SEN06889-02

Shop Manual

HYDRAULIC
EXCAVATOR

PC2000-11E0

SERIAL NUMBERS 30015 and up

KOMATSU

Precautions for disconnecting air conditioner piping

NOTICE

When replacing the air conditioner unit, air conditioner compressor, condenser or receiver drier, etc., collect the refrigerant (air conditioner gas: R134a) from the air conditioner circuit before disconnecting the air conditioner hoses.

REMARK

- Ask a qualified person for collecting, adding and filling operations of the refrigerant (air conditioner gas: R134a).
- Never release the refrigerant (air conditioner gas: R134a) to the atmosphere.

⚠ **Put on the protective eyeglasses, gloves and working clothes with long sleeves while you are collecting or filling the refrigerant. Otherwise, when refrigerant gas (R134a) gets in your eyes, you may lose your sight, and when it touches your skin, you may suffer from frostbite.**

- When loosening the nuts fixing air conditioner hoses and tubes, be sure to use 2 wrenches; use one wrench to fix and use the other one to loosen the nut.

Precautions for air conditioner piping

- When installing the air conditioner piping, be careful so that dirt, dusts and water do not enter the hose.
- Check that the O-rings are fitted to the joints when connecting the air conditioner piping.
- Do not reuse an O-ring because it is deformed and deteriorated if it is used once.
- When removing the O-rings, use a soft tool so that the piping is not damaged.
- Check that the O-ring is not damaged or deteriorated.
- Apply compressor oil for refrigerant (R134a) to O-ring.

  REMARK

  Do not apply oil to the threaded portion of a bolt, nut or union.

Manufacturer	Part name
DENSO	ND-OIL8
VALEO THERMAL SYSTEMS	ZXL100PG (PAG46 or equivalent)
SANDEN	SP-10

When tightening nuts of the air conditioner hoses and tubes, be sure to use 2 wrenches. Use one wrench to fix and tighten the nut with the other wrench to the specified torque (Use a torque wrench for tightening).

Nominal No.			0.5f	0.5	0.75f	0.85	1.25f	1.25
Coating D	CAVS	Standard	-	1.6	-	1.8	-	2.1

REMARK

"f" of nominal No. denotes "flexible".

Color codes table

(Table 3)

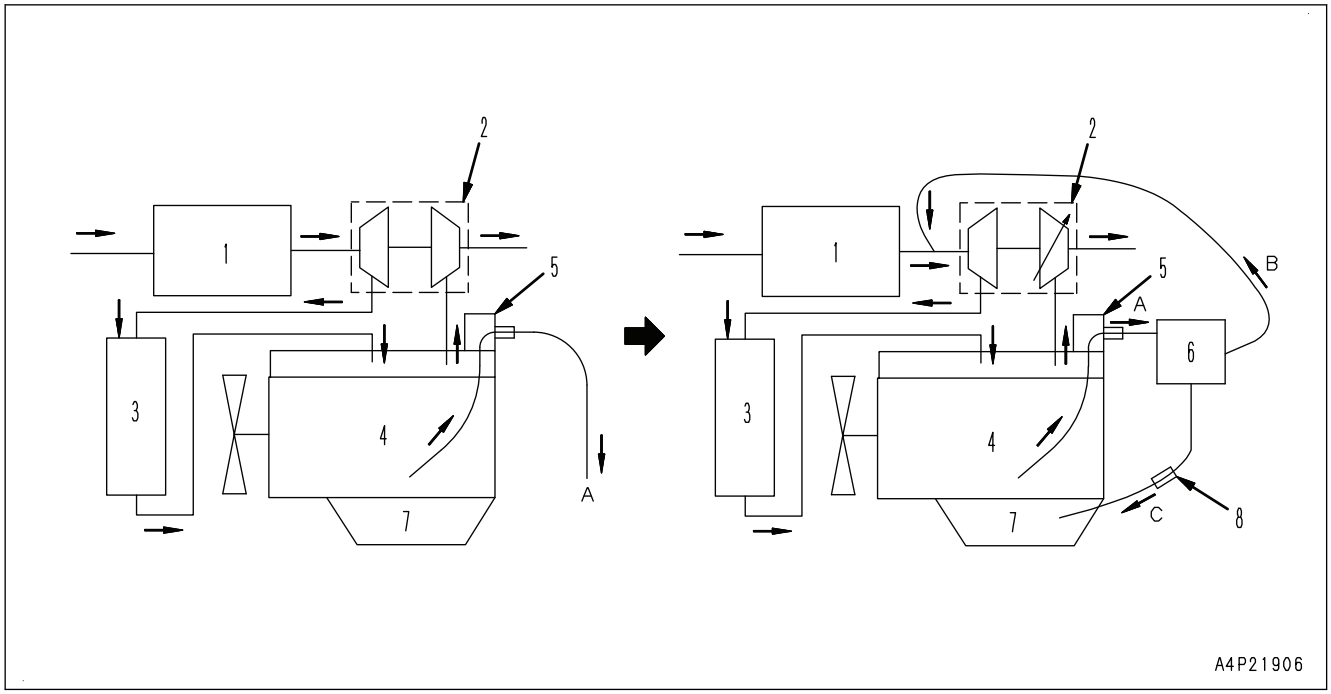
Color Code	Color of wire	Color Code	Color of wire
B	Black	LgW	Light green and White
Br	Brown	LgY	Light green and Yellow
BrB	Brown and Black	LR	Blue and Red
BrR	Brown and Red	LW	Blue and White
BrW	Brown and White	LY	Blue and Yellow
BrY	Brown and Yellow	O	Orange
Ch	Charcoal	P	Pink
Dg	Dark green	R	Red
G	Green	RB	Red and Black
GB	Green and Black	RG	Red and Green
GL	Green and Blue	RL	Red and Blue
Gr	Gray	RW	Red and White
GR	Green and Red	RY	Red and Yellow
GW	Green and White	Sb	Sky Blue
GY	Green and Yellow	Y	Yellow
L	Blue	YB	Yellow and Black
LB	Blue and Black	YG	Yellow and Green
Lg	Light green	YL	Yellow and Blue
LgB	Light green and Black	YR	Yellow and Red
LgR	Light green and Red	YW	Yellow and White

REMARK

In a color code consisting of 2 colors, the first color is the color of the background and the second color is the color of the marking.
Example) GW indicates that the background is "Green" and marking is "White".

OPERATION OF KCCV SYSTEM

The left side of the figure shows the conventional blowby gas flow, and the right side shows the blowby gas flow suctioned and returned by the KCCV ventilator.



A: Blowby gas
B: Clean gas
C: Engine oil
1: Air cleaner
2: VGT
3: Aftercooler
4: Cylinder block (crankcase)
5: Breather
6: KCCV ventilator
7: Engine oil pan
8: Check valve

1. The blowby gas (A) in the cylinder block (4) passes through the breather (5), the filter in the KCCV ventilator (6) separate the engine oil (C), and the clean gas (B) is returned to the air intake side of VGT (2).
2. The separated engine oil (C) is discharged into the engine oil pan (7) through the check valve (8).

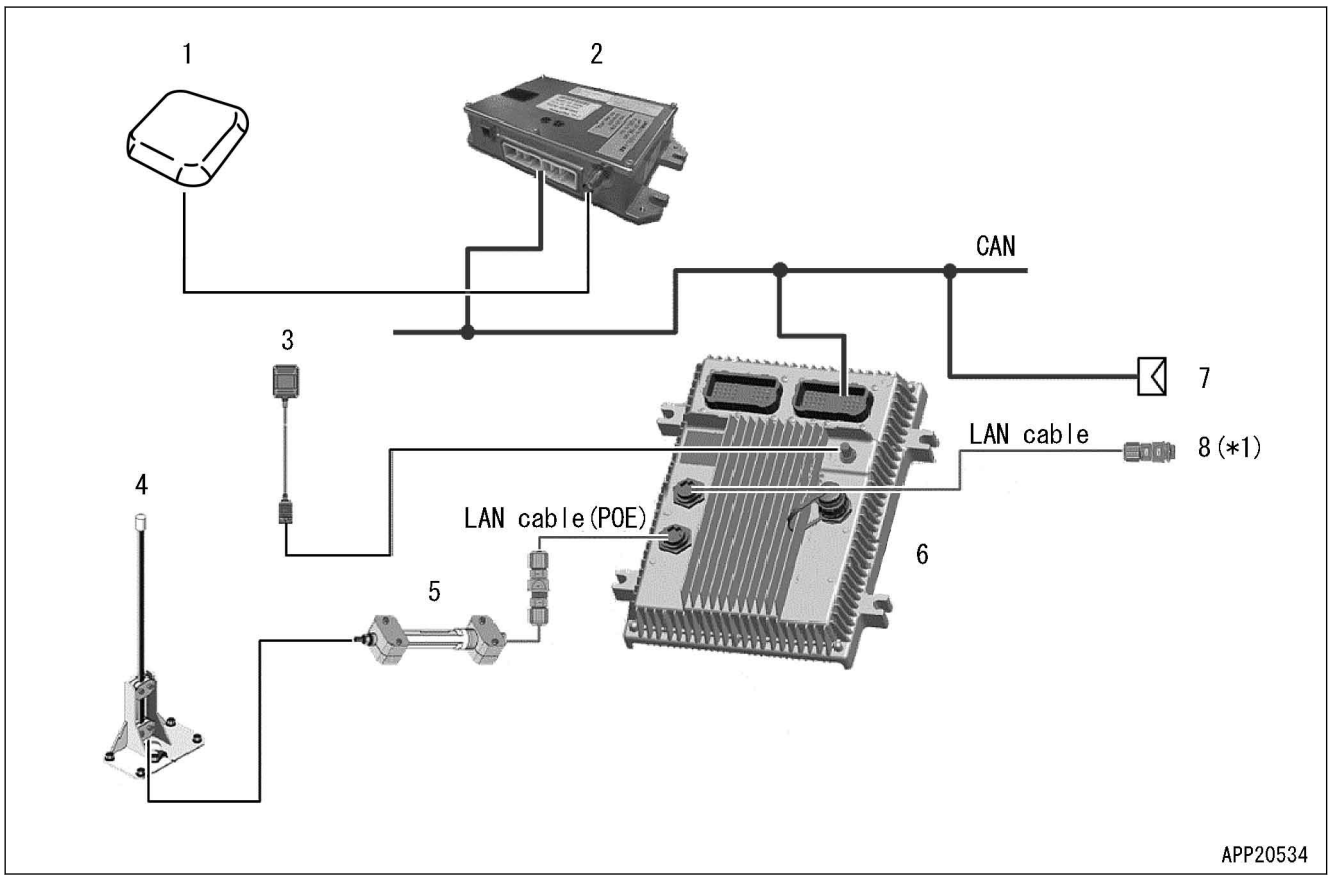
KCCV VENTILATOR

KCCV

Abbreviation for KOMATSU Closed Crankcase Ventilation

KOMTRAX Plus SYSTEM

KOMTRAX Plus SYSTEM DIAGRAM



1: KOMTRAX communication antenna
2: KOMTRAX terminal
3: KOMTRAX GPS antenna
4: Wireless LAN antenna
5: Wireless LAN unit
6: KOMTRAX Plus controller
7: Service connector
8: Download connector in the cab (*1)

*1: Connect this when the wireless is not used.

KOMTRAX Plus system consists of KOMTRAX Plus controller, KOMTRAX terminal, wireless LAN unit, KOMTRAX GPS antenna, KOMTRAX antenna, and wireless LAN antenna.

FUNCTION OF KOMTRAX Plus SYSTEM

Function for sending and recording of machine information

- KOMTRAX Plus is a system that records various information of the machine obtained from the sensors and controllers of the machine. It sends the information by KOMTRAX terminal and wireless LAN unit through wireless communication.
- KOMTRAX Plus administrator in the office can supply various services to the customers by referring to the following information.
- KOMTRAX Plus system can transmit the following information.
  - Positional information
  - Operation information (service meter)
  - Alarm, troubleshooting
  - Fuel consumption information
  - Maintenance information

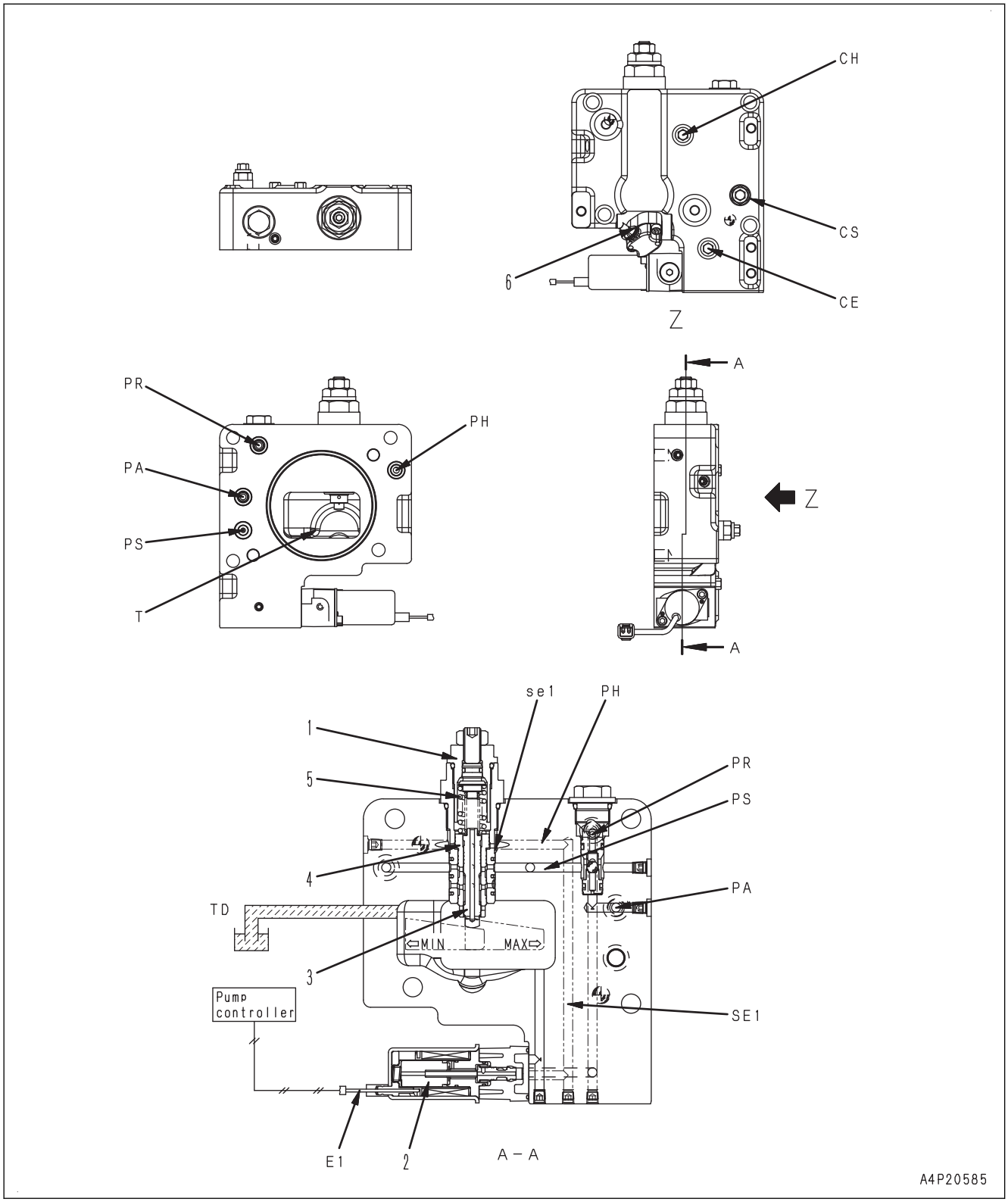
Pin No.	Signal name	Input and output
5	R1 valve boom RAISE EPC	Output
6	L1 valve arm IN EPC	Output
7	(*1)	Output
8	Auto greasing solenoid	Output
9	(*1)	Input
10	Auto grease Hi level switch	Input
11	Continuous power supply	Input
12	Solenoid power supply	Input
13	GND (solenoid)	-
14	Key switch (Terminal ACC)	Input
15	Bucket DUMP EPC	Output
16	L1 valve arm OUT EPC	Output
17	Service center check solenoid	Output
18	(*1)	Output
19	(*1)	Input
20	Auto greasing manual selector switch	Input
21	GND	-
22	Solenoid power supply	Input
23	GND (solenoid)	-
24	Key switch (Terminal ACC)	Input
25	Bucket CURL EPC	Output
26	R2 valve arm IN EPC	Output
27	(*1)	Output
28	(*1)	Output
29	(*1)	Input
30	Ladder UP switch	Input
31	GND	-
32	GND	-
33	GND	-
34	System connect busy signal	Output
35	(*1)	Output
36	R2 valve arm OUT EPC	Output
37	(*1)	Output
38	(*1)	Output
39	(*1)	Input
40	Ladder DOWN switch	Input

*1: Never connect these pins, otherwise it may cause malfunctions or failures.

MAIN PUMP SERVO VALVE

STRUCTURE OF MAIN PUMP SERVO VALVE

General view and sectional view



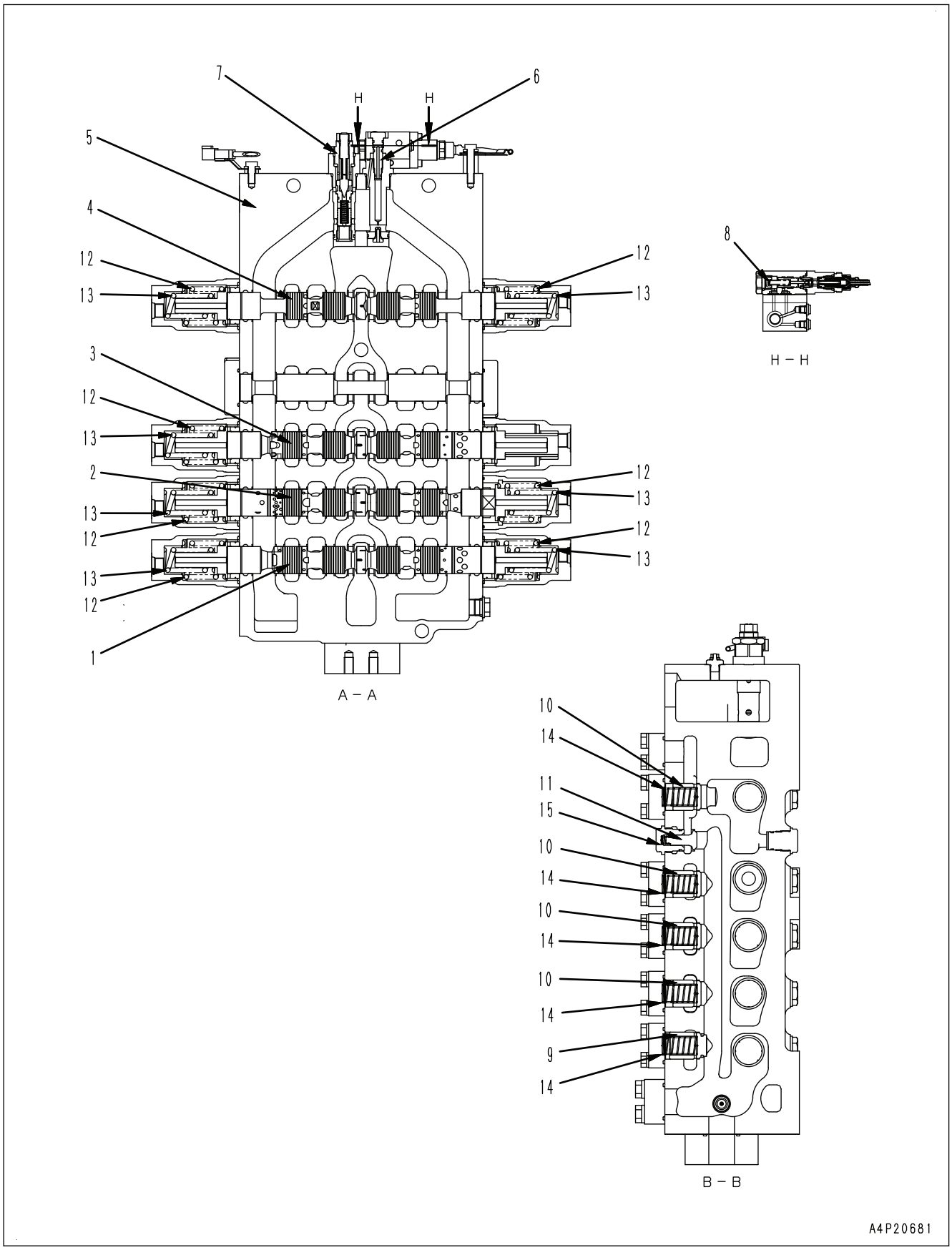
CE: Control pressure pickup port

CH: Servo actuator pressure pickup port

CS: Servo actuator pressure pickup port

PA: Main pump pressure port

Sectional views (A-A, B-B)



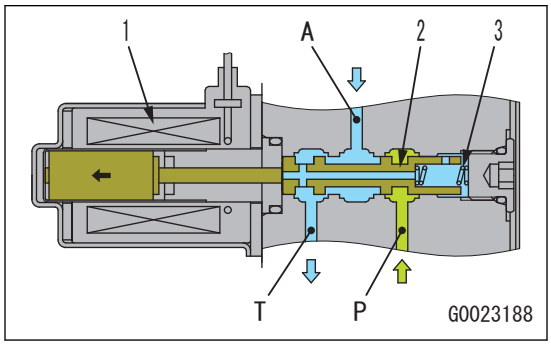
1: Spool (Arm Hi) 2: Spool (Boom Lo)

To PPC valve (for the safety lock)
1: Swing parking brake solenoid valve
2: Connector
3: Coil
4: Movable iron core
5: Body
6: Plug
P: From control pump
7: Spring
8: Spool
9: Body
10: Plug
11: Spring
12: Spool

OPERATION OF SOLENOID VALVE AND CHECK VALVE

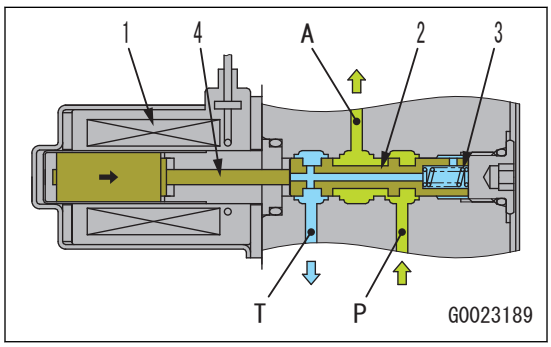
When the solenoid valve is “de-energized” (the circuit is blocked).

1. Coil (1) is de-energized when the signal current does not flow to coil (1).
2. Spool (2) is pushed back to the left with the reaction force of spring (3).
3. The circuit between port (P) and port (A) closes and pilot pressure does not flow from port (A) to the actuator. At the same time, port (T) opens and oil from the actuator is drained to the hydraulic tank.



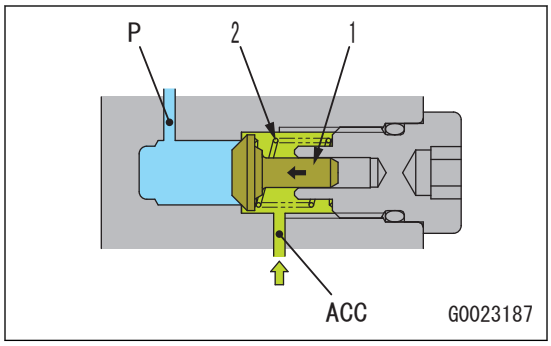
When the solenoid valve is “energized” (the circuit is connected).

1. Coil (1) is energized when the signal current flows to coil (1).
2. Accordinglys, spool (2) is pushed to the right by push pin (4).
3. The circuit between port (P) and port (A) opens and pilot pressure flows from port (A) to the actuator. At the same time, port (T) closes and oil from the actuator does not flow to the hydraulic tank.



Check valve (with engine stopped)

The check valve is installed between port (P) and PPC solenoid valve. When the engine is stopped, the reaction force of spring (2) pushes plunger (1) to the left, and port (ACC) and port (P) are disconnected, thus the accumulated pressure in the accumulator is held.

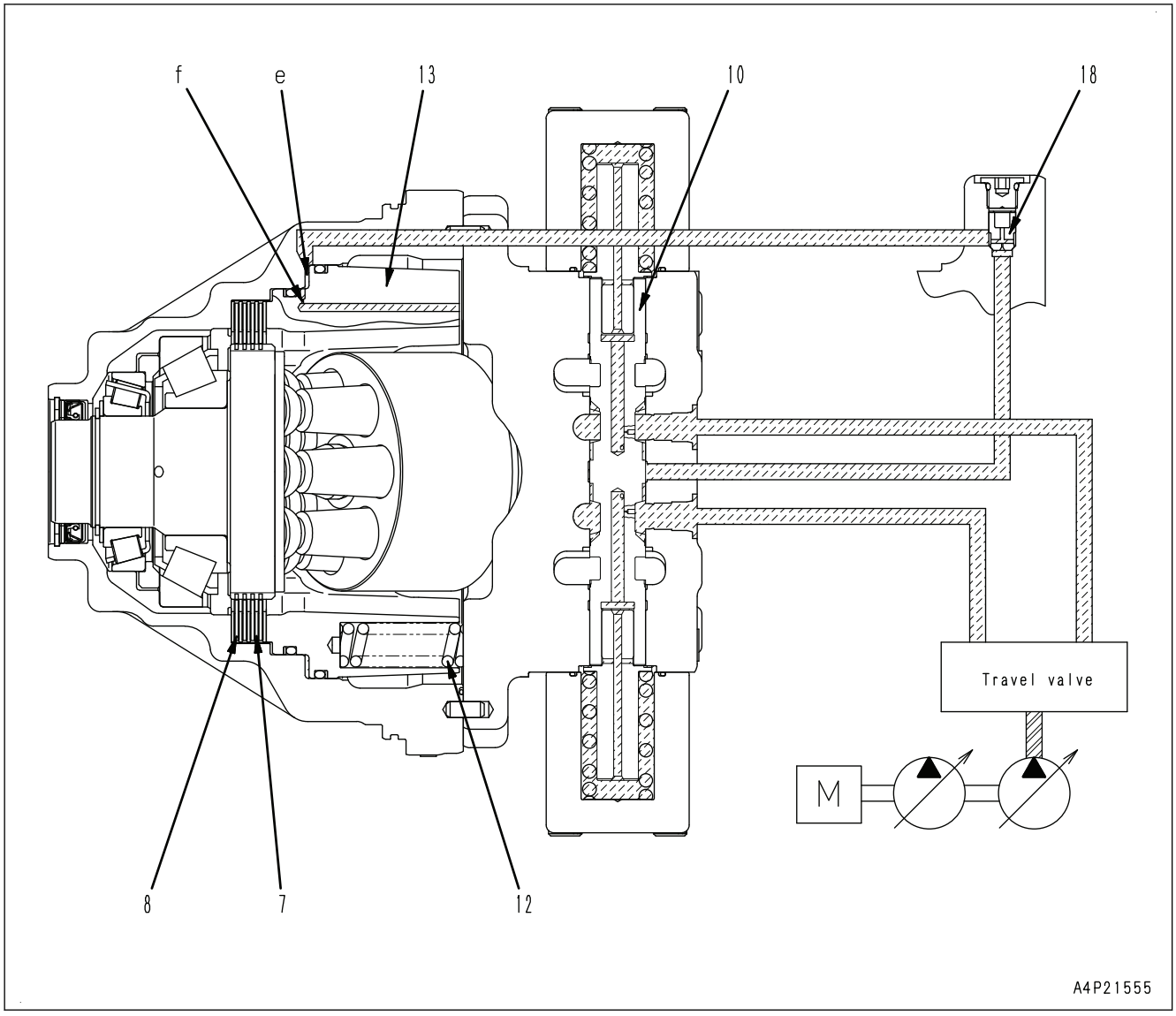


Check valve (with engine running)

When the engine is running, the pilot pressure in port (P) pushes plunger (1) to the right, and port (P) and port (ACC) are interconnected.

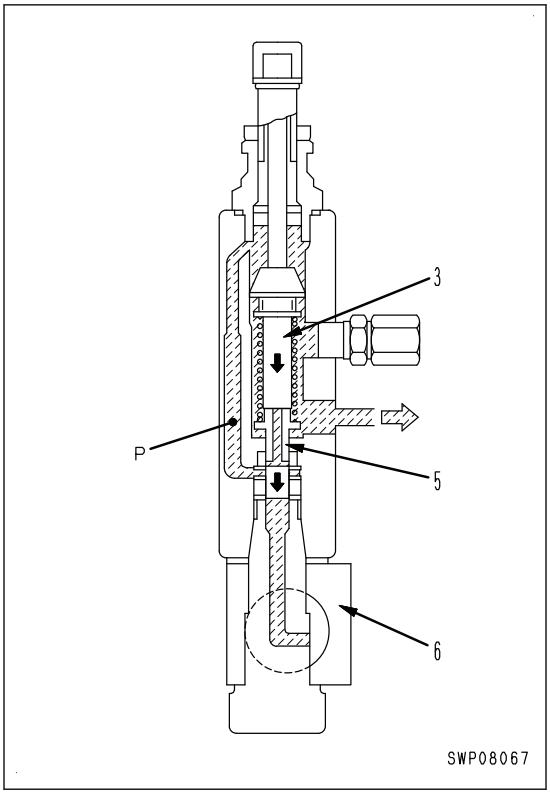
2. The pressurized oil flows into the chamber (e) of the brake piston (13). The brake spring (12) is compressed, and the brake piston (13) is pushed to the right.
3. The push force to the plate (7) and disc (8) is lost, and the plate (7) and disc (8) separate from each other to release the brake.

When the machine stops traveling

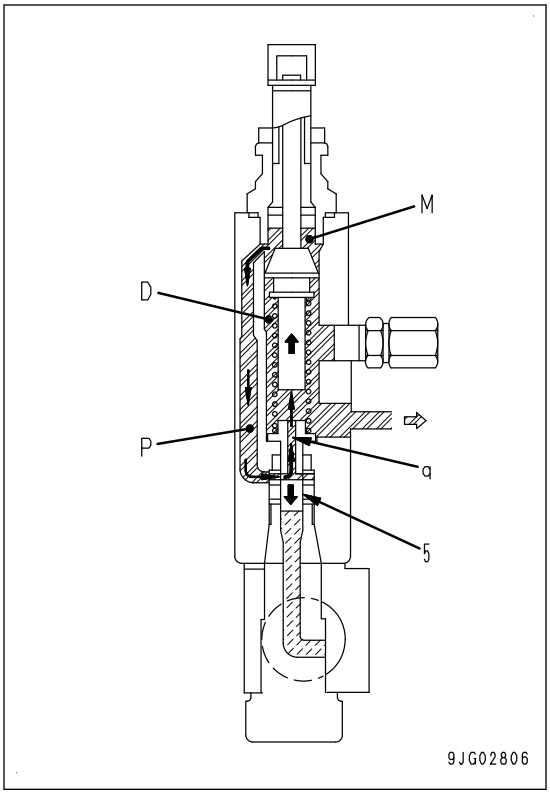


1. When the travel lever is set in NEUTRAL position, the counter balance valve spool (10) returns to the NEUTRAL position to close the parking brake circuit.
2. The pressurized oil in the chamber (e) of the brake piston (13) passes through the throttle of the slow return valve (18) until the counterbalance valve spool (10) returns to the neutral position.
3. When the counterbalance valve spool (10) returns to the neutral position, the oil is drained from the throttle (f) of the brake piston (13) into the case.
4. The brake piston (13) is pushed to the left by the spring (12).
5. The plate (7) and disc (8) are pressed, and the brake is applied.
6. When the brake piston (13) returns, pressurized oil flow is throttled by the slow return valve (18).
7. The brake is applied after the machine is stopped since the application of the brake is set to be delayed.

- Process 3 (STAGE 3)
  When the injector piston (3) is lowered, it comes into contact with the slide valve (5), and starts pressing down this valve and the manifold (6) and path (P) are disconnected.



- Process 4 (STAGE 4)
  If the slide valve (5) is pushed down, the path (P) is connected with the discharge chamber (D) via the valve port (q), and the grease flows from the measuring chamber (M) into the discharge chamber (D) for the next refilling. 1 cycle has been completed.



SPECIFICATIONS OF INJECTOR DISTRIBUTION VALVE

Discharged volume: 0.13 to 1.31 cc/rev

Fig. 10

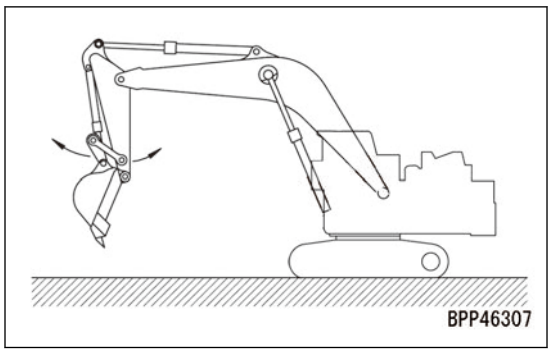


Fig. 11

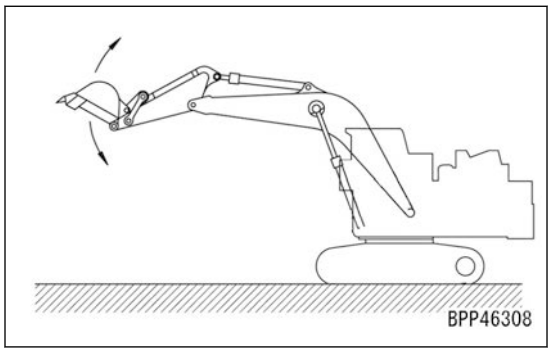


Fig. 12

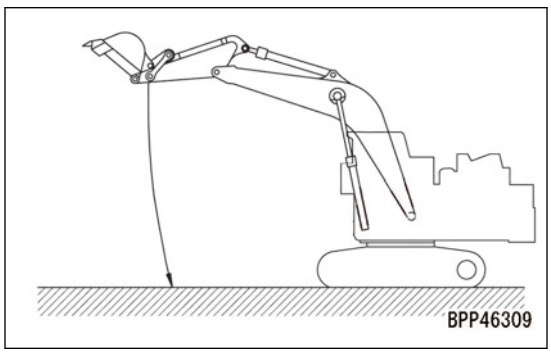


Fig. 13

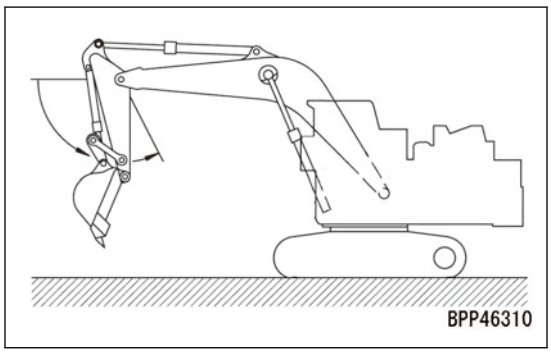
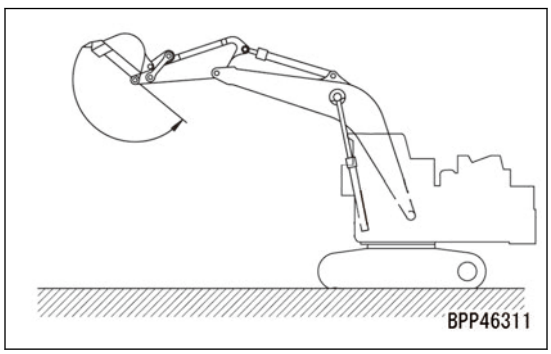
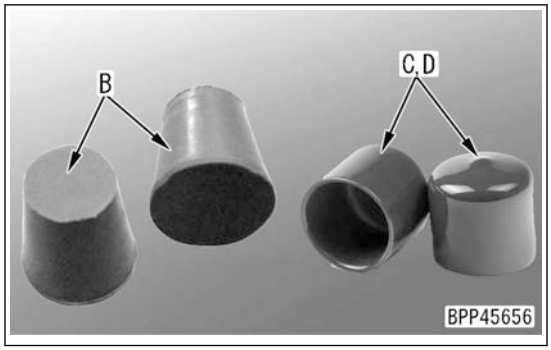


Fig. 14



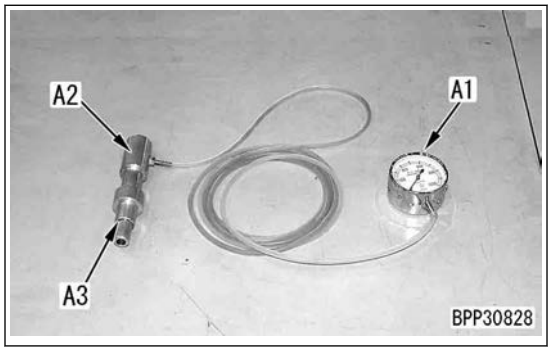
11. Put the caps C to the blowby gas inlet side and the outlet side of KCCV (8).
12. Install the plug B to KCCV gas outlet hose side (11) and attach it using the clamp (9).

