UENBM00522

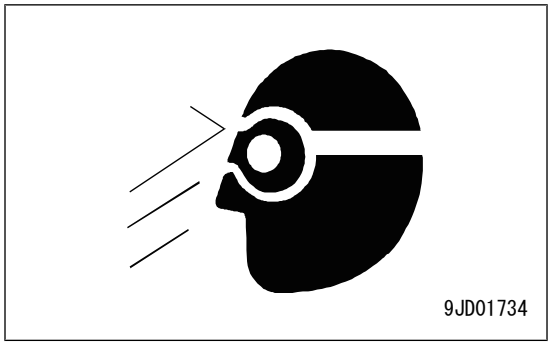
Shop Manual

HYDRAULIC
EXCAVATOR

HB365LC-3E0
HB365NLC-3E0

SERIAL NUMBERS 5001 and up
K70001 and up

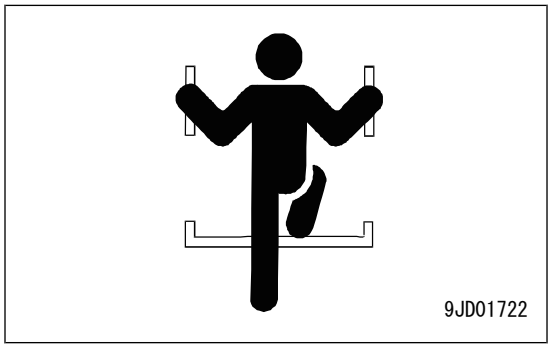
KOMATSU



- Always wear the protective eyeglasses when hitting parts with a hammer.
- Always wear the protective eyeglasses when grinding parts with a grinder, etc.
- When performing any operation with multiple workers, always agree on the operating procedure before starting. Be clear in verbal communication, and observe hand signals. Hang “UNDER REPAIR” warning tag in the operator's compartment Before starting work.
- Work and operation which require license or qualification should be performed by qualified workers.
- Welding repairs should be performed by trained and experienced welders. When performing welding work, always wear welding gloves, apron, welding goggles, cap and other clothes suited for welding work.
- Warm up before starting the work with exercise which increases alertness and the range of motion in order to prevent injury.
- Avoid prolonged work, and take a rest at times to keep up a good condition. Take a rest at designated safe area.

Precautions for preparatory work

- Place the machine on a firm and level ground, and apply the parking brake and chock the wheels or tracks to prevent the machine from moving before adding oil or making any repairs.
- Lower the work equipment (blade, ripper, bucket, etc.) to the ground before starting work. If this is not possible, insert the lock pin or use blocks to prevent the work equipment from falling. In addition, be sure to lock all the control levers and hang “UNDER REPAIR” warning tag on them.
- When performing the disassembling or assembling work, support the machine securely with blocks, jacks, or stands before starting the work.



- Remove all mud and oil from the steps or other places for going up and down on the machine. Always use the handrails, ladders or steps when for going up and down on the machine. Never jump on or off the machine. When the scaffold is not provided, use steps or stepladder to secure your footing. Do not use handrails, ladders, or steps if they are damaged or deformed. Repair it or replace it immediately.

Precautions during work

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

  REMARK

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

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

  REMARK

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

PRECAUTIONS FOR THE COLD SEASON

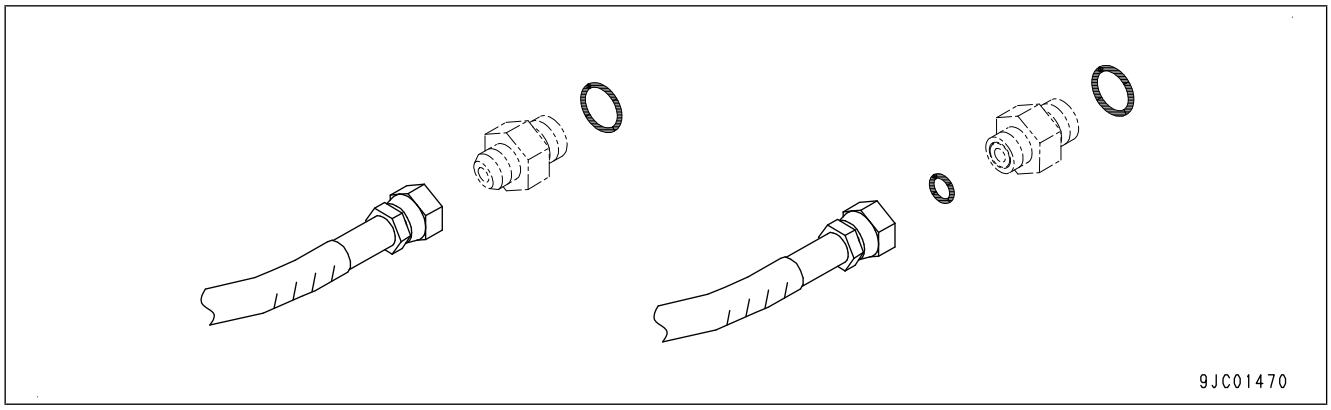
- The swing operation is performed the same in the cold season as the other seasons. The work equipment operation and travel operation are performed slower in cold season than other seasons, and unexpected movement may occur. Perform the sufficient warming up operation, otherwise the machine may hit an obstacle.
- Operate the work equipment and travel the machine with extreme care if sufficient warming up operation cannot be performed out of necessity. Keep in mind that the work equipment operation and travel operation are performed slower in cold season than other seasons, and unexpected movement may occur.

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

Table of tightening torque for hose (taper seal type and face seal type)

REMARK

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



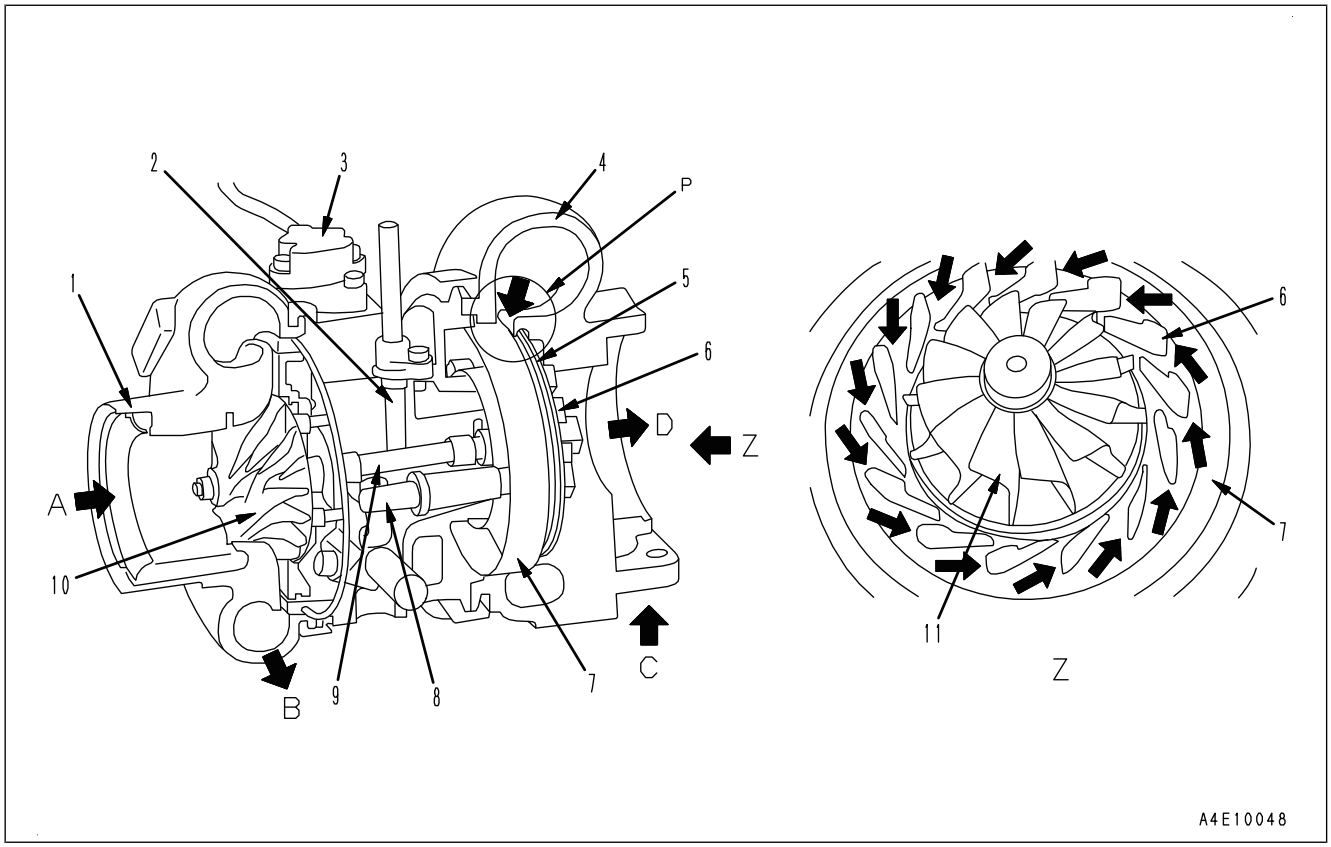
Nominal No. of hose	Width across flats (mm)	Tightening torque (Nm {kgfm})		Taper seal	Face seal	
		Range	Target	Thread size (mm)	Nominal size - threads per inch	Thread root diameter(mm) (reference)
02	19	34 to 54 {3.5 to 5.5}	44 {4.5}	-	$^{9}/_{16}$-18UN	14.3
		34 to 63 {3.5 to 6.5}	44 {4.5}	14	-	-
03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

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
CRI	Common Rail Injection	Engine	This is a function that maintains optimum fuel injection amount and fuel injection timing. This is performed the engine controller which electronically controls supply pump, common rail, and injector.
ECM	Electronic Control Module	Electronic control system	This is an electronic control device that send the command to actuators using the signals from the sensors on the machine so that the optimum actuation is performed. (Same as ECU)
ECMV	Electronic Control Modulation Valve	Transmission (D, HD, WA, etc)	This is a proportional electromagnetic valve that decreases the transmission shock by gradually increasing oil pressure for engaging clutch.
ECSS	Electronically Controlled Suspension System	Travel (WA)	This is a device that ensures smooth high-speed travel by absorbing vibration of machine during travel with hydraulic spring effect of accumulator.
ECU	Electronic Control Unit	Electronic control system	This is an electronic control device that send the command to actuators using the signals from the sensors on the machine so that the optimum actuation is performed. (Same as ECM)
EGR	Exhaust Gas Recirculation	Engine	This is a function that recirculates a part of exhaust gas to combustion chamber, so that it reduces combustion temperature, and reduces emission of NOx.
EMMS	Equipment Management Monitoring System	Machine monitor	This is a function with which operator can check information from each sensor on the machine (filter, oil replacement interval, malfunctions on machine, failure code, and failure history).
EPC	Electromagnetic Proportional Control	Hydraulic system	Electromagnetic proportional control This is a mechanism with which actuators operate in proportion to the current.
FOPS	Falling Object Protective Structure	Cab and canopy	This structure protects the operator's head from falling objects. (Falling object protective structure) This performance is standardized as ISO 3449.
F-N-R	Forward-Neutral-Reverse	Operation	Forward - Neutral - Reverse
GPS	Global Positioning System	Communication (KOMTRAX, KOMTRAX Plus)	This system uses satellites to determine the current location on the earth.
GNSS	Global Navigation Satellite System	Communication (KOMTRAX, KOMTRAX Plus)	This is a general term for system uses satellites such as GPS, GALILEO, etc.
HSS	Hydrostatic Steering System	Steering (D Series)	This is a function that enables the machine to turn without steering clutch by controlling a difference in travel speed of right and left tracks with a combination of hydraulic motor and bevel shaft.
HST	Hydro Static Transmission	Transmission (D, WA)	Hydraulic transmission system that uses a combination of hydraulic pump and hydraulic motor without using gears for stepless gear shifting.

5: Temperature sensor controller
6: Ammonia sensor
7: Hanger plate
8: water baffle
9: Water drain port
10: Sensor table
11: Sensor table band
12: Catalyzer hold mat
13: Water dam
14: Downstream SCR catalyst and ammonia oxidation catalyst (integrated type)
15: Upstream SCR catalyst
16: Rectifier tube

- SCR assembly consists of rectifier tube (16) equalizing the distribution of flow speed by leading exhaust gas, upstream SCR catalyst (15), downstream SCR catalyst, ammonia oxidation catalyst (14), and water dam which prevents rain water from entering into downstream SCR catalyst and ammonia oxidation catalyst (14) while exhausting gas.
- Ammonia oxidation catalyst (a part of 14) oxidizes ammonia to water and nitrogen with ammonia oxidation catalyst (a part of 14) to prevent ammonia which is supplied to SCR assembly from being released out because SCR catalyst (a part of 14, 15)cannot completely consume it.
- Each 1 piece of SCR temperature sensor (2), SCR outlet temperature sensor (4), ammonia sensor (6), and SCR outlet NOx sensor (3) are installed. These sensors are usable for various troubleshooting, such as they are used to control the feedback of denitration efficiency or they monitor that SCR catalyst properly functions or not.
- Rectifying tube (16) equalizes the distribution of exhaust gas flow speed.
- SCR catalyst (15, a part of 14) uses the ceramic honeycomb.
- The catalyzer holding mat (12) is made of a specific fiber and protects the ceramic catalyst against vibrations by the engine and the machine body. It also protects the outer periphery of SCR assembly against a heat transfer of the ceramics during operation.
- Water dam (13) is located at the upstream side of the outlet and prevents rainwater from entering into downstream SCR catalyst unit and ammonia oxidation catalyst (14).
- Water baffle (8) is located at the downstream side of the outlet and prevents rainwater at outlet from splashing over the detection part of NOx sensor.

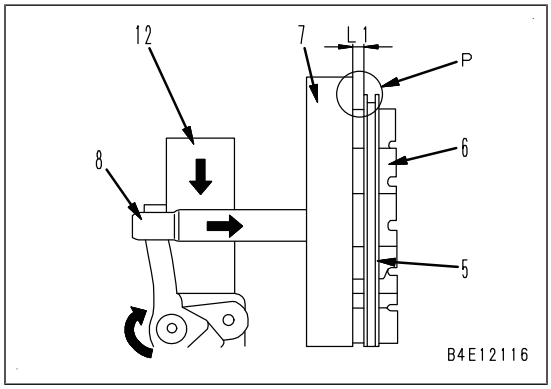
OPERATION OF VGT



1. The exhaust gas enters (C) of turbine housing (4) and flows out through portion (P) and (D). Portion (P) is surrounded by plate (5) fixed to turbine housing, nozzle ring (7), and vanes (6).
   The area of its passage is changed by sliding push rod (8) to the right or left.
2. Hydraulic actuator (3) moves piston (12) in the actuator up and down with the hydraulic pressure controlled by EPC valve installed to the front cover, and slides push rod (8) to the right and left.
3. The exhaust gas flowing through vanes (6) rotates blower impeller (10) through shaft (9) joined to turbine impeller (11). As the result, the blower impeller works as a compressor, and the intake air entering through (A) is compressed and discharge through (B).
4. When the exhaust gas pressure at inlet (C) of turbine housing (4) is low (engine speed is in low range), push rod (8) slides to the right and narrows portion (P).
5. The exhaust gas acting on turbine impeller (11) increases, the turbocharger speed increases, and more air (oxygen) is taken in.
   VGT speed sensor (2) detects the rotation of the turbocharger.

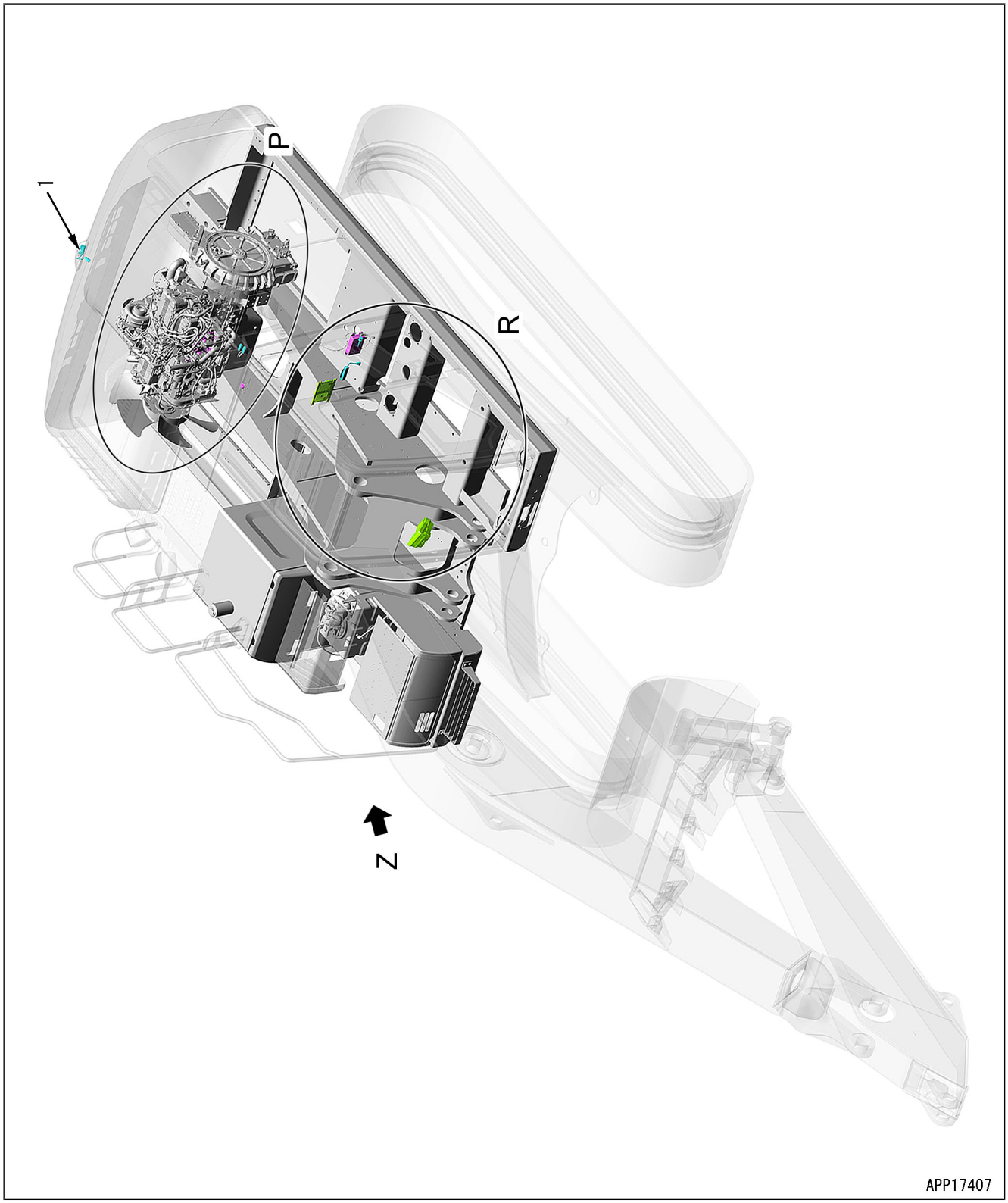
When nozzle ring is “closed”

1. During low speed operation (rotation), exhaust gas inlet passage (P) is narrow (L1). (It is not fully closed, however.)
2. If the turbine inlet pressure increases while the nozzle ring is closed, the turbine inflow speed increases, and accordingly the turbocharger speed increases.



CONTROL SYSTEM

LAYOUT DRAWING OF CONTROL SYSTEM



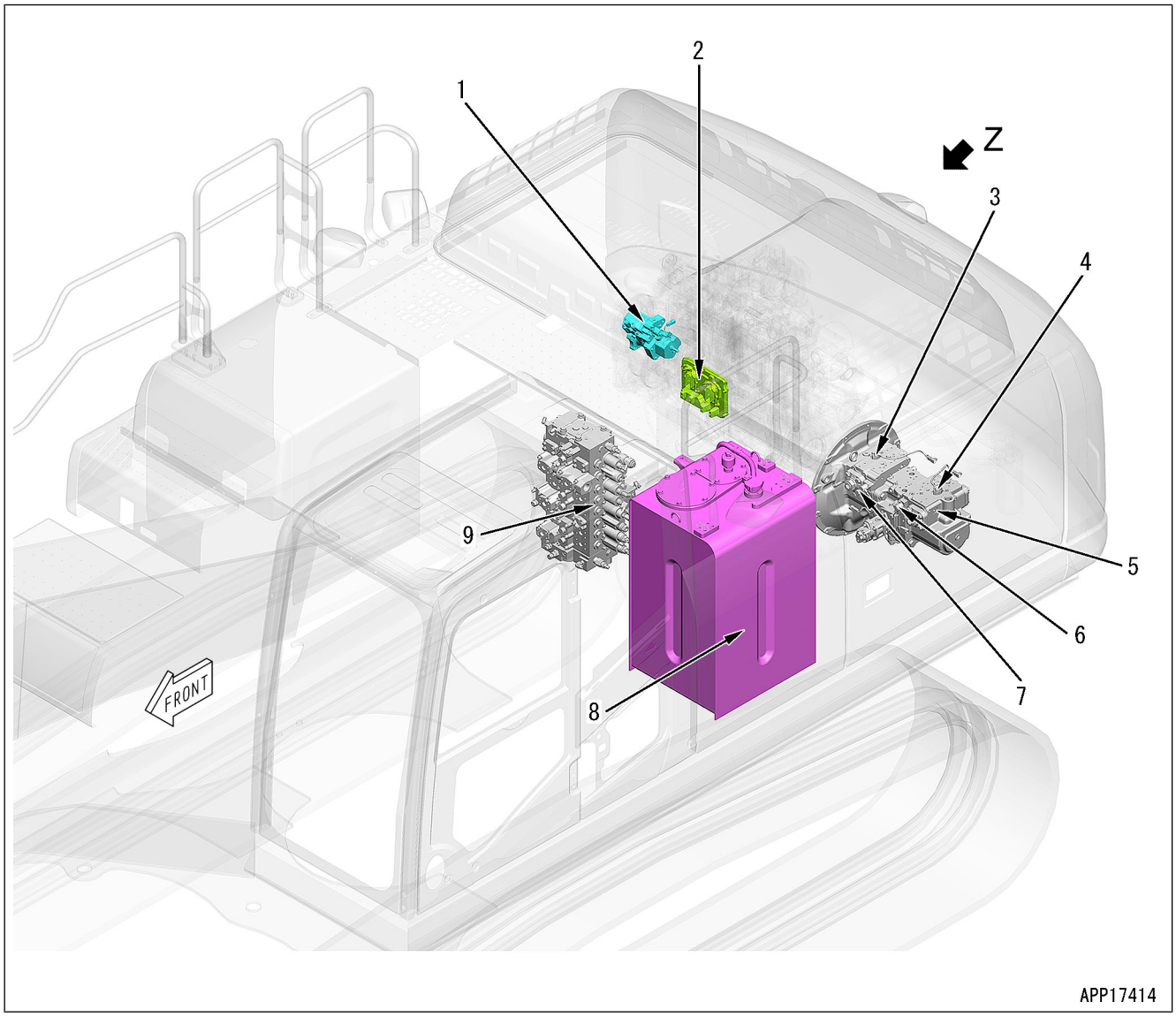
1: Camera

Symbol	Item to be displayed	Range and method for display			Remarks
		Range	Caution lamp display (Color)	Action level	
 9JC01163	Battery charge (*1)	When charging is faulty (charge voltage < battery voltage)	Lit (red)	L03	Caution lamp lights up and alarm buzzer sounds when an abnormality is detected while engine is running.
		When normal	Not lit	-	
 9JC01164	Engine oil pressure (*1)	When it is abnormal (Below specified pressure)	Lit (red)	L03	Caution lamp lights up and alarm buzzer sounds when an abnormality is detected while engine is running.
		When normal	Not lit	-	
 9JC01165	Engine oil level (*1)	When it is abnormal (below specified level)	Lit (yellow)	L01(*4)	Caution lamp lights up when an abnormality is detected while engine is stopped.
		When normal	Not lit	-	
 9JC01166	Air cleaner clogged (*1)	When it is abnormal (Above the specified pressure)	Lit (yellow)	L01(*4)	Caution lamp lights up when an abnormality is detected while engine is running.
		When normal	Not lit	-	
 9JC01167	Water separator (*1)	When it is abnormal (There is water collected above the specified amount.)	Lit (red)	-	Caution lamp lights up when an abnormality is detected while engine is running.
		When normal	Not lit	-	
 9JC01168	Maintenance due time warning	When maintenance due time is over	Lit (red)	-	• The display changes depending on how long it has passed since the maintenance due time was over. • After starting switch is turned to ON position, caution lamp lights up if condition for lighting it up is satisfied, and then goes out in 30 seconds.
		When maintenance notice time is over (*3)	Lit (yellow)	-	
 9JC01169	State of system	When action level L04, L03 is detected	Lit (red)	L04, L03	• Caution lamp lights up when an abnormality is detected in machine system. • Warning buzzer sounds when the color of caution lamp is red.
		When action level L01 is detected	Lit (yellow)	L01(*4)	

HYDRAULIC SYSTEM

LAYOUT DRAWING OF HYDRAULIC SYSTEM

Chassis part



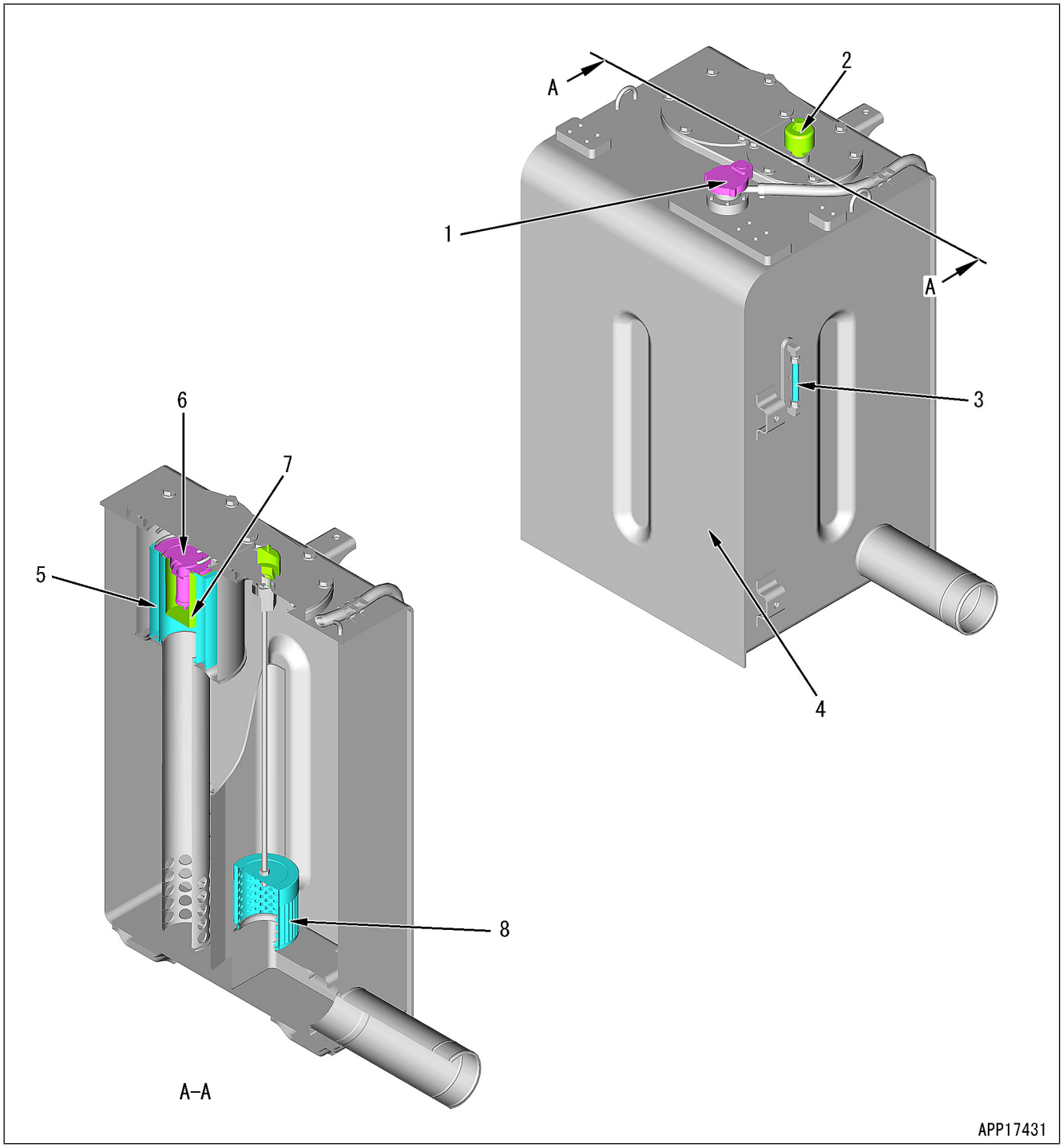
1: Supply pump
2: Engine controller
3: Front pump swash plate angle sensor
4: Rear pump swash plate angle sensor
5: Main pump
6: Rear pump PC-EPC valve
7. LS-EPC valve
8: Hydraulic tank
9: Control valve

