0 PC850SE-8E0	PC850SE-8E0
		3.6 m arm	4.6 m arm	5.6 m arm	3.6 m heavy-duty arm	2.9 m short arm	3.6 m arm
1		ϕ115	ϕ115	ϕ115	ϕ110	ϕ110	ϕ110
2		100	100	100	129	129	129
3		531	531	531	531	531	531
4		ϕ140	ϕ140	ϕ140	ϕ140	ϕ140	ϕ140
5		580	620	639	663	750	663
6		397	467	530	329	401	329
7		1,332	1,389	1,328	925	916	925
8		3,578	4,569	5,575	3,585	2,917	3,585
9		3,675	3,668	3,673	4,011	3,580	4,011
10		585	570	585	585	500	585
11		950	950	950	1,035	840	1,035
12		740	740	740	865	640	865
13		756	756	756	765	670	765
14		2,285	2,237	2,237	2,295	2,280	2,295
15		ϕ115	ϕ115	ϕ115	ϕ115	ϕ115	ϕ115
16(link)		519	519	519	519	519	519
17		ϕ130	ϕ130	ϕ130	ϕ130	ϕ130	ϕ130
18	Arm boss (without bushing)	519	519	519	519	519	519
	When press fitting bushing (with bushing)	535	535	535	535	535	535
19	Min.	2,380	2,380	2,380	2,590	2,490	2,590
	Max.	3,990	3,990	3,990	4,410	3,910	4,410

Air conditioner component



Condenser



A: Refrigerant inlet (from compressor)
B: Refrigerant outlet (to receiver drier)

Function

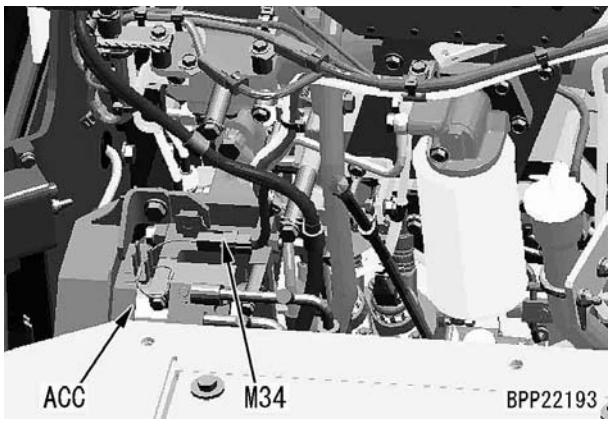
- The condenser cools and liquefies the high pressure and high temperature misty refrigerant sent from the compressor.

★ If the fin is crushed or is clogged with dust, heat exchange efficiency is reduced and complete liquefaction of refrigerant becomes impossible.
If the heat exchange efficiency is reduced, pressure in the refrigerant circulation circuit will be increased, applying extra load to the engine or reducing the cooling effect. Take extreme care not to crush or damage the fins when hangling it or performing daily inspection.

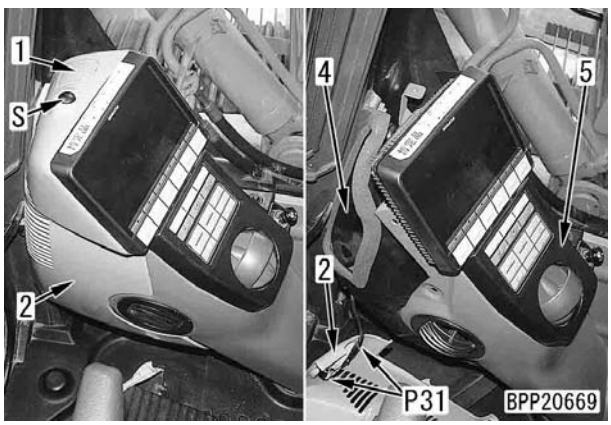
Specifications

Fin pitch (mm)	4.0
Height x width x thickness (mm)	357 x 540 x 16
Max. working pressure (MPa {kg/cm^2}	3.6 {36}

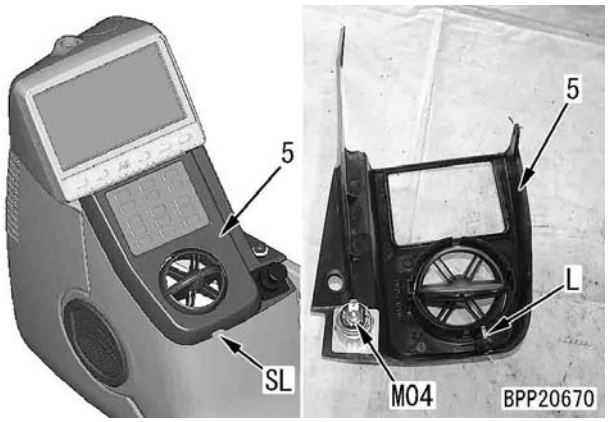
5. Open the engine hood.
   - ACC: Air conditioner compressor
   - M34: Air conditioner compressor connector



