SEN06734-11

Shop Manual

HYDRAULIC
EXCAVATOR

PC210LC-11

SERIAL NUMBERS 500001 and up

KOMATSU

Precautions for Slinging Work and When You Make Signals

- Only one appointed worker must make signals and co-workers must communicate with each other frequently. The appointed signaler must make specified signals clearly at a place where he is well seen from the operator's seat and where he can see the working condition easily. The signaler must always stand in front of the load and guide the operator safely.

  ⚠ Do not do the work while the lifted load is in the range where it possibly falls. It is not allowed to go in the range where the lifted load possibly falls.

  ⚠ Do not move a load over a person.

  ⚠ Never step on the load.

  ⚠ Do not prevent the load from swinging or falling down by holding it simply with the hands.

  ⚠ The sling workers and assistant workers other than the guide must move to a place where they are not caught between the load and materials or equipment on the ground or hit by the load even if the crane starts abruptly.

- When you lift or fix the machine, see “Operation and Maintenance Manual” or “Field Assembly Instruction”.

  ⚠ Do not lift or fix the machine by the positions where the name plate is not attached.

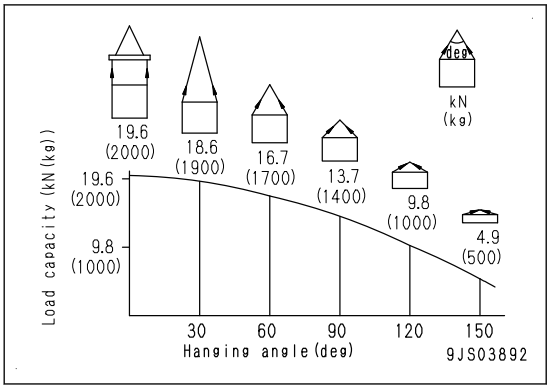
- When you lift the machine for the disassembly and assembly, follow the instructions on the Disassembly and Assembly.
- Check the slings before starting sling work.
- Keep putting on gloves during sling work. (Put on leather gloves, if available.)
- Measure the weight of the load by the eye and check its center of gravity.
- Use proper sling corresponding to the weight of the load and method of slinging. If too thick wire ropes are used to sling a light load, the load may slip and fall.
- Do not sling a load with 1 wire rope alone. If it is slung so, it may rotate and may slip out of the rope. Install 2 or more wire ropes symmetrically.

  ⚠ Slinging with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original slinging position on the load, which can result in a dangerous accident.

- Hanging angle must be 60 ° or smaller as a rule.
- When slinging a heavy load (20kg or heavier), the hanging angle of the rope must be narrower than that of the hook.

  REMARK

  When slinging a load with 2 or more ropes, the force subjected to each rope increases with the hanging angle. The figure below shows the variation of allowable load in kN {kg} when slinging is made with 2 ropes, each of which is allowed to sling up to 9.8 kN {1000 kgf} vertically, at various hanging angles. When the 2 ropes sling a load vertically, they can sling up to 2000 kg of total weight. This weight is reduced to 1000 kg when the 2 ropes make a hanging angle of 120 °. If the 2 ropes sling a 2000 kg load at a hanging angle of 150 °, each rope is subjected to a force as large as 39.2 kN {4000kgf} .



- When installing wire ropes to an angular load, apply pads to protect the wire ropes. If the load is slippery, apply proper material to prevent the wire rope from slipping.
- Use the specified eye bolts and fix wire ropes, chains, etc. to them with shackles, etc.

Precautions for Disconnection and Connection of Connectors

Disconnect Connectors

1. Hold the connectors when disconnecting.

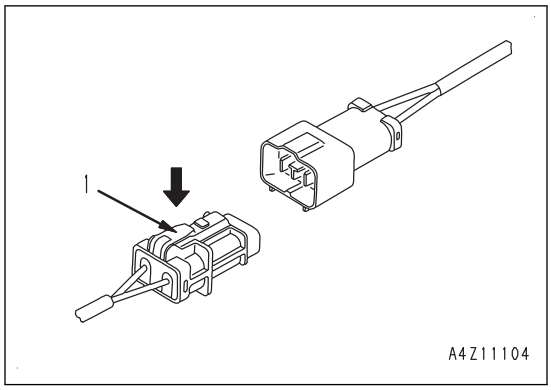
   When disconnecting the connectors, always hold the connecting portion. If the connector is fixed with screw, loosen the screw of the connector completely, hold the both of male and female connectors, and pull them out in parallel.

   NOTICE

   Do not pull the connectors with one hand.

   REMARK

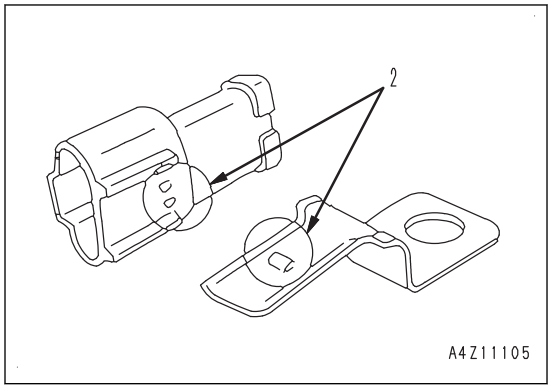
   If it is a lock stopper type connector, pull it out as pushing the stopper (1) with your thumb.

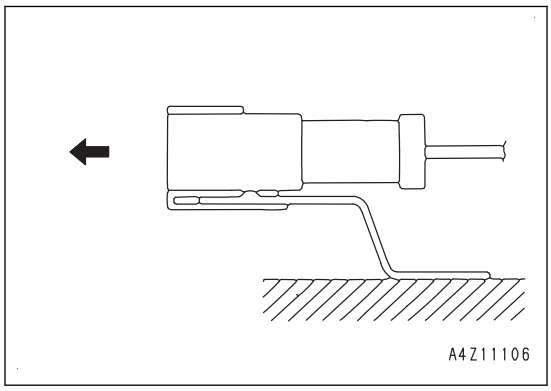


2. When removing a connector from a clip
   - Both of the connector and clip have stoppers (2), which are engaged with each other when the connector is connected.
   - When removing a connector from a clip, pull the connector in parallel with the clip as removing stoppers.

     NOTICE

     If the connector is pried up and down or to the right or left, it may break the housing.



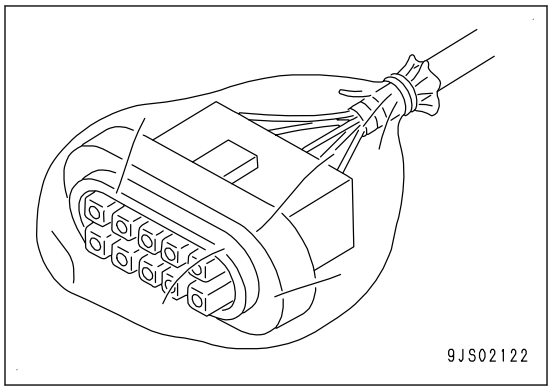


3. Action to be taken after removing connectors

   After removing the connector, cover it with plastic bags to prevent entry of dust, dirt, oil, or water in the contact portion.

   NOTICE

   Be sure to cover the connector with plastic bags when leaving the machine disassembled for a long time, otherwise defective contact may occur.



Connect Connectors

1. Check the connector visually.
   - Check that there is no dust, dirt, oil, or water stuck to the connector pins (joint portion).

1 °C = 33.8 °F

°C		°F	°C		°F	°C		°F	°C		°F
-27.8	-18	-0.4	-8.3	17	62.6	11.1	52	125.6	30.6	87	188.6
-27.2	-17	1.4	-7.8	18	64.4	11.7	53	127.4	31.1	88	190.4
-26.7	-16	3.2	-7.2	19	66.2	12.2	54	129.2	31.7	89	192.2
-26.1	-15	5.0	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-25.6	-14	6.8	-6.1	21	69.8	13.3	56	132.8	32.8	91	195.8
-25.0	-13	8.6	-5.6	22	71.6	13.9	57	134.6	33.3	92	197.6
-24.4	-12	10.4	-5.0	23	73.4	14.4	58	136.4	33.9	93	199.4
-23.9	-11	12.2	-4.4	24	75.2	15.0	59	138.2	34.4	94	201.2
-23.3	-10	14.0	-3.9	25	77.0	15.6	60	140.0	35.0	95	203.0
-22.8	-9	15.8	-3.3	26	78.8	16.1	61	141.8	35.6	96	204.8
-22.2	-8	17.6	-2.8	27	80.6	16.7	62	143.6	36.1	97	206.6
-21.7	-7	19.4	-2.2	28	82.4	17.2	63	145.4	36.7	98	208.4
-21.1	-6	21.2	-1.7	29	84.2	17.8	64	147.2	37.2	99	210.2
-20.6	-5	23.0	-1.1	30	86.0	18.3	65	149.0	37.8	100	212.0
-20.0	-4	24.8	-0.6	31	87.8	18.9	66	150.8	40.6	105	221.0
-19.4	-3	26.6	0	32	89.6	19.4	67	152.6	43.3	110	230.0
-18.9	-2	28.4	0.6	33	91.4	20.0	68	154.4	46.1	115	239.0
-18.3	-1	30.2	1.1	34	93.2	20.6	69	156.2	48.9	120	248.0
-17.8	0	32.0	1.7	35	95.0	21.1	70	158.0	51.7	125	257.0
-17.2	1	33.8	2.2	36	96.8	21.7	71	159.8	54.4	130	266.0
-16.7	2	35.6	2.8	37	98.6	22.2	72	161.6	57.2	135	275.0
-16.1	3	37.4	3.3	38	100.4	22.8	73	163.4	60.0	140	284.0
-15.6	4	39.2	3.9	39	102.2	23.3	74	165.2	62.7	145	293.0
-15.0	5	41.0	4.4	40	104.0	23.9	75	167.0	65.6	150	302.0
-14.4	6	42.8	5.0	41	105.8	24.4	76	168.8	68.3	155	311.0
-13.9	7	44.6	5.6	42	107.6	25.0	77	170.6	71.1	160	320.0
-13.3	8	46.4	6.1	43	109.4	25.6	78	172.4	73.9	165	329.0
-12.8	9	48.2	6.7	44	111.2	26.1	79	174.2	76.7	170	338.0
-12.2	10	50.0	7.2	45	113.0	26.7	80	176.0	79.4	175	347.0

comprising device uses which heating system and which temperature sensors in relation to which operation mode.

	Heating system	Thawing mode	Freeze prevention mode
DEF suction and purge hose DEF pressure hose (low-temperature side)	Heater around hose	Ambient temperature sensor	Ambient temperature sensor
DEF pressure hose (high-temperature side)	Heater around hose	Engine room temperature sensor	Engine room temperature sensor
DEF pump	Pump built-in heater	DEF pump temperature sensor	Ambient temperature sensor
DEF tank	Circulation of coolant	DEF tank temperature sensor	DEF tank temperature sensor

Inducement Strategy

- The purpose of inducement is to prompt the operator to perform maintenance or repair on the emissions control system.
- Inducement strategy is a control action to ensure prompt correction of various failures in the engine emissions control system. It requires actions to limit engine performance and defines required indication such as warning lamps and messages, as well as alarms while the control actions are imposed.
  The warning steps of Inducement are different for North America and for European Union.
- The categories of abnormalities that have triggered Inducement are displayed on the “SCR Information” screen of the machine monitor.

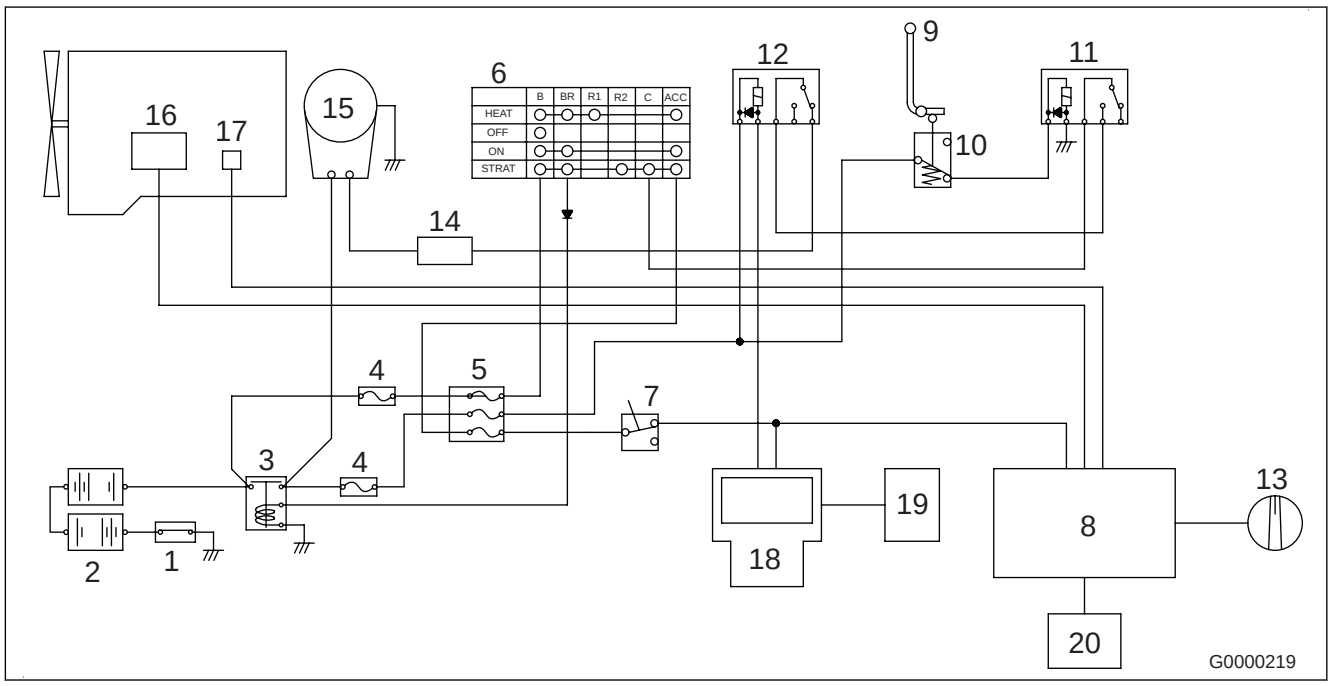
Inducement Strategy When the DEF Level in the Tank Becomes Low (For North America)

- When the DEF level in the tank becomes low, DEF level caution lamp on the machine monitor lights up, the Audible alert sounds, the action level is displayed and Inducement strategy including engine power deration is activated.
- The Inducement strategy progresses in 5 levels from Warning, Escalated Warning, Mild Inducement, Severe Inducement and Final Inducement.
- Up to the start of Severe Inducement the start of each warning step is triggered by the amount of DEF in the DEF tank. Final Inducement starts at 1 hour after the start of Severe Inducement if the machine continues its operation without adding DEF into the tank, and reduces the engine speed to low idle and keeps it at low idle.
- The Inducement strategy status can be checked on “SCR Information” screen of the user menu.
- The table shows warning indications and engine power derations by each Inducement strategy status.

Status		DEF level (*1) (DEF level gauge)	Machine monitor				Engine deration (*3)
			Message of SCR Information	DEF level caution lamp (Action level)	Tone of audible alert	Activated failure code (*2)	
1	Warning	10% (The bottom two gradations light on)	1: DEF low level warning appears.	Red  APP14419	No sound	CA3497 (DEF level low error 1)	No deration

Engine Control System

System Diagram of Engine Control



1: Battery disconnect switch
2: Battery
3: Battery relay
4: Fusible link
5: Fuse box
6: Starting switch
7: Engine shutdown secondary switch
8: Engine controller
9: Lock lever
10: PPC lock switch
11: Starting motor cut-off relay (for PPC lock)
12: Starting motor cut-off relay (for personal code)
13: Fuel control dial
14:Safety relay
15: Starting motor
16: Fuel supply pump
17: Various sensors
18: Machine monitor
19: Gateway function Controller
20: Pump controller

- Keep KCCV ventilator warm with warmed-up engine coolant, to prevent the blowby gas passage from being clogged due to freeze.
- Relief valve (4) is inside case (1) and it protect both KCCV ventilator and the engine when filter (6) is blocked.

Operation of KCCV Ventilator

1. When blowby gas enters blowby gas inlet (A) and passes through the hole of impactor (5) in filter (6), large particles in the oil mist are separated.
2. Small particles in the oil mist are separated by filter (6).
3. The separated oil oozes out from the bottom of the filter (6), and flows to oil drain port (C), and then flows to the engine oil pan.
4. The crankcase pressure sensor (3) senses the crankcase pressure (blowby gas pressure).
   If the engine controller detects filter clogging by detected value of crankcase pressure sensor (3), it displays failure code CA555. If the pressure increases further, it displays failure code CA556.
5. Relief valve (4) is installed in case (1) and operates when filter (6) is blocked.
6. When the crankcase pressure becomes negative, CDR valve (2) operates for it not to become excessively negative.

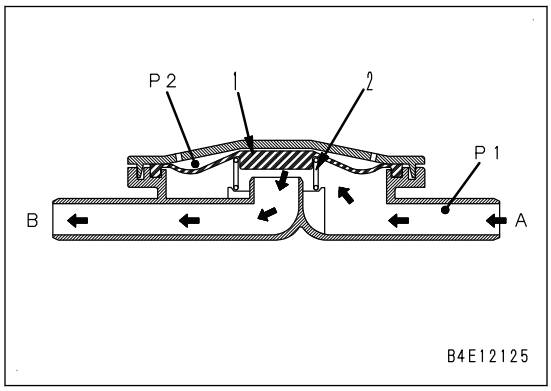
CDR Valve

CDR

Abbreviation for Crankcase Depression Regulator

Operation of CDR Valve

1. Spring (2) normally pushes up diaphragm (1), and the blowby gas flows from crankcase side (A) into turbocharger side (air intake side) (B).
2. As the intake air at turbochaeger side (air intake side) (B) increases, pressure on crankcase side (P1) decreases.
3. The reaction force of spring (2) is overwhelmed by ambient pressure (P2). Diaphragm (1) shuts the passage and temporarily blocks the flow.
4. When the blowby gas accumulates in the crankcase, pressure (P1) on the crankcase side increases, and it pushes up diaphragm (1) again and blowby gas starts to flow.

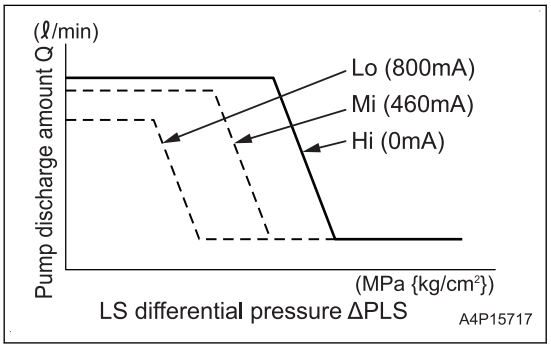


Symbol	Display item	Description			Remarks
		Range	Caution lamp display (background color)	Action level display	
 9JC01167	Water separator (*1)	When it is abnormal (There is water collected above the specified amount.)	Lit (red)	-	Caution lamp lights up when an abnormality is detected while engine is running.
		Normal	Not lit	-	
 9JC01168	Maintenance due time warning	When maintenance due time is over	Lit (red)	-	• The display changes according to 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 (*2)	Lit (yellow)	-	
 9JC01169	State of system	When action level L04, L03 are sensed	Lit (red)	L04, L03	• Caution lamp lights up when an abnormality is detected in machine system. • Alarm buzzer sounds when the background color of the caution lamp is red.
		When action level L01 is detected	Lit (yellow)	L01 (*3)	
 9JC01170	State of engine system	When action level L04, L03 are sensed	Lit (red)	L04, L03	• Caution lamp lights up when an abnormality is detected in engine system. • Alarm buzzer sounds when the background color of the caution lamp is red.
		When action level L01 is detected	Lit (yellow)	L01 (*3)	
 9JC01171	State of hydraulic system	When action level L04, L03 are sensed	Lit (red)	L04, L03	• Caution lamp lights up when an abnormality is detected in hydraulic system. • Alarm buzzer sounds when the background color of the caution lamp is red.
		When action level L01 is detected	Lit (yellow)	L01 (*3)	
 9JC01172	State of KDPF system	When action level L04, L03 are sensed	Lit (red)	L04, L03	• Caution lamp lights up when a failure is detected in KDPF system. • Alarm buzzer sounds when the background color of the caution lamp is red.
		When action level L01 is detected	Lit (yellow)	L01 (*3)	

Pin No.	Signal name	Input/output signal
53	DEF injector (-)	Ground/Shield/ Return
54	GND	Ground/Shield/ Return
55	(*1)	-
56	Ambient temperature sensor	Input
57	GND	Ground/Shield/ Return
58	(*1)	-
59	(*1)	-
60	(*1)	-
61	GND	Ground/Shield/ Return
62	(*1)	-
63	(*1)	-
64	(*1)	-
65	Engine room temperature sensor	Input
66	(*1)	-
67	(*1)	-
68	(*1)	-
69	(*1)	-
70	(*1)	-
71	(*1)	-
72	(*1)	-
73	Power GND	Ground/Shield/ Return
74	(*1)	-
75	Intake air heater relay (+)	Output
76	(*1)	-
77	DEF injector (+)	Output
78	(*1)	-
79	DEF pump voltage	Output
80	VGT solenoid (+)	Output
81	DEF Flow control valve	Output
82	DEF tank heating valve	Output
83	DEF pump heater relay	Output
84	(*1)	-
85	(*1)	-
86	(*1)	-
87	(*1)	-

Travel Control

- As travel speed selector switch is switched to Hi, Mi or Lo, command current from controller changes, and the output pressure from LS-EPC valve to LS valve changes, and pump discharged volume change point “LS differential pressure (PLS)” in the LS valve changes.
- The start-up time of the pump discharged volume is optimized and the combined operation and fine control performance are improved.



Cut-off Function

- This function increases PC-EPC current to reduce the flow rate in the relief state and improve the fuel economy.
- Operating condition for turning on cut-off function
  When the one-touch power maximizing function is not activated and the average of front pump and rear pump oil pressure sensor values is 27.9 MPa {285 kgf/cm^2} or higher.

  While machine is traveling, it does not work if mode is work mode or “P mode”, or the swing lock switch is “ON”.

Pressure Compensation Control

Function of Pressure Compensation Control

- Pressure compensation valves (2) (2 pieces) are installed at outlet of the downstream and return side of main spool (4) by each actuator (1).
- The highest LS pressure is transmitted to the back of all pressure compensation valves (2), and light load side is throttled.
- When it is throttled until all pressure compensation valves (2) are balanced, the differential pressures before and after main spool (4) become the same.
- As a result, the flow rate control in proportion to the travel of levers (3) in the combined operation becomes available without influenced by the load.

  A: Heavy load

  B: Light load

  C: LS circuit

  1: Actuator

  2: Pressure compensation valves

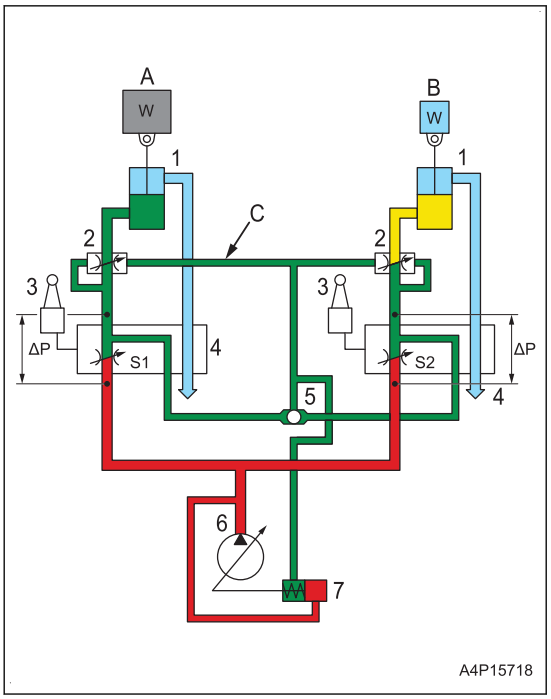
  3: Levers

  4: Main spool

  5: LS shuttle valve

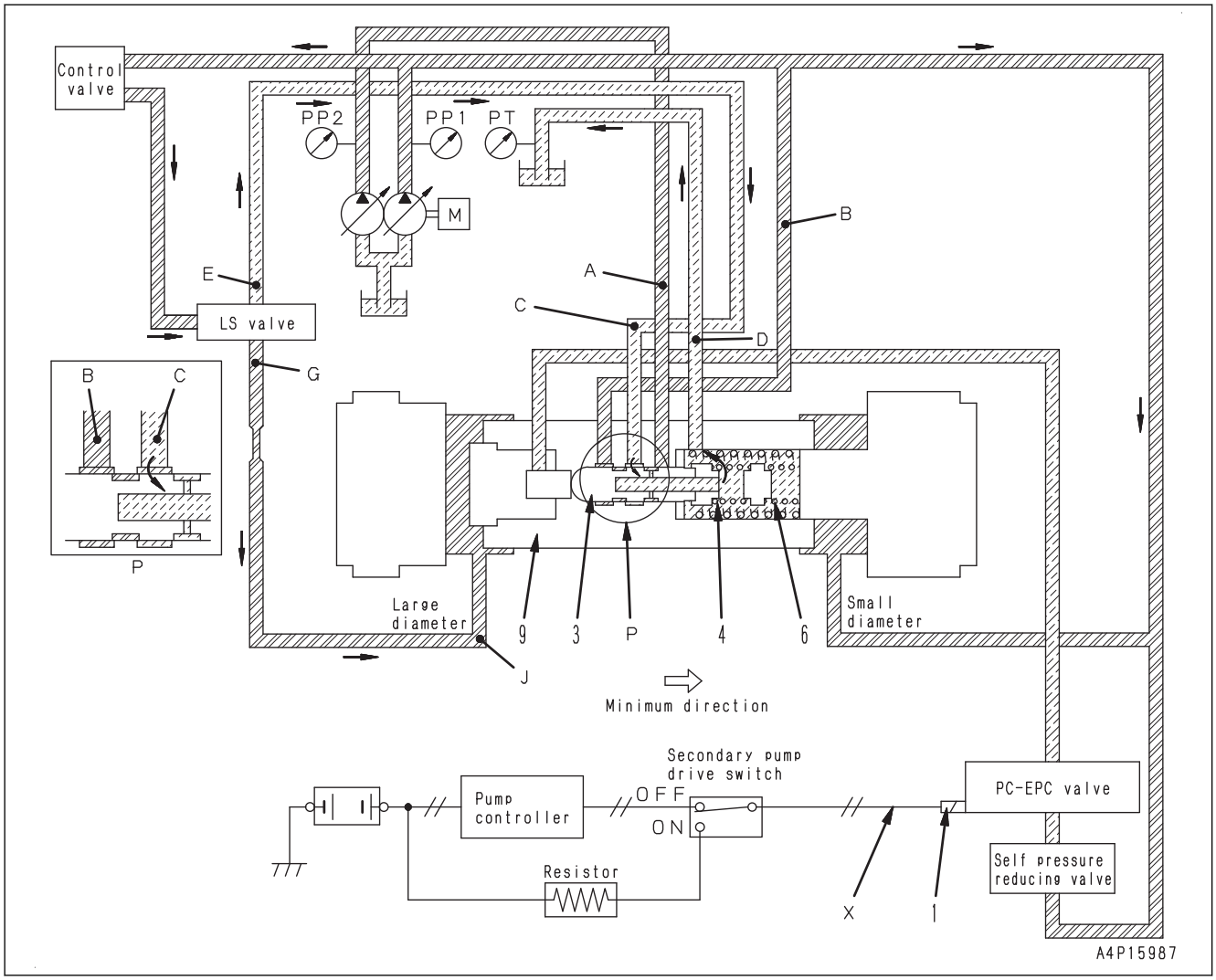
  6: Main pump

  7: Servo piston



12. When the reaction forces of the springs decrease, spool (3) moves to the right, port (C) is disconnected from port (D), and pump discharged pressure port (B) is connected to port (C).
13. Since the pressure in port (C) increases and the pressure on the large diameter piston side increases, servo piston (9) stops moving to the left.
14. The stop position (= pump discharged volume) of servo piston (9) is determined by the position where the thrust caused by pressures (PP1) and (PP2) applied to spool (3) is balanced with the thrust of PC-EPC valve solenoid and forces of springs (4) and (6).

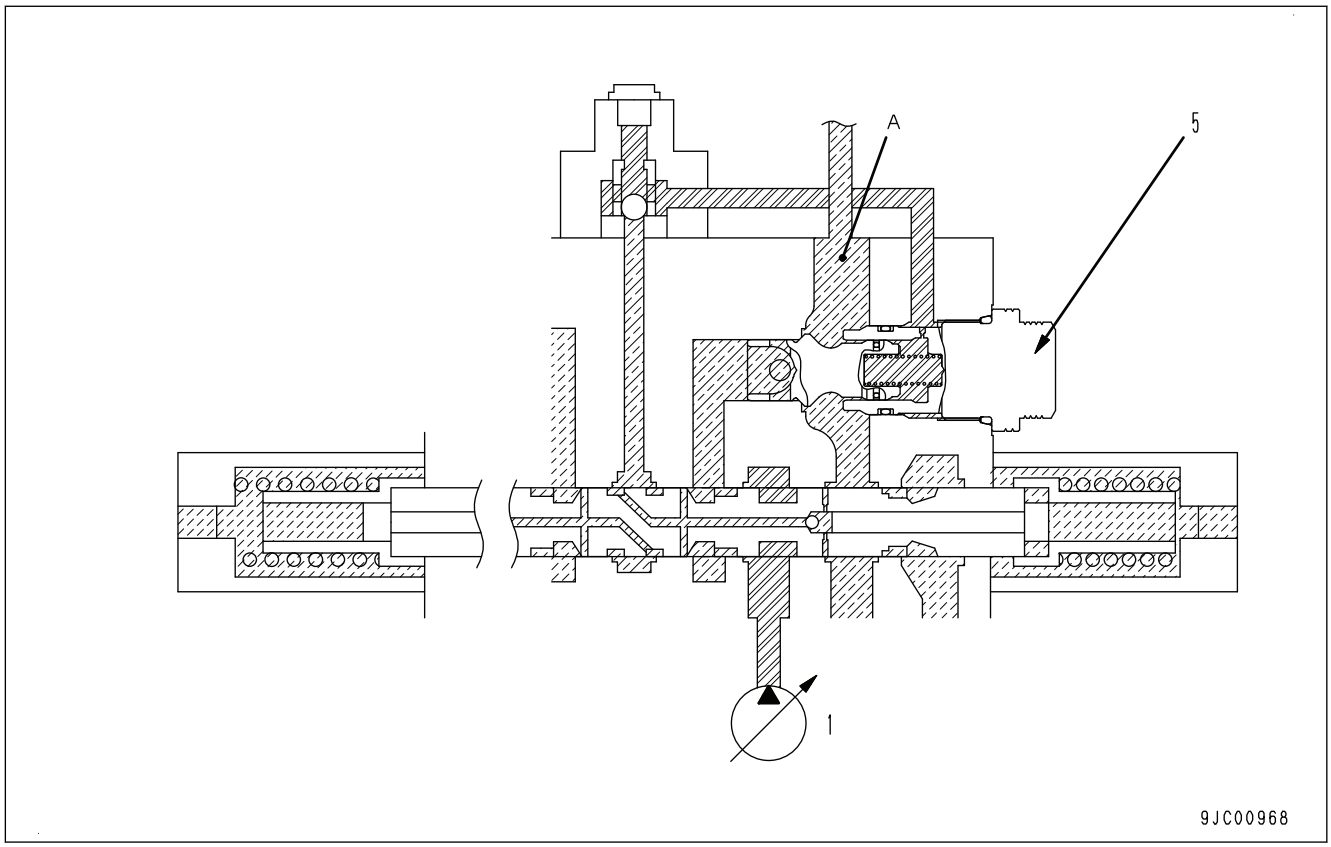
When the Pump Controller is Normal, the Actuator Load is Large, and the Pump Pressures (PP1) and (PP2) are High



1. When the load is high and pump discharged pressures (PP1) and (PP2) are high, the force pushing spool (3) to the right increases and spool (3) is positioned as shown in the previous figure.
2. Part of the pressure from port (B) flows through LS valve and port (C) to port (D) as shown in the previous figure, and the pressure flowing from port (C) to LS valve becomes approximately half of pump pressure (PP2).
3. When spool (3) moves to the left, the openings of port (C) and port (D) increase further.
4. The pressure (= J) in port (C) decreases and servo piston (9) stops moving to the right.
   At this time, servo piston (9) stops at a position on the right side of the position when pump pressures (PP1) and (PP2) are low.
5. When port (E) of LS valve and port (G) are connected, this pressure enters from port (J) to the large diameter piston side of servo piston, and servo piston (9) stops.

