SEN06901-05

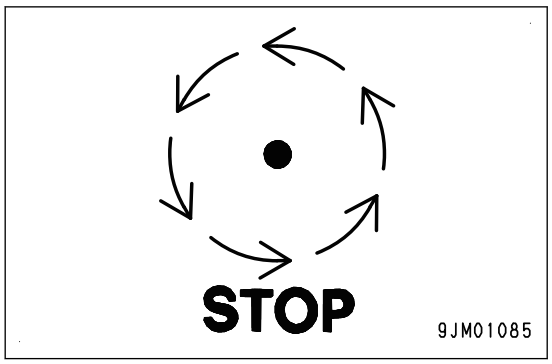
Shop Manual

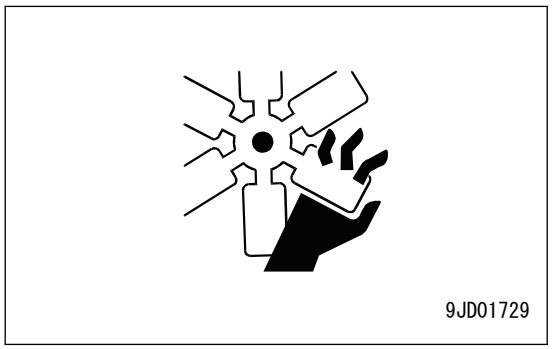
BULLDOZER

D85EX -18
D85PX -18

SERIAL NUMBERS 25001 and up

KOMATSU

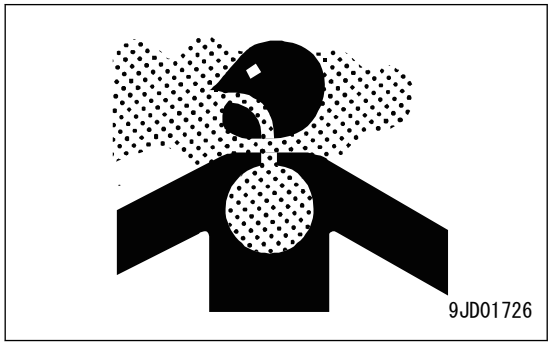




- Before starting work, shut down the engine. When working on or around a rotating part, in particular, shut down the engine. When checking the machine without shutting down the engine (measuring oil pressure, revolving speed, temperature, etc.), take extreme care not to get caught in rotating parts or moving parts.
- When raising a heavy component (heavier than 20kg), use a hoist or crane. Before starting work, check that the slings (wire ropes, webbing slings, chains, and hooks) are free from damage. Always use slings which have ample capacity and install them to proper places. Operate the hoist or crane slowly to prevent the component from hitting any other part. Do not work with any part still raised by the hoist or crane.
- When removing a part which is under internal pressure or under reaction force of a spring, always leave 2 bolts in diagonal positions. Loosen those 2 bolts gradually and alternately to release the pressure, and then remove the part.
- When removing components, do not break or damage the electrical wiring. Damaged wiring may cause a fire.
- When removing piping, do not spill the fuel or oil. If any fuel or oil drips onto the floor, wipe it off immediately. Fuel or oil on the floor can cause you to slip and can even cause fires.
- Do not use gasoline to wash parts as a general rule. Do not use gasoline to clean electrical parts, in particular.
- Install the disassembled parts again to the original position. Replace the damaged parts or the parts that cannot be used again with new ones. Before you connect the hoses or wiring harnesses, make sure that they do not touch and give damage to other parts when you operate the machine.

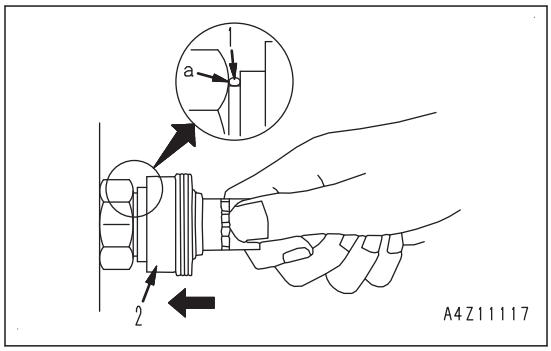
  REMARK

  When you replace the removed or disassembled parts with new ones, refer the parts book to find out the part number.
- When installing high pressure hoses and tubes, make sure that they are not twisted. Damaged hoses and tubes are dangerous, so be extremely careful when installing hoses and tubes for high pressure circuits. In addition, check that high pressure hoses and tubes are correctly installed.
- When assembling or installing parts, always tighten them to the specified torques. When installing protective parts such as guards, or parts which vibrate violently or rotate at high speed, check again that they are installed correctly.
- Never insert your fingers or hand when aligning 2 holes. Be careful not to get your fingers caught in a hole.
- Check that the measuring tools are correctly installed when measuring hydraulic pressure.
- Take care when removing or installing the tracks of track-type machines. Since the track shoe may separate suddenly when you remove it, never let anyone stand at either end of the track shoe.
- If the engine is operated for a long time in a closed place with poor ventilation, it may cause gas poisoning. Open the windows and doors to ventilate the place well.



Connection

Hold the tightening adapter part, and push body (2) straight until sliding prevention ring (1) contacts contact surface (a) of the hexagonal part at the male end.



1 kgf/cm^2 = 14.2233 lb/in^2

	0	1	2	3	4	5	6	7	8	9
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1010	1024	1038	1053	1067	1081	1095	1109	1124
80	1138	1152	1166	1181	1195	1209	1223	1237	1252	1266
90	1280	1294	1309	1323	1337	1351	1365	1380	1394	1408
100	1422	1437	1451	1465	1479	1493	1508	1522	1536	1550
110	1565	1579	1593	1607	1621	1636	1650	1664	1678	1693
120	1707	1721	1735	1749	1764	1778	1792	1806	1821	1835
130	1849	1863	1877	1892	1906	1920	1934	1949	1963	1977
140	1991	2005	2020	2034	2048	2062	2077	2091	2105	2119
150	2134	2148	2162	2176	2190	2205	2219	2233	2247	2262
160	2276	2290	2304	2318	2333	2347	2361	2375	2389	2404
170	2418	2432	2446	2460	2475	2489	2503	2518	2532	2546
180	2560	2574	2589	2603	2617	2631	2646	2660	2674	2688
190	2702	2717	2731	2745	2759	2773	2788	2802	2816	2830
200	2845	2859	2873	2887	2901	2916	2930	2944	2958	2973
210	2987	3001	3015	3030	3044	3058	3072	3086	3101	3115
220	3129	3143	3158	3172	3186	3200	3214	3229	3243	3257
230	3271	3286	3300	3314	3328	3343	3357	3371	3385	3399
240	3414	3428	3442	3456	3470	3485	3499	3513	3527	3542

Temperature

Conversion of Fahrenheit to Celsius

- A simple way to convert a Fahrenheit temperature reading into a Celsius temperature reading or vice versa is to see the number in the center column of the following table. The figures in the center of the following table show the temperatures in both Fahrenheit and Celsius.
- When converting from Fahrenheit to Celsius degrees, consider the center column to be a table of Fahrenheit temperatures and read the corresponding Celsius temperature in the column at the left.
- When converting from Celsius to Fahrenheit degrees, consider the center column to be a table of Celsius values, and read the corresponding Fahrenheit temperature on the right.

1 °C = 33.8 °F

°C		°F	°C		°F	°C		°F	°C		°F
-40.4	-40	-40.0	-11.7	11	51.8	7.8	46	114.8	27.2	81	177.8
-37.2	-35	-31.0	-11.1	12	53.6	8.3	47	116.6	27.8	82	179.6
-34.4	-30	-22.0	-10.6	13	55.4	8.9	48	118.4	28.3	83	181.4
-31.7	-25	-13.0	-10.0	14	57.2	9.4	49	120.2	28.9	84	183.2
-28.9	-20	-4.0	-9.4	15	59.0	10.0	50	122.0	29.4	85	185.0
-28.3	-19	-2.2	-8.9	16	60.8	10.6	51	123.8	30.0	86	186.8

10 Structure and Function

DEF Tank Sensor

Structure of DEF Tank Sensor

REMARK

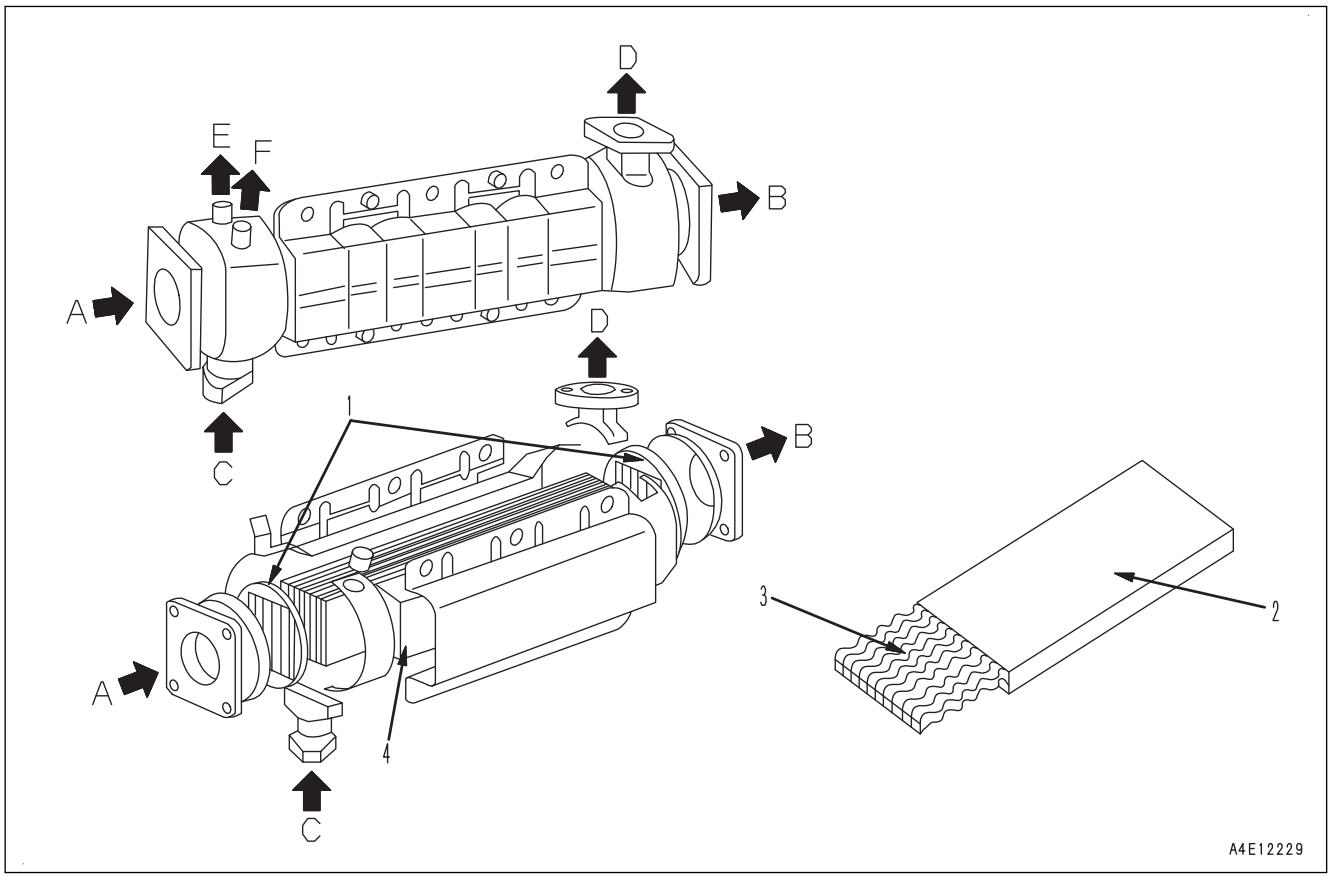
The shape is subject to machine models.

1: Connector
2: Concentration Sensing part
3: Temperature sensing part
4: Level sensing part

Function of DEF Tank Sensor

- This sensor is installed to DEF tank and outputs DEF level, DEF concentration, and DEF temperature through CAN communication.
- DEF level and DEF concentration are measured by using ultrasonic wave.
- When the tank is frozen or empty, DEF level and DEF concentration are not measured.

General View and Sectional View



A: EGR gas inlet
B: EGR gas outlet (to EGR valve)
C: Coolant inlet
1: Header plate
2: Flat tube
D: Coolant outlet
E: Air vent
F: Air vent
3: Inner fin
4: Case

Operation of EGR Cooler

- EGR gas enters through (A) and flows through flat tubes (2) (9 pieces).
- Coolant enters through (C), flows outside of flat tubes (2) in case (4), and goes out through (D).
- Flat tube (2) has inner fins (3), thus EGR gas is cooled efficiently and discharged through EGR gas outlet (B).

KCCV System

KCCV

Abbreviation for KOMATSU Closed Crankcase Ventilation

Layout Drawing of KCCV System

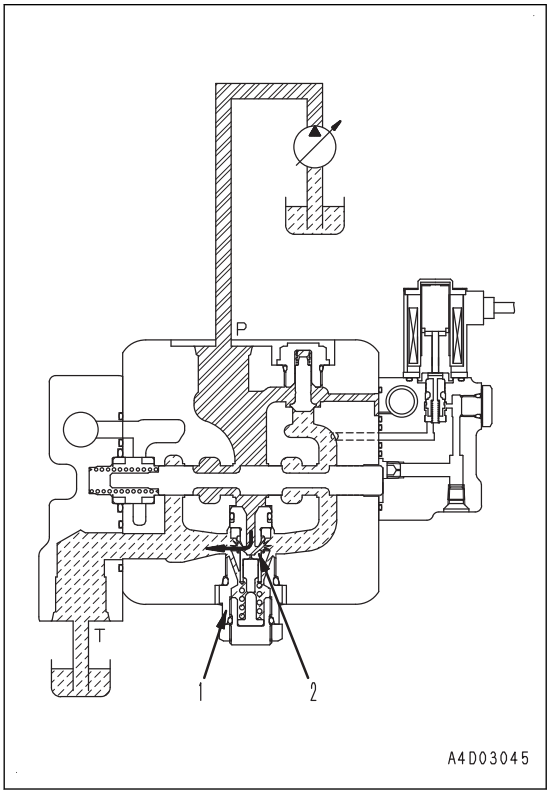
REMARK

The shape is subject to machine models.

Safety Valve of Cooling Fan Motor

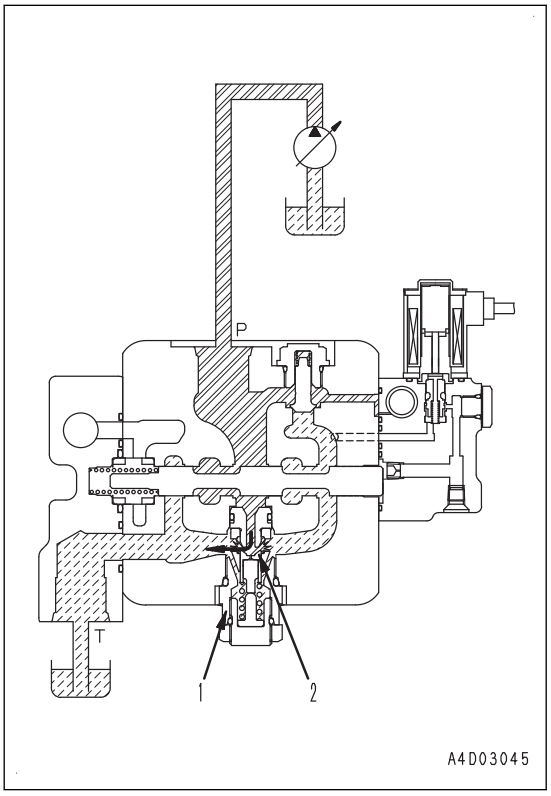
Function of Safety Valve of Cooling Fan Motor

The pressure in motor port (P) may increase when the engine is started, etc. Safety valve (1) is installed to protect the fan system circuit in this case.



Operation of Cooling Fan Motor Safety Valve

When the pressure in port (P) exceeds the cracking pressure of safety valve (1), valve (2) of safety valve (1) opens to release the pressurized oil into port (T). Occurrence of abnormally high pressure in port (P) is prevented by this operation.



25	Transmission R clutch fill switch	Input
26	(*1)	-
27	Blade control lever lower switch (NC)	Input
28	Backup Alarm	Input
29	GND (pulse)	-
30	Transmission output shaft speed sensor	Input
31	(*1)	-
32	CAN0_H	Input and output
33	CAN1_H	Input and output
34	RS232C GND	-
35	Transmission F clutch fill switch	Input
36	(*1)	-
37	Blade control lever lower switch (NO)	Input
38	(*1)	-
39	GND (pulse)	-
40	Cooling fan speed sensor	Input

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

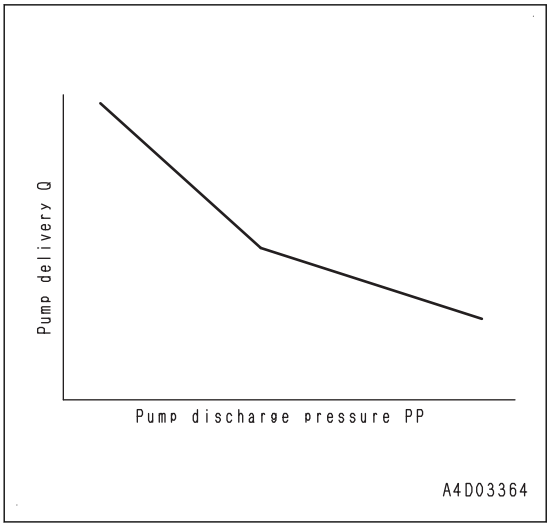
*2: Applicable Machine: 25001 to 25152

*3: Applicable Machine: 25153 and up

DRC26-40P(B)(PTCN3)

Pin No.	Signal name	Input and output signals
1	Continuous power supply (24 V)	Input
2	Power supply (24 V)	Input
3	GND (solenoid common)	-
4	For battery relay drive	Output
5	Left steering EPC valve	Output
6	Transmission 3rd clutch ECMV	Output
7	Pitch selector solenoid valve	Output
8	HSS pump TVC solenoid valve	Output
9	(*1)	-
10	Work equipment iB switch (NO)	Input
11	Continuous power supply (24 V)	Input
12	Power supply (24 V)	Input
13	GND (solenoid common)	Input
14	Starting switch ACC signal	Input
15	Right steering EPC valve	Output
16	(*1)	-
17	Cooling fan reverse solenoid	Output
18	Cooling fan control solenoid	Output

10. Since springs (3) and (4) are 2-stage springs, the positional relation between pump discharged pressure (PP) and servo piston (9) becomes a polygonal line, and the relation between pump discharged pressure (PP) and pump discharged volume (Q) is as shown in the figure.

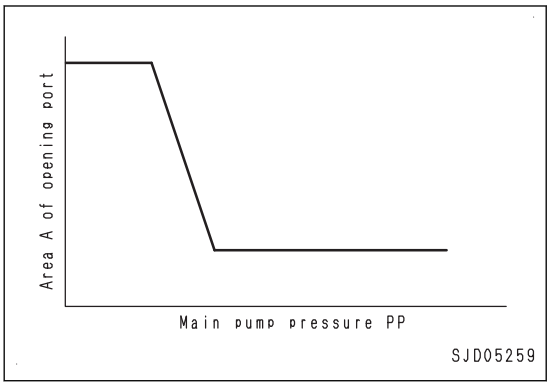


Variable Throttle Valve

Function of Variable Throttle Valve

- Since the work equipment and HSS pump controls itself with its own pressure, the swash plate tends to respond quickly at high pressure and slowly at low pressure.
- The variable throttle valve reduces the swash plate speed in the ranges from the minimum to maximum angle and from the maximum to minimum angle, when the pressure is high.
  The impacts applied to the rods of the work equipment and HSS pump are reduced to prevent the high stress from being generated.
- When the pressure is high, the variable throttle valve reduces the speed of the swash plate moving from the minimum to maximum angles in order to restrict sudden increase of the suction volume.
  By this operation, cavitation at the suction port caused by sudden increase of the suction volume is prevented.
- The variable throttle valve has the characteristics shown in the figure, and it decreases the open area when the pressure is high, and increases the open area when the pressure is low.

  It increases the response speed of the swash plate at low pressure, and secures the response during work.

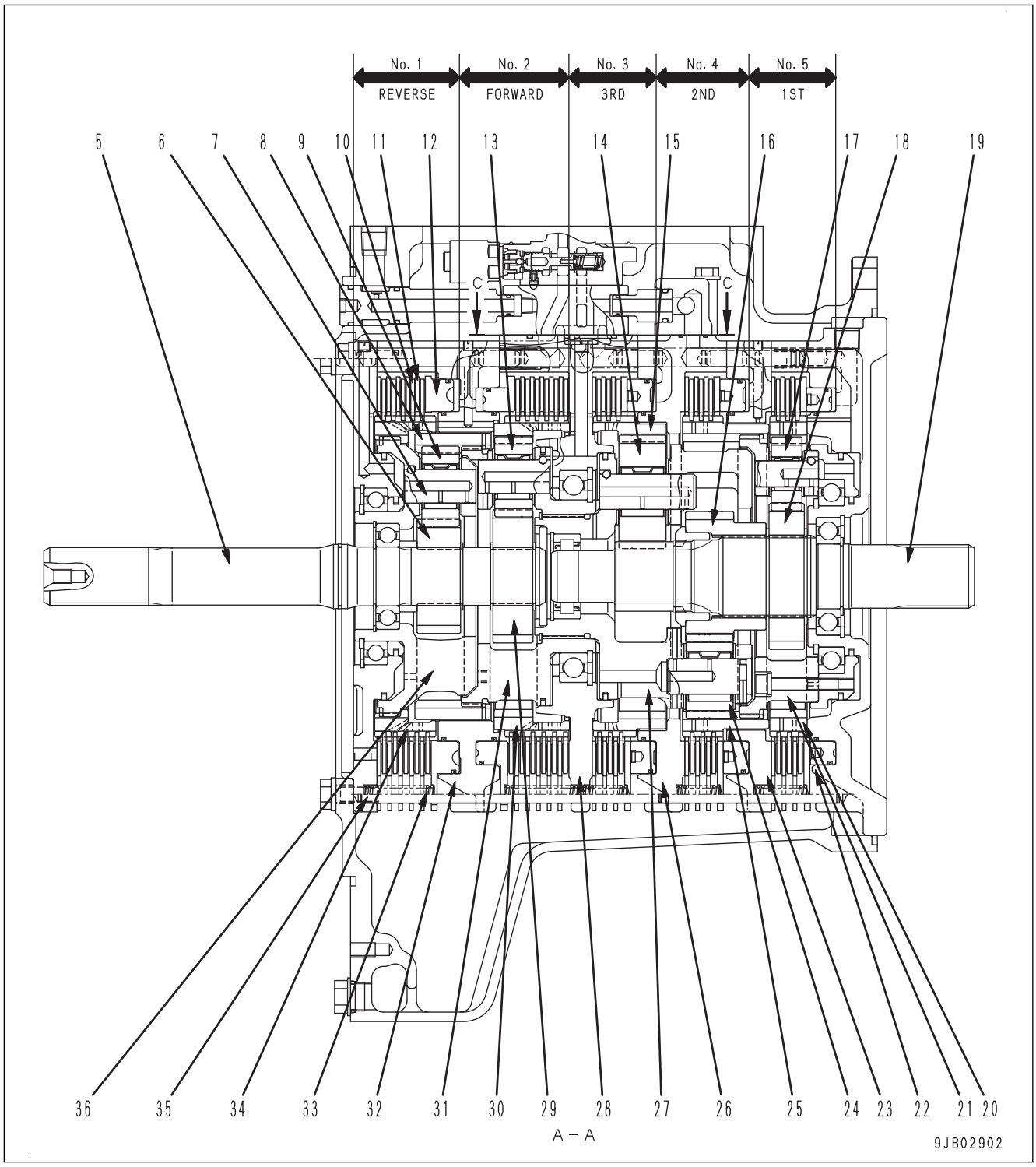


Operation of Control Valve During Mixed Operation
During Mixed Operation of Steering System and Work Equipment

REMARK

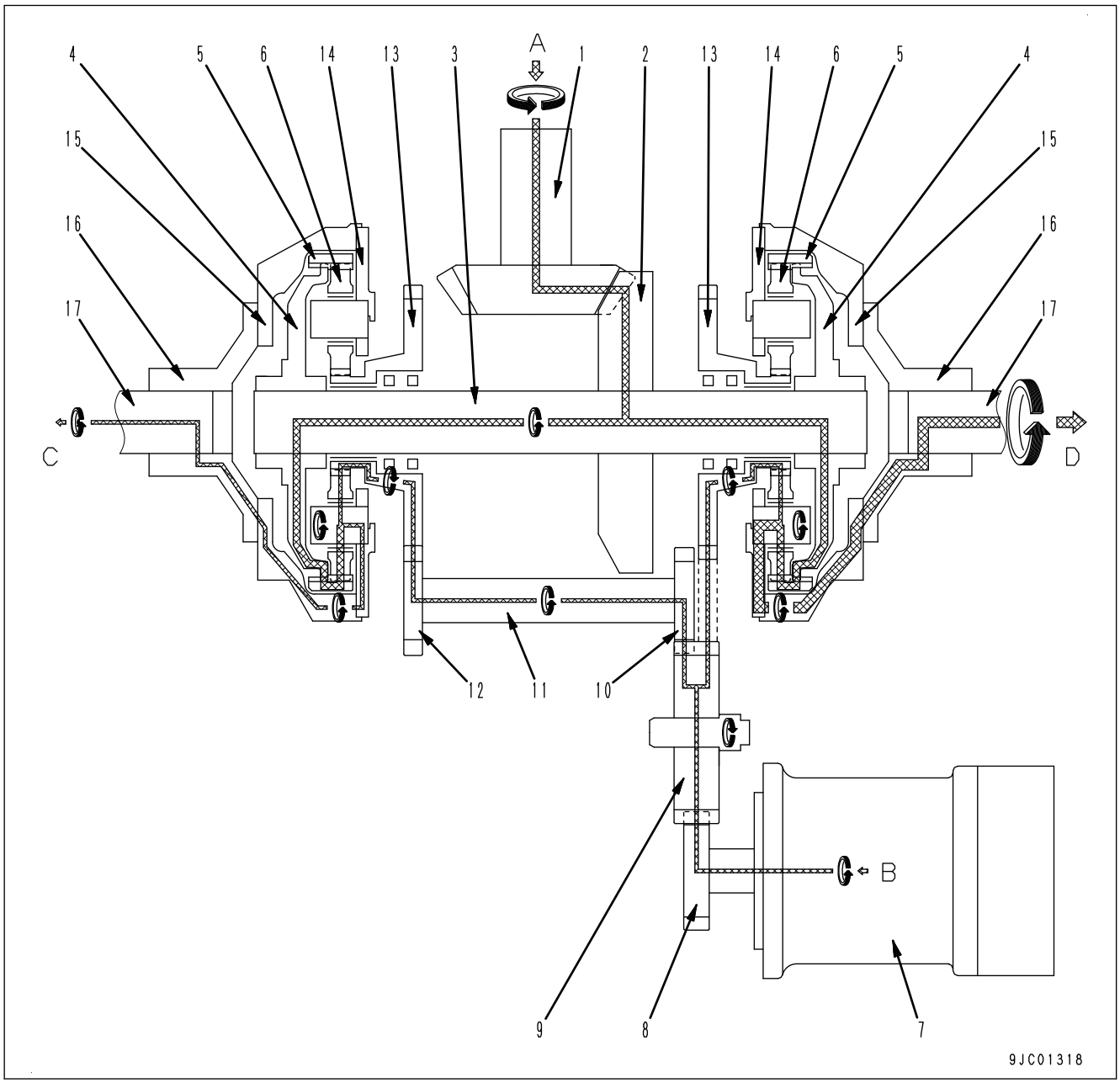
The figure shows the steering and blade lift valve during combined operation.