    Clamp (9):
    4.4±0.5 Nm {0.45±0.05 kgfm}

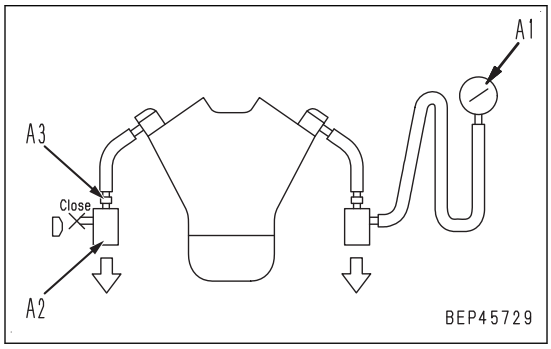


13. Install the tool A2 of blowby checker A and the adapter A3 to the inlet hose (10) of KCCV (8), then attach it using the clamp (9).

    Clamp (9):
    4.4±0.5 Nm {0.45±0.05 kgfm}



14. Use cap D or the like to plug the tube connection opening (to which gauge A1 is connected) of the tool A2 for the right bank.
15. Start the engine.
16. Select “Pre-defined Monitoring” (01/39), and display it by referring to “SET AND OPERATE MACHINE MONITOR”.
17. Set the engine coolant temperature and the hydraulic oil temperature so that it is within the testing condition range.
18. Set the working mode to P+ (“Power Plus Mode”).
19. Turn off the auto-deceleration.



20. Turn the fuel control dial to MAX (High idle) position.
21. Operate the work equipment control lever to perform Boom RAISE relief, and measure the blowby pressure.

    REMARK

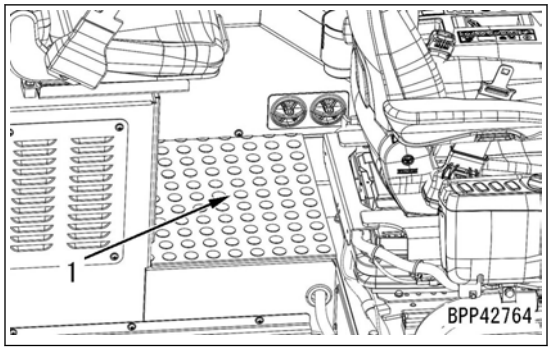
    - Read the blowby pressure when the pointer of gauge is stabilized.
    - Blowby pressure varies greatly with the condition of the engine. If the value by the test is considered unusual, perform inspection for phenomena such as excessive oil consumption, bad color of exhaust gas, early oil deterioration, early oil contamination, etc., which are related to blowby problems.

    For standard values, see STANDARD VALUE TABLE, “STANDARD VALUE TABLE FOR ENGINE”.

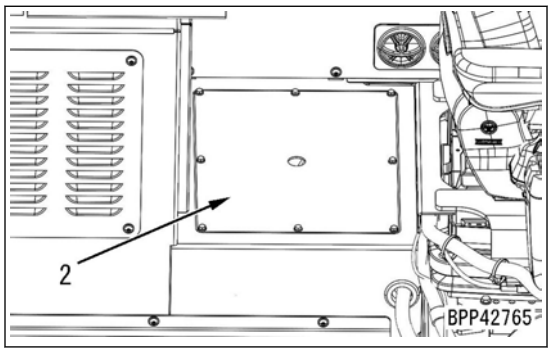
Remove the testing tools and restore the machine after the test is finished.

Clamp (4) or (9):
4.4±0.49 Nm {0.45±0.05 kgfm}

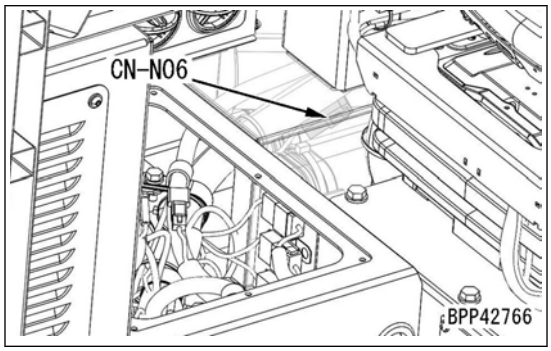
5. Remove the floor mat (1).



6. Remove cover (2).



7. Connect to the service connector (CN-N06).

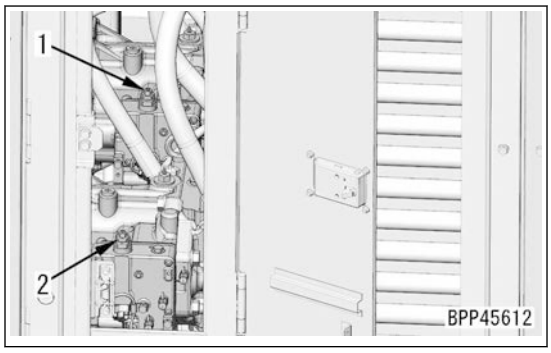


8. Start the personal computer.
9. Turn the starting switch to ON position to supply the power from the battery to the engine controller.
10. Double-click the icon shown in the figure.

11. Establish communication with the engine controller according to the following procedure.

METHOD FOR ADJUSTING OIL PRESSURE OF CONTROL CIRCUIT

Adjust the self-pressure reducing valve (1) or (2) of the No.1 or No.2 pump according to the following procedure when the control relief pressure is not normal.

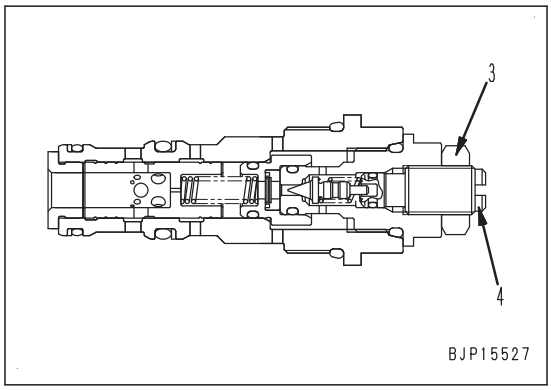


1. Open the pump room inspection cover.
2. Loosen the lock nut (3) with the adjustment screw (4) fixed.
3. Turn the adjustment screw (4) to adjust the oil pressure.

   See STANDARD VALUE TABLE, “STANDARD VALUE TABLE FOR MACHINE” for standard values.

   REMARK

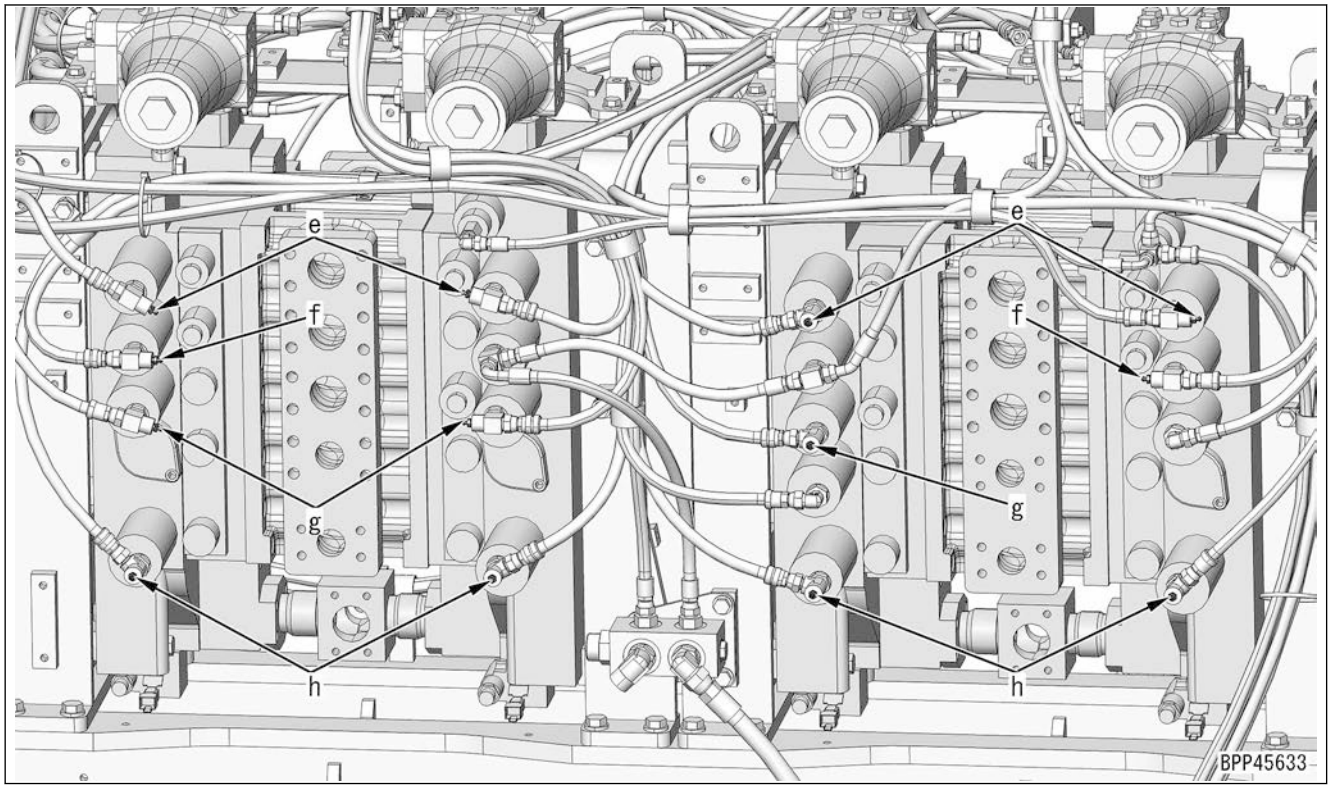
   - Turn adjustment screw (4) clockwise to raise the pressure. Turn it counterclockwise to lower the pressure.
   - Quantity of pressure adjustment per turn of adjustment screw (4)1.16 MPa {11.9 kgf/cm^2}



4. Tighten the lock nut (3) with the adjustment screw (4) fixed.

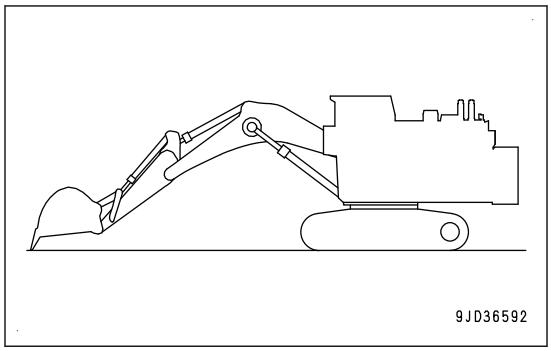
   Lock nut (3):
   59 to 78 Nm {6 to 8 kgfm}

After the adjustment, recheck the oil pressure according to the testing procedure previously described.



Method of checking oil level and operation

1. Start the engine, retract the arm cylinder and bucket cylinder fully, lower the work equipment to the ground, and stop the engine.
2. Turn the starting switch to ON position within approximately 15 seconds after the engine is stopped. Operate the all control levers and travel pedal to the stroke end to release internal pressure from the circuit.



“Pre-defined Monitoring” (26/39) PPC related (2)

No.	Monitoring code	Self-define Monitoring items (screen display)	Unit			Applicable component
			SI	Metric	Imperial	
1	01002	Engine Speed	r/min	rpm	rpm	ENG
2	04401	Hydraulic Oil Temperature	°C	°C	°F	PUMP
3	09013	Swing Right PPC Pressure	MPa	kg/cm2	psi	PUMP
4	09012	Swing Left PPC Pressure	MPa	kg/cm2	psi	PUMP
5	07304	Bucket CURL PPC Pressure	MPa	kg/cm2	psi	PUMP
6	07305	Bucket DUMP PPC Pressure	MPa	kg/cm2	psi	PUMP

“Pre-defined Monitoring” (27/39) PPC related (3)

No.	Monitoring code	Self-define Monitoring items (screen display)	Unit			Applicable component
			SI	Metric	Imperial	
1	01002	Engine Speed	r/min	rpm	rpm	ENG
2	04401	Hydraulic Oil Temperature	°C	°C	°F	PUMP
3	07116	Travel Forward Left PPC Press	MPa	kg/cm2	psi	PUMP
4	07117	Travel Forward Right PPC Press	MPa	kg/cm2	psi	PUMP
5	07118	Travel Reverse Left PPC Press	MPa	kg/cm2	psi	PUMP
6	07119	Travel Reverse Right PPC Press	MPa	kg/cm2	psi	PUMP

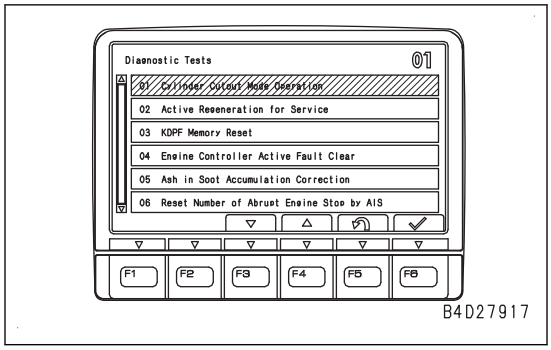
“Pre-defined Monitoring” (28/39) Hydraulic fan related

No.	Monitoring code	Self-define Monitoring items (screen display)	Unit			Applicable component
			SI	Metric	Imperial	
1	01002	Engine Speed	r/min	rpm	rpm	ENG
2	04107	Coolant Temperature	°C	°C	°F	ENG
3	04401	Hydraulic Oil Temperature	°C	°C	°F	PUMP
4	18403	Intake Temperature_2	°C	°C	°F	ENG
5	10001	RAD Fan Speed Signal	r/min	rpm	rpm	PUMP
6	10007	RAD Fan Speed	r/min	rpm	rpm	PUMP

“Pre-defined Monitoring” (29/39) Hydraulic fan related (2)

No.	Monitoring code	Self-define Monitoring items (screen display)	Unit			Applicable component
			SI	Metric	Imperial	
1	01002	Engine Speed	r/min	rpm	rpm	ENG
2	37502	Ambient Temperature	°C	°C	°F	ENG
3	04401	Hydraulic Oil Temperature	°C	°C	°F	PUMP
4	10010	O/C Fan Speed Signal	r/min	rpm	rpm	PUMP
5	10021	O/C Fan Speed	r/min	rpm	rpm	PUMP

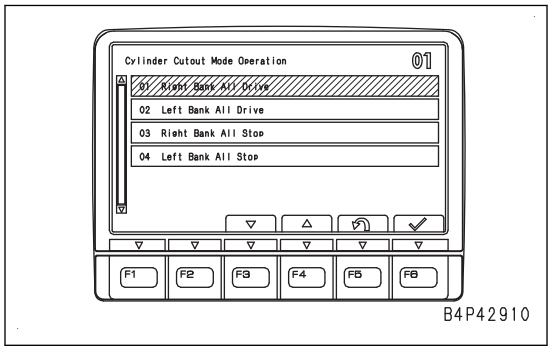
2. Select “Cylinder Cutout Mode Operation” using the function switches or numeral input switches on the “Diagnostic Tests” screen.



REMARK

For selecting method, see “METHOD FOR OPERATING SERVICE MODE” in “SERVICE MODE”.

3. Select a bank to set cylinder cutout on the “Cylinder Cutout Mode” screen using the function switches or numeral input switches.

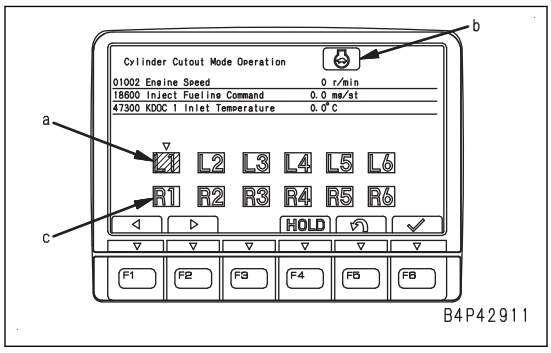


REMARK

- For selecting method, see “METHOD FOR OPERATING SERVICE MODE” in “SERVICE MODE”.
- Divide the V12 cylinder into right and left banks, and issue a cylinder cutout command example. For details of the status and specifications for each bank, see the table below.

	Menu	Right bank	Left bank
01	Right Bank All Drive	All drive	The selected cylinder has stopped.
02	Left Bank All Drive	The selected cylinder has stopped.	All drive
03	Right Bank All Stop	All stop	The selected cylinder has stopped.
04	Left Bank All Stop	The selected cylinder has stopped.	All stop

4. On the “Cylinder Cutout Mode Operation” screen, select the cylinders to set cylinder cutout using the function switches.



F1: Moves the selected item to the left

F2: Moves the selected item rightward

F4: Selects HOLD or releasing HOLD. (When HOLD is selected, “HOLD” part is hatched.)

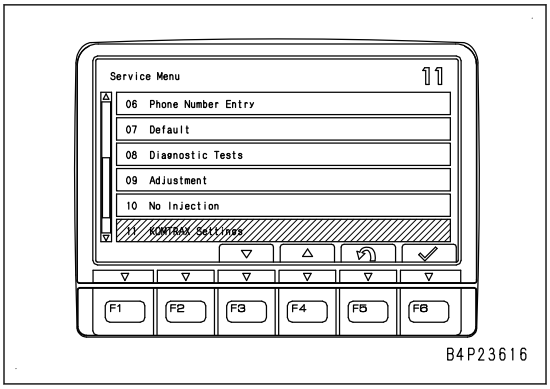
F5: The screen returns to “Diagnostic Test” screen

F6: Enters the selected item.

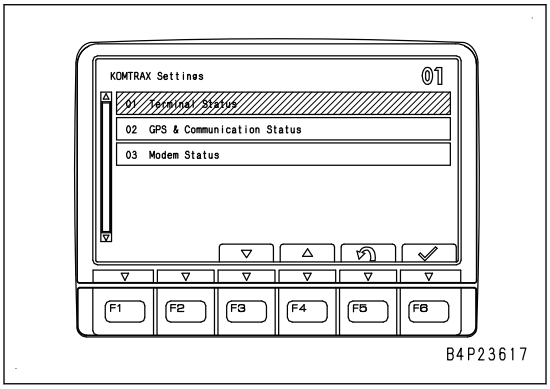
REMARK

- This operation can be performed while the engine is running.
- If background (a) of the selected cylinder number becomes white after you press F6, the cylinder is cutout.
- If the machine monitor cuts out a cylinder but the engine controller cannot cutout that cylinder, the background (a) of the cylinder number becomes yellow.
- The bank for which all drive or all stop is selected in the previous step is displayed against a dark background (c), and cutout cylinders cannot be selected individually.
- The cylinders in the left bank are indicated by L1 to L6, and those in the right bank by R1 to R6.
- One or more cylinders can be cutout.

1) Select “KOMTRAX Settings” on “Service Menu” screen with function switches or numeral input switches.

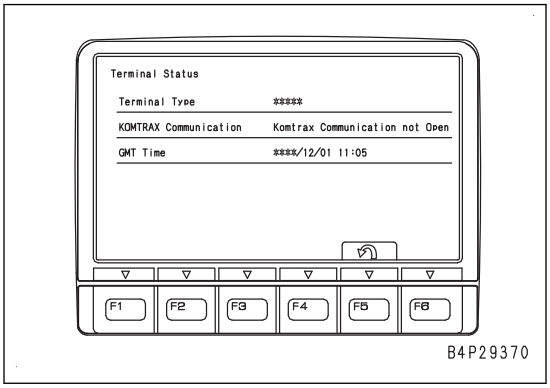


2) Select “Terminal Status” on “KOMTRAX Settings” screen with the function switches or numeral input switches.



3) When the “Terminal Status” is displayed, check “KOMTRAX Communication”.

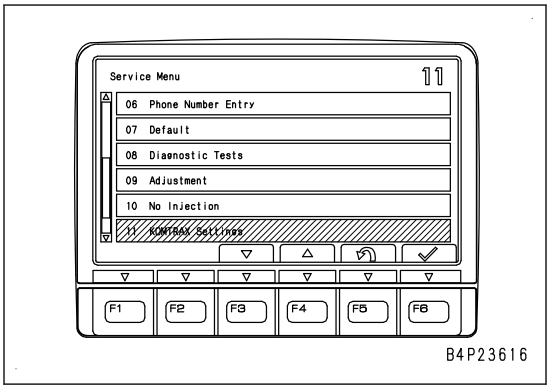
   If “KOMTRAX Communication Not Open” is displayed in “KOMTRAX Communication”, perform Step 2. If “Already Open” is displayed, KOMTRAX Communication Inspection is not needed.



2. KOMTRAX Communication Inspection

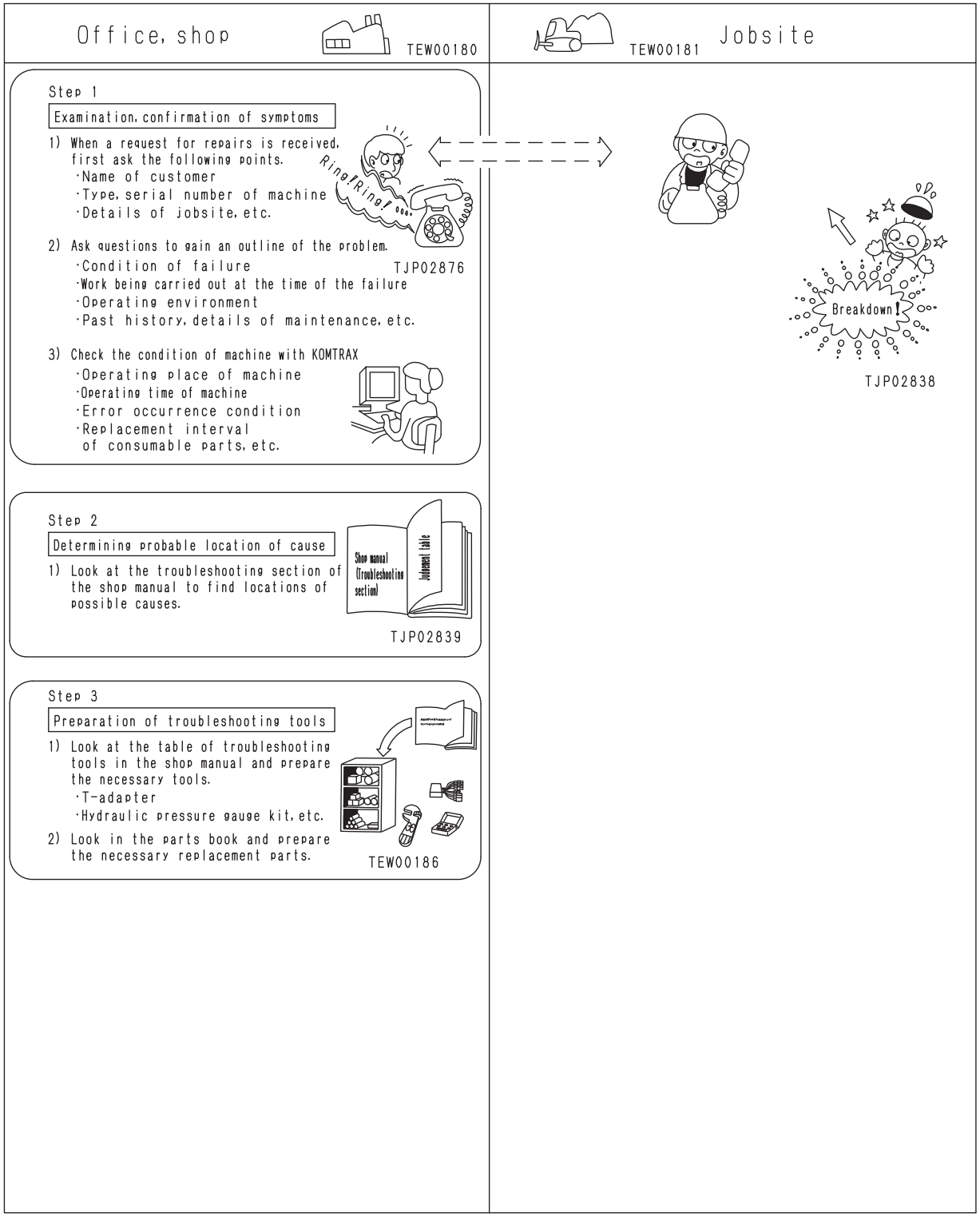
   Perform KOMTRAX Communication Inspection according to the following procedure.

1) Select “KOMTRAX Settings” on “Service Menu” screen with function switches or numeral input switches.

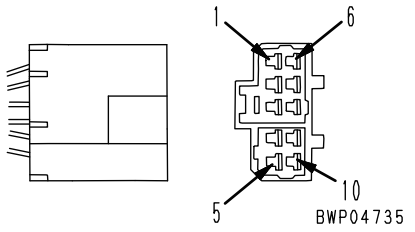
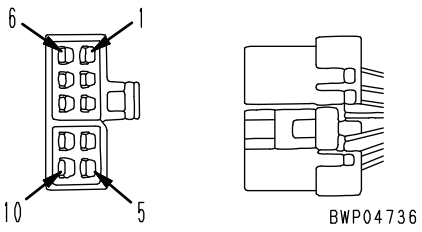
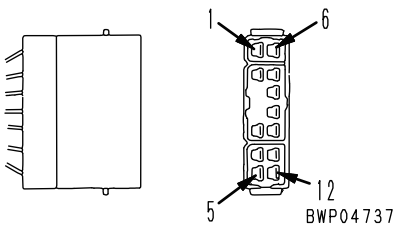
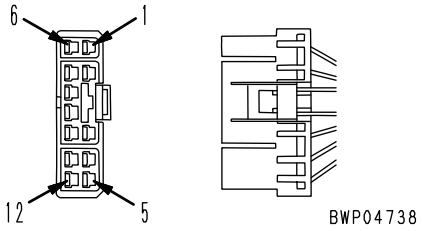
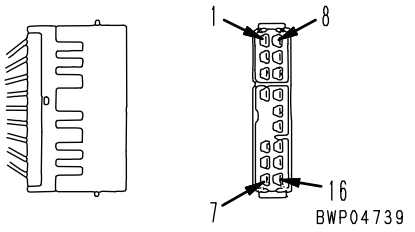
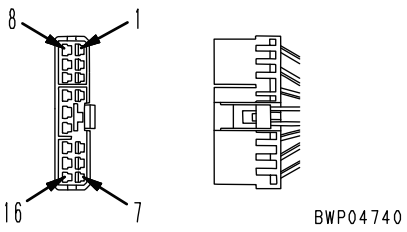


Machine model				PC2000-11E0			Good	No good
Engine				SAA12V140E-7				
Item	Testing conditions		Unit	Standard value for new machine	Repair limit	Measured value		
Pump EPC current (*1)	• Hydraulic oil temperature45 to 55 °C • Working mode: P+ (Power Plus Mode) • Auto-deceleration switch: OFF • Fuel control dial: MAX (High idle) position	Control lever: NEUTRAL position	mA	160 to 280	160 to 280			
		Right-travel track idle rotation with the lever set at the stroke end		P1: 390 to 510 P2: 615 to 735	P1: 390 to 510 P2: 615 to 735			
		Left-travel track idle rotation with the lever set at the stroke end						

SEQUENCE OF EVENTS IN TROUBLESHOOTING



No.	Symptom of failure	Troubleshooting Index
34	Alarm does not sound during travel.	E-38
35	Alarm does not stop sounding while machine is stopped.	E-39
36	Machine unintentionally turns to one side when machine travels (to the same side both in forward and reverse travels).	H-20
37	Machine unintentionally turns to one side when machine travels (to different sides in forward and reverse travels).	H-21
38	Travel deviation is large at start of travel only when travel lever is fully moved.	H-22
39	Travel deviation is large at start of traveling regardless of stroke of travel lever.	H-23
40	Travel deviation is large at combined operation.	H-24
41	Travel speed or power is low.	H-25
42	R.H. or L.H. travel system does not operate (either forward or reverse)	H-26
43	R.H. or L.H. travel system does not operate (both forward and reverse)	H-27
44	Speed range does not change.	H-28
	Swing	
45	Upper structure does not swing while swing parking brake cancel switch is set to CANCEL position.	E-36
46	Swing brake does not operate while swing parking brake cancel switch is set to NORMAL position.	E-37
47	Upper structure does not swing both to the right and left.	H-29
48	Upper structure does not swing only one direction.	H-30
49	Swing acceleration or swing speed is low in both directions.	H-31
50	Swing acceleration or swing speed is low in either direction.	H-32
51	Swing speed or power is low during combined operation with bucket.	H-33
52	Swing acceleration or swing speed is low during combined operation with boom in swing priority mode.	H-34
53	Upper structure overruns excessively when it stops swinging in both directions of right and left.	H-35
54	Upper structure speed is high when it stops swinging (in either right or left direction).	H-36
55	Shock is large when upper structure stops swinging (in both right and left directions).	H-37
56	Shock is large when upper structure stops swinging (in only right of left direction)	H-38
57	Large unusual noise is heard when upper structure stops swinging (in both right and left directions).	H-39
58	Large unusual noise is heard when upper structure stops swinging (in either right or left direction).	H-40
59	Swing drift on a slope is large.	H-41
	Work equipment	
60	All work equipment, swing and travel do not work.	E-34
61	All work equipment, swing and travel cannot be locked.	E-35
62	All work equipment, travel, and swing speed or power is low.	H-1

No. of pins	S type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
10 (Blue)			—
	—	—	
12 (Blue)			799-601-7160 (T-adapter)
	Part No. : 08056-11272	Part No. : 08056-11282	
16 (Blue)			799-601-7170 (T-adapter)
	Part No. : 08056-11672	Part No. : 08056-11682	

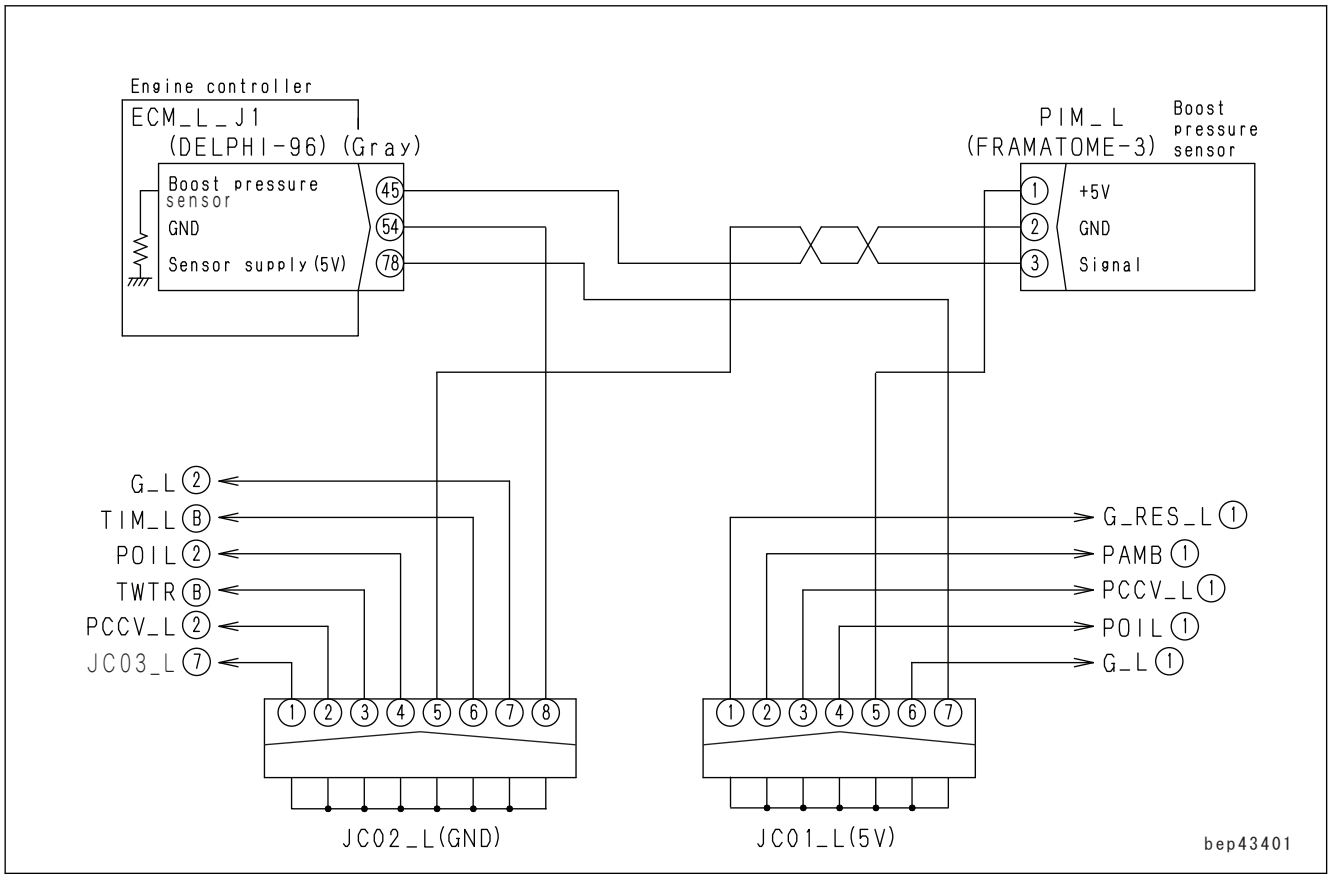
B4D18195

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	
799-601-7530	Adapter for 070	14	07-14							●								
799-601-7540	Adapter for 070	18	07-18							●								
799-601-7550	Adapter for 070	20	07-20							●								
799-601-7360	Adapter for relay	5	REL-5P															●
799-601-7370	Adapter for relay	6	REL-6P															●
799-601-7380	Adapter for JFC	2																●
799-601-9010	Adapter for DTM	2	DTM2									●		●				
799-601-9020	Adapter for DT	2	DT2									●		●		●	●	
799-601-9030	Adapter for DT	3	DT3									●		●				
799-601-9040	Adapter for DT	4	DT4									●		●		●	●	
799-601-9050	Adapter for DT	6	DT6									●		●				
799-601-9060	Adapter for DT (gray)	8	DT8GR									●		●				
799-601-9070	Adapter for DT (black)	8	DT8B									●		●				
799-601-9080	Adapter for DT (green)	8	DT8G									●		●				
799-601-9090	Adapter for DT (brown)	8	DT8BR									●		●				
799-601-9110	Adapter for DT (gray)	12	DT12GR									●		●				
799-601-9120	Adapter for DT (black)	12	DT12B									●		●				
799-601-9130	Adapter for DT (green)	12	DT12G									●		●				
799-601-9140	Adapter for DT (brown)	12	DT12BR									●		●				
799-601-9210	Adapter for HD30-18	8	D18-8									●	●					
799-601-9220	Adapter for HD30-18	14	D18-14									●	●					
799-601-9230	Adapter for HD30-18	20	D18-20									●	●					
799-601-9240	Adapter for HD30-18	21	D18-21									●	●					
799-601-9250	Adapter for HD30-24	9	D24-9									●	●					
799-601-9260	Adapter for HD30-24	16	D24-16									●	●					
799-601-9270	Adapter for HD30-24	21	D24-21									●	●					
799-601-9280	Adapter for HD30-24	23	D24-23									●	●					
799-601-9290	Adapter for HD30-24	31	D24-31									●	●					
799-601-9310	Plate for HD30 (24 pins)											●	●		●			
799-601-9320	T-box (for ECONO)	24										●	●		●			
799-601-9330	Case											●						
799-601-9340	Case												●					
799-601-9350	Adapter for DRC	40	DRC-40												●			
799-601-9360	Adapter for DRC	24	DRC-24												●			
799-601-9410*	Socket for engine (CRI-T2)	2	G															●