Shuttle Valve in Pressure Compensation Valve of Control Valve

Structure of Shuttle Valve in Pressure Compensation Valve of Control Valve When You Travel

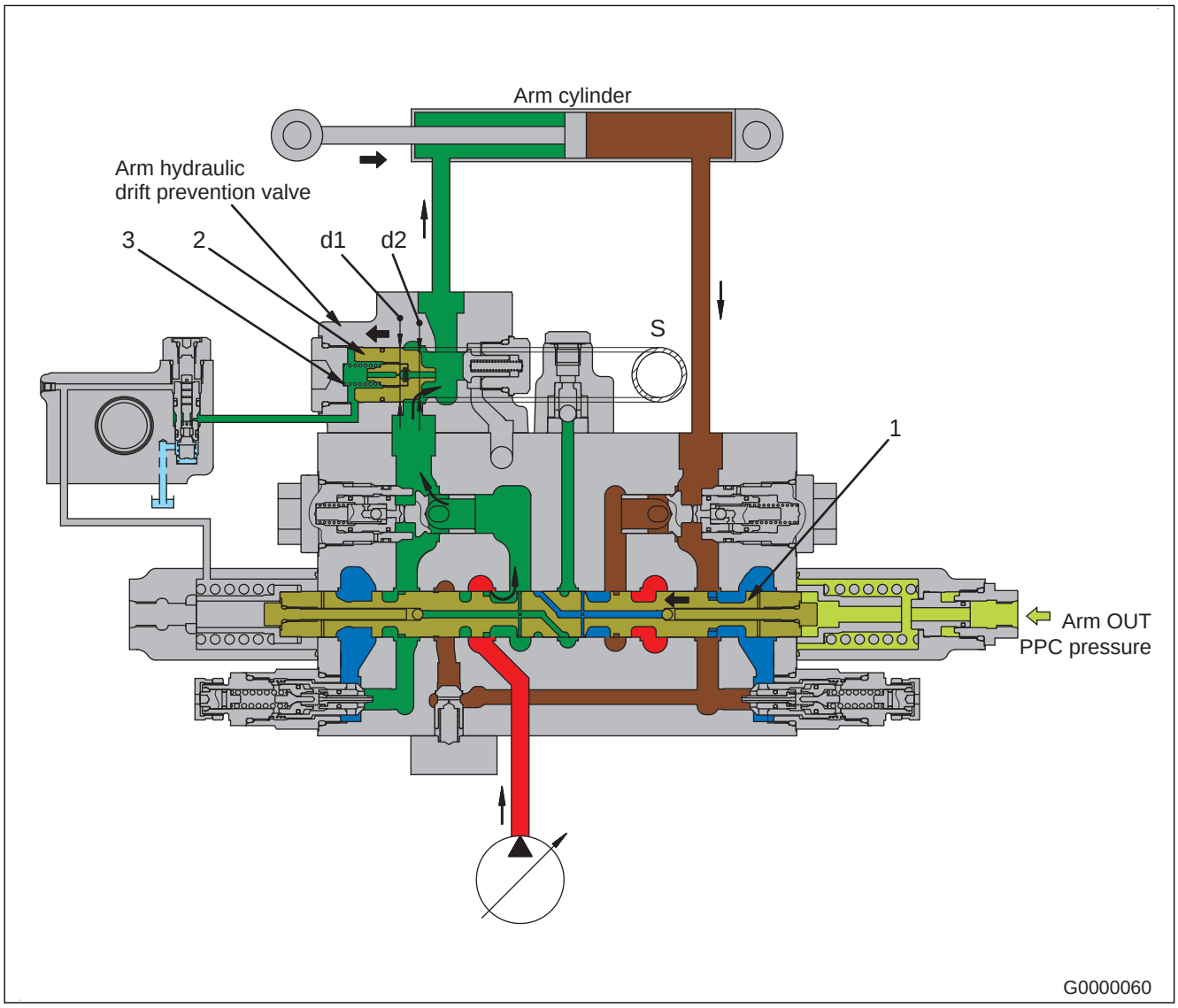


1: Main pump 5: Pressure compensation valve

Since no holding pressure occurs in port (A) of the travel circuit, pressure compensation valve (5) having no shuttle valve is employed.

Operation of Arm Hydraulic Drift Prevention Valve of Control Valve

In Arm OUT Operation



At arm OUT, the pressurized oil from the control valve acts in the left direction to the area (S) whose outside diameter is the diameter (d1) of the poppet (2) and inside diameter is the seat diameter (d2). This force compresses the spring (3) and moves the poppet (2) to the left. The pressurized oil from the control valve flows into the cylinder head through the opening of the poppet (2).

L.H. work equipment control lever

P: From self-pressure reducing valve

P1: To control valve (arm OUT port)

P2: To control valve (arm IN port)

P3: To control valve (swing LEFT port)

P4: To control valve (swing RIGHT port)

T: To hydraulic tank

R.H. work equipment control lever

P: From self-pressure reducing valve

P1: To control valve (boom LOWER port)

P2: To control valve (boom RAISE port)

P3: To control valve (bucket CURL port)

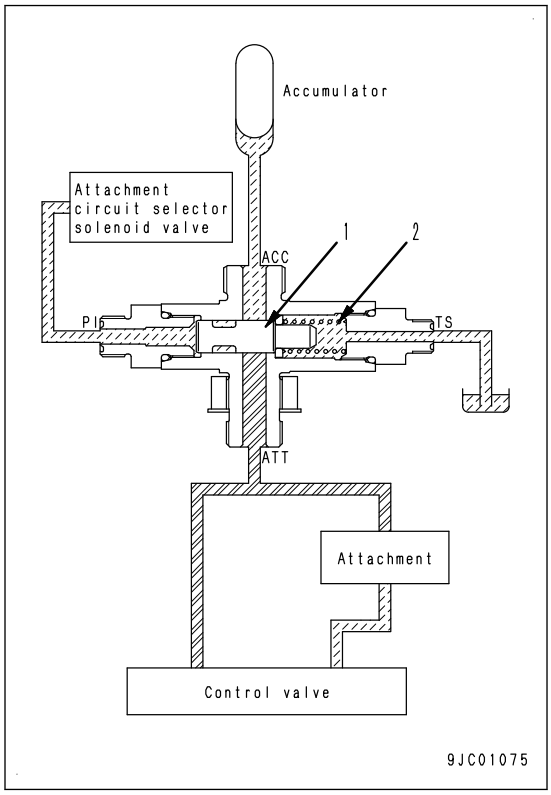
P4: To control valve (bucket DUMP port)

T: To hydraulic tank

Operation of Attachment Circuit Selector Valve (For High Pressure)

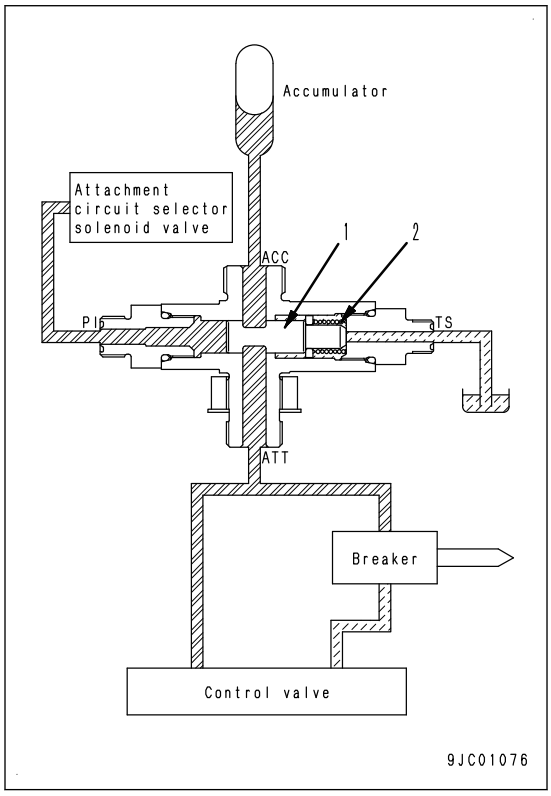
When Attachment Other Than Breaker is Installed

1. Spool (1) is pressed to the left by the force of spring (2).
2. Since port (ATT) and port (ACC) are disconnected, no oil flows into the accumulator.



When Breaker is Installed

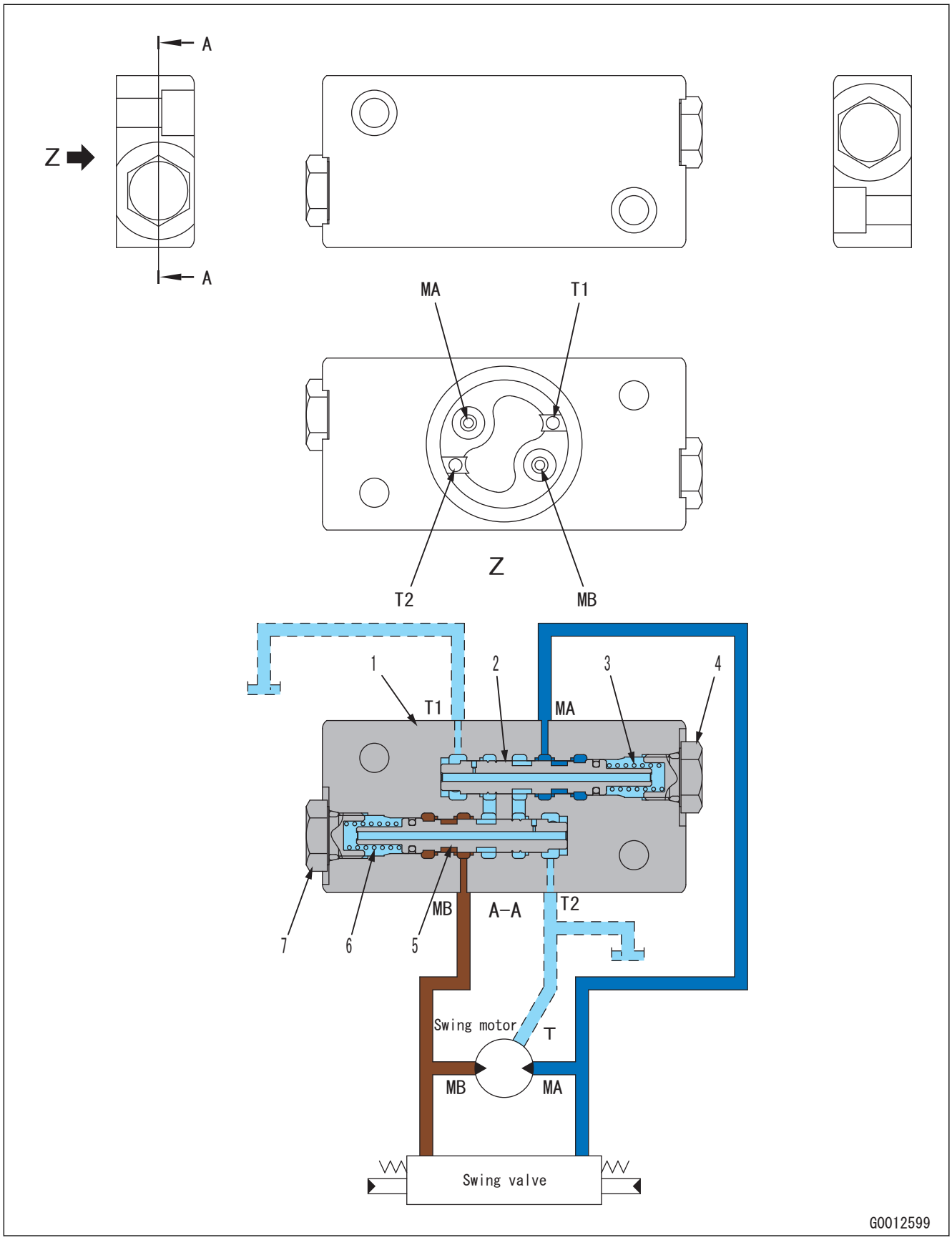
1. Pilot pressure (PI) from the attachment circuit selector solenoid valve compresses spring (2), and spool (1) moves rightward to the stroke end.
2. Since port (ATT) and port (ACC) are interconnected, oil flows into the accumulator and absorbs the oil pulsation.



Swing Motor Reverse Prevention Valve

Structure of Swing Motor Reverse Prevention Valve

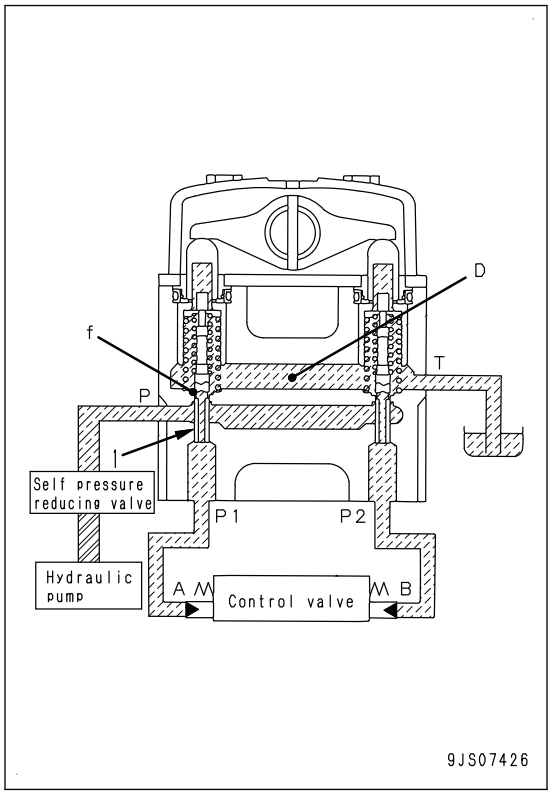
General View and Sectional View



Operation of Travel PPC Valve

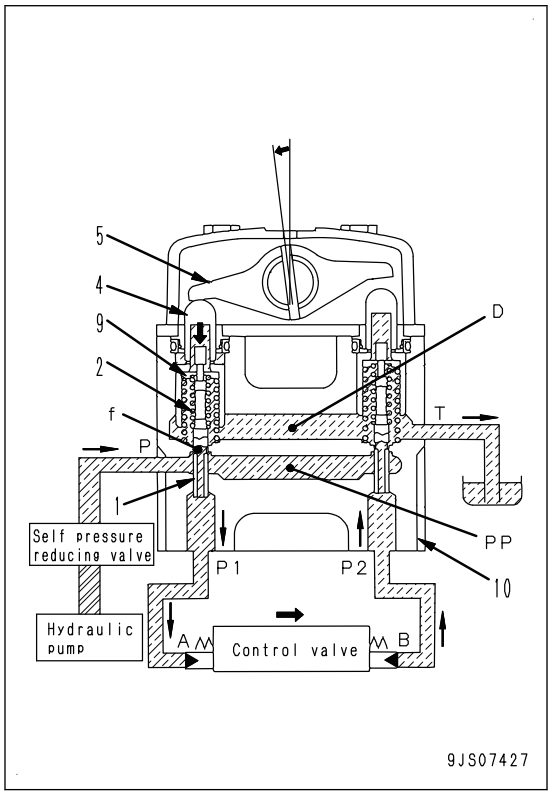
At NEUTRAL Position

Ports (A) and (B) of the control valve and ports (P1) and P2) of PPC valve are connected to drain chamber (D) through fine control hole (f) of spool (1).



In Fine Control (When Fine Control is Started from Neutral State)

1. When piston (4) is pushed by lever (5), retainer (9) is pushed and spool (1) is also pushed and moved down through metering spring (2).
2. Almost at the same time when fine control hole (f) is disconnected from drain chamber (D), it is connected to pump pressure chamber (PP).
3. The pilot pressure oil of the control pump flows to port (A) through fine control hole (f) and port (P1).
4. When the pressure in port (P1) increases, spool (1) is pushed back. Almost at the same time when fine control hole (f) is disconnected from pump pressure chamber (PP), it is connected to drain chamber (D), and the pressure in port (P1) is released.
5. Spool (1) moves up and down so that the force of metering spring (2) is balanced with the pressure in port (P1).
6. The positional relationship between spool (1) and body (10) “fine control hole (f) is in an intermediate position between drain chamber (D) and pump pressure chamber (PP)” does not change until retainer (9) touches spool (1).
7. Metering spring (2) is compressed in proportion to the travel of control lever.
8. The pressure in port (P1) also increases in proportion to the travel of control lever.



9. The control valve spool moves to a position where the pressure in port (A) “which is the same as the pressure in port (P1)” is balanced with the reaction force of the control valve spool return spring.

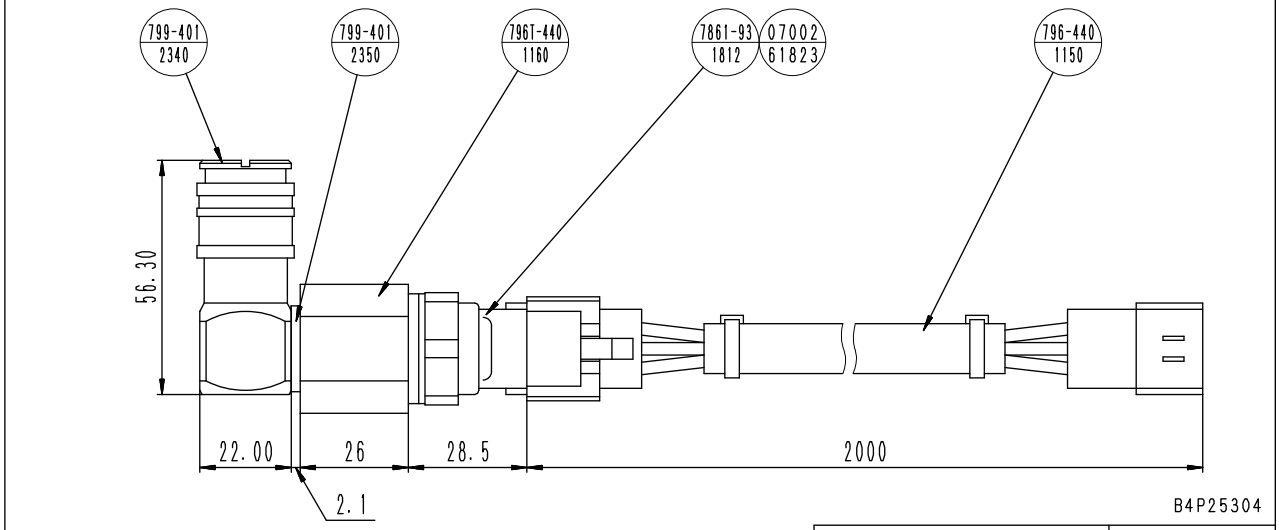
Pump Performance

<table>
<tr><td colspan="3">Machine model</td><td colspan="2">PC210LC-11</td></tr>
<tr><td colspan="3">Engine</td><td colspan="2">SAA6D107E-3</td></tr>
<tr><td>Item</td><td colspan="2">Measurement condition</td><td>Unit</td><td>Standard value for new machine</td><td>Repair limit</td></tr>
<tr><td>Combined operation performance
(Travel deviation at simultaneous operation of work equipment + travel)</td><td colspan="2">• Hydraulic oil temperature: 45 to 55 °C
• Fuel control dial: MAX position (High idle)
• Working mode: P(Power Mode)
• Travel speed: Lo
• Travel deviation (x) in travel of 20 m after running up 10 m on a firm and level ground
• For measuring posture, see "Travel 2" and “Travel 3”</td><td>mm</td><td>Max. 200</td><td>Max. 220</td></tr>
<tr><td rowspan="2">Output voltage of pump swash plate sensor</td><td rowspan="2">• Hydraulic oil temperature: 45 to 55 °C
• Fuel control dial: MAX position (High idle)
• Working mode: P(Power Mode)
• Travel speed: Hi
• Travel operation or oneside track idle off ground</td><td>All control levers at NEUTRAL</td><td rowspan="2">V</td><td>1.35 ± 0.20</td><td>1.35 ± 0.63</td></tr>
<tr><td>At running track idle off ground
(At lever full stroke)</td><td>3.35 ± 0.20</td><td>3.35 ± 0.63</td></tr>
<tr><td>Characteristics of PC flow control
(Time required for boom RAISE + swing start at 90 °)</td><td colspan="2">• Hydraulic oil temperature: 45 to 55 °C
• Fuel control dial: MAX position (High idle)
• Working mode: P(Power Mode)
• Bucket filled up with dirt and sand, or at the rated load (0.8 m^3: 1440 kg)
• Arm vertical and bucket back grounding on a firm and level ground
• Time required to swing from 0 to 90 ° with combined operation of boom RAISE and swing
• Measurement posture: See “Machine posture and procedure for measuring performance”, “Travel 8”.</td><td>sec</td><td colspan="2">4.2 ± 0.4
(Reference value)</td></tr>
<tr><td>Main pump performance</td><td colspan="2">• Pump speed: 1700 rpm
• PC-EPC current value: 440 mA
• Test pump discharged pressure (MPa { kg/cm2}): P1
• Other pump discharged pressure (MPa { kg/cm2}): P2
• Average pump discharged pressure (MPa { kg/cm2}): Pp=(P1+P2)/2</td><td>ℓ/min</td><td>Q
(See graph.)</td><td>Q
(See graph.)</td></tr>
</table>

Sketch of Tools for Testing and Adjusting

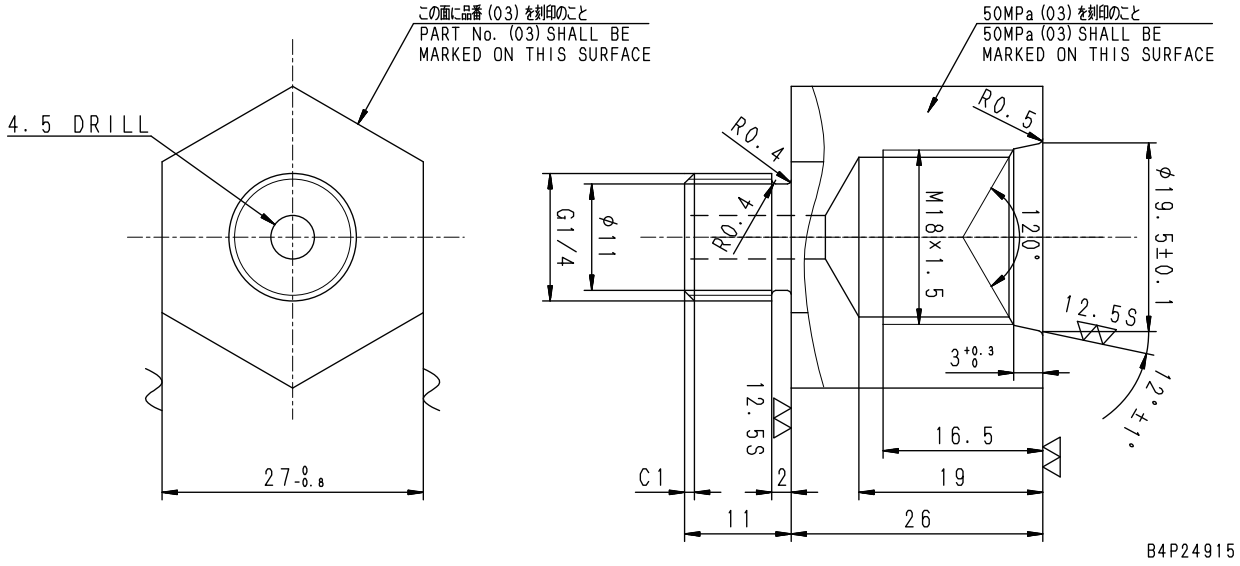
Note: Komatsu does not take any responsibility for special tools manufactured according to these sketches.

Sensor Adapter



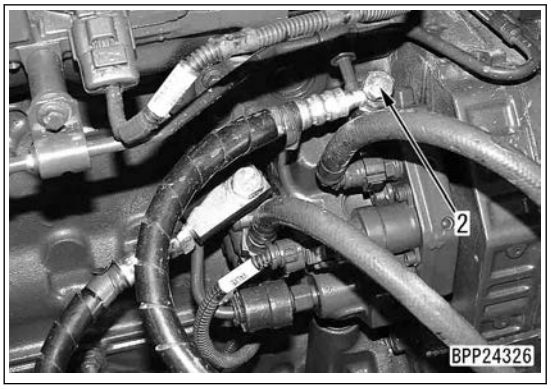
HEAT TREATMENT	MATERIAL
----	ASSY
PART NAME	Q'TY
SENSOR ADAPTER	1
796T-440-1101 △	

Nipple



HEAT TREATMENT	MATERIAL
----	S45C
PART NAME	Q'TY
NIPPLE	1
796T-440-1160 △1	

2. Remove joint bolt (2) of the fuel return hose between supply pump and fuel cooler.

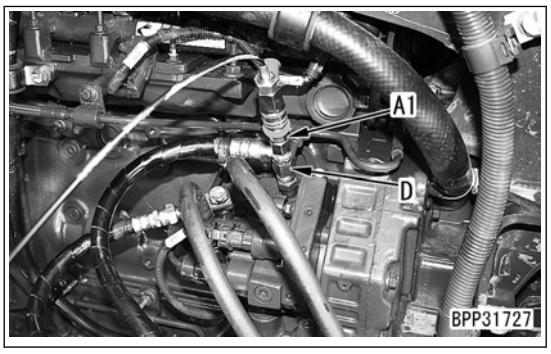


3. Install screw D and nipple A1 of hydraulic tester A instead of joint bolt (2), and connect hose to gauge E.

REMARK

When installing screw D, be sure to install the seal washer.

Screw D:
19.6 to 29.4 Nm {2 to 3 kgfm}

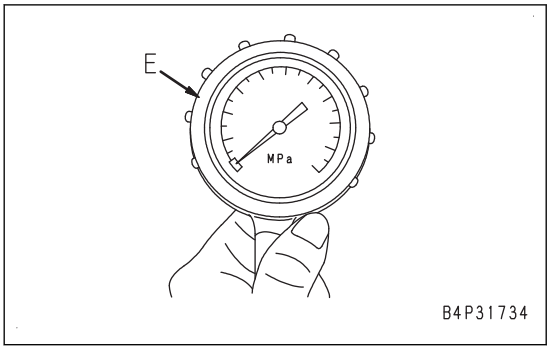


4. Start the engine, and measure the return circuit pressure with fuel control dial at MAX (High idle) position.

NOTICE

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

For standard values, see Standard Value Table, “Standard Value Table for Engine”.

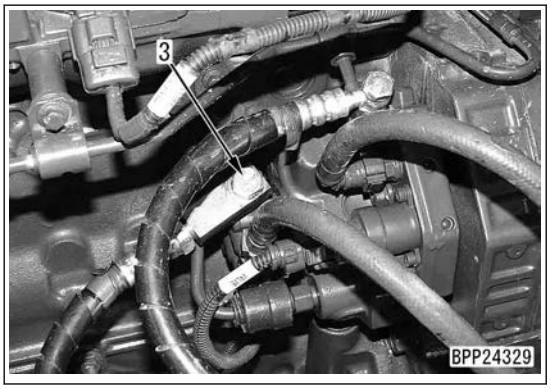


After finishing the test, remove the testing tools and restore the machine.

Joint bolt (2):
19.6 to 29.4 Nm {2 to 3 kgfm}

Examine Negative Pressure Circuit

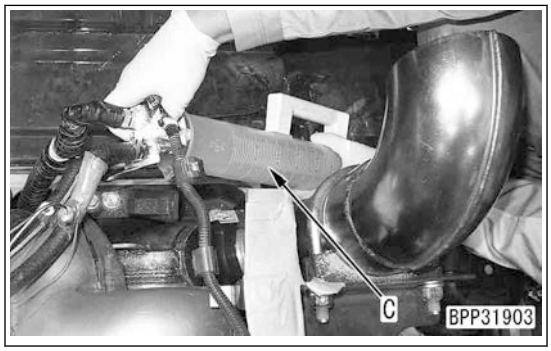
1. Remove joint bolt (3) of the fuel supply hose between fuel prefilter and supply pump.



REMARK

- If the crystal of DEF is adhered at the tip of DEF injector (2), wipe it off with clean cloth.
- If the crystal of DEF is stuck and it is difficult to wipe it off, soak new DEF to clean cloth and wipe crystal off with it. Or, wipe crystal off by using distilled water or deionized water instead of DEF.

11. Securely insert the injection port of DEF injector (2) into measuring cylinder C.



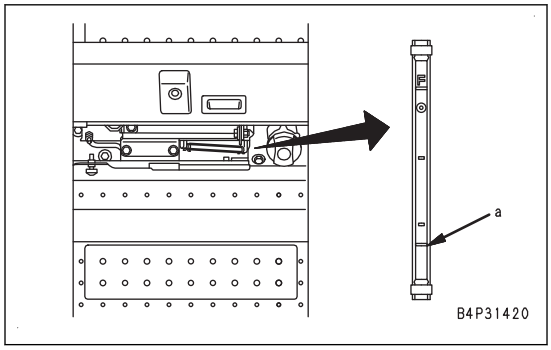
12. Check that DEF level is higher than level (a) of the sight gauge.

REMARK

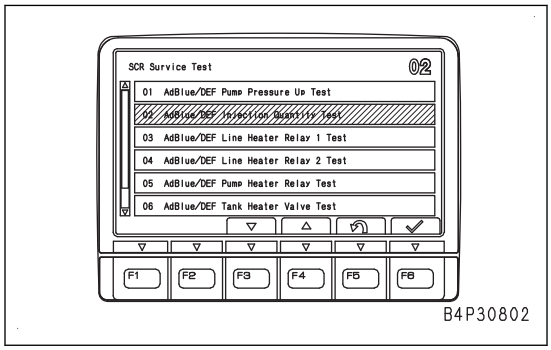
When DEF level is below level (a), the DEF level is low. Refill DEF.