Sectional View (A-A)



5: Transmission input shaft
6: R sun gear (number of teeth: 30)
7: Pinion shaft
8: R ring gear (number of teeth: 70)
9: R planetary pinion (number of teeth: 20)
10: Disc
11: Plate
12: Clutch piston
13: F planetary pinion (number of teeth: 20)
14: 3rd planetary pinion (number of teeth: 30)
15: 3rd ring gear (number of internal teeth: 76, number of external teeth: 90)
16: 2nd sun gear (number of teeth: 35)
17: 1st planetary pinion (number of teeth: 18)
18: 1st sun gear (number of teeth: 39)

Operation When Direction is in “Reverse” and Steering is “LEFT Turn”



A: Transmission output

B: HSS motor output

C: Left bevel gear shaft output (= - A + B)

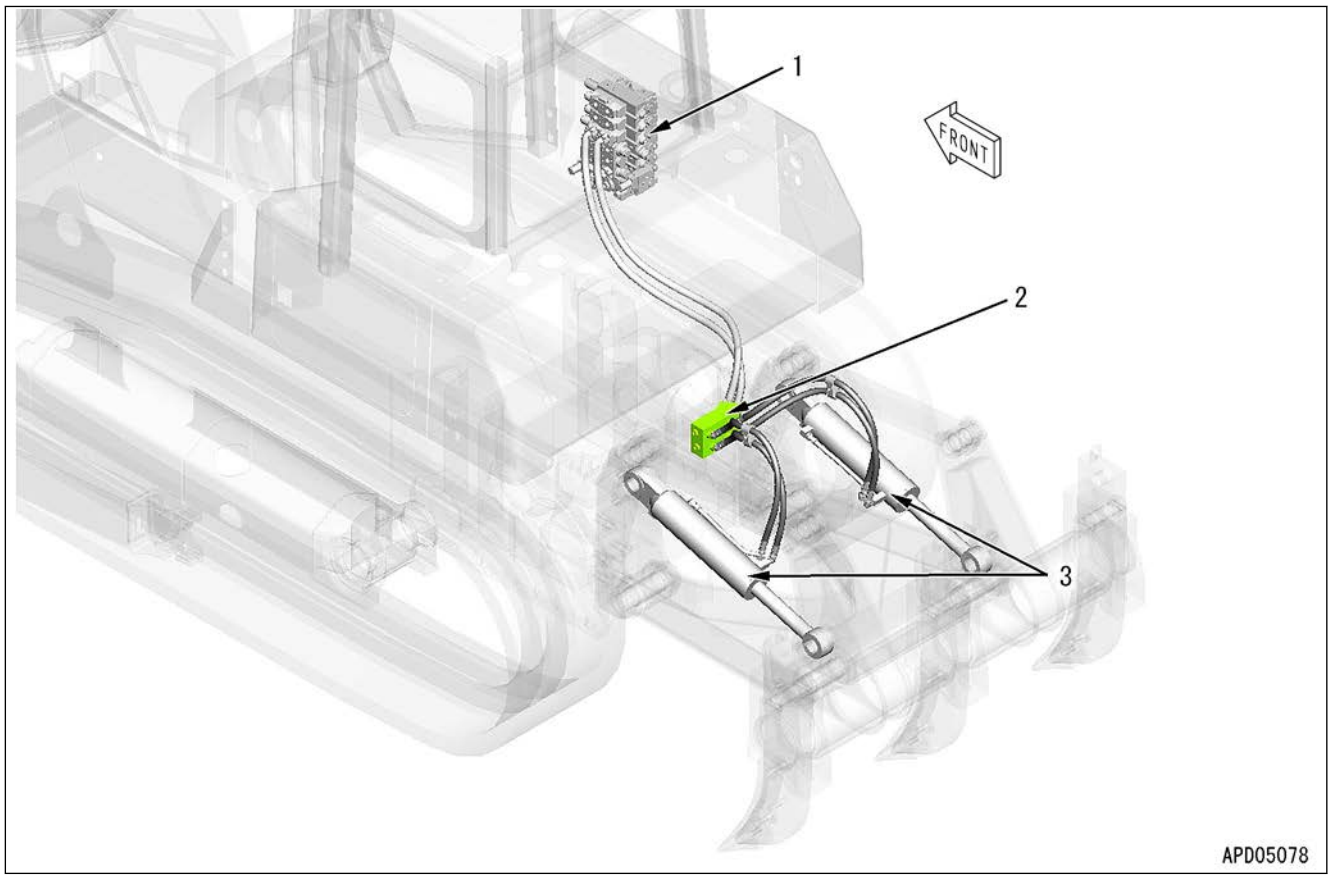
D: Right bevel gear shaft output (= - A - B)

REMARK

When the PCCS lever is set to “LEFT turn” while it is in REVERSE, HSS motor (7) rotates counterclockwise when it is viewed from the left side of the machine.

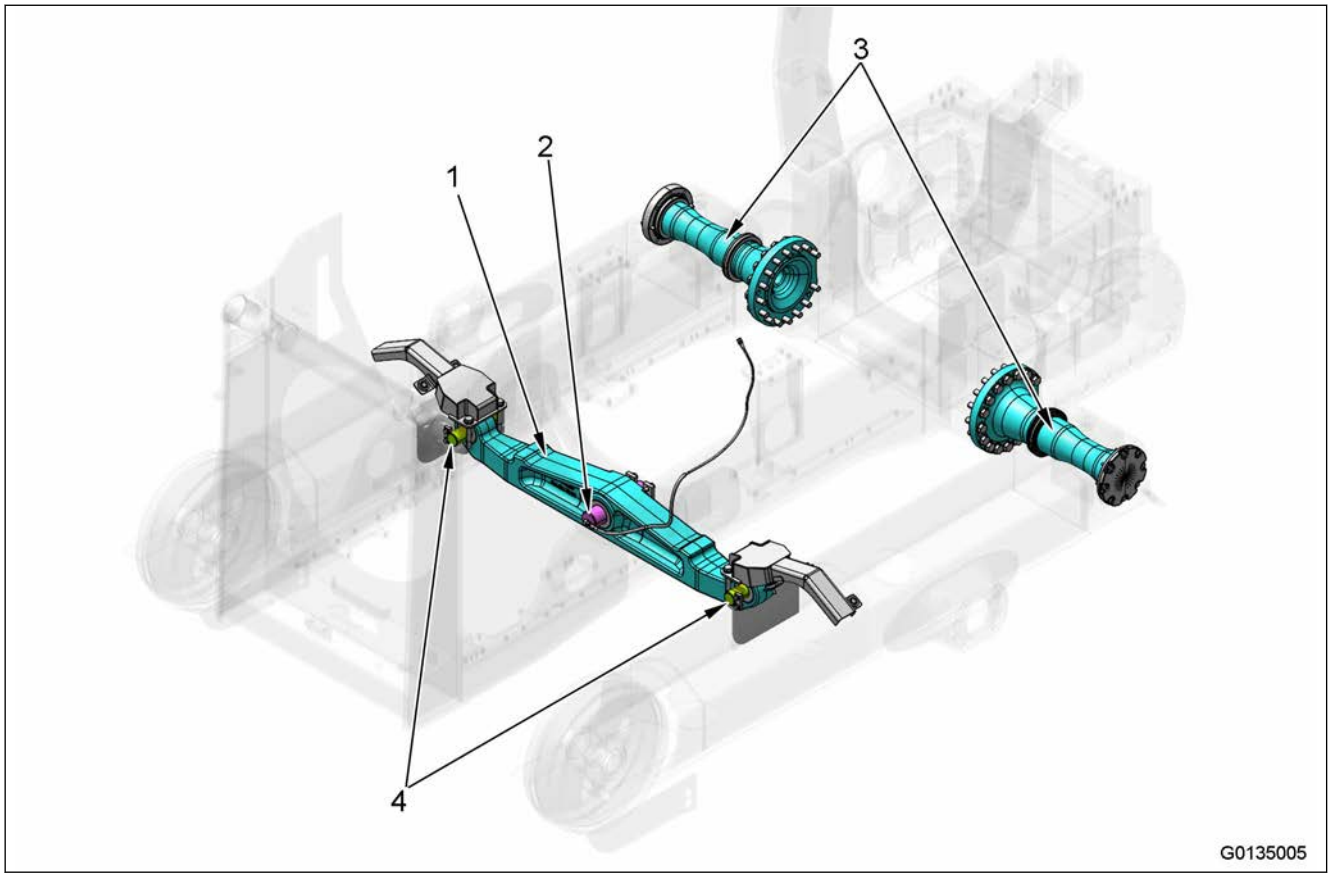
Power from transmission (REVERSE)		Power from HSS motor (7) (counterclockwise rotation when it is viewed from left side of machine)	
↓		↓	
Bevel pinion (1)		Drive gear (8)	
↓		↓	
Bevel gear (2)		Gear D (9)	→ ↓
↓		↓	↓

Layout Drawing of Fixed Multi-Shank Ripper



1: Control valve
2: Branch block
3: Ripper cylinder

Function of Suspension



The track frame moves the front part up and down with the pivot shaft (3) at the rear end used as a pivot. The equalizer bar (1) rocks with the center pin (2) used as a pivot, and is connected to the right and left track frames with the side pins (4).

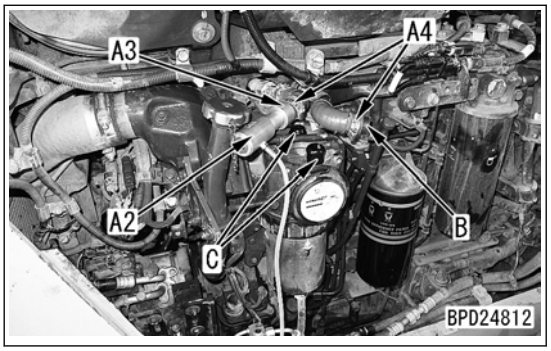
Machine model				D85EX-18	
Engine				SAA6D125E-7	
Item	Measurement condition		Unit	Standard value for new machine	Repair limit
Ripper lift relief pressure	• Engine coolant temperature: 60 to 100 °C • Power train oil temperature: 70 to 80 °C • Hydraulic oil temperature: 45 to 55 °C • Operating Mode: P (Power mode) • Ripper control lever: RAISE	Fuel control dial: MIN (Low idle) position	MPa {kg/cm^2}	20.4 to 22.8 {208 to 232}	20.4 to 22.8 {208 to 232}
		Fuel control dial: MAX (High idle) position		21.4 to 23.7 {218 to 242}	21.4 to 23.7 {218 to 242}
LS pressure (Work equipment load sensing pressure)	• Engine coolant temperature: 60 to 100 °C • Power train oil temperature: 70 to 80 °C • Hydraulic oil temperature: 45 to 55 °C • Operating Mode: P (Power mode) • Work equipment control lever: Operation of blade RAISE or blade tilt relief	Fuel control dial: MIN (Low idle) position	MPa {kg/cm^2}	19.2 to 21.2 {196 to 216}	19.2 to 21.2 {196 to 216}
		Fuel control dial: MAX (High idle) position		19.2 to 21.2 {196 to 216}	19.2 to 21.2 {196 to 216}
Control circuit oil pressure (HSS, PPC, Fan)	• Engine coolant temperature: 60 to 100 °C • Power train oil temperature: 70 to 80 °C • Hydraulic oil temperature: 45 to 55 °C • Operating Mode: P (Power mode) • Fuel control dial: MAX (High idle) position • Joystick (steering, directional, and gear shift lever) (PCCS lever): NEUTRAL position		MPa {kg/cm^2}	3.97±0.29 {40.5±3.0}	3.97±0.29 {40.5±3.0}

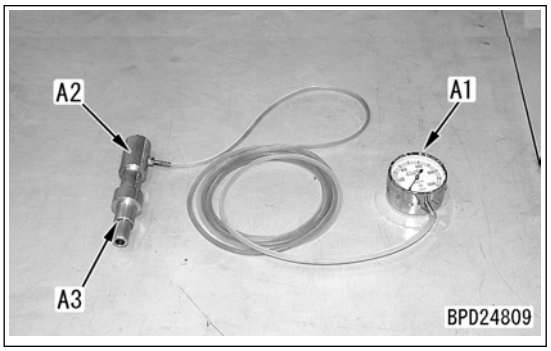
2. Disconnect hose (1) on the KCCV blowby gas outlet side, install plug B to the hose with clamp A4, and install cap C to the KCCV hose insertion pipe side.

   Clamp A4:
   4.4±0.49 Nm {0.45±0.05 kgfm}

3. Disconnect hose (2) on the KCCV blowby gas inlet side, install cap C to the KCCV hose insertion pipe side. Install tool A2 and adapter A3 of the blowby checker A to hose (2), and connect gauge A1.

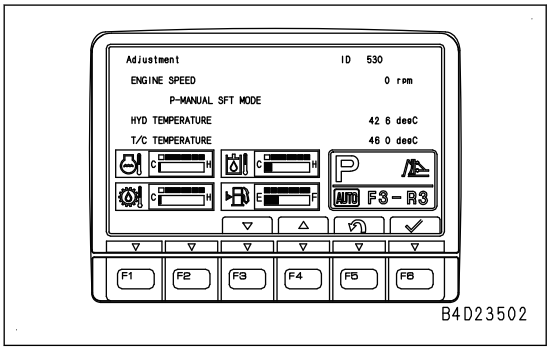
   Clamp A4:
   4.4±0.49 Nm {0.45±0.05 kgfm}





4. Start engine, and refer to “Set and Operate Machine Monitor” to display Adjustment ID: 0530 “Stall mode”.
5. Set the fuel control dial to MAX (High idle) position, and measure the blowby pressure at the time when torque converter stall is performed.

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



Write Correction for Ash in Soot Accumulation to Engine Controller

⚠ **Check that there is no person or combustible material around the machine (particularly in the direction of the exhaust gas flows).**

- When starting the engine, ash contained in engine oil accumulates in KCSF and increases filter differential pressure.
- Since filter differential pressure is used for calculation of soot accumulation in the engine controller, increase amount of differential pressure by ash needs to be corrected.
- Correction amount of filter differential pressure increased by ash is calculated in the engine controller as “Soot Correction by Ash Influence”.
- When engine controller is replaced with the new one, “Soot Correction by Ash Influence” becomes default value, 0 g/ℓ.
- When engine controller is replaced with the new one, perform applicable operation to obtain correct “Soot Correction by Ash Influence”.

How to Write Correction for Ash in Soot Accumulation to Engine Controller

Perform the applicable operation according to the following procedure.

- When only the engine controller is replaced.
  Perform “Ash in Soot Accumulation Correction”. For detail, see “Set and Operate Machine Monitor”.
- When both of engine controller and KCSF are replaced,
  the value of “Soot Correction by Ash Influence” and Ash Accumulationaccumulated in KCSF become 0 g/ℓ, “Ash in Soot Accumulation Correction” needs not to be performed.

  Perform applicable operation. For details, see TROUBLESHOOTING, “Precautions for KDPF (KCSF, KDOC) cleaning and change”.

Clean DEF Pump

Tools to Clean DEF Pump

Symbol	Part No.	Part name	Q'ty	Remarks
A	790-361-1000	DEF pump cleaning kit	1	
A1	6540-71-2720	Cap	3	
B	Commercially available	Resin container	1	• Made with polypropylene/polyethylene • Capacity:Approx.1ℓ
C	600-919-5030	Plug (for 3/8 inch diameter hose)	4	
D	600-919-5050	Plug (for 5/16 inch diameter hose)	4	

⚠ Place the machine on a level ground, stop the engine, and set the parking brake lever and the work equipment lock lever to the LOCK position.

⚠ For handling of DEF, see Operation and Maintenance Manual, "PRECAUTIONS FOR DEF".

⚠ When holding DEF pump with your hands, be sure to put on safety glasses and rubber gloves.

⚠ Toxic gas or corroded material may be generated by a chemical reaction if an iron or aluminum container is used to catch the draining fluid waste of DEF from the machine. Use a container made of resin (PP, PE) or stainless steel to catch the draining fluid waste of DEF.

NOTICE

- **If a KOMNET communication error which cannot be sensed by the engine controller occurs within 1 second, the machine monitor continues the test in some cases even though the test is not continued (standard screen). In such a case, turn the starting switch to the OFF position. The system operating lamp goes off, and the engine controller shuts down. Then the test is reset.**
- **DEF can freeze when the ambient temperature is low. Before you clean the DEF pump, make sure that the DEF is thawed. If you clean the DEF pump while DEF is frozen, devices can be damaged.**

REMARK

See "Clean DEF Tank"and prepare a cleaning equipment to clean the DEF tank.

How to Clean DEF Pump

Preparation for cleaning

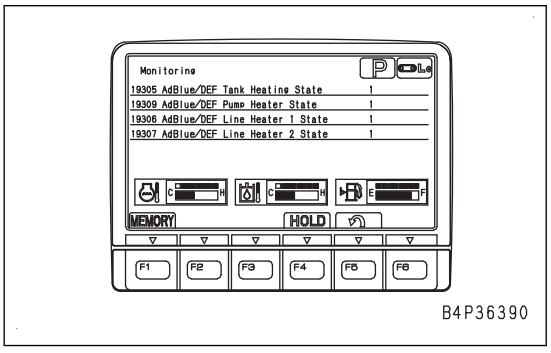
1. Start the engine.
2. Check the DEF state.
   1) Select and show the monitoring items that follow. For details, see "Set and Operate Machine Monitor".

      Monitoring code: 19305 "DEF Tank Heating State"

      Monitoring code: 19309 "DEF Pump Heater State"

      Monitoring code: 19306 "DEF Line Heater 1 State"

      Monitoring code: 19307 "DEF Line Heater 2 State"



Move Machine by Parking Brake Release When Machine Does Not Travel

Tools to Release Parking Brake

Sym-bol		Part No.	Part name	Q'ty	Remarks
A	-	790-190-1601	Pump assembly	1	
	1	790-190-1510	Pump	1	
	2	792-610-1710	Hose	1	
B		799-101-5220	Nipple	1	SizeM10x1.25 mm
C		07002-11023	O-ring	1	
D		19M-06-52930	Switch assembly	1	
E		14X-06-6430	Wiring harness	1	
F		7824-66-6430	Resistor	1	
G		7827-10-1520	Resistor	1	

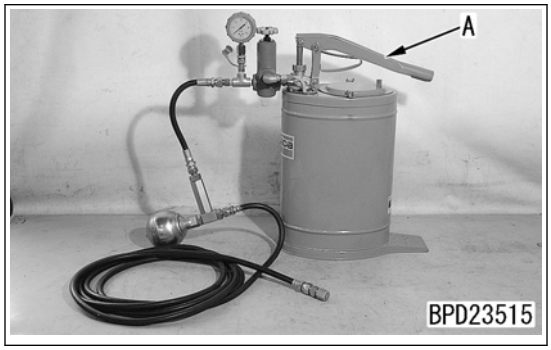
⚠ Start work after inserting a block to prevent rotation into the crawler so that the machine will not move on slopes.

If parking brake cannot be released and machine cannot be moved, refer this function and move the machine.

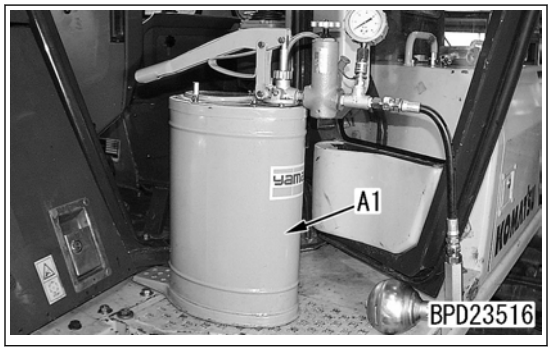
How to Move Machine with Hydraulic Type Parking Brake Release System

- If the engine cannot be started and the parking brake cannot be released, move the machine according to the following procedure.
- When you can start the engine, see “Move Machine with Electric Type Parking Brake Release System”.

1. Pump assembly A.



2. Install pump A1 of pump assembly A to the outside of the operator’s cab.



Work Equipment

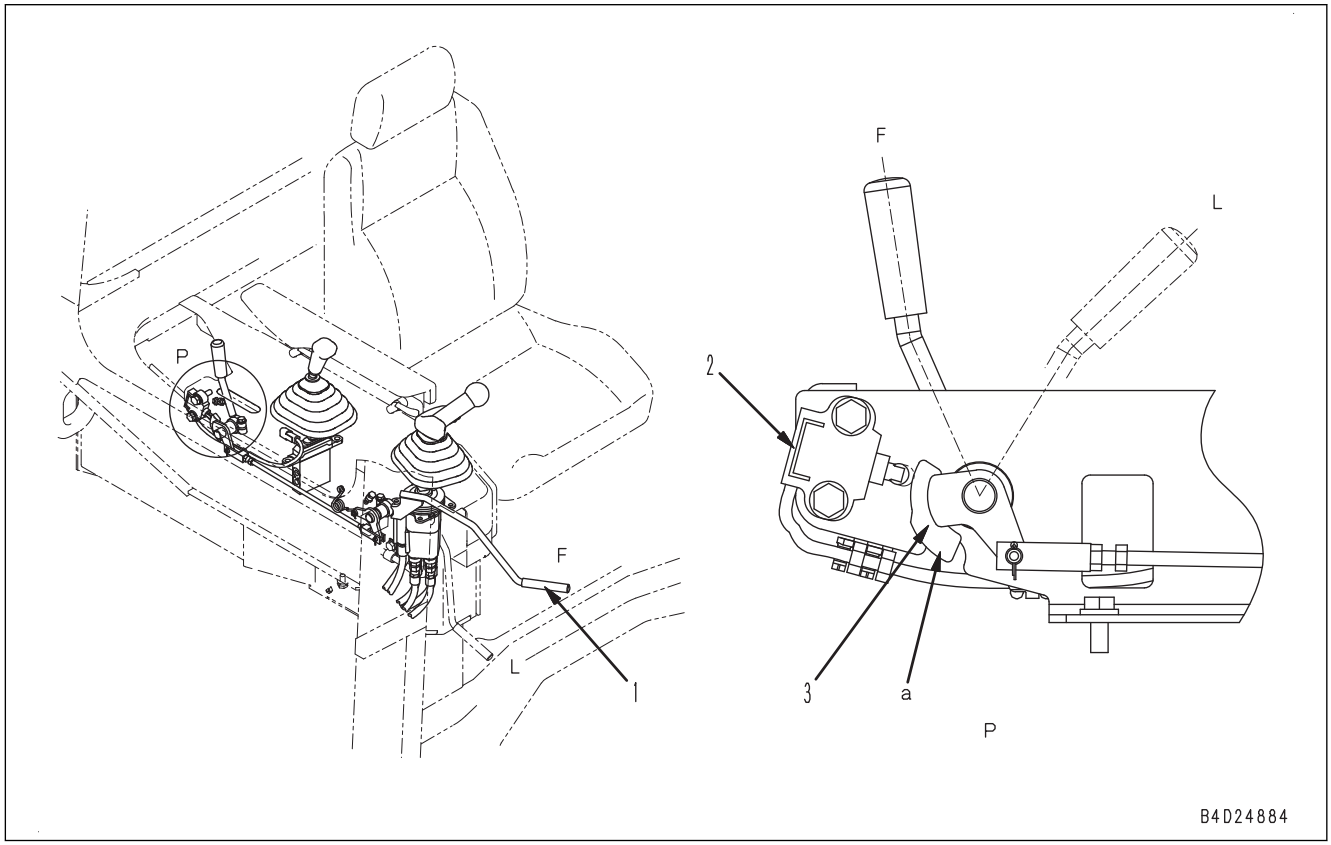
Adjust Work Equipment Lock Lever

⚠ Place the machine on a level ground, lower the work equipment to the ground, stop the engine, and set the parking brake lever and work equipment lock lever to LOCK position.

For adjusting of the work equipment lock lever to perform troubleshooting or others, refer to this section.

How to Adjust Work Equipment Lock Lever

The figure is a structural view for adjustment.



1. Set work equipment lock lever (1) in LOCK position (L).
2. Install limit switch (2) so that it is set to sliding surface (a) of lever (3).

   REMARK

   Set the roller of the limit switch lightly, and do not stroke it.
3. Set work equipment lock lever (1) to FREE position (F), and check that limit switch (2) operates normally.

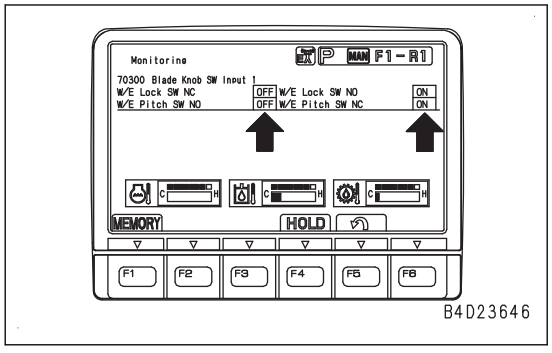
   Stroke of limit switch: 2.5 to 3 mm
4. Turn the starting switch to ON position, see SETTING AND OPERATION OF MACHINE MONITOR and display the monitoring code “70300” on the screen.

   Monitoring code: 70300 “Blade Knob SW Input 1”
5. Check that the signal of limit switch is input normally when work equipment lock lever (1) is set to FREE position (F) or LOCK positions (L).

   FREE position (F)

   “W/E Lock SW NC”: “ON”, “W/E Lock SW NO”: “OFF”

   LOCK positions (L)



Code No.	Monitoring item (display on screen)		Unit (default: SI)			Applicable component	Remarks
			SI	Metric	Imperial		
04401	Hydraulic Oil Temperature		°C	°C	°F	P/T	
04402	Hydraulic Oil Temp Sensor Volt		V	V	V	P/T	
10000	Fan Speed command		r/min	rpm	rpm	P/T	
10007	Fan Speed		r/min	rpm	rpm	P/T	
10013	Fan Speed Sensor Voltage		V	V	V	P/T	
70300	Blade Knob SW Input 1	W/E Lock SW NC	ON/OFF			P/T	
		W/E Lock SW NO	ON/OFF			P/T	
		W/E Pitch SW NC	ON/OFF			P/T	
		W/E Pitch SW NO	ON/OFF			P/T	
01300	Pump TVC Solenoid Current		mA	mA	mA	P/T	
01301	Pump TVC Solenoid 2 Current		mA	mA	mA	P/T	
31624	Fan Pump EPC Solenoid Current		mA	mA	mA	P/T	
60600	Battery Relay Drive Voltage		mV	mV	mV	P/T	
04300	Battery Charge Voltage		V	V	V	MON	
04200	Fuel Level Sensor Voltage		V	V	V	MON	
04500	Monitor input 1	Key SW	ON/OFF			MON	
		Start	ON/OFF			MON	
		Preheat	ON/OFF			MON	
		Light	ON/OFF			MON	
		Engine Coolant Level	ON/OFF			MON	
04501	Monitor input 2	Air Cleaner	ON/OFF			MON	
		Battery Charge Voltage	ON/OFF			MON	
04502	Monitor input 3	Engine Shutdown 2nd SW	ON/OFF			MON	
		Seat Belt SW	ON/OFF			MON	
04503	Monitor Function SW	F1	ON/OFF			MON	
		F2	ON/OFF			MON	
		F3	ON/OFF			MON	
		F4	ON/OFF			MON	
		F5	ON/OFF			MON	
		F6	ON/OFF			MON	
04504	Monitor 1st & 2nd Row SW	SW1	ON/OFF			MON	
		SW2	ON/OFF			MON	
		SW3	ON/OFF			MON	
		SW4	ON/OFF			MON	
		SW5	ON/OFF			MON	
		SW6	ON/OFF			MON	

Adjustment Menu

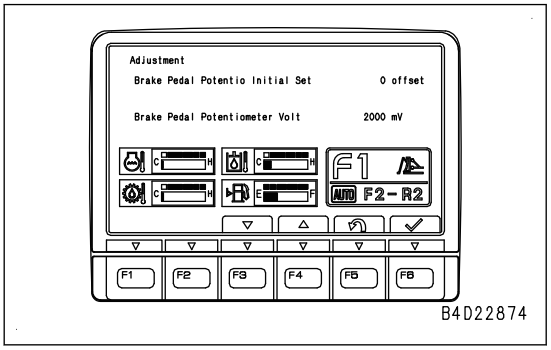
How to do Settings of Machine

Perform the adjustment of each machine setting with adjustment menu or Adjustment ID.

To perform each adjustment, select the adjustment item according to two following procedures.

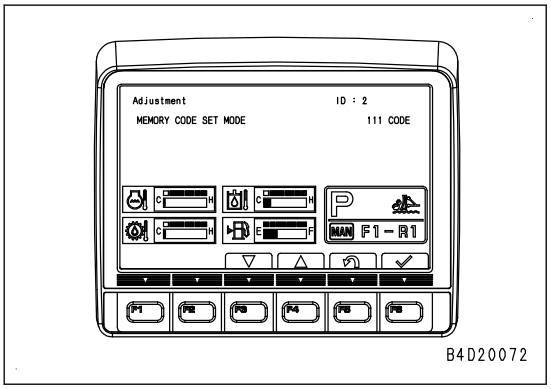
When You Select Adjustment Items from Adjustment Menu:

- The following figure is an example of an adjustment menu “Brake Pedal Potentio Initial Set” screen displayed.
- Functions allocated to the function switches F3 to F6 vary depending on the adjustment items.
- For details of how to operate the adjustment items, refer to the explanation for each Adjustment menu.



When You Select Adjustment Items from Adjustment ID:

- The figure shows an example of Adjustment ID “0002”.
- The “000”, “00”, and “0” of the first 3 digits of Adjustment ID must be input. However, those numbers are not displayed in “Adjustment” screen.
- Functions allocated to the function switches F3 to F6 vary depending on the adjustment items.
- For details of how to operate the adjustment items, refer to the explanation for each Adjustment ID.



Adjustment Item Table

NOTICE

After completion of assembling the machine or during the controller replacement, be sure to perform the adjustment marked with (*) in its “code” column or “Adjustment ID” column.

Items to be Selected from “Adjustment Menu”

Code	Adjustment item	Remarks	Reference page
02 (*)	Brake Pedal Potentio Initial Set	Makes the power train controller recognize the zero point of the brake pedal potentiometer.	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (BRAKE PEDAL POTENTIO INITIAL SET)
04 (*)	S/T Lever N Position Setting	Makes the power train controller recognize the zero point of the steering potentiometer.	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (S/T LEVER NEUTRAL POSITION SET)
05 (*)	IP Auto Compensation Setting	Makes the power train controller recognize the transmission condition automatically.	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (IP AUTOMATIC CORRECTION, TRIGGER INITIAL LEARNING SETTING)

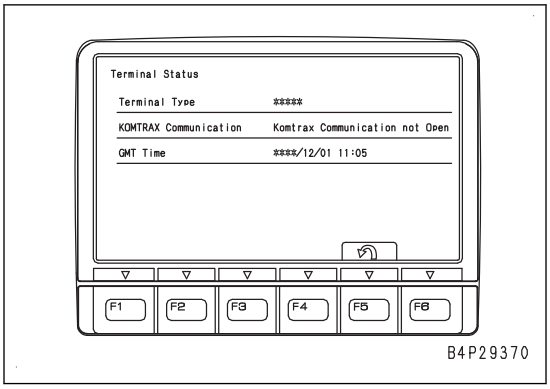
3. On “Terminal Status” screen, the following items are displayed.