Failure code	Failure (displayed on screen)	Applicable equipment	Action level	History category	Remarks
DWNCKA	O/C Fan Pump control EPC Solenoid System Open Circuit	PUMP	L03	Electrical system	
DWNCKB	O/C Fan Pump Control EPC Solenoid System Short Circuit	PUMP	L03	Electrical system	
DWNPKA	Service Center RAISE Solenoid Open Circuit	VALVE2	L03	Electrical system	
DWNPKB	Service Center RAISE Solenoid Short Circuit	VALVE2	L03	Electrical system	
DWNPKY	Service Center RAISE Solenoid Hot Short Circuit	VALVE2	L01	Electrical system	
DWNQKA	Service Center LOWER Solenoid Open Circuit	VALVE2	L01	Electrical system	
DWNQKB	Service Center LOWER Solenoid Short Circuit	VALVE2	L01	Electrical system	
DWNQKY	Service Center LOWER Solenoid Hot Short Circuit	VALVE2	L01	Electrical system	
DWNRKA	Ladder RAISE Solenoid Open Circuit	VALVE2	L03	Electrical system	
DWNRKB	Ladder RAISE Solenoid Short Circuit	VALVE2	L03	Electrical system	
DWNRKY	Ladder RAISE Solenoid Hot Short Circuit	VALVE2	L03	Electrical system	
DWPNKA	L2 Arm Dump Cushion Solenoid Open Circuit	VALVE1	L01	Electrical system	
DWPNKB	L2 Arm Dump Cushion Solenoid Short Circuit	VALVE1	L01	Electrical system	
DWPNKY	L2 Arm Dump Cushion Solenoid Hot Short Circuit	VALVE1	L01	Electrical system	
DWPPKA	R1 Arm OUT EPC Cushion Solenoid Open Circuit	VALVE1	L01	Electrical system	
DWPPKB	R1 Arm OUT EPC Cushion Solenoid Short Circuit	VALVE1	L01	Electrical system	
DWPPKY	R1 Arm OUT EPC Cushion Solenoid Hot Short Circuit	VALVE1	L01	Electrical system	
DXAAKA	P1F Pump Control EPC Solenoid System Open Circuit	PUMP	L03	Electrical system	
DXAAKB	P1F Pump Control EPC Solenoid System Short Circuit	PUMP	L03	Electrical system	
DXABKA	P1R Pump Control EPC Solenoid System Open Circuit	PUMP	L03	Electrical system	
DXABKB	P1R Pump Control EPC Solenoid System Short Circuit	PUMP	L03	Electrical system	
DXACKA	P2F Pump Control EPC Solenoid System Open Circuit	PUMP	L03	Electrical system	
DXACKB	P2F Pump Control EPC Solenoid System Short Circuit	PUMP	L03	Electrical system	

No.	Cause	Procedure, measuring location, criteria and remarks		
4	Defective charge (boost) pressure sensor	1. Turn the starting switch to OFF position. 2. Insert the T-adapter into connector ECM_L_J1 or PIM_L. 3. Turn the starting switch to ON position.		
		Voltage	Between ECM_L_J1 (45) and (54), or between PIM_L (3) and (2)	0.3 to 4.7 V
5	Defective engine controller	If no failure is found by preceding checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit diagram related to charge pressure sensor



FAILURE CODE [CA271]

Action level	Failure code	Failure	PCV 1 Short Circuit Error (Engine controller system)
L03	CA271		
Detail of failure	Short circuit is detected in supply pump PCV1_L circuit.		
Action of controller	Stops driving PCV1_L.		
Phenomenon on machine	• Engine output is reduced. • Engine startability becomes poor.		
Related information	• Connectors of electrical parts around engine may be defective due to heat and vibration. See “RELATED INFORMATION ON TROUBLESHOOTING”, “CHECKS BEFORE TROUBLESHOOTING”, “Electrical equipment”, and check them according to the descriptions of wiring harness and connectors. • While engine is running normally, Approx. 24 V of pulse voltage is supplied to PCV1_L(1). Because it is pulse voltage, it cannot be measured by using multimeter. • After completion of repair, check with following operation that the failure code is cleared. Procedure: Start the engine.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective supply pump PCV1_L	1. Turn the starting switch to OFF position. 2. Disconnect the connector PCV1_L, and connect the socket to male side.		
		Resistance	Between PCV1_L (male) (1) and (2)	2.3 to 5.3 Ω
			Between PCV1_L (male) (1) and ground	Min. 1 MΩ
2	Ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors ECM_L_J1 and PCV1_L, and connect the T-adapter to each female side.		
		Resistance	Between ECM_L_J1 (female) (23) and ground	Min. 1 MΩ
			Between ECM_L_J1 (female) (24) and ground	Min. 1 MΩ
3	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Insert the T-adapter into connector ECM_L_J1. 3. Turn the starting switch to ON position.		
		Voltage	Between ECM_L_J1 (24) and ground	Max. 1 V
4	Short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connector ECM_L_J1, and connect the T-adapter to female side.		
		Resistance	Between ECM_L_J1 (female) (23) and (24) (PCV1_L resistance)	No continuity
5	Defective engine controller	If no failure is found by preceding checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

FAILURE CODE [CA442]

Action level	Failure code	Failure	HC Desorb Request 1 (Engine controller system)
L04	CA442		
Detail of failure	High voltage (Min. 36 V) is generated in power supply circuit of controller.		
Action of controller	Operates the engine with power supply voltage at fixed value of Approx. 6.0.		
Phenomenon on machine	Operates the engine normally but may stop it running during operation or prevent it from starting.		
Related information	• Connectors of electrical parts around engine may be defective due to heat and vibration. See “RELATED INFORMATION ON TROUBLESHOOTING”, “CHECKS BEFORE TROUBLESHOOTING”, “Electrical equipment”, and check them according to the descriptions of wiring harness and connectors. • Power supply voltage of engine controller can be checked by monitoring. (Code: 03203) • After completion of repair, check with following operation that the failure code is cleared. Procedure: Turn the starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective battery	Check the battery voltage and specific gravity of battery electrolyte.			
		Battery voltage (per 1 battery)	Min. 12 V		
		Battery voltage (2 batteries in series)	Min. 24 V		
		Specific gravity of battery electrolyte	Min. 1.26		
2	Defective alternator	1. Turn the starting switch to OFF position. 2. Start the engine.			
		Voltage	Between alternator terminal R and ground	Engine speed in medium or higher	26 to 30.5 V
3	Defective engine controller	If no failure is found by preceding checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)			

Circuit diagram related to engine Bkup speed sensor

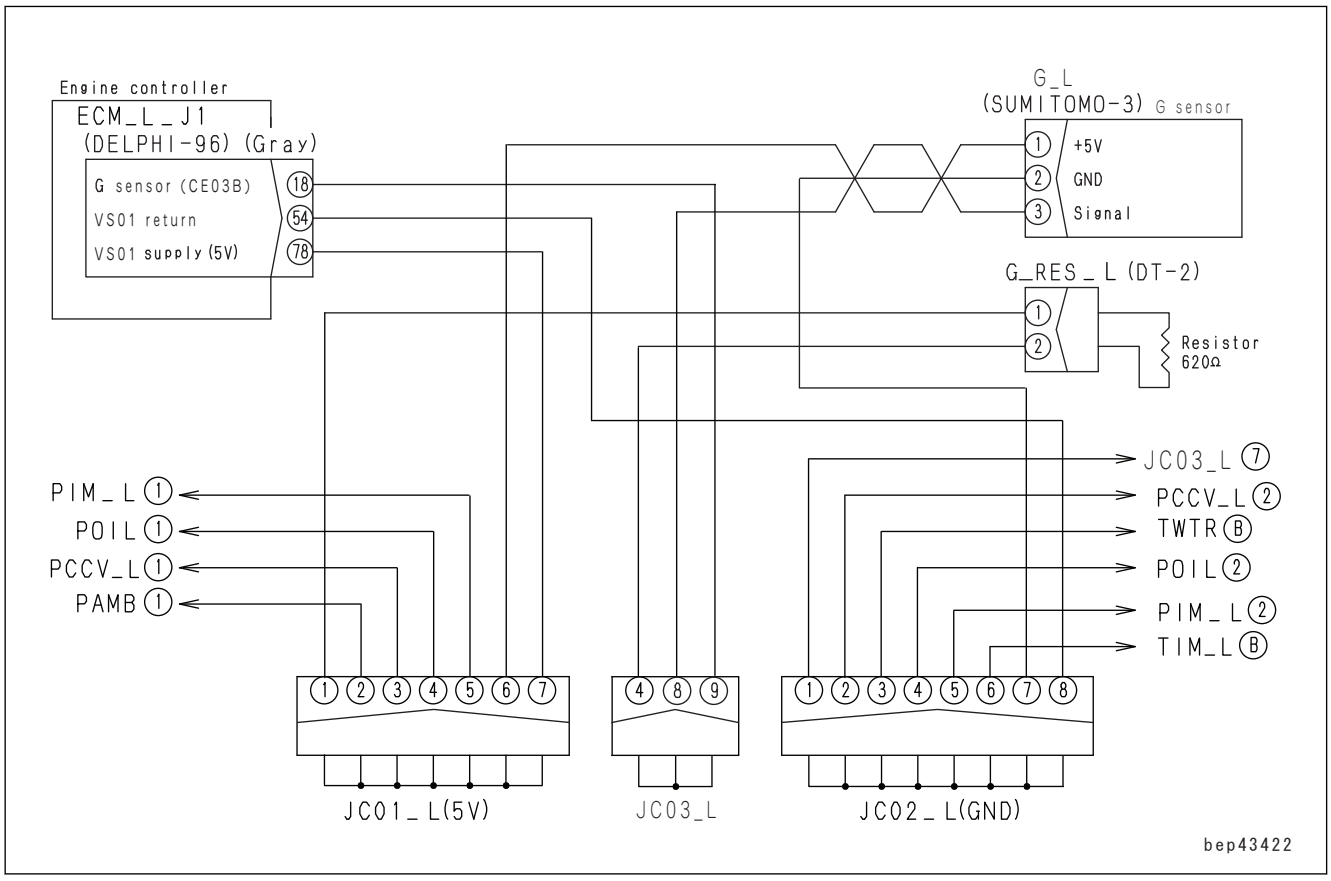
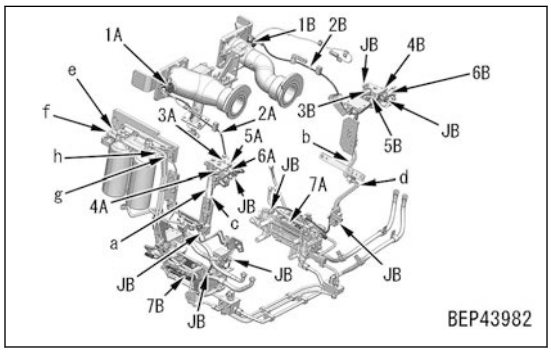
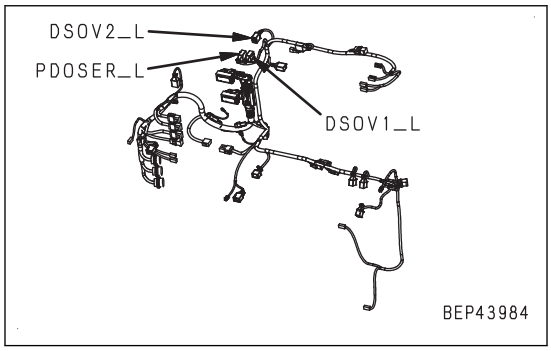
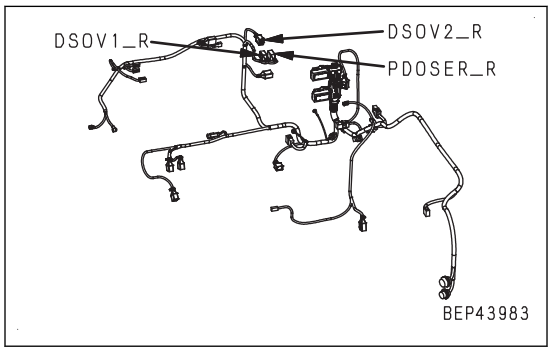


Diagram related to fuel doser

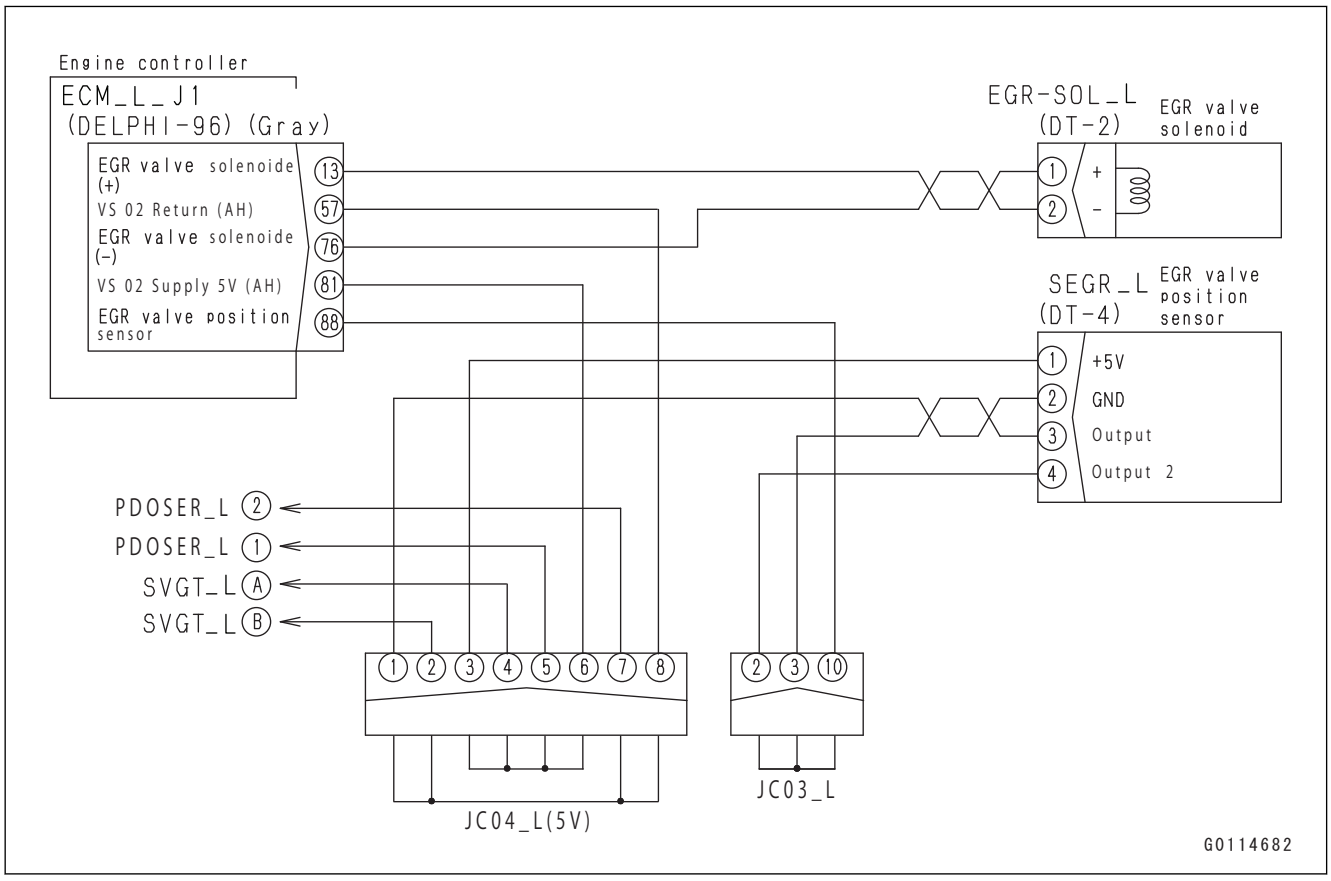






1A. Fuel doser-A
1B. Fuel doser-B
2A. Fuel supply line-A
2B. Fuel supply line-B
3A. Fuel doser solenoid valve 1-A (shut off valve)
3B. Fuel doser solenoid valve 1-B (shut off valve)
4A. Fuel doser solenoid valve 2-A (drain valve)
4B. Fuel doser solenoid valve 2-B (drain valve)
5A. Dosing fuel pressure sensor-A
5B. Dosing fuel pressure sensor-B
6A. Relief valve A
6B. Relief valve B
7A. Fuel feed pump A (fuel feed pump A)
7B. Fuel feed pump B (fuel feed pump B)
a: From fuel feed pump-A
b: From fuel feed pump-B
c: Fuel return (from fuel doser-A)
d: Fuel return (from fuel doser-B)
e: From LB cooling plate
f: To LB supply pump
g: From RB cooling plate
h: To RB supply pump
JB: Fuel tube joint bolt
PDOSER_L: Dosing fuel pressure sensor-A
PDOSER_R: Dosing fuel pressure sensor-B
DSOV1_L: Fuel doser solenoid valve 1-A (shut off valve)
DSOV2_L: Fuel doser solenoid valve 2-A (drain valve) connector
DSOV1_R: Fuel doser solenoid valve 1-B (drain valve) connector
DSOV2_R: Fuel doser solenoid valve 2-B (shut off valve) connector

Circuit diagram related to EGR valve solenoid



FAILURE CODE [CA3134]

Action level	Failure code	Failure	HC Desorb Request 1 (Engine controller system)
L03	CA3134		
Detail of failure	Low voltage is generated in signal circuit of KDPF outlet pressure sensor.		
Action of controller	Drives the value of KDPF differential pressure sensor at an estimated value (gauge pressure). (If another failure code is also displayed at the same time, controller may set it to 0 kPa (gauge pressure) and runs engine.)		
Phenomenon on machine	None in particular		
Related information	• Connectors of electrical parts around engine may be defective due to heat and vibration. See “RELATED INFORMATION ON TROUBLESHOOTING”, “CHECKS BEFORE TROUBLESHOOTING”, “Electrical equipment”, and check them according to the descriptions of wiring harness and connectors. ⚠ **KDPF is heated to Min. 500 °C. Be careful not to get burn injury.** • If failure code [CA1695] or [CA1696] is displayed, sensor power supply system may be defective. Perform troubleshooting for [CA1695] or [CA1696] first. • Signal voltage detected by KDPF outlet pressure sensor can be checked by monitoring. (Code: 47001) • Differential pressure detected by KDPF outlet pressure sensor can be checked by monitoring. (Code: 47000) • After completion of repair, check with following operation that the failure code is cleared. Procedure: Turn the starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Open circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors ECM_L_J2 and E25A, and connect the T-adapter to each female side.		
		Resistance	Between ECM_L_J2 (female) (32) and E25A (female) (1)	Max. 1 Ω
			Between ECM_L_J2 (female) (8) and E25A (female) (4)	Max. 1 Ω
			Between ECM_L_J2 (female) (41) and E25A (female) (2)	Max. 1 Ω
2	Ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors ECM_L_J2 and E25A, and connect T-adapter to either female side.		
		Resistance	Between ground and ECM_L_J2 (female) (42) or E25A (female) (3)	Min. 1 MΩ
3	Short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors ECM_L_J2 and E25A, and connect the T-adapter to female side of ECM_L_J2.		
		Continuity	Between ECM_L_J2 (female) (42) and each pin other than pin (42)	No continuity

FAILURE CODE [CA3321]

Action level	Failure code	Failure	HC Desorb Request 1 (Engine controller system)
L03	CA3321		
Detail of failure	Ground fault in KDPF outlet temperature sensor measuring section or probe (+) side		
Action of controller	• Uses KDOC outlet temperature for KDPF outlet temperature to run engine.(If failure is detected in KDOC outlet temperature sensor, too, controller takes it that KDPF outlet temperature is at default value (250 °C) and allows engine to run.) • Engine power deration. • Closes EGR valve. • Stops regeneration control. • Stops fuel dosing.		
Phenomenon on machine	• Control malfunction of active regeneration • Soot accumulation is high.		
Related information	• Connectors of electrical parts around engine may be defective due to heat and vibration. See “RELATED INFORMATION ON TROUBLESHOOTING”, “CHECKS BEFORE TROUBLESHOOTING”, “Electrical equipment”, and check them according to the descriptions of wiring harness and connectors. ⚠ **KDPF and KDOC are heated to Min. 500 °C. Be careful not to get burn injury.** • Engine power deration is canceled by turning the starting switch to OFF position after this failure code is cleared. (This deration is not canceled by simply failure code being cleared.) • After completion of repair, check with following operation that the failure code is cleared. Procedure: Turn the starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective KDOC outlet temperature sensor	1. Check the sensor connector for stain or damage. 2. Turn the starting switch to OFF position. 3. Replace KDPF temperature sensor. 4. Turn the starting switch to ON position. **REMARK** As to procedure for accessing KDOC inlet temperature sensor, KDOC outlet temperature sensor, and KDPF outlet temperature sensor, see DISASSEMBLY AND ASSEMBLY, “REMOVE AND INSTALL KDPF ASSEMBLY” and “DISASSEMBLE AND ASSEMBLE OF KDPF ASSEMBLY”.
		If this failure code is not displayed, the original KDPF outlet temperature sensor is defective. (Since this is an internal defect, troubleshooting cannot be performed.)
2	Defective engine controller	If no failure is found by preceding checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

FAILURE CODE [CB271]

Action level	Failure code	Failure	PCV 1 Short Circuit Error_2 (Engine controller system)
L03	CB271		
Detail of failure	Short circuit is detected in supply pump PCV1_R circuit.		
Action of controller	Stops driving PCV1_R.		
Phenomenon on machine	• Engine output is reduced. • Engine startability becomes poor.		
Related information	• Connectors of electrical parts around engine may be defective due to heat and vibration. See “RELATED INFORMATION ON TROUBLESHOOTING”, “CHECKS BEFORE TROUBLESHOOTING”, “Electrical equipment”, and check them according to the descriptions of wiring harness and connectors. • While engine is running normally, Approx. 24 V of pulse voltage is supplied to PCV1_R(1). Because it is pulse voltage, it cannot be measured by using multimeter. • After completion of repair, check with following operation that the failure code is cleared. Procedure: Start the engine.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective supply pump PCV1_R	1. Turn the starting switch to OFF position. 2. Disconnect the connector PCV1_R, and connect the socket to male side.		
		Resistance	Between PCV1_R (male) (1) and (2)	2.3 to 5.3 Ω
			Between PCV1_R (male) (1) and ground	Min. 1 MΩ
2	Ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors ECM_R_J1 and PCV1_R, and connect the T-adapter to each female side.		
		Resistance	Between ECM_R_J1 (female) (23) and ground	Min. 1 MΩ
			Between ECM_R_J1 (female) (24) and ground	Min. 1 MΩ
3	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Insert the T-adapter into connector ECM_R_J1. 3. Turn the starting switch to ON position.		
		Voltage	Between ECM_R_J1 (24) and ground	Max. 1 V
4	Short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connector ECM_R_J1, and connect the T-adapter to female side.		
		Resistance	Between ECM_R_J1 (female) (23) and (24) (PCV1_R resistance)	2.3 to 5.3 Ω
5	Defective engine controller	If no failure is found by preceding checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

C. Check of fuel circuit pressure		Testing conditions	Unit	Standard value (reference value)	Measured value	Good	No good
6	Fuel pressure	High idle	MPa {kg/cm^2}	0.15 to 0.3 {1.5 to 3.0}			

D. Check of strainer and filter		Good	No good
7	Visual check of strainer		
8	Visual check of gauze filter		
9	Visual check of fuel filter		
10	Visual check of bypass valve		

E. Check of leakage and return amount		Testing conditions	Unit	Standard value (reference value)	Measured value	Good	No good
11	Leakage from pressure limiter	High idle	cc/min	Max. 10			
12	Return amount from injector	Arm IN relief 1600 rpm	cc/min	960	Speed: Return amount:		
		Arm IN relief 1700 rpm	cc/min	1020			
		Arm IN relief 1800 rpm	cc/min	1080			
		Arm IN relief 1900 rpm	cc/min	1140			
		Arm IN relief 2000 rpm	cc/min	1200			

FAILURE CODE [CB1696]

Action level	Failure code	Failure	Sensor 5 Supply Voltage Low Error_2 (Engine controller system)
L03	CB1696		
Detail of failure	Low voltage error is detected in 5 V power supply of KDPF differential pressure sensor and KDPF outlet pressure sensor.		
Action of controller	• Drives KDPF outlet pressure sensor at estimated value (may drive at 0 kPa {0 kgf/cm^2}). • Sets KDPF differential pressure sensor value to an estimated value and continues operation (may operate at 0 kPa {0 kgf/cm^2}). • Closes EGR valve. • Engine power deration. • Stops regeneration control.		
Phenomenon on machine	Engine output is reduced.		
Related information	• Connectors of electrical parts around engine may be defective due to heat and vibration. See “RELATED INFORMATION ON TROUBLESHOOTING”, “CHECKS BEFORE TROUBLESHOOTING”, “Electrical equipment”, and check them according to the descriptions of wiring harness and connectors. • Engine power deration is canceled by turning the starting switch to OFF position after this failure code is cleared. (This deration is not canceled by simply failure code being cleared.) • After completion of repair, check with following operation that the failure code is cleared. Procedure: Turn the starting switch to ON position.		

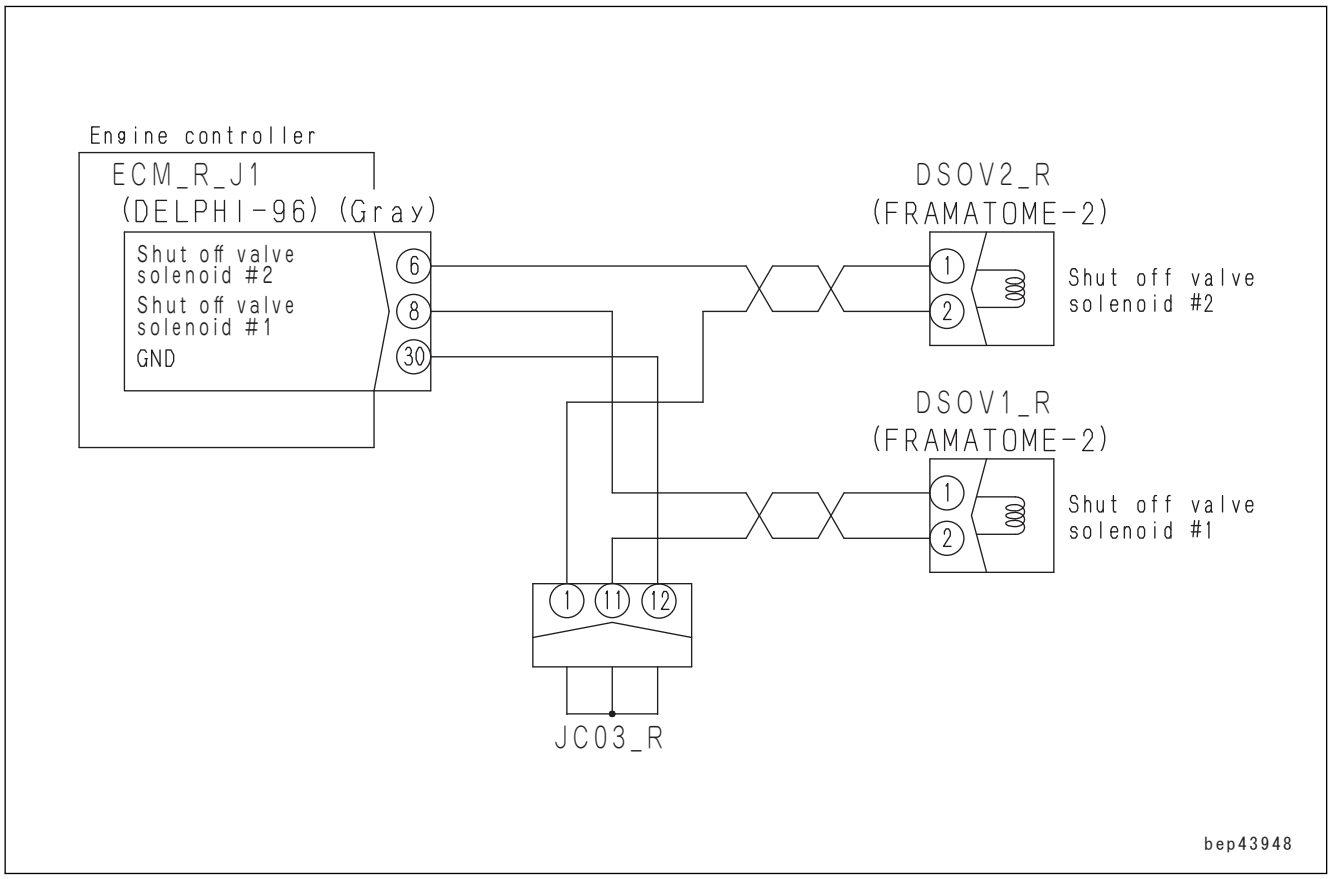
No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective KDPF differential pressure (outlet pressure) sensor	1. Turn the starting switch to OFF position. 2. Disconnect the connector E25B, and turn the starting switch to ON position. **REMARK** Since connector is disconnected, other failure codes are also displayed. Ignore all of displayed failure codes other than this one.		
		If this failure code is not displayed, KDPF differential pressure (outlet pressure) sensor is defective.		
2	Ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors ECM_R_J2 and E25B, and connect the T-adapter to either female side.		
		Resistance	Between ground and ECM_R_J2 (female) (8) or E25B (female) (4)	Min. 1 MΩ
3	Short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors ECM_R_J2 and E25B, and connect the T-adapter to female side of ECM_R_J2.		
		Resistance	Between ECM_R_J2 (female) (8) and each pin other than pin (8)	No continuity
4	Defective engine controller	If no failure is found by preceding checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

FAILURE CODE [CB1993]

Action level	Failure code	Failure	KDPF Differential Pressure Low Error_2 (Engine controller system)
L03	CB1993		
Detail of failure	Sensor voltage from KDPF differential pressure sensor is lower than threshold value.		
Action of controller	• Closes EGR valve. • Engine power deration. • Stops regeneration control. • Stops fuel dosing.		
Phenomenon on machine	Engine output is reduced.		
Related information	⚠ **KDPF is heated to Min. 500 °C. Be careful not to get burn injury.** • If failure code [CB1879] or [CB1881] or [CB1883] is displayed, KDPF differential pressure sensor system may be defective. Perform troubleshooting for [CB1879] or [CB1881] or [CB1883] first. • Engine power deration is canceled by turning the starting switch to OFF position after this failure code is cleared. (This deration is not canceled by simply failure code being cleared.) • To restart engine, wait until system operating lamp goes out after turning the starting switch to ON position. **NOTICE** • **This failure code requires machine operation for clearing the 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.** • **For machines that conform the regulation of Stage IV (until 2018), this failure code can be cleared by the Engine Controller Active Fault Clear. For details, see TESTING AND ADJUSTING, “SETTING AND OPERATING MACHINE MONITOR”, “SERVICE MODE”, “METHOD FOR SETTING WITH TESTING MENU (ENGINE CONTROLLER ACTIVE FAULT CLEAR)”.** • **For machines that conform the regulation of Stage V (2019 and after), this failure code cannot be cleared by the "Engine Controller Active Fault Clear". To clear the current failure code, see “TROUBLESHOOTING POINTS FOR AFTERTREATMENT SYSTEMS”, “Clearing Failure Code”.** • **When KDPF is replaced, perform the reset_2 after KDOC change and the reset_2 after KDPF change, then perform Manual Stationary Regeneration or Active Regeneration for Service.**		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Error of KCSF	1. Turn the starting switch to OFF position temporarily, and then turn it to ON position again. 2. Check if a failure code other than [CB1993] appears. 3. See TESTING AND ADJUSTING, “TEST EXHAUST GAS COLOR”, and check the exhaust gas color. (Check it at KDPF outlet (tale pipe).) 4. If it exceeds the standard value of the standard value table, KCSF is defective. Check the existence of KCSF, and check for a damage and mixed foreign material. If any abnormality is found, replace the KDPF.

Circuit diagram related to fuel doser solenoid valve 2



FAILURE CODE [CB3256]

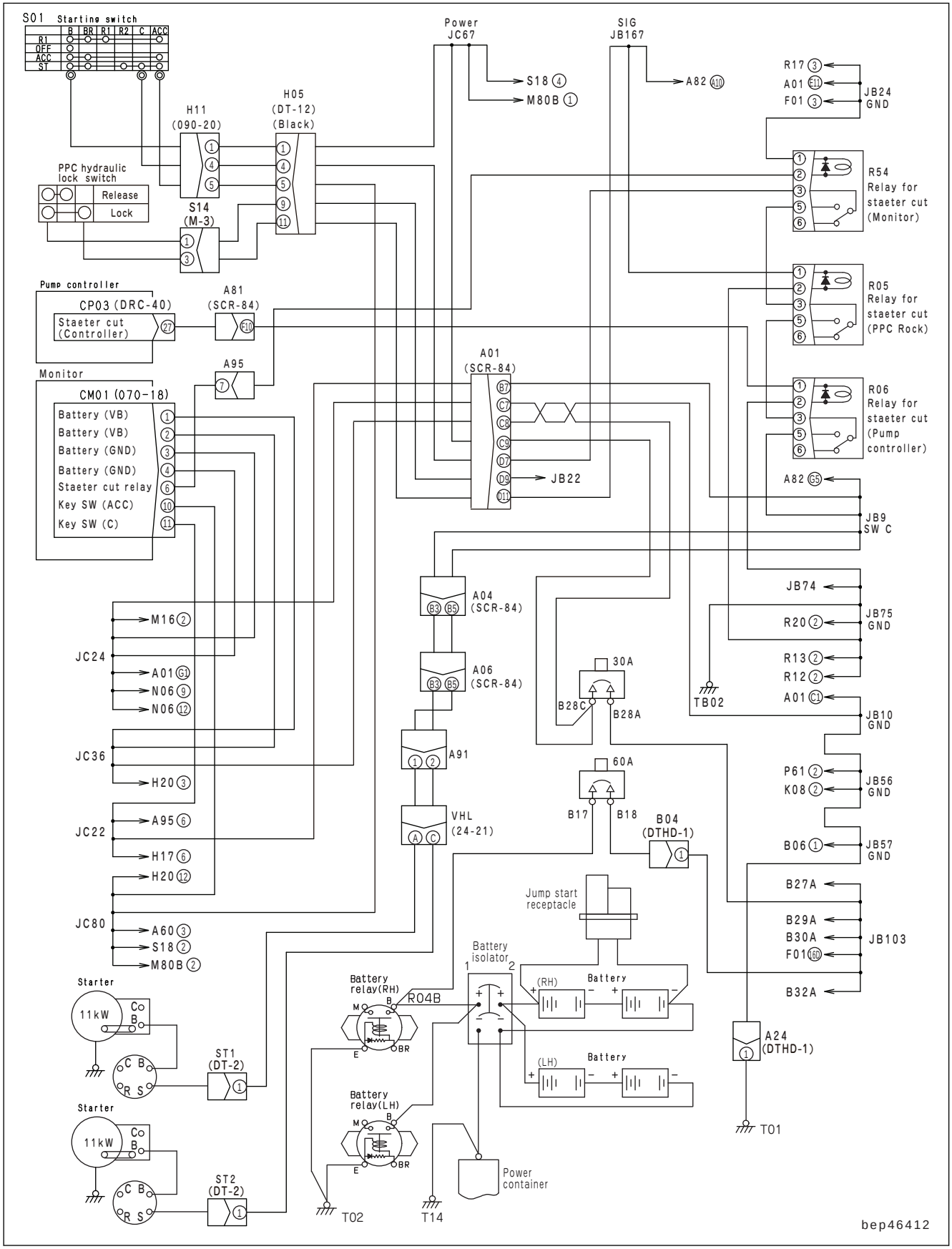
Action level	Failure code	Failure	KDPF Outlet Temperature High Error 1_2 (Engine controller system)
L01	CB3256		
Detail of failure	KDPF outlet temperature remains at high level.		
Action of controller	None in particular		
Phenomenon on machine	None in particular		
Related information	• Connectors of electrical parts around engine may be defective due to heat and vibration. See “RELATED INFORMATION ON TROUBLESHOOTING”, “CHECKS BEFORE TROUBLESHOOTING”, “Electrical equipment”, and check them according to the descriptions of wiring harness and connectors. ⚠ **KDPF and KDOC are heated to Min. 500 °C. Be careful not to get burn injury.** • If failure code [CB3319] or [CB3321] or [CB3322] is displayed, KDPF outlet temperature sensor may be defective. Perform troubleshooting for [CB3319] or [CB3321] or [CB3322] first. • When misfire occurs, 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. • To restart engine, wait until system operating lamp goes out after turning the starting switch to OFF position, and then turn the starting switch to ON position. **NOTICE** **If this failure code is displayed, KCSF may be damaged. Check followings after repairing this failure code.** 1. See TESTING AND ADJUSTING, “TEST EXHAUST GAS COLOR”, and check the exhaust gas color. (Check it at KDPF outlet (tale pipe).) If it exceeds the standard value of the standard value table, replace KDPF. • When checking the exhaust gas color, perform Regeneration Disable from the machine monitor. 2. To finish the exhaust gas color check, cancel Regeneration Disable. **NOTICE** • **This failure code requires machine operation for clearing the 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 can be cleared by performing “Engine Controller Active Fault Clear”. (For details, see TESTING AND ADJUSTING, “ELECTRICAL SYSTEM”, “SET AND OPERATE MACHINE MONITOR”, “SERVICE MODE” and “Diagnostic Tests”, “METHOD FOR SETTING WITH TESTING MENU (ENGINE CONTROLLER ACTIVE FAULT CLEAR)”.)**		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective intake system	Check air intake hoses, clamps, and tubes for damage and loosening. Repair as necessary.
2	Defective injector	As a result of the check in the cylinder cut-out mode, a cylinder running at the unchanged speed is found. (For details, see TESTING AND ADJUSTING, “HANDLE CYLINDER CUT-OUT MODE OPERATION”.)