13. Turn the starting switch to ON position.

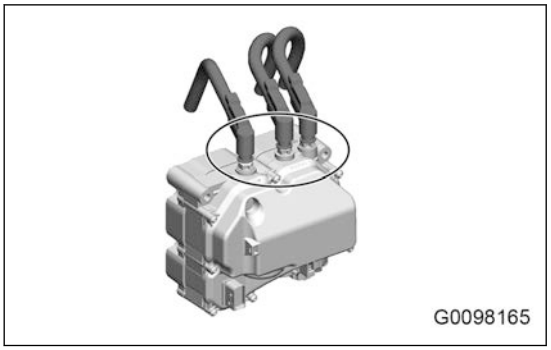
⚠ Do not perform this test while engine is running for the safety reasons.



14. Select “DEF Injection Quantity Test” by referring “Set and Operate Machine Monitor”.



23. Connect the DEF hoses (3 pieces).



24. Test the DEF pump raised pressure, and make sure that the pump pressure is raised. For details, see “How to Examine DEF Pump Raised Pressure”.

NOTICE

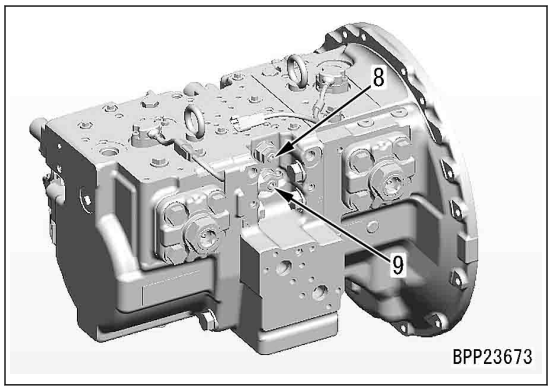
If the pressure up test cannot be done, see the related failure code, and go to the next troubleshooting.

Adjust LS Valve

If the LS differential pressure is abnormal, adjust LS valves (8) and (9) according to the following procedure.

(8): Rear LS valve

(9): Front LS valve

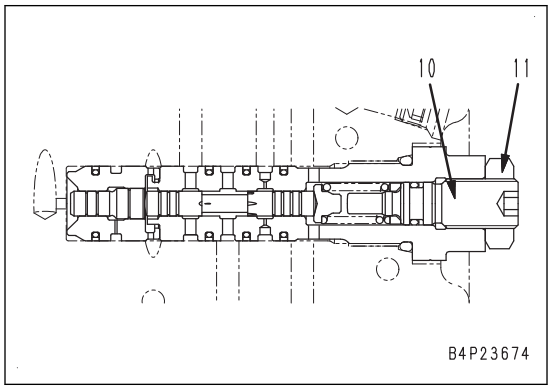


1. Loosen lock nut (11) with adjustment screw (10) fixed.
2. Turn adjustment screw (10) to adjust differential pressure.

   REMARK

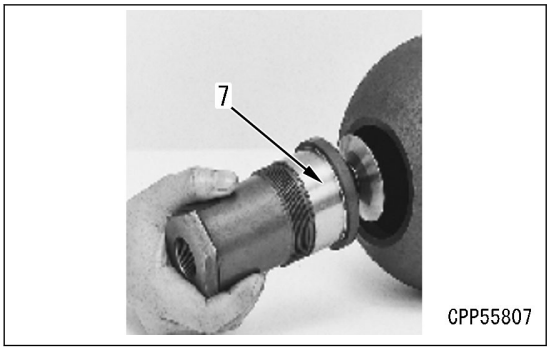
   - Turn adjustment screw (10) to the right to raise the differential pressure or turn it to the left to lower the differential pressure.
   - Quantity of pressure adjustment (LS differential pressure) per turn of adjustment screw (10)1.110.8 kgf/cm^2
3. With adjustment screw (10) fixed, tighten lock nut (11).

   Locknut (11):
   49 to 68.6 Nm {5 to 7 kgfm}

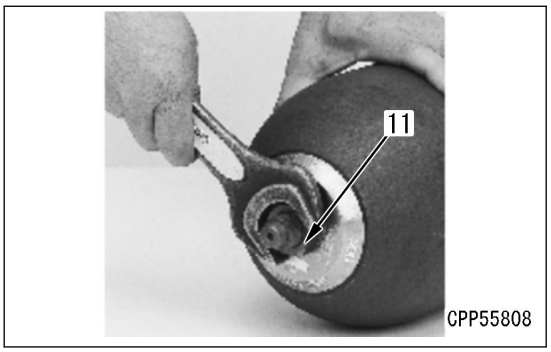


After the adjustment, see “How to Examine LS Valve Outlet Pressure (Servo Piston Inlet Pressure)” to check whether LS valve outlet pressure (servo piston inlet pressure) is normal.

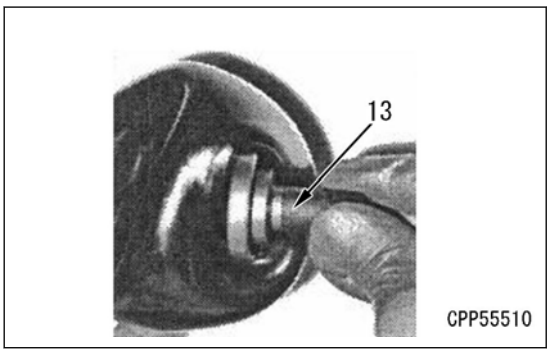
9. Remove the oil port (7) from the shell.



10. Remove the nut (11). Remove the bladder and valve stem assembly (12).



11. Remove the valve stem (13).

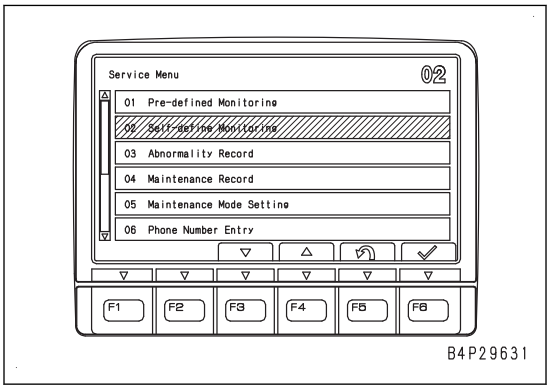


How to Examine Self-Define Monitor Information

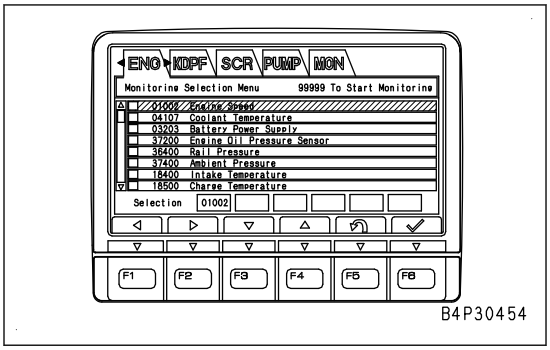
The machine monitor can monitor the condition of the machine in real time by receiving signals from various switches, sensors, and actuators installed to various parts of the machine and the information from the controllers which is controlling switches, etc.

“Self-define Monitoring”function is used to select a desired monitoring item.

1. Select “Self-define Monitoring” on “Service Menu” screen.



2. After “Monitoring Selection Menu” screen is displayed, select items to be monitored by using the function switches or numeral input switches.



F1: Moves the selection leftward

F2: Moves the selection rightward

F3: Moves the selection downward

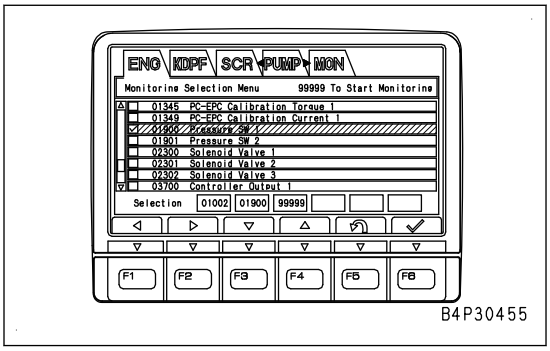
F4: Moves the selection upward

F5: Clears input numbers/Returns the screen to “Service Menu” screen

F6: Enters the selection

- For setting of the monitoring, each time function switch F2 is pressed, sequential switching among “ENG” → “KDPF” → “SCR” → “PUMP” → “MON” → “ENG” takes place in this order. (When F1 is pressed, sequential switching takes place in the reverse order.)
- Selection with function switches: Select an applicable equipment by using F1 or F2, select an item by using F3 or F4, and then enter it by using F6.
- Selection with numeral input switches: Enter a 5-digit code, and the item of that code is selected directly. Enter that item by using F6.
- If the color of the selected box changes from yellow to red, the selection of the item of that box is entered.
- Up to six monitoring items are selectable at a time. However, the items may not be set up to six depending on the form of display of the selected item.

3. After selecting monitoring items, execute monitoring with the function switch or numeral input switch.



- Execution with function switch: Double click or keep pressing F6 (for approximately 2 seconds).
- Execution with numeral input switch: Input “99999” and press F6.
- If monitoring items are selected up to the limit number, monitoring is executed automatically.

REMARK

When monitoring only two items, select them and confirm with F6. If F6 is pressed once more at this time, monitoring is executed.

3. On “Camera” screen, select the set value with the function switches.

   F3: Moves the selection downward

   F4: Moves the selection upward

   F5: Cancels the settings inputted before they are entered. Screen returns to “Default” screen

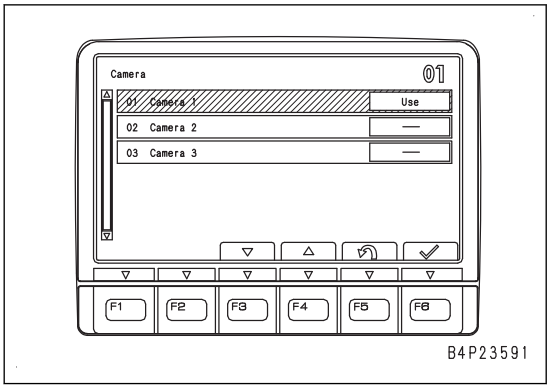
   F6: Enters the selected item in each line

   Not Use: Camera is not used

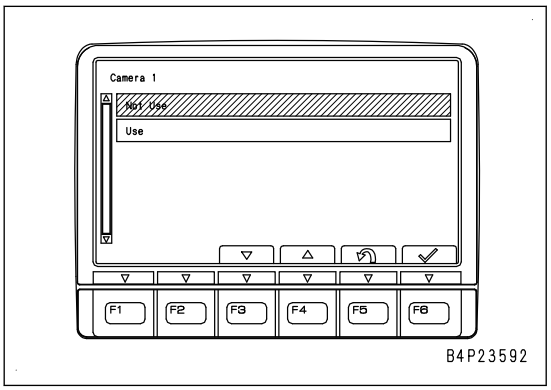
   Use: Images from connected camera are displayed as a normal image (mirror images if it is used for rearview monitor).

   Я: Reverse images (mirror images if it is used for rear view monitor) are displayed.

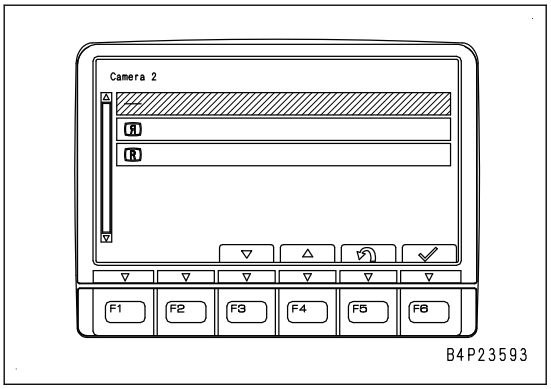
   R: Normal images (visual images if it is used for front or side monitor) are displayed.



B4P23591

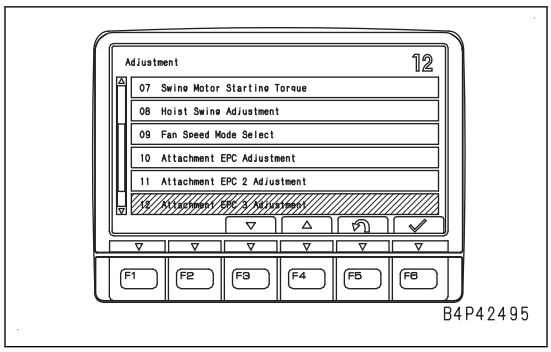


B4P23592



B4P23593

2. Select “Attachment EPC 3 Adjustment” with the function switches or numeral input switches on “Adjustment” screen.



REMARK

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

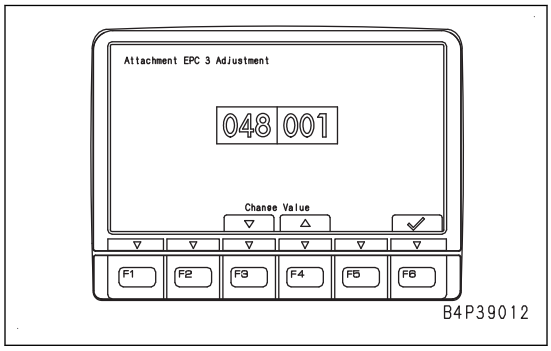
3. Change the set value on the right side by using the function switches on “Attachment EPC 3 Adjustment” screen.

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

F3: Decreases the set value.

F4: Increases the set value.

F6: The setting is confirmed and entered. The screen returns to “Adjustment” screen.



REMARK

The 3-digit number in the left column does not change. This is the code for this function.

3. On the “KomVision Adjustment” screen, select the “Main setting” with function switches.

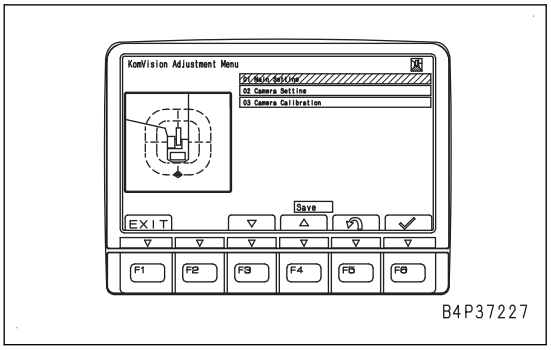
   F1: The screen goes back to the Service Menu screen.

   F3: Moves the selection downward.

   F4: Moves the selection upward.

   F5: Selection is canceled. The screen goes back to “Adjustment” screen

   F6: Enters the selected item.



4. On the “Main setting” screen, select the “Machine Model”with function switches.

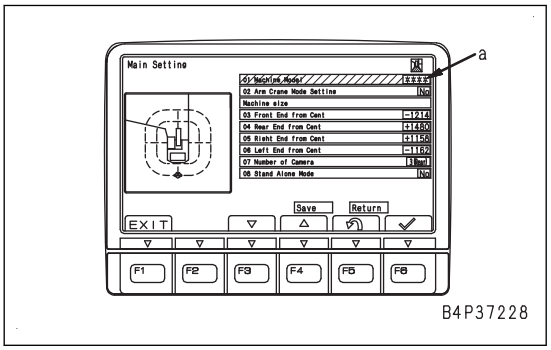
   F1: The screen goes back to the Service Menu screen without saving the setting.

   F3: Moves the selection downward.

   F4: Moves the selection upward.

   F5: The screen goes back to the “KomVision Adjustment” screen without saving the setting.

   F6: Enters the selected item.



REMARK

When the selected item is entered, the back ground color of icon (a) turns yellow.

5. Select the applicable machine model code by referring to the “Machine model code table”.

   F1: The screen goes back to the Service Menu screen without saving the setting.

   F3: Moves the selection downward.

   F4: Moves the selection upward.

   F5: The screen goes back to the “KomVision Adjustment” screen without saving the setting.

   F6: Enters the selected item.

NOTICE

Do not change the values of the “03 From center to front end” to “07 Number of cameras”

Machine Model Code List

Machine model	Model code	Specifications/Optional devices	
		Without option	Long crawler specifications
PC200/ PC210	C010	○	○

When the machine model code is entered, the values of the following items are automatically updated , and the back ground color of icon (a) goes back to black.

“03 From center to front end”

“04 From center to rear end”

“05 From center to right end”

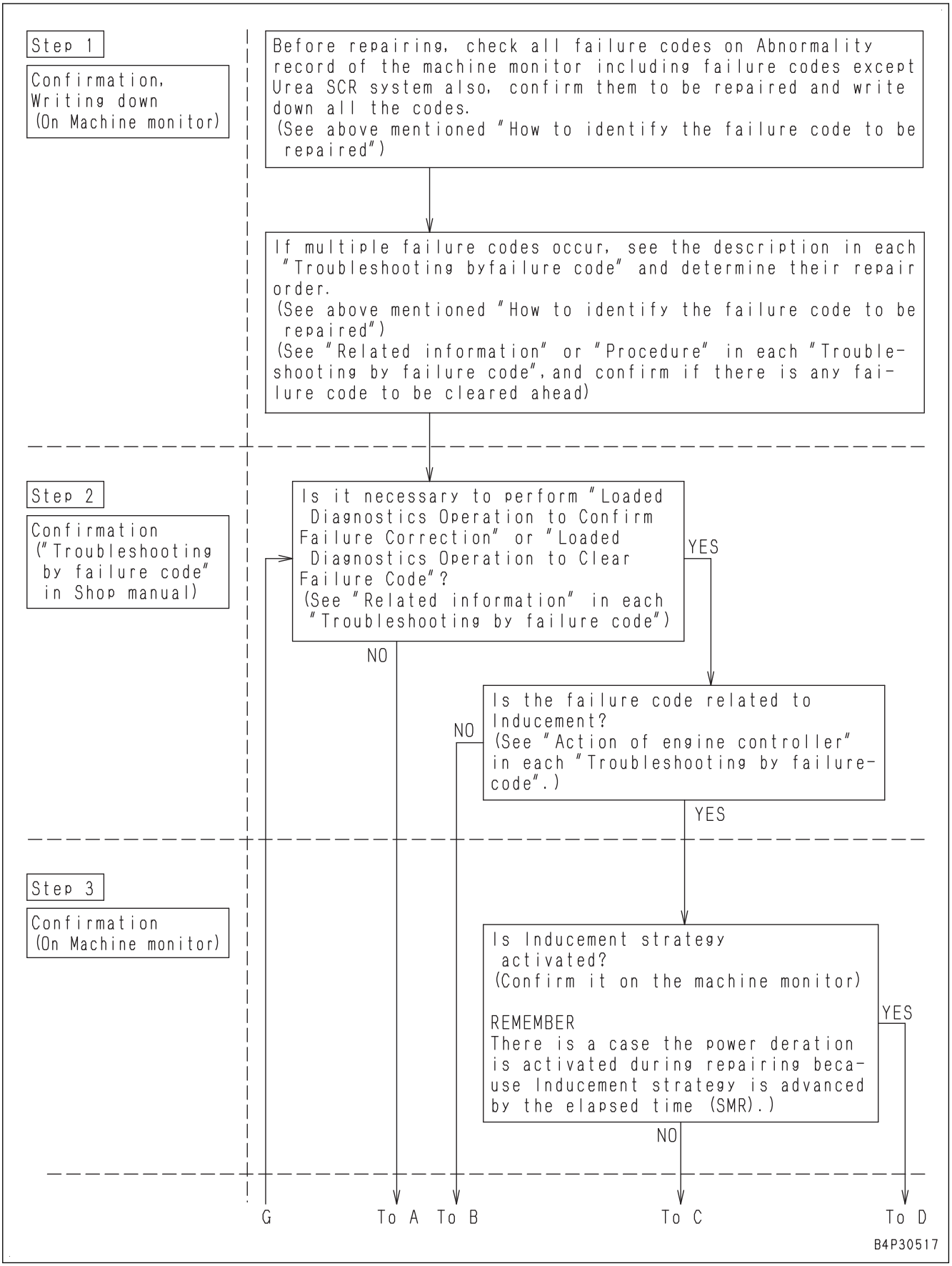
“06 From center to left end”

“07 Number of cameras”

Work Equipment Speed

Machine model				PC210LC-11			Good	No good
Engine				SAA6D107E-3				
Item	Testing conditions		Unit	Standard value for new machine	Repair limit	Measured value		
Boom RAISE	• Hydraulic oil temperature: 45 to 55 °C • Fuel control dial: MAX (High idle) position • Working mode: P (Power Mode) • Measurement range: Between bucket ground point and RAISE stroke end • Measurement posture: Fully extended boom See “Standard value table”, “Machine posture and measurement posture for measuring performance”, “Work equipment 2”.		Sec.	3.2 to 4.0	Max. 4.7			
Arm IN	• Hydraulic oil temperature: 45 to 55 °C • Fuel control dial: MAX (High idle) position • Measurement range: Between arm OUT stroke end and arm IN stroke end • Measurement posture: Boom top face horizontal See "Standard value table", “Machine posture and measurement posture for measuring performance”, “Work equipment 3”.	Working mode: P (Power Mode)	Sec.	3.1 to 3.9	Max. 4.5			
		Working mode: E (Economy Mode)		3.2 to 4.0	Max. 4.5			
		Working mode: L (Fine Operation Mode)		5.8 to 7.2	Max. 7.9			

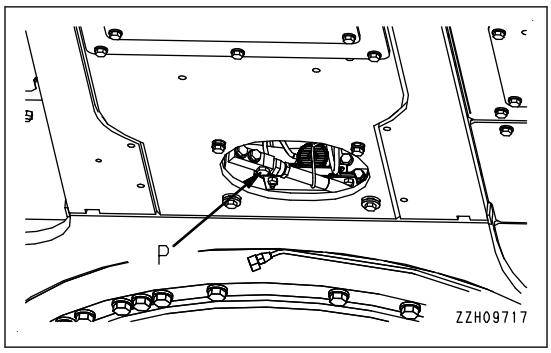
Troubleshooting Flow



5. If the oil level is above mark (H) of dipstick (G), loosen drain valve (P) and drain the excess oil.

   When draining the oil, place an oil container under drain valve (P).

6. After checking the oil level and adding oil, install dipstick (G) and oil filler cap.



Examine Oil Level in Damper Case

⚠ **When checking the oil level, place the machine on a level ground, wait at least 30 minutes after stopping the engine, and check.**

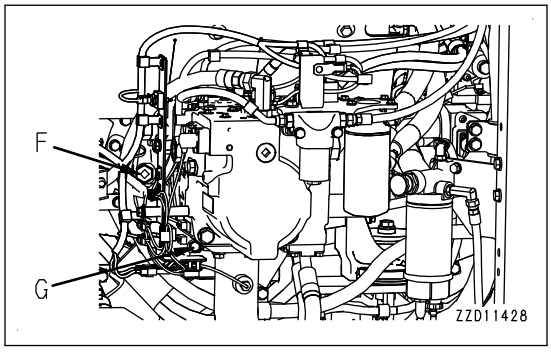
1. Open the side cover on the rear right side of the machine.
2. Remove plug (G) and check the oil level. If it is near the bottom line of the plug hole, it is appropriate.

   If it is not, remove plug (F), and add the oil until it reaches to the bottom of plug (G) through oil filler port (F).

   REMARK

   If the oil level is too high, it may cause overheating. Drain oil until it becomes specified level.

3. Install plug (G) and plug (F).
4. Close the side cover.



Examine Oil Level in Final Drive Case

⚠ **Since the oil may spurt out due to internal pressure, rotate the plug gradually from its side to release the internal pressure and then remove it carefully.**

⚠ **Immediately after the engine is stopped, its parts and oil are still very hot, and may cause burn injury. Accordingly, wait until all parts have cooled down before starting the work.**

- Refill capacity (each of right and left): 5.0 ℓ
- Prepare a hex wrench for the work.

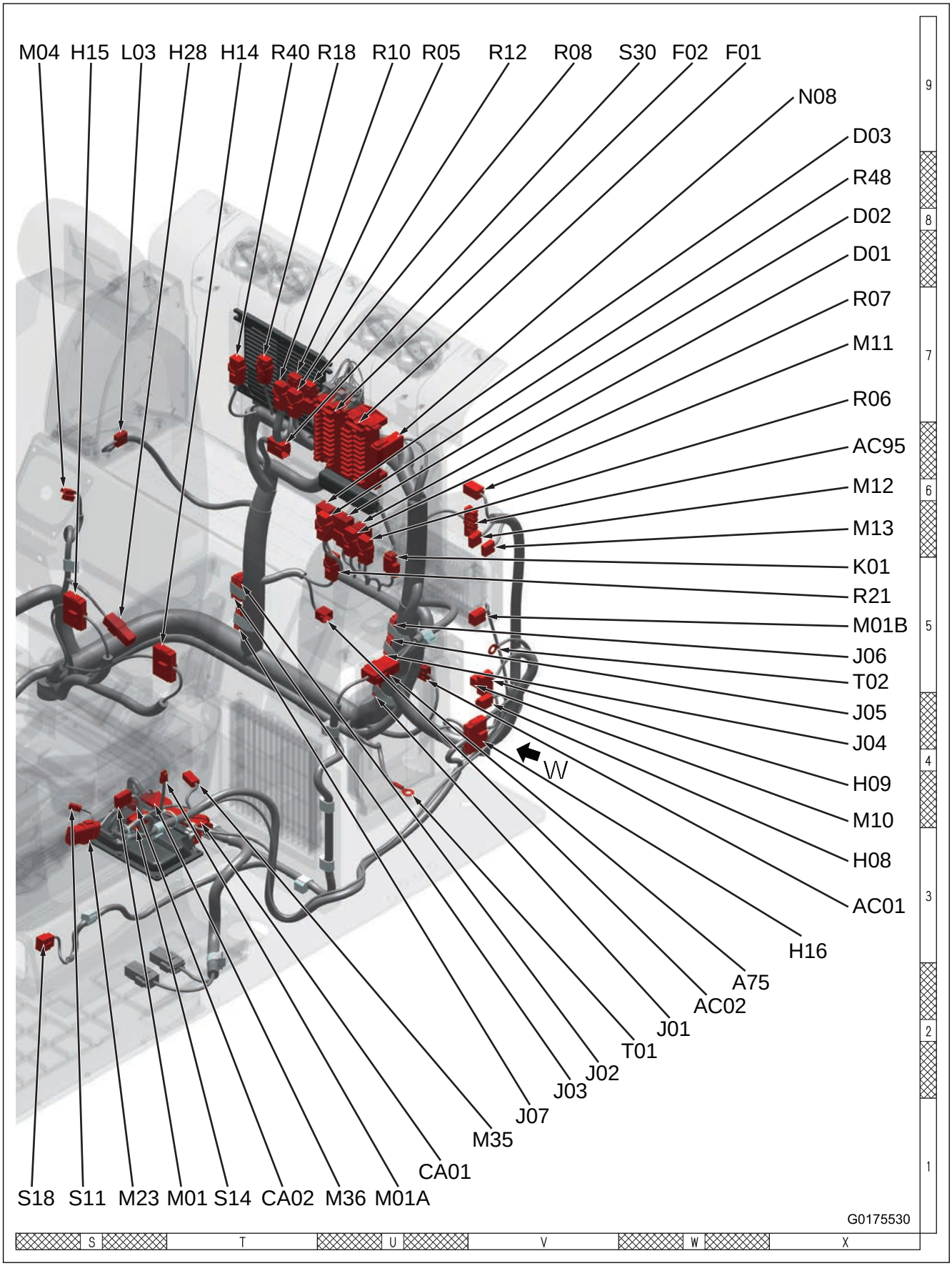
Information Shown in Troubleshooting Table

The following types of information are described in the troubleshooting list and related circuit diagram. Fully understand the description and perform troubleshooting.