COMPONENT PARTS OF HYDRAULIC SYSTEM

HYDRAULIC TANK

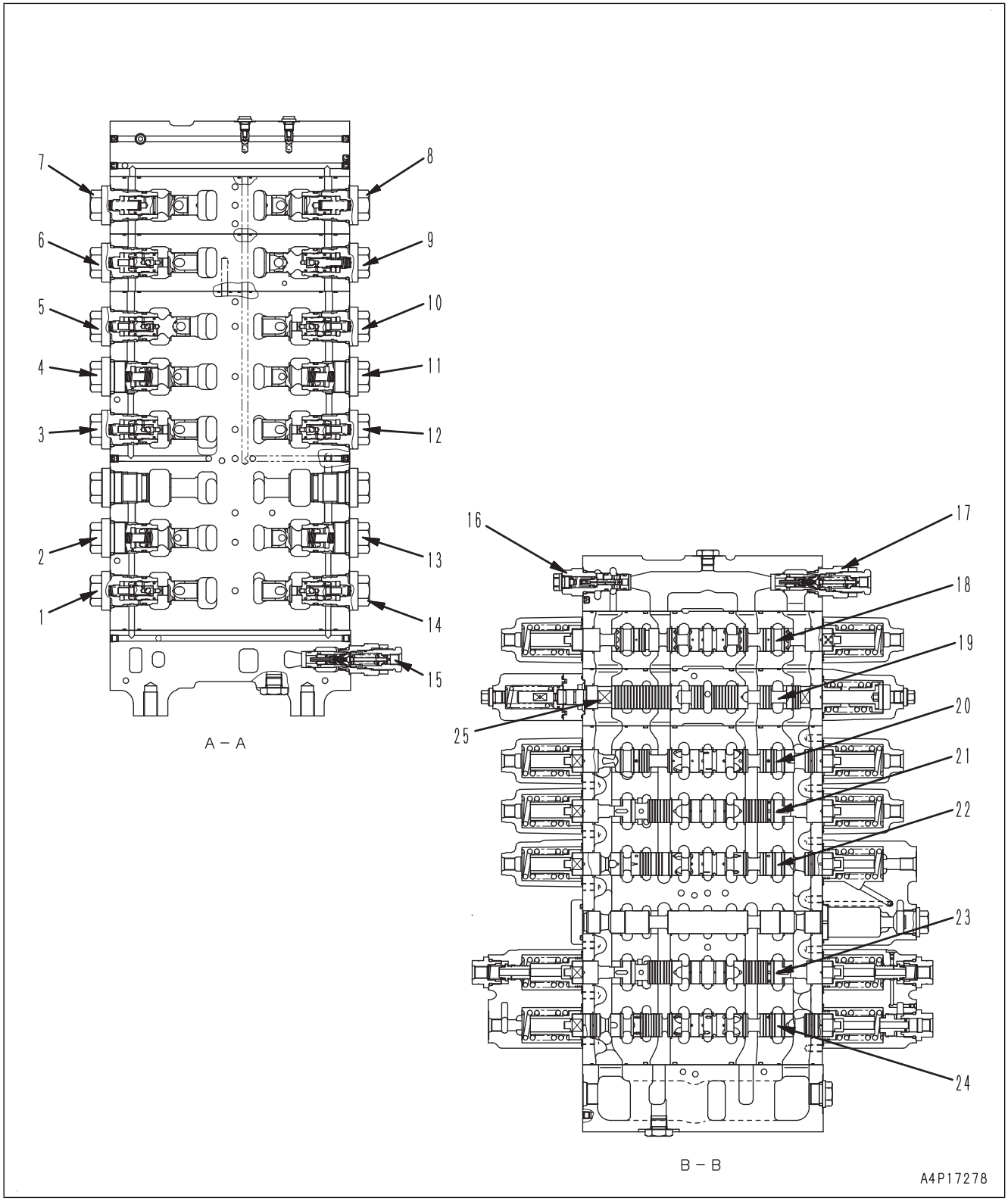
STRUCTURE OF HYDRAULIC TANK

General view and sectional view



1: Oil filler cap
2: Breather
3: Sight gauge
4: Hydraulic tank
5: Filter element
6: Bypass valve
7: Strainer
8: Suction strainer

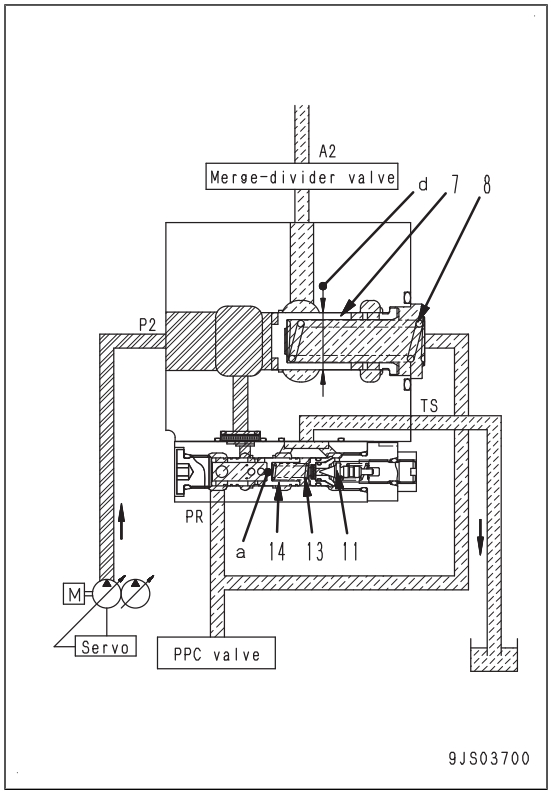
Sectional views (A-A, B-B)



1: Pressure compensation valve (arm OUT)
2: Pressure compensation valve (right travel REVERSE)
3: Pressure compensation valve (boom RAISE)
4: Pressure compensation valve (left travel REVERSE)
5: Pressure compensation valve (bucket CURL)
6: Pressure compensation valve (boom Hi RAISE)
7: Pressure compensation valve (service 1)
8: Pressure compensation valve (service 1)
9: Pressure compensation valve (arm Hi IN)

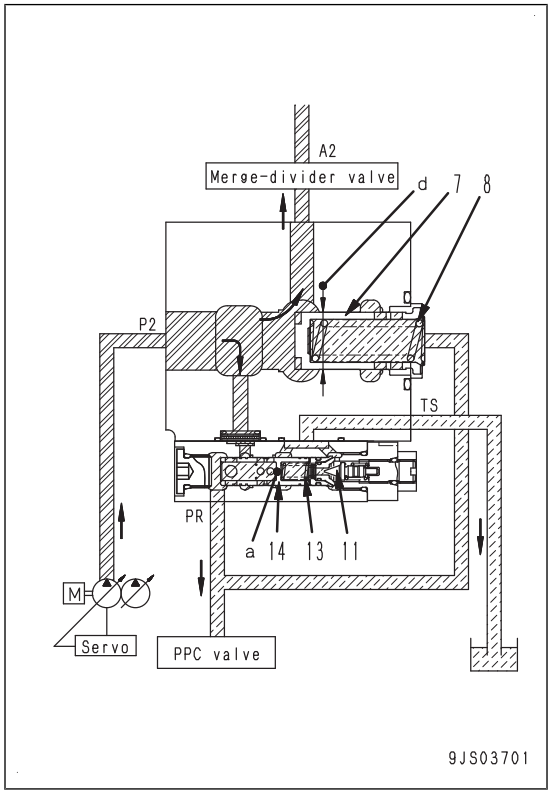
When load pressure (A2) is lower than self-pressure reducing valve output pressure (PR) and control valve is in neutral or when load pressure (P2) is low

1. Spring (8) and pressure (PR) (0 MPa {0 kgf/cm^2} when the engine is stopped) apply force to valve (7) in the direction to close the circuit between ports (P2) and (A2).
2. When pressurized oil flows in from port (P2), "(Area of diameter d x Pressure P2) = Force of spring (8) + (Area of diameter d x Pressure PR)", and the valve is balanced.
3. The opening of valve (7) is so adjusted that pressure (P2) is kept higher than pressure (PR).
4. When pressure (PR) exceeds the set pressure, poppet (11) opens.
5. The pressurized oil flows from port (PR) to orifice (a) in spool (14), and then flows to seal drain port (TS) through the opening of poppet (11).
6. Differential pressure occurs between the upstream side downstream side of orifice (a) in spool (14), and spool (14) moves in the direction to close the opening between ports (P2) and (PR).
   Pressure (P2) is reduced and adjusted to a constant pressure (set pressure) by the opening at this time, and it is supplied as pressure (PR).



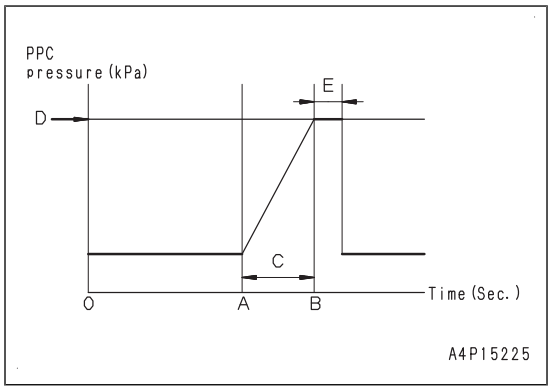
When load pressure (P2) is high

1. Load pressure (A2) is increased by the operation of digging, etc., and the pump discharged volume increases.
2. Pressure (P2) increases and "(Area of diameter d x Pressure P2) > Force of spring (8) + (Area of diameter d x Pressure PR)", and valve (7) moves to the right stroke end.
3. The opening between ports (P2) and (A2) increases and the passage resistance decreases, and the engine horsepower loss reduces.
4. When pressure (PR) exceeds the set pressure, poppet (11) opens.
5. The pressurized oil flows from port (PR) to orifice (a) in spool (14), and then flows to seal drain port (TS) through the opening of poppet (11).
6. Differential pressure occurs between the upstream side downstream side of orifice (a) in spool (14), and spool (14) moves in the direction to close the opening between ports (P2) and (PR).
   Pressure (P2) is reduced and adjusted to a constant pressure (set pressure) by the opening at this time, and it is supplied as pressure (PR).



OPERATION OF WORK EQUIPMENT AND TRAVEL AUTOMATIC LOCK SYSTEM

When an oil pressure switch or a sensor detects pressure higher than specified pressure (D) or an attachment drive signal is input within certain time (C) after the lock lever is unlocked (A), this function judges that the operation is abnormal and the pump controller outputs the lock lever automatic lock relay drive signal to shut off the current to PPC lock solenoid to lock the machine (B).



A: PPC lock lever is canceled

B: Lock lever automatic lock operates

C: Within 0.4 seconds

D: : 5 kPa

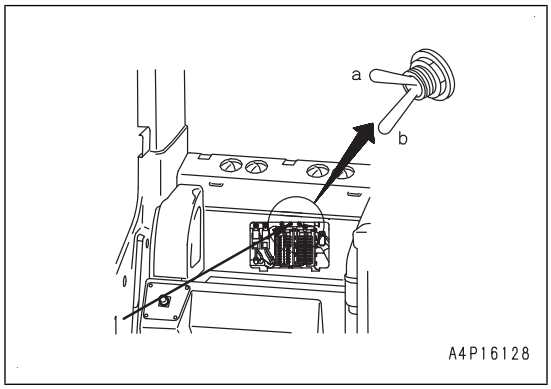
E: 0.1 seconds

REMARK

When the hydraulic oil temperature is low or high-viscosity hydraulic oil is used, the pressure does not increase within time (C), and the lock lever automatic lock control may not operate.

Control when lock lever automatic lock cancel switch is “ON”

When any abnormality occurs in controller, PPC solenoid valve does not operate normally, and operation cannot be performed, operate the lock lever automatic lock cancel switch (1) to enable operation.



At this time, the lock lever automatic lock control function does not work.

a: Emergency (when abnormal)

b: Normal (when normal)

REMARK

Lock lever automatic lock cancel switch (1) is an alternate type switch. If it is set to “Emergency” position (a) while PPC lock lever is in the free state, the lock lever automatic lock cancel pilot lamp lights up on the display.

The following failure codes are recorded when this switch is “ON”.

Action level	Failure code	Failure (displayed on screen)
L00	DDNS00	Lock Lever Auto Lock Release Switch On

7: C port 8: Main spool

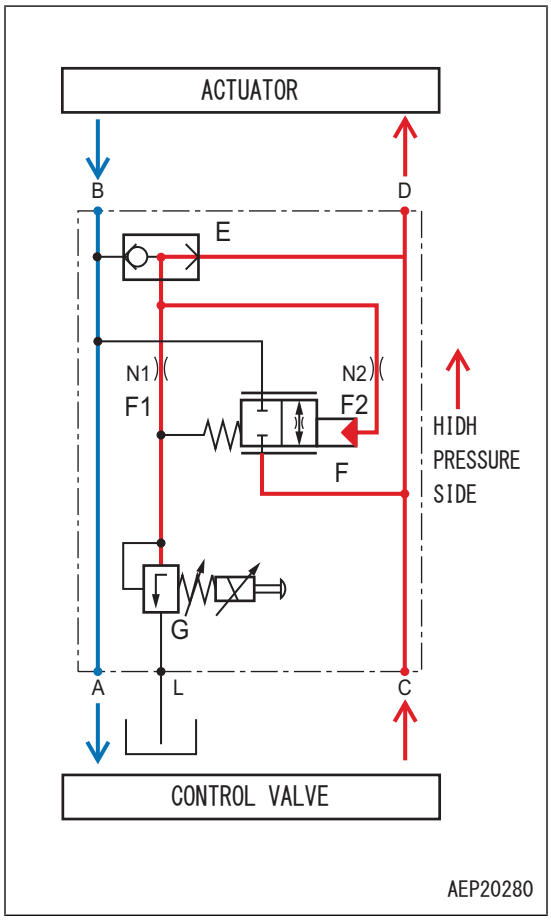
⚠ **Do not rotate the pressure adjustment nut. Otherwise, the pressure adjustment value will be changed.**

FUNCTION OF 1ST-LINE ATTACHMENT VARIABLE RELIEF VALVE

1st-line attachment variable relief valve is a valve which controls hydraulic oil pressure flowing to the attachment. It is enabled by depressing the attachment control pedal while the working mode and pressure are set on the machine monitor.

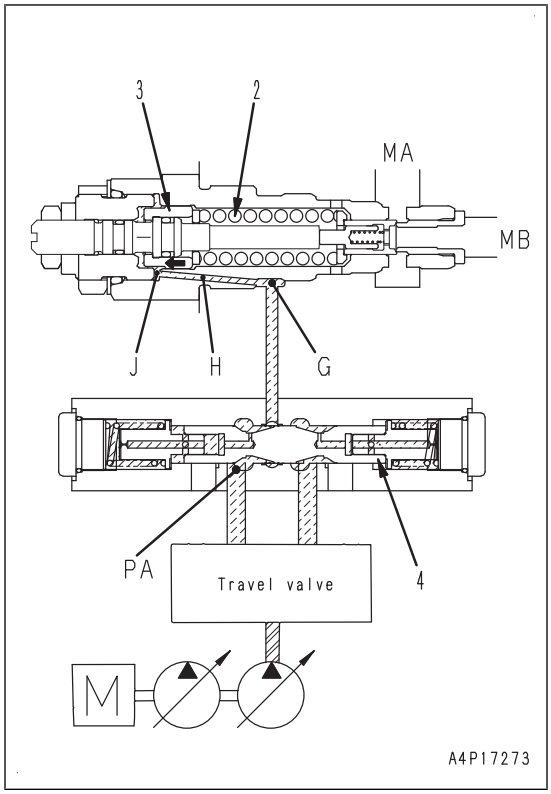
OPERATION OF 1ST-LINE ATTACHMENT VARIABLE RELIEF VALVE

1. Hydraulic oil on the operation side (high pressure) is led to F1 and F2 through the check valve (E).



Set pressure changing mechanism (when machine stops traveling (setting to low pressure))

1. When the travel lever is set to NEUTRAL position, the pressure in chamber (PA) decreases and spool (4) returns to the NEUTRAL position.
2. The pressurized oil in chamber (J) continues to flow to chamber (PA) through passage (H) and chamber (G), until spool (4) returns to the NEUTRAL position.
3. Piston (3) moves to the left and reduces the set load.
4. The safety valve is set to low pressure, and reduces the shocks during deceleration.



STANDARD VALUE TABLE FOR MACHINE

STANDARD VALUE TABLE FOR MACHINE: HB365LC-3E0, HB365NLC-3E0

Engine Speed

Machine model			HB365LC/NLC-3E0	
Engine			SAA6D114E-6	
Item	Measurement condition	Unit	Standard value for new machine	Repair limit
Engine speed at 2-pump relief	• Engine coolant temperature60 to 100 °C • Hydraulic oil temperature45 to 55 °C • Working mode: P (Power Mode) • Auto-deceleration switch: OFF • Swing lock switch: OFF • Fuel control dial: MAX (High idle) position • Work equipment control: Arm IN relief	rpm	1380±100	1380±100
Engine speed when oil pressure of 2 pumps are relieved + One-touch power maximizing is actuated	• Engine coolant temperature60 to 100 °C • Hydraulic oil temperature45 to 55 °C • Working mode: P (Power Mode) • Auto-deceleration switch: OFF • Swing lock switch: OFF • Fuel control dial: MAX (High idle) position • Operation of work equipment: Relief the pressure at arm IN and actuate one-touch power maximizing	rpm	1528±100	1528±100
Speed when auto deceleration is actuated	• Engine coolant temperature60 to 100 °C • Hydraulic oil temperature45 to 55 °C • Working mode: P (Power Mode) • Auto-deceleration switch: ON • Swing lock switch: OFF • Fuel control dial: MAX (High idle) position • Work equipment control lever, control pedal: NEUTRAL position	rpm	700±50	700±50

RELATED INFORMATION ON TESTING AND ADJUSTING

TOOLS FOR TESTING AND ADJUSTING

Tools for testing the boost pressure

Symbol		Part No.	Part name	Q'ty	Remarks
A	-	799-201-2002	Boost gauge kit	1	
	1	799-401-2311	Gauge	1	-101 to 200 kPa {-760 to 1500 mmHg}
	2	799-101-5160	Nipple	1	Size: R1/8
B	-	799-401-2301	Pm kit	1	
	1	790-261-1130	Coupling	1	

Tools for testing the exhaust gas color

Symbol		Part No.	Part name	Q'ty	Remarks
A		799-201-9002	Handy smoke checker	1	
B	-	Commercially available	Smoke meter	1	
	1	Commercially available	Probe	1	

Tools for testing and adjusting the valve clearance

Symbol	Part No.	Part name	Q'ty	Remarks
A	795-799-1131	Gear	1	
B	Commercially available	Feeler gauge	1	

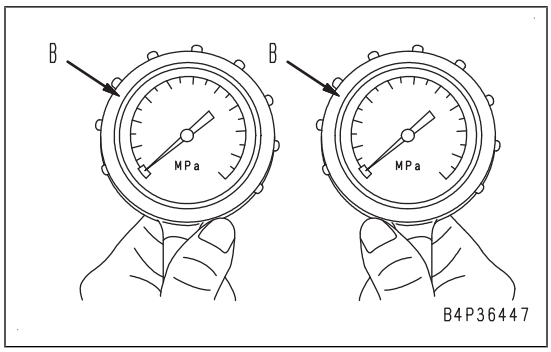
Tools for testing the compression pressure

Symbol	Part No.	Part name	Q'ty	Remarks
A	795-502-1590	Gauge assembly	1	Pressure range0 to 7 MPa
B	795-799-6700	Puller	1	
C	795-790-6111	Adapter	1	
D	6754-11-3130	Gasket	1	
E	795-799-8150	Remover	1	

Tools for testing the blowby pressure

Symbol		Part No.	Part name	Q'ty	Remarks
A	-	799-201-1506	Blowby checker	1	
	1	799-201-1541	Gauge	1	Pressure range: 10 kPa
	2	799-201-1511	Tool	1	
	3	799-201-1450	Adapter	1	
B		Commercially available	Plug	1	Hose inside diameter: 24 mm
C		Commercially available	Cap	2	Tube inside diameter: 25.4 mm

4. Connect the gauge B to the nipple A1.



REMARK

When installing the adapter C, be sure to fit the O-ring D.

Adapter C:
20 to 22 Nm {2.0 to 2.2 kgfm}

5. Start the engine.
6. Select and display “SET AND OPERATE MACHINE MONITOR” (01/28). See “SET AND OPERATE MACHINE MONITOR”.
7. Keep the engine coolant temperature and the hydraulic oil temperature in the testing condition range.
8. Test the pressure of the inlet and the outlet of the low-pressure circuit with fuel control dial at MAX (High idle) position.

NOTICE

If the engine cannot be started, you may perform the measurement while rotating the engine by using the starting motor. But do not crank the engine for more than 20 seconds continuously to protect the starting motor.

9. Calculate the pressure difference of the low-pressure circuit.

Pressure difference in low-pressure circuit = Pressure on fuel main filter inlet side - Pressure on fuel main filter outlet side

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

REMARK

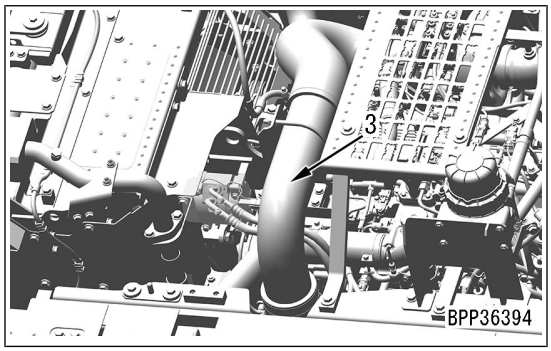
If it exceeds the standard value, the fuel main filter may be clogged. Replace the fuel main filter, and test it again.

After finishing the test, remove the testing tools and restore the machine.

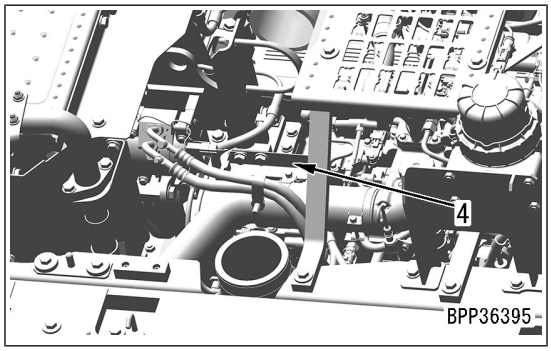
Fuel pressure pickup plug (1) and (2):
20 to 22 Nm {2.0 to 2.2 kgfm}

Testing of return circuit

1. Open the engine hood.
2. Remove the piping (3) between the air cleaner and VGT.



3. Remove the bracket (4).



REMARK

If the measurement result is out of the standard value, replace the AdBlue/DEF injector. For the replacement procedure of AdBlue/DEF injector, see “DISASSEMBLY AND ASSEMBLY”, “REMOVE AND INSTALL AdBlue/DEF INJECTOR”.

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

After finishing the test, remove the testing tools and restore the machine.

NOTICE

- **Replace the gasket on the mounting face of the AdBlue/DEF injector with new one.**
- **For the installation procedure of AdBlue/DEF injector, see DISASSEMBLY AND ASSEMBLY, “REMOVE AND INSTALL AdBlue/DEF INJECTOR”.**

TEST AdBlue/DEF LINE HEATER RELAY 1

Tools for testing AdBlue/DEF line heater relay 1

Symbol	Part No.	Part name	Q'ty	Remarks
A	799-601-9020	T-adapter	1	
B	799-601-2600	T-box	1	
C	Commercially available	Multimeter	1	

⚠ **Place the machine on a level ground, lower the work equipment with a stable posture to the ground, set the lock lever in LOCK position, and stop the engine.**

NOTICE

If KOMNET communication error remains less than 1 second, engine controller is unable to detect it, and the test may be continued while the machine monitor does not continue (standard screen). In that case, turn the starting switch to OFF position once, and then system operating lamp goes out, and the engine controller shuts down to reset the test.

“AdBlue/DEF Line Heater 1 Relay Test” function can actuate AdBlue/DEF line heater 1 at any timing, and can check electrical action.

For testing of AdBlue/DEF suction circuit, or purge circuit or to perform troubleshooting or others, refer to this section.

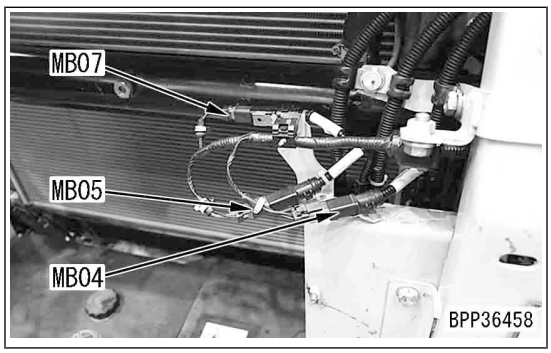
METHOD FOR TESTING AdBlue/DEF LINE HEATER RELAY 1

1. Check that the system operating lamp is not lit, turn the battery disconnect switch to OFF position, and remove the key.
2. Open the cover on the right side of the machine.
3. Disconnect the connector to be tested.

   When testing the low temperature pressure line heater relay of AdBlue/DEF: Connector (MB07)

   When testing the return line heater relay of AdBlue/DEF: Connector (MB05)

   When testing the suction line heater relay of AdBlue/DEF: Connector (MB04)



- When there are abnormalities in electrical system or hydraulic system:
  Check the spot where abnormality is detected.
- When there is no abnormality in electrical system and hydraulic system:
  The mechanical system may have abnormality. Disassemble the swing machinery assembly, and check the swing parking brake disc (1) for wear. See DISASSEMBLY AND ASSEMBLY, “DISASSEMBLE AND ASSEMBLE SWING MACHINERY ASSEMBLY”.
  If there are signs of wear on the swing parking brake of swing motor (1) after disassembling the swing machinery assembly, replace it with a new one.

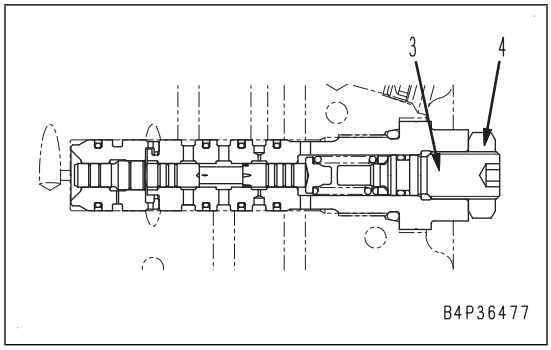
7. Assemble the machine again.
8. Perform steps 3 to 4, and check again that the swing parking brake operates normally.

1. While fixing the adjustment screw (3), loosen the lock nut (4).
2. Turn the adjustment screw (3) to adjust the differential pressure.

   REMARK

   - Turn the adjustment screw (3) clockwise to raise the differential pressure or turn it counterclockwise to lower the differential pressure.
   - Quantity of pressure adjustment (LS differential pressure) per turn of adjustment screw (3)1.3 MPa {13.3 kgf/cm^2}
3. With adjustment screw (3) fixed, tighten the lock nut (4).

   Lock nut (4):
   49 to 68.6 Nm {5 to 7 kgfm}



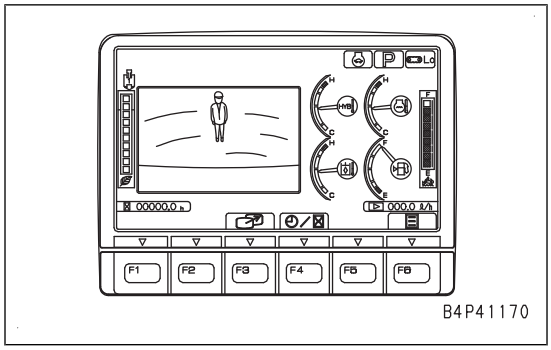
After the adjustment, see “METHOD FOR TESTING LS VALVE OUTLET PRESSURE (SERVO PISTON INLET PRESSURE)” to check whether LS valve outlet pressure (servo piston inlet pressure) is normal.

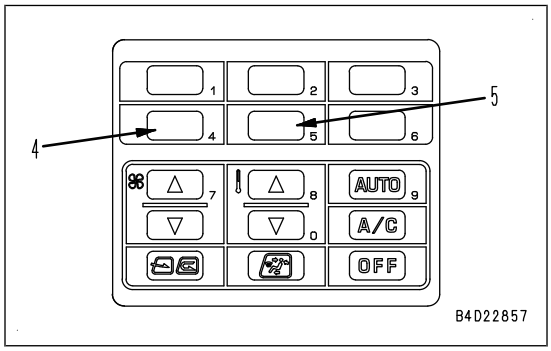
1. While the standard screen is displayed, perform the following operation with the numeral input switches.