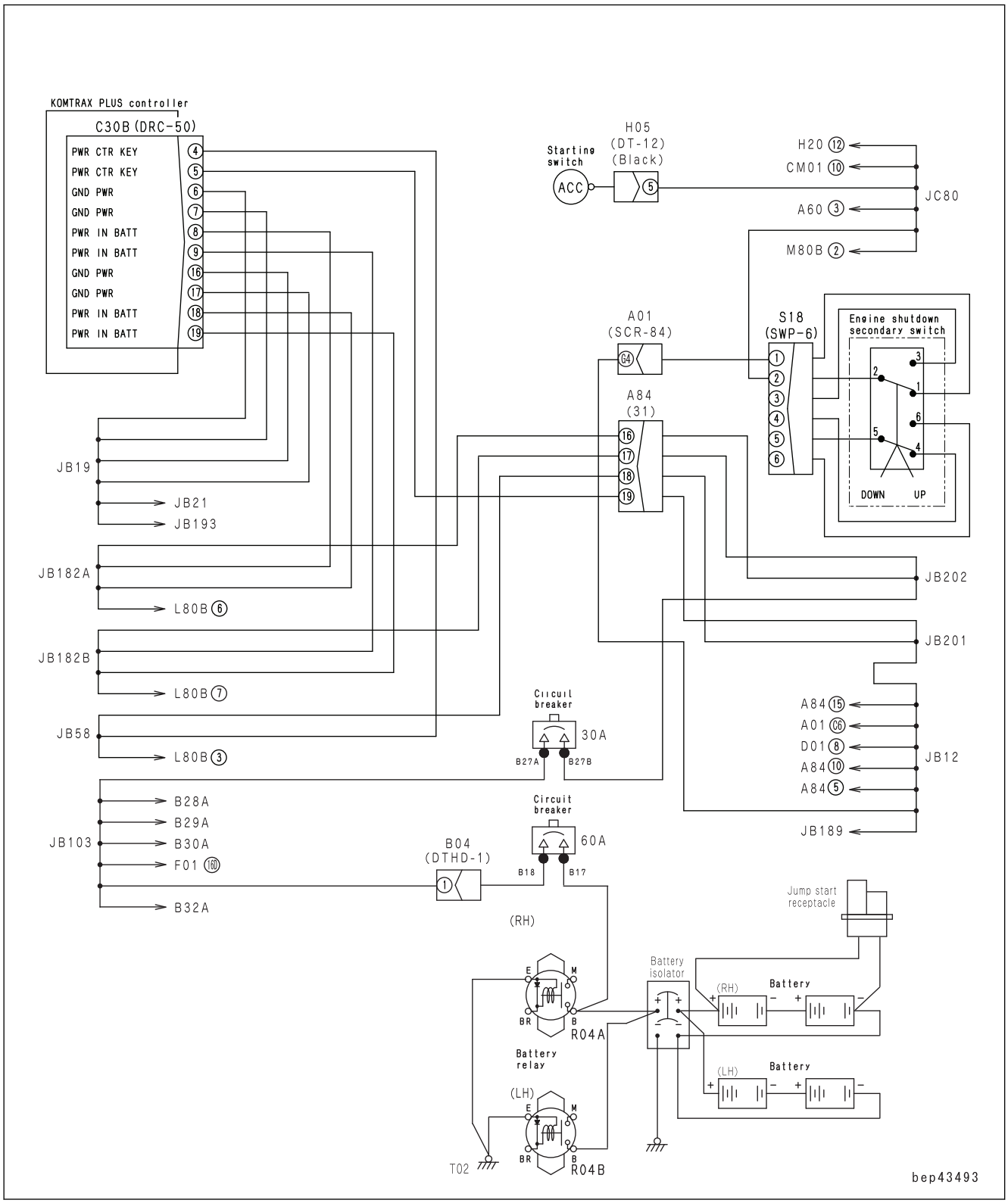
No.	Cause	Procedure, measuring location, criteria and remarks
2	Defective KDPF temperature sensor	1. Turn the starting switch to OFF position. 2. Replace the KDPF temperature sensor (E26B). 3. Turn the starting switch to ON position. **REMARK** For KDPF temperature sensor replacement, see DISASSEMBLY AND ASSEMBLY, “DISASSEMBLE AND ASSEMBLE OF KDPF ASSEMBLY”.
		If this failure code is cleared, the original sensor is defective. (Since this is an internal defect, troubleshooting cannot be performed.)
3	Defective engine controller	If no failure is found by preceding checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="5">4</td><td rowspan="5">Open circuit in wiring harness</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Check that the system operating lamp is turned off, and then turn the battery disconnect switch to OFF position.
3. Disconnect the connectors CP02 and B01, and connect the T-adapters to female side of CP02, male side of B01, and female side of B01.</td></tr>
<tr><td rowspan="4">Resistance</td><td>Between CP02 (female) (116) and B01 (male) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP02 (female) (118) and B01 (male) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP02 (female) (121) and B01 (male) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between B01 (female) (2) and R03</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Ground fault in wiring harness</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Check that the system operating lamp is turned off, and then turn the battery disconnect switch to OFF position.
3. Disconnect the connectors CP02 and B01, and connect the T-adapters to either female side of CP02 and male side or female side of B01.</td></tr>
<tr><td rowspan="2">Resistance</td><td>Between ground and any of CP02 (female) (116), (118), (121), and B01 (male) (2)</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between ground and either B01 (female) (2) or R03</td><td>Min. 1 MΩ</td></tr>
<tr><td>6</td><td>Defective pump controller</td><td colspan="3">If no failure is found by above checks, pump controller is defective. (Since this is an internal defect, troubleshooting cannot be performed).</td></tr>
</table>

Circuit diagram related to monitor controller power supply

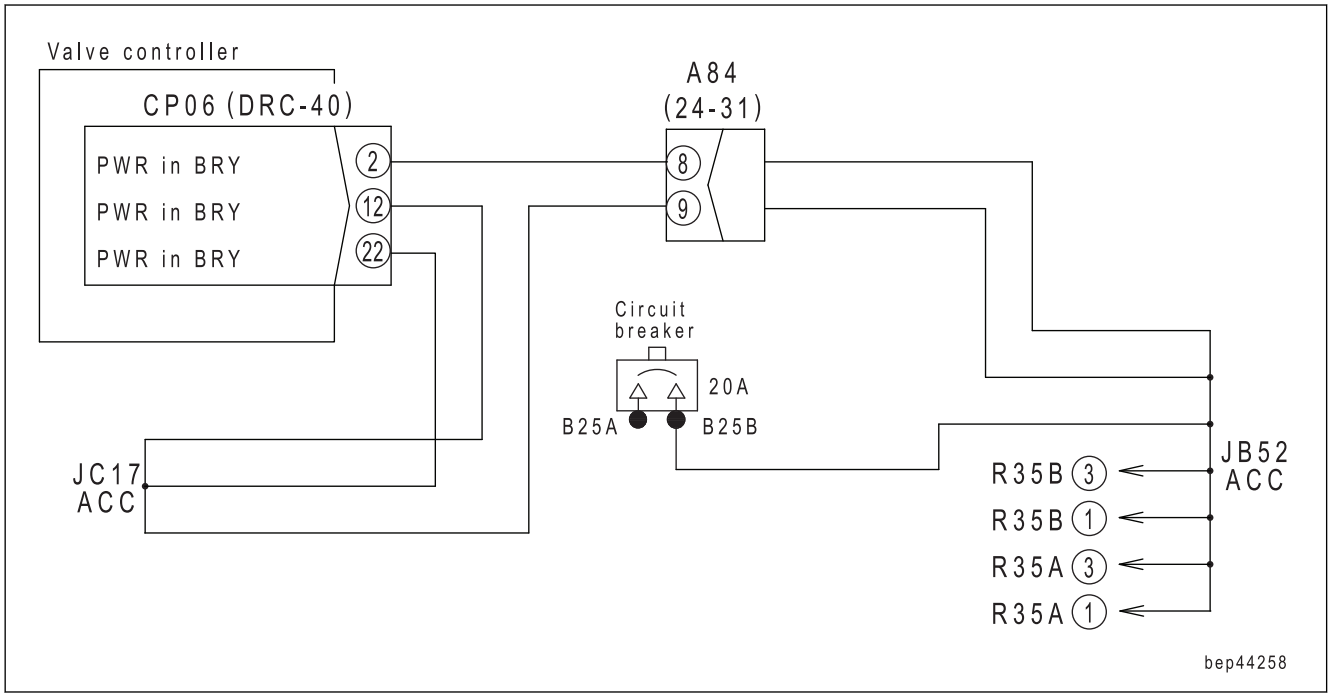


Circuit diagram related to KOMTRAX Plus power supply



No.	Cause	Procedure, measuring location, criteria and remarks		
4	Ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Check that the system operating lamp is turned off, and then turn the battery disconnect switch to OFF position. 3. Disconnect the connectors CP06 and B25B, and connect them to T-adapter.		
		Resistance	Between CP06 (female) (2) and ground	Min. 1 MΩ
			Between CP06 (female) (12) and ground	Min. 1 MΩ
			Between CP06 (female) (22) and ground	Min. 1 MΩ
			Between B25B and ground	Min. 1 MΩ
5	Defective valve 1 controller	If no failure is found by above checks, valve 1 controller is defective. (Since this is an internal defect, troubleshooting cannot be performed).		

Circuit diagram related to valve 1 controller solenoid



FAILURE CODE [DDNRKA]

Action level	Failure code	Failure	Work Equipment Lever Lock Switch Open Circuit (Pump controller system)
L03	DDNRKA		
Detail of failure	• Signal voltage of PPC lock lever relay side circuit is Max. 1.8 V when work equipment lock lever is in FREE position. • PPC lock signal voltage of controller side circuit is Max. 1.8 V when work equipment lock lever is in LOCK position.		
Action of controller	• None in particular (Lock lever auto lock control may malfunction) • If cause of failure disappears, machine becomes normal by itself.		
Phenomenon on machine	Starting motor does not start.		
Related information	• State of lock lever can be checked with monitoring function. (Code: 02203) Lock lever (Start side) ON: Lock, OFF: Free Lock lever 2 (Solenoid side) ON: Lock, OFF: Free • Method of reproducing failure code: Turn the starting switch to ON position + Move the work equipment lever to each of LOCK and FREE.		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective fuse No. 3 in fuse box F01	If fuse is burnt out, circuit may have ground fault, etc.			
2	Defective lock lever switch	1. Turn the starting switch to OFF position. 2. Disconnect the connector S23, and connect the T-adapter to female side. 3. Operate lock lever and perform troubleshooting.			
		Resistance	Between S23 (female) (1) and (2)	Lock lever: LOCK	Min. 1 MΩ
				Lock lever: FREE	Max. 1 Ω
3	Open circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors CP04 and S23, and connect the T-adapter to female side of CP04 and male side of S23.			
		Resistance	Between CP04 (female) (11) and S23 (male) (3)	Lock	Max. 1 Ω
			Between CP04 (female) (24) and S23 (male) (2)	FREE	Max. 1 Ω
4	Defective pump controller	If no failure is found by preceding checks, pump controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)			

FAILURE CODE [DHPEMA]

Action level	Failure code	Failure	VR1/ P1F Pump Pressure Sensor Malfunction
L03	DHPEMA		
Detail of failure	VR1 P1F pump pressure sensor voltage is Max. 0.3 V or Min. 4.5 V.		
Action of controller	Controls pump swash plate angle, assuming P1F pump pressure equivalent to 29.4 MPa.		
Phenomenon on machine	Work equipment may operate slowly during medium-load work.		
Related information	After completion of repair, check with following operation that the failure code is cleared. Procedure: Turn the starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective 5 V sensor 1 power supply system	1. Turn the starting switch to OFF position. 2. Disconnect the connector P32, and connect the T-adapter to female side. 3. Turn the starting switch to ON position.			
		Voltage	Between P32 (female) (3) and (1)	Power supply	4.5 to 5.5 V
2	Defective VR1/ P1F pump pressure sensor	1. Turn the starting switch to OFF position. 2. Insert the T-adapter into connector P32. 3. Turn the starting switch to ON position.			
		Voltage	Between P32 (2) and (1)		0.5 to 4.5 V
3	Open circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors CP01, CP02, and P32, and connect T-adapter to each female side.			
		Resistance	Between CP01 (female) (4) and P32 (female) (1)		Max. 1 Ω
			Between CP01 (female) (8) and P32 (female) (2)		Max. 1 Ω
			Between CP02 (female) (1) and P32 (female) (3)		Max. 1 Ω
4	Ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors CP01 and P32, and connect the T-adapter to either female side.			
		Resistance	Between CP01 (female) (8) and ground, or P32 (female) (2) and ground		Min. 1 MΩ
5	Short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors CP01 and P32, and connect the T-adapter to female side of CP01.			
		Resistance	Between CP01 (female) (8) and each pin other than (8)		No continuity
6	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connector P32. 3. Connect the T-adapter to female side of connector P32. 4. Turn the starting switch to ON position.			
		Voltage	Between P32 (female) (2) and ground		Max. 1 V

FAILURE CODE [DHSFMA]

Action level	Failure code	Failure	Travel Forward Left PPC Pressure Sensor Abnormality (Pump controller system)
L01	DHSFMA		
Detail of failure	Signal voltage of travel forward left PPC pressure sensor circuit is Max. 0.3 V or Min. 4.5 V.		
Action of controller	Controls travel forward left PPC pressure sensor as 0 MPa. If cause of failure disappears, machine becomes normal by itself.		
Phenomenon on machine	Auto-deceleration function cannot be reset. Operability of travel is poor.		
Related information	**REMARK** If 5V circuit (3) and GND circuit (1) of pressure sensor are connected inversely, pressure sensor will break. Accordingly, take extreme care when checking. • As T-adapter for pump controller connector is “socket-type box”, operating voltage cannot be measured at pump controller connector. • Travel forward left PPC pressure can be checked with monitoring function. (Code: 07102 Travel forward left PPC pressure) • After completion of repair, check with following operation that the failure code is cleared. Procedure: Turn the starting switch to ON position or start the engine.		

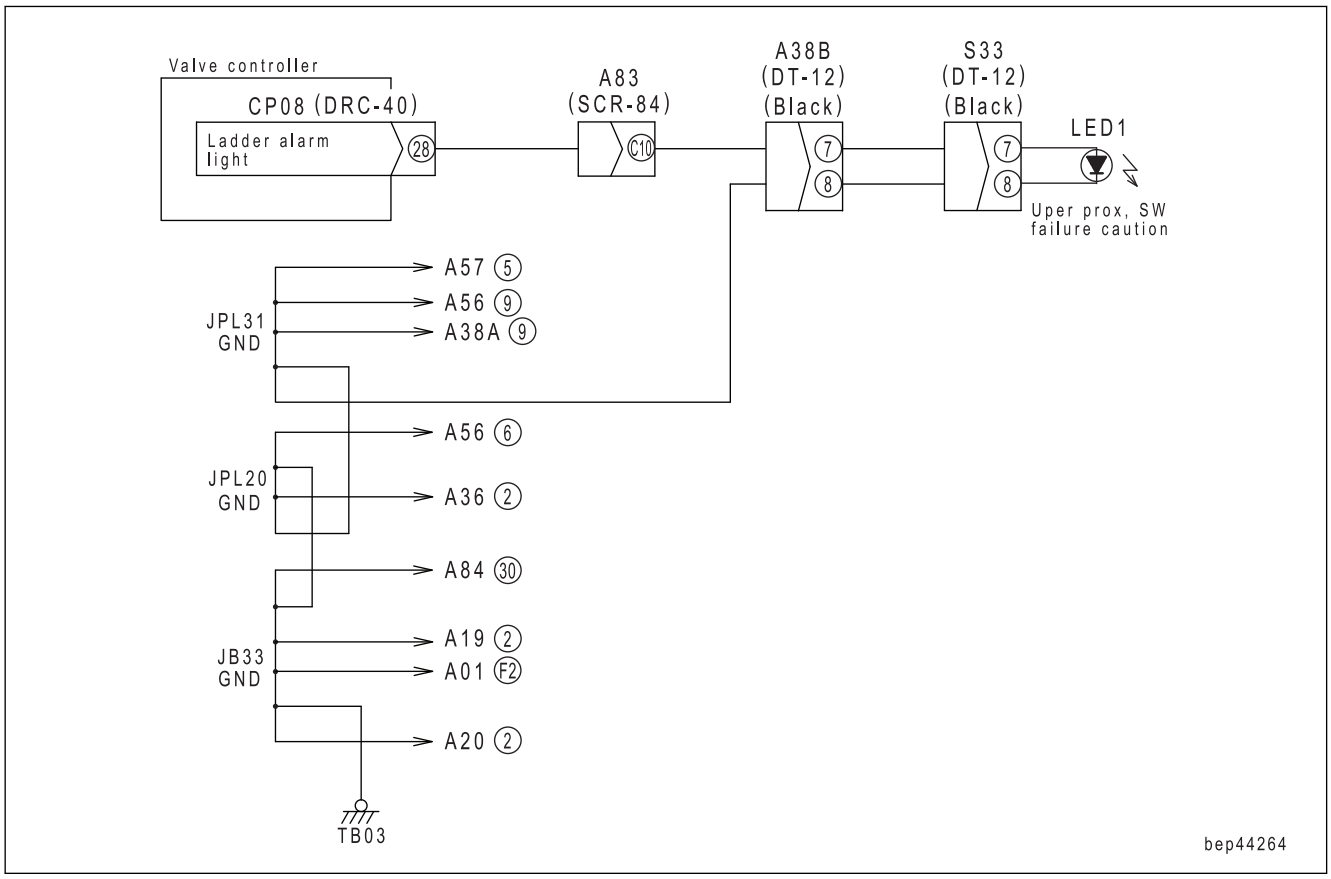
No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective 5 V sensor 1 power supply system	If failure code [DA26KP] is also displayed, perform troubleshooting for that code first.			
		1. Turn the starting switch to OFF position. 2. Disconnect the connector P09, and connect the T-adapter to female side. 3. Turn the starting switch to ON position. If power supply voltage is abnormal, go to check on cause 3 and after.			
		Voltage	Between P09 (female) (3) and (1)	Power supply	4.5 to 5.5 V
2	Defective travel forward left PPC pressure sensor (Internal defect)	1. Turn the starting switch to OFF position. 2. Insert the T-adapter into connector P09. 3. Turn the starting switch to ON position.			
		Voltage	Between P09 (2) and (1)	Sensor output	0.5 to 4.5 V
		REMARK If power supply voltage is normal and sensor output voltage is abnormal, it is difficult to determine the failure between ground fault and hot short circuit in wiring harness. Check as follows. 1. Turn the starting switch to OFF position. 2. Exchange the connector P09 with connector of other PPC pressure sensor. 3. Turn the starting switch to ON position, and display “Electrical System Abnormality Record” screen of machine monitor. 4. If E mark is not displayed again in this failure code column, travel forward left PPC pressure sensor is defective. **REMARK** After troubleshooting, restore the connector.			

FAILURE CODE [DKULKA]

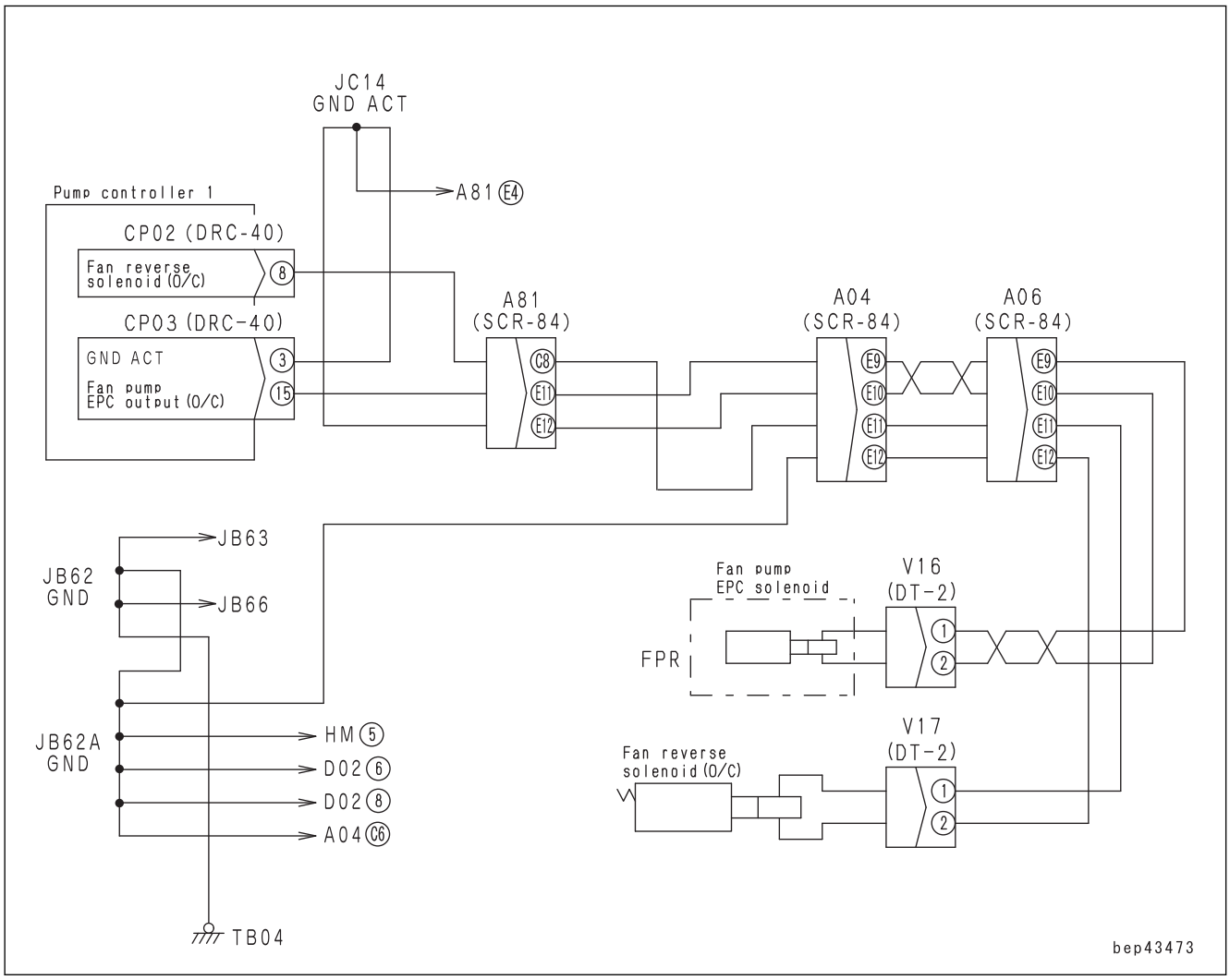
Action level	Failure code	Failure	PPC Lock Relay Open Circuit (Pump controller system)
L03	DKULKA		
Detail of failure	When controller does not drive PPC lock relay, relay output pressure of controller is higher than specified value, and open circuit is detected		
Action of controller	If cause of failure disappears, machine becomes normal by itself.		
Phenomenon on machine	Since PPC lock is kept applied, work equipment cannot operated.		
Related information	• This failure code checks primary side of relay, but does not check secondary side. • After completion of repair work, check that work equipment can be operated by the following operation. Procedure: Turn the starting switch to ON position + Release the work equipment lock lever + Turn the work equipment lever ON		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective battery cut-off relay R48	1. Turn the starting switch to OFF position. 2. Disconnect the connector R48, and connect the T-adapter to male side.		
		Resistance	Between R48 (male) (1) and (2)	200 to 600 Ω
2	Open circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connector CP05 and relay R48, and connect the T-adapter to female side.		
		Resistance	Between CP05 (female) (19) and R48 (female) (1)	Max. 1 Ω
			Between R48 (female) (2) and ground	Max. 1 Ω
3	Defective pump controller	If no failure is found by preceding checks, pump controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

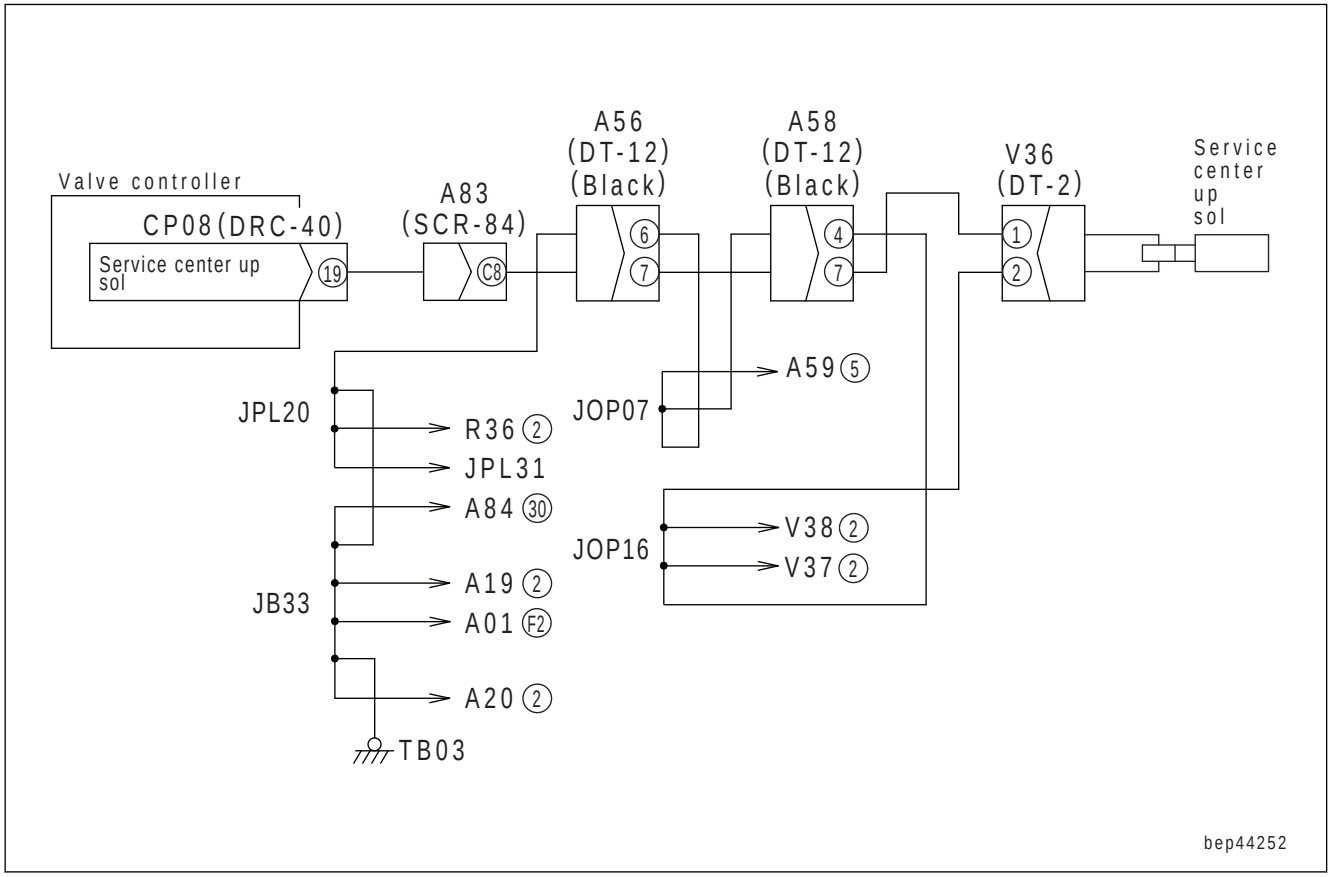
Circuit diagram related to caution lamp



Circuit diagram related to O/C fan reverse solenoid



Circuit diagram related to service center RAISE solenoid

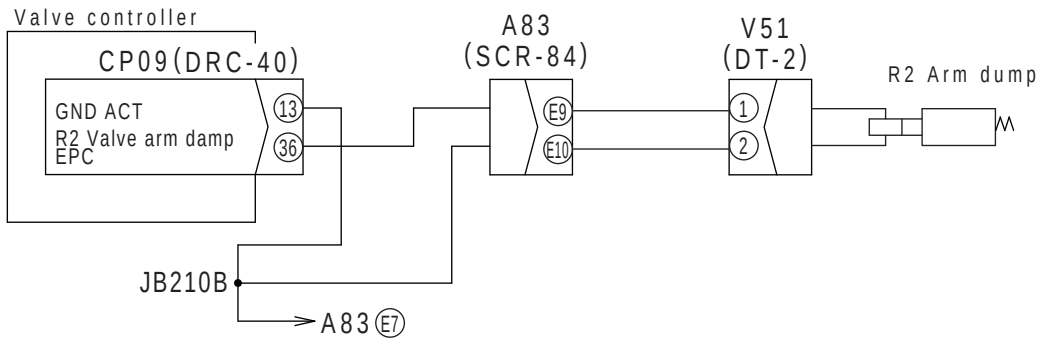


FAILURE CODE [DXRAKY]

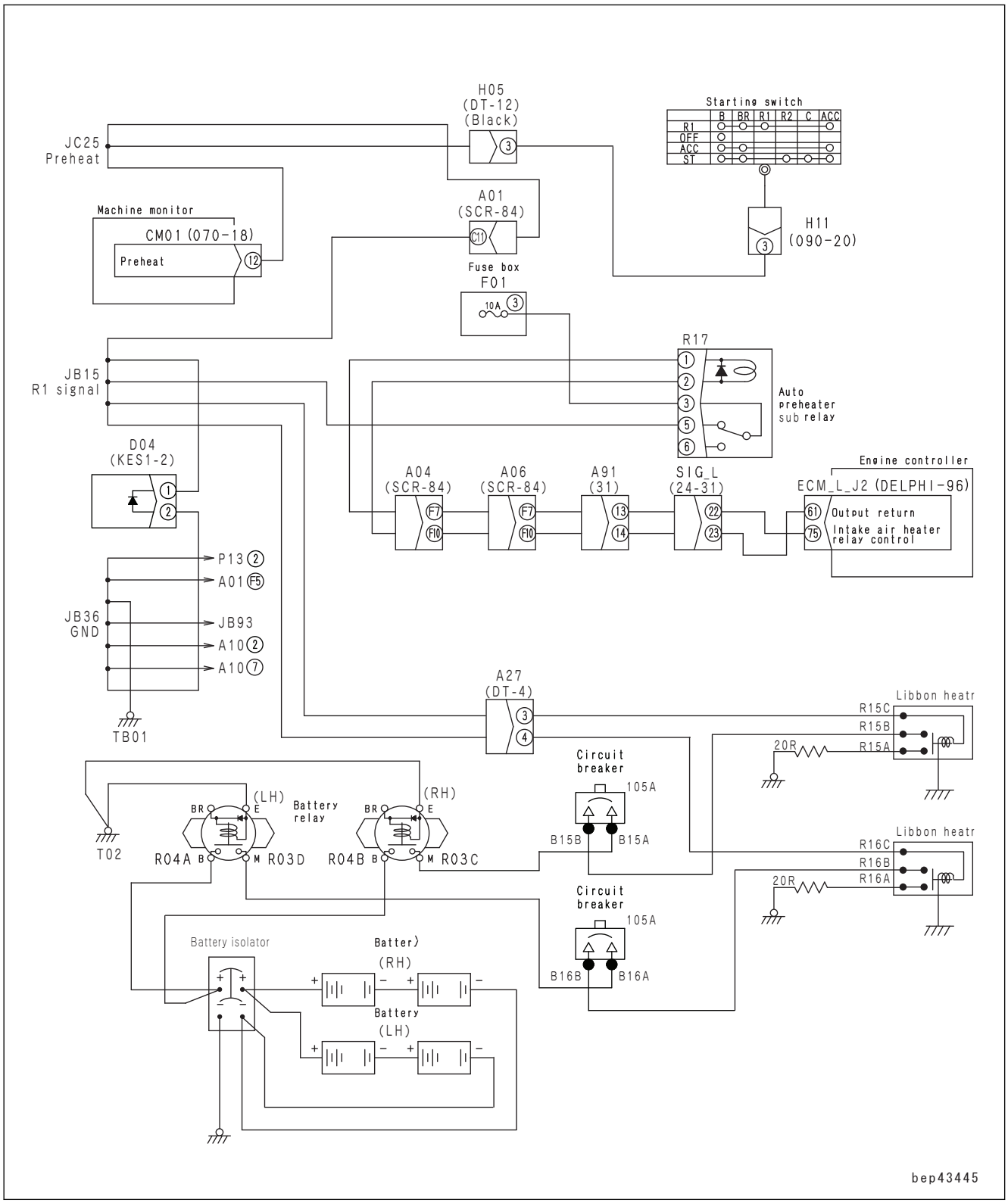
Action level	Failure code	Failure	R2 Valve Arm OUT EPC Hot Short Circuit
L03	DXRAKY		
Detail of failure	Solenoid power supply voltage is Min. 18 V and terminal voltage when output is OFF is Min. 2.6 V.		
Action of controller	None		
Phenomenon on machine	Work equipment operates slowly.		
Related information	After completion of repair, check with following operation that the failure code is cleared. Procedure: Turn the starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connector V51, and connect the T-adapter to female side. 3. Turn the starting switch to ON position.		
		Voltage	Between V51 (female) (1) and ground	Max. 4.5 V
2	Defective valve controller 2	If no failure is found by above checks, valve controller 2 is defective. (Since this is an internal defect, troubleshooting cannot be performed).		

Circuit diagram related to R2 valve arm OUT EPC



Circuit diagram related to the engine preheating



E-33 WHEN SWING BRAKE CANCEL SWITCH IS SET TO CANCEL POSITION, MACHINE CANNOT SWING

Failure	Upper structure does not swing while swing parking brake cancel switch is set to CANCEL position.
Related information	Signal state of the swing lock switch can be checked with the monitoring function. (Code: 02200)

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective fuse No.1 in the fuse box F01	If the fuse is burnt out, it is highly probable that the circuit has a ground fault. In this case, perform check on cause 5 first.			
2	Defective swing parking brake cancel switch (internal short circuit)	1. Turn the starting switch to OFF position. 2. Disconnect the connector A32, and connect the T-adapter to the male side.			
		Resistance	Between A32 (male) (2) and (3)	Swing parking brake cancel switch: Normal	Min. 1 MΩ
				Swing parking brake cancel switch: Cancel	Max. 1 Ω
3	Defective diode array D01 (internal short circuit)	1. Turn the starting switch to OFF position. 2. Remove diode array and connect T-adapter to male side.			
		Continuity	Between D01 (male) (7) (+) and (3) (-)		Continuity
		Continuity	Between D01 (male) (3) (+) and (7) (-)		No continuity
4	Defective wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connector V20, and connect the T-adapter to the female side. 3. Turn the starting switch to ON position. 4. Turn off the swing lock switch.			
		Voltage	Between V20 (female) (1) and (2)	Swing parking brake cancel switch: Cancel	20 to 30 V
				Swing parking brake cancel switch: Normal	Max. 1 V
5	Open circuit in wiring harness	If no failure is found by check on cause 5, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect the connectors V20 and A32, and connect the T-adapter to each female side. 3. Turn off the swing lock switch.			
		Resistance	Between V20 (female) (1) and A32 (female) (3)		Max. 1 Ω
			Between V20 (female) (2) and ground		Max. 1 Ω
6	Ground fault in wiring harness	If no failure is found by check on cause 5, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect the connectors A32 and V20, and connect the T-adapter to the female side of V20.			
		Resistance	Between V20 (female) (1) and ground		Min. 1 MΩ

E-52 SWING INDICATOR IS NOT DISPLAYED PROPERLY WITH MONITORING FUNCTION

Failure	“Swing” indicator is not displayed properly with monitoring function.
Related information	Monitoring code: 01914

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective swing PPC oil pressure sensor system (internal open or short circuit)	Perform troubleshooting for failure code [DHSAMA] or [DHSBMA].