   Terminal Type: Model name of the KOMTRAX communication modem

   KOMTRAX Communication Inspection: State of radio station establishment

   GMT time: Greenwich Mean Time (add 9 hours to it for Japan time)

   F5: Returns the screen to “KOMTRAX Settings” screen



How to Examine KOMTRAX Settings (GPS & Communication State)

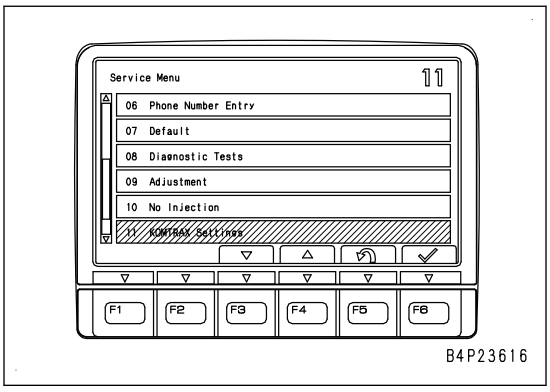
The setting and operating state of KOMTRAX can be checked by using “KOMTRAX Settings” screen.

“GPS & Communication State” is used to check the positioning and communication state of the KOMTRAX system.

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

   REMARK

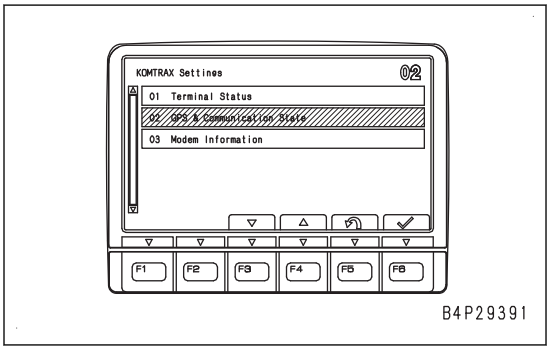
   For selecting method, see “How to Operate Service Mode” in “SERVICE MODE”.



2. On “KOMTRAX Settings” screen, select “GPS & Communication State” with the function switches or numeral input switches.

   REMARK

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



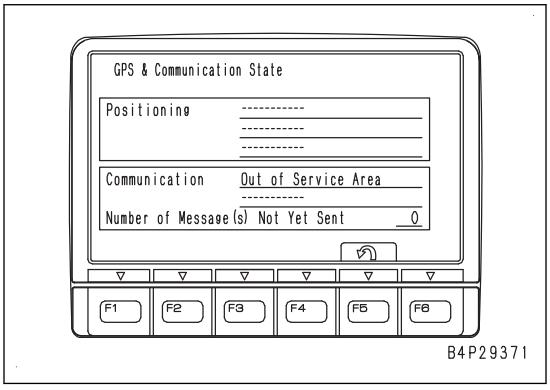
3. On “GPS & Communication State” screen, the following items are displayed.

   Positioning: GPS positioning state

   Communication: Communication environment and connection state of the communication modem

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

   F5: Returns the screen to “KOMTRAX Settings” screen



How to Examine KOMTRAX Settings (Modem Information)

You can check the settings and operating state of KOMTRAX with the "KOMTRAX Settings".

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

Machine model				D85EX-18			Good	No good
Engine				SAA6D125E-7				
Item	Measurement condition		Unit	Standard value for new machine	Repair limit	Measured value		
PPC valve outlet pressure	• Engine coolant temperature: 60 to 100 °C • Power train oil temperature: 70 to 80 °C • Hydraulic oil temperature: 45 to 55 °C • Operating Mode: P (Power mode) • Work equipment control levers: Full stroke end • Fuel control dial: MAX (High idle) position	Blade tilt relief	MPa {kg/cm^2}	3.82 to 4.12 {39.0 to 42.0}	3.82 to 4.12 {39.0 to 42.0}			

*1: Item that can be checked in monitoring function of machine monitor

Test in Accordance with Testing Procedure

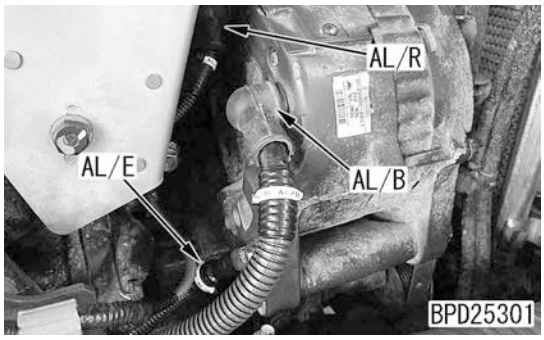
How to Examine Electric Equipment

Check of battery terminal for looseness and corrosion

1. Open the battery cover.
2. Check the battery cable terminals for looseness and corrosion.

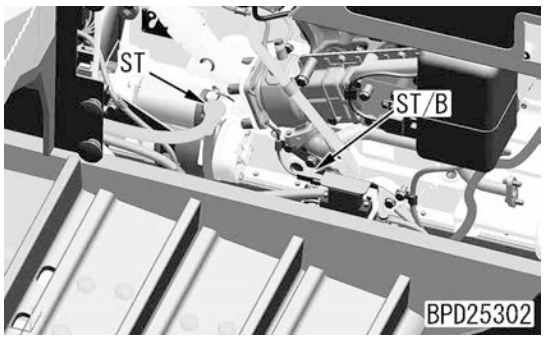
Check of alternator terminal for looseness and corrosion

3. Open the right engine hood.
4. Check alternator terminal B (AL/B), ground terminal (AL/E) and terminal R (AL/R) for open circuit, looseness and corrosion.



Check of starting motor terminal for looseness and corrosion

5. Check starting motor terminal B (ST/B) and connector ST for open circuit, looseness and corrosion.



Check of battery voltage (with engine stopped)

6. Check the battery voltage by using the battery tester while the engine is stopped.

Check of battery electrolyte level

7. Check before operating the machine.

⚠ Do not use the battery while its electrolyte level is below LOWER LEVEL. If it is used under that condition, its inside becomes deteriorate, its service life is shortened, and it may lead to an explosion.

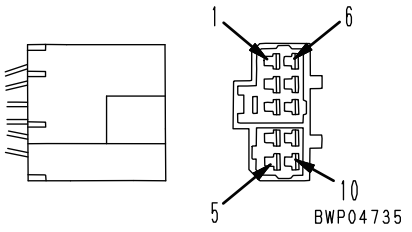
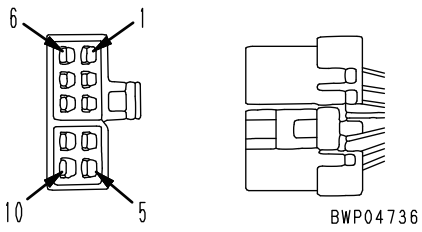
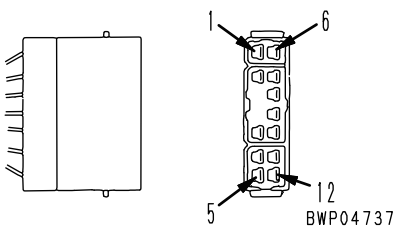
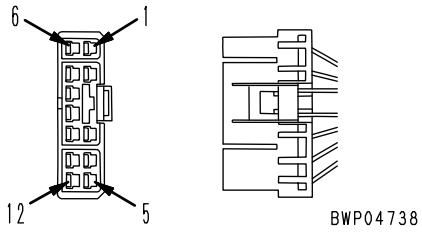
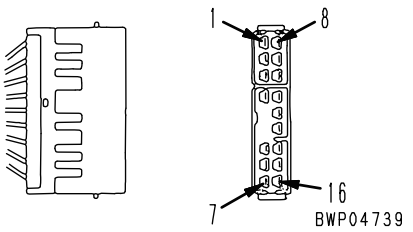
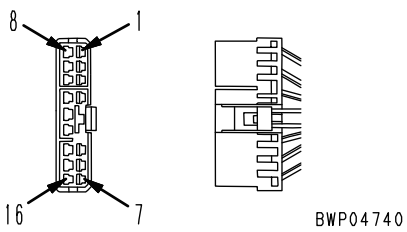
⚠ Since the battery produces combustible gas that can explode, do not bring any open flame near it.

⚠ Battery electrolyte is dangerous. Take care that it does not come in contact with your eyes or skin. If it does, wash it away with water and contact your doctor.

REMARK

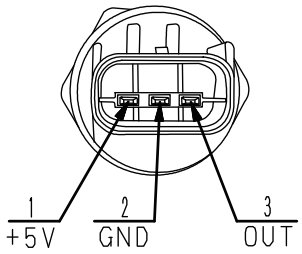
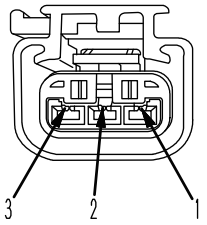
- Do not add the electrolyte to the battery exceeding UPPER LEVEL line. Otherwise it may leak and cause damage to the paint surface or corrode other parts.
- When adding purified water in cold weather, add it before starting operations in the morning to prevent the purified water from freezing.
- When checking the electrolyte level through the side face of the battery

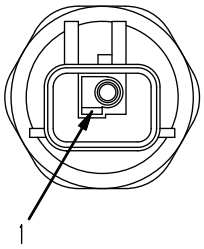
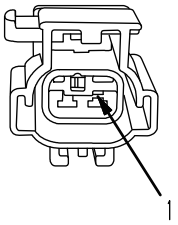
Connector No.	Connector type	Number of pins	Location	Address
PCV1	SUMITOMO	2	Supply pump #1	AK-4
PCV2	SUMITOMO	2	Supply pump #2	AK-3
PDOSER	FRAMATOME	3	HC dozing pressure sensor	AN-9
PDPF	F.C.I	4	KDPF pressure sensor	G-9
PFUEL	AMP	3	Common rail pressure sensor	AP-3
PHR	-	5	Preheater relay	T-1
PIM	FRAMATOME	3	Boost pressure sensor	AP-6
PKSW	DT	3	Parking lock switch	X-4
PL1	DRC16-70A	70	Intermediate connector	X-4
POIL	FRAMATOME	3	Engine oil pressure sensor	AK-5
PRT	DT	12	Intermediate connector	D-1
PRTR	DT	12	Intermediate connector	L-8
PSL	-	5	Personal lock relay	U-1
PT1	DT	3	Pitch angle sensor	B-2
PTCN1	DRC	24	Power train controller	V-2
PTCN2	DRC	40	Power train controller	V-2
PTCN3	DRC	40	Power train controller	V-2
PTP	DT	2	Blade pitch selection solenoid (if equipped)	AF-8
R SOL	DT	2	Reverse clutch ECMV solenoid	AH-2
R SW	DT	2	Reverse clutch ECMV fill switch	AI-3
RFD	DT	12	Intermediate connector	AE-5
RHT	Terminal	1	Ribbon heater	E-1
RLP	-	5	Rear lamp relay	U-1
RLSW	SWP	6	Rear lamp switch	M-7
RSD	DT	2	BR hold	X-3
RSR	-	5	Reverse signal relay	X-6
SBC	DT	2	Seat belt warning switch	X-4
SCRT	TYCO	4	SCR temperature sensor	E-8
SEGR	DT	4	EGR stroke sensor	AK-7
SESW	SWP	6	Engine shutdown secondary switch	O-9
SFTD	-	3	Downshift switch	U-9
SFTU	-	3	Upshift switch	U-9
SLS	050	2	Sunlight sensor	M-8
SRV	DT	12	Intermediate connector (for service)	X-4
SSR	DT	12	Smart sensor relay	L-3
ST	DT	2	Starting motor	F-1
ST/B	Terminal	1	Starting motor B terminal	G-1
SVGT	DT	3	VGT stroke sensor	AO-8

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

B4D18195

FRAMATOME connector for engine

No. of pins	Lubricating oil pressure sensor (125, 140 engine)		
	Sensor side (plug)	Harness side (receptacle)	Testing connection use special tool Part No.
3			799-601-4150 (T-adapter) (Kit: 799-601-4101) (Kit: 799-601-4201)
	-	-	

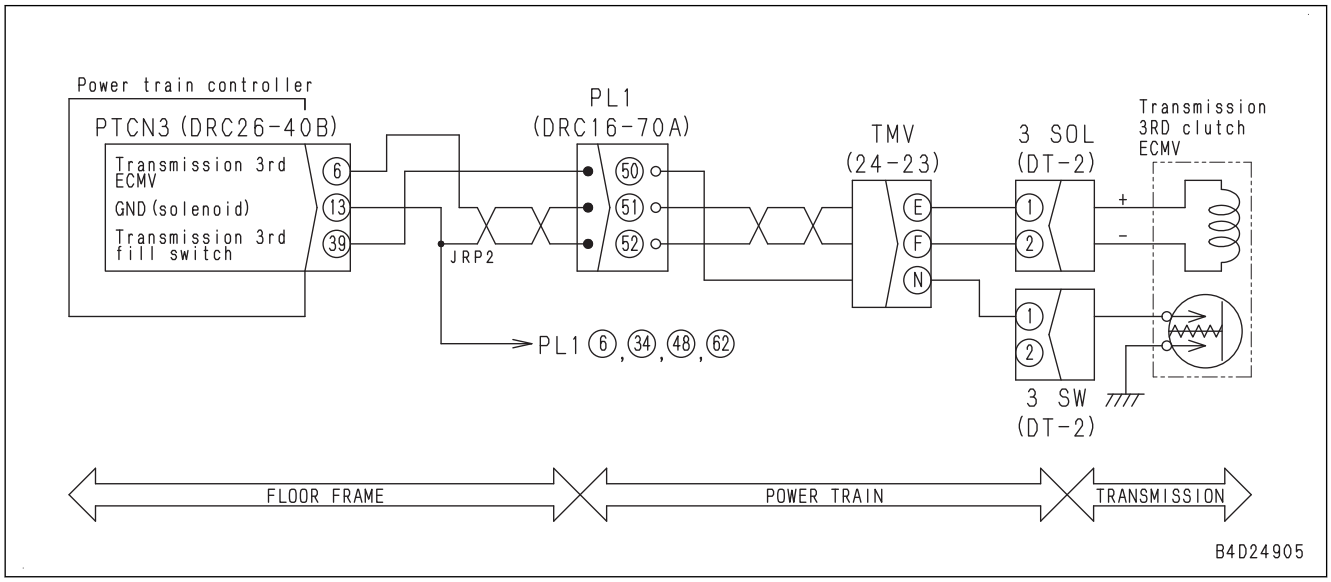
No. of pins	Hydraulic switch (95, 107, 114 engine)		
	Switch side (plug)	Harness side (receptacle)	
2			799-601-4160 (T-adapter) (Kit: 799-601-4101) (Kit: 799-601-4201)
	☆ Without pin (2)	☆ Without pin (2)	

B4W21629

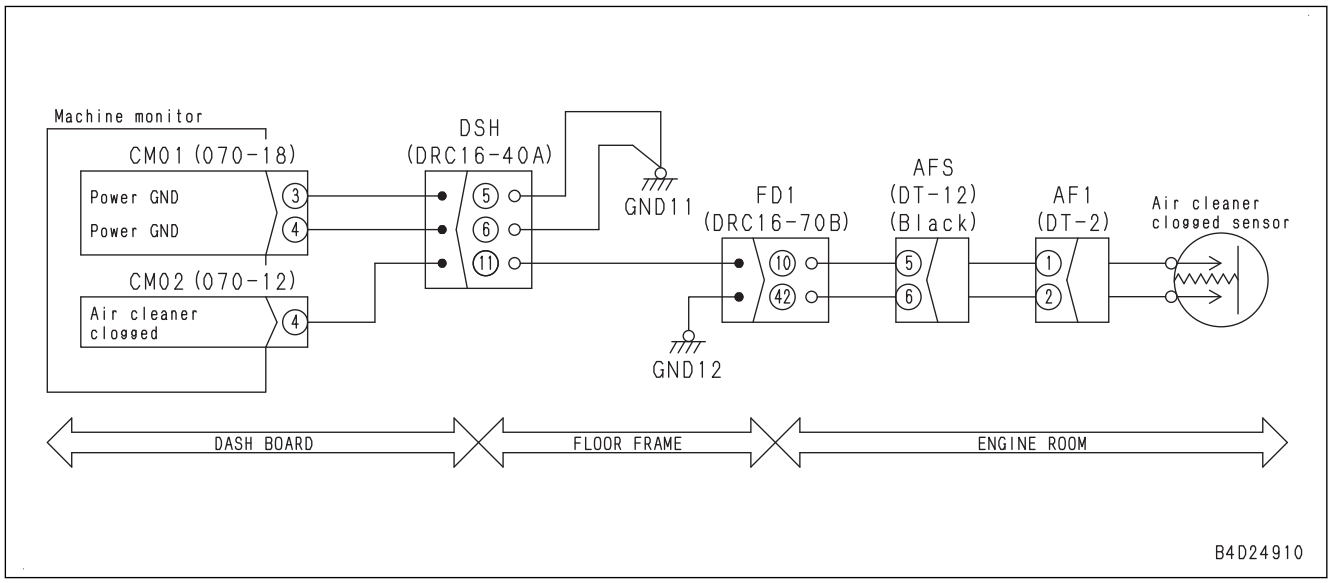
Failure code	Failure (Shown on screen)	Applicable equipment	Action level	History category	Remarks
CA3231	SCR Temperature High Error - Non Regeneration	ENG	L03	Electrical system	
CA3232	Turbo Outlet NOx Sensor Datalink Timeout Error	ENG	L01	Electrical system	
CA3235	SCR Outlet Temperature High Error - Non Regeneration	ENG	L03	Electrical system	
CA3239	DEF Line Heater 2 Voltage High Error	ENG	L01	Electrical system	
CA3241	DEF Line Heater 2 Voltage Low Error	ENG	L01	Electrical system	
CA3242	DEF Tank Heating Error	ENG	L01	Electrical system	
CA3251	KDOC Inlet Temperature High Error	ENG	L03	Electrical system	
CA3253	KDOC Temperature Error - Non Regeneration	ENG	L03	Electrical system	
CA3254	KDOC Outlet Temperature High Error 1	ENG	L01	Electrical system	
CA3255	KDPF Temperature Error - Non Regeneration	ENG	L03	Electrical system	
CA3256	KDPF Outlet Temperature High Error 1	ENG	L01	Electrical system	
CA3311	KDOC Outlet Temperature High Error 2	ENG	L03	Electrical system	
CA3312	KDPF Outlet Temperature High Error 2	ENG	L03	Electrical system	
CA3313	KDOC Inlet Temperature Sensor Low Error	ENG	L03	Electrical system	
CA3314	KDOC Inlet Temperature Sensor High Error	ENG	L03	Electrical system	
CA3315	KDOC Inlet Temperature Sensor In Range Error	ENG	L03	Electrical system	
CA3316	KDOC Outlet Temperature Sensor Low Error	ENG	L03	Electrical system	
CA3317	KDOC Outlet Temperature Sensor High Error	ENG	L03	Electrical system	
CA3318	KDOC Outlet Temperature Sensor In Range Error	ENG	L03	Electrical system	
CA3319	KDPF Outlet Temperature Sensor High Error	ENG	L03	Electrical system	
CA3321	KDPF Outlet Temperature Sensor Low Error	ENG	L03	Electrical system	
CA3322	KDPF Outlet Temperature Sensor In Range Error	ENG	L03	Electrical system	
CA3419	MAF Sensor Supply Voltage High Error	ENG	L03	Electrical system	

<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="5">4</td><td rowspan="5">Defective power train controller</td><td colspan="4">If any failure is found by check on Cause 2 and failure code is still displayed after above checks on Cause 3, power train controller is defective.
• Reference
1. Turn starting switch to OFF position.
2. Insert T-adapter into connector PTCN3.
3. Start engine.
REMARK
Keep joystick (steering, directional and gear shift lever) in N.</td></tr>
<tr><td>Voltage</td><td colspan="2">Between PTCN3 (39) and ground</td><td>7 to 11 V</td></tr>
<tr><td colspan="4">1. Turn starting switch to OFF position.
2. Insert T-adapter into connector PTCN3.
3. Start engine.
4. While depressing brake, operate joystick (steering, directional and gear shift lever) to perform troubleshooting.</td></tr>
<tr><td>Voltage</td><td>Between PTCN3 (39) and ground</td><td>F3/R3</td><td>Max. 1 V</td></tr>
</table>

Circuit Diagram of 3rd Clutch ECMV



Circuit Diagram of Air Cleaner Clogging Switch



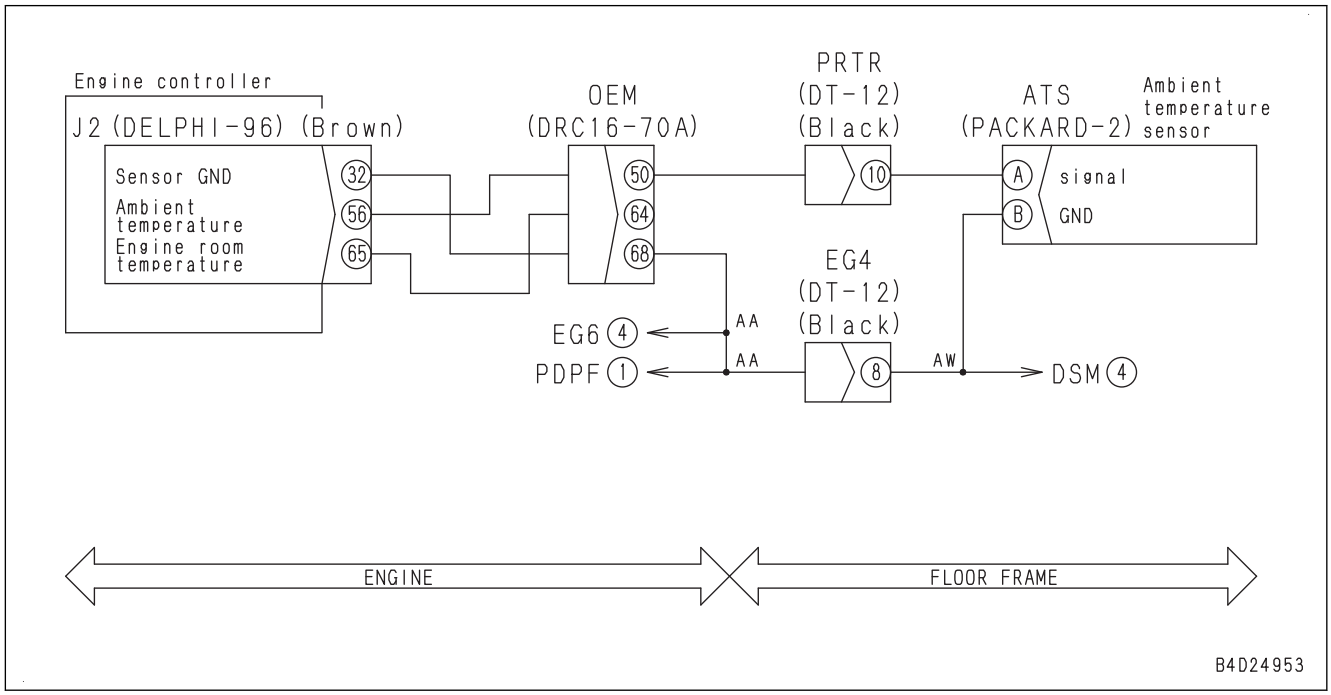
Failure Code [CA132]

Action level	Failure code	Failure	Throttle Sensor Low Error (Engine controller system)
L03	CA132		
Details of failure	Low voltage occurs in signal circuit of decelerator pedal (throttle sensor).		
Action of controller	Operates at fixed value of decelerator pedal (throttle sensor).		
Phenomenon on machine	Engine speed cannot be controlled by decelerator pedal (throttle sensor).		
Related information	• Signal voltage of decelerator pedal (throttle sensor) can be checked by monitoring function. (Code: 31703) • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position and operate decelerator pedal.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	1. Perform checkup referring to descriptions of wiring harness and connectors in “c Electric equipment” of “Checks before troubleshooting” in “General information on troubleshooting”. 2. Turn starting switch to ON position.		
		If this failure code is cleared, wiring harness connector is defective.		
2	Defective throttle sensor power supply system	If failure code [CA2185] is also displayed, perform troubleshooting these first.		
3	Defective decelerator pedal (throttle sensor)	1. Turn starting switch to OFF position. 2. Disconnect connector DCL, and connect T-adapter to male side.		
		Resistance	Between DCL (male) (B) and (C)	Approx. 2 kΩ
			Between DCL (male) (A) and (C)	0.2 to 1.8 kΩ
			Between DCL (male) (B) and (A)	0.2 to 1.8 kΩ
4	Open or short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector J2, and connect T-adapter to female side.		
		Resistance	Between J2 (female) (9) and (33)	Approx. 2 kΩ
			Between J2 (female) (10) and (33)	0.2 to 1.8 kΩ
5	Open circuit in wiring harness (wire breakage or defective contact of connector)	1. If failure code is still displayed after above checks on cause 4, this check is not required. 2. Turn starting switch to OFF position. 3. Disconnect connectors J2 and DCL, and connect T-adapters to each female side.		
		Resistance	Between J2 (female) (9) and DCL (female) (B)	Max. 1 Ω
			Between J2 (female) (10) and DCL (female) (A)	Max. 1 Ω
			Between J2 (female) (33) and DCL (female) (C)	Max. 1 Ω

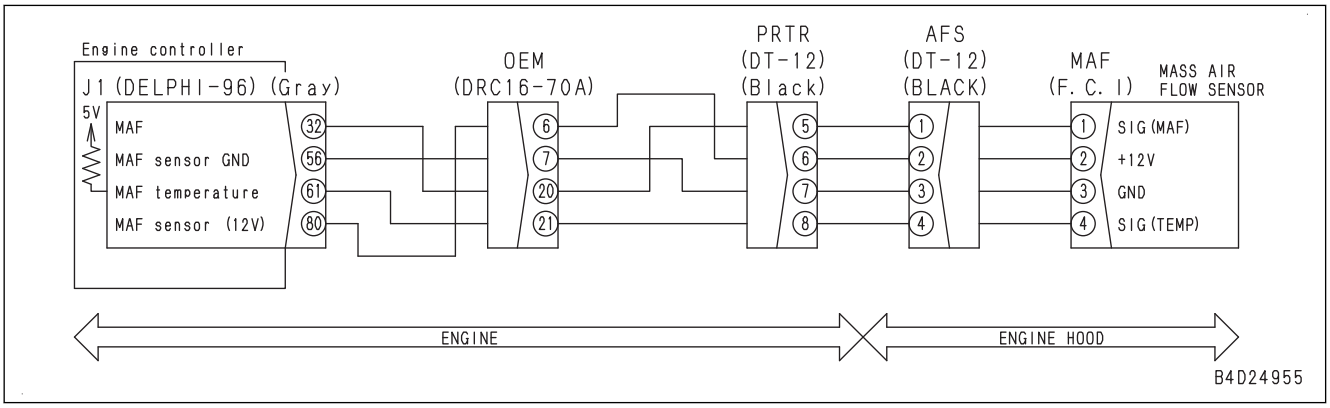
No.	Cause	Procedure, measuring location, criteria and remarks		
3	Open or short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connector J2, and connect the T-adapter to female side. **REMARK** Use charge temperature sensor resistance characteristics table for check on cause 2 as resistance criteria.		
		Resistance	Between J2 (female) (56) and (32)	280 Ω to 382 kΩ
4	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Insert T-adapter into connector J2. 3. Turn the starting switch to ON position.		
		Voltage	Between J2 (56) and (32)	Max. 4.96 V
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.)		

Circuit Diagram of Ambient Temperature Sensor



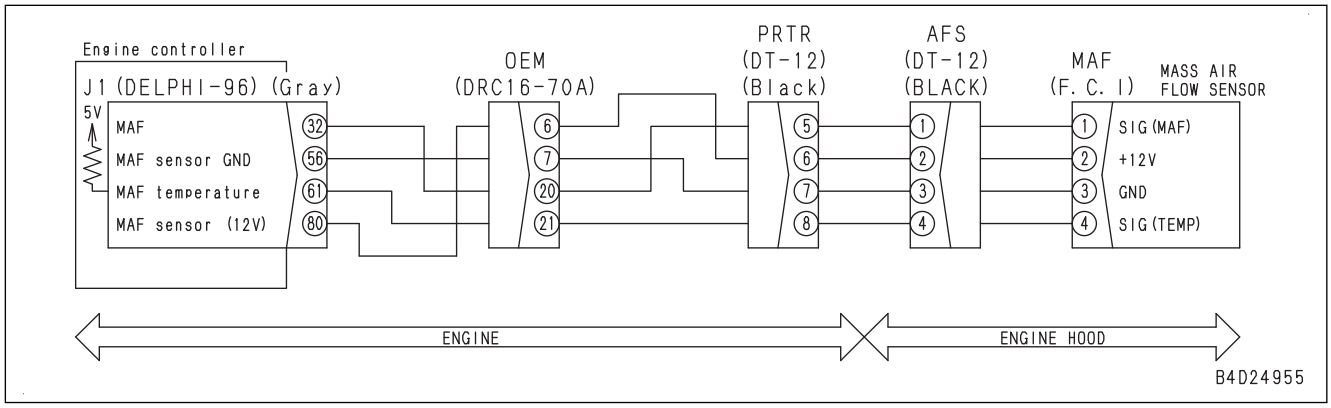
No.	Cause	Procedure, measuring location, criteria and remarks		
5	Open circuit in wiring harness (wire breakage or defective contact of connector)	1. Turn starting switch to OFF position. 2. Disconnect connectors J1 and MAF, and connect T-adapter to either female side.		
		Resistance	If failure code is still displayed after above checks on cause 4, this check is not required. Between J1 (female) (80) and MAF (female) (2)	Max. 1 Ω
			If failure code is still displayed after above checks on cause 4, this check is not required. Between J1 (female) (56) and MAF (female) (3)	Max. 1 Ω
			Between J1 (female) (32) and MAF (female) (1)	Max. 1 Ω
6	Ground fault in wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors J1 and MAF, and connect T-adapter to either female side.		
		Resistance	Between ground and J1 (female) (32) or MAF (female) (1)	Min. 1 MΩ
7	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors J1 and MAF, and connect T-adapters to female side of J1.		
		Continuity	Between J1 (female) (32) and each pin other than J1 (32) pin.	No continuity
8	Hot short circuit in wiring harness	1. Perform preparation when starting switch is in OFF position. 2. Disconnect connector MAF and connect T-adapter to female side. 3. Turn starting switch to ON position.		
		Voltage	Between MAF (female) (1) and (3)	Max. 1 V
9	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit Diagram of Intake Air Temperature Sensor



No.	Cause	Procedure, measuring location, criteria and remarks		
4	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector MAF. 3. Insert T-adapter into connector J1, or connect T-adapter to female side of MAF.		
		Voltage	Between J1 (61) and (56) or MAF (female) (1) and (3).	Max. 5.25 V
5	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors J1 and MAF, and connect T-adapters to female side of J1.		
		Continuity	Between J1 (female) (61) and each pin other than J1 (61) pin.	No continuity
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.)		

