SEN06577-12

Shop Manual

BULLDOZER

D61EX -24
D61PX -24

SERIAL NUMBERS D61EX-40001 and up
D61PX-40001

KOMATSU

Safety Notice for Operation

- Appropriate servicing and repair are extremely important to ensure safe operation of the machine. The shop manuals describe the effective and safe servicing and repair methods recommended by Komatsu. Some of the servicing and repair methods require the use of special tools designed by Komatsu for special purposes.
- The symbol mark ⚠ is indicated for such matters that require special precautions. The work indicated with this warning mark ⚠ should be performed according to the instructions with special attention. Should a hazardous situation occurs or be anticipated during such work, be sure to keep safe first and take every necessary measures.

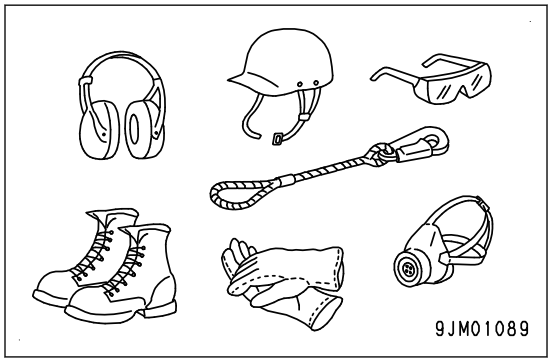
Safety Considerations

- Well organized work place
- Correct work clothes
- Observance of work standard
- Enforcement of hand signals
- Prohibition against unlicensed persons operating and handling the machine
- Safety check before starting work
- Wear of dust glasses (for cleaning or grinding work)
- Wear of welding goggles and protectors (for welding work)
- Being in good physical condition, and good preparation
- Always be alert and careful.

General Precautions

⚠ **If the machine is handled incorrectly, it is dangerous. Read and understand what is described in the operation and maintenance manual before operation. Read and understand what is described in this manual before operation.**

- Read and understand the meaning of all the safety labels stuck to the machine before performing any greasing or repairs. For the locations of the safety labels and detailed explanation of precautions, see Operation and Maintenance Manual.
- Tools and removed parts in the workshop should be well organized. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dust, dirt, oil, or water on the floor. Smoke only in the designated areas. Never smoke while working.
- Keep all tools in good condition, learn the correct way to use them, and use the proper ones. Check the tools, machine, forklift truck, service car, etc. thoroughly before starting the work.
- Always wear safety shoes and helmet when performing any operation. Do not wear loose clothes, or clothes with buttons missing.



Precautions When You Handle Intake System Equipment

The machines equipped with Variable Geometry Turbocharger (VGT) consists of more precise parts (variable system)than the parts used in the conventional turbocharger. If foreign material enters this system, it may cause a failure. Use special care to prevent entry of the foreign material when servicing the intake system.

Select an Applicable Workplace

Avoid the work of adding hydraulic oil, replacing filters, or repairing the machine in rainy or windy weather, or in dusty environment.

Seal the Opening

Plug the removed pipes and the openings of the removed components with the caps, tapes, plastic bags, etc. to prevent foreign material from entering.

NOTICE

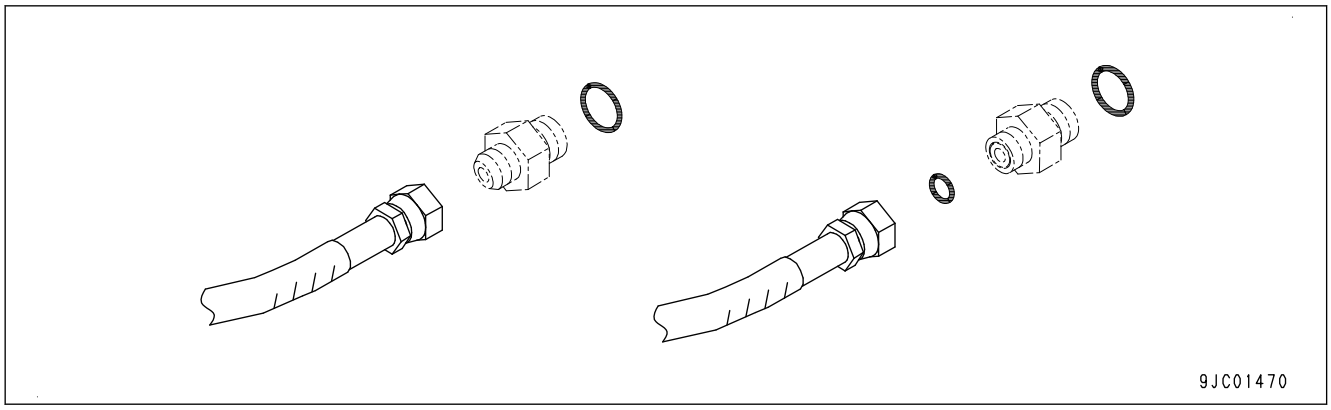
Do not expose the openings or stuff it, otherwise foreign material may enter it.

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

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

REMARK

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



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

Item	Unit	D61PX-24
Min. distance between pins	mm	856
Blade tilt cylinder		
Type	-	Double-acting piston type
Cylinder bore	mm	120
Outside diameter of piston rod	mm	70
Piston stroke (maximum)	mm	164
Max. distance between pins	mm	919
Min. distance between pins	mm	755
Blade angle cylinder		
Type	-	Double-acting piston type
Cylinder bore	mm	110
Outside diameter of piston rod	mm	65
Piston stroke (max.)/(effective)	mm	452/448(*4) 467/463(*5)
Max. distance between pins (max.)/(effective)	mm	1345/1343(*4) 1366/1364(*5)
Min. distance between pins (max.)/(effective)	mm	893/895(*4) 899/901(*5)
Hydraulic tank	-	Box type (external control valve type)
Hydraulic oil filter	-	Tank return side
Hydraulic oil cooler	-	Air-cooled (laminated aluminum)

*4:Serial No.: 40001 to 40635

*5:Serial No.: 40636 and up

Work equipment

Blade supporting method	-	Right and left: angle cylinder type
Performance		
Maximum raising distance (from the ground)	mm	1025
Maximum lowering distance (from the ground)	mm	580
Maximum tilt amount	mm	515
Maximum amount of angling	Degree	24
Dimensions		
Blade width	mm	3860
Blade height	mm	1155
Blade edge angle	Degree	55

Function of Temporary Restoration from Inducement (For North America)

- Temporary Restoration from Inducement is one of the Inducement strategies allowed to be included in Urea SCR systems. In case the Urea SCR system advances to “Severe Inducement”, engine power is derated heavily. This may cause difficulties of moving the machine to a safe place for adding DEF or troubleshooting and correcting abnormalities of the Urea SCR system. For temporary remedies from these difficulties the operator can restore engine power for a short time to the deration of “Mild Inducement” through the machine monitor. Note that “Temporary Restoration from Inducement” does not regain full engine power.
- “Temporary Restoration from Inducement” can be activated only when the Urea SCR system is in “Severe Inducement”. The maximum duration is limited to 30 minutes in each restoration operation, and 3 operations are allowed, but “Temporary Restoration from Inducement” is turned off whenever the system advances to “Final Inducement” even if either 30 minutes or 3 operations are not used up. All the abnormalities of the Urea SCR system need to be corrected to regain another restoration capability.
- If all the abnormalities of the Urea SCR system are not corrected when the system is in “Severe Inducement”, the system advances to “Final Inducement” in 1 hour after “Severe Inducement” started and engine speed will be fixed to low idle to disable practical machine operation.
- To activate Temporary Restoration, follow the procedures described below.

  REMARK

  For the operating procedure on this function, refer to “Temporary Restoration from Inducement” on the OPERATION section in the Operation and Maintenance Manual.

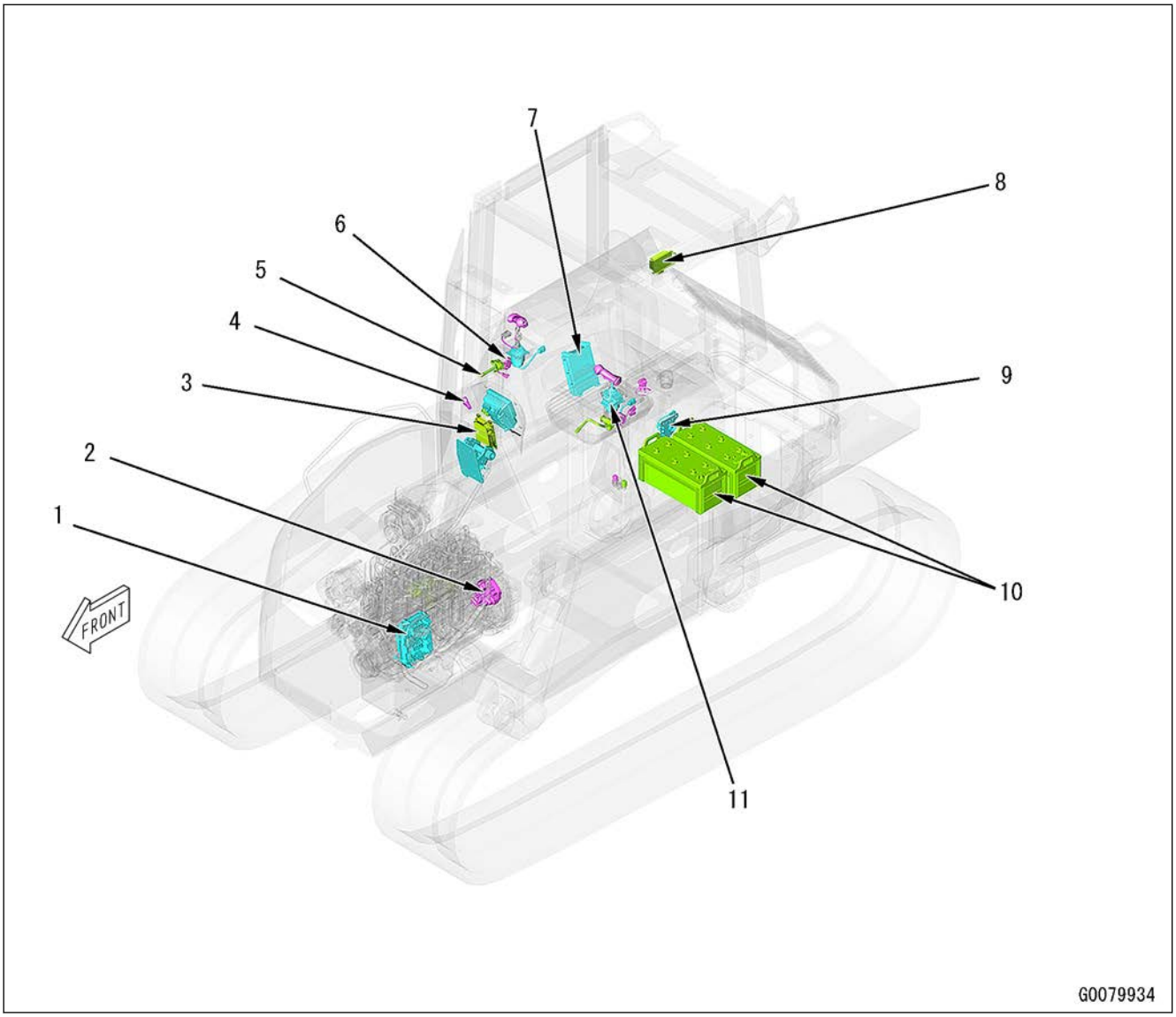
Inducement Strategy for Abnormality Recurrence in 40 Hours (For North America)

- The Urea SCR system continuously monitors its operation conditions and stores information on inappropriate operations including malfunctions.
- The stored information is utilized to monitor recurrences of abnormalities, “Abnormality Counter”. “Abnormality Counter” is required by the authorities. The abnormality counting spans 40 hours and it monitors the abnormalities that trigger Inducement other than the amount of DEF in the tank.
- If another abnormality/abnormalities is detected within 40 hours after the previous abnormalities were corrected, regardless of the level of the previous Inducement and whether the new abnormality/abnormalities is the same as the previous ones or not, it is judged as a recurrence.
- If a recurrence occurs, the Inducement strategy will be activated and starts from “Severe Inducement”.
- The duration of “Severe Inducement” in the recurrence is limited to 30 minutes. If the abnormalities are not corrected while Inducement is in “Severe Inducement (30 minutes)”, Inducement will advance to “Final Inducement” and engine speed will be fixed to low idle to disable practical machine operation.

Inducement Strategy When the DEF Level in the Tank Becomes Low (For European Union)

- When the DEF level in the tank becomes low, DEF level caution lamp on the machine monitor lights up, the Audible alert sounds, the action level is displayed and Inducement strategy including engine power deration is activated.
- The Inducement strategy progresses in 4 levels from Warning, Continuous Warning, Low-Level Inducement, and Severe Inducement.
- Up to the start of Severe Inducement the start of each warning step is triggered by the amount of DEF in the DEF tank.
- The Inducement strategy status can be checked on “SCR Information” screen of the user menu.
- The table shows warning indications and engine power derations by each Inducement strategy status.

Layout of Engine Control System (Machine with Gateway Function Controller)



1: Engine controller
2: Fuel supply pump
3: Gateway Function Controller
4: Engine shutdown secondary switch
5: Work equipment lock lever
6: Work equipment lock limit switch
7: HST controller
8: Communication terminal
9: Battery disconnect switch
10: Battery
11: Electric steering control lever

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

Operation of KCCV Ventilator

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

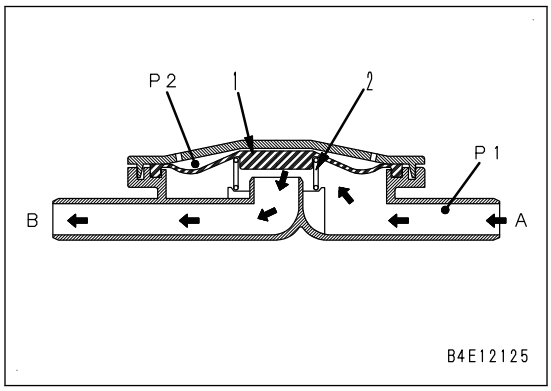
CDR Valve

CDR

Abbreviation for Crankcase Depression Regulator

Operation of CDR Valve

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



070-20P “CM03”

Pin No.	Signal name	Input/output signal
1	(*1)	-
2	(*1)	-
3	(*1)	-
4	(*1)	-
5	(*1)	-
6	(*1)	-
7	(*1)	-
8	(*1)	-
9	(*1)	-
10	(*1)	-
11	(*1)	-
12	(*1)	-
13	(*1)	-
14	(*1)	-
15	(*1)	-
16	(*1)	-
17	(*1)	-
18	(*1)	-
19	(*1)	-
20	(*1)	-

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

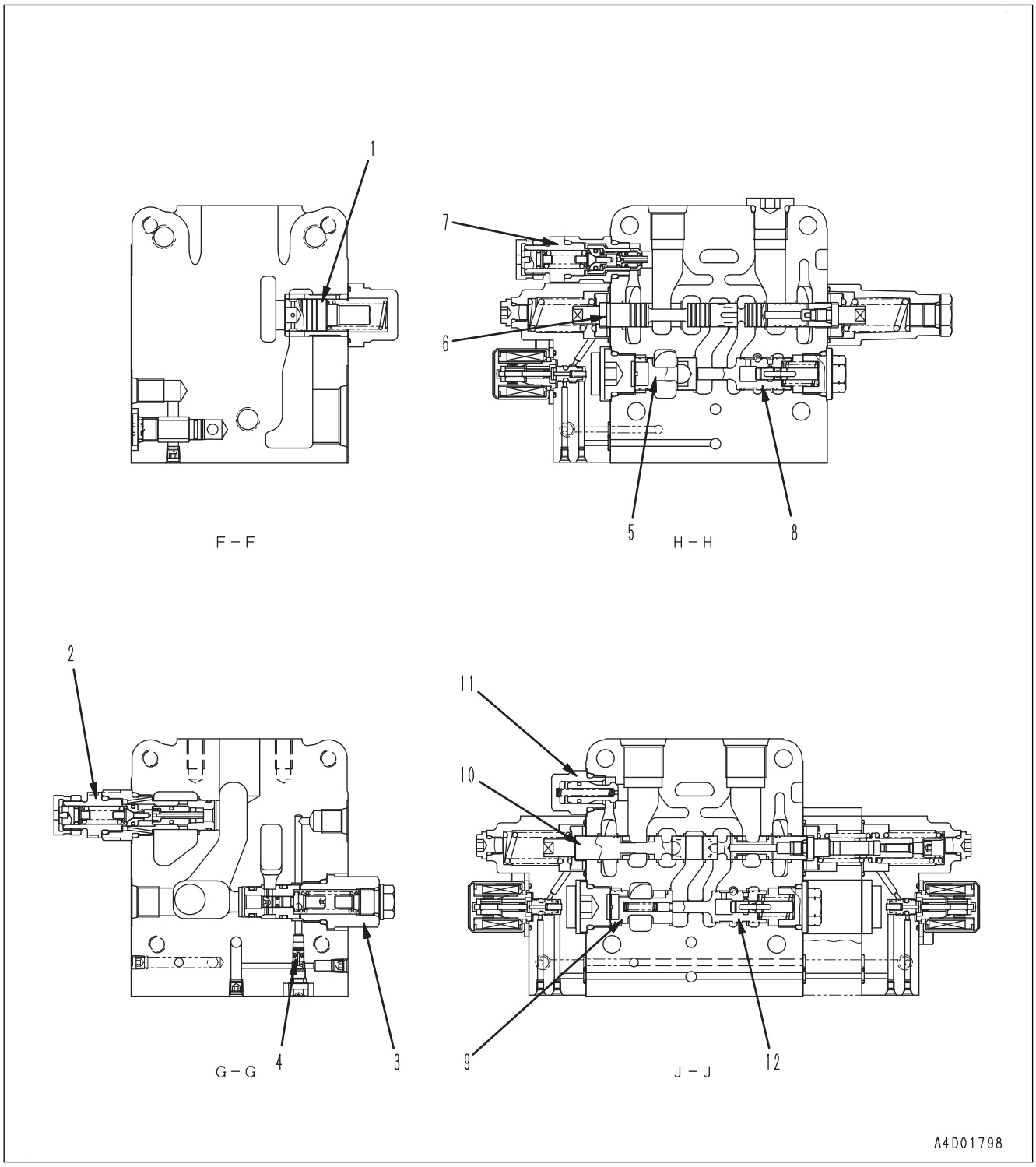
070-8P“CM04”

Pin No.	Signal name	Input/output signal
1	Power supply for camera (8 V)	Output
2	Camera NTSC signal	Input
3	(*1)	-
4	(*1)	-
5	GND (power supply for camera)	-
6	(*1)	-
7	(*1)	-
8	GND (shield)	-

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

Pin No.	Signal name	Input/output signal
20	(*1)	-
21	Datalink4 (+) (sensor controller)	Communication
22	Datalink4 (+) (KOMNET/c)	Communication
23	(*1)	-
24	(*1)	-
25	Power supply (+24 V, continuous)	Power supply
26	Power supply (+24 V, continuous)	Power supply
27	Power supply (+24 V, continuous)	Power supply
28	Power supply (+24 V, continuous)	Power supply
29	(*1)	-
30	(*1)	-
31	(*1)	-
32	GND	Ground/Shield/ Return
33	GND	Ground/Shield/ Return
34	(*1)	-
35	(*1)	-
36	(*1)	-
37	(*1)	-
38	DEF line heater Diag1	Input
39	DEF line heater Diag2	Input
40	(*1)	-
41	KDPF differential pressure sensor	Input
42	KDPF outlet pressure sensor	Input
43	(*1): Machine equipped with fuel control dial Idle validation switch 2: Machine with accelerator pedal	-
44	(*1): Machine equipped with fuel control dial Idle validation switch 1: Machine with accelerator pedal	-
45	Datalink4 (-) (Sensor controller)	Communication
46	Datalink4 (-) (KOMNET/c)	Communication
47	(*1)	-
48	System operating lamp	Output
49	Power GND	Ground/Shield/ Return
50	Power GND	Ground/Shield/ Return
51	Power GND	Ground/Shield/ Return
52	Power GND	Ground/Shield/ Return

Sectional Views (F-F, G-G, H-H, J-J)



1: Back pressure valve

2: Main relief valve

3: Unload valve

4: LS bypass valve

Cooling fan valve

5. Pressure compensation valve (*1)

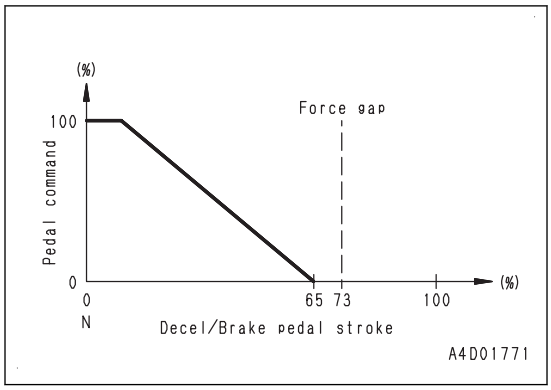
6: Spool

Deceleration and Brake Control Function

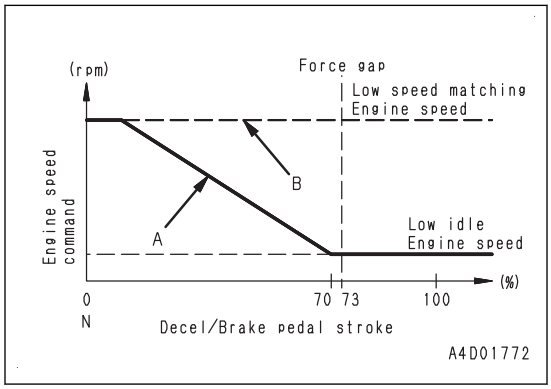
REMARK

The pedal command means the ratio to the set travel speed.

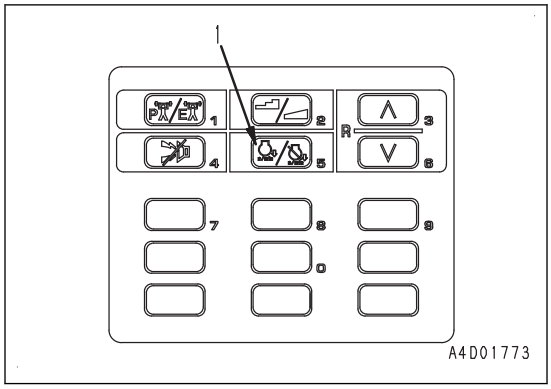
- When the decelerator and brake pedal is operated, the pedal command based on the rate shown in the figure is transmitted.
- When decelerator and brake pedal is depressed halfway
  The travel speed is limited by the formula of Command travel speed = Pedal command x Set travel speed / 100.



- When the decelerator and brake pedal is operated while Pedal Mode is set in Decel Mode (A), the engine speed decreases as shown in the figure.
- While Pedal Mode is in Brake Mode (B), the engine speed does not decrease even when the decelerator and brake pedal is operated.
- Brake Mode is used to control only the travel speed while keeping the work equipment speed constant during winch work, etc.



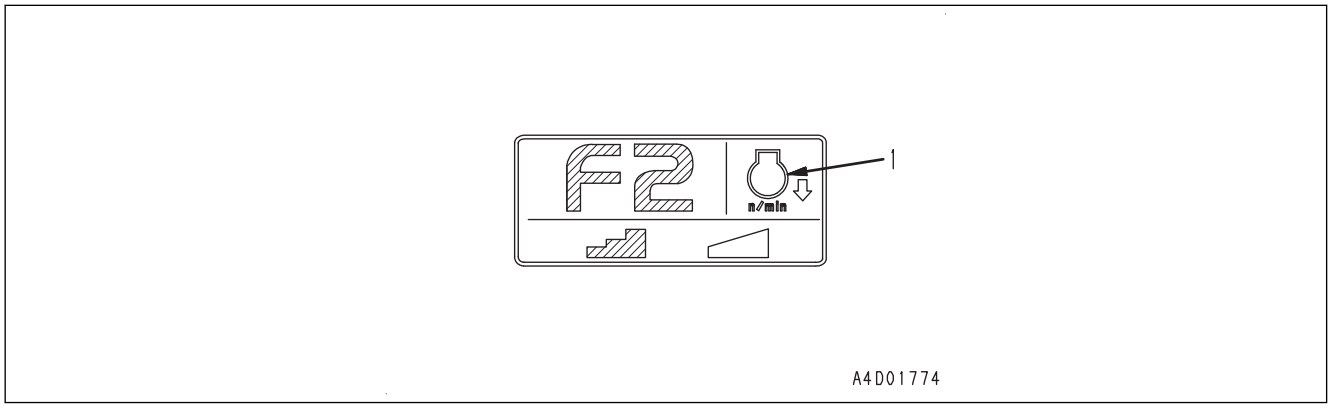
- Decel Mode or Brake Mode (B) is selected by operating pedal Mode switch (1).



Screen Display

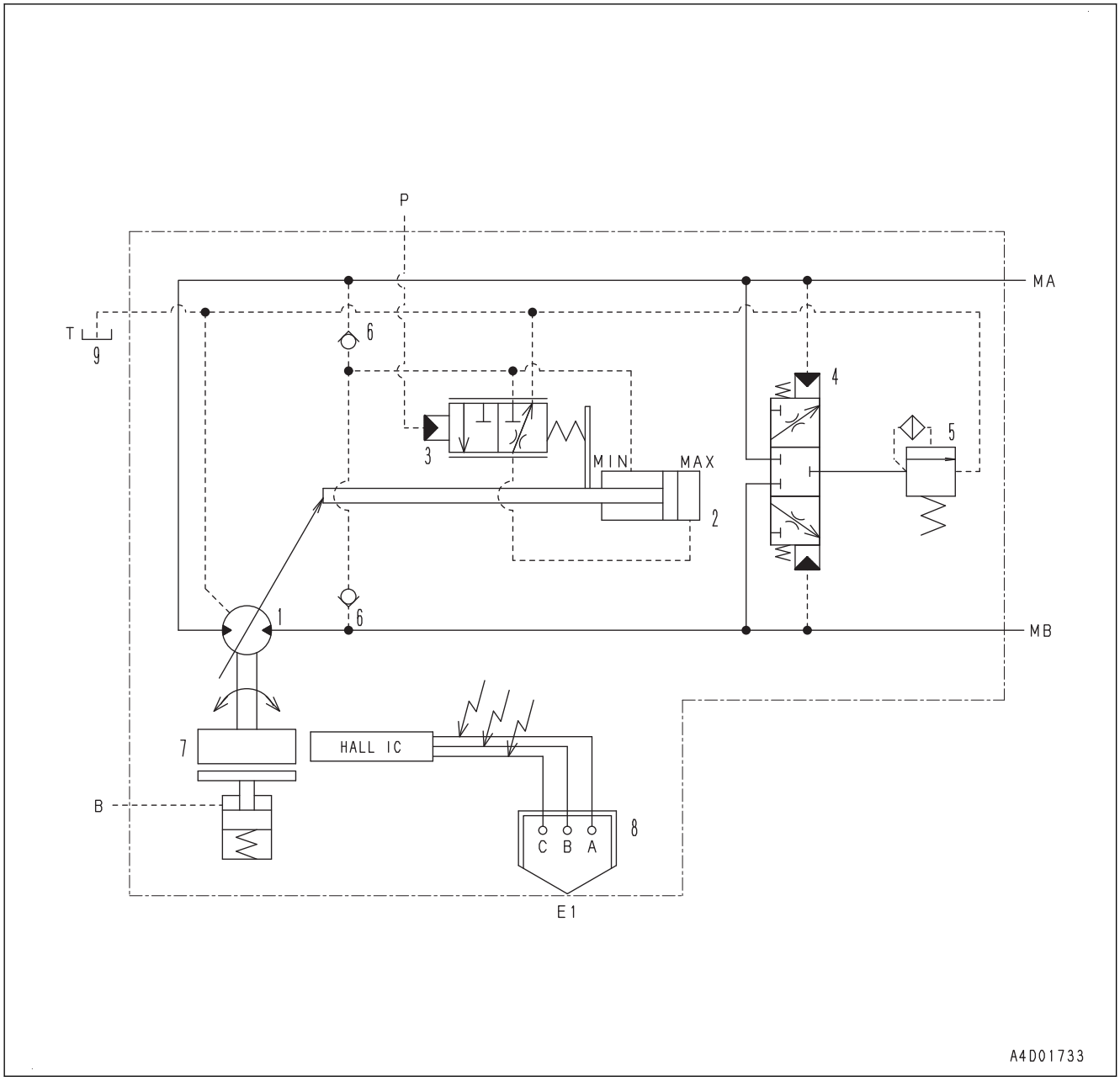
Pedal Mode is displayed on the speed range display portion of the machine monitor as shown below.

Decel Mode



Structure

- Pistons (1) (7 pieces) are attached to the disc portion of the drive shaft like a spherical joint. Each of them is stowed in cylinder block (5) at a certain angle to the drive shaft.
- The inclination of cylinder block (5) and piston (6) changes corresponding to the capacity control pressure from EPC valve.



