SEN06507-20

Shop Manual

HYDRAULIC
EXCAVATOR

PC290LC-11

SERIAL NUMBERS 35001 and up

KOMATSU

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Precautions During Work

- For the machine with the battery disconnect switch, check before starting the work that the system operating lamp is not lit. Then, turn the battery disconnect switch to OFF (○) position.

  REMARK

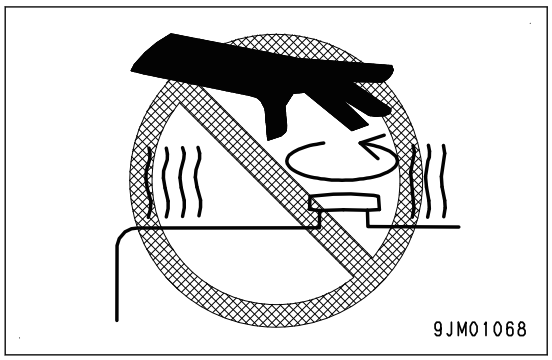
  Remove the key after it is turned to OFF (○) position if the battery disconnect switch is a switch key type. For the machine without the battery disconnect switch, turn the starting switch to OFF position, wait for two minutes or more before starting the work. Disconnect the battery cable by starting from the negative (-) terminal first.

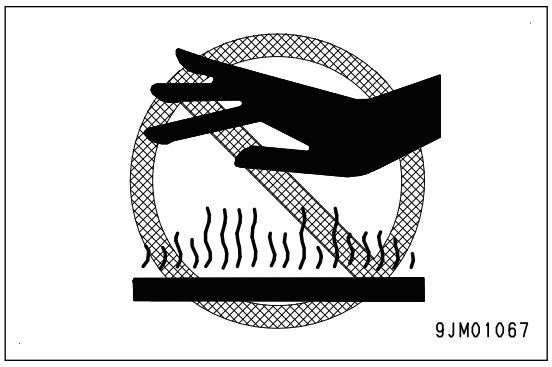
- For the machine with the quick release battery terminal (-), check before starting the work that the system operating lamp is not lit. Then, disconnect the quick release battery terminal (-).

  REMARK

  For the machine without the system operating lamp, turn the starting switch to OFF position, wait for two minutes or more before starting the work. Disconnect the quick release battery terminal (-).

- Release the remaining pressure from the circuit before starting the work of disconnecting and removing of oil, fuel, water, or air from the circuit. When removing the cap of oil filter, drain plug, or oil pressure plug, it should be done slowly otherwise the oil spills.
- When removing or installing the checking plug or the piping in the fuel circuit, wait 30 seconds or longer after the engine is shut down and start the work after the remaining pressure is released from the fuel circuit.
- The coolant and oil in the circuits are hot when the engine is shut down. Be careful not to get scalded. Wait for the oil and coolant to cool before performing any work on the oil or coolant circuits.





Practical Use of KOMTRAX

Various information which KOMTRAX system transmits by using the radio communication is useful for KOMTRAX operator to provide various services for the customers.

When KOMTRAX system is installed to the machine and it is enabled, machine information can be checked by KOMTRAX system, and it is used for testing and troubleshooting to be performed efficiently.

Large-sized models are equipped with KOMTRAX Plus which can use more detailed information.

REMARK

(KOMTRAX may not be installed to the machine in some countries or areas.)

Advantage to Use KOMTRAX

- The location where the machine is working at can be checked on the map in a personal computer.
- Operation information such as service meter, operating hours, fuel consumption, and occurred caution as well as failure code can be checked.
- The operator can check the hours used and replacement interval of consumable parts of the machine such as fuel filter, hydraulic oil filter, hydraulic oil and engine oil.
- Information of how machine is operated (idling time, traveling time, digging time, relieving time, etc.) can be checked, and it is used to presume the machine operating condition.
- Various reports such as “Fuel saving operation support”, “Operation summary”, etc. is generated, and it is utilized as an advice tool for the user and operator.
- KOMTRAX Plus can record the data of abnormality record, trend data, snap shot data, etc. to grasp the soundness of machine, in addition to KOMTRAX function described above. These data can be used on personal computer screens.

How to Make a Full Use of KOMTRAX

Making use of KOMTRAX enables the following activities.

- Quick response to a request for immediate repair
  1. To check the displayed caution and failure code, etc. through KOMTRAX upon receiving a repair request from a user.
  2. To immediately arrange necessary tools, replacement parts, etc, immediately in accordance with the displayed failure code.
  3. To find the location of the failed machine by using the map of KOMTRAX, to visit the customer there.
- Proactive maintenance
  1. To check the service summary screen of KOMTRAX, to find the machine which has high priority failure code indicated by a red or yellow flag.
  2. To check the condition of the machine with the customer and to make a plan to visit.
  3. To immediately arrange necessary tools, replacement parts, etc, immediately in accordance with the displayed failure code.
- Practice of periodic maintenance and periodic inspection service
  1. To check the service summary screen of KOMTRAX, and to find the machine of which the usage limits for the consumable parts indicated by red flags are over.
  2. To submit an estimate sheet for the consumable parts to be replaced and the labor cost for the replacement work to the customer.
  3. To propose the periodic inspection (Pm clinic, etc.) according to the service meter reading.

How to Operate KOMTRAX

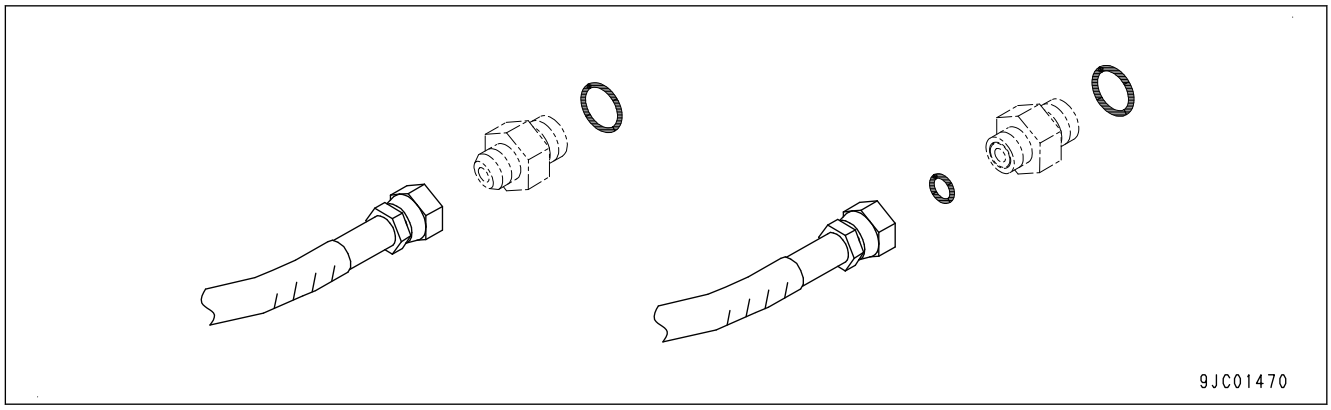
For the operating method of each screen of KOMTRAX, ask KOMTRAX key person in your Komatsu distributor.

Nominal No.	Thread diameter (mm)	Width across flats (mm)	Tightening torque (Nm {kgfm})	
			Range	Target
18	18	27	34.3 to 44.1 {3.5 to 4.5}	39.2 {4.0}
20	20	30	44.1 to 53.9 {4.5 to 5.5}	49.0 {5.0}
24	24	32	58.8 to 78.4 {6.0 to 8.0}	68.6 {7.0}
30	30	32	93.1 to 122.5 {9.5 to 12.5}	107.8 {11.0}
33	33	-	107.8 to 147.0 {11.0 to 15.0}	127.4 {13.0}
36	36	36	127.4 to 176.4 {13.0 to 18.0}	151.9 {15.5}
42	42	-	181.3 to 240.1 {18.5 to 24.5}	210.7 {21.5}
52	52	-	274.4 to 367.5 {28.0 to 37.5}	323.4 {33.0}

Table of Tightening Torque for Hose (Taper Seal Type and Face Seal Type)

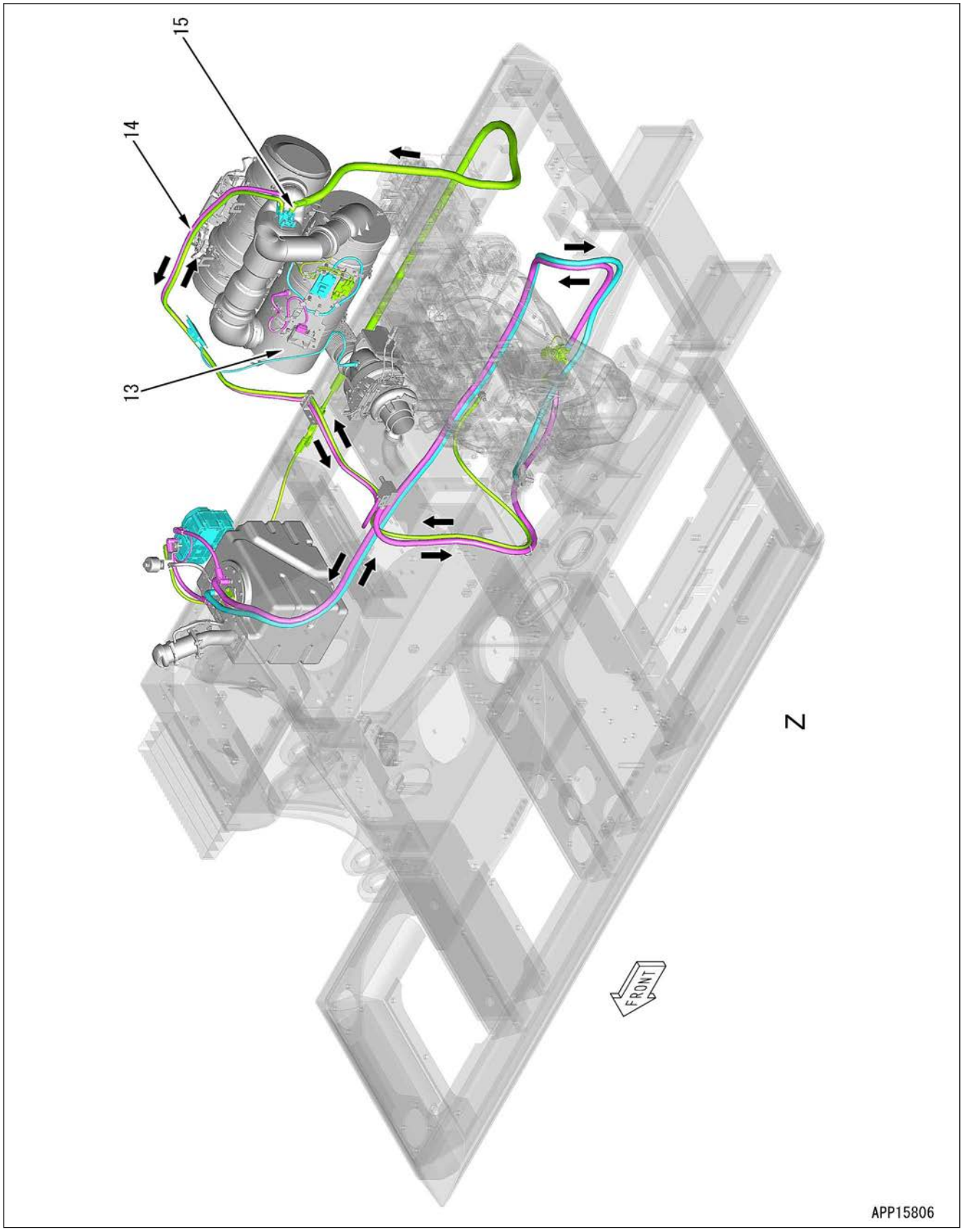
REMARK

- Tighten the hose fittings (taper seal type and face seal type) to the torque shown in the following table unless otherwise specified.
- The table is applied to the threaded portion coated with engine oil (wet threaded portion).



Nominal No. of hose	Width across flats (mm)	Tightening torque (Nm {kgfm})		Taper seal	Face seal	
		Range	Target	Thread size (mm)	Nominal size - threads per inch	Thread root diameter(mm) (reference)
02	19	34 to 54 {3.5 to 5.5}	44 {4.5}	-	$^{9}/_{16}$-18UN	14.3
		34 to 63 {3.5 to 6.5}	44 {4.5}	14	-	-
03	22	54 to 93 {5.5 to 9.5}	74 {7.5}	-	$^{11}/_{16}$-16UN	17.5
	24	59 to 98 {6.0 to 10.0}	78 {8.0}	18	-	-
04	27	84 to 132 {8.5 to 13.5}	103 {10.5}	22	$^{13}/_{16}$-16UN	20.6
05	32	128 to 186 {13.0 to 19.0}	157 {16.0}	24	1 -14UNS	25.4
06	36	177 to 245 {18.0 to 25.0}	216 {22.0}	30	$1^{3}/_{16}$-12UN	30.2
(10)	41	177 to 245 {18.0 to 25.0}	216 {22.0}	33	-	-
		240 to 300 {24.5 to 30.5}	270 {27.5}	-	$1^{7}/_{16}$-12UN	36.5
(12)	46	197 to 294 {20.0 to 30.0}	245 {25.0}	36	-	-
(14)	55	246 to 343 {25.0 to 35.0}	294 {30.0}	42	-	-

5: DEF tank pressure hose (low temperature side)
6: DEF pump
7: DEF suction hose
8: DEF tank coolant inlet hose
9: DEF pressure hose (high-temperature side)
10: DEF tank heating valve



11: KDPF
12: DEF mixing tube

DEF Injector

Structure of DEF Injector

A: Pressurized sending from DEF pump

B: Coolant inlet

C: Coolant outlet

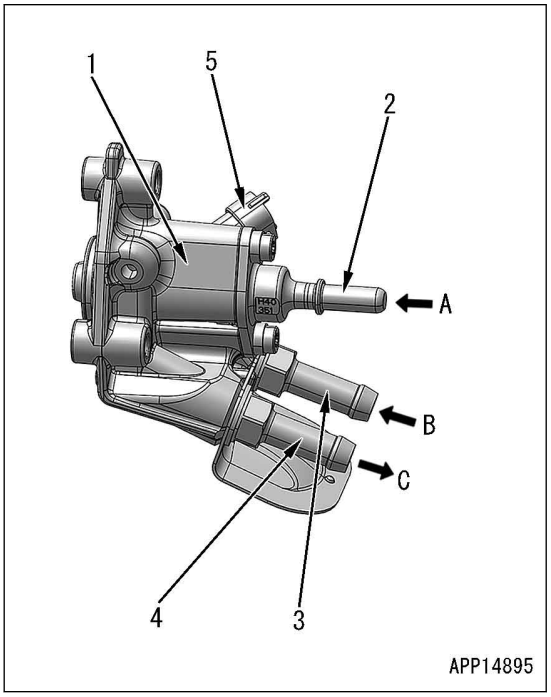
1: DEF injector

2: DEF inlet connector

3: Coolant inlet connector

4: Coolant outlet connector

5: Electric connector



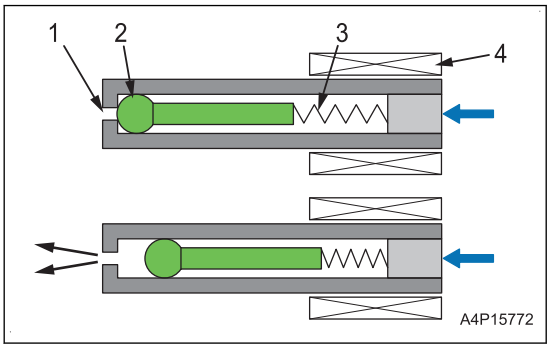
Function of DEF Injector

- It injects DEF which is pressurized by DEF pump into DEF mixing tube.
- The injection amount is controlled by the valve opening or closing time while the pressure is constant.
- It circulates the engine coolant to prevent it from being heated by the heat from the exhaust pipe.

Operation of DEF Injector

Principle of injection of the injector is described. Following figure shows the state of injection.

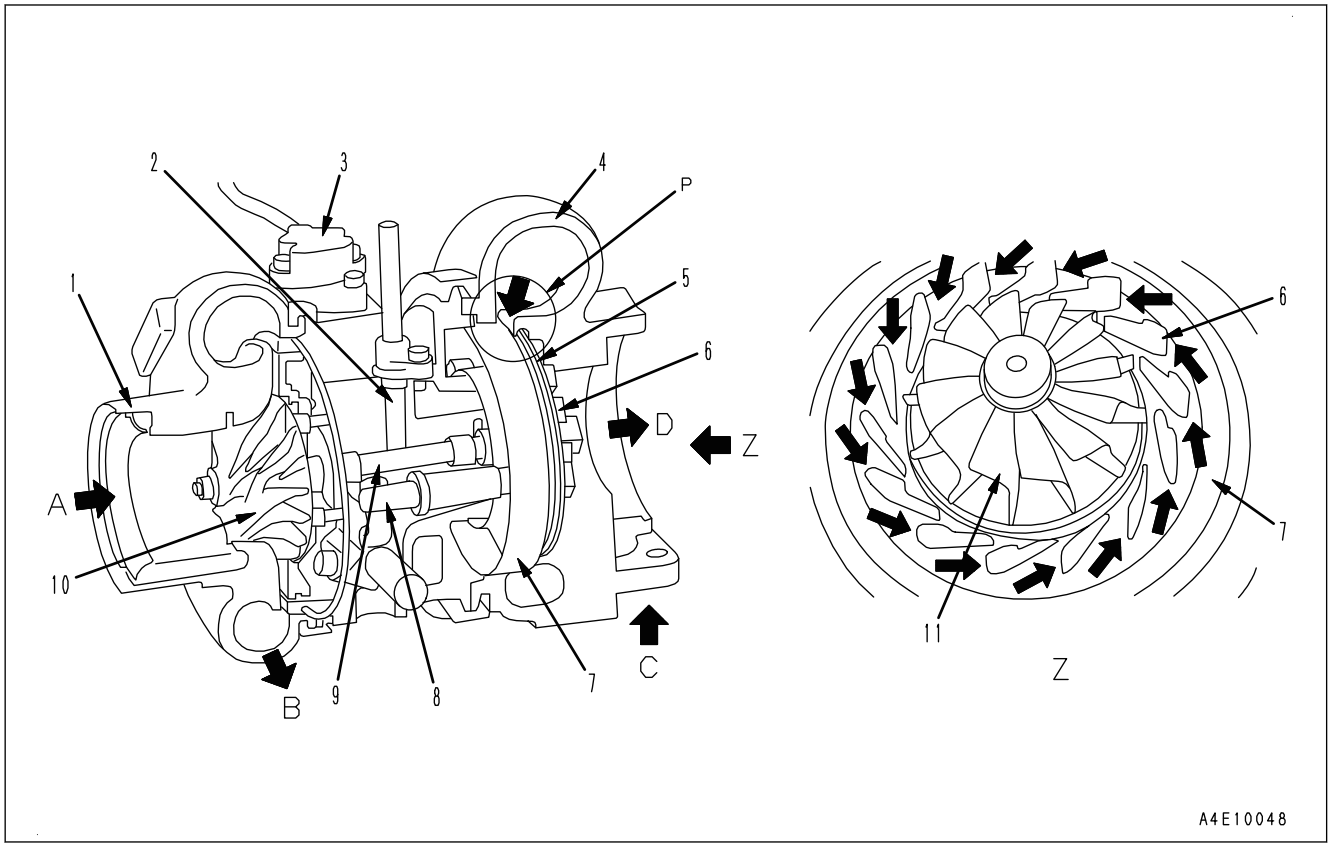
1. Engine controller sends the electrical signal to control DEF injector.
2. Solenoid (4) moves seal ball (2), and seal ball (2) leaves from injection port (1) to make opening state.
   Pressurized DEF by DEF pump is injected.
3. When the electrical signal is not sent, seal ball (2) closes injection port (1) with spring force (3), so DEF is not injected.



Operation of VGT

REMARK

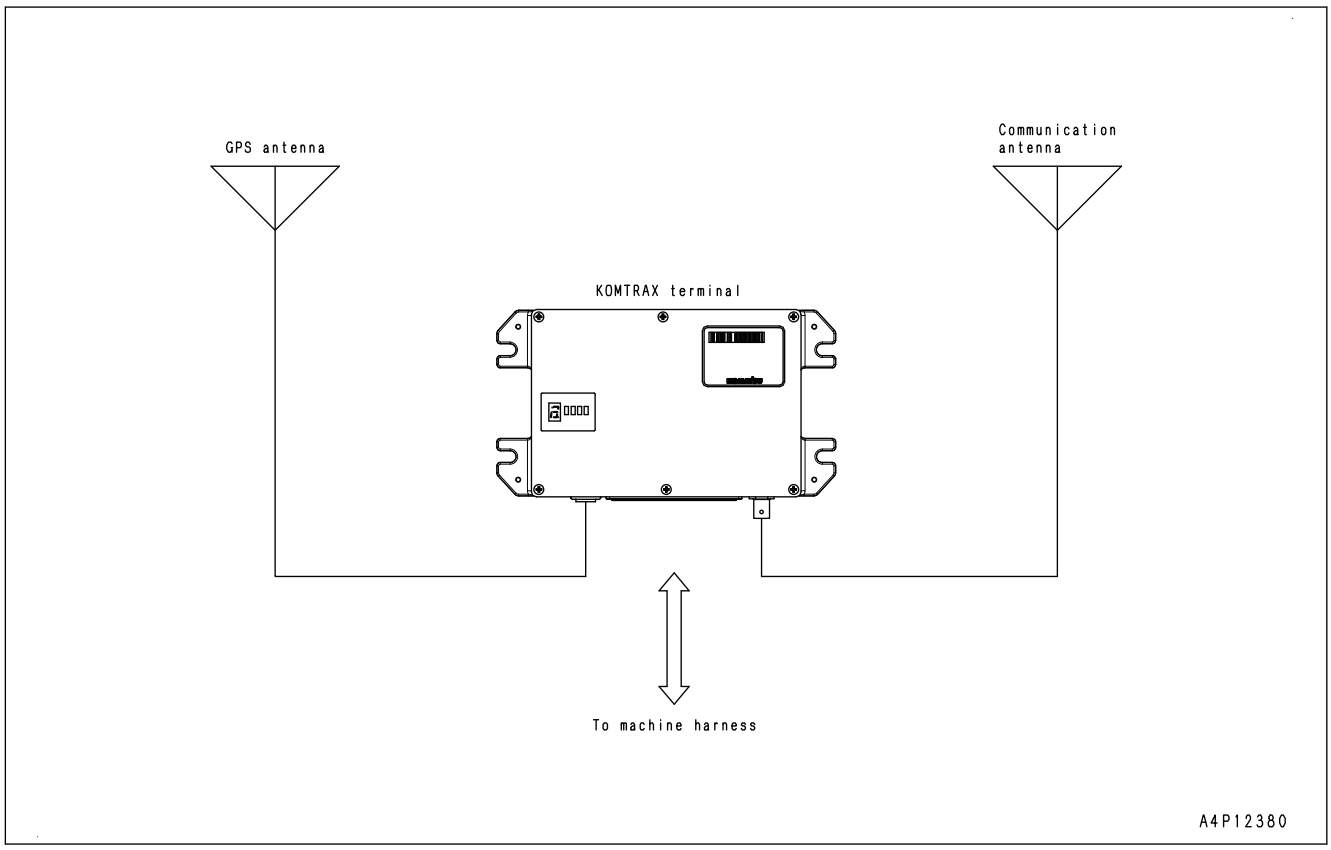
Six cylinder engine is shown in this item.



1. The exhaust gas enters (C) of turbine housing (4) and flows out through portion (P) and (D). Portion (P) is surrounded by plate (5) fixed to turbine housing, nozzle ring (7), and vanes (6).
   The area of its passage is changed by sliding push rod (8) to the right or left.
2. Hydraulic actuator (3) moves piston in the actuator up and down with the hydraulic pressure controlled by EPC valve installed to the front cover, and slides push rod (8) to the right and left.
3. The exhaust gas flowing through vanes (6) rotates blower impeller (10) through shaft (9) joined to turbine impeller (11). As the result, the blower impeller works as a compressor, and the intake air entering through (A) is compressed and discharge through (B).
4. When the exhaust gas pressure at inlet (C) of turbine housing (4) is low (engine speed is in low range), push rod (8) slides to the right and narrows portion (P).
5. The exhaust gas acting on turbine impeller (11) increases, the turbocharger speed increases, and more air (oxygen) is taken in.
   VGT speed sensor (2) detects the rotation of the turbocharger.

KOMTRAX System

System Diagram of KOMTRAX System



KOMTRAX system consists of KOMTRAX terminal, communication antenna, and GPS antenna

Function of KOMTRAX System

- KOMTRAX system transmits various types of information on the machine. KOMTRAX administrator sees the information in the office and supplies various services to the customers.
- KOMTRAX system can transmits the following information.
  - Positional information
  - Working information
  - Alarm and failure information
  - Fuel consumption information
  - Maintenance information
  - Machine working condition information

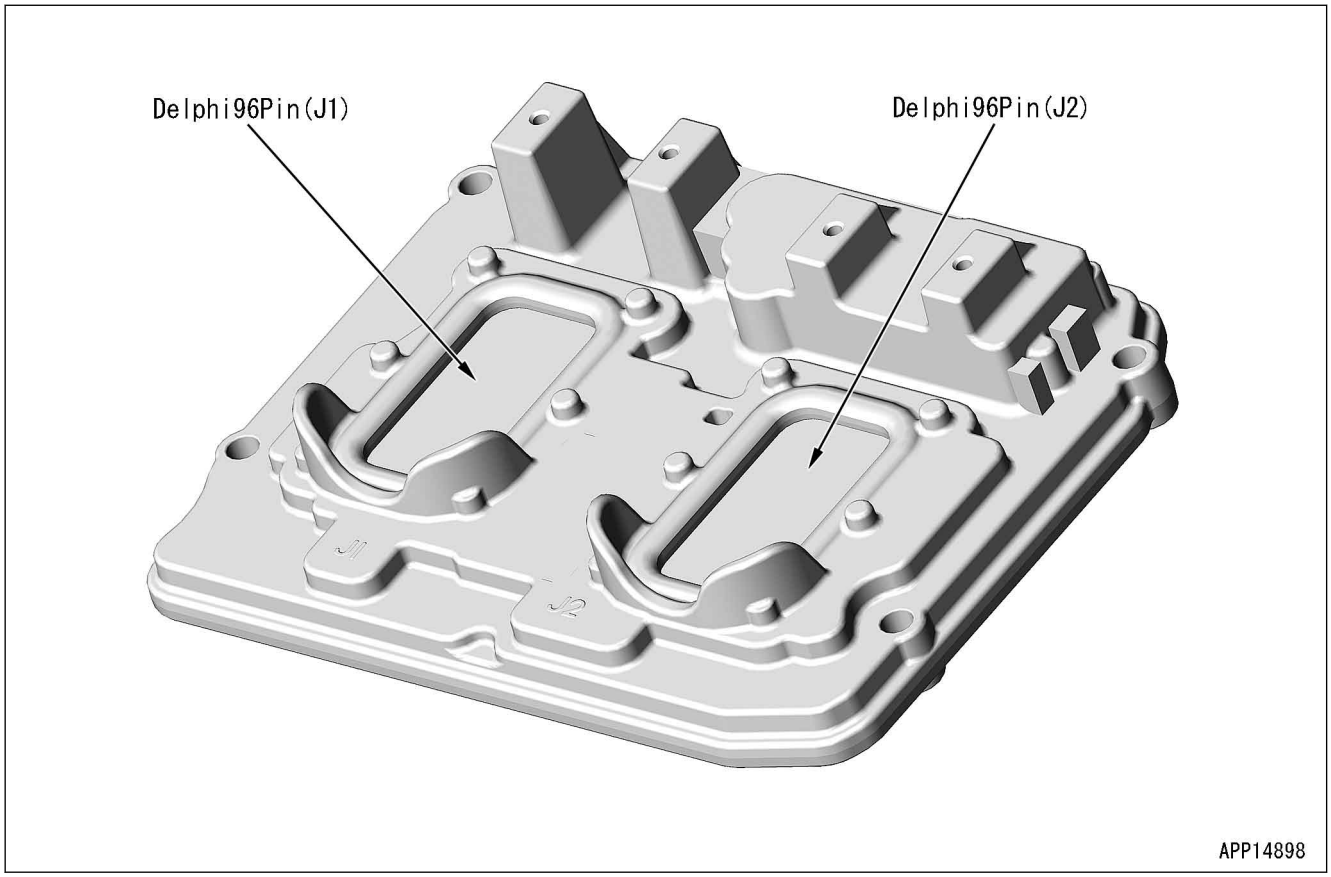
REMARK

To provide the services, you need to establish radio station for KOMTRAX separately.

Engine Controller

Structure of Engine Controller

General View

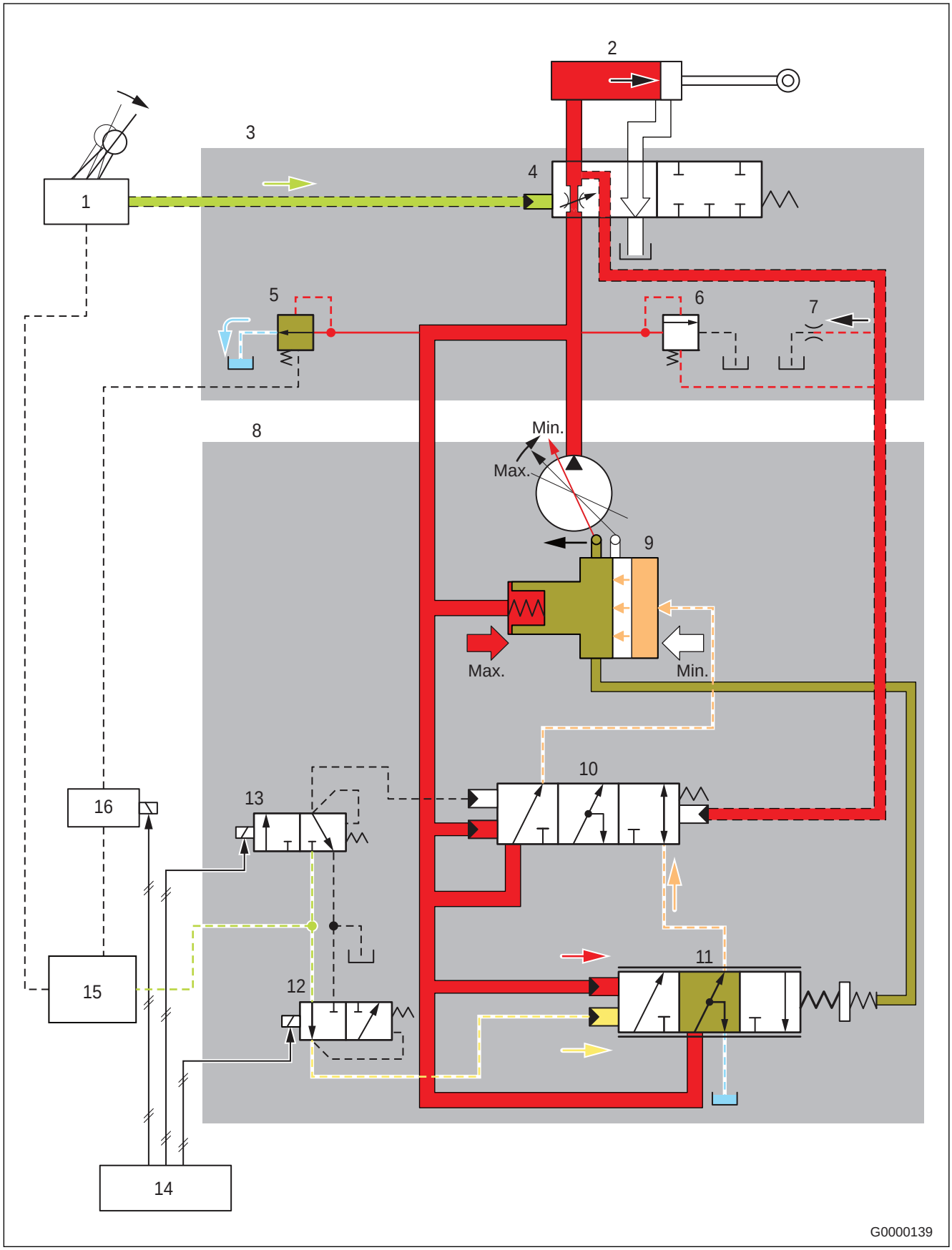


Input and Output Signals of Engine Controller (Machine with KOMTRAX Terminal)

Delphi96Pin “ECM J1”

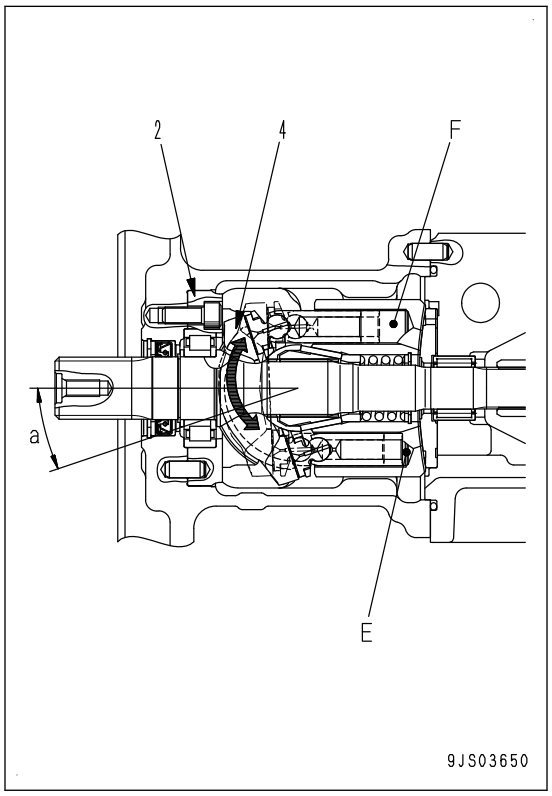
Pin No.	Signal name	Input/output signal
1	Injector #1 (-)	Ground/Shield/ Return
2	Injector #2 (-)	Ground/Shield/ Return
3	Injector #3 (-)	Ground/Shield/ Return
4	(*1)	-
5	(*1)	-
6	(*1)	-
7	(*1)	-
8	(*1)	-
9	Sensor power supply relay	Output
10	IMV (-)	Ground/Shield/ Return

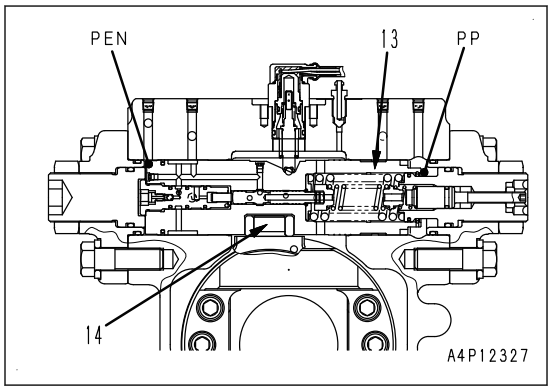
When Control Lever is Stroked to the End and Cylinder is in Stroke End Position (When Relief)



Control of Discharged Volume

1. The swash plate angle (a) increases, the difference between volumes (E) and (F) increases, and also pump discharged volume (Q) increases.
2. Swash plate angle (a) is changed by servo piston (13).
3. Servo piston (13) moves in a linear reciprocating motion corresponding to the signal pressure from the PC valve and LS valve.
   This linear reciprocating motion is transmitted to rocker cam (4) through slider (14).
4. Rocker cam (4) supported on the cylindrical surface of cradle (2) slides and pivots on that surface.
5. Output pressure (PEN) of LS valve is supplied to the pressure chamber on large diameter piston side.
6. The pressure receiving areas on the right and left sides of servo piston (13) are different, and discharged pressure (self pressure) (PP) of the main pump is constantly supplied to the pressure chamber on the small diameter piston side.
7. The movement of servo piston (13) is controlled by the difference between pressure (PP) on the small diameter piston side and pressure (PEN) on the large diameter piston side and the ratio of the pressure receiving area between the small diameter piston and large diameter piston.