Action level	Failure code	Failure	Failure name displayed on “Abnormality Record” screen of the machine monitor
Display on machine monitor	Display on machine monitor		
Details of failure	Description of the failure detected by the machine monitor or controller		
Action of controller	An action that is performed to protect the system and devices when a failure is detected by the machine monitor or controller		
Problem on machine	A problem that is displayed as a failure on the lift truck as a result of an action (shown above) that is performed by the machine monitor or controller.		
Related information	Information related to the occurred failure and its troubleshooting		

No.	Cause	Procedure, measuring location, criteria, and remarks
1	Defective ---	Contents of description • Procedure • Measuring point “Between A and B” denotes measuring values such as voltage and resistance between A and B. “Between A and ground” means the measurement of voltage, resistance or others between place A and the place which has a continuity with chassis frame such as unpainted hexagonal head bolt or bolt hole which has no rust, etc. • Criteria to judge probable causes (standard value), remarks How to use troubleshooting sheet • Perform troubleshooting procedures in following order. • If the check result does not meet the criteria, the probable cause described on the left column is the actual cause of the failure. • If the check result meet the criteria and there is no specific instruction, proceed to the next step (cause). • If a defect is found and repaired, check that the defect has been corrected. Failures in wiring harness • Open circuit When the wiring and the internal circuit of the connector are not connected with each other, and there is no continuity • Ground fault A wiring harness not to be connected to the GND (ground) circuit comes into contact with the GND (ground) circuit or chassis accidentally. • Hot short circuit A wiring harness not to be connected to the power circuit comes into contact with the power circuit accidentally. • Short circuit An independent wire in the harness abnormally comes into contact with one of another wire. (Defective insulation in connector or others)
2	Open or short circuit in wiring harness	
3	Open circuit in wiring harness (wire breakage or defective contact of connector)	
4	Ground fault in wiring harness (contact with ground circuit)	
5	Hot short circuit	
6	Short circuit in wiring harness	

4/6


M04 H15 L03 H28 H14 R40 R18 R10 R05 R12 R08 S30 F02 F01
N08
D03
R48
D02
D01
R07
M11
R06
AC95
M12
M13
K01
R21
M01B
J06
T02
J05
J04
H09
M10
H08
AC01
H16
A75
AC02
J01
T01
J02
J03
J07
M35
CA01
S18 S11 M23 M01 S14 CA02 M36 M01A
W
G0175530
9
8
7
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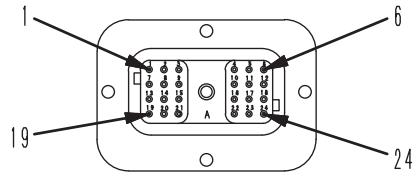
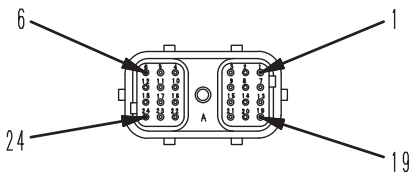
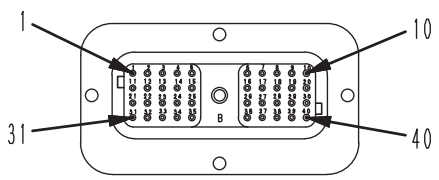
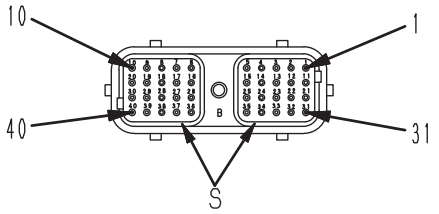
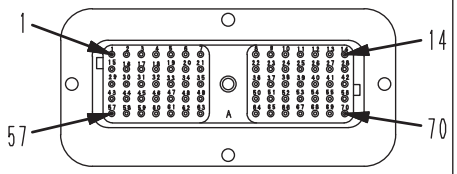
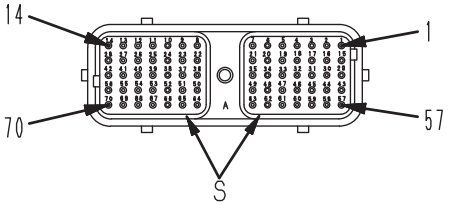
2
1
S
T
U
V
W
X

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

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

B4D18416

Failure Code Table

Failure code	Failure (Shown on screen)	Applicable equipment	Action level	History category	Remarks
6AZ0ZG	Quick Coupler Pressure Low	PUMP	L03	Mechanical system	
879AKA	A/C Recirculation Air Temperature Sensor Open Circuit	MON	-	Electrical system	
879AKB	A/C Recirculation Air Temperature Sensor Short Circuit	MON	-	Electrical system	
879BKA	A/C Fresh Air Temperature Sensor Open Circuit	MON	-	Electrical system	
879BKB	A/C Fresh Air Temperature Sensor Short Circuit	MON	-	Electrical system	
879CKA	Ventilating Sensor Open Circuit	MON	-	Electrical system	
879CKB	Ventilating Sensor Short Circuit	MON	-	Electrical system	
879DKZ	Sunlight Sensor Open Circuit or Short Circuit	MON	-	Electrical system	
879EMC	Ventilation Damper Malfunction	MON	L01	Electrical system	
879FMC	Air Mix Damper Malfunction	MON	L01	Electrical system	
879GKX	Refrigerant Pressure Input Signal Out of Range	MON	L01	Electrical system	
989L00	Engine Controller Lock Caution 1	MON	-	Electrical system	
989M00	Engine Controller Lock Caution 2	MON	-	Electrical system	
989N00	Engine Controller Lock Caution 3	MON	-	Electrical system	
A1U0N3	HC Desorb Request 1	ENG	L01	Electrical system	
A1U0N4	HC Desorb Request 2	ENG	L03	Electrical system	
A900FR	Abrupt Engine Stop by Auto Idling Stop 3	MON	L03	Mechanical system	
A900N6	Abrupt Engine Stop by Auto Idling Stop 1	MON	-	Mechanical system	
A900NY	Abrupt Engine Stop by Auto Idling Stop 2	MON	L01	Mechanical system	
AA10NX	Air Cleaner Clogging	MON	L01	Mechanical system	
AB00KE	Charge Voltage Low	MON	L03	Mechanical system	
AQ10N3	Manual Stationary Regeneration Request (KDOC Face Plugging)	ENG	L01	Electrical system	

Failure Code [879DKZ]

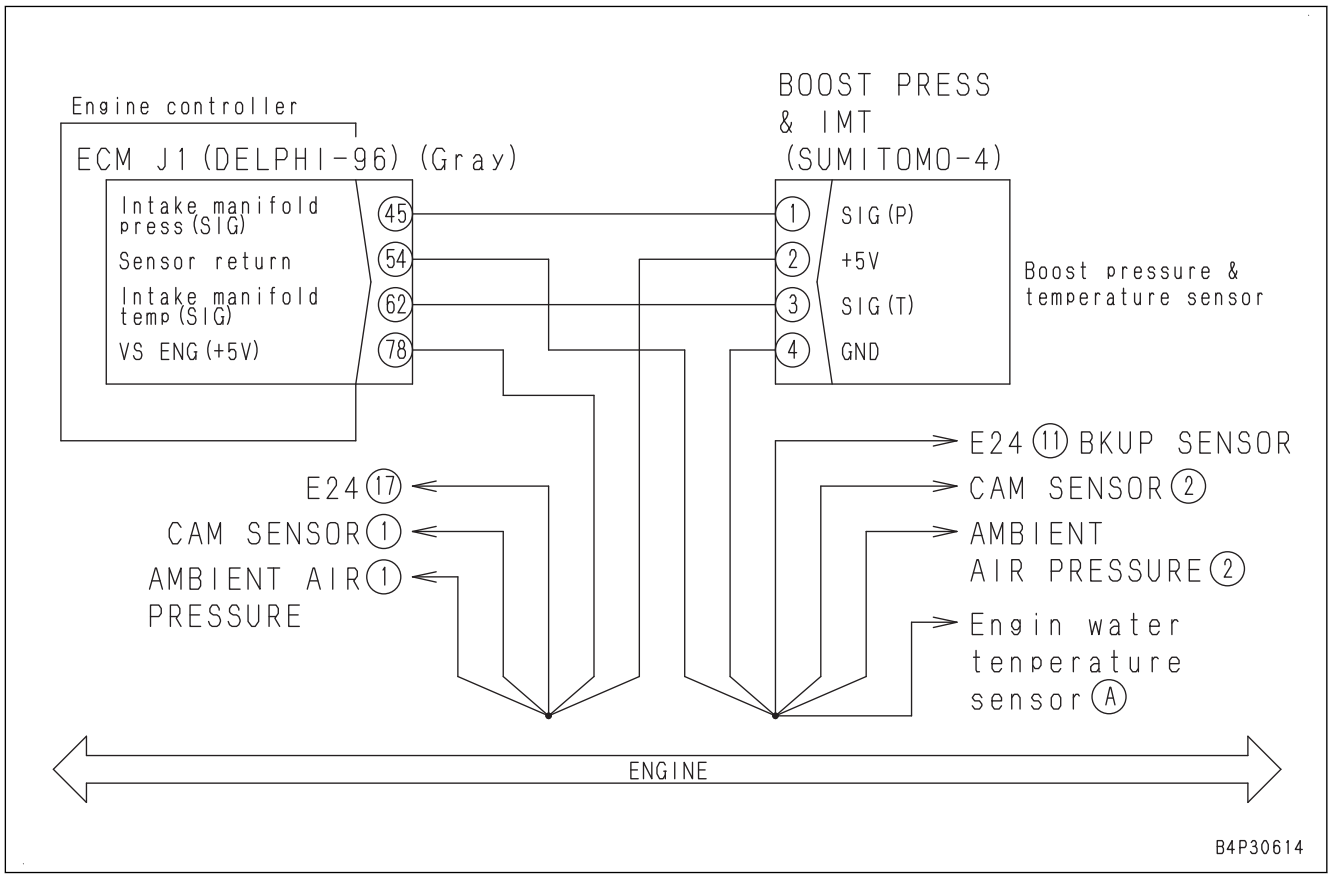
Action level	Failure code	Failure	Sunlight Sensor Open Circuit or Short Circuit (Machine monitor system)
-	879DKZ		
Details of failure	Air conditioner controller detects open or short circuit in sunlight sensor.		
Action of controller	• Air conditioner controller transmits open or short circuit information of sunlight sensor to machine monitor by CAN communication. • Ignores data of sunlight sensor and continues control of air conditioner in automatic air conditioner mode.		
Phenomenon on machine	Since air conditioner sunlight sensor has open or short circuit, sunlight intensity is not considered in automatic air conditioner mode.(Air conditioner is not affected in manual mode.)		
Related information	• After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position. • Check if this failure code is displayed on electrical system failure record screen in service mode of machine monitor. • For each connector, see 80 APPENDIX, “Installation locations of air conditioner parts and arrangement of connectors”. • Since air conditioner controller connector ACECU has no T-adapter and has small pins, perform troubleshooting by using intermediate connector (although intermediate connector has no T-adapter either, it has large pins). • When replacing air conditioner harness between air conditioner controller connector ACECU and intermediate connector, replace air conditioner unit. • T-adapter is not provided for connectors of sunlight sensor.		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective sunlight sensor	See 80 APPENDIX, “Testing sunlight sensor”.			
		Voltage	Between sunlight sensor terminals	Direct sunlight	Approx. 0.55 V
				Cloudy	Approx. 0.45 V
				Indoor	Approx. 0.4 V
2	Open circuit in wiring harness (wire breakage or defective contact of connector)	See “Testing sunlight sensor”. 1. Turn starting switch to OFF position. 2. Disconnect connector P31 and AC01.			
		Resistance	Between P31 (female) (1) and AC01 (female) (10)		Max. 1 Ω
			Between P31 (female) (2) and AC01 (female) (9)		Max. 1 Ω
3	Defective air conditioner controller	If failure code is still displayed after above checks, air conditioner controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly Replace whole assembly.)			
4	Defective air conditioner unit	If failure code is still displayed after above checks, air conditioner unit may be defective. (In case of an internal defect, troubleshooting is impossible as an assembly Replace whole assembly.)			

Failure Code [AS00R6]

Action level	Failure code	Failure	Temporary Recovery of Inducement (Engine controller system)
-	AS00R6		
Detail of failure	• Temporary recovery of inducement is implemented from the machine monitor while engine deration.		
Action of controller	• Restore engine power temporarily • The information related to this failure code is displayed on the monitor screen.		
Phenomenon on machine	• Engine power recovered temporarily.		
Related information	• This failure code is not failure but caution to display that temporary restoration from inducement has been performed on Abnormality Record screen and KOMTRAX on the machine monitor. • After performing “Temporary restoration from inducement”, “E” of this failure code that is active currently is displayed for 20 second on the “Abnormality record” screen.		

Circuit Diagram of Charge Air Temperature Sensor



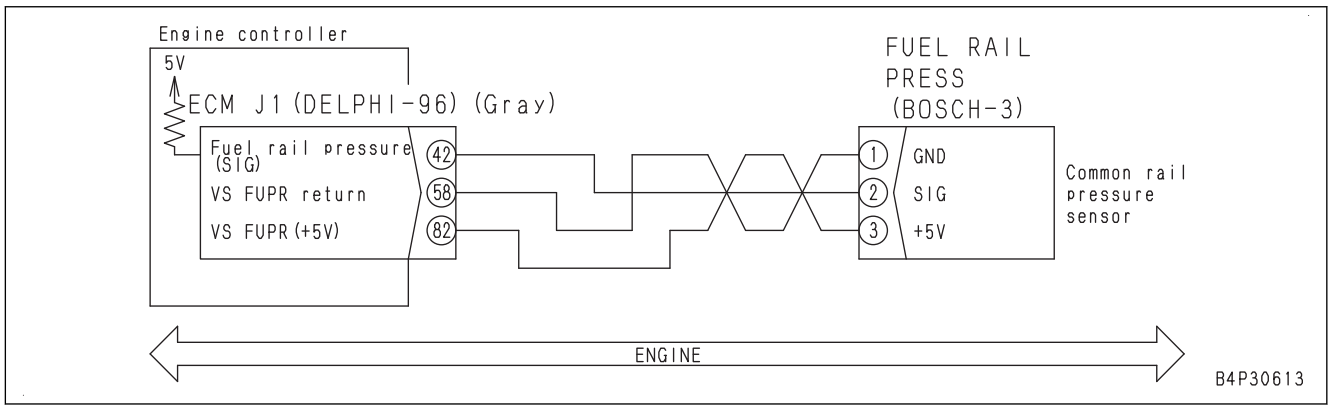
Failure Code [CA325]

Action level	Failure code	Failure	Injector #6 (L#6) Open Circuit Error or Short Circuit Error (Engine controller system)
L03	CA325		
Details of failure	Open or short circuit is detected in #6 injector circuit.		
Action of controller	None in particular		
Phenomenon on machine	• Engine power deration • Engine does not run stably.		
Related information	• After repairing, check if the failure code is cleared by the following procedure. Procedure: Start engine. • If ground fault or hot short circuit is detected, failure codes [CA323], [CA325] and [CA332] appear simultaneously. • While engine is running normally, approximately 65 V of pulse voltage is supplied to injector (+) side. Because it is pulse voltage, it cannot be measured by using multimeter.		

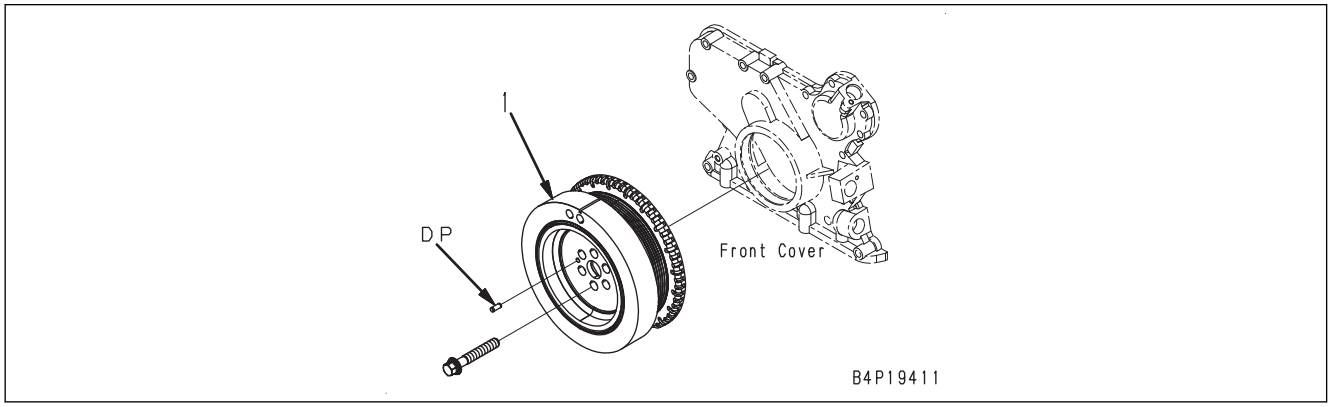
No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it. 2. Start the engine.		
		If this failure code is cleared, wiring harness connector is defective.		
2	Defective injector #6	1. Turn starting switch to OFF position. 2. Disconnect connector INJECTOR CYL 5 & 6, and connect T-adapter to male side.		
		Resistance	Between INJECTOR CYL 5 & 6 (male) (1) and (2)	Max. 2 Ω
			Between INJECTOR CYL 5 & 6 (male) (1) and ground	Min. 100 kΩ
3	Open circuit or ground fault in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector ECM J1, and connect T-adapter to female side.		
		Resistance	Between ECM J1 (female) (51) and (75)	Max. 2 Ω
			Between ECM J1 (female) (51) and ground	Min. 100 kΩ
4	Open circuit in wiring harness (wire breakage or defective contact of connector)	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 5 & 6, and connect T-adapter to each female side.		
		Resistance	Between ECM J1 (female) (51) and INJECTOR CYL 5 & 6 (female) (2)	Max. 2 Ω
			Between ECM J1 (female) (75) and INJECTOR CYL 5 & 6 (female) (1)	Max. 2 Ω

No.	Cause	Procedure, measuring location, criteria and remarks		
5	Ground fault in wiring harness (contact with ground circuit)	1. Starting switch: OFF 2. Disconnect connectors ECM J1 and FUEL RAIL PRESS, and connect T-adapter to female side of ECM J1.		
		Resistance	Between ECM J1 (female) (42) and ground	Min. 100 kΩ
6	Short circuit in wiring harness	1. Starting switch: OFF 2. Disconnect connectors ECM J1 and FUEL RAIL PRESS, and connect T-adapter to female side of ECM J1.		
		Resistance	Between ECM J1 (female) (42) and (58)	Min. 100 kΩ
7	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

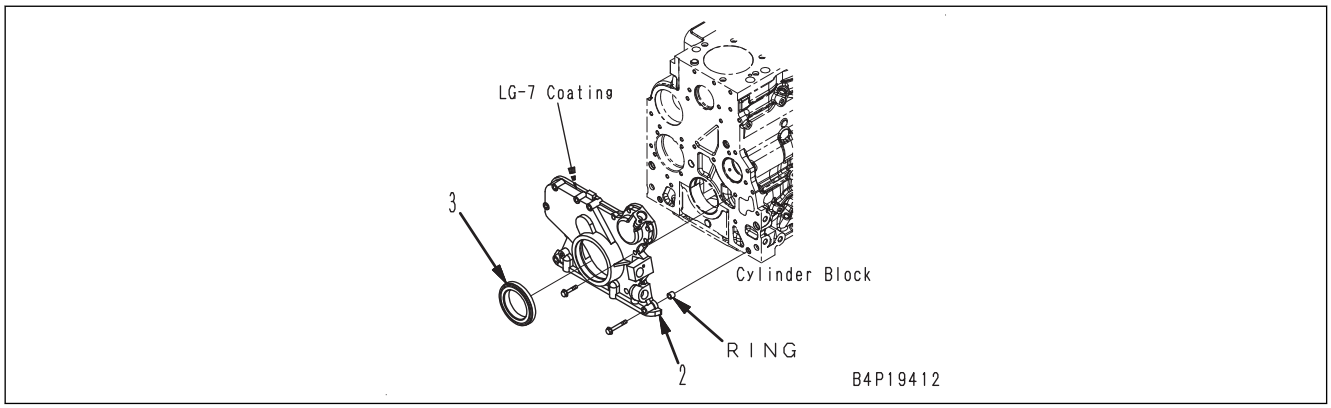
Circuit Diagram of Common Rail Pressure Sensor



(DP): Dowel pin

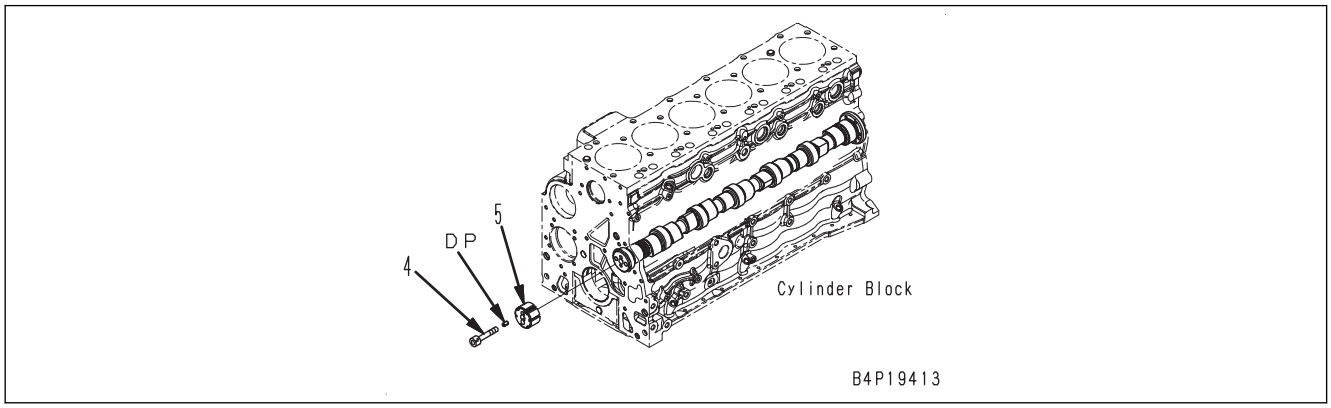


4. Remove front cover (2).
5. Remove front seal (3).
(RING): Ring



6. Check mounting bolt (4) of camshaft ring (5) for looseness.

Mounting bolt (4):
10±2 Nm {0.98±0.2 kgfm}



Installation

REMARK

For the figure, see Removal.

1. Install front cover (2).
Housing:
Liquid gasket LG-7
2. see Disassembly and Assembly, “Remove and Install Engine Front Oil Seal” and,.
   1) Install front seal (3).

No.	Cause	Procedure, measuring location, criteria and remarks
3	Mechanical failure of DEF tank heating valve	See Testing and adjusting, “service modes” of “setting and operating machine monitor”, “operating method of testing menu (SCR service test)” to perform an “DEF tank heater relay test” and check if the DEF tank heater valve is driven normally. Confirm that the DEF tank heating valve operates in response to 19102 “DEF Tank HtrValve Command” (switches between 0 and 1). 1. Remove the coolant hose from the outlet side of the DEF tank heating valve, and plug the removed hose. 2. Start the engine. 3. Perform an “DEF tank heater relay test” to drive the DEF tank heating valve. 4. Make sure that coolant flows out in response to valve open and close commands. If coolant flows out regardless of valve open and close commands, replace the DEF tank heating valve. **REMARK** If coolant flows out in response to valve operation, the DEF tank heating valve is normal.
4	Defective DEF tank temperature sensor	Perform “Loaded Diagnostics Operation To Confirm Failure Correction”. If the DEF tank temperature does not rise correctly, replace the DEF tank sensor.
5	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Loaded Diagnostics Operation to Confirm Failure Correction

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

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

1. Turn the starting switch to OFF position, and shut down the engine controller.
2. Turn the starting switch to ON position.
3. Check if monitoring code 19102 “DEF Tank HtrValve Command” is not issued (0) on “Pre-defined Monitoring” screen.
4. Start the engine and check the monitoring code 19115 “DEF Temperature in Tank”.
5. Raise monitoring code 04107 “Coolant Temperature” to the degree 10 °C or more than DEF tank temperature.
6. Check again if the monitoring code 19102 “DEF Tank HtrValve Command” is not issued (0) on the “Pre-defined Monitoring” screen.
7. Check if monitoring code 19115 “DEF Temperature in Tank” is 1 °C or less after a lapse of 5 minutes after starting the engine.
8. 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

If the monitoring code 19115 “DEF Temperature in Tank” is 2 °C or more, return to troubleshooting.

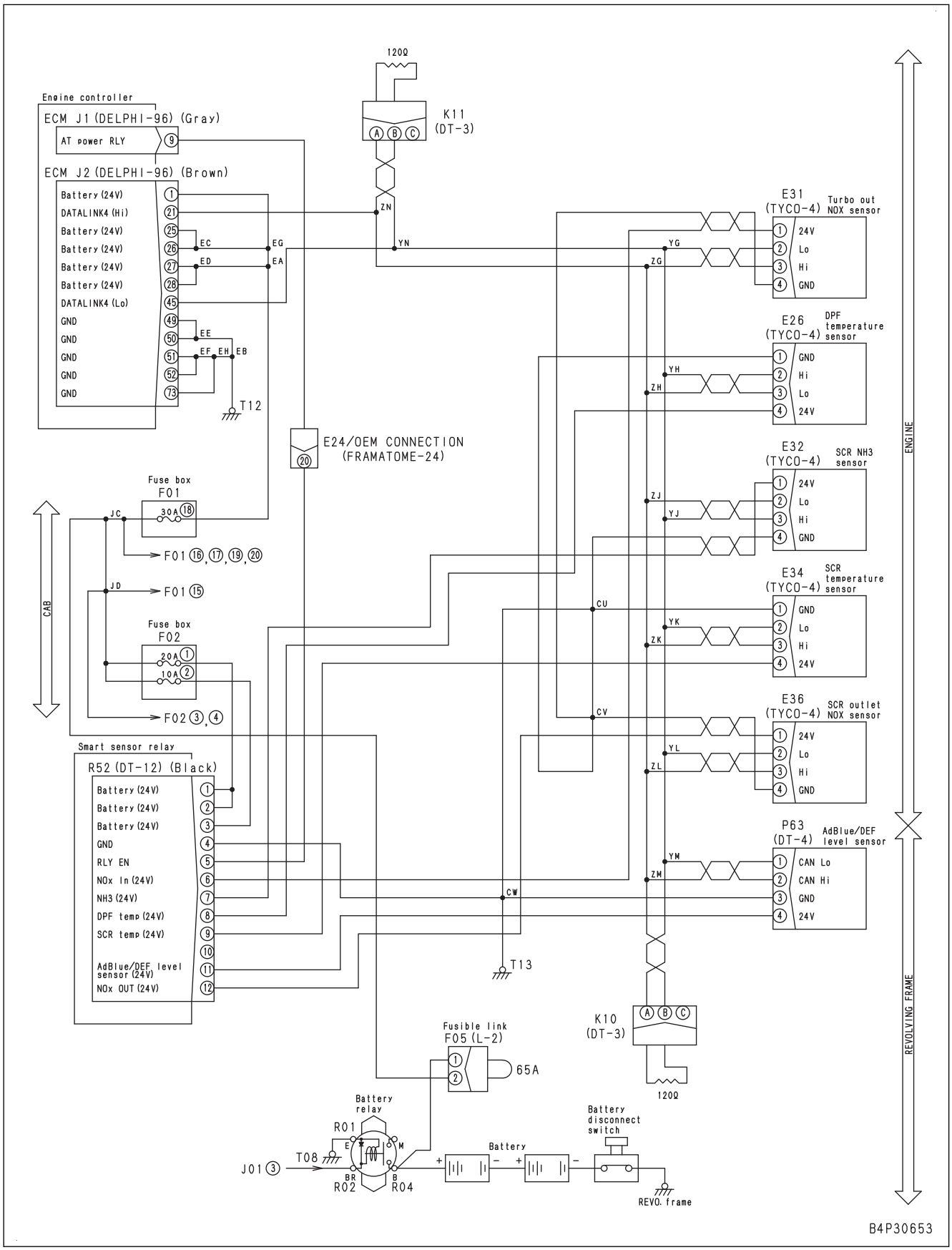
Related information	Time required for the manual stationary regeneration depends on the accumulated soot in KCSF, however, it is estimated as follows. • If soot accumulation is level 4: Approximately 40 minutes to 1 hour • If soot accumulation is level 5: Approximately 1 to 2 hours • If soot accumulation is level 6 or 7: Approximately 2 to 3 hours • If soot accumulation is level 8: Manual stationary regeneration cannot be performed. Cause for excessive soot accumulation 1. Engine runs in light load area where exhaust gas temperature is high enough to burn soot in KDPF. • Low gas temperature at entering into KDPF cause a large amount of soot to be accumulated. • To protect KDPF from soot accumulation, it is necessary to run the engine under high load. 2. There is an engine failure generating excessive black smoke. 3. The function of disable regeneration is set from monitor. • Regeneration is set not to perform automatically even if soot is accumulated. Cancel regeneration disable at safe place. Method of canceling regeneration disable Select Cancel of Regeneration Disable from Aftertreatment devices regeneration screen of user menu, and perform it. (For details, see “Procedure for Cancel of Aftertreatment Devices Regeneration Disable Setting” of “HANDLE Komatsu Diesel Particulate Filter (KDPF)” of “Handling” in Operation and Maintenance Manual.) Method of performing active regeneration for service When soot accumulation is at level 3 or lower, manual stationary regeneration can be performed only from Active Regeneration for Service. 1. Start engine. 2. Make sure that machine is in a safe condition. 3. From service menu of machine monitor, display Diagnostic Tests screen, open Active Regeneration for Service, and then perform Manual Stationary Regeneration. Method of resetting KDPF cleaning Display Testing screen from service menu of machine monitor, open KDPF Memory Reset, and perform KDPF cleaning (resetting KDPF cleaning). Method of resetting KDPF change Display Testing screen from service menu of machine monitor, open KDPF Memory Reset, and perform KDPF change (resetting KDPF change). Removing humidity in KCSF When KCSF of KDPF has been replaced, be sure to perform Manual Stationary Regeneration from Active Regeneration for Service and remove humidity, etc. in KCSF after resetting KDPF cleaning and KDPF change. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position.

Failure Code [CA2382]

Action level	Failure code	Failure	VGT Position Sensor Low Error (Engine controller system)
L03	CA2382		
Detail of failure	Low voltage is generated in VGT position sensor signal circuit.		
Action of controller	• Engine power deration. • EGR valve closes and fully opens VGT. • Regeneration control stops.		
Phenomenon on machine	Engine power deration		
Related information	• Signal voltage from VGT position sensor can be checked with monitoring function. (Code: 48701 (V)) • Position (mm) detected by VGT position sensor can be checked with monitoring function. (Code: 48700 (mm)) • Engine power deration is canceled by turning starting switch to OFF position after this failure code is cleared (note that the engine power deration is not canceled right after the failure code is cleared). • 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 if sensor connector is disconnected.		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it. 2. Turn starting switch to ON position.			
		If this failure code is cleared, wiring harness connector is defective.			
2	Defective sensor power supply system	If failure code [CA187] or [CA227] is also displayed, perform troubleshooting these first.			
		1. Turn starting switch to OFF position. 2. Disconnect connector SVGT and connect T-adapter to female side. 3. Turn starting switch to ON position.			
		Voltage	Between SVGT (female) (A) and (B)	Power supply	4.75 to 5.25 V
3	Open circuit of connector box (wire breakage or defective contact of connector)	1. Turn starting switch to OFF position. 2. Disconnect connectors INTER-CONNECT and SVGT, and connect T-adapter to male side of INTER-CONNECT or female side of SVGT.			
		Resistance	If failure code is still displayed after above checks on cause 2, this check is not required. Between INTER-CONNECT (male) (8) and SVGT (female) (A)		Max. 10 Ω
			If failure code is still displayed after above checks on cause 2, this check is not required. Between INTER-CONNECT (male) (9) and SVGT (female) (B)		Max. 10 Ω
			Between INTER-CONNECT (male) (10) and SVGT (female) (C)		Max. 10 Ω

Circuit Diagram of SCR System CAN Communication



No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective SCR outlet temperature sensor	If failure code [CA3146] or [CA3147] is displayed, perform troubleshooting for [CA3146] or [CA3147].
2	Defective KDPF system (Abnormal exhaust gas temperature to SCR)	1. If failure code [CA3251] is displayed, perform troubleshooting for [CA3251]. 2. If failure code [CA3253], [CA3254], or [CA3311] is displayed, perform troubleshooting for [CA3253], [CA3254], or [CA3311]. 3. If failure code [CA3255], [CA3256], or [CA3312] is displayed, perform troubleshooting for [CA3255], [CA3256], or [CA3312].
3	Defective SCR temperature sensor (installation error or malfunction)	See “Disassembly and assembly”, “Removal and installation of SCR temperature sensor” and fix installation error, if any.
4	Improper DEF quality	1. Turn starting switch to ON position. 2. If failure code [CA4277] is displayed or failure code [CA4277] is logged on the abnormality record screen, perform troubleshooting these first. 3. Confirm the “DEF concentration” on the Pre-defined Monitoring screen (normal value: 29 to 36 %). 4. If failure code is still displayed after above checks, it may be contaminated. Replace the DEF in the tank. 5. Replace the DEF injector. 6. Perform “Loaded Diagnostics Operation To Confirm Failure Correction”.
5	Defective SCR outlet temperature sensor (internal defect)	1. If the failure code persists after the above checks, replace the SCR temperature sensor. 2. Perform “Loaded Diagnostics Operation To Confirm Failure Correction”.
		If the failure code is cleared, the SCR temperature sensor may be defective.
6	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Loaded Diagnostics Operation to Confirm Failure Correction

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

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

REMARK

If this failure code is displayed during “Loaded Diagnostics Operation To Confirm Failure Correction” return to troubleshooting.

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

1. Turn the starting switch to OFF position, and shut down the engine controller.
2. Turn the starting switch to the ON position, and check the failure code is not displayed. If this failure code is displayed, return to troubleshooting.
3. Start engine.
4. Run the engine at low idle speed for 10 minutes.
5. Run the engine at high idle speed for 10 minutes.
6. If this failure code is not displayed, repair is completed.