Circuit Diagram of Intake Air Temperature Sensor



Failure Code [CA1695]

Action level	Failure code	Failure	Sensor 5 Supply Voltage High Error (Engine controller system)
L03	CA1695		
Details of failure	High voltage error is detected in 5 V power supply of the KDPF differential pressure sensor, KDPF outlet pressure sensor and, DEF pump pressure sensor.		
Action of controller	• Operates at estimated value of KDPF outlet pressure sensor. (Operation may be performed at 0 kPa {0 kgf/cm^2} .) • Operates at estimated value of KDPF differential pressure sensor. (Operation may be performed at 0 kPa.) • Operates at fixed value (1300 kPa) of DEF pump pressure. • EGR valve closed. • Engine power deration • Regeneration control stops.		
Phenomenon on machine	Engine power deration		
Related information	• KDPF differential pressure sensor and KDPF outlet pressure sensor are provided as a unit. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position. • 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).		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective sensor 5 power supply system	Perform troubleshooting for failure code [CA1696].

No.	Cause	Procedure, measuring location, criteria and remarks
6	Defective KDPF differential pressure sensor	**NOTICE** **If failure codes [CA1881] and [CA1879] are displayed after checks on cause 5, the KDPF differential pressure sensor is defective.**
7	Defective engine controller	If failure code is still displayed after above checks, any internal parts in the engine controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)

Loaded Diagnostics Operation to Clear Failure Code

Perform the procedure below to check that the repair is completed.

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

⚠ Park the machine on a level ground.

1. Turn starting switch to ON position and leave it for 1 minute.

   REMARK

   It is required that the engine controller recognizes the dispersion of sensor.
2. Turn the starting switch to OFF position, and shut down the engine controller.
3. Turn the starting switch to ON position, and start the engine.
4. Run the engine at low idle speed for approximately 1 minute.
5. After warm-up operation, perform torque converter stall operation continuously for 40 seconds with fuel control dial at MAX (high idle) position.

   Torque converter stall operation

   1) Use a manual gear shift mode in P mode.
   2) On the “Service Menu” screen of the machine monitor, select “Adjustment”.
   3) Enter 0530 “Stall mode” as an ID on the “Adjustment” screen.
   4) Use a shift up (UP) switch on the PCCS lever to set preset mode display to [F3-R3].
      The preset mode display (on the lower right of the screen) can be set to [F3-R3] only when the stall mode is selected in the “Adjustment” function.
   5) With the brake pedal depressed securely and the parking brake lever in FREE position, set the direction of the PCCS lever to FORWARD position.

      NOTICE

      - **Make sure [F3] is displayed in a gear range display (on the lower right of the screen) before proceeding to the next step.**
      - **Hold the steering at NEUTRAL position.**
   6) Depress the decelerator pedal and set the fuel control dial at High idle (MAX) position.
   7) Return the decelerator pedal slowly to stall the torque converter with the engine at high idle.

      ⚠ With the brake pedal depressed securely, place your right foot on the decelerator pedal for safety until the work is completed.
   8) As soon as torque converter (power train) oil temperature (T/C (P/L) oil temperature) indicates 118 °C, reset the PCCS lever to NEUTRAL position.

      NOTICE

      - **Take care not to overheat the oil of torque converter.**
      - **Temperature indicated at the top of the green range on the power train oil temperature gauge is approximately 118 to 120 °C.**
   9) If the failure code is cleared, repair work is complete.
6. If the failure code is not cleared, repeat the preceding step 4 and 5 for three times.
   If the failure code is cleared, repair work is completed.

No.	Cause	Procedure, measuring location, criteria and remarks		
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 J1 and DOSER and connect T-adapters to each female side.		
		Resistance	Between J1 (female) (5) and DOSER (female) (1)	Max. 1 Ω
			Between J1 (female) (29) and DOSER (female) (2)	Max. 1 Ω
5	Ground fault in wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors J1 and DOSER, and connect T-adapter to either female side.		
		Resistance	Between ground (frame) and J1 (female) (5) or DOSER (female) (1)	Min. 1 MΩ
6	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors J1 and DOSER, and connect T-adapter to female side of J1 .		
		Continuity	Between J1 (female) (5) and each pin other than pin (5)	No continuity (no sound is heard)
7	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector DOSER, and connect T-adapter to female side. 3. Turn starting switch ON (with connector DOSER disconnected).		
		Resistance	Between ground and DOSER (female) (2)	3 V
8	Defective engine controller	Start the engine, and run it at low idle, and leave it for approximately 1 minute.		
		If this failure code is still displayed and no failure is found by preceding checks, engine controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)		

Loaded Diagnostics Operation to Clear Failure Code

Perform the following operation to confirm the completion of the repair:

(Check that this failure code is not displayed.)

1. Turn the starting switch to OFF position.
2. Turn the starting switch from OFF to ON.
3. Start the engine, and perform active regeneration for service.
4. When failure code [CA1977] is cleared, stop the active regeneration for service.

Failure Code [CA2386]

Action level	Failure code	Failure	VGT Solenoid Short Circuit Error (Engine controller system)
L03	CA2386		
Detail of failure	Short circuit occurs in VGT solenoid drive 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 current to VGT solenoid can be checked with monitoring function. (Code: 48600 (mA)) • 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). • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it. 2. Turn starting switch to ON position.		
		If this failure code is cleared, wiring harness connector is defective.		
2	Defective VGT solenoid (internal short circuit)	1. Turn starting switch to OFF position. 2. Disconnect connector VGT-SOL, and connect T-adapter to male side.		
		Resistance	Between VGT-SOL (male) (1) and (2)	5 to 10 Ω
			Between VGT-SOL (male) (1) and ground	Min. 1 MΩ
3	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector VGT-SOL and connect T-adapter to female side. 3. Turn starting switch ON (with connector VGT-SOL disconnected). **REMARK** hot short circuit in negative line		
		Voltage	Between VGT-SOL (female) (2) and ground	Max. 3 V
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.)		

No.	Cause	Procedure, measuring location, criteria and remarks
6	Defective dosing fuel solenoid valve 2 (drain valve)	1. Turn starting switch to OFF position. 2. Disconnect connectors DSOV1 and DSOV2. 3. Replace dosing fuel solenoid valve 1 with dosing fuel solenoid valve 2. **REMARK** Do not replace connector DSOV1 with DSOV2. 4. Turn starting switch to ON position.
		If failure code changes to [CA1963], original dosing fuel solenoid valve 2 (drain valve) is defective.
7	Clogged fuel return tube	Check fuel return tube for clogging by removing fuel return tube.
8	Defective fuel shut off manifold	Check fuel connector of fuel shut off manifold for clogging by removing fuel tube.
9	Defective doser fuel pressure sensor	1. Turn starting switch to OFF position. 2. Disconnect fuel supply line (2) from fuel doser (1). 3. Turn starting switch to ON position. 4. See Related information, and display dosing fuel pressure and ambient pressure at the same time.
		If the dosing fuel pressure is clearly different from ambient pressure, the dosing fuel pressure sensor is defective. **REMARK** Doser fuel pressure should read atmospheric pressure.
10	Defective engine controller	1. Start the engine, and leave it for approximately 3 minutes. 2. If this failure code are displayed, perform troubleshooting for Related information, “Method of clearing failure code”.
		If this failure code is still displayed and no failure is found by preceding checks, engine controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)

Failure Code [CA3165]

<table>
<tr><td>Action level</td><td>Failure code</td><td rowspan="2">Failure</td><td rowspan="2">SCR Outlet Temperature High Error
(Engine controller system)</td></tr>
<tr><td>L03</td><td>CA3165</td></tr>
<tr><td>Detail of failure</td><td colspan="3">The SCR outlet temperature has been high.</td></tr>
<tr><td>Action of controller</td><td colspan="3">• Advances to Inducement strategy.
• DEF injection stops
• Regeneration control stops.
• Fuel dosing stops.</td></tr>
<tr><td>Phenomenon on machine</td><td colspan="3">• NOx emission increases because DEF injection is disabled.
• Engine power deration according to inducement strategy.</td></tr>
<tr><td>Related information</td><td colspan="3">⚠ Since KDPF, KDOC, and SCR are heated to 500 °C or above, be careful not to get burned.
• The SCR temperature sensor and SCR outlet temperature sensor are integrated into one sensor controller which provides CAN communication with the engine controller.
• For the replacement procedure of the SCR temperature sensor, see “50 Disassembly and Assembly”, “Removal and installation of SCR temperature sensor”.
• After turning starting switch to OFF position, engine controller performs DEF purging (for Max. 6 minutes) and then stops. To restart engine, wait until system operating lamp goes off after turning starting switch to OFF position, and then turn starting switch to ON position.
• The temperature detected by the SCR outlet temperature sensor can be confirmed from the “Pre-defined Monitoring” screen.
• Use engine operation state diagnosis, DEF level, or DEF quality sensor diagnosis on the “Pre-defined Monitoring” screen. (The following numbers are the monitoring codes)
• If regeneration is not performed, the failure code [CA3235] may appear as well.
• Engine operation state diagnosis
01002 Engine speed
19200 Exhaust gas flow rate
47300 KDOC Inlet Temperature
19300 SCR Temperature
19302 SCR Outlet Temperature
• DEF level, DEF quantity sensor diagnosis
19100 DEF Concentration
19110 DEF Level
19111 DEF Level Corrected
19115 DEF Temperature in Tank
19400 Ambient Temperature
19305 DEF Tank Heating State
NOTICE
For this failure code, 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. (Repair completion cannot be judged without raising the exhaust temperature even if this failure code is cleared by turning ON the starting switch)</td></tr>
</table>

No.	Cause	Procedure, measuring location, criteria and remarks
2	Defective KDOC outlet temperature sensor	Perform checks on causes 1 and 8 for failure code [CA3254].
3	Defective KDOC	1. Remove KDPF. 2. Remove KDOC. **NOTICE** • **Check if KDOC has any cracks (change KDOC if any).** • **If KDOC of KDPF is changed, perform the reset after KDOC change, then troubleshooting is complete without performing manual stationary regeneration. (See cause 7 for failure code [CA2637].)** • **Check if KDOC inlet surface is clogged with soot 50 % or more.** **(Clean KDOC if it is clogged with soot.)**
4	Defective KDPF temperature sensor	If the failure code is not cleared after performing above-mentioned troubleshooting, replace KDPF temperature sensor.
5	Defective engine controller	If this failure code is kept displayed, or is displayed again after above checks are performed, engine controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)

Loaded Diagnostics Operation to Clear Failure Code

Perform the procedure below to check that the repair is completed.

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

1. Turn the starting switch from OFF position to ON position.
2. Start the engine and run it at low idle speed for 15 minutes.
   If the failure code is cleared, repair work is complete. Otherwise, perform the following:

   NOTICE

   If failure code is not cleared after preceding steps 1 and 2 are performed, following temperature requirements are included in clearing condition. Steps 4 and 5 are required to satisfy temperature requirements.

   - **KDOC inlet temperature 200 °C or above**
   - **KDOC outlet temperature 200 °C or above**
3. Display KDOC inlet and outlet temperatures with monitoring function.
4. Perform continuously the blade RAISE relief for 15 minutes with fuel control dial at MAX (high idle) position.
5. When the KDOC inlet temperature or KDOC outlet temperature does not exceed 200 °C, perform “Loaded Diagnostics Operation To Clear failure Code” [CA1883].
6. If the failure code is cleared, repair work is completed.

Failure Code [CA3322]

Action level	Failure code	Failure	KDPF Outlet Temperature Sensor In Range Error (Engine controller system)
L03	CA3322		
Details of failure	Temperature sensed by KDPF outlet temperature sensor differs from expected value. (Signal voltage is within input range.)		
Action of controller	• Substitute the KDOC outlet temperature for the KDPF outlet temperature and run the engine (if the KDOC outlet temperature sensor also has an error, use the default value of the KDPF outlet temperature (250 °C). • EGR valve closed. • Engine power deration • Regeneration control stops. • Fuel dosing stops. • Advances to Inducement strategy. • DEF injection stops.		
Phenomenon on machine	• NOx emission increases because DEF injection is disabled. • Engine power deration. • Engine power deration according to Inducement strategy.		
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)) • For details, see “Remove and Install KDPF Assembly”, and “DISASSEMBLE AND ASSEMBLE OF KDPF ASSEMBLY” in Chapter 50 DISASSEMBLY AND ASSEMBLY. Repair as necessary. • Engine controller does not shut itself down immediately after turning the starting switch to the OFF position. The DEF purging starts after the starting switch is turned to the OFF position and Engine controller keeps working until the purging is completed. The purging lasts for maximun 6 minutes. Do not re-start the engine until the system operating lamp in the battery box goes out even if quick restart becomes necessary. **NOTICE** • **This failure code “Loaded Diagnostics Operation To Confirm Failure Correction”. After investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Confirm Failure Correction” to make sure the failure code is cleared again.** • **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 only by the failure code is cleared).**		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective KDPF outlet temperature sensor	If failure code [CA3319] or [CA3321] is displayed, perform troubleshooting for those codes.

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 Clear Failure Code”.			
		If this failure code is cleared, wiring harness connector is defective.			
2	Defective DEF injector	1. Turn starting switch to OFF position. 2. Disconnect connector UDM and connect socket to male side.			
		Resistance	Between UDM (male) (1) and (2)	20 °C	11.4 to 12.6 Ω
3	Open or short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector J2, and connect T-adapter to female side. **REMARK** The resistance is the same as DEF injector.			
		Resistance	Between J2 (female) (77) and (53)	20 °C	11.4 to 12.6 Ω
4	Ground fault in wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors J2 and UDM, and connect T-adapter to female side of connector J2.			
		Resistance	Between J2 (female) (77) and ground		Min. 1 MΩ
			Between J2 (female) (53) and ground		Min. 1 MΩ
5	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors J2 and UDM, and connect T-adapter to female side of connector J2.			
		Continuity	Between J2 (female) (77) and each pin other than pin (77)		No continuity (no sound is heard)
6	Hot short circuit in wiring harness (hot short circuit in negative line)	1. Turn starting switch to OFF position. 2. Disconnect connector UDM. 3. Insert T-adapter into connector J2. 4. Turn starting switch to ON position (with injector disconnected).			
		Voltage	Between J2 (53) and ground		Max. 3 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.)			

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, and start the engine.
3. Check if DEF pump pressure is around 900 ± 100 kPa after running the engine at low idle speed (with no load) for 2 minutes.
4. Turn the starting switch to OFF position, and shut down the engine controller.
5. Turn the starting switch to ON position.

Failure Code [CA3649]

<table>
<tr><td>Action level</td><td>Failure code</td><td rowspan="2">Failure</td><td rowspan="2">Turbocharger Outlet NOx Sensor Heater Warming up Error
(Engine controller system)</td></tr>
<tr><td>L01</td><td>CA3649</td></tr>
<tr><td>Detail of failure</td><td colspan="3">There is an abnormality in the heater part of the turbocharger outlet NOx sensor. (It is not heated or the temperature cannot be kept)</td></tr>
<tr><td>Action of controller</td><td colspan="3">• Operate using the NOx value in the memory.
• Advances to Inducement strategy. (EU Specification)</td></tr>
<tr><td>Phenomenon on machine</td><td colspan="3">• NOx emission may increase or ammonia may be exhausted because DEF injection works inappropriately.
• Engine power deration according to inducement strategy. (EU Specification)</td></tr>
<tr><td>Related information</td><td colspan="3">⚠ The KDPF, sensor fitting piping, and sensor probe become hot (Min. 500 °C). Be careful not to get burned.
⚠ The SCR assembly, sensor fitting piping, and sensor probe become hot (Min. 400 °C). Be careful not to get burned.
⚠ Be careful not to get burned by the sensor probe as it is heated by itself even if the ambient temperature is not high.
• The turbocharger outlet NOx sensor operates when 47300 “KDOC inlet temperature” is 150 °C or more (19203 “turbocharger outlet NOx sensor measurement state” is “1”).
• The turbocharger outlet NOx sensor is a smart sensor which performs CAN communication with the engine controller together with the other sensors.
• The turbocharger outlet NOx sensor does not operate when KDOC inlet temperature is 150 °C or lower, and correct value is not displayed.
• Use engine operation state diagnosis, SCR catalyst, NOx sensor, and ammonia sensor diagnosis on the “Pre-defined Monitoring” screen. (The following numbers are the monitoring codes)
• Engine operation state diagnosis
01002 Engine speed
19200 Exhaust gas flow rate
47300 KDOC Inlet Temperature
19300 SCR Temperature
19302 SCR Outlet Temperature
• SCR catalyst, NOx sensor, ammonia sensor diagnosis.
19203 Turbo Outlet NOx Sensor State
19210 SCR Outlet NOx Sensor State
19202 Turbo Outlet Concentration Corrected
19209 SCR Outlet NOx Corrected
19205 Ammonia Concentration Corrected
19120 DEF Injection Quantity
NOTICE
For this failure code, after investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Confirm Failure Correction” to make sure the failure code is cleared. (This failure code is not cleared by only turning ON the starting switch.)</td></tr>
</table>

Related information	• If SCR efficiency is degraded due to lowered DEF concentration, failure code [CA3582] SCR Catalyst Efficiency Low Error 1 may be displayed. • A surface in DEF fluctuates more in work on slopes or travel on uneven ground, possibly disabling to detect the correct level or concentration. • If DEF level monitor lights up in red or warning for concentration is displayed when machine is operated on slopes or travels on rough ground, immediately move the machine to level ground, clear the failure code related to concentration according to step 3 “Contaminated DEF” and subsequent procedures, and add DEF. If these phenomena occur repeatedly, increase the DEF in DEF tank. • If DEF tank temperature is 0 °C or below, the engine controller does not troubleshoot this failure code (“Loaded Diagnostics Operation To Clear Failure Code” does not clear this failure code). • Make sure that DEF tank temperature is 0 °C or above on the Pre-defined Monitoring screen before troubleshooting this failure code. • When DEF tank level is 0 %, the engine controller does not troubleshoot this failure code (“Loaded Diagnostics Operation To Clear Failure Code” does not clear this failure code). • Make sure that DEF tank temperature is 20 % or above on the Pre-defined Monitoring screen before troubleshooting this failure code. • For draining and cleaning procedures of DEF tank, see Testing and adjusting, “DEF Tank Washing”. • For the replacement procedure of DEF level sensor, see Disassembly and assembly, “Disassembly and assembly of DEF level sensor”. • On the Pre-defined Monitoring screen troubleshooting for DEF level and DEF quality sensors are used (the figures below denote monitoring codes). • Troubleshooting for DEF level and DEF quality sensors 19100 DEF Concentration 19110 DEF Level 19111 DEF Level Corrected 19115 DEF Temperature in Tank 19400 Ambient Temperature 19305 DEF Tank Heating State **NOTICE** **This failure code requires “Loaded Diagnostics Operation To Clear Failure Code”. After investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Clear Failure Code” to make sure that the failure code is cleared.**

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective DEF tank sensor system	1. If failure code [CA1669] or [CA1677] or [CA1678] or [CA1686] or [CA1714] or [CA1715] or [CA3868] or [CA4277] or [CA4731] or [CA4732] or [CA4739] or [CA4768] or [CA4769] is displayed, perform troubleshooting these first. 2. If troubleshooting has been performed, carry out “Loaded Diagnostics Operation To Clear Failure Code” topics.

Failure Code [CA4151]

Action level	Failure code	Failure	KDOC and KDPF Temperature Sensor Datalink Timeout Error (Engine controller system)
L03	CA4151		
Detail of failure	• The engine controller does not receive data from KDOC inlet temperature sensor, KDOC outlet temperature sensor, and KDPF outlet temperature sensor due to a communication error with KDPF temperature sensor. • This occurs when information on the KDOC inlet temperature sensor, the KDOC outlet temperature sensor, and the KDPF outlet temperature sensor cannot be received for a certain amount of time.		
Action of controller	• Run the engine by using the default value of the KDOC inlet temperature, KDOC outlet temperature, and the KDPF outlet temperature (250 °C). • Engine power deration • DEF injection stops • EGR valve closed. • Regeneration control stops. • Fuel dosing stops. • Advances to Inducement strategy.		
Phenomenon on machine	• NOx emission increases because DEF injection is disabled. • Defective forcible regeneration control. • KDPF Soot Accumulation High. • KDOC inlet temperature, KDOC outlet temperature, and KDPF outlet temperature detection error. • Engine output is reduced based on inducement strategy.		
Related information	⚠ **Be careful not to get burned as the temperature of KDPF and KDOC rises up over 500 °C.** ⚠ **The turbocharger outlet, the sensor installation piping, KDPF, and KDOC become hot (Min. 500 °C). Be careful not to get burned.** • This failure code is displayed if the sensor connector or a smart sensor (power supply) relay connector is removed. • CAN communication failure codes related to engine sensors include [CA2771], [CA3232], [CA3868], [CA3911], [CA4151], and [CA4152]. If all of these failure codes are displayed, a defect in any of the 6 sensors, a defective smart sensor power supply relay/relay system, or a ground fault, short circuit, or hot short circuit in wiring harness (CAN communication line) can be suspected. • Since signal of active CAN communication line is pulse voltage, it cannot be measured by using multimeter. • The KDPF temperature sensor consists of the KDOC inlet temperature sensor, the KDOC outlet temperature sensor, and the KDPF outlet temperature sensor and is integrated into one sensor controller which provides CAN communication with the engine controller. • For replacement of the KDPF temperature sensor, see Disassemble and Assembly, “Disassemble and Assemble KDPF Assembly”. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position. • 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 only by the failure code is cleared).		

Failure Code [CA4166]

Action level	Failure code	Failure	SCR Temperature Sensor ECU High Temperature Error (Engine controller system)
L01	CA4166		
Detail of failure	High temperature error is detected in SCR temperature sensor controller. (Min. 150 °C)		
Action of controller	None in particular		
Phenomenon on machine	• Defective detection of SCR temperature and SCR outlet temperature		
Related information	⚠ **The SCR assembly, sensor fitting piping, and sensor probe become hot (Min. 400 °C). Be careful not to get burned.** • The SCR temperature sensor and SCR outlet temperature sensor are integrated into one sensor controller which provides CAN communication with the engine controller. • For the replacement procedure of the SCR temperature sensor, see “50 Disassembly and Assembly”, “REMOVE AND INSTALL SCR TEMPERATURE SENSOR”. **NOTICE** **For this failure code, 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. (Repair completion cannot be judged without raising the exhaust temperature even if this failure code is cleared by turning ON the starting switch)**		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Exhaust gas leakage (high environmental temperature)	Check if the temperature sensor controller environmental temperature is extraordinary high (150 °C or above).
2	Defective SCR temperature sensor (internal defect)	1. Turn starting switch to OFF position. 2. Replace SCR temperature sensor. 3. Turn starting switch to ON position. 4. Perform “Loaded Diagnostics Operation To Confirm Failure Correction”.
		If this failure code is cleared, the original sensor is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)
3	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Loaded Diagnostics Operation to Confirm Failure Correction

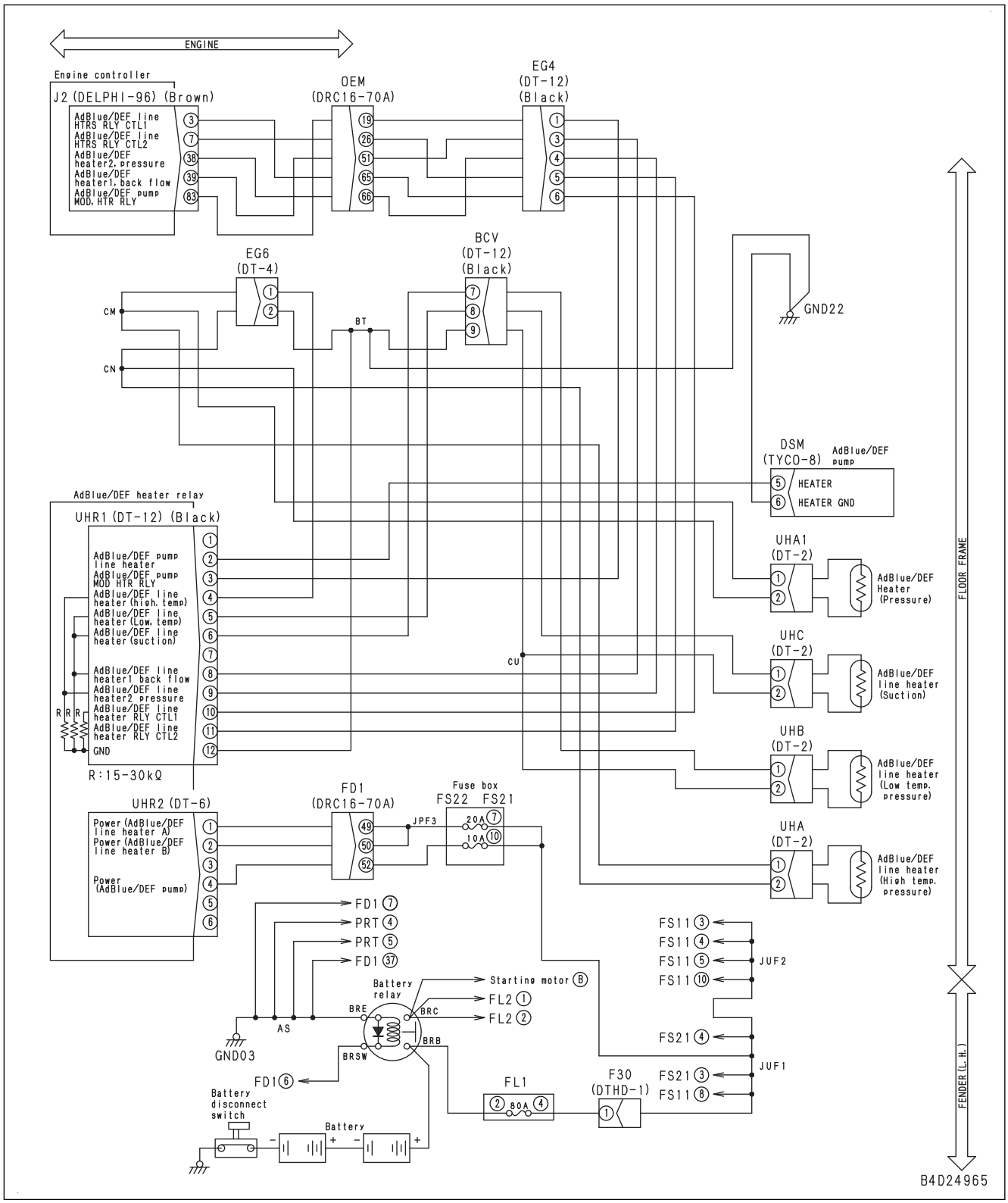
REMARK

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

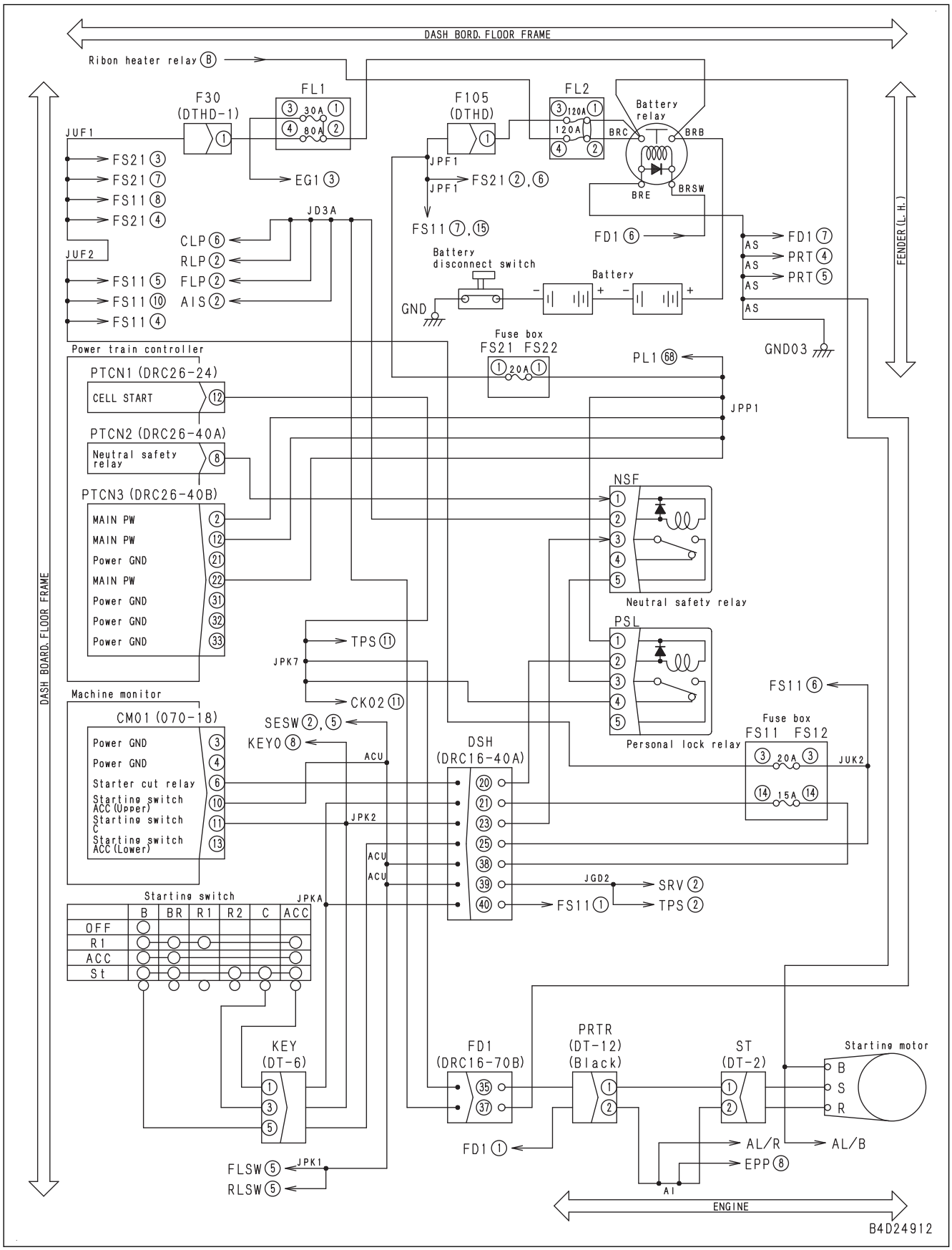
Check if the repair has been completed with the following procedure:

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 cleared. If this failure code is displayed, return to troubleshooting.
3. Start the engine.
4. Run the engine at low idle speed for 10 minutes.
5. Run the engine at high idle speed for 10 minutes.