H-13 HYDRAULIC DRIFT OF BOOM IS LARGE

Failure	Hydraulic drift of boom is large.
Related information	

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective boom control valve (spool) seal	The boom control valve (Lo, Hi) spool seal may be defective. Check it directly.		
2	Defective boom control valve (Safety & suction valve)	The boom control valve (Lo) safety & suction valve may be defective. Check it directly (to replace with other work equipment circuit, be sure to return it after troubleshooting is completed since the set pressure and structure are different).		
3	Defective boom cylinder seal	Be ready with the engine stopped, and then perform troubleshooting with the engine at high idle.		
		Oil leakage from cylinder	R.H. work equipment control lever: Boom RAISE to hydraulic relief	Max. 20 cc/min

No.	Cause	Point to check, remarks	Remedy
12	Seizure and damage of VGT	• Unusual noise is heard from VGT. • Check if VGT shaft rotates (by manually moving VGT's blade axially and vertically).	VGT replacement
13	Defective valve clearance	• When engine is operated, unusual noise is heard from around cylinder head. • Check the valve clearance. (Reference: See TESTING AND ADJUSTING, “TEST AND ADJUST VALVE CLEARANCE”.)	Valve clearance adjustment
14	Defective contact of valve and valve seat	• Measure the compression pressure (see standard value table). (Reference: See TESTING AND ADJUSTING, “TEST COMPRESSION PRESSURE”.) • Check the valve clearance. (Reference: See TESTING AND ADJUSTING, “TEST AND ADJUST VALVE CLEARANCE”.)	Valve or valve seat repair or replacement
15	Defective piston ring	• Remove the plug of hole for measuring the exhaust gas color before KDPF, and check the exhaust gas color. (Reference: See TESTING AND ADJUSTING “TEST EXHAUST GAS COLOR”) • Measure the compression pressure (see standard value table). (Reference: See TESTING AND ADJUSTING, “TEST COMPRESSION PRESSURE”.) • Check the piston ring and piston ring groove.	Piston ring and piston replacement
16	Defective engine controller	Since this is an internal defect, troubleshooting cannot be performed.	Engine controller replacement

Symbol		Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
B	1	798-102-2102	Spring pusher	■	1			Disassembling and assembling the cylinder head
	2	795-102-2110	Handle	■	1			
	3	795-102-2120	Bracket	■	1			
	4	795-102-4210	Bracket	■	1			
	5	01016-50830	Bolt	■	1			
	6	01580-10806	Nut	■	1			
	7	01144-31270	Stud	■	1			
	8	01580-11210	Nut	■	1			
C		795-331-1110	Wrench	■	1			Angle tightening of the bolt

Tools for removing and installing the radiator assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	Commercially available	Hose remover	■	1			

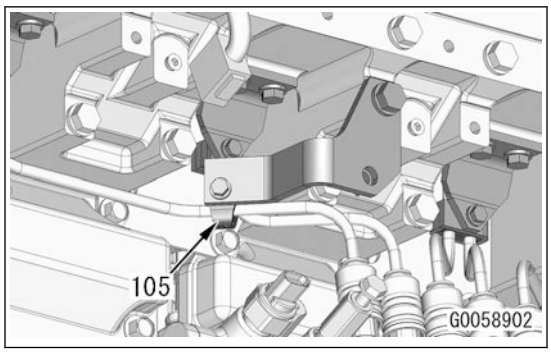
Tools for removing and installing the hydraulic oil cooler assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	Commercially available	Guide bolt (M10 × 190 mm)	■	1			

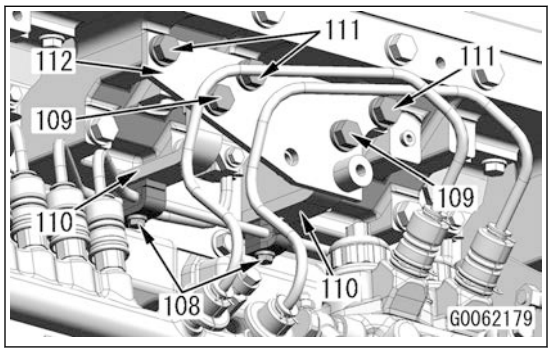
Tools for removing and installing cooling fan motor assembly

Symbol		Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	1	07376-70422	Plug (Nominal: 04)	■	3			For disconnecting hoses and tubes
	2	02789-00422	Cap (Nominal: 04)	■	3			
B	1	07376-70522	Plug (Nominal: 05)	■	1			
	2	02789-00522	Cap (Nominal: 05)	■	1			
C	1	07376-70628	Plug (Nominal: 06)	■	5			
	2	02789-00628	Cap (Nominal: 06)	■	5			

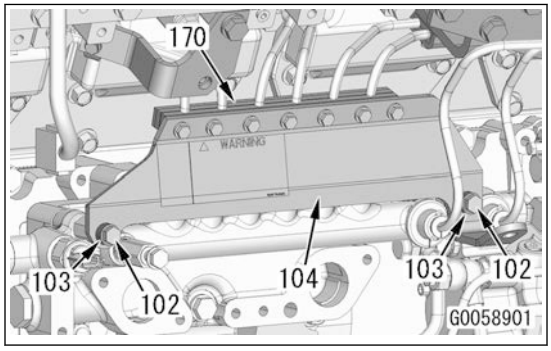
19. Fasten clamp (105) lightly.
    Tool: Ratchet handle, socket
    Bolt for clamp (105): Width across flats 10 mm, M6



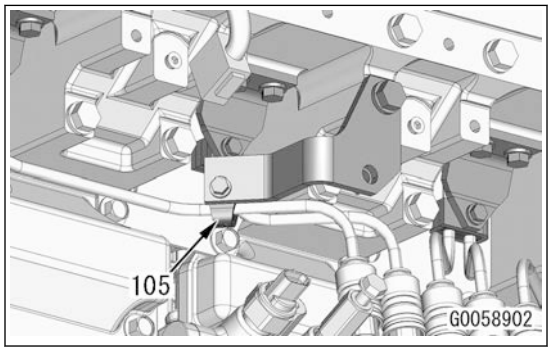
20. Lightly fasten plate (112) with bolts (111) (3 pieces).
    Tool: Impact wrench, socket
    Bolt (111): Width across flats 17 mm, M10
21. Lightly fasten brackets (110) (2 pieces) with bolts (109) (2 pieces).
    Tool: Impact wrench, socket
    Bolt (109): Width across flats 17 mm, M10
22. Fasten clamps (108) (2 pieces) lightly.
    Tool: Ratchet handle, socket
    Bolt for clamp (108): Width across flats 10 mm, M6



23. Lightly fasten bracket (104) with bolts (102) (2 pieces).
    REMARK
    Spacers (103) (2 pieces) and bracket (104) are tightened together.
    Tool: Impact wrench, socket
    Bolt (102): Width across flats 13 mm, M8
24. Install clamp (170).
    Tool: Ratchet handle, socket, torque wrench
    Bolt for clamp (170): Width across flats 10 mm, M6
    Bolt for clamp (170):
    11.8 to 14.7 Nm {1.2 to 1.5 kgfm}
25. Tighten bolts (102) (2 pieces) to the specified torque.
    Tool: Ratchet handle, socket, torque wrench
    Bolt (102): Width across flats 13 mm, M8
    Bolt (102):
    30.5 to 34 Nm {3.1 to 3.5 kgfm}

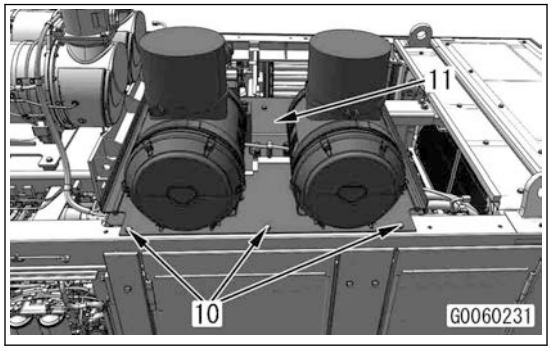


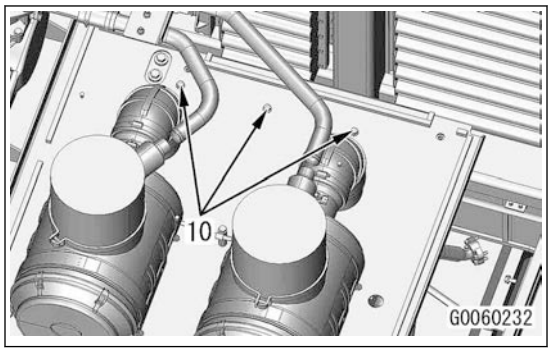
26. Fasten clamp (105) to the specified torque.
    Tool: Ratchet wrench, socket, torque wrench
    Bolt for clamp (105): Width across flats 10 mm, M6
    Bolt for clamp (105):
    11.8 to 14.7 Nm {1.2 to 1.5 kgfm}



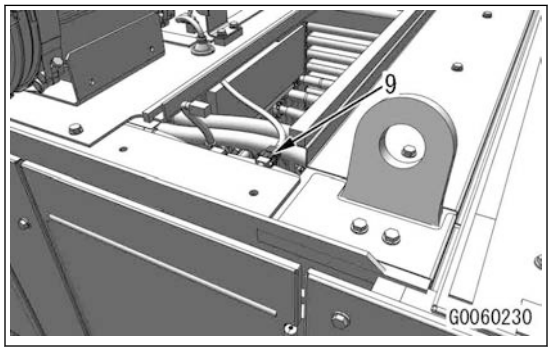
Air cleaner assembly

70. Sling air cleaner assembly (11), and install it with bolts (10) (6 pieces).
    Tool: Ratchet handle, socket, torque wrench, wire sling
    Bolt (10): Width across flats 19 mm, M12
    Air cleaner assembly (11):
    135 kg
    Bolt (10):
    98 to 123 Nm {10.0 to 12.5 kgfm}

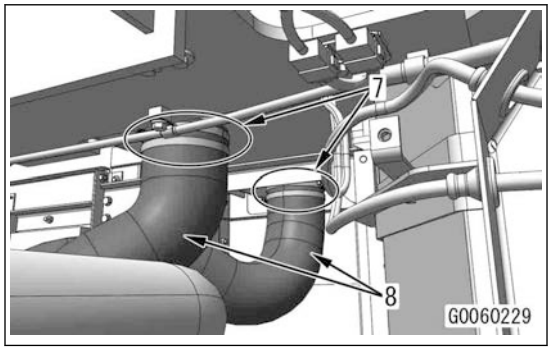




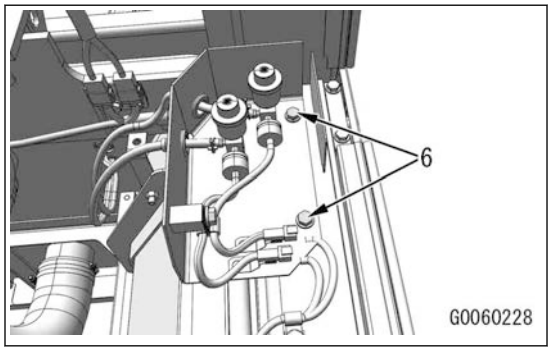
71. Connect connector A67 (9).



72. Connect hoses (8) (2 pieces) with clamps (7) (4 pieces).
    Tool: Ratchet handle, socket, torque wrench
    Clamp (7): Width across flats 11 mm
    Clamp (7):
    10.5±0.5 Nm {1.07±0.05 kgfm}



73. Install bolts (6) (2 pieces).
    Tool: Ratchet handle, socket, torque wrench
    Bolt (6): Width across flats 19 mm, M12
    Bolt (6):
    98 to 123 Nm {10.0 to 12.5 kgfm}



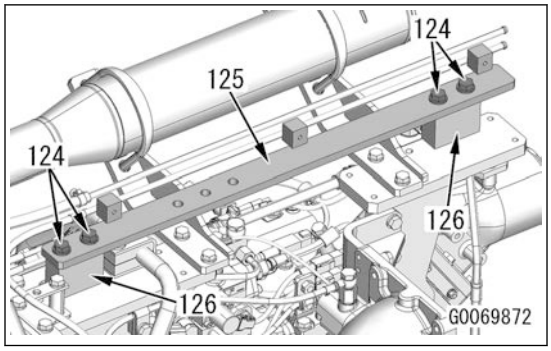
26. Remove bolts (124) (4 pieces), and remove plate (125) and blocks (126) (2 pieces).

REMARK

Plate (125) and block (126) are tightened together.

Tool: Impact wrench, socket

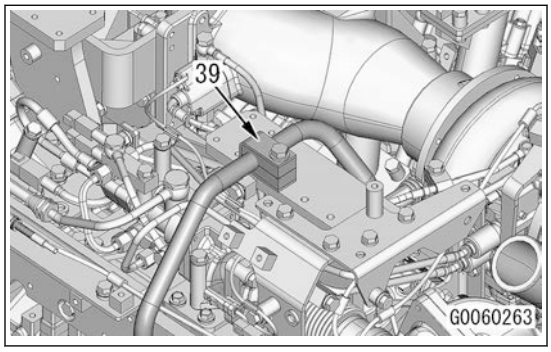
Bolt (124): Width across flats 19 mm, M12



27. Remove clamp (39).

Tool: Impact wrench, socket

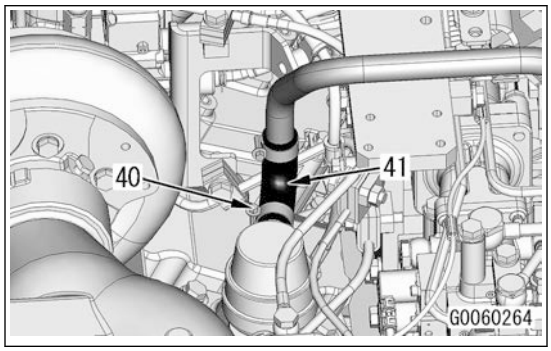
Bolt for clamp (39): Width across flats 19 mm, M12



28. Loosen clamp (40), and disconnect hose (41).

Tool: Ratchet handle, socket

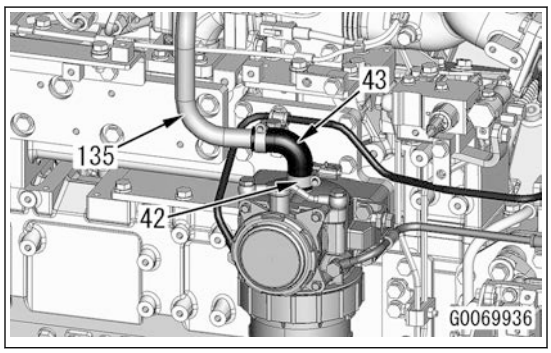
Clamp (40): Width across flats 7 mm



29. Loosen clamp (42), disconnect hose (43), and remove tube (135).

Tool: Ratchet handle, socket

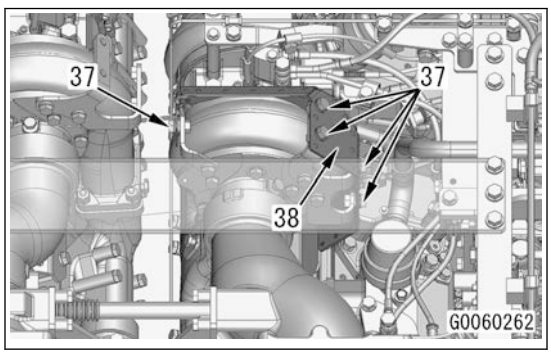
Clamp (42): Width across flats 7 mm



30. Remove bolts (37) (5 pieces), and remove heat insulation cover (38).

Tool: Impact wrench, socket

Bolt (37): Width across flats 17 mm, M10



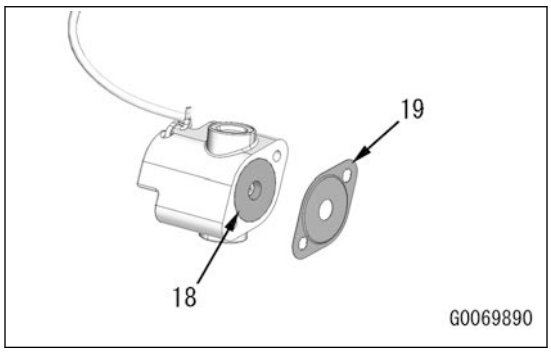
METHOD FOR INSTALLING FUEL DOSER ASSEMBLY (LEFT BANK)

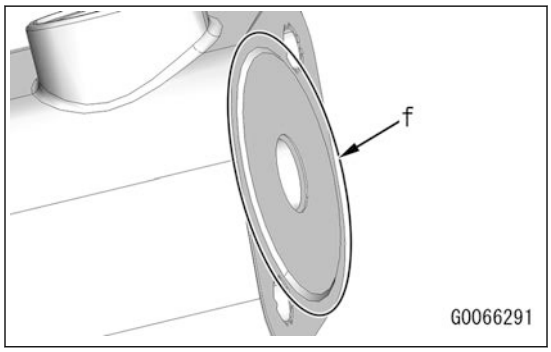
Fuel doser assembly

1. Install heat insulation material (18) and gasket (19).

   REMARK

   Install gasket (19) so that stepped portion (f) faces the convex portion of the exhaust connector.





2. Install fuel doser (17) with bolts (16) (2 pieces).

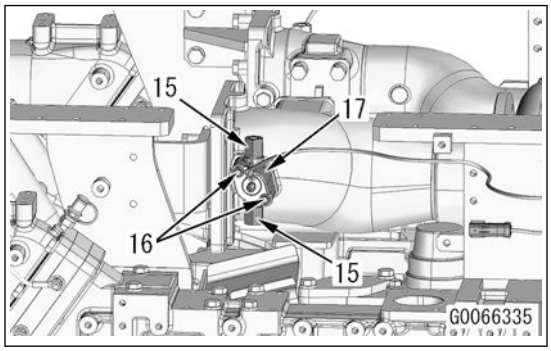
   REMARK

   - Install it so that wiring harness comes to the top.
   - Tighten bolts (16) alternately, and tighten them again.

   Tool: Ratchet handle, socket, torque wrench

   Bolt (16): Width across flats 8 mm, M6

   Bolt (16):
   9±0.5 Nm {0.92±0.05 kgfm}



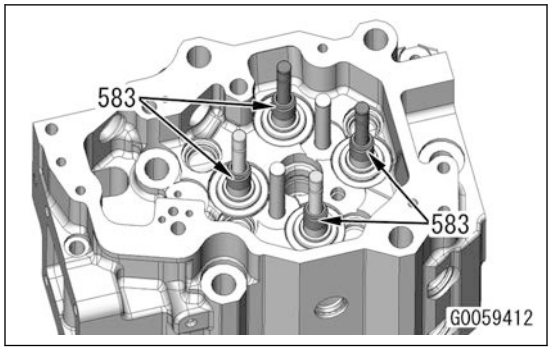
3. Install nipples (15) (2 pieces).

   Tool: Ratchet handle, socket, torque wrench

   Nipple (15): Width across flats 22 mm, M16

   Nipple (15):
   55 to 61 Nm {5.6 to 6.2 kgfm}

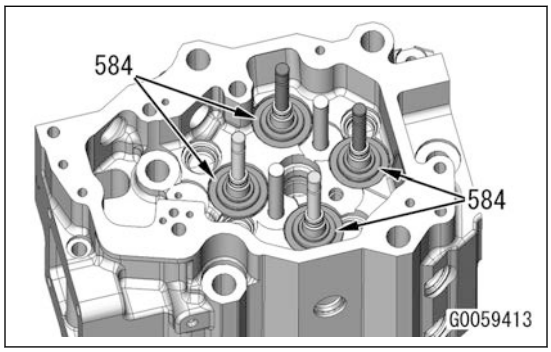
5) Remove stem seals (583) (4 pieces).



6) Remove lower spring seats (584) (4 pieces).

REMARK

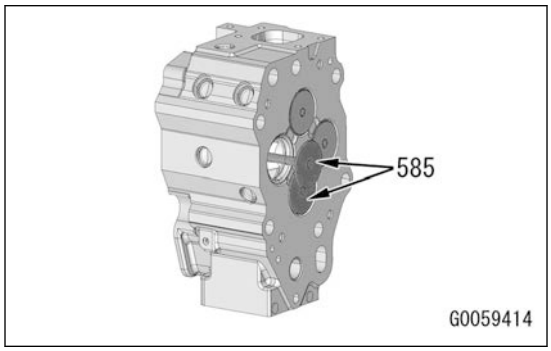
Put a mark on lower spring seat (584) so that it can be a same set when assembling.



7) Stand cylinder head, and remove air intake valves (585) (2 pieces).

REMARK

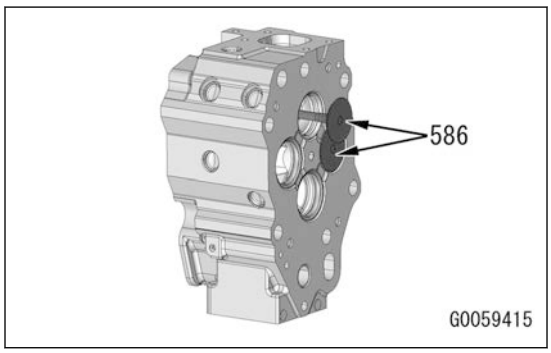
Put a mark on air intake valve (585) so that it can be a same set when assembling.



8) Remove exhaust valves (586) (2 pieces).

REMARK

Put a mark on exhaust valve (586) so that it can be a same set when assembling.



METHOD FOR INSTALLING CYLINDER HEAD ASSEMBLY (RIGHT BANK)

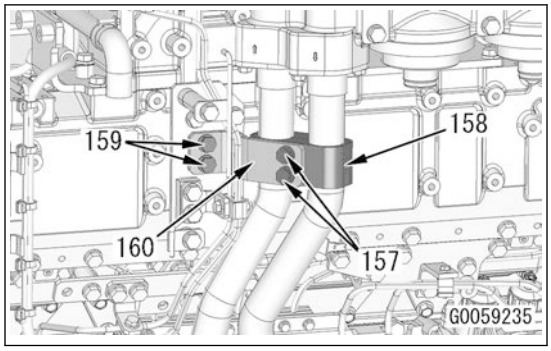
Cylinder head assembly

1. Assemble cylinder head assembly (577) according to the following procedure.

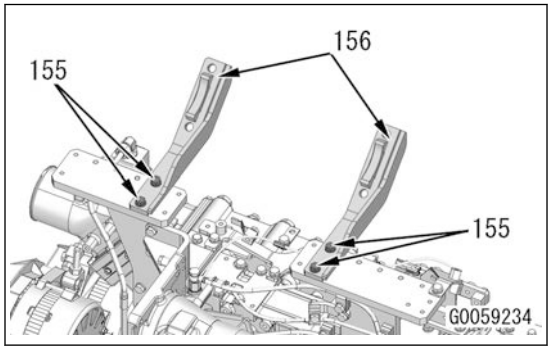
REMARK

Perform the same work for each of 6 cylinders.

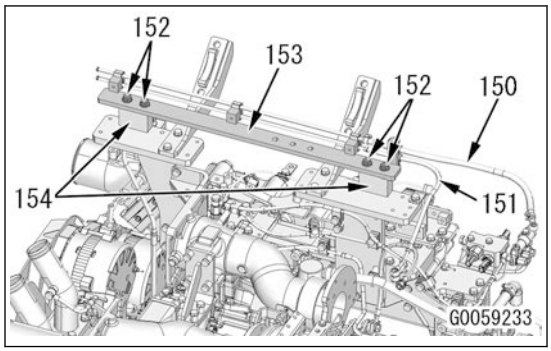
163. Lightly fasten bracket (160) with bolts (159) (2 pieces).
Tool: Impact wrench, socket
Bolt (159): Width across flats 17 mm, M10
164. Lightly fasten clamp (158) with bolts (157) (2 pieces).
Tool: Impact wrench, socket
Bolt (157): Width across flats 17 mm, M10
165. Tighten bolts (157) (2 pieces) and (159) (2 pieces) to the specified torque.
Tool: Ratchet handle, socket, torque wrench
Bolt (157), (159): Width across flats 17 mm, M10
Bolt (157), (159):
59 to 74 Nm {6 to 7.5 kgfm}

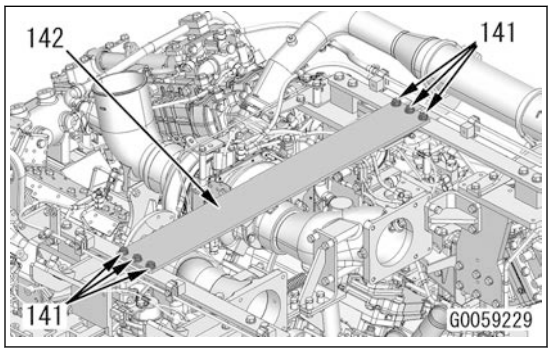


166. Install brackets (156) (4 pieces) with bolts (155) (2 pieces).
Tool: Ratchet handle, socket, torque wrench
Bolt (155): Width across flats 17 mm, M10
Bolt (155):
59 to 74 Nm {6 to 7.5 kgfm}

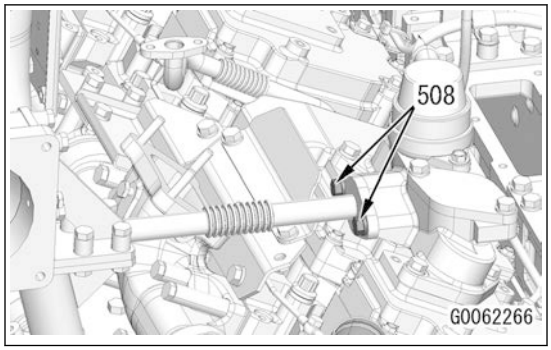


167. Install blocks (154) (2 pieces), plate (153), EGR cooler air bent tube (150), and VGT air bent tube (151) together as a unit with bolts (152) (4 pieces).
REMARK
Plate (153) and block (154) are tightened together.
Tool: Ratchet handle, socket, torque wrench
Bolt (152): Width across flats 19 mm, M12
Bolt (152):
98 to 123 Nm {10 to 12.5 kgfm}
168. Install plate (142) with bolts (141) (6 pieces).
Tool: Ratchet handle, socket, torque wrench
Bolt (141): Width across flats 19 mm, M12
Bolt (141):
98 to 123 Nm {10 to 12.5 kgfm}

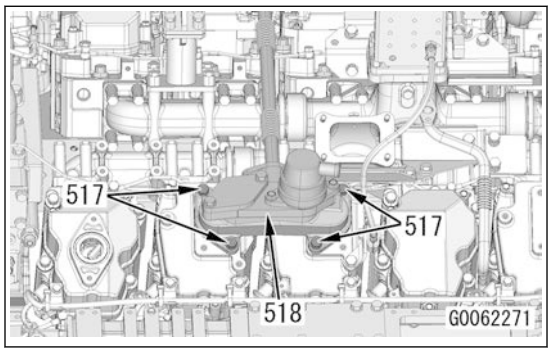




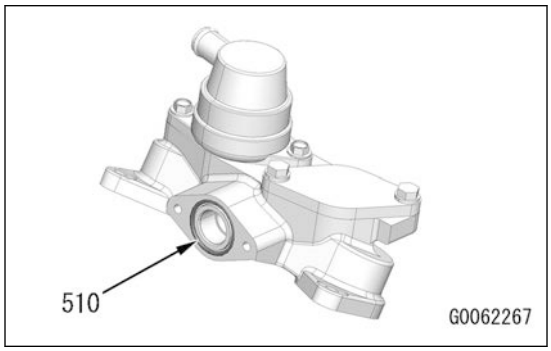
141. Remove bolts (508) (2 pieces).
Tool: Impact wrench, socket
Bolt (508): Width across flats 17 mm, M10



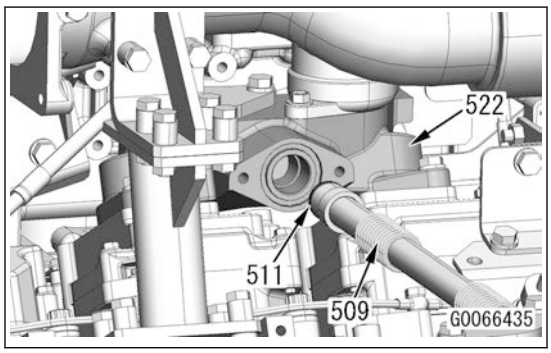
142. Remove bolts (517) (4 pieces), and remove connector (518).
Tool: Impact wrench, socket
Bolt (517): Width across flats 17 mm, M10



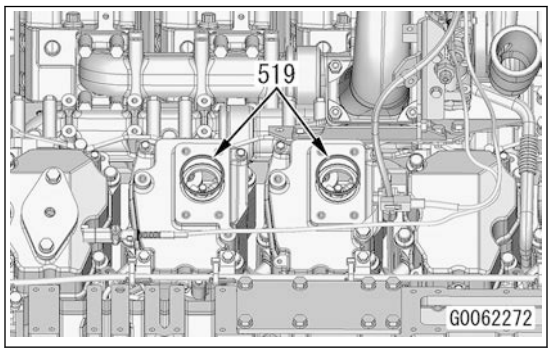
143. Remove O-ring (510).



144. Remove tube (509) and O-ring (511) from connector (522).



145. Remove O-rings (519) (2 pieces).

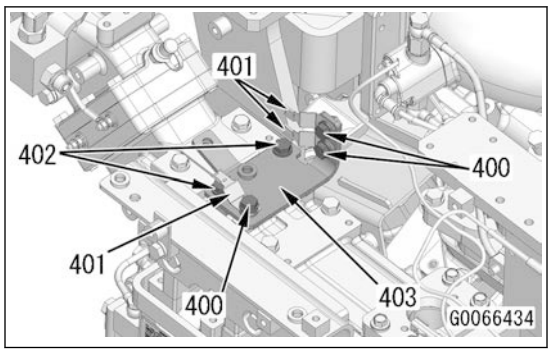


91. Install bracket (403) with bolts (402) (2 pieces).

    Tool: Ratchet handle, socket, torque wrench

    Bolt (402): Width across flats 17 mm, M10

    Bolt (402):
    59 to 74 Nm {6 to 7.5 kgfm}



92. Install clips (401) (3 pieces) with bolts (400) (3 pieces).

    Tool: Ratchet handle, socket, torque wrench

    Bolt (400): Width across flats 17 mm, M10

    Bolt (400):
    59 to 74 Nm {6 to 7.5 kgfm}

93. Lightly fasten bracket (499) with bolts (498) (4 pieces).

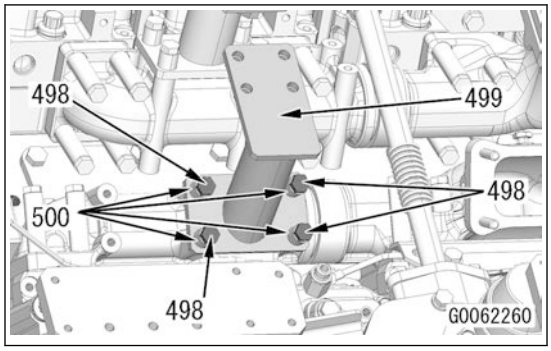
    REMARK

    Spacers (500) (4 pieces) and bracket (499) are tightened together.

    Tool: Impact wrench, socket

    Bolt (498): Width across flats 17 mm, M10

    Threaded portion and seat surface of bolt (498):
    Seizure prevention compound (LC-G)



94. Lightly fasten exhaust connector (493), connector (494), brackets (495), (491), and fuel doser (492) together as a unit with bolts (489) (4 pieces).

    REMARK

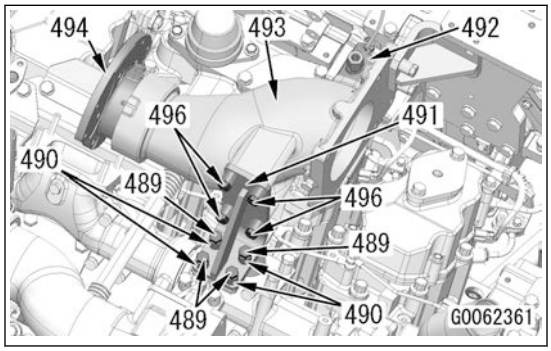
    Spacers (490) (4 pieces) and bracket (491) are tightened together.

    Tool: Impact wrench, socket

    Bolt (489): Width across flats 17 mm, M10

    Exhaust connector (493):
    14.5 kg

    Threaded portion and seat surface of bolt (489):
    Seizure prevention compound (LC-G)



95. Loosen bolts (496) (4 pieces).

    Tool: Impact wrench, socket

    Bolt (496): Width across flats 17 mm, M10

    Threaded portion and seat surface of bolt (496):
    Seizure prevention compound (LC-G)

96. Tighten bolts (488) (2 pieces) lightly.

    Tool: Impact wrench, socket

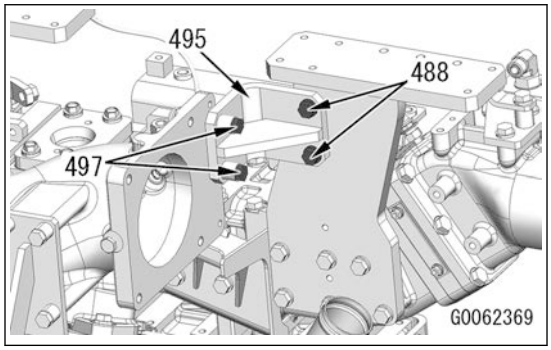
    Bolt (488): Width across flats 17 mm, M10

    Threaded portion and seat surface of bolt (488):
    Seizure prevention compound (LC-G)

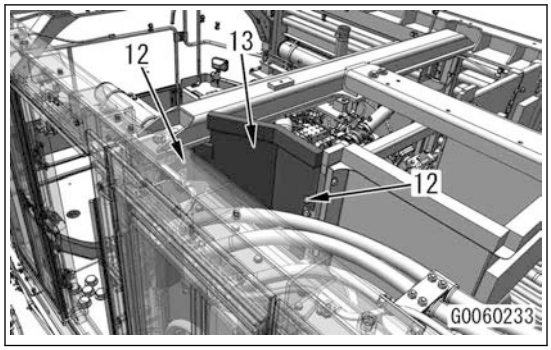
97. Loosen bolts (497) (2 pieces).