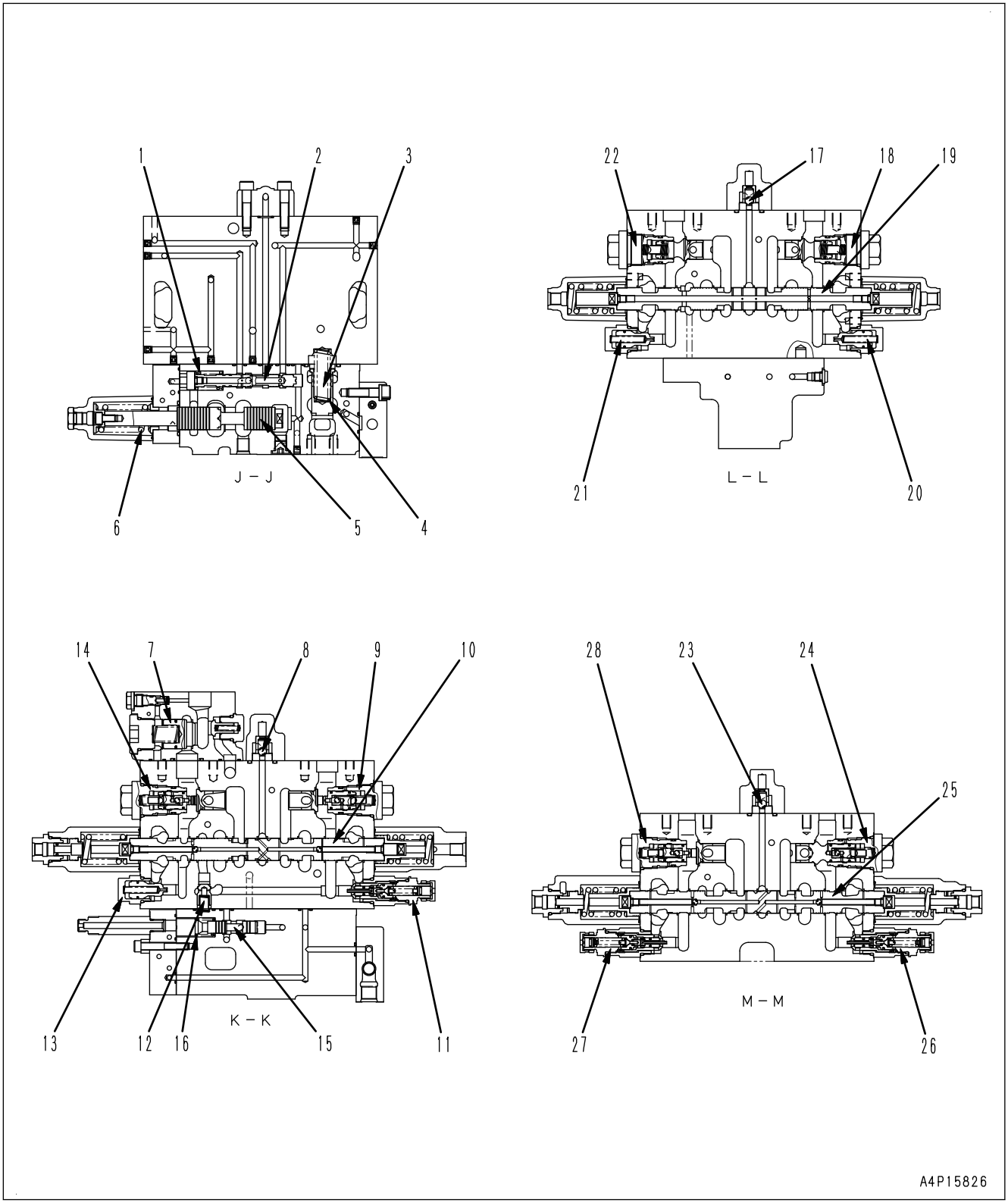


Main Pump LS Valve

LS

Abbreviation for Load Sensing

Sectional Views (J-J, L-L, K-K, M-M)



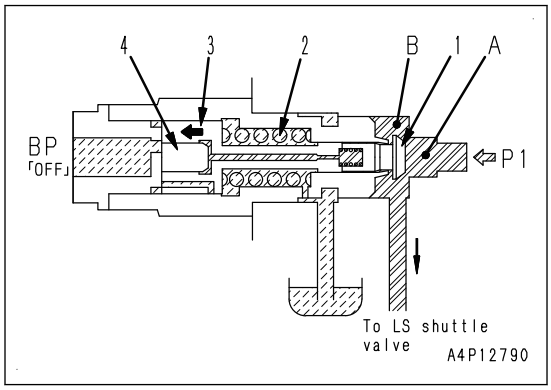
1: Return spring
2: Merge-divider valve (for LS)
3: Valve (sequence valve)
4: Spring (sequence valve)
5: Merge-divider valve (main)
6: Return spring

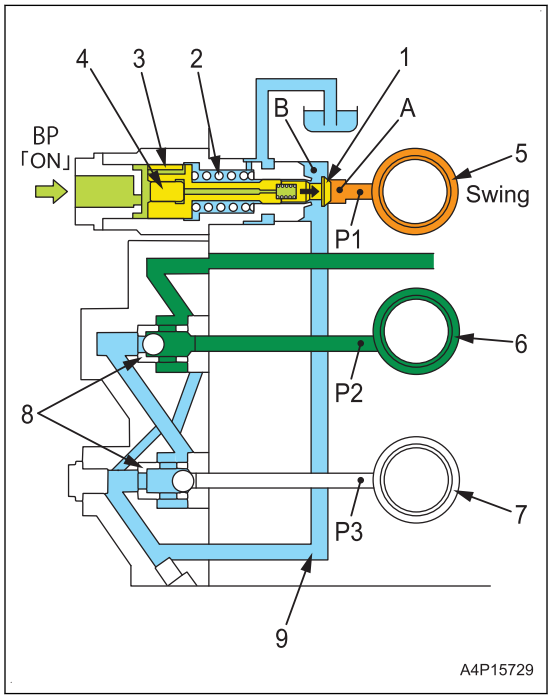
Boom Valve

7: Boom hydraulic drift prevention valve

Operation of LS Select Valve of Control Valve When Pilot Pressure (BP) is Cut Off

1. Since pilot pressure (BP) is cut off, piston (3) is pressed to the left by the reaction force of spring (2).
2. When the swing operation is performed, swing LS pressure (P1) passes through swing spool (5) and enters port (A).
3. Swing LS pressure (P1) pushes valve (1) to the left, and port (A) is connected to port (B).
4. Swing LS pressure (P1) flows from port (A) through port (B) to LS shuttle valve (8).

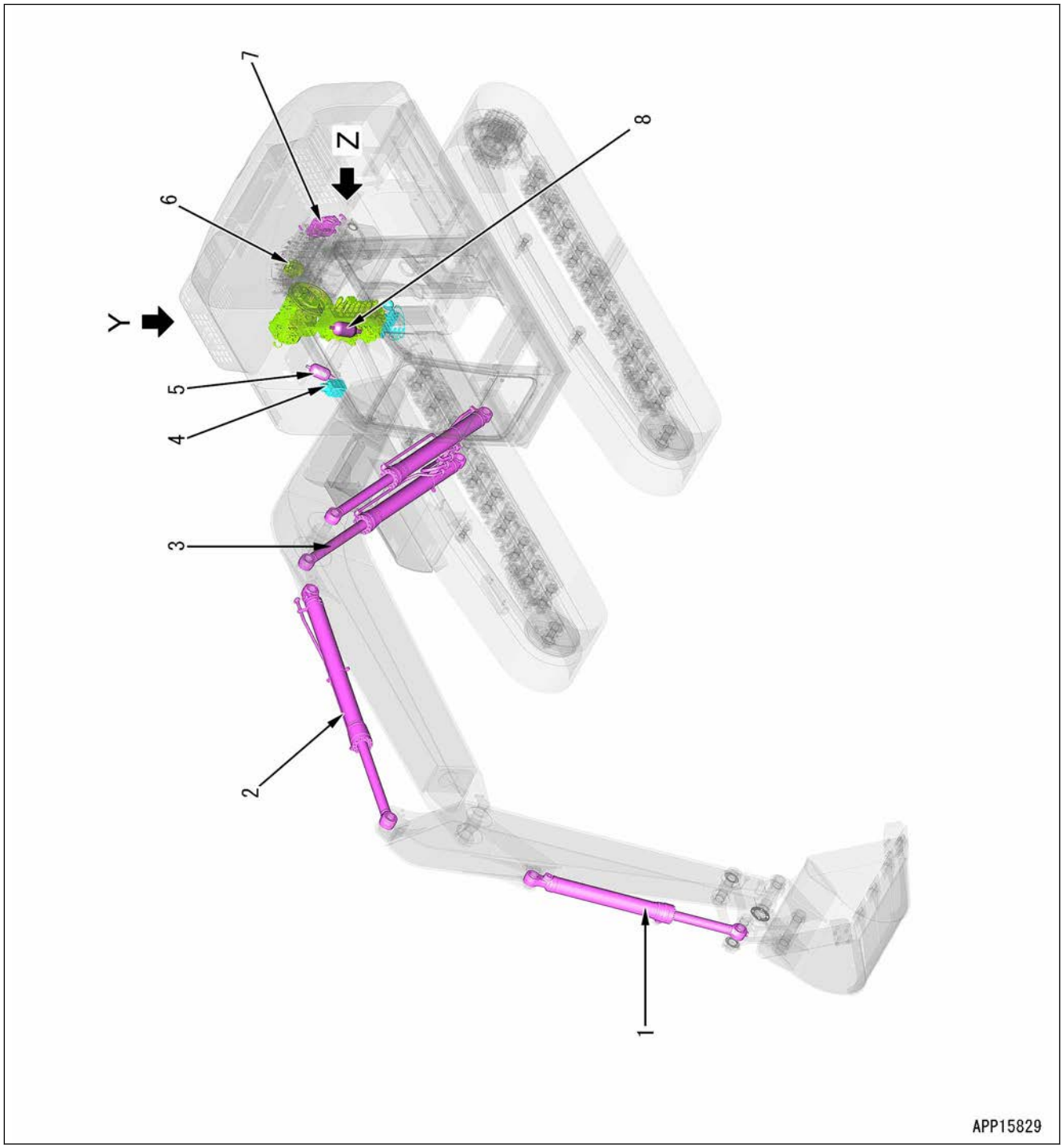




Work Equipment System

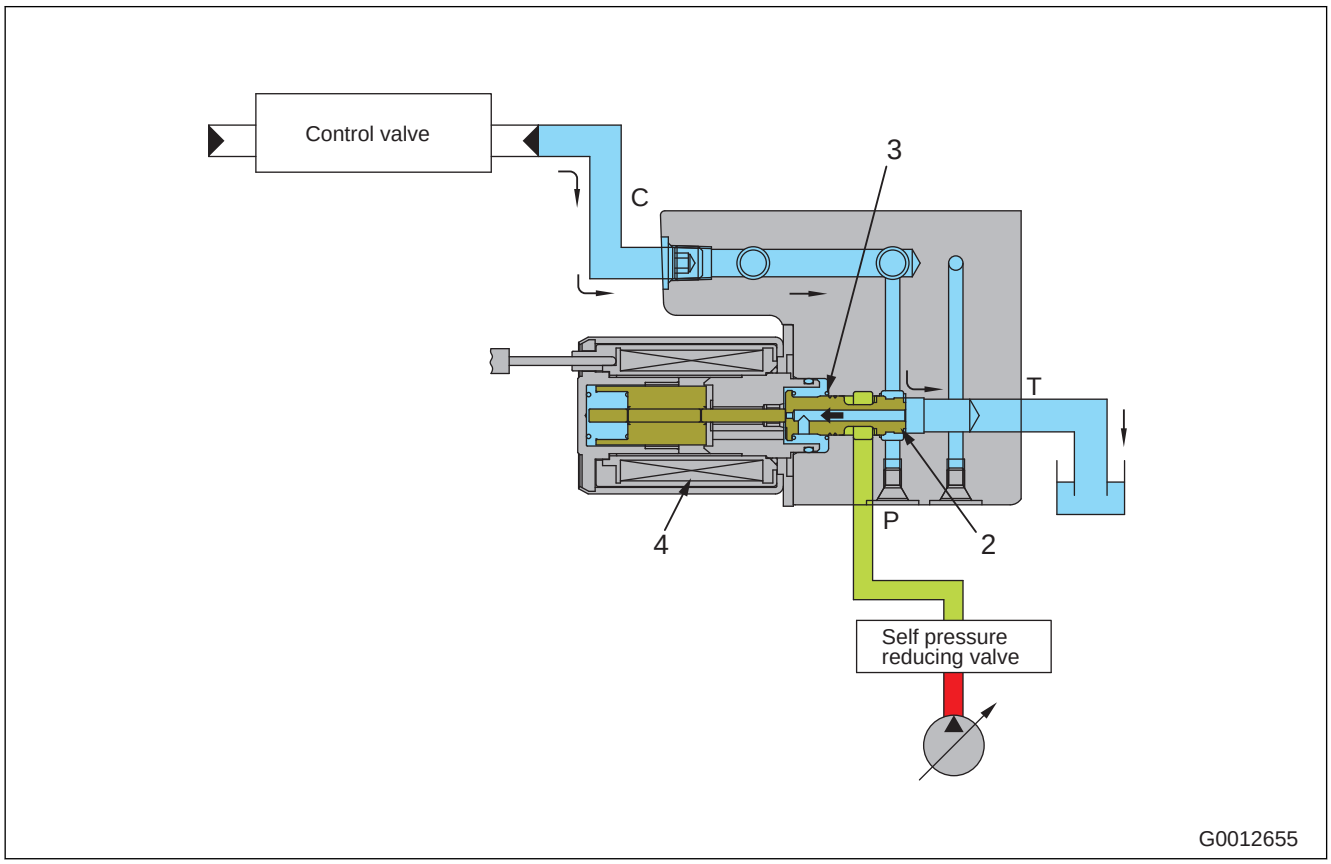
Layout Drawing of Work Equipment System

Chassis Part



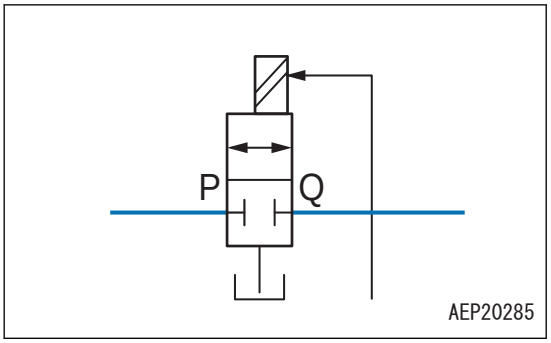
1: Bucket cylinder
2: Arm cylinder
3: Boom cylinder
4: Attachment selector valve
5: Attachment circuit accumulator (for low pressure circuit)
6: Fuel supply pump
7: Engine controller
8: Attachment circuit accumulator (for high pressure circuit)

Operation of EPC Valve of 1st-Line Attachment PPC Valve When Signal Current is Zero (Coil is De-energized)

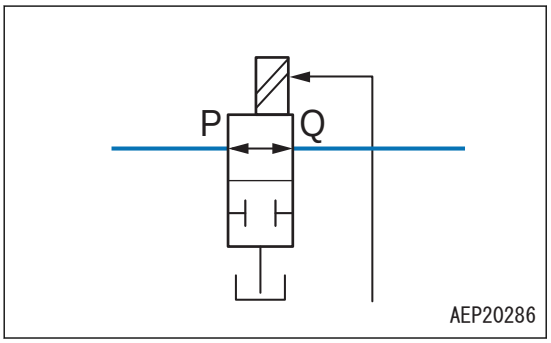


1. When the signal current from the controller does not flow through coil (4), coil (5) is de-energized.
2. Spool (2) is pressed to the right by spring (3).
3. Port (P) is closed and no pressurized oil from the self-pressure reducing valve flows to the control valve.
4. The oil from the control valve is drained into the tank from port (C) through port (T).

Attachment bypass solenoid valve blocks the hydraulic oil passage between the attachment solenoid valve (P) and attachment solenoid valve (Q) so as to keep the pressure on the attachment operation side constant.



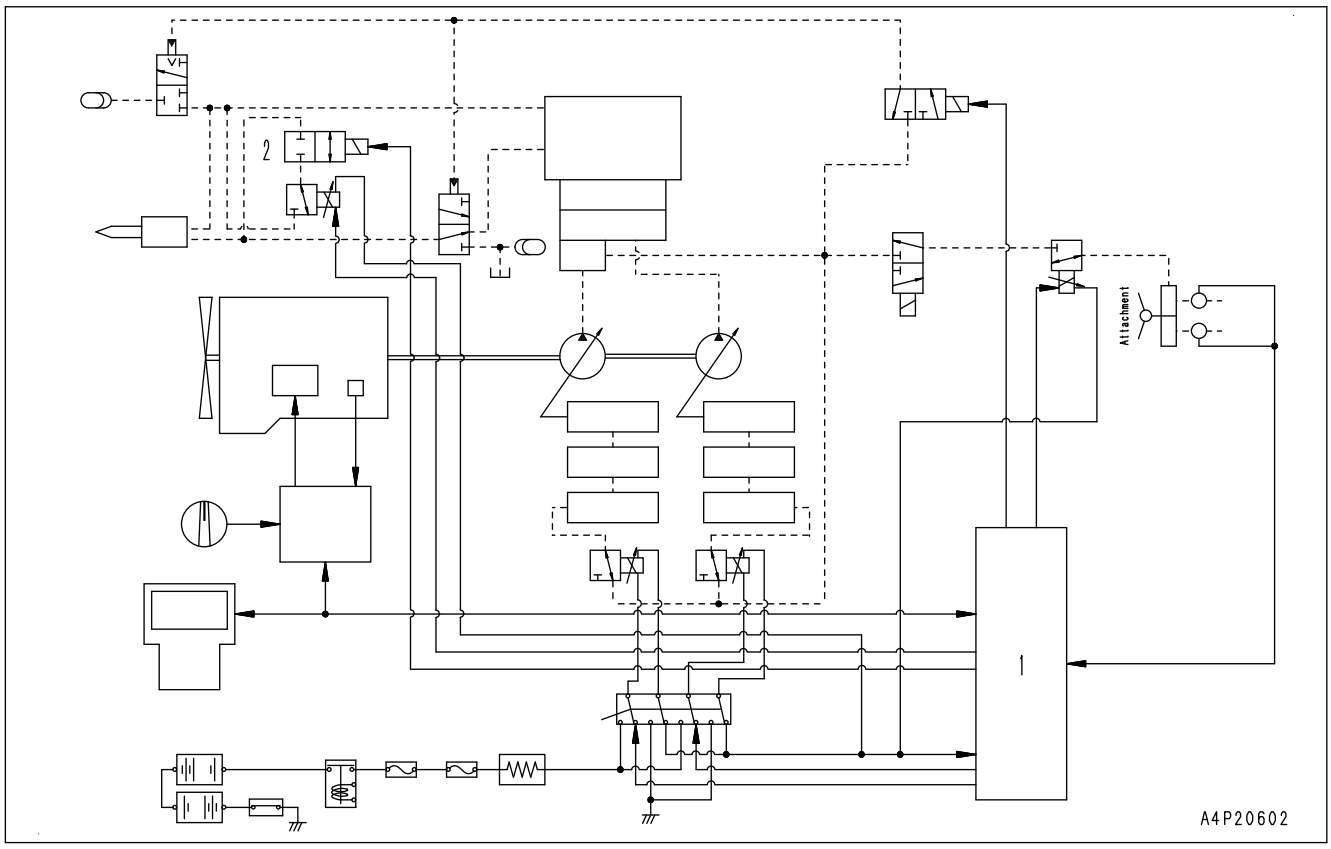
2. When the attachment control pedal is depressed
Attachment bypass solenoid valve is energized with a current supplied from the pump controller (1), it moves the spool, and the hydraulic oil passage between the attachment solenoid valve (P) and attachment solenoid valve (Q) is opened.



Function of Attachment Bypass Solenoid Valve

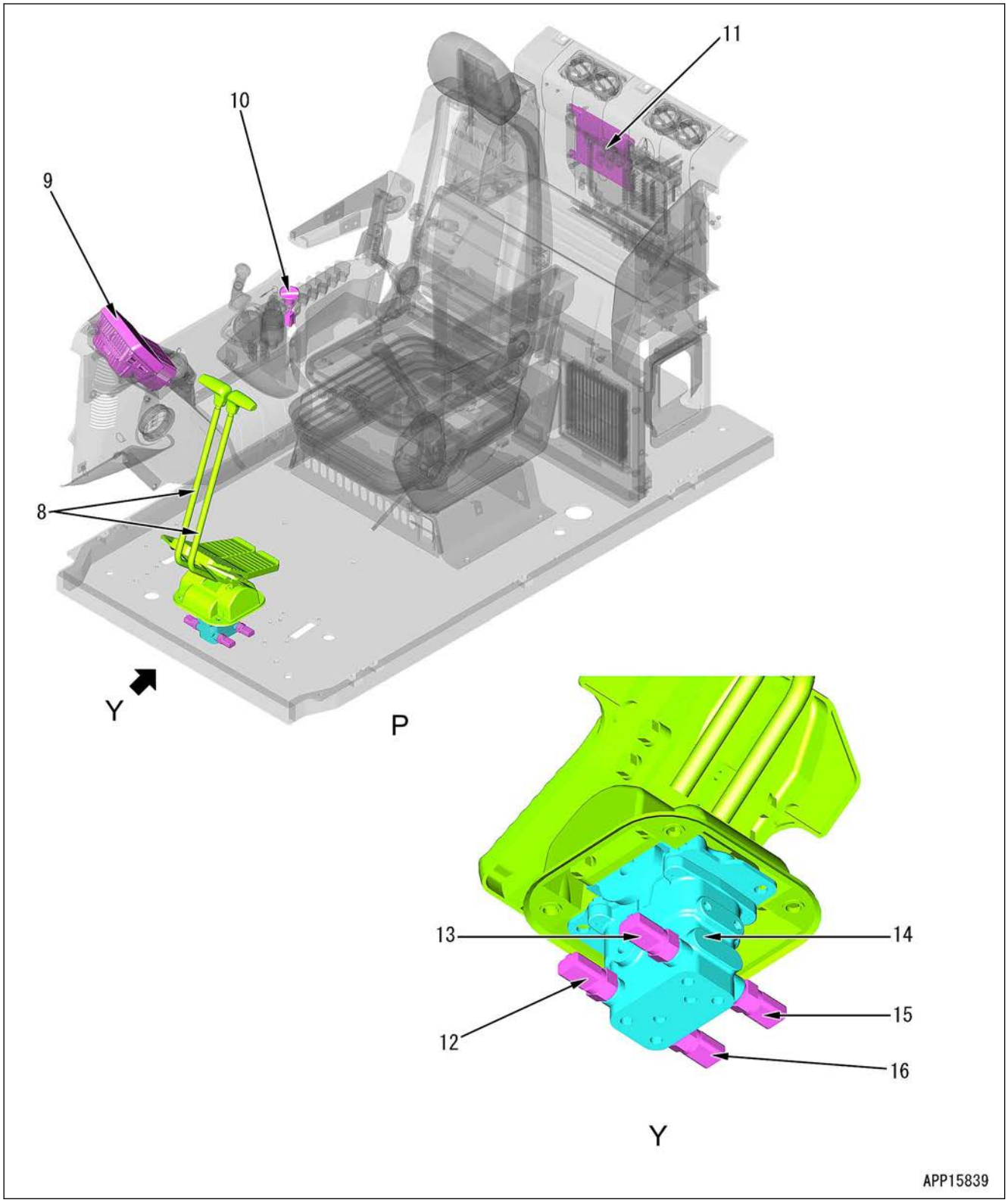
Attachment bypass solenoid valve is a valve which blocks the hydraulic oil passage between the attachment solenoid valve (P) and attachment solenoid valve (Q) so that the hydraulic oil from high pressure side to low pressure side is not leaked. It is enabled when the attachment control pedal is not depressed.

Operation of Attachment Bypass Solenoid Valve



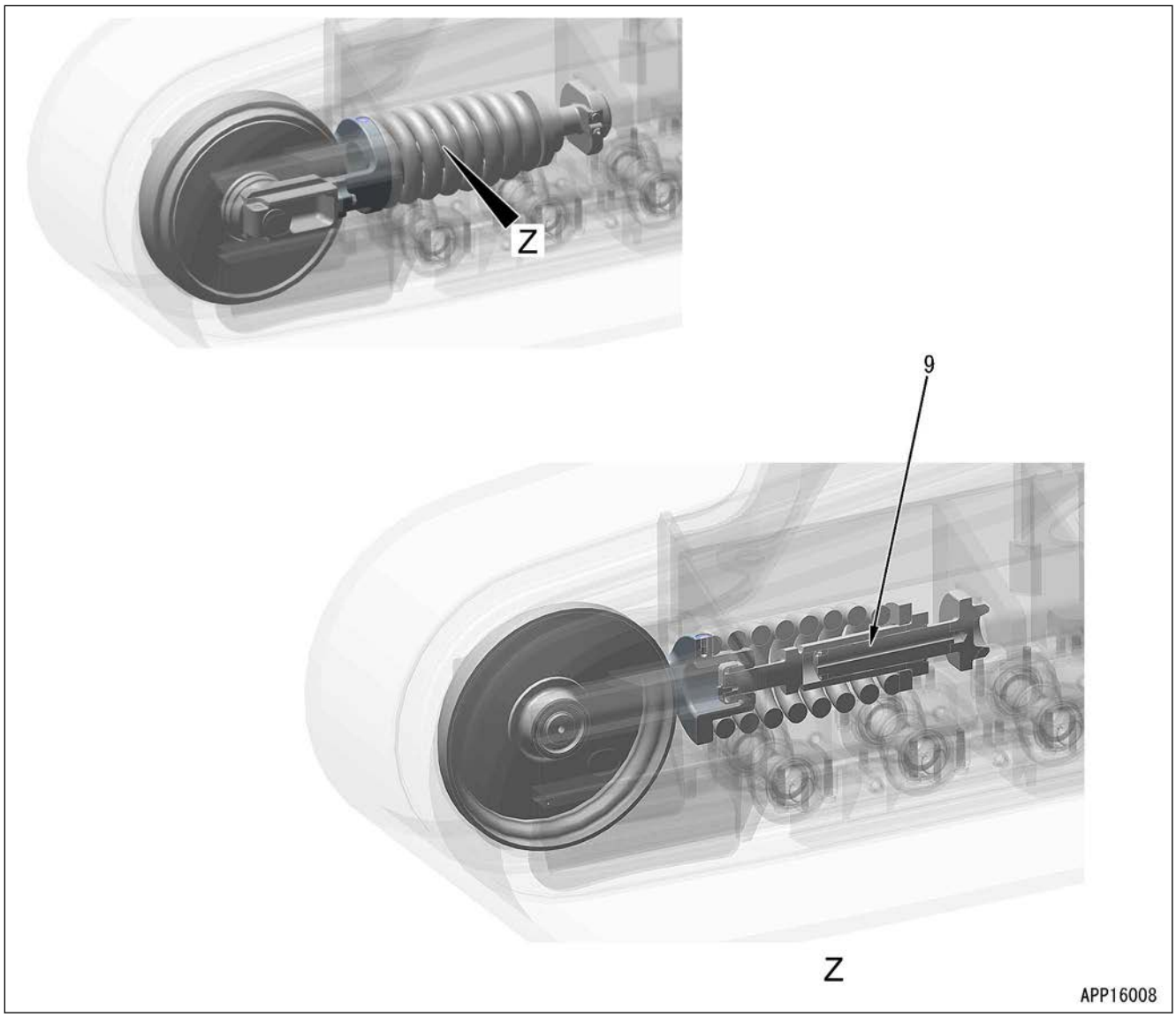
1: Pump controller
2: Attachment bypass solenoid valve

1: Control valve
2: Main pump
3: LS-EPC valve
4: Fuel supply pump
5: Engine controller
6: Travel alarm



8: Travel control lever
9: Machine monitor
10: Fuel control dial
11: Pump controller
12: R.H. travel REVERSE pressure sensor
13: R.H. travel FORWARD pressure sensor

Front Idler Detailed Drawing



9: Idler cushion

Specifications of Undercarriage

Quantity of Track Rollers (One Side)

10 pieces

Standard Shoe

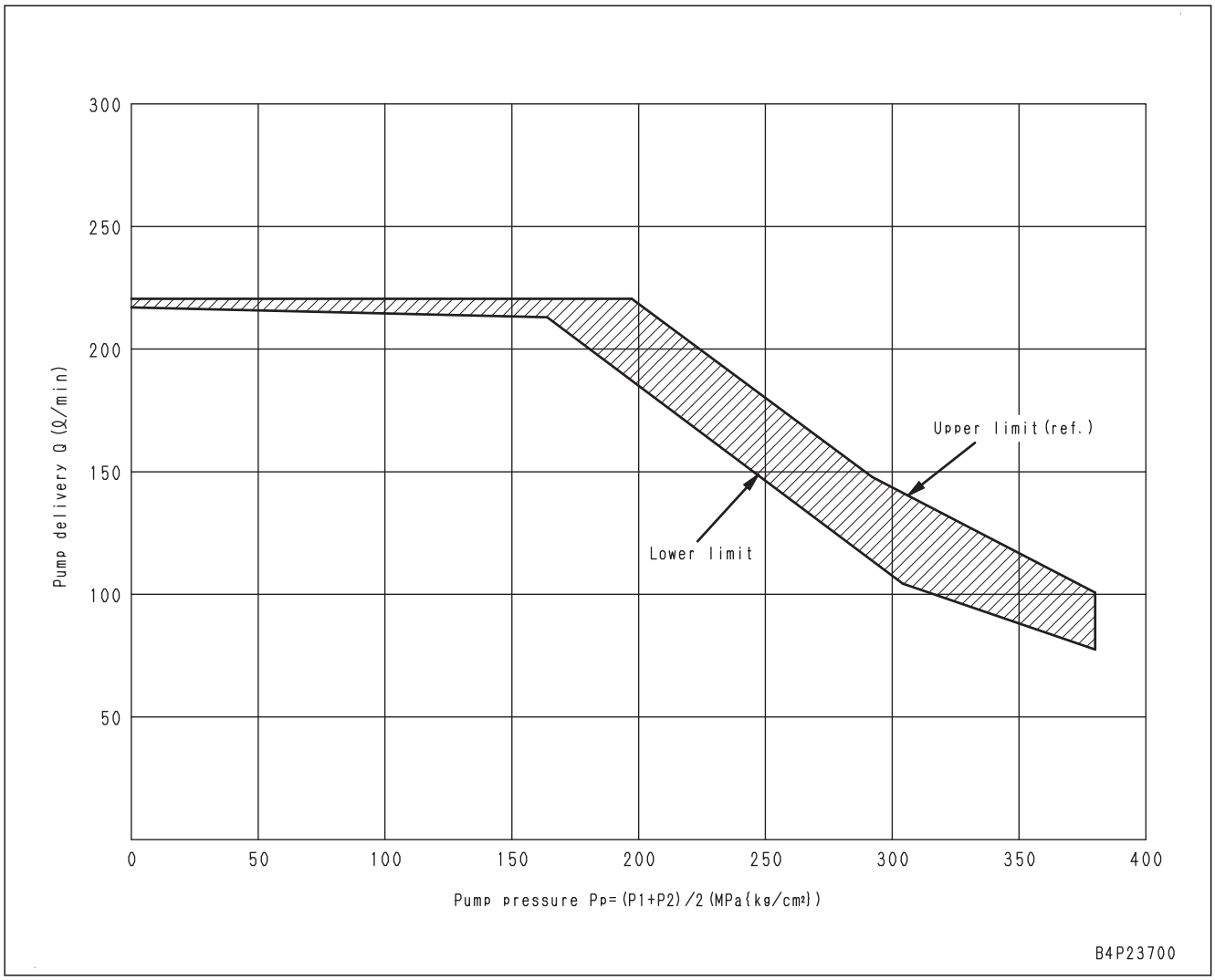
Shoe width: 800 mm

Link pitch: 190.3 mm

Number of shoes (each side) 51 pieces

REMARK

- Bring pump discharged pressure P1 and P2 as close as possible to the average pressure when measuring.
- Avoid measuring the near turning point of the graph because the error increases there.
- When measuring with the pump mounted on the machine, if it is impossible to set the engine speed to the specified speed by using the fuel control dial, take the pump discharged volume and the engine speed at the time of measurement, and use them as a base for calculating the pump discharged volume at the specified speed.