Related information	**⚠ The temperature of KDPF and KDOC becomes hot (Min. 500 °C). Be careful not to get burned.** • The KDOC inlet temperature sensor, the KDOC outlet temperature sensor, and the KDPF outlet temperature sensor are integrated into one sensor controller which provides CAN communication with the engine controller. • Temperature in KDOC inlet temperature sensor can be checked by monitoring function. (Code: 47300 (°C)) • Temperature in KDOC outlet temperature sensor can be checked by monitoring function. (Code: 47400 (°C)) • Temperature in KDPF outlet temperature sensor can be checked by monitoring function. (Code: 47200 (°C)) • If the engine runs with poor combustion, (poor fuel spray due to troubles in the fuel injectors is one of the examples of root causes but not limited to it), large amount of unburnt fuel slips out with the exhaust gas and will be trapped in the aftertreatment system. The trapped unburnt fuel can start burning in the aftertreatment system once the exhaust gas becomes hot and it can keep burning. • As to procedure for accessing KDPF temperature sensor, see “50 Disassembly and Assembly”, “REMOVE AND INSTALL KDPF ASSEMBLY” and “DISASSEMBLE AND ASSEMBLE KDPF ASSEMBLY”. • Engine controller does not shut itself down immediately after turning the starting switch to the OFF position. The DEF purging starts after the starting switch is turned to the OFF position and Engine controller keeps working until the purging is completed. The purging lasts for maximun 6 minutes. Do not re-start the engine until the system operating lamp in the battery box goes out even if quick restart becomes necessary. • Engine power deration is canceled when the failure code is cleared and the starting switch is turned OFF (not canceled only by deactivation of the failure code). **NOTICE** **If this failure code is displayed, it indicates that KCSF may be damaged. After completing the repair of the problem, check the following. Replace the KCSF if the black smoke comes out of the exhaust pipe outlet.** • Start the engine, perform the quick acceleration from low idle to high idle two times, and then keep the engine running at high idle for 5 seconds. • Check that the black smoke does not come out of the exhaust pipe outlet during this quick acceleration and high idling. **NOTICE** • **This failure code requires “Loaded Diagnostics Operation To Clear Failure Code”. After investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Clear Failure Code” to make sure the failure code is cleared. (This failure code is not cleared by only turning ON the starting switch again.)** • **This failure code is cleared by performing operations indicated in “TESTING AND ADJUSTING”, “SETTING AND OPERATION OF MACHINE MONITOR”, “SERVICE MODE”, “METHOD FOR SETTING WITH TESTING MENU (ENGINE CONTROLLER ACTIVE FAULT CLEAR)”.**

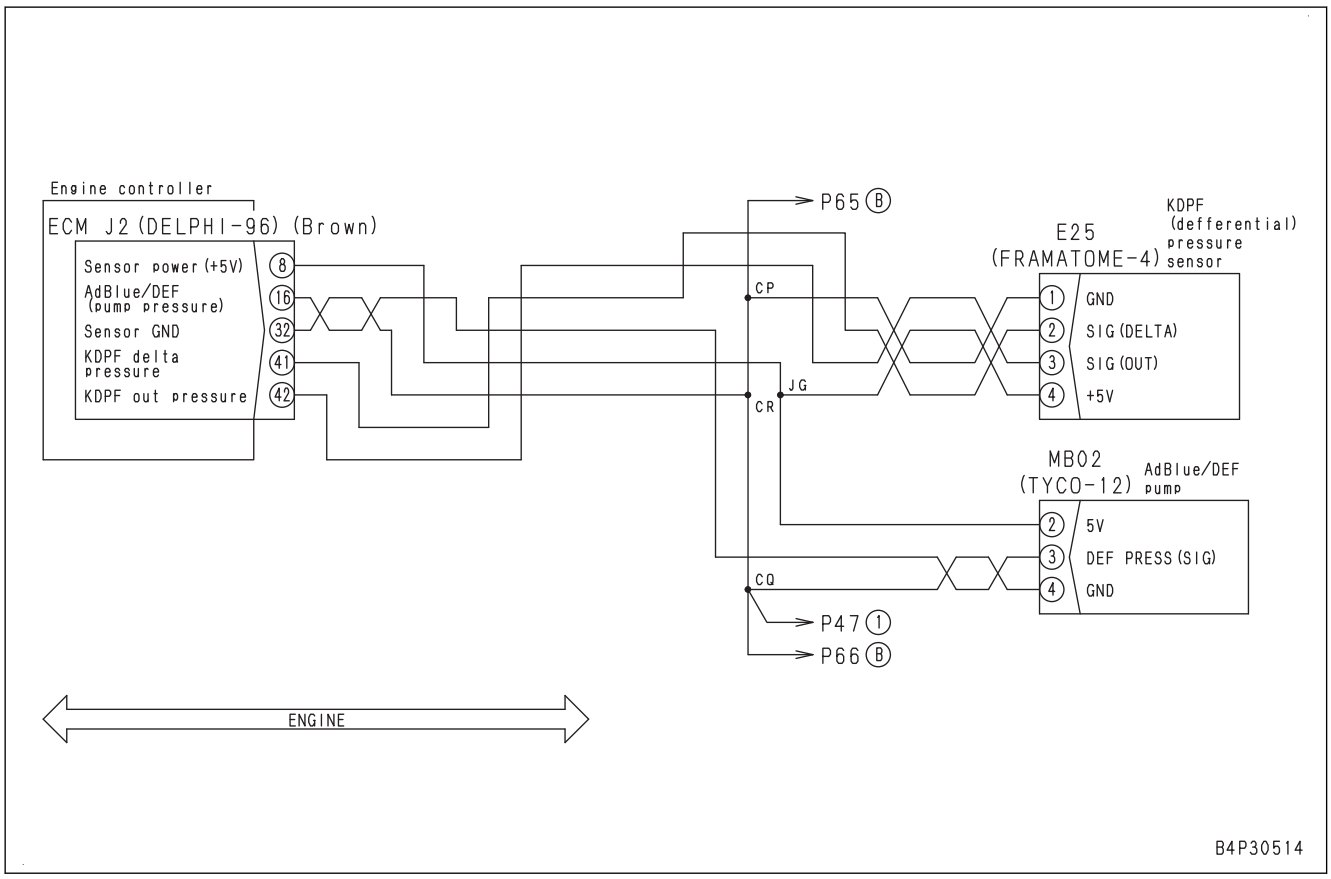
No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective KDPF outlet temperature sensor	If failure code [CA3319], [CA3321] or [CA3322] is displayed, perform troubleshooting for [CA3319], [CA3321] or [CA3322].
2	Defective intake air system	Check intake air system hoses, clamps, and tubes for damage and loosening. Repair as necessary.

Failure Code [CA3543]

Action level	Failure code	Failure	DEF Quality Error (SCR Catalyst Efficiency Low) (Engine controller system)
L01	CA3543		
Detail of failure	• The SCR catalyst efficiency is poor (65 % or less) after DEF refilling with coolant. • It is likely that the DEF quality is abnormal.		
Action of controller	• Advances to Inducement strategy.		
Phenomenon on machine	• The NOx emission likely to have increased. • Engine power deration according to inducement strategy.		

No.	Cause	Procedure, measuring location, criteria and remarks			
5	Ground fault in wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect MB02, and connect T-adapter to female side or insert T-adapter to connector ECM J2.			
		Resistance	Between MB02 (female) (3) or ECM J2 (16) and ground		Min. 100 kΩ
6	Defective DEF pressure sensor	1. Turn starting switch to OFF position. 2. Insert T-adapter into connector ECM J2 or MB02. 3. Turn starting switch to ON position.			
		Voltage	Between ECM J2 (female) (16) and (32), or between MB02 (female) (3) and (4)	Sensor output	0.25 to 4.75 V
7	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)			

Circuit Diagram of DEF Pump Pressure Sensor



4. After the procedure in 3., if failure code is not displayed after 3 minutes have passed with running the engine at low idle speed, repair is completed.

REMARK

If the turbocharger outlet NOx sensor cannot be activated (that is, the monitoring code 19203 “Turbo Outlet NOx Sensor State” remains as 0), return to troubleshooting.

Failure Code [CA3899]

Action level	Failure code	Failure	SCR NH3 Sensor Circuit Error
L01	CA3899		(Engine controller system)
Detail of failure	Ammonia sensor controller detected an ammonia sensor circuit error.		
Action of controller	• Uses DEF injection control without using the ammonia sensor. • Advances to Inducement strategy. (EU Specification).		
Phenomenon on machine	• NOx emission may increase or ammonia may be exhausted because DEF injection works inappropriately. • Engine output is reduced based on inducement strategy. (EU Specification).		
Related information	⚠ **SCR assembly, the sensor installation piping, and the sensor probe become hot (400 °C). Be careful not to get burned.** ⚠ **Be careful not to get burned by the sensor probe as it is heated by itself even if the ambient temperature is not high.** • If the ammonia sensor controller detects a circuit error of the ammonia sensor, the error is sent to the engine controller via CAN communication, and this failure code is displayed. • This failure code is displayed when a connector at the sensor probe is removed during the machine operation. In this case, failure code [CA3935] is displayed when setting the starting switch to ON position. • If the exhaust temperature is 150 °C or below, this sensor does not detect any value (The sensor does not work by only setting the starting switch to ON position even if the sensor is normal). • On the “Pre-defined Monitoring” screen troubleshooting for the engine operation state are used (the figures below denote monitoring codes). Engine operation state troubleshooting 01002 Engine Speed 19200 Exhaust Gas Flow Rate 47300 KDOC Inlet Temperature 19300 SCR Temperature 19302 SCR Outlet Temperature **NOTICE** **After investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Confirm Failure Correction” to make sure that the failure code is cleared.**		

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. Perform “Loaded Diagnostics Operation To Confirm Failure Correction”.
		If this failure code is cleared, wiring harness connector is defective.
2	Defective ammonia sensor	If the failure code persists after the above checks, the sensor may be defective. 1. Turn starting switch to OFF position. 2. Replace the ammonia sensor. 3. Perform “Loaded Diagnostics Operation To Confirm Failure Correction”.
		If the failure code is cleared, the original ammonia sensor may be defective.

Failure Code [CA4156]

Action level	Failure code	Failure	DEF Pump Heater Relay Voltage Low Error (Engine controller system)
L01	CA4156		
Detail of failure	A low voltage error is detected in DEF pump heater relay circuit.		
Action of controller	None in particular		
Phenomenon on machine	• DEF thawing defective. • NOx emission increases because DEF injection is disabled at low temperature.		
Related information	• DEF pump heater relay is driven at DEF supply system thawing/thermal insulation or “a DEF pump heater relay test”. • DEF pump heater relay is integrated in the DEF heater relay. • Troubleshooting of this failure code covers circuits from engine controller through DEF heater relay to ground. • This failure code is detected only when the DEF pump heater relay is turned ON. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Start the engine in low temperature (ambient temperature of 5 °C or below) or see “Service Mode” of “setting and operating machine monitor”, and “explanation of operating method of testing menu (SCR service test)” to perform “DEF pump heater relay test”.		

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 “DEF pump heater relay test”.		
		If this failure code is cleared, wiring harness connector is defective.		
2	Defective fuse No. 3 in fuse box F02	Check if fuse No. 3 in fuse box F02 is blown. **REMARK** If blown, perform troubleshooting for ground fault in wiring harness.		
3	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
4	Ground fault in wiring harness (Contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J2, and R53A, and connect T-adapter to any of female sides.		
		Resistance	Between ECM J2 (female) (83) and ground, or between R53A (female) (3) and ground	Min. 100 kΩ

Failure Code [CA4251]

Action level	Failure code	Failure	DEF Pump Temperature Sensor 2 In Range Error (Engine controller system)
L01	CA4251		
Detail of failure	DEF pump temperature sensor 2 response is poor.		
Action of controller	None in particular		
Phenomenon on machine	• DEF pump is not thawed • NOx emission increases because DEF injection is disabled at low temperature.		
Related information	• 19309 “DEF Pump Heater State”, 1: Thawing 2: Heating 3 or 0: OFF (the figures below denote monitoring codes). Troubleshooting for DEF pump thawing control 19107 DEF Pump Heater Control Command 19309 DEF Pump Heater State 19136 DEF Pump Temperature 19304 DEF Pump State 19400 Ambient Temperature 03203 Battery Power Supply **NOTICE** **After investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Confirm Failure Correction” to check if the repair is completed. (Clearing the failure code does not determine the completion of repair.)** **(This failure code is not cleared by starting switch at ON position or “DEF pump heater relay drive test” only.)** • **If “DEF pump temperature” is 45 °C or higher when starting switch is turned to ON position, “Loaded Diagnostics Operation To Confirm Failure Correction” cannot determine if the repair is completed successfully, therefore, wait until “DEF pump temperature” becomes 45 °C or lower.** • **In addition, if “DEF pump temperature” is 55 °C or higher, “DEF pump heater relay drive test” in “Loaded Diagnostics Operation To Confirm Failure Correction” is disabled.**		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective DEF pump system	Perform troubleshooting for failure code [CA3558] or [CA3559] or [CA2976].
2	Defective DEF pump heater relay system	Perform troubleshooting for failure codes [CA4155] and [CA4156].
3	Defective DEF pump temperature sensor	1. Perform “Loaded Diagnostics Operation To Confirm Failure Correction”. 2. If the DEF pump temperature does not rise by at least 5 °C during the test, replace the DEF pump. 3. Perform “Loaded Diagnostics Operation To Confirm Failure Correction”.
4	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Loaded Diagnostics Operation to Confirm Failure Correction

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

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

1. Turn the starting switch to ON position.

No.	Cause	Procedure, measuring location, criteria and remarks
1	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 DEF in the DEF tank. 3. If there is no DEF, or DEF level is low. 1) Refill with DEF. 2) Turn starting switch to OFF position. 3) If the value of DEF level is displayed correctly on machine monitor, perform “Loaded Diagnostics Operation To Clear Failure Code”and repair is completed. 4) If DEF level is not sensed and the color of DEF icon remains changed even after DEF has been refilled, proceed to cause 2. 4. If DEF level is normal 1) Turn starting switch to OFF position. 2) If DEF level is not sensed and the color of DEF icon remains changed even after DEF has been refilled, proceed to cause 2. 3) If the value of DEF level is displayed correctly on machine monitor, perform “Loaded Diagnostics Operation To Clear Failure Code”and repair is completed.
2	Check inside conditions of DEF tank	1. Turn starting switch OFF, and confirm the following. 1) There is no foreign material such as dirt in DEF tank. 2) There is not a problem in quality and concentration of DEF. 3) There is no foreign material such as dirt attached to DEF sensor. 4) DEF float is not stuck. 2. Repair, or replace to solve if any of these failures are found. 3. Turn starting switch to ON position. 4. If the value of DEF level is displayed correctly on machine monitor, perform “Loaded Diagnostics Operation To Clear Failure Code” and repair is completed. 5. If DEF level is not sensed and the color of DEF icon remains changed even after performing remedy for these, proceed to cause 3.
3	Defective DEF tank sensor	• Check the sensor connector for contamination and damage. • Make sure that DEF tank contains 15 % or more of DEF. 1. Turn starting switch to OFF position. 2. Replace the DEF tank sensor. 3. Turn starting switch to ON position. 4. If the value of DEF level is displayed correctly on machine monitor, perform “Loaded Diagnostics Operation To Clear Failure Code” and repair is completed.
4	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Loaded Diagnostics Operation to Clear Failure Code

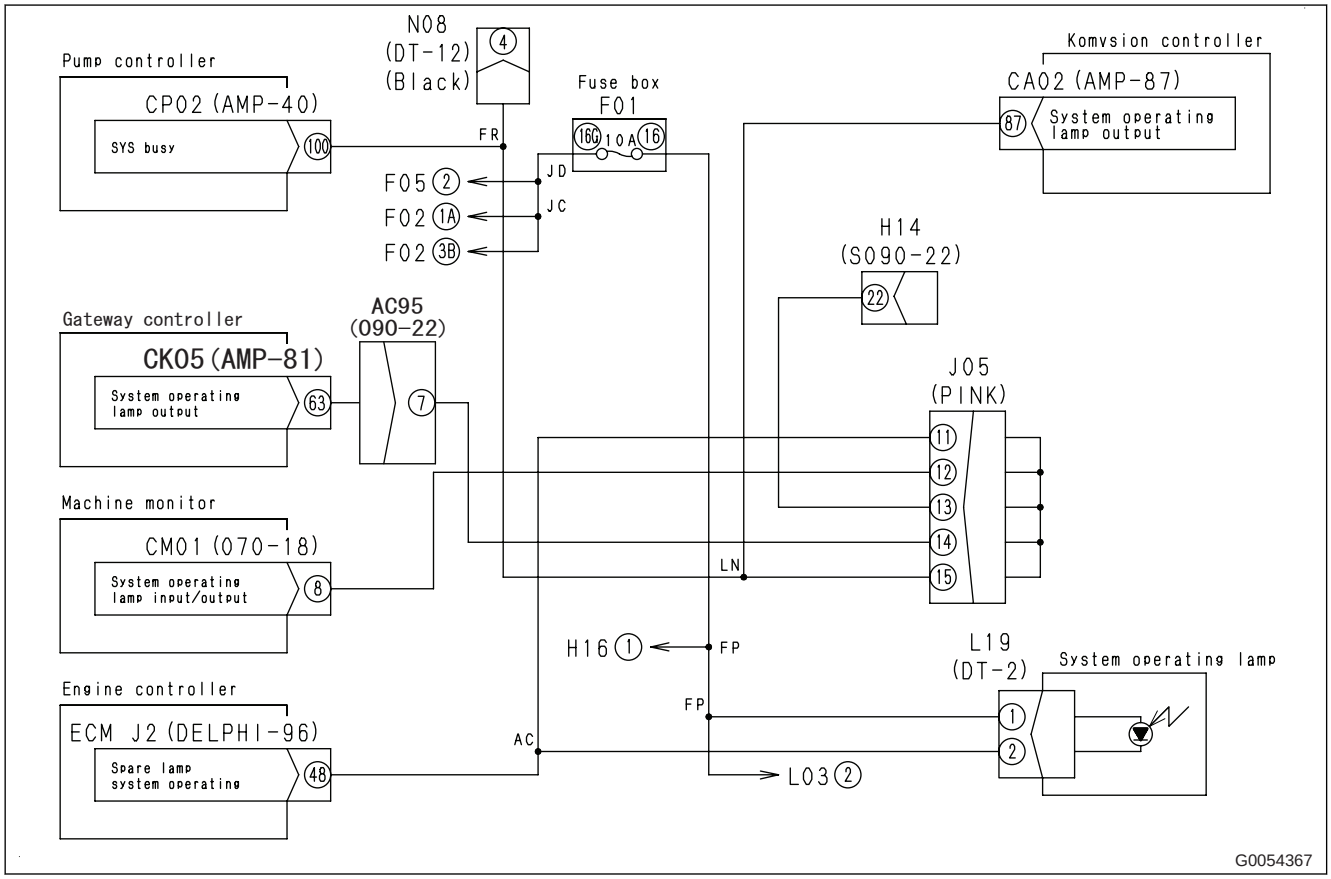
Check if the repair has been completed with the following procedure:

(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 “DEF Temperature in Tank” on “Pre-defined Monitoring” screen.

No.	Check item	Procedure of troubleshooting	Judgment and remedy	
3	Reconfirmation of check item	1. Do the previous checks again. 2. Can you identify the cause when the check is repeated?	YES	The repair is completed.
			NO	• The gateway controller can be defective. • Replace the gateway controller. • Go to “Confirmation of repair”.
4	Confirmation of repair	1. Turn the starting switch to the OFF position. 2. Connect all the component parts. 3. Turn the starting switch to the ON position to troubleshoot. 4. Is this failure code shown?	YES	Go back to the first check item.
			NO	The repair is completed.

Circuit Diagram of System Operating Lamp



<table>
<tr><th>No.</th><th>Check item</th><th colspan="3">Procedure of troubleshooting</th><th colspan="2">Judgment and remedy</th></tr>
<tr><td rowspan="5">4</td><td rowspan="5">ACC signal circuit of pump controller</td><td colspan="3">1. Turn the starting switch to the OFF position.
2. Disconnect the connector CP01. Connect the T-adapter to the female side.
3. Turn the starting switch to the ON position to troubleshoot.
4. Does the troubleshooting result agree with the standard value?</td><td>YES</td><td>• The ACC signal circuit of the pump controller is normal.
• Go to the check item of “CAN terminating resistor”.</td></tr>
<tr><td>Item</td><td>Measurement position/condition</td><td>Standard value</td><td rowspan="4">NO</td><td rowspan="4">• The ACC signal circuit of the pump controller is defective.
• Go to the next check item.</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 (2)</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="8">5</td><td rowspan="8">Open circuit in wiring harness (ACC signal circuit of pump controller)</td><td colspan="3">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. Remove the fuse No.14 in the fuse box F01.
4. Disconnect the connector CP01, and connect the T-adapter to the female side to troubleshoot.
5. 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>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="5">Resistance</td><td>Between F01-14 and CP01 (female) (24)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between F01-14 and CP01 (female) (43)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between F01-14 and CP01 (female) (80)</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>
</table>

<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="3">2</td><td rowspan="3">ACC signal circuit of air conditioner controller</td><td colspan="4">1. Turn the starting switch to the OFF position.
2. Disconnect the connector AC02. Connect the T-adapter to the female side.
3. Turn the starting switch to the ON position to troubleshoot.
4. Does the troubleshooting result agree with the standard value?</td><td>YES</td><td>• The ACC signal circuit of the air conditioner controller is normal.
• Go to the check item of “CAN terminating resistor”.</td></tr>
<tr><td>Item</td><td colspan="2">Measurement position/condition</td><td>Standard value</td><td rowspan="2">NO</td><td rowspan="2">• The ACC signal circuit of the air conditioner controller is defective.
• Go to the next check item.</td></tr>
<tr><td>Voltage</td><td colspan="2">Between AC02 (female) (4) and (1)</td><td>20 to 30 V</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Open circuit in wiring harness (ACC signal circuit of air conditioner controller)</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. Remove the fuse No.13 in the fuse box F01.
4. Disconnect the connector AC02, and connect the T-adapter to the female side to troubleshoot.
5. 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="3">NO</td><td rowspan="3">• The wiring harness has an open circuit.
• Repair or replace the defective wiring harness.
• Go to Confirmation of repair.</td></tr>
<tr><td rowspan="2">Resistance</td><td colspan="2">Between F01-13 and AC02 (female) (4)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between AC02 (female) (1) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">CAN terminating resistor</td><td colspan="4">1. Turn the starting switch to the OFF position.
2. Disconnect the connectors CM02 and K02, and connect the T-adapter to each male side to troubleshoot.
3. Does the troubleshooting result agree with the standard value?</td><td>YES</td><td>• The CAN terminating resistor is normal.
• 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="3">NO</td><td rowspan="3">• The CAN terminating resistor is defective.
• Replace the CAN terminating resistor.
• Go to Confirmation of repair.</td></tr>
<tr><td rowspan="2">Resistance</td><td colspan="2">Between CM02 (male) (7) and (9)</td><td>120 ± 12 Ω</td></tr>
<tr><td colspan="2">Between K02 (male) (A) and (B)</td><td>120 ± 12 Ω</td></tr>
</table>

<table>
<tr><th>No.</th><th>Check item</th><th colspan="3">Procedure of troubleshooting</th><th colspan="2">Judgment and remedy</th></tr>
<tr><td rowspan="4">4</td><td rowspan="4">ACC signal circuit of KomVision controller</td><td colspan="3">1. Turn the starting switch to the OFF position.
2. Disconnect the connector CA02. Connect the T-adapter to the female side.
3. Turn the starting switch to the ON position to troubleshoot.
4. Does the troubleshooting result agree with the standard value?</td><td>YES</td><td>• The ACC signal circuit of the KomVision controller is normal.
• Go to the check item of “CAN terminating resistor”.</td></tr>
<tr><td>Item</td><td>Measurement position/condition</td><td>Standard value</td><td rowspan="3">NO</td><td rowspan="3">• The ACC signal circuit of the KomVision controller is defective.
• Go to the next check item.</td></tr>
<tr><td rowspan="2">Voltage</td><td>Between CA02 (female) (96) and (104)</td><td>20 to 30 V</td></tr>
<tr><td>Between CA02 (female) (97) and (105)</td><td>20 to 30 V</td></tr>
<tr><td rowspan="6">5</td><td rowspan="6">Open circuit in wiring harness (ACC signal circuit of KomVision controller)</td><td colspan="3">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. Remove the fuse No.14 in the fuse box F01.
4. Disconnect the connector CA02, and connect the T-adapter to the female side to troubleshoot.
5. 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>Measurement position/condition</td><td>Standard value</td><td rowspan="5">NO</td><td rowspan="5">• The wiring harness has an open circuit.
• Repair or replace the defective wiring harness.
• Go to Confirmation of repair.</td></tr>
<tr><td rowspan="4">Resistance</td><td>Between F01-14 and CA02 (female) (96)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between F01-14 and CA02 (female) (97)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CA02 (female) (104) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CA02 (female) (105) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="5">6</td><td rowspan="5">CAN terminating resistor</td><td colspan="3">1. Turn the starting switch to the OFF position.
2. Disconnect the connectors CM02 and K02, and connect the T-adapter to each male side to troubleshoot.
3. Does the troubleshooting result agree with the standard value?</td><td>YES</td><td>• The CAN terminating resistor is normal.
• Go to the next check item.</td></tr>
<tr><td>Item</td><td>Measurement position/condition</td><td>Standard value</td><td rowspan="4">NO</td><td rowspan="4">• The CAN terminating resistor is defective.
• Replace the CAN terminating resistor.
• Go to Confirmation of repair.</td></tr>
<tr><td rowspan="2">Resistance</td><td>Between CM02 (male) (7) and (9)</td><td>120 ± 12 Ω</td></tr>
<tr><td>Between K02 (male) (A) and (B)</td><td>120 ± 12 Ω</td></tr>
</table>

<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="5">3</td><td rowspan="5">Open circuit in wiring harness
(Wire breakage or defective contact of connector)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors CP01 and P04, and connect T-adapters to each female side.</td></tr>
<tr><td rowspan="3">Resistance</td><td>REMARK
If power supply voltage in check on cause 1 is normal, this check is not required.
Between CP01 (female) (18) and P04 (female) (1)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (14) and P04 (female) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td>REMARK
If power supply voltage in check on cause 1 is normal, this check is not required.
Between CP01 (female) (6) and P04 (female) (3)</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Ground fault in wiring harness
(Contact with ground circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors CP01 and P04, and connect T-adapter to either female side.</td></tr>
<tr><td>Resistance</td><td>Between ground and CP01 (female) (14) or P04 (female) (2)</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Hot short circuit in wiring harness
(Contact with 5 V circuit and 24 V circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connector P04.
3. Connect T-adapter to female side of connector P04.
4. Turn starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td>Between P04 (female) (2) and ground</td><td>Max. 1 V</td></tr>
<tr><td>6</td><td>Defective pump controller</td><td colspan="3">If no failure is found by preceding checks, pump controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly).</td></tr>
</table>

Failure Code [DHSHMA]

Action level	Failure code	Failure	Travel Reverse Left PPC Pressure Sensor Defective Function (Pump controller system)
L01	DHSHMA		
Detail of failure	Signal voltage of travel reverse left PPC pressure sensor circuit is 0.3 V or less or 4.5 V or above.		
Action of controller	Controls machine by regarding travel reverse left PPC pressure sensor as 0 MPa. If cause of failure disappears, machine becomes normal by itself.		
Phenomenon on machine	Auto-deceleration function cannot be reset. Poor operability of travel		
Related information	**REMARK** If 5 V circuit (3) and ground circuit (1) of pressure sensor are connected inversely, pressure sensor will break. Accordingly, take extreme care when checking. • As T-adapter for pump controller connector is “socket-type box”, operating voltage cannot be measured at pump controller connector. • Travel reverse left PPC pressure can be checked with monitoring function. (Code: 07104 Travel reverse left PPC pressure) • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position or start engine.		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective 5 V sensor power supply 1 system	If failure code [DA25KP] is also displayed, perform troubleshooting these first.			
		1. Turn starting switch to OFF position. 2. Disconnect connector P10, and connect T-adapter to female side. 3. Turn starting switch to ON position. If power supply voltage is abnormal, proceed to check on cause 3.			
		Voltage	Between P10 (female) (3) and (1)	Power supply	4.5 to 5.5 V
2	Defective travel reverse left PPC pressure sensor (Internal defect)	1. Turn starting switch to OFF position. 2. Insert T-adapter into connector P10. 3. Turn starting switch to ON position.			
		Voltage	Between P10 (2) and (1)		0.5 to 4.5 V
		REMARK If power supply voltage is normal and sensor output voltage is abnormal, it is difficult to judge whether cause of failure is defective sensor, ground fault or hot short circuit in wiring harness. Check as below. 1. Turn starting switch to OFF position. 2. Interchange connector P10 with connector of another PPC pressure sensor. 3. Turn the starting switch to ON position and display the Electrical Sys Abnormality Record screen of the machine monitor. 4. If E mark is not displayed again in this failure code column, travel reverse left PPC pressure sensor is defective. **REMARK** After troubleshooting, restore connector.			

Failure Code [DR21KX]

Action level	Failure code	Failure	Camera 2 Picture Reverse Drive Input Out of Range (Machine monitor system)
L01	DR21KX		
Detail of failure	Voltage that is different from output voltage of machine monitor occurs in camera 2 picture reverse drive circuit (pin 6 of connector CM04).		
Action of controller	Camera 2 picture is not displayed		
Phenomenon on machine	Camera 2 picture is not displayed.		
Related information	• Normal image and mirror image if the camera 2 picture reverse output line (6 pins of connector CM04) is 0 V and 8 V (mirror image command is 8 V because the camera power supply is 8 V). • Since there may be several connectors A46, check connector A41 to identify the camera 2. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position.		