   Switch operation (While pressing 4, press other switches in order): 4 + 5 → 5 → 5

   REMARK

   This switch operation is available in 10 minutes after the starting switch is turned to ON position.





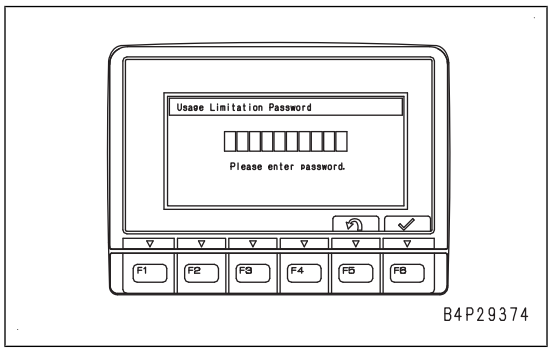
2. On “Usage Limitation Password” screen, input the current password with the numeral input switches and enter it with the function switch.

   F5: Clears the inputted numbers/Returns to the standard screen

   F6: Enters the inputted password

   REMARK

   - Default password: 000000
   - When the inputted password is correct, the screen changes to the next screen.
   - When the inputted password is incorrect, the monitor displays a message prompting reinput of the password.
   - The password for the inducement and the engine start lock password are the same.



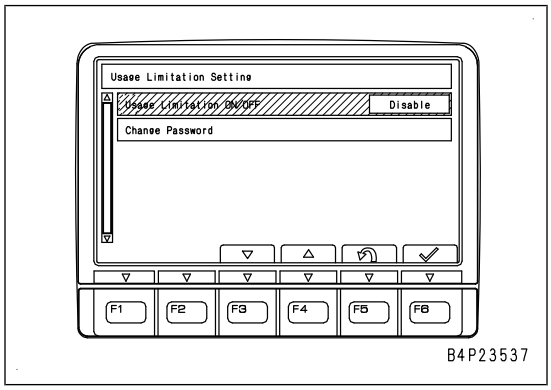
3. On “Usage Limitation Setting” screen, select a setting with the function switch.

   F3: Moves down the selected item

   F4: Moves up the selected item

   F5: Cancels the selection and returns the screen to the previous screen

   F6: Enters the selected item



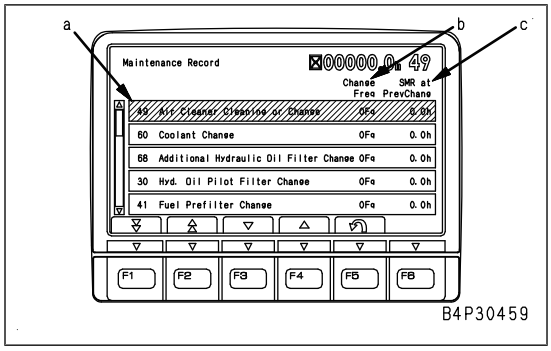
Code	Item
58	“AdBlue/DEF Filter Change”
48	KDPF Filter Cleaning
37	“AdBlue/DEF Tank Washing”
10	Hydraulic Oil Change

Displayed information of “Maintenance Record” screen

a: Maintenance item

b: Number of replacements up to now

c: Service meter reading (SMR) at the last replacement



METHOD FOR OPERATING MAINTENANCE MODE SETTING

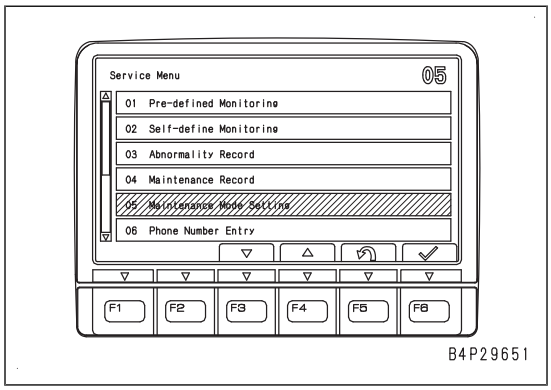
Operating condition of the maintenance reminder function in the operator mode can be set and changed by using this menu.

- To enable or disable the function of maintenance items.
- To change the replacement interval setting of maintenance items (by item).
- To initialize all of the replacement interval setting of maintenance items.

1. Select “Maintenance Mode Setting” on “Service Menu”.

   REMARK

   For selecting method, see “Operating method of service mode” in “SERVICE MODE”.



2. On the “Maintenance Mode Setting” screen, select “Maintenance Mode Change” with function switches or numeral input switches.

   F1: Moves to the next page

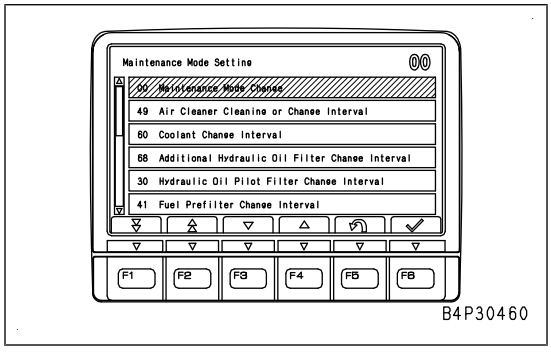
   F2: Returns to the previous page

   F3: Moves down the selected item

   F4: Moves up the selected item

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

   F6: Enters the selected item



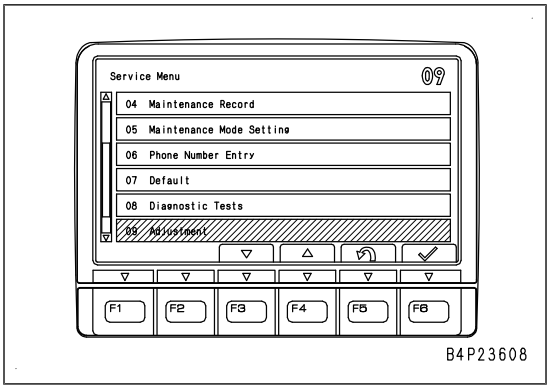
REMARK

Input a code (2-digit) with the numeral input switches to directly select the item, and then press F6 to enter the selected item.

1. Select “Adjustment” on the “Service Menu” screen.

   REMARK

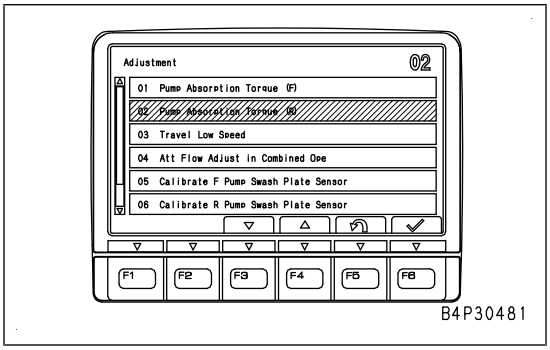
   For selecting method, see “Operating method of service mode” in “SERVICE MODE”.



2. On the “Adjustment” screen, select “Pump Absorption Torque (R)” with function switches or numeral input switches.

   REMARK

   For selecting method, see “Operating method of service mode” in “SERVICE MODE”.



3. After the “Pump Absorption Torque (R)” screen is displayed, change the value by using the function switches.

   Set value: For the actual torque adjustment value, see the table of relationship between set value and torque adjustment value.

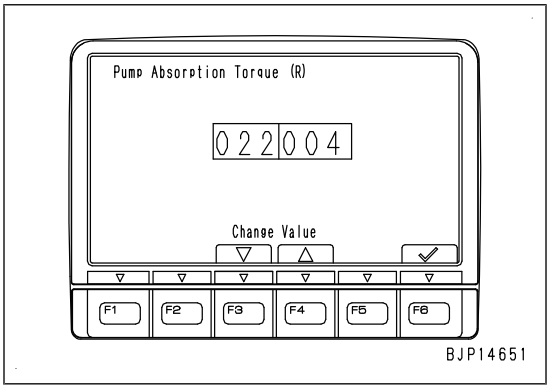
   F3: Decreases the set value

   F4: Increases the set value

   F6: Checks and enters setting. Returns to “Adjustment” screen.

   REMARK

   The 3-digit number in the left column does not change since it is the code of this function.



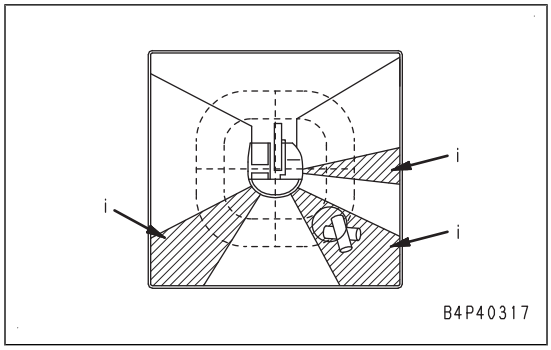
A relation as a table (set value and torque adjustment value)

Code	Set value	Torque adjustment value
022	000	+39.2 Nm {+4 kgfm}
	001	+29.4 Nm {+3 kgfm}
	002	+19.6 Nm {+2 kgfm}
	003	+9.8 Nm {+1 kgfm}
	004	0 Nm {0 kgfm}
	005	-9.8 Nm {-1 kgfm}
	006	-19.6 Nm {-2 kgfm}
	007	-29.4 Nm {-3 kgfm}
	008	-39.2 Nm {-4 kgfm}

METHOD FOR ADJUSTING (Low Speed)

Adjustment menu is used to check the various settings of the machine or to adjust the value.

- Shift: Images cross each other on yellow reference line (ground level)



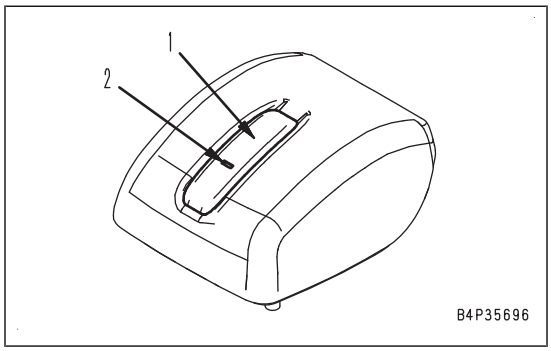
METHOD FOR ADJUSTING KomVision CAMERA ANGLE

Angle adjustment method for front right camera, rear right camera, and rear left camera

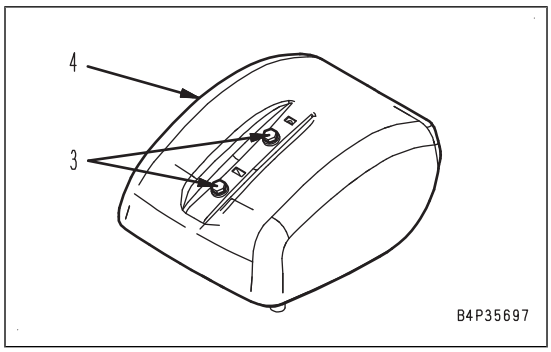
1. Insert a flat-head screwdriver into hole (2) of bolt cover (1) and remove the bolt cover (1) while pressing the internal claw.

   REMARK

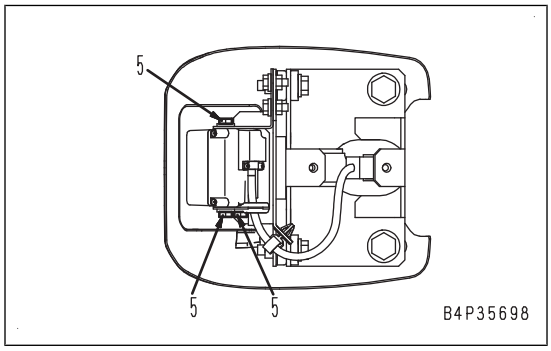
   The bolt cover (1) is made of plastic, so be careful not to break it when removing.



2. Remove the bolt (3).
3. Remove the cover (4).



4. Loosen the mounting bolt (5).



Machine model			HB365LC/NLC-3E0			Good	No good
Engine			SAA6D114E-6				
Item	Testing conditions	Unit	Standard value for new machine	Repair limit	Measured value		
Bucket CURL	• Hydraulic oil temperature45 to 55 °C • Working mode: P (Power Mode) • Fuel control dial: MAX (High idle) position • Time required to operate the bucket from the DUMP stroke end to the CURL stroke end • Measuring posture: See “MACHINE POSTURE AND PROCEDURE FOR MEASURING PERFORMANCE”, “Fig. 11”.	Sec.	2.9 to 3.5	Max. 3.8			

Swing speed

Machine model				HB365LC/NLC-3E0			Good	No good
Engine				SAA6D114E-6				
Item	Testing conditions		Unit	Standard value for new machine	Repair limit	Measured value		
Time required for swinging	• Hydraulic oil temperature45 to 55 °C • Working mode: P (Power Mode) • Fuel control dial: MAX (High idle) position • Time required to complete 5 swings after 1 swing • Measuring posture: See “MACHINE POSTURE AND PROCEDURE FOR MEASURING PERFORMANCE”, “Fig. 2”.	Swing RIGHT	Sec.	30.7 to 32.5	Max. 38			
		Swing LEFT		30.7 to 32.5	Max. 38			

Case 3 : Functional restrictions caused by other failures

- The failure code may not be able to clear due to functional restrictions (Regeneration control stops, Stops AdBlue/DEF injection, etc.) caused by other failures. Operation and procedure required for clearing the code are given under “Troubleshooting by each failure code”.
- Measures to be taken:
  By following the clearing procedure, clear the failure code.
- Examples:
  1. The failure code cannot be cleared because an abnormal high voltage, abnormal low voltage, or communication error (open or short circuit) of failure code is displayed for a related component.
  2. The failure code cannot be cleared because correct values are not input from a sensor (a failure code for a related sensor is displayed).
  3. The failure code cannot be cleared because a failure code that disables auto regeneration or manual stationary regeneration of the aftertreatment devices is displayed.
  4. The failure code cannot be cleared because a failure code that stops the AdBlue/DEF pump or disables AdBlue/DEF injection is displayed.

How to identify the failure code to be repaired

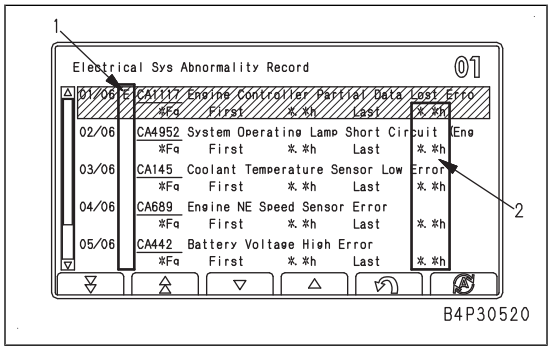
Among failure codes displayed on “Abnormality Record” screen of the machine monitor, identify failure codes that have following conditions as a code to be repaired

1. Failure codes displayed with “E” (“E” is displayed on the left of failure code. See the following figure.)
   - Check the “Abnormality Record” screen and identify all failure codes that “E” is currently displayed as a code to be repaired.
   - The failure codes are displayed in the upper row from the “E” on the “Abnormality Record” screen.
2. Failure codes displayed without “E” and their service meter reading (SMR) at last occurrence (at previous working time, etc.) become the most recent time.
   - The failure codes that have detected records most recently and are displayed without “E” may be in the state that their abnormalities are not cleared (*1). Due to that, check the description of “Troubleshooting by failure code” and identify them as a code to be repaired.
   - The failure codes are displayed on “Abnormality Record” screen in ascending order. (See the following figure.)

   *1: It corresponds to a failure code that is cleared by turning the starting switch to OFF position, or by stopping the engine though the repair is not completed. Due to this kind of failure code, the failure code to be repaired is not determined only by the existence of “E”. (Failure C pattern in the following REMARK “Display of “E” on the Abnormality Record screen”.)

1: Area where “E” is displayed

2: Area where the most recent SMR is displayed



REMARK

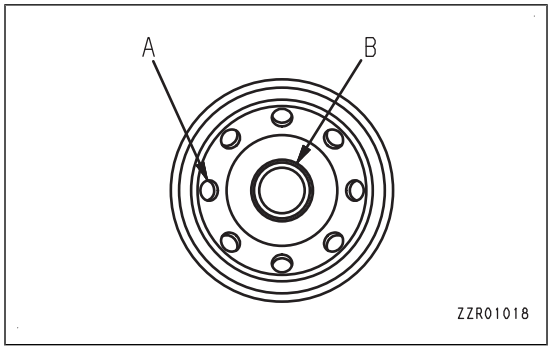
Display of “E” on the “abnormality record” screen

1. Transition of “E” displayed with failure code has a following pattern.

   The table is shown the display of “E” on “Abnormality Record” screen of the machine monitor when turning the starting switch to O N position after turning the starting switch to OFF position and shutting down the engine controller.

NOTICE

- **When adding fuel, do not remove the cap (B) at the center. Always fill the fuel from the dirty side (8 places) of small holes (A).**
- **After adding fuel, remove the cap (B) at the center and install the fuel filter.**
- **Always fill with clean fuel. Be careful not to let any dirt or dust get into the fuel. In particular, center part is the clean side, so do not remove the cap (B) when adding fuel. Be careful to prevent dirt or dust from entering the center clean side part.**



12. When installing the cartridge, tighten it until the packing surface contacts the sealing surface of the filter head, and then further tighten it by 1/2 to 3/4 turns.

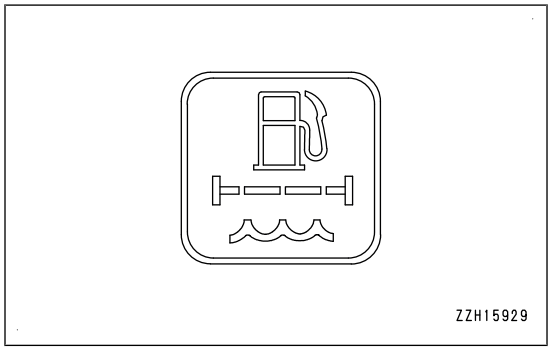
REMARK

If the filter cartridge is fastened too much, the packing will be damaged and this leads to leakage of fuel. If the filter cartridge is too loose, fuel will also leak from the packing. Be sure to observe the tightening angle. When using a filter wrench for tightening, take care not to leave flaws or dents on the filter.

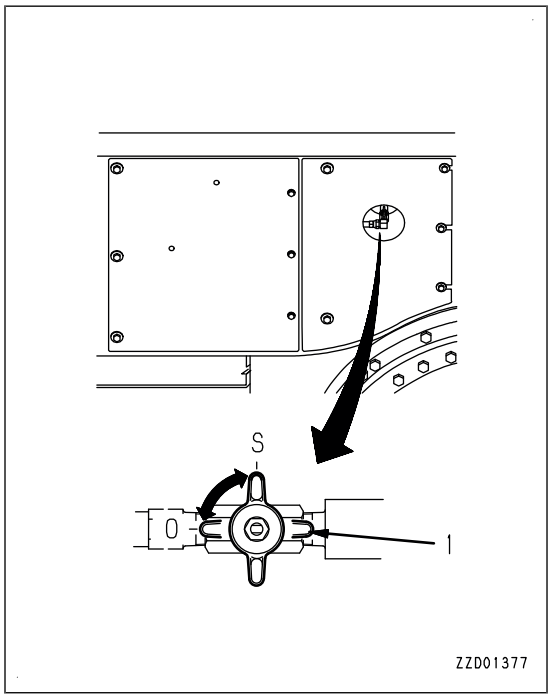
13. Check that the drain valve (2) is closed securely.
14. Remove the plastic bag wrapping the connector (5), then connect the connector (5).

REMARK

- If water gets on the connector (5), the sensor may malfunction and the water separator caution lamp may light up. When removing the connector (5), be extremely careful that water does not attach to the connector.
- If water gets on the connector (5), dry it completely before connecting it.

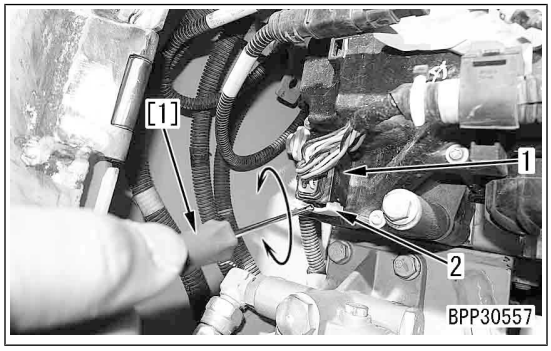


15. Set the valve (1) at the bottom of fuel tank to OPEN position (O).



TYCO connector

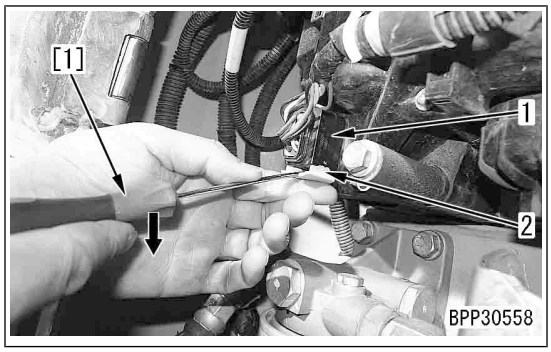
- How to disconnect the connector
  1. Insert the small flat-head screwdriver [1] in the yellow lock part (2) of the TYCO connector (1).
  2. Turn the small flat-head screwdriver [1] clockwise and counterclockwise to slowly release the lock part (2).



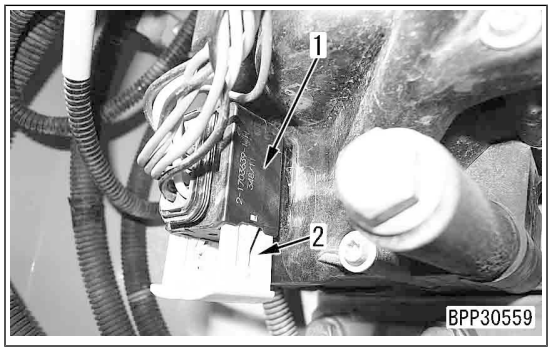
  3. When the yellow lock part (2) is released to the certain degree, lightly hold the lock part (2) by hand to prevent it from coming off, and then release the lock thoroughly.

     REMARK

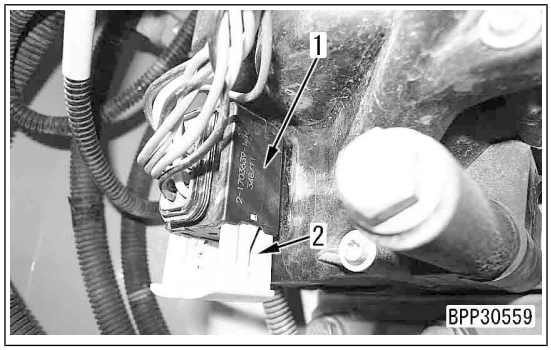
     Be careful not to apply excessive force when you release the lock. The yellow lock part (2) can be come off.



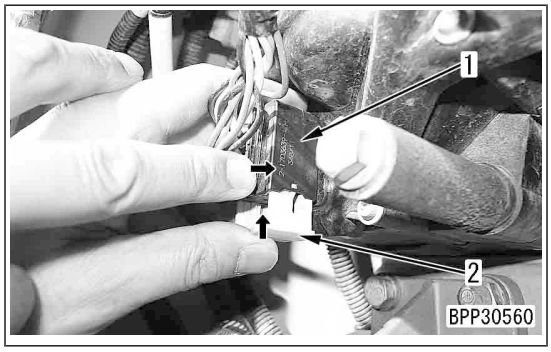
  4. Disconnect the connector (1) with the lock part (2) released thoroughly.

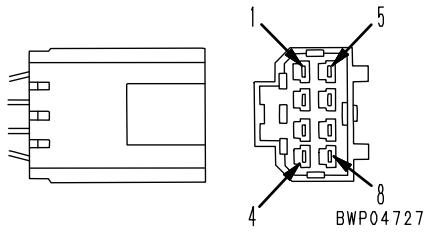
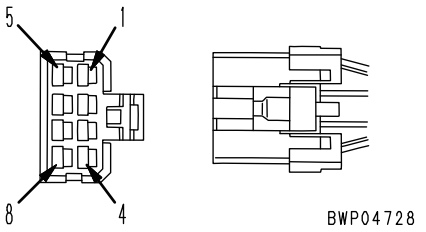
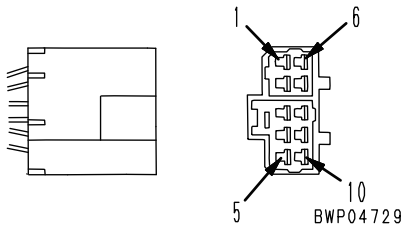
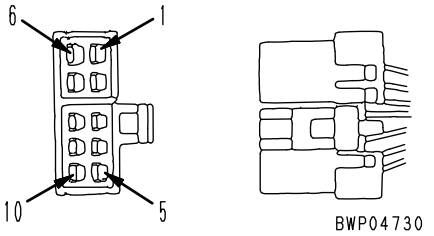
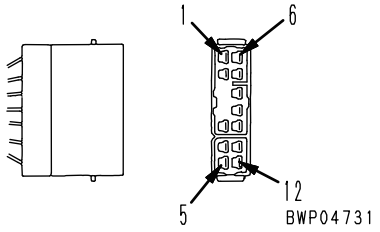
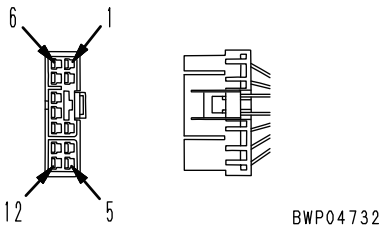
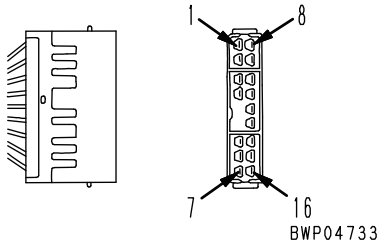
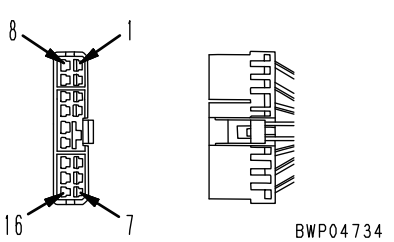


- How to connect connector
  1. Release the yellow lock part (2) thoroughly, align the mating surface, and install the connector (1) straight.



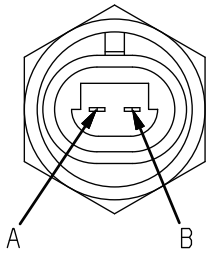
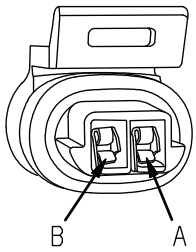
  2. While pressing the yellow lock part (2), install the connector (1) gradually.