Symbol	Part No.	Part name	Q'ty	Remarks
B	Commercially available	Nitrogen gas cylinder	1	
C	792-610-1400	Regulator	1	
D	792-610-1270	Hose	1	
E	792-610-1260	Nipple	1	
F	792-610-2410	Nipple	1	

Replace Tools for Accumulator Bladder on High Pressure Side for Attachment Piping

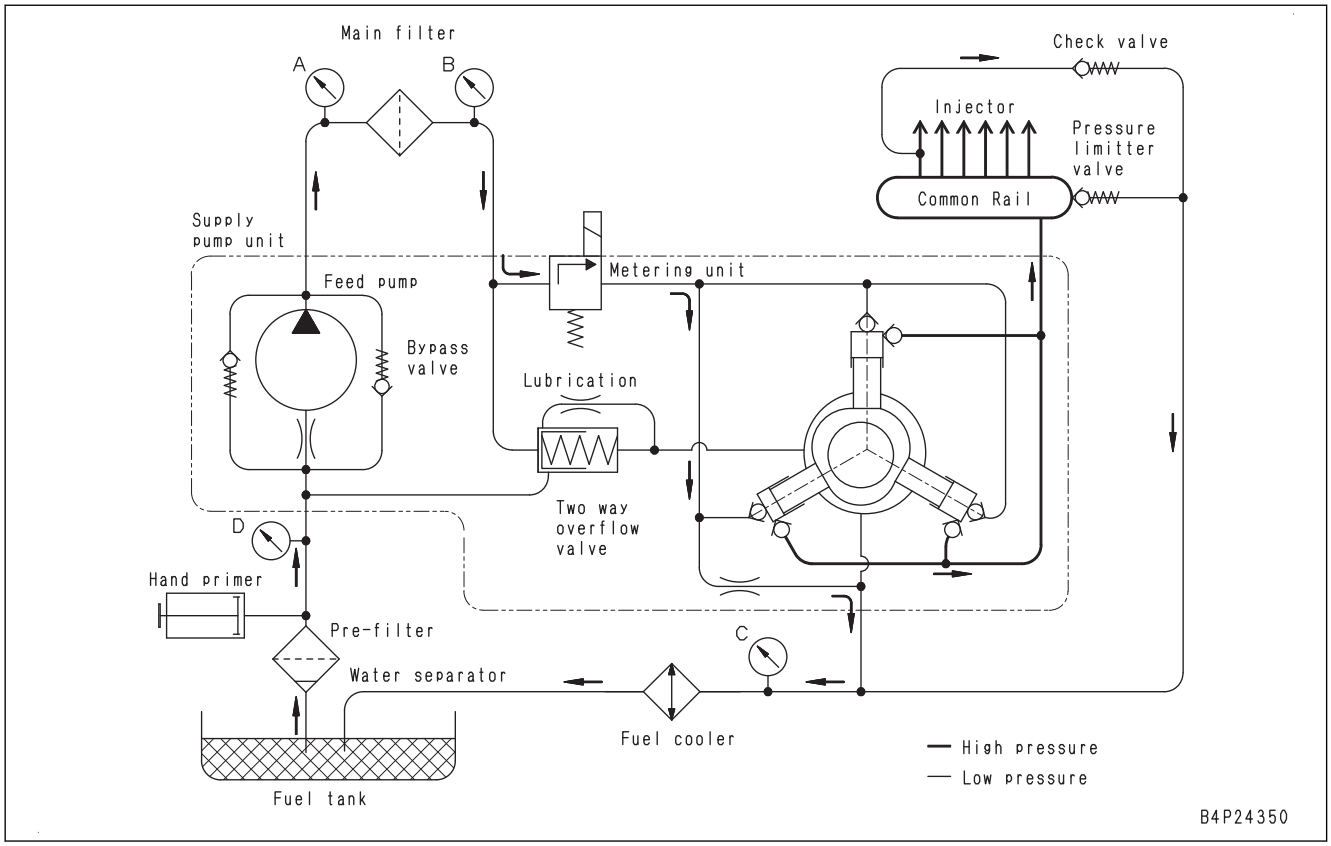
Symbol	Part No.	Part name	Q'ty	Remarks
A	792-610-1703	Charge valve assembly	1	Gas charging tool of accumulator N2
B	Commercially available	Valve core driver	1	For JIS valve core B type
C	09003-03639	Wrench	1	For outside diameter 55 mm
D	790-170-1110	Bladder installation tool	1	
E	Commercially available	Flat-head screwdriver	1	

Tools to Adjust KomVision Camera Angles

Symbol	Part No.	Part name	Q'ty	Remarks
A	Commercially available	Digital angle gauge	1	Niigata Seiki bevel box: BB-180 equivalent

Tools to Examine KomVision (Camera Calibration)

Symbol	Part No.	Part name	Q'ty	Remarks
A	-	Angle setting calibration marker	1	
B	-	Position setting calibration marker	1	
C	Commercially available	Tripod	1	
D	Commercially available	Traffic cone	2	Height : Approx. 70 cm



A: Low-pressure circuit measuring position (fuel main filter inlet side)

B: Low-pressure circuit measuring position (fuel main filter outlet side)

C: Return circuit measuring position (supply pump drain port)

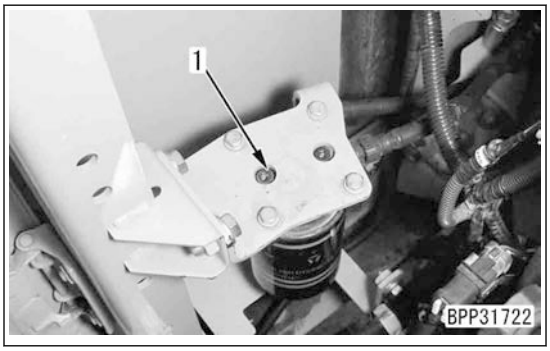
D: Negative pressure circuit measuring position (supply pump inlet)

For testing the fuel pressure to perform troubleshooting, refer to this section.

How to Examine Fuel Pressure

Examine Low-Pressure Circuit (Fuel Main Filter Inlet Side)

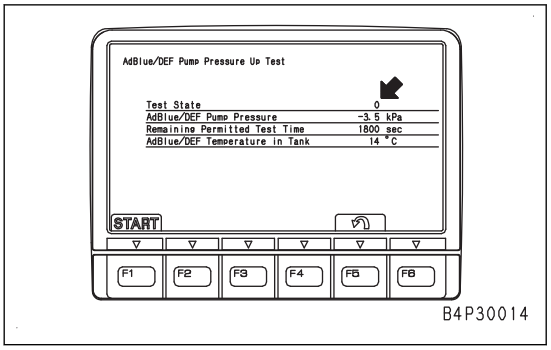
1. Open the side cover on the right side of the engine and remove fuel pressure pickup plug (1) on the inlet side of the fuel main filter.



7. Check that “0” of “Test State” is flashing.

REMARK

Flashing of “0” indicates “Waiting for the start (default)”, and test can be performed. Display other than “0” appears, follow instructions according to “Parameter list of test state”.

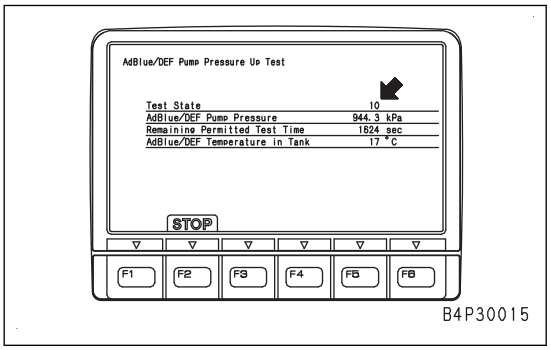


8. Press F1 to start “DEF Pump Pressure Up Test”.

F1: Starts “DEF Pump Pressure Up Test”.

F2: Stops “DEF Pump Pressure Up Test”. (When “STOP” is displayed.)

F5: Returns the screen to “SCR Service Test” screen.



NOTICE

“Test State” does not change to “10” and test does not start even if F1 is pressed, turn starting switch to OFF position once, and repeat the testing procedure from step 1.

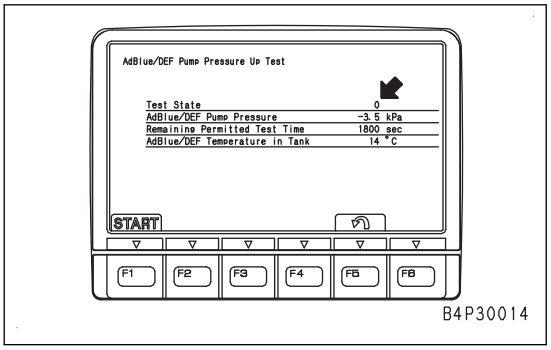
REMARK

- Display of “Test State” changes to flashing of “10”, and value of “DEF Pump Pressure” increases. While the pressure is increasing, display of “Remaining Permitted Test Time” is counted down from “1800 to 0 sec”, and when it reaches to “0 sec”, the test will be finished automatically.
- When the display of “Test State” is “11” to “41”, follow “Parameter list of Test State”.
- When the value of “DEF Pump Pressure” exceeds “900 kPa” within 1800 seconds of “Remaining Permitted Test Time”, DEF pump and DEF pressure line are normal. Press F2 to complete the test.
- If the value of “DEF Pump Pressure” does not increase, check each part of DEF pressure line for leakage, or check by sound and vibration that DEF pump operates. However, perform the checking of each part of DEF pressure line for leakage, and DEF pump for operation, before “Remaining Permitted Test Time” becomes “0sec”.
- If the value of “DEF Pump Pressure” does not exceeds 800 kPa after approximately 200 seconds are elapsed, DEF stops operation automatically and failure code [CA1682] is displayed. If the failure code is displayed, perform troubleshooting.

9. When the display of “Test State” changes from flashing of “20” to flashing of “0”, press F5.

REMARK

- The display of “20” of “Test State” indicates that DEF purge is in progress, and it starts automatically and stops in 5 minutes at maximum.
- The display of “0” of “Test State” indicates “Wait for the start (default)”, and is ready for test again.



2) Check the monitoring information of (a) to (d).

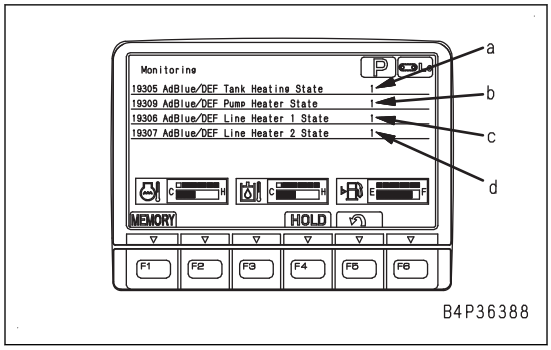
Details of the monitoring information are as follows.

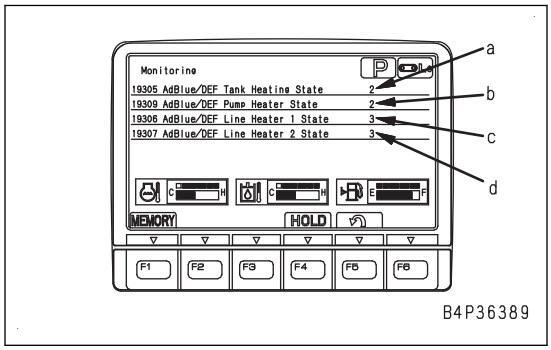
1: Thawing is in process.

2: Thermal insulation is in process.

3: OFF

- When one or more of the status of the monitoring information (a) to (d) is “1”:
  DEF is frozen. Thawing is in process. Keep the engine speed at low idle and wait until all the states of (a) to (d) of the monitoring information become “2” or “3”. And then, go to Step 3.
- When the monitoring information of (a) to (d) are “2” or “3”:
  DEF is not frozen. Go to Step 3.





3. Show the Abnormality Record screen. For details, see “How to See Abnormality Record (Mechanical Systems)” and “How to See Abnormality Record (Electrical Systems)”.
4. Make sure that the failure code (other than [CA1682], [CA3574], and [CA3596]) with the action level is not shown.

   NOTICE

   If the failure code (other than [CA1682], [CA3574], and [CA3596]) is shown, see TROUBLESHOOTING to do the troubleshooting.

   REMARK

   The failure codes [CA1682], [CA3574], and [CA3596] can be shown when foreign materials in the tank are caught to the DEF pump.

   CA1682: DEF Pump Priming Error

   CA3574: DEF Pump Pressure Too Low Error

   CA3596: DEF Pump Pressure Unstable Error
5. Stop the engine.

   ⚠ **Parts and oil are still very hot immediately after the engine is stopped. It can cause burn injury. Wait for the temperature to go down, and then start the work.**
6. Check the stored condition and procedure to add DEF.
   1) Make sure that the pump or container with corrosion resistance is used to add DEF.
   2) Before you add DEF, be sure to clean around the filler port.

   REMARK

   For details, see the Service news “AT16201”.
7. Clean the surface of DEF pump, around the DEF tank filler port, and inside of the DEF tank cap.

   REMARK

   - Use water and brush to clean the surface of DEF pump, around the DEF tank filler port, and inside of the DEF tank cap. Fully clean up the dirt.
   - If they are not cleaned fully, foreign material can go into them when you replace the DEF filler port filter or when you clean the DEF pump.

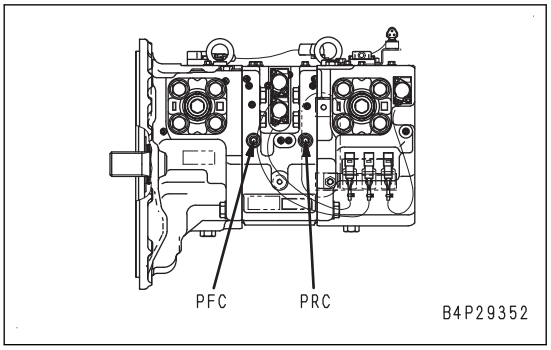
1. Open the cover on the right side of the machine, and remove oil pressure pickup plugs (PFC), (PRC), (PLSFC), (PLSRC).

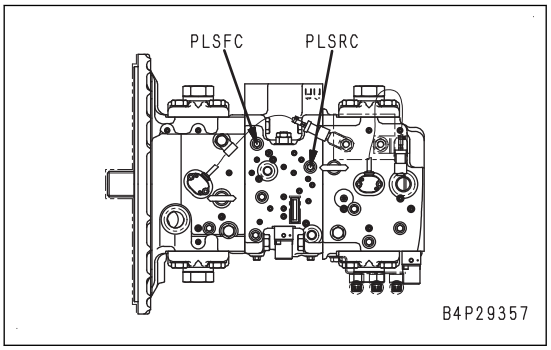
   (PFC): Front pump discharge pressure pickup port

   (PRC): Rear pump discharge pressure pickup port

   (PLSFC): Front load pressure pickup port

   (PLSRC): Rear load pressure pickup port





Examine and Charge Accumulator Nitrogen Gas Pressure for Attachment (High Pressure Side)

Examine and Charge Tools for Accumulator Nitrogen Gas Pressure for Attachment

Symbol	Part No.	Part name	Q'ty	Remarks
A	792-610-1703	Charge valve assembly	1	
B	Commercially available	Nitrogen gas cylinder	1	
C	792–610–1400	Regulator	1	
D	792–610–1270	Hose	1	
E	792–610–1260	Nipple	1	
F	792–610–2410	Nipple	1	

⚠ Put on protection safety equipment, goggles, leather gloves and clothing to prevent nitrogen gas leak from your skin. Do this work on the up wind side as much as possible.

⚠ When using the nitrogen gas indoors or on an ill-ventilated location, ventilate the room, etc. and observe the Industrial Safety and Health Law, Ordinance on Prevention of Anoxia, etc.

⚠ The accumulator is charged with high-pressure nitrogen gas. Obey the precautions that follow to handle it. If not obeyed, it can cause an explosion which will lead to personal injury or death.

- Do not bring open flame near or put it in fire.
- Do not do drilling, welding, or flame-cutting.
- Do not hit, drop, or apply it to the external force.
- Release the gas before you discard.
- Before you remove and take the assembly apart, be sure to lower the gas pressure to the ambient pressure.
- Be sure to use the nitrogen gas for charging.
- Do not use the explosive gas such as oxygen.
- Follow this procedure always when handling accumulator.

Examine Accumulator Nitrogen Gas Pressure for Attachment (High Pressure Side)

Release the remaining pressure

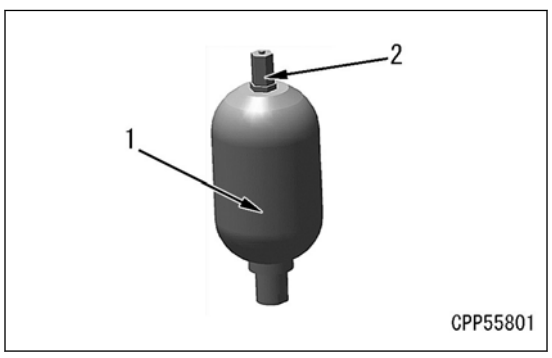
1. Release the remaining pressure in the attachment circuit. See Testing and Adjusting, “Release Remained Pressure in Hydraulic Circuit”

   REMARK

   If there is remaining pressure in the oil inside the piping, you cannot charge the gas correctly into the accumulator.

Preparation

2. Remove the protective cap (2) of the accumulator (1).



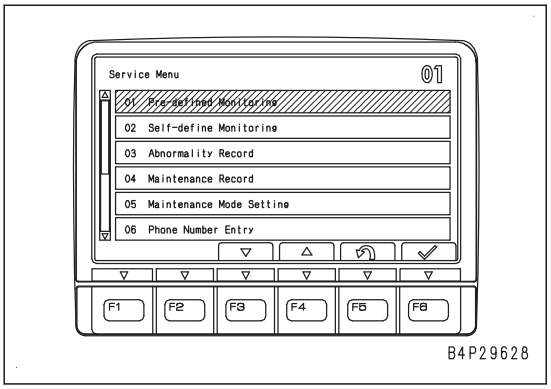
Code	Item		Reference page
11	KOMTRAX Setting Display	Terminal Setting State	KOMTRAX SETTINGS MENU (TERMINAL STATUS)
		GPS & Communication State	KOMTRAX SETTINGS MENU (GPS AND COMMUNICATION STATUS)
		Modem Information	KOMTRAX SETTINGS MENU (MODEM STATUS)
12	Service Message		SHOW SERVICE MESSAGE

How to See Pre-defined Monitoring Information

The machine monitor can monitor the condition of the machine in real time by receiving signals from various switches, sensors, and actuators installed to various parts of the machine and the information from the controllers which is controlling switches, etc.

In “Pre-defined Monitoring”, frequently used monitoring items in daily work are selected beforehand.

1. Select “Pre-defined Monitoring” on “Service Menu” screen.



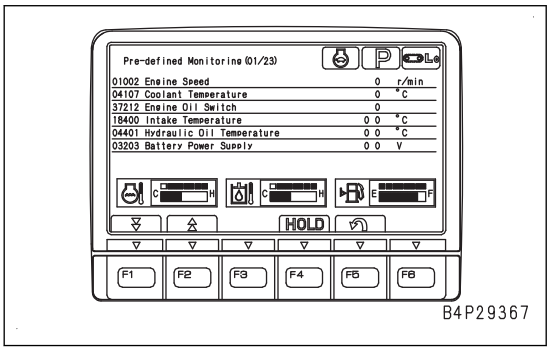
2. After “Pre-defined Monitoring” screen is displayed, the items displayed in it can be checked with the function switch.

   F1: Moves the selection to next page (screen)

   F2: Moves the selection to previous page (screen)

   F4: Selects hold or releasing hold (If the Hold is selected, HOLD part is hatched.)

   F5: Returns the screen to “Service Menu” screen.



REMARK

- For the items not displayed in “Pre-defined Monitoring”, you can freely select and check from “Self-define Monitoring” items.
- When the working mode is changed to Breaker Mode “B”, the screen to confirm the change of the setting is displayed as in changing the working mode on the standard screen.

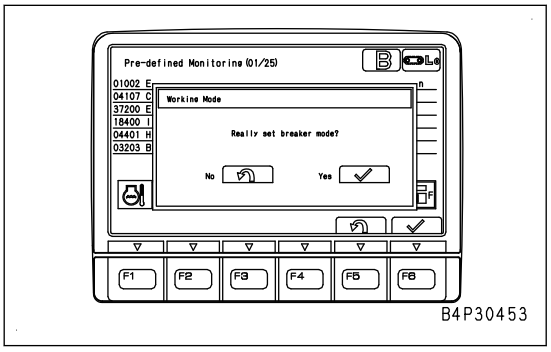


Table of Pre-defined Monitoring Items

Pre-defined Monitoring (01/23) Machine Basics

No.	ID	Item name	Unit			Applicable equipment
			SI	Metric	Imperial	
1	01002	Engine Speed	r/min	rpm	rpm	ENG

2. On “Phone Number Entry” screen, register/correct the phone number with the function switches or numeral input switches.

   F2: Deletes all the numbers.

   F3: Moves the input position to the next left place (if not blank).

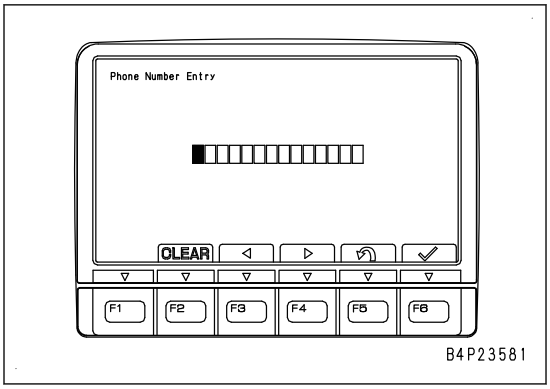
   F4: Moves the input position to the right (if not blank)

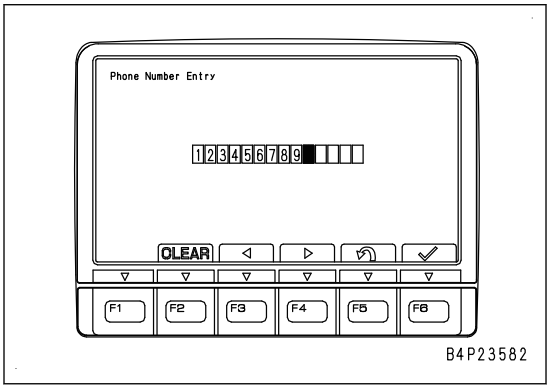
   F5: Returns the display to the “Service Menu” screen

   F6: Enters the input.

   REMARK

   - Up to 14 digits can be inputted from the left. Leave the surplus places without inputting any digit.
   - If an inputted numeral is wrong, move the cursor (orange background) to that digit and overwrite it with the correct numeral.
   - No telephone number is displayed in the operator mode when F6 is pressed without inputting any digit, since there is no information of telephone number for it.





Default Menu

Default Setting Menu (KEY-ON MODE)

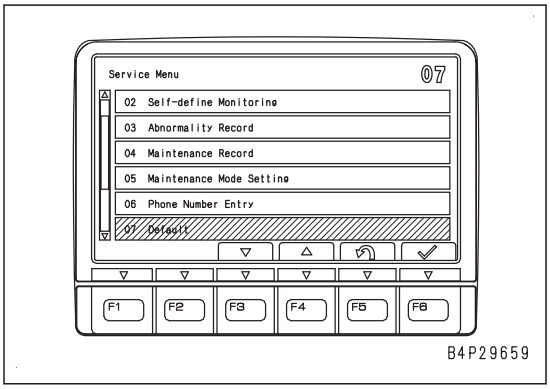
Default setting menu is used to check or change default values of the machine monitor and the machine.

Use “Key-on Mode” function to set the working mode selected and displayed on the machine monitor when the starting switch is turned to ON position.

1. Select “Default” on “Service Menu” screen.

   REMARK

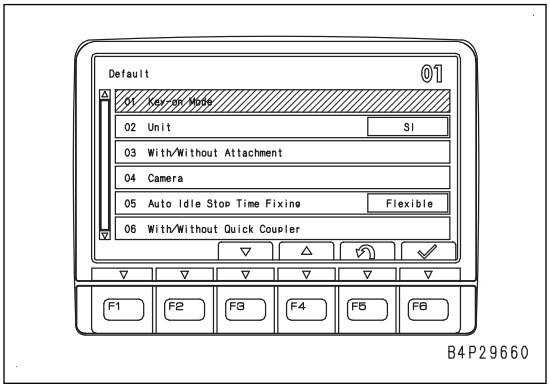
   For selecting method, see “How to Operate Service Mode” in “SERVICE MODE”.



2. Select “Key-on Mode” with the function switches or numeral input switches on “Default” screen.

   REMARK

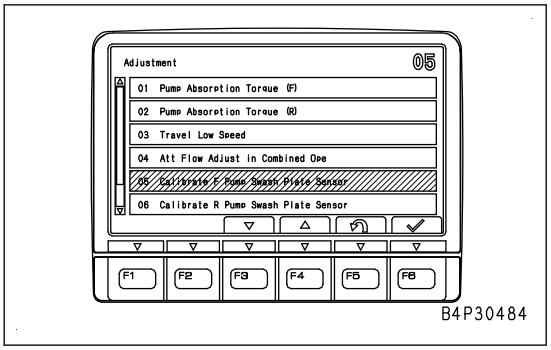
   For selecting method, see “How to Operate Service Mode” in “SERVICE MODE”.



2. On “Adjustment” screen, select “Calibrate F Pump Swash Plate Sensor” by using function switches or numeral input switches.

   REMARK

   Method of selecting is similar to “Service Menu” screen.



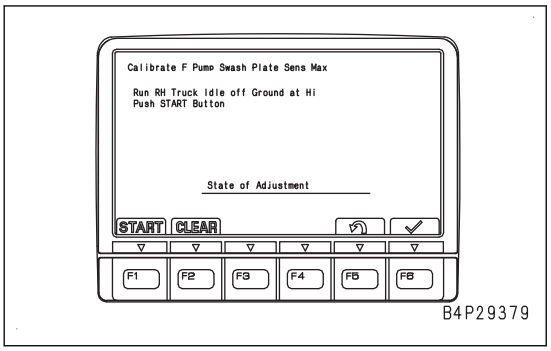
3. After “Cal F pump swash plate sensor max” is displayed, calibrate the front pump swash plate sensor for the maximum angle by running track idle off the ground and operating the function switches.

   F1: Starts calibration

   F2: Initializes calibration value

   F5: Returns the screen to “Adjustment” screen.

   F6: Confirms setting



4. Raise the left track off ground by using the work equipment and move the left travel lever to the stroke end to run the left track idle off the ground.

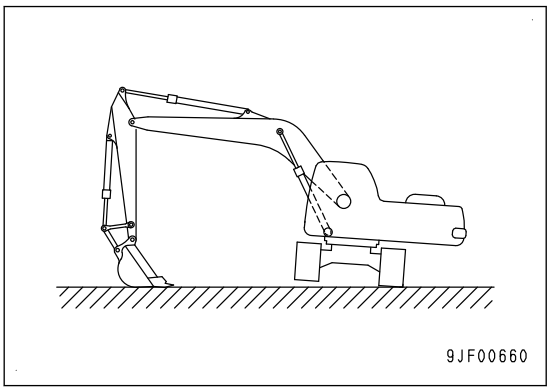
   Fuel control dial: MAX (High idle) position

   L.H. travel lever: Full stroke (Both forward and reverse travel may be set.)

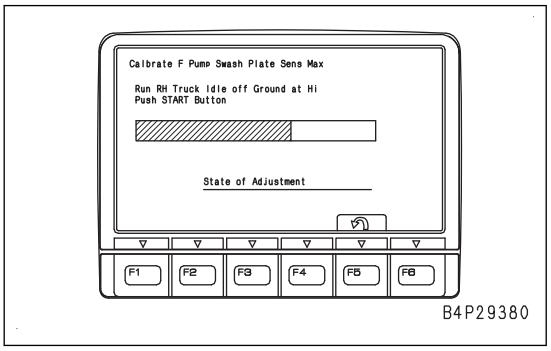
   Swing lock switch may be set in either ON or OFF.

   ⚠ Provide an enough work space to run the raised track idle off the ground for testing.

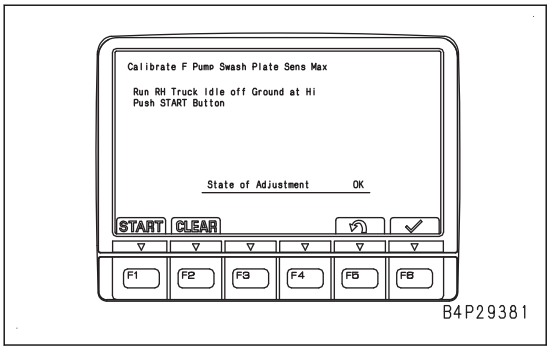
   ⚠ Run the raised track idle, paying enough attention to the surroundings for safety.



5. When running speed of the track idle off the ground becomes steady, hold down button [F1] of machine monitor to start the calibration. The state of process is displayed as a bar on the screen during calibration, so keep running the track idle off the ground until the end of calibration.



6. When calibration is finished successfully, “OK” is displayed for the State of Adjustment to show that calibration for the maximum angle is complete. Press F6 to go to calibration for the minimum angle.



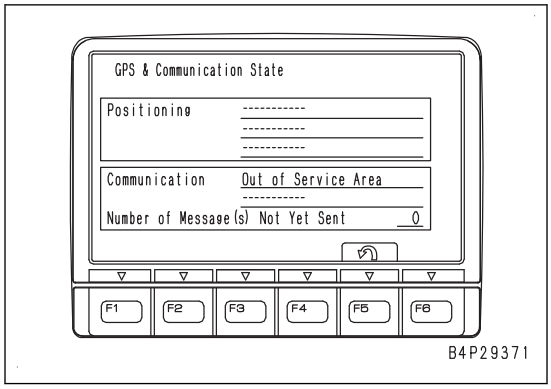
3. On “GPS & Communication State” screen, the following items are displayed.

   Positioning: GPS positioning state

   Communication: Communication environment and connection state of the communication modem

   Number of message not yet sent: Number of mails that are saved on the machine monitor and have not yet been transmitted

   F5: Returns the screen to “KOMTRAX Settings” screen



Examine KOMTRAX Settings (Modem Information)

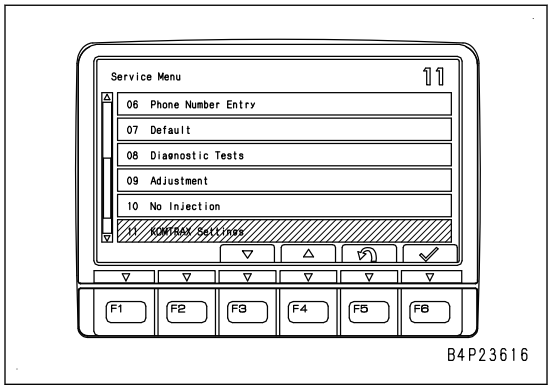
The setting and operating state of KOMTRAX can be checked by using the menu of “KOMTRAX Settings”.

“Modem Information” is used to check the phone number and IMSI of the KOMTRAX communication modem.

1. Select “KOMTRAX Settings” on “Service Menu” screen.

   REMARK

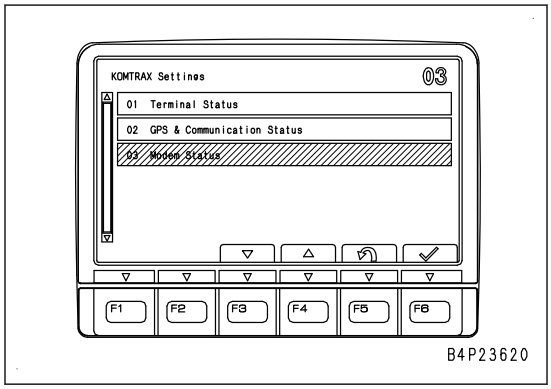
   For selecting method, see “How to Operate Service Mode” in “SERVICE MODE”.