B: Parking brake release signal port

MA: Discharge port (L.H. HST motor: High pressure during reverse travel, R.H. HST motor: High pressure during forward travel)

MB: Discharge port (L.H. HST motor: High pressure during forward travel, R.H. HST motor: High pressure during reverse travel)

1: Continuously variable displacement clinoaxis type piston motor

2: Servo piston

P: Capacity control signal port

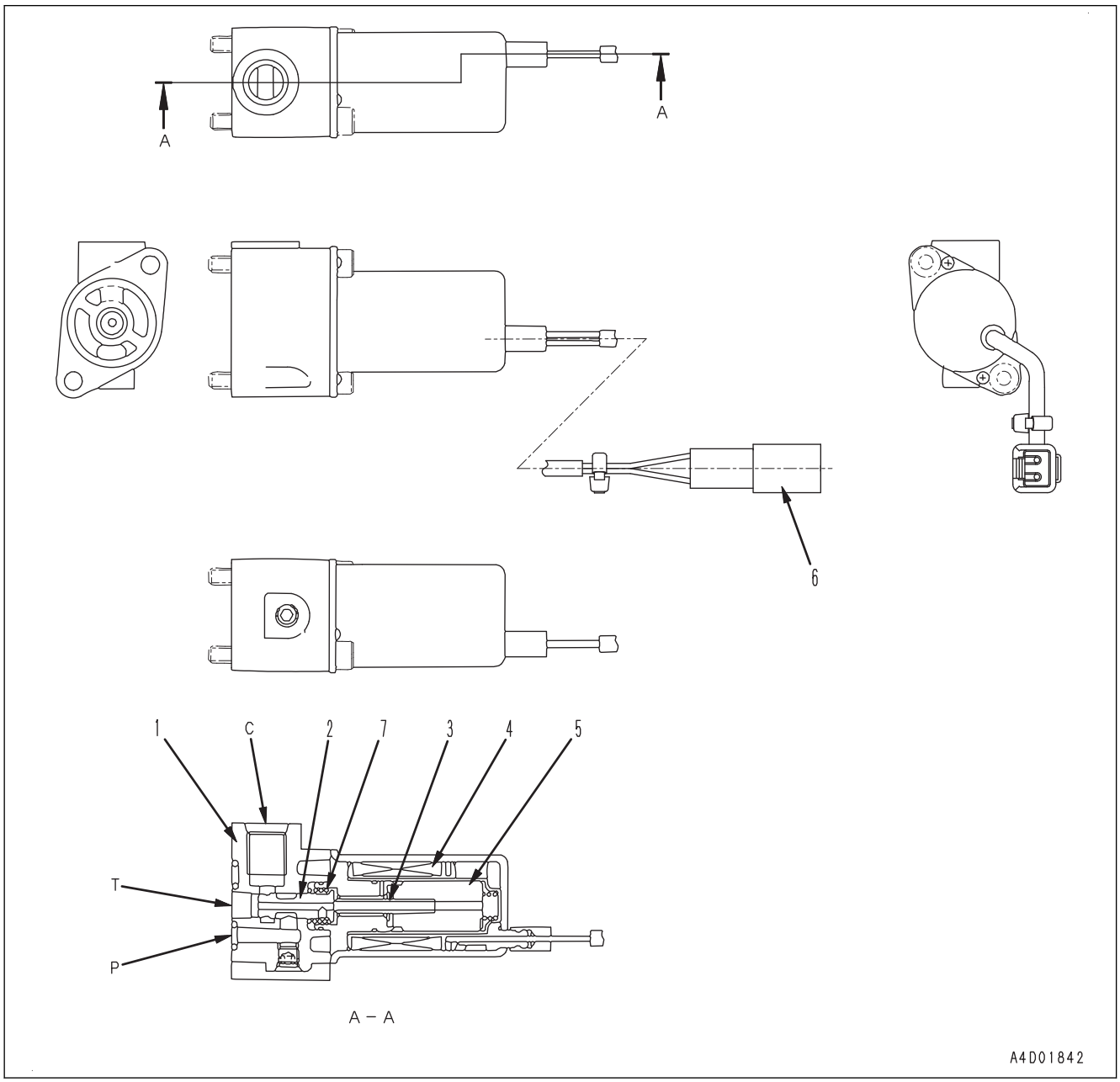
T: Drain

3: Servo valve

4: Low pressure selector spool

5: Charge relief valve

Structure of EPC Valve
General View and Sectional View



C: To HST motor (port P)
P: From charge filter outlet
1: Body
2: Spool
3: Rod
4: Coil
T: To hydraulic tank
5: Plunger
6: Connector
7: Return spring

Abbreviation List

- This list of abbreviations includes the abbreviations used in the text of the shop manual for parts, components, and functions whose meaning is not immediately clear. The spelling is given in full with an outline of the meaning.
- Abbreviations that are used in general society may not be included.
- Special abbreviations which appear infrequently are noted in the text.
- This list of abbreviations consists of two parts. The first part is a list of the abbreviations used in the text of the manual, and the second part is a list of the abbreviations used in the circuit diagrams.

List of Abbreviations Used in the Text

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
ABS	Antilock Brake System	Travel and brake (HD, HM)	This is a function that releases the brake when the tires skid (tires are not rotated). This function applies the brake again when the tires rotate.
AISS	Automatic Idling Setting System	Engine	This is a function that automatically sets the idle speed.
AJSS	Advanced Joystick Steering System	Steering (WA)	This is a function that performs the steering operations with a lever instead of using a steering wheel. This function performs gear shifting and changing forward and reverse direction.
ARAC	Automatic Retarder Accelerator Control	Travel and brake (HD, HM)	This is a function that automatically operates the retarder with a constant braking force when letting go of the accelerator pedal on the downhill.
ARSC	Automatic Retarder Speed Control	Travel and brake (HD, HM)	This is a function that automatically operates the retarder to ensure that the machine speed does not accelerate above the speed set by the operator when letting go of the accelerator pedal on the downhill.
ASR	Automatic Spin Regulator	Travel and brake (HD, HM)	This is a function that drives both wheels automatically using the optimum braking force when the tire on one side spins on the soft ground surfaces.
ATT	Attachment	Work equipment	A function or component that can be added to the standard specification.
BCV	Brake cooling oil control valve	BRAKE (HD)	This is a valve that bypasses a part of the brake cooling oil to reduce the load applied to the hydraulic pump when the retarder is not being used.
CAN	Controller Area Network	Communication and electronic control	This is one of communication standards that are used in the network on the machine.
CDR	Crankcase Depression Regulator	Engine	This is a regulator valve that is installed to KCCV ventilator. It is written as CDR valve and is not used independently.
CLSS	Closed-center Load Sensing System	Hydraulic system	This is a system that can actuate multiple actuators simultaneously regardless of the load (provides better combined operation than OLSS).

Hydraulic drift of work equipment

Machine model			D61EX-24	
Engine			SAA6D107E-3	
Item	Measurement condition	Unit	Standard value for new machine	Repair limit
Hydraulic drift of lifted blade	• Level ground • HST oil temperature (hydraulic oil temperature)40 to 60 °C • Engine: Stopped • Joystick (steering, directional, and gear shift lever): NEUTRAL position • Measure the amount of blade drop (H) 15 minutes after the stop of engine • See “Machine Posture and Procedures to Measure Performance”, Fig. 6.	mm	Max. 100	Max. 100
Hydraulic drift tilted by blade	• Level ground • HST oil temperature (hydraulic oil temperature)40 to 60 °C • Engine: Stopped • Joystick (steering, directional, and gear shift lever): NEUTRAL position • Measure the amount of blade drop (H) 15 minutes after the stop of engine • See “Machine Posture and Procedures to Measure Performance”, Fig. 7.	mm	Max. 200	Max. 200
Hydraulic drift amount of ripper (if equipped)	• Level ground • HST oil temperature (hydraulic oil temperature)40 to 60 °C • Move the ripper down to 100 mm from the rising end • Engine: Stopped • Joystick (steering, directional, and gear shift lever): NEUTRAL position • Amount of shank ripper drop (H) 15 minutes after the stop of engine	mm	Max. 50	Max. 50

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
MMS	Multimedia Messaging Service	Communication	This is a service that allows transmission and reception of short messages consisting of characters or voice or images between cell phones.
NC	Normally Closed	Electrical system, hydraulic system	This is a characteristic of electrical or hydraulic circuits. Circuit is normally closed if it is not actuated, and it opens when it is actuated.
NO	Normally Open	Electrical system, hydraulic system	This is a characteristic of electrical or hydraulic circuits. Circuit is normally open if it is not actuated, and it closes when it is actuated.
OLSS	Open-center Load Sensing System	Hydraulic system	This is a hydraulic system that can operate multiple actuators at the same time regardless of the load.
PC	Pressure Compensation	Hydraulic system	This is a function that corrects the oil pressure.
PCCS	Palm command control system	Steering (D Series)	This is a function that electrically controls the engine and transmission in an optimal way with the controller instantly analyzing data from levers, pedals, and dials.
PCV	Pre-stroke Control Valve	Engine	This is a valve that adjusts the fuel intake amount at the pump inlet in order to control fuel discharged volume of supply pump.
PPC	Proportional Pressure Control	Hydraulic system	This is a system that operates actuators in proportion to the oil pressure.
PPM	Piston Pump and Motor	Hydraulic system (D, PC, etc)	Piston type hydraulic pump and motor.
PTO	Power Take Off	Power train system	Power take-off mechanism
PTP	Power Tilt and power Pitch dozer	Work equipment (D Series)	This is a function that performs hydraulic control of the tilt and pitch of the dozer blade of the bulldozer.
ROPS	Roll-Over Protective Structure	Cab and canopy	ROPS is a protective structure that intended to protect the operator wearing seat belt from suffering injury which may be caused if the cab is crushed when the machine rolls over. (Roll-over protective structure) This performance is standardized as ISO 3471 or ISO 12117-2.
SCR	Selective Catalytic Reduction	Urea SCR system	This is an exhaust gas purifier using urea water that converts nitrogen oxides (NOx) into harmless nitrogen and water by oxidation-reduction reaction. It may also be mentioned as exhaust gas purification catalyst or part of the name of related devices.
SI	Le Systeme International d' Unites (International unit system)	Unit	Abbreviation for “International System of Units” It is the universal unit system and “a single unit for a single quantity” is the basic principle applied.
SOL	Solenoid	Electrical system	This is an actuator that consists of a solenoid and an iron core that is operated by the magnetic force when the solenoid is energized.

6. Remove retaining nut (6), and remove inlet connector (7).

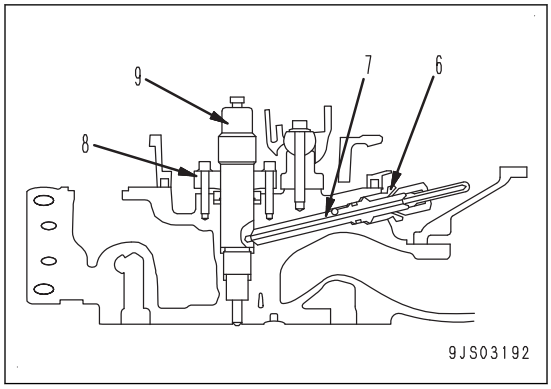
NOTICE

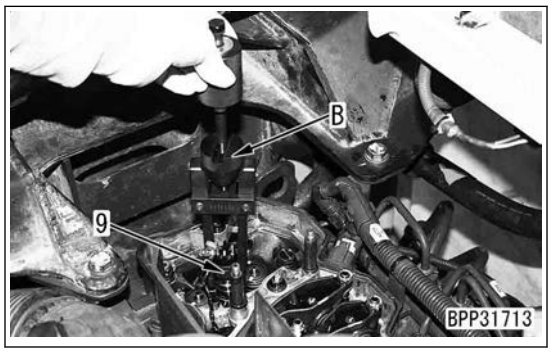
Remove mud, etc. sticking around in advance to prevent it from entering the hose of inlet connector (7).

7. Remove holder (8).
8. Remove injector (9).

REMARK

- Remove injector (9) with the impacts of the slide hammer by using puller B.
- Do not pry the top of injector (9) to remove.





9. Install the gasket D to the tip of adapter C, and insert them into the injector mounting part.
10. Fix adapter C with holder (8).

REMARK

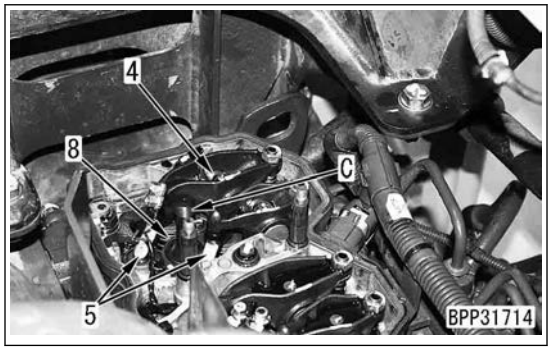
Tighten the holder (8) mounting bolts alternately.

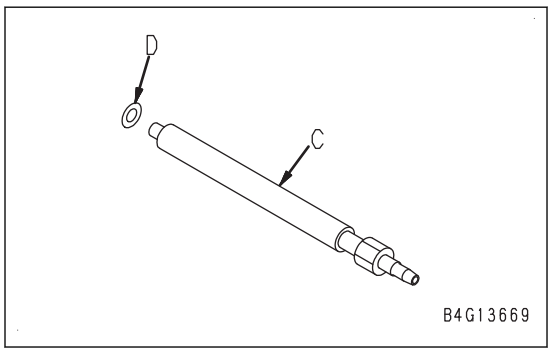
Holder (8) mounting bolt:
8±0.8 Nm {0.82±0.08 kgfm}

11. Install the crosshead (5) and rocker arm assembly (4).

Rocker arm assembly (4) mounting bolt:
36±5 Nm {3.67±0.51 kgfm}

12. Adjust the valve clearance. For details, see “Examine and Adjust Valve Clearance”.
13. Restore the engine so that it can be cranked.



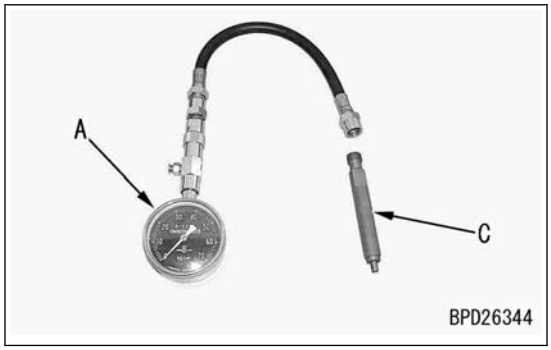


14. Connect the gauge assembly A to adapter C.

REMARK

If a small amount of oil is applied to the connecting parts of gauge assembly A and adapter C, air will not leak easily.

15. Turn the battery disconnect switch to ON position, then turn the starting switch to ON position.



Examine KDPF, SCR and Muffler Stack for Looseness and Damage

⚠ 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.

⚠ Chock the tires to prevent the machine from moving.

⚠ Wait for the engine to be cooled down sufficiently before starting the work.

⚠ Since SCR assembly is heated to 500 °C or more, take care not to get burn injury.

⚠ If SCR assembly is hot, wait until it has cooled down before starting any work.

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

For testing of KDPF, SCR, and muffler stack for looseness and damage to perform troubleshooting or others, refer to this section.

How to Examine KDPF, SCR and Muffler Stack for Looseness and Damage

1. Visually check KDPF, SCR, and muffler stack for crack and damage.

   REMARK

   If any part is damaged, replace it.

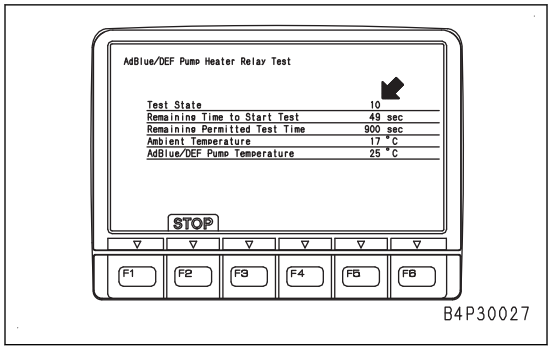
2. Check the mounting bolts of the KDPF, SCR, and muffler stack for looseness.

   REMARK

   - If any part is loosened, retighten it.
   - For the tightening torques, see “50 Disassembly and Assembly”.

NOTICE

- **"Test State" does not change to "10" and test does not start even if F1 is pressed, turn starting switch to OFF position once, and perform the testing procedure again from step 5.**
- **If you turn starting switch to OFF position by mistake during test, do not turn starting switch to ON position immediately. Check that system operating lamp is off, and turn starting switch to ON position again after engine controller shuts down.**
- **If KOMNET communication error remains less than 1 second, engine controller is unable to detect it, and the test may be continued while the machine monitor does not continue the test (standard screen). In that case, once the starting switch is turned to OFF position, system operating lamp goes out, and the engine controller shuts down to reset the test.**



REMARK

- Display of "Test State" changes to flashing of "10", and display of "Remaining Time to Start Test" is counted down from "60" to "0 sec".
- When the display of "Test State" is "11" to "41", perform the required action according to the "Parameter list of test state".
- When the display of "Remaining Time to Start Test" becomes "0 sec", the voltage is outputted.
- The relay operates for 900 seconds at maximum, and is displayed with "Remaining Permitted Test Time". The relay operates for 900 seconds at maximum and displayed with Remaining Permitted Test Time. However, it stops operation automatically if the temperature of the pump reaches to 55 °C to protect pump heater. Wait for the temperature to drop before re-starting the relay operation.
- Perform measuring when energization ON/OFF is not repeated to measure the stable voltage.
- When energization is repeated ON/OFF, press F2 to stop the test, and wait for the pump temperature to drop.
- When the sum of (Remaining time to start test 1 minute + Heater operating time) exceeds 15 minutes after F1 is pressed, the test stops automatically.
- DEF pump heater relay can be checked by "DEF pump temperature" indicated by the machine monitor if it rises 5 °Cor more by starting "DEF Pump Heater Relay Test" when DEF pump temperature is below 45 °C.

10. Measure the voltage between pin 2 and pin 12.

REMARK

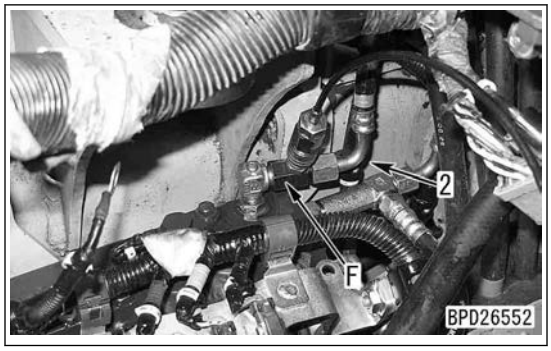
- If an abnormality occurs during measurement, failure codes [CA4115], [CA4156], and [CA4169] are displayed. If these failure codes are displayed, perform troubleshooting.
- If 24.5±1.5 V is measured within 900 seconds of "Remaining Permitted Test Time", you can finish the measurement by pressing F2.

For standard values, see Standard Value Table, "Standard Value Table for Machine".

5. Insert the adapter F and connect disconnected hose (2) again.
6. Install the nipple A2 of hydraulic tester A and connect it to gauge A1.

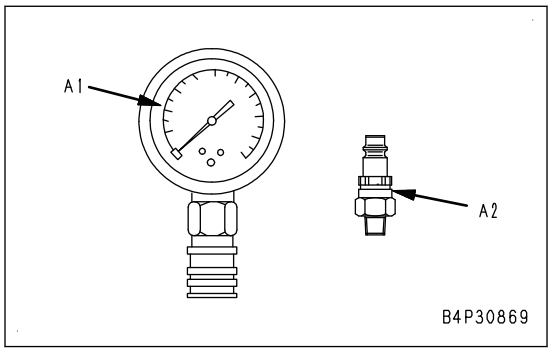
   REMARK

   Gauge in digital hydraulic tester B can also be used in place of gauge A1.
7. Start the engine.



8. Set the fuel control dial to MAX (High idle) position, set the work equipment lock lever to LOCK and FREE positions, and measure the oil pressure at each position.

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

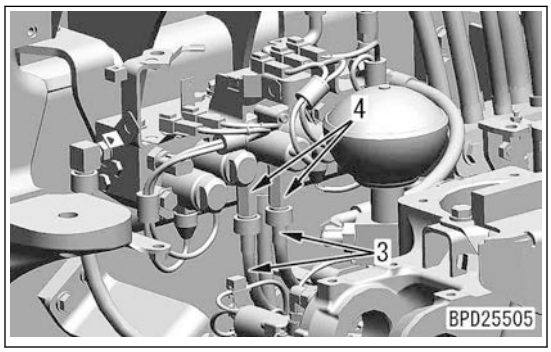


After finishing the test, remove the testing tools and restore the machine.

How to Examine Outlet Pressures of Right HST Motor EPC Valve and Left HST Motor EPC Valve

⚠ **Perform the work on a level ground where there is no obstacle, since the machine is to be stopped and driven actually for the measuring of the outlet pressures of R.H. HST motor EPC valve and L.H. HST motor EPC valves.**

1. Release the remaining pressure in the circuit. For details, see “Release Remained Pressure in Hydraulic Circuit”.
2. Set the work equipment lock lever to LOCK position, then turn the starting switch to OFF position.
3. Disconnect the hoses (3) at the bottom of the solenoid valve assembly, and remove the nipples (4).



4. Install the nipple C, and connect gauge A1.

   REMARK

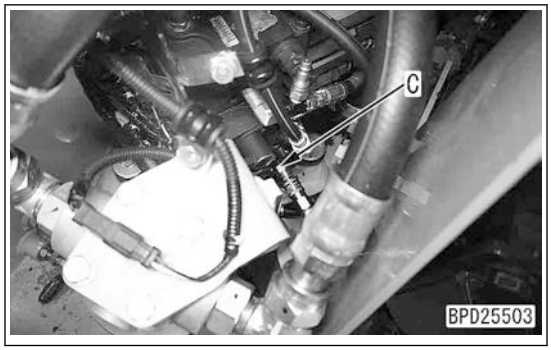
   Gauge in digital hydraulic tester B can also be used in place of gauge A1.

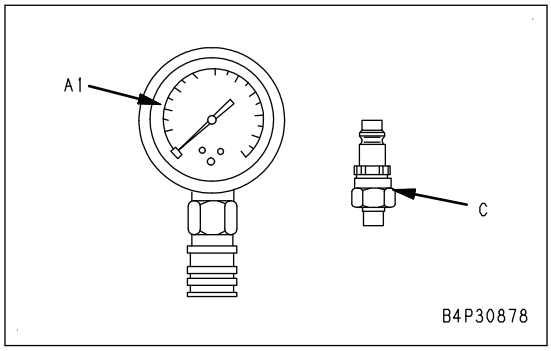
5. Start the engine.
6. Display “Fan Test Mode” screen of adjustment menu and select “Fan 100% mode”. For details, see “Set and Operate Machine Monitor”, “VARIOUS SETTINGS OF MACHINE”.
7. Set the work equipment lock lever to FREE position.
8. Set the fuel control dial to MAX (High idle) position, operate the control lever of the circuit to be tested, and test the oil pressure.

   REMARK

   Operate the control lever to the stroke end.

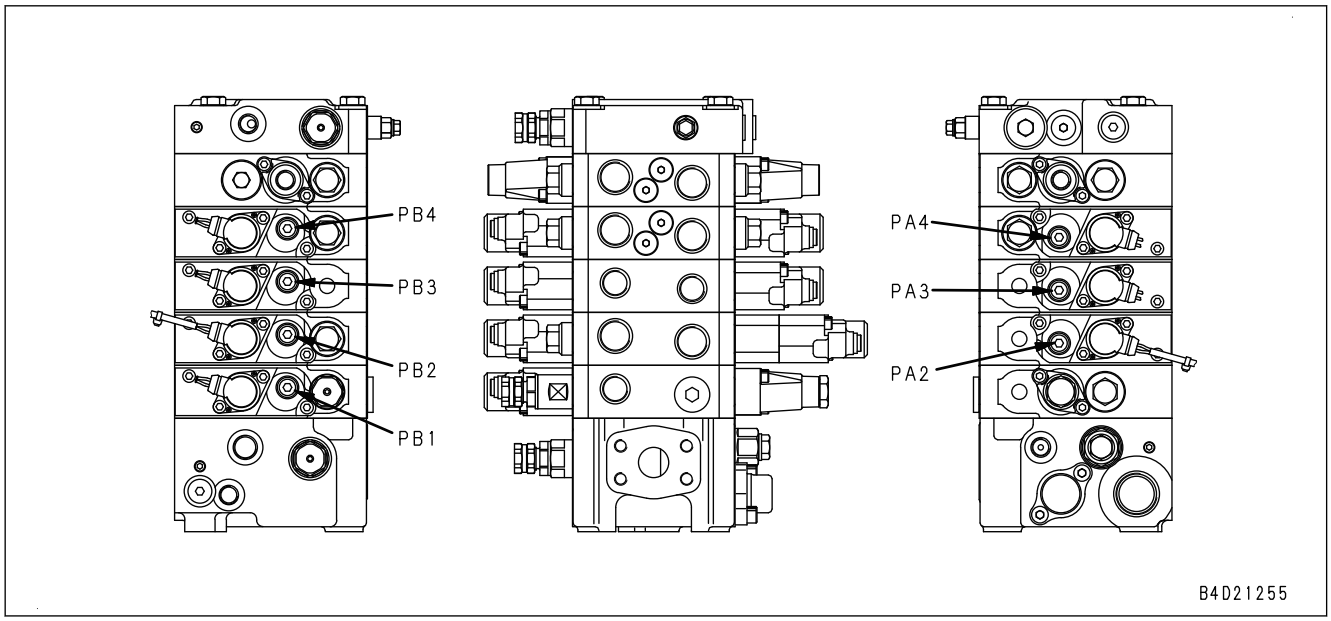
   For standard values, see Standard Value Table, “Standard Value Table for Machine”.





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

The figure shows the check point of each system.



PB4: Blade angle LEFT

PA4: Blade angle RIGHT

PB3: Blade tilt LEFT

PA3: Blade tilt RIGHT

PB2: Blade lift LOWER

PA2: Blade lift RAISE

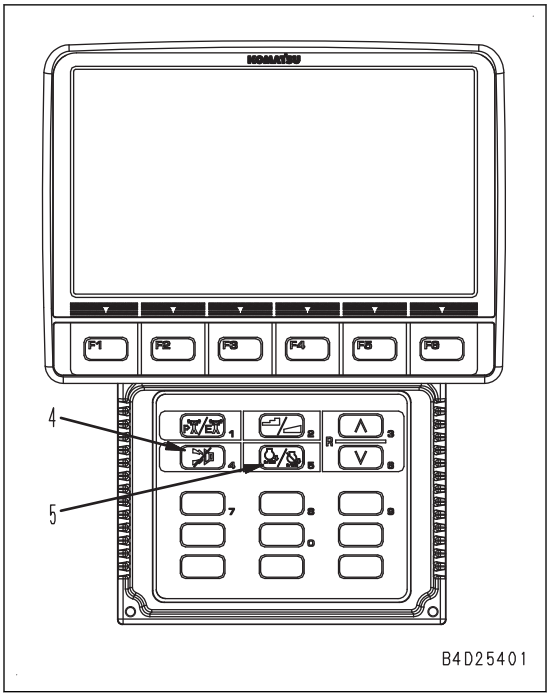
PB1: Fan motor

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

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

   REMARK

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



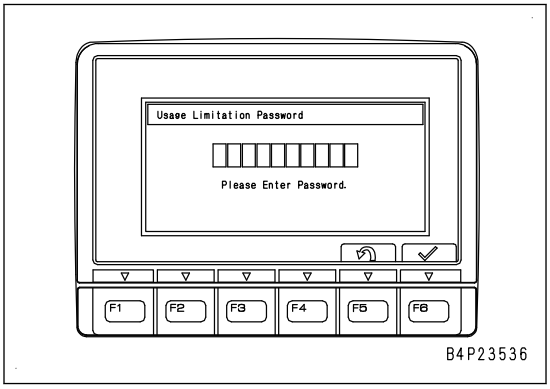
2. On “Usage Limitation Password” screen, input the current password with the numeral input switches and enter it with the function switch.

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

   F6: Enters inputted password

   REMARK

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



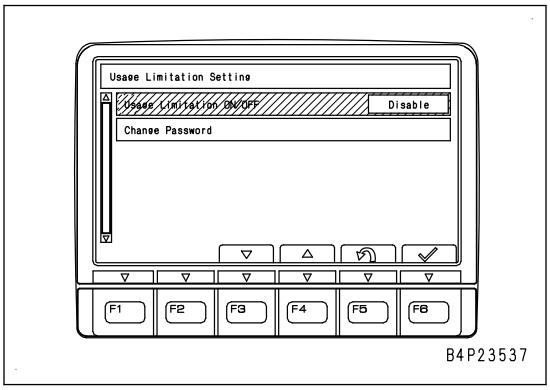
3. On “Usage Limitation Setting” screen, select a setting with the function switch.

   F3: Moves the selection down by one item

   F4: Moves the selection up by one item

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

   F6: Enters the selection



REMARK

- Displayed screen is an example of “Engine Oil Change Interval”.

6. Select “Set” of each maintenance item. When the screen of each maintenance item is displayed, perform the setting with the function switches.

   Default value: Maintenance notice time set on the machine monitor (Recommended by the manufacturer and not changeable).

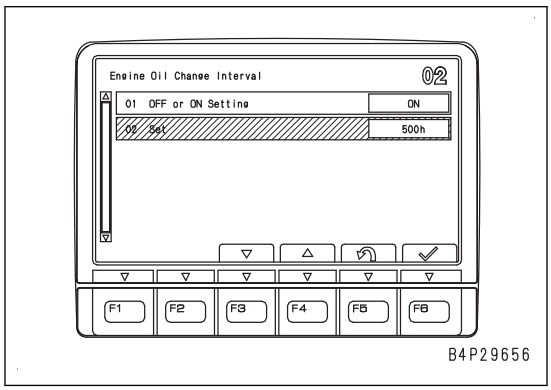
   Set: Maintenance notice time that is arbitrarily set. Maintenance reminder function works according to this set time in operator mode (the time can be increased or decreased in multiples of 25 h).

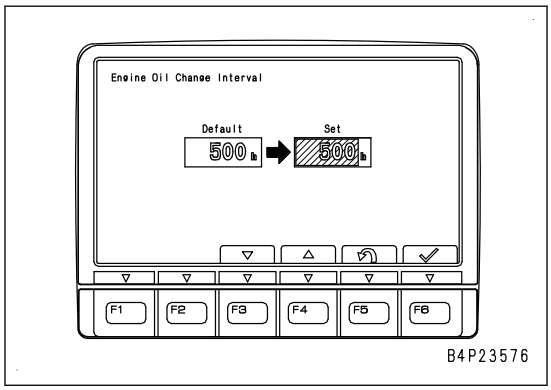
   F3: Decreases the set value

   F4: Increases the set value

   F5: Cancels the set value and returns the screen to “Maintenance Mode Change”.

   F6: Enters the set value and returns the screen to “Maintenance Mode Change”.





REMARK

- Press F6 and confirm the setting. When the setting is enabled, the screen returns to “Maintenance Mode Setting”.
- If the value of an item which is set to “ON” is changed after more than 1 h from the setup, the change is recognized as a reset operation.
- Maintenance notice time of “Air Cleaner Cleaning Interval or Change Interval” can be set individually. However, perform the cleaning or replacement of the air cleaner element when air cleaner clogging monitor lights up.

3. On “Adjustment” screen, perform “S/T Lever Left Detent Setting” with the function switches.

   F3: Not used

   F4: Not used

   F5: Returns to adjustment item selection screen

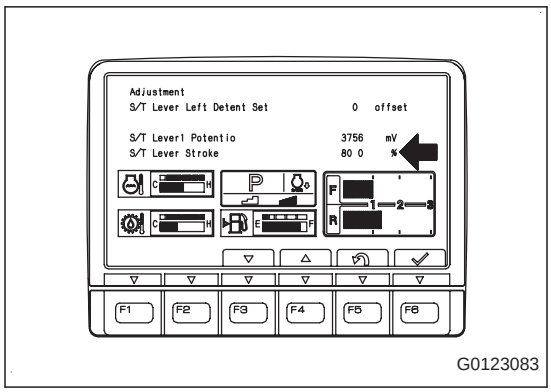
   F6: Saves the compensation value.

   1) Keep joystick (steering, directional and gear shift lever) at the L.H. operating effort detent position (Steering lever ratio: -80 %) (Pivot turn range).