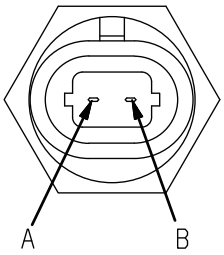
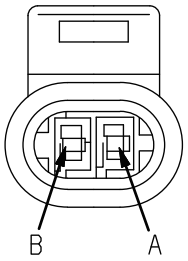


No. of pins	S type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
8			799-601-7140 (T-adapter)
	Part No. : 08056-10871	Part No. : 08056-10881	
10 (White)			799-601-7150 (T-adapter)
	Part No. : 08056-11071	Part No. : 08056-11081	
12 (White)			799-601-7350 (T-adapter)
	Part No. : 08056-11271	Part No. : 08056-11281	
16 (White)			799-601-7330 (T-adapter)
	Part No. : 08056-11671	Part No. : 08056-11681	

B4D18194

PACKARD conncetor for engine

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

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

B4W21630

Failure code	Failure (Displayed on screen)	Applicable component	Action level	History category	Remarks
DGH2KA	FAILURE CODE [DGH2KA] Hydraulic Oil Temperature Sensor Open Circuit	PUMP	L01	Electrical system	
DGH2KB	FAILURE CODE [DGH2KB] Hydraulic Oil Temperature Sensor Ground Fault	PUMP	L01	Electrical system	
DHA4KA	FAILURE CODE [DHA4KA] Air Cleaner Clog Sensor Open Circuit	MON	L01	Electrical system	
DHAAMA	FAILURE CODE [DHAAMA] KDPF Differential Pressure Sensor Frozen	ENG	—	Electrical system	
DHACMA	FAILURE CODE [DHACMA] KDPF Outlet Pressure Sensor Frozen	ENG	—	Electrical system	
DHPAMA	FAILURE CODE [DHPAMA] Front Pump Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHPBMA	FAILURE CODE [DHPBMA] Rear Pump Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHS3MA	FAILURE CODE [DHS3MA] Arm IN PPC Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHS4MA	FAILURE CODE [DHS4MA] Bucket CURL PPC Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHS8MA	FAILURE CODE [DHS8MA] Boom RAISE PPC Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHS9MA	FAILURE CODE [DHS9MA] Boom LOWER PPC Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHSAKZ	FAILURE CODE [DHSAKZ] Swing RIGHT PPC Pressure Sensor Defective Function	PUMP	L03	Electrical system	
DHSBKZ	FAILURE CODE [DHSBKZ] Swing LEFT PPC Pressure Sensor Defective Function	PUMP	L03	Electrical system	
DHSCMA	FAILURE CODE [DHSCMA] Arm OUT PPC Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHSDMA	FAILURE CODE [DHSDMA] Bucket DUMP PPC Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHSFMA	FAILURE CODE [DHSFMA] Travel Forward Left PPC Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHSGMA	FAILURE CODE [DHSGMA] Travel Forward Right PPC Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHSHMA	FAILURE CODE [DHSHMA] Travel Reverse Left PPC Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHSJMA	FAILURE CODE [DHSJMA] Travel Reverse Right PPC Pressure Sensor Defective Function	PUMP	L01	Electrical system	
DHVAKZ	FAILURE CODE [DHVAKZ] HYB Swing RIGHT PPC Pressure Sensor Open and Short Circuit	HYB	L03	Electrical system	
DHVAL8	FAILURE CODE [DHVAL8] HYB Swing RIGHT PPC Pressure Sensor Signal Mismatch	HYB	L03	Electrical system	
DHVAMA	FAILURE CODE [DHVAMA] HYB Swing RIGHT PPC Sensor Malfunction	HYB	L03	Electrical system	
DHVBKZ	FAILURE CODE [DHVBKZ] HYB Swing LEFT PPC Pressure Sensor Open and Short Circuit	HYB	L03	Electrical system	

FAILURE CODE [AA10NX]

Action level	Failure code	Failure	Air Cleaner Clogging (Machine monitor system)
L01	AA10NX		
Detail of failure	Air cleaner clogging switch signal voltage is not 1 V and below while engine is running, and machine monitor detects clogging of air cleaner (open of sensor contacts).		
Action of controller	Displays air cleaner clogging monitor in yellow on machine monitor.		
Phenomenon on machine	If machine is used as it is, engine may be damaged.		
Related information	• Input (ON/OFF) from air cleaner clogging switch can be checked with monitoring function. (Code: 04501) • After completion of repair, check that the failure code is cleared by the following procedure. Procedure: Start the engine.		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Clogging of air cleaner	Air cleaner may be clogged. Check it for clogging and then clean or replace if clogged.			
2	Defective air cleaner clogging sensor	1. Turn the starting switch to OFF position. 2. Disconnect the connector P23, and connect the T-adapter to male side. 3. Start the engine. **REMARK** Air cleaner suction resistance value *1: -3430 Pa Max. {-350 mmH_2O} *2: -7470±490 Pa {-762±50 mmH_2O}			
		Resistance	Between P23 (male) (1) and (2)	When air cleaner: is normal *1	Max. 1 Ω
				When air cleaner is clogged *2	Min. 1 MΩ
3	Open circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors CM02 and P23, and connect the T-adapter to each female side.			
		Resistance	Between CM02 (female) (4) and P23 (female) (1)		Max. 1 Ω
			Between P23 (female) (2) and ground		Max. 1 Ω
4	Defective machine monitor	If no failure is found by above checks, machine monitor is defective. (Since this is an internal defect, troubleshooting cannot be performed.)			

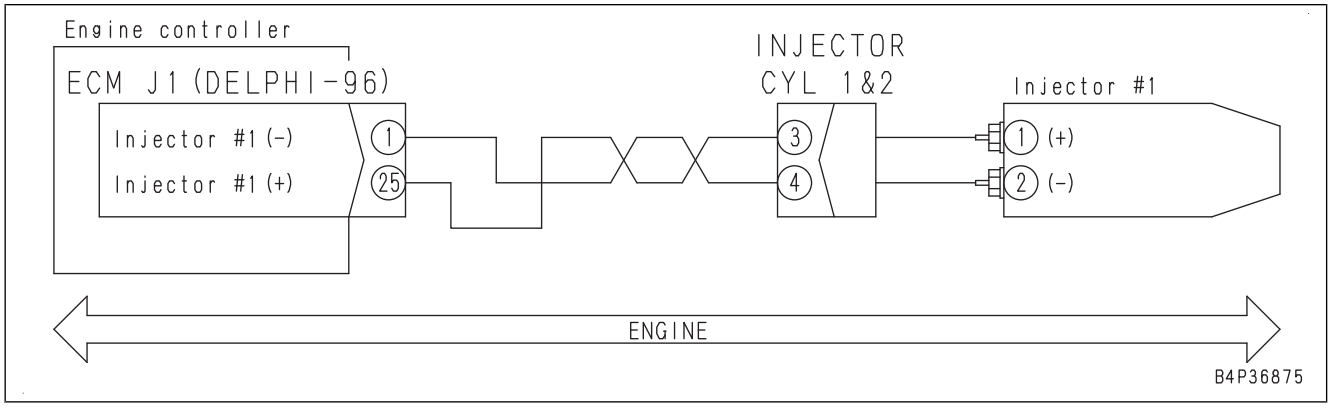
FAILURE CODE [CA144]

Action level	Failure code	Failure	Coolant Temperature Sensor High Error (Engine controller system)
L01	CA144		
Details of failure	High voltage occurs in signal circuit of engine coolant temperature sensor.		
Action of controller	Sets coolant temperature to fixed value for operation.		
Phenomenon on machine	• Engine startability becomes poor in low temperature. • Overheat prevention function does not operate.		
Related information	• Signal voltage from engine coolant temperature sensor can be checked by monitoring function. (Code: 04105 (V)) • Temperature in engine oil coolant sensor can be checked by monitoring function. (Code: 04107 (°C)) • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position. • This failure code is displayed when temperature sensor connector is disconnected. • Because female connector alone is provided in “Socket” for troubleshooting for this sensor, socket cannot be connected to female connector on wiring harness side of sensor and check for wire breakage cannot be performed (T-adapter is not provided). ⚠ **Do not work at high coolant temperature, when testing and replacing coolant temperature sensor.**		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “c: Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it. 2. Turn starting switch to ON position.			
		If this failure code is cleared, wiring harness connector is defective.			
2	Defective coolant temperature sensor	1. Turn starting switch to OFF position. 2. Disconnect connector COOLANT TEMP and connect socket to male side. **REMARK** Regard coolant temperature sensor as normal if its resistance is 700 Ω to 37 kΩ when coolant temperature is min. 0 °C.			
		Resistance	Between COOLANT TEMP (male) (A) and (B) Coolant temperature characteristics	0 °C	30 to 37 kΩ
				25 °C	9.3 to 10.7 kΩ
				50 °C	3.2 to 3.8 kΩ
				80 °C	1.0 to 1.3 kΩ
				95 °C	700 to 800 Ω
			Between COOLANT TEMP (male) (B) and ground	All coolant temperature range	Min. 100 kΩ

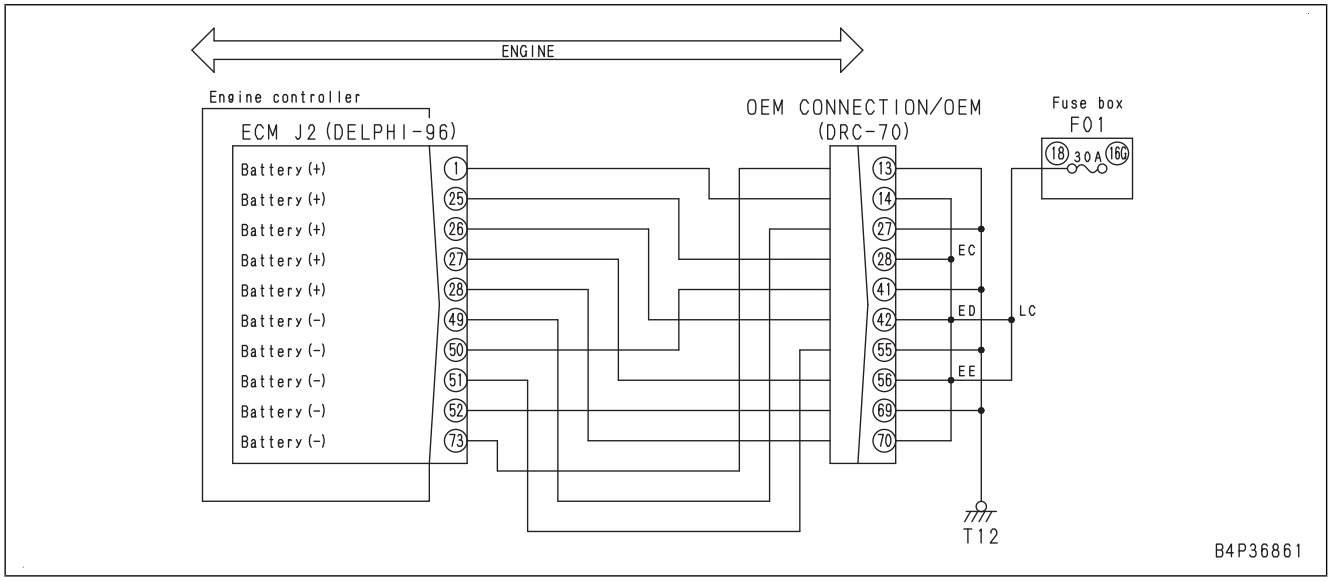
No.	Cause	Procedure, measuring location, criteria and remarks		
5	Ground fault in wiring harness (contact with ground circuit)	If failure code is still displayed after above checks on cause 3, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and INJECTOR CYL 1 & 2, and connect T-adapter to each female side.		
		Resistance	Between ground and ECM J1 (female) (25) or INJECTOR CYL 1 & 2 (female) (3)	Min. 100 kΩ
			Between ground and ECM J1 (female) (1) or INJECTOR CYL 1 & 2 (female) (4)	Min. 100 kΩ
6	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and INJECTOR CYL 1 & 2, and connect T-adapter to female side of ECM J1.		
		Continuity	Between ECM J1 (female) (25) and each pin other than pin (25)	No continuity (no sound is heard)
			Between ECM J1 (female) (1) and each pin other than pin (1)	No continuity (no sound is heard)
7	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Insert T-adapter to connector ECM J1. 3. Turn starting switch to ON position.		
		Voltage	Between ECM J1 (25) and ground	Max. 6 V
		If measured voltage is abnormal, disconnect connector INJECTOR CYL 1 & 2 and measure the voltage at the same point again. If the abnormality persists, a positive (+) line is defective. If the voltage is restored back to a normal range, a negative (-) line is defective.		
8	Defective another cylinder's injector or wiring harness	When failure code for abnormality in multiple injectors is displayed, perform troubleshooting these first.		
9	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit diagram related to injector #1



No.	Cause	Procedure, measuring location, criteria and remarks
8	Defective supply pump	If failure code is still displayed after above checks on Causes 1 to 9, supply pump may be defective.

Related circuit diagram to engine controller ground



FAILURE CODE [CA731]

Action level	Failure code	Failure	Engine Backup Speed Sensor Phase Error (Engine controller system)
L01	CA731		
Detail of failure	Engine controller detects phase error by signal from engine Bkup speed sensor. (Compared with signal from NE speed sensor, phase does not fit.)		
Action of controller	Controls by NE speed sensor signal.		
Phenomenon on machine	• Running engine stops (when NE speed sensor is also defective). • Engine cannot start or engine is hard to start. • Engine idling speed is unstable.		
Related information	After repairing, check if the failure code is cleared by the following procedure. Procedure: Start engine.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Breakage of engine NE speed (CRANK) sensor	Engine NE speed sensor (CRANK sensor) may be broken. Check it.
2	Breakage of engine Bkup speed (CAM) sensor	Engine Bkup speed sensor (CAM sensor) may be broken. Check it.
3	Defective installation or breakage of rotation sensing wheel on crankshaft	Rotation speed sensing wheel on crankshaft side may be installed improperly or damaged. Check it according to the following procedure. 1. Set No. 1 cylinder to compression top dead center (align stamping mark). 2. Remove NE speed sensor (crankshaft sensor). 3. If tooth missing part (A) of rotation speed sensing wheel can be seen through mounting hole of sensor, the wheel is installed normally.
4	Defective installation or breakage of camshaft gear	Speed sensing ring on camshaft side is a camshaft gear (CAMG) and may be installed improperly or damaged. Check it according to the following procedure. 1. Set No. 1 cylinder to compression top dead center (align stamping mark). 2. Remove Bkup speed sensor. 3. Installation is correct if twin groove rib (B) of camshaft gear (CAMG) is visible through sensor mounting hole.
5	Defective timing of crankshaft and camshaft	• Timing of crankshaft and camshaft may be defective. Check it directly. • Remove engine front cover, and check that matchmarks of crank gear and cam gear are matched.
6	Defective connection of ground terminal	Ground terminal may be connected defectively. Check following terminals directly. • Ground terminal of machine ((-) terminal of battery) • Ground terminal of engine • Ground terminal of engine controller • Ground terminal of starting motor

1] Perform warm-up operation, and raise the monitoring code 04107 “Coolant Temperature” to the degree over 20 °C added to the ambient temperature.

2] See “TESTING AND ADJUSTING”, “SERVICE MODE” and “METHOD FOR OPERATING TESTING MENU (SCR SERVICE TEST)” in “SETTING AND OPERATION OF MACHINE MONITOR” to perform “AdBlue/DEF Tank Heater Valve Test”.

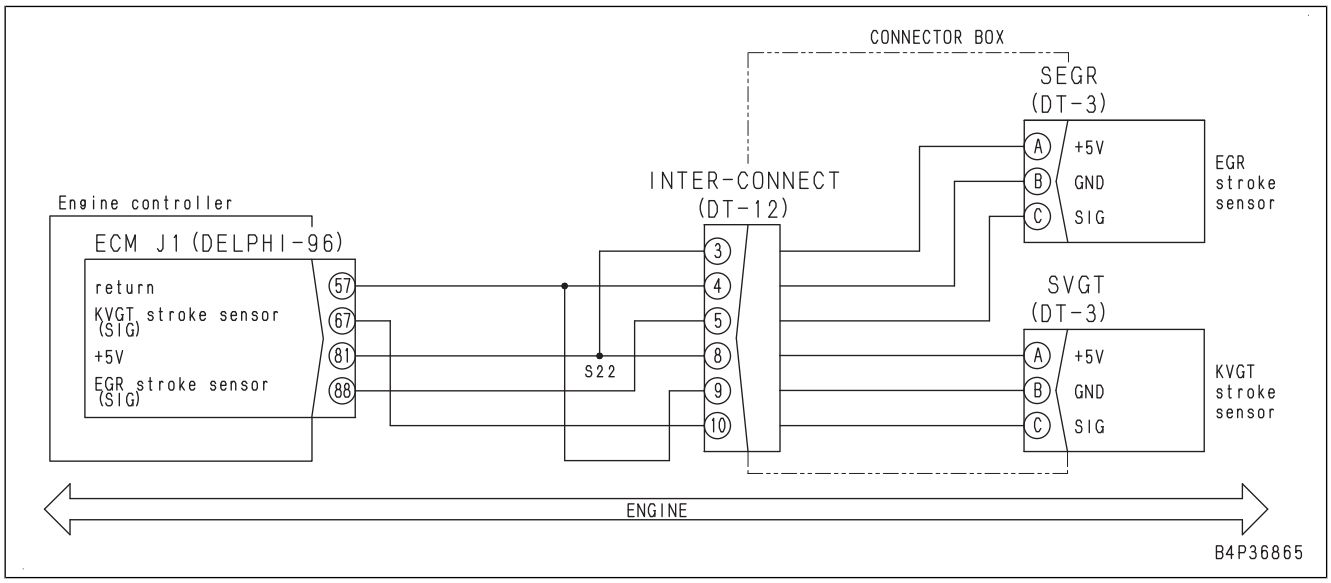
3] When monitoring code 04107 “Coolant Temperature” is less than the ambient temperature added to 20 °C during “AdBlue/DEF tank heater relay test”, perform warm-up operation together with “AdBlue/DEF Tank Heater Valve Test” again.

4] Confirmation will be completed if the AdBlue/DEF temperature in Tank becomes 5 °C or above within an hour after starting the “AdBlue/DEF Tank Heater Valve Test”. If it becomes 5 °C or less, return to troubleshooting.

4. After the repair is completed, see “PROCEDURE FOR TESTING AND TROUBLESHOOTING” to clear the failure code and make sure that the failure code has been cleared from the Abnormality Record screen.

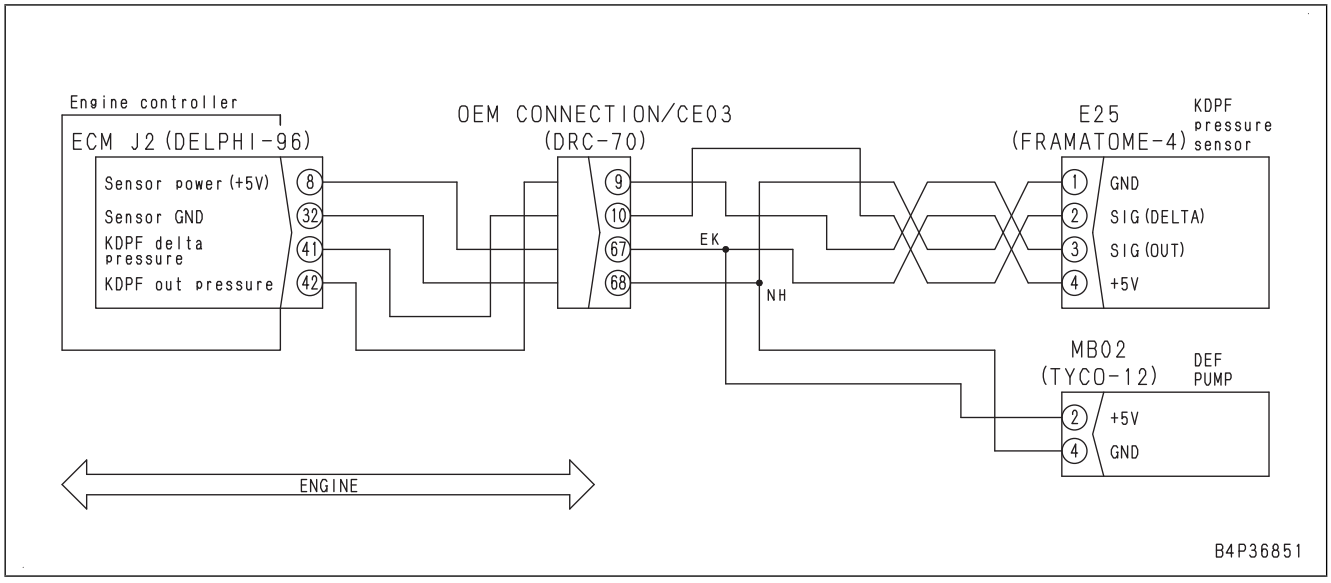
No.	Cause	Procedure, measuring location, criteria and remarks
2	Defective KDPF (KCSF) (change KCSF)	Check records for appeared failure codes. 1. Turn starting switch to ON position. 2. ON the Abnormality Record screen of the machine monitor, check records for appeared failure codes CA2639, CA1921, and CA1922.
		Period between CA2639 and CA1921 ≧ 360sec. (KOMTRAX Record) or ≧ 0.1h (Monitor Record screen) and period between CA1921 and CA1922 ≧ 360sec. (KOMTRAX Record) or ≧ 0.1h (Monitor Record screen) [When the above condition is met] **REMARK** Because accumulated soot amount is high, KDPF regeneration cannot be performed. 1. Change KCSF or KDPF. 2. Turn the starting switch to ON and perform “KDPF Cleaning” reset (see “PRECAUTIONS FOR KDPF (KCSF, KDOC) CLEANING AND CHANGE”). Make sure that failure code [CA1922] changed to [CA1921]. If failure code [CA1922] persists, check the operation procedure for “KDPF Memory Reset”, then perform “KDPF Cleaning” Reset again. 3. Perform Reset after “KDPF Change” (see “PRECAUTIONS FOR KDPF (KCSF, KDOC) CLEANING AND CHANGE”). 4. Perform checks on causes 4 to 7. 5. Start the engine. 6. Secure the safety of the machine. 7. Perform “Active Regeneration for Service” to remove humidity, etc. in KCSF. When the manual stationary regeneration is finished correctly, the repair is completed. If the regeneration is not completed after 3 hours, perform troubleshooting for [CA2639]. Check that the failure code is cleared after manual stationary regeneration is complete. If failure code [CA1922], [CA1921] or [CA2639] is displayed after manual stationary regeneration is complete, perform checks on cause 8. [When the above condition is NOT met] Actual accumulation of soot is less than the indicated value. Perform checks on cause 3.

CIRCUIT DIAGRAM (VGT POSITION SENSOR)



No.	Cause	Procedure, measuring location, criteria and remarks		
4	Ground fault in wiring harness (contact with ground circuit)	1. Starting switch: OFF 2. Disconnect connectors ECM J2 and E25, and connect T-adapters to each female side.		
		Resistance	Between ECM J2 (female) (42) and ground, or between E25 (female) (3) and ground	Min. 100 kΩ
5	Short circuit in wiring harness	1. Starting switch: OFF 2. Disconnect connectors ECM J2 and E25, and connect T-adapter to female side of ECM J2.		
		Continuity	Between ECM J2 (female) (42) and each pin other than pin (42)	No continuity (no sound is heard)
6	Defective KDPF outlet pressure sensor	1. Turn starting switch to OFF position. 2. Insert T-adapter into connector E25. 3. Turn starting switch to ON position.		
		Voltage	Between E25 (3) and (1)	0.5 to 4.5 V
7	Defective engine controller	Turn starting switch to ON position.		
		If this failure code is still displayed and no failure is found by preceding checks, engine controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)		

Circuit diagram related to KDPF outlet pressure sensor



<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Hot short circuit in AdBlue/DEF line heater</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Disconnect the connector MB06, and connect the T-adapter to female side.
3. Turn the starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td>Between MB06 (female) (1) and (2)</td><td>Max. 3 V</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Defective AdBlue/DEF heater relay</td><td colspan="3">1. Turn starting switch to OFF position.
2. Check that system operating lamp does not light up, and then turn the battery disconnect switch OFF.
3. Disconnect connector R53A and R53B, and replace AdBlue/DEF heater relay.
4. Turn the battery disconnect switch ON.
5. Turn starting switch to ON position.</td></tr>
<tr><td colspan="3">If this failure code is cleared, the original AdBlue/DEF heater relay is defective.</td></tr>
<tr><td>7</td><td>Defective engine controller</td><td colspan="3">If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

FAILURE CODE [CA3317]

Action level	Failure code	Failure	KDOC outlet temperature sensor high error (Engine controller system)
L03	CA3317		
Detail of failure	Open circuit, hot short-circuit, or sensor circuit error in KDOC outlet temperature sensor measuring section or probe (+)		
Action of controller	• As KDOC outlet temperature cannot be detected, substitutes KDOC inlet temperature for KDOC outlet temperature and runs the engine (if KDOC inlet temperature sensor also has an error, uses a fixed value (250 °C)). • Engine power deration. • Closes EGR valve. • Stops regeneration control. • Stops fuel dosing.		
Phenomenon on machine	• Control of active regeneration is defective. • Soot accumulation is high. • Engine output is reduced.		
Related information	⚠ **KDPF and KDOC are heated to 500 °C or higher. Be careful not to get burn injury.** • The KDOC inlet temperature sensor, KDOC outlet temperature sensor, and KDPF outlet temperature sensor are integrated into one sensor, and controller of integrated sensor communicates with the engine controller through CAN communication. • If open circuit or hot short circuit or sensor circuit error in KDOC outlet temperature sensor measuring section or probe (+) side occurs, the information is sent to the engine controller through CAN communication, and this failure code is displayed. • As to procedure for accessing KDOC inlet temperature sensor, KDOC outlet temperature sensor, and KDPF outlet temperature sensor, see 50 DISASSEMBLY AND ASSEMBLY, “REMOVE AND INSTALL KDPF ASSEMBLY” and “DISASSEMBLE AND ASSEMBLE OF KDPF ASSEMBLY”. • After completion of repair, check that the failure code is cleared by the following operation. Procedure: Turn the starting switch to ON position. • Engine power deration is canceled by turning starting switch to OFF position after this failure code is cleared. (This deration is not canceled by simply failure code being cleared.)		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective KDOC outlet temperature sensor system	Perform troubleshooting for failure code [CA3316].

FAILURE CODE [CA3567]

<table>
<tr><td>Action level</td><td>Failure code</td><td rowspan="2">Failure</td><td rowspan="2">AdBlue/DEF injector open circuit error or short circuit error
(Engine controller system)</td></tr>
<tr><td>L01</td><td>CA3567</td></tr>
<tr><td>Detail of failure</td><td colspan="3">Short circuit or open circuit is detected in AdBlue/DEF injector circuit.</td></tr>
<tr><td>Action of controller</td><td colspan="3">• Stops driving AdBlue/DEF pump.
• Stops AdBlue/DEF injection.
• Inducement strategy is activated.</td></tr>
<tr><td>Phenomenon on machine</td><td colspan="3">• NOx emission increases because AdBlue/DEF injection is disabled.
• Engine output is reduced based on Inducement strategy.</td></tr>
<tr><td>Related information</td><td colspan="3">⚠ AdBlue/DEF injector part is heated to 400 °C or higher. Be careful not to get burn injury.
• This failure code is displayed if connector is disconnected when stopping the AdBlue/DEF injector.
• This failure code is displayed when both ends of the connector between (+) and (-) short-circuit in activating the AdBlue/DEF injector.
• Since the voltage between female side terminals is 20 V or more when AdBlue/DEF injector connector is disconnected and starting switch is turned to ON position, check of hot short circuit in wiring harness of plus side line is not available.
• The AdBlue/DEF injector is activated at the time of AdBlue/DEF injection or AdBlue/DEF purge.
• After repairing, turn the starting switch from OFF to ON position, inject AdBlue/DEF, and this failure code is cleared.
• The AdBlue/DEF pump stops under the following 3 conditions:
1. Outside air temperature -24 °C or lower
2. AdBlue/DEF thawing in progress
3. When the failure code that the controller activates to stop the AdBlue/DEF pump or to prohibit the AdBlue/DEF injection is displayed.
If the AdBlue/DEF injector cannot be driven due to any of the above-mentioned functions, clear the failure code from the monitor after investigating the cause and make sure that it is not displayed when troubleshooting is possible (when AdBlue/DEF injection is activated).
• Because female connector alone is provided in “Socket” for troubleshooting for this injector, socket cannot be connected to female connector on wiring harness side of injector, and check for wire breakage cannot be performed (T-adapter is not provided).
• On Pre-defined Monitoring screen, AdBlue/DEF pump diagnosis is used. (The numbers below denote monitoring codes).
• Pre-defined Monitoring (18/28) AdBlue/DEF pump
1. 19120 AdBlue/DEF Injection Quantity
2. 19108 AdBlue/DEF Pump Pressure
3. 19109 AdBlue/DEF Pump Pressure Sensor Voltage
4. 19304 AdBlue/DEF Pump State
5. 19136 AdBlue/DEF Pump Temperature
6. 19114 AdBlue/DEF Reverting Valve Cmd
NOTICE
This failure code requires “Loaded Diagnostics Operation To Clear Failure Code”. After investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Clear Failure Code” to make sure the failure code is cleared. (This failure code is not cleared by simply turning the starting switch to ON position.)</td></tr>
</table>

FAILURE CODE [CA3681]

<table>
<tr><td>Action level</td><td>Failure code</td><td rowspan="2">Failure</td><td rowspan="2">SCR outlet NOx sensor power voltage error
(Engine controller system)</td></tr>
<tr><td>L01</td><td>CA3681</td></tr>
<tr><td>Detail of failure</td><td colspan="3">SCR outlet NOx sensor cannot detect the value due to defective power supply of SCR outlet NOx sensor.</td></tr>
<tr><td>Action of controller</td><td colspan="3">• Operates the engine at default NOx value (0 ppm).
• Inducement strategy is activated (EU specifications).</td></tr>
<tr><td>Phenomenon on machine</td><td colspan="3">• AdBlue/DEF injection becomes inappropriate and the NOx emission may increase, or ammonia may be discharged.
• Engine output is reduced based on Inducement strategy (EU specifications).</td></tr>
<tr><td>Related information</td><td colspan="3">⚠ KDPF, sensor installation piping, and sensor probe are heated to 500 °C or higher. Be careful not to get burn injury.
⚠ SCR assembly, sensor fitting piping, and sensor probe are heated to 400 °C or higher. Be careful not to get burn injury.
⚠ As for the sensor probe, be careful not to get burn injury even if the surroundings are not hot, because sensor itself is heated.
• SCR outlet NOx sensor operates when 19302 SCR Outlet Temperature is 150 °C or higher (19210 SCR Outlet NOx Sensor State is “1”).
• SCR outlet NOx sensor is smart sensor which communicates with engine controller with other sensors through CAN communication.
• SCR outlet NOx sensor does not operate when SCR outlet temperature is 150 °C or lower, and correct value is not displayed (the sensor does not operate by simply turning the starting switch to ON position even when it is normal).
• On Pre-defined Monitoring screen, engine operation state diagnosis, SCR catalyst, NOx sensor, and ammonia sensor diagnosis are used. (The numbers below denote monitoring codes).
• Pre-defined Monitoring (16/28) Engine operation state
1. 01002 Engine Speed
2. 18600 Inject Fueling Command
3. 19200 Exhaust Gas Flow Rate
4. 47300 KDOC 1 Inlet Temperature
5. 19300 SCR Temperature
6. 19302 SCR Outlet Temperature
• Pre-defined Monitoring (19/28) SCR catalyst/NOX sensor/NH3 sensor
1. 19120 AdBlue/DEF Injection Quantity
2. 19205 SCR NH3 Concentration Corrected
3. 19202 Turbo Outlet NOx Corrected
4. 19209 SCR Outlet NOx Corrected
5. 19203 Turbo Outlet NOx Sensor State
6. 19210 SCR Outlet NOx Sensor State
NOTICE
This failure code requires “Loaded Diagnostics Operation To Confirm Failure Correction”. After investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Confirm Failure Correction” to make sure the failure code is cleared. (Even if this failure code is not displayed with starting switch in ON position, completion of repair cannot be determined unless exhaust temperature becomes high.)</td></tr>
</table>

No.	Cause	Procedure, measuring location, criteria and remarks
6	Defective engine controller	1. Replace the engine controller. 2. If “AdBlue/DEF concentration” ranges from 29 to 36 % on the Troubleshooting Pre-defined Monitoring screen, perform “Loaded Diagnostics Operation To Clear Failure Code” and repair is completed.