2. On “KOMTRAX Settings”screen, select “Modem Information” with the function switches or numeral input switches.

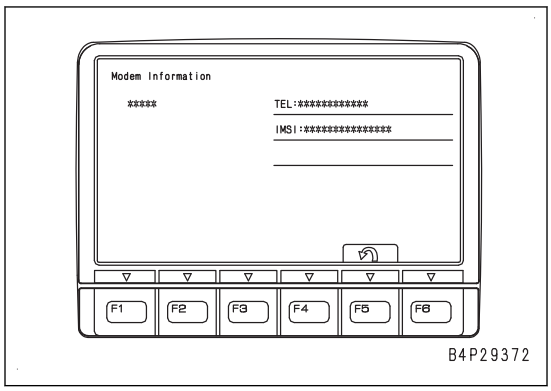
   REMARK

   For selecting method, see “How to Operate Service Mode” in “SERVICE MODE”.



3. Display the phone number and IMSI.

   F5: Returns the screen to “KOMTRAX settings” screen.



Show Service Message

Special messages for the technician sent from the KOMTRAX base station (a distributor, etc.) can be checked with this function.

10. Select and enter “Camera Lateral Position” with the function switches.

    F1: The screen returns to “Service Menu” screen.

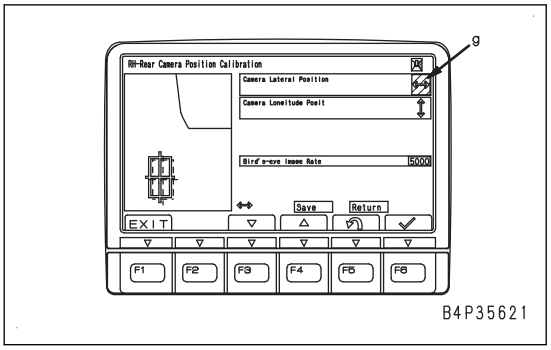
    F3: Moves the selection downward.

    F4: Moves the selection upward.

    F5: Selection is canceled. The screen returns to “CAMERA CALIBRATION” screen.

    F6: Enters the selected item.

    The back ground color of icon (g) turns yellow when the selected item is entered.



11. Align the marker of the target camera and the lateral position of the calibration marker B for position setting with the function switches.

    z: Marker of camera to be adjusted

    B: Position setting calibration marker B

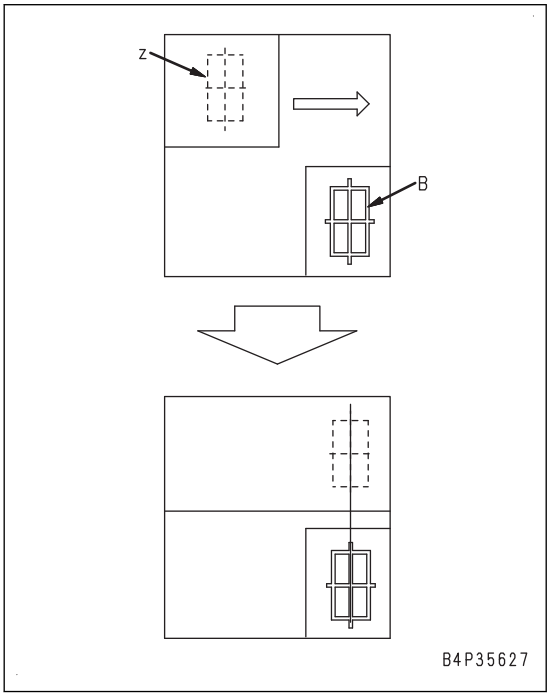
    F1: The screen returns to “Service Menu” screen.

    F3: Moves the camera image to the left

    F4: Moves the camera image to the right

    F5: Cancels the calibration item/the Cancels the changed item. The screen returns to “Camera Selection (Position Calibration)” screen.

    F6: Enters the calibration item/Enters the change



12. Select and enter “Camera longitude Posit” with the function switches.

    F1: The screen returns to “Service Menu” screen.

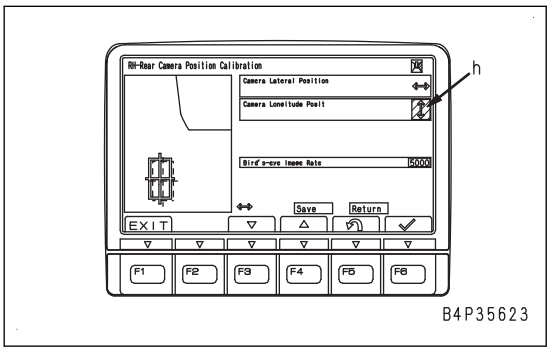
    F3: Moves the selection downward.

    F4: Moves the selection upward.

    F5: Selection is canceled. The screen returns to “CAMERA CALIBRATION” screen.

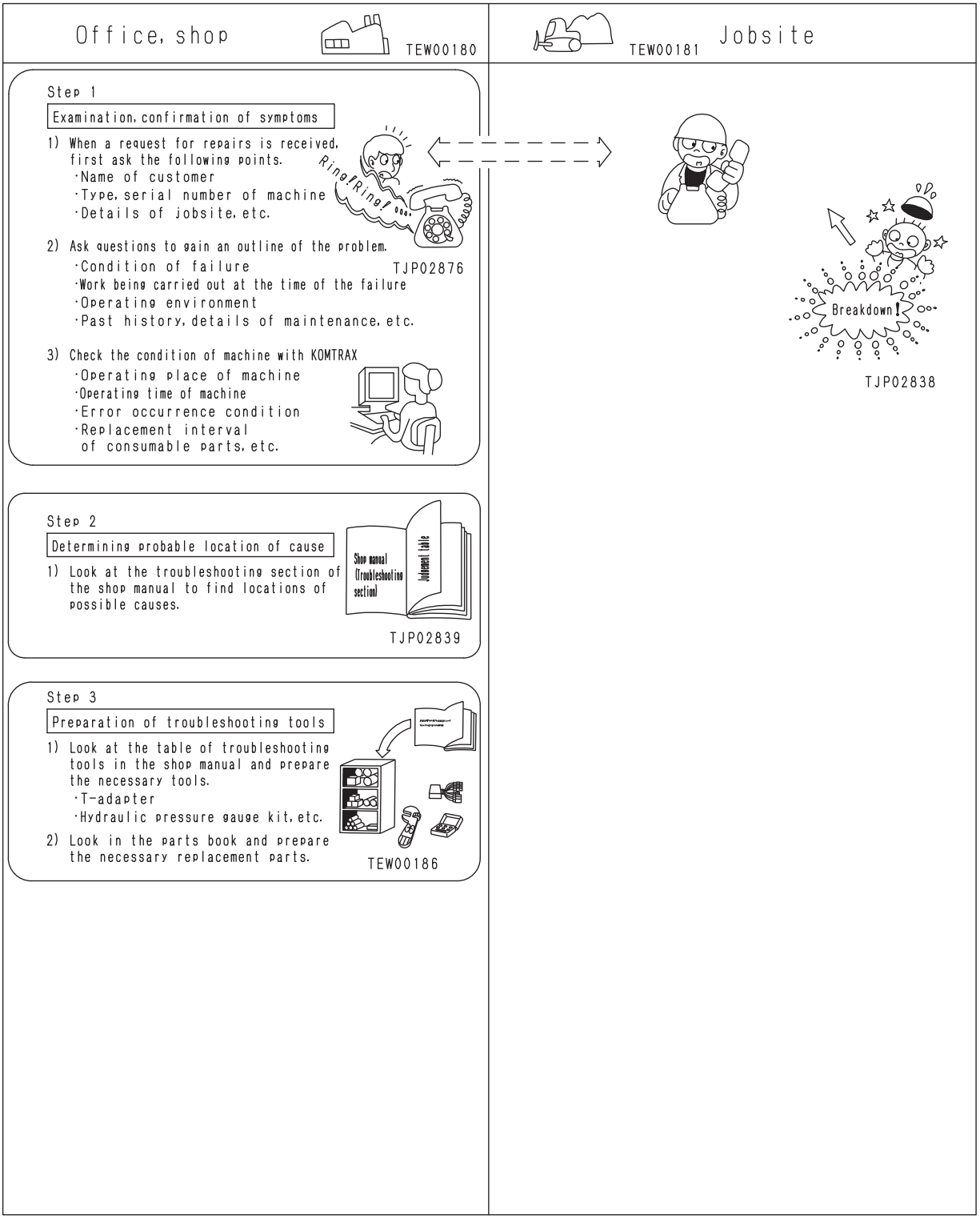
    F6: Enters the selected item.

    The back ground color of icon (h) turns yellow when the selected item is entered.

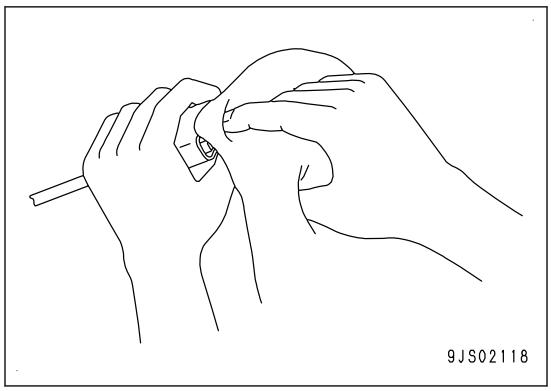


40 Troubleshooting

Sequence of Events in Troubleshooting



- Wipe and remove any foreign material inside connector with a cloth or others, and blow the air to clean the connector.

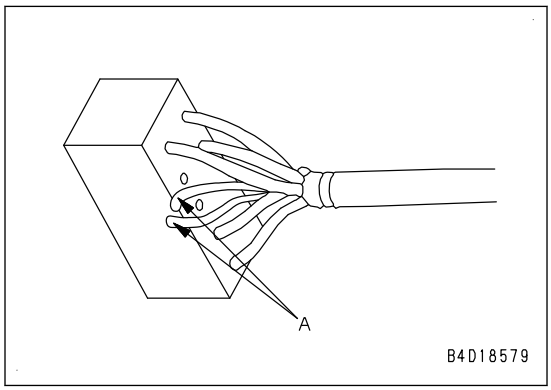


Check of wiring harness for open or short circuit

20. Check the connection (crimped part) between connector pins and wiring harness.

    If it is open as shown as (A), repair or replace the wiring harness or connectors.

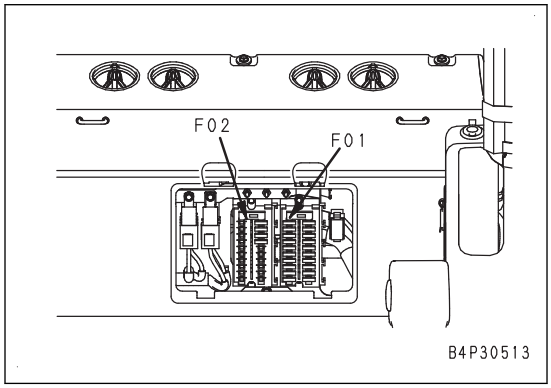
21. Visually check wiring harnesses for peeling of harness covers and the pins for contact with adjacent pins due to defective crimping.



Check of fuse for blowing out and corrosion

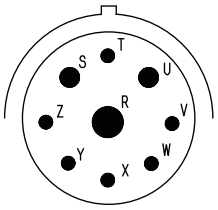
22. When replacing a fuse, be sure to turn off the power (turn the starting switch to OFF position) and turn the battery disconnect switch to OFF position.
    - A fusible link is a large-capacity fuse.
    - If a fuse is corroded and coated with white powder, or there is any play between the fuse and fuse holder, replace the fuse.
    - Replace each fuse with the one of the same capacity.

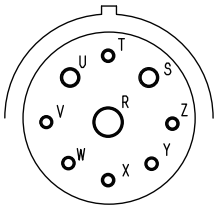
23. Remove the cover at the rear right of the operator's cab, and fuse holders (F01) and (F02) are seen.

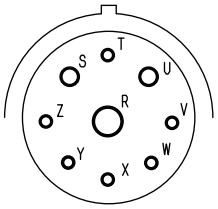


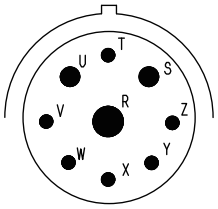
Connector No.	Connector type	Number of pins	Location	Address
M14	DT	2	Travel alarm	A-1
M1A	M	2	Optional power supply (continuous power supply)	X-3
M22	DTM-A	12	Right knob switch (option)	N-7
M23	DTM-B	12	Left knob switch (option)	S-1
M35	DT	2	Heated seat	V-1
M36	DT	2	Air suspension seat	U-1
M40	X	2	Headlamp (option) (front left of cab)	Z-9
M41	X	2	Headlamp (option) (front right of cab)	Y-8
M80	X	2	Bucket quick coupler control box (option)	M-2
M81	X	2	Bucket quick coupler solenoid valve	M-4
MB02	TYCO	12	DEF pump	C-7
MB03	BDK	2	DEF injector	I-9
MB04	DT	2	DEF line heater (suction and return side)	D-8
MB06A	DT	2	DEF line heater (force-fed low temperature side)	D-8
MB06B	DT	2	DEF line heater (force-fed high temperature side)	C-8
N08	DT	12	Service connector	W-8
OEM CONNECTION (E24)	FRAMATOME	24	Intermediate connector (engine wiring harness)	AH-1
OIL PRESSURE SWITCH	FRAMATOME	2	Engine oil pressure switch (low-pressure)	AE-2
P01	AMP	3	Bucket CURL pressure sensor	C-3
P02	AMP	3	Boom LOWER pressure sensor	C-3
P03	AMP	3	Swing (LEFT) pressure sensor	C-2
P04	AMP	3	Arm IN pressure sensor	C-2
P05	AMP	3	Bucket DUMP pressure sensor	C-2
P06	AMP	3	Boom RAISE pressure sensor	C-2
P07	AMP	3	Swing (RIGHT) pressure sensor	C-2
P08	AMP	3	Arm OUT pressure sensor	C-2
P09	AMP	3	Travel forward LEFT pressure sensor	F-1
P10	AMP	3	Travel reverse LEFT pressure sensor	F-1
P11	AMP	3	Travel forward RIGHT pressure sensor	E-1
P12	AMP	3	Travel reverse RIGHT pressure sensor	E-1
P13	X	2	Intermediate connector (service PPC oil pressure switch)	D-1
P14	X	2	Right attachment control pedal forward tilt PPC oil pressure switch	D-1
P15	X	2	Right attachment control pedal backward tilt PPC oil pressure switch	D-1

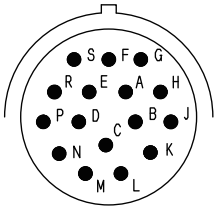
[The pin No. is also marked on the connector (electric wire insertion end)]

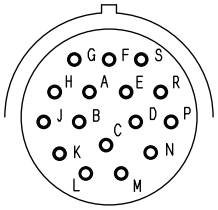
<table>
<tr><td rowspan="2">Type (shell size code)</td><td colspan="2">HD30 Series connector</td><td rowspan="2">Testing connection use special tool Part No.</td></tr>
<tr><td>Body (plug)</td><td>Body (receptacle)</td></tr>
<tr><td rowspan="3">24-9 (5)</td><td>Pin (male terminal)</td><td>Socket (female terminal)</td><td rowspan="3">799-601-9250 (T-adapter)</td></tr>
<tr><td>

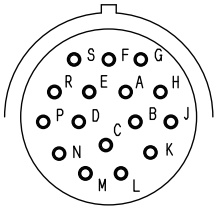
BWP05017</td><td>

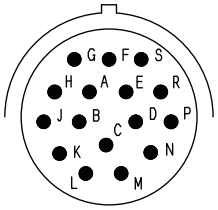
BWP05018</td></tr>
<tr><td>Part No. :08191-51201, 08191-51202</td><td>Part No. :08191-54101, 08191-54102</td></tr>
<tr><td rowspan="3"></td><td>Socket (female terminal)</td><td>Pin (male termial)</td><td rowspan="3">799-601-9250 (T-adapter)</td></tr>
<tr><td>

BWP05019</td><td>

BWP05020</td></tr>
<tr><td>Part No. :08191-52201, 08191-52202</td><td>Part No. :08191-53101, 08191-53102</td></tr>
<tr><td rowspan="5">24-16 (6)</td><td>Pin (male terminal)</td><td>Socket (female terminal)</td><td rowspan="3">799-601-9260 (T-adapter)</td></tr>
<tr><td>

BWP05021</td><td>

BWP05022</td></tr>
<tr><td>Part No. :08191-61201, 08191-62202,
08191-61205, 08191-62206</td><td>Part No. :08191-64101, 08191-64102,
08191-64105, 08191-64106</td></tr>
<tr><td>Socket (female terminal)</td><td>Pin (male termial)</td><td rowspan="3">799-601-9260 (T-adapter)</td></tr>
<tr><td>

BWP05023</td><td>

BWP05024</td></tr>
<tr><td>Part No. :08191-62201, 08191-62202,
08191-62205, 08191-62206</td><td>Part No. :08191-63101, 08191-63102,
08191-63105, 08191-63106</td></tr>
</table>

B4D18407

Part No.	Part name	Number of pins	ID marking	T-adapter kit													Non-kit part
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4101	799-601-4201	
799-601-4340*	Socket for engine (CRI-T3) Pump actuator	2	2, PA													●	●	
799-601-4380*	Socket for engine (CRI-T3) (95) Intake pressure/temperature	4	1, 2, 3, 4T															●
799-601-4260	Adapter for controller (ENG)	4	DTP4													●	●	
799-601-4211	Adapter for controller (ENG)	50	DRC50													●		
799-601-4220	Adapter for controller (ENG)	60	DRC60													●		
799-601-4390*	Socket for controller (95ENG)	60																●
799-601-4280*	Box for controller (PUMP)	121																●
799-601-9720	Adapter for controller (HST)	16	HST16A															●
799-601-9710	Adapter for controller (HST)	16	HST16B															●
799-601-9730	Adapter for controller (HST)	26	HST26A															●
799-601-9890	Multi-adapter for DT 2 to 4, DTM 2 pins	2, 3, 4																●
799-902-9600	T-adapter for ICT control box	26																●
799-902-9700	T-box	26																●
799-970-1010	Adapter for radio control receiver	7																●

*: These are not T-adapters but sockets.

Failure code	Failure (Shown on screen)	Applicable equipment	Action level	History category	Remarks
DY20MA	Wiper Motor Defective Function	PUMP	-	Electrical system	
DY2CKB	Washer Motor Short Circuit	PUMP	-	Electrical system	
DY2DKB	Wiper Motor (Normal Rotation) Short Circuit	PUMP	-	Electrical system	
DY2EKB	Wiper Motor (Reverse Rotation) Short Circuit	PUMP	-	Electrical system	

- In this table, failure codes are arranged in alphabetical order.
- Applicable equipment is the controller which checks the system.
  MON: Machine monitor

  ENG: Engine controller

  PUMP: Pump controller

  KOMTRAX: KOMTRAX terminal

  KomVision: KomVision controller
- The failure codes that do not have numbers in the action level columns are not shown on the standard screen even when a failure related to them occurs. They are simply recorded in the abnormality record (electrical system or mechanical system) of the service menu.
- History category means the classification of either electrical system or mechanical system which is used for storage in the Failure History of the service menu.
  (For details, see “Troubleshooting by Failure Code (Display of Code)”.)

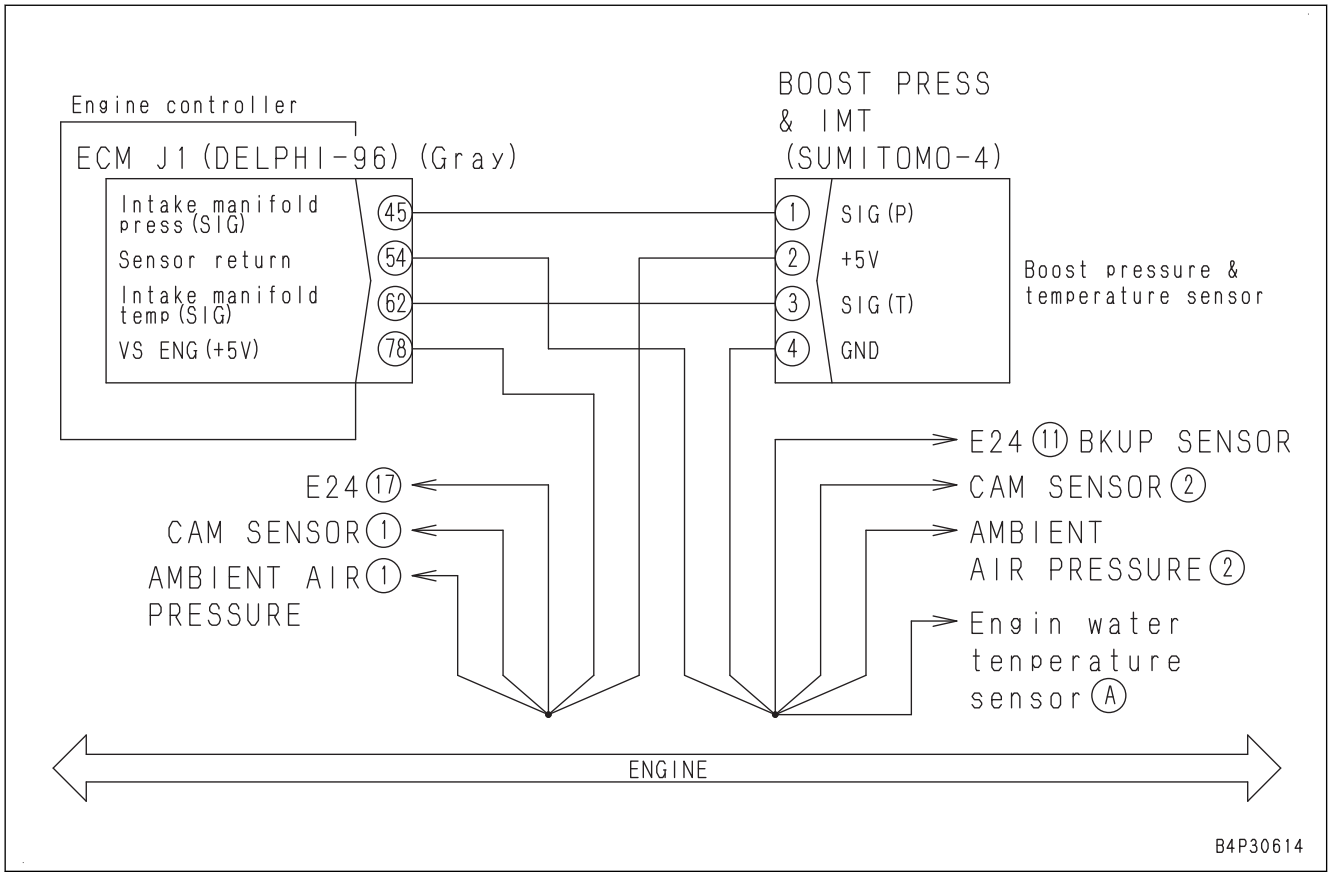
Failure Code [AB00KE]

Action level	Failure code	Failure	Charge Voltage Low (Machine monitor system)
L03	AB00KE		
Details of failure	While engine is running, voltage from alternator drops, and machine monitor detects charge voltage low.		
Action of machine monitor	Displays the charge level monitor in red on machine monitor.		
Phenomenon on machine	If machine continues to be operated, battery may not be charged.		
Related information	• Battery power supply can be checked with monitoring function. (Code: 04300 battery charge voltage) • After repairing, check if the failure code is cleared by the following procedure. Procedure: Start engine.		

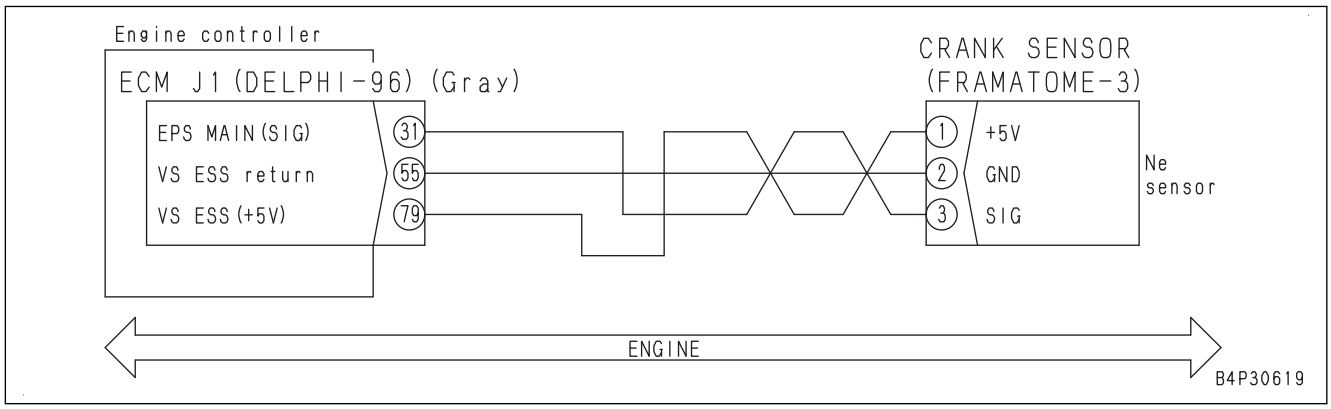
No.	Cause	Procedure, measuring location, criteria and remarks			
1	Loose alternator terminal or open circuit at terminal	1. Turn starting switch to OFF position. 2. Check terminal.			
2	Defective charging by alternator (when system works properly)	1. Turn starting switch to OFF position. 2. Insert T-adapter into connector E08. 3. Start engine.			
		Voltage	Between E08(1) and ground	Engine speed: Medium or above	27.5 to 29.5 V
3	Defective diode	1. Turn starting switch to OFF position. 2. Disconnect diode D01 and connect T-adapter to male side. **REMARK** Measure it in diode range.			
		Continuity	Between D01 (male) (2) (+) and (6) (-)		No continuity
			Between D01 (male) (6) (+) and (2) (-)		Continuity
4	Defective wiring harness or machine monitor	1. Turn starting switch to OFF position. 2. Insert T-adapter into connector CM01. 3. Start engine.			
		Voltage	Between CM01 (16) and ground		20 to 30 V
5	Open circuit in wiring harness (wire breakage or defective contact of connector)	**REMARK** If failure code is still displayed after above checks on cause 2, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors CM01 and E08, and connect T-adapter to each female side.			
		Resistance	Between CM01 (female) (16) and E08 (female) (1)		Max. 1 Ω

No.	Cause	Procedure, measuring location, criteria and remarks		
4	Open circuit in wiring harness (ground line breakage or defective contact of connector)	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and BOOST PRESS & IMT, and connect T-adapters to each female side.		
		Resistance	Between ECM J1 (female) (54) and BOOST PRESS & IMT (female) (4)	Max. 10 Ω
5	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and BOOST PRESS & IMT, and connect T-adapter to female side of ECM J1.		
		Resistance	Between ECM J1 (female) (45) and (78)	Min. 100 kΩ
6	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector BOOST PRESS & IMT and connect T-adapter to female side, or insert T-adapter into connector ECM J1. 3. Turn starting switch to ON position (with connector BOOST PRESS & IMT disconnected).		
		Voltage	Between BOOST PRESS & IMT (1) and (4), or between ECM J1 (female) (45) and (54)	Max. 1 V
7	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit Diagram of Charge Air Pressure Sensor

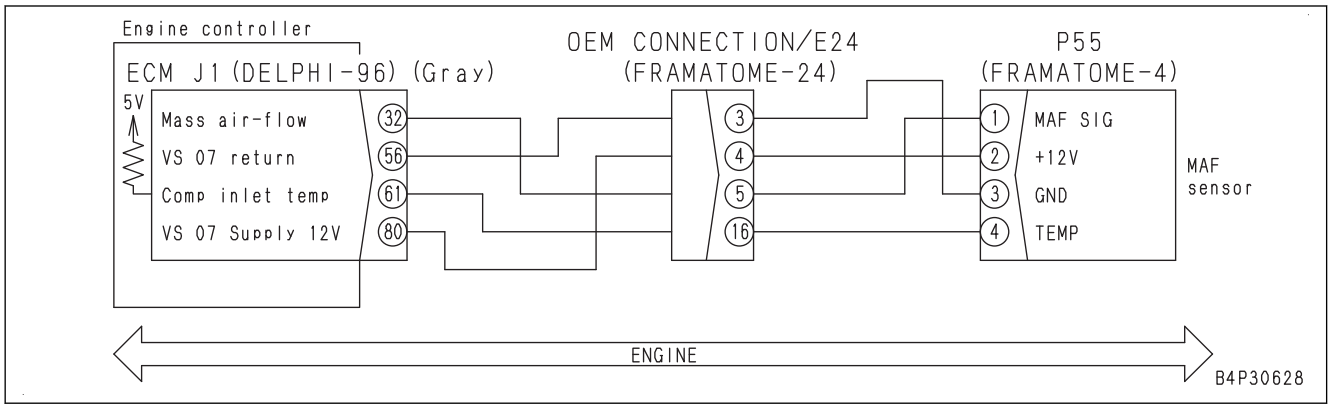


Circuit Diagram of Ne Speed Sensor



No.	Cause	Procedure, measuring location, criteria and remarks		
5	Open circuit in wiring harness (wire breakage of ground line or defective contact of connector)	If failure code is still displayed after above checks on cause 4, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connectors ECM J1 and P55, and connect T-adapters to each female side. **REMARK** Open circuit in GND line		
		Resistance	Between ECM J1 (female) (56) and P55 (female) (3)	Max. 10 Ω
6	Short circuit in wiring harness	1. Starting switch: OFF 2. Disconnect connectors ECM J1 and P55, and connect T-adapter to female side of ECM J1. Check by using multimeter in continuity mode.		
		Continuity	Between ECM J1 (female) (32) and each pin other than (32) pin.	No continuity
7	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit Diagram of Intake Air Temperature Sensor

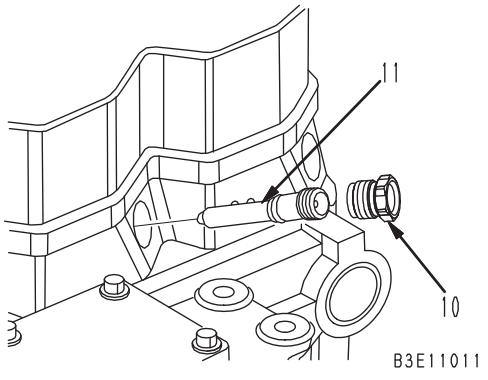


No.	Cause	Procedure, measuring location, criteria and remarks		
7	Defective injector	For check of return rate from injector, see Testing and Adjusting, “Examine Fuel Return Rate and Leakage”.		
		Return rate from injector	At cranking (Min. 150 rpm, for 30 seconds)	Max. 45 cc/30 sec
			At low idle (For 30 seconds)	Max. 125 cc/30 sec
8	Defective supply pump	For details of testing return rate from supply pump, see Testing and Adjusting, “Examine Fuel Return Rate and Leakage”.		
		Return rate from supply pump	At cranking (Min. 150 rpm, for 30 seconds)	Max. 575 cc/30 sec
			At low idle (For 30 seconds)	Max. 575 cc/30 sec
9	Defective pressure limiter	For details of testing pressure limiter leakage amount, see Testing and Adjusting, “Examine Fuel Return Rate and Leakage”.		
		Leakage from pressure limiter	At low idle (for 30 seconds)	Max. 8 cc/30 sec
10	Air in low-pressure circuit	Air may be in low-pressure circuit. Check it according to the following procedure. 1. Remove pressure pickup plug (outlet side) of fuel main filter. 2. Operate feed pump of fuel prefilter. 3. Check pressure pickup plug for leakage of fuel and air. If this error occurs during air bleeding after fuel filter is replaced, air may remain in fuel circuit. Keep running engine at low idle speed for approximately 3 minutes. As air is bled from fuel circuit, engine speed is stabilized, and error display disappears.		
11	Defective common rail pressure sensor system	Perform troubleshooting for failure code [CA451] and [CA452].		

Note 1: Investigate low-pressure fuel circuit parts for following items.

1. Clogging of fuel tank breather
2. Leakage from or clogging of low-pressure fuel piping
3. Clogging of fuel prefilter
4. Clogging of fuel main filter
5. Replace fuel filter when problem is not removed even if no clogging is found.