   2) Press F6, and check that warning buzzer sounds.

   REMARK

   - This adjustment does not change the displayed values other than the compensation value.
   - In this adjustment, the saved adjustment values are effective even when the starting switch is turned to OFF position after the adjustment is completed.
   - “S/T Lever Left Detent Setting” does not adjust the steering performance.
   - Even if F3 or F4 is pressed, switches do not work.



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Adjustment Menu (S/T Lever Left Full Set)

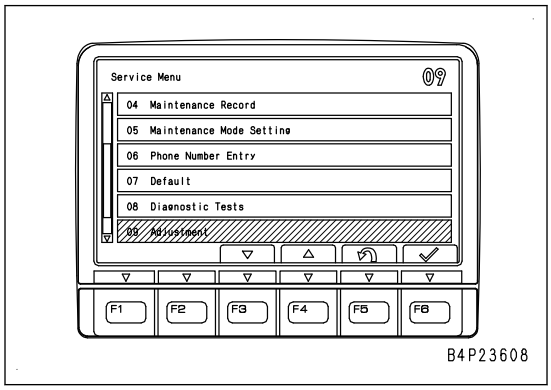
“S/T Lever Left Full Set” makes the HST controller recognize and save the voltage of the steering potentiometer of joystick (steering, directional and gear shift lever) at leftward maximum position (Steering lever ratio = -100 %).

When HST controller or joystick (steering, directional and gear shift lever) is replaced, always perform this adjustment.

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

   REMARK

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

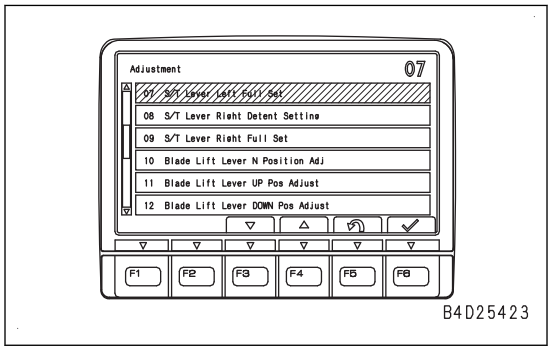


B4P23608

2. On “Adjustment” menu screen, select “S/T Lever Left Full Set” with function switches or numeral input switches.

   REMARK

   - For details of adjustment items, see “Adjustment Item Table”.
   - For selecting method, see “How to Operate Service Mode” in “SERVICE MODE”.



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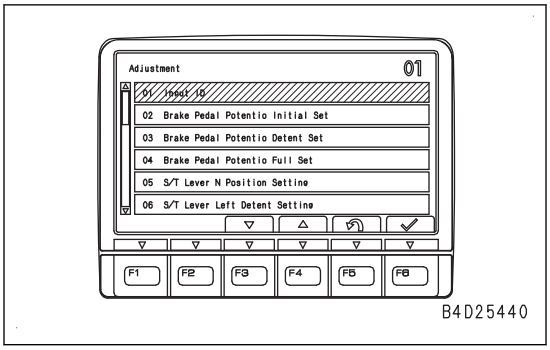
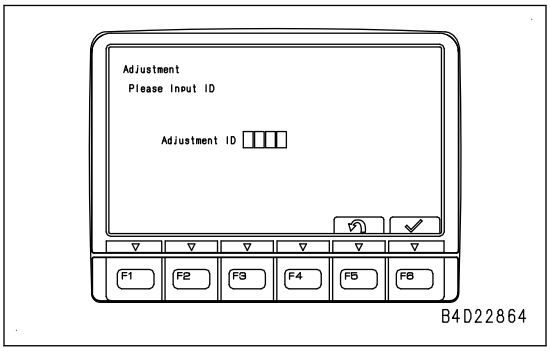
3. On “Adjustment”, select “Input ID” to be set.



REMARK

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

4. On “Input ID” screen, directly input Adjustment ID “3425” by using the numeral input switches.



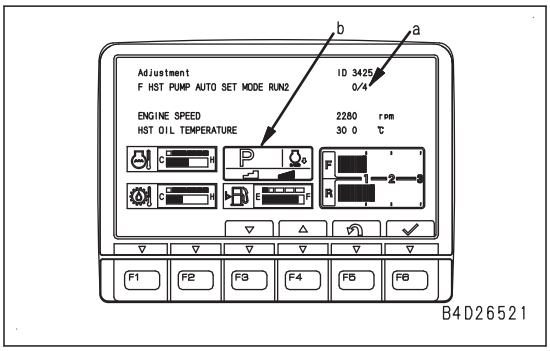
F5: Returns the screen to “Adjustment” screen

F6: Enters input Adjustment ID

REMARK

- For details of Adjustment ID and adjustment items, see “Adjustment Item Table”.
- When the input Adjustment ID is incorrect, “Adjustment not allowed” appears, and the screen next to “Input ID” does not appear (you can input Adjustment ID again when this screen is displayed).

5. On “HST Pump Forward Adjust Self-propelled 2” screen, set the fuel control dial to MAX position (High idle).



F3: Not used

F4: Not used

F5: Returns the screen to “Input ID” screen

F6: Not used

REMARK

Even if F3, F4, or F6 is pressed, switches do not work.

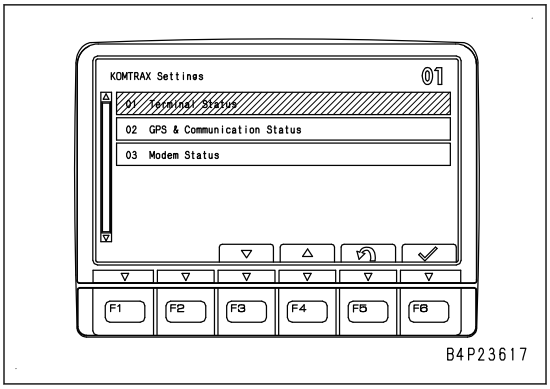
6. Check that the parking brake lever is in the LOCK position, and joystick (steering, directional and gear shift lever) is in NEUTRAL position.
7. Check that “P” is flashing in gear speed display (b).
8. Move the parking brake lever to the FREE position, set joystick (steering, directional and gear shift lever) to the FORWARD position, and start HST pump forward adjustment.

⚠ After the adjustment starts, the machine travels and stops repeatedly. Do not touch the machine until “4/4” is displayed (a).

REMARK

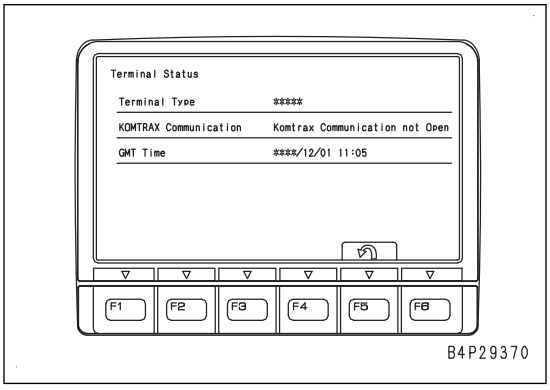
- The alarm buzzer keeps sounding during adjustment.
- After the adjustment starts, display (a) of adjustment changes from “1/4” to “4/4” automatically.
- When the machine stops and “4/4” is displayed (a), the adjustment is completed.
- If joystick (steering, directional and gear shift lever), decelerator/brake pedal, or fuel control dial is operated, the machine operates correctly as instructed, and interrupts the adjustment work.
- When the adjustment is interrupted, the travel speed at the time of interruption is maintained.
- When restarting the adjustment after an interruption, repeat the procedure from step 5.

2) On “KOMTRAX Settings” screen, select “Terminal Status” with the function switches or numeral input switches.



3) On “Terminal Status” screen, check the state of “KOMTRAX Communication Inspection”.

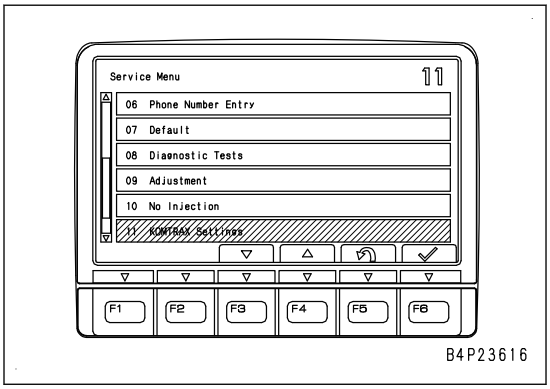
If “KOMTRAX Communication Not Open” is displayed on the state of “KOMTRAX Communication Inspection”, Perform step 2. If “Already Open” is displayed, KOMTRAX Communication Inspection is not needed.



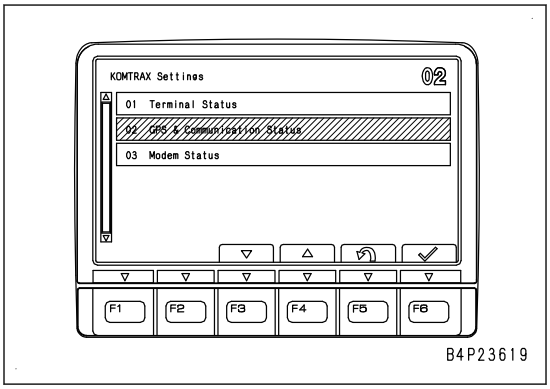
2. KOMTRAX Communication Inspection

Observe the following when performing KOMTRAX Communication Inspection.

1) On “Service Menu” screen, select “KOMTRAX Settings” with function switches or numeral input switches.



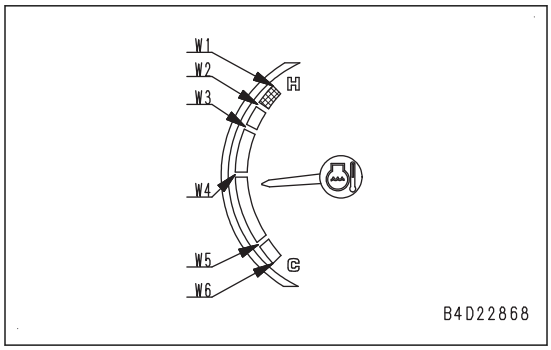
2) On “KOMTRAX Settings” screen, select “GPS & Communication State” with the function switches or numeral input switches.



Mechanical Sys Abnormality Record					Electrical Sys Abnormality Record			
B@BCNS	Times/First time	h/Latest	h		Times/First time	h/Latest	h	
B@CRNS	Times/First time	h/Latest	h		Times/First time	h/Latest	h	
B@CRZG	Times/First time	h/Latest	h		Times/First time	h/Latest	h	
CA234	Times/First time	h/Latest	h		Times/First time	h/Latest	h	

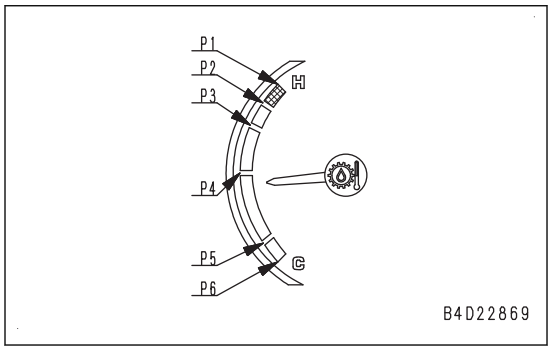
Maximum Range of the Engine Coolant Temperature Gauge

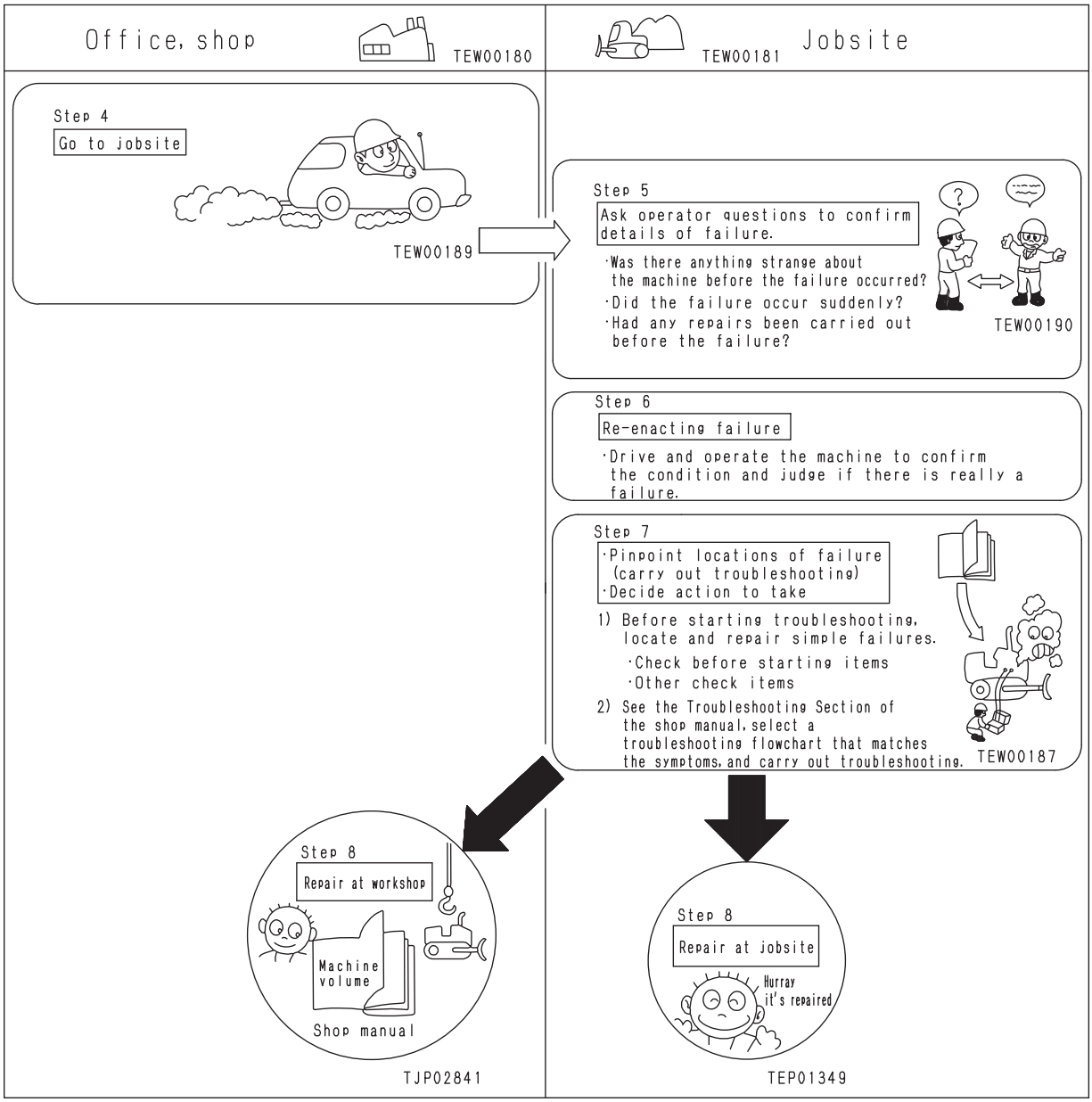
Coolant temperature gauge level	Coolant Temperature	Color of monitor light (a)
W1	105 °C	Red
W2	102 °C	
W3	100 °C	Green
W4	85 °C	
W5	60 °C	
W6	30 °C	White



Maximum Range of the HST Oil Temperature Gauge

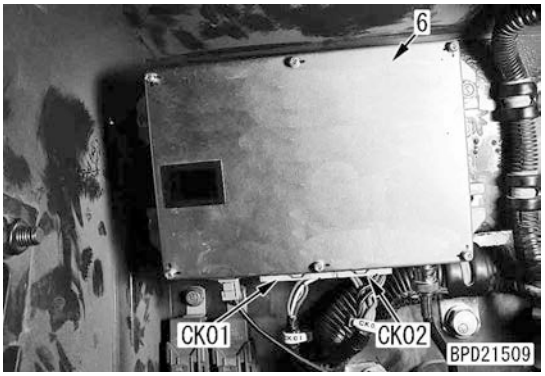
Oil temperature level	Hydraulic oil temperature	Color of monitor light (a)
P1	110 °C	Red
P2	100 °C	
P3	98 °C	Green
P4	70 °C	
P5	20 °C	
P6	0 °C	White




Office, shop
TEW00180
TEW00181
Jobsite
Step 4
Go to jobsite
TEW00189
Step 5
Ask operator questions to confirm details of failure.
·Was there anything strange about the machine before the failure occurred?
·Did the failure occur suddenly?
·Had any repairs been carried out before the failure?
TEW00190
Step 6
Re-enacting failure
·Drive and operate the machine to confirm the condition and judge if there is really a failure.
Step 7
·Pinpoint locations of failure (carry out troubleshooting)
·Decide action to take
1) Before starting troubleshooting, locate and repair simple failures.
·Check before starting items
·Other check items
2) See the Troubleshooting Section of the shop manual, select a troubleshooting flowchart that matches the symptoms, and carry out troubleshooting.
TEW00187
Step 8
Repair at workshop
Machine volume
Shop manual
TJP02841
Step 8
Repair at jobsite
Hurray it's repaired
TEP01349
B4W18488

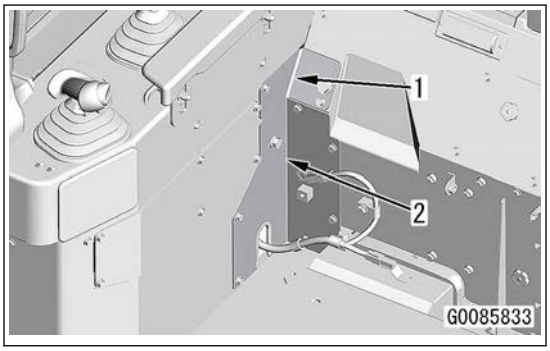
KOMTRAX Terminal

Insert or connect the T-adapter for troubleshooting to connectors CK01 and CK02 of KOMTRAX terminal (6).



Gateway Function Controller

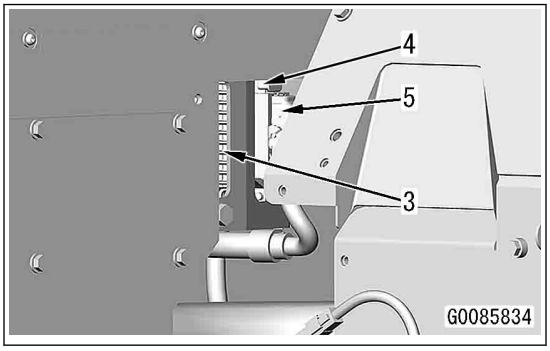
1. Remove the operator's seat.
2. Remove the covers (1) and (2).



3. Remove the cap (4) of the Gateway Function Controller (3).
4. Disconnect the connector CK05 (5) of the Gateway function controller (3), and insert or connect the T-adapter for troubleshooting.

   REMARK

   Because the adapter for the gateway function controller is not a T-adapter, the voltage cannot be measured by insertion of adapter into the connector.



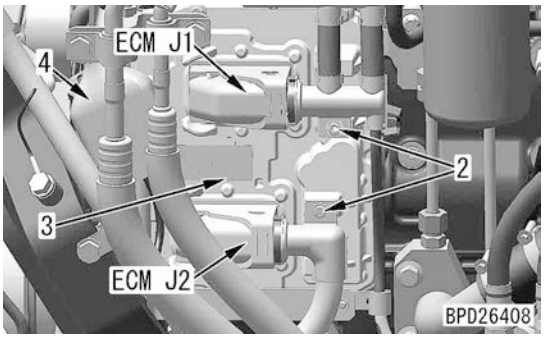
Engine Controller

1. Open the side cover on the left side of the machine.
2. Remove the 2 bolts (2) which fix the connectors (ECM J1) and (ECM J2).

   Use a hexagonal wrench with 5mm width across flats for the bolts (2).

   Bolt (2): 9±1Nm {0.9±0.1kgfm}

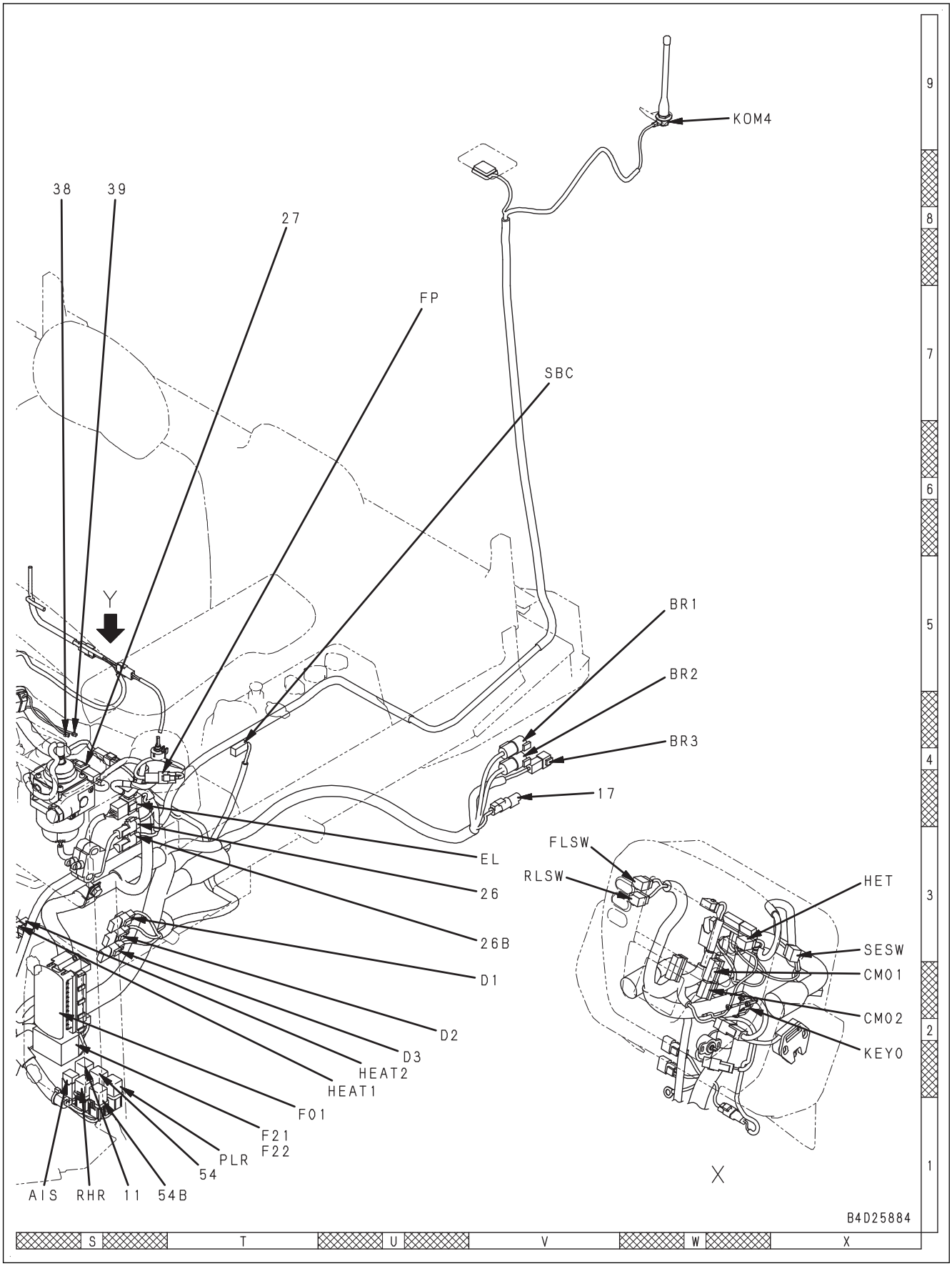
   For details of the engine intermediate connector (4), see “Engine Intermediate Connector”.

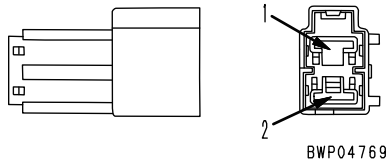
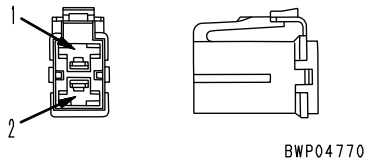


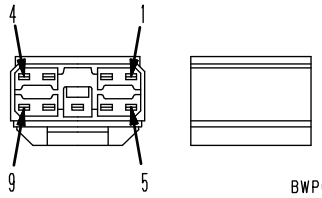
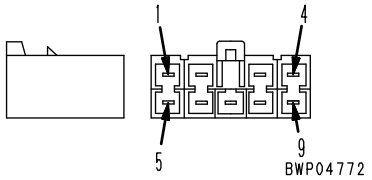
3. Disconnect the connectors (ECM J1) and (ECM J2) of the engine controller (3) as follows to connect or insert T-adapter for troubleshooting.
4. Disassembly procedure of engine controller connector

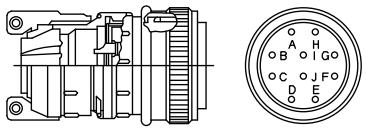
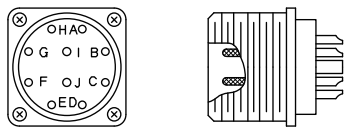
   The direction of the engine controller is different in accordance with the model.

4/6


KOM4
38
39
27
FP
SBC
Y
BR1
BR2
BR3
17
EL
26
26B
D1
D2
D3
HEAT2
HEAT1
F01
F21
F22
PLR
54
AIS
RHR
11
54B
FLSW
RLSW
HET
SESW
CM01
CM02
KEY0
X
B4D25884
9
8
7
6
5
4
3
2
1
S
T
U
V
W
X

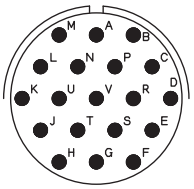
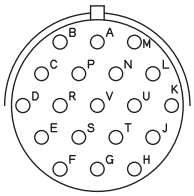
No. of pins	L type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
2	 BWP04769	 BWP04770	—
	—	—	

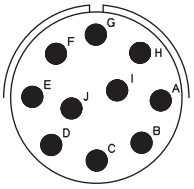
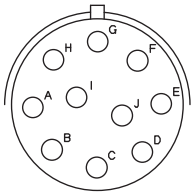
No. of pins	Connector for PA		
	Male (female housing)	Female (male housing)	
9	 BWP04771	 BWP04772	—
	—	—	

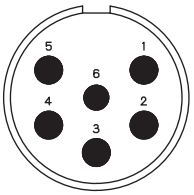
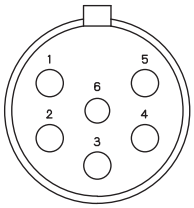
No. of pins	Bendix MS connector		
	Male (female housing)	Female (male housing)	
10	 BWP04773	 BWP04774	799-601-3460 (T-adapter)
	—	—	

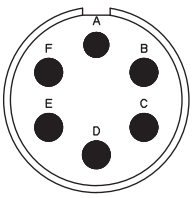
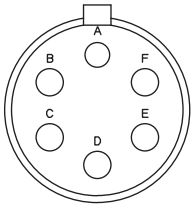
B4D18401

Connector for ICT (Amphenol)

No. of pins	PT series connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
19			799-902-9310 (T-adapter)
	—	—	

No. of pins	AC series connector		
	Male (female housing)	Female (male housing)	
10			799-902-9320 (T-adapter)
	—	—	

No. of pins	C091 series connector		
	Male (female housing)	Female (male housing)	
6			799-902-9330 (T-adapter)
	—	—	

No. of pins	GT series connector		
	Male (female housing)	Female (male housing)	
6			—
	—	—	

B4P35254

Failure code	Failure (Displayed on screen)	Applicable component	Action level	History category	Remarks
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	
CA3421	MAF Sensor Supply Voltage Low Error	ENG	L03	Electrical system	
CA3497	DEF Level Low Error 1	ENG	-	Electrical system	
CA3498	DEF Level Low Error 2	ENG	-	Electrical system	
CA3543	DEF Quality Error (SCR Catalyst Efficiency Low)	ENG	L01	Electrical system	
CA3545	SCR Outlet NOx Sensor Unstable Error	ENG	L01	Electrical system	
CA3547	DEF Level Low Error 4	ENG	L04	Electrical system	
CA3558	DEF Pump Voltage High Error	ENG	L01	Electrical system	
CA3559	DEF Pump Voltage Low Error	ENG	L01	Electrical system	
CA3562	DEF LineHeater Relay 1 Voltage High Error	ENG	L01	Electrical system	
CA3563	DEF LineHeater Relay 1 Voltage Low Error	ENG	L01	Electrical system	
CA3567	DEF Injector Open Circuit Error or Short Circuit Error	ENG	L01	Electrical system	
CA3568	DEF Injector Malfunction	ENG	L01	Electrical system	
CA3571	DEF Pump Pressure Sensor High Error	ENG	L01	Electrical system	

Failure code	Failure (Displayed on screen)	Applicable component	Action level	History category	Remarks
DXHTKY	Blade Tilt Left Head EPC Solenoid Hot Short Circuit	HST	L03	Electrical system	
DXHUKA	Blade Tilt Right Bottom EPC Solenoid Open Circuit	HST	L01	Electrical system	
DXHUKB	Blade Tilt Right Bottom EPC Solenoid Short Circuit	HST	L01	Electrical system	
DXHUKY	Blade Tilt Right Bottom EPC Solenoid Hot Short Circuit	HST	L03	Electrical system	
DXJ4KA	W/E Lock Solenoid Open Circuit	HST	L03	Electrical system	
DXJ4KB	W/E Lock Solenoid Short Circuit	HST	L03	Electrical system	
DXJCKA	Blade Angle Left EPC Solenoid Open Circuit	HST	L01	Electrical system	
DXJCKB	Blade Angle Left EPC Solenoid Short Circuit	HST	L01	Electrical system	
DXJCKY	Blade Angle Left EPC Solenoid Hot Short Circuit	HST	L03	Electrical system	
DXJDKA	Blade Angle Right EPC Solenoid Open Circuit	HST	L01	Electrical system	
DXJDKB	Blade Angle Right EPC Solenoid Short Circuit	HST	L01	Electrical system	
DXJDKY	Blade Angle Right EPC Solenoid Hot Short Circuit	HST	L03	Electrical system	
DXK1KA	Left HST Motor EPC Open Circuit	HST	L03	Electrical system	
DXK1KB	Left HST Motor EPC Short Circuit	HST	L03	Electrical system	
DXK1KY	Left HST Motor EPC Hot Short Circuit	HST	L04	Electrical system	
DXK2KA	Right HST Motor EPC Open Circuit	HST	L03	Electrical system	
DXK2KB	Right HST Motor EPC Short Circuit	HST	L03	Electrical system	
DXK2KY	Right HST Motor EPC Hot Short Circuit	HST	L04	Electrical system	
F313KA	Gateway Controller Communication Terminal Output Signal Open Circuit	GW	-	-	
F313KB	Gateway Controller Communication Terminal Output Signal Short Circuit	GW	-	-	
F318KB	Gateway Controller Communication Terminal Signal Ground Fault	GW	-	-	
F318KY	Gateway Controller Communication Terminal Output Signal Hot Short Circuit	GW	-	-	

- In this table, failure codes are arranged in alphabetical order.
- Applicable component is the controller which checks the system.