Loaded Diagnostics Operation to Clear Failure Code

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

(Make sure this failure code is cleared after this procedure.)

1. Turn the starting switch to OFF position, and shut down the engine controller.
2. Turn the starting switch to ON position.
3. Display monitoring code 19115 “AdBlue/DEF Temperature in Tank” on “Pre-defined Monitoring” screen.
4. Stand by with the lever and pedal of the machine not operated.
   Standby time depends on the initial value of the AdBlue/DEF Temperature in tank as follows.
   - When the value is 0 °C or below, run the engine and wait for 0 °C or above in tank temperature (about 60 minutes).
   - When the value ranges from 0 to 5 °C, stand by for 30 minutes. (engine may be either started or not.)
   - When the value is 5 °C or above, stand by for 10 minutes. (engine may be either started or not.)
5. If this failure code is cleared, repair is completed.

FAILURE CODE [CA4155]

Action level	Failure code	Failure	AdBlue/DEF Pump Heater Relay Voltage High Error (Engine controller system)
L01	CA4155		
Detail of failure	A high voltage error is detected in AdBlue/DEF pump heater relay circuit.		
Action of controller	Advances to Inducement strategy.		
Phenomenon on machine	• Engine output is reduced based on inducement strategy. • AdBlue/DEF thawing defective. • NOx emission increases because AdBlue/DEF injection is disabled at low temperature.		
Related information	• AdBlue/DEF pump heater relay is driven at AdBlue/DEF supply system thawing/thermal insulation or an AdBlue/DEF pump heater relay test. • AdBlue/DEF pump heater relay is integrated in the AdBlue/DEF heater relay. • Troubleshooting of this failure code covers circuits from engine controller through AdBlue/DEF heater relay to ground. • This failure code is detected only when the AdBlue/DEF pump heater relay is turned OFF. • This failure code is displayed if the connector is removed. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it. 2. See “service modes” of “setting and operating machine monitor”, “operating method of testing menu (SCR service test)” to perform an “AdBlue/DEF pump heater relay test”.		
		If this failure code is cleared, wiring harness connector is defective.		
2	Open circuit in wiring harness (wire breakage or defective contact of connector)	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J2, R53A and MB02, and connect T-adapters to each female side.		
		Resistance	Between R53A (female) (12) and ground	Max. 10 Ω
			Between ECM J2 (female) (83) and R53A (female) (3)	Max. 10 Ω
3	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector R53A, and connect T-adapter to female side. 3. Turn starting switch to ON position.		
		Voltage	Between R53A (female) (3) and (12)	Max. 4.5 V
4	Defective AdBlue/DEF heater relay	1. Turn starting switch to OFF position. 2. Check that system operating lamp does not light up, and then turn the battery disconnect switch OFF. 3. Disconnect connector R53A and R53B, and replace AdBlue/DEF heater relay. 4. Turn the battery disconnect switch ON. 5. Turn starting switch to ON position.		
		If this failure code is cleared, the original AdBlue/DEF heater relay is defective.		

1. Turn the starting switch to ON position (Do not start the engine).
2. Check if monitoring code 19136 “AdBlue/DEF Pump Temperature” is 45 °C or below (If not, wait until monitoring code 19136 “AdBlue/DEF Pump Temperature” falls down to below 45 °C).
3. See “TESTING AND ADJUSTING”, “Service mode” and “Inspection menu (SCR Service Test)” in “SETTING AND OPERATION OF MACHINE MONITOR” to perform “AdBlue/DEF Pump Heater Relay Test”.
4. When the increase of monitoring code 19136“AdBlue/DEF Pump Temperature” is 5 °C or more from the start of testing within 30 minutes, repair is completed.
5. After the repair is completed, see “CLASSIFICATION AND PROCEDURES OF TROUBLESHOOTING” to clear the failure code and make sure that the failure code has been cleared from the “Abnormality Record” screen.

REMARK

When the increase of “AdBlue/DEF Pump Temperature is not ”5 °C or more from the start of testing after 30 minutes, return to troubleshooting.

FAILURE CODE [CA4769]

Action level	Failure code	Failure	AdBlue/DEF level measurement impossible (Engine controller system)
L01	CA4769		
Detail of failure	AdBlue/DEF level sensor cannot measure the AdBlue/DEF level and that state continues.		
Action of controller	Inducement strategy is activated.		
Phenomenon on machine	• AdBlue/DEF level cannot be measured. • Indication of AdBlue/DEF level on the monitor changes. • Engine output is reduced based on Inducement strategy.		
Related information	• This failure code is displayed when AdBlue/DEF tank becomes completely empty. • Possible causes other than empty AdBlue/DEF tank are sticking of foreign material to sensing part and defective sensor. • For this failure code, if the temperature of AdBlue/DEF in tank is 0 °C or lower, the failure code cannot be cleared. • On “Pre-defined Monitoring” screen, AdBlue/DEF level and quality sensor are used. • Pre-defined Monitoring (19/23) AdBlue/DEF level, quality sensor 1. 19100 AdBlue/DEF Concentration 2. 19110 AdBlue/DEF Level 3. 19111 AdBlue/DEF Level Corrected 4. 19115 AdBlue/DEF Temperature in Tank 5. 19400 Ambient Temperature 6. 19305 AdBlue/DEF Tank Heating State **NOTICE** **This failure code requires“ Loaded Diagnostics Operation To Clear Failure Code”. After investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Clear Failure Code” to make sure the failure code is cleared.**		

No.	Cause	Procedure, measuring location, criteria and remarks
1	AdBlue/DEF tank remaining amount check	1. Turn starting switch to OFF position. 2. Check the sight gauge to confirm that there is sufficient amount of AdBlue/DEF in the AdBlue/DEF tank. 3. If there is no AdBlue/DEF, or AdBlue/DEF level is low. 1) Refill with AdBlue/DEF. 2) Turn starting switch to OFF position. 3) If the value of AdBlue/DEF level is displayed correctly on machine monitor, perform “Loaded Diagnostics Operation To Clear Failure Code”and repair is completed. 4) If AdBlue/DEF level is not sensed and the color of AdBlue/DEF icon remains changed even after AdBlue/DEF has been refilled, proceed to cause 2. 4. If AdBlue/DEF level is normal 1) Turn starting switch to OFF position. 2) If AdBlue/DEF level is not sensed and the color of AdBlue/DEF icon remains changed even after AdBlue/DEF has been refilled, proceed to cause 2. 3) If the value of AdBlue/DEF level is displayed correctly on machine monitor, perform “Loaded Diagnostics Operation To Clear Failure Code”and repair is completed.

<table>
<tr><th>No.</th><th>Check item</th><th colspan="4">Procedure of troubleshooting</th><th colspan="2">Judgment and remedy</th></tr>
<tr><td rowspan="8">5</td><td rowspan="8">Open circuit in wiring harness (CAN2 communication circuit)</td><td colspan="4">1. Turn the starting switch to the OFF position.
2. Make sure that the system operating lamp is not lit. Turn the battery disconnect switch to the OFF position.
3. Disconnect the connectors CK05, CM02, and K02, and connect the T-adapter to the each female side to troubleshoot.
4. Does the troubleshooting result agree with the standard value?</td><td>YES</td><td>• The wiring harness has no open circuit.
• Go to the next check item.</td></tr>
<tr><td>Item</td><td colspan="2">Measurement position/condition</td><td>Standard value</td><td rowspan="7">NO</td><td rowspan="7">• The wiring harness has an open circuit.
• Repair or replace the defective wiring harness.
• Go to Confirmation of repair.</td></tr>
<tr><td rowspan="6">Resistance</td><td colspan="2">Between CK05 (female) (45) and CM02 (female) (7)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between CK05 (female) (45) and CM02 (female) (8)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between CK05 (female) (64) and CM02 (female) (9)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between CK05 (female) (45) and K02 (female) (A)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between CK05 (female) (64) and K02 (female) (B)</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="8">6</td><td rowspan="8">Ground fault in wiring harness (CAN2 communication circuit)</td><td colspan="4">1. Turn the starting switch to the OFF position.
2. Make sure that the system operating lamp is not lit. Turn the battery disconnect switch to the OFF position.
3. Disconnect the connectors CK05, CP01, AC01, ECM J2, CA02, CM02, and K02, and connect the T-adapter to any female side to troubleshoot.
4. Does the troubleshooting result agree with the standard value?</td><td>YES</td><td>• The wiring harness has no ground fault.
• Go to the next check item.</td></tr>
<tr><td>Item</td><td colspan="2">Measurement position/condition</td><td>Standard value</td><td rowspan="7">NO</td><td rowspan="7">• The wiring harness has a ground fault.
• Repair or replace the defective wiring harness.
• Go to Confirmation of repair.</td></tr>
<tr><td rowspan="6">Resistance</td><td colspan="2">Between ground and one of CK05 (female) (45), CP01 (female) (45), AC01 (female) (2), ECM J2 (female) (22), CA02 (female) (110), CM02 (female) (7), CM02 (female) (8), and K02 (female) (A)</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Between ground and one of CK05 (female) (64), CP01 (female) (64), AC01 (female) (1), ECM J2 (female) (46), CA02 (female) (111), CM02 (female) (9), and K02 (female) (B)</td><td>Min. 1 MΩ</td></tr>
</table>

<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="6">2</td><td rowspan="6">Open circuit in wiring harness</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position.
3. Remove the fuse No.17 in fuse box F01
4. Disconnect the connector CP01 and connect the T-adapter to female side.</td></tr>
<tr><td rowspan="4">Resistance</td><td>Between CP01 (female) (1) and F01-17</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (4) and F01-17</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (2) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (5) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="5">3</td><td rowspan="5">Defective pump controller ACC signal circuit</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position.
3. Disconnect the connector CP01 and connect the T-adapter to female side.
4. Turn the battery disconnect switch to ON position.
5. Turn the starting switch to ON position.
REMARK
If there is no failure, troubleshooting for No. 4 is not required.</td></tr>
<tr><td rowspan="3">Voltage</td><td>Between CP01 (female) (24) and (2)</td><td>20 to 30 V</td></tr>
<tr><td>Between CP01 (female) (43) and (5)</td><td>20 to 30 V</td></tr>
<tr><td>Between CP01 (female) (80) and (2)</td><td>20 to 30 V</td></tr>
<tr><td rowspan="6">4</td><td rowspan="6">Open circuit in wiring harness</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position.
3. Remove the fuse No. 14 in fuse box F01.
4. Disconnect the connector CP01 and connect the T-adapter to female side.</td></tr>
<tr><td rowspan="4">Resistance</td><td>Between CP01 (female) (24) and F01-14</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (43) and F01-14</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (80) and F01-14</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (2) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (5) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Defective CAN 1 terminating resistor</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Disconnect the connectors C23 and CM02, and connect the T-adapter to each male side.</td></tr>
<tr><td rowspan="2">Resistance</td><td>Between CM02 (male) (10) and (12)</td><td>120 ± 12 Ω</td></tr>
<tr><td>Between C23 (male) (A) and (B)</td><td>120 ± 12 Ω</td></tr>
</table>

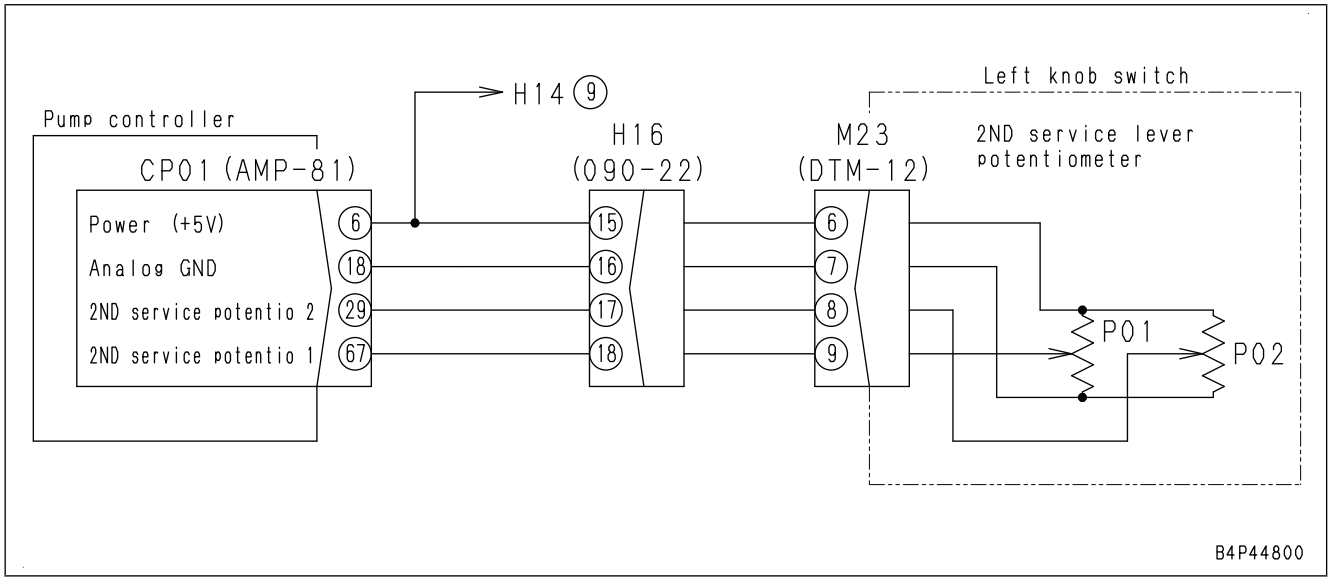
FAILURE CODE [DB2QKR]

Detail of failure	The machine monitor cannot recognize the engine controller on the CAN2 communication line (KOMNET/c).
Action level	L03
Action of controller	Keeps information when a defect is found.
Phenomenon on machine	The information from the engine controller are not shown. Special functions do not operate. Received data do not update. (Such as failure codes and monitoring codes sent from the engine controller)
Related information	**Reference information** • The starting switch transmits the ACC signal to each controller to tell that CAN communication is started. • There are 5 failure codes ([D8AQKR], [DA2QKR], [DAZQKR], [DB2QKR], and [DBPQKR]) for CAN2 communication errors that the machine monitor senses. When all of these failure codes are shown, there can be a ground fault, short circuit, or hot short circuit in the wiring harness (CAN communication line). **REMARK** If the air conditioner can be operated, no ground fault, short circuit, or hot short circuit occurs in wiring harness (CAN communication line). • Terminating resistor of CAN 2 on cab side is provided in machine monitor, and that on engine side is connector “K02”. • Since each controller and machine monitor are connected directly to the battery, they are supplied with power even when the starting switch is in the OFF position. • Since the signals passing an active CAN communication line are pulse voltages, they cannot be measured by using a multimeter.

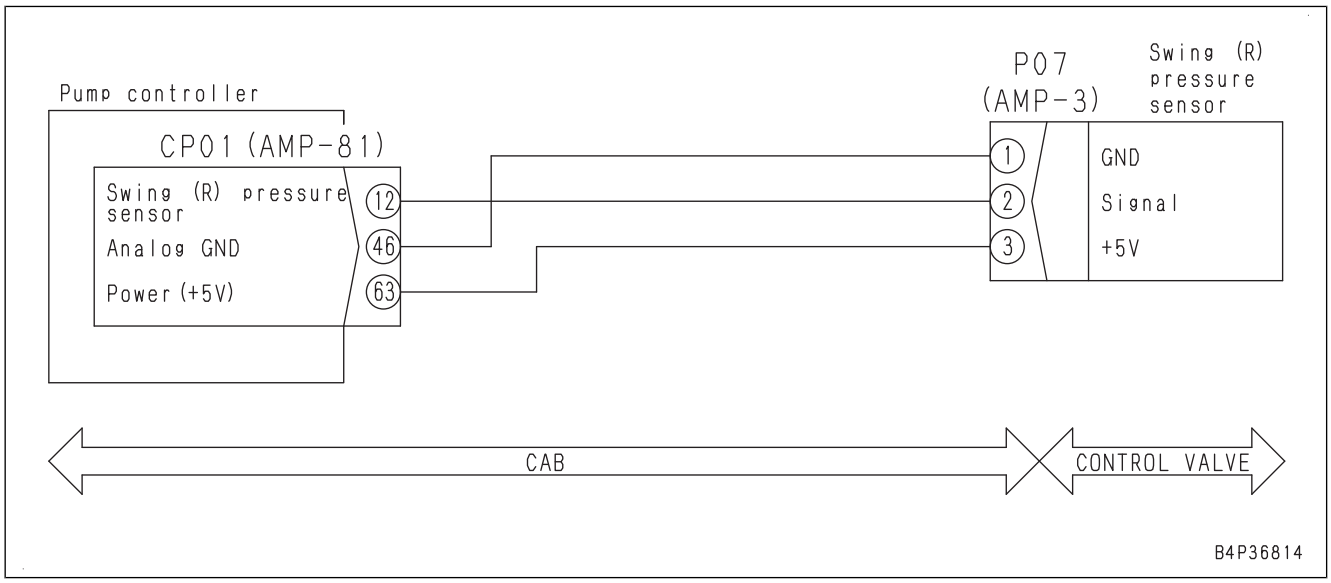
No.	Check item	Procedure of troubleshooting	Judgment and remedy	
1	Wiring harnesses, connectors and terminals	1. Check the wiring harnesses, connectors and terminals. For details, see “Related information of troubleshooting”, “Check before troubleshooting”, “Check method of electrical parts”. 2. Are the wiring harnesses, connectors and terminals normal?	YES	• The wiring harnesses, connectors and terminals are normal. • Go to the next check item.
			NO	• The wiring harness, connector or terminal is defective. • Repair or replace the defective wiring harness, connector or terminal. • Go to Confirmation of repair.

No.	Cause	Procedure, measuring location, criteria and remarks
6	Defective pump controller	If no failure is found by above checks, pump controller is defective. (Since this is an internal defect, troubleshooting cannot be performed).

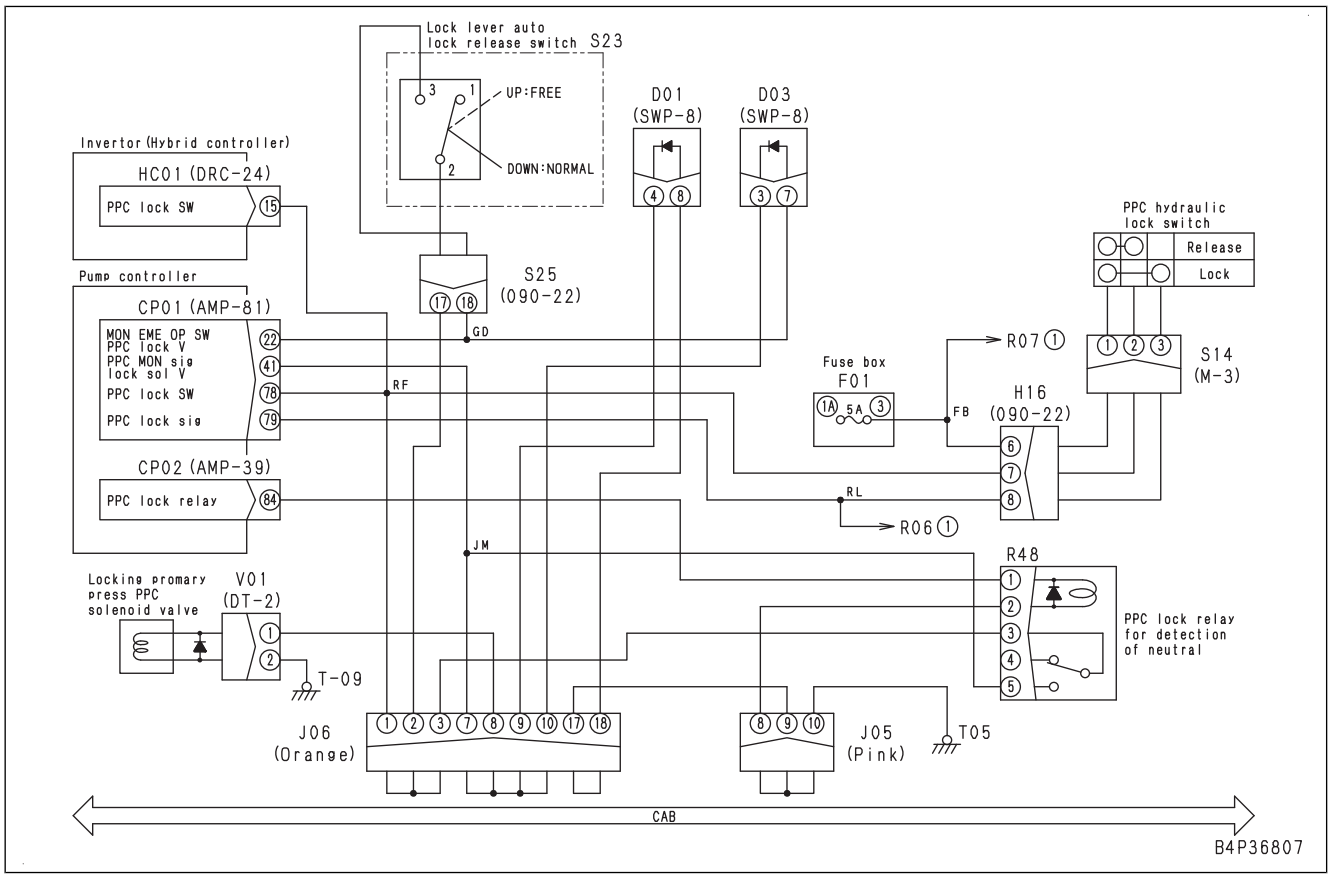
Circuit diagram related to service lever potentiometer 2



Circuit diagram related to swing RIGHT PPC pressure sensor



Circuit diagram related to PPC lock switch



FAILURE CODE [DW45KY]

Action level	Failure code	Failure	Swing parking brake solenoid hot short circuit (Hybrid controller system)
L03	DW45KY		
Detail of failure	When controller does not drive swing parking brake solenoid, output terminal voltage of controller is higher than specified value, and hot short circuit is detected.		
Action of controller	• None in particular • If cause of failure is eliminated, machine becomes normal by itself.		
Phenomenon on machine	Swing parking brake does not work.		
Related information	• If no failure is found in solenoid or wiring harness, set swing parking brake cancel switch to CANCEL position to enable swing operation (swing parking brake is effective if starting switch is in OFF position). • Set swing lock switch to OFF position, and set swing parking brake cancel switch is to CANCEL position during diagnosis. If swing parking brake solenoid is normal, current flows to it after turning starting switch to ON position under this condition, and swing parking brake is canceled. • Controller's command (ON/OFF) to swing parking brake solenoid can be checked with monitoring function. (As long as controller's command to solenoid is OFF, sensor state displayed on monitoring screen is OFF even if solenoid is energized due to open short circuit.) (Code: 09700) • After completion of repair, check that the failure code is cleared by the following operation. Procedure: Turn the starting switch to ON position. • Power supply of swing parking brake solenoid is HC01 (8) pin of inverter (hybrid controller) or No.1 of fuse box F01.		

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 V05, and connect the T-adapter to female side. 3. Turn the starting switch to ON position.		
		Voltage	Between V05 (female) (1) and (2)	Max. 1 V
2	Defective inverter (hybrid controller)	If no failure is found by above checks, inverter (hybrid controller) is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

No.	Cause	Procedure, measuring location, criteria and remarks		
5	Open circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors CP02, S25, and V11, and connect the T-adapter to each female side.		
		Resistance	Between CP02 (female) (96) and S25 (female) (3)	Max. 1 Ω
			Between S25 (female) (2) and V11 (female) (1)	Max. 1 Ω
			Between S25 (female) (5) and V11 (female) (2)	Max. 1 Ω
			Between CP02 (female) (115) and S25 (female) (6)	Max. 1 Ω
			Between CP02 (female) (117) and S25 (female) (6)	Max. 1 Ω
			Between CP02 (female) (120) and S25 (female) (6)	Max. 1 Ω
6	Defective pump controller	If no failure is found by above checks, pump controller is defective. (Since this is an internal defect, troubleshooting cannot be performed).		

FAILURE CODE [DXE8KB]

Action level	Failure code	Failure	Attachment Flow Regulating EPC 3 Solenoid Short Circuit (Pump controller system)
-	DXE8KB		
Detail of failure	Controller detects short circuit in attachment flow rate adjustment EPC3 solenoid.		
Action of controller	• Stops driving attachment flow rate adjustment EPC1, EPC2, EPC3, and EPC4 solenoids. • Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position.		
Phenomenon on machine	Attachment does not move.		
Related information	• Drive current of attachment flow rate adjustment EPC3 solenoid can be checked with monitoring function (code: 01703). • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position and set machine in attachment mode (ATT).		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective attachment flow rate adjustment EPC 3 (internal short circuit or ground fault)	1. Turn starting switch to OFF position. 2. Disconnect connector V93, and connect T-adapter to male side.		
		Resistance	Between V93 (male) (1) and (2)	7 to 14 Ω
			Between V93 (male) (1) and ground	Min. 1 MΩ
2	Ground fault in wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors CP02 and V93, and connect T-adapters to each female side.		
		Resistance	Between CP02 (female) (87) and ground, or between V91 (female) (1) and ground	Min. 1 MΩ
3	Defective pump controller	If no failure is found by preceding checks, pump controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly).		