Note 2



Failure Code [CA1678]

Action level	Failure code	Failure	DEF Temperature Sensor High Error (Engine controller system)
L01	CA1678		
Detail of failure	Failure of DEF temperature sensor (Open circuit of thermistor for temperature measurement)		
Action of controller	Advances to Inducement strategy. (EU Specification)		
Phenomenon on machine	• Failure to measure DEF level. • Engine power deration according to inducement strategy. (EU Specification)		
Related information	• The DEF temperature sensor is one of the DEF tank sensors integrated with the DEF level sensor and DEF quality sensor performs CAN communication with the engine controller. • If the thermistor for temperature measurement is open, this failure code is sent to the engine controller via CAN communication and displayed. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it. 2. Turn starting switch to ON position.
		If this failure code is cleared, wiring harness connector is defective.
2	Defective DEF tank sensor	1. Check the sensor connector for contamination and damage. 2. Turn starting switch to OFF position. 3. Replace the DEF tank sensor. 4. Turn starting switch to ON position.
		If this failure code is cleared, any internal parts in the original DEF tank sensor is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)
3	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Failure Code [CA1777]

Action level	Failure code	Failure	Sensor Supply Relay Voltage Low Error
L01	CA1777		(Engine controller system)
Detail of failure	Low voltage error occurs in sensor power supply relay circuit.		
Action of controller	None in particular		
Phenomenon on machine	• Inoperative KDPF temperature sensor, turbocharger outlet NOx sensor, SCR outlet NOx sensor, ammonia sensor, SCR temperature sensor and DEF tank sensor. • NOx emission increases because DEF injection is disabled.		
Related information	• Be careful that voltage is applied to the connector of the sensor power supply relay even if the starting switch is OFF. • Troubleshooting of this failure code covers circuits from engine controller through sensor power supply relay to ground. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position.		

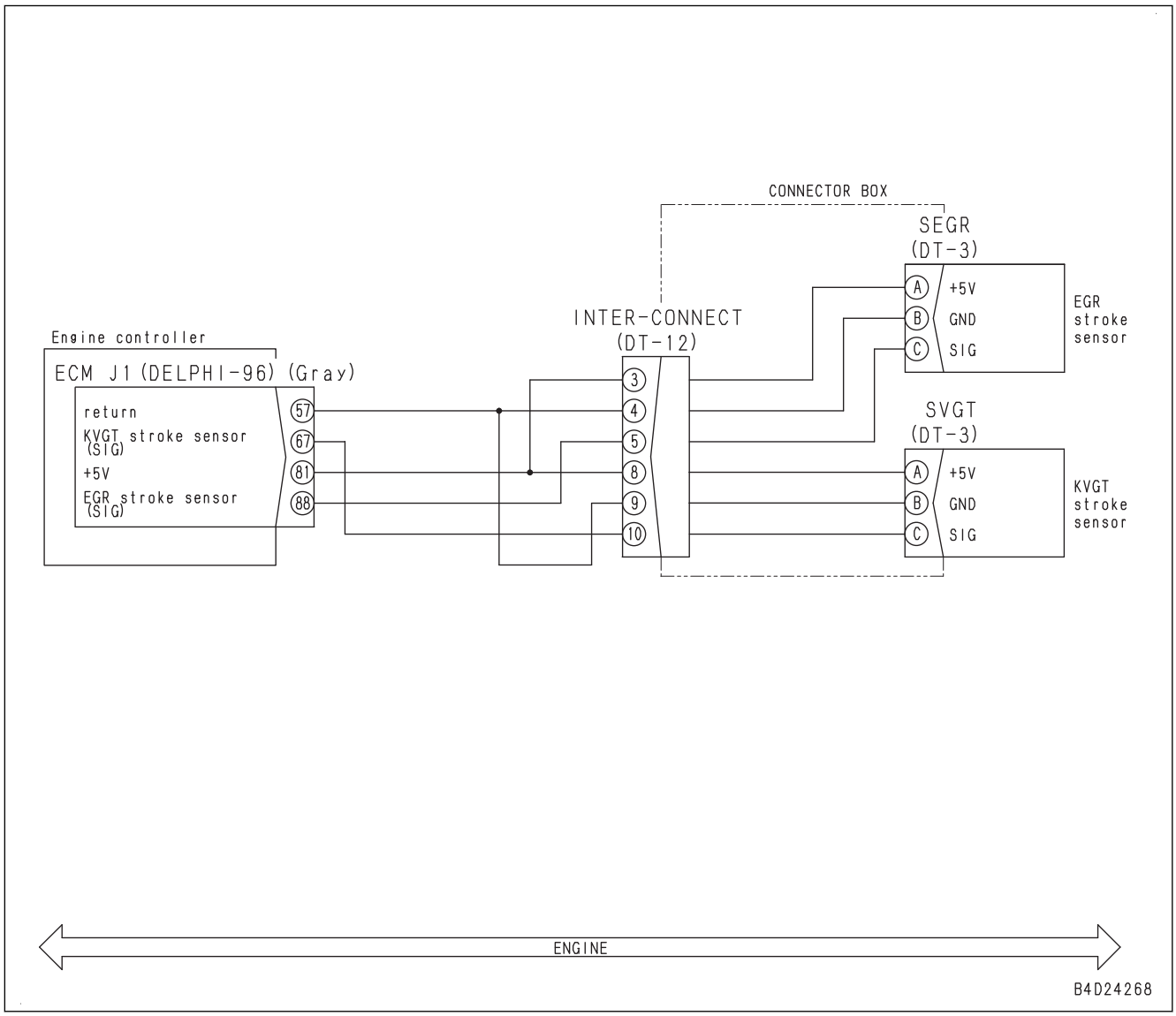
No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it. 2. Turn starting switch to ON position. 3. Perform deletion of “Electrical Sys Abnormality Record” in “SERVICE MODE” of machine monitor. 4. Turn the starting switch to OFF position, and shut down the engine controller. 5. Turn starting switch to ON position.
		If this failure code is not logged on Abnormality Record screen, wiring harness connector is defective.
2	Defective fuses No. 1 and 2 in fuse box F02	Check if fuses No. 1 and 2 in fuse box F02 are blown. **REMARK** If blown, perform troubleshooting for ground fault in wiring harness.
3	Defective sensor power supply relay	1. Turn starting switch to OFF position. 2. Check that system operating lamp does not light up, and then turn the battery disconnect switch OFF. 3. Disconnect connector R52, and replace sensor power supply relay. 4. Turn the battery disconnect switch ON. 5. Turn starting switch to ON position.
		If this failure code is cleared, the original sensor power supply relay is defective.

Failure Code [CA1942]

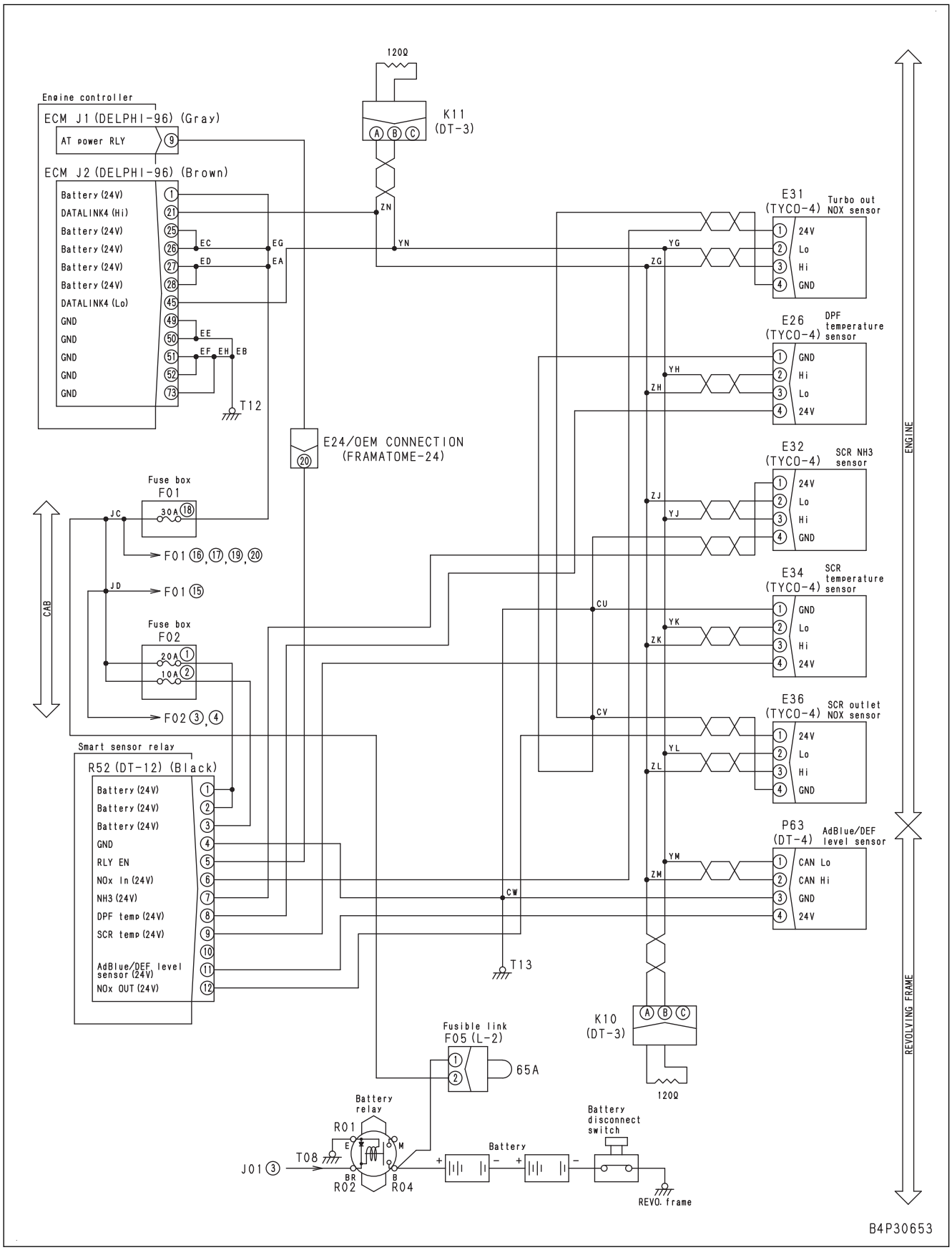
Action level	Failure code	Failure	Crankcase Pressure Sensor In Range Error (Engine controller system)
L01	CA1942		
Details of failure	For output from crankcase pressure sensor, value out of normal range is displayed.		
Action of controller	None in particular		
Phenomenon on machine			
Related information	• Signal voltage from crankcase pressure sensor can be checked by monitoring function. (Code: 48401 (V)) • Pressure in crankcase pressure sensor can be checked by monitoring function. (Code: 48400 (MPa)) • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position. • This code is displayed if sensor value is not abnormal when turning starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective crankcase pressure sensor	Crankcase pressure sensor system may be defective. Perform troubleshooting for failure codes [CA1843] and [CA1844].
2	Clogged KCCV filter	Replace the KCCV filter.
3	Blocked KCCV gas piping	If an error persists after replacement of the KCCV filter and emulsions are detected inside KCCV, blocked emulsions may be suspected in KCCV blow by gas piping. Check that there is no coolant leakage.
4	Increase of blowby gas	The error does not disappear after replacing KCCV filter, and “Crankcase Pressure High Error 1” or “Crankcase Pressure High Error 2” is also displayed, piston ring may be worn or broken, or oil from VGT may be leaked, valve guide and stem seal may be worn or damaged. Perform troubleshooting “TROUBLESHOOTING OF ENGINE (S MODE)”, “Engine oil consumption is excessive”.

Circuit Diagram of VGT Position Sensor



Circuit Diagram of SCR System CAN Communication



Loaded Diagnostics Operation to Confirm Failure Correction

Check if the repair has been completed with the following procedure:

(Make sure that this failure code and failure code [CA3582] are not displayed after this procedure.)

1. Clear this failure code by “Engine Controller Inducement Fault Clear”.
2. Turn the starting switch to OFF position, and shut down the engine controller.
3. Turn the starting switch to ON position.
4. Start the engine.
5. Run the engine at low idle speed for approximately 1 minute.
6. After warm-up operation, set the swing lock to ON, the working mode to P, and the fuel control dial to MAX position.
7. Operate for approximately 30 seconds with Arm IN relief.

   REMARK

   Be careful care not to overheat hydraulic oil temperature.
8. Run engine at high idle speed for approximately 30 seconds.
9. Repeat above steps 6. and 7. 20 times.
10. If this failure code and failure code [CA3582] are not displayed, repair is completed

If this failure code or failure code [CA3582] is displayed:

1. Display the SCR temperature and ammonia concentration on the Predefined Monitoring screen.
2. Operate so that the SCR temperature 250 °C or above is kept.
3. A normal value of ammonia concentration ranges from 5 to 100(ppm). If 0(ppm) is displayed consistently or 100(ppm) or above is displayed, return to troubleshooting because the repair work is not completed.

Failure Code [CA3254]

Action level	Failure code	Failure	KDOC Outlet Temperature High Error 1(Engine controller system)
L01	CA3254		
Details of failure	KDOC outlet temperature remains at high level.		
Action of controller	None		
Phenomenon on machine	None		
Related information	⚠ **The temperature of KDPF and KDOC becomes hot (Min. 500 °C). Be careful not to get burned.** • Temperature in KDOC inlet temperature sensor can be checked by monitoring function. (Code: 47300 (°C)) • Temperature in KDOC outlet temperature sensor can be checked by monitoring function. (Code: 47400 (°C)) • Temperature in KDPF outlet temperature sensor can be checked by monitoring function. (Code: 47200 (°C)) • KDOC inlet temperature, KDOC outlet temperature, and KDPF outlet temperature when at low idle speed (KDPF regeneration is not executed) are approximately 100 to 250 °C, and difference between these temperatures is approximately 10 °C. (KDOC inlet temperature > KDOC outlet temperature > KDPF outlet temperature) • If the engine runs with poor combustion, (poor fuel spray due to troubles in the fuel injectors is one of the examples of root causes but not limited to it), large amount of unburnt fuel slips out with the exhaust gas and will be trapped in the aftertreatment system. The trapped unburnt fuel can start burning in the aftertreatment system once the exhaust gas becomes hot and it can keep burning. 1. Combustion is impaired causing high exhaust temperature. 2. Cylinders other than disabled cylinder may increase their fuel injection in order to compensate for torque drop, causing high exhaust temperature. • As to procedure for accessing KDPF temperature sensor, see “50 Disassembly and Assembly”, “REMOVE AND INSTALL KDPF ASSEMBLY” and “DISASSEMBLE AND ASSEMBLE KDPF ASSEMBLY”. • Engine controller does not shut itself down immediately after turning the starting switch to the OFF position. The DEF purging starts after the starting switch is turned to the OFF position and Engine controller keeps working until the purging is completed. The purging lasts for maximun 6 minutes. Do not re-start the engine until the system operating lamp in the battery box goes out even if quick restart becomes necessary. **NOTICE** • **This failure code requires “Loaded Diagnostics Operation To Clear Failure Code”. After investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Clear Failure Code” to make sure the failure code is cleared. (This failure code is not cleared by only turning ON the starting switch again.)** • **This failure code is cleared by performing operations indicated in “TESTING AND ADJUSTING”, “SETTING AND OPERATION OF MACHINE MONITOR”, “SERVICE MODE”, “METHOD FOR SETTING WITH TESTING MENU (ENGINE CONTROLLER ACTIVE FAULT CLEAR)”.**		

Failure Code [CA3419]

Action level	Failure code	Failure	Mass air flow sensor sup volt high error (Engine controller system)
L03	CA3419		
Detail of failure	High voltage occurs in mass air flow sensor power supply (12 V) circuit.		
Action of controller	None in particular		
Phenomenon on machine	Engine output lowers.		
Related information	• If failure code [CA356] or [CA357] is displayed, remedy described in “Action of controller” of their failure code is performed. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position. • Engine power deration is canceled by turning starting switch to OFF position after this failure code is not displayed (note that the deration is not canceled right after the failure code is not displayed).		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	1. Perform checkup referring to descriptions of wiring harness and connectors in “c Electric equipment ”of “CHECKS BEFORE TROUBLESHOOTING” in “RELATED INFORMATION ON TROUBLESHOOTING”. 2. Turn starting switch to ON position.		
		If this failure code is cleared, wiring harness connector is defective.		
2	Defective mass air flow sensor (internal defect)	1. Starting switch: OFF 2. Disconnect connector P55. 3. Starting switch: ON		
		If this failure code is cleared, mass air flow sensor is defective. Other failure codes are displayed at the same time. This happens because the connector is disconnected. So ignore other codes besides this failure code.		
3	Defective wiring harness	1. Starting switch: OFF 2. Disconnect connector ECM J1. 3. Starting switch: ON		
		If this failure code is cleared, wiring harness is defective. **REMARK** Many other failure codes appear at same time because of disconnected connector. Ignore failure codes other than this.		
4	Defective engine controller	1. Starting switch: OFF 2. Disconnect connector ECM J1 and connect T-adapter to male side. 3. Starting switch: ON		
		Voltage	Between ECM J1 (male) (80) and (56)	Approximately 12 V
		If failure code is still displayed after above checks, engine controller is defective. Replace engine controller. (Troubleshooting will be impossible, because this is an internal defect.)		

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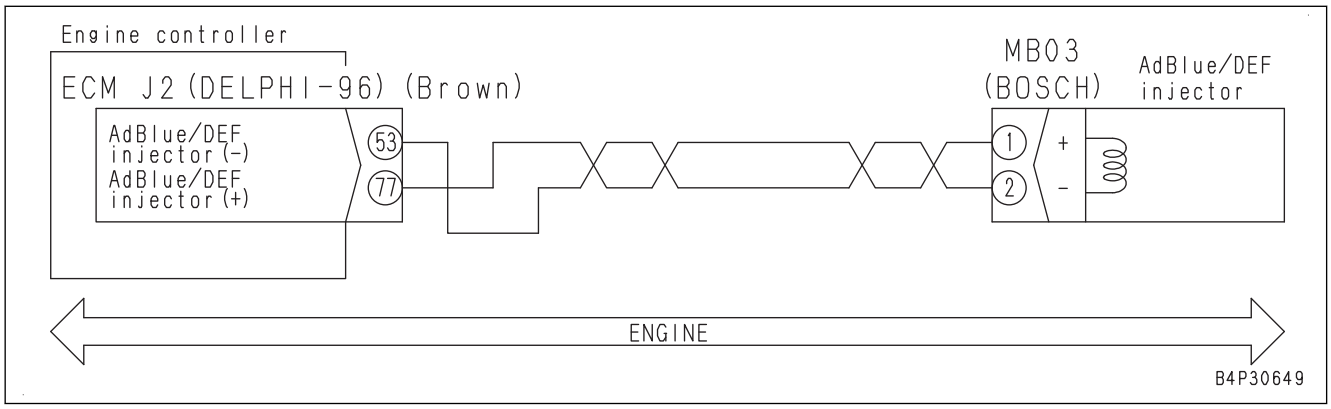
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REMARK

If this failure code is cleared at this point, repair is completed, but if not, return to troubleshooting.

Circuit diagram related to DEF injector



No.	Cause	Procedure, measuring location, criteria and remarks
1	CAN communication system error	If failure code [CA3232] is displayed, perform troubleshooting for [CA3232] first.
2	Defective sensor power supply system	If failure code [CA1776] or [CA1777] is displayed, perform troubleshooting for [CA1776] or [CA1777] first.
3	Defective turbocharger outlet NOx sensor system (internal circuit abnormality)	If failure code [CA1885] or [CA3682] or [CA3718] is displayed, perform troubleshooting for these failure codes first.
4	Defective turbocharger outlet NOx sensor	If failure code is still displayed after above checks, the turbocharger outlet NOx sensor may be defective. (Offset/drift due to sulfur-poisoned turbocharger outlet NOx sensor) 1. Turn starting switch to OFF position. 2. NOx sensor fails, therefore, replace the turbocharger outlet NOx sensor. 3. Turn starting switch to ON position. 4. Perform “Loaded Diagnostics Operation To Confirm Failure Correction”.
5	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Loaded Diagnostics Operation to Confirm Failure Correction

Check if the repair has been completed with the following procedure:

(Make sure this failure code is not displayed after this procedure.)

Clear this failure code by “Engine Controller Inducement Fault Clear” before step 1. (EU Specification)

1. Turn the starting switch to OFF position, and shut down the engine controller.
2. Turn the starting switch to ON position, and start the engine.
3. Run the engine at high idle speed safely to raise the exhaust temperature. (Keep the engine speed so that monitoring code 47300 “KDOC 1 Inlet Temperature” becomes 150 °C or higher. Check that monitoring code 19203 “Turbo Outlet NOx Sensor State” changes from 0 to 1).
4. Repair is completed if failure code is not displayed after 3 minutes has passed.

REMARK

If the turbocharger outlet NOx sensor does not activate (that is, 19203 “Turbo Outlet NOx Sensor State” remains as 0), return to troubleshooting.

Failure Code [CA3866]

Action level	Failure code	Failure	DEF Low Concentration Error 2
L01	CA3866		(Engine controller system)
Detail of failure	The more NOx emission increases, the lower concentration DEF gets.		
Action of controller	• Advances to Inducement strategy. (*1) • DEF injection stops. (*1) • DEF pump stops. (*1) *1: It corresponds to machines of EU, Japan, and North America specification which equipped with engines compatible with EPA and California regulations since 2017. **REMARK** EPA and California regulations can be checked on the nameplate of the engine serial number.		
Phenomenon on machine	• Engine power deration according to inducement strategy. (*1) • NOx conversion rate is lower. *1: It corresponds to machines of EU, Japan, and North America specification which equipped with engines compatible with EPA and California regulations since 2017. **REMARK** EPA and California regulations can be checked on the nameplate of the engine serial number.		

No.	Cause	Procedure, measuring location, criteria and remarks
3	Defective ammonia sensor controller	1. Turn starting switch to OFF position. 2. If this failure code is displayed in above diagnosis, replace an ammonia sensor controller. 3. Perform “Loaded Diagnostics Operation To Confirm Failure Correction”.
		If the failure code is cleared, the original ammonia sensor controller may be defective.
4	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Loaded Diagnostics Operation to Confirm Failure Correction

Check if the repair has been completed with the following procedure:

(Make sure this failure code is not displayed after this procedure.)

Clear this failure code by “Engine Controller Inducement Fault Clear” before step 1. (EU Specification)

1. Turn the starting switch to OFF position, and shut down the engine controller.
2. Turn the starting switch to ON position, and start the engine.
3. Run the engine at high idle speed to raise the exhaust temperature. (Keep the engine speed so that monitoring code 19300 “SCR temperature” is 150 °C or higher.)
4. Check if this failure code is not displayed after 1 minute.

REMARK

- If this failure code is not displayed, repair is completed.
- In case it is displayed, return to troubleshooting.

Failure Code [CA4164]

Action level	Failure code	Failure	SCR Temperature Sensor ECU Voltage High Error (Engine controller system)
L01	CA4164		
Detail of failure	High voltage error is detected in power supply voltage of SCR temperature sensor controller.		
Action of controller	• The SCR temperature and SCR outlet temperature are the latest normal value for operation. • Advances to Inducement strategy. • DEF injection stops		
Phenomenon on machine	• Defective detection of SCR temperature and SCR outlet temperature. • NOx emission increases because DEF injection is disabled. • Engine power deration according to inducement strategy.		
Related information	⚠ **The SCR assembly, sensor fitting piping, and sensor probe become hot (Min. 400 °C). Be careful not to get burned.** • The SCR temperature sensor and SCR outlet temperature sensor are integrated into one sensor controller which provides CAN communication with the engine controller. • For the replacement procedure of the SCR temperature sensor, see “50 Disassembly and Assembly”, “REMOVE AND INSTALL SCR TEMPERATURE SENSOR”. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it. 2. Turn starting switch to ON position. If this failure code is cleared, wiring harness connector is defective.		
2	High battery voltage	1. Turn starting switch to OFF position. 2. Check that system operating lamp is not illuminated, and then turn the battery disconnect switch to OFF position. 3. Disconnect connector R52, and connect T-adapter to female side. 4. Turn the battery disconnect switch to ON position. 5. Turn starting switch to ON position.		
		Voltage	Between R52 (female) (1) and (4)	22 to 30 V
			Between R52 (female) (2) and (4)	22 to 30 V
			Between R52 (female) (3) and (4)	22 to 30 V
3	Defective SCR temperature sensor (internal defect)	1. Turn starting switch to OFF position. 2. Replace SCR temperature sensor. 3. Turn starting switch to ON position. If this failure code is cleared, the original SCR temperature sensor is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)		
4	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

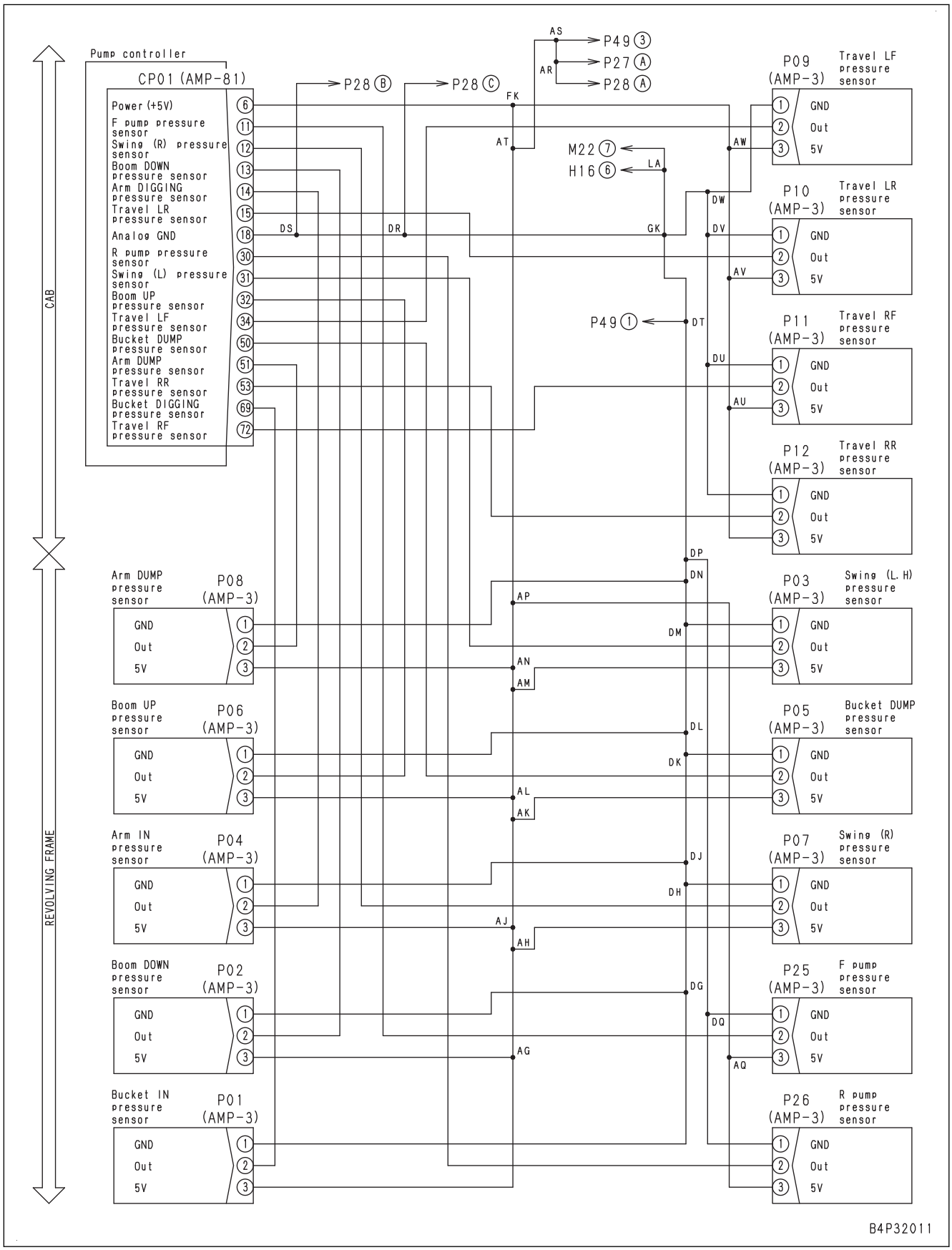
Failure Code [CA4281]

Action level	Failure code	Failure	SCR NH3 Sensor Stuck Response Error (Engine controller system)
L01	CA4281		
Detail of failure	Ammonia concentration in ammonia sensor changes slow.		
Action of controller	Uses DEF injection control without using the ammonia sensor.		
Phenomenon on machine	NOx emission may increase or ammonia may be exhausted because DEF injection works inappropriately.		
Related information	**⚠ SCR assembly, the sensor installation piping, and the sensor probe become hot (min. 400 °C). Be careful not to get burned.** **⚠ Be careful not to get burned by the sensor probe as it is heated by itself even if the ambient temperature is not high.** • This failure code is displayed when ammonia sensor value cannot be detected; a sensor probe is not attached to the exhaust pipe. • This failure occurs also when DEF injector is clogged, and when [CA3568] or [CA3582] or [CA4658] is displayed, repair these codes first. • If DEF injector is clogged when outside air temperature is -5 °C or below, this error may appear solely. • On the Pre-defined Monitoring screen troubleshooting for DEF injector and the engine operation state are used (the figures below denote monitoring codes). • Troubleshooting for DEF injector 19304 DEF Pump State 19120 DEF Injection Quantity 19205 ammonia concentration (compensation value) 19202 Turbo Outlet NOx Corrected 47200 KDPF Outlet Temperature • Engine operation state troubleshooting 01002 Engine Speed 19200 Exhaust Gas Flow Rate 47300 KDOC Inlet Temperature 19300 SCR Temperature 19302 SCR Outlet Temperature **NOTICE** **This failure code requires “Loaded Diagnostics Operation To Clear Failure Code”. After investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Clear Failure Code” to make sure the failure code is cleared. (This failure code is not cleared by only turning starting switch to ON position.)**		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective DEF injector system	If failure code [CA3568] or [CA4658] is displayed, perform troubleshooting for the code first.
2	Defective SCR catalyst	If failure code [CA3582] is displayed, perform troubleshooting for the code first.