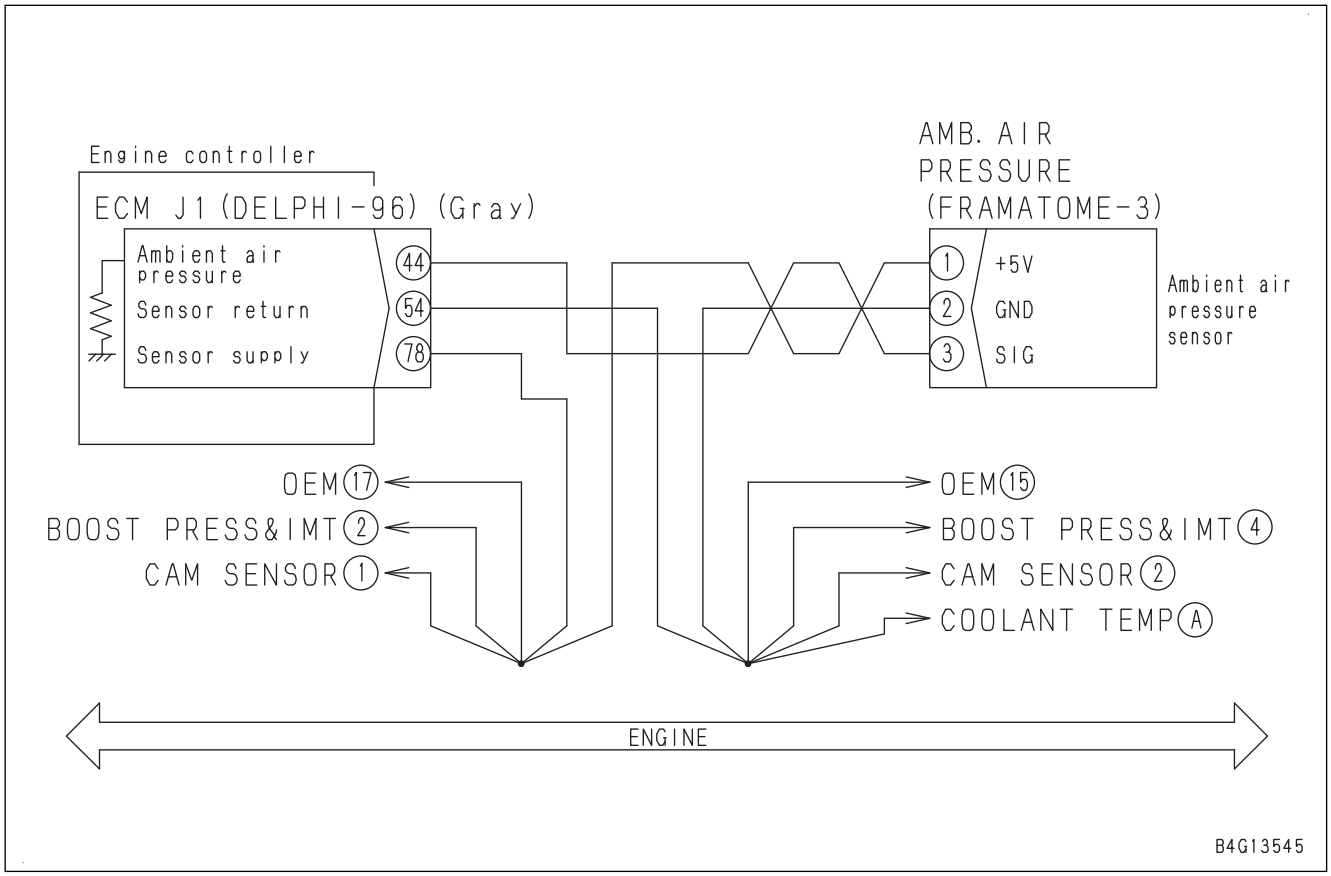
Failure Code [AS10KM]

Action level	Failure code	Failure	DEF Injector Overheat Warning (Machine monitor system)
L01	AS10KM		
Detail of failure	Engine stops over 150 times under the condition of engine and aftertreatment devices with high temperature		
Action of controller	Displays the caution symbol of Engine Stop at DEF system Overheat on the machine monitor.		
Phenomenon on machine	Defective injection of DEF may occur when engine starts operation again		
Related information	• On the Pre-defined Monitoring screen, troubleshooting for the engine aftertreatment related items is used (the figures below denote monitoring codes). 47000 KDPF Outlet Pressure 47100 KDPF Differential Pressure 47200 KDPF 1 Outlet Temperature 47300 KDOC 1 Inlet Temperature 47400 KDOC 1 Outlet Temperature		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective operation	Instruct an operator about performing running at low idle approximately 5 minutes before stopping the engine.
		After instruction to the operator, see TESTING AND ADJUSTING, and perform “METHOD FOR OPERATING TESTING MENU (ENGINE STOP DEF INJECTOR OVERHEAT COUNTER RESET)”.

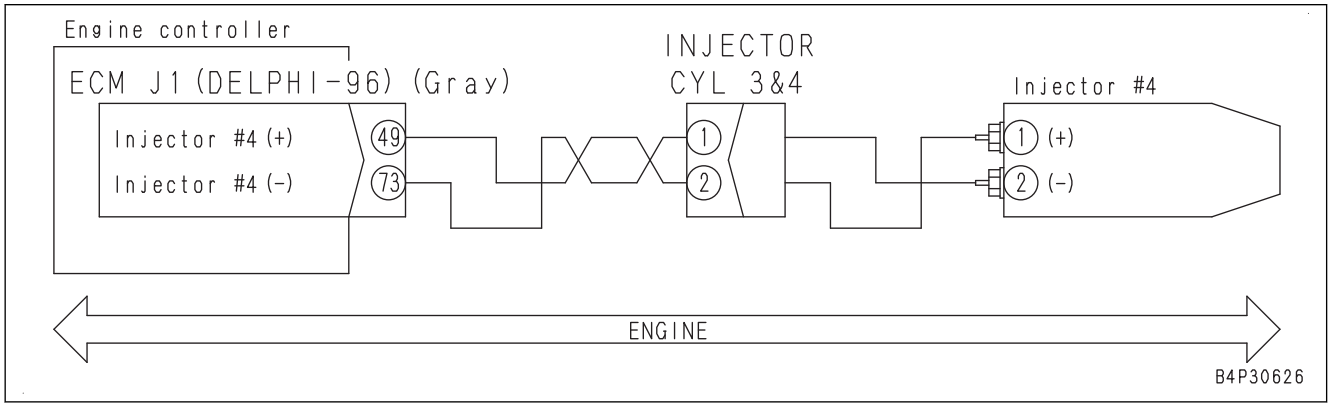
No.	Cause	Procedure, measuring location, criteria and remarks		
5	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and AMB.AIR PRESSURE, and connect T-adapter to either female side.		
		Resistance	Between ECM J1 (female) (78) and (44), or between AMB.AIR PRESSURE (female) (1) and (3)	Min. 100 kΩ
6	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector AMB.AIR PRESSURE, and connect T-adapter to female side. 3. Turn starting switch to ON position.		
		Voltage	Between (2) and AMB.AIR PRESSURE (female) (3)	Max. 1 V
7	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit Diagram of Ambient Pressure Sensor



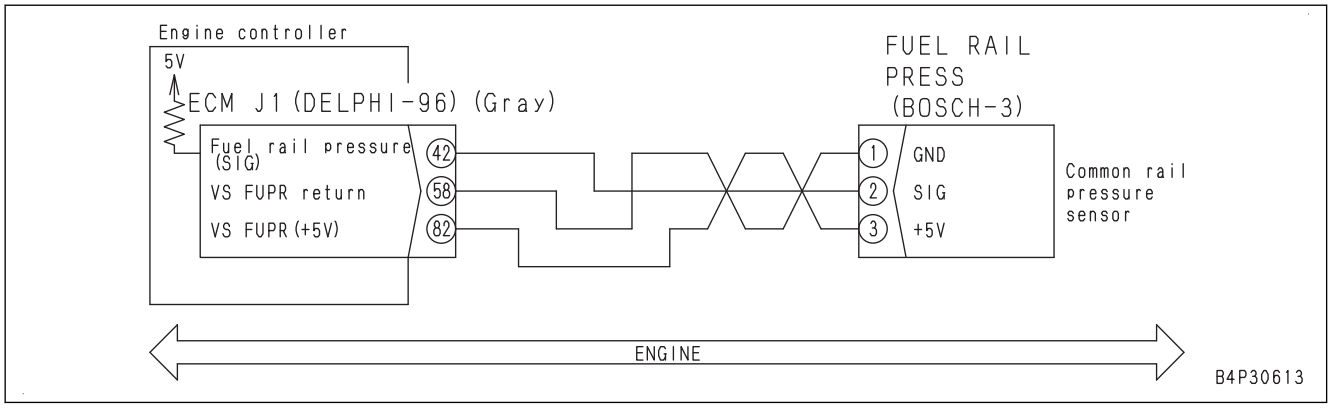
No.	Cause	Procedure, measuring location, criteria and remarks		
5	Ground fault in wiring harness (contact with ground circuit)	If failure code is still displayed after above checks on cause 3, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and INJECTOR CYL 3 & 4, and connect T-adapter to either female side.		
		Resistance	Between ground and ECM J1 (female) (49) or INJECTOR CYL 3 & 4 (female) (1)	Min. 100 kΩ
			Between ground and ECM J1 (female) (73) or INJECTOR CYL 3 & 4 (female) (2)	Min. 100 kΩ
6	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and INJECTOR CYL 3 & 4, and connect T-adapter to female side of ECM J1.		
		Continuity	Between ECM J1 (female) (49) and each pin other than pin (49)	No continuity (no sound is heard)
			Between ECM J1 (female) (73) and each pin other than pin (73)	No continuity (no sound is heard)
7	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Insert T-adapter to connector ECM J1. 3. Turn starting switch to ON position.		
		Voltage	Between ECM J1 (49) and ground	Max. 6 V
		If measured voltage is abnormal, disconnect connector INJECTOR CYL 3 & 4 and measure the voltage at the same point again. If the abnormality persists, a positive (+) line is defective. If the voltage is restored back to a normal range, a negative (-) line is defective.		
8	Defective another cylinder's injector or wiring harness	When failure code for abnormality in multiple injectors is displayed, perform troubleshooting these first.		
9	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit Diagram of Injector #4



No.	Cause	Procedure, measuring location, criteria and remarks		
5	Defective engine controller	1. Turn starting switch to OFF position. 2. Disconnect connector ECM J1, and connect T-adapter to male side. 3. Turn starting switch to ON position.		
		Voltage	Between ECM J1 (male) (82) and (58)	4.7 to 5.25 V
		If failure code is still displayed after above checks, engine controller is defective. Replace engine controller. (Troubleshooting will be impossible, because this is an internal defect.)		

Circuit Diagram of Common Rail Pressure Sensor



Failure Code [CA1117]

Action level	Failure code	Failure	Engine Controller Partial Data Lost Error (Engine controller system)
L04	CA1117		
Details of failure	Internal defect is detected in controller.		
Action of controller	None in particular		
Phenomenon on machine	• Engine runs normally. However, engine may be stopped during operation or stopped engine may not be started. • Engine controller cannot memorize internal data correctly.		
Related information	• After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position. • Engine controller internal data (related to KDPF, DEF Level, etc.) may be lost. Appropriate remedy must be performed after resetting error. • This error code is displayed when power supply is disconnected by battery disconnect switch, etc. before engine controller is normally exited. **NOTICE** **Remedy after resetting error** **See “TESTING AND ADJUSTING”, “SERVICE MODE” and “METHOD FOR SETTING TESTING (ACTIVE REGENERATION FOR SERVICE)” in “SETTING AND OPERATION OF MACHINE MONITOR” to perform “Active Regeneration for Service”.**		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective power supply circuit system	Since the power supply circuit may be defective, perform troubleshooting for failure code [CA441].
2	Improper operation of battery disconnect switch	Battery disconnect switch may be operated improperly.
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.)

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

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

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

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

4. After the repair is completed, see “Procedure for Troubleshooting” to clear the failure code and make sure that the failure code has been cleared from the Abnormality Record screen.

No.	Cause	Procedure, measuring location, criteria and remarks
2	Defective sensor power supply system	If failure code [CA1776] or [CA1777] is displayed, perform troubleshooting for [CA1776] or [CA1777] first.
3	Defective SCR outlet NOx sensor	If no failure is found by preceding checks, the SCR outlet NOx sensor is defective. 1. Turn starting switch to OFF position. 2. Replace the SCR outlet NOx 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.)
4	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Loaded Diagnostics Operation to Confirm Failure Correction

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

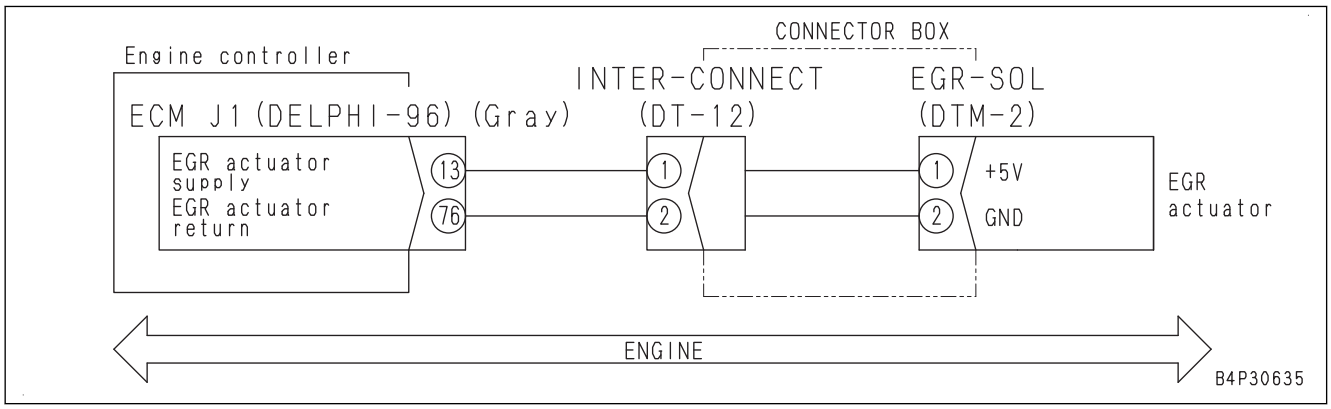
Clear this failure code by “ Engine Controller Inducement Fault Clear ” before step 1.

1. Turn the starting switch to OFF position, and shut down the engine controller.
2. Turn the starting switch to ON position, and start the engine.
3. Run the engine at high idle speed safely to raise the exhaust temperature. (Keep the engine speed so that monitoring code 19302 “ SCR Outlet Temperature ” becomes 150 °C or higher °C. Check that monitoring code 19210 “ SCR Outlet NOx Sensor State ” changes from 0 to 1.)
4. Repair is completed if failure code is cleared after 3 minutes has passed.

REMARK

If the SCR outlet NOx sensor does not activate (that is, 19210 “ SCR Outlet NOx Sensor State ” remains as 0), return to troubleshooting.

CIRCUIT DIAGRAM (EGR VALVE SOLENOID)



Failure Code [CA2639]

<table>
<tr><td>Action level</td><td>Failure code</td><td rowspan="2">Failure</td><td rowspan="2">Manual Stationary Regeneration Request (Engine controller system)</td></tr>
<tr><td>L01</td><td>CA2639</td></tr>
<tr><td>Details of failure</td><td colspan="3">The “Manual Stationary Regeneration Request”prompts operator to forcibly perform “Manual Stationary Regeneration”, which is more effective to remove soot, because soot accumulation in the KCSF of KDPF has exceeded the level for automatic regeneration.
Soot accumulation reaches level 4 or 5.</td></tr>
<tr><td>Action of controller</td><td colspan="3">Normal control</td></tr>
<tr><td>Phenomenon on machine</td><td colspan="3">None in particular</td></tr>
<tr><td>Related information</td><td colspan="3">NOTICE
• If this failure code [CA2639] is displayed, perform manual stationary regeneration.
• This failure code is displayed during Manual Stationary Regeneration, but it is normal.
• If this failure code is still displayed after several hours have passed since the manual stationary regeneration, perform the following troubleshooting procedures.
⚠ Since KDOC and KDPF are heated to 500 °C or above, be careful not to get burned.
• If KDOC inlet temperature is below approximately 280 °C, fuel dosing is disabled, so actually regeneration does not start when engine controller started manual stationary regeneration.
• Temperature detected by KDOC inlet temperature sensor can be checked with monitoring function. (Code: 47300 (°C))
• VGT solenoid current can be checked with monitoring function. (Code: 48800 (mA))
• Temperature detected by KDOC outlet temperature sensor can be checked with monitoring function. (Code: 47400 (°C))
• Temperature detected by KDPF outlet temperature sensor can be checked with monitoring function. (Code: 47200 (°C))
• KDOC inlet temperature, KDOC outlet temperature, and KDPF outlet temperature when at low idle speed (KDPF regeneration is not executed) are approximately 100 to 250 °C, and difference between these temperatures is approximately 10 °C. (KDOC inlet temperature > KDOC outlet temperature > KDPF outlet temperature)
• When manual stationary regeneration is in progress, KDOC inlet temperature is approximately 250 to 400 °C, and KDOC outlet temperature and KDPF outlet temperature are approximately 450 to 550 °C.
• 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.
• For check of the exhaust gas color, see “30 Testing and Adjusting”, “TEST EXHAUST GAS COLOR”.</td></tr>
</table>

Failure Code [CA3148]

<table>
<tr><td>Action level</td><td>Failure code</td><td rowspan="2">Failure</td><td rowspan="2">SCR Outlet Temperature Sensor In Range Error
(Engine controller system)</td></tr>
<tr><td>L01</td><td>CA3148</td></tr>
<tr><td>Detail of failure</td><td colspan="3">Temperature difference between SCR temperature sensor and SCR outlet temperature sensor is not the same as the expected value.</td></tr>
<tr><td>Action of controller</td><td colspan="3">• Advances to Inducement strategy.
• DEF injection 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.
• For the inducement failure codes, refer “List of failure codes related to Inducement” of “Troubleshooting Points for Urea SCR System”.
• 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 outlet 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 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)
• 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>

Confirmation will be completed if the DEF tank temperature becomes 5 °C or more within an hour after starting the DEF tank heater relay test.

4. After the repair is completed, see “Procedure for Troubleshooting” to clear the failure code and make sure that the failure code has been cleared from the Abnormality Record screen.

REMARK

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

⚠ Depress the decelerator/brake pedal to stroke end securely to prevent the machine from moving, and hold it.

3) Operate the shift switch and shift up the speed range to the 3rd gear speed, tilt joystick (steering, directional and gear shift lever) (PCCS lever) to the stroke end to the turning direction either right or left.

REMARK

Engine speed increases up to approximately 2280 rpm by this operation.

4) Move blade control lever to RAISE while keeping the high engine speed, and raise the blade to maximum height, and relieve continuously for 1 minute.

NOTICE

Pay attention not to overheat of HST oil. Immediately after the relieve, return the joystick (steering, directional and gear shift lever) (PPC lever) to NEUTRAL position before overheating.

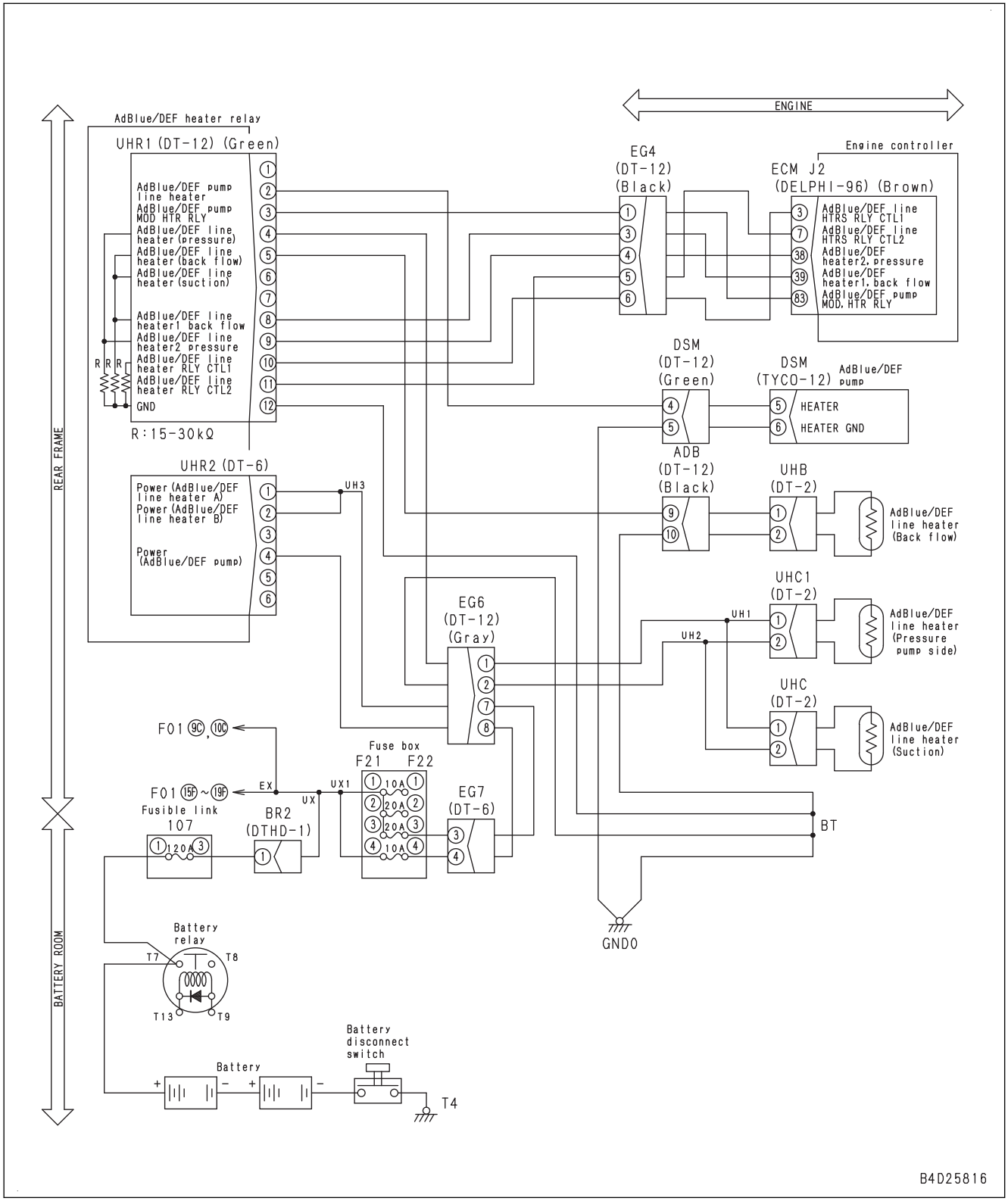
5) When finishing, return the joystick (steering, directional and gear shift lever) (PCCS lever) to NEUTRAL position, and move the parking brake lever to LOCK position, and then release the decelerator/brake pedal.

7. Make sure this failure code is not displayed after steps 5 and 6 are repeated for 3 times.

REMARK

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

Circuit Diagram of DEF Line Heater



No.	Cause	Procedure, measuring location, criteria and remarks		
2	Defective turbocharger outlet NOx sensor system (Open circuit, internal defect, defective sensor heater)	If failure code [CA1885], [CA3232], [CA3649], [CA3682], [CA3718], [CA3725], or [CA3748] is displayed, perform troubleshooting for these failure codes failure codes first.		
3	Defective SCR outlet NOx sensor system (Open circuit, internal defect, defective sensor heater)	If failure code [CA1887], [CA2771], [CA3545], [CA3583], [CA3681], or [CA3717] is displayed, perform troubleshooting for these failure codes first.		
4	Defective SCR temperature sensor system (Open circuit, Internal defect)	If failure code [CA3142] or [CA3143] or [CA3144] or [CA3146] or [CA3147] or [CA3148] or [CA3165] or [CA3229] or [CA3231] or [CA3235] or [CA4152] or [CA4159] or [CA4164] or [CA4165] or [CA4166] is displayed, perform troubleshooting for these failure codes first.		
5	Defective ammonia sensor system (Open circuit, internal defect, defective sensor heater)	If failure code [CA3899], [CA3911], [CA3912], [CA3932], [CA3933], [CA3934], [CA3935], [CA3936] or [CA4281] is displayed, perform troubleshooting for these failure codes first.		
6	Clogged DEF injector	1. If failure code [CA4658] or [CA3568] is displayed, or failure code [CA4658] or [CA3568] is displayed on the service meter display of the abnormality record within 2 hours, perform “Loaded Diagnostics Operation To Confirm Failure Correction”, check if failure code [CA3151], [CA3543], or [CA3582] is displayed. 2. If 19205 “Ammonia concentration (compensation value)” indicates a normal value (5 to 100 ppm) and the failure code is cleared, the repair is completed (Loaded Diagnostics Operation To Confirm Failure Correction has resolved the clogging problem and the machine has restored normal operation). 3. If the ammonia concentration indicates an abnormal value or either failure code [CA3151], [CA3543], or [CA3582] is displayed, proceed to the next step.		
7	Defective mixing tube (exhaust gas leakage)	1. Visually check the piping from the KDPF outlet to the SCR outlet for damage or defective connection. 2. Visually check for white crystallized DEF deposits on the surrounding area. 3. If defective connections or damages are found, fix or replace parts.		
8	Open circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors ECM J2,UHR1, and UHB and connect the T-adapter to each female side.		
		Resistance	Between ECM J2 (female) (39) and UHR1 (female) (8)	Max. 10 Ω
			Between UHR1 (female) (12) and ground	Max. 10 Ω
			Between UHB (female) (1) and UHR1 (female) (5)	Max. 10 Ω
			Between UHB (female) (2) and ground	Max. 10 Ω

Failure Code [CA3725]

Action level	Failure code	Failure	Turbocharger Outlet NOx Sensor Unstable Error (Engine controller system)
L01	CA3725		
Detail of failure	The turbocharger NOx sensor does not become measurable status.		
Action of controller	• Operate using the NOx value in the memory. • Advances to Inducement strategy.		
Phenomenon on machine	• The DEF injection becomes inappropriate, NOx emission increases. • Engine power deration according to inducement strategy.		

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

Loaded Diagnostics Operation to Confirm Failure Correction

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

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

Clear this failure code by “ Engine Controller Inducement Fault Clear ” before step 1.

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

REMARK

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

Failure Code [CA4158]

Action level	Failure code	Failure	KDOC and KDPF Temperature Sensor Internal Circuit Error (Engine controller system)
L03	CA4158		
Detail of failure	An abnormality was detected in any of the sensor circuits: KDOC inlet temperature sensor, KDOC outlet temperature sensor, and KDPF outlet temperature sensor.		
Action of controller	• Operate with the KDOC inlet temperature, KDOC outlet temperature, and KDPF outlet temperature set to the default value (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. • Any of the KDOC inlet temperature, KDOC outlet temperature, and KDPF outlet temperature cannot be detected. • Engine power deration according to inducement strategy.		
Related information	⚠ **Be careful not to get burned as the temperature of KDPF and KDOC rises up over 500 °C.** • For the inducement failure codes, refer “List of failure codes related to Inducement” of “Troubleshooting Points for Urea SCR System”. • The KDPF temperature sensor is composed of the KDOC inlet temperature sensor, the KDOC outlet temperature sensor, and the KDPF outlet temperature sensor and provides CAN communication with the engine controller integrated into one sensor controller. • For the replacement procedure of the KDPF temperature sensor, see “50 Disassembly 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).		

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 KDPF temperature sensor	1. Turn starting switch to OFF position. 2. Replace KDPF temperature sensor. 3. Turn starting switch to ON position.
		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.)

Failure Code [CA4259]

Action level	Failure code	Failure	KDOC and KDPF Temperature Sensor Power Interrupt Error (Engine controller system)
L03	CA4259		
Detail of failure	KDPF temperature sensor interrupt power failure error (12 open circuits are detected in the power supply line in 60 seconds.)		
Action of controller	Normal control • 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	• KDOC inlet temperature, KDOC outlet temperature, and KDPF outlet temperature detection error. • Defective regeneration control. • NOx emission increases because DEF injection is disabled. • KDPF accumulated soot level is high. • Engine output is reduced based on inducement strategy.		
Related information	• For the inducement failure codes, refer “List of failure codes related to Inducement” of “Troubleshooting Points for Urea SCR System”. • Mostly, momentary power failure is caused by defective contact and visually check a torn harness coating and check for defective contact at the connector. • To detect an incomplete wire breakage, sway the wiring harness as much as possible at the resistance measurement to check if the resistance can change or not. • 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. • Note that sensor power supply relay connector is energized even if starting switch is turned to OFF position. • For replacement of the KDPF temperature sensor, see Disassembly and assembly, “Disassembly and assembly of KDPF assembly”. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Start engine and travel (vibrate the machine). • 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 sensor power supply relay system	Perform troubleshooting for failure code [CA1776].