FAILURE CODE [DY2CKB]

Action level	Failure code	Failure	Washer Motor Short Circuit (Pump controller system)
—	DY2CKB		
Detail of failure	When outputting current to window washer motor, abnormal current flows and short circuit is detected.		
Action of controller	Stops output to washer motor. Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position.		
Phenomenon on machine	Wind washer does not operate.		
Related information	After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position and turn washer switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective fuse	1. Turn the starting switch to OFF position. 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Remove the fuse No.4 in fuse box F01. Check visually if it is not burnt out. 4. When it is not burnt out, check if it is blown out by continuity test.		
		• When it is burnt out, check the wiring harness for ground fault. • When it is not burnt out but it has no continuity, replace the fuse.		
2	Defective washer motor	1. Turn the starting switch to OFF position. 2. Disconnect the connector M06 and connect the T-adapter to male side.		
		Resistance	Between M06 (male) (1) and (2)	5 to 20 Ω
			Between ground and M06 (male) (1) or (2)	Min. 1 MΩ
3	Defective diode	1. Turn the starting switch to OFF position. 2. Disconnect the connector D02, and connect the T-adapter to male side. **REMARK** Measure it with diode range.		
		Continuity	Between D02 (male) (6)(+) and (2)(-)	Continuity
			Between D02 (male) (2)(+) and (6)(-)	No continuity
4	Ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Remove the fuse No.4 in fuse box F01 3. Disconnect the connectors M06, CP01, and D02, and connect the T-adapter to any female side.		
		Resistance	Between ground and any of F01-4, M06 (female) (2), and D02 (female) (2)	Min. 1 MΩ
			Between ground and any of CP01 (female) (3), M06 (female) (1), and D02 (female) (6)	Min. 1 MΩ

FAILURE CODE [GA08KG]

Action level	Failure code	Failure	Hardware source voltage high error in DC line after boosting (Hybrid controller system)
L03	GA08KG		
Detail of failure	Hardware detects overvoltage error in power train.		
Action of controller	• Stops controlling swing motor and motor-generator, and applies swing parking brake. • Disables low-speed matching function. • Disables hoist matching function. • Even if cause of failure is cleared naturally, machine does not become normal until starting switch is set to OFF position once.		
Phenomenon on machine	• Swinging is disabled. • Low-speed matching is disabled.		
Related information	**NOTICE** **Use electric charge release tool (796-426-1800) to release electric charge of capacitor.** • Power train voltage can be checked with monitoring function. (Code: 09200) • After completion of repair, check that the failure code is cleared by the following operation. Procedure: Turn the starting switch to ON position or start the engine.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Open circuit in power cable (capacitor)	1. Turn the starting switch to OFF position. 2. Disconnect the inverter side and the capacitor side of connectors HC06 and HB01.		
		Resistance	Between HC06 (DC+) (female) and capacitor side (DC+) (female)	Max. 1 Ω
			Between HB01(DC-) (female) and capacitor side (DC-) (female)	Max. 1 Ω
2	Deterioration of insulation in power cable (capacitor)	1. Turn the starting switch to OFF position. 2. Disconnect the inverter side and the capacitor side of connectors HC06 and HB01. **REMARK** • Wipe the dirt of the metal part of the cable housing. • When the measured values are not stable, use the value measured after 1 minute. • Measure it by mega-ohm tester.		
		Resistance	Between HC06 (DC+) (female): tester (red) and connector part shield (part Q): tester (black)	Min. 10 MΩ
			Between HC06 (DC+) (female): tester (black) and connector part shield (part Q): tester (red)	Min. 10 MΩ
			Between HB01 (DC-) (female): tester (red) and connector part shield (part Q): tester (black)	Min. 10 MΩ
			Between HB01 (DC-) (female): tester (black) and connector part shield (part Q): tester (red)	Min. 10 MΩ

FAILURE CODE [GA10MC]

Action level	Failure code	Failure	Hybrid controller malfunction (Hybrid controller system)
-	GA10MC		
Detail of failure	Inverter (hybrid controller) malfunction		
Action of controller	None in particular		
Phenomenon on machine	Inverter (hybrid controller) does not operate normally.		
Related information	**NOTICE** **Use electric charge release tool (796-426-1800) to release electric charge of capacitor.** After completion of repair, check that the failure code is cleared by the following operation. Procedure: Turn the starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective inverter (hybrid controller)	Inverter 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="8">4</td><td rowspan="8">Deterioration of insulation in power cable (electric swing motor)</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Disconnect the connectors HC05 and PM02.
REMARK
• If the connector on the capacitor side has already disconnected, leave it as it is.
• Wipe the dirt of the metal part of the cable housing.
• When the measured values are not stable, use the value measured after 1 minute.
• Measure it by mega-ohm tester.</td></tr>
<tr><td rowspan="7">Resistance</td><td>Between HC05 (U) (male): tester (red) and cable housing metal (P part): tester (black)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC05 (U) (male): tester (black) and cable housing metal (P part): tester (red)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC05 (V) (male): tester (red) and cable housing metal (P part): tester (black)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC05 (V) (male): tester (black) and cable housing metal (P part): tester (red)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC05 (W) (male): tester (red) and cable housing metal (P part): tester (black)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC05 (W) (male): tester (black) and cable housing metal (P part): tester (red)</td><td>Min. 10 MΩ</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Open circuit between phases of electric swing motor system</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Disconnect the connectors HC05, HC06(DC+) and HB01(DC-).
REMARK
There is a coil resistance of motor in the motor-generator.</td></tr>
<tr><td rowspan="3">Resistance</td><td>Between HC05 (U) (male) and HC05 (V) (male)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between HC05 (V) (male) and HC05 (W) (male)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between HC05 (W) (male) and HC05 (U) (male)</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="4">6</td><td rowspan="4">Deterioration of insulation in electric swing motor system</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Disconnect the connectors HC05, HC06(DC+) and HB01(DC-).
REMARK
• Wipe dirt of the inverter (case).
• Measure one phase any of (U), (V) and (W).
• When the measured values are not stable, use the value measured after 1 minute.
• Measure it by mega-ohm tester.</td></tr>
<tr><td rowspan="2">Resistance</td><td>HC05 (U) (male): tester (red) and inverter (case): tester (black)</td><td>Min. 10 MΩ</td></tr>
<tr><td>HC05 (U) (male): tester (black) and inverter (case): tester (red)</td><td>Min. 10 MΩ</td></tr>
</table>

<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="7">3</td><td rowspan="7">Internal short circuit in power cable (motor-generator)</td><td colspan="3">1. Turn the starting switch to OFF position.
2. REMARK
Disconnect the connectors HC03, HC04, GM02 and GM03.
REMARK
If the connector on the capacitor side has already disconnected, leave it as it is.</td></tr>
<tr><td rowspan="6">Resistance</td><td>Between HC03 (A1) (male) and HC03 (B1) (male)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC03 (B1) (male) and HC03 (C1) (male)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC03 (C1) (male) and HC03 (A1) (male)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC04 (A2) (male) and HC04 (B2) (male)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC04 (B2) (male) and HC04 (C2) (male)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC04 (C2) (male) and HC04 (A2) (male)</td><td>Min. 10 MΩ</td></tr>
</table>

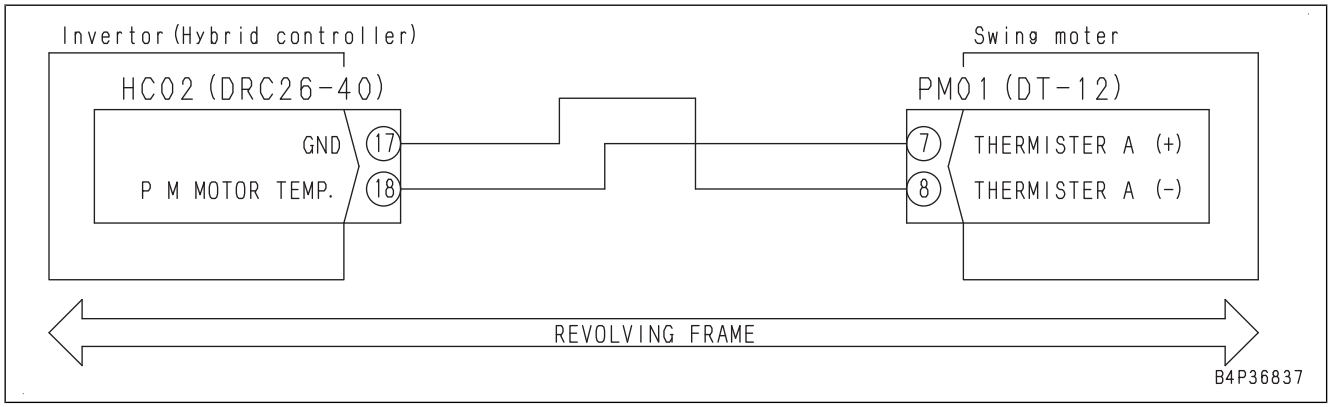
<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="4">6</td><td rowspan="4">Short circuit between phases of motor-generator system.</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Disconnect the connectors HC03, HC04, HC06 (DC+) and HB01 (DC-).
REMARK
Measure one either HC03 or HC04.</td></tr>
<tr><td rowspan="3">Resistance</td><td>Between HC03 (A1) (male) and HC03 (B1) (male)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC03 (B1) (male) and HC03 (C1) (male)</td><td>Min. 10 MΩ</td></tr>
<tr><td>Between HC03 (C1) (male) and HC03 (A1) (male)</td><td>Min. 10 MΩ</td></tr>
<tr><td rowspan="7">7</td><td rowspan="7">Deterioration of insulation in motor-generator system</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Disconnect the connectors HC03, HC04, HC06 (DC+) and HB01 (DC-).
REMARK
• Wipe dirt of the inverter (case).
• When the measured values are not stable, use the value measured after 1 minute.
• Measure it by mega-ohm tester.</td></tr>
<tr><td rowspan="6">Resistance</td><td>HC03 (A1) (male): tester (red) and inverter (case): tester (black)</td><td>Min. 10 MΩ</td></tr>
<tr><td>HC03 (A1) (male): tester (black) and inverter (case): tester (red)</td><td>Min. 10 MΩ</td></tr>
<tr><td>HC03 (B1) (male): tester (red) and inverter (case): tester (black)</td><td>Min. 10 MΩ</td></tr>
<tr><td>HC03 (B1) (male): tester (black) and inverter (case): tester (red)</td><td>Min. 10 MΩ</td></tr>
<tr><td>HC03 (C1) (male): tester (red) and inverter (case): tester (black)</td><td>Min. 10 MΩ</td></tr>
<tr><td>HC03 (C1) (male): tester (black) and inverter (case): tester (red)</td><td>Min. 10 MΩ</td></tr>
</table>

FAILURE CODE [GA70NS]

Action level	Failure code	Failure	Hybrid swing motor overheat (Hybrid controller system)
-	GA70NS		
Detail of failure	Swing motor temperature is 140 °C or higher.		
Action of controller	• Restricts swing speed. • If cause of failure is eliminated, machine becomes normal by itself.		
Phenomenon on machine	Swing speed, etc. is restricted.		
Related information	• This failure code appears in case of excessive charge or discharge (swing, swing stop) of capacitor. • Swing motor coil temperature can be checked with monitoring function. (Code: 09101) • For details, see “ELECTRIC SWING MOTOR TEMPERATURE INCREASES ABNORMALLY” in Y mode. • After completion of repair, check that the failure code is cleared by the following operation. Procedure: Turn the starting switch to ON position or start the engine.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective inverter (hybrid controller)	If no failure is found by above checks, inverter (hybrid controller) is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		
2	Defective electric swing motor	If no failure is found by above checks, electric swing motor is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		
3	Defective hybrid cooling system circuit	See “CAPACITOR TEMPERATURE INCREASES ABNORMALLY” in Y mode, and check the radiator coolant level of the hybrid system cooling circuit and clogging of the radiator fin and the water pump operation.		
4	Ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors HC02 and PM01, and connect the T-adapter to either female side.		
		Resistance	Between ground and either HC02 (female) (18) or PM01 (female) (7)	Min. 1 MΩ

Circuit diagram related to electric swing motor temperature sensor



E-5 WHEN STARTING SWITCH IS TURNED TO ON POSITION, MACHINE MONITOR DISPLAYS NOTHING

Failure	When starting switch is turned to ON position, machine monitor displays nothing.
Related information	• When starting switch is turned to ON position, machine monitor displays KOMATSU logo, screen to input password (if set), screen to check breaker mode (if set), screen of check before starting, screen to check working mode, screen to check travel speed, and standard screen in order. • Battery voltage may drop sharply when engine is started, depending on ambient temperature and battery condition. In this case, machine monitor display may disappear for a while. This phenomenon is not abnormal.

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Omission of turning battery disconnect switch ON	Turn starting switch to OFF position, and check that battery disconnect switch is turned ON.			
2	Loose terminal or open circuit in terminal	1. Turn starting switch to OFF position.			
		Check terminals of battery relay.			
3	Insufficient battery capacity	Be ready with starting switch at OFF, then perform troubleshooting without turning starting switch to ON position.			
		Battery voltage (measure 2 batteries in series)		Min.24 V	
		Gravity of battery (measure gravity in each cell)		Min.1.26	
4	Defective fuse F01-14	If fuse is burnt out, circuit may have ground fault. (See cause 9.)			
5	Defective fusible link	If fusible link F05 is burnt out, circuit probably has ground fault. (See cause 9.)			
6	Defective fuse F01-17	If fuse is burnt out, circuit may have ground fault. (See cause 9.)			
7	Defective wiring harness, starting switch, or machine monitor	1. Turn starting switch to OFF position, and turn battery disconnect switch to OFF position. 2. Insert T-adapter into connector CM01. 3. Turn battery disconnect switch to ON position, and turn starting switch to ON position (connect ACC).			
		Voltage	Between CM01 (1) and (3)		20 to 30 V
			Between CM01 (2) and (4)		20 to 30 V
			Between CM01 (10) and (4)		20 to 30 V
		1. Turn starting switch to OFF position.			
		Check terminals of battery relay.			
8	Defective starting switch (internal open circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connector H15A. 3. Turn starting switch to ON position and perform troubleshooting again.			
		Resistance	Between starting switch terminal B and terminal ACC	Turn the starting switch to OFF position.	Min. 1 MΩ
			Between starting switch terminal B and terminal ACC	Turn the starting switch to ON position.	Max. 1 Ω

E-33 ALARM BUZZER CANNOT BE CANCELED

Failure	Alarm buzzer does not stop sounding.
Related information	• Condition of signal of alarm buzzer cancel switch can be checked with monitoring function. (Code: 04504)

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective machine monitor	Machine monitor may be defective. (Because this is an internal defect, troubleshooting cannot be performed.)

E-55 SWING INDICATOR IS NOT DISPLAYED PROPERLY WITH MONITORING FUNCTION

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

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 codes [DHSAMA] and [DHSBMA].

<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="5">12</td><td rowspan="5">Malfunction of boom control valve (suction safety valve)
(LOWER side)</td><td colspan="4">Be ready with engine stopped, then perform troubleshooting with engine at high idle.</td></tr>
<tr><td rowspan="3">Boom relief pressure</td><td>Hydraulic oil temperature: 45 to 55 °C</td><td>Boom RAISE relief</td><td>33.1 to 36.8 MPa {338 to 375 kgf/cm^2}</td></tr>
<tr><td>Hydraulic oil temperature: 45 to 55 °C</td><td>Boom LOWER relief (at low pressure)</td><td>16.7 to 19.6 MPa {170 to 200 kgf/cm^2}</td></tr>
<tr><td>Hydraulic oil temperature: 45 to 55 °C</td><td>Boom LOWER relief (at high pressure)</td><td>29.4 to 33.3 MPa {300 to 340 kgf/cm^2}</td></tr>
<tr><td colspan="4">If only boom LOWER relief pressure in the above relief pressures is low, suction safety valve may be defective. Check the safety valve.
Check for damaged sealing material, etc. by appearance (Be careful to prevent foreign matter from entering during repair).
When disassembling, replace the suction safety valve assembly with a new one since its relief pressure cannot be adjusted on the machine.
• Check that suction valve is seated on body of safety valve in position (it is not stuck halfway).
• If suction valve is pushed and external force is removed, check whether it returns smoothly and seats on valve body.
Boom LOWER safety valve has machine push-up function, so 2-stage relief is set.</td></tr>
<tr><td rowspan="4">13</td><td rowspan="4">Malfunction of boom control valve (LS shuttle valve)</td><td colspan="4">Be ready with engine stopped, then perform troubleshooting with engine at high idle.</td></tr>
<tr><td rowspan="2">LS differential pressure</td><td>Hydraulic oil temperature: 45 to 55 °C</td><td>All control levers in NEUTRAL</td><td>3.9±1.0 MPa {40±10 kgf/cm^2}</td></tr>
<tr><td>Hydraulic oil temperature: 45 to 55 °C</td><td>Boom RAISE fine control</td><td>2.45±0.1 MPa {25±1 kgf/cm^2}</td></tr>
<tr><td colspan="4">Among the above measuring points, if LS differential pressure becomes higher than the standard value, LS shuttle valve may be defective. Check for defect of the check valve (ball).</td></tr>
</table>

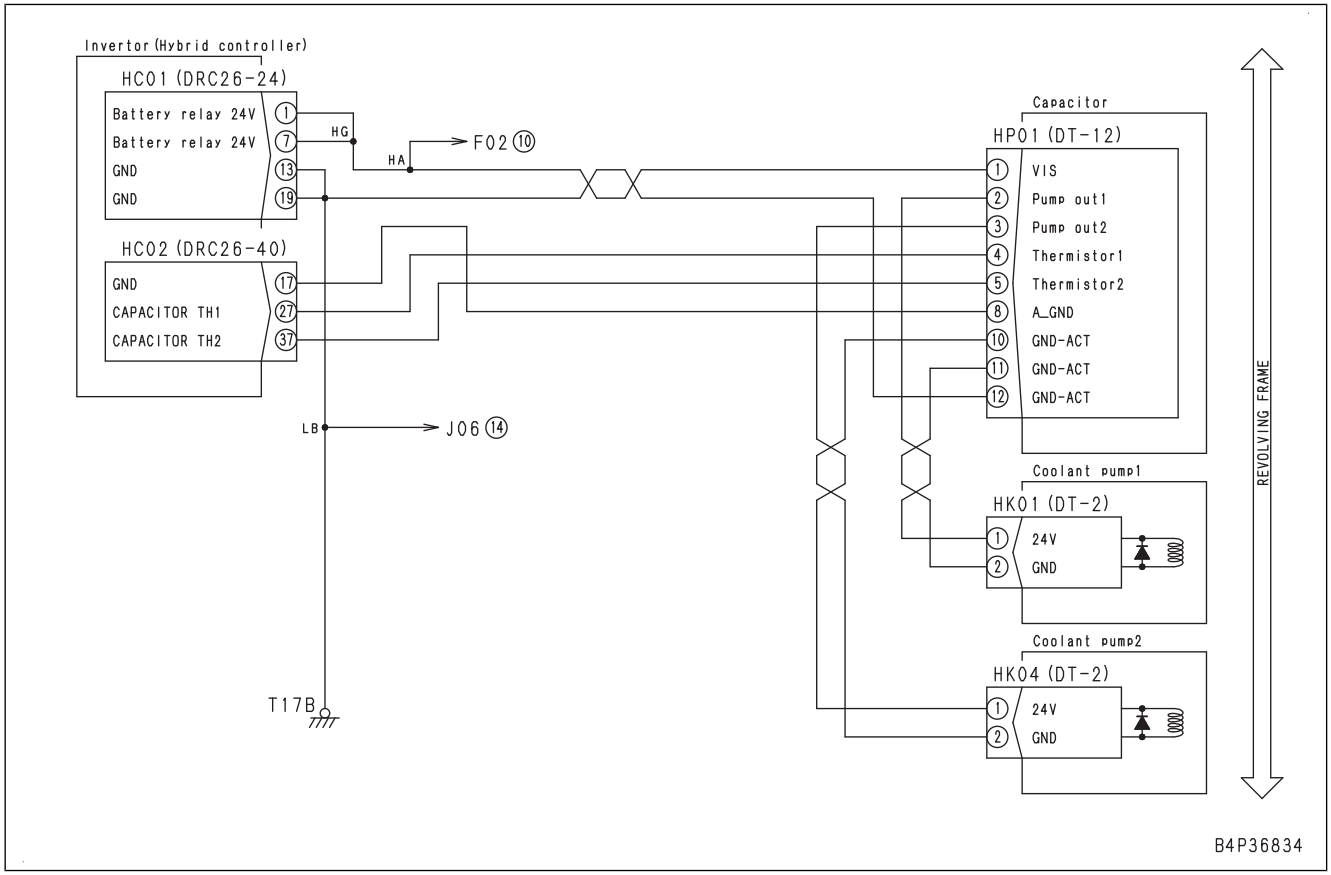
No.	Cause	Procedure, measuring location, criteria and remarks
8	Defective final drive	Check for unusual noise, unusual heat, and metallic powders in drained oil to make judgment.

S-13 OIL IS IN COOLANT (OR COOLANT SPURTS BACK OR COOLANT LEVEL GOES DOWN)

Failure	Oil is in coolant (or coolant spurts back or coolant level goes down)
Related information	If any failure code is displayed, perform troubleshooting for that code first.

No.	Cause	Point to check, remarks	Remedy
1	Engine oil is milky.	Engine oil is increasing and milky.	Perform troubleshooting of “WATER MIXES INTO ENGINE OIL (MILKY)” in S mode, and take corrective action.
2	Breakage of oil cooler element	Check oil cooler element.	Oil cooler element replacement
3	Breakage of cylinder head	• There are many bubbles in radiator and coolant blows back. • Disassemble engine and check cylinder head for abnormality by pressure test.	Cylinder head replacement
4	Breakage of head gasket	• Many bubbles and blow-back are found in radiator. • Disassemble and inspect engine. Check cylinder head gasket for failure.	Cylinder head gasket replacement
5	Cracking or hole caused by pitting in cylinder block	• Engine oil is increasing and milky. • Disassemble engine and check inside of cylinder block for cracking or hole caused by pitting.	Cylinder block replacement

Circuit diagram related to capacitor

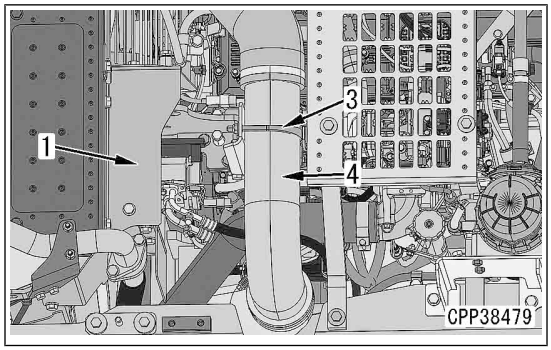


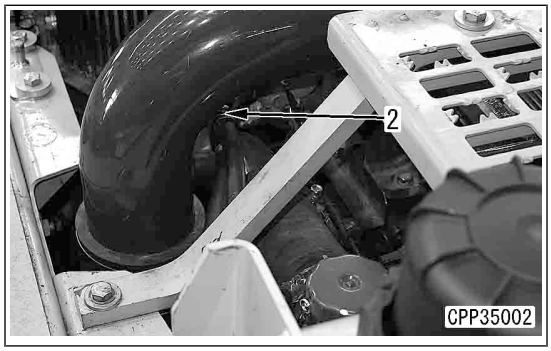
Symbol		Part No.	Part name	Necessity	Q'ty	New/redesign	Sketch	Remarks
D	-	6540-71-1720	AdBlue/DEF injector cap kit	■	1	N		Removal and installation of AdBlue/DEF injector
	1	-	• AdBlue/DEF side cap	■	1	N		Disconnection and connection of AdBlue/DEF hose
	2	-	• Coolant side cap	■	2	N		Removal and installation of coolant hose
	3	-	• Injector side cap	■	1	N		Removal and installation of AdBlue/DEF injector
E		Commercially available	Sling	●	1			Removal and installation of KDPF and SCR assembly
F		421-98-61410	Restraint jig	■	1			Bellows pipe restraint jig
G		Commercially available	Plastic hammer	●	1			Tightening of bellows pipe clamp

Tools to be used when removing and installing AdBlue/DEF mixing tube

Symbol		Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A		Commercially available	Vinyl gloves	●	1	N		Disconnection and connection of AdBlue/DEF hose
B		6540-71-1310	Cover for AdBlue/DEF injector electric connector	■	1	N		Removal and installation of AdBlue/DEF injector electric connector
C		600-919-5050	Plug (for 5/16 inch hose diameter)	■	1	N		Disconnection and connection of AdBlue/DEF hose
D		6540-71-1720	AdBlue/DEF injector cap kit	■	1	N		Removal and installation of AdBlue/DEF injector
	1	-	• AdBlue/DEF side cap	■	1	N		Disconnection and connection of AdBlue/DEF hose
	2	-	• Coolant side cap	■	2	N		Removal and installation of coolant hose
	3	-	• Injector side cap	■	1	N		Removal and installation of AdBlue/DEF injector
E		Commercially available	Lifting tool	●	1			Removal and installation of AdBlue/DEF mixing tube

38. Connect the air intake tube (4), and install U-bolt (3).
    U-bolt (3) nut:
    14.7 to 44.1 Nm {1.5 to 4.5 kgfm}
39. Install the clamp (2).
40. Install the fan guard (1).





Engine hood assembly

41. Install the engine hood assembly by referring to “REMOVE AND INSTALL ENGINE HOOD ASSEMBLY”.

Checking for fuel leakage

42. Check the fuel system for leakage by referring to TESTING AND ADJUSTING, “TEST FUEL CIRCUIT FOR LEAKAGE”.

Air bleeding

43. Bleed air from the fuel system by referring to TESTING AND ADJUSTING, “BLEED AIR FROM FUEL SYSTEM”.

15. Apply the engine oil to O-ring and the mounting hole on the head side of the inlet connector (11).

    O-ring of the inlet connector (11) and head side:
    Engine oil (EO15W-40)

16. Apply the liquid gasket (f) (whole area of hatched area) to the inlet connector (11).

    Inlet connector (11) (whole area of hatched area):
    Liquid gasket (LG-7)

17. Tighten the inlet connector (11) lightly with the nut (10).

    Nut (10):
    17.5 to 2.5 Nm {1.78 to 0.25 kgfm}

    NOTICE

    After tightening it lightly, it should be tightened to the specified torque. Be sure to tighten each one to the specified torque. If the tightening torque is insufficient or too much, it may cause fuel leakage inside the engine.

18. Tighten the mounting bolts alternately so that the top of the holder (6) is parallel to the top of the cylinder head.

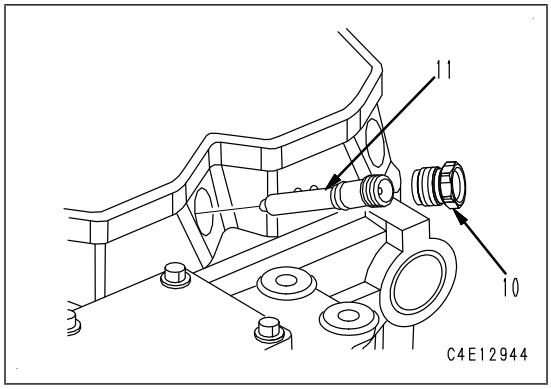
    Bolt of holder (6):
    10±2 Nm {1.02±0.2 kgfm}

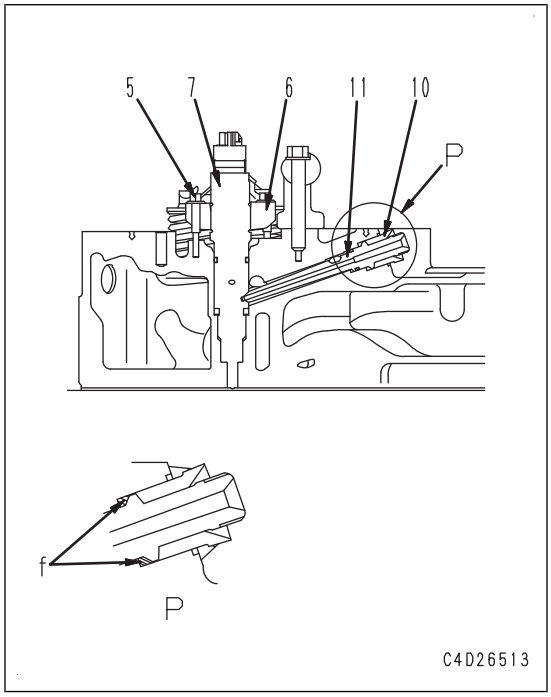
    REMARK

    Maximum allowable angle2.4 °

19. Tighten the inlet connector (11) to the specified torque with the nut (10).

    Nut (10):
    50 to 4 Nm {5.1 to 0.41 kgfm}





Push rod

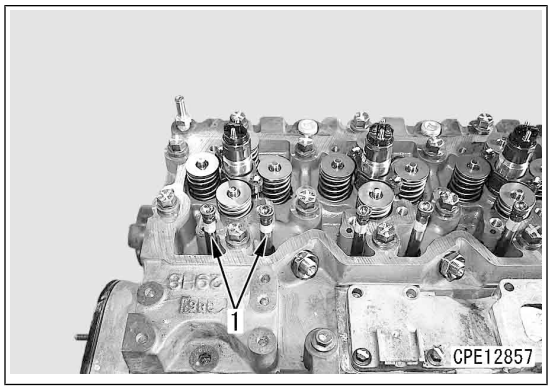
20. Pour the engine oil to the socket part of the push rod (1).

    Socket part of the push rod (1):
    Engine oil (EO15W-40)

21. Install the push rods (1).

    NOTICE

    Check that the push rod (1) is fitted to the tappet.

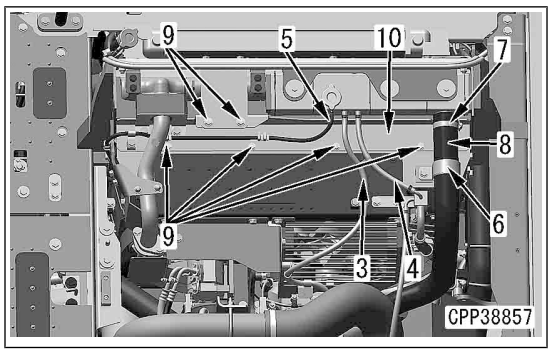


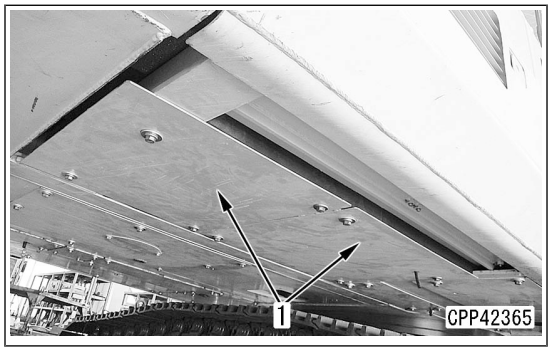
8. Install the cover (10) with the bolts (9) (6 pieces).
9. Connect the hose (8), and install it with the clamp (7).