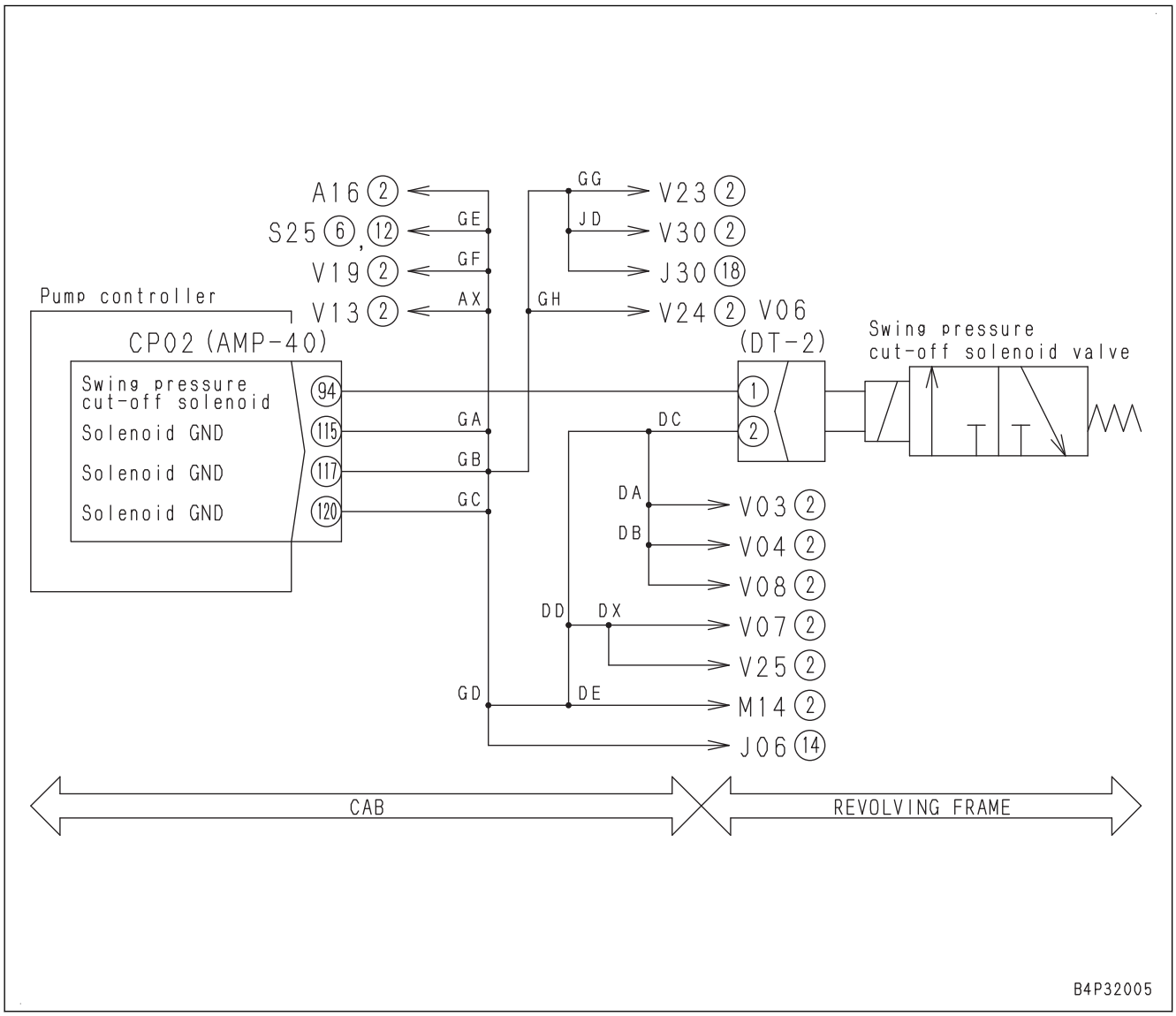
No.	Cause	Procedure, measuring location, criteria and remarks		
1	Open circuit in wiring harness (Wire breakage or defective contact of connector)	1. Turn starting switch to OFF position. 2. Disconnect connector CM04 and A46, and connect T-adapter to female side.		
		Resistance	Between CM04 (female) (6) and A46 (female) (3)	Max. 1 Ω
			Between CM04 (female) (8) and A46 (female) (4)	Max. 1 Ω
2	Ground fault in wiring harness (Contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors CM04 and A46, and connect T-adapter to either female side.		
		Resistance	Between ground and CM04 (female) (6) or A46 (female) (3)	Min. 1 MΩ
3	Hot short circuit in wiring harness (Contact with 24 V circuit)	1. Turn starting switch to OFF position. 2. Disconnect connector A46, and connect T-adapter to female side. 3. Turn starting switch to ON position. **REMARK** Check that camera 2 setting is normal image.		
		Voltage	Between A46 (female) (3) and (4) or ground	Max. 1 V
4	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector CM04 and connect T-adapter to female side.		
		Resistance	Between CM04 (female) (6) and every pin other than pin (6)	Min. 1 MΩ
5	Defective camera 2	If failure code is still displayed after above checks, camera 2 is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)		
6	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 [DW4CKY]

Action level	Failure code	Failure	PPC Lock Solenoid Hot Short Circuit (pump controller system)
L03	DW4CKY		
Details of failure	Controller detects hot short circuit in PPC lock solenoid.		
Action of controller	• None in particular • If cause of failure disappears, machine becomes normal by itself.		
Phenomenon on machine	Lock cannot be engaged by using lock lever.		
Related information	After repairing, check if the failure code is cleared by the following procedure. Procedure: Start the engine and lock the lock lever.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector V01 and connect T-adapter to female side.		
		Voltage	Between V01 (female) (1) and ground	Max. 1 V
2	Defective pump controller	If no failure is found by preceding checks, pump controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly).		

Circuit Diagram of Swing C/O Solenoid System

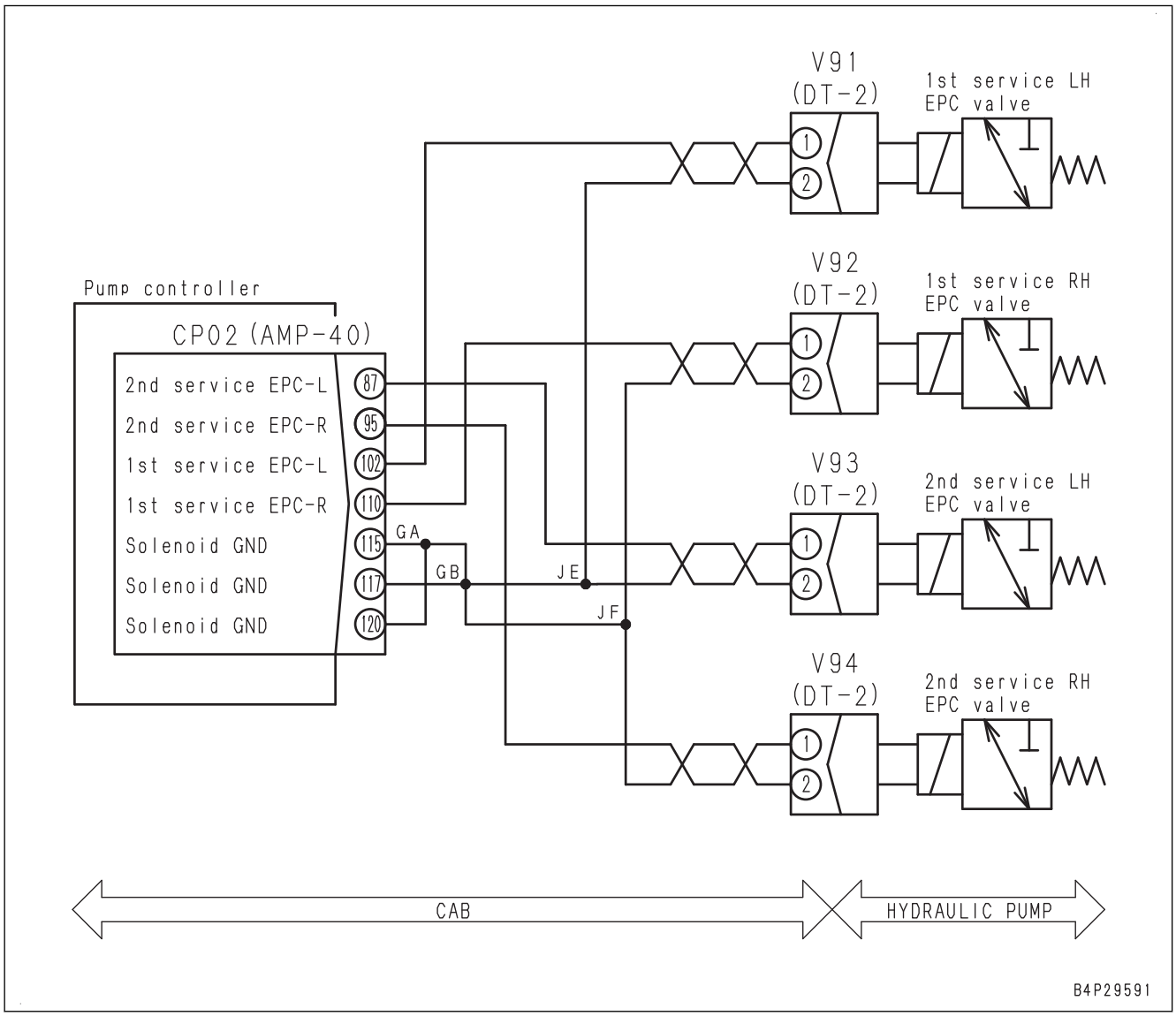


Failure Code [DXE4KB]

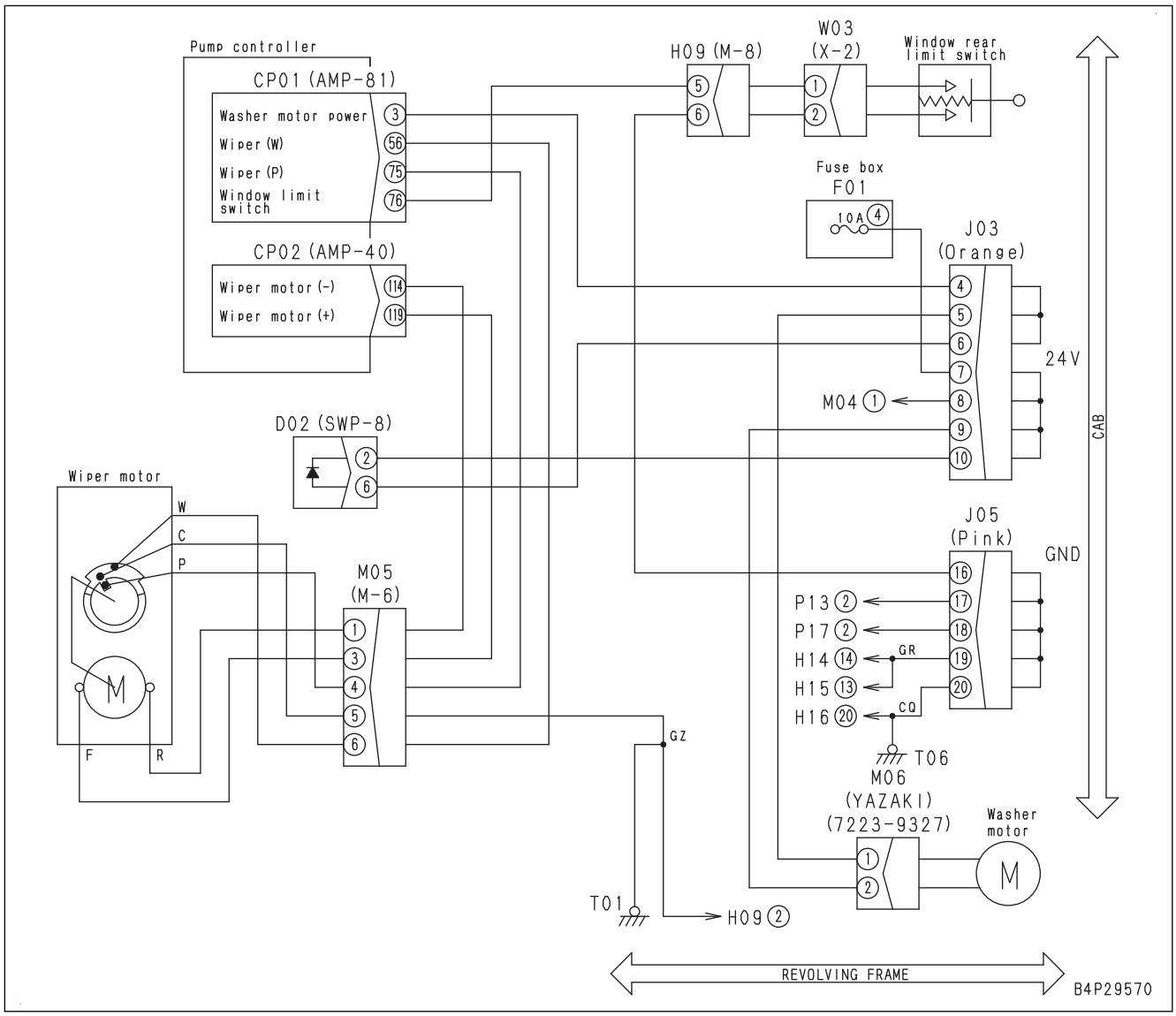
Action level	Failure code	Failure	Attachment Flow Regulating EPC Solenoid Short Circuit (Pump controller system)
-	DXE4KB		
Detail of failure	Controller detects short circuit in attachment flow rate EPC solenoid.		
Action of controller	Stops driving attachment flow rate adjustment EPC solenoid. Even 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 (service current) EPC solenoid can be checked with monitoring function. (Code: 01700 attachment solenoid current) • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position and set machine in breaker mode (B).		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective attachment oil flow adjustment EPC solenoid (internal open or ground fault)	1. Turn starting switch to OFF position. 2. Disconnect connector V30, and connect T-adapter to male side.		
		Resistance	Between V30 (male) (1) and (2)	3 to 14 Ω
			Between V30 (male) (1) and ground	Min. 1 MΩ
2	Short circuit or ground fault in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector CP02 and connect T-adapter to female side.		
		Resistance	Between CP02 (female) (97) and each of (115), (117), and (120)	3 to 14 Ω
			Between CP02 (female) (97) and ground	Min. 1 MΩ
3	Ground fault in wiring harness (Contact with ground circuit)	If failure code is still displayed after above checks, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors CP02 and V30, and connect T-adapter to either female side.		
		Resistance	Between ground and CP02 (female) (97) or V30 (female) (1) and ground	Min. 1 MΩ
4	Defective pump controller	If no failure is found by preceding checks, pump controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly).		

Circuit Diagram Related to ATT Flow Rate Adjustment EPC



Circuit Diagram of Windshield Wiper



Failure Code [F318KY]

Detail of failure	Since the voltage of the communication terminal power output line from the gateway function controller became 7 V or more while the command is OFF, a power supply voltage fault or hot short circuit is detected.
Action level	-
Action of controller	• Does not turn ON the power output of the communication terminal. • Even after the cause of failure is corrected, the machine will not return to normal until the starting switch is turned to the OFF position.
Phenomenon on machine	The KOMTRAX system does not operate normally.
Related information	

<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="2">1</td><td rowspan="2">Wiring harness and connector</td><td colspan="4" rowspan="2">1. See RELATED INFORMATION TO TROUBLESHOOT, CHECKS BEFORE TROUBLESHOOTING, ELECTRICAL EQUIPMENT. Check according to the descriptions of wiring harnesses and connectors.
2. Are the wiring harness and connectors normal?</td><td>YES</td><td>• The wiring harness and connectors are normal.
• Go to the next check item.</td></tr>
<tr><td>NO</td><td>• The wiring harness or a connector is defective.
• Repair or replace the defective wiring harness or connector.
• Go to “Confirmation of repair”.</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Hot short circuit in wiring harness</td><td colspan="4">1. Turn the starting switch to the OFF position.
2. Disconnect the connector CK06. Connect the T-adapter to the female side.
3. Turn the starting switch to the ON position.
4. Measure the voltage.
5. Does the troubleshooting result agree with the standard value?</td><td>YES</td><td>• The wiring harness has no hot short 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="2">NO</td><td rowspan="2">• The wiring harness has a hot short circuit.
• Repair or replace the defective wiring harness.
• Go to “Confirmation of repair”.</td></tr>
<tr><td>Voltage</td><td colspan="2">Between CK06 (female) (1) and (3)</td><td>Max 7 V</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Reconfirmation of check item</td><td colspan="4" rowspan="2">1. Do the previous checks again.
2. Can you identify the cause when the check is repeated?</td><td>YES</td><td>The repair is completed.</td></tr>
<tr><td>NO</td><td>• The gateway function controller can be defective.
• Replace the gateway function controller.
• Go to “Confirmation of repair”.</td></tr>
</table>

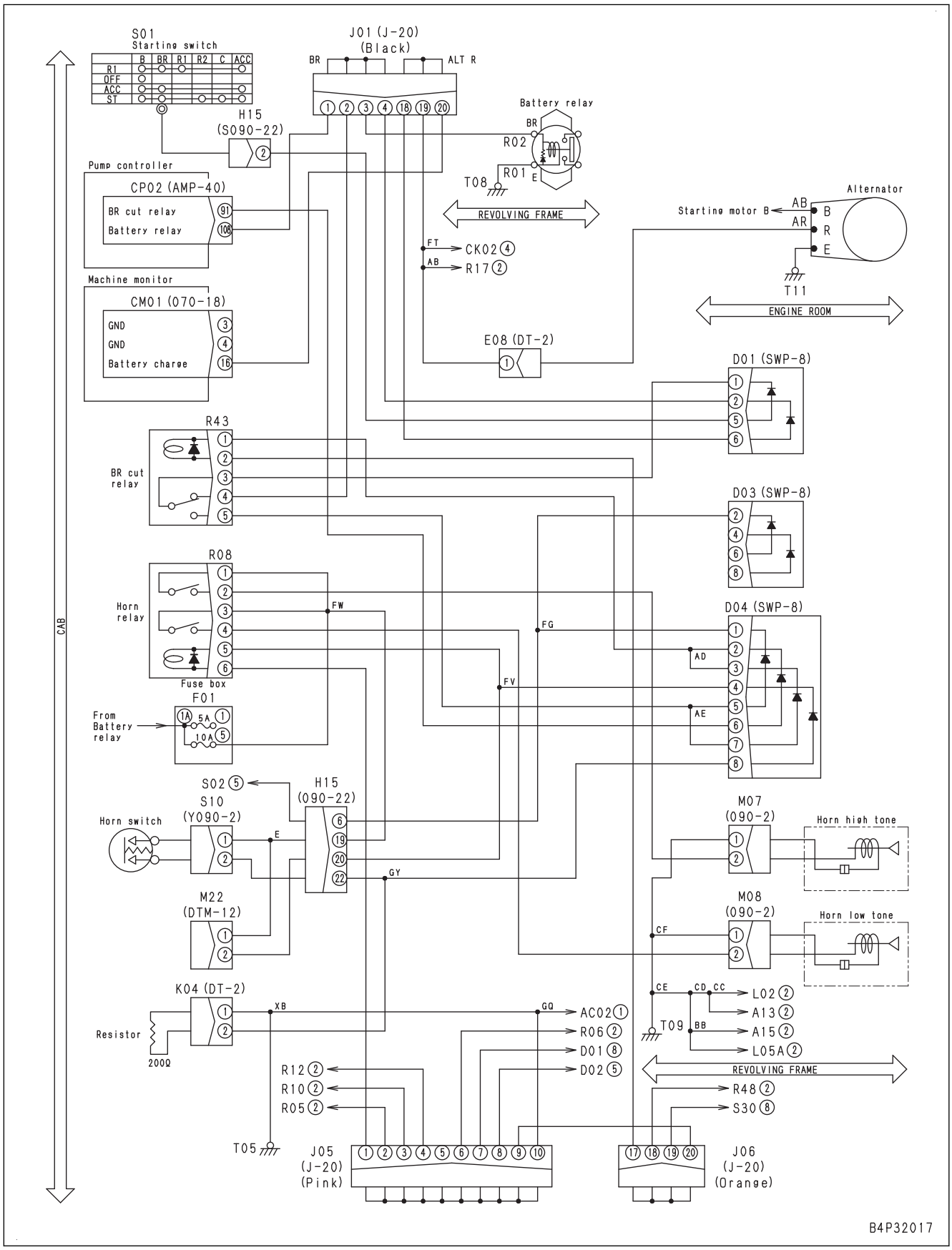
<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Defective diode D02
(Internal open or short circuit)</td><td colspan="4">If no failure is found in primary side by check on cause 3, this check is not required.
1. Turn starting switch to OFF position.
2. Disconnect connector D02 and connect T-adapter to diode.</td></tr>
<tr><td rowspan="2">Continuity</td><td colspan="2">Between D02 (male) (1) (+) and (5) (-)</td><td>No continuity</td></tr>
<tr><td colspan="2">Between D02 (male) (5) (+) and (1) (-)</td><td>Continuity</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Defective starting switch</td><td colspan="4">If no failure is found in primary side by check on cause 3, this check is not required.
1. Turn starting switch to OFF position.
2. Turn battery disconnect switch to OFF position.
3. Disconnect connector H15.
4. Turn starting switch to OFF and HEAT positions to perform troubleshooting.</td></tr>
<tr><td rowspan="2">Resistance</td><td rowspan="2">Between starting switch terminal B and terminal R1</td><td>Turn starting switch to OFF position.</td><td>Min. 1 MΩ</td></tr>
<tr><td>Turn starting switch to HEAT position.</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Defective intake air heater (internal open circuit)</td><td colspan="4">1. Turn starting switch to OFF position.
2. Disconnect E01 terminal.</td></tr>
<tr><td>Continuity</td><td colspan="2">Between E01 terminal and ground</td><td>Continuity</td></tr>
<tr><td>7</td><td>Defective heater relay
(Does not turn ON) (terminal R16A)</td><td colspan="4">If failure code is still displayed after above checks on cause 3 and heater relay operation sound is not heard, the heater relay is defective.</td></tr>
<tr><td rowspan="4">8</td><td rowspan="4">Ground fault in wiring harness (contact with ground circuit)</td><td colspan="4">If failure code is still displayed after above checks on cause 2, this check is not required.
1. Turn starting switch to OFF position.
2. Disconnect connectors H15, CM01, and D02, terminals R15 and E01 and starting motor terminal B terminal.</td></tr>
<tr><td rowspan="3">Resistance</td><td colspan="2">Between heater relay terminal R15 (wiring harness side) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Between heater relay R16B (contact side input terminal) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Between heater terminal E01 (wiring harness side) and ground</td><td>Min. 1 MΩ</td></tr>
</table>

E-26 When Auto-Decelerator Switch is Operated, Auto-Decelerator Monitor Does Not Come On or Does Not Go Out

Failure	When auto-deceleration switch is operated, auto-deceleration monitor does not light up or does not go off.
Related information	• State of auto-deceleration switch signal 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.)

Circuit Diagram of Horn



Failure mode	Component causing failure		Swing motor						Swing machinery	Center swivel joint	Travel motor						Hydraulic cylinder	Fan clutch	Exterior components around fan	Alternator belt
			Piston motor	Safety valve	Check valve	Suction valve	Shock-less valve	Parking brake			Piston motor	Counterbalance valve	Check valve	Safety valve	Parking brake	Final drive				
Work equipment, Swing, Travel	All of work equipments, swing and travel lack speed or power.																			
	Engine speed drops significantly or engine stalls.																			
	All of work equipment, travel and swing do not work																			
	Unusual noise is heard from around hydraulic pump.																			
	Fine control performance or response is poor.																			
Work equipment	Boom speed or power is low.																○			
	Arm speed or power is low.																○			
	Bucket speed or power is low.																○			
	Work equipment does not move in single operation.																			
	Hydraulic drift of work equipment is large.	Boom															○			
		Arm															○			
		Bucket															○			
	Time lag of work equipment is large.																			
	When single work equipment is relieved hydraulically, other work equipment moves.																			
	One-touch power maximizing function does not operate.																			
	In combined operation of work equipment, equipment having heavier load moves slower.																			
Swing + Boom	In combined operations of swing and boom RAISE, boom rising speed is low																			
Swing + Travel	In combined operation of swing and travel, travel speed drops largely.																			

H-14 Time Lag of Work Equipment is Large

Failure	Time lag of work equipment is large.
Related information	• Perform all troubleshooting with working mode set in power mode (P). • If any failure code is displayed, perform troubleshooting for that failure code first. (DXE0KA, DXE0KB)

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Malfunction of LS-EPC valve	Be ready with engine stopped, then perform troubleshooting with engine at high idle.			
		LS-EPC output pressure	Travel speed: Lo	Travel lever: Fine control	Approx. 2.45 MPa {Approx. 25 kgf/cm^2}
			Travel speed: Hi	Travel lever: Fine control	0 MPa {0 kgf/cm^2}
2	Malfunction of boom control valve (regeneration valve)	Release remaining pressure from hydraulic tank and piping, and then perform troubleshooting with engine stopped.			
		• Check for stuck or seized boom regeneration valve in control valve body (valve should move smoothly). • Check that regeneration valve (check valve) is seated on control valve in position (it is not stuck halfway), and then remove it from control valve body and check it for defects and dirt. • Check spring of check valve for fatigue and deformation. Be careful to prevent foreign matter from entering the valve during restoration.			
3	Malfunction of arm control valve (regeneration valve)	Release remaining pressure from hydraulic tank and piping, and then perform troubleshooting with engine stopped.			
		• Check for stuck or seized arm regeneration valve in control valve body (valve should move smoothly). • Check that regeneration valve (check valve) is seated on control valve in position (it is not stuck halfway), and then remove it from control valve body and check it for defects and dirt. • Check spring of check valve for fatigue and deformation. Be careful to prevent foreign matter from entering the valve during restoration.			
4	Malfunction of control valve (suction safety valve)	• Check relief pressure of each work equipment. If relief pressure is unusual, suction safety valve of control valve (boom: head, arm, bucket: bottom) may malfunction. Check it. (See H-mode “Speed or power of boom is low”,“Speed or power of arm is low”,“Speed or power of bucket is low”) • You can replace suction safety valve with other one and check whether failure symptom changes for judgment.			
5	Malfunction of control valve (pressure compensation valve)	• Check whether each cylinder moves slowly when performing hydraulic relief of other work equipment. (If it moves, it is abnormal.) • If any failure is found in above check items, interchange pressure compensation valves on both ports, and check whether failure symptom changes. (Each area ratio is different, so be sure to restore it after checking the symptom.)			

S-1 Engine Does Not Crank When Starting Switch is Turned to Start Position

Failure	Engine does not crank when starting switch is turned to “START” position
Related information	• See E-mode in “ENGINE DOES NOT START (ENGINE DOES NOT CRANK)” for electrical system troubleshooting • If any failure code is displayed, perform troubleshooting for that code first.

No.	Cause	Point to check, remarks	Remedy
1	Defective starting circuit wiring system	When starting switch is turned to START, starting motor pinion does not pop out.	Perform troubleshooting of “ENGINE DOES NOT START (ENGINE DOES NOT CRANK)” in E mode, and take corrective action.
2	Defective starting motor (safety relay portion)	• Starting motor pinion makes grating noise (When starting switch is turned to START position, starting motor pinion pops out). • Starting motor pinion comes off halfway (When starting switch is turned to START position, starting motor pinion pops out). • Starting motor makes flapping sound and does not turn (When starting switch is turned to START position, starting motor pinion protrudes) (Reference: “Flapping sound” means sound made when starting motor pinion pops in and out)	Perform troubleshooting of “ENGINE DOES NOT START (ENGINE DOES NOT CRANK)” in E mode, and take corrective action.
3	Breakage of flywheel ring gear	If starting motor pinion makes grating noise and the starting motor does not turn, visually check the flywheel ring gear.	Replace if the item is broken
4	A crack on the EGR cooler (Reference: coolant contained in exhaust)	Disconnect the inlet and outlet gas piping of EGR cooler to check if water containing coolant is draining. **REMARK** Moisture in exhaust gas may be condensed, but this is not a failure. Check if it is coolant or not.	After EGR cooler replacement, drain the water in the engine cylinder.

S-22 Active Regeneration Continues Long

Failure	Active regeneration takes time.
Related information	• If any failure code is displayed, perform troubleshooting for that code first. • Since the time required for manual stationary regeneration depends on the accumulated soot level, see failure code CA2639.

No.	Cause	Point to check, remarks	Remedy
1	Defective operation of VGT	VGT may have a mechanical failure. Check it. If KDOC inlet temperature: approximately 250 °C or below and VGT solenoid current: approximately 1000 mA are kept after active regeneration for service, VGT is defective (See failure code CA2639 because approximate manual stationary regeneration time depends on the soot level estimation).	Replace VGT assembly (including hydraulic actuator and VGT position sensor)
2	Bad exhaust gas color	Remove plug of bore for measuring the exhaust gas color in front of KDPF, and check color of the exhaust gas coming out of the bore. (Reference: See Testing and Adjusting “Examine Exhaust Gas Color”)	Perform troubleshooting for “Exhaust gas is black”
3	Blocked KDOC when exhaust gas color is defective	If regeneration frequently is not improved after a corrective action for cause 2, KDOC is blocked.	KDOC cleaning
4	Coolant leakage to exhaust system	Check for lowering of coolant level.	Perform troubleshooting of “WATER MIXES INTO ENGINE OIL (MILKY)” in S mode, and take corrective action.
5	Blocked KCSF caused by coolant leakage to exhaust system	Check for clogged KCSF.	KCSF cleaning
6	Unspecified fuel is used.	Unspecified fuel is used.	Use recommended fuel described in Operation and Maintenance Manual.
7	Urea deposit (white deposit) is accumulated in the DEF mixing tube.	Check whether urea deposit is accumulated in the DEF mixing tube.	• Cleaning inside DEF mixing tube • Perform service regeneration.
8	Defective DEF injector	• Perform DEF injector injection amount test and detect any leakage. • Perform troubleshooting for failure code [CA3568] and [CA3582].	Replacement of DEF injector
9	Deteriorated KDOC by the use of non-designated fuel	KDOC deterioration due to high volume of sulfur (If regeneration time is not improved after a corrective action for causes 1 to 8, KDOC is deteriorated).	KDOC replacement
10	Blocked KDOC	If regeneration time is not improved after a corrective action for causes 1 to 9, KDOC is blocked.	KDOC cleaning
11	Damaged KDOC	Check for damaged KDOC.	KDOC replacement

Tools for Disassembly and Assembly of Carrier Roller Assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	790-434-1660	Installer	■	1			
B	793T-613-1380	Spacer	●	1		○	
C	790-201-2820	Spacer	■	1			
D	793T-417-1310	Spacer	●	1		○	
E	796T-430-1310	Push tool	■	1		○	
F	-	Washer	■	1			

Tools for Removal and Installation of Counterweight Assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	-	Lifting tool eyebolt M48x2	●	1			
B	-	Socket wrench (Width across flats46 mm)	●	1			
C	-	Impact wrench	●	1			

Tools for Disassembly and Assembly of Center Swivel Joint Assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	790-101-2501	Push-puller	●	1			
	790-101-2510	• Block		1			
	790-101-2520	• Screw		1			
	790-112-1180	• Nut		1			
	790-101-2540	• Washer		1			
	790-101-2630	• Leg		2			
	790-101-2570	• Plate		4			
	790-101-2560	• Nut		2			
	790-101-2680	• Adapter		2			
	790-201-1410	Plate	●	1			

How to Remove Cylinder Head Assembly

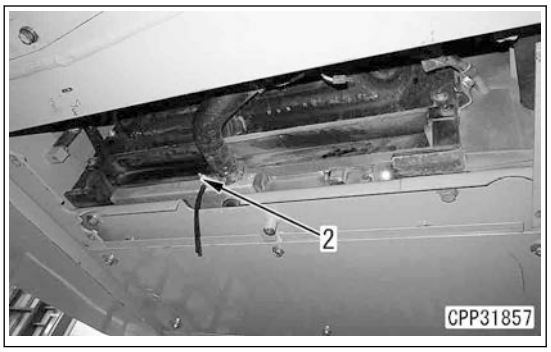
Undercover

1. Remove undercover (1).

Draining

2. Drain the coolant through drain valve (2). (Inside diameter of drain hose7 mm)

   Radiator:
   30.7 ℓ



Engine hood

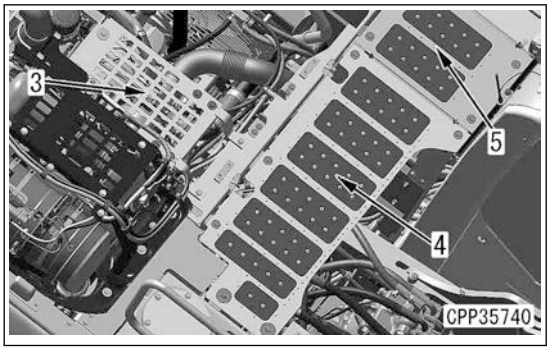
3. Remove the engine hood assembly. For details, see “Remove and Install Engine Hood Assembly”.

KDPF and SCR assembly

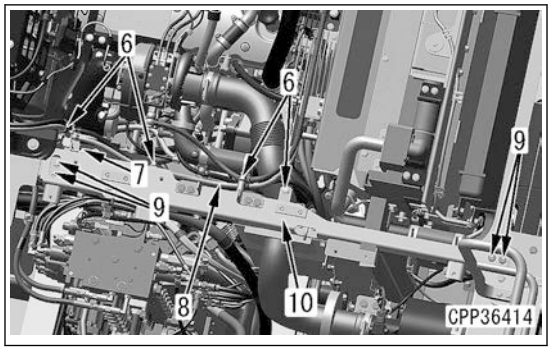
4. Remove KDPF and SCR assembly. For details, see “Remove and Install KDPF and SCR Assembly”.