Circuit Diagram of DEF Line Heater



Circuit Diagram of Neutral Safety Relay



Failure Code [D8G6KT]

Action level	Failure code	Failure	Malfunction (Communication terminal) (Gateway function controller system)
-	D8G6KT		
Detail of failure	Malfunction of communication terminal		
Operation of controller	None		
Phenomenon on machine	KOMTRAX system does not operate normally		
Related information	After the repair is completed, do the operation explained below to make sure that the failure code is not shown. Procedure: Starting switch ON		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective communication terminal	Defective communication terminal (The troubleshooting cannot be done because this is an internal defect.)
2	Defective gateway function controller	If no failure is found by above checks, gateway function controller is defective. (The troubleshooting cannot be done because this is an internal defect.)

Failure Code [DBE0MC]

Action level	Failure code	Failure	P/T Controller Malfunction (Power train controller system)
—	DBE0MC		
Detail of failure	Power Train Controller Malfunction		
Action of controller	Power train controller starts again.		
Phenomenon on machine	• The presetting of the gear speed becomes “F1-R1”. • If this trouble occurs during the machine travels, the gear speed becomes F1 or R1, and the engine speed becomes low idle.		
Related information	After the repair is done, check that the failure code is not shown with the operation that follows. Procedure: Starting switch ON		

No.	Cause	Procedure, measurement location, criteria and remarks
1	Defective power train controller	The power train controller is defective. (Because this is an internal defect, troubleshooting cannot be done.)

Failure Code [DD13KB]

Action level	Failure code	Failure	Shift Down SW Short Circuit (Power train controller system)
L03	DD13KB		
Detail of failure	NO(Normally Open) and NC(Normally Closed) lines of downshift switch circuit becomes 0 V (switch: ON) simultaneously.		
Action of controller	Assumes that downshift switch is not pressed.		
Phenomenon on machine	Downshift is disabled.		
Related information	• NO line is for detecting operation, and NC line is for detecting errors. • State of downshift switch signal can be checked with monitoring function. (Code: 40905 P/T SW Input 1) • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position and operate downshift switch. • Since no T-adapter is provided for connector SFTU, troubleshooting is not performed on the female side.		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective shift down switch (internal open circuit)	1. Turn starting switch to OFF position. 2. Disconnect connector TLV2, and connect T-adapter to male side. 3. Turn shift down switch ON and OFF to perform troubleshooting. **REMARK** “Switch OFF”: Release, “Switch ON”: Press			
		Resistance	Between TLV2 (male) (5) and (6)	Switch OFF	Max. 1 Ω
				Switch ON	Min. 1 MΩ
			Between TLV2 (male) (4) and (5)	Switch OFF	Min. 1 MΩ
				Switch ON	Max. 1 Ω
2	Ground fault in wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors PTCN1 and SFTU, and connect T-adapter to female side of PTCN1.			
		Resistance	Between PTCN1 (female) (23) and ground		Min. 1 MΩ
			Between PTCN1 (female) (17) and ground		Min. 1 MΩ
3	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors PTCN1 and SFTU, and connect T-adapter to female side of PTCN1. **REMARK** Check by using multimeter in continuity mode.			
		Continuity	Between PTCN1 (female) (23) and each pin other than (23)		No continuity (no sound is heard)
			Between PTCN1 (female) (17) and each pin other than (17)		No continuity (no sound is heard)

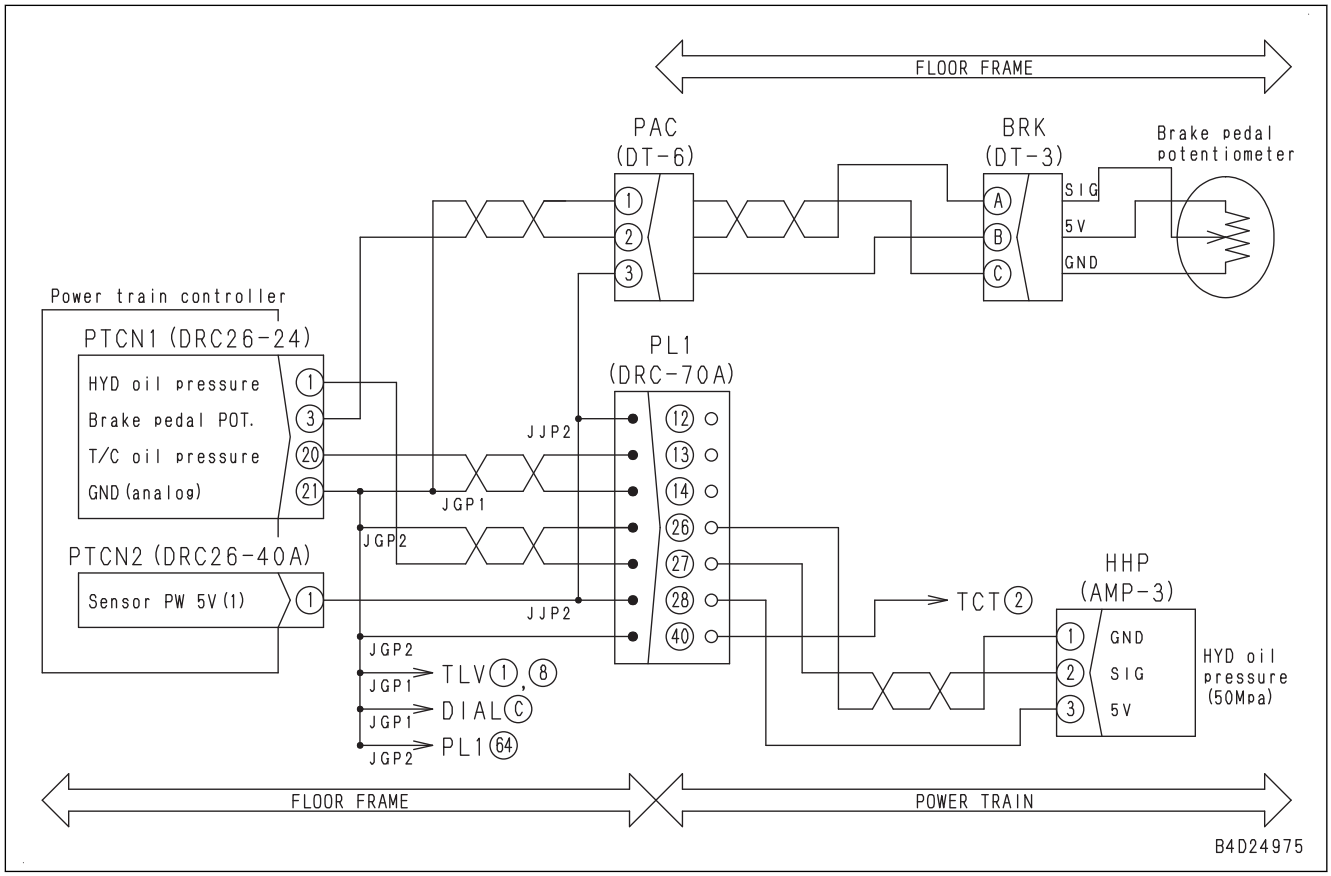
Failure Code [DH21KY]

Action level	Failure code	Failure	Work Equipment Pump Pressure Sensor Hot Short Circuit (Power train controller system)
L01	DH21KY		
Detail of failure	Signal voltage of work equipment pump pressure sensor is 4.8 V or above.		
Action of controller	None in particular		
Phenomenon on machine	Oil pressure of work equipment pump cannot be monitored.		
Related information	• Signal voltage of work equipment pump oil pressure sensor can be checked with monitoring function. (Code: 70701 Hydraulic Pressure Sensor1) • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position. • Even when system works properly, failure code [DH21KA] is displayed if work equipment oil pressure sensor connector is disconnected and starting switch is turned to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective 5 V sensor power supply system	If failure code [DB97KK] is also displayed, perform troubleshooting for that failure code first.		
		1. Turn starting switch to OFF position. 2. Disconnect connector HHP and connect T-adapter to female side. 3. Turn starting switch to ON position. **REMARK** If power supply voltage is abnormal, go to check on cause 3 and after.		
		Voltage	Between HHP (female) (3) and (1)	4.5 to 5.5 V
2	Defective work equipment pump oil pressure sensor (internal defect) or ground fault	1. Turn starting switch to OFF position. 2. Disconnect connector HHP. 3. Turn starting switch to ON position.		
		If failure code [DH21KB] disappears and [DH21KA] for open circuit appears, work equipment pump oil pressure sensor is defective. (If failure code [DH21KB] is still displayed, wiring harness or power train controller is defective.)		
3	Hot short circuit in wiring harness (Contact with 24 V circuit)	1. Turn starting switch to OFF position. 2. Disconnect connector HHP and connect T-adapter to female side. 3. Turn starting switch to ON position.		
		Voltage	Between HHP (female) (2) and (1) or ground	Max. 1 V
4	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors PTCN1 and HHP, and connect T-adapter to female side of PTCN1. **REMARK** Check by using multimeter in continuity mode.		
		Continuity	Between PTCN1 (female) (1) and each pin other than (1)	No continuity (no sound is heard)

No.	Cause	Procedure, measuring location, criteria and remarks		
5	Defective power train controller	If failure code is still displayed after above checks, power train controller is defective. • Reference 1. Turn starting switch to OFF position. 2. Insert T-adapter into connector PTCN1. 3. Turn starting switch to ON position. 4. Depress brake pedal to perform troubleshooting.		
		Voltage	Between PTCN1 (3) and (21)	0.5 to 4.5 V

Circuit Diagram of Brake Pedal Potentiometer



Failure Code [DW5AKA]

Action level	Failure code	Failure	Work Equipment Pitch Select Solenoid Open Circuit (Power train controller system)
L01	DW5AKA		
Detail of failure	Current does not flow when power is output to work equipment pitch selector solenoid circuit.		
Action of controller	Stops output to work equipment pitch selector solenoid circuit.		
Phenomenon on machine	Blade pitch cannot be changed.		
Related information	• Output state (ON/OFF) to work equipment pitch selector solenoid can be checked in monitoring mode. (Code: 90803) • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position and operate pitch selector switch.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective work equipment pitch selector solenoid (internal open circuit)	1. Turn starting switch to OFF position. 2. Disconnect connector PTP, and connect T-adapter to male side.		
		Resistance	Between PTP (male) (1) and (2)	18 to 28 Ω
2	Open circuit, short circuit, ground fault, hot short circuit of wiring harness, or defective power train controller	1. Turn starting switch to OFF position. 2. Disconnect connector PTP, and connect T-adapter to female side. 3. Turn starting switch to ON position. 4. Shake the wiring harness by hand while measuring the voltage. If the voltage becomes 0 V while shaking, wiring harness has open circuit.		
		Voltage	Between PTP (female) (1) and (2)	Max. 4.5 V
3	Open or short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector PTCN3, and connect T-adapter to female side. **REMARK** If resistance is 1 MΩ and above, wiring harness has open circuit. If resistance is 1 Ω and below, wiring harness has short circuit.		
		Resistance	Between PTCN3 (female) (7) and (3)	18 to 28 Ω
4	Open circuit in wiring harness (wire breakage or defective contact of connector)	If failure code is still displayed after above checks on open or short circuit in wiring harness, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors PTCN3 and PTP and connect T-adapters to each female side.		
		Resistance	Between PTCN3 (female) (7) and PTP (female) (1)	Max. 1 Ω
			Between PTCN3 (female) (3) and PTP (female) (2)	Max. 1 Ω
5	Defective power train controller	If failure code is still displayed after above checks, power train controller may be defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)		

Failure Code [DWN2KB] (Applicable Machine:25153 and up)

Action level	Failure code	Failure	Steering Control Valve Left EPC Solenoid Short Circuit (power train controller system)
L03	DWN2KB		
Details of failure	When controller drives HSS left EPC solenoid, unusual current flows through circuit.		
Action of controller	• Stops driving HSS left EPC solenoid. • Restricts operation of engine and transmission.		
Phenomenon on machine	• Once machine stops, engine speed is restricted to medium (half) speed. • Once machine stops, selectable gear speeds are restricted to F1 and R1. • Left turn cannot be performed.		
Related information	• Output condition to HSS left EPC solenoid can be checked with monitoring function. (Code: 50600 Left HSS EPC Solenoid Current(F/B)) • After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position and operate steering lever (to steer to left).		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective HSS left EPC solenoid (internal open circuit)	1. Turn starting switch to OFF position. 2. Disconnect connector HSL, and connect T-adapter to male side.		
		Resistance	Between HSL (male) (1) and (2)	4.5 to 14.5 Ω
			Between HSL (male) (1) and ground	Min. 1 MΩ
2	Ground fault in wiring harness (contact with ground circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors PTCN3 and HSL, and connect T-adapter to either female side.		
		Resistance	Between ground and PTCN3 (female) (5) or HSL (female) (1)	Min. 1 MΩ
3	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors PTCN3 and HSL, and connect T-adapter to either female side.		
		Resistance	Between PTCN3 (female) (5) and (23) or between HSL (female) (1) and (2)	Min. 1 MΩ
4	Defective power train controller	If failure code is still displayed after above checks, power train controller may be defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)		

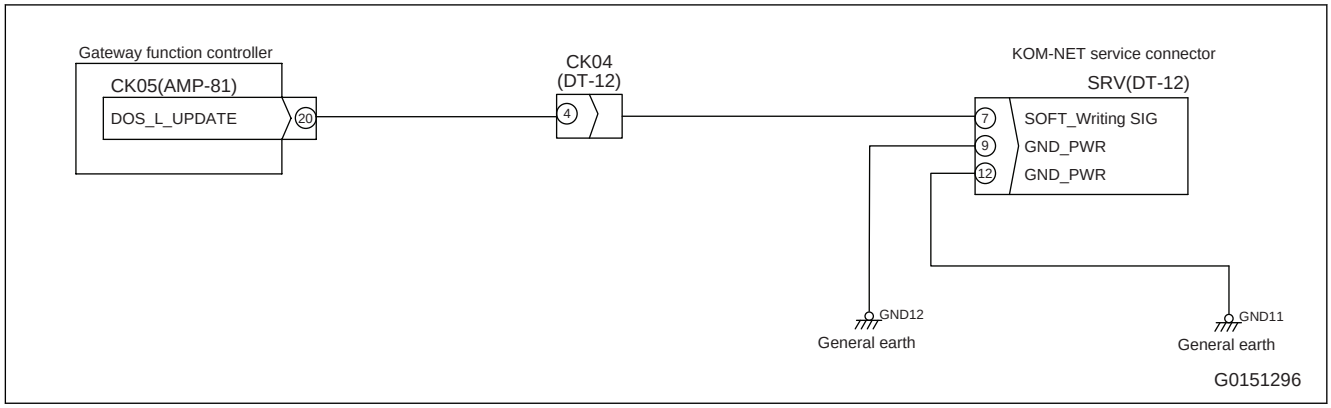
Failure Code [DXH6KY]

Action level	Failure code	Failure	T/M 3rd Clutch ECMV Solenoid Hot Short Circuit (Power train controller system)
L03	DXH6KY		
Detail of failure	Current flows constantly when outputting to solenoid circuit of the transmission 3rd clutch ECMV.		
Action of controller	• Stops driving solenoid circuit of the transmission 3rd clutch ECMV. • Restricts operations of engine and transmission.		
Phenomenon on machine	• Automatic gear shift function of travel does not work. • Once machine stops, engine speed is restricted to medium (half) speed. • Once machine stops, selectable gear speeds are restricted to F3 and R3.		
Related information	• Output state to 3rd clutch ECMV solenoid can be checked with monitoring code. (Code: 31614) • After completion of repair, check that the failure code is cleared by the following operation. Procedure: Start the engine.		

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 3_SOL and connect T-adapter to female side. 3. Turn starting switch to ON position.		
		Voltage	Between 3_SOL (female) (1) and ground	Max. 4.5 V
2	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors PTCN1 to 3 and 3_SOL, and connect T-adapters to female side of PTCN1 to 3.		
		Continuity	Between PTCN3 (female) (6) and each pin of PTCN1 (female)	No continuity (no sound is heard)
			Between PTCN3 (female) (6) and each pin of PTCN2 (female)	No continuity (no sound is heard)
3	Defective power train controller	If failure code is still displayed after above checks, power train controller may be defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)		

<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">3</td><td rowspan="3">Ground fault in wiring harness</td><td colspan="4">1. Turn the starting switch to the OFF position.
2. Disconnect the connectors CK05 and SRV. Connect a T-adapter to one of the female side of CK05 or the male side of SRV.
3. Measure the resistance.
4. Does the troubleshooting result agree with the standard value?</td><td>YES</td><td>• The wiring harness does not have a ground fault.
• Go to the next check item.</td></tr>
<tr><td>Item</td><td colspan="2">Measurement position, condition</td><td>Standard value</td><td rowspan="2">NO</td><td rowspan="2">• The wiring harness has a ground fault.
• Repair or replace the defective wiring harness.
• Go to "Confirmation of repair".</td></tr>
<tr><td>Resistance</td><td colspan="2">Between ground and one of CK05 (female) (20) or SRV (male) (7)</td><td>Min. 1MΩ</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Confirmation of check results</td><td colspan="4" rowspan="2">1. Do the troubleshooting above again.
2. Can you find the cause by the check?</td><td>YES</td><td>The repair is done.</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>
<tr><td rowspan="2">5</td><td rowspan="2">Confirmation of repair</td><td colspan="4" rowspan="2">1. Turn the starting switch to the OFF position.
2. Connect all the component parts.
3. Turn the starting switch to the ON position. Then, do the troubleshooting.
4. Is this failure code shown?</td><td>YES</td><td>Go back to the first check item.</td></tr>
<tr><td>NO</td><td>The repair is done.</td></tr>
</table>

Circuit Diagram of Gateway Function Controller



Failure Code [F31EKB]

Detail of failure	Because the voltage of the sensor power supply 24V (boost) signal output line from the gateway function controller is 2.5V or less while the command is ON, a short circuit is found.
Action level	-
Action of controller	• Sensor power supply 24V (boost) signal is turned OFF. • Even if the cause of the abnormality is removed, the machine will not go back to the correct condition until the starting switch is turned to the OFF position one time.
Phenomenon on machine	KOMTRAX system does not operate correctly.
Related information	

<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="2">1</td><td rowspan="2">Wiring harness and connector</td><td colspan="3" rowspan="2">1. Do the check in accordance with the descriptions of wiring harnesses and connectors in RELATED INFORMATION FOR TROUBLESHOOTING, CHECKS BEFORE TROUBLESHOOTING, ELECTRICAL EQUIPMENT.
2. Are the wiring harnesses and connectors in the correct state?</td><td>YES</td><td>• The wiring harnesses and connectors are in the correct state.
• Go to the next check item.</td></tr>
<tr><td>NO</td><td>• A 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="4">2</td><td rowspan="4">Ground fault in wiring harness</td><td colspan="3">1. Turn the starting switch to the OFF position.
2. Disconnect the connectors CK05 and CK06. Connect a T-adapter to one of the female side of CK05 or the male side of CK06.
3. Measure the resistance.
4. Does the troubleshooting result agree with the standard value?</td><td>YES</td><td>• The wiring harness does not have a ground fault.
• Go to the next check item.</td></tr>
<tr><td>Item</td><td>Measurement position, condition</td><td>Standard value</td><td rowspan="2">NO</td><td rowspan="2">• The wiring harness has a ground fault.
• Repair or replace the defective wiring harness.
• Go to "Confirmation of repair".</td></tr>
<tr><td>Resistance</td><td>Between ground and one of CK05 (female) (57) or CK06 (male) (2)</td><td>Min. 1MΩ</td></tr>
</table>

E-12 Hydraulic Oil Temperature Monitor Comes On in Red While Engine is in Operation

Failure	Hydraulic oil temperature monitor lights up in red while engine is running.
Related information	• Signal voltage of hydraulic oil temperature sensor is input to power train controller that transmits information to machine monitor through CAN communication system. • Hydraulic oil temperature can be checked with monitoring function. (Code: 04401)

No.	Cause	Procedure, measuring location, criteria and remarks
1	Overheating of hydraulic oil (when system is normal)	Hydraulic oil may overheat. Check hydraulic oil temperature, and remove cause of failure if hydraulic oil overheats.
2	Defective hydraulic oil temperature sensor system	Defective hydraulic oil temperature sensor system or machine monitor is suspected, perform troubleshooting for failure codes [DGS1KA] and [DGS1KX].
3	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.)

<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="11">5</td><td rowspan="11">Open circuit or ground fault in wiring harness</td><td colspan="3">REMARK
Check where voltage is abnormal and figure out where wiring harness is defective.
1. Turn starting switch to OFF position.
2. Disconnect connector LREL and LRER, and connect T-adapter to female side.
3. Turn starting switch to ON position.
4. Turn rear lamp switch to ON position.</td></tr>
<tr><td rowspan="2">Voltage</td><td>Between LREL (female) (1) and (2)</td><td>20 to 30 V</td></tr>
<tr><td>Between LRER (female) (1) and (2)</td><td>20 to 30 V</td></tr>
<tr><td colspan="3">If no failure is found by preceding checks, this check is not required.
1. Turn starting switch to OFF position.
2. Disconnect connector RLP and connect T-adapter to female side.
3. Turn starting switch to ON position.
4. Turn on rear lamp switch.</td></tr>
<tr><td rowspan="2">Voltage</td><td>Between RLP (female) (1) and (2)</td><td>20 to 30 V</td></tr>
<tr><td>Between RLP (female) (3) and (2)</td><td>20 to 30 V</td></tr>
<tr><td colspan="3">If no failure is found by preceding checks, this check is not required.
1. Turn starting switch to OFF position.
2. Disconnect connector RLSW and connect T-adapter to female side.
3. Turn starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td>Between RLSW (female) (5) and (2)</td><td>20 to 30 V</td></tr>
<tr><td rowspan="11">6</td><td rowspan="11">Open circuit in wiring harness
(open circuit or defective contact)</td><td colspan="3">If failure code is still displayed after above checks on cause 5, this check is not required.
1. Turn starting switch to OFF position.
2. Remove fuse FS12–9.
3. Disconnect connectors RLSW, RLP, LREL, LRER and KEY, and connect Tadapters to each female side.</td></tr>
<tr><td rowspan="10">Resistance</td><td>Between LREL (female) (2) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td>Between LRER (female) (2) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td>Between LREL (female) (1) and RLP (female) (5)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between LRER (female) (1) and RLP (female) (5)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between RLP (female) (1) and RLSW (female) (6)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between RLP (female) (2) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td>Between RLP (female) (3) and FS12-9</td><td>Max. 1 Ω</td></tr>
<tr><td>Between RLSW (female) (5) and KEY (female) (1)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between RLSW (female) (2) and ground</td><td>Max. 1 Ω</td></tr>
</table>

Failure Mode and Cause Table

Component causing failure / Failure		Power train					
		Power train pump	Torque converter	Transmission	Transmission main relief valve	Transmission valve (ECMV)	Transmission clutch (*1)
Power train system	Machine lacks power (insufficient drawbar pull).	○	○	○	○	○	
	Machine does not travel (at 2ND or 3RD gear speed).		○	○		○	○
	Machine does not move off at all gear speeds.	○		○	○	○	
	Machine travels only in one direction, either forward or in reverse.	○			○	○	○
	Large time lag is in gear shifting or directional change.	○			○	○	○
	Machine cannot be steered (machine does not turn left or right).						
	Steering speed or power is insufficient.						
	Brake does not work.						
	Power train oil overheats	○	○				○
	Unusual noise is heard from around HSS, work equipment pump or HSS motor.						
Work equipment system	All work equipments operate slowly.						
	All work equipments do not operate.						
	BLADE LIFT SPEED OR POWER IS LOW.						
	Blade tilt speed or power is low.						
	Ripper lift speed or power is low.						
	Hydraulic drift of lifted blade is large.						
	Hydraulic drift of tilted blade is large.						
	Hydraulic drift of lifted ripper is large.						
Fan system	Fan rotation is abnormal (too high or low, or stationary)						
	Unusual noise is heard from around fan						

No.	Cause	Procedure, measuring location, criteria and remarks
7	Malfunction of fan motor (forward/reverse selector valve)	Release remaining pressure from hydraulic tank and piping, and then perform troubleshooting with engine stopped.
		• Check for stuck or seized body and spool of normal/reverse selector valve (spool should move smoothly). • Remove the selector's spool from valve body and check for defects and dirt. Be careful to prevent foreign matter from entering the valve during restoration.
8	Internal defect of fan motor	If failure code is still displayed after above checks on causes 1 to 7, fan motor may have internal defect.

S-21 Active Regeneration is Done Frequently

Failure	Active regeneration is executed frequently.
Related information	If any failure code is displayed, perform troubleshooting for that code first.

No.	Cause	Point to check, remarks	Remedy
1	Engine run at a medium speed for prolonged time.	Unless heavy-duty operation is performed, soot is accumulated because the exhaust gas temperature does not rise.	Choose “Manual Stationary Regeneration” for service by “Active Regeneration for Service” screen on the monitor and carry out complete combustion of soot to remove it completely.
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	Use of oil out of specification	Oil out of specification is used	Use recommended oil described in Operation and Maintenance Manual.
5	Blocked KCSF by the use of non-designated oil	If regeneration frequently is not improved after a corrective action for cause 4, KCSF is blocked.	KCSF cleaning and replecement
6	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.
7	Clogging of KCSF by coolant leakage to exhaust system	Check for clogging at KCSF inlet.	KCSF cleaning and replecement
8	Unspecified fuel is used.	Unspecified fuel is used.	Use recommended fuel described in Operation and Maintenance Manual.
9	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.
10	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
11	Deteriorated KDOC by the use of non-designated fuel	Deteriorated KDOC by high sulfur content (If the check result does not correspond to cause 1 to 10 and frequency of regeneration is not improved, KDOC is deteriorated.)	KDOC replacement

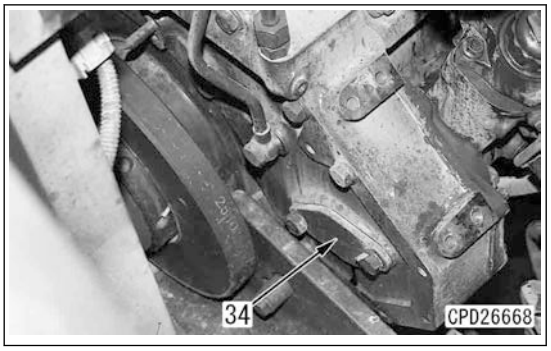
Tools for Removal and Installation of DEF Injector

Symbol		Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A		-	Vinyl gloves	●	1	N		Disconnecting and connecting DEF hose
B		6540-71-1310	DEF injector electric connector cover	■	1	N		Removing and installing DEF injector electric connector
C		600-919-5050	Plug (for 5/16 inch hose diameter)	■	1	N		Disconnecting and connecting DEF hose
D		6540-71-1720	DEF injector cap kit	■	1	N		Removing and installing the injector
	1	-	• DEF side cap	■	1	N		Disconnecting and connecting DEF hose
	2	-	• Coolant side cap	■	2	N		Removing and installing the coolant hose
	3	-	• Injector side cap	■	1	N		Removing and installing the injector

Tools for Removal and Installation of DEF Pump

Symbol		Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A		-	Vinyl gloves	●	1	N		Disconnecting and connecting DEF hose
B		600-919-5050	Plug (for 5/16 inch hose diameter)	■	4	N		
C		600-919-5030	Plug (for 3/8 inch hose diameter)	■	4	N		
D		6540-71-2720	DEF pump and tank cap kit	■	2	N		
	1	-	• DEF pump and injector side cap	■	1	N		
	2	-	• DEF pump and tank side cap	■	4	N		
	3	-	• DEF pump electric connector cap	■	1	N		DEF pump electric connector cap

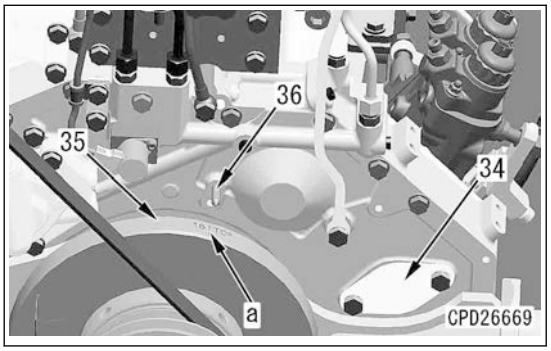
15. Remove cover (34) at the engine front cover.