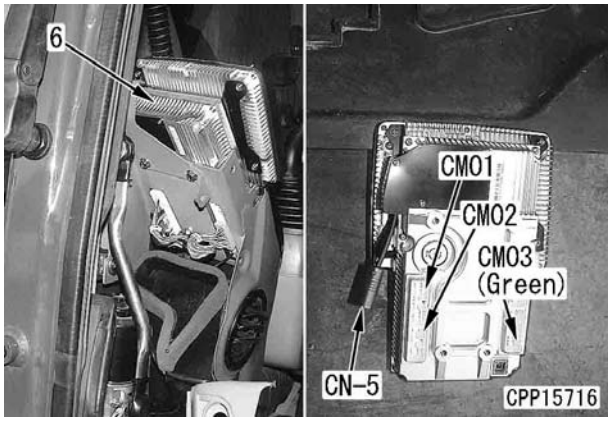
6. Testing sunlight sensor connector P31 and machine monitor connector CM02 (CAN communication connector)
   ★ If machine monitor connector CM02 is disconnected, neither of the engine controller and pump controller can carry out the CAN communication and failure code [DAFRMC] is displayed. If the screen changes to the air conditioner operation screen at this time, “A/C Controller error” is displayed in red. If the above error is not displayed, no check is necessary.
   Note: "A/C Controller Error" is also displayed on the air conditioner operation screen when the vent changeover is not possible, when a temperature control abnormality occurs, or when the refrigerant's pressure switch is set to OFF.
   1) Remove cap (1).
   2) Remove cover (2), and disconnect wiring connector P31 (3) for the air conditioner sunlight sensor (S).
   3) Remove duct (4).
   4) Remove cover (5) as shown in the following. [*1]



   1] Insert a flat-head screwdriver into the slit (SL) and lift up.
   2] Release lock (L) and remove cover (5).
   3] At the rear of cover (5), disconnect the connector (M04) for the cigarette lighter.



   5) Remove four mounting bolts and lift up monitor assembly (6). [*2]
   6) Check connector CM02.
      ★ CM02 and CM03 can be installed in reverse, so take care not to install them in reverse. CM03 is a green connector.
      ★ The connector CN-5 is connected on models with rear view camera specification.

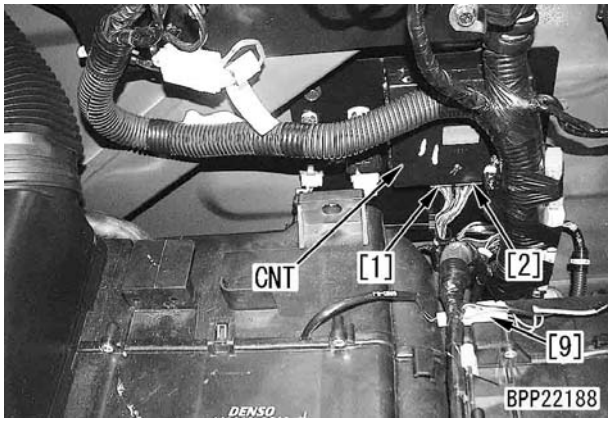


Caution about installation
[*1], [*2]
1. Fix machine monitor assembly (6) temporarily using four mounting bolts, and install cover (5).
2. With cover (5) installed, tighten the mounting bolts of monitor assembly.
   - Carry out the rest of installation in the reverse order to removal.

Testing evaporator temperature sensor

- When "Ventilating Sensor abnormal" is displayed by the self-diagnosis (on "03 Air-conditioning System" screen of "Abormality Record" in the machine monitor), test the evaporator temperature sensor.
- To reset the self-diagnosis system (detection of abnormality), the starting switch must be turned OFF.

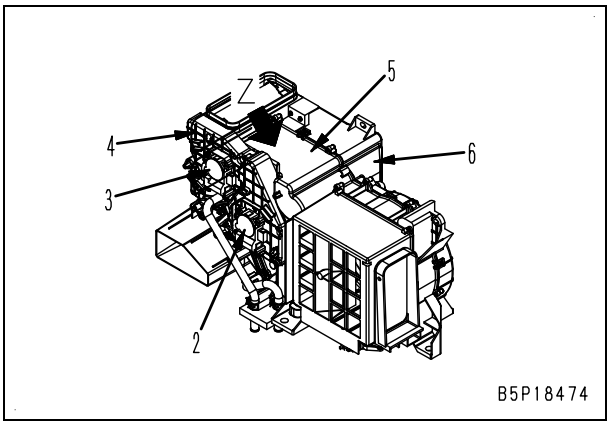
1. Referring to testing temperature control 1, remove covers (1) - (3).
2. Check the contact of connector (9). (Check whether the connector is coming off.)
3. Remove connector (9).
4. Measure the resistance between the opponent (female) of connector(9) and the terminal at evaporator temperature sensor side. Standard resistance:
   4.8 kΩ (0 °C)
   2.3 kΩ (15 °C)
   ★ If error is detected with self-diagnosis and evaporator temperature control sensor is normal, air conditioner controller (CNT) or wiring harness is defective.
5. Remove connectors [1], [2] from air conditioner controller (CNT). (Connector [9] must be connected.)