Step, Cover

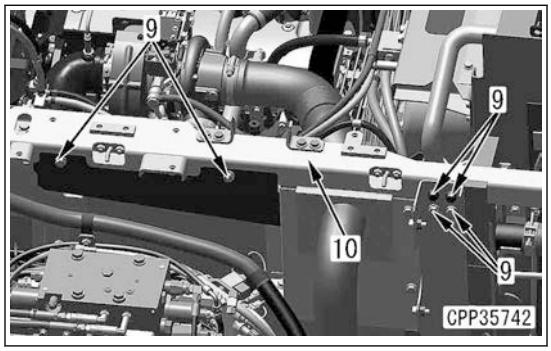
5. Remove step (3), and covers (4) and (5).



4. Remove clips (6) (3 places).
5. Remove bracket (7), and move DEF hose (8) aside so that it does not hinder the work.



6. Remove mounting bolts (9) (10 pieces), and remove frame (10).

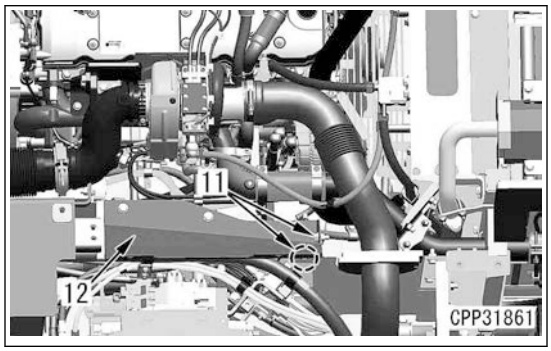


7. Remove mounting bolts (11) (2 pieces), and remove cover (12).

   ⚠ Prevent harness and hose from being caught

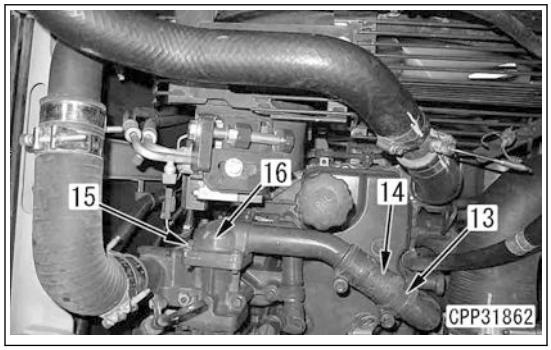
   REMARK

   Cover (12) consists of 2 stages (upper and lower). However, it is not required to separate them since the cover can be removed as a unit.



Hose, wiring

8. Loosen hose clamp (13) and remove hose (14).
9. Remove mounting bolts (15) (4 pieces), and remove EGR piping flange (16).



10. Disconnect connectors (17), (18), and (19).

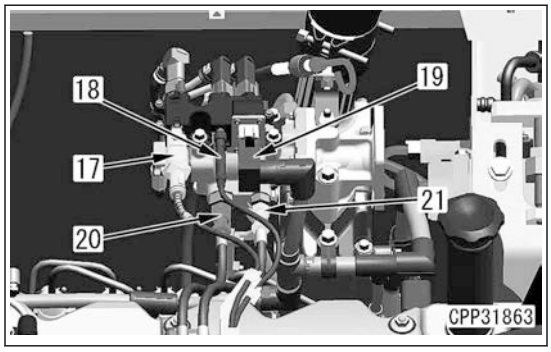
    Connector (17): KVGT position sensor (SVGT)

    Connector (18): KVGT speed sensor (VGT_REV)

    Connector (19): Connector box (INTER CONNECT)
11. Disconnect hoses (20) and (21).

    ⚠ When disconnecting the hoses, always disconnect at the intake manifold side to prevent the oil from splashing to high temperature area which causes fire.

    Hose (20): KVGT control hydraulic circuit



Aftercooler assembly

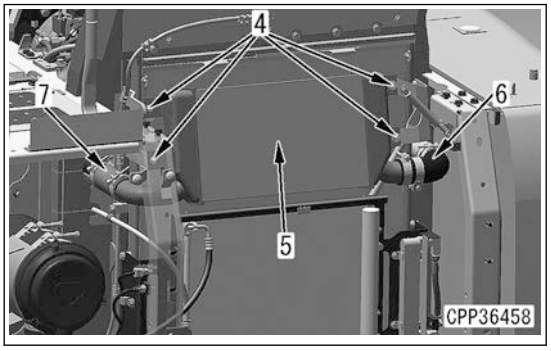
3. Sling aftercooler assembly (5), hold it, and remove mounting bolt (4).
4. Disconnect hoses (6) and (7) from aftercooler assembly (5).

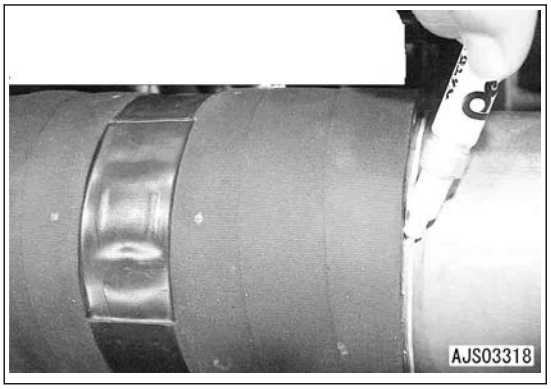
   REMARK

   Make matchmarks on the hose end and tube so that they can be reconnected correctly.
5. Sling aftercooler assembly (5), and remove it.

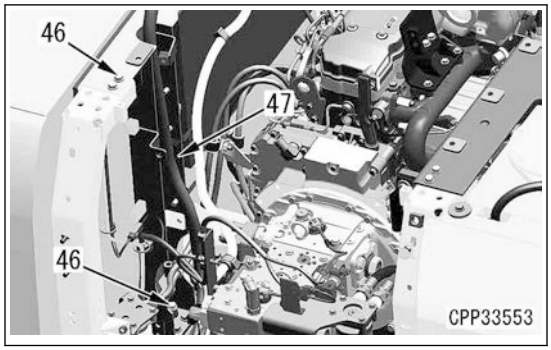
   Aftercooler assembly:

   8 kg

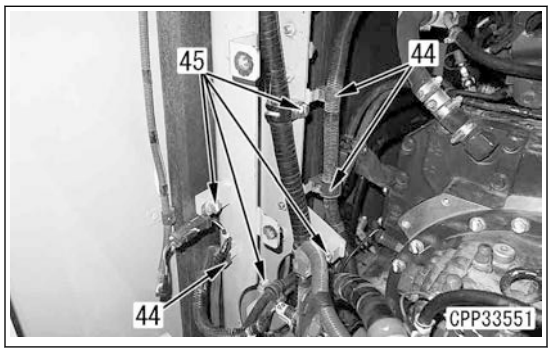


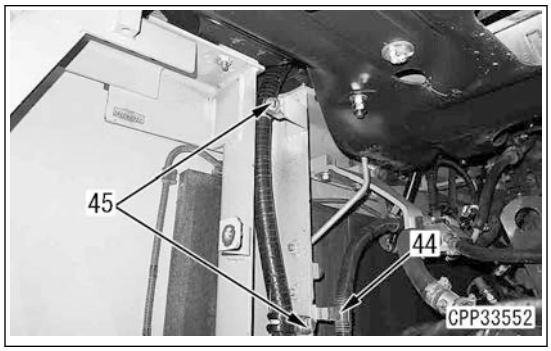


42. Install frame (47) with mounting bolts (46) (8 pieces).



43. Install clips (44) (3 places).
44. Install clips (45) (5 places).



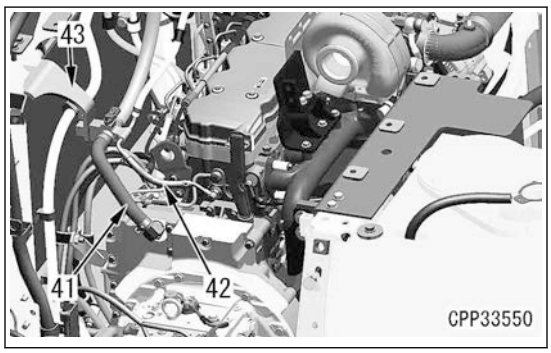


45. Install bracket (43).
46. Install coolant outlet hose (42).

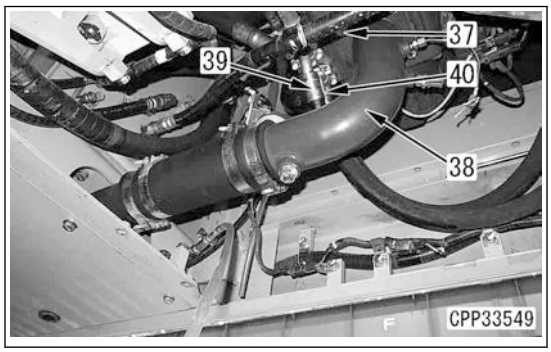
Clamp:
3.3±0.49 Nm {0.34±0.05 kgfm}

47. Install blowby gas inlet hose (41).

Clamp:
4.4±0.49 Nm {0.45±0.05 kgfm}

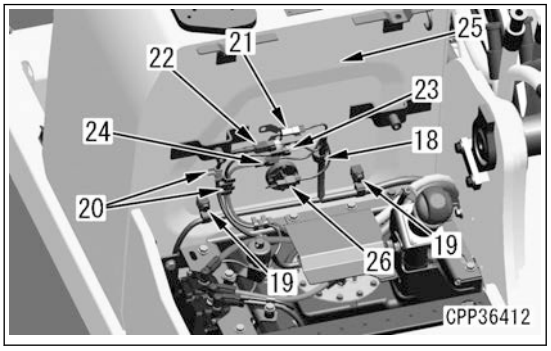


48. Install branch hoses (39) and (40).
49. Install mounting bolts (37) (4 pieces), and install pump suction port tube (38).



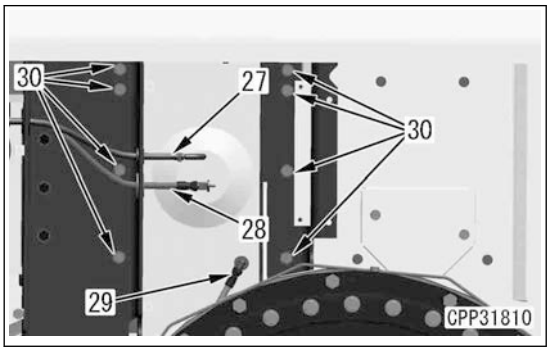
Wiring connector

15. Remove the clamps (18) and (19).
16. Remove the wiring harness clamp (20).
17. Disconnect the connector K10 (21), connector P63 (22), connector MB06A (23), and connector MB04 (24) from the fuel tank (25).
18. Disconnect the connector P21 (26).



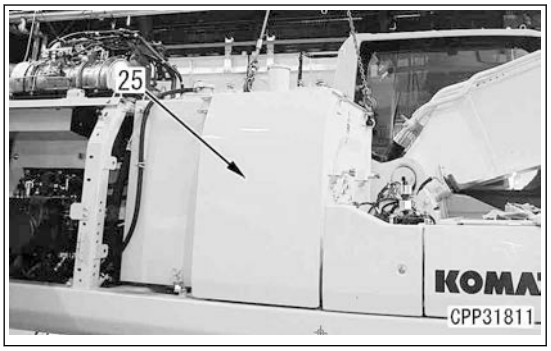
Fuel tank assembly

19. Disconnect the drain hose (27), fuel outlet hose (28), and fuel inlet hose (29) under the fuel tank.
20. Remove the mounting bolts (30) (8 pieces).



21. Lift the fuel tank assembly (25), and remove it.

Fuel tank assembly: 170 kg

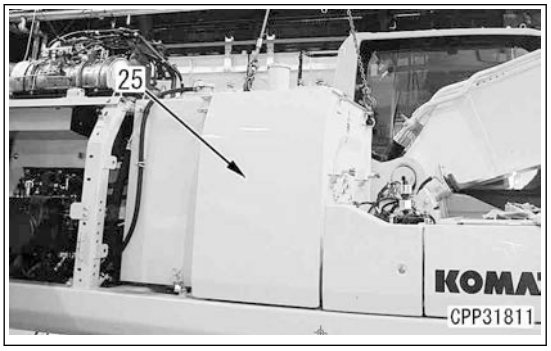


Install Fuel Tank Assembly

Fuel tank assembly

1. Lift the fuel tank assembly (25), and install it.

Fuel tank assembly: 170 kg



Remove and Install DEF Tank Sensor

Remove DEF Tank Sensor

DEF tank sensor flange assembly

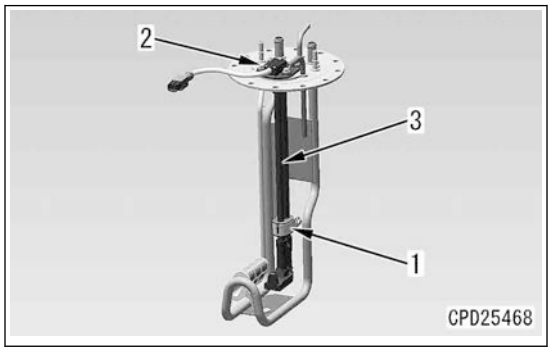
1. Remove DEF tank sensor flange assembly. For details, see “Remove and Install DEF Tank Sensor Flange Assembly”.

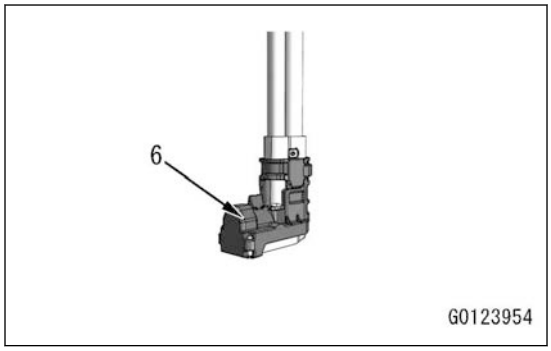
DEF tank sensor

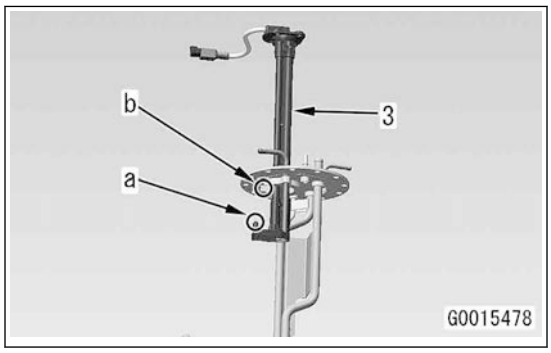
2. Remove clamp (1).
3. Remove the boot (6).
4. Remove mounting bolts (2) (4 pieces), and remove DEF tank sensor (3).

NOTICE

Pull out tip (a) of DEF tank sensor (3) carefully not to interfere with edge (b) of DEF tank sensor flange assembly.







Install DEF Tank Sensor

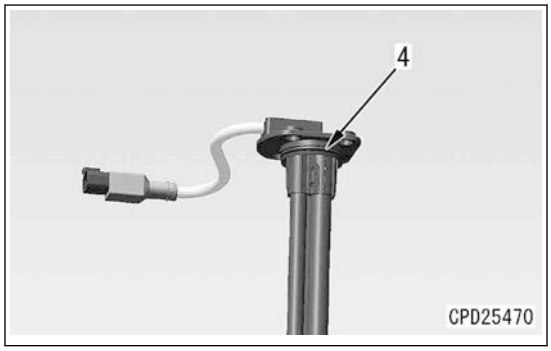
DEF tank sensor

1. Install O-ring (4).

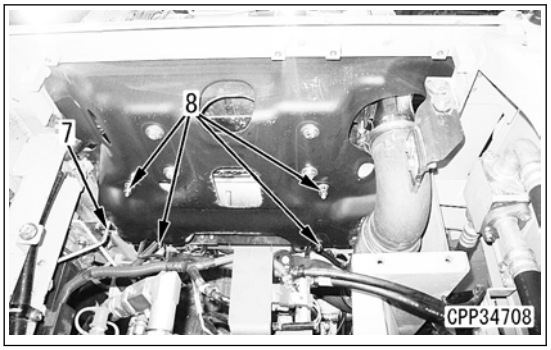
REMARK

- Use a new O-ring.
- If any foreign material is mixed into DEF tank, it may be the cause of the failure. Do not use grease, lubricating oil or any lubricating substance.
- Apply distilled water to O-ring (4) for lubricating.

O-ring (4): Distilled water

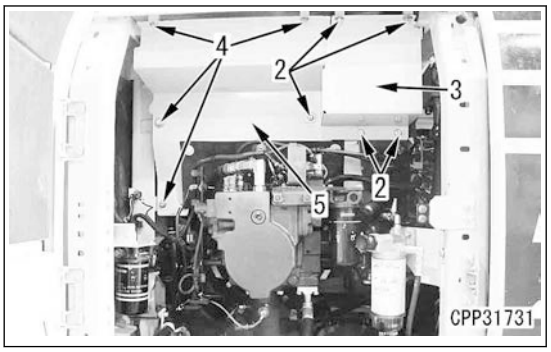


7. Install SCR drain tube (7).
8. Install U-bolt mounting nuts (8) (2 pieces).
   - 1st nut:
     14.7 to 34.3 Nm {1.5 to 3.5 kgfm}
   - 2nd nut:
     21 to 49 Nm {2.1 to 5.0 kgfm}

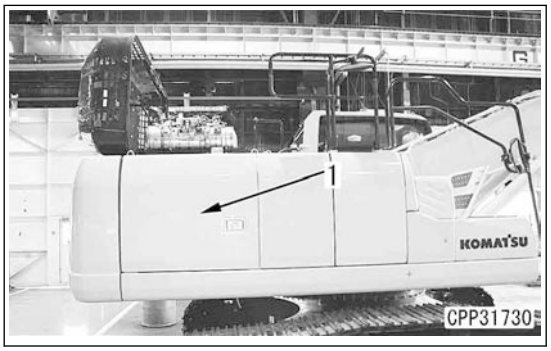


Cover

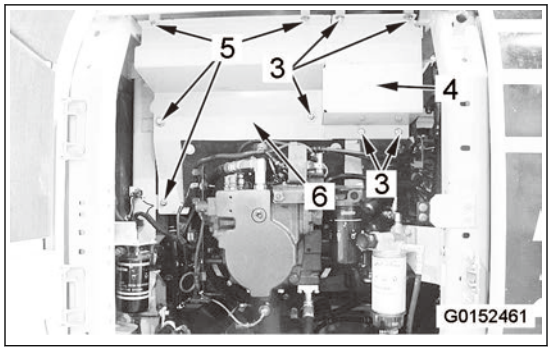
9. Install partition plate (5) with mounting bolts (4) (4 pieces).
10. Install partition plate (3) with mounting bolts (2) (5 pieces).



11. Close side cover (1) on the right side of the machine.



3. Remove the bolts (3) (5 pieces), and remove the partition plate (4).
4. Remove the bolts (5) (4 pieces), and remove the partition plate (6).



Bellows pipe assembly

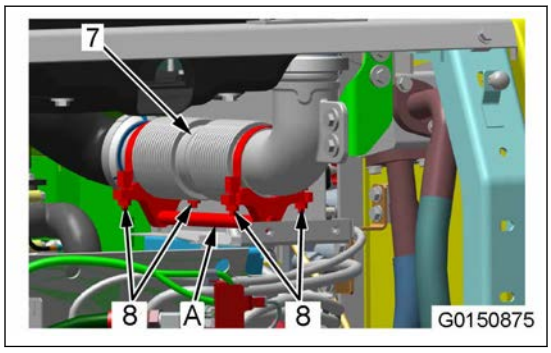
5. Install the restraint tool (A) to the bellows pipe assembly (7).

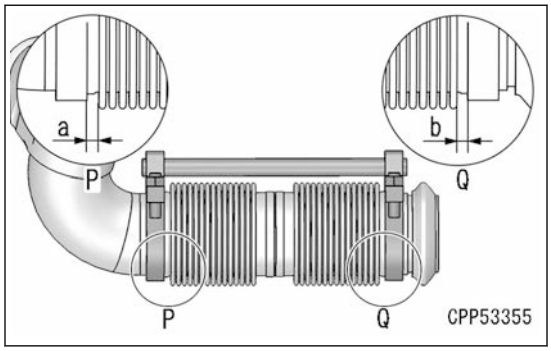
   Nut (8): 14.8Nm{1.5kgfm}

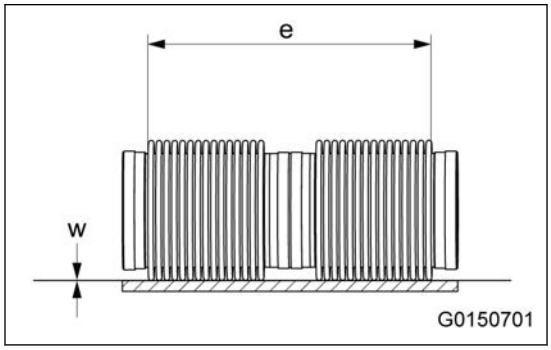
   NOTICE

   Install the restraint tool (A) with the clearances (a) and (b) equal.
   If you replace the bellows pipe assembly (7) with a new one when you install it again, the restraint tool (A) is not necessary for removed parts. The restraint tool (A) is installed to the new one.
   If the restraint tool is not installed, remove it without the restraint tool. When you install it to the machine again, assemble it with the restraint tool. Make sure that the length (e) of the bellows part is the equilibrium length of 260±5 mm.

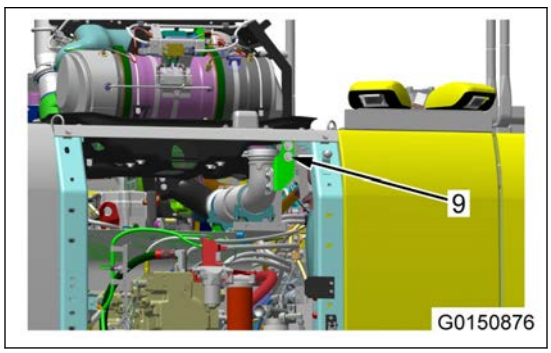
   If the removed bellows pipe assembly has damage, replace it with a new one.
   If the length of the bellows pipe cannot be restored, the replacement with a new one is recommended.







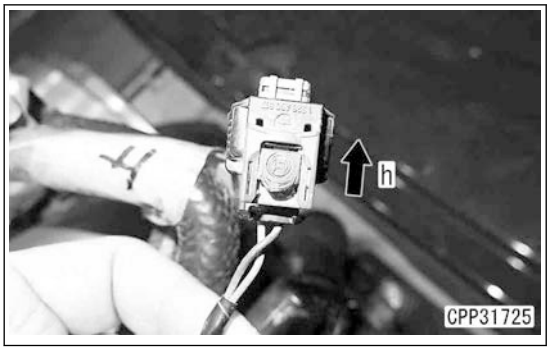
6. Remove the bolts (9) (2 pieces).

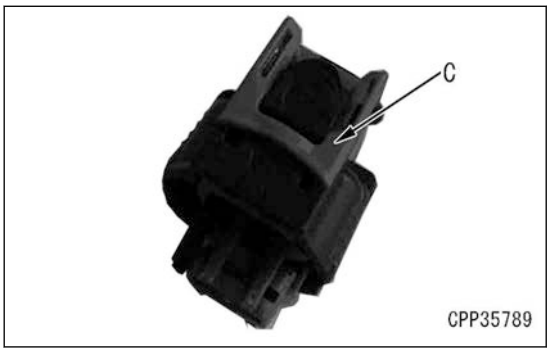


5. Connect connector MB03 (5), and return the red lock in the direction of h.

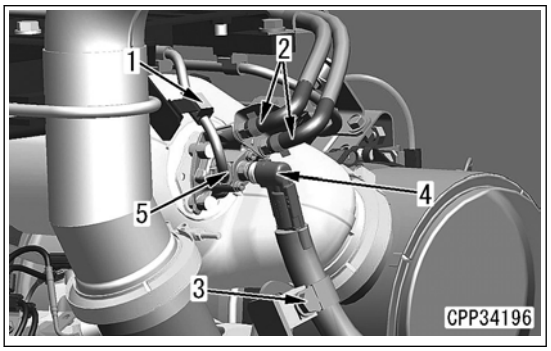
NOTICE

Remove tool C from the electrical connector side of DEF injector, and then connect DEF wiring connector MB03 (5).



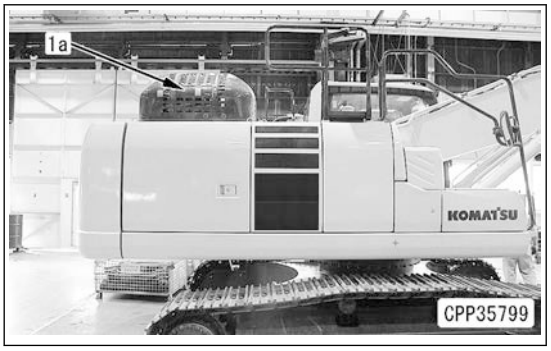


6. Install clamp (3).
7. Install clip (1).



Engine hood

8. Close engine hood (1a).



Remove and Install Air Conditioner Condenser Assembly

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

⚠ 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".)

⚠ If refrigerant gas (air conditioner gas: R134a) gets in your eyes, you may lose your sight. And if it touches your skin, you may suffer from frostbite. Put on protective eyeglasses, gloves and working clothes with long sleeves while collecting the refrigerant or filling the air conditioner circuit with the refrigerant.

NOTICE

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

How to Remove Air Conditioner Condenser Assembly

Air conditioner condenser assembly

1. Collect the refrigerant (air conditioner gas: R134a) from the air conditioner circuit.

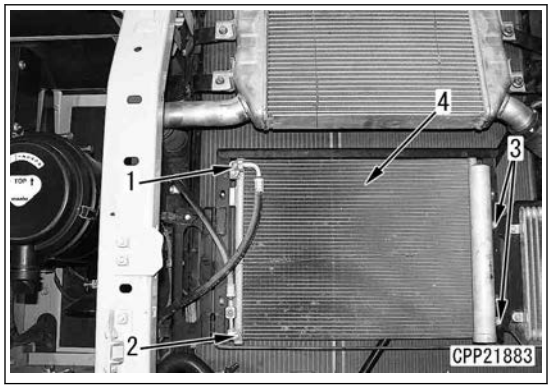
   Quantity of refrigerant to be collected: 930±50 g

2. Open the side cover on the left of the machine, and disconnect hoses (1) and (2) from air conditioner condenser assembly (4).

   REMARK

   - Plug the hose to prevent dust and water from entering.
   - Be careful not to damage or lose O-ring.

3. Remove mounting bolt (3), and open air conditioner condenser assembly (4).



4. Remove mounting bolts (5) (4 pieces) of the air conditioner condenser assembly, and remove air conditioner condenser assembly (4).

   REMARK

   When removing, take care not to damage the core.

3. Install cover assembly (6) to case assembly (5).

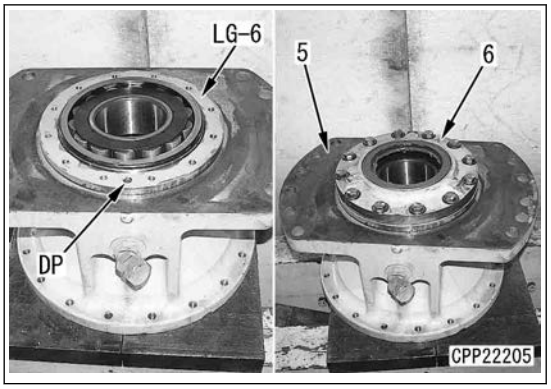
   Cover mounting face:
   Liquid gasket (LG-6)

   Mounting bolt of cover assembly (6):
   59 to 74 Nm {6.0 to 7.5 kgfm}

   NOTICE

   Be careful that liquid gasket (LG-6) does not stick to the drain port part (DP).

4. Align the drain machining part of the cover with the drain port part (DP).



Assembly of shaft and case assembly

5. Set case assembly (10) to shaft (9).

   Oil seal lip:
   Grease (G2-LI)

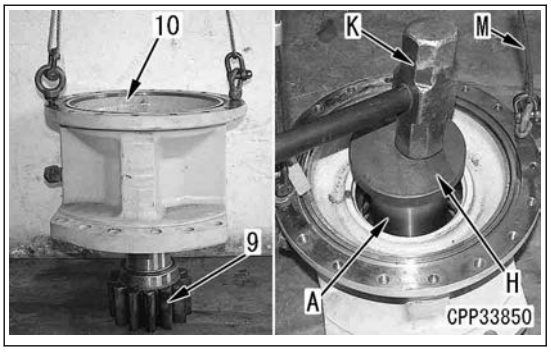
6. Place case assembly (10) without touching the oil seal.

7. Tap the inner race of bearing (12) to press fit it by using tools A, H, and K.

   ⚠ **Press fit it until shaft (9) does not come off even when it is lifted.**

8. Loosen the tool M.

9. Set it to the press.



10. Press fit shaft (9) by using tools A, H, and N.

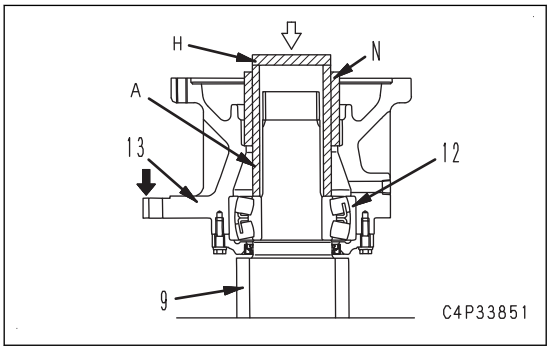
    Bearing press-fitting force (inner race): 41.7 to 117.8 kN {4250 to 12000 kg}

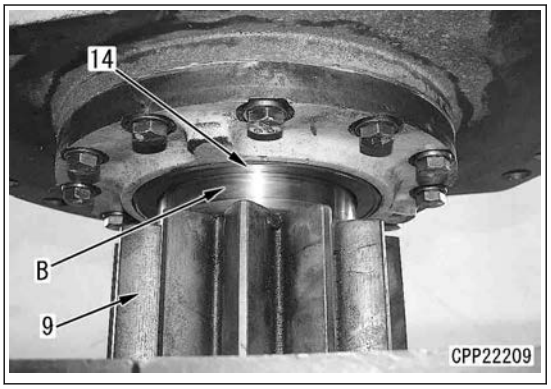
    REMARK

    - Prepare tool N in case that case assembly (13) tilts.
    - When case assembly (13) tilts, tap the flange part lightly to correct it.

    NOTICE

    Immediately before oil seal (14) is inserted into shaft (B) part, keep case assembly (13) horizontally so that case assembly (13) is at the center of shaft (9), and be careful not to damage the oil seal lip part.