Failure Code [CA4769]

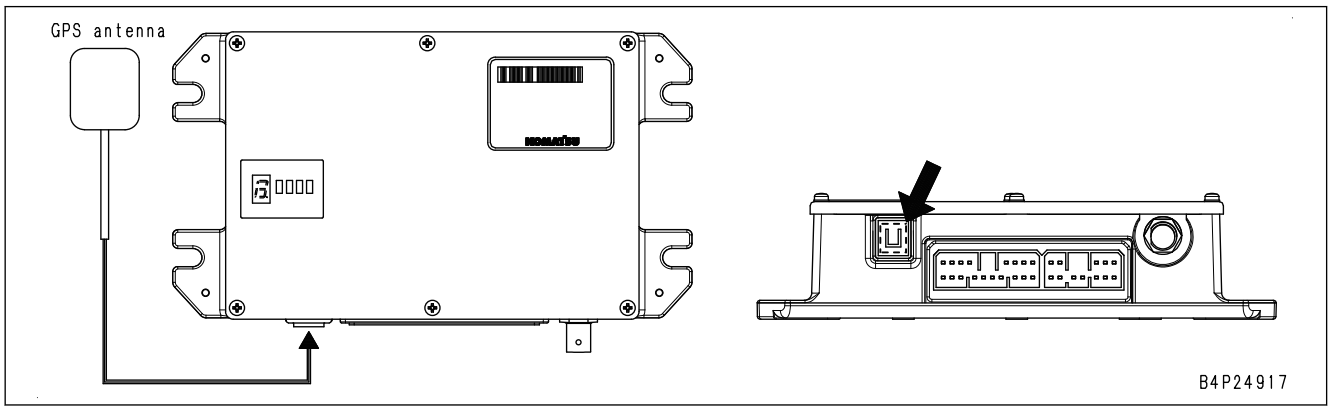
Action level	Failure code	Failure	DEF Level Measurement Impossible (Engine controller system)
L01	CA4769		
Detail of failure	DEF level sensor stays in disabling to measure DEF level.		
Action of controller	Advances to Inducement strategy.		
Phenomenon on machine	• DEF level cannot be measured. • DEF level on the monitor changes. • Engine output is reduced based on inducement strategy.		
Related information	• For the inducement failure codes, refer “List of failure codes related to Inducement” of “Troubleshooting Points for Urea SCR System”. • Displayed when DEF tank is completely empty. • Contaminated sensing part or a failure in the sensor can be suspected as a cause other than empty DEF tank. • This failure code cannot be cleared if DEF tank temperature is 0 °C or lower. • On the Pre-defined Monitoring screen troubleshooting for DEF level and quality sensors is used. • Troubleshooting for DEF level and 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 .**		

Failure Code [D862KA] (Machine with KOMTRAX Terminal)

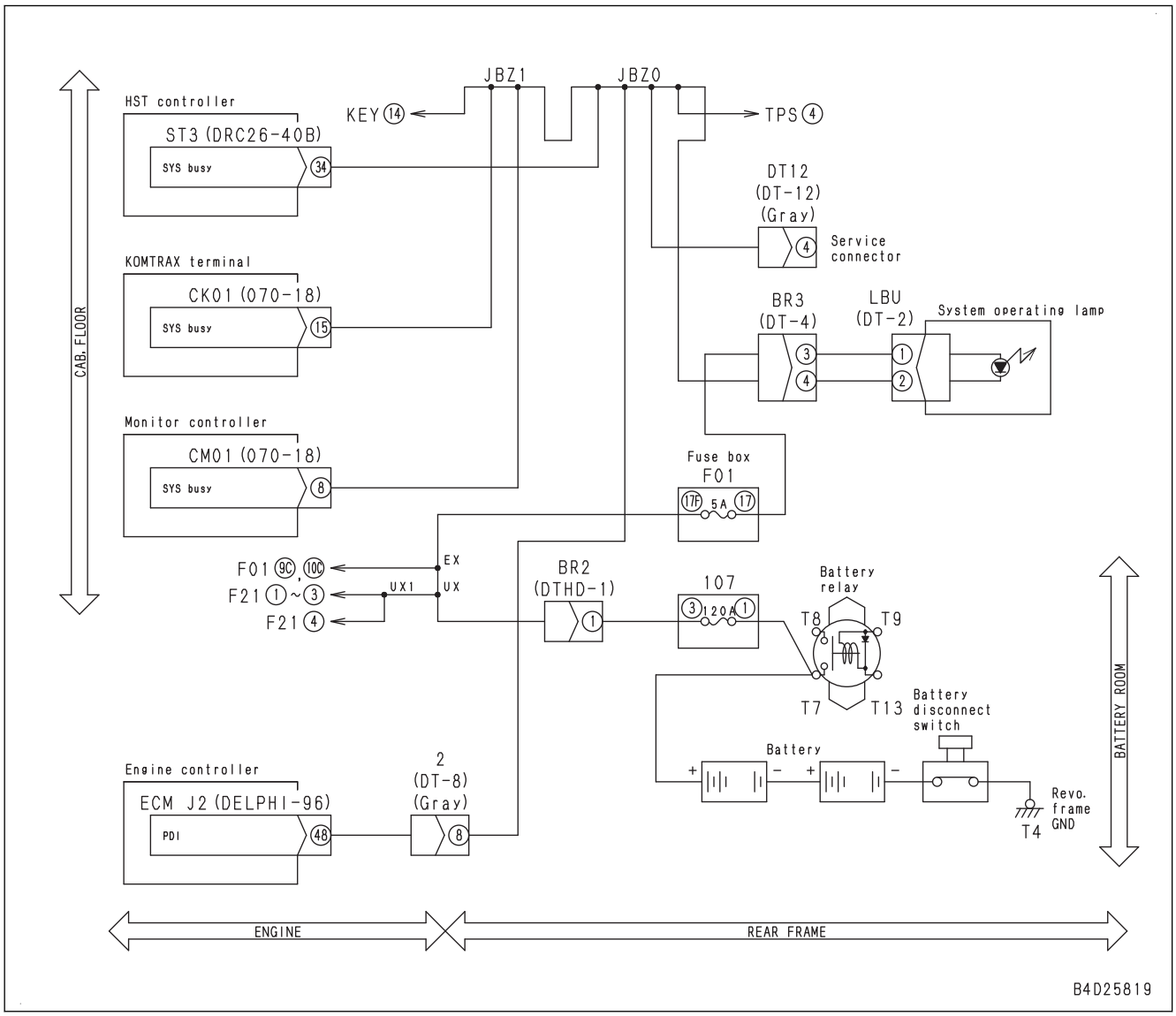
Action level	Failure code	Failure	GPS Antenna Open Circuit (KOMTRAX system)
-	D862KA		
Details of failure	Open circuit occurs in GPS antenna circuit.		
Action of controller	• None in particular • If cause of failure disappears, machine becomes normal by itself.		
Phenomenon on machine	GPS positioning system does not work.		
Related information	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 GPS antenna or antenna cable	GPS antenna may be defective, or antenna cable may have open or short circuit, or poor contact at terminal area (GPS).

Figure of Structure



Circuit Diagram of System Operating Lamp



Failure Code [DAJQKR] (Machine with Gateway Function Controller)

Action level	Failure code	Failure	Controller Area Network 2 Defective Communication (Hydrostatic Transmission Controller) (Machine monitor system)
L03	DAJQKR		
Detail of failure	Machine monitor does not recognize HST controller through CAN communication 2 line (KOMNET/c).		
Action of controller	None in particular		
Phenomenon on machine	None in particular		
Related information	• After completion of repair, check that the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position. • ACC signal of starting switch is the command to start CAN communication for each controller. • 3 different failure codes, [DAJQKR], [DB2QKR], and [D8AQKR] are used for defective CAN communication by CAN2, which are detected by machine monitor. When all of these 3 failure codes are displayed, there may be a ground fault, short circuit or hot short circuit in wiring harness (CAN communication circuit). • Since each controller and machine monitor are connected directly to battery, they are supplied with power even after starting switch is turned to OFF position. • Since signal of active CAN communication line is pulse voltage, it cannot be measured by using multimeter.		

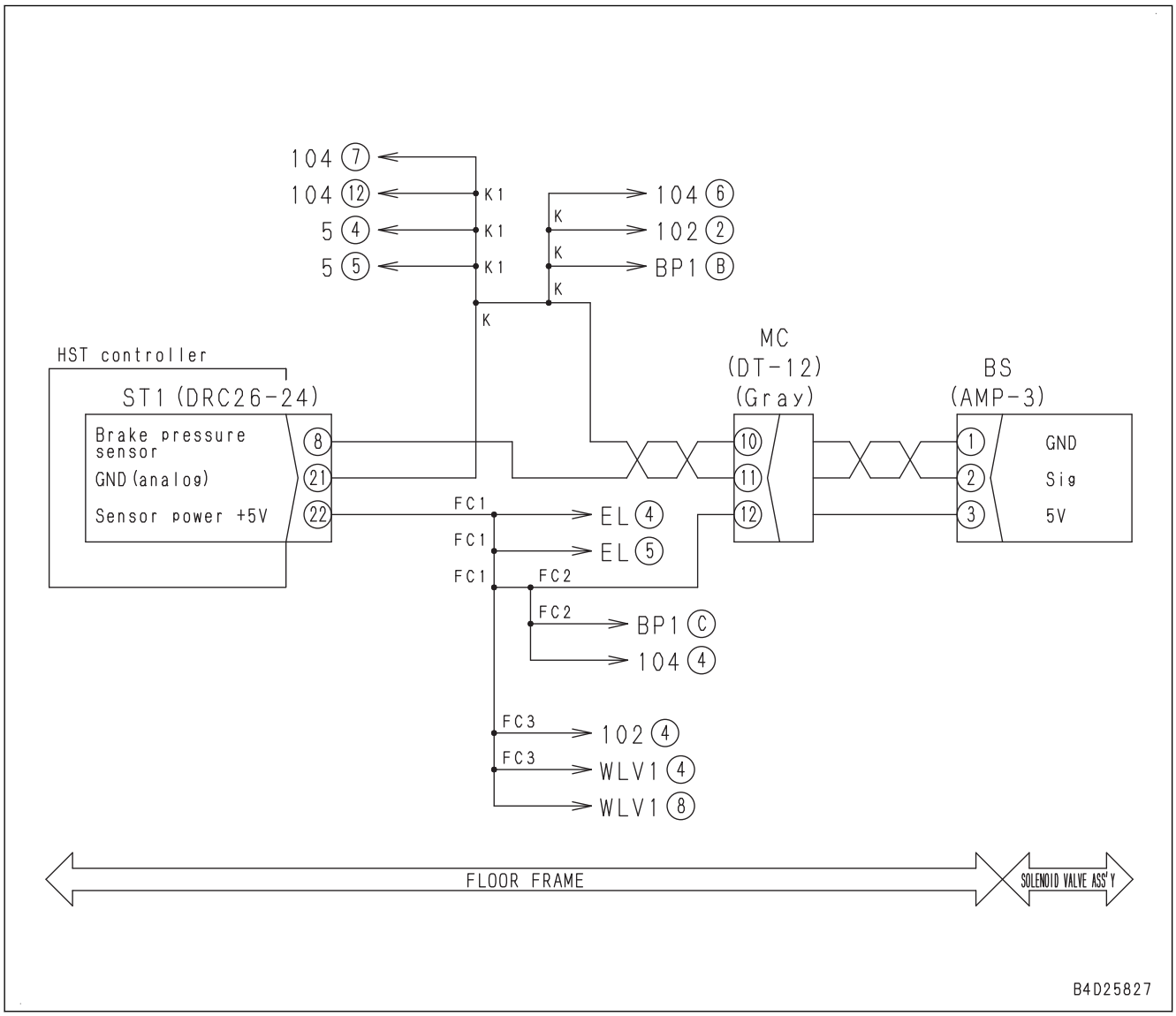
No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective power supply to HST controller	Perform troubleshooting for failure code [DAJ1KK].
2	Defective CAN communication 2 system	Perform checks on causes 4 to 9 in troubleshooting for failure code [DB2QKR].
3	Defective HST controller	If no failure is found by preceding checks, HST controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)
4	Defective machine monitor	If no failure is found by above checks, machine monitor is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Failure Code [DD13KB]

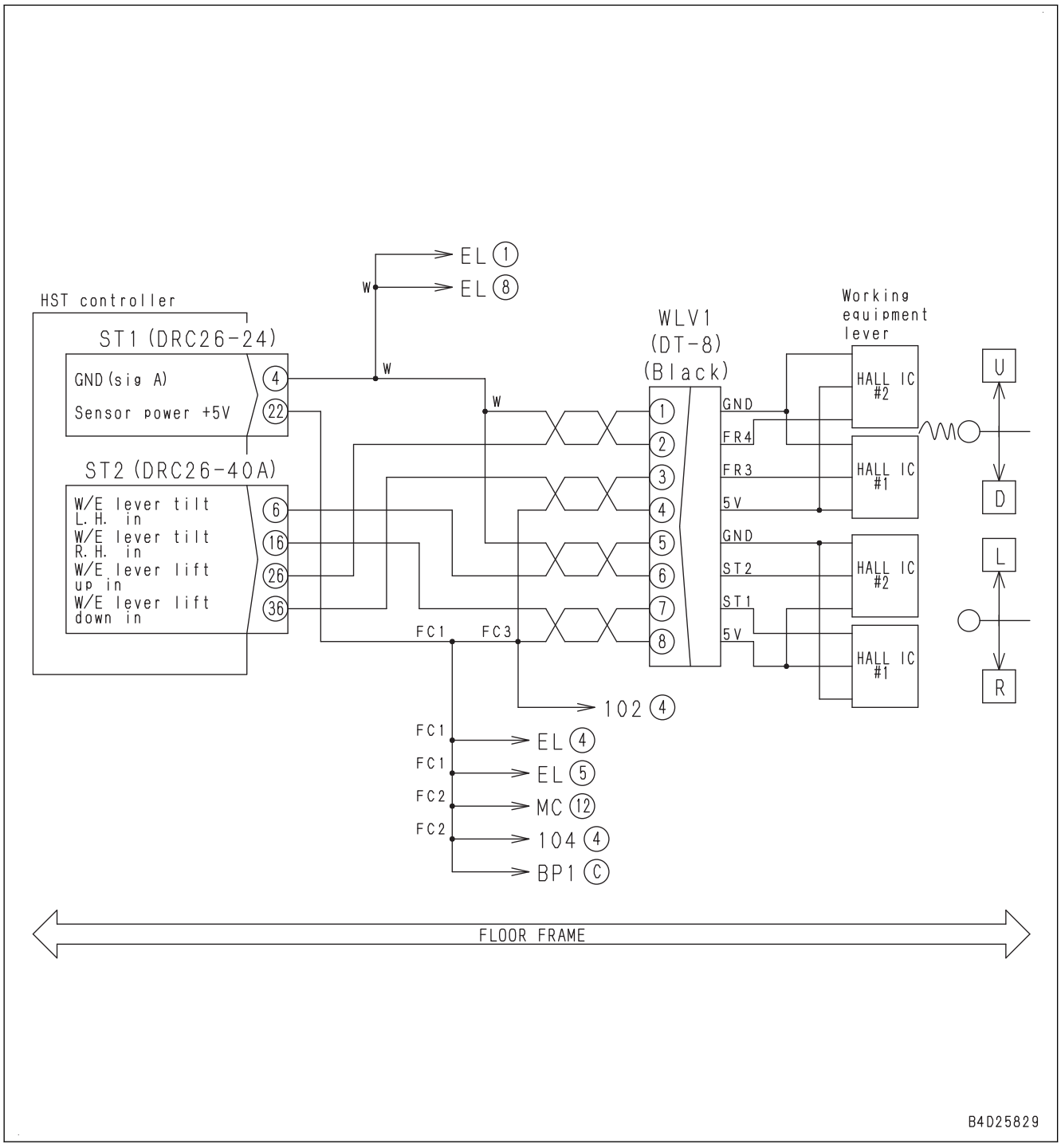
Action level	Failure code	Failure	Shift Down Switch Short Circuit (HST controller system)
L03	DD13KB		
Detail of failure	2 lines of NO (Normally Open) and NC (Normally Closed) of downshift switch circuit become 0 V (switch: ON) simultaneously.		
Action of controller	Recognizes that downshift switch is not pressed.		
Phenomenon on machine	• Downshifting is disabled. • Auto shift down function does not operate. • Once machine stops, engine speed is restricted to medium (half) speed. • Once machine stops, selectable speed ranges are restricted to F1 and R1.		
Related information	• NO line is for detecting operation, and NC line is for detecting errors. • Signal state of downshift switch can be checked with monitoring function. (Code: 40905) • After completion of repair, check that the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position, and operate downshift switch. • Since T-adapter is not prepared for connector 39, measure it at connector 27.		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective shift down switch (internal open circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connector 27, and connect T-adapter to male side. 3. Turn on and off the downshift switch to perform troubleshooting. **REMARK** “Switch OFF”: Release, “Switch ON”: Press			
		Resistance	Between 27 (male) (6) and (5)	Switch OFF	Max. 1 Ω
				Turn on the switch.	Min. 1 MΩ
			Between 27 (male) (4) and (5)	Switch OFF	Min. 1 MΩ
				Turn on the switch.	Max. 1 Ω
2	Ground fault in wiring harness (contact with ground circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connectors ST1 and 39, and connect T-adapter to female side of ST1.			
		Resistance	Between ST1 (female) (5) and ground		Min. 1 MΩ
			Between ST1 (female) (11) and ground		Min. 1 MΩ
3	Short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connectors ST1 and 39, and connect T-adapter to female side of ST1. **REMARK** Check it by using multimeter in continuity mode.			
		Continuity	Between ST1 (female) (5) and each pin other than pin (5)		No continuity (no sound is heard)
			Between ST1 (female) (11) and each pin other than pin (11)		No continuity (no sound is heard)

Circuit Diagram of Brake Pressure Sensor

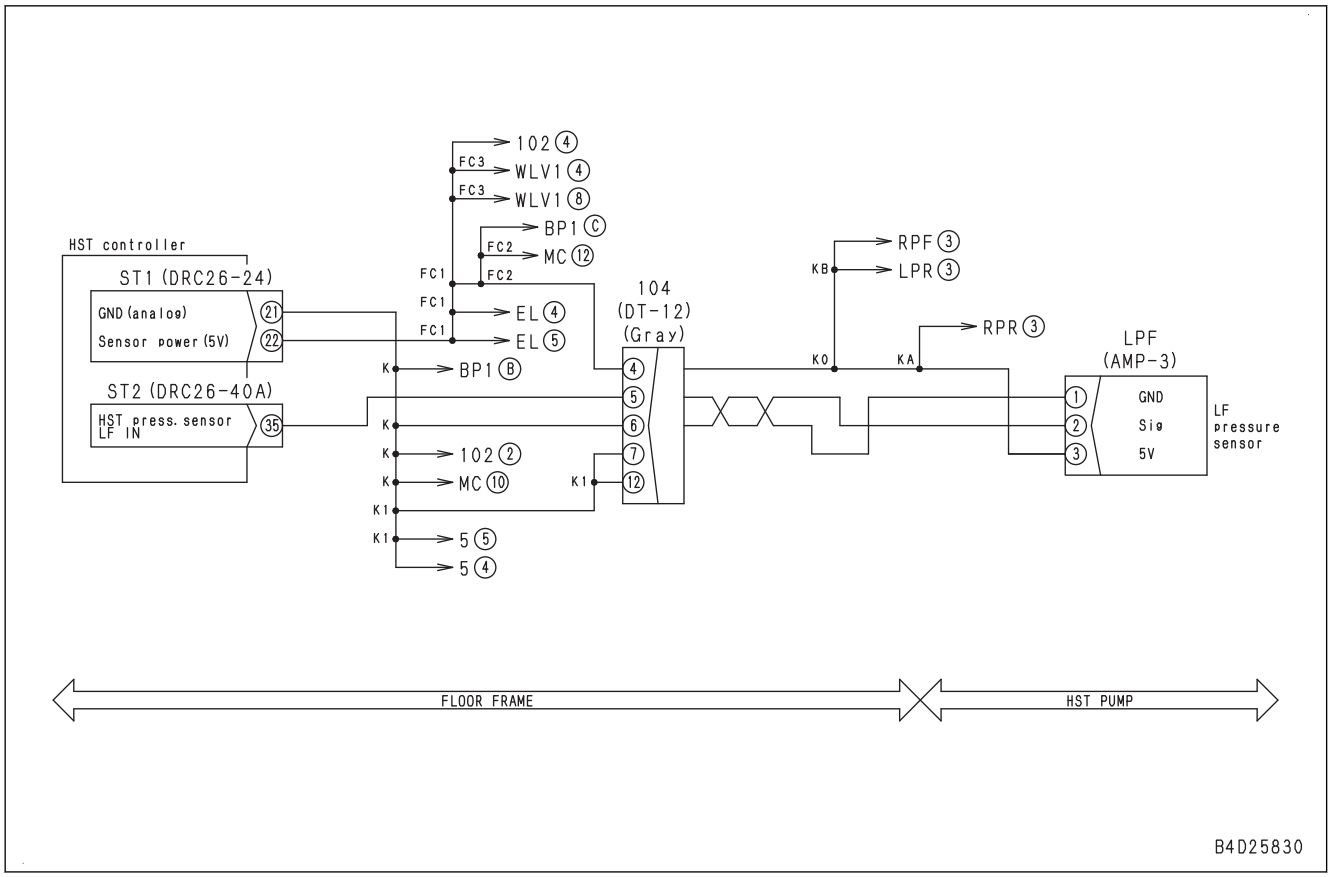


Circuit Diagram of Blade Tilt Lever Potentiometer



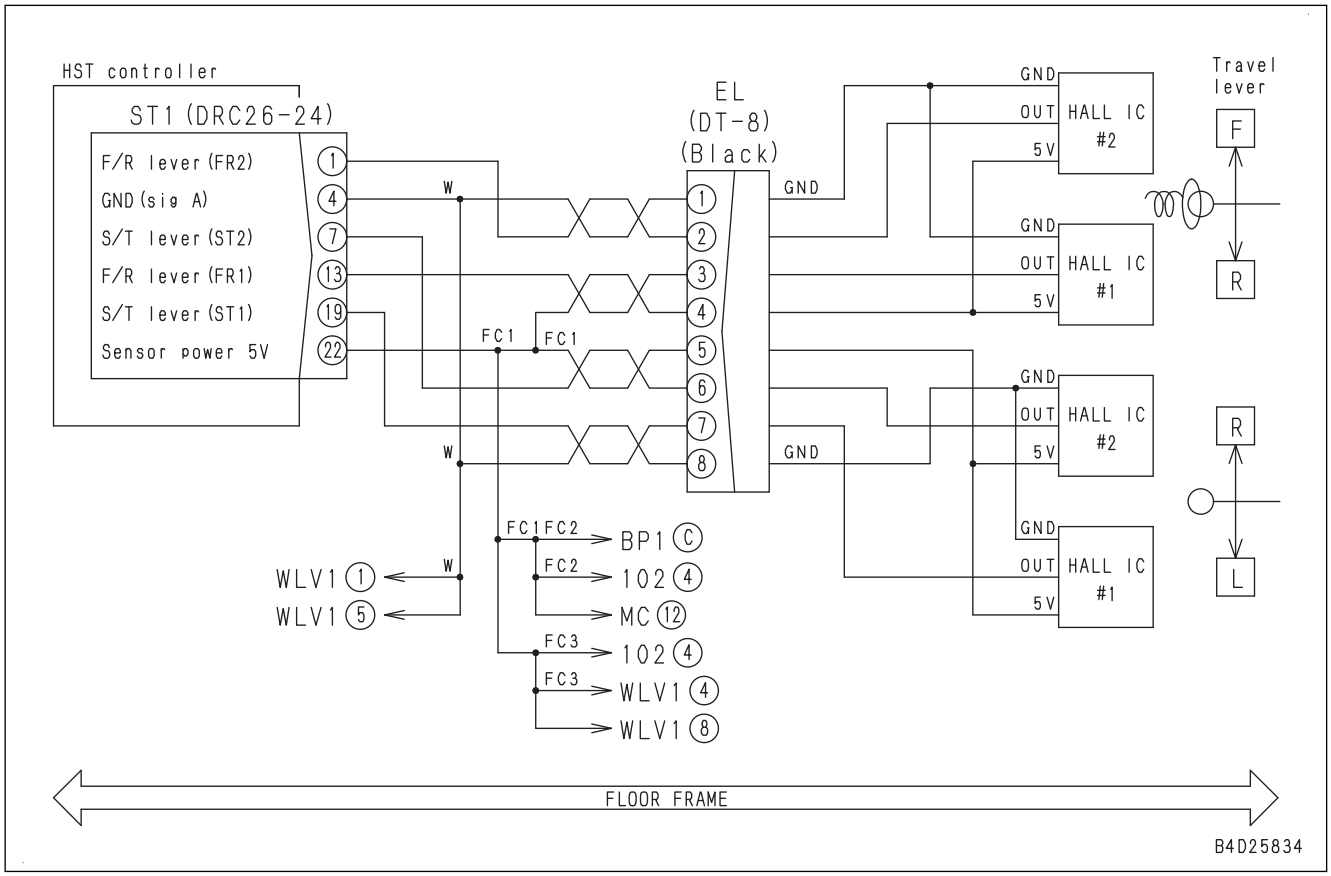
No.	Cause	Procedure, measuring location, criteria and remarks		
4	Short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connectors ST2 and LPF, and connect T-adapter to female side of ST2. **REMARK** Check it by using multimeter in continuity mode.		
		Continuity	Between ST2 (female) (35) and each pin other than pin (35)	No continuity (no sound is heard)
5	Defective HST controller	If no failure is found by preceding checks, HST controller is defective. Reference 1. Turn the starting switch to OFF position. 2. Insert T-adapter into connector ST1 and ST2. 3. Turn the starting switch to ON position.		
		Voltage	Between ST2 (35) and ST1 (21)	0.5 to 4.5 V

Circuit Diagram of Lf HST Pressure Sensor

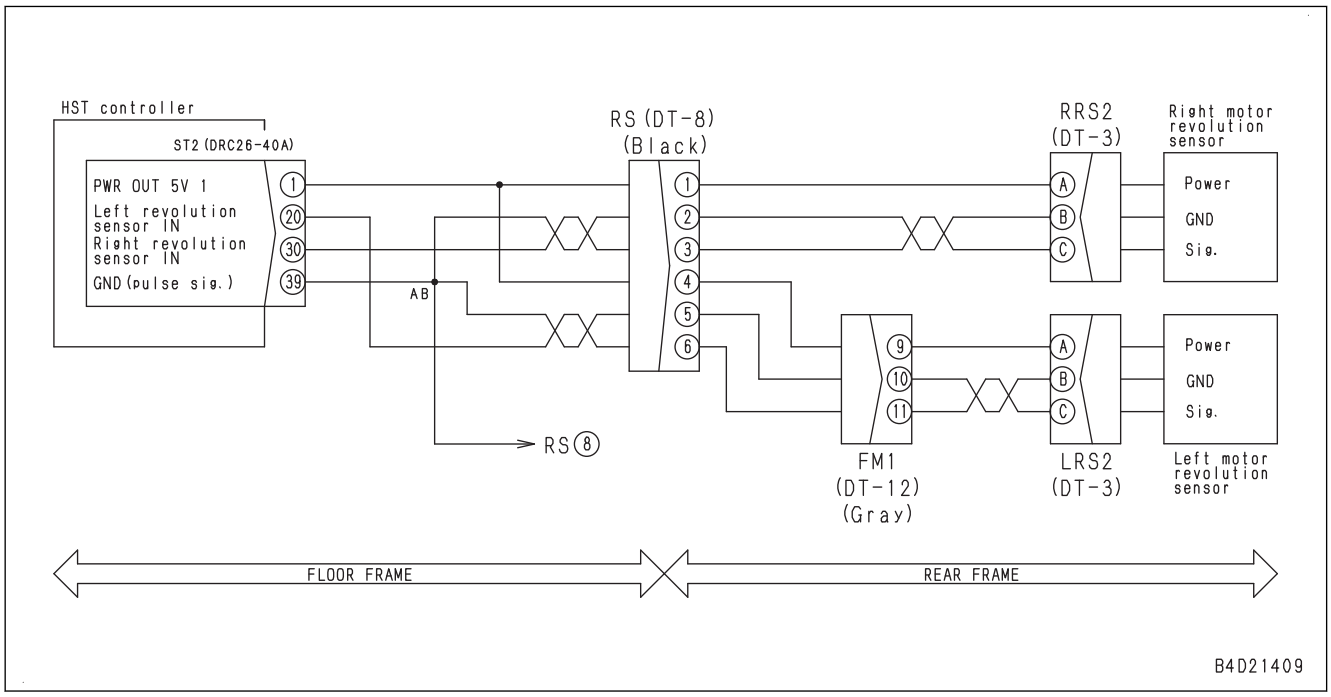


No.	Cause	Procedure, measuring location, criteria and remarks		
5	Defective HST controller	If no failure is found by preceding checks, HST controller is defective. Reference 1. Turn the starting switch to OFF position. 2. Insert T-adapter into connector ST1. 3. Turn the starting switch to ON position. 4. Operate the joystick (steering, directional and gear shift lever) to perform troubleshooting.		
		Voltage	Between ST1 (7) and (4)	0.5 to 4.5 V

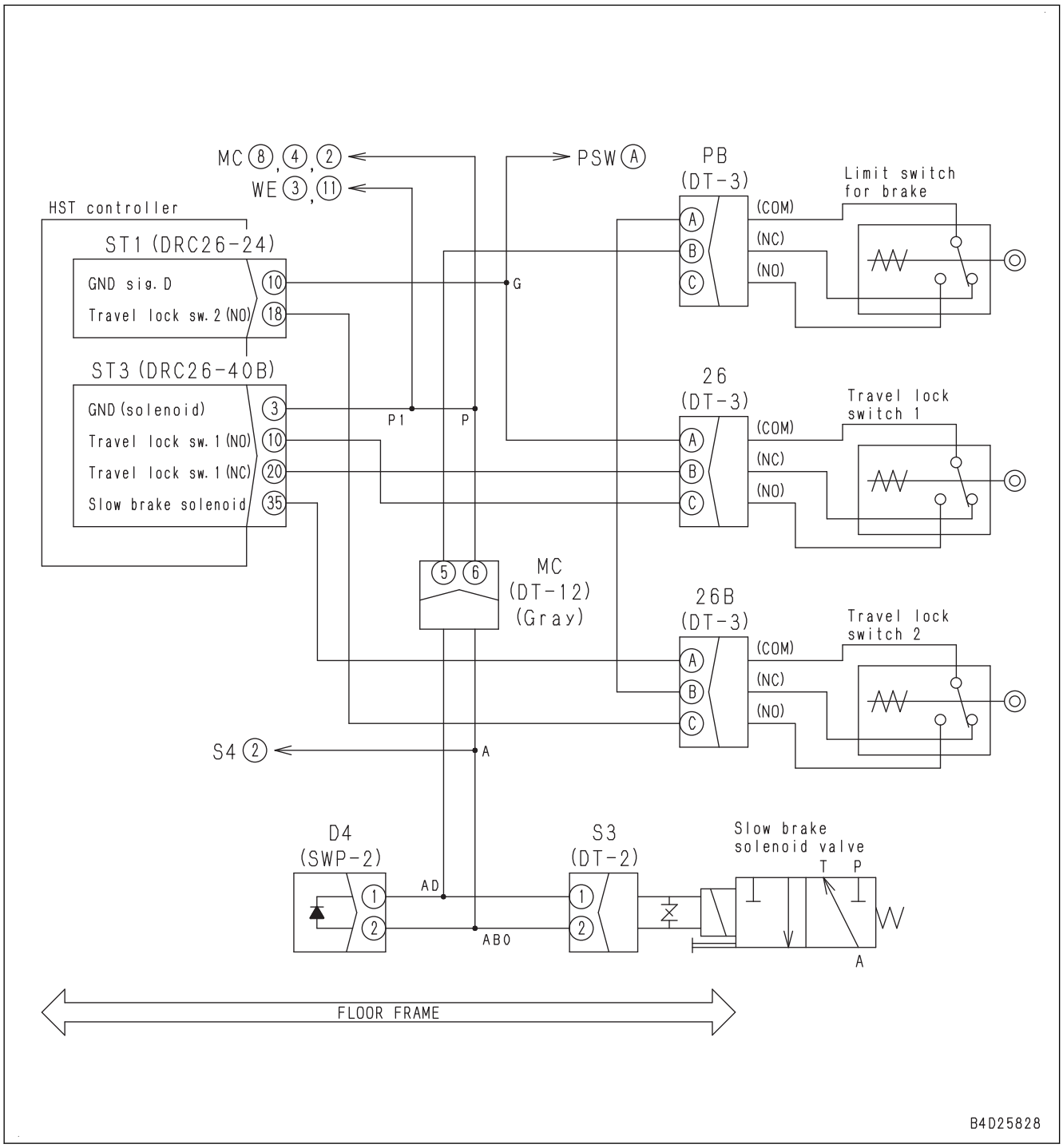
Circuit Diagram of Steering Potentiometer