   Standard resistance between terminal (11) (PB) of connector [1] and terminal (27) (BrR) of connector (2):
   4.8 kΩ (0 °C)
   2.3 kΩ (15 °C)
   ★ If item 5 above is normal, the controller (CNT) is defective. If item 5 above is abnormal and item 4 is normal, wiring harness is defective.
   ★ If the evaporator temperature sensor is defective, replace it according to the following procedure.

- **Replacement of evaporator temperature sensor**

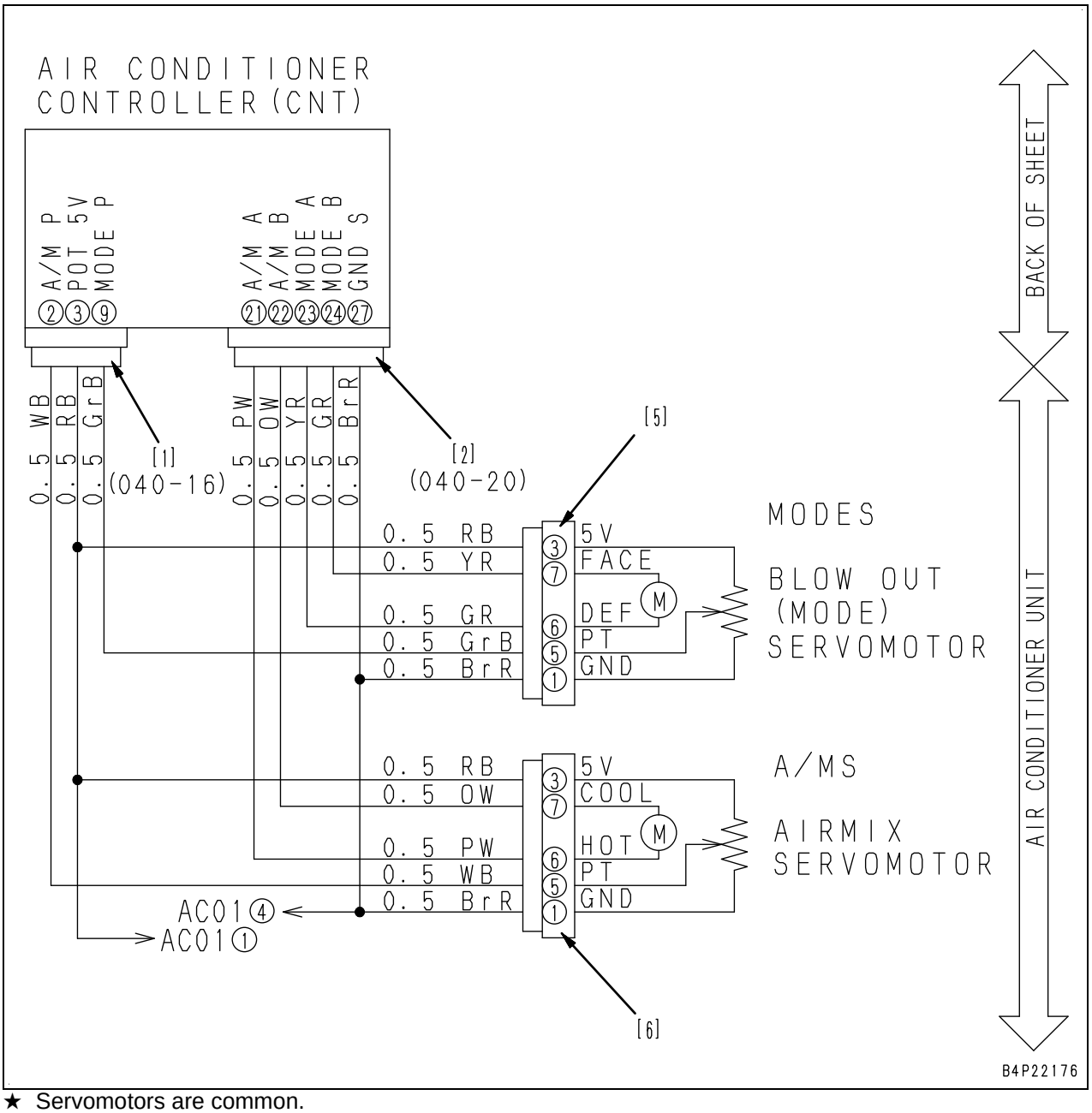
1. Referring to Shop Manual Chapter 50, "Removal and installation of air conditioner unit assembly", remove air conditioner unit assembly (A/CU).
2. Remove wiring harness. (For each connector, see "Parts and connectors layout".)
3. Remove servo motors (2) and (3).
4. Remove cover (4).
5. Remove the link section. For details, see Shop Manual, Chapter 80, Structure and function, "Air conditioner unit".
6. Disconnect cases (5) and (6).