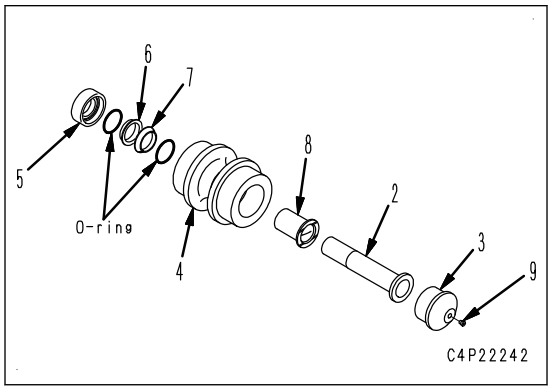


Disassemble and Assemble Carrier Roller Assembly

Tools for Disassembly and Assembly of Carrier Roller Assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	790-434-1660	Installer	■	1			
B	793T-613-1380	Spacer	●	1		○	
C	790-201-2820	Spacer	■	1			
D	793T-417-1310	Spacer	●	1		○	
E	796T-430-1310	Push tool	■	1		○	
F	-	Washer	■	1			

Configuration diagram

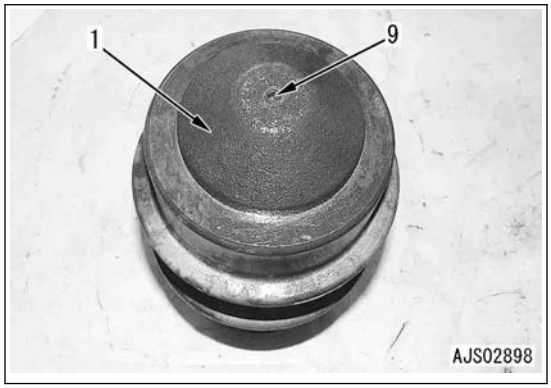


Disassemble Carrier Roller Assembly

Draining

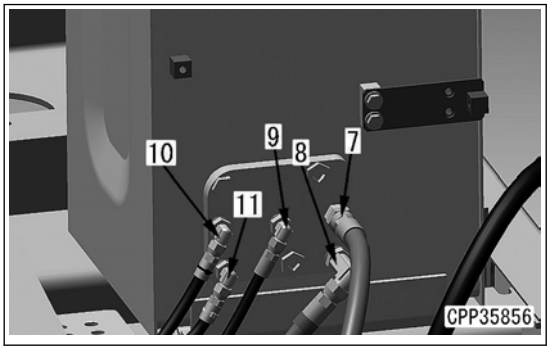
1. Remove plug (9) to drain the oil from carrier roller assembly (1).

   Amount of oil:
   75 to 85 cc

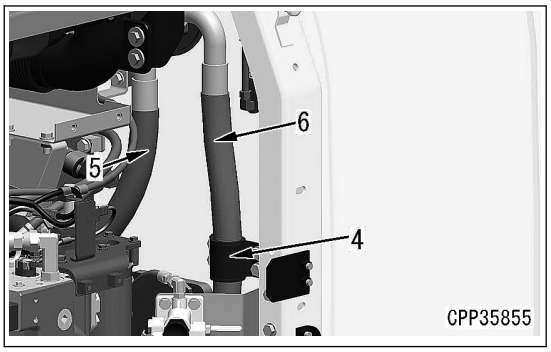


Hose

9. Install the hoses (7), (8), (9), (10), and (11).
   Hose (7): Main pump drain hose
   Hose (8): Travel and swing motor drain hose
   Hose (9): PPC drain hose
   Hose (10): Solenoid valve drain hose
   Hose (11): Main valve drain hose

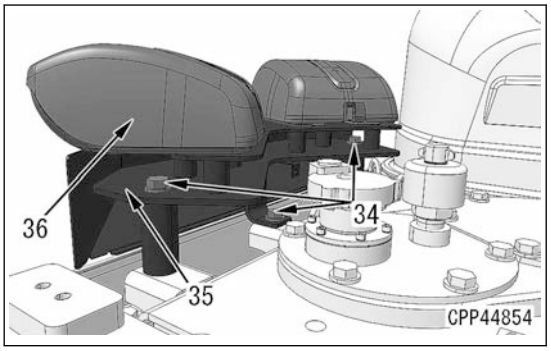


10. Install the hoses (5) and (6).
    Hose (5): Between hydraulic tank and control valve
    Hose (5): Between hydraulic tank and oil cooler
11. Install the clamp (4).

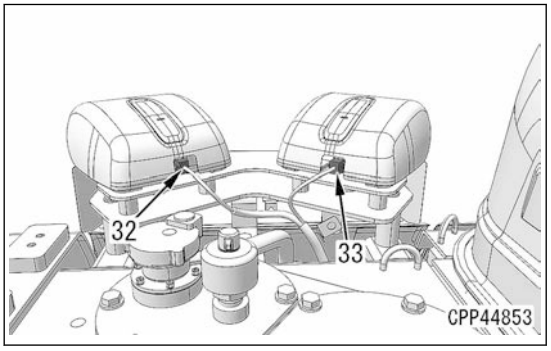


KomVision camera

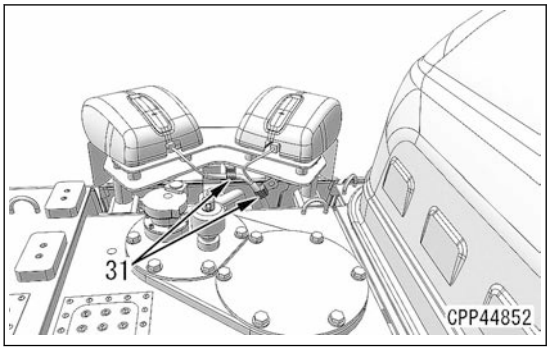
12. Install the bracket (35) and KomVision camera assembly (36) together with the bolts (34) (3 pieces).



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

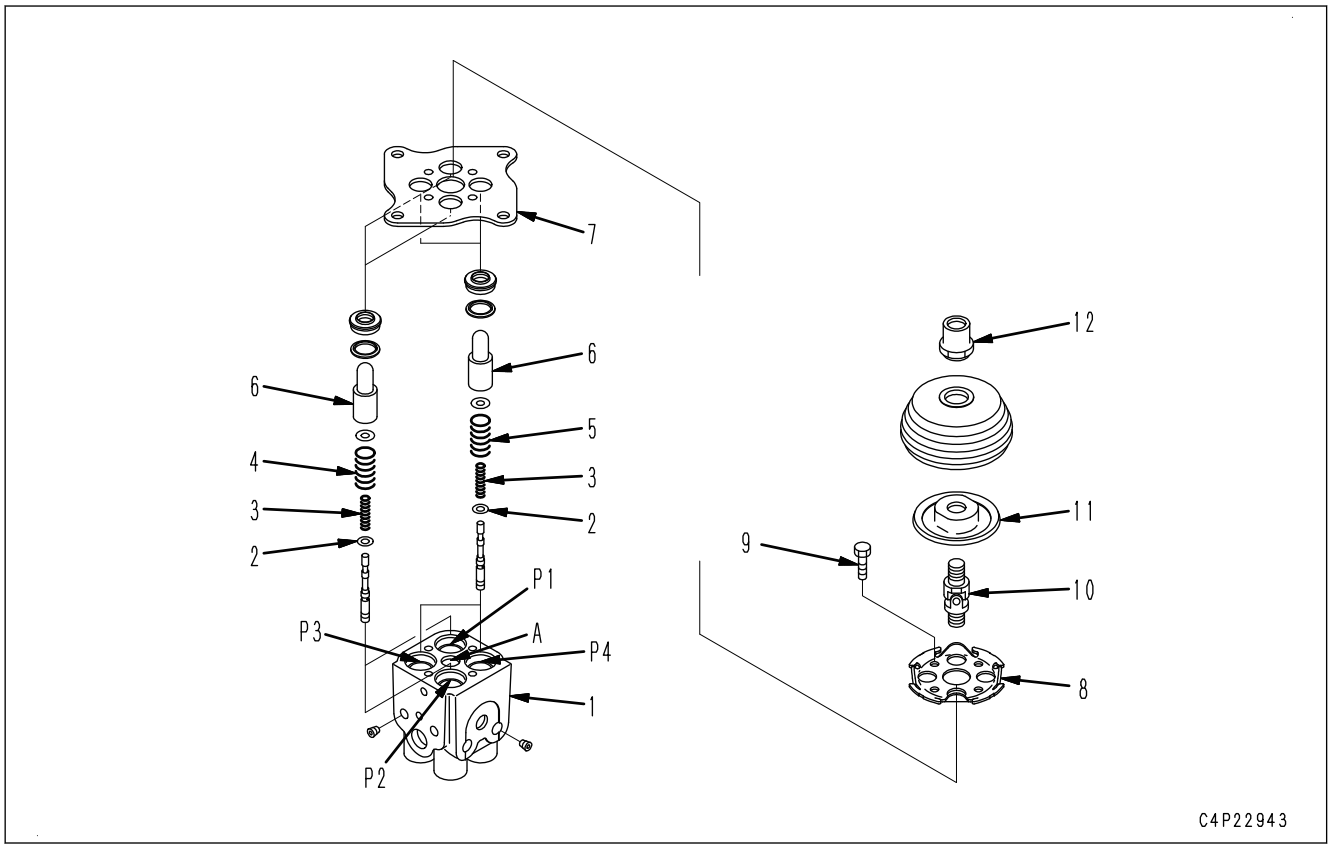


14. Install the clip (31).



Disassemble and Assemble Work Equipment PPC Valve Assembly

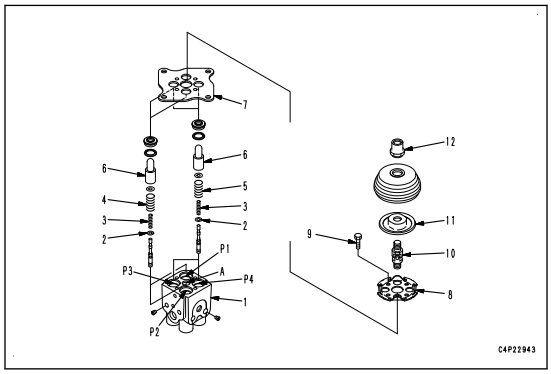
Configuration diagram



Disassemble Work Equipment PPC Valve Assembly

In this section, only precautions for disassembling the work equipment PPC valve assembly are explained.

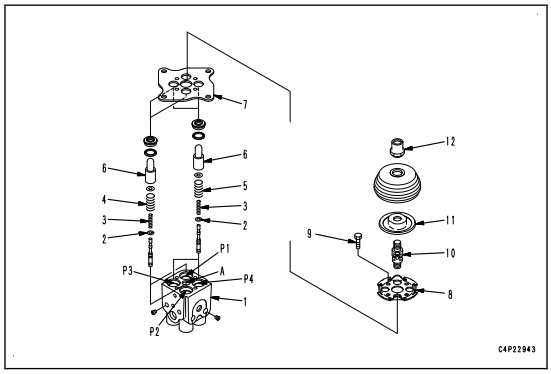
⚠ As for springs (4) and (5), 2 each of 2 different types of springs with different load at installed height are installed. Check the installed position (hydraulic port) and put tags to prevent any wrong installation.



How to Assemble Work Equipment PPC Valve Assembly

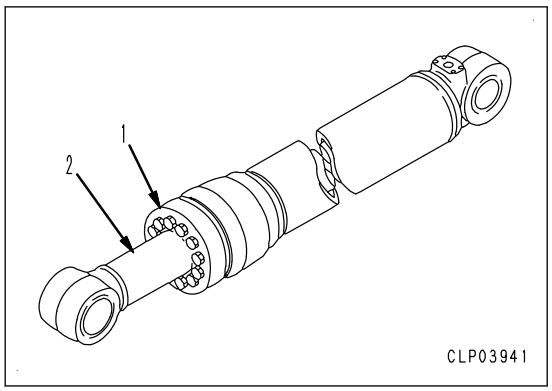
In this section, only precautions for assembling the work equipment PPC valve assembly are explained.

⚠ Carefully clean and inspect the parts to prevent failure due to dust, rust, scratch, etc., and then take extreme care when assembling them.



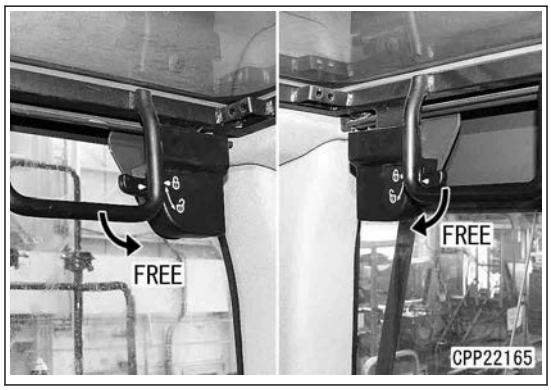
1. When installing spring (3), install the end surface of the smaller end turn diameter to shim (2) side.

23. Tighten the mounting bolts for cylinder head assembly (1).
    Cylinder head assembly (1) mounting bolt:
    - Boom cylinder and bucket cylinder:
      270±39 Nm {27.5±4.0 kgfm}
    - Arm cylinder:
      373±54 Nm {38.0±5.5 kgfm}
24. Install the piping.
    - Mounting bolt of piping fixing band (boom cylinder only):
      27.4±6.9 Nm {2.8±0.7 kgfm}



Unlocking

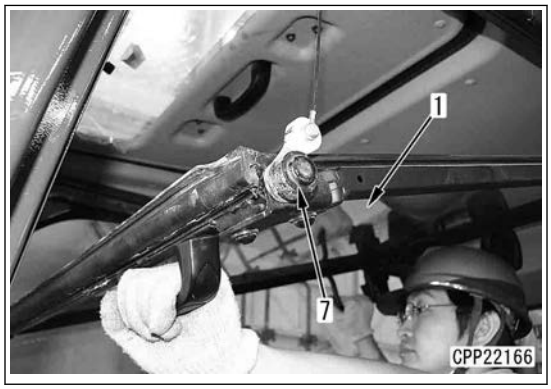
4. Unlock front window assembly (1).

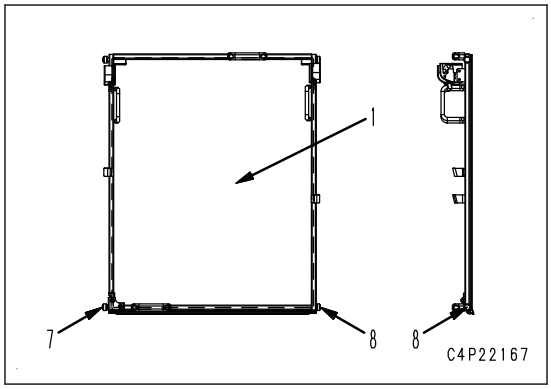


Sliding front window assembly

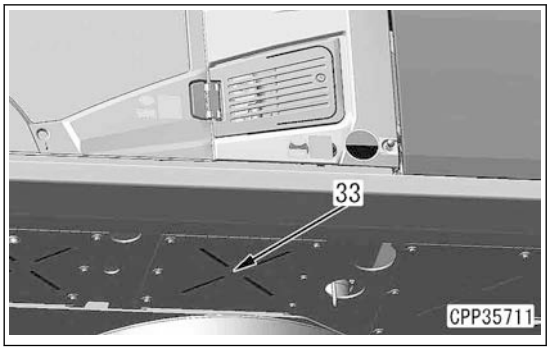
5. Carefully slide front window assembly (1), bring out the bottom of front window assembly (1) downward from the bracket removal area (rail opening area) at the corner where the bracket was removed in step 2, and hold it.

   ⚠ **Right and left rollers (7) and (8) are the insertion type and are easily removed. They must be handled with care.**





4. Install the cover (33) (6 bolts).



KOMTRAX terminal

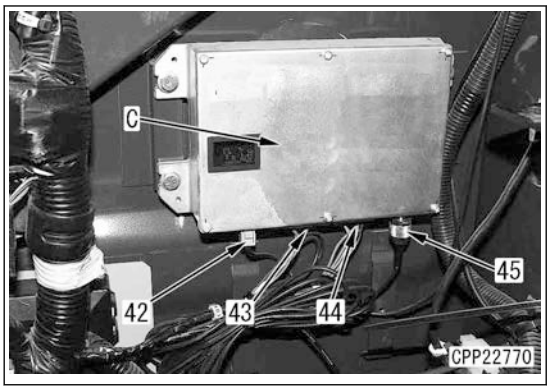
5. Install the KOMTRAX terminal (C) (4 bolts).
6. Connect the connectors (42), (43), (44), and (45) to the KOMTRAX terminal (C).

   Connector (42): Communication antenna GPS

   Connector (43): Machine main wiring harness CK01

   Connector (44): Machine main wiring harness CK02

   Connector (45): Communication antenna

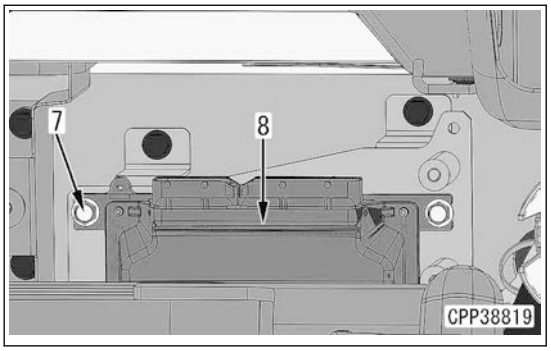


KomVison controller

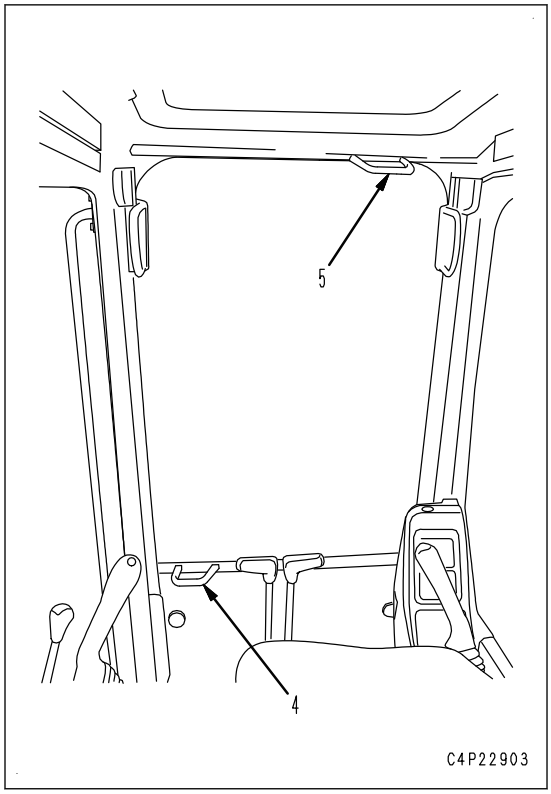
7. Install the KomVision controller assembly (8) with the bolts (7) (4 pieces).

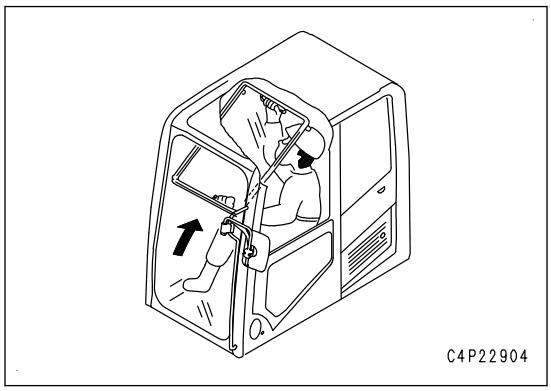
   REMARK

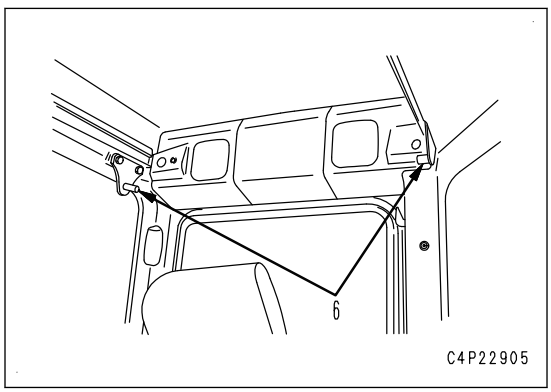
   - Be careful not to step the KomVision controller assembly (8) wrongly.
   - KomVision controller assembly (8) can be damaged if it is accidentally stepped on.



3. Pull up lower grip (4) by left hand and upper grip (5) by right hand, and push them to lock catch (6) at the rear of the cab to lock.

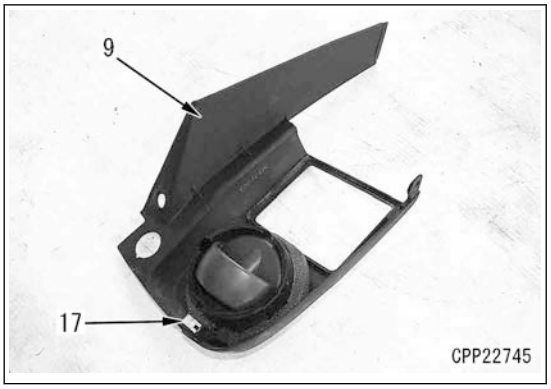






REMARK

Claw (17) is attached to the back side of cover (9), and fixes cover (9).

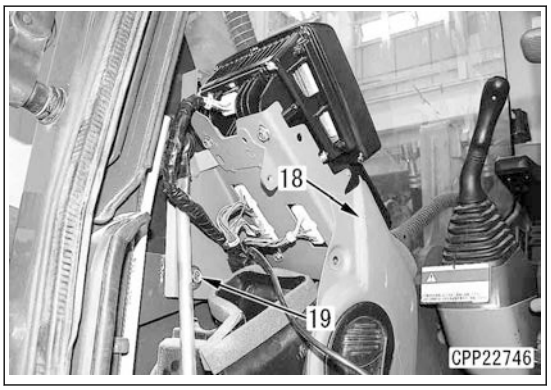


Cover and duct assembly mounting bolt

8. Loosen mounting bolts (19) of cover and duct assembly (18).

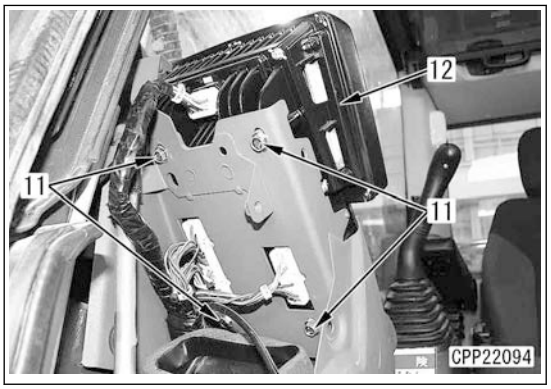
REMARK

By loosening mounting bolt (19), machine monitor mounting bolt (11) can be removed easily.



Machine monitor assembly

9. Remove mounting bolts (11), and remove machine monitor assembly (12).



Remove and Install Communication Terminal Wiring Harness

Standard tool list

The listed tools are just for reference. Other tools not on the list can also be used if purpose of use is the same.

No.	Part name	Part No.	Specifications	Q'ty	Remarks
1	Socket	Commercially available	10 mm	1	
2	Socket	Commercially available	12 mm	1	
3	Extension bar	Commercially available	300 mm	1	
4	Ratchet handle	Commercially available		1	
5	Box-end combination wrench	Commercially available	10 mm	1	
6	Torque wrench	Commercially available	0.5 to 3 Nm	1	
7	Torque wrench	Commercially available	2 to 20 Nm	1	
8	Torque wrench	Commercially available	5 to 50 Nm	1	
9	Phillips screwdriver	Commercially available		1	
10	Nippers	Commercially available		1	

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

⚠ Set the work equipment lock lever to LOCK position.

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

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

NOTICE

Check the connector numbers and installed positions before disconnecting wirings and hoses, and write them down.

Remove Communication Terminal Wiring Harness

Operator's seat assembly

1. Move the operator's seat assembly forward, and recline the backrest (1a) forward.

Unit: mm

No.	Item	Criteria			Remedy
1	Backlash between swing motor shaft and No. 1 sun gear	Standard clearance	Allowable clearance		Replace
		0.18 to 0.28	-		
2	Backlash between No. 1 sun gear and No. 1 planetary gear	0.16 to 0.50	1.00		
3	Backlash between No. 1 planetary gear and ring gear	0.18 to 0.59	1.10		
4	Backlash between No. 1 planetary carrier and No. 2 sun gear	0.39 to 0.71	1.40		
5	Backlash between No. 2 sun gear and No. 2 planetary gear	0.16 to 0.50	1.00		
6	Backlash between No. 2 planetary gear and ring gear	0.18 to 0.59	1.20		
7	Backlash between No. 2 planetary carrier and swing pinion	0.07 to 0.23	-		
8	Backlash between swing pinion and swing circle	0.22 to 1.32	2.00		
9	Clearance between plate and No. 2 planetary carrier	0.9 ± 0.24	-		
10	Clearance between plate and No. 2 sun gear	2.3 ± 0.64	-		
11	Outside diameter of oil seal contact surface of spacer	Standard dimension	Tolerance	Repair limit	Repair by hard chrome plating or replace
		125	0 -0.100	-	

Unit: mm

No.	Item	Criteria					Remedy
		Standard dimension			Repair limit		
1	Spool return spring	Free height x outside diameter	Installed height	Load at installed height	Free height	Load at installed height	
		55.2 x 34.4	51.2	407 N {41.5 kg}	-	326 N {33.2 kg}	
2	Spool return spring	54.5 x 34.8	51.2	393 N {40.1 kg}	-	315 N {32.1 kg}	Replace spring if damaged or deformed
3	Spool return spring	54.4 x 34.8	51.2	375 N {38.2 kg}	-	300 N {30.6 kg}	
4	Spool return spring	54.6 × 34.8	51.5	384 N {39.2 kg}	-	307 N {31.4 kg}	
5	Spool return spring	54.2 × 34.8	51.5	363 N {37.0 kg}	-	290 N {29.6 kg}	

Unit: mm

No.	Item	Criteria					Remedy
		Standard dimension	Tolerance		Clearance	Allowable clearance	
			Shaft	Hole			
1	Clearance between mounting pin and bushing of revolving frame and boom	90	-0.036 -0.071	(+0.135) (+0.074)	(0.110 to 0.206)	1.0	Replace pin and bushing
2	Clearance between mounting pin and bushing of boom and arm	90	-0.036 -0.071	(+0.137) (+0.077)	(0.113 to 0.208)	1.0	
3	Clearance between mounting pin and bushing of arm and link	70	-0.030 -0.076	(+0.158) (+0.078)	(0.108 to 0.234)	1.0	
4	Clearance between mounting pin and bushing of arm and bucket	80	-0.030 -0.076	(+0.137) (+0.074)	(0.104 to 0.213)	1.0	
5	Clearance between mounting pin and bushing of link and bucket	80	-0.030 -0.076	(+0.166) (+0.086)	(0.116 to 0.242)	1.0	
6	Clearance between mounting pin and bushing of links	80	-0.030 -0.076	(+0.335) (+0.275)	(0.305 to 0.411)	1.0	

( ):Reference dimension

2. When refrigerant gas (2) sealed in the diaphragm chamber (hatched portion) receives the temperature change from thermoprobe (1a-2), its pressure varies, and accordingly force (Fg) to press needle valve (1a) varies.
3. The position of needle valve (1a) is determined by the balance between the rightward reaction force of spring (1b) and force (F g) of refrigerant gas (2) to push needle valve (1a) to the left through diaphragm (1a-1).
4. The position of needle valve (1a) determines the flow rate of the refrigerant from the receiver drier to evaporator (3).

When Evaporator (3) Outlet Temperature is High

1. The pressure of refrigerant gas (2) in the diaphragm chamber (hatched portion) increases and the volume increases.
2. Force (F g) of refrigerant gas (2) to push needle valve (1a) increases, and needle valve (1a) moves to the left.
3. Needle valve (1a) opens wider to increase the refrigerant flow rate to evaporator (3), and the cooling performance increases. (State (A) in the above figure)

When Evaporator (3) Outlet Temperature is Low

1. The pressure of refrigerant gas (2) in the diaphragm chamber (hatched portion) decreases, and accordingly the volume decreases.
2. Force (F g) of refrigerant gas (2) to push needle valve (1a) decreases, and needle valve (1a) moves to the right.
3. Needle valve (1a) opens smaller to decrease the refrigerant flow rate to evaporator (3), and the cooling capacity decreases. (State (B) in the above figure)

Function of Dual Pressure Switch

The dual pressure switch is installed to the air conditioner hose under the floor.

Below LA: Abnormally low pressure

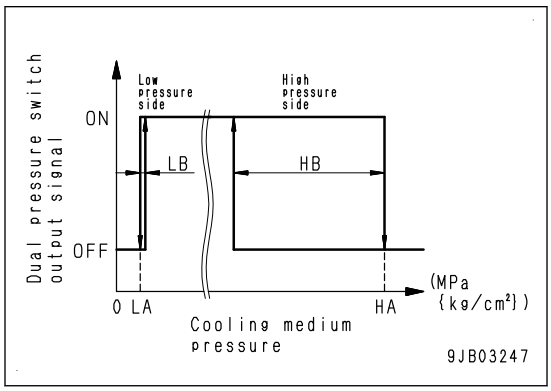
Above HA: Abnormally high pressure

LA: 0.20 MPa {2 kgf/cm^2}

LB: 0.02 MPa {0.2 kgf/cm^2}

HA: 3.14 MPa {32 kgf/cm^2}

HB: 0.59 MPa {6 kgf/cm^2}



- The dual pressure switch turns “OFF” when it detects abnormally low refrigerant pressure in low-pressure line or abnormally high refrigerant pressure in high-pressure line.
- When the dual pressure switch turns “OFF”, the air conditioner controller turns the compressor clutch relay “OFF”. As a result, the compressor's magnet clutch is released and air conditioner components are protected.

Air Conditioner Troubleshooting Chart 2

Blower Fan Motor Does Not Turn in Cooling and Heating Modes, or Its Speed is Different from Flow Setting in Cooling Mode.

Probable cause	Check method	Remedy
Open circuit or defective connection in wiring	Check for disconnection of connector. See “Parts and connectors layout”.	Repair the open circuit. Connect it correctly.
Defective blower fan motor	Operate fan switches in order and check that fan turns. See “Air Conditioner Unit”.	Replacement
Defective power transistor (PTR)	Operate fan switches in order and check that fan turns.	Replacement

Blower Fan Motor is Correct but Air Flow is Not Sufficient During Cooling.

Probable cause	Check method	Remedy
Draft resistance is high.	Check for clogging of filter and for crushing and clogging of duct.	Repair
Air leakage through connection part of duct	Check connection part of duct. See “Examine Air Leakage (Duct)”.	Repair
Obstacles on suction side of evaporator	Check evaporator for dirt and obstruction.	Clean it to remove obstacles.
Defective evaporator temperature sensor, defective contact of evaporator temperature sensor, or defective expansion valve *1	Evaporator is frozen. Check sensor fixing clip, check sensor for dirt and dust. Check if air conditioner hose near pressure switch is frosted (when freezing occurs more)	Replacement or repair

*1: Evaporator temperature sensor and expansion valve are located inside air conditioner unit.

Pressure is Abnormal in Cooling Mode (Low/High Pressure)

Probable cause	Check method	Remedy
Insufficient refrigerant	Check refrigerant volume through sight glass during normal operation.	Repair leaking point and refill with proper volume of refrigerant.
Over-filling with refrigerant	For better accuracy, connect check gauge manifold and check it.	Collect refrigerant, then refill with proper volume of refrigerant.
Judgment by pressure at outlet and inlet of compressor	Normal refrigerant pressure range Low pressure: : Approximately 0.13 to 0.2 MPa {1.3 to 2.0 kgf/cm^2} High pressure: : Approximately 1.5 to 1.7 MPa {15 to 17 kgf/cm^2} Temperature in operator's cab: : 30 to 35 °C, engine speed: Approximately 1500 rpm	See “Troubleshooting by Gauge Pressure”.

Compressor Does Not Turn at All or Does Not Turn Correctly in Cool Mode.

See “Troubleshooting of compressor system (Air is not cooled)”.