<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Ground fault in wiring harness (contact with ground circuit)</td><td colspan="3">1. Starting switch: OFF
2. Disconnect connectors ECM J2, R53A, MB04, and MB06A, and connect T-adapter to either female side.</td></tr>
<tr><td rowspan="3">Resistance</td><td>Between ground and ECM J2 (female) (39) or R53A (female) (8)</td><td>Min. 100 kΩ</td></tr>
<tr><td>Between R53A (female) (5) and ground, or between MB06A (female) (1) and ground</td><td>Min. 100 kΩ</td></tr>
<tr><td>Between R53A (female) (6) and ground, or between MB04 (female) (1) and ground</td><td>Min. 100 kΩ</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Open circuit or short circuit in wiring harness (line heater relay output side)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connector R53A, and connect T-adapter to female side.
REMARK
Resistance value is the internal resistance value of the heater relay mentioned above.</td></tr>
<tr><td rowspan="2">Resistance</td><td>Between R53A (female) (5) and (12)</td><td>5 to 40 Ω</td></tr>
<tr><td>Between R53A (female) (6) and (12)</td><td>5 to 40 Ω</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">Defective DEF heater relay</td><td colspan="3">1. Turn starting switch to OFF position.
2. Check that system operating lamp does not light up, and then turn the battery disconnect switch OFF.
3. Disconnect connector R53A and R53B, and replace DEF heater relay.
4. Turn the battery disconnect switch ON.
5. Perform the “DEF Line Heater Relay 1 Test” by staring the engine in low ambient temperature (5 °C or below), or by referring “Service Mode” of setting and operating machine monitor, “METHOD FOR OPERATING TESTING MENU (SCR SERVICE TEST)”.</td></tr>
<tr><td colspan="3">If this failure code is cleared, the original DEF heater relay is defective.</td></tr>
<tr><td>8</td><td>Defective engine controller</td><td colspan="3">If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

Circuit Diagram of Pump Controller 5 V Sensor Power Supply

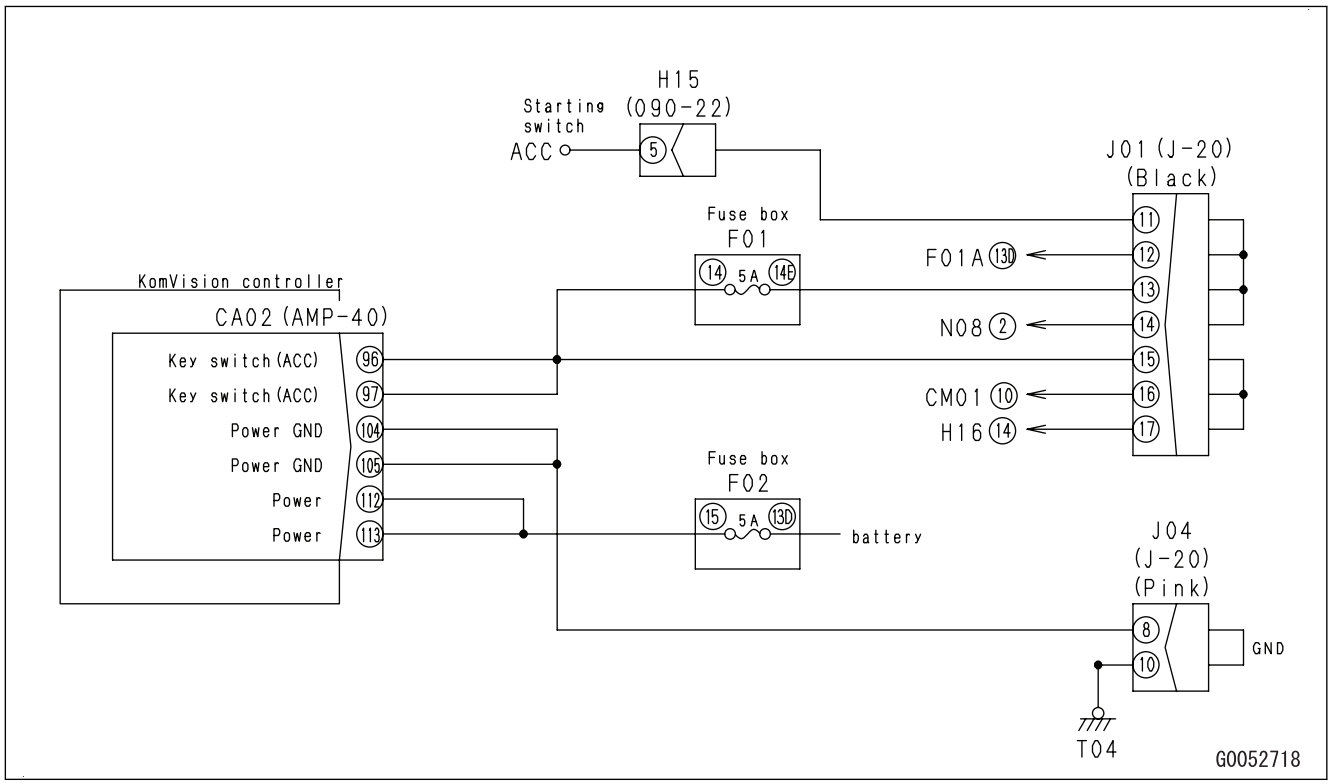


Failure Code [DAZQKR]

Action level	Failure code	Failure	CAN 2 Defective Communication (Air Conditioner) (Machine monitor system)
L01	DAZQKR		
Detail of failure	In CAN communication 2 line (KOMNET/c), machine monitor cannot recognize air conditioner controller.		
Action of controller	Retains information when the failure occurred.		
Phenomenon on machine	Information obtained from engine controller is not shown. (Such as failure codes and monitoring codes sent from the engine controller) Air conditioner cannot be controlled (air does not blow out). Air conditioner operation screen of machine monitor is not shown properly.		
Related information	• After the repair is completed, do the operation explained below to make sure that the failure code is not shown. Procedure: Starting switch ON • Start of CAN communication is recognized by each controller when ACC signal of starting switch is received. • 5 different failure codes, [DA2QKR], [DB2QKR], [D8AQKR], [DAZQKR] and [DBPQKR] are used for defective CAN communication by CAN 2 when it is detected by machine monitor. When all of these 5 failure codes are shown, ground fault, short circuit or hot short circuit in wiring harness (CAN communication line) can be suspected. • Since each controller and machine monitor are connected directly to battery, they are supplied with power even after starting switch is turned to the OFF position. • Since signal of active CAN communication line is pulse voltage, it cannot be measured with multimeter.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective power supply to air conditioner controller	Do the “Troubleshooting of power supply system” in chapter 80.		
2	Defective CAN terminating resistor (internal open or short circuit)	1. Starting switch OFF 2. Disconnect the connectors CM02 and K02. Connect the T-adapter to the male side.		
		Resistance	Between K02 (male) (A) and (B)	120±12 Ω
			Between CM02 (male) (7) and (9)	120±12 Ω

Circuit Diagram Related to KomVision Controller Power Supply



<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="5">3</td><td rowspan="5">Open circuit in wiring harness
(Wire breakage or defective contact of connector)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors CP01 and P01, and connect T-adapters to each female side.</td></tr>
<tr><td rowspan="4">Resistance</td><td>REMARK
If power supply voltage in check on cause 1 is normal, this check is not required.
Between CP01 (female) (18) and P01 (female) (1)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (69) and P01 (female) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (6) and P01 (female) (3)</td><td>Max. 1 Ω</td></tr>
<tr><td></td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Ground fault in wiring harness
(Contact with ground circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors CP01 and P01, and connect T-adapter to either female side.</td></tr>
<tr><td>Resistance</td><td>Between ground and CP01 (female) (69) or P01 (female) (2)</td><td>Min. 1 MΩ</td></tr>
<tr><td></td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Hot short circuit in wiring harness
(Contact with 5 V circuit and 24 V circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connector P01.
3. Connect T-adapter to female side of connector P01.
4. Turn starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td>Between P01 (female) (2) and ground</td><td>Max. 1 V</td></tr>
<tr><td></td></tr>
<tr><td>6</td><td>Defective pump controller</td><td colspan="3">If no failure is found by preceding checks, pump controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly).</td></tr>
</table>

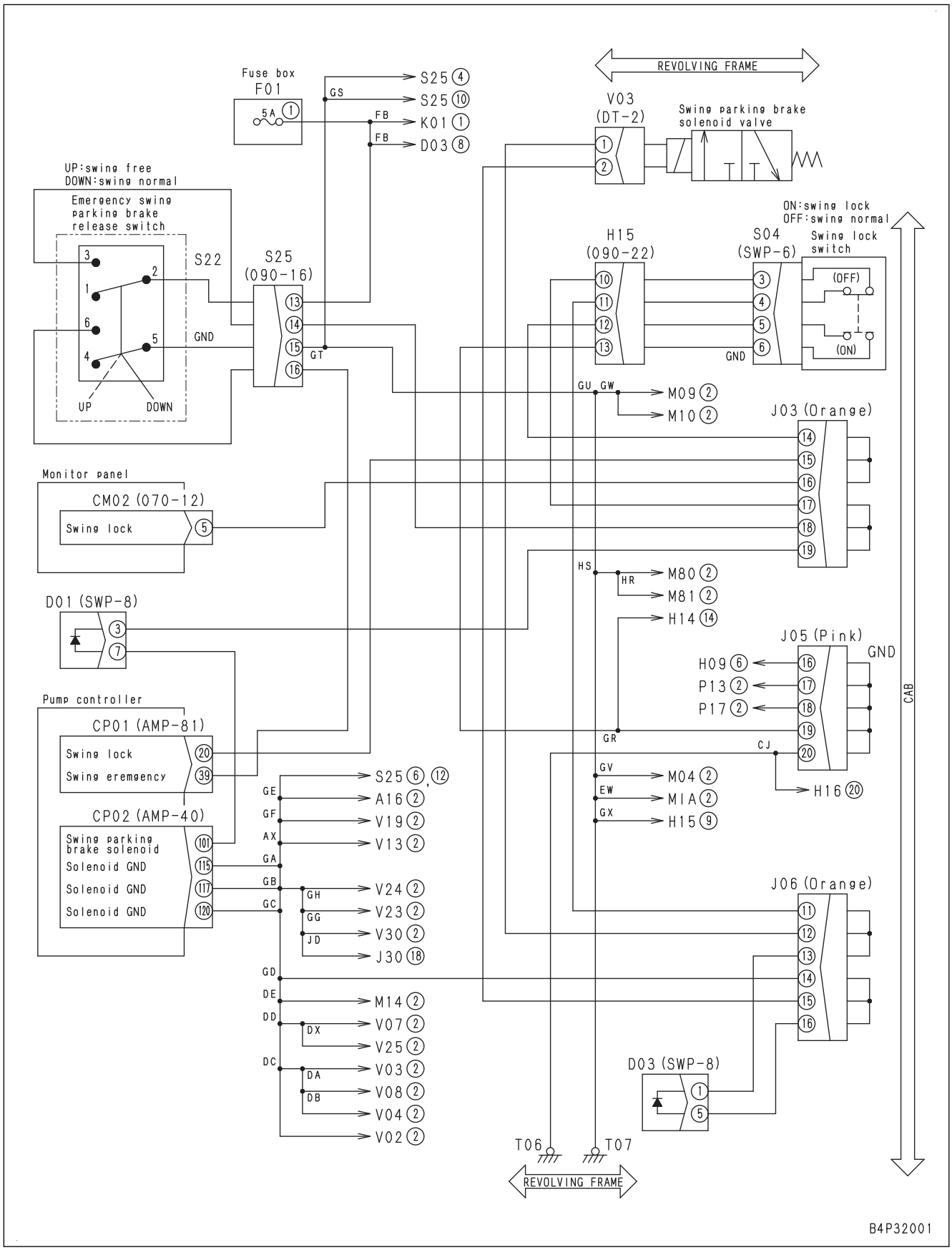
<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="5">3</td><td rowspan="5">Open circuit in wiring harness
(Wire breakage or defective contact of connector)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors CP01 and P10, and connect T-adapters to each female side.</td></tr>
<tr><td rowspan="4">Resistance</td><td>REMARK
If power supply voltage in check on cause 1 is normal, this check is not required.
Between CP01 (female) (18) and P10 (female) (1)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (15) and P10 (female) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td>REMARK
If power supply voltage in check on cause 1 is normal, this check is not required.
Between CP01 (female) (6) and P10 (female) (3)</td><td>Max. 1 Ω</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Ground fault in wiring harness
(Contact with ground circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors CP01 and P10, and connect T-adapter to either female side.</td></tr>
<tr><td>Resistance</td><td>Between ground and CP01 (female) (15) or P10 (female) (2)</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Hot short circuit in wiring harness
(Contact with 5 V circuit and 24 V circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connector P10.
3. Connect T-adapter to female side of connector P10.
4. Turn starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td>Between P10 (female) (2) and ground</td><td>Max. 1 V</td></tr>
<tr><td>6</td><td>Defective pump controller</td><td colspan="3">If no failure is found by preceding checks, pump controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly).</td></tr>
</table>

Failure Code [DR20KA]

Action level	Failure code	Failure	Disconnection of Camera 2 NTSC Input (KomVision controller system)
L01	DR20KA		
Detail of failure	Image signal of the camera 2 cannot be detected.		
Action of controller	None in particular		
Phenomenon on machine	Display area of the R.H. camera and the single camera images are shown in black.		
Related information	After the repair is completed, do the operation explained below to make sure that the failure code is not shown. Procedure: Turn the starting switch to the ON position and have a bird's eye view shown.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Open circuit in wiring harness	1. Starting switch OFF 2. Disconnect the connectors CA01, and A76. Connect the T-adapter to the female side of each connector.		
		Resistance	Between CA01 (female) (25) and A76 (female) (1)	Max. 1 Ω
			Between CA01 (female) (23) and A76 (female) (2)	Max. 1 Ω
			Between CA01 (female) (42) and A76 (female) (4)	Max. 1 Ω
2	Ground fault in wiring harness	1. Starting switch OFF 2. Disconnect the connectors CA01 and A76. Connect the T-adapter to the female side of one of them.		
		Resistance	Between ground and one of CA01 (female) (23) or A76 (female) (2)	Min. 1 MΩ
3	Hot short circuit in wiring harness	1. Starting switch OFF 2. Disconnect the connector A76. Connect the T-adapter to the female side. 3. Starting switch ON		
		Voltage	Between A76 (female) (2) and (4)	Max. 9 V
			Between A76 (female) (4) and ground	Max. 9 V
4	Defective camera	1. Starting switch OFF 2. Replace the R.H. camera. 3. Starting switch ON		
		If failure code is not shown, camera has an internal defect.		
5	Defective KomVision controller	If no failure is found by above checks, the KomVision controller is defective. (Since this is an internal defect, troubleshooting cannot be done).		

Circuit Diagram of Swing Parking Brake

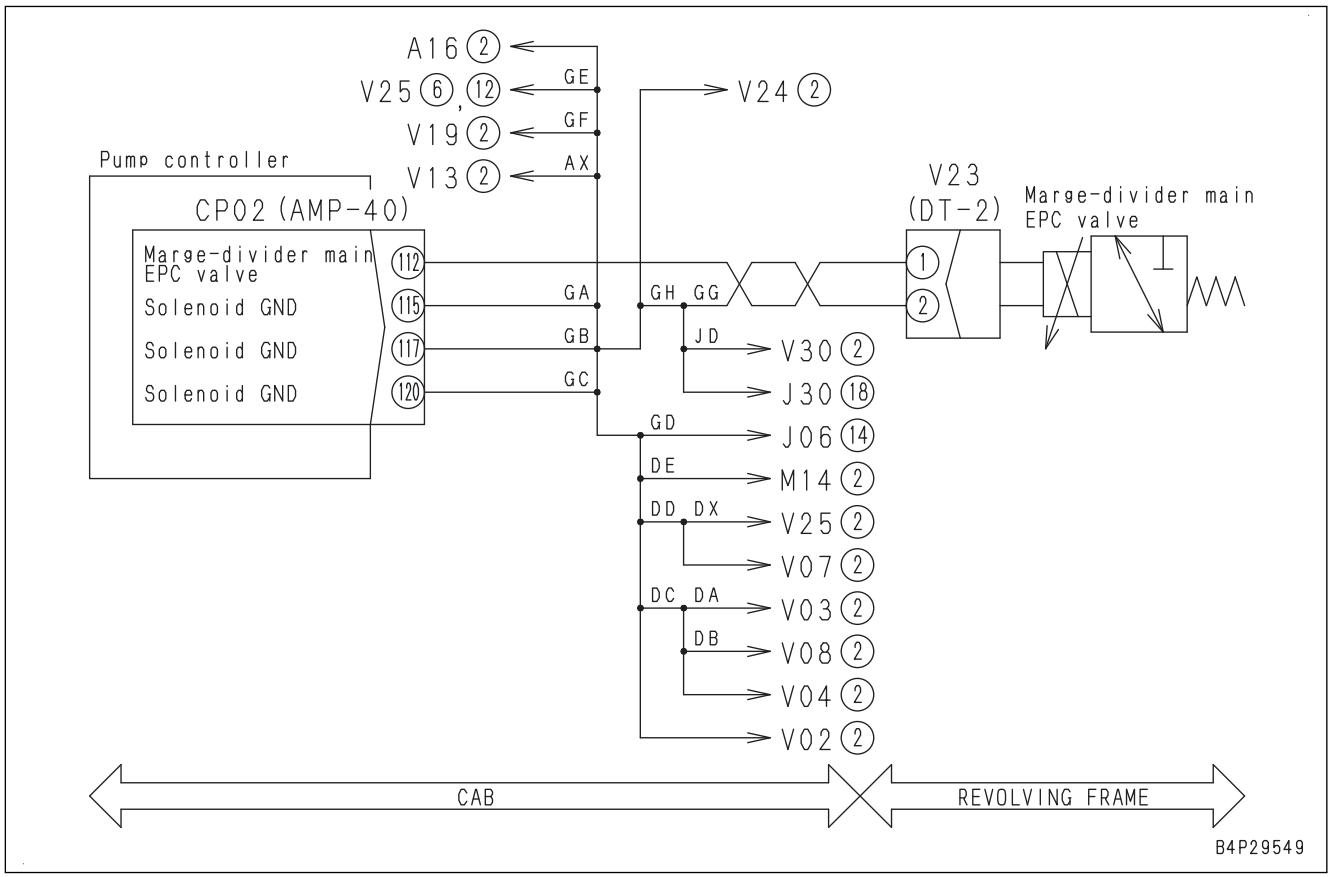


Failure Code [DWK2KY]

Action level	Failure code	Failure	Variable Back Pressure Solenoid Hot Short Circuit (Pump controller system)
L01	DWK2KY		
Detail of failure	Controller detects hot short circuit in variable back pressure solenoid.		
Action of controller	Stops driving variable back pressure solenoid.		
Phenomenon on machine	Fuel consumption is degraded.		
Related information	• Controller's command (ON/OFF) to variable back pressure solenoid can be checked with monitoring function. (As long as controller's command to solenoid is OFF, sensor state displayed on monitoring screen is OFF even if solenoid is not energized due to hot short circuit.) (Code: 02301 solenoid 2) • When controller's command to solenoid is ON, back pressure valve set pressure decreases. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector V25 and connect T-adapter to female side. 3. Turn starting switch to ON position.		
		Voltage	Between V25 (female) (1) and ground	Max. 4.5 V
2	Defective pump controller	If no failure is found by preceding checks, pump controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly).		

Circuit Diagram of Merge-Divider Main Solenoid



Failure Code [DXEAKB]

Action level	Failure code	Failure	Attachment Flow Regulating EPC 5 Solenoid Short Circuit (Pump controller system)
-	DXEAKB		
Detail of failure	Controller detects short circuit in attachment flow rate adjustment EPC1 solenoid.		
Action of controller	• Stops driving attachment flow rate adjustment EPC1, EPC2, EPC3, and EPC4 solenoids. • Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position.		
Phenomenon on machine	Attachment does not move.		
Related information	• Drive current of attachment flow rate adjustment EPC1 solenoid can be checked with monitoring function (code: 01701). • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position and set machine in attachment mode (ATT).		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective attachment flow rate adjustment EPC 1 (internal short circuit or ground fault)	1. Turn starting switch to OFF position. 2. Disconnect connector V91, and connect T-adapter to male side.		
		Resistance	Between V91 (male) (1) and (2)	7 to 14 Ω
			Between V91 (male) (1) and ground	Min. 1 MΩ
2	Ground fault in wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors CP02 and V91, and connect T-adapters to each female side.		
		Resistance	Between ground and CP02 (female) (102) or V91 (female) (1)	Min. 1 MΩ
3	Defective pump controller	If no failure is found by preceding checks, pump controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly).		

Troubleshooting of Electrical System (E-Mode)

E-1 Engine Does Not Start (Engine Does Not Crank)

Failure	Engine does not start (engine does not crank)
Related information	• The engine start circuit is equipped with the start lock function of the following two systems. 1. Start lock by password of machine monitor 2. Start lock by lock lever • If failure symptom is battery relay operation sound is not heard when starting switch is turned to ON position, perform troubleshooting for E-mode “ENGINE DOES NOT START (ENGINE DOES NOT CRANK)” as well. • If failure symptom machine monitor does not light up is displayed while starting switch is turned to ON position, main power supply system may be defective. Perform troubleshooting for E-mode “WHEN STARTING SWITCH IS TURNED TO ON POSITION, MACHINE MONITOR DISPLAYS NOTHING”.

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Loose terminal or open circuit in terminal	1. Turn starting switch to OFF position.		
		Check terminals of starting motor, alternator, battery relay, and ground terminals T04, T08, etc.		
2	Contact between battery relay and frame (ground)	1. Turn starting switch to OFF position.		
		Resistance	Between battery relay terminal R01 and ground	Max. 1 Ω
3	Insufficient battery capacity	Be ready with starting switch at OFF, then perform troubleshooting without turning starting switch to ON position.		
		Battery voltage (measure 2 batteries in series)	Min.24 V	
		Gravity of battery (measure gravity in each cell)	Min.1.26	
4	Defective engine controller system	Defects of engine controller power supply and ACC signal are indicated with failure code [DB2QKR] or [DB2RKR]. If these codes appear, perform troubleshooting for causes 1 to 3 of [DB2QKR] first.		
5	Defective fuse No. 3 in fuse box F01	If fuse is burnt out, circuit may have ground fault. (See cause 22.)		
6	Defective battery relay system	1. Turn starting switch to ON position. If battery relay operation sound is not heard, go to checks on cause 22.		
7	Defective fusible link F04, defective wiring harness	1. Turn starting switch to OFF position and remove fuse No. 3 in fuse box F01. 2. Turn starting switch to ON position (connect ACC).		
		Voltage	Between input terminal (1A) of fuse box F01-3 and ground	20 to 30 V
		If voltage is abnormal, go to check on cause 10.		

E-17 Fuel Gauge Display Does Not Move from Minimum or Maximum

Failure	Fuel gauge display does not move from minimum or maximum.
Related information	• Signal voltage of fuel sensor can be checked with monitoring function. (Code: 04200)

<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Defective fuel level sensor
(Internal open or short circuit)</td><td colspan="4">1. Turn starting switch to OFF position.
2. Disconnect connector P21, and connect T-adapter to male side.</td></tr>
<tr><td rowspan="2">Resistance</td><td rowspan="2">Between P21 (male) (1) and ground</td><td>Fuel level FULL</td><td>Approx. 12 Ω</td></tr>
<tr><td>Fuel level EMPTY</td><td>85 to 110 Ω</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Open or short circuit in wiring harness</td><td colspan="4">1. Turn starting switch to OFF position.
2. Disconnect connector CM01 and connect T-adapter to female side.</td></tr>
<tr><td rowspan="2">Resistance</td><td rowspan="2">Between CM01 (female) (15) and ground</td><td>Fuel level FULL</td><td>Approx. 12 Ω</td></tr>
<tr><td>Fuel level EMPTY</td><td>85 to 110 Ω</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Open circuit in wiring harness
(Wire breakage or defective contact of connector)</td><td colspan="4">REMARK
If check on cause 2 is normal, this check is not required.
1. Turn starting switch to OFF position.
2. Disconnect connectors CM01 and P21 and connect T-adapters to each female side.</td></tr>
<tr><td>Resistance</td><td colspan="2">Between CM01 (female) (15) and P21 (female) (1)</td><td>Max. 1 Ω</td></tr>
<tr><td></td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Ground fault in wiring harness
(Contact with ground circuit)</td><td colspan="4">1. Turn starting switch to OFF position.
2. Disconnect connectors CM01 and P21, and connect T-adapter to either female side.</td></tr>
<tr><td>Resistance</td><td colspan="2">Between ground and CM01 (female) (15) or P21 (female) (1)</td><td>Min. 1 MΩ</td></tr>
<tr><td></td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Hot short circuit in wiring harness
(Contact with 24 V circuit)</td><td colspan="4">1. Turn starting switch to OFF position.
2. Disconnect connector P21.
3. Insert T-adapter into connector CM01, or connect T-adapter to female side of P21.
4. Turn starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td colspan="2">Between ground and CM01 (15) or P21 (female) (1)</td><td>Approx. 3.3 V</td></tr>
<tr><td></td></tr>
<tr><td>6</td><td>Defective machine monitor</td><td colspan="4">If no failure is found by above checks, machine monitor is defective. (Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

No.	Cause	Procedure, measuring location, criteria and remarks		
7	Ground fault in wiring harness (Contact with ground circuit)	If failure code is still displayed after above checks on cause 5, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors S25 and V03 and connect T-adapter to female side of V03.		
		Resistance	Between V03 (female) (1) and ground	Min. 1 MΩ

E-55 "Travel" is Not Shown Correctly with Monitoring Function

Failure	“Travel” is not displayed correctly with monitoring function.
Related information	• Monitoring code: 01901

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective travel PPC oil pressure sensor system (Internal open or short circuit)	Perform troubleshooting for failure codes [DHSFMA], [DHSGMA], [DHSHMA], and [DHSJMA].

<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Malfunction of boom control valve (regeneration valve)</td><td colspan="4">Release remaining pressure from hydraulic tank and piping, and then perform troubleshooting with engine stopped.</td></tr>
<tr><td colspan="4">• Check for stuck or seized boom regeneration valve in control valve body (valve should move smoothly).
• Check that regeneration valve (check valve) is seated on control valve in position (it is not stuck halfway), and then remove it from control valve body and check it for defects and dirt.
• Check spring of check valve for fatigue and deformation.
Be careful to prevent foreign matter from entering the valve during restoration.</td></tr>
<tr><td rowspan="3">10</td><td rowspan="3">Malfunction of safety valve for boom lock valve and malfunction of lock valve (OPT)</td><td colspan="4">Be ready with engine stopped, then perform troubleshooting with engine at high idle.</td></tr>
<tr><td>Arm and boom relief pressure</td><td>Hydraulic oil temperature: 45 to 55 °C</td><td>• Arm IN relief
• Arm OUT relief
• Boom RAISE relief
• Boom LOWER relief</td><td>33.1 to 37.2 MPa {338 to 380 kgf/cm^2}</td></tr>
<tr><td colspan="4">Among above relief pressures, if either of boom RAISE and LOWER relief pressures is low, suction valve may be defective. Check suction valve.
Since the safety valve circuit is connected to both of the boom RAISE and arm OUT circuits through a check valve, the arm lock valve is judged to be defective if the boom circuit is normal.
If safety valve has no abnormality, check lock valve.
• Check that pilot piston and puppet are seated on valve body in position (they are not stuck halfway).
• Check for stuck or seized pilot piston and puppet in lock valve body (they should move smoothly).
• Remove pilot piston and puppet from valve body and check them for defects and dirt.
• Check puppet spring for fatigue and deformation.
Be careful to prevent foreign matter from entering the valve during restoration.</td></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Malfunction of boom control valve (suction valve)
(RAISE side)</td><td colspan="4">Be ready with engine stopped, then perform troubleshooting with engine at high idle.</td></tr>
<tr><td>Boom relief pressure</td><td>Hydraulic oil temperature: 45 to 55 °C</td><td>• Boom RAISE relief
• Boom LOWER relief</td><td>33.1 to 37.2 MPa {338 to 380 kgf/cm^2}</td></tr>
<tr><td colspan="4">Among above relief pressures, if either of boom RAISE and LOWER relief pressures is low, suction valve may be defective. Check suction valve.
• Check that check valve is seated on valve body in position (it is not stuck halfway).
• Remove check valve from valve body and check it for defects and dirt.
• Check spring for fatigue and deformation.
Be careful to prevent foreign matter from entering the valve during restoration.</td></tr>
</table>

No.	Cause	Procedure, measuring location, criteria and remarks			
4	Operation of merge-divider main EPC valve	If a significant travel deviation occurs when operating the work equipment simultaneously, troubleshoot the following:			
		Be ready with engine stopped, then perform troubleshooting with engine at high idle.			
		EPC output pressure	EPC current value: 0 mA	Work equipment control lever: NEUTRAL	0 to 0.49 MPa {0 to 5 kgf/cm^2}
			EPC current value: 800 to 1000 mA	Work equipment control lever: Bucket CURL and arm IN relief	2.55 to 3.98 MPa {25 to 34 kgf/cm^2}
5	Malfunction of merge-divider LS-EPC valve	Be ready with engine stopped, then perform troubleshooting with engine at high idle.			
		EPC output pressure	EPC current value: 0 mA	Work equipment control lever: NEUTRAL	0 to 0.49 MPa {0 to 5 kgf/cm^2}
			EPC current value: 800 to 1000 mA	Work equipment control lever: Arm and Bucket CURL relief	2.55 to 3.98 MPa {25 to 34 kgf/cm^2}
6	Malfunction of merge-divider LS spool	Release remaining pressure from hydraulic tank and piping, and then perform troubleshooting with engine stopped.			
		• Check for stuck or seized LS spool and merge-divider valve body (spool should move smoothly). • Remove the LS spool from valve body and check for defects and dirt. Be careful to prevent foreign matter from entering the valve during restoration.			
7	Malfunction of merge-divider main spool	Release remaining pressure from hydraulic tank and piping, and then perform troubleshooting with engine stopped.			
		• Check for stuck or seized main spool in merge-divider valve body (spool should move smoothly). • Remove main spool from valve body and check it for defects and dirt. When restoring, be careful about the dirt, etc. to enter.			
8	Malfunction of travel control valve (spool) (L.H., R.H.)	Release remaining pressure from hydraulic tank and piping, and then perform troubleshooting with engine stopped.			
		• Check for stuck or seized travel spool in control valve body (spool should move smoothly). • Remove travel spool from valve body and check for defects and dirt. Be careful to prevent foreign matter from entering the valve during restoration.			

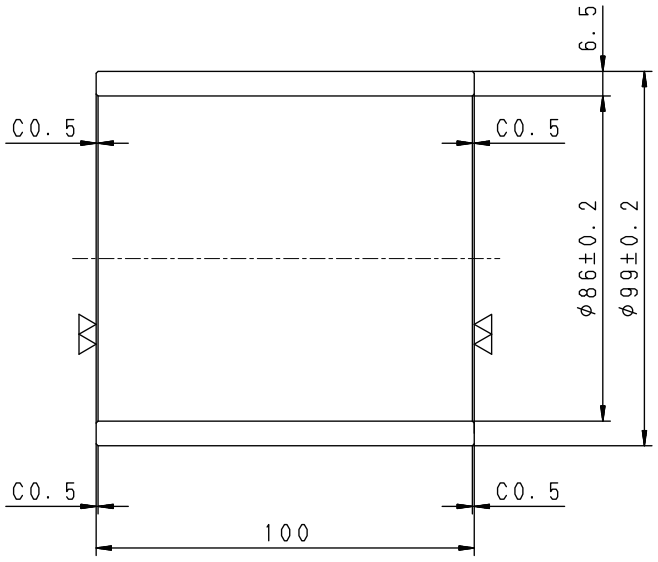
S-7 Engine Runs Rough or is Not Stable

Failure	Engine runs rough or is unstable.
Related information	If any failure code is displayed, perform troubleshooting for that code first.

No.	Cause	Point to check, remarks	Remedy
1	Fuel level is low.	If fuel tank is checked, it is empty.	Refueling
2	Clogging fuel tank cap air bleeding hole	Fuel tank cap air bleeding hole is clogged.	Flush air breather hole in fuel tank cap surrounding area.
3	Clogged fuel filter element	Check used hours of fuel filter element. If it is used over specified time, fuel filter element may be clogged.	Fuel filter element replacement
4	Foreign materials are mixed into fuel.	If drain fuel from fuel tank, rust or water comes out.	Fuel replacement
5	Air mixed in fuel piping system	When performing bleeding air from the fuel system, air comes out. (For details, see Testing and Adjusting, “Bleed Air from Fuel System”).	• Perform air bleeding operation • Correct or replace fuel piping
6	Leakage from fuel piping system	Fuel leaks from fuel piping. (For details, see Testing and Adjusting, “Examine Fuel Circuit for Leakage”).	Correct or replace fuel piping related parts
7	Fuel leakage at Injector and inlet connector	Return rate from injector is high. (See Testing and Adjusting, “How to Examine Fuel Discharge, Return, and Leakage”)	Tighten or replace inlet connector
8	Leakage from boost system	Check boost system (between VGT outlet and aftercooler, aftercooler and between aftercooler and air intake manifold) for leakage.	Boost piping repair or replacement
9	Defective mass air flow and temperature sensor	Replace a sensor, and check if it operates normally (failure code may be displayed due to dust attached to sensor).	Mass air flow and temperature sensor replacement

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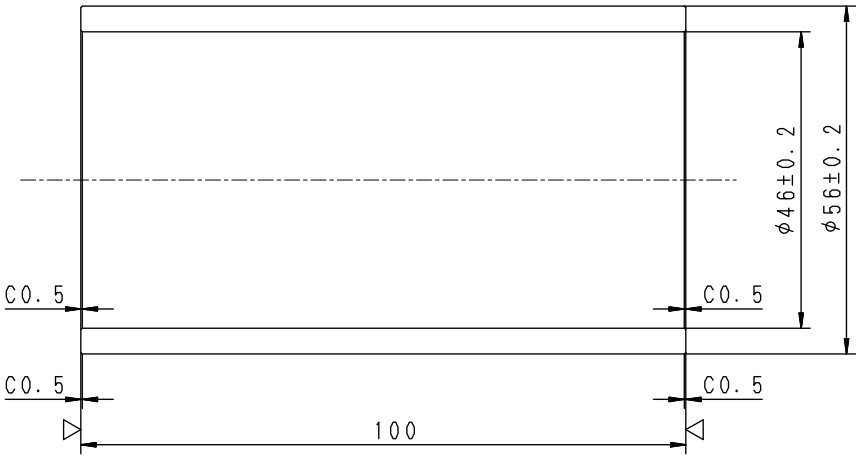


C4W24276

HEAT TREATMENT	CASE DEPTH	MATERIAL
Hardring and tempering	HRC30-38	S45C
PART NAME		Q'TY
SPACER		1
793T-613-1380 △		

OPTIONAL MATERIAL:STKM16A

Spacer

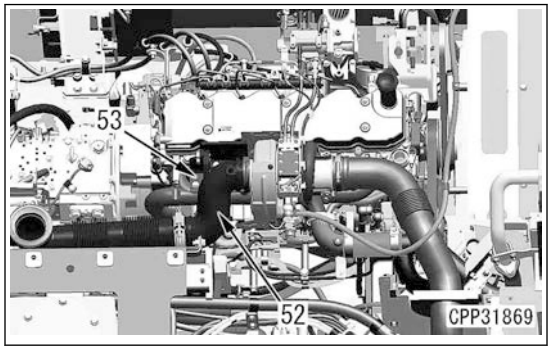


C4W25161

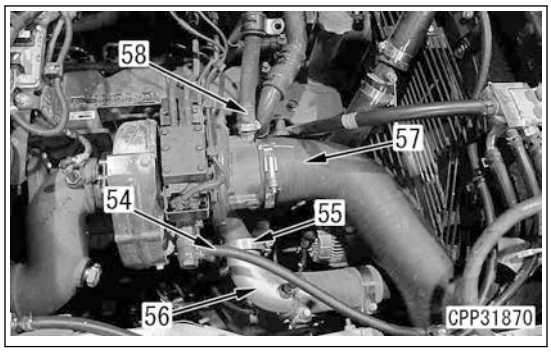
HEAT TREATMENT	MATERIAL
----	STKM13A
PART NAME	Q'TY
SPACER	1
793T-417-1310 △	

VGT assembly

35. Remove tube (52), and remove bracket (53).



36. Disconnect hose (54).
37. Remove clamps (55).
38. Disconnect tube (56).
39. Disconnect hose (57).
40. Disconnect hose (58).



41. Disconnect tube (59) from VGT.

    REMARK

    VGT side is tightened together.

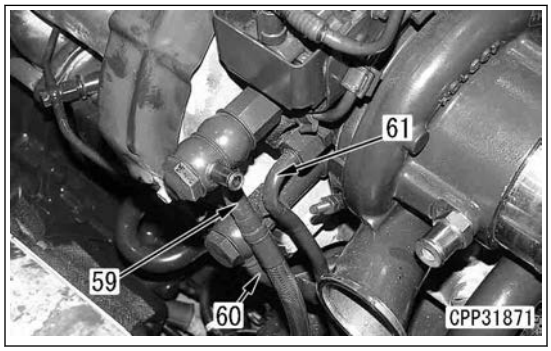
42. Disconnect tube (60).