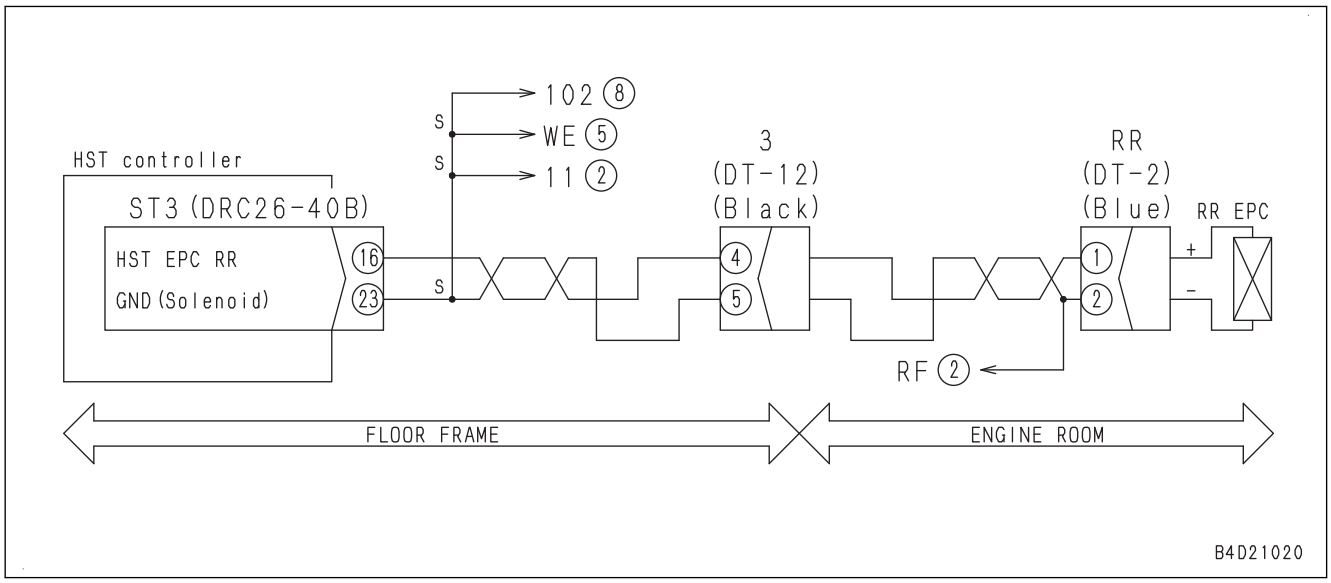
Circuit Diagram Related to R.H. HST Motor Speed Sensor



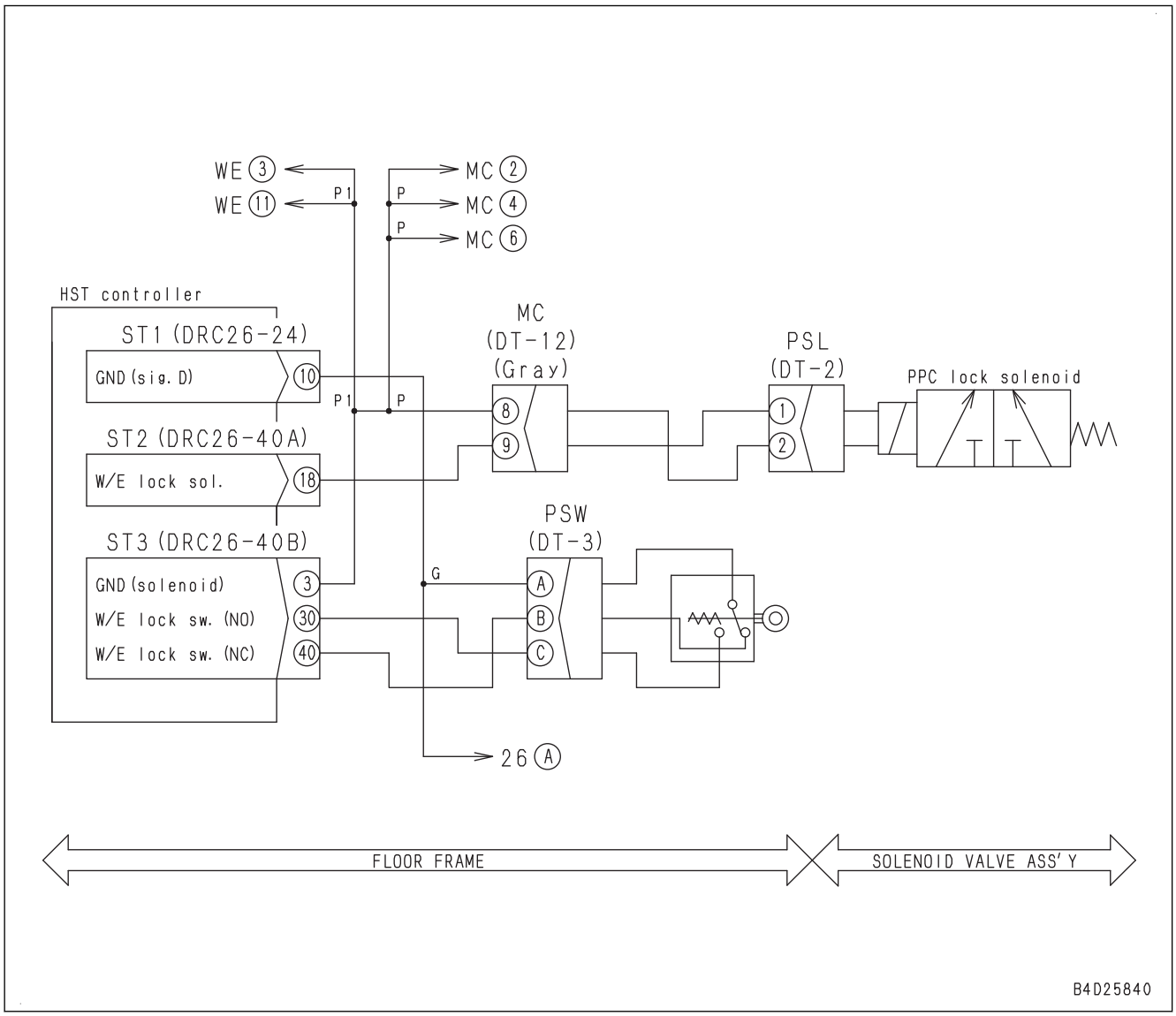
Circuit Diagram of Slow Brake Solenoid



Circuit Diagram Related to Right Reverse HST Pump EPC



Circuit Diagram of Work Equipment Lock Lever Solenoid

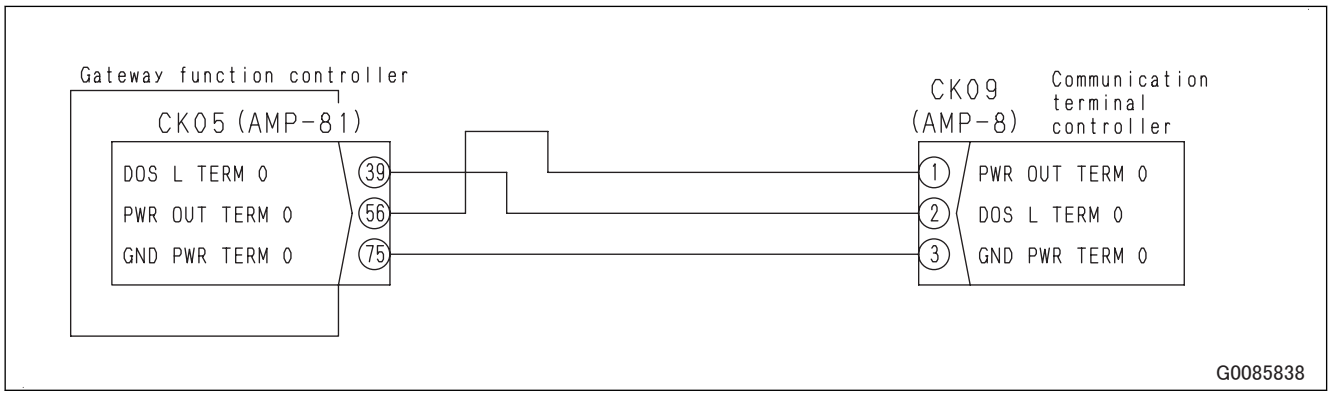


Failure Code [F313KB]

Action level	Failure code	Failure	Gateway Controller Communication Terminal Output Signal Short Circuit (Gateway function controller system)
-	F313KB		
Detail of failure	Since the voltage of the communication terminal signal output line from the gateway function controller became 5.7 V or more while the command is ON, a short circuit (hot short circuit) is found.		
Action of controller	• Turns “OFF” the start signal of the communication terminal. • Even if the cause of the failure no longer exists, the machine does not become normal until the starting switch is turned to the OFF position one time.		
Phenomenon on machine	KOMTRAX system does not operate normally		
Related information	-		

No.	Cause	Procedure, measurement location, criteria and remarks		
1	Short circuit in wiring harness	1. Starting switch: OFF 2. Make sure that the system operating lamp is not lit. Turn the battery disconnect switch to the OFF position. 3. Disconnect the connectors connector CK05 and CK09. Connect the T-adapter to the female side of CK05.		
		Resistance	Between CK05 (female) (39) and each pin other than (39)	Min. 1MΩ
2	Defective communication terminal	If no failure is found by above checks, communication terminal is defective. (Since this is an internal defect, troubleshooting cannot be done.)		
3	Defective gateway function controller	If no failure is found by the previous checks, the gateway function controller is defective. (Since this is an internal defect, troubleshooting cannot be done.)		

Circuit Diagram of Gateway Function Controller



E-13 HST Oil Filter Clogging Monitor Comes On in Red While Engine Runs

Failure	HST oil filter clogging monitor lights up in red while engine is running.
Related information	Signal state of HST clogging switch can be checked with monitoring function. (Code: 40912)

No.	Cause	Procedure, measuring location, criteria and remarks
1	Clogged HST oil filter (when system is normal)	HST oil filter may be clogged, check it and if it is clogged, clean or replace it.
2	Defective HST oil filter clogging switch system	Perform troubleshooting for failure code [6091NX].

E-29 Rear Lamp Does Not Come On

Failure	Rear lamp does not light up
Related information	If a harness shared between a rear lamp relay, rear lamp switch, and right and left rear lamps is defective, both right and left rear lamps do not light up (if either of the rear lamps lights up, checking the cause of these failures is not required).

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective rear lamp (burned-out bulb)	Since the rear lamp may be defective, check its bulb for breakage.			
2	Defective fuse	If fuse No.1 in fuse box F01 is blown out, circuit probably has ground fault, etc.			
3	Defective rear lamp relay (Internal open or short circuit)	1. Turn the starting switch to OFF position. 2. Replace headlamp relay (connector: 54) with rear lamp relay (connector: 54B). 3. Turn the starting switch to ON position. 4. Turn on the rear lamp switch.			
		If rear lamp lights up, original rear lamp relay is defective.			
4	Defective rear lamp switch	1. Turn the starting switch to OFF position. 2. Disconnect connector RLSW, and connect T-adapter to male side. 3. Turn on and off rear lamp switch to perform troubleshooting.			
		Resistance	Between RLSW (male) (5) and (6)	OFF	Min. 1 MΩ
				ON	Max. 1 Ω
5	Open circuit or ground fault in wiring harness	Check where voltage is abnormal and figure out where wiring harness is defective. 1. Turn the starting switch to OFF position. 2. Disconnect connectors CBL3 and CBL4, and connect T-adapter to each female side. 3. Turn the starting switch to ON position. 4. Turn on the rear lamp switch.			
		Voltage	Between CBL3 (female) (2) and (1)		20 to 30 V
			Between CBL4 (female) (2) and (1)		20 to 30 V
		If no failure is found by preceding checks, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connector 54B, and connect T-adapter to female side. 3. Turn the starting switch to ON position. 4. Turn on the rear lamp switch.			
		Voltage	Between 54B (female) (5) and (6)		20 to 30 V
			Between 54B (female) (1) and (6)		20 to 30 V
			Between 54B (female) (3) and (6)		20 to 30 V
		If no failure is found by preceding checks, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connector RLSW, and connect T-adapter to female side. 3. Turn the starting switch to ON position.			
		Voltage	Between RLSW (female) (5) and (2)		20 to 30 V

Failure mode \ Component causing failure		Engine system	Air leakage from air supply piping	Rear damper	Hydraulic tank strainer	Pump suction piping (ECMV)	Charge filter	Hydraulic oil cooler (including bypass valve)	Pump suction piping (sucking air)	Piping between pump and motor	Hydraulic oil (oil temperature, oil type, etc.)	Pump and motor								
												HST pump (body)	HST pump (initial adjustment)	HST pump (air bleeding)	HST pump EPC valve (including wrong connection of connectors)	HST pump servo valve	HST pump suction safety valve	Work equipment (fan) pump (body)	Work equipment pump PC valve	Work equipment pump LS valve
Work equipment system	All work equipments speed or power is low.						○	○										○	○	○
	Blade lift speed or power is low.				○	○														
	Blade tilt speed or power is low.				○	○														
	Blade angle speed or power is low.				○	○														
	Time lag of blade lift is large.																			
	Hydraulic drift of lifted blade is large.																			
	Hydraulic drift of tilted blade is large.																			
	Unusual noise is heard from around work equipment and cooling fan pump or control valve.				○				○		○							○		
Fan system	Fan rotation is abnormal (too high or low, or fan does not rotate).	○																		
	Unusual noise is heard from around fan.																			

H-13 All Work Equipment Speed or Power is Low

Failure	All work equipments speed or power is low.
Related information	• Check that oil level in hydraulic tank is normal before performing troubleshooting. • If any failure code is displayed, perform troubleshooting for that failure code first. ([6091NX]) • Check that engine high idle speed is normal on the monitor. (Monitoring code: 01002) • Work equipment pump pressure can be checked on the monitor as well. (Monitoring code: 70700)

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Clogged charge filter	Check if charge filter is clogged. Clogging state of charge filter can be checked with monitoring function. (Monitoring code: 40912 “HST Oil Filter Clogging Sensor”)			
2	Defective adjustment or malfunction of oil cooler bypass valve (charge safety valve)	Be ready with engine stopped, set the machine monitor to “Control Brake Release Mode” by adjustment menu with engine at high idle, and then perform troubleshooting.			
		HST charge circuit pressure	Joystick (steering, directional and gear shift lever)	When it is in neutral	3.23 ± 0.29 MPa {33 ± 3 kgf/cm^2}
		If oil pressure cannot be adjusted to normal level, charge safety valve of oil cooler bypass valve may be defective. Check spring for deterioration and valve for sticking.			
3	Internal defect of charge pump	If checks on cause 2 are normal, internal defect of charge pump is suspected.			
4	Malfunction of control valve (unload valve)	If relief pressure increases to only the same pressure as unload pressure during work equipment relief, unload valve may remain opened. Since unload valve cannot be adjusted, replace it as an assembly.			
5	Defective adjustment and malfunction of control valve (main relief valve)	Be ready with engine stopped, then perform troubleshooting with engine at high idle.			
		Work equipment pump relief pressure	Blade lift or tilt cylinder	At relief	Min. 27.5 MPa {Min. 280 kgf/cm^2}
		If oil pressure cannot be adjusted to normal level, malfunction or internal defect of main relief valve is suspected. Check spring for deterioration and valve for sticking.			
6	Malfunction of PC valve	Check PC valve spool for sticking and spring for deterioration, and replace them if any failure is found.			
7	Malfunction of LS valve	Check LS valve spool for sticking and spring for deterioration, and replace them if any failure is found.			
8	Internal defect of work equipment and cooling fan pump (pump body)	If measured oil pressure is unusual in check on cause 5 and main relief valve is normal, disconnect work equipment and cooling fan pump outlet hose, crank engine, and check that oil flows out. If oil does not flow out, replace the work equipment pump.			

S-10 Engine Oil Consumption is Excessive

Failure	Engine oil consumption is excessive
Related information	If any failure code is displayed, perform troubleshooting for that code first.

No.	Cause	Point to check, remarks	Remedy
1	Dust intake from air intake system	If air intake piping between air cleaner and engine is removed, dust enters in piping.	Air intake piping cleaning or replacement
2	Breakage or wear of piston ring	• Measured blowby pressure is above standard value. • After KCCV filter element is replaced, blowby pressure is still high. • Measure compression pressure (See standard value table). (Reference: See “TESTING AND ADJUSTING”, “Testing compression pressure”.)	Piston ring replacement or repair
3	Oil leakage from KCCV oil return piping.	Check for oil leakage from KCCV oil return piping.	Oil piping repair or replacement
4	Oil leakage out of engine	Check for oil leakage.	Oil leakage part repair
5	Oil leakage from oil filter	Check for oil leakage from oil filter.	Oil filter re installation or replacement
6	Oil leakage from oil piping	Check for oil leakage from oil piping	Oil piping repair or replacement
7	Oil leakage from oil drain plug	Check oil leakage from oil drain plug.	Retighten oil drain plug
8	Oil leakage from oil pan	Check for oil leakage from oil pan.	Oil pan repair or replacement
9	Oil leakage from cylinder head	Check for oil leakage from cylinder head.	Cylinder head repair or replacement
10	Wear of damage of rear oil seal	Oil in clutch chamber or damper chamber on mounted machine side is increased.	Rear oil seal repair or replacement
11	Oil leakage from VGT	• Inlet/outlet of blower and outlet of turbine in VGT have oil stains. • Check if VGT shaft can rotate (by manually moving the VGT's blade axially and vertically).	VGT replacement
12	Oil leakage from oil cooler	• Oil is mixed in coolant. • Remove oil cooler, and visually check for oil leakage from the oil cooler surface. • Check oil cooler for leakage by air pressure test.	Oil cooler replacement
13	Oil leakage from EGR valve system	Outlet port is stained with oil after the EGR valve is disconnected.	EGR valve replacement
14	Wear or damage of valve guide or stem seal	• Check valve guide and stem seal. • Remove cylinder head and check guide internal surface and stem seal for damage (Reference: See Maintenance standard).	Valve guide and stem seal replacement

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

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
C	790-302-1270	Socket (width across flats 60 mm)	■	1			Removal and installation of nut
	790-102-1330	Socket (width across flats 80 mm)	■	1			
	790-302-1340	Socket (width across flats 75 mm)	■	1			
D	790-720-1000	Expander	■	1			Installation of piston ring
E	796-720-1650	Ring	■	1			
	07281-01029	Clamp	■	1			
	796-720-1660	Ring	■	1			
	07281-01159	Clamp	■	1			
	796-720-1670	Ring	■	1			
	07281-01279	Clamp	■	1			
F	790-201-1702	Push tool kit	■	1			Press-fit of bushing
	790-101-5021	• Grip		1			
	01010-50816	• Bolt		1			
	790-201-1781	• Push tool		1			
	790-201-1811	• Push tool		1			
	790-201-1791	• Push tool		1			
G	790-201-1500	Push tool kit	■	1			Press-fit of dust seal
	790-101-5021	• Grip		1			
	01010-50816	• Bolt		1			
	790-201-1590	• Plate		1			
	790-201-1620	• Plate		1			
	790-201-1610	• Plate		1			

Tools for Removal and Installation of U-Frame Assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	Commercially available	Lifting tool	■	5			Removal and installation of U-frame assembly

Remove and Install Injector Assembly

Engine hood assembly – Fuel supply valve – Draining coolant – Connector, hose, tube – Cylinder head cover – A

A – Rocker arm, crosshead assembly – Injector assembly

Tools for Removal and Installation of Injector Assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	795-799-8150	Remover	●	1			Removal of inlet connector
B	795-799-6700	Puller	■	1			Removal of injector

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

⚠ Set the work equipment lock lever to LOCK position.

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

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

⚠ When removing and installing the fuel piping, take care to prevent foreign materials from entering the fuel piping. If dusts, etc. stick to any part, clean that part thoroughly with clean fuel.

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

⚠ When disconnecting the wirings and hoses, take extreme care not to damage or deform the wirings and hoses by the clips and clamps. If the wirings or hoses may be damaged or deformed, remove the clips and clamps in advance.

⚠ If you drain the radiator coolant when it is still hot, you may be scalded. Wait for the coolant temperature to drop before draining.

How to Remove Injector Assembly

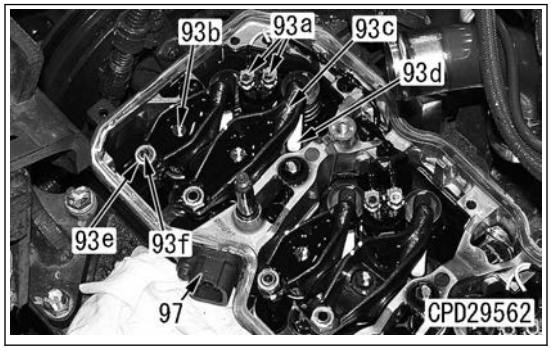
Engine hood assembly

1. Remove the engine hood assembly. For details, see "Remove and Install Engine Hood Assembly".

Rocker arm, crosshead assembly

80. Remove the nuts (93a) (2 pieces).

Color of wiring harness	Cylinder No.
White	1, 3, 5
Black	2, 4, 6



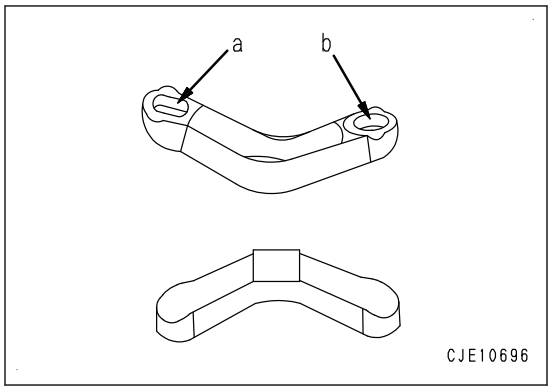
REMARK

Do not remove the connector (97) of the injector wiring harness from the rocker housing unless it is required.

81. Remove the bolts (93b) (12 pieces), and remove the rocker arm assembly (93c), the crosshead (93d), and the rocker arm support.

REMARK

- Loosen the locknut (93e) and loosen the adjustment screw (93f) by several turns so that an excessive force is not applied to the push rod when installing the rocker arm.
- Write down the locations and directions of the crossheads (shapes of holes (a) and (b)). (Install them in the recorded directions when reassembling.)



Injector assembly

82. Remove the retaining nut (94a), and remove the inlet connectors (94) (6 pieces).

REMARK

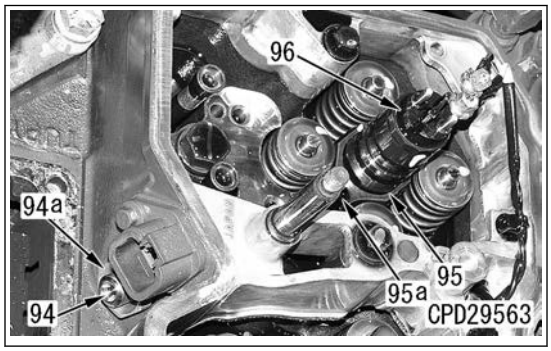
- Clean around the parts in advance to prevent mud, etc. from entering the inlet connector hole.
- Remove the inlet connector (94) by using the remover (A).

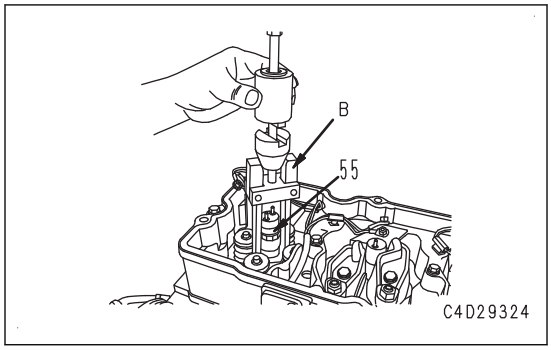
83. Remove the bolts (95a) (2 pieces), and remove the holder (95).

84. Remove injector assembly (96) by using puller (B).

REMARK

Be careful not to allow dusts and foreign materials to enter the installing portion of the injector assembly.



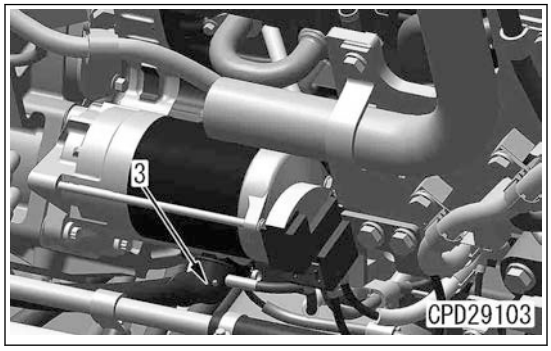


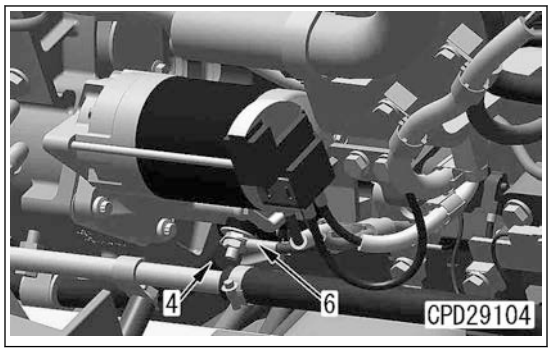
Starting motor assembly

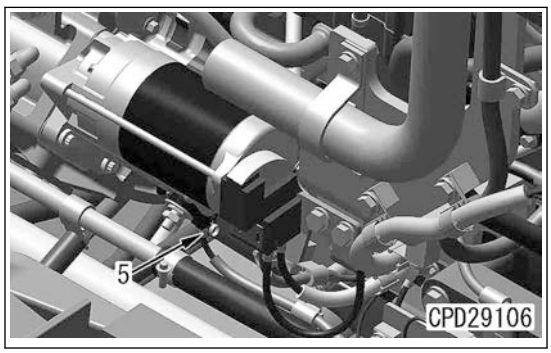
4. Pull off the cap (3), and disconnect the connectors T1 (4) and T2 (5).

   REMARK

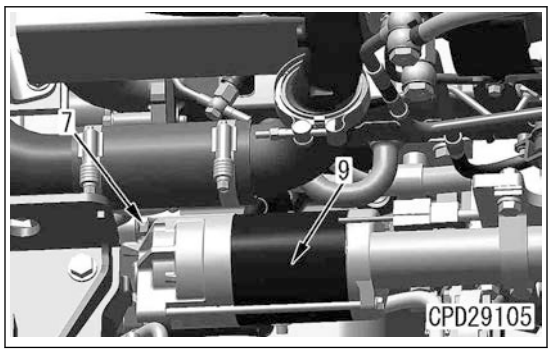
   Connector T1 (4) is tightened together with the engine wiring harness (6).

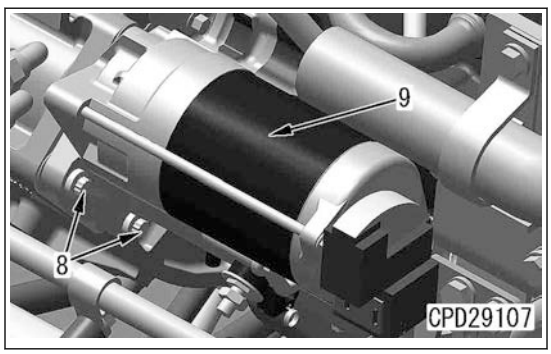






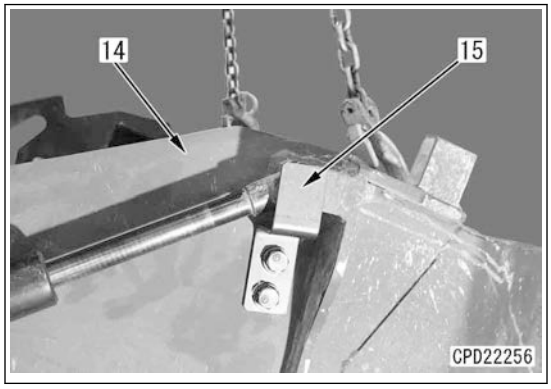
5. Remove the nut (7) and the joint bolts (8) (2 pieces), and remove the starting motor assembly (9).



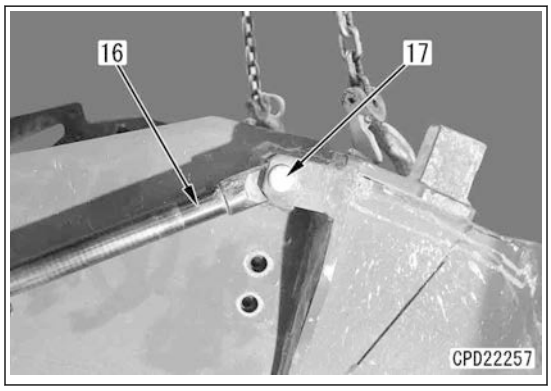


Cooling fan drive assembly

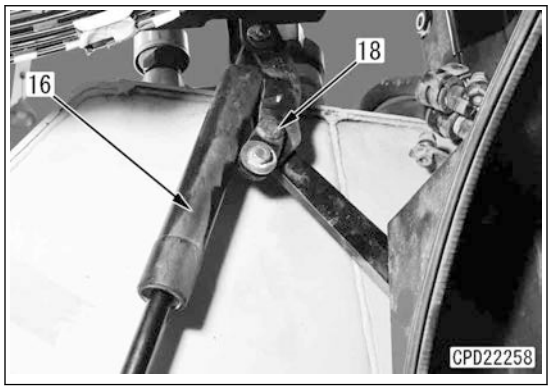
11. Fully raise the cooling fan drive assembly (14), sling the assembly, and hold it.
12. Remove the covers (15) on the right and left.