16. Rotate the crankshaft in the normal direction, and align center point (a) between marks 2/5TOP and 3/4TOP of damper (35) with pointer (36).

REMARK

For center point (a), the stamp 1/6TOP is almost at the bottom of pointer (36).

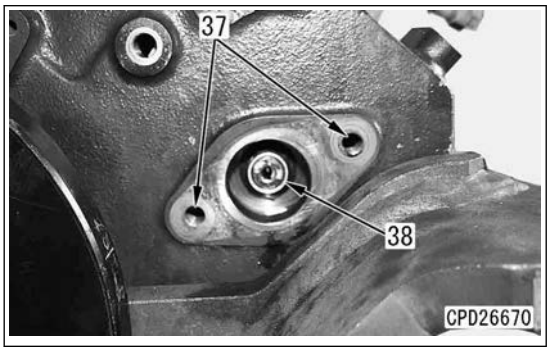


17. Check that the supply pump drive gear forcing tap is aligned with cover mounting bolt hole (37).

REMARK

If it is not aligned, rotate the crankshaft 1 more turn. (At this time, the shaft key of the pump is located at a position 15 deg. clockwise.)

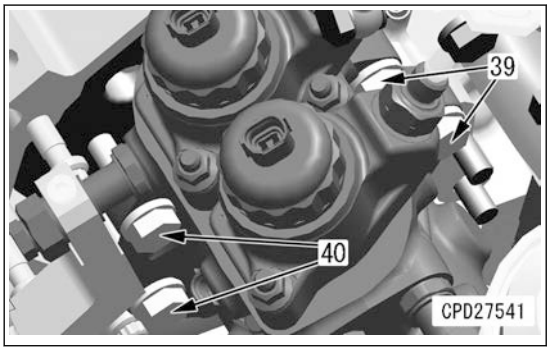
18. Remove nut (38).



19. Remove fuel supply pump assembly mounting bolts (39) (2 pieces), and loosen mounting bolts (40) (2 pieces).

REMARK

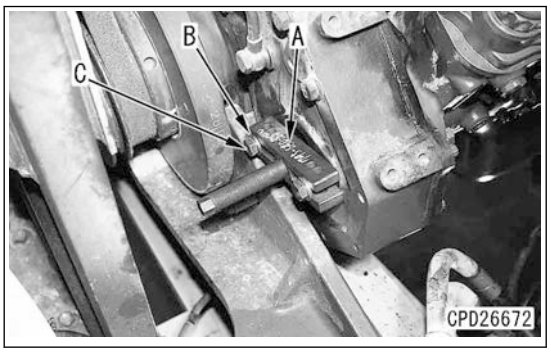
To prevent the fuel supply pump assembly from falling off, keep mounting bolts (40) (2 pieces) screwed for approximately 3 turns.



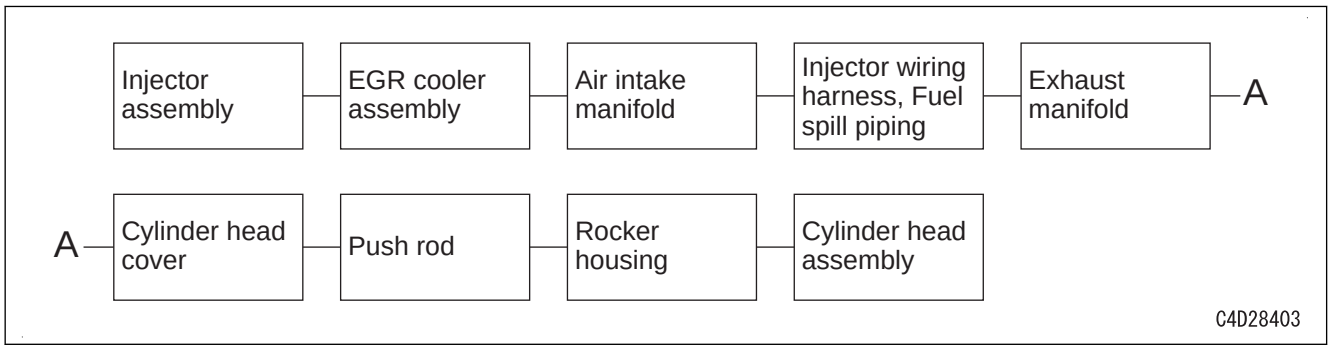
20. Install tool A by using tool B and tool C, screw in the center bolt of tool A, and remove the gear from the shaft.

REMARK

Leave tools A, B, and C installed.



Remove and Install Cylinder Head Assembly



Tools for Removal and Installation of Cylinder Head Assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	-	Lifting tool	■	1			Removal and installation of cylinder head
B	790-331-1110	Wrench	●	1			Angle tightening of bolts

⚠ Park the machine on a level ground, and set parking brake lever to the LOCK position.

⚠ Lower the work equipment to the ground, and 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".)

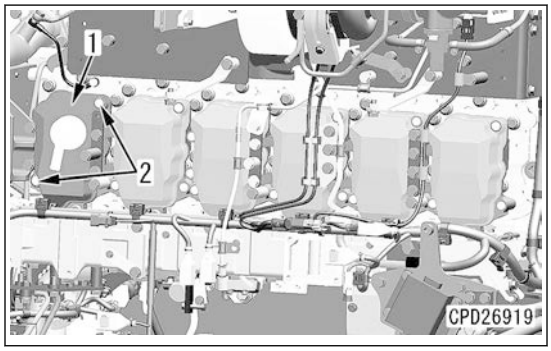
NOTICE

- **When removing and installing the fuel piping, take care to prevent foreign material from entering into the fuel piping. If dust, etc. sticks to any part, wash that part thoroughly with clean fuel.**
- **Check the connector numbers and installed positions before disconnecting wiring and hoses, and record them.**
- **When disconnecting the wiring and hoses, take extreme care not to damage or deform the wiring and hoses by the clips and clamps. If the wiring and hoses may be damaged or deformed, remove the clips and clamps before disconnecting work.**

How to Remove Cylinder Head Assembly

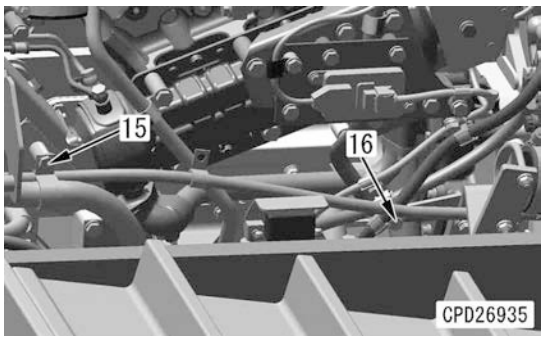
Injector assembly

1. Remove the injector assembly. For details, see "Remove and Install Injector Assembly".
2. Install head covers (1) (6 pieces) to prevent foreign materials from entering, and finger-tighten mounting bolts (2) (2 pieces) to install them to each cover.

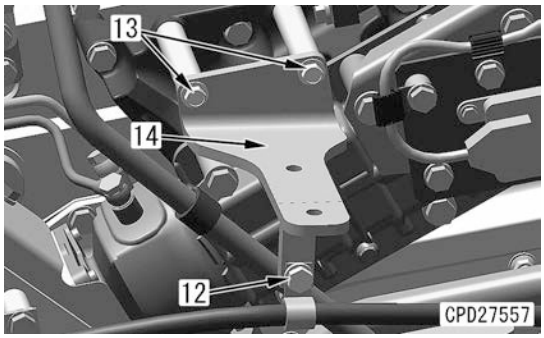


Cover, bracket

18. Fix the wiring to the bracket with clip mounting bolts (15) and (16).

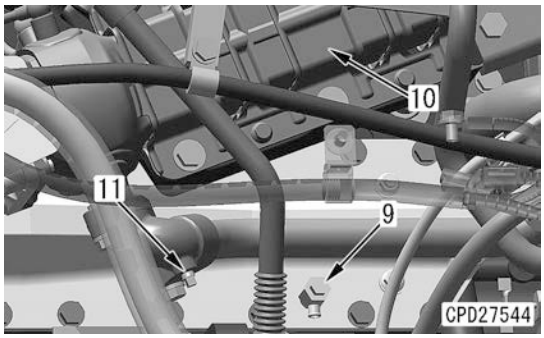


19. Install bracket (14) with mounting bolt (13), and fix the tube with clip mounting bolt (12).



Drain plug

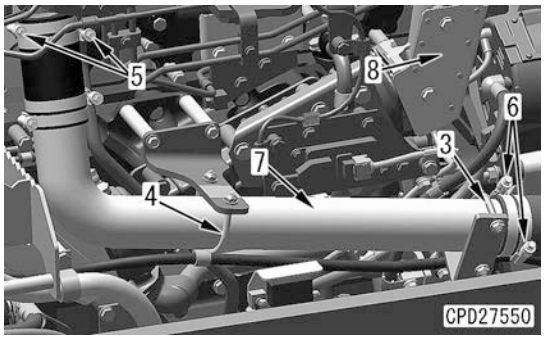
20. Tighten drain plug (9) of the engine block.
21. Tighten drain plug (11) of the tube on the coolant side of EGR cooler (10).



Air piping

22. Install EGR gas pipe cover (8) with mounting bolts (2 pieces).
23. Fasten clamps (5) and (6), and install air piping (7).

    Hose clamps (5) and (6):
    10.5±0.5 Nm {1.07±0.05 kgfm}
24. Install U-bolts (3) and (4).

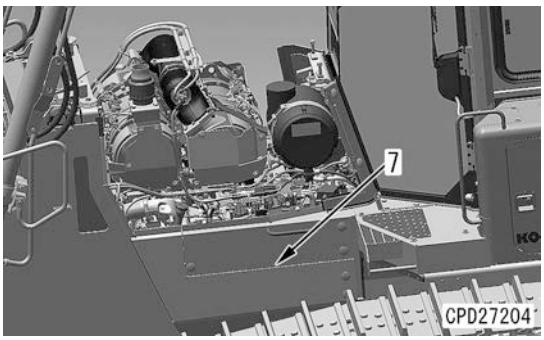


Cooling fan drive assembly

13. Install the cooling fan drive assembly. For details, see “Remove and Install Cooling Fan Drive Assembly”.

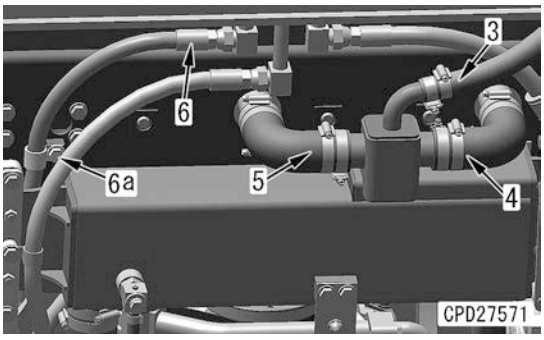
Engine hood assembly, cover

14. Install covers (7) on both sides of the machine.
15. Install the engine hood assembly. For details, see “Remove and Install Engine Hood Assembly”.



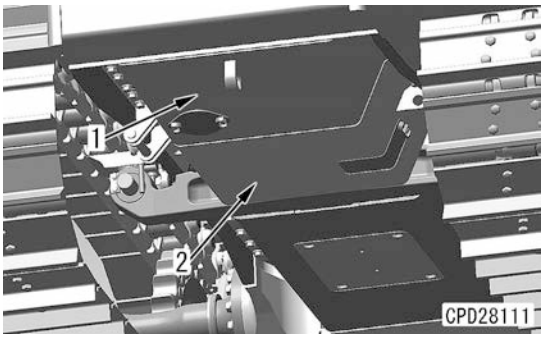
Hoses under radiator

16. Connect coolant hoses (3), (4), and (5) under the radiator.
    - Clamp mounting bolt of coolant hose (3): 8.8 ± 0.5 Nm {0.9 ± 0.05 kgfm}
    - Clamp mounting bolt of coolant hoses (4) and (5): 8.8 ± 0.5 Nm {0.9 ± 0.05 kgfm}
17. Connect oil hose (6).



Undercover

18. Install undercovers (1) and (2) by using lifting tool or floor jack.
    - Undercover (1): 75 kg
    - Undercover (2): 120 kg



Refilling with oil

19. Refill with oil to the specified level through the oil filler port. Run the engine to circulate the oil through the system. Then check the oil level again.
    - Hydraulic tank: 69 ℓ

Refilling with coolant

20. Refill with coolant to the specified level through the coolant filler port. Run the engine to circulate the coolant through system. Then check the coolant level again.
    - Radiator: 69 ℓ

Refrigerant

21. Refill the air conditioner circuit with refrigerant (R134a).
    Refrigerant quantity(Standard core condenser): 900 ± 50 g
    Refrigerant quantity(Wide core condenser): 1175 ± 50 g

Remove and Install Engine Rear Oil Seal

Tools for Removal and Installation of Engine Rear Oil Seal

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	-	Guide bolt	●	1			Removal and installation of damper assembly
B	-	Lifting tool	●	1			Removal and installation of flywheel
E	-	Dial gauge	●	1			Measurement of facial runout and radial runout
F	795-931-1100	Seal puller assembly	■	1			Removal of engine rear oil seal
G	795T-421-1350	Push tool	■	1		○	Installation of engine rear oil seal
H	01010-61635	Bolt	■	3			
J	01643-31645	Washer	■	3			
K	795-931-1220	Push tool	■	1			
L	01010-61650	Bolt	■	3			
M	01643-31645	Washer	■	3			
N	795T-421-1330	Push tool	■	1		○	
P	01010-61640	Bolt	■	3			
Q	01643-31645	Washer	■	9			

⚠ Park the machine on a level ground, and set parking brake lever to LOCK position.

⚠ Lower the work equipment to the ground, and set the work equipment lock lever to LOCK position.

⚠ Turn the starting switch to OFF position, and 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".)

⚠ Release the remaining pressure in the piping, loosen the cap of the hydraulic tank gradually, and release the remaining pressure in the tank. For details, see TESTING AND ADJUSTING, "RELEASE REMAINING PRESSURE FROM HYDRAULIC CIRCUIT".

NOTICE

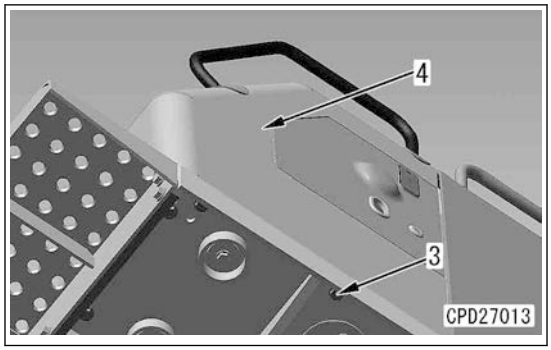
- **When removing and installing the fuel piping, take care to prevent foreign material from entering the fuel piping. If dust, etc. sticks to any part, wash that part thoroughly with clean fuel.**
- **Fit a plug or flange in the place where a hydraulic hose is disconnected to prevent oil from flowing out.**
- **Write down the connector numbers and installed positions before disconnecting electric wiring and hoses.**

How to Remove Engine Rear Oil Seal

Damper assembly

1. Remove the damper assembly. For details, see "Remove and Install Damper Assembly".

3. Remove bolts (3) (5 pieces), and remove cover (4).



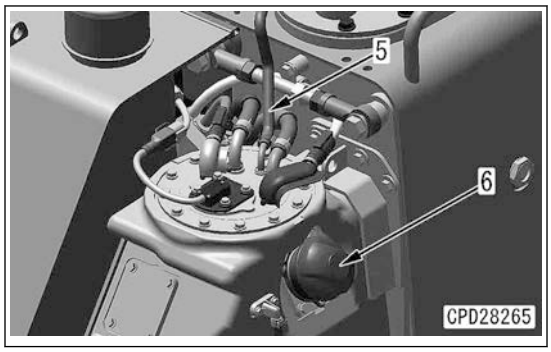
Draining

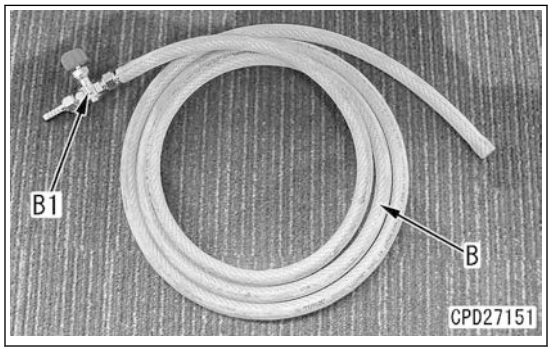
4. Remove breather hose (5), and connect tool B.

   REMARK

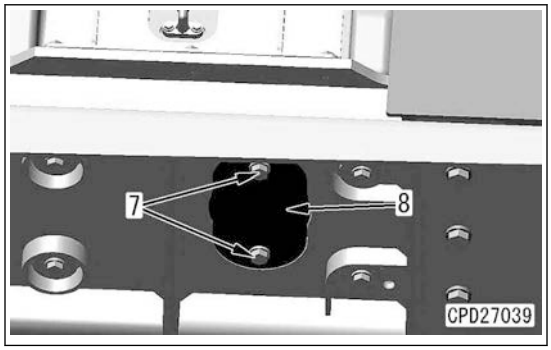
   When connecting tool B, be sure to close valve B1 of tool B.

5. Check that cap (6) is securely closed.





6. Remove bolts (7) (2 pieces), and remove cover (8).

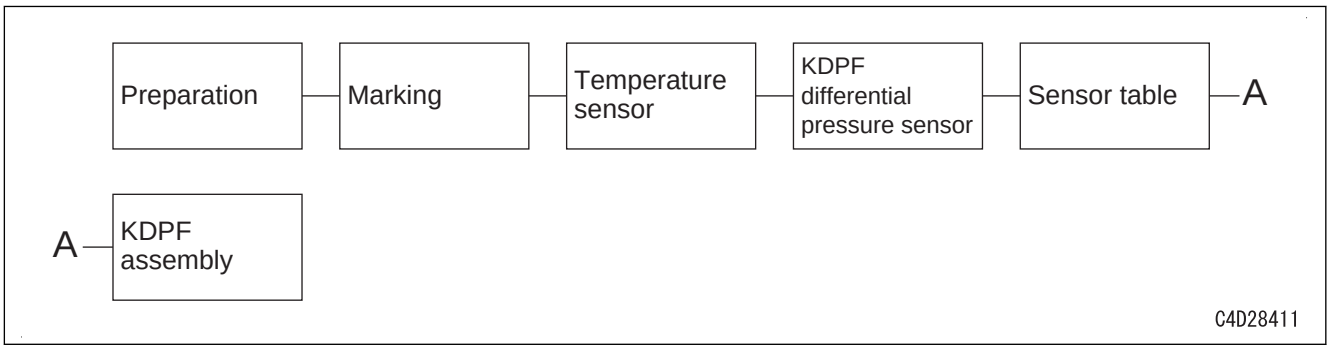


7. Place tool C on the track shoe for future use as described in the following steps.
8. Prepare tool A under DEF tank.

   REMARK

   Toxic gas or corroded material may be generated by a chemical reaction if an iron or aluminum container is used to catch the draining DEF from the machine. Use a container made of resin (PP, PE) or stainless steel to catch the draining DEF.

Disassemble and Assemble KDPF Assembly



Tools for Disassembly and Assembly of KDPF Assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	-	Block	■	4			Fixing KDPF assembly
B	-	Long socket	■	1			Removal and installation of sensor table
C	-	Level gauge	■	1			Assembly of KDPF assembly

⚠ Since KDPF is heated to 500 °C or above, be careful not to get burn injury.

⚠ Wait for the temperature of KDPF to cool down before starting any work.

⚠ When cleaning, replacing, or disposing KDPF, use anti-dust mask during the work to prevent inhaling accumulated soot, ash, mat material or metallic powder inside KDPF.

⚠ Since KDPF is fragile against shock such as falling, handle it with care, and never reuse damaged part.

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

⚠ The band used to mount the KDPF is made of stainless steel, accordingly never use an impact wrench for removal and installation to avoid damage on the threaded portion.

REMARK

- After cleaning or replacing the KDPF, be sure to perform the following works.
  - Clean and degrease the KDPF unit and surrounding area.
  - After installing it to the machine, start the engine and check for fuel leakage and sticking soot.
- When removing mounting band and gasket, prepare new mounting band and gasket.
- If the both units of mm and inch are expressed for some tools, use the general tools for them.

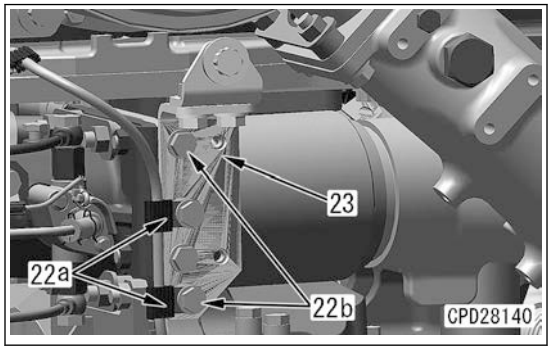
How to Disassemble KDPF Assembly

Preparation

1. Prepare tool A of dimension in the right figure.

Exhaust pipe

30. Install bracket (23) with bracket mounting bolts (22b), (2 pieces), and fix the wiring with clip mounting bolts (22a) (2 pieces).

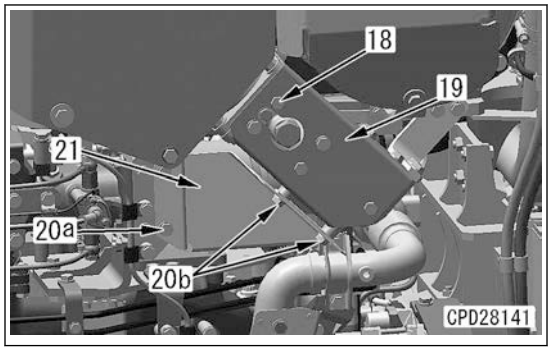


31. Install cover (21) with bolts (20a) (2 pieces) and bolts (20b) (2 pieces).

    Threaded portion of mounting bolt (20b): Seizure prevention compound (LC-G)

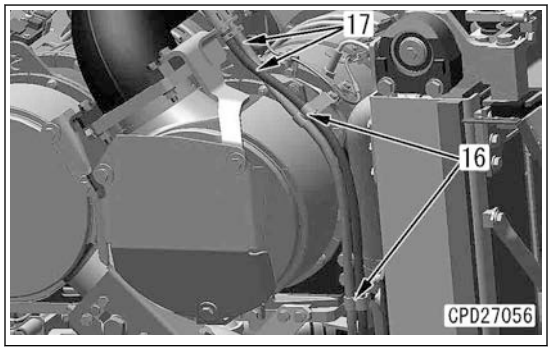
32. Install cover (19) with bolts (18) (7 pieces).

    Threaded portion of mounting bolt (18): Seizure prevention compound (LC-G)

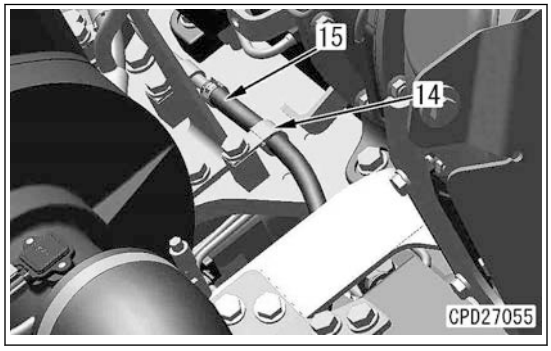


Wiring, hose

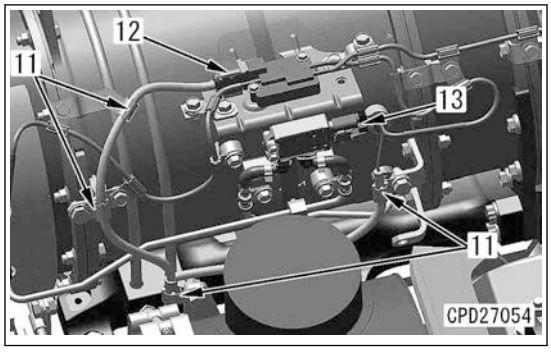
33. Connect hoses (17) (2 pieces), and install clamps (16) (2 places).



34. Connect hose (15), and install clamp (14).

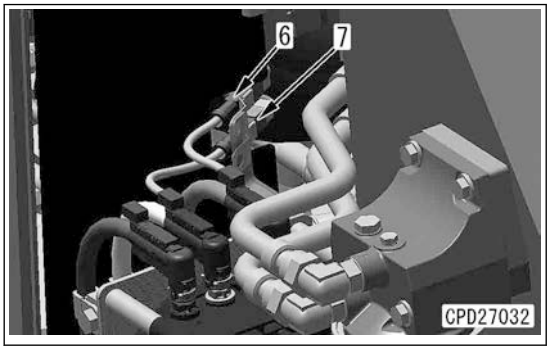


35. Connect connector PDPF (13) and connector TDPF (12) according to the following procedure.

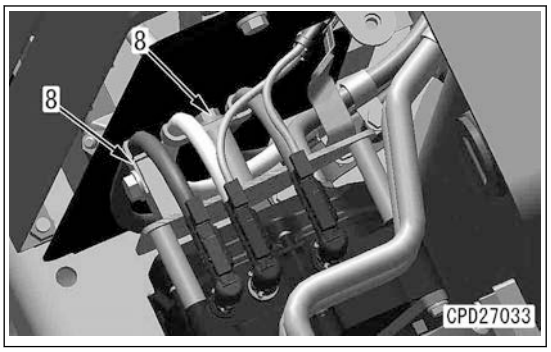


DEF pump

5. Disconnect connectors UHA (6) and UHB (7).



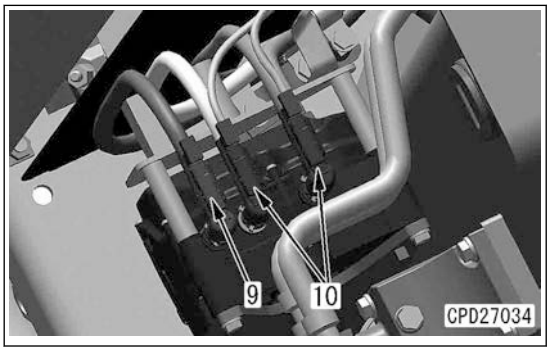
6. Remove clamps (8) (2 places).

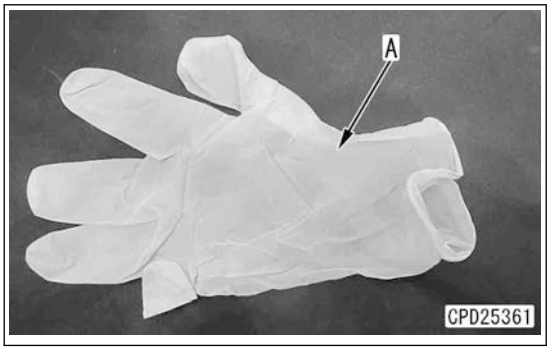


7. Remove the fouling by washing the connecting part of DEF hose (10) with clean tap water before disconnecting the DEF hose. Disconnect DEF hose (10) according to the following procedure.