    REMARK

    VGT side is tightened together.

43. Disconnect tube (61).

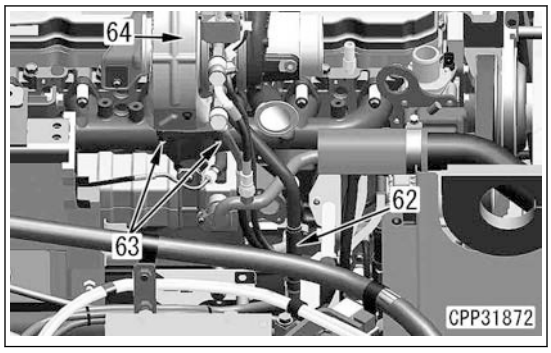
    ⚠ VGT side is tightened together with tube. Be careful about narrow working space



44. Loosen the hose clamp, and remove VGT return tube (62).
45. Remove mounting bolts (63) (4 pieces), sling VGT (64), and remove it.

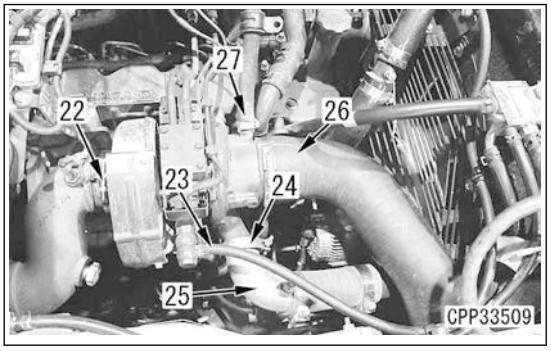
    VGT:

    25 kg



Hose (21): VGT drive hydraulic circuit

12. Remove clamps (22).
13. Disconnect hose (23).
14. Disconnect clamp (24).
15. Disconnect tube (25).
16. Disconnect hose (26).
17. Disconnect hose (27).
18. Disconnect tube (28) from VGT.



REMARK

VGT side is tightened together.

19. Disconnect tube (29).

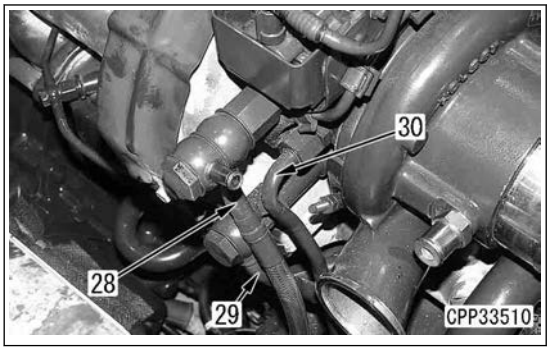
REMARK

VGT side is tightened together.

20. Disconnect tube (30).

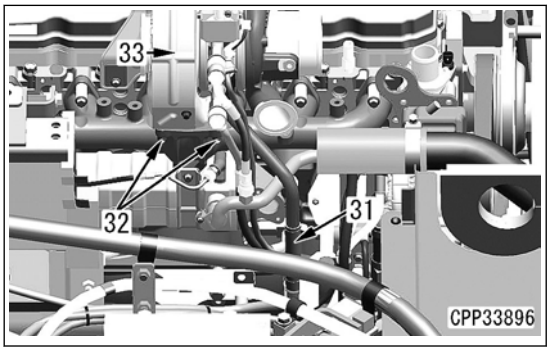
NOTICE

VGT side is tightened together with it. Be careful about narrow working ranges.



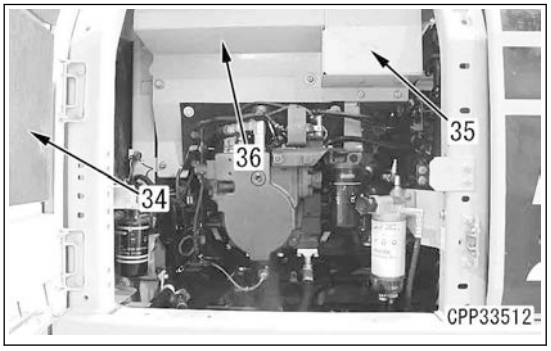
21. Loosen the hose clamp, and remove VGT return hose (31).
22. Remove mounting bolts (32) (4 pieces), sling VGT (33), and remove it.

VGT:
25 kg

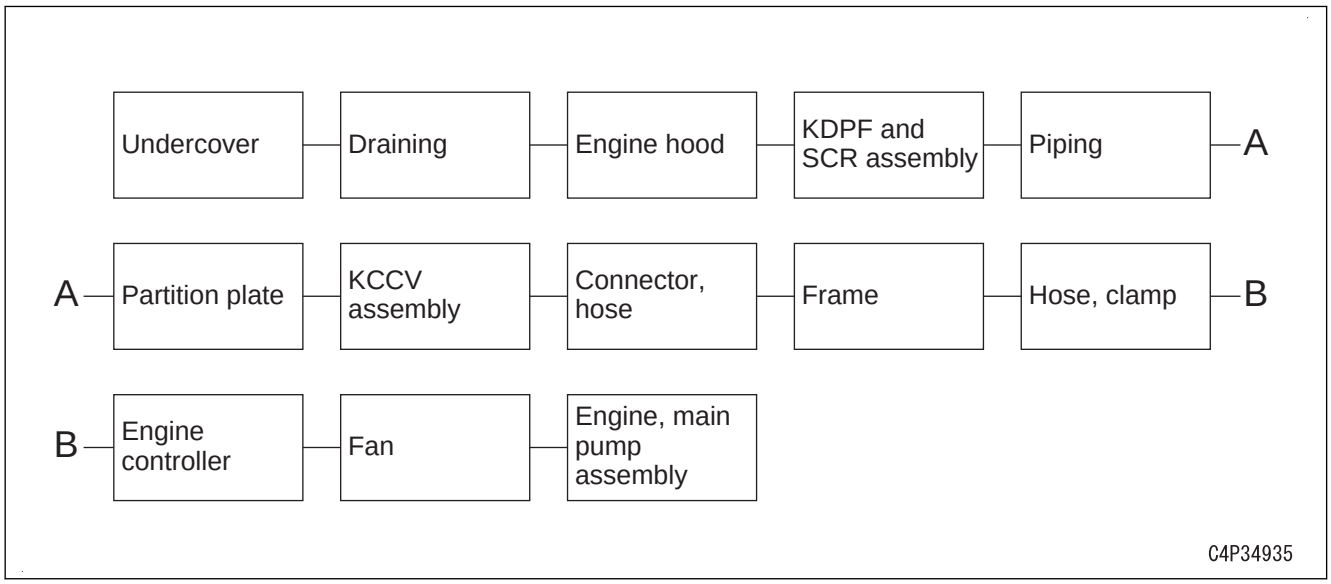


Partition plate

23. Open side cover (34) on the right side of the machine.
24. Remove partition plates (35) and (36).



Remove and Install Engine and Main Pump Assembly



Tools for Removal and Installation of Engine and Main Pump Assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	-	Vinyl gloves	●	1			Disconnection and connection of DEF hose
B	F00B-H40-445	Injector cap kit	●	1	N		
C	600-919-5050	Plug (for 5/16 inch diameter hose)	●	1	N		
D	796T-601-1110	Stopper	■	1		○	Removing and installing engine mount bolts
E	796T-401-1110	Plate	●	1		○	
F	795-799-9300	Lifting tool	●	1			
K	796-460-1210	Oil stopper	●	1			
M	796-770-1320	Adapter	●	1			

⚠ Place the machine on a level ground and lower the work equipment to the ground in a stable posture.

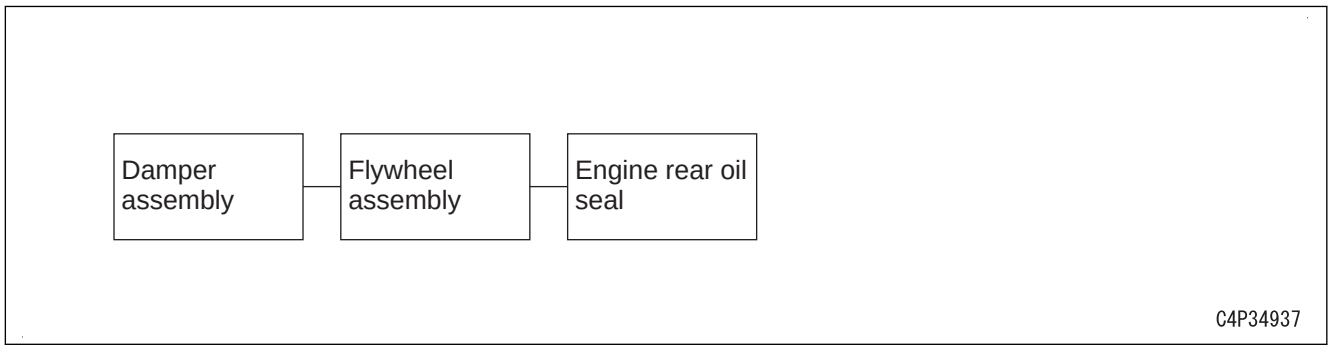
⚠ Stop the engine, turn the battery disconnect switch to OFF position, and remove the key. (For details, see Testing and Adjusting, "Handle Battery Disconnect Switch".)

⚠ Operate the work equipment lock lever to LOCK position.

NOTICE

Write down the connector numbers and installed positions before disconnecting wiring and hoses.

Remove and Install Engine Rear Oil Seal



Tools for Removal and Installation of Engine Rear Oil Seal

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	795-799-6500	Seal puller	●	1			
B	-	Guide bolt	■	1			
C	-	Guide bolt	■	1			
D	-	Tapping screw	●	1			
E	-	Pilot	●	1			
F	-	Plate	■	1			
G	-	Dial gauge	●	1			

⚠ **Place the machine on a level ground, lower the work equipment to the ground so that it is stable, and set the lock lever to LOCK position, and then stop the engine.**

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

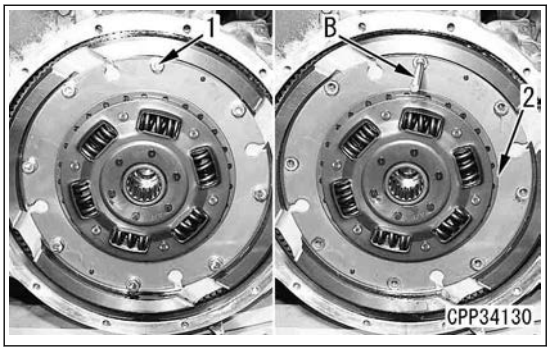
How to Remove Engine Rear Oil Seal

Main pump assembly

1. Remove main pump assembly. For details, see “Remove and Install Main Pump Assembly”.

Damper assembly

2. Remove mounting bolt (1), and install tool B.
3. Remove damper assembly (2).



DEF tank filler port cover

10. Remove mounting bolts (7) (4 pieces).

    REMARK

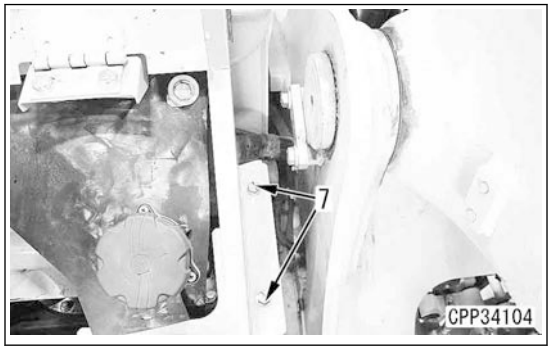
    Bolts on the left side of the machine are provided outside of the cover, and right side bolts are inside.

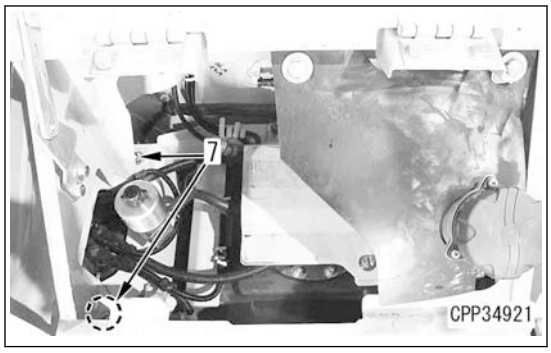
11. Sling DEF tank filler port cover (8), and remove it.

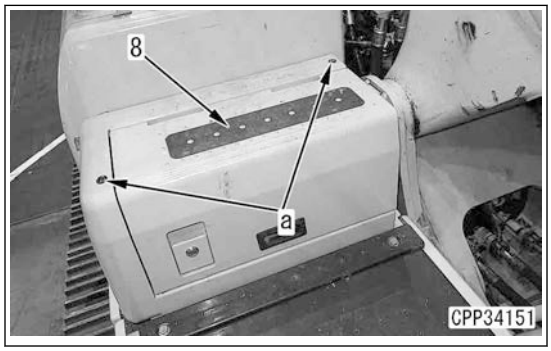
    REMARK

    Remove cap (a) on the top of DEF tank filler port cover (8), and install lifting tool to it.

    DEF tank filler port cover:
    15 kg

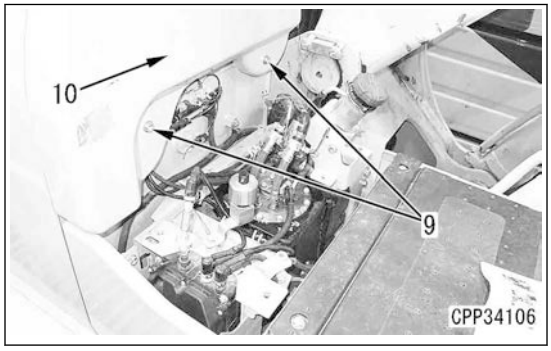


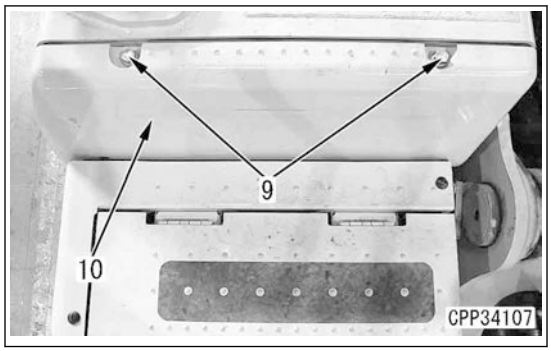




Cover

12. Remove mounting bolts (9) (4 pieces), and remove fuel tank front cover (10).





Remove and Install DEF Tank Filler Port Filter

Tools for Removal and Installation of the DEF Tank Filler Port Filter

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	Commercially available	Vinyl gloves	•	1			Removal and installation of DEF tank filler port filter

⚠ Place the machine on a level ground, and lower the work equipment to the ground in a stable posture.

⚠ Set the work equipment lock lever to LOCK position.

⚠ Turn the starting switch to OFF position to stop the engine.

⚠ Turn the battery disconnect switch to OFF position, and remove the key. (For details, see Testing and Adjusting, "Handle Battery Disconnect Switch".)

NOTICE

- **If any filter other than a Komatsu genuine filter is used, foreign material may enter DEF pump or DEF injector and cause failures. When replacing parts, use Komatsu genuine parts.**
- **Do not wash DEF tank filler port filter. Even if the filter is washed or regenerated, its performance decreases and DEF pump may break. Never reuse the filter.**
- **If DEF tank filler port filter is assembled incorrectly, DEF may leak. Install DEF tank filler port filter in the correct order.**
- **DEF freezes at -11°C. If it freezes, filter replacement is difficult. Replace the filter in a state where the temperature around DEF tank is above -11°C and DEF does not freeze.**
- **Clean around DEF tank filler port before starting the work, and be very careful that no dirt enters the tank during the work.**
- **When DEF is added, if it blows back because of clogged DEF tank filler port filter, replace the filter even if it is not used for 2000 hours.**
- **Do not replace DEF tank filler port filter when the tank is full.**
- **Remove DEF tank filler port filter slowly to prevent DEF in it from spilling.**
- **Wear safety glasses and vinyl gloves when you touch DEF during the work.**

Remove DEF Tank Filler Port Filter

NOTICE

When handling DEF, be sure to wear the vinyl gloves (A).

DEF tank filler port case

1. Open DEF tank filler port cover (1).



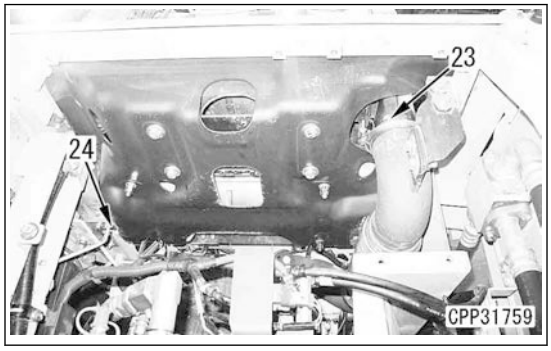
KDPF and SCR assembly

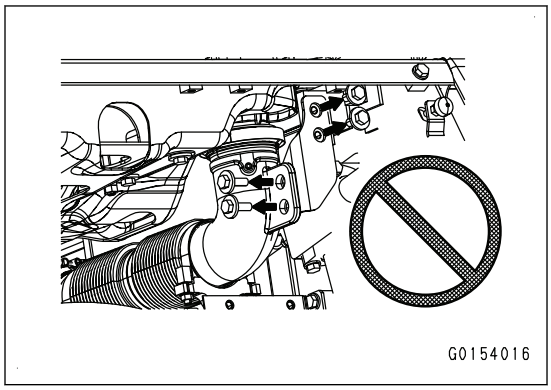
23. Remove clamps (23).

NOTICE

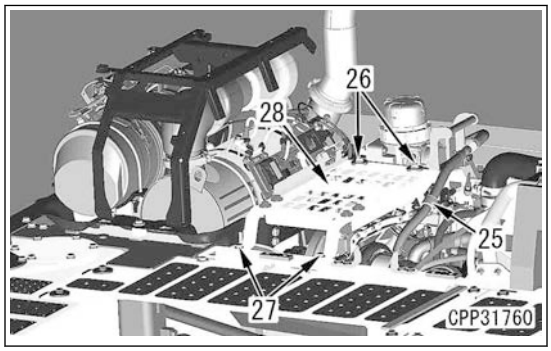
Do not loosen the bolt that fixes the bellows pipe.

24. Disconnect SCR drain tube (24).

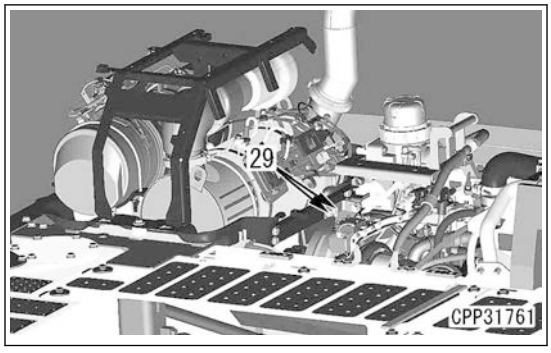




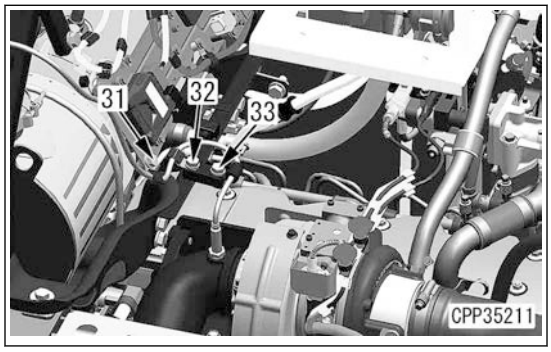
25. Remove clamps (25).
26. Loosen mounting bolts (26) (2 pieces).
27. Remove mounting bolts (27) (2 pieces), and remove step (28).



28. Remove mounting bolts (29) (2 pieces).

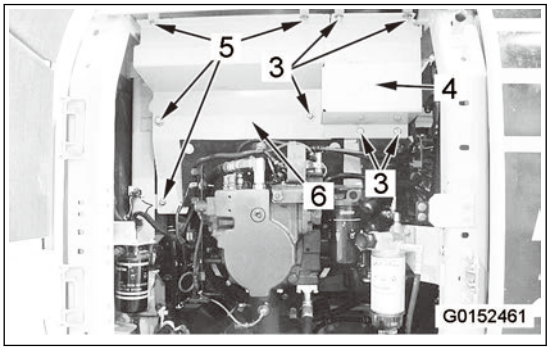


29. Remove clips (31), (32), and (33), and move them aside so that they do not hinder the work.

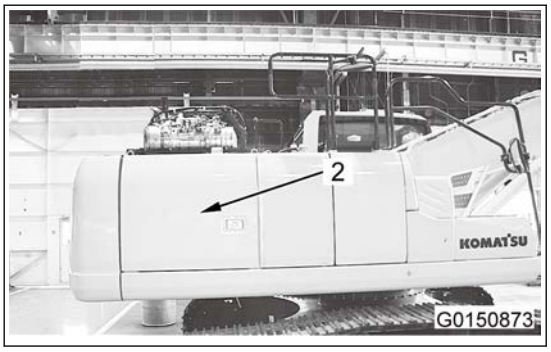


Engine hood, cover

10. Install the partition plate (6) with the bolts (5) (4 pieces).
11. Install the partition plate (4) with the bolts (3) (5 pieces).



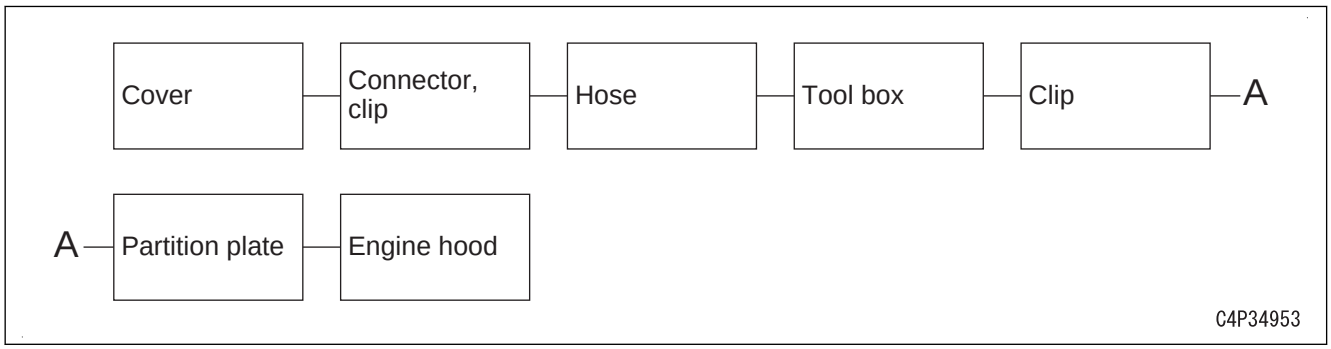
12. Close the cover (2).



13. Close the engine hood assembly (1).



Remove and Install DEF Hose



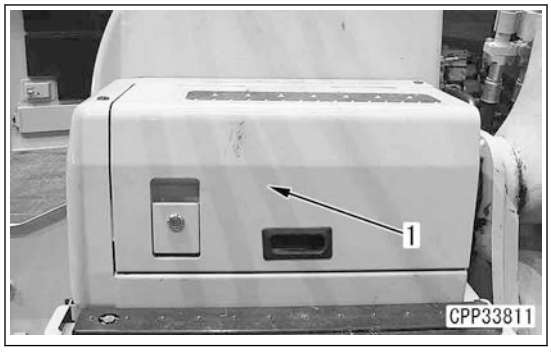
Tools for Removal and Installation of DEF Hose

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	-	Vinyl gloves	●	1			Disconnect and connect DEF hose
B	600-919-5050	Plug (for 5/16 inch hose diameter)	●	5			Remove DEF hose
C1	6540-71-1720	DEF injector cap kit	●	1			Remove DEF hose
C2	(6540-71-2720)	DEF injector cap kit	●	3			Remove DEF hose

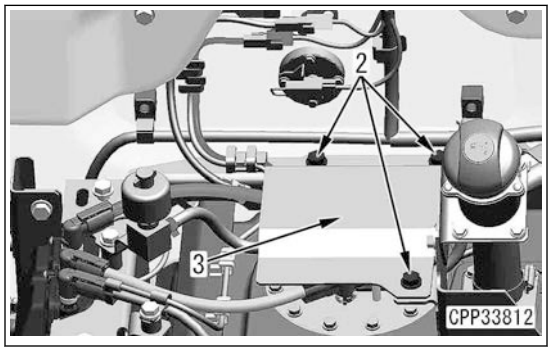
Remove DEF Hose

Cover

1. Open the DEF tank filler port cover (1).

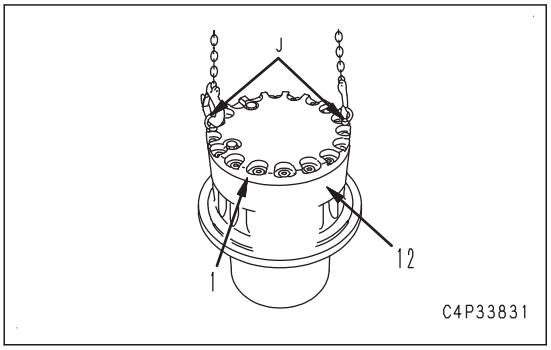


2. Remove the mounting bolts (2) (3 pieces), and remove the cover (3).



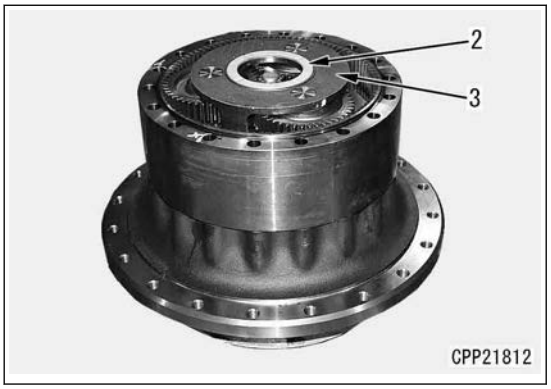
Cover:
20 kg

3. If ring gear (12) is lifted together, tap the ring gear lightly with a plastic hammer to separate it.



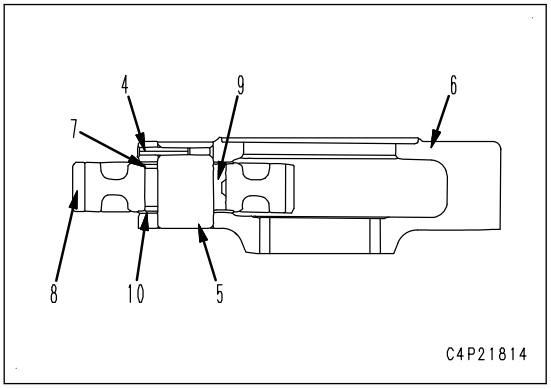
No.1 planetary carrier assembly

4. Remove washer (2).
5. Remove No.1 planetary carrier assembly (3).



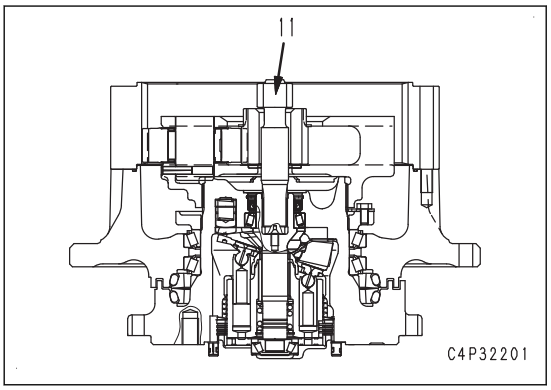
Disassembly of No.1 planetary carrier assembly

6. Drive pin (4) into shaft (5), and remove shaft (5) from No.1 planetary carrier (6).
7. After removing shaft (5), remove pin (4) from shaft (5).
8. Remove thrust washer (7), No.1 planetary gear (8), needle bearing (9), and thrust washer (10).

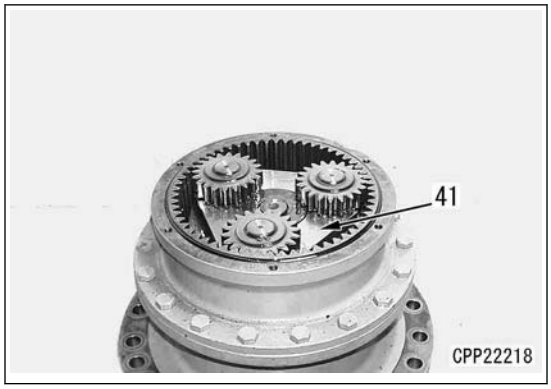


No.1 sun gear shaft

9. Remove No.1 sun gear shaft (11).



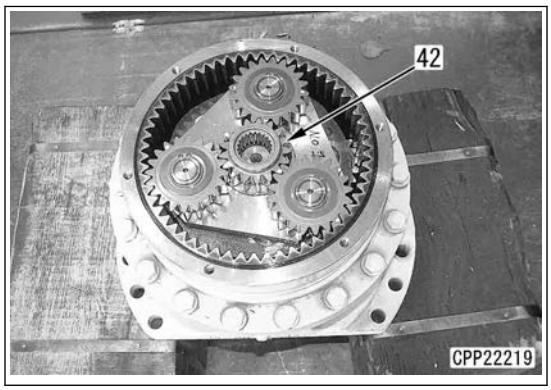
32. Install No.1 carrier assembly (41).

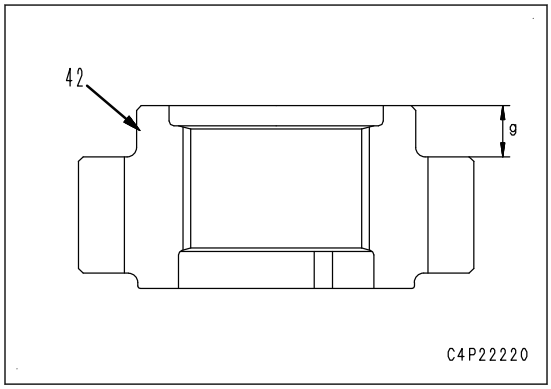


33. Install No.1 sun gear (42).

NOTICE

Install No.1 sun gear (42) with longer stepped part (g) facing upward.

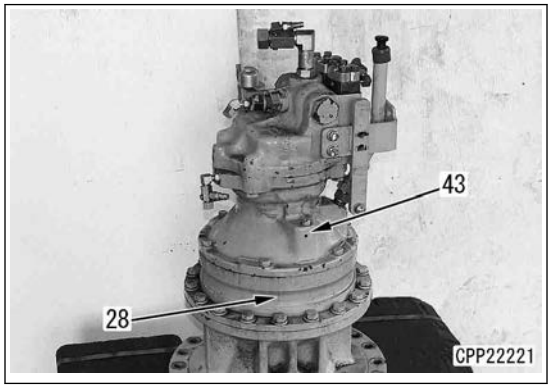




Assembly of swing motor assembly

34. Install swing motor assembly (43) to ring gear (28).

Swing motor:
55 kg



35. Degrease the mating faces of swing motor assembly (43) and ring gear (28).

NOTICE

- **Do not apply liquid gasket on the mating faces of swing motor assembly (43) and ring gear (28).**
- **Install it while aligning matchmarks put during disassembly.**

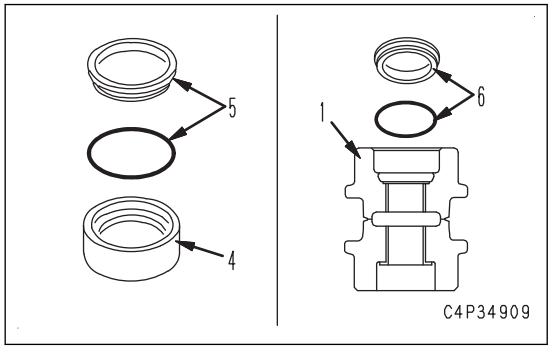
Floating seal

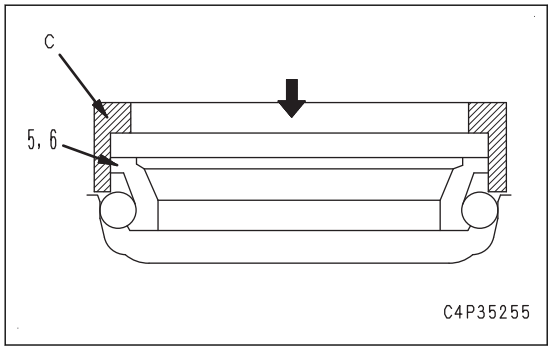
3. Install the floating seal (5) to the ring (4).
4. Install the floating seal (6) to the roller (1) with the tool C.