    Tool: Impact wrench, socket

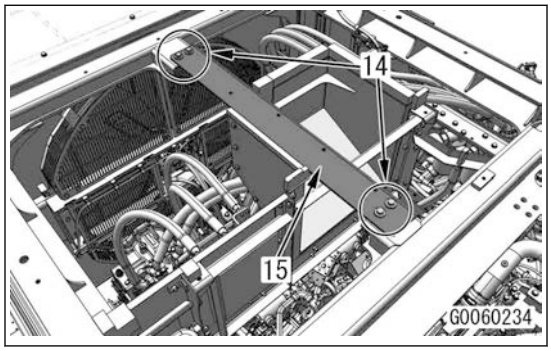
    Bolt (497): Width across flats 17 mm, M10



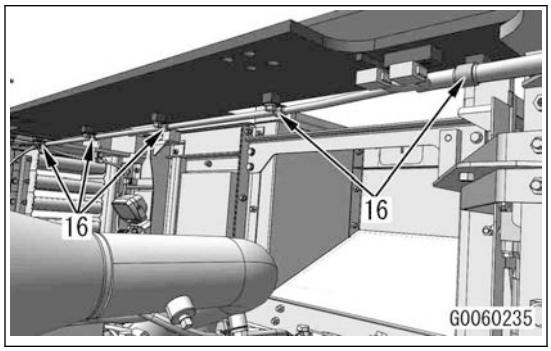
10. Remove bolts (12) (6 pieces), and remove partition plate (13).
    Tool: Impact wrench, socket
    Bolt (12): Width across flats 19 mm, M12



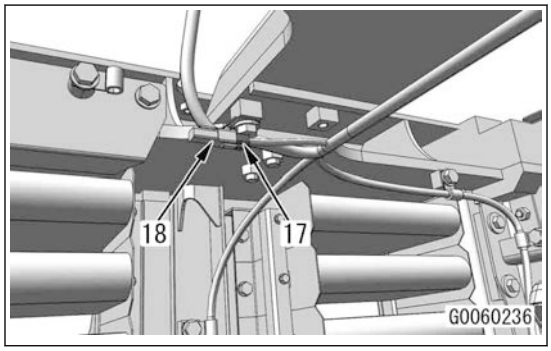
11. Remove bolts (14) (4 pieces), and remove frame (15).
    Tool: Impact wrench, socket
    Bolt (14): Width across flats 19 mm, M12



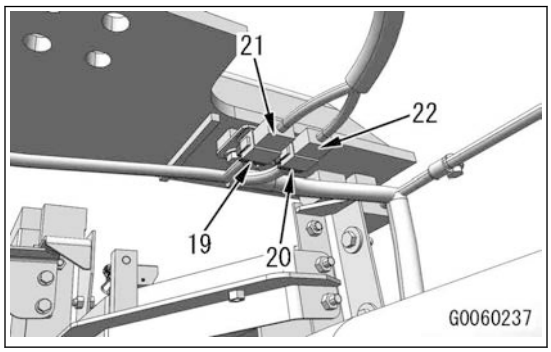
12. Remove clamps (16) (5 pieces).
    Tool: Impact wrench, socket
    Bolt for clamp (16): Width across flats 19 mm, M12



13. Disconnect connector L05B (17).
14. Remove connector L05B (18) from clip.



15. Disconnect connectors A66 (19) and A65 (20).
16. Remove connectors A66 (21) and A65 (22) from clip.



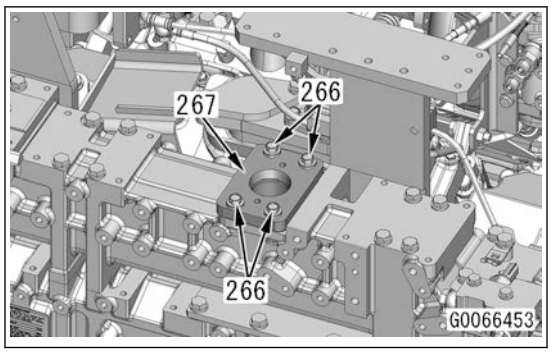
71. Remove bolts (266) (4 pieces), and remove connector (267).

    REMARK

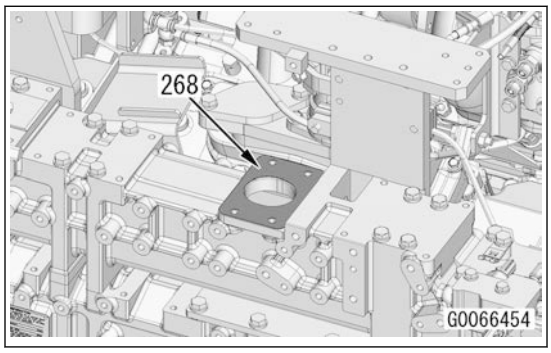
    Be careful not to drop bolt and washer since they are not the same unit.

    Tool: Impact wrench, socket

    Bolt (266): Width across flats 14 mm, M10



72. Remove gasket (268).



73. When replacing EGR valve assembly with a new one, perform the following procedure.
    1) Remove nipples (269) (2 pieces).

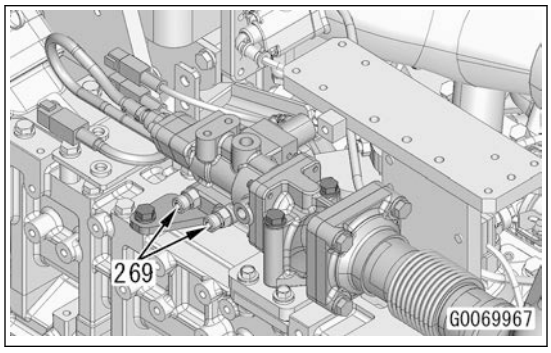
       Tool: Spanner wrench

       Nipple (269): Width across flats 19 mm
    2) Install nipples (269) (2 pieces) to new EGR valve assembly.

       Tool: Spanner wrench, socket

       Nipple (269): Width across flats 19 mm

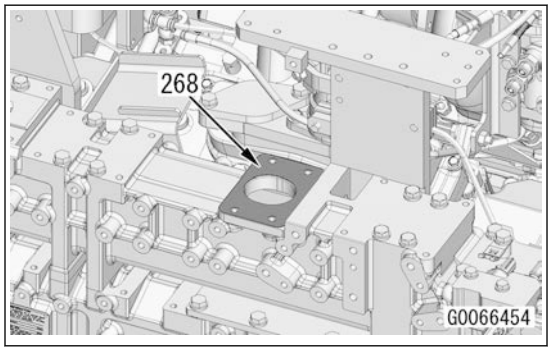
       Nipple (269):
       35 to 63 Nm {3.5 to 6.5 kgfm}



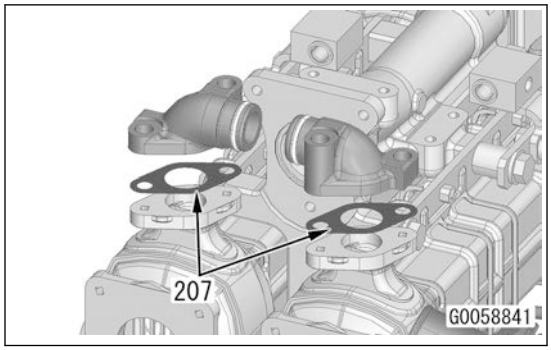
METHOD FOR INSTALLING EGR VALVE ASSEMBLY (LEFT BANK)

EGR valve assembly

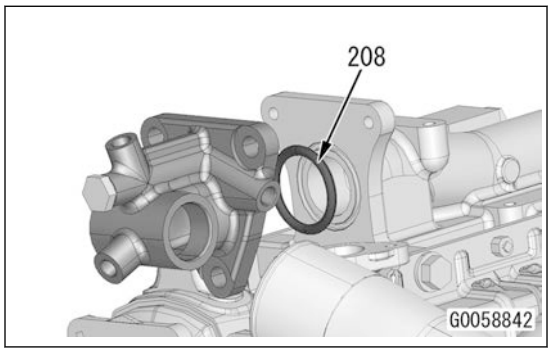
1. Set gasket (268) to its installing position.



121. Remove gaskets (207) (2 pieces).



122. Remove O-ring (208).



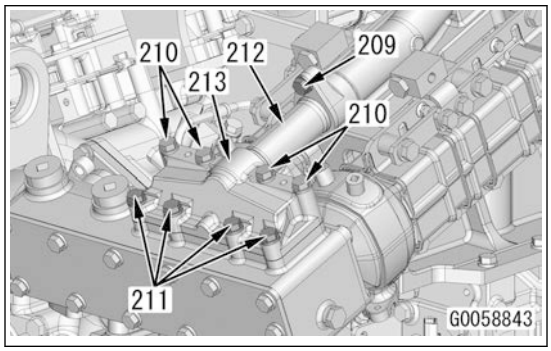
123. Remove bolts (209), (210) (4 pieces), and (211) (4 pieces), and remove tube (212) and connector (213) as a unit.

REMARK

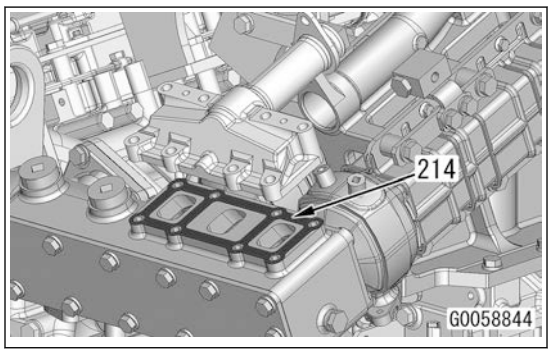
Note that the length of each bolt are different.

Tool: Impact wrench, socket

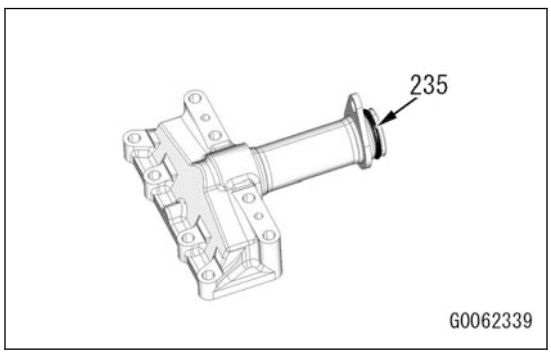
Bolt (209), (210), (211): Width across flats 17 mm, M10



124. Remove gasket (214).



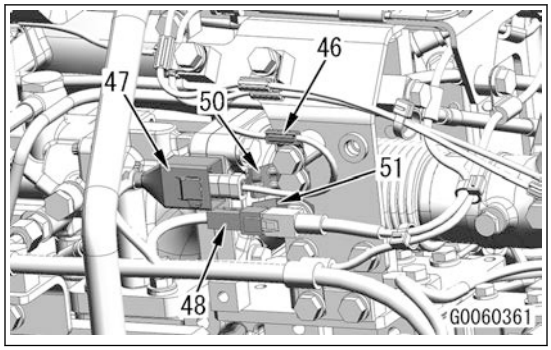
125. Remove O-ring (235).

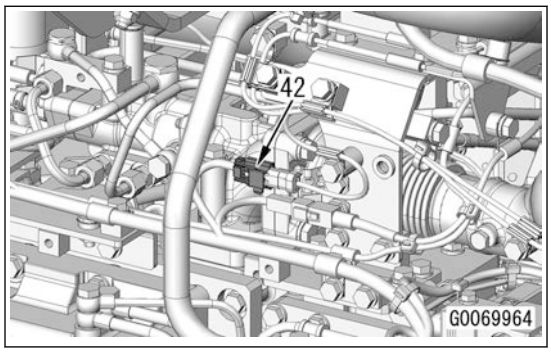


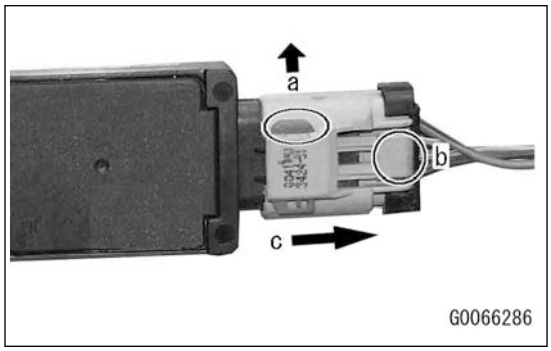
46. Disconnect connector VGT_REV_L (48).
47. Roll up boot (47).
48. Disconnect connector DORSER_L (42) according to the following procedure.
    1) Slide the connector lock in the direction of (a), and release the lock.
    2) While pressing the part (b) of the connector, disconnect it in the direction of (c).
49. Remove clamp (46).

    Tool: Impact wrench, socket

    Bolt (46): Width across flats 17 mm, M10
50. Remove connectors VGT_REV_L (48) and DOSER_L (42) from clips (50) and (51).







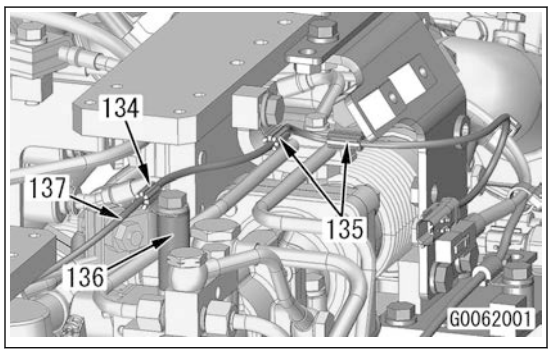
51. Remove clamps (134) and (135) (2 pieces).

    REMARK

    - Move the fuel doser harness (137) to a safe place where it does not interfere with the work.
    - Spacer (136) and clamp (134) are tightened together.

    Tool: Impact wrench, socket

    Bolt for clamp (134), (135): Width across flats 17 mm, M10



52. Remove bands (138) (2 pieces).

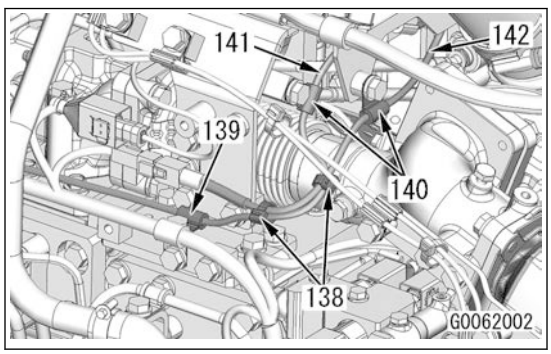
    Tool: Nippers
53. Remove clamps (139) and (140) (2 pieces).

    REMARK

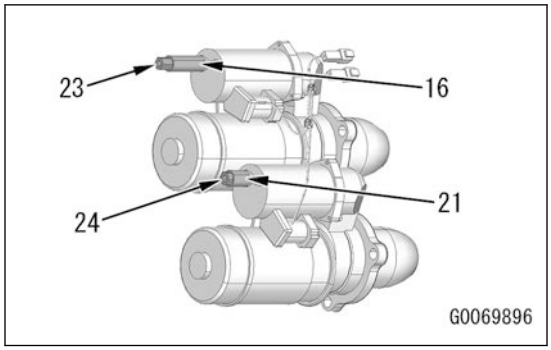
    Move the VGT speed sensor harness (141) and VGT position sensor harness (142) to a safe place where they do not interfere with the work.

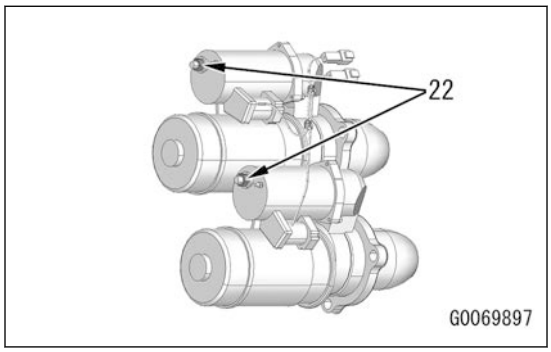
    Tool: Impact wrench, socket

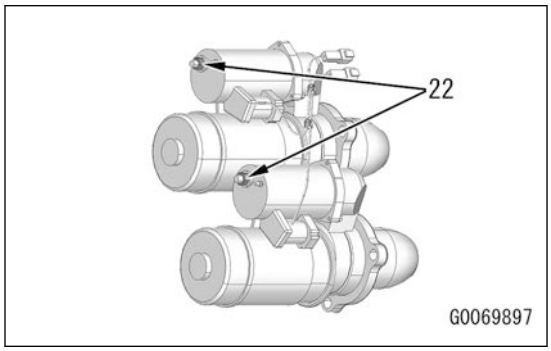
    Bolt for clamp (139), (140): Width across flats 17 mm, M10

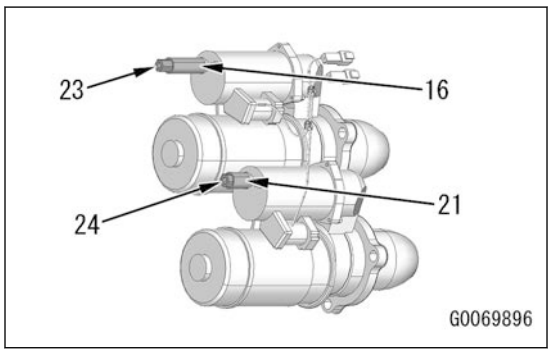


10. When replacing starting motor assembly with a new one, perform the following procedure.
    1) Remove rubber covers (16), (21) (2 pieces) and spacers (23), (24) (2 pieces) from starting motor assembly.
       Tool: Ratchet handle, socket
       Spacer (16): Width across flats 17 mm
    2) Remove nuts (22) (2 pieces) from starting motor assembly.
       Tool: Ratchet handle, socket
       Nut (22): Width across flats 17 mm
    3) Install nuts (22) (2 pieces) to new starting motor assembly.
       Tool: Ratchet handle, socket
       Nut (22): Width across flats 17 mm
       Nut (22):
       19.6 to 25.5 Nm {2.0 to 2.6 kgfm}
    4) Install spacers (16) (2 pieces) and rubber covers (21) (2 pieces) to new starting motor assembly.
       Tool: Ratchet handle, socket
       Spacer (16): Width across flats 17 mm
       Spacer (16):
       19.6 to 25.5 Nm {2.0 to 2.6 kgfm}









REMOVE AND INSTALL AFTERCOOLER ASSEMBLY

⚠ **Park the machine on level ground, lower the work equipment to the ground and keep it in a stable position, and set the work equipment lock lever to LOCK position.**

⚠ **Stop the engine, set the battery isolator switch to OFF position, and take out the starting switch key. (For details, see TESTING AND ADJUSTING, "HANDLE BATTERY ISOLATOR AND STARTING MOTOR ISOLATOR".)**

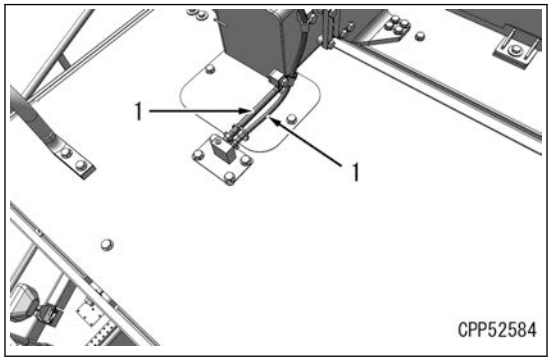
NOTICE

Before disconnecting wires and hoses, check and note the connector numbers and installed positions.

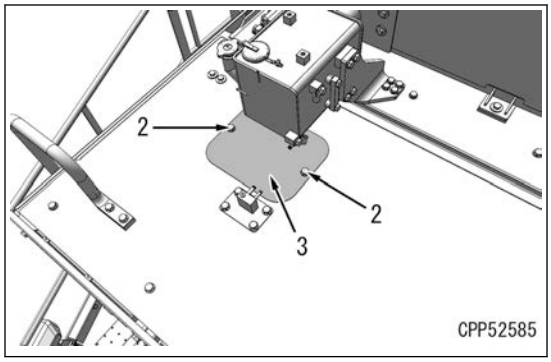
METHOD FOR REMOVING AFTERCOOLER ASSEMBLY

Duct assembly

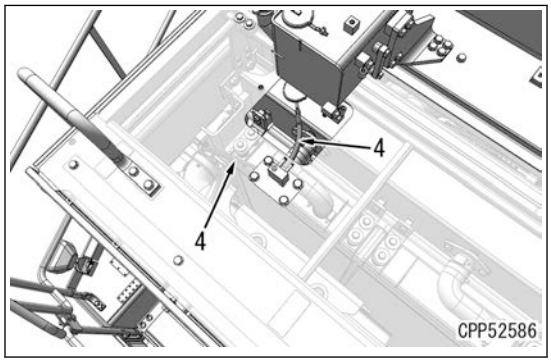
1. Disconnect hoses (1) (2 pieces).
   Tool: Pliers



2. Remove the bolts (2) (2 pieces), and remove the cover (3).
   Tool: Impact wrench, socket
   Bolt (2): Width across flats 19 mm, M12



3. Disconnect hoses (4) (2 pieces).
   Tool: Pliers

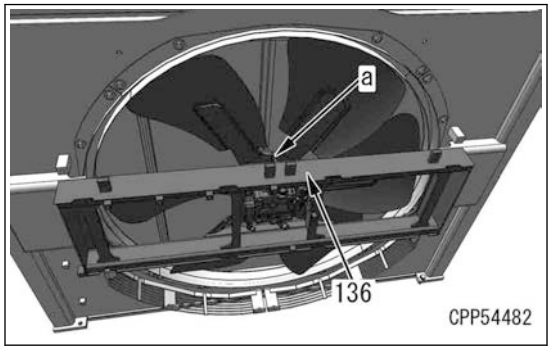


Cooling fan motor assembly

4. Install lifting tools to lifting positions (a), sling cooling fan motor assembly (136), and set the assembly to its installed position.

   Tool: Shackle

   Cooling fan motor assembly (136) :
   230 kg

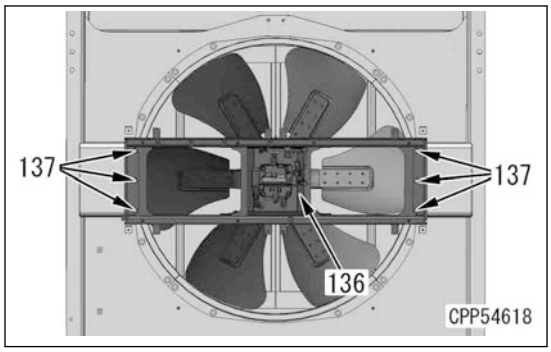


5. Use bolts (137) (6 pieces) to install cooling fan motor assembly (136).

   Tool: Ratchet handle, socket wrench, torque wrench

   Bolt (137): Width across flats 19 mm, M12

   Bolt (137) :
   98 to 123 Nm {10.0 to 12.5 kgfm}

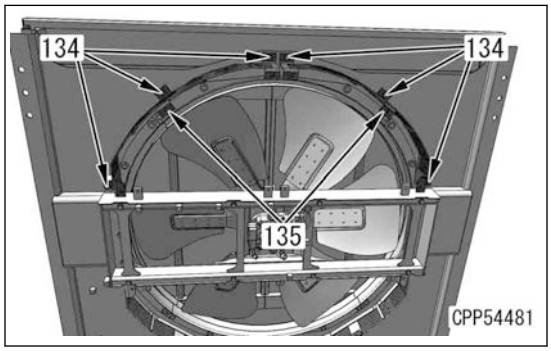


6. Use bolts (134) (6 pieces) to install fan guards (135) (2 pieces).

   Tool: Ratchet handle, socket wrench, torque wrench

   Bolt (134): Width across flats 19 mm, M12

   Bolt (134) :
   98 to 123 Nm {10.0 to 12.5 kgfm}

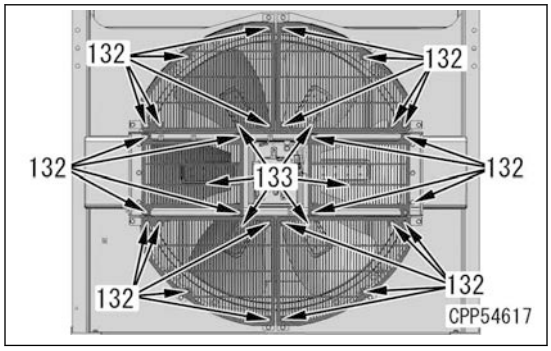


7. Use bolts (132) (28 pieces) to install fan guards (133) (6 pieces).

   Tool: Ratchet handle, socket wrench, torque wrench

   Bolt (132): Width across flats 19 mm, M12

   Bolt (132) :
   98 to 123 Nm {10.0 to 12.5 kgfm}

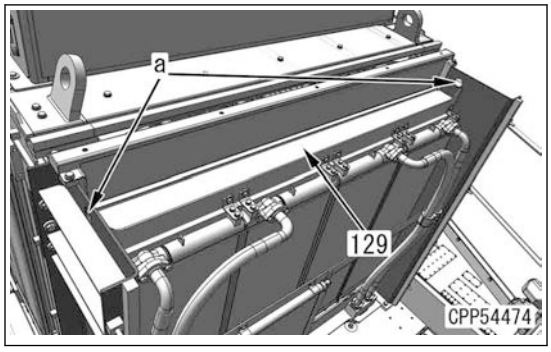


Cooling assembly on the left side of the machine

8. Install the lifting tools to lifting positions (a), sling cooling assembly (129), and set the assembly to its installed position.

   Tool: Shackle

   Cooling assembly (129) :
   1000 kg



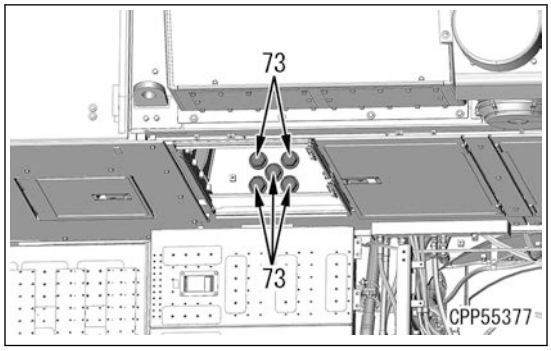
69. Remove the bolts (73) (5 pieces).

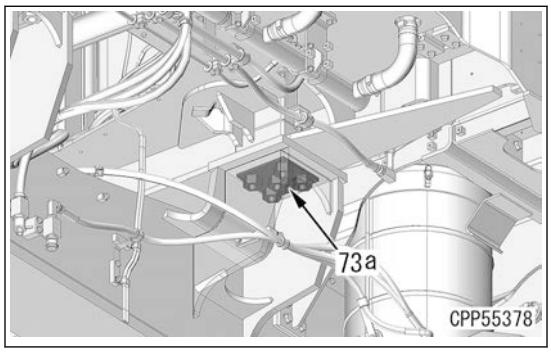
REMARK

Be careful not to let the plate (73a) at the back side fall off.

Tool: Impact wrench, socket

Bolt (73): Width across flats 65 mm

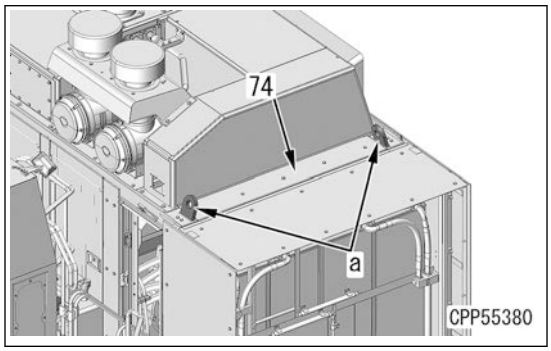


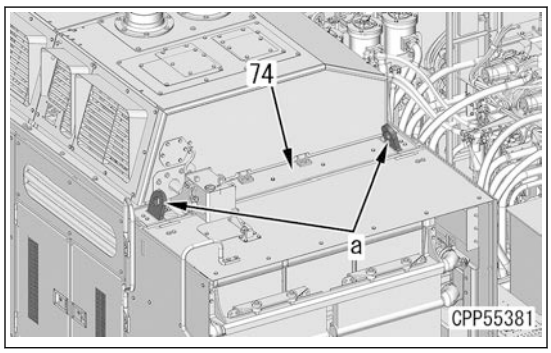


70. Install the lifting tool to the points (a), lift the power module packaging assembly (74), and remove it.

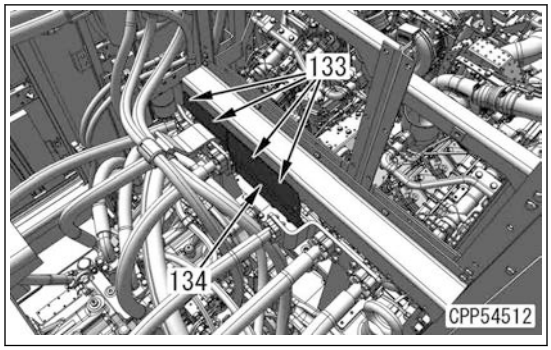
Power module packaging assembly (74):

16300 kg

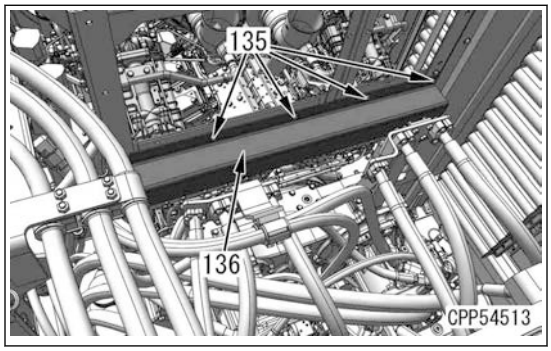




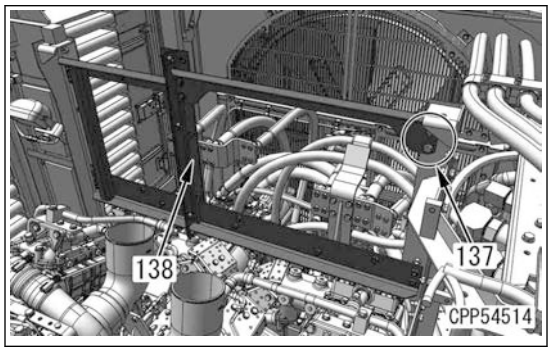
97. Remove bolts (133) (8 pieces) to remove partition plate (134).
Tool: Impact wrench, socket wrench
Bolt (133): Width across flats 19 mm, M12

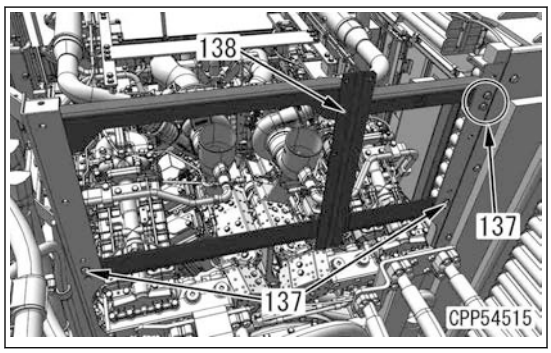


98. Remove bolts (135) (9 pieces) to remove frame (136).
Tool: Impact wrench, socket wrench
Bolt (135): Width across flats 19 mm, M12

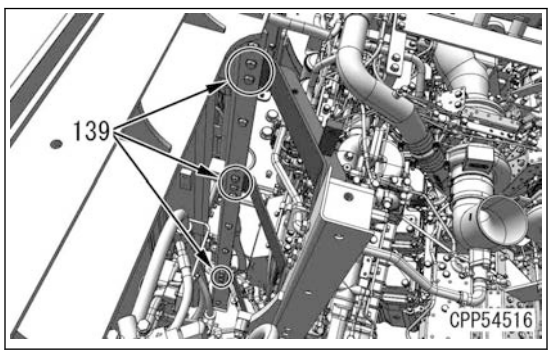


99. Remove bolts (137) (6 pieces) to remove frame (138).
Tool: Impact wrench, socket wrench
Bolt (137): Width across flats 19 mm, M12

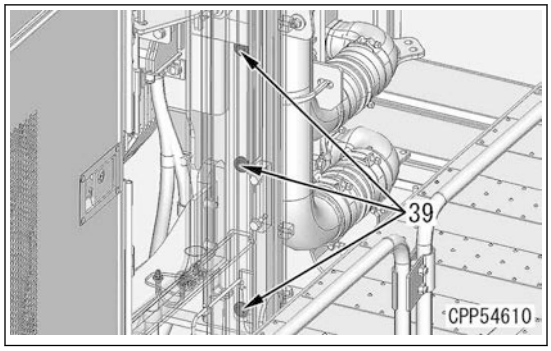


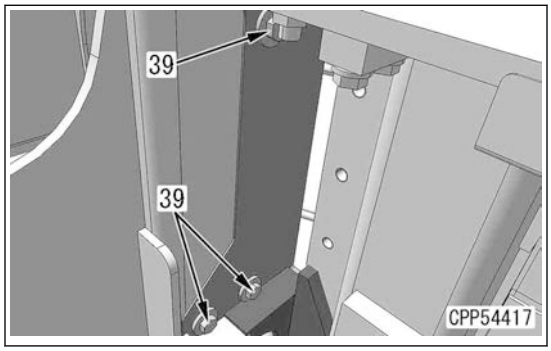


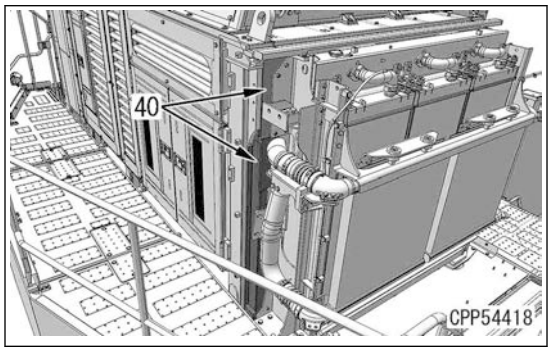
100. Remove bolts (139) (6 pieces).
Tool: Impact wrench, socket wrench
Bolt (139): Width across flats 19 mm, M12



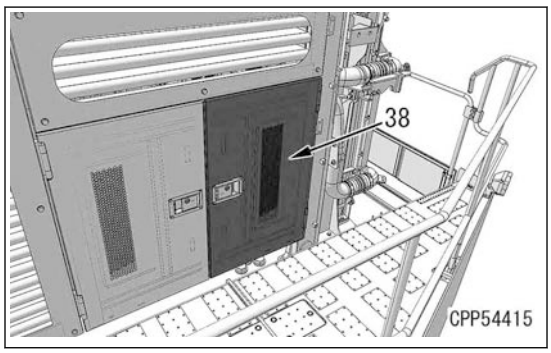
112. Use bolts (39) (6 pieces) to install covers (40) (2 pieces).
Tool: Ratchet handle, socket wrench, torque wrench
Bolt (39): Width across flats 19 mm, M12
Bolt (39) :
98 to 123 Nm {10.0 to 12.5 kgfm}



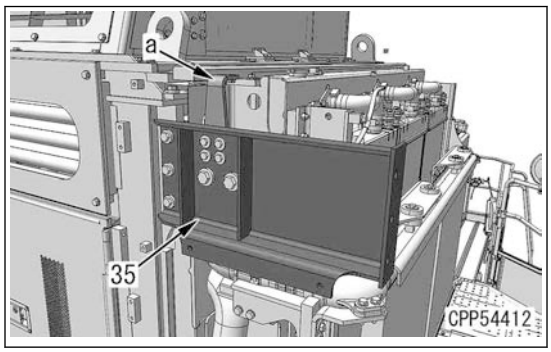




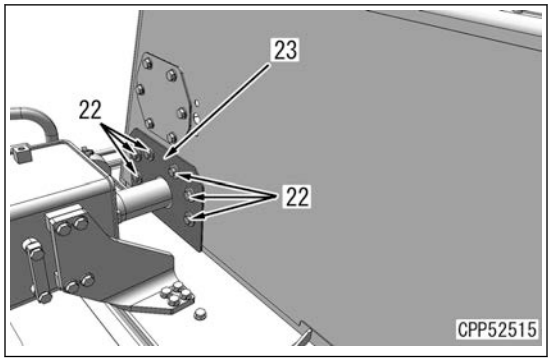
113. Close the cover (38).