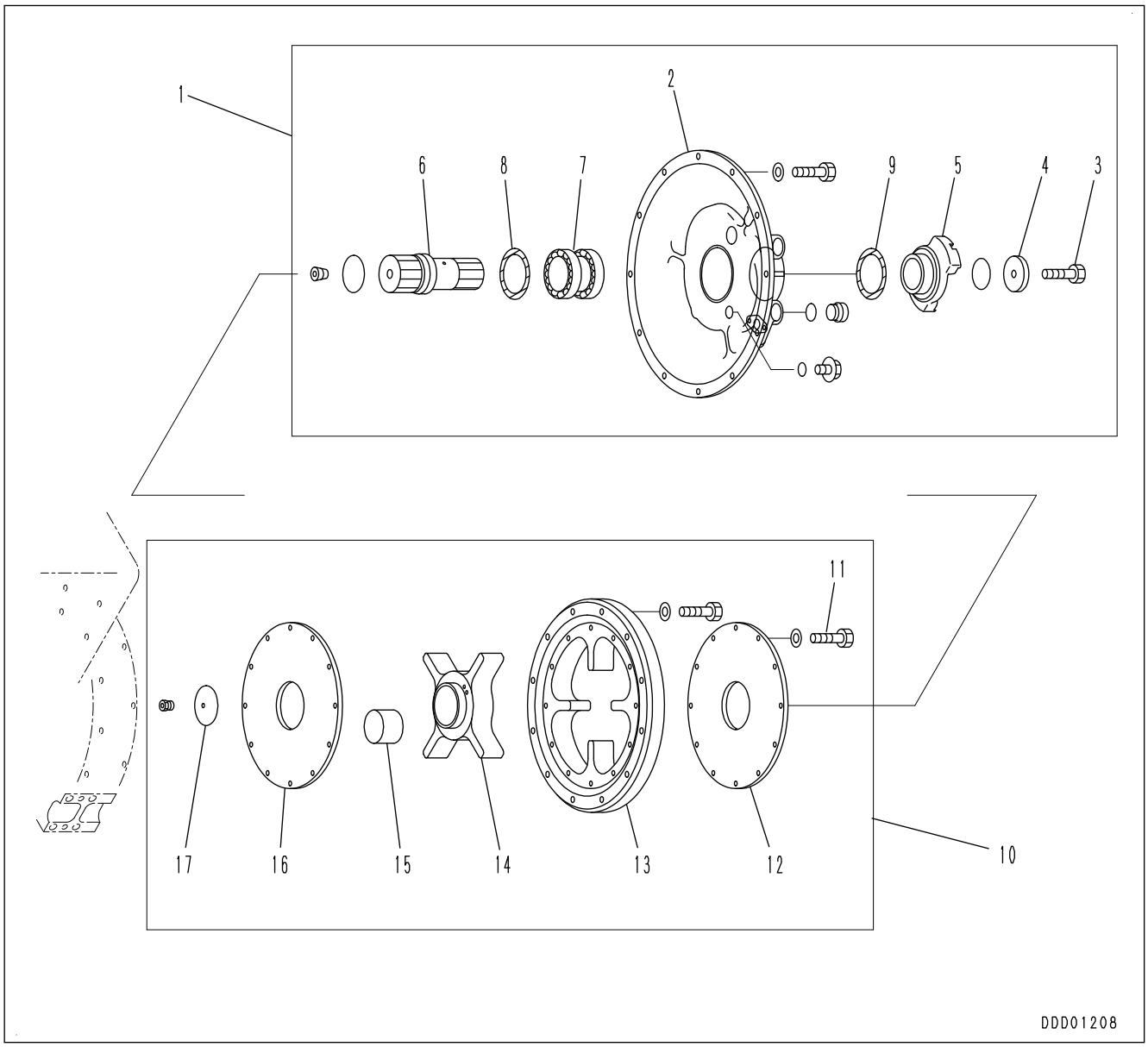
   NOTICE

   - **When handling DEF hose, be sure to use tool A.**
   - **Do not splash water to the electric connectors when washing DEF hose.**





Disassemble and Assemble Damper Assembly



Tools for Disassembly and Assembly of Damper Assembly

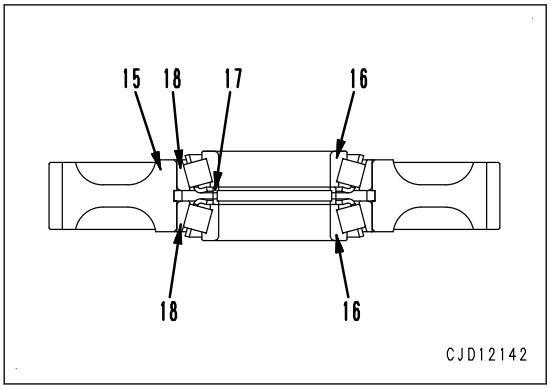
Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	-	Block	■	2			Disassembly and assembly of damper assembly
B	-	Cylinder	■	2			
C	793T-623-1170	Push tool	■	2		○	Assembly of damper assembly
D	791-612-1100	Installer	■	2			Press fit of bearing
	790-101-4200	Puller (294 kN {30 t})	■	1			
	790-101-1102	Hydraulic pump	■	1			

12. Remove bearing (16) and spacer (17) from gear (15).

REMARK

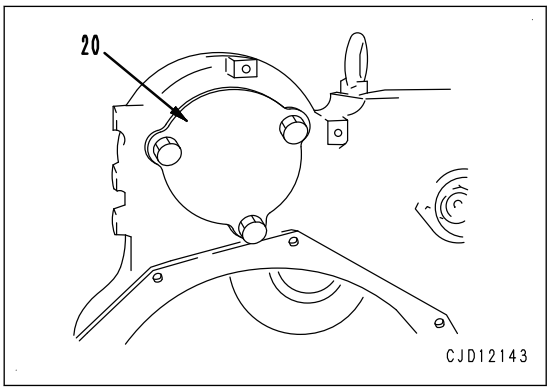
For reusing, do not change the combination with the outer race when storing them.

13. Remove outer race (18) from gear (15).



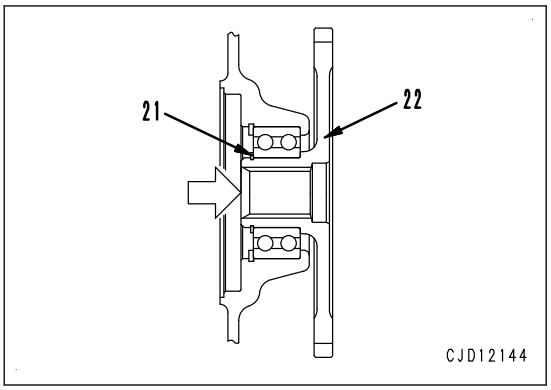
Cover

14. Remove cover (20) on the opposite side to cover assembly (R.H.).

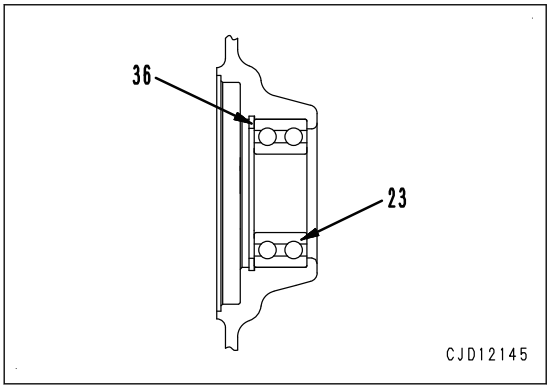


Scavenging pump drive gear

15. Remove snap ring (21).
16. Drive out gear (22) from the snap ring side, and remove it.

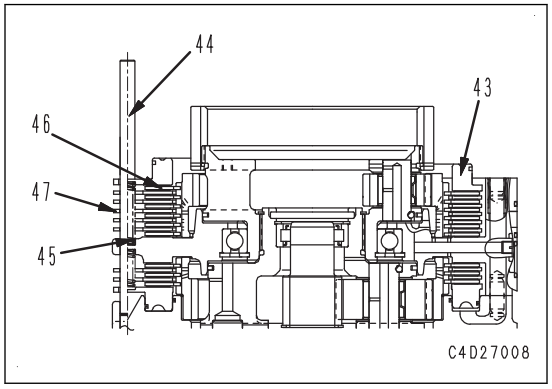


17. Remove snap ring (36), and remove bearing (23).



No.2 disc and plate

52. Install No.2 disc (46) and plate (47).
    Discs (6 pieces) and plates (5 pieces)

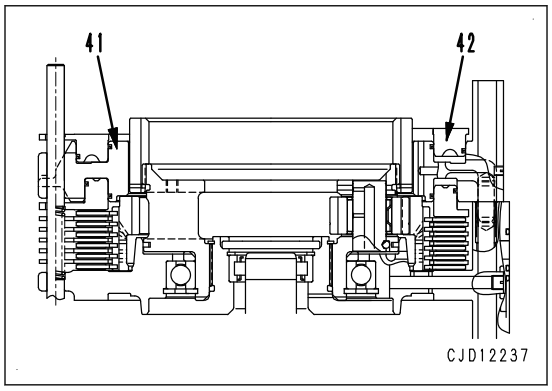


No.2 clutch spring

53. Install spring (45).
    Free length of spring: 77 mm

No.2 piston

54. Fit the seal ring, align the spring with the spring groove, and install No.2 piston (43).



No.1 housing assembly

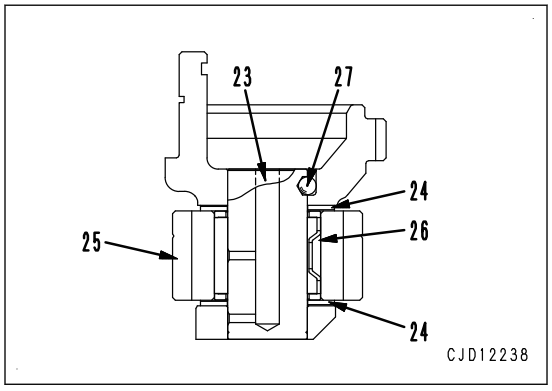
55. Set seal ring, and install No.1 piston to housing (41).
56. Install No.1 housing assembly (41) while aligning its position with No.2 piston by using the eyebolt.

    REMARK

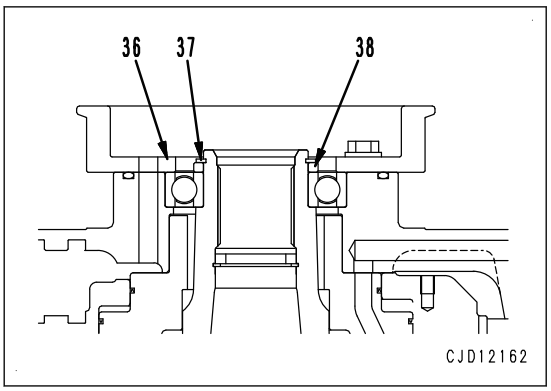
    Press down the housing, and tap the dowel pin.

Input shaft and No.1 carrier assembly

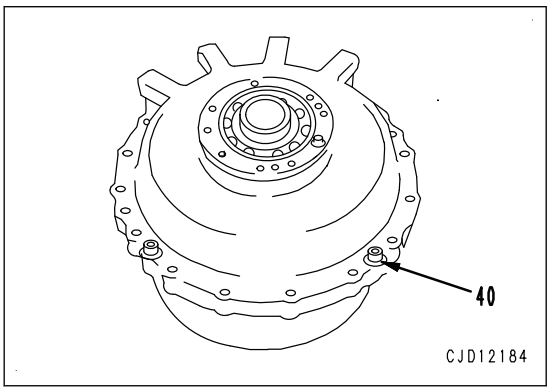
57. Install bearing (26) to gear (25), fit thrust washers (24) to both sides, and set it on the carrier.
58. Install ball (27), and install shaft (23).



55. Fit spacer (38), and install snap ring (37).
56. Install flange (36).

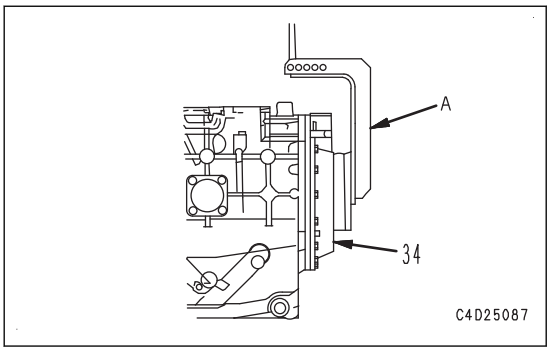


57. Remove the bolts and nuts used for compressing the spring, and install bolts (40) (4 pieces).



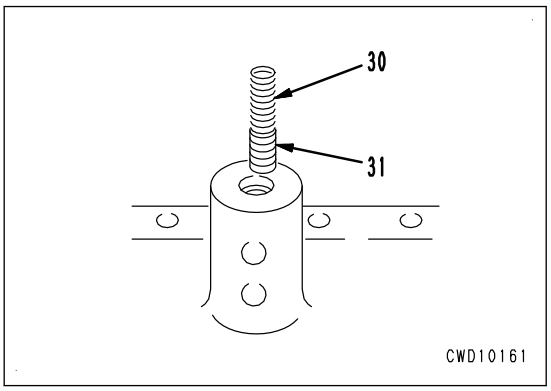
Assembly of brake and carrier assembly

58. Adjust the length of the seal ring on the carrier side so that it is equal to the extending size from the shaft even.
59. Install brake and carrier assembly (34) by using tool A.



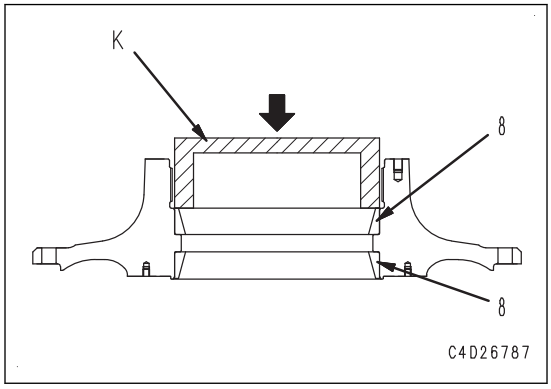
Assembly of cover assembly

60. Install valve (31) and spring (30) to the covers, and then install the plug.

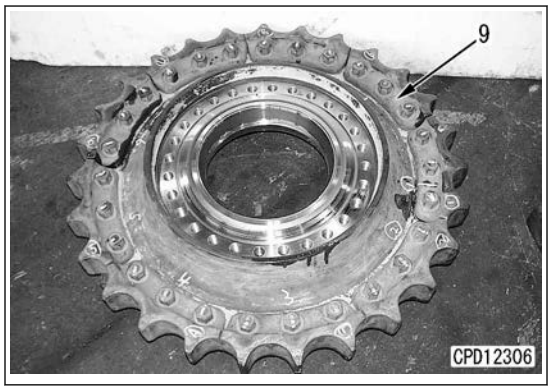


Sprocket hub assembly

34. Press fit bearing outer race (8) by using tool K.
    Bearing press-fitting force: 15 to 35 kN {1.5 to 3.6 t}



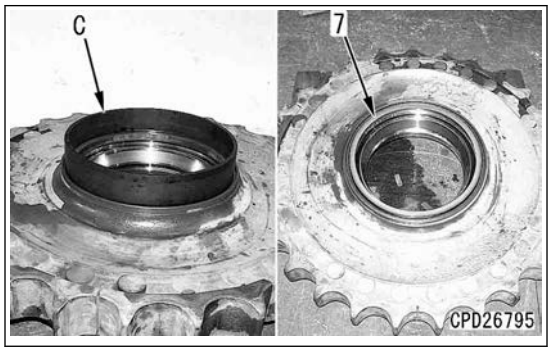
35. Install sprocket segment (9) to the sprocket hub.
    Mounting bolt:
    931 to 1127 Nm {95 to 115 kgfm}



36. Press fit floating seal (7) by using tool C.

    REMARK

    - Completely remove oil and grease from O-ring and contact surface of O-ring and dry them before installing.
    - After installing the floating seal, check that its leaning is 1 mm or less.

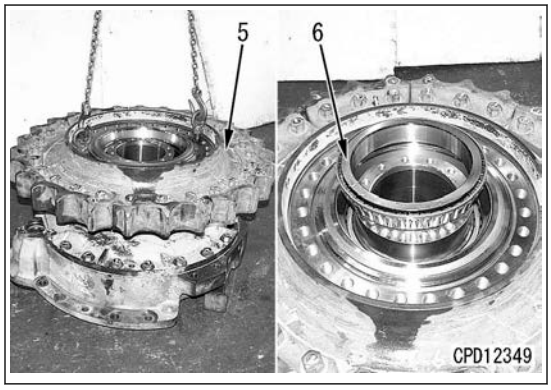


37. Install sprocket hub assembly (5) to the cover assembly by using tool R.

    REMARK

    Check the floating seal sliding surface for dirt, etc. and lightly apply engine oil to it.

38. Set the bearing (6).



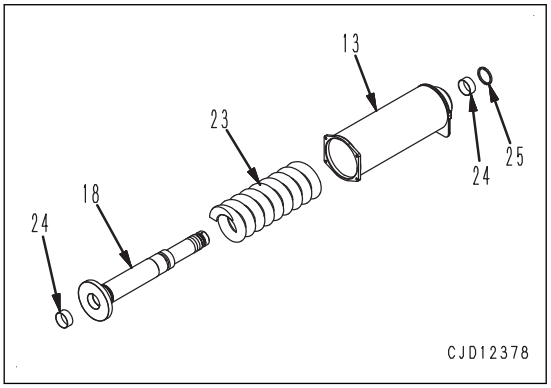
How to Assemble Recoil Spring Assembly

Recoil spring assembly

1. Press-fit bushing (24) to recoil spring case (13) by using the push tool, and install seal (25).

   Bushing press-fitting force: 19.6 to 29.4 kN {2.0 to 3.0 t}

   Bushing:
   Grease(G2-LI)



2. Press-fit bushing (24) to cylinder (18) by using the push tool.

   Bushing press-fitting force: 19.6 to 29.4 kN {2.0 to 3.0 t}

   Bushing:
   Grease(G2-LI)

3. Assemble recoil spring (23) and cylinder (18) temporarily to recoil spring case (13), and set them to tool B.

   NOTICE

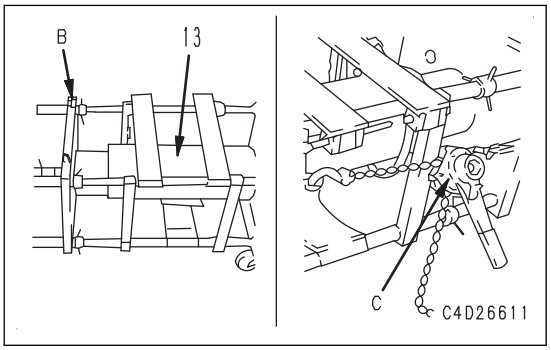
   Since the load at installed length of the spring is large and dangerous, set the spring securely.

   Load at installation of spring: 232 kN {23200 kg}

   REMARK

   To protect the threaded portion when the spring is compressed, use tool C, etc. to center the spring and compress it.

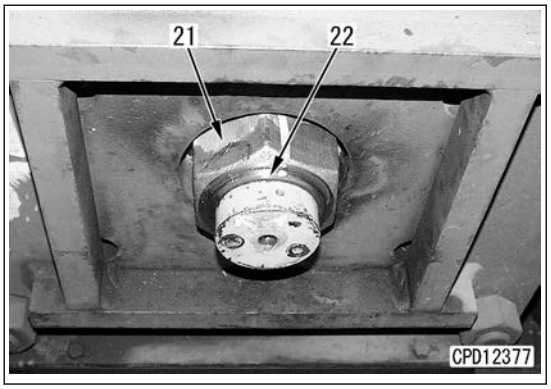
   Installed length of spring: 651 mm



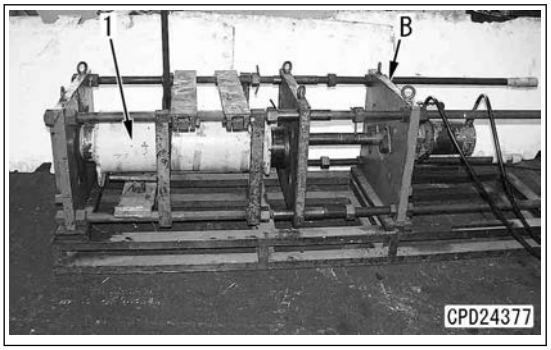
4. Install shaft end nut (21), and install spacer (22).

   NOTICE

   - **Install the shaft end nut and spacer so that clearance is not created between them.**
   - **If the clearance is created, the spring load is applied to the threaded part of the shaft end nut. Therefore, the screw may be damaged. (If the screw is damaged, disassembly may not be preformed next time.)**



5. Gradually release the oil pressure, loosen the spring tension completely, and remove recoil spring assembly (1) from tool B.



Disassemble and Assemble Track Assembly Generally

Tools for General Disassembly and Assembly of Track Shoe Assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	-	Jaw	■	1			General disassembly and assembly of track shoe assembly
B	791-650-3000	Remover, installer	■	1			
	790-101-1300	Cylinder assembly	■	1			
	790-105-2300	Jack assembly	■	1			
	790-101-1102	Hydraulic pump	■	1			
C	791-646-7531	Plug remover	■	1			Driving-in of plug (small)
D	791-660-7460	Pin brush	■	1			Cleaning of pin
E	791-432-1110	Plug push tool	■	1			Driving-in of plug (large)
	790-646-7550	Bar	■	1			
	790-646-7560	Guide	■	1			
F	791-632-1060	Installer	■	1			Insertion of link seal
G	-	Spacer	■	1			Press fit of pin and bushing
H	790-701-3000	Seal checker	■	1			Check of floating seal airtightness
J	791-601-1000	Oil lubricator	■	1			Refilling with oil
K	791-932-1110	Plug push tool	■	1			Driving-in of plug (small)
	791-646-7523	Bar	■	1			
	791-646-7590	Guide	■	1			

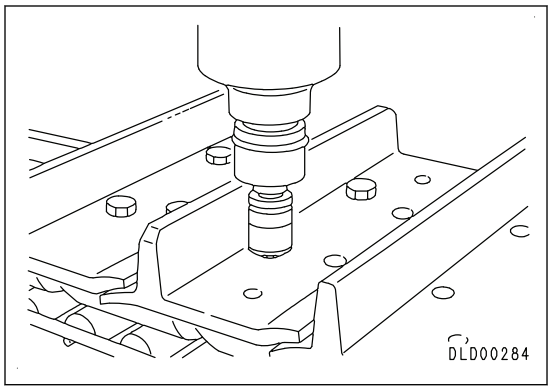
REMARK

Perform the work referring to “Parts judgment guide, undercarriage, sealed and lubricated track shoe” and “Parts judgment guide, undercarriage, method for reversing sealed and lubricated track shoe”.

How to Disassemble Full Track Shoes Assembly

Shoe

1. Sling the shoe assembly, set it on the floor with the shoe facing upward, and remove the shoe by using a shoe bolt impact wrench.

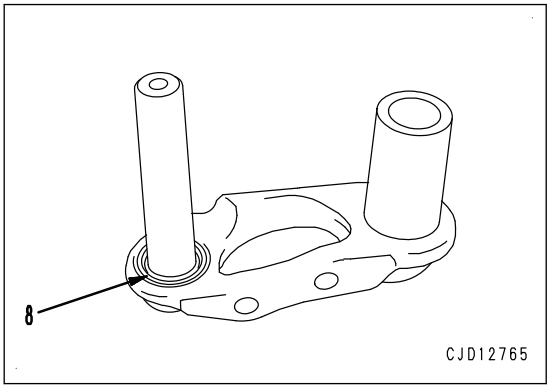


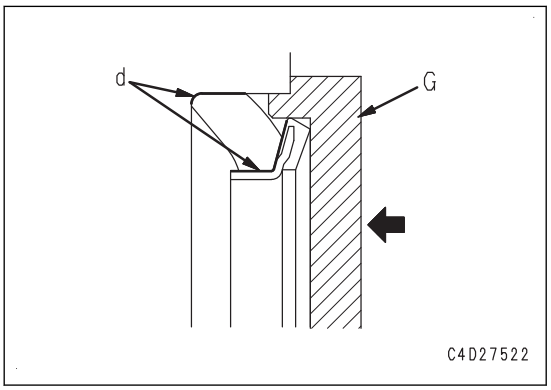
Seal

6. Install seal (8) by using tool G.

   NOTICE

   Check that the oil is not attached to contact face (d) of the link and seal.



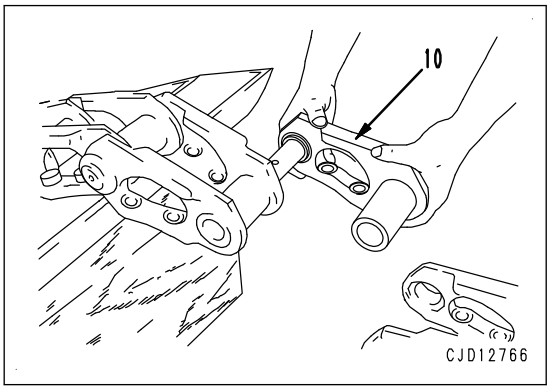


Link sub assembly

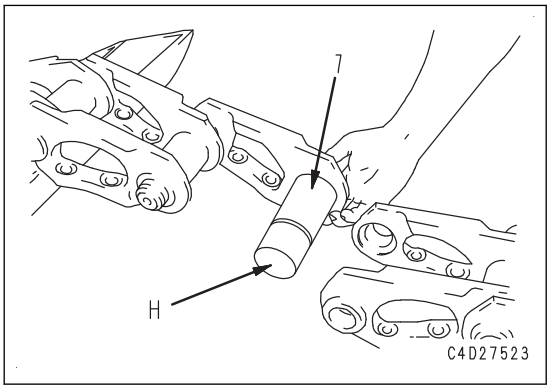
7. Install link sub assembly (10).

   NOTICE

   Check that the seal surfaces and bushing end faces are free from dirt, and then apply gear oil (GO80W90) on them by using a clean cloth or brush.

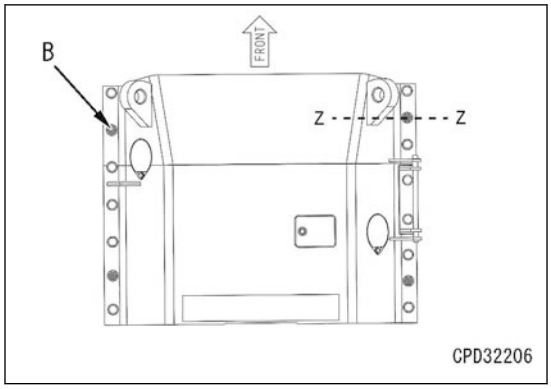


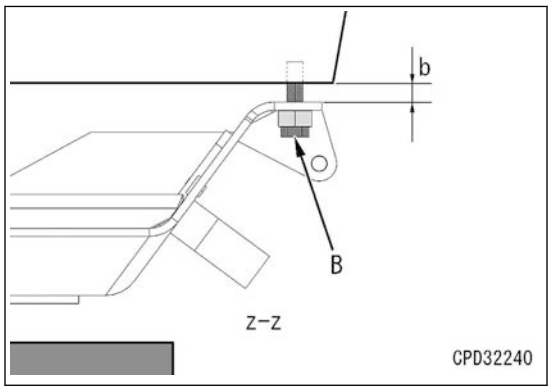
8. Install tool H (guide for press-fit link) to bushing (7).



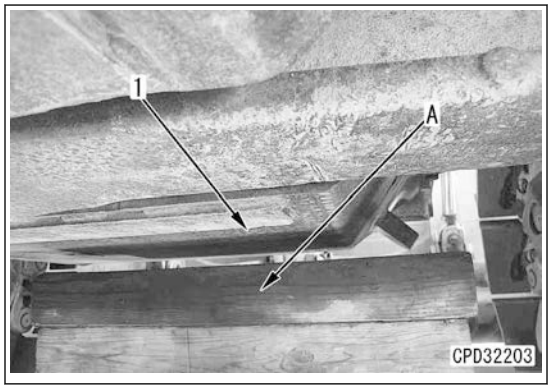
1) Allocate the clearance (b) when installing guide bolts (B) (4 pieces on left and right side).
   - Guide bolt (B) length 100 mm
   - Clearance (b) 25 mm

   NOTICE
   - **Be sure to measure the clearance (b) after guide bolts (B) are installed.**

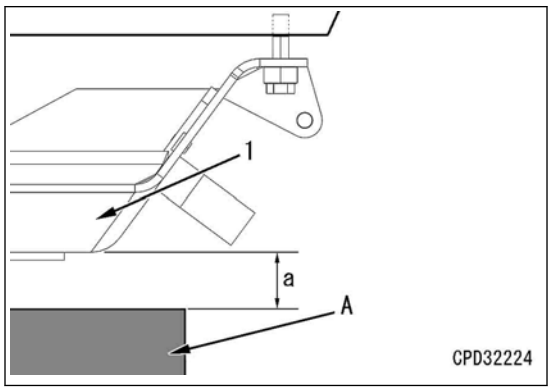




3. Set block (A) below under guard (1).

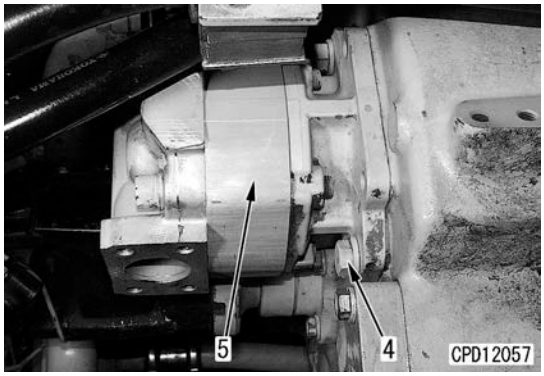


4. Allocate the clearance (a) between under guard (1) and block (A).
   - Clearance (a) 30 to 50 mm



Scavenging pump assembly

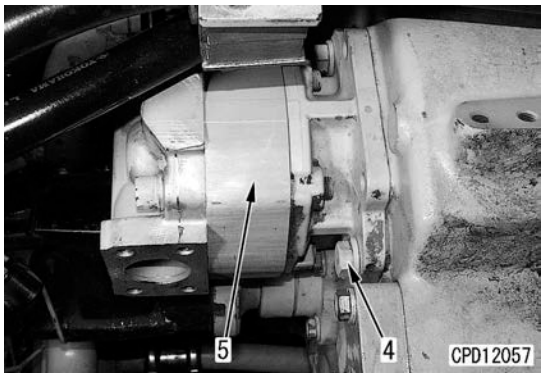
5. Remove mounting bolts (4) (2 pieces), and remove scavenging pump assembly (5).