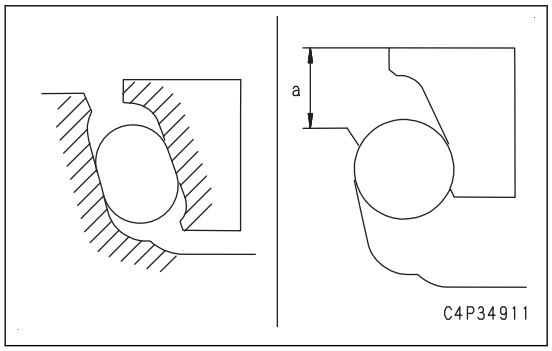
   ⚠ **When you install the floating seal, clean the contact surfaces (hatched area) of the O-ring and floating seal, and completely degrease and dry them. Also, take care that dirt does not stick to the floating seal contact face.**

   ⚠ **Be sure to push the O-ring when you insert the floating seal with the tool A.**

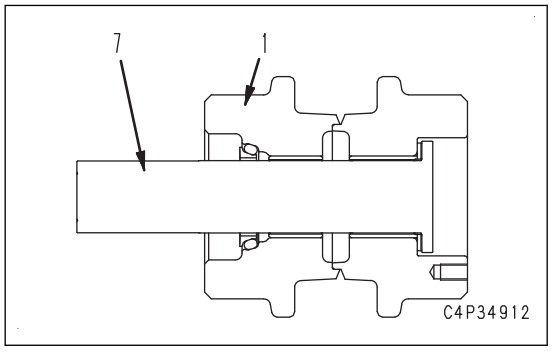
   ⚠ **After you insert the floating seal, make sure that the tilt of the seal is 1 mm or below and protrusion of the seal (a) is within the range of 5 to 7 mm.**







5. Insert the shaft (7) into the roller (1).



6. Press fit the ring (4) into the shaft with the tool D so as to make the step between the roller (1) and ring (4) is (x) .

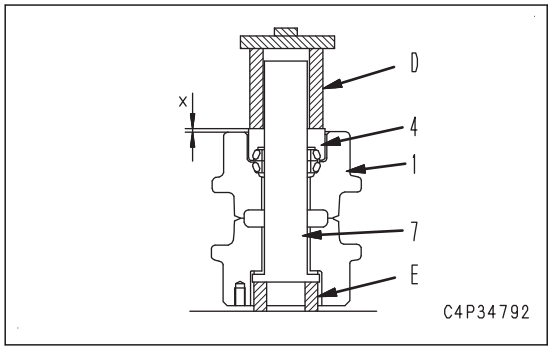
   NOTICE

   x=: 5.1±0.2 mm

7. Support the shaft (7) from the underside with the tool E.

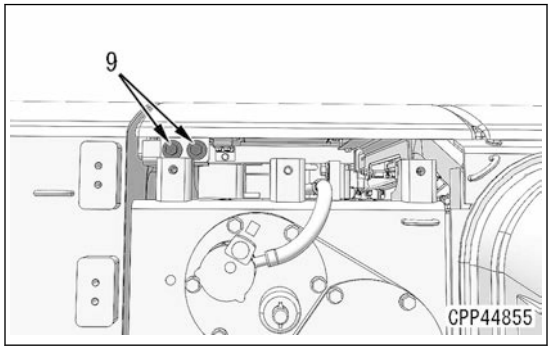
   NOTICE

   Press-fitting force: 22 to 25 kN {2.2 to 2.5 t}
   Do not make a large impact until the cover (8) is installed because the press-fitted ring (4) can slide by it.

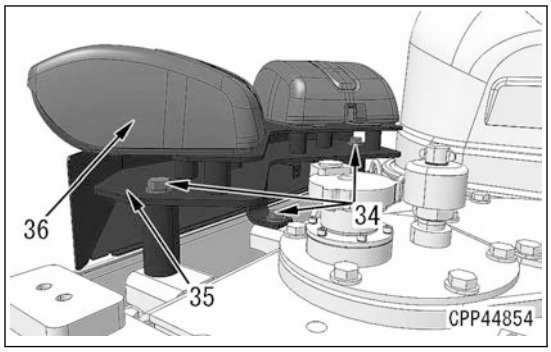


KomVision camera

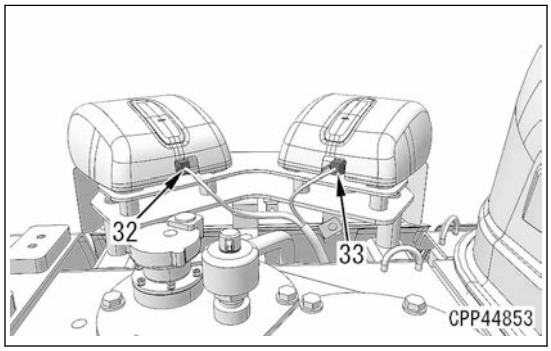
14. Install the bolts (9)(2 pieces).



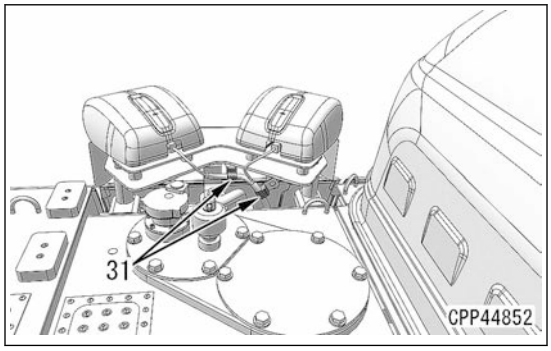
15. Install the bracket (35) and KomVision camera assembly (36) together with the bolts (34) (3 pieces).



16. Connect the connectors A76 (32) and A77 (33).



17. Install the clip (31).
18. Install the fuel tank assembly. For details, see “Remove and Install Fuel Tank Assembly”.



Add Komatsu genuine oil

19. Fill the hydraulic tank with Komatsu genuine oil to the specified level through the oil filler port. Run the engine to supply the oil through the piping. Then check the oil level again. (For details, see Structure and Function, “Table of Fuel, Coolant, and Lubricants”.)

Hydraulic tank: 132 ℓ

Bleed air

20. Bleed air from the hydraulic circuit. See Testing and Adjusting, “How to Bleed Air from Hydraulic System”.

End turn diameter of spring (3) (inside diameter)

Small diameter: 4.9 mm

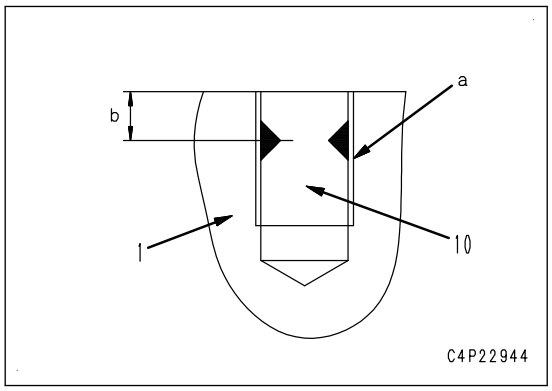
Large diameter: 5.55 mm

2. As springs (4) and (5), different springs are used for hydraulic ports. Check them before installing.
   - Installed height (all)31.9 mm
   - Load at installed height
     Spring (4) (P1, P2): 35.3 N {3.6 kg}

     Spring (5) (P3, P4): 21.6 N {2.2 kg}
3. When assembling piston (6), apply grease to the piston periphery and inner periphery of the body hole.

   Periphery of piston and body hole::
   Grease (G2-LI)
4. Install plates (7) and (8) with bolts (9) (4 pieces).

   Bolt (9):
   11.8 to 14.7 Nm {1.2 to 1.5 kgfm}
5. When installing joint (10) to body (1), apply Loctite according to the following procedure.
6. When installing the joint, apply 1 drop each (approximately 0.02 g) of Loctite (No.262) to the female threaded portion (a) (2 places) of the valve body. Before installing, thoroughly degrease and dry the male threaded portion of the joint and the female threaded portion of the valve body by using Drysol.
7. The drop positions of Loctite are as follows.



   Body screw hole (a):
   Adhesive (Loctite No. 262 or equivalent)

   Joint (10):
   39 to 49 Nm {4 to 5 kgfm}
8. Apply grease (G2-LI) to the sliding surface of joint (10) and to the contact surfaces of disc (11) and piston (6).

   Rocking portion of joint:
   Grease (G2-LI)

   Application amount: 7 to 10 mℓ (whole circumference)

   Disc and piston contact surface:
   Grease (G2-LI)

   Application amount: 0.3 to 0.8 mℓ (1 place)

   Install disc (11). For details, see TESTING AND ADJUSTING, “ADJUSTING PLAY OF WORK EQUIPMENT AND SWING PPC VALVE”.

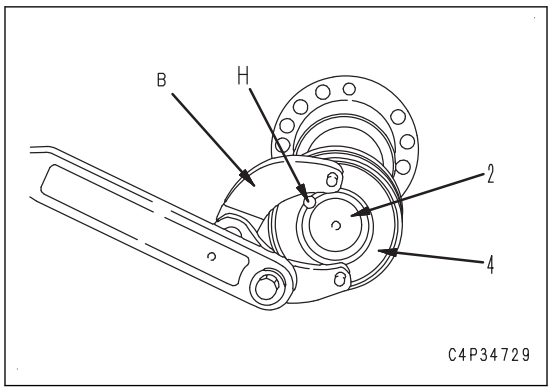
   Play of lever: 0.5 to 3.0 mm (200 mm from lever rotation center)
9. Tighten nut (12).

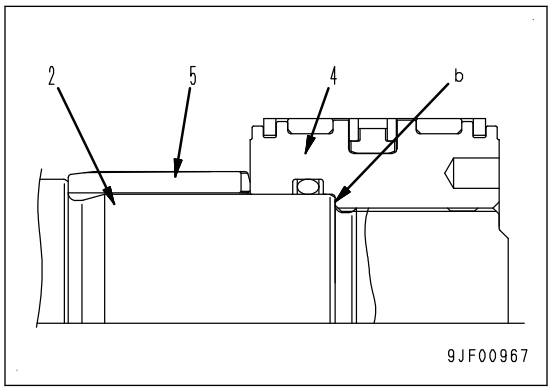
   Nut (12):
   69 to 88 Nm {7 to 9 kgfm}

1) Install piston assembly (4) to piston rod assembly (2) by using tool B.

NOTICE

- **Any burrs or sharp edges on threaded parts must be removed using files before installation.**
- **Fully screw piston assembly (4) until it comes into contact with the rod end face (b). Then, align the piston with the screw holes (H) on the rod end face around it.**
- **For a cylinder with head cushion, check that plunger (5) has a certain play after installing piston assembly (4).**
- **Only for boom cylinder and arm cylinder**





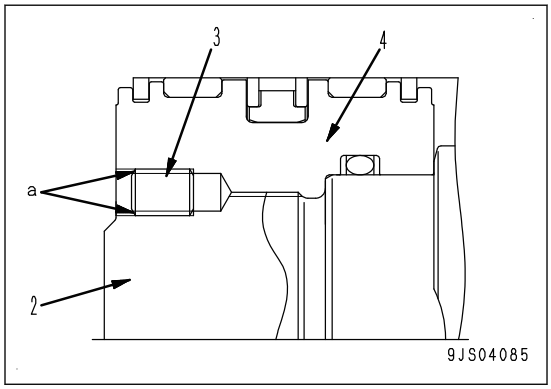
2) Install screw (3) to lock piston assembly (4) and piston rod assembly (2).

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

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

REMARK

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



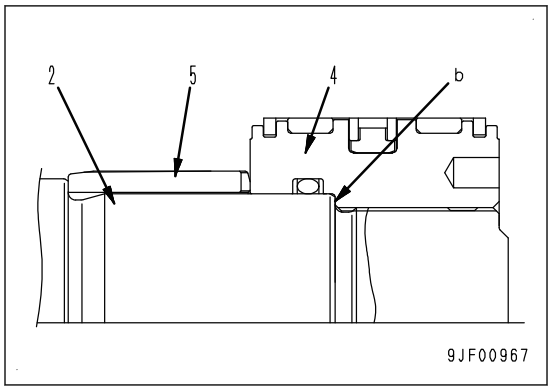
20. When replacing either or both of piston rod assembly (2) and piston assembly (4) with new ones, assemble the new ones according to the following procedure.

1) Tighten piston assembly (4) until it touches end surface (b) of the rod by using tool B.

NOTICE

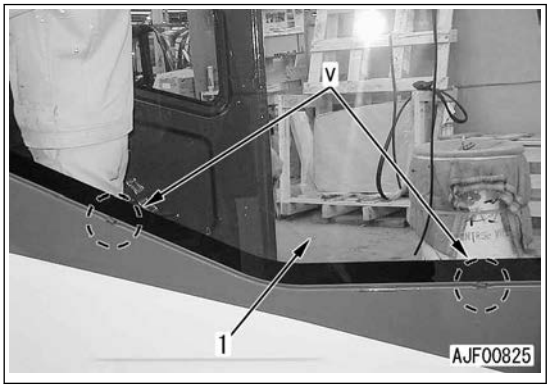
- **If the cylinder has the bottom cushion, put a mark to indicate the tightening position of the ball cap on the rod end surface.**
- **For a cylinder with head cushion, check that plunger (5) has a certain play after installing piston assembly (4).**
  Only for boom cylinder and arm cylinder

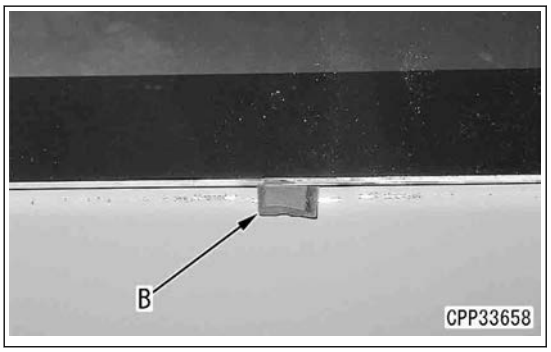
Piston assembly (4):
294±29.4 Nm {30±3.0 kgfm}



Fixing glass

8. Fix the glass.
   1) After installing right window glass (1) in the operator's cab, install and fix tool B in 2 places (v) at the bottom of the glass.
   2) In order to make the window glass and dam rubber completely stick together, fix them by using tool H and tool I, and cure them in that state.







Removal of primer and adhesive

9. After installing the glass, remove any excess of the primer and adhesive on the operator's cab and glass.

   NOTICE

   Wipe off adhesives before it is dried up by using white gasoline.

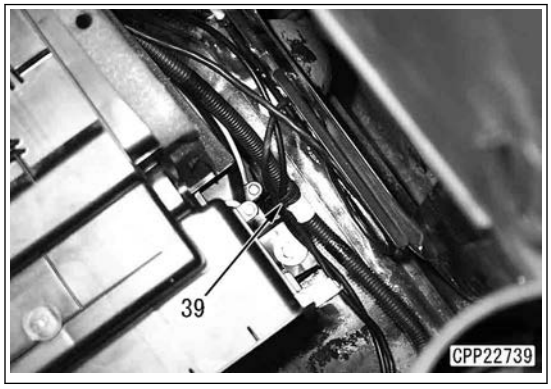
   ⚠ When cleaning the glass, do not give an impact to it.

Cure the adhered glass.

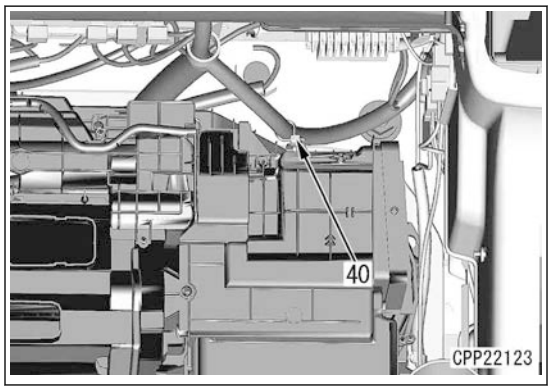
10. Cure the adhered glass.
    1) Do not remove tool B. tool H, and tool J. Fix them for 10 hours (ambient temperature 20 °C/humidity 60 %).
    2) Cure the glass 14 hours after removal of tool B. tool H, and tool J, namely, 24 hours in total after application of the adhesive.

Pump controller assembly

18. Remove the cable tie (39) of the L.H. console wiring harness.



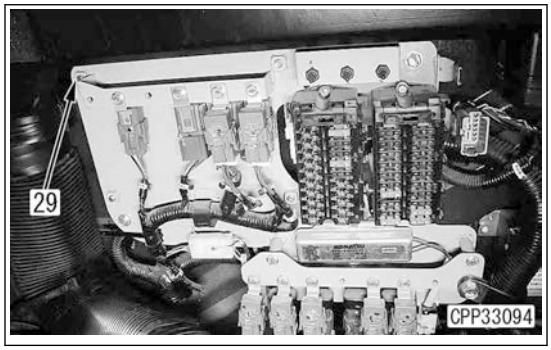
19. Remove the cable tie (40) of the floor harness.



20. Remove the bolts (29) (4 pieces), and remove the pump controller assembly (A).

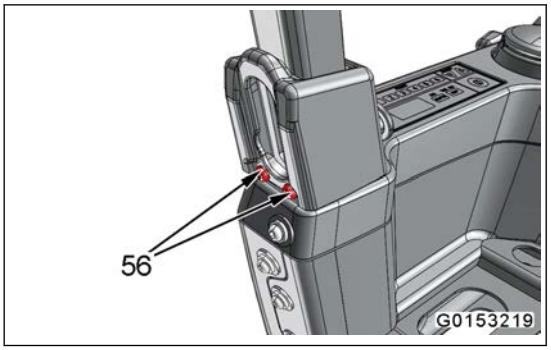
    REMARK

    Move the pump controller assembly (A) away from the operator cab, and put it with others on the floor.

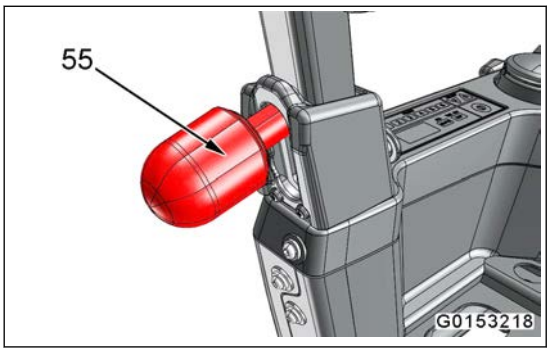




7. Install the 2 screws (56).



8. Install the knob (55).

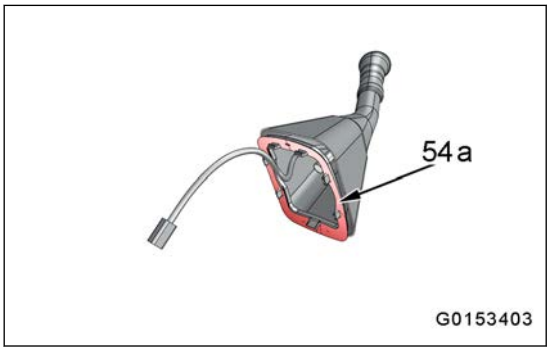


Right hand lever

9. Install the seat (54a) to the work equipment control lever assembly (54).

   REMARK

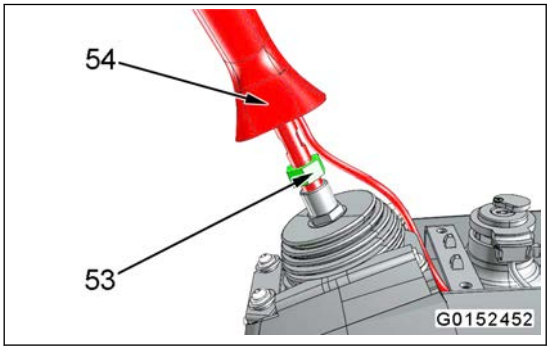
   - Use a new work equipment control lever assembly.
   - When you install the seat, put it onto the latches of the boot.
   - The seat is not installed on some machines which were made earlier.



10. Install the work equipment control lever assembly as follows.
    - Threaded type

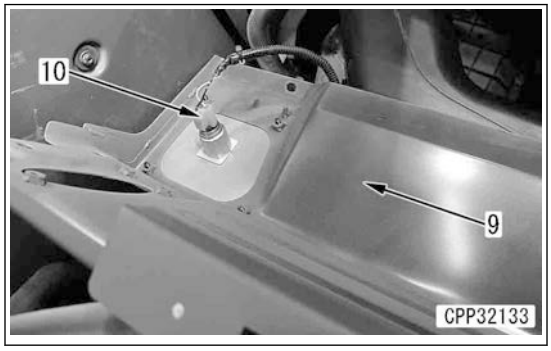
    1) Install the work equipment control lever assembly (54) with the nut (53).

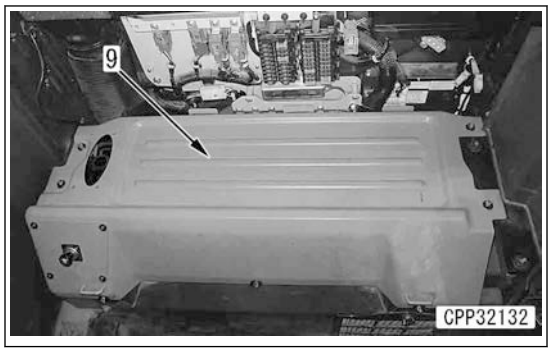
       Nut (53): 34.3 to 58.8Nm{3.5 to 6.0kgfm}



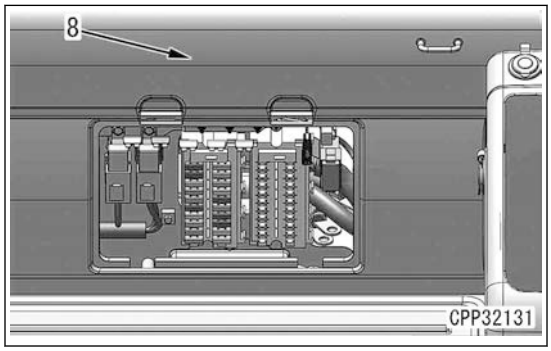
Cover

3. Connect wiring connector M04 (10), return cover (9) and install it.
4. Install cover (9), and install bolts (7 pieces).



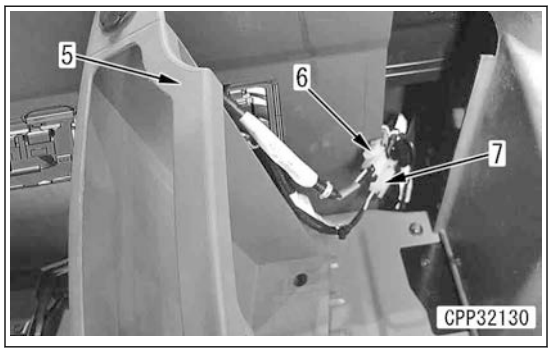


5. Install cover (8), and install bolts (3 pieces).

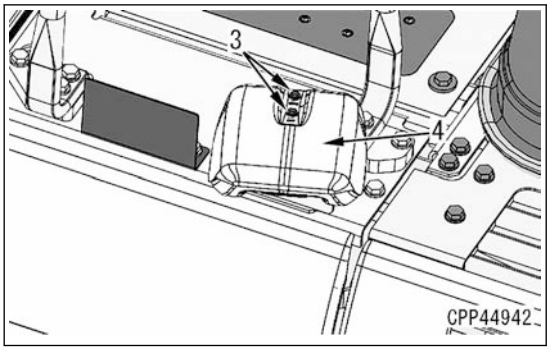


6. Connect wiring connectors M13A (6) and M13B (7) to box (5).
7. Install left box (5), and install bolts (3 pieces).

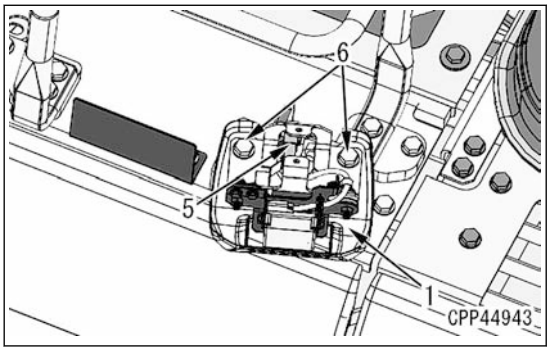




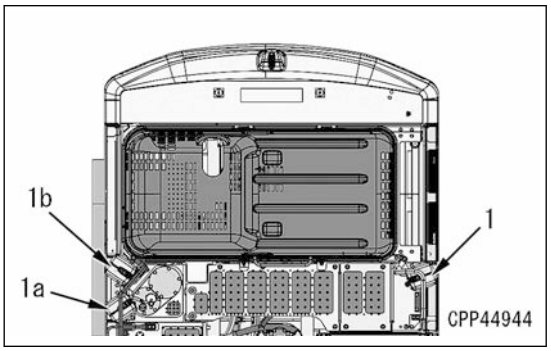
2. Remove bolts (3) (2 pieces) to remove cover (4).
   Tool: Socket wrench
   Bolt (3): M6 with width across flats of 10 mm



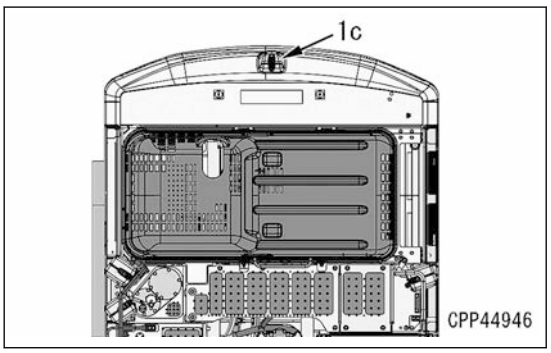
3. Disconnect connector A78 (5).
4. Remove bolts (6) (2 pieces) to remove KomVision camera (1).
   Tool: Socket wrench
   Bolt (6): M12 with width across flats of 19 mm



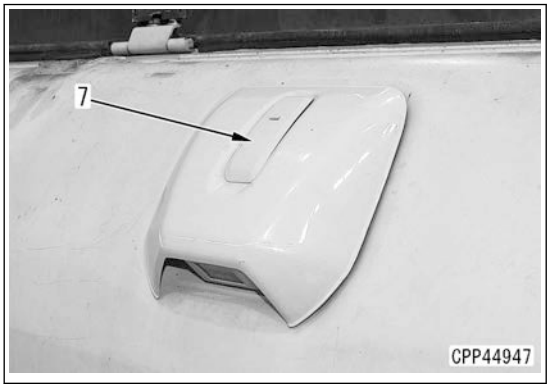
5. Remove KomVision cameras (1a) and (1b) in the same procedure.
   Note that their connector numbers differ from that for KomVision camera.
   KomVision camera (1a): Connector A77
   KomVision camera (1b): Connector A76



6. Remove KomVision camera (1c) according to the following procedure.



   1) Remove cover (7).



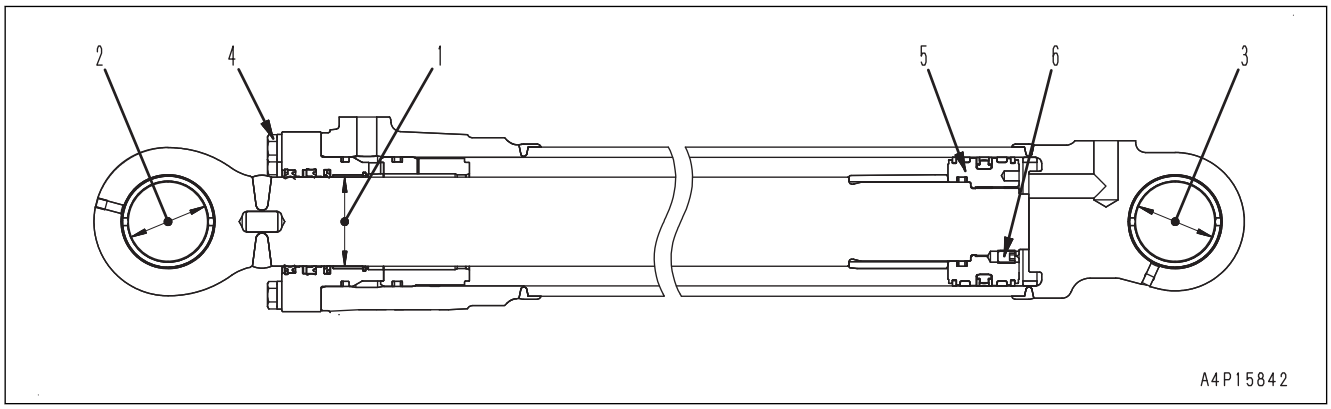
Unit: mm

No.	Item		Criteria				Remedy
1	Outside diameter of outer flange		Standard dimension	Repair limit			Rebuild by build-up welding or replace
			216	-			
2	Outside diameter of inner flange (double flange)		210	-			
3	Outside diameter of tread		180	168			
4	Thickness of tread		54	48			
5	Overall width		250	-			
6	Width of tread	Single flange	49	-			
		Double flange	47.7	-			
7	Width of flange	Single flange	27	-			
		Double flange	27	-			
8	Width of inner flange (double flange)		20	-			
9	Clearance between bushing and collar (sum of both clearances at outside and inside)		Standard dimension	Repair limit			Replace
			0.44 to 0.97	-			
10	Clearance between shaft and bushing		Standard dimension	Tolerance		Standard clearance	Allowable clearance	Replace bushing
				Shaft	Hole		
			65	-0.250 -0.350	+0.186 -0.064	0.186 to 0.536	-
11	Interference between roller and bushing		Standard dimension	Tolerance		Standard interference	Allowable interference	
				Shaft	Hole		
			72	+0.108 +0.008	-0.006 -0.036	0.014 to 0.144	-

Unit: mm

No.	Item	Judgment criteria					Remedy
		Standard dimensions			Repair limit		
1	Check valve spring	Free length x outside diameter	Installed height	Load at installed height	Free length	Load at installed height	Replace (Replace spring if damaged or deformed as well)
		24.5 x 11.6	18	4.9 N {0.5 kg}	-	3.9 N {0.4 kg}	
2	Spool return spring	31.75 x 8.5	25	29.4 N {3.0 kg}	-	23.5 N {2.4 kg}	
3	Spool return spring	30.41 x 20.6	29	51.4 N {5.24 kg}	-	41.1 N {4.2 kg}	

Maintenance Standard for Boom Cylinder



Unit: mm

No.	Item	Criteria					Remedy
1	Clearance between piston rod and bushing	Standard dimension	Tolerance		Clearance	Allowable clearance	Replace bushing
			Shaft	Hole			
		100	-0.036 -0.090	+0.257 +0.047	0.083 to 0.347	0.437	
2	Clearance between piston rod support shaft and bushing	80	-0.030 -0.060	(+0.190) (+0.070)	(0.100 to 0.250)	1.0	Replace pin and bushing
3	Clearance between cylinder bottom support shaft and bushing	80	-0.030 -0.060	(+0.190) (+0.070)	(0.100 to 0.250)	1.0	
4	Tightening torque of cylinder head	373 ± 54.0 Nm {38.0 ± 5.5 kgfm}					Retighten
5	Tightening torque of cylinder piston	294 ± 29.4 Nm {30.0 ± 3.0 kgfm}					
6	Tightening torque of cylinder piston fixing screw	58.9 to 73.6 Nm {6.0 to 7.5 kgfm}					

( ):Reference dimension

Air Conditioner Related Sensors

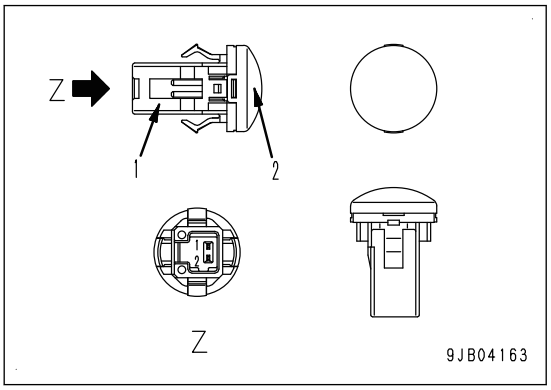
Structure of Sunlight Sensor

The sunlight sensor is installed to the top of the machine monitor.

General View

1: Connector

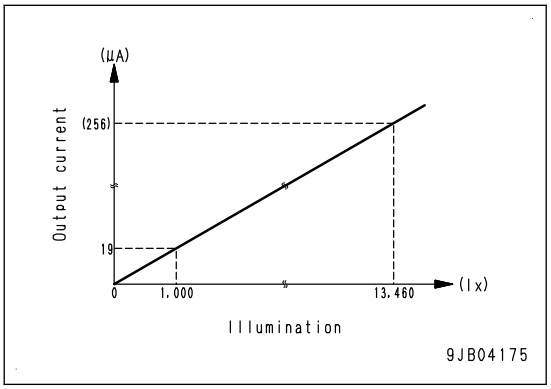
2: Sensor



Function of Sunlight Sensor

- The sunlight sensor senses the sunlight intensity and sends signals to the air conditioner controller.
- Only in the automatic air conditioner mode, the air conditioner controller controls the blower motor and air mix servomotor to adjust the air temperature and flow rate by using the data of the sunlight sensor.

Output Properties



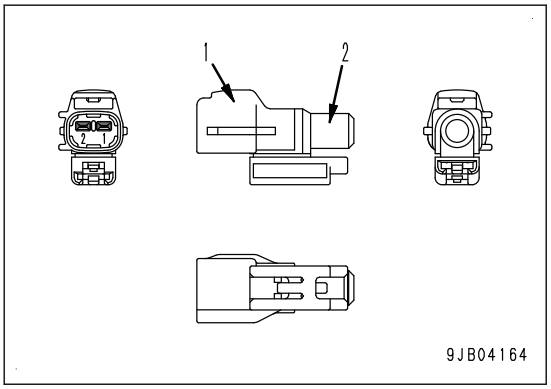
Structure of Outside Temperature Sensor

The outside air temperature sensor is installed to the cooling unit.

General View

1: Connector

2: Sensor



Function of Outside Air Temperature Sensor

- The resistance of the sensor changes according to the temperature, and the sensor senses the outside air temperature.
- The air conditioner controller converts the change in resistance of the outside air temperature sensor into the change in voltage to determine the outside air temperature.

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