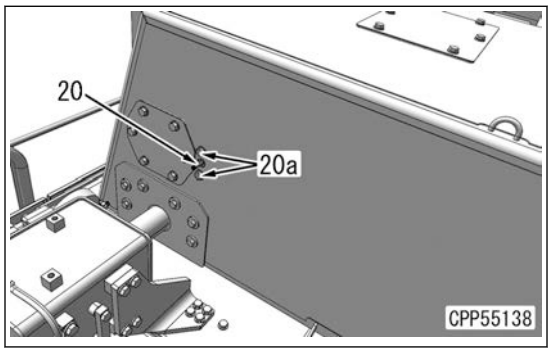
114. Install the lifting tools to lifting positions (a), sling frame (35), and set it to its installed position.
Tool: M12 eyebolt
Frame (35) :
30 kg



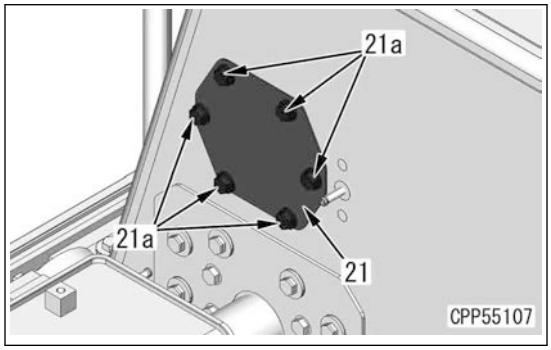
6. Use bolts (22) (6 pieces) to install bracket (23).
   Tool: Impact wrench, socket, torque wrench
   Bolt (22): Width across flats 19 mm, M12
   Bolt (22) :
   98 to 123 Nm {10.0 to 12.5 kgfm}



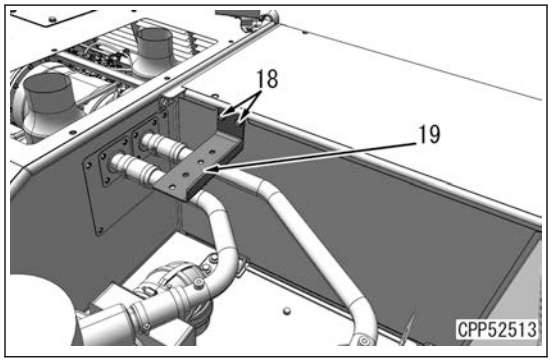
7. Use bolts (20a) (2 pieces) to install bracket (20).
   Tool: Impact wrench, socket, torque wrench
   Bolt (20a): Width across flats 19 mm, M12
   Bolt (20a) :
   98 to 123 Nm {10.0 to 12.5 kgfm}



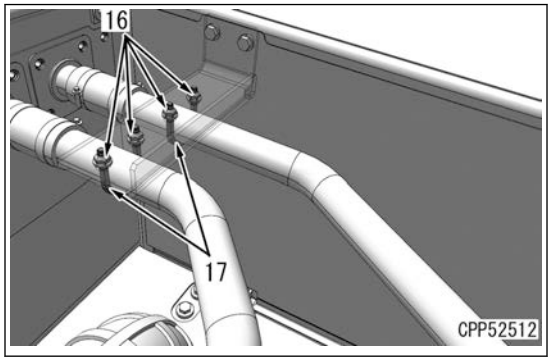
8. Use bolts (21a) (6 pieces) to install cover (21).
   Tool: Ratchet handle, socket, torque wrench
   Bolt (21a): Width across flats 19 mm, M12
   Bolt (21a) :
   98 to 123 Nm {10.0 to 12.5 kgfm}



9. Use bolts (18) (2 pieces) to install bracket (19).
   Tool: Impact wrench, socket, torque wrench
   Bolt (18): Width across flats 19 mm, M12
   Bolt (18) :
   98 to 123 Nm {10.0 to 12.5 kgfm}



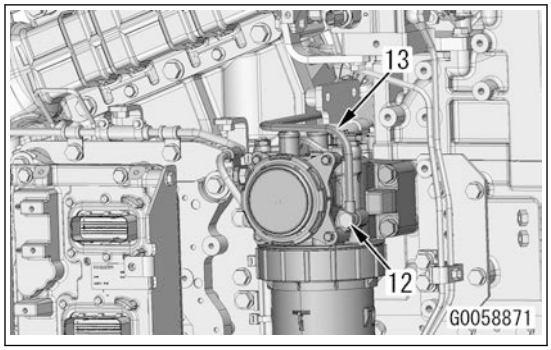
10. Use nuts (16) (4 pieces) to install U-bolts (17) (2 pieces).
    Tool: Impact wrench, socket, torque wrench
    U-bolt (17): Width across flats 17 mm, M10
    U-bolt (17) :
    11 to 28 Nm {1.12 to 2.86 kgfm}

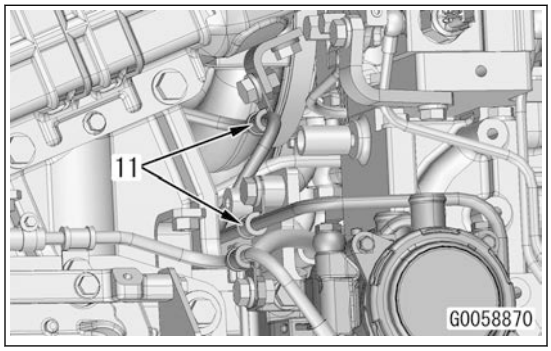


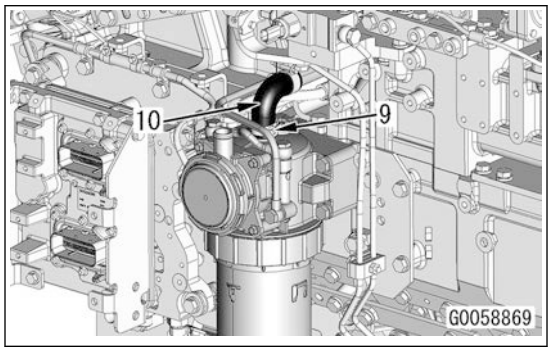
7. Lightly fasten tube (13) with joint bolt (12).
   Tool: Impact wrench, socket
   Joint bolt (12): Width across flats 17 mm, M12
8. Fasten clamps (11) (2 pieces) lightly.
   Tool: Impact wrench, socket
   Bolt for clamp (11): Width across flats 17 mm, M10
9. Tighten joint bolt (12) to the specified torque.
   Tool: Ratchet handle, socket, torque wrench
   Joint bolt (12): Width across flats 17 mm, M12
   Joint bolt (12):
   19.6 to 29.4 Nm {2.0 to 3.0 kgfm}
10. Fasten clamps (11) (2 pieces) to the specified torque.
    Tool: Ratchet handle, socket, torque wrench
    Bolt for clamp (11): Width across flats 17 mm, M10
    Bolt for clamp (11):
    59 to 74 Nm {6 to 7.5 kgfm}
11. Insert hose (10).
12. Install clamp (8).
    Tool: Ratchet handle, socket, torque wrench
    Bolt for clamp (8): Width across flats 19 mm, M12
    Bolt for clamp (8):
    98 to 123 Nm {10 to 12.5 kgfm}
13. Fasten clamp (9).

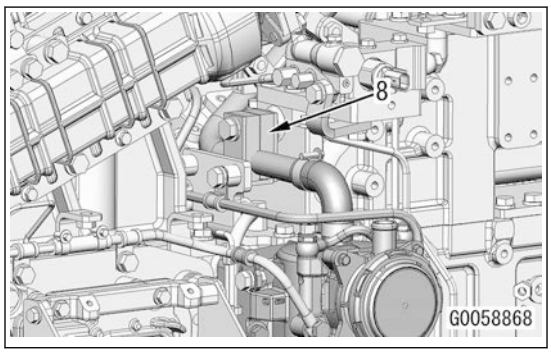
    REMARK

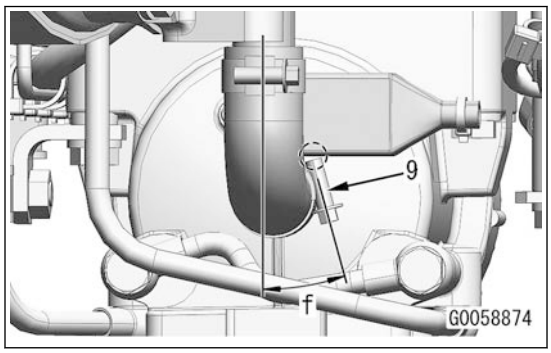
    Install clamp (9) in the rotation range of (f) as shown in the figure so that it does not touch wiring harness connector.
    Rotation range (f): 0 to 15 °
    Tool: Ratchet handle, socket, torque wrench
    Clamp (9): Width across flats 7 mm
    Clamp (9):
    4.4±0.49 Nm {0.45±0.05 kgfm}



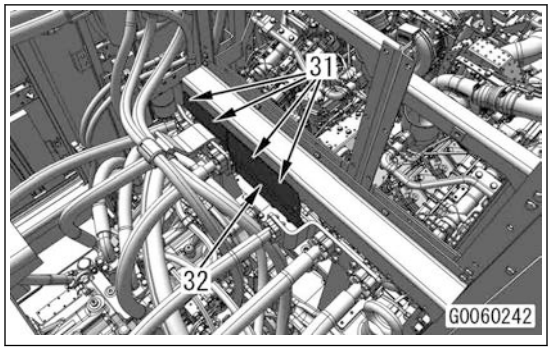




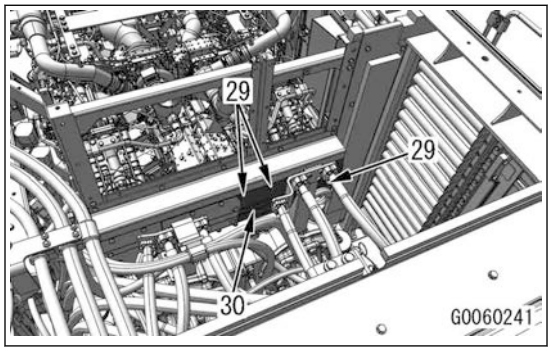




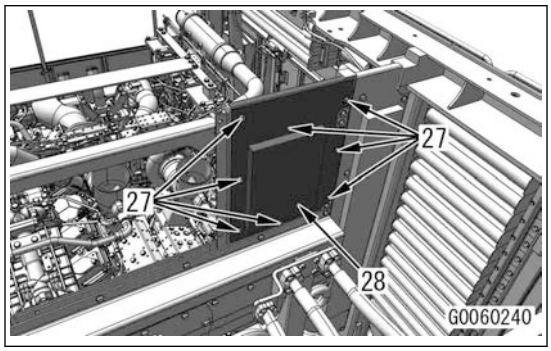
58. Install partition plate (32) with bolts (31) (8 pieces).
Tool: Ratchet handle, socket, torque wrench
Bolt (31): Width across flats 19 mm, M12
Bolt (31):
98 to 123 Nm {10.0 to 12.5 kgfm}



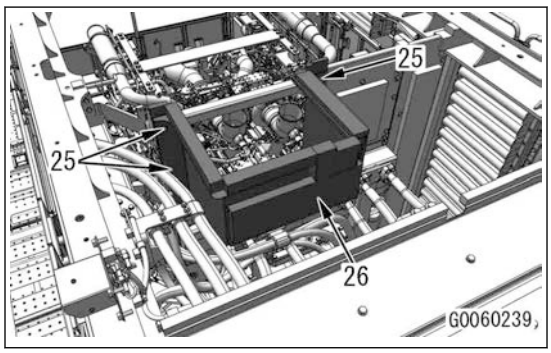
59. Install partition plate (30) with bolts (29) (9 pieces).
Tool: Ratchet handle, socket, torque wrench
Bolt (29): Width across flats 19 mm, M12
Bolt (29):
98 to 123 Nm {10.0 to 12.5 kgfm}



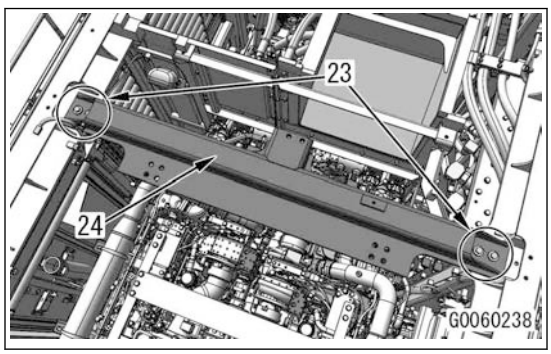
60. Install partition plate (28) with bolts (27) (8 pieces).
Tool: Ratchet handle, socket, torque wrench
Bolt (27): Width across flats 19 mm, M12
Bolt (27):
98 to 123 Nm {10.0 to 12.5 kgfm}



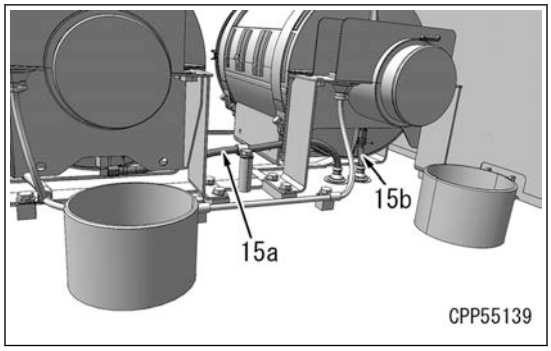
61. Install partition plate (26) with bolts (25) (8 pieces).
Tool: Ratchet handle, socket, torque wrench
Bolt (25): Width across flats 19 mm, M12
Bolt (25):
98 to 123 Nm {10.0 to 12.5 kgfm}

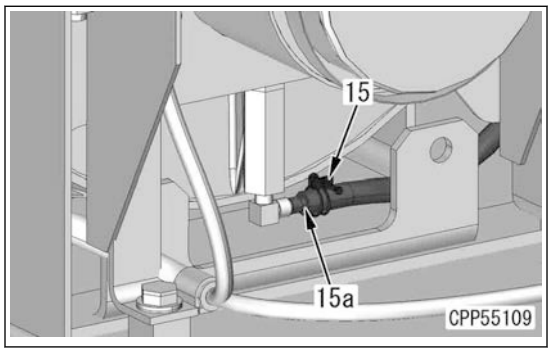


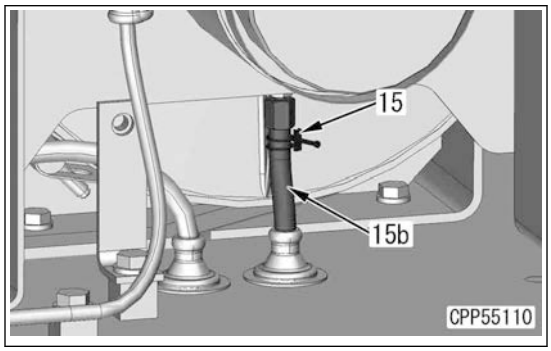
62. Sling frame (24), and install it with bolts (23) (4 pieces).
Tool: Ratchet handle, socket, torque wrench, wire sling
Bolt (23): Width across flats 19 mm, M12
Frame (24):
100 kg
Bolt (23):
98 to 123 Nm {10.0 to 12.5 kgfm}



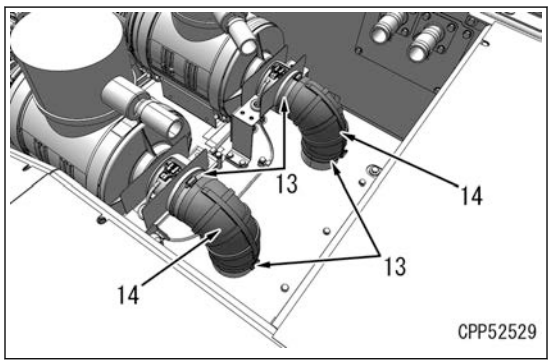
3. Tighten the sleeve nuts to connect hoses (15a) and (15b).
   Tool: Spanner wrench, torque wrench
   Sleeve nut of hose (15a): Width across flats 14 mm
   Sleeve nut of hose (15b): Width across flats 22 mm
   Sleeve nuts for hoses (15a) and (15b) :
   4.90 to 6.96 Nm {0.5 to 0.7 kgfm}
4. Tighten clamps (15) (2 pieces).
   Tool: Ratchet handle, socket, torque wrench
   Clamp (15): Width across flats 4 mm
   Clamp (15) :
   1.5 to 2.0 Nm {0.15 to 0.2 kgfm}



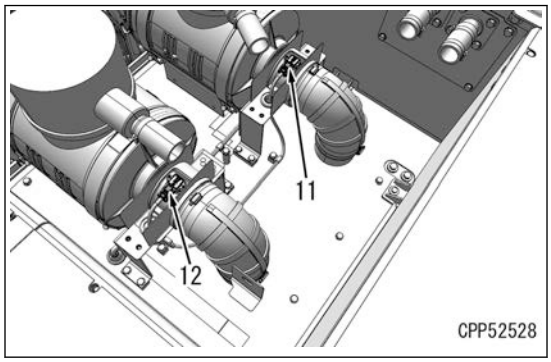




5. Use clamps (13) (4 pieces) to connect hoses (14) (2 pieces).
   Tool: Ratchet handle, socket, torque wrench
   Clamp (13): Width across flats 8 mm
   Clamp (13) :
   8.8 ± 0.5 Nm {90 ± 5 kgfm}



6. Connect connectors P55 (11) and P54 (12).

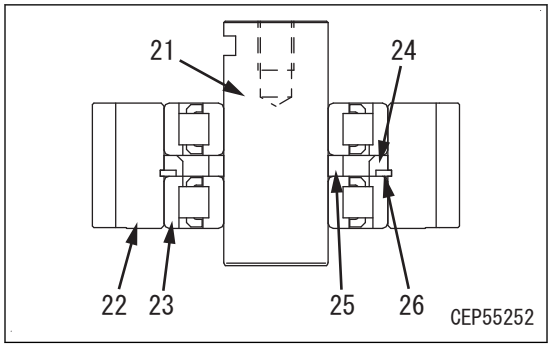


2) Push the shaft (21) out of the carrier by using the press.
3) Remove the gear (22) and bearing (23).

REMARK

The outer race and bearing are paired with each other. Put the matchmarks on them.

4) Remove the spacers (24) and (25) from the gear (22), and remove the snap ring (26).

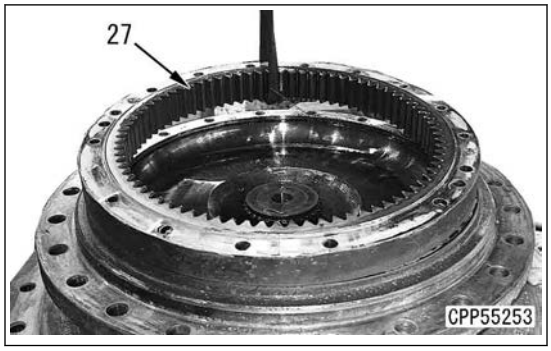


Ring gear (small)

7. Sling the ring gear (27), and remove it.

Tool: Lifting tool

Ring gear (27):
65 kg

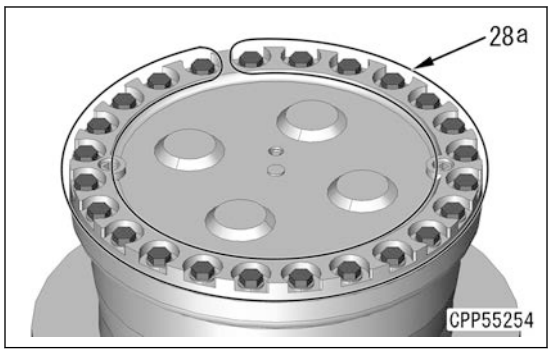


Carrier assembly (large)

8. Invert the final drive assembly (28), and remove the bolts (28a) (24 pieces).

Tool: Impact wrench, socket

Bolt (28a): Width across flats 46 mm, M30



9. Screw in the forcing screw, sling the carrier assembly (29) by using the eyebolts (C) (M24, P = 3.0), and remove it.

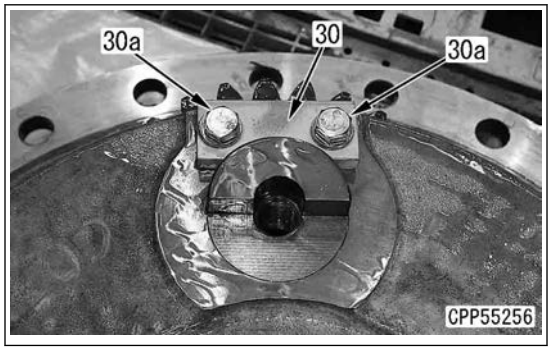
Tool: Lifting tool

Carrier assembly (29):
470 kg

10. Disassemble the carrier assembly according to the following procedure.
1) Remove the bolts (30a) (8 pieces), and remove the lock plates (30) (4 pieces).

Tool: Impact wrench, socket

Bolt (30a): Width across flats 24 mm, M16



2) Align the pin hole positions of the shaft (9) and carrier (11), and lightly tap the shaft with a plastic hammer, etc. to install it.

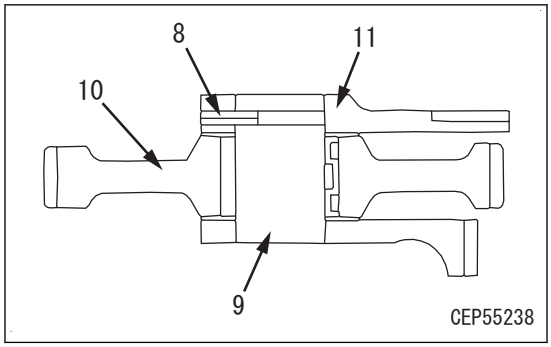
REMARK

When installing the shaft, keep rotating the planetary gear. Be careful not to damage the thrust washer.

3) Insert the pin (8).

REMARK

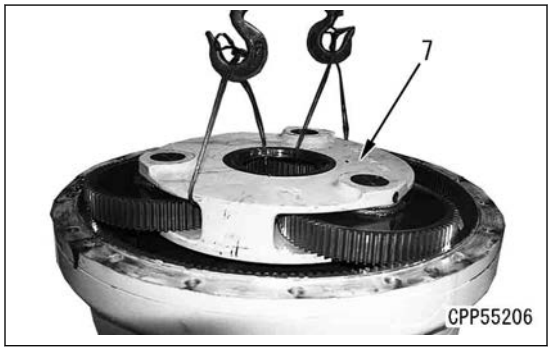
- Check that the groove and protruding portion of the pin are not deformed. If any failure is found, replace it.
- Displace the punching position from the previous one when reassembling the pin.
- After inserting the pin, punch the carrier pin (indicated by the arrow) by referring to descriptions of “No.2 carrier assembly”.
- After assembling the carrier assembly, check that the gear (10) rotates smoothly.



4) Attach the wire to the carrier case, sling the carrier assembly (7), and align it with the No.2 sun gear (15) to install it.

Tool: Lifting tool

Carrier assembly (7):
55 kg



No.1 ring gear

18. Align with the drill hole of the oil filler port, sling the No.1 ring gear (14) to install it.

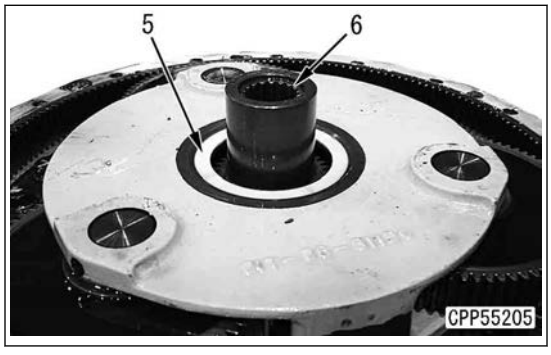
Tool: Lifting tool

No.1 ring gear (14):
16 kg

Mounting face:
Liquid gasket (LG-6)

No.1 sun gear

19. Install the thrust washer (5).
20. Install the No.1 sun gear (6).



REMOVE AND INSTALL COUNTERWEIGHT ASSEMBLY

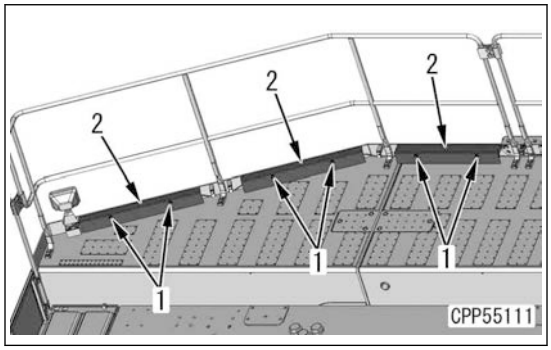
⚠ Stop the machine on a level ground, lower the work equipment completely to the ground in a stable posture, and set the work equipment lock lever to LOCK position.

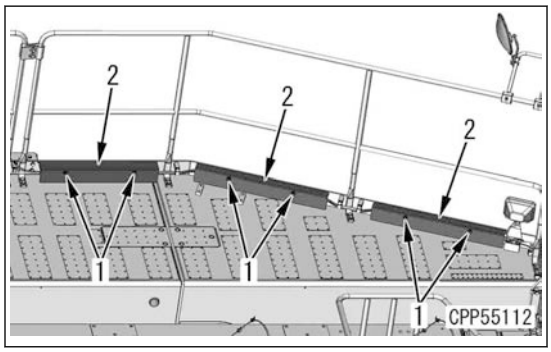
⚠ Stop the engine, turn the battery isolator switch to OFF position, and remove the key. (For details, see TESTING AND ADJUSTING, "HANDLE BATTERY ISOLATOR AND STARTING MOTOR ISOLATOR".)

METHOD FOR REMOVING COUNTERWEIGHT ASSEMBLY

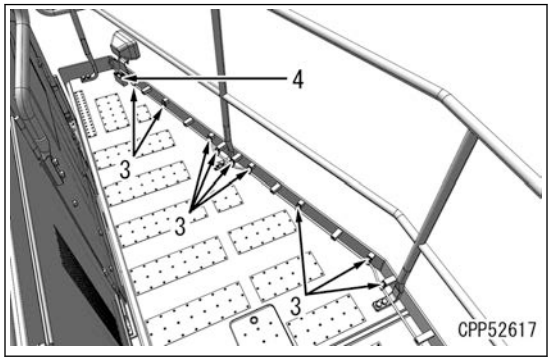
Counterweight assembly

1. Remove the bolts (1) (12 pieces), and remove the covers (2) (6 pieces).
   Tool: Impact wrench, socket
   Bolt (1): Width across flats19 mm, M12

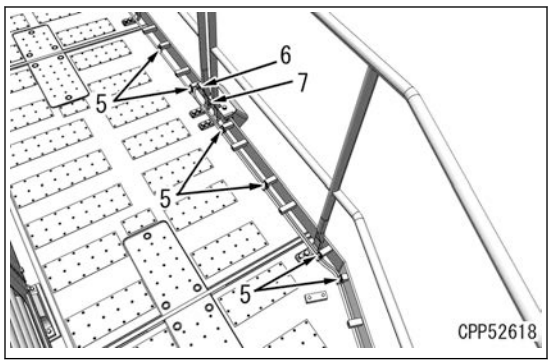




2. Remove the clamps (3) (9 pieces), and disconnect the connector L09A (4).
   Tool: Impact wrench, socket
   Bolt for clamp (3): Width across flats19 mm, M12

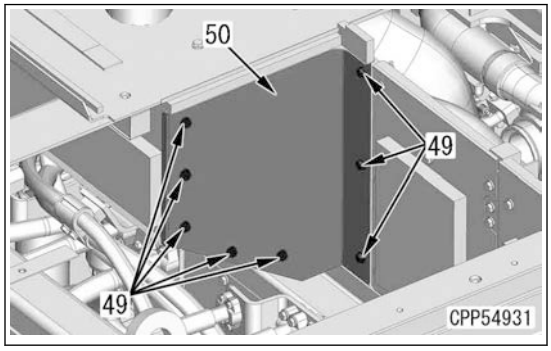


3. Remove the clamps (5) (7 pieces), and disconnect the connectors CAM4 (6) and A49 (7).
   Tool: Impact wrench, socket
   Bolt for clamp (5): Width across flats19 mm, M12

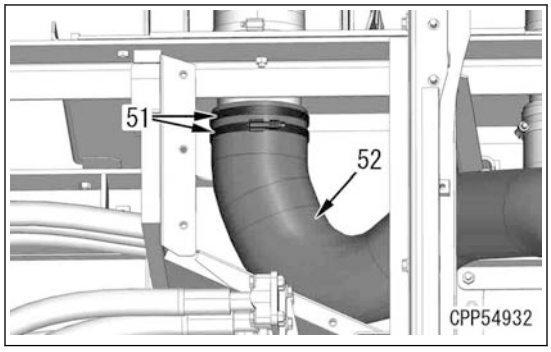


Air cleaner assembly

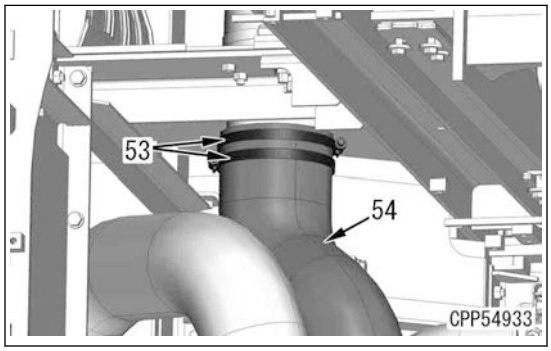
35. Remove the bolts (49) (8 pieces), and remove the cover (50).
    Tool: Impact wrench, socket wrench
    Bolt (49): Width across flats17 mm, M10



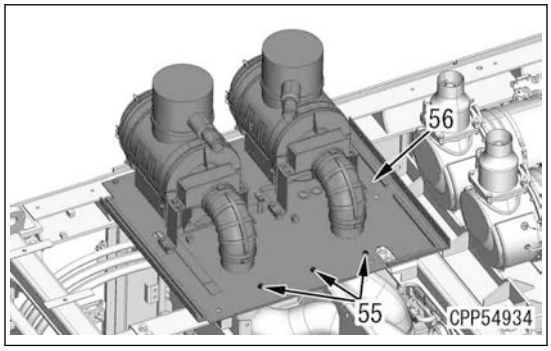
36. Remove the clamps (51) (2 pieces), and disconnect the hose (52).
    Tool: Ratchet handle, socket wrench
    Clamp (51): Width across flats9.5 mm(3/8 in)

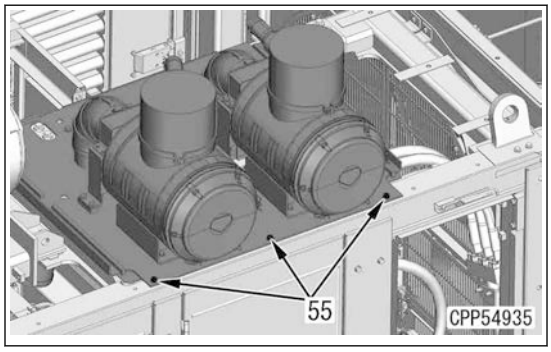


37. Remove the clamps (53) (2 pieces), and disconnect the hose (54).
    Tool: Ratchet handle, socket wrench
    Clamp (53): Width across flats9.5 mm(3/8 in)

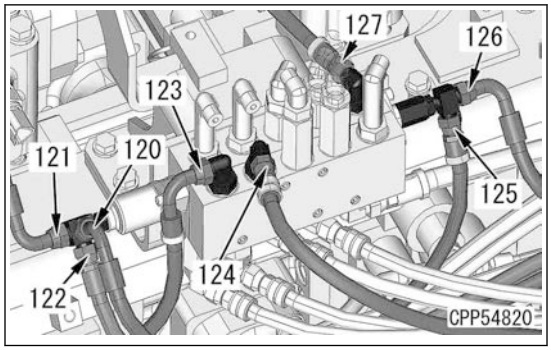


38. Remove the bolts (55) (6 pieces), and remove the air cleaner assembly (56).
    Tool: Impact wrench, socket wrench
    Bolt (55): Width across flats19 mm, M12





62. Loosen the sleeve nut, and disconnect the hoses (120), (121), (122), (123), (124), (125), (126), and (127).



(120): No color band

(121): No color band

(122): No color band

(123): Black

(124): Red, Red

(125): Yellow

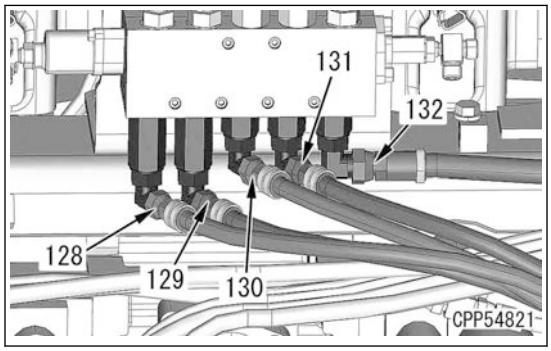
(126): No color band

(127): Brown

Tool: Open-end wrench, plug, cap

Hose (120), (121), (122), (123), (124), (125), (126), (127): Width across flats 22 mm, #03 size

63. Loosen the sleeve nut, and disconnect the hoses (128), (129), (130), and (131).



(128): Black, Black

(129): Red, Black

(130): Blue, Black

(131): Green, Black

Tool: Open-end wrench, plug, cap

Hose (128), (129), (130), (131): Width across flats 22 mm, #03 size

64. Loosen the sleeve nut, and disconnect the hose (132).

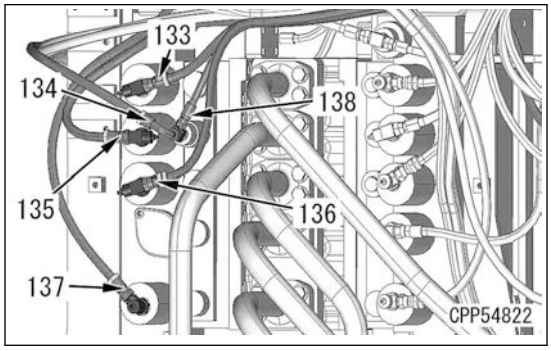
(132): Brown

Tool: Open-end wrench, plug, cap

Hose (132): Width across flats 27 mm, #04 size

Front of main valve (R2), hose

65. Loosen the sleeve nut, and disconnect the hoses (133), (134), (135), (136), and (137).



(133): Blue (arm IN)

(134): Brown (boom RAISE)

(135): Green (boom RAISE)

(136): Black, Brown (bucket CURL)

(137): Black (Right travel REVERSE)

Tool: Open-end wrench, plug, cap

Hose (133), (134), (135), (136), (137): Width across flats 22 mm, #03 size

66. Loosen the sleeve nut, and disconnect the hose (138).

(138): No color band (boom RAISE)

Tool: Open-end wrench, plug, cap

Hose (138): Width across flats 19 mm, #02 size

Pin

4. Pull out the pin (20) from the body (1).

Oil seal, Collar

5. Remove the oil seals (9) (4 pieces) and collars (8) (4 pieces).

Piston

6. Pull out the pistons (7) (4 pieces), and remove the retainers (6) (4 pieces), springs (5) (4 pieces), (4) (4 pieces), shims (3) (4 pieces), valves (2) (4 pieces), and washers (27) (4 pieces).

   REMARK

   Check the thickness and quantity of the shims (3) for each installing position, and write them down.

7. Remove the pistons (25) (4 pieces) and springs (26) (4 pieces).

Cover

8. Remove the hexagonal socket head bolts (21) (3 pieces) and washers (22) (3 pieces), and remove the cover (23).

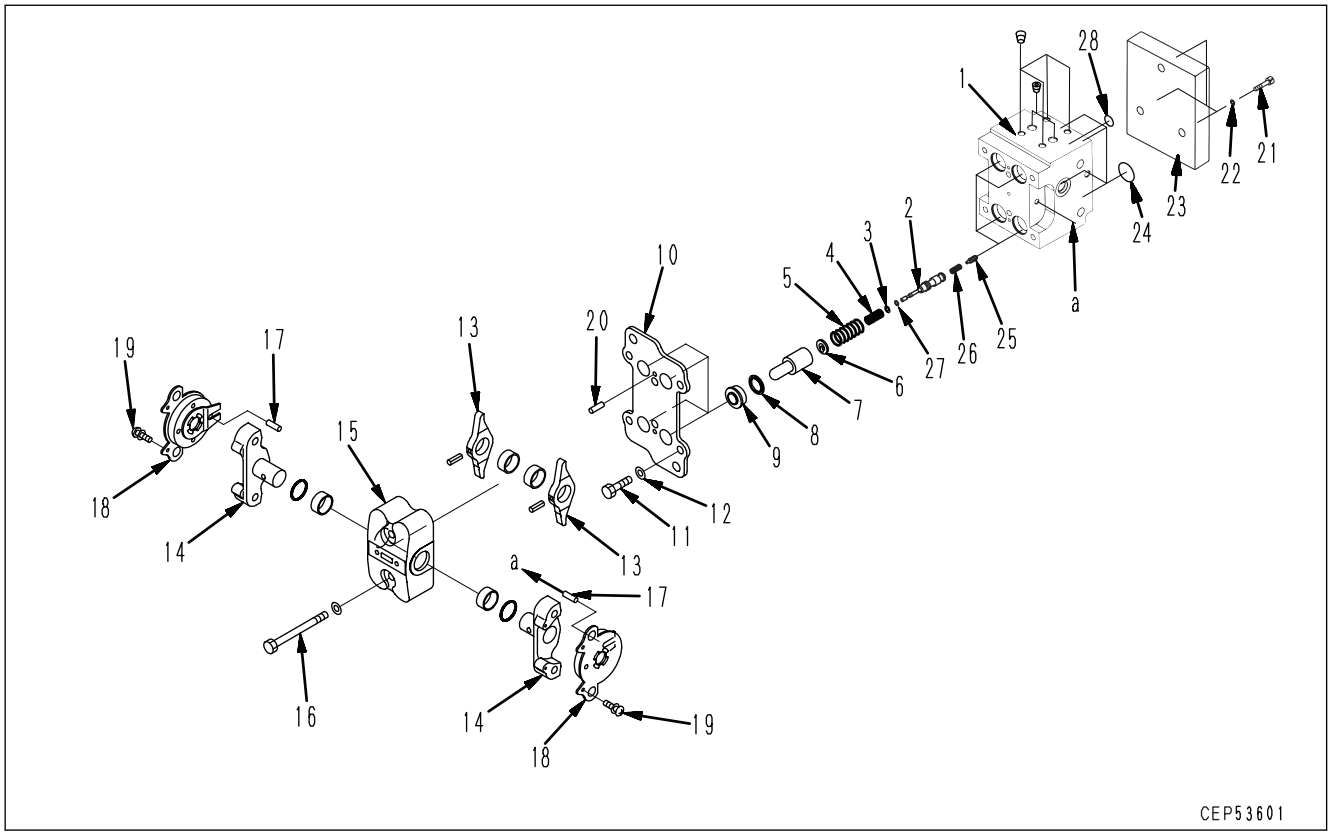
   Tool: Hexagonal wrench

   Hexagonal socket head bolt (21): Width across flats 6 mm, M8

9. Remove O-rings (24) (4 pieces) and (28).

METHOD FOR ASSEMBLING TRAVEL PPC VALVE ASSEMBLY

The following is the explanation of precautions for assembling the travel PPC valve assembly.