How to Install Scavenging Pump Assembly

Scavenging pump assembly

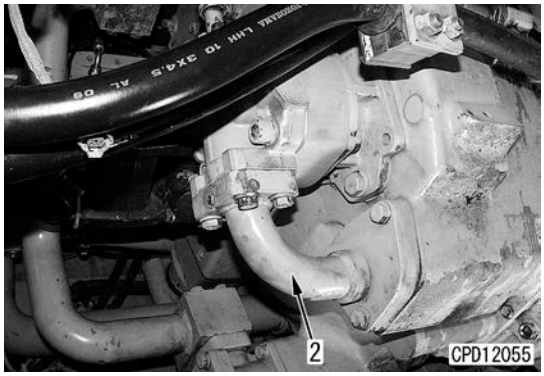
1. Install scavenging pump assembly (5) with mounting bolts (4) (2 pieces).



Tube, hose

2. Install discharge hose (3).

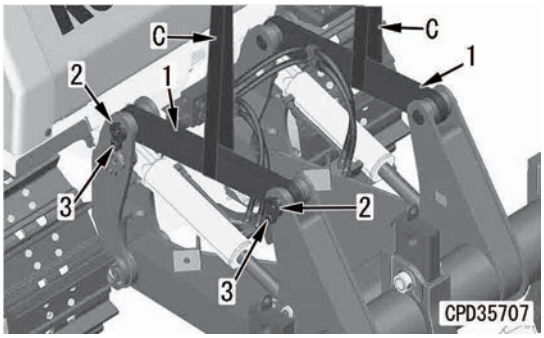
3. Install suction tube (2).



2. Sling and hold link (1) on either side with tool C, then remove pin (2) and lock bolt (3).
3. Remove pin (2), and remove link (1).

   Link:

   71 kg
4. Remove the link on the opposite side similarly.

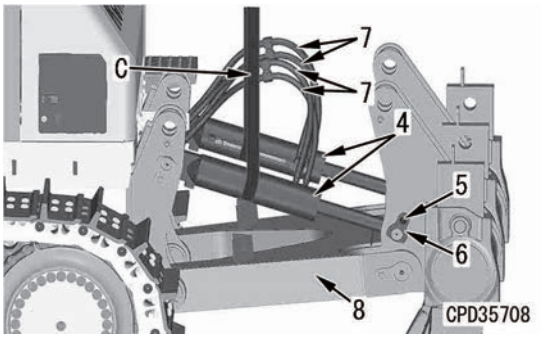


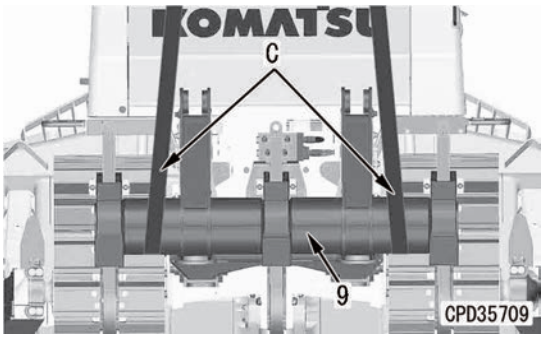
Lift cylinder assembly and beam

5. Sling and hold lift cylinder assembly (4) with tool C.

   Lift cylinder assembly (4):

   78 kg
6. Remove lock bolt (5), and remove pin (6).
7. Fully retract the piston rod of lift cylinder assembly (4), and lower it to arm (8).
8. Remove the lift cylinder assembly on the opposite side similarly.
9. Disconnect hoses (7) (2 pieces on each side).
10. Sling and hold beam (9) with tool C.

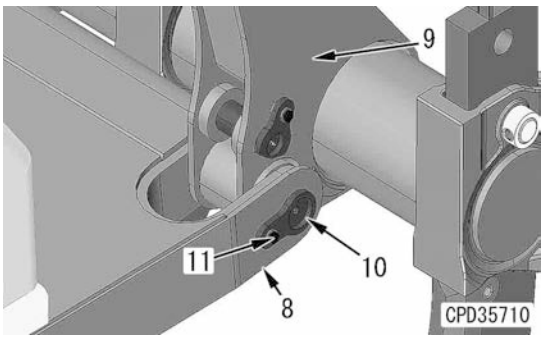




11. Remove lock bolt (11) of pin (10).
12. Remove pin (10), and remove the pin on the opposite side similarly, then remove beam (9) from arm (8).

    Beam (9) (with 3 shanks):

    1402 kg

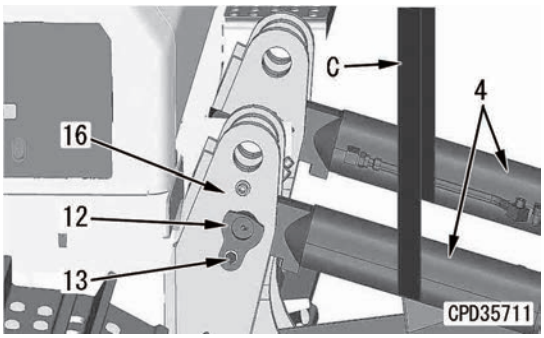


Lift cylinder assembly

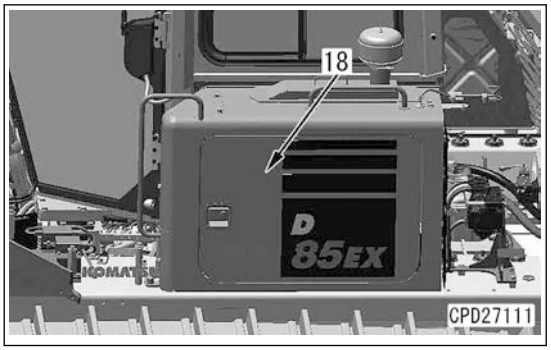
13. Sling and hold lift cylinder assembly (4) with tool C, and remove lock bolt (13) of pin (12).
14. Remove pin (12), and sling and remove lift cylinder assembly (4) from bracket (16).

    Lift cylinder assembly (4):

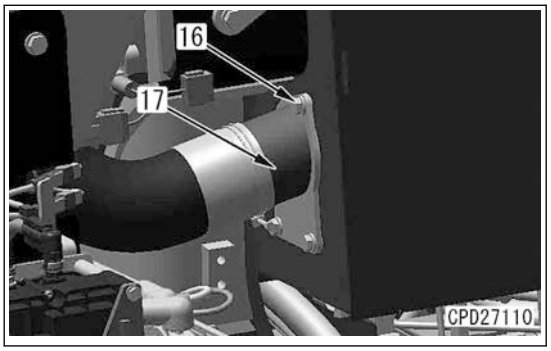
    78 kg
15. Remove the lift cylinder assembly on the opposite side similarly.



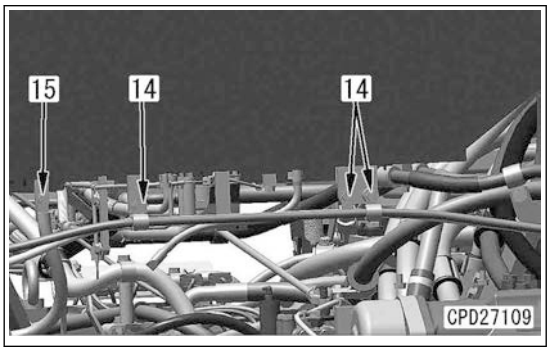
26. Close the cover (18).



27. Connect the duct (17) with the bolts (16) (3 pieces).



28. Connect the floor ground (15).
29. Install the clamps (14) (3 places).

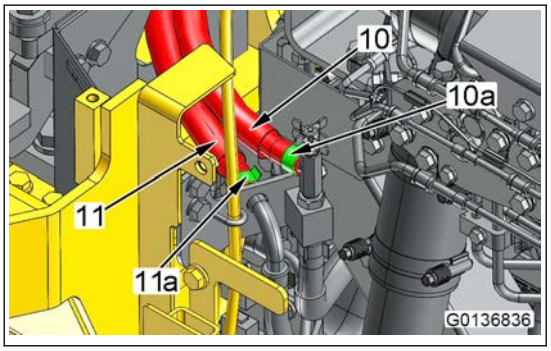


Fuel tank

30. Install the fuel tank assembly. For details, see “Remove and Install Fuel Tank Assembly”.

Hose

31. Connect the coolant hoses (10) and (11).
32. Install the bands (10a) and (11a).



REMARK

Be careful that engine controller assembly (20) does not fall off during removal.

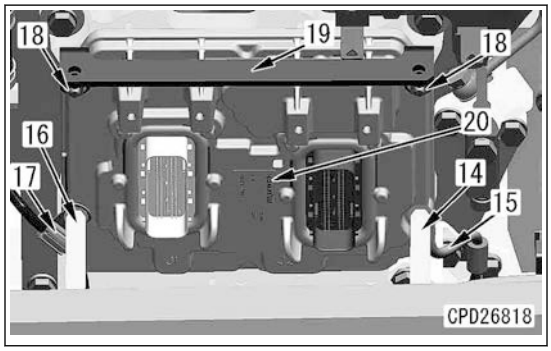
How to Install Engine Controller Assembly

NOTICE

- **When replacing the engine controller, write the injector compensation value written on the old engine controller to the new engine controller.**
- **Write the compensation value correctly, otherwise the wrong value may cause an engine trouble.**

Engine controller assembly

1. Set engine controller assembly (20) and bracket (19) to stud bolts (18) (2 pieces), and install it by tightening the nuts.



REMARK

Be careful that engine controller assembly (20) does not fall when it is being installed.

Stud bolt (18) mounting nut:
27 to 34 Nm {2.8 to 3.5 kgfm}

2. Install mounting bolt (16).

REMARK

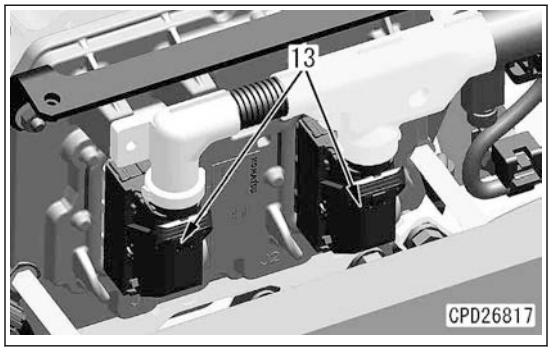
Mounting bolt (16) is tightened together with engine controller assembly (20) and clamp (17).

3. Install mounting bolt (14).

REMARK

Mounting bolt (14) is tightened together with engine controller assembly (20) and ground cable (15).

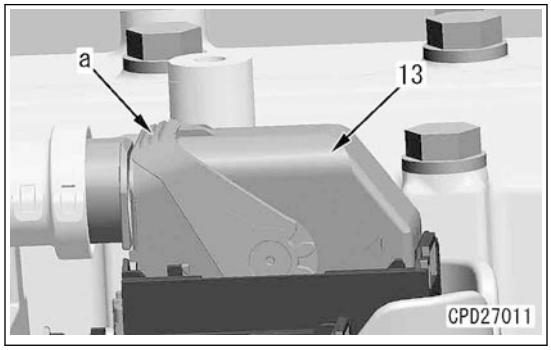
4. Connect harness connector (13).



REMARK

Take care to prevent dust from entering the clearance between engine controller and connector (13).

5. Place connector lever (a) to LOCK position, and fix connector (13).



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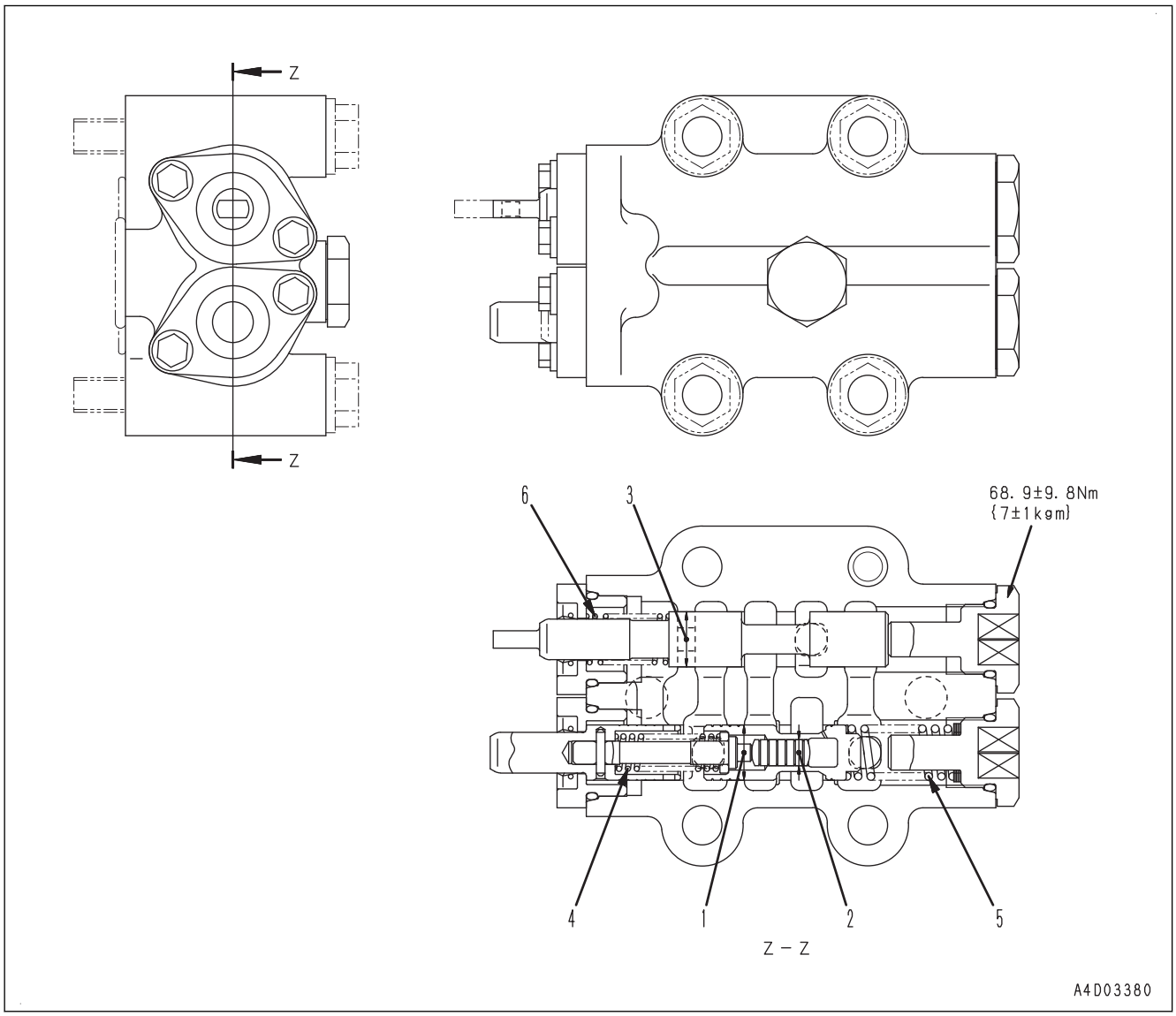
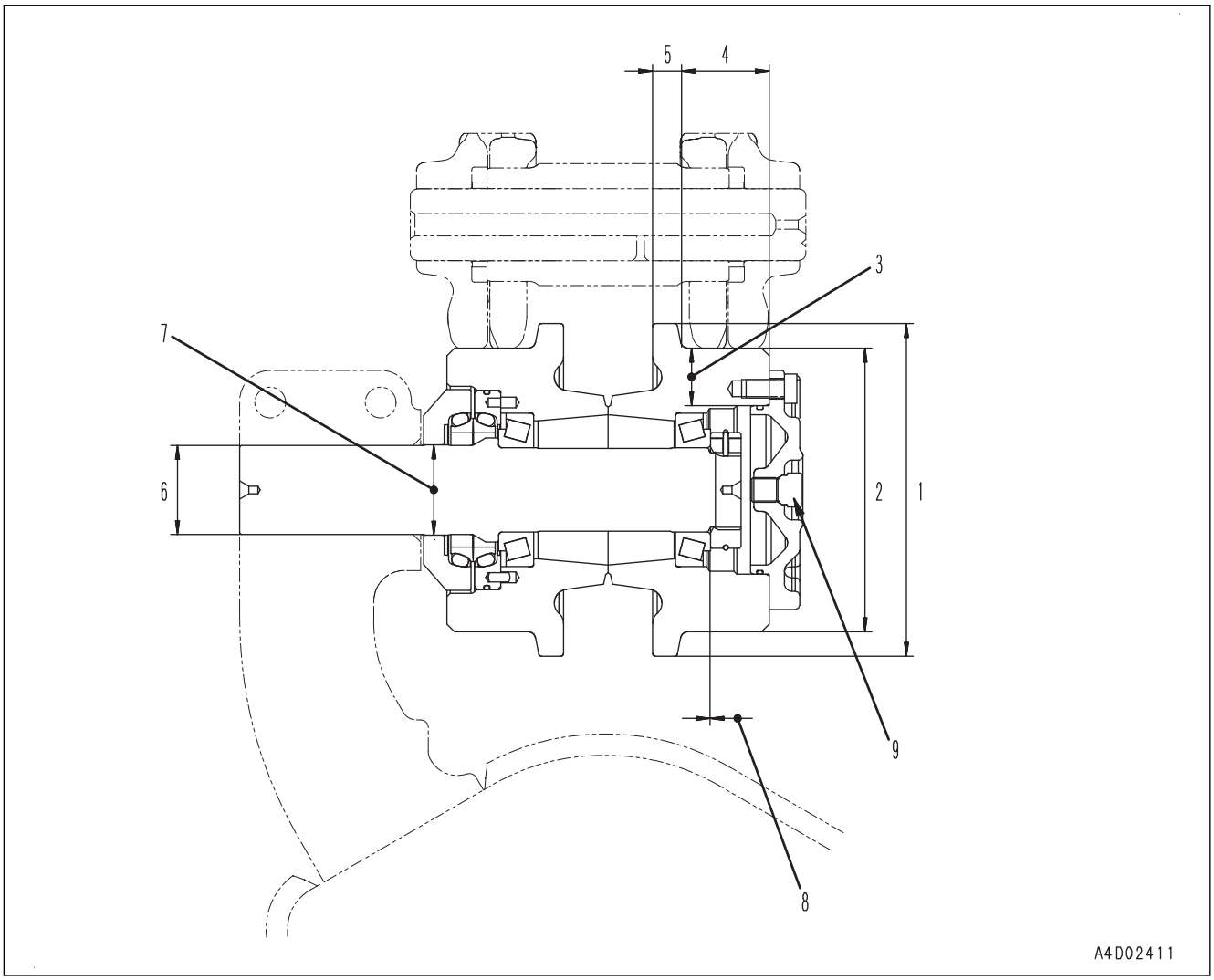
Maintenance Standard for Brake Valve

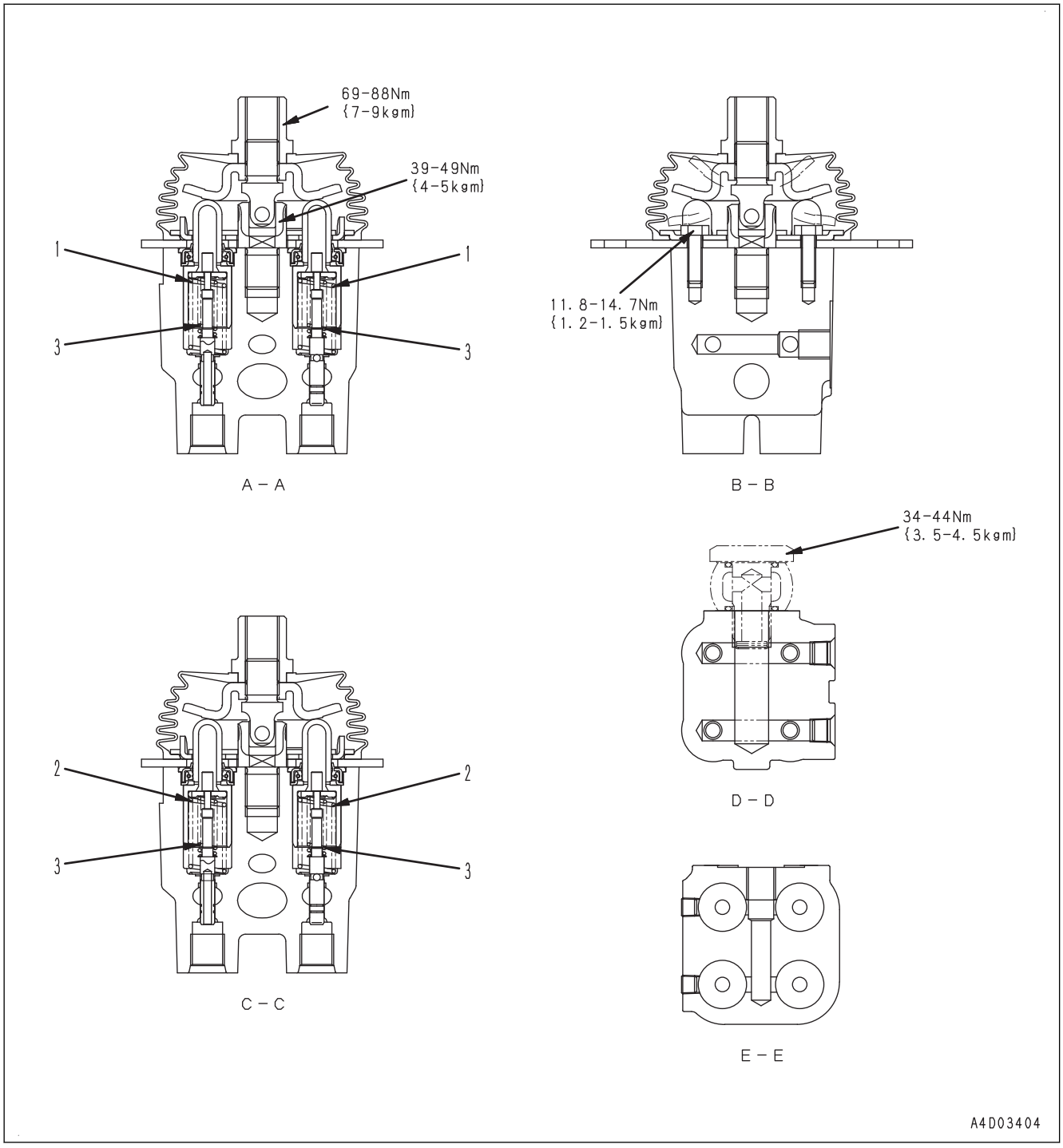


Maintenance Standard for Carrier Roller for Conventional Type Track Shoes

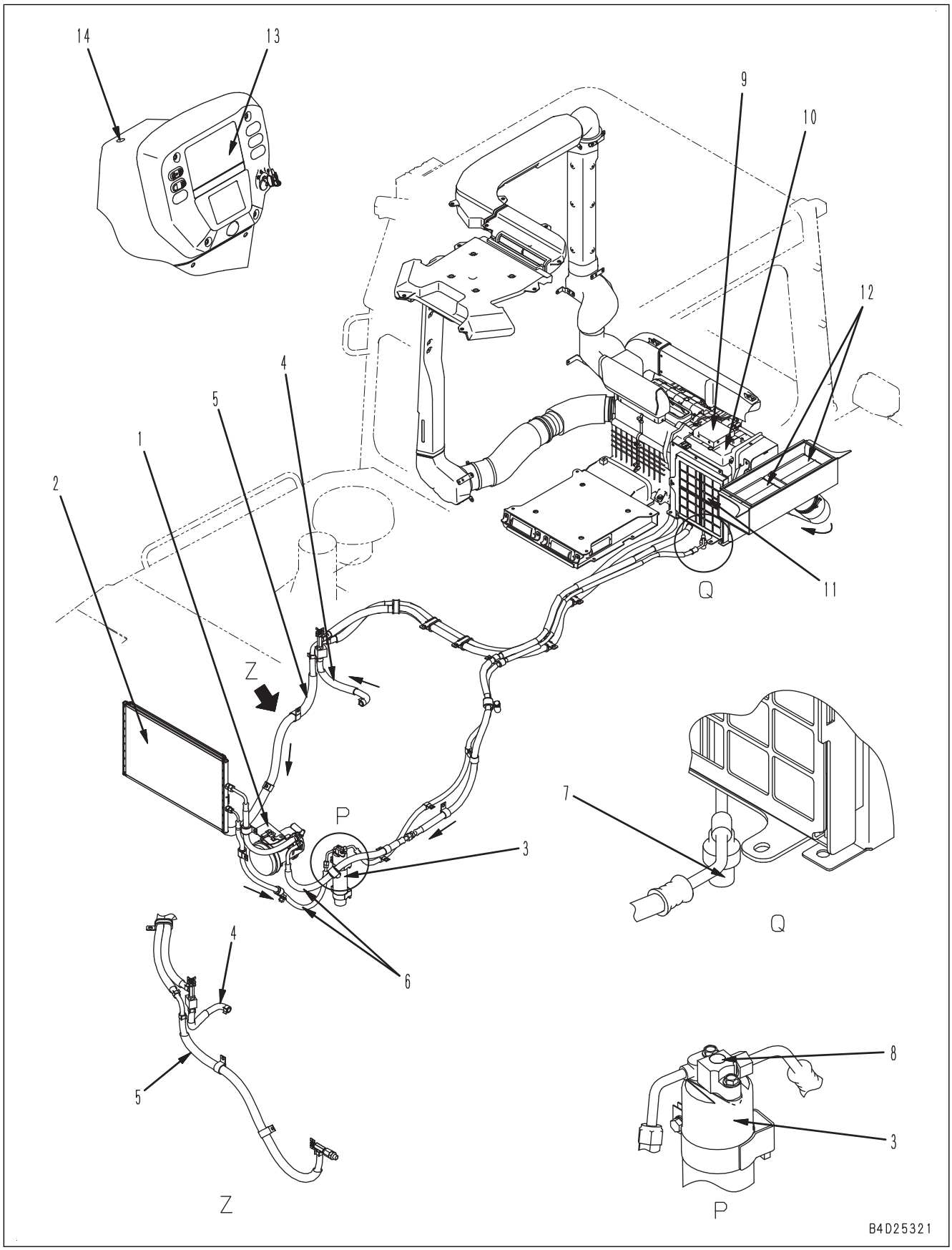


Unit: mm

No.	Item	Judgment criteria		Remedy
1	Outside diameter of flange	Standard dimension	Repair limit	Repair by build-up welding or replace
		217	-	
2	Outside diameter of tread	185	162	
3	Thickness of tread	37.5	26	
4	Width of tread	57	-	
5	Width of flange	19	-	


69-88Nm
{7-9kgm}
39-49Nm
{4-5kgm}
1
1
3
3
A - A
11.8-14.7Nm
{1.2-1.5kgm}
B - B
34-44Nm
{3.5-4.5kgm}
D - D
2
2
3
3
C - C
E - E
A4D03404

Air Conditioner Component



1: Compressor 2: Condenser

Connector No.	Remarks	Location	Reference
CBACC_2	ACC socket 2	Left of the cab	Air conditioner unit, Air conditioner controller
CBCIG	Cigarette lighter	Left of the cab	Air conditioner unit, Air conditioner controller
DSH	Intermediate connector of machine monitor	Inside of the engine hood	Intermediate connector
EG2	Intermediate connector of air conditioner compressor	Inside of the engine right cover	Air conditioner compressor
FD1	Intermediate connector	Between battery box and cab	Intermediate connector
FS12	Fuse box	Under the console box on the left of the cab	Fuse
FS21	Fuse box	Under the console box on the left of the cab	Fuse
PRT	Power transistor connector	Back side of air conditioner unit	Air conditioner unit, Air conditioner controller
S	Sunlight sensor	Defective back side of machine monitor	Sunlight sensor connector SLS and machine monitor connector CM02
SLS	Sunlight sensor connector	Defective back side of machine monitor	Sunlight sensor connector SLS and machine monitor connector CM02
TOA	Outside air temperature sensor	Battery box	Outside air temperature sensor

*: Connectors which do not appear in troubleshooting.

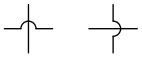
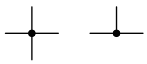
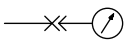
Failure Code [879CKA]

Action level	Failure code	Failure	Ventilating sensor Open Circuit (Machine monitor system)
-	879CKA		
Details of failure	Air conditioner controller detects open circuit in evaporator temperature (frost) sensor.		
Action of controller	• Air conditioner controller transmits open circuit information of evaporator temperature (frost) sensor to machine monitor by CAN communication. • Stops air conditioner.		
Phenomenon on machine	Air conditioner does not operate because of open circuit in evaporator temperature (frost) sensor.		
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. • Since connector of air conditioner evaporator temperature (frost) sensor cannot be checked when it is mounted on machine, troubleshooting cannot be performed.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective air conditioner controller	Air conditioner controller may be defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)
2	Defective air conditioner unit	Air conditioner unit may be defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)

Hydraulic Circuit Diagram

Symbols Used in Hydraulic Circuit Diagram

Symbol	Content
9JC01473	Main piping route
9JC01474	Pilot and drain route
 9JC01475	Flexible piping such as hose
 9JC01476	Crossing of disconnected route
 9JC01477	Connected route
9JC01478	Flow of fluid
 9JC01479	Throttle
 9JC01480	Variable
 9JC01481	Electric
 9JC01482	Spring
 9JC01483	Pickup port
 9JC01484	Pickup port and pressure gauge