13. Remove the pins (17) of right and left gas cylinders (16).



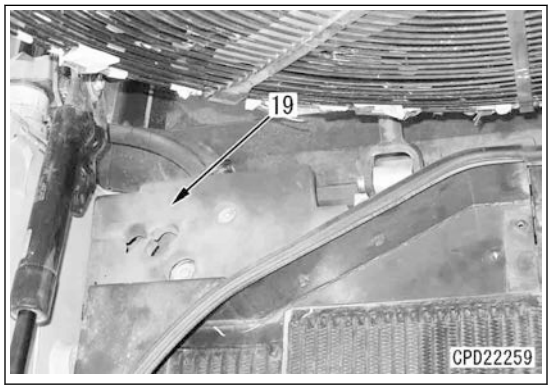
14. Remove right and left pins (18) while the gas cylinders (16) are hanging.



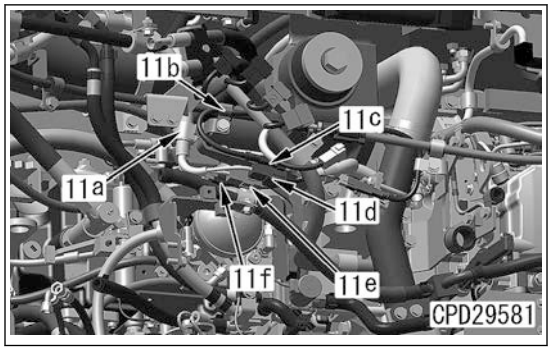
15. Remove the rubber cushion (19).

    REMARK

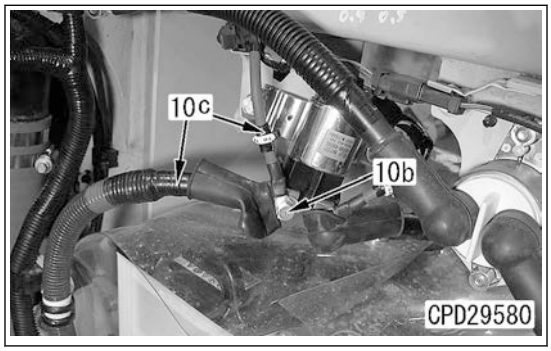
    This is to prevent it from interfering when removing the pin.

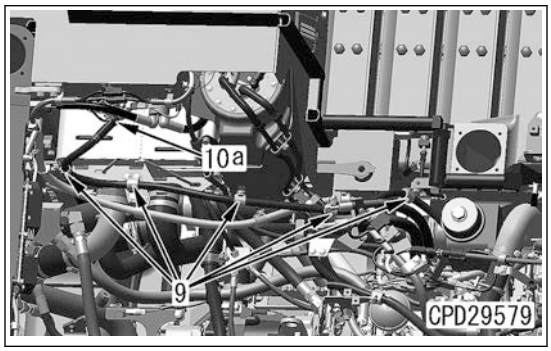


29. Connect the connectors EG4 (11f), EG6 (11e), EG5 (11d) and (11c), and install the clamps (11b) and (11a).



30. Connect the wiring harness terminals TB (10c), and install the bolt (10b).
31. Install the cap (10a).
32. Install the clamps (9) (5 places).



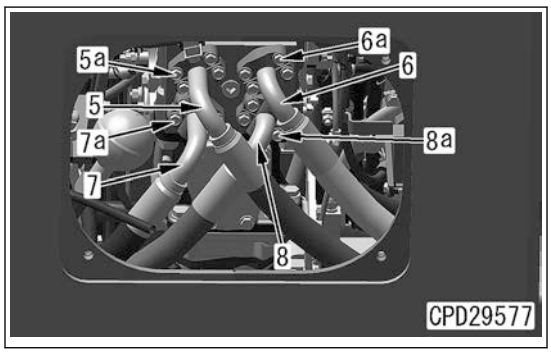


33. Connect the following hydraulic hoses with the bolts (5a), (6a), (7a), and (8a) (4 pieces each).
    - Hose PA2 Red (8)
    - Hose PB2 Blue (7)
    - Hose PA1 Yellow (6)
    - Hose PB1 Green (5)

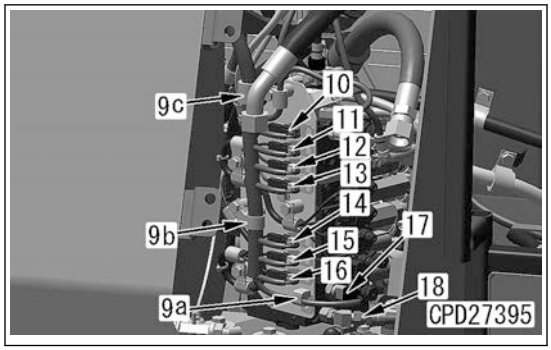
    REMARK

    Replace O-rings of each hydraulic hose with the new ones.

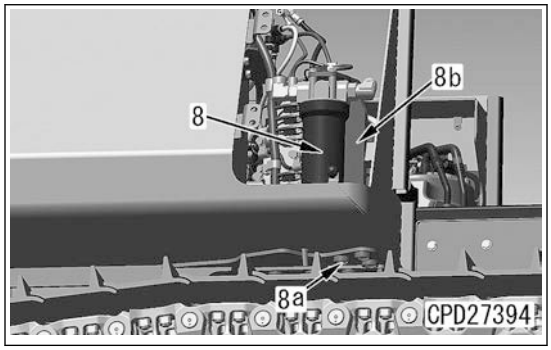
    Bolts (5a), (6a), (7a), and (8a):
    98 to 123 Nm {10.0 to 12.5 kgfm}



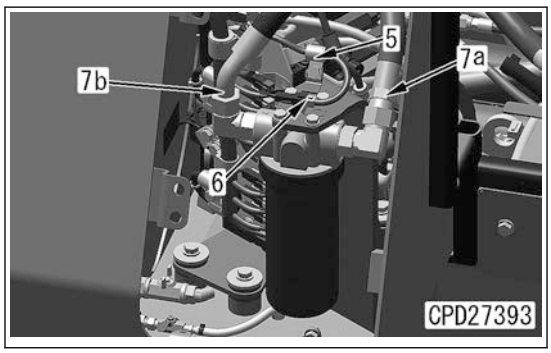
18. Connect the hose (18).
19. Connect the following connectors, and install the clips (9c), (9b), and the clamp (9a).
    - Connector WP (17)
    - Connector LU (16)
    - Connector TR (15)
    - Connector AR (14)
    - Connector FAC (13)
    - Connector LD (12)
    - Connector TL (11)
    - Connector AL (10)



20. Install the bracket (8b) and the charge filter (8) with the bolts (8a) (3 pieces).



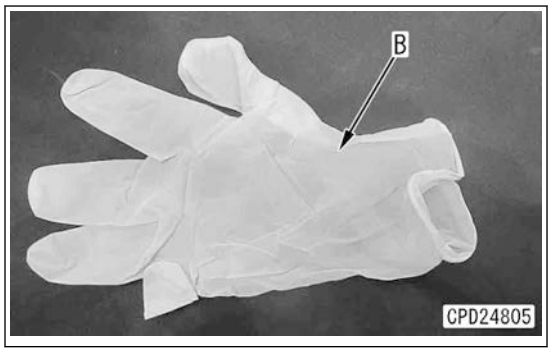
21. Connect the hoses (7b) and (7a).
22. Connect the connector (6), and install the clamp (5).



Install DEF Tank Strainer

NOTICE

When handling DEF, be sure to use the vinyl gloves (B).



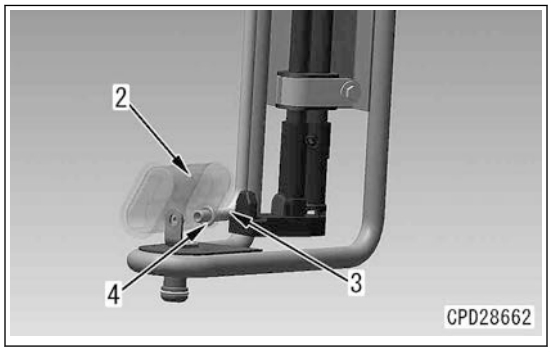
1. Apply distilled water for lubricating O-ring (4).

   O-ring (4):
   Distilled water

   REMARK

   If any foreign material is mixed into DEF tank, it may cause failures. Do not use grease, lubricating oil, or any lubricating substance.

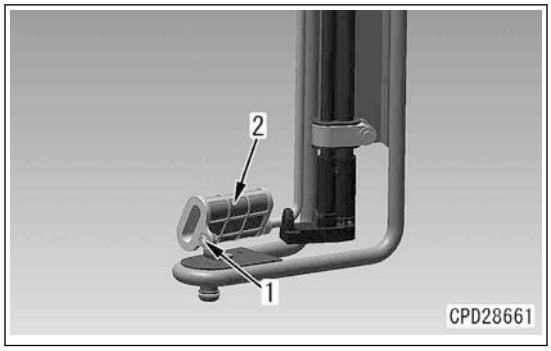
2. Install DEF tank strainer (2) to tube (3).



3. Install DEF tank strainer (2) with mounting bolt (1).

   Mounting bolt (1):
   4.9 to 5.9 Nm {0.5 to 0.6 kgfm}

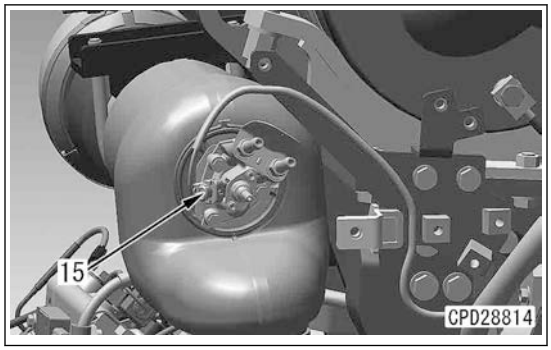
4. Install DEF tank sensor flange assembly. For details, see “Remove and Install DEF Tank Sensor Flange Assembly”.
5. Install DEF tank assembly. For details, see “Remove and Install DEF Tank Assembly”.

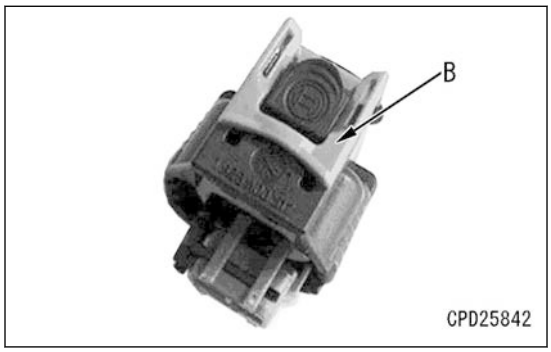


14. Disconnect DEF wiring connector UDM (15) according to the following procedure.

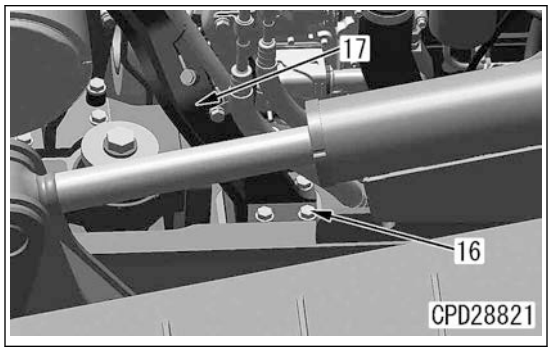
    NOTICE

    - **After disconnecting DEF hose (9), disconnect DEF wiring connector UDM (10) (to prevent DEF from attaching to DEF wiring connector).**
    - **After disconnecting DEF wiring connector UDM (10), install DEF injector electrical connector cover (B) to DEF injector electrical connector side (to prevent entry of the foreign materials).**

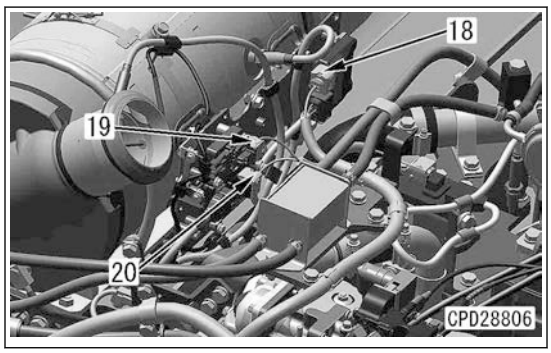


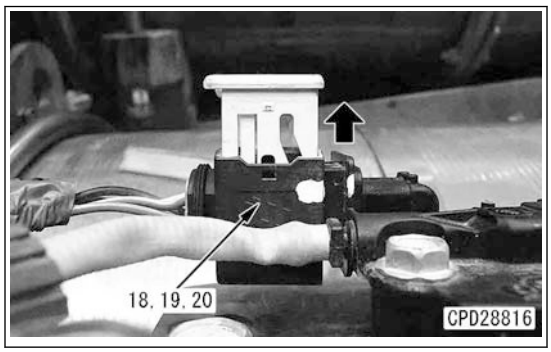


15. Remove the bolts (16) (4 pieces), and move the bracket (17) aside so that it does not interfere when removing KDPF and SCR assembly.



16. Slide the lever (yellow) on each connector NH3 (18), NOx2 (19), and SCRT (20) in the direction of the arrow to unlock it, and disconnect the connectors NH3 (18), NOx2 (19), and SCRT (20). (For details, see the following.)

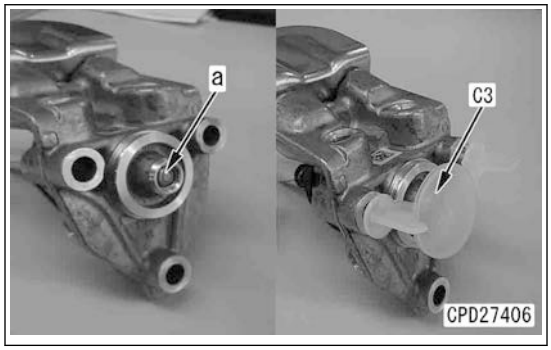




Install DEF Injector

DEF injector

1. Remove the cap (C3) on the injector side at nozzle tip end (a).
2. Install DEF injector (13) according to the following procedure.
   1) Apply seizure prevention compound LC-G to the threaded portion of the mounting bolt (12).



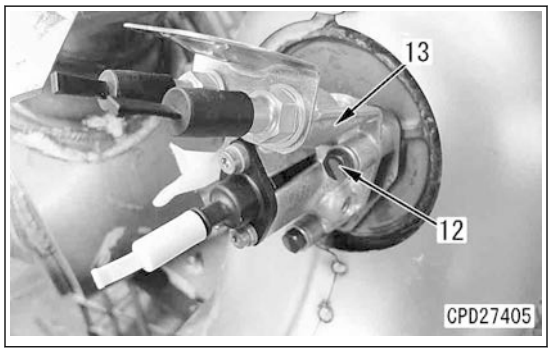
   2) Temporarily assemble the gasket (13a) and the mounting bolts (12) (3 pieces) to DEF injector (13), and install them to DEF mixing tube (14).

      NOTICE

      Use a new gasket.

      REMARK

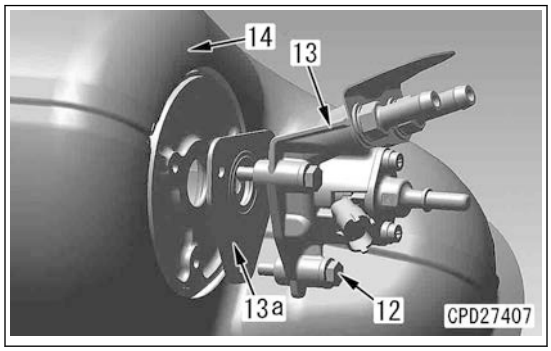
      Install the injector with no clearance between the gasket (13a) and DEF mixing tube (14) before tightening the mounting bolts (12).

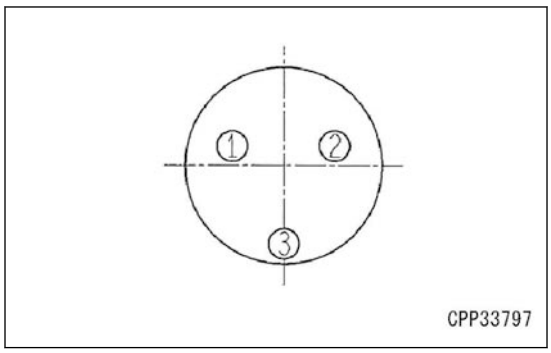


   3) Tighten the mounting bolts (12) to 6 to 8 Nm {0.6 to 0.8 kgfm} in the order of 1 to 3 in the following figure.
   4) Again, tighten the mounting bolts (12) to 6 to 8 Nm {0.6 to 0.8 kgfm} in the order of 1 to 3 in the following figure.

      NOTICE

      - **After tightening the mounting bolts to the specified torque, tighten all the bolts to specified torque again.**
      - **Be careful not to damage DEF inlet and the coolant inlet/outlet connector parts by hitting them to the parts around them, etc.**





Wiring connector

3. Remove DEF injector electrical connector cover (B) on DEF injector electrical connector side, and install the wiring connector UDM (10) according to the following procedure.
   1) Insert the wiring connector UDM (10) in the opposite direction to that of arrow (d) until click sound is heard.

Remove and Install Air Conditioner Condenser Assembly

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

⚠ Set the work equipment lock lever to LOCK position.

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

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

⚠ Ask a qualified person for collecting, adding and filling operations of the refrigerant (air conditioner gas: R134a).

⚠ Never release the refrigerant to the atmosphere.

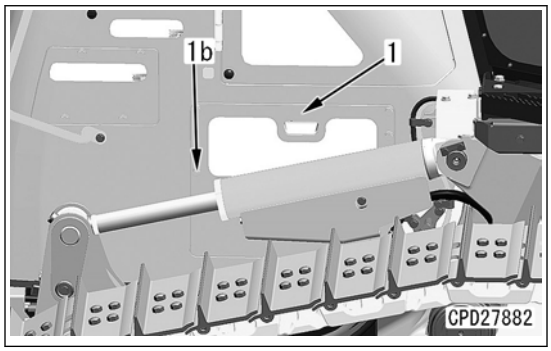
⚠ If refrigerant gas gets in your eyes, you may lose your sight. And if it touches your skin, you may suffer from frostbite. Put on protective eyeglasses, gloves, and working clothes with long sleeves while collecting the refrigerant or filling the air conditioner circuit with the refrigerant.

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

How to Remove Air Conditioner Condenser Assembly

Collecting refrigerant

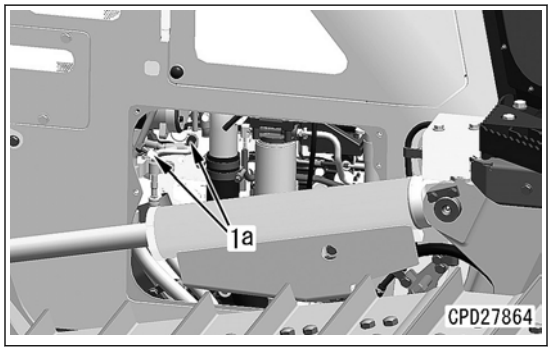
1. Remove the bolts (1b) (4 pieces), and remove the cover (1) on the left of the machine.



2. Collect the refrigerant (air conditioner gas: R134a) from the ports (1a).

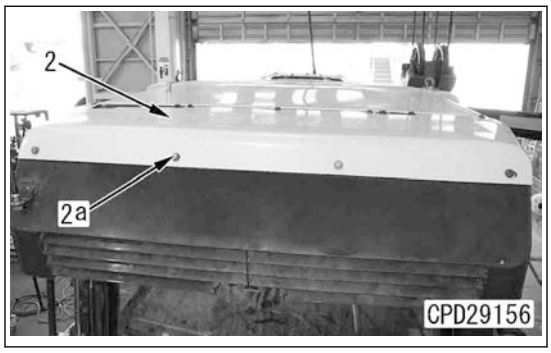
   REMARK

   Quantity of refrigerant to be collected: 1150±50 g



Cover

3. Remove the bolts (2a) (11 pieces), and remove the cover (2).



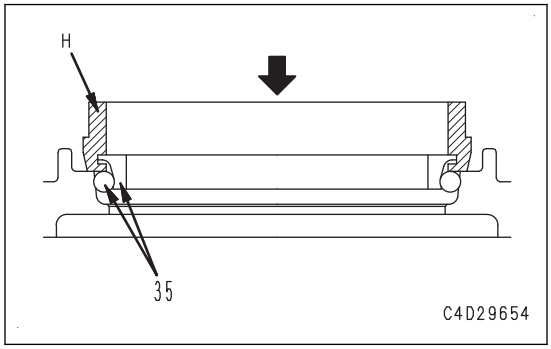
Floating seal

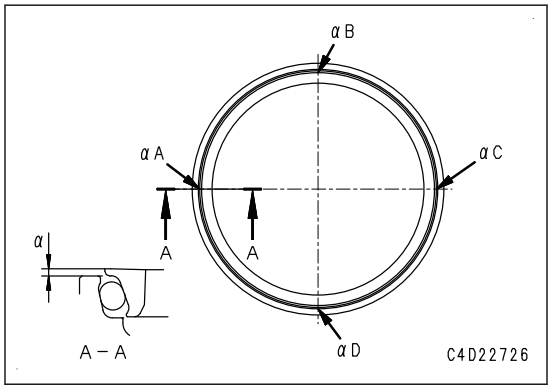
1. Install the floating seal (35) to HST motor case by using installer (H) according to the following procedure.

   REMARK

   Install the floating seal after degreasing and drying the O-ring and O-ring contacting surface completely.

   1) Push the floating seal and insert it by using installer (H).
   2) After inserting the floating seal, measure projections αA to αD (4 places) of the floating seal.
   3) Check that the maximum value of the protrusion a is 11 mm, minimum value of the protrusion α is 9 mm, and the difference between each protrusion a is 1 mm or less.
   4) After installing the floating seal, thinly apply oil (TO30) to the sliding surface.



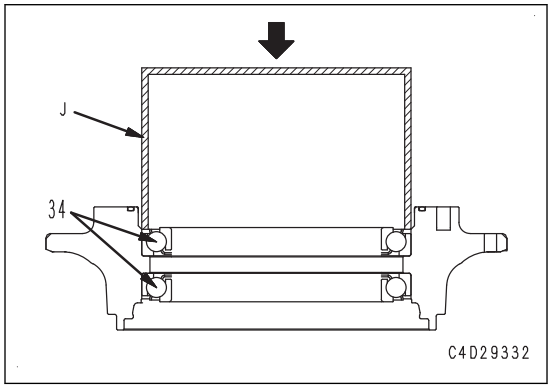


Hub assembly

2. Press fit the bearing (34) into the hub by using spacer (J).

   REMARK

   - Press fit the bearing until the outer race end surface contacts the hub securely.
   - After press fitting the bearing, check that 0.03 mm feeler gauge cannot be inserted into the gap between the outer race end surface and hub.



3. Install retainer (33) with bolts (32) (18 pieces).

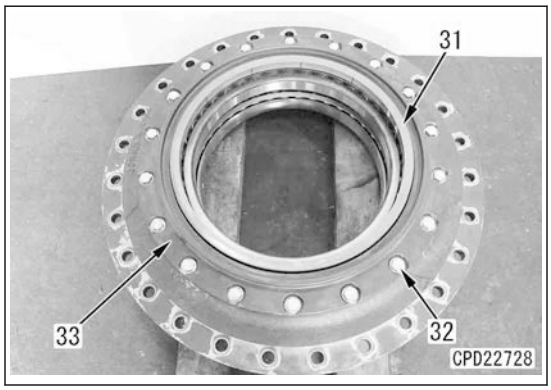
   Retainer mating face:
   Liquid gasket (LG-8)

   Bolt (32):
   98 to 123 Nm {10 to 12.5 kgfm}

4. Install floating seal (31) to the retainer by using installer (H).

   REMARK

   See step 1 for the installation procedure.



Remove and Install Recoil Spring Assembly

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

⚠ Set the work equipment lock lever to LOCK position.

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

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

Remove Recoil Spring Assembly

Track shoe assembly

1. Separate the track shoe assembly. For details, see “Separate and Connect Track Assembly”.

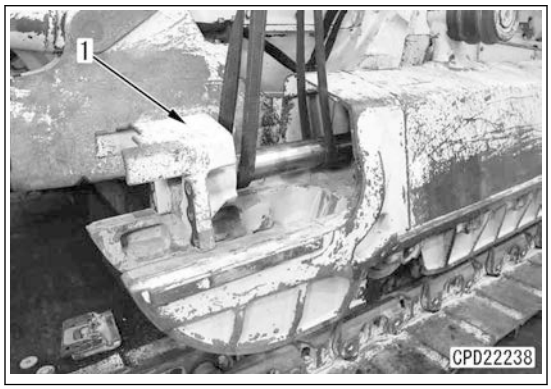
Idler assembly

2. Remove the idler assembly. For details, see “Remove and Install Idler Assembly”.

Yoke and piston assembly

3. Sling the yoke and piston assembly (1), and remove it.

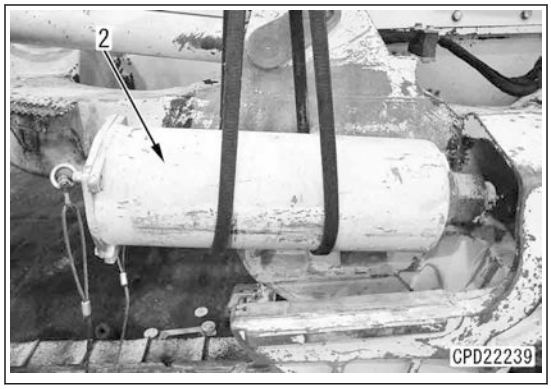
   Yoke and piston assembly (1):
   45 kg



Recoil spring assembly

4. Pull out the recoil spring assembly (2), sling the assembly, and remove it.

   Recoil spring assembly (2):
   160 kg



Separate and Connect Track Assembly

Tools for Separation and Connection of Track Shoe Assembly

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	Commercially available	Block	●	1			Fixing of track shoe
B	Commercially available	Block	●	1			

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

⚠ **Set the work equipment lock lever to LOCK position.**

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

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

Examine Before Separation of Track Assembly

Check the following items before the separation of the track shoe assembly since the separation of the track shoe assembly is very dangerous.

Lubricator

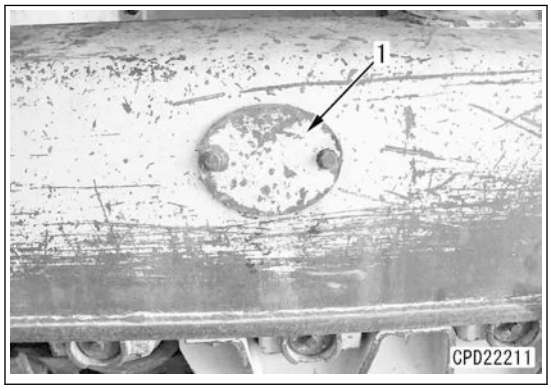
1. Remove the cover (1), loosen the lubricator (2) of the recoil spring assembly, and drain the grease.

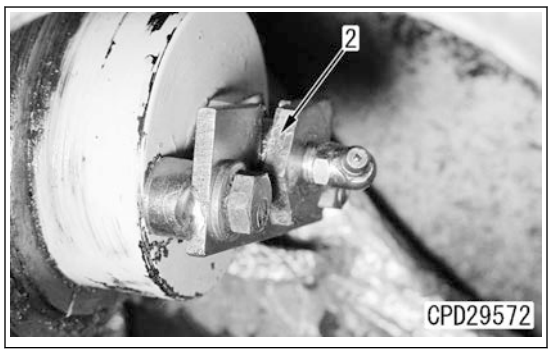
   NOTICE

   Do not loosen the lubricator by more than 1 turn.

   REMARK

   If the tension of the track shoe assembly is not decreased even by loosening the lubricator (2), move the machine backward and forward.





3. Adjust the press-fitting jig dimensions for the link press.

   Dimensions of press jig and installing dimensions

   Dimension (b): 4.7 mm

   Dimension (c): 87 mm

   Dimension (d): 100 mm

   REMARK

   - This is to maintain the protrusion dimensions of pins and bushings constant when assembling, and to keep the seal installing dimension within the specified value range.
   - Set the link receiving surface of jaw (R) vertically.
   - Using replaceable wear plate (Q) is desirable.

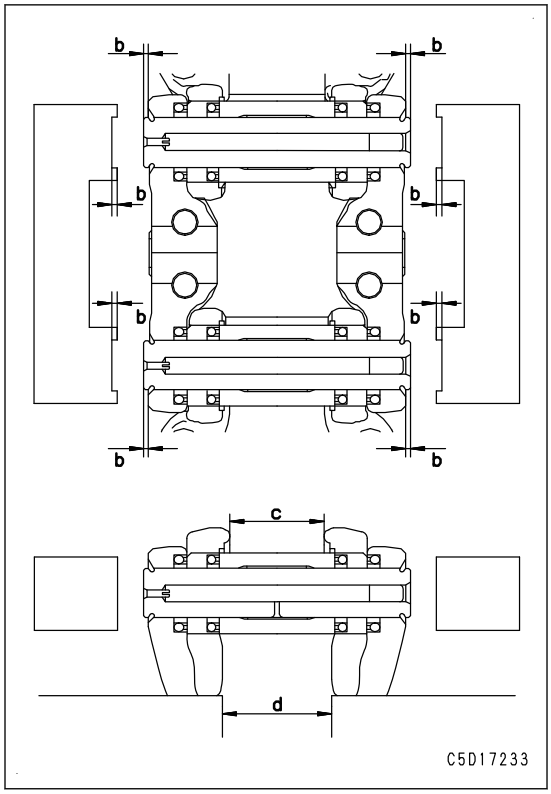
4. Adjust the relief pressure of the link press so that the pressing force of the press does not exceed the following specified value.

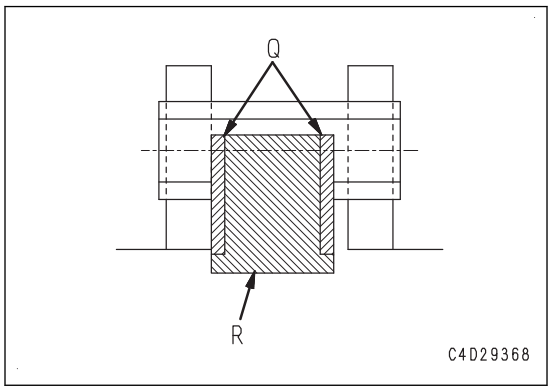
   Specified pressing force: 314 kN {32 t}

   REMARK

   Excessive pressing force may cause failures described below.