   REMARK

   Do not use an impact wrench.

   Clamp (7):
   10.8 to 11.8 Nm {1.1 to 1.2 kgfm}
10. Install the clamp (6).
11. Connect the hoses (3), (4), and (5).
12. Install the undercover (1).





Refill with coolant

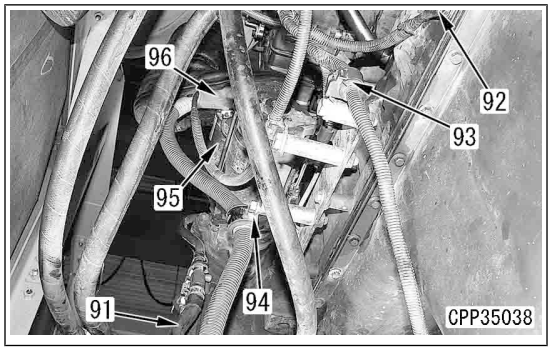
13. Refill the radiator with coolant to the specified level through the coolant filler port. Run the engine to circulate the coolant, and then check the coolant level again.

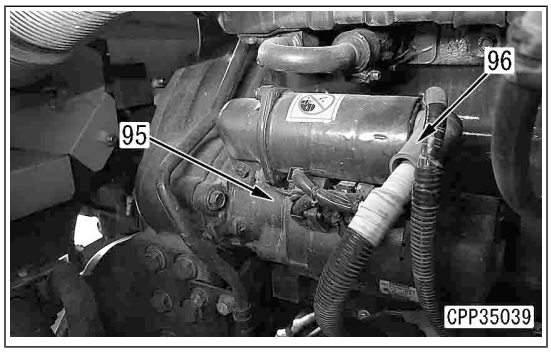
    Radiator:
    36 ℓ

7. Connect the terminal B (96) to the starting motor (95).

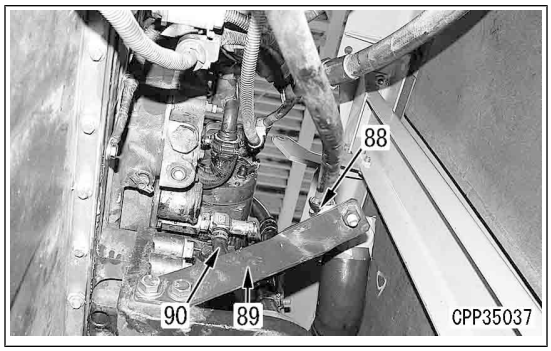
   Terminal B (96):
   19.6 to 25.5 Nm {2.0 to 2.6 kgfm}

8. Install the clamps (93) and (94).
9. Connect the ground cable (92).
10. Connect the hose (91).

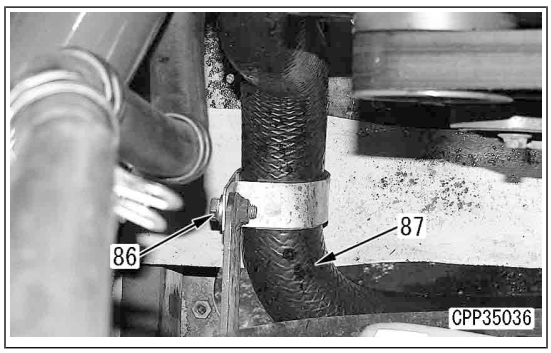




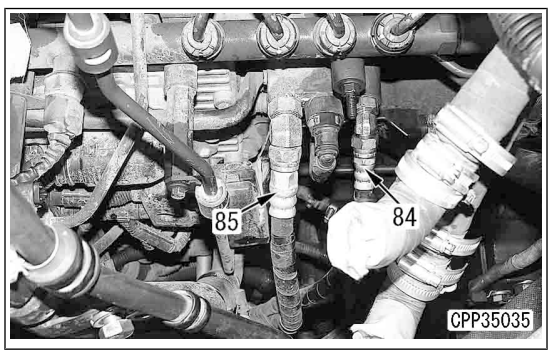
11. Connect the hose (90).
12. Install the bracket (89).
13. Install the clamp (88).



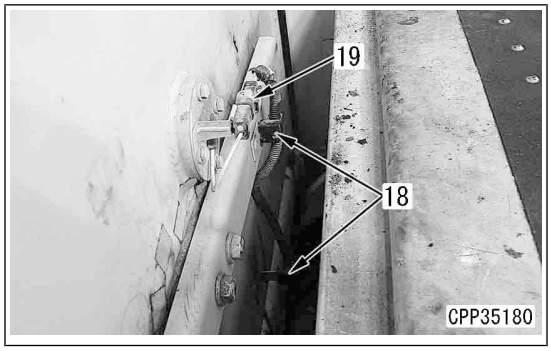
14. Connect the lower radiator hose (87).
15. Install the clamp (86) of the radiator hose (87).



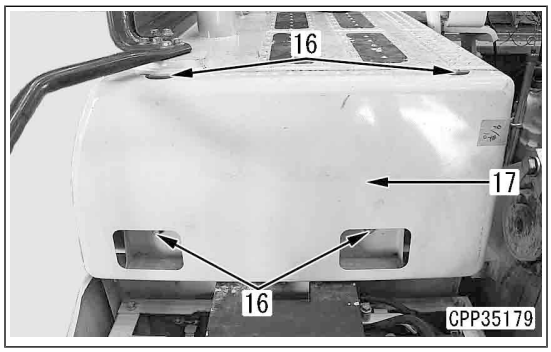
16. Connect the hoses (84) and (85).



4. Remove the clamp (18), and disconnect the connector P21 (19).



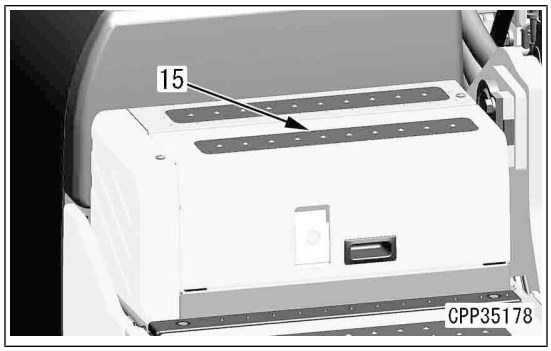
5. Install the cover (17) with the bolts (16) (4 pieces).



6. By using the lifting tool (A), install the AdBlue/DEF tank filler port case (15).

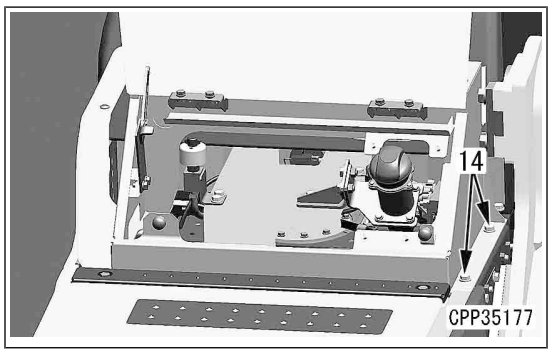
REMARK

AdBlue/DEF tank filler port case (15):
30 kg

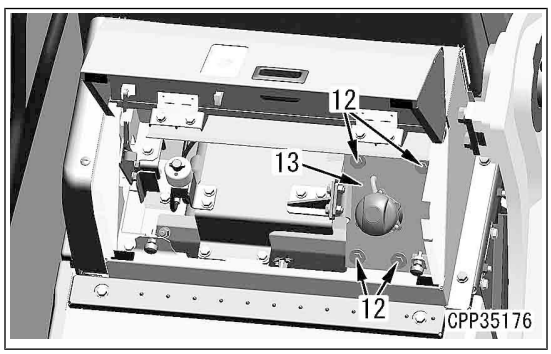


7. Install the cap on the top of AdBlue/DEF tank filler port case (15).

8. Install the bolts (14) (4 pieces).



9. Install the cover (13) with the bolts (12) (4 pieces).
10. Close the AdBlue/DEF tank filler port cover.



REMOVE AND INSTALL KDPF ASSEMBLY

Tools to be used when removing and installing KDPF assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/redesign	Sketch	Remarks
A	421-98-61410	Restraint jig	■	1			Bellows pipe restraint jig
B	Commercially available	Plastic hammer	●	1			Tightening of bellows pipe clamp
C	Commercially available	Sling	●	1			Removal and installation of KDPF assembly
D	Commercially available	Digital angle gauge	●	1	N		For checking KDPF inlet and outlet angles

REMARK

- Restraint jig (A) comes with the purchased bellows pipe assembly.
- When reusing the bellows pipe assembly, purchase restraint jig (A) singly.

⚠ Place 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 disconnect switch to OFF position, and remove the key. (For details, see TESTING AND ADJUSTING, "HANDLE BATTERY DISCONNECT SWITCH".)

⚠ Since KDPF assembly and around it are heated to 500 °C or above, take care not to get burn injury.

⚠ If KDPF and around it are hot, wait until they have cooled down before starting any work.

⚠ Check that no combustible material (dry leaves, twigs, etc.) is accumulated around KDPF. If any dust or combustible materials are found, remove them.

⚠ Since KDPF is fragile against shock such as falling, handle it with care. Do not use a damaged part.

⚠ Keep the record for each KDPF unit to manage the service life, and never use KDPF exceeding its service life.

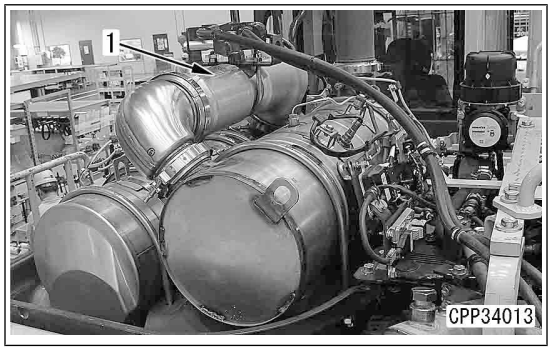
NOTICE

When removing the bellows pipe assembly, be sure to install restraint jig (A).

METHOD FOR REMOVING KDPF ASSEMBLY

AdBlue/DEF mixing tube

1. Remove AdBlue/DEF mixing tube (1). For details, see "REMOVE AND INSTALL AdBlue/DEF MIXING TUBE".

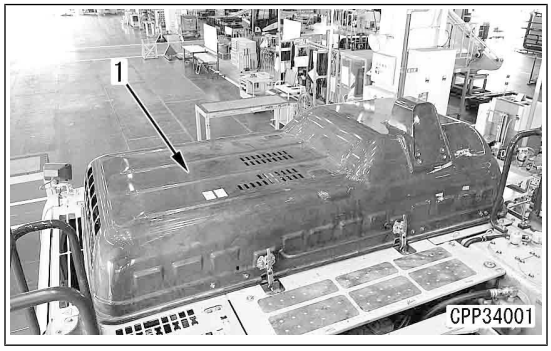


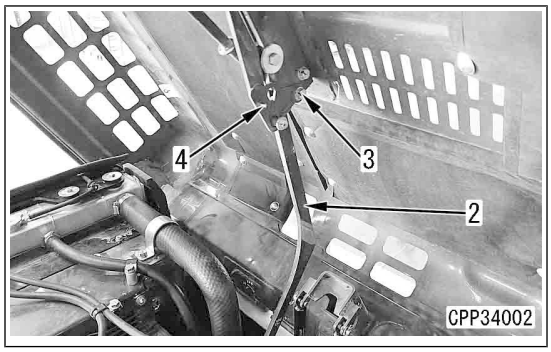
Engine hood assembly

16. Close engine hood assembly (1).

REMARK

Tighten bolts (3) of stay (2) in order to fix bracket (4). (Return to the normal position)





REMOVE AND INSTALL AdBlue/DEF HOSE

Tools to be used when removing and installing AdBlue/DEF hose

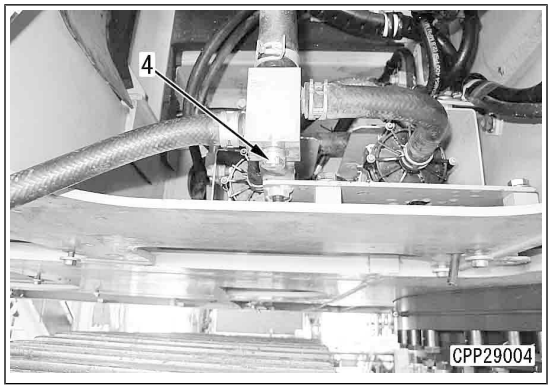
Symbol		Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A		Commercially available	Vinyl gloves	●	1	N		Removal and installation of AdBlue/DEF hose
B		6540-71-1310	Cover for AdBlue/DEF injector electric connector	■	1	N		Removal and installation of AdBlue/DEF injector electric connector
C		600-919-5050	Plug (for 5/16 inch hose diameter)	■	2	N		Removal and installation of AdBlue/DEF hose
D	-	6540-71-1720	AdBlue/DEF injector cap kit	■	1	N		Removal and installation of AdBlue/DEF injector
	1	-	• AdBlue/DEF side cap	■	1	N		Removal and installation of AdBlue/DEF hose
	2	-	• Coolant side cap	■	2	N		Removal and installation of coolant hose
	3	-	• Injector side cap	■	1	N		Removal and installation of AdBlue/DEF injector
E		600-919-5030	Plug (for 3/8 inch hose diameter)	■	4	N		Removal and installation of AdBlue/DEF hose
F	-	6540-71-2720	AdBlue/DEF pump, tank cap kit	■	2	N		Removal and installation of AdBlue/DEF hose
	1	-	• AdBlue/DEF pump, injector side cap	■	1	N		Between AdBlue/DEF pump and AdBlue/DEF injector (pressure)
	2	-	• AdBlue/DEF pump, tank side cap	■	4	N		• Removal and installation of AdBlue/DEF hose between AdBlue/DEF pump and AdBlue/DEF tank (return) • Removal and installation of AdBlue/DEF hose between AdBlue/DEF pump and AdBlue/DEF tank (suction)
	3	-	• AdBlue/DEF pump electric connector cap	■	1	N		AdBlue/DEF pump electric connector cap
G		Commercially available	Lifting tool	●	1			Removal and installation of AdBlue/DEF tank filler port case

⚠ Place 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 disconnect switch to OFF position, and remove the key. (For details, see TESTING AND ADJUSTING, "HANDLE BATTERY DISCONNECT SWITCH".)

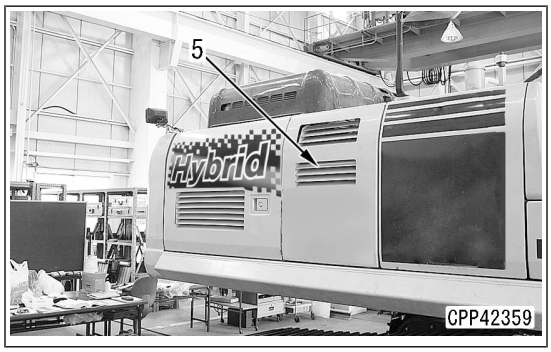
4. Place a container under the drain hose to receive coolant, loosen the drain plug (4), and drain the coolant.

   Hybrid radiator:
   8.8 ℓ

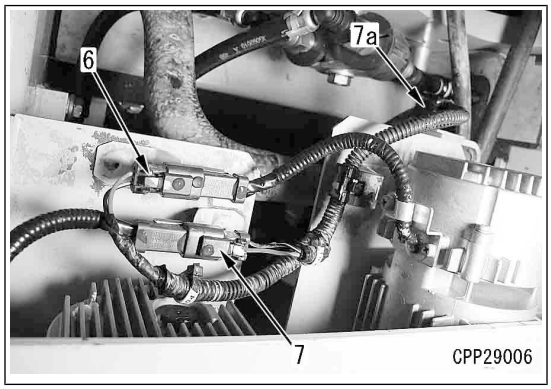


Hybrid water pump assembly

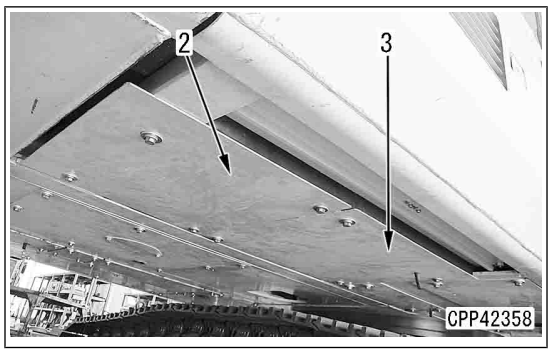
5. Open the cover (5).



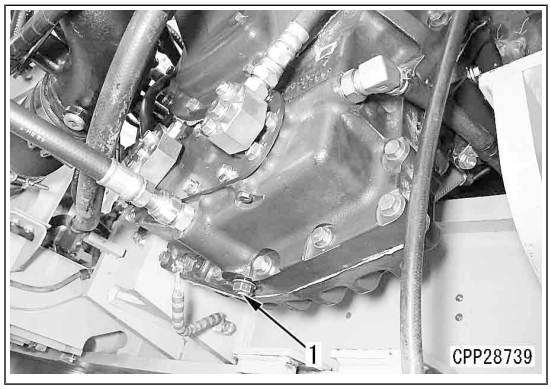
6. Disconnect the connectors (6) and (7).
7. Remove the clip (7a).



23. Install the undercovers (2) and (3).



24. Install the oil drain plug (1).



25. Install the undercover (27).

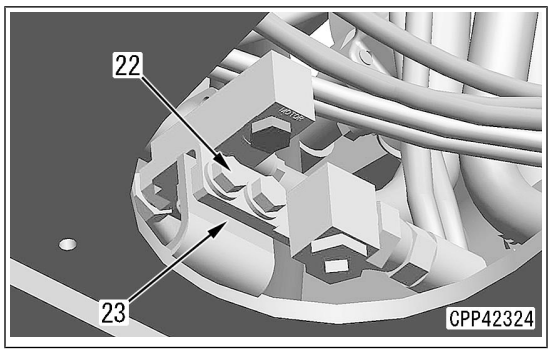
Refilling with oil

26. Refill with oil to the specified level through the oil filler port. Run the engine to circulate the oil through the piping, and check the oil level again.

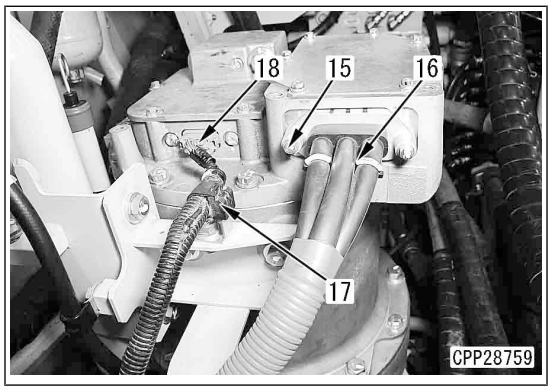
Refilling with coolant, air bleeding

27. Refill with coolant and bleed air of hybrid radiator. For details, see TESTING AND ADJUSTING, “DRAIN, REFILLING, AIR BLEEDING OF HYBRID SYSTEM COOLANT”.

4. Install the drain hose to the bracket (23) with the bolts (22) (2 pieces).



5. Connect the connector PM01 (18).
6. Install the clip (17).



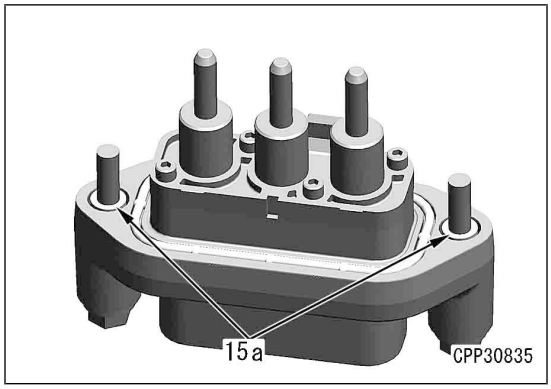
7. Connect the connector of high voltage wiring (power cable) in the following procedure.
   1) Replace O-ring with a new one.
   2) Check that there is no stain or damage on the cable side plug (P) and surface of O-ring.
   3) Insert the cable side plug straight to the motor side power feeding terminal socket (S).

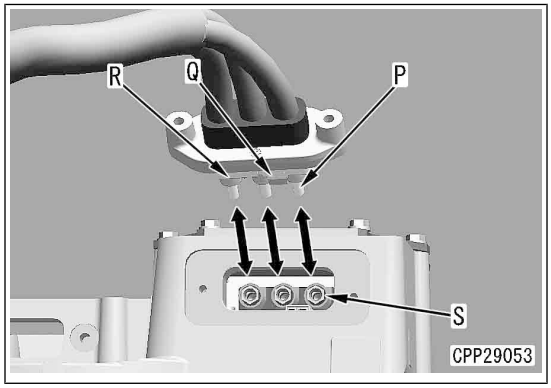
      REMARK

      - Before inserting the cable, check that the rubber washer (T) is installed to the bolt.
      - Face the black mark upward.
      - Insert the contact (Q) for detecting removal and installation of power cable facing downward.

   4) Install the bolts (15) (2 pieces).

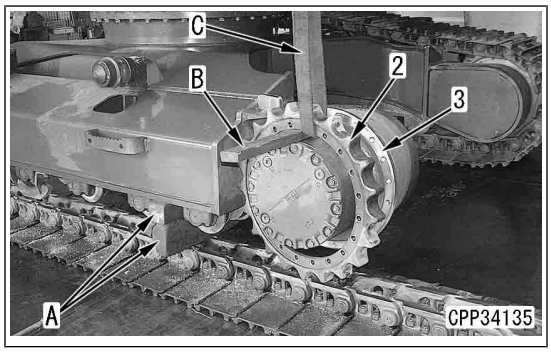
      High voltage wiring (power cable) plug mounting bolts:
      11.8 to 14.7 Nm {1.2 to 1.5 kgfm}





METHOD FOR INSTALLING SPROCKET

1. Swing the work equipment 90 °, raise the machine off the ground by using the work equipment, and set the block (A) between the track frame and track shoe.



2. Sling the sprocket (2) by using the sling (C), and install it.

   Sprocket:
   40 kg

   REMARK

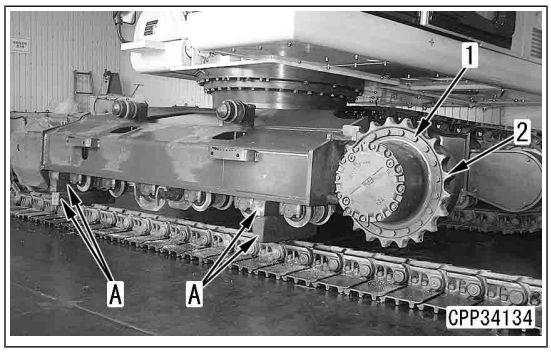
   Secure clearance by using the block (B) before installing the bolt (1).

3. Install the bolts (1).

   Threaded portion of the bolt (1):
   Adhesive (LT-2)

   Bolt (1):
   640 to 785 Nm {60 to 80 kgfm}

4. Install the track shoe assembly. For details, see “SEPARATION AND CONNECTION OF TRACK ASSEMBLY”.

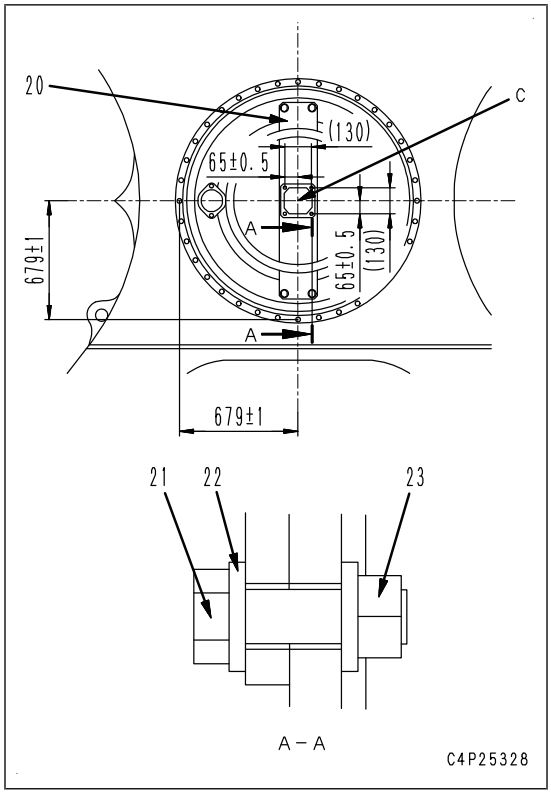


- When the center swivel joint assembly (9) has been removed, install the center swivel joint stand (20), bolts (21) (4 pieces), washers (22) (8 pieces), and nuts (23) (4 pieces) with the dimensions shown in the drawing to obtain the swing center position (C).

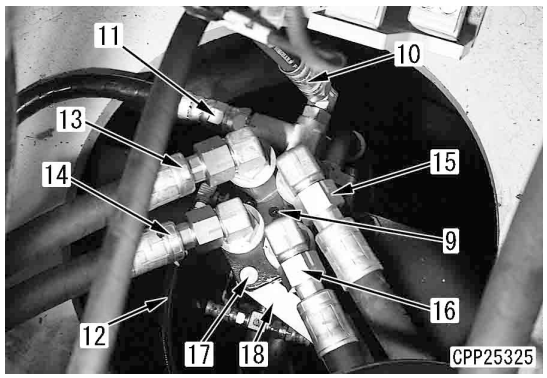
3. Install the stopper plate (18) to the center swivel joint (9), and install the pin (17) on the center swivel joint assembly (9) side.

NOTICE

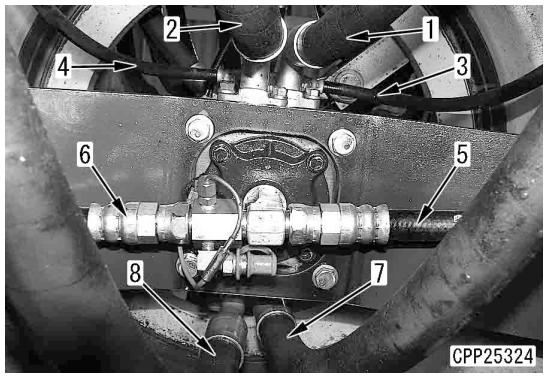
Since the pin (17) has a cotter pin at its bottom, be sure to install it.



4. Connect the hoses (10), (11), (12), (13), (14), (15), and (16) of the center swivel joint assembly (9).
   - Hose (10): Center swivel joint (port D) to swing motor (port T)
   - Hose (11): Center swivel joint (port D) to hydraulic tank
   - Hose (12): Center swivel joint (port E) to solenoid valve
   - Hose (13): Center swivel joint (port B) to control valve L.H. travel (port B2)
   - Hose (14): Center swivel joint (port D) to control valve R.H. travel (port B5)
   - Hose (15): Center swivel joint (port A) to L.H. travel motor (port A2)
   - Hose (16): Center swivel joint (port C) to R.H. travel motor (port A5)



5. Connect the hoses (1), (2), (3), (4), (5), (6), (7), and (8) (8 pieces) between the center swivel joint and travel motor.
   - Hose (1): Center swivel joint (port C) to R.H. travel motor (port PA)
   - Hose (2): Center swivel joint (port A) to L.H. travel motor (port PB)
   - Hose (3): Center swivel joint (port E) to R.H. travel motor (port P)
   - Hose (4): Center swivel joint (port E) to L.H. travel motor (port P)
   - Hose (5): Center swivel joint (port T) to R.H. travel motor (port T)
   - Hose (6): Center swivel joint (port T) to L.H. travel motor (port T)
   - Hose (7): Center swivel joint (port D) to R.H. travel motor (port PB)
   - Hose (8): Center swivel joint (port B) to L.H. travel motor (port PA)



DISASSEMBLE AND ASSEMBLE CONTROL VALVE ASSEMBLY

REMARK

This section explains only the precautions for assembling the control valve assembly.