NOTICE

Perform cleaning and testing before assembling in order to prevent a failure caused by dust, rust, damages, etc.

Cover

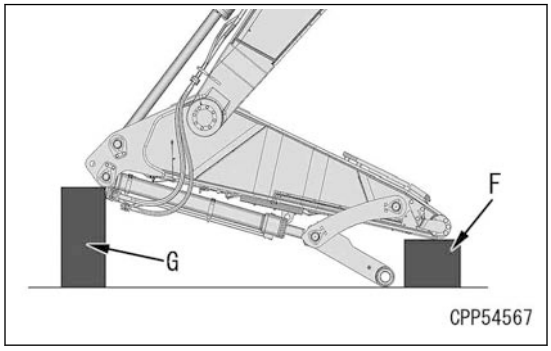
1. Install O-rings (24) (4 pieces) and (28).
2. Install the cover (23) with the hexagonal socket head bolts (21) (3 pieces) and washers (22) (3 pieces).

Arm cylinder assembly

2. Extend the piston rod of the arm cylinder to approximately 200 mm before the arm IN stroke end, and lower the arm on the block (F) and blocking tool (G).

   NOTICE

   Set the lock lever to the LOCK position, and stop the engine.



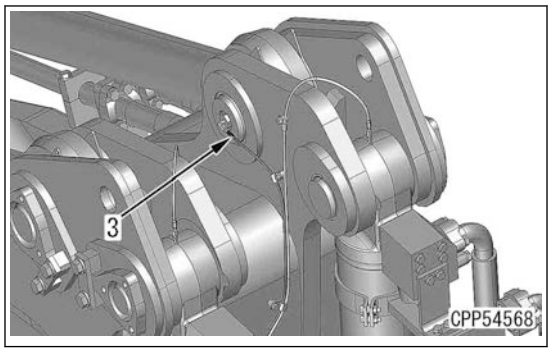
3. Loosen the sleeve nut, and disconnect the lubrication hose (3).

   REMARK

   Install the plugs to the disconnected hose and port to prevent oil leakage.

   Tool: Open-end wrench

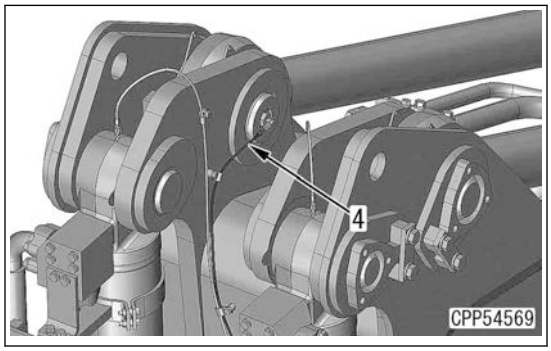
   Hose (3): Width across flats 12 mm



4. Loosen the sleeve nut, and disconnect the lubrication hose (4).

   Tool: Open-end wrench, plug, cap

   Hose (4): Width across flats 12 mm

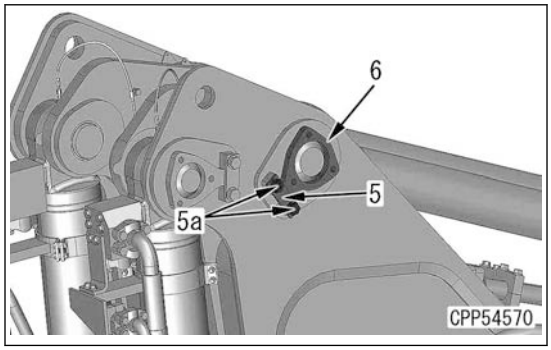


5. Remove the bolts (5a) (2 pieces), and remove the plate (5).

   Tool: Impact wrench, socket wrench

   Bolt (5a): Width across flats 36 mm, M24

6. Remove the lock plate (6).

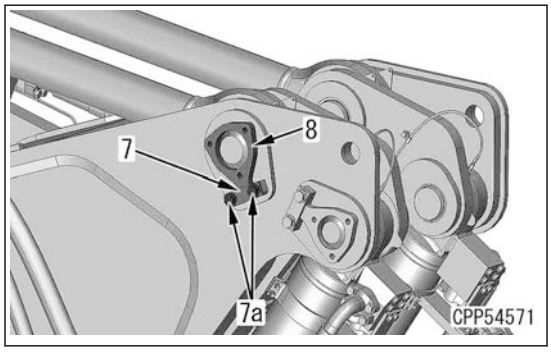


7. Remove the bolts (7a) (2 pieces), and remove the plate (7).

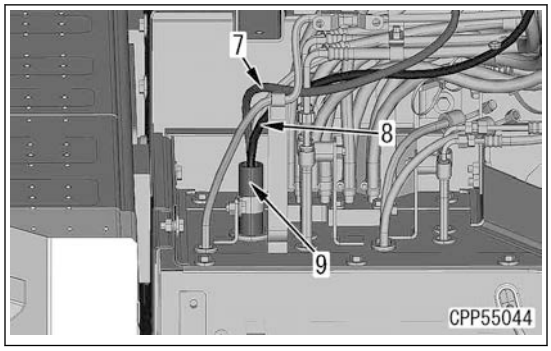
   Tool: Impact wrench, socket wrench

   Bolt (7a): Width across flats 36 mm, M24

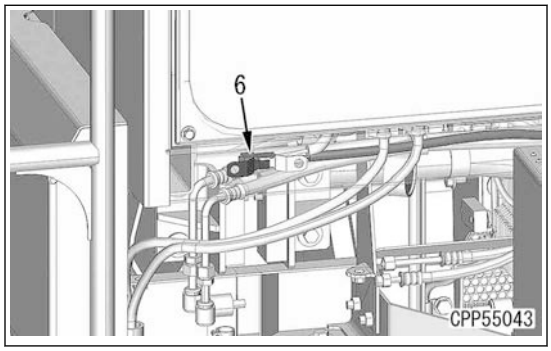
8. Remove the lock plate (8).



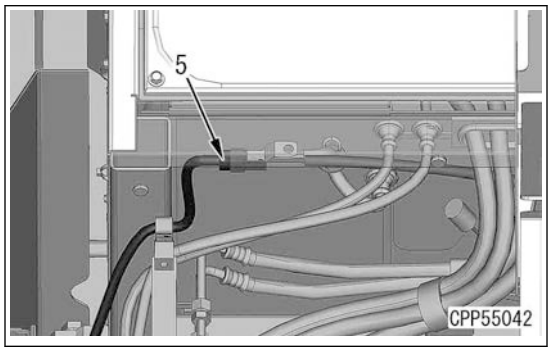
18. Insert the air conditioner drain hoses (7) and (8) into the drain tube (9).



19. Install the connector (6) to the connector table.



20. Connect the connector (5).



21. Connect the air conditioner hose (3) with the sleeve nut.

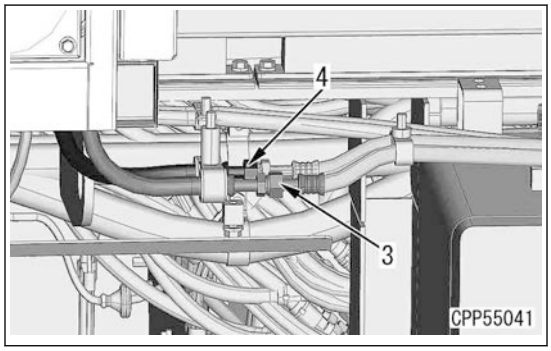
REMARK

- When installing the air conditioner piping, be careful to prevent dirt, dust, and water from entering the hose.
- Check that O-ring is installed to the connecting part of the air conditioning piping before connecting.
- Be sure to use a new O-ring since it is deformed and deteriorated if it is used once.
- When removing O-ring, do not damage the piping.
- Apply compressor oil for refrigerant (R134a) to O-ring.

Tool: Ratchet handle, wrench, torque wrench

Hose (3): Width across flats 27 mm, size #04

Hose (3):
84.0 to 132 Nm {8.5 to 13.5 kgfm}



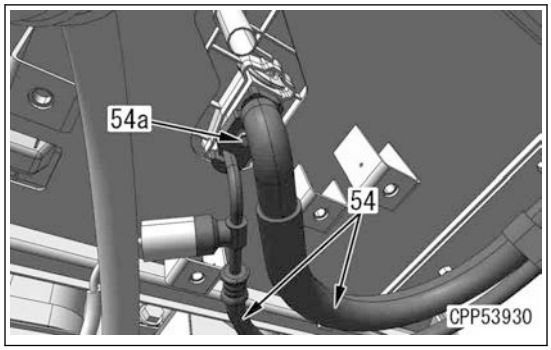
22. Connect the air conditioner hose (4) with the sleeve nut.

Tool: Ratchet handle, wrench, torque wrench

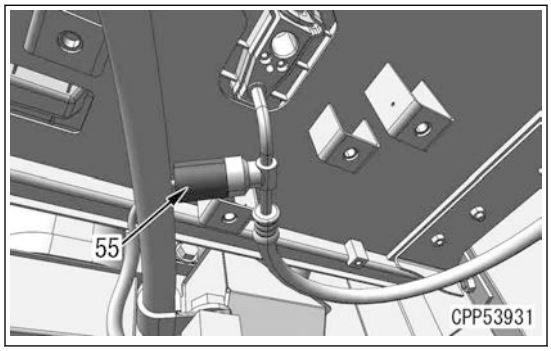
Hose (4): Width across flats 27 mm, size #04

Hose (4):
84.0 to 132 Nm {8.5 to 13.5 kgfm}

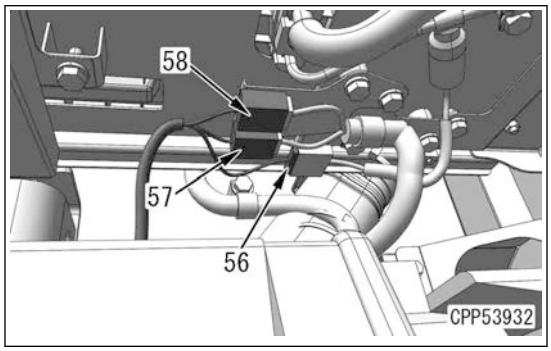
57. Remove the bolt (54a), and disconnect the hoses (54) (2 pieces).
    Tool: Ratchet wrench, socket wrench
    Bolt (54a): Width across flats 10 mm, M6



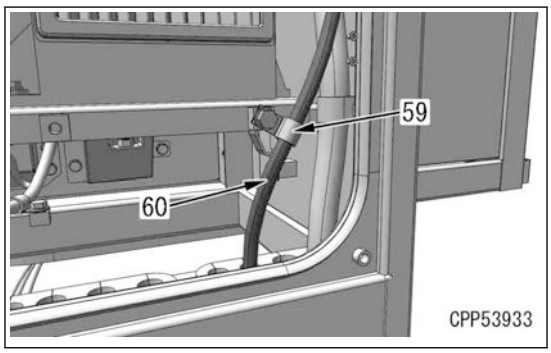
58. Disconnect the connector M84B (55).



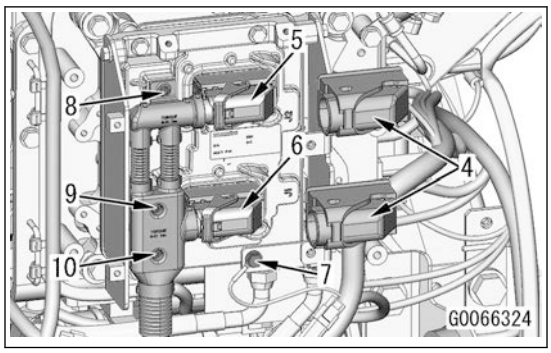
59. Disconnect the connectors M27B (56), M33B (57), and M34B (58).



60. Remove the clamp (59), and move the hose (60) to a safe place not to interfere with the work.
    Tool: Impact wrench, socket wrench
    Bolt for clamp (59): Width across flats 17 mm, M10



4. Connect connectors ECM_L_J1 (6) and ECM_L_J2 (5) to engine controller according to the following procedure.

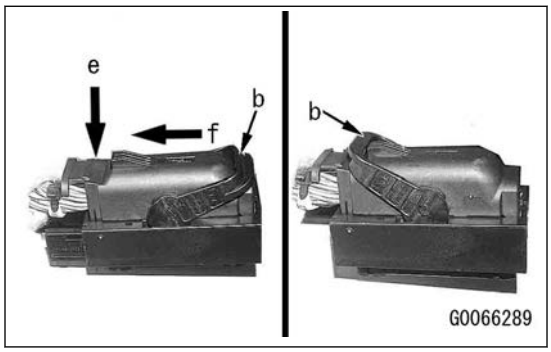


REMARK

- Connect connectors ECM_L_J1 (6) and ECM_L_J2 (5) in this order.
- Insert connector to engine controller securely.

1) Connect the connector in the direction of (e).
2) Slide lock lever (b) in the direction of (f), and lock it.

5. Install hexagonal socket head bolts (10), (9), and (8) in this order, and connect wiring harness.



REMARK

Note that the length of each hexagonal socket head bolt are different.

Tool: Hexagonal wrench, torque wrench

Hexagonal socket head bolt (8), (9), (10): Width across flats 5 mm, M6

Hexagonal socket head bolt (8), (9), (10):
8 to 10 Nm {0.8 to 1.02 kgfm}

6. Lightly fasten ground terminal with bolt (7).

REMARK

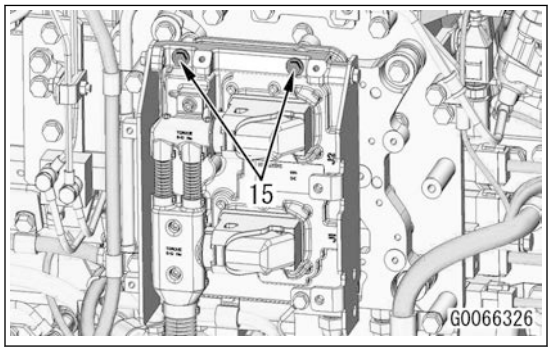
Ground terminal, engine controller (17), and bracket (14) are tightened together.

Tool: Impact wrench, socket

Bolt (7): Width across flats 13 mm, M8

7. Install boots (4) (2 pieces) to connectors ECM_L_J2 (5) and ECM_L_J1 (6).

8. Tighten bolts (15) (2 pieces) to the specified torque.



Tool: Ratchet handle, socket, torque wrench

Bolt (15): Width across flats 13 mm, M8

Bolt (15):
27 to 34 Nm {2.8 to 3.5 kgfm}

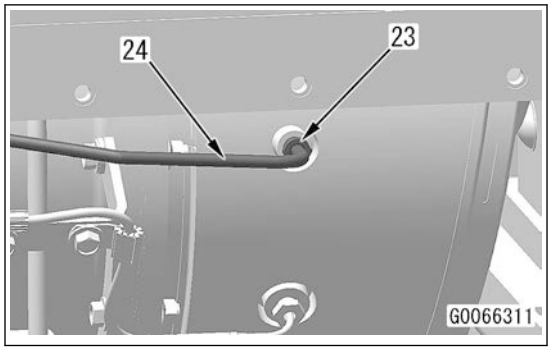
15. Loosen nut (23), and disconnect KDPF differential pressure sensor Lo pipe (24).

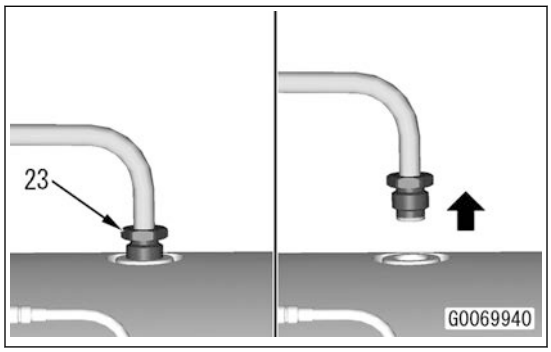
REMARK

Loosen nut (23), and pull out tube vertically by your hands.

Tool: Spanner wrench

Nut (23): Width across flats 15.9 mm





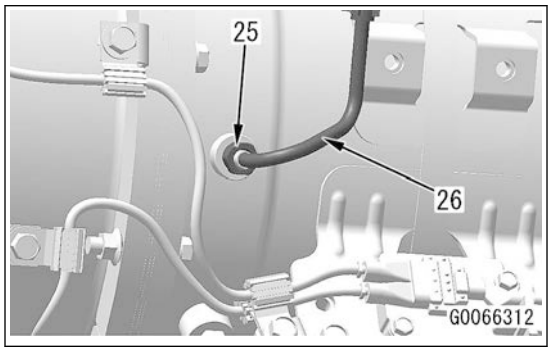
16. Loosen nut (25), and disconnect KDPF differential pressure sensor Hi pipe (26).

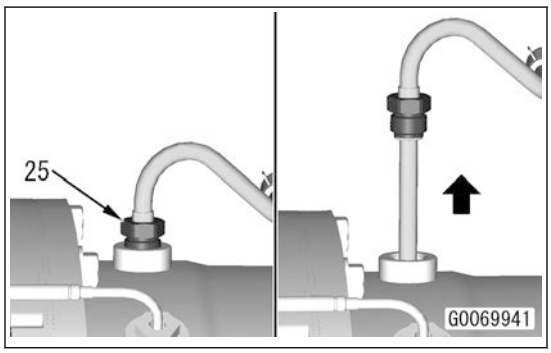
REMARK

Loosen nut (25), and pull out tube vertically by your hands.

Tool: Spanner wrench

Nut (25): Width across flats 17.5 mm

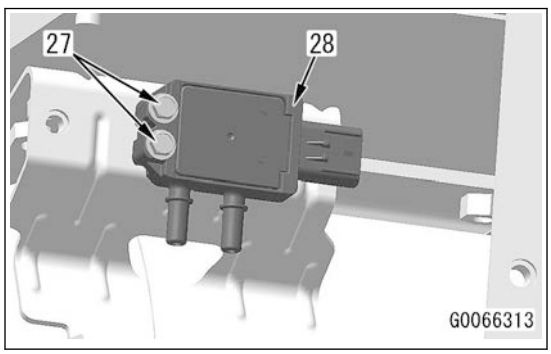




17. Remove bolts (27) (2 pieces), and remove KDPF differential pressure sensor (28).

Tool: Ratchet handle, socket

Bolt (27): Width across flats 10 mm, M6

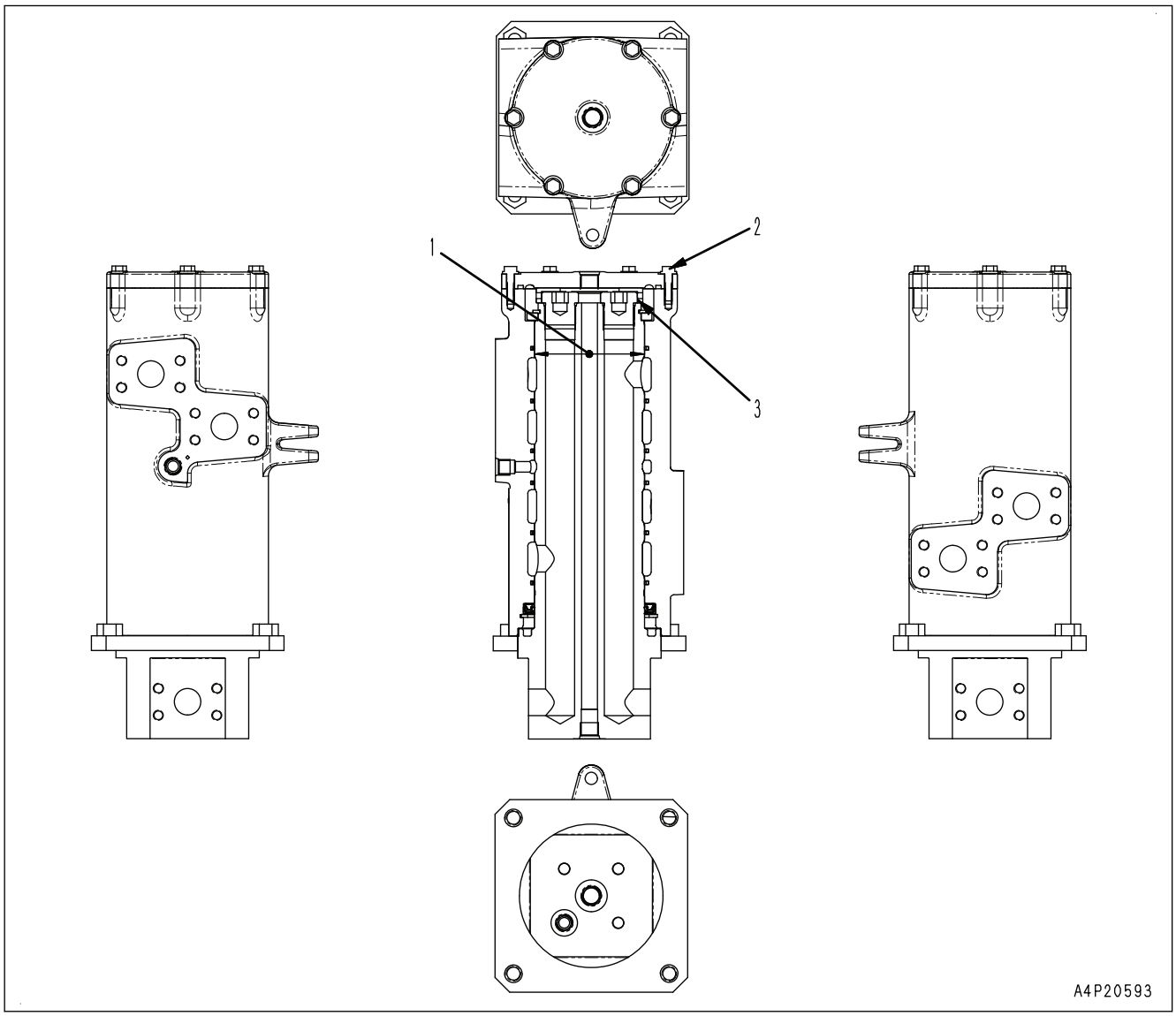


Unit: mm

No.	Item	Judgment criteria		Remedy
1	Backlash between the drive gear and driven gear	Standard clearance	Allowable clearance	Replace
		0.21 to 0.73	-	
2	Backlash between No. 1 sun gear and driven gear	0.085 to 0.207	-	
3	Backlash between No. 1 sun gear and No. 1 planetary gear	0.25 to 0.46	-	
4	Backlash between No. 2 sun gear and No. 1 planetary gear	0.089 to 0.293	-	
5	Backlash between No. 2 planetary gear and No. 2 sun gear	0.24 to 0.62	-	
6	Backlash of the housing	0.067 to 0.258	-	
7	Backlash between the housing and No. 2 ring gear	0.276 to 0.808	-	
8	Clearance between the housing and hub	10	-	
9	Standard shim thickness of the cover mounting portion	2		Adjust
10	Tightening torque of the bolt	2790 to 3190 Nm {285 to 325 kgfm}		Re-tighten
11	Tightening torque of the bolt	1520 to 1910 Nm {155 to 195 kgfm}		
12	Tightening torque of the bolt	824 to 1030 Nm {84 to 105 kgfm}		
13	Tightening torque of the bolt	127.4 to 176.4 Nm {13.0 to 18.0 kgfm}		
14	Tightening torque of the bolt	127.4 to 176.4 Nm {13.0 to 18.0 kgfm}		
15	Tightening torque of the bolt	245 to 309 Nm {25.0 to 31.5 kgfm}		

	Item	Judgment criteria	Remedy
1	Tightening torque of the plug	177 to 196 Nm {18 to 20 kgfm}	Retightening
2	Tightening torque of the suction valve	216 to 235 Nm {22 to 24 kgfm}	

MAINTENANCE STANDARD OF CENTER SWIVEL JOINT



Unit: mm

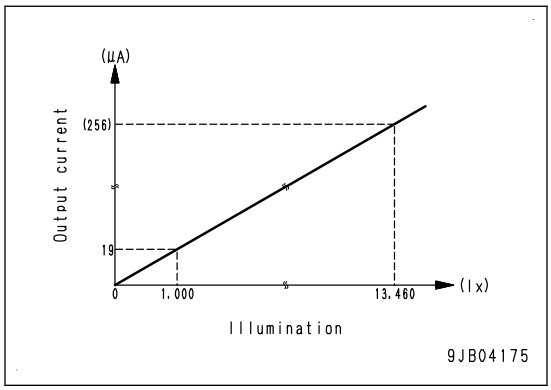
No.	Item	Judgment criteria					Remedy
		Standard dimensions	Tolerance		Standard clearance	Allowable clearance	
			Shaft	Hole			
1	Clearance between the rotor and shaft	150	-0.050 -0.068	+0.039 +0.014	+0.064 to +0.107	0.111	Replace
2	Tightening torque of the bolt	58.8 to 73.6 Nm {6.0 to 7.5 kgfm}					Re-tighten
3	Tightening torque of the plug	245±24.5 Nm {25±2.5 kgfm}					

SENSORS FOR AIR CONDITIONER SYSTEM

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 characteristics



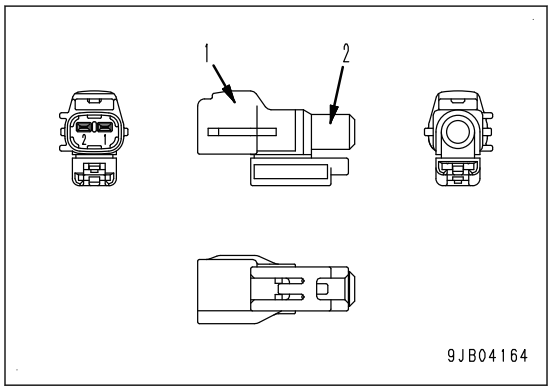
STRUCTURE OF AMBIENT TEMPERATURE SENSOR

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

General view

1: Connector

2: Sensor



FUNCTION OF AMBIENT 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.
- 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 outside air temperature sensor.

PT07A-14-18S(023)(WG): KVN6

Pin No.	Signal name	Input/output signal
A	Camera power supply (8 V)	Output
B	(*1)	-
C	Camera 1 NTSC signal	Input
D	GND (Camera 1 NTSC signal)	-
E	Camera 2 NTSC signal	Input
F	GND (Camera 2 NTSC signal)	-
G	Camera 3 NTSC signal	Input
H	GND (Camera 3 NTSC signal)	-
J	Camera 4 NTSC signal	Input
K	GND (Camera 4 NTSC signal)	-
L	Camera 5 NTSC signal	Input
M	GND (Camera 5 NTSC signal)	-
N	Camera 6 NTSC signal	Input
P	GND (Camera 6 NTSC signal)	-
R	Camera 7 NTSC signal	Input
S	GND (Camera 7 NTSC signal)	-
T	(*1)	-
U	(*1)	-

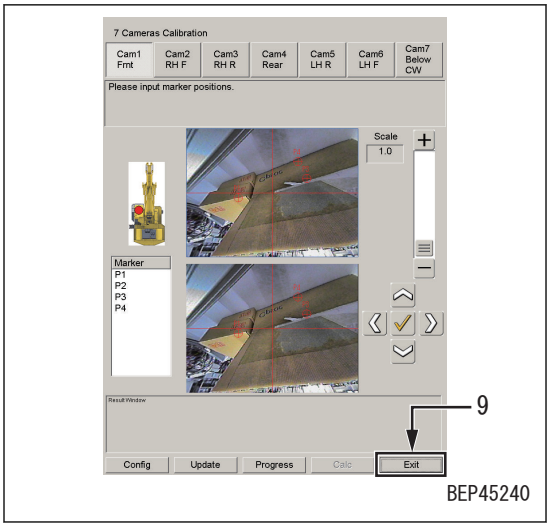
*1: Never connect these pins. Malfunctions or failures may occur.

PT07A-12-10S(023)(WG): KVN10

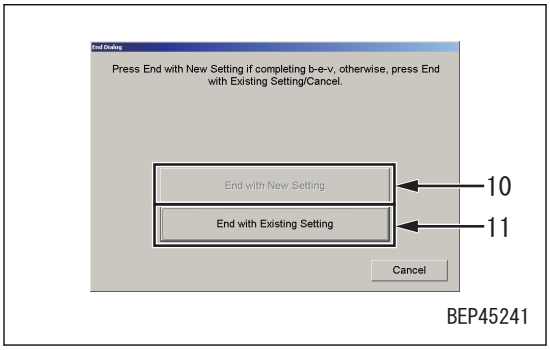
Pin No.	Signal name	Input/output signal
A	Horizontal synchronizing signal	Output
B	Vertical synchronizing signal	Output
C	RGB R signal	Output
D	GND (RGB R signal)	-
E	RGB G signal	Output
F	GND (RGB G signal)	-
G	RGB B signal	Output
H	GND (RGB B signal)	-
J	GND_SIG_SYNT	-
K	(*1)	-

*1: Never connect these pins. Malfunctions or failures may occur.

7. Press the “Exit” button (9).



8. When the “Exit” screen is displayed, perform the following operations.
   - When saving the calibration results:
     Press “End with New Setting” (10).
     The calibration results are saved and the screen returns to the maintenance mode screen.
     Automatic 7 cameras calibration is completed.
   - When not saving the calibration results or when performing 7 camera calibration again due to the problem with the bird's eye view image on step 5:
     Press “End with Existing Setting” (11).



REMARK

The calibration results for this time are not saved and the screen returns to the maintenance mode screen.

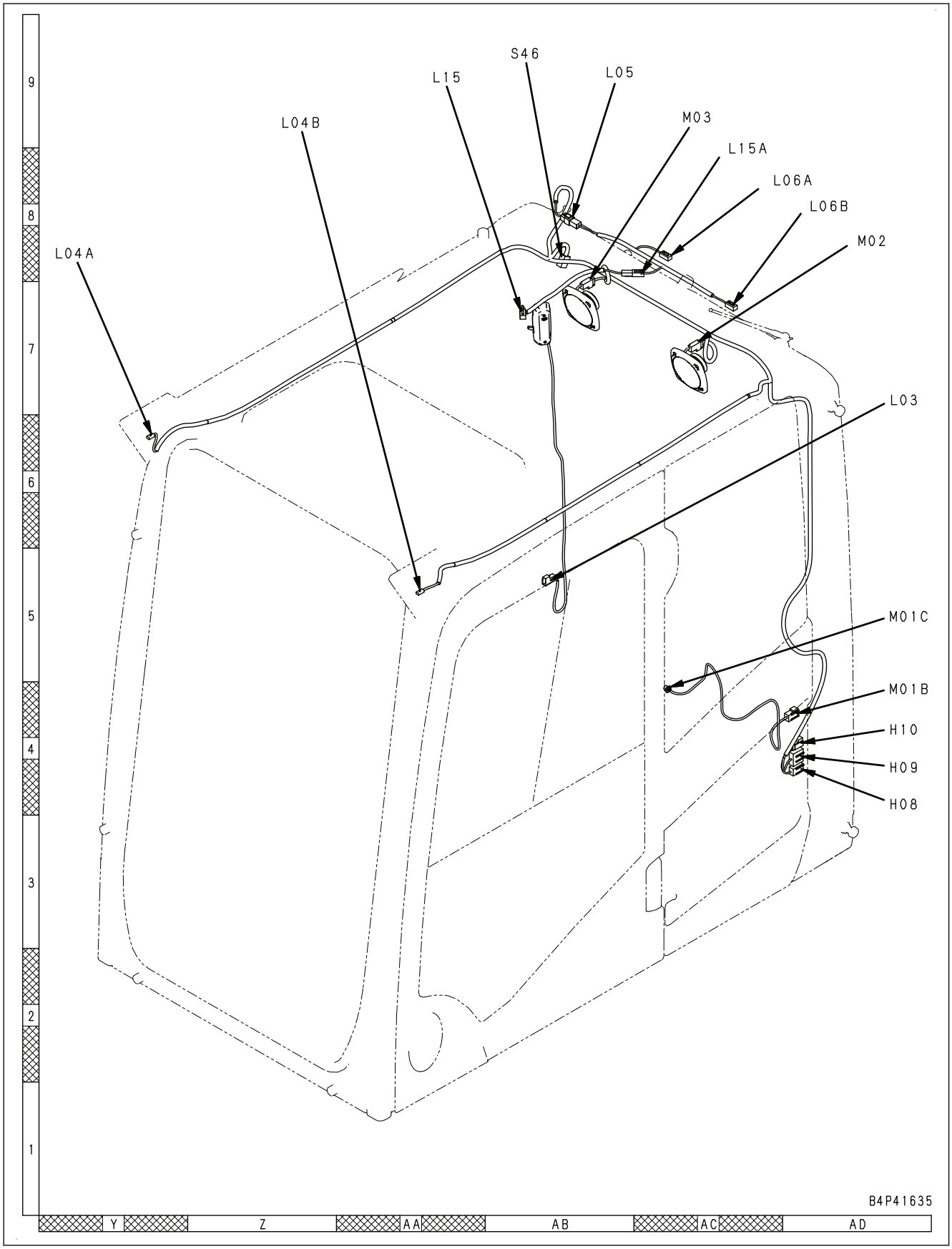
NOTICE

To perform 7 cameras calibration again, see “MANUAL CALIBRATION” to perform manual calibration.

SETTING MANUAL MARKER POSITION

If the marker positions could not be detected automatically, specify the marker positions manually according to the following procedure.

5/6


S46
L15
L05
L04B
M03
L15A
L06A
L06B
M02
L04A
L03
M01C
M01B
H10
H09
H08
B4P41635
9
8
7
6
5
4
3
2
1
Y
Z
AA
AB
AC
AD

No.	Cause	Procedure, measuring location, criteria and remarks		
3	Open circuit in wiring harness	1. Starting switch: OFF 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Disconnect the connectors KVM and H22, and connect the T-adapter to each female side. 4. Battery disconnect switch: ON 5. Starting switch: ON		
		Resistance	Between KVM (male) (47) and (39)	Max. 1 Ω
			Between KVM (male) (48) and (40)	Max. 1 Ω
			Between KVM (male) (49) and (39)	Max. 1 Ω
			Between KVM (male) (50) and (40)	Max. 1 Ω
			Between H22 (male) (5) and (3)	Max. 1 Ω
			Between H22 (male) (6) and (4)	Max. 1 Ω
			Between H22 (male) (7) and (3)	Max. 1 Ω
			Between H22 (male) (8) and (4)	Max. 1 Ω
		1. Starting switch: OFF 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Disconnect the connectors KVM and H22, and connect the T-adapter to each female side. 4. Remove the circuit breaker.		
		Resistance	Between KVM (male) (49) and B28C	Max. 1 Ω
			Between KVM (male) (50) and B28C	Max. 1 Ω
			Between KVM (male) (39) and ground	Max. 1 Ω
			Between KVM (male) (40) and ground	Max. 1 Ω
			Between KVM (male) (47) and S18 (female) (5)	Max. 1 Ω
			Between KVM (male) (48) and S18 (female) (5)	Max. 1 Ω
4	Ground fault in wiring harness	1. Starting switch: OFF 2. Disconnect the connectors KVM and H22, and connect the T-adapter to either female side. 3. Remove the circuit breaker.		
		Resistance	Between ground and H22 (male) (7) or B28C	Max. 1 Ω
			Between ground and H22 (male) (8) or B23C	Max. 1 Ω
			Between ground and KVM (male) (49) or B23C	Max. 1 Ω
			Between ground and KVM (male) (50) or B23C	Max. 1 Ω
5	KomVision monitor	If no failure is found by above checks, KomVision monitor is defective.		