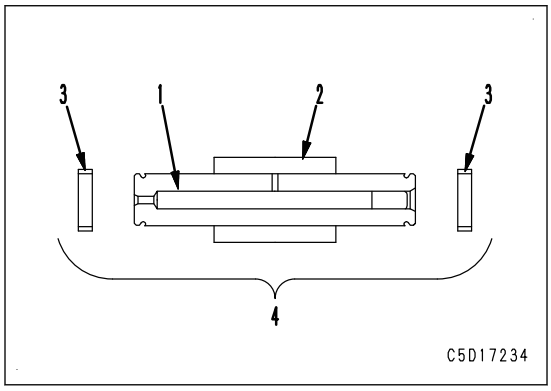
   - Be careful that excessive force pressing the spacer to the bushing may damage the spacer.
   - Abnormal wear occurs between the spacer and the bushing end surface.





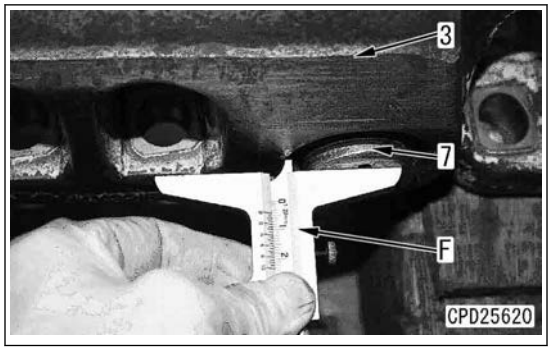
Assembly of link (for odd-numbered set of the link assemblies)

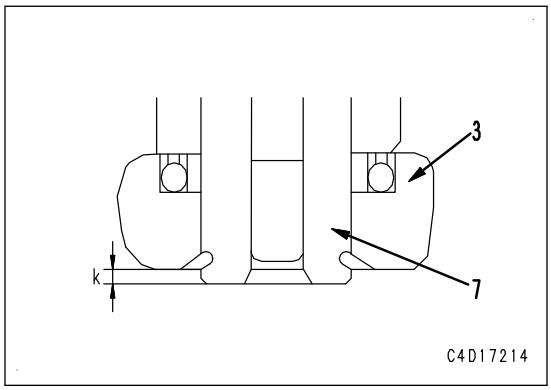
5. Assemble the pin (1), the bushing (2), and the spacers (3) (2 pieces) temporarily, and prepare the pin sub assemblies (4) (3 pieces).



9. Measure the protrusion dimension (k) of the pin (7) from the outer link (3) by using the depth gauge (F).

   Standard protrusion dimension (k): 4.7±0.2 mm



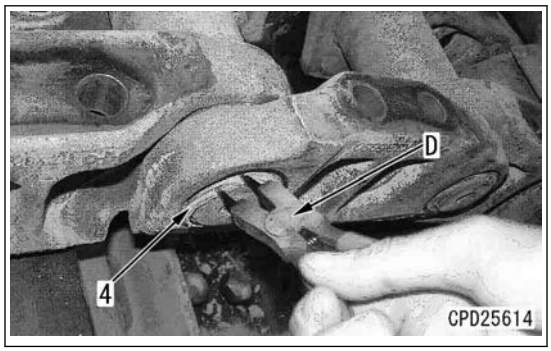


Wedge ring

10. Install the wedge ring (4) by using the snap ring pliers (D).

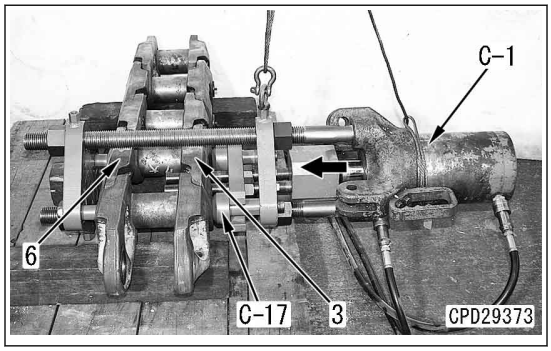
    REMARK

    - Install the wedge ring (4) with its opening facing shoe mounting side of the link.
    - Install the wedge ring so that the even height is secured toward the link side surface.

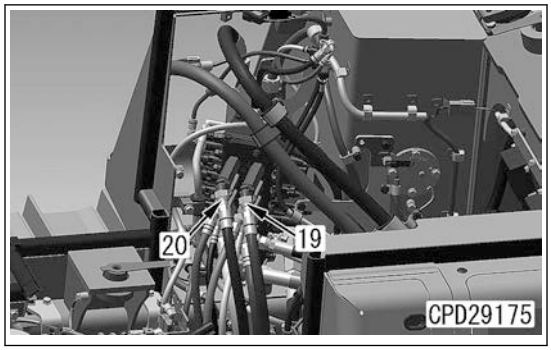


11. Sling the remover and installer assembly (C-1), and set it on the link.
12. While slinging the remover and installer assembly (C-1), perform centering of the tool so that the center positions of the pins are aligned.
13. Operate the pump assembly (A), and press the push tool (C-17) in the direction of the arrow at the following specified pressure, and bring the pin into close contact with the wedge ring.

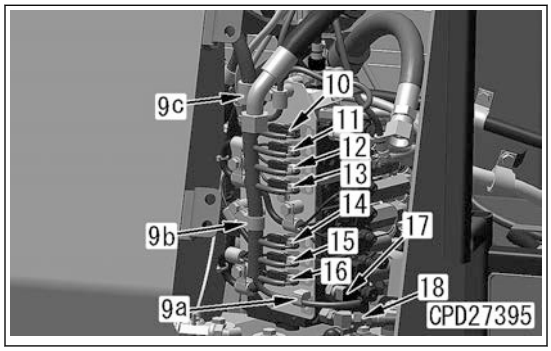
    Specified pressure: 118 to 236 kN {12 to 24 t}
14. Remove the remover and installer assembly (C-1).



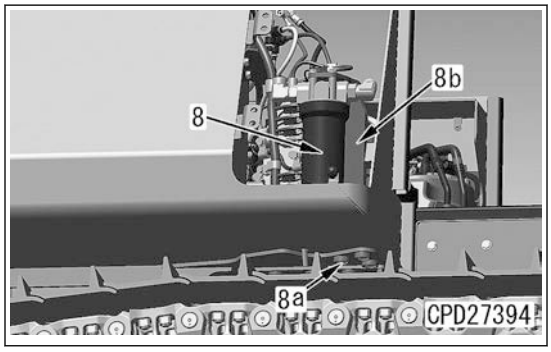
13. Connect the hoses (20) and (19).
    - Hose (20): Ripper top
    - Hose (19): Ripper bottom



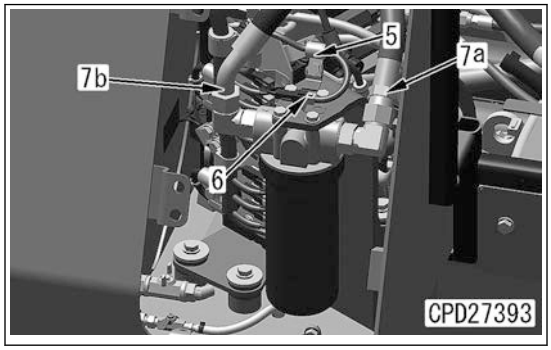
14. Connect the hose (18).
15. Connect the following connectors, and install the clips (9c), (9b), and the clamp (9a).
    - Connector WP (17)
    - Connector LU (16)
    - Connector TR (15)
    - Connector AR (14)
    - Connector FAC (13)
    - Connector LD (12)
    - Connector TL (11)
    - Connector AL (10)



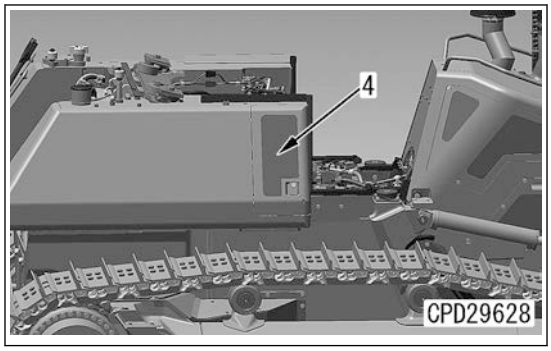
16. Install the bracket (8b) and the charge filter (8) with the bolts (8a) (3 pieces).



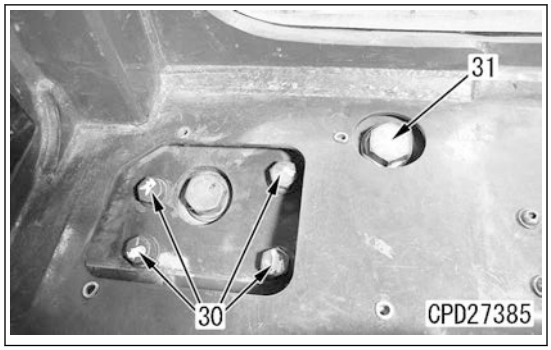
17. Connect the hoses (7b) and (7a).
18. Connect the connector (6), and install the clamp (5).



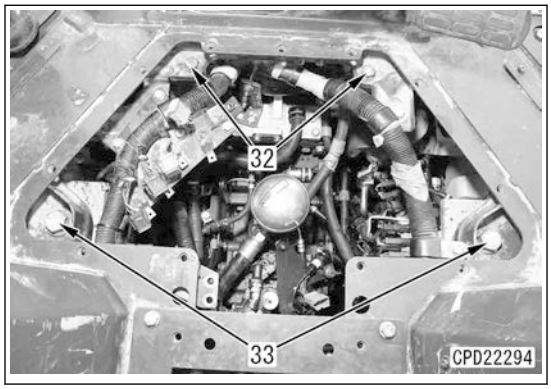
19. Close the cover (4) on the right side of the machine.



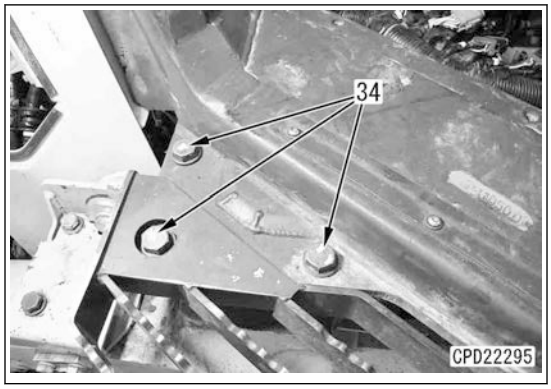
32. Remove right and left bolts (30) (4 pieces each).
33. Remove right and left stopper bolts (31).



34. Remove the bolts (32) (2 pieces).
35. Remove the stopper bolts (33) (2 pieces).



36. Remove right and left bolts (34) (3 pieces each).



37. Sling the operator's cab assembly (49), and remove it.

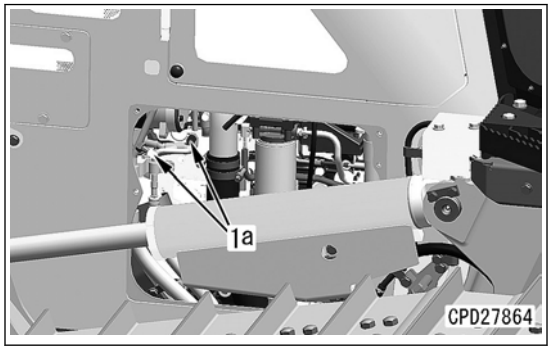
REMARK

Check that all the wirings, pipings, and clamps, etc. are disconnected before removing.

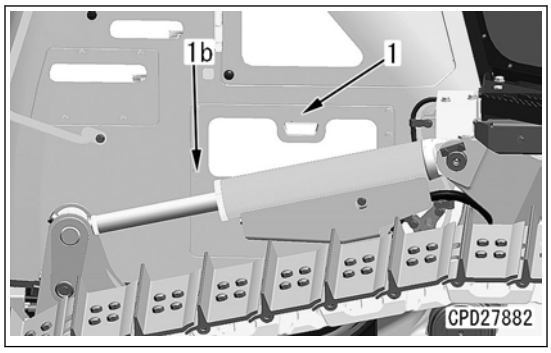
Refilling with refrigerant

29. Refill the air conditioner circuit with refrigerant (air conditioner gas: R134a) from port (1a).

    Filling quantity: 1150±50 g



30. Install the cover (1) on the left side of the machine with the bolts (1b) (4 pieces).



How to Install Mass Air Flow and Temperature Sensor

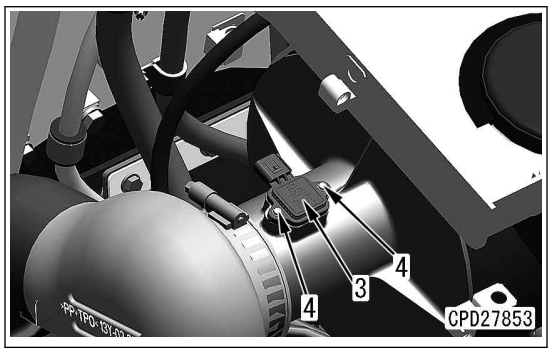
Mass air flow and temperature sensor assembly

1. Install the mass air flow and temperature sensor assembly (3) with the bolts (4) (2 pieces).

   Bolt (4):
   0.98 to 1.27 Nm {0.1 to 0.13 kgfm}

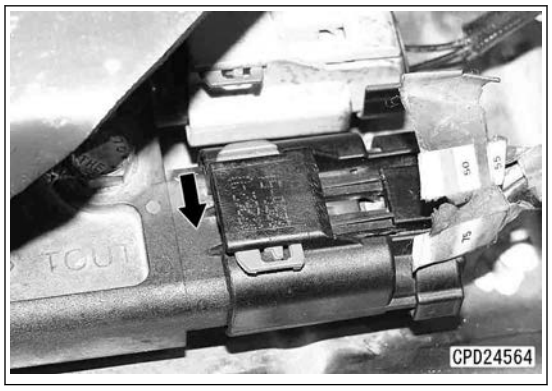
   REMARK

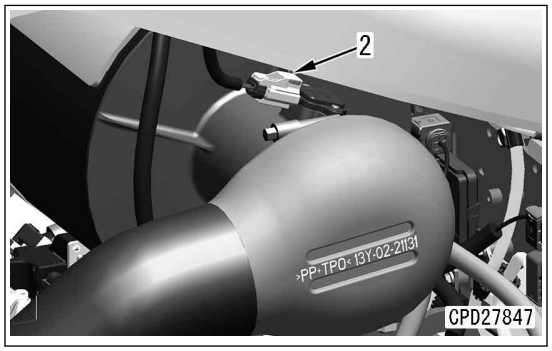
   Take extreme care to prevent dust from entering the air cleaner.



Wiring connector

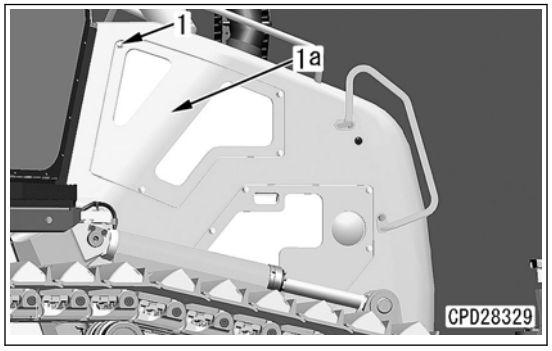
2. Connect the connector P55 (2).



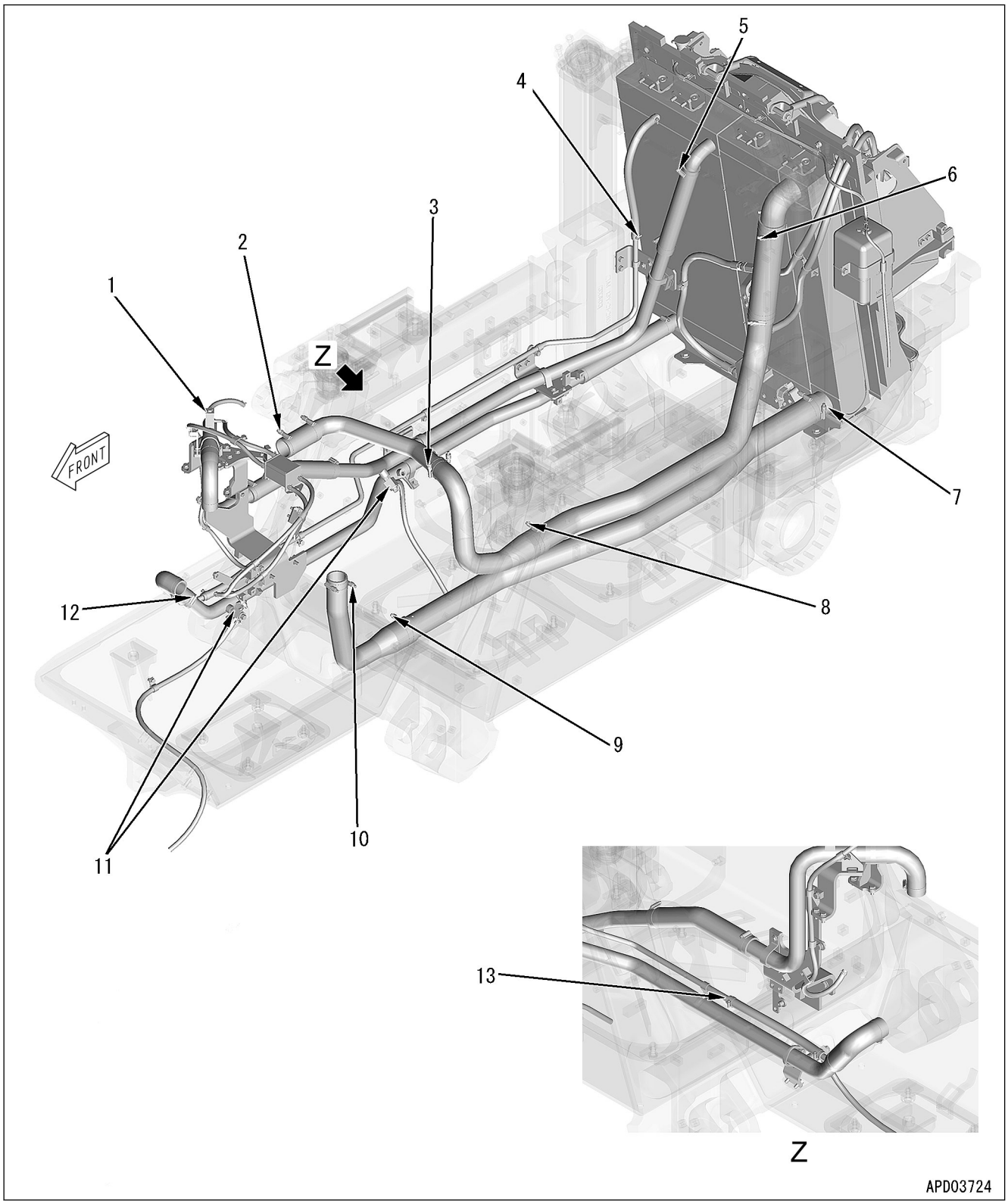


Cover

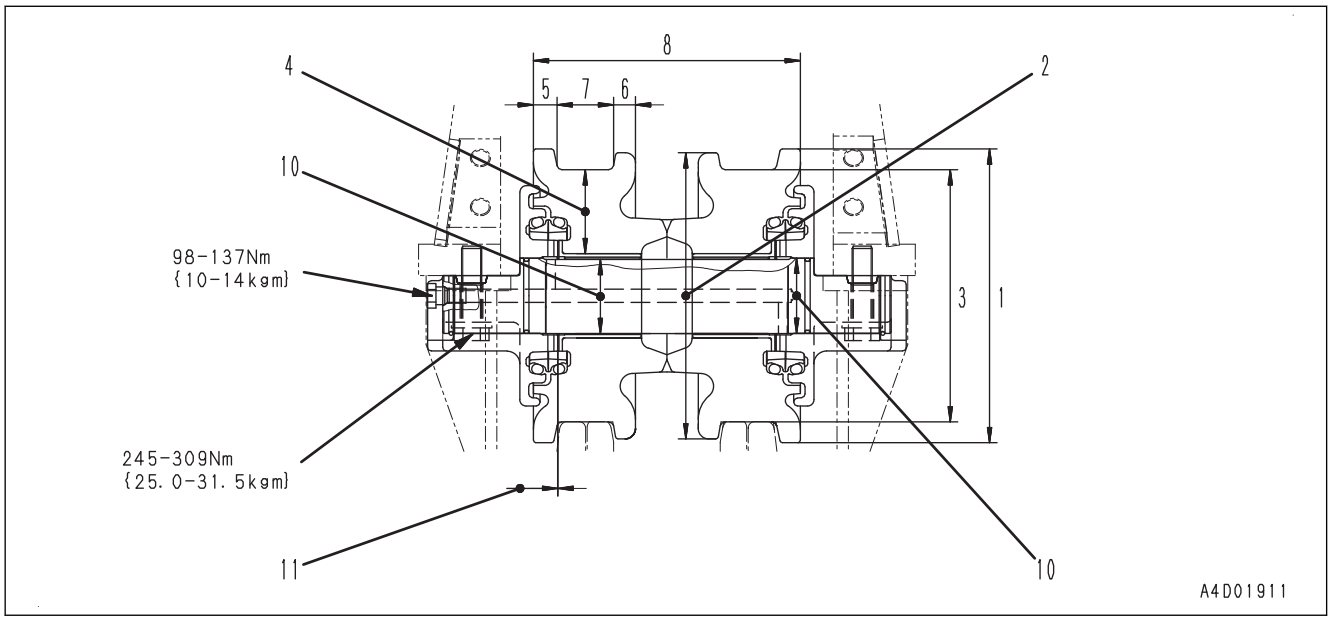
3. Install the cover (1a) on the right side of the machine with the bolts (1) (4 pieces).



Maintenance Standard for Cooling System

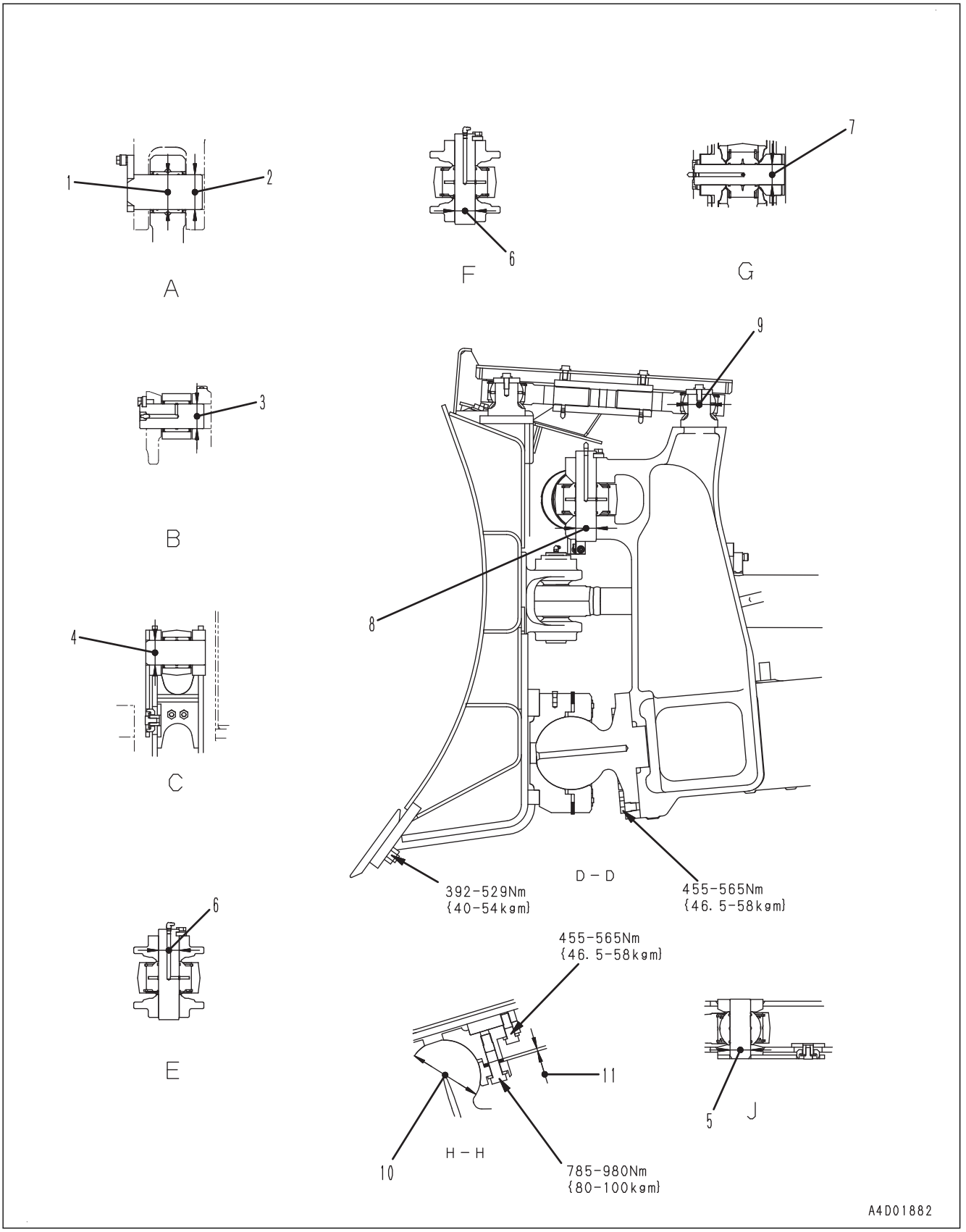


Maintenance Standard for Track Roller for PLUS Type Track Shoes (Double Flange Type)



Unit: mm

No.	Item	Criteria				Remedy
1	Outer diameter of flange (outside)	Standard dimension		Repair limit		Repair by build-up welding or replace
		233		-		
2	Outside diameter of flange (inside)	220		-		
3	Outside diameter of tread	200		164		
4	Thickness of tread	66.5		48.5		
5	Width of flange (outside)	19.5		13.5		
6	Width of flange (inside)	18		12		
7	Width of tread	43.5		-		
8	Overall width	212		-		
9	Clearance between shaft and bushing	Standard dimension	Tolerance		Standard clearance	Allowable clearance	Replace
			Shaft	Hole		
		60	-0.244 -0.290	+0.208 -0.037	0.207 to 0.498	-	
10	Clearance between shaft and collar	59.7	-0.250 -0.300	-0.160 -0.230	0.020 to 0.140	-	
11	Axial play of roller	Standard clearance		Allowable clearance		
		0.26 to 0.66		-		


1
2
A
6
F
7
G
3
B
9
8
4
C
D – D
392–529Nm
{40–54kgm}
455–565Nm
{46.5–58kgm}
6
E
455–565Nm
{46.5–58kgm}
11
10
H – H
785–980Nm
{80–100kgm}
5
J
A4D01882

- To evaporate the liquid refrigerant at lower temperature, the pressure in the evaporator must be kept as low as possible. For this purpose, the compressor sucks in the evaporated refrigerant.

Relation Between Refrigerant and Cooling Trouble

- While repeating the refrigeration cycle, the refrigerant circulates in the refrigeration circuit and dissipates the heat in the cab to the outside of the cab.
- If there is an insufficient quantity of refrigerant, all of it is evaporated while it is passing through the evaporator. This causes evaporator efficiency to deteriorate, which will result in defective air conditioning.
- If there is excessive refrigerant, not all of it is evaporated and part of it will be sucked into the compressor in liquid form, which causes the compressor to compress the liquid and may damage the components.
- If water is contained in the refrigerant circuit, it freezes in the small hole of the expansion valve and blocks the refrigerant flow to cause a cooling trouble.

A-1 Troubleshooting for Condenser Fan

Failure	Condenser fan does not rotate.
Related information	• When air does not come out air conditioner after turning the starting switch to ON position and fan switch to any position (1 to 4) other than OFF, perform troubleshooting for “TROUBLESHOOTING FOR BLOWER MOTOR SYSTEM (NO AIR COMES OUT OR AIR FLOW IS ABNORMAL)” first. • When refrigerant pressure is abnormal (such as when refrigerant is not provided), condenser fan relay is not turned on by pressure switch. (Condenser fan does not rotate.) • A connector label is not attached to a relay connector. • A T-adapter is not provided for relay and pressure switch connectors.

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective pressure switch of condenser fan	1. Turn the starting switch to OFF position. 2. Disconnect connector [4]. **REMARK** When an abnormality is detected, attach a pressure gauge to air conditioner compressor, and measure refrigerant pressure. (See “Troubleshooting by Gauge Pressure”.)		
		Resistance	Between connector [4] (male) (A) and (B)	Max. 1 Ω
2	Defective condenser fan, or defective fan switch, or open circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connector ACR3. 3. Turn the fan switch to any position (1 to 4) other than OFF.		
		Resistance	Between ACR3 (female) (85) (black) and ground	Max. 1 Ω
			Between ACR3 (female) (87) (orange) and ground Parallel connection of condenser fan resistors	Approx. 1 Ω
		1. Turn the starting switch to OFF position. 2. Disconnect connector ACR3. 3. Turn the starting switch to ON position. 4. Turn the fan switch to any position (1 to 4) other than OFF.		
		Voltage	Between ACR3 (female) (30) and (85)	20 to 30 V
			Between ACR3 (female) (87) and (85)	20 to 30 V
3	Defective heater mode relay	See “Examine Relay” and check the sound of heater mode relay ACR1 turned on.		
4	Defective relay of condenser fan	Referring to “Examine Relay”, check sounds when condenser fan relay ACR3 is turned on.		
5	Defective condenser fan	If no failure is found by check on cause 2, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connector [3], and connect T-adapter to male side.		
		Resistance	Between connector [3] (male) (1) and (3)	Approx. 2 Ω
			Between connector [3] (male) (3) and (4)	Approx. 2 Ω

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
TOPS	Tip-Over Protective Structure	Cab and canopy	This is a protective structure that intended to protect the operator wearing seat belt from suffering injury which may be caused if the cab is crushed when the machine tips over. (Roll-over protective structure of hydraulic excavator) This performance is standardized as ISO 12117.
TWV	2-Way Valve	Hydraulic system	This is a solenoid valve that switches over direction of flow.
VGT	Variable Geometry Turbocharger	Engine	This is a turbocharger on which the cross-section area of the exhaust passage is variable.
VHPC	Variable Horse Power Control	Engine control	This is a function that finely controls the maximum output of the machine so that high work efficiency and low fuel consumption rate are both achieved.

*1: Code for applicable machine model

D: Bulldozer

HD: Dump truck

HM: Articulate dump truck

PC: Hydraulic excavator

WA: Wheel loader

List of Abbreviations Used in the Circuit Diagrams

Abbreviation	Actual word spelled out
A/C	Air Conditioner
A/D	Analogue-to-Digital
A/M	Air Mix Damper
ACC	Accessory
ADD	Additional
AUX	Auxiliary
BR	Battery Relay
CW	Clockwise
CCW	Counter Clockwise
ECU	Electronic Control Unit
ECM	Electronic Control Module
ENG	Engine
EXGND	External Ground
F.G.	Frame Ground
GND	Ground
IMA	Inlet Metering Actuator
NC	No Connection