Tools to be used when disassembling and assembling the control valve assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	796-946-1310	Push tool (guide diameter 21.8 mm)	■	1			For 723-46-40100 and 723-46-40601
	796-946-1410	Push tool (guide diameter 21.6 mm)	■	1			For 723-46-44600
	796-946-1810	Push tool (guide diameter 21.2 mm)	■	1			For 723-46-43100 and 723-46-43600
	796-946-2110	Push tool (guide diameter 20.9 mm)	■	1			For 723-46-44100
	796-946-2210	Push tool (guide diameter 20.6 mm)	■	1			For 723-46-45100 and 723-46-45700
B	796-946-1320	Push tool (guide diameter 21.8 mm)	■	1			For 723-46-40100, for 723-46-40601
	796-946-1420	Push tool (guide diameter 21.6 mm)	■	1			For 723-46-44600
	796-946-1520	Push tool (guide diameter 21.6 mm)	■	1			For 723-46-42800
	796-946-1820	Push tool (guide diameter 21.2 mm)	■	1			For 723-46-43100 and 723-46-43600
	796-946-2120	Push tool (guide diameter 20.9 mm)	■	1			For 723-46-44100
	796-946-2220	Push tool (guide diameter 20.6 mm)	■	1			For 723-46-45100 and 723-46-45700
C	796-946-1330	Sleeve	■	1			For 723-46-40100 and 723-46-40601
	796-946-1430	Sleeve	■	1			For 723-46-42800 and 723-46-44600
	796-946-1830	Sleeve	■	1			For 723-46-43100 and 723-46-43600
	796-946-2130	Sleeve	■	1			For 723-46-44100
	796-946-2230	Sleeve	■	1			For 723-46-45100 and 723-46-45700

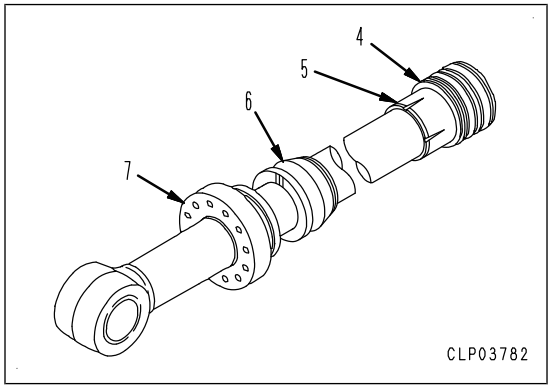
METHOD FOR REPLACING PRESSURE COMPENSATION VALVE SEAL RING

REMARK

There are multiple types of the pressure compensation valves. Record the positions of removal by marking them in advance not to install them wrongly.

Boom, Arm cylinder

7. Remove the plunger (5) of the boom and arm cylinder.
8. Remove the collar (6) of the boom and arm cylinder.

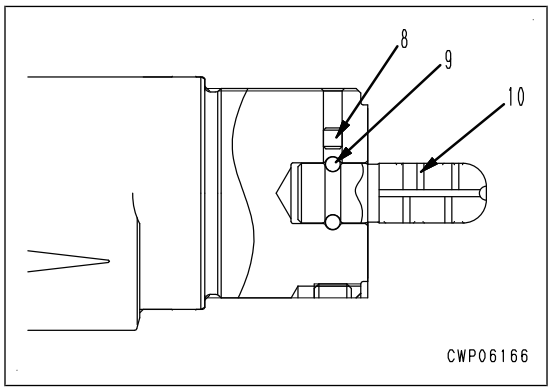


Cylinder head assembly

9. Remove the cylinder head assembly (7).

Cap

10. By using the pliers, pull out the nylon cap (8) of the arm cylinder while screwing in the screws, etc.

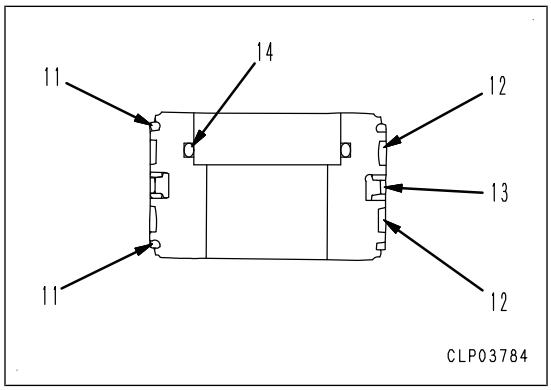


Plunger

11. Pull out the balls (9) (12 pieces) of the arm cylinder, and remove the plunger (10).

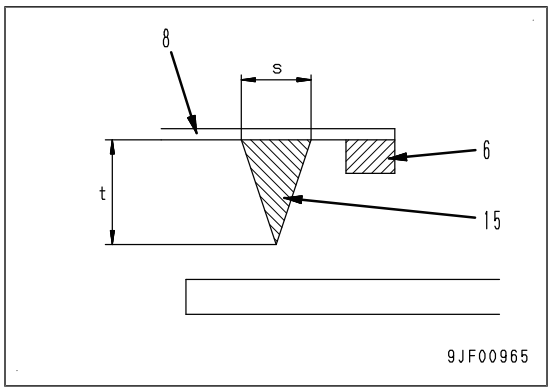
Disassembling the piston assembly

12. Remove the ring (11).
13. Remove the wear ring (12).
14. Remove the piston ring (13).
15. Remove O-ring and the backup ring (14).



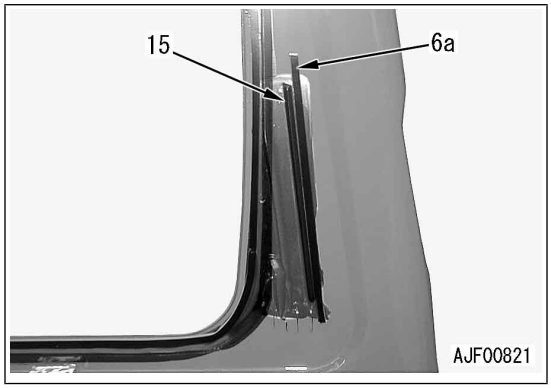
REMARK

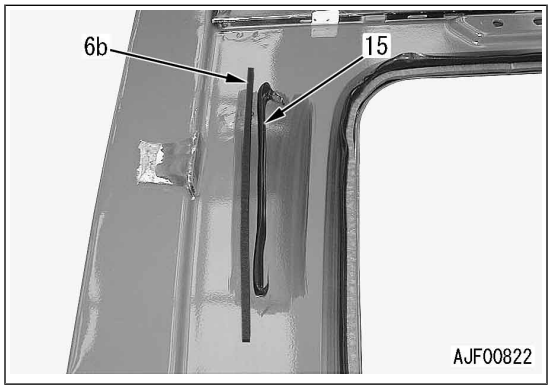
- Thickness of the applied adhesive (15) must be higher than that of the dam rubber (6).
- Height of the applied adhesive must be even.



REMARK

Also apply the adhesive (15) to the additional dam rubber (6a) of R.H. window glass and additional dam rubber (6b) of the door lower window glass.





Glass

7. Install the glass.
   1) Install the glass (9) aligning it to the lines drawn on the tapes in the process of step 5.

NOTICE

- **Since the glass cannot be removed and installed again, install it with utmost caution.**
- **Glass bonding work must be finished within 5 minutes from application of adhesive.**

Refilling with coolant

26. Refill with coolant to the specified level through the coolant filler port. Run the engine to circulate the coolant, and then check the coolant level again.


Radiator:

36 ℓ

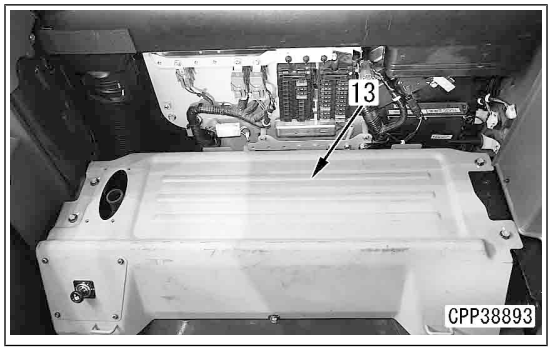
Refilling with refrigerant

27. Refill the air conditioner circuit with refrigerant (air conditioner gas: R134a).

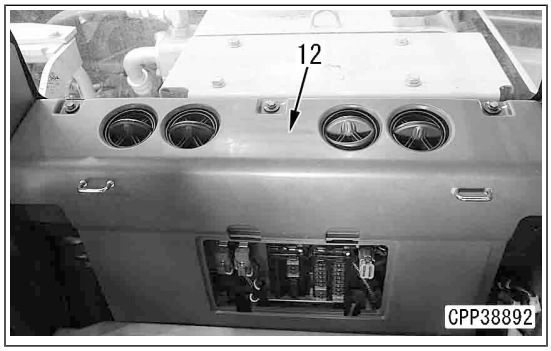
Refrigerant quantity: 750±50 g

28. Refill with the air conditioner compressor oil. See APPENDIX, “HANDLE COMPRESSOR OIL”.

5. Install the cover (13) with the bolts (7 pieces).



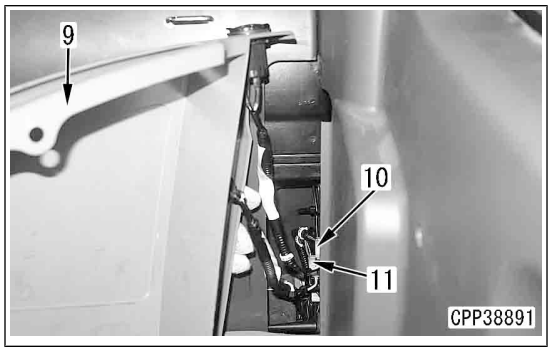
6. Install the cover (12) with the bolts (3 pieces).

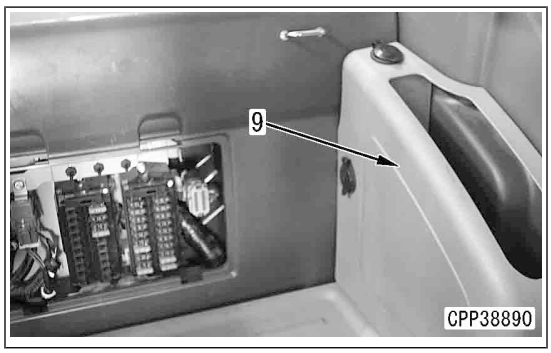


7. Connect the connectors M13A (10) and M13B (11).
8. Install the box (9) with the bolts (3 pieces).

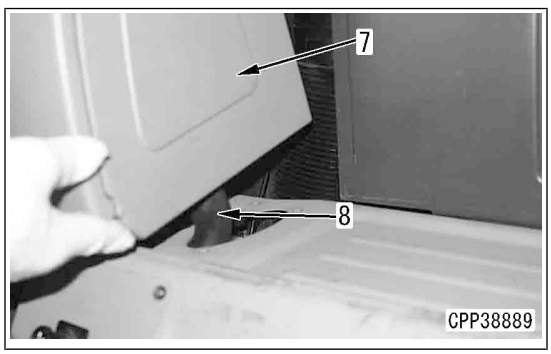
REMARK

When installing the box (9), be careful not to catch the harness of the connectors M13A (11) and M13B (12).





9. Connect the hose (8).

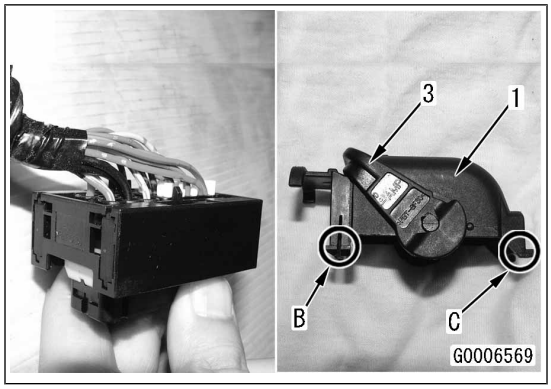


2. Place the lever (3) of the connector cover (1) in LOCK position (indicated by the right figure).

   (B), (C): Claws

   NOTICE

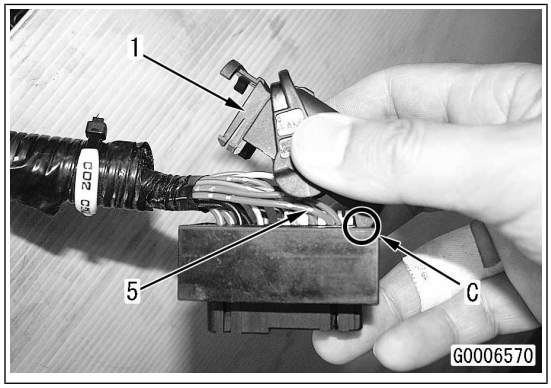
   If the sliders and lever are not locked, the connector is not disconnected or locked securely with the lever. Accordingly, check their positions again.



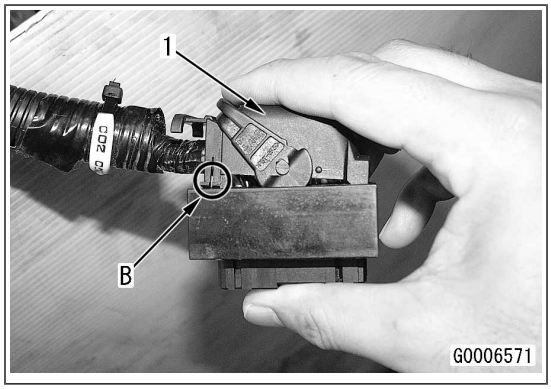
3. Set the claw (C) to the connector, and place the connector cover (1).

   NOTICE

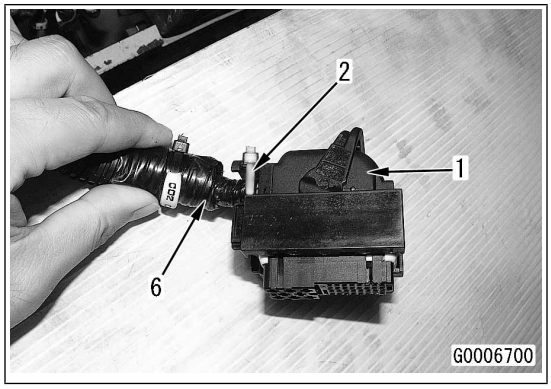
   Take care not to catch the wiring harness (5).



4. Put in the claw (B), and install the connector cover (1).

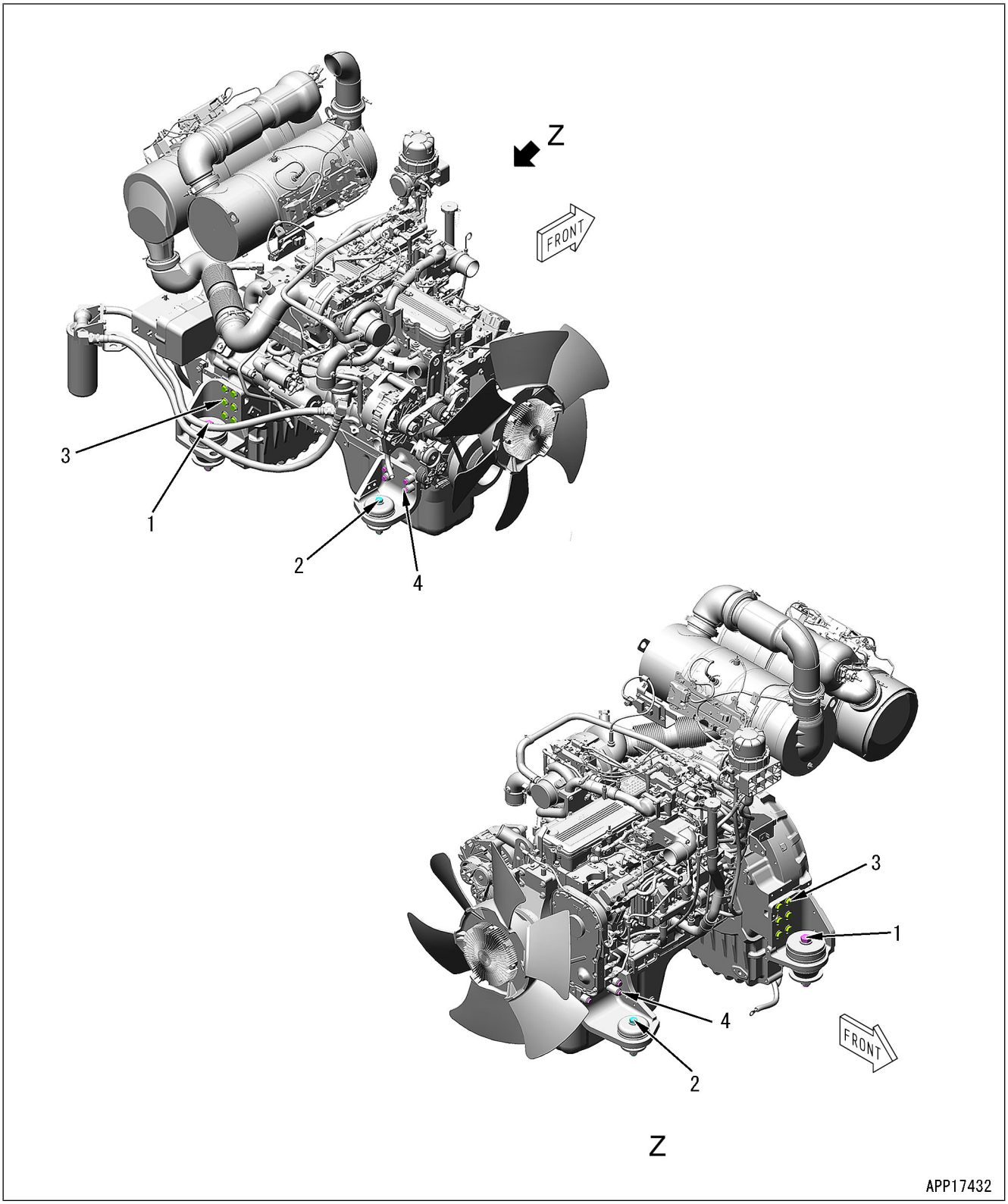


5. Replace the cut band (2) with new one to bind the connector cover (1) and wiring harness (6) together.



ENGINE AND COOLING SYSTEM

MAINTENANCE STANDARD OF ENGINE MOUNT



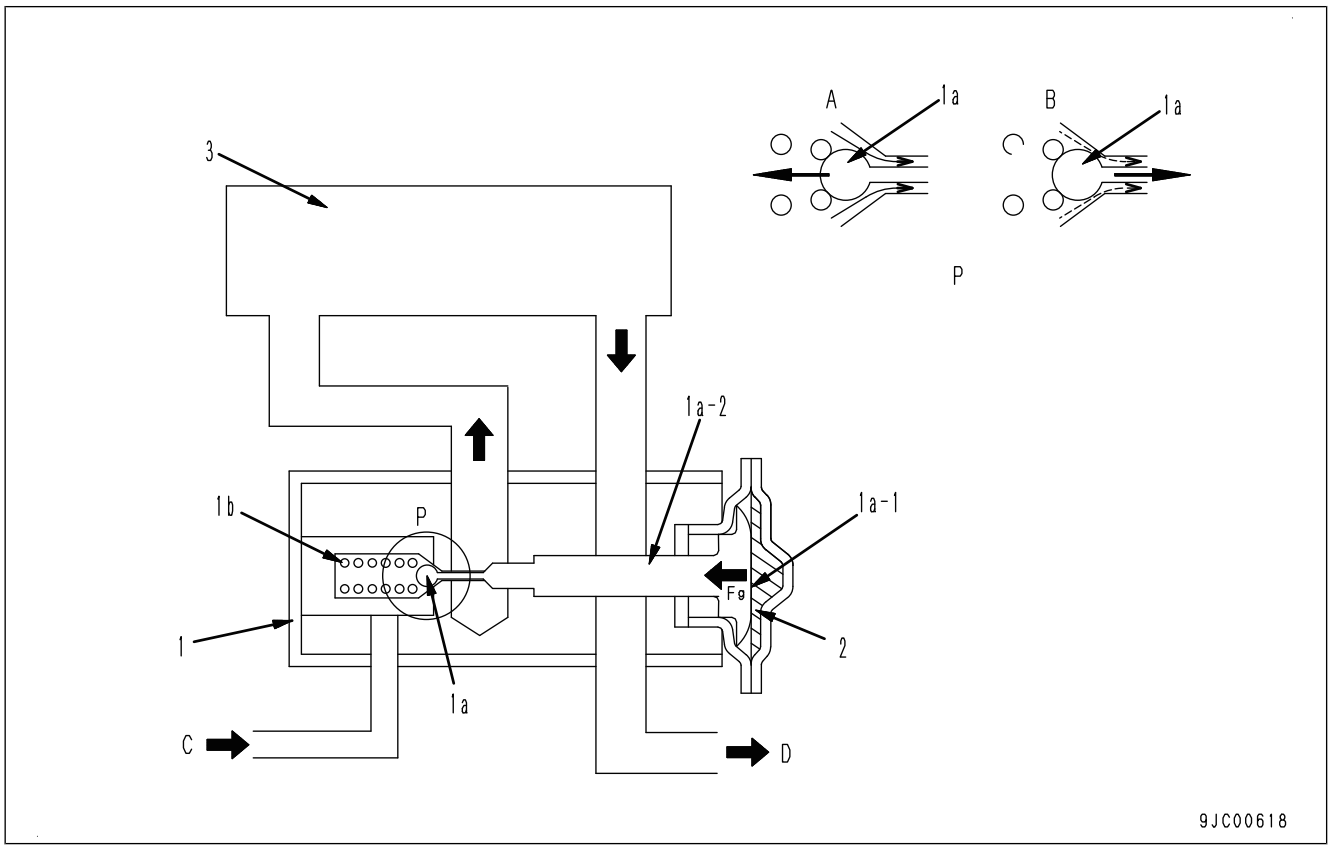
No.	Item	Judgment criteria	Remedy
1	Tightening torque of the bolt	27.5 to 34.3 Nm {2.8 to 3.5 kgfm}	Re-tighten
2	Tightening torque of the bolt	156.9 to 176.5 Nm {16 to 18 kgfm}	
3	Tightening torque of the bolt	58.8 to 73.6 Nm {6.0 to 7.5 kgfm}	
4	Tightening torque of the bolt	9.8 to 12.7 Nm {1.0 to 1.3 kgfm}	

Unit: mm

No.	Item	Lubrication interval	Judgment criteria					Remedy
			Width of boss		Width of hinge		Standard clearance	
			Standard dimension	Tolerance	Standard dimension	Tolerance		
7	Joint of revolving frame and boom		776	–0.5 –1.0	780	+3 0	4.5 to 8.0	Adjust clearance to 1.0 mm or less by using shims
		(*2) 500 hours	L7: Adjust by combining shims 2.0 mm thickness (2), 2.5 mm thickness (1), 3.0 mm thickness (1), and 3.5 mm thickness (1) R7: Insert shim of 2.0 mm thickness (1)					
8	(*1) Joint of revolving frame and boom cylinder		106	±1.2	109.3	+1.5 0	2.1 to 6.0	Adjust clearance to 1.5 mm or less by using shims
		(*2) 500 hours	L8: Adjust by combining shims 1.0 mm thickness (1) and 2.0 mm thickness (2) R8: Insert shim of 1.0 mm thickness (1)					
9	Joint of boom and boom cylinder		821	±2.9	827	+3 –1	2.1 to 11.9	Adjust clearance to 1.5 mm or less by using shims
		(*2) 500 hours	L9-1: Adjust by combining shims 1.0 mm thickness (1) and 2.0 mm thickness (2) L9-2: Insert shim of 1.0 mm thickness (1) R9-1: Insert shim of 1.0 mm thickness (1) R9-2: Insert shim of 1.0 mm thickness (1)					
10	Joint of boom and arm cylinder		116	±1.2	119.3	+1.5 0	2.1 to 6.0	Adjust clearance to 1.5 mm or less by using shims
		(*2) 500 hours	L10: Insert shim of 1.0 mm thickness (1) R10: Adjust by combining shims 1.0 mm thickness (1) and 2.0 mm thickness (2)					
11	Joint of boom and arm		316	–0.3 –0.8	320	+0.5 0	4.3 to 5.3	Adjust clearance to 1.0 mm or less by using shims
		(*2) 500 hours	L11: Insert shim of 2.0 mm thickness (1) R11: Adjust by using shim 2.0 mm thickness (2) or 2.5 mm thickness (1) or 3.0 mm thickness (1)					
12	Joint of arm cylinder and arm		116	±1.2	119.3	+1.5 0	2.1 to 6.0	Replace shim
		(*2) 500 hours	L12: Insert shim of 2.0 mm thickness (1) R12: Insert shim of 2.0 mm thickness (1)					
13	Joint of arm and bucket cylinder		106	±1.2	109.3	+1.5 0	2.1 to 6.0	Adjust clearance to 1.5 mm or less by using shims
		(*2) 500 hours	L13: Insert shim of 1.0 mm thickness (1) R13: Adjust by combining shims 1.0 mm thickness (1) and 2.0 mm thickness (2)					

STRUCTURE OF EXPANSION VALVE AS AIR CONDITIONER UNIT COMPONENT

Route diagram



A: When evaporator outlet temperature is high
B: When evaporator outlet temperature is low
1: Expansion valve
1a: Needle valve
1a-1: Diaphragm
1a-2: Thermoprobe
C: From condenser (high-pressure refrigerant)
D: To compressor (Low-pressure refrigerant)
1b: Spring
2: Refrigerant gas
3: Evaporator

Structure

- Box-type expansion valve (1) consists of needle valve (1a), spring (1b), etc.
- The diaphragm chamber (hatched area) on the outside of diaphragm (1a-1) of needle valve (1a) is filled with refrigerant gas (2).

FUNCTION OF EXPANSION VALVE AS AIR CONDITIONER UNIT COMPONENT

- Expansion valve (1) converts the high-pressure and high-temperature liquid refrigerant sent from the receiver drier into low-pressure and low-temperature misty refrigerant by throttle action.
- It controls the refrigerant flow rate by changing the throttle degree according to the temperature in the operator's cab.
- The temperature of the air flowing out of the vents is controlled by the flow rate of the refrigerant into evaporator (3).

OPERATE EXPANSION VALVE AS AIR CONDITIONER UNIT COMPONENT

1. Thermoprobe (1a-2) senses the temperature of the refrigerant after it passes through evaporator (3).
   The temperature of the refrigerant after it passes evaporator (3) is transmitted through thermoprobe (1a-2) to refrigerant gas (2) in the diaphragm chamber (hatched portion).

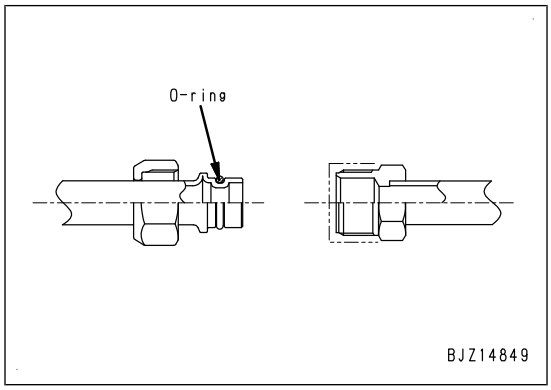
Abnormality of fan speed in cooling mode

Probable cause	Check method	Remedy
Fan speed is low.	See Shop Manual, 30, Testing and adjusting, “Testing and adjusting tension of fan belt and alternator belt”.	Repair

Other abnormalities in cooling or heating mode

Probable cause	Check method	Remarks
Temperature cannot be adjusted.	Change temperature setting in manual mode.	Common to cooling and heating modes
Vents (modes) cannot be changed.	See “TEST VENT (MODE) CHANGEOVER”.	
Fresh air and recirculation air cannot be changed over.	See “TESTING FRESH/RECIRC AIR CHANGEOVER”.	
Too much compressor oil	See “HANDLE COMPRESSOR OIL”.	Cooling mode only
Water leakage into operator's cab	Clogging of drain hole	

Precautions for connection



- When connecting the piping, apply compressor oil (ND-OIL8) for R134a to its O-rings. (See item 4 of “Handling of compressor oil”)
  Do not apply oil to the threaded part of a bolt, nut or union, however.

  REMARK

  An O-ring is fitted to every joint of the air conditioner piping.
- Once an O-ring is used, it is deformed and deteriorated. Accordingly, do not reuse it. When removing it, use a soft tool (such as a toothpick) so that the piping will not be damaged.
- When connecting a pipe, push it into the end and fully finger-tighten the bolt or nut.
- Be sure to use 2 wrenches to tighten each nut. Use one wrench to fix one nut and the other wrench (torque wrench) to tighten the other nut to the specified torque.

Table of tightening torque for refrigerant pipe joint.

Thread size	Tightening torque
M6x1.0	Receiver drier: : 3.9 to 6.9 Nm {0.4 to 0.7 kgfm} Air conditioner unit, compressor: : 8 to 12 Nm {0.8 to 1.2 kgfm}
M16x1.5	12 to 15 Nm {1.2 to 1.5 kgfm}
M22 x 1.5	20 to 25 Nm {2.0 to 2.5 kgfm}
M24 x 1.5	30 to 35 Nm {3.1 to 3.6 kgfm}

ELECTRICAL CIRCUIT DIAGRAM (5/12)

HB365LC-3E0, HB365NLC-3E0

REMARK

This figure includes the equipment and device that are unavailable as optional items in some areas.