7. Remove the evaporator.

<table>
<tr><th colspan="2">Cause</th><th colspan="5">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="4">6</td><td rowspan="4">Open circuit in CAN communication line
(Communication is not possible between the machine monitor and the air conditioner controller.)</td><td colspan="5">★ When short circuit or ground fault occurs in CAN communication line, a [DAFRMC] error is displayed.
★ Terminating resistor: Terminating resistors of approximately 120 Ω are provided inside the machine monitor and engine. Since they are connected in parallel, the combined resistance is approximately 60 Ω.
1. Turn starting switch to OFF position.
2. Disconnect the cable from the negative (–) terminal of the battery.
3. Disconnect connectors [1] and [2] from the air conditioner controller, and connect the T-adapter to the harness side.</td></tr>
<tr><td>Between (17) and (18) on the wiring harness side of connector [2]</td><td>Resistance</td><td>Approx. 60 Ω</td><td>H</td></tr>
<tr><td colspan="5">★ If result H above is abnormal, perform following procedure.
★ If an abnormality is recorded for H above and J below, the cab harness is defective.
★ If an abnormality is recorded for H above but J below is normal, the air conditioner harness is defective.
★ Terminating resistor: Terminating resistors of approximately 120 Ω are provided inside the machine monitor and engine. Since they are connected in parallel, the combined resistance is approximately 60 Ω.
1. Turn starting switch to OFF position.
2. Disconnect the cable from the negative (–) terminal of the battery.
3. Disconnect connectors [1] and [2] from the air conditioner controller, and connect the T-adapter to the harness side.</td></tr>
<tr><td>Between (male) (1) and (2) of connector N10</td><td>Resistance</td><td>Approx. 60 Ω</td><td>J</td></tr>
<tr><td>7</td><td>Defective air conditioner controller</td><td colspan="5">If results of cause 1 and cause 2, 3 A, and 6 H are normal, replace the air conditioner controller.</td></tr>
<tr><td>8</td><td>Defective machine monitor</td><td colspan="5">If no abnormality is found in the checkup of potential causes 1 - 7, the machine monitor is defective.</td></tr>
</table>

Circuit diagram related to temperature control



★ Servomotors are common.

Handling of compressor oil

1. Compressor oil management (DENSO: ND-OIL8 for R134a)

Although compressor oil differs from engine oil in that it does not need regular checking or filling, the following types of problem can occur if the amount in the system is too high or too low.

Condition	Content
Insufficiency of oil	Lubrication trouble and seizure of compressor
Excess of oil	Cooling trouble (Excessive oil stick to parts and lower heat exchange performance)

Accordingly, compressor oil must be filled to the specified level, similarly to refrigerant.

2. Filling compressor oil

⚠ **Refrigerant is potentially hazardous to health and to the environment. Before disconnecting air conditioner hoses, therefore, refrigerant should be collected in accordance with "Precautions for connecting air conditioner piping."**

★ If oil for CFC-12 (R-12) is used, lubrication trouble will occur and the compressor may be broken or seized.
Be sure to use an oil suitable for **R134a** (DENSO: ND-OIL8).

★ Oil for use with **R134a** is extremely hygroscopic, and therefore, the cap must be immediately closed after use to limit contact with air.
Store the oil can in a dry and ventilated place.

★ Precautions for using oil
Do not allow oil for use with **R134a** to come into contact with acrylic plastic or polystyrene surfaces (except a baked finish) as it may dissolve these plastics.

Check compressor oil in the following cases, and then add new oil if necessary.

- When much refrigerant is discharged because of leakage.
- When the compressor is troubled and replaced. (See 3 below)
- When a cycle parts such as condenser, receiver drier, evaporator unit, etc. is replaced.

- Quantity of oil to be added when cycle part is replaced

Air conditioner part	Quantity to be added (cc)
Air conditioner unit, evaporator	Approx. 40
Condenser	Approx. 40
Receiver drier	Approx. 20
Hose (Compressor – Cab)	Approx. 50
Hose (Compressor – Condenser)	Approx. 45
Hose (Condenser – Receiver dryer)	Approx. 30
Hose (Cab – Receiver drier)	